Northern Cross Energy Limited
555 Southdale Road E. Suite 203
London, Ontario, Canada
N6E 1A2
Telephone: (519) 436-9010
Fax: (519) 529-7299
dmclean@northerncross.ca

***VIA COURIER & RESS***

April 24, 2017

Ontario Energy Board
P.O. Box 2319
2300 Yonge Street, 27th Floor
Toronto ON M4P 1E4

**Attention: Registrar**

**RE: EB-2016-0137 | EB-2016-0138 | EB-2016-0139**
**South Bruce Expansion Applications – Northern Cross Energy Limited ("NCE") Evidence**

**RESPONSE TO PROCEDURAL ORDER #5**

Please find attached Northern Cross Energy Limited ("NCE") Phase 1 evidence for the above-noted proceeding. This evidence is filed pursuant to the Ontario Energy Board's ("the Board") Procedural Order No.5 (dated April 20, 2017).

NCE has structured its evidence to respond to each of the Issues 1, 4, 5 and 6 identified in the Board's Draft Issues List (see Schedule B to Procedural Order No.5).

If you have any questions with respect to this submission please contact me at 519-436-9010.

Respectively,

David A. McLean

David McLean, P.Eng.
Vice President

# EVIDENCE OF NORTHERN CROSS ENERGY LIMITED

## INTRODUCTION

1. My name is David Thompson. I am the President and majority shareholder of Northern Cross Energy Limited (**NCE**). My resume is included under Exhibit 3.

2. My name is David McLean. I am a Vice President of NCE. My resume is included under Exhibit 3.

3. My name is James McIntosh. I am the President and owner of Jim McIntosh Petroleum Engineering Inc. and the current chairperson of the Ontario Petroleum Institute's Producer's Committee. My resume is included under Exhibit 3.

4. This evidence pertains to, and is intended to assist the Ontario Energy Board (the **Board**) in its consideration of Issues 1, 4, 5 and 6 of the Board's Procedural Order #5, Schedule B, of these EB-2016-0137 | EB-2016-0138 | EB-2016-0139 proceedings. It may also assist in the development of the information required under Schedule C of Procedural Order #5.

5. As a general overview to this evidence, NCE is highly supportive of the Board asserting its public interest function to ensure that there is, where possible and as a pre-condition to receiving approvals, appropriate contestability in the service offerings of any utility in Ontario - particularly when there is a brand new utility infrastructure under examination. This should be a paramount

consideration to ensure that competitive forces are fostered and cultivated in all relevant aspects of the new facilities. This more transparent and predictable approach benefits utility system users and service providers and local energy sector participants.

6. NCE owns and operates five natural gas production pools and an associated 50 km of gathering and transmission lines in the Townships of Ashfield-Colborne-Wawanosh and North Huron in Huron County. These townships are located adjacent to the southern boundary of what is being referred to as the South Bruce franchise territory.
   Three of the five pools are good candidates to be converted to natural gas storage pools.
   NCE also serves one end use customer: Thompsons Limited's Port Albert facility, primarily supplying natural gas for its grain drying needs in the autumn each year.
   NCE has advanced proposals to incorporate these assets into a pipeline system design that supports the distribution of natural gas to the three South Bruce municipalities. This includes a stand-alone proposal to the three South Bruce municipalities as well as attempts to work with both EPCOR and Union Gas Limited.

7. NCE would emphasize that the incorporation of local resources in utility developments should be among the early critical design parameters, when any new distribution system is being evaluated. This includes available local natural gas production, both currently on-line and the potential for new production, the potential for local storage and the utilization of existing pipeline assets.
   Consideration and inclusion of these assets could lead to improved security of supply, reduction of new upstream pipeline reinforcement, better utilization of the existing upstream pipeline system and reduced pipeline size and pressure of the new distribution system.
   The utilization of these resources would provide additional benefit to the local community

compared to just serving the area with a distribution pipeline that is supplied with natural gas from either western Canada and/or the United States. This would come in the form of production and storage royalties to those land owners who participate in the these ventures, increased tax revenue to the local municipalities, reduced transportation costs and local employment for those operating the storage and production facilities.

Environmentally, local production reduces the amount of greenhouse gas that is emitted through the avoidance of the transportation of that gas from either western Canada or the United States. In addition, the gas that is sourced from the Marcellus region in the northeastern United States is recovered using high pressure fracturing techniques that requires significant energy to produce the natural gas.

All of the above considerations may contribute to lower customer rates, which is a key element of the board's assessment mandate.

To reinforce the provincial impact that placing a priority on the utilization of local resources may have, NCE recommends that the Board consider the Ontario Petroleum Institute's (**OPI**) submission to the Ontario Long-term Energy Plan (**OLTEP**) update, as Exhibit 2. The development of the updated OLTEP is underway now. NCE is a member of OPI. The OPI submission contemplates increased local Ontario production that will equal nominally 2% of Ontario's current natural gas and oil requirements.

This submission was developed through ongoing discussions over the past 2 years with the Ontario Ministry of Energy. As a result of these discussions, the OPI submission is being revised to address a higher level of production equal to nominally 5% of Ontario's current natural gas and oil requirements.

8. The concepts underlying the use of local resources are applicable to any new distribution system that is being considered in Ontario, including the new South Bruce system that is being considered under these proceedings. NCE believes that a consistent evaluation format is the best way to compare competing proposals for the same franchise territory. It also allows for the comparison of competing projects within the province for the purpose of determining a preference to one project over another for such things as the allocation of government funds that may be available to aid in the economics of a project.

   To that end, NCE has developed an Evaluation Tool that the Board may find helpful as it considers issues 1, 4 and 5 under Procedural Order #2. It is submitted as Exhibit 1.

**THE EVALUATION TOOL**

**Part 1: Project Market Parameters**

9. The Evaluation Tool provides a method to organize and weigh the many factors that go into the evaluation of a capital project such as the one under consideration in South Bruce.

   It is segmented into three parts. The first deals with the Project Market Parameters and addresses the issues of quantifying the size of the potential market, the number and type of potential customers and when they will convert. This is usually accomplished through a survey of the potential customers that results in the applicant developing a forecast of the level of market penetration and the time to achieve that degree of capture that ultimately impacts the rate structure for the project.

   Values are assigned based on a maximum score for each of the criterion. The value assigned would reflect the Board's confidence in the submissions of the competing parties. The better the data, the higher the score.

   One criterion that is very critical in this part of the Evaluation Tool is the amount of risk that is assumed by each applicant for forecasting errors. An applicant that is willing to accept more

forecasting error risk should be given a higher score and the amount of points available for this criterion should be more than the other criterion to recognize its critical nature.

Finally, the amount of weight that is given to this part of the evaluation should be less than the part dealing with the Project Distribution System Parameters. NCE believes that the Project Market Parameter portion of the evaluation would be consistent among the applicants, but the system design will be much more quantifiable and will result in the most difference between the projects.

**Part 2: Project Customer Parameters**

10. The second part of the Evaluation Tool deals with the Project Customer Parameters. This section considers the competing fuels in the target market that natural gas will displace and the relative advantage that natural gas will have over each of these fuels. Key criterion will include annual projected savings by customer class, forecasted average cost of conversion, is a conversion assistance program offered, the period forecasted to reach the total conversion target and the environmental benefits of displacing the fuel type with natural gas. Similar to the preceding section, the amount of weight that is given to this part of the evaluation should be less than the part dealing with the Project Distribution System Parameters. NCE believes that the Project Customer Parameter portion of the evaluation will be consistent among the applicants but the system design will be much more quantifiable and will result in the most difference between the projects.

**Part 3: Project Distribution System Parameters**

11. The third and final part of the Evaluation Tool deals with the Project Distribution System Parameters. This is further segmented in to six sub-sections. The first deals with the pipeline system and includes the cost of the pipeline, the cost of upstream reinforcement, project

financing and the amount of the government assistance that is required.

The cost of the pipeline should be evaluated using several criteria, including the total cost of the project, the cost per customer served and the cost per unit of volume (or energy). A large project such as the South Bruce project will have a relatively larger cost, but the other two criteria will be the more enlightening, when it comes to deciding the competing merits of one project over another, or one applicant over another for the same project.

12. The next section deals with the associated rates by customer class to support the project including the amount of Temporary Expansion Surcharge (TES) and Incremental Tax Equivalent (ITE) that is required by each applicant.

13. The third section deals with the source of supply of the natural gas supplying the system. This section makes a distinction between where the gas is sourced and puts a premium on choosing locally supplied hydrogen-enriched natural gas over other sources, then Ontario supplied natural gas over other sources, then Canadian supplied natural gas over other sources and finally United States supplied natural gas.

14. The fourth section deals with the security of supply of whatever source of natural gas is supplying the system. This section makes a distinction between how many points of supply are incorporated into the system design and if local production and/or storage is used. As a practical matter, and based on direct experience, the Board's oversight is seriously required on this point. By way of example, the costs of a local producer connecting to an Ontario gas utility's system are very high compared to the same station designed and built by a licensed contractor. The costs that the utility charges often makes the project much less financially attractive and presents a significant barrier to bringing these local resources on line. This contestability issue is compounded by the

phantom Ontario producer delivery point to Dawn, at rates, which pay a local producer significantly less than what the utility then charges for the same gas to its customers even though it is delivered and used in the local market.

15. The fifth section deals with the environmental benefits from local production. Local production avoids the need to incur fuel gas to move the natural gas from either western Canada or the United States. It also avoids the energy needed to recover the natural gas using high pressure unconventional fracturing from the Marcellus basin. NCE acknowledges that each individual project will not have a significant impact on the reduction in greenhouse gas in Ontario but directionally the province would benefit from maximizing its production of Ontario natural gas from an environmental and economic perspective as demonstrated by the OPI OLTEP submission in Exhibit 2.

16. The final section deals with the community benefits that the project will provide. This includes such criteria as direct employment created through engineering and construction jobs, on-going employment for the operation and maintenance of the system, the spin-off effects the community will realize in the form of more locally created revenue from the sale of goods and services, the reduction in the cost for energy and the re-direction of these funds to other purchases in the community, land owner royalties and municipal taxes and other fees.

17. The overall weighting of the sections should be used to convey the importance that each section carries relative to the overall project. As noted earlier, NCE believes that the most quantifiable section and the one that has the most bearing on the competitiveness of the applicant is the last section. NCE recommends that Part 1: Project Market Parameters and Part 2: Project Customer Parameters each be weighted as 30% of the overall score. Part 3: Project Distribution System

Parameters would then be weighted as 40% of the overall score.

18. Regarding Issue 6 that Board has put forward, NCE believes that it is important to ensure that the successful applicant be required to install the system as proposed or relinquish the franchise rights for the area so other proponents can step forward and provide alternate service. Regardless of the size of the project, there is significant work that must be done to achieve the approvals for any project. To acknowledge this, NCE believes that a three year period from the time the applicant is granted the Franchise and the Certificate of Public Convenience and Necessity by the Board, to the time when gas is being provided to the first customer, is a reasonable period. If gas is not flowing by this time, the Board should have the right to terminate the Franchise and Certificate of Public Convenience and Necessity and to re-open the project to other applicants.

19. In conclusion, NCE believes that the Evaluation Tool is a reasonable and practical methodology to objectively consider many competing criterion and to put them into an overall scoring system that objectively weighs competing projects in Ontario and competing applicants that are competing for the same project in Ontario.

    NCE strongly believes that there is value is incorporating local, contestable resources into any project, where this is economically efficient, and that this guiding principle should be recognized as a priority in the evaluation of any project.

**EXHIBIT 1**

**Project Evaluation Tool**

**NORTHERN CROSS ENERGY LIMITED**
**CRITERIA FOR THE EVALUATION OF NEW NATURAL GAS PROJECTS**

**Notes:** 1. Rural customers are defined as those customers not having access to a central municipal water supply and municipal storm & sanitary sewer systems.
2. Scoring guide: Moderately Important 10 points; Important = 15 to 20 points; Very Important = 25 to 30 points

| Part 1 | PROJECT PARAMETER: Market Potential (Typically Based on Independent Market Research) | | Residential and Small Commercial | Large Commercial and Institutional | Industrial | Assigned Score | Maximum Possible Score | Weighted Score For Part 1 30% |
|---|---|---|---|---|---|---|---|---|
| | Size of Total Potential Market (TPM) | | | | | | 10 | |
| | Percent of TMP Forecasted to be Captured | | | | | | 10 | |
| | Period Forecasted to reach Full Market Capture | | | | | | 10 | |
| | Risk Assumed by Applicant for Forecasting Errors | | | | | | 20 | |
| | Forecasted Economic Development in Market -due to natural gas being available | | | | | | 10 | |
| | **Part 1 Sub-total** | | | | | | **60** | |
| | | | | | | | | |
| **Part 2** | **PROJECT PARAMETER: Customer Utilization (Typically Based on Recent Actual Data from Similar Markets)** | | **Residential and Small Commercial** | **Large Commercial and Institutional** | **Industrial** | **Assigned Score** | **Maximum Possible Score** | **Weighted Score For Part 2 30%** |
| | | | | | | | | |
| | **Customers Switching from Propane** | | | | | | | |
| | Urban & Suburban | | | | | | | |
| | Number | | | | | | 5 | |
| | Volume | | | | | | 5 | |
| | Rural | | | | | | | |
| | Number | | | | | | 5 | |
| | Volume | | | | | | 5 | |
| | Annual Average Projected Savings | | | | | | 5 | |
| | Forecasted Average Cost of Conversion | | | | | | 5 | |
| | Strength of Conversion Assistance Program (CAP) Offered | | | | | | 10 | |
| | Period to Reach All Forecasted Conversions | | | | | | 10 | |
| | Annual Environmental Benefit (after all conversions are completed) | | | | | | 5 | |
| | | | | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |
| | **Customers Switching from Light Fuel Oil** | | | | | | | |
| | Urban & Suburban | | | | | | | |
| | Number | | | | | | 5 | |
| | Volume | | | | | | 5 | |
| | Rural | | | | | | | |
| | Number | | | | | | 5 | |
| | Volume | | | | | | 5 | |
| | Annual Average Projected Savings | | | | | | 5 | |
| | Forecasted Average Cost of Conversion | | | | | | 5 | |
| | Strength of Conversion Assistance Program (CAP) Offered | | | | | | 15 | |
| | Period to Reach All Forecasted Conversions | | | | | | 10 | |
| | Annual Environmental Benefit (after all conversions are completed) | | | | | | 10 | |
| | | | | | | | | |
| | **Customers Switching from Electricity** | | | | | | | |
| | Urban & Suburban | | | | | | | |
| | Number | | | | | | 5 | |
| | Volume | | | | | | 5 | |
| | Rural | | | | | | | |
| | Number | | | | | | 5 | |
| | Volume | | | | | | 5 | |
| | Annual Average Projected Savings | | | | | | 5 | |
| | Forecasted Average Cost of Conversion | | | | | | 5 | |
| | Strength of Conversion Assistance Program (CAP) Offered | | | | | | 20 | |
| | Period to Reach All Forecasted Conversions | | | | | | 10 | |
| | Annual Environmental Benefit (after all conversions are completed) | | | | | | -10 | |
| | | | | | | | | |
| | **Customers Switching from Other (e.g. Heavy Fuel Oil, Diesel, Wood)** | | | | | | | |
| | Urban & Suburban | | | | | | | |
| | Number | | | | | | 5 | |
| | Volume | | | | | | 5 | |
| | Rural | | | | | | | |
| | Number | | | | | | 5 | |
| | Volume | | | | | | 5 | |
| | Annual Average Projected Savings | | | | | | 5 | |
| | Forecasted Average Cost of Conversion | | | | | | 5 | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Strength of Conversion Assistance Program (CAP) Offered | | | | | | 20 | |
| | Period to Reach All Forecasted Conversions | | | | | | 10 | |
| | Annual Environmental Benefit (after all conversions are completed) | | | | | | 10 | |
| | **Part 2 Sub-total** | | | | | | **240** | |
| | | | | | | | | |
| **Part 3** | **PROJECT PARAMETER: Distribution System (Typically Based on the Unique Design to Serve the Specific Target Market)** | | **Residential and Small Commercial** | **Large Commercial and Institutional** | **Industrial** | **Assigned Score** | **Maximum Possible Score** | **Weighted Score For Part 3 40%** |
| | | | | | | | | |
| | Pipeline | | | | | | | |
| | Total Cost | | | | | | 5 | |
| | Cost per Customer | | | | | | 10 | |
| | Cost per Unit Volume | | | | | | 10 | |
| | Percent of Pipeline using Canadian Sourced Parts & Material | | | | | | 5 | |
| | Cost of Required Upstream Reinforcement | | | | | | 20 | |
| | Financing | | | | | | | |
| | Cost (borrowing rate) | | | | | | 5 | |
| | Type (e.g. debt, project, contribution in aid-to-construction) | | | | | | 5 | |
| | Amortization Period | | | | | | 5 | |
| | Amount of Government Funding Required | | | | | | 10 | |
| | Strength of Partnership with Local Municipality | | | | | | 5 | |
| | Rates | | | | | | | |
| | Rate Design by Customer Class | | | | | | 10 | |
| | Temporary Expansion Surcharge (TES) Required | | | | | | 10 | |
| | Incremental Tax Equivalent (ITE) Required | | | | | | 10 | |
| | Source of Gas Supply | | | | | | | |
| | Locally Produced Hydrogen Enriched Natural Gas (HENG) using Local NG Production | | | | | | 20 | |
| | Locally Produced HENG using Pipeline Blend | | | | | | 15 | |
| | Ontario | | | | | | 15 | |
| | Western Canada | | | | | | 10 | |
| | United States | | | | | | 5 | |
| | Security of Supply | | | | | | | |
| | Number of Upstream Interconnects Serving the Project | | | | | | 10 | |
| | Supported by Local Storage | | | | | | 15 | |

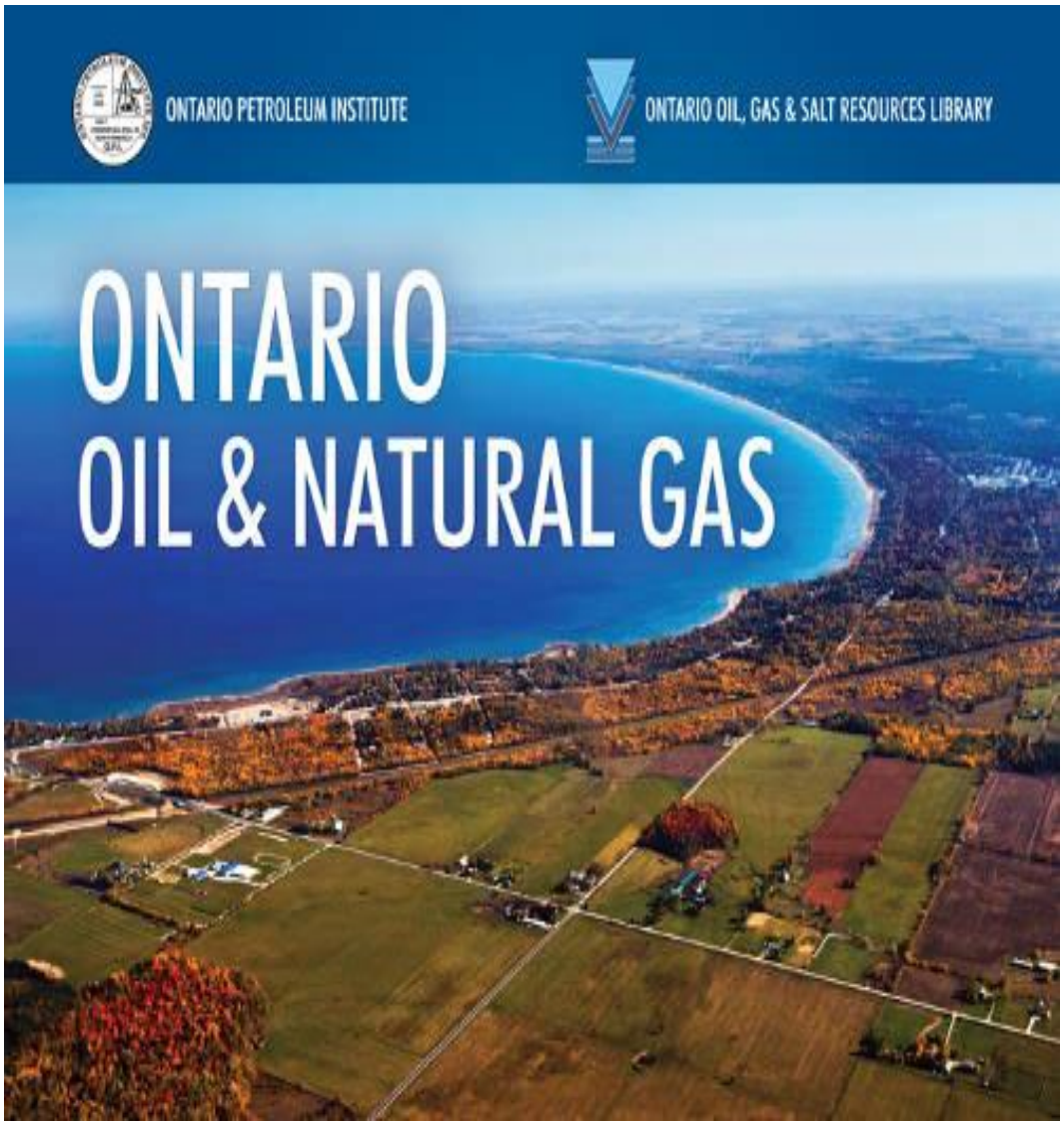
| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Supported by Local Production | | | | | | 20 | |
| | | | | | | | | |
| | | | | | | | | |
| | Environmental Benefit from Local Production | | | | | | 10 | |
| | Community Benefit from Project | | | | | | | |
| | Direct Employment<br>- engineering and construction | | | | | | 10 | |
| | In-direct Employment<br>– engineering and construction | | | | | | 5 | |
| | Total Revenue to Community<br>during Construction | | | | | | 10 | |
| | On-going Direct Employment | | | | | | 10 | |
| | On-going In-direct Employment | | | | | | 5 | |
| | Annual Revenue to Local Community<br>(New Disposable) | | | | | | 5 | |
| | Annual Tax Revenue<br>(municipal and provincial) | | | | | | 10 | |
| | Annual Royalties & Other Payments<br>(land owners & municipalities) | | | | | | 10 | |
| | **Part 3 Sub-total** | | | | | | **295** | |
| | | | | | | | | |
| | **Project Total Weighted Score** | | | | | | | |
| | | | | | | | | |

**EXHIBIT 2**

**Ontario Petroleum Institute Submission**

**to the**

**Ontario Long-term Energy Plan Update**




# OPI SUBMISSION

# 2017 ONTARIO LONG-TERM ENERGY PLAN

**Prepared by:**
**The Ontario Petroleum Institute**
**December 2016**

Ontario Petroleum Institute Inc.
555 Southdale Road East, Suite 203
London, Ontario N6E 1A2 ● Telephone (519) 680-1620
opi@ontariopetroleuminstitute.com ● www.ontariopetroleuminstitute.com

# *MISSION*

Founded in 1963, the Ontario Petroleum Institute Inc. is a non-profit industry association which represents explorationists, producers, contractors, geologists, petroleum engineers and other professionals, individuals or companies directly related to the oil and gas, hydrocarbon storage and solution-mining industries of Ontario.

Fundamental objectives of the Institute are:

To encourage responsible exploration of the oil, gas, hydrocarbon storage and solution-mining industries of Ontario

To maintain close liaison with government agencies which regulate the industry

To disseminate information relevant to member needs

To promote the legislative goals of the membership

To inform and educate the general public on the significance of the industry to the province of Ontario

## Table of Contents

## 1.0 EXECUTIVE SUMMARY

The Ontario Petroleum Institute (OPI) welcomes the opportunity to participate in the review and consultation of the 2017 Ontario Long-Term Energy Plan (LTEP). Thank you for providing the industry with the opportunity to consult with the Government of Ontario on the continuing contribution of the province's oil and natural gas industry to the energy needs and economy of Ontario.

The OPI is pleased to provide the "**OPI Submission**" as its formal response to the Ontario Minster of Energy's Proposal Notice: EBR Registry Number 012-8840.

The OPI is a non-profit industry association that represents the oil and natural gas exploration and production, hydrocarbon storage and salt solution-mining industries of Ontario. The membership represents a diverse set of constituents which include developers, producers, service companies, financial, legal and geology professionals, utilities, educational institutions, government agencies, and consultants.

The oil and natural gas sector in Ontario undertakes exploration, development, production operations, storage of hydrocarbons, environmental protection response, closure of abandoned wells, and the provision of specialized services to support these undertakings. Presently, 80 companies of differing size produce oil and natural gas throughout Southwestern Ontario supplying local residents, farms and businesses. The industry is supported by the Ontario Oil, Gas and Salt Resources Library, a resources centre managed by the OPI.

The exploration and production of oil and natural gas has made a valuable contribution to the province supplying energy, jobs and supporting the economic prosperity of communities throughout Ontario. For decades, this value-added industry has safely and sustainably produced millions of barrels of oil and billions of cubic feet of natural gas for Ontarians.

Ontario's oil and natural gas industry provides $77 million in direct oil and natural gas product revenues, annual investments of $25 - 30 million in capital expenditures, 700 full time jobs, $20 million in salary and wages and 1500 additional indirect jobs as well as generating $7 million in annual royalties, and significant yearly corporate taxes that play a vital role in the prosperity and well-being of Ontario's economy.

The OPI Submission provides a review of our industry history, its present state and its future potential to contribute to Ontario's long-term energy needs and the Climate Change Action Plan. It will build on the sector's involvement in "Achieving Balance, the 2013 Ontario Long-Term Energy Plan". The OPI recognizes the need to balance society's social, environmental and economic values using responsible extraction techniques for the exploration, production and storage of Ontario's oil and natural gas resources.

The OPI has held extensive and ongoing discussions with political and public service representatives of various ministries of the Government of Ontario in preparation for the review of the long-term energy plan.

From these discussions it is the OPI's understanding that the Government of Ontario has a desire to develop its oil and natural gas resources for the benefit of the citizens of Ontario and as an important contributor to economic prosperity.

The benefits include expanding the exploration, production and distribution of the province's oil and natural gas resources. Increasing the provincial supply of these resources is of value to all Ontarians and it has the potential to be most beneficial as a source of energy to rural communities and the agricultural economy. And increasing local production supports a less carbon intensive future that results from significantly less emissions from imported energy sources.

***Ontario Provincial Production Program***

The OPI is proposing that the Government of Ontario establish an Ontario **Provincial Production Program (PPP)** to develop Ontario's oil and natural gas resources to meet a target of 2% of province's annual supply: 2 million barrels of oil and 18 billion cubic feet of natural gas.

To meet the goal of expanding Ontario oil and natural gas production it will require a collaborative partnership between the Government of Ontario and the industry to develop initiatives to stimulate exploration. Ontario producers have the experience and expertise to meet that goal to integrate local production by managing supply, storing reserves and distributing oil and natural gas.

The PPP will enable the industry to increase its share of the province's energy supply, displace imports from jurisdictions with higher associated greenhouse gas emissions, and continue its contribution as value-added stakeholder in the Ontario economy.

The OPI recommends that the PPP be based on the Ontario government's commitment of increasing and maintaining the production of Ontario's oil and natural gas to at least 2% of the province's annual consumption.

Achieving the 2% target will require Ontario oil production increasing from its current 400,000 barrels per year to 1 million barrels per year, and natural gas an increasing from the current 6 billion cubic feet (BCF) per year to 18 BCF per year. A commitment to this PPP target would result in many significant benefits to the province.

The purpose of the PPP would be to increase Ontario exploration and production of oil and natural gas as an integral part of the 2017 LTEP will place an emphasis on natural gas production to supply underserviced communities will result in broader benefits to the province.

The OPI estimates that for natural gas PPP would involve:

- a $700 million capital investment program over six years based on 2017 projections;
- a phased in "feed-in-tariff" for natural gas; and
- the creation 500 new jobs bringing the total in the sector to 1200.

A PPP would be expected to provide the following benefits:

- a forecasted contribution of $10.5 million per year in royalties and $1 million per year in municipal taxes from natural gas production in the seventh year of the program;
- the removal of $CO_2$ greenhouse gas emissions per year by reducing natural gas imports; and
- a reduction on the transportation cost of natural gas by reducing imports.

The OPI is committed to fostering a sustainable oil and natural gas industry. It regards its participation in the development of the next Ontario Long-Term Energy Plan as an opportunity for oil and natural gas producers to collaborate with the Ontario Ministry of Energy on how provincially produced natural resources fit into Ontario's current and future energy supply.

## 2.0 AN INDUSTRY HISTORY

The Ontario Petroleum Institute (OPI), an industry association founded in 1963, represents companies and individuals involved in oil and natural gas production, natural gas and hydrocarbon storage, and salt/solution mining. The OPI's primary objective is to encourage the responsible exploration and development of oil and natural gas.

### 2.1 Oil 1858-2016

Ontario producers have been safely harvesting energy for 150 years. The first heartbeat of oil production in North America started in Ontario with oil in 1858. Oil continues to flow from wells discovered some 150 years later. In fact more than 50,000 oil and natural gas wells have been drilled in this time span on land as well as offshore. Exploration has resulted in the discovery of many producing oil and natural gas fields and storage pools that have contributed to the energy needs of a significant number of Ontario consumers.

**Birthplace of the Oil & Gas Industry**

**Oil Springs Ontario, 1858**

#### 2.1.1 Commercial Development

Ontario's commercial oil production was launched with the first commercial oil well in North America being drilled 155 years ago. It was from this early discovery that drilling and refining techniques were developed.

Oil from the first commercial fields in the communities of Oil Springs and Petrolia in Southwestern Ontario still flow today from those historical wells that spawned oil production in North America. In 2015 there were 18 companies operating 717 wells from "historical oil fields" in Ontario.

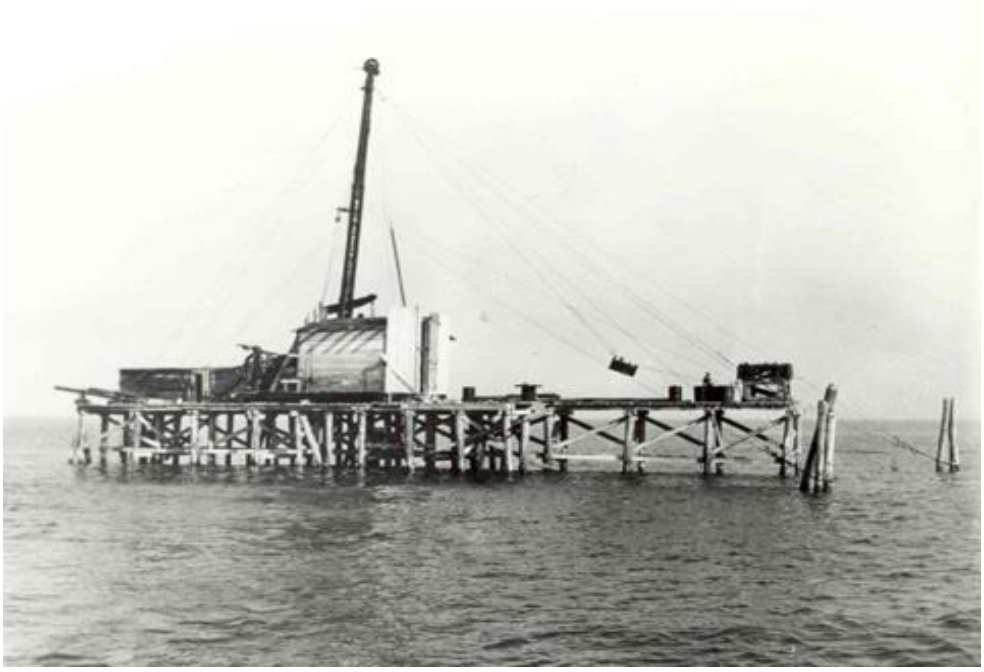

## 2.2 Natural Gas – 1880'S - 2016

Natural gas has been around as long as crude oil in Canada. Originally a by-product of oil production the first natural gas plant was established in Central Canada. By the early 1880's it became widely used as a source of energy for power generation and heating.

### 2.2.1 Commercial Development

Natural gas production has evolved with Southwestern Ontario being the centre of natural gas distribution with one of North America's largest underground natural gas storage hub that is located in Dawn Township to supply consumer needs for Central Canada and the Northeastern United States.

**Offshore Well- Lake Erie 1913**



## 2.3 Hydrocarbon Storage

The storage of hydrocarbons is a very important component of the Ontario Oil and natural gas industry. Most gas storage comes in the form of depleted natural gas or oil fields that have been repurposed.

Salt caverns are man-made cavities constructed within thick beds of salt in the subsurface of Ontario. They are formed by drilling through the overlaying strata down into the salt formation, and washing the cavern to the appropriate size. Salt caverns are formed with a leaching process by injecting a water stream down a well bore in order to "wash" a cavern into the salt. The wall of the completed cavern is insoluble in hydrocarbons and therefore prevents leakages.

## 2.4 Expanding the Globe

Ontario's importance in launching the petroleum industry and commercial oil production cannot be understated. The list of firsts includes first commercial oil well in North America, first petroleum company, first oil exchange. It was from this early discovery that drilling and refining techniques were developed.

Innovations in refining laid the foundation for the distribution and marketing of oil that became North America's largest industry in the 20$^{th}$ century with the advent of the automobile and its requirements for gasoline.

The experience and expertise obtained from these early beginnings in southwestern Ontario would provide the foundation for exploration and production activity worldwide.

## 3.0 ONTARIO OIL AND NATURAL GAS PRODUCTION

Ontario production of oil and natural gas has gone on uninterrupted since oil began flowing in 1858 and natural gas in the early 1900's. This production has led to the development of a storage industry for hydrocarbons and other liquids that is valued in the billions.

The graph below illustrates the volume of production extracted from the sedimentary basins throughout Southwestern Ontario – just under 90 million barrels of oil and 1.2 trillion cubic feet of natural gas.

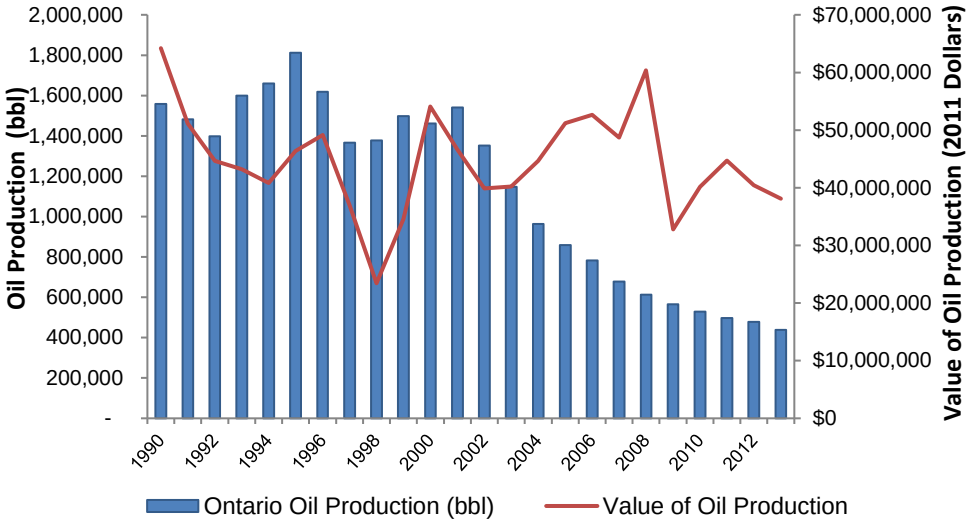
## Cumulative Production in Ontario through 2010

| Period | Oil ($m^3$) | Oil (bbls) | Gas (1000 $m^3$) | Gas (bcf) |
|---|---|---|---|---|
| **Devonian** | **7,130,148** | **44,848,203** | **15,041** | **0.5** |
| **Salina** | **2,350,282** | **14,783,138** | **18,576,632** | **656.0** |
| **Clinton** | **13,775** | **86,643** | **14,237,978** | **502.8** |
| **Ordovician** | **3,787,718** | **23,824,525** | **1,165,304** | **41.1** |
| **Cambrian** | **863,019** | **5,428,343** | **879,270** | **31.0** |
| **Total** | **14,144,942** | **88,970,852** | **34,874,225** | **1,231.4** |

### 3.1 Oil

Ontario oil production went from a high point in 1995 of 1.8 million barrels to 385,000 barrels in 2015.

*Oil Production in Ontario*

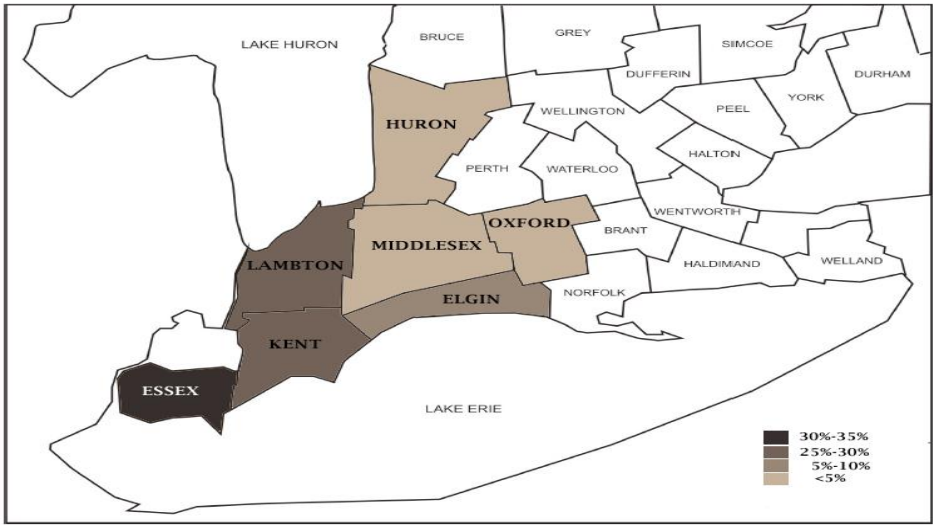



**Source**: Ontario Oil, Gas and Salt Resources Library

#### 3.1.1 Wells

In 2015 there were 717 historical and 466 producing commercial oil wells in located predominately in Southwestern Ontario.

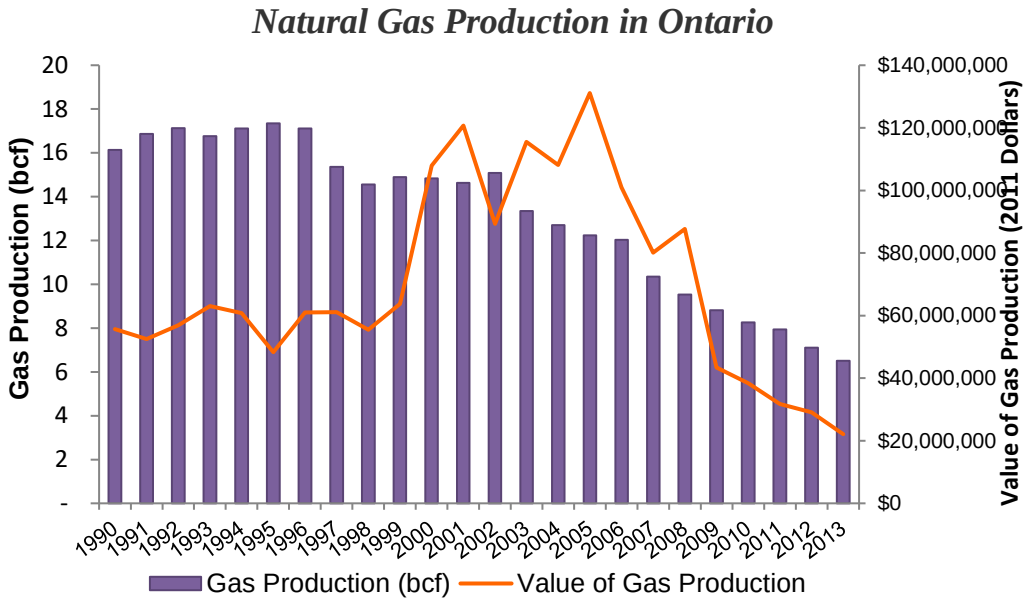
*Oil Production by County*




**Source**: Ontario Oil, Gas and Salt Resources Library

### 3.2 Natural Gas

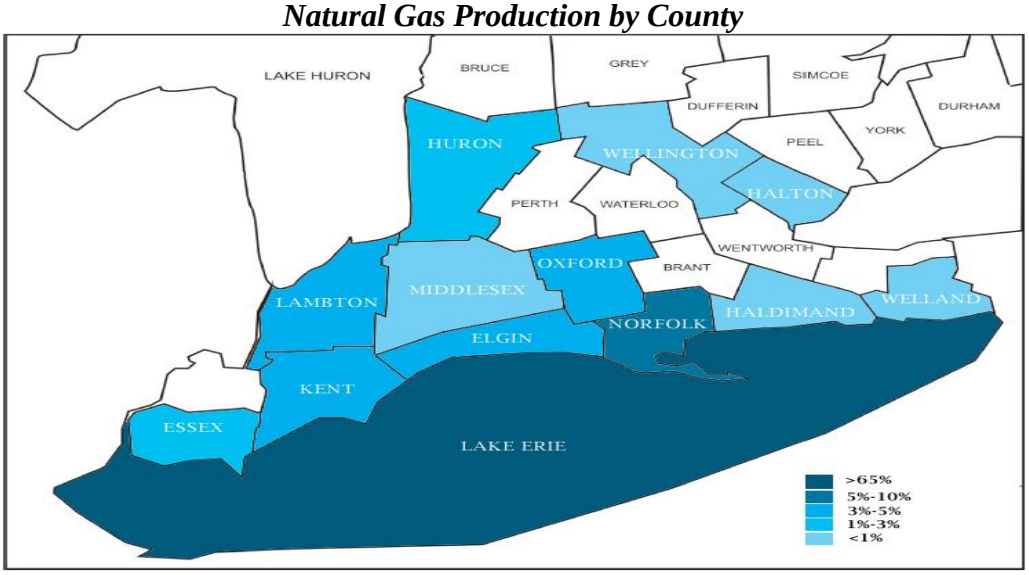
Ontario natural gas production went from a high point in 1995 of 16 billion cubic feet to 5.5 billion cubic feet in 2015.




Source: Ontario Oil, Gas, & Salt Resources Library; Prices from National Energy Board

#### 3.2.1 Wells

In 2015 there 1,221 wells producing natural gas in Southwestern Ontario a significant portion extracted from Lake Erie.




**Source**: Ontario Oil, Gas and Salt Resources Library

### 3.3 Storage

Ontario has over 400 wells used to store natural gas and hydrocarbons. It is a significant and valuable asset of the energy industry for Ontario.

#### 3.3.1 Natural Gas

Southwestern Ontario has one of the largest natural gas storage hubs in North America with 285 wells storing natural gas for distribution to Central and Eastern Canada and the Northeastern United States.

Ontario provides substantial storage capacity for energy products. These include storage pools for (i) natural gas and (ii) liquefied petroleum gas. These facilities are essential to the economic success of the oil and gas sector in the province and help distinguish it from other jurisdictions.

***Natural Gas Storage Pools in Ontario***

| Operator | County | Wells | Working Capacity at Delta Pressure (Bcf) |
|---|---|---|---|
| Union Gas | Lambton | 151 | 149.7 |
| Enbridge Energy Distribution | Lambton/Well and/Kent | 119 | 100.3 |
| Sarnia Airport Storage Pool | Lambton | 5 | 5.3 |
| Huron Tipperary Limited Partners | Huron | 9 | 2.9 |
| Market Hub Partners | Lambton | 2 | 1.1 |

**Source**: Ontario Oil, Gas and Salt Resources Library

## 4.0 CONTRIBUTING TO ONTARIO'S CLIMATE ACTION PLAN

The Ontario oil and natural gas production industry can be an important contributor to the success of Ontario's Climate Action Plan. The industry has the expertise and experience to develop programs to assist the Government of Ontario reduce its greenhouse gas footprint.

### 4.1 Supporting the Climate Action Plan

It is recognized that the use of natural gas to generate electrical power provides primary support to ensure the success of renewable energy programs (the Intergovernmental Panel on Climate Change has stated that the use natural gas will be a significant contributor to meeting the world's targets for green-house-gas emissions reductions).

It is environmentally beneficial to develop Ontario's oil and natural gas resources as a measure to offset higher green-house-gas emissions resulting from the importing of crude oil and natural gas.

In the next decade in other parts of Canada it's expected that there will be a 45% reduction in methane emission. An incentive based program in Ontario can achieve that target voluntarily through offset credits in the Ontario Cap and Trade Program. The protocols for offset credits can be adapted by Ontario from protocols developed in other jurisdictions such as Alberta.

The sector's capability to develop offset credits will benefit the Ontario Cap and Trade program. As well, it provides the industry with the opportunity to generate revenue through the sale of the offset credits.

It would be useful to have programs like the Climate and Clean Air Coalition supported by the Government of Canada available to Ontario's oil and gas sector.

### 4.2 Collaborating with Wind, Solar and Bio-fuel Producers

The Ontario oil and natural gas industry would welcome the opportunity to work with companies producing renewable energy: wind, solar and bio-fuels. To meet the energy needs of the future requires the cooperation and coordination of all energy producers. Collaborative cooperation can result in a balanced approach to providing energy.

Ontario's Long-Term Energy Plan includes the use of natural gas – a clean burning fossil fuel – to support the production of energy from renewables to reduce harmful emissions, which contribute to smog, pollution and climate change.

The oil and natural gas industry looks forward to collaborating with renewable energy producers as Ontario continues to develop its renewable energy potential over the next decade.

### 4.3 The Fourth Leg

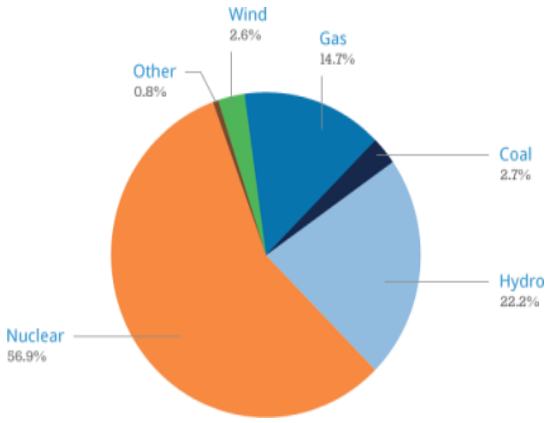
Ontario's electrical power is produced from nuclear generation, hydro power, renewables – wind, solar and bio-fuels – and from the Fourth Leg - natural gas.

Natural gas accounts for approximately one-third of Ontario's primary energy use and is a widely used fuel in the residential, commercial, industrial, and electricity generation sectors and will continue to play a strategic role in Ontario's supply mix as it helps to:

- Support the intermittent supply from renewables like wind and solar
- Meet local and system reliability requirements
- Ensure adequate capacity is available as nuclear plants are being modernized

Natural gas is ideal for these purposes because it can be easily "dispatched," which means plants can be fired up quickly to produce electricity and meet demand. Since 2003, Ontario has brought more than 5,000 MW of natural gas generation online in Ontario.

In 2013 natural gas provides close to 15% of the province power source.




In 2015 natural gas as a power source is at 10% and coal has been eliminated and in the coming years, natural gas is likely to continue to have role in the production of Ontario's power supply mix. The current natural gas power plant fleet has the capability to generate more electricity when other sources are in short supply. Over the next decade or so, natural gas could be used for additional base-load generation.

## 4.4 Environmental Responsibility

Sustainable exploration and production of oil and natural gas involves a commitment to the environment. There is an inherent responsibility to ensure the protection of the environment and water resources. Safely harvesting energy for 150 years, the Ontario industry is committed to sustainable oil and natural gas development. Exploring and producing these natural resources in Ontario is a process regulated by the Government of Ontario's Ministry of Natural Resources and Forestry through the Ontario Oil, Gas and Salt Resources Act

### 4.4.1 Protecting Groundwater

Exploration and production of oil and natural gas involves a commitment to clean water quality through the design and operation of facilities that meet or exceed federal or provincial water quality objectives.

The Ontario oil and natural gas industry is equally committed to safeguarding the quality of regional surface and ground water resources, to reducing the amount of fresh water required per barrel equivalent of production by improving water recycle rates, using low quality (e.g. saline) water sources where feasible, and by developing new technologies.

Using non-potable water sources, where feasible, developing and implementing new technologies, such as treating water from underground saline aquifers, are other ways industry is working to manage water. Industry is also working with provincial and federal government agencies to monitor the quality of regional surface and groundwater resources, striving to ensure that any water re-entering waterways meets all applicable standards.

### 4.4.2 Land Use Footprint

Sustainable exploration and production of oil and natural gas involves a commitment to preserving fertile land, maintaining regional ecosystems and biodiversity, and reclaiming all lands affected by our operations, returning them to self-sustaining landscapes.

The oil and natural gas industry recognizes that lands with rich biodiversity are critical resources to Ontarians and it is important to assess the impact of industry activities on the land, as well as the effectiveness of mitigation activities.

The industry strives to keep land in its original state, a self-sustaining landscape with biodiversity ensuring that each phase of development, from preparing the site for work, through the exploration and production stages and the reclamation phase is designed to reduce the impacts of operations.

## 5.0 FIRST NATIONS COMMUNITY

Ontario First Nations, Inuit and Metis people have a historical place in the province as a result of a unique relationship that involves an affiliation with the Crown as embodied in the reigning sovereign, Queen Elizabeth, and the Government of Canada. Treaties negotiated by Indigenous peoples are an important voice in in the development of the Ontario's natural resources.

### 5.1 Building a Relationship

The OPI has recognized the inherent value of establishing relationships with the province's First Nations and Metis communities understanding that the relationship must reflect First Nations' participation in the energy sector as key partners.

### 5.2 Mutual Stakeholders

Frist Nations are members of the OPI providing the industry with an opportunity to work together with the First Nations as stakeholders with a focus on exploration, production, and training.

## 6.0 CONTRIBUTING TO ONTARIO'S ECONOMY

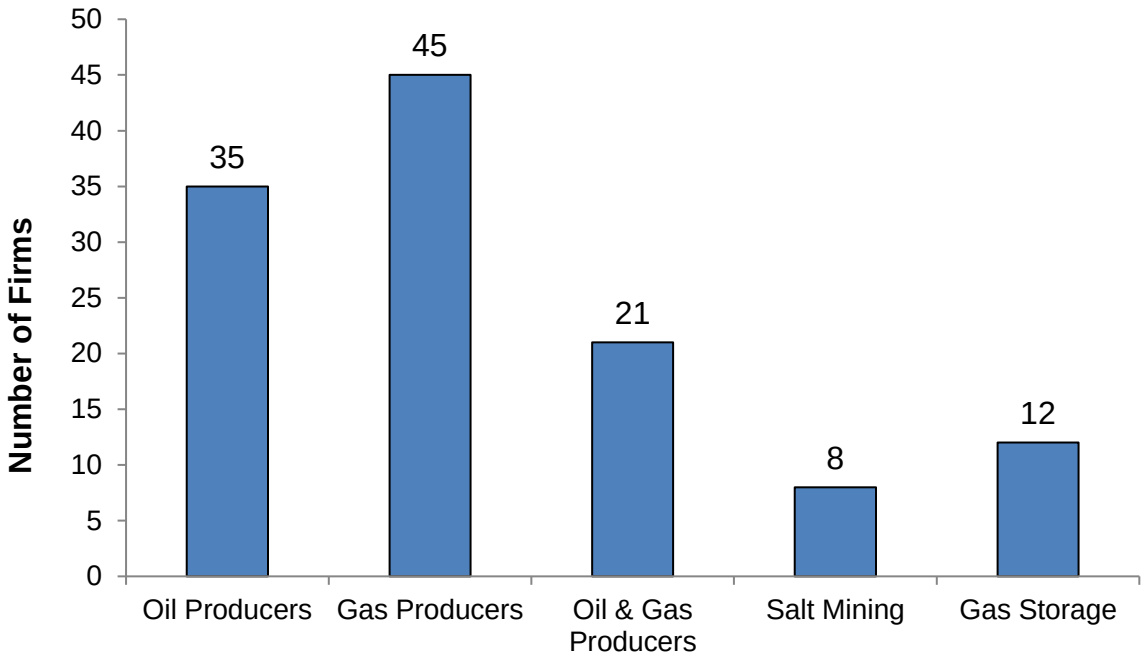
### 6.1 Industry Overview

Upstream crude oil and natural gas exploration and production has been an important contributor to Ontario's economy. For 150 years this value-added industry has safely and sustainably produced millions of barrels of oil and billions of cubic feet of natural gas for Ontarians.

The sector's major activities include exploration and development of new fields and storage activities that are an important part of the Ontario economy. The industry represents a diverse set of constituents that include producers, service companies, financial and legal professionals, utilities, educational institutions, government agencies, and consultants.

At the core of the sector's activities is the production and storage of energy. The OPI represents the majority of those firms actively engaged in these activities in the province.

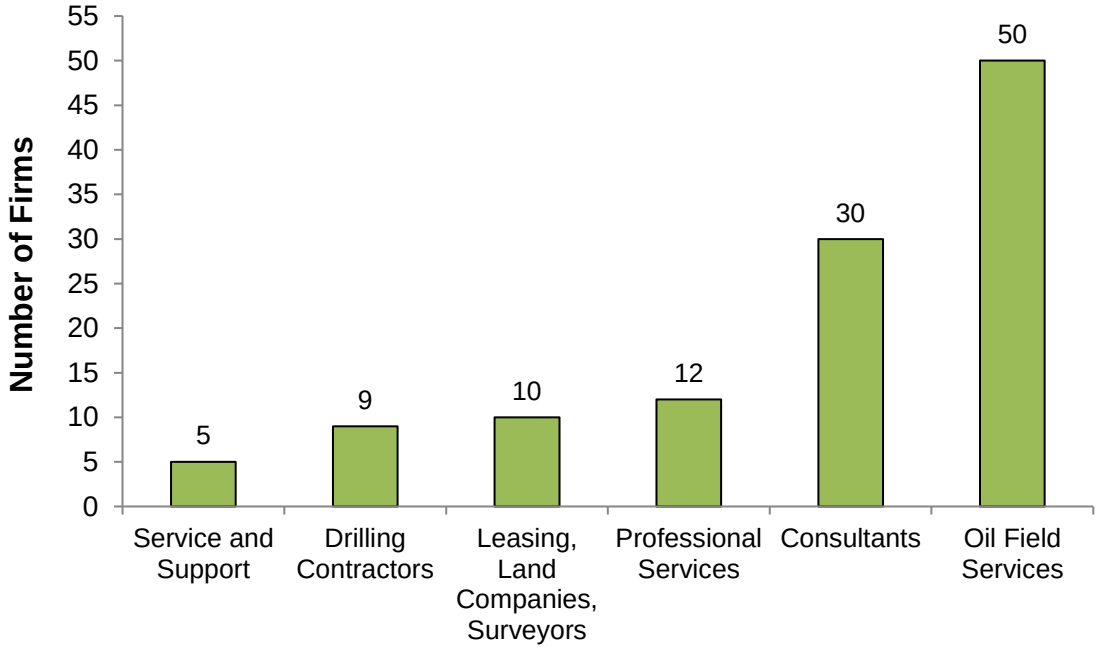
*Number of Active Firms*




**Source:** Ontario Oil, Gas and Salt Resources Library

The sector also includes firms that provide the support activities necessary for a productive sector that include drilling and operations as well as high value added support of finance, accounting and legal services.

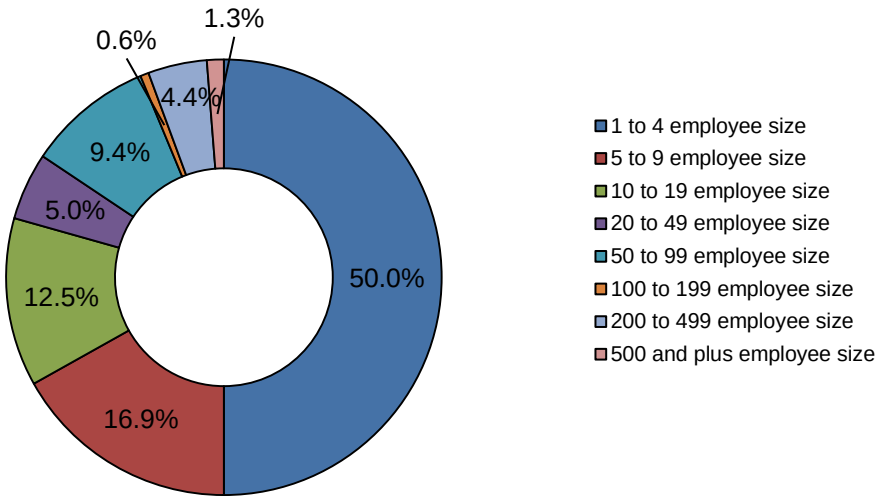
*Number of Support Firms*




**Source**: Ontario Petroleum Institute

The composition of the firms that are active in the sector vary considerably in the size of the operations with the majority considered as small business.

*Composition of Firms in the Ontario Oil and Natural Gas Industry*



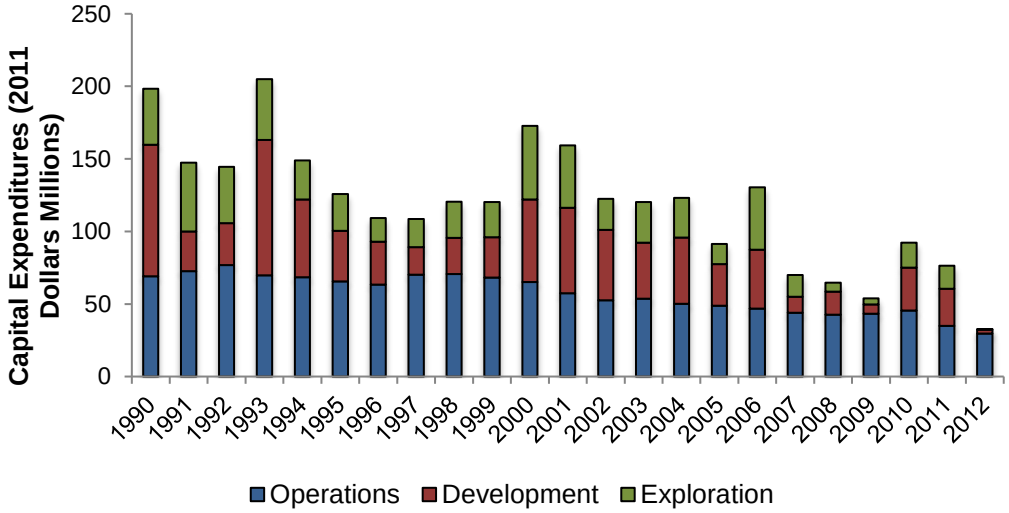

**Source**: Statistics Canada

All economic activity of these firms occurs in Southwestern Ontario.

## Capital Expenditures

The sector has consistently developed natural resources through sustained capital expenditures.

*Capital Expenditure in the Ontario Oil and Natural Gas Sector*

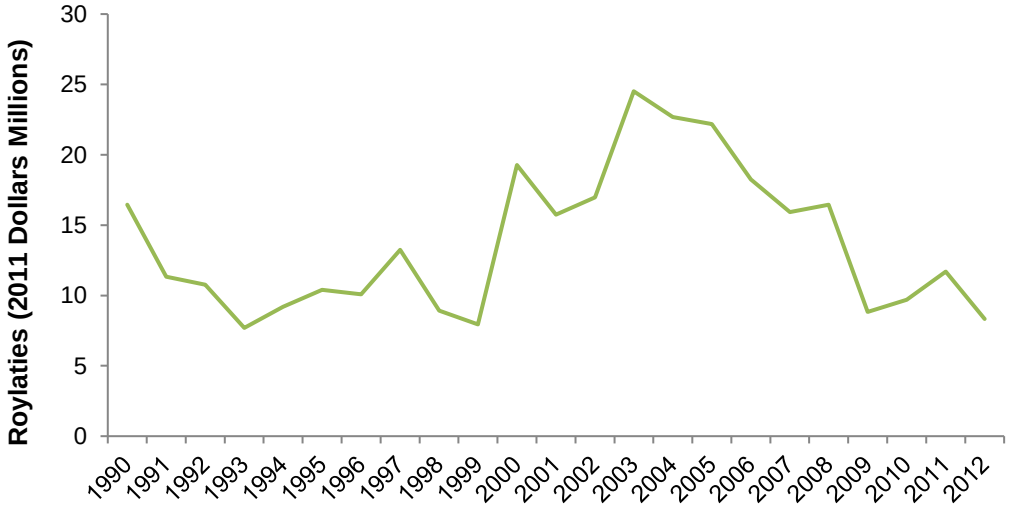



**Source**: Canadian Association of Petroleum Producers

**Royalty Benefits**

Beyond the direct benefits from economic activity, the oil and natural gas sector provides significant payments to the province and landowners in the form of royalties.

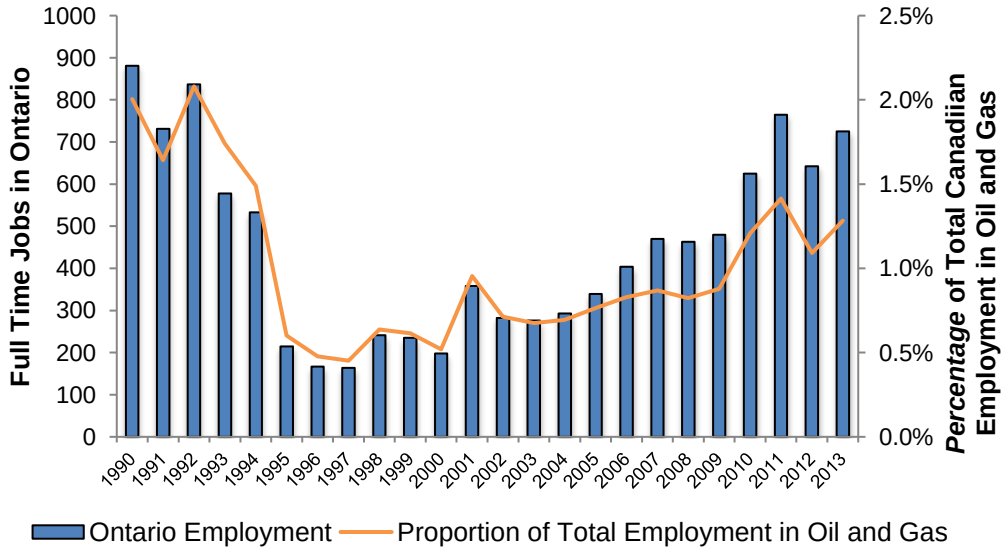
***Royalty Payments by the Ontario Oil and Natural Gas Sector***




## 6.2 Employment and Productivity

The Ontario oil and natural gas exploration and development sector directly supports about 700 full-time jobs. For each full-time position in the sector there is an additional position offering support activities that brings the number of jobs to approximately 1,500.

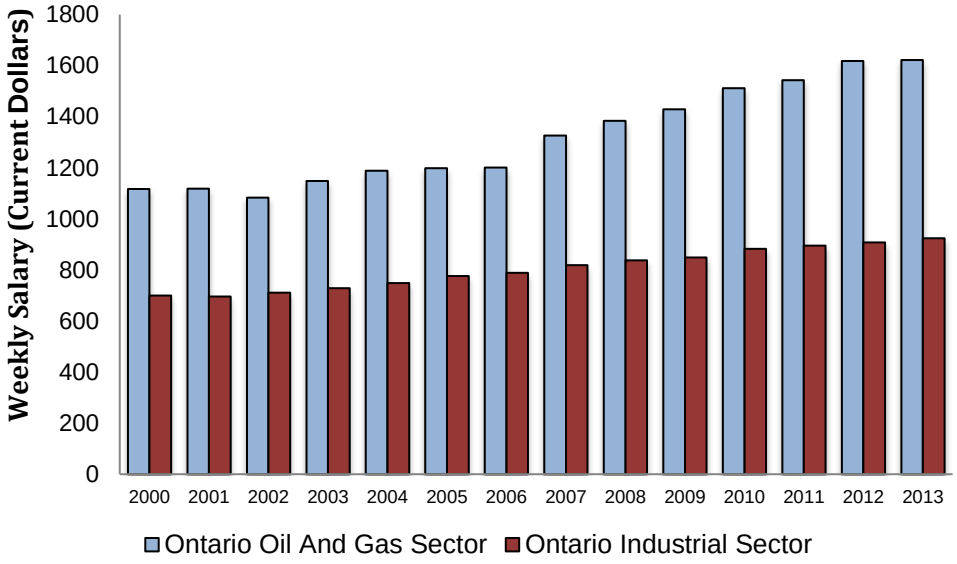
***Employment in the Ontario Oil and Natural Gas Production Sector***




**Source**: Statistics Canada (Survey of Employment, Payrolls, and Hours)

The full time positions in the Ontario industry tend to be well-paying jobs that exceed the average industrial position in the province.

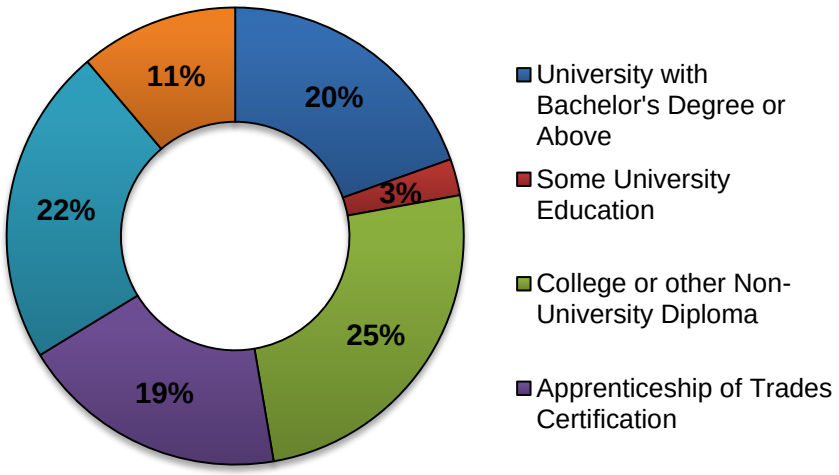
***Comparison of Weekly Salary - Ontario Oil and Natural Gas/Industrial Sectors***




**Source**: Statistics Canada

The vast majority of the labour force in the Ontario oil and natural gas industry have received higher education and/or specialized training which is reflected in the higher levels of productivity and compensation in the sector.

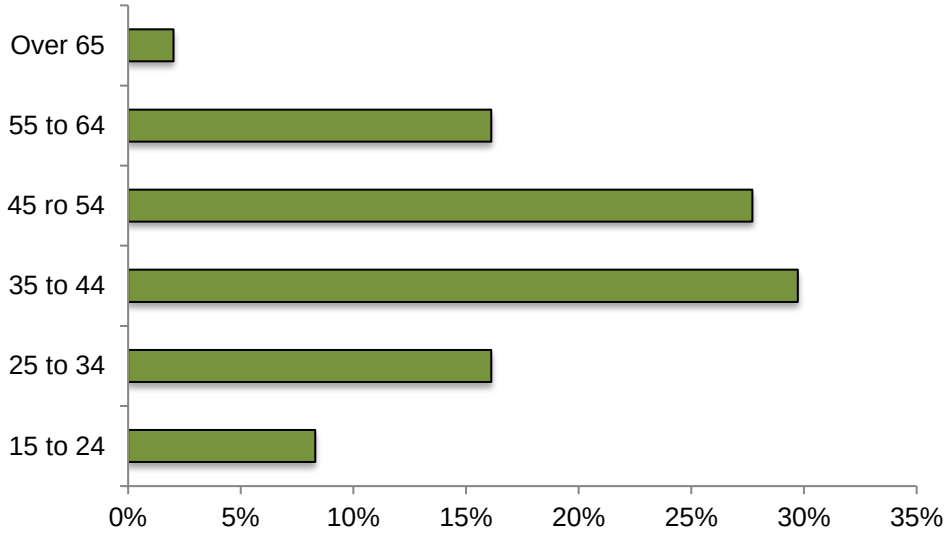
***Levels of Educational Attainment in the Ontario Oil and Gas Sector - 2011***




**Source:** Statistics Canada (2011 National Household Survey)

The demographic profile of the industry is well balanced where the middle 35 to 44 and 45 to 54 years old categories is the largest component.

***Demographic Profile of the Ontario Oil and Gas Sector -2011***




**Source**: Statistics Canada

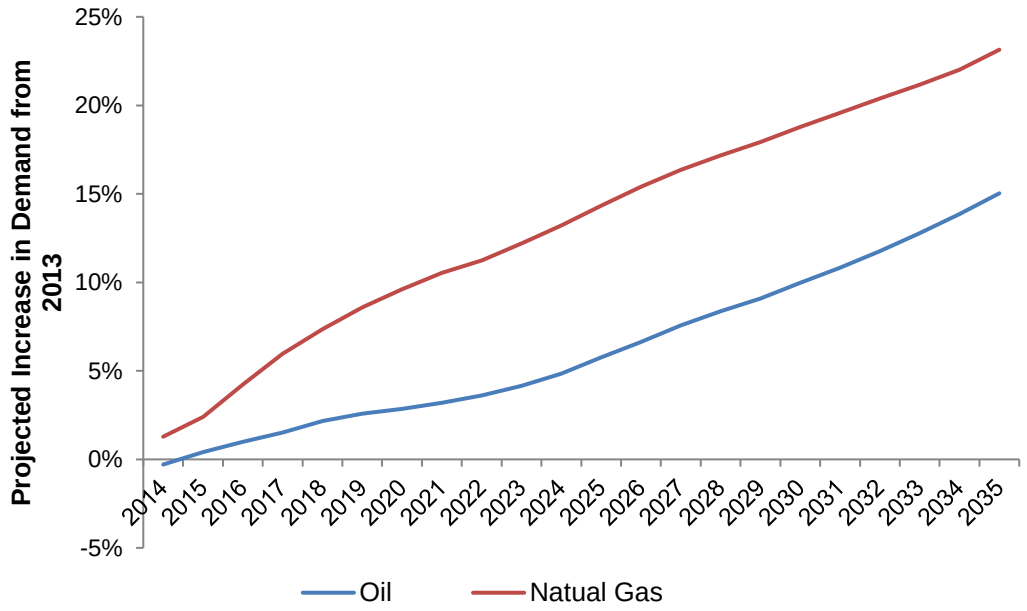
## 7.0 CONTRIBUTING TO ONTARIO'S ENERGY SUPPLY

### The Ontario Advantage

Ontario oil and natural gas production has been sustained by the advantages of long life reserves, low operating costs, drilling capacity and infrastructure – roads, rail, pipelines, storage and refineries.

The Ontario oil and natural gas industry has the potential to supply energy for the foreseeable future. Ontario producers can produce energy from the province's natural resources to enhance the security of that supply, contribute to the province's economic well-being and supports the Climate Action Plan.

***Projected Growth in Ontario Demand for Oil and Natural Gas***




**Source**: National Energy Board (Canada's Energy Future, 2013)

### 7.1 Exploration and Production

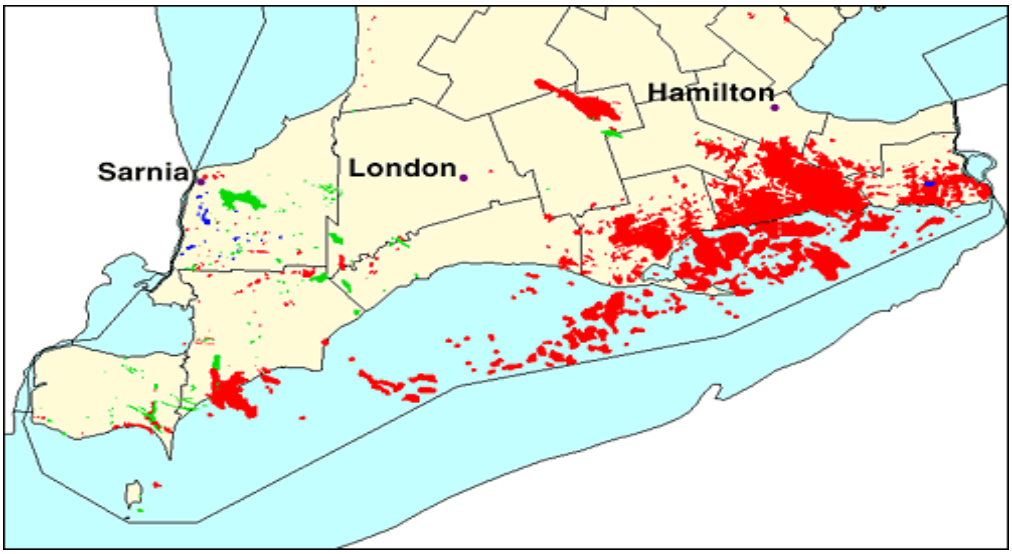
Ontario companies have been exploring and producing oil and natural gas for 150 years. The industry has made a significant contribution to Ontario's economy with an estimated 50,000 oil and natural gas wells that have been safely drilled on land as well as offshore.

Whether it's oil from new "plays" or natural gas from "shale" formations, the technologies that are commonly practiced around the world have come from Canadian innovators. These technologies are widely used in most of North American oil and natural gas basins with a few exceptions.

### 7.1.1 Resource Potential

In Ontario, 50% of the potentially recoverable conventional oil and natural gas remains to be developed. There are 2500 active oil and natural gas wells in Ontario at the end of 2014. It is estimated that cumulative production to the end of 2014 amounted to 1.33 trillion cubic feet of natural gas and 90.4 million barrels of oil. The quantitative assessments of the potential in Ontario indicate that there is 190 million barrels of oil remaining to be produced or still undiscovered, and 1.45 trillion cubic feet of natural gas. No quantitative resource estimate has been completed for unconventional resources in the organic-rich shales of Ontario.

***Oil and Natural Gas Pools in Southwestern Ontario***




### 7.1.2 Conventional Reserves

Exploration for conventional oil and natural gas has been the sole focus of the industry since it began nearly 150 years ago. Conventional oil and natural gas is typically "free oil and gas" trapped in multiple, relatively small, porous zones in various naturally occurring rock formations such as carbonates, sandstones, and siltstones.

In Ontario conventional reserves are found in the following Southwestern Ontario reservoirs: (i) Cambrian sandstones and dolomites; (ii) Middle Ordovician hydro-thermal dolomites; (iii) Lower Silurian sandstones; (iv) Silurian reefs and carbonates; and (v) Middle Devonian carbonates.

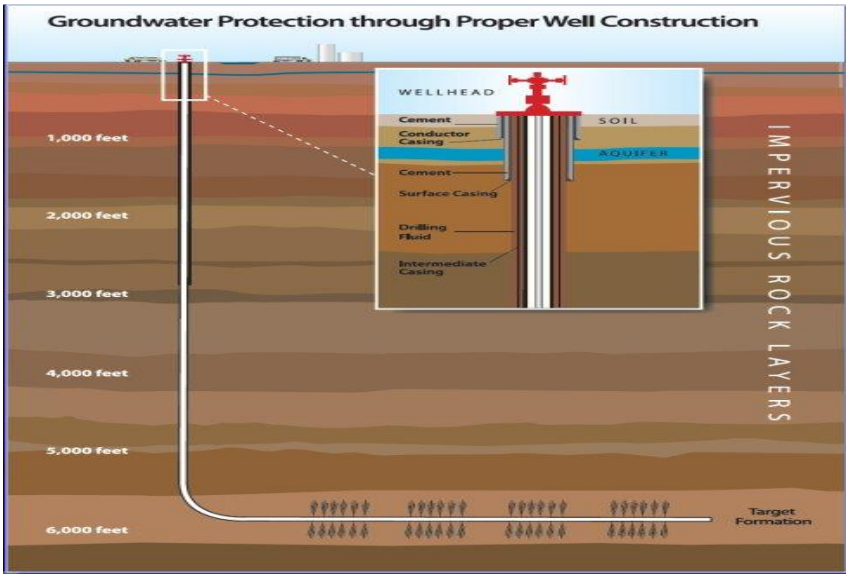
### 7.1.3 Shale Oil and Natural Gas

Shale rock formations hold unconventional energy resource potential for natural gas and light oil. Development of unconventional resources has revolutionized production of oil and natural gas. Unconventional production has accelerated with much of this development primarily as a result of innovative drilling and well stimulation technologies – notably horizontal drilling and hydraulic fracturing.

Southwestern Ontario has organic-rich shale formations that have potential for unconventional sources of oil and natural gas. The resource potential of the oil shale could be 100 million barrels of oil based upon a physical estimation of the resource.

Recent innovations in the use of hydraulic fracturing in horizontal wells has resulted in increases in oil and natural gas production.

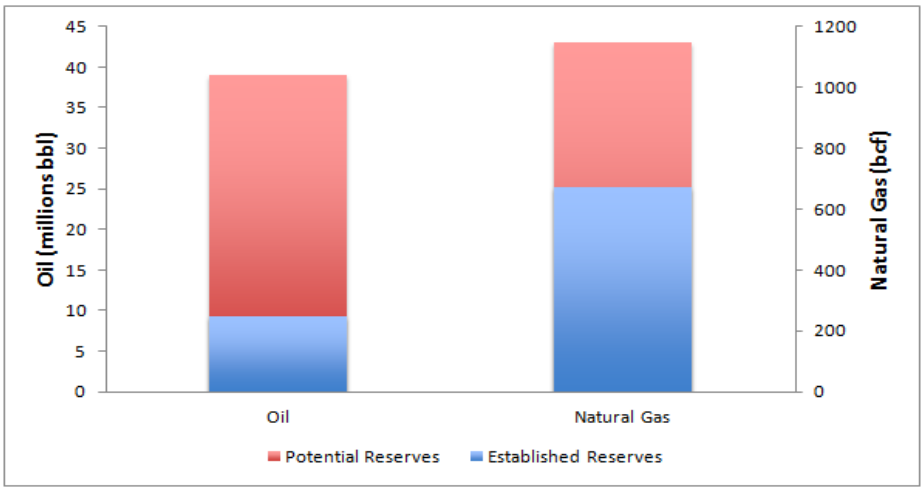
***Horizontal Well***




## 7.2 Reservoir Life

Ontario has long-life reserves with wells estimated to produce, on average, for 30 years. Independent studies indicate that 50% of the potentially recoverable conventional oil and natural gas remains to be developed in Southwestern Ontario.

***Established and Potential Reserves of Oil and Natural Gas***

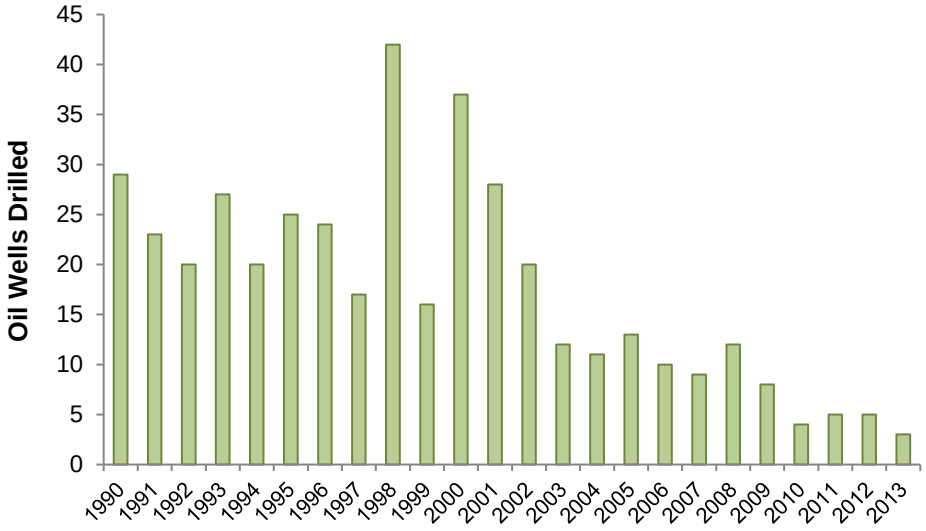



**Source**: Ontario Oil, Gas and Salt Resources Library

### 7.3 Drilling Capacity

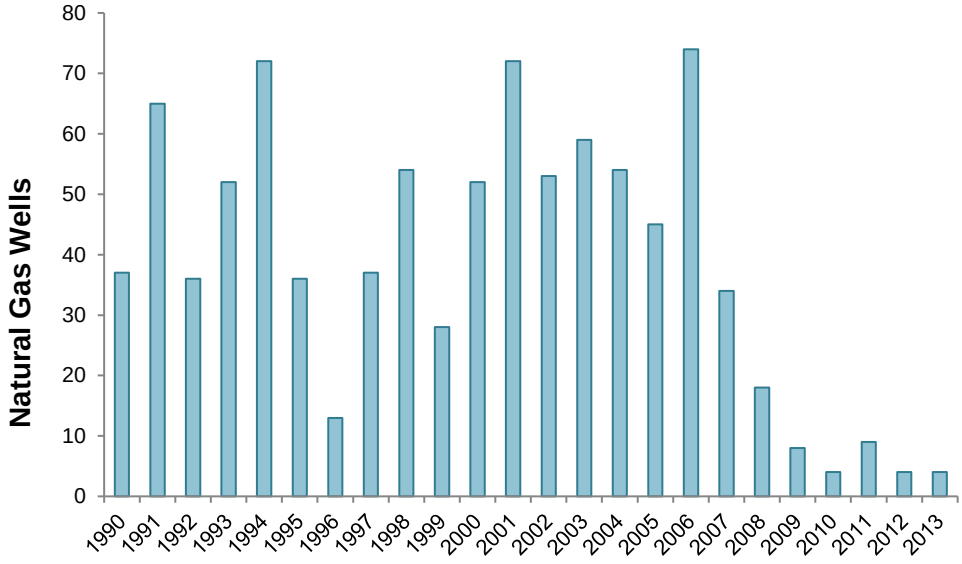
The Ontario oil and natural gas industry has considerable experience in drilling for energy. This drilling capability and innovations have contributed to the industry's record of safely developing oil and natural gas.

***Oil Wells Drilled in Ontario Since 1990***




**Source**: OPI Well Data

***Natural Gas Wells Drilled in Ontario Since 1990***




**Source**: OPI Well Data

The downward decline in drilling continued in 2014 and in 2015 with only one exploration or developed well drilled in each of those years.

## 7.4 Transportation

The oil and natural gas and hydrocarbon storage industries operate with a significant investment in transportation infrastructure. Delivery of hydrocarbons in Ontario is by truck transport and pipelines.

### 7.4.1 Truck Transport

Oil production is trucked directly from producers to storage facilities in Sarnia, Ontario prior to being refined.

### 7.4.2 Pipelines

Natural gas production is transported through a network of pipelines directly to customers or to storage hubs in Southwestern Ontario.

## 8.0 ONTARIO PROVINCIAL PRODUCTION PROGRAM

The OPI regards its participation in the development of the next Ontario Long-Term Energy Plan as an opportunity for the Ministry of Energy and the industry to collaborate on how oil and natural gas fits into Ontario's current and future energy supply.

In recent years, due to a variety of factors Ontario exploration and production has been in decline with only one new exploration well per year drilled in 2015 and 2016. Based on several independent studies it is estimated that 50% of the potentially recoverable conventional oil and natural gas remains to be developed in the province.

For the industry to achieve the goals it has set the OPI is proposing that the following measures and mechanisms be implemented to enable the industry to fulfill its commitment to the Ontario Long-Term Energy Plan:

### 8.1 Provincial Production Program

The OPI is proposing the Government of Ontario establish an Ontario Provincial Production Program (PPP) to encourage expanded exploration of crude oil and natural gas in the province by local companies and to attract investment from companies outside the province.

While the purpose of the PPP would be to increase Ontario exploration and production of oil and natural gas the focus of the objectives and elements of the PPP is on local natural gas production to supply Ontario in general but in particular to provide access to natural gas to underserviced communities in the province.

#### 8.1.1 Objectives

The PPP would focus on exploration to supply the requirements in the Ontario Long-Term Energy Plan to:

- Increase Ontario produced oil and natural gas to meet local consumer, commercial and industrial demand with a target of 2% of the Ontario's 2017 forecast consumption.
- Support the increased supply of Ontario sourced natural gas with a target of 2% of the Ontario's 2017 forecast consumption.
- Supply underserviced communities in Ontario with affordable natural gas including mechanisms for producers to convert locally produced natural gas to electricity in areas where the installation of new natural gas infrastructure is not currently practical, and where an existing utility has a municipal franchise but has chosen not to serve some customers within that jurisdiction.
- Support the updating of geological studies of Southwestern Ontario
- Establish a tax credit program to encourage drilling for untapped oil and natural gas.
- Support the promotion of Ontario's oil and natural gas resources throughout North America in the Government of Ontario's economic development programs that support key industries, small business, training and skills, and infrastructure.

### 8.1.2 Program Elements

The PPP would include but not be limited to the following elements:

1) A "feed-in-tariff" for Ontario natural gas production that would facilitate and maintain an increase in exploration.

2) The first phase of funding to support the PPP be derived from paying the Ontario natural gas producers the cost of natural gas as currently charged by the utilities to the end user in the local market less the utilities' handling cost to accept and distribute the gas locally. Abolish the current pricing mechanism that is used by the utilities that imposes a "deemed" round trip transportation fee for locally produced gas to and from the storage hub, even though the natural gas is never moved beyond the local market.

3) The second phase of funding to support the PPP be derived from contracts with the Ontario Government to buy locally produced natural gas preferentially under longer-term contracts.

4) The PPP be augmented as required to support the level of capital and operating cost that the producers will be required to incur to meet the natural gas production target of 2% of all the natural gas consumed in the province. The recovery of the "augmented cost" will be reviewed by the Ontario Energy Board.

5) The costs that represent "barriers to entry" for the local Ontario oil and natural gas producers be reduced or eliminated to facilitate the proposed production increases. The most pressing is the reduction in the fees that utilities charges to connect to their pipelines.

6) The PPP would provide the basis for a strategic reserve that the OPI suggests be developed by the Government of Ontario as a contingency for electricity in the event of an interruption of the power supply from the disruption of nuclear energy or imported natural gas. Ontario has the cavern storage capacity to designate a portion of any new production to a strategic reserve

### 8.1.3 Production Projections

The initial target of the PPP would be the re-establishing and maintaining of the level of production that it realized at its peak in 1995 of 1.8 million barrels of crude oil and 16 billion cubic feet of natural gas with the goal of reaching 2% of provincial requirements by 2032.

**Ontario Oil and Natural Gas Production 2017 to 2023**

| **Year** | **Oil (barrels/year)** | **Natural Gas (cubic feet/year)** |
|---|---|---|
| **2017** | **400,000** | **6 billion** |
| **2022** | **1 million** | **18 billion** |
| **2027** | **2 million** | **24 billion** |
| **2032** | **3.5 million** | **30 billion** |

The long-term potential of hydrocarbon resources in the province is significant and opportunities remain to develop the province's established reserves of 190 million barrels of oil and 1.45 trillion cubic feet of natural gas with further exploration.

For natural gas, the 2% target would result in Ontario production increasing from its current 6 billion cubic feet (BCF) per year to 18 BCF per year.

To achieve the 2022 natural gas PPP target of 2%, OPI estimates that it will require:

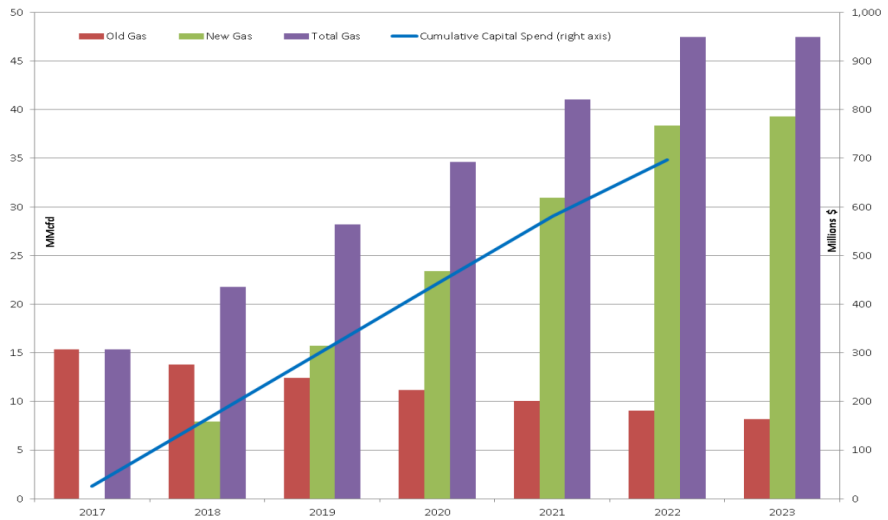
- $700 million capital investment program over 6 years to reach the 2% target of all provincial consumption based on 2017 projections.

- Initial natural gas "feed-in-tariff" that would be funded by paying the local natural gas producers the local price for natural gas at the inlet to a residential or small commercial customer less a handling fee for the utility to accept and distribute the production locally. For example, a feed-in-tariff of $5.50/MCF would be established based on an assumed local selling price by the distribution utility of $6.00/MCF and an assumed local handling fee by the distribution utility of $0.50/MCF.

- Gradual increase in the "feed-in-tariff" to account for any shortfall the Ontario producer industry may encounter to achieve and maintain the 2% target. Based on the "feed-in-tariff" rate above, OPI estimates that the "feed-in-tariff" would need to rise to approximately $6.54/MCF by the sixth year of the program to break even on the capital carrying and operating & maintenance costs of the PPP for natural gas.

Notwithstanding this potential a Provincial Production Program requires a projection target set by the Ministry of Energy in collaboration with the industry's present and future capability.

***Ontario Provincial Production Program***



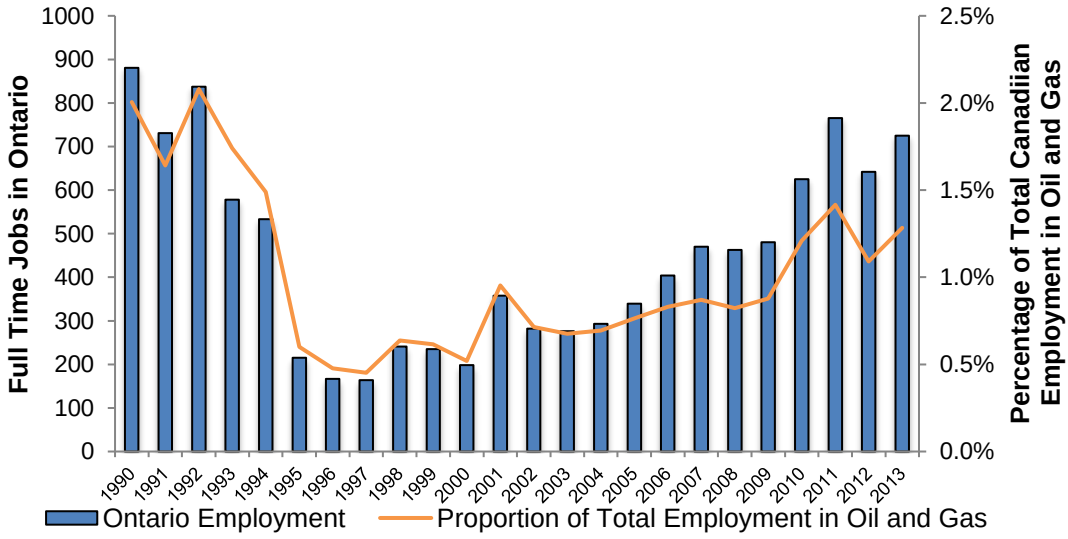
The OPI regards its participation in the development of the next Ontario Long-Term Energy Plan as an opportunity for the Ministry of Energy and our industry to collaborate on how oil and natural gas fits into Ontario's current and future energy supply.

### 8.2 Provincial Stimulus Program

The objective of a Provincial Stimulus Program is to work with the Government of Ontario to revitalize the oil and natural gas industry through exploration and development in Ontario to maximize the utilization of the province's natural resources.

The production of Ontario oil and natural gas has supplied energy, created economic activity and wealth creation in the province. At certain times governments have provided support in various ways to stimulate economic development to develop an industry's resources in such sectors as mining, forestry, agriculture, renewable energy, manufacturing, and the automotive sector.

In 2015 – 47 companies produced 400,000 million barrels of oil and 5.6 billion cubic feet of natural gas valued at $77 million with 700 full-time employees and an additional 1,500 employed indirectly through support services.




In 1994 - 72 companies produced close to 2 million barrels of oil and 16 billion cubic feet of natural gas valued at $101 million with 1,200 full-time employees and an additional 1,200 employed indirectly through support services.

By meeting the 2022 provincial production targets for the natural gas outlined above the OPI estimates that the industry will employ:

- 1,200 full time employees, up from the current 700;
- 2,400 indirectly employed up from the current 1,500; and
- 200 construction jobs over the six year program

The OPI estimates that the natural gas component PPP will contribute:

- $10.5 million per year in royalties and $1 million per year in municipal taxes from the PPP in the seventh year of the program.

### 8.2.1 Ontario Ministry of Energy

A commitment from the Ministry of Energy that encourages and supports the development of the province's oil and natural gas resources as part of the 2017 Ontario Long-Term Energy Plan to:

● Increase Ontario produced oil to meet local consumer, commercial and industrial demand
● Connect consumers in underserviced communities with a supply of affordable natural gas
● Supply Ontario sourced natural gas to the provincial power grid
● Contribute to the Ontario Climate Action Plan

### 8.2.2 Drilling Incentive Program

A commitment from the Ministry of Finance to:

● Establish a Provincial Tax Credit program as an incentive to encourage drilling for untapped oil and natural gas.

● Initiate an assessment review to correct irregularities between producers and utilities with respect to municipal assessments of pipelines, wellheads and related surface equipment.

***Drilling Starts Are Equivalent to a Housing Start***

A drilling program sets off a flurry of business opportunities that stimulates economic activity that generates income, creates employment, and tax revenues

### 8.2.3 Promote Ontario Oil and Natural Gas Industry

A commitment from the Ministry of Economic Development and Growth to:

● Include the industry in the Government of Ontario economic development programs that support key industries, small business, training and skills, and infrastructure.

● Partner with industry to promote Ontario oil and natural gas exploration, development as a profitable business opportunity.

***Value of Resource Extraction***

General wealth creation benefits the industry and every level of government. Hydrocarbons explored for and produced locally reduces Ontario's greenhouse footprint. Reducing imports off-sets energy requirements for refining, trucking, railing, and pipelining of crude oil and natural gas across the continent

### 8.2.4 Ontario Oil, Gas and Salt Resources Library

Support the industry funded Ontario Oil, Gas and Salt Resources Library with the resources necessary to establish it as the geological center of excellence dedicated to the development of Ontario oil and natural gas resources (Ontario Geological Survey equivalent).

#### 8.2.4.1 Geological and Geophysical Program

Update geological/geophysical studies of Southwestern Ontario Seismic Programs / Aerial survey / Geochemistry

## 9.0 2017 ONTARIO LONG-TERM ENERGY PLAN

### A Bridge to the Future

Developing an energy plan in 2016 is a challenging undertaking. The demand for energy is increasing rapidly as is the importance of managing climate change. The source of supply must take into account that managing climate change is a significant factor.

The goal of the Government of Ontario's Climate Action Plan of which one of its signature components is a Cap and Trade Program is an increase over time in vehicle transportation powered by low carbon fuels which will reduce the use of crude oil for gasoline and diesel. Ontario oil and natural gas production has an important role to play as a bridge to that future.

Even while focusing on carbon emissions, the OPI believes that oil and natural gas will continue to be part of the province's energy supply for the foreseeable future. It will remain a requirement for heavy machinery, railway traffic and aircraft as well as an array of manufactured products such as cosmetics, fabric and plastics. And there will be a continuing demand for natural gas for heating, fuel truck transportation, generate power for fuel cells, and to offset the intermittency often involved in the generation of renewable electrical energy.

It is encouraging to note that an overview of the fuels sector will be included in the next LTEP. The OPI is actively promoting Ontario as a profitable exploration and development opportunity throughout North America at selected regional and national conferences. We are there to encourage companies to come to Ontario. It is important for these companies to hear that Ontario has a government that is an open and friendly place to do business.

The oil and natural gas industry has a long history as a value-added contributor to the Ontario economy. To continue to do so the industry has challenges that must be addressed. It is important that the Government of Ontario include the oil and natural gas sector in the economic development of the province's natural resources.

Locally produced natural gas and crude oil not only supports economic growth but it assists in the reduction of green-house-gas emissions when compared to what we believe are higher emissions associated with the production and transmission of imported natural gas and crude oil.

The Premiers' Mandate letters to the Ministers of Natural Resources and Forestry, Energy and Economic Development and Growth asks the Ministers to ensure the good stewardship of petroleum resources, implement the long-term energy plan, and support the access to natural gas for underserviced communities.

The OPI's objective is to collaborate with the Government of Ontario to revitalize the oil and natural gas industry through exploration and development in the province to maximize the utilization of province's natural resources and to enable the industry to continue its contribution to the Ontario economy.

Ontario's requirement for energy to support its economy is significant. A certain amount of that supply exists in the natural resources of Southwestern Ontario to be explored and produced by an experienced industry sector.

The OPI looks forward to the collaborative stewardship of the province's natural resources with the Ontario Ministry of Energy and on how Ontario's long-standing and historic oil and natural gas industry contributes to the energy requirements of citizens of Ontario.

**EXHIBIT 3**

**Northern Cross Energy Panel Resumes**

# DAVID R. THOMPSON

## EDUCATION

Queen's University at Kingston, Ontario
B.Sc. (Mechanical Engineering) 1978

Institute of Corporate Directors
ICD.D 2014 Rotman School of Business, Directors Education Program

## INDUSTRY VOLUNTEER POSITIONS

Chair of the Energy Committee, Yukon Chamber of Commerce, current
Director, Ontario Petroleum Institute, current
Director, Small Explorers and Producers Association, 1991-2001

## EXPERIENCE

**1982 - Present**

**Northern Cross Energy Limited, Goderich, Ontario**
(Incorporated 1984)
President, Director and Founder

Northern Cross Energy Limited owns and operates natural gas production, processing and distribution facilities and approximately 50 km of associated gathering and sales gas lines in Huron County, Ontario, Canada. The company also operates a commercial solar energy project and a gas fired cogeneration facility. Northern Cross Energy Limited is developing natural gas underground storage for local gas distribution and conducts an ongoing exploration program for natural gas. NCE is currently working with Next Hydrogen on underground hydrogen storage and producing hydrogen enriched natural gas (HENG) in Ontario.

**1994 – Present**

**Northern Cross (Yukon) Limited, Calgary and Whitehorse**
1994 – 2008 President
2008 – 2016 Chief Executive Officer and Director
2106 – Present Director

Northern Cross (Yukon) Limited operates 1.3 million net acres of exploration permits and 3 significant discovery licenses in the Eagle Plain basin of Northern Yukon. NCY has executed a multi-well exploratory drilling and 3D seismic program backed by a significant equity investment through CNOOC Canada

Limited. The company has applied for regulatory approval to drill and test up to 20 wells within the 3D seismic area.

**2000 – Present**

**Northern Cross Minerals Limited, Whitehorse**
President, Director and Founder

Northern Cross Minerals Limited participates in mineral exploration in Manitoba as well as owning and operating industrial properties and equipment in Yukon.

**2007- Present**

**Next Hydrogen Corporation, Mississauga, Ontario**
Director and Founder

Next Hydrogen Corporation has researched, patented, tested and is now commercializing world leading large scale industrial electrolysers for the production of green hydrogen from surplus renewable energy. The company is currently building and delivering multi-MW scale units for onsite hydrogen generation for refuelling hydrogen fuel cell vehicles.

**2003 – 2009**

**StrataGold Corporation**
Director
Compensation Committee, Chair
Health and Safety Committee

StrataGold Corporation was active in advanced stage gold exploration projects in Yukon and Guyana. The Company shares were publicly traded on the TSX. The company merged with Victoria Gold in 2009.

**2006 – 2011**

**Applied Intellectual Capital**
Non-Executive Director 2006-2009
Chairman of the Board 2009-2011

AIC was an LSE, AIM listed company based in Alameda, California with offices in the UK. The company developed and commercialized new technologies in batteries and electrochemistry. It was taken private in 2011.

**2005 – 2007**

**Cruikshank Wind Farms Limited**
Director and Founder

Cruikshank Wind Farms Limited undertook greenfield development of wind power projects in Ontario. The company was sold to Enbridge in 2007.

**2001 - 2005**

**Port Albert Wind Farms Ltd.**
Chief Executive Officer, Director and Founder

Port Albert Wind Farms Ltd. (PAWF) undertook greenfield development of wind power project from resource assessment through interconnection and commercial production. The company was sold to EPCOR in 2005. The Capital Power K2 windfarm that was originally developed by PAWF has now been constructed and is operating at its full design 270MW capacity.

**1995 – 1998**

**Smart Pipeline Services Limited**
President, Director and Founder

Smart Pipeline Services researched, designed, tested and commercialized its patented systems for variable bypass and speed control of smart in-line pipeline inspection tools. The company was sold to Tuboscope Vetco of Houston in 1998. Tuboscope was at the time the largest pipeline inline inspection company in the World.

**1993 - 1999**

**Northern Cross Exploration Limited**
President, Director and Founder

Northern Cross Exploration conducted exploration programs to complement the production activities of Northern Cross Energy Limited. The company was amalgamated with Northern Cross Energy in 1999.

**1986 - 1993**

**Northern Cross Resources Limited**
President, Director and Founder

Northern Cross Resources Limited undertook projects involving exploration, production, transportation and sale of oil and natural gas. Northern Cross

developed gas reserves, production facilities, pipelines and sales facilities located primarily in Alberta, Canada. The company was sold to Amber Energy Limited in 1993.

**1985 - 1988**

**Novacorp Pressure Transport Ltd./ Novacorp International**
Manager, Business Development

Managed a marketing, engineering and development effort that lead to the first commercial use of CNG Transportation technology in Western Canada. Developed marketing concepts and technical improvements which lead to improvements in the transportation and utilization of natural gas. Consulted on natural gas development projects overseas – Africa, Asia, South America and Oceania through Novacorp International.

**1981 - 1982**

**Nova Corporation of Alberta**
Senior Engineer/Economic Analyst
Economic Studies Department

Conducted technical and economic evaluations of new business and investment opportunities on behalf of Nova senior management. Participated in the analysis of several major acquisitions and the development of new businesses including Novacor Chemicals, Husky Oil and Novatel.

**1978 - 1981**

**Nova Corporation of Alberta**
Supervising Engineer
System Planning Department

Supervision and technical guidance of a group responsible for gas supply and pipeline planning in Nova's gas transmission division in Alberta, Canada.

**1977**

**Schlumberger of Canada**
Open Hole Logging Engineer

Managed a crew conducting open hole oil and gas well logging operations throughout Western Canada.

**DAVID ALEXANDER McLEAN, P. Eng.**
7657 Grande River Line, R.R.7
Chatham, Ontario, Canada
N7M 5J7
(519) 351-5494
dmclean7657@gmail.com
dmclean@rb-consulting.ca

## CAREER HISTORY

2016 - Present — NORTHERN CROSS ENERGY LIMITED, Calgary, Alberta/London, Ontario

VICE PRESIDENT

Key Responsibilities

* Business Development and Data Analysis for a natural gas production company with its primary production assets located in Ontario.
* Technical and Operation supervision of the company's day-to-day activities.

2011 - Present — 962912 ONTARIO INC., o/a RIVER BEND CONSULTING, – ENGINEERING & BUSINESS CONSULTING SERVICES, Chatham, Ontario

OWNER AND PRINCIPAL

Key Responsibilities

* Own and operate a multi-disciplined engineering and business consulting firm.
* Providing business and engineering feasibility, design, project management and operations services in the disciplines of energy, environment, health and safety, quality and operating systems in the workplace.

2012 - 2013 — NGAGE ENERGY SOLUTIONS INC., Leamington, Ontario

VICE PRESIDENT & CHIEF OPERATING OFFICER

Key Responsibilities

* Developing sales forecasts and analyses.
* Securing sales for NGAGE.
* Market development and analyses.
* Development and oversight of all design, construction and operating activities for NGAGE.
* Development of new business opportunities for NGAGE.
* Participating at the executive level in the operation of the corporation.

2011 - 2012 962912 ONTARIO INC., ENGINEERING CONSULTANT, Chatham, Ontario

OWNER AND PRINCIPAL

Key Responsibilities

* Own and operate a multi-disciplined engineering consulting firm.
* Providing engineering design and project management services in the disciplines of energy, environment, health and safety, quality and operating systems in the workplace.

2004 – 2011 NEXTENERGY CENTER, Detroit, Michigan

VICE PRESIDENT, TECHNOLOGY PROGRAMS & CHIEF OPERATING OFFICER

Key Responsibilities

* Oversaw the operation of a Michigan non-profit alternative energy and distributed electrical generation research, development and demonstration (RD&D) facility.
* Worked with key United States government committees and agencies to establish program needs.
* Government relationships included the federal Michigan delegation – Senators and Representatives and staff; Senate and House committees including the Senate and House Armed Services committees and Energy & Natural Resources committees; government agencies included the Departments of Energy (DOE), Defense (DoD), Environmental Protection (EPA), Homeland Security (DHS), Commerce and Agriculture.
* Established teams comprised of other levels of governments (e.g. state), academia, private industry, and U.S. national labs; developed “cost share” arrangements with these team members. NextEnergy typically received two funding awards per year of $3 to $5 million per award.
* Operation and maintenance of the NextEnergy Center facility; an annual budget of $550,000; Integrated Management System (ISO 9001, ISO 14001 and ANSI Z10 compliant), 8 research labs; operation of a MicroGrid Pavilion and an Alternative Fuels Test Platform.
* Member of the NextEnergy Center executive.

1991 - 2005 DAVID A. McLEAN and ASSOCIATES, INC. (DMA) Chatham, Ontario

OWNER & PRINCIPAL

Key Responsibilities

* Owned and operated a multi-disciplined consulting firm.
* Provided engineering, design and project management services in the disciplines of energy, environment, health and safety, quality and operating systems in the workplace.
* Development of an alternative energy systems practice including compressed natural gas for vehicles and hydrogen for vehicles and stationary power applications.

1977 - 1991 UNION GAS LIMITED, Chatham, Ontario

1987 - 1991 OPERATIONS MANAGER, CHATHAM DIVISION

Key Responsibilities:

* General administration of a geographic territory in southwestern Ontario.
* Duties included plant services, construction, customer service, accounting and all support functions including an NGV distribution network.
* 90 unionized staff with capital budget of $2 million, operating budget of $7 million.
* 33,000 customers.

1986 - 1987 SALES MANAGER, CHATHAM DIVISION

Key Responsibilities:

* Administration of five market sectors within a geographic territory in southwestern Ontario.
* Staff of 10 and 33,000 customers.

1984 - 1986 MANAGER, MAJOR GAS SALES

Key Responsibilities:

* Sales and administration of company's 19 largest contract accounts.
* Contract preparation; price negotiation; engineering gas utilization analysis.
* 100 BCF (Billions of Cubic Feet) of sales annually (40% of all Union's sales) generating $428 million in revenue annually.
* Support at National and Ontario Energy Board hearings.

1983 - 1984 SUPERVISOR, CONTRACT SALES SUPPORT

Key Responsibilities:

* Engineering and financial analysis of all contract accounts including the company's 19 largest accounts.

1980 - 1983 SUPERVISOR, GAS SUPPLY ANALYSIS

Key Responsibilities;

* Administration of gas supply contracts (primarily with Trans Canada Pipelines) and Transportation and Storage contracts with such firms as Enbridge Gas Distribution and Gaz Metropolitan.
* Supply analysis from an engineering, financial and regulatory perspective; development of "gas balance" computer programs; support filings and hearings before the Ontario and National Energy Boards.

1977 - 1980 MEASUREMENT ENGINEER

Key Responsibilities

* Design, specification, purchase and implementation of a new, real-time company wide Supervisory Control & Data Acquisition computer system.

EDUCATION

| | |
|---|---|
| 1987 | HONOURS BACHELOR OF COMMERCE (BUSINESS ADMINSTRATION)<br>University of Windsor |
| 1977 | BACHELOR OF APPLIED SCIENCE (ELECTRICAL ENGINEERING)<br>University of Windsor |
| 1989 | EXECUTIVE EFFECTIVENESS COURSE – PARTS I & II<br>American Management Association, Williamsburg, VA and Hilton Head, SC |
| 1987 | MARKETING MANAGEMENT COURSE<br>University of Western Ontario, Ivey School of Business |
| 1984 | COMBUSTION SCHOOL<br>Industrial Heating Equipment Association, Chicago, IL |
| 1980 | ADVANCED PROJECT ECONOMICS COURSE<br>Institute of Gas Technology, Chicago, IL |

PROFESSIONAL MEMBERSHIPS

Professional Engineers of Ontario (PEO) – licensed as a P.Eng.
Institute of Electrical and Electronic Engineers (IEEE)
Former Voting Member of NFPA 2 – Hydrogen Technology Code - Technical Committee (initial publication)

# JAMES WILLIAM McINTOSH, P Eng.

479 Grandview Avenue
London, Ontario, N6K 2T4

**(519) 657-2176 (Res)**
**(519) 472-7897 (Bus/Fax)**
**(519) 878-1006 (Cell)**
**E-mail: jim.mcintosh.p.eng@sympatico.ca**


---

## EDUCATION

April, 1976 — **B. Sc., Chemical Engineering**
University of Alberta,
Edmonton, Alberta

1972 — Graduation with Distinction
Fort Saskatchewan Senior High School,
Fort Saskatchewan, Alberta

## WORKING EXPERIENCE

Oct, 2001 to Present — **JIM MCINTOSH PETROLEUM ENGINEERING LTD.**

Position: President

- Independent consultant providing oil and gas production, reservoir, and drilling engineering, and facility design and construction services, primarily to the Ontario upstream oil and gas industry.
- Pressure transient analysis and reserves estimating associated with new drilling (DST's and initial production tests) and existing gas pools. This work lead to production optimization and restimulation recommendations.
- Prepared corporate reserve reports using the National Instrument 51-101 format for public companies.
- Designed a large gas gathering system, complete with compression, multiple delivery points, wellsite facilities and a 12 mile sales gas line. Design including tendering all aspects of the job, including gathering line installation, steel line installation, compressor site piping and fabricating, compressor sizing and compressor building selection.
- Designed and supervised construction of an oil battery and associated produced fluid gathering/water injection system to replace an older, outdated system. This work involved specifying materials, line sizing, route selection, and construction procedures to be used.
- Designed and supervised plugging and site restoration operations for client companies.
- Inspected independent wells and made recommendations to the operator to come into compliance with current standards.
- Designed a gas storage facility, including designing multi-lateral horizontal Injection/Withdrawal wells, the pipeline interconnect with the local utility, design and sizing of all equipment at the compressor facility, and compressor site facility construction supervision.
- Chairman of the Producers' Committee within the Ontario Petroleum Institute (the OPI). The Producers' Committee liaisoned with Harold Marcus Limited/Imperial Oil concerning crude oil sales and Union Gas concerning natural gas sales from Ontario producers. The committee met with Ontario government ministry representatives to help spur increased exploration activity in the province.

-

Sept 1993 to Sept, 2001 **SHININGBANK ENERGY LTD/CAMBRIGHT GAS CORPORATION/ DENBRIDGE GAS CORPORATION**

Position: Manager, Ontario Operations
Area of Activity: South-west Ontario

- Responsible for internal reserve reports, production forecasts, and reservoir drainage recommendations for the company. Negotiated with the company's reserves consultants while preparing corporate reserve numbers.
- Responsible for the design, cost estimates, and licence applications for all company drilling operations. Initially, supervised a drilling and completion technician who was responsible for all wellsite supervision of drilling and completion operations. Since late 1994, I was directly supervising all drilling operations, with completion operations supervised in conjunction with field personnel.
- Responsible, in conjunction with our field personnel, for the design and cost estimates for all new production installations including oil well standard set ups, gas well standard set ups, pipeline and gathering system layout and sizing, specifying and purchasing inlet separators, dehydrators, and compressors. Co-ordinated installation with our field personnel who were responsible for all field construction and all daily production operations.
- Past chairman of the Drilling Practices committee of the Ontario Petroleum Institute. This committee formulated the guidelines for rotary and cable tool drilling operations in Ontario. These guidelines documented the minimum requirements to safely drill oil and gas wells in Ontario with particular emphasis on protection of uphole aquifers. These guidelines have now, with minor changes, been adopted by the Ontario Ministry of Natural Resources as part of the Operating Standards appended to the Oil, Gas, and Salt Resources Act.
- I have held various positions on the board of directors of the Ontario Petroleum Institute including President, 1st Vice President, and 2nd Vice President.
- Designed and analyzed pressure transient tests on selected gas wells in the Innerkip field, which has led to comprehensive isobaric maps and an accurate material balance plot of the pool since 1993.
- Prepared all inputted well and pressure data and worked closely with reservoir simulation consultants to perform a detailed 4 layer reservoir simulation tied to a pipeline and surface network simulator for the Innerkip gas field.
- Performed property economic evaluations for company planning and budgeting. These evaluations were used to prioritize exploration and development opportunities for the company.
- Negotiated with Union Gas, the local gas utility, for all company gas contract work. Worked along with Union Gas to create the first M-13 Local Producer Sales and Load Balancing Contract, which is still in common use. Recommended sales point sites and negotiated meter station designs with the Union Gas engineers.
- Negotiated with gas marketers, including reviewing contracts with our land manager, forecasting, nominations, gas prices, and selecting the volume of gas to sell to each of the gas marketers that the company uses.

June 1987 to Sept. 1993 **RAM PETROLEUMS LIMITED**

Position: **Chief Engineer**
Area of Activity: South-west Ontario, Michigan

- Responsible for corporate reserve reports and the reserve portion of Annual Reports
- Responsible for the design, cost estimates, cost control, wellsite supervision, and location preparation and cleanup of all company operated drilling, both rotary and cable tool rig types. Recommended DST interval selection, supervised and analysed the DSTs, interpreted electric log suites, and made the resultant well case/abandon recommendations. At casing point, recommended completion interval selection and stimulation requirements.
- Supervised a production technologist who was responsible for well completion supervision, and production

facility design and construction. Provided relief supervision for him in this work.
- Chairman of both the Drilling Practices and Environmental committees of the Ontario Petroleum Institute. These committees were responsible for formulating new drilling and environmental regulations for adoption by the Ontario Ministry of Natural Resources: Petroleum Sector in revisions to existing legislation.
- Liaisoned with other oil companies with which Ram was a partner. This included both Ram operated and partner operated wells and fields.
- Monitored well and field production. This monitoring included pressure buildup recommendations and interpretation, workover recommendations, and well evaluations.
- Negotiated with Union Gas for all company gas contract work. Recommended sales point sites and negotiated meter run designs with Union Gas engineers.
- Performed the engineering work associated with selling Ram's Edys Mills Guelph pinnacle reef to Union Gas for conversion to a gas storage pool. In this sale, Ram retained the downdip oil rights. I made recommendations for maximizing Ram's oil production from this pool in conjunction with storage operations.
- Supervised the first successful exploration directional drilling operation in Ontario. Designed and supervised the highest angle directional well (63º) drilled to that date in Ontario. Designed and supervised the first horizontal well drilled in Ontario. This horizontal re-entry was into a producing Ordovician oilwell and was successful.
- Became proficient at both Lotus 1-2-3 and Word Perfect computer programs. Performed facility design work on AutoCad.

May 1981 to June 1987 **VOYAGER ENERGY COMPANY**
(Now part of POCO Petroleums Limited)

Position: **Petroleum Engineer**
Area of Activity: East-central Alberta, South-east Saskatchewan

- Responsible for reserve calculations for all new wells drilled, both Voyager operated and partner operated.
- Responsible for reserves adjustments to producing properties to reflect production and pressure history from the reservoirs.
- Well completion design responsibilities
- Downhole electric log analysis and interpretation
- Design of workover programs for currently producing oil and gas wells.
- Design surface and subsurface facilities for producing oil wells.
- Company representative for pre-unit technical and operating committee meetings with other oil companies.
- Preparation of government submissions for increased reserves recognition, change of well spacing within pools, approval of salt water disposal and injection well conversions.

July 1976 to June 1981 **UNION OIL COMPANY OF CANADA LTD.**

Positions:

**(1) Reservoir and Evaluation Engineer (3 yrs)**

- Reservoir evaluation, reserves calculation, updating and adjustment on new and producing properties.
- Monitoring partner operated operations and capital and operating expenditures.
- Economic evaluations and recommendations on proposed drilling and major capital expenditures.
- Partner interactions and negotiations in pre-unitization and unit technical and operating committee meetings.

**(2) Production Engineer (2 yrs)**

- Responsible for completions and work-overs in northern Alberta and north-eastern British Columbia.
- Pipeline and facility construction, design and supervision.

**PREVIOUS EXPERIENCE**

Summer 1975 **HUDSON'S BAY OIL AND GAS LIMITED**
Position: Summer assistance within the Gas Plant Design Department.

Summer 1974 **GULF OIL COMPANY LIMITED**
Position: Summer relief operator, Edmonton Refinery.

Summer 1973 **SHERRITT GORDON MINES LTD.**
Position: Summer relief operator, Fort Saskatchewan nickel extraction and fertilizer facility.

## TRAINING CERTIFICATES AND PROFESSIONAL ASSOCIATIONS

- Jim McIntosh Petroleum Engineering Ltd hold a Certificate of Authorization (C of A) from the Professional Engineers, Ontario: C of A #100056409
- Member of Professional Engineers Ontario: Membership # 30537807
- Member of Society of Petroleum Engineers: Membership # 0636589
- Certified in PITS 1st Line Supervisor's Blowout Prevention
- Certified in H2S Alive
- Certified in St John Ambulance Standard 1st Aid

## OUTSIDE INTERESTS

Hockey, tennis, and jogging. I am married and have 2 children.

## REFERENCES

Available upon request.