Overview of Eastern and Atlantic Canada’s Petroleum Industry and Economic Impacts of Offshore Atlantic Projects (2010-2035)

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Executive Summary and Highlights

As resources are delineated and exploration companies have been more actively involved in the region, *Eastern Canada*\(^1\) has the potential to become a region of increasing importance in terms of future resource development for the Canadian petroleum industry (mainly, Quebec and possibly Ontario).

However, public opposition and regulator’s initiatives have created a cloud of uncertainty around future resource development in some regions.

Nonetheless, Eastern Canada has a history of hydrocarbon development, yet the produced volumes coming from the region are not very significant on a national scale.

However, Eastern Canada’s main driver of activity for the Canadian oil and gas industry lies on the demand side, as well as a source of inputs (human and physical capital) for the petroleum industry.

Eastern Canada’s economic structure and importance also means that this region is a significant recipient of the economic benefits associated with oil and gas developments across Canada.

Recently, companies have sought to transfer knowledge and technology from other regions in North America and moved to explore potential conventional and unconventional hydrocarbon resources including coalbed methane (CBM), shale gas, and shale oil, onshore, across the Atlantic Provinces of New Brunswick, Prince Edward Island, Nova Scotia, and Newfoundland and Labrador.

This trend is, however, fairly recent, the number of commercial developments are scarce, and thus there is a high degree of uncertainty in regards to how future petroleum development in these areas will unfold.

*Atlantic Canada*\(^2\) is home to an important segment of Canada’s petroleum industry. Natural gas development offshore shallow water Nova Scotia and crude oil development off Newfoundland and Labrador’s offshore areas have increasingly become more important over the last couple of decades in the overall Canadian context.

The industry has sought to explore for and develop petroleum resources around the various offshore areas, while the local economy (including governments, businesses, and the general public) has benefited from such development.

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\(^1\) In the context of this report, Eastern Canada refers to the provinces of Ontario and Quebec
\(^2\) In the context of this report, Atlantic Canada refers to the provinces of New Brunswick, Nova Scotia, Prince Edward Island, and Newfoundland and Labrador
Meanwhile, various projects have advanced and continue to produce resources as planned, while new projects are being built as companies move from the drawing board and exploration phases to the development and operation stages.

This region (the offshore) will continue to be the focus of hydrocarbon development in the eastern half of Canada over the medium to long term, and it is thus the focus of our analysis.

The offshore projects included in our analysis are currently operating projects in Nova Scotia (such as the Sable Offshore Energy Project [SOEP]) as well as those in Newfoundland and Labrador (Hibernia, Terra Nova, and White Rose).

Also, projects which are expected to be developed over the next decade, with a high degree of certainty, including the Deep Panuke sour gas project, and the Hebron heavy crude oil project, are included in our analysis.

In order to be able to generate an outlook for production and capital expenditures, two models were developed by the Canadian Energy Research Institute (CERI) for analyzing offshore Atlantic projects.

One model is the unconstrained production outlook model which was developed on a project-by-project basis, and takes into consideration historical production patterns, resource constraints, and project design limitations.

The second model is a cash-flow (CF) outlook model (also developed on a project-by-project basis) that includes all the information necessary to evaluate a project’s economics, and in turn provides a feedback mechanism that constraints a project’s production outlook as needed.

The results from these models (oil and gas production volumes, as well as industry expenditures), as presented in Figures E.1 and E.2, are used as inputs or injections into CERI’s United States-Canada Multi-Regional Input/Output Model (UCMRO 2.0)

This model in turn estimates the economic impacts associated with the level of activity stemming from the outlook models over the 2010 to 2035 time period.

Thus, the obtained results are the estimated economic benefits stemming from the offshore industry’s continued activity offshore Atlantic Canada over the outlook period (2010-2035) including:

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3 In the context of this report the terms short, medium, and long term are defined as five, ten, and over ten year periods in the outlook, correspondingly. This is the case as the reference outlook period is 25 years.
Figure E.1: Offshore Nova Scotia Natural Gas Historical (1999-2009) and Outlook (2010-2035) Production (MMcf/d), by Project (top) & Offshore Nova Scotia Projects Historical (1994-2009) and Outlook (2010-2035) Expenditures (Millions of $ 2010), \(^4\) by Project (bottom)

**Note:** See notes for Figures 2.6 and 2.10 on main report.

Source: CAPP data, CNSOPB data, EnCana data, ExxonMobil Sable Project data, NEB data, Stantec/Nova Scotia Department of Energy study data, outlook analysis and figure by CERI.

\(^4\) Unless otherwise stated, all values are given in 2010 real (inflation-adjusted) Canadian dollars and Unites States (US)/Canadian Dollar parity is assumed
Figure E.2: Offshore Newfoundland and Labrador Crude Oil Historical (1997-2009) and Outlook (2010-2035) Production (Mb/d), by Project (top) & Offshore Newfoundland and Labrador Projects Historical (1990-2009) and Outlook (2010-2035) Expenditures (Millions of $ 2010), by Project (bottom)

Note: See notes for Figure 2.12 on main report.

Sources: CAPP data, CNLOPB data, Memorial University data, NEB Data, outlook analysis and figure by CERI.

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Economic Impacts of Offshore Nova Scotia Projects

In Canada

- Close to $4 billion in industry investments (including capital and operating expenditures) generated offshore Nova Scotia (NS) over the outlook period\(^5\)
- Over 1 trillion cubic feet (1 tcf) of cumulative natural gas production over the outlook period
- Over $5 billion in value added gross domestic product (GDP) across Canada over the outlook period
- Over $1 billion in employment compensation (including wages and benefits) across Canada over the outlook period
- Direct employment in NS stemming from the local offshore industry, calculated at over 600 jobs at the start of the outlook period, will reach a peak of close to 1,000 jobs by 2011, from which point will exhibit an overall declining pattern until 2025
- A total of over 5,600 direct jobs created and preserved in NS over the outlook period
- Total employment in Canada (including direct, indirect, and induced) stemming from NS’s offshore industry, calculated at over 2,700 jobs at the start of the outlook period, will reach a peak of close to 4,000 jobs by 2011, from which point will exhibit an overall declining pattern until 2025
- A total of over 25,000 jobs created and preserved across Canada (direct, indirect, and induced) over the outlook period
- Over $1 billion in tax receipts (including indirect, personal, and corporate taxes) to all levels of government (municipal, provincial, and federal) in Canada over the outlook period
- In Canada, the largest share of the economic benefits are allocated to Nova Scotia, followed by Ontario, Quebec, and the rest of Canada
- Over $700 million in royalties to the NS government over the outlook period

In the United States

- Over $330 million in value added GDP across the United States (US) over the outlook period, with PADD I (East Coast, closest market and location of existing associated transportation infrastructure), PADD II (Midwest, large refining and petrochemical cluster), and PADD V (West Coast, large economy and demand centre), in that order, receiving the greatest share of such benefits
- Over $167 million in employment compensation across the US over the outlook period

\(5\) While the general reference outlook period for this study is from 2010 to 2035, based on current (as of the time of writing) project’s available information and CERI’s models results, no offshore natural gas production is expected in Nova Scotia past 2025. Therefore, the economic benefits associated with offshore natural gas development in Nova Scotia are expected to occur in the 2010 to 2025 time period and are limited to those associated with the SOEP and Deep Panuke projects. This is outlook is, however, based on CERI’s assumptions and subject to both upside and downside risks as discussed in Chapter 3 of this report.
• Employment in the US (indirect and induced) stemming from NS’s offshore industry, calculated at over 400 jobs at the start of the outlook period, will reach a peak of over 600 jobs by 2011, from which point will exhibit an overall declining pattern until 2025
• A total of over 4,000 jobs created and preserved across the US over the outlook period
• In the US, the states of Massachusetts, California, Texas, New York, and New Hampshire (in that order), are expected to benefit the most from the economic impacts of Nova Scotia’s offshore industry

Economic Impacts of Offshore Newfoundland and Labrador Projects

In Canada

• Over $35 billion in industry investments (including capital and operating expenditures) generated offshore Newfoundland and Labrador (NL) over the outlook period\(^6\)
• Over 1.7 billion barrels (Bb) of cumulative crude oil production over the outlook period
• Over $193 billion in value added gross domestic product (GDP) across Canada over the outlook period
• Close to $20 billion in employment compensation across Canada over the outlook period
• Direct employment in NL stemming from the local offshore industry, calculated at close to 5,000 jobs at the start of the outlook period, will reach a peak of close to 6,000 jobs by 2020, from which point will exhibit an overall declining pattern reaching an estimated level of about 1,000 jobs by 2035
• A total of over 104,000 direct jobs created and preserved in NL over the outlook period
• Total employment in Canada (including direct, indirect, and induced) stemming from NL’s offshore industry, calculated at about 17,000 jobs at the start of the outlook period, will reach a peak of close to 23,000 jobs by 2020, from which point will exhibit an overall declining pattern reaching an estimated level of over 5,000 jobs by 2035
• A total of over 420,000 jobs created and preserved across Canada (direct, indirect, and induced) over the outlook period
• Close to $36 billion in tax receipts (including indirect, personal, and corporate taxes) to all levels of government (municipal, provincial, and federal) in Canada over the outlook period
• In Canada, the largest share of the economic benefits are allocated to Newfoundland and Labrador, followed by Ontario, Quebec, and the rest of Canada
• $46 billion in royalties to the NL government over the outlook period

\(^6\) While CERI’s models estimate offshore crude oil production from Newfoundland and Labrador (based on existing projects plus the Hebron project) to continue until 2046, the general reference outlook period for this report is 2010 to 2035, as previously stated. As in the case for Nova Scotia, the outlook is however, based on CERI’s assumptions and subject to both upside and downside risks as discussed in Chapter 4 of this report

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In the United States

- Over $8 billion in value added GDP across the United States (US) over the outlook period, with PADDs I, II, and V (in that order) receiving the greatest share of such benefits
- Over $4 billion in employment compensation across the US over the outlook period
- Employment in the United States (indirect and induced) stemming from NL’s offshore industry, calculated at over 4,000 jobs at the start of the outlook period, will reach a peak of close to 6,000 jobs by 2011, from which point will exhibit an overall declining pattern reaching an estimated level of over 1,000 jobs by 2035
- A total of over 102,000 jobs created and preserved across the United States over the outlook period
- In the US, the states of New York, Maine, California, Texas, and Florida (in that order), are expected to benefit the most from the economic impacts of Newfoundland and Labrador’s offshore industry

Clearly, there are several and significant economic benefits associated with the continued and expected future development of the offshore petroleum industry in Atlantic Canada. However, it is important to note that these benefits are associated with CERI’s unique assumptions and outlook for future development in the region, and as such, the results are subject to both upside and downside risks over the long term as discussed in this report.
Introduction and Report Structure

Various regions in Eastern and Atlantic Canada are of major importance to the petroleum industry due to their large populations (demand) and their industrial sectors’ relation to the industry across Canada as a source of inputs (mainly Ontario and Quebec).

Meanwhile, other provinces have recently started to explore for and are sought to possibly develop onshore conventional and unconventional oil and natural gas resources over the medium to long term (including Quebec, New Brunswick, Prince Edward Island, Newfoundland and Labrador, and Nova Scotia).

Yet, only offshore oil and gas projects (in Nova Scotia and Newfoundland and Labrador) have significantly contributed to Canadian hydrocarbon production levels over the last few decades. These projects have not only generated investments by the oil and gas industry in the region, but also spawned a host of economic benefits to various stakeholders at various levels across North America\(^1\) over the same time period.

The high degree of uncertainty associated with development of petroleum resources in not-yet-developed regions where resources are not clearly delineated and commercial projects are not yet present or in operation, makes it a difficult task (if not possible but with a high degree of uncertainty and speculation) to establish a reasonable outlook or forecast for future development.

For this reason, only established regions with already developed commercial projects and where future project plans are underway are examined in this report. These include: offshore shallow water natural gas projects in Nova Scotia, as well as offshore crude oil projects in Newfoundland and Labrador (offshore Atlantic Projects).

This report begins with an overview of the petroleum industry in Eastern and Atlantic Canada (Chapter 1), followed by an explanation of the methodology developed by the Canadian Energy Research Institute (CERI) to establish an outlook for production as well as a discussion of the cash-flow (CF) models developed for the allocation of historical and future capital and operating expenditures (investments) for offshore oil and gas projects in Atlantic Canada (Chapter 2). These chapters together will be the components of the first part of this report.

The second part of this report will discuss the results obtained from CERI’s Input/Output (I/O) model, in regards to development of offshore projects off Nova Scotia and Newfoundland and Labrador. CERI’s Input/Output model estimates various levels of economic impacts across Canada and the United States (US), ranging from value added gross domestic product (GDP) impacts, to employment (job creation and preservation) impacts, employment compensation (including wages and supplements), as well as taxation revenues across all levels of

\(^1\)In the context of this report, North America refers to Canada and the United States

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government. CERI’s production and cash-flow models are used to calculate future royalty revenues for the respective provincial governments.

Chapter 3 will present the obtained results (economic impacts) from continued operation of existing natural gas projects and investment on projects currently under development in offshore shallow water Nova Scotia, while Chapter 4 will serve the same purpose as Chapter 3 but in regards to offshore crude oil projects in Newfoundland and Labrador.