

Stantec

FINAL REPORT

12-YEAR RETROSPECTIVE OF NATURAL GAS PRODUCTION IN NOVA SCOTIA



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NOVA SCOTIA**

Nova Scotia Department of Energy

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Executive Summary

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Nova Scotia has been involved in the offshore natural gas industry for over 50 years, but what has this meant for the province and its residents? This report documents, from a broad perspective, the socioeconomic benefits realized by offshore natural gas exploration and development in the Province of Nova Scotia, focusing on the 12-year period from 1996 to 2008. Nova Scotia has seen some significant successes related to the offshore natural gas sector, as well as some disappointments. Based on a literature and document review, economic impact model results, and interviews with key business operators, the important contribution of the offshore to economic development in the province is established.

Natural resources have historically made major contributions to the NS economy. Resource sectors in the province, which include oil and gas, forestry, fishing, agriculture and mining, directly make up about 7.8% our economy, and generate substantial spinoff of economic activity and related employment and income. Oil and gas extraction is now the largest of the resource sectors, accounting for an average of about 3% of total provincial GDP from 2003 to 2007. Within the 12-year study period, natural gas exploration, development and production in Nova Scotia have provided many socioeconomic benefits.

Overview of Benefits from the Offshore

Offshore petroleum development (“the offshore”) involves a wide range of activities covering many economic sectors. In Nova Scotia, petroleum companies involved in exploration, development or production operate local offices and supply bases, and maintain their operations through contracts with many local firms to provide the different goods and services required. This provides employment and income to individuals directly employed by the petroleum companies and to individuals employed by the firms that support offshore operations.

In addition to employment and income effects, governments receive payments in the form of royalties (resource rents) and related revenues, personal and corporate income taxes, sales tax, property tax, and lease and license fees. These payments to government have become an important source of revenue, and support the delivery of a wide range of public services to communities, organizations and individuals throughout the province.

More difficult to document but similarly important are the additional benefits of offshore petroleum development. In particular, the building of energy infrastructure, education and training, and research and development (R&D) in support of the offshore provide a foundation and innovation for additional economic growth. Natural gas also provides environmental benefits, as it gives our utilities, industry, and commercial and residential buildings a fuel choice with lower emissions. Access to natural gas also gives Nova Scotia Power Inc. a new fuel

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option for quick and efficient backup of intermittent renewable sources such as wind power. All of the above additional benefits enhance the Province's strength in exports, its competitive position in the world, and its ability to meet environmental goals.

Economic Components

The economic components of the offshore include businesses that are directly involved in exploration, development and production activities, and those that indirectly supply goods and services to support those activities. The major components include:

- Engineering services;
- Scientific services;
- Waste management and remediation services;
- Construction, machining, manufacturing and fabrication;
- Finance and real estate;
- Information services;
- Materials supply;
- Transportation services;
- Ship building and repair;
- Port and harbour operations;
- Food and hospitality services; and
- Research and education.

A range of companies and institutions provide these goods and services, from large national and international corporations, to small and medium Nova Scotia-based enterprises, colleges and universities.

The offshore oil and gas industry in Nova Scotia has connections to several other industries within the province. Marine construction, manufacturing, ship and boat building, and ports and shipping have all gained direct and indirect benefits from offshore gas exploration, development, and production. Nova Scotia engineering, scientific and technical services receive millions of dollars in contracts from offshore development. There are strong relationships between offshore activities and marine construction and manufacturing because the offshore industry requires specialized infrastructure, facilities, and equipment to be fabricated, assembled and maintained. Aspects of ports and shipping that have the potential to grow as a result of the offshore energy industry include marine towing, marine cargo hauling, harbour and port operations, pilotage, marine shipping agencies, and ship chartering.

Offshore gas activities can also lead to indirect benefits for a variety of land-based industries in Nova Scotia. These inter-industry connections may not be easily recognizable, but they are

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nonetheless valuable to the provincial economy. Nova Scotian businesses are capable of manufacturing components to meet a wide variety of systems and equipment needs for offshore projects. Among other items, local manufacturers can produce structural frames, pressure vessels, tanks, piping, electrical equipment, hydraulic equipment, and other modules and packages required for the offshore. In addition to manufacturing components, many companies in the province are equipped for assembly, testing, and provision of on-going services for maintenance and repair.

Nova Scotian companies already have service and supply capabilities for many of the activities along the value chain. However, a considerable amount of offshore gas and oil expenditures flow out of the provincial economy because certain required inputs are not sufficiently available in Nova Scotia or local suppliers fail to qualify for bids. Drill rigs, industry-specific materials and equipment, and offshore construction vessels are examples of required goods that are not manufactured locally and for which expenditures “leak” from the domestic economy. There is, therefore, potential opportunity for the development of provincial supply capabilities for some of these goods and services.

Examples of Business Success

This report provides an analysis of business examples selected from companies in Nova Scotia that have been active in the petroleum sector or that have otherwise benefited from the offshore. A description is provided of the effects the offshore industry has had on companies and institutions in terms of their initial business place, internal and sectoral growth, market development in technical services and geographic areas, labour development, and business alliances. Examples of local companies that illustrate growth of new or innovative technologies and services are included. These examples provide a better understanding of the full economic impacts of natural gas developments on existing Nova Scotia companies and institutions, as well as the provincial economy.

A broad range of companies were examined, varying in size, geographic location, and the goods and services provided. Fourteen case studies are presented based on these interviews to highlight successes and socioeconomic benefits. Additional interviews were conducted with a number of other businesses, and this information provided further insight. Case studies presented in this report include:

1. Lloyd’s Register North America;
2. A.P. Reid Insurance;
3. Stewart, McKelvey, Stirling, Scales (law firm);
4. Jacques Whitford;
5. ACCENT Engineering Consultants Inc.;

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6. Secunda Marine;
7. Rowan Companies, Inc.;
8. Irving Shipbuilding Inc.;
9. North Atlantic Marine Terminals Ltd.;
10. Martec;
11. Dominion Diving;
12. Nova Scotia Community College/Cape Breton University;
13. Survival Systems; and
14. RPS Energy Canada Ltd.

The above companies have demonstrated a strong entrepreneurial spirit, an ability to manage risks inherent to working in the offshore industry, and a remarkable ability to adapt to the high standards, demanding time lines and cyclical nature of the offshore. Nova Scotians are respected in this industry worldwide, as they have proven that they can compete on an international scale for offshore work.

Economic Impacts

Based on information provided by the CNSOPB to the NSDE on the reported value of contract expenditures between 1996 and 2007, an input-output economic analysis was completed jointly by the Nova Scotia Department of Energy and the Department of Finance. The economic impact model provides estimates of employment, both direct and spinoff (which includes indirect and induced employment) and impacts on household income, as well as the resulting provincial government tax revenue from these personal incomes.

The economic impacts to the Province of NS have been substantial. From 1996 to 2007, total employment (direct and spinoff) has been approximately 38,500 person-years, or an average employment of about 3,200 per year (full-time equivalent). In the same period, total household income from the offshore has been approximately \$1.406 billion, or an average of about \$117 million per year. This income produced government tax revenues of approximately \$158 million, or about \$13 million per year. Not included in the government revenue total are corporate income taxes direct from the project developers and contractors, and direct revenues, such as royalties.

Perhaps of greater importance to the Province of Nova Scotia are direct revenues from royalties paid by the project developers from the sale of natural gas during production. Revenues paid directly to government include royalties proper, Crown share adjustment payments, and offshore offset payment from the Offshore Accords (1986 and 2005). The provincial government received over \$1.5 billion in these royalty-related revenues in fiscal years 1996-1997 to 2007-2008. Offshore royalties are Nova Scotia's third largest source of provincially-

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generated revenue and support our social programs, infrastructure development, and debt reduction, among other uses.

Additional Benefits

In addition to the direct and spinoff economic impacts of offshore gas development in Nova Scotia, there are a number of important additional benefits that are more difficult to quantify. These benefits are those that support socioeconomic development not directly related to, but certainly dependent upon, the development of the offshore. These benefits include: the development of energy infrastructure (including access to a supply of natural gas); education and training; R&D; and export strength.

The development of offshore petroleum in Nova Scotia has increased and improved the energy infrastructure in the Province in several important ways. The pipeline now built across Nova Scotia makes feasible the exploration and production of other offshore and onshore gas in the province. The pipeline also creates a means to transport other new natural gas discoveries to major markets, which is a key to attracting major investment in exploration and development in the province, both offshore and onshore. The pipeline provides access to gas for industrial, institutional, and residential customers through Heritage Gas, our regulated local distributor.

To meet the requirements of the offshore industry, the Province's post-secondary education institutions have developed a number of training programs. The institutions have not only trained workers for direct employment in NS, but have provided a foundation for offshore suppliers to develop the skill sets and qualifications necessary to export their services. The SOEP partners also contribute to education and training in the province, in particular through the \$2 million Pengrowth-Nova Scotia Scholarship program and the Innovation Grants for research.

Nova Scotia companies have been active in R&D to support business in the offshore. This has enhanced the local body of knowledge and skills that not only build on the strong scientific and engineering reputation of the Province, but also provide a foundation for technical advancements in other fields. For some Nova Scotia companies, offshore R&D has led to the development of products and services now sold internationally.

Common to most of the Nova Scotia companies that have become successful in working for the offshore industry is a strong export business. A common statement from stakeholders was that their experience and expertise developed locally has led to significant growth opportunities internationally. This demonstrates the germination of export strength, and an increased international profile of Nova Scotia business.

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Concluding Remarks

While the major focus of this study was to document the socioeconomic benefits of the offshore, the barriers, challenges, and lessons learned from the interviews proved very valuable. Businesses had to overcome several hurdles to enter into the offshore industry in Nova Scotia, including forming strategic partnerships with companies that had proven experience in the offshore, as well as having the necessary access to capital. Once companies successfully won work in the offshore, they had to work quickly and adapt to the high expectations and standards of the offshore industry.

The preference of the industry towards large, multinational corporations is seen as a persistent challenge in working offshore Nova Scotia. A common sentiment among many businesses is that Nova Scotia's offshore industry is too small to sustain them. Businesses either have to diversify the range of goods and services they provide, or they need to operate outside of Nova Scotia, nationally and/or internationally.

In spite of the challenges businesses faced when entering into the offshore industry in Nova Scotia, many have been extremely successful. This success is illustrated by the case studies, which highlight just some of the many businesses that proved that Nova Scotians can provide reliable, high quality work at a competitive price in the offshore industry locally and internationally. Work in the offshore has assisted businesses to grow their service lines and areas of operation.

The most commonly-cited requirement for work to continue in Nova Scotia was to increase exploration efforts, followed by the development of marginal finds. Continued support for funding, exploration, local content requirements, time limitations on Significant Discovery Licenses (SDLs), regulatory regime streamlining, and public education were frequently cited as possible ways for the province to continue to support the offshore natural gas industry in Nova Scotia.

Nova Scotia's experiences in the offshore to-date can be used to continue to succeed in this competitive industry, both here and abroad. The amassed knowledge and experience is a benefit and a value that cannot be quantified, but that will surely continue to be used to operate and compete successfully in the offshore industry around the world.

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1.0 Introduction

This report is in response to a need to document, based on a broad perspective, the socioeconomic impacts realized by offshore natural gas exploration and development in the Province of Nova Scotia (NS). The insights gained from this socioeconomic analysis establish the important contribution of the offshore to economic development in the province. An examination of case studies illustrates the successes and challenges faced by suppliers of goods and professional services for the offshore. Together, these provide invaluable information to support decision-making and government policy development regarding future discoveries. This report was prepared by Stantec Consulting Ltd. for the Nova Scotia Department of Energy (NSDE).

1.1 SOCIOECONOMIC SETTING

Natural resources have historically made major contributions to the NS economy. Traditional resource-based industries such as fishing, forestry, agriculture and mining remain significant components. The provincial economy continues to diversify with tourism, technology, finance, health care, transportation, trade, and other service industries becoming increasingly prevalent. The contribution of various industries in recent years to NS Gross Domestic Product (GDP) is shown in Table 1.1.

Table 1.1 NS GDP by Industry (million 2002 dollars)

	2003	2004	2005	2006	2007
Agriculture, forestry, fishing, and hunting	800.4	740.4	734.9	674.8	679.9
Mining and oil and gas extraction	893.6	795.1	826.2	753.8	799.2
Utilities	642.9	615.8	611.6	565.8	600.4
All resource industries	2,336.9	2,151.3	2,172.7	1,994.4	2,079.5
Manufacturing	2,629.5	2,847.1	2,858.7	2,766.9	2,892.0
Construction	1,482.6	1,546.6	1,531.5	1,595.6	1,561.5
All goods producing industries	6,426.5	6,490.1	6,527.4	6,290.4	6,474.9
Transportation and warehousing	1,053.0	1,037.0	1,017.6	1,026.4	1,043.7
Wholesale trade	1,113.0	1,123.1	1,125.3	1,115.0	1,150.9
Retail trade	1,651.9	1,659.6	1,681.2	1,762.3	1,814.3
Information and culture industries	896.0	867.2	918.4	935.3	949.2
Finance and insurance, real estate, and leasing and management of companies	4,902.6	5,027.7	5,151.7	5,349.1	5,506.0
Professional, scientific, and technical	790.6	800.0	811.2	846.7	867.2
Administrative and support, waste management	502.2	569.6	575.5	601.1	613.7
Educational services	1,421.7	1,449.9	1,513.0	1,561.5	1,577.2
Health care and social assistance	2,070.7	2,100.9	2,151.5	2,243.1	2,272.6
Arts, entertainment and recreation	179.7	184.8	186.8	187.5	186.7
Accommodation and food services	642.3	640.6	628.1	630.7	619.7
Other services	616.6	630.5	630.7	644.8	648.2
Public administration	2,689.5	2,688.4	2,738.2	2,772.5	2,787.1
All service producing industries	18,531.2	18,815.7	19,168.3	19,718.0	20,075.5
All industries	24,954.7	25,250.2	25,635.1	25,924.2	26,467.2

Source: Statistics Canada, Cat. No. 15-203-XPB.

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Resource sectors in the province, which include oil and gas, forestry, fishing, agriculture and mining, directly make up about 7.8% our economy, but generate substantial spinoff of economic activity and related employment and income. Oil and gas extraction is now the largest of the resource sectors, accounting for an average of about 3% of total provincial GDP from 2003 and 2007 (see Table 1.1).

Coal was formerly the most valuable product of the province's extractive industries (MacDonald 2006). Coal production declined between 1995 and 2001 as many coal mines ceased operations. In 1996, Nova Scotia Power Incorporated (NSPI) began importing coal to meet its fuel requirements (NSDNR and NSPD 2001), as approximately 79% of the province's electricity is generated by coal (NSDE 2009). After 1994, light crude oil from our offshore replaced coal as NS's most valuable extracted product, and by 1998 it accounted for about 35% of the province's mined output in terms of value (Mandale *et al.* 1998). Since the cessation of oil production from the offshore in 1999, natural gas has taken the position as NS's most valuable mined product.

Given NS's proximity to the ocean, marine-based industries form a significant part of the provincial economy. As shown in Table 1.2, the ocean sector accounts for a notable proportion of provincial GDP. Between 2002 and 2006, the oil and gas sector accounted for 23% of NS's ocean related sector GDP, just behind National Defence (24%) and just ahead of the fishing industry (22%) (Gardner *et al.* 2009).

Table 1.2 Direct Impact of Ocean Sector on NS GDP, 2002-2006

Year	Ocean sector GDP as % of NS GDP
2002	18.0
2003	18.5
2004	17.1
2005	16.9
2006	15.5

Source: Adapted from Gardner *et al.* (2009).

NS's rich offshore resources are estimated to include 40 trillion cubic feet (TCF) of natural gas potential and 1.3 billion barrels of oil (CAPP 2008). 40 TCF is roughly equal to 20 projects the size of the Sable offshore natural gas project.

Within the 12-year study period (1996 to 2008), natural gas production offshore NS has provided many socioeconomic benefits through exploration, development and production. Associated design, engineering, construction and supply activities have provided direct and indirect benefits to a number of economic sectors in the provincial economy, and are also the foundation for additional induced benefits that stimulate the provincial economy and support sustainable prosperity. The critical role that these energy projects play in the NS economy was highlighted in the province's 2001 and 2009 Energy Strategy.

In *Opportunities for Prosperity* (OfP), a provincial Economic Growth Strategy released in 2000, the Government of Nova Scotia identified the gas and oil sector as a vital economic sector that

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“offers significant fiscal and economic opportunity in such areas as royalties, more competitively priced fuels, feedstocks for petrochemical development, and employment in development, fabrication, operations, and supply. And similar to the digital technology sector, gas and oil is an enabling sector for business” (NSED 2000, p. 27).

An updated Economic Growth Strategy, *Opportunities for Sustainable Prosperity (OfSP)*, was released in 2006. This strategy is based on the core ideas of socially, environmentally, and economically sustainable growth and competitiveness. The model proposed by OfSP is based on five building blocks or assets for improving the province’s innovative capacity, trade and competitiveness and business climate (NSED 2006):

- Financial capital, which includes conventional assets such as savings and investments;
- Natural capital that includes natural resources, land, and ecosystems;
- Built capital that includes machinery, buildings, and all infrastructure;
- Human capital that is the knowledge, skills, competencies, and attributes of our people; and
- Social capital that refers to the strength of relationships among people, companies, organizations, and government in a society.

As will be demonstrated throughout this document, the offshore natural gas sector contributes to and supports these essential building blocks.

1.1.1 Summary of Major Offshore Petroleum Activities in Nova Scotia

Development of the offshore petroleum industry in NS can be broadly assigned to three major work categories: exploration and development drilling; production; and decommissioning. The following provides a summary of the activities conducted for each category within the study period, 1996-2008. A brief history of activities leading up to the study period is included as context.

1.1.1.1 Exploration and Development Drilling

Exploration programs for offshore natural gas and oil began in 1959 and the first exploration well was drilled on Sable Island in 1967. During offshore petroleum development activity, three distinct cycles of exploration can be identified. The first cycle took place between 1959 and 1979 and resulted in significant oil and gas finds near Sable at the lease blocks of Onondaga, Primrose, West Sable, Thebaud, Cohasset, Citnalta and Intrepid. The second exploration cycle took place between 1979 and 1989 resulting in new discoveries at South Venture, West Venture, Olympia, West Olympia, South Sable, Glenelg, Alma, North Triumph, Uniake, Eagle, Banquereau and Chebucto.

The third cycle of exploration from 1989 to 2004 was concurrent with light oil production activities by LASMO at Cohasset/Panuke (CoPan) and gas development in the Sable area by

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Sable Offshore Energy Incorporated (SOEI). In this period, a gas find was discovered at Deep Panuke, which was located below the existing Panuke oilfield. Delineation drilling at other locations did not produce significant or commercial gas finds. Six exploration wells were drilled at deep water locations with limited success on the Annapolis and Newburn lease blocks. No further exploration drilling has taken place since 2006.

Exploration licenses are granted on the basis of the value of work to be completed on a block over a given period of time; therefore, a license can be active for a number of years. The number of exploration licenses decline as operators complete their work plans and fail to renew their licenses or forfeit licenses through lack of activity. Table 1.3 shows the annual number of active licenses for offshore exploration programs for each year from 1996-2008.

Table 1.3 Total Active Exploration, Significant Discovery and Production Licenses 1996-2008

Fiscal Year	Exploration Licenses (as of March 31 of period)	Significant Discovery Licenses (as of March 31 of period)	Production Licenses (as of March 31 of period)
1996-1997	2	32	2
1997-1998	4	32	2
1998-1999	13	32	2
1999-2000	43	33	6
2000-2001	50	33	6
2001-2002	59	33	6
2002-2003	57	33	6
2003-2004	56	33	7
2004-2005	34	33	8
2005-2006	27	33	8
2006-2007	23	33	8
2007-2008	10	35	8

In total, there have been 204 exploration, delineation or development wells drilled on the Scotian Shelf and adjacent deep waters during this time. At the beginning of the study period, 1996-1997, two exploration licenses, 32 significant discovery licenses covering 22 significant discoveries, and two production licenses had been granted to resource developers (CNSOPB 1996-1997). Between 1996 and 2002, exploration activity increased to a high of 59 active exploration licenses. Subsequently, exploration activity has declined as licenses expired, were not renewed or were forfeited. At the end of the study period, 2007-2008, there were 10 exploration licenses, 35 significant discovery licenses for 23 significant discoveries and 8 production licenses granted by the Canada Nova Scotia Offshore Petroleum Board (CNSOPB).

Table 1.4 summarizes the drilling programs that were conducted to further explore and develop petroleum hydrocarbon resources on the Scotian Shelf and in the adjacent deep water. From 1996 to 2008, 57 wells were drilled. Of these, 30 wells were considered Development or Development and Exploration and 27 were Exploration or Exploration and Delineation wells. The results of this program indicate that approximately two-thirds of the wells drilled were

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classed oil or gas wells and many have been exploited for oil and gas production. Seven exploration wells (12%) contained gas but were not identified as producers. Eleven wells (19%) were dry holes.

Although exploration drilling programs can be considered small in comparison to development activities in some reservoirs, the results indicate a significant success rate, particularly for natural gas development.

Table 1.4 Summary of Exploration Drilling Activities, 1996 – 2008 (adapted from CNSOPB 2008)

Company ¹	Number of Wells Drilled	Drilling Platform	Time Period	Purpose	RESULTS
PanCanadian	17	Rowan Gorilla II (1 well) Rowan Gorilla III (11 wells) Rowan Gorilla IV (1 well) Rowan Gorilla V (4 wells)	1996 - 2001	Development , Exploration and Delineation	6 Oil Wells 6 Gas Wells 2 Gas Shows 3 Dry Holes
SOEP ²	13	Rowan Gorilla II (6 wells) Galaxy II (6 wells)	1998 - 2001	Development	13 Gas Wells
Mobil	2	Galaxy II (2 wells)	2000 - 2001	Exploration	1 Gas Show 1 Dry Hole
ExxonMobil	10	Galaxy II (9 wells) Rowan Gorilla V (1 wells)	2002 - 2006	Development (9 wells) Exploration (1 well)	9 Gas Wells 1 Dry Hole
Shell Canada	1	Galaxy II (1 wells)	2001- 2002	Exploration	1 Gas Well
EnCana	6	Eirik Raude (2 wells) Rowan Gorilla V (2 wells) Rowan Gorilla VI (2 wells)	2003 - 2006	Exploration	2 Gas Wells 3 Dry Holes 1 Confirmation
Imperial Oil	1	Eirik Raude (1 well)	2003	Exploration	1 Dry Hole
Marathon Oil	3	West Avion (1 well) Deepwater (1 well) Millenium (1 well)	2001	Exploration	1 Gas Well 2 Gas Shows
Chevron Canada	1	Deepwater (1 well)	2002	Exploration	1 Gas Show
Canadian Superior	3	Rowan Gorilla V (3 wells)	2002 - 2004	Exploration	1 Gas Show 2 Dry Holes
TOTAL	57	10 drilling platforms	1996- 2006	29 Development Wells 24 Exploration Wells 1 Development and Exploration 2 Exploration and Delineation\ 1 Delineation	6 Oil Wells 32 Gas Wells 7 Gas Shows 11 Dry holes 1 Confirmation

Notes:

¹The Company named is the lead Company, other partners may have participated² SOEP = Sable Offshore Energy Project

1.1.1.2 Production

The main operational components of offshore nature gas production include: corporate and operations management offices; a Field Production Centre (FPC); a natural gas processing plant; a natural gas fractionation plant; a pipeline to transport the market-ready natural gas product; and facilities for transporting other natural gas products. The FPC is where the raw natural gas is extracted from the reserve. The raw gas is then delivered to a processing facility where heavier gas components (*e.g.*, propane and butane) and undesirable contaminants (*i.e.*, hydrogen sulfide) are removed. The processed natural gas is then shipped to markets via pipelines. The heavier gas components are sent to a fractionation plant for the further separation of different heavy gas components, which are then transported elsewhere (via ship or rail) for industrial use.

These main operational components of offshore production are illustrated in Figure 1.1.

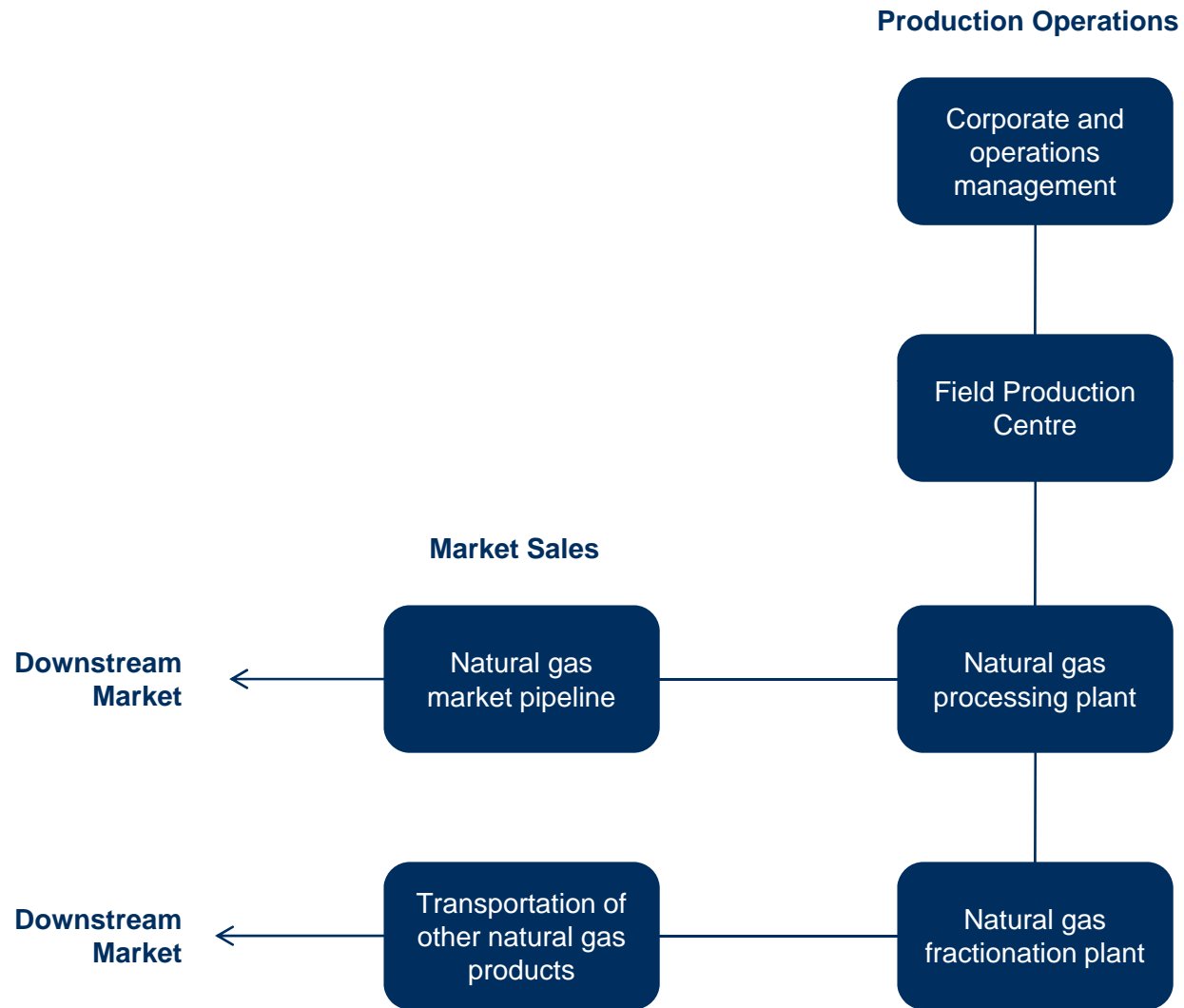
Cohasset and Panuke Oilfields

The first offshore petroleum product in NS was developed by LASMO for the production of light crude oil from the Cohasset and Panuke (CoPan) oilfields. Production began in June 1992 and continued to mid-December 1999. This facility consisted of a production platform on the Cohasset site connected by a subsea pipeline to a satellite platform at the Panuke well site. Light crude oil was transferred through a subsea pipeline to a storage tanker moored at a Calm Buoy near the production platform. This facility produced 7.1 million cubic metres of oil during its life span. Ownership of this field passed from LASMO to PanCanadian Petroleum, and subsequently to EnCana Corporation.

Sable Offshore Energy Project

The Sable Offshore Energy Project (SOEP) was formed by a consortium of five companies: ExxonMobil Canada Properties Ltd, Shell Canada Limited, Imperial Oil Resources, Pengrowth Energy Trust (Emera Inc.) and Mosbacher Operating Limited. Following regulatory approval in 1998, SOEP undertook the development of natural gas production from discoveries near Sable Island. Initially, the discoveries at Thebaud, North Triumph and Venture were put into production in late 1999 in what is referred to as the Tier I project. Subsequently, Tier II saw the development of the Alma Field in late 2003 and South Venture in late 2004.

Figure 1.1 Main Operational Components of Offshore Production



In Tier I, SOEP constructed a pipeline to bring natural gas from the Sable area to Goldboro, NS. A natural gas processing plant was constructed at Goldboro to prepare the raw gas for market, and Maritime and Northeast Pipeline (M&NP) constructed an onshore pipeline to carry natural gas to the principle consumer market in the northeast United States (US), with laterals to Point Tupper, Halifax, Amherst and Saint John. The by-products from the gas processing plant at Goldboro are separated from the market gas and transported to the SOEP Fractionation Plant at Point Tupper. The Fractionation Plant separates the by-products into liquid propane, butane and condensate which are shipped out of the Point Tupper facility to buyers.

The M&NP pipeline runs from Goldboro through NB and into Maine and the major northeast market. Lateral pipelines run off the main pipeline to supply commercial markets in Halifax and Amherst, NS and in Saint John, NB.

Deep Panuke

In 1999, PanCanadian discovered the Deep Panuke gas field in a geological formation below the former Panuke oil field and announced its intention to develop Deep Panuke in 2001. Pan Canadian merged with Alberta Energy Company to form EnCana, which took over the development of the Deep Panuke gas field, and work on the engineering design and regulatory approvals began at that time. In May 2003, EnCana called for a regulatory “time-out” to re-assess the project and its economic viability. The regulatory process for the project was re-activated in 2006 and the project received regulatory approvals in 2007.

Unlike SOEP, the Deep Panuke Project will develop somewhat sour gas. The offshore production facility will process the sour gas creating “sweet” market gas which will be transported to Goldboro in a subsea pipeline that will be adjacent to the existing SOEP pipeline. The by-products of processing will be re-injected at the production facility and sequestered in a deep geological formation. The offshore pipeline will be connected to the M&NP onshore pipeline through a metering station at Goldboro for market distribution. Present activities include the construction of production facilities and preparations for the installation of the pipeline, to be completed in 2009. Natural gas production is scheduled to begin in 2010.

Blue Atlantic Project

In December 2001, El Paso Corporation initiated studies for the Blue Atlantic Transmission System which would provide a subsea natural gas pipeline from the Sable Island area to New Jersey to supply the energy market in the northeast US. The project called for a collection system of gathering platforms in the production area around Sable Island. Gas production was to be transported in a subsea pipeline to an onshore processing and compression facility near Shelburne in southwest NS. The processed natural gas was then to be transported by subsea pipeline to the US landing in Linden, New Jersey.

El Paso established a project office in Halifax and developed a project team to prepare a preliminary engineering design and initiate environmental impact studies and geophysical

surveys. The project team included NS based engineering, surveying and environmental consulting firms. Work was stopped and the project was shelved indefinitely in 2003.

1.1.1.3 Decommissioning

CoPan Decommissioning

In 1999, production at the CoPan Facility ceased and the decommissioning of the production facility was undertaken. Phase 1 of the decommissioning was conducted in 2000. In 2003, the regulatory approval process for the decommissioning plan was initiated. Decommissioning of the top sides and removal of the jackets was completed in 2005. Final decommissioning activities were completed in 2007, although an ongoing annual seabed monitoring program continues.

1.1.2 Deriving Benefits from the Offshore

Offshore petroleum development projects (“the offshore”) involve a wide range of activities covering many economic sectors, and thus provide a range of socioeconomic benefits. The benefits are described fully in Section 2 and impacts are estimated in Section 3.

Delineating the benefits and deriving estimates of impacts from our offshore energy is important, though a complex task. In NS, petroleum companies involved in exploration, development or production operate local offices and supply bases, and maintain their operations through contracts with many local firms to provide the different goods and services required. Within NS, this provides employment and income to individuals directly employed by the petroleum companies and to individuals employed by the firms that support offshore operations. The investors and owners of firms operating within NS also enjoy profits realized by their business activities.

In addition to employment and income effects, governments receive payments in the form of royalties (resource rents) and related revenues, personal and corporate income taxes, sales tax, property tax, and lease and license fees. These payments to government have become an important source of revenue, and support the delivery of a wide range of public services to communities, organizations and individuals throughout the province.

More difficult to document but similarly important are the additional benefits of offshore petroleum development. In particular, the building of energy infrastructure, education and training, and research and development (R&D) in support of the offshore provide a foundation and innovation for additional economic growth. Energy infrastructure, such as natural gas pipelines, contributes to the Province’s built capital that facilitates the growth of other businesses. Human capital is enhanced with education and training, as well as through various R&D activities. R&D also provides the knowledge products that can, in turn, be marketed for application in other sectors or for export. Natural gas also provides environmental benefits, as it gives our power company, industry, and commercial and residential buildings a fuel choice with

lower emissions. Access to natural gas also gives NSPI a new fuel option for quick and efficient backup of intermittent renewable sources such as wind power.

All of the above additional benefits enhance the Province's strength in exports, its competitive position in the world, and its ability to meet environmental goals.

1.1.2.1 Nova Scotia's Entitlement to Benefits from the Offshore

Federal legislation requires parties that wish to undertake offshore gas or oil related work or activity to submit development plans for approval. These development plans must contain Canada-NS benefits plans with provisions for (Canada-Nova Scotia Offshore Petroleum Resources Accord Implementation Act 1988):

- The employment of Canadians, especially members of the provincial labour force;
- Promoting education, training, and s in the province in relation to offshore petroleum resource activities; and
- Giving first consideration to services provided from within NS and to goods manufactured in the province, where those services and goods are competitive in terms of fair market price, quality and delivery.

The rights of the Province as the principal beneficiary of its offshore petroleum resources are recognized under the Canada-Nova Scotia Offshore Petroleum Resources Accord, an agreement entered into by the Government of Canada and the Government of NS in 1986. The agreement entitles the Government of NS to manage revenues from its offshore petroleum resources as if these resources were located on the land portion of the province. The Province therefore receives the proceeds of all fees and provincial-type taxes from offshore gas and oil activity, including royalties, bonus payments, rental and license fees, provincial corporate income tax, and sales tax. These revenues are extremely valuable to the Province. In fact, after personal income tax and sales tax, the gas and oil industry is the largest single source of provincially-generated revenue for NS (CAPP 2008; NSDE and NSE 2009). Offshore royalties contribute to all core government program areas, including education, health care, infrastructure, and debt reduction (CAPP 2008; NSDE and NSE 2009). The Government of NS estimates that \$2.2 to \$3 billion in royalties are expected to be paid to the Province over the life of SOEP alone (CAPP 2008).

In 2005, the benefits received by the Province were enhanced by the signing of an agreement requiring the federal government to make offset payments to reimburse NS for 100% of any reduction in federal transfer payments (*i.e.*, the Equalization Program) caused by offshore revenues. The arrangement included an advance payment of \$830 million to give the Province immediate flexibility to reduce its outstanding debt (Government of Canada and Government of Nova Scotia 2005). The 1986 Offshore Accord also provides the Province with a statutory right to a portion of revenue Ottawa collects from our offshore developers. These revenues to the

provinces are called the Crown Share Adjustment Payments (See Table 3.2 for a summary of all revenues).

1.1.2.2 Major Commercial Beneficiaries of Offshore Gas Development

The commercial beneficiaries (“the suppliers”) for the offshore include businesses that are both directly involved in exploration, development and production activities, and those that indirectly supply goods and services to support those activities. They include:

- Engineering services (engineering design, project construction management, facility commissioning and upgrading, sourcing and procurement, project management);
- Scientific services (environmental assessment, environmental management and planning, environmental studies, meteorological services, oceanographic studies and monitoring, hydrographic surveys, geo-hazard studies, marine and offshore safety services);
- Waste management and remediation services (solid waste handling and disposal, wastewater treatment, drilling mud treatment and disposal);
- Construction, machining, manufacturing and fabrication (building and component construction and manufacturing, onshore fabrication facilities, offshore construction operations and equipment);
- Finance and real estate (financial services, real estate development and leasing);
- Information services (telecommunications, information technology services);
- Materials supply (structural materials and equipment, specialized materials and technologies for production facilities);
- Transportation services (air, road, rail and marine transportation);
- Ship building and repair (construction, retrofit and maintenance of supply vessels, operations vessels and drill rigs);
- Port and harbour operations (material stockpile and inventory, warehousing, marine base operations);
- Food and hospitality services (catering, accommodations); and
- Research and education (scientific research, trades and technical certificate programs, skills upgrading and placement).

Those providing these goods and services include a range of different companies from large national and international corporations, to NS-based small and medium enterprises. Suppliers to the offshore are located throughout the province, predominantly in the Halifax Regional Municipality (HRM), but also in the counties of Guysborough, Pictou, and Antigonish, among others. These major economic components of the offshore gas industry provide the foundation for community-level benefits within NS.

1.1.2.3 The Value Chain

The economic benefits associated with development and production of offshore natural gas can be analyzed by looking at the stages of development along the value chain, the various types of activities within each stage, and the goods and services purchased to support these activities. Within each stage, there are requirements for a range of suppliers, which have often been sourced or provided in the Province.

The main elements of the offshore value chain can be separated into two basic categories: upstream activities, which encompass all activities up to and including extracting the fuel source from beneath the seafloor; and downstream activities, which consist of all activities undertaken after the fuel source has been extracted (Strategic Concepts Inc. *et al.* 1999). As is explained below, downstream activities can be understood to include a “midstream” subcomponent.

Although stages may be concurrent with other activities, for simplicity the four main stages of upstream gas and oil activity can be separated in the following:

- Stage 1: Exploration;
- Stage 2: Development of Production Facilities;
- Stage 3: Production; and
- Stage 4: Decommissioning of Production Facilities.

These stages follow in sequence for any given gas field that comes into production, with exploration activities typically continuing in geographical areas where fields are already under development. It is, therefore, possible for all four stages to occur simultaneously within a single gas-producing area (Gardner Pinfold Consulting Economists Ltd. 2002).

Exploration consists of seismic surveys and drilling of investigative and delineation wells in licensed areas in order to determine the existence of commercial natural gas or petroleum reserves. Development takes place once a gas or oil field has been declared commercially viable. Development has a substantial economic impact as it involves designing, constructing, installing and maintaining production equipment, as well as systems to transport the fuel onshore. The gas is then extracted during the production stage. The final upstream stage, decommissioning, is a process that occurs after the field has exhausted its commercially productive reserves. It entails dismantling and removing structures and equipment that were involved in offshore operations (Gardner Pinfold Consulting Economists Ltd. 2002).

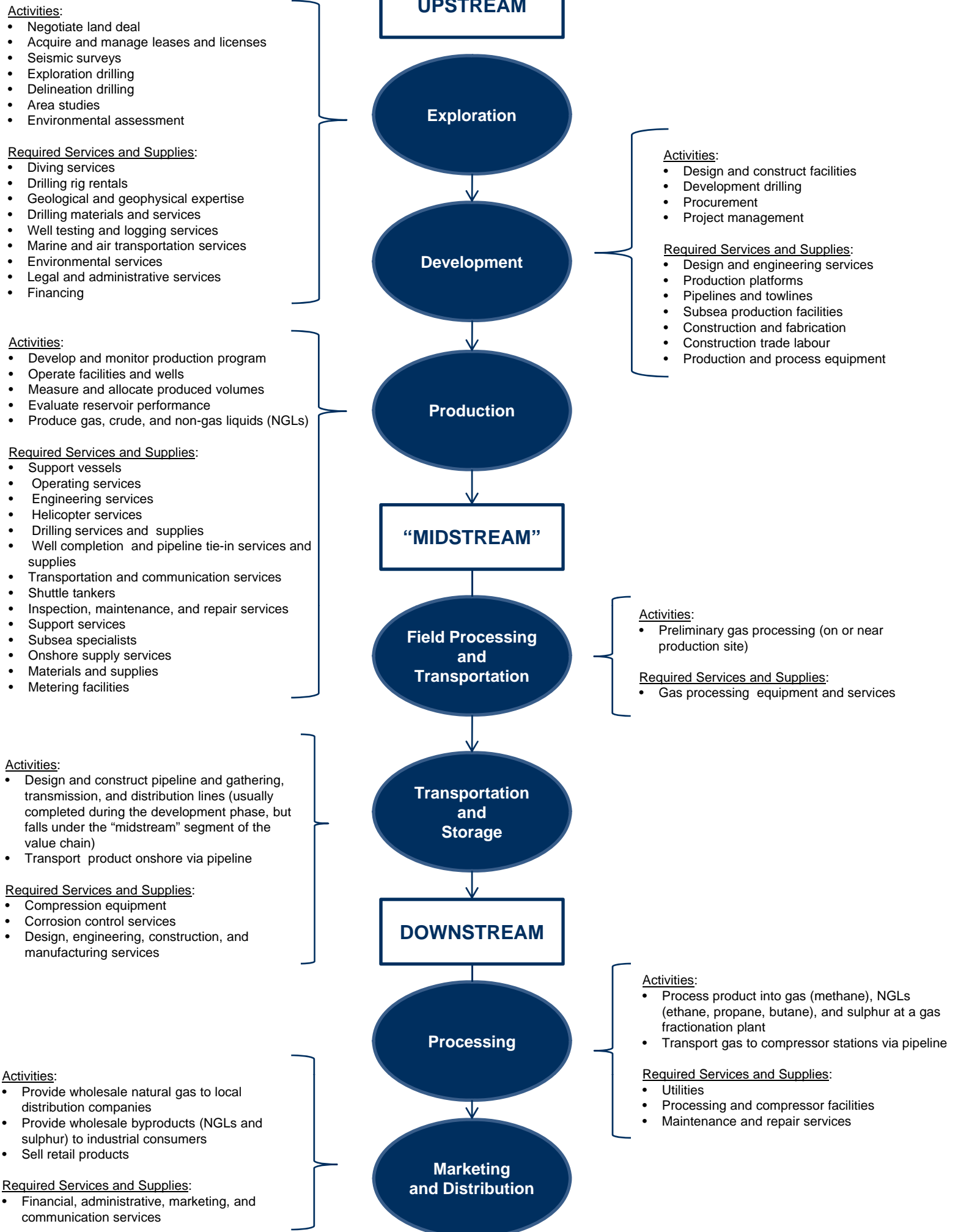
Downstream gas and oil activities include transportation and storage, processing, and marketing and distribution (Strategic Concepts Inc. *et al.* 1999). Natural gas often requires preliminary field processing (at or near the wellhead) to purify it into pipeline-quality gas that can be transported onshore for further processing before final distribution. A prominent “midstream” component has, therefore, emerged within Atlantic Canada’s offshore value chain as a result of

offshore gas purification activities and the development of offshore-onshore transmission pipeline systems (PricewaterhouseCoopers 2001).

Figure 1.2 is a representation of the operational activities that take place at each step along the offshore gas value chain, as well as some of the services and supplies that may be required to support those activities. It should be noted that the diagram is not exhaustive; it is limited to include only some of the most significant value chain activities and inputs. Furthermore, many activities (e.g., project management, procurement, environmental studies, monitoring) and goods and services (e.g., legal and administrative services, communication equipment and services, financing) are required continuously along the value chain, but they are only shown at certain points in the simplified schematic below.

Nova Scotian companies already have service and supply capabilities for many of the activities along the value chain. However, a considerable amount of offshore gas and oil expenditures flow out of the provincial economy because certain required inputs are not sufficiently available in NS or local suppliers fail to qualify for bids. Drill rigs, industry-specific materials and equipment, and offshore construction vessels are examples of required goods that are not manufactured locally and for which expenditures “leak” from the domestic economy (Gardner *et al.* 2005). There is, therefore, potential opportunity for the development of provincial supply capabilities for some of these goods and services.

Figure 1.2 Offshore Natural Gas Value Chain



1.1.3 Characterizing the Economic Benefits

There are a number of different ways in which economic benefits have been realized from the development of the offshore. A broad characterization of the benefits considers the following:

- *Employment.* This includes direct, indirect and induced employment. Direct employment is the hiring of individuals directly by the petroleum companies to work on offshore projects, while indirect employment consists of those working for suppliers of goods and services to the offshore. Induced employment is generated by consumer spending of incomes generated from direct and indirect employment.
- *Enhancement of Financial Capital.* The offshore sector benefits to financial capital include both value added and government revenue.
 - *Value added* primarily includes incomes from employment and profits to business owners and investors. The combination of indirect and induced benefits from the spending of incomes and profits is sometimes referred to as “spin-off” benefits. Incomes contribute to the enhancement of financial capital by providing assets for business investment directly or in the form of savings.
 - *Government revenue* from the offshore include royalties (resource rents) and related offset payments and related shares of Federal revenue, personal and corporate income taxes, sales tax, property tax, and lease and license fees. This revenue supports a wide variety of government services and debt reduction.
- *Enhancement of built capital.* Built capital includes equipment and infrastructure that are used to support other economic activities, as well as provide public goods and services. For example, the gas pipeline supports additional investment by power companies, industry and residents to make use of our offshore natural gas. Petroleum companies may also include community contributions (e.g., building of a community hall, providing needed recreation infrastructure) as part of their development plan.
- *Enhancement of human capital.* Human capital consists of the knowledge, skills and competencies of individuals. Worker education, training and experience for the offshore, including participation in R&D, all contribute to the enhancement of human capital. Human capital is a key ingredient in the success of any business, and provides the foundation for entrepreneurship and innovation.
- *Enhancement of social capital.* Social capital can be described as the strength of networks among people, companies, organizations, and government. The development of the offshore has given a number of companies the opportunity to forge new business ties, both domestic and international, and has allowed some communities to receive new investments and employment opportunities.

Many of the above benefits are immediate and readily documented. However, a number of other benefits, such as the enhancement of human and social capital, are more difficult to characterize but are important to sustainable prosperity and competitiveness. The above categorization of benefits from the offshore serves as the framework for the discussion in this report.

1.2 STUDY OBJECTIVES AND APPROACH

NSDE is seeking a broad perspective on the socioeconomic impacts of natural gas development and production on the provincial economy which have accrued over the period of 1996 to 2008. The insights gained from the analysis and lessons learned will help support decision-making and government policy regarding future offshore activity. The foundation for the economic benefits analysis include statistical records from the CNSOPB and NSDE, other data and information available from reports, and descriptive information and examples drawn from the business and academic community. A description of the study methods is provided in Appendix A.

The project includes an analysis of business examples selected from NS companies which have been active in the petroleum sector, as well as businesses in other sectors of the economy that have benefited from the offshore. A description is provided of effects the industry and institutions experienced in terms of their initial business place, internal and sectoral growth, market development in technical services and geographic areas, labour development and business alliances. Examples of local companies that illustrate growth of new or innovative technologies and services are included. These examples will provide a better understanding of the full economic impacts of natural gas developments on existing NS companies and the provincial economy.

2.0 Benefits from the Offshore

2.1 THE INDUSTRY IN NOVA SCOTIA

The petroleum industry reported spending of over \$9 billion for development and production of NS's offshore resources from 1996 to 2008 (CAPP 2008), with approximately \$2.5 billion of that total being direct within NS (NSDE 2008a). SOEP alone reported direct expenditures of almost \$2 billion within NS (NSDE 2008a). Table 2.1 summarizes direct employment impacts and project expenditures during the study period. Notably excluded from the figures shown in Table 2.1 are the direct employment and expenditures from offshore exploration activities (seismic exploration and exploration drilling) and the El Paso Blue Atlantic Project, for which statistics are not readily available.

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Benefits from the Offshore

Table 2.1 Direct Employment and Project Expenditures of Offshore Projects

	Direct Employment Summary (person years)							Project Expenditure (million current dollars)						
	Total	Nova Scotian	% Nova Scotian	Other Canadian	% Other Canadian	Non-Canadian	% Non-Canadian	Total	Nova Scotian	% Nova Scotian	Other Canadian	% Other Canadian	Non-Canadian	% Non-Canadian
Cohasset														
1996	346.9	291.2	83.9%	29.6	8.5%	26.1	7.5%	118.3	43.4	36.7%	52.8	44.7%	22.0	18.6%
1997	412.5	355.6	86.2%	27.9	6.8%	29.0	7.0%	1045.8	397.2	38.0%	180.8	17.3%	467.8	44.7%
1998	450.9	376.7	83.5%	35.2	7.8%	39.0	8.6%	1160.1	444.5	38.3%	201.0	17.3%	514.6	44.4%
1999	393.7	341.3	86.7%	42.9	10.9%	9.5	2.4%	122.6	47.6	38.8%	20.0	16.3%	55.0	44.9%
2000	546.0	447.0	81.9%	54.0	9.9%	45.0	8.2%	171.5	59.3	34.6%	23.1	13.5%	89.1	52.0%
1996-2000 Cumulative	2150.0	1811.8	84.3%	189.6	8.8%	148.6	6.9%	2618.2	992.0	37.9%	477.7	18.2%	1148.5	43.9%
Sable Offshore Energy Project (SOEP)														
1996	178.4	57.6	32.3%	47.8	26.8%	72.9	40.9%	17.9	5.8	32.4%	6.7	37.8%	5.3	29.9%
1997	376.2	74.6	19.8%	98.0	26.0%	203.6	54.1%	105.6	18.1	17.1%	37.9	35.9%	49.6	47.0%
1998	2716.0	1207.0	44.4%	336.0	12.4%	1172.9	43.2%	844.3	189.4	22.4%	116.7	13.8%	538.2	63.7%
1999	3050.0	1600.0	52.5%	250.0	8.2%	1150.0	37.7%	1069.9	405.1	37.9%	116.3	10.9%	548.5	51.3%
2000	1340.0	1165.0	86.9%	145.0	10.8%	50.0	3.7%	363.9	172.1	47.3%	102.3	28.1%	89.5	24.6%
2001	830.0	680.0	81.9%	85.0	10.2%	65.0	7.8%	276.1	139.1	50.4%	47.1	17.1%	89.9	32.6%
2002	910.0	490.0	53.8%	145.0	15.9%	275.0	30.2%	439.9	176.7	40.2%	100.6	22.9%	162.6	37.0%
2003	1520.0	970.0	63.8%	155.0	10.2%	395.0	26.0%	544.0	209.6	38.5%	102.1	18.8%	232.3	42.7%
2004	1235.0	815.0	66.0%	105.0	8.5%	315.0	25.5%	509.0	180.7	35.5%	83.1	16.3%	245.2	48.2%
2005	1330.0	635.0	47.7%	90.0	6.8%	600.0	45.1%	457.6	154.2	33.7%	56.7	12.4%	246.6	53.9%
2006	1090.0	695.0	63.8%	90.0	8.3%	305.0	28.0%	463.0	176.9	38.2%	71.3	15.4%	214.8	46.4%
2007	610.0	535.0	87.7%	50.0	8.2%	25.0	4.1%	242.2	106.7	44.1%	42.2	17.4%	93.3	38.5%
1996-2007 Cumulative	15185.6	8924.22	58.8%	1596.83	10.5%	4629.43	30.5%	5333.4	1934.3	36.3%	883.1	16.6%	2515.9	47.2%
Deep Panuke														
2007	128.5	54.4	42.3%	4.4	3.4%	69.7	54.2%	32.8	No data	No data	No data	No data	No data	No data

Sources: CNSOPB 1997-2008 (Annual Reports 1996-1997 to 2007-2008); SOEI 1998-2001 (Annual Reports 1997-2000); Exxonmobil Canada Properties Ltd. 2002, 2008, n.d. (Annual Reports for 2001 and 2007, and Restated Tables); and EnCana Corporation 2008 (Annual Report 2007)

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Benefits from the Offshore

The offshore oil and gas industry in NS has connections to several other industries within the province. Marine construction, manufacturing, ship and boat building, and ports and shipping have all gained direct and indirect benefits from offshore gas exploration, development, and production (e.g. Case Studies 8 and 9). Nova Scotia engineering, scientific and technical services receive millions of dollars in contracts from offshore development. There are strong relationships between offshore activities and marine construction and manufacturing because the offshore industry requires specialized infrastructure, facilities, and equipment to be fabricated, assembled and maintained (e.g. Case Studies 7 & 11). Aspects of ports and shipping that have potential to grow as a result of the offshore energy industry include marine towing, marine cargo hauling, harbour and port operations, pilotage, marine shipping agencies, and ship chartering.

Offshore gas activities can also lead to indirect benefits for a variety of land-based industries in NS. These inter-industry connections may not be easily recognizable, but they are nonetheless valuable to the provincial economy. Past impacts on the local real estate market provide a good example of how industries that may seem unrelated to gas and oil can still benefit from development of the offshore. The vacancy rate for residential accommodation in Halifax fell from 8.6% to 3.6% during the development phase for the SOEP (from 1996 to 1999). The SOEP played a significant role in these circumstances, although it was not the only contributing factor. This period also saw an increase in demand for high-end homes, and condominiums in the \$150,000 to \$250,000 price range. The explanation offered by informed observers of the real estate market is that this was attributable to the influx of executives and other high-level managers associated with offshore businesses (Gardner Pinfold Consulting Economists Ltd. 2002).

Nova Scotian businesses are capable of manufacturing components to meet a wide variety of systems and equipment needs for offshore projects. Among other items, local manufacturers can produce structural frames, pressure vessels, tanks, piping, electrical equipment, hydraulic equipment, and other modules and packages required for the offshore (L N Perry Consulting Inc. 2000). In addition to manufacturing components, many companies in the province are equipped for assembly, testing, and provision of on-going service (*i.e.*, for maintenance and repair). However, local businesses may lack specialized knowledge of the offshore industry, engineering expertise, and past experience in the production of these components (L N Perry Consulting Inc. 2000).

Below is the first of 14 case studies profiling various businesses and institutions. These case studies are placed throughout the document to provide the reader with a deeper understanding of socioeconomic benefits realized from the offshore.

Case Study 1: Lloyd's Register North America

Lloyd's Register North America (LRNA) is the regional arm of the Lloyd's Register Group of entities, a multinational independent risk management organization with 7,000 employees working in 226 countries. Lloyd's Register began in 1760 in London, England with the formation of a society to standardize ship inspection and classification systems. The company printed its first register of ships in 1764, which recorded the conditions of ships for insurance and chartering purposes. LRNA has had a presence in NS since 1886, and all of the company's Canadian operations are run from its national headquarters in Dartmouth, NS.

Today, Lloyd's Register acts as a classification body and a third party Certifying Authority (CA) that ensures compliance with codes and standards. The company also does technical consulting work, but it avoids doing this work for projects that it audits, as this could lead to a perceived conflict of interest. LRNA recently acquired Martec, a Halifax-based engineering firm employing 50 professionals, to enhance its Marine Consultancy Services. Lloyd's Register provides services to the Marine, Energy, Transportation and Management Systems (Quality) sectors.

The company operates as a registered charitable trust in the United Kingdom and as a not-for-profit organization in Canada. Bud Streeter, Vice President and Marine Business Manager for Canada, and Mark Horswill, Class and Compliance Manager for Canada, feel that this enhances the quality and integrity of the company and its work. Because LRNA does not have any shareholders, there is no pressure from investors to cut corners or compromise standards to increase profits.

Lloyd's Register first became involved in the offshore industry in the mid 1960s, at the onset of activity in Europe's North Sea. The company gained valuable offshore experience in the North Sea that complemented the knowledge that it had acquired during its long international marine history. Streeter and Horswill believe that Lloyd's Register's contribution of global expertise has directly benefited development of NS's offshore industry.

The experience and capabilities gained doing offshore work have enabled Lloyd's Register to expand into a variety of other industries. Because the offshore environment is very harsh and the industry tends to push technological boundaries, other industries are comparatively easy to bridge after participating in the offshore. Some of the many industries that the company has forayed into worldwide as a result of its involvement in the offshore include nuclear power generation; rail transportation; LNG terminals; marine security services; plan development and implementation; and assessment and auditing against international standards.

Lloyd's Register participates in R&D related to the offshore. LRNA staff members sit on committees for certain projects for Petroleum Research Atlantic Canada (PRAC) and the Canadian Association of Petroleum Producers (CAPP). The company also participates in R&D forums with Atlantic Canadian universities. Additionally, LRNA provides feedback to proponents of R&D projects regarding how they need to modify proposals in order to comply with requirements. LRNA's newly acquired subsidiary, Martec, is also actively involved in the R&D community.

In NS, LRNA has played an important role assisting regulators and other provincial authorities in ensuring compliance with applicable requirements, such as those for safety and environmental protection. For example, it has acted as a CA for SOEP and Deep Panuke on behalf of the CNSOPB. LRNA has also acted as a CA for the Bear Head and Maple liquefied natural gas (LNG) projects on behalf of the Nova Scotia Utility and Review Board (NSUARB). LRNA has performed audits on behalf of the provincial government for offshore-related projects.

LRNA has enjoyed considerable success working in NS's offshore. In 2008, approximately \$4 million in revenues were generated from participation in the local petroleum industry. Remarkably, this amount has quadrupled since 1996. Horswill explained that "Atlantic Canada is carrying the oil and gas initiative for the Americas" and that approximately half of all of LRNA's total petroleum industry revenue is from sales within NS alone; the other half is from sales in Newfoundland and Labrador (NL). Within all of Canada, work in the energy sector accounts for about 50% of LRNA's total revenues, with work in the Marine sector accounting for the other half.

Streeter and Horswill say that utilization has not posed a problem in LRNA's Dartmouth office. On the contrary, the local staff size has tripled since 2000 and continues to grow. The office currently employs 19 people, 10 of which directly provide services to the offshore. Streeter and Horswill are proud of the opportunities that their company provides to local graduates. Because of Lloyd's Register's global coverage, its young employees have exciting opportunities to work abroad and gain international industry experience that can then be applied to the local context.

Atlantic Canada's offshore presents the LRNA with several foreseeable future opportunities, including participation in projects ranging from new vessel construction and refits to work for LNG terminals. LRNA anticipates that it will do work from its Dartmouth location for the Hebron Project and Hibernia South Project in NL. In addition, the company has been engaged as the CA for the SOEP and Deep Panuke projects in NS, and will be involved with all future regulatory approvals and permits for those projects to continue. Natural Resources Canada is currently developing Canadian standards for offshore certification. Once completed, Lloyd's Register will benefit from additional opportunities to act as CA for offshore projects.

Case Study 2: A.P. Reid Insurance

A.P. Reid Insurance (A.P. Reid) is a brokerage firm that offers insurance products and provides related advice-based services. They serve corporate clients in a variety of industries, as well as individuals and families. The company started up in NS in 1980 and currently boasts 15 locations (13 in NS, including its corporate head office in Dartmouth, and two in NB). The company employs a total of 50 people, 16 in their Dartmouth office alone. Four employees are directly involved in providing services to the offshore.

In the mid 1980s, A.P. Reid recognized the great commercial potential offered by the province's offshore oil and gas resources. Wanting to take advantage of offshore opportunities, the brokerage joined the Offshore Technology Association of Nova Scotia (OTANS) and strategically targeted the industry for business development purposes. Their efforts paid off, and the business experienced significant growth during the early 1990s. As much as 20% of the company's revenue was linked to the petroleum industry during that decade.

The firm has developed new products and services specifically for the offshore. Noticing that local business' ability to break into the offshore industry can be hindered by insurance and financing issues, and that local expertise was not available to address this issue, A.P. Reid realized another opportunity. Small businesses attempting to do work related to the offshore require specialized insurance services and policies that provide protection and enable them to manage risk and compete more effectively. Accordingly, the brokerage identified a need to use their capabilities to help smaller contractors expand into the industry, rather than focusing on large operating companies.

Some of A.P. Reid's clients started in other industries before transitioning into the offshore, as A.P. Reid itself did. In these cases, the firm and its clients have been able to learn from each other and grow and develop together. The brokerage also works with many contractors that are involved with the offshore as well as other industries (*i.e.*, contractors that are involved with construction, including marine construction). A.P. Reid is a "yes we can" provider that sees itself as a partner in the growth of its offshore clients. They help their clients build customized insurance portfolios that enable them to bid on bigger projects and expand their business. As James Reid, President of A.P. Reid, explains, "Our success is a reflection of our clients' success."

As a brokerage, A.P. Reid purchases insurance from suppliers on behalf of its clients. The dominant marine insurance providers to the offshore are large foreign companies based out of London or the U.S., and expertise in this area has generally not been developed to the same extent by insurance suppliers in Canada. Therefore A.P. Reid frequently deals with international companies on behalf of its offshore clients operating in the province.

The services that A.P. Reid provides to companies working in the province's offshore oil and gas industry occupy an important niche, especially when the firm does business on behalf of smaller local clients. Much of this offshore work is "too large" or specialized for local insurance suppliers to handle, yet is considerably smaller than the work that large foreign insurance companies typically deal with. A.P. Reid creates products and solutions to help bridge this gap.

As a small player in a large international market, A.P. Reid has faced considerable challenges getting established in the offshore. The brokerage has overcome these challenges by building solid relationships and a strong reputation within the industry, and by learning and growing through experiences and relationships. The firm also mentors local insurance companies to move them further into the offshore, and works with the international market to explain the size and scope of the industry in NS.

A.P. Reid is proud to be the only 100% Atlantic Canadian insurance broker with clients in every province and territory in Canada, earning them the title of Atlantic Canada's National Insurance Broker. The firm provides local employment and is an active member of the local community. The company supports a variety of registered charities and community organizations, and participates in business associations and events.

The majority (60%) of A.P. Reid's petroleum industry revenue is from sales within NS, with approximately 30% coming from sales within the U.S. and the remainder coming from sales within NL. Regardless of where the sale is made, the work is done from the Dartmouth, NS office. A.P. Reid, therefore, brings money into the province through the export of its offshore insurance products and expertise.

The firm's experiences in the offshore have instilled a fighting spirit and a resolve to demonstrate that bigger is not necessarily better. This determination is important, as most of the major players in the industry are multinational corporations and A.P. Reid's two main competitors have over 5,000 employees. A.P. Reid appreciates the importance of making connections, networking within the industry, and building a good reputation. The positive relationships and strong reputation that A.P. Reid has established in the offshore industry, as well as in other industries, remains a key factor in the success of its business today.

Case Study 3: Legal Council

The provision of legal services is an integral component to the offshore industry in the province. Stewart, McKelvey, Stirling, Scales (SMSS) is a renowned law firm in Halifax, and is one of the dominant firms providing legal services to the offshore industry in the province. This law firm dates back to the 1860s, and began providing council to the offshore industry in the 1980s, particularly in NL. SMSS became Atlantic Canada's first regional law firm more than 18 years ago, and has one office in NS, three in NB, one in Prince Edward Island (PE) and one in NL. In NS, SMSS employs approximately 250 employees, 100 of which are lawyers.

The law firm provides corporate/commercial, regulatory and tax legal services, among others. SMSS very specifically targeted the offshore industry and offshore clients in the 1980s with work in NL. Offshore-related work really began in NS around 1996 with SOEP. SMSS was able to adapt to provide the necessary services to offshore clients, especially for the exploration, development and transportation aspects of the industry.

The offshore industry in NS has allowed SMSS to increase employment by hiring more lawyers and support staff. Now, in the NS office alone, there are five lawyers specialized in various offshore-related legal services, each having two or three junior lawyers to assist them. Although the firm has many large, offshore clients, they have a diversified practice which enables them to remain busy despite offshore industry fluctuations.

Atlantic Canadian law firms are dominant in the provision of legal services for offshore companies operating in the province. The presence of firms in NS with proven offshore expertise, such as SMSS and McInnes Cooper among others, makes it possible for oil and gas companies to meet their legal needs locally. Local firms in this industry also have a competitive advantage, as they are less expensive than firms in Calgary and Houston but are equally qualified. Economic benefits for NS would be lost if operating companies had to look to firms in other provinces in order to obtain necessary legal services.

SMSS has joined various legal associations specific to the industry, such as the Canadian Petroleum Law Foundation (CPFL). SMSS assists in organizing and participating in CPFL's annual seminars. OTANS is the primary, non-legal industry association that SMSS is a member of. Part of the firm's culture is to be involved in community. SMSS supports many charities, such as Habitat for Humanity, Feed Nova Scotia, and Dress for Success. SMSS also supports local hospitals and the Mission to Seafarers. Staff is encouraged to be involved with charitable organizations, particularly at the board level.

From their experiences working in the offshore industry, SMSS learned of the high level of safety upheld by the industry, as well as the importance of successfully dealing with urgent matters and very tight timelines. Working for this industry has made SMSS more service conscious, and has enhanced the level of service provided to all clients in all industries.

Based on the offshore industry's typical pattern of buying goods and services, SMSS anticipates that there will be significant opportunities for involvement during the development stage of Deep Panuke. Between large projects, the firm will continue to provide maintenance services to their offshore clients.

The practice has developed solid client relationships at various levels within the offshore industry, including both suppliers and license holders. SMSS' long-term investments in their people and their offshore capabilities have paid off in returns, and the company hopes to continue recruiting and training young lawyers to work in the industry.

2.2 BENEFITS FROM EXPLORATION OF THE OFFSHORE

The first stage of offshore development involves a seismic exploration program to identify potential geological formations which may contain petroleum reserves, and drilling into these formations to assess the geology and identify zones containing hydrocarbons. This process is complex and costly, has high capital intensity, and requires the use of specialized mobile equipment such as seismic vessels, drilling rigs, and supply/support vessels. These are often owned and operated by multinational companies that are contracted to do exploration work for petroleum companies.

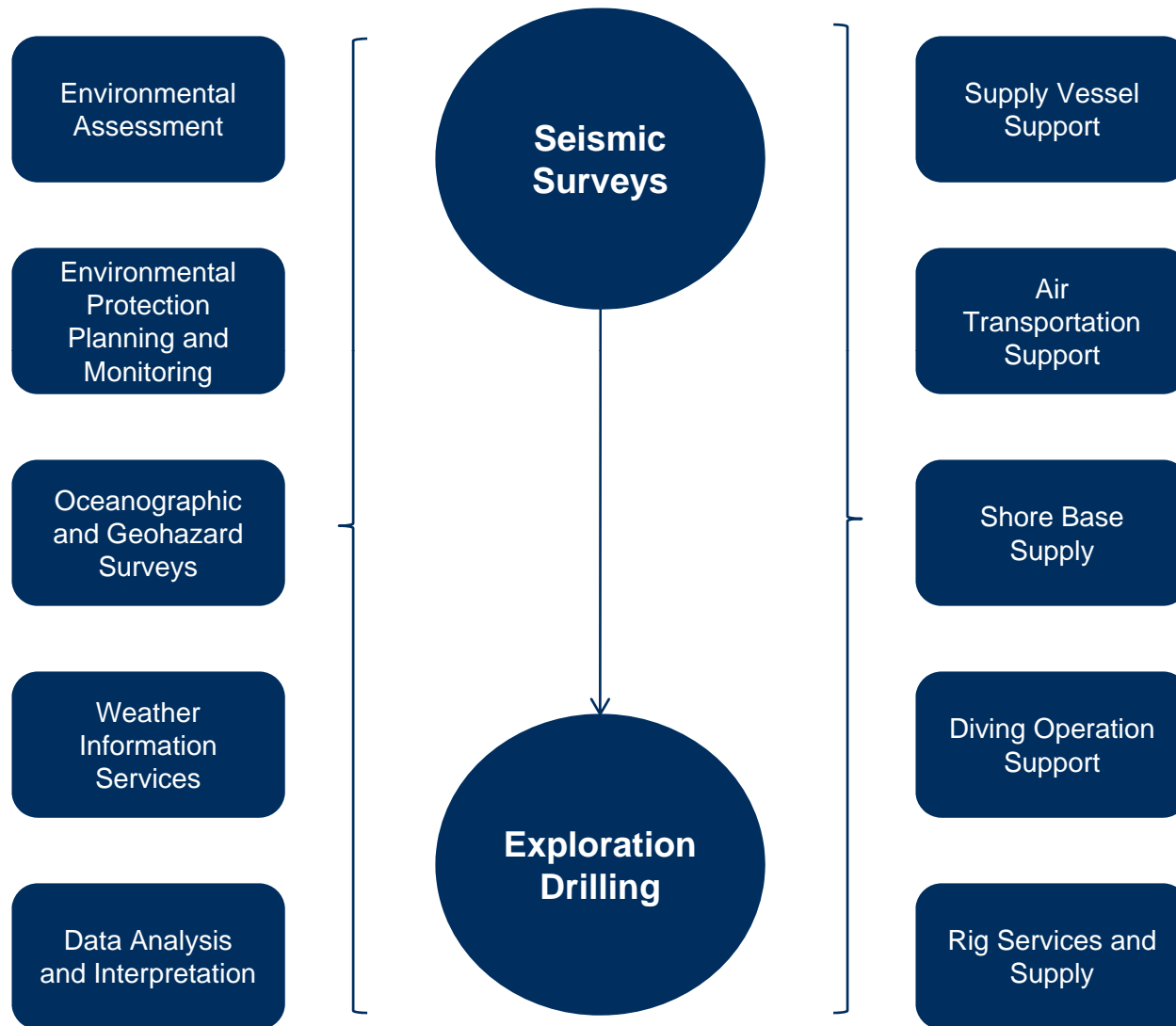
Seismic research involves the shipboard collection of geophysical data from the seabed using towed arrays of electronic sensors and the interpretation of this data to evaluate the potential hydrocarbon-bearing geological formations. From this information, exploration wells can be drilled into target locations. The main programs and services required to support these activities are outlined in Figure 2.1.

In NS, there are a number of firms that provide these services to the petroleum industry (e.g. Case Studies 4 - 7 and 14). Exploration programs were typically supported by shore-based operations in Halifax (Pier 9) and Dartmouth (Woodside). Shore-based support included supply of pipe (e.g. Tenaris), casing, drilling fluids, drill mud, fuel, water, mechanical support and support of offshore personnel and a myriad of other materials needed to operate offshore (e.g. Case Study 9). Helicopter services from Halifax Airport provided support for crew changes and technical service personnel. Other exploration support supplies and services, most of which are readily available within the Atlantic Canadian economy, include: well testing, wireline logging, wellheads, directional drilling, mud logging, coring, solid controls, offshore communications, drilling tools, ice data management, weather forecasting, sampling services, core analysis, and remote operated vehicle (ROV) services (Strategic Concepts, Inc. *et al.* 1999).

Gas and oil exploration has been taking place offshore in Atlantic Canada for over 40 years. As a major seaport, Halifax has existing capacity for marine-based services and over the period of offshore exploration has developed specific infrastructure and technical skills to support exploration programs. NS also has extensive capabilities in the study of ocean related sciences, which form the basis for the assessment of potential impacts of offshore programs on the marine environment. The region has, therefore, developed key capabilities for the provision of exploration support services, materials, and equipment. However, spending related to the rental of seismic vessels and drilling rigs – the largest single expenditure for exploration – has typically leaked out of the local economy (Strategic Concepts, Inc. *et al.* 1999).

Activity during the exploration phase is unpredictable, with companies sometimes abandoning their efforts for reasons such as poor exploration results, better prospects elsewhere, a global recession in exploration, or unwillingness to comply with local requirements (Gardner Pinfold Consulting Economists Ltd. 2002). The local socioeconomic benefits associated with exploration are therefore also highly variable. Over the study period (1996-2008), approximately \$1.8 billion in work value was awarded for exploration permits in NS's offshore. However, due to forfeitures, the total expenditure for actual exploration work conducted during this period was just under \$1 billion (CNSOPB 2008). The uncertainty that this phase entails can hinder local involvement and investment (Gardner Pinfold Consulting Economists Ltd. 2002).

Figure 2.1 Key Activities of Offshore Exploration



Case Study 4: Jacques Whitford

Jacques Whitford (JW) began as a geotechnical engineering firm in Halifax in 1972, started by two men, Hector Jacques and Michael Whitford. JW has since expanded to more than 1800 employees in more than 45 offices across North America and internationally. JW sold to Stantec, a leading engineering and design firm, in January 2009.

JW's first big break came from its ability to enter the offshore industry by forming key partnerships. Hector Jacques knew the industry was risk averse and that he needed credibility to win offshore work. Thus, JW partnered initially with McClelland Geosciences in Houston, Texas. The Offshore Development Fund (ODF) was instrumental to providing JW with its first offshore rig, providing \$360,000. JW invested \$1 million in 1979 to break into the offshore – a risky investment, but one that certainly paid off.

“The reason we went big was because we got involved in the oil patch,” said Jacques. “It drove our business model.”

JW grew approximately 30% each year between 1979 and 1988, and then had the funds to expand into new service lines. JW was one of the first local businesses to prove that NS companies could compete and succeed in the offshore, and internationally.

Every major development project in the offshore was done with a team of companies, most of which were local. JW entered into a joint venture with Fugro (which purchased McClelland Geosciences) for expertise in geotechnical services. JW also entered into a joint venture with EM&I for the provision of operational and asset integrity management services. JW acquired AXYS Environmental Consulting Ltd. to enhance expertise in the Northern and Pacific Canadian offshore.

JW first forayed into the offshore in 1985 in NL by providing geotechnical services. The environmental division of JW was created in 1989, and it won the work for the environmental assessment (EA) for Cohasset-Panuke that same year. Entering the offshore industry early allowed JW to develop the expertise necessary to continue being successful in offshore projects. The first job led to many more, including work for SOEP, M&NP, Deep Panuke and Blue Atlantic. JW conducted more than 90% of all EAs for exploration work along the Scotian Shelf.

“The east coast offshore has been a huge boost to the growth and development of JW, and has enabled us to work in other areas of Canada as well as internationally,” said Steve Fudge, Principal, Senior VP and Business Unit Director for Sciences in Atlantic Canada. “It provided us with experience, confidence and capability.”

Due to its success and growth from working in the offshore, JW expanded to include many more service lines, such as environmental site assessment and remediation, sustainability and facilities assessment. Work in the offshore also allowed JW to delve into new energy frontiers, winning work on tidal projects in the Bay of Fundy, natural gas pipelines and LNG facilities.

JW was able to win work on international oil and gas projects around 1990, based on offshore geotechnical exploration work done for Sable. JW has worked in the offshore internationally in places such as West Africa, Qatar, Brunei, Abu Dhabi, and Houston. As JW grew in size and in services, it continued to work on a variety of challenging projects all around the world.

JW has performed environmental permitting, assessment, and/or effects monitoring for all offshore development projects on the Scotian shelf at one point or another, helping to ensure that environmental requirements and regulations were met.

“We helped to establish the NS community as a player in the offshore,” said Brian Taylor, Principal and Project Manager for Geotechnical & Materials Engineering. “We’ve established ourselves as a credible player in the offshore, which will allow us to continue to export our services internationally.”

Hector Jacques was honoured with the Petroleum Pioneer Award by OTANS in 2006. JW has demonstrated true entrepreneurial spirit in breaking into the offshore and proving that it can deliver quality services. JW has successfully established itself as a globally-recognized presence in the geotechnical and environmental services industry.

Case Study 5: ACCENT Engineering Consultants Inc.

ACCENT Engineering Consultants Inc. (ACCENT), the Atlantic Canada Consulting Engineering Team, is a Halifax-based joint venture that was established to pursue offshore projects on Canada’s East coast. CBCL Limited, Lewis Engineering Inc., and Neill and Gunter Limited (now Stantec) formed this partnership in 1997 in order to leverage the complementary capabilities that each of the firms had gained through prior project experience in Atlantic Canada’s offshore with Hibernia, Cohasset and Panuke. Since its inception, ACCENT has been a major player in the provision of engineering services to the oil and gas industry in NS and NL. The alliance has developed into the largest and most successful locally-owned engineering enterprise involved in the offshore industry, employing more than 450 professional engineers, technicians and support staff.

Immediately after its formation, ACCENT began building its impressive portfolio of offshore projects through substantial involvement with the SOEP. The consortium won contracts for the design of both offshore and onshore facilities for the project. It subsequently provided operational and maintenance engineering support for all of ExxonMobil’s (formerly Sable Offshore Energy Inc., SOEI) onshore and offshore facilities for that development, including the associated offshore living quarters, supply dock, liquids fractionation plant, and gas plant. ACCENT also provided onshore and offshore environmental monitoring programs for SOEP. In 2002, ACCENT was presented with the prestigious Lieutenant-Governor’s Award for Excellence in Engineering for the detailed engineering design of Sable’s Natural Gas Liquids Fractionation Plant in Point Tupper.

Among other projects, ACCENT's extensive history of involvement in NS's offshore also includes conducting value engineering services, feasibility studies and Front-End Engineering and Design (FEED) studies for EnCana's Deep Panuke project and El Paso's Blue Atlantic Transmission System project; providing development and options analysis and Asset Integrity Studies for the Maple LNG pipeline project; and providing engineering services for Sante Fe and Rowan drilling projects.

NS's offshore oil and gas industry played an important role in fueling the growth of the ACCENT partner firms. It enabled them to expand on the services previously provided to onshore petroleum clients, and to develop a broader range of services and technologies that can be applied to the offshore as well as to a variety of other industries. For example, as a result of involvement in gas sector projects, the services offered by Stantec have grown to include planning, scheduling and procurement services, as well as the use of air monitoring technologies.

Involvement in the industry has also exposed the ACCENT constituent companies to a broader market place and an expanded range of clients. Offshore work has increased Stantec's client base to include natural gas pipeline companies and others requiring compression systems engineering services. It has also enhanced their customer base in fields such as industrial engineering and environmental monitoring. Experience in the offshore has helped CBCL to expand its client base geographically and has increased the company's presence in NL. Furthermore, work in the offshore has contributed to valuable project experience and the development of capabilities that have enhanced each of the firms' individual credibility and marketability, as well as that of the ACCENT alliance.

Working in the extremely safety-conscious oil and gas sector has embedded safety into the corporate culture of the ACCENT companies, and they partially attribute their success to the maintenance of a model safety record. ACCENT has proudly committed to implement industry-leading health, safety and environmental policies and procedures, and to mitigate health, safety and environmental risk in all of its project activities.

Each of the ACCENT partners contributes to socioeconomic benefits for the local community. For example, a large proportion of the professionals employed by the firms are alumni of NS universities, thus contributing to the retention of skilled graduates in the province. The companies also participate in co-op and work term education programs for local students. Stantec's Dartmouth location supports community groups and charitable organizations. CBCL's Halifax office contributes to the IWK Grace Hospital, the Queen Elizabeth II Health Sciences Centre, and the Canadian Heart & Stroke Foundation, among other causes. It also provides sponsorship and staff participation in local sport and cultural events.

Peter Rent, Vice President, Resources of Stantec and President of ACCENT, recognizes that engineering services in NS provide valuable socioeconomic benefits and keep skilled professional and technical people in the province. He therefore emphasizes the importance of promoting NS content in the oil and gas industry, as the industry is a potential source of significant opportunities for the services that these people deliver.

Through their dealings with the province's offshore industry, the ACCENT affiliates discovered the value of teaming agreements and joint ventures as a way for local firms to compete more effectively against large companies and other major players in the oil and gas sector. ACCENT provides an excellent example of how strategic alliances with the right partners can work to the mutual benefit of all firms involved.

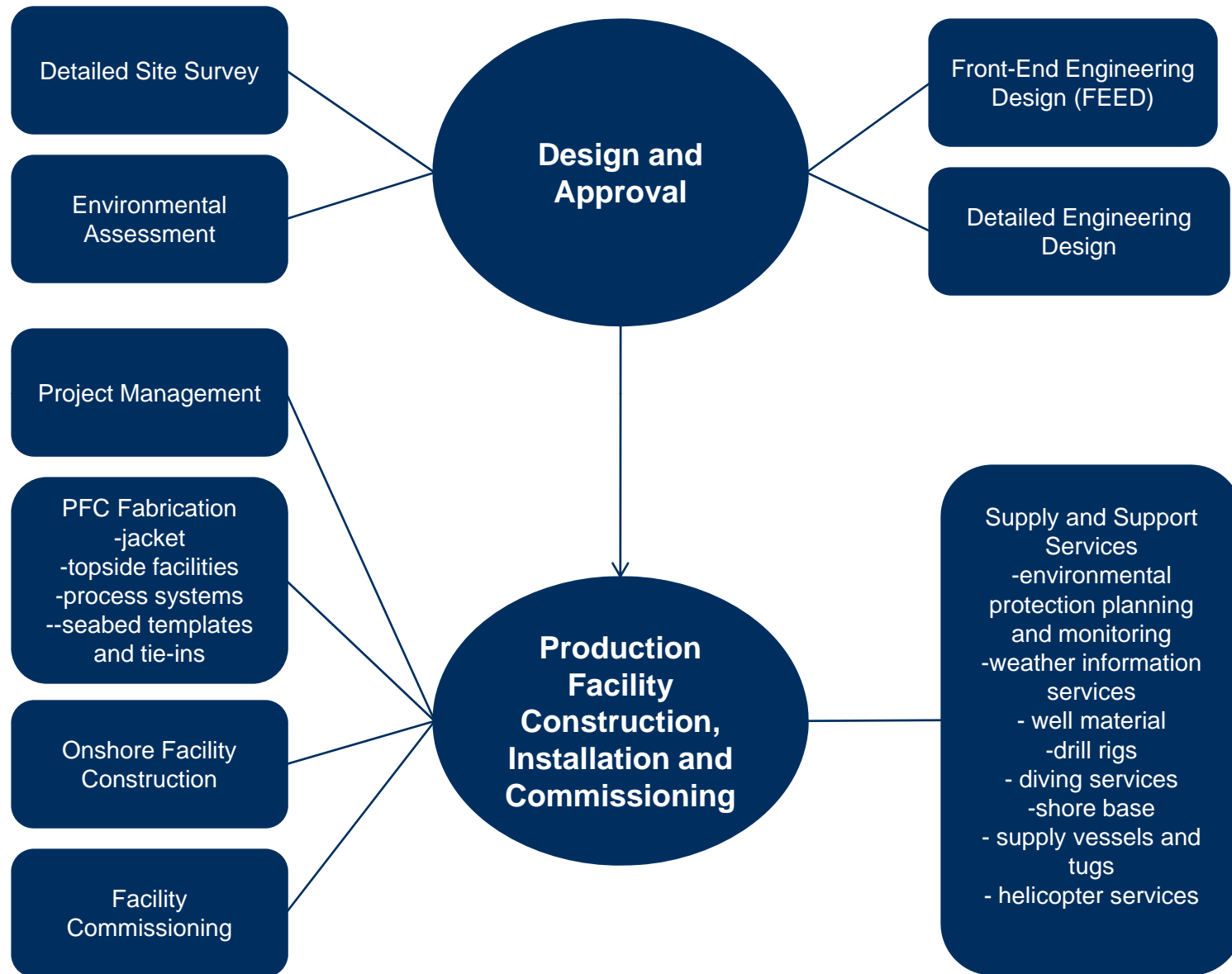
Alan Perry, CEO of CBCL and Chairman of ACCENT, sees potential for future opportunities to become involved in infrastructure projects as a result of local offshore investments. He believes that prospects are good for NS's offshore industry, but that the industry could benefit from further exploration and delineation.

2.3 BENEFITS FROM DEVELOPMENT OF PRODUCTION FACILITIES

The development of an offshore production-scale petroleum reserve requires significant investment in engineering services to design and construct the offshore production facility, onshore processing plant, and associated pipelines. During this stage of the development, the expenditures necessary to bring the project to development offer significant economic opportunities to firms in the Province. Within the project period 1996 to 2008 there were two significant offshore development initiatives: SOEP and Deep Panuke. SOEP is currently in production. EnCana's Deep Panuke Project has been approved and is currently under construction. In addition, the El Paso Blue Atlantic Pipeline project completed a substantial amount of engineering design, survey and environmental work before the project was subsequently abandoned prior to applying for regulatory approval (see Section 1.1.1.2). The development of each of these projects has required the support of local firms and suppliers (e.g. Case Studies 4, 5 and 7).

An offshore production project involves two basic stages. The first stage is the engineering design process integrated with the regulatory approvals process. Once this first stage is completed, the focus shifts to construction of the production facility or PFC. The PFC requires the installation of production wells, the fabrication and installation of offshore and onshore production facilities, the installation of the pipeline to transport the product to shore, and the completion and commissioning of these production facilities. Once commissioning is complete, production of natural gas to the market can begin. This process is guided by a Project Management Team selected by the Project Proponent. The Project Management Team is made up of personnel responsible for the regulatory approvals process, project finances, procurement and contracting, and delivery of the project to the required schedule. Figure 2.2 provides an overview of key activities associated with the development of offshore production.

Figure 2.2 Key Activities for Development of Offshore Production



Case Study 6: Secunda Marine

Creativity and perseverance were the keys to success for Secunda Marine Services (Secunda) since it began in Dartmouth, NS in 1983. What began as a small operation with a single vessel has now been successfully incorporated into a Fortune 500 Company, McDermott International, Inc. Secunda was sold in 2007 to J. Ray McDermott, the offshore oil and gas construction arm of the US publicly-traded company.

Secunda owns and operates a fleet of offshore support vessels to work in the oil and gas sector both nationally and internationally. Secunda has expanded over the years from one boat to 18 at present. Secunda employs approximately 275 Nova Scotians, working for Secunda on ships and in offices around the globe.

Secunda's success did not come easily, as it struggled to survive through the many cycles in the offshore oil and gas industry in Canada over the past 25 years. Secunda began as a joint venture between Fred Smithers and five other individuals. The mid-80s were difficult, and by 1989 the company was solely owned by Fred Smithers. During this time, Secunda took a number of different jobs to keep the business going, including everything from sludge removal to tow jobs. In 1989-90, Secunda won a contract for the CoPan project, which marked the second stage in the company's life. Secunda also bought local boats for conversion to stay competitive in the market. From 1989-2000, Secunda completed 13 conversions, almost all of them locally in Dartmouth.

"Buying smart and retrofitting was the means to an end," said Dwayne Smithers, Vice President & General Manager of Secunda, as well as the son of founder, Fred Smithers. "We worked in every marine market just to stay afloat."

Between 1990 and 2000, Secunda grew quickly and had 60-65% of the domestic market. It worked on every offshore oil and gas project on the east coast in one way or another. Then came another low in the cycle of the offshore industry. In 2003, Dwayne Smithers switched from operations and project management to sales, in order to rebrand and refocus the strategic direction for the company. It was then that he decided to take Secunda to the international market.

And go to the market they did. Secunda did a complete 180 within two short years. In 2004, revenues were a 90/10 split domestic/international. By 2006 it was the reverse, with a 10/90 split domestic/international. Secunda is now active all around the world, in oil and gas hot spots such as the North Sea, North and West Africa, Caribbean, US Gulf of Mexico, Mexico, and Eastern Canada.

"We had to go international to survive," said Dwayne Smithers. "We took what we learned here and just advertised it internationally and it kept us in business... our people made the difference."

Because the North Atlantic is one of the harshest environments in which to work, employees who can work here are capable of working almost anywhere. Employees of Secunda are also provided with extensive, in-house training on everything from confined space and first aid to compliance and project management.

Secunda is a large supporter of the NS community at large. Its support is focused on education, hospital infrastructure and safety. Secunda donates to the IWK Children's Hospital and is the largest contributor to the Dartmouth General Hospital. It donates to more than 100 foundations, though it is more restricted now that it is part of a US publically-traded company. Secunda has donated defibrillators to emergency services throughout the province, and runs a cadet program to teach sailing and seafaring.

Secunda has contributed to the NS economy in other ways as well. Many smaller companies were born over the years as a result of Secunda doing more than 20 in-house projects. Whenever possible, Secunda uses local support and expertise. Dwayne Smithers worked alongside some people who have since started companies and are successful in part due to the work provided to them by Secunda. The company also buys all major components locally and ships them to projects in other areas.

While Secunda continues to expand globally, it hopes to carry on with work in eastern Canada. It has been the main supplier for Exxon since 1997, and currently has four boats operating in Newfoundland and Labrador.

Case Study 7: Rowan Companies, Inc.

Rowan Companies, Inc. (RCI) is a major multinational provider of contract drilling services for the offshore and onshore oil and gas industry. Their manufacturing division builds drilling products and systems including those that serve hard-to-drill deep gas wells. The company, which originated in 1923 as a small business run by two brothers in Delaware, has grown to operate around the world. RCI has offices in the U.S., Mexico, Australia, the United Kingdom, Denmark, the Netherlands, Norway, Qatar, Saudi Arabia and Egypt, and owns a fleet of offshore rigs located in the Gulf of Mexico, North Sea, Middle East and West Africa.

Despite its global range, RCI has important ties to Canada and NS. In fact, RCI's key management team is partially composed of Canadians. The company's contracting services division has been actively involved in NS's offshore industry since the 1980s, and its Canadian office is situated in Dartmouth, NS. The company's self-elevating mobile offshore drilling platforms (jack-up rigs) have been used for both exploratory and development drilling off the coasts of NS and NL, and as many as three of RCI's rigs have been active in NS's offshore at one time. RCI played a noteworthy role in the history of the national petroleum industry, as it was the first company to become involved with offshore oil production in Canada.

RCI's offshore production facility at Panuke, in NS's offshore, was the first such facility in Canada. The company's operational experience in NS inspired innovation, leading to the development of a new breed of "Super Gorilla Class" drilling rigs (an enhanced version of the Gorilla Class rig that was used for Panuke). Super Gorilla rigs feature the additional capability for simultaneous drilling and production in marginal oil and gas fields, and were designed to withstand harsher weather and sea conditions. This class emerged in response to the unique and challenging environmental characteristics off NS, as well as the increased knowledge and technical capacity that the company gained in working here.

Although designed based on local experience, the Super Gorilla has also proved useful in other regions, such as the North Sea. RCI has since developed a “Tarzan Class” of rigs and has made improvements to its previous rig classes. The company’s experiences working in the province have no doubt contributed to the significant enhancements in equipment quality that RCI has achieved. RCI has also participated in standards development in Canada and internationally based on its experiences off NS. The company credits the offshore industry for causing the business to become more sophisticated in terms of health and safety, quality assurance and quality control, and transparency.

For the past 29 years, RCI has been hiring local youth with no specific skill sets and training them in the offshore, thereby providing valuable opportunities for these people and building capacity in the province’s labour force. The company maintains employment for approximately 100 to 175 local people, the vast majority working offshore on the rigs. As an alternative to downsizing, RCI exports personnel internationally when fluctuations in the industry result in low levels of domestic activity. Approximately five to 10 employees are permanently stationed in the Dartmouth office.

The company contributes to economic spin-offs within the province by preferentially dealing with local suppliers whenever practical. As a demonstration of their sense of corporate social responsibility and their desire to be a part of the local community, RCI proudly sources goods and services from 150 to 200 Nova Scotian vendors. The company has a positive relationship with local suppliers and helps them identify ways that they can participate in RCI’s procurement system. For example, RCI suggested that a neighbouring business pursue a specific level of certification that would enable them to provide thread cutting services to the company.

RCI anticipates that NS’s offshore industry will experience a stable 2-3% average growth rate, and they see this level of growth as ideal. The company believes that it is important to maintain an appropriate and manageable pace of development, and that unchecked expansion is problematic and unsustainable over the long-term. RCI is pleased that NS’s offshore industry is currently developing at a pace that it believes to be environmentally, economically and socially sustainable.

2.3.1 SOEP

SOEP provides the single largest example of production development in the province. SOEP is a consortium formed by ExxonMobil Canada Limited (50.8%), Shell Canada Limited (31.3%), Imperial Oil Limited (9.0%), Emera Inc. (8.4%) and Moshbacher Operating Limited (0.5%). The project consists of the following:

- Five offshore production fields (Thebaud, Venture, North Triumph, Alma, South Venture with subsea pipelines to Thebaud);
- An offshore pipeline from Thebaud to Goldboro;
- A natural gas processing plant in Goldboro and tie-in to the Maritime & Northeast Pipeline (M&NP);
- A pipeline for liquids from Goldboro to Point Tupper;

- A liquids Fractionation Plant in Point Tupper; and
- The M&NP pipeline from Goldboro to the US with lateral pipelines to Point Tupper, Halifax, Amherst and Saint John.

In addition to the operations facilities, SOEP has an office in Halifax and operates a shore supply base in Halifax Harbour. Halifax Harbour provides the mobilization centre for the project, the base for construction operations, and the supply base for the offshore facilities. The pipeline construction centre was located in Sheet Harbour.

Development expenditures for Tier I of SOEP (1998-1999) totaled \$2,282 million, of which an estimated \$712 million (31%) were spent in the province. Of the 14,460 person-years of employment generated during SOEP's Tier I development activities, 3,440 (24%) person-years of work went to Nova Scotians (Gardner *et al.* 2005).

2.3.2 Deep Panuke

EnCana's Deep Panuke project is a significant new production field located in a deeper geological formation near the former Panuke/Cohasset project. The project was initiated by Pan Canadian Resources, which was purchased by EnCana in early 2001. EnCana has commissioned the services of various engineering firms and suppliers to bring this project on stream in late 2010 (*e.g.* Case Studies 5 and 8 - 10).

The project has gone through two phases of development. The first phase was initiated in 2001 with the FEED and the environmental approvals process. This stage progressed through to the detailed design stage, preparation of the environmental assessment and submission to and approval of the Comprehensive Study Report by the Minister of Environment. At that time, EnCana requested a time-out to re-evaluate the project. Re-evaluation of the project continued until mid 2007 when EnCana began detailed engineering and contracting for construction of the revised project. In 2007, development activities for Deep Panuke entailed a total of approximately \$32.8 million in project expenditures and 54.4 person-years of Nova Scotian employment (EnCana Corporation 2008).

Case Study 8: Irving Shipbuilding Inc.

Irving Shipbuilding Inc. (ISI) is part of J.D. Irving Limited (JDIL), a diverse, family-owned business that began in Saint John, NB over 125 years ago. With deep roots in the Maritime Provinces, ISI has become one of Atlantic Canada's leading industrial groups and has figured prominently in the region's offshore oil and gas industry. The company is a major contributor to OTANS and has a representative sitting on the Canada-Nova Scotia Offshore Petroleum Board (CNSOPB).

ISI is an integrated team of companies operating in the Marine, Industrial Manufacturing and Services sectors. It began providing shipbuilding and repair, drill rig construction and conversion, offshore fabrication, industrial manufacturing, engineering, supply chain management and quality and technical services in NS about 50 years ago. Its headquarters are based in Halifax, NS, and its five production facilities are all located within a 200 km radius. The company owns the only two floating docks on the East coast of Canada, both of which are situated in Halifax, and operates the largest machine shop in Atlantic Canada. ISI's facilities in the province comprise the following locations (ISI n.d.):

- Halifax Shipyard provides comprehensive ship repair services for vessels up to Panamax size, as well as construction of ships up to 20 m beam;
- Woodside Industries, in Halifax, does work relating to industrial fabrication, offshore topsides, rig upgrades, and steel fabrication; and
- Shelburne Ship Repair, on the south shore of NS, specializes in repair and refits of vessels up to 3,048 tonnes.

ISI also operates two out-of-province facilities: the East Isle Shipyard in Georgetown, PE; and Fleetway Facility Services (FFS) in Saint John, NB.

Although much of ISI's work can be indirectly linked to the offshore industry, the organization's focus for products and services specific to the offshore generally falls into two main areas. The first focus area is the construction of topsides modules. Among other projects, ISI constructed and commissioned topsides for the SOEP's South Venture gas field. The second focus area is rig conversions and upgrades. For example, ISI converted the Grand Banks explorer and was involved with winterization and completion of the Eirik Raude (the world's largest semi-submersible).

The Eirik Raude project provides an excellent example of how ISI's work for the offshore industry can generate considerable socioeconomic benefits for the province. Approximately 2000 people in NS were employed by ISI when it was working on the Eirik Raude from 2001 to 2002. One hundred and forty subcontractors were also hired for the job. ISI spent about \$66 million in local purchase orders, and discovered an excellent supply chain in NS that it has continued to use in subsequent projects.

As Tim Brownlow, ISI's Director of Government Affairs and Business Development, puts it, "When we're full, everyone else feeds."

The completion of the rig was worth about \$80 million to the NS economy (CBC News 2001). Furthermore, ISI and the rig owners (PanCanadian and Ocean Rig) contributed millions of dollars to train offshore workers at community colleges in the province, leading to further spin-off benefits.

Considering that it takes approximately 450,000 person-hours to build a ship, it is not surprising that ISI offers significant opportunities for local employment. In fact, ISI's parent company, JDIL, is one of the top five employers in the province. ISI currently employs a total of around 400 people, and this number is expected to rise to 1000 by the end of summer 2009 because of anticipated upcoming work.

Ongoing repair work for Pemex's semi-submersible accommodation platform, PSS Chemul, is generating employment for approximately 350 people (200 staff and 150 subcontractors). In addition to providing local jobs, offshore projects such as this account for a vital proportion of ISI's revenue. ISI's work on Chemul accounts for roughly half of the company's current revenue.

It was recently announced that a supply vessel will be constructed at the Halifax Shipyard for EnCana's Deep Panuke project. Approximately 75% of ISI's total revenue will be tied to the offshore industry while this project is ongoing. At peak, over 200 shipyard workers will be employed for the building and commissioning of the new vessel. This work will generate an estimated payroll of \$20 million and will result in about \$14 million in purchases of goods and services from approximately 50 NS suppliers (JDIL 2009).

The number of jobs available with ISI fluctuates along with the cyclical nature of the industry. Around 1999, the company experienced a low point in which their workforce was reduced to 125 staff members. During this slow period, ISI helped modify a submarine for use as a theatrical prop in the making of Hollywood movie *K-19: The Widowmaker*.

ISI is keen to invest in education and training for its employees. They subsidize post secondary education for employees who want to pursue a university degree. ISI has a very close relationship with NSCC and has made significant financial contributions to support the college's offshore-related training programs. The company also provides leadership training for its executives. In addition, ISI has put money into universities to establish centres of excellence for R&D of green offshore technologies (e.g., tugs and supply vessels that use hybrid power sources).

The company's experience in NS's offshore has influenced the way it does business. The corporate attitude towards safety has changed, and ISI's safety standards have risen to a higher level. This stronger emphasis on safety has benefited the company in all aspects of its work, and ISI credits its safety record for enabling them to win a job working on a tanker for Exxon. The province's offshore industry has also helped ISI build a worldwide reputation and become a major offshore player. Now ISI is able to competitively bid on and win work for projects in areas such as Aberdeen, UK and the Gulf of Mexico.

In addition to regular rig maintenance and repair, the company is pursuing several opportunities for future work, both at home and abroad. In NS, ISI hopes to do some work on a second rig for EnCana and a barge for the Deep Panuke project. The company is also chasing work for a second rig for Pemex and is seeking ways to become involved with NL's Hebron project. These prospects present exciting opportunities for ISI, as well as for positive spin-off effects within the local economy.

2.3.3 Gas Pipelines

As discussed previously (Section 2.3.1), SOEP uses an offshore pipeline from the FPC to onshore at Goldboro, where the gas is processed to separate out heavier components to be market ready. From Goldboro, the M&NP pipeline transports natural gas through NS and NB to markets in the US, with lateral connections to Point Tupper, Halifax, Amherst and Saint John. A separate pipeline transports the heavier gas components from Goldboro to Point Tupper and through a fractionation plant that produces petroleum products for the industrial market (*i.e.*, propane, butane, and condensate).

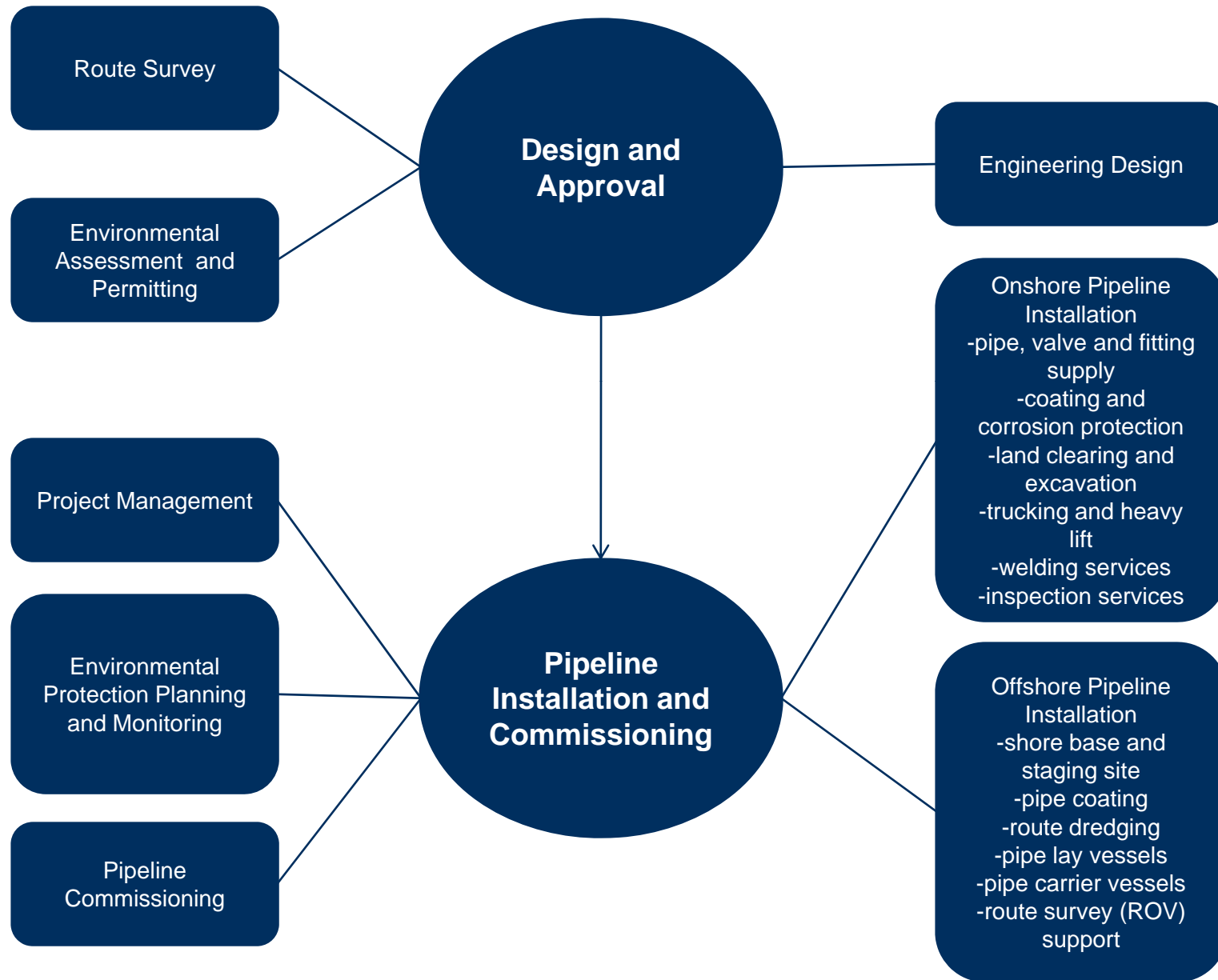
In pipeline construction, there are a number of goods and services required. This includes materials (pipe, valves and fittings, coatings and corrosion protection, welding services, inspection services, trucking and heavy lift equipment), project design and management, environmental and engineering services, routes surveying, land clearing and preparation, permitting, and other professional services. Figure 2.3 provides an overview of key activities associated with the construction of pipelines.

Construction of the main M&NP pipeline was completed in the fall of 1999, with an estimated total cost of \$743 million (1996 dollars). For NS, construction generated an estimated 2,770 person-years of employment (direct, indirect and induced), \$192 million in total household income, and contributed approximately \$231 million to GDP (at factor cost, 1996 dollars) (Gardner Pinfold Consulting Economists Limited 2002).

Planning and design for the Halifax and Point Tupper lateral pipelines began in 1997 and construction was completed in 2000. The total capital costs were estimated at \$118.3 million (1997 dollars), with total employment (direct, indirect and induced) of about 820 person years and household income of approximately \$56.1 million; the total GDP impact is estimated at about \$67.2 million (Gardner Pinfold Consulting Economists Limited 2002).

In addition to the construction and operation of the M&NP pipeline and laterals, in 2001 El Paso Corporation initiated the Blue Atlantic Project to provide a subsea natural gas pipeline from the Sable Island area to New Jersey to supply the energy market in the northeast US. The proposed pipeline would collect natural gas from the Sable Island area and connect to an onshore processing and compression facility near Shelburne in southwest NS, and transport the processed natural gas by subsea pipeline to the landing in Linden, New Jersey. El Paso commissioned a feasibility and design study, conducted oceanographic and geological surveys, and initiated the environmental assessment process (*e.g.* Case Study 4). The project was abandoned in late March of 2003 due to a lack of necessary gas reserves to support the concept. Local firms were contracted to conduct the initial engineering design, surveying and environmental assessment studies. Although the Blue Atlantic Pipeline was not constructed, there were substantial expenditures associated with this work.

Figure 2.3 Key Activities for Offshore Pipeline Construction



Case Study 9: North Atlantic Marine Terminals Ltd.

North Atlantic Marine Terminals (NAMT) is located in Sheet Harbour, along NS's eastern shore. NAMT began 13 years ago, and provides wharf and crane services, and handles cargoes and bulk materials, such as pipe for pipelines and iron ore concentrate for pipeline coating. NAMT also provides stevedoring services in the form of inbound transport of pipe and coating materials to the Shaw & Shaw pipe yard and outbound loading of finished pipe to pipe carrying vessels that deliver it to installation barges.

NAMT began working in the NS offshore in 1998 with the construction of the Sable pipeline. NAMT has been involved in Sable Tier 1 & 2, as well as the EnCana Deep Panuke pipeline. Approximately 60% of the company's 2008 revenue came from working in the offshore in NS.

Malcolm Swinemer, Vice President of NAMT, says that NS's offshore industry has allowed his company to increase its range of services, including materials handling, on land and at the terminal. It has also allowed the company to improve its equipment and service capacity at the terminal. The additional investments in infrastructure for working in the offshore have been used to service other clients.

The Sheet Harbour terminal operates as a conventional marine terminal, providing stevedoring services using crews of local unionized stevedore. During offshore pipeline construction this workforce increases and local contactors provide equipment and operators under subcontract. For the Sable Tier 1 pipeline construction, 25,000 to 30,000 person-hours were used, and a similar workforce can be expected for Deep Panuke.

NAMT has had a positive socioeconomic impact to the local community of Sheet Harbour and to NS in general. NAMT is committed to using local suppliers as much as possible, and all employees are from the local community. All subcontractors are hired from the local community and efforts are made to share the work to benefit a number of contractors.

Swinemer says that learning the business and safety cultures of the oil and gas companies at an early stage was vital for success. Attention to detail and work experience count for a lot in the offshore industry. Swinemer would like to see more exploration off NS to establish consistency of work.

2.4 BENEFITS FROM OFFSHORE GAS PRODUCTION

After commissioning of the offshore facility, production of natural gas begins for sale to market. The main operational components of offshore gas production are described in Section 1.1.1.2 and illustrated in Figure 1.1. Part of the revenue earned through gas sales pays for the investment made during exploration and development, as well as all ancillary costs associated with the production operations and future decommissioning. The production phase also requires maintenance of offshore and onshore facilities and technical enhancements to production equipment to maintain or improve production capacity.

The production phase has potential to offer substantial economic benefits to the province, especially when this stage is carried out over an extended period of time. Although production activity for some projects may be completed in less than ten years, production from a large field can last for several decades. Natural gas operations with a long-run commitment to ongoing activity in one area offer longer-term economic opportunities to local workers and businesses. When a project is long-lasting, operating companies are more likely to hire locally, as well as consume locally-produced goods and services (e.g. Case Studies 11 and 13). These projects also provide NS with a long-term source of revenues from royalties and taxes (Gardner Pinfold Consulting Economists Ltd. 2002).

Case Study 10: Martec

Martec is a leading Canadian engineering firm based in Halifax, NS that has been specializing in structural design and analysis since 1973. It provides consulting services, engineering software, and contract research for a variety of industries including Oil and Gas, Marine, Aerospace and Defense. In 2008, Martec was acquired by the North American arm of the Lloyd's Register Group (LRG), a multinational independent risk management organization. Martec's activities fall under LRG's Marine Consultancy Services division.

The firm applies its strong ocean engineering capabilities to projects involving ships, ports, harbours, and offshore facilities. Martec is a pioneer in its field and has provided services to major offshore players such as Petro-Canada, Exxon Mobil and EnCana. Specific services that it provides for the offshore oil and gas industry include Structural Response, Thermal Analysis, Structural Design, and Impact Analysis services.

Local engineering firms such as Martec play an important role in NS's offshore. Claude DesRochers, Manager, Structural Analysis Group for Martec, points out that the local economy benefits from considerable manufacturing spin-offs when engineering work is done locally.

Martec has been involved in the offshore since 1996, when it took advantage of a Nova Scotia Petroleum Directorate (now NSDE) funding program to help companies obtain offshore training. The industry is risk averse, which can make it difficult for companies to break into the offshore without prior experience. Participation in the funding program provided the opportunity Martec needed to demonstrate its abilities through practice. The money allowed Martec to partner with Mustang Engineering, a Houston-based company, and do two projects with them for free in order to gain experience.

As a result of the program, Martec developed additional expertise, proved its capabilities, and was able to better market itself to potential offshore clients.

The government grant also enabled Martec to purchase expensive specialized structural analysis software. Without this funding, Martec would not have been able to afford the software license's \$30,000 price tag. Mr. DesRochers credits the software for generating work for the company and strengthening its competitive edge.

Because of the highly specialized nature of the firm's work, Martec is typically hired on to projects as a subcontractor. They have a good relationship with ACCENT, a joint venture of Stantec, CBCL, and Lewis Engineering. For example, ACCENT has subcontracted Martec to design a wellhead protection system for Deep Panuke and also to do maintenance work for Exxon Mobil.

The company proudly retains highly talented and educated people in NS. Martec employs about 50 professional staff members, over 70% of which hold Master's or Doctoral degrees. Over the past six years, three people have been employed full-time to do work specifically relating to Atlantic Canada's offshore industry. At the industry's peak, six staff members were devoted full-time to offshore work.

Martec is heavily involved with R&D. The firm is currently seeking innovative technologies for extracting small pockets of oil and natural gas safely and affordably. More specifically, they are studying the feasibility of using minimal structures to produce oil and gas from marginal fields in the harsh conditions of offshore NS. Minimal platform technology is promising and has been known to reduce the size and cost of offshore developments, in some cases removing the need to use heavy-lift vessels for platform installation. This project is funded by NSDE and Petroleum Research Atlantic Canada (PRAC). The purpose of the study is to better understand the options available for developing marginal finds, with the ultimate objective of attracting smaller operating companies to do work offshore NS.

DesRochers is pleased about the potential opportunities that may result from Martec's investigation into minimal platforms for marginal finds, the second phase of which will soon be underway. Not only does the project have potential to lead to further R&D opportunities for Martec, but the study's findings could stimulate renewed interest in developing the province's resources by increasing the accessibility of marginal fields in NS's offshore. Needless to say, this is an exciting prospect for Martec as well as for the entire province.

2.5 BENEFITS FROM DECOMMISSIONING

The only development that has been decommissioned in NS's offshore thus far is the Cohasset oil field. It was decommissioned in 2000 after operating for approximately seven years (*e.g.* Case Study 11). Decommissioning activities were completed below budget and in less time than anticipated. Total decommissioning costs for the project are estimated at \$50 million (Gardner *et al.* 2005).

At the beginning of the study period (1997-1998), the CoPan project was producing petroleum hydrocarbons in the form of light crude. This production was pumped into tankers at the production facility for shipment to market. At the end of production in 2000, the first phase of the decommissioning of these facilities was undertaken with the removal of the Calm buoy, topsides production facilities, and some seabed equipment. Finally, the jackets at Cohasset and Panuke were removed in 2005.

Case Study 11: Dominion Diving

Dominion Diving (DD) is a local company that has gained a world class reputation over its 40 year history. From its headquarters in Dartmouth, NS, DD operates throughout Canada and around the world, including in the U.S., United Kingdom, and South America. The company has thrived to become the largest diving, remote operated vehicle (ROV) and marine services provider in Canada. This homegrown success story began in NS in 1969, and the business is still based entirely in the province today.

DD is a marine solutions company that provides a variety of services for the offshore as well as inshore industries. These services fall into four key categories: diving services; ROV services; marine transport; and marine construction. The company employs a total of 45 people, approximately 20 of which are directly involved in providing services to the offshore oil and gas industry.

The company has been active in NS's offshore oil and gas industry since the early 1990s when it installed and maintained the CoPan field for Lasmo Nova Scotia Ltd. DD has provided services for offshore clients during all stages of work, including exploration, development, production, and decommissioning. Impressively, they have been involved with work for approximately 95% of the drilling rigs that have operated in NS's offshore.

Some of the many activities that DD has been involved with for the offshore oil and gas industry include transport of people and equipment via tugs and barges; platform installation; concrete mattress design, fabrication and positioning; pipeline placement and assembly, and underwater robotics for various applications. Their divers have worked from rigs and platforms, gravity based structures, drill ships, semi-submersibles, construction support vessels, and diving/ROV support vessels. DD is the only company in Atlantic Canada with the equipment and capability to conduct offshore air diving operations.

NS's offshore industry has enabled DD to acquire personnel and to expand their services and capabilities. It has also helped them to purchase the equipment necessary to continue in a very capital-intensive industry. In fact, the primary reason that DD offers ROV services at all is due to demand from the offshore, without which they would not have had a compelling reason to invest in expensive ROV equipment. Their three work-class ROV systems, which cost approximately \$5 million, have since become an integral part of DD's business and are the basis of one of their core service lines. In addition, DD invested approximately \$2.25 million into the purchase of deep diving equipment; a 90 foot offshore support vessel for diving, ROV and research purposes; and other equipment such as pumps and generators. This equipment has been used for projects provincially, nationally and internationally. Although these supplies were acquired for the purpose of providing services for the offshore, they have enhanced DD's capacity to do work for other industries as well.

The company also does internal R&D and has experienced innovations relating to equipment for the industry. DD staff has undertaken to improve existing equipment, devise new pieces of gear, and design and build equipment when it is not readily available. The equipment that they have developed for internal purposes includes underwater power blasters, hydraulic equipment, and ROV components.

Employees receive training on health and safety, inspection, diving (including specialized diving techniques such as saturation diving), ROV piloting, electrical and hydraulic systems, and other technical training. DD also provides education services to students from PE's Holland Community College. Under supervision from DD, the students use the Bedford Basin for the 165 foot deep diving practical component of their diving course.

DD contributes to economic spin-off benefits within the province through its local dealings. The company provides local employment opportunities and makes an effort to purchase supplies and services locally whenever possible. Many of their customers are local, particularly on the transport side (e.g., local shipping agencies). They also support local charities and organizations, for example by donating to local hospitals; providing a local Scout Troup with free transportation to an island camping trip; and sponsoring Techsploration, an initiative to promote careers for young Nova Scotian women in trades and technology occupations.

DD participates in industry associations such as OTANS, the Canadian Association of Diving Contractors (CADC), and is represented on the Board of Directors for the Diver Certification Board of Canada (DCBC). They also participate in events such as the Canadian Underwater Conference.

Working in the offshore has influenced the way that DD does business in several ways. It has enhanced the corporate understanding and culture of health and safety, a benefit which has a positive effect on the work that they do for all industries. It has also led them to develop a Quality Assurance and Quality Control system that is more suited to the company than the ISO system that they were using previously. Their experiences in this competitive industry have encouraged them to adopt a more pragmatic and "cautiously aggressive" approach to business. Finally, offshore work in Atlantic Canada enabled them to expand their service provision area internationally. About 90% of the international work that they do today is in the offshore.

DD does not expect to be involved with any new major local offshore opportunities in the near future, although they may bid for pieces of work for EnCana's Deep Panuke project. They anticipate that their short-term participation in the industry will primarily involve maintenance, as they currently have two years remaining on a maintenance contract with Exxon Mobil and will also likely conduct sporadic maintenance work for other offshore projects.

3.0 Summary of Socioeconomic Impacts

3.1 SOCIOECONOMIC IMPACTS

There are a range of socioeconomic impacts accruing from offshore petroleum projects in NS. Overall, they include the following: substantial expenditures for supply and professional services for the projects; employment and the resulting household incomes derived from the projects; and resource revenues such as royalties accrued directly by the Province.

Economic modeling tools have been used to summarize the diverse benefits from the offshore during the study period. Based on information provided by the CNSOPB to the NSDE on the reported value of contract expenditures between 1996 and 2007, an input-output economic analysis was completed jointly by the Nova Scotia Department of Energy and the Department of Finance. The economic impact modeling provides estimates of employment, both direct and spinoff (which includes indirect and induced employment) and impacts on household income, as well as the resulting provincial government tax revenue from these personal incomes.

Note that the government revenue estimates in Table 3.1 below do not include direct revenue from offshore royalties and related revenues (see Table 3.2), nor does it include corporate income tax revenue from project partners (information that is confidential). Impact estimates are reported for all offshore exploration/development and other related construction between 1996 and 2007. The results are provided in Table 3.1.

Table 3.1 Socioeconomic Impacts from the Offshore, 1996-2007

	Offshore Exploration, Development & Production	Other Related Construction	Total	Annual Average
Expenditures (\$ million)	\$1,935	\$868	\$2,803	\$234
Employment (person years)				
Direct	16,650	2,802	19,452	1,621
Spinoff	13,345	5,728	19,073	1,589
Total	29,995	8,530	38,525	3,210
Household (\$ thousands)				
Direct	\$598,000	\$151,039	\$749,039	\$6,242
Spinoff	\$454,000	\$202,982	\$656,982	\$54,749
Total	\$1,052,000	\$354,021	\$1,406,021	\$117,168
Provincial Revenue (\$ thousands)				
Direct	\$64,300	\$22,720	\$87,020	\$7,252
Spinoff	\$47,000	\$23,833	\$70,833	\$5,903
Total	\$111,200	\$46,553	\$157,753	\$13,146

As is evident from Table 3.1, the economic impacts to the Province of NS have been substantial. From 1996 to 2007, total employment (direct and spinoff) has been approximately 38,500 person-years, or an average employment of about 3,200 per year (full-time equivalent). In the same period, total household income from the offshore has been approximately \$1.406 billion, or an average of about \$117 million per year. This household income produced government tax

revenues of approximately \$158 million, or about \$13 million per year. Not included in the government revenue total are corporate income taxes direct from the project developers and contractors, and direct revenues, such as royalties (see Table 3.2).

3.1.1 Direct Revenues to the Province: Royalties and Other Direct Revenues

Perhaps of greater importance to the Province of NS are direct revenues from royalties paid by the project developers from the sale of natural gas during production. Revenues paid directly to government include royalties¹ proper, Crown Share Adjustment Payments (CSAP), and offshore offset payments from the Offshore Accords (1986 and 2005).

Intergovernmental arrangements have created a federal-provincial policy context that is conducive for NS to benefit substantially from its offshore energy resources. Offset payments are provided to NS by Ottawa (under the 2005 Arrangement between the Government of Canada and Government of Nova Scotia on Offshore Revenues) to compensate the Province for 100% of any reduction in equalization payments caused by offshore revenues. These offset payments will continue until at least fiscal year 2012-2013, with the potential to extend until fiscal year 2019-2020.

In 1982, NS also acquired the right to obtain a portion of the Crown Share, an ownership interest that was granted to the federal government under the National Energy Program (NEP) of 1980. The Province lost those rights when the NEP was cancelled in 1986 and the Crown Share was abolished. In 2008, an agreement was reached between the Province and the Government of Canada regarding payments to reimburse NS for the loss of these offshore rights.

Based on the recommendation of an independent panel, Canada provided \$234.4 million in CSAPs to NS in 2008 as reimbursement for notional profits up to March 31, 2008. The two governments will work together to calculate CSAPs for future years. It is estimated that the value of future CSAPs for the Sable Island and Deep Panuke offshore energy projects will be approximately \$633 million.

The provincial government received over \$1.5 billion in royalty-related revenues in fiscal years 1996-1997 to 2007-2008 (Table 3.2). As was described in Section 1.1.1, offshore royalties are NS's third largest source of provincially-generated revenue and support our social programs, infrastructure development, and debt reduction, among other uses (CAPP 2008; NSDE and NSE 2009). Note that royalty revenues are expected to decline in 2009 due to the temporary collapse of natural gas prices and planned shutdowns for maintenance.

¹ Royalties are how petroleum developers share income with the jurisdiction from the sale of the resource.

Table 3.2 Royalty-related Revenue from Offshore Gas and Oil Production for the Period 1996-2008

Fiscal Year (April 1 to March 31)	CoPan	SOEP
1995-1996	\$3,908,000	
1996-1997	\$3,524,000	-
1997-1998	\$2,494,000	-
1998-1999	\$1,996,000	-
1999-2000	\$704,000	\$901,000
2000-2001	-	\$9,287,000
2001-2002	-	\$17,329,000
2002-2003	-	\$11,115,000
2003-2004	-	\$25,327,000
2004-2005	-	\$123,202,000
2005-2006	-	\$228,158,000
2006-2007	-	\$330,748,000
2007-2008	-	\$808,976,000
TOTAL (1995/96 to 2007/08)	\$12,626,000	\$1,555,043,000

Source: CNSOPB 1996-2008 (Annual Reports 1995-1996 to 2007-2008); Provincial Accounts FY 2000-2001 to 2007-2008.

3.2 ADDITIONAL BENEFITS

In addition to the direct, indirect and induced economic impacts of offshore gas development in NS, there are a number of important additional benefits that are more difficult to quantify. These benefits support socioeconomic development not directly related to, but certainly dependent upon, the development of the offshore. The key additional benefits are: the development of energy infrastructure (including access to a supply of natural gas); education and training; R&D; and export strength.

3.2.1 Energy Infrastructure

The development of offshore petroleum in NS has increased and improved the energy infrastructure in the Province in several important ways. The pipeline now built across Nova Scotia makes the exploration and production of other offshore and onshore gas in the Province more feasible. In addition, access to natural gas has enabled our power utility, NSPI, to invest in new, more efficient, fast-start generation capacity, which has economic and environmental benefits.

The pipeline built for transporting Sable gas to New England markets creates a means to transport other new natural gas discoveries to major markets. This is important for attracting new investment in exploration and development in the Province, both offshore and onshore.

The pipeline provides access to gas for industrial, institutional, and residential customers through Heritage Gas, our regulated local distributor. Mr. Ray Ritcey, President of Heritage Gas, believes that natural gas is successful for two main reasons: fuel savings and efficiency gains. In its fifth year, Heritage Gas now has more than 2,100 customers. Ritcey says that the

provision of natural gas has also benefited places such as Amherst, by helping it to compete as a place for new businesses in Eastern Canada.

“The benefit ultimately is happy customers,” said Ritcey, “and we do have happy customers, and that is all because of the offshore.”

Access to natural gas has encouraged NSPI to invest in new infrastructure, such as the highly efficient combined-cycle generation facilities at Tufts Cove in Halifax. This new generation capacity allows NSPI to use natural gas when its market price is lower than that of other fuels, providing a cost savings to all NSPI customers. As natural gas is the lowest emitter among fossil fuels, the new infrastructure provides an environmental benefit by helping NSPI to meet regulations on air pollutants and greenhouse gas emissions. Access to natural gas also enables the utility to provide fast backup capacity whenever needed, which is essential to adding more intermittent renewable sources (e.g. wind, tidal, etc.) into the system, as required by the Renewable Energy Standard Regulations (2007) of the Province.

3.2.2 Education and Training

To meet the requirements of the offshore industry, the Province’s post-secondary education institutions have developed a number of training programs. The institutions have not only trained workers for direct employment in NS, but have provided a foundation for offshore suppliers to develop the skill sets and qualifications necessary to export their services. Moreover, NS institutions have become preferred suppliers for training of workers from around the world (e.g. Case Study 12).

The SOEP partners also contribute to education and training in the province, in particular through the two million dollar Pengrowth-Nova Scotia Scholarship program and Innovation Grants for research. Pengrowth, one of the SOEP partners, joins the Province in funding this scholarship program to encourage higher education in energy-related disciplines. Students enrolling in business, engineering, science, environmental and energy-related programs through university or community college can develop the knowledge and skills needed to work in the energy sector.

As many as 12 scholarships, valued at \$10,000 each (\$2,500 renewable over four years), are awarded annually to students pursuing energy-related studies at a university, with an additional scholarship for a member of a First Nation or visible minority. The program offers up to 10 non-renewable \$2,500 scholarships for first-year students pursuing energy-related trades and technology programs at the Nova Scotia Community College (NSCC). The Province also supports the Energy Training Program, a wage subsidy and travel allowance for students with work terms for energy companies in Nova Scotia or abroad.

Case Study 12: Education & Training

The Nova Scotia Community College (NSCC) Marconi Campus and Cape Breton University (CBU) have seen tremendous economic, social and business gains in Cape Breton from their provision of education and training services for the offshore industry in NS and internationally.

LearnCore International (LCI) is a wholly owned subsidiary and foundation company of CBU, designed to do R&D tailored to the private sector. LCI applied for funding to develop capabilities for training for the offshore, as did NSCC Marconi campus, when Sable development began. From this, a partnership was born, and NSCC and LCI jointly received funds from DOE, Atlantic Canada Opportunities Agency (ACOA), and Enterprise Cape Breton Corporation (ECBC). NSCC and LCI developed capabilities for education and training programs, and are currently the preferred suppliers of these services to large international companies such as ExxonMobil.

The offshore training program focuses on process operations (e.g., oil extraction and refinement), a program in high demand by the offshore oil and gas industry. The program trains 20 students for 10 months, and has been full with a long waiting list since its inception seven years ago. The schools receive approximately 150 applicants for the 20 available spaces.

NSCC and LCI have together won projects against tough national and international competitors in Western Canada, the U.S. and elsewhere, because they provide a complete service package and have a good reputation with the industry for providing quality service on time and under budget. Once the program began and proved successful, NSCC and LCI were able to bid on and win several international projects. They have since trained workers from Angola, Italy and Russia, developed curriculum for Malaysia, and worked in the Caribbean – all in the short span of five years.

“It’s been a tremendous boost to our program here, and to our reputation,” said Bruce Clark, Project Manager for the School of Trades & Technology at NSCC Marconi Campus. “There are a lot of balls in the air and things are happening.”

NSCC and LCI were able to begin working internationally due to their offshore experience acquired here in NS, beginning with the provision of training for the Sable project. NSCC and LCI then began hosting international employees at home in Sydney, Cape Breton. They have since expanded their services and partnered with local institutions in other countries to develop curriculum to assist these countries in meeting international oil and gas industry expectations. Capacity building in other countries is considered the current market opportunity for NSCC/LCI.

NSCC and LCI have won 16 offshore contracts between 1996 and 2008, valued at approximately 16-18 million dollars. Approximately 110 people were trained throughout these contracts. At present, local work consists mainly of upgrades for skills, typically based on shorter, two-week contracts.

Sterling Feener, Manager of Business Development at NSCC Marconi, wishes there was more work to be done at home. However, he says training lends itself more to international work, particularly because Canada is viewed as having a very strong education system.

“We have become somewhat of a known commodity internationally,” Feener said. “It has opened our eyes that a small institution in Nova Scotia can compete on a world stage.”

The partnership has been incredibly innovative in the training it provides, adding to its success and credibility. Programs are flexible in order to meet the changing demands of industry. For example, Imperial Oil in Dartmouth provided funds to assist them in building a refining component into the program to meet its training needs. ExxonMobil provides its task books to NSCC/LCI for them to design the necessary curriculum. Investments such as this show a strong confidence in NSCC and LCI, encouraging them to continue to look for new markets and opportunities on a global scale.

A working model of a hydrocracker refinery unit forms part of the training program at NSCC. This model, built in France, is believed to be the only one of its kind in the world. Another innovation stemmed from work on a Sable compression platform, where a 3D video model of the compression deck provided virtual training (since the platform was not yet complete). Use of this technology allowed students to learn location-specific details on the platform. The same software has since been used in competency evaluations. This experience and innovation is now a new selling point, as NSCC/LCI could offer this service again if the opportunity arose.

The success of the NSCC/LCI partnership has not only improved organizational self esteem, but has carried through to positively impact the community in Sydney and all of the Cape Breton Regional Municipality (CBRM). Clark believes community members are witnessing the extent of our global economy, and the domino effect that can occur with hard work. Lucia McIsaac, Director of the Institute for the Development of Energy and Sustainability, and Instructor with the Department of Engineering, School of Science & Technology at CBU, credits the Sable project for providing NSCC and CBU with the initial opportunity, but also gives credit to NSCC, LCI and local companies for “pulling up their socks” and succeeding in the face of these new offshore opportunities.

NSCC and LCI benefited from funding assistance from companies and organizations such as Shell Canada, M&NP, ECBC/ACOA, and federal money from the Offshore Development Fund. Funds have been spent on infrastructure (e.g., laboratories, equipment), library resources, renovations, salaries and classroom-dedicated oil and gas software. NSCC estimates that it has spent between \$8 to 10 million in infrastructure related to the petroleum industry in the last seven or eight years.

Offshore training at NSCC and CBU provide full and part time employment, for both permanent and contract positions. Employment consists of educators, engineers, technicians, and logistics support staff. Approximately six NSCC employees work full and part time on any given contract. McIsaac estimates that at its peak, CBU had five fulltime equivalents for five years and three technical full time equivalents. NSCC and CBU each have one full time staff person when working on a large offshore project.

NSCC Marconi estimates that in 2008, one percent of all NSCC revenues were derived from oil and gas-related projects. Oil and gas work is a growth area for NSCC. Approximately 15% of all petroleum revenues stem from work done in NS, and 85% is from work done internationally.

CBU takes a three-pronged approach in its training for the offshore. It offers a certificate (i.e., the first 10 ExxonMobil contracts), a two-year diploma, and a three-year degree in engineering technology. The diploma and degree are sequential, so a student can choose to stop after two years and receive a diploma, or complete a third for the degree. CBU was recently approached by the Australian College of Kuwait. This college offers a diploma but not a degree, and wishes to partner with CBU. The College discovered CBU from articles based on its work for ExxonMobil.

Employees for NSCC and CBU believe there have been significant economic spinoffs from their provision of training for the offshore. Food, accommodation, and transportation locally have benefited from having international workers live and train in Cape Breton for up to a year at a time. For example, 18 Italian students trained in CBRM for six months, each staying with a family in the area. Students took taxis wherever they needed to go and flew home every 10 weeks. These travels benefitted the Sydney airport and taxi companies in the area, to name a few. Angolan students bought many material goods that were not available in Angola to bring home from Cape Breton. Suppliers and equipment rental providers have also benefited, along with day/night couriers, laboratories (for third party verification, sample testing), and other local companies. Local students have benefitted, as oil and gas is part of the schools' core programming. Upon graduation they have the opportunity to seek employment internationally.

NSCC and CBU see many opportunities for the future. Their partnership has proven to be a huge success, and has allowed them to gain experience and credibility with the offshore industry. Through this partnership, they continue to compete and win training jobs here at home as well as abroad.

3.2.3 Research and Development

NS companies have been active in R&D to support business in the offshore (e.g. Case Studies 10 and 13). This has enhanced the local body of knowledge and skills that not only build on the strong scientific and engineering reputation of the Province, but has provided a foundation for technical advancements in other fields. For some NS companies, offshore R&D has led to the development of products and services now sold internationally. The Pengrowth–Nova Scotia Trust funds several research grants annually for graduate student research in an energy-related field. Four \$15,000 grants are disbursed each year.

Case Study 13: Survival Systems

Survival Systems Ltd. began in 1982 in Dartmouth, NS to provide safety training to the offshore industry. This company has been so successful that it has since divided into two separate companies that work closely together to provide training and training equipment all around the world. Since its inception, Survival Systems has expanded from two core training programs to 32.

Albert Bohemier, CEO of Survival Systems (SS), and his partner began the company, borrowed \$1000 to purchase equipment, and then went to the oil and gas industry to pitch their services. The industry knew that this training was necessary, especially in the harsh marine environment typical of the east coast of Canada. The industry was supportive of their efforts, and they built their first facility in 1984.

SS built its first training dunker in 1986, and began to receive requests for dunkers from other companies. This led to new business in the simulation industry. SS had gained a reputation for providing quality services that had come to be expected in the more advanced European market, and had proved themselves as a solid and fair business. Their credibility helped them to succeed in selling these simulators.

John Swain joined SS in 1991 as an expert in training education for the industry. After the company survived several rough patches due to the cyclical nature of the industry, Lasmo helped to kick-start a new surge of business. As both the training and infrastructure components of the business continued to grow, Bohemier and Swain decided to split the company into two in 1997/98. Swain purchased and is now the CEO of the training component, called Survival Systems Training (SST). Bohemier remains CEO of the infrastructure side of the business, Survival Systems. SS/SST also has a sister company in the U.S., and just opened a new office in NL in spring of this year. In 2007, SST purchased the Atlantic Petroleum Training College. In addition to providing training to offshore workers, the college trains 250 people for entry-level positions for the Alberta oil sands each year.

SST provides training in five main areas:

- Offshore;
- Land-based industrial training (e.g., for pulp mills, refineries);
- Military (e.g., for Canadian Armed Forces, RCMP, Coast Guard);
- Marine (e.g., for ship crews); and
- Customized training.

SST trains in basic survival, hydrogen sulfide, helideck firefighting, confined space, hazardous materials, and emergency management, among others. SST prides itself in being a responsive service company, always up for the challenge of solving new problems and meeting imminent training needs. When rigs arrive, workers are often non-compliant based on Canada's health and safety standards. SST is the only company who can provide some of the necessary certifications to ensure compliance.

Approximately 80% of SST's training occurs in NS (though about 60% is done for large, international companies), 10% is done in NL, and a final 10% is done internationally.

On the infrastructure side, SS builds and sells dunkers, cranes, gantry systems, specialized aircraft systems and more. About 98% of all infrastructure is exported. Most of the infrastructure sold is made locally. SS uses approximately 150 different suppliers, having a large positive impact on the local economy.

Innovation stems from training expertise, as well as a strong focus on R&D. SS builds simulators for the harshest of marine environments. Currently, they have seven different models of simulators to serve various training needs and purposes. Emergency situations must be simulated as accurately as possible, because companies cannot afford to do the training out at sea. R&D is almost always done through partnership with universities, such as Dalhousie University and Saint Mary's University.

SS has developed the Modular Egress Training Simulator (METS™) to replicate helicopters and other aircraft configurations, which is used in simulating and training people on how to survive a ditching situation. SS has also designed and built large theatres capable of generating huge storms with strong winds, large waves and rain.

“It was almost like we were sitting on a spring...to basically serve the industry,” Bohemier said. “We are making our eightieth simulator now, and we have sold them in 24 countries.”

Bohemier says it is his company’s R&D, as well as the credibility of the devices they build, that keeps them in the game. It is also the relationships his company has with clients and suppliers. Bohemier says his business relationships are based on trust. SS & SST take a partnership approach, even when working internationally. Instead of selling a theatre and insisting that they do all of the necessary servicing for it, they instead train locally for the provision of these services.

For Bohemier and Swain, the future is bright. The industry has served them well and they have plans for continuing to grow in new markets and new service areas. The safety field is a burgeoning industry, and the requirement for higher fidelity training exists worldwide. Potential for the development of new simulator models exists, along with new strategies for providing training to key clients. Bohemier and Swain’s positive energy, client focus, attention to quality, and entrepreneurial spirit have brought these companies to new heights – from a small Dartmouth company to two large players in the global safety training industry.

3.2.4 Export Strength

Common to most of the NS companies that have become successful in working for the offshore industry is a strong export business. A frequent comment from stakeholders has been that their experience and expertise developed from working in NS has led to significant growth opportunities internationally (e.g. Case Studies 11 to 14). This demonstrates the germination of export strength, and an increased international profile of NS business.

Case Study 14: RPS Energy Canada Ltd. (Halifax)

RPS Energy Canada Ltd. (RPSECL) is the Canadian arm of RPS Energy, which is one of the business streams associated with the global consultancy known as RPS Group Plc. The company's multinational Energy division provides technical, commercial and project management support services to the energy sector.

In 2006, RPSECL established its presence in NS with the acquisition of Geoprojects Canada Ltd. (Geoprojects), a local independent consulting firm. Geoprojects was founded in 1994 and based in Halifax, NS. Its initial focus was to support offshore exploration projects in Canada, and it soon became the leading provider of marine exploration consulting services in the country.

The province's offshore industry played an extremely important role in Geoprojects' development. The firm became active in NS's offshore oil and gas industry in 1999, and it has been involved in 90% of all offshore exploration projects in Atlantic Canada since that time. This is especially impressive considering Geoprojects often had to compete against much larger foreign firms for these projects. Geoprojects credits legislated requirements for local content as a factor in their success, as these requirements helped them win work and build their reputation.

A decline in the local offshore industry in 2003 encouraged Geoprojects to alter its focus to include global operations. The company was able to draw on experience, capabilities, and contacts gained working in NS's offshore to market itself and develop business internationally. During its history of work in Atlantic Canada, the company earned a strong reputation. It also partnered effectively with companies with complementary services and cultivated strategic relationships based on trust and mutual benefit. Relationships that were established with companies operating in NS were maintained even after the companies left the province. Geoprojects was then able to use its reputation and worldwide relationships as leverage to gain new business.

As a result of Geoprojects' shift to an internationally-oriented business strategy, its export sales grew significantly, from 5% of total sales in 2003 to 48% in 2004. They have won and completed contracts offshore of the U.S., the Caribbean, Africa, Korea, and India. Nova Scotia Business Inc. (NSBI), the province's business development agency, presented Geoprojects with an Export Achievement Award in 2005. Part of the reason that RPSECL was interested in acquiring Geoprojects was due to the success they had already demonstrated locally and their proven ability to export their services. The firm is optimistic about the potential for future opportunities off the coast of Africa, China, and India, and remains very busy working internationally in those regions as well as offshore Brazil and Greenland, among other locations.

RPSECL's Halifax location (formerly Geoprojects) continues to provide the same services for domestic and international offshore projects as before the acquisition. These services include project management, professional consulting, and technical specialists in the fields of geophysical operations, site investigations, survey and positioning, health and safety, and environment. They also provide expert advice on other energy projects, including wind, tidal, and hydro, but over 95% of their work relates to offshore oil and gas.

Fifty five people in 19 countries do work through the Halifax office, and a core group of five employees is permanently based there. RPSECL Halifax contributes to the local community by providing local employment, procuring goods and services locally, and contributing to causes including the United Way, The Ride to Conquer Cancer, local amateur sports, and drug and alcohol awareness. They are a member of OTANS, the Association of Professional Geoscientists of Nova Scotia (APGNS), and the Association of Professional Engineers of Nova Scotia (APENS).

Tony LaPierre, founder of Geoprojects and current VP Marine Seismic and Survey for RPSECL, recognizes the importance of gaining a better scientific understanding of NS's offshore petroleum systems and demonstrating sound geological reasons for companies to pursue further exploration in the province. He commends the provincial government's investment to promote exploration, and believes that it is important to continue to invest in initiatives that encourage offshore activity. The Offshore Energy Technical Research Association (OETR) commissioned RPSECL Halifax to coordinate an industry standard Play-Fairway Analysis project for NS's offshore.

A play fairway is an area that contains all of the elements of a hydrocarbon system as well as one or more prospects (i.e., features that are sufficient to warrant drilling a well without further investigation). The analysis will compare offshore drilling results against remaining resource opportunities in order to evaluate the hydrocarbon potential and investment risk in NS's offshore. A data package will also be developed to allow potential investors to further analyse the data. The objective of the project is to promote new exploration and production activity in the province's offshore industry. The results of the analysis will have significant implications for the future of the local offshore industry and have the exciting potential to offer immense socioeconomic benefits for NS.

4.0 Potential Future Economic Benefits

The substantial economic benefits from the offshore to the Province of NS are expected to continue in the near future. The pipeline and related energy infrastructure built for SOEP provide a means of distributing natural gas to major markets, thereby helping to potentially attract new exploration and development of natural gas on and offshore in NS. In order to define the range of possible future benefits, three development scenarios are explored. These scenarios are based on what can reasonably be expected to occur over the next 12 years (2009-2020).

As described previously in this report, there are currently two active offshore projects in NS – SOEP and Deep Panuke. SOEP has produced to date approximately 1.3 trillion cubic feet (TCF) or 37.1 billion cubic meters ($\times 10^9 \text{ m}^3$) of gas, and has an expected total recovery of about 2.98 TCF ($84.3 \times 10^9 \text{ m}^3$). With planned production to 2024, annual production over the coming years will average approximately 0.1 TCF/yr ($3.0 \times 10^9 \text{ m}^3/\text{yr}$). Deep Panuke, currently under construction, is expected to begin production in 2010 and continue to 2022. Total recovery is estimated at 0.89 TCF ($25.1 \times 10^9 \text{ m}^3$), or an average of about 0.067 TCF/yr ($1.9 \times 10^9 \text{ m}^3/\text{yr}$).

In addition to SOEP and Deep Panuke, three Calls for Bids have been issued by the CNSOPB (NS07-1, NS08-2, and NS08-2) for Exploration Licenses covering a total of six different land parcels. The Exploration Licenses for the Eagle Discovery (two parcels) were awarded in July 2008, with a commitment to spend approximately \$216.8 million over five years (2009-2013). Exploration Licenses for Call for Bids NS08-1 (two parcels) were awarded in November 2008, with commitments to spend approximately \$136.9 million over the next nine years (2009-2017). Information on the results of the third Call for Bids (NS08-2) was not available at the time of writing of this report. The issuing of these Exploration Licenses can be used to define the potential for further development of the offshore in the near future (to 2020). Actual development will, of course, be dependent on a number of factors, mainly the finding of economic reserves within these parcels. Economic feasibility will require, among others, a sufficiently high market price for natural gas, and the availability of feasible technologies and infrastructure to support recovery of the offshore reserves.

Based on the above information, three scenarios are described below:

- *Development and Production Only.* Under this scenario, economic activity from the offshore continues at historic levels, where future development and production expenditures are assumed to be the same as actual expenditures over the past 12 years (1996-2007). This is used as an estimate of the future production from SOEP and the planned construction and operation of Deep Panuke. No other exploration or development of the offshore occurs in NS, and the current commitments under the active Exploration Licenses are forfeited. This defines the likely *minimum* benefits from the offshore.
- *Exploration, Development and Production.* Under this scenario, the current planned activities of SOEP and Deep Panuke continue, and the expenditure commitments for all

active Exploration Licenses are met. In order to estimate this total expenditure, the actual expenditures on exploration, development and production over the past 12 years (1996-2007) are assumed to be repeated. However, within the timeframe for the scenario analysis (2009-2020), no development of new offshore leases occurs.

- *New Project Expansion.* Under this scenario, the current planned activities of SOEP and Deep Panuke continue, the expenditure commitments for all active Exploration Licenses are met and, within the timeframe for the scenario analysis, development and production occurs for new parcels. In order to estimate this total expenditure, the actual expenditures on exploration, development and production over the past 12 years (1996-2007) are assumed to be repeated, but assuming two development projects and an increase in production expenditures by 50%. This defines the likely *maximum* benefits from the offshore.

The predicted economic benefits (employment, household income, and provincial government revenue from household income) for the period from 2009-2020 under each of these scenarios are described in Table 4.1.

Table 4.1 Predicted Economic Impacts from the Offshore, 2008-2020

	Direct	Spinoff	Total
Scenario 1: Development and Production Only			
Employment (person years)	8,015	7,040	15,055
Household Income (million \$)	360.4	294.3	654.6
*Provincial Government Revenue (million \$)	50.0	39.1	89.1
Scenario 2: Exploration, Development and Production			
Employment (person years)	14,535	11,150	25,685
Household Income (million \$)	617.2	461.6	1,078.8
*Provincial Government Revenue (million \$)	82.8	61.0	143.7
Scenario 3: New Project Expansion			
Employment (person years)	19,635	15,895	35,530
Household Income (million \$)	851.6	660.8	1,512.4
*Provincial Government Revenue (million \$)	115.6	87.6	203.2

* Provincial Government Revenue is income tax from household income, plus estimated sales tax due to spending that income. This estimate does not, however, include direct revenues to the Province from royalties and other related direct revenue (See Table 3.2 for direct revenues). A reasonable estimate of royalties and other direct revenue for Scenario 1 and 2 would be to use the level of direct revenue averaged annually since production began in 2000. For Scenario 3 a reasonable estimate of royalties and other direct revenue would be to double the average annual revenue since 2000.

5.0 Moving Forward

5.1 POLICIES FOR DEVELOPING FUTURE BENEFITS IN THE OFFSHORE

NSDE developed a Nova Scotia Offshore Renewal Plan in October 2008. The plan consists of a series of concurrent initiatives that seek to rekindle interest in offshore exploration and development. The 13 projects proposed in the plan fall within four areas:

- Geosciences
 - Resource Analysis Project
 - Data Package Project
- New Policy
 - Access to Infrastructure Project
 - Data Release Project
 - Rights Issuance Project
 - Research and Development Incentives Project
 - Global Competitiveness Project
- Regulation
 - Coastal Trading Act Project
 - Frontier Offshore Regulatory Renewal Initiative
 - Occupational Health and Safety Project
 - Drilling Rig Pool Project
 - Extended Rig Duty Relief Project
- Investment Attraction
 - Interim Investment Attraction Project

As well as renewing interest in the offshore, many of the initiatives that fall within these categories will contribute additional socioeconomic benefits throughout the Province. For example, initiatives such as the creation of a code of practice for developing and accessing infrastructure, facilitation of private sector investment in R&D, and promotion of a more competitive fiscal regime will directly benefit many NS businesses in a variety of industries. Furthermore, the Province has invested nearly \$19 million for offshore geosciences and data initiatives under this plan via the Offshore Energy Technology Association (NSDE 2008a). The intended outcome of that investment is improved scientific knowledge about offshore resources, but it will also result in enhanced technical capabilities (from related research, education, and training opportunities) in the Province.

5.2 DEVELOPMENT OF THE PROVINCIAL ECONOMY

As discussed previously, direct offshore royalty-related revenues are now the third largest source of provincial revenue in NS, greater than all corporate tax revenue to the province. In addition, offshore gas activities have been important contributors to NS GDP (Gardner Pinfold Economists Ltd. 2002; Gardner *et al.* 2005, 2009), an estimate of value added in our economy. However, due to the industry's capital intensive nature and unique technical requirements, its contribution to employment levels and associated household income impacts has been modest relative to value of output (Mandale *et al.* 1998).

The socioeconomic impacts of offshore gas activities are diminished to a certain extent due to sources of "leakage" from the provincial economy (Gardner Pinfold Economists Ltd. 2002). As previously described, certain inputs required along the natural gas value chain are not produced in NS, nor is there, for certain specialized goods and services, a critical concentration of expertise yet within the province. The corporate revenues earned by the sale of natural gas do not contribute substantially to economic development within the Province. For example, in its first year of production (2000), SOEP contributed about \$810 million directly to the provincial GDP, of which approximately \$780 million was net sales revenue. This net revenue supports substantial project expenditures during production (over \$180 million annually), which bring highly skilled employment, and its related incomes, plus local business expansion. But the majority of this net revenue goes to investors outside of NS, meaning that this portion passes through the provincial economy without causing spin-off impacts (Gardner Pinfold Economists Ltd. 2002; Gardner *et al.* 2005). It has been recommended that in order to minimize these economic leakages, the offshore natural gas industry must become more fully integrated into the provincial economy through development of backward linkages (*i.e.*, use of domestically produced goods and services) and forward linkages (*i.e.*, use of gas as feedstock by other domestic industries) such as those that traditional primary industries have formed over time in NS (Gardner Pinfold Consulting Economists Ltd. 2002).

This effort is occurring, as illustrated by the case studies presented throughout this report. A number of companies have worked closely with the offshore industry to develop specialized products and services domestically. Moreover, involvement in R&D and education and training has led not only to a provincial economy more integrated within the NS offshore, but the export of products and services to the industry worldwide (see Section 3.0). This export strength is evolving, as local companies and institutions respond to industry needs.

The development of energy infrastructure, particularly natural gas supply to regions of the province and NSPI, provides a foundation for the growth of downstream industries, as well as a more environmentally friendly energy source. However, more could be done to further develop the sector, to position NS for future benefits.

5.3 CHALLENGES AND LESSONS LEARNED

Many lessons learned as noted in the industry interviews stemmed from the barriers companies had to overcome to break into the offshore oil and gas industry. The offshore industry is inherently risk averse, and oil and gas companies prefer to use suppliers with proven experience and known reputations. In order for local companies to succeed in entering the industry, many formed strategic partnerships with other businesses that had proven reputations and capabilities in the offshore. Once that chance was provided, companies had to prove themselves by delivering top quality services on par with international standards and expectations in a timely fashion and for a financially-competitive price. This was accomplished successfully by many local firms and institutions.

The ability to enter the industry is also contingent upon the necessary access to capital, as offshore projects require large investments in training, infrastructure and equipment. Companies must take calculated risks and invest in order to have the opportunity to succeed in the offshore industry. Some companies still found the expense required to be a large barrier to entry.

Once companies successfully won contracts in the offshore, they quickly learned the caliber of work and operating standards, such as health and safety, required and expected by the industry. Successful companies were able to learn quickly and adapt to meet these expectations and deliver quality products and services. Many companies stated that every lesson that a company could learn was learned by working in the offshore. The industry is complex, expensive for operations, dynamic and demanding, and only companies that can excel in this environment will succeed.

The scales of projects in the offshore are so large that some companies find it very difficult to compete with established multinational corporations for local work. Partnerships with other companies can help to overcome this barrier, though preference tends to be towards large international companies that have performed successfully for oil and gas clients in the past. Although efforts have been made to require local content in offshore contracts, many local companies feel the requirements could be more stringent. Some NS suppliers believe that requests for proposals are tailored towards specific multinational companies, putting local companies at a serious disadvantage.

The cyclical nature of the offshore industry is also a major challenge noted by many of those interviewed. It is difficult to keep experienced offshore workers gainfully involved during a downturn in the industry, and companies find it hard to maintain the necessary skills and equipment needed for offshore contract work. Businesses must be capable of “ramping up” quickly upon winning a bid, especially if they are coming out of a period with little to no offshore work.

While permanent infrastructure was not frequently cited as a barrier, the costs to bringing in rigs and other specialized equipment for only a short period of time was commonly cited as a challenge with the NS offshore. Because our offshore industry is small relative to elsewhere in the world, there is not enough work for rigs to stay and work here continuously. Companies are not able to effectively cost share the importation of these rigs and equipment.

Canada and NS's regulatory regimes were cited as posing a challenge to the NS offshore. For example, a drilling application can take considerably longer to gain approval in NS relative to other jurisdictions, such as the North Sea. While it is important for Canada to have stringent regulations, it does put us at a competitive disadvantage. The federal and provincial regulatory systems have been and continue to be improved. However, some industry stakeholders feel that past experiences still inform opinions on the NS offshore within the industry.

Other challenges shape our reputation with the global offshore industry. To date, the sizes of the finds from exploration have been relatively small and past explorations have concluded with somewhat disappointing results. Many stakeholder interviewed stated that the NS offshore is too small to sustain them, forcing businesses to either diversify their services or to increasingly focus on the export market to provide these services in other areas of Canada and internationally.

However, the Province of NS has actively supported the development of the offshore industry. There is a continued demand for more investment and an increase in government support for local companies to participate in the industry. Continued funding for businesses, the further development of infrastructure, exploration activity, improvements on local content requirements, and public education are often cited as possible ways for the Province to continue its support.

6.0 Next Steps

The majority of industry stakeholders interviewed stated that their future work in the offshore industry will come mainly from opportunities outside NS, now that they have established some expertise in the offshore industry. Many see opportunities in NL, the Arctic, the North Sea, the Gulf, North Africa, and other international locations. The most commonly-cited requirement for work to continue or expand in the NS offshore is to increase exploration. NS should continue to focus on finding new petroleum deposits by funding research on geological and seismic work.

Work is currently being funded by the Offshore Energy Technical Research Association (OETR) to promote oil and gas exploration in the offshore. The objective of the Play Fairway Analysis Program is to promote hydrocarbon prospects to the industry in order to attract maximum participation in future licensing rounds.

Working to develop the marginal finds in NS could provide future opportunities as well. Research is currently being done on technological advancements for the exploitation of marginal fields through the use of minimal platforms. In addition, NS will need to continue to attract companies that wish to exploit these marginal fields and make it economically attractive for them to do so.

There is a belief among stakeholders that the continued support for funding (e.g. for R&D), exploration, local content requirements, time limitations on Significant Discovery Licenses (SDLs), regulatory regime streamlining, and public education will promote the further growth of the offshore industry in the Province.

7.0 CLOSURE

This report has been prepared for Nova Scotia Department of Energy (NSDE). Any uses that a third party makes of this report, or any reliance on decisions made based on it, are the responsibility of such third parties. Stantec Consulting Limited accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made, or actions taken, based on this report.

The information and conclusions contained in this report are based upon work undertaken by trained professional and technical staff in accordance with generally accepted scientific practices current at the time the work was performed. Conclusions and recommendations presented in this report should not be construed as legal advice.

The conclusions presented in this report represent the best technical judgement of Stantec Consulting Limited

based on the data and information obtained from the work. If any conditions become apparent that differ significantly from our understanding of conditions as presented in this report, we request that we be notified immediately to reassess the conclusions provided herein.

8.0 REFERENCES

8.1 LITERATURE CITED

- Canada-Nova Scotia Offshore Petroleum Board (CNSOPB). 1996. *Annual Report 1995-1996*. Halifax, NS.
- Canada-Nova Scotia Offshore Petroleum Board (CNSOPB). 1997. *Annual Report 1996-1997*. Halifax, NS.
- Canada-Nova Scotia Offshore Petroleum Board (CNSOPB). 1998. *Annual Report 1997-1998*. Halifax, NS.
- Canada-Nova Scotia Offshore Petroleum Board (CNSOPB). 1999. *Annual Report 1998-1999*. Halifax, NS.
- Canada-Nova Scotia Offshore Petroleum Board (CNSOPB). 2000. *Annual Report 1999-2000*. Halifax, NS.
- Canada-Nova Scotia Offshore Petroleum Board (CNSOPB). 2001. *Annual Report 2000-2001*. Halifax, NS.
- Canada-Nova Scotia Offshore Petroleum Board (CNSOPB). 2002. *Annual Report 2001-2002*. Halifax, NS.
- Canada-Nova Scotia Offshore Petroleum Board (CNSOPB). 2003. *Annual Report 2002-2003*. Halifax, NS.
- Canada-Nova Scotia Offshore Petroleum Board (CNSOPB). 2004. *Annual Report 2003-2004*. Halifax, NS.
- Canada-Nova Scotia Offshore Petroleum Board (CNSOPB). 2004. *Application to Amend the Cohasset Development Plan: Decision Report*. Halifax, NS.
- Canada-Nova Scotia Offshore Petroleum Board (CNSOPB). 2005. *Annual Report 2004-2005*. Halifax, NS.
- Canada-Nova Scotia Offshore Petroleum Board (CNSOPB). 2006. *Annual Report 2005-2006*. Halifax, NS.
- Canada-Nova Scotia Offshore Petroleum Board (CNSOPB). 2007. *Annual Report 2006-2007*. Halifax, NS.
- Canada-Nova Scotia Offshore Petroleum Board (CNSOPB). 2008. *Annual Report 2007-2008*. Halifax, NS.
- Canadian Association of Petroleum Producers (CAPP). 2008. *Nova Scotia's Oil and Natural Gas Industry: Contributing to a Strong Provincial Economy*. Calgary, AB and St. John's, NL.
- EnCana Corporation. 2008 (March 28). *Canada-Nova Scotia Benefits: 2007 Annual Report*. Halifax, NS.
- Energy Information Administration (EIA). 1999. *Natural Gas 1998: Issues and Trends*. Office of Oil and Gas, US Department of Energy, Washington, DC.

REFERENCES

- ExxonMobil Canada Properties Limited. 2002. *The Sable Project: Canada-Nova Scotia Benefits 2001 Annual Report*.
- ExxonMobil Canada Properties Limited. 2008. *Sable Offshore Energy Project 2007 Canada-Nova Scotia Benefits Report*.
- ExxonMobil Canada Properties Limited. n.d. Restated Tables for the *Sable Offshore Energy Project 2007 Canada-Nova Scotia Benefits Report* (Tables 1, 2, 4 and 7 restated based on *Final ASC Audit Report*).
- Gardner Pinfold Consulting Economists Limited. 2002 (November). *Economic Impact of Offshore Oil and Gas Development on Nova Scotia, 1990-2000*. Prepared for the Nova Scotia Department of Finance.
- Gardner, Michael, Gregory MacAskill, and Chris DeBow. 2009 (March). *Economic Impact of the Nova Scotia Ocean Sector, 2002-2006*. Prepared for the Government of Canada and the Government of Nova Scotia by Gardner Pinfold Consulting Economists Ltd., Halifax, NS.
- Gardner, Michael, Robert Fraser, Mike Milloy and James Frost. 2005 (January). *Economic Value of the Nova Scotia Ocean Sector*. Prepared for the Government of Canada and the Government of Nova Scotia by Gardner Pinfold Consulting Economists Ltd. and MariNova Consulting Ltd., Halifax, NS.
- Government of Canada and Government of Nova Scotia. 2005 (February 14). *Arrangement between the Government of Canada and the Government of Nova Scotia on Offshore Revenues*. Signed in Halifax, NS.
- Irving Shipbuilding Inc. (ISI). n.d. Focused on Solutions: Irving Shipbuilding Inc.
- L N Perry Consulting Incorporated. 2000 (September). *Infrastructure and Manufacturing Capabilities Study*. Prepared for the Nova Scotia Petroleum Directorate (NSPD) and Enterprise Cape Breton Corporation (ECBC). Liverpool, NS.
- MacDonald, D.R. 2006. Appendix 1 - Mining Industry Activity in Nova Scotia, 2003. *Mineral Resources Branch Report of Activities 2005*. Nova Scotia Department of Natural Resources (NSDNR), Report ME 2006-1, Province of Nova Scotia, Halifax, NS.
- Mandale, Maurice, Michael E. Foster and Janice Plumstead. 1998 (February). *Estimating the Economic Value of Coastal and Ocean Resources: The Case of Nova Scotia*. Prepared for the Oceans Institute of Canada and the Atlantic Coastal Zone Information Steering Committee. Mandale Consulting, Chester, NS.
- Mitchell, Carlyle L. 2003 (September). *Canada's Ocean Industries: Contribution to the Economy 1988-2000*. Prepared for the Ocean Policy Division of the Department of Fisheries and Oceans (DFO). Roger A Stacey Consultants Limited, Ottawa, ON.
- Nova Scotia Department of Energy (NSDE). 2008a (October). *Nova Scotia Offshore Renewal Plan*. Halifax, NS.
- Nova Scotia Department of Energy (NSDE). 2009 (January). *Toward a Greener Future: Nova Scotia's 2009 Energy Strategy*. Province of Nova Scotia, Halifax, NS.
- Nova Scotia Department of Natural Resources (NSDNR) and the Nova Scotia Petroleum Directorate (NSPD). 2001. Part V Coal. *Seizing the Opportunity: Nova Scotia's Energy*

REFERENCES

- Strategy* (Volume 2 - Energy Strategy Background Papers). Province of Nova Scotia, Halifax, NS
- Nova Scotia Economic Development (NSED). 2000. *Opportunities for Prosperity: A New Economic Growth Strategy for Canadians*. Province of Nova Scotia, Halifax, NS.
- Nova Scotia Economic Development (NSED). 2005 (May). *An Environmental Scan of Issues Facing the Nova Scotia Economy (Working Document)*. Province of Nova Scotia, Halifax, NS.
- Nova Scotia Economic Development (NSED). 2006. *Opportunities for Sustainable Prosperity 2006: An Updated Economic Growth Strategy for Nova Scotia*. Province of Nova Scotia, Halifax, NS.
- Nova Scotia Environment (NSE) and Nova Scotia Department of Energy (NSDE). 2009. *Background: Energy Security*. Province of Nova Scotia, Halifax, NS.
- Offshore/Onshore Technologies Association of Nova Scotia (OTANS). n.d. *2005 Annual Report*.
- PricewaterhouseCoopers. 2001 (April). *Final Report: A Study into Optimizing Technology Transfer for Atlantic Canada's Oil and Gas Industry – A Study of Service and Supply Capabilities in Atlantic Canada to Meet Current and Future Demand Requirements of Oil and Gas Value Chain*. Prepared for the Newfoundland Ocean Industries Association (NOIA).
- Strategic Concepts, Incorporated, Dr. Wade Locke and Community Resource Services. 1999 (January). *Harnessing the Potential – Atlantic Canada's Oil and Gas Industry*. Prepared for the Newfoundland Ocean Industries Association (NOIA), Offshore/Onshore Technologies Association of Nova Scotia (OTANS), Metal Working Association of New Brunswick (MWANB) and Atlantic Canada Opportunities Agency (ACOA).

8.2 INTERNET SOURCES

- CBC News. 2001 (July 26). The Eirik Raude Arrives in Halifax. Available online at: http://www.cbc.ca/news/story/2001/07/26/ns_rigjobs010726.html (Accessed June 8, 2009).
- Department of Finance Canada. 2008 (July 13). *Governments of Canada and Nova Scotia Resolve Crown Share Adjustment Payments*. Retrieved March 19, 2009 from: <http://www.fin.gc.ca/n08/08-053-eng.asp> (Updated October 23, 2009).
- J.D. Irving Limited (JDIL). 2009 (March 12). Atlantic Towing Awarded Contract; New Ship to be Built at Halifax Shipyard. Available online at: <http://www.jdirving.com/article.aspx?id=1914> (Accessed June 8, 2009).
- Nova Scotia Department of Energy (NSDE). 2008b. *Oil & Gas – Offshore Industry & Exploration History*. Available online at: <http://www.gov.ns.ca/energy/oil-gas/offshore/our-history.asp> (Updated July 3, 2008).
- Statistics Canada. 2008 (November 21). *Nova Scotia Gross Domestic Product by Industry in Chained 2002 Dollars (\$ millions)*. Cat. No. 15-203-XPB. Available online at:

REFERENCES

<http://www.gov.ns.ca/finance/statistics/agency/index.asp?p=2&s=2e> (Accessed March 25, 2009).

8.3 PERSONAL COMMUNICATIONS

Bagnell, Graham. Engineering Manager, Rowan Companies Inc. May 26, 2009.

Bohemier, Albert. CEO, Survival Systems Limited. May 27, 2009.

Borland, Angus. President, Remote Access Technologies. May 19, 2009.

Brownlow, Tim. Director, Government Affairs and Business Development, Irving Shipbuilding Inc. April 24, 2009.

Clark, Bruce. Project Manager, School of Trades & Technology, Nova Scotia Community College (Marconi Campus). April 27, 2009.

desRoachers, Claude. Manager, Structural Analysis Group, Martec. June 4, 2009.

Feener, Sterling. Manager, Business Development, Nova Scotia Community College (Marconi Campus). April 30, 2009.

Fudge, Steve. Principal and Senior VP, Business Unit Director, Sciences, Atlantic, Jacques Whitford. June 4, 2009.

Horswill, Mark. Class & Compliance Manager for Canada, Lloyd's Register North America Inc. May 7, 2009.

Jacques, Hector. Co-founder, Jacques Whitford (Retired). June 5, 2009.

LaPierre, Tony. President, RPS Energy Canada Ltd. May 21, 2009.

Lohnes, Robin. CEO, Diving Supervisor, Dominion Diving. May 4, 2009.

Maclsaac, Lucia. Director & Instructor, Cape Breton University. April 27, 2009.

McEachern, Paul. Managing Director, OTANS. April 17, 2009.

Moreira, A. William. Q.C., Partner, Stewart, McKelvey, Stirling and Scales. May 15, 2009.

Mulrooney, Paul. General Manager, Tenaris. May 5, 2009.

Perry, Alan. Chairman, ACCENT Engineering. June 4, 2009.

Perry, Len. Consultant, Cherubini. June 2, 2009.

REFERENCES

Reid, James. President, A.P. Reid Insurance. May 21, 2009.

Rent, Peter. President, ACCENT Engineering. May 22, 2009.

Ritcey, Ray. President, Heritage Gas Limited. July 21, 2009.

Scott, John. Business Development Director, QHSE Director, Dominion Diving. May 4, 2009.

Smithers, Dwayne. Vice President and General Manager. Secunda Marine Services. June 23, 2009.

Sommerville, Frank. NS Department of Energy (Retired). April 22, 2009.

Streeter, Bud. Vice President, Marine Manager for Canada, Lloyd's Register North America Inc. May 7, 2009.

Surette, Dave. Regional Vice President, Export Development Canada (EDC). May 26, 2009.

Swain, John. CEO, Survival Systems Training Limited. May 27, 2009.

Swinemer, Malcolm. Vice President, North Atlantic Marine Terminals Ltd. June 24, 2009.

Taylor, Brian. Principal and Project Manager, Geotechnical & Materials Engineering, Jacques Whitford. June 2, 2009.

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FINAL REPORT

12-YEAR RETROSPECTIVE OF NATURAL GAS PRODUCTION IN NOVA SCOTIA

9.0 Appendices

APPENDIX A Study Methods

APPENDIX B Organizations and Individuals Contacted

APPENDIX C Industry Questionnaire

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APPENDIX A
Study Methods

A. Study Method

A.1 DATA AND LITERATURE REVIEW

The first task of the study was to design and conduct a review of all available information and data provided in documents and databases for economic activity directly and indirectly related to offshore natural gas development and production in Nova Scotia between 1996 and 2008. The document review drew upon a number of past reports that have been prepared on the offshore, as well as existing data from the NSDE and CNSOPB. The relevant information was then synthesized for presentation in this study. A complete listing of all sources referred to in this study is presented in Section 8.0.

An important part of the review of existing information was the development of a description of petroleum development activities for projects from 1996 to 2008 (see Section 1.1.1 and Section 2.0) and identification of economic sectors and the individual companies involved. This company activity profile was critical in the development of the case study descriptions.

A.2 CASE STUDIES AND SUMMARY OF SOCIOECONOMIC IMPACTS

Several businesses were selected for case studies to further explore and describe the socioeconomic impacts of natural gas development in the province. A sample of companies was selected along the development path, from exploration through to production and decommissioning. Case studies were also selected to represent benefits in different geographical regions of Nova Scotia and to include firms of different size and market penetration.

Analysis of the available information identified a number of Nova Scotia-based companies who have participated in the offshore. The participation of Nova Scotia firms occurs under three general contractual arrangements: independently; through a consortium with other Canadian-based companies; or through a consortium with companies outside Nova Scotia and Canada. Generally, due to the size and complexity of the projects and the level of required expertise and capability, these projects are conducted by consortia, with management supervision and additional project team expertise provided by the petroleum companies involved. In the presentation of case studies, Nova Scotia-based firms have been selected that represent a range of different working relationships, from independent sole-service providers to multiple goods and services providers operating through a consortium.

A list of all companies and individuals contacted for information is presented in Appendix B. In order to focus the collection of self-reported, descriptive information from the business community, a questionnaire was developed. For reference, the questionnaire is included in Appendix C. The questionnaire was provided to all respondents and administered in person. In some cases it was necessary to deliver the questionnaire by e-mail and follow-up by telephone to facilitate collection of information.

Study Method

To supplement the information presented in this study, the NSDE, in cooperation with the Nova Scotia Department of Finance (NSDF), completed input-output model runs to quantify the employment, income, value-added and government revenue impacts of offshore development. As input information for the model, the primary source of information was project benefits reports to the CNSOPB. These reports are a regulatory requirement, and must identify project expenditures and all contracts of a value of \$100,000 or greater.

Based on the information collected from the data and literature review, development of the case studies through the use of the questionnaire, and the results of provincial input-output model runs conducted by the NSDE and NSDF, a summary of the economic impacts of the offshore was prepared.

A.3 POTENTIAL FUTURE ECONOMIC BENEFITS

Future scenarios for offshore development were defined in consultation with the NSDE and the CNSOPB, also taking into account the results of the information collected during previous study tasks. A small number of future scenarios were evaluated to predict their likely influence on the provincial economy. The results are described in both qualitative and quantitative terms, relying on the background information collected as part of the data and literature review, information collected from interviews with the business community, and the results of the NSDF input-output model runs. The analysis also examines likely regional and sectoral impacts of future development.

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APPENDIX B
ORGANIZATIONS AND INDIVIDUALS CONTACTED

Table B.1 Individuals and Organizations Contacted

Name	Organization
Peter Rent, President	Accent Engineering: Neill and Gunter
Alan Perry, Chairman	Accent Engineering: CBCL
Ken McCormick, Vice President/General Manager	Aecon/Fabco
Aileen Reid, CEO	A.P. Reid Insurance
James Reid, President	A.P. Reid Insurance
Cory Tanner, Operations Manager	Atlantic Customs Brokers
Liam O'Shea, General Manager	Atlantic Offshore Medical
Sean Lewis, Area Manager	Atlantic Offshore Medical
Bruce Batstone, Unit Manager	AMEC Earth & Environmental
Besim Halef, President	Banc Metal Industries
Mark Healy, General Manager	Black and MacDonald (AMEC)
Pat Wilson, President	Bluewater Agencies Limited
Lucia MacIsaac, Director & Instructor	Cape Breton University
Sean Tucker, Base Manager	CHC
Len Perry, Consultant	Cherubini, formerly Steel and Engine Products (Stenpro)
Paula Lunn, Sales and Customer Support	Cobham Tracking and Locating (Seimec)
Norma Prosper, Environment	Confederacy of Mainland Mi'kmaq (CMM)
Frank Sommerville	DOE (Retired)
John Scott, Business Development Director, QHSE Director	Dominion Diving
Robin Lohnes, CEO, Diving Supervisor	Dominion Diving
Dave Surette, Regional Vice President	Export Development Canada (EDC)
Leonard Thompson, President	Floating Pipeline Company Incorporated
Gary Crotty, Manager	Founders Square Limited
Barry Ryan, Regional Manager	Fugro Jacques GeoSurveys Inc.
Ray Ritcey, President	Heritage Gas Limited
Shawn Amirault, VP Sales & Marketing	Helly Hansen
Fred Smithers, President & CEO	Iona Resources Holdings Ltd.
Tim Brownlow, Director, Government Affairs and Business Development	Irving Shipbuilding Inc.
Hector Jacques, Co-founder	Jacques Whitford
Steve Fudge, Principal & Senior VP, Business Unit Director, Sciences, Atlantic	Jacques Whitford
Brian Taylor, Principal & Project Manager, Geotechnical & Materials Engineering	Jacques Whitford
Martin Karlsen, President	Karlsen Shipping Company Limited
Bud Streeter, Vice President, Marine Manager for Canada	Lloyd's Register North America Inc.
Mark Horswill, Class & Compliance Manager for Canada	Lloyd's Register North America Inc.
Derek Owen, General Manager	Maple LNG
Dr. J. L. Warner, President, CEO, & Manager, Ocean Engineering Group	Martec
Claude desRoachers, Manager, Structural Analysis Group	Martec
Shaun Reid, President and General Manager	Mulgrave Machine Works Limited
Malcolm Swinemer, Vice President	North Atlantic Marine Terminals Ltd.
Sterling Feener, Manager, Business Development	Nova Scotia Community College (Marconi Campus)
Bruce Clark, Project Manager, School of Trades & Technology	Nova Scotia Community College (Marconi Campus)
Paul McEachern, Managing Director	OTANS
Susan Helliwell, CEO	Praxes
Angus Borland, President	Remote Access Technologies
Cory Tanner, Manager ctanner@matherslogistics.com	R. H. Mathers Co.
Graham Bagnell, Engineering Manager	Rowan Companies Inc.
Tony LaPierre, President	RPS Energy Canada Ltd. (formerly Geoprojects Canada Limited)
David Lombardi, President	Seaforth Engineering

Table B.1 Individuals and Organizations Contacted

Name	Organization
Dwayne Smithers, VP & General Manager	Secunda Marine Services
Dan Gibson, Executive Vice President of Clayton Developments Limited	Shaw Group Ltd.
A. William Moreira, Q.C., Partner	Stewart, McKelvey, Stirling and Scales
Peter Gibbs, President	Survival Systems Training Limited
Albert Bohemier, CEO	Survival Systems Limited
John Swain, CEO	Survival Systems Training Limited
Paul Mulrooney, General Manager	Tenaris (formerly R.F. Ironworks Limited Partnership)
Anthony Hall, Managing Director	Welaptega Marine Limited

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**APPENDIX C
INDUSTRY QUESTIONNAIRE**



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Jacques Whitford Stantec Limited
3 Spectacle Lake Drive
Dartmouth NS B3B 1W8
Tel: (902) 468-7777
Fax: (902) 468-9009

Questionnaire for Business

**12-Year Retrospective Offshore
Natural Gas in Nova Scotia**

June 2009

1.0 Introduction

We are contacting you on behalf of the Nova Scotia Department of Energy. We have been asked to interview companies and organizations that have been involved in some way by natural gas production in Nova Scotia between 1996 and 2008.

The Department of Energy is seeking a broad perspective on the business impacts of natural gas production on the provincial economy. The insights gained from this analysis and identification of lessons learned will provide valuable information to the government and assist decision-making regarding future development of the offshore. It is also expected that our report to the Department of Energy will form the basis of a public document that they will later produce.

We would like to ask you to participate in an interview. You will be asked questions about your company's involvement with the natural gas industry in the province. We are interested in hearing your story as it pertains to the offshore over the last 12 years. In telling your story, we would like you to consider describing:

- Characteristics of your business and involvement in the offshore;
- History of growth and changes in the business over time;
- Investments and innovations;
- Partnerships and joint ventures;
- Challenges and lessons learned; and
- Future plans and opportunities.

Information that you provide during this interview may be presented in our report to the Department of Energy and other stakeholders, with an attribution to the individual and organization providing the information. However, during the interview please identify any specific information that you wish not to be reported or for which you have confidentiality concerns.

2.0 General Information

Date:

Participant's Name:

Organization:

Address:

Telephone:

E-mail:

3.0 Business Activities

1. What is the name of the business and what is its legal structure?
2. What is the age of the company?
3. How many years has your company been active in Nova Scotia?
4. Where is your business located? Multiple locations, countries?

9. How many employees does your business have? What is the number directly involved in providing goods or services to the offshore?

10. Can you estimate what proportion of your revenue is directly and/or indirectly tied to the petroleum industry in 2008? How has this changed since 1996?

11. For all petroleum industry revenue, can you estimate what proportion is for sales within Nova Scotia? Elsewhere in Canada? Outside of Canada?

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QUESTIONNAIRE

4. Has your business experienced any innovations as a result of the offshore industry?

5. How has work in the offshore altered the way you do business? How has it contributed to your business entrepreneurship?

7.0 Lessons Learned

1. What lessons has your business learned in its dealings with the offshore industry in Nova Scotia? What has it done well, what could be done better?

2. What were/are the key challenges in doing business with the offshore?

