The Politics of the Future for Sustainable Energy

Controversy, Realism, and the International Energy Agency's World Energy Outlook

By

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Abstract

In this thesis I develop a generalized framework for understanding the relationship between politics and the observation of the future for sustainable energy and use it to explore the connections between politics and controversy surrounding a prominent energy future report. Given that the 'observation' of the future is instrumentally oriented towards bringing more information into present processes of decision-making, thereby intending to shape the very thing that they observe, I explore conventional perspectives on the relationship between politics and technology as an analogue for futures. Following a review of the underlying concept of the political, I adopt an approach in which politics is conceived of as 'distinction', thus noting that controversy is a reliable indicator of politicization. I then use this framework to explore the connection between politics and controversy surrounding the International Energy Agency's *World Energy Outlook*. Tracing the emergence of a controversy surrounding this report, I identify three main political themes or allegations (bias, corruption, and irresponsibility) and explore the conditions of their politicization through a series of interviews with key stakeholders in the controversy. I then explore four sites of contention through which these allegations are expressed. I conclude by discussing the findings of the 'internal' perspective with the 'external' framework, reflecting on my two primary research questions. Based both on the theoretical argument and the findings of the empirical investigation, I will argue that at the root of the politics of the future for sustainable energy is a *question of realism:* that is, what is or is not realistic to see, hope, or do about the future for sustainable energy.

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Chapter 1) Introduction

Malthus published his treatise on population in 1817, arguing that the imbalance between rates of growth in population and food production entailed that humanity would soon surpass the limits placed on the size of the population by the natural world, leading to widespread famine, disease, malnourishment and death.[1] Malthus was not without his detractors, and one of his most vehement critics was Marx, who admonished Malthus' on several grounds.[2] His main mistake, argued Marx, was to "transform historically distinct relations into an abstract numerical relation;" a relationship which "he has fished purely out of thin air, and which rests neither on natural nor on historical laws." In short, Marx alleged that Malthus contrived the tension between geometric and arithmetic growth to serve some ulterior motive of denigrating the poor, subjecting them once again to the capitalist logic of survival of the fittest, and thus benefiting the established powers-that-be. In Marx's view, limits to society did not exist as fixed external checks on growth, but rather as 'immanent' limits imposed by the mode of production in any given society.[3] "Malthusian man", he argued, is thus "abstracted" from 'real' history.[4]

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[1] T. R. (Thomas Robert) Malthus, *An Essay on the Principle of Population*, 2003, http://www.gutenberg.org/ebooks/4239.

[2] Questioning for example the legitimacy of the trends he "expounded" with "clerical fanaticism" and accusing him of given "brutal expression to the brutal viewpoint of capital." Karl Marx, "The Grundisse," in *The Marx-Engels Reader*, ed. Robert C Tucker, 2nd ed. (New York: W.W. Norton & Co., 1978), sec. F.

[3] Marx' use of the term "immanent", I suggest, can be considered as roughly equivalent to the use of term 'endogenous' in contemporary political science and economics, i.e., that the object or process that is understood as being immanent is contained within or emanates from the 'whole' in or on which it operates*, as are the forces that oppose or contradict it*. See Robert J. Antonio, "Immanent Critique as the Core of Critical Theory: Its Origins and Developments in Hegel, Marx and Contemporary Thought," *The British Journal of Sociology* 32, no. 3 (September 1, 1981): 330–45.

[4] Ibid., 276–277.

Though it may not seem the case, the dispute between Marx and Malthus has much in common with contemporary controversies concerning the future for sustainable energy. Much like Malthus' arguments concerning the disjuncture between population growth and food production, contemporary formulations of sustainability often invoke the metaphor of *balance* between opposing interests or trends as one of its core characteristics. Where Marx pointed to changes in the mode of production as a key immanent determinant of what level of population a given society could support, we now recognize the importance of both internal and external *limits* to continued development, limits set to a greater or lesser extent by the present state of technology. Lastly, in referring to processes of historical *change* as pertinent to the determination of balance and limits, Marx and Malthus' dispute presages the prominent role that forecasts, scenarios and projections of the future play in late 20th century deliberation about sustainable energy.

The aim of this study is to broaden our understanding of the politics of disputes such as the one between Marx and Malthus, though transposed to speak to contemporary concerns about the future for sustainable energy. In this introductory chapter, I will briefly state the purpose of this study and my thesis on the politics of the future for sustainable energy; outline some key concepts and considerations that inform the two primary research questions which motivate the ensuing theoretical discussion and empirical investigation; discuss the methodological choices and procedures used to address these questions; and conclude with a short overview of the structure of the remaining chapters.

1.1) Statement of Intent and Thesis

In this study, I intend to develop a generalized framework for understanding the relationship between politics and the future for sustainable energy (or visions thereof) and use that framework to explore the controversy surrounding a prominent energy future report, the International Energy Agency's *World Energy Outlook*. Based both on a theoretical argument and the findings of the empirical investigation, I will argue that at the root of the politics of the future for sustainable energy is a *question of realism* - that is, what is or is not realistic to see, hope, or do about the future for sustainable energy, a question that I argue stems from the pragmatic / instrumental character of *observations* of the future for sustainable energy.

Three important considerations should be added to this statement:

1. By 'generalized framework' (see Sections 4.3 and 5.4), I mean one that is not beholden to any *particular* energy technology, system configuration, or practice/technique of observing the future. This is not a thesis on the politics of the future for wind power, the politics of forecasting, or the politics of climate change, but rather on the politics of all visions of the future for sustainable energy that share a common goal: to bring more information (about the future) into a process of decision-making in the present, so as to influence choice and thus to shape the future itself.

2. By 'politics of' I mean: a) the relationship between politics and the thing in question (in this case, the future for sustainable energy), comprising both the *source* and *location* of politics vis-à-vis visions of the future, and; b) an account

of the nature or meaning of 'the political.' It is assumed that there is no one correct perspective on these issues, but also that any particular perspective may be blind to the politics of its own account. 'The politics' of something thus comprises both an *external* (i.e., a view on the politics of something held by those outside that thing) and an *internal* perspective (i.e., a view on the politics of that thing from those on the 'inside' of that thing) on the question.

3. This project thus has both a theoretical and an empirical component, the former involves building a framework based on existing literature and theoretical argumentation (the external perspective), and the latter requires us to deploy, evaluate and potentially modify that framework via a consideration of the perspectives of people involved in or connected to a prominent example of a controversial energy future (i.e., a case study). This thesis will therefore employ two 'modes of discussion' – a theoretical mode for chapters 2 through 5, and an empirical/case study mode for chapters 6 through 10.

The case study will focus on the emergence of controversy surrounding the International Energy Agency's *World Energy Outlook* between the years 1998 and 2010. The investigation consists both of an analysis of the primary documentation and historical record, as well as a series of qualitative, semi-structured interviews with key persons either involved in the controversy or familiar with the IEA or the Outlook. The purpose of the case study is to analyze the controversy using the framework of politics developed in the first part of the study, and to evaluate, buttress and/or modify that framework in light of the perspectives of the people 'on-the-ground' – in short, to supplement my

external analysis with an internal account of the meaning and location of politics in envisioning futures for sustainable energy.

The contribution of this thesis will be to address what I consider the *partial* and *incomplete* politics of the future for sustainable energy advanced in existing literature in related disciplines and studies. That is to say, the understanding of politics advanced in existing work is: a) not specific to the topic of futures for sustainable energy); b) too insular and uncritical of its own politics; c) not considerate of the perspectives of the people involved in the object of analysis. However, though existing accounts may be partial and incomplete, this does not entail that they are wrong. Moreover, that controversy may exist around the World Energy Outlook does not entail that the allegations that comprise the controversy are justified and legitimate. My objective in this study is to supplement and broaden our appreciation of the politics of the future for sustainable energy by looking at an important component (i.e., the observation of different 'futures') in a different light, thus adding to the set of conceptual tools with which we can interpret, observe, and manipulate the future for sustainable energy. It is not to prove or disprove any particular perspective on the relationship between politics and the future for sustainable energy, nor any specific allegation made of the World Energy Outlook.

1.2) Concepts, Questions and Methodology

The topic 'the politics of the future for sustainable energy' sits at the intersection of three very broad bodies of academic literature: development studies, 'futures' studies, and science and technology studies. In this section, I will briefly review some key

concepts from these fields that are relevant to the issue at hand and establish two primary research questions based upon them.

1.2.1) Key Concepts

The 'problem' of the future for sustainable energy is fundamentally a problem of the social condition of *modernity,* the evolution of which in the 20th century - from an early idealism, to confrontation by crises mid-century, and to the subsequent response to these crises – provides the context within which to situate both the historical development of the three fields noted above, and the current discourse and practice of sustainable energy.

Modernity can be defined as a social condition characterized by persistent upheaval (or change), generally considered to have begun circa the l7-18th centuries in Western Europe.[5] Under this condition, according to Marx, "all that is solid melts into air" – a phrase Berman uses as the title for his book on the subject, linking it with such varied objects as Goethe's *Faust* or the underdevelopment of St. Petersburg.[6] Polanyi suggests the central animus of modernity is the tension between "the gentleman's desire for improvement" and "the poor man's need for habitation," the consequence of which is to produce a "double-movement" of resistance against the process of change that enabled it.[7] As modernity stands to traditional society – rational, conscious and principled against the irrational, unconscious or conventional – "reflexive modernity" now stands to early modernity (complex, non-linear and reflexive versus simplistic, linear and unreflective),

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[5] For a discussion of modernity from its beginnings in the 17th century to its present, 'radicalised' form, see Anthony Giddens, *The Consequences of Modernity* (Stanford University Press, 1990).

[6] Karl Marx and Friedrich Engels, "Manifesto of the Communist Party," in *The Marx-Engels Reader*, ed. Robert C Tucker, 2nd ed. (New York: W.W. Norton & Co., 1978); Marshal Berman, *All That Is Solid Melts into Air: The Experience of Modernity* (London; New York: Verso, 1983).

[7] Karl Polanyi, *The Great Transformation: The Political and Economic Origins of Our Time*, 2nd Beacon Paperback (Boston, M.A.: Beacon Press, 2001).

such that it is ironically the exact expression of the original narrative of modernity, reanimated for postmodern sensibilities.[8]

A critical component of modernity is the concept of development,[9] which provides the basis for the notion of sustainable development. Thinking on the issue of development changed greatly over the course of the 20th century, broadly moving from a close association with economic and political 'modernization' (i.e., industrialization and democratization) to a greater emphasis on human-centred development (i.e., ensuring that all people have the capacity to choose a life they have reason to value).[10] For the purposes of this study, the concept of development will be considered commensurate with Polanyi's notion of "improvement", and sustainable development as the *ameliorative* desire to balance improvement with habitation so that the latter may continue to progress.[11] 'Sustainable energy', I will argue, is connected with sustainable development, not so much as a subsidiary or subservient concept (i.e., wherein a sustainable energy system is that which furthers the cause of sustainable development), but as a peer or equal, sharing roughly similar conceptual and practical origins and implications, but having some unique features that necessitate it standing on its own. Therefore, sustainable energy will be understood as entailing a balance between the

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[8] See Giddens, *The Consequences of Modernity*; Ulrich Beck, Anthony Giddens, and Scott Lash, *Reflexive Modernization: Politics, Tradition and Aesthetics in the Modern Social Order* (Stanford University Press, 1994).

[9] Michael Cowen and Robert W. Shenton, *Doctrines of Development* (London; New York: Routledge, 1996).

[10] W. W. Rostow, *The Stages of Economic Growth: A Non-Communist Manifesto* (Cambridge University Press, 1960); Colin Leys, *The Rise and Fall of Development Theory* (Bloomington: Indiana University Press, 1996); Amartya Kumar Sen, *Development as Freedom* (Oxford University Press, 2001).

[11] World Commission on Environment and Development, *Our Common Future* (Oxford University Press, 1987), http://www.un-documents.net/wced-ocf.htm essentially defines sustainable development in this way; See also James Meadowcroft, "Planning, Democracy and the Challenge of Sustainable Development," *International Political Science Review*, 1997, 167–189.

improvement of energy systems (improvement defined according to social/political processes of deliberation) with continuity of service;[12] a process rather than a state or future arrangement that we might hope to one day achieve; and, drawing from the above, a matter of conscious social choice about the developmental trajectory we wish our energy systems to follow.[13] It is, in short, about *governing change* in energy systems so as to balance 'limits' with improvement.

The science and technology studies' subfields of socio-technical systems theory and transition management are thus quite relevant to the topic at hand. Generally speaking, a socio-technical system is thought to comprise both technological and social components, facts and values, policies, regulations, and perceptions.[14] Such systems are primarily constituted through the 'regime' practices and technologies that define the present status quo, and change from one regime to the next is referred to as a *transition*.[15] Management of these transitions is informed by the theories of reflexive modernization and reflexive governance, in which the practice of envisioning future developmental trajectories plays an important role in goal and consensus formation, strategic and policy planning, and the evaluation of the sustainability of different plausible trajectories.[16] Based on the definition of sustainable energy above, we can thus situate the problem of

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[12] Godfrey Boyle, Bob Everett, and Janet Ramage, eds., *Energy Systems and Sustainability* (Oxford: Oxford University Press, 2003); Jefferson W. Tester et al., *Sustainable Energy: Choosing among Options* (Cambridge, MA: MIT Press, 2005).

[13] Meadowcroft, "Planning, Democracy and the Challenge of Sustainable Development," 167.

[14] Thomas P. Hughes, "The Evolution of Large Technical Systems," in *The Social Construction of Technological Systems: New Directions in the Sociology and History of Technology*, ed. Wiebe E. Bijker, Thomas P. Hughes, and Trevor J. Pinch (Cambridge, MA: MIT Press, 1987), 51–83.

[15] F.W. Geels, "The Dynamics of Transitions in Socio-Technical Systems: A Multi-Level Analysis of the Transition Pathway from Horse-Drawn Carriages to Automobiles (1860–1930)," *Technology Analysis & Strategic Management* 17, no. 4 (December 2005): 445–76.

[16] Jan Rotmans, René Kemp, and Marjolein van Asselt, "More Evolution than Revolution: Transition Management in Public Policy," *Foresight* 3, no. 1 (January 2001): 15–31.

the future for sustainable energy as largely one of *socio-technical transitions management*.

With that being said, the focus in this study is on the role or place of 'images of the future' in this practice. These images and visions are referred to as *futures*, in contrast to the singular term *future* that implies the existence of a one true future that can be predicted with a high degree of certainty. The term 'futures', by contrast, emphasizes the contingent, subjective and normative dimensions of the future, as well as its multiplicity.[17] The distinction between future and futures roughly corresponds to a tension within the broader field between those who conceive of the practice as more of a *science,* utilizing techniques such as forecasting, modelling or probability analysis to increase the predictive capacity of their visions of the future, and those inclined to see it as an *art*, the aim of which is to facilitate more comprehensive thinking by decision-makers about the range of possible futures, using stakeholder deliberation, scenario-building exercises, and 'backcasts' to construct their images.[18] In this study, however, I will use the term 'future' to describe individual visions or images of 'the future' (a set thereof being a set of 'futures'), and 'the future' as being simply the temporal arena in which the social/political aspects of observing futures takes place. Though a forecast of 'the future' might represent an understanding of that temporal arena as being fixed or determined, it nonetheless is one 'future' among many. Thus, the range of 'futures'

[17] Note the name of the field and its primary journal: 'Futures' Studies. I will discuss this distinction between futures and the future in more detail below, but by way of introduction see Kjell Dahle, "50 Key Works: A Beginner's Guide to Futures Literature," in *New Thinking for a New Millennium*, ed. Richard Slaughter (London; New York: Routledge, 1996); Wendell Bell, *Foundations of Futures Studies: History, Purposes, and Knowledge* (New Brunswick, NJ: Transaction Publishers, 1997); Richard Slaughter, "From Forecasting and Scenarios to Social Construction: Changing Methodological Paradigms in Futures Studies," *Foresight* 4, no. 3 (2002): 26–31.

[18] See Bell, *Foundations of Futures Studies*, chap. 4.

relevant to this study include *probable, plausible* and/or *preferable* visions of the future (and to some extent predictions), but not prophecies, visions of utopia or dystopia, divinations, and so on.[19] Therefore, what defines a 'future' for sustainable energy is not its position on this spectrum between the future and futures, but rather the intention of *the production of information about the future so as to influence decision-making in the present and thus to shape the future itself.*

Given this definition and the definition of sustainable energy as an ameliorative response to contradictions of modernity, futures for sustainable energy are fundamentally characterized, I will argue, by their *instrumentality.* This characteristic, alongside the centrality of technology to the future of sustainable energy more generally and the role of technique in producing images of the future, scientific or artistic, renders the practice of observing futures for sustainable energy *technological* in nature.[20] That is to say, the practice is situated in the centre of the animating tensions of modernity - it aims to be a pragmatic, ameliorative, *via media*. As I intend to demonstrate in Chapter 4 below,

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[19] On the 'Three Ps' of futures studies, see Wendell Bell, "Making People Responsible: The Possible, the Probable, the Preferable," *American Behavioral Scientist* 42, no. 3 (1998): 323–39. Alternatively, Marien identifies 5 'Ps': Michael Marien, "Futures Studies in the 21st Century: A Reality-Based View," *Futures* 34, no. 3–4 (April 2002): 261–81. As will become clear in the ensuing discussion, 'prophecy' does sometimes rear its head in contemporary futures studies (and in the case study below) as a kind of unscientific or non-rational vision or engagement with the future. Nevertheless, I exclude it from consideration in my discussion of politics and the future for sustainable energy for two reasons: 1) prophecy appears to be fundamentally structurally different than more common kinds of futures for sustainable energy, in that it presents a rather deterministic vision of the future that is not based on reason or empirical observation (rather, it comes from some external, omnipresent source), and; 2) perhaps because of this, though it can be used as a way of critiquing someone's observation of the future, prophecy itself is at best a marginal type of future in contemporary sustainable energy discourse and practice. While it may be that the politics outlined below are applicable to such kinds of futures, I do not explicitly intend to speak to them.

[20] On the technological as the instrumental, see W. Brian Arthur, *The Nature of Technology: What It Is and How It Evolves* (Simon and Schuster, 2009); Jacques Ellul, *The Technological Society* (Vintage Books, 1967); Martin Heidegger, "The Question Concerning Technology," in *Basic Writings : From Being and Time (1927) to the Task of Thinking (1964)*, ed. David Farrell Krell, 2nd ed. (San Francisco, C.A.: HarperSanFrancisco, 1993).

thinking on the politics of the future for sustainable energy has to date approached the problem from one or the other sides of the many different tensions and contradictions that bound it,[21] rendering most accounts *partial.* Moreover, this work has also been generally inexplicit on its use or understanding of 'politics' or the concept of the political itself, making these conventional accounts *incomplete* as well.

To address these issues, I will define a concept of the political based not on the use of power or influence to attain consensus amongst social actors, nor on the articulation or expression of difference. Instead, I will outline a view of '*politics-as-distinction*.' To make or mobilize a distinction often pits the distinguished against each other. Accordingly, the existence of controversy can be taken as probable evidence of the *politicization* of a given object, action or process. The main methodological move that informs the ensuing analysis of the underlying tensions and the implications thereof for understanding the politics of the future for sustainable energy is thus to resist siding with one or the other perspective on any given dispute or conflict. Rather, the aim is to outline a politics of the 'middle-way' between a science of *the future* and art of envisioning *futures* for sustainable energy.

1.2.2) Questions

To summarize, this study privileges no particular energy technology, technique used to 'observe' the future for sustainable energy, nor definition of sustainability.[22] It does,

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[21] The contrast between Craig Galbraith, "The Politics of Forecasting: Managing the Truth," *California Management Review* 38, no. 2 (1996): 29–43., and Thomas Baumgartner and Atle Midttun, eds., *The Politics of Energy Forecasting: A Comparative Study of Energy Forecasting in Western Europe and North America* (Oxford: Clarendon Press, 1987)., is instructive on this point.

[22] As noted above, I do exclude certain kinds of futures from consideration here (i.e., prophecies, utopias, divinations, and to some extent prediction as well). It is possible that such kinds of futures could be characterized by the politics outlined in the analysis below, though that could be an issue for

however, address its main research questions at the level of socio-technical systems, focusing on controversy around futures that are intended to assist in the governance of a transition (change) towards a more sustainable (i.e., balanced, within limits) energy future. The kinds of futures I am interested in are those that attempt to bring more information into a process of decision-making in the present in order to change the future (i.e., probable, plausible, or preferable futures). Where studies to date have addressed the politics of the future (and in rare cases the politics of the future for sustainable energy specifically) they have tended to approach the issue from a partial and/or incomplete perspective. The aim in this study is to address this by constructing a framework for understanding the politics of 'the middle' and testing it in the case of a prominent, controversial global energy futures report, the *World Energy Outlook*.

This study thus poses the following theoretical and empirical questions and sub-questions:

1.2.2.1) Theoretical Question: How can we characterize 'the politics of' the future for sustainable energy?

To discuss 'the politics of' something implies at least two components: a definition of politics, and a perspective on the relationship between politics and the thing in question (i.e., the source and location of politics vis-à-vis that thing). Of the four primary definitions of politics in the Oxford English Dictionary, this usage most closely resembles the last: "The principles relating to or inherent in a sphere or activity,

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subsequent research. In this study, I wish to confine my analysis only to the most common, contemporary forms of envisioning futures, *specifically for sustainable energy.* We do not find many instances of prophecy in this context.

especially when concerned with power and status" (i.e., typically 'the politics of').[23] Therefore, this question might be restated as 'what are the principles relating to or inherent in the activity of envisioning the future for sustainable energy that concern power and/or status in that activity? This question directs the building of a theoretical framework for understanding the various perspectives on the question of the politics of future for sustainable energy, but it also requires a more thorough consideration of the 'concept of the political' itself - a question about what it means to say 'the politics of' the future for sustainable energy.

Sub-question: What is the relationship between politics and controversy surrounding visions of the future for sustainable energy?

The latter requirement of the primary theoretical question leads to a distinction between the concept of the political and the acting out of politics - the behavioural or practical aspects of politics.[24] It often seems that the activity of politics (captured by Oxford's main definition of politics, as "the activities associated with the governance of a country or area, especially the debate between parties having power")[25] are characterized or accompanied by contestation, debate, or *controversy*. Controversy, therefore, may be a reliable indication that there are politics 'taking place.' That being said, the existence of controversy may not be sufficient to indicate that the thing in question is political (nor perhaps are all instances of politics necessarily controversial). The field of science and technology studies, from which the methodological approach in this thesis is adapted

[23] "Politics," *Oxford English Dictionary* (Oxford University Press), accessed March 1, 2014, http://www.oxforddictionaries.com/definition/english/politics?q=politics.

[24] Giovanni Sartori, "The Essence of the Political in Carl Schmitt," *Journal of Theoretical Politics* 1, no. 1 (1989): 63–75.

[25] "Politics."

(discussed below), has tended to proceed by identifying a controversy and tracing the processes by which it is closed.[26] This question seeks to invert that approach and look at how politics is connected to the expression or manifestation of controversy.

1.2.2.2) Empirical Question: What is the controversy surrounding the World Energy Outlook (WEO) and in what ways (or to what extent) can it be considered political?

The aim of the case study is both to evaluate the framework developed in the theoretical analysis, supplementing it with an 'internal' perspective - that is, one that is informed by the perceptions of the people connected in one way or another to the controversy surrounding the WEO. This question is empirical, since there is little doubt that controversy did emerge around the WEO around 2008-9, propelled by the criticisms and allegations of both academic and non-academic actors, in several cases criticisms of an overtly political nature. Not all actors, however, would perceive these allegations as legitimate, nor perceive the WEO as being 'political' in the same way. This question thus addresses the connection between politics and the WEO from an internal (though not necessarily internal to the IEA) perspective.

The controversy itself exists in the historical record - criticisms and allegations made in academic journals, in the reports and publications of NGOs and industry associations, in the media, by experts, students and practitioners, and by anonymous internal whistle-blowers. One task is to gather and present them in a historical light (that is, as a narrative of the emergence of controversy). Another task is to identify what about the controversy

[26] On the social construction of technology and the empirical programme of relativism, see Trevor J. Pinch and Wiebe E. Bijker, "The Social Construction of Facts and Artifacts: Or How the Sociology of Science and the Sociology of Technology Might Benefit Each Other," in *The Social Construction of Technological Systems: New Directions in the Sociology and History of Technology*, ed. Wiebe E. Bijker, Thomas P. Hughes, and Trevor J. Pinch (Cambridge, MA: MIT Press, 1987), 18–50.

is politically relevant – what are the main themes of the controversy, in a political sense? This question, as suggested above, will be addressed primarily by asking those connected to the controversy to reflect on both the allegations and the relationship of politics to the World Energy Outlook (though interpreted, of course, through the lens of the prior theoretical discussion).

Sub-question 1: What are the main 'sites of contention' through which these themes are expressed?

If we wish to uncover the roots of controversy surrounding the WEO, it seems reasonable we should aim to follow or trace the criticisms and allegations to their focal point or origins. A final empirical question is thus to identify the specific objects, methods, claims, projections, numbers or institutions via which controversy is expressed or in which controversy is contained. It may be one thing to note an allegation that the WEO is too optimistic about the future for oil supply, but it is another thing altogether to understand why one could make that claim or how the authors of it might defend themselves.

1.3) Methodological Approach

This study combines a *theoretical* investigation, used to produce a framework for analysis (including an argument of my own about the underlying source of controversy) and accomplished through an exhaustive review of relevant theoretical literature, with an *empirical* investigation of an instance of controversy surrounding a prominent global energy future report, based on primary and secondary documentation and a series of interviews with key actors. The case study will thus be a qualitative, almost ethnographic,

inductive exploration of controversy and politics surrounding the IEA's *World Energy Outlook*, informed (but not determined) by the theoretical analysis provided earlier.[27]

This study is thus one directed more at theory-building than theory-testing, though not in the sense of striving for a definitive law-like statement of the essential connection of politics and the future, nor in the inductive observation of some statistical regularity.[28] That being said, I do intend for my findings to be *generalizable*, in a sense, to the class of activities encompassed by my definition (observations of the future intended to produce information about it in order to influence decision-making and thus shape the future); I just do not presume that the politics I identify need always be the case.[29] This study could be considered to aim more for 'soft' rather than 'hard' theory-building (i.e., "any mental construct that orders phenomenon or inquiry into them"), accomplished through what Eckstein describes as idiographic / configurative (and somewhat 'disciplined') case study analysis.[30] Though the phrasing of the second research questions as a 'what' question suggests that a case study may not be the best method to answer it (as Yin suggests), it nonetheless does pertain to contemporary events that are outside the researcher's control.

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[27] Early work in what is now referred to as 'actor-network theory' utilized a similar ethnographic approach to studying the construction of scientific knowledge, in the laboratories in which science is practiced. See, for example, Bruno Latour and Steve Woolgar, *Laboratory Life: The Construction of Scientific Facts* (Princeton University Press, 2013).

[28] The 'nomological-deductive covering law' being the mainstay of what are often (perhaps unjustly) summarized as "positivist" inspired approaches to the social sciences, i.e., to posit a series of axioms from which can be logically derived the outcome of social or political processes. For a summary of such 'logical empiricism', see A. Wendt, *Social Theory of International Politics* (Cambridge Univ Pr, 1999), 79. For a good representation of the inductive (i.e., behavioural) approach, see Arend Lijphart, "Comparative Politics and Comparative Method," *American Political Science Review* 65, no. 3 (1971): 682–93; Robert Dahl, "The Behavioral Approach in Political Science : Epitaph for a Monument to a Successful Protest," *The American Political Science Review* 55, no. 4 (1961): 763–72.

[29] This might be considered 'analytical generalization' (i.e., generationalition from a case study to theoretical propositions) rather than statistical generalization. See Robert K. Yin, *Case Study Research: Design and Methods*, 3rd ed. (SAGE Publications, 2003), 10; chap. 2.

[30] See Harry Eckstein, "Case Study and Theory in Political Science," in *Handbook of Political Science*, ed. Fred I Greenstein and Nelson W Polsby, vol. 7 (Reading, Mass: Addison-Wesley, 1975).

Moreover, the nature of the topic and interest in analytic generalization suggests that context cannot be separated from the phenomenon of interest (i.e., politics and controversy in energy futures), thereby ruling out an experimental research design. Therefore, it is appropriate to think of the case examined here as an exploratory case study of a representative case, relying on multiple sources of evidence and benefiting from the prior development of theoretical propositions to guide data collection and analysis.[31]

This analysis is thus not intended to be "explanatory" of social / political behaviour or action in either the causal or constitutive sense as described by Wendt (i.e., the difference between asking 'why' versus 'how possible', roughly equating to an objective versus subjective ontology).[32] Neither, however, is this study 'critical' in the manner advanced by Cox, distinguishable from 'problem-solving' (i.e., explanatory) approaches to social or political questions in its desire not only to understand but to change such relations, emancipating people from the yoke of the ostensibly objective social world.[33] And, lastly, neither should it be considered a work fully in the vein of post-positivist or post-structural critique either, of the kind typically associated with Foucault or Derrida.[34] The aim is not to expose the textual (or intertextual) origins of controversy, nor to provide a politics of

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[31] See Yin, *Case Study Research*, 12–14; also 46–50 on single case studies.

[32] Wendt, *Social Theory of International Politics*, 79.

[33] Robert Cox, "Social Forces, States and World Orders: Beyond International Relations Theory," *Millennium: Journal of International Studies* 10, no. 2 (1981): 126–55.

[34] Both authors were prolific writers on many subjects, but for discussions of their methodological philosophy as it concerns social sciences, seeJacques Derrida, "Structure, Sign and Play in the Discourse of the Human Sciences," in *Writing and Difference* (Chicago, I.L.: University of Chicago Press, 1978), 278–93; Michel Foucault, *The Order of Things: An Archaeology of the Human Sciences* (Routledge, 2003).

the future that is based on the routinization, regularization, or intellectual disciplining of people through knowledge about the future.[35]

If this study is none of these things, what is left for it to be? The so-called *via media* that is often advanced is a combination of constructivist ontology (i.e., a view of the world as composed of social or subjective ideas) and a scientific (or critical) realist epistemology.[36] A scientific realist holds that even though we cannot observe causal relationships, we can make inferences, through a style of reasoning sometimes termed 'retroduction,' to the 'best explanation', based on the heuristic or practical utility of the theory advanced in that explanation.[37] Together, such an approach would concentrate on elucidating the 'social' (read: ideas, norms, values or beliefs) origins of behaviour or events, relying on a philosophy of scientific explanation that grounds the legitimacy of such an explanation on its own explanatory usefulness (i.e., broad explanatory power), rather than on a presumed metaphysical connection between ideas and the real world. Replace the word explanation with understanding (thus broadly changing the methodological approach from one of external analysis of a subject to an exploration of

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[35] For examples of such approaches in international relations, see Richard Ashley, "Untying the Sovereign State: A Double Reading of the Anarchy Problematique," *Millenium: Journal of International Studies* 17, no. 2 (1988): 227–62; David Campbell, *Writing Security: United States Foreign Policy and the Politics of Identity*, Revised (Minneapolis: University of Minnesota Press, 1998).

[36] See in particular Wendt, *Social Theory of International Politics*. It should be noted that other constructivists reject the combination of a social ontology with an empiricist or objective epistemology as tenuous at best. See Colin Wight, "Philosophy of Social Science and International Relations," in *Handbook of International Relations*, ed. Walter Carlsnaes, Beth A. Simmons, and Thomas Risse (London: Sage, 2002), 23–51. Also, Steve Smith, "Wendt's World," *Review of International Studies* 26, no. 01 (2000): 151–63.

[37] For an overview, see Richard Boyd, "Scientific Realism," in *The Stanford Encyclopedia of Philosophy*, ed. Edward N. Zalta, accessed July 12, 2012, http://plato.stanford.edu/archives/sum2010/entries/scientific-realism/.

internal perspectives on that subject, i.e., from analytical to hermeneutic), and this middle way becomes an adequate description of the case study methodology deployed here.[38]

The hermeneutic approach, represented in the social sciences by works such as Clifford Geertz's 'deep interpretation' of symbolic acts in culture,[39] views the purpose of inquiry in the social sciences as the contextual interpretation or understanding of social activity from the perspective of the individuals involved. The key distinction is that social activity does not include all behaviour: unlike purely 'reflexive' or instinctual acts, social behaviour is intentional, "meaningfully oriented" towards the behaviour of others. This approach stems from Max Weber's concept of *verstehen* which, as Tucker describes it, does not seek to understand the social world through the mental or psychological constitution of individuals *per se*, but rather how their actions towards others are reflective, or are given significance or meaning, by the nature of the social situation in which they understand themselves to be.[40] Thus, Tucker distinguishes between an 'internal' and an 'external' locus of motivation for social actions. Internal motivations, he suggests, are inner psychological 'tensions' that individuals grapple with – goals, interests, perhaps even ideas, beliefs and values. External motivation, on the other hand, refers more to the "complex of subjective meaning which seems to the actor himself or to

[38] On the distinction between analytical and hermeneutic modes of analysis in the social sciences, see Martin Hollis and Steve Smith, *Explaining and Understanding International Relations* (Oxford; New York: Clarendon Press; Oxford University Press, 1990).

[39] Clifford Geertz, *The Interpretation of Cultures: Selected Essays* (Basic Books, 1973). For an overview of this aspect of constructivism in comparative politics, see Martha Finnemore and Kathryn Sikkink, "Taking Stock : The Constructivist Research Program in International Relations and Comparative Politics," *Annual Review of Political Science* 4, no. 1 (2001): 391–416.

[40] William T. Tucker, "Max Weber's 'Verstehen,'" *The Sociological Quarterly* 6, no. 2 (April 1, 1965): 157–65.

the observer an adequate ground for the conduct in question."[41] The goal of *verstehen* is thus to understand the meaning of a social (or political) concept or act within a given social context – a context of which the actors themselves may be more or less conscious. As Tucker puts it, this approach might best be understood as,

> "A methodological tool designed to discover the nature of the situation- including in the concept, 'nature of the situation,' the coercive forces (i.e., normative prescriptions, observable values held by the different individuals composing the situation, and the apparent goals of these individuals in terms of their known values and situational norms) in which human social action takes place."[42]

When I stated above that the approach to answering my research questions requires both an external and an internal perspective, I do not mean that we must fully expose the inner, psychological motivations of the actors involved in the controversy under investigation to get at the politics of the future. Rather, I mean that a fuller appreciation (or understanding) of the politics of the future for sustainable energy can best be achieved through a theoretically informed or guided (the external) interpretation of the situation as perceived by the actors involved (the internal). In practice, this involves being aware of the complex array of divisions, groupings and networks of actors and organizations involved in any given dispute, and seeking not to ignore or preclude any from consideration from the outset. Figure 1 below provides a simplified example of the various collections of internal/external divisions involved in the controversy surrounding the WEO's estimates of future oil supply.

[41] Ibid., 160.

[42] Ibid.

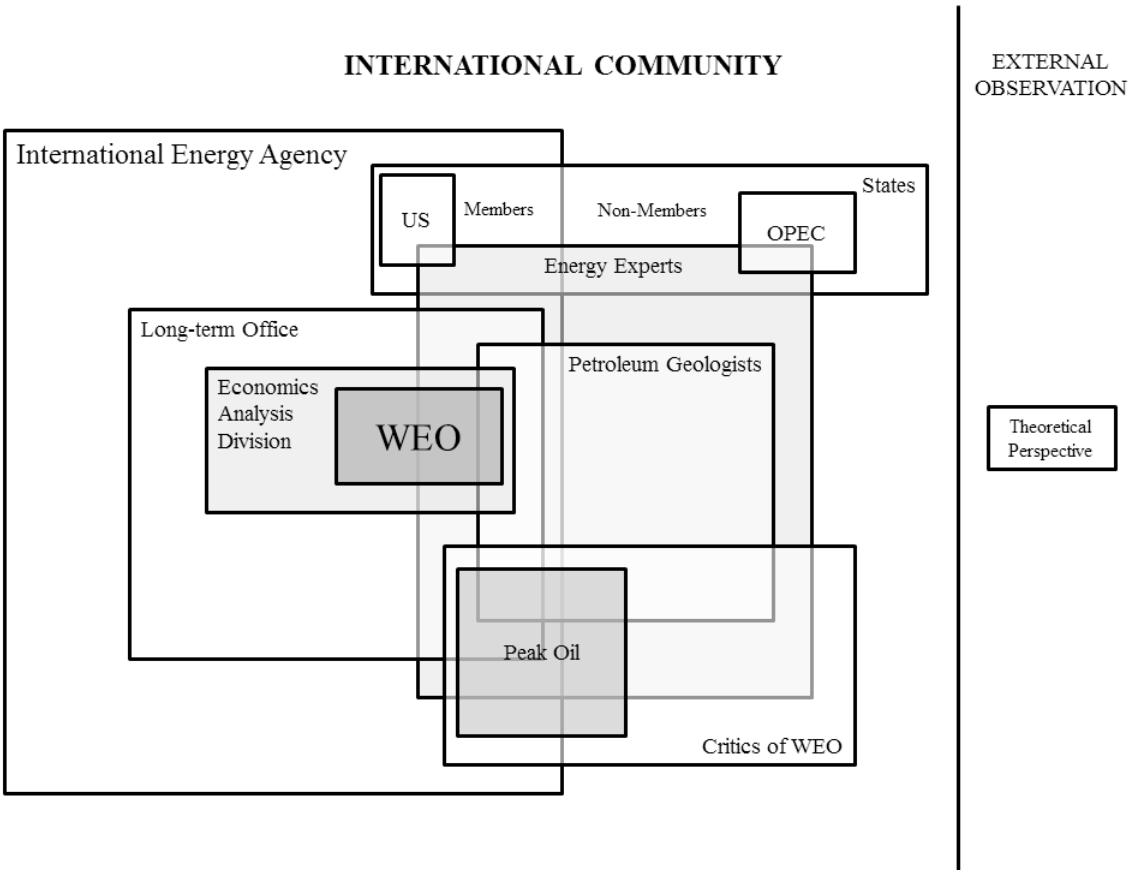

Figure 1) Challenges of an Internal/External Perspective on Politics

A main point of departure in the approach I will take to the questions noted above is that, whereas the focus in most hermeneutic analyses is the intersubjectively-*shared* understandings of the meaning or significance of some social act, concept or institution (i.e., the production, or closure towards, consensus on a shared understanding of a situation)[43], I intend to look at the obverse – the expression and enduring existence of differences. As will be discussed in further detail in Chapter 5 below, this choice is

[43] As discussed by Pinch and Bijker, "The Social Construction of Facts and Artifacts: Or How the Sociology of Science and the Sociology of Technology Might Benefit Each Other.", this is the motivation of the two schools of the social construction of technology and empirical programme of relativism. See also work on discourse and policy in Maarten Hajer, *The Politics of Environmental Discourse* (Oxford, England: Oxford University Press, 1997), http://www.oxfordscholarship.com/oso/public/content/politicalscience/019829333X/toc.html; Frank Fischer and John Forester, *The Argumentative Turn in Policy Analysis and Planning* (Duke University Press, 1993).

influenced by the conception of the political advanced by scholars in the tradition of classical realism,[44] a school generally distinguishable from the approach to communication and discourse advanced by Habermas.[45] Furthermore, my approach to developing an argument of my own regarding the nature of the politics for the future for sustainable energy will be influenced more by systems-based approaches to social or communicative processes, than by the more actor-oriented approaches generally found in constructivist comparative politics (or indeed that of the early sociology of science and technology by Pinch and Bijker or Latour and Woolgar).[46]

That being said, the subfield of contemporary science and technology studies known as 'actor-network theory', closely associated with Latour's later work, does influence the methodological approach adopted here, namely via the premise that non-human objects or processes can possess political agency alongside human ones.[47] The primary implication of this premise (for this study) is that politics is not assumed solely to be a product of ideas, interests, and/or institutions.[48] Insofar as we wish to understand the

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[44] In particular, Carl Schmitt, *The Concept of the Political*, ed. George Schwab (University of Chicago Press, 2007); Hans Joachim Morgenthau, *Scientific Man vs. Power Politics* (University of Chicago Press, 1967); E. H Carr, *The Twenty Years' Crisis, 1919-1939: An Introduction to the Study of International Relations*, ed. M. Cox (Palgrave Macmillan, 2001).

[45] As put by Bohman and Rehg, in Habermas theory of communicative action, "the telos of communication is understanding." See James Bohman and William Rehg, "Jürgen Habermas," in *The Stanford Encyclopedia of Philosophy*, ed. Edward N. Zalta, Winter 2011, 2011, http://plato.stanford.edu/archives/win2011/entries/habermas/.

[46] Closer perhaps to Nicholas Greenwood Onuf, *World of Our Making: Rules and Rule in Social Theory and International Relations* (Columbia, S.C.: University of South Carolina Press, 1989)., than the kind described by Finnemore and Sikkink, "Taking Stock : The Constructivist Research Program in International Relations and Comparative Politics."

[47] See for example Bruno Latour, *Reassembling the Social: An Introduction to Actor-Network Theory* (Oxford: Oxford University Press, 2005), chap. 2–3.

[48] It is hard to point to any one source that embodies this constitutive and explanatory trinity of social/political phenomena, though a good deal of contemporary international relations and comparative politics is informed by it. See perhaps Mark Irving Lichbach and Alan S Zuckerman, eds., *Comparative Politics: Rationality, Culture, and Structure* (Cambridge, U.K.; New York, NY, USA: Cambridge University Press, 1997)., for a broad overview of the different core components in

sources of controversy and the aspects of that controversy that are political, especially for something as technologically-laden as the future for sustainable energy, we should remain open to the inclusion of non-human (i.e., technologies, methods, datasets, models, etc.) in the set of things that could possess agency in the 'construction' of controversy. Here, non-human objects have the potential to act as "mediators" of information, receiving and modifying it to have an active role in shaping social processes or phenomena, rather than as simple "intermediaries", relaying or transmitting information without interference.[49]

Another key methodological tenet of actor-network theory is that analysis should proceed slowly, tracing connections between actors (human and otherwise) along a flat ontological plane, without 'jumping' to alternate hierarchies of explanation.[50] I understand this to entail a thorough, open-ended and inductive exploration of the things actors deem relevant or not in the construction of some event or occurrence (for us, a controversy), without precluding or limiting the scope of analysis beforehand (e.g., by excluding things from consideration *a priori*, from bounding the time/space of analysis too tightly).

1.3.1) Resources

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comparative politics, or James Meadowcroft, "Engaging with the Politics of Sustainability Transitions," *Environmental Innovation and Societal Transitions* 1, no. 1 (June 2011): 70–75., for reference to it in the context of sustainability transitions.

[49] Latour, *Reassembling the Social: An Introduction to Actor-Network Theory*, chap. 3.. An excellent example of this approach is found in Doug Mackenzie's analysis of the performativity of contemporary financial economic theory. See Donald A. MacKenzie, *An Engine, Not a Camera: How Financial Models Shape Markets* (MIT Press, 2006).

[50] Latour, *Reassembling the Social: An Introduction to Actor-Network Theory*, chap. 1.

The framing of the research questions and choice of analytical approach rules out utilization of statistical and/or other quantitative analytical resources. Though some quantitative data is included, it is mainly anecdotal or for context-building purposes. Therefore, the resources used to address the main research question are primarily qualitative, comprising three main primary sources: the textual record comprising the controversy (literature, reports, and other documentation critical of the IEA/WEO, official responses, material referenced in these sources); the World Energy Outlook itself, from the mid-1990s to the present, and accompanying documentation (e.g., descriptions of the World Energy Model, special reports, etc.); and interviews with actors who have played some part in the controversy. In circumstances where I was unable to conduct interviews on the record (e.g., with present IEA employees), I relied on triangulation amongst other sources to give as accurate a picture of the situation as possible (e.g., public interviews with Birol published in the Guardian or by BBC Hardtalk, coupled with official responses to criticism in the WEO or in Agency' News Releases).

The documentation that served as the entry point for the exploration of the controversy comprised a series of articles published by the Guardian, a report by the Energy Watch Group, and an academic journal article published in Energy Policy.[51] Numerous additional sources of criticism were identified during the course of study, as well as official responses from the IEA to some of the criticisms and a BBC Hardtalk interview by Dr. Fatih Birol, all of which will be discussed further in Chapter 6. The

[51] Fatih Birol, When will the oil run out?, interview by George Monbiot, December 15, 2008, http://www.guardian.co.uk/business/2008/dec/15/oil-peak-energy-iea; Rudolf Rechsteiner, *Wind Power in Context: A Clean Revolution in the Energy Sector* (Switzerland: Energy Watch Group, December 2008); K. Aleklett et al., "The Peak of the Oil Age - Analyzing the World Oil Production Reference Scenario in World Energy Outlook 2008," *Energy Policy* 38, no. 3 (2010): 1398–1414.

other main source of documentation was the World Energy Outlook, which has been published annually since 1993 (except in 1997). At the time the study was commenced, the latest freely available report was for 2010. Given the important structural changes that the IEA was undergoing in the mid-1990s, and the equally important changes occurring in the global energy sector at this time, the period for analysis was set from approximately the mid-1990s to the present. I therefore include WEOs between 1998 and 2010 in my analysis (with occasional reference to earlier or later WEOs), as well as accompanying documentation (descriptions of the World Energy Model and special reports) that was published during this time. Not including the 'special issue' WEOs that were published every other year between 2000 and 2007, this left eight WEOs to review.[52]

My method of identifying interview participants was one part based on the documentation regarding the controversy, one part drawn from the Acknowledgements section of the WEO itself, and one part 'snowballing.' Potential participants were approached primarily via email, in which I sent a letter of request, and ethics approval form, and a list of general issues I wished to discuss with them. The list of issues was intended to address their personal response to or perspective on the controversy as well as to capitalize on their particular area of expertise in order to gain a better understanding of the more technical and esoteric aspects of the *World Energy Outlook*. A total of 36 requests were sent, and 16 interviews were successfully completed on the record (Appendix A contains the invitation letter sent to participants, Appendix B contains a

[52] Roughly divided into three periods, defined by some shared structural and analytical features detailed below, the WEOs reviewed included: 1995, 1996, 1998 in the 'early' period; 2000, 2002, 2004, 2006 in the 'mid-period'; and 2008, 2009, 2010 in the 'late' period,

sample list of issues discussed, and Appendix C contains a list of all interview participants). In total, including all transcripts, primary and secondary documentation, 43 documents were collected, imported into *Atlas.ti* for review and analysis.

1.3.2) Challenges Experienced During Interview Process

As noted above, the interviews were intended to provide an internal perspective on the allegations that comprised the controversy around the WEO. It very quickly became evident during the course of the research, however, that there was yet another internal/external division to be made, though it was not clear along what line exactly this divide could be drawn. Some potential participants may have interpreted my approach as biased and one in particular refused to participate on these grounds. Others refused to participate because of possible legal or economic implications. A consequence (possibly owing to this challenge) was that I was unable to interview anybody currently on contract at the IEA and working on the *World Energy Outlook* (though I did manage to interview several past employees, some of whom had extensive experience working on the report). Early on in the research, I was recommended to contact the OECD legal department to determine the obligations and requirements of past and present employees of the IEA in participating in public-domain research. I was then informed that I would need to attain the approval of a team leader in order to speak with department staff. I made repeated attempts to gain such approval from the head of the department that produces the WEO (Fatih Birol, IEA Chief Economist), though I was unable to reach him directly. The person whom the legal department put me in contact, a subordinate of Birol's, was cordial and apparently made repeated efforts to get my inquiry on the discussion table, though this avenue eventually led nowhere as well.

'Selection bias' was therefore a potential consequence of the interview process, in which either only those sufficiently critical of the IEA (or the key personnel involved in producing the WEO) or those more open to considering the WEO as political felt may have comfortable speaking with me. To counter this risk, I selected as wide an array of people to interview as possible, including those with tangential connections to the WEO itself, but critically important in other key 'sites of contention'.[53] As a result, the interviews I conducted were more than enough to provide ample material with which to identify and investigate a key component of the broader controversy (e.g., oil supply projections), and wide-ranging enough to produce a comprehensive and nuanced internal perspective of 'politics.'

The experience served as a synecdoche, in a way, of the larger political controversy surrounding the World Energy Outlook, both confirming to me that the dispute was indeed heated (that is, controversial) and political (not merely a disagreement among experts), but also encapsulating the distinction-based politics which formed the core of my theoretical argument. Though I may have attained more insight into the constraints, relationships and perceptions that constitute the politics of the WEO within the IEA had I been able to speak to current officials, it seems likely that this additional information would only have supplemented the themes and issues I identify below and not introduced anything dramatically new or surprising. However, one negative consequence was that one of the main allegations discussed below - that the WEO possesses a bias *against* renewable energy, specifically wind power - could not be examined in sufficient detail

[53] For example, Dr. Thomas Ahlbrandt – lead author on the critically important US Geological Service 2002 assessment of global petroleum resources, but having little direct experience working with or on the WEO.

without the input of any present or former IEA official who had worked on this portfolio. I did manage to contact several such actors, but they politely refused to participate in the project. As a result, most of the discussion below concentrates on peak oil-related criticisms and allegations, for which there was an abundance of material and a number of people willing to participate in interviews.

1.4) Structure of the Study

Chapters 2 through 5 comprise the review of the relevant literature, the setting of definitions of the key concepts, and the development of the theoretical framework. In Chapter 2, I advance a definition of sustainable energy as emanating out of three tensions inherent in our relationship to historical change, as well as our capacity or responsibility to govern it. In Chapter 3, I critically examine that the core tension between the future/futures for sustainable energy, and identify four 'spectra' that comprise this tension. Chapter 4 argues that 'observation' of the future for sustainable energy is a technological practice, and identifies four perspectives on the relationship between politics and technology/futures. In Chapter 5, I address the partiality and incompleteness of this preliminary framework by looking at five relevant theoretical considerations of 'politics', argue for the conceptualization of 'politics-as-distinction', and outline my case for considering a 'question of realism' as lying at the heart of the politics of the future for sustainable energy.

The examination of the case study takes place in Chapters 6 through 9. Chapter 6 provides background on the International Energy Agency and its *World Energy Outlook.* In Chapter 7, I trace the development of the controversy surrounding the report between 1998 and 2010, presenting it in a historically linear form even though most of the

controversy only emerged post-2008, and identify three primary themes: an allegation of bias, of political corruption, and of irresponsibility. In Chapter 8, I examine these three themes from the perspectives of the people involved, exploring how, whether (or in what cases) they are artifacts of politics. Chapter 9 explores four ‘sites of contention’ through which these politics of the WEO are expressed: people and relationships; 'numbers'; methods; and presentation / messaging.

A theoretical reflection is provided in Chapter 10 that evaluates the framework and arguments advanced in Chapter 4 and 5, and in light of the findings in the empirical case study. It is structured in two parts, addressing both of the main research questions noted earlier. This chapter is followed by a short concluding chapter summarizing the study and identifying directions for future research.

Chapter 2) The History and Future of Sustainable Energy

The topic of this thesis rests at the interstices of three primary bodies of literature: development studies, futures studies, and science and technology studies. In this chapter, I will do three things:

1. Provide an overview of the three fields of development studies, science and technology studies and futures studies as they pertain to the topic at hand
2. Define sustainable energy as a process of governing historical change so as to achieve balance between improvement and the continuity of service and note the importance of the future to this task
3. Define 'futures' for sustainable energy as images or visions of the future made with the intention of bringing more information about the future in a process of decision-making in the present, and thus shaping the future itself

The general intent of this chapter is to situate the ensuing study of the politics of the future for sustainable energy within a particular historical context (i.e., the condition of modernity), and to define the key concepts as generally and inclusively as possible.

2.1) The Modern Roots of Sustainability

The 'problem' of the future for sustainable energy is fundamentally a problem of *modernity,* a social condition characterized by persistent upheaval (change) generally considered to have been inaugurated circa the 17-18th centuries.[54] The 'conceit' of

[54] Marx described it as the epoch in which "all that is solid melts into air." See Marx and Engels, "Manifesto of the Communist Party"; Berman, *All That Is Solid Melts into Air*.

modernity is to stand in opposition to all that was traditional, making unconscious practices conscious, replacing customs with principles, religious belief with scientific knowledge, community with society, feudalism with capitalism - in short, replacing the irrational with the rational.[55] At the outset of the 20th century, the definition of rational accorded in general with a "doctrine" of economic and political development as an autonomous, immanent historical process, governed by the principles of classical liberalism;[56] an understanding of the natural world as governed by laws, operating in the clock-like fashion suggested by Newtonian physics, coupled with a faith in the accumulative and uni-directional progress of science and technology;[57]and a general optimism, even certainty, about the future for all these facets of modern life.[58]

Over the course of the 20th century, however, the early, idealistic optimism that characterized thinking about development, the future, and science and technology, was beset by a series of 'crises' that undermined faith in the prevailing narrative of change. Classical liberalism faltered on the rocks of two World Wars, the Great Depression,

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[55] See any of the classics of early modernism: Emile Durkheim, *The Division of Labor in Society* (Simon and Schuster, 2014); Ferdinand Tonnies, *Community and Society* (Courier Dover Publications, 2011); Max Weber, *From Max Weber : Essays in Sociology.*, ed. Hans Heinrich Gerth and C. Wright Mills (New York: Oxford University Press, 1946). On conscious versus unconscious technique, see Ellul, *The Technological Society*.

[56] Cowen and Shenton, *Doctrines of Development*; Andrew C Janos, *Politics and Paradigms: Changing Theories of Change in Social Science* (Stanford, C.A.: Stanford University Press, 1986). Woodrow Wilson, "President Woodrow Wilson's Fourteen Points," January 8, 1918, http://avalon.law.yale.edu/20th_century/wilson14.asp., is often given as an example of the expression of these principles in international politics.

[57] Peter Godfrey-Smith, *Theory and Reality: An Introduction to the Philosophy of Science* (University of Chicago Press, 2009); Gabriel Almond, "Clouds, Clocks, and the Study of Politics," *World Politics* 29, no. 4 (1977): 489–522; David Bloor, *Knowledge and Social Imagery* (London: Routledge & K. Paul, 1976).

[58] See Edward Cornish, *The Study of the Future: An Introduction to the Art and Science of Understanding and Shaping Tomorrow's World* (Washington, D.C.: World Futures Society, 1977)., for an overview, H. G. (Herbert George) Wells, *The Discovery of the Future* (New York : B. W. Huebsch, 1913)., for an example.

multiple Communist revolutions in the East and enduring socialist and labour rights movements in the West.[59] The mechanistic certainty of classical physics was besieged both by Einstein's theories of relativity and the development of quantum mechanics, the latter field reinforcing the growing recognition and acceptance of the fundamental probable character of scientific theory knowledge.[60] Somewhat later, Kuhn's work on scientific paradigms and revolutions would come to challenge the narrative of accumulative progress in the sciences, as well as theories of the scientific method as a rational process itself.[61] As the century progressed, 'modernization theories' of economic and political development (which construed the process as consisting of well-defined universal stages of industrialization and democratization as experienced in the West), could not account for the varied experiences of countries throughout the 'developing' world, in many of which the ostensibly natural process of development had become corrupted.[62]

Thinking about the nature of the future and the knowledge that we might have of it was also changing during this time. The damage done to liberal idealism by the two World Wars and Great Depression also took its toll on the optimistic, technological

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[59] See Carr, *The Twenty Years' Crisis, 1919-1939*.

[60] See Ian Hacking, *The Emergence of Probability: A Philosophical Study of Early Ideas about Probability, Induction and Statistical Inference*, 2nd ed. (Cambridge ; New York: Cambridge University Press, 2006)., on the historical processes leading up to the contemporary acceptance of the fundamental probability of the world, as expressed by C.S. Peirce in the late 19th century.

[61] Thomas Kuhn, *The Structure of Scientific Revolutions*, 3rd ed. (Chicago, I.L.: Chicago University Press, 1996)., whose work is often contrasted with the Popper's account of method of scientific discovery in Karl Popper, *The Logic of Scientific Discovery*, 2005.

[62] Rostow, *The Stages of Economic Growth*., is an oft-cited example of modernization theory. Emergent challengers at the time, drawing attention to the empirical variation in modernization processes, include Barrington Moore, *Social Origins of Dictatorship and Democracy : Lord and Peasant in the Making of the Modern World* (Boston: Beacon Press, 1966); Raúl Prebisch, *The Economic Development of Latin America and Its Principal Problems* (United Nations Department of Economic Affairs, 1950).

utopianism of early 20th century science fiction.[63] In the ensuing Cold War era, thinking about the future became imbued with a much stronger strategic purpose, in which it was perceived as risky to rely on only one possible vision of the future. [64] Scholars concerning themselves with the practice of predicting or forecasting the future of technology were becoming increasingly aware of the differences between assessing the future for social and political phenomena and prediction in the more "exact" sciences.[65] A lot of this thinking was influenced by the rational choice and game-theoretic methodologies being developed at the RAND Corporation, representing in some respects a more militant formulation of the earlier, softer rationalism of pre-war liberal idealism.[66] That being said, similar developments were taking place in Europe at the same time, particularly France, wherein the notion of the multidimensionality of the future was gaining a foothold. Here the aim was to further the study and practice of prospective analysis or *foresight* - a more open-ended engagement with the future with more social and democratic objectives than the more strategic scenarios developed by Kahn - an initiative advanced in particular by philosophers Gaston Berger and Bertrand de Jouvenel,

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[63] Wells, as noted, was one such technological optimist who became increasingly pessimistic as the 20th century went by (See Cornish, *The Study of the Future: An Introduction to the Art and Science of Understanding and Shaping Tomorrow's World*.) Another oft-cited example of the optimism about the future prevalent at the time, though more in the domain of the future of social and political progress is Edward Bellamy, *Looking Backward, 2000-1887* (Houghton, Mifflin and Company, 1888)., in which the author envisions a future American socialist utopia in the year 2000.

[64] See, for example, Herman Kahn, *Thinking about the Unthinkable* (New York: Avon Books, 1962); Herman Kahn, *On Thermonuclear War* (Transaction Publishers, 2011).

[65] Olaf Helmer and Nicholas Rescher, "On the Epistemology of the Inexact Sciences," *Management Science* 6, no. 1 (1959): 25–52. For early thinking on technological forecasting, see Colum Gilfillan, "The Prediction of Technical Change," *The Review of Economics and Statistics* 34, no. 4 (1952): 368–85. Both papers outline methods or techniques for assessing the future of inherently more uncertain social processes and developments.

[66] On this, see S. M. Amadae, *Rationalizing Capitalist Democracy: The Cold War Origins of Rational Choice Liberalism* (University of Chicago Press, 2003). Also, Helmer, Rescher and Kahn were all employees of RAND when they published the works cited in the previous two footnotes.

who both founded organizations and journals in the late 1950s and early 1960s to further the field.[67]

Critical changes were also taking place in the global energy system in the early 20th century, changes which worked to destabilize the 19th century order that had been based primarily on coal. In 1900, coal was by far the dominant form of primary energy - accounting for 95% of global commercial energy consumption (in exajoules) with an annual production of only 800 megatonnes.[68] By mid-century, however, oil had come to challenge coal for primary energy dominance and, unlike the latter, resources for the former where not distributed evenly across the globe. Though the U.S. had largely dominated the early period of the nascent oil industry,[69] discovery of the world's few "super-giant" oil fields (primarily in the Middle East and North Africa) had all but been fully accomplished by 1950, demonstrating that over 50% of the world's oil resources lay outside of direct Western political control.[70] In 1950, Saudi Arabia threatened to nationalize its resources on the heels of similar developments in Venezuela, and in 1960 the Organization of Petroleum Exporting Countries (OPEC) was formed.[71]

Broadly speaking, we might characterize the crises, challenges and contradictions that beset 'modernity' around the mid-20th century as that paradigm (to borrow Kuhn's term)

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[67] See "About Us - History," *Futuribles: Analyse et Prospective*, n.d., http://www.futuribles.com/en/qui-sommes-nous/a-propos/histoire/. For a fuller though slightly later account of the thinking behind this approach, Bertrand de Jouvenel, *The Art of Conjecture*, trans. Nikita Lary (New York, N.Y.: Basic Books, 1967)., or Cornish, *The Study of the Future: An Introduction to the Art and Science of Understanding and Shaping Tomorrow's World*., for a retrospective overview.

[68] Vaclav Smil, "Energy in the Twentieth Century: Resources, Conversions, Costs, Uses, and Consequences," *Annual Review of Energy and Environment* 25 (2000): 25, 28.

[69] Daniel Yergin, *The Prize: The Epic Quest for Oil, Money & Power* (Simon and Schuster, 2011).

[70] See *60 Years: BP Statistical Review of World Energy, 1951-2011* (London, UK: BP, 2011)., for some charts on the distribution of world resources at mid-century.

[71] Francisco Parra, *Oil Politics: A Modern History of Petroleum* (I.B.Tauris, 2004).

butting up against the *limits* of its capacity to account for the 'real' world. Kuhn referred to the same kinds of challenges to the conduct of normal science under a paradigm as 'anomalies' – observed empirical phenomena for which a paradigm could not account - and so in one sense we can consider the limits that destabilized early 20th century rationalism about development, science and technology, and the future as *external* to the modern condition.[72] While it may be that some limits may have initially been seen as anomalous (that is, unexpected and/or exogenous to the condition of modernity) however, it increasingly became the case that the empirical crises and contradictions faced by modernity were in fact of its own making.

The evolution of concerns about environmental limits to population and economic growth between the early 1960s and late 1970s is a case in point (concerns which, it should be noted, relied extensively on projections or scenarios for the future to make their point). M.K. Hubbert, for instance, successfully predicted the peak of U.S. oil production (which occurred in 1971) in a presentation he gave to the American Petroleum Institute in 1956. His method for doing so was heavily 'top-down', however, and thus did not include much endogenous determining factors of peak oil production. [73] Similarly, Paul Ehrlich's concerns about the impending "Population Bomb" in the 1970s was, much like Malthus' much earlier warning of the same looming problem, not extensively based on factors internal to the condition of modernity (for instance, acknowledging neither the role technology can play in increasing food production nor the role that modern political

[72] Kuhn, *The Structure of Scientific Revolutions*.

[73] M. King Hubbert, "Nuclear Energy and Fossil Fuels," in *Publication No. 95* (presented at the Spring Meeting of the Southern District Division of Production, American Petroleum Institute, Plaza Hotel, San Antonio, TX: Shell Development Company, 1956). Also, Kenneth S Deffeyes, *Hubbert's Peak : The Impending World Oil Shortage* (Princeton, N.J.: Princeton University Press, 2001)., for a thorough discussion of Hubert's method.

or economic institutions might play in perpetuating food insecurity).[74] By the time the well-known report *Limits to Growth* was published however, thinking about the underlying causes of such problems had changed. *Limits* was both funded by and methodologically-influenced by the Club of Rome, an organization that, as stated in their founding manifesto, was founded upon the perspective that it was the particular analytical / reductive mindset characteristic of early 20th century science that was responsible for the failure to address problems of environmental degradation, resource depletion and poverty.[75] The world systems model developed by Jay Forrester at MIT and used by Donald and Donella Meadows to conduct the analysis for *Limits* was designed according to this imperative.[76]

In short, a shift was taking place from the interpretation of crisis and limits as external to the condition of modernity to identifying the internal or endogenous factors that played a role in causing or creating them. The same was true of the transition from modernization to dependency theory in development studies. Influenced by the work done by Prebisch and Singer cited above, scholars working in this tradition broadly sought to explain the state of underdevelopment in a Latin or South American countries, not on the basis of failings internal to the countries in question but rather on the manner

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[74] Paul Ehrlich, *The Population Bomb* (New York, N.Y.: Ballantine Books, 1968)..

[75] Club of Rome, "The Predicament of Mankind: Quest for Structured Responses to Growing World-Wide Complexities and Uncertainties," 1970, http://sunsite.utk.edu/FINS/loversofdemocracy/Predicament.PTI.pdf.

[76] See D. H Meadows et al., *The Limits to Growth* (New York: Universe Books, 1972). H. S. D. Cole, *Models of Doom: A Critique of The Limits to Growth* (Universe Books, 1973)., for a critique of the model.

in which they were integrated into the prevailing, global capitalist system.[77] Like the *Limits to Growth* study, these approaches often took a systemic approach to the problem, drawing attention to the distinction between the economic core and the developing periphery and in particular the economic and political relationships between the two.[78] Similarly, Bloor's 'strong programme' in the sociology of science renounced earlier work that had conceived of false beliefs or pseudo-science as a product of some failure to abide by the correct scientific method , and instead seeking to explain - via the same *internal* social processes - the establishment not of justified true belief but "whatever people take to be knowledge."[79] In other words, Bloor sought an explanatory framework for the construction of knowledge that was impartial to the retrospective truth or falsity of that knowledge. Influenced by Bloor's programme, subsequent work in science and technology studies thus took a more ethnographic approach to understanding the actual processes of social interaction involved in the construction of scientific facts.[80]

The collection of varied approaches, perspectives and practices of engaging with the future was at this time just beginning to be formalized as the academic discipline known today as 'Futures Studies.' Two of the main journals, *Futures* and *Social and Technological Forecasting*, were both established in the late 1960s, and in 1973 the World Futures Studies Federation was founded (at a meeting of Jouvenel's *Futuribles* group) to further advance the discipline. Several key works were published around this

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[77] See Andre Gunder Frank, "The Development of Underdevelopment," in *Imperialism and Underdevelopment*, ed. Robert I Rhodes (New York: Monthly Review Press, 1970); Frantz Fanon, *The Wretched of the Earth.* (New York: Grove Press, 1965).

[78] Immanuel Maurice Wallerstein, *The Modern World-System*, Studies in Social Discontinuity (New York: Academic Press, 1974); Paul Baran, "On the Political Economy of Backwardness," in *Imperialism and Underdevelopment: A Reader*, ed. Robert I. Rhodes (New York: MR, 1970).

[79] Bloor, *Knowledge and Social Imagery*.

[80] Latour and Woolgar, *Laboratory Life*.

time that serve of a canon of sorts for the discipline, including Jouvenel's *Art of Conjecture*, Polak's *Images of the Future*, Jantsch's *Technological Forecasting*, and Bell and Mau's *The Sociology of the Future*.[81] What these works generally held in common, a point buttressed by the name of the discipline itself, was a concern for and belief in the importance of social/cultural and/or subjective constructions of images of *futures,* in contrast to the technocratic prediction of 'the future'.[82] Moreover, they also tended to perceive the study and practice of futures as having a social or normative purpose – not strictly for building knowledge, but for expanding mental horizons, facilitating more inclusive discussion about the desired future and, in particular, for influencing, creating or shaping the future itself. As Bell and Mau noted,

> "We suggest that the effort to study the future is itself an effort to be relevant to the socially important questions. It is relevant partly because the struggle to control the future frequently defines what is important now, and mostly because it is in the future to be that the ultimate judgement of what is important now will be made. The study of the future...can bring one closer both to the struggle and to the emergent future itself."[83]

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[81] Jouvenel, *The Art of Conjecture*; Erich Jantsch, *Technological Forecasting in Perspective: A Framework for Technological Forecasting, Its Techniques and Organization* (Washington, D.C.: Organization for Economic Cooperation and Development, 1967); Fred Polak, *The Image of the Future*, trans. Elise Boulding (Amsterdam; New York: Elsevier Scientific Pub. Co., 1973), http://books.google.com/books?id=LBJmAAAAMAAJ; Wendell Bell and James A. Mau, *The Sociology of the Future: Theory, Cases, and Annotated Bibliography* (New York: Russell Sage Foundation, 1971).

[82] Bell, *Foundations of Futures Studies*; Cornish, *The Study of the Future: An Introduction to the Art and Science of Understanding and Shaping Tomorrow's World*.;

[83] Bell and Mau, *The Sociology of the Future*, chap. Preface., as well as the Editor's own article within the volume, Wendell Bell and James A Mau, "Images of the Future: Theory and Research Strategies," in *The Sociology of the Future: Theory, Cases, and Annotated Bibliography*, ed. Wendell Bell and James A. Mau (New York: Russell Sage Foundation, 1971), 6 – 44.

In the next section, I will discuss how the concept of sustainable development (and thus sustainable energy) emerged out of the context of the 'crises' that faced modernity at roughly mid-20th century.

2.2) Development, Sustainability and Energy

Though some authors trace the roots of the concept of sustainability back to the 19th century or earlier, the roots of sustainable development lay in the crises of 1960s and 1970s noted above.[84] Kidd, for instance, traces the origins of concept to a preparatory document used in a series of Woodlands Conferences, funded and organized by Texas geologist George P. Mitchell (Club of Rome member and later pioneer in hydraulic fracturing) in the early 1970s.[85] The UN Environment Program was established at the 1972 Conference on Human Environment in Stockholm and in 1974, the UN Conference on Trade and Development (UNCTAD), in Cocoyoc, Mexico, produced the Cocoyoc Declaration, which stated:

> "It has proved impossible to meet the 'inner limits' of satisfying fundamental human needs. On the contrary, more people are hungry, sick, shelterless and illiterate today than when the United Nations was first set up. At the same time, new and unforeseen concerns have begun to darken the international prospects. Environmental degradation and the rising pressure on resources raise the question whether the 'outer limits' of the planet's physical integrity may not be at risk."[86]

The first explicit reference to sustainable development is found in the 1980 World

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[84] See J. A.D Pisani, "Sustainable Development: Historical Roots of the Concept," *Journal of Integrative Environmental Sciences* 3, no. 2 (2006): 83–96.

[85] C. V Kidd, "The Evolution of Sustainability," *Journal of Agricultural and Environmental Ethics* 5, no. 1 (1992): 1–26.;

[86] Keith Pezzoli, "Sustainable Development: A Transdisciplinary Overview of the Literature," *Journal of Environmental Planning and Management* 40, no. 5 (1997): 549.

Conservation Strategy (subtitled "Living Resource Conservation for Sustainable Development") of the International Union for the Conservation of Nature (IUCN), commissioned by the UNEP and the World Wildlife Fund.[87] The foreword contrasted the "reality of resource limitation" and the needs of future generations with the limitless ability of people to both create and destroy, suggesting that the "escalating needs of soaring numbers" have induced a short-sighted exploitation of natural resources. In its summary of the principles of sustainable development, it notes that "development and conservation operate in the same global context, and the underlying problems that must be overcome if either is to be successful are identical", calling for (among other things) all countries to introduce "conscious population policies" with the aim to "achieve a balance between numbers and the environment."

Motivated by both the 1972 conference in Stockholm and the IUCN strategy, the UN General Assembly affirmed the creation of the independent 'World Commission on Environment and Development' in 1984, chaired by the former Prime Minister of Norway Gro Harlem Brundtland. The report of the commission published in 1987 *Our Common Future* contained the most commonly cited definition of sustainable development:

> Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains within it two key concepts:
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> - the concept of 'needs', in particular the essential needs of the world's poor, to which overriding priority should be given; and

[87] International Union for Conservation of Nature and Natural Resources, *World Conservation Strategy: Living Resources for Sustainable Development* (IUCN-UNEP-WWF, 1980).

- the idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and future needs[88]

This definition efficiently expresses several key attributes of the 'sustainability' ethic as it had been developing since the early 1970s: 1) that sustainable development must meet the needs of the present as well as the future, implying that current living standards, poverty, and lack of access to resources and energy services entail that 'development' has to this point been unsustainable; 2) intergenerational equity (e.g., not comprising the ability of future generations to meet their needs), implying that there is or may be a trade-off between present and future generations' satisfaction of their needs and desires that necessitates striking some 'balance' between the two; 3) the recognition of (albeit potentially flexible) 'limits' that are a function of both internal technological potential and external environmental boundaries.[89] There are, however, a few more points worth noting about this conception of sustainable development.

"The first thing to notice about sustainable development", according to Meadowcroft, "is that what is to be sustained is not a particular institution, a specific pattern of activity, or a given environmental asset, but rather a process, that is, the process of 'development.'"[90] The concept is simultaneously both conservative and not – it does not call for a break with modernity (indeed, it wishes to see the condition furthered) but at the same time it recognizes the need for change, for deliberate invention in the otherwise undirected process of development society was on in the present. In short, though the

[88] World Commission on Environment and Development, *Our Common Future*.

[89] W. M Lafferty, "The Politics of Sustainable Development: Global Norms for National Implementation," *Environmental Politics* 5, no. 2 (1996): 185–208.

[90] Meadowcroft, "Planning, Democracy and the Challenge of Sustainable Development."

future course of present development was unsustainable, there may be alternative futures for development. Sustainable development, as Meadowcroft notes, thus implies "a conscious process of social choice to select and realize a preferred, and sustainable, development trajectory."[91]

As will be discussed in more detail in the following chapter, the distinction between the future we would have without intervention and the future we could have with it – indeed, the recognition of multiple possible futures, given our powers of conjecture and causal force over the future – was in many ways a product of the evolution in futures studies that had taken place throughout mid-century, moving from its earlier determinism to a greater recognition of the contingency of the future.[92] By the 1970s, therefore, the nascent concept of sustainable development was able to contrast the unsustainable present course with the possibility of more desirable alternatives, thereby rendering the future of sustainability a matter of "social choice."

Amory Lovins' contrast between a 'hard' and 'soft' trajectory of development in energy is a good example.[93] A hard energy path, according to Lovins, followed along the present trend of large-scale, centralized production coupled with inefficient use of energy, whereas a soft energy path would be based on renewable sources of electricity, efficiency gains, and decentralization. Because it was difficult to envision a soft energy path when trends seemed to be pointing in the other direction, Lovins described his future as "backwards-looking analysis." This method would later become known as backcasting:

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[91] Ibid., 170.

[92] Jouvenel, *The Art of Conjecture*., is an exemplary expression of this transition, as will be discussed below.

[93] Amory B. Lovins, *Soft Energy Paths: Toward a Durable Peace* (Friends of the Earth International, 1977).

creating visions of desirable futures and then working backwards from them to determine how they might be achieved.[94] This approach had a precursor in what Janstch referred to as a "normative" technological forecast: whereas traditional forecasting sought to make probabilistic statements about future current trends in technology, a normative technological forecast was intended to "spur innovation" by thinking about what future technologies might be possible, given the current state of the art.[95] The manner in which Lovins and later 'backcasters' would deploy the technique, however, was intended more to facilitate learning about the dimensions of present social problems or challenges and, accordingly, recognition that there could be alternate possible futures.[96]

It should also be noted that Lovins was responding not only to the environmental or social problems that might be associated with the continuation of the present, 'hard' energy trajectory, but also to the energy insecurity that might accompany that path – insecurity that had at the time been brought front and centre by the first 'oil crises' of the 1970s, triggered by OPEC's oil embargo against the U.S. in 1973. This crisis was, like those noted earlier, a direct consequence of the early 20th century paradigm that characterized the energy policy of many industrialized counties. Scott refers to this paradigm as the "optimistic-passive" approach to energy policy, defined by the largely "uncoordinated and independent actions" that had led to the reliance on cheap oil imports across much of the industrialized world, such that 'cheap oil' was the effective national

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[94] See John Bridger Robinson, "Energy Backcasting: A Proposed Method of Policy Analysis," *Energy Policy* 10, no. 4 (1982): 337–44, doi:10.1016/0301-4215(82)90048-9.

[95] Jantsch, *Technological Forecasting in Perspective*.

[96] John Bridger Robinson, "Future Subjunctive: Backcasting as Social Learning," *Futures* 35, no. 8 (2003): 839–56. Also, see Peter Schwartz, *The Art of the Long View: Paths to Strategic Insight for Yourself and Your Company* (New York; London: Currency Doubleday, 1996)., on the use of scenarios to expand the 'mental maps' of decision-makers

energy policy of many developed countries in the early 20th century.[97] Once it had become clear (i.e., post-1973) that the optimistic-passive policy approach was no longer tenable and, in hindsight, foolish - perhaps even irresponsible – members of the OECD created, through the International Energy Programme (I.E.P) treaty, the International Energy Agency "to promote secure oil supplies on reasonable and equitable terms."[98] Though the creation of an oil sharing system was at the time a core prerogative of the IEA (the details of which comprise the first 4 of the 8 core chapter of the I.E.P), other objectives included working closer with oil companies and improving relations with oil producing countries, establishing and maintaining an information system on global oil markets, and facilitating long-term policy coordination among its members to reduce dependence on imported oil.[99] This last objective entailed, presaging in some respects Lovins' distinction between energy trajectories, the coordinated pursuit of alternative options to the energy status-quo.[100]

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[97] Richard Scott, *IEA, The First 20 Years: Origins and Structure*, vol. 1 (Paris: OECD/IEA, 1994), sec. 2:23.. Though Scott notes that awareness of the insecurity of this condition was growing leading up to 1973, several assumptions prevented countries from deviating from the paradigm: the assumption that producers needed to sell more than consumers needed to buy, and that threats of the producers were not therefore serious; that short-term profit and quick payoffs were what the producers wanted; that there were vast remaining resources to be found; or that OPEC could not coordinate an effective embargo in any case. See also S.2:32; 2:25; 2.29-30.

[98] Organization for Economic Cooperation and Development, "Agreement on an International Energy Program (as Amended 25 September 2008" (OECD, September 25, 2008), http://www.iea.org/about/docs/iep.pdf.. For more on the history of the IEA, see Ulf Lantzke, "The OECD and Its International Energy Agency," *Daedalus* 104, no. 4 (1975): 217–27; Scott, *IEA, The First 20 Years: Origins and Structure*; Richard Scott, *IEA, The First 20 Years: Major Policies and Actions*, vol. 2, 3 vols. (Paris: OECD/IEA, 1994); Richard Scott, *IEA, The First 20 Years: Principal Documents*, vol. 3, 4 vols. (Paris: OECD/IEA, 1994).

[99] See Chapters, 6, 8, 5 and 7, of Organization for Economic Cooperation and Development, "Agreement on an International Energy Program (as Amended 25 September 2008."

[100] The IEP notes four possible measures: conservation; development of alternative sources (either domestic supplies of fossil fuels, or nuclear/hydroelectricity); cooperation on research and development on new technology (primarily nuclear-based, though 'solar energy' is also mentioned); and uranium enrichment. See Ibid., chap. VII.

Returning to sustainable development, a second thing to note about it is that it is ambiguous – in particular on the question of 'balance' between potentially conflicting interests or goals. As Meadowcroft explains, since "what is to be sustained in sustainable development is the process of improvement rather than any particular institution, practice or environment, an activity that is not itself sustainable could be a part, even an essential part, of an ongoing movement that was sustainable."[101] In other words, the long-term goal of sustainability may nevertheless involve short-term trade-offs between the different economic, social or environmental imperatives. The issue of intergenerational equity is a case in point because it is open to contrasting interpretation on the 'optimum' balance to strike; a dispute operationalized in the economic modeling of the costs of climate change or policies to address it through the notion of "time preference discounting", i.e., the rate at which we discount the value of future wealth vis-à-vis present wealth. The contrast between the Stern Review of climate change (using a discount rate of zero, based on an ethical imperative to future generations) and Nordhaus' analysis in *A Question of Balance* (who argues the discount rate should be set according to empirical observed rates of return on capital investment if we wish to conduct objective analysis of the costs of climate change) demonstrates how ambiguity can lead to interpretative conflict in the assessment of the future for, and policy implications of, climate change.[102]

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[101] Meadowcroft, "Planning, Democracy and the Challenge of Sustainable Development," 167.

[102] Nicholas Stern and HM Treasury, *The Economics of Climate Change: The Stern Review* (Cambridge, UK: Cambridge University Press, 2007).. Nordhaus is actually quite critical of the Stern Review, suggesting it, "should be read primarily as a document that is political in nature and has advocacy as its purpose." See William Nordhaus, *A Question of Balance : Weighing the Options on Global Warming Policies* (New Haven Conn.: Yale University Press, 2008), 176.

Indeed, Lafferty suggests that the interpretative ambiguity of sustainable development renders it an "essentially contested" concept, which he defines (quoting Connelly) accordingly:

> "When the concept involved is appraisive in that the state of affairs it describes is a valued achievement, when the practice is internally complex in that its characterisation involves reference to several dimensions, and when the agreed and contested rules of application are relatively open, enabling parties to interpret even those shared rules differently as new and unforeseen situations arise, then the concept in question is an 'essentially contested concept.'"[103]

These qualities, Lafferty argues however, are exactly what make the concept of sustainable development an effective *normative* goal in international politics, even though each country may have contrasting interpretations of the norm.

Though ambiguity may serve the concept of sustainable development well in its function as normative, aspirational goal for actors to rally around, it does complicate things when it comes to the more practical questions of what it really entails and how to go about attaining it. Whereas differences in ethical, cultural or political leanings may lead to contestation on the normative side of sustainable development, here interpretations may also vary according to disciplinary background. In a practical, policy setting sustainable development is *interdiscursive* as well. Hajer describes interdiscursivity as a policy problem around which the 'discourse' (categorizations, concepts, theories, etc.) involves knowledge from many different academic disciplines.[104] Such differences can lead to conflict during the process of "discourse

[103] Lafferty, "The Politics of Sustainable Development."
[104] Hajer, *The Politics of Environmental Discourse*.

institutionalization", or the process of translating theoretical concepts into concrete policies. Story lines, Hajer suggests, can help to overcome discursive fragmentation and closure during this process, potentially leading to the creation of "discourse coalitions" - groups of actors with different disciplinary backgrounds but sharing nonetheless a commitment to a story-line they all find plausible (i.e., it 'sounds right').[105]

Both 'balance' and 'limits' are, not surprisingly, highly interdiscursive aspects of sustainable development. The example given earlier of the contrast between Stern and Nordhaus is demonstrative of some of the difficulty with balance; on the issue of limits, the distinction between "strong" and "weak" sustainability is exemplary. Though the division between strong and weak sustainability can refer to many different debates within economics,[106] at its core is the issue of technological progress and economic growth –namely, the question of substitutability amongst factors in a given economy's production function.[107] A weak sustainability advocate might argue, generally speaking, that technological advance progressively enables either human capital to be substituted

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[105] Ibid., 62–65. The intentional construction of story-lines, narratives, or shared images of the future is one technique of the kind of "reflexive governance" that might help overcome the ambiguity of sustainable development. On that, see Gordon Walker and Elizabeth Shove, "Ambivalence, Sustainability and the Governance of Socio-Technical Transitions," *Journal of Environmental Policy & Planning* 9, no. 3 (September 2007): 213–25.

[106] Beckerman, for example, refers to the position of weak sustainability as holding that resource depletion is not a problem so long as sufficient restitution is made to future generations, a formulation which renders the position equivalent with "conventional" problems of welfare maximization in economics. Strong sustainability, by contrast, allows for no resource depletion – a condition he finds "morally repugnant." Beckerman may be working with straw-man caricatures of either position, however. See W. Beckerman, "'Sustainable Development': Is It a Useful Concept?," *Environmental Values* 3, no. 3 (1994): 191–209; Herman Daly, Michael Jacobs, and Henryk Skolimowski, "Discussion of Beckerman's Critique of Sustainable Developemnt," *Environmental Values* 4 (February 1995): 49–70; W. Beckerman, "How Would You like Your'sustainability', Sir? Weak or Strong? A Reply to My Critics," *Environmental Values* 4, no. 2 (1995): 167–79.

[107] Eric Neumayer, *Weak versus Strong Sustainability: Exploring the Limits of Two Opposing Paradigms* (Northampton, MA: Edward Elgar Publishing, 2004). On the basic components of the standard production function, as well as for some history on the topic of economic growth, Robert J. Barro and Xavier Sala-i-Martin, *Economic Growth* (MIT Press, 2004).

for depleted natural capital (resources) or the use of more abundant resources in place of the depleted one. This process mitigates the limits to economic growth. A strong sustainability advocate would respond that there are limits to what can be substituted for what, that human capital and natural capital are in fact complementary not substitutes, and regardless there are other limits to economic growth besides resource depletion (like pollution, population growth, etc.) The difference between these two perspectives aligns closely with that between conventional or "neoclassical" theories of the economy and economic growth on the one hand;[108] and ecological economics on the other, which, conceiving of the economy as an energy system constrained by entropy, advocates for attaining a "steady-state" in which economic growth is eliminated.[109]

In sum, sustainable development is a response to the recognition of 'limits' to the continuity of development as it had been understood in the early 20th century. It is essentially contested and interdiscursive, normative and practical, and is a process not a state. What are the implications of this for arriving at a definition of sustainable energy? One approach to answering that question is simply the concept in relation to sustainable

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[108] An additional distinction in 'conventional' theories of economic growth exists between the older, neoclassical view advanced by Solow in which technological progress is an 'exogenous' parameter in the production function, and more contemporary formulations by economics like Romer in which the technological factor is endogenized through factors like 'human capital'. See R. M Solow, "A Contribution to the Theory of Economic Growth," *The Quarterly Journal of Economics* 70, no. 1 (1956): 65–94; Paul M. Romer, "Endogenous Technological Change," *The Journal of Political Economy* 98, no. 5 (October 1990): S71–S102; Barro and Sala-i-Martin, *Economic Growth*.

[109] On the 'steady-state', see Herman Daly, *A Steady-State Economy*, SDC Reports & Papers (London, UK: Sustainable Development Commission, April 24, 2008); T. Jackson, *Prosperity without Growth: Economics for a Finite Planet* (Earthscan/James & James, 2009). The introduction of the concern for entropy in economics is often traced to N. Georgescu-Roegen, "Energy and Economic Myths," *Southern Economic Journal* 41, no. 3 (1975): 347–81. Georgescu-Roegen argues that then mainstream economics (the neoclassical variant advanced by Solow) possesses an overly mechanistic world-view that ignores the underlying thermodynamic foundations of all economic processes. The systems-perspective advanced by Georgescu-Roegen was an important influence on the ecological economics further developed by Daly and others. See Herman E. Daly, "Georgescu-Roegen versus Solow/Stiglitz," *Ecological Economics* 22, no. 3 (September 1997): 261–66.

development; that is, a sustainable energy system is one which better facilitates meeting today's needs without jeopardizing the capacity of future generations to do the same.[110] While this is certainly a tenable strategy in some respects, it will not be the approach adopted in this study. For this I give three principal reasons. For one, defining sustainable energy as subservient to sustainable development only passes the 'definitional buck' to sustainable development and in particular to 'development'. As was suggested in the overview provided in S.2.1 above the definition of development is itself contested, and while this may not be a problem for arriving at a working definition of sustainable energy, the futures we would be interested would be essentially futures for sustainable development (or for how energy systems can serve sustainable development), not for sustainable energy. Secondly, though energy systems certainly are important, if not central, to the process of sustainable development, to align the two too closely risks downplaying any unique or internal aspects of energy systems that are not strictly about increasing living standards, decreasing poverty, increasing economic growth or whatever other measure of development is used. Energy systems are, after all, systems that exist to provide some sort of function or service; their sustainability should also entail their ability to continually provide that function or service. Lastly, given the history of global energy system governance, our definition of sustainable energy should encompass concerns about security as well as environmental, economic or social aspects of sustainability if it truly aims to be general and inclusive.

The overview of sustainable development was not for naught however, since I propose to define sustainable energy as conceptually equivalent to sustainable

[110] This is the approach of Meadowcroft, "Planning, Democracy and the Challenge of Sustainable Development."

development – indeed, the effective aim of this section is define the notion of sustainability as it pertains to both development and energy. Drawing on the discussion in S.2.1, I therefore suggest that the contemporary notion of sustainability should be understood as an ameliorative move to balance the normative idea of or desire for progress with the real, practical constraints and limits to that pursuit – in short, to govern a process of historical change so as to ensure the continuity of that change. As Polanyi described it, this tension between the desire for *improvement* on the one hand and the need for *habitation* on the other was the core animating feature of the 'Great Transformation' (i.e., the transition to modernity).[111] Improvement (as per the doctrine of development noted earlier) required intervention in society only so that the natural course of progress could then occur, the *rearrangement* of society according to natural laws of history, human nature, and political economy. This required "dis-embedding" social relations from their traditional mores and customs so as to realize the "liberal creed."[112] The consequence of this dis-embedding was to produce a "double-movement" however, a countervailing political response to re-embed political and economic relations. The increasing strain between the dis- and re-embedding of social relations led in part to the "20 years crises" of classical liberalism in the early 20th century.[113] It is thus the interplay of these forces that animates modernity, and produces the crises that threaten to disrupt it – sustainability aims to prevent that from occurring by balancing progress and limits.

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[111] Polanyi, *The Great Transformation*, chap. 3.

[112] Ibid., chap. 18–21.

[113] On the 20 years' crises, see Carr, *The Twenty Years' Crisis, 1919-1939*. On the 'embedded liberalism' that prevailed in the post-war era in international governance, John Gerard Ruggie, "International Regimes, Transactions, and Change: Embedded Liberalism in the Postwar Economic Order," *International Organization* 36, no. 02 (1982): 379–415.

In the context of energy this suggests three things: 1) that the progressive improvement of systems should be balanced with the need for continuity of service to attain 'sustainability'; 2) that sustainability is in fact not a state that can be achieved, but a process of maintaining this balance, and; 3) that sustainable energy is, like sustainable development, an issue of social choice regarding the trajectory of change we are or wish to be on. I will outline these characteristics below. It should also be noted, however, that in conceiving of sustainable energy and sustainable development as conceptually similar but practically distinct, the conflicts stemming from the ambiguity of sustainable development above (e.g., Nordhaus v. Stern on the intergenerational balance and ethical versus empirical foundations for modeling; Daly versus Beckerman on the questions of substitutability and growth) - essentially the distinction between strong and weak sustainability - remains applicable to the question of sustainable energy.

As Boyle et al., note, no one needs or wants energy per se, but rather the services that it can be used to provide.[114] The improvement of an energy system is, however, not necessarily commensurate with the improvement of services (either providing more services, the same services more efficiently, or providing services to more people). Indeed, improvement can refer to any intentional intervention in the present 'trajectory' of energy system development – if improvement is seen to require more renewable energy, then the process of introducing that should not jeopardize the ability of electricity systems to continue providing the same level of service (with the same reliability) as at present. As put by Tester et al., sustainable energy entails a state of "dynamic immutability," in which "desired energy-derived benefits are available without term,

[114] A non-trivial point made in Boyle, Everett, and Ramage, *Energy Systems and Sustainability*.

owing to technologic and policy measures that evolve both rapidly and substantially, in response to evolving human and environmental needs."[115]

Tester's emphasis on "dynamic immutability" illustrates the second point – this balance is a process, not a state. Threats to the continuity of service can be either internal or external, but are generally direct to the system. The deterioration of infrastructure or depletion of a resource are examples of internal threats to continuity, while a supply embargo imposed by a political opponent or a hurricane disrupting refineries in the Gulf of Mexico would be an external threat. Indirect threats to energy sustainability on the other hand are those that may not threaten the continuity of service *per se*, but are nonetheless primarily a result of the current arrangement and/or operation of present systems (e.g., as climate change, driven in large part by predominance of fossil fuels in contemporary energy systems, threatens the continuity of service in many other systems but not, perhaps, energy). Sustainable energy thus requires the perpetual anticipation and response to all these 'threats.'

Lastly, sustainable energy, to paraphrase Meadowcroft on sustainable development, requires "a conscious process of social choice to select and realize a preferred, and sustainable, development trajectory."[116] As is clear from the first two criteria, the kinds of energy systems we might wish to make more sustainable are neither wholly normative nor strictly practical – they comprise both technology and technological/energy policy and regulations, standards of service provision and reliability and ideas about how to improve service provision, facts about the availability or safety of a resource or

[115] Tester et al., *Sustainable Energy*, 8.

[116] Meadowcroft, "Planning, Democracy and the Challenge of Sustainable Development," 170.

technology and values and perceptions around what resources and technologies are desirable.[117] They are, in short, *socio-technical systems* with more or less well-defined established configurations and probable and preferable future trajectories of change, change which can be either incremental or 'radical', involving a transition to a new status quo.[118] As an ameliorative response to the tension between improvement and habitation, sustainable energy entails managing these transitions, not forestalling them or allowing them to proceed undirected.[119]

The future - or rather images of different possible futures - serves several functions in this context. For one, creating and discussing alternative images or visions of the future helps transition stakeholders to appreciate the breadth and depth of the challenges we face, as well as possibility facilitating consensus about the direction in which we should be heading.[120] That is, envisioning the future for sustainable energy engages in the construction of the normative dimensions of the concept. The capacity to project or

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[117] As Hughes describes socio-technical systems, they comprise a "seamless web" of technology, institutions, scientific knowledge and concepts, and policy and regulation that comprises the social provision of important services or functions like electricity or transportation. See Hughes, "The Evolution of Large Technical Systems."

[118] The literature on socio-technical systems and transitions is vast and rapidly expanding. For a solid introduction, see Giovanni Dosi, "Technological Paradigms and Technological Trajectories: A Suggested Interpretation of the Determinants and Directions of Technical Change," *Research Policy* 11, no. 3 (1982): 147–62; Hughes, "The Evolution of Large Technical Systems"; F. W Geels and J. Schot, "Typology of Sociotechnical Transition Pathways," *Research Policy* 36, no. 3 (2007): 399–417; G.P.J. Verbong and F.W. Geels, "Exploring Sustainability Transitions in the Electricity Sector with Socio-Technical Pathways," *Technological Forecasting and Social Change* 77, no. 8 (2010): 1214–21.

[119] On transitions management, see Rotmans, Kemp, and van Asselt, "More Evolution than Revolution: Transition Management in Public Policy"; A Smith, Andrew Stirling, and F Berkhout, "The Governance of Sustainable Socio-Technical Transitions," *Research Policy* 34, no. 10 (December 2005): 1491–1510; Meadowcroft, "Engaging with the Politics of Sustainability Transitions."

[120] Rotmans, Kemp, and van Asselt, "More Evolution than Revolution: Transition Management in Public Policy.", discusses the role of visions in this context. So do Smith, Stirling, and Berkhout, "The Governance of Sustainable Socio-Technical Transitions"; Derk Loorbach, "Transition Management for Sustainable Development: A Prescriptive, Complexity-Based Governance Framework," *Governance* 23, no. 1 (2010): 161–83. On scenarios and a 'sustainability science', see R. J. Swart, P. Raskin, and J. Robinson, "The Problem of the Future: Sustainability Science and Scenario Analysis," *Global Environmental Change Part A* 14, no. 2 (July 2004): 137–46.

forecast trends, identify key indicators of likely consequential developments, or assess the probability of different outcomes in the future is important in both recognizing a given practice or trajectory to be unsustainable and in identifying the risks and threats that could destabilize a presently sustainable process in the future.[121] Economic and natural systems models help us to test hypotheticals by creating multiple scenarios for the future, which help us to evaluate the possible impacts of one policy versus another or to anticipate the consequences of inaction.[122] In short, projecting, predicting or anticipating the future is also important in realizing the practical aspects of sustainable energy.

We can thus define these images of the future for sustainable energy – diverse in both their form and structure, their intent, and in the techniques used to create them – as sharing a common, underlying purpose or function: *the production of information about the future so as to influence decision-making in the present and thus to shape the future itself.* As will be discussed in detail below, it is common practice to refer to the collection of images, projections, etc., of the future as *futures*, and though the title of this

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[121] More rigorous images of the future like forecasts or statements of probability are not as common in the publically available literature on sustainable energy. Some prominent energy future reports do lean this way, though often avoid discussing probability. See for example the US Department of Energy's Energy Information Administration's *Annual Energy Outlook*, http://www.eia.gov/forecasts/aeo/er/index.cfm; or the International Energy Agency's *World Energy Outlook*, http://www.worldenergyoutlook.org/. Even still, these reports are economic modelling / scenario-based exercises as much as those cited in the next footnote. Pure forecasting is perhaps more important in national and corporate strategic planning or regulatory reporting. See for example the EU members' forecasts of renewable energy growth, which they are required to produce to demonstrate their progress towards the binding 2020 obligations set out in Directive 2009/28/EC on Renewable Energy, available here: http://ec.europa.eu/energy/renewables/action_plan_en.htm.

[122] This is perhaps the most prominent approach to envisioning the future in the field of sustainable energy. For some quintessential examples, see Intergovernmental Panel on Climate Change, *Emissions Scenarios*, Special Report (Cambridge, U.K.: Cambridge University Press, 2000), http://www.ipcc.ch/ipccreports/sres/emission/index.php?idp=0; Sven Teske, *Energy [r]evolution: A Sustainable Canada Energy Outlook* (Amsterdam: Greenpeace International / European Renewable Energy Council, May 11, 2009); International Institute for Applied Systems Analysis, ed., *Global Energy Assessment - Toward a Sustainable Future* (Cambridge University Press, Cambridge, UK and New York, NY, USA and the International Institute for Applied Systems Analysis, Laxenburg, Austria, 2012), www.globalenergyassessment.org.

thesis is the politics of 'the future' for sustainable energy, the manner in which we produce information about it will be of central focus.[123] In the context of sustainable energy therefore, we can conceive of futures as engaged primarily in the governance of historical change (as put forward above), with the aim of balancing improvement and continuity of service. Actors may have different interpretations of that balance, but that does not mean that they are not still engaged in the process of governing historical change for sustainable energy – indeed, as will be discussed in Chapter 4, it is precisely these *differences* that are of political interest.

2.3) (Post) Modern Reflections

In the above two sections, I argued that the roots of the concept of sustainable energy lie in the tension that emerged between an early, optimistic idealism about change and the crises it was beset by circa mid-20th century. According to Polanyi, this condition is the product of an enduring tension between the desire for improvement and the need for habitation that is the animus of modernity. There are, however, other ways of interpreting the tension inherent to modernity, to the study of development, science and technology and the future, and thus to the problem of the future for sustainable energy.

One such interpretation is the enduring distinction between the 'tough and tender-minded', noted by the philosopher William James in 1907. "The history of philosophy," James argued, "is to a great extent that of a certain clash of human temperaments"

[123] Given that 'futures' as defined here are one of the primary, if not only means by which we engage with 'the future' proper for sustainable energy, I believe that the title of this thesis – even though the focus is on 'futures' and not 'the future' per se – is not a misnomer. I use 'the future' in the singular only to refer to the fact that there is a domain of social and political concern that is not past or present, a sphere of social/political behaviour and contestation that has some unique characteristics, and not to suggest that there is only one possible future to which we are inevitably destined. This is not a study of the politics of the perspective that tends towards that kind of deterministic or fatalistic understanding of the future.

between the tough and tender-minded. Tender-minded philosophers, as James described them, were "Rationalistic [in that they were swayed or motivated by 'principles'], Intellectualistic, Idealistic, Optimistic, Religious, Free-willist, Monistic, Dogmatical." The tough-minded were "Empiricist (going by 'facts'), Sensationalistic, Materialistic, Pessimistic, Irreligious, Fatalistic, Pluralistic, Sceptical."[124] As James described them, these temperaments were not only the source of most major debates in philosophy but also, at a more individual level, the source of one's intellectual interests, sympathies and biases:

> "Of whatever temperament a professional philosopher is, he tries when philosophizing to sink the fact of his temperament. Temperament is no conventionally recognized reason, so he urges impersonal reasons only for his conclusions. Yet his temperament really gives him a stronger bias than any of his more strictly objective premises. It loads the evidence for him one way or the other, making for a more sentimental or a more hard-hearted view of the universe, just as this fact or that principle would. He trusts his temperament. Wanting a universe that suits it, he believes in any representation of the universe that does suit it. He feels men of opposite temper to be out of key with the world's character, and in his heart considers them incompetent and 'not in it,' in the philosophic business, even though they may far excel him in dialectical ability."[125]

James did not therefore suppose that one or the other intellectual proclivity expunged the intervening social or cultural factors that shaped one's view from the individual philosopher, or that one or the other approach could obtain full and complete impartiality. Instead, observation of the world was only possible through these lenses. Moreover, in describing the conflict as one of temperament, James suggested both that the source of

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[124] William James, *Pragmatism: A New Name for Some Old Ways of Thinking*, 2004, 9–10, http://www.gutenberg.org/ebooks/5116.

[125] Ibid., 7–8.

tension was at a level beneath that of conscious intellectual choice and of an historical character such that it was an enduring condition of the pursuit of knowledge, going back to Ancient Greece (i.e., not a 20th century phenomenon).

James' temperaments do seem to characterize the early 20th century conflict between the liberal idealism criticized by Polanyi and others and the school of political realism that developed largely in opposition to it post-WWII. As espoused by Morgenthau, Carr and others, the latter approach to international politics was more reflective of human nature, of the way things empirically are in the real world, and not driven foolishly by ideals about how it should be.[126] Similarly, interest in the 'social construction of technology' that grew during the 1980s, influenced by Bloor and Kuhn before him, sought to return to the real empirical processes by which science and technology developed and disputes about them were resolved, in contrast to the earlier approaches which emphasized the logic and rationalism of such processes.[127] Moreover, the 'crises' that challenged the modern paradigm around mid-century were essentially empirical anomalies to the optimism and idealism about progress held by that paradigm (e.g., underdevelopment versus modernization).

The distinction is not airtight, however, as the rigorous 'rationalism' in rational choice approaches to the social sciences or the tough-minded 'neoliberal' approach to international development of the 1980s and 1990s seem to suggest. Indeed, it often seems the case that the supposedly tough-minded empirical responses to *conventional*

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[126] Carr, *The Twenty Years' Crisis, 1919-1939*; Morgenthau, *Scientific Man vs. Power Politics*; also Hans J. Morgenthau, *Politics among Nations : The Struggle for Power and Peace*, ed. Kenneth Thompson, Brief Edition (McGraw-Hill, 1992).

[127] Wiebe E. Bijker, Thomas Parke Hughes, and Trevor J. Pinch, *The Social Construction of Technological Systems: New Directions in the Sociology and History of Technology* (MIT Press, 1987).

theories of development, scientific and technological progress and futures studies – drawing attention to the multiplicity of developmental paths, the inherent subjectivity of 'futures', counting anything people deem to be knowledge as knowledge – are more tender-minded than their supposed rationalist counterparts. Here the tension seems to arise more from a rift between science and the humanities than from a specific approach to inquiry.

C.P. Snow saw this as a rift between the "two cultures" of modern intellectual life, noting the divide between literary intellectuals on the one hand (whom society seemed to perceive as the sole recipient of the label 'intellectual'), and scientists on the other. The tension between the two cultures was palpable:

> "Between the two [cultures] a gulf of mutual incomprehension – sometimes (particularly among the young) hostility and dislike, but most of all lack of understanding. They have a curious distorted image of each other. Their attitudes are so different that, even on the level of emotion, they can't find much common ground"[128]

Scientists, Snow noted, were perceived by non-scientists as brash and boastful, possessing a shallow optimism and being unaware of man's condition. Conversely, scientists viewed the literary intellectuals as lacking foresight, also unconcerned with their fellow man and, in their desire to restrict art to the 'existential moment', deeply anti-intellectual.[129]

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[128] C.P. Snow, *The Two Cultures and the Scientific Revolution* (New York, N.Y.: Cambridge University Press, 1959), 4–5.

[129] Ibid., 5–6.

Snow's two cultures do indeed seem to characterize the so-called "Science Wars" in the 1990s between the inheritors of the approach to the sociology of science set forth by Bloor, Latour and Woolgar and others in the 1970s, and natural and physical scientists who took objection with the representation of science put forward in some of that work.[130] Broadly speaking, the 'war' was over the realism of scientific knowledge (i.e., its purported ability to describe the external 'real' world), with scientific realists on the one hand criticizing sociologists of science ('relativists') for rejecting the possibility of objectivity or the legitimacy of the scientific method, and the relativists on the other accusing the realists of operating under a falsely-conceived assumption that they are somehow free from cultural or social influences and biases or, worse, for attempting to monopolize or colonize the definition of rationality across all cultures, times or places.[131]

Snow's characterization may seem better placed to describe some of the academic tension in the fields of futures studies, science and technology studies and development studies in the latter half of the 20th century, but not perhaps the concerns over physical and biological limits to growth in the 1960s that sparked the evolution of the contemporary concept of sustainability.[132] Furthermore, though the differences between the tough-minded individual rationalists and the tender-minded humanities and social

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[130] A critical moment in the war being physicist Alan Sokal's successful publication of nonsensical article, written using the postmodern / poststructural jargon and terminology of that wing of science and technology studies, in the 1996 special issue of the journal *Social Text* that was on the science wars itself. For Sokal's own account of the event, see Alan D. Sokal, "A Physicist Experiments with Cultural Studies," *Lingua Franca* 6, no. 4 (1996): 62–64.

[131] See Andrew Ross, *Science Wars* (Duke University Press, 1996); Keith Ashman and Phillip Barringer, *After the Science Wars: Science and the Study of Science* (Routledge, 2000). For an example, see Ross' introduction to the 1996 *Social Text* special issue, Andrew Ross, "Introduction," *Social Text*, no. 46/47 (April 1, 1996): 1–13..

[132] Ehrlich was a biologist for instance, Hubbert a geologist, and the whole school of ecological economics is heavily influenced by ecology, thermodynamics, and systems theory.

constructivists may account for some interdisciplinary conflicts,[133] it is not clear exactly why these differences in analytical cultures can be so antagonistic.

Conceiving of the tension from which sustainability emerged as between empiricism and rationalism or habitation and improvement – i.e., the way the world is versus the way we think it should or could be – does not do justice to another, equally significant analytical distinction to the concept of sustainability: that between critique and complacency or, as Cox put it, between critical theory and problem-solving theory.[134] As much, if not more, of the tension between the analytical temperaments noted above (rationalism versus empiricism, idealism versus realism, normative versus practical, rationalism versus reflectivism, etc.,), distinguished so far by what are mainly epistemological differences, may also be due to differences in how the purpose or intention of the social sciences are themselves conceived – to describe the way things are by nature, or to change the way things are for the better. Critical theory, according to Cox, "stands apart from the prevailing order of the world and asks how that order came about."[135] Accordingly, such approaches operate according to Marx's dictum: "The philosophers have only *interpreted* the world…; the point, however, is to *change* it."[136] Conventional approaches (or 'complacent', according to critics) aim to account for the

[133] For example, see the characterization by Keohane of the difference between rationalists and reflectivists in the study of institutions, noting that the latter lack a strong research programme because of the lack of clear and concise theoretical framework, and the responses to him from scholars of the "reflectivist" persuasion. Robert Keohane, "International Institutions : Two Approaches," *International Studies Quarterly* 32 (1988): 379–96; J. Ann Tickner, "You Just Don't Understand : Troubled Engagements between Feminists and IR Theorists," *International Studies Quarterly* 41 (1997): 611–32; James Fearon and Alexander Wendt, "Rationalism v. Constructivism : A Skeptical View," in *Handbook of International Relations*, ed. Walter Carlsnaes, Beth A Simmons, and Thomas Risse-Kappen (London: Sage, 2002).

[134] See Cox, "Social Forces, States and World Orders."

[135] Ibid., 129.

[136] Karl Marx, "Theses on Feuerbach," in *The Marx-Engels Reader*, ed. Robert C Tucker, 2nd ed. (New York: Norton, 1978), 143–45..

features of the world which it deems natural and unchanging; a "conceit of scholars who will have it that 'what they know is as old as the world," Cox writes, that "[takes] a form of thought derived from a particular phase of history...and [assumes] it to be universally valid."[137]

Though the critical / complacent distinction is not strictly an epistemological dispute (as the tension between rationalism and empiricism more clearly is), much post-positivist work in the social sciences tends to see it as one; distinguishing itself largely on the basis of a more circumspect attitude towards the objectivity of both the subject matter and the approaches to gaining knowledge of it than found in the prior 'positivist' school. One such example is the school of 'critical futures studies' research, a field emerging late in the 20th century.[138] Inayatullah, for example, distinguishes between the empirical (approximately the 'tough-minded' school of futures studies, seeking disinterestedly to predict the future), the interpretive (the tender-minded concern with creating shared understandings of the future) and the critical branches of futures studies.[139] The last he describes against the former two approaches as seeking to "create distance" from conventional or hegemonic concepts and categories used in futures discourse. This distance allows the critical approach to see "current social practices as fragile, as particular, and not as universal categories of thought", but rather as "discourse--a term similar to paradigm but inclusive of epistemological assumptions."[140] Accordingly, the

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[137] Cox, "Social Forces, States and World Orders," 133.

[138] See Richard Slaughter, ed., *New Thinking for a New Millennium* (London: Routledge, 1996)., for an overview of critical futures studies.

[139] See Sohail Inayatullah, "Deconstructing and Reconstructing the Future: Predictive, Cultural and Critical Epistemologies," *Futures* 22, no. 2 (1990): 115–41; Sohail Inayatullah, "Causal Layered Analysis: Poststructuralism as Method," *Futures* 8 (1998): 815–29.

[140] Inayatullah, "Causal Layered Analysis," 816.

task of futures studies is not to predict or compare futures, but "one of making units of analysis problematic…to 'undefine' the future." The goal, as he puts it, "is thus to disturb present power relations through making problematic our categories and evoking other places or scenarios of the future."[141] Similar examples can be found in both development studies and science and technology studies.[142] The conflict between critical and complacent theory is thus quite similar to that between the desire for improvement on the part of Polanyi's gentleman and his 'poor man's' need for habitation,[143] though in the case of 'the Great Transformation' the improvement that was sought was most certainly not a Marxist-inspired desire to emancipate the world from the yoke of capitalism (indeed, it was development of universalistic liberalism and capitalism that defined the improvement to which Polanyi was referring).[144] The terms habitation and improvement need not always refer to the same analytical, political or economic motivation; rather, it is the underlying tension between a desires for change or for continuity that characterizes this conflict.

The notion of "reflexive modernization", put forward by 'Third Way" scholars Ulrich Beck, Anthony Giddens and Scott Lash, represents the same kind of ameliorative

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[141] Ibid., 817.

[142] See, for example, Paul Bowles, "The Postmodern Pivot in Development," *Canadian Journal of Development Studies/Revue Canadienne D'études Du Développement* 22, no. 3 (2001): 566–568; Geeta Chowdhry and Sheila Nair, "Power in a Postcolonial World: Race, Gender and Class in International Relations," in *Power, Postcolonialism and International Relations: Reading Race, Gender and Class*, ed. Geeta Chowdhry and Sheila Nair (New York, N.Y.: Routledge, 2002), 1–32; Nik Brown, Brian Rappert, and Andrew Webster, eds., *Contested Futures: A Sociology of Prospective Techno-Science* (Aldershot England;;Burlington VT: Ashgate, 2000); Paul N. Edwards, "Hyper Text and Hypertension: Post-Structuralist Critical Theory, Social Studies of Science and Software," *Social Studies of Science* 24, no. 2 (1994): 229–278; John Law, "Networks, Relations, Cyborgs: On the Social Study of Technology," in *Visualizing the Invisible: Towards an Urban Space*, ed. Stephen Read and Camilo Pinilla (Amsterdam: Techne Press, 2006), http://oro.open.ac.uk/21394/.

[143] Polanyi, *The Great Transformation*, 36.

[144] See in particular the chapters on "The Birth of the Liberal Creed", "Market and Man" and "Market and Nature", Ibid., chap. 12–15.

response to this tension as the idea of sustainable development was to the conflicts noted above.[145] According to Beck, reflexive modernization stands to modernization as modernization stood to feudalism for Marx – dis-embedding and re-embedding of older industrial social forms by a new, "radical" modernity – and thus characterizing the period of modernity in which the notion of sustainability was argued to have emerged above (i.e., the mid-to-late 20th century). This process is "reflexive" because, in contrast to unforeseen, autonomous and undirected transition from the older industrial to the newer "risk society,"[146] this modernization is reflectively aware of both its own conditions as well the problems that it itself produces, which are one and the same (e.g., environmental pollution, poverty and inequality, etc.).[147] The reflexive aspect of reflexive modernization thus refers not only to the self-referential aspects of modern society, but to the fact that it is modernity itself that is being modernized.[148]

In standing to modernity as modernity stood to traditionalism, the notion of reflexive modernization thus posits some key characteristics of the older paradigm which it seeks to supplant, nuance or subvert: old modern societies conceived of social change as occurring with "a stable system of coordinates", proceeding in a linear fashion according to the principles of functional differentiation; nature was conceived as both central and marginal to society, existing only to be exploited; a conception of scientific rationality held sway that emphasized instrumental control over the world; society was differentiated

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[145] Beck, Giddens, and Lash, *Reflexive Modernization*.

[146] See, of course, Ulrich Beck, *Risk Society: Towards a New Modernity* (SAGE Publications, 1992)..

[147] Ulrich Beck, "The Reinvention of Politics," in *Reflexive Modernization: Politics, Tradition and Aesthetics in the Modern Social Order*, ed. Ulrich Beck, Anthony Giddens, and Scott Lash (Stanford University Press, 1994), 6–8.

[148] Ulrich Beck, Wolfgang Bonss, and Christoph Lau, "The Theory of Reflexive Modernization Problematic, Hypotheses and Research Programme," *Theory, Culture & Society* 20, no. 2 (2003): 1–33.

by clearly-defined subsystems; experiential or occupational knowledge was devalued in favour of theoretical knowledge; and a hierarchy developed between experts and laymen, grounded on the monopoly of knowledge by professionals.[149] By contrast, in a reflexively modern society many of these stable social forms or practices have become destabilized through globalization, the increasing recognition of a "global ecological crisis", by intensification of the process of individualization which has led to reformed gender roles and conceptions of both work and employment, and by the side-effects of its own disruptive process of change.[150] These "meta-changes" in modern, Western society thus involve everything that defines it: "its coordinates, its correlations, its categories and even its ideas of change."[151]

Reflexive modernization is essentially the articulation of the 20th century developmental narrative as described above, but fast-forwarded in time and applied to itself. The notion of reflexive governance in transitions management aims to apply the theories and principles of reflexive modernization to the problem of sustainability: one of, "if not the main *second-order* problem of modernist problem-solving."[152] Second-order problems, according to this school of thought, are equivalent to the Club of Rome's concept of the global problematique – they are problems that are largely the consequence of the older mindset or analytical framework now being deployed to solve them; namely, the rationalism of simple modernity as conceived of by Beck et al. Reflexive governance recognizes instead the "post-normal" character of contemporary scientific problems and

[149] Ibid., 2–7.

[150] "Our central thesis is that side-effects of modern Western society eventually put its touchstone ideas into question." Ibid., 8.

[151] Ibid., 9.

[152] Loorbach, "Transition Management for Sustainable Development."

the inherent complexity and irreducible uncertainty of natural phenomena.[153] As put by Kemp, "sustainability is thus an ambiguous and moving target that can only be ascertained and followed through processes of iterative, participatory goal formulation."[154] That process, of 'iterative, participatory goal formulation' is to be achieved largely through the construction and use of visions of the future for sustainability, thus demonstrating the centrality of foresight and futures to the contemporary notion of sustainability as the governance of historical change.

2.4) Summary

The aim of this chapter was to situate the concept of sustainable energy within the historical and intellectual context of the 20th century, particularly in the mid-century crises and tensions that emerged to challenge the intellectual status quo in the study of development, science and technology and the future. Generally speaking, these concerns manifested themselves as 'limits' to the condition or paradigm of modernity but not necessarily as inherent, irresolvable flaws. Sustainable energy, I argued, emerged out of this context as an ameliorative response to the increasingly evident failings of the modernist paradigm but not as a wholesale critical rejection of it. The theories of reflexive modernization and reflexive governance essentially replicate this narrative in their account of and prescriptions for the post-modern situation, thus positioning themselves, like the idea of sustainable development before them, as an ameliorative

[153] S.O. Funtowicz and J.R. Ravetz, "Science for the Post-Normal Age," *Futures* 25, no. 7 (1993): 739–55; J.R. Ravetz, "What Is Post-Normal Science," *Futures* 31 (1999): 647–53.

[154] René Kemp and Derk Loorbach, "Transition Management: A Reflexive Governance Approach," *Reflexive Governance for Sustainable Development, Cheltenham, UK and Northampton, MA, USA: Edward Elgar*, 2006, 15–16.

solution to the equally as important tension between critical and complacent theory in the social sciences.

I also sought to show that the tensions or conflicts that characterize both the three key fields and the condition of modernity that gave rise to the notion of sustainability in the 20th century are not easily characterized. The distinctions between the two cultures, between improvement and habitation, critique and complacency, strong and weak sustainability, rationalism and empiricism, or normative and practical do not align according to some master dichotomy and none appears to encompass all the others. That being said, it is possible to distinguish three key tensions which appear that encompass both the origins and contemporary discourse and practice of sustainable energy. These are:

1. **Improvement versus Habitation** – the original animating tension of modernity, the distinction between improvement and habitation also broadly captures the distinction between critique and complacency or change and continuity. The former often a desire (for change), the latter sometimes a need (for stability, continuity), this distinction appeals both to the agency we can have or should seek to attain over the process of historical change.
2. **Rationalism versus Empiricism** – simultaneously addressing both the essence of the knowledge we have of the world or of the future as well as the balance between the normative and practical dimensions of sustainability, this tension is critical in the academic or intellectual interpretation and implementation of sustainable energy.

3. **Action versus Reflection –** as suggested above, the conceit of modernity is that it stands consciously opposed to all that was unconsciously held or done before. Early modernity thus stood opposed to traditional society, just as reflexive modernity stands opposed to early modernity. The tension thus speaks to the balance that sustainability must strike between doing and thinking, the maintenance of energy systems in the present and considering the possible futures that might come to pass.

These tensions should not be read as discrete and unique facets of sustainable energy so much as they are dimensions of an invisible and undefinable core opposition that animates the discourse and practice. The critical point to note, however, is that on each of these conflicts or tensions, the concept of sustainability (and thus sustainable energy) posits itself as a middle way – an intermediate, ameliorative or pragmatic move to balance the conflicting tendencies in order to perpetuate the condition that gave rise to them. In the following chapter, I will explore the tension that characterizes the discipline of futures studies in particular – namely, the question of whether the practice of envisioning the future is a science or an art – and identify some core sub-attributes that characterize this distinction. Given the above discussion, I will argue that the practice of 'observing futures' for sustainable energy takes place in between these poles, as a *technological* activity. As will be seen, the enduring influence of the tensions identified here also shape discussion of the politics of both technology and the future, despite the positioning of the future for sustainable energy at the pragmatic centre. The aim of this thesis is to articulate a politics of the middle-way.

Chapter 3) The Future versus Futures: Four Dimensions

In the preceding chapter, I situated the concept of sustainable energy within the historical context of the destabilization of modernity circa the mid-20th century. Thinking about both the nature of the future and of the knowledge that we might have of it underwent a general transition during this period, in which an optimistic certainty in the predictability of the future in the early 20th century slowly gave way to a cautious recognition of the inherent uncertainty and multiplicity of futures in the latter half of the century – in short, a shift from a science of the future to an art of conjecturing futures.

This chapter will look more closely at the implications of the destabilization of modernity for the field of futures studies, for the nature of the information that is provided by images of the future, and for the implications thereof for the practice of constructing futures for sustainable energy. I will begin by noting three 'problems' of the future that distinguish it from either the past or the present. I will then differentiate the scientific versus the 'art of conjecture' perspective on the question of the future on the basis of four criteria - or spectra - that stem from these problems and that comprise the main elements of difference.

3.1) The Future and Futures: Art or Science?

The history of futures studies as described in the previous chapter paints a picture of the field as *maturing,* from an early, youthful optimism (or naivety) about the promise of the future to its later, more nuanced appreciation of the complexity and multiplicity of futures. This transition occurred as uncertainty about the future was increasing, as

dissatisfaction with the poor accuracy of prevailing forecasting techniques was growing, and as more, and dissonant, voices sought to be added to the discussion about the future. In place of *predictions* of the future, we now construct images of different *plausible*, *probable* or *preferable* futures.[155] These kinds of futures stem from some underlying characteristics or 'problems' of the future that differentiate it from either the past or present; problems that have important implications for how we can understand the kinds of knowledge or information that we produce about the future.

3.1.1) Problem #1 – Non-Existence (or Contingency)

If we consider 'futures' as basically just declarative statements about the future, the first problem that arises is that the future does not 'exist' in the same way that the past or present (at least not *yet)*.[156] This quality makes it difficult to weigh the meaning of information or knowledge about the future based on its accuracy or truthfulness, either at the time the statement was made or after it (the future) has come to pass (or not). For example, (though a position more-or-less long abandoned by the majority of contemporary philosophers) the logical positivists of the early 20th century argued that the meaning of a statement rested largely on its ability to be verified.[157] Thus, the statement that 'it is raining' has meaning since it indicates the conditions of its verification and is possible to verify through empirical observation, whereas 'God exists' cannot be so

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[155] The 'Three Ps' of futures studies. See Bell, *Foundations of Futures Studies*.

[156] For example, Rescher notes that "most philosophers agree that the future is unreal, or at any rate presently unreal." See Nicholas Rescher, *Predicting the Future: An Introduction to the Theory of Forecasting* (Albany: State University of New York Press, 1998), 70. Most, but not all: the philosophy of time that holds the future is unreal is referred to as presentism, but an opposing school – eternalism – holds the ontological status of objects does not depend on temporality. See Ned Markosian, "Time," in *The Stanford Encyclopedia of Philosophy*, ed. Edward N. Zalta, Spring, 2014, http://plato.stanford.edu/entries/time/#3D4Con., for a brief overview.

[157] See Godfrey-Smith, *Theory and Reality*, chap. 2.

verified. Since the future does not exist, a statement about it cannot be verified as true or false until such time that it is no longer the future.[158]

This alone is not terribly problematic as it doesn't preclude the possibility of there being a true future; only that our statements describing it are difficult to evaluate at the time they are made. A larger problem arises if we consider whether statements about the future can *ever* have a truth value. Put differently, if a statement about the future made in advance can be true, it was true yesterday and the day before. But if things that are true of the past are *necessarily* so (there's nothing we can do to change it), then is a true statement about the future also necessarily true? This is known as the problem of future contingents, formulated early on by Aristotle, who recognized that the principle of bivalence (that declarative statements are either true or false, to the extent they correspond with reality) is problematic with *contingent* statements about the future.[159] The problem is complex and has had various formulations and solutions over the centuries, but boils down to a question of whether statements about future contingents can be true or false, under an assumption of an open (i.e., free-will) future. Aristotle's example was 'the sea-battle that will take place tomorrow' - if indeed the battle does take place then the statement was true, but then it would have been true yesterday and the day before, and thus it was necessarily true that the sea battle take place. To assign truth values to statements about the future thus seems to lead towards an historical

[158] Rescher, *Predicting the Future*, 70–75.

[159] Aristotle's discussion of the sea battle, specifically questioning how to evaluate the truth of conflicting statements about tomorrow (there will or will not be sea battle), are indicative of this problem. See Aristotle, *On Interpretation* (Raleigh, N.C. : Boulder, Colo: Alex Catalogue ; NetLibrary, 1999), chap. 9, http://www.netLibrary.com/urlapi.asp?action=summary&v=1&bookid=1085844.. Also, see Peter Øhrstrøm and Per Hasle, "Future Contingents," in *The Stanford Encyclopedia of Philosophy*, ed. Edward N. Zalta, Summer 2011, 2011, http://plato.stanford.edu/archives/sum2011/entries/future-contingents/..

determinism that runs counter to both our experience, but also to the assumed purpose of being able to make accurate statements about the future (i.e., to change it).[160]

I mention the problem of future contingents (i.e., the future does not exist) to highlight the *long-standing* recognition that statements made about the future are different than statements made about the past or present, in part because we assume that the future (or at least some aspects of it) is open or contingent. This does not entail, however, that the future is indeterminate until it comes to pass or that statements about it are meaningless in the absence of a means to verify them – contingency can mean both dependency of an outcome on a prior event *or* chance.[161] In other words, the contingency of the future implies that some things may be indeterminate while others are simply undecided until we take steps to realize them. The same cannot be said of the past or present (at least not in day-to-day practical matters). To consider futures as simple declarative statements about the future thus seems misguided.

Perhaps futures represent something more; perhaps they contain real knowledge about the future or the nature of historical change. The condition of contingency implies that this knowledge can only ever be *probable*.[162] It's common today to conceive of two

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[160] In the Middle Ages, the problem was reformulated as one of God's divine foreknowledge versus our assumed moral accountability (e.g., if God knows how we will choose to act in advance, than we cannot hope to change our fate through our behaviour during our life). See Simo Knuuttila, "Medieval Theories of Future Contingents," in *The Stanford Encyclopedia of Philosophy*, ed. Edward N. Zalta, 2006, http://plato.stanford.edu/entries/medieval-futcont/; Frederik Lodewijk Polak, *Prognostics: A Science in the Making Surveys and Creates the Future* (Amsterdam: Elsevier Pub. Co, 1971). Also, as suggested in the previous footnote, analytic philosophers in 19th and 20th century have dealt extensively with the problem.

[161] See, for example, Rescher's discussion of determinism and predictability in Rescher, *Predicting the Future*, 72–75.

[162] Again, Rescher: "a predictively benign world need not be one that admits of predictive certitude – it need only afford a fair prospect of predictive success whose efficacy is not universal and invariable but probabilistic and 'by and large'" Ibid., 74.

different kinds of probability – the type that deals with frequencies or propensities and is commonly employed in statistical methods of analysis (the 'frequentist' understanding); and the aleatory or epistemological variant, used to represent the quality of knowledge or degree of belief (Bayesian probability).[163] Both modern kinds of probability are common to the contemporary practice of envisioning futures. Econometrics and natural system modeling makes extensive use of the frequentist type when it conducts sensitivity analysis, runs Monte Carlo simulations, and presents spreads in a projection in place of a single line. Bayesian probability, on the other hand, is employed in decision-making analysis, choice theory, as well as in in sports strategy and electoral predictions (recently elevating American statistician Nate Silver to considerable fame).[164]

In his *Emergence of Probability*, Ian Hacking traces the roots of the contemporary dualism of the concept back to its origins in the 16th century work of Pascal and earlier. Prior to Pascal, he argues, the term was used to describe something that carried the weight of authority which came either from authoritative texts or speakers. The 'evidence' of the authoritative text or the testimony of authoritative speakers was, however, only applicable to opinion which, under medieval Aristotelian science was the domain of the lesser, 'low' sciences (whereas knowledge was the domain of the higher sciences). Unlike knowledge, opinion could not demonstrate its claims, and thus could only hope to be probable (though this quality did not entail truth – a more probable interpretation of a text could end up being incorrect).[165] However, an evolution in

[163] Hacking, *The Emergence of Probability*, chap. Introduction.

[164] Silver includes a discussion and defense of Bayesian probability versus frequentism in predicting social or political outcomes in Nate Silver, *The Signal and the Noise: Why So Many Predictions Fail-but Some Don't* (Penguin, 2012).

[165] Hacking, *The Emergence of Probability*, chap. 2–5.

understanding was taking place in the several centuries leading up to the Enlightenment (as documented also by Foucault),[166] in which people began to consider signs in the natural world as evidence of the ultimate authority's (i.e., God) intentions, though some where more reliable than others. Once this transition had been made, Hacking argues, the road was now open for the emergence of the modern understanding of probability and the intimately related problem of inductive knowledge. Pascal, in his arguments for belief in the existence of God, represents a synthesis of sorts of the later frequentist and Bayesian notions of probability. As Hacking puts it, Pascal argued that the uncertain question of God's existence put us "in the same epistemological position as someone who is gambling about a coin whose aleatory properties are unknown."[167]

Over time, the 'external evidence' in signs from God was internalized, losing the connection with authority, and thus becoming a kind of evidence, i.e., evidence from experience or observation; a middle way between demonstration (knowledge) and testimony (opinion). The next step was laid, according to Hacking, when the concept of causation also made the transition from knowledge to opinion (since even in Newton, gravity was proposed only as an observed regularity). This cleared the way for Hume to formalize the problem of induction we still grapple with today. As Hacking summarizes,

> "An expectation that the future will be like the past must be either knowledge or opinion. But all reasoning concerning the future must be based on cause and effect. Reasoning concerning cause and effect is not knowledge. Therefore it must be opinion, or probability. But all probable reasoning is founded on the supposition that the future will resemble the past, so opinion cannot be justified without circularity. Knowledge and

[166] See Foucault, *The Order of Things*., in particular the chapters dealing with signs, representation, and classification (Chs. 2,3,5 and 7).

[167] Hacking, *The Emergence of Probability*, 70.

> probability are exhaustive alternatives. Hence expectation about the future is unjustified"[168]

Probability is not a solution to this epistemological problem, Hacking argues; the absence of a foundation for knowledge of the future also calls into question the foundations of belief and expectation. The two contemporary strains of probability, he suggests, are moral responses – evasions, not solutions – to the modern problem of induction as expressed by Hume: whereas the Bayesian demands "to one's past self be true", the Frequentist relies on C.S. Peirce's solution to the fundamental probability of the natural world, "faith, hope and charity."[169] Without the modern concepts of evidence and facts, Hacking suggests, "we might have gone on, 'like any farmer', inferring the future from the past without ever being flummoxed by a skeptical problem of induction."[170]

3.1.2) Problem #2 – Induction and Inference

Thus it would seem that the information futures provide cannot count as 'knowledge' *per se*, as even the most rigorous statistical analyses of the probable future is little more than dressed up opinion. This encapsulates a second problem of the future, the problem of inductive inferences – namely, there is no logical basis for the expectation that the

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[168] Ibid., 180.

[169] Peirce, in Vol. 2 of his Collected Papers, outlines the elements of logic in world that is fundamentally based on irreducible chance (i.e., probability). One problem is how to ground logic (and thus reason) without the possibility of a concrete foundation – reasoning under a condition of probability seems to require the possibility of infinite inferences, but our lives are finite. Peirce's answer, that logic "rests on the social principle", i.e., that one's interests must align with the "whole community", extended indefinitely in time and space, is found in Para. 653-655. Here he identifies three sentiments as "indispensable requirements of logic": interest in an indefinite community, recognition of the possibility of this interest being made supreme, and hope in the unlimited continuance of intellectual activity – sentiments which he notes are 'pretty much the same' as the trio of Charity, Hope and Faith as found in Christian tradition. Charles S. Peirce, *The Collected Papers of Charles Sanders Peirce*, Past Masters (Charlottesville, Va: InteLex Corporation, 1994), para. 653–655.,

[170] Hacking, *The Emergence of Probability*, Preface.

future will be like the past.[171] The solution that was adopted in the 20th century was, broadly speaking, to move from an emphasis on induction in the philosophy of science and futures studies, to conjecture - namely, an art of conjecture. There are, however, two different strands to this transition. On the one hand is the strand running from C.S. Peirce, who advocated for a form of reasoning he referred to as 'abduction' in place of inductive reasoning (more-or-less equivalent to the 'retroduction' advanced by scientific realism and the notion of the inference to the best explanation, as described earlier),[172] to Popper, who rejected the idea of verificationism altogether and advocated for it to be replaced with conjecture and falsification.[173] The solution in these approaches was not to reject inductive inference entirely, but rather to push for a *critical* approach to the theories that we derive from such observations – to take the implications thereof to form hypotheses or conjectures about the world (i.e., predictions) that, if rejected or proven false, would thus demonstrate the theory to be wrong or misguided.[174] A prediction (i.e., conjecture) about the future is not useful only if proven true or accurate, and neither does it represent knowledge of the future; rather, it is mainly a test of present knowledge (or beliefs).

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[171] The "problem of induction", which haunts a good deal of contemporary philosophy of science, is typically traced to Hume (See David Hume, *An Enquiry Concerning Human Understanding, and Selections from A Treatise of Human Nature*, Philosophical Classics : Religion of Science Library (Chicago: Open Court Pub. Co, 1912), bk. 1, Pt. III, S.4. See Godfrey-Smith, *Theory and Reality*, 39–40; Hacking, *The Emergence of Probability*, chap. 19.; Hacking 2006, Ch. 19.

[172] See Wendt, *Social Theory of International Politics*. Peirce describes abduction in Vol. 5 of the Collected Papers, in the Lectures on Pragmatism.

[173] See Karl Popper, *The Logic of Scientific Discovery*. Hacking, *The Emergence of Probability*, chap. 16., also discusses the 'art of conjecture'.

[174] Popper's emphasis on this mode of reasoning or knowledge creation as being truly *critical*, in contrast to the pseudo-scientific theories (e.g., Marx), in *The Poverty of Historicism* or *The Open Society and Its Enemies*, suggests a slightly different use of the term than as advanced in Chapter 1 above. Popper's notion of critical reasoning implies one is above all non-dogmatic – that they are willing to test their beliefs and find them wanting, if need be. See Karl Raimond Popper, *The Poverty of Historicism*, Harper Torchbooks (New York: Harper & Row, 1964); Karl Popper, *The Open Society and Its Enemies* (Routledge, 2006).

The other strand is that put forward by Jouvenel in his *Art of Conjecture* who, as noted in Chapter 2, conceives of conjecture as being akin to the construction of representations of futures, namely *plausible* futures.[175] Jouvenel recognizes the first two problems of the future, though he discusses them in a different manner. The entirety of his analysis in Art of Conjecture stems from an initial distinction between the world of *facta* and that of *futura,* derivations of the Latin verbs *facere* (to do or to make) and *esse* (to be), the former of which is used for things or events that are "'done', accomplished, completed, shaped" while the latter is used for future events or situations. In Latin, according to Jouvenel, "everything that has not yet come is opposed...to what is."[176] *Facta* cannot be changed, though statements about them can be verified, while *futura* do not admit of verification and are not capable of being true or false. Thus he argues "knowledge of the future" seems a contradiction in terms. Furthermore, Jouvenel notes a distinction between *prevision* and *prevoyance*, the former of which connotes complete and absolute knowledge of the future (and is only held by God) while the latter describes "an action of the human mind: there is an effort or *work* tending to make us know 'what may happen'...rather than 'what will happen'. The result of this work is a *fan of possible futures*."[177] Therefore, echoing Hacking's criticism of probability, Jouvenel notes that "when we foresee or forecast the future, we form *opinions about the future.*" Conjecture is that act or work – the intellectual construction of images of the future - which he notes "is a work of art, in the full sense of the term."[178]

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[175] Jouvenel, *The Art of Conjecture*.
[176] Ibid., 3.
[177] Ibid., 15–16.
[178] Ibid., 17.

We should not be too quick to allow Jouvenel's characterization to open the gates to all kinds of visions of the future – not any work of the imagination counts as a *futurible*, in his terms. Though the work of the future consists of envisioning possible futures, *futuribles* are those visions that are "descendants of the present", in which the "mode of production from the present state of affairs is plausible and imaginable."[179] Thus he notes that though the ancients may have conceived of aviation, those conceptions where not true *futuribles* until "certain new facts" became known that made those conceptions conceivable or realizable. Furthermore, Jouvenel suggests that people are not especially inclined to contemplate a large variety of such *futuribles* at one time and therefore tend to latch onto the vision "that appears to be intellectually the most probable or affectively the most desirable." We are lucky when the two coincide, but most often we are left with the task of trying "to bend the course of events in a way which will bring the probable closer to the desirable." This, Jouvenel argues, "is the real reason why we study the future."[180]

In short, for Jouvenel, the usefulness of the image of the future is of paramount concern; a concern that would seem to run counter to the characterization of the practice of creating them as an art.[181] The arbiter of usefulness of a vision of the future is its ability to inform decision-making, itself a function of the capacity of a forecast,[182] not necessarily to reduce uncertainty, but rather to separate 'subjective foreknowns' (things

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[179] Ibid., 18–19.

[180] Ibid., 19.

[181] Rescher echoes this sentiment when he sets out some criteria for evaluating predictions or predictors, one of which is 'difficulty' – that is, if the prediction takes no chances in forecasting the future for something, it is not all that informative. Rescher, *Predicting the Future*, chap. 7.

[182] Despite his attachment to futures, de Jouvenel writes almost exclusively about forecasting and prediction, rather than scenarios or 'futures' in general. It should be recalled that he was writing at roughly the time that, according to the developmental narrative, the idealistic faith in prediction of the future began to recede and a more realistic emphasis on the multidimensionality of futures. It should not be surprising therefore if he used familiar words in his attempt to express the 'newer' concepts

an individual may know about and consider highly likely to continue in the future as it had in the past/present) and 'structural certainties' (institutional regularities, the basis for subjective foreknowns) from things that remain uncertain *because* they are susceptible to change.[183]

To make this point, Jouvenel distinguishes between scientific and historical prediction, the former of which speaks mainly to *processes* and the latter to *interventions*.[184] A process, Jouvenel implies, is autonomous or natural – it follows a certain course or tendency and would do so absent any external interventions (but may indeed require an external intervention to precipitate). Interventions, on the other hand, are intentional acts made by agents aware of the process, often to counter or balance the tendency or trajectory of the natural course of things. Prediction in the sciences consists essentially of anticipating the future course of a process while historical prediction speaks to the intervention of agents in processes, though human behaviour can be included in either form of prediction (endogenously, as objects of a process in the former; exogenously, as acting subjects in the latter).

There are several possible positions to take on the question of a process that involves human behaviour – 1) all behaviour, causal and potential retroactive measures, is subsumed within the process (i.e., the future can be known); 2) any process involving human behaviour renders it subject to our will (i.e., we can shape any such process); 3)

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[183] Jouvenel, *The Art of Conjecture*, 41–43. Interestingly, this is approximately the same method for creating useful scenarios of the future found in the world of business. See, for example, the work of Wack and Schwartz based on their time at Shell: Pierre Wack, "Scenarios: Shooting the Rapids," *Harvard Business Review* 63, no. 6 (1985): 139–50; Pierre Wack, "Scenarios: Uncharted Waters Ahead," *Harvard Business Review* 63, no. 5 (1985): 73–89; Schwartz, *The Art of the Long View*.

[184] Jouvenel, *The Art of Conjecture*, chap. 10–11.

some admixture of the two, recognizing different possibilities for intervention effective to varying degrees.[185] Though the first "flatters our intellect", Jouvenel argues, it runs contrary to our "mores" of understanding of social phenomena; namely, that even as we recognize the existence of social processes (e.g., inflation), we "habitually contrast" such processes with a presumed ability to shape them according to our desires (e.g., by undertaking anti-inflationary policy). Even though the process may result from individual decisions and choices with specific purposes or intentions, these decisions are not of the same order as the process and therefore cannot be considered interventions. Therefore, "for an intervention to have a chance of working, it must be of the same dimension as the process: the action of the intervening agent must balance the pull of the process."[186]

Processes therefore do play an important role in forecasting, since "any systematic effort at forecasting must rest on the understanding of processes."[187] Various different thinkers have, however, sought to render all of historical change as subsumed by some larger process, and even gone so far as to describe the task of inquiry as to understand that process so as to stand as master to it. Marx is an obvious example; Jouvenel also quotes Comte on his aspirations for a "social physics" that could unveil the future. In passage equating the development of a science of politics with the natural sciences, Comte argues:

> "The determination of the future must even be regarded as the direct aim of political science, as in the case of the other positive sciences. Indeed, it

[185] Ibid., 102–3.
[186] Ibid., 106.
[187] Ibid., 110.

> is clear that knowledge of what social system the elite of mankind is called to by the progress of civilization – knowledge forming the true practical object of positive science – involves a general determination of the next social future such as it results from the past"[188]

Comte, Jouvenel argues, conflates scientific prediction with historical prediction – his 'dream' is equivalent to the first position on processes and behaviour noted above. Contrary to what Comte says, Jouvenel argues, "science does not unveil the future: its role is both less ambitious and more useful." The predictions of science are not intended to determine the future state of the world, but rather to warn us what might happen in the presence or absence of certain human actions; action which are the domain of historical prediction.[189] Thus, for Jouvenel, the goal is not to turn all of history into process. Instead, "what is important is to find points of fulcrum on which we can exert pressure, thereby deflecting the course of events in one direction rather than another. The commonsense distinction between process and action is therefore salutary."[190] Forecasting, or more appropriately 'conjecture', aids decision-making in identifying where action or intervention can have a role to play in shaping the future; that is, through the identification of *plausible* futures.

3.1.3) Problem #3 - People

A peculiar feature of grand historical theories like those of Comte or Marx is (despite Jouvenel's account) that even as they intend to describe a deep-seated law of historical change the realization of the future that is promised often requires an agent of change to

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[188] Auguste Comte, *Système de Politique Positive Ou Traité de Sociologie* (Osnabrück: Zeller, 1967); cited in Jouvenel, *The Art of Conjecture*, 111.

[189] Jouvenel, *The Art of Conjecture*, 111–2.

[190] Ibid., 113.

make it happen; even so-called laws of historical change are often contingent on exogenous intervention, though not necessarily in the open-future manner suggested by the Jouvenel's second position on process and human behaviour noted above. In these cases, frustrated by the discrepancy between the theorized process and the actual course of history, theorists of a grand historical law may take it as *their role* to prepare, adapt, educate the non-conforming *many* so that they may both enable the process to take place as prophesied *and* have the skills or characteristics required of people in the soon-to-be new era.[191]

This is what Popper refers to as 'the poverty of historicism', a term he uses to describe holistic, absolutist theories of historical change.[192] Insofar as scientific knowledge is "the muse of practicality" (that is, knowledge of processes) Popper argues, historicism is a poor means to achieving it: though historicism aims to inform practice, it is not effective in doing so. The practice he has in mind is to inform policy, which he argues should be conceived of as piecemeal social engineering: "to design social institutions, and to reconstruct and run those already in existence."[193] This he considers a "technological" approach to social science, one that is committed to methodological instrumentality rather than methodological essentialism and which conceives of institutions not as rational constructions, but organically-grown means to an end which is itself beyond the control of the planner.[194] Changes to social institutions should thus be

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[191] The obvious example is Vladimir Il′ich Lenin, *What Is to Be Done?* (Penguin Group (USA) Incorporated, 1990).

[192] Popper, *The Poverty of Historicism*.

[193] Ibid., 70.

[194] The difference between these two 'methodologies' is in short that the former approaches concepts and terms in the knowledge of the world as imperfect tools to describe it such that we can act upon our knowledge, while the latter intends to describe the essence of the real world concept, perfect form, or

undertaken in a piecemeal or incremental fashion, informed by empirically-corroborated knowledge of behaviour and trends, but not in pursuit of them.

Popper contrasts this approach with the "utopian engineering" that is often undertaken in the name of historicist theories of change. Utopian engineering, he argues, committed as it is to wide-scale and complete reconstruction of society *a priori* rejects the "human factor" of institutions - the law of uncertainty in outcomes, essentially (no policy or institution can enforce total compliance) - that no matter the design and intent of policy, it will and cannot be implemented "perfectly". Utopianism forgets this and thereby calls for not only the transformation of institutions but also the transformation of man, a project which Popper argues is doomed to fail, "for it substitutes for [the historicist's] demand that we build a new society, fit for men and women to live in, the demand that we 'mold' these men and women to fit into [the historicist's] new society."[195] In short, historicism (ruthlessly) subjects *people* to the supposed law of historical change.

Part of the problem with historicism, Popper suggests, is that it confuses laws of change with trends. For Popper, there is no such thing as a law of change or succession of states, though there may be laws of causation (e.g., mutation, segregation, etc.). What historicists take as laws of development are actually just specific historical statements, or 'facts' – by no means guaranteed to occur in the same form universally. Thus, what they see as manifestations of the historical law are in fact only trends, i.e., historically-specific

natural kind in truth. Popper is effectively presenting a scientific realist perspective on knowledge, not committed to the actually, true existence of its concepts but only effective, efficient knowledge. See also Popper, *The Open Society and Its Enemies*, 31–32..

[195] Popper, *The Poverty of Historicism*, 70.

tendencies. The confusion of laws with trends in historicism, he argues, leads to a belief in absolute trends – "trends which, like laws, do not depend on initial conditions, and which carry us irresistibly in a certain direction into the future. They are the basis of unconditional *prophecies*, as opposed to conditional scientific *predictions*."[196] Because the historicist refuses to acknowledge the possibility of conditions under which his favoured trends would not exist, Popper concludes that "the poverty of historicism...is a poverty of imagination. The historicist...cannot imagine a change in the conditions of change."[197]

The tension between process and intervention identified by Jouvenel or between historical laws and trends identified by Popper thus suggests a third problem with the future; or, more accurately, a problem with the conditions from which we attempt to envision it and bring it into being. That problem is, basically, *people*; it is people whose actions will shape the future we try to envision (and we can't know for certain how a given individual will act), it is people upon whom actions to realize specific futures will be enacted (and imposing upon individuals a rigid vision of improvement is not sensitive to the 'human factor', as Popper referred to it), and it is people who may or may not change their behaviour according to the vision of the future to which they are exposed (since people possess free will). Following Jouvenel, we might refer to this problem as concerning the *legality* of historical change. [198] A rule-governed process, taking place in controlled and identical conditions to other instances of it, will produce similar or identical outcomes – this is the domain of scientific prediction, in which change is

[196] Ibid., 128.
[197] Ibid., 130.
[198] Jouvenel, *The Art of Conjecture*, 85–86.

assumed to proceed with a high degree of 'legality' (i.e., conformity to the rule). However, most of the systems we wish to know the future for, though consisting of processes and rules, are either opaque or unknowable in their initial conditions (e.g., the weather), or otherwise *illegal* – not characterized by anything more than a probability of conformance to the rule. As will be discussed below, though institutions, norms and rules do exist in society there are no guarantees that people will abide by them; the decision to conform rests with the individual, in the end.[199] Given both the centrality of people to both the creation of images of the future and in the realization of them, premised ultimately on the presumption of individual free will, the future thus becomes a realm in which we discuss and strive to bring about competing visions of the *preferable* future.[200]

3.2) Four Spectra of Future/Futures

Based on the above discussion of the three main problems of 'the future' - problems which confound our ability to predict a single future but enable us to consider probable, plausible and preferable ones - we can identify four dimensions to the broader transition from the future to futures in the 20th century. .

3.2.1) From objective to subjective.

One aspect of this shift is the growing *internalization* of the future. In other words, we can no longer conceive of the future as being something that exists external to our

[199] Barnes discusses the flexibility inherent in normative injunctions, and uses it to critique Parsons' systems-based account of politics. See Barry Barnes, *The Nature of Power* (Oxford: Polity Press, 1988). Also, on rules, behaviour and the construction of society, see Onuf, *World of Our Making*.

[200] Though the condition of free will may confound our ability to predict any one individual's behaviour, as Jouvenel notes in his discussion of Quetelet's *l'homme moyen* there can exist a kind of statistical legality in human behaviour. Though I may not be able to predict if someone is going to get married on the basis of their individual behaviour, choices or apparent trajectory, I can make some inferences based on the probable outcome, given social or cultural trends. Trends may not be laws, but they do tend towards them at the aggregate level; a tendency which suggests free choice of preferable futures may be somewhat of an illusion. See Jouvenel, *The Art of Conjecture*, 86–90.

beliefs, desires or interests in it, but rather as a complex issue comprises only those varied beliefs, desires and interests. There is no *real* future, of which we can possess knowledge, only *ideas* of the future, as held separately or potentially in concert, by individuals and groups capable of thinking about it. Thus, the 'objective future' is only a figment of some people's imagination - statements about the future can only ever be subjective. However, 'subjective' also suggests a greater role for agency in determining the future, that our relationship to change is as acting subjects rather than passive objects. Thus, even as the future was internalized as a creation of our intentionality, our agency vis-à-vis historical change was externalized.

3.2.2) From deterministic to contingent.

A related, though distinct, dimension to the internalization of the future is a growing sense of our causal influence over it. In other words, the future is understood not as predetermined outcome but as contingent on our choices and actions to shape it. Statements or knowledge about the future are therefore recognized not to be subject to criteria like true/false or accurate/inaccurate, but instead in their connection with decision-making. The word contingent also conveys chance however, and in this sense we now recognize that some aspects of the future are not even subject to any amount of foreknowledge whatsoever (even if only partial), but are fundamentally indeterminate - there are no grounds on which to judge the validity of statements about them in advance at all.

3.2.3) From discrete to diffuse.

Though some things about the future may be indeterminate, we do not accept that all things are - we just recognize that for most of these things, there is no singular possible

outcome or manifestation of it as it comes to pass. Thus, we no longer hold statements about discrete futures to be legitimate, instead conveying all outcomes as functions of probability. This is not necessarily to say, however, that we conceive of the probability of different futures as being more or less likely, but rather that, from our standpoint at least, aspects of the future just do not possess discrete characteristics - we can only envision (or represent) these characteristics as diffuse spreads or curves. This does not rule out aggregate conformity to the rule, however - though the legality of any individual choice, action, or future may be indeterminate, the existence of statistical legality still allows for some predictability in outcomes, even if at a more general or diffuse level than for individual acts or choices.

3.2.4) From impartial to normative.

A last implied characteristic of the paradigm transition from future to futures is that we no longer consider the future as an impartial object of concern. Instead, it is just another social domain in which we can place, construct and/or dispute normative issues (beliefs, values, desires, 'norms', etc.). This is different than saying we construct visions of a desired future and work backwards (referred to above as a 'normative' approach to forecasting). Rather, this characteristic suggests that the very notion of 'the future' as a temporal or spatial region, akin to the past or present, inside or outside, as well as the visions we have of it, are now things of ethical significance, something for which we are responsible - not only as causes or subjects, but also guardians.

We can summarize the above four dimensions accordingly. The first dimension characterizes the how we perceive the relationship between the future and our ideas, intentions and actions – in short, the *autonomy* of the future. The second perspective

speaks to the conceptualization of the nature of historical change and the future in general, or the *knowability* of the future. The third perspective addresses the content of futures, the character of both agent-based behaviour/outcomes and the forecasts or projections that can be based on them; I will refer to it as the *legality* of the future. The fourth and last dimension describes the growing sense of an ethical or moral duty to our relationship with the future or, in other words, our *responsibility* to the future.

3.3) Summary

These dimensions belie several ironies of the narrative of modernity presented in Chapter 2. For one, it was only when the disparate futures of peoples across the world began to merge into a common fate that we abandoned the 'idea' of the latter in preference for the 'reality' of the former. It seems incontrovertible now that the progression of energy systems, economic growth and modernity have bound most of the world to a future in which the actions (or inactions) of some can have a large impact on all. But, the narrative does not hold that we completely abandoned 'the future'; we only ceased to conceive of it as a deterministic outcome of things outside of our control. This shared future, despite its hegemony, is a product of our making (or unmaking). This leads to a second irony of the 20th century narrative: just as we were becoming aware of the fundamental uncertainty that pervades the natural world and our fundamental lack of control over it, we adopted a world-view of the future in which our choices and actions were among its primary determinants, shaping its coming to pass. Though it seems more humble, the 'new' view nevertheless affords a privileged place to both our agency and our beneficence in constructing the future.

A third irony follows: in the rush to accommodate the diversity of different perspectives of the future by opening up to 'futures', adherents of this view unwittingly aligned themselves to an inherently partial approach to knowledge and the future/futures. Even as it has become unfashionable to conceive of a science of the future, there nonetheless remains an informal distinction within the field between those who lean towards the tough-minded approach of methodological rigour, statistical analysis and forecasting; and those who would adopt a more tender-minded method, based on perceptions, narratives, and coherent scenarios for different possible futures (to say nothing of those that might possess an even more humble, perhaps fatalistic, perspective on our relationship to the future, in which we have no real power to shape it.)[201]

In practice, the narrative of modernity in the 20th century, as with any narrative, always risks being overblown and overwrought, descending from legitimate observation and critique to caricature and cynicism. As the discussion in Chapter 2, Section 3 was intended to demonstrate, the tensions that gave rise to the contemporary concept of sustainability were not momentary peculiarities of the mid-20th century. We should not therefore proceed under the illusion that there was some great awakening in the mid-to-late 20th century that 'the future' was impossible and only futures exist. Indeed, much like the reflexive response to modernity in the late 20th century, subsequent work in the field has tended to diminish or dissolve the hard distinction between tough and tender-minded futures.[202] Therefore, it may be better to conceive of these dimensions not as

[201] A perspective that the contemporary narrative might deem emblematic of a failure of character, a refusal to accept one's responsibility to future generations, or a general complacency in the face of challenge.

[202] See, for instance, forecasters adopting scenario analysis as a means of dealing with highly complex, highly uncertain phenomena, or the prominence in general of complex economic and natural systems models used to produce scenarios for the future of climate change and energy. Paul J. H. Schoemaker,

one-way transitions that occurred in the latter half of the 20th century, but rather as four spectra along which one's position on the larger distinction between futures and the future might be placed – tough-minded on one-side, tender-minded on the other.

SCIENCE *(Tough-minded)*	**ART** *(Tender-minded)*
Objective	Subjective
Deterministic	Contingent
Discrete	Diffuse
Impartial	Normative

Figure 2) Rudimentary Distinction between Future / Futures

Figure 2 thus summarizes the enduring distinction between a tough and tender minded approach to the question of the one true future versus the multidimensionality of futures, even if the former position has been softened during the course of the 20th century.

We are left, therefore, with the task here of identifying something common to these varied practices and perspectives that we can use to refer to them in general, without leaving anything open to allegations of bias and/or prejudice in the distinction between a science of the future and an art of envisioning futures. Futures are not complete constructions, free of constraint and entirely open to interpretation, just as the future is not closed down, determined, and rule-governed. What term can serve to describe the

"Forecasting and Scenario Planning: The Challenges of Complexity and Uncertainty," in *Blackwell Handbook of Judgment and Decision Making*, ed. Derek J. Koehler and Nigel Harvey (John Wiley & Sons, 2008); Derek W. Bunn and Ahti A. Salo, "Forecasting with Scenarios," *European Journal of Operational Research* 68, no. 3 (August 13, 1993): 291–303; Intergovernmental Panel on Climate Change, *Emissions Scenarios*.

practice in general without falling victim to such partiality? I will answer this question in the following chapter, wherein I argue that all visions of the future for sustainable energy are *observations* of the future.

Chapter 4) Observation, Technology, and the Politics of the Future

In the previous chapter, I explored the tension between a science of 'the future' and an art of conjecturing 'futures' in detail, identifying three problems of the future that appear to confound the notion of a singular future that can be known with certainty. Nevertheless, tension remains between the tough and tender-minded approaches to the envisioning futures, each characterized by a tendency towards one or another pole on the four 'spectra' of the future/future: the autonomy, knowability, and legality of, and our responsibility for the future.

This rift within the field of futures studies frustrates our ability to describe the varied practices and approaches in one word without upsetting one side or the other (and thus the construction of a generalized framework of their politics). In this chapter, I will present an argument for considering the set of probable, plausible and preferable futures for sustainable energy as 'observations' of the future. This quality, alongside the general *saturation* of sustainable energy futures by technology, the centrality of *technique* in observing futures, and the ultimately pragmatic or *instrumental* nature of the practice, establishes the observation of the future for sustainable energy a technological activity. Based on that characterization, I note four possible perspectives on the relationship between politics and the future.

4.1) Futures as Observation

As the previous chapter was intended to demonstrate, the distinction between those looking to forecast 'the future' versus those creating scenarios and visions of 'futures' is

a core tension defining the history and present field of futures studies. It is also an opaque and muddy difference that seems increasingly to be dissolving into a synthesis of diffuse, yet ostensibly objective and complex, modeling exercises and scenario 'analysis'.[203] Despite the seeming dissolution of this tension, however, the fact remains that there are forecasts and there are scenarios – though the two may at times share techniques, the *raison d'etre* seems to differ.[204] If we wish to characterize their politics in a general sense, we should perhaps seek a single term that encompasses both the function and purpose or intention of 'tough' and 'tender-minded' futures.

This is largely an epistemological issue. As noted above, the three problems of the future confound the production of reliable, accurate, certain *knowledge* of the future. If we cannot know the future as we might know the past/present, or the things in this world that "do not admit of change" (i.e., the eternal truths), we are left with a question of how to ground the information that is produced by both tough-minded forecasters and tender-minded scenario planners (as well as what they are trying to get better at). Bell's answer to the question of whether futures studies was a science or an art was that it was neither; instead, he characterized the epistemological foundation of the field as being critically realist – the familiar *via media* noted earlier.[205] Futures aren't predictions but neither are they complete fabrications. Instead, as both Popper and Jouvenel preferred to conceive of the activity, they are (unverifiable) conjectures about the (perhaps unobservable)

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[203] Notten et al., provide a comprehensive typology of 'scenarios' in contemporary practice – they are not so straightforwardly simple as subjective 'images of the future'. Philip W.F. van Notten et al., "An Updated Scenario Typology," *Futures* 35 (2003): 423–43.

[204] See footnote 198 for examples of dissolution. One need not look far for differences in motive – as Schoemaker notes in his opening statement, "forecasting involves making predictions about an unknown issue." See Schoemaker, "Forecasting and Scenario Planning: The Challenges of Complexity and Uncertainty," 274.

[205] Bell, *Foundations of Futures Studies*, chap. 4,5.

truth.[206] Conceiving of futures as somewhere *between* an art and a science seems appropriate, if only because such a middling strategy seems most likely not to offend either end of the spectrum too much. That being said, perhaps Bell's approach leans a bit too far to the tough-minded side for those disposed to more critical perspectives.[207] I suggest instead that we refer to the set of plausible, probable and preferable images, visions, forecasts, scenarios and backcasts as *observations* of the future for sustainable energy. We should be careful to clarify exactly what is entailed by the term observation however, as it does carry connotations of the 'naïve empiricism' exhibited by earlier logical positivists.[208] Moreover, as noted in the first problem of the future, it doesn't actually exist; a characteristic that would seem to make observation a challenging feat. The open-endedness and horizon-expanding intentions of foresight activities also does not seem adequately characterized by the act of observing something for the way that it is, not imagining or envisioning alternate ways it could be.

Indeed, at least since Popper it has been hard to characterize the act of 'observing,' even in the natural sciences, as pure, unfiltered reception of external information, unguided by *a priori* concepts and theoretical expectations. Observation, accordingly, carries some baggage, without which the boundaries of the thing it observes would not be intelligible; to 'observe' the future thus implies the imposition of frames of reference on

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[206] Ibid., 189.

[207] The prominence of truth, as well as his emphasis on "making people" responsible through futures in other works, contrasts sharply with the post-structural approaches of Inayatullah and Slaughter. See Bell, *Foundations of Futures Studies*; Bell, "Making People Responsible."

[208] In which scientists could observe empirical phenomena completely purely, without bias or a priori notions and conceptions. See Karl Popper, *The Logic of Scientific Discovery*; Godfrey-Smith, *Theory and Reality*..

the otherwise indeterminate contingency of the future.[209] But neither is the process entirely one-way in the other direction – not any and all mental impositions on the future will 'work' and, unlike for conjecture (ostensibly), observations of the future are not all made with the intention of falsifying the frames upon which they were constructed. The manner in which I use the term observation thus draws upon the notion of frames of reference, but entails a somewhat different process.

Following Niklas Luhmann, I use the term 'observing' to instead denote "making a distinction and indicating one side (and not the other side) of that distinction."[210] Luhmann, a theorist of 'self-observing' or *autopoetic* systems, considered difference (or distinction) to be the defining characteristic of a system; namely, the distinction of itself, its boundaries or limits, from its environment (a self-observing systems 'observes' this boundary by processing communication, but for our purposes we can place the act of observing a distinction in an external 'observer of the future' for sustainable energy).[211] The connection between observation and difference stems from Spencer Brown's "Laws of Form", who held that any objectification of something in the 'world' requires distinguishing it from what it is not:

> "that the world undoubtedly is itself (i.e. is indistinct from itself), but, in any attempt to see itself as an object, it must, equally undoubtedly, act so

[209] Given the 'radical uncertainty' of the future, what else could the practice of observing it be? John Alic, "The Radical Uncertainty of the Future," *Technological Forecasting & Social Change* 62 (1999): 147–50.

[210] Niklas Luhmann, "The Paradoxy of Observing Systems," *Cultural Critique*, no. 31 (October 1, 1995): 43.

[211] Niklas Luhmann, "System as Difference," *Organization* 13, no. 1 (January 1, 2006): 37–57.

> as to make itself distinct from, and therefore false to, itself. In this condition it will always partially elude itself"[212]

From this flows the notion that futures exist to produce 'information' about the future. Luhmann's account also drew from Bateson's work on information that held that information itself is "difference that makes a difference"; or, as Luhmann put it, information is only information if "it instigates a change in the state of the system."[213] Observation doesn't replace the existing difference with a state of "determinate unity"; it only changes the state of the difference.[214]

Taking this notion of observation, I suggest that the act or consequence of 'observing' futures is the 'observation' of the distinction between future and futures; or, more specifically, the taking of a partial stance on a question about the future by observing where aspects of that future lie on the four criteria of autonomy, knowability, legality, responsibility noted above (see Figure 3 below). Jouvenel's discussion of process and intervention in the preceding chapter is an example of just such a distinction – we do not wish to transform all of history into process, but neither can we make interventions without it.[215] The goal of 'conjecturing' futures (i.e., observing) is to distinguish between things that are more-or-less determined and those that "admit of change."[216] Whatever specific thing a forecast or scenario may say about or envision for the future, the process

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[212] G. Spencer-Brown, *Laws of Form*, New ed (New York: Julian Press, 1972); cited in Luhmann, "The Paradoxy of Observing Systems," 44.

[213] Gregory Bateson, *Steps to an Ecology of Mind; Collected Essays in Anthropology, Psychiatry, Evolution, and Epistemology*, Chandler Publications for Health Sciences (San Francisco: Chandler Pub. Co, 1972); Luhmann, "System as Difference," 40.

[214] Luhmann, "System as Difference," 40.

[215] See Jouvenel, *The Art of Conjecture*, chap. 10–11.

[216] For example, Peter Schwartz – a prominent scenario planner and theorist in the business world – describes the key step in creating scenarios as distinguishing between critical uncertainties and pre-determined elements. See Schwartz, *The Art of the Long View*, 106.

of making it engages the observer more-or-less unconsciously in the act of observing these distinctions.

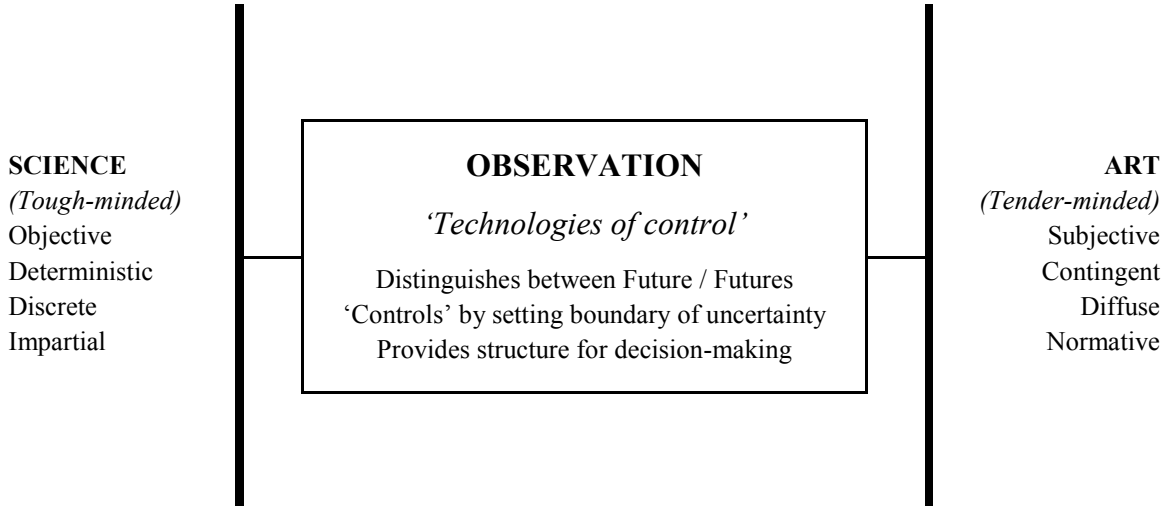

Figure 3) Observation: Futures as 'Technologies of Control'

4.2) The Technological Future

Conceiving of the varied practices and techniques for creating information about the future for sustainable energy as observation opens the way for considering the activity in general as *technological*, rather than an art or a science. In this section, I will present four arguments to support this claim: 1) that the future for sustainable energy is *saturated* with technology; 2) that this is in part a condition of modernity, in which rationalized technique predominates; 3) that the *technê* of observing futures is essentially the skilled use of techniques for informing decision-making; and lastly, 4) that the combination of these factors positions the practice firmly in the domain of *instrumentality*.

As discussed in Chapter 2, the problem of sustainable energy is an issue of socio-technical transition management.[217] Though present policy, regulations, norms, values and behaviours are no doubt important aspects of this problem (let alone the general economic and political structure of modern society), the solution in most cases necessarily involves technological change. That is to say, it seems difficult to observe a future for sustainable energy in which technological *improvement* did not play a prominent if not central role.[218] For this reason alone, we might say that the future for sustainable energy is *saturated* with technology. There is another dimension to this characterization, however, which stems from the underlying social condition that both produced and seeks to solve the problem of sustainable energy: namely, the condition of modernity.

According to Ellul, the definitive characteristic of modernity is the predominance of *technique*, which he defines as "the totality of methods rationally arrived at and having absolute efficiency."[219] Technique is not just methods, but rather a preoccupation with finding the best method for accomplishing any goal, and wherein best is defined by only efficiency. Machines, Ellul suggests, are just the perfect expression of *technique*, the

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[217] Various sources where cited above, but in particular Smith, Stirling, and Berkhout, "The Governance of Sustainable Socio-Technical Transitions"; James Meadowcroft, "What about the Politics? Sustainable Development, Transition Management, and Long Term Energy Transitions," *Policy Sciences* 42, no. 4 (July 11, 2009): 323–40.

[218] Improvement can be either incremental (i.e., efficiency gains) or transformational (i.e., regime change), but both are important aspects of transitioning towards sustainability. Not only must technology improve, but our progressive learning about niche alternatives facilities their ability to eventually challenge the status quo. See Arthur, *The Nature of Technology*., on technological change as evolution; Geels and Schot, "Typology of Sociotechnical Transition Pathways.", for a typology of transition pathways (e.g., how regimes can be destabilized and niche technologies emerge to replace them). Timothy J. Foxcon, *Inducing Innovation for a Low-Carbon Future: Drivers, Barriers and Policy* (London, UK: The Carbon Trust, 2003)., is a particularly exemplary account of the causes and constraints on technological innovation.

[219] Ellul, *The Technological Society*, xxv.

purest manifestation of what is more a world-view than a process or object, just as capitalism is the economic expression of technique. Being definitive of modernity (the conceit of which, as noted earlier, is to stand in contrast to the age that precedes it) technique is more than mere 'means to an end'; it also comprises both *consciousness* and *judgment*.[220] Whereas simple or traditional technique was most often "tentative, unconscious, and spontaneous" - unreflective and automatic actions taken to achieve clear goals - the contemporary "technical phenomenon" seeks to judge those actions on the basis of their efficiency. Technique is thus the realm of "clear, voluntary, and reasoned" actions and concepts, evaluated on the basis of best adaptation to a given challenge. There can be only one "best means" and it is the task of the specialist to evaluate this efficiency through numerical calculation; a task that has given rise to a "science of techniques."[221]

Ellul's characterization of modernity suggests that technology may be integral not only in the *content* of sustainable energy futures, but also perhaps in the *creation* of those futures as well. On the one hand, many contemporary energy futures studies could not be conducted without computers powerful enough to run the complex models that generate the scenarios, models which are themselves required to process the immense datasets that contain the energy and economic data on past and present trends and developments in both systems.[222] In a broader sense though, perhaps in response to the "emergence of probability" detailed by Hacking or the increasing uncertainty about both the natural

[220] Ibid., 20–21.

[221] See Ibid., 22–27, chap. 2.

[222] For example, the model that is used to produce the International Energy Agency's World Energy Outlook comprises over 13,000 equations and reportedly takes hours to run (based on interviews I conducted for the case study below). Also, see International Energy Agency, *World Energy Model: Methodology and Assumptions* (Paris: OECD/IEA, 2011).

world and the future characteristic of mid-20th century modernity, contemporary practices of observing futures are heavily reliant on technique to control for uncertainty.[223] As Hacking suggested above, in the age of probability we can no longer continue as farmers unreflectively projecting the future as an extension of the present or past; we need to be more rigourous.

This is certainly true of more scientifically-inclined futures but so too is it true for more 'artistic' ones: whereas in the former practices techniques may be designed so as to utilize probability theory in order to better represent uncertainty,[224] in the latter the 'technique' typically belongs to the scenario planner, whose task it is to both convey uncertainty to their audience but also to control it in such a way as not to frustrate the decision-maker. Pierre Wack's account of his scenario-planning approach at Shell during the tumultuous 1970s and 1980s provides a good example, wherein he notes the central challenge of scenarios was not uncertainty *per se* but to provide structure upon which decision-makers could exercise judgement. "Useful scenarios," he suggests, must balance "the world of facts with the world of perceptions", using the latter to shape the former.[225]

The kind of technique espoused by Wack suggests yet another 'technological' aspect of the observation of the future, which is its nature as *technê* – an ancient Greek term that

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[223] Hacking, *The Emergence of Probability*..

[224] For instance, the Delphi Method (described early on in Helmer and Rescher, "On the Epistemology of the Inexact Sciences."); Monte Carlo simulation (Olaf Helmer, *Looking Forward: A Guide to Futures Research* (Beverly Hills, CA.: Sage Publications, 1983); Ronald R. Charpentier and T.R. Klett, "Monte Carlo Simulation Method," in *World Petroleum Assessment 2000*, vol. Chapter MC, U.S. Geological Survey Digital Data Series DDS-060 (Denver, CO: U.S. Geological Survey, 2000), http://pubs.usgs.gov/dds/dds-060/.

[225] One of Wack's main influences was Kahn. See Wack, "Scenarios"; Wack, "Scenarios: Uncharted Waters Ahead."

is often identified as the historic root of the modern term 'technology.[226] Loosely translated as 'art' or 'crafts', *technê* was typically contrasted with *episteme* in Classical Greek philosophy, wherein the latter implied knowledge (especially 'scientific' knowledge) of things that do not 'admit of change', i.e., knowledge of the 'essence' of a thing, while the former referred to knowledge of how to do or make something, a facility with the implements to make that occur, or knowledge of how something works or what it does, but not necessarily knowledge of the fundamental principles that make something a 'real' object or kind. [227] Examples of *technê* thus include activities such as cooking, house-holding or building, playing a musical instrument, carpentry, painting, or any other practice that requires a degree of skill. Wack's description of the challenges of scenario planning, the degree of education and skill required to effectively utilize the complex techniques and models used, the numerous professional communities that exist for both scholars and practitioners of 'futures' all point to the art or craft-like nature of observing futures.[228]

There is one last aspect of futures for sustainable energy that suggests they are technological, an aspect that derives from their status as *technê,* makes technique so central to them, and is essential to their role in governing socio-technical transitions: their pragmatic or instrumental nature. As Ellul conceived of technique as in part the *means*

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[226] See, for example, Arthur, *The Nature of Technology*., as well as Heidegger, "Basic Writings."

[227] See Richard Parry, "Episteme and Techne," in *The Stanford Encyclopedia of Philosophy*, ed. Edward N. Zalta, Fall 2008, 2008, http://plato.stanford.edu/archives/fall2008/entries/episteme-techne/., for an overview of this distinction

[228] Some of these organizations where noted earlier, some of which include the Association of Professional Futurists; the World Future Society; the World Futures Studies Federation; the Applied Foresight Network; the International Institute of Forecasters; and Futuribles.

used to achieve valued *ends*,[229] the definition of 'technology' itself has typically been to emphasize its instrumental character.[230] As *technê,* futures deal in the world of things which 'admit of change.' To be skilled in this art entails a practical ability, a knowledge of how to do something (rather than knowledge of why something is as it is). Indeed, the whole point of observing the distinction between future/futures (as has been suggested by Jouvenel and other futurists who emphasize the aiding of judgment, strategic planning and decision-making as being key goals of futures) is to produce *useful* information about the future so as to shape (i.e., govern) the transition towards it. That utility lies not in accuracy, certain foreknowledge, or prediction, but rather the ability to control uncertainty so as to guide choice; to lean too far towards science or art risks undermining the pragmatic value of observing the future.

The characterization of observation of the future for sustainable energy as a technological practice not only helps to side-step the intractable tension between the 'art-versus-science' debate discussed in Chapter 3, it also opens up a new avenue for conceiving of the politics of the future; namely, by drawing on the broader literature on the politics of technology. Figure 4 shows how the rudimentary distinction between future and futures might influence perspectives on the relationship of politics to the practice of 'observing' the future. In the next section, I will outline four main perspectives on the relationship between politics and the future for sustainable energy, drawing equally from literature on the politics of technology and the politics of futures.

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[229] He quotes H.D. Lasswell's definition approvingly: technique is "the ensemble of practices by which one uses available resources in order to achieve certain valued ends" Ellul, *The Technological Society*, 18.

[230] Heidegger considers the definition of technology as instrumental as itself an "instrumental definition" of technology, and goes on to explore its roots in classical Greek and Roman philosophy. He ends by describing technology as a "revealing" of the world or, more perniciously, an "enframing". See Heidegger, "Basic Writings," 318–320.

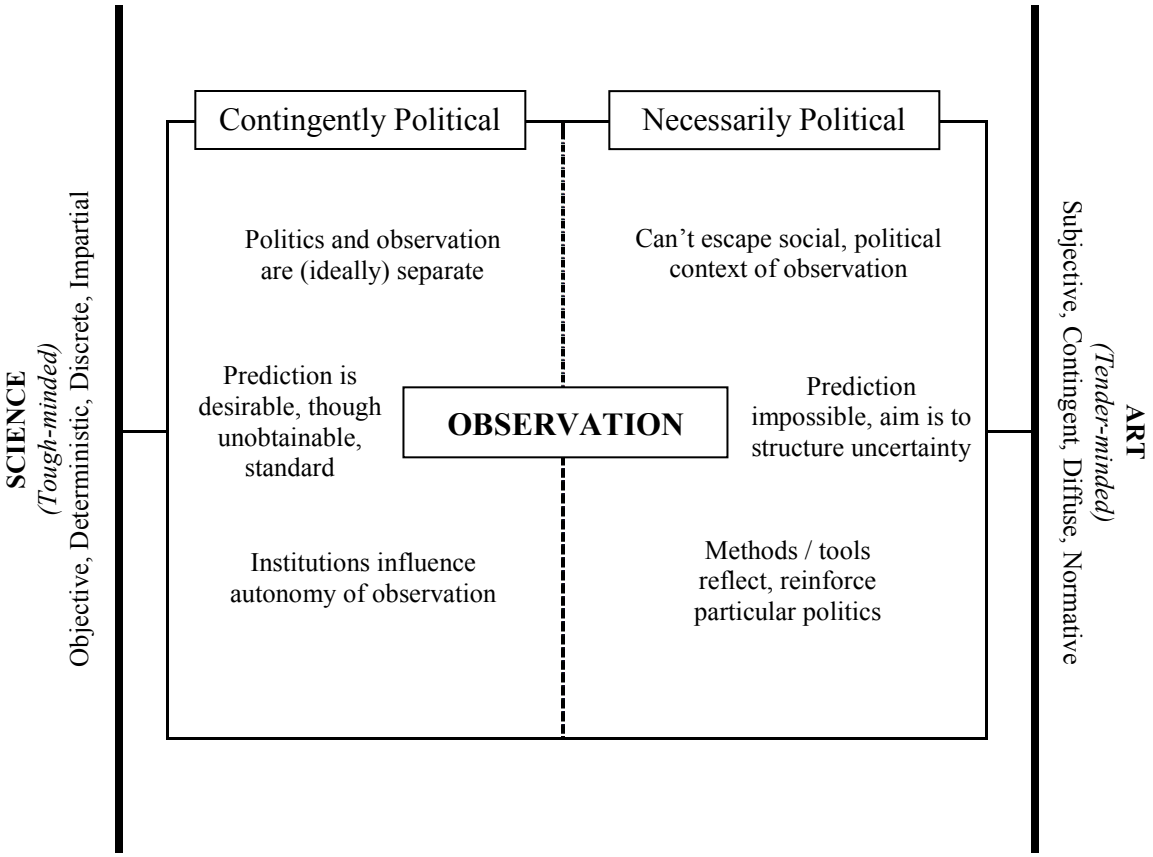

Figure 4) Politics and Observation - Contingent versus Necessary

4.3) Four Perspectives on Politics of Technology / Futures

Perspectives on the relationship between politics and the future differ along two primary dimensions: the first concerns the source of the political and the second its location, expression or functioning through observation of the future. Together, these dimensions create four distinct perspectives on the relationship between politics and the future for sustainable energy: 1) Politics as intervention; 2) Politics as mediative; 3) Futures as performative; 4) Futures as intermediary. Below I will outline these perspectives, cite some examples thereof, and note connections to the various dichotomies and spectra noted earlier.

4.3.1) Sources of Politics

Broadly speaking, we can distinguish between two sources of politics: individual acts, decisions, ideas or interests on the one hand and historically situated social or cultural norms, values, and institutional arrangements – in short, individuals or society. This distinction roughly corresponds with that between the tough and tender-minded approaches to inquiry, or perhaps between the 'science and art' contrast that characterized the history of futures studies above – Nelkin describes it as between rationalism and politics in general, though that characterization risks caricaturing the former as naively considering itself bereft of politics.[231] Accordingly, the individual (or 'tough-minded') perspective tends to render social and political concerns in technological questions *external* to the technology itself, lending itself to a negative view of politics in which the parochial interests or misconceived views of individual actors obstruct the rational solution to the problem.[232] Taken to the extreme, this perspective is exemplified by the technocracy movement of the 1920s and 1930s (in which M.K Hubbert, of later peak oil fame, was a leading figure), which sought to remove all 'politics' from the administration of society.[233] As Hughes suggests, this perspective is typically more common among the scientists and engineers, since "textbooks for engineering students often limit technological systems to technical components, thereby leaving the student with the mistaken impression that problems of system growth and management are neatly

[231] See Dorothy Nelkin, ed., *Controversy: Politics of Technical Decisions* (Beverly Hills, CA.: Sage Publications, Inc, 1979), 11–15. It is arguable whether the 'rationalist' perspective sees itself bereft or not needing of politics, rather than just calling for a particular relationship with politics.

[232] Indeed, this perspective would recognize only 'problem-solving' approaches to technical, policy or analytical questions as legitimate, and likely eschew more 'critical' approaches. See Robert W Cox, *Production, Power, and World Order : Social Forces in the Making of History*, Political Economy of International Change 1 (New York: Columbia University Press, 1987).

[233] William E. Akin, *Technocracy and the American Dream : The Technocrat Movement, 1900-1941* (Berkeley: University of California Press, 1977); Dr. M. King Hubbert, Session IV, interview by Ronald Doel, Transcript, January 17, 1989, http://www.aip.org/history/ohilist/5031_4.html.

circumscribed and preclude factors often pejoratively labeled 'politics.'"[234] Perhaps as a consequence, this perspective often pits scientists and engineers against the social and political forces that often prohibit them from solving the more-or-less technical and practical problems in attaining 'sustainable energy'.[235]

Galbraith outlines this perspective in relation to futures, specifically in the use of forecasting in business wherein he suggests politics' intervenes by "managing the truth."[236] Forecasting serves many purposes in business, one of which is to demonstrate to potential investors why the company might be a good investment, though futures might also be used internally for planning or strategic purposes, to gauge the direction a market, important trend, or competitor may be heading. In any case, Galbraith associates the manipulation of such futures for personal or subjective reasons with politics – for example, if management refuses to allow the consideration of a competitor in a scenario, despite the fact that doing so might produce a more accurate and comprehensive picture of the future, because they are deemed inferior or of lesser quality (even worse is if management requires forecasters to game their forecasts to portray an unrealistically optimistic future for the company to attract investment). In either example, the primary indicator of political manipulation of a future is accuracy, which confounds rational decision-making – as Galbraith notes, "one must assume that when accuracy is decreased,

[234] Hughes, "The Evolution of Large Technical Systems," 55.

[235] For example, see Colin Brown, "Engineers Can Build a Low-Carbon World If We Let Them," *New Scientist*, 2011, http://www.newscientist.com/article/dn20963-engineers-can-build-a-lowcarbon-world-if-we-let-them.html?full=true..

[236] Galbraith, "The Politics of Forecasting."

both internal decision makers and external stakeholders are less likely to make informed choices."[237]

Though Galbraith suggests that institutional structure may play a role in influencing the degree to which actors are inclined to try to intervene,[238] it is nonetheless the parochial 'interests and ideas' of individual actors that confound ostensibly apolitical forecasting. This perspective is not consigned only to the practice of forecasting either; foresight activities designed to facilitate consensus around preferable futures can also become imbricated by "nasty politics," when they remain naively absent of "detailed institutional provisions to actually safeguard reflexive governance designs from being dominated and captured by powerful political actors."[239] Neither does it possess a wholly negative view of politics, as it recognizes that 'good' politics is necessary to facilitating acknowledgement and acceptance of the reality of the problems we face, as well as in taking concerted (however unpopular) action to steer the proper course.[240] What is important to this perspective is for politics (good or bad) to remain more or less external to the process of observing futures, interjecting only to reduce the ability of powerful actors to dominate the discussion in a way that furthers only their own interests.

Taken to its extreme, this perspective lends itself to what proponents of the opposing 'social' (or 'tender-minded') persuasion might refer to as a 'social engineering' approach

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[237] Ibid., 38.

[238] He notes that democratic or non-hierarchical management structures are more likely to allow unimpeded forecasting than more rigid ones. Ibid., 34–5.

[239] Jan-Peter Voß and Basil Bornemann, "The Politics of Reflexive Governance: Challenges for Designing Adaptive Management and Transition Management," *Ecology and Society* 16, no. 2 (2011): 9.

[240] Even the New Scientist article cited above recognizes the need for brave politicians to take a stand against anti-rational or purely self-serving interests that would forestall or hinder the change that is necessary (See Brown, "Engineers Can Build a Low-Carbon World If We Let Them.")

to the observation of the future.[241] The desire to keep the process of observing futures free from political interference can lead towards a technocratic elitism if taken too far, one in which potentially radical policies and institutional rearrangements are enforced on society without regard for the human impacts. Moreover, what the individual perspective fails to recognize, these critics argue, is that there can be no stepping outside of politics to observe the future objectively; there is no incontrovertible definition of or means to achieve sustainability and no apolitical technologies. Instead, technologies (and futures) are necessarily objects of social and political concern, subject to values and beliefs about what is a desirable or legitimate technological option, to existing norms and institutions concerning technological practice, and to the actions of those who have an interest in maintaining them.[242] They are, in short, embedded within a social / political context.

Controversies surrounding technology are thus indicative, not of negative, parochial resistance to technological progress but rather the declining ability of laypeople to have a say in technological matters - dissatisfaction not with the technologies themselves but with the power relationships associated with them. They are less a rejection of science than about the use of scientific rationality to mask political choices.[243] Instead of portraying the perspectives of laypeople of the risks of certain technologies as irrational

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[241] Baumgartner and Midttun define a social-engineering approach to the future as holding that: a) there is only one 'correct' model of society possible; b) that knowledge of social processes is sufficient to formulate laws that allow for accurate prediction of the future; c) that data is available to map these processes in detail; d) that political and administrative bodies operate under consistent and static goal-structures and can pursue long-term policies without fear of losing legitimacy, and; e) that modeling/forecasting is a purely technical activities free from commercial or political considerations. Thomas Baumgartner and Atle Midttun, "The Socio-Political Context of Forecasting," in *The Politics of Energy Forecasting: A Comparative Study of Energy Forecasting in Western Europe and North America*, ed. Thomas Baumgartner and Atle Midttun (Oxford; New York: Clarendon Press, 1987).

[242] Bijker, Hughes, and Pinch, *The Social Construction of Technological Systems*., is the archetypal expression of this approach.

[243] Nelkin, *Controversy: Politics of Technical Decisions*, 11.

and in need of correction, the social perspective focuses on the demographic, social and cultural characteristics of people that influence how people perceive technology. In the social perspective,

> "[H]ow one perceives science and technology reflects special interests, personal values, attitudes towards risk, and general feelings about science and authority. The social and moral implications of science and technology, the threat to human values, may assume far greater importance than any details of scientific verification."[244]

To overcome the gap between experts and the public, this perspective emphasizes deliberation, education and learning as a means to achieving consensus, as well as the importance of opportunity to participate in decision-making and creating a sense of the social value of controversial technologies in order to gain public support.[245]

Baumgartner and Midttun outline a social perspective on the source of politics in forecasting for energy, arguing that politics is present at three points or locations in the practice:[246]

1. In the choice and selection of data and modeling methodologies, which can often be 'political loaded' in cases where there is weak theoretical knowledge or conflicting interests attached to the setting of modeling parameters;

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[244] Ibid., 14.

[245] For example, one potentially controversial energy technology is carbon capture and storage. Supporters of this technology are keen to avoid the fate of nuclear technology, and thus are particularly interested in understanding how to mitigate public opposition through communications and educational programmes designed to build a sense of trust, provide opportunities for joint decision-making, and create a 'social value proposition'. See Global CCS Institute, "Social Value Proposition," Global CCS Institute, accessed July 12, 2012, http://www.globalccsinstitute.com/node/16496.

[246] Baumgartner and Midttun, "The Socio-Political Context of Forecasting."

2. In the role the institutional and professional environment for forecasting has in shaping outputs, which can lead to "cognitive monopolies" and group-think, anti-democratic exclusion of contending perspectives, and 'self-fulfilling of falsifying prophecies' if the feedback loops between forecasting, planning, and policy implementation actors are underestimated, and;
3. In the interplay between forecasting and political decision-making in general, in which forecasts can be used to define reality, shape political debates, and to legitimate political decisions.

A more recent paper also influenced by science and technology studies, similarly identifies three locations in which politics relates to scenario planning: [247] 1) the emergence (institutional and organizational contexts, or macro-settings; whose interests or values are embedded in the analysis) of scenarios; 2) the effects of scenarios (scenarios as boundary objects or boundary ordering devices, where knowledge and social order are 'co-produced'), and; 3) the effectiveness of scenarios (influence on decision-making, utilizing network analysis to look at density and structure of scenario work, which scenarios are most likely to influence policy).

How different are the social and individual perspectives on the source of politics? In some respects, the social perspective subverts the politics laid out by the individual approach, construing a faith in the 'one true future' as bad politics and holding up a 'many futures' perspective as an example of good politics. Put differently, politics in futures for the second perspective are associated not with the obstruction of objective

[247] Simone Pulver and Stacy D. VanDeveer, "'Thinking About Tomorrows': Scenarios, Global Environmental Politics, and Social Science Scholarship," *Global Environmental Politics* 9, no. 2 (2009): 1–13.

information but rather the unnecessary exclusion of subjective information. Yet the two perspectives are also not that far apart – Galbraith did note the importance of institutional arrangements to shaping the process of forecasting, suggesting forecasts in a non-democratic organization are more likely to be invested with politics through the interference of those with more political power, whereas Baumgartner and Midttun suggest that, "if we accept the fact that long-term society futures cannot be objectively and accurately predicted, but actually must be highly normative and politically loaded, the question of how such planning and prediction can be democratically controlled becomes pertinent."[248]

Though both may share a predilection for democratic institutional arrangements, for Galbraith institutional design is an important factor in shaping the management of the truth, whereas for Baumgartner and Midttun it both reflects and constructs the social and political values by which we choose to live. There is therefore an important distinction to be made between futures that are deemed political because they have been invested with the political intentions or normative visions of people on one hand, and the view that futures are irrevocably ensconced in political norms and values and that we should therefore reflect the politics we value in both their content and construction on the other. Whereas politics in the individual perspective *intervenes* in the activity of observing the future, politics in the social perspective *mediates* it instead.

4.3.2) Expression of Politics

[248] Thomas Baumgartner and Atle Midttun, "Modelling in Self-Reactive Contexts," in *The Politics of Energy Forecasting: A Comparative Study of Energy Forecasting in Western Europe and North America1*, ed. Thomas Baumgartner and Atle Midttun (Oxford; New York: Clarendon Press, 1987).

The second dimension that characterizes thinking on the politics of the future concerns the relationship between the two, or the location of the former in the latter. More accurately, it addresses the manner in which politics is expressed through or the political effects of the activity of observing the future for sustainable energy. It is to some extent commensurate with the distinctions made between critique and complacency or reflection and action in Chapter 2, though it also draws on distinctions between the objective and the subjective, or the impartial and the normative made in Chapter 3.

As noted above, the social perspective draws heavily from the 'social construction of technology' school of science and technology studies, itself influenced by Bloor's Strong Programme in the sociology of science.[249] This position does differentiate itself from the ostensibly more rational, early-modernism of the individual perspective, partially based on a more reflective, or critical and empirical approach to the construction of technological or scientific facts.[250] That being said the approach was certainly not without detractors, one form of which was the scientific realist rejection of the 'relativity' they perceived such theories of science and technology as propagating.[251] Another line of critique, more pertinent to the issue at hand, was that advanced by Langdon Winner who, though commending the social constructivist approach for its concern with specifics and its empiricism in developing models of technological change, also admonished this

[249] Bijker, Hughes, and Pinch, *The Social Construction of Technological Systems*; Bloor, *Knowledge and Social Imagery*.

[250] Nelkin, *Controversy: Politics of Technical Decisions*., is a case in point, contrasting 'rationalist' technocratic-elitism with 'politics'. The distinction in general is associated with the rift between "positivist" and "post-positivist" social science, as was covered in Chapter 2.

[251] E.g., the 'science wars'. See Ross, *Science Wars*.

school often 'leaving out' politics.[252] Specifically, Winner noted four such 'lacunae' in social constructivist approaches to technological politics: disregard for the social consequences of technological decisions; disregard for social groups not considered 'important' by the analyst; disregard for the 'deeper' cultural, economic, intellectual origins of social choices around technology; and the general lack of an evaluative (i.e., critical) stance vis-à-vis the technological issues they investigate.[253] In their rush to stand opposed to the "outmoded" and simplistic accounts of forebears such as Mumford, Ellul, Heidegger or Marx the social constructivist approach, Winner suggests, has unintentionally replicated the early positivist belief in "value neutrality" in the postmodern commitment to "interpretative flexibility."[254]

An example of the kind of post-positivist yet impartial approach to the study of technology that is somewhat related to the observation of the future is Donald Mackenzie's work on the history of financial economics and the attempt to find a way to rationally price 'futures' contracts.[255] Playing on an offhand comment of Milton Friedman's that economic theory should aim to be 'more engine than camera', producing useful predictions rather than simply reflecting the world as it is, Mackenzie traces the development of complex equations to price options (futures contracts) from their early

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[252] Winner actually cites several of the authors used here to represent the social constructivist approach to science and technology: "H. M. Collins, Trevor Pinch, Wiebe Bijker, Donald MacKenzie, Steven Woolgar, Bruno Latour, Michel Callon, Thomas Hughes, and John Law." See L. Winner, "Upon Opening the Black Box and Finding It Empty: Social Constructivism and the Philosophy of Technology," *Science, Technology, & Human Values* 18, no. 3 (1993): 384.

[253] Ibid., 368–373. In many ways, Winner's critique of the early social construction of technology studies presages the critiques Meadowcroft and others made of socio-technical systems theory 30 years later. On the absence of politics in that school, see Meadowcroft, "What about the Politics?"; Meadowcroft, "Engaging with the Politics of Sustainability Transitions."

[254] Winner, "Upon Opening the Black Box and Finding It Empty," 367, 373.

[255] MacKenzie, *An Engine, Not a Camera: How Financial Models Shape Markets*; Donald A. MacKenzie, Fabian Muniesa, and Lucia Siu, *Do Economists Make Markets?* (Princeton University Press, 2007).

mid-century beginnings, to their incorporation into technology used by traders on the stock exchange floor, and finally to their role in producing / generating contemporary financial catastrophes like the collapse of Long-term Capital Management in the late 1990s. The essence of Mackenzie's argument is that financial economic theory moved from mere interpretation of the world to becoming a generative or formative force as theory was progressively incorporated into the techniques and practices that comprise financial economics. This generative effect Mackenzie terms "Barnesian performativity," a tertiary form of informational reflexivity he considers as beyond the mere use of information in guiding decision-making (the first level of performativity) and the secondary level of the self-fulfilling/denying prophecy.[256]

Though Mackenzie's account is certainly provocative and well outside the conventional forms of causation and explanation likely to be recognized as legitimate by more positivist-inclined social scientists, he does not provide much in the way of a social or political commentary about the phenomena he purports to be observing as 'Barnesian performativity.' Indeed, though self-fulfilling prophecies and performative theory may seem intuitively political, the precise connection remains somewhat ambiguous, as does the meaning of politics in general in such accounts. Though much is gained in empirical relevance by attending to the complexity of technological development, this type of analysis risks losing the critical voice that Winner suggests should be retained. As Barney suggests, this kind of empirical closeness to the thing being investigated, oddly

[256] See MacKenzie, *An Engine, Not a Camera: How Financial Models Shape Markets*, chap. 1., as well as Barnes, *The Nature of Power*., which will be discussed in greater detail in the following chapter

characteristic of some postmodern or post-structural work, can make it difficult to "gain the distance that is crucial for judgment."[257]

The risk of the constructivist position, if taken to far, is to return to complacency in the face of ostensibly "autonomous technology."[258] Though Winner notes that "to discover either virtues or evils in aggregates of steel, plastic, transistors, integrated circuits, and chemicals seems just plain wrong, a way of mystifying human artifice and of avoiding the true sources, the human sources of freedom and oppression, justice and injustice," it is nevertheless important to consider the politics of technology as the "things themselves." This perspective, he suggests, complements the more 'social determinist' attention to the social and political context in which technology is situated, represented above by Baumgartner and Midttun. Winner identifies two manners in which technologies themselves may contain political properties. The first are instances in which "the invention, design, or arrangement of a specific technical device or system becomes a way of settling an issue in a particular community." The second are those situations in which "man-made systems...appear to require, or to be strongly compatible with, particular kinds of political relationships." [259] The politics of the former kind Winner considers "fairly straightforward," whereas the latter pose the more interesting case of inherently political technology.

As an example, he cites the allegation that New York City planner Robert Moses had the bridges over parkways on Long Island built intentionally low to prohibit public

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[257] See Darin Barney, *Prometheus Wired: The Hope for Democracy in the Age of Network Technology* (Vancouver, B.C. :: UBC Press,, 2000).

[258] See Langdon Winner, *Autonomous Technology: Technics-out-of-Control as a Theme in Political Thought* (Cambridge, Mass.: MIT Press, 1978)., for a comprehensive overview of this concept.

[259] Langdon Winner, "Do Artifacts Have Politics?," *Daedalus* 109, no. 1 (1980): 130.

transportation (and thus inner-city blacks) from patronizing the parks he had built there. In these cases, technologies can be interpreted as having been "designed or built in such a way as to produce a set of consequences logically and temporally prior to any of its professed uses."[260] Though ostensibly freeways are only intended to carry cars from one point or another, the embedded political decisions of Moses in their design entail that they serve more nefarious, if obscured purposes as well. He equates technology in this sense to social or political institutions, designed and constructed as a way of 'ordering our world.' Seemingly arcane technological decisions, as a result, can have a lasting impact on the social order; as Winner summarizes, "The issues that divide or unite people in society are settled not only in the institutions and practices of politics proper, but also, and less obviously, in tangible arrangements of steel and concrete, wires and transistors, nuts and bolts."[261]

The case with inherently political technology is somewhat different. Whereas the design or practical implementation of most technology (e.g., highways) is remarkably flexible, there are some technologies that seem to either require "the creation and maintenance of particular social conditions", or are at least strongly compatible with such arrangements. Winner cites as examples the atom bomb, as well as nuclear versus solar power, the former requiring a centralized, elite-dominated administrative system due to its complexity, risk and scale; the latter being more compatible with a decentralized,

[260] Ibid., 125.
[261] Ibid., 128.

democratic arrangement in which more people have a voice in the technological composition of energy systems.[262]

The arguments made by Baumgartner and Midttun about the importance of choosing futures' observation techniques that reflect the political and social principles we value is a partial example of an argument about the embedded politics of forecasting, though they may not comprise inherently political 'technologies' for observing the future in the sense conveyed by Winner. Another example might be the attention paid to discursive and rhetorical aspects of observing futures that have inadvertent, constraining consequences for how we conceive of the future – as, perhaps, a scenario with a lengthy timeline may unintentionally convey the impression that the need for action is not immediate.[263] Similarly, other work in 'critical futures studies' pays close attention to how discourse about the future is constitutive of reality, though in a more politically-charged (read: divisive) manner than suggested by Mackenzie's analysis of economic theory.[264]

Notwithstanding the silence of Mackenzie as to the political implications of his analysis of financial economics (nor assuming he is required to say something on this matter in any case), I suggest we can distinguish broadly between two divergent approaches to the expression of politics through the observation of the future based on the

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[262] Ibid., 130–135.. Another example might be the database structure that underlies a social networking service like Facebook, reflecting unintentionally political choices of its original builders, can lead to fundamental changes in the way actors express their connections to other people or things (by 'Liking' them). According to Jarod Lanier, when manifested in a technology that cannot reflect the intricacies and complexities of social relationships, these choices debase and simplify the social world as well, producing gadgets out of people, even if not intended by their originators. See Jaron Lanier, *You Are Not a Gadget: A Manifesto*, 1st ed. (Knopf, 2010).

[263] Mike Michael, "Futures of the Present: From Performativity to Prehension," in *Contested Futures: A Sociology of Prospective Techno-Science*, ed. Nik Brown, Brian Rappert, and Andrew Webster (Aldershot England ;;Burlington VT: Ashgate, 2000), 21–39.

[264] Inayatullah, "Causal Layered Analysis."

above discussion. On the one hand is Winners' approach, standing against the interpretative flexibility and empirical closeness of 'strong' social constructivist or post-modern/structural approaches to technology and/or the future. Here the objects possess politics themselves, either through the institutionalization of past political decisions (i.e., Moses' bridges) or through inherent characteristics that either require or are strongly compatible with certain social arrangements. On the other end of the spectrum, the approach to analysis does not move far beyond the empirical level, instead striving to remain impartial as to the social or political implications of the phenomenon they investigate. Here politics is largely external to the technology or future in question. Therefore, the first perspective I term the 'immanent' relation of politics and the observation of the future, and the second the extrinsic.

4.3.3) Preliminary Framework

We can now begin to construct a framework for consideration of the politics of the future for sustainable energy. Based on the two 'dimensions' of the source of politics and its location, relationship to, or expression through observations of the future, I identify four perspectives: the politics-as-intervention (i.e., individual source, extrinsic to futures) and the politics-as-mediative (social source, extrinsic to futures) perspectives on the one hand; and the futures-as-intermediaries (e.g., individual source, immanent to futures) and futures-as-performative (e.g., social source, immanent to futures) perspectives. Figure 5 below summarizes these four approaches to the politics of the future.

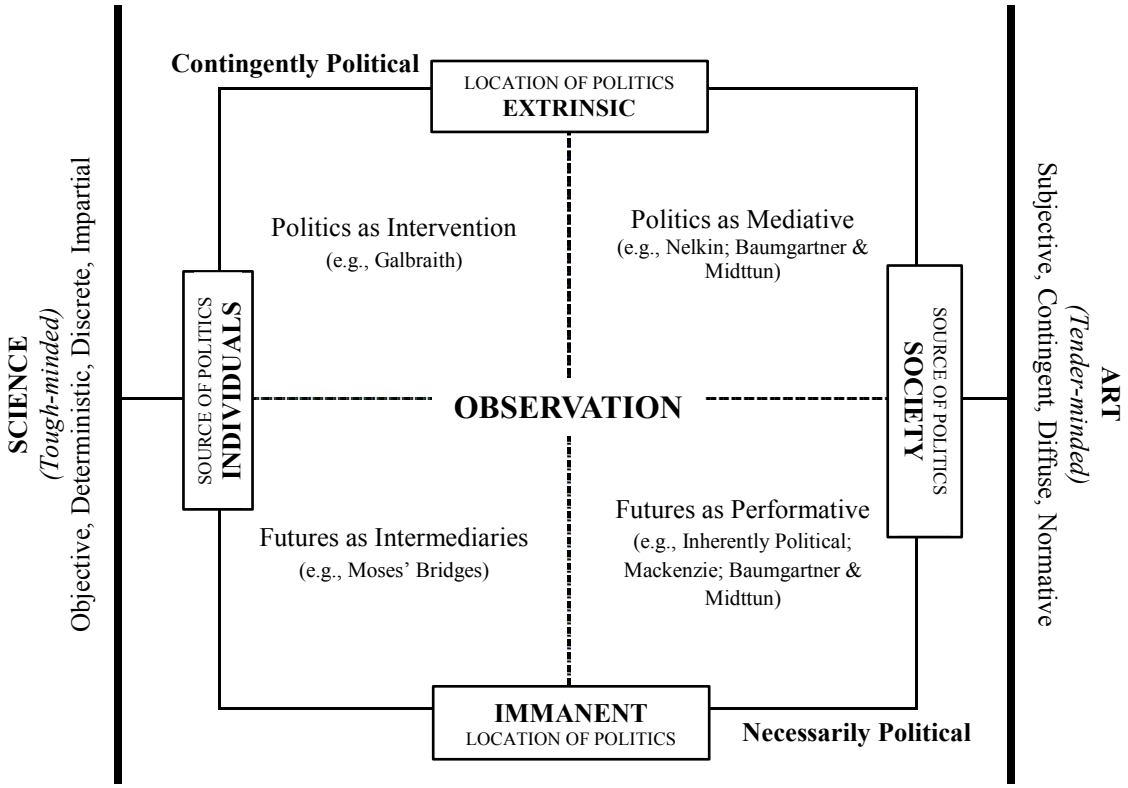

Figure 5) Perspectives on Politics and the Future for Sustainable Energy, Preliminary Framework

On the layout of the table and choice of terminology used to describe the perspectives, a couple words should be given. For one, the authors given as examples under each perspective do not fit perfectly in the box afforded them, though they are more representative of that perspective than any other. For instance, Baumgartner and Midttun's critique of the practice of forecasting for what they perceive as its inherent elitism is close to the futures-as-performative perspective outlined by Winner, though other aspects of their approach indicate a politics-as-mediative perspective as well.[265] It is important therefore to remember that these perspectives are in effect "ideal types" – intended to address a theoretical distinction and not to describe empirical (i.e., the

[265] Baumgartner and Midttun, *The Politics of Energy Forecasting*. Moreover, Baumgartner and Midttun's chapter in that volume on the challenges of modelling in "self-reactive" contexts certainly invokes the kind of constructive, constitutive aspects of futures that is associated with the 'Performative'. Baumgartner and Midttun, "Modelling in Self-Reactive Contexts."

perspectives of various authors) with complete accuracy. Also, the reason why the boxes on the bottom begin with "Futures as" and the top as "Politics as" is primarily because the Y-Axis differences on the location of politics inverts the focus of the perspectives from the relation of politics to futures to the expression through futures of politics.

The distinction between mediative and intermediative comes from Latour's account of the role of non-human 'actants' in actor-network theory.[266] As Latour describes it, the focus of sociology should be on the construction of assemblages, the formation of social groups, connections, relationships, associations and not society *per se*. This distinguishes his approach from conventional "sociology of the social", in which the connections between things are grounded in the unempirical, unobservable 'social'.[267] In focusing on associations the sociologist must thereby pay attention to the means by which such groupings are formed, and it is on the question of means where the distinction between intermediary and mediative comes into play. An intermediary "transports meaning or force without transformation: defining its inputs is enough to define its outputs. For practical purposes, an intermediary can be taken not only as a black box, but also as a black box counting for one, even if it is internally made of many parts." Mediative means, by contrast, "transform, translate, distort, and modify the meaning or the elements they are supposed to carry." No matter how simple a mediator may appear, it cannot be counted 'as one', since it may at any point become "complex", leading in many directions

[266] See Latour, *Reassembling the Social: An Introduction to Actor-Network Theory*, chap. 2., on the 'nature of groups'.

[267] A distinction he equates with that between the sociology of Gabriel Tarde versus that of Emile Durkheim, the former of whom critiques the latter for abandoning the task of explaining society by confusing cause and effect, and replacing an impartial focus on social linkages with a political project of social engineering. See Ibid., 13–14., for brief discussion; also Bruno Latour, "Gabriel Tarde and the End of the Social," in *The Social in Question: New Bearings in History and the Social Sciences*, ed. Patrick Joyce (London ; New York: Routledge, 2002).

and thus "modifying all the accounts attributed to its role."[268] I use the two terms to contrast more-or-less opposite approaches to the relationship and expression of politics through the observation of the futures: one holding that the political context in which the activity is performed mediates the observation or interpretation of futures; the other holding that futures (or perhaps the models used to produce them) can become imbricated with individual interests, ideas or decisions and continue to exert that influence unobstructed long after its original creation. In short, the latter view tends to see the futures as being politically regulative or order producing, where the former allows for more flexibility in the political ordering of futures.

Lastly, on the notion of 'performativity', perhaps confusingly adopted from Mackenzie's non-political account of the evolution of futures contracts, some clarification should be added – the key is the informational reflexivity of futures and the implications it has for actors and social organization. Mackenzie identified performativity as a tertiary kind of reflexivity, above simple information-response (i.e., futures-as-intermediary) as well as above 'self-fulfilling prophecies', which I include in the mediative box. Performativity differs in that it describes a situation wherein the situation described by a concept, observation of theory is instantiated in its utterance, use or practice.[269] Thus for Mackenzie, theories about financial economics ended up generating the phenomena they only sought to reflect. Winner's notion of inherently

[268] A properly functioning computer Latour gives as an example of an intermediary, though a malfunctioning one may act more as a mediator. See Latour, *Reassembling the Social: An Introduction to Actor-Network Theory*, 37–45.

[269] For a comprehensive, lucid introduction to concept of performativity in the philosophy of language, literature, and cultural theory see James Loxley, *Performativity* (London; New York: Routledge, 2007).

political technology describes a very similar kind of informational reflexivity, in which the specific technologies or futures may impel certain political arrangements.

Though the above framework is reasonably comprehensive and gives accurate depictions of the four ideal-type perspectives on the relationship between politics and the future for sustainable energy, we can note a couple of shortcomings. For one, the four perspectives described above are frustratingly antagonistic to each other and incommensurate in their outlooks; in a word, *partial*. Indeed, the second perspective emerged almost in direct response to the shortcomings of the first, and Winner's criticisms (which here serve as the basis for both the third and fourth perspectives) were directed primarily at the extremes of the second perspective. In the interest of having a political framework that applies generally to all futures for sustainable energy, we should try to address this partiality. Furthermore, though some reference was made in the above discussion to order and democracy, ideas, interests and institutions, it is not as clear as it could be what the concept of 'politics' means or entails in each perspective. In other words, the perspectives of the relationship between politics and the future remain somewhat *incomplete,* without a more explicit account of 'politics' or the concept of the political. Addressing the partiality and the incompleteness of the preliminary framework is the focus of the next chapter.

Chapter 5) Technologies of Control: A Question of Realism

Sartori writes: "politics is a most elusive term...We are seemingly unable to define it, and yet we incessantly charge one another with conceiving politics either too broadly or too narrowly, and/or of pursuing 'politicization', presumably a vicious extension of politics."[270] He suggests that if we are to properly distinguish politics from other aspects of social life (like economics or ethics), we must be able to define it conceptually (that is, what makes something political) and behaviorally (what it means to be acting politically – or, what is politics).

In this chapter, I will address the partiality and incompleteness of the above four perspectives by: a) reviewing some key conceptual and behavioural accounts of 'politics' and the political; b) outlining a view of 'politics-as-distinction' that suggests the observations of the future are in fact 'technologies of control', and; c) identifying the core question that animates the politics of distinction for the future for sustainable energy, i.e., a 'question of realism'. This perspective implies that politicization is a kind of 'vicious extension' of politics, and thus serves as the bridge between politics and controversy. I will then proceed to revise the preliminary framework on the politics of the future for sustainable energy based on my review, and identify six theoretical extensions of this relationship between politics, politicization and controversy for futures for sustainable energy.

5.1) Order and Difference (What is Politics?)

[270] Sartori, "The Essence of the Political in Carl Schmitt," 63.

The starting point for any discussion of politics is power. As the literature on power and politics is too vast to summarize here, this section will look primarily at four different theorists, selected mainly for their connection to the discussion above (Weber and Jouvenel for the individual perspective on the source of politics; Barnes and Luhmann for the social perspective), though I will also touch on structural and post-structural accounts of power, including the Foucauldian-inspired notion of 'governmentality'. I will also consider a fifth theorist (Carl Schmitt), whose 'concept of the political' will help to bridge the distance between the four 'conventional' perspectives on politics and the approach advanced here – the 'politics-as-distinction' perspective.

According to Weber, power is "the *chance* of a man or of a number of men to realize their own will in a communal action even against the resistance of others who are participating in the action" (emphasis added).[271] The basis upon which power rests can be economic (money, ownership of property) or social (honor, charisma), and the social order consists of various categories distinguished by holding such bases in common. When individuals within these categories undertake "communal action", it is typically based on their common interest. Yet of the various possible social and economic groupings, however, only "parties" operates strictly in the domain of power, since their communal action is directed at society. The 'interest' that a party seeks to realize in society may be either a "cause" (a general conception of some good) or a more parochial, "personal" interest of the people comprising the party; therefore, Weber argues,

[271] Weber, *From Max Weber*, 180. I emphasize 'chance' because it suggests that Weber allowed for a spectrum of probability that one might abide the instructions of power, and thus that most real instances of power are not absolute and the outcome of power's exertion therefore more or less uncertain.

"parties...are always structures struggling for domination."[272] Weber often implicitly contrasts "naked" and transparent forms of power from more subtle, structural or concealed forms. Whereas the former are manifest in the use of force or pure economic power (i.e., money), the latter combine different basis (property and status). The legal order is in part a determinant of the distribution of power in society, but is not itself a manifestation of power. Rather, for Weber, "law exists when there is a probability that an order will be upheld by a specific staff of men who will use physical or psychical compulsion with the intention of obtaining conformity with the order, or of inflicting sanctions for infringement of it."[273]

Weber's definition of power as the capacity to influence the behaviour or actions of others is often lumped together with other "positivist" conceptions of the political. As Barnes will argue below, this approach seeks an empirical basis for the concept, one which would lend itself easily to observation of the phenomenon in day-to-day politics. Thus, the school of political behaviouralism that first began to emerge in the 1950s and 1960s picked up Weber's atomistic / individualist notion of power, since the event of its being exercised was clearly manifest in the real world. While this may be true of later behaviouralists the description does not, I believe, accurately characterize Weber's conception of power, the manifestation of which for him took place in society, via groups or categories sharing a common interest that they pursue in communal action. Moreover, Weber explicitly conceived of power as a contingent and probable causal factor, not a

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[272] Ibid., 195.

[273] Ibid., 180. Again, Weber associates the use of power through law with the *probability* that someone will act to enforce it. In other words, the existence of power and its ability to produce order depends to some extent on the choices of free agents – it is not an all-encompassing, rigid and deterministic cause of action.

deterministic one (as I indicated in adding emphasis to the above quotations). Weber's recognition of contingency in the exercise of power, I suggest, signifies that he did not conceive of politics as a purely mechanistic or ordered phenomena, but rather as one which involves both non-observable and non-determinate factors.

Attempting to outline what he describes as a "pure theory of politics", Jouvenel adopts a similar conceptual foundation for politics as does Weber, but he proceeds to focus more on what it is to behave politically, or to act or do politics – what he refers to as the "technology" of politics.[274] The focus of politics is events, he suggests, and he distinguishes between two kinds: *eventus* and *eventum*. The latter denote events that are entirely out of one's control, while the former are events which one wishes to bring about, to 'design' or to 'author.'[275] Politics, for Jouvenel, is in large part as a '*causa efficiens'* in relation to *eventus* – that is, acting as both an architect and construction foreman in the realization of some conception of the good ('cause').[276] "The smallest identifiable component of any political event," he argues, "is the moving of man by man,"[277] and thus the dynamics of politics, or the essence of a political system, is a series of what he refers to as "instigation-response."[278]

Acting or doing politics, he argues, is a distinct skill from the acquisition of wisdom or knowledge; indeed, the former does not require the latter – an effective politician creates both an understanding of the good, and convinces others that it is both probable

[274] Bertrand de Jouvenel, *The Pure Theory of Politics* (Cambridge: Cambridge University Press, 1963).
[275] Ibid., 6.
[276] Ibid., 7.
[277] Ibid., 10.
[278] Ibid., pt. III.

and desirable.[279] However, politics does not need to rest in the actions of individuals specifically; instead, he regards "every systematic effort, performed at any place in the social field", in which 'man' is moved by 'man' as political ('man' being an aggregation or generalization). Politics thus includes any instance in which a 'sign' instigates a response from a decision-making agent. However, Jouvenel rejects the social contract-based conceptualizations of society in which hypothetically fully free individuals choose to surrender their freedom to benefit from cooperation. Instead, the condition of man's freedom to decide is precisely the "structured field" into which we are born, dependent and unschooled, and into which we become integrated through the group protection and 'tuition' of its existing participants. He quotes Leibniz on society, as "being formed by mental aggregation, owing its unity to our mind", and thus Jouvenel notes, "If we want to see things clearly we had better think of a complex of people tied together by a pattern of behaviour." The same conditions that make us free also make us susceptible to prompting, and inciting people to action through prompting is the essence of politics. Indeed, a last 'condition' of the political is that we are innately forward-looking, the future being what directs the actions of people - "it is the casting of the mind into some future moment of time, where the imagination raises a picture which becomes a fixed point attracting our actions."[280] Thus, Jouvenel suggests, "developed and equipped by education, operating in a structured field, conceiving desirable goals and calling on his fellows to help him to their attainment – such is Political Man."

[279] Ibid., chap. 2.

[280] Ibid., 43.

Whereas it was only implied by Weber's recognition of the 'probability' of power, Jouvenel thus makes it much more explicit that power rests on the influence of decisions made by people with free-will – subjects to power, in other words, can exercise discretion in their choice to be swayed. While we tend to think of "Prejudice" and "Authority" as being constraints on our free-will, he argues, they are in fact the basis upon which that freedom exists: one's prior principles and beliefs, being artifacts of experience and social integration, inform choice just as they enable it, just as the capacity to recognize authority makes us aware of when it is trying to influence us.[281] Just as responses to instigation need not be automatic, neither need all instigations be uniform and complementary; indeed, they often compete, pulling free agents in different directions.

Jouvenel's conception of politics bears some strong resemblance to that of Barnes, though Barnes inherits a different legacy of political theory.[282] Rather than starting with Weber (which he glosses over in connection with the other 'positivist' notions of power), Barnes approach begins with Weber's close contemporary, Emile Durkheim. Where Weber may have laid the foundations for the individualistic/behavioural approach to politics, Durkheim set out some components of what would later become, in Barnes' terms, the "systemic/generalized" conception of power, mainly through his preoccupation with the general social/structural aspects of the transition from traditional to modern society. The most prominent mid-20th century follower of Durkheim's social/structural approach to power was Talcott Parsons, whose systems-based perspective Barnes discusses at length.

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[281] Ibid., 93.

[282] See Barnes, *The Nature of Power*.

Whereas the positivist legacy conceives of power as inhering in individuals, expressed as a capacity to influence others, Parsons aims to describe power as a *generalized capacity*, latent in all of society (generalized in the sense that the same force can be used to drive various different actions, or used towards different ends).[283] He conceives of power as akin to money in the economic system: not only does power function in the political system much as money does in economics, it also in large part derives its force or capacity from the shared trust that people have in it as a social institution, just as money does. If the shared belief that people have in an institution of power fails, however, it must fallback on the more 'naked' forms of power noted by Weber. According to Parsons, power is the "generalized capacity to secure the performance of binding obligations by units in a system of collective organization when the obligations are legitimized with reference to their bearing on collective goals, and where in case of recalcitrance there is a presumption of enforcement by negative situational sanctions - whatever the actual agency of that enforcement."[284]

Barnes is clear in his preference for Parsons' approach over the positivist one, as he believes it gets closer to an *essentialist understanding* of politics.[285] That said, he finds numerous faults with it as well – namely, that it is incomplete and unnecessarily conservative. The analogy between economics and politics he suggests requires a supposition of social order, since what else is the foundation for one to respect a "claim" like authority or property, rather than to go against it (as those inclined to more economic view of 'man' might argue is more likely). Parson's theory hinges on the process of

[283] Ibid., chap. 1.
[284] Ibid., 14.
[285] Ibid., 6–7.

socialization to enforce the social order, which entails the internalization of social norms (somewhat like Jouvenel's process of "group tuition" noted above). This, Barnes argues, is not a solution to "Hobbes' Problem", which he then sets out to solve without requiring the internalization of social order while retaining the generality of the systems approach.[286]

What is 'Hobbes' Problem'? In short, Hobbes' problem asks why people should cooperate, when they might benefit more individually from not doing so. Barnes refines the question accordingly, "whether and why routines persist as those who execute them become aware of them and of themselves in relation to them."[287] Rejecting the notion of people as being rational, calculative agents, Parson grounded this continuity (or order) on the internalization of shared norms, which he believed reinforced the social order. 'Deviance', though clearly a common occurrence nonetheless represented a failure to properly internalize or interpret the norm. It thus requires sanction to maintain order. Barnes criticizes this account because, as he argues, there is no such thing as normative determinism – there are multiple ways to interpret a norm, and no guarantee that one will choose to abide by it in every instance. Barnes also does not want to throw the rational, calculative baby out with the positivist/agential politics bathwater, since it is not clear that it is in fact antithetical to the social order. As he puts it, "calculation depends on knowledge. Knowledge transcends the individual and is carried collectively by the

[286] Ibid., 32.A closely related systems-based account of politics to Parson's is that of David Easton, who conceived of the political system as the authoritative, decision-making apparatus in society. See David Easton, *A Framework for Political Analysis*, Prentice-Hall Contemporary Political Theory Series (Englewood Cliffs, N.J: Prentice-Hall, 1965).

[287] Barnes, *The Nature of Power*, 37.

interactions of a society. Calculation is therefore itself social action, a part of social life, a symbol of the individual's attachment to a specific culture."[288]

His solution is similar to that of Jouvenel. Whereas Jouvenel saw a society as a 'complex of people, tied together by patterned behaviour,' Barnes argues we should conceive of it as a "distribution of knowledge", not necessarily a persisting set of routine practices.[289] However, this knowledge is different from the kind of knowledge we have of the natural world, which can be verified through empirical observation. Rather, the knowledge that comprises society is self-referring; not only is it about something, that something exists because of that knowledge in the first place. As Barnes puts it, "whereas knowledge of nature may be confirmed or disconfirmed by processes involving reference to states of affairs that exist independently of the knowledge, knowledge of society must be confirmed or disconfirmed by processes involving reference to states of affairs that exist only because the knowledge is generally presumed to be true," Whereas Parsons relied on the internalization of norms to produce the social order, Barnes substitutes shared knowledge, which, once we become aware or possessors of it, we can choose to follow it or not. Thus, "if we step back from all these ongoing processes, and focus on knowledge of society as a core constituent of society itself as a distribution of knowledge, then society is revealed as a sublime, monumental, self-fulfilling prophecy."[290] Power, accordingly, 'must be an aspect or a characteristic of a distribution of knowledge.' He defines it accordingly:

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[288] Ibid., 42.
[289] Ibid., 45..
[290] Ibid., 53.

> "Any specific distribution of knowledge confers a generalized capacity for action upon those individuals who carry and constitute it, and that capacity for action is their social power, the power of the society they constitute by bearing and sharing the knowledge in question. Social power is the added capacity for action that accrues to individuals through their constituting a distribution of knowledge and thereby a society"[291]

The conceptual basis of power is the knowledge or belief we have of people whom we believe to possess it, but its possession entails something different: discretion over social action, or over the use of routines. This discretion, Barnes continues, "is nothing more than the ability of an agent to act or to give a sign, which act or sign is followed by an appropriate change in the routine in question."[292]

Thus, Barnes' approach is strikingly similar to Jouvenel's, given two decades earlier, though Jouvenel retains more of an individualistic focus than does Barnes. Barnes approach is certainly more in the vein of social constructivism, but it was only one trajectory emanating out of the earlier structural/systemic approaches to politics and power. Another approach took a different angle on the connection between knowledge and power, in which the latter was not so much a product of the former as it was made manifest through it. Much of Michel Foucault's work in the late 1960s and early 1970s exemplifies such an approach, tracing the history of madness and sexuality in conjunction with the rise of contemporary psychology and sociology and their conceptions of deviance, or the transition from punishment to discipline in methods used to protect and

[291] Ibid., 57.

[292] Ibid., 64.

maintain the social order between the middle ages and contemporary modern society.[293] The essence of the latter work is encapsulated in Bentham's notion of the panopticon, in which the perception of perpetual surveillance induces members of society to internalize domination and discipline themselves, according to the doctrines of the sciences of humanity.[294] 'Deviance' is as much an individual transgression of the norm, as it is a product of the construction of the norm itself.[295]

The manner in which these approaches conceive of the nature of power and its exercise are broadly captured by the concept of 'governmentality,' a term which Foucault himself defined later in his career.[296] Though open to interpretation, the concept of governmentality can be considered to point primarily to the techniques by which contemporary society is routinized, rationalized, or ordered; techniques which are largely the product of the application of the modern (especially social) sciences. Hacking's other major work on probability, *The Taming of Chance*, in which he traces the development of the understanding of probability in conjunction with the emergence of social statistics, the insurance industry, public pensions and so forth in the 18th and 19th centuries, is one example of how technique can be coopted by 'power' to govern society.[297] Scott's *Seeing*

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[293] Michel Foucault, *Discipline and Punish: The Birth of the Prison* (Random House LLC, 1977); Michel Foucault, *The History of Sexuality*, 1st American ed (New York: Pantheon Books, 1978); Michel Foucault, *History of Madness* (London ; New York: Routledge, 2006).

[294] Foucault, *Discipline and Punish*, pt. III, chap. 3.

[295] A related trajectory is that which focuses on construction of broad cultural or social caricatures through cultural and social works themselves, caricatures that reinforce the subjugation or domination of 'the other', which is distinguished against the self yet considered inferior. See Edward W. Said, *Orientalism* (Random House LLC, 1979)., for the quintessential expression of this perspective, as well as later works in post-colonialism and gender studies. Geeta Chowdhry and Sheila Nair, eds., *Power, Postcolonialism and International Relations: Reading Race, Gender and Class* (New York: Routledge, 2002).

[296] See Mitchell Dean, *Governmentality: Power and Rule in Modern Society* (SAGE, 1999).

[297] Ian Hacking, *The Taming of Chance*, Ideas in Context (Cambridge [England] ; New York: Cambridge University Press, 1990).

Like a State is another good example, in which the author demonstrates how the 'four horsemen of the modern apocalypse' - administrative ordering of society, a high-modernist ideology with hubristic confidence in scientific progress, an authoritarian state willing and able to actualize high-modernist design, and a prostrate civil society beset by war, revolution, or economic collapse – combined in the 19th and 20th centuries to create some of modernity's most catastrophically tragic episodes of upheaval, disorder, and genocide.[298]

These approaches share with Barnes' account a general 'post-positivist' quality, thus distinguishing themselves from the strict empiricism and actor-based accounts of Weber and the early behaviouralists. In doing so, however, they also differ from the earlier systems-based approaches of Parson or Easton which themselves are also distinguished from earlier structural accounts of power and politics. Broadly speaking, the latter approach to politics focused on how structure in society was produced and maintained, based either on economic relations or via the main political entity of the state.[299] This approach fell generally out of favour in the mid-20th century but saw a 'return to structure' in the 1970s and afterwards.[300] The post-positivist perspectives on power and politics noted above also stand opposed to structuralism, broadly speaking, though the difference is subtle (indeed, they are often referred to as post-structural). Whereas

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[298] James C Scott, *Seeing like a State : How Certain Schemes to Improve the Human Condition Have Failed*, Yale Agrarian Studies (New Haven: Yale University Press, 1998).

[299] Examples of earlier structural approaches are numerous. Some seminal works include: Moore, *Social Origins of Dictatorship and Democracy : Lord and Peasant in the Making of the Modern World*; Samuel P. Huntington, "Political Development and Political Decay," *World Politics*, 1965, 386–430.

[300] See for Theda Skocpol, *States and Social Revolutions : A Comparative Analysis of France, Russia, and China* (Cambridge; New York: Cambridge University Press, 1979); Peter B Evans, Dietrich Rueschemeyer, and Theda Skocpol, eds., *Bringing the State Back in* (Cambridge: Cambridge University Press, 1985).

conventional structural approaches to power/politics tend to focus mainly on the external maintenance of social order by 'the state', a decision-making entity in its own right, post-structural approaches recognize an additional internalized dimension to the maintenance of order – the varied techniques and practices noted above by Foucault, Hacking or Scott, all of which "work locally, entering social processes, breaking them down into separate functions, rearranging the parts, increasing their efficiency and precision, and reassembling them into more productive and powerful combinations."[301] The distinction between the state and society is, therefore, "not a simple border between two freestanding objects or domains, but a complex distinction internal to these realms of practice."[302] As Mitchell notes, it is through the coalescing of the "infinitesimal practices" described by Foucault that the apparent shape of a unitary state emerges. As in Scott's account of the state cited above, the aggregation of discrete administrative and coordinating practices are seen in this perspective to "contribute to constructing a world that appears to consist not of a complex of social practices but of a binary order: on the one hand individuals and their activities, on the other an inert 'structure' that somehow stands apart from individuals."[303]

Niklas Luhmann (cited earlier in the discussion of 'observation'), a former student of Parsons, provides a systems-based perspective on politics informed to a degree by the post-positivist or post-structural 'turn' post-1975. Like Parsons, Luhmann conceives of society as a system, itself composed of sub-systems (economics, science, politics, etc.),

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[301] Timothy Mitchell, "Society, Economy, and the State Effect," in *State/culture : State-Formation after the Cultural Turn*, ed. George Steinmetz (Ithaca, N.Y.: Cornell University Press, 1999), 86.

[302] Ibid., 83.

[303] Ibid., 89.

but the basis of these systems is not the actions of individuals but rather communications. The systems of society are what Luhmann refers to as "autopoetic", meaning they define their own boundaries through the process of 'observation', which refers to the coding of communications based on whatever the core code is for that system.[304] Through this process, they distinguish themselves from their 'environment' (i.e., everything that is not itself). In the legal system, for example, the core code is legal/non-legal, so in observing this distinction on the communication it receives from its environment, it self-defines the boundaries of what is or is not a matter for the legal system to decide. The political system, according to Luhmann, functions in much the same way, though its core code is to distinguish between government/opposition.[305] Luhmann retained an aspect of Parsons' understanding of the function of the political system, however, which was the manufacture of collectively binding decisions for society. Once communication had been coded and the boundary of the political defined, the work of the political system was then to make decisions about those things deemed within the boundaries of the political.

Like Parsons', Luhmann's theory of politics was also 'accused' of conservatism, though not strictly for its internal account of change and/or deviation from the rule. Rather, the association that was damning for Luhmann was an alleged indebtedness to disgraced German jurist Carl Schmitt, who had notoriously supported and joined the Nazi party, and still lived in Germany after the war.[306] Of Schmitt's varied work on politics and law, perhaps the most relevant to this discussion is his *Concept of the Political*, an

[304] Luhmann, "The Paradoxy of Observing Systems"; Luhmann, "System as Difference.". Also, Hans-Georg Moeller, *Luhmann Explained: From Souls to Systems* (Open Court Publishing, 2006).

[305] See Michael King and Chris Thornhill, *Niklas Luhmann's Theory of Politics and Law* (Basingstoke: Palgrave Macmillan, 2003).

[306] Chris Thornhill, "Niklas Luhmann, Carl Schmitt and the Modern Form of the Political," *European Journal of Social Theory* 10, no. 4 (November 1, 2007): 499–522.

essay he first published in 1927, largely as a critique of liberalism. As Luhmann did, and Parsons before him, Schmitt sought to identify the essence of the concept of the political, which would serve to set out and define politics from other spheres of social activity. Also like Luhmann, Schmitt was inclined to construct these essences as binary distinctions (though the way he describes them suggests they were also spectrums) – economics deals with the distinction between valuable and not-valuable, aesthetics between beautiful and non-beautiful, and so forth. Like these other systems, Schmitt argued, "the political must therefore rest on its own ultimate distinctions, to which all action with a specifically political meaning can be traced."[307] That distinction, "to which all political actions and motives can be reduced", was for Schmitt the distinction between friend and enemy. The political distinction corresponds (in function) with similar definitions in other systems, though it cannot be reduced to them; as Schmitt writes,

> "The political enemy need not be morally evil or aesthetically ugly; he need not appear as an economic competitor, and it may even be advantageous to engage with him in business transactions. But he is, nevertheless, the other, the stranger; and it is sufficient for his nature that he is, in a specially intense way, existentially something different and alien, so that in the extreme case conflicts with him are possible."[308]

Importantly, the political distinction was one only the 'actual participants' could recognize, judge, and decide in the extreme case on conflict; there was no norm or third-party that could decide who 'negates' the way of life of another, thereby justifying repulsion and violence in order to preserve one's "own form of existence." Though it is common for these distinctions to coincide, they are nonetheless autonomous – there is no

[307] Schmitt, *The Concept of the Political*, 26.
[308] Ibid., 27.

necessary connection between them, though they can become political (read: politicized) as they approach "the most extreme point."[309]

Liberalism tries to muddy or weaken such distinctions, or to rule out friend/enemy by way of moral ideals. Schmitt's concern, however, "is neither with abstractions or normative ideals, but with inherent reality and the *real possibility* of such a distinction. (emphasis added)"[310] The entity that assumes the capacity to make the friend/enemy distinction is the decisive entity, the political entity, and it alone is "sovereign in the sense that the decision about the critical situation, even if it is the exception, must always necessarily reside there."[311] Liberalism and pluralism seek depoliticization by excluding the possibility of the pure expression of a political entity, according to Schmitt, suggesting instead that people belong at all times to multiple different groupings and associations which can be on an equal footing with the decisive entity (for Schmitt, the state).[312] These are dangerous misconceptions, Schmitt suggests, for if one refuses to assert the will of the political entity, another might; the political friend/enemy distinction is an existential necessity.

At root, Schmitt suggests, lies a question of one's "anthropological" predilections to consider man as being evil or good by nature – the pessimistic versus the optimistic conceptions of human nature, which underwrite the tension between authoritarian and anarchist theories of politics. "Anarchist" theories, of which liberalism is one, wish to subvert or abolish the state (which they associate with the degradation of man's liberty)

[309] Ibid., 29.
[310] Ibid., 28.
[311] Ibid., 38.
[312] Ibid., 42–44.

and replace it with society. According to Schmitt, "the radicalism vis-à-vis state and government grows in proportion to the radical belief in the goodness of man's nature."[313] Liberalism, while not wanting to negate the state, nonetheless seeks to tie it down and constrain it with a series of checks and balances, and to tie the political to the ethical and subjugate it to economics. However, for Schmitt, the political realist recognizes that there can be no such thing as politics without the possibility of enmity; "political conceptions and ideas cannot very well start with an anthropological optimism."[314]

Thornhill notes four points at which the analyses of Luhmann and Schmitt were supposed to coincide: 1) Luhmann's arguments about the self-differentiation of the political system are similar to Schmitt's about the autonomy of the political entity (and thus anti-pluralistic in its exclusion of other entities); 2) Luhmann's retaining of the political system's function to provide collectively binding decisions sounds similar to Schmitt's association of the political with the "decisive entity"; 3) that Luhmann appeared, like Schmitt, to renounce the capacity of law or norms to serve as a foundation for the legitimacy of the political entity; 4) the theories of both scholars seemed to indicate their support for a technocratic, administrative approach to politics, conducted by experts who were removed from the public.[315] Thornhill notes that Luhmann took care to address these criticisms, pointing to the de-centred nature of the political system in his account, wherein the system (and its decisions) existed alongside other social systems. Nonetheless, Luhmann and Schmitt seem to share an understanding of politics as "a formal sphere of planning or programmatic policy-making, which creates the originating

[313] Ibid., 61.
[314] Ibid., 64.
[315] Thornhill, "Niklas Luhmann, Carl Schmitt and the Modern Form of the Political," 500–502.

sources of legitimacy for all political communications, but which remains relatively independent of the technical processes of legislation and societal regulation." This lends their accounts to support of an "executive democracy", according to Thornhill, given to insular bureaucratic administration.[316]

In a critique of Schmitt's politics, Sartori, quoted at the outset of this section, suggests that Schmitt's entire approach to 'politics as polemics' was derived itself as a polemic against the liberalism and legal normativism of his day.[317] The result was that he theorized 'war-like politics' to the exclusion of 'peace-like politics', focusing mainly on 'high politics' (war, revolution, etc.) to the detriment of day-to-day politics (e.g., policy-making). Accordingly, "Schmitt does, then, perceive politics as conflict," and in doing so he precludes himself from being able to speak to the 'concept of the political' writ large, instead speaking only to one of its, albeit important, modalities.[318] Sartori admits his bias towards the "liberal taming" of the political as conceived by Schmitt, but stresses that even though the politics of the latter may never be conquered, we are nonetheless left with two modes or "paradigms" of politics: politics-as-war and peace-like-politics.

We might therefore distinguish between accounts of politics wherein the affect or expression of power is to produce order on the one hand, and those in which power manifests itself through the articulation, or imposition, of difference. Schmitt's conflict-based politics is certainly of the latter kind, as is Luhmann's and perhaps the post-structural and governmentality-oriented accounts of Foucault and Mitchell as well.

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[316] Ibid., 507.

[317] Sartori, "The Essence of the Political in Carl Schmitt," 70.

[318] Ibid., 73.

Weber, Jouvenel, Sartori, Parsons and Barnes all emphasize the order-producing - or compliance-securing – aspects of politics, by contrast. The former tend towards Schmitt's 'war-like' vision of politics, in which the consequence of politics is violence, domination or oppression; the latter towards a 'peace-like' politics, tending towards agreement, consensus and cooperation. In short, we are left with yet another distinction (order and difference) to include in our discussion. How can this help us resolve the issues of partiality and incompleteness noted of the preliminary framework laid out at the end of Chapter 4?

5.2) Control: a Politics-as-Distinction

My solution is to conceive of futures as *technologies of control,* based on a view of *politics-as-distinction*. Recall that I identified two dimensions to the relationship between politics and the future for sustainable energy based on the characterization of 'observation' of the future as technological: the source (individual or social) and location (immanent or extrinsic) of politics. Out of these two dimensions, I described four perspectives: politics-as-intervention (individual/extrinsic); politics-as-mediation (social/extrinsic); futures-as-intermediaries (individual/immanent); futures-as-performative (social/immanent). These I noted as being both partial (largely irreconcilable, holding views antagonistic with each other) and incomplete (being either silent or inexplicit on the meaning or implications of 'politics' in their perspectives). The discussion of politics in the section above leaves us yet another distinction between order and difference to incorporate in our framework.

The first step to finalizing the framework is to note that, irrespective of whether one adopts a perspective of politics as order/compliance or difference/conflict, the underlying

commonality is control – a desire to render the otherwise opaque, uncertain or recalcitrant aspects of the world clear and forthright; ready and willing to be deployed at a moment's notice toward the realization of a goal.[319] This is not the same as obedience, though obedience may be one manifestation of control (i.e., the kind that Weber saw as the evidence of power). Similarly, the manner in which difference is mobilized in poststructural accounts of power or through practices of 'governmentality' – e.g., setting out 'natural' social kinds, categorizing and rationalizing social relations, administering, routinizing, etc., – is neither the antithesis of order, nor the production of uniformity. In this sense, order and difference are in many ways two-sides of the same coin: both being results of different techniques or expressions of the underlying aim of politics – control.

Thus, we can see how the process of observation serves as a 'technology of control' over the future for sustainable energy. It is not solely through its (i.e., the process of observation) ability to secure compliance of the observed (i.e., the future) with our prior beliefs, ideas and desires about it, nor for that matter its ability to facilitate consensus in the present about what those beliefs, ideas and desires should be. Neither are futures political simply because of the difference (subjectivity, multidimensionality) inherent in the future, or for their function in 'dominating' difference in the present. Rather, I suggest it is the practice of *observation* itself, a practice that necessitates distinguishing between 'the future and futures' – a distinction which, as noted above, is integral to the overall instrumentality or utility of futures – that affords us control over the future for sustainable energy.

[319] Heidegger's characterization of technology as an 'enframing' of nature, calling it forth to sit in a 'standing reserve' so that it may be utilized as we see fit is a perfect example of the sense in which I am using 'control.' See Heidegger, "Basic Writings."

A simple technological example might help to clarify exactly how observation of the future, as a technology of control, aids us in our effort to govern change. Whereas the humble home thermostat often serves as a 'technology of control' in the regulatory system that is a residential heating or air conditioning system (i.e., responding to inputs, adjusting furnace output, maintaining an equilibrium temperature, etc.),[320] without the walls, insulation and vapour barriers that comprise the 'building envelope,' the ability of the thermostat to maintain order would be severely compromised.[321] In fact, the more effective that envelop is in maintaining a clear and distinct, impermeable barrier between the system and the environment, the more able we are to maintain order within. Futures are more the insulation than the thermostat. Indeed, the 'thermostat' in the problem of the future for sustainable energy is, ultimately, us – it is our decision-making that we hope to inform through the practice of observing futures. The information provided by observation, useful in its ability to furnish us with control over the process of change, thus also serves as the 'input' into the system regulator; as Jouvenel argued, we are both the architects and construction foremen in bringing about the future we desire.

Herein lays the difficulty with both Jouvenel and Barnes' conception of the political as resting in some shared distribution of understanding or knowledge. The basis of control that observation of the future purports to provide is the ability to make distinctions about the future; however, there is no guarantee that the capacity to make distinctions nor the knowledge (and control) that results will be distributed uniformly,

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[320] See, for example, Cliff Joslyn and Francis Heylighen, "Cybernetics and Second-Order Cybernetics," in *Encyclopedia of Physical Science & Technology*, ed. R.A Myers, 3rd ed. (New York: Academic Press, 2001).

[321] John F. Straube, *High Perfomance Enclosures: Design Guide for Institutional Commercial and Industrial Buildings in Cold Climates*, 2nd ed (Somerville, MA: Building Science Press, 2012).

either internally or 'systemically'. In other words, not everybody will uniformly have access to the 'distribution of knowledge' that comprises our observations of the future, just as they need not agree on any particular set of observations (i.e., distinctions between future and futures) in a given vision of the future. Even the act of distinguishing between or amongst things implies a division within the sphere of knowledge between the thing demarcated and that which is not – but what if the 'thing not demarcated' is another observers' vision of the future?[322]

This leads to what might be considered a 'politics-as-distinction' perspective, in which the making of a distinction is considered the essential political act. Both Luhmann and Schmitt articulated a similar vision of politics wherein the making of a distinction played a key role in differentiating politics form other domains of social interaction. For Luhmann it was the distinction between government and opposition; for Schmitt, friend and enemy (notably, Schmitt also allowed that when distinctions critical to other facts of social life reached a degree of intensity such that assume a friend/enemy form, they too can become political). A politics-as-distinction approach attaches no such qualifiers to turn a distinction from non-political to political (except perhaps that the distinction in question pertains to social life), recognizing that the act of making a distinction is in fact the basis of both difference (between the things distinguished) and order (within thing 'observed').[323]

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[322] This is the essence of the process of observation, as outlined earlier by Luhmann, himself influenced by Spencer Brown. As we observe futures, we 'observe' what is not in that future inadvertently. However, other observers may see things differently. Luhmann, "The Paradoxy of Observing Systems"; Luhmann, "System as Difference."

[323] To observe a tree is also to observe what is not tree, but is the act of making a distinction between tree and not-tree political? That hardly seems the case.

There are many examples of this kind of politics in contemporary society. As Mitchell noted, the distinction between state and society is one such case. Said's account of Orientalism is another (as are all 'self/other' based accounts of the political, common in post-structuralism influenced perspectives). The distinction between modernity and traditionalism is another (or between reflexive modernity and regular modernity), as are all the various distinctions and spectra identified in this study. We may even reflect back on accounts like Mitchell's and Said's – in true 'second-order observing' fashion – and note that the arguments they present are all the more controversial because they themselves mobilize distinctions to make them.[324] Few might have found the cultural representations of the East that Said described as Orientalism as *political* as he made them seem without the host of distinctions that he mobilized to make his case – West/East; Representation/Caricature; Knowledge/Power. Indeed, they may not have seemed so political (or controversial) had they not been made so starkly.[325]

Before a distinction is made there is uncertainty, vagueness and ambiguity. We might consider that initial condition as a question, and the intervention of politics being to propose an answer. That answer comes in the form of a distinction. Not all people will agree with the answer, though some will, and the intensity with which a distinction sets two things apart - the cohesiveness or uniformity of its differentiated groups - correlates with the degree of controversy that attends it. Thus, we can define politicization as a 'vicious extension' of the politics of distinction, the mobilization or intensification of

[324] Luhmann defines his systems as 'second-order' observing systems. See Luhmann, "The Paradoxy of Observing Systems"; Joslyn and Heylighen, "Cybernetics and Second-Order Cybernetics."

[325] This stands as support for Schmitt's argument regarding the intensity of distinctions being related to their politics, I would suggest. Had Said's account (or any such critical work) muddied the distinctions they were trying to make, or if 'Orientalism' itself had recognized the empirical variation and diversity it was running roughshod over, neither might have become so controversial.

distinctions to drive home a point, and the bridge that connects politics and controversy. A thing thus gets politicized as the ambiguity surrounding it hardens into a distinction (or set thereof) with clearly defined, opposing camps. Controversy may thus be a reliable indicator of politics (though not a necessary or sufficient condition for politics to be present) in that it suggests a situation in which underlying political distinctions have been hardened and/or clarified. Under this perspective, it thereby remains possible for something like the observation of the future for sustainable energy to be both necessarily political as per the social/immanent perspectives, and contingently political (or apolitical) as per the individual/extrinsic perspectives. Insofar as we consider politics as distinction vis-à-vis a prior uncertainty or question, thus preceding the consequent orders and/or differences that follow therefrom and increasing in intensity with the degree of contrast in the distinction, any engagement with that question (i.e., all observations of the future) must therefore be political though not necessarily politicized until someone or something 'makes' it so (by clarifying the distinction).

5.3) Questions of Realism

I submit that the question that is at the core of the politics for the future of sustainable energy is a 'question of realism' – what is or is not *realistic* to see, hope, or do about the future for sustainable energy. The question can only be phrased as what is or is not realistic (rather than what is or is not real) because, as will be recalled from the discussion of the three problems of the future, the future does not itself 'exist'.[326] Therefore, the question of whether the objects of our knowledge of the future really do

[326] This distinguishes the question, I would argue, from the concern of scientific realism concerning the connection of scientific knowledge with real, 'natural' kinds. On that dispute, see Boyd, "Scientific Realism"; Ian Hacking, "A Tradition of Natural Kinds," *Philosophical Studies* 61, no. 1 (1991): 109–26; Ian Hacking, "On Boyd," *Philosophical Studies* 61, no. 1 (1991): 149–54.

exist outside of our ideas about them is not entirely relevant (though not completely irrelevant either).[327] As the first problem of the future implied, our knowledge of the future can only be probable; it can only hope to approximate the future as it will come to pass, though to do so it has also to account for our actions (and desires) to bring it about. 'Realistic' in this sense thus pertains in part to the *representative quality* of our observations of the future, but also at the same time the extent to which those representations accommodate our will for things to be otherwise.

In this respect, we can consider the question of realism to be intervening in the conflict between empiricism and rationalism, identified in Chapter 2 as one of the key tensions inherent to the problem of the future for sustainable energy.[328] We wish our observations of the future to approximate reality to some extent, to strive for an empiricism that – given the non-existence of the future – is an unobtainable goal. At the same time, our observations of the future are intended in part to identify the contingent aspects of the future, points of intervention at which we might shift things according to our aims. The same is true of the techniques used to produce the observation in question – they cannot be so tied down to the empirical 'way things are' that they abolish potential for rationally conceived and guided change. Futures for sustainable energy, being

[327] The question of the 'mind-independence' of knowledge is perhaps the central issue of realism in philosophy, very generally speaking, wherein a realist holds that a) the world does exist outside of our ideas of it and, possible, b) that our ideas can gain access to that world in its true form. This contrasts with, among other things, the school of idealism that holds that 'true' objects can only be conceived in the mind. See Alexander Miller, "Realism," in *The Stanford Encyclopedia of Philosophy*, ed. Edward N. Zalta, Spring 2012, 2012, http://plato.stanford.edu/archives/spr2012/entries/realism/.

[328] Recall that this tension, identified by William James as the difference between the tough and tender-minded approach to philosophy, entailed for sustainable energy the balance between the normative and the practical aspects of the concept. The question of realism as it pertains to representation thus does not concern only the empiricism (or practicality) of our observations, but also the room for more 'tender-minded' attendance to questions of ethics, norms and values. The contrast between Nordhaus and Stern is informative on this issue. See James, *Pragmatism*; Nordhaus, *A Question of Balance*; Stern and HM Treasury, *The Economics of Climate Change: The Stern Review*.

pragmatic, aim to balance these conflicting goals since they rapidly lose their utility as they move toward either end of the spectrum.

The second problem of the future was, in essence, the problem of induction.[329] As was discussed earlier, deprived of a strong foundation for observation of the one true future, the emphasis thus shifted from inductively derived truths to conjecture to the imagination of alternative, plausible futures. In part, this was a strategic move. Taleb's discussion of the turkey, who inductively infers the night before Thanksgiving, after a year of regular feedings, that his future is bright, is a good example of why we might not want to rest our observations of the future on pure, empirical inference from the past.[330] To be realistic about the future does not thus imply only sufficient representation; it also entails *prudence*.

The classic formulation of this in the study of international politics comes from realists like Morgenthau and Carr who, as noted in Chapter 1, critiqued the liberal idealism of their forbearers on the basis of their ignorance of 'human nature' (in effect, the human propensity to defect from cooperative endeavours.)[331] Realism, they held, suggested a correspondence to truth, though not necessarily an empirically derived or

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[329] Knowledge cannot rest on induction alone, since that belief rests itself on induction. See Hume, *An Enquiry Concerning Human Understanding, and Selections from A Treatise of Human Nature*; Godfrey-Smith, *Theory and Reality*.

[330] Nassim Nicholas Taleb, *The Black Swan: The Impact of the Highly Improbable* (Random House of Canada, 2011).

[331] Morgenthau, *Politics among Nations : The Struggle for Power and Peace*; Carr, *The Twenty Years' Crisis, 1919-1939*.Also, on classical realism in international political theory in general, see Michael Smith, *Realist Thought from Weber to Kissinger* (Baton Rouge: Louisiana State University Press, 1986); Robert Gilpin, "The Richness of the Tradition of Political Realism," in *Neorealism and Its Critics*, ed. Robert O Keohane, Political Economy of International Change (New York, N.Y.: Columbia University Press, 1986).

rational/reasoned truth.[332] Classical realism's conception of human nature as the 'truth' that rendered idealistic politics foolhardy thus tended to portray the school as dour, conservative and tragic – certainly the tough-minded counterparts to the tender-minded, liberal pre-occupation with 'peace-like-politics'.[333] A prudent approach to politics need not be war-like, though it must always stand on guard for the possibility of conflict.

In the context of the future for sustainable energy, I would suggest that this aspect of the question of realism concerns the balance between action and reflection, another key tension noted in Chapter 2. The challenge of sustainable energy requires both reflection on the alternate plausible futures we might work towards, but also action to maintain the present system, to secure it from threats of disruption, and to change it as well. Too much reflection without action, and we risk reproducing the status quo. At the same time, too much 'action' without reflection risks subjecting the system to unforeseen risks and hazards, or implementing policy without considering the possible detrimental consequences. The governance of change that is implied by the notion of sustainable energy thereby requires prudent observations of the future, not too given to action or reflection.

This brings us to the third and final dimension to the question of realism, stemming from the third problem of the future noted in Chapter 3 and the remaining tension inherent to the condition of modernity from which sustainable energy emerges – the

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[332] See in particular Morgenthau, *Scientific Man vs. Power Politics*.

[333] The realist tradition is often traced back to Thucydides, Hobbes, and Machiavelli, though Schmitt would certainly be included in this tradition. On the 'tragic' vision of politics that these authors share, see Richard Ned Lebow, *The Tragic Vision of Politics: Ethics, Interests and Orders* (Cambridge University Press, 2003). Morgenthau , however, critiqued Carr for his overreliance on Schmitt, leading to a politics in which power is unrestrained. See Hans Morgenthau, "The Political Science of E.H. Carr," *World Politics* 1, no. 1 (1948): 127–34.

tension between improvement and habitation, and its connections with and implications for 'people.' Improvement is the desire of the 'gentleman', in Polanyi's formulation, but for sustainable energy it only implies intentional, directed change; intervention in the way things are at present in order to bring about an idealized conception of the way things should or could be.[334] It is thus the project both of the modernizers and the critics; to paraphrase Marx, it entails action to change the world, not just reflection on it. Habitation on the other hand commits itself to 'process' in place of intervention (to borrow Jouvenel's terms). The future is not a sphere in which to design the ideal future, to exercise our will, but rather something to which we are subjected to - a world largely beyond our control. The autonomy of the future may stem either from a belief it is predetermined, or because it is perceived as too big for our intervention to have any meaning or impact.[335]

I term this dimension of the question of realism as one of *efficacy*, particularly self-efficacy. Here, a realistic perspective of the future balances the desire for change with the capacity to realize it. Given the 'tragic vision' of the world that the prudent attitude toward the future requires, however, the question of realistic efficacy concerning the future might often be settled more to the 'habitation' side. It thus is suggestive of the kind of 'depressive realism' observed in some psychological studies, in which depressed

[334] Polanyi's formulation is clearly directed at those who would rearrange society according to the principles of classical political and economic liberalism. Cox considers critical theory to be a reaction against the mindset that there are natural laws of economic and political organization that dictate how society should be organized. I would suggest that both the desire of Polanyi's gentleman and Cox's aim in critical theory are in fact the same intention: to change the way things are in order to make them better. Cox, *Production, Power, and World Order*; Polanyi, *The Great Transformation*.

[335] As Jouvenel noted, retroactive action to address process must take place at a level sufficiently high enough to counter that process. Thus, one person's decision to save more will not counter inflation, though changes in fiscal and monetary policy might.

patients have a more realistic assessment of their abilities to accomplish a task.[336] Whereas the issues of representation concerned probable futures and prudence involves plausible futures, the issue of efficacy pertains in particular to preferable futures. Accordingly, in any such vision of future that touches on questions of preferability (or 'improvement') the question of our efficacy in bringing them about always reigns in the discussion.

Based on this discussion, I suggest we can identify three dimensions or 'sub-questions' to the broader question of realism that is at the core of the politics of the future for sustainable energy – questions that align both with the tensions inherent to sustainable energy and the three problems of the future. These are:

1) A question of representation ('to see'). This question concerns the representative value of the data, models and techniques that are used in the observation of the future as well as the balance thereof with our ideas, ability or will to change it. It stems mainly from the non-existence of the future and the tension between rationalism and empiricism. For example, does the future accurately depict the state of something in the real world? Does the setting or configuration of the model and its parameters realistically portray the thing they were meant to represent? Does it sufficiently represent the degree of uncertainty in the thing it is measuring or modeling? Does the future nevertheless provide enough structure so that decision-makers retain some scope for action?

[336] Ruby Ackermann and Robert J. DeRubeis, "Is Depressive Realism Real?," *Clinical Psychology Review* 11, no. 5 (1991): 565–84; Lorraine G. Allan, Shepard Siegel, and Samuel Hannah, "The Sad Truth about Depressive Realism," *The Quarterly Journal of Experimental Psychology* 60, no. 3 (2007): 482–95.

2) A question of prudence ('to do'). This question, in the line of political realism, asks whether the course of action or vision of the future presented is realistic in the sense of being a wise or prudent move. It relates mainly to the problem of inductive inference and the tension between action and reflection in sustainable energy. For example, perhaps a government produces an energy plan in which it states its intention to implement a carbon tax that increases over time that would lead to a projected reduction in fossil fuels of a certain, desired amount. Critiques could attack the plan for its prudence along several lines – the carbon price could hurt the domestic economy, trading partners are not also implementing one, a carbon tax is less likely to work than an emission trading scheme, etc.

3) A question of efficacy ('to hope'). A last question of realism concerns the issue of the efficacy of ones' actions or intentions in working towards a more sustainable energy future. It is similar to the 'depressive realism' of individual psychology, though in this case it extends to the believed efficacy of group or collective action as well. It stems from the tension between improvement and habitation, and the problem of 'people' in observing the future. We often find this question answered in statements such as, 'Canada only produces a small amount of emissions in a global, absolute sense; therefore our action to reduce them would have little consequence for global climate change'; or, 'I am only one person – my decision to bike instead of drive is insignificant.'

5.4) A Revised Framework of Politics

The question now becomes how to integrate the 'technologies of control,' politics-as-distinction, and questions of realism outlined in this chapter with the preliminary framework for politics and the future for sustainable energy given at the end of Chapter 4.

I noted at the outset that the aim of this discussion is to articulate a politics of the 'middle way'. The notion of sustainability, I argued, is an ameliorative balancing of three tensions inherent to modernity: improvement and habitation; rationalism and empiricism; action and reflection. In positioning itself in the middle, futures thereby take on a pragmatic or instrumental character; a character I argued renders them technological (rather than art or science). Accounts of the politics of futures nevertheless continue to be made from one or another end of various different 'spectra:' some see politics as separate, interventionist, others as immanent and performative. Some see politics as mediating the practice of observing futures; others see futures as intermediaries for politics. Above I suggested that futures could be considered technologies of control, based upon and expressing a politics-as-distinction, and finally, I noted that at the core of a politics-as-distinction is a question – the question(s) of realism

First, it is important to note that each question of realism can be answered both at the individual and at the social or 'systemic' level, the former being a matter of choice and the latter context. As Mitchell noted of the 'infinitesimal' techniques of governmentality, individual decisions as to a question of realism have the capacity to aggregate or coalesce into a more diffuse, social distinction with the apparent quality of being fixed and natural. Indeed, it may only be because of the existence of aggregate distinctions as to the questions of realism that individuals can decide for themselves one way or the other. If, for example, one observation of the future projects a high growth rate for an alternative or niche technology, it may be ruled an unrealistic projection if the general consensus is that this technology does not realistically have that potential (note this does not strictly depend on whether that technology really does have that potential or

not), or because the optimistic forecast suggests an unrealistic skew towards 'improvement' on the part of the observer.

Second, and relatedly, the questions of realism clearly exist both internally and extrinsically to them as well. In an immanent sense, decisions must be made in order to carry out an observation of the future – what goes in and what out, what timeline, what sector and suite of actors or technologies, what range of policies will be considered, what will be determined within the model and what will be set by assumption outside it. Answering the question of realism is a matter of the *will* to order or control the future. In some cases, it may be that these 'choices' may be built in to the techniques and models used to conduct observation.[337] On the other hand, they may be enforced upon the observer by external circumstances: perhaps the publically available data to address a crucial question does not exist, or (as Galbraith noted) a superior rules out consideration of a specific future for parochial reasons. Here, the answers to the question of realism are *determined* external to the will to change something. Furthermore, what is or is not realistic to envisage in the future for sustainable energy should not be construed as an issue occurring only in the discourse about the future – actually existing conditions in the present are likely to influence it as well. Given the present dominance of fossil fuels in the global energy system, it seems unrealistic to project their radical decline by 2030, for instance. Similarly, from a perspective internal to a specific technology, it also seem unrealistic to assume that fusion will arrive in time to resolve our sustainability problems given the length of time we've been working it and the current state of the technology.

[337] For example, the general distinction between 'top-down' and 'bottom-up' energy/economic models coincides with the likelihood of seeing substantial change as either expensive or more affordable. That is, top-down models are more likely to see the costs of change being high, whereas bottom-up models will seem that being lower.

Third, we can expect that the three 'sub-questions' of the question of realism will be at their most indistinct at the intersections between the opposing perspectives on the source and location of politics. That is to say, if it is unclear whether the individual or society is the one answering the question of realism regarding any particular vision of the future, the distinction between realistic and unrealistic will also be opaque. Following Schmitt, we might also expect that where the distinction between realistic and non-realistic is muddied or unclear, it is less likely to serve as the basis for politicization (that is, the 'vicious extension' of the politics of distinction).

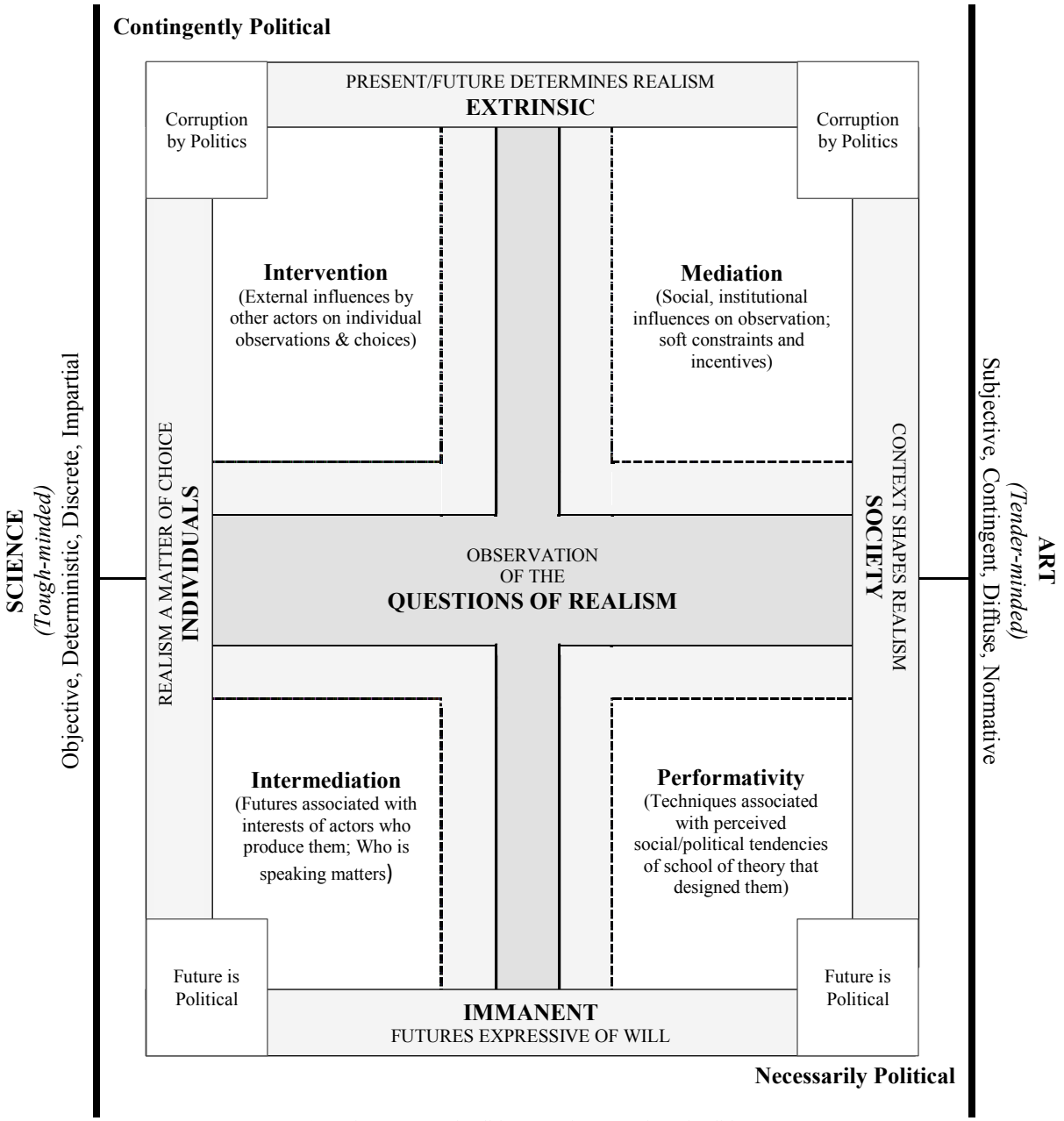
Why should we consider all this 'political'? In short, because deciding the question of realism shapes and is shaped by what we believe is probable, plausible or preferable about the future for sustainable energy. Moreover, the utility that futures provide (i.e., the ability to govern or control change) seems likely to accrue mainly to those that benefit from stable, systemic determinations of the question of realism. To the extent those configurations exist as shared, social consensus about the future, observations of the future may tend towards a self-fulfilling prophecy. To the extent they are embedded within the techniques used to make the observations themselves, they might become performative.

The above theoretical discussion of the connection between politics, politicization and controversy in futures for sustainable energy suggests several extended claims of the theory:

1. A future will become controversial if it makes statements that transgress a boundary of realism;

2. The boundary of realism in question may be that of an individual or that of society;
3. The more individual the boundary, the more ‘fringe’ the critic. The more social the boundary, the more fringe the future;
4. To the extent that the transgression is perceived as being the result of something external to the observation, that observation will be seen as ‘corrupted’ by politics
5. To the extent that the transgression is perceived as being the result of something internal to the observation, that observation will itself be perceived as political.
6. The degree to which a controversy is politicized will correlate with the intensity of the distinctions involved;

Figure 6 summarizes the revised framework of politics for the future for sustainable energy.



(X Axis = Source of Politics; Y Axis = Location of Politics;
Dark to Light = Increasing Intensity of Politics)

Figure 6) Perspectives on Politics and the Future for Sustainable Energy, Revised Framework

Chapter 6) The International Energy Agency and the World Energy Outlook

Having established our general framework for the consideration of the relationship between politics, politicization, controversy and the future for sustainable energy, we can now turn our attention to a case study in which we can evaluate theoretical extensions of that framework. The case study in question will be the controversy around the International Energy Agency's World Energy Outlook, which emerged approximately between 1998 and 2010.

This short chapter will provide background on the origins and structure of the International Energy Agency (IEA); note how its mission and priorities have changed since its creation in 1973; briefly outline the governance of the organization; and introduce the World Energy Outlook (WEO), issues of which I suggest can be separated into three 'eras': an early period (1993-1998); a middle or meso-period (2000-2007); and a late period (post-2008). Discussion of the controversy that enveloped the report between the early and late periods will be the focus of the following chapter. .

6.1) Origins and Current Structure

The IEA was established by treaty on November 18, 1974 by select members of the Organization for Cooperation and Economic Development (OECD) in response to the oil embargo set by Arab members of the Organization of Petroleum Exporting Countries (OPEC) against the United States, the Netherlands, and Denmark.[338] The treaty, called the "Agreement on an International Energy Program" (the I.E.P), was drafted by the

[338] Scott, *IEA, The First 20 Years: Origins and Structure*..

Energy Co-ordinating Group established by the OECD in early 1974 to address the specific issues that were believed to have aggravated the oil crisis.[339] Chief among these issues were the overdependence on imported oil in most OECD states, an institutional framework that required unanimous support from OECD members in order to implement emergency measures (support that was not forthcoming during the crisis, given divergent interests and concerns among states), and a general lack of good-quality, transparent and objective information on energy (in this case, oil) markets.

The IEP established the core structure and functions of the IEA and has not since been substantially amended. Structurally there are two main sides to the organization: a political side that consists of a Governing Board ("the supreme institutional organ" of the IEA, staffed by high-ranking officials from member-states and having the final word on all Agency matters), [340] four Standing Groups, several Working Groups, and two Industry Boards; and the administrative/analytical side consisting of the Secretariat, and various different Offices, Committees and Directorates on the other.[341] The principal difference between these two sides is that the former is staffed by official representatives from the member states and major energy companies while the latter is composed of energy experts drawn from member state bureaucracies, firms, and academia. Representatives on the political side are thus there to represent their country, while officials on the Secretariat are impartial analysts and administrators.

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[339] Organization for Economic Cooperation and Development, "Agreement on an International Energy Program (as Amended 25 September 2008."

[340] Scott, *IEA, The First 20 Years: Origins and Structure*, 1:1–157.

[341] Scott, *IEA, The First 20 Years: Origins and Structure*; International Energy Agency, "About the IEA: Standing Groups and Committees," *International Energy Agency*, accessed January 2, 2012, http://www.iea.org/about/stancom.asp.

The IEP set out five major objectives for the IEA: establishing and administering the oil-sharing system; building and maintaining an oil information system; building strong working relationships with industry; facilitating long-term policy cooperation among members to lessen dependence on imported oil; and improving relations with producer countries.[342] Overseeing these initiatives was the remit of the four Standing Groups established by the IEP: The Standing Group on Emergency Questions (overseeing the oil-sharing system); the Standing Group on the Oil Market (oil-sharing and long-term cooperation); the Standing Group on Relations with Producer and other Consumer Countries (now called the Standing Group on the Global Energy Dialogue); and the Standing Group on Long-term Cooperation. The Standing Groups are assisted in their efforts by two industry working groups (one for oil, another for coal), the IEA Energy Business Council (an executive-level group representing a wide-range of industry whose main function is to provide a 'reality-check' of IEA analyses), and the internal Committee on Energy Research and Technology (CERT) which comprises four departments (fossil fuels, efficiency, renewables and fusion). In addition, the IEA works closely with other organizations that specialize in different energy technologies, such as the OECD Nuclear Energy Agency and various EU bodies focusing on energy efficiency or renewable energy.[343]

The 'visible and permanent' presence of the IEA is provided by the Secretariat, composed of energy experts drawn from member-state bureaucracies, industry and

[342] Scott, *IEA, The First 20 Years: Major Policies and Actions*.

[343] Scott, *IEA, The First 20 Years: Origins and Structure*, vol. 1, chap. 4; Craig S. Bamberger, *IEA, The First 30 Years: Supplement to Volumes I, II, & III*, vol. 4 (Paris: OECD/IEA, 2004), chap. 5.

academia on fixed-year terms.[344] The head of the Secretariat is the Executive Director, who is vested with considerable power – it is the Executive Director who can trigger the emergency sharing system if the necessary findings are made, a decision that can in theory be made without consulting member-states. The Executive Director also oversees the activities of the IEA in general and acts as the public face of the IEA, when traveling to member and non-member states or representing the IEA at other international organizations. The Office of the Executive Director includes a Deputy Executive Director who assists the Executive Director, and six offices that are responsible for much of the IEA's analytical and operational work: the Energy Statistics Division, the Office of the Legal Council, the Communication and Information Office, the Information Systems Division, the Personnel and Finance Division, and the Office of the Chief Economist, which publishes the *World Energy Outlook*.[345]

In addition to the Office of the Executive Director, there are three Directorates that assist the Governing Board working groups on specific issues: the Directorate of Global Energy Dialogue (relations between member and non-member states); the Directorate of Energy Markets and Security (houses the 'action unit' that monitors and forecasts market trends to assess risk of supply disruption or other threats to security), and the Directorate of Sustainable Policy and Technology (responsible for both demand and supply-side initiatives as well as energy technology policy).[346] The Directorate of Energy Markets and Security comprises four divisions: the Emergency Policy division; the Oil Industry

[344] Scott, *IEA, The First 20 Years: Origins and Structure*, vol. 1, chap. 5.

[345] International Energy Agency, "FAQs: Organisation and Structure," *International Energy Agency*, n.d., http://www.iea.org/aboutus/faqs/organisationandstructure/.

[346] International Energy Agency, "About the IEA: Standing Groups and Committees."

and Markets division; the Gas, Coal and Power Markets division; and the Renewable Energy division. The general aim of this Directorate is to monitor energy market trends in order to identify and address future risks that could harm energy security. These divisions produce the Oil Market Report, the Medium-term Oil and Gas Markets report, and the Gas Market Review. The Directorate of Global Energy Dialogue contains two regional groups (DALSA – Asia Pacific, Latin America, and Sub-Saharan Africa; DEMA – Europe, Middle East, and North Africa) and the Country Studies Division. The latter division conducts the In-depth Reviews of member state energy policies, an important tool in wielding the power of community pressure on member-state energy policy choices and actions. The Directorate of Sustainable Energy Policy and Technology consists of the Energy Efficiency and Environment division and the Energy Technology Policy Division, the latter of which produces the increasingly prominent Energy Technology Perspectives (energy scenarios and strategies up to 2050), as well as Energy Technology Roadmaps and the OPEN Energy Technology Bulletin.

Last, but not least, is the Office of the Chief Economist, part of the Office of the Executive Director, which is responsible for the production of the *World Energy Outlook (WEO)* – the 'flagship' energy report produced by the IEA. Though this Office is now approximately on par with the other Directorates, and the Chief Economist himself essentially a Director, this was not always so: up until approximately 2008, the WEO was produced by the Economics Analysis Division, headed by the Chief Economist, within the now defunct directorate for Long-term Policy Coordination.[347] Before it was

[347] As of September 2013, the IEA appears to be restructuring the Secretariat to make the Office of the Chief Economist a formal directorate, of 'Global Energy Economics.'

disbanded and replaced with the Office of the Chief Economist, the Directorate for Long-term Policy Coordination was headed by the Director of the Long-term Office, to whom the Economics Analysis Division and the IEA Chief Economist reported. Figure 7 below shows the evolution of the IEA Secretariat between the years 1994 and 2002, and Appendix D contains the current organization chart available from the IEA website.[348]

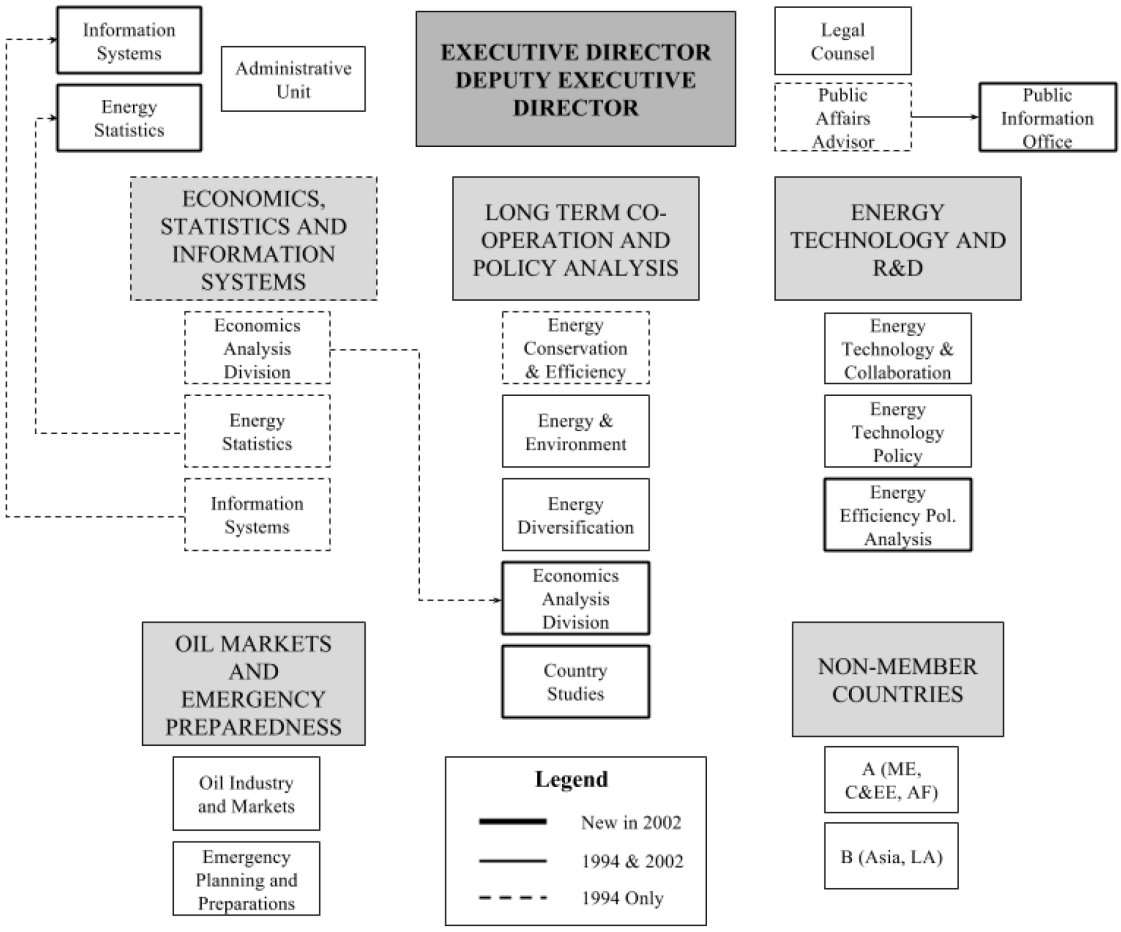

Figure 7) Organization of the IEA Secretariat, 1994 - 2002

6.2) Changing Priorities

[348] Scott, *IEA, The First 20 Years: Origins and Structure*, 1:411; Bamberger, *IEA, The First 30 Years: Supplement to Volumes I, II, & III*, 4:122; International Energy Agency, "FAQs: Organisation and Structure."

Though the IEP remains the principal document concerning the IEA's organization and mandate, and though it has never been extensively amended, the IEA has nevertheless significantly broadened its activities since the 1970s. While energy security remains the central focus of the IEA, this concept has been extended to encompass sources of energy other than oil, including coal, natural gas, and electricity generation. Environmental concerns became increasingly prominent throughout the 1980s and 1990s and are now a "horizontal" concern that touches all IEA activities. The changing nature of international energy markets (increasing liberalization and interconnectedness through trade) and the growing share of energy consumption in emerging economies (China and India, for example) have led the IEA to take a much more market-oriented and global approach to energy policy and security. While the emergency oil sharing system remains available as an option during oil supply crises, in practice it has never been fully implemented (despite several instances where it might have been justified). Instead, the IEA and its members have increasingly chosen to 'water-down' emergency measures so as not to unduly constrain markets during times of crisis, preferring instead to draw down oil stocks as needed to prevent market volatility and rapid price increases. And while alternative energy sources specified in the IEP as viable competitors to oil reflected the times in which the IEP was drafted (preference for nuclear and coal and a near complete absence of renewable energies other than hydroelectricity), the IEA now pays much greater attention to energy efficiency and renewable energy (though nuclear and coal remain prominent).

Of the numerous documents that now define the IEA's mandate alongside the IEP, none is perhaps as important as the 1993 Ministerial Action on IEA Shared Goals.[349] The Goals were developed as a review of IEA energy policy in light of changing markets and growing environmental concerns, signified by the IEA's recognition in the late 1980's of the "Three E's" of energy policy: balancing economic development, energy security, and environmental protection. There are nine Shared Goals:

- Diversity, efficiency and flexibility in energy is essential for long-term security
- Energy systems should be able to respond promptly and flexibly to energy emergencies
- Environmentally sustainable energy provision and use is important; government interventions should heed the Polluter Pays Principle
- More environmentally acceptable energy sources need to be encouraged and developed
- Improved energy efficiency promotes energy security and environmental protection in a cost-effective manner
- Research, development and market deployment of new and improved energy technology contributes to the above objectives
- Undistorted energy prices enable markets to work efficiently
- Free and open trade and a secure framework for investment contribute to efficient energy markets and energy security
- Cooperation among all energy market participants improves understanding and information, encourages development of efficient, environmentally acceptable and flexible energy systems and markets worldwide

The Shared Goals are a comprehensive statement on the IEA's approach to energy policy and touch all aspects of its work, but they represent a significant difference from its original remit. Broadly speaking, the IEA has moved from a relatively narrow, and

[349] International Energy Agency, "Shared Goals," *International Energy Agency*, accessed June 8, 2012, http://www.iea.org/about/sharedgoals.asp; Bamberger, *IEA, The First 30 Years: Supplement to Volumes I, II, & III*.

interventionist, focus on controlling for oil supply shocks, to a more general interpretation of security, in its overlap with environmental concerns, deregulated and liberalized energy markets, and cooperation among both IEA member and non-member states. However, it is important to recall that, as Richard Scott noted in 1995 "at no time have the Members considered the IEA to be an 'environmental protection agency for energy', and it is still not so considered today despite the enormous growth in IEA work on energy and the environment."[350] Instead, the IEA's engagement with environmental issues tends to be directed towards ensuring that complementary solutions to security and environmental concerns are found. This includes incorporating environmental concerns into energy policy, but also consideration of energy security in the development of environmental policy.

The evolution of the IEA has occurred not only in its mission. Van de Graaf and Lesage provide an overview of the institutional flexibility and adaptability of the IEA as witnessed in 5 spheres: membership (which has grown to include nearly all OECD states, not including the significantly strengthened relationships with OPEC, Russia, and China); the strength of its core mandate (mainly the Emergency Sharing System, which has never been used and was more or less replaced by the Coordinated Emergency Response Measures); broadening issue scope (the Shared Goals being the primary example, but also the inclusion of the IEA in G8 meetings after 2005); organizational function and structure (which has remained relatively unchanged in its fundamentals; Japan and the US together contribute nearly 50% of the IEA's budget and perhaps have a 'louder voice at the table', as remarked by an informant to Van de Graaf and Lesage); and, lastly, the

[350] Scott, *IEA, The First 20 Years: Major Policies and Actions*, 2:40–41.

IEA's changing competitive environment (the establishment of the International Energy Forum, the Energy Charter Treaty, and the International Renewable Energy Agency being examples of recent, competing organizations).[351] Overall, they attribute change in the IEA to a combination of factors – to the role that the member-states have in guiding the organization (i.e., US and Japan), the path dependent constraints established by the IEP, and also the decisions of the Secretariat, itself an important actor in this regard.

6.3) Governance

Though the IEA was considered when founded to be an exceptionally powerful and unique international organization (mainly because the emergency oil sharing system was legally binding on member states and could be implemented by the Executive Director of the Secretariat without their consultation), in practice its influence is considerably more subtle. In an early study, Keohane found that though the political side of the IEA often reflects conventional inter-state politics (i.e., a realm in which states advance and try to protect their own interests), the administrative/analytical branch wields considerable power through its 'trans-governmental' work of coordinating policy and action among members (a process which takes place at a level below that of states and their official delegates).[352] That being said, relations in the Governing Board are noted to be rarely tense in the official documentation: despite the complex voting structure (in which

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[351] Thijs Van de Graaf and Dries Lesage, "The International Energy Agency after 35 Years: Reform Needs and Institutional Adaptability," *The Review of International Organizations* 4, no. 3 (2009): 293–317.

[352] Robert O Keohane, "International Agencies and the Art of the Possible: The Case of the IEA," *Journal of Policy Analysis and Management* 1, no. 4 (June 1, 1982): 469–81.; See also Robert Keohane, *After Hegemony : Cooperation and Discord in the World Political Economy* (Princeton, N.J.: Princeton University Press, 1984), chap. 10.; supported by more recent analysis by Ann Florini and Benjamin K. Sovacool, "Who Governs Energy? The Challenges Facing Global Energy Governance," *Energy Policy* 37, no. 12 (December 2009): 5239–48..

members' voting weights are based on levels of oil consumption in the early 1970s)[353] and varying levels of agreement required to approve actions and statements, in practice the Governing Board rules by consensus on "virtually every agenda item."[354] While many aspects of the IEP are technically legally binding on members, the majority of commitments made at the IEA are 'aspirational' in nature, with the principal means of enforcement being the regular review of member state energy policies which provides a public evaluation of the extent to which the member is working towards IEA goals.

While the Governing Board may be the highest authority on the 'political' side of the IEA, the Executive Director of the Secretariat (ostensibly the administrative/analytical side to the Agency) might be considered the "strongest political arm" of the IEA as an organization itself.[355] According to Robert Skinner, a former Director of the Long-term Office, it is at the level of the Executive Director that the "political dialogue" between the member states and the Secretariat takes place.[356] Originally, the Executive Director was appointed by the Governing Board and served at its pleasure, though this was subsequently changed in the 1990s to being based on 4-year terms. Ulf Langtze was appointed Director when the Agency was created and served for 10 years (1974-1984), as did his successor, Helga Steeg (1984-1994).[357] Her successor, Robert Priddle (1994-2002), served two 4 year terms, though all subsequent Executive Directors have served

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[353] Amendments were proposed to this structure in the late-1990s when the IEA was about to offer membership to Hungary, but the Governing Board rejected the proposed changes. Bamberger, *IEA, The First 30 Years: Supplement to Volumes I, II, & III*, 4:28–29.

[354] Scott, *IEA, The First 20 Years: Origins and Structure*, 1:127.

[355] Graham Campbell, Interview, interview by James Gaede, Phone, February 14, 2013. See also Scott's discussion of the Office in Scott, *IEA, The First 20 Years: Origins and Structure*.

[356] Robert Skinner, Interview, interview by James Gaede, May 28, 2013.

[357] Deputy Executive Director at the time, Wallace ('Wally') Hopkins, served in the brief interim between Langtze and Steeg. See Scott, *IEA, The First 20 Years: Origins and Structure*, 1:260.

only one (Claude Mandil 2003-2007; Nobuo Tanaka 2007-2011; Maria van der Hoeven 2011-present).

By some accounts, the biggest shifts in IEA policy and direction, and perhaps outlook, coincide with changes of Executive Directors, though the extent to which these shifts are driven by personnel or by the wishes of the member states is not clear. Prior to the Shared Goals (1994), the IEA was by most accounts a much more conservative organization ("almost closed", according to Skinner) - in fact, Skinner described the IEA as being in a virtual "cold war" with OPEC in the 1980s.[358] The renegotiations that led to the Shared Goals began near the end of Steeg's term,[359] and were continued under Priddle's.[360] According to Priddle, this shift aimed primarily at the enlargement of the idea of energy security beyond its close association with oil, an expanded mission that entailed developing a much better relationship with OPEC, alongside further liberalization of energy markets, and attention to environmental concerns.[361] It was during this time that the Producer-Consumer dialogue was started (which subsequently developed into the International Energy Forum (IEF). One tangible outcome of this dialogue was the creation of the Joint Oil Data Initiative (JODI) in the early 2000s, an effort to address the lack of transparency and reliability of oil market data that was

[358] Skinner, Interview. Steeg even reportedly forbade the usage of the term 'OPEC' in the earliest WEOs, preferring instead to "producer group" - David Knapp, Interview, interview by James Gaede, Phone, May 15, 2013. This practice appears to have lasted until around the publication of the 1995 WEO, which does not use the acronym.

[359] Reportedly with some hesitancy from the Executive Director (Skinner, Interview.)

[360] Despite being, according to Knapp, a "died-in-the-wool Thatcherite" and "certainly no great friend to OPEC." Knapp, Interview.

[361] Robert Priddle, Interview, interview by James Gaede, Phone, June 20, 2013.

believed to be a contributing factor to price volatility in the late 1990s.[362] Priddle's successor, Claude Mandil, was credited by Knapp in an interview as being the "perfect guy for the job" of continuing the Producer-Consumer Dialogue, and facilitating better relations between the IEA and OPEC.[363]

After the Executive Director the next in command is the Deputy Executive Director, an office one interview participant described as the "Kissinger Post", because it is always held by an American (the Chairman of the Standing Group on Long-term Co-operation is also always an American).[364] In the 1980s, this office was held for some time by Wallace Hopkins.[365] Following Hopkins, the Office was staffed by John P. Ferriter (1989 to 1999), William Ramsay (1999 to 2008), Richard Jones (2008-2013), Kenneth Fairfax (2013-Present) – all former US diplomats.[366] All reports produced by the Secretariat were vetted by the Executive Director and Deputy Executive Director during the 1980s, and if anything in the report was deemed potentially embarrassing to a member state, the author would be asked to nuance the point: "above all," Skinner noted, the implicit rule of writing the reports was "do not have an advocacy tone to it."[367]

As noted above, the rest of the Office of the Executive Director is comprised of the four Directorates that mirror the Standing Groups on the political side of the Agency. The

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[362] See JODI-Oil: Joint Organisations Data Initiative, "History," *JODI-Oil: Joint Organisations Data Initiative*, accessed February 6, 2014, http://www.jodidata.org/about-jodi/history.aspx.

[363] Knapp, Interview. Mandil is half-Turkish, half-French.

[364] Skinner, Interview. Also, Bamberger, *IEA, The First 30 Years: Supplement to Volumes I, II, & III*, 4:298.

[365] Skinner described Hopkins as a "bombastic, brutal guy" who "ruled with an iron fist." Skinner, Interview.

[366] See Bamberger, *IEA, The First 30 Years: Supplement to Volumes I, II, & III*, 4:300.; "Richard H. Jones Named next IEA Deputy Executive Director," *International Energy Agency*, May 2, 2008, http://www.iea.org/newsroomandevents/pressreleases/2008/may/name,20242,en.html.

[367] According to Skinner, Interview.

directorate that most directly concerns this paper is the Office of Long-term Co-operation and Policy Analysis (the directorate which mirrored the Standing Group on Long-term Cooperation), which for most of the period under analysis here housed the Economics Analysis Division that produced the WEO. The Director of this Office thus could ostensibly exercise some jurisdiction over the report themselves, though they would nevertheless have to report to the Office of the Executive Director above them. Robert Skinner held this position from 1988 until 1995, followed by Jean-Marie Bourdaire, a French petroleum geologist from Total until 1999. Olivier Appert, former chair of the French Petroleum Institute, served between 1999 and 2003, and Noé Van Hulst of the Netherlands served after him until the office's dissolution in 2008.[368] As will be covered in the chapters below, the changes in personnel in this office in particular may have been responsible for some of the shifts in outlook in the WEO during this time.

Beneath the Director of the Long-term Office was, from 1995-2008, the head of the Economics Analysis Division (EAD). Prior to 1998, this position was held by Ken Wigley. Following his (and Boudaire's) departure in 1998/1999, Fatih Birol was promoted to head the division, whom the Agency began to refer to as the Agency's 'Chief Economist' around 2002. In 2008, the EAD was brought out from under the control of the Director of the Long-term Office and renamed the Office of the Chief Economist (OCE). Birol continues to serve as the IEA's Chief Economist and lead author of the WEO, and as such his name and reputation are closely intertwined with the report).

Underneath Birol is a team of approximately 20-25 analysts whose principle task is conducting the research and analysis that comprise the World Energy Outlook. As noted

[368] Bamberger, *IEA, The First 30 Years: Supplement to Volumes I, II, & III*, 4:300.

earlier, the report typically includes an extensive Acknowledgments section at the beginning, listing the various experts and contributors to the report both within and external to the IEA. By some accounts, a standard practice is to keep one-time analysts on a peer-review list after their term at the IEA expires, who then receive advance copies of the WEOs before publication to comment on the realism of the assumptions and/or projections.[369] While there are some repeat offenders, the total list of contributors (which includes both analysts and non-analysts, such as proofreaders, communications staff, and editors) runs to approximately 958 discreet individuals between 1998 and 2010 (including the special issues). As shown in Figure 8, the vast majority of these consult on only one report. Most of the longest standing contributors to the report have been 'insiders' in the IEA, meaning they made their contributions as an official of the IEA, though not necessarily in Birol's department. Appendices E and F show the top 20 inside and 'outsider' contributors to the WEO between 1998 and 2010.

Figure 8) Acknowledgements per Person, Insiders and Outsiders

[369] Peter Fraser, Interview, interview by James Gaede, Phone, February 13, 2013.

6.4) The World Energy Outlook

The World Energy Outlook (WEO) began annual publication in 1993 (roughly around the time of the passing of the Ministerial Action on IEA Shared Goals). The WEO can be organized into three main 'eras' roughly based on international energy and climate change-related negotiations: 1) the pre-Kyoto period (mid to late 1990s); 2) a meso-period (2000-2007), and; 3) the pre-Copenhagen period (2008-2010). The structure and content of the WEOs produced during these periods and the personnel working on them are what distinguish the three eras.

Pre-Kyoto WEOs consist of two scenarios, one of which is more 'alternative' than the other, though the focus of the alternative scenario (called 'Energy Savings' scenario in 1995 and 1996) is more on efficiency gains that could be attained based on alternate assumptions about consumer behavior instead of the policies that could be implemented to fight global climate change. The more conventional scenario, called 'Capacity Constraints' in 1995/1996, is similar to the later Reference Scenario and focuses on future investment needs on the supply side. There was no WEO produced in 1997. The 1998 WEO can be lumped into this category for reasons described below, despite dropping the Capacity Constraints/Energy Savings scenario structure and instead offering only a business-as-usual case, as can the 1999 WEO (a special issue on subsidies). The reason that the latter two WEOs should be grouped in the early period owes mainly to personnel changes in the IEA, but also for energy supply 'paradigm' reasons, both of which will be discussed below.

The meso-period (2000-2007) is defined by the introduction of a new World Energy Model, an extension of the time horizon to 2030, and the adoption of the Reference

Scenario / Alternative Policy scenario structure that prevailed until the 2010 WEO. The 2002 WEO describes the latter change accordingly:

> The core projections in this World Energy Outlook are derived from a Reference Scenario based on a set of assumptions about macroeconomic conditions, population growth, energy prices, government policies and technology. It takes into account only those government policies and measures that have been enacted, though not necessarily implemented, as of mid-2002. An OECD Alternative Policy Scenario considers the impact of a range of new energy and environmental policies that OECD countries might adopt and of a faster rate of deployment of new energy technologies. The time horizon for this edition has been extended from 2020 to 2030 so as to consider the possible impact of new technologies on energy supply and demand, since much of the energy-related equipment in use today will have been replaced by 2030.[370]

It should be noted that the IEA did not consider the Reference Scenario as a business-as-usual scenario when it was introduced; though it was intended to demonstrate to decision-makers the consequences of taking no further action to change the energy future, the fact that it was based on existing though possibly not fully implemented policy meant that the WEO could not simply extrapolate past trends. As a result, the IEA would have to exercise some judgment about how policies and other assumptions would proceed differently across different regions and sectors. They note that though they assume current energy and environmental policies remain unchanged at both national and regional levels throughout the projection period, the pace and implementation of those policies and the approaches adopted are nonetheless assumed to vary by fuel and by region.[371] The Alternative Policy scenario, first conducted in 2000 for only the OECD region, was intended mainly to conduct some sensitivity analysis around key

[370] International Energy Agency, *World Energy Outlook 2002* (Paris: OECD/IEA, 2002), 37–38.

[371] International Energy Agency, *World Energy Outlook 2000* (Paris: OECD/IEA, 2000), 40–41.

assumptions. Though population and macroeconomic growth assumptions were kept the same, assumptions about policies, prices and technological change were different. The Alternative Policy scenario also assumed new policies would be implemented, mainly for addressing climate change and energy security concerns, and that there would be faster deployment of "new energy technologies." The IEA described the aim of the Alternative Policy scenario as being "to assist in the formulation of future policies by providing insights into how effective they might be."[372] During this period, the WEO continued the alternate year 'special issue' practice (special issues published in 2001, 2003, 2005 and 2007).

The last period (2008-Present) in the run-up to COP-15 at Copenhagen is marked by increasing emphasis on greenhouse gas reductions, a more radical and pressing tone (noting the necessity of an 'energy revolution'), the introduction of the 450 Policy Scenario and, in 2010, the dropping of the Reference Scenario all together (repackaging it as a 'Current Policies' scenario, but with less centrality to the overall report than the former Reference). WEOs since 2010 now have a "New Policies" scenario as the main focus, a moderated version of the former Alternative Policy scenario that incorporates some assumptions as to what proposed policies will be implemented (and how effectively), with Current Policies for contrast.[373]

Regardless of which period the WEO falls into, the basic structure of the report remains similar over the full time period. Each report begins with the Executive Director's foreword, Acknowledgments section, and the Executive Summary. In the

[372] International Energy Agency, *World Energy Outlook 2002*, 40.

[373] International Energy Agency, *World Energy Outlook 2010* (Paris: OECD/IEA, 2010), 60–62.

first chapter, the report details the assumptions which frame the analysis (including assumptions about future world population growth, oil prices, economic growth and other important trends), before presenting the results of the Reference or conventional scenario. Alternative scenarios, sensitivity analyses and specific regional studies comprise later chapters. Critically, the authors are almost always explicit that the WEO is not intended to be a prediction of the future, but is instead intended only to demonstrate to policy-makers the possible consequences if then present policies remain unchanged.[374]

According to interviews conducted with former IEA personnel, the Agency used to publish a WEO infrequently in the 1980s, though the report was "spasmodic." Owing to the conservative culture of the Agency at the time (under Steeg and Hopkins), the report mainly compiled the official projections of its member states without conducting any analysis of its own. According to Guy Caruso, former head of the Oil Industry Division and Director of the Non-Member Countries Directorate, the consequence of the reliance on official projections and the strict attendance to neutrality was an Outlook so extremely optimistic that few believed it.[375]

It appears to have been an initiative of Priddle's to bring the WEO out from control by the member states and turn it into a more autonomous document – i.e., the perspective of the IEA as an independent organization. This move may not have had the express support of the Governing Board; according to Caruso, there was a "great outcry" from the 'political' side of the IEA (i.e., the government representatives) to the independence of

[374] Most WEO's note as much in the Executive Director's Introduction or in the first chapter overview. The section on 'Message' in the chapter on Sites of Contention below deals with this issue in further detail, and provides some examples.

[375] Guy Caruso, Interview, interview by James Gaede, Phone, April 2, 2013.

the report. To this day, the WEO retains its relatively unique (compared to other reports produced by the IEA) autonomy. While most other studies are overseen by one of the Standing Committees, the WEO is unique in being the responsibility of the 'directorate' of the Office of the Chief Economist, and is produced without prior scrutiny by governments. Only when it is on the way to the printers are governments notified of its contents, but they do not get to shape the contents in any manner. According to Priddle, the review process is more an advance screening, which the members generally appreciate: "the governments really see the value in having something that is untainted by any attempt to shape it politically."[376]

[376] Priddle, Interview.

Chapter 7) Controversy and the World Energy Outlook

Though the WEO has been published annually since 1993, and though criticisms have been made of both it and other reports published by the Agency since this time, the report itself did not become *politically* controversial until after the 2008 report. Based on new research the Agency conducted for that report, oil supply projections were downgraded relatively significantly compared to past reports. This prompted criticism from some quarters that the IEA had been misleading governments as to the 'reality' of peak oil production. These criticisms where intensified after an IEA whistleblower alleged the report was manipulated at the behest of US foreign policy interests in 2009.

The emergence of this controversy prompted others to go back and review the history of the WEO on oil supply, in particular the 1998 issue which stands alone as being 'pessimistic' on the future for oil supply. This chapter will proceed to review the emergence of the controversy in a linear fashion, however, starting in the late 1990s and moving forward to the 2008 WEO and whistleblower allegations. It will conclude by noting three important themes or allegations of the controversy surrounding the WEO: an allegation of bias (towards the status quo), an allegation of political corruption (by member state interests), and an allegation of irresponsibility (for concealing the reality of peak oil).

7.1) The 'Missing Barrels' Saga of the late 1990s

The first 'controversy' does not pertain directly to the WEO specifically, but does touch on some of the key themes and involves some key people, so it serves as a good

place to start. In the late 1990s, oil prices took a bit of a dive from their 1996 highs. Though there were a number of attenuating causes that eventually were recognized, the direct issue appeared to be an imbalance between supply and demand (i.e., oversupply).

At the IEA, the short-term Oil Market Report had recently come under the direction of a new editor, David Knapp, in February 1997. This was followed shortly by a slight change in format in the long-unchanged OMR format – the addition of a special feature section given to the discussion of a key issue, just following the bullet point highlights and before the demand analysis sections. In October 1997, this section began to express concern about the higher than usual 'miscellaneous-to-balance' numbers for the second and third quarter of that year, which it noted could indicate some problems with the estimates of supply and demand contained in the report.[377] As prices continued to decline into 1998, it was becoming clear that the market was in oversupply, and despite recent OPEC agreements to cut production, the trend was continuing.

Perplexed by the ongoing imbalance, the special section highlighted the 'Strange Mathematics' of lasting imbalances between supply/demand and in OECD stock figures, which were not increasing as expected.[378] It appeared that there were 'missing barrels' to account for the oversupply and static stock figures. Throughout the rest of 1998, the OMR continued to question where these missing barrels where located and when they

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[377] The report notes that revisions are an inescapable part of forecasting, but "what is critical is the maintenance of objectivity in the face of these necessary adjustments, taking the information from the revisions and applying to related estimates, without overcompensating." Analysing the miscellaneous-to-balance number is one aspect of how the IEA attempts to achieve this on an ongoing basis. See *Living with Revisions*, Oil Market Report (Paris, France: International Energy Agency, October 9, 1997), 3.

[378] *Strange Mathematics*, Oil Market Report (Paris, France: International Energy Agency, April 10, 1998), 29.

would show up in the data. Into 1999, markets slowly tightened and the 'saga of the missing barrels' began to recede, its actual existence even coming to be questioned in the 08/99 OMR.[379] Finally, in December, the OMR bid an "un-fond farewell" to the missing barrels, noting that though the issue had been controversial (did they really exist?), it believed the evidence suggested that they had.[380]

Perhaps the most vociferous critic of the missing barrels was Texas investment banker Matthew Simmons, who claimed the issue was a "market myth" created and propagated by the IEA. Simmons main argument was that the IEA was needlessly (and possibly intentionally) creating a self-fulfilling prophecy:

> "The longer the IEA arrogantly refuses to admit that its supply and demand analysis has some flaws, and the longer the agency holds to a belief that massive amounts of petroleum are still hiding somewhere, the greater the risk becomes that oil markets might crash again on another perception of oversupply. Even worse, this misguided information could accidently create a situation where oil supply falls too much and a bona fide physical shortage is created"[381]

The root of the problem could be underestimation of demand or overestimation of supply, not, as the IEA believed, 'missing barrels'. Simmons believed that the problem was mainly due to an overestimation of OPEC supply, caused in part by the IEA's unreliable data collection techniques for this number. OPEC had ceased officially publishing production numbers some time ago, and the IEA had to rely on the 'harbor spies' of an

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[379] *Yesterday, Today and Tomorrow*, Oil Market Report (Paris, France: International Energy Agency, August 10, 1999).

[380] *A Thirsty Market*, Oil Market Report (Paris, France: International Energy Agency, December 8, 1999).

[381] Matthew Simmons, "There Are No 'Missing Barrels:' Our Oil Markets Are Tightening" (Simmons & Company International, June 17, 1999), 2, http://www.simmonsco-intl.com/content/documents/whitepapers/There%20Are%20No%20Missing%20Barrels-Our%20Oil%20Markets%20Are%20Tightening.pdf.

independent consultant to estimate production based on tanker traffic out of key OPEC ports. The IEA's insistence that there was a real "missing barrels" phenomenon occurring, and not that there were problems with their data, Simmons argued was creating a 'house of mirrors', in which IEA bearishness on oil led speculators to increase shorts on NYMEX oil contracts. As shorts grew, prices fell, and as prices fell, the IEA got even more bearish. The consensus view that Saudi Arabia had tired of being a swing producer, and was increasing production to swamp the market with cheap oil to drown out rising competitors, fed into this cycle (despite official efforts on the part of Saudi Arabia to lower OPEC production quotas). In time, markets tightened; Simmons concluded: "There never was an oil glut. There was merely a glut of poor data."[382]

Simmons was the CEO of Simmons & Company, a Texas investment firm specializing in energy, and eventually became an important energy advisor to US President George W. Bush. He also achieved some notoriety as a trenchant critic of Saudi Arabia oil reserve data and official statements about oil production potential in the country; a criticism which secured his place in the peak oil pantheon (regardless of whether or not he wished it so). In 2003, Simmons published *Twilight in the Desert,* outlining the basis for his concerns. "Every important energy supply model has assumed that Saudi Arabian oil is so plentiful and can be produced so inexpensively that its supply is expandable to any realistic demand level the world might need, at least through the year 2030,"[383] Simmons noted, but this was "foolish speculation" that prevented analysts from asking the right question: what should Saudi Arabia be producing in order to

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[382] Matthew R. Simmons, *Twilight in the Desert : The Coming Saudi Oil Shock and the World Economy* (Hoboken, NJ: John Wiley & Sons, 2005), 83.

[383] Ibid., xiii.

optimize production, cost and the health of the resource? To Simmons, the issue was one of sustainability, a question of finding the right balance between maximizing supply and maintaining low costs of production – if, as Simmons believed, there was good reason for concern about the health of the resource, the future production rates assumed by experts where highly unrealistic, both because of physical limits and the unlikeliness of Saudis to willfully meet those projections. "Sadly," he notes, "we may have begun asking this question too late to alter the course of energy in any meaningful way…"

> "…simply because the question was ignored for so long while the mortality of the Saudi oil fields was concealed by three veils – secrecy, sovereignty, and self-delusion. Saudi Arabia drew the veils of secrecy and sovereignty. We expert energy observers drew our own veil of self-delusion with our lack of skeptical curiosity, our willingness to trust, and perhaps our reluctance to confront the unpleasant truth"[384]

His text was to become part of the canon of literature raising concerns about the potential for future oil supply, and therefore an important component in the controversy surrounding the WEO.

At around the same time that Simmons was issuing concerns about the OMR (1997-9), concerns about the limits for future oil supply were beginning to re-emerge, after generally lying dormant since the early 1980s. In 1997, retired petroleum geologist Colin Campbell was contracted by Petroconsultants, a consulting firm that happened to possess the world's most comprehensive database on oil reserve data, to assess potential future supply using their latest figures. The study led to the publication of another key text in

[384] Ibid., 97.

the peak oil canon, Campbell's *The Coming Oil Crisis*.[385] The book itself was essentially an energy future, comprising three scenarios for supply (high, low, base) that were driven by three key parameters: the 'natural' increase in demand likely to occur based on population growth; the 'swing share' (i.e., the point at which prices become high enough to influence demand); and, of course, physical constraints on the resource itself. Based on his analysis of the Petroconsultant data, Campbell argued that conventional oil production was likely to peak sometime around the year 2000.[386]

Campbell's work led to a collaborative article between himself and another retired petroleum geologist, Jean Laherrère (formerly of Total), published in 1998 in Scientific American. The article, titled "The End of Cheap Oil", covered some of the key points emerging out of Campbell and Laherrère's work using the Petroconsultant data, and made a strong case for 'peak oil' as a probable, near-term reality.[387] While neither Campbell's book nor his article with Laherrère mentions the IEA or the WEO in any critical sense, there is nevertheless a connection between the emerging peak oil movement and the WEO.

7.2) The 'Coded Message' of the 1998 WEO

The WEO at this time was produced by the Economics Analysis Division, a department of the Long-Term Office, which was under the direction of another former Total employee, Jean-Marie Bourdaire, who had worked with Laherrère at Total (in fact,

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[385] C. J Campbell and R. C Duncan, *The Coming Oil Crisis* (Brentwood, Essex, England: Multi-Science Pub. Co. & Petroconsultants, 1997).

[386] Ibid., chap. 8, 15.

[387] C. J. Campbell and J. H. Laherrère, "The End of Cheap Oil," *Scientific American* 278, no. 3 (1998): 60–65.

Laherrère was his supervisor when he was initially hired).[388] In 1997, Bourdaire organized a series of three technical workshops, with the aim of fostering discussion and learning within the IEA on key issues. One of these workshops was on oil supply modeling. Bourdaire brought in a number of experts on both the optimistic side (including, among others, Michael Lynch, and Thomas Ahlbrandt, a senior official at the United States Geological Service) and the pessimistic side, i.e., the peak oil proponents (Campbell and Laherrère, as well as several others). The workshop was meant to inform oil supply modeling at the IEA and specifically to inform the analysis and preparation of the 1998 World Energy Outlook, which was to be a relatively significant departure from both the scope and structure of past WEOs. The oil supply chapter in the 1998 WEO suggests that the message of the pessimists was heard more loudly[389] by the team that produced the report: "For the first time", the author's note, "the WEO's oil supply projections have to consider the possibility that the production of conventional oil could peak before 2020."[390]

Though it was apparently not seen as controversial at the time, the 1998 WEO would later be referred to by critics as the first evidence of a systemic and long-standing effort at the IEA to 'cover up' peak oil concerns. There are a number of things about the 1998 oil supply chapter that stand out in comparison with later WEOs. For one, it is the only one until 2008 that discusses 'peak oil' production as a necessary eventuality. For example,

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[388] Jean-Marie Bourdaire, Interview, interview by James Gaede, Phone, May 3, 2013.

[389] Was this because they presented a more convincing message, or because it was pre-ordained by Boudaire's sympathetic attitude to peak oil and his long-standing connection with Laherrère? It is difficult to say which is the case with any certainty, the interviews I conducted with people at the IEA during this time suggests that it was more due to the latter factor than the former. See Chapters 8 and 9 below for more discussion.

[390] International Energy Agency, *World Energy Outlook 1998* (Paris: OECD/IEA, 1998), 91.

though "technology can extend the peak and delay or slow the decline in production", the authors note, "eventually production falls, given a fixed oil resource." Moreover, this WEO also repeatedly casts publicly-available reserve estimates data as being highly uncertain ('many commentators have questioned the reliability of the reserves estimates data published in the BP Statistical Review of Energy and the Oil and Gas Journal') and cites work done by peak oil proponents, include both Laherrère and Campbell, in a non-critical context. Though the report does pay credence to both an 'optimistic' and a 'pessimistic' approach to future conventional oil supply,[391] they adopt a centrist approach they term "a synthesis of static and dynamic views", utilizing the geological data of the pessimists, but permitting estimates of proven or probable recoverable resources to increase over time (this phenomenon is known as 'reserve growth' and will be discussed below).[392] Though the analysts write that "we do not foresee any shortage of liquid fuels before 2020", the projections included in the WEO do seem to indicate a peak in conventional oil production around 2010 at 79Mb/d. Demand, however, is projected to increase to 111.5 Mb/d by 2020. The difference is made up by a 'balancing item', what the authors of the report termed 'unidentified unconventional oil', accounting for 19.1 Mb/d of production by 2020 (from nothing in 2010).

The reliance on 'unidentified unconventional' was later described by critics as a 'coded message' from the IEA that peak oil was a real phenomenon to be dealt with in the short-term, but that they could not officially cast aspersion on the ability to meet future demand. The basis for the 'coded message' claim appears to be a meeting that

[391] Ibid., 95–98.

[392] Ibid., 99.

supposedly took place between a UK journalist and environmentalist David Fleming, and then senior economist working on the WEO, Fatih Birol. Following the publication of the WEO, Campbell told Fleming about the true meaning of the term, who then reached out to the IEA for comment. Birol reportedly met with Fleming in at the Cambridge Club in London, "look[ing] over his shoulders to check that nobody could hear what he was about to say."[393] Birol is alleged to have confirmed to Fleming that the unidentified unconventional oil was a code that OPEC was unlikely to fill the gap in supply, and that the IEA was constrained by the interference of the US, "or so remembered Fleming."[394]

Fleming published several pieces recounting his investigation, in which he noted that the 19.1Mb/d was in effect a coded message to obscure the possibility of 'the next oil shock'. The balancing item, he noted, was included "only as a thought experiment: it is what would be required if the [assumed growth rate in demand] were realistic, which it patently is not."[395] Moreover, not only would physical limits to oil production contribute a supply shortage, as reliance on OPEC for supply increased, it seemed likely that this would lead to the cartel exercising market power. As the WEO did not incorporate this probability in their oil price projections, "the logic," Fleming suggested, "leaves the reassuring data in the Outlook in ruins."

Fleming was nevertheless quite understanding of the situation the IEA was in. Given the prominence of the WEO and the history of the IEA as an oil consuming nations' club, the IEA couldn't run the risk of bolstering OPEC's bargaining power by giving away

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[393] Lionel Badal, "How the Global Oil Watchdog Failed Its Mission," *Countercurrents.org*, May 25, 2010, http://www.countercurrents.org/badal250510.htm.

[394] Ibid.

[395] David Fleming, "Decoding a Message about the Market for Oil," *European Environment* 9, no. 4 (July 1999): 127.

information: "the IEA is therefore constrained in what it can say, so it has presented the data in a way that shows what would have to happen to sustain business as usual, knowing full well that someone would, sooner or later, pick up the anomalies and start thinking." Though their analysis may imply something about the future, in other words, the IEA was not capable of explicitly saying so and must only present 'the facts'. Furthermore, Fleming also considered that they were limited in how alarmist they could be about a controversial issue like peak oil, since it was "highly likely" that if they started sounding alarms about oil supply, their projections "would be met with denial, skepticism, and reassurance." "It is for these understandable reasons," he concluded, "that the IEA has presented its message in the form of code. It has provided statistics that signal the gaps and inconsistencies clearly, and that invite readers to draw their own conclusions. In effect, it is fulfilling its mandate to the letter."[396] But the job was not finished:

> "The data published by the IEA can be taken as authoritative and, as this paper has shown, its implications – even if they are in code – are very clear, but there is no doubt that we need a more rigorous analysis than simply the interpretation of the IEA's figures as set out in this paper."[397]

7.3) Interregnum (2000 - 2007)

Subsequent WEOs would not however provide the 'rigorous analysis' (or perhaps, the conclusion) that Fleming and other critics thought should follow the 1998 WEO. The 1999 issue was a special report on subsidies that utilized some of the data from the 1998

[396] Ibid., 129.

[397] Ibid., 133.

version. In 2000, however, the message of the WEO on oil supply changed quite dramatically:

> "The Outlook views the physical world oil-resource base as adequate to meet demand over the projection period. Although oil industries in some countries and regions are maturing, the resource base of the world as a whole is not a constraining factor. One need expect no global 'supply crunch.'"[398]

Indeed, though the 2020 forecast for demand remained similar to the 1998 projection (114.7 Mb/d vs. 111.5Mb/d, respectively), unconventional oil would only comprise 4.2 Mb/d of it (and OPEC would be responsible for ~54% of total demand).[399]

What was the reason for the change in 'outlook'? The report itself notes one factor: its analysis was based in part on the 'more optimistic' resource base estimates of the recently released USGS *World Petroleum Assessment 2000* report.[400] Though this report will be discussed in greater detail below, it suffices to say it was a dramatic departure from the preceding USGS petroleum survey in 1994, increasing the estimate of ultimately recoverable oil resources to 3345 Gb. Of course, some allege that there were still other forces at work. Graham Campbell, reflecting on the shifting supply forecasts between 1998 and 2000 in a 2009 letter to the Guardian newspaper regarding the 'whistleblower' affair discussed below, had this to say:

> "The primary function of the IEA was to supervise OECD strategic stocks, which in turn were perceived to be a certain defence against any excessive demands by OPEC. So the IEA came to see its role as protecting

[398] International Energy Agency, *World Energy Outlook 2000*, 22.

[399] Ibid., 75.

[400] USGS World Energy Assessment Team, *World Petroleum Assessment 2000* (Denver, CO: United States Geological Service, 2000), 94, http://pubs.usgs.gov/dds/dds-060/.

> consumers' interests, and it therefore had every reason to downplay any notion of depletion and finite limits imposed by Nature, because indirectly such would strengthen the hand of OPEC."

Similar allegations are found in a 2008 article on global oil production forecasts, published in the journal *Environment and Planning B: Planning and Design*. In the article, authors Roger Bentley and Godfrey Boyle divide various forecasts into three groups: those that predict a peak before 2020, those that predict 'business as usual', and those that rule out the possibility of a peak on 'theoretical grounds'. The post-1998 WEOs they locate in the second group (the 1998 WEO is in the first). Reflecting on the change between the earlier and later WEOs, they speculate:

> "It may have been the loss of Bourdaire, Wigley, and Miller, or the arrival of Appert (formerly Deputy Direct General of the Institut Francais du Petrol) - with the latter's emphasis on technology - or the political pressure of the US and Canada which caused the transition from the `peaking' view given in the World Energy Outlook 1998. The latter two countries opposed that report's gloomy message on oil nearly as much as they opposed the view that gas production was about to peak in North America – they intervened so that the IEA's report was softened on the latter issue."[401]

Regardless of the reason for shift in perspective, Bentley and Boyle reserved "particular remarks" for the WEO, post-1998. Noting that since its creation in 1974 in the wake of the 1973 oil crisis and with "the remit to help forewarn the world of future shocks", the IEA had done 'many useful things', their supply-side modeling left something to be desired:

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[401] Roger Bentley and Godfrey Boyle, "Global Oil Production: Forecasts and Methodologies," *Environment and Planning B: Planning and Design* 35, no. 4 (2008): 622. It should be noted that though they give these reasons in a voice that suggests evidence, no supporting reference or source is given for the allegation that the US and Canada interfered with the content of the post-1998 WEOs.

> "For many years (and essentially still) the IEA's supply models simply assumed supply as sufficient, and equated this to demand. This view is not surprising, as it reflects the prevailing view among most energy specialists for the last twenty years or so. But by not listening to petroleum geologists with global knowledge the IEA has misled the world with a very inaccurate picture of the energy future"[402]

While the IEA continued its bullish stance on oil in WEOs between 2000 and 2007 the dramatic increase in oil prices, beginning around 2003 and really coming to the fore in 2007/8, was feeding renewed concerns about constraints on supply, and prompting a response from the IEA. Again, the focus was on the OMR rather than the WEO. In August 2004, noting tightening markets and record high prices, the OMR special section, titled "Irrational Exuberance", seemed (again) to be questioning the market's price: "the market is tight, production and infrastructure capacity is less than desired and uncertainties continue to weigh on the market. But, does this justify $45 oil? Current oil prices are a concern and are causing economic damage."[403]

A former (Canadian) Director of the Office of Long-Term Coordination at the IEA, Robert Skinner, took issue with this characterization in a briefing note he authored while then at the Oxford Institute for Energy Studies. The note, titled "Exuberant Irrationality" echoed concerns similar to those made by Simmons half a decade earlier.[404] Noting that though "signaling" in oil markets is very common, though "generally done carelessly and invariable in the signaller's self-interest", the OMR's piece was "a brazen, and clumsy, attempt to influence the price of oil", and a departure from the Agency's tradition of staying neutral as to what prices should or should not be. Moreover, Skinner suggests, the

[402] Ibid., 624.

[403] Robert Skinner, "Exuberant Irrationality," n.d.

[404] Ibid.

intervention may not lead to the outcome he argues the IEA and its members "presumably" had in mind. He speculated candidly that perhaps the rising prices induced IEA members to "punt the ball" to the IEA, asking them to do something to cool markets (the statement implying irrationality can thus be interpreted as the IEA's effort to ease prices).

This break with tradition - implying a position on price and suggesting drawing upon strategic stocks as an ameliorative measure – Skinner argued suggests to the market that the IEA is really "in a panic" about a pending crisis they cannot overtly mention. He saw only two possible outcomes of this (ostensibly unintended) feint: either the market ignores IEA's signal of panic because it is ahead of the IEA (i.e., has already priced in the root problem); or, the signaling drives prices up further based on new information coming from the IEA. Skinner also noted that the IEA's handling of this crisis was coming at an interesting juncture of surging and unforeseen demand outside of the OECD, an evident lack of spare capacity in some OPEC members, and a US election in which high energy prices where certain to play an important role (given the ongoing Iraq war). The US election, he added, will be the first time a Republican administration has sought re-election against a major increase in oil prices: "We have to wonder whether the IEA got a signal from Washington to engage in some exuberance, to irrationally ignore the facts to the contrary and talk down oil prices."[405]

One last criticism that emerged during this period concerned the WEO's projections for renewables, specifically wind power. In January 2007, the Global Wind Energy

[405] Ibid.

Council released a position paper on the 2006 WEO, stating a number of positive and critical points about the report. On the positive side, the GWEC welcomed the fact that wind had been treated for the first time as a separate source in the 2006 WEO, suggesting however that this separation should be maintained throughout the report, and in all tables and graphs that refer to electricity generation and installed capacity. They were also supportive of the IEA's attention to the alternative and 'beyond alternative' policy scenarios in the 2006 issue, and suggested making the beyond alternative analysis an integral part of the World Energy Model to allow the WEO to become "a more visionary tool for policy makers" and to help "drive policy" instead of just reporting on measures already taken, considered or discussed. Even the Reference Scenario showed considerable adjustments to wind projections, increasing from 328 GW to 430 GW by 2030.

Nevertheless, the WEO scenarios all "fall behind the industry's expectations", the GWEC stated. In their own recently released 'Global Wind Energy Outlook 2006', the GWEC had outlined two scenarios: a 'moderate scenario', described as a "very realistic projection… [based on] similar assumptions as the WEOs APS [Alternative Policy Scenario]"; and an 'advanced scenario', which assumed all policy options in favour of renewable energy would be selected and implemented, and "that the political will exists to carry them out". Whereas the IEA 2006 Alternative scenario projected between 9.8-12/5% annual growth in installations to 2030 (leading to 538 GW), the previous ten-year average of 28% suggested to the GWEC that the IEA assumptions are "more than pessimistic." In the GWEC moderate scenario, by contrast, an assumed 17% annual growth rate, reducing to 3% by 2030, leads to over 1,100 GW in the same timeframe.

The GWEC also argued that the WEO projections ran contrary to the political and market responses to climate change and supply security concerns, which, they argued, had shifted towards greater use of and investment in gas and wind energy.

Lastly, though they were encouraged by the inclusion of a chapter on the impact of high energy prices, they nonetheless found the WEO's assumptions on oil and gas prices to be "grossly disparate with market expectations." They noted that the WEO appears to base future fuel prices on the cost of extraction which might make sense in an environment of free competition and 'large geographic distribution' of the resource, but the fact that OPEC runs a cartel and resources are concentrated only "in a few countries" suggests that price reductions are unlikely to occur. This situation is unlikely to change by 2030, they argue, and therefore "an oil price lower in 2030 than it is today does not seem credible."[406]

7.4) The 2008 World Energy Outlook – Opening the Floodgates

The price of oil hit $145 a barrel on June 14, 2008.[407] The choice of focus and much of the preparatory analysis for the 2008 WEO would already have been done by this time. Accordingly, the 2008 issue should be seen in the context of rapidly escalating oil prices, driven by largely underestimated demand in emerging economies, but also perhaps – at least, this may have been a plausible consideration at the time – by supply constraints, possibly brought on by 'peaking' oil production. Indeed, the 2008 WEO stands out as the

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[406] Global Wind Energy Council, "GWEC Position Paper on the IEA World Energy Outlook 2006," January 2007, 6, http://www.gwec.net/uploads/media/GWEC_Position_Paper_on_IEA_WEO_2006.pdf.

[407] U.S. Energy Information Administration, "Spot Prices (Crude Oil in Dollars per Barrel, Product in Dollars per Gallon)," 2013, http://www.eia.gov/dnav/pet/pet_pri_spt_s1_d.htm.

most pessimistic WEO on the future for oil supply[408] since 1998 (and after 2008 as well), showing a dramatic decrease in the long-run oil supply projection. Despite this (or maybe because of it), the 2008 WEO was a turning point of sorts, an escalation of former criticism into heated and public controversy - an opening of the floodgates.

What makes the 2008 WEO unique is that the team had for the first time undertaken an in-depth, field-by-field analysis of over 800 producing oil fields in preparation for the report, using data acquired from IHS (the firm that had purchased Petroconsultants back in the mid-late 1990s). The official purpose of this study was two-fold: to get a better sense of actual decline rates following peak production at the individual field level for a variety of different sizes and types of fields, and also to reassess global petroleum resources for the first time since the 2000 USGS study. The results – an increase in the average decline rate used by the IEA from 3.7% to 6.7% - forced a much lower long-run supply potential projection. Whereas oil supply potential reached its apogee in the 2004 WEO at 121.3 Mb/d in 2030, the 2008 WEO projected only 106.4 Mb/d year in the same year; in short, a 12% reduction from the 'peak' projection.[409] Though the 2008 WEO did not say that oil resources were unable to meet demand in 2030 (indeed, they note in the highlights to the special analysis section, "The world is far from running short of oil"[410]), the projected increase in conventional oil production between 2007 and 2030 was only 5 Mb/d (i.e., from ~70Mb/d to 75Mb/d), the bulk of the difference being made up by natural gas liquids (increasing to 19.8Mb/d by 2030, up from 10.5Mb/d in 2007) and

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[408] Based on projected global supply in the final year of the projection period.

[409] International Energy Agency, *World Energy Outlook 2004* (Paris: OECD/IEA, 2004); International Energy Agency, *World Energy Outlook 2008* (Paris: OECD/IEA, 2008), 200.

[410] International Energy Agency, *World Energy Outlook 2008*, 197.

unconventional resources (from 1.6 to 8.8Mb/d over the projection period). Overall, oil would not peak before 2030, though non-OPEC conventional resources were seen to have peaked in 2007.

Perhaps unsurprisingly, the shift in outlook prompted some not-so-positive feedback. In December 2008, a month after the publication of the WEO, Guardian journalist George Monbiot took Chief Economist Fatih Birol to task for the about-face in supply projections in an interview he conducted with Birol in Paris.[411] The article Monbiot wrote afterwards begins by noting that it is the responsibility of governments to plan for disasters, including the possibility of peak oil. Monbiot had submitted a freedom of information request for the contingency plans the UK government had for peaking oil production, but received the response: "The government does not feel the need to hold contingency plans specifically for the eventuality of crude-oil supplies peaking between now and 2020."[412] Monbiot attributes this to the confidence consistently expressed by the IEA in the WEO pre-2008. But in 2008, he suggests, the IEA "radically changed its assessment." Whereas previous WEOs dismissed concerns about peak oil, the latest issue seemed to softly support, if not confirm, some of the worries these critics had been making for the past 10 years.[413]

The main target of Monbiot's criticism was the increase in decline rates, which was driving an aggregate decline for all currently producing fields of approximately 50% by 2030. Given the discrepancy between early versions and the 2008 parameter setting

[411] Fatih Birol, BBC Hardalk, Podcast, January 12, 2013.

[412] Birol, When will the oil run out?.

[413] The Executive Summary of WEOs between 2000 and 2007 confirm this, as well as the sections on Oil supply, all of which typically "find no evidence" for a possible supply crunch within the projection period.

Monbiot asked what the previous studies where based on, to which Birol replied, "it was mainly an assumption, a global assumption about the world's oil fields."[414] Monbiot alleged that it was irresponsible for the IEA to publish a decline rate absent strong research to justify the value they had chosen, to which Birol replied, "No, our previous decline assumptions have always mentioned that these are assumptions to the best of our knowledge." When pressed on the shift in position, Birol responded the IEA had never claimed that we had hundreds of years of oil left, that someday we will run out: "Our line that we are on an unsustainable energy path has not changed," to which Monbiot retorted:

> "This, of course, is face-saving nonsense. There is a vast difference between a decline rate of 3.7% and 6.7%. There is an even bigger difference between suggesting that the world is following an unsustainable energy path…and revealing that conventional oil supplies are likely to plateau around 2020. If this is what the IEA meant in the past, it wasn't expressing itself very clearly."[415]

At the same time, a group called Energy Watch Group (tagline: "Energy policy needs objective information; Objective information needs independent financing") released an energy future report on wind power that was highly critical of both the 2008 WEO and past editions.[416] The study was authored by Dr. Rudolf Rechsteiner, a Swiss MP at the time and member of the Green Party. Noting the recent price volatility in oil, this report also strongly advocates for renewables instead of peaking oil and gas resources. The essence of Rechsteiner's criticism echoed that made by the GWEC earlier: that the WEO had persistently underestimated growth in wind power over the past decade.

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414 Birol, When will the oil run out?.

415 Ibid.

416 Rechsteiner, *Wind Power in Context: A Clean Revolution in the Energy Sector*.

Rechsteiner criticized IEA forecasts for wind and other energy for several specific reasons: they rarely if ever give reasons for why wind power forecasts are so conservative or stagnating; they don't give specific sources for cost numbers for wind (which, Rechsteiner suggested in his report, are nearly half of what the IEA assumes: $0.055-$0.063 in the US (including production tax credit) vs. $0.10 for onshore wind in the 2008 WEO);[417] learning curves for wind are not specified; it's not clear if the IEA considers the cost of wind and other renewables once the initial capital investment has been written off; and cheaper coal and nuclear forecasts could be based on older plant performance than wind – an unfair comparison. If the reason for slow growth is doubts about commercial viability, lack of grid expansion, or a reduction in manufacturing, he argued, then why does the IEA not act to resolve these bottlenecks and advance energy security overall? In short, "the forecasts for wind power worldwide clearly missed the wind *reality*".[418] The IEA, even its senior officials, "regularly demonstrate a behaviour of neglect or ignorance toward renewable energy".[419]

The implication, according to Rechsteiner, is that "the IEA Outlook remains attached to oil, gas, coal and nuclear." The IEA "has been producing misleading data on renewables for many years," he wrote, while forecasting relatively cheap oil prices, and using sneaky tricks to play up the potential of nuclear (basing projections on the best historical year for capacity additions, while using averages for all other technologies). While the 2008 Outlook changed its oil price forecast, noting 'the risk of a supply crunch'

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[417] Ibid., 92. Rechsteiner derives his numbers from Wiser, R., and M. Bolinger. Annual Report on US Wind Power Installation, Cost, and Performance Trends: 2007 (Revised). National Renewable Energy Laboratory (NREL), Golden, CO., 2008. http://www.osti.gov/scitech/biblio/929587.

[418] Ibid., 106.

[419] Ibid., 110.

for oil after 2010 could be 'driving up oil prices – possibly to new record high', Rechsteiner asks why they failed to give a structurally revised perspective of affordable renewables in light of rising oil prices. Instead, they continue to have faith in nuclear (a 'technology in decline') and 'great expectations' for CCS, a technology with a 'highly uncertain future', beyond the certainty that it will be expensive. He goes on:

> "One has to ask if the ignorance and contempt of IEA toward wind power and renewables in general is done with a structure of intent. Renewables tend to look ever expensive and close to irrelevant while oil, coal and nuclear look irreplaceable in the IEA World Energy Outlook reference scenarios. Is it a message that big companies and US presidents need to fight a war for oil, subsidies and profits, disguised as a 'war on terrorism'"?[420]

The allegation that poor IEA forecasts for wind were done out of deliberate intent rather than neglect, was reiterated by the founder of Energy Watch Group, German MP Hans-Josef Fell. In a press release about the report Fell writes, "The permanent overestimation of the availability of conventional energies and the underestimation of the renewable energy possibilities is a deliberate method to hedge ever increasing profits for the conventional energy sector."[421] Fell continued: "the disregard of renewable energy possibilities, despite – meanwhile – vast positive experiences, is at the origin of a lack of political actions for renewable energies by politicians. The classic example is the recently settled target of 20 per cent renewable energies until 2020 by the European Union. So far the growth patterns lead us to expect a significantly higher share until 2020, even without increased political support."

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[420] Ibid., 11–12.

[421] Hans-Josef Fell, "Statement of Hans-Josef Fell, Press Conference for the Energy Watch Group" (Energy Watch Group, September 1, 2009), http://www.energywatchgroup.org/fileadmin/global/pdf/2009-01-09_Fell_Statement.pdf.

The implications of conservative projections for wind could have dire implications for the industry, according to Stefan Gsänger, President of the World Wind Energy Association (WWEA). Responding to the WEO 2008, Gsänger noted:

> "Although the IEA report calls for a global energy revolution, it still underestimates the contribution that renewable energy can deliver. We regret that the IEA still does not fully realize the actual dynamics and economics of renewable energy. The new World Energy Outlook may, as a kind of self-fulfilling prophecy, mislead policy makers to make poor decisions by not putting enough focus on renewable energy and thus slowing down the renewable energy deployment rates. Governments around the world should understand that wind and other renewable energy technologies can be implemented immediately, providing practically infinite energy at low cost, without doing harm to climate and the environment and even creating additional jobs in a key industry."[422]

Rechsteiner reiterated this concern in an interview with BusinessGreen, suggesting that the misleading data produced by the IEA has had the consequence that the necessary infrastructure to facilitate greater wind development is missing.[423]

Concerns about how the WEO treated ultimately recoverable petroleum resources were also being raised. In August 2009, the UK Energy Research Centre released a comprehensive study of peak oil and the policy implications thereof. The study, conducted by a research team headed by Steve Sorrell and including both Bentley and Boyle (as well as several others), was comprised of seven technical reports, one of which compared global forecasts for oil production as well as global estimates of ultimately

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[422] Stefan Gsänger, "WWEA Press Release: International Energy Agency Still Underestimates Renewable Energy" (World Wind Energy Association, November 13, 2008), http://preneal.ca/media/2008-11-13-wwea-press-release-international-energy-agency-still-underestimates-renewable-energy.pdf.

[423] James Murray, "IEA Accused of 'Deliberately' Undermining Global Renewables Industry," *businessGreen*, January 12, 2009, http://www.businessgreen.com/bg/news/1806340/iea-accused-deliberately-undermining-global-renewables-industry.

recoverable oil resources (URR). In their discussion of the 2008 World Energy Outlook on the latter item, they note several peculiarities. For one, the stated estimate for URR is higher than that contained in the USGS 2000 report (3577 Gb vs. 3345). This on its own is not too perplexing, but the IEA also included a cost-curve table for oil supply that Sorrell et al., argues implies a conventional URR of 4276Gb – "one of the largest estimates seen to date" – but the IEA does not explicitly say as much (see Figure 11 below).[424] The higher implied estimate appears to include 'conventional oil produced by unconventional means', and though the precise definition of this category is not given, Sorrell et al., believe it to refer to enhanced oil recovery. Moreover, concerning projected production rates, Sorrell et al., note that the IEA's numbers imply aggregate depletion rates of 10% or more, numbers "which far [exceed] the historical experience of any oil-producing region."[425]If the IEA were to use more "realistic" depletion rates, they suggest, this would imply an earlier peak date or higher rates of discovery and reserve growth than given in the WEO.

Several of the points raised by the authors of the UKERC study stem from a then in-press article written by Professors' Kjell Aleklett and Mikael Hook of Uppsala University in Sweden (and several other authors), in which the authors conduct a very thorough investigation of the oil supply projections in the 2008 WEO.[426] As Alekett et al., note, IEA oil demand projections have always been guided by the connection between economic growth and increasing oil consumption, and that the IEA assumes a continued

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[424] Steve Sorrell et al., *Global Oil Depletion: An Assessment of the Evidence for a near-Term Peak in Global Oil Production* (Sussex: UK Energy Research Centre, 2009), 132.

[425] Ibid., 160–161.

[426] Aleklett et al., "The Peak of the Oil Age - Analyzing the World Oil Production Reference Scenario in World Energy Outlook 2008."

downward trend in oil intensity. However, they argue, "the key question that must be asked of the future demand scenario is whether or not 'business as usual' (BAU) is a realistic assumption, or whether peak oil (i.e., the arrival of a global maximum oil production) will undermine this presumptive analysis."[427] In other words, the authors question whether there will actually be enough oil to satisfy the demand which the IEA forecasts.

Oil production in the 2008 Outlook was divided amongst 6 segments: four for conventional crude oil (currently producing fields; fields yet to be developed, or 'fallow fields'; fields yet to be found; and additional EOR; and two others (unconventional oil and natural gas liquids). Alektett et al., investigate the projections for each segment by deriving IEA figures from graphs contained in the report and comparing them with historical observations, particularly for the *depletion rate*[428] that has been historically obtainable: "Our approach here is to compare the depletion rate behavior in the IEA outlooks with historical experience and see if they agree with realistic values." For currently producing conventional fields, they found no problem with the post-peak production weighted decline rates identified by the IEA. For the other categories, however, they have some issues. Using the North Sea as a benchmark (which they note has never exceeded a 7% depletion rate), they find the derived figures for depletion in the 2008 WEO for yet to be developed field of nearly 16% for OPEC and non-OPEC onshore, and non-OPEC offshore. They write, "The IEA is expecting the oil to be

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427 Ibid., 1399.

428 Note that this differs from the post-peak decline rate, which captures the rate at which remaining resources dwindle following a production peak. Depletion rate, on the other hand, refers to the rate at which resources can be produced during the lifetime of the field (i.e., the production rate) but expressed as a ratio against remaining recoverable resources in the field.

extracted at a pace never previously seen without any justification for this assumption." Similarly, though they do not take issue with the size of the resources remaining to be discovered that the IEA projects, they do argue that the 2030 contribution to supply from these resources of 19Mb/d is based on an "unrealistically" high depletion rate of nearly 10%.[429]

In the unconventional categories, they take issue with some of the assumptions the IEA has around oil sands, heavy oils, and shales, but do not drastically undercut the IEA's 2030 projections for these categories. On natural gas liquids, however, they find surprisingly that the IEA, unlike the EIA, does not measure the contribution of NGLs in oil-equivalent barrels, but rather just in a strict, volumetric equivalency. Because a barrel of NGL has only ~70% the energy as a barrel of oil, they argue, the NGLs projection must be decreased by such a ratio. Furthermore, they take issue with the IEA's original projection for NGLs as well: though the IEA states that they assume the proportion of NGL in gas production remains the same (a correlation of ~0.99) over the projection period, they see approximately a 100% increase in NGLs and only a 47% increase in dry gas production. In place of the IEA's projection of 19.1Mb/d by 2030, Aleklett et al., project only 11Mb/d (oil equivalent).[430] Therefore, based on what the authors deem their more 'reasonable' assumptions about depletion and production, they find a more 'realistic' forecast for oil production of 78.5Mb/d in 2030, versus the IEA's 101.5, when adding up their revisions in all the above categories. They argue the data suggests that in fact global oil production was peaking at the time they wrote the article (~2008). The

[429] Aleklett et al., "The Peak of the Oil Age - Analyzing the World Oil Production Reference Scenario in World Energy Outlook 2008," 1407.

[430] Ibid., 1411.

'business-as-usual' case, which assumes a strict relationship between GDP growth and oil consumption, is no longer tenable, they suggest, and "if this is the case, then the world has reached the 'Peak of the Oil Age.'"[431]

A last critique of the 2008 WEO that bears worth mentioning is the *Heads in the Sand: Governments Ignore the Oil Supply Crunch and Threaten the Climate* report, produced by the NGO Global Witness and released in late 2009, shortly before the publication of the 2009 WEO in November. Though the report was primarily intended as a critique of and a suggestion for national energy policy makers regarding the issue of the peak oil, much of the report is taken up with discussion of the WEO and what the authors allege is a history of overconfidence and misdirection regarding future oil supply. This history is a problem, they argue, because the misinformation provided by the IEA had delayed response to climate crisis and encouraged climate negotiations to focus on 'pragmatic' targets, instead of working to redesign energy systems, a result they suggest that stems from a focus on 'business-as-usual' scenarios.[432]

The first half of the report discusses peak oil and the possible implications thereof, pointing to the price shock between 2003 and 2008 as an indication of growing supply constraints. Chapter 3 takes the publication of the 2008 WEO as evidence of official awareness of the reality of the problem. That being said, and though they do commend the IEA on the revisions vis-à-vis past outlooks, they nevertheless take issue with the 2008 projections. Finding the downward revision of remaining yet-to-find resources encouraging, echoing Aleklett et al., they argue that, "although the Agency appears to

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431 Ibid., 1412.

432 Global Witness (Organization), *Heads in the Sand: Governments Ignore the Oil Supply Crunch and Threaten the Climate.* (Global Witness, 2009), 4, 35.

have finally provided a more realistic estimate of future discoveries, unfortunately, it now appears to be projecting unrealistic estimates of potential flow rates from these unknown and yet-to-discovered fields."[433] Furthermore, regarding the IEA's assumptions regarding the potential for EOR, they note that this also assumes a dramatic increase in carbon capture and storage implementation in order to provide the necessary CO2 for injection. CCS, however, is an uncertain technology with high costs, they argue, which raises questions about the overall energy return on investment for unconventional resources and EOR. Overall, they state that despite some promising revisions, "the Agency continues to retain an overly-optimistic, and therefore misleading, view about potential future oil production – predicated on massive and sustained investment" that may not be as forth coming as the Agency projects.

Chapter 4 of the *Heads in the Sand* study looks at the record of WEOs between 2002 and 2007 to drive home their argument that the IEA had consistently painted a picture of resource abundance, but lacked strong justifications for their perspective, and with deleterious consequences for action on climate change. [434] Part of the problem, they allege, has been the IEA's initial reliance on the USGS 2000 estimates of ultimately recoverable resources; estimates they note that have been criticized as optimistic and based on unrealistic assumptions regarding reserve growth and yet-to-find resources. While this may have been excusable in the period shortly after the publication of the study, such reliance could not be sustained after the 2005 follow-up study done by the USGS itself, which found that the pace of discovery was far below what it should have

[433] Ibid., 40.

[434] Ibid., 47.

been based on their analysis (reserve growth, on the other hand, appeared to be proceeding in check). Moreover, they also take issue with the fact that the IEA used the mean estimates in the USGS report, rather than the estimates with the highest probability of being reliable (i.e., the P95 estimates, having a 95% chance of being met).[435] The poor performance of discovery implies that to meet the longer-term estimate of yet-to-find resources, the rate of discovery needs to increase in the years remaining in the initial USGS projection period. Thus the authors note, even after the IEA's downward revision of yet-to-find resources from 939Gb to 880Gb between 2000 and 2005, a revision the IEA stated themselves was based on the most recent data regarding discoveries and production, the lower figure would still require an annual discovery rate of ~46Gb, a rate not seen since the mid-1960s (see Figure 9 below). "Despite this absurd suggestion," they conclude, "even though the IEA knew by 2005 that the actual rate of discovery amounted to a mere 18% of what would have been required, it continued to present its downward revision of the USGS 2000 mean estimate as a likely outcome in 2005 and 2006."[436]

It should be noted that the IEA, specifically Birol, responded to some of the allegations made above, notably Rechsteiner's report. In an interview with BusinessGreen, Birol argued there was a 'logical explanation' for the underestimation in past forecasts: namely, the fact that the reference scenario shows what would happen if no new policy were implemented. Therefore, Birol explained, "If in following years new policies are put in place to promote renewables this would definitely mean that our

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[435] Ibid., 48. This may have been a poor recommendation on their part, based on the widely-held view that 2P numbers are better indicators of remaining resources. This will be discussed in more detail below.

[436] Ibid., 49.

reference scenario projections do not hold anymore." The intention of low growth projections are not to discourage government from supporting the sector, but rather to indicate to them to consequences of not taking greater action to support renewables. On the accusation of bias towards fossil fuels and nuclear, Birol argued:

> "*Anyone looking at our latest World Energy Outlook report from an unbiased position will see that the reference scenario points to a six degree increase in average temperatures and increased insecurity that would make life very difficult…We clearly state that that should not be done and we set out two scenarios to curb emissions that call for more energy efficiency, more renewables and an increase in low carbon energy sources such as CCS and nuclear"*

Past conventional oil discoveries v projections of future discovery rate (Gb)

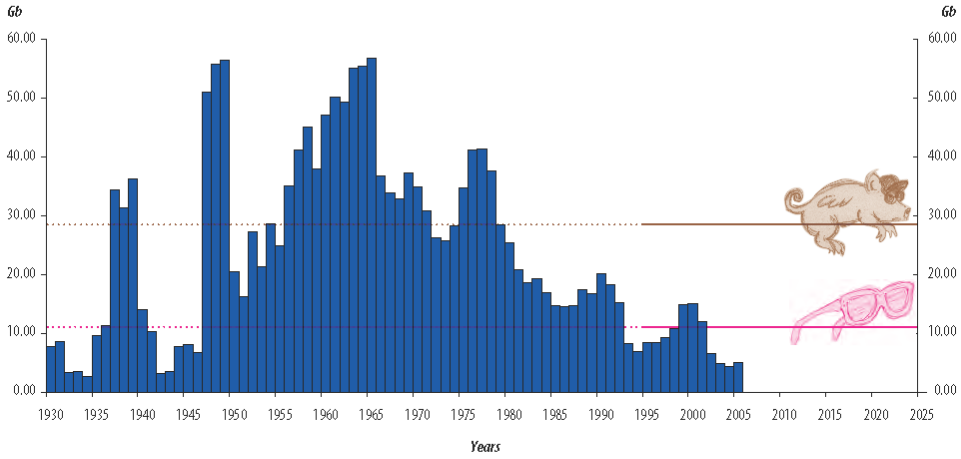

Figure 5: **Past actual discoveries (blue) against two projections (see bullets) for future discoveries to 2025.**[152,153]

Figure 5 is a graph of past discoveries (**blue**) plotted against two projections for future discoveries:

- The **flying pig** illustrates the volume that would need to have been discovered annually (29.3bn barrels) over the 30 year period to 2025 to realise the IEA's 2006 projection for future world crude oil discoveries. This projection included NGLs (880bn barrels).*
- **The rose-tinted glasses** show the volume that would need to be discovered annually (11.13bn barrels) to realise the USGS 95% confidence estimate for world conventional crude oil discoveries. This figure excludes both a projection of conventional production from the United States, and world NGLs. Despite excluding these projections, it is clear from the history of past declining discoveries (**blue**), that to sustain the discovery of even this volume of oil over the projection period would be an enormous achievement.[154]

Figure 9) IEA Implied Required Discovery Rates Against Backdated 2P Discovery Data

7.5) The Whistleblower Affair

A last and perhaps larger controversy was emerging at the same time as the Global Witness report was released. At some point in 2008, an undergraduate student in politics at Exeter University, Lionel Badal, began work on his undergraduate thesis on peak oil. He managed to secure an interview with an unidentified employee working at the IEA on the WEO. When asked about his opinion on peak oil, the IEA official reportedly said he was very worried about peak oil, which led Lionel to believe there was "a problem…as publicly the IEA did not say this type of thing."[437]

Subsequently, Badal arranged a meeting between the IEA official and a French MP Corrine Lepage. At the meeting, the official reportedly said that reports were modified under pressure in the IEA from the US not to make too pessimistic predictions. Though the official agreed to write a briefing note for M. Lepage, Badal encouraged the official to go on the public record anonymously. After receiving no interest from either the Independent or the Economist, Badal managed to contact Ashley Seager at the Guardian, after having read his article about the Global Witness report mentioned earlier. Seager forwarded the matter to the Guardian's energy editor, Terry Macalister, just in time for the anticipated release of the WEO 2009. On November 9, Macalister published his article: "Key oil figures were distorted by US pressure, says whistleblower."[438]

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[437] Badal, "How the Global Oil Watchdog Failed Its Mission."

[438] Terry Macalister, "Key Oil Figures Were Distorted by US Pressure, Says Whistleblower," *The Guardian*, November 9, 2009, http://www.guardian.co.uk/environment/2009/nov/09/peak-oil-international-energy-agency.

The IEA 'peak oil whistleblower' was big news and quite embarrassing for the WEO team, which was at the same time announcing the latest version of the report.[439] The article quotes the whistleblower on declining projections for oil supply:

> "The IEA in 2005 was predicting oil supplies could rise as high as 120m barrels a day by 2030 although it was forced to reduce this gradually to 116m and then 105m last year. The 120m figure always was nonsense but even today's number is much higher than can be justified and the IEA knows this"[440]

Not only did the whistleblower appear to confirm the concerns put forward by Sorrell et al., Aleklett et al., and Global Witness (i.e., that even the 2008 numbers were too high), but also he indicated that the reluctance of the IEA to report this was due not to disbelief within the agency, but to political interference from the US:

> "Many inside the organization believe that maintaining oil supplies at even 90m to 95m barrels a day would be impossible but there are fears that panic could spread on the financial markets if the figures were brought down further. And the Americans fear the end of oil supremacy because it would threaten their power over access to oil resources"[441]

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[439] Alex Lawler, "IEA Whistleblower Says Peak Oil Nearing: Report," *Reuters*, November 9, 2009, http://www.reuters.com/article/2009/11/09/us-iea-oil-idUSTRE5A85JT20091109; CBC News, "Looming Oil Crunch Played down: IEA Whistleblower - International Energy Agency Accused of Bowing to U.S. Pressure," *CBC News*, November 9, 2009, http://www.cbc.ca/news/business/story/2009/11/10/iea-whistleblower-accuses-agency-of-downplaying-oil-shortage.html; Hillary Whiteman, "Energy Body Rejects Whistleblower Allegations of Oil Cover up," *CNN*, November 11, 2011, http://edition.cnn.com/2009/BUSINESS/11/10/france.iea.oil.supplies/; Jeremy Hsu, "IEA Whistleblower Claims Agency Has Downplayed Looming Oil Shortage," *Popular Science*, November 11, 2009, http://www.popsci.com/science/article/2009-11/whistleblower-says-energy-watchdog-has-downplayed-looming-oil-shortage; Kate Mackenzie, "Did the US Pressure the IEA over Oil Supply Forecasts?," *Financial Times*, November 10, 2009, http://blogs.ft.com/energy-source/2009/11/10/did-the-us-pressure-the-iea-over-oil-supply-forecasts/.

[440] Macalister, "Key Oil Figures Were Distorted by US Pressure, Says Whistleblower."

[441] Ibid.

These claims were also backed up by a second whistleblower, this time a former IEA official who also wished to remain nameless. The second whistleblower stated that it was a rule of sorts not to anger the US, and agreed that the world had already reached a period of peak oil.

The issue was sufficiently controversial to prompt a response from the Agency a day after the allegations became known. In a press conference on November 10th, both the Executive Director of the IEA at the time, Nobua Tanaka and Birol responded to questions about the whistleblower affair. Tanaka stated:

> "We are a very neutral organisation and we are very proud of the analysis in these WEOs, which are published by my authority, and we have been always saying that investment is necessary (or) we cannot achieve the balance of demand and supply. We need 45m more barrels per day of capacity for 2030. We have always been warning and warning, and this year we are warning on gas."[442]

When asked about the affair, Birol had this to say:

> "I was both surprised and disappointed. I was up to now criticised as being too alarmist. We finished last year's [WEO] as a wake-up call to governments. One should read very carefully [the report] before making such general judgments.
>
> About 200 international experts review our work… we have received very good feedback.
>
> Our decline rate numbers are the highest among our peers."[443]

[442] Mackenzie, "Did the US Pressure the IEA over Oil Supply Forecasts?".

[443] Ibid.

In an interview with CNN, deputy executive director Richard Jones argued that the IEA was the only organization claiming that oil and gas were running out 'in an authoritative manner', though he added that they do not see it happening as quickly as some of the peak oil theorists. Jones also suggested that the IEA is generally seen as being "more pessimistic than we should be by the (oil) industry." When asked about the allegation that the Agency downplayed supply concerns at the behest of US interests, Jones noted, "I don't see why that would be in the U.S. interest. I don't see the logical chain of that allegation."[444]

7.6) Postscript – Three Allegations

In the years since, some critics have continued to issue concerns about the projections found in later WEOs. Following the release of the 2010 WEO, Aleklett reiterated his criticisms of the report, suggesting that the 2010 issue was "a cry for help."[445] In 2011, a former IEA official named Olivier Rech, contrary to the official IEA perspective, suggested in an interview with Le Monde that conventional oil would decline shortly after 2015.[446] Simmons' concerns about Saudi production capacity were renewed following the Wikileaks publication of the US embassy cables, in which several cables were uncovered from the Riyadh embassy, noting that a former Saudi Aramco VP was arguing the country would be unable to meet its stated targets for 2012.[447] Some have

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[444] Hillary Whiteman, "Energy Body Rejects Whistleblower Allegations of Oil Cover up."

[445] K. Aleklett, "World Energy Outlook 2010 Is a Cry for Help" (countercurrents.org, November 11, 2010), http://www.countercurrents.org/aleklett111110.htm.

[446] Matthieu Auzanneau, "Oil Will Decline Shortly after 2015, Says Former Oil Expert of International Energy Agency," *Oil Man - Le Monde*, December 30, 2011, http://petrole.blog.lemonde.fr/2011/12/30/oi-will-decline-2015-according-to-a-former-expert-of-the-international-energy-agency/.

[447] John Vidal, "WikiLeaks Cables: Saudi Arabia Cannot Pump Enough Oil to Keep a Lid on Prices," *The Guardian*, February 8, 2011, http://www.theguardian.com/business/2011/feb/08/saudi-oil-reserves-

continued to question the IEA's political neutrality and overall objectivity.[448] More recently, the statements in the 2012 WEO, to the effect that the US would surpass Saudi Arabia as the world's largest oil producer by 2020, have sparked some heated debate as well. [449]

Though criticism of the WEO may continue, the material reviewed above is sufficient to identify three key themes of the controversy that enveloped the report between 1998 and 2010. For one, the allegations made by Rechsteiner, the findings of Aleklett et al., the analysis by GlobalWitness and the research of Badal all suggest that the WEO possesses a *bias* toward fossil fuels, particularly oil, and against renewable energy. This allegation distinguishes the controversy from mere criticism of the IEA's oil supply projections for being too high or its wind projections for being too low. Analysts take issue with other analyst's projections, but the allegation of bias implies that something more than poor analysis is at work. Indeed, the implication of this allegation is to expand

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overstated-wikileaks; Embassy Riyadh, *Former Aramco Insider Speculates Saudis Will Miss 12.5 Mbd In 2009*, US Embassy Cables, December 10, 2007; Embassy Riyadh, *Is This Oil Market Broken? Views from Riyadh*, US Embassy Cables (Riyadh, Saudi Arabia, June 3, 2008), http://wikileaks.org/cable/2008/06/08RIYADH868.html.

[448] Chris Nelder, "The 2009 IEA Oil Report and World Energy Outlook: Is the IEA World Energy Outlook Politically Distorted?," *Energy & Capital: Practical Investment Analysis in the New Energy Economy*, November 13, 2009, http://www.energyandcapital.com/articles/IEA-oil-report/999; Chris Nelder, "Is the IEA World Energy Outlook Politically Distorted? Panic and Penitence: The Evolution of the IEA" (getReallist), accessed March 20, 2012, http://www.getreallist.com/is-the-iea-world-energy-outlook-politically-distorted.html; Gail the Actuary (Gail Tverberg), "Objectivity of the International Energy Agency," *The Oil Drum*, November 10, 2010, http://www.theoildrum.com/node/7106.

[449] Elisabeth Rosenthal, "Report Sees U.S. as Top Oil Producer, Overtaking Saudi Arabia, in 5 Years," *The New York Times*, November 12, 2012, sec. Business Day / Energy & Environment, http://www.nytimes.com/2012/11/13/business/energy-environment/report-sees-us-as-top-oil-producer-in-5-years.html; Gail Tverberg, "IEA Oil Forecast Unrealistically High; Misses Diminishing Returns," *Our Finite World*, accessed September 18, 2013, http://ourfiniteworld.com/2012/11/13/iea-oil-forecast-unrealistically-high-misses-diminishing-returns/; Chris Nelder, "U.S. Will Not Surpass Saudi Arabia's Oil Production by 2020," *Smartplanet*, November 8, 2012, http://www.smartplanet.com/blog/take/us-will-not-surpass-saudi-arabias-oil-production-by-2020/268.

upon the criticism of optimistic oil supply and pessimistic wind forecasts to suggest the IEA possesses a bias towards the perpetuation of the status quo in general.

A second theme of controversy is perhaps best encapsulated by the allegations of the whistleblower, but is also evident in Simmons' criticism of the OMR or the 'coded message' of the 1998 WEO. This theme alleges the WEO has been *corrupted* by political interests, in particular those of the US. As noted in Chapter 6, the structure and governance of the IEA does seem to bolster the position of the US within the organization (e.g., the voting structure, the 'Kissinger Post'). However, the internal balance between the 'political' and 'administrative/analytical' sides of the Agency suggests that other member-state interests may also shape the production of the WEO. Moreover, the international context in which the IEA operates, including its institutional legacy as a direct response to OPEC, suggests that these larger politics may also constrain the WEO's ability to 'speak truth to power.'

A last theme, put forcefully by Monbiot, but stemming as well from the other two allegations, is that the WEO has been *irresponsible* in its duties as a 'global watchdog' for energy. Monbiot's specific complaint was that the IEA had irresponsibly published projections for oil supply based on a depletion rate that was not based on any empirical observation, without drawing sufficient attention to the tenuous quality of their analysis. The consequence has thus been to 'flood the market' with poor quality information, hindering the ability of governments worldwide to make the necessary contingency plans for the impending peak in global oil production. As a result, this allegation can also be expanded to suggest the WEO is irresponsible for forestalling or preventing the transition to a more sustainable energy future.

Based on the framework presented in Chapter 5, we can make some preliminary observations about the politics of these three allegations that comprise the larger controversy surrounding the WEO. For one, the allegation of corruption clearly evokes a politics that is extrinsic to the WEO, perhaps the result of individual actors intervening in the report. This suggests as well that the settling of the questions of realism in the WEO's observations is done by default, or determined by the condition or context in which it finds itself. It is also perhaps the most 'politically charged' allegation, implying that the contrast between extrinsic/intrinsic politics is stark. On the other hand, the allegations of bias and irresponsibility appear internal to the report, represented or expressed in such specific components as decline rates or conventional crude production. Here the settling of the questions of realism could be expected to be more individual, intentional. These allegations also tend toward political intensity, but in proportion to the extent to which the bias or irresponsibility was conscious and intended.

In the following chapter, I will explore the relationship between politics and this controversy by looking at the perspectives of the players involved, asking them both to respond to the allegations of bias, corruption and irresponsibility and to provide their perspective on the meaning, source or location of politics in relation to them. As indicated in Chapter 1, this step is integral to acquiring the internal perspective on the relationship between politics and the controversy surrounding the WEO that will serve to both test and potentially expand upon the theoretical framework constructed above.

Chapter 8) Bias, Corruption and Irresponsibility

The WEO has been accused of bias, corruption and irresponsibility: bias in its preference for the status quo, represented in its optimistic forecasts for oil and pessimistic forecasts for wind; corrupted by the interests of the member-states of the IEA, in particular the US; irresponsible in publishing poor information based on tenuous assumptions. What do these three themes imply? How might those more sympathetic to the WEO respond to them? What, if any, is the connection between politics and bias, corruption and irresponsibility?

In this chapter, I will review the interpretation of these issues by key participants, based on their responses to the allegations in the interviews conducted with them. The aim is to expand on the allegations in hopes of attaining a more nuanced appreciation of how both 'sides' perceive the controversy, to see what basis there is for these claims, and explore how people involved in the dispute (or closely connected to it) perceive these issues to be political.

The following discussion will be based primarily on the responses given by interview participants. However, following the hermeneutic methodological approach described in Chapter 1, these responses have been organized and interpreted by the author in order to identify the important characteristics of the three themes in determining the extent to which they can be considered political.

8.1) Bias

Bias, according to Oxford English Dictionary, is defined as "inclination or prejudice for or against one person or group, especially in a way considered to be unfair."[450] The unfairness of bias implies that, though there may be valid grounds to judge a thing, person or group in a particular way, the reasons used by a biased person are erroneous or not germane to the matter at hand. Thus, a 'biased' person may be predisposed to judge other's culpability for a crime based on their race or gender, rather than on the facts of the case. Bias might also incline someone to take a favourable or unfavourable attitude towards something novel because of previous - though unconnected - experiences with something they perceive to be similar.[451] Though this definition does cover some of the broader points about bias, the manner in which bias is used in reference to *observing the future* (viz., in allegations against the WEO) is a bit more complex.

The clearest manifestation of bias is a persistent optimism or pessimism regarding the future for a given energy technology or source. It is this form of bias that is most explicitly alleged in the criticisms above – namely, that the IEA is optimistic about the potential for future oil supply and pessimistic about renewables. This alone would probably not be a cause for alarm, but an allegation of bias also implies that one's optimism or pessimism is somehow unjustified. The basis for the assessment of whether an outlook is justified in its optimism or pessimism is typically the projections of the observer's peers. Several interview participants made the point that one could not interpret the WEO as unduly or unjustifiably optimistic without comparing it to its peers, among which it is not always "the most optimistic" on all dimensions of the oil supply

[450] ""Bias," *Oxford English Dictionary* (Oxford University Press), accessed February 8, 2014, http://www.oxforddictionaries.com/definition/english/bias.

[451] More a more thorough exploration of ingroup bias from a social psychological standpoint, see Clifton Wilcox, *Bias: The Unconscious Deceiver* (Xlibris Corporation, 2011).

question (the 'peer' group for the WEO was generally restricted to the US DOE's Energy Information Administration's *Annual Energy Outlook,* and sometimes including BP's 'Energy Outlook', produced as part of that company's annual *Statistical Review of World Energy*). On the question of pessimism regarding renewables, several observers – one of whom was selected because of their past criticism of the WEO – argued that in fact some found the latest WEOs far too optimistic about their potential.[452]

Bias becomes more problematic when it is perceived as being relational, in addition to being relative - that is, when it is expressed as a co-incident tendency towards optimism for one thing *and* pessimism towards something that is perceived as its antagonist or opposite. For Dr. Rechsteiner, the former Swiss MP and author of the Energy Watch Group report discussed earlier, the WEO's record on oil, nuclear and wind should not be seen as separate, individual biases – rather, they are all part of a general, "systemic" fault to hide the weaknesses of fossil fuels and forestall the emergence of more sustainable alternatives.[453] The IEA, Rechsteiner argued, prevents renewables from being a success story by "talking [them] small all the time", while at the same time underestimating both the impending shortage and cost of additional fossil fuels. This, Rechsteiner described as a "double game." The danger, for Rechsteiner, is that the IEA succeeds in creating a self-fulfilling prophecy, in which their bias for fossil fuels/nuclear and against renewables directs investment only into the status quo technologies, so that "nothing else will grow."[454] Bias in this context is more problematic as it is perceived as

[452] Skinner, Interview; Caruso, Interview; Gail Tverberg, Interview, interview by James Gaede, Phone, April 15, 2013.

[453] Rudolf Rechsteiner, Interview, interview by James Gaede, Phone, February 20, 2013.

[454] Ibid.

taking sides, more than just a tendency to optimism or pessimism for specific technologies – instead, such predilections are seen as emanating from a prior agenda.

Bias can also be expressed more generally, not necessarily about the fate of one or another particular energy technologies or sources. For example, former IEA official Graham Campbell describes the WEO as being prone to 'euphoria' about new and/or up-and-coming energy technologies, noting the recent statements in the 2012 WEO about the potential for unconventional oil and gas resource production in the United States as an example. The tendency to get "swept away", Campbell suggested, is due to the "think-tank environment" at the IEA, in which Birol and his team of analysts, "detached" as they are from the "real world" of geology, corporate bottom lines, of the general inertia of global energy systems, and the challenges of public acceptance, can more easily get ahead of what will turn out to be the "practical reality" of the situation. In the case of the 2012 WEO and North American unconventional fuels, Campbell noted that it "was his personal bias" that it was a mistake for the IEA to so aggressively report the issue and that the projections will most likely appear 'silly' in the future.[455] This general type of bias is not strictly an issue of optimism or pessimism, but more a general tendency to be carried away or swept up in current technological developments or trends. Consequently, this bias is likely to induce observations of the future that seem foolish in retrospect.

General bias can work the other way as well. Several interview participants suggested that critics of the WEO, especially those associated with the peak oil movement, were driven to do so by a more general pessimism about the future. When asked to respond to the allegation of bias, Skinner replied,

[455] Campbell, Interview.

> "...people do not read and they do not understand what words mean, because they come at the subject with a bias - the guys at Uppsala, they have a bias and that is that they believe the world is facing peak oil and there is Armageddon on the other side of it. So if they do not see the kind of future that they see in the WEO, then they impose on the IEA bias. I mean one biased group saying to another, 'you're biased.'"

According to Michael Lynch, a self-described persistent optimist about oil supply prospects, peak oil proponents are driven by "a Malthusian bias" held-over from the days of limits-to-growth, of technological and economic stagnation, and when OPEC possessed considerably more market power than they do at present. Like Malthus, Lynch argued, critics see fundamental limits where others, more optimistic about the prospects for technological progress, see flexible ones. The belief in peak oil is partly a consequence of this underlying attitude.[456]

A variation of this theme came from Dr. Thomas Ahlbrandt (lead author of the USGS 2000 report). Ahlbrandt, though not speaking specifically about critics of the WEO, extended the range of pessimistic bias to include a group he referred to as 'the rapturists'. Whereas the pessimistic bias for Malthusians concerns the capacity of technology to expand limits, for rapturists it stems from a prophetic faith in the near-term end of the world. For rapturists, there is no need to conserve energy resources or produce so as to maximize long-term benefits; rather, we should exploit them as fast as we can. What the two groups share is a bias towards 'catastrophism.' This 'catastrophic' bias is not strictly

[456] Michael Lynch, Interview, interview by James Gaede, Phone, April 17, 2013.

a Western world phenomenon: Ahlbrandt noted meeting rapturists in Saudi Arabia as well, though for them "a different group wins" in the end.[457]

What the 'rapturists' and peak oil proponents share (in the eyes of their critics) is a "Chicken Little, sky-is-falling" tendency to continually see crisis on the horizon, stemming in part from their general pessimism about the future. However, a bias towards crisis is not enough to place one in the 'Chicken Little' camp. As Lynch noted, the WEO is also prone to see 'crises' lying ahead, though (at least under the direction of Birol) these crises have generally concerned the dire need for significant investment in order to ensure supply can meet projected demand.[458] This kind of crisis appears less problematic than the 'catastrophic' kind, and part of the difference may be that the kind of crises the IEA foresees do not carry the same kind of foreboding, 'nothing-we-can-do about-it' connotations as does a bias towards catastrophe. In responding to the accusation of bias, for instance, Priddle noted that unlike its opponents the WEO is not trying to "fulfill any prophecy" about the future.[459] The implication of this statement is that the vision of the future allegedly informing the 'Malthusian bias' is a dogmatic one – one which we simultaneously cannot avoid, but also one which its possessors are committed to realizing in signs and evidence at hand. The WEO, by contrast, lacks such a dogmatic commitment; its crises are merely possible future events that we can take action to avoid. A bias towards crisis may not be problematic therefore, if it is not accompanied by fatalism about our ability to do anything about it.

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[457] Thomas S. Ahlbrandt, Interview, Part 1, interview by James Gaede, Phone, May 16, 2013.
[458] Lynch, Interview.
[459] Priddle, Interview.

Another dimension of bias as it pertains to energy futures concerns the manner in which change is incorporated in the analysis. In this sense, as was noted by several interview participants, the WEO is indeed 'biased,' by design, towards conservatism; as Skinner put it, the WEO has a bias towards "relying on where we've been and where we are in terms of primary energy."[460] This design bias stems mainly from the fact that, at least prior to 2010, the WEO Reference Scenario (the central scenario of the report) was based on the central and core assumption of no change in energy policy. This, Lynch suggested, constitutes the WEO's "real bias" when it comes to sustainable energy: since the policies typically seen as necessary to incentivize adoption of sustainable technology have by and large not yet been implemented, the Reference Scenario can only envisage so much change without modifying the policy context. One might say it is biased towards a conservative outlook for the sustainable energy future, but that this 'bias' is more an intended consequence of the design of the Outlook than a manifestation of some kind of concealed agenda to forestall change.

Conversely, some 'optimists' described the outlook of peak oil proponents as being overly conservative as well. Colin Campbell is widely recognized, even by others associated with the peak oil movement, has having a particularly conservative outlook on ultimately recoverable oil resources.[461] Similarly, Ahlbrandt described the views of his predecessors at the USGS and of Laherrère, Campbell and other peak oil proponents as reflective of a 'static' and outdated understanding of petroleum resources, in which reserve growth and future discoveries, both factors resulting from technological progress,

[460] Skinner, Interview.

[461] Roger Bentley, Interview, interview by James Gaede, Phone, May 1, 2013.

are not afforded their proper potential. Lynch suggested that the Malthusian view reflected a conservative response to uncertainty regarding the potential for future oil discovery.

Yet another characteristic of bias - one which possesses a bit more political cogency than simple optimism, pessimism or conservatism – is the association with a pre-existing commitment to a certain position, belief, or desire on a question of importance about the future. This type of bias is more controversial and typically alleged in a pejorative manner, as a slight against one's opponents. When asked what he perceived as being the reason for the WEO's past inaccuracies, Rechsteiner replied, "they don't understand energy...for us the World Energy Outlook is 100% ideology; it's not based on fact." As an example, Rechsteiner noted that despite oil prices increasing year after year, the WEO continued to project relatively stable, even flat, oil prices into the future. The implication of this kind of accusation is two-fold: 1) the objectivity of the speaker or observer of the future is questionable, as well as is the information they provide, but; 2) neither are they offering a purely subjective or normative vision of the future. Rather, the accusation is that their pre-existing beliefs or desires both inform their interpretation of the facts they are presented with *and* act as a guiding story or narrative with which they aim to bend or manipulate 'facts' into accordance. The difference between this and a pure subjective vision of the future is subtle but important for the connection between politics and bias – a subjective vision for the future is simply an opinion; a biased one reflects an effort to guise an agenda in a cloak of neutrality.

The allegation works both ways; for example, the same critiques were made by some participants of the 'peak oil' proponents. When asked if, had peak oil people had access

to the same data as did the IEA they would change their mind, one participant noted that, based on "the people I know and met with and talked to, I suspect they will continue to talk about peak oil regardless of what the facts are telling them."[462] Though they quote numbers, he continued, they misinterpret them. Some, like the Uppsala team that produced the 2009 Energy Policy paper noted earlier, are a "bit more scientific", not trying to "personalize the debate" as others do, but in general their analysis was faulty. However, their misinterpretation of data did not mean their vision of the future was inherently wrong, the participant qualified; "I guess one day they'll be right! It's just going to take quite a bit longer than they think."[463] Not all participants found the Uppsala approach to be authentically committed to rational analysis, however; Skinner described the group as providing a "scientific fig leaf" for their underlying, pre-existing commitment to a peak oil narrative.[464]

Some participants explicitly associated bias with an internal, psychological process of flawed reasoning.[465] As a psychological phenomenon, bias entails a tendency to gather and interpret information in a way that accords with ones prior intuitions, theories or assumptions (i.e., confirmation bias). Another term for this kind of information-seeking and interpretation behavior is 'motivated reasoning' - reasoning based on an emotional imperative to shore up one's beliefs or desires (i.e., a non-rational relationship with

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[462] Anonymous, Interview, interview by James Gaede, Phone, March 12, 2013..

[463] Ibid.

[464] Skinner, Interview.

[465] Lynch in particular made this connection, connecting criticism of the WEO and peak oil with Shermer's "believing brain." See Michael Shermer, *The Believing Brain: From Ghosts and Gods to Politics and Conspiracies--How We Construct Beliefs and Reinforce Them as Truths* (New York: St. Martin's Griffin, 2012).

information).[466] However, there is an important yet subtle difference between bias as a psychological phenomenon and bias as a personal agenda. For example, Bentley agreed that the WEO did indeed have a 'political agenda', which he defined as a conscious choice to "take an upside on all of this" – 'this' being questions about the various different uncertainties that influence the future for oil supply. He noted, however, that he could not be sure whether or not this could be chalked up to "naïve analysis" or whether there was "real malfeasance behind the numbers."[467] Here politics is the decision to 'take the upside', but the reason for that decision (either incompetence or actual mal-intent) is left undecided.

A psychological bias towards optimism or pessimism seems less political – a common psychological quality that people possess to varying degrees. However, innate bias can become problematic if accompanied by a lack of self-awareness, or, if one is aware of one's own biases, when they are not communicated transparently. Several participants noted the importance of being transparent about the assumptions that are made in the course of conducting an observation of the future, because it enables others to conduct sensitivity analysis, to assess the likeliness of the projection in light of their own assessment of the realism of the assumption, or to assess the observation's reliability itself. Where analysts are perceived not to have met these requirements, what may before have been an excusable natural bias may now become evidence of poor analysis, possible manipulation of facts, or, worst of all, a concealed agenda. This can be politically problematic because it confounds the ability of others to interpret the (biased)

[466] See Ziva Kunda, "The Case for Motivated Reasoning," *Psychological Bulletin* 108, no. 3 (1990): 480–98.

[467] Bentley, Interview.

information accordingly, or for the public in general to assess the reliability of that information.

Transparency and self-awareness are important features of good observations of the future. There appear to be two reasons for these requirements: 1) to demonstrate openness about what facts imply about the future (by allowing other analysts to test the reliability of your future by tweaking assumptions), and 2) to demonstrate a willingness to change or adapt assumptions as historical circumstances require. Fulfilling these criteria indicates, in short, that one is willing to be wrong about the future (as the long-standing editor of the WEO explained, "we know we're never going to be right, but…we're perfectly prepared to display how far we got towards what happened."[468]) Failing to meet either imperative indicates a bias that goes beyond simple psychology and has become political.

Alleging bias is often used to discredit one's opponents and thus to weaken the claims they make against you. For example, while critics of the WEO often allege the report disregards or misinterprets information in order to envisage the future it secretly desires, the counter-argument given by those sympathetic to the report is essentially the same, e.g., Birol's retort that, "anyone coming from an unbiased position," would see that the WEO is not biased against renewable energy technology.[469] Several other interview participants responded to the allegation of bias in the WEO in the same manner: noting that it was important to consider the source of the accusation, in particular when that source is 'free' of political or other pre-commitments. For some, it was not surprising

[468] Priddle, Interview.

[469] Birol, When will the oil run out?.

that renewable energy associations would be critical of the WEO since they have a clear stake in the game and wish the report to reflect their own interests for the future. Similarly, critiques of the WEO were often parsed by those interviewed for this study on the basis of the nationality of the critic, the presumption being that people are biased toward their own country's energy sector (e.g., 'of course he is for renewables, he's Danish').

Thus it would seem bias as a pre-decided commitment or position can take two forms, both of which can make the resulting analysis 'political': it can be a conscious choice to consistently take the same side on a particular question, but a 'good faith' decision nonetheless; or it can be driven by decidedly less-honest agenda that is in some way concealed. Lynch also used bias in this dual sense – on the one hand, he saw it as a natural tendency of people to one persuasion or another (e.g., towards either bullishness or bearishness in financial markets) but, on the other, also possibly the result of an underlying interest. The latter type he described as "institutional bias" (e.g., "he's funded by whoever"). Here, bias is not so much an internalized predilection as it is a function of one's social or political context, passed on by the imperatives of funders, supervisors, or the like, though not necessarily explicitly. Institutional bias can still manifest as individual bias, though it stems not from a psychological flaw.

There is one last structural type of bias that became known during the research, in which bias refers to an innate predilection to assume a continuance of trends prominent during the unique and particular historical contexts in which observers find themselves. At the level of industry decision-making, one interview participant noted that it has been observed that the oil industry tends to over-invest during times of high prices and to

under-invest during times of low prices, perhaps due to an assumption that recent developments augur a long-term shift. This 'bias' can cause problems if the price trend is only temporary and business gets over extended.[470] This worry was noted by several participants, but in reference to renewables – if the WEO was too optimistic about the potential for renewables, or set too high an energy price assumption, based on recent trends, it could lead to many 'stranded assets' in this sector when things calm down.

This type of bias derives from cyclical and landscape-level trends in global energy economics and politics. It is thus less an individual or institutional prejudice but more a self-propelled welling up of shared sentiment about the way things are, or are going. Several interview participants noted that the general context of optimism regarding oil supply in the early 2000s, stemming from recent technological and scientific 'breakthroughs'[471] in the industry, is in some ways the obverse of the pessimistic context that was prominent in the wake of the 1970s oil shocks or in the early 1990s. Large-scale, general bias is thus a common, and understandable, phenomenon to which all experts are susceptible. One cannot truly be held accountable for possessing a bias that aligned with the paradigm of the day (though perceptive observers/investors should aim to be one-step ahead of the curve).

In the context of these macro-level trends, bias thus has a peculiar character - it can be a trait of both 'good' and 'poor' analysis. On the one hand, a skilled, independent and autonomous observer (of the future, in our case, but also perhaps of markets), possessing

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[470] Lynch, Interview.

[471] 'Breakthrough' should not imply newness or invention per se, but instead the successful penetration of an alternate way of doing/seeing things, a way that may or may not have been around for some time before finally entering the mainstream.

a strong bias towards a future which current trends suggest is unlikely, should be able to tack against the prevailing headwinds pushing other analysts to a consensus position he or she finds to be mistaken, thus willingly marginalizing his or herself in pursuit of the unpopular or inconvenient 'truth' others cannot bring themselves to see (I will look more closely at the extent to which the institutional and political realities of the IEA constrain this kind of analytical autonomy in the next two chapters). Thus, some of the interview participants took pride in the fact that they remained committed to their position in times of circumspection, either in 'beating up' the IEA and others for their pessimistic pronouncements in the 1990s, or in doggedly pushing the USGS into the new era of reserve growth and 'continuous resource plays'.[472] Similarly, some peak oil proponents pride themselves on their outlier position in the industry, taking it as an indication of their superior groundedness and clairvoyance. One respondent noted that it was the analogy made by Colin Campbell at the 1997 workshop on oil supply at the IEA between people who do not believe in peak oil and Neville Chamberlain at Munich that prompted him to look a bit more closely at the material (although he was not convinced).[473]

Yet a resolute and adamant attachment to a particular story, persisting in the face of all opposing evidence, could also indicate an ulterior fealty to something other than the truth. As one former IEA official put it, if you find, year-after-year "a very, very consistent story then you'd begin to expect that there is a commitment to that story."[474] Here again, we see find bias associated with a hidden attachment, a deep-seated continuity, persisting in the face of shifting evidence and determined to weather

[472] Lynch, Interview; Ahlbrandt, Interview, Part 1.
[473] Lynch, Interview.
[474] Priddle, Interview.

disruptive present events in the interest of realizing a lost past or idealized future. This can be problematic if it drives the biased person or group to disregard strong indicators pointing the other way and to continue pressing foolishly ahead with their belief, thereby exposing themselves (and anyone listening to them) to the dangers of being over-leveraged in a constricting market. Therefore, good futures observation should not be too distantly removed from the changes and trends taking place in the present, but at the same time should also keep trends in perspective and critically assess the reliability of the available evidence. Accordingly, the somewhat volatile record of the WEO regarding the future for oil supply could suggest not hubris but rather humility regarding the extent to which 'the facts' of the day license a dissenting projection.

8.2) Corruption

Perhaps unsurprisingly, interview participants tended to find the allegation of political 'corruption' an unduly strong and negative way of expressing the relationship between politics and the WEO. However, several participants – both insiders and outsiders to the WEO – acknowledged that though the relationship implied by 'corruption' is not the correct way of conveying it, both the IEA and the WEO are indeed 'political', in the sense that politics is present in the day-to-day activities of the organization. In this section, I will look at how the participants themselves perceive and interpret 'politics' and its relationship with analytical autonomy at the IEA/WEO, thereby getting at the extent (and manners in which) politics is perceived to 'corrupt' the information it produces.

As the discussion of bias above indicated, politics is often associated with an infidelity to the truth, a willful and concealed unfaithfulness in interpreting uncertainty or in treating potential alternative options. Though it can be manifested institutionally or

even structurally, bias is thereby typically seen as a property of individual (personal or corporate) agents – a difference that is internal to agency. Yet, politics at the level of individuals need not always be so insidious; a similar usage of politics by the participants associated not so much with willful intent to disrupt the public interest, but more so as insincerity or superficiality; as a perfunctory and/or self-serving commitment to the public interest. This is the interpretation of politics that makes the vocation 'politician' pejorative. Consequently, it is typically alleged of individuals, not institutions, numbers or models. For instance, when asked what he meant by calling Birol "a political man", Laherrère replied:

> "Because...he's not a scientist; for me, a scientist... looks for the truth. A politician does not care about the truth...it is what is good for my career...I'm going to please my manager, I'm going to please my shareholders and so on."

Politics, as a characteristic of individuals, is thus not so much opposed to or against 'the truth' as it is inclined instead to use the truth only instrumentally, in the pursuit of parochial interests.

What might those parochial interests be, if not manifested as bias towards a particular vision of the future? The interview participants identified many ways in which individual agent's interests can nevertheless 'corrupt' the practice of envisioning futures. The ambition of people is one such interference, as is hinted at in Laherrère's description of Birol, in which one's career aspirations interfere with one's duty to observe the future faithfully. This can go several ways: it can induce an observer to overly sensationalize futures for purposes of aggrandizement, or it can prompt one to take a hesitant,

conservative approach, in order to avoid 'making waves'. Either approach can entail saying what one perceives one's audience or superiors want to hear, which does not always line up with what they should be hearing. For example, Knapp thought he detected something of this sort in OMRs produced following his departure – not because of interference from head office, but more likely due to the officials writing the report thinking that perhaps that is what head office 'wants' to hear. "But," Knapp continued, "that's rogue, that's not strategic, that's not structural. That's an individual maybe or some group of individuals trying to please the boss, which has happened before in the world."

The implication is that one is acting politically when they are perceived to be doing what it takes to further their own, personal interests at the expense of the public interest, but not necessarily because someone else told them to or for some other, more nefarious, reason. This kind of politics is typically a property of individuals, though the context they find themselves in may be an important conditioning factor pushing them towards this type of behaviour. One example that was raised in several interviews is the issue of contract terms. IEA officials are contracted for three-year terms that are generally renewable, but only up to a hard limit of around 5-6 years. However, for most of the time period considered here, EU labour regulations stipulated that contract employees must be hired on as permanent employees after having served 7 years on a contractual basis. If someone could prolong their contract long enough, they would therefore gain effective

tenure at the IEA. This situation was interpreted by some interview participants as an incentive to 'not make waves.'[475]

This kind of politics was also seen in a perceived desire of officials to 'stand out', often by differentiating themselves from their predecessors. According to this interpretation, politics is associated with a desire to enhance one's status by breaking with the past. This motive can be for the better or for the worse, depending on the case and on one's perspective – interfering with established practices can lead one to discard more of the 'old way' than is necessary, or it can induce a more general, and politically desirable, shift in the organization or institution in which the individual finds themselves. The change in direction at the IEA paralleled by the change in Executive Directors could partly be interpreted in this light – Skinner suggested that it was partially a desire to differentiate herself from her predecessor that prompted Steeg to support the renegotiation of the Shared Goals.[476] Similarly, it was common among critics of the oil supply projections in the WEO to associate the increasing bullishness in the early 2000s with personnel change (namely, the arrival of Appert who was believed by critics to be overly cautious), which could stem from the desire of Appert and Birol to signify their difference from their predecessors.[477]

At the individual level, therefore, politics is often associated with having an agenda. This is mainly the type of politics that is associated with bias (e.g., Bentley: a political agenda to "take an upside on all of this"), though it can be manifested in other ways. For

[475] Bourdaire, Interview.

[476] Skinner, Interview.

[477] Bentley reiterated this claim in an interview with the Author, as did Laherrerè. Bentley, Interview; Jean Laherrère, Interview, interview by James Gaede, April 17, 2013.

instance, the agenda in question need not be one held autonomously by a person or organization – it can be the result of a past decision or event that constrains an actor into taking a consistent position on something, or of course it can be imposed by another group.

The important thing to remember about the IEA is that it is inherently a political agency, and not merely because it represents its members; it is also political in the sense that it represents its members *as opposed* to other countries – or at least that is how it was originally set up, as the OECD (i.e., the oil consuming countries), response to OPEC. As Laherrère pointed out, the IEA was formed as a "consumer's club" and must therefore reflect a *partial* view of the global energy system. Historically, some OECD countries have been an awkward fit at the IEA, for example Norway, Mexico, and even Canada.[478] Norway only participates under a 'special agreement' that limits its full participation in the organization, and Mexico is not a member at all. Though Canada joined at the outset, it did express reservations about some aspects of the long-term coordination plan (specifically rejecting Chapter V, which contained provisions around treating nationals of all participating countries equally in energy markets). And though the IEA has significantly broadened and enhanced its non-member country outreach efforts over the years, OECD membership remains a necessary prerequisite for membership in the IEA (non-member countries can participate in limited ways as observers on other Agency's initiatives).

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[478] Scott notes that though Norway was present in the negotiations leading to the IEP, "it soon became apparent that despite the broad scope of Norwegian interests which corresponded to those of the other industrial, market economy countries in the OECD, the political conjuncture in late 1974 made it impossible for it to join the Agency as a full Member." Especially problematic was the oil sharing system commitments. See Scott, *IEA, The First 20 Years: Origins and Structure*, 1:124.

The IEA is not, therefore, a *world* energy organization (though perhaps some may wish it so). At the very least, the historically close relationship between the OECD and the IEA (despite formal autonomy on budgets, personnel, and other matters set forth in the founding documents) creates a perception of partiality. Tverberg, echoing the criticism of Laherrère, questioned the objectivity of the IEA for its close relationship with the OECD. When asked for her assessment of the allegations of bias and political 'corruption', she supposed that perhaps "they are under pressure by the folks that are paying their bills." The close linkage with the OECD ("I think they're housed in the same building, aren't they?"), suggested to her (not unlike the sentiment expressed by Caruso above) that the story line the OECD wants is what the IEA gives in its reports (which for her was "piling fiction upon fiction"). In her words, the IEA is "the small teeth of the OECD."[479]

While the relationship may not be quite as stark as Tverberg perceives it to be, it should be recalled that the OECD is not a 'world' organization either (indeed, it is very much a 'Western' body). In energy matters, this means that the IEA does not include among its members some of the most important countries for both supply and demand – Russia, China, India, and of course the OPEC nations are not included. And neither are they likely to be invited: according to Knapp, China has accepted that it will not be invited and has gone about creating its own reserve system to ensure security. When asked why they might not be invited, Knapp, quoting an associate of his, noted that "before you allow somebody to join your club, you need to find out whether they think the way you do on fundamental things." The last time he checked, he continued, "China

[479] Tverberg, Interview.

was a communist country and a planned economy," implying that this would contradict the liberal, market-oriented perspective of the OECD and the IEA. When it was pointed out that China managed to join the WTO, Knapp replied, "Well, they have lower standards."[480]

The allegation of the IEA whistleblower that the WEO was produced under the direction of the US government and in the interest of the US foreign policy agenda is a continuation of this theme. In this light, the allegation of a status-quo bias with the inclination towards the preservation of fossil fuel dominance is a reflection of the deeper interests of the US in sustaining a system for which it is well adapted and in which it is heavily invested. Having an international 'watchdog' agency cast aspersion about the ability of the status quo regime to be sustained in the future would threaten those interests, and accordingly the US exercises informal or formal authority in controlling what is or is not said in the WEO. When asked to respond to the allegations of the whistleblower, however, most former IEA officials suggested that the claims of direct US intervention where "utter rubbish." According to the anonymous participant, the "reality is", it's just not like that.[481] Similarly, Caruso suggested, "nobody ever put it so bluntly" when he was there.[482] That being said, several participants did suggest that the US has a 'certain presence' at the IEA. Institutionally, the US has a prominent place in the IEA – as Skinner noted, they comprise about 25% of the budget of the organization, they have more official voting power at the Governing Board than any other country, in addition to the offices apparently reserved for US officials (Deputy Executive Director, Chair of the

[480] Knapp, Interview.
[481] Anonymous, Interview.
[482] Caruso, Interview.

Standing Group on Long-term Cooperation).[483] Graham Campbell also suggested that the US exerts a strong influence at the IEA – it sends 'excellent people' who make good contributions, and though they do not necessarily "come with the stars and stripes waving," US State department representatives do typically accompany their analytical officials in the various Working Parties. He recounted a time in which he was involved in the preparation of a report on the future of hydrogen, to which the US took exception and requested some changes to be made during review. Echoing Skinner, however, Campbell noted that the changes were mostly presentational: "wording had to be very carefully chosen in order to get the message out but not throw a cold pail of water on the future of the hydrogen economy."[484]

Of course, the US is not the only country that sits on the various Standing Committees and Working Parties that do have a role in the production of the analytical reports (with the possible exception of the WEO, however), and the Germans and Japanese are also recognized as having a strong presence at the organization. As Graham Campbell noted, there are multiple channels at every level of the organization by which member states can communicate their interests or preferences on various issues – they can actively participate in the Implementing Agreements to ensure that national messages don't get overturned, the chairs of the Working Parties are quite influential (Campbell noted that the head of the fossil fuel Working Party has typically been American), and, according to Skinner, even the country reviews are somewhat of a negotiated process. As with official decisions at the Governing Board, however, the input of members on reports

[483] Skinner, Interview.

[484] Campbell, Interview.

is also a consensus-driven process. As Caruso suggested, the result is that "what you see is what the members wanted on a consensus basis"[485] (or at least what they did not find too repulsive). Some member countries have relatively consistent energy preferences – the French for nuclear, the Scandinavians for renewables – and these are taken into consideration when editing the reports. For instance, Graham Campbell noted that there are some countries that just will "not countenance" any discussion of nuclear, and the IEA has thus had to historically treat the technology "delicately" (perhaps one of the reasons why nuclear's contribution to electricity generation capacity is handled by exogenous assumptions rather than the model, as noted earlier). And while analysts may try to remain separate from the 'political' influences that may come from the Standing Committees and Working Parties, they are not immune – "we're all human, and you sort of question yourself if somebody's beating you up all the time."[486]

From an institutional perspective, therefore, it is important to remember that the IEA is a treaty-based organization that serves at the behest of its members, who are states, which have their own interests and varying levels of formal and informal influence at the organization. Asked whether member state politics had an influence on the reports when he was at the IEA, Skinner responded, "oh absolutely…you can't…write things that will embarrass the government of the day of a particular member state, so you have to be very careful. And one of the dominant players is of course the United States."[487] Though the insiders interviewed widely rejected the view that the US was directly involved in the projections of the WEO, there was nonetheless a general agreement that it does possess a

[485] Caruso, Interview.
[486] Ibid.
[487] Skinner, Interview.

certain degree of institutional presence. Mainly, however, participants who had served in the IEA seemed to perceive this variant of 'politics' as a constraint on analysts – both on what can be said (about future policy, for instance) and how it is said (the presentation of the analysis). In sum, there appears to be a consensus among former officials that have worked on or closely with the WEO that, "if the reports were written by engineers and scientists only, the reports would come out very differently."[488]

As noted above however, the WEO is reportedly less mediated by institutional politics than are other reports produced by the Agency. The reasons for this autonomy are also somewhat political, driven in part as they were by the prerogatives of the Executive Directors over the years – starting with Priddle's initiative to bring the WEO out of the hands of the 'political' side of the IEA. In his opinion, the member states appreciate the analytical autonomy of the WEO, because they recognize an interest in having a document that is free from political intervention. Nevertheless, the report remains subject to a similar imperative as other IEA activities – to "say it like it is but without offending", according to Graham Campbell. For his part, Priddle confirmed that analysts are aware of issues that will be especially controversial, and the authors take efforts not to be "unnecessarily provocative." The WEO "obviously cannot say things that are directly confrontational" with a firmly held position of one of the member states. However, he added that this does not compromise the overall objectivity of the report, according to insiders; it is mostly just a matter of attending to political sensibilities of the member states – "a matter of tone".[489]

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[488] Knapp, Interview.

[489] Priddle, Interview.

A related use of the term 'politics' is in reference to something that stands in the way of having a controlled or theoretically pure understanding of a phenomenon. Politics – much like 'uncertainty' – confounds the task of producing reliable observations of the future. For example, on the difficulty of determining a plausible future for oil prices, Knapp suggested that, as an economist, he thought the marginal production costs should set prices. But what are those? The marginal cost of production in Saudi Arabia is "about $5". This number is uncertain however, because there are additional 'political' costs that need to be factored into the cost of production (like having higher prices in order to quell public discontent). As Knapp argued, "you don't have politics if you want to do pure economics." Economic forecasting, in other words, should aim to proceed on the basis of economics alone, and not try to incorporate ambiguous social or political factors, though this means that uncertainty will not be resolved. If one where to proceed on the basis of 'revealed preference theory' (i.e., prices are what people are willing to pay), Knapp continued, prices could be upwards of $200/bbl. "So", he noted, "it's either $5 or $200 and everything in between has to do with politics, and conditions, and imperfect knowledge, and dysfunctional markets, and various market failures."[490]

The constraints imposed on the IEA associated with its relationship to both its members and non-member states serves as a reminder that both the WEO and the IEA exist in a larger world of what might be called 'big' politics – the matters of global or international concern, involving big economic or strategic stakes, decisions that impact the lives of millions – as well. Though the allegation of the whistleblower was that the WEO is directly implicated in such political battles, when and where 'big politics' did

[490] Knapp, Interview.

come up during the interviews it served as more of a backdrop to the effort of observing energy futures. And though reports like the WEO or the USGS were generally recognized by interview participants to have possible, significant political repercussions and implications in the world of 'big politics,'[491] that world was nonetheless still perceived as separate and divorced from that of the analysts and officials serving at the organizations producing the reports.

Engaging in this world could be either tedious or exhilarating for analysts. According to the anonymous participant, he had been "on the fringes of the climate process, the negotiation process, for many many years." Every now and then he would "get sucked into it and manage to pull myself out." "I can't stand it to be honest," he continued; everybody at the climate meets leaves "desperate" to do be doing something else, all "scandalized" at lack of action on the issue. "Like everybody that works at the IEA...politics just grind me down," the participant said.[492] Alternatively, being called to speak on panels in which the presenter sitting next to you is a Saudi prince can provide a bit of an 'ego-boost', as Knapp put it.[493]

It is important to recall that the IEA is only one of several international, energy-oriented, organizations at present, others including the World Energy Council (WEC), the International Energy Forum (IEF), the International Atomic Energy Agency (IAEA), and the International Renewable Energy Agency (IRENA), to name a few (one might include

[491] Ahlbrandt in particular briefly recalled an instance where his work was used to settle a boundary dispute involving oil resources somewhere in South America (he was not specific). Bentley also held the view that reports like the WEO could certainly influence governments not to undertake the necessary policy actions to address impending peak oil. Thomas S. Ahlbrandt, Interview, Part 2, interview by James Gaede, Phone, May 24, 2013; Bentley, Interview.

[492] Anonymous, Interview.

[493] Knapp, Interview.

OPEC in this list as well, given that it is an international body that represents the interests of a group of member states, just like the IEA). There are also numerous national and private energy-related organizations that have an international profile, and produce data, reports and analysis complementary to that of the IEA. Some of these organizations significantly predate the IEA (the WEC was formed in 1923, and the IAEA in 1957, for instance), and others have been created afterwards, and sometimes with the participation of the IEA (i.e., the IEF or IRENA). Two in particular are devoted to a technological subset of the larger global energy system (the IAEA and IRENA). The existence of these organizations raises some questions about how the relationships between them, either in the context of their original founding purposes or in their present operation and activities, may serve as a political context for the IEA/WEO.

One last dimension to the IEA's international political context is its, somewhat self-ascribed, status as the 'global energy watchdog', a role that has afforded it an important seat at most global climate change proceedings. Recognition of the importance of environmental issues to energy security dates back in the Agency to before the Shared Goals: the IEA Greenhouse Gas R&D Program began as an Implementing Agreement in 1991, and the IEA Secretariat has from the outset played an important role in the implementation of the UNFCCC, holding in concert with the OECD Environment Directorate the Secretariat of the Annex 1 countries' Energy Group. In response to the first Conference of the Parties (COP-1), the IEA Governing Board agreed that the IEA Secretariat should play an active role in subsequent convention meetings, bringing "the energy perspective to the table through balanced analysis and concrete assessment of cost-effective policy and technology response options in the energy sector." In particular,

it stressed, "[t]echnology responses are especially critical."[494] When the IEA reviewed its 'medium-term strategy' in 1999, it added an objective under the Climate Change section that the Secretariat would assist its Member countries with analysis of policy options that would help them to meet their Kyoto commitments.

So it was in the 2000 WEO that the Alternative case scenario was introduced, and the Reference scenario replaced the strict business-as-usual scenarios of the past (the main difference being that the Reference scenario considers policies that have been enacted or announced in the OECD by the time the WEO was prepared, even if not yet fully implemented and thus not reflected in the historical data).[495] The Alternative cases (of which there were three in the 2000 WEO), built on the Reference case by changing assumptions around different variables, mainly related to policy but also technological improvement rates. Alternative scenarios could also be more normatively inclined as well, setting an end-point or target and working backwards to determine the kind of policy that would be required to meet the goal. The role of the Alternative cases was, as the IEA suggested, "to assist in the formulation of future policies by assessing their likely effectiveness, [but] not to pre-empt discussion."[496] Later WEOs separated out the Alternative Policy scenario (including announced or plausible future policies) from the 450 Scenario (a normative scenario working backwards from an emissions target of 450 ppm atmospheric concentrations of GHGs), which was first introduced in the 2008 WEO.

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[494] Bamberger, *IEA, The First 30 Years: Supplement to Volumes I, II, & III*, 4:220.
[495] International Energy Agency, *World Energy Outlook 2002*, 41.
[496] Ibid., 43.

Some interview participants expressed doubts that the 450 scenario would be continued in future WEOs, given that it was moving beyond being unrealistic and becoming more-or-less impossible.[497] The important point to note about the inclusion and format of the scenarios that the WEO produces is not so much their plausibility given current trends, however, but rather that they are conceived of, constructed, and presented in response to the pressures and issues of the international political context in which the Agency operates. Accordingly, the 450 Scenario (and others like it) will be continued so long as it remains a feature in international political discourse on climate change policy and not so long as IEA analysts may deem it realistic or not.[498]

8.3) Irresponsibility

Of the three allegations, the charge the WEO has been or is irresponsible when it comes to observing the future for sustainable energy is perhaps the most difficult to capture succinctly. The criticism was put most forcefully by Monbiot, who specifically took issue with the practice of the WEO to offer supply projections based on untested assumptions. The insinuation, however, is that had the WEO been more realistic in the past on the potential for oil supply, IEA member states may have put in place more aggressive policies to shift away from reliance on fossil fuels. If that had happened, our current energy/climate change dilemma might not have been as dire. The alleged irresponsibility of the WEO thus stems in part from its perceived failure to facilitate better planning. An important question is, to paraphrase one of the interview participants,

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[497] Anonymous, Interview; Caruso, Interview.

[498] The IEA website continues to list the Scenario among the others the Agency produces, noting its connection with the policy goal of limiting warming to 2 degrees Celsius. See International Energy Agency, "Scenarios and Projections," *International Energy Agency*, accessed February 8, 2014, https://www.iea.org/publications/scenariosandprojections/.

'if we imagined a different future, would that future come to pass?'[499] Conversely, others have criticized the IEA/WEO for taking too strong a position on energy policy and/or prices, for becoming too normative in their later scenario work, and have argued that the WEO is in fact too optimistic on renewables and the likeliness of governments implementing the policies they claim they intend to. The issue of irresponsibility thus involves more than faulty assumptions, also touching on the issues of self-fulfilling and self-denying prophecies and the problematic aspects of 'signaling', the proper use of tools such as models, the challenges of communication and messaging, and the duties of both the observer and the reader in the practice of observing futures.

One basic question that pertains to the responsibility of the WEO is what the intended purpose of the WEO actually is, in the eyes of those who have worked on it. According to Priddle, the "first, basic task" of the IEA is to gather good statistics about energy and to make them available internationally. The WEO uses those historical statistics to give a vision of the future, which itself depends greatly upon the assumptions that frame it. Beyond that, Priddle argued, "it's up to the member states...to make what they will of those scenarios, which we offer to influence their policy." Though it does not aim to tell decision-makers what to do, the WEO is nevertheless "designed to influence policy, certainly."[500] According to Knapp, the Reference Scenario is "meant to be a motivator so that it becomes a self-defeating prophecy" - "some dumb bureaucrat says, hey maybe we should do something", though he noted that 'history' suggests this doesn't happen often.[501] Even the Alternative Scenarios, products of climate change negotiations and based on the

[499] Skinner, Interview.
[500] Priddle, Interview.
[501] Knapp, Interview.

political targets set by member states, only intend to show the course that would be necessary to meet those targets – the next step is for countries to decide what is "feasible, politically, and which path they are prepared to take."[502]

In short, Priddle described the purpose of the WEO as being to make available "good information" about energy, in order to help policy makers consider the adequacy of present policies and to suggest how they might change them. When questioned what makes information about the future better or worse, given that there is nothing to measure its truth against, Priddle suggested that the aim is to make the analysis "as rigourous as possible." For the purposes of futures observation, this entails developing a 'good' econometric model, "which, if applied retrospectively, could also explain the past." The model must "adequately reflect" what has happened in the past, and projects forward on that basis; this is the basis of good information about the future. Priddle noted further that an "obvious limitation," and a limitation that people who use projections are aware of, is that the WEO can only envision futures within boundaries of continuity – key relationships stay the same. Sensitivity analysis can look at variations of these relationships, however, which is what the Alternative Policy scenarios are intended to be. Making the model as "good as it can be", Priddle continued, offers a "sound basis" for projections, but they are not forecasts.[503]

Thus, according to Priddle, the extent to which the information provided by the WEO can be considered 'good' is related to the ability of the underlying model to accurately portray the workings of energy systems, but this ability is fundamentally limited because

[502] Anonymous, Interview.

[503] Priddle, Interview.

it can only be calibrated against the past – a model, therefore, is limited in how much novelty it can envision. Thus, as Caruso suggested, it is not really fair to criticize projections retrospectively for a lack of accuracy, since they are not able to 'predict' the most important indicators 20 years in advance. This highlights the critical role that assumptions and judgment have to play in the use of models, irrespective of how good the model is at 'explaining' past developments.[504] Another way of conceiving of the quality of the model, in addition to its retrospective predictive capacity, is its overall 'reliability.' According to the anonymous participant, reliability entails that the model is "more accurate, in a sense", meaning that if the assumptions that frame the analysis prove to be accurate, then the projections it makes would be closer to predictions or forecasts – in other words, the reliability of the model is related to the extent to which the forecast "will become reality", if the assumptions do as well.[505] Thus, as Skinner put it, "models are only spreadsheets, upon which assumptions are imposed."[506]

A model improves (as does the utility of the WEO, accordingly) as it becomes more "reliable [and] robust." The model underlying the WEO does not therefore 'stand still', as Priddle and others noted, and the WEO team is always trying to improve it. The process of model improvement can be considered one of increasing "sophistication", such as adding new modules, or nuancing existing ones. Investing time and resources into the sophistication of the model is a long-term investment that pays off for years down the road. According to the anonymous participant, the World Energy Model is now much

[504] I use the term 'explaining' here quite loosely, since a model arguably doesn't explain anything. Priddle used the term in relationship to an effective model, implying a similarity between explanation and retrospective 'prediction'.

[505] Anonymous, Interview.

[506] Skinner, Interview.

more “mature” than it was in the early days, incorporating behavioural modeling alongside bottom up analysis in the assessment of future oil supply, for example, whereas in the past it did not (more on the modeling practices for oil supply below). That being said, the increasing sophistication of the model is not synonymous with its reliability or robustness; there is a tendency for models to get “heavy, complicated” over time. People, typically younger analysts who work more closely with the model, tend to “needlessly add things on.” 'Better', in modeling, is thus partly a product of keeping things “as simple as possible”, i.e., parsimonious.[507]

A dimension of responsibility in conducting observations of the future thus includes the relationship between analysts and the model that they use to conduct analysis. In practice, the experience of the analyst is important in this regard. According to Caruso, it is important to think about models “as tools which would help you decide…if you want to go in a direction where you’re going to limit your GHG emissions, this is what you have to do to achieve that.”[508] Models are useful for ensuring “internal coherence and consistency” and without them it would be “just not realistic” to process such a huge amount of data.[509] Though most of the modeling work in the WEO is done by 'younger staff', the “more experienced” members of the team realize that, “a model is...a model, it's a tool, and never forget that it is a tool, never allow the model to determine the results by

[507] Anonymous, Interview.

[508] Caruso, Interview.

[509] Anonymous, Interview.

itself, if you like." Birol reportedly shares this view, that the "model is only as good as the person using it."[510]

Though the underlying tool (i.e., the model) may be considered 'better' (reliable, mature) for its predictive capacity when shaped using assumptions that turn out to 'true,' the assumptions used to shape the WEO are not all intended to be true. Instead, they are control factors, designed to produce a certain scenario that serves more as a hypothetical, "if...then" story, in order to influence decision-makers away from the observed future. In making assumptions, the WEO team often conducts the analysis iteratively, changing assumptions in order to end-up with a "coherent picture of the possible future." A crucial aspect of coherency is to make sure the scenario "balances" - that is, to ensure that supply matches demand, at a given price. The WEO cannot show a supply shortfall because, as Priddle noted, "that's not what happens in the real world" - if supply is short, prices go up and demand decreases until the market clears. In short, the WEO aims to offer plausible and coherent scenarios, based on a reliable model.

The importance of expertise and judgment in modeling means that observers have additional responsibilities, for example to be transparent and forthright about the assumptions and modeling practices that are used in the analysis. Transparency is important, as Caruso noted, "if someone is looking at your work, they can see your assumptions and then take issue with the realism of the assumptions."[511] Other analysts can then play with the assumptions, helping to create boundaries of plausibility. Similarly, observers have a responsibility to dutifully re-assess their past work.

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[510] Ibid.

[511] Caruso, Interview.

According to Priddle, the IEA does look at its record and has done so in the past, reflecting an awareness that " we know we're never going to be right, but...we're perfectly prepared to display how far we got towards what happened."[512] Skinner, on the other hand, suggested there was some grounds for criticism of the WEO on this front and of Fatih "for becoming bigger than life," neither being "sufficiently self-critical." According to Skinner, the EIA is more "honest" in 'seriously' assessing past projections and publishing the assumptions that framed them.

Observers should also "challenge themselves" - not just by critically assessing their past performance, but also by questioning their own, possibly internal assumptions, beliefs and biases. This also entails pushing the limits of foreseeability, according to Lynch, going beyond mere extrapolation of trends (which he argued is a "foolish approach"). In other words, an observer of the future should take some risks in making predictions about what will happen in the future. At the same time, Lynch suggested that for organizations like the IEA, there is a "much bigger responsibility to caution", leading them typically to be inherently more conservative. In other words, analysts need to exercise judgment both in how they set assumptions and decide other uncertainties, but also in considering what is prudent, or politically acceptable and/or desirable.

The IEA/WEO thus finds itself in somewhat of a tricky spot – intended to influence decision-making so as to prompt change, but also potentially constrained by an institutional 'responsibility to caution', the latter of which in practice stems from the IEA's political context vis-à-vis its member states. Taking stances on policy, in other words, is not the IEA's job. Doing so, according to Skinner, would mean "they would be

[512] Priddle 2013

crapped on from all directions."[513] Rather, the job of the IEA is just to look at the energy implications of existing or proposed policies, which includes letting member states forbid things like nuclear; Priddle thus described a 'balance' between demonstrating need for change and not being "unnecessarily provocative." In the context of a sustainability transition, however, this seems to be a precarious balance. As Skinner put it, the IEA's role is not to say whether or not climate change exists, but rather to look at the energy implications thereof. As a result, the Alternative policy scenarios were established to meet the needs of the international community, particularly the OECD countries, for analysis that would inform their decisions on energy-related climate change issues, but not to direct those decisions. But, it is not the position of the IEA to take too strong an advocacy stance on any specific policy or energy technology. It should not be surprising therefore that perceptions of the alternative policy scenarios and climate change negotiations amongst both insiders and critics can at times be critical. As Laherrère put it, the 450 scenario is 'bullshit', something the IEA is forced to do by the international political community and is only there to please shareholders; it is not something that they really believe in. Similarly, Tverberg described them as "complete fiction", "a bunch of baloney", meant to show that "they have control over these things." She continued, "So the story is not what the future will be, but imagining one way perhaps things might work out all right if we all cross our fingers and hope an awful lot." Conversely, some 'insiders' find the alternative scenarios of questionable realism, speculating that it is being kept

[513] Skinner, Interview.

around only for "political" reasons, and arguing that the IEA should cease publishing it, due its lack of plausibility.[514]

Priddle acknowledged that there could be a risk of inadvertently dissuading people from pursuing challenging goals if the alternative scenarios seem too implausible or politically unpalatable, though this "depends on what your analysis shows about how difficult it is."[515] The latest study from the WEO team, however, he noted manages to achieve required GHG reductions with no economic cost. In any case, this kind of 'signaling' is not really an issue - "it really is for the actors in the market to make what they will of the information which is given to them." In other words, it is not the responsibility of the WEO to lead a sustainability transition, but only to provide the information that decision-makers require, based on their actions at present. To do more goes beyond the scope of the report. On the idea that the WEO can inadvertently 'signal' oil markets or create self-fulfilling/denying prophecies, Skinner suggested it was "pretentious" to assume the WEO could signal something as "inertia ridden" as the global energy system – like "a fly crawling up the back leg of an elephant with the intention of rape."[516]

That being said, several interview participants noted that the WEO has become increasingly normative. Normative in this context does not necessarily entail a future working backwards from a desired goal, though that type of future is certainly reflected in the 450 Scenario. Rather, the participants tended to use normative to refer either to

[514] Noted in the preceding section. Anonymous, Interview; Caruso, Interview.
[515] Priddle, Interview.
[516] Skinner, Interview.

the WEO's increasingly provocative, even alarmist, tone vis-à-vis climate change and the need to deploy more low-carbon technology, or to the shift away from the Reference Scenario to the "New Policies" scenario as of late, in which the WEO makes assumptions about what policies will be implemented and how effectively.

The OMR (at least according to Knapp) could be considered "so apolitical as to be self-threatening." As Knapp put it, the OMR is more:

> "objective...yeah, the OMR is looking at the numbers and putting down the trends, based on real data; the WEO in some sense belongs on the fiction shelf, because its dealing with scenarios rather than true forecasts, although there are set of assumptions that go in and then you run demand models, a set of assumptions that go in and then you run supply models, but basically when you set up scenarios they are inherently political"[517]

The difference is due in part to the different imperatives of short-term versus long-term analysis, since over the long term the likelihood of a trend continuing gets increasingly unreliable. Thus, in the long-term reports, despite sharing a similar set of base-line and historical data as the OMR, "building those longer term scenarios is more about the scenarios than it is necessarily about the trends." The scenarios, in other words, are political in that they are not objective. That the OMR's 'apoliticism' could be self-threatening, Knapp implied, suggested a more politically aware study could have a longer shelf life, owing partly to its ability to construct fictional futures.

One problem, however, is that people do not seem to care to listen to fiction. This requires walking a fine line in the presentation of the WEO: "In a way," Caruso noted,

[517] Note that Knapp's use of 'inherently political' is not strictly in the same sense as Winner's, but rather implying that a scenario-based approach to observing the future is a more astute way to navigate political sensibilities around what future may come to pass.

"you've got Fatih and others making presentations, no one wants to start off by saying 'don't pay any attention,'" but at the same time not wanting people to get too caught up on the specifics of the projections. As a result, the marketing and presentation of the report emphasizes particulars less and more the general story, which, as Peter Fraser noted, is what policy-makers want anyhow,[518] According to Fraser, the general message of the WEO's business-as-usual scenario is, as Fraser identifies (and, indeed, as most of the WEOs since the beginning of the report note as well), that "we are still on this fossil fuel track."

One might expect that the increasingly normative stance on policy and markets that is implied in the new approach would be at odds with the politics of the member state constituency, though in fact the change may have been due in part to requests from the audience. According to the anonymous participant, it was repeatedly found that in the presentation of the findings of the WEO, the audience would stress that they did not want to know what things would *not* be like, but rather what will happen. In other words, decision-makers were telling the IEA,

> "What we need for our planning purposes is a central scenario; we need something which we can use as forecast in effect. We know you can't produce a forecast and we don't expect you to, but at least come up with a central scenario which is sort of a middle path...which we can use as a forecast; as a reasonable, realistic projection of the future."[519]

[518] Fraser, Interview.

[519] Anonymous, Interview.

Moreover, some on the WEO team were finding the 'spread' between the Reference Scenario and the Alternative Scenarios to be getting uncomfortably large, suggesting either trajectory was becoming less plausible.

The shift to a more normative and optimistic, but also "realistic"[520] scenario for the future – more progressive than the Reference Scenario but also more conservative than the Alternative Policy scenario – thus raises some questions around responsibility and messaging. According to Priddle, this has meant that the WEO "is becoming more political; it's becoming more of a policy document." While he noted that the shift to the new scenario structure was a "very significant political step", he assured that "it was done with very great seriousness in the IEA, and again with as much as possible of the process exposed."[521] The shift to the 'New Policies' scenario does present some challenges, however, as it requires analysts to effectively say to member-state governments, "'you say you're going to do that, but frankly we don't think you'll ever do it.'" Perhaps it is not surprising that Priddle found things to be "easier" in the days of the Reference Scenario. This tension highlights the expectation of responsibility on the IEA's part in walking a fine line between provocation and caution.

One last dimension of responsibility that deserves to be mentioned is the responsibility of the reader of observations of the future. Observers of the future may not always abide by their responsibilities for transparency, rigorous analysis, caution and so forth – perhaps bias and corruption by politics can never really be eliminated. How should readers treat observations of the future? As Graham Campbell noted, one should

[520] Ibid.

[521] Priddle, Interview.

try to read as many studies as possible in order to get a 'balanced view,' for example, to counter the tendency to technological euphoria among some. Similarly, the extent to which a report is objectively bullish on this or that fuel is somewhat separate from the extent to which it is "bullish in the eyes of the reader, bullish in the eyes of the guy who writes the first thing about it."[522] Information is not put out into the world fully formed and unmalleable, with a direct and definite message – it depends on how people receive it, interpret it, reframe and discuss it. For someone to find the report 'bullish' implies they think it may be somewhat optimistic, but not necessarily because the authors of the report intended to produce an optimistic vision. Thus, it is the responsibility of the reader to question the reports they read, and assess them critically. As Knapp put it, the first question any reader should ask when they receive a new report is, "what did they get wrong this time?"[523]

[522] Lynch, Interview.

[523] Knapp, Interview.

Chapter 9) Sites of Contention: The Complicated Expression of Politics in the WEO

The charges of bias, corruption and irresponsibility thus all stem from a broader concern about the WEO's objectivity and/or impartiality, which itself is an issue of the quality of the information provided by the report. In the sections below, I will review the ways in which these themes pervade several 'sites of contention' – areas or aspects of the WEO in which bias, corruption, and irresponsibility is thought to manifest themselves in the practice of observing sustainable energy futures. These sites are:

4. People
5. Message
6. Numbers
7. Methods

Though this section will touch on some of the specific criticisms of the WEO in detail, it is important to remember that the aim in this study is not to take a side in these disputes. Instead, I aim to show how these themes are present in some particularly controversial aspects of the WEO.

9.1) People

'People' - personalities, perspectives and personal relationships – are a key site of contention in the production of the WEO. For nobody is this truer than Birol. As was noted above, Birol's name and reputation are closely intertwined with that of the WEO – as Knapp noted, "Fatih, as other people will tell you, does have his eye on the marketability of himself and the report, and the durability of himself and the report, and

he's still there and there's still the report."[524] For some, his academic background suggests he is disconnected from the 'real world'; as Bourdaire put it, Birol 'doesn't know a single word [sic] about oil', all his life [has been] spent modeling." His only concern was to stay the requisite number of years, Bourdaire suggested, so that his temporary fixed-term contract would become permanent under OECD rules. Even Skinner admitted one could be critical of Birol for becoming "bigger than life" and for not being sufficiently self-critical (i.e., for not conducting "serious" assessment of the assumptions or projections of past WEOs). Thus, as Laherrère expressed above, some perceive Birol as a 'political' person. The perception of 'detachment' feeds into the allegation of bias. As Graham Campbell suggested, the tendency of the WEO towards technological 'euphoria' is in part a product of the think-tank like environment in which the WEO is produced. When discussing the allegation of bias, he painted a picture of Birol's "cadre" of analysts, enjoying life in Paris, "working under the shadow of the Eiffel Tower." The academic/analytical image of the WEO, reflected in the persona of Birol, thus reinforces the perception of the WEO team as a think-tank, disconnected from "real-world, grass-roots" issues.

The perceived 'ivory-tower' detachment of the WEO team coincides with the image of analysts doing what is necessary to maintain their position, incentivized towards self-serving behaviour by the benefits of working for the IEA, without a concern for how things 'really' work outside of the Agency. Birol's alleged concern for achieving a permanent position is representative of this image; a concern that, as noted above, was a context set by OECD labour regulations. It is worth noting, however, that the issue of

[524] Ibid.

contract terms seems unjustified in Birol's case. According to Knapp, the rules at the time Birol was hired (rules that he described as "some Common Law provision handed down by the Court of Versailles or something") held that after 7 years of service under fixed-term contracts, the contract position became permanent. The practice at the IEA to get around this was to have employees that reached this limit sign one-year contracts for each year after the limit, which also waived his/her right to a permanent contract. In exchange, the employees were also granted an additional month of leaving allowance, and other unspecified benefits. According to Knapp, Birol, himself, and another long-standing contributor to the WEO, Trevor Morgan, were among the first officials to sign such a waiver. Accordingly, Birol's term would have been renewable by Bourdaire after the first three years (i.e., in 1998/9), around which time he would have been promoted to Head of the Economics Analysis Division (an 'A5' employee classification under current OECD labour policy) as is indicated by the 2000 WEO Acknowledgments section. He would then have reached his term limit around 2002, at which point he would have had to shift to the rolling one-year contract scheme. Given that the WEO was producing its most 'optimistic' oil supply projections during this time, it's not clear that the supposed shift in outlook in 2008 would have been a result of a newfound contractual freedom (although Birol was promoted to Director (A6 or A7 classification) after the 2008 WEO.)[525]

The perception of disconnection or detachment was also held of critics of the WEO, especially those associated in some way with the peak oil movement. Ahlbrandt, recalling

[525] See Organization for Economic Cooperation and Development, "Staff Regulations, Rules and Instructions Applicable to Officials of the Organization" (OECD, January 2013)., for current information on OECD employment policies and classifications.

a conference at which both Kenneth Deffeyes and he were presenters, noted that though Deffeyes had said "the meaniest and nastiest things," he lacked the qualifications to back them up; he had "never found a barrel of oil in Wyoming's life – he didn't understand much about it." A lot of peak oil work, in Ahlbrandt's perspective, suffers from a similar problem, consisting of "people who know nothing about the oil business writing these books about nonsense, never having done it, [it] is just utter folly."[526] This perception may stem from the fact that many prominent figures in the peak oil movement are long retired and elderly. One interview participant, in discussing the relevance of the peak oil movement, found the image of "Colin Campbell, sitting in a farmhouse somewhere" upon "reams of data that can be used to argue either way," a comical expression of the groundedness of peak oil claims. Laherrère was also described as being behind the times, or 'removed,' by both Ahlbrandt and Lynch. Laherrère retired from Total in the early 1990s and has done the bulk of his work on peak oil since, compiling quite a vast bibliography of esoteric papers on the issue.[527] This lends to the perception of rift between the world of industry and practice on the one hand and idle academic or theoretical work on the other. Laherrère was aware of this rift: when asked why more people do not read or consult his work, he replied, "Because they are unable to, it's quite a job." He did, however, see a benefit to his position: "to tell the truth, you have to be retired."[528]

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[526] Ahlbrandt, Interview, Part 1.

[527] A partial selection of this material is available online, from the website of the Association for the Study of Peak Oil and Gas – France (http://aspofrance.viabloga.com/texts/documents#jl). From here, you can also download his complete bibliography: http://aspofrance.viabloga.com/files/JL_biblio_june2013.pdf

[528] Laherrère, Interview.

Of course, people on the pessimistic side make the same criticism of the optimistic assessments made by IHS/CERA, mainly because that organization's association with Daniel Yergin, author of bestselling books on the history of the oil industry. As Laherrère saw it, there is a difference between knowing about the history of oil and knowing *about* oil, the latter on which Yergin "doesn't know anything."[529] Only someone without industry experience could be as unrestrainedly optimistic as Yergin, Laherrère figured. But he also extended a similar critique to the IEA, and even the USGS. The WEO team, Laherrère argued, is staffed entirely by economists who lack real world experience - "no one there has found one drop of oil." Similarly, he argued that the USGS also has an academic bent and despite the fact that Ahlbrandt was indeed "bright," he was a specialist, not a generalist.

This brings to the fore a related site of contention to the notion of detachment: the perspective of the other's *bona fides*. Literally meaning "good faith" but also implying earnest intentions, sincerity, and authenticity, a key aspect of one's bona fides is their record of success or professional experience – in short, one's credentials. In the fields of oil exploration and geology, an important component of one's credentials is thus their past success in discovering oil. In this respect, Laherrère was credited by those more optimistic about future oil supply for his record while at Total – Ahlbrandt noted that despite their disagreements, he respected Laherrère because he had "paid his dues." As the examples of Yergin and Campbell suggest above, other experts are less likely to suffer the pessimism and/or optimism of their opponents in the absence of what they consider relevant and respectable bona fides.

[529] Ibid.

The perception of detachment can also lead quickly into marginalization, particularly if the detached person is also seen as 'fringe'. On the peak oil community in general, the anonymous interview participant suggested that the "vast majority of people think they're nutters, basically."[530] Knapp also saw a difference between "good" critics who make "reasonable" assessments and the "environmental fringe" that stage high-profile "non-constructive" protests using extreme methods.[531] Perceiving opponents as 'fringe' allows for easier generalization about their position. For example, Knapp suggested that environmental fringe sees "anything to do with energy" as being bad and, given that the IEA is about energy and the WEO is its most visible product, the fringe thus holds the view that, "'whatever they say is inherently wrong because it's about energy', 'whatever they say is a lie and its made up'."[532] Similarly, Lynch made a connection between fringe beliefs (noting Jenny McCarthy and the anti-vaccine movement) and conspiratorial thinking, attributing such thinking to biased reasoning.[533] Not all of peak oil was a conspiracy theory, Lynch suggested, but sometimes "the conspiracy types" latch on to peak oil, and other times peak oil proponents themselves resort to conspiracy theory to explain why no one listens to them. In any case, though he did not perceive peak oil as a completely fringe notion, noting that the issue is both political and technical (e.g.,

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[530] Anonymous, Interview.

[531] He cited as an example of the fringe a Greenpeace protest in which activists spread manure on the walls to protest a global meeting of energy ministers

[532] Knapp, Interview.

[533] As noted above, Lynch cited Shermer on the "Believing Brain" on this issue. According to Sherman's website, the thesis of this book holds that, "we form our beliefs for a variety of subjective, personal, emotional, and psychological reasons in the context of environments created by family, friends, colleagues, culture, and society at large; after forming our beliefs we then defend, justify, and rationalize them with a host of intellectual reasons, cogent arguments, and rational explanations. Beliefs come first, explanations for beliefs follow." Michael Shermer, "Michael Shermer," accessed February 21, 2014, http://www.michaelshermer.com/the-believing-brain/.

depletion rates), he did figure that many people who believe in peak oil are only repeating "bumper-sticker knowledge."

Though not necessarily a resort to 'conspiratorial thinking', marginalization does appear to reinforce the perception of an opposing bias that prevents others from listening. Bentley, for example, described the long-standing efforts of peak oil proponents in the UK to get the government to listen to them, but always being told in response, "you're wrong, but even if you're right the market is the best hand," to sort out such matters. This, he felt, was mainly because groups like the IEA had the ear of government, to the exclusion of dissenting voices. This pre-eminence has ensured that:

> "'if anybody came along and said something different, i.e., a Campbell or anybody else, they were just dismissed, because clearly the IEA knew what they were doing and they'd been set up to deliberately stop us having any 1973 shocks again, so its importance cannot be overstated"

In a what he took as a confirmation of this belief, Bentley relayed the comments of a UK government representative at a workshop of energy modellers he had recently attended, held under Chatham House rules, to the effect that the WEO was a "bible" for policy-makers in the UK. When told that, based on the input from other interview participants, the advocacy from peak oil proponents in the 2000s may have contributed to the decision to undertake the field-by-field study in 2008 Bentley was encouraged, "We all worked so hard to get them to move." It was a fascinating question, he suggested, how new ideas get into the mainstream – "the fact that we failed for so long to persuade the British government there was anything worth considering, politely given cups and tea and ... let

out the front door politely" – but that is how society changes, he figured: "noisy people shouting loudly and the incumbency [does] slowly change."[534]

Another factor that appears to contribute to the dissension between experts is a degree of incommensurable between disciplinary knowledge or world-views, a schism that prohibits productive discourse between groups. For example, the controversy surrounding peak oil has long been construed in large part as a disagreement between geologists and natural scientists (who study the physical aspects of petroleum resources that enforce hard limits on our use of them) and economists (who focus on the social factors that either relax those limits, or mitigate their disruptive potential). As Bentley describes it, there is "a chasm of understanding between the physicists like us and the economists…[the latter of which] never seem to understand the world view in which there is something physical out there that you've got to deal with."[535] The crude economic response, of course, is that though there may be real limits posed by the natural world, the price mechanism will largely soften the blow – as supply becomes increasingly scarce, prices will increase, thereby both reducing demand and making a wider range of resources economic to develop.

At the same time, technological advances and learning also act to expand the pool of recoverable resources. Thus, as noted by the anonymous interview participant earlier, few would say that peak oil concerns are fundamentally incorrect, since they will eventually be proved right.[536] Appert (Bourdaire's replacement), though having a natural science

[534] Bentley, Interview.

[535] Ibid.

[536] "One day, they'll be right…it's just going to take a lot longer than they think." Anonymous 2013.

background, was reportedly a proponent of the latter view, that technological progress will largely circumvent the constraints of the present, while Bourdaire believed that geology was a bigger issue and that technology could only do so much. Similarly, as Bentley suggests, though Birol was "green behind the ears" when initially hired by Bourdaire, it was the combination of his economic background and the publication of the USGS 2000 that prompted him to 'toss out' everything that Bourdaire had done before him.

Optimism/pessimism does not therefore capture all of the difference in perspective, but neither does the economist/geologist distinction. While one's perspective on the human capacity to push limits is certainly a factor in the dispute, another aspect that doesn't receive as much attention is the relative 'abstractness' of the other side's perspective (and, consequently, the 'distance' of the problem), a concern that relates to the 'detached' position of the observer. Accordingly, the economist/optimist, geologist/pessimist distinction does not always hold up. For instance, Tverberg (financial accountant and energy blogger), sees the geological concern about peak oil as abstract and distant – for her, peak oil is a later problem; the more immediate concern is the effect that increasing oil prices will have on OECD economies (a consideration she notes the WEO does not appear to include in its projections). Conversely, Ahlbrandt, a petroleum geologist, certainly does not hold a pessimistic view about the extent of recoverable petroleum resources (and, according to him, neither does pretty much any practicing petroleum geologist in the US at present) – however, he did note that he found himself in the interesting position of being the 'pessimist at the table', in a panel on unconventional

resources at a recent IEF conference, at which both the IEA and OPEC presented projections for this sector.

At the root of Ahlbrandt's 'optimism' vis-à-vis Laherrère et al., is, as several interview participants suggested, a Kuhnian-type of paradigm shift in conventional thinking about the nature of petroleum resources. The way Ahlbrandt described it was as a difference between an older 'static' view, and the current 'dynamic' or 'continuous' perspective. The older understanding was, he suggested, a "counting cans" (of beans) approach, in which the beans are the oil and the cans are basins. To assess resources, you count the cans, but you do not worry about the beans (or where they came from, rather). The new perspective, of which the USGS 2000 is indicative, looks at 'total petroleum systems', encompassing both 'the cans' and the 'source rock' from which the beans were derived. This conceptual shift dramatically increases the estimate of how much resource we can expect 'yet to find' and, when combined with an historical record of growth in reserves (a function of economics and technology), allow for a much more 'optimistic' view about the future for oil supply. Recent developments in horizontal drilling and hydraulic fracturing ('fracking') can be taken as a confirmation or justification for this optimism. The current perspective is thus incommensurable with the outdated view, in which many peak oil proponents are entrenched (according to Ahlbrandt and others). In fact, Ahlbrandt invoked Plato's allegory of the cave to explain the difference, in which people of the old perspective are only seeing the shadows. Shown the 'real' cause of the shadows, they find their cave more comfortable. As he put it:

> "perception becomes reality and you don't need data to the contrary, so what do you do if your reality is, and you belief this, if it's your

> philosophy, you then challenge the data - 'this can't be happening, it's a misstatement of how you count or what you measure, how you looked; it couldn't be that I don't see', and then that slides in to rapturism - 'we've got to have a catastrophe, it's obvious we're running out, we know this is a problem, it can't be good'"

This inability to see a different point of view, other than one's own, thus marks an incommensurability of perspective and reinforces the perception of bias of one's opponents. It is not strictly a 'rational' issue of incommensurable scientific paradigms, however; there is an ethical imperative as well. Bourdaire, echoing very much Ahlbrandt's opinion that peak oil critics "can't see" the correctness of the new paradigm, suggested of 'optimists': "generally speaking, they are totally stupid, because they do not accept to open their mind or to even open their heart."

9.1.1) The 1997 Workshop and the 1998 WEO

As noted earlier, the IEA convened a special workshop on oil supply in 1997, intended in part to inform the upcoming WEO. Several of the persons interviewed for this study where present at this meeting, and based on their recollections, it highlights the enduring role difference plays in the politics of the future for sustainable energy. The seminar was convened by Bourdaire. Bourdaire – a colleague of Laherrère's from his days at Total – invited a range of experts to come and discuss the future for oil supply at the IEA. Interview participants who were present at the meeting include Bourdaire and Laherrère, Knapp, Ahlbrandt, and Lynch.

The 1998 WEO does appear to have been directly influenced by the workshop. The chapter on oil supply in this issue discusses some of the key tropes of the peak oil movement, recognizing that the production of conventional oil could peak before

2020.[537] It states that production is ultimately a factor of remaining reserves and recovery rates, and questions the 330 billion barrel increase in reserves in the mid-1980s ("since reserves were an important factor in determining quota allocations, every OPEC country had an incentive to increase its published reserve estimate."[538]) Given that "official oil reserve estimates cannot be considered reliable indicators," the WEO notes, experts typically rely on the Petroconsultants data or the USGS assessments (which it notes are not entirely independent). That being said, experts still disagree on the extent of remaining resources. Thus, the WEO notes a "pessimists' view, which makes a static assessment of reserves", and an "optimists' view, which employs a continuous upward reappraisal of recoverable resources."

The WEO affords around five pages of discussion to the pessimists' view. The pessimists, it notes, "treat the estimate of remaining reserves as a snapshot of the situation today with little or no anticipation of new information that may become available over time."[539] They take issue with the subjective, Delphi-method approach used in the USGS, preferring their own "statistical" approach, which yields results that are more conservative. The WEO discusses the Hubbertian approach to translating reserves to supply projections (discussed below), and notes that even assuming 'low-price increases', if the WEO used this method as did Campbell and others, oil could peak around 2009. It cites a paper of Laherrère's, presented at the workshop, entitled "Distribution and Evolution of Recovery Factor", which it notes highlights a potential overstating of reserves. The optimists' view receives two paragraphs, noting they allow for "new

[537] International Energy Agency, *World Energy Outlook 1998*, 91.
[538] Ibid., 92.
[539] Ibid., 93.

information" - "for them, the current estimate of ultimate oil reserves is treated as nothing more than inventory that can grow as uncertainty is reduced, as technology advances or as the oil prices rises." Furthermore, unlike the pessimists, optimists do not assume a Hubbert curve, but rather, "say very little about how higher oil reserves are transformed into higher oil production or the date at which worldwide oil production will peak." The WEO then adds a precautionary note, "When the world's demand for oil is steadily rising, one cannot simply assume that world production will remain flat and then suddenly fall to zero when reserves are exhausted."[540]

In response to the uncertainty, the WEO adopted a middle route, attempting to 'synthesize' the pessimistic and optimistic approach: it takes Colin Campbell's estimate of 1800 billion barrels for remaining resources as a lower boundary but includes a range of higher estimates (between 2000 and 3000) as well. It also assumes that oil production follows the Hubbert curve, but allows for reserve growth over time, and considers various recovery factors for an accepted estimate of 6 trillion barrels of original oil in place. For the BAU scenario, they use the latest USGS estimate of 2300 billion barrels, and treat OPEC as a 'residual supplier' and cap its production at 47.9 Mb/d. The result is "no expected shortage of liquid fuels", given the miraculous 19.1 Mb/d of unidentified unconventional oil, but also a possible conventional peak between 2010 and 2020. Thus, "the potential clearly exists for mismatches between world oil supply and demand," because of the long-lead times associated with bringing on unconventional oil sources. In short, "the role of unconventional oil in the WEO projections is to act as the residual producer once OPEC Middle East is no longer able to fulfill this role. Thus, once global

[540] Ibid., 98.

conventional oil production peaks, all additional oil demand is sourced from unconventional oil reserves."

Bourdaire states that, "to be frank, I was rather on the side of the pessimists," mainly because of the relationship he had with Laherrère. According to Bourdaire, Laherrère was his supervisor when he was originally hired on at Total, and they became very good friends. Bourdaire had followed Laherrère's work for several years after the latter left Total in 1991. Regarding the "crazy folk" representing the optimists' view at the workshop, he generally had kind things to say (he noted that Lynch was a "charming guy" though he totally disagreed with him). On Ahlbrandt and the USGS 2000 report, he reiterated some common peak oil criticisms (reliance on the US as an analogue "is not using an unbiased estimate of reserves"), but nonetheless talked about Ahlbrandt favourably. Asked whether disagreement entailed animosity between experts, Bourdaire replied "absolutely [not]...but with these people, if you disagree you have to kill him."

On the impact of the workshop he argued, "What is sure is that in the IEA, people after this forum...became convinced that there was a problem with supply." As noted earlier, Knapp strongly disagreed with this conclusion. Knapp suggested that the workshop was contrived by Bourdaire, whom he described as a "peak oil guy" to convince the USGS and the IEA to take a peak oil approach. According to Lynch (who stated he was good friends with Knapp), the workshop was very much "Knapp versus Bourdaire on the question of oil supply." The 'idea' of the workshop, he recalled, was "to bring people in on both sides of the issue and have a debate", but not to influence the WEO specifically. He noted Bourdaire was a personal friend of Laherrère's and was touting his findings. In general, however, it was not much of a debate – more of a "he

said, she said" affair. On Laherrère's presentation, Lynch noted it was difficult to follow – Laherrère, he noted, "puts up a graph with 400 data points on it, and hard to understand legends, and then does 'obviously this shows this' and then whips it away, and, you know, leaves people going 'what, what?'" Ahlbrandt recalled Bourdaire as having a strong "Hubbertian view", which was very conservative on the potential for oil supply.

Lynch agreed that 1998 was a 'breakpoint' or sorts, which ended decades of general pessimism that had started with the Iranian oil crisis. After 1998 he agreed the IEA had generally been too optimistic on future oil supply. His explanation for the trend was that the price collapse in 1998 had cause of many projects to be delayed, which really slowed down non-OPEC production for a time. The tension within the IEA at this time, he added, did not appear to be the result of any institutional bias: "I think it was much more the personalities of David and Jean-Marie that were driving it, rather than the US government or Norwegian or anything like that."

9.2) Numbers

The WEO has a peculiar relationship with 'numbers,' both being based on them and in the business of producing them, yet simultaneously not wanting to be too closely tied to them. That is to say, they are and always have been explicit about the contingent nature of their projections. Compare the Forewords of several WEOs:

> "We do not see our analysis as a forecast but...as a way of raising the subject for serious debate"[541]

[541] Ibid., 3.

> "This study does not try to predict the future, but to identify and analyze key factors in global energy over the next two decades."[542]

> "The World Energy Outlook is a compendium of thousands of numbers and hundreds of pages of detailed analysis. It is a rich quarry."[543]

> "Projecting the future is a hazardous process, however sophisticated the selection of assumptions and the complexity of the energy model. The International Energy Agency does not hold out any of the scenarios depicted here as forecasts of the energy future. But they are reliable indications of what the future could be on the given assumptions"[544]

> "We have two options. We can accept as broadly inevitable the outcome portrayed here in the first part of the analysis, which shows the destination of the course on which we are now set...Or we can plan and implement a new course, drawing on united determination on the part of governments and action by committed citizens across the globe."[545]

> "Predicting what governments might do is hazardous business."[546]

Although the question of what can be gleaned from a sample of short quotes from a much longer report remains open,[547] these quotes do suggest a certain tension in the making of the report. This tension exists between the uncertainties inherent in the future and the

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[542] International Energy Agency, *World Energy Outlook 2000*, 3.

[543] International Energy Agency, *World Energy Outlook 2002*, 3.

[544] International Energy Agency, *World Energy Outlook 2006* (Paris: OECD/IEA, 2006), 4.

[545] International Energy Agency, *World Energy Outlook 2008*, 3.

[546] Ibid., 4.

[547] As I will discuss in the section on Message below, it is not clear which is more important – the discrete, specific statements, numbers or projections within the WEO, or the general message, problem or narrative that each issue of the WEO is marketed upon. In other words, those these quotes indicate that the IEA is explicit about the contingency of the futures it produces, it may be that the aggregate effect of the many more concrete projections in the report outweigh the disclaimer and inadvertently create an image of determinism and certainty.

numbers used to make projections of it on the one hand, versus the desire for precision, rigorous analysis and definitive statements on the other.

Part of this could be related to an aversion to risk (note that several of the Forewords describe observing the future as being "hazardous.") According to Lynch, prediction tends to make people uncomfortable. As he put it, as an observer you do not want to "hang your hat" on specifics, making statements about general trends or trajectories is "more comfortable ground". Furthermore, analysts tend to measure their projections against those of their perceived peers, the logic consisting of something like: "as long as my price forecast is between BP and Exxon's, I'm safe." Exponential growth is another thing that makes people nervous, Lynch suggested, as it can lead to seemingly remote and unlikely future projections. Lynch figured this as a problem of 'perception,' in which people (mistakenly) pay less attention to growth rates and more to the projected absolute figures.

Specific numbers are therefore often a focal point for controversy. For several critics, it is with the specific numbers that the WEO offers (on future oil supply and on wind power growth, as well as on the key drivers and parameters determining these figures) that they take issue. As Ahlbrandt put it, when talking about OPEC reserve figures, "if you put a number on something, it becomes very debatable."[548] "People do interesting things with numbers," he continued, "and very significant political decisions are based on

[548] Ahlbrandt, Interview, Part 2.

them." Similarly, when asked on how one could deal with the inherent uncertainty in key parameters and variables, Knapp suggested, "Don't write them down."[549]

Yet obfuscation and ambiguity can reinforce perceptions of mal-intent. For example, the WEO gives projections of natural gas liquids in barrels-of-oil-equivalency, though as Aleklett et al. argue the volumetric basis for equivalency that they appear to be using actually overstates available energy.[551] Laherrère, talking about a similar episode wherein he was perplexed by a mysterious 2mb/d of crude oil production in the WEO that he could not account for, eventually discovered that it was for condensate defined as natural gas liquids (indicating they were describing the product on the basis of how it was being sold). Consequently, one year it would show up under crude oil, the next under

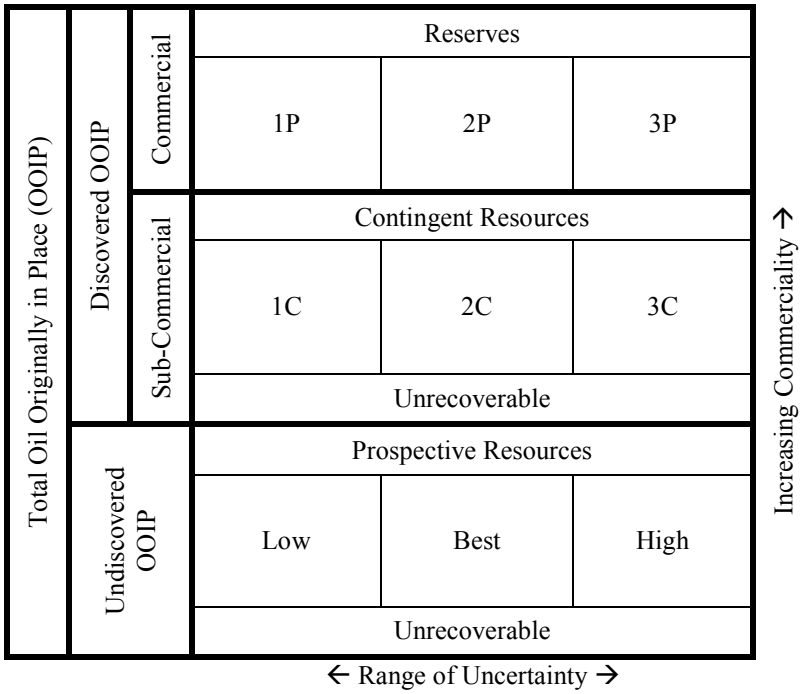

Figure 10) Modified 'McKelvey Box'[550]

[549] Knapp, Interview.

[550] Adapted from Erica Thompson, Steve Sorrell, and Jamie Speirs, *Definition and Interpretation of Reserve Estimates*, Technical Report, UKERC Review of Evidence on Global Oil Depletion (UK: UK Energy Research Centre, 2009), 24.

[551] They argue that the IEA confuses the distinction between volumetric-equivalency with energy-equivalency. Since NGLs are less energy-dense than crude oil, to present volumetric numbers overstates the amount of usable energy in a barrel of NGL. See Aleklett et al., "The Peak of the Oil Age - Analyzing the World Oil Production Reference Scenario in World Energy Outlook 2008."

NGLs. The issue was flustering, "they are following their own definition...everybody is changing the definition...no one wants to agree." "They prefer to have ambiguity," he suggested, "because they can say anything."[552] In short, a large part of controversy surrounding the concerns what critics often perceive to be 'bad numbers'; as Laherrère put it, the numbers the IEA is relying on and those it produces are "political numbers – they have nothing to do with reality." People that publish data should be held accountable for it, Laherrère argued, and be fired if shown to be wrong. Alternatively, as Ahlbrandt put it, the connection between politics and numbers "starts off with your belief system [whereby] you use the data that you choose to use for your belief system and you ignore the data that is contrary to it and the scientific method requires you to honor all data."

There are several 'numbers' involved in the broader issue of oil supply around which there exists some contention, broadly distinguishable between questions of how much oil exists and how fast we can produce it, i.e., stocks and flows. The sections below look at some of the issues around reserves, resources, and 'rates' and their expression in the WEO.

9.2.1) Reserves

The basic scheme by which to classify mineral resources such as oil (and on which current schemes are usually based) is known as the 'McKelvey Box', after Vincent McKelvey, head geologist of the USGS between 1971 and 1977. In an influential 1972 paper, McKelvey noted two "built-in" sources of uncertainty in assessing potential resources like oil: 1) that generally the resource lies hidden beneath the earth's surface

[552] Laherrère, Interview.

and is difficult to accurately characterize initially (though overtime this characterization should converge on reality as we gain better understanding of its true features), and; 2) that the extent of the resource considered recoverable is constantly changing as technological progress permits us to exploit previously marginal resources (or makes it possible to use materials previously considered not usable at all), and the economic context changes to make more or less of the total resource profitable. Therefore, McKelvey devised a classification scheme to represent two "prime elements" of information: the degree of certainty about the existence of the materials, and the economic feasibility of recovering them. Reserves are therefore the economically recoverable material in identified deposits, whereas resources include undiscovered and (presently) unrecoverable deposits as well.[553]

Within the reserve category, a further distinction can be made among three degrees of certainty about the deposit – (in order of certitude): proved, probable, and possible reserves. Proved reserves are otherwise known as 1P estimates and are the most conservative figure, the quantity of the resource that is closest to being brought to market, the amount profitable to produce under current conditions, the proportion for which there is 'reasonable certainty' of recoverability. Probable estimates are called 2P (proved and probable) estimates, and are intended to be a 'best' guess or approximation of the actual quantity of resource that will be recoverable, when taking into consideration certain assumptions about how the geological understanding, technology and economics will play out in the future. Possible estimates as called 3P (proved, probable and possible)

[553] Vincent E. McKelvey, "Mineral Resource Estimates and Public Policy: Better Methods for Estimating the Magnitude of Potential Mineral Resources Are Needed to Provide the Knowledge That Should Guide the Design of Many Key Public Policies," *American Scientist*, 1972, 34.

figures, and represent an optimistic assessment of the resource under ideal future conditions. Because 1P numbers are conservative, they are more likely to remain static or even increase over time (despite production), while 3P numbers would most likely decrease more than production or other additions would require. 2P numbers, ideally, would decline in accordance with the rate production since, as Bentley put it, "they are what you thought you had all the time."[554]

There are many problems associated with reserve numbers, most of which can be summarized as owing to:[555]

1. A lack of standardization in the production of the figures and in the representation of the underlying uncertainty;

2. The importance of and differences in incentives for reporting reserves for different segments of the market and for different individuals involved in the process, and;

3. Limitations and constraints associated with access to data.

The result is that the data that is available in the public domain is typically 1P data (or worse, i.e., being presented as 1P but in actuality being more or less probable than is suggested by that classification).

Relying on the publicly available 1P data to get a sense of the trends in oil supply could inadvertently (and somewhat counter-intuitively) bias one towards an optimistic

[554] Bentley, Interview.

[555] Erica Thompson, Steve Sorrell, and Jamie Speirs, *Definition and Interpretation of Reserve Estimates*.

outlook.[556] For one, as noted, the conservative 1P figures are likely to remain static, (despite production declines) or to increase as understanding of the resource and technology and economics improves. Absent a thorough understanding of the reporting practice, the trend for global proven reserves would thus appear to be continually and gradually increasing, which could be misinterpreted as a trend likely to continue. This interpretation would in some sense be misplaced, since the actual resource was only discovered once. If one were instead to look at 2P data, especially if "backdated" (that is, *real* reserve growth backdated to the year of the initial discovery), some argue we would have a more accurate representation of the real trends in production, decline, and technological progress. Secondly, the lack of a standard method for conveying the uncertainty around proved/probable/possible estimates can work to conceal, according to Thompson et al., "deliberate bias for political or financial gain, or accidental bias due to misinterpretation of language or human error."[557] The problem is basically that, absent a proper representation of the underlying uncertainty, the single-number (or "deterministic") proved figure conveys a false sense of certainty. In doing so, it masks both the degree of subjective judgment that went into the figure, but also the incentives that may have influenced the firm to arrive at it. Perhaps it was the original reserve estimator that judged a prospect more optimistically than he should have, inducing the firm into a costly and less profitable project that was desired. Alternatively, perhaps the bias originates from management, who want to minimize exposure to taxes and preclude

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[556] Ibid. Also, Erica Thompson, Steve Sorrell, and Jamie Speirs, *The Nature and Importance of Reserve Growth*, Technical Report, UKERC Review of Evidence for Global Oil Depletion (UK: UK Energy Research Centre, 2009); R.W. Bentley, S.A. Mannan, and S.J. Wheeler, "Assessing the Date of the Global Oil Peak: The Need to Use 2P Reserves," *Energy Policy* 35, no. 12 (December 2007): 6364–82.

[557] Erica Thompson, Steve Sorrell, and Jamie Speirs, *Definition and Interpretation of Reserve Estimates*, 33.

the possibility of having to write down reserves in the future (which could have detrimental consequences for stock prices). An example of this would be the 2004 write-down of proven reserves by Shell on the order of 3.9 billion barrels, an event that caused their stock price to tumble. Another example would be OPEC's reserve figures that, in addition to being proved numbers, are considered unreliable and inflated by many. Though national oil companies are not subject to the same market imperatives as private firms, they are subject to political imperatives – when OPEC changed its production quota in the 1980s to align with reserves, the reserve figures in each country experienced a sudden, dramatic increase of approximately 300 billion barrels (in aggregate). Though some claim that there was some legitimacy to this increase (reserve figures in OPEC having been underreported in the past), many continue to question their reliability, both because of the peculiarity of the increase in the 1980s and the fact that they continue to remain static, despite years and years of production. Laherrère reduces total Saudi reserves by 300mb, for example, on the advice of former Aramco VP of exploration and production Sadat Al-Husseini, who reportedly confirmed to him that the increase was entirely 'political'.

On the issue of static figures, however, one cannot say that this indicates across-the-board that the numbers are too optimistic – as Ahlbrandt noted, in some cases, the figures are kept static because there is no incentive to report anything more than is justified by the production quota system.[558] Some reserve figures may accordingly be too low. Similarly, Skinner noted that, though the Saudi's may be irritated by the lack of trust people have in their reserve numbers, they have no reason to tell us the complete truth,

[558] Ahlbrandt, Interview, Part 1.

given that they have different imperatives for development and resource maximization.[559] Lastly, the main sources for publicly available 1P data (Oil & Gas Journal, World Oil, and BP), may show static 1P reserve figures not for any underlying issue with the numbers themselves, but because companies and countries don't respond to their annual request for updated figures, so they just use last years'.[560]

In short, 'deterministic' estimates, i.e., one number, produced via a subjective assessment, are not effective communicators of the underlying uncertainty of that figure. The alternative - moving to a standardized, "probabilistic" framework in which probabilities are assigned to the key parameters and tested in a Monte Carlo simulation (thereby conveying the uncertainty of an estimate alongside the number) - would not remove the underlying uncertainty, but could make the whole system more "accountable", according to proponents.[561] The idea is essentially that a probabilistic approach allows for the determination of an estimator's predictive accuracy overtime, whereas the deterministic approach does not (a record of predictive accuracy thus being a measure of one's objectivity and skill). Though there has been movement towards such an approach in the past several years, for most of the period under investigation in this study the deterministic approach was prevalent and the SEC requirement for 'reasonably certain' reserve numbers a *de facto* standard. As suggested by Rose, change may have been long in coming because people prefer the artificial certainty and precision of

[559] Skinner, Interview.

[560] Bentley, Interview.

[561] The argument of Erica Thompson, Steve Sorrell, and Jamie Speirs, *Definition and Interpretation of Reserve Estimates*; Bentley, Interview; and also Ahlbrandt, Interview, Part 1.

deterministic figures at the same time that others prefer them for their unaccountable and inherently vague nature.[562]

Another problem is access. As mentioned, companies typically report 1P data and hold 2P data for internal planning purposes (in some jurisdictions they are required to report all three levels of certainty, but notably not in the US, where SEC regulations required only the 'reasonably certain' number). Public sources of reserves data are thus typically 1P (e.g., Oil and Gas journal, BP statistics). While a good historical dataset of 2P data would be instrumental in clarifying the real trends in reserve additions, growth and discovery, it is very expensive to come by – IHS possesses perhaps the best data, but charges over $1million a year for access to the field-level data, and attaches non-disclosure clauses to the analysis that results. Campbell and Laherrère had access to the earlier database through a personal connection to the former firm's founder, but the database has likely changed significantly since then. A lot of subsequent work has been done using a country-level database (PEPS) provided by IHS at a considerably lower cost, though this is not fully "bottom-up" analysis. According to Bentley, "if we had access to the 2P data, nobody would be in doubt about the problem."[563] Instead, continued reliance on the 1P data record by the major observers has artificially inflated expectations of future reserves additions. "Proved really sounds so solid", he noted, and it's not that the data is complete rubbish; you just can't do any forecasting on the basis of it.[564] Laherrère expressed the same view, arguing that it should in fact be a "right of

[562] Peter R. Rose, "Measuring What We Think We Have Found: Advantages of Probabilistic over Deterministic Methods for Estimating Oil and Gas Reserves and Resources in Exploration and Production," *AAPG Bulletin* 91, no. 1 (January 1, 2007): 21–29.

[563] Bentley, Interview.

[564] Ibid.

humanity" to have access to the best data (though he recognized OPEC would probably disagree).[565]

The IEA did not have direct access to 2P reserve data until the 2008 WEO, when they acquired a limited set of data for ~800 fields from IHS in a 'gentleman's agreement' of sorts, which allowed them to conduct a thorough assessment of decline rates (which, along with a higher oil price assumption, was responsible for knocking down the long-run estimate of oil supply potential).[566] Until this point, they mainly relied on USGS figures for ultimately recoverable resources (discussed in the following section), and 1P figures for reserves. That being said, the record of the WEO on the topic does not indicate a completely 'head in the sand' approach to the issues, though it is clear that they abandoned the 'middle route' between static and dynamic assessments outlined in the 1998 WEO as well as the Hubbertian approach to translating reserves into production profiles (discussed in more detail in the section on Methods below).

Between 2000 and 2006, the WEO is remarkably consistent on the broad strokes of reserves issues. The Oil Market chapter typically begins with a discussion of the problems of reserves figures, notably the inherent uncertainty of the numbers that stems from the lack of standardization in procedures. The report usually notes a spread in official, public proven reserve estimates, and quotes the R/P ratio as being in between 40 and 50 years (reserves to production). In some, aspersion is cast on the reliability of OPEC figures though this factor is not used to write down official numbers, but only to highlight overall uncertainty. Most note the importance of reserve growth, resulting from

[565] Laherrère, Interview.

[566] Caruso, Interview.

new information, technological advances, and initial estimate conservatism and so on. Interestingly, the importance (and also the ignorance) of decline rates was recognized from the start – the 2000 WEO "assumes" significant decline rates, though not as great as the "natural decline rate" (see the section on rates below).[567] The 2004 WEO contains the most thorough discussion of reserves of all the WEOs between 1998 and 2008, most likely because it was in that year that Shell wrote down its reserve estimates. That event is discussed in brief, as well as other downgrades by Nexen, Husky Energy, and other firms, as an example of the uncertainty and comparability of industry data. The WEO also describes the SEC process as being the most 'restrictive' and 'detailed' in the world.[568] It notes that reserves are distributed unequally across the world, and also that the OPEC reserve hikes in the 1980s are questionable ("This hike...was driven by negotiations at that time over production quotas, and had little to do with the actual discovery of new reserves.")[569] They also note that reserve figures are rarely updated year-after-year to account for production, and that the main public sources are not 'backdated'.

Accordingly, reserve figures may be useful for estimating short to medium term oil availability, but estimates of recoverable resources are better suited to long-term projections. However, the means by which those are converted into production in the report's analysis is unclear. They note only that they 'derive' their production estimates from the USGS mean estimate of URR, concluding that "according to each of the

[567] International Energy Agency, *World Energy Outlook 2000*, 75; International Energy Agency, *World Energy Outlook 2002*, 99.

[568] International Energy Agency, *World Energy Outlook 2004*, 89.

[569] Ibid., 91–92.

primary data sources described above, proven reserves of conventional oil today are sufficient to meet cumulative world demand...but a lot more oil will have to be 'proved up' to prevent production from reaching its peak before 2030."[570] The last section of the chapter discusses the "urgent need" to reform the process of reporting reserves, specifically calling for the creation of a common set of definitions and procedures, and for collection, compilation and publication of primary data on national reserves and production, *by field* (emphasis in original). The latter is "critical" to understanding production-decline profiles and the lack such data makes it "impossible to assess the quality of data on total reported proven reserves, whether by company or country."

The 2006 and 2008 WEOs broadly continued the approach to reserves as set out in the 2004 issue, though they no longer question the reliability of OPEC reserve figures. One possible reason for this, aside from the 2005 Special Issue on Middle East oil prospects, could be that the increasingly cooperative relationship between IEA and OPEC meant criticism of the latter was becoming more politically untenable. Skinner, Ahlbrandt and Knapp all indicated that the Saudi's did not take kindly to IEA questioning of their official numbers. The 2005 Special Issue does however note that reserves figures are highly uncertain and cloud the analysis, but politely[571]. The 2006 report again notes the uncertainty around decline rates, and the 2008 report of course finally addresses the issue. In short, the bullishness of the WEO on oil supply during this period does not appear to be attributable to its understanding of reserves, though on that issue it does appear to have taken the fact that 1P data are more restrictive as an indication of their

[570] Ibid., 102.

[571] International Energy Agency, *World Energy Outlook 2005: Middle East and North Africa Insights* (Paris: OECD/IEA, 2005), 48.

greater degree of reliability. That, however, could be mainly because that is the only data they had.

9.2.2) Resources

Reserves are one thing, resources are another. Recall that reserves are *identified*, economically extractable resources. This, in combination with cumulative production, gives cumulative discovery. There remains the question about how much presently 'unknown' oil we may eventually be able to extract – an uncertain amount including both growth in present reserves due to technological advance (i.e., reserve growth), and oil remaining to be discovered (yet-to-find resources). The combination of cumulative discovery with these two factors gives an estimate of ultimately recoverable resources (URR) Table 1 summarizes some of the key terms for oil supply numbers). Though the rate of production and decline are perhaps more important in determining the shape of the ultimate supply curve (and thus the peak of production), considerable debate exists around the extent of total resources. As noted by Sorrell and Speirs, "other things being equal, larger estimates of the resource size for conventional oil lead to more optimistic forecasts for future global oil supply – and vice versa."[572]

On that note, the 2000 WEO makes it immediately clear that it was taking a different approach than the 1998 WEO, beginning the oil supply chapter by noting that it incorporates "more optimistic estimates of the world resource base than did the 1998 WEO."[573] That change was due, the report states, to the publication of the USGS 2000

[572] Steve Sorrell and Jamie Speirs, *Methods of Estimating Ultimately Recoverable Resources*, Technical Report, UKERC Review of Evidence for Global Oil Depletion (UK: UK Energy Research Centre London, 2009).

[573] International Energy Agency, *World Energy Outlook 2000*, 74.

assessment of global petroleum resources. Indeed, all subsequent WEOs produced up to the 2008 WEO continue to use the USGS 2000 study as the core of its oil supply and production projections.

Cumulative Production		Oil production to date
Reserves	Proved (1P)	Deterministic estimates of existing, identified and economically extractable resources, in decreasing certainty from top to bottom
	Proved and Probable (2P)	
	Proved, Probable and Possible (3P)	
Cumulative Discovery		Sum of reserves and cumulative production
Unidentified Resources	Reserve Growth	Estimate of future reserve growth
	Yet-to-Find	Estimate of yet-to-find resources
Ultimately Recoverable Resources (URR)		Sum of Cumulative Discovery & Unidentified Resources
Oil originally in place (OOIP)		Sum of URR and unrecoverable resources

Table 1) Key Oil Supply Numbers - Terminology

The publication of the USGS report on world petroleum resources in 2000 dramatically increased the estimated ultimately recoverable conventional oil resources from previous USGS reports, and indeed from what appears to have been a general consensus between 1980 and 2000 - whereas estimates made during this period tended to pool between 2000 and 2500 billion barrels (Gb) of oil (averaging ~2200Gb), the 2000 study upped that estimate to 3345Gb (a 52% increase over the average for the past 20yrs).[574] Moreover, as can be seen inFigure 11, several other studies conducted around the same time as the USGS analysis appear to pool around a higher estimate: between 1998 and 2004, the average estimate is ~2900 GB). Some subsequent estimates have

[574] USGS World Energy Assessment Team, *World Petroleum Assessment 2000*.

been even higher, including those made by the IEA: as part of the in-depth oil supply study conducted for the 2008 WEO, the IEA reassessed the USGS estimates using updated numbers, and consequently upped their estimate to 3570gb (though, as Sorrell and Speirs note, a cost-curve contained in the 2008 WEO implies a much higher estimate of 4276gb, though this may include 'conventional oil produced by unconventional means', i.e., extremely marginal conventional oil resources, that the lower estimate does not).[575] Regardless, the IEA's reassessment places it among some of the most 'optimistic' estimates of URR over the past several decades.

[575] Sorrell and Speirs, *Methods of Estimating Ultimately Recoverable Resources*, 175–176.

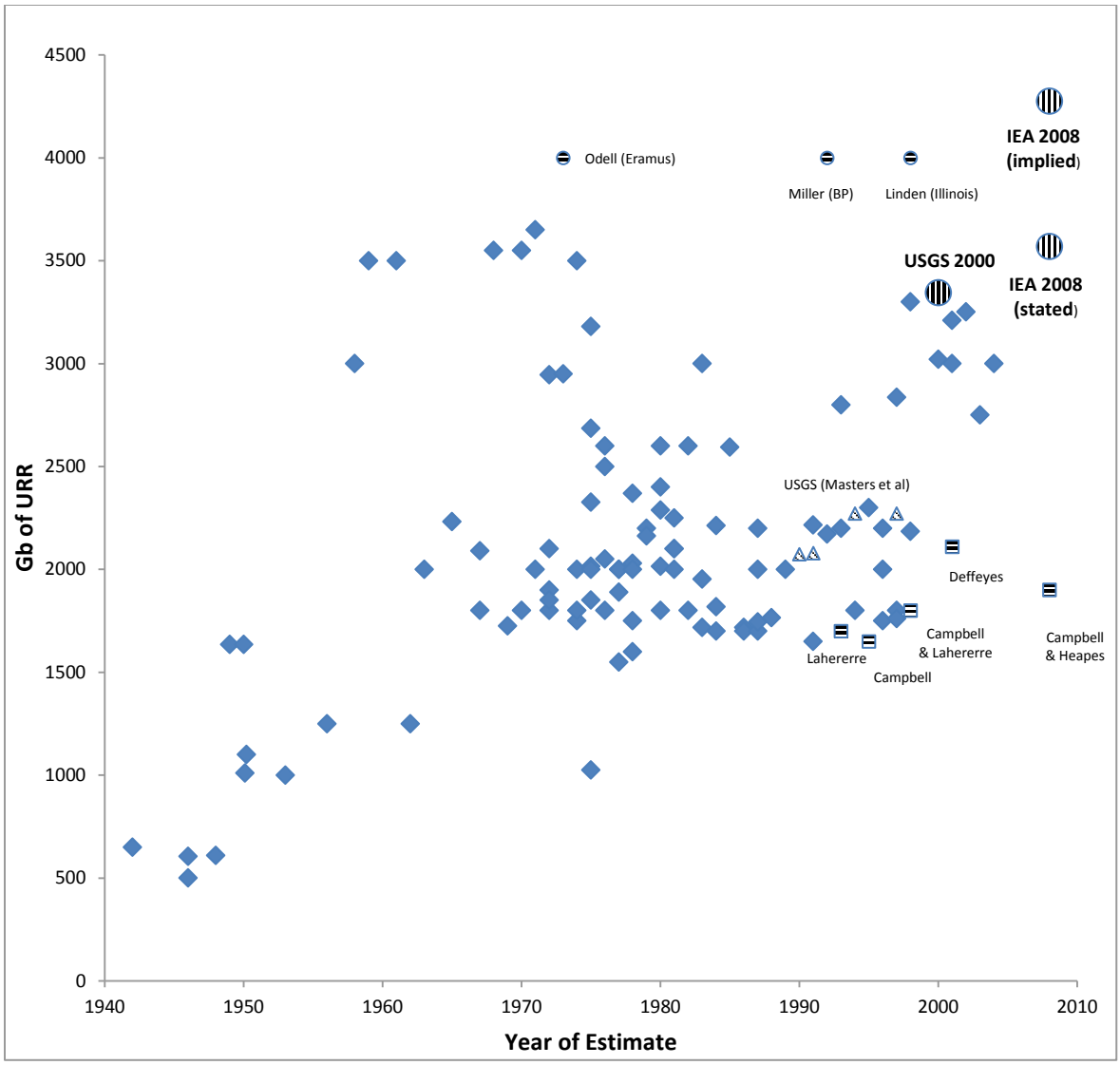

Figure 11) Estimates of Ultimately Recoverable Resources - Adapted from Sorrell & Speirs 2009

This chart shows the range of estimates of URR made between 1940 and 2010. USGS estimates prior to the 2000 study are represented by a triangle; peak oil estimates by a box with horizontal lines; optimistic estimates by a circle with horizontal lines. The USGS 2000 and IEA 2008 (implied and explicit) estimates are marked)

As alleged by Bentley (and seemingly confirmed from Figure 11) the USGS 2000 ushered in an era of significantly higher estimates of URR, thereby enabling Birol to 'toss out' all of Bourdaire's previous work on supply and resort instead to concentrating on

demand (see section on methods below). But what accounts for the dramatic shift seen in the late 1990s in global estimates of URR, and why did more pessimistic estimates not also shift upwards at this time? According to Ahlbrandt, project lead for the USGS study, the increase represents the larger paradigm shift in the industry at this time, which he described (as noted above) as a transition from a static view of petroleum resources to a 'dynamic' perspective. There are several technical components to this shift: a revised classification scheme (the 'total petroleum systems/assessment unit' scheme); a different methodology from past USGS reports for estimation of undiscovered resources (Masters et al., used the Delphi method to conduct estimation, Ahlbrandt et al., used Monte Carlo simulation); and the inclusion of reserve growth for known fields, based on the US as an analogue for the rest of the world. All three of these components were contentious at the time.

At the time the USGS was preparing to conduct its study, Petroconsultants possessed the best database on world 2P reserves (from which it would be possible to estimate reserve growth), though (as Laherrère confirmed) the Petroconsultant database was stuck in the 'old' paradigm while Ahlbrandt et al., wished to move to the 'genetic' approach based on the total petroleum system (TPS) / assessment unit (AU).[576] The notion of petroleum system, according to Laherrère, was first introduced by a French geologist Allan Perrodon with whom Laherrère worked at Total (though the relevant chapter in the USGS 2000 report cites Dow 1974 as the progenitor of the systems-based approach).[577]

[576] Laherrère, Interview; Ahlbrandt, Interview, Part 1.

[577] L.B. Magoon and James W. Schmoker, "The Total Petroleum System - The Natural Fluid Network That Constrains the Assessment Unit," in *World Petroleum Assessment 2000*, vol. Chapter PS, U.S. Geological Survey Digital Data Series DDS-060 (Denver, CO: U.S. Geological Survey, 2000),

The idea was 'picked up' by Les Magoon (said Laherrère), who worked with Ahlbrandt on the study.[578] Similarly, the notion of the 'assessment unit' was an extension of past prospect/play analysis, developed by Magoon in order to 'reduce confusion' that may have resulted from using the play-based approach alongside the TPS scheme. The difference between the old and 'new' method was basically this: whereas the old approach to estimating URR looked at plays (i.e., geologic basins wherein petroleum was present), the new method considered the system in which the basin was found, including in addition "all genetically related hydrocarbons," discovered and undiscovered, occurring around the main play and whose 'provenance' was a "single pod of active source rock" (a difference Ahlbrandt described as 'counting cans of beans' in the older method versus looking at where the beans came from in the newer approach).[579]

Accordingly, the USGS study began by mapping 937 geological 'provinces' (encompassing a single geologic entity), and ranking them according to known petroleum resources (i.e., cumulative discoveries) using the Petroconsultant and NRG Associates, Inc. (for US and Canada), databases. Then they identified within those provinces 159 of the most important TPSs (comprising 270 AUs), which, based this data, comprised about 2.4 trillion BOE.[580] According to Ahlbrandt, this alone was a somewhat radical departure

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http://pubs.usgs.gov/dds/dds-060/; Wallace G. Dow, "Application of Oil-Correlation and Source-Rock Data to Exploration in Williston Basin," *AAPG Bulletin* 58, no. 7 (July 1, 1974): 1253–62.

[578] Laherrère, Interview.

[579] L.B. Magoon and James W. Schmoker, "The Total Petroleum System - The Natural Fluid Network That Constrains the Assessment Unit"; Ahlbrandt, Interview, Part 1.

[580] This ranking, the authors note, is useful mainly because of its relevance to US energy security – both provinces that have historically been important and those in which large undiscovered resources exist close to existing infrastructure (and thus with potentially low marginal costs of development) rank highly. The alternative would be to rank according to remaining reserves, but this would rank provinces with high cumulative production lower, and not adequately rank provinces that are largely unexplored. In short, the method used is directly related to the goal of the study – to rank order parts of the world most important to US energy security, both in the present in the future. T.R. Klett, James W.

from accepted methodology – when he first officially presented the report at the World Petroleum Conference in Calgary shortly after its publication, the first questions he received following the presentation asked, "Where are the structures?"[581] The audience was not concerned with where the oil came from (i.e., source rocks) but where it was (i.e., plays), because in the minds of people operating out of the old paradigm, "those where the true things."[582] The method nevertheless caught on, and today Ahlbrandt noted, you would be hard-pressed to find any petroleum geologist, operating in the US at least, that did not work out of the TPS perspective.

What the USGS report did next was, however, even more controversial (among some critics) – they made estimates of the undiscovered resources and the potential world reserve growth from known fields over a 30 year time span. For the latter, using a method they term the 'Seventh Approximation' technique, they assigned probabilities to a number of parameters for the AUs identified in the first part of the study and, incorporating the input of an assessment geologist for each AU (and/or play, where applicable),[583] they then utilized a Monte Carlo simulation model (run in a program called 'Emc2') to estimate the extent of undiscovered resources with probability distributions. The data collected on the assessment form was reviewed by the Assessment Meeting Team, and the assessment process took the "unusual step" of

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Schmoker, and Thomas S. Ahlbrandt, "Assessment Hierarchy and Initial Province Ranking," in *World Petroleum Assessment 2000*, vol. Chapter RH, U.S. Geological Survey Digital Data Series DDS-060 (Denver, CO: U.S. Geological Survey, 2000), 8, http://pubs.usgs.gov/dds/dds-060/.

[581] Ahlbrandt, Interview, Part 1.

[582] Ibid.

[583] By my count, the team consisted of 25 province geologists in total, and most provinces were assessed by one person only. See "Members of the U.S Geological Survey World Petroleum Assessment 2000 Team," in *World Petroleum Assessment 2000*, vol. Chapter LS, U.S. Geological Survey Digital Data Series DDS-060 (Denver, CO: U.S. Geological Survey, 2000), http://pubs.usgs.gov/dds/dds-060/.

precluding any non-USGS personnel from attending, in order "to ensure that the World Petroleum Assessment 2000 remained fair, honest, and objective," and that the process "served no particular agenda, within or outside of government, and was not influenced by special interest groups."[584]

The main difference between this approach and that utilized by Masters et al., in the previous USGS study is that Masters et al. used the Delphi method whereas Ahlbrandt et al. used a simulation model. Ahlbrandt described the older approach as a 'subjective' approach, noting that the group of 8 ('senior gentleman') experts that composed the team back then where viewed as 'insular' from the rest of the petroleum geology crowd. (Ahlbrandt also mentioned that Masters and Bourdaire where friends, and both had a "don't rock the boat mentality". When Ahlbrandt tried to convince the IEA of the 'new perspective' at the 1997 workshop on supply, he was therefore not heeded, given both the personal and scientific connection to the status quo, in his opinion).[585] The result was a 20% increase in undiscovered oil resources (i.e., 649gb), a 14% decrease in gas, and 130% increase for natural gas liquids (NGLs) over the estimates in Masters et al.[586] Laherrère, however, was not impressed by the switch to a probabilistic approach, and questioned the estimates of resources for several assessment units. When he tried to follow up on one (relatively unexplored) unit in particular, to find out how the assessor arrived at his conclusion, no one was able to provide him with the data. Whereas the old approach made estimates based on the input of a team of experts, Ahlbrandt, Laherrère

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[584] T.R Klett, Ronald R. Charpentier, and James W. Schmoker, "Assessment Operational Procedures," in *World Petroleum Assessment 2000*, vol. Chapter OP, U.S. Geological Survey Digital Data Series DDS-060 (Denver, CO: U.S. Geological Survey, 2000), 8, http://pubs.usgs.gov/dds/dds-060/.

[585] Ahlbrandt, Interview, Part 2.

[586] USGS World Energy Assessment Team, *World Petroleum Assessment 2000*.

argued, only asked one geologist – Les Magoon (Magoon being the assessor for the unit in question). Without reliable data, he argued, even the best analytical techniques will not be productive: as he phrased it, "they made beautiful graphs from bullshit; for me, its garbage in, gospel out."[587] As noted above, Bourdaire used the same idiom to describe the USGS 2000 report.[588]

The other, perhaps even more contentious move of the USGS 2000 study was to include reserve growth for the first time. As noted earlier, reserves are known recoverable resources and reserve additions are the changes from year to year that stem from production (declines) and gaining a better understanding of the field and increased drilling activity (additions). Reserve growth is a more fundamental and aggregate form of addition, in which technological, scientific and economic change over time shift the limit of 'recoverable'. Reserve growth was not unknown at the time (Ahlbrandt suggested that Masters was aware of it) and is generally accepted as a real phenomenon, though it had never been incorporated in a USGS study previously, perhaps because of the extreme paucity of global data on the subject which made realistic estimates difficult.[589] Nevertheless, and in contrast with the complex and thorough methods for measuring known and undiscovered resources noted above, the 2000 study incorporated this factor using a very 'crude' method – taking the US historical experience as an analogue and extending it to the world. The result of this inclusion was to add another 612 GB of oil over the previous study (which had never included this factor in the first place).

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[587] Laherrère, Interview.

[588] Bourdaire, Interview.

[589] Ahlbrandt, Interview, Part 1.

The problem, according to both Laherrère and Bourdaire, was that the US data they had and on which they constructed their reserve growth parameter was 'corrupted' by the SEC regulations that required that only reserves for which there was 'reasonable certainty' of being brought to market in the near term could be reported. As a result, US data was generally 1P data (or even 'lower', i.e., more conservative). Because these figures were never meant to be an accurate estimate of reserves, they were in effect engineered for artificial reserve growth – remaining static (or even increasing) year-after-year as companies adjusted their near-term definition of 'reasonably certain.' Even the IHS data was somewhat suspect, as it was quite old and some of the growth factor could be due to updating and revising the database itself (instead of representing something that was actually occurring in the real world).[590] According to Bourdaire, the USGS did not therefore use "an unbiased estimate of reserves;" echoing Laherrère, he suggested it is "garbage in, gospel out."[591] For Laherrère: "they don't have the data, but they are dreaming it; it's made in a pure dream." Ahlbrandt, when asked about this issue, suggested it was a "silly" concern, since the petroleum systems outside the US are generally of much better quality and therefore are likely to experience the same if not more reserve growth (also, production techniques and profiles are perhaps more refined than they may have been when the US oil production industry first began in the late 19th century). In fact, given the chance to do the study over again, he said he would have used an even higher reserve growth factor.[592] Indeed, a follow-up evaluation of the 2000 study done in 2005 (by Klett, Gaudier and Ahlbrandt) looked at how discovery and reserve

[590] According to Laherrère, Interview.

[591] Bourdaire, Interview.

[592] Ahlbrandt, Interview, Part 1.

growth had performed in the eight years since the year of the IHS data the 2000 report used (1996-2003).[593] This period accounted for approximately 27% of the original thirty-year outlook, so in principle reserve growth and discovery rates in this time should have proceeded at the same rate. In fact, the study found that 28% of the total estimated reserve growth had occurred (remarkably in line with the hypothetical trend), but only 11% of expected discovery had occurred. Ahlbrandt suggested that the reason for the differential success was that it was primarily due to economics – it just makes more economic sense to continue to develop known resources then to conduct exploration. Nevertheless, as noted in the Heads in the Sand report from 2009, the required discovery rate to meet the USGS estimate of URR in the period specified – given the poor performance to date – seems remarkably optimistic when looking at the historical record (Recall Figure 9 above).

It is important to note however that the USGS report was not intended to be a prediction, forecast or projection (though it did make some observations about the future). The purpose of the report was explicitly to estimate the quantity of recoverable conventional oil resources for purposes of US energy security. Though it included as a part of this some estimates of how much oil *could* be discovered or how much reserves *could* grow in the period running to 2025, it did not venture to say anything about how much of that would probably (or plausibly, for that matter) be realized. The methods used by the USGS 2000 team do dispose it to a larger estimate than past studies by the department, but it is not clear that this was done with an ulterior agenda (i.e., bias) of exaggeration or by concealing or willfully excluding any evidence. Moreover, as noted

[593] T. R. Klett, Donald L. Gautier, and Thomas S. Ahlbrandt, "An Evaluation of the U.S. Geological Survey World Petroleum Assessment 2000," *AAPG Bulletin* 89, no. 8 (August 1, 2005): 1033–42.

by Sorrell et al., even relatively large differences in URR mean little in determining the date of 'peak' oil supply. For example, they note that, using a simple logistic model, increasing global URR by 1 billion barrels only shifts the peak 4.7 days (the difference between a low estimate of 2500gb and a high one of 4500gb thereby being a peak in 2009 versus 2032).[594] While that may sound like a significant difference, the authors suggest otherwise – given the scale of the discoveries required to significantly shift the date of peak production, and the fact that this analysis hasn't yet factored in economic and political questions about whether or how these resources could be brought to market, "the range of uncertainty over the date of peak production must be significantly less than the range of uncertainty over the size of the resource." Quoting Brandt 2007, they add that as a result, "Hubbert-like theories based on good estimates of ultimate recovery cannot be wrong by decades, regardless of the details."[595]

Not all WEOs explicitly mention the dates around which they see conventional oil peaking. The most bullish of the WEOs by highest projected production rate, the 2004 issue, includes some sensitivity analysis based on probabilities around the USGS mean URR estimate (i.e., a 10% likelihood of 3200 of the 3345 GB that could be developed and a 90% case of 1700 GB becoming available). The dates of the conventional peak range from between 2013-2017 for the conservative case and 2033-2037 for the optimistic one (under which production peaks at 142mb/d!).[596] Also, it should be noted that the 2008 WEO does not see conventional crude production peaking before 2030

[594] Sorrell and Speirs, *Methods of Estimating Ultimately Recoverable Resources*, 179.

[595] Adam R. Brandt, "Testing Hubbert," *Energy Policy* 35, no. 5 (2007): 3074–88; cited in Sorrell and Speirs, *Methods of Estimating Ultimately Recoverable Resources*, 179.

[596] International Energy Agency, *World Energy Outlook 2004*, 102.

either, though it does 'level off'. In the 2009 WEO, non-OPEC production peaks around 2010 and declines afterwards though, as before, unconventionals step in to ensure a steady increase in total liquid fuels production.[597] The same is true for the 2010 WEO.

In short, the WEO does not foresee oil production 'peaking' under any scenario, in any issue, post-USGS 2000. This is a testament to the role that the inclusion of reserves growth and future discovery play in prolonging the date of the peak in the projections. That being said, as the Heads in the Sand report suggested, the IEA does continue to use what appear to be optimistic assessments of future discoveries, even after the USGS update found that to be considerably lower than would have been required to meet its 2025 value. As of the 2008 WEO, the figure for potential new discoveries is 805 GB, down 14% from the original USGS figure. As indicated by Figure 9, to achieve that by 2030 would be quite a feat. Moreover, this figure jumps to 900 GB in the 2010 WEO, the reason for which is not explained.[598] Possible reasons why the IEA continues to use such high figures are two: a) it would seem unlikely for the IEA to question the USGS report figures, beyond noting their uncertainty; b) it expects the lion's share of additions to come from OPEC in the future, which to date has seen little and for which their data is less reliable. Table 2, adapted from the 2008 WEO and several others, shows the evolution of their numbers for the main reserves and resources variables.

Can the USGS 2000 report be labeled as "overly-optimistic"? That much is not clear. It does appear that the publication of the report certainly provided a benchmark around which subsequent estimates of URR may orient themselves, however; a benchmark

[597] International Energy Agency, *World Energy Outlook 2009* (Paris: OECD/IEA, 2009), 85.
[598] International Energy Agency, *World Energy Outlook 2010*, 117.

significantly higher than had existed in the 1980s and 1990s. This in effect shifted the boundaries of what is considered a fringe estimate of URR, and even though the significance of the number for determining peak oil supply may be small, this enables a more optimistic outlook for oil supply potential. Also, it should not be forgotten that the timing of the USGS report coincides with the onset of the first term of the Bush Administration in the US that, though not being in place to commission or design the report from the ground-up, certainly was in a place to respond to the implications of its findings. Perhaps Ahlbrandt had this in mind to an extent when he noted that "very significant political decisions" are made on specific numbers.[599] In any case, the main result of the change in outlook was to change the implications of balance and limits in oil futures – if resources were not the limit to balancing demand with supply, then something else could be (i.e., a lack of investment and/or production/decline rates).

	0. Proven Reserves (i.e., 1P)	1. Initial Reserves (i.e., 2P?)	2. Cumulative Production	3. Reserves Growth	4. Undiscovered Resources	5. URR (1+3+4)	6. Remaining Reserves (1-2)	7. Remaining Recoverable Resources (5-2)
USGS		*1676**	*717*	*730*	*939*	*3345*	*959*	*2628*
2001 WEO	845 – 1100							
2002 WEO			718		939	3345	959	2627
2004 WEO	1051 – 1266		717	730	939	3345	959	
2006 WEO								
2008 WEO	1120 – 1322	2369	1128	402	805	3577 – 4077	1241	2449
2010 WEO	1354				900			~2500

Table 2) Summary of WEO Reserve/Resource Estimates (billion barrels)

The 2008 WEO, despite being the WEO that ushered in a more 'realistic' assessment of conventional production, in fact ups the overall estimate of global URR. As the

[599] Ahlbrandt, Interview, Part 1.

Sorrell and Speirs article note, even this figure is confusing, because the supply curve they provide seems to indicate a global conventional URR of over 4000 GB, which places them very near the top of all historical estimates of URR.[600] The primary contributor to that addition is approximately 500 GB of "conventional oil produced by unconventional means", specifically by various types of enhanced oil recovery, the inclusion of Arctic resources, and ultra-deepwater drilling. It is not clear if these forms of reserve additions were considered in the original USGS 2000, but if indeed they were then the IEA would be effectively double-counting them.

9.2.3) Rates

The last set of numbers that has been problematic are those concerning rates: rates at which fields decline after their peak production; the overall 'recovery' rate that is seen as achievable in the future; and, as noted earlier by Aleklett, the 'realistic' rate at which reserves can be depleted (i.e., the production rate).

The field-by-field study conducted for the WEO 2008 was what prompted the relatively significant drop in oil supply projections, mainly because the IEA analysis suggested a higher post-peak production decline rate than had been assumed earlier. Using data provided primarily by IHS[601], the IEA conducted an in-depth analysis of 798 oilfields worldwide, a set which the IEA notes includes the world's 54 supergiant fields (fields with reserves greater than 5gb) and the bulk (264 of ~320) of giant producing fields (reserves > 0.5 Gb). The other 481 fields are large (reserves > 0.1 Gb) or small

[600] Sorrell and Speirs, *Methods of Estimating Ultimately Recoverable Resources*, 175–176.

[601] Other data sources included the USGS, the US EIA, and official statistics published by governments of oil-producing countries, international and national oil companies, and oilfield services and consulting companies. International Energy Agency, *World Energy Model: Methodology and Assumptions* (Paris: OECD/IEA, 2009), 22.

(reserves between 50 and 100 million barrels). This breakdown, they note, was "partly driven by data availability", though the set is considered "reasonably representative" of the actual geographic distribution of all fields in production today. Data on each field included annual production; initial and remaining 2P reserves; volume of oil originally in place; the lithology of the field; the physiographic location (onshore/offshore, shallow/deep water); and the discovery date. For some fields, they also included reservoir porosity and thickness, as well as the deployment of improved recovery techniques. To establish the production profiles by field type, they conducted regression analysis of these variables for fields that had been in production for at least 20 years (noting that though this method does show the most informative variable, it does not provide "efficient predictions" of the curve since variance within each group is high).[602]

Post-peak decline rates were calculated by weighting production for each field by the cumulative production over the lifetime of the field, a method that entails that the average for a type or region of fields includes the level of production for each field. This analysis was done for a smaller set of 580 fields, which, the IEA notes, produced nearly 60% of world production in 2007 (40.5mb/d). However, by number of fields, 580 fields accounts for less than 1% of all currently producing fields (>33,000). Because of this limitation, they note, "it is impossible to know precisely what the observed decline rates are" for all fields, but it is nonetheless "reasonable" to assume they will on average be at least as high as the larger fields in the IEA database. However, "in reality," they continue, decline rates for remaining fields "are likely to be somewhat higher," since the remaining fields are generally smaller and decline rates were found to be inversely proportional to

[602] International Energy Agency, *World Energy Outlook 2008*, 110.

field size (i.e., bigger fields, lower decline rates).[603] The IEA assumes that the aggregate decline rate for all fields is, however, the same as their finding for large fields, an assumption they note is thus "somewhat optimistic."[604]

They also looked at the natural decline rate of fields, which is the decline rate that would have taken place absent any additional investment or development, which they calculated by a top-down approach that strips out the increases in production that could be associated with investment over a five-year period (an approach they note necessarily depends on the exercising of expert judgment). This is in some sense a notional figure only, since few fields are ever left to produce without further development work. However, it is useful to determine the amount of investment that is needed to offset an otherwise 'natural' process of decline. What these rates say about the future is mixed – though there is little reason to suspect that the natural decline rate of any given field will change in the future, the aggregate decline rate could with the shift to smaller reservoirs and offshore, deepwater fields (which would increase the natural decline rate). Conversely, more new developments from onshore locations in the Middle East (where rates are lowest because fields are larger) will partially offset the effects of declining field sizes.

How might these numbers contain bias? For one, because the depletion rate varies according to field size, location, and regional distribution (i.e., the production profile of a field), a single average figure for all fields will be conservatively biased by the immense scale of reserves and low depletion in OPEC. Secondly, it is likely that the IEA's

[603] Ibid., 245–246.

[604] International Energy Agency, *World Energy Model: Methodology and Assumptions*, 2009, 35.

estimates of decline rates prior to gaining access to the IHS data where made on the basis of 1P data. Recall that because 1P estimates are intentionally low, looking at that trend would inflate 'growth' factors artificially. Estimates of decline rates based on the trends in cumulative production and proven reserve growth would thus be biased to the low side and therefore depletion of remaining reserves biased towards an optimistic outlook. As suggested above, the WEOs between 2000 and 2008 did typically discuss the problem of decline rates, noting that their estimates for the natural decline rate varied across regions (between 2 and 11%). They do not, however, give a figure for decline rates outside of that, but according to the interview between Birol and Monbiot, it was much lower than the finding in the 2008 WEO.[605]

The scale of investment believed to be required to 'prove up' the necessary reserves should indicate the difference in methodology, since the scale of the challenge presumably became much larger post-2008. The 2001 Special Issue was the first WEO that calculated investment required to bring energy resources into the market. Noting that "global oil production need not peak in the next two decades if necessary investments are made,"[606] and, in particular, avoiding a 'supply crunch' would require "large and sustained capital investment...in Middle East OPEC,"[607] the report estimated a total investment of $1.3t in 2000 dollars, would be necessary to meet projected supply (61.8 mb/d for OPEC, 46.1 for non-OPEC by 2020).[608] Investment analysis began in earnest in the 2003 Special Issue WEO, however, which estimated a total cost of $2.2t (2000$) to

[605] Birol 2008

[606] International Energy Agency, *World Energy Outlook 2001: Assessing Today's Supplies to Fuel Tomorrow's Growth* (Paris: OECD/IEA, 2001), 32.

[607] Ibid., 36.

[608] Ibid., 75.

reach 120mb/d by 2030.[609] In 2004 this number increased to $3t (2000$) to meet 121mb/d. Interestingly, the 2004 WEO notes that only a quarter of upstream investment would go into meeting rising demand, the rest to offsetting natural production declines.[610] In 2006, investment requirements rose to $4.3t in 2005$ for 116mb/d by 2030, 73% of which was for 'upstream' (i.e., production).[611] Finally, in 2008, upstream investment alone reached $5t (2007$) to hit 106mb/d by 2030.[612] In the 2010 WEO, total investment in the oil-supply infrastructure by 2035 is projected to reach $8t (2009$) to meet production of 107mb/d. A rough calculation, to put into real terms, shows that the total investment required grew from $3 in 2004 to $3.8t in 2006 (of which $2.7t was for upstream), and then again to $4.2t for upstream alone in 2008, and then to $6.5t overall in 2010. Basically, the required upstream investment to meet nearly 12% lower production target doubled between 2004 and 2010.

On an annual basis, the 2008 issue paradoxically notes, that is actually significantly less than was currently being spent at the time, though the likelihood of those investments actually being made was much more uncertain.[613] Investment projections are evidently tricky, since it is precisely the regions where the oil is that are by-and-large not subject to the same market pressures as private industry. The reason why the WEO could foresee lower annual investment was that a very large share of future production in the 2008 Reference Scenario accordingly had to come from areas not fully open to foreign investment (but with lower production costs, i.e., OPEC). This raises the uncertainty of

[609] International Energy Agency, *World Energy Investment Outlook 2003* (Paris: OECD/IEA, 2003), 43.
[610] International Energy Agency, *World Energy Outlook 2004*, 120–121.
[611] International Energy Agency, *World Energy Outlook 2006*.
[612] International Energy Agency, *World Energy Outlook 2008*, 324.
[613] Ibid, 303-4

whether that investment will in fact be forthcoming. For example, the 2006 WEO notes that 37% of world resources are under the control of national oil companies only, and another 13% with only limited access by private companies.[614] Thus the 2008 WEO adds, "the sheer scale of the investment needed raises questions about whether all of the additional capacity we project will be needed will actually occur."[615]

In short, once the IEA conducted the bottom-up study, it seems that production rates > 110 Mb/d within the projection period became untenable. This has not removed the potential for bias, however. As noted by the IEA itself, though its sample of field data comprised over 40% of global production, it accounted for less than 1% of the total number of fields, many of which are smaller and prone to more rapid decline. This is in part due to geological factors, but also due to the different 'production profiles' that firms may use for fields of different sizes. Because the IEA relies on an average estimate of decline rates (based on their sample of large fields) and because it utilizes a standard production profile, there is a possibility of bias towards an optimistic assessment if the global supply portfolio shifts increasingly to smaller, offshore fields, and if industry significantly changes its calculation of net-present value (e.g., if firms move to value the long-term more, the IEA's projections may end up being too optimistic about future production rates).

In any case, it was on the basis of IHS' backdated 2P data that the IEA was able to arrive at its findings for aggregate decline rates, an important driver of the 2008 WEO's lower oil supply projection. Caruso agreed that this, in combination with the revised oil

[614] International Energy Agency, *World Energy Outlook 2006*, 105.
[615] International Energy Agency, *World Energy Outlook 2008*, 104.

price assumptions, probably meant for a more "realistic" projection for conventional crude, a sentiment echoed by Bentley, who noted that when Birol was finally permitted to conduct his field-by-field analysis, "a whole new realism comes in."[616] In other words, when the IEA finally conducted a serious analysis of oil supply based on 'real' discovery, production, and reserve addition data, it was clear that production from many fields was declining faster than would have been concluded from just looking at production and 1P reserve data. According to Bentley, "peak oil falls out of the numbers."[617]

But does it? Though the 2008 WEO ushered in a new era of WEOs with significantly lower total production rates at the end of their projection period, they nevertheless did not envisage global conventional oil peaking at any point, as noted above. In fact, as the Heads in the Sand report indicates and the previous section noted, the 2008 WEO actually ups the estimate of global URR, based mainly on the category of "conventional oil produced by unconventional means" that apparently was not included in the USGS 2000 reserve addition estimates. If anything, an increase in the estimate of URR coupled with a lower projected production rate suggests the peak will occur even later than had been envisaged during the ostensibly more "bullish" meso-period WEOs (2000-2007). So perhaps peak oil has not in fact fallen out of the more accurate 2P numbers.

According to the anonymous interview participant the emphasis on decline rates in the 2008 WEO was to help "sell the story" (what 'story' will be discussed below), despite his position that what really mattered (in terms of future supply) was the total *recovery rate.* The IEA defines the recovery rate as the total recoverable reserves, including that

[616] Caruso, Interview; Bentley, Interview.
[617] Bentley, Interview.

already produced, expressed as a percentage share of the original hydrocarbons in place.[618] In other words, the recovery rate is an expression of URR versus oil originally in place (OOIP). "New information" and technology drive the recovery rate up (to its eventual max at URR; OOIP is higher because not all oil is recoverable – see Table 1 above). Basically, the recovery rate represents the IEA's two assumptions of oil prices and technology advance, which drive reserve growth, and it is very important in their approach to estimating future supply.[619]

The WEOs prior to the 2008 issue modeled long-term supply via a top-down 'resource depletion model,' which, according to the 2000 WEO, took "into account" URR (in turn depending on the recovery rate.) In the 2001 WEO, they note that a 1% increase in the recovery rate adds 60 GB to 'reserves,' by which they mean that it "proves up" that quantity of resources. Taking an estimate of 6t barrels of OOIP, they show the progression from a 30% recovery rate giving 1700gb of URR to a 50% recovery rate giving 3000gb of URR (the latter a close approximation of the USGS mean estimate).[620] In the 2008 WEO, the ratio between a 1% increase in a depletion rates and additions to URR was upped from 60 GB to 80 GB. A special section in the 2008 WEO discusses the potential for recovery rates to reach 50% from its present rate of ~35%, noting that it could take "much more than two decades", though this would add about 1200gb to world proved reserves.[621]

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[618] International Energy Agency, *World Energy Outlook 2008*, 210.

[619] International Energy Agency, *World Energy Outlook 2002*, 95..

[620] International Energy Agency, *World Energy Outlook 2001: Assessing Today's Supplies to Fuel Tomorrow's Growth*, 50.

[621] International Energy Agency, *World Energy Outlook 2008*, 212.

The final contributor to greater 'realism' of post-2008 WEOs appears to be a rethinking of OPEC's contribution. Table 3 shows the highest projected production rate for conventional oil for each general WEO between 1998 and 2010 and the share of OPEC/Non-OPEC in producing it. The figures are for conventional oil only because it controls for the 'balancing effect' that unconventional oil often serves in the scenarios. Also, they include NGLs because prior to 2006, the WEO did not differentiate NGLs from crude in the regional supply breakdown. Between the years of 1998 and 2004, the WEO projected a very large proportion of supply coming from OPEC – well above the historical record of 53% set in the 1970s. Between 2006 and 2008, OPEC's total production falls back somewhat and its global share of supply is closer to its historical max (though still exceeding it). Also, note that non-OPEC supply projections have remained nearly static across all the WEOs - with the curious exception of the 2006 WEO, they have generally been around ~43mb/d – whereas the OPEC projections vary quite largely.

The difference between the most bullish and most bearish WEOs on future conventional crude production is -14% - only slightly more than the differences including unconventional (~-12%), suggesting the latter does not play as huge a balancing role as it did in 1998. When NGLs are taken out of the equation, the difference between the middle and late period WEOs becomes a bit starker. The WEO includes NGLs in Crude Oil up to 2004, so 2006 is the latest of the middle-period WEOs. The difference in long-term outlook between that year and 2010 for conventional crude oil is -17%. However, the difference between the most bullish/bearish outlooks (in terms of production rates) for conventional crude and NGLs in OPEC alone (this time 2002 v. 2010) is -21%.

WEO	Year of Projection	**WORLD**	**OPEC**		**NON-OPEC**	
		mb/d	*mb/d*	*share*	*mb/d*	*share*
1998	2020	72.2	45.2	62.6%	27	37.4%
2000	2020	107.9	61.8	57.3%	46.1	42.7%
2002	2030	107	64.9	60.7%	42.1	39.3%
2004	2030	108.2	64.8	59.9%	43.4	40.1%
2006	2030	104.9	54.7	52.1%	50.2	47.9%
2008	2030	95	52.9	55.7%	43.2	45.5%
2009	2030	95.6	52.7	55.1%	42.9	44.9%
2010	2035	93.1	50.9	54.7%	42.1	45.2%

Table 3) Oil Market Share: OPEC v Non-OPEC

WEO	Year of Projection	**WORLD**		**OPEC**		**NON-OPEC**	
		Conv.	*NGLs*	*Conv.*	*NGLs*	*Conv.*	*NGLs*
2006	2030	108.2					
2006	2030	89.1	15.8	45.7	9	43.4	6.8
2008	2030	76	19.8	39.7	13.2	36.3	6.6
2009	2030	76.7	18.9	41.4	11.3	35.3	7.6
2010	2035	73.6	19.4	38.6	12.3	35	7.1

Table 4) Oil Market Share, OPEC v Non-OPEC (NGLs & Conv.)

Therefore, while the adoption of more realistic decline rates in 2008 did play an important role in reducing the WEO's long-run outlook for oil supply, the biggest difference between the middle and late period WEOs is in how they project OPEC production. When factoring in the price assumptions made during the middle period, which as discussed below remained approximately static in real terms over the projection period, the 'unrealism' of the WEO's so-called "call on OPEC" becomes clear – even if OPEC could produce 65mb/d, it is not clear that they would at a static oil price. The later WEOs, specifically those after the 2005 issue (which was a Special Issue on the Middle East), appear to have heeded the advice of New York University professor Dermot Gately

(despite his speculation about whether or not they did)[622] and revised the meaning of 'reasonable' (i.e., the limits to) contribution from OPEC. (As a side note, the 1998 WEO places a hard limit on the contribution from OPEC, thus further constraining its already more conservative assessment).

9.3) Methods

Yet another area of contention concerns the methods by which the IEA produces the WEO and the scenarios contained within. In this section, I will look at three closely related issues: the World Energy Model and its sub-modules; the energy (read: oil) price assumption; and assumptions in general and their connection to the scenarios they frame.

9.3.1) The World Energy Model

To produce the WEO, the IEA relies on its own World Energy Model (WEM), a "large-scale mathematical construct" comprising over 13,000 equations, which it has been developing since 1993 (as of 2011 it was in its 15th generation).[623] The IEA has occasionally released documentation on the WEM,[624] which provides slightly more than a token level of transparency – the basic structure and annual changes and additions to the model are well documented, though in-depth and specific information about how the modeling is carried out, or the actual settings for the numerous parameters and equations required to run the model are not always included (they note that parameters are set 'econometrically', but they rarely state specific numbers for things like discount rates, learning rates, plant efficiency or utilization.)

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[622] Dermot Gately, Interview, interview by James Gaede, May 28, 2013.

[623] International Energy Agency, *World Energy Model: Methodology and Assumptions*, 2011.

[624] I was able to find five such instances: an Appendix section in the 2000, 2002 and 2004 WEOs, and a separate document on the model released in both 2009 and 2011.

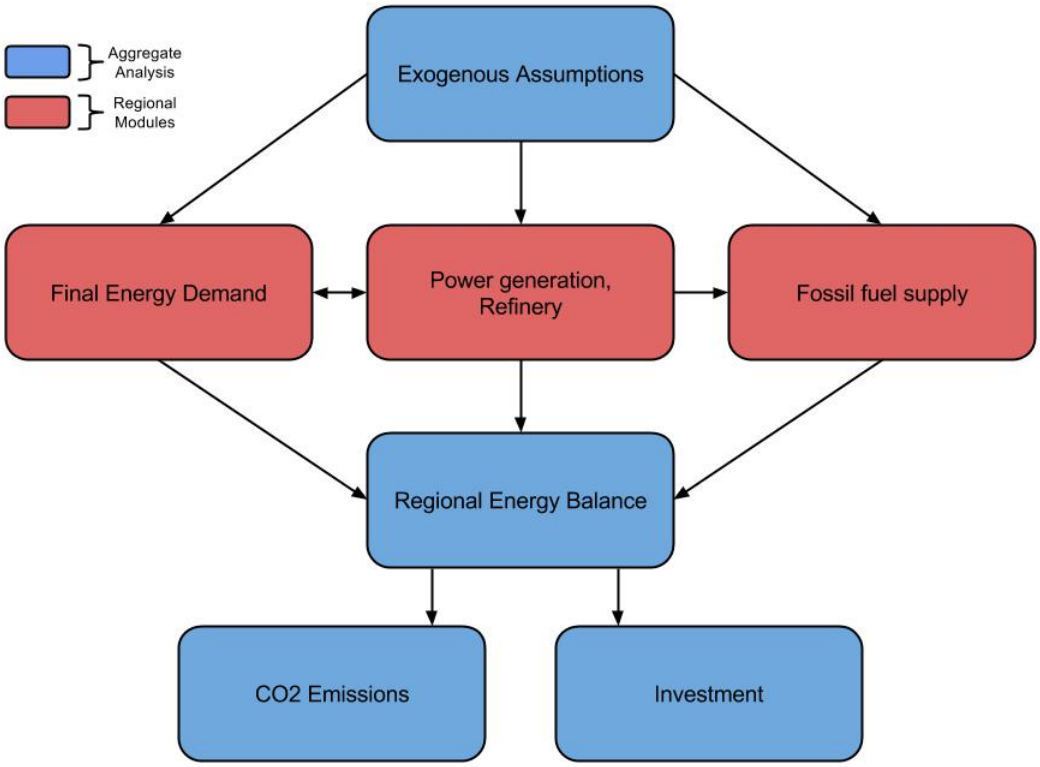


Figure 12) Basic Structure of WEM (Adapted from IEA 2011)

At the basic level, the approach to modeling consists of estimating demand (based on exogenous assumptions about population, economic growth, technological progress and energy prices) and then determining the supply profile based on a variety of factors, including costs, availability, and behavioral parameters. The modeling of demand and supply and global energy balances takes place in six (at present) 'modules': final energy demand; power and heat; fossil fuel supply; refinery; regional energy balances; and the emissions profile module. The two modules that are most directly relevant to this study are the power generation and fossil fuel supply modules.

In the 2000 WEO, the approach to modeling power generation was to establish supply on the basis of levelised cost, though the contribution of renewables and nuclear was set by exogenous assumption (the documentation notes that these are still 'influenced by international fossil fuel prices to take account of price incentives to develop such plants', though the assumptions around fossil fuel prices in the mid-era WEOs suggests that perhaps they were not much of a driver).[625] This changed for renewables in the 2002 WEO, when their contribution to generation began to be modeled based on "detailed cost-curves" in the OECD regions. In 2004, the modeling of renewables moved into its own more detailed sub-module, developed by the Energy Economics Group at the Vienna University of Technology. The new sub-module computed renewables generation by long-term marginal costs using dynamic cost curves for each region (i.e., incorporating learning), but also incorporating financial incentives and barriers, and social and technical constraints to their deployment as well. The latter factors provide a 'starting point' for modeling renewables – their "long-term realizable potential", a subset of their theoretical maximum potential and of the lesser 'technical' potential.[626] This method appears to have been kept unchanged through to at least the 2011 WEO, when the IEA added an additional model to estimate future subsidies for renewables generators.

The fossil fuel supply module, in its earlier formulations, did not really 'model' supply over the long-term. Rather, it took an estimate of ultimately recoverable resources (determined by the USGS 2000 estimate and a 'recovery rate' trend that was itself a function of projected fossil fuel prices and a 'technological improvement factor' – both

[625] International Energy Agency, *World Energy Outlook 2000*, 425.

[626] See International Energy Agency, *World Energy Model: Methodology and Assumptions*, 2009., for a discussion of the evolution of the renewables sub-module.

assumptions set by the IEA) and applied a depletion rate based on historical data (not at the time having access to IHS reserve data) to arrive at non-OPEC supply. That figure, plus unconventional supply (determined by a 'direct link' to oil prices, i.e., a proportional relationship), gave "residual demand", which OPEC was simply 'presumed' to fill. In short, for the long-run analysis at least, the IEA modeled demand, assumed more-or-less maximized production in the non-OPEC regions, and let OPEC "fill the gap" in demand – "analysis by subtraction", as Knapp put it.[627]

Between 1995 and 2005/6, this appears to have been the general approach to projecting oil supply in each WEO, though it increasingly became seen as unrealistic. As Knapp described it, the "original problem" of the WEO was to unproblematically treat OPEC as a swing producer – to model demand and OECD production and assume that OPEC would fill the gap "with nothing about whether they want to, much less whether they actually can."[628] The manner in which they were projecting OPEC supply simply removed any agency on the part of OPEC countries. The 'feedback' relationship to prices that one would assume important if more than 60% of the market was dominated by a cartel was not included in the modeling effort. As described by Knapp, the approach used by the IEA simply estimated capacity utilization in OPEC to gauge the impact on prices – if utilization exceeded 85%, then they assumed there would be upwards price pressure. The problem is (according to Knapp) that capacity is actually 'endogenous', i.e., Saudi Arabia decides what it wants capacity to be in response to a wide array of parameters

[627] Knapp, Interview.This approach was certainly not kept secret – there are multiple places in the WEOs produced during this time that describe the method. The clearest expression is in the Appendix to the 2004 WEO, where it details the submodules of the WEM at that time. See International Energy Agency, *World Energy Outlook 2004*, 545.

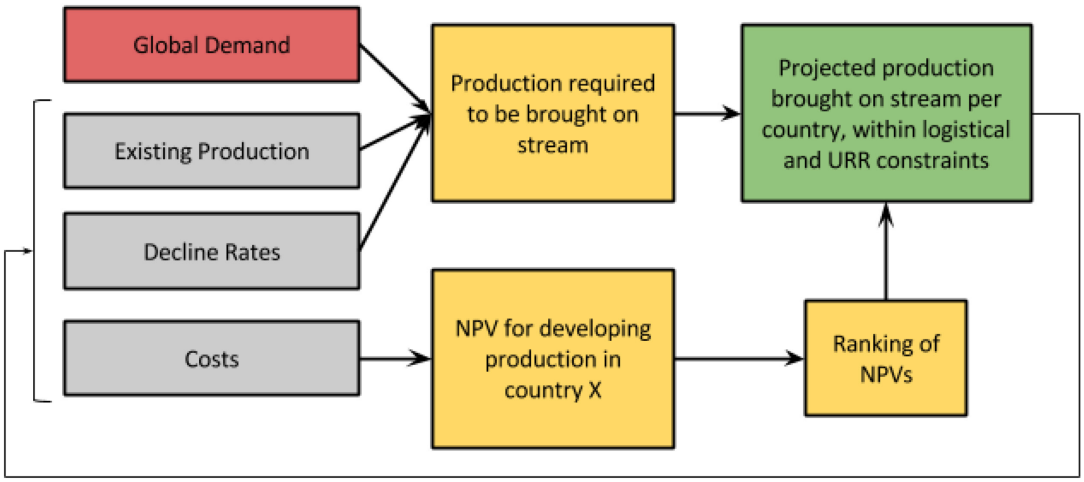
[628] Knapp, Interview.

(prices, geology, strategy, etc.). To assume they would simply produce at the maximum rate irrespective of other developments is therefore unrealistic.

Gately, who was called to consult on the WEO twice in relation to this concern, confirmed in an interview that this was indeed the IEA's approach. As noted above, some WEOs in the 2000s projected OPEC production reaching 60mb/d (64mb/d in the 2004 WEO), but as Gately noted, OPEC would only do this if "they were really stupid," since it would not be their interest to produce at so high a rate as to deflate prices to an undesirable level.[629] According to Gately, economists are trained to assume that people are going to act in their own best interest, so if you create a scenario in which someone does something quite different, you "really have to have a good story behind it." The IEA, in his opinion, lacked such a story: "they have not even asked the question…or at least addressed the question…in a very straightforward way." [630] Though he consulted twice on the WEO between 2000 and 2008, he was unclear whether or not he made any real impact on the WEO methodology. Though the IEA appeared open to listening, he suggested, he was not sure if there might be an underlying approach or theme that was really determining the story.

[629] Gately, Interview.
[630] Ibid.

Figure 13) Oil Supply Module - Simplified



The oil supply model got considerably more complicated in 2008/9. A stripped down diagram of it is available in Figure 13,[631] but a much richer representation of it is available in Appendix D. For one, the model moved to represent production at the country level, and to distinguish for each producing country among six components: currently producing fields, discovered field with planned developments, discovered fields awaiting development, yet-to-be discovered fields, estimated additions from EOR projects, and production of NGLs. Unconventional projects are included both in the 'planned developments' component, and in an additional list of speculative projects set by exogenous expert assessment which is merged with the list of potential conventional projects yet-to-be developed). Second, it incorporated some modeling of industry decision-making in ranking projects (for yet-to-be developed fields but excluding EOR, which is estimated using expert judgment) by their net-present value. As they note, however, the NPV approach, "although powerful in replicating the decision mode of the

[631] International Energy Agency, World Energy Model: Methodology and Assumptions, 2011, 21

industry and convenient in terms of modeling…only reflects the economic dimension of projects and ignores the qualitative factors in assessing the various types of risk which also guide a final investment decision."[632] Third, it incorporates decline rates and the 'standard production profile' for different types of fields, as determined in the 2008 field-by-field study described earlier.

The module makes an additional distinction, represented by a binary variable, between countries open or closed to investment, in order to set exploration, development and maintenance budgets year after year (the former being linked to production and market prices, the latter by 'decisions and plans' of the national companies) in the 'exploration sub-module'.[633] Though this distinction closely maps that between non-OPEC and OPEC, it is not identical – several OPEC nations are considered open (including Algeria, Angola, Ecuador, Libya and Nigeria). This distinction also differentiates the modeling of discovery for either group. To model production from yet-to-be discovered fields, the IEA uses a creaming curve that plots cumulative discoveries against cumulative exploration wells ('new wildcats') drilled.[634] In principle, such a

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[632] The main variables of the NPV model include: total capital expenditures; annual production, assuming a standard production profile; a discount rate for weighted average cost of capital; the price threshold per barrel (a function of market prices at the time of the decision and the onshore/offshore location of the project); the estimated government's take; and the estimated operating expenditures per barrel. The two first factors are both a function of the estimated size of the reserves and the location of the project being either onshore/offshore.

[633] See International Energy Agency, *World Energy Model: Methodology and Assumptions*, 2009., for a thorough discussion of the revised oil supply module.

[634] The 'creaming curve' plots cumulative discovery against a measure of 'exploratory effort' (e.g., drilling 'new field wildcats', i.e., exploratory drilling). The curve is intended to demonstrate the decreasing returns to exploration, and thus to anticipate how yet-to-find oil discoveries may play out in the future. The method is actually a mainstay of Laherrère and Campbell, but dates back to the mid-20th century. It has been criticized on numerous grounds, mainly on grounds of being a poor representation of the actual global trend. See the discussion in Sorrell and Speirs, *Methods of Estimating Ultimately Recoverable Resources*, 72–79., as well as Thomas S. Ahlbrandt and T. R. Klett, "Comparison of Methods Used to Estimate Conventional Undiscovered Petroleum Resources: World Examples," *Natural Resources Research* 14, no. 3 (September 2005): 187–210.

curve is pretty straightforward: because of diminishing returns to exploration activities, the cumulative discovery curve converges on the URR overtime. For open countries, the IEA takes the aggregate exploration budget and the estimated URR of each country (based on USGS and IHS figures) and allocates exploration activity based on the projected 'marginal discovery yield' (basically, how geologically 'attractive' the prospects are for different countries). They then forecast discoveries by inputting the exploration activity into the country's estimated creaming curve (assuming a constant field-size distribution consistent with historical observations). For closed countries, exploration is directly related to the stated exploration budget. However, because the latter group is not exposed to competition, the IEA notes that exploration in closed countries may thus be 'sub-optimal' because it is not based on geological-attractiveness.[635] As noted above, some unconventional projects are included in the exploration module, and others are set by exogenous assumptions.

Despite the considerable complexity that was added with the incorporation of the NPV and exploration sub-modules, and the results from the field-by-field analysis, the balancing of supply with demand still in some sense occurs by fiat. According to the official documentation, matching supply and demand is done through an "iterative process" in which supply and demand projections are run separately and repeatedly until supply matches demand using the same price scenario.[636] However, supply from closed countries is projected using a policy-based scenario rather than a market-based one, meaning that the iterative process also involves changing the policy assumptions for

[635] International Energy Agency, *World Energy Model: Methodology and Assumptions*, 2009, 30.
[636] Ibid., 31.

'closed' countries. In short, the 'model' (in reality, two models – one for supply, one for demand) does not generate a balanced energy market on its own – the team fiddles with its assumptions in order to produce a supply projection that matches the demand projection. This also is no secret – it was confirmed by several interview participants, including Priddle.[637] When asked why the WEO could not just show a projected imbalance in energy markets, Priddle noted (as quoted above) that such a scenario is "not what happens in the real world." The IEA therefore has to rerun the demand and supply modules under different price assumptions until they arrive at a balanced output.

9.3.2) Oil Prices

A primary reason for the iterative process is that prices are not (fully) endogenized - they are one of the four main exogenous (i.e., external) assumptions that serve as input for the model. At its simplest, the endogenous/exogenous distinction implies that something of the latter category does not change in response to the operations of the model whereas something of the latter category does. Knapp suggested that one of the biggest problems with the WEO is the lack of consideration of several "feedback loops" that stem from certain exogenous assumptions that should change in response to the scenario.[638] One such example, he noted, was the connection between economic growth and oil demand, two obviously very closely related processes which in principle should be interactive (e.g., as economic growth proceeds, oil demand increases, but as demand increases so does price, which adversely affects economic growth). Similarly, as another interview participant noted,[639] neither does the IEA appear to allow consumption in oil

[637] Priddle, Interview.
[638] Knapp, Interview.
[639] Gately, Interview.

exporting countries to increase in proportion to their economic growth rates in a manner consistent with historical observations. Given that the IEA treats economic growth as an exogenous assumption, this interrelationship is not factored in and thus allows for the construction of a scenario in which energy prices do not present a constraint on overall growth (and neither does the domestic consumption of OPEC present a limit on oil available for export). Tverberg voiced a similar concern when she argued the more pressing problem with the WEO was that it did not account for the limits on OECD economies to absorb higher energy prices – by keeping that causal chain out of the model, the IEA could more easily present a scenario in which oil prices are free to rise high enough to justify all sorts of unconventional sources (as conventional sources dry up), but without considering whether or not such a scenario is realistic.[640]

In practice, however, that doesn't happen – the assumption, as noted by one interview participant, has typically been that oil prices will rise gradually and only marginally above base year values. Indeed, for the several WEOs produced during in the mid-2000s, the WEO assumed prices would remain essential static. For example see Figure 14, which shows the price assumptions per WEO as a ratio to the base year data. Each WEO that is not a special issue contains an oil supply table that summarizes the projections. Typically, there are 2-3 dates for which there are projections in this table, as well a base year (usually the year prior to the publication year). Based on the duration between the base year and the projection years, I distinguished between short (<10 years), medium (10-20 years), and long-term (>20 years) projections. As the chart indicates, between the

[640] Tverberg, Interview.

years 2002 and 2009 (excluding the 2008 WEO), the oil price assumption was set at near static levels.

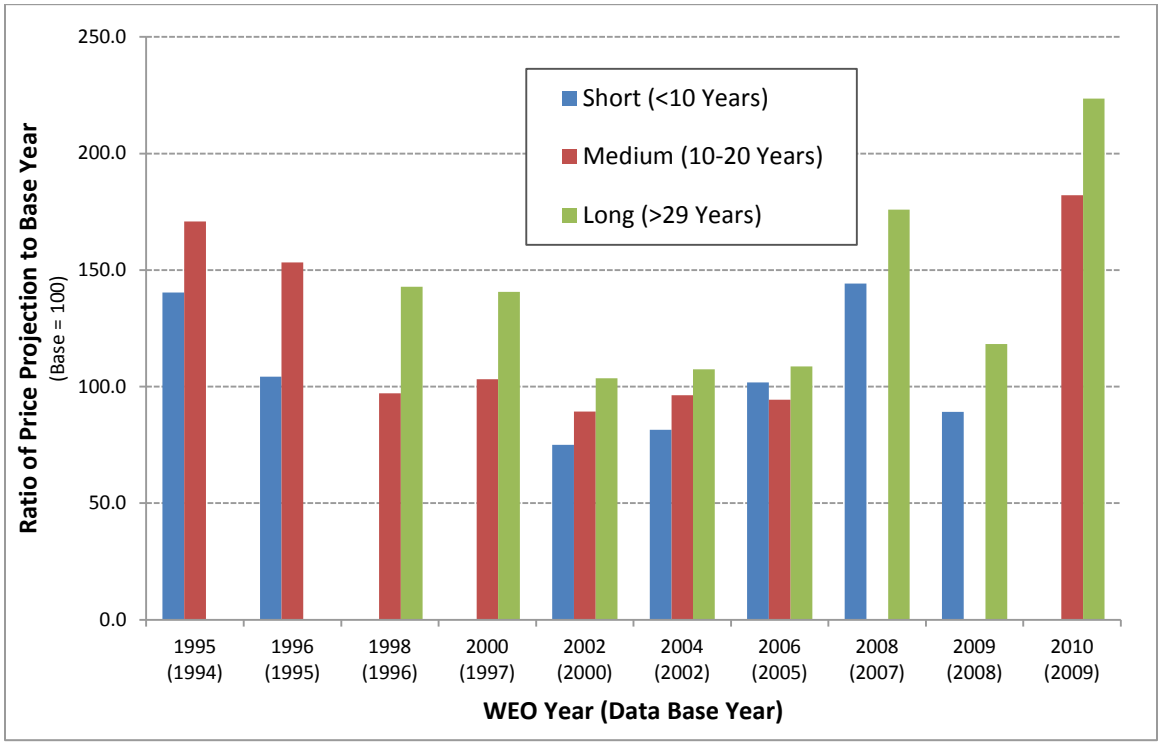


Figure 14) WEO Oil Price Projections, Ratio to Base Year Data

Projection Years					Oil Prices		
WEO	BASE	Short	Medium	Long	Short	Medium	Long
1995	1994	2000	2010		140.3	170.8	
1996	1995	2000	2010		104.2	153.3	
1998	1996		2010	2020		97.1	142.9
2000	1997		2010	2020		103.1	140.6
2002	2000	2010	2020	2030	75.0	89.3	103.6
2004	2002	2010	2020	2030	81.5	96.3	107.4
2006	2005	2010	2015	2030	101.7	94.4	108.7
2008	2007	2015		2030	144.2		176.0
2009	2008	2015		2030	89.2		118.3
2010	2009			2035		182.1	223.5

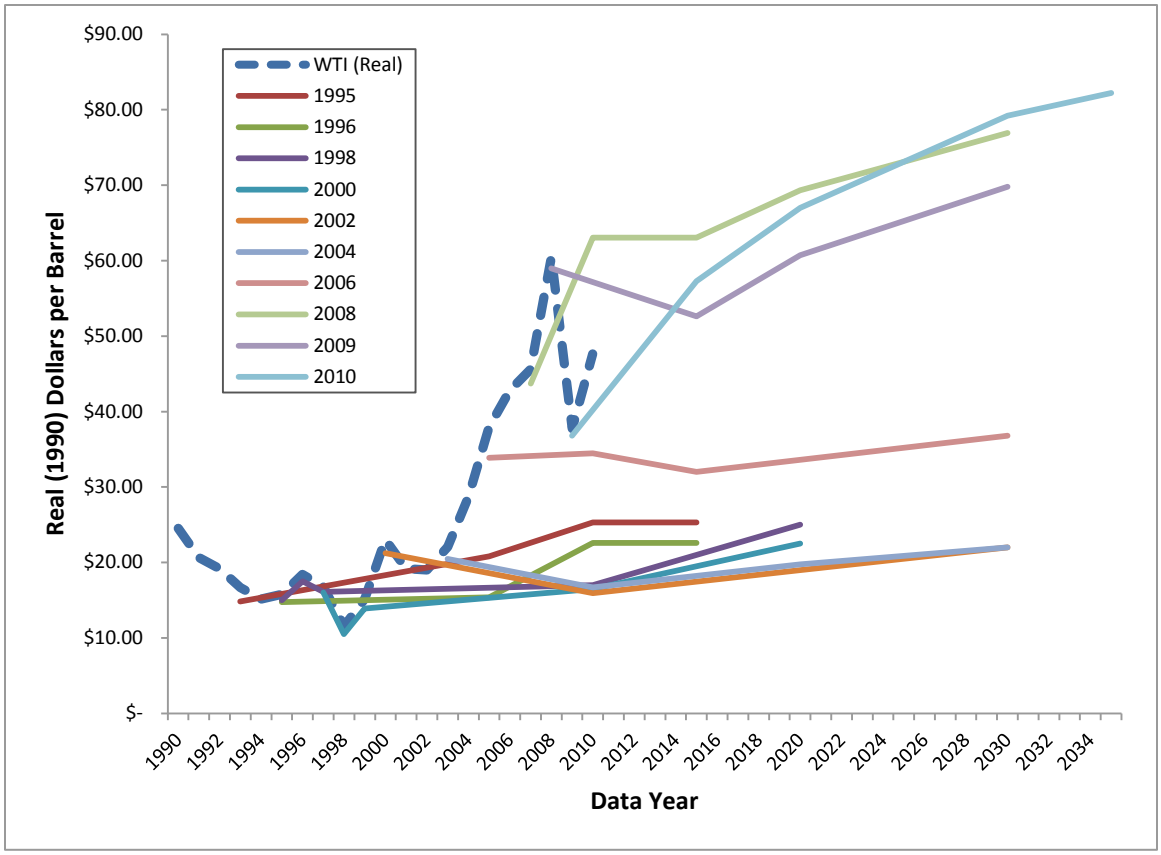
Figure 14 shows the ratio of WEO oil price assumptions across 2 or 3 projection periods to the data base year for each report. Price projections are in the real terms of each WEO's base year (i.e., they are not in comparable terms between WEOs)

The table on the left below the chart show the years of the projection data in each WEO and give the base year for each report. The table on the right shows the oil price ratios used in the chart.

What does a static price assumption entail? One might expect that a low oil price might make it more difficult for the model to produce an 'optimistic' oil supply projection, but then one would be forgetting that during the mid-2000s, the WEO did not really model OPEC supply. According to Knapp, they IEA looked only at capacity utilization, which, if they estimated to be below 85%, would have no upward price pressure (but without considering how this rate might be 'set' by OPEC in response to other variables). Moreover, the marginal cost of production is recognized to be quite low in OPEC, much lower than in non-OPEC regions, as is the estimated investment required to 'prove' up more reserves. Therefore, a low oil price poses no limit to OPEC supply if one does not set any limits to capacity. This is of course how the mid-2000s WEOs generally proceeded – taking the URR for a region as given by the USGS report and assuming that all of that resource will be brought to markets. Higher prices would in fact actually hurt OPEC supply prospects. Thus, in the 2004 WEO, total production from OPEC reached 61mb/d by 2030, while global demand hit 121mb/d (the highest projection then and since).

These assumptions were certainly a bone of contention for some critics, notably Rechsteiner who, as noted earlier, established the Energy Watch Group in part because he found the price projections completely unrealistic, especially when prices in the mid-2000s where increasing so dramatically. Figure 15 shows the actual price trend with an approximate price projection for each WEO between 1995 and 2010 in 1990 US$. Some qualifications must be made for these figures, however: the real price data is for WTI Cushing spot prices, while the IEA figures are for the average import price for IEA members. Also, because the IEA typically gives their price assumptions in 'real' terms,

the projected values are in the same dollars as the base year they use – in order to make everything comparable, I converted all figures to 1990$ by deflating future values by the inflation of their base year over 1990. The chart clearly show that, despite wording that would suggest otherwise, the IEA always keeps the price assumption in near stasis with the values observed in the benchmark year. Thus, throughout the 'price shock' between



This chart shows the price projections of each WEO in real terms (1990$) alongside the real observed prices for West Texas Intermediate between 1990 and 2010. The 2006 projection straddles the earlier, static price era (and made in the midst of rapidly escalating prices between 2004 and 2008) and the later, gradual long-term price increases in the post-2008 WEOs.

Figure 15) WEO Oil Price Assumptions, Real 1990$

2003 and 2008, the IEA consistently assumed prices would decline and remain relatively close the pre-2000s averages. Only after 2008 does the price assumption begin to rise

over the long-term. Also, it should be noted that in the midst of the dramatic rise in real prices between 2004 and 2008, the 2006 WEO projected a static future oil price. When Caruso noted that the combination of revised decline rates and a better price assumption meant post-2008 WEOs were more realistic on conventional crude production, he also noted that the revised price assumption is not really something of the IEA's choosing. Rather, the 'price shock' that occurred in the mid-2000s ushered in a new era of much higher oil prices while the IEA has continued to project relative price stasis. Of course, this need not be considered a foolish assumption – several interview participants noted the extreme difficulty of forecasting oil prices. It is nonetheless a conservative one.

Keeping the price assumption exogenous was also problematic for some people who have worked on the WEO. The anonymous interview participant noted that, even though "the reality is that, these days at least" the price assumption is not strictly exogenous (there is some consideration of marginal costs of production in setting them), they were nevertheless too 'outside the model' for his liking before 2008. Exogenous price assumptions are "crude" and "unsophisticated," he suggested.[641] If your model does not include a link between prices and costs of production, your projections will be unreliable. Though prices may get ahead of costs temporarily, he noted, ultimately the "whole system collapses, prices came crashing down." On the other hand, predicting oil prices is "a mug's game" – even though prices "always balance supply and demand", there is no reliable way to model them. Therefore, staying close to the long-term historical trend is the safest best.

[641] Anonymous, Interview.

The participant felt that the IEA should "come clean" on how prices really relate to the modeling effort, but when he suggested they do so to his superiors, he was told "oh no, that's…don't want to do that."[642] Why would the IEA not move to completely endogenized prices in the interest of modeling coherence and completion? The answer was that oil prices are too 'political.' The issue is controversial within the IEA, the anonymous participant noted, mainly for presentational or political reasons, though he was not sure why this would be an issue. Keeping the oil price assumption exogenous – even if only for presentational purposes – is less controversial.

Why? If there is one aspect of energy systems that the IEA must resolutely refrain from 'signaling', (aside from government policy, that is), it seems to be energy prices.[643] Making projections of oil prices that deviate any more than marginally from base line levels is indirectly making a statement about the health of the oil industry – forecasting much higher prices, without including a policy driver (which the reference case, by design, does not), suggests that the market balance in the future will be tight for reasons not directly related to our choices in the present. Perhaps unsurprisingly, nations that are predominately oil consumers might balk at a scenario in which prices rise for reasons outside of their control. Lower prices, on the other hand, suggest a future dearth of demand (or possible oversupply), which could upset oil producing countries. Moreover, the speculative nature of these statements could also inadvertently drive prices in the short-term towards or away from the projection, as people undertake strategic action in the present. There thus appear to be two distinct 'signaling' implications / risks from

[642] Ibid.

[643] Recall the criticisms of Robert Skinner, "Exuberant Irrationality."

observations of contentious, core issues like oil prices – the *prima facie* effect, in which the vision of the future upsets parties with an economic interest in seeing it otherwise; and the potential knock-on consequence, dragging trends up or down by the nose, i.e., the speculative effect. If future prices are set entirely by the model (that is, autonomously), there is a risk that the result could come out undesirable. By keeping prices exogenous, the IEA retains a certain amount of discretion over the resulting scenario, and is more easily able to manipulate it according to political (read: presentational) sensibilities.

Bottom-up analysis of oil supply was likely contentious at first, just for the risk that it might produce results that would constrain (or limit) the ability of future supply to meet demand – which it did. Similarly, modeling of OPEC production (beyond simple subtraction) also complicates the ability of the IEA to produce coherent scenarios in which the connection between costs, prices and supply/demand are taken 'in hand'. If, as was eventually accepted, the IEA allowed for a production projection that better reflected OPEC's interest (i.e., in making sure their resources last for future generations), the consequent limit on supply meant that a static price assumption (which would entail steadily increasing demand, parallel to population and economic growth – the other two exogenous assumptions) would be increasingly untenable. It works the other way as well, however. According to Knapp, he was unable to make projections for OPEC production when editor of the Oil Market Report because to do so would be like "making a price call."[644] Lacking good data on non-OECD inventories, Knapp was thus often left

[644] Presumably, this is because of the extremely unequal distribution of resources, whereby the Middle East has vast resources and very low marginal costs of production. In the long-run, forecasting more Middle East production would have a price-dampening effect, presumably, since their costs are low. In the short-run, a projection implies an assumption about strategic behaviour to drive prices up or keep them stable (or, indeed, to drive them down to punish countries with higher marginal costs of production within the group for bad behaviour).

with an uncomfortably large “miscellaneous-to-balance” figure (which, recalling from above, sparked the controversy around 'missing barrels' in the late 1990s). Attributing the large miscellaneous to balance figures as an indication of a hidden oversupply, according to critics, implies that the market is imbalanced, which risks driving prices lower – a self-fulfilling prophecy. The “callous reason” why Simmons, an investment banker, might take issue with that that, according to Knapp, is that he is invested – literally – in an expectation of stable, if not rising, oil prices.[645]

The complications around the price assumption and OPEC production projections recalls Knapp's argument about fair prices, noted above, being between $5 and $200 a barrel, and everything in between being politics, etc. In other words, everyone realizes that there are 'political' forces at hand in the determination of oil prices, but that is not reason enough to accept more political intervention. If the IEA gives explicit recognition of those political forces, this can be interpreted as taking a stance on the issue and thus to be adding yet another, unwanted, political sheen on top of an already contested issue. A large part of this stems from the 'responsibility to caution' that goes hand in hand with being a prominent, global institutional observer of the future. Knapp noted he was relieved, upon taking his current position at Energy Intelligence (which describes itself as providing “objective insight, unbiased analysis”), when he was no longer constrained by politics from making estimates or projections of 'contested' issues like OPEC inventories or future production.

A static oil price assumption is safe, conservative – in line with the status quo bias that the Reference Scenario is intended to have. Moreover, it serves as a politically astute

[645] Knapp, Interview.

compromise on the behalf of the IEA to walk the fine line between upsetting consumer member states and producing non-member states. It is unrealistic, perhaps, but so too is the Reference Scenario.

9.3.3) Assumptions & Scenarios

Concerns about how the IEA 'models' oil prices are indicative of a larger site of contention in the practice of observing futures in general: namely, the role of assumptions in determining the output or content of a scenario. As Skinner put it, models are just spreadsheets on which assumptions can be "imposed."[646] Assumptions, in other words, are potentially a key site for 'bias' to be present, since modellers can frame their assumptions in such a way as to get the output from the model they expect or desire. They are also crucial in determining the relative accuracy of the observations in retrospect. Responding to the criticism that the IEA had been too optimistic about oil supply throughout the early 200s, the anonymous interview participant noted that its "easy with hindsight to say yeah, that was a stupid or that wasn't a good projection, but a projection is always conditional on the assumptions you make, and you know, those assumptions – sometimes you get them more or less right, sometimes you get them completely wrong. But at the time, those assumptions seem reasonable."[647] Perhaps the tendency of the IEA to assume oil prices will remain more or less static in the long-term is partially attributed to the apparent 'reasonableness' of that assumption in the context of the historical record – given the long-run relative stasis in oil prices (see Figure 16), and

[646] Skinner, Interview.

[647] Anonymous, Interview.

the apparent impossibility of 'predicting' prices, the oil price assumption could be just a 'safe bet.'

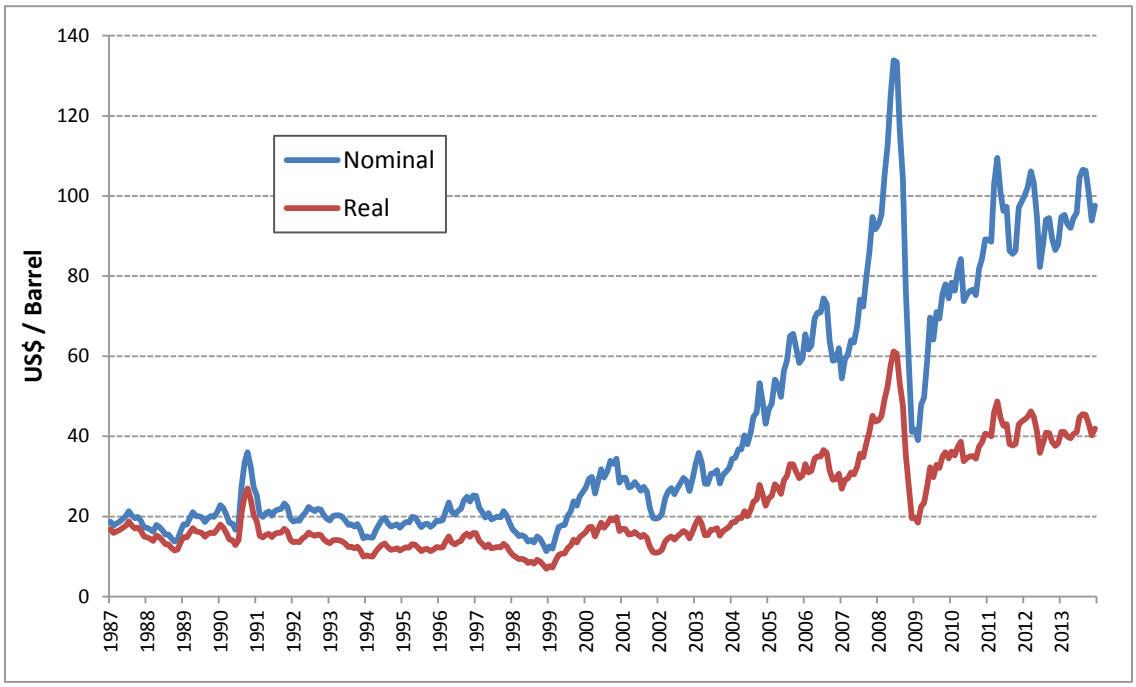


Figure 16) Medium-Term Oil Price Trends - US$ / Barrel of WTI (1982-4 = 100)

Several participants noted that the WEO, especially the Reference Scenario that formed its core between 2000 and 2008, is intentionally 'biased' towards a conservative view of the future.[648] Aside from the price assumption (and the economic and population growth assumptions), the other main assumption in the WEO Reference Scenario is that no new policies will be implemented in the course of the scenario beyond what is presently in place. This is a conservative assumption about the probable trajectory of energy systems around the world – it seems more likely that policies will change. But this assumption marks a key difference between more 'objective' futures (e.g., the EIA's Outlook, or the short/medium term OMR also produced by the IEA) and the more

[648] Knapp, Interview; Anonymous, Interview; Priddle, Interview.

'political' WEO – whereas the former is not supposed to interject in energy matters in any way, the latter is premised on the need for such intervention.

The policy assumption that effectively necessitates a conservative bias in the Reference Scenario is therefore indicative not of a concealed intention to maintain the status quo, but instead of the challenge decision-makers face. Projections of renewables in the late 1990s and early 2000s WEOS would be understandably conservative, as noted by one interview participant, since at the time explicit policy support for them was much less prevalent.[649] Though the WEO may indeed be construed as a political document (in that it takes a stance on important *policy pillars* for which the international community has demonstrated widespread support, e.g., liberalization) until such time as this official support is forthcoming, the business-as-usual scenario will not reflect this. Things are different now, as the participant noted, because "reality is" that renewables are a now a 'fourth pillar' for the OECD - "a separate, specific policy target in many countries" that can be incorporated as an assumption about policy moving forward.[650]

As Knapp saw it, this 'bias' is indicative of a different type of feedback than that which may be internal to the model. In his words, the Reference scenario is conservative because it is "meant to be a motivator so that it becomes a self-defeating prophecy." By contrast, the OMR was much more objective as it did not aim to take a stance on policy or the market, instead looking only at trends, whereas in the WEO, "building those longer term scenarios is more about the scenarios than it is necessarily about the trends," and the scenarios are more political interventions in the future than is mere trend extrapolation.

[649] Fraser, Interview.
[650] Ibid.

Indeed, the controversy that has at times surrounding the OMR typically stems from an allegation that the report was taking a stance on the market, which could have external feedback implications (e.g., having price effects). The WEO Reference scenario is intended to have such external feedback implications, but not directly or literally. The assumptions that one sets, in other words, at the outset of the modeling process, though integral aspects of the story or narrative that one wishes to portray in the final scenario, may not necessitate a particular stance on what is the most probable or preferable future, and should not therefore be taken as *literal* expressions of underlying (i.e., political) bias.

The Reference Scenario is intended only to be a plausible observation of what could be, absent any efforts to make it otherwise, as is clearly evidenced in the core 'no-new-policy' assumption at the base of it. The assumptions about technological change are another important factor to consider. As noted earlier, the WEO tends not to see any major technological advances in the future. It does, however, make exogenous assumptions about how present technology will evolve over the course of its outlook, some of which may be somewhat optimistic (e.g., recovery rates in oil production), but it does not foresee any more radical, 'regime-type' change on the horizon. Technological change assumptions, according to Knapp, are "usually dealt with as a one-way, here's-our-assumed-technological-progress which gets more energy from the same amount of dollars or effort or whatever," in part because, as other participants also noted, it is difficult to foresee anything other than incremental productivity improvements. As Caruso suggested, it is always "possible you could have some kind of technological breakthrough, but you can't just assume it," so instead they say we are on a path of improvement for which history is a partial basis upon which we can make assumptions

for future change. Scenarios (in which one can manipulate those assumptions) are useful for sensitivity analysis around variations from the trend, analysis that "gives you some boundaries" about the probable future. These are boundaries of plausibility: as Skinner noted, you can impose all the new technology you want through assumptions, but you still need to retain credibility.[651]

9.4) Message

The simple fact is that the Reference Scenario (really, the WEO itself, given the centrality of this scenario) is intended to be a conservative and - hopefully - self-denying projection of the energy future. As discussed above, this conservative 'bias' is expressed through a number of channels. Indeed, several interview participants, both critical of the WEO and not, were of the view that this 'bias' renders the WEO a political report. In this last section, I will discuss how the messaging and presentation of the report relate to its politics – namely, the perception of the report as being 'political' coincides with a presumed disjunction between the official message of the report and either: a) what the specific projections suggest, or; b) what the IEA 'truly' believes.

The alleged 'coded message' of the 1998 WEO is one such instance in which an apparent dis-juncture exists between message and the underlying information. Recall that the 1998 WEO's projection of ~20mb/d by 2020 of "unidentified unconventional oil" was purported to be a "coded message" from the IEA that the organization was unsure of how oil supply would be able to meet oil demand, and that the mealy mouthed-like nature of the message was taken as suggestive of an underlying politics interfering with forthright statements about peak oil. Though several sources discussing this matter deal

[651] Skinner, Interview.

with it in a way that reinforces the secrecy or intrigue of the message (e.g., meeting in bars, looking over shoulders, etc.,) Bourdaire was quite straightforward about the matter. Bourdaire confirmed that the 1998 WEO did indeed find that oil would peak sometime before 2020, but was constrained in its ability to say as much:

> "you have to understand, the IEA is a political body and is very sensitive to the wording, and this is the reason why we used very strange wording - rather than saying there is no way to achieve it [i.e., supply necessary to meet demand), we say 'well, we can achieve it, but there is a lack of 20mbd of unidentified unconventional oil supply', which was a way to say 'we don't know how to close the system.'"[652]

In short, Bourdaire agreed that the unidentified unconventionals was 'code' for the real finding: that production of conventional crude was likely to peak before 2020. The authors thus inserted it to show a balance between supply and demand, despite the analysts not knowing where that it would come from, mainly for 'political' reasons.

A few points are worth noting about this statement. For one, Bourdaire does not imply that the unidentified unconventional oil was entirely contrived; rather, it was a choice of "wording" (i.e. presentation) taken in the interest of 'political' sensibilities. Moreover, these political sensibilities do not appear to involve an intentional bias towards or subservient relationship with the oil sector, but are instead connected to the difficulty of presenting a fatalistic message to its members ("rather than saying there is no way to achieve it"). Lastly, an important ulterior message in Bourdaire's opinion was not that peak oil is an unavoidable impending reality, but that the IEA could not see how to "close" (i.e., balance) the system. Of course, the latter uncertainty was certainly due to

[652] Bourdaire, Interview.

the projection of peaking conventional oil production, but nevertheless the message of uncertainty is a nuanced but significantly distinct message from that of ‘peak oil.’ Interpreting the ‘coded message’ accordingly suggests that the internal ‘controversy’ stemming from this report was not over limits to oil supply, but rather that the IEA simply did not know how to meet demand with supply.

As indicated by the chapter on the evolution of controversy surrounding the WEO above, however, the alleged 'coded' nature of this message allowed for the development of a perception that the WEO was actively working to conceal the real fact of peak oil, particularly when it was followed by the effective dismissal of Bourdaire and a prolonged period of optimism about the future for oil supply. This perception feeds into the allegations of bias, corruption and irresponsibility – i.e., the IEA at one point recognized the reality of peak oil, then abruptly changed course (coinciding with a new and more fossil-fuel oriented American administration), and proceeded to project unrealistically high oil production in the face of rapidly escalating prices and criticism about its modeling of OPEC production. As the above discussion should indicate, however, it never appears to have been so overt, and faithful reading of the report in its entirety (keeping in mind that it is intended to show a conservative future to induce decision-makers to change it) suggests that the WEO is not trying to reproduce the present in the future.

There is nonetheless a question of the *received* message, which may in fact differ from the intended message. Accordingly, one site of bias in messaging may be the actual words that are written down on the page. Here the potential for bias is not so much in the choice of adjectives used to describe different energy technologies or sources, but rather

in potential to create a lasting perception or image based on the consistent use of the same terms. In other words, it is the received message that matters – a message which may be different than the explicit or implied message. Thus, for Rechsteiner, the WEO's persistent "talking small" for renewables, when contrasted with the language used to describe the future for fossil fuels, indicates an underlying bias in favour of the status quo. Indeed, making a cursory reading of the WEOs between 2000 and 2006 might give one this impression:

> "Oil remains the dominant fuel in the primary energy mix"; "The Outlook views the physical world oil-resource base as adequate to meet demand over the projection period"; "[R]enewables...are expected to be the fastest growing primary energy sourc[e]…[but] despite this rapid growth, the share of renewables climbs to only 3% by 2020 from the current 2%."[653]

> "…fossil fuels continue to dominate the energy mix"; "The Earth's energy resources are undoubtedly adequate to meet rising demand for at least the next three decades"; "Oil will remain the fuel of choice in road, sea and air transportation"; despite rapid growth, "non-hydro renewables will still make only a small dent in global energy demand in 2030, because they start from a very low base";[654]

> 2004: "Fossil fuels will continue to dominate global energy use, accounting for some 85% of the increase in world primary energy demand"; "Carbon-free energy sources will meet only a small part of surging electricity needs"; "Finding good sites for land-based wind turbines is becoming more difficult in some areas";[655]

> 2006: "Fossil energy will remain dominant to 2030"; "The share of oil drops, though oil remains the largest single fuel in the global energy mix in 2030"; "There are formidable hurdles to the adoption and

[653] International Energy Agency, *World Energy Outlook 2000*.

[654] International Energy Agency, *World Energy Outlook 2002*.

[655] International Energy Agency, *World Energy Outlook 2004*.

> implementation of the policies and measures in the Alternative Policy Scenario";[656]

All of these quotes were taken from the reports' Executive Summary sections. On their own, they seem to indicate a messaging bias against renewables and in favour of fossil fuels. There are many qualifications to be made that would attenuate that perception (for one, they are reporting projections from the Reference Scenario).

For example, one could pick other quotations that suggest a different message just as easily, and a thorough reading of the actual analysis in the rest of the reports would find more nuanced statements. For instance, here is another collection of quotes that offer a somewhat convoluted image of the future:

> "The energy future which we are creating is unsustainable. If we continue as before, the energy supply to meet the needs of the world economy over the next twenty-five years is too vulnerable to failure arising from under-investment, environmental catastrophe or sudden supply interruption."[657]

> The era of cheap oil is over.[658]

> "The outcome of the landmark UN conference on climate change held in December 2009 in Copenhagen was a step forward, but still fell a very long way short of what is required to set us on the path to a sustainable energy system"[659]

These quotes give a somewhat different impression that the previous ones (though it should be noted that they are culled from more recent WEOs). Also, it should be noted

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[656] International Energy Agency, *World Energy Outlook 2006*.

[657] Ibid., 4.

[658] International Energy Agency, *World Energy Outlook 2008*, 3.

[659] International Energy Agency, *World Energy Outlook 2009*, 45.

that the message received by decision-makers may not always be based on specific details in the chapters if they never read past the Executive Summary. As noted earlier by Fraser, what policy-makers want to hear is the *general message* and it is this message that the WEO aims to provide. For most of the period under consideration here, he added, that message has been that we are still on a "fossil fuel track."[660]

Not everyone interviewed agreed that the WEO was indeed 'pessimistic' on renewables, however. When asked to respond to the allegation of bias against renewables, Skinner replied this charge was "rubbish…even if you quadruple the amount of renewables in the year 2000 it wouldn't have amounted to a tinker's fart." "The simple reality," he continued, "is that the availability of wind power in Germany is 18%," implying both that the WEO cannot have an influence on the development of technology and that the potential of technology is limited by facts outside of our desires for them. Accordingly, the WEOs statements vis-à-vis the limited impact of renewables is (or at least was) borne out by reality at the time. On the other hand, according to Caruso, "a lot of people" now think the main scenario is now too optimistic about the potential for sustainability improvements because of its basis on unrealistic assumptions about the extent to which proposed policies will be achieved. The IEA risks being "misleading", said Caruso, by saying there is a chance we can meet goals like 450 ppm CO2, when there is no real chance of this happening. Similarly, the anonymous interview participant expressed the same concern about the 450 scenario: "frankly, if you ask me if I think this will happen … I don't think it will."[661] The reason the scenario is still produced, the

[660] Fraser, Interview.

[661] Anonymous, Interview.

participant noted, was that there is a demand for it in the climate community and among environmental NGOs and organizations that still use it. But in the interest of credibility, the participant thought it should be discarded: "if we constantly present numbers and charts showing the 450, we are giving the impression that we think this is a plausible scenario, and I've always argued we should never show in the WEO any scenario which is, which we do not consider to be plausible." Caruso similarly suspected that this scenario is being kept around for 'political' reasons – that inside the IEA there is wide skepticism about such targets, but "they can't say it publicly."[662] Here again we find a discrepancy between what the IEA says publicly and what they 'really' believe, which feeds into a perception of politics at hand. In this case, however, it is from experts on the other side, who suspect that the IEA is driven to bullishness or 'euphoria' for alternative technology and/or policy by the governments who want their good intentions reflected in the outlook for the future. It is in many ways, however, the same concern as that espoused by the whistleblower – that governments have 'corrupted' the WEO by asking it to say specific things about the future that it would not have otherwise.

Another dimension to the importance of messaging and presentation of the WEO, and one that is closely related to the concern about the sensibilities of audiences is the *marketability* of the report. This has two manifestations – a close attention to the political sensibilities of its audience, and a desire to make the report readable, interesting and topical. The WEO is after all the "flagship" report of the IEA, and reportedly is responsible for drawing a significant amount of independent funding for the agency.

[662] Caruso, Interview.

The tendency of the WEO and the marketing and communication of its findings to play up 'hot topics' from year to year struck some interview a participants as political, in that too much effort goes into tailoring messages to suit the audience. Laherrère described the report as akin to a "*girouette*", i.e., a weathervane, in that it simply goes with the direction of the wind (the wind being, of the course, the current sentiment about new and exciting issues).[663] Similarly, Rechsteiner takes this tendency as evidence of a tenuous and flaky connection with the truth, and mainly the consequence of Birol being the head of the report (following the publication of each WEO in November, it is commonplace for Birol to travel extensively to promote the report and its key findings). However, Birol, Rechsteiner argued, only gives audiences what they want to hear and does not tell them the truth; he is such an "organizer of misconceptions".[664] In short, it appears that messaging of the WEO is driven both by a desire to be marketable and topical, to latch onto important trends or big issues, but also by the perceived political sensibilities of the audience and context. According to Priddle, however, there is "never any attempt to twist the projections to make them more dramatic." The goal is to only to influence policy. Therefore, the writers take what they think is the 'essence' of any particular chapter, the 'real messages' of the analysis, and put them up front in a visible format. Moreover, Priddle's note about the connection between bias and consistency of message seems pertinent in this matter as well – if the WEO were consistently telling the same story, people might suspect an underlying agenda.[665]

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[663] Laherrère, Interview.

[664] Rechsteiner, Interview.

[665] Priddle, Interview.

Part of the problem concerns the presentation of energy data and statistics. Perhaps because of political constraints imposed by the reliance on official, national projections early reports from the agency apparently put a great degree of emphasis on minimizing interpretation of the data and forbidding any sort of editorializing. This was certainly true of the Oil Market Report. As David Knapp noted, the report was "absolute sawdust" when he took over as editor in 1997. The format of the report was formulaic, consisting of the same bullet points in the same order in every issue, only using the words increase or decrease. It was Knapp that pushed for the report to bring a key theme up front and center in a lead article, as a kind of letter from the editor (though the special section is not presented as authored by the editor specifically). Indeed, Knapp noted that the ability to parse data for key themes – testing for the skill to determine what "ought to go first" - was a favoured method of his to screen potential new hires. Recalling that the lead article of the OMR was where the issue of 'missing barrels' was brought to the fore in the period between 1998 and 1999, one wonders whether the discrepancy in IEA estimates would have been exposed to the controversy it received if it had not been attached to the pithy notion of 'missing barrels'? It is not possible to say in retrospect of course, though, as Knapp noted, he did as a result become known as "David 'Missing Barrels' Knapp."[666] In any case, the WEO appears to be subject to a similar tension – as Priddle suggested, the report would be "dull" if it were only to report statistics.[667]

Graham Campbell attributed the desire to have a "topical flair" as a partial contributor to the tendency to 'euphoria' in the WEO. Energy statistics, Campbell noted, "don't get

[666] Knapp, Interview.

[667] Priddle, Interview.

much press." Hot topics are "irresistible" for the WEO since it aims not to be a "pedestrian document"; it "has to have some spice to it," and it is thus prone to getting swept away in its presentation of big issues.[668] This may perhaps be why, as Lynch noted, the IEA has "generally been accused of seeing a looming crisis." While this crisis has typically been a dearth of investment rather than impending shortages of oil, as noted above, this should not be taken to imply that under Birol the WEO has conveyed an optimistic message for oil as a matter of course; there remains the possibility that this 'optimistic' message was due more to marketability of the report than fealty to the oil industry or US foreign policy. Regarding the depletion rate finds of the 2008 WEO, for example, the anonymous participant suggested that the WEO team "put a certain spin" on the report, exaggerating the implications of the field-by-field study in a way that played up the peak oil message. He noted that he had disagreed with this at the time: "what really matters" was not the decline rate, he argued, but rather "the total recovery rate," could increase enough to obviate the constraints imposed by depletion. Though he had argued against the messaging choices for the field-by-field study, his suggestions had not heeded because, as he stated, it "wouldn't help sell the story."[669]

One may be tempted to conclude that the 'story' in question is the imminence of peak oil supply, though that is not so clear – 'the story' could equally as well be the urgent need for investment. Or, perhaps, the 'story' was simply the decline rate findings that were the result of the field-by-field analysis – at the time, one of the very few in-depth considerations of the topic from a 'reputable' source, and a finding that implied a

[668] Campbell, Interview.

[669] Anonymous, Interview.

relatively significant shift in the vision for the future of energy that the IEA was able to present. Likely, the 'story' of that WEO is that provided at the outset, in the very first sentence of the Director's foreword: “the era of cheap oil is over.” The report did nevertheless appear to compliment the message coming from the peak oil movement, and to indicate a shift in the mainstream perspective on future oil supply. As Bentley suggested, whereas prior to the 2008 WEO oil supply projections were basically “hand-waving”, “since that Birol study of decline rates, that field-by-field study, it’s a sea change at the IEA.” Once the IEA adjusted its decline rates, Bentley noted, “suddenly” one is presented with the shocking message: the “Campbell’s of this world where right all along.” Several participants confirmed that the decision to undertake the field-by-field study was at least in part because the peak oil issue was “kind of hot” at the time. As the anonymous participant noted, the IEA was increasingly “under pressure” to buttress its supply projections:

> “the peak oil community was becoming more vociferous, and they were grabbing headlines in the press around the world, getting airtime on the TV, and we were increasingly being confronted by people, journalists you know, how do you defend against this, do we really have enough oil in the ground, etc.”;[670]

Though it seems that the decision to undertake the field-by-field study in the 2008 WEO was related to concerns about peak oil, and the messaging and presentation of the findings did indeed ‘play up’ the peak oil implications, an equally important story that the WEO offered was that the need for investment was even more dire than it had been before – a ‘crisis’ to be sure, but not one of imminent and unavoidable oil shortages. The

[670] Ibid.

projected growth of unconventional fuels found in WEOs since has mostly alleviated the supply constraint.

Chapter 10) Theoretical Reflection: Realism and the Future for Sustainable Energy

I stressed at the outset of this study that any comprehensive account of the politics of the future for sustainable energy should strive to encompass both an external and an internal account, lest it render itself partial and/or incomplete. The construction of the revised framework for understanding the politics of the future for sustainable energy and the extended claims derived thereof constitute the 'external' perspective in this study. The 'internal' perspective consists of the individual accounts that comprise the causes and characteristics of the controversy surrounding the WEO, including both critiques of the WEO and responses to those allegations from important stakeholders in the dispute. The task that remains is to provide a reflective analysis on the connections between these two perspectives.

This chapter will provide such an analysis in three sections, the first recapping the theoretical discussion in Chapters 2 through 5, and the second reflecting on the second (empirical) research question put forward in Chapter 1 (the relationship between politics and controversy surrounding the WEO), using the framework as an interpretative guide. The third section will reflect on the first (theoretical) research question (what are the politics of the future for sustainable energy), evaluating the connections between the three 'questions of realism' I put forward earlier, the three allegations surrounding the WEO, and the three tensions inherent to the problem of the future for sustainable energy. I will conclude by noting a third dimension to the relationship between politics and the future (the opacity of politics) and a fourth question of realism (a question of authenticity) that came to light in the internal investigation..

10.1) Recap of Theoretical Framework

As noted in the introduction, this study aimed to provide a framework for understanding the politics of the 'middle-way' between a science of the future and an art of envisioning futures for sustainable energy. I argued that the notion of sustainability implies balance between the opposing poles of rationalism and empiricism, action and reflection, improvement and habitation – tensions, I suggested, that where not separate dimensions to the problem of the future for sustainable energy, but rather manifestations of some deeper, harder-to-define distinction characteristic of the condition of modernity. The expression of this tension in the discipline and practice of futures studies is in the contrast between the practices as a science versus an art, or between the tough and tender-minded approach to the question of 'the future' or 'futures'. I identified four spectra that comprise this tension (autonomy, knowability, legality, and responsibility) and argued that the practice of 'observing' the future is in fact the act of distinguishing amongst these spectra and thus the question of future vs. futures. I suggested, therefore, that we consider observation of the future as technological, indeed as a technology of control, in that in making these distinctions the goal of observation of the future is to attain greater control over the process of historical change.

The question that remained was what the politics of this technological activity are. Based on contrasting positions on the source and location of politics, I then identified four competing perspectives on the relationship between politics and the future for sustainable energy. I noted their incompleteness and partiality, and addressed those via an account of 'politics-as-distinction.' At the core of politics-as-distinction is a question. That question in the context of the future for sustainable energy was a question of

realism: what is or is not realistic to say, hope, or do about the future for sustainable energy. I proceeded to outline three subsidiary questions of realism (representation, prudence, and efficacy) and to offer several extended claims concerning the nature of the relationship between politics, politicization and controversy. These claims were derived from the revised framework for the consideration of the relationship between politics and the future for sustainable energy that was offered at the end of Chapter 5.

The primary difference between the preliminary framework developed in Chapter 3 and the revised framework repeated here was that the latter incorporates the 'politics-as-distinction' perspective on the relationship between politics and controversy and the questions of realism into the system, thereby adding a dimension of intensity to the relationship between politics and the future for sustainable energy and mechanism for determining the level of intensity. The six theoretical extensions of this framework were as follows:

1. A future will become controversial if it makes statements that transgress a boundary of realism;
2. The boundary of realism in question may be that of an individual or that of society;
3. The more individual the boundary, the more 'fringe' the critic. The more social the boundary, the more fringe the future;
4. To the extent that the transgression is perceived as being the result of something external to the observation, that observation will be seen as 'corrupted' by politics

5. To the extent that the transgression is perceived as being the result of something internal to the observation, that observation will itself be perceived as political.
6. The degree to which a controversy is politicized will correlate with the intensity of the distinctions involved;

With this framework in place and extended claims reviewed, we can proceed to revisit the primary (theoretical) and secondary (empirical) research questions stated in Chapter. I will address these questions in reverse order as the aim of the case study was to buttress and/or extend the theoretical framework developed prior to empirical investigation with an 'internal' perspective. It is therefore beneficial to reflect on the connection between politics and controversy surrounding the WEO first, in order to interpret it in light of the framework and extended claims and note any inconsistencies, inaccuracies or incompleteness in that framework.

10.2) Empirical Question: What is the controversy surrounding the World Energy Outlook (WEO) and in what ways (or to what extent) can it be considered political?

On the surface, the controversy that enveloped the WEO between 1998 and 2010 appears quite straightforward. Critics alleged the report was unduly optimistic about future conventional oil supply potential and unduly pessimistic about the future for renewable energy. Some argued that the report was heavily influenced by the politics of the member-states that comprise the IEA, or by the politically motivated behaviour of the analysts who work on the report. Others took issue with the report publishing projections that were based on unfounded assumptions, suggesting a cavalier attitude in the WEO vis-à-vis a sustainable energy future that may have worked to dupe policy-makers into

not taking actions to lead us to such a future. I summarized these three themes of controversy as allegations of bias, corruption, and irresponsibility in the WEO.

Throughout these three themes of the controversy, we see aspects of the four perspectives on politics and the future for sustainable energy (i.e., politics as intervention, mediation, intermediation, or performativity). The allegations of the whistleblower are the purest expression of any of these, specifically the 'individual/extrinsic' perspective on the relationship between politics and futures. Here the US is accused of manipulating the report to further its own interests, while the analysts that produce the WEO lose all agency or choice in the matter. Conversely, the earliest WEOs, before the Shared Goals and Priddle's efforts to make the report more autonomous, were also 'corrupted' by politics, but of the social variety. A simple collation of member-state forecasts retains all the subjective political context of the report, but thereby becomes unreliable. The informational content of such a report may not be low, but its utility will be. The manner in which bias may be contained within the use of certain data exemplifies an immanent/social politics, whereas the assumptions that shape the report (choice of which is 'mediated' by the political context of the Agency) transmit an immanent/individual politics through the report.

It is important to recall the difference between politics and politicization, however. Many of those interviewed agreed (irrespective of whether they were critical of or sympathetic to the WEO) that the report is indeed *political*. For critics, this implied that it was partial, biased, corrupted; for those sympathetic to the IEA, it meant that it was shaped by its context, designed not to objectively forecast the future but rather to present a contrived vision with the aim of influencing policy. The former accused the WEO of

forestalling change, while the latter agreed it offered a conservative vision of the future. Furthermore, 'insiders' tended to agree that the WEO itself should not be held accountable for the actions (or inaction) of states to address climate change. Needless to say, that the WEO may be 'political' was not as problematic a statement for those sympathetic to the report. But why then did it become controversial between 1998 and 2010? What set of factors enables differences in opinion, analysis or perspective to become disputes that are heated, prolonged, public (i.e., controversial?) Put differently, why is it possible to speak of critics and sympathizers, insiders and outsiders, rather than just differences in expert opinion over the relative representational value of 1P versus 2P reserve data? To answer these questions, it will help to review some of the characteristics of the disputes about the WEO in light of the framework of politics laid out earlier.

One interesting characteristic was the tendency for criticisms to be *mirrored* on either side of whatever line it was that divided the interview participants. This was most clear in the allegation of bias. Critics of the WEO alleged the report to be biased toward fossil fuels for a number of reasons: individual ambition, member-state politics, poor or incompetent analysis, disciplinary backgrounds, real-world detachment, and so on. However, when faced with such allegations, those more sympathetic to the WEO were inclined to return the allegation, suggesting that critics would say such things since they had some kind of agenda to push, or a favoured technology they wished to see prosper. If the vision of the future the WEO offered was not to their liking, the critics would accuse the report of impropriety. In some ways, this aspect of the bias allegation underwrites the other two allegations as well: a biased person is driven by parochial interests.

Consequently, their interpretation of information as well as the information they provide is 'corrupted' by their politics. Therefore, the biased person's analysis, assumptions, criticisms, etc., are irresponsible. Because of bias, even one's assessment of another is biased.[671] The tendency of such an allegation is thus to further intensify the distinction over which the initial difference was articulated – almost like a positive feedback cycle of differentiation. Before long, the initial theoretical dispute becomes personalized – the difference is no longer over the interpretation of the future, but the parochial reasons as to why they do not agree.

A related characteristic that certainly seems pertinent to the question of what makes for politicization is the degree to which those parochial reasons are perceived as *concealed*. If an observer of the future wears their biases on their sleeves, that information is transmitted along with the information about the future they provide; it is included in the package that all could recognize as being 'political'. If on the other hand that bias is concealed, obscured behind a veneer of impartiality and objectivity, it is much more likely to be seen as politically controversial. The challenge in the latter case is, however, that a concealed bias is mostly a matter of perception, in which others perceive you as holding or transmitting a concealed agenda. In short, such allegations more effectively politicize a future if they posit a discrepancy between appearance and reality (even though it may be an unobservable reality).

All this suggests however that there can be no 'pure' information, no truly impartial or objective observation of the future. You either wear your biases on your sleeve or risk others accusing you of concealing an agenda. Either case renders your observation

[671] Thus Skinner, "one biased person saying to another: you're biased!"

political - even if the transgression in question is a politically-naïve, pithy characterization of an unexplained but observed phenomenon (i.e., missing barrels), others may concoct a concealed agenda to account for your actions. This situation has the consequence of making the controversy surrounding the WEO seem to be a fight over the 'objective' middle ground, a controversy concerning the impartiality of the information that the WEO provides about the future. Put differently, if the WEO were *not* biased, corrupt, and irresponsible, would it then be able to provide an objective (i.e., non-political, non-controversial) view of the energy future?

There is a fine but important line to be drawn between the idea of objective information about the future and a complete separation of politics and the future. The contrast between the first and second perspectives noted in Chapter 3 (i.e., politics-as-intervention and politics-as-mediation) seems to create a dichotomous situation wherein you either believe in objective information about the future or you only allow for subjective observation. Even more crudely, observations of the future are either *contingently political* (observations themselves being apolitical) or *necessarily political* (irrespective of the location of politics). The case of the WEO indicates that such a distinction is overwrought. While there may indeed be no possibility of standing outside of politics to objectively predict the future, in this particular situation the obverse – allowing member-states to submit their own forecasts and to collate them without critique or evaluation – seems equally undesirable. Thus, though we have a situation where the WEO certainly is mediated by its political context (it cannot be too provocative, it cannot be too aggressive about change, it cannot predict oil prices, etc.), it is in some ways precisely this position that creates the condition for an objective observation of the future.

That is to say, the WEO would not retain the credibility or legitimacy it enjoys where it not for its occupation of some 'middle ground' between the analyst's best estimate and the wishes and desires of the member states of the IEA.

The allegations made of the WEO politicized the report precisely because they attacked this middle ground – pushing the report away from an opaque, indistinct balance between extrinsic and immanent politics, individual and social influences. This is why the allegations of the whistleblower are the most 'political' – they relegate the WEO to the upper left-hand box of the framework of politics. The dispute then becomes heated, intense and personal because it is the status and prestige of the report and its authors that are threatened, the creditability and the legitimacy of the report itself. The aura of balanced objectivity that makes the report possible and which it cultivates through careful messaging, conservative assumptions, prudent selection of topics for analysis, dissipates upon allegations of bias, corruption, and irresponsibility. Perhaps it is no surprise that differences then tend towards distinctions of friends and enemies.

On that note, the distinction between immanent and extrinsic (or internal and external) also played an important role in shaping the controversy and the politics of the WEO. Perhaps the most concrete manifestation of this distinction is between those who work or have worked on the WEO or for the IEA and those who have not; by-and-large, *insiders* were more sympathetic to the plight of the WEO, less likely to interpret the 'politics' of the report in an negative manner, tending more towards a soft politics-as-mediation perspective on the relationship between politics and the future for sustainable energy. In general, 'politics' was indeed perceived as externally present in the production, messaging and presentation of the report, though rarely as corruptive or

intervening force - more so as a social context in which observers were constrained from being too provocative or from pushing the observation of the future toward their personal views. As noted above, it is largely because of this social context that the WEO can approximate the 'objective' vision of the future that it ostensibly produces, and thus also why allegations of hidden or concealed agendas – stemming from either the individual actors involved or contained within the assumptions and datasets used – are so politically charged. Conversely, outsiders (generally the critics of the WEO) perceived the report not only as being malignly political, but also as somewhat of a black box; a closed-off process of observing futures from which they were largely excluded from having any input. For some this was truer than others: Laherrère for instance played an important role in shaping the 1998 WEO and has been cited in various other WEOs as well. On the other hand, Rechsteiner (a much more vehement critic of the WEO, more likely to interpret the report's analysis as intentionally political) had little to no direct connection with the WEO or the WEO's authors. Though this may not necessarily be true in all circumstances, outsiders interpreted the politics of the report closer to the extremities of the framework laid out earlier and insiders closer to the indistinct boundaries in the middle.

This was not the only manifestation of the inside/outside distinction in the analysis above, however - two other instances appear relevant to the discussion of the politics of the WEO. For one, there is the internal/external distinction that is itself immanent to the production of the WEO; namely, the distinction between exogenous and endogenous aspects of the World Energy Model. Secondly, there is a larger, extrinsic distinction to be made between the parts of the world that are 'open' to the WEO's analysis, so-to-

speak, and those that are 'closed'. This latter distinction pertains mainly to the divide between OPEC and non-OPEC, but also perhaps to the availability of data and information. In both instances, the distinction between internal/external appears to play an important role in maintaining control.

In the case of the World Energy Model, the fact that the oil price assumption is kept more-or-less external to the modeling effort – despite the lack of coherence and consistency this implies in the model itself – is very clearly a methodological choice intended to retain the analyst's discretion over the results. Moreover, this contrast (between external and controlled, and internal and technologically 'autonomous') is mirrored by the seniority of the user. As the anonymous interview participant noted, it is the senior personnel (notably Birol) that recognize the model for what it is (i.e., only a tool) and that a tool should be controlled by its user. Junior analysts, conversely, aim to increase the sophistication of the model by adding modules and parameters to enhance its representation of the world, but in doing so tend to subject themselves to the model's autonomy in producing observations of the future. The latter approach, if taken to its extreme, becomes irresponsible; risking the production of futures that violate the 'responsibility to caution' that is characteristic of institutions like the IEA, as well as the overstepping of boundaries of determinism vis-à-vis the future – the audience needs to retain the capacity to change the future if needs be.

The 'extrinsic' dimension of the internal/external distinction (i.e., the manifestation of this distinction in the world outside or external to the WEO) is also related to control, though a sense less connected to the individual actor. We see in the examples of 'analysis-by-subtraction' and by the representation of open/closed states by a binary

variable in the later versions of the Word Energy Model the utility of creating and maintaining an external 'buffer zone' in futures, into which can be placed all the residual uncertainty that is left after a thorough consideration of the 'internal'. Owing to historical circumstance, the IEA has not always had reliable data on oil resources and production in OPEC countries, though it does by design have much better information on the OECD oil sector. Comprehensive analysis of the OECD countries is therefore both possible but also more tightly constrained by the question of what is or is not realistic for future production in those regions. Absent detailed knowledge of OPEC, analysis-by-subtraction seems a logical consequence, dumping the remaining required oil supplies (after consideration of demand) on the back of OPEC, thus effectively 'controlling' uncertainty by locating it in 'the external'. This is only really possible to the extent that the audience of the report is confined to the countries on the 'inside.' As the IEA progressively engaged with non-member countries and OPEC throughout the 2000s, this strategy become much more tenuous. An interesting question, however, is how uncertainty could be similarly controlled in the context of a hypothetical 'world energy agency' (which the IEA is not, and does not intend to become). As suggested by Knapp's discussion of this hypothetical situation, control in the context of a less distinct internal/external distinction might tend towards bureaucratic centralization and the exertion of control inward, on the markets themselves, in the form of collusion.

As with all the other distinctions, dichotomies and spectra noted above, the question of just how much uncertainty to place in the buffer zone of the external versus the exertion of control directed inward (on behaviour, on markets, etc.) is a matter of judgment. Too much reliance on heroic levels of OPEC production in the mid-2000

WEOs undermined the report's realism and credibility, even among non-peak oil-motivated critics, thus tending towards an irresponsibility vis-à-vis the Agency's mission of maintain energy security. Similarly, resolutely sticking with a conservative oil price assumption throughout the historic rise of real world prices between 2003 and 2008 not only damages the creditability of the report, but allows for the perception of a concealed, political corruption of the report to emerge and take hold. Conversely, outsider critics of the report are not as constrained in their assessments of the politics of the report as insiders may be. This absence of constraint, combined with a lack of experience in the Agency or awareness of the 'real' way in which politics mediates the production of the report, allows for more radical assessments to be made of the report, at times approximating the extreme corners of the framework given above. Insiders tailor their perception of outsiders accordingly – the less extreme, the more relevant the observations of the critic; the more extreme, the more fringe and political are the charges put forward.

Is the WEO 'biased, corrupt and irresponsible'? As this discussion was intended to suggest, the answer to that question depends largely on personal perception and individual judgement, both of which themselves depend on where in relation to the report one stands. Given the discussion of these themes in Chapter 8 and of the sites of contention in Chapter 9, it seems fair to say that the WEO does indeed present a conservative vision of the energy future – not necessarily in the sense of being biased towards the status quo, but more to present a relatively safe and structured image of the future within which the report's audience retain their discretion and autonomy vis-à-vis the energy future. As a result, the report is clearly mediated by the politics internal to the IEA and external to the Agency as well. Indeed, it is because of the balance struck

between autonomy and external control that the report can retain its creditability and objectivity without actually being objective and autonomous. Lastly, on the question of irresponsibility, it seems challenging to offer anything more than a partial, individual response. Who can judge 'responsibility' after all, in the absence of a clear, empirical connection between the report's analysis and the state of sustainability in global energy systems? Perhaps, like futures more generally, judgment on this question cannot be passed until after the future has come into the present, until after the issue on which the charge of irresponsibility was put forward is settled.

Does any of this entail that that the WEO is not really a sustainable energy future, or that the criticisms put forward of the report were unfounded? On both those questions, I would argue that it does not. Though it may lean more to the practical, empirical, 'continuity-of-service' connotations of sustainability, this does not preclude it from being a future for sustainable energy in general. It may help to contrast the WEO with an imaginary, non-sustainable energy future. For one, such a future need not include any rhetoric about sustainability or change whatsoever, and it also would likely not bother too much with issues of climate change and energy poverty, except where they may be relevant factors in determining the content of the vision. The fact that the IEA does speak to these issues (even if only because they are required to do so by its members) suggests it is a sustainable energy future. Moreover, given the global status of the WEO, there is a case to be made that whatever it does or does not intend its statements about the future concern the public interest. Sustainability is in large part a public interest; the equivalent aims expressed privately (that is, to ensure balance, identify limits, govern change) are strategic. In other words, a non-sustainable energy future may not also seek

to influence the decisions of people in the present beyond those within the group or organization that is doing the observation, and then only for the purposes of self-preservation or prosperity. The WEO does not offer a vision of the future for energy for strictly strategic (i.e., for inside audiences only) purposes - it is a public report.

On the legitimacy of the allegations put forward in Chapter 7 and 8, the question is somewhat murkier. To the extent that a controversy is characterized by strict distinction between insiders and outsiders, friends and enemies, the possibility of finding some middle ground that recognizes both sides as legitimate (or illegitimate) is diminished. It seems that one must take sides in such disputes, adopt a partial perspective on the politics of the thing in question. This phenomenon cuts to the core of 'the politics of the future for sustainable energy,' I believe, which I will outline in the following, final section in this chapter.

10.3) Theoretical Question: How can we characterize 'the politics of' the future for sustainable energy?

As noted in the recap provided above, the aim of this study was to outline a politics of the 'middle way', since the future for sustainable energy is positioned between the poles of improvement and habitation, empiricism and rationalism, and action and reflection. The manifestation of these tensions in the field of futures studies is the conception of the practice as being a science (the tough-minded approach) or an art (the tender-minded approach). Rather than predicting 'the future' or constructing 'futures', the practice instead sorts aspects of the future into those that are 'future' and those that are 'futures.' This occurs via the 'observation' of the four spectra noted above, thereby distinguishing between: 1) objective and subjective elements of the future; 2) determined and contingent

possibilities; 3) discrete or diffuse rule-governed outcomes or behaviour; and 4) things we are or are not responsible for in the future for sustainable energy. Because the distinction between future and futures is thus to a large extent a product of the activity of observing the future, there is little difference between a politics of futures for sustainable energy and a politics of the future for the same – the two are intimately intertwined.

To offer a politics of this 'middle way' means going beyond a perspective in which futures are contingently political (i.e., politics only intervenes in an otherwise neutral or apolitical state of affairs) and the contrasting perspective of futures being necessarily political (i.e., that they are always and inevitable ensconced in a social/political context), but still retaining the possibility that either perspective may in fact be an accurate depiction of the state of affairs in some cases. The politics-as-distinction approach is the answer to the question of the politics of the 'middle-way.' The pragmatic response to apparently unresolvable tension between the tough and tender-minded is to carve out some balanced synthesis position between them, to take what is has practical implications as the defining characteristic of validity or legitimacy – what works, not what is right – and to reject the extremities of the spectrum as contrived, dogmatic, artifices that in their purity cease to be representative of real character of the world. The 'truth-value' of any given future is not therefore dependent wholly on the verifiability or degree of correspondence with empirical reality, and neither on the construction of subjectively 'true' beliefs. Instead, futures connect with 'the real' world *instrumentally* - sorting knowledge of the future into either category in order to better serve decision-making (and thus agency) in the present.

Contemporary practices of observing the future for sustainable energy embrace this pragmatic, instrumental attitude. In doing so, they embody the technological approach more so than a science of prediction or art of conjecture, thereby renouncing the stark choice between a contingently political future and necessarily political futures. Their aim is to dissolve the differences of the extremes, work toward the formation of consensus and agreement at the centre, and thus to produce order in the process of historical change towards a sustainable future. Yet a 'politics of distinction' suggests that the notion of the 'middle ground' is a myth, that at the core of any 'balance' always and necessarily remains a choice, a question, a matter of judgement. One must decide one way or the other, and in doing so the grounds for difference (and thus dispute, controversy, and politicization) are set; to refuse to judge is to place oneself external to the matter at hand. The stronger and more concrete the distinction at the core of the middle is, the more intense and stark the resulting politics. Whereas the naïve division is between contingently and necessarily political futures, politics-as-distinction sees more a spectrum of *political charge* that correlates with the degree of contrast in any given distinction: politics is always present or possible, even inherent in an observation of the future, but that observation need not necessarily be politically charged.

As suggested by my account of the question of realism and the claims I derived from it, the degree of political charge thus depends on the intensity of the distinctions made on the three 'questions of realism' of representation, prudence and efficacy. It should be noted however that none of these questions are meant to imply a static reality against which an answer to them can be evaluated. Rather, the question posits a process by which a shifting boundary of 'realistic-ness' changes over time to softly (or resolutely) rule out,

or in, different configurations of the probable, the plausible, or the preferable. It is not, in other words, a battle between realistic forecasts and idealistic, preferable futures. Neither does it imply that there is a concrete definition of what is realistic or not, or that observers of the future are consciously trying to weed out idealistic elements from their scenarios; indeed, many futures for sustainable energy are explicit in their incorporation of ideas and desires about the preferable future. The questions of realism are accordingly *boundary-setting* rather than rule-constructing or implementing processes. The question of what is or is not realistic can therefore shift over time as new information comes to light (as for example the publication of the USGS 2000 report did for global recoverable oil resource figures), or as social and/or cultural attitudes shift or change.

In short the 'question of realism' is in large part an issue of judgment under uncertainty, rather than an simple opposition to idealism, the enduring reality of power politics, or reactionary obstacles to change. The future is uncertain but that alone is not enough to make it political. No matter how faithfully we describe that uncertainty, it remains. In the end, a decision must be made. Over time, those discrete decisions compound and congeal into the fabric from which future decisions draw their thread - where once there was only muddled uncertainty, now the boundaries of future have been carved out more rigorously. People who only disagreed previously now are forced towards 'camps', opposing the others with vehemence proportional to the clarity of the distinction between realistic and non-realistic. The reason why the question of realism is political is that it concerns the exclusion or inclusion of possible futures; it circumscribes the boundaries of plausibility and in doing so renders marginal futures borderline fringe

concerns. To exercise judgment is, in a sense, to weigh competing goals and determine the appropriate balance.

How do the questions of realism and the framework and extensional claims put forward in Chapter 5 characterize the controversy and politics surrounding the WEO? Based on the above discussion, we can identify several examples:

10.3.1) A question of representation.

In the case of the WEO, the question of representation was at work especially in the contention surrounding oil reserve figures. This pertains on the one hand to the use of 1P data in the WEO, which critics allege are intentionally unrealistic portrayals of the true extent of reserves. The WEO's reliance on them thus biases the projections towards optimism, and an unrealistic expectation of future resources. On the other hand, it also pertains to the discrete nature of WEO oil supply projections. Here critics take issue with the unrealistic confidence that is suggested by the presentation of singular figures. In both cases, the underlying uncertainty of the issue has been masked or otherwise not faithfully represented in the resulting information. Alternatively, the question of representation could also characterize the assumptions that the IEA uses in producing the WEO, namely the oil price assumption. Is it realistic to assume that prices will remain more or less stable? Some would disagree, arguing that to assume as much is evidence of an underlying bias towards the perpetuation of the status quo.

In both the case of assumptions and in the use of and representation of data, the IEA has had to exercise judgment, mainly in the direction of simplification and likely in the interest of facilitating decision-making down the road. The alternative is to represent

uncertainty as completely as possible, or to combine the conflicting perspectives of multiple parties into one, opaque mess. In either case, the need for judgment does not disappear, and may in fact be hindered (as Wack and Schwartz suggested above, in noting the need for structure to guide decision-makers). The manner in which the IEA exercised judgment on these issues should thus be seen as a key contributing factor to the allegation of bias within the report, since without this aspect the question of representation would be simply a matter of poor data. In other words, the data, model or assumptions themselves can be better or worse representations of reality, but they only truly become political concerns when the manner in which the observer exercises judgment on the uncertainties within them is perceived as unfaithful to the stated task of the observation. Accordingly, it seems that the degree of political charge associated with the question of realism in a future for sustainable energy is not solely dependent on the relative representative 'realism' of the observation or the techniques used to produce it – it requires an additional charge of infidelity to the task, or a *duplicity* in the desire to represent the future for sustainable energy faithfully.

It should be recalled, however, that the question of representation is not solely an issue of empiricism; it also entails the scope left for our will to change the future retained in the observation. Judging the question of representation thus intervenes in the tension between empiricism and rationalism in the context of the non-existent future: too much empiricism becomes unrealistic, as does too much rationalism. Politicization via this question could occur via either imbalance. An allegedly duplicitously unrepresentative future like the WEO (in an empirical sense, e.g., discrete predictions, poor assumptions) might thus defend itself on the charge of politicization on the grounds that judgment was

passed in representation so as to enhance structure to guide decision-making (i.e., to tilt towards the rational in representing the future). In the absence of a clear, transparent and forthright statement of this intent, specific to the sites of contention involved, the perception of concealed intent will continue to characterize the politics of the WEO's representation of the future.

10.3.2) A question of prudence.

One could interpret the self-preserving ethos allegedly pervading the WEO staff as an example of the question of prudence, and similarly the 'responsibility to caution' that supposedly characterizes the IEA more broadly. The coded messages contained in some WEOs and the political mediation of the analysis, messaging and presentation of reports are also examples of this question. As one observer noted, it would not have been prudent of the IEA to do more for renewables in the early 2000s while the Bush Administration had control over its principal source of funds. The IEA, and thereby the WEO, not only exist within a political context but also gain their voice and standing from it. To jeopardize that in the pursuit of an idealistic goal, even if all the analysts at the IEA agree it is a desirable goal, would not be particularly prudent. Even the general structure of the WEO can be taken as an example of the question of prudence – given the political context the WEO is produced in, it seems most prudent to influence action by showing what could happen in its absence, rather than drilling home the desirability of a particular future to be achieved by taking specific courses of actions.

The question of prudence is thus closely connected to the social and political context in which the WEO is produced, deriving its political force from the tension between action within that context and reflection upon it. The question of prudence is

therefore primarily an issue of judgment, a choice between un-reflexively acting according to some kind of imperative and proceeding with cautious awareness of the constraints imposed by one's social and political context. Like the question of representation, differing opinions as to how these choices have been made are a key contributing factor in the controversy concerning the WEO. Critics argue the WEO is tilted too far to the latter position; that it should do more to push change or advocate for certain technologies. They suggest its context corrupts its ability to provide an impartial future, or that serves as a mere intermediary of powerful actors' politics. In either case, the agency of the WEO (or WEO team, rather) becomes subjected to the imperatives of social or individual politics, to the point where their own action can only be directed toward self-interest or self-preservation.

To assuage such criticisms, the response implied by the theoretical framework would be to abandon the guise of reflection and adopt one of action, of strong and concerted statements on what needs to be done to reach a defined vision of the preferable energy future. Indeed, in recent years the WEO has 'taken on more of an advocacy tone', as some former insiders noted. It may be that such an advocacy tone has only been made politically 'realistic' by the changing social and political context in which the WEO finds itself; a prudent course of action, not because it is safe, but because it will allow the WEO to retain its relevance in a world increasingly concerned with climate change and environmental sustainability. If it travels too far in that direction, however, it seems likely that it could become re-politicized but in the opposing direction, for being too provocative or unreflective of the realities of member-state, energy system inertia.

Ultimately, how far the WEO can go in this direction before becoming politicized will depend on the social context and the individuals assessing the report. The controversy reviewed here appears to confirm the claims regarding the marginal / fringe source of allegations, in that the boundary or realism that was transgressed in order to produce controversy is that of the individual, not the social context in which the WEO operates. As the boundary of prudence shifts more towards action in the social context (i.e., among the member-states) previously fringe allegations may become more mainstream.

10.3.3) A question of efficacy.

Differences of opinion as to what the IEA/WEO could or should be held accountable or responsible for are one manifestation of this question. As noted above, some observers found it preposterous that the WEO could have large-scale, self-fulfilling prophecy effects on the global energy system, like forestalling a transition to sustainable energy or facilitating the development of unconventional oil technologies. While it may be the case, according to critics, that the WEO has inadvertently dissuaded countries from developing necessary contingency plans for peak oil, this is not to say that had they done anything differently countries would have listened to them. Similarly, a common view expressed by IEA 'insiders' regarding the WEO's responsibility to address climate change was that, a) it is not the IEA's role to do anything more than provide an energy perspective as required by national governments, and; b) the WEO would likely be unable to affect any more meaningful influence on governments on this issue than it does at present (which, evidence suggests, is not much).

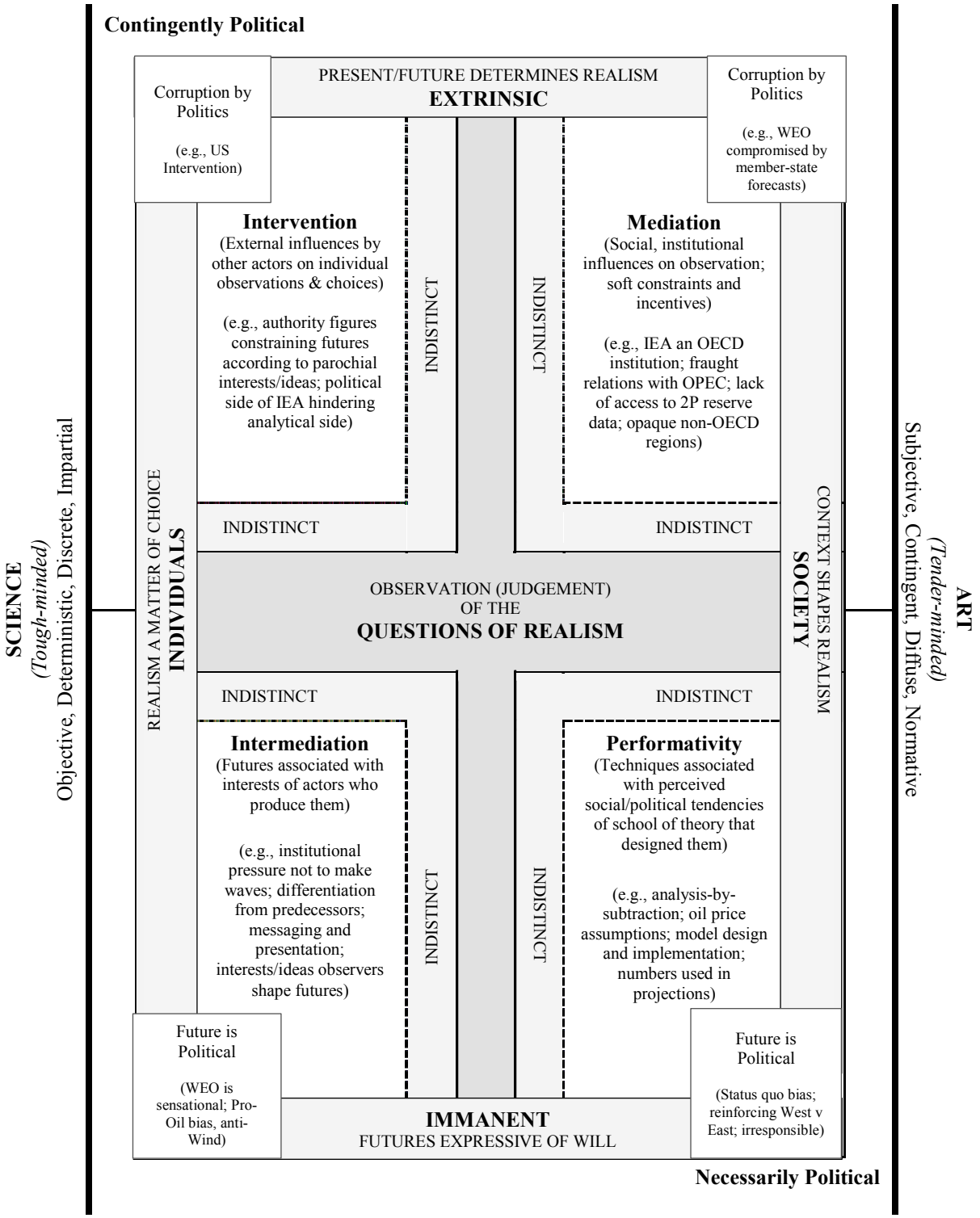
On the whole, divergent interpretations of the efficacy of the IEA/WEO vis-à-vis climate change can be seen to be a cause of the controversy concerning the irresponsibility of the WEO. As with the above two questions, the question of efficacy is also a matter of judgment – primarily of the individual or organization assessing their own agency in relation to the external world. The balance that is struck in this choice is between the will and the world, between the immanent, internal capacity to choose, act and exert control and the aggregate, external recalcitrance to such aims. Critics argue the WEO, given its privileged position as the world's flagship energy future report, should more strongly exert a progressive influence on global energy and climate change policy. Defenders argue that the processes by which those policies are constructed are too hopelessly complicated, too bogged down by parochial interests – in short, too political – for the WEO to have any hope of swaying them. Moreover, in conjunction with the question of prudence, the WEO would be jeopardizing the privileged status that affords it its voice were it to move to far beyond what the IEA's members allow.

Of all the variants of the question of realism identified here (and there may of course be others), it is perhaps the question of efficacy that is most prone to leading to a self-fulfilling or self-denying prophecy. The more the balance tips towards acquiescence in the face of adversity, compliance with the imposed requirements, or towards fatalism in the contingency of the future, the more likely we are to become passive recipients of our fate – a fate that is the direct result of our inaction. Tipped too far in the other direction and we are setting ourselves up for frustration, disappointment and failure. It is in that sense a double self-fulfilling / self-denying prophecy: not only does the question of

efficacy reflectively affirm or negate the assessment internally; it does so externally as well. Perhaps the same might be said of the question of realism in general.

How might these issues plot on the revised framework developed earlier? What is the relationship between the questions of realism, the sites of contention in the controversy, and the four perspectives on politics and the future for sustainable energy? Figure 17 below replicates the revised framework developed earlier, plotting the key allegations and sites of contention in the boxes that best reflect the politics perceived to be at play in them. Where the allegation approximates the clearest distinction between source and location of politics, it is located in the corner-most boxes.

It should be noted that the four perspectives given by the framework (intervention, mediation, intermediation and performative) are only partial accounts of the *perceived relationship* between politics and the future for sustainable energy. The questions of realism, on the other hand, are *matters of judgement under uncertainty* that underpin any given observation of the future for sustainable energy. 'Politics-as-distinction' is an account of both the 'concept of the political' and the act of behaving politically; it thus applies equally to the questions of realism and to the relationships between perceived sources and locations of politics. The four perspectives might adequately cover the kinds of relationships between politics and the future for sustainable energy that are perceived to be at play by the actors involved, but it is the questions of realism that form the core of the possibility of those politics. The connection between the perspectives on politics and the questions of realism is, in short, the information that futures provide.



(X Axis = Source of Politics; Y Axis = Location of Politics;
Dark to Light = Increasing Intensity of Politics)

Figure 17) Revised Framework including WEO Controversies and Sites of Contentions

In other words, the information provided by a report like the WEO may be perceived as political in one of four ways but both the fount and consequence of the political in that information is, I have argued, the question of realism. Therefore, the reason why US intervention in the WEO is a political concern is the intervention it makes in the determination what is or is not realistic to say, hope, or do about the future for sustainable energy.

In all, I believe a strong case can be made that both the source and intensity of controversy surrounding the WEO, as well as the course that this controversy took between 1998 and 2010, can be understood via the politics-as-distinction perspective and the three questions of realism I have put forward here. In the discussion above, I demonstrated how these questions run through the three allegations made of the WEO, and how the character of their politicization aligns with the theoretical claims advanced in Chapter 5. I pointed to the role of judgement in deciding these questions, a role that cannot be disavowed or dissolved by striving to take a 'balanced' middle way. Based on the above discussion, the framework of politics advanced in Chapter 5 can be seen to serve as an effective tool with which to interpret the connection between controversy and politicization in energy futures.

Nevertheless, the initial framework did not adequately capture what has emerged out of the 'internal' perspective gained through interviews as important distinction in determining an observation's politicization - that is, the degree to which politics is perceived as being concealed versus transparent. Both the bias and corruption allegations

seemed to gain in intensity insofar as the underlying cause or condition that created them was perceived as being hidden or concealed. In cases where the IEA was more transparent on potential sites/issues of contention, the controversy was not as politically charged (e.g., instances where both insiders and outsiders agreed that the report was indeed 'political' – like in the choice of a scenario-based approach). We can thus consider this to be a third dimension to the relationships between politics, controversy and the future for sustainable energy: alongside the source and location of politics, we also find that the *opacity* of politics plays an important role in differentiating perspectives on the politics of the future. Adding this third dimension would thereby distinguish between two types of each of the four perspectives - basically between concealed or overt political intervention, mediation, intermediation, or performativity.

The alleged duplicity of the observer in exercising judgment on the questions of realism is, I believe, closely related to this third dimension, such that we might consider it to be a fourth 'question of realism' – i.e., what is or is not the real intention of the actor exercising judgement vis-à-vis the future for sustainable energy (alternatively, how 'realistic' to one's true self is one's appearances). Thus, the answer to any of the other three questions of realism may be characterized by a greater or lesser degree of disingenuousness. This leads to such questions as: If someone judges their efficacy in the future for sustainable energy to be weak or insignificant, are they doing so because they sincerely believe they are powerless or because they wish to use that representation to skirt their responsibility to act? Is an observer's projection for some aspect of the future a reflection of what they truly believe or is it being made for ulterior purposes? To what extent are those purposes stated forthrightly? If an observer is seen to be acting meekly

and states the constraints imposed upon them by context as a justification for this behaviour, are they being honest or are they using that as a guise for their real underlying cowardice? Each of these questions was posed in the allegations of bias (e.g., one's *bona fides*, the transparency and awareness of bias), corruption (e.g., are analysts/the WEO self-serving or serving in the interest of the community?) and irresponsibility (e.g., the IEA is not responsible for the decisions or lack thereof made by their member-states), working to reinforce the politicization of the other distinctions at play in those accusations. And, as with the other questions of realism, it was only when the disjuncture between appearance and perceived reality was at is most distinct that the accusation became fully politicized.

We might therefore frame this fourth question of realism as *a question of authenticity* – a question of what is or is not sincere in any given observation of the future for sustainable energy. As discussed above, the other three questions of realism (representation, prudence and efficacy) each aligns with a tension inherent to the problem of the future for sustainable energy (rationalism versus empiricism; action versus reflection; and improvement versus habitation). This raises a question of a tension with which this fourth question of realism might similarly align. The question of authenticity appears to be closely related to a tertiary dimension of politics (i.e., the opacity thereof). It plays upon a possible disjuncture between the outward-facing, appearance of an act or observation of the future and the internal, concealed, real motive of intention behind it. This question thus appears to derive its political force from the distinction between parochial, individual or *private* intentions and the common, social or *public* good. Information is the medium in which the politics of the future is contained and/or by

which it is expressed. The possibility of insincere or inauthentic observations of the future creates the perception of a disjuncture between the information available publicly and the real information held privately (i.e., the 'coded message' of the 1998 WEO). To return to the question of the legitimacy of the critiques levelled at the WEO, the perspective of politics-as-distinction that I have outlined in this study seems to suggest that any such answer to that question requires one to either take one or the other side, or to affect a second distinction between that choice and some third option. What would that option be? It may be that the alternative choice is that indecisiveness and choice itself: one either takes a side or relinquishes the ability to choose. A more realistic option might be to reserve judgment on the matter until it is clearer as to what might be gained by deciding or on what grounds one's choice will be evaluated.

Chapter 11) Conclusion

This study sought to outline a politics of the 'middle way' between a science of the future and an art of envisioning futures for sustainable energy. In brief, that middle way is encapsulated in the metaphor of *balance*. In the context of 20th century modernity, the aim of balance is ameliorative: to dissolve the tensions and contradictions inherent to modernity itself, foster consensus and agreement, and increase the overall order of the process of historical change. Sustainable energy entails not only the designation and desire to work towards an idealized future for energy, but also the maintenance and security required for continuity of service. Environmental protection must be balanced with social goals and economic imperatives, growth and improvement maintained but without transgressing limits to stability, certainty or habitation. The representations we make of the present and the future to further this cause must therefore balance the normative aspects of sustainability with the practical, empirical reality of energy systems at present. Our attitude towards change needs to balance action to bring it about with reflection as to its direction and desirability. Sustainable energy is not a state that we might someday hope to achieve, but rather a process - a process of governing (historical) change.

'The future' is a central concern in this process – it is where we conceive of alternate possibilities for our energy systems, where we can anticipate threats or challenges to our ability to provide energy services, and where we can extrapolate the consequences of our actions (or inactions) in the present. These engagements with 'the future' are often termed 'futures', though to do so re-enacts a distinction between a science of predicting the one true future and an art of conjecturing multiple possible futures. Indeed, the

distinction between a tough and tender-minded approach to the future is another manifestation of the tensions inherent to the problem of sustainable energy. Given that sustainable energy is aims to balance normative and practical concerns, however, the manner in which we engage with the future for it takes on a pragmatic, instrumentalist quality. 'Observations' of the future for sustainable energy do not only set out probable, plausible or preferable futures with the intention of influencing decision-making in the present, they also distinguish between aspects of the future that are predetermined or contingently uncertain; between processes and points of intervention within them. Observations of the future are thus technologies of control, affecting distinctions on the future that are instrumentally important in our control over the process of historical change.

At the core of this control is a distinction between what is or is not realistic to say, hope or do about the future for sustainable energy. This distinction can be made by individuals, or it can be made through the aggregation of individual decisions. As the distinction between what is or is not realistic to say about a given aspect of the sustainable energy future coalesces and hardens, it comes to approximate a social fact: a socially constructed condition of reality that it would be foolhardy to oppose. Yet, because the future does not exist, it never can become a real condition of reality; it can only ever be probable. Accordingly, there is always the possibility for an alternative judgement as to the boundary between the realistic and non-realistic and, therefore, always the possibility that this boundary will shift. The question of realism itself contains three dimensions: a question of representation (what balance to strike between empiricism and rationalism); a question of prudence (whether or to what extent to act or

reflect); and a question of efficacy (to strive for change or to acquiesce in continuity). Any given observation about the future for sustainable energy is thus subject to the question of realistic/unrealistic based on its decision or judgement vis-à-vis these three subsidiary questions. The general effect of the question of realism is thus to restrain or restrict one from being drawn out to the extremes of the problem of the future for sustainable energy; a tendency towards conservatism perhaps, but a conservatism that is non-dogmatic and willing to change according to circumstance.

At the interstices between an understanding of politics as the production of order or the expression of difference lies a view in which politics is simply the act of making a distinction - there is no difference that does not depend on a distinction, and no order is possible without a boundary condition to define it. The politics-as-distinction perspective outlined here posits that the intensity with which such distinctions are made, the purity of the things distinguished or the starkness of the contrast between them correlates with the amount of political charge that distinction carries, i.e., with its politicization. This perspective offered six extensional claims on the connection between politics, politicization and controversy surrounding the future for sustainable energy.

Based on the theoretical discussion of 'technologies of control' and 'politics-as-distinction,' this study then outlined an internal perspective on the causes and characteristics of the politicization of the World Energy Outlook. This perspective was comprised of both a review of the documentation critical of the WEO and gathering the responses of key stakeholders to the three main allegations of the controversy: that the WEO is biased; corrupted by politics; and irresponsible in its projections of the future for oil supply. I then explored in depth each allegation via interpretation of the responses

from the interview participants. Bias was generally recognized as a political phenomenon, though the degree to which it was seen as political depended a good deal on the extent to which the bias was concealed or obscured behind a veil of objectivity or impartiality. Though not all agreed that the IEA/WEO is indeed 'corrupted' by the politics of its member-states or international context, these two factors certainly do mediate the production of the report, constraining analysts from taking too strong a stance on most issues, though also encouraging them to sensationalize certain aspects of the analysis in order to more successfully promote the report. The charge of irresponsibility was the most difficult to assess. 'Insiders' tended to renounce the accusation that they should be held accountable for the actions (or inaction) of states on sustainable energy policy, and generally argued that modeling assumptions are made with the best intentions. At the same time, however, the political mediation of the WEO does suggest that perhaps some 'truths' about the modeling approach and the possible future for energy are left unsaid.

I followed the review of the three allegations with an examination of their expression in four 'sites of contention': people, numbers, methods, and messages. Personal relationships are certainly a flashpoint for controversy, some of which become quite antagonistic. In many cases, this is driven by a perceived duplicity on the part of an individual, who is thought to act according only to their own self-interest. At the same time, respect for another's *bona fides* will obviate these tensions. 'Numbers' are particularly contested sites, especially when they are used to represent an uncertain phenomenon. Reserves, resources, and rates are three key numbers that are contested in the WEO, with critics arguing the choices of the IEA analysts on these issues biases the

result toward an optimistic future for oil supply. Moreover, the representation of uncertainty is alleged to be unrealistic given that only single figures are given and projections are made that seem unlikely given past trends. On 'methods', I examined the WEO's 'analysis by subtraction', noting its connection with political mediation of the IEA. I also looked at the oil price assumption, noting that it had generally been quite conservative (especially during the most optimistic years of oil price projections). Lastly, I looked at how messaging and presentation of analysis can also become contested, when for example it is perceived to obscure the real meaning of the numbers or to over-sensationalize and over-editorialize certain trends.

A final chapter provided a theoretical reflection on both the case study analysis and the framework developed earlier, discussing in detail the two main research questions of the study: what are the causes and characteristics of the politicization of the World Energy Outlook, and what are the politics of the future for sustainable energy. On the whole, I argued that the framework developed in Chapter 5, alongside the concepts of technologies of control, politics-as-distinction and the questions of realism were useful tools in interpreting the connections between politics, politicization and controversy surrounding the WEO. The extended claims given in Chapter 5 were mostly corroborated: the questions of realism did appear to be a contributing factor in the emergence of controversy, as did the intensity with which the allegations were made (e.g., a clear accusation of extrinsic, social political corruption of the report being the most 'political' allegation). Insider's tended to view critics as holding marginal, fringe perspectives on the question of what is or is not realistic in oil supply futures, suggesting that the boundaries of realism that were transgressed in the emergence of controversy

where generally those held by individuals. Moreover, it was apparent that the boundaries of realism are not set in stone, and do change over time; the chart showing the history of URR estimates over time, including the large upward jump in the average estimate precipitated by the publication of the USGS 2000 report, suggests a boundary shift in the question of realism.

The contribution of this thesis was to address the *partial* and *incomplete* perspectives on the politics of the future for sustainable energy in both a theoretical and an empirical context. Existing literature on the topic, and commonplace, day-to-day consideration of this relationship, has tended to approach the issue from either a 'tough-minded' or 'tender-minded' standpoint, construing the future as either contingently political (i.e., that politics intervenes or corrupts visions of the future for sustainable energy) or necessarily political (i.e., that futures are inevitably and unavoidably ensconced in a social or political context). In actuality, observations of the future for sustainable energy typically (if not always) strive to work out some kind of balance between these poles. This does not obviate the three tensions I identified as integral to the future for sustainable energy (e.g., improvement vs. habitation, rationalism vs. empiricism, action vs. reflection) but instead lead to tension between different considerations of the appropriate balance to strike, as the contrast between Nordhaus and Stern described in Chapter 2 illustrates. What I sought to achieve in this study was the construction of a framework for understanding the manner in which politics pervades such differences, the ways in which it (the allegation of the political) is used by actors to critique the balance struck by other observers, and the kinds of perspectives on the relationship between politics and observations of the future that are most often articulated. I also sought to test and, if

necessary, supplement or revise this framework on the basis of an 'internal' perspective on the question (i.e., the perspective of actual observers of the future for sustainable energy, especially those with some connection to the controversy surrounding my case study). The revised framework described in Chapter 10, with the addition of the opacity dimension of politics and the fourth question of authenticity, effectively satisfies these goals. From an empirical standpoint, this study contributes to the sparse academic literature in political science on the International Energy Agency (IEA). The balanced analysis of the politics of controversy surrounding the IEA's World Energy Outlook provided here had not been attempted before, and may thus serve as a good introduction and thorough examination of some of the key issues concerning that report's impartiality for its many readers.

Furthermore, not only do I consider my arguments about politics-as-distinction and the questions of realism as novel approaches to grounding the politics of the future for sustainable energy on characteristics shared by both tough and tender-minded considerations of the problem, I also believe that they may help to 'broaden the mental maps' of the relationship between politics and the future for sustainable energy, held by practitioners of futures observation and policy-makers alike. Accordingly, I consider this study to be a useful contribution to both futures studies and sustainable energy policy studies. Armed with this perspective we can more easily recognize the mobilization of these distinctions in debates and contests over the future for sustainable energy and deduce the balance that is being stuck in their making. We can anticipate the potential for politicization in our observations of the future and the lines along which such controversy might flow. We might also utilize these politics in designing strategic communication

plans to either support or critique a proposed sustainable energy policy or plan advanced by either government or industry. Observers of the future can usefully note the importance of transparency in their assumptions and methodological choices in order to lessen the potential for politicization. Above all, we can remind ourselves that in any given argument concerning the realism of some aspect of the future for sustainable energy, the issue is rarely a matter purely of fact or value. Rather, it is an instrumental claim that is susceptible to pragmatic engagement.

Two issues present themselves as potential topics for future research. On the one hand, the framework given in Chapter 5 failed to consider one other dimension that appears to be relevant to the process of politicization and that is the relative concealment or transparency of the distinction in question. In the final pages of the theoretical review chapter, I suggested that this dimension might in fact comprise a third criteria in determining the relationship of politics to the future for sustainable energy; namely, the opacity of the politics involved (alongside the source and location identified initially). Moreover, this gives rise to a fourth question of realism – a question of authenticity – that was shown to be pertinent in determining the politicization of each of the three allegations made of the WEO (bias, corruption and irresponsibility). It seems likely that this issue may be connected with a division between public and private information, and also thereby with the strategic production, dissemination and use of such information. Further thought should be given to the ways in which the availability of information follows or reinforces social or political distinctions from which it is generated (e.g., the reinforcement of an insider/outsider distinction).

The other issue that was not dealt with in great detail here concerns the distribution of the benefits of the observation of the future. As was argued above, the primary instrumental value of futures is to afford us greater control over the process of historical change, not so much by eliminating uncertainty, but by dividing it up, locating in certain sectors, reigning it in. Several questions arise from this: What are the precise mechanisms by which the control of uncertainty feeds into control over change? What are the social or political consequences of techniques used to control uncertainty in this manner? And, how is that control distributed throughout society? One observation made of the question of realism is that it tends towards a stabilization of boundaries, a conservative assessment of what is or is not realistic, given past and present realities. It seems plausible therefore that the production and distribution of control vis-à-vis information about the future would tend to benefit the status quo. A possible avenue for future research might be to investigate the processes by which 'regimes' of realism can become destabilized, and boundaries shifted. Communications strategies, decision-making software, the structural connections of information and actor networks, and system modeling are all pertinent areas for future research into these issues.

In general, I consider this topic and the issues for future research to fall under the broader field of the *political economy of information*. Political economy is a diverse field itself, characterized equally by opposing critical and problem-solving approaches within. A seminal figure in the former approach is, of course, Karl Marx, who constructed a vast and complex theoretical edifice to explain how modes of production in the material world developed over time, generating both the political-economic relationships that characterized different orders and the contradictions between which would eventually

lead to the dissolution of that order. His theory reflected a curious and ultimately tenuous balance of contingent mechanisms of change with historical laws by which all relations of production where destined to abide. Though the approach outlined here (politics-as-distinction, questions of realism) is wholly absent of the latter feature, it does embrace the former – in particular the attention to the production of distinctions and, through that act, the contradictions and tensions that motivate social change. Of particular concern in this process are not the 'real' relationships or social classes that might be consequences of the 'mode of production,' but rather the production and operation of the more ethereal world of intersubjective, mental 'maps' of the real world, and the effect thereof on judgement and decision-making. In our reflexively modern world, the production, dissemination and strategic use of information has grown to accompany, if not supplant, older 'material' modes of production. Indeed, we now realize that information itself can go beyond mere interpretation and affect change in the world.

Appendix A) Letter of Invitation to Interview Participants

Dear [participant name],

My name is James Gaede and I am a PhD student at Carleton University in Ottawa, Canada working on a thesis on the political implications of forecasting and scenario development for energy and sustainability. The objective of my research is to investigate the sources of controversy concerning the future for energy systems, particularly concerning the International Energy Agency's *World Energy Outlook's* projections for oil supply and wind power growth.

I would like to invite you to participate in an interview (by telephone or on Skype) where I will ask some open-ended questions to learn from your expertise. I expect the interview to take about an hour (or whatever period you are able to make available). I selected you as a potential participant in my research because of your [participants' relationship to the research question], which I believe is an important element in this matter. I have attached a list of issues for your consideration which I would like to discuss with you. I might later ask follow-up questions or provide some short writing drafts for your expert review.

I intend to audio record the interview, unless you request otherwise. The recording is to aid my recollection of the interview. Please note that you would be identified in the thesis and any subsequent publications and presentations of the research. Your statements may also be attributed to you, unless you request otherwise, though I will note that statements given are those of the participants and do not reflect the official position of the International Energy Agency or your present employer. You may also refuse to answer any question or stop the interview at any time. A list of all participants will be included in an Appendix to the thesis.

If you participate in this research you may still withdraw from the study by contacting me at any point up until June 1, 2013. Should you withdraw from the study I will destroy the information you have provided. Upon request I will return your audio recorded interview after my thesis defense.

This project has been reviewed and received ethics clearance through Carleton University's Research Ethics Board (CUREB). If you have any concerns or questions about your involvement in the study, you can address them to the CUREB chair Prof. Andrew Adler, Carleton University Research Office, 1325 Dunton Tower, Carleton University, 1125 Colonel By Drive, Ottawa, ON K1S 5B6; 613-520-2517 or ethics@carleton.ca

Please do not hesitate to contact me if you have any questions or concerns about the project. Otherwise, I look forward to your agreeing to participate in my study.

Regards,
James Gaede
Ph.D Student, Political Science
Carleton University, Ottawa, ON Canada

Appendix B) Issues Discussed with Interview Participants

The approach I used for interviews was largely semi-structured and open-ended. Accordingly, I did not send along specific questions to interview participants, but rather a list of general issues to be discussed (as specified above in the Letter of Invitation). These issues differed according to the expertise, background and affiliation of the interview participant. Below is a sample list of issues drawn from several different interview request letters.

Relationship / History with the IEA

- Role/relationship with the International Energy Agency;
- Connections or familiarity with the World Energy Outlook;
- Perceptions of the IEA / Outlook and their influence over energy systems/policy in Canada;
- Awareness of controversy concerning oil supply / wind power projections;
- Response to the concerns about IEA projections;

Your work on / with the IEA's World Energy Outlook (WEO)

- The nature of your responsibilities
- The process and methods by which the Outlook is produced
- Connections with industry / policy-makers
- Balance between political / analytical arms of the IEA in drafting the Outlook

Current and past record of the WEO on future oil supply

- How accurate has it been / is it now;
- Motivations for the 2008 field-by-field analysis, extent to which it forced change in perspective within the agency;
- Meaning of 'realistic' in reference to assessments of future oil supply

Your response to four controversies concerning the IEA/WEO

- Allegation of undue optimism re: future fossil fuel supply
- Allegation of bias towards fossil fuels against renewables
- Allegation of 'corruption' by political interests
- Allegation of irresponsibility, re: statements passed as facts when based on assumptions

Assessing the future for oil markets

- Best practices, key challenges or uncertainties
- Primary aim of assessing the future for energy markets
- Role of assumptions, methods to control for arbitrariness
- Balance between economic and physical/geographic factors in assessing oil supply

Record on oil supply / international political context

- Reasons for high oil projections throughout 2000s
- Constraints on analysts to tell a different story
- Political climate for producing the WEO; institutional barriers
- The IEA record on fossil fuels

Your work on the 2000 USGS World Petroleum Assessment

- Motivation for study and the approach used in 2000 assessment that differed from past work (e.g., reserve growth, Monte Carlo, Delphi, geological rather than probabilistic approach)
- IHS data used in assessment, reliability thereof for different world regions;
  - Does lack of accessibility to data or lack of consistent methodology in producing data hinder analysis and discussion?
- Response to criticisms claiming it is too 'optimistic' or taking issue with the methodology (i.e., criticisms from 'peak oil' proponents re: using US as benchmark for reserve growth)
  - To what extent has subsequent analysis confirmed the findings in the USGS 2000 report?

Appendix C) Interview Participants

Dr. Thomas Ahlbrandt – Petroleum geologist, Lead author of the USGS 2000 report

Dr. Roger Bentley – Professor, Department of Cybernetics, University of Reading; Joint author on UKERC Global Oil Depletion study;

Jean-Marie Bourdaire – Former Director of the Long-Term Office, IEA 1997-1999

Graham Campbell – Former chair of the Committee on Energy Research and Technology (CERT), IEA;

Guy Caruso – Former head of the Oil Industry Division and chair of the Non-Member Countries Standing Group, IEA;

Peter Fraser – Former senior electricity policy advisor at the IEA;

Dr. Dermot Gately – Professor, Economics, New York University; Former consultant on WEO OPEC oil supply modelling

David Knapp – Former head of Oil Industry and Markets division at IEA (1993-2000) and lead author of the IEA Oil Market Report;

Jean Laherrère – Former petroleum geologist at Total; prominent peak oil critic and author of the 1997 report "The End of Cheap Oil" with Colin Campbell;

Michael Lynch – Oil market economist, participant at 1997 Workshop on Supply;

Robert Priddle – Former Executive Director of IEA, 1994-2000;

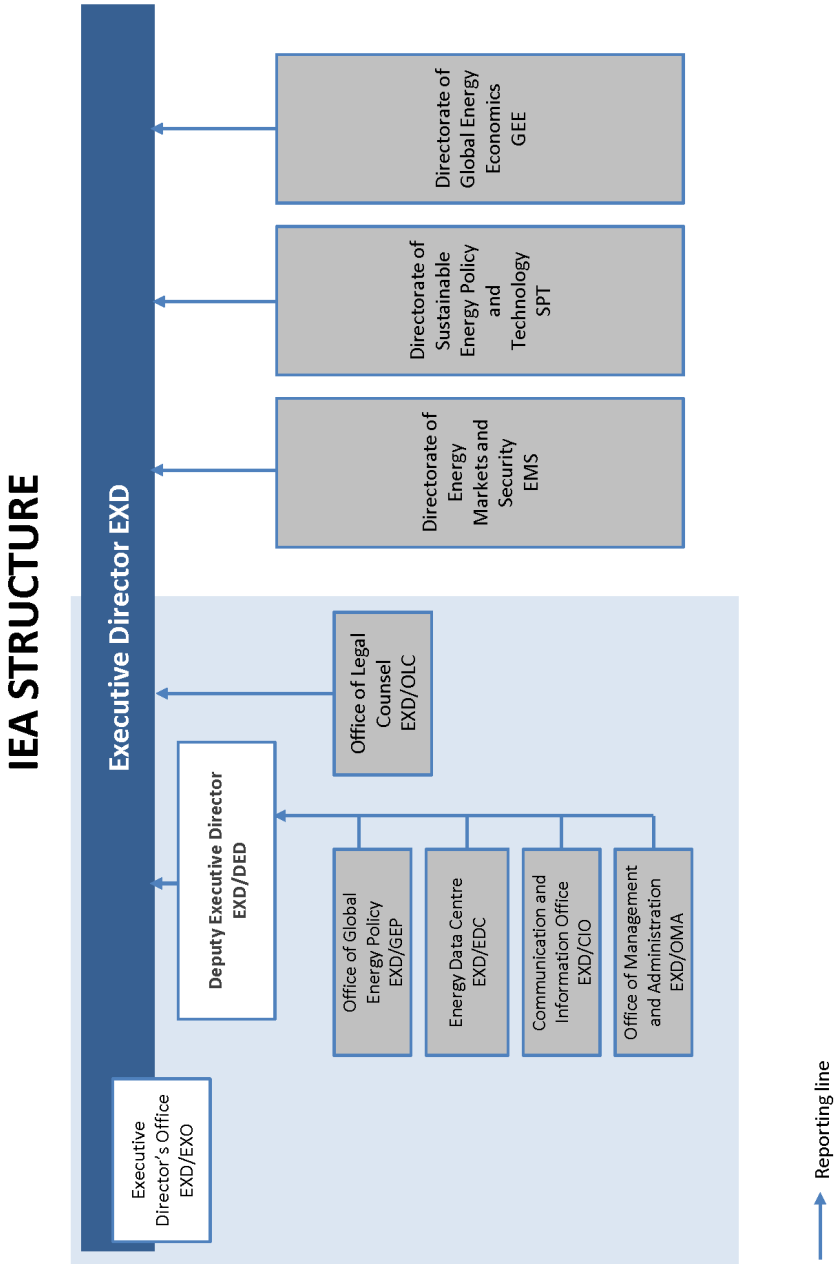
Dr. Rudolf Rechsteiner – Former Swiss MP, economist, and author of 2008 Wind Energy in Context report;

Robert Skinner – Former Director of the Long-Term Office, IEA (1988-1995)

Gail Tverberg – Blogger at 'The Oil Drum' website;

Anonymous – Former IEA oil supply analyst and contributor on multiple WEOs;

Appendix D) Organization of the IEA Secretariat, 2014



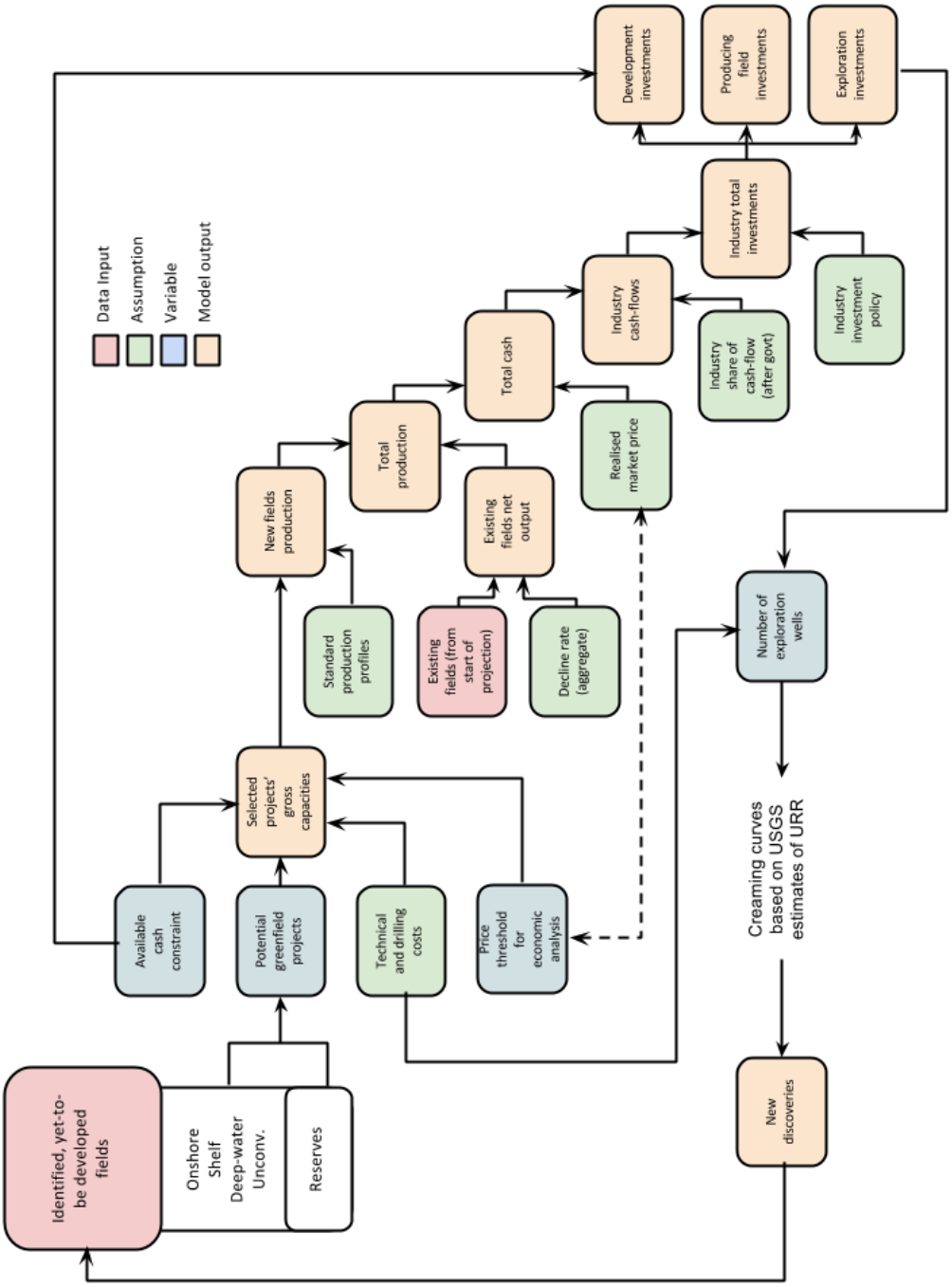
Appendix E) Top Inside Contributors

Name	WEOs		Areas	IEA Department
Fatih Birol	12	All	General	EAD
Maria Argiri	11	1998 – 2006, 2008 – 2010	Power generation; Renewables	EAD
Trevor Morgan	11	1998 – 2006, 2008 – 2010	Oil and Gas	EAD
Laura Cozzi	10	2000 – 2006, 2008 – 2010	Climate policy	EAD
Amos Bromhead	8	2002 – 2006, 2008 – 2010	Regional (S.E Asia); Fossil fuel subsidies	EAD
Rebecca Gaghen	8	2002 – 2006, 2008 – 2010	Support	Communication and Information Office
Teresa Malyshev	8	2000 – 2002, 2005, 2006, 2008 – 2010	Regional (Africa)	EAD
Bertrand Sadin	7	2003 – 2006, 2008 – 2010	Support	Communication and Information Office
David Fyfe	7	2003 – 2006. 2008 – 2010	Oil markets; OPEC/Non-OPEC supply	Oil Market Report
Isabel Murray	7	1999 – 2004, 2009	Regional (Russia);	Non-member countries
Claudia Jones	6	2003 – 2006, 2009	Support	EAD
François Cattier	6	2000 – 2005		EAD
Jean-Yves Garnier	6	1999, 2004, 2006, 2008 – 2010	Statistics	Energy Statistics Division
Loretta Ravera	6	2003 – 2006, 2009	Support	Communication and Information Office
Michael Taylor	6	2001 – 2004, 2008, 2009		Other
Muriel Custodio	6	2003 – 2006, 2008, 2010	Support	Communication and Information Office
Noé van Hulst	5	2003 – 2006, 2009	Guidance	Long-term Office
Dolf Gielen	5	2003, 2004, 2006, 2008, 2009		Energy Technology Policy
Fridtjof Unander	5	2000, 2002 – 2005	Power Generation; Fossil Fuels	Other
Lisa Guarrera	5	2001 – 2005		EAD

Appendix F) Top 'Outside' Contributors

Name	WEOs		Affiliations	Consulted On
Nadir Gürer	9	1999-2007	OPEC	Oil & Gas; Oil; Investment trends;
Alessandro Lanza	8	2001 - 2009	Eni Spa	Oil & Gas; Deferred Investment; Investment trends; Oil supply prospects
Jonathan Stern	8	2001, 2003 - 2010	Royal Institute of International Affairs; Oxford Institute for Energy Studies	Oil & Gas; Natural Gas; Investment trends; Oil supply prospects
John Paffenbarger	7	2001 - 2004, 2006, 2008 - 2009	Orion Power; Constellation Energy	Renewables; Electricity & Nuclear; Climate Change
David Knapp	6	2003 - 2006, 2008, 2010	Energy Intelligence Group	Oil & Gas; Oil; Investment trends; Oil supply prospects
James Jensen	6	2001, 2003, 2004, 2006, 2009, 2010	Jensen Associates	Oil & Gas; Investment trends
Reinhard Haas	6	2002-2004, 2006, 2008-2009	Technical University of Vienna	Electricity and Renewables; Biofuels; Climate Change
Adnan Shihab-Eldin	5	2003, 2005, 2008 - 2010	OPEC	Special Advisory Panel; Oil Supply Prospects
Guy Caruso	5	2003, 2005, 2008 - 2010	US DOE	Oil & Gas; Special Advisory Panel; Oil supply prospects
Gustav Resch	5	2002, 2004, 2008 - 2010	Technical University of Vienna	Electricity and Renewables; Climate Change
Hans-Holger Rogner	5	2001, 2006, 2008 - 2010	IAEA	Uranium; Alternative Policy; Climate Change
Jamal Saghir	5	2002 - 2004, 2006, 2009	World Bank	Special Advisory Panel; Energy & Development; Alternative Policy
Carmen Difiglio	4	2006, 2008 - 2010	US DOE	Alternative Policy; Climate change
William Davie	4	2003, 2005, 2008 - 2009	Schlumberger; Simmons & Company	Oil & Gas; Oil
Keith Welham	4	2000, 2001, 2003, 2006	Rio Tinto	Coal
David Victor	4	2005, 2006, 2008, 2009	Stanford University	Deferred Investment; Alternative Policy
Dermot Gately	4	2001, 2004 - 2006	New York University	Oil & Gas; Deferred Investment; Impact of high energy prices
Edmilson Dos Santos	4	2000, 2002, 2003, 2006	University of Sao Paulo	Electricity and Renewables; Brazil
Frank Verrastro	4	2005, 2008, 2009, 2010	Center for Strategic and International Studies	Deferred Investment
Jan-Hein Jesse	4	2006, 2008 - 2010	Shell	Oil & Gas; Investment Trends

Appendix G) The World Energy Model, Oil Supply Module, post-2008 (Detailed)



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