In Deep Heavy Water: Cape Breton's Foray into the Heavy Water Industry, 1963-1985

by

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Table of Contents

Abstract

This thesis focuses on the life and times of the Glace Bay Heavy Water Plant and The Port Hawkesbury Heavy Water Plant on Cape Breton Island, Nova Scotia, Canada, from 1963 to 1985. The Cape Breton heavy water plants were situated at the centre of major political and economic approaches to industrial development in Canadian peripheral regions during the post-Second World War years. The rise and fall of the heavy water plants in Cape Breton includes many major themes of Canada's and Nova Scotia's political economy during this period of Canadian history. The establishment and operation of the heavy water plants in Cape Breton was a major industrial undertaking that attempted to play its part in the emerging nuclear age. This thesis covers themes of Canada's role in the development and export of nuclear technology and equipment, state interventionism in postwar Canada and Nova Scotia, and the shift in Canadian approaches to economic development.

Acknowledgments

This thesis began its life as a project for me when I was enrolled as an intern at the Beaton Institute. I spent many hours taking inventory of the Don Nazzer Collection. During this time, the Don Nazzer Collection was a largely unprocessed collection of archival materials mostly related to the Cape Breton heavy water plants. I have been very fortunate to have had the opportunity to become immersed in the materials of the Don Nazzer Collection. I would like to thank the Beaton Institute Archivist, Jane Arnold, for her help and guidance. I am sincerely thankful for the help I received from the Beaton Institute front desk employees.

I would like to sincerely thank my thesis advisor, Dr. Lachlan MacKinnon. I am eternally grateful for the help and support I received during this undertaking and thank you for loaning me those books on regional development for the better part of a year. I would also like to thank my thesis class professor, Dr. Ian Brodie for his help and organizing the thesis class.

Special thanks to my parents Gary and Laurie Cameron for their support, encouragement, and all those dinner table discussions about heavy water and political economy. I would also like to thank my sister Julia Cameron for her encouragement and advice on writing a thesis.

Introduction

It is a spring day just outside the town of Glace Bay, Cape Breton, Nova Scotia, and a huge gathering of large significance is taking place. Politicians, business leaders, industrialists, scientists, journalists and writers from all over are present at this event. The day is 1 May, 1967, and the first commercial heavy water plant of its kind is receiving its grand unveiling. This heavy water plant is believed to be the driver of making Cape Breton, Nova Scotia a part of Canada's bright future—the nuclear age. Glace Bay is a coal mining town—one of several in Cape Breton. The coal industry is the major employer of many residents of Glace Bay, and its legacy is planted firmly in the town. The other major employer and industry in Cape Breton is the steel industry, with its plant in the city of Sydney. However, the 1960s are a turbulent time for both the steel and coal industries. With the opening of the Glace Bay Heavy Water Plant underway, and the opening of the second heavy water plant just around the corner on the other side of the Island, just outside the town of Port Hawkesbury, deliverance from the unstable nature of the coal and steel industries is within reach for the Island of Cape Breton.

This thesis will focus on the establishment and downfall of Cape Breton's foray into the heavy water producing industry from the 1960s to the 1980s. The history of the Glace Bay Heavy Water Plant (GBHWP) and the Port Hawkesbury Heavy Water Plant (PHHWP) stands at the intersection of period experiencing major political and economic developments and approaches. The major themes that are intertwined with the history of Cape Breton's heavy water plants include Canada's history of the manufacture and exports of nuclear reactors, Canada's history of heavy water production, regionalism in Canada, the legacy of the national policy, the regional economic development approach, and Nova Scotia's history of state-interventionist measures to stimulate industrial growth.

Lachlan MacKinnon's article, "Importing the Clairtone Sound: Political Economy, Regionalism, and Deindustrialization in Pictou County," expanded on a question that was posed by Fred Burrill in his article, "Re-developing Underdevelopment: An Agenda of New Histories of Capitalism in the Maritimes." Burrill's question was, "What was the particular balance of class forces … that made these [mid-20th-century] modernizers so fervently pursue such obviously flawed industrial development schemes?"[1] This thesis seeks to join this conversation by investigating the history of Cape Breton's heavy water plants and the surrounding moment in Canadian and Nova Scotian history that the plants occupied.

The establishment of two heavy water producing facilities in Cape Breton was a major industrial undertaking. However, the plants did not live up to the expectations set on them. The establishment of the two heavy water plants in Cape Breton occurred during a moment in Canadian history that was experiencing change, and the history of the heavy water plants themselves was turbulent. The GBHWP under the operation of Deuterium of Canada Limited (DCL) is most infamous for its disastrous construction and operational history. However, all Canadian heavy water plants have experienced equipment, materials, and process problems.[2] In the early 1970s, federal Crown corporation Atomic Energy of Canada Limited (AECL) eventually took over ownership and operation of both the GBHWP and the PHWWP. Despite the successful production history of both facilities under AECL, the heavy water plants would eventually be shut down in 1985. Why did the Cape Breton heavy water plants fail?

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[1] MacKinnon citing Burrill. Lachlan MacKinnon, "Importing the Clairtone Sound: Political Economy, Regionalism, and Deindustrialization in Pictou County," *Labour | Le Travail* 91 (March 2023): 150.

[2] R. K. Rae, "Heavy Water," in *Canada Enters the Nuclear Age: A Technical History of Atomic Energy of Canada Limited as Seen from its Research Laboratories*, ed. D.G. Hurst (Montreal: Queen's School of Policy Studies, 1997), 339.

Literature Review

I will be addressing the academic environment in which my thesis question exists. This thesis acts almost like a continuation of MacKinnon's article in terms of the moment in history both works focus on—MacKinnon's concludes in the 1970s, and my thesis topic concludes in the 1980s.

My thesis will focus on Cape Breton's attempts to establish a heavy water industry on the Island. Although the heavy water industry and the Clairtone Sound Corporation are two dramatically different industries, the similarities are undeniable between these two examples of Nova Scotia's attempts at establishing secondary manufacturing in the province during the Premiership of Robert Stanfield and his successors. This literature review seeks to provide a 'state of the question' regarding the academic works my thesis will be supported by. There is a void in academic scholarship that focuses on Cape Breton's heavy water plants. Much of the sources do not specifically cover the heavy water plants but instead provide context to wider conversations happening that contributed to the establishment and failure of the heavy water plants of Cape Breton. My thesis will require considerable use of analyzing primary sources to explain the history and how it fits into a wider conversation of the legacy of state interventionism, economic underdevelopment, and the process of deindustrialization.

MacKinnon's article is among the most crucial academic works that my thesis draws on regarding Nova Scotia's history of economic development during the post-Second World War period, and up to the early 1970s. MacKinnon's article is also involved in a wider academic conversation happening regarding finding answers for why Nova Scotia's ambitious industries - like Clairtone Sound Corporation, and the heavy water industry - meant to take reliance off of the steel and coal industries.

MacKinnon argues that although Clairtone operated in Nova Scotia for a brief time, its history reveals how industrial and economic policies of the mid-twentieth century were deeply rooted in the political economy of the postwar period.[3] As MacKinnon explains, Clairtone was one of many firms that were attracted to operate in Nova Scotia thanks to a far-reaching set of interventionist policies enacted to address Nova Scotia's issues of regional economic underdevelopment.[4] The central argument in MacKinnon's article states that

> …the establishment and failure of the Clairtone Sound Corporation reveals how this so-called new industry of Nova Scotia came to collapse under the dual weight of structural deindustrialization and the hubris of a political class that was committed to allowing regional and national capitalists to direct industrial development decisions and policies.[5]

Considering how Clairtone and the heavy water industry were once thought of to be Nova Scotia's bright new industries, similar patterns can be found between these two examples. Specifically, the substantial role the Nova Scotian Crown corporation Industrial Estates Limited played for both Clairtone and the Deuterium of Canada Limited heavy water plant.

The history of Cape Breton's heavy water plants is undeniably part of Robert Stanfield's legacy as Premier of Nova Scotia. To provide the wider context, the heavy water plants were a part of discussions about Nova Scotian provincial politics from the postwar period and onward. MacKinnon explains that before Stanfield took power, long-serving Liberal Premier Angus L. Macdonald viewed infrastructure as an essential aspect of provincial development.6 Under the

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[3] MacKinnon, "Importing the Clairtone Sound," 148-9.
[4] MacKinnon, "Importing the Clairtone Sound," 150.
[5] Ibid.
[6] Ibid. 151.

Liberals during Macdonald's Premiership, public works and a provincial economy based on private equity was the preferred approach.7 For Stanfield to distinguish himself from his opposition, he took up the mantle of managerial capitalism during the 1950s.8 However, MacKinnon further explains that understanding regionalism in the Nova Scotia economy has a longstanding legacy that can be traced back to concerns the Maritime provinces regarding inequities within confederation.9 MacKinnon argues:

> …the program of industrial development enacted under Stanfield sought to diminish some of the economic difficulties facing the Maritimes under Confederation; however, as we shall see, such efforts were not rooted in the aims of social justice and were ultimately devoid of significant social democratic commitment.[10]

Contrary to how many might view state intervention in the economy, the Nova Scotian example under the Stanfield Premiership did not concern itself with shifting power in favour of the workers, but rather its focus involved regional capitalists in the provincial economy—an almost deputizing of regional capitalists into the Provincial posse. During the 1947 Coal Strike in Pictou County and Cape Breton, the miners were calling for state involvement in the industry and for workers to have an influence and direction of the industry they worked in.[11] When State-led development became the focus of both levels of government during the 1950s, it wasn't intended to be a social partnership that Nova Scotian miners had previously proposed. Instead, it

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[7] Ibid.
[8] Ibid.
[9] MacKinnon, "Importing the Clairtone Sound,"153.
[10] Ibid.
[11] Ibid, 154.

was predicated on the goals of the modernist provincial state and the desires and direct participation of regional capitalists and the business class.[12]

MacKinnon's concluding remarks are significantly relevant to understanding the larger political context that my thesis focuses on,

> In the end, the history of Clairtone in Nova Scotia reveals the class forces inherent in the "development state" that emerged during the mid-1950s. Although government intervention (and nationalization, in some cases) was called for by the Nova Scotia workers' movement dating back to the early 20th century, the system that emerged was a pantomime of this demand. Instead of being rooted in social justice, or in close collaboration with the men and women of the province and their trade unions, the industrial development model that blossomed between 1957 and 1972 was founded on a particular elite view of industrial development that wholeheartedly accepted the ability—and indeed the right—of individual controllers of capital to operate and direct the state levers of economic policy.[13]

Researching the regional economic development model that took place in Canadian history between the postwar period—and roughly around the same time my thesis concludes—will be a significant factor that deserves considerable attention.

Fred Burrill's 2019 article, "Re-developing Underdevelopment: An Agenda of New Histories of Capitalism in the Maritimes," acts as almost the point of origin for my thesis question. Burrill's article provides context to the surrounding academic conversations happening regarding economic underdevelopment in the Maritime provinces. Burrill argues that for much of

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[12] Ibid.

[13] MacKinnon, "Importing the Clairtone Sound," 168.

the ladder half of the twentieth century, narratives of economic underdevelopment in the Maritime provinces had a stranglehold over the study of the region's position within Canada.[14] Burrill further states that Maritime-born scholars during the postwar period experienced regional stereotypes in universities in central and western Canada.[15] This speaks to the wider understanding of other Canadians about the Maritime provinces relating to economic strength, and the severity of the region's economic underdevelopment among the aspects of the region that came to mind to outsiders.

> The narrative of underdevelopment particularly influenced the rapidly growing number of labour historians of Atlantic Canada in the 1970s and 1980s as well as the solidification of Atlantic Canada Studies as a field. These scholars constructed a Golden Age narrative of their own, focusing on the brief window of regional industrialization and labour strength between the 1890s' "Second Industrial Revolution" and the deindustrialization of the 1920s.[16]

Burrill further comments on Atlantic Canada's attempted development as Atlantic Canada falling under the notions of modernity betrayed - its future hampered by central Canada in the 20th century.[17] Burrill's mentioning of the 'Golden Age Narrative' could explain why many academics who write on regional development in the Atlantic provinces are typically from areas most affected by underdevelopment, which is something I must consider since I am also from the same location that I am researching. In many academic discussions about issues in the Maritime province's political economy, events in history like confederation and the National Policy are

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[14] Fred Burrill, "Re-developing Underdevelopment: An Agenda for New Histories of Capitalism in the Maritimes," *Acadiensis* 48 (October, 2019): 181.

[15] Ibid.

[16] Burrill, "Re-developing Underdevelopment," 181-2.

[17] Ibid, 182.

brought up as examples of the point of origin of the Maritime province's inability to develop at the same level as their central and western Canadian counterparts.

During the period of Canadian history this thesis focuses on, a noticeable shift in political doctrines began to happen, and the regional development model became less favoured. "I suspect that a better understanding of the Atlantic Canadian state and its actors in the 1960s and 1970s would help in the project of generating new insights into the regional experience of the rise of neoliberal globalization."[18] Part of my thesis will research the rise of neoliberalism and how that factors into the history of the Cape Breton heavy water plants, and the wider conversation about this period of Canadian history experiencing a moment of transition. Burrill's article almost serves as a 'state of the question' as well, except the focus is mostly on the current scholarship relating to the Maritime province's struggles with regional development, and the shortcomings of researching in that field.

Roy E. George's 1974 book, *The Life and Times of Industrial Estates Limited*, acts as almost the authoritative text for any academic work that focuses on 1950s-1970s Nova Scotian political economy. I would argue that it is impossible not to cite George's book while researching Nova Scotia's attempts at developing a secondary manufacturing base in the province. However, George's book can be both a primary source as well as an academic secondary source material. Regarding its use as a primary source, George's book was published in 1974 while Industrial Estates Limited was still operating as a Crown corporation. Although the discourse surrounding Nova Scotian regional development has changed since 1974, the information regarding the history of IEL is very useful to this thesis. George's book can be used as a secondary source but

[18] Ibid, 188.

it's important to keep in mind the limitations of this source and to not rely on it too much for its arguments.

However, George's arguments offer insight into how IEL's shortcomings were viewed during the time of its operation, and into the arguments circulating regarding why Nova Scotia's attempts at developing a secondary manufacturing base resulted in failures. George argues that the reasons for Nova Scotia's economic underdevelopment include transportation costs, lack of skilled labour, and shortage of capital, but also claims, "…attitude of mind which resulted in a poor supply of entrepreneurship and managerial talent."[19] I don't consider this argument to be satisfying and believe there is more to why Nova Scotia's development strategies failed. However, it seems George and I view this topic from different perspectives. I would argue that the burden for why secondary manufacturing development in Nova Scotia was unsuccessful cannot be squarely placed on the shoulders of individuals, but rather on larger systems at play and issues in Nova Scotia's political economy that are steeped in a long history.

How IEL operated was very emblematic of how state interventionism worked in Nova Scotia during this period. A history of IEL written during the time when the regional development model was being used could offer insights into how this changed compared to the subsequent introduction of neoliberalism. George's book was published within the context and worldview of the regional development model. This aspect of this source can be further researched and compared to contribute to a wider image of Nova Scotian political economy during the mid-1970s and early 1980s. Literature on IEL is considerably limited, which is part of the reason why George's book can be considered the authoritative text on this topic.

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[19] Roy E. George, *The Life and Times of Industrial Estates Limited* (Halifax: Dalhousie University, Institute of Public Affairs, 1974), 5.

Furthermore, during the methodologies section of this thesis, George's book provides much-needed context to properly analyze the primary sources on the Cape Breton heavy water plants.

R.K. Rae's chapter, "Heavy Water," in the book, *Canada Enters the Nuclear Age: A Technical History of Atomic Energy of Canada Limited*, is significantly important to this thesis. Rae's chapter provides an overview of the operational history of both the Glace Bay Heavy Water Plant and the Port Hawkesbury Heavy Water Plant, and covers important context on the history of the heavy water industry'. Heavy water's history in the Manhattan Project contributed greatly to the establishment of Canada first heavy water plant owned and operated by Cominco, in Trail, British Columbia.[20] The operational history of the GBHWP and PHHWP was very useful with filling in the gaps left in the Don Nazzer Collection, and provided a good overview of the wider operational conversations being had regarding the corporate and governmental points of view.

Steven High's 2003 book, *Industrial Sunset: The Making of North America's Rustbelt, 1969-1984*, is a considerably influential book on deindustrialization studies. High's book focuses on car and steel plant closures in Ontario and the United States during the late 1960s to the early 1980s, but the wider arguments High makes regarding deindustrialization can be applied to my thesis topic. High references the demolition of factory buildings as something similar to the toppling of Marx and Lenin statues in Eastern Europe during the early 1990s, High argues something similar but less obvious occurred in North America with industrial closures and its subsequent demolition.[21] However, more questions are raised when this is applied to the heavy water plants in Cape Breton. Unlike the toppling of industrial buildings like steel plants and car

[20] Rae, "Heavy Water," 334.

[21] Steven High, *Industrial Sunset: The Making of North America's Rustbelt, 1969-1984* (Toronto: University of Toronto Press, 2003), 3.

factories shortly after these industries were deindustrialized, the AECL heavy water plant sat idle for twenty-eight years until it was dismantled. High references how identities were forged in industrial towns and cities, and the deindustrialization of these industries was viewed as the end of an era for people who worked in those industries.[22]

High argues that the destruction of old economic landmarks was a carefully choreographed effort to engineer consent and legitimate impending economic changes.[23] Then why did the AECL plant sit idle for twenty-eight years before being dismantled? I am inclined to argue that, unlike the steel and auto manufacturing industries, no identities were being forged to the same degree. Despite the successful production history of both plants under AECL, the heavy water industry in Cape Breton had been seen as a failure by many Cape Breton residents. However, this only raises more questions. If the Cape Breton heavy water plants were successful, would they have been deindustrialized much sooner? High argues that the period from 1969 to 1984 was a moment in time that began and ended in a recession.[24] This moment in time also correlates with the closures of the DCL plant in 1969-70, and the closure of the AECL plant in 1985. Although the dates don't perfectly match up, it is telling of a greater trend happening relating to the Canadian economic downturn of secondary manufacturing.

Dimitry Anastakis's 2005 book *Auto Pact: Creating a Borderless North American Auto Industry, 1960-1971*, focuses on the Canadian auto industry during the 1960s and 1970s. Although the focus of this book is on the Ontario auto industry, much of the greater political doctrines that informed the Canadian federal government during this period have influenced the

[22] Ibid.
[23] Ibid, 3-4.
[24] High, *Industrial Sunset*, 4.

heavy water plants in Cape Breton. Specifically, Canada's view on interventionism was believed to promote further national economic development in the form of incentive programs designed to spur exports.[25] Furthermore, Anastakis argues that during this period, the Canadian federal government held a protectionist view regarding Canada's economy, stemming from a postwar anxiety about continental integration with the United States.[26] However, the 1960s was also a period when ideas of free trade and protectionism had an uneasy coexistence at the national policy-making level.[27] Did this disproportionately affect regional development in provinces less developed than Ontario and Quebec? Were Nova Scotia's attempts at developing secondary manufacturing always going to fail because of the economic shift being discussed in the 1960s?

Donald Savoie's 1986 book *Regional Economic Development: Canada's Search for Solutions* is very useful to my thesis because it examines the regional development model that was utilized in Canada. Nova Scotia's attempts at developing a secondary manufacturing base had existed within the scope of this model. Savoie claims that Canada's economy is the most regionalized and the most fragmented.[28] He further argues that not all regions benefit simultaneously in free-market economy countries and that there will always be an imbalance between regions.[29] Concerning Nova Scotia's place in the Canadian economy, the balance is in favour of Ontario and Quebec. However, this view of underdevelopment and imbalances against greater economic regions harkens back to what Burrill commented on in his article where this

[25] Dimitry Anastakis, *Auto Pact: Creating a Borderless North American Auto Industry, 1960-1970* (Toronto: University of Toronto Press, 2005), 7.
[26] Ibid, 5.
[27] Ibid, 4.
[28] Donald Savoie, *Regional Economic Development: Canada's Search for Solutions, Second Edition* (Toronto: University of Toronto Press, 1992), 3.
[29] Ibid.

understood east-west economic oppression happening within the Canadian context, exists with the wider context and mental frame of Western economic oppression in the global south.[30]

The aspect of global north-south imbalances seems to be unavoidable because Savoie references the third world when listing the different forms of economic approaches. Specifically, when Savoie is describing the development approach, he states that it was largely inspired by the study of underdeveloped countries.[31] Savoie claims that the development approach fell out of favour in Canada because the problems of developing countries and slow-growth countries have changed considerably compared to when the approach was first used in slow-growth countries.[32] The development approach views regional disparities through a broad scope, and the measures this approach focuses on include capital accumulation, assistance in creating adequate industrial infrastructure, an increase in the educational level of the workforce, promotion in the application of technology, constructing new roads, harbours, and sewer systems.[33] This approach almost perfectly describes the goals of IEL. The reference to the education level of the workforce echoes Roy E. George's views about Nova Scotia's workforce and entrepreneurial spirit.

Rick Williams' chapter, "The World is in Chaos, The Future Looks Bright," in *Toward a New Maritimes* was very useful in establishing arguments of how the legacy of the National Policy in the Maritimes was a factor in the history of the Cape Breton heavy water plants. Information on Canada being a highly regionalized country, and arguments of Canada being built on the inequality of the nation's constituent regions located on the economic and political

[30] Burrill, "Re-developing Underdevelopment," 185.
[31] Savoie, *Regional Economic Underdevelopment*, 7.
[32] Ibid, 7-8.
[33] Ibid.

periphery—like the Maritimes.[34] Williams' chapter helped establish a historic precedent for the challenges Nova Scotia faced with developing a manufacturing sector.

Dieter Plehwe's introduction chapter in the 2015 book *The Road from Mont Pelerin: Making of the Neoliberal Thought Collective*, is a relevant source to my thesis that explains the history and the functions of neoliberalism. My thesis seeks to research this moment in Canadian history that saw the gradual shift from the regional development approach to the neoliberal view regarding Nova Scotia's political economy. To examine the role neoliberalism played during the moment in Canadian history my thesis focuses on, I would argue it's important to research sources that attempt to deconstruct and explain an unclear subject like neoliberalism. Plehwe argues that neoliberalism is anything but a clearly defined political philosophy, "In terms of academic disciplines, the neoliberal continues to be stereotypically imagined as a neoclassical economist."[35] The reference to neoclassic economics is further expanded in the Savoie piece. In the United States, the term 'neoliberal' is hardly used to describe the US configuration of free-market forces—which typically are labelled as libertarian or neoconservative.[36]

In the Draft Statement of Aims in the Mont Pelerin Society, the sixth "commandment" states, "As far as possible government activity should be limited by the rule of law. Government action can be made predictable only when it is bound by fixed rules. Tasks which require that authorities be given discretionary powers should therefore be reduced to the indispensable minimum. But it must be recognized that each extension of the power of the state gradually

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[34] Rick Williams, "Tomorrow is in Chaos, the Future Looks Bright," in *Toward a New Maritimes*, ed. Ian McKay and Scott Milsom (Ragweed Press, 1992), 362-3.

[35] Dieter Plehwe, "Introduction," In *The Road from Mont Pelerin: The Making of Neoliberal Thought Collective, With a New Preface*, ed. Philip Mirowski (Cambridge: Havard University Press, 2015), 1.

[36] Plehwe, "Introduction," 2.

erodes the minimum basis for the maintenance of a free society."[37] Plehwe claims that in 2015, the only official statement from the Mont Pelerin Society was the Draft Statement of Aims.[38] Perhaps this view of the government's role in society from the Mont Pelerin Society—the intellectual point of origin for neoliberalism—has contributed to the shift away from the regional development model being used in Nova Scotia.

Duane Bratt's 2006 book *The Politics of CANDU Exports*, speaks to the wider conversation happening around heavy water, and its place within a larger economic plan for Canada in the 1960s and 1970s. Furthermore, Bratt's book provides context for my thesis in the form of the history of the CANDU reactors and the Canadian federal government's desire to export nuclear reactors abroad. My familiarity with the Don Nazzer collection at the Beaton Institute -which is where the majority of the primary sources used for this thesis are located—provides an additional piece to the puzzle that is heavy water and Canada's nuclear energy history. Bratt claims,

> …successive governments have considered the CANDU to be 'Canada's last and/or best chance for developing and maintaining a high-technology-based and internationally competitive and respected industry. The prestige of nuclear power has meant that the CANDU has assumed an important place, one that extends beyond simple monetary value, in Canada's international trade.[39]

[37] Ibid, 22-23.
[38] Ibid, 24.
[39] Duane Bratt, *The Politics of CANDU Exports* (Toronto: University of Toronto Press, 2006), 5.

This thesis seeks to focus on the heavy water plants and their place in Nova Scotian history, however, Canadian federal politics is a significant factor and how it relates to wider policy doctrines during the postwar period and beyond.

The history of the CANDU reactors in Bratt's book focuses on complements the material that cannot be found in the Don Nazzer collection. Specifically, there is primary source material on both the experimental ZEEP reactor and its descendant, the CANDU reactor. The Don Nazzer collection holds material from both heavy water, the heavy water-producing plants, as well as material on Canadian nuclear reactors. This further proves that although CANDU manufacturing and heavy water production in Canada were entirely separate entities located in separate provinces, the two were interlinked. Although heavy water isn't the focus of Bratt's book, it is more than likely heavy water was planned to be exported abroad same as the CANDU reactors. The Don Nazzer collection plugs in much of the gaps in the literature on Canada's nuclear energy history.

Although Roland MacInnis' 2018 book *Hell and Heavy Water: A Glace Bay Heavy Water Plant Story*, isn't a scholarly secondary source, I would argue that it's important to bring attention to existence and to discuss its relevance to this thesis. MacInnis' book should be viewed almost as a written oral history of the Glace Bay Heavy Water Plant from a former plant worker. Although MacInnis dabbled in researching and adding to the conversation of Cape Breton's brief history of heavy water production, this source should be treated the same way an oral history interview is treated—with a degree of appropriate scrutiny and to read into the deeper insights of what's being said. MacInnis further corroborates the fact that Canada's foray into the nuclear

energy field was a product of the Second World War.[40] The development of the CANDU reactors and the production of heavy water were both intertwined, as MacInnis puts it, "No heavy water, no CANDU."[41] Furthermore, MacInnis' book is an example of several other non-scholarly books I found that complements both the literature and primary source materials located at the Beaton Institute.

Stanley M. Davies' book, *Is Making Heavy Water Painful: A Story of the Port Hawkesbury Heavy Water Plant, 1969-1975*, provides prospectives on plant operations through the point of view of a plant engineer. Davies offers some biographical information on plant manager Don Nazzer. This thesis uses a significant amount of material from the Don Nazzer Collection—the archival materials in the collection were once in Nazzer's possession. Davies' book provides information on Canadian General Electric (CGE)'s operation on the PHHWP. Davies mentions CGE's disappointment on their investment on the PHHWP, which resulted in the company selling the facility to AECL in the spring of 1975.[42] Similar to MacInnes book, Davies' piece is not a formal history book, but it does provide information on plant worker perspectives, as well as data on PHHWP operations.

This thesis seeks to research Cape Breton's brief foray into the heavy water-producing industry, and its potential wider roles on the provincial, national, and world stage. Although scholarly secondary sources that focus on the Cape Breton heavy water plants are non-existent, it is the goal of this thesis to piece together the wider history surrounding how three heavy water plants came into being on Cape Breton Island through literature researching wide economic and

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[40] Roland MacInnis, *Hell and Heavy Water: A Glace Bay Heavy Water Plant Story* (CrateSpace Independent Publishing Platform; 1st Edition, 2018), 7.

[41] Ibid.

[42] Stanley M. Davies, *Is Making Heavy Water Painful: A Story of the Port Hawkesbury Heavy Water Plant, 1969-1970* (Self-Published on Amazon.ca, 2023), 232.

political forces at play. The investigation of these forces seeks to add Cape Breton's role into the conversation of 1960 to 1970s industrial history and to add Cape Breton's heavy water plants to conversations in deindustrialization studies. The literature examined in this literature review is linked together in fascinating ways that include pieces citing each other work, as well as pieces sharing common themes in their arguments. The literature will provide the wider context surrounding the economic and political forces of Cape Breton's heavy water plants while examining the primary source materials will provide insights into the construction, operation, and conversations happening between key decision makers involved with the heavy water plants. Moreover, this thesis seeks to provide a foundation for future research on this understudied moment in Cape Breton's history.

Methodology

My thesis focuses on the development of the heavy water plants on Cape Breton Island between the 1960s and 1980s. Much like the heavy water plants, this thesis is an ambitious undertaking and involves a wide range of diverse crucial details to properly frame this event as thoroughly as possible. The history of the Cape Breton heavy water plants goes beyond Cape Breton Island and is connected to wider conversations happening provincially in Nova Scotia, nationally, and on the world stage. Similar to the heavy water plants and its wider connections further afield, the state of academic discourse also goes beyond Cape Breton and the heavy water plants and is more telling of a wider shift in approaches to topics in Atlantic Canada such as regional economic development, approaches to Atlantic Canadian political economy history, and approaches to Atlantic Canadian labour history.

Researching the history of the Cape Breton heavy water plants is a considerable undertaking concerning the current state of academic sources that cover this topic. The

methodology for researching this topic is mainly concerned with analyzing academic and primary sources. This essay will briefly discuss the current state of academic works concerning the heavy water plant. In terms of primary sources, the Don Nazzer Collection at the Beaton Institute, located at Cape Breton University, houses many of the important textual primary sources available on the heavy water plants. Furthermore, autobiographies will also be utilized in this thesis as they offer a different accounting of how the heavy water plants are remembered compared to the business records and correspondence letters in the Don Nazzer Collection.

My thesis requires heavy research of primary source materials to piece together the history of the heavy water plants, and to connect it to academic literature focused on topics similar to this. The Don Nazzer collection holds the majority of vital primary source materials required to properly research the heavy water plants. It should be mentioned that I am a former intern at the Beaton Institute, and the project I was assigned was to take inventory of the materials in the unprocessed Don Nazzer Collection. My previous experience working towards processing the collection has granted me first-hand knowledge of the kinds of material the it holds, as well as knowledge of the abundance of important materials that is unknown to many researchers.

The types of sources this thesis will utilize from the Don Nazzer Collection are diverse, and the scope of sources used will broaden beyond the types of sources mentioned in this essay. The Don Nazzer Collection holds correspondence between major actors that participated in the development and operation of the heavy water plants concerning the DCL plant in Glace Bay and the CGE plant in Port Hawkesbury. These are often inter-firm letters written by company decision-makers, such as a letter from DCL Director and Secretary H. J. Egan to AECL President J. L Grey, where Grey was requesting a month extension from AECL for the purchase order of

4000 tons of heavy water. This letter is beneficial to my research because it serves as an example of how operations occurred at the DCL plant and the DCL director's working relationship with AECL. This letter is one of several extension requests from DCL to ACEL and offers a glimpse into the wider conversation happening on the management level.

Found in the Don Nazzer Collection is the press release from Premier Robert Stanfield in August 1966 regarding the acquisition of exclusive rights for the Province of Nova Scotia to use the GS Process (Spevack Process) in its heavy water plants without needing to pay royalty payments. The press release also mentions how negotiations were underway for CGE to use the Spevack Process in the Port Hawkesbury heavy water plant. CGE was not a client firm of Industrial Estates Limited like DCL nor had a close relationship with the provincial government the same way DCL did. The press release mentions the province will also be able to license other firms seeking to join Nova Scotia's heavy water industry. It can be gathered that the Stanfield government believed there would be more heavy water plants opening in Nova Scotia in the future. The press release also demonstrates the Stanfield government's optimistic view on heavy water being a part of Nova Scotia's industrial landscape. Furthermore, it shows the view of state interventionism in Nova Scotian industries the Stanfield government had, where firms were not nationalized or state-owned the same way DEVCO was, but were privately owned and operated, yet would have an active working relationship with the provincial government.

Among the useful materials that can be found in the Don Nazzer Collection includes an investigation report of an explosion inside one of the GS tanks at the PHHWP plant. Examples such as this offer another fascinating glimpse into the nature of operations at the heavy water plants. However, much of the Don Nazzer Collection is made up of monthly progress reports from contractor firms hired to construct the heavy water plants. The sources can be useful and

offer perspectives from the construction standpoint and negotiations between the contracting companies and the client companies. Part of the legacy of the Cape Breton heavy water plants is the infamous chaotic nature of its construction of all the projects. Newspaper clippings from the *Cape Breton Post* and *Chronicle Herald* were useful sources concerning media coverage of both the announcement of the mega-project and media coverage of its construction. The lifespan of the heavy water plant can be seen through media coverage from hopeful optimism of heavy water being a part of Cape Breton and Nova Scotia's future, to coverage of the construction's setbacks, to the grand unveiling, and then its later closure.

Autobiographies will make up a significant section of the primary source materials this thesis will make use of. However, it should be noted that not all sources labelled as 'autobiographies,' necessarily fit the proper definition of what an autobiography is. These sources are books published by authors who are writing about their experiences of working at the heavy water plants in various capacities. But a noticeable trend can be gleaned from the authors themselves, and typically—concerning the autobiographies this thesis will use—the authors come from professional middle-class backgrounds and had either an occupation related to operating the heavy water plant or were managers in some capacity. So far, working-class voices are absent regarding the construction, operation, and dismantling of the heavy water plants regarding published materials.

Examples of what this thesis refers to as autobiographies include *Hell and Heavy Water: A Glace Bay Heavy Water Plant Story*, by Roland MacInnis, *Is Making Heavy Water Painful? A Story of The Port Hawkesbury Heavy Water Plant, 1969-1975*, by Stanley M. Davies, and *A Splash in Many a Pool*, by John A. MacPherson. These sources deal largely with communicating lived experience of working at the heavy water plants and, despite the authors themselves

disclaiming that they're not historians, they also attempt to piece together the history and politics of the heavy water plants they worked at. Knowing that these texts are not academic pieces, they are still valuable as sources, if the information shared in these autobiographies is carefully considered and treated with the same degree of academic scrutiny as any other primary source.

Some of the information shared in the previously mentioned texts could be considered hearsay. For example, MacInnes claims that AECL President J.L. Grey was strongarmed into awarding DCL the contract for a heavy water plant, as Alberta was the originally planned location for a heavy water plant.[43] MacInnis further claims that this decision was political, as it fits into a wider framework of efforts to economically develop Nova Scotia.[44] It should be noted that MacInnis' book is not the most rigorously researched or completely reliable text, However, MacInnis' claims might also be more telling of a wider narrative that got circulated among MacInnis and his colleagues at the heavy water plant.

E.D. Haliburton's book *My Years with Stanfield* also falls under the category this thesis considers to be an autobiography. Haliburton's book focuses on creating a somewhat biographic sketch of former Nova Scotia Premier Robert L. Stanfield. However, the author was also a colleague of Stanfield and knew each other well. Haliburton's book will be useful for this thesis because it offers a glimpse into how the Stanfield government operated, as well as a perspective on how some of those around Stanfield viewed him. This relates to my thesis because it's almost impossible not to mention Stanfield or his government when discussing the history of the development and operation of Cape Breton's heavy water plants. Moreover, the degree of

[43] Roland MacInnis, *Hell and Heavy, 1*3.
[44] Ibid.

academic scrutiny as discussed regarding the previously mentioned biographies must be equally applied to Haliburton's book as well.

The textual sources mentioned previously offer important insights into the history of the heavy water plants. Materials from the Don Nazzer Collection offer a glimpse into the day-to-day aspects of the construction and operation of the heavy water plants, as well as insights into wider conversations happening at a decision-making level, such as correspondence letters from plant managers, construction contractor managers, and AECL officials—to name a few. However, the limitations of these sources must be addressed, as they are important for the development of framing the heavy water plants, these sources mentioned do not necessarily show the complete story, and certain voices are left out of the conversation.

In *The Voices of the Past: Oral History*, Paul Thompson argues that autobiographies are often produced by what he refers to as a restricted group of social, political, and intellectual leaders.[45] He further states that even if a historian can find an autobiography that matches the particular place, time, and social group, the autobiography might not give attention to the point of the issue the historian is investigating.[46] This is highly relevant concerning the materials available for research for this thesis. Although the autobiographies do not necessarily reliably explain the larger factors at play for why the heavy water plants failed, it doesn't make them less valuable of a source, but their limitations must be taken into consideration.

Thompson argues that the nature of textual primary sources regarding business records do not necessarily account for the complete picture of the realities of working for a company.[47] An

[45] Paul Thompson, *The Voices of the Past: Oral History* (Oxford: Oxford University Press, 1978), 4.
[46] Ibid.
[47]Ibid, 66-67.

example Thompson uses is British mining company records where company record books do not account for the experience of the miners or account for the unconventional methods of pay distribution. The introduction of oral history interviews of the miners themselves showed the realities of how the company worked from the miner's perspective versus the framing of the record books and how the company ought to have worked. Furthermore, it is important to make note of this because much of this thesis utilizes business records typically produced by individuals from similar backgrounds as Thompson mentions. Part of the realities of the construction and operation of the heavy water plants is absent from these records.

The use of oral history interviews would have been very useful for this thesis as the lived experience of a building trades worker would tell a different story than what is reported in materials from the Don Nazzer Collection, or the autobiographies previously listed. Thompson mentions how oral history interviews are like autobiographies but can offer a much more focused scope on the issue being investigated.[48] The materials from the Don Nazzer Collection regarding the heavy water plants often regarded the heavy water plants as Cape Breton's future and the marker of greater things to come. However, local recollection of the Cape Breton heavy water plants does not remember these megaprojects in the same way. Instead, local recollections of the heavy water plants remember it as a flash-in-the-pan event in local history with very little, long-lasting legacies in the communities where the plants are located. Perhaps future research can turn to the oral historical record: it was not feasible at this time.

The research methods utilized for this thesis regarding its analysis of archival and autobiographical primary sources will help with piecing together the turbulent history of Cape Breton's heavy water plants. The information found in the primary sources will help fill in the

[48] Thompson, *Voices from the Past*, 4.

gaps left by the academic secondary sources. The current scholarship on the heavy water plants is non-existent. The Don Nazzer Collection is an untapped wealth of information that is very understudied and offers countless useful materials for piecing together the history of the heavy water plant. However, the limitations of the sources must be addressed, and to do this topic justice, oral history interviews would help provide a clearer image of this event in history and offer a perspective that is underrepresented in formal sources regarding the Cape Breton heavy water plants.

Chapter 1: Canada, Nova Scotia, and the Postwar years

During the 1960s, the Nova Scotia government attempted a variety of industrial schemes in the province. One of the industries that was attracted to Nova Scotia, thanks to the provincial government, was the heavy water industry. The twenty-year foray into heavy water production in Cape Breton, Nova Scotia was a tumultuous endeavour that never ceased to make headlines in the local newspapers during each plant's construction and period of operation. However, the heavy water plants have not made much of an impact on local memory aside from a passing anecdote made by a tradesman once employed by one of the many contracting companies hired to build the heavy water plants, or it could come up in conversation—usually within the context of "remember when?" Cape Breton's heavy water plants were nevertheless part of a much wider context of postwar Canada, views on Canadian economic development, and energy.

The regional economic development view that was taken in Canada during the postwar period greatly contributed to the establishment of heavy water producing facilities in Cape Breton. The historical moment of Cape Breton's heavy water plants' emergence was within a much wider framework involving federal Canadian policies towards regional economic development, and state interventionism in industrial development at the federal level: the shortcomings of these policies would eventually give way to federal Canadian economic philosophies departing from the economic development model, towards a neoliberal view of the state's role in the economy and industrial development.

Canada's involvement with nuclear energy began with the Second World War, the Manhattan Project, and the development of the first nuclear bomb in the 1940s. In Duane Bratt's book, *The Politics of CANDU Exports*, the author explains that, in 1942, Canada's role in the early stages of nuclear technology development, as part of the Manhattan Project, included a lab

at the Universite de Montreal studying heavy water for its nuclear properties.[49]At this point in nuclear weapons development, heavy water was believed to be a viable avenue for construction of a nuclear weapon. However, in 1943, control was wrested from British and Canadian scientists on the Manhattan Project, and the United States had almost complete control of the project.[50] Bratt claims that after General Leslie Groves took control of the Manhattan Project, British and Canadian governments became less welcome on the project because of American concerns regarding British and Canadian companies such as Imperial Chemical Industries and Defense Industries Ltd. emerging as possible competitors for American corporations in terms of developing atomic energy for civilian use.[51]

The potential for nuclear fission to be used as an energy resource for the civilian world was recognized even while the first nuclear bomb was being developed. Shortly after the first uses of the nuclear bomb in the cities of Hiroshima and Nagasaki, C.D. Howe, the Canadian Minister of Munitions and Supply, argued in his statement to the provincial premiers

> …the real significance does not lie in the fact that this new bomb has accomplished an almost incredible feat of destruction, important as that fact may be; its significance is that this bomb is a sign which all can appreciate that the basic problems of the release of energy by atomic fission have been solved, and that the unbelievably large amounts of energy which scientists have long believed to be associated with matter can now be made available for practical use.[52]

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[49] Duane Bratt, *The Politics of CANDU Exports* (Toronto: University of Toronto Press, 2006), 8.
[50] Ibid, 9.
[51] Ibid.
[52] Bratt is citing part of C.D. Howe's statement to the provincial premiers in October 1945. Ibid. 10-11.

C.D. Howe is a very important figure in mid-twentieth-century Canadian labour history. Howe was a Liberal Cabinet Minister and former Member of Parliament for Port Arthur, Ontario. During Howe's service in the Canadian federal government, he was described as Canada's 'minister of everything.'[53] His role as Minister of Munitions and Supply during the Second World War had significantly set the stage for much of Canada's industrial future in the latter half of the twentieth century.[54] C.D. Howe's view of the potential for civilian uses of nuclear fission was mostly absorbed into the pantheon of industrial schemes Howe wished to get involved with.

The international component of nuclear technology is inextricable from the realities of nuclear weapons development. It is almost impossible to write a comprehensive history of nuclear energy without mentioning how intertwined the development of nuclear energy is with the development and implementation of nuclear weapons. The development and the proliferation of both nuclear energy and nuclear weapons has always had significant state intervention. As Bratt reminds us, negotiations of trade in nuclear technology requires significant state intervention.[55] Due to the high risk involved with trading nuclear technology, industrial development in the nuclear industry was inevitably going occur under different conditions compared to other industrial schemes.

Research on the civilian uses of heavy water in Canada can also be traced back to 1943, when a small heavy water plant in Trail, British Columbia had been established.[56] The plant was built and operated by the Consolidated Mining and Smelting Company of Canada Ltd (Cominco)

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[53] Anastakis, *Auto Pact*, 22.

[54] Don Nerbas, *Dominion of Capital: The Politics of Big Business and the Crisis of the Canadian Bourgeoisie, 1914-1947* (Toronto University Press, 2013), 240-1.

[55] Bratt, *Politics of CANDU Exports*, 4.

[56] R. K. Rae, "Heavy Water," in *Canada Enters the Nuclear Age: A Technical History of Atomic Energy of Canada Limited as Seen from its Research Laboratories*, ed. D.G. Hurst (Montreal: Queen's School of Policy Studies, 1997), 334.

and was financed as part of the Manhattan Project.[57] It operated until 1956 when the contract expired with the USAEC:[58] Cominco attempted to broker a deal with the Canadian Crown corporation Atomic Energy of Canada Ltd. (AECL), but Cominco's offer was not accepted by AECL.[59] In *Auto Pact: Creating a Borderless North American Auto Industry, 1960-1971*, Dimitri Anastakis explains that during this period of Canadian history, postwar concerns of continental integration with the United States significantly influenced Canadian economic protectionist policies.[60]

AECL not accepting Cominco's offer is likely part of a wider conversation happening in Canada during the postwar period, such as federal Canadian economic protectionist policies as well as ideas of regional economic development. It is likely AECL's refusal of Cominco's offer may have stemmed from AECL's and the Canadian federal government's concern with working with a firm that once did business with the USAEC during the Second World War and for a brief stint in the postwar period. It is also likely that AECL didn't view the offer as necessary since this was before the development of the CANDU reactors in Canada, and previous reactors such as the ZEEP and NRX were mostly for research.[61] However, it is equally possible that AECL didn't like the rate of $76 per kg of heavy water Cominco was offering.[62]

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[57] Ibid.

[58] Ibid. It is unclear if Rae was referencing the United States Atomic Energy Commission, or if he was referencing the United States Army Environmental Command – both of which use the same acronym USAEC.

[59] Rae, "Heavy Water," 334.

[60] Dimitry Anastakis, *Auto Pact: Creating a Borderless North American Auto Industry, 1960-1970* (Toronto: University of Toronto Press, 2005), 5.

[61] Bratt, *CANDU Exports*, 10.

[62] Rae uses the metric system when explaining the value of heavy water. However, most (if not all) the materials in the Don Nazzer Collection that deal with negotiations between AECL and DCL, and AECL and CGE, measure the value in imperial tons. Documents regarding the construction of the DCL and CGE plants, including letters from AECL reference the plants in the imperial system. For example, the DCL plant was referred to as a"200-300 ton a year, heavy water plant." Rae, "Heavy Water," 334.

The history of Canada's heavy water industry is interlinked with the history of Canada's development of nuclear reactors—and vice versa. Roland MacInnes' book, *Hell and Heavy Water: A Glace Bay Heavy Water Plant Story*, notes "No heavy water, no CANDU!"[63] This view of the importance of heavy water regarding the success of the CANDU reactors was most likely held by many plant workers at the Glace Bay Heavy Water Plant. The role of Canadian nuclear reactors—culminating in the CANDU reactors— was intended to go beyond national energy self-sufficiency. As early as 1955, AECL outlined that one of its major objectives was to carry out the nuclear reactor program in such a way that Canada would be able to design and construct nuclear power reactors and their components for both the domestic and foreign markets.[64] Exporting nuclear technology and equipment internationally was viewed as a necessary component of Canada's nuclear industry because Canada's domestic market for nuclear technology and equipment wasn't large enough to sustain itself.[65] Canadian nuclear reactors such as CANDU reactors require a supply of heavy water for operation. The demand for heavy water producing facilities in Canada was not only to supply the CANDU reactors across Canada, but also with the more than likely intention to export heavy water to the nations where Canada had sold its CANDU reactors. Bratt argues that CANDU exports were not normal business transactions between countries but significant long-term, intensive, and expensive bid processes that required substantial state intervention.[66]

There are multiple examples of Canadian state interventionist policies being implemented in the economy and industries during the postwar period. Since the Canadian federal government

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[63] Roland MacInnis, *Hell and Heavy Water: A Glace Bay Heavy Water Plant Story* (CreateSpace Independent Publishing Platform, 2018), 7.

[64] Bratt, *Politics of CANDU Exports*, 16.

[65] Ibid, 21.

[66] Ibid, 19.

already had a track record involving itself in Canadian industries (most notably the auto industry) it wasn't an enormous leap for the involvement of the state in the development, construction, and manufacturing of nuclear technology, equipment, and components. Many who have written histories of the Cape Breton heavy water plants have argued that the place of the heavy water industry in Canadian economic history was viewed by both federal and provincial governments as part of regional economic development efforts.[67]

The regional economic development approach and how it was viewed and implemented by both federal and provincial governments is highly relevant to explaining the context of the historical moment that surrounded Cape Breton's heavy water plants. In Donald Savoie's book, *Regional Economic Development: Canada's Search for Solutions*, he claims that among the nations that the UN classified as industrialized market economies, Canada's economy is the most regionalized.[68] Savoie further argues that in free-market economies, inequalities are part and parcel of that system, and not all regions simultaneously benefit.[69] There is a conflict where people from economically disadvantaged areas argue that national economic policies are largely responsible for economic underdevelopment, while people from better economically developed areas argue that too much money is being spent on inefficient economic activity in what Savoie refers to as slow-growth areas.[70] An example of this dichotomy is the Atlantic Canadian provinces concerning larger economic and political powerhouses of central Canada, specifically Ontario and Quebec.

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[67] MacInnis, *Hell and Heavy Water*, 13; Rae, "Heavy Water,"337.

[68] Donald Savoie, *Regional Economic Development: Canada's Search for Solutions, Second Edition* (University of Toronto Press, 1992), 3.

[69] Ibid.

[70] Ibid.

In Fred Burrill's article, "Re-developing Underdevelopment: An Agenda of New Histories of Capitalism in the Maritimes," regarding the Maritime provinces and the legacy of economic underdevelopment, he argues:

> For much of the latter half of the 20th century, various versions of the narrative of Maritime economic underdevelopment exercised a virtual stranglehold over the study of the region's position in the country. Post-Second World War Maritime-born scholars experiencing the indignity of regional stereotypes in universities in central and western Canada and the frustrations at home of an alphabet soup of successive, incomplete federal government regional development programs helped develop an alternative regionalist narrative—a story of political machinations in far-off Ottawa systematically disadvantaging regional interests and of a central Canadian historiography littered with falsehoods of patronage-ridden regional conservatism and inevitable decline after a "Golden Age" of wind and sail in the mid-19th century.[71]

The economic and political inequalities between the Atlantic provinces and central Canada can be traced back as far as Confederation and beyond. Concerns of economic underdevelopment in the Atlantic provinces during the mid-twentieth century were a crucial factor that contributed to the establishment of heavy water producing facilities on Cape Breton Island. The introduction of a heavy water industry in Cape Breton could have acted as a solution to possible related to the coal and steel industries, since the plants required coal for the heavy water making process.

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[71] Fred Burrill, "Re-developing Underdevelopment: An Agenda of New Histories of Capitalism in the Maritimes," *Acadiensis* 48 (October, 2019): 181-2.

Donald Savoie describes the objectives of the economic development approach consisting of (a) capital accumulation, (b) assistance in creating an adequate industrial infrastructure, (c) an increase in the educational level of the workforce, (d) promotion of the application of new technology, and (e) assistance in modernizing agricultural methods and in constructing new roads, harbours, and sewer systems.[72] Except for the objective to educate the workforce, the objectives Savoie outlines correspond with the objectives of Nova Scotia's notorious provincial Crown-owned industrial development agency, Industrial Estates Ltd.[73] The development approach was heavily inspired by the study of underdeveloped countries.[74] This theme of inequalities from differences of cardinal directions is common. Burrill expands on this idea:

> the axis needs to be expanded in order not only to understand East-West "relations of extraction" but also to look at productive links along global North-South supply chains and to re-centre environmental factors and engage in a more complex manner with the internal logic of primary resource economies.[75]

Views regarding east-west oppression concerning economic development can carry the risk of aligning itself and minimizing the damage caused by the global north-south legacy of oppression.[76]

Cape Breton's heavy water plants overlap with a moment in Canadian history when the role that the state played in the economy and industrial development began to be called into question, and a noticeable shift away from the economic development approach began to

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[72] Savoie, *Regional Economic Development*, 7.

[73] Roy E. George, *The Life and Times of Industrial Estates Limited* (Halifax: Dalhousie University, Institute of Public Affairs, 1974), 7-8.

[74] Savoie, *Regional Economic Development*, 7.

[75] Burrill, "Re-developing Underdevelopment," 185.

[76] Ibid.

manifest. The emergence of neoliberalism significantly impacted much of Canada's industrial sector, and Cape Breton's heavy water plants were no exception. In 1985, Brian Mulroney's government in Ottawa shut down the AECL Glace Bay Heavy Water Plant, which resulted in the loss of seven hundred jobs.[77] This was part of wider shift from the Mulroney government to move away from development approaches of previous regimes.[78] Instead, the federal government took a different approach, one inspired by "Reaganomics," and government focus became principally concerned with national debt and deficits, and budgetary matters. [79]

A good example of this shift in views of state interventionism in Canada's economy is the federal Crown corporation, Cape Breton Development Corporation (DEVCO). In Cape Breton, DEVCO was largely known as the operating agency that managed Cape Breton's key primary industries which consisted of coal and steel. Happening at the same time as Mulroney's government's decision to shut down the Glace Bay Heavy Water Plant, twelve hundred jobs were lost due to a disastrous fire at No. 26 Colliery, which claimed the life of one miner.[80]

DEVCO was intended to experiment with regional development in Cape Breton.[81] In December 1988, bill C-103 eliminated DEVCO's Industrial Development Division (IDD), and replaced it with Enterprise Cape Breton Corporation (ECBC) in its stead, essentially hamstringing Cape Breton Island's ability for future industrial development during a time of economic distress for the region. [82] ECBC was created to administer the Cape Breton Investment

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[77] This paper was presented by James Bickerton on behalf of the United Mine Workers of America for an arbitration hearing. James Bickerton, "Assessing the Regional Development Aspects of the DEVCO Closure" (Unpublished Manuscript, November 1999), typescript, 5.

[78] Raymond B. Blake, *Transforming the Nation: Canada and Brian Mulroney* (McGill-Queens University Press, 2007), 164.

[79] Blake, *Transforming the Nation*, 164.

[80] Bickerton, "Regional Development Aspects of the DEVCO Closure," 5.

[81] Bickerton quoting Tom Kent, former DEVCO President. Ibid.

[82] Ibid, 5-6.

Tax Credit, which resulted in substantial public funds being funnelled towards private investors willing to launch or expand businesses in Cape Breton.[83] This is one link in the chain of the process of deindustrialization Cape Breton Island was subjected to.

Cape Breton's heavy water plants occupy a unique position in Atlantic Canadian industrial history. The heavy water plants were products of the nuclear age, and the optimistic view of the future many believed it would be a part of in the postwar years. It sat at the crossroads of the economic development approach, and the emergence of neoliberalism. The heavy water plants were once part of a wider concerted effort of mid-twentieth century industrialists in Atlantic Canada who attempted to develop the region away from primary industries such as steel and coal. The desire for the Atlantic Canadian region to view attracting industries as a driver of both economic development and regional independence from central Canada mirrors the Canadian federal government's concerns of dependence on the United States. The international and federal Canadian views place Cape Breton's heavy water plants into wider conversations about federal policies of development and construction of nuclear technology and components, Canadian views on nuclear energy, and the international relations aspects of exporting nuclear technology and components.

The Nova Scotia Perspective of Attempted Regional Industrial Development

Nova Scotia's efforts at regional development during the postwar years, up until the 1970s, significantly impacted this history. As mentioned in the previous section, Cape Breton's heavy water plants are connected to a multitude of conversations that were occurring at all levels of government as well as in international politics—a great majority concerning the United States.

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[83] Ibid.

Private enterprise was also attached to these government conversations, as the industries they represented were much sought after because of the unstable nature of the province's pre-existing primary industries such as coal and steel, as well as issues related to staple industries in the province such as agriculture, forestry, and fishing—respectively. The Premier's seat in the province of Nova Scotia was a significant driver for industrial development in the province. But despite public demand, political will, and state interventionist policies being implemented, Nova Scotia's attempts at creating a new secondary manufacturing sector didn't stimulate the province's economy as much as what was expected.

There are many factors for why Nova Scotia's postwar industrial development didn't meet the optimistic expectations the provincial government had set out. These factors include the legacy of the National Policy in Nova Scotia and the way the Canadian economy is structured, the unstable foundation the regional economic development model is built on, and Nova Scotia's mismanagement of managerial capitalism.[84] The heavy water plants do not encompass the entirety of Nova Scotia's attempts at postwar industrial development, but the failures of the Glace Bay Heavy Water Plant and the Port Hawkesbury Heavy Water Plant cost millions of dollars and had damaged public perceptions of the government's ability to intervene in industry and the economy. However, these heavy water plants were part of a longer list of unsuccessful firms Nova Scotia had involved itself with.

Cape Breton's heavy water plants were born from the climate beginning with the Premiership of Robert L. Stanfield. The previous provincial Liberal government, under the leadership of long-serving Premier Angus L. Macdonald, had taken the position that public

[84] Williams, "The world is in Chaos,"362-3. These arguments have also been made in other pieces too such as, Savoie's *Regional Economic Development*, and Acheson's "The National Policy and Deindustrialization of the Maritimes, 1880-1910."

works and infrastructure development was their preferred method of provincial development.[85] As MacKinnon explains, part of the reason why Robert Stanfield took up the position of managerial capitalism during the 1950s, was to distinguish himself from Angus L. Macdonald.[86] However, this was all occurring within a moment in Canadian history where this transitionary phase in Canadian capitalism does not occupy a simple categorization of two dichotomous forms.[87] Angus L. Macdonald represents liberal traditional approaches to the state's role in the economy and industry, and Robert Stanfield represents state-interventionist capitalism.[88]

The history of Cape Breton's heavy water plants is intertwined with the history of the regional economic development model being used in Nova Scotia, which is also connected to wider conversations that date back to pre-confederation in Canada. Robert Stanfield's premiership from 1956-1967 is an important piece of the puzzle for understanding how industrial development was approached in the Nova Scotia during the mid-twentieth century. The approaches the Stanfield government had towards industrial development in the province were grand and optimistic. However, the introduction of new industrial firms to the province didn't stimulate the economy to the degree that was hoped for. Investigating these failures and approaches Robert Stanfield and his government had can yield insights into the ways that deindustrialization had manifested itself in Nova Scotia during the latter half of the twentieth century.

In Rick Williams' chapter, "The World is in Chaos, The Future Looks Bright," in *Toward a New Maritimes*, he writes that during the pre-Confederation period, the Maritimes once

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[85] MacKinnon, "Importing the Clairtone Sound," 151.
[86] Ibid.
[87] MacKinnon citing Don Nerbas. Ibid, 152.
[88] Ibid.

prospered under the approaches of the early to mid-eighteenth-century Canadian regime because the Maritimes had the skills and the capital to industrialize quickly.[89] The introduction of the National Policy in 1878 severely hampered the Maritime province's abilities to grow their economies. Williams argues that Canada is built on the economic inequality of its constituent regions, and the National Policy was used by Canada's early nation-builders to protect markets and build up a manufacturing sector.[90] However, the population of central Canada expanded, and Toronto and Montreal banks and trusts were able to gain control of national capital markets.[91] While this was occurring, investment in the Maritime region had drained, and it became indisputable that central Canada was the centre of the national economy.[92]

Williams' central argument is that "To understand what free trade with the United States is doing to the central Canadian economy today, one need only study the dramatic deindustrialization that took place in the Maritimes under similar conditions of free trade within Canada a century ago."[93] During the early years of Canada, a pattern developed in the country where manufacturing was clustered in the central regions to serve the domestic markets, while regions that existed on the periphery relied on the staple trades that existed since the colonial period—agriculture, forestry, minerals, and energy.[94] This economic pattern produced severe economic inequalities and regional disparities. This resulted in public pressure for the federal government to use its taxation and legislative powers to intervene.[95] As Williams explains, a dual

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[89] Rick Williams, "The World is in Chaos, The Future Looks Bright," in *Toward a New Maritimes*, ed. Ian McKay and Scott Milsom (Ragweed Press, 1992), 362.

[90] Ibid.

[91] Ibid.

[92] Rick Williams, "The World is in Chaos, The Future Looks Bright," 362

[93] Williams, "The World is in Chaos," 363.

[94] Ibid.

[95] Ibid.

economy was formed in Canada during the postwar period where the "real" economy moved wealth toward the centre, while the federal government used its taxation powers to extract taxes on corporate personal income tax from the centre, which is then distributed to people and governments occupying the peripheral regions.[96]

The theme of neoliberalism is one of many factors that contributed to the failure of the Cape Breton heavy water plants. Not only have neoliberal doctrines from Ottawa in the mid-1980s contributed to the shutdown of the last remaining heavy water plant in Cape Breton, but the establishment of central Canada as the centre of the Canadian economy and industrial base of the country, and the National Policy ratcheting away Canadian regions from trading with foreign markets during the early years of Confederation, has contributed to the construction of an economic system that has severely inhibited the Maritime region from developing a strong industrial sector beyond coal and steel.

The premiership of Robert Stanfield and his government acted enthusiastically within the purview of regional economic development and believed that Nova Scotia could once again prosper by attracting manufacturing firms to do business in the province. E.D. Haliburton, former Minister of Agriculture and Marketing, and later Minister of Lands and Forests in the Stanfield government, and author of *My Years with Stanfield*, gives fascinating insights into perspectives and conversations that were happening in the Stanfield government—with an emphasis on industrial development.

Perhaps one of the many factors that influenced Stanfield's views on state interventionism and the necessity of industrial development in Nova Scotia was the Stanfield

[96] Ibid.

family's business. Haliburton explains that Charles Edward Stanfield was the first Stanfield to emigrate from Bradford, England to Prince Edward Island in 1856, where he would eventually establish a woollen mill.[97] In 1896, Frank and John Stanfield moved the mill to Truro, Nova Scotia, and Haliburton comments, "It is one of the few successful enterprises which has not sold out to the capitalists of central Canada."[98] Haliburton is referencing the effects the National Policy had on the Maritime region and further emphasizes the contrasts between pre and post-Confederation Maritime provinces.[99] The Stanfield family mill and the family's well-to-do status had undoubtedly shaped Robert Stanfield's views towards regionalism, the necessity for industrial growth, and his political philosophy which he inherited from his family.[100]

The legacy of the National Policy is a consistent reoccurring theme regarding conversations on why Nova Scotia didn't develop an industrial sector that was as successful as central Canada's. As Williams explains, the Maritime economy isn't built on market forces the same way central Canada was, as the Maritime economy relies on politically generated policies, institutions, and programs.[101] This might help to answer Burrill's question of why 20th-century modernizers pursued such flawed industrial schemes. In the case of Stanfield's premiership, state interventionism was most likely the only route available for industrial growth in the province. Relying solely on foreign markets and outside investment in the province wasn't an option.[102] Incentives to invest in the region aren't as attractive to investors as the already developed central

[97] E.D. Haliburton, *My Years with Stanfield* (Windsor: Lancelot Press, 1972), 10.
[98] Ibid.
[99] Ibid, 25.
[100] Haliburton claims that Robert Stanfield's political philosophy of conservatism didn't entail maintaining the status quo but had views on how to improve it. Ibid, 13.
[101] Williams, "The World is in Chaos," 363.
[102] Williams, "The World is in Chaos," 363.

Canadian industrial sector and financial hub: why take a chance when the safer option could yield more returns on investment?

Roy E. George, in *The Life and Times of Industrial Estates Limited*, states that during the Macdonald premiership the Department of Trade and Industry had operated an Industrial Loan Act in 1948 and an Industrial Expansion Act in 1951, but these policies didn't produce the radical results in growing the province's industrial sector that were needed.[103] Bringing industrial development to Nova Scotia was a heavily significant goal the Stanfield government attempted to achieve. Its first venture into economic development was in 1957 when the Stanfield government created the Crown corporation known as Industrial Estates Limited (IEL), with the assigned role of stimulating the growth of secondary manufacturing in Nova Scotia by attracting new industries to establish themselves in the province and encouraging existing industries to expand.[104] IEL stands out as the Stanfield government's main tool of state intervention in the economy and industry in Nova Scotia. George claims that IEL was the first company of its kind in Canada and the forerunner to similar companies being established in other provinces.[105]

In the postwar years in Canada, much of the Canadian left viewed the possibility of state interventionism as a possible salve for the problems identified by popular movements like social democracy. The Conservatives under Stanfield did not take this view. Instead, Nova Scotia's industrial development schemes took a more industrialist/technocratic approach—much different than the version of state interventionism many Nova Scotians had in mind. As MacKinnon reminds us:

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[103] Roy E. George, *The Life and Times of Industrial Estates Limited* (Halifax: Dalhousie University, Institute of Public Affairs, 1974), 5.

[104] Ibid, XI.

[105] Ibid.

> …the program of industrial development enacted under Stanfield sought to diminish some of the economic difficulties facing the Maritimes under Confederation; however, as we shall see, such efforts were not rooted in the aims of social justice and were ultimately devoid of significant social democratic commitment.[106]

Before Stanfield and the heavy water plants, there existed desires for state-led interventionist policies in the coalfields of Nova Scotia that can be traced back to the "Labour Wars" of the 1920s.[107] Calls for state-led interventionism in Nova Scotia viewed it taking shape in the form of understandings of working-class solidarity and economic justice.[108]

The way state interventionism manifested itself in Nova Scotia under the premiership of Robert Stanfield was not rooted in the same socially conscious understandings of interventionism thought of in the province's coal towns. Managerial capitalism under Stanfield had, in a sense, deputized select business leaders and politicians to grow Nova Scotia's industrial base, taking shape in the form of IEL. This is exemplified in the leadership of the provincial Crown corporation: George claims that, between 1957-1971, four out of the thirty-seven serving directors for IEL were Ministers in the Nova Scotia Government.[109] The three Ministers of Trade and Industry always held the directors' seat.[110] Most of the other directors were drawn from the Nova Scotia business community, largely comprising owners or executives of real estate development businesses, distribution companies, and contracting businesses.[111] Considering how

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[106] MacKinnon, "Importing the Clairtone Sound," 153.
[107] Ibid.
[108] Ibid.
[109] George, *Industrial Estates Limited*, 14.
[110] Ibid.
[111] George, Industrial Estates Limited, 14.

IEL was intended to be an industrial development company, George comments on how the lack of experience the directors had in the industrial field of business was a problem for the company's effectiveness.[112]

The theme of major business owners in Nova Scotia being deputized by IEL to stimulate industrial growth in the province is a highly significant factor in understanding how this Crown corporation operated. This is evident when considering IEL's first and longest running President, Frank H. Sobey, the grocery store magnate, who served from 1957 until his resignation in 1969. [113] Stanfield had described Frank Sobey as "…one of the most energetic and successful businessmen in Nova Scotia.[114] This esteem Stanfield held for Sobey is significant for understanding the rationale for why he was asked to lead a state-owned industrial development company. However, as George explains, Sobey's incompatibility with managing an industrial growth company became apparent, as Sobey was sometimes described as the old-style businessman in the sense that he wasn't very articulate but forceful and regarded to be a good judge of business ventures.[115]

Despite the problems that were present during IEL's tenure, it did manage to gain two successful deals. IEL's successes include Michelin and Stora Kopparberg. In 1970, Michelin came to Nova Scotia thanks to the efforts of IEL to secure the deal.[116] The reasoning behind Michelin's coming to Nova Scotia was to establish North American manufacturing facilities to supply North American markets.[117] But labour relations at the Michelin plants were poor, and the

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[112] Ibid.
[113] Ibid, 16.
[114] George citing Stanfield. Ibid.
[115] Ibid.
[116] George, *Industrial Estates Limited*, 90.
[117] Ibid.

union organizing environment at the facilities was described as half game and half guerilla warfare.[118] This gives an idea of how Nova Scotia's foray into state interventionism in industry had taken shape, and how it wasn't necessarily for the benefit of Nova Scotian workers as a whole. As for Stora Kopparberg, the pulp mill located in Pictou is currently still in operation. However, IEL's biggest failures were twofold: they included Clairtone Sound Corporation Limited and Deuterium of Canada Limited.[119] Regarding IEL's failures, Haliburton stated, "It [Deuterium of Canada Limited] was one of the two nightmare incidents in the course of the Stanfield administration. The other was Clairtone."[120]

The premiership under Robert Stanfield is highly relevant for understanding the political and economic climate in Nova Scotia during the postwar period. Although Stanfield had employed the help of major business owners such as Frank H. Sobey to manage his organization that was thought to lead Nova Scotia toward a brighter future of economic and industrial development for the province, the execution of Stanfield's initiatives did not yield the desired results of stimulating growth or leaving a positive long-lasting impact on the province. However, the legacy of the Nation Policy on Nova Scotia might help explain why Stanfield's efforts of attempting to develop a secondary manufacturing base were unsuccessful.

There are many factors for why managerial capitalism was chosen as the preferred method of stimulating growth in Nova Scotia by the Robert Stanfield government. As Williams explains, because of the legacy the Nation Policy had on Nova Scotia, the province relies on

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[118] Ken Clare, "Michelin: The Fortress that Didn't Fall," in *Toward a New Maritimes*, ed. Ian McKay and Scott Milsom (Ragweed Press, 1992), 33.

[119] Haliburton, *My Years with Stanfield*, 92.

[120] The history of Nova Scotian government's experiment with attracting Clairtone to establish a home electronics manufacturing facility is the subject of MacKinnon's 2023 article, "Importing the Clairtone Sound." Ibid.

politically generated policies and programs for its economy.[121] If Nova Scotia instead relied on foreign investment, the province would have been more deprived and underdeveloped than it already is.[122] State intervention was necessary for development, as there isn't much capitalist incentive to invest in the region compared to the safer investment options located in central Canada. The Stanfield government perhaps recognized this and the necessity for state intervention but never addressed or considered the deep-seated systemic issues of why Nova Scotia is in this position.

[121] Williams, "The World is in Chaos," 363.

[122] Williams, "The World is in Chaos," 363.

Chapter 2: The Heavy Water Plants

In heavy water nuclear reactors—including CANDU reactors—heavy water is used as a coolant and moderator because it absorbs fewer neutrons than hydrogen.[123] This is extremely important for the operation of a heavy water nuclear reactor because nuclear fission reactions require neutrons to carry out their chain reactions.[124] Heavy water is kept under pressure which increases its boiling point so that it can operate at high temperatures.[125] Heavy water is the common name for D_2O, which is the chemical name for deuterium oxide.[126] Light water (H_2O) and heavy water are similar in many ways, but the key difference is that the hydrogen atom in each water molecule is replaced by "heavy" hydrogen—the proper name for this is deuterium.[127] The deuterium in the water molecule makes D_2O about 10% heavier than ordinary water.[128] Deuterium occurs in nature with hydrogen at a concentration varying from 80 to 160 parts per million atom ratio.[129]

There is a low natural abundance of deuterium, which is why separating equipment with both a very large flow capacity and a high degree of enriching capability is required to manufacture heavy water.[130] The low absorption cross-section of heavy water permits the use of natural uranium, which is low in fissile content and would not attain critically in a light-water

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[123] "Use as a moderator," Heavy Water, Energy Education, effective 15 April, 2025, https://energyeducation.ca/encyclopedia/Heavy_water.

[124] Ibid.

[125] Ibid.

[126] "What is Heavy Water," CANDU Nuclear Power Technology, Canadian Nuclear FAQ, effective 28 March, 2025, https://www.nuclearfaq.ca/cnf_sectionA.htm#e.

[127] Ibid.

[128] Ibid.

[129] Rae, "Heavy Water," 333.

[130] Ibid.

lattice in a nuclear reactor core.[131] Instead of using enriched uranium, CANDU reactors use uranium in its natural state -thanks to the use of heavy water for its functions.[132] CANDU reactors tend to be larger than light water reactor cores, and boast a larger water inventory.[133] This leads to advantages regarding safety under extreme accident conditions.[134]

The heavy water making process that both the Glace Bay Heavy Water Plant and the Port Hawkesbury Heavy Water Plant used was the Girdler Sulfide process (GS process), also known as the Spevack Process – named after its discoverer and eventual President of Deuterium of Canada Limited The basis for the GS process is the exchange between liquid water (H_2O) and gaseous hydrogen sulfide.[135] During the process, the reaction occurs spontaneously in the liquid phase between the water molecules and the dissolved hydrogen sulfide molecules—which is in equilibrium with the gas phase.[136] After this reaction, deuterium transfers between the gas phases and liquid phases, until the two phases reach equilibrium with each other.[137] This process is carried out in large towers that look similar to distillation towers.[138] The towers contain sieve trays where the gas and water used in the process are intimately mixed so their deuterium contents approach equilibrium.[139] The two phases of liquid and gas then separate and the gas flows upward from tray to tray countercurrent to the water flowing down from tray to tray.[140]

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[131] "What is Heavy Water," CANDU Nuclear Power Technology, Canadian Nuclear FAQ, effective 28 March, 2025, https://www.nuclearfaq.ca/cnf_sectionA.htm#e.

[132] "Use as a moderator," Heavy Water, Energy Education, effective 15 April, 2025, https://energyeducation.ca/encyclopedia/Heavy_water

[133] "What is Heavy Water," CANDU Nuclear Power Technology, Canadian Nuclear FAQ, effective 28 March, 2025, https://www.nuclearfaq.ca/cnf_sectionA.htm#e.

[134] Ibid.

[135] Rae, "Heavy Water," 335.

[136] Ibid.

[137] Ibid.

[138] Rae, "Heavy Water," 335.

[139] Ibid.

[140] Ibid.

Enrichment of deuterium in one phase to another is the result from repeated countercurrent contact.[141]

The GS process captures deuterium by cascading it through successive hot and cold towers—the same towers that contain the sieve trays—at high pressure.[142] Deuterium concentrates in the gas in the hot tower, while deuterium is simultaneously being concentrated in the liquid being held in the cold tower.[143] The outcome of this process of moving liquid and gas forward through the outlined steps is deuterium being concentrated at around 20%, which can then be upgraded to 99.75% using an ordinary distillation process.[144] In Roland MacInnes' book, he shares a rhyme that is used to remember the GS process, "Deuterium will pass from the liquid to gas if the tower is hot…otherwise it will not."[145]

Heavy Water Comes to Cape Breton

Cape Breton's heavy water plants were at the centre of a crossroads during a moment in Canadian history that was experiencing drastic change. This region, on Canada's economic and political periphery, had played host to what was thought to be not only the dawn of a new form of industrial development taking shape in Cape Breton but also a monumental step forward into the future for Canada's contribution to the world. The legacy of the National Policy contributed significantly to the stagnation and decline of industrial growth in the region.[146] Calls for nationalization and other state interventionist policies that have stemmed from the labour

[141] Ibid.
[142] MacInnes, *Hell and Heavy Water*, 128.
[143] MacInnes, *Hell and Heavy Water*, 128.
[144] Ibid.
[145] Ibid.
[146] Williams, *The World is in Chaos*, 362-3.

movement since the early twentieth century with social justice in mind, had created an environment where political leaders such as Premier Robert Stanfield, taking up the mantle of managerial capitalism.[147] The development approach was utilized in Nova Scotia through state-interventionist policies and managerial capitalism– as relying purely laissez-faire capitalism in Nova Scotia was not yielding the desired results. Investigating the births of both the Deuterium of Canada Limited Heavy Water Plant in Glace Bay and the Canadian General Electric Heavy Water Plant in Port Hawkesbury offers a unique example of when all the above points intersect with one another.

The Glace Bay Heavy Water Plant opened on May 1st 1967, to great fanfare. Some forty journalists and writers from across the United States and Canada attended the press conference that was held on the site of the newly built facility.[148] Following the press conference, the writers and journalists would then be taken on a tour of the facility.[149] Later that day, a dinner and official party was held at the Isle Royale Hotel in Sydney. The party was led by the Lieutenant Governor for Nova Scotia, H.P. MacKeen, and in attendance were major figures such as: Nova Scotia Premier Robert Stanfield; Federal Health Minister and Member of Parliament for Inverness Richmond Allan J. MacEachen who at the time was federal Health Minister; Frank H. Sobey, Chairman of the Board of Deuterium of Canada Limited, as well as President of Industrial Estates Limited;[150] Jerome Spevack, President of both Deuterium of Canada Limited and Deuterium Corporation in New York; Harold C. Urey, director of Deuterium Corporation and the scientist who discovered deuterium; J.L. Grey, President of Atomic Energy of Canada

[147] MacKinnon, "Importing the Clairtone Sound," 151.
[148] "Heavy Water Plant Opens Monday: Colorful Ceremony," *Cape Breton Post* (Sydney: 27 April, 1967): 3.
[149] Ibid.
[150] Roy E. George, *Industrial Estates Limited*, 16.

Limited; and the Mayor of Glace Bay, Dan MacDonald.[151] They were all major figures in the effort to establish a heavy water industry in Canada and key decision-makers in its management.

Leading up to the grand opening, the mood around the area was highly optimistic. A *Cape Breton Post* article viewed the opening of the Glace Bay Heavy Water Plant, the world's first commercial heavy water plant, as a significant step towards bringing the town of Glace Bay closer to the "age of miracles."[152] The newspaper wrote about the technological and scientific advances up until that point in history, and how it was believed that the atomic age would bring civilization even closer to a utopian future thanks to scientific discoveries and the adoption of nuclear technology: "Cape Breton now enters the age of nuclear energy, and could now well be entering an era of industrial development such as was never envisioned by our ancestors."[153] Although the topic of the article was the plant opening, its author references the unstable nature of Cape Breton's coal and steel industries, as well as references to Cape Breton's history of losing industries to Quebec and Ontario.[154] However, it was also believed that the coal and heavy water industries could coexist because this design of heavy water plant could use coal to produce steam, a requirement for the heavy water making process.[155] The heavy water plants weren't meant to replace the existing coal and steel industries in Cape Breton but were envisioned to be supported by the local coal industry.

Conversations regarding the unequal relationship Nova Scotia has with Quebec and Ontario correspond with Rick Williams' arguments regarding the legacy of the National Policy in

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[151] "Heavy Water Plant Opens Monday: Colorful Ceremony," 3.
[152] "The Miracle of Mans Achievement," *Cape Breton Post* (Sydney: 1 May, 1967): 1.
[153] "The Miracle of Mans Achievement," *Cape Breton Post* (Sydney: 1 May, 1967): 1.
[154] Ibid.
[155] Haliburton, *My Years with Stanfield*, 86.

Nova Scotia.[156] This shows that the shift in how the Canadian economy would operate shortly after confederation, and the direct effects it had on periphery regions such as Nova Scotia, were still being felt almost a century after the Nation Policy was passed into law. The subtext of this newspaper article reads as though the heavy water plant could be the start of a shift away from the Island's main industries of steel and coal, and evidence of a desire to contribute to the production of something that was thought to help improve living standards and be a positive impact on the world. While this was happening, construction on the Port Hawkesbury Heavy Water Plant was underway, and residents of Cape Breton were led to believe that their Island would soon become the heavy water production centre of the world.[157]

Almost four years prior, on the 31st of August, 1963, the *Cape Breton Post* had announced that the largest industrial undertaking in Cape Breton since the construction of the Sydney steel plant at the turn of the 20th century would occur.[158] News was circulating of the proposed construction of a $50 million heavy water plant, and it was believed that negotiations were held for over eight months to get this mega-project started.[159] High praise was given to Premier Robert Stanfield and the province's coverage of the multi-million dollar investment through the Crown corporation Industrial Estates Limited.[160] Nova Scotia's success in gaining the heavy water plants as part of its industrial sector was a highly significant victory for the

[156] Williams, "The World is in Chaos," 362-363.

[157] Ibid.

[158] The *Cape Breton Post* would later change their report on cost of the Glace Bay Heavy Water Plant from $50 million to $30 million on the 4th December 1963. Roland MacInnes, *Hell and Heavy Water*, 14.

[159] Ibid.

[160] Ibid.

province since it was competing with more industrially developed provinces such as Quebec and Ontario.[161]

Reasons for why Nova Scotia was chosen as the site for two heavy water plants involve consideration of many factors. One of the main arguments, corroborated by Rae, was the quantity of D_2O (deuterium) content in local water supplies. [162] It was argued that the western provinces had low D_2O content, while the waters around Nova Scotia had an almost universal availability of D_2O, a point repeated in much of the literature as well as the archival material.[163] Irrespective of whether this was completely factual, Haliburton reminds us that Nova Scotia was competing with other provinces such as Alberta and Saskatchewan which both offered cheap oil and coal to create steam.[164] The heavy water plant contract was something all the Canadian provinces sought,[165] and the purported abundance of D_2O had served as a major justification for why Nova Scotia should be awarded the contract, an argument even repeated by the Premier in press releases. [166]

However, the second reason for why Cape Breton was an attractive location for heavy water plants was the proximity to electricity infrastructure. In Haliburton's book, he claims that DCL had a commitment from bond houses to provide the $18 million, and Jerome Spevack had to find a site that could produce cheap steam.[167] During this time, the Nova Scotia Power Commission (NSPC), a Crown corporation, was building a new thermal power plant "at the

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[161] Haliburton, *My Years with Stanfield*, 89.

[162] Rae, "Heavy Water," 337.

[163] "Letter from Don Nazzer to Premier Gerald Regan," 23 July, 1973, Box 8, Heavy Water Plant Business Folder, Don Nazzer Collection, Beaton Institute, Cape Breton University, Sydney, Nova Scotia, 1.

[164] Haliburton, *My Years with Stanfield*, 86-7.

[165] Ibid.

[166] "Press Release, - Hon. Robert L. Stanfield," 29 August, 1966, Box 8, Decision to Proceed with Y-Exp. [Expansion] Folder, Beaton Institute, Cape Breton University, Sydney, Nova Scotia, 2-3.

[167] Haliburton, *My Years with Stanfield*, 88.

pithead" in Glace Bay.[168] At the request of the government, the NSPC and DCL had negotiated a process for using comparatively low-pressure, secondary steam from the turbines after they had skimmed off the cream of the power.[169] Haliburton claims this appealed to Spevack, and DCL bid on the contract based on the site near the new power plant.[170] The Port Hawkesbury Heavy Water Plant was similarly built near a recently completed power plant—also built by the NSPC—in the Strait of Canso, from which it would also receive power and steam.[171] CGE was further influenced to build in the Strait of Canso and near the power plant because it was awarded a federal grant for locating in a designated area.[172] However, it is unclear why the proximity to power generating stations as a rationale for why Nova Scotia was chosen to host two heavy water plants didn't (and still doesn't) circulate as widely as the quantity of D_2O content in the water argument does.

The third argument for why Nova Scotia was awarded the heavy water plant contracts is a cynical one but was nevertheless a significant contributing factor. It is suggested in much of the literature that Nova Scotia was chosen because of political influences regarding attempts at regional industrial development. MacInnes argues that federal Minister Allan J. MacEachen played a key role in regional development efforts for Cape Breton and is responsible for getting the Glace Bay Heavy Water Plant project in motion.[173] Rae claims that AECL's status as a federal Crown corporation has allowed the Canadian federal government to play an overriding role in decisions in major expenditures, which could be used to reinforce other government priorities.[174]

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[168] Ibid.
[169] Ibid.
[170] Ibid.
[171] Allan J. MacEachen, "Cape Breton is Industrial Focal Point," *Cape Breton Post* (Sydney: 23 March, 1970): 3.
[172] Rae, "Heavy Water," 337.
[173] MacInnes, *Hell and Heavy Water*, 12.
[174] Rae, "Heavy Water," 337.

He goes on to suggest that the federal government saw an opportunity to foster a regional development policy at the DCL plant.[175] Although this indeed was one of the contributing factors, Rae essentially argues that this was the main argument. As Savoie argues, people from economically developed areas push against development initiatives in slow-growth areas because it is believed the capital should be used to further the continuation of the developed areas.[176] However, despite Rae's cynicism towards regional development approaches, this corresponds to the calls for the nationalization of industries with social justice in mind, as discussed by MacKinnon.[177] Furthermore, letters in the Don Nazzer collection echo these ideas of regional development approaches being used in Nova Scotia, and claimed that AECL has always shown recognition of the need for Canada to decentralize its economy for the benefit of other provinces besides Quebec and Ontario.[178]

The opening of the Port Hawkesbury Heavy Water Plant was less glamorous and had significantly less fanfare—if any—compared to when the Glace Bay Heavy Water Plant opened in May 1969. Details appear to be fuzzy as to when the plant officially came online. However, what is known is that heavy water production began before March 1970: in a contributed article by Allan J. MacEachen's in the *Cape Breton Post*, he reports that "Already completed and in initial production is the $65,000,000 heavy water plant built at the Strait of Canso by Canadian General Electric."[179] The history of the PHHWP is heavily linked to the career of plant manager, Don Nazzer.

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[175] Ibid.
[176] Savoie, *Regional Economic Development*, 4.
[177] MacKinnon, "Importing the Clairtone Sound," 153.
[178] "Letter from Don Nazzer to Premier Gerald S. Regan," 2.
[179] MacEachen, "Cape Breton is Industrial Focal Point," 3.

Described as somewhat taciturn, autocratic, and the consummate corporate professional, Don Nazzer is a key figure for perspectives on the day-to-day management of the CGE plant, as well as for management perspectives on the rehabilitation efforts of the Glace Bay Heavy Water Plant. [180] He is also responsible for the preservation of many of the important archival materials for the establishment of Cape Breton's heavy water plants. Don Nazzer assumed many high-echelon management positions throughout his tenure working in the heavy water production field. Born in 1918 in Vancouver, British Columbia,[181] he would later attend the University of British Columbia and graduate with a Bachelor of Science in Mechanical Engineering, First Class with Honours.[182] Under 'additional studies' in Don Nazzer's resume, he listed advanced mathematics, feed control systems, transients in linear systems, fluid mechanics, and nuclear physics and engineering.[183] Before moving to Cape Breton, Don Nazzer had an impressive employment history and was involved in several major engineering and scientific projects in Canadian history. For example, between Spring 1944 and Summer 1956, Nazzer worked at the National Research Council in Ottawa, in the Mechanical Engineering Division.[184] While at the NRC, Nazzer's duties were to provide engineering design and project engineering on special projects for defence, atomic energy, and aeronautical research.[185] During his tenure at the NRC, Nazzer was one of the principal members of the design and construction team of the ZEEP reactor for the Atomic Energy Division—the predecessor to AECL.[186]

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[180] Stanley M. Davies, *Is Making Heavy Water Painful: A Story of the Port Hawkesbury Heavy Water Plant* (Self-published on Amazon.ca, March 2023),13.

[181] "Don Nazzer Resume," Undated, Box 13, BD of Trade Folder, Beaton Institute, Cape Breton University, Sydney, Nova Scotia, 1

[182] Ibid.

[183] Ibid. Nazzer doesn't mention which institutions he earned these credentials from.

[184] Ibid, 4.

[185] "Don Nazzer Resume," 4.

[186] Ibid.

In the Spring of 1958, Don Nazzer was hired at CGE and worked at the Peterborough CGE plant.[187] In March 1963, he began working with heavy water when he managed a project team that was tasked to "…review the technology, define the plant, assess the costs and risks involved in the manufacture of heavy water in large quantities."[188] In 1965, heavy water became Don Nazzer's primary endeavour.[189] During the construction of the Port Hawkesbury Heavy Water Plant, Nazzer would be made Project Manager for CGE.[190] During his tenure at the PHHWP, Nazzer claims heavy water production was achieved at the plant in September 1970.[191] Moreover, the CGE plant didn't have as much Nova Scotia provincial government involvement as the DCL plant did. CGE was not a client firm of IEL, unlike DCL.[192]

Three Wise Men

American scientist, inventor and engineer, Jerome Spevack, President of both DCL and Deuterium Corp, is among the important figures of the history of the Cape Breton heavy water plants. Spevack is credited for his scientific discovery of a form of heavy water production that was the only proven process capable of large-scale commercial heavy water production during this period.[193] The heavy water making process in both the DCL plant and the CGE plant was his

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[187] Ibid, 2.

[188] Ibid.

[189] It is unclear if 1965 was the year when Don Nazzer moved to Cape Breton to lead the construction of the Port Hawkesbury Heavy Water Plant, or if construction began in 1965 or not. "Letter From Don Nazzer to MacKenzie McMurray," 1.

[190] Ibid.

[191] Sources for the official opening of the Port Hawkesbury Heavy Water Plant are scare. However, looking through *Cape Breton Post* newspapers between January to September 1970 could help pinpoint when the plant came online. "Letter From Don Nazzer to MacKenzie McMurray," 21 September, 1973, Box 8, Heavy Water Plant Business Folder, Beaton Institute, Cape Breton University, Sydney, Nova Scotia, 1.

[192] The CGE plant is mentioned when George discusses DCL as a client firm of IEL. George has a comprehensive list of all of IEL's client firms and writes a detailed history of each firm – CGE is not listed among them. George, *Industrial Estates Limited*, 81.

[193] George, *Industrial Estates Limited*, 79.

GS Process (Girdler Sulfide Process), which was thus also known as the 'Spevack Process.'[194] Spevack invented this process when working on the Manhattan Project during the Second World War, but the United States Atomic Energy Commission secured the basic patent from Spevack.[195] However, Spevack controlled the improvement patents for his process.[196] This made Spevack the acknowledged world authority on heavy water during this period, and his process was chosen by the USAEC for the development of the hydrogen bomb.[197]

On the 29th of August, 1966, Premier Robert Stanfield announced that the Province of Nova Scotia and the New York firm Deuterium Corporation had successfully completed negotiations for Nova Scotia to hold exclusive rights to one of Spevack's patents on an improved GS Process.[198] This same press release also mentions that the Province had secured the elimination of all royalty payments to Deuterium Corporation, which was stipulated during agreements leading up to the establishment of the Glace Bay Heavy Water Plant.[199] This had allowed the Nova Scotian government to license the newly acquired GS Process patent to other companies seeking to join (what was believed to be) Nova Scotia's emerging heavy water industry.[200] This is a good example of how managerial capitalism operated in Nova Scotia during the Stanfield and later G.I. Smith premierships. The theme of government control of patents related to industrial production aligns with the calls for further nationalization of industries and more state involvement previously mentioned. It stands to reason that government control over

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[194] "Press Release, - Hon. Robert L. Stanfield," 29 August, 1966, Box 8, Decision to Proceed with Y-Exp. [Expansion] Folder, Beaton Institute, Cape Breton University, Sydney, Nova Scotia, 2.

[195] Rae, "Heavy Water," 337.

[196] Ibid.

[197] George, *Industrial Estates Limited*, 80.

[198] "Press Release, - Hon. Robert L. Stanfield," 29 August, 1966, Box 8, Decision to Proceed with Y-Exp. [Expansion] Folder, Beaton Institute, Cape Breton University, Sydney, Nova Scotia, 1.

[199] Ibid.

[200] Ibid.

patents such as Spevack's improved GS Process was hoped to entice other firms—IEL involved or not—to establish themselves in Nova Scotia, with the greater ambition of contributing to wider efforts of regional economic development.

R.B. Cameron is another important managerial figure during the eventual fallout and rehabilitation of the Glace Bay Heavy Water Plant. The GBHWP under the operation DCL became an enormous boondoggle. Ownership and operational leadership of the plant would be reshuffled, and Cameron found himself in charge of the rehabilitation effort. R.B. Cameron was born in New Glasgow, Nova Scotia, and in 1967, Cameron arrived in Sydney, Nova Scotia, as President and Chief Executive Officer of the Sydney Steel Corporation (SYSCO).[201] By 1971, Cameron held many important positions such as Director and Chairman of the Board of SYSCO, Director and Chairman of the Board for Cape Breton Development Corporation (DEVCO), and Director, Deputy Chairman, and CEO of DCL, all of which were Crown Corporations.[202] Cameron was held in high regard by both G.I. Smith and Gerald Regan.[203] R.B. Cameron is a prime example of Nova Scotian industrialists being deputized by the province corresponding to the belief that regional capitalists were best suited to manage Crown corporations operating under the purview of regional economic development and industrial development.

The opening of both the GBHWP and the PHHWP were monumental undertakings. The PHHWP was successful because it was able to produce heavy water—but not without difficulty. However, in the case for the GBHWP under DCL, the resulting disappointment in the plant's inability to produce a barrel of heavy water had severely damaged public belief in this being a

[201] "Cameron Resigns Posts: Accepts New Position," *Cape Breton Post* (Sydney: 3 April, 1971), 3.
[202] Ibid.
[203] Ibid.

worthwhile project. Between the fall of 1968 and the winter of 1969, the technical difficulties the DCL plant was experiencing became obvious to the Nova Scotian public.[204] This cast a pallor over the Port Hawkesbury Heavy Water Plant as, between 1969 and March 1970, construction was completed and initial production was underway.[205]

The importance of analyzing key decision-makers such as Jerome Spevack, Don Nazzer, and R.B. Cameron, is paramount for being able to piece together a clearer image of how management has handed at the heavy water plants. Much of the archival material on the heavy water plants was produced by high-level officials from DCL, CGE, and AECL, respectively. Despite the importance of these high-level perspectives, Paul Thompson reminds us in his book, *The Voices of the Past: Oral History*, that the nature of textual primary sources does not necessarily capture the complete reality of day-to-day operations of the companies and organizations these sources are concerned with.[206]

The history leading up to, and of the establishment of the Cape Breton heavy water plants offers a unique glimpse of an intersection of when Canadian federal and provincial politicians during the postwar period, attempted efforts of regional economic development approaches in regions occupying Canada's economic and political periphery. This is combined with a history of calls for nationalization of industries with ideas of social justice in mind, versus the realities of how state interventionism manifested in Nova Scotia and the personalities involved. This perfect

[204] George, *Industrial Estates Limited*, 78.

[205] As of writing this, it is unclear the specific date when the Port Hawkesbury Heavy Water Plant officially came online but MacEachen's statement confirms that it was completed before March 1970. MacEachen, "Cape Breton is Industrial Focal Point," 3.

[206] Paul Thompson, *The Voices from the Past: Oral History* (Oxford University Press, 1978), 66-7.

storm of mismanagement is a constant theme in the administrative history of Cape Breton's heavy water plants.

Chapter 3: Downfall

The Cape Breton heavy water plants are most infamous for their operational history. Due to difficulties with labour and construction of heavy water plants, the projects had become a joke in Cape Breton. A folksong called, "The Glace Bay Heavy Water Plant Song," outlines public perceptions of plants being a farce where even the workers didn't take it seriously.[207] However, despite the technical difficulties that both the Glace Bay Heavy Water Plant and the Port Hawkesbury Heavy Water Plant experienced, the facilities persisted in operations until their eventual closures in the mid-1980s. The realities of day-to-day during construction of the DCL plant was not made public knowledge until it became obvious serious technical problems were being experienced.[208] Problems with feedwater, equipment incompatibility during construction, the decision to double plant production capacity while the facility was still under construction, and labour were significant problem areas for the GBHWP. Whereas the Port Hawkesbury Heavy Water Plant was a success, it wasn't as lucrative as CGE had hoped it would be.[209] However, despite CGE achieving what DCL could not, the plant shared similar issues with DCL regarding the construction and operation of the plant.

The heavy water plants' veneer of a futuristic industry for Cape Breton belied problems that were always present and just beneath the surface. The heavy water plants were an ambitious mega project, and despite the glaring issues that were being presented, visions of future expansions were being pitched. What started out as an opportunity for industrial development that IEL had secured for Nova Scotia, had now seen IEL take complete control of DCL due to the

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[207] "The Heavy Water Plant Song," WordPress, 27 April, 2011, https://caperpics.wordpress.com/2011/04/27/glace-bay-heavy-water-plant-song-lyrics/.

[208] George*, Industrial Estates Limited*, 78.

[209] Davies, *Is Making Heavy Water Painful*, 231.

company's failure of operating the plant, which resulted in the Province selling the plant to AECL.[210] As the neoliberal period took shape in Canada, and the old state interventionist policies from the postwar period did not align so well with the emerging economic policies, Cape Breton's foray into the nuclear age would eventually come to a close.

Establishment of the Glace Bay Heavy Water Plant

Former Nova Scotia Minister for Agriculture Marketing in the Stanfield government and friend of Premier Robert Stanfield, E.D. Haliburton, stated in his book, "I cannot write "My Years with Stanfield" without recalling how we got involved with Deuterium of Canada Ltd."[211] The original design of the Glace Bay Heavy Water Plant was intended to be a 200-300 ton a year facility.[212] AECL's contract was predicated on the assumption that it would have first option to purchase any part—or all—of the heavy water output during the first five years of production.[213] The original plan for the Glace Bay Heavy Water Plant stipulated that,

> While the government of Canada is not, by issuing through AECL this invitation, to be taken as undertaking to accept any proposal, the government is, nonetheless, prepared to consider all the proposals on the basis, assumed for the purposes of such consideration, that the sale of up to 1500 tons of heavy water to be delivered over a five-year period beginning on or before 1st day of July 1967 would be underwritten by the government.[214]

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[210] Davies, *Is Making Heavy Water Painful*, 252.

[211] Haliburton*, My Years with Stanfield*, 86.

[212] "AECL Information for the Press," 29 October, 1964, Box 8, Early Negotiations with AECL Re Exp Folder, Beaton Institute, Cape Breton University, Sydney, Nova Scotia.

[213] "Letter from J.L Grey to Jerome Spevack,"26 October, 1964, Box 8, Early Negotiations with AECL Re Exp folder, Don Nazzer Collection, Beaton Institute, Cape Breton University, Sydney, Nova Scotia, 3.

[214] Ibid, 2.

However, this plan would change, as would many more things change about the Glace Bay Heavy Water Plant.

The DCL plant was supposed to cost $30 million, and while $12 million would be subscribed by IEL, the remaining $18 million would be raised by DCL.[215] Haliburton claims that the experimental nature of this project wasn't adequately communicated to the Provincial government.[216] One of the first indicators of suspicion, Haliburton argues, were concerns of how the produced heavy water would go to market after the initial quantity of heavy water had been produced for AECL.[217] This is a valid concern because CANDU reactors do not require a constant supply of heavy water.[218] If domestic production of CANDU reactors cease, than prospects in foreign markets would need to be investigated—this is one of the factors for why heavy water was part of the CANDU exports conversation. However, by 1974, production would exceed demand.[219]

On the 13th May, 1966, AECL President J. L. Grey sent a letter to V.T. Anwyll, General Manager at DCL, expressing anxiety over the need to make arrangements for the supply of heavy water between the 1967 and 1969.[220] Time was running out for AECL and Grey stated that a decision must be made whether to expand the production capacity of the Glace Bay Heavy Water Plant or eliminate it from AECL's plans.[221] This marks a crucial point for the realities of operations at the Glace Bay Heavy Water Plant, and an example of when this mega project

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[215] George, *Industrial Estates Limited*, 77.

[216] Haliburton, *My Years with Stanfield*, 87.

[217] Ibid.

[218] "What is Heavy Water," CANDU Nuclear Power Technology, Canadian Nuclear FAQ, effective 28 March, 2025, https://www.nuclearfaq.ca/cnf_sectionA.htm#e.

[219] Rae, "Heavy Water," 338.

[220] "Letter from J. L. Grey to V. T. Anwyll," 13 May, 1966, Box 8, Decision to Proceed with Y-Exp [Expansion] Folder, Don Nazzer Collection, Beaton Institute, Cape Breton University, Sydney, Nova Scotia.

[221] Ibid.

ballooning beyond what was originally planned. By the 12th July, 1966, AECL ultimately decided to expand the Glace Bay Heavy Water Plant.[222] Haliburton claims that the downfall of the DCL plant began with the Provincial government talking about a $30 million industry, and then, when AECL asked to double the capacity, an additional $30 million was easy to approve. Haliburton states that the expansion delayed their awareness of the project turning into a money pit as construction went on.[223] Major technical difficulties began to be encountered at the DCL plant such as issues with the heavy water making process itself. Salt water was used in the process, which wasn't viewed as an issue since salt water was successfully used in other analogous industrial processes.[224] In 1969, salt water had been left standing which corroded the pipes and other equipment, rendering the plant inoperable.[225] This was due to a combination of salt water with hydrogen sulfide, and the plant suffered catastrophic equipment failure.[226] There was also trouble with equipment needing to be sent back to suppliers because of lack of operating effectiveness, and in some cases, reoccurring equipment failure of items that were already returned to the Glace Bay Heavy Water Plant after supposedly being repaired or replaced.[227]

Haliburton maintains that Robert Stanfield and his government were unaware of how risky the heavy water plant project in Glace Bay would be.[228] The involvement of construction contracting companies like Burns and Roe, which had a world-wide reputation for handling contracts like the DCL plant, put the government at ease.[229] However, one of the major

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[222] "Letter from H.J, Egan to J. L. Grey," 12 July, 1966, Box 8, Decision to Proceed with Y-Exp [Expansion] Folder, Don Nazzer Collection, Beaton Institute, Cape Breton University, Sydney, Nova Scotia.

[223] Haliburton, *My Years with Stanfield*, 90.

[224] George*, Industrial Estates Limited*, 81.

[225] Ibid.

[226] MacInnes, *Hell or Heavy Water*, 18.

[227] George, *Industrial Estates Limited*, 82.

[228] Haliburton, *My Years with Stanfield*, 90.

[229] Ibid.

challenges Spevack faced during the construction of the plant was the decision of which construction company to hire. The main contracting company for the GBHWP would be Brown and Root, Canada Limited.[230] But Spevack preferred Burns and Roe Inc. engineers to perform both the construction and engineering functions.[231] However, this decision would be overruled by the IEL board of directors, despite Spevack being the President of DCL.[232] Instead, Burns and Roe Inc. were contracted to perform detailed engineering of the plant, and Brown and Root, Canada Limited were contracted to undertake construction of the plant.[233] This was a clear indication of Spevack's actual control over DCL and the decisions being made at the Glace Bay Heavy Water Plant.

However, Rae makes the point that Spevack and DCL had little experience in managing the design, construction, or operation of a large-scale chemical plant like the Glace Bay Heavy Water Plant,[234] and Haliburton claims that

> It wasn't until the directors of Industrial Estates Limited, represented by a majority of the directors of Deuterium of Canada, began to be disturbed and worried about the plant, the lack of progress and increased demands for more money, that they began to lose faith in Mr. Spevack's direction and bring the problem to the government.[235]

The setbacks the plant suffered and its inability to produce a single barrel of heavy water would contribute to Spevack's dismissal. By the end of 1968, attempts to produce heavy water at the

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[230] George*, Industrial Estates Limited*, 83.
[231] Ibid.
[232] IEL held six out of the eleven directors' seats, as well as 25,001 out the 50,000 DCL shares. Ibid.
[233] MacInnes, *Hell and Heavy Water*, 15.
[234] Rae, "Heavy Water," 337.
[235] Haliburton, My Years with Stanfield, 91.

Glace Bay Heavy Water Plant under DCL were abandoned.[236] In October 1968, Spevack was discharged on the grounds that IEL's investment was in jeopardy.[237] Afterward, IEL assumed direct control of DCL.[238] Between 1964 and 1968, over $110 million was spent on the Glace Bay Heavy Water plant.[239]

The rehabilitation of the Glace Bay Heavy Water Plant was wrested from Provincial responsibility in 1971, and AECL directed the rehabilitation and operated the plant themselves.[240] During this time, R.B. Cameron had offered Don Nazzer, then plant manager at the CGE plant in Port Hawkesbury, a position to manage the undertaking of the rehabilitation of the Glace Bay Heavy Water Plant.[241] Don Nazzer claims that in the fall of 1970, he directed the work of engineers to develop the concept that would eventually form the basis for the rehabilitation of the Glace Bay Heavy Water Plant.[242] The rehabilitation effort would prove successful and, after nine years, on 16th June, 1976 the Glace Bay Heavy Water Plant had finally produced a barrel of heavy water.[243] The plant wasn't initially self-sustaining for its first barrel of heavy water since partially enriched feedwater was brought in from the Bruce Heavy Water Plant in Ontario to help with production.[244] But by June 1976, the plant was operating on a supply of local water for production.[245] Despite this success, demand for heavy water had already

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[236] Rae, "Heavy Water," 337.

[237] George, *Industrial Estates Limited*, 84.

[238] Ibid.

[239] "Glace Bay Plant Produces First Heavy Water," *Cape Breton Post* (Sydney, 15 June, 1976): 1.

[240] Rae, "Heavy Water," 337.

[241] "Letter from Don Nazzer to MacKenzie McMurray," 21 September, 1971, Box 8, Heavy Water Plant Business Folder, Don Nazzer Collection, Beaton Institute, Cape Breton University, Sydney, Nova Scotia, 1.

[242] Ibid.

[243] "First Heavy Water," *Cape Breton Post* (Sydney: 21 June, 1976): 1.

[244] "Glace Bay Plant Produces First Heavy Water," 1.

[245] Ibid.

declined.[246] The estimation of the rehabilitation of the Glace Bay Plant is believed to have cost $140 million.[247]

Establishment of the Port Hawkesbury Heavy Water Plant

Construction on the Port Hawkesbury Heavy Water plant began in 1966, and the plant became operational in 1970.[248] On the 26th of September, 1970, the Port Hawkesbury plant had begun to produce heavy water.[249] Although the CGE plant was more of a success than the Glace Bay Heavy Water Plant, it wasn't without issues. Davies describes a mysterious processing issue called 'foaming.'[250] This issue in the heavy water making process wasn't well understood at the Port Hawkesbury Heavy Water plant, nor its drastic implications on limiting heavy water production.[251] Davies believes that 'foaming,' was related to water purity in the local supply of water used at the plant.[252] Rae states that,

> At both the PHHWP and the [Bruce Heavy Water Plant], early operation was plagued by hydraulic instability. This was manifested by a high and fluctuating pressure drop, which led to flooding and dumping of the trays. Stable operation was possible only at about 70 percent of the design flow rate, and deuterium extraction was less than half of the design rate.[253]

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[246] Rae, "Heavy Water," 338.

[247] "Glace Bay Plant Produces First Heavy Water," 1.

[248] "Tray Damage Investigation for CGE," Undated, Box 2, Don Nazzer Collection, Beaton Institute, Cape Breton University, Sydney, Nova Scotia, 1.

[249] Ibid.

[250] Davies, *Is Making Heavy Water Painful*, 59.

[251] Davies, *Is Making Heavy Water Painful*, 59.

[252] Ibid.

[253] Rae, "Heavy Water," 342.

Moreover, 'foaming' wasn't the only major problem the Port Hawkesbury Heavy Water Plant had encountered.

What was described by Don Nazzer as "anomalous behavior" began to manifest in the GS Process (the Spevack Process), which became progressively worse to the point where plant needed to be shut down.[254] During an investigation of the problem the plant was experiencing, the tower internals were examined and it was discovered that the sieve trays had suffered extensive damage, as well as other hardware on the first and second stage towers.[255] Nazzer believes the tray damage was more than likely caused by the 'foaming' phenomena mentioned previously.[256] Although this incident launched a huge investigation led by Don Nazzer, the Port Hawkesbury Heavy Water Plant survived and continued its operations. [257] 1974 was the best year for revenue at the Port Hawkesbury plant, which earned $12 million for CGE.[258] However, this was not the investment return CGE had hoped for, and by the spring of 1975, CGE would sell the Port Hawkesbury Heavy Water Plant to AECL for a total $63 million.[259]

One of the major issues that occurred at both the Glace Bay Heavy Water Plant and the Port Hawkesbury Heavy Water Plant was labour. Both plants became infamous in local memory for turbulent labour relations between management and tradesmen. Furthermore, discussing the theme of labour at the Cape Breton heavy water plants offers an opportunity to investigate how regional economic development approaches were experienced by working-class people

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[254] "Tray Damage Investigation for CGE," 1.

[255] Ibid.

[256] Ibid, 3.

[257] The tray investigation report was written by Don Nazzer. There are also tray patents that Don Nazzer held that were used at the Port Hawkesbury Heavy Water Plant. This event could have contributed to Nazzer finding employment at DCL for the rehabilitation for the Glace Bay Heavy Water Plant. Ibid, 1.

[258] Davies, Is Making Heavy Water Painful, 231.

[259] Davies, *Is Making Heavy Water Painful*, 232.

employed on these attempts at expanding Nova Scotia's industrial development. In his book, George cites that one of the reasons for why Nova Scotia was comparatively underdeveloped in its industrial sector was lack of skilled labour.[260] Commenting on this, George stated that the Nova Scotian "attitude of mind […]resulted in a poor supply of entrepreneurship and managerial talent."[261] In addition, Savoie mentions how increase in educational level of the workforce is part of the development approach.[262] Ideally, large megaprojects like the heavy water plants would lead to training the local workforce, which would benefit the population of availability of skilled labour for a potential future project. The availability of skilled workers for this sort of industrial project was discussed by the contractors Brown and Root, who claimed that from their experience in Sarnia, Ontario and Edmonton, Alberta, all the evidence indicates that the labour market for skilled journeymen in the pipefitting, electrical, millwrighting, ironworker, and boilermaker trades will be in extremely short supply throughout Ontario, in Montreal and also in New Brunswick and Nova Scotia.[263]

In the contract negotiations between DCL and Brown and Root one can see evidence of the development approach being involved during the construction of the Cape Breton heavy water plants:

> …with an adequate supply of skilled journeymen and that the journeymen to apprentice (junior journeymen or helpers) ratio be increased appreciably to use local semi-skilled men in the mechanical trades. We find that in the Maritime

[260] George*, Industrial Estates Limited*, 5.

[261] Ibid.

[262] Savoie, Regional Economic Development, 7.

[263] "Letter for V.T. Anwyll from R.J. Belfour," 3 Feburary, 1965, Box 8, Solic. & Award of Contract to Brown and Root Folder, Don Nazzer Collection, Beaton Institute, Cape Breton University, Sydney, Nova Scotia, 3.

> areas this class of construction workers is available and with a training program and sufficient supervision may be used to advantage for industrial project work.[264]

Brown and Root argued that training maritime workers to be skilled journeymen would be more favourably regarded by the Nova Scotia Department of Labour in view of rapid increase of industrial growth in Nova Scotia.[265] However, Brown and Root seem to have been somewhat conscious in their role of contributing to the expansion of Nova Scotia's development. Brown and Root believed that it would be more beneficial to the Maritime economy to train Maritime workers than attempt to import large number of skilled journeymen from Quebec and Ontario at increasingly higher rates and considerable premium wage incentives.[266]

Davies mentions how at the Port Hawkesbury Heavy Water Plant there was a huge gap between upper Canadians and locally hired Cape Breton workers that severely affected plant management for many years.[267] Something similar happened at the Glace Bay Heavy Water Plant where many of the managers were from western Canada and the big cities, while most of the tradesmen were from Cape Breton.[268] When the Cape Breton coal mines began to close, some of the newly unemployed miners got support to learn new trades and many of them found work at the heavy water plants.[269] The legacy of the coal strikes spanning from 1919 to 1925, known as the 'Labour Wars' was at play with the Cape Breton workers employed at the Port Hawkesbury Heavy Water plant. as Davies stated, the locally hired Cape Breton workers were similar to their

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[264] "Letter for V.T. Anwyll from R.J. Belfour," 3-4.

[265] Ibid, 4.

[266] Ibid.

[267] Davies, *Is Making Heavy Water Painful*, 18.

[268] This source is discussing the makeup of the workforce at the Glace Bay Heavy Water Plant after ACEL took it over in 1971. It is yet to be confirmed if management was also brought in from other parts of Canada during the DCL years. John Alec MacPherson, A Splash in Many a Pool, 104.

[269] John A. MacPherson, A Splash in Many a Pool: A Translation from the Gaelic Original," Unpublished Manuscript (2011), Typescript, 105.

coal mining brethren in the sense that the workforce was suspicious of plant managements motivations.[270]

Demand for heavy water declined by the 1980s, and, by 1982, AECL recommended that both the Glace Heavy Water Plant and the Port Hawkesbury Heavy Water Plant be closed.[271] The plants would not be shut down until 1985, but inevitably resulted in the loss of seven hundred jobs.[272] After the announcement, the Port Hawkesbury Heavy Water Plant was scrapped and the site was cleared, although the administration building was left standing and was converted for general industrial use.[273] Meanwhile, the Glace Bay Heavy Water Plant sat vacant for twenty-seven years, until the remaining buildings were demolished starting May 2013.[274] In High's book, he compares the demolition of industrial landmarks after their deindustrialization to the toppling of Karl Marx and Vladimir Lenin statues in eastern Europe after the collapse of the Soviet Union, a ritualized toppling of markers that were symbolic to the previous regime. [275] With this in mind, if the Glace Bay Heavy Water Plant was more successful and less of a controversial history, would it have been demolished sooner?

During the time of the heavy water plants, their arrival in Cape Breton was seen as a marker for change that would have a positive long-lasting impact on the development of Cape Breton's industrial base, and thence more employment opportunities for local workers. However, despite this glowing view, problems were being experienced just beneath the surface, and the

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[270] Davies, *Is Making Heavy Water Painful*, 18.

[271] Rae, "Heavy Water," 338.

[272] Ibid.; Bickerton, "Assessing the Regional Development Aspects of the DEVCO Closure," 5.

[273] Davies, *Is Making Heavy Water Painful*, 252. This was last confirmed in March 2021

[274] "Former Heavy Water Plant in Glace Bay Demolished," CBC (March, 2013), https://www.cbc.ca/news/canada/nova-scotia/former-heavy-water-plant-in-glace-bay-demolished-1.1369048.

[275] Steven High, *Industrial Sunset: The Making of North America's Rust Belt*, 1969-1984 (Toronto University Press, 2003), 3.

degree of issues faced beginning with the Glace Bay Heavy Water Plant, was just the start of things to come. Construction and operational issues were not readily shared with the public. However, because of the disaster the DCL plant turned out to be, AECL took the view that it was necessary to keep the public and media fully informed.[276] Despite the eventual successes of both the heavy water plants, the facilities would eventually be shut down during the rise of the neoliberal era. What was supposed to be Cape Breton's brave step into the nuclear age was instead abandoned and forgotten.

[276] MacPherson, "A Splash in Many a Pool: A Translation from the Gaelic Original," 103.

Conclusion

This thesis began with the aim of joining the conversation between Lachlan MacKinnon and Fred Burrill. Originating in Burrill's article, "Re-developing Underdevelopment: An Agenda of New Histories of Capitalism in the Maritimes," and expanded on in MacKinnon's article, "Importing the Clairtone Sound: Political Economy, Regionalism, and Deindustrialization in Pictou County," Burrill asks the question, "What was the particular balance of class forces … that made these [mid-20th-century] modernizers so fervently pursue such obviously flawed industrial development schemes?"[277] This thesis had set out with the objective of contributing to finding a partial answer to this question. The Cape Breton heavy water plants offer significant perspectives and insights into why industrial schemes from the ladder half of the twentieth century were not the monumental successes they were envisioned to be.

The guiding question for this thesis is, why did the Cape Breton heavy water plants fail? To begin attempts at finding a partial answer to this question, research on secondary source literature was necessary for understanding the wider academic context surrounding the Cape Breton heavy water plants. As it stands, there are no academic pieces that focus on the establishment and downfall of the Cape Breton heavy water plants. To answer my thesis question, research on major variables that contributed to the establishment of the heavy water plants was required. Such variables include Canada's history of the manufacture and exports of nuclear reactors, Canada's history of heavy water production, regionalism in Canada, the legacy of the national policy, the regional economic development approach, and Nova Scotia's history of state-interventionist measures to stimulate industrial growth.

[277] MacKinnon citing Burrill. MacKinnon, "Importing the Clairtone Sound," 150.

Research on archival materials was crucial for answering my thesis question. The Don Nazzer Collection at the Beaton Institute, located on the Cape Breton University campus, holds a treasure trove of archival materials that were created by major actors who were involved in managerial conversations regarding the establishment of Cape Breton's heavy water plants. Newspaper articles from the period this thesis focuses on significantly contributed to the establishment of the heavy water plants that were perceived by the media and the Cape Breton residents living near the heavy water plant sites. The primary sources materials offered valuable insights into the day-to-day aspects of the construction and operation of the heavy water plants. While the secondary sources provided context for the wider conversations the heavy water plants were a part of. The primary sources significantly helped with filling in the gaps of the available secondary sources of my thesis topic, as well as corroborating data and arguments from the secondary sources.

There were many factors for why the Cape Breton heavy water plants failed. Although the heavy water plants were not complete failures, their operations did not meet the high expectations of success that were imposed on them. The heavy water plants were borne as part of wider calls for industrial development in postwar Nova Scotia. The legacy of the National policy created an environment in Nova Scotia where industrial development declined in the region.[278] During the latter half of the nineteenth century, the National Policy helped central Canada's consolidation of power, making that region the country's economic and political centre, while regions on the periphery relied on exporting raw materials.[279] This system forced the Nova Scotian economy to rely on politically generated policies, institutions, and programs.[280] This was

[278] Williams, "The World is in Chaos," 362-3.
[279] Ibid, 363.
[280] Ibid.

the environment that the Robert Stanfield premiership existed in. In E.D. Haliburton's book, his testimony establishes an ideological motivation in Stanfield's government for the desire to build a secondary manufacturing base in Nova Scotia for the twentieth century.[281]

The requirement of state interventionism to build a manufacturing sector in Nova Scotia resulted in the establishment of IEL. However, IEL was not a Crown corporation that was created out of social justice of the Nova Scotian worker. Instead, IEL had essentially deputized the province's regional capitalists and ceded more industrial development power to selected members of Stanfield's government.[282] IEL and by extension, Stanfield's government, were successful in attracting DCL to establish themselves in Nova Scotia. Stanfield's government most likely didn't take up the purview of managerial capitalism as the supreme form of how the Nova Scotian economy ought to operate. State-interventionist policies were most likely viewed by Stanfield's government and IEL as a means of establishing a foundation of manufacturing companies in Nova Scotia that would entice future private industrial investment in the province without state intervention. With the introduction of CGE's establishment of the PHHWP, this doctrine appeared to be working for Stanfield and IEL.

The downfall of DCL, and the sorry state the GBHWP was in during the late 1960s, had severely damaged public perceptions of the viability of this project.[283] What began with federal Crown corporation AECL subcontracting out responsibility by awarding contracts to DCL and CGE to increase Canada's heavy water production capacity, had resulted in AECL taking complete ownership and operation of both facilities anyway.

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[281] Haliburton, *My Years with Stanfield*, 10.

[282] George, *The Life and Times of Industrial Estates Limited*, 14.

[283] MacInnes, Hell and Heavy Water, 34.

AECL took ownership and operation of the GBHWP because of the disastrous operation of the plant, and then took control over the PHHWP because CGE was not getting returns on their investment to the degree they were hoping for.[284] Both plants would continue operations until 1985 when the new federal Conservative government under Brian Mulroney decided to shut down the Cape Breton heavy water plants. The heavy water plant closures resulted in the loss of seven hundred jobs in Cape Breton.[285] Despite the success of both the GBHWP and the PHHWP, there are two major factors for why the plants were shut down. Canada's heavy water production exceeded demand, and with Canada's heavy water market being relegated to Ontario, there was little need to maintain the heavy water producing facilities as AECL had an ample surplus of heavy water.[286]

As Canada entered the 1980s, the regional economic development approach began to give way to the neoliberal approach to economics in Canadian political economy. One of the major views of neoliberalism is a rejection of state involvement in the economy and industry.[287] The neoliberal view is that government activity ought to be scaled back to be focused entirely on the rule of law.[288] With the supply of heavy water exceeding demand in available markets and the lack of political will to continue operations of the heavy water plants, Cape Breton's participation in the nuclear age had come to an end. The closure of the Cape Breton heavy water plants would become one link in the chain of deindustrialization that the Island was yet to further experience.

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[284] Davies, *Is Making Heavy Water Painful*, 231.
[285] Bickerton, "Regional Development Aspects of the DEVCO Closures," 5.
[286] Rae, "Heavy Water," 338.
[287] Mirowski and Plehwe, "Introduction," 6.
[288] Ibid.

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