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THE CANADIAN ROLE IN THE DEVELOPMENT
OF ATOMIC ENERGY:
1942-1946

by

Judith Helga Lougheed, B.A.

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A thesis submitted to the Faculty of
Graduate Studies and Research in partial
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The undersigned recommend to the Faculty of Graduate Studies and Research acceptance of the thesis "The Canadian Role in the Development of Atomic Energy: 1942-1946" submitted by Judith Helga Lougheed, B.A. Hons., in partial fulfilment of the requirements for the degree of Master of Arts.

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ABSTRACT

The purpose of this thesis is to show how the atomic energy partnership between Canada, the United States and the United Kingdom during and immediately after the Second World War was an example of the breakdown of the triangular relationship between the three countries. The breakdown occurred because of the personalities involved in the Canadian atomic energy project during the war, British and American attitudes towards Canada, and the increasing importance of the United States both as a market for Canadian exports and as a military power. As a result, Canada grew more dependent on the United States for its economic well-being and military security and felt it necessary to support the Americans in their arguments with the British and in their attempt to maintain their monopoly of the atomic bomb in the immediate post-war period.

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PREFACE

From 1942 until 1946, Canada was a partner with the United Kingdom and the United States in the development of atomic energy. Despite the passage of well over thirty years, however, neither the role Canada played in the development of the atomic bomb nor the nature of the tripartite partnership and its significance for the early post-war period have been examined adequately. Only two academic studies have appeared reviewing the partnership in any detail.

Wilfrid Eggleston wrote the semi-official history of the Canadian project.¹ Thus, Eggleston is interested in the trilateral partnership only as it affected the development of atomic energy in Canada. The partnership per se is not of interest to him. As a result, he deals with it only until 1944 when the Chalk River pilot plant was started. However, even in the periods when the partnership is pertinent to his story, Eggleston's treatment of it is inadequate. As a semi-official history, Canada's Nuclear Story is very uncritical of the decisions and policies of the Canadian government. In addition,

¹Wilfrid Eggleston, Canada's Nuclear Story, (Toronto: Clark, Irwin and Co., 1965).

Eggleston relies heavily on the wartime diary of C.J. Mackenzie, the Acting President of the National Research Council and head of the Canadian atomic energy project. That Mackenzie's perceptions of events were basically sound is never questioned. However, there were times when Mackenzie was quite mistaken about British and American attitude and action.

The second work is by James Eayrs in the third volume of In Defence of Canada.¹ Eayrs gives a very cursory outline of the partnership during the war, often relying on Eggleston's account and interpretation. He underestimates the role that Canadian uranium played; at one point he misses the significance of the dates of the American contracts with the Canadian firm which mined and refined the uranium. In addition, the section dealing with the early post-war period is so confused chronologically that Eayrs often misses the impact of some events on others. For example, by dealing with the events leading up to the breakdown of tripartite cooperation in the spring of 1946 after having described the negotiations in the United Nations Atomic Energy Commission in the latter part of the year, he cannot explain adequately the Canadian decision to support the United States at the United Nations. Most importantly, Eayrs underplays the dynamics of the

¹James Eayrs, In Defence of Canada, III: Peacemaking and Deterrence, (Toronto: University of Toronto Press, 1972), ch. 5.

situation. The partnership is shown within the framework of the North Atlantic triangle and the many problems between Canada, Great Britain and the United States are described as North Atlantic "tangles".

The purpose of this thesis is to show how trilateral cooperation in atomic energy during and immediately after the Second World War is an example of a complete breakdown in the triangular relationship and of the growing dependence of Canada on the United States for economic and military security.

The idea of the North Atlantic triangle was developed in the first part of this century. In the 1920's, it was expressed by several historians, such as Chester Martin and George Wrong, who believed that Canada was a member of a community of English-speaking nations which included the United States. They saw Canada as an interpreter between the British Empire and the United States.¹ In the 1930's, the concept of the triangle was downplayed as many historians, in reaction to the earlier stress on Imperial history, began to emphasize Canada as a North American nation. In 1934, a twenty-five volume series on Canadian-American relations, financed by the Carnegie Corporation, was started under the direction of James Shotwell. However, Canada's British

¹Carl Berger, The Writing of Canadian History: Aspects of English-Canadian Historical Writing, 1900 to 1970, (Toronto: Oxford University Press, 1976), p. 146.

connection was never completely forgotten and several volumes, notably those by A.L. Burt, Harold Innis and Donald Creighton, traced transatlantic ties as well as those with the south.¹ The importance of looking at Great Britain's influence on Canadian-American relations was most clearly recognized in the final volume, a study intended to synthesize the series, John Bartlet Brebner's North Atlantic Triangle.²

The basis of the triangle concept was the triangular nature of trade between Canada, Great Britain and the United States, whereby Canada financed its imports of manufactured goods from the United States by exporting staple and primary products to Britain, other Commonwealth countries and Europe. Added to this were the cultural, linguistic and historical ties as well as the movement of peoples which bound the three nations in such a way that the nature of the relationship between any two could not be explained without reference to the third. As a North American nation with membership in the British Commonwealth of Nations, Canada could play an important role as interpreter or "lynchpin" between the United States and Great Britain. Moreover, the vulnerability of the Canadian economy because of its dependence on trade and the consequent foreign policy limitations were offset somewhat

¹ Berger, The Writing of Canadian History, pp. 151, 58.

² John Bartlet Brebner, North Atlantic Triangle: The Interplay of Canada, the United States, and Great Britain, (Toronto: Ryerson Press, 1945).

by Canada's ability to strike a balance between the two greater powers.

The perception of Canada as the lynchpin between the United States and Great Britain was cherished by Prime Minister Mackenzie King. As C.P. Stacey remarks, King's diaries "document very fully his conviction that it was most important to his own political fortunes that he should appear to the Canadian public as a close and intimate associate of Churchill and Roosevelt and as a personal link between them."¹ However, King saw close relations with both the United States and Great Britain as important to more than his public image. Although through much of his political life King had resisted attempts to draw Canada closer to the British, he also saw the danger of being too dependent on the United States. On 30 December 1942, for example, he confided to his diary that efforts "would be made by the Americans to control developments in our country after the war, and to bring Canada out of the orbit of the British Commonwealth of Nations into their own orbit."² In order to protect Canada from this fate, King felt that Canada had to maintain close links with the British. In addition, however, Canada had to do everything in its power to ensure cooperation

¹C.P. Stacey, Arms, Men and Governments: The War Policies of Canada, 1939-1945, (Ottawa: The Queen's Printer, 1970), p. 186.

²W.L.M. King Diary, 30 December 1942; see also 9 May 1946.

between the United States and Great Britain so that Canada would never have to choose between them. As Eayrs notes, "No principle of Mackenzie King's foreign policy had become more firmly established than the prime necessity of keeping the United Kingdom and the United States agreed upon essentials. Their divergence was contrary to Canadian interests and was to be avoided at all costs."¹

King had very little to do with the development of atomic energy in Canada or with the wartime nuclear partnership. Instead, he entrusted the problem to C.D. Howe, his Minister of Munitions and Supply. Howe held sole responsibility for atomic energy and his policies were rarely questioned. Yet, Howe's ideas about relations with the United States and the United Kingdom were substantially different than those of King. Unlike King, Howe thought in terms of economic goals and was more of an entrepreneurial than a political being.² He was a superb administrator, perhaps the best in the history of Canadian government. However, his concern was maximizing economic benefits in the short-term and he rarely seems to have considered the long-term political or diplomatic implications of his policies. Even King noted at one point that Howe was

¹Eayrs, In Defence of Canada, III, p. 260; see also King Diary, 9 June 1946.

²Robert Bothwell and William Kilbourn, C.D. Howe: A Biography, (Toronto: McClelland and Stewart, 1979), p. 351; Eayrs, p. 9.

"almost an innocent abroad."¹ Moreover, as a Canadian born and raised in the United States, Howe was more sympathetic to the Americans than many of his colleagues and was certainly less suspicious of American motives than King. On the other hand, he was clearly suspicious of the British and lacked the sense of loyalty to Britain and the Commonwealth possessed by most English-speaking Canadians. His lack of patience with the British is evident throughout the period.

The Canadian in charge of the day-to-day operation of the atomic energy programme was C.J. Mackenzie. As a scientist and an administrator, Mackenzie was very able. However, he was not a politician and, like Howe, had little idea of the political and diplomatic aspects of atomic energy. Certainly, theories about a North Atlantic triangle did not influence his decisions. Nor did he (nor Howe for that matter) worry about the destructive force or political consequences of the atomic bomb. As an administrator sent to do a diplomat's job, he was, not surprisingly, often out of his depth. Consequently, he was easily deceived by some of the American officials who wanted him to believe that they were much more sympathetic to Canadian interests than they actually were.

The Canadians who might have worried about the impact of the wartime partnership in atomic energy on Canada's post-war external policies, the diplomats and the

¹King Diary, 5 May 1948.

military advisors were not told of the developments until the Americans had dropped the atomic bomb on Hiroshima. As a result, there was no planning during the war to cope with the problems of atomic energy. This is in contrast to the extensive amount of planning done in other areas by the Post-Hostilities Problems Committees of the Department of External Affairs¹ -- much of whose work was negated as a result of ignorance about atomic weapons. By the end of the war, when the Department of External Affairs was brought into the problem, many of the key decisions had already been made or policies already determined by earlier events.

The British and the Americans did not necessarily share King's view of Canada as an important link between Great Britain and the United States. The Canadians were rarely consulted on major strategic decisions. As Cuff and Granatstein remark, King was "prominent only by his absence" at the important allied policy conferences, such as the meeting which produced the Atlantic Charter in August 1941.² He was not even permitted to take an active part in the two conferences he hosted in Quebec City during the war. Lester Pearson had reason to comment in his memoirs about Canada being "squeezed out" of discussions

¹See Don Page and Don Munton, "Planning in the East Block: the Post-Hostilities Problems Committees in Canada 1943-5", International Journal, 32 (autumn 1977), pp. 687-726.

²R.D. Cuff and J.L. Granatstein, Ties that Bind: Canadian-American Relations in Wartime from the Great War to the Cold War, 2nd ed., (Toronto: Hakkert, 1977), p. 104.

by the British and the Americans.¹

There seems to have been a real confusion in both London and Washington about Canada's status. The British, especially Churchill, often treated Canada as merely part of the Empire. The decision to transfer part of the British atomic energy project to Canada during the war was based partly on the assumption that Canadian interests would readily be subordinated to those of Great Britain. The British even went so far as to accuse C.D. Howe of disloyalty to the British Empire! It was not until the end of the war that they realized that Canadians were determined to give priority to Canadian needs. They then rejected the possibility of a partnership with the Canadians on equal terms. The Americans were also insensitive towards Canada. Pearson, when he was Minister-Councillor of the Canadian Legation in Washington, noted that Canada "was suspended...somewhat uneasily in the minds of so many Americans between the position of a British colony and an American dependency."² Later, in his memoirs, Pearson asserted that of the two powers, the Americans were the worse: "Indeed, the Americans were more likely to ignore our national interests and feelings, through

¹Lester B. Pearson, Mike: The Memoirs of the Right Honourable Lester B. Pearson, I: 1897-1948, (Toronto: University of Toronto Press, 1972), p. 212.

²Pearson to McCarthy, 18 March 1943, King Papers, v. 350, folder 2788, c241884.

insensitivity to our pride, than the British through imperial habit."¹ John Holmes, also a diplomat during this period, agrees. At times the Americans preferred to regard Canada as a junior member of the British team; bilateral negotiations were easier and less confusing than having to deal with both the United Kingdom and Canada. Their attitude changed, however, whenever they needed Canadian support against a British demand.² They also assumed that Canadian resources, especially uranium, would be readily available. As Holmes notes,

[The Americans] assumed no doubt that Canadian resources were something they could confidently count on; Canadians always wanted to sell things, and they would recognize their own security interest in seeing that the Americans had the raw materials for the bomb.³

King's hopes for close cooperation between the Americans and the British were also to be disappointed. During the war, Winston Churchill pressed Roosevelt for a post-war Anglo-American entente, based to a large degree on cooperation in atomic energy. Roosevelt wavered during the early years, but by 1944 accepted Churchill's idea of the "two policemen".⁴ However, many of his advisors

¹ Pearson, Mike, pp. 212-13.

² John W. Holmes, The Shaping of Peace: Canada and the Search for World Order, I, (Toronto: University of Toronto Press, 1979), p. 200.

³ Ibid., p. 212.

⁴ Barton J. Bernstein, "The Uneasy Alliance: Roosevelt, Churchill and the Atomic Bomb, 1940-1945", Western Political Quarterly, 29 (June 1976), p. 203.

and other American officials disagreed, often distrusting British motives and feeling that the United States, backed with the atomic bomb, would be strong enough to stand by itself. In the absence of strong pressure from Roosevelt, these men pursued policies designed to minimize cooperation with the British. Roosevelt's death and his replacement by Harry Truman ended any chance of an entente.

The biggest blow to King's hopes, however, was the breakdown of the triangular trading pattern between Canada, the United States and Great Britain. During the war, Canadian exports to the United Kingdom tripled, only to fall almost to the pre-war levels in the late 1940's. As a result of the war-related economic dislocations, Britain could no longer afford to import Canadian goods.¹ Moreover, much of the British spending in Canada during the war was financed by Canadians. In the six years of the war, Canada gave the United Kingdom one billion dollars as an outright gift, another seven hundred million dollars in the form of an interest-free loan, and disbursed a further two billion dollars through the Mutual Aid Board. After the war, Canada lent another \$1.25 billion to the United Kingdom and cancelled a \$425 million dollar debt from the Commonwealth Air Training Programme.²

¹A.F.W. Plumptre, Three Decades of Decision: Canada and the World Monetary System, 1944-75, (Toronto: McClelland and Stewart, 1977), p. 301, table 1.

²Ibid., pp. 61, 77.

Trade with the United States, however, grew as a result of the war. Exports to the United States equalled those to the United Kingdom both before and during the war, but stayed at the high wartime levels afterwards. In addition, arrangements such as the Hyde Park Agreement, which allowed American defence spending in Canada in an attempt to maintain Canadian reserves of American dollars, served to shift Canadian attention away from the United Kingdom and Europe as a market for Canadian goods.¹

At the same time, the United States was looking more important as a dominant military power. As the war progressed it became apparent that the Soviet Union might pose a threat to Western interests after the defeat of Germany. Canadians had to decide whether they should develop an independent military capacity or rely on the United States for protection. The first alternative was never seriously considered.²

The combination of personalities, changed economic and military circumstances, and British and American attitudes towards Canada and each other spelled the end of the North Atlantic triangle as conceived by Mackenzie King. The resulting shift in the relative importance of the United States and Great Britain had a strong impact on the atomic energy partnership. Instead of the three nations

¹Plumptre, Three Decades of Decision, pp. 67-69.

²Holmes, The Shaping of Peace, I, p. 219; see also Eayrs, In Defence of Canada, III, ch. 6.

being mutually dependent, Canada and the United States began to feel no need of Great Britain. At the same time, Canada was becoming more closely tied to the United States. As a result, Canadian officials felt it necessary to support the United States, both in its attempt to restrict cooperation with the British during the war and in its actions to maintain its monopoly of the atomic bomb afterwards.

INTRODUCTION

The enormous amount of energy locked within the atom was appreciated by the scientific community in the first part of this century. However, a means of releasing and utilizing the energy was a remote theoretical problem very far from practical solution. It was not until late 1938 and early 1939 that nuclear fission, or the splitting of a uranium atom as a result of neutron bombardment, was a possibility. By the spring of 1939, the theory of nuclear fission had gained wide acceptance. Nevertheless, practical application of the theory was still seen by most scientists as a mere dream.

As the likelihood of war increased throughout 1939, the possibility that the energy released by fission could be harnessed for military purposes had to be examined despite the almost universal feeling that atomic energy posed no threat in the foreseeable future. The main question to be answered concerned whether or not a chain reaction could be achieved; that is, whether the fission of one uranium nucleus could release more neutrons which would split more uranium nuclei, so creating a self-sustaining process. The second question was whether such a reaction could be controlled enough to provide a new

source of power, either for peaceful uses or for the creation of a new "super bomb".

In the spring of 1939, a group of physicists in Great Britain, particularly Professor George P. Thomson of the Imperial College of Science and Technology, read about a French experiment which indicated that enough neutrons were indeed emitted as a result of fission to permit a chain reaction. Thomson decided that, as a precaution against possible German development of this finding, the British government should take steps to prevent world stocks of uranium from falling into German hands as well as to monitor developments in research. Thomson met with Sir Henry Tizard who was the chairman of the Committee on the Scientific Survey of Air Defence. Although Tizard felt that there was only one chance in 100,000 that a military application of nuclear theories could be achieved, he agreed that steps should be taken to control world uranium stocks. At about the same time, it was decided that the Air Ministry, through Tizard's Committee, should have sole responsibility for all work being done on fission in Britain in order to avoid any overlapping of efforts. Professor Thomson was put in charge of the experiments.

The outbreak of war in September slowed down work on the experiments since it was felt that British scientists could play a more fruitful role working on more feasible projects, such as radar. Nevertheless, the War

Cabinet decided to consult with Professor James Chadwick, the discoverer of the neutron, who urged more research and data collection so that the practicality of nuclear theory could be better known. Despite Chadwick's recommendation, however, by early 1940, Thomson was becoming discouraged and concluded that any effort spent on fission would be wasted.

Fortunately, before any action could be taken, a breakthrough occurred. O.R. Frisch, a physicist at Birmingham University, had, in the process of writing a paper dismissing the possibility of an atomic bomb, become convinced that perhaps the bomb was feasible after all. Together with his colleague, Professor R.E. Peierls, Frisch prepared a brilliant memorandum which removed many of the doubts about atomic energy. As the official British historian of the subject, Margaret Gowing, remarks, "it stands as the first memorandum in any country which foretold with scientific conviction the practical possibility of making a bomb and the horrors it would bring."¹ The questions raised, and answered to an amazingly accurate degree considering that the authors worked from theory without the aid of experiments, were ones which the Americans ignored for several months and with which the Germans, contrary to British fears, never did attempt to deal.

¹Margaret Gowing, Britain and Atomic Energy, 1939-1945, (London: Macmillan, 1964), p. 42.

As a result of the memorandum, work on atomic energy intensified and a programme was established to discover the extent of German experiments, safeguard existing stocks of uranium, find out what the Americans were doing, and begin new experiments.¹

Experimental work was organized initially by a sub-committee of the Committee for the Scientific Survey for Air Warfare. When the latter organization was disbanded in June 1940, the sub-committee became an independent body officially known as the M.A.U.D. Committee.²

As experimental work began, two problems emerged, both involving personnel and both of which were destined to plague British efforts in atomic energy for the rest of the war. Due to wartime security regulations, non-nationals were not allowed to work on war-related projects. As a result, neither Frisch nor Peierls were members of the Maud Committee, despite the fact that their memorandum was largely responsible for its establishment. There were several other non-nationals, many of whom had fled to Great Britain to escape Nazism, who could also make great contributions to the Committee's work, such as Doctors

¹For a more thorough discussion of this period see Gowing, Britain and Atomic Energy, ch. 1.

²This name arose as a result of confusion over the meaning of a personal name cited in a telegram from Niels Bohr to Frisch. Although officially called M.A.U.D., it was usually referred to as Maud, and this rendition will be used here.

Hans von Halban and Lew Kowarski who had done the experiments which proved a chain reaction was possible. Ironically, at the same time, there was a shortage of qualified British scientists to work on the Maud projects since these men had already been recruited to work on projects with higher priorities. Fortunately, a compromise was worked out by the summer of 1940. Although non-nationals were not allowed to work directly for the government, they were permitted to work at universities. All the Maud experiments, therefore, were financed by the government through the universities. Nevertheless, many of the foreign scientists still resented their lack of representation on Maud itself. This problem was resolved in March, 1941, when a technical sub-committee was established to assist it and non-nationals were allowed on this body.¹

The second problem which arose later when the British started to collaborate with the Americans was the number of men recruited from the world of commerce. Again, lack of qualified personnel had forced the Maud Committee to rely on private firms, and Imperial Chemical Industries in particular, to do much of the chemical work. Although this seemed to be an efficient and sensible way to get the work done at the time, as cooperation between the government-paid physicists and the employees of Imperial grew, the suspicion increased in the minds of the

¹Gowing, Britain and Atomic Energy, p. 54.

Americans that the British were overly concerned with the post-war commercial applications of atomic energy.¹

American scientists were also experimenting with fission, although at this point they had not done nearly as much work as the British. Since the United States was not at war, the military applications of atomic energy had received relatively little attention. Most of the emphasis had been on the power possibilities. Nevertheless, the military implications of atomic energy were not ignored. As early as March 1939, the scientists connected with the work at Harvard University approached the Navy. Very little happened as a result. Later that year, however, a group of scientists was able to impress the significance of fission upon Alexander Sachs, an economist with access to the White House. On 11 October, Sachs met with President Roosevelt who was sufficiently interested to establish an Advisory Committee on Uranium to prepare a feasibility study. The Committee's report, submitted on 1 November, concluded that a chain reaction was possible and that sufficient supplies of graphite and uranium should be obtained for further experimentation. Another report, released in April 1940, concluded that while fission was a definite possibility, production of an atomic bomb was doubtful. Consequently, while some work proceeded more or less haphazardly at several American

¹Gowing, Britain and Atomic Energy, p. 167.

universities, not much was done with government support or direction. Although a Uranium Committee, headed by Vannevar Bush, was established under the auspices of the National Defense Research Committee in the fall of 1940 in conjunction with a major overhaul of government scientific establishments, progress remained slow. Unlike the British, the Americans lacked any sense of urgency. In addition, they continued to concentrate their efforts on slow neutron fission and, at this stage, the fast neutron process, towards which most of the British effort was directed, held the most promise for military purposes.

Information gained on British work from the Tizard Mission, which was sent to the United States in the fall of 1940 to encourage the exchange of secret scientific and technical discoveries, failed to overcome the scepticism of most of the Americans.¹

By the summer of 1941, the British had made demonstrable progress. The Maud Committee completed its work and submitted two reports on 29 July. Two approaches to fission had been taken. The first, fission of natural uranium by slow, or moderated, neutrons, had been undertaken by Halban and Kowarski, who had started their work in Paris with Professor Joliot-Curie. They had used heavy water as a moderator. Unfortunately, there was very

¹Richard G. Hewlett and Oscar E. Anderson, Jr., A History of the United States Atomic Energy Commission, I: The New World, 1939-1945, (University Park, Penn.: Pennsylvania State University Press, 1962), ch. 2.

little heavy water in existence. The only known quantity had been produced in Norway and was smuggled to Paris before the German invasion. When France fell in June 1940, Halban and Kowarski brought the remaining supply with them to Great Britain. Graphite could also be used as a moderator, but it was not nearly as efficient. The Maud report, however, dismissed the lack of heavy water. The Committee decided that while slow fission had potential for power production, it was of little military value. There was a possibility, however, that some of the by-products resulting from fission, particularly element 94, might prove useful. Further experimentation was necessary before this could be determined.

The other route was through the fission of uranium 235 by fast neutrons. The problem here was in devising a method of extracting this extremely rare isotope from natural uranium. There were three possible methods: the electromagnetic, the centrifuge, and gaseous diffusion. The scientists on the Maud Committee suggested the third method. After discussing the technical problems and costs the Committee concluded that if a programme to extract uranium 235 and to devise a triggering mechanism was given the highest priority, an atomic bomb could be produced as early perhaps as the end of 1943. The bomb would have an equivalent destructive capacity as the 1917 Halifax explosion.¹

¹The reports are reprinted in Gowing, Britain and Atomic Energy, appendix 2.

The Maud reports were studied by the Defence Services Panel of the Cabinet's Scientific Advisory Committee. The members of the Panel concluded, in a report dated 25 September 1941, that the atomic bomb was feasible though probably not within the time period specified by Maud. In addition, they recommended that there should be cooperation with the United States, although not a joint programme. The necessary plants could be built in Canada to avoid the dangers of bombing in Great Britain.

The Maud reports were also read by the Chiefs of Staff who received their copies from Prime Minister Churchill with an accompanying memorandum which stated, in part, "Although personally I am quite content with the existing explosives I feel we must not stand in the path of improvement..."¹ The Chiefs recommended that the project proceed at full speed, but unlike the Defence Services Panel, they felt that all work should be done in Great Britain.²

This was all the encouragement that Churchill needed to decide to push forward with the project. Responsibility for it was given to Sir John Anderson, who was Lord President of the Council and in charge of the Department of Scientific and Industrial Research. Due

¹Quoted in Winston S. Churchill, The Second World War, IV: The Hinge of Fate, (London: Cassell, 1951), pp. 379-80.

²Gowing, Britain and Atomic Energy, pp. 91-106.

to the need for extreme secrecy, very few other members of the War Cabinet (not even Deputy Prime Minister Attlee) were informed. Anderson, along with Lord Hankey, Secretary to the Cabinet, and Lord Cherwell, Churchill's scientific advisor, decided that a directorate, later named Tube Alloys, should be established within the Department of Scientific and Industrial Research. Wallace A. Akers, Research Director of Imperial Chemical Industries, was selected as head. A small advisory body, called the consultative council and chaired by Anderson, was also set up.¹

The Maud reports were shown to the Americans and were very influential. The conclusion that slow fission would not have military value, at least until more was known about element 94, or plutonium as it was now coming to be called, resulted in a shift away from similar work in the United States. The second conclusion, that fission of uranium 235 was feasible, resulted in a new burst of effort.

On 9 October 1941, Vannevar Bush met with Roosevelt and Vice-President Henry Wallace to discuss the reports. It was agreed that although Bush would need further authorization from the President before he could begin an actual production programme, he was to push ahead as quickly as possible on basic theoretical work using monies from a secret Presidential fund if necessary. They also agreed that if the experiments were fruitful enough to

warrant production, a joint Anglo-American project should be established, with the plants in Canada if need be.

To implement the decisions a new organizational structure was devised. The Office of Scientific Research and Development was established with Bush as director. The National Defense Research Committee continued within the framework of the Office and was headed by James Conant, President of Harvard University. The Committee on Uranium became the Office's Section on Uranium, code-named S-1. It was headed by Lyman Briggs, a government scientist who had been connected with the uranium experiments since the beginning. Besides S-1, a Planning Board was set up to do engineering studies and was to be taken over by the army once full-scale construction began.

The scientists working on the fission experiments learned of the President's decisions and the details of the new organization on 6 December 1941. The bombing of Pearl Harbour the next day gave the project the final impetus towards an all-out effort.¹

Now that the United States, like Great Britain, was committed to full scale research and development, two new concerns arose: the need to secure the necessary supplies of raw materials, especially uranium, and the problem of deciding what form, if any, cooperation with Great Britain would take. Both issues were to draw Canada into the picture in the new year.

¹Hewlett and Anderson, The New World. pp. 44-52.

CHAPTER I

CANADA BECOMES INVOLVED

Canadian work on nuclear physics before 1942 was limited. Within the Physics and Electrical Engineering Division of the National Research Council there was a small research group, led by George C. Laurence, which dealt with nuclear physics, radioactivity and radiology. Laurence began experimenting with nuclear fission in March 1940. In his spare time, he began work on an atomic pile, using uranium oxide as his fuel and carbon as the moderator. In the early summer, Laurence was visited by Professor R.H. Fowler, who was the head of the Central Scientific Office attached to the British Supply Council in Washington and had been a member of the Tizard Mission. Fowler told Laurence of similar work being carried out in the United Kingdom and the United States. Another member of the Tizard Mission arrived a couple of months later and helped arrange financial help from Imperial Chemical Industries.¹

The British informed the Americans of the work being done in Ottawa and, as a result of talks between

¹Eggleston, Canada's Nuclear Story, pp. 18-28; Gowing, Britain and Atomic Energy, p. 179.

the Acting President of the National Research Council, Dr. C.J. Mackenzie, and Lyman Briggs, Laurence was allowed to visit Washington and New York to observe work being done there.

Cooperation was short lived. Although Laurence continued his experiments during the summers of 1941 and 1942, he was hampered by the lack of pure materials and by more pressing duties with the National Research Council. His work was put aside.¹

This did not, however, end British and American interest in Canada. In December 1941, an American official approached the Consolidated Mining and Smelting Company at Trail, B.C. on behalf of the Planning Board. An electrolytic process of producing heavy water had been developed earlier in the year and, since the firm was the largest producer of electrolytic hydrogen for the purpose of manufacturing ammonia in North America, it was hoped that a system could be developed which would remove heavy hydrogen from the hydrogen supply to the ammonia plant without interfering unduly with production. The firm was most cooperative and, by the following May, the Planning Board decided to proceed with its plans. Negotiations with Consolidated were concluded by the summer and construction began in September. The Americans hoped that the plant

¹Eggleston, Canada's Nuclear Story, pp. 27-28.

would be turning out approximately one half a ton of heavy water per month by early 1943, but full capacity was not reached until the middle of 1944.¹

The negotiations between the United States and Consolidated were carried out without the knowledge of the Canadian government. The first official approach was made to Ottawa in August 1942 when the Americans brought up the problem of patent rights with Mackenzie.²

Canadian deposits of uranium made it inevitable that Canada would be drawn into the atomic bomb projects even more closely. The British had investigated the existing stocks of uranium in 1940, although at the time their motive was only to determine whether or not Germany was working on an atomic bomb and to restrict German access. By late 1941 and early 1942, when both the British and the Americans had decided to embark on full-scale programmes, one of the main concerns was to ensure sufficient stocks for their work. Additionally, both were afraid that if they did not gain control of existing stockpiles, speculators might get wind of the new interest in uranium and drive up the price.

Up until this time, uranium had been regarded as an annoying by-product resulting from the extraction of

¹Hewlett and Anderson, The New World, pp. 66-67; Eggleston, Canada's Nuclear Story, pp. 49-50.

²Ibid., C.J. Mackenzie Diary, 31 August 1942, National Research Council files, v. 283.

radium from pitchblende. The major known sources of pitchblende were in the Belgium Congo and northern Canada. The mines in the Congo were at Katanga and were owned by the Union Minière of Belgium. In 1942, the allies did not know if these mines were still open since Belgium had been conquered by Germany the year before. Fortunately, the president of the company, M. Sangier, who was aware of the fission experiments and feared a German invasion of the Congo, moved the stockpiles of uranium to the United States in the fall of 1940. He had also taken measures to reduce stockpiles of the ore in Belgium.¹

The Canadian mine was at Port Radium on Great Bear Lake near the Arctic Circle. It was opened in 1932 by Eldorado Gold Mines Ltd., headed by Gilbert LaBine. The ore from the mine was refined at Port Hope in Ontario. Port Radium had been a successful venture but wartime shortages of men and equipment forced its closure in July 1940. There was a large enough stockpile of ore in Port Hope, however, to allow Eldorado to continue its refining operations.²

Besides the Belgium Congo and Canada, the other sources of uranium ore were Portugal and Czechoslovakia. The ore in Portugal was of low quality, but the British

¹Gowing, Britain and Atomic Energy, pp. 181, 36.

²For a description of LaBine's career and his discovery of the Port Radium deposits see D.M. LeBourdais, Canada and the Atomic Revolution, (Toronto: McClelland and Stewart, 1959), pp. 43-54.

bought the mines in 1942 to keep the ore out of German reach. The ore from the Czechoslovakian mines was, of course, unavailable.¹

The American Planning Board completed a survey of other accessible sources of uranium in January 1942. It estimated that there were 1200 tons from the Belgium Congo at Staten Island which needed refining, one hundred tons of uranium oxide from Belgium, and three hundred tons of Eldorado oxide at Port Hope, plus another five hundred tons of oxide from some vanadium refineries in Colorado. In addition, the survey estimated that Eldorado could produce a further three hundred tons of oxide per year from the Port Radium mine if it were reopened. The American programme would require only 150 tons of oxide before the summer of 1944, but to ensure that the mine was in working order the Planning Board recommended that the Office of Scientific Research and Development place an order for at least two hundred tons in the near future.²

LaBine was approached through an American purchasing company in April 1942 and, on the basis of a prospective contract, work began to reopen the mine within the month.

¹Gowing, Britain and Atomic Energy, p. 180.

²Hewlett and Anderson, The New World, p. 65. Both the British and the Americans had already placed small orders with Eldorado. Britain had purchased two tons through the National Research Council and the United States had bought eight tons directly through the company. Gowing, p. 179; Eggleston, Canada's Nuclear Story, p. 44.

It was a difficult task because, although caretakers had been left at the mine, it had flooded and then frozen. However, production of ore began in August.¹

The British were hard on the heels of the Americans in realizing the importance of the Eldorado mine. As Gowing remarked, by the early months of 1942, officials "agreed that efforts must be made, and quickly, to control the output of the Eldorado uranium and if possible to take control of the company itself."² Unlike the Americans, however, the British decided that the best way to achieve this was to work through the Canadian government. And so, on 15 June, Prime Minister Mackenzie King was visited by Malcolm MacDonald, the British High Commissioner in Ottawa, Professor Thompson, who was now the scientific liaison officer to Canada and the United States, and M.W. Perrin of the Directorate of Tube Alloys. As King described the visit in his diary:

It had to do with the acquisition of some property in Canada, so as to prevent competition in price on a mineral much needed in connection with the manufacture of explosives. I was given a very interesting account of the particular mineral, but made clear it was desirable that the British and American Governments should work together in their research upon it, and seek, if possible to

¹Hewlett and Anderson, The New World, p. 85. Eggleston states that LaBine conferred with Howe to avoid problems with Canadian export regulations and the lack of equipment before he took any action, Canada's Nuclear Story, p. 44. However, there is no confirmation of the visit in any other sources and it appears that Howe did not learn of the American interest in Eldorado for several months.

²Gowing, Britain and Atomic Energy, p. 182.

outdistance the Germans who have already secured some of it from the Belgium Congo though this supply might have been lost in a ship that was sunk.

The whole business was very secret but it was represented that it might, within a very short time, lead to a development that whichever country possessed this material in time would unquestionably win the war with its power of destruction in development processes being so great.¹

King referred the three men to Howe and Mackenzie² and they all met later that afternoon. According to Mackenzie's account, Howe agreed "to control the raw material" and it was decided that "mutual arrangements will be made for the project between the three countries." As a start, Perrin and Mackenzie would both go down to Washington and inform the Americans of what was being done.³

Once these decisions were reached, Howe and MacDonald reported back to King. King recorded:

They told me that there had been complete agreement among them as to the desirability of the government not only controlling but owning the particular mineral deposit in question and I was asked if I could authorize the government getting the majority of shares from the owner. Howe thought there would be no trouble in securing this....I agreed to this step being taken at once so long as the Americans were advised in advance of the intention. Also that we were taking the step we were to meet the wishes of the British Government.

After agreeing that no one else in the Canadian government

¹King Diary, 15 June 1942.

²Mackenzie already had a good idea of British and American work, both as a result of Laurence's project and of a visit from Akers and Thompson in February. Mackenzie Diary, 19 February 1942.

³Ibid., 15 June 1942.

should be informed, including those responsible for Defence, in order to maintain the secrecy of the project. MacDonald pointed out that "even if the war should end soon, it was important to keep anything of the kind away from the enemy in a post-war period."¹

Although both King's and Mackenzie's records of the meetings indicate complete harmony between the Canadians and the British, the official British history shows that there was a misunderstanding which was to cause tensions in the coming months. Howe had suggested that outright expropriation of Eldorado would create unwanted publicity. A better alternative, he suggested, was for the government to purchase LaBine's shares through personal negotiations between himself and LaBine since the two were good friends.² The British understood that once Howe had acquired a controlling interest he would negotiate "a division of control with the United Kingdom and United States Governments even if such a division left the Canadian Government with no large share of control."³ Howe had no such intention, however, and when MacDonald later proposed such an arrangement, Howe politely demurred, giving difficulties over acquisition of the shares as the

¹King Diary, 15 June 1942.

²Mackenzie Diary, 15 June 1942.

³Gowing, Britain and Atomic Energy, p. 183.

reason.¹

Similarly, the Americans seem to have had a confused idea about the origin of and purpose for the Canadian takeover of Eldorado. As agreed, Mackenzie visited Vannevar Bush in Washington on 19 June. According to the official American account, Mackenzie "proposed that his government quietly buy up a controlling interest in Eldorado so that American purchases of Canadian ore would become an intergovernmental affair." It goes on to claim that the plan was not approved until Churchill met with Roosevelt a few days later in Hyde Park.² However, the Canadian government had already decided to go ahead. Moreover, there is no indication that Churchill and Roosevelt ever discussed the issue.³ The American misunderstanding of the purpose for acquiring Eldorado might have resulted from the manner in which Mackenzie described the proposal to Bush. While we do not know precisely what Mackenzie said, he did report that Bush "appreciated very much Mr. Howe's offer" to acquire the mine.⁴

The Canadian government went ahead as planned and on 15 July an order-in-council was passed authorizing the

¹MacDonald to Howe, 4 August 1942, Howe to MacDonald 5 August 1942, Howe Papers, v. 14, folder 8.

²Hewlett and Anderson, The New World, p. 85.

³See Churchill, The Hinge of Fate, pp. 380-81; Gowing, Britain and Atomic Energy, p. 145n.

⁴Mackenzie Diary, 19 June 1942.

purchase of Eldorado. LaBine agreed to sell all his shares, which accounted for about one quarter of the total, and to acquire as many more shares as he could for resale to the government.¹ It would take some time before the government could gain a majority interest in the firm. Mackenzie wrote Bush of these developments on 22 July and assured him that Howe was prepared to negotiate an agreement allocating the output "in a manner agreeable to the Governments of the United States, the United Kingdom and our own."²

Despite these good intentions, no discussions were ever held to determine the allocations. On 15 July, MacDonald placed an order for twenty tons of oxide through Howe and, in a second letter dated 22 July, requested delivery by the end of September.³ On 16 July, the Americans placed another order with LaBine which, with the April order, brought the total oxide wanted by the Americans to 350 tons.⁴

Because of the difficulties of reopening the mine, and the short mining season in the Arctic, Port Radium's production that summer was not high enough to meet all the contracts. Fortunately, there was the stockpile of

¹Stacey, Arms, Men and Governments, p. 516.

²Eggleston, Canada's Nuclear Story, p. 48.

³MacDonald to Howe, 15 July 1942, MacDonald to Howe, 22 July 1942, Howe Papers, v. 14, folder 8.

⁴Gowing, Britain and Atomic Energy, p. 184.

Congo ore at Staten Island which could be purchased and refined at Port Hope. However, when Eldorado tried to purchase five hundred tons of this ore from Union Minière, officials from S-1 arranged to have export controls imposed. In late August and early September an agreement was reached through the State Department whereby Union Minière sold the entire stockpile to the United States. Three hundred tons were then shipped to Port Hope for refining by Eldorado after assurances were given that all the refined uranium would be shipped back to the United States.¹

Despite this addition of ore, the American contracts were so large that LaBine was concerned that he might not be able to fill the British order. As he wrote to Howe, "At the present time we are producing just enough of this material to meet the requirements of the U.S. O.S.R.D. About October 15th we will complete the expansion of our production facilities to a point where we can start to fill the twenty ton order for the United Kingdom without interfering with the deliveries to O.S.R.D." LaBine asked Howe to talk with the Americans and the British, and if the British were unable to wait, convince the Americans to allow him to give priority to the British order.² Howe appealed to the British who agreed that as long as five tons of the order were delivered by 20 November, the

¹ Howe to LaBine, n.d., Howe Papers, v. 14, folder 8; Hewlett and Anderson, The New World, p. 86.

² LaBine to Howe, 15 September 1942, Howe Papers, v. 14, folder 8.

remainder could wait until the end of the year.¹

Since the middle of 1941, both the British and the Americans had talked of the need for cooperation between their two programmes. Initially, the Americans were the most concerned. At the beginning of August, Dr. Charles Darwin, head of the British Central Scientific Office in Washington, met with Bush and Conant who suggested a joint project. Darwin informed London, but no reply to the proposal was sent until March 1942. In the middle of October 1941, Roosevelt wrote to Churchill suggesting that the two countries' efforts be coordinated, or even operated jointly. Churchill did not respond for two months and then was rather vague and noncommittal. He arranged for meetings between the American Scientific Liaison Officer in London and British officials, but again the British appeared quite aloof. Sir John Anderson, ironically given later events, questioned American security procedures and suggested that the Americans improve their organization.²

Given the coolness with which the British received their overtures, it is not surprising that the Americans started to consider relying on themselves. By early 1942, they were beginning to realize that their own programme was not only overtaking British efforts, but that their

¹Eayrs, In Defence of Canada, III, p. 261.

²Gowing, Britain and Atomic Energy, pp. 123-25.

resources were so great that they could pursue atomic energy without British assistance. As a result, whereas in 1941, the Americans were begging for a joint programme, by the spring of 1942, Vannevar Bush was satisfied with the existing level of cooperation: infrequent discussions on the administrative level and occasional interchange on the scientific level.¹

While Bush and Conant were now satisfied with the degree of cooperation with the British, Roosevelt was prepared to consider the issue further. In the middle of June 1942, Churchill flew to the United States to discuss the allied military campaign for 1942-43 as well as atomic energy. According to Churchill:

I strongly urged that we should at once pool all our information, work together on equal terms, and share the results, if any, equally between us. The question then arose as to where the research plant was to be set up... Considering that Great Britain was under close bombing attack and constant air reconnaissance, it seemed impossible to erect in the Island the vast and conspicuous factories that were needed. ...[If] the Americans had not been willing to undertake the venture we would certainly have gone forward on our own power in Canada, or, if the Canadian Government demurred, in some other part of the Empire. I was however very glad when the President said he thought the United States would have to do it. We therefore took this decision jointly and settled a basis of agreement.²

Unfortunately, there is no other record of this meeting.

¹Hewlett and Anderson, The New World, p. 260.

²Churchill, The Hinge of Fate, pp. 380-81.

No minutes were taken and Churchill did not report it on his return to London. Moreover, Churchill had not been briefed by anyone connected with Tube Alloys before his departure and must have been quite vague on the details of both it and the American project.¹ Roosevelt's only reference to the meeting was in a memorandum to Bush several weeks later when he wrote simply that he and Churchill were in "complete accord."²

Churchill's eagerness for a partnership with the United States was beginning to show in the behavior of other British officials. Their initial reluctance was due to the feeling that they were so far ahead of the Americans that they would not gain much from a joint programme. However, a tour of the United States by a group of scientists headed by W.A. Akers in the spring of 1942 made them realize how far the Americans had advanced. On their return to Great Britain they recommended a combined programme under the supervision of a joint policy committee. This conclusion was based not only on the sheer size of the American effort, but also on American progress in slow neutron work. In Britain, similar work by the Halban group had received a low priority since it was felt that its main contribution would be to postwar industrial applications; work on slow fission had been continued

¹Gowing, Britain and Atomic Energy, p. 145n.

²Hewlett and Anderson, The New World, p. 261.

mainly to ensure that the Americans would not have a commercial advantage at the end of the war. However, American scientists, headed by Professor Compton at the University of Chicago, had proven that a transuranic element (element 94 or plutonium) produced as a by-product of slow fission, could be used as the fuel for an atomic bomb. As a result, S-1 had given Compton's group the same priority as the groups working on fast fission.¹

The British were now interested in the possibility of transferring Halban's group to the United States where, although acting as a separate group, closer collaboration would be possible. Akers suggested this to Bush when he was in the United States and Bush replied that, since most of the British group was of non-British origin, they would not be allowed to work in the United States for security reasons. A second suggestion, that Halban and a few others from his team join the Compton group, was also rejected as a result of disagreements over patent rights. The final option was to transfer the entire team to Canada, where, it was felt, problems arising from national status and patent rights could be overcome, while at the same time allowing for closer collaboration than was possible if the group stayed on the other side of the Atlantic.²

¹Gowing, Britain and Atomic Energy, p. 133.

²Ibid., pp. 142-43.

As these options were being considered, the British began to feel that closer collaboration on the other part of their programme, the gaseous diffusion work, would also be beneficial. On 5 August, Sir John Anderson wrote to Bush and, on the basis of a Tube Alloys Consultative Council report, suggested that a large part of the British diffusion team be transferred to the United States and that the British receive representation on the Executive committee. Anderson also suggested that a patent agreement be worked out as well as long term arrangements for the control of raw materials and post-war international restraints on the use of atomic energy.¹

Bush's reply, dated 1 September, was a polite rebuff. While he assured Anderson of the need for scientific interchange, he explained that problems in determining priorities for the pilot plant stage of American work precluded any decisions about closer cooperation with the British at the time. However, he concurred with the suggestion to transfer Halban's group to Canada and felt that cooperation between it and the Compton group in Chicago was, on the whole, desirable.²

About the same time that Anderson wrote Bush, he also wrote to Malcolm MacDonald in Ottawa outlining his hopes to move the diffusion team to the United States

¹Gowing, Britain and Atomic Energy, pp. 145-46.

²Hewlett and Anderson, The New World, pp. 259-63.

and Halban's group to Canada. He suggested that he approach C.J. Mackenzie.¹

Gordon Munro, the Deputy High Commissioner, met with Mackenzie on 17 August and asked if Halban could work in Canada. Mackenzie was very excited by the proposal. As he later explained, he saw that "Canada had, for the first time in her history, an opportunity to 'get in on the ground floor' of a great new technological advance, an opportunity that must not be lost."² However, as he could not authorize such a scheme, he referred Munro to Howe.³

On 2 September, MacDonald and Munro met with Howe and Mackenzie and outlined a definite proposal for the establishment of a project in Canada involving both laboratory and semi-technical work. It would be staffed by thirty British scientists and engineers, including Halban and his team, accompanied by twenty-five mechanics and assistants, and as many Canadians as could be found. MacDonald promised more detailed cost estimates, but thought that the project would cost approximately \$450,000 per year, excluding rent. He suggested that each government pay the salaries of its own employees, and that the remaining costs either be

¹Gowing, Britain and Atomic Energy, p. 188.

²C.J. Mackenzie, Forward to Eggleston, Canada's Nuclear Story.

³Mackenzie Diary, 17 August 1942.

borne by the Canadian government or be shared in a proportion to be agreed on later.¹ Howe told MacDonald that he was prepared to support the proposal if Mackenzie agreed. When the latter indicated approval, Howe asked MacDonald to inform Anderson and to send an advance party to work out the details of the plan.²

The advance party, consisting of Hans von Halban and Dr. J.F. Jackson of the Department of Scientific and Industrial Research, arrived in Ottawa on 24 September. After three days of talks with MacDonald, Munro and Mackenzie, the organizational structure was agreed upon. Broad policy was to be decided by a Policy Committee composed of Howe and MacDonald, which was to be responsible for financing the project and for the general principles governing cooperation between the two countries as well as coordinating research with the United States. The actual administration was to be handled by Mackenzie. All formal reports and transactions were to go through the National Research Council for approval before being dealt with by the Policy Committee, or either government. At the operating level, the direction of research was to be handled by Halban and Jackson, who were named chairman and secretary of the Scientific and Technical Committee.³

¹Aide-Memoire from MacDonald to Howe, 2 September 1942, Howe Papers, v. 14, folder 8.

²Mackenzie Diary, 1 September 1942.

³Ibid., 24-26 September 1942.

With the organizational details settled, Halban returned to Britain to prepare for the transfer. Mackenzie, with an eye to ensuring the supplies of uranium and heavy water, wrote to Bush in Washington, informing him of the negotiations. He stressed the advantages of close collaboration with the Compton group and wrote, "It is the opinion of Mssrs Howe, MacDonald, and myself that it is essential for us, if the project goes through, to have the most intimate and sympathetic coordination as between your group and mine."¹

Bush's reply, dated 1 October, was a detailed outline of the American organization and priorities. As a result of changes made through the summer and early fall, the American programme was headed by a Military Committee responsible for general supervision of the entire programme with particular attention to its military aspects. The programme had been divided into three phases: fundamental experimentation; development of pilot plants, heavy water and the Compton experiments; and construction and operation of plants to produce enriched uranium by the electromagnetic process. The first phase was nearly finished and the other two were in progress. The third phase had been given the highest priority as it was now felt that this method of separating uranium was the fastest route to the atomic bomb. There was no point in cooperating

¹ Mackenzie to Bush, 29 September 1942, National Research Council Files (hereafter NRC), v. 284.

with the British since they were only working on the diffusion method, a method which the Americans gave low priority. Concerning the Canadian-British project, however, Bush had already informed Anderson that "adequate and frequent interchange would be highly desirable." Bush had learned that Halban and Jackson had stopped in Chicago on their way to Canada and that their conversations with Compton were "already producing the type of interchange which is desirable." He concluded, "On this phase of the matter I will look forward to close consultations with you as the matter proceeds, in order that all aspects of the relationships may be handled in a way that will be most helpful to your plans."¹

With this apparent guarantee of close cooperation between the Halban and the Compton teams, and with the concomitant, although implicit, assurance of the needed heavy water and uranium for Halban's work, Howe and Mackenzie continued to make arrangements for the transfer of his team. Howe went to London with Malcolm MacDonald for discussions with Sir John Anderson on matters of policy and finance. Mackenzie stayed in Ottawa with Halban and Jackson and tried to settle some of the technical details. During the first meeting, Halban lectured on the progress and future needs of the team. Surprisingly, given Mackenzie's enthusiasm for the project ever since

¹ Bush to Mackenzie, 1 October 1942, NRC v. 284.

Gordon Munro had first suggested it to him in August, he confided to his diary that Halban "was quite optimistic about the power possibilities and it does not seem as inconceivable as we first thought."¹

The meetings continued throughout October and, by the end of the month, Montreal was chosen as the site of the laboratory. Montreal was preferable to Ottawa because it was so large and cosmopolitan that a large group of scientists of various origins could arrive without being noticed. By late November, space in the new Medical Wing of the University of Montreal was obtained. While suitable offices and laboratories were being constructed, the team was quartered in an old mansion in central Montreal which was so crowded "that bathrooms were used for offices, and books and papers were stacked in the bathtubs."²

While accommodations were being worked out, additional staff was hired. The British recruited three French scientists, two of whom had been working in North America, the other in Great Britain. One of them, Professor P. Auger, was appointed head of the experimental physics division. Dr. F.A. Placzek, a Czech physicist already in North America, agreed to become head of the theoretical physics division. An Italian physicist, Bruno Pontecorvo,

¹Mackenzie Diary, 8 October 1942.

²Gowing, Britain and Atomic Energy, p. 190.

who had been working in Chicago, was also recruited despite the initial objections of the British Department of Scientific and Industrial Research which was becoming concerned about the number of non-British nationals that were being engaged. In addition, three engineers and a metallurgist were seconded from Imperial Chemical Industries. These men were to join the Halban group which was being sent intact, with the exception of Kowarski, who felt he could play a more rewarding role by staying in Britain.¹

These men, who were to be paid by the British government, were joined by several Canadians, notably George Laurence, who had worked on the early National Research Council experiments, and Dr. George Volkoff, from the University of British Columbia. Laboratory assistants were hired from schools in the Montreal area.²

Once accommodation and staff had been obtained, the members of the team and their equipment began to arrive in Montreal. The process was slow, complicated by the difficulties of moving such a large number of people and so much equipment while the Battle of the Atlantic still raged. The final equipment did not arrive until April 1943. In addition passports for all the various nationalities had to be arranged, as well as passports and transportation for the team members' dependents. The

¹Gowing, Britain and Atomic Energy, pp. 190-92.

²Eggleston, Canada's Nuclear Story, p. 63.

payrolls proved complicated, with some members being paid by the Canadian or British governments, others being paid by Imperial Chemical Industries, and one who was being paid by the Free French organization.¹

Once these and other housekeeping details were worked out, Mackenzie started to worry about the availability of heavy water. He first mentioned his concern to the British on 27 October. However, as he later noted in his diary, "no one else took this seriously."²

After more discussions with Akers, who was in Ottawa supervising the transfer of Halban's group, the possibility arose of the Canadian government taking over the negotiations that the American Army was now conducting with the Consolidated Mining and Smelting Company in Trail. Howe decided, however, that such a move would be regarded unfavourably by the Americans. Since the Department of Munitions and Supply could, as a last resort, prevent the export of heavy water to the United States if the Americans behaved unreasonably, he felt the contract should be allowed to proceed as planned.³

In any case, a takeover of the heavy water plant in Trail seemed unnecessary. On 4 November, Conant sent a telegram to Mackenzie asking him to outline Canadian

¹Gowing, Britain and Atomic Energy, p. 192.

²Mackenzie Diary, 27 October, 1942.

³Gowing, p. 193.

requirements. A few days later, Mackenzie met with Akers who had been in Washington to discuss the situation with the Americans. Akers reported that Bush and Conant were prepared to let Halban have the first year's output from Trail. However, he warned that the American Army, which was increasing its control over the whole American programme, might disagree and insist that the heavy water be used in the United States.¹

Mackenzie responded to Conant's telegram the next day. After outlining the progress made in establishing the Montreal laboratory, which he felt would be operating by early January, he stressed that the success of the project depended on the availability of heavy water, as well as a "large measure of courteous cooperation and strong support" from the American group in Chicago. Specifically, the Montreal group would be ready to use the first year's output, estimated at six tons, from Trail as soon as it was available.²

Conant gave tentative approval to Mackenzie's request on 17 November. Conant declared that "we must consider Dr. Halban's undertaking in Canada as one aspect of the total effort." Consequently, Halban could use the six tons of heavy water on the condition that small amounts be made available for experimental work in the United States

¹ Mackenzie Diary, 8 November 1942.

² Mackenzie to Conant, 9 November 1942, NRC v. 284.

and that the allocation be subject to review and modification where necessary by a committee composed of himself, Akers and Mackenzie.¹ Mackenzie was delighted by Conant's decision and informed him that it was "eminently fair and generous."²

Conant further assuaged Mackenzie's fears about heavy water when the latter went to Washington at the end of the month. According to Mackenzie, "I said we did not want to involve ourselves too deeply unless we could be sure of the supply of heavy water. He said there was no danger on that score." The conversation took an ominous turn, however, when Conant remarked that the Army was "clamping down on interchange." As Mackenzie noted, "General Groves is making his presence felt, and while Conant does not like it, he feels the necessity of security."³

Nevertheless, Mackenzie was confident about the heavy water situation. On his return to Ottawa, he asked Akers to review the other requirements for the Montreal laboratory. After talks with Halban and the Americans, Akers sent his report to Mackenzie on 4 December. The Americans, he noted, had been most helpful and it appeared that Halban would get everything he needed. The requirements included four tons of uranium metal, one half ton of

¹Conant to Mackenzie, 17 November 1942, NRC v. 284.

²Mackenzie to Conant, 24 November 1942, NRC v. 284.

³Mackenzie Diary, 28 November 1942.

uranyl nitrate, and sixty tons of graphite, all to be supplied by the United States. In addition, he would need twenty tons of uranium oxide. This quantity had been ordered in July and the British had already received five tons. Akers suggested that the remaining fifteen tons be released to the Americans to be purified by the Mallinckrodt process, on the understanding that three tons be returned to Montreal by 1 March 1943 and that five tons be sent to Britain. Mackenzie gave his approval to the list and formally submitted it to the American authorities on 12 December.¹

Thus, as 1942 ended, the Montreal laboratory was becoming a reality, and Mackenzie was excited that Canada was now a partner, even if a very junior one, in the development of atomic energy. It thus stood on the threshold of a great new technological breakthrough.

¹Akers to Howe, 4 December 1942, Howe Papers, v. 14, folder 8; Eggleston, Canada's Nuclear Story, pp. 61-62.

CHAPTER II

BREAKDOWN IN COOPERATION

Within a few weeks of sending his formal request for materials to the United States, Mackenzie was to discover that the future of the Montreal laboratory was in doubt. The British and the Americans began to be at odds and both were trying to gain Canadian support. As a result Canada was put in a position which threatened not only to end its short experience with atomic energy but also jeopardize its relations with the other two nations.

The problem arose as a result of the British view that, even though the Americans were doing ten times as much work as they on atomic energy and were far ahead of them in several areas, they were entitled to full scientific interchange. They reasoned that they had done much of the early theoretical work, the results of which had convinced the Americans to launch their own programme. Sharing results at the later stages seemed only fair play. Even if the call for fairness was ignored, the Americans had already committed themselves to cooperate as a result of the meeting between Churchill and Roosevelt in June.

As we have seen, by June, Conant and Bush had cooled towards the idea of a full partnership with the British. The two, however, no longer held paramount

authority. By June, parts of the American programme were reaching the design and construction stage. Realizing that the existing research teams lacked the engineering expertise and size of organization to undertake this task, S-1 had already decided to use the Army. Army representatives began to attend S-1 meetings early in 1942 to familiarize themselves with the potential engineering and construction needs. In June, Bush completed plans to reorganize the programme which included the transfer of authority for the design and construction phase from the Office of Scientific Research and Development to the Army. In September, General Leslie R. Groves was placed in charge of the Army project, which was called the Manhattan Engineer District after the location of Groves' headquarters. To supervise Groves, a military policy committee was established with one representative from the Army, the Navy and the Office of Scientific Research and Development. Bush was chosen to be chairman and Conant was his alternate. The Army now controlled over sixty per cent of the funding for the entire programme and, in the months to come, acquired the corresponding authority over how it was to be run. One area in which it demanded control was security.¹

On 23 September the Military Policy Committee met with the Secretary of War, Henry Stimson. Conant and Bush brought up the subject of cooperation with the British,

¹Hewlett and Anderson, The New World, pp. 167-83.

advocating that it was now unnecessary. The United States was doing so much more work than Great Britain that an agreement binding the Americans to cooperation could even possibly slow down their progress. It could also give the British post-war industrial advantages at the expense of the American taxpayer. In addition, they argued, the large number of foreigners working on the British projects presented a very real security risk. These arguments convinced Stimson, who agreed to present them to Roosevelt. Until Roosevelt approved the new policy, however, they agreed that the British would have to be stalled.¹

Bush replied to Sir John Anderson's letter of 5 August, in which Anderson suggested the transfer of the British diffusion team to the United States, a week later. He adopted a "wait and see" approach to the suggestion, explaining that priorities still had to be worked out. He ignored Anderson's comments about ~~post-war~~ controls and patent rights. As Conant commented after seeing a draft of the letter, it was a "masterly evasive reply."²

Stimson met with Roosevelt to discuss atomic energy on 29 October. Stimson asked if Roosevelt had come to any agreements with Churchill. Roosevelt replied that he and Churchill had discussed the matter once and then only in a general way. So much for the "complete accord" he had

¹Hewlett and Anderson, The New World, pp. 263-64; Bernstein, "The Uneasy Alliance", p. 209.

²Quoted in Hewlett and Anderson, p. 264.

mentioned to Bush. After Stimson outlined Bush's and Conant's arguments against complete cooperation with the British, Roosevelt agreed to a new policy of restricted interchange.¹

The British were not aware of the new policy until Akers arrived in Washington in November to discuss linking the efforts of both countries as well as to negotiate for the requirements of the Montreal team with Conant. Akers had several arguments with Conant, despite the fairly rosy picture that he was giving Mackenzie about the talks. On 11 December, the day before Mackenzie sent his official list of requirements to the Americans, the disagreements between Akers and Conant came to a head. Akers insisted upon the closest possible cooperation in all areas of all the scientific and engineering projects, regardless of which country was doing the work. Scientists from both countries needed to know about all developments in order to make sound decisions about their own work. Besides, he argued, Churchill had already agreed upon full cooperation. Conant ignored this point and insisted that interchange be restricted to information that the British could use to hasten the development of the atomic bomb during the war. The meeting ended without any agreement being reached.²

¹Bernstein, "The Uneasy Alliance", p. 210.

²Hewlett and Anderson, The New World, pp. 265-66.

Bush and Conant met the next day and, after reviewing the discussions with Akers, decided that they needed to convince Roosevelt to issue a presidential directive on the subject. Conant outlined the arguments they should use. First, he argued, the exchange of military secrets could be justified only if it aided the prosecution of the war. In those areas in which both countries were working, exchange was permissible. For example, there should be cooperation with Halban's team since it was doing similar work to that being done at Chicago. Moreover, the Chicago group was using graphite as a moderator because heavy water was still unavailable. Since Halban's team was using the much more efficient heavy water, its work could prove valuable to the Americans. On the other hand, the British did not intend to build the plants necessary for the production of plutonium during the war. Giving them information on this phase would not aid the military effort and, therefore, should not be permitted.

Conant considered the impact of ending all cooperation with the British. He felt that this would slow down the progress of some of the American projects but it would not be unduly damaging to the overall effort. However, there was a problem with raw materials. As Hewlett and Anderson explained:

If the President should stop the transmittal of S-1 data, Canada might refuse to allow heavy water from Trail to cross the border. This would slow down but not cripple the effort in the [United States], for domestic plants would be

producing substantial quantities by 1944. Canadian ore was a more difficult matter. Pending further exploration of supplies in Colorado, Conant hesitated to estimate the effects should Canada impose an embargo on oxide shipments.

Consequently, Conant favoured the more moderate policy of limiting, but not terminating totally, cooperation. This policy would still require, however, careful handling of the Canadians as well as steps to guarantee supplies of uranium from Eldorado.¹

Bush incorporated Conant's arguments into a report for the President on 16 December. The report was endorsed by the Military Policy Committee as well as Stimson, General George Marshall, the Army Chief of Staff, and Vice-President Henry Wallace. Stimson then took it to the President on 27 December along with a letter Akers had sent Conant outlining the British position and Bush's rebuttal of it. From Conant's and Bush's point of view, the timing was perfect. The day before, Roosevelt had learned of a treaty Great Britain had signed with the Soviet Union on 29 September 1942 for the exchange of new weapons. Angered as a result of not being told of the treaty earlier and worried about its impact on atomic energy secrets, Roosevelt wrote to Bush the next day that he would approve the new policy.²

¹Hewlett and Anderson, The New World, pp. 266-67.

²Ibid., pp. 267-68; Bernstein, "The Uneasy Alliance", p. 210.

C.J. Mackenzie learned of the new policy from a letter Conant wrote to him on 2 January 1943.¹ The letter explained that two changes had been made to the American programme. First, the Americans had decided to supplement the Chicago project with another to produce plutonium from a heavy water moderated reactor. DuPont had already been hired to develop, construct and operate the new plant, to build heavy water plants, and to design a plant to manufacture the plutonium. Conant noted, "You will see that this decision greatly modifies the basis of our previous discussions." The second change, he wrote:

...is an order which Dr. Bush and I have received from the top which restricts our interchange on the whole subject by the application of the principle that we are to have interchange on design and construction of new weapons and equipment only if the recipient of the information is in a position to take advantage of it in this war.

The new policy, which had been developed in the interests of secrecy, meant, for example, that since neither the Canadians nor the British were involved in the production of heavy water, no information would be released about the process. As for the Montreal laboratory:

We should very much like to have the group of scientists assembled in Canada carry on the fundamental scientific work for the use of heavy water so that DuPont Company could base their designs on this experience. To this end, we would be quite ready to release all the production of the Trail Plant initially for the

¹Conant, in line with his "be nice to the Canadians" policy, phoned to warn Mackenzie that he was sending a letter which "might sound more harsh than was really intended." Mackenzie Diary, 2 January 1943.

use of this group. We should expect that this Canadian group would direct their progress along lines worked out in connection with the American engineers (DuPont Company) and make all their results available to this designing group.

The Anglo-Canadian group would not receive any information about the chemistry of plutonium, its extraction from fission by-products, nor about the design of the extraction plant. Interchange would be limited to information about the use of heavy water in the chain reaction and about the chain reaction itself. Conant concluded by urging Canadian acceptance of the policy, claiming that it was the best way to ensure the achievement of their joint aim: "the production of a weapon to be used against our common enemy in the shortest possible time under the conditions of maximum security."¹

The new policy on interchange did not appear unreasonable to Mackenzie. Canadians would not learn how to produce heavy water, but were guaranteed enough supplies of it to meet their needs so long as they cooperated with the Americans and assisted the DuPont engineers. Canadians would not learn how to build the bomb, but there is no evidence to suggest that they wanted to develop one. Certainly, Mackenzie was not interested. As he later recalled, he did not really believe that the bomb would be built in time to be used in the war. He did feel that atomic energy "would open up prospects

¹Conant to Mackenzie, 2 January 1943, NRC v. 284.

for peacetime applications of much more hopeful significance than the destruction wrought by bombs."¹ Similarly, Howe showed no interest in developing an atomic bomb. As one of his biographers commented: "In Howe's perspective on the world, atomic energy, including the bomb, was a small matter. Not that he underestimated its importance; he simply had so many other things to do."² The people who might have been interested, such as the military, were not even told of the programmes to develop it.

On the other hand, the British wanted the bomb badly. Mackenzie informed Akers of the letter and he came to see it on 7 January. Mackenzie recorded that Akers was very upset and brought with him a letter he had drafted and wanted Mackenzie to sign. The letter, addressed to Conant, said, in part, "I cannot agree that the procedure suggested by you is likely to result in the joint effort receiving the maximum assistance from the Anglo-Canadian group."³ Mackenzie refused to sign the letter and suggested instead that the two of them go to Washington to discuss the issue. In summing up the meeting later in his diary, Mackenzie wrote, "The British think the American offer is a very one-sided one. I am not so sure."⁴

¹Mackenzie, Forward to Eggleston, Canada's Nuclear Story.

²Letter to author from Robert Bothwell, 28 Feb. 1979.

³Quoted in Eggleston, p. 70.

⁴Mackenzie Diary, 7 January 1943.

In London, Sir John Anderson was shocked by the letter. Not realizing that Roosevelt had approved the policy, he wired Churchill, who was in Casablanca with Roosevelt, and asked him to approach the President about the matter. Although it is doubtful that Churchill talked to Roosevelt,¹ he did talk with Harry Hopkins, Roosevelt's friend and advisor, who assured him that the President would straighten out the problem when he returned to Washington.²

Meanwhile, Mackenzie talked to Howe, who had been in Boston for surgery when the letter had arrived. Howe agreed with Mackenzie's views on the matter and agreed that Mackenzie should go to Washington. Fearing British intransigence, he suggested that Mackenzie, rather than Akers, talk with the Americans.³

Mackenzie met with Conant and Bush on 18 January. He was still unaware that they were the authors of the new policy and they were able to give the impression that General Groves was responsible for it. Mackenzie was pleased by the talk and recorded in his diary: "I think there is a great deal to be said for their point of view. We had a very pleasant and profitable discussion and they

¹Gowing Britain and Atomic Energy, p. 159; Bernstein, "The Uneasy Alliance", p. 211.

²Gowing, p. 159.

³Mackenzie Diary, 15 January 1943.

are very friendly to us."¹

Two days later, Mackenzie was back in Ottawa where he described the talk to Howe, Malcolm MacDonald, and Akers. The British were still most unhappy and decided that Akers should go to Washington and insist that since the Anglo-Canadian group planned to build a pilot plant in Canada, the Americans should relax their restrictions. Mackenzie questioned whether that approach would make any difference.²

Akers confronted Conant and Groves on 26 January. The Americans repeated the new rules governing interchange and made it clear that no arrangements would be made concerning information or material until the British agreed to conform to them and a more detailed outline contained in a memorandum written by Conant on 7 January. In addition, they insisted that the material needed for a plant would not be allocated to Montreal unless the DuPont engineers decided that such a plant would help them construct a full-scale plant in the United States. Groves invited members of the British diffusion team to the United States for talks on the construction of a diffusion plant but added that further consultation would depend on whether the British could contribute to the design. He also invited Professors Chadwick and Peierls to discuss the bomb with the experimental physicists who were soon to

¹ Mackenzie Diary, 18 January 1943.

² Ibid., 20 January 1943.

be isolated at Los Alamos. Akers responded indignantly and threatened British retaliation in other areas if the Americans did not relent. Groves and Conant simply agreed that the British should adopt a similar policy in areas they were ahead of the Americans.¹

Faced with continued British resistance to the new policy, Conant gave the official American response to Mackenzie's request for raw materials the next day. The orders for uranyl nitrate and uranium oxide processed by the Mallinckrodt method could be filled. However, supplies of graphite and uranium metal were low and the United States was not able to spare any in the immediate future.²

Refusing to be intimidated by this news, the British continued to resist the new rules. Although Hopkins had promised Churchill that something would be done, nothing had happened. Churchill sent several telegrams to Hopkins, all without result.³ By February, the British decided to carry out Akers' threat of retaliation and Anderson ordered that contacts with the United States be kept to a minimum. When the Americans invited Halban to New York to discuss some of the problems with his early experiments, Anderson refused permission. This

¹Hewlett and Anderson, The New World, pp. 268-69.

²Ibid., p. 270.

³Gowing, Britain and Atomic Energy, pp. 160-61; Eggleston, Canada's Nuclear Story, pp. 75-76.

outraged both Halban, who wanted to go, and Mackenzie, who felt that the invitation was an indication that the American attitude was softening.¹

The imbroglio between the Americans and the British was bringing work to a standstill in Montreal and morale among the staff was getting low. It was made worse on 30 March when the American Military Policy Committee decided that, in view of the British attitude, it was no longer necessary to allot the first years' production of heavy water from Trail to Montreal.² This decision discouraged the scientists still further and Malcolm MacDonald began to worry that some would soon ask to be allowed to return to Great Britain where they could pursue more constructive work.³

Relations between members of the team were also deteriorating. One problem involved the lengthy bureaucratic procedures of the National Research Council. There were others involving pay scales, Dr. Halban's lack of management abilities, and the high-minded attitude of some of the scientists.⁴ No doubt many of these problems were exaggerated in the absence of any sense of purpose as the laboratory remained largely idle through the first

¹ Eggleston, Canada's Nuclear Story, p. 76.

² Hewlett and Anderson, The New World, p. 270.

³ Gowing, Britain and Atomic Energy, p. 193.

⁴ Ibid., p. 198.

few months of the year. Nevertheless, they left a residue of bad feelings on both sides, which took a long time to disappear.

British officials in London were also becoming irritated with the Canadians. They felt it was important to show a united front to the Americans. The Canadians, on the other hand, were unwilling to do anything which might endanger their relationship with the Americans, especially for a cause with which they had little sympathy. Mackenzie seems to have made this clear to the Americans during his visits to Washington, and there is some evidence to suggest that the Americans gave informal assurances to Howe that supplies of uranium and heavy water would be forthcoming if the Canadians cooperated with them.¹

To the British this smacked of treachery. They were particularly upset by the American invitation to Halban because they felt it was "a blatant attempt to divide the British and Canadians, particularly since the attempt seemed to be meeting with some success."² Gowing's claim that "somehow or other the front which the British and Canadians presented to the Americans was maintained unbroken"³ is ill-founded. The Americans knew of the differences and did their best to aggravate

¹See for example Stacey, Arms, Men and Governments, p. 521.

²Gowing, Britain and Atomic Energy, p. 161.

³Ibid.

them.

On 24 April, Mackenzie was in Washington once again to confer with Bush and Conant. They told him that the situation was deteriorating further due to the continued British resistance to accepting the conditions spelled out in Conant's letter and memorandum. Moreover, they asserted, there was no chance of Churchill being able to change Roosevelt's mind. Maintaining his pretense of being a victim of Groves' harsh security regulations, Conant suggested that if the Canadians resumed control over the negotiations, he would do everything possible to help. However, according to Mackenzie, "the Army is firmly in the saddle now and he could not guarantee their views."¹ Won over by Conant and Bush, Mackenzie reported the conversation to Howe and the two decided that it was time to get tough with the British. "If they did not accept the American conditions, Canada would terminate the Montreal project."²

Armed with new determination, Mackenzie went to London. On 11 May, he met with Anderson who informed him that the British had considered breaking off completely with the Americans and developing the bomb alone. At the time, the British were spending roughly £430,000 per year on research and planned to spend another £150,000

¹ Mackenzie Diary, 24 April 1943.

² Ibid., 1 May 1943.

on experimental diffusion plants.¹ If they went ahead on their own, the cost of research would be two to three million pounds a year and a diffusion plant to produce one kilogram of enriched uranium per day would cost well in excess of £50 million, taking three or five years to build. If a plant to manufacture plutonium was built in Canada, it would take five years and five million pounds. In addition, a heavy water plant, at a cost of five to ten million pounds, and a plant to produce uranium metal, at another one and a half million, would have to be constructed. These estimates were prepared by Akers and Perrin who did not take into account the necessity of Tube Alloys receiving overriding priority. Such a priority would mean serious disruptions of other war programmes. A labour force of 20,000 plus the demand for steel and electricity would place a severe strain on the total war effort.² Not surprisingly, most of the British experts felt that an independent effort was beyond British means. Anderson, however, appeared quite serious when he suggested it to Mackenzie. Mackenzie became quite impatient and warned that if the British broke with the Americans and pursued such a scheme the Canadian government would close down the Montreal laboratory. The ensuing discussion, with

¹This compares with \$35 million on research per year and \$400 million for plants in the United States. The pound was officially valued at \$4.00.

²Gowing, Britain and Atomic Energy, pp. 162-63.

Anderson bemoaning the Americans' lack of fair play and Mackenzie supporting the American position, was brutally frank, but inconclusive. As Gowing remarked, the talk "simply left a residue of bad feeling and the memory of it rankled on both sides."¹

Relations between the Canadians and the British worsened still further when the British discovered that the Americans had apparently secured the entire output of Eldorado for themselves. The whole affair was rather like a mystery and took several months to unravel. It began on 7 April when the British ordered an additional twenty tons of ore from Eldorado. Howe placed the order with LaBine but nothing appears to have been done.² The British were not too concerned by the delay at first, assuming that Howe was looking after British interests. However, early in May, Bertrand Goldschmidt, a member of the Montreal team and a former consultant to Eldorado, visited the refinery at Port Hope. There he learned, to his dismay, that somehow the entire output had been contracted for and that British needs could not be met. He informed London and Sir John Anderson immediately wired Churchill, who was on his way to Washington for talks with Roosevelt and Mackenzie King.

Over the next few days, Churchill, Lord Cherwell,

¹Gowing, Britain and Atomic Energy, p. 197; Eggleston, Canada's Nuclear Story, p. 78.

²MacDonald to Howe, 7 April 1943; LaBine to Howe, 13 April 1943, Howe Papers, v. 14, folder 8.

and MacDonald, who had been summoned from Ottawa at Anderson's request, all approached King in the hope that he could straighten out the confusion over uranium allocations as well as enlist his support against the American policy on interchange.

King had had nothing to do with atomic energy since meeting with MacDonald eleven months earlier, and he certainly knew nothing about the American contracts with Eldorado. He was quite ignorant of the problems between Canada, the United States, and Great Britain, and was easily swayed by the British entreaties. On 19 May, he met with Lord Cherwell. He later recorded in his diary:

It appears that both the British and the Americans have been experimenting on similar lines. The latter have made contracts with Canada for some of the raw materials and power needed, and are now unwilling to let the British know what they have done. This is because the army has got a hold of the matter....They are as difficult about it in their relations with Britain as Stalin had been in telling of what was being done in Russia.

I had known nothing about the contracts and will know nothing until I talk the matter over further with Howe.¹

The next day, Churchill tried his hand at influencing King. King, relishing his role as "lynchpin", offered to talk to Roosevelt about the problem. Churchill promised to let him know if that would be of any help.²

¹King Diaries, 19 May 1943.

²Ibid., 20 May 1943.

The British kept up the pressure, and on the next day, MacDonald spoke with King. MacDonald complained that the British had expected Canada to look after their supply needs, but that Howe had not kept them informed of the American contracts. King promised to talk to Howe in a few days after checking back with MacDonald to see if there had been any developments. He later confided to his diary that "Churchill had said that they might need to have me intervene with the President as the [American Army] were selfishly keeping everything to themselves and there certainly should be a sharing."¹

Churchill tried again later the same day. He flattered King and commended Canada for its stature in both the United States and the Empire. He suggested that the British would be glad "to have Britain's interests entrusted to Canada" in the area of atomic energy. With this Churchill perhaps went too far. King's long standing distrust of British ideas of Empire were aroused and he demurred. He later explained in his diary, "I had in mind, of course, my own feeling that it would not do for Canada to assume to act for Britain."²

Gowing claims that Churchill accused Howe of selling the British Empire "down the river" in one of these conversations and this story has been repeated in

¹King Diaries, 21 May 1943.

²Ibid.

other accounts.¹ It seems unlikely, first, because Churchill was trying to flatter King, and secondly, because King would surely have mentioned it in his diary.² Nevertheless, it is evident that somebody, perhaps Akers or MacDonald, made such a remark sometime around this date because Mackenzie refers to it in his diary.³

In any case, whether or not Churchill made such a charge, King was upset enough by what he had heard to confront Howe when he returned to Ottawa. Howe must have justified his position on the American interchange policy because King does not mention the issue again and the Canadian position remained unchanged. However, Howe did promise to straighten out the matter of the uranium contracts. On 26 May, he wrote to LaBine and explained the British accusation that Eldorado had sold the entire output of oxide for the next two years to the Americans. He continued:

I have no knowledge of such a sale and I feel sure that you would not dispose of your production in a way that would interfere with filling urgent requisitions from the United Kingdom.

In any event, I would be opposed to selling our full output of uranium for a long period in advance under present day circumstances.

¹Gowing, Britain and Atomic Energy, p. 185; see Bothwell and Kilbourn, C.D. Howe, p. 169; Eayrs claims that Churchill questioned Howe's loyalty to Canada. There is no evidence at all of this. In Defence of Canada, III, p. 263.

²Stacey, Arms, Men and Governments, p. 518.

³Mackenzie Diary, 30 June 1943.

Since the Prime Minister was anxious about the situation, Howe wrote, he urgently needed information about any contracts.¹

LaBine's reply, sent two days later, revealed that the British fears were justified. Eldorado had three contracts with the American government. The first, which the Canadians and British were aware of, had been placed on 16 July 1942 and called for the delivery of 350 tons of oxide from Eldorado ore. Over half had been delivered already. The remainder was to be sent after fulfilling a second contract which called for the refining of another 655 tons of Belgium ore. A third contract ordered five hundred more tons of oxide to be delivered after the oxide from the first two contracts, but before 31 December 1944. These later two contracts were signed on 21 and 22 December 1942, less than two weeks before Conant wrote the letter to Mackenzie outlining the new interchange policy.²

From LaBine's explanation of why he accepted the orders, it is clear that the root of the problem lay in a letter Howe had sent him the previous December. When Akers submitted the list of requirements for the Montreal laboratory, he suggested that of the twenty tons already ordered by the British, three should be sent to Montreal and five to the United Kingdom after first being sent to

¹Howe to LaBine, 26 May 1943, Howe Papers, v. 14, folder 8.

²LaBine to Howe, 28 May 1943, ibid.

the United States to be processed by the Mallinckrodt method. Howe must have concluded that this was the sum total of all British and Canadian requirements. He wrote to LaBine on 5 December and suggested that the five ton order was an outside estimate, probably far higher than would actually be required. He instructed LaBine to notify his American customer that all the uranium oxide produced by Eldorado could be shipped to him, subject to the return of the eight tons specifically requested by the British.¹

Moreover, as LaBine went on to explain in his letter, as a result of his talks with Howe, he "was of the opinion that it was policy to accept all contracts that came our way for the refining of ore, in order to give our industry revenue and at the same time protect our company against other interests which were anxious to take on the job of refining from the United States Government." In any case, he added, he had a verbal understanding with the Americans that they would take care of the needs of the British and Canadian governments. He expected a written agreement to this effect any day.²

Reassured by this news, Howe wrote back on 1 June and asked for copies of the contracts. The British, he explained, "seem to be very worried about this, and as our Prime Minister has interested himself in this matter,

¹Howe to LaBine, 5 December 1942, Howe Papers, v. 14, folder 8.

²LaBine to Howe, 28 May 1943, ibid.

I would like to set their fears to rest."¹ However, the British fears were not so easily dismissed. It seems they did not have the same faith in verbal understandings with the Americans as did LaBine and Howe. And for good reason; the written agreement never did arrive.

At this point, the situation becomes even more confused. Howe knew the details of the contracts by the end of May, yet did not inform the British of them. In the middle of June, Akers complained to London that after two weeks of trying to sort things out, everything was still a muddle. He could not find out what or how many contracts had been signed, when, or by whom. Nor could he discover whether they contained a qualifying clause guaranteeing that British and Canadian needs would be met.² One possible explanation is that Howe was embarrassed by his mistake and hoped to stall the British while he made an arrangement with the Americans. It appears that even Mackenzie was left in the dark. On 14 June, Howe met with LaBine and two representatives of the American Army. Mackenzie attended at least part of the meeting but later complained that he was not fully informed about the contracts nor about how they would be worked out.³ During the meeting, Howe insisted that clauses be inserted into the

¹Howe to LaBine, 1 June 1943, Howe Papers, v. 14, folder 8.

²Gowing, Britain and Atomic Energy, p. 185.

³Mackenzie Diary, 14 June 1943.

contracts guaranteeing British needs and he suggested that the decision over allocation of Eldorado's oxide be left to him.¹

On 6 July, the Canadians pressed their case with the Americans further. Mackenzie met with General Groves in New York to explain the problem and Howe's awkward position. Groves insisted that the output from Eldorado was not sufficient to meet the needs of the British and the Canadians. However, when Mackenzie hinted that the Canadian government might have to interfere with deliveries, Groves backed down. After some discussion, the two agreed to investigate the possibility of increasing the efficiency of the mine and the refinery so that the output would be large enough to satisfy total demand.²

The next week, Mackenzie was back in Ottawa trying to placate the British. MacDonald complained once again about the lack of exact information. In addition, he was worried about reports that the Americans were investigating other properties near the Port Radium mine for uranium deposits. Fearing that they might gain control over the entire area, he wanted to phone Howe, who had just left for a holiday, and ask him to instruct LaBine and anyone else concerned to avoid any negotiations with the Americans. Mackenzie warned against phoning. He had seen

¹Mackenzie Diary, 14 June 1943.

²Eggleston, Canada's Nuclear Story, pp. 81-82.

Howe a couple of days earlier and felt that he had been so annoyed with the British that the slightest cause, such as a call on the first night of a well deserved vacation, would result in the closure of the Montreal laboratory.¹

MacDonald decided to write to Howe instead.²

MacDonald did not get a reply to his letter until Howe returned from his holidays ten days later. By then the issue had been resolved. General Groves had come to Ottawa on 26 July and had agreed to allocate enough uranium to satisfy British and Canadian needs up until September 1944. To ensure adequate supplies thereafter, he suggested that the mine and the refinery be expanded. Meanwhile, in order to prevent future embarrassments, it was agreed that the Canadian government would take over deliveries so that all would have to be made by order of Mackenzie.³ MacDonald was informed of the decision the next day and LaBine received his instructions on 28 July.⁴

Groves willingness to find a solution to the problem represented an overall softening of the American attitude towards cooperation by the end of July. The first sign of a reconciliation between the Americans and the British occurred while Churchill was in Washington in late

¹ Mackenzie Diary, 13 July 1943; see also 10 July 1943.

² MacDonald to Howe, 17 July 1943, Howe Papers, v. 14, folder 8.

³ Mackenzie Diary, 26 July 1943.

⁴ Howe to MacDonald, 27 July 1943; Howe to LaBine, 28 July 1943, Howe Papers, v. 14, folder 8.

May, but the progress during the next two months was slow and tortuous.

Churchill had finally brought up the subject of atomic energy with Roosevelt on 25 May, after King had returned to Ottawa. Roosevelt succumbed to Churchill's pleas and agreed to renew interchange. Unfortunately, neither Roosevelt nor Hopkins, who knew of the agreement, told Bush.¹ Bush, meanwhile, had had a long discussion with Cherwell on the same day. Cherwell admitted that Britain could not use much of the information it wanted from the Americans during the war. However, he said, the British wanted the information so they could develop the bomb immediately after the war. Bush argued that the post-war applications of atomic energy were entirely outside his authority since the issue involved long-term foreign policy considerations that could only be resolved by treaty. Cherwell continued to insist on the need for the information and threatened that Britain would divert men and material from the war effort in order to develop the information on their own if the Americans did not cooperate.²

Not knowing about Roosevelt's agreement with Churchill, Bush continued to insist upon the policy of restricted interchange. Churchill tried to find out what

¹For a discussion of the peculiar event see Bernstein, "The Uneasy Alliance", p. 215.

²Hewlett and Anderson, The New World, pp. 272-73.

had happened in early July but, by this time, Roosevelt had reversed himself once again. On 24 June, he met with Bush for the first time since the Washington conference and learned of Cherwell's admission that the British wanted the bomb for post-war use. Roosevelt was shocked, and when Bush left the meeting he was under the impression that the President wanted to maintain the policy.¹

Bush left for London for talks with the British soon afterwards. While he was there he received new instructions from Roosevelt. Hopkins, who had received a telegram from Churchill asking why no information had been released, confronted Roosevelt and insisted that he had made a firm commitment. Consequently, Roosevelt wired Bush to renew full exchange of all information. The message was garbled in transmission and Bush's copy read "review" instead of "renew". Not realizing the true meaning of the message, he continued to insist upon limited interchange during his discussions.

Bush did not find out about the mistake until he returned to Washington at the end of July. Roosevelt was out of town, but after discussing the problem with Stimson, he decided to renew negotiations with Sir John Anderson, who had just arrived in Washington. The talks went smoothly. The British had decided that they had to make some concessions to avert the stalemate and had

¹Hewlett and Anderson, The New World, p. 274.

moved considerably closer to the American position than they had been only a few weeks earlier. Bush did not reveal that Roosevelt had authorized full cooperation, but appeared to take a similarly conciliatory approach. An agreement was reached in early August and it was decided that the details could be worked out in time for the agreement to be signed at the Churchill-Roosevelt summit scheduled for the middle of the month in Quebec City.¹

Although Canada was not to be a signatory of the agreement and took no part in the negotiations leading up to it, Canadian officials were aware of the progress of the talks. Sir John Anderson stopped in Ottawa on his way to Washington to meet Bush² and stopped in again eight days later on his way to the Quebec conference. While in Ottawa, he met with Prime Minister King at his Gatineau Hills estate and informed him of the agreement. He explained that although Canada was a party to the agreement, only Churchill and Roosevelt would sign it. In addition, he and Bush had decided that a Canadian representative on the proposed policy committee was necessary to avoid any problems with allocations of uranium and heavy water, much of which was produced in Canada.³ He also gave a theoretical description of atomic energy and a warning about the

¹Hewlett and Anderson, The New World, pp. 277-78.

²Mackenzie Diary, 31 July 1943.

³Gowing, Britain and Atomic Energy, p. 171.

strategic implications of the atomic bomb.¹ The Germans and Russians were also working on the bomb, so it was necessary to have a full out effort to ensure it was developed first by the Americans and the British. Even if it was not developed in time for use during the war, it would be an important factor in the post-war period, giving absolute control to whichever country possessed the secret.²

King followed Anderson to the Quebec conference, where his main function was to pose with Roosevelt and Churchill for the publicity photographs. Neither he nor any other Canadian official, military or civilian, took part in the discussions. However, Churchill did keep King informed of the developments and even attended a meeting of the Cabinet War Committee in Quebec City on 11 August.³ On 15 August, Churchill briefed him on the agreement on atomic energy, offering to give him a copy.⁴

Churchill and Roosevelt signed "The Articles of Agreement Concerning Collaboration between the Authorities of the U.S.A. and the U.K. in the Matter of Tube Alloys",

¹King did not have a scientific background and obviously did not understand much of what Anderson told him. He recorded in his diary, "The root secret of it all was some atomic power. As he developed the matter scientifically, my own mind made a parallel between the power of the mind that comes from tapping deeper sources as explained by William James." King Diary, 8 August 1943.

²Ibid.

³Ibid., 10 and 11 August 1943.

⁴Ibid., 15 August 1943.

more commonly known as the "Quebec Agreement", on 19 August. The preamble noted that the atomic bomb would be developed more quickly if the British and Americans pooled their efforts. In the first three articles, the British and Americans agreed not to use the bomb against each other, not to use it against third parties without each other's consent, and not to give any information about it to a third party without mutual consent. The fourth article reflected American fears that the British would gain post-war commercial and industrial advantages from interchange on the bomb. It stated:

...in view of the heavy burden of production falling upon the United States as the result of a wise division of war effort, the British Government recognises that any post-war advantages of an industrial or commercial character should be dealt with as between the United States and Great Britain on terms to be specified by the President of the United States to the Prime Minister of Great Britain. The Prime Minister expressly disclaims any interest in these industrial and commercial aspects beyond what may be considered by the President of the United States to be fair and just and in harmony with the economic welfare of the world.

The final article called for the establishment of a Combined Policy Committee composed of Stimson, Bush, and Conant for the United States, Field Marshall Sir John Dill and Colonel J.J. Llewellyn for Great Britain, and C.D. Howe for Canada. The functions of the Committee were to decide on the programme of work to be carried out in the two countries, to review the progress of existing projects, and to allocate materials, apparatus, and plant. It was also empowered to settle any differences over the

interpretations of the Agreement. Since the Americans outnumbered the British on the Committee, the plan guaranteed that American views would prevail, as long as Canada cooperated. As for interchange, the members of the Committee and their immediate technical advisors would have full access to all information on all sections of the programme. At the basic research and experimental stage, there was to be full interchange between scientists engaged in the same areas of work. However, at the design and construction stage, cooperation was to be more limited. The Agreement read:

...interchange of information and ideas shall be regulated by such ad hoc arrangements as may, in each section of the field, appear to be necessary or desirable if the project is brought to fruition at the earliest moment. Such ad hoc arrangements should be subject to the approval of the Policy Committee.¹

Although the Article did not guarantee the degree of cooperation the British wanted, it at least ensured a certain amount of collaboration and indicated a willingness by the Americans to take British interests into consideration. Thus, finally, after eight months of bitter recrimination, the path towards a limited partnership in atomic energy was open.

¹The Quebec Agreement is reprinted in Gowing, Britain and Atomic Energy, appendix 4.

CHAPTER III

WARTIME PARTNERSHIP

The Quebec Agreement signalled the start of a new era in atomic energy and, for the rest of the war, relations between the United States, Great Britain, and Canada in this area were, for the most part, harmonious and fruitful. The United States was now in a position to utilize all its resources, as well as those of Great Britain and Canada, to pursue the development of the atomic bomb at maximum speed. Great Britain and Canada could now reap the benefits of the progress in the United States.

Initially, however, cooperation got off to a slow start. There was another break-down in communications between Roosevelt and his officials; Conant and Stimson did not find out the terms of the Agreement until early September. In addition, the Americans were still wary of Wallace Akers and his connections with Imperial Chemical Industries. During the Quebec Conference, Hopkins made it clear that Akers was not welcome in the United States and asked Churchill to send a top scientist to Washington as a technical advisor. When Churchill informed Anderson

of this, the latter was upset, but agreed to find someone in Britain who could be spared from existing war work. In the meantime, it was decided that Dr. James Chadwick, who had been sent to North America with several other leading British nuclear scientists when the Agreement was reached, would act as the technical advisor. Akers, however, would continue to direct the British effort in North America.¹

The Combined Policy Committee finally met on 8 September in Washington. It was called at such short notice that Bush was not able to attend and Howe did not find out about it until afterwards. As a result of an earlier agreement between Anderson and Bush, Stimson was appointed chairman. At the meeting, the Committee established a technical sub-committee of Richard Tolman, an advisor to General Groves, Chadwick, and C.J. Mackenzie to arrange for the exchange of data and personnel. It was agreed that if the sub-committee was unanimous in its decisions, it could go ahead without the Committee's approval.²

One more organizational task remained. On 11 September, the Americans protested Akers' continued presence as the chief British liaison officer. As a result, Chadwick assumed these duties as well as his membership on the technical sub-committee. Mackenzie was

¹Gowing, Britain and Atomic Energy, pp. 172-73.

²Hewlett and Anderson, The New World, p. 280.

delighted with the change. He had become impatient with Akers through the year and, by early September, complained in his diary that Akers was becoming a nuisance.¹ He felt that Chadwick and Groves would like each other and that many of the problems of the past, which he felt resulted partly from personality clashes, could now be solved.²

The spirits of the scientists in Montreal improved for a while with the news of the Agreement. In late August, Chadwick visited the laboratory and was sympathetic about the internal problems facing it. The greatest problem was the leadership of Dr. Halban. Although a technical committee had been established to advise him, Halban was ignoring it and making all the decisions on his own. He was not circulating the technical reports from Great Britain to the other scientists. The Canadians felt there was a bias against them, especially against their French speaking colleagues, and that Imperial Chemical Industries in Britain was better informed about the developments at Montreal than they were.³ Chadwick conferred with Mackenzie about the situation and expressed his lack of regard for Halban. They decided that more top calibre Anglo-Saxon scientists were needed in Montreal, both to find someone to replace Halban as administrator

¹ Mackenzie Diary, 29 August and 2 September 1943.

² Ibid., 12 September 1943.

³ Eggleston, Canada's Nuclear Story, p. 91.)

and to help overcome American distrust of the project. In addition, Chadwick reactivated the technical committee and arranged for wider circulation of reports.¹

Mackenzie informed Howe of these developments on 3 September. Howe was still pessimistic about the project and Mackenzie felt he was still prepared to close down the laboratory on any excuse. However, he was able to convince Howe that they should wait until the agreements on actual cooperation had been worked out and then lay down the conditions as to how the laboratory should operate.²

An agreement concerning the Anglo-Canadian project was a long-time coming. While the Americans and British were making rapid strides towards collaboration in other areas of the bomb programme, Halban and the Montreal team were no longer considered to be of central concern.³ The Americans felt that their plutonium plant, being constructed at Hanford, Washington, would produce enough plutonium for wartime use using the fission products from the graphite moderated reactor.⁴ Since a heavy water pile in Canada was of no use to them, the Americans were deaf to Anglo-Canadian pleas for enough material to allow them to build one. They did, however lend one ton of heavy

¹Eggleston, Canada's Nuclear Story, p. 91; Mackenzie Diary, 27 and 19 August 1943.

²Ibid., 3 September 1943.

³Ibid., 19 September 1943.

⁴Hewlett and Anderson, The New World, p. 282.

water and one thousand pounds of uranium and allowed the exchange of basic experimental data. Unknown to the British and the Canadians, the Americans had decided to go ahead with the plans announced by Conant in his 2 January 1943 letter to Mackenzie to build a heavy water pile themselves. For some time nothing had been done, but by the summer of 1943, Groves decided to use the Chicago team, largely idle since their experimental graphite pile went critical on 2 December, to build and operate a heavy water pile in the Argonne Forest near Chicago.¹

American reluctance to support a large project in Canada diminished somewhat when they learned that Professor John D. Cockcroft was being considered as the director of the Montreal laboratory. Cockcroft was an eminent nuclear physicist and had been a member of the Maud Committee. He was currently the head of the British radar establishment and had gained a reputation as a good administrator. The Canadians were also delighted with this news. Mackenzie felt that if Cockcroft agreed to head the Montreal project, the Americans, who were also unhappy with Halban, would be willing to supply the necessary heavy water and uranium for a large plant.²

At first, Cockcroft was unwilling to give up his radar work. However, he was in Washington in December for

¹Gowing, Britain and Atomic Energy, p. 270.

²Mackenzie Diary, 21 November and 8 December 1943.

discussions with the Americans and was persuaded to go to Ottawa and Montreal to see what was being done there before he returned to Great Britain. Although he was interested in the project, after seeing the situation in Montreal, he insisted that he would take charge only if the Americans agreed to cooperate and supply the materials needed to build a pile. The Americans in turn insisted that they would consider it only when Cockcroft took over. Cockcroft also felt he had obligations to the radar project and to Cambridge University which made a move to Canada undesirable. However, Sir John Anderson was able to convince him that the Montreal project would be abandoned if he refused. Cockcroft agreed to accept the post once he had taken care of some pressing duties in Great Britain.¹

The Americans remained reluctant to do anything about Montreal. Groves and Chadwick went there on 16 December and Mackenzie made an impassioned plea to Groves. As he recorded in his diary:

I told him what we were doing; that we had no self interest in the matter; we were spending large sums on the basis that cooperation had been worked out. I told him that the Montreal Laboratory was far from satisfactory and that unless it was accepted as a real unit soon we would shut it down.

Groves appeared sympathetic but refused to make any promises.²

¹Gowing, Britain and Atomic Energy, pp. 271-72; Eggleston, Canada's Nuclear Story, pp. 94-95.

²Mackenzie Diary, 19 December 1943.

The continued inactivity was once again affecting the morale of the staff at Montreal. Their idleness stood in stark contrast to the other areas of the programme. Arrangements for fusing parts of the British and American projects were completed by the end of the year. The British diffusion and electromagnetic teams had both arrived in the United States in December and several British scientists had joined the American weapon development group then being isolated at Los Alamos.¹ The Montreal team became completely demoralized. As Gowing describes the situation:

The scientists and engineers had been sent to Canada on the understanding that they were to take part in war work of the highest importance but instead their existence appeared merely futile. The team was in abysmally low spirits and had lost any sense of direction. The air was thick with resignations and disintegration seemed at hand.²

The French scientists had been invited by the Free French organization to work in Algiers and one of them decided to leave. To prevent further resignations, Anderson instructed Malcolm MacDonald to go to Montreal and assure the scientists that if the negotiations with the Americans failed to allow for the development of a heavy water pile in Canada, the whole team would be transferred back to Great Britain where a pile would be built no matter what

¹Gowing, Britain and Atomic Energy, p. 255.

²Ibid., p. 274; see also Mackenzie Diary, 31 March 1944.

the cost.¹

The long wait was also affecting relations between Howe and Anderson. On 28 January 1944, Howe announced in the House of Commons that an order-in-council had been approved the day before ordering the expropriation of the outstanding shares of Eldorado effective at 3:00 that afternoon. The management of Eldorado was to remain unchanged. He explained to the House that the expropriation was necessary for the war effort and asked that no questions be asked until the need for secrecy was gone. A week later Howe received a veiled reprimand from Anderson because Howe had not consulted him or the Combined Policy Committee on such a sensitive issue before making his announcement, and he suggested that Howe explain his actions before the next meeting of the Committee. Howe's response was similarly stiff. He pointed out that he had informed several members of the Committee of the Canadian government's intentions when he was in Washington in December but, unfortunately, Sir John Dill had been out of town at the time. He also intended to inform the Committee of what had been done at its next meeting. Again unfortunately, he had not yet had an opportunity to attend a meeting because the British had never informed him of the times or places of any of them. He would appreciate notice of the next one.²

¹Gowing, Britain and Atomic Energy, p. 274.

²Stacey, Arms, Men and Governments, pp. 524-25.

Howe was duly informed that the next meeting was to be held in Washington on 17 February. Howe intended to be present, but his plane was held up by bad weather and Mackenzie, who was already in Washington, sat in for him. Mackenzie had met with Chadwick the day before and they decided that it was time to confront the Americans about Montreal. Chadwick felt that Groves was sympathetic, but that Conant and Bush were opposed to building a pile in Canada and were procrastinating.¹ Consequently, at the meeting the next day, Chadwick insisted that the issue be dealt with. He made the case for the pile, arguing that a heavy water pile was a more efficient route to the production of plutonium than a graphite pile and that plutonium now looked like the best explosive for an atomic bomb. Still unaware of the work being done at Argonne, he insisted that the Montreal team was the best choice to develop such a pile because it was prepared to begin immediately. He warned that if the Americans decided to go ahead without the Montreal project, they might miss the chance to develop the bomb in time for use in the war. Bush and Conant remained unconvinced, and were able to defer any decision on the matter by suggesting that a sub-committee of Groves, Chadwick, and Mackenzie investigate and report back to the next meeting of the Committee.

¹Mackenzie Diary, 16 February 1944. Hewlett and Anderson also note that Bush and Conant were willing "to let the matter drift indefinitely." The New World, p. 282.

Chadwick was annoyed by the delaying tactic but the suggestion carried.¹

Mackenzie took no part in the sub-committee's work, telling Groves and Chadwick that he would adhere to their recommendations. Groves appointed an assistant to draft a paper outlining all the arguments for and against a large scale pile in Canada. Groves edited the draft and gave it to Chadwick for his opinion. Chadwick was unhappy with the draft; it concluded that there would be little military value in a heavy water pile, particularly one in Canada. He redrafted it, leaving most of the original arguments intact but changing the conclusions to recommend that a small experimental pile be built in Canada as a joint Anglo-American-Canadian project. Surprisingly, Groves accepted Chadwick's changes and sent the revised draft to Mackenzie for his approval in early April.²

Mackenzie sent the report to Howe on 10 April, along with his own cost estimates and recommendations. He felt that the total capital cost of the project would be eight million dollars with annual operating costs of one and a half million. Assuming that the costs would be shared by Great Britain and Canada, and that the heavy water and uranium would be supplied by the United States, he expected that the total cost to the Canadian government

¹Mackenzie Diary, 17 February 1944.

²Gowing, Britain and Atomic Energy, pp. 272-73; Eggleston, Canada's Nuclear Story, pp. 98-100.

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in 1944-45 would be four and a half million dollars. This was cheap, Mackenzie argued. He compared the development of atomic energy, the fruits of which Canada could share as a result of the project, to the invention of the steam engine. It was an opportunity which Canada could not "afford to turn down."¹ Howe agreed with Mackenzie's assessment and took his estimates to the next meeting of the Cabinet War Committee. Under the cover of a secret radiological project, the Committee approved an expenditure of up to \$4.75 million dollars.²

The Combined Policy Committee met to discuss the Groves-Chadwick report on 13 April. In its final form, the report recognized that the current project to produce plutonium from the graphite piles was sufficient but that the advantages of a heavy water pile were so great that they could not be ignored. A full-scale plant was not necessary but a small experimental pile was. Groves presented the report and gave it strong backing. Howe also endorsed it and informed the Committee that Canada was prepared to assume the costs of the project. The recommendations were accepted unanimously and it was decided to proceed immediately. Steps were to be taken to strengthen the existing team in Montreal with more scientists from Canada, Great Britain and the United States.

¹Mackenzie to Howe, 10 April 1944, Howe Papers, v. 14, folder 32.

²Stacey, Arms, Men and Governments, p. 527

Mackenzie, Chadwick and Groves were asked to supervise the project on behalf of the Committee.¹

Many of the British and Canadians involved in the Montreal laboratory were disappointed when they heard of the decision. They had hoped for a full-scale project.² The surprising fact, however, is that even the pilot plant was approved. All members of the Combined Policy Committee recognized that the project had no wartime value. The post-war value was seen, but the Americans already had a similar project at Argonne and would not receive much benefit from the project in Canada. On the other hand, the project was of great importance to the Canadians and the British, and their post-war accomplishments in atomic energy would not have been as considerable without the decision to proceed. Moreover, the Americans approved the plan knowing that the Canadians were concerned only with the commercial and industrial applications of atomic energy. That Groves was able to ensure American support, in the face of opposition from both Bush and Conant, is even more astounding considering that he later boasted that he had done everything he could to minimize cooperation with the British.³ His motives are not clear. Perhaps, as a result of his growing friendship with Chadwick, he was

¹ Mackenzie Diary, 13 April 1944.

² Gowing, Britain and Atomic Energy, p. 275.

³ Bernstein, "The Uneasy Alliance", p. 221.

developing the sense of fair play the British hoped for and wanted to recognize the early British contribution to atomic energy and the role that British scientists were now playing in the American projects. Refusal to cooperate with the Montreal team would have resulted in the project's closure and the resulting British and Canadian hostility might have endangered other projects. It is also likely that Groves wanted to reward the Canadians for their cooperation during the eight months preceeding the Quebec Agreement and to live up to informal assurances that Canada's raw material needs would be filled. Backing the project ensured that the Canadian government would not interfere with shipments from Trail and Port Hope.

The British and Canadians were quick to start preparations for the pilot pile. Cockcroft arrived in late April to assume the post of director. New scientists were recruited, including a small team from New Zealand and Lew Kowarski and the other members of the Halban team who had decided to stay in Britain in 1942. Groves set up a liason office in Montreal and outlined the rules governing information exchange for the project. The Americans would exchange data on everything but the chemistry of plutonium and its separation from fission products.¹ After a great deal of persuasion from Chadwick, Groves agreed to give irradiated uranium slugs to the Montreal laboratory so that the team could work out these

¹Mackenzie Diary, 22 May 1944.

problems for themselves.¹

Work on the design of the pile began immediately. By July, designs for NRX (for National Research Xperimental) as it was now called, were completed. When completed the pile would produce at least five thousand kiloWatts and possible even ten thousand kiloWatts of power. The scientists also decided to build a much smaller, low energy pile (called ZEEP for Zero Energy Experimental Pile) to obtain the data necessary for the construction of NRX.²

While the piles were being designed, the site for NRX was chosen. Because of considerations of both secrecy and safety, the plant had to be constructed away from urban centres. It was also necessary to be near a large river or lake to dump the effluent from the plant and to provide cold, pure water for the coolant system. In April, a tentative site at Nobel, near Georgian Bay, had been selected and Groves approved it after a visit on 5 May.³ However, the site proved unsuitable and in July a new site was chosen near Chalk River, one hundred thirty miles north-west of Ottawa. A township site at nearby Indian Point, renamed Deep River, was chosen to house the team members. Howe approved the estimates for the sites on 19 August 1944 and construction began almost

¹Mackenzie Diary, 26 May 1944.

²Gowing, Britain and Atomic Energy, pp. 278-81.

³Mackenzie Diary, 5 May 1944.

immediately.¹

Cockcroft and Mackenzie also had to choose an engineering firm to construct the plant. The obvious choice was Defence Industries Limited, a Crown Corporation that had been established at the beginning of the war to construct and operate munitions plants. However, there were some problems with the corporation. Many of its personnel had been drawn from Canadian Industries Limited, a subsidiary of DuPont and Imperial Chemical Industries. The Americans, still suspicious, were worried that information about the design of the plant would leak back to Imperial. Groves approached Mackenzie on 6 May and asked that the Canadians adopt the same type of security system as the Americans used whereby no one knew more than was absolutely essential for his own job. In addition, he asked that the directors connected with Imperial Chemical Industries be excluded from any discussions regarding the project. On the other hand, he requested that the directors associated with DuPont be allowed to participate on the grounds that DuPont was doing similar work in the United States.² At first, Defence Industries Limited was reluctant to take on the job. The directors were wary of the degree of secrecy required and also of the possibility of a major accident which might kill hundreds and affect

¹Mackenzie Diary, 19 August 1944.

²Ibid., 6 May 1944.

future public relations. However, by late May, they agreed to undertake the job and signed the contract with the Department of Munitions and Supply on 7 July.¹

Although the pace of work was hectic after the April decision, progress on the Anglo-Canadian project was slow. Groves complained to Chadwick in late July that the Americans were disappointed. Chadwick tried to reassure him, explaining the difficulties of recruiting new staff, selecting the site, and so on. London was also worried; the British wanted to impress the Americans with their skill and expertise. Moreover, their post-war atomic energy programme depended on the success of this project.² Despite efforts to speed up the work, ZEEP did not go critical until 5 September 1945, construction of the Chalk River plant was not finished until October 1945, and NRX did not go critical until 22 July 1947.³

The slow progress was not the only problem to trouble the team. Five of its scientists were French and they formed a tight knit group with strong loyalties to the Free French organization. They became members of the French Scientific Mission in London when it was formed

¹Eggleston, Canada's Nuclear Story, pp. 123-24, 133.

²Chadwick to Mackenzie, 11 August 1944, NRC v. 283; Gowing, Britain and Atomic Energy, p. 281.

³Gowing, p. 281. Stacey comments that, "Few Canadians were likely to regret that it was too late to contribute to the bombs that went down on Hiroshima and Nagasaki." Arms, Men and Governments, p. 528. He forgets the Canadian uranium which went into the bombs!

in 1944 and considered themselves to be French civil servants even though four of them were paid by the British. Three were hired on a month to month basis and were anxious to return to France after its liberation. Halban and Kowarski were under longer term contracts, but wanted to settle patent rights with their colleagues who had remained in France and with the new French government. In 1942, the British government had agreed to give the French the rights to the patents from Halban's and Kowarski's experiments after they fled France if they in turn convinced the French authorities to give the British the rights to their earlier work in France. Under the terms of the Quebec Agreement, however, Britain was not allowed to release information without the consent of the United States. Yet, the British had not informed the Americans of their obligations at the time the Agreement was signed. In the fall of 1944, Halban was in England where he requested permission to visit Dr. Joliot in Paris. Despite certain American disapproval, Anderson allowed Halban to go in hopes that he could achieve his end of the bargain. When the Americans found out, they were furious. They felt that Halban would reveal secret information to Joliot, a member of the French Communist Party, thereby risking a leak to the French and possibly even the Soviet governments. Once the French government found out what the Americans were doing on atomic energy they might demand full partnership. This was unacceptable.

The Americans wanted to have the utmost control over post-war developments and the more nations that knew how to build the bomb, the less able the Americans would be to dominate.¹ Moreover, as their conditions to the British in the Quebec Agreement indicate, they were eager to protect their commercial advantages in atomic energy.

The Americans launched a strong protest with the British about the visit and the intention to give the French the patent rights. In addition, Groves complained to Mackenzie and sent a strongly worded note to Howe. Howe in turn blasted Malcolm MacDonald for putting the Canadians in an embarrassing position that could possibly lead to the Americans losing confidence in the Chalk River project. The British in North America agreed with Howe. Chadwick was particularly upset and was concerned that the incident would lead to the collapse of the partnership.²

London soon relented under pressure from Stimson, Chadwick, and others in North America. Anderson agreed to tell the French that they would consider any French claims to patent rights after the war. No information would be released in the meantime. As for Halban, Howe decided after consultation with the other members of the Combined

¹Gowing, Britain and Atomic Energy, pp. 289-90; Hewlett and Anderson, The New World, p. 333.

²Mackenzie Diary, 6 and 22 December 1944; Gowing, p. 295.

Policy Committee that he could not be allowed to return to Montreal. He stayed in London and, for security reasons, remained an employee of the Department of Scientific and Industrial Research. The other French scientists were placed under longer term contracts and told that visits to France would be restricted during the war.¹

By 1944, the Americans and British were becoming increasingly concerned with the post-war period and realized the provisions in the Quebec Agreement for the allocation of uranium, while adequate for wartime, would not suffice afterwards. It would be fruitless to make this massive effort to build an atomic bomb only to be thwarted after the war, when their own stocks of uranium would be nearly depleted, by nations who gained control of uranium deposits elsewhere. Some steps to gain control over world uranium deposits had already been taken independently. By early 1944, however, both countries decided that it would be better to coordinate their efforts. Negotiations to this end took place through the spring and, on 13 June 1944, Churchill signed an agreement entitled the "Declaration of Trust". They had considered including Canada in the agreement, but since the Declaration was to be governed by the Quebec Agreement, they decided with Canadian concurrence, against it.²

¹Gowing, Britain and Atomic Energy, pp. 294-95; Hewlett and Anderson, The New World, pp. 335-36.

²Mackenzie Diary, 20 May 1944.

The Declaration dealt with supplies of thorium ore as well as uranium. In 1944, it was felt that thorium, which produced the fissile isotope uranium 233 after irradiation, might become an important source of fuel, although no research had been done on it so far. It was agreed to establish a Combined Development Trust composed, as in the Quebec Agreement, of one Canadian,¹ two British and three American representatives to be appointed by the Combined Policy Committee. The Trust was to gain control of uranium and thorium outside the jurisdiction of the two governments and the governments of the Dominions and India. To this end, the Trust was empowered to survey and explore for deposits, acquire and develop mines, provide equipment for the mines, improve mining techniques, and provide storage facilities for the ore. The uranium and thorium obtained was to be held in trust for the two governments jointly and was to be allocated by the Combined Policy Committee. The Trust was to be financed equally by the United States and the United Kingdom. Finally, the Trust was to continue after the war, if the two governments so decided, even if the Combined Policy Committee was disbanded.²

The Combined Development Trust proved to be one of the most successful projects in the atomic energy

¹Howe appointed George Bateman, a mining engineer, to the Trust on 3 June 1944.

²The Declaration is reprinted in Gowing, Britain and Atomic Energy, appendix 7.

partnership. By November 1944, it succeeded in reaching an agreement with Union Minière for the entire output of uranium ore in the Belgian Congo for ten years with the right of first refusal thereafter. In addition, a world survey was completed and control was gained over uranium deposits in several countries, including Portugal, Sweden, South Africa, and Australia. Some effort was made to control thorium deposits, but the ore was so plentiful that neither the Americans nor the British were overly concerned. Although Canada was not involved in these activities, prospecting in the northern areas was increased and the Trust kept fully informed of all discoveries.¹

As the decisions about allowing access to atomic energy information and uranium indicate, by the summer of 1944, Roosevelt was determined to keep the American programme a secret from most of the allies. He recognized that Great Britain would develop an atomic bomb as soon as possible, but was confident that, as a result of wartime cooperation, this posed no threat to American interests. He also suspected that the Soviets were experimenting with atomic energy but, while he did perceive this as a threat, he felt that the Americans were so far ahead of them that there would be no problem. He also felt that the Americans

¹Gowing, Britain and Atomic Energy, pp. 308-19; Hewlett and Anderson, The New World, pp. 385-88.

should not entertain any ideas about sharing the fruits of their work with the Soviets. Churchill, always the virulent anti-Communist, agreed with him. Suggestions, by the eminent physicist Neils Bohr, for example, that the Americans and British should share their information with the Soviets, since they were bound to develop an atomic bomb in any case and would resent being excluded from the atomic partnership, were dismissed.

Roosevelt and Churchill decided to incorporate these ideas in a joint declaration, entitled "Aide-Memoire of a Conversation between the President and the Prime Minister at Hyde Park, 19 September 1944." The first part of the aide-memoire stated:

The suggestion that the world should be informed regarding tube alloys, with a view to an international agreement regarding its control and use, is not accepted. The matter should continue to be regarded as of the utmost secrecy.

In addition, they agreed that after "mature consideration" the bomb might be used against the Japanese. Roosevelt and Churchill also decided that full collaboration should continue after the war for both military and commercial purposes. Finally, they decided that Bohr's activities should be investigated to ensure that he did not leak information to the Soviet Union.¹

By late 1944, the Americans were confident that the

¹The aide-memoire is reprinted in Gowing, Britain and Atomic Energy, appendix 8.

atomic bomb would be ready in time to use against the Japanese. Prime Minister King first heard that the bomb might be used in a conversation he had with Malcolm MacDonald on 24 February 1945. King was quite disturbed, later recording in his diary that the development of the bomb "could mean the destruction of civilization."¹ MacDonald's news was confirmed two weeks later when King visited Roosevelt in Washington. Roosevelt informed him that the bomb would be ready by early August, in time to use it against the Japanese, and that Japan would collapse shortly afterwards.²

Roosevelt died on 12 April, but his successor, Harry S. Truman, maintained his policies on the bomb. The Soviet Union was still to be excluded from the programme and plans for using the bomb against Japan were kept. Mackenzie and Howe heard of the tentative decision on 20 June during a meeting with Cockcroft and Chadwick. Chadwick, fearing that the end of the war might conclude collaboration with the Americans, urged Mackenzie to put as much pressure on the Chalk River project as possible to speed up the progress of work before the bomb was dropped.³ The Americans made their formal announcement to use the

¹King Diary, 24 February 1945.

²Ibid., 9 March 1945. Wily as ever, Roosevelt also told King that he felt that the Soviets should be informed of American work on the bomb, but that Churchill had opposed the idea.

³Mackenzie Diary, 20 June 1945.

the bomb on 4 July to the Combined Policy Committee. The next day, Howe returned to Ottawa and informed Mackenzie, suggesting that press releases explaining the Canadian part in the endeavor be prepared immediately for release on the day the first bomb was dropped.¹ The releases were approved by King on 31 July.²

Waiting for the atomic bomb to be used, King was preoccupied by its implications. On 29 July, he confided to his diary:

I feel that we are approaching a moment of terror to mankind, for it means that...men have at last not only found but created the Frankenstein which conceivably could destroy the human race.³

A week later, he wrote about the bomb again, concluding that "It makes one very sad at heart to think of the loss of life that it will occasion among innocent people as well as those that are guilty."⁴

The first bomb was dropped over Hiroshima two days later. The news was conveyed to Howe by MacDonald. King was presiding over a Dominion-Provincial meeting and Howe sent a message to him. King waited until it was time to adjourn the session and then read the prepared statements.⁵

¹Eayrs, In Defence of Canada, III, pp. 274-75.

²King Diary, 31 July 1945.

³Ibid., 29 July 1945.

⁴Ibid., 4 August 1945.

⁵Ibid., 6 August 1945. Later that day King mused some more on the significance of the atomic bomb and remarked that it was "fortunate that the use of the bomb should have been upon the Japanese rather than upon the white races of Europe."

The second bomb was dropped on Nagasaki on 10 August, and the Americans accepted the Japanese unconditional surrender four days later. Their defeat marked the start of a new era in atomic energy and in international relations.

CHAPTER IV

THE IMMEDIATE POST-WAR PERIOD

Throughout the war, the only members of the Canadian government who knew the details of the atomic energy programmes were Howe and King, and the only officials who dealt with atomic energy were Mackenzie and a few others in the National Research Council and the Department of Munitions and Supply. Neither the Department of External Affairs nor the Department of National Defence were informed of the developments, although at least two members of the military establishment knew vaguely that work was being done on an atomic bomb.¹ Consequently, once the war ended, there was a mad scramble, especially by the Department of External Affairs, to formulate post-war policy on the development and control of atomic energy. The planners were faced with three inter-related issues: the domestic development of atomic energy; the future of the Anglo-

¹Both General A.G.L. McNaughton, who had been President of the National Research Council before the war, and General Maurice Pope, who was the Chairman of the Canadian Joint Staff Committee in Washington during much of the war, knew of the work, but neither had any input on policy. John Swettenham, McNaughton, III: 1944-1966, (Toronto: Ryerson Press, 1969) p. 91; Maurice A. Pope, Soldiers and Politicians: The Memoirs of Lt.-Gen. Maurice A. Pope, (Toronto: University of Toronto Press, 1962), p. 276.

American-Canadian partnership; and international control of both the industrial and military applications of nuclear power. By the end of 1946, the questions arising from all three areas were resolved.

Despite their initial ignorance of the subject, with the help of Mackenzie the planners soon gained a strong grasp of the potentials and dangers of atomic energy. As early as 5 September 1946, well thought-out position papers and memoranda began to appear, bearing witness to the high calibre of the officials of the Department of External Affairs at the time. By October, as Eayrs has commented, the Department of External Affairs had arrived at a series of proposals which, "for technical sophistication no less than imaginative sweep and grasp bear comparison with those of any government."¹

It appears that there was never any serious consideration of developing atomic weapons in Canada,² for several reasons. First, Canada had a non-military tradition. There had never been peace-time conscription and the conscription programmes in both world wars had provoked severe crises. The peace-time military establishment had always been small and its maintenance generally considered to be a low priority in government spending. Moreover, as we have seen, Prime Minister King was horrified by the destructiveness of the atomic bomb and

¹Eayrs, In Defence of Canada, III, p. 277.

²See Holmes, The Shaping of Peace, I, p. 219.

this revulsion was also reflected in the position papers of the members of the Department of External Affairs. Secondly, the cost of developing a weapons programme was prohibitively expensive. Although the Canadian scientists were starting to learn about the chemistry of plutonium and its separation from fission by-products, they had little or no knowledge of the separation of Uranium 235 or of weapons development. The Canadian officials needed only to look at the expense of the American programme to be deterred. In addition, it would also be necessary to develop a delivery system, and it was already evident that new systems based on the principles of the German V1 and V2 rockets would soon be developed. Despite Howe's statement in the House of Commons that "having the explosive material which we make in Canada, our ordnance people could make a bomb of their own.... I do not think it is particularly difficult to make a bomb"¹, the task was obviously beyond the means of a middle power like Canada which faced many economic problems because of the dislocation of its trading patterns during the war. As a group of officials noted in April 1947,

The exclusion of research on military applications irrespective of any fundamental principle in national policy, follows the practical consideration that it is beyond the industrial resources of the country to undertake the manufacture of atomic weapons in significant quantity, and it is beyond the capacity of our equipment to produce fissionable materials in

¹House of Commons, Debates, 14 June 1946, p. 2490.

sufficient quantities for research on military weapons and their applications,¹

The exorbitant cost of developing weapons can be seen in the fact that Britain did not test its first nuclear weapon until 1952. Britain devoted a great deal of time and money to its programme and its scientists knew much more than the Canadians as a result of the transfer of the British teams to the American projects in late 1943.² Thirdly, the only potential military threat to Canada seemed to come from the Soviet Union and Canada could rely on the American nuclear capacity, both as a deterrent and as a defence against an attack over the North Pole.³

Although it is apparent that the government had disavowed atomic weapons from the start, the policy was not announced to the public until June 1946. Howe, when asked in the House of Commons why there were no military representatives on the newly formed Atomic Energy Control Board, replied:

¹"Views of the Canadian delegation to the Atomic Energy Commission on International Control of Research on Atomic Energy," Department of External Affairs (hereafter DEA) files, 201-B(S) 6.

²Alfred Goldberg, "The Atomic Origins of the British Nuclear Deterrent" International Affairs, 40 (July 1964), p. 409.

³Jon B. McLin, Canada's Changing Defence Policy, 1957-1963: The Problems of a Middle Power in Alliance, (Baltimore: Johns Hopkins Press, 1967), pp. 124-25; Despite devoting volume III of In Defence of Canada to Canadian defence policy immediately after the Second World War, Eayrs does not deal with the decision not to build an atomic bomb in Canada.

...it is not the intention, as far as Canada is concerned, to develop atomic energy for the manufacture of weapons. Therefore, I doubt whether a member of the defence forces would logically be a member of the Board.

Howe reiterated this position again later in the month.¹

Just as there was a quiet consensus that the development of an atomic bomb was not desirable, a consensus soon developed among the diplomats and the government about Canada's role in international discussions on atomic energy. Ideally, the best way to deal with the dangers of atomic energy was to reach an international agreement to control development with adequate safeguards to ensure that weapons could not be built by individual nations for use against each other. Until such time as an agreement of this nature was reached, Canada should continue to cooperate with the United States and Great Britain. That the Americans and the British would continue to cooperate in atomic matters was not questioned. There was no evidence to suggest that they were planning otherwise. Moreover, the Canadians felt that continued cooperation between all three nations was essential if Canada was to avoid total dependence on the United States.

These basic premises were expressed as early as 8 September in a memorandum by Charles Ritchie of the First Political Division of the Department of External Affairs. Ritchie explained that if Canada had been a great

¹House of Commons, Debates, 3 June 1946, p. 2122; 16 June 1946, pp. 2490, 92.

power, its vast deposits of uranium might enable Canadian diplomats to determine the outcome of negotiations on atomic energy. However, since this was not the case, the deposits could even prove to be an embarrassment if the American government demanded unrestricted access to the uranium in the face of international opposition. Ritchie forecast that there would be close collaboration between the British and the Americans and added that, while an international agreement would be in Canada's best interests,

The [American and British] Governments might jointly decide that it was not safe to disclose the secret of production and that international control was not practicable. The Canadian Government might share this view, but even if the Government of Canada had come to the opposite conclusion and was willing to cooperate now in pooling information and in setting up a system of international control, it would hardly be possible for Canada to take any action in this direction of which the United States and United Kingdom did not approve.

Ritchie also warned that Canada would be in a difficult position if the British and Americans did not proceed jointly along similar lines.¹

Similar ideas were expressed by General Pope, now Military Staff Officer to the Prime Minister and the Military Secretary to the Cabinet War Committee. In a memorandum written to Hume Wrong, the Associate Under-Secretary of State, Pope urged that Canada follow the lead of the United States and the United Kingdom and keep a low

¹Charles Ritchie, "Control of the Atomic Bomb by the United Nations Organization", 8 September 1945, DEA file 50219-W-40(1).

profile in international discussions:

...it is but the policy of wisdom to pass on the first round and to content ourselves with a supporting bid when we next have an opportunity to speak.¹

The British had similar hopes as the Canadians for continued cooperation with the Americans in atomic energy after the war. However, the new Labour government distrusted the Americans, fearing that the United States might decide to pursue an independent course and try to retain its monopoly on the atomic bomb. In addition, the British hoped to launch its own nuclear programme in the United Kingdom, but were worried that the article in the Quebec Agreement limiting British commercial development of atomic energy might be enforced. They hoped to negotiate a new arrangement to resolve this problem as well as to ensure the continuation of information interchange. As a result, on 8 August and 25 September, Prime Minister C.R. Attlee wrote to President Truman urging that they meet to decide on future policy.²

Truman's replies on both occasions were evasive. The Americans were still trying to decide what course they should take and there was a great deal of debate, both at the Executive and Congressional levels of the government and by the public. In the Senate, a Special Committee chaired by Brian McMahon was discussing a bill, sponsored

¹Pope to Wrong, 21 September 1945, DEA file 201(S).

²Goldberg, "Atomic Origins", pp. 410-11; Hewlett and Anderson, The New World, p. 457.

by the War Department but opposed by President Truman, for the domestic control of atomic energy. Within the Cabinet, there was a great deal of disagreement over international control. Secretary of State James Byrnes saw American possession of the atomic bomb as a chance for the Americans to force their views on other nations, particularly the Soviet Union. Robert Patterson, who had replaced Stimson as Secretary of War on 21 September 1946, felt that a more conciliatory approach was necessary.¹

Few Americans were aware of the role played by the British and Canadians during the war and the Executive was in no hurry to inform them. James Newman, special counsel to the McMahon Committee, later recalled that the Committee members learned by accident of an agreement in Quebec City between the United States and Great Britain. However, repeated efforts to learn of its contents were unsuccessful. As a result, he claims, there developed a "myth" that the Americans were the sole creators of the atomic bomb.² Moreover, the Hyde Park Agreement was only an executive agreement, and since it had not been ratified by Congress, was not binding on Truman. Unfortunately, it had been misfiled by a clerk who assumed that "Tube Alloys" had something to do with naval supplies. Few of Roosevelt's

¹Hewlett and Anderson, The New World, pp. 461-64.

²James R. Newman, "The Rift in the Anglo-American Nuclear Partnership" in Herbert F. York, comp., Arms Control: Readings from Scientific American, (San Francisco: W.H. Freeman, 1973), p. 15.

advisors had been aware of the agreement and, consequently, the Truman administration did not learn of it until the British sent the Americans a copy.¹ Since the Agreement was not binding, Truman saw no reason to publicize it. The resulting ignorance of the British role in the development of the atomic bomb and of Roosevelt's commitments for a post-war atomic alliance with the British led to the overwhelming sentiment in the United States that the Americans should not share any secrets concerning atomic energy with any nation, nor surrender any control over it to an international body.²

Nevertheless, an approach to the British and to the rest of the world was necessary. On 3 October, Truman announced that after consultations with the United Kingdom and Canada, the United States would discuss renouncing the development and use of atomic weapons for military purposes with other nations. No date for the talks was set. A week later, Truman told reporters that he would not take part in the talks with the British and Canadians. However, as a result of increased pressure from Attlee and the British Ambassador in Washington, Lord Halifax, Truman decided that he could ignore British pleas for a conference no longer. On 30 October, he invited Prime Ministers Attlee

¹ Barton J. Bernstein, "The Quest for Security: American Foreign Policy and International Control of Atomic Energy, 1942-1946", Journal of American History, 60 (March 1974), p. 1022.

² Ibid., p. 1020.

and King to come to Washington in the middle of November to discuss atomic energy.¹

In preparation for the conference, King had Lester Pearson, Canada's Ambassador to Washington, prepare a memorandum outlining the issues. Pearson's memorandum, which was dated 8 November, began by outlining the assumptions upon which Canadian policy should be based. First, the atomic bomb could not be considered merely as the latest development in weaponry. It had to be seen as a revolutionary departure in destructive capacity. Secondly, the use of the bomb against Japan was only the beginning of the use of atomic energy for destructive purposes and increasingly destructive weapons would be developed. Thirdly, the United States could not keep the information about building an atomic bomb a secret and the Soviet Union would develop its own bomb within five years. Fourthly, any industrialized nation which knew the secret could build a bomb. Finally, delivery systems based on the principle of jet propulsion would soon be developed. Pearson warned that Canadians might develop a false sense of security as a result of sole American possession, or joint trilateral control, over atomic energy. He argued that even if the monopoly lasted for several years, Anglo-Saxon public opinion would never sanction the use of the bomb against another nation

¹Truman sent the invitation to Atlee. King found out about the conference from a news broadcast aboard the ship he was taking to Europe. Eayrs, In Defence of Canada, III, p. 279. Hewlett and Anderson, The New World, pp. 458-59.

as a pre-emptive measure. He also stressed the importance of reaching an international agreement in order to prevent an arms race which, like all previous races, would doubtlessly end in war. Given the capacity of nuclear weapons, such a war would be "international suicide". In order for such an agreement to be reached, several principles should be advocated as the basis of negotiations: the destruction of or transfer to the United Nations of existing weapons; the pooling of all basic scientific information so that the secret development of atomic energy would be more difficult; the establishment of a system of inspection under a United Nations agency; and the stipulation that such an agency would be responsible to the General Assembly. In reference to a statement by Truman that responsible people would regard the American possession of the atomic bomb as a sacred trust that would not be violated because of the peace-loving nature of American society, Pearson warned that such people would probably not include the Soviet leaders: "This 'sacred trust' approach to the problem, as a substitute for international agreement, is, in fact, negative and unsatisfactory. There can be no lasting world security on that basis." In his conclusion, Pearson idealistically asserted that while the atomic bomb was one of the greatest threats to mankind, it might prove to be the factor which produced real peace:

Weapons so horrible in effect, possessed by many nations and under national control only, might, of course produce peace; in the sense that life

might be made impossible on this planet. There is another and better kind of peace, however, which the grim prospect of a warfare might help to produce; that which comes from sanity and cooperation in international relations, influenced by the prospect of what will happen if the peace is disturbed.

Moreover, a successful international agreement would make the United Nations an effective organization for the achievement of world peace. Consequently, "If there was ever an occasion for seeking a solution to any international problem on the broadest international basis -- this is it."¹

Armed with this memorandum, King arrived in Washington on 10 November.² With him was a strong corps of advisors, including Pearson, Wrong, Norman Robertson, the Under-Secretary of State for External Affairs, C.J. Mackenzie, and C.D. Howe. Meetings started the next day aboard the launch of the Secretary of the Navy. Attlee, King and Truman met alone in the morning to discuss general principles and were joined by their advisors after lunch. There was general agreement on the need to find an international approach to atomic energy and it was agreed that a combined statement should be prepared. For the next two days, three draft statements were prepared, one by each country. The Canadian draft was based on Pearson's memorandum and on discussions the Canadians held with Dean Acheson, the

¹Pearson, "Memorandum on Atomic Energy", 8 November 1945, DEA file 50219-W-40.

²Unfortunately, King's diary for the period 10 November to 31 December have been lost, stolen, or misplaced. As a result, there is no record of his impressions of the talks.

American Assistant Secretary of State. However, King decided not to table it on the grounds that it was similar to both the British and American drafts and would only confuse the attempt to develop a single statement. Instead, it was used as the basis for a Canadian revision of the American draft. On 14 November, Attlee, King and Truman met again to discuss the British and American drafts.

Basing his comments on the American version, King suggested several changes to make the draft more positive in tone and to remove the impression that the three nations had few ideas about international control and were relegating the problem to the United Nations. In addition, King successfully argued that a proposal to prohibit atomic warfare was ineffective and should be dropped.¹ The three leaders then asked Vannevar Bush, Sir John Anderson and Pearson to form a drafting committee to incorporate the ideas and changes into a single draft. They completed their task late that night and, in the early hours of the morning, their draft was approved by the President and the two Prime Ministers.²

In its final form, the "Agreed Declaration on Atomic

¹Copies of the draft statements can be found in the King Papers, v. 234, file 2285, c158013-42.

²Pearson to King, 21 November 1945, DEA, Canadian Embassy in Washington (hereafter CEW) file AE 1945, Pt. 1, v. 2458. See also Lester B. Pearson, Mike: The Memoirs of the Right Honourable Lester B. Pearson, 1897-1948, (Toronto: University of Toronto Press, 1972), pp. 262-67; Hewlett and Anderson, The New World, pp. 159-69.

Energy" called for the establishment of a United Nations commission which would promote the development of atomic energy for commercial and industrial uses and prevent its use for destructive purposes. Specifically, the commission should develop a programme of four stages, the objective of each to be reached before the next began. The stages were: the exchange of basic scientific, or theoretical, information on peaceful applications; the control of atomic energy to ensure its use for peaceful purposes only; the elimination of national stockpiles of nuclear weapons and other means of mass destruction; and the development of safeguards and a system of inspection to ensure that no nation could develop atomic energy for military purposes.¹

The Declaration was signed by Truman, Attlee and King the next day at the White House and its contents were revealed to the press and to Congressional leaders immediately afterwards.²

During the discussions, the British had approached the Americans about the need to replace the Quebec Agreement with a new arrangement suitable for the post-war period. The Americans agreed, but insisted that there was no time to negotiate a new agreement during the conference and that,

¹A copy of the Declaration can be found in the King Papers, v. 234, file 2285, c158022-23.

²King made his first public statement about the Declaration and other aspects of atomic energy since the bomb was dropped on Hiroshima in the House of Commons a month later. House of Commons, Debates, 17 December 1945, pp. 3632-38.

in any case, the Combined Policy Committee was the best forum for deciding on the details of collaboration. In the meantime, all that was needed was a directive from the President and the Prime Ministers authorizing such talks. Consequently, on 16 November, Truman, Attlee and King signed a second declaration calling for full and effective cooperation in atomic energy between the three countries and the continuation of the Combined Policy Committee and the Combined Development Trust in suitable form and requesting the Committee to make arrangements to this end.¹ This declaration was not released since it was later decided that it might be interpreted by the Soviet Union and other nations as proof of American and British insincerity in trying to arrive at an international agreement.²

At the same time, a drafting committee, composed of General Groves, Anderson, and their advisors, started to prepare a "Memorandum of Intention" to present to the Combined Policy Committee meeting scheduled for 17 November. The memorandum was a set of recommendations to the Committee and suggested four changes to the Quebec Agreement. First, Canada was to be included as a full partner. Secondly, a party to the new agreement need only consult rather than gain consent from the other two before it used an atomic bomb. Thirdly, all raw materials, no matter what source,

¹King Papers, v. 234, file 2284, c157737.

²Robértson to King, 19 November 1945, King Papers, v. 234, folder 2884, c158158.

should be made subject to allocation by the Committee. Finally, there was no mention of commercial or industrial rights. Nothing was suggested to alter the article on information exchange. The Committee approved the memorandum and agreed to consider it more fully at the next meeting.¹

That afternoon, the Canadian delegation returned to Ottawa to ponder the events of the previous week. On the whole, they were satisfied with the Washington Declaration, although Pearson expressed some reservations about the speed with which it had been prepared. He also questioned Truman's wisdom in not consulting with the War or State Departments (except Byrnes) or with the members of Congress.

C.D. Howe was not at all pleased with two aspects of the conference. First, at the Combined Policy Committee meeting, the British had informed him that they were planning to concentrate their post-war atomic energy project in the United Kingdom. An Experimental Establishment had been set up and Cockcroft had been selected to head it. Howe and Mackenzie were both upset and argued with the British, but to no avail.³

Secondly, under the terms of the Groves-Anderson memorandum, Canada was to become a full member of the Combined Development Trust and, consequently, all Canadian

¹Howe to Pearson, 30 November 1945, DEA file 201(S); Hewlett and Anderson, The New World, pp. 467-69.

²Pearson to Robertson, 21 November 1945, DEA CEW file AE1945, pt. 1, v. 2458.

³Eggleston, Canada's Nuclear Story, p. 145.

uranium would be subject to allocation by the Combined Policy Committee. Fearing that Canada would lose control over its uranium deposits and possibly not get enough uranium to meet the needs of its own project in Chalk River, Howe instructed Pearson, who was to represent him at the next meeting of the Committee, to demand revisions to the memorandum. Canada should not be a member of the Trust, and the Trust should not have control over Canadian uranium. Instead, he suggested adding a paragraph in which Canada promised to make every effort to secure all uranium deposits within its boundaries and agreed to use the ore "in the common interest."¹

Howe's instructions to Pearson were repeated in a directive from the Department of External Affairs.² Both Pearson and the Canadian representative on the Trust, George Batemen, were alarmed. Instead of pressing for the changes as directed at the next meeting of the Combined Policy Committee, Pearson asked Ottawa to reconsider its position. In a report to Robertson, Pearson argued that Canada was already a member of the Trust even if it had not been a signatory to the Declaration of Trust. Although Howe was claiming that Bateman was actually a British representative, according to Howe's letter appointing Bateman, he made it clear that Bateman was to represent

¹Howe to Pearson, 30 November 1945, DEA file 201(S).

²Wrong to Pearson, 3 December 1945, DEA file 201(S).

Canada. Moreover, the Americans and the British would be upset and angry if Canada stayed on the Committee but not on the Trust. If Canada insisted on leaving the Trust, it might be a good idea to quit the Committee as well. This would have certain advantages: Canada "may be dragged along in directions where we might not desire to go but over which we would have little control" by staying on. If the government decided to pull out, an assurance from the Americans and the British that Canadian interests would be taken care of would be necessary.¹

Bateman wrote to Howe along the same lines on the same day. He had also interpreted his letter of appointment to mean that he was a Canadian representative, as had the Americans and the British. In any case, Howe had not understood the Groves-Anderson memorandum; Canadian interests would be met. If Canada withdrew from the Trust, the Americans might stop buying uranium from Canada and since the United States was the largest market for Canadian uranium, this would prove disastrous. On the other hand, if Canada stayed on the Trust, there was a guaranteed market for any surplus Canadian ore, even if it was not needed by the Committee.²

A guaranteed market for Canadian uranium was music to Howe's ears. In two letters sent to Bateman a week

¹Pearson to Robertson, 4 December 1945, DEA file 201(S).

²Bateman to Howe, 4 December 1945, DEA file 201(S).

later, Howe instructed him to ensure that the Trust would buy all the unallocated uranium and that Canada would not have to finance the Trust's operations. If the Trust would not agree to these demands, then Canada would withdraw. As for Bateman's remarks about his letter of appointment, Howe was evidently embarrassed:

My file indicates that you were named by the British as a desirable member on their side of the Trust and it was my understanding that they desired your membership on account of your wide knowledge of metallurgy in many countries. It was known that you would represent Canada and report to me but it is also a fact that Canada did not ask to be represented on the Trust.¹

Despite Howe's instructions to Bateman, the Department of External Affairs continued to discuss Canadian membership on the Trust. Wrong notified Pearson that Canada should stay on, so long as the British and Americans recognized that Canada's position on it was different in that it was the sole producer of uranium. Canada would therefore not share equally in the Trust's purchasing operations.²

With this decision, Pearson was able to continue his work with the other members of the Committee on the new agreement. At a meeting on 4 December, it had been decided to deal with the clause in the Quebec Agreement restricting British commercial development of atomic energy by asking Truman to write to Attlee acknowledging that

¹Howe to Bateman, 11 December 1945, DEA file 201(S).

²Wrong, "Memorandum for File", 14 December 1945, DEA file 201(S).

restrictions would not be in the interests of the economic welfare of the world. In addition, a sub-committee of Pearson, Groves and Roger Makins,¹ the Minister of the British Embassy in Washington, was asked to draft an agreement based on the Groves-Anderson memorandum. The sub-committee first met on 14 December. Pearson was a little distressed by Groves, reporting to Ottawa that he appeared "more concerned with the national than the international aspects of this matter and with the military than industrial uses of atomic energy." Pearson outlined Howe's objections to the existing draft. Groves replied that as a member of the Committee, Canada had to be a full member of the Trust. The Americans "would regret" a Canadian withdrawal. Makins agreed. However, both Groves and Makins conceded that Canada would not have to assume any financial burdens due to its membership.²

The sub-committee met two weeks later and two draft agreements, one governing the Committee and the other the Trust, were completed. Both Pearson and Bateman felt that Canadian interests were sufficiently protected in each. However, the Canadian government was not yet convinced and Pearson was called to Ottawa the next day to discuss the the issues.³ Even after consultations with Pearson, however,

¹Later Lord Sherfield.

²Pearson to Robertson, 14 December 1945, DEA file 201(S).

³For the draft agreements see Pearson to Wrong, 29 December 1945, DEA file 201(S); Wrong, "Note for File", 29 December 1945, DEA file 201(S).

it took another month before a decision was made.

Prime Minister King felt that Canada was committed to the Combined Policy Committee as a result of the 16 November declaration. It would be difficult to withdraw from it at the time. He accepted Pearson's arguments that Canada could not stay in the Committee and not the Trust. As a result, despite reservations about losing control over Canadian uranium, he told Pearson to support the draft agreements when they were presented to the Committee at its next meeting. The Cabinet approved his decision on 30 January 1945.¹

Despite the decision of the Canadian government, the chances of reaching an agreement with the Americans and the British were becoming slim. One problem involved the Anglo-Canadian project at Chalk River. C.D. Howe, who had never been terribly sympathetic towards the British, became absolutely anglophobic in 1946. Aware that the British were continuing to make plans to return Cockcroft to the United Kingdom and frustrated by the slow progress at Chalk River, Howe prepared a stiff statement for Pearson to read to the British officials at the 15 February meeting of the Combined Policy Committee. He had no objections to the British plan to concentrate their post-war project in the United Kingdom. However,

¹Heeney to King, 23 January 1946, King Papers, v. 234, folder 2886; Heeney to Pearson, 31 January, 1946, Canada, Department of External Affairs, Documents on Canadian External Relations, XII: 1946, (Ottawa: Supply and Services Canada, 1977), (hereafter DCER), no. 263.

...since the programme involves withdrawal from Canada of scientists presently directing the Chalk River project, Canada considers that the partnership arrangement as between the United Kingdom and Canada previously recorded in the Minutes of the Combined Policy Committee will be ended with the withdrawal of these men.

He added that teams of British scientists would be welcome to visit the Canadian project, subject to the decision of the new director, and he hoped that the British would accord similar opportunities to Canadian teams.¹

Pearson met with Chadwick and Makins before the meeting and read the statement to them. They were confused by it; neither remembered such a reference to a partnership in the Minutes of the Committee, nor could they find any. Since Pearson had no knowledge of any arrangements, he asked Howe for clarification. Chadwick also denied that the British had taken any steps which might hinder the project, explaining that they had already informed Howe of plans for a gradual withdrawal of British personnel.²

To settle the dispute, Howe and Mackenzie met with Chadwick and Cockcroft in Ottawa on 23 March. It was decided that each country would be in complete control of its own project. There would continue to be free interchange of personnel at the discretion of the director of each project. Canada finally agreed to Cockcroft's move, effective probably in June. The new director would be in the employ of the

¹Howe to Pearson, 14 February 1946, DEA file 201(S), Mackenzie Diary, 14 February 1946.

²Pearson to Heeney, 16 February 1946, DEA Washington Embassy Atomic Energy (hereafter WEAE) file 3.

Canadian government and would not be responsible to any other authority. As Howe later reported to Malcolm MacDonald, the four men "reached a complete understanding in the matter."¹

The complete understanding between Howe and the British was not to last for long. By the spring of 1946, the Americans had finally decided against cooperation with the British in atomic energy and Howe began to reconsider collaboration with them as well. Many of the reasons for the American decision were similar to those which precluded complete cooperation during the war: fears about the vulnerability of Great Britain to attack; concern about British security measures; and the knowledge that they could do as well without the British. There were new reasons as well. The Canadian government had released information about the Gouzenko defection and the Soviet spy ring in Canada on 15 February 1946.² In addition, too close a relationship with the British might jeopardize American plans for the international negotiations on the control of atomic energy. Groves felt, and was able to convince Byrnes, that the British wanted an atomic alliance. If discussions at the United Nations failed, the public and Congress would not

¹Howe to Heeney, 23 March 1946, DCER no. 270; Howe to MacDonald, DEA file 201(S) TS(1). Cockcroft did not actually leave until the end of September 1946. He was replaced by Dr. W.B. Lewis. Mackenzie Diary, 14 September 1946.

²For security reasons, very few American officials knew about the case before this time. Hewlett and Anderson note that the revelations were a "psychological shock" to most, reinforcing their fears about Soviet perfidy and about the futility of international cooperation. The New World, p. 501.

approve of such an arrangement no matter how much the administration did.¹

As the Canadians began to realize that their cherished dream of Anglo-American cooperation was not to be, they saw that a choice had to be made: they could support the British position and try to convince the Americans of the advantages of trilateral cooperation or they could abandon the British and follow the American lead. There was little actual choice, however; Canadian interests were too closely tied to the United States. In any case, Canada had little to lose in terms of its atomic energy project if the partnership ended. Unlike the United Kingdom, Canada did not want to develop atomic weapons and did not need American information to the same extent as the British. As Howe told the House of Commons in June:

We have made it a point not to ask the United States for any information we do not need. We never ask for things that are likely to be refused, and I could not think of any good reason at all for asking the United States to tell us how to make the bomb.²

The possibility that the drafting sub-committee would not reach an agreement occurred to the Canadians in March. A.D.P. Heeney, the Secretary to the Cabinet, wrote to Howe suggesting that unless there were any pressing

¹Hewlett and Anderson, The New World, pp. 477-78; Goldberg, "Atomic Origins", pp. 412-13; Lord Sherfield, "On the Diplomatic Trail with L.B.P.: Some Episodes, 1930-1972", International Journal, 29 (winter 1973-74), p. 81.

²House of Commons, Debates, 14 June 1946, p. 2492.

problems relating to Canada's role as a supplier of raw materials, it was not important that the sub-committee conclude its task.¹

The Americans found the means to break off the talks by pointing out that keeping the revised agreements secret, as was deemed necessary to protect the talks at the United Nations, was in violation of Article 102 of the United Nations charter. Article 102 required that every treaty and international agreement be registered with the Secretariat and then be published. The Americans first used this argument at the Committee meeting on 15 February. Someone suggested that, in order to avoid the problem, cooperation be continued under the terms of the Quebec Agreement. However, it was agreed that this would not be a satisfactory solution since the Agreement was only an executive agreement and provided only for collaboration on the development of the atomic bomb.² At the next meeting of the Committee, two months later, the Americans again argued that they could not accept the revised agreements. The British suggested ways to avoid the requirements of the Article, but the Americans rejected them, claiming they were only subterfuges. Lord Halifax demanded that Byrnes give him detailed information on the design and construction of atomic energy plants at the next meeting of the Committee. Byrnes refused. Halifax then demanded to know how the

¹Heeney to Howe, 20 March 1946, DEA file 201(S)TS(1).

²Hewlett and Anderson, The New World, pp. 478-79.

Americans planned to live up to their obligations, as expressed in the 16 November declaration and in the wartime agreements between Churchill and Roosevelt. Byrnes denied any knowledge of the wartime commitments and suggested that the whole issue be referred back to Truman, Attlee and King. Pearson, who clearly sympathized with the American position, stayed out of the argument as much as possible.¹

Attlee sent a protest to Truman the next day, arguing that the American position on the Committee was in conflict with the joint declaration of 16 November. Truman replied on 20 April that the declaration only meant cooperation in the basic scientific stage of research. The design and construction phase was to be governed by ad hoc arrangements as outlined by the Quebec Agreement. Due to the efforts to find an international system of control, cooperation in this phase should remain limited.²

Attlee also sent a telegram to King on 17 April, along with a copy of his message to Truman. He explained that he felt a working agreement on cooperation was necessary until the outcome of the United Nations meetings was known. If the Combined Policy Committee was unable to reach agreement, the three heads of government should intervene.³

¹Hewlett and Anderson, The New World, p. 479; Bateman to Howe, DCER no. 272; Sherwell, "On the Trail with L.B.P.", pp. 79-80; Goldberg, "Atomic Origins", p. 413.

²Hewlett and Anderson, pp. 479-80.

³Attlee to King, 17 April 1946, DCER no. 274.

The Canadians were untouched by Attlee's pleas. King decided that the best position for Canada was to appear to stay out of the dispute. His reply to Attlee was simply that the government had not reached a point of view.¹

However, a week later he found an ingenious way of appearing not to take sides but, at the same time, supporting the American position. The Americans had asked the Canadians to give their interpretation of the paragraph in the 16 November declaration calling for "full and effective cooperation". The Canadian reply was given to the Americans on 29 April:

...Mackenzie King's understanding of the Agreement ...is indicated by the fact that the Canadian authorities, both during the war and in the post-war period, have provided the United States authorities with full information on all Canadian activities in this field. In particular, the United States authorities have had access to full information as to developments at Chalk River. In fact, a United States official is stationed there permanently and is in a position to secure a complete picture of the work going forward in the plant.²

The Americans were very impressed with this formulation. Pearson reported that Acheson "expressed some admiration for the ingenuity with which we handled this matter."³

However, cooperation with the British was to be less complete. When the British asked Howe for the plans for the Chalk River plant, he refused. As he explained to Bateman, "we found that we were bound to secrecy on

¹King to Attlee, 21 April 1946, DEA file 201(S)TS(1).

²Stone to Acheson, 29 April 1946, DCER no. 277.

³Pearson to Heeney, 18 April 1946, DCER no. 275.

the design and that we cannot guarantee our U.S. friends secrecy if the plans are sent to the U.K."¹

With this exchange, tripartite cooperation was virtually finished. Negotiations continued, but the Canadians lost interest and the only field in which the Americans and the British continued to collaborate was raw materials. The passage of the "Bill for the Development and Control of Atomic Energy", commonly known as the McMahon Act, by the American Congress in July 1946 made it impossible to exchange information with the British even if the Administration decided to soften its attitude.²

While decisions about the tripartite partnership were being made, the Canadian government was also developing policies on both the domestic and international control of atomic energy. On 27 March, the Cabinet established an Advisory Panel on Atomic Energy composed of Heeney, General McNaughton, who had just been appointed as the Canadian representative on the United Nations Atomic Energy Commission,³

¹Howe to Bateman, 18 April 1946, DCER no. 275.

²Hewlett and Anderson, The New World, p. 481.

³George Ignatieff later recalled that when King was making his choice for the position, he had inquired what type of representatives other countries were sending. "He was told that some were appointing diplomats, others scientists, and some were sending politicians. Mr. King had commented: 'McNaughton -- all three.'" McNaughton had been President of the National Research Council before the war, Commander of the First Canadian Army, and, for a short while, Minister of National Defence. "General A.G.L. McNaughton: A Soldier in Diplomacy", International Journal, 22(summer 1967), p. 404.

C.J. Mackenzie, George Bateman, Omond Solandt, the Director-General of Research of the Department of National Defence, and several members of the Department of External Affairs, including Robertson, Pearson, Wrong, and George Ignatieff, McNaughton's advisor. On the domestic level, the Panel was responsible for preparing legislation transferring control of the Canadian atomic energy project from the National Research Council to the new Atomic Energy Control Board.¹ At the international level, the Panel coordinated Canadian policy with that of the Americans and suggested approaches to the United Nations Atomic Energy Commission.

The Canadian position on the Commission had been determined in late 1945 and early 1946. After the Washington Conference in November, the Americans approached the Soviet Union about preparing a common policy on international control. Secretary of State Byrnes suggested that the Soviets host a conference of the Big Three foreign ministers in December and that atomic energy be placed at the top of the agenda. At the conference, he succeeded in convincing the Soviet government to co-sponsor a General Assembly resolution creating the Atomic Energy Commission along the lines suggested by the Washington Declaration. The Soviets insisted only that the Commission be accountable to the Security Council where the veto operated.²

¹Eggleston, Canada's Nuclear Story, p. 106.

²Bernstein, "The Quest for Security", pp. 1028-29.

The Canadian government kept a watchful eye over these developments, eager to ensure that the Canadian role in the development of atomic energy was recognized but, at the same time, careful not to interfere unduly with the discussions. On 29 November, King wrote to Malcolm MacDonald urging that, since Canada was also to be a co-sponsor of the resolution, it should have permanent representation on the Commission.¹ The Americans were also informed of the request and they told the Canadians that they agreed but that they could not promise anything definite until the Moscow meeting.² At one point, the British suggested to the Americans that Canada send a delegate, preferably Dana Wilgress, the Canadian Ambassador to Moscow, to the meeting. However, King asked the British to drop the idea, since it might cause embarrassment if the Americans or Russians disagreed. He also informed them that the suggestion to send Wilgress, who was then in London at the United Nations Preparatory Commission, was a "shade officious."³

The British and Americans kept the Canadians informed of the progress of the talks. Pearson, for example, was given a copy of the proposals, which included, as the Canadians hoped, provision for Canadian representation on

¹King to MacDonald, 29 November 1945, DEA file 201-B(S).

²Pearson to Robertson, 5 December 1945, DEA file 201-B(S).

³MacDonald to Robertson, 7 December 1945, DEA file 7DE(S)-1; Robertson to King, 7 December 1945, ibid.

the Commission. Canada was also formally requested to co-sponsor the resolution on 27 December.¹

The government informed the Americans a week later that they agreed to co-sponsor the resolution,² which was passed by the General Assembly on 24 January. However, Canada was not yet completely satisfied with the arrangements. When the non-permanent members of the Security Council were elected in January, Canada was not included. The Commission was accountable to the Security Council and Canadian officials feared that Canada would not be able to participate in Council debates which concerned atomic energy. Wrong suggested that Canada use Article 31 of the United Nations charter, which allowed a nation to attend meetings of the Security Council if its interests were "specially affected". After authorization from Ottawa, Wrong approached other members of the Commission who appeared agreeable to the suggestion.³

Little more was done to prepare for the discussions in the Commission until the Americans produced a plan for international control of atomic energy. The plan, outlined in the Acheson-Lilienthal report⁴, entailed a system of

¹Pearson to Robertson, 12 December 1945; Atherton to Robertson, 27 December 1945, DEA file 201-B(S).

²King to Pearson, 3 January 1946, DCER no. 261.

³Wrong to Robertson, 7 February 1946, DCER no. 264; Wrong to Robertson, 15 February 1946, DCER no. 268.

⁴The report was prepared by a group of technical advisors headed by David Lilienthal and a State Department committee chaired by Acheson in early 1946.

control which depended on the control of raw materials rather than sanctions to ensure atomic energy was not used for military purposes. All uranium and thorium was to be owned by an international agency, called the Atomic Development Authority, which would promote the development of atomic energy for peaceful purposes only. Although inspection of national atomic energy plants and mining sites was part of the plan, it was minimized. Instead, the authority would rely on the fact that enough nations would have access to the raw materials to ensure that they could prepare for retaliatory measures if one nation violated the agreement. As in the Washington Declaration, the plan envisioned a series of stages, beginning with a survey of raw materials and the exchange of basic theoretical data and ending with the destruction or transfer to the United Nations of nuclear weapons. Completion of all the stages would take several years.¹

The Canadian Advisory Panel met to discuss the plan on 16 April. The members decided that it was a good basis for the discussions at the United Nations. McNaughton felt that it was the most constructive policy so far produced, including one prepared by Chadwick for the British government. It was agreed that McNaughton and his staff should prepare a paper expressing the Canadian attitude on international control, based on the premise

¹Bernstein, "Quest for Security", p. 1030.

that the Acheson-Lilienthal report was the only acceptable approach.¹

The Acheson-Lilienthal report, although praised by the Advisory Panel and others, held serious disadvantages to the Soviet Union, whose acceptance was vital to its success. As Bernstein comments,

It required the penetration of Russian secrecy, upon which the Soviets believed their security depended, and maintenance of the American nuclear, bomb-producing monopoly, until about the time when the Russians would have been expected independently to develop a bomb. Because the plan guaranteed the [Atomic Development Authority's] control of plant and materials, the Soviets would have been barred from research on the bomb...and thereby compelled to rely upon America's good faith.²

The Canadians had good reason to rely on American good faith; that the Soviets might see things in a different light did not occur to them for some time.³

However, since the war had ended, relations between the West and the Soviet Union began to sour. In late 1945, there were differences over Soviet moves to dominate Eastern Europe and over British and American actions in Greece and Italy. In the first months of 1946, there was a confrontation in Iran, with the Soviets having to back down in the face of American and British

¹"Minutes of a meeting of the Advisory Panel on Atomic Energy", 16 April 1946, DCER no. 273.

²Bernstein, "Quest for Security", p. 1031.

³See Ritchie to Robertson, 26 April 1946, DCER no. 276; "Memorandum by the Advisory Panel on Atomic Energy", 7 May 1946, DCER no. 279.

opposition from its claims to oil concessions. In March, Churchill made his infamous "Iron Curtain" speech in Fulton, Missouri, interpreted by many to be a declaration of cold war. Stalin responded by adopting a series of measures designed to isolate the Soviet Union from the West. He rejected the terms of a one billion dollar loan from the United States and refused to join the International Monetary Fund and the World Bank. He announced as well a new five year plan, initiating an intense programme to eliminate Western influences in the Soviet Union. As the year progressed, the confrontations between the West and the Soviet Union increased in number, and in intensity. Sharp disagreements over German war reparations resulted in the United States and the Soviet Union deciding to develop their sectors independently of each other. This was followed by a dispute over Soviet claims to the Dardanelles.

Despite this build up in tensions, most Canadian diplomats felt that cooperation in atomic energy was still possible. Throughout 1946 and 1947, the Canadians felt that the Soviet Union need not be hostile and, if dealt with firmly but fairly, would not pose a threat to world peace. In fact, many felt that the American policy towards the Soviet Union was excessively harsh and that American anti-communism could pose as serious a threat to peace as Soviet aggressiveness.¹

¹Don Page and Don Munton, "Canadian Images of the Cold War", International Journal, 32 (summer 1977), p. 595-96.

McNaughton received provisional instructions from the Cabinet a few days before the first meeting of the Atomic Energy Commission on 14 June. He was advised that the United States was to "call the tune" in the Commission. He could make constructive suggestions during negotiations but was not to go "further or faster" than the Americans or British. If the Americans should decide to use the Acheson-Lilienthal report as the basis of negotiations, McNaughton should indicate Canada's support.¹

The proposal presented by the Americans to the Commission was based on the report, but with a few significant changes. On 18 March, Truman appointed Bernard Baruch, a New York financier and self-appointed advisor to presidents, as the American Ambassador to the Commission. Although disliked by Truman, Acheson and many others in the administration, Baruch had a good public image and was respected by Congress as an elder statesman. His reputation, it was hoped, would soften criticism of the Acheson-Lilienthal report and enable its use as the basis for negotiations at the United Nations. Unfortunately, Baruch felt that complete acceptance of the report might make him appear as a mere messenger for the State Department and insisted that he be allowed a large say in defining American policy. Determined to put his own mark on the report, Baruch introduced several modifications.

¹Ignatieff to Wrong, 8 June 1946, DCER no 282; Robertson to McNaughton, 10 June 1946, DCER no. 283.

The most important were provisions waiving the right of veto in the Security Council on votes dealing with the Commission's work and providing for condign punishments in case of violations of the agreement.¹

McNaughton later claimed that the veto provision in the Baruch plan was "insincerity from beginning to end"²; that the Americans did not want an international agreement and allowed discussions only to score a propaganda victory by forcing a display of Soviet intransigence.³ However, the plan as a whole, based as it was on the Acheson-Lilienthal report, seemed at the time to be a good basis for discussion. As a result, on 19 June, McNaughton told Baruch that he had been authorized by the Canadian government to give him his full support.⁴

It was soon apparent that Baruch meant his plan to be more than a mere working paper and that he was not prepared to compromise or alter the plan, particularly not the provisions concerning the veto. As Pearson commented, Baruch appeared "almost as inflexible" as his

¹Harry S. Truman, Memoirs, I: Year of Decisions, (Garden City, N.Y.: Doubleday, 1955), pp. 7-10; Dean Acheson, Present at the Creation: My Years at the State Department, (New York: Norton, 1969), p. 154; Bernard Baruch, The Public Years, (London: Odhams, 1960), p. 331; Bernstein, "Quest for Security", pp. 1032-37.

²John Swettenham, McNaughton, III: 1944-1966, (Toronto: Ryerson Press, 1969), p. 124.

³Ibid., p. 110.

⁴McNaughton to King, 19 June 1946, King Papers, v. 234, folder 2286, c158264.

Soviet counterpart, Andrei Gromyko.¹ George Ignatieff also complained of Baruch's uncompromising attitude.²

Canadian criticism of the veto provision centred on two points. The first was that it was not necessary. Other parts of the United Nations charter provided for armed action against a power threatening world peace, although not through the Security Council where the veto operated. The second point was that the Soviet Union would not accept tampering with its right of veto.³

Since the Canadians were still strongly convinced of the need for an international agreement on atomic energy, Canadian policy was to "explore every possibility in an endeavour to prevent the Commission from reaching a stalemate." Such an impasse would be disastrous; if a breakdown in the relations between the Soviet Union and the West should occur, the worst possible area for it to happen was atomic energy.⁴ Consequently, the Canadians worked as hard as possible to avoid such an outcome. When the Soviet Union proposed a treaty outlawing nuclear warfare, the Canadians seriously considered supporting it,

¹Pearson to King, 27 June 1946, DCER no. 285.

²Ignatieff to Ritchie, 14 June 1946, DEA file 201-B(S)1; see also Ritchie to Wrong, 18 June 1946, DEA file 201-B(S)TS1.

³Reid to St. Laurent, 18 December 1946, DCER no. 311; Swettenham, McNaughton, p. 111.

⁴"Minutes of a Meeting of the Advisory Panel on Atomic Energy", 14 August 1946, DCER no. 293.

despite the opposition of the United States, as a conciliatory gesture.¹ The Canadians also emphasized the technical rather than the political side of the discussions. The Scientific and Technical Committee of the Commission, which dealt with the feasibility of international control, was one of the most successful areas of the negotiations and representatives from all the member nations, including the Soviet Union, played a constructive role.²

Relations between the Soviet and Canadian delegations were relatively warm, despite a Soviet attempt in June to block Canadian attendance at a Security Council meeting which was to discuss atomic energy.³ The Canadians felt that the Soviets were acquiescent and prepared to make compromises in order to arrive at an agreement. In early December, the Soviets made two major concessions: they dropped their earlier demand that individual projects be subject to national rather than international regulation and agreed to waive the veto right in the day to day operations of the Commission and the Atomic Development Authority. The Canadians were quick to inform the Soviets

¹Pearson to King, 27 June 1946, DCER no. 285; Wrong to Robertson, 28 June 1946, DCER no. 286; Robertson to Stone, 5 July 1946, DCER no. 287.

²McNaughton to Pearson, 21 September 1946, DCER no. 295; Robert A. Spencer, Canada in World Affairs: From the United Nations to NATO, 1946-1949, (Toronto: Oxford University Press, 1959), p. 132.

³Ignatieff to Wrong, 27 June 1946, DCER no. 291.

of their delight with the decisions.¹

The desire to do as much as possible to encourage an agreement, however, was often at odds with the policy to maintain close ties with the Americans. By early December, the Americans decided to force the adoption of the Baruch plan, complete with its provision for the veto, by the end of the year when the Atomic Energy Commission was to submit its first report to the Security Council. Baruch met with the Canadian and other reluctant delegates in an attempt to gain support, but he encountered a great deal of resistance.² For their part, the Canadians still believed an agreement was possible. Moreover, they felt that if negotiations did break down, they would have to support the American position which, as a result, would have to appear faultless. As Escott Reid, a member of the Canadian delegation to the General Assembly, explained to Pearson, who had become Under-Secretary of State in September,

It may well be that the break in the Atomic Energy Commission is going to come before the end of the year. If it is to come we must surely, however, make every effort to ensure that the issue on which the breakdown occurs is one carefully chosen by us as being best calculated to put the Soviet Union in the wrong.³

¹Swettenham, McNaughton, p. 114; Spencer, Canada in World Affairs, p. 129; McNaughton to St. Laurent, 5 December 1946, DCER no. 304.

²McNaughton to St. Laurent, 12 December 1946, 15 December 1946, DCER nos. 307, 308.

³Reid to Pearson, 31 October 1946, DCER no. 300.

Baruch's insistence on waiving the veto right and his attempt to push through his plan in the face of opposition from nations that were friendly to the United States were clearly provocative actions which could place the Soviet Union in a sympathetic light. As Wrong, now the Ambassador to Washington, suggested, Baruch was "taking a line which plays into Russian hands."¹ Consequently, the Canadians launched a dual campaign to attempt to moderate the American position as well as to delay a confrontation through the use of procedural tactics in the Commission. The first tack failed with the American refusal to consider any modifications which would detract from the veto provision. The second was a little more successful but still did not put off the American-imposed deadline.²

The final vote was scheduled for 30 December and as the date approached the Americans increased their pressure on their allies, threatening even to withdraw from the United Nations if they did not give their support. Although McNaughton and other members of the delegation considered abstaining on the vote,³ they were overruled by Ottawa. Unlike most of the diplomats in New York, King was no longer optimistic about the possibility of cooperation

¹Memorandum by Wrong, 17 December 1946, DCER no 310.

²McNaughton to St. Laurent, 28 December 1946, DEA file 201-B(S)4; Ignatieff to St. Laurent, 23 December 1946, DCER no. 317.

³See Pearson to St. Laurent, 18 December 1946, DCER no. 311.

between the United States and the Soviet Union and was beginning to feel that there was a good chance of war between them. Afraid that Canada would not be able to defend itself, he felt that Canada would have to support the United States and rely on it for protection. He discussed the atomic energy question with Louis St. Laurent, now Secretary of State for External Affairs, a few days before the vote and they decided that Canada should cast its vote with the Americans. Perhaps as a result of a suspicion that McNaughton might oppose such a policy, they also decided, as King recorded in his diary, that "it would be well for Pearson to go to New York to be with McNaughton and the others on Monday. He was to let them know that both St. Laurent and myself wished to have the American position supported."¹

The Americans appreciated the Canadian decision. Baruch told Pearson after the vote that McNaughton's statement beforehand had a decisive effect in persuading the other reluctant delegations, such as the British, the French and the Dutch, to also vote in favour of the plan.²

The final vote was 10-0 for the American plan, with the Soviet Union and Poland abstaining. This marked the death-blow of the Commission. Although negotiations continued, the Commission served merely as a forum for

¹King Diary, 28 December 1946.

²Pearson to St. Laurent, 6 January 1947, DEA file 201-B(S)S.

propaganda and cold war rhetoric.

Thus, by the end of 1946, Canadian dreams for a new international order based on the international control of atomic energy, as well as their hopes for an Anglo-American-Canadian partnership within the framework of such an agreement, were shattered. Instead, the country faced what it had always considered to be the worst possible outcome: the world was now divided into two hostile camps, Canada was becoming increasingly dependent on the United States without the counter-balance of Great Britain, and, as a result, Canadians were committed to supporting American policy on atomic energy.

CONCLUSION

Cooperation between the United States, the United Kingdom and Canada in the development of atomic energy during and immediately after the Second World War is an example of the breakdown in the triangular relationship between them and the growing dependence of Canada on the United States for its economic well-being and military security. The two studies already written on this subject, those by Eggleston and Eayrs, do not consider the atomic partnership in the context of this structural shift in the relationships and, as a result, often fail to explain adequately the motivations behind many of the events.

As his diaries testify, King was horrified by the prospect of nuclear weapons and was fully cognizant of their destructive capacity. However, he does not seem to have realized the impact that the atomic energy partnership would have on tripartite relations or on post-war Canadian external policy in general. During the war, he left the direction of policy to C.D. Howe, who was more interested in marketing Canadian raw materials and goods than in the long-term diplomatic significance of atomic energy, and to C.J. Mackenzie, a science administrator who appears never to have been briefed on foreign policy considerations and never to have had a private interview with King on the

subject. The Canadians who would have been interested in the impact of atomic energy on international relations, the officials from the Departments of External Affairs and National Defence, were not informed of the wartime developments.

During the war, Canada was involved in a tug-of-war between the expectations of the United States and the United Kingdom. Both assumed that Canadian deposits of uranium would readily be made available and that Canada would support them in their disagreements with each other. Given King's ideas about the North Atlantic triangle and Canada's role as a lynchpin, it is probable that he would have tried to strike a balance between the expectations of each power and not to have favoured one at the expense of the other. Instead, Howe and Mackenzie adopted a policy which favoured the United States. Howe was most interested in marketing Canadian uranium and Mackenzie wanted to build an atomic power plant. Both objectives could be achieved by cooperating with the United States. Neither had much sympathy for the British position which was based on the perception that the United Kingdom would need the atomic bomb to protect its interests in the post-war world. Neither Howe nor Mackenzie wanted to develop atomic weapons in Canada, a sentiment shared by other Canadian decision makers after the war.

Although Eggleston is interested primarily in the development of atomic energy in Canada, he deals with the

partnership when it affects the Canadian project. However, as a semi-official history, Canada's Nuclear Story is very uncritical of the action of all three governments. For example, although he recognizes that Bush and Conant were responsible for the policy of restricted interchange,¹ he does not point out that Mackenzie was unaware of the fact and was consequently much more cooperative with them than he might otherwise have been. Similarly, Eggleston ignores the fact that the Americans had contracted for the entire output from Eldorado before they announced the new policy to the Canadians early in 1943. Eggleston also downplays the intrigue in the war-time interchanges. He does not deal with the fact that the British were intentionally hiding the disagreement between Bush and Conant and Akers in late 1942, nor does he mention that Howe hid the details of the American contracts with Eldorado from the British in the middle of 1943 while he attempted to strike a better deal with the United States. Moreover, Eggleston does not deal with the larger issues, such as Howe's increasing hostility to the British or the American motivations for agreeing to let the Chalk River project go ahead.

Eayrs' account of the wartime partnership follows Eggleston's study for the most part, with a few exceptions. Eayrs claims that Bush and Conant spoke in "good faith"

¹Eggleston, Canada's Nuclear Story, p. 67.

in late 1942 and 1943,¹ when it is evident that they were trying to mislead Mackenzie about their true feelings in order to secure his cooperation. Secondly, Eayrs explains Howe's hostility to the British by claiming that Churchill accused him of disloyalty to Canada.² This Churchill did not do, although it is apparent that someone did accuse Howe of disloyalty to the British Empire.

The most questionable aspect of Eayrs treatment, however, is that he discusses the negotiations in the United Nations Atomic Energy Commission and the Canadian decision to support the Baruch plan before he deals with the breakdown of the trilateral partnership. Therefore, he ignores the possibility that the breakdown might have influenced the Canadian behavior on the Commission.

Neither Eayrs nor Eggleston deal with the decision not to build atomic weapons in Canada. This is especially surprising in the case of Eayrs since his book treats the development of military policy in the immediate post-war period. Perhaps this omission reflects the unconscious assumptions made by the decision-makers at the time; few Canadians seemed capable of imagining a Canadian nuclear deterrent.

The decisions made by the Canadian government in

¹Eayrs, In Defence of Canada, III, p. 268.

²Ibid., p. 262.

this period had far reaching implications. Canada has never developed atomic energy for military purposes and has continued to advocate disarmament in world councils. However, then as now, Canadians are willing to help the United States develop their nuclear weapons. Canada sells plutonium from Canadian reactors to the Americans and has allowed nuclear warheads on Canadian soil. After 1946, the United States continued to increase in economic and military importance to Canada, although successive Canadian governments have attempted different methods to ensure that the transatlantic links are kept through membership in organizations such as NATO and the Commonwealth and through policies like the Third Option in the early 1970's. Overall, the Canadian-American relationship remains strong.

NOTE ON THE SOURCES

The primary documents used in this thesis come from the W.L.M. King Papers and Diaries, the C.D. Howe Papers, the National Research Council files (including the wartime diary of C.J. Mackenzie), and the files of the Departments of External Affairs and National Defence. Unfortunately, many of the relevant documents are still classified, despite the passage of over thirty years. For example, about half of the Howe Papers and Department of National Defence files pertaining to atomic energy are still closed. The files relating to the Gouzenko Affair are also still classified.

Many of the decisions concerning Canadian atomic energy policy were never committed to paper. During the war, few Canadians were involved and their decisions were often made during informal meetings where no minutes were taken. This is also a problem with the development of policy during the negotiations at the United Nations Atomic Energy Commission. As the introduction to the 1946 volume of Documents on Canadian External Relations states:

When a Canadian delegate in New York wanted to discuss routine matters he had the telephone at his disposal, while for more important issues he could easily return to Ottawa for an unrecorded meeting with the Prime Minister and a few officials. All the major decisions on the international control of atomic energy, for example, were made in this fashion.¹

Major Canadian newspapers and magazines for the

¹DCER, p. xxi.

period August 1945 to March 1947 were also examined.

There was little public debate about atomic energy and no real criticism of government policy either in the press or in the House of Commons. As John Holmes remarked, "There has rarely been such evidence of the docility of the Canadian public as during that period on atomic questions."¹ Since public opinion played such a minimal role in the determination of Canadian policy, it has not been dealt with in this thesis.

The American and British documents were not examined either, due to the time and space limitations of a Master's thesis. Information about British and American actions and policies has been taken from secondary sources, primarily the official histories. The historians' remarks about Canadian actions and attitudes have been checked against the Canadian evidence. Unfortunately, Margaret Gowing does not document her evidence and it is often difficult to corroborate some of her statements or to understand how she came to some of her conclusions.

¹Homes, The Shaping of Peace, p. 224.

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