Future Human Resources Development in British Columbia's Offshore Oil & Gas Industry

PRELIMINARY ANALYSIS

BC INNOVATION COUNCIL

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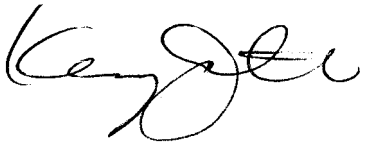

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EXECUTIVE SUMMARY

In February 2004, the BC Innovation Council contracted with Human Capital Strategies to complete a preliminary analysis of human resource requirements and issues associated with offshore oil and gas. This report represents a preliminary analysis as a first step of building blocks towards the provincial government goal of facilitating the start up and development of "scientifically sound and environmentally responsible" offshore oil and gas development in BC.

This analysis concludes the following:

- **That if the moratorium on BC offshore oil and gas development is lifted and exploration and development occur, significant incremental employment growth could be generated.**
- **If the current growth in onshore oil and gas activity continues, combined with Northern, East Coast and global offshore demand pressures on the supply of skilled labour for any future offshore oil and gas development in BC will be significant.**
- **A series of steps can and should be taken to research and analyze more specific labour demand and supply details for the BC offshore industry.**
- **If British Columbia is to efficiently meet the labour demands of the industry and also to ensure that British Columbians are prepared to participate in employment opportunities as they are developed, it will be necessary that programs be planned and implemented (based on the above mentioned analysis).**
- **Thirty-one recommendations within eight broad categories of activities are provided in chapter 8 of this report. The recommendations call for collaborative planning among government, industry, community and education stakeholders. They reflect an immediate priority for further research, analysis, labour demand and supply modelling, and human resource planning.**
- **The research for this report entailed in-depth analysis of relevant literature, gathering and analysis of available data, and interviews with several key industry and stakeholder representatives and experts, a brief outline of which follows:**

LABOUR DEMAND

- A diverse array of over 300 occupations are involved offshore oil and gas activity, ranging from owner/operators, drilling, logistics, catering and accommodation to environmental consulting, engineering, specialty services, and onshore support.
- Excluding future offshore oil and gas development impacts, the labour demand in job categories most related to offshore oil and gas is projected to reach 27,000 new employment openings in the 10-year period ending 2011. This is very sizeable given the current employment of just over 10,000 in BC oil and gas activity. Estimates of the needed skills will not be clear until there is a better sense of the results of exploration, changing technology and policy considerations in the longer term.
- Indications of incremental labour demand from offshore oil and gas development on the East Coast show very significant positive impacts. In Newfoundland and Labrador, offshore oil and gas activity created an estimated annual average of almost 14,000 person years of incremental employment during 1999-2002.
- The East Coast experience also shows a significant employment multiplier impact of offshore development—averaging 3 jobs per 1 offshore job—higher than those associated with typical resource extraction industries such as logging and mining. Local benefits from future projects will vary depending on the nature of the resources and on the policies and technologies.

- This report estimated total person years of employment generated as a result of one offshore oil and gas project. Based on East Coast experiences, it is estimated that one fixed-production platform could result in 15,148 person years of employment or approximately twice BC's present oil and gas employment.
- East Coast patterns of employment growth in each phase of oil and gas activity show skilled trades were most prominent in the development phase and much less so in other phases. Marine occupations were significant in all phases, particularly in exploration and production. Engineering jobs were most significant during exploration and development; while technician/technologist demand was spread across phases.

LABOUR DEMAND-SUPPLY GAPS AND BARRIERS

- A labour demand-supply analysis indicates that potential sources of supply could provide enough workers to satisfy demand in some occupations. However, potential shortages are projected in 13 of the 33 occupational categories considered, with some likely to face a deficit well over 50% of their respective demand. Without good planning, major industrial development activities in the province could further exacerbate these gaps, should offshore development take place concurrently.
- It is also important to note that these estimates of labour gaps have been derived from comparing "base" demand and existing sources of labour supply, and have not taken into account the incremental labour demand associated with potential offshore oil and gas activities. Therefore, should offshore development occur, projected surpluses would be lessened, while projected shortages would be elevated.
- In terms of labour gaps in the East Coast experience, studies identified several "difficult to recruit" positions. Human resource gaps identified in the East Coast and onshore experiences include skill exportability, cross-sector applicability, cyclical/non-traditional nature of offshore work, and the need for multi-skilling. Other pressures include the global nature of highly skilled offshore talent, increasing education requirements, information deficiencies, and access for non-traditional workforce groups.

LESSONS LEARNED FROM OTHER JURISDICTIONS

- A key factor in the development of offshore oil and gas is the local community role. The cyclical nature of offshore oil and gas can restrict what can be done locally. Local communities see the oil and gas industry as a way to diversify their economy, but may have unrealistic expectations and poorly informed about the nature of offshore activities. Offshore development should be seen as only a part of an area's economic development strategy.
- This report also briefly looked at the evolution of policies on offshore development in other countries such as the U.K. and Norway, where they have moved from intervention to facilitation to bring together all parties to develop a common vision for the development of the industry, using a collaborative approach.
- A review of the experiences elsewhere identified successful human resource practices offshore oil and gas companies are using to address skills shortages, including competency-based training and selection, partnerships (union/ management/ government/education), experiential learning models such as apprenticeship and co-op, innovative training delivery, and alternative work arrangements.
- Offshore oil and gas education and training in Canada is a critical success factor in the East Coast offshore activity, where a network of several post-secondary institutions created specialized and mature offshore-related training and research. Alberta has also developed onshore oil and gas training programs, some of which can be used for offshore skill requirements. BC post-secondary institutions have had little involvement in offshore-specific training, but most coastal/northern institutions have trades, technical and science programs which can be expanded and adapted for offshore oil and gas.
- There is an expectation that there will likely be an influx of experienced professional engineers, trades workers, and labourers from outside the province, during initial seismic testing and exploration. Training

highly technical and specialized engineers, technicians, and tradespersons should only be undertaken when the long-term prospect of on-going production is favourable.

- Governments can take coordinated steps to ensure the public, especially those making career decisions, is aware of the many employment opportunities available from such industry development. Planning and development of education and training strategies should begin half a decade in advance of offshore exploration, first focusing on adapting existing onshore oil and gas and marine programs and on generic skill sets that can be transferred between offshore and onshore development.

IMPLICATIONS OF FINDINGS

- Some experts feel there will be an adequate amount of labour arising from the downsizing of BC's traditional resource industries which could transfer to the offshore oil and gas sector with minimal upgrading. A more common view is that BC's labour market is not currently meeting its own needs with respect to trades and technical workers, and offshore development will only exacerbate skilled labour supply gaps.

- Ensuring that there is an adequate supply of suitable workers is an important policy concern, and decisions will be needed concerning local hiring requirements. While there could be less local jobs for BC workers in early stages of development, workers for the marine sector and onshore support components can be locally supplied, providing a considerable number of jobs until the more job-intensive construction and production phases begin. Other factors in offshore oil and gas development were also identified, including:

  The combination of rapidly changing technology and the expected timelines of offshore production in BC mean that work and skills could look very different several years from now.
  Planning for offshore development needs to reflect the fact that companies and workers are very much part of a global industry where companies and institutions need to train for global markets.
  Skills requirements and the nature and extent of human resources will depend on negotiating to maximize economic benefits.
  Many of the trades, technical, marine and professional occupations required for offshore oil and gas development require several years of education and training.
  There are different viewpoints regarding transferability between offshore and onshore skills.

- In addition to training measures, a full range of public policy options should be taken into account when planning how to address offshore-related skill requirements. These would range from scheduling and work-restructuring strategies to recruitment and retention measures to removing regulatory disincentives and innovative local agreements.
- For short term and highly specialized occupations, the most likely source of supply in the earlier stages of the industry's development in BC, will be bringing in labour from other parts of Canada and abroad, especially for the non-production phases which are, by their nature, of limited duration. As the industry becomes established and for the longer term jobs in production, more local labour can be used.
- This report shows that developing BC's offshore oil and gas resources will result in a significant increase in demand for workers, although the exact numbers and occupational mix of such workers can only be determined once the nature of resources to be developed are specified and technologies are determined.
- Several components of the skills required for offshore oil and gas workers will need to be considered, including generic skills which would not be specific to offshore oil and gas activity, skills needed in onshore oil and gas production, skills specific to the offshore sector, and skill demand from both indirect employment in the supply and support industries and induced employment from spending of workers in offshore jobs.
- The shortages most likely to be experienced in staffing a BC offshore oil and gas sector are for trades workers, technicians and production workers experienced in oil and gas construction and production. Since these workers are currently in short supply, efforts should be undertaken soon to increase their numbers.

1. INTRODUCTION

1.1 Purpose and Context[1]

From David Strong, Patricia Gallagher and Derek Muggeridge, *British Columbia Offshore Hydrocarbon Development: Report of the Scientific Review Panel*, *Volumes I and II* (January 2002).

5.6.1 Human Resource Development Strategy

One of the lessons learned from the eastern Canada offshore experience is that new opportunities for provincial and local employment can be lost in the absence of a concerted, multi-agency planning effort. The job market does not adjust quickly or automatically when a decision is made to begin or resume exploratory offshore drilling. It is essential to alleviate the already difficult challenges in recruitment of skilled and highly qualified people. An appropriate technical training program would be designed to encompass a wide variety of technical skills covering the entire range of the ocean technology industry. BC educational institutions that specialize in vocational training should be assisted to develop offshore-related courses in consultation with the appropriate sectors of the petroleum industry and others in BC, and perhaps with specialized institutions elsewhere. Such courses should be made available throughout BC.

Recommendation 11: If the BC government should decide to begin preparation for offshore exploration, one of its first steps should be to design a strategy for the training of British Columbians and the wide range of job requirements and opportunities associated with these activities.

The upstream petroleum industry in Canada, including offshore oil and gas activity, has grown by 250 percent since 1990, and today spends $65 billion a year, accounting for 6 percent of the country's GDP and employment of over 120,000 (Petroleum Human Resources Council of Canada, 2003). It has become a growing driver of Canada's regional and national economies, with offshore development becoming a more significant part of it.

It was particularly noteworthy that during the course of completing this project and report, an increasing number of industry and media reports have shown evidence of increasing labour demand and skill shortages in onshore oil and gas in Canada. If this continues, combined with Northern, East Coast and global offshore demand, it will increase pressures on the supply of skilled labour for any future offshore oil and gas development in BC.

Since 2001, three major studies have concluded that there are no apparent scientific or technological impediments to lifting a longstanding moratorium on West Coast oil and gas exploration and development (Jacques Whitford Environment Limited, 2001; Strong, Gallagher and Muggerridge, 2002; and Addison, Dower, Hall and Jordaan, 2004).

In 2002, the Government of British Columbia made a commitment in its energy policy ("Energy for our Future: A Plan for BC") to address "scientifically sound and environmentally responsible offshore oil and gas development." The February 11, 2003 Throne Speech outlined the BC government's direction, stating that "by 2010, your Government wants to have an offshore oil and gas industry that is up and running, environmentally sound and booming with job creation."

[1] See Appendix A for a chronological summary of British Columbia's history of engaging in oil and gas development.

Last year, the federal government announced the appointment of a public review panel, chaired by Roland Priddle. This panel is to conduct public hearings after the report of the independent science review panel chaired by Dr. Jeremy Hall and released earlier this year. Interested parties throughout BC will have the opportunity to express their views on matters relevant to the moratorium on exploration and development of offshore oil and gas reserves in the province. These matters include science, the environment, protected areas, and socioeconomic issues.

In February 2004, the BC Innovation Council contracted with Human Capital Strategies to complete a preliminary analysis of labour demand and supply and implications for future human resources development associated with BC offshore oil and gas development. This report is intended to be a first building block in a staged development of human resources planning and preparation to support BC's offshore oil and gas development.

The project was initiated to achieve the following objectives:

- Highlight the broader planning environment of BC offshore oil and gas development and the potential pressures and impacts of economic, social, demographic and political factors;
- Identify effective practices, pitfalls to avoid, and critical success factors in the experience of other jurisdictions regarding oil and gas human resources;
- Provide a high level analysis of current and future labour demand and labour supply for the BC offshore oil and gas development;
- Identify potential gaps in human resources which could adversely affect BC offshore oil and gas development;
- Identify key occupations and skill sets and training needs in the oil and gas, ocean/marine, support/service sectors associated with BC offshore oil and gas development and other industries which may share certain skills;
- Provide an overview of education and training programs, providers and requirements;
- Assess and identify general options for addressing potential human resource supply shortages and other human resource issues regarding BC offshore oil and gas development; and,
- Provide recommendations on next steps and future research and analysis.

1.2 Project Context and Scope

As will be shown later in this report, the implementation of offshore oil and gas development would result in a significant increase in the demand for human resources in BC. This increased demand—when added to competition for some similar skill sets from onshore oil and gas activity and from other industries—means careful long-term planning is needed now.

Offshore oil and gas activities comprise a series of sub-sectors related to various phases of the industry. The labour demand and supply associated with the four phases of oil and gas—exploration, development, production, and decommissioning—are reviewed in this report. Each phase entails different human resource requirement implications, with energy, ocean marine, and support service needs reflected throughout each phase. An increase in labour demand would involve many different occupational groups ranging from skilled trades and technicians, to mariners and aviators, to engineers, medics and other professions as well as those in supporting activities such as providing supplies, food, and accommodation.

The primary issue facing governments, educational and training institutes, as well as the petroleum and marine industries, is how to assess the likely demand for these various types of human resources, both in terms of numbers of employees and competencies, in order to facilitate the provision of the necessary industry career promotion, recruitment, training and education, retention and other strategies to meet this demand.
The occupational scope of analysis involves all skill levels, including operators, technicians, technologists, trades, maintenance, marine, administrative, service, and management positions. These include those occupations specific to offshore oil and gas and those this sector shares with other industries. This analysis considers transferability of skills between offshore oil and gas and other sectors.

Depending on the occupation and skill and the extent of labour mobility, a labour supply analysis needs to consider skilled workers in other regions and countries. The geographic breadth of the scope of the labour market in offshore oil and gas development varies with the transferability of and competition for such occupations and skills. This report briefly considers to what extent labour and skills used in oil and gas development in other regions of Canada and abroad are transferable to BC offshore development. As will be shown later in this report, an obvious factor in offshore oil and gas is that it is a global industry with an internationally mobile labour force.

All levels and methods of formal education and training are considered in this analysis, including apprenticeship and other work-based training programs, career/technical/vocational education, high school, online learning, college, university and post-graduate education.

Findings from other jurisdictions are considered for their application to the BC situation. Changing technology, practices and geography affect how labour is used to execute various tasks and jobs, and will need to be factored into the degree of applicability to BC based on what we have learned from other areas and times.

The labour market will undoubtedly grow in BC over the next decade, and the analysis in this report has attempted to differentiate between "base" (i.e., without offshore oil and gas development) and "incremental" (i.e., from offshore oil and gas development) growth to the extent possible within time constraints and limited available data.

1.3 Project Methodology

The research process for this project entailed both secondary and primary research methodologies. On the secondary research, an extensive literature review and limited data gathering was performed. Primary research involved in-depth personal interviews with several key industry and stakeholder representatives. Synthesis and analysis of research findings are provided in this report.

See Appendix B for more details on the project methodology, including a list of interviewees, and the questionnaire instrument.

2. BROAD ECONOMIC, SOCIAL AND INDUSTRY ENVIRONMENT

Projected labour demand and supply, and potential human resources development issues in BC's offshore oil and gas industry must be considered within the broader economic, social and policy environment. These broader contextual factors will directly influence the quantity and quality of required talent and will affect the efficacy of future policy, program and operational measures.

In a comprehensive review of the environment of Canada's oil and gas activities, the Petroleum Human Resources Council of Canada identified the following key influences on human resources issues in the upstream petroleum industry:

- Globalization and the mobility of investment capital;
- Cyclical economic conditions;
- Operational excellence business model;
- Government regulatory requirements;
- Stakeholder expectations for involvement;
- Technological advances;
- Changing demographics; and,
- Workplace skills.

2.1 Economic and Demographic Context

The economy of BC, now and through the planning horizon, is and will be become less dependent on the traditional resource sectors of forestry, on-land mining and fishing, and will move toward newer extractive sectors like offshore oil and gas and a broader spectrum of higher technologically based industries such as information technology and biotechnology.

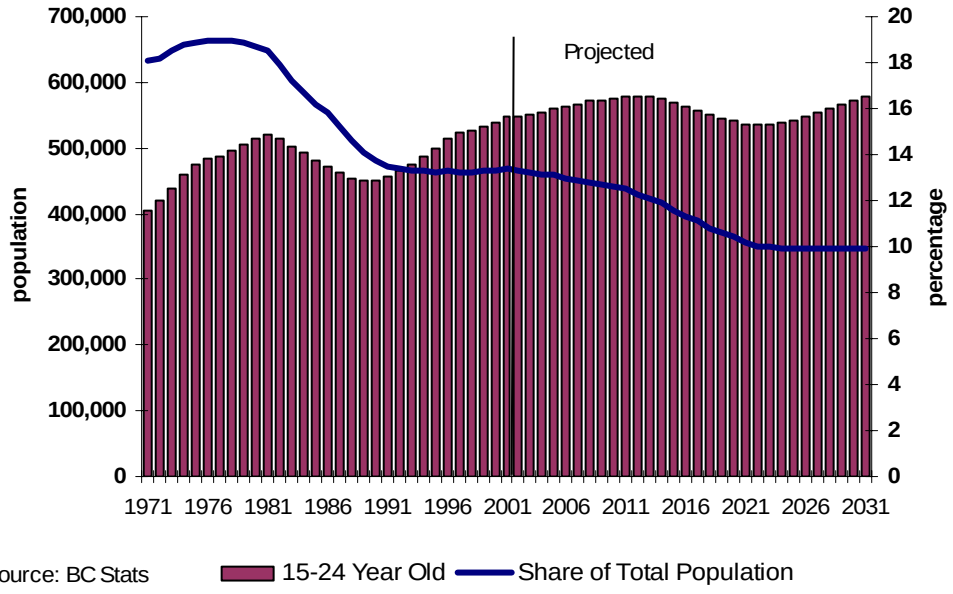
This trend will increase the demand for the skilled trades, technical workers and professionals while reducing the demand for those workers who are unskilled or who possess only basic skills. Many of the newly redundant workers will be located in the non-metropolitan areas of the province. They will require geographic and or occupational mobility and appropriate upgrading to meet rising skill requirements.

As BC moves further into the 21st century, other factors will challenge the successful operation of province's labour market. The demographic trend of an aging workforce is well documented with high proportions of trades workers, professional, managers and others fast approaching retirement years. The numbers of trainees and young workers entering many of these occupational groups will not be sufficient to replace expected retirees and fill newly created positions. This problem is exacerbated in those specialty occupations (e.g., the marine sector) where specific and/or local work experience is required that cannot be replaced by institutional training.

As Figure 1 shows, a prime labour force supply cohort, 15-24 year-olds represented over 18 percent of the BC population in 1971, and its share of the population will decline to under 10 percent by 2031.

Figure 1

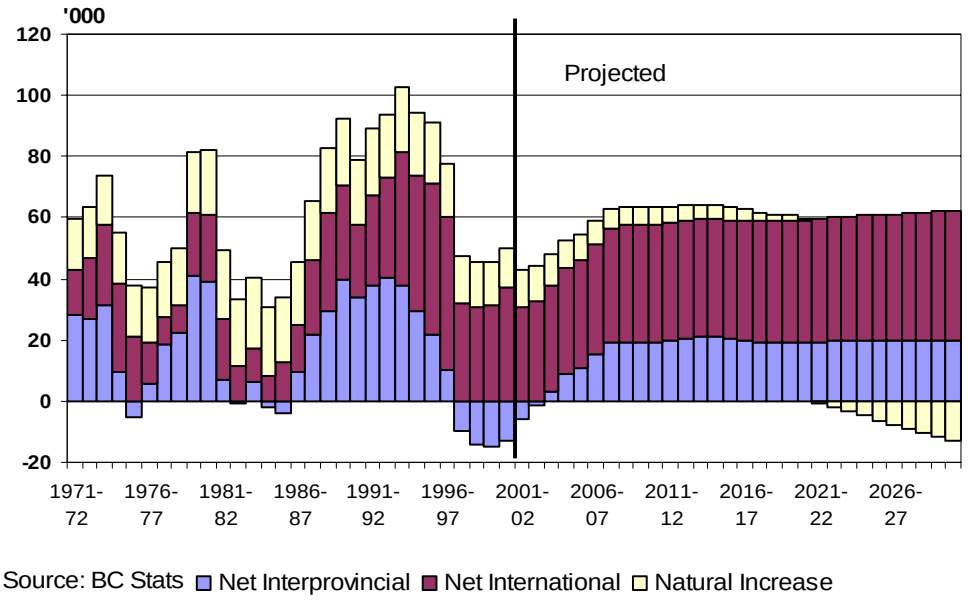
Population of Age 15-24 Years in BC, 1971 to 2031



To counter demographic factors, employers will need to turn to less traditional pools of labour supply such as women, Aboriginal people, and people trained outside the country. Changes and adjustments will be required by all parties involved. As Figure 2 clearly shows, immigration will continue to represent the large majority of BC net labour supply growth.

Figure 2

Components of Population Change, 1971/72 to 2030/31



Not only is offshore oil and gas a global industry, but also labour markets generally are spanning wider geographic areas within and across countries. This is especially true for skilled workers and professionals. Attraction and retention of suitable human resources become an increasing challenge to employers in this environment, particularly for those employers who require workers to move to remote work areas away from home.

Adding further momentum to labour mobility will be the growing number of major projects in BC and beyond competing for workers, skills and managerial talent. In BC alone, the 2010 Olympics and other major projects during 2003-2015 will generate approximately 130,000 person years of labour demand in addition to base growth of over 900,000 job openings (Roslyn Kunin & Associates, Inc., April 2003). Additional demand will be generated by other major projects in infrastructure and private developments in BC and elsewhere – many of them will be in energy production sectors and thus having overlapping demands for workers with offshore oil and gas experience.

Major energy projects outside BC may make it difficult to recruit and retain skilled workers during the development and production of BC offshore oil and gas. For example the Syncrude expansion, the Horizon Oil Sands project and the Mackenzie Valley Pipeline project are expected to exacerbate an already tight oil and gas labour market.[2]

A recent Canada West Foundation study found labour shortages to be highly prevalent in Western Canada (Hirsch, 2004):

> The industries encompass all major sectors including health care, professional and scientific industries, education, trades, and natural resources. The results of this snapshot are indicative of a looming problem: four fifths of the respondents indicate "some" or "severe" difficulty finding qualified labour currently; almost all of them anticipate some degree of difficulty in the coming five years. While the questionnaire was not large enough to constitute scientific accuracy, it is clearly an indication of a serious problem.

For the foreseeable future, demand for traditional sources of energy is likely to remain high. Technological advances may moderate this demand, but these are not likely to be quantitatively significant in the intermediate future and could well be offset by the rapidly growing demand for energy in developing economies like China. Nevertheless, BC will have to be competitive with other traditional energy sources, meet high environmental standards and successfully address First Nations' issues.

2.2 Emerging trends in the global offshore oil and gas industry

Introduction of new technologies are a key driver of human resource requirements in offshore oil and gas development. Examples of such technologies include improved seismic capabilities, developments in directional drilling, further automation, and a move from fixed production platforms to floating systems and sub-sea completions.

There have been great advances made in the use of downhull and underwater separation of oil and gas from associated condensates and liquids. Use of this technology means that topside structures on platforms—frequently the source of considerable local employment for finishing and installation—are not required for separation and stabilization of oil for export. In parts of the North Sea, sub-sea separation technology is being used and this appears to be the direction of the future.

[2] For example, see Michelle DaCruz, "Oilsands players gird for labour crunch." National Post, p. FP5, March 6, 2004; and Claudia Cattaneo and Kate MacNamara, "Oil and gas drilling labour crunch: Busiest winter season crippled by shortage." National Post, p FP1 and FP10, March 15, 2004.

The general implication of these trends is that they reduce the potential for local employment and local production of goods and services for the offshore industry (Jacques Whitford Environment Ltd., 2001).

New business approaches in offshore oil and gas development frequently emerge throughout the world. Practices such as a greater focus on 'core business' interests by oil companies, an associated increased reliance on contractors including use of alliances, and growth in the pooling or sharing of assets by different operators affect what skills are needed and how they are used.

This means that in the initial stages of offshore testing and exploration, companies are more likely to contract out more specialized jobs to a mobile workforce rather than train local workers. Resource pooling also means that the total size of local opportunities may be limited, as such opportunities will be concentrated in the hands of a limited number of companies. However, in the subsequent construction and production stages and from support industries, many more business development and employment opportunities can be expected. Further, during the initial stages, major petroleum companies involved in the exploration phase rely heavily on local marine and other suppliers of goods and services.

The continued globalization of the offshore oil and gas industry is prevalent, especially in the expansion of the contracting sector. This means that operators are more aware of the range of prospects worldwide; and that the potential supply community needs to be aware of the implications of the global marketplace and the need to be globally competitive.

3. CURRENT AND FUTURE LABOUR DEMAND

The scope of analysis of this project required that components of the offshore oil and gas activity be clearly defined. Offshore oil and gas activity is comprised of a series of sub-sectors related to various phases of the activity. As previously indicated, in general, there are four phases of oil and gas activity: exploration, development, production, and decommissioning. Each phase entails different human resource requirement implications. In this section, the four phases of oil and gas development are described in turn. Thereafter, sub-sectors of offshore oil and gas will be defined. Finally, the occupational mix related to offshore oil and gas activity will be described. Illustrative estimates of labour demand will also be shown during a production phase, based on a number of technologies utilized.

The bottom line is that from all indications of the experiences in other jurisdictions, in the medium to long-term, offshore oil and gas development is a significant job creator for local and regional economies, and there is every reason to expect the experience to be the same in BC if offshore development is pursued—even notwithstanding technological advances and other economic, social and policy factors.

3.1 Offshore Oil and Gas Phases

The *BC Offshore Oil and Gas Technology Update* (Jacques Whitford Environment Limited, 2001), provides a very good description of the main phases of offshore oil and gas development, which are summarized below.

Exploration

Exploration consists of seismic surveys and exploration drilling to determine the existence of commercial petroleum reserves in licensed areas. Exploration work requires the use of expensive and highly mobile equipment, including seismic vessels, drilling rigs, supply/support vessels, and helicopters. Typically these are owned and operated by specialist multinational companies that undertake exploration for oil companies on a contractual basis. Labour requirements vary, but are generally believed to be short term and specialized. For example, a seismic program may last only a few weeks and use a crew of 20 to 30 individuals. A single well drilling program can be completed in three to four months using a rig with a crew of approximately 45 and two or three support vessels crewed by approximately 12 persons each.

In addition to offshore activity described above, onshore support includes wharf space, heliports, storage yards, office space, hotel space and administrative centres.

Development

This phase involves the design, construction and installation of production equipment, including systems to bring the oil and/or gas onshore. Traditionally, production equipment consisted of steel or concrete platforms, containing drilling and processing facilities and associated accommodations, resting on the seabed. Such equipment is usually massive and expensive to build. However, with the advancement of technology, there is increasing use of floating production, storage and off-loading systems (FPSOs) and other floating production systems. Major components of such production systems can be manufactured at great distance from a field, although they still need to be assembled at facilities close to the field.

There has also been an increased use of tankers rather than pipelines to transport oil ashore, but gas is still normally transported by pipelines. Offshore pipelines are laid by specialized pipe laying vessels imported from the international market.[3]

[3] *British Columbia Offshore Oil and Gas Technology Update*. Jacques Whitford Environment Ltd., October 19, 2001, p. 145.

Production

The production phase for a large field can last for several decades, although for small fields it could be much shorter. Production over a long period of time is potentially the most stable and beneficial phase of oil and gas activity to any jurisdiction. It can generate a substantial number of jobs in operations, maintenance, and the periodic upgrade of systems. Furthermore, it signals a very significant fixed investment by an oil and gas company or companies, which usually leads to use of local sources of supply and services. With the change in technologies, labour requirements associated with production in BC could be quite different from current practices. See the trends referred to above.

Decommissioning

The socio-economic impact of an offshore oil and gas field decommissioning is difficult to estimate at this point since only one field has been decommissioned off Canada's East Coast so far. With the change in technologies, labour requirements associated with decommissioning in BC could be quite different from current practices. In any case, the human resources required to decommission an operation are not expected to be large or long lasting.

3.2 Industry and Occupational Scope

Industry Classification

Having described these four phases of offshore oil and gas activity, industry sub-sectors associated with such an activity can be summarized as including the categories listed in Table 1, based upon the North American Industry Classification System (NAICS) 2002.

Table 1

NAICS	Industry Classification	Example Activities
211113	Conventional Oil Extraction	Crude oil, conventional, waterflood recovering
213111	Oil and Gas Contract Drilling	Directional drilling of oil and gas wells, on a contract basis
213118	Services to Oil and Gas Extraction	Fire-fighting service, other than forestry or public Servicing oil and gas wells, on a contract basis
237120	Oil and Gas Pipeline and Related Structures Construction	Pipelines, gas and oil, construction Storage tanks, natural gas or oil, construction
336611	Ship Building and Repairing	Drilling and production platforms, floating, oil and gas, building
483115	Deep Sea Transportation	Supply vessels to drilling rigs
541360	Geophysical Surveying and Mapping Services	Seismic drilling Seismic geophysical surveying services
541690	Other Scientific and Technical Consulting Services	Occupational health and safety consulting services

Occupational Distribution

In total, a list of over 300 occupations exists for offshore oil and gas activity, covering the exploration, development and production phases.

In this sub-section, only the major occupational groups present in offshore oil and gas development and production are summarized. These occupational groups, based on National Occupational Classification (NOC) categories, have been grouped by industry sub-sector activity where applicable.

Table 2 provides a list of the key occupational categories and job titles in offshore oil and gas development. This list of occupational categories is based on the most comprehensive nomenclature of offshore oil and gas occupations in Canada, the*Labour Market Assessment of the Oil and Gas Industry Supply and Service Sector in Newfoundland and Labrador* (Strategic Directions Inc., 2002). See Appendix E for descriptions of many of these occupational categories.

Table 2

Sub-Sector	NOC Reference	Example Titles
Owner/Operator	0210 Engineering, Science and Architecture Managers	▪ Engineering Manager ▪ Senior Engineering Manager (Subsea Engineering Manager, Topsides Engineering Manager, Turret Engineering Manager, Hull Engineering Manager)
	0711 Construction Managers	▪ Installation managers ▪ Construction managers
	0811, Primary Production Managers	▪ Drilling Manager ▪ Offshore Installation Manager
	2113, Petrophysicist	▪ Petrophysicist ▪ Geophysicist ▪ Petroleum Geologist
	2142 Metallurgical and Materials Engineers	▪ Corrosion Engineer
	2145, Reservoir Engineer, Petroleum	▪ Reservoir Manager ▪ Reservoir Engineer
	2273, Deck Officers, Water Transport	▪ Master – Marine
	2274, Engineer Officers, Water Transport	▪ Chief Engineer – Marine
	8222, Supervisors, Oil and Gas Drilling and Service	▪ Rig Superintendent
	9232, Process Technician, Refinery	▪ Process/Field Operator
Drilling	0811, Primary Production Managers	▪ Offshore Installation Manager (Drilling)
	1225, Material Management Officer	▪ Materials Coordinator (Rig Operations)
	2145, Subsea Engineer	▪ Subsea Technician
	2243, Industrial Instrument Technicians and Mechanics	▪ Instrumentation-Electronics Technician
	2263 Inspectors in Public and Environmental Health and Occupational Health and Safety	▪ Health Safety Environment Quality Officer
	2273, Deck Officers, Water Transport	▪ Ballast Control Operator ▪ Dynamic Positioning/Stability Technician
	2274, Engineer Officers, Water Transport	▪ Chief Engineer – Marine (Drill Rig)
	7272, Industrial Electricians	▪ Electrical Technician (Marine)
	7311, Industrial Mechanic	▪ Mechanical Technician
	7371, Crane Operator, Offshore Drilling	▪ Offshore Crane Operator
	7422 Maintenance Equipment Operators	▪ Maintenance Support Technician (Drilling)
	8222, Supervisor, Oil and Gas Drilling and Service	▪ Well Services Manager ▪ Drilling Supervisor ▪ Drilling Superintendent ▪ Drilling and Completions Manager ▪ Drilling Coordinator ▪ Toolpusher ▪ Rig Manager

Table 2 (cont'd)

Sub-Sector	NOC Reference	Example Titles
Drilling (cont'd)	8232, Oil and Gas Well Drillers, Servicers, Testers and Related Workers	▪ Directional Driller ▪ Driller/Assistant Driller ▪ Drilling Technician (Senior, Intermediate Junior) ▪ Control Technician ▪ Drilling Specialist
	8615 Oil and Gas Drilling, Servicing and Related Labourers	▪ Roustabouts ▪ Roughneck ▪ Stevedores ▪ Derrickperson/Assistant Derrickperson
Well Services	2132 Mechanical Engineers	▪ Completions Engineer ▪ Production Engineer (Senior, Intermediate)
	2145, Offshore Drilling Engineer	▪ Well Planning/Drilling Engineer
	2212, Geological and Mineral Technologists and Technicians (Petroleum Technician)	▪ Completions Tool Technician ▪ Liner Hanger Technician ▪ Casing Running Technician ▪ Gun Mechanic
	2261, Non Destructive Testers and Inspectors	▪ Thread Inspector
	8232, Fishing Tool Operator, Oil Field Services	▪ Fishing Tools Supervisor ▪ Directional Drilling Engineer ▪ Permanent Downhole Gauges Coordinator ▪ Slickline Supervisor
	8412, Oil and Gas Well Drilling Workers and Service Operators	▪ Cementing Engineer – Well Services ▪ Coil Tubing Supervisor
Marine Logistics and Transportation	0713 Transportation Managers	▪ Logistics Manager
	2271, Helicopter Pilot	▪ Helicopter Pilot ▪ Helicopter Captain ▪ Helicopter Co-Pilot ▪ Aircraft Base Manager ▪ Aircraft Assistant Base Manager
	2273, Deck Officers, Water Transport	▪ Master – Marine ▪ Second Mate ▪ Third Mate ▪ Ballast Control Operator ▪ Dynamic Positioning/Stability Technician
	2274, Engineer Officers, Water Transport	▪ Second, Third and Fourth Engineer ▪ Barge Engineer
	7315 Aircraft Mechanics and Aircraft Inspectors	▪ Aircraft Technician
	7382 Commercial Divers	▪ Diver
Catering and Accommodation	6241, Chefs	▪ Chef
	6242, Cooks	▪ Cook
	6453, Food and Beverage Servers	▪ Chief Stewart ▪ Caterer
Electrical and Instrumentation	2132, Piping Engineer	▪ Piping Engineer
	2133, Electrical Engineer	▪ Electrical Engineer
	2261, Nondestructive Testers and Inspectors	▪ Vibration Specialist
	7242 Industrial Electricians	▪ Electrician ▪ Instrumentation (Intermediate, Senior/Supervisor)

Table 2 (cont'd)

Sub-Sector	NOC Reference	Example Titles
Environmental Consulting	2113, Physical Oceanographer	▪ Physical Oceanographer
	2114, Weather Forecaster	▪ Weather Forecaster
	2121, Marine Biologist	▪ Marine Biologist
	2132, Acoustics Engineer	▪ Acoustic Engineer
	2263 Inspectors in Public and Environmental Health and Occupational Health and Safety	▪ Environmental Observer
Inspection Services	2131, Civil Inspection Engineer	▪ Inspection Engineer
	2132, Mechanical Engineer	▪ Mechanical Engineer
	2261, Non Destructive Testers and Inspectors	▪ NDT Technician ▪ Tubular - Drill Pipe Inspector
	4161, Industrial Hygienist	▪ Certified Industrial Hygienist
Engineering Design and Fabrication	0112, Occupational Health & Safety Manager	▪ Health, Safety and Environment Manager
	0211, Engineering Service Quality Control Manager	▪ QA/QC Manager
	2131, Civil Engineers	▪ Structural Engineer
	2133, Electrical Engineers	▪ Instrumentation Engineer
	2134, Process Engineer	▪ Process Engineer ▪ Loss Control Engineer
	2141, Quality Control Engineer	▪ QA/QC Manager
	2233, Quality Assurance Technologist	▪ QA/QC Inspector ▪ QA Inspector
	2243, Industrial Instrument Technicians and Mechanics	▪ Instrumentation/Electronics Technician
	2253 Drafting Technologists and Technicians	▪ Draftsperson ▪ Designer
	7252, Steamfitters, Pipefitters	▪ Pipefitter (Exotic Materials) ▪ Pipefitter (apprentice, journeyperson, senior, supervisor) ▪ Tubefitter ▪ Industrial plumber
	7263 Structural Metal and Platework Fabricators and Fitters	▪ Iron worker ▪ Steel fabricator ▪ Fitter ▪ Burner (metal cutter/placement)
	9496, Painters and Coaters – Industrial. 9497, Plating, Metal Spraying & Related Operators	▪ Industrial Painter
	9510 Welders and Soldering Machine Operators	▪ Welder (Exotic Metals)

Table 2 (cont'd)

Sub-Sector	NOC Reference	Example Titles
Specialty Services	1475, Marine Radio Operator	▪ Radio Operator
	2113, Marine Geologist	▪ Marine Geologist ▪ Geophysicist
	2148 Other Professional Engineers, N.E.C.	▪ Naval Architect
	2212 Geological and Mineral Technologists and Technicians	▪ Seismic Supervisor ▪ Seismic Processor ▪ Seismic Observer ▪ Seismic Navigator ▪ Seismic Interpreter
	2255 Mapping and Related Technologists and Technicians	▪ Remote Operated Vehicle (ROV) Pilot
	3152, Industrial Nurse	▪ Medic/Offshore Nurse ▪ Nurse ▪ Paramedic ▪ Medic ▪ Physician's Assistant
	7246, Telecommunications Technician	▪ IT/Telecommunications Technician
Onshore Support	1411 General Office Clerks	▪ Secretary ▪ Administrative Assistant ▪ Receptionist ▪ Logistics Clerk ▪ Storeperson ▪ CADD operator
	2233 Industrial Engineering and Manufacturing Technologists and Technicians	▪ Logistics specialist ▪ Estimator ▪ Human Resource Planner ▪ Job Scheduler

This list represents the very significant quantity, range and diversity of employment opportunities related to offshore oil and gas development. Note that most of occupations listed are professional, technical, and trades positions, and, through the literature review, represent those requiring specific competencies which are difficult to find in the labour market.

3.3 Occupational Demand

Table 3 on the next page represents "base demand" of the occupational categories shown above and which are of relevance to offshore oil and gas. Base employment demand refers to the projected employment growth in the BC economy in the absence of major new industrial development such as an offshore oil and gas industry. It is based on historic employment performance in the province and projected by the Canadian Occupational Projections System (COPS).[4]

Given the Government of BC's goal of having offshore oil and gas "up and running" by 2010, these projections of labour demand have implications for offshore labour market in its early phase. Future analysis and modeling will need to expand labour projections beyond 2011 for the obvious reason that the period of greater offshore labour demand will be after the initial start up and exploration phase.

[4] For a more detailed description of the COPS, refer to, for example, Work Futures – British Columbia Occupational Outlook, 2000 Edition, pp. 593

The total employment openings of 77,818 in BC in occupations related to offshore oil and gas is a sizable part (11 percent) of BC's total projected growth of 695,867. Based on findings from Roslyn Kunin & Associates (2003), and based on anecdotal information, there is a general consensus that this base-case scenario will create labour market pressures. Offshore oil and gas development will only increase net labour demand. It should also be noted that some of these occupations and skill sets exist in other industries and therefore these numbers do not represent labour demand exclusively for offshore oil and gas activity.

Table 3
Employment Projections by Occupation Related to Offshore Oil and Gas in BC, 2001 to 2011

Occupation	2001	2011	2001-2011 Av Annual Growth	2001-2011 Net Change	2001-2011 Attrition	2001-2011 Total Openings	Attrition as % of total openings
0112 Human Resources Mgrs	2,562	3,230	2.3%	669	742	1,411	52.6%
0210 Engr, Arch. & Science Mgrs	2,858	3,232	1.2%	375	776	1,151	67.4%
0711 Constr. Mgrs	9,531	11,226	1.7%	1,695	2,415	4,109	58.8%
0713 Transportation Mgrs	2,919	3,321	1.3%	402	887	1,289	68.8%
0811 Primary Production Mgrs	887	925	0.4%	38	266	304	87.6%
1225 Purchasing Agnts & Officers	2,625	3,121	1.7%	495	627	1,122	55.9%
1411 General Office Clrks	15,845	15,861	0.0%	16	3,606	3,622	99.6%
1475 Dispatchers & Radio Ops	4,218	4,782	1.3%	564	783	1,347	58.1%
2113 Geolog., Geochem. & Geophys.	997	1,249	2.3%	252	203	455	44.6%
2114 Meteorologists	235	264	1.2%	29	72	101	71.4%
2121 Biologists & Rel. Scientists	1,218	1,529	2.3%	311	192	503	38.2%
2131 Civil Engrs	4,436	5,460	2.1%	1,025	964	1,989	48.5%
2132 Mechanical Engrs	2,948	3,701	2.3%	753	643	1,396	46.1%
2133 Electr & Electrs Engrs	3,417	4,474	2.7%	1,057	667	1,723	38.7%
2134 Chemical Engrs	800	1,023	2.5%	223	162	385	42.1%
2141 Industrial & Manu. Engrs	1,113	1,287	1.5%	173	246	419	58.7%
2142 Metallurg. & Materials Engrs	477	527	1.0%	50	108	158	68.5%
2145 Petroleum Engrs	236	310	2.8%	75	38	113	33.8%
2148 Other Prof. Engrs, NEC	1,321	1,639	2.2%	318	317	635	49.9%
2212 Geological & Mineral Techs	1,402	1,532	0.9%	130	270	399	67.5%
2233 Ind. Engr. & Manu. Techs	960	1,121	1.6%	161	213	374	56.9%
2243 Ind. Instrument Techs	1,002	1,148	1.4%	146	226	372	60.7%
2253 Drafting Techs	3,870	4,672	1.9%	802	828	1,630	50.8%
2255 Mapping & Rel. Techs	888	1,226	3.3%	338	144	482	29.8%
2261 Nondestruct. Tstrs & Insptrs	220	283	2.6%	63	42	105	40.1%
2263 Ins. in Pub. & Env. Health	1,576	1,811	1.4%	235	409	644	63.5%
2271 Air Pilots, Engrs & Instruct	1,430	1,700	1.7%	270	353	623	56.7%
2273 Deck Officers, Water Trans	1,005	1,281	2.5%	276	287	563	51.0%
2274 Engineer Off., Water Trans	414	507	2.0%	93	120	213	56.5%
3152 Registered Nurses	27,375	31,574	1.4%	4,200	7,817	12,017	65.1%
4161 Nat/App Sci Pol Rsrchrs	1,337	1,711	2.5%	374	292	667	43.8%
6241 Chefs	4,319	5,364	2.2%	1,045	761	1,806	42.1%
6242 Cooks	31,337	38,322	2.0%	6,984	5,020	12,005	41.8%
6453 Food & Beverage Servers	33,156	39,710	1.8%	6,554	2,807	9,362	30.0%
7242 Industrial Electricians	3,784	4,348	1.4%	564	846	1,410	60.0%
7246 Telecom Install & Repair	3,227	3,293	0.2%	66	568	633	89.6%
7252 Steamfitters & Pipefitters	1,924	2,191	1.3%	267	475	743	64.0%
7263 Structural Metal & Platework	851	962	1.2%	111	197	309	63.9%
7272 Cabinetmakers	2,970	3,446	1.5%	477	590	1,067	55.3%
7282 Cement Finishers	1,202	1,392	1.5%	189	252	441	57.1%
7311 Const Millwrts (Ex. Text)	8,604	9,013	0.5%	409	2,175	2,583	84.2%
7315 Aircraft Mech. & Insptrs	2,152	2,653	2.1%	500	457	957	47.7%
7371 Crane Ops	1,271	1,574	2.2%	303	362	664	54.4%
7422 Pub Works Maint Equip Ops	1,536	1,694	1.0%	158	356	514	69.2%
8222 Supers-Oil & Gas Drilling	478	555	1.5%	77	109	186	58.7%
8232 Oil & Gas Well Drillers	405	470	1.5%	65	75	140	53.5%
8412 Oil & Gas Well Drilling Wrks	529	585	1.0%	55	76	131	57.8%
9232 Gas & Chemical Process Ops	638	791	2.2%	153	156	309	50.4%
9496 Painters & Coaters, Manu.	1,174	1,416	1.9%	242	198	440	45.0%
9497 Plating, Metal Spray & Rel	192	256	2.9%	63	33	96	34.2%
9510 Welding & Solder Machine Ops	12,193	13,282	0.9%	1,089	2,609	3,698	70.6%
Subtotal of Selected Occupations	212,063	247,042		34,979	42,839	77,818	
All Occupations	1,942,364	2,238,900	1.4%	296,536	399,331	695,867	57.4%

Source: COPS

In Table 4 below, a shorter list of occupations most closely related to potential offshore oil and gas activity in BC is provided. The table ranks these occupational demand categories in order of annual employment growth rate. These occupations represent over 27,000 new employment openings in the ten-year period ending 2011. This is very sizeable given the current employment size of BC oil and gas activity is estimated to be 10,040 (Ministry of Skills Development and Labour, 2004).

Table 4
Base Demand of Occupations Most Closely Related to Potential Offshore Oil & Gas Activity

Occupation	2001	2011	2001-2011 Av Annual Growth	2001-2011 Net Change	2001-2011 Attrition	2001-2011 Total Openings
2255 Mapping & Rel. Techs	888	1,226	3.3%	338	144	482
2145 Petroleum Engrs	236	310	2.8%	75	38	113
2133 Electr & Electrs Engrs	3,417	4,474	2.7%	1,057	667	1,723
2261 Nondestruct. Tstrs & Insptrs	220	283	2.6%	63	42	105
2134 Chemical Engrs	800	1,023	2.5%	223	162	385
2273 Deck Officers, Water Trans	1,005	1,281	2.5%	276	287	563
2132 Mechanical Engrs	2,948	3,701	2.3%	753	643	1,396
2121 Biologists & Rel. Scientists	1,218	1,529	2.3%	311	192	503
2113 Geolog., Geochem. & Geophys.	997	1,249	2.3%	252	203	455
2148 Other Prof. Engrs, NEC	1,321	1,639	2.2%	318	317	635
7371 Crane Ops	1,271	1,574	2.2%	303	362	664
2131 Civil Engrs	4,436	5,460	2.1%	1,025	964	1,989
2274 Engineer Off., Water Trans	414	507	2.0%	93	120	213
2253 Drafting Techs	3,870	4,672	1.9%	802	828	1,630
2271 Air Pilots, Engrs & Instruct	1,430	1,700	1.7%	270	353	623
2233 Ind. Engr. & Manu. Techs	960	1,121	1.6%	161	213	374
8232 Oil & Gas Well Drillers	405	470	1.5%	65	75	140
8222 Supers-Oil & Gas Drilling	478	555	1.5%	77	109	186
2141 Industrial & Manu. Engrs	1,113	1,287	1.5%	173	246	419
7242 Industrial Electricians	3,784	4,348	1.4%	564	846	1,410
2243 Ind. Instrument Techs	1,002	1,148	1.4%	146	226	372
7252 Steamfitters & Pipefitters	1,924	2,191	1.3%	267	475	743
0713 Transportation Mgrs	2,919	3,321	1.3%	402	887	1,289
1475 Dispatchers & Radio Ops	4,218	4,782	1.3%	564	783	1,347
0210 Engr, Arch. & Science Mgrs	2,858	3,232	1.2%	375	776	1,151
7263 Structural Metal & Platework	851	962	1.2%	111	197	309
2142 Metallurg. & Materials Engrs	477	527	1.0%	50	108	158
8412 Oil & Gas Well Drilling Wrks	529	585	1.0%	55	76	131
2212 Geological & Mineral Techs	1,402	1,532	0.9%	130	270	399
9510 Welding & Solder Machine Ops	12,193	13,282	0.9%	1,089	2,609	3,698
7311 Const Millwrts (Ex. Text)	8,604	9,013	0.5%	409	2,175	2,583
0811 Primary Production Mgrs	887	925	0.4%	38	266	304
7246 Telecom Install & Repair	3,227	3,293	0.2%	66	568	633
Total	72,301	83,201		10,900	16,228	27,128

Source: COPS

Again, it is important to note that this table was derived from the base employment projections in British Columbia, and as such, the information does not include incremental demand associated with any potential offshore oil and gas activities.

As can be seen from the above table, most professional and technical occupations closely related to any potential offshore oil and gas activities in British Columbia are projected to grow at a faster than average annual growth rate of 1.4 percent over the period of analysis (2001-2011).

Petroleum Engineers, Geologists, Chemical Engineers, Mechanical Engineers, and Civil Engineers are some examples of professional occupations projected to face relatively high growth even in the absence of offshore oil and gas activities. Technical occupations such as Mapping and Related Technicians, Non-destructive Testers and Inspectors, Drafting Technicians, Industrial Engineering and Manufacturing Technicians are also projected to grow faster than average in the overall economy. On the marine side, Marine Officers and Marine Engineers are also projected to experience higher than normal growth.

Note, however, that even though some of these occupations face relatively high growth rates, the actual number required is comparatively low, given the relatively small size of these occupations. Examples of this include Petroleum Engineers (facing an average demand of 11 per year) and Non-destructive Testers and Inspectors (total openings of 10 per year).

3.4 Incremental Demand

Incremental demand in this context refers to the "additional" demand associated with potential offshore oil and gas exploration, development, and production activities in BC. Estimating the incremental demand arising from potential offshore oil and gas activities along the West Coast of BC is of course, difficult at this point. Estimates of the numbers, years, and occupations of the workers that will be needed will not be clear until there is a much clearer sense of the results of exploration and other decisions in order to form reasonable assumptions about the sizes, numbers, types, depths and durations of the wells that will eventually be operating. Many key informants interviewed have stressed that the technology will be very different in 10 or 20 years, moving to more robotics and sub-sea technologies, and therefore needing a different workforce. The type of employment and the numbers needed are dependent upon the technologies in offshore oil and gas.

Indications of incremental demand from offshore oil and gas development on the East Coast show very significant positive employment impacts. For example, as Table 5 shows, in Newfoundland and Labrador, offshore oil and gas activity created an estimated annual average of almost 14,000 person years of incremental employment during 1999-2002.

Table 5

Direct Employment Impact (Person Years)	1999	2000	2001	2002	Average
Development	1,082	1,976	1,508	400	
Production and Services to Production	1,874	1,895	2,251	2,928	
Total	2,957	3,871	3,759	3,328	
Overall Impact ('000s)					
Development	8,800	15,400	13,500	5,200	10,700
Production and Services to Production	2,700	2,100	2,300	5,500	3,200
Total	11,500	17,500	15,800	10,700	13,900

Source: *Socio-Economic Benefits from Petroleum Industry in Newfoundland and Labrador, 2003.*

In Table 6, estimates are provided for the number of full-time equivalent positions (FTEs) associated with three types of production environments: floating production storage offloading (FPSO) unit; fixed production platform (FPP); and semi-submersible (SS). This is for illustrative purposes only.

Note that the numbers refer to the personnel required to resource such production facilities, but no time frame with respect to such requirement is given.[5]

Table 6

1 FPSO	2 FPSOs	3 FPSOs	1 FPP	2 FPPs	3 FPPs	1 SS	2 SSs	3 SSs
736.20	1,164.20	1,613.20	1,081.66	1,731.02	2,419.38	322.80	555.50	804.00

Multiplier Effect – The East Coast Experience

The following table is a reproduction from the report, *Socio-Economic Benefits from Petroleum Industry in Newfoundland and Labrador* (Community Resource Services Ltd., 2003), which shows direct employment (in person years) and total employment impact (in person years) between 1999 and 2002.[6]

From this table, multipliers associated with development phase and the production phases in the East Coast are derived in Table 7.

Table 7

East Coast Impact Multipliers	1999	2000	2001	2002	Average
Development	7.1	6.8	8.0	12	7.6
Production and Services to Production	0.4	0.1	0.02	0.9	0.4
Total	2.9	3.5	3.2	2.2	3.0

The development phase typically consists of design, construction, and installation of production equipment, including systems to bring the oil and/or gas ashore. It can be seen from these derived multipliers that indirect and induced impact during the development phase is much higher than during the production phase. This is because during the development phase, especially in Newfoundland and Labrador's case, many infrastructures were built, which meant there was a considerable impact brought about by the expansion of those businesses that provided goods and services to the building of the infrastructure. Multipliers shown here during the production phase mainly refer to the induced impact, as the level of employment associated with services provided to production has already captured the indirect impact.

It should be noted that these are based on the assumption that offshore oil and gas construction will follow similar patterns as that on the Canadian East Coast. For example, some construction of offshore oil and gas structures are done in other countries and transported to the exploration and production sites.
It should be further noted that these multiplier values are substantially higher than those associated with typical resource extraction industries such as logging and mining. This may be explained, in part, by the Benefits Plans approved for the projects during this period emphasizing the maximization of local content. It should therefore be cautioned that local benefits could be lower for future projects depending on the nature of the resources and on the policies and technologies in place in the future as has been described above. Consequently, multiplier values may be lower or higher depending on the evolving circumstances.

[5] Source: Appendix G, in Strategic Directions Inc., *Labour Market Assessment of the Oil and Gas Industry Supply and Service Sector in Newfoundland and Labrador,* Petroleum Industry Human Resource Committee, December 2002

[6] One person year is equivalent to one person working full time for a whole year. In reality, the actual number of persons employed can be higher when some only work for part of the year.

Illustrative Example

For illustrative purposes, the above can be applied to estimate total person years of employment that can be generated as a result of one offshore oil and gas project. Assuming the project allows for production for ten years, and the production environment is one fixed production platform, total person years of employment demand would be: 10 years x 1,082 per years per year = 10,820 person years of employment.

This would include all involved in the production, maintenance, support and services, and marine transportation. Further, there will be an additional 10,820 x 0.4 (multiplier) = 4,328 person years of employment generated as a result of indirect and induced impacts. Overall the project would result in 15,148 person years of employment for one fixed production platform.

This order of magnitude impact on employment demand is very significant given that BC's oil and gas employment is currently just over 10,000 (excluding downstream activities), and total petroleum employment in Canada is just over 120,000. Therefore, for this example, the ten-year impact of one fixed production platform represents more than 150 percent of current oil and gas industry impact in BC.

Again, it must be noted that this example is extrapolated from East Coast data, and is based on the assumption that the BC offshore experience will involve similar technology, investments, etc.

Note that person years of employment associated with the development phase have not been included, as the labour requirement is generally fairly short and, depending on the technology adopted, may or may not generate many opportunities for local communities.

Other aspects of the type of labour demand that could be expected on the West Coast can be extrapolated from the experiences on the East Coast.

Hiring within a Region

One issue that will be discussed later in this report is the degree to which local hiring for offshore oil and gas projects can be expected. While some key informants and reports warn that community expectations need to be kept in check, data from the recent Nova Scotia experiences is interesting.

An analysis of offshore oil and gas benefits in Nova Scotia, showed that a majority of employment during offshore production on two projects benefited Nova Scotians (Morris, 2003). In the Cohasset Offshore Project, during six years of production, 78 percent or 3,727 person hours of employment went to Nova Scotia workers, while 12 per cent and 10 percent benefited other Canadians and non-Canadians, respectively. On the Sable Offshore Energy Project, in its first three years, 8.8 million person hours or 55 percent of employment was completed by Nova Scotians, 11 percent by other Canadians and 5.4 percent by non-Canadians. Of 1,424 persons employed by the Sable Project worldwide, 78 percent or 1,105 were inhabitants of Nova Scotia.

Types of Occupations in Demand

Another way of projecting types of occupations that will be in greater demand because of offshore oil and gas development in BC is by learning from the experiences on the East Coast. Below are lists of the occupations in greatest demand during Newfoundland and Labour and Nova Scotia offshore activity. It is interesting to note that many of these occupations currently exist in relatively small numbers in BC.

While from a different region and a different phase of oil and gas activity, projections from a Petroleum Human Resources Council of Canada study (2003) illustrate the types of jobs that will be in demand. Below is the number of skilled people required over the next decade in two offshore jurisdictions.

Nova Scotia:

Below are the top ten projected largest offshore-related occupations in Nova over the period 2002-2012.[7] Data on current employment levels could not be found for comparison.

General labour	462
Seaman	445
Engine Room Operator	196
Ship's Officer	130
Drilling Technician	67
Draftsperson	61
Well Technician	53
Maintenance Technician	49
Barge Engineer	48
Drilling Superintendent	48

Newfoundland and Labrador:

Table 8 lists what are projected to be the ten largest offshore-related occupations in Newfoundland and Labrador over the next ten years.

Table 8

Occupation	Current Employment[8]	Increase 2002-2012[9]	Percentage Change
Deck Hand	132	179	+135%
Roustabout	32	96	+300%
Roughneck	30	84	+280%
Engineering Technologist/Technician	32	60	+188%
Captain	32	53	+166%
Chief Engineer	30	48	+160%
Maintenance Engineer	9	48	+533%
Electronic Wireline Operator/Technician	22	48	+218%
First Mate	32	46	+144%
Electronic Technologist	12	44	+367%

The amount of employment for British Columbians would increase significantly once development and construction activity begins on the West Coast, particularly in trades and technical positions, and in service and marine jobs. However, relative to the production phase, the construction period will be shorter and more intense. As indicated above, the offshore production phase will bring a longer, sustained period of incremental labour demand, but with relatively lower multipliers in terms of impacts.

[7] From Petroleum Human Resources Council of Canada, April 2004.
[8] From Strategic Directions Inc., 2002.
[9] From Petroleum Human Resources Council of Canada, April 2004.

Based on the literature, during the exploration phase of offshore activity, BC may see relatively small amounts of employment opportunities for provincial workers because the highly specialized and international nature of seismic and exploration activities.

While technology advancements, the unique qualities of BC's offshore environment and situation, energy markets, and the regulatory framework may be quite different from the East Coast offshore experiences, Table 9 illustrates the patterns of offshore labour demand projections for the major occupational categories for each phase of the oil and gas activity.

A quick review of this table shows the following patterns:

- Various patterns of volatility and stability in labour demand growth within each occupational cluster throughout the 15-year period;
- Skilled trades are most prominent in the development phase and much less so in the other two activities;
- Marine occupations are significant in all three phases, particularly in exploration and production;
- Engineering jobs are most significant during exploration and development; and,
- Technician/technologist demand is spread evenly throughout all three phases.

Offshore oil and gas labour demand is further discussed in the context of labour demand-supply gaps after the next section on labour supply.

Table 9
Projected Labour Demand ("Moderate" Scenario) – Nova Scotia Offshore Oil & Gas
Major Occupational Categories by Phase – 2002 to 2016

Phase/Occupations	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	TOTAL
Exploration																
• Engineers	47	50	50	54	70	98	65	89	58	66	79	71	48	81	47	973
• Technicians/Technologists	81	81	81	82	97	133	89	116	83	94	110	97	68	114	67	1393
• Skilled Trades	34	34	34	36	50	72	42	66	38	46	56	50	31	60	30	679
• Marine	353	353	353	336	386	531	356	460	334	382	440	391	278	463	273	5689
Development																
• Engineers	18	85	133	5	23	62	131	190	279	129	210	0	47	172	282	1766
• Technicians/Technologists	6	37	96	1	5	31	71	103	216	58	175	0	20	79	214	1112
• Skilled Trades	0	1014	738	0	156	417	507	1455	911	929	754	0	0	1627	1310	9818
• Marine	0	20	433	0	5	87	172	180	594	11	493	0	0	21	709	2725
Production																
• Engineers	14	11	9	25	21	18	16	19	22	44	44	69	69	68	65	514
• Technicians/Technologists	32	32	33	72	73	74	74	76	79	145	144	210	209	208	204	1591
• Skilled Trades	11	11	11	25	25	26	26	30	35	64	62	84	84	83	78	655
• Marine	85	87	88	196	197	199	200	226	251	412	410	550	547	544	516	4508
All Phases																
• Engineers	79	147	192	84	114	178	212	298	360	239	333	140	163	322	394	3255
• Technicians/Technologists	119	151	211	155	175	237	234	295	377	297	429	307	297	400	485	4151
• Skilled Trades	45	1060	784	61	231	514	574	1551	984	1039	872	134	115	1770	1418	11152
• Marine	438	460	874	532	588	818	727	865	1180	804	1343	941	825	1027	1498	12920

Source: Brown, Foster and Whiteside. *Nova Scotia Offshore Labour Demand Model Final Report.* Petroleum Research Atlantic Canada, 2002

4. CURRENT AND FUTURE LABOUR SUPPLY

In order to estimate labour supply to meet the needs of occupational demand in BC offshore oil and gas activity, data from five sources was gathered and analyzed to support this research. Supply from five sources—university grads, college grads, trade certification completers, interprovincial in-migration, and immigration—was estimated by extrapolating from information as described below.

4.1 Labour Supply Sources

University Graduates

University outcomes data were made available from the *2002 Graduate Outcomes Survey*. These data track occupational categories that university graduates find work in two years following graduation, or for year 2000 graduates employed in 2002 when the survey was done. A cross-tab of occupational outcomes based on field of study was requested by the BC Offshore Oil & Gas Team and provided by The University President's Council (TUPC). The data from 2002 indicate that occupationally specific outcomes are available for approximately 8,759 university student graduates.

However, the likelihood that past experience is a useful predictor of future occupational outcomes is likely to be limited. The main reason for this is that while many students choose fields of study based primarily on personal preferences and inherent skills endowments (such as music, languages and athletics, for example), many other students deliberately select education and training based on job, career and pay prospects, which change with the business cycle. Two obvious examples of this selection are the growth in electrical and electronic engineering and software and computer engineering during the 1990s, and more recent increased interest in natural sciences, particularly areas such as biology and chemistry, and related disciplines such as bio-informatics.

A second factor to bear in mind is the evolution of educational programs themselves in response to changing student and job-market demands, as well as changes in policies. Clearly, therefore, ongoing survey work must be undertaken to track changes in college and university programs and occupational outcomes from these programs.

College Graduates

College graduate outcomes data were made available from BC Stats. Like the university data, these data track occupational categories that college graduates find work in. However, they follow a nine-month timeline from graduation and capture the career start, but not career movements thereafter.

The college outcomes data in 2002 reflect occupational detail for some 23,115 graduates, thus providing a larger pool of potential labour for meeting demand needs and a more geographically dispersed pool. Specific to the occupational groups that are of interest in this report, college graduates provide approximately 1,400 persons towards the supply pool.

Trade Certificate Completers

In British Columbia, information on apprenticeship including registration, certification, withdrawal, and termination is managed through a database called the Apprenticeship Information Management System (AIMS). Currently AIMS is housed with the Industry Training Authority at the Ministry of Advanced Education.

Data on the number of trades certificates awarded each year from 1999 to 2003 in the province by trades was provided. From this data source, an annual average of 1,300 trades certificates are awarded to apprenticeship completers in relevant occupations each year.[10] This number includes those who obtain a trades credential by challenging the certification examination.

Interprovincial and International In-Migration

Data on the number of interprovincial and international in-migrants by occupation in BC was obtained from a custom cross-tabulation by Statistics Canada. These are 2001 Census data, detailing the number of migrants in the experienced labour force during the previous five years by Standard Occupation Classification (SOC). The average number of migrants per year has been calculated and the data was converted to conform to the NOC.

Of course, the supply of labour can come from sources other than the five analyzed for this project. Other sources include those from the unemployed, on income assistance programs, high school and private training completers, and inter-occupational mobility. As indicated in the Methodology section of this report, labour supply data from these sources has not been included for two reasons. First, some sources of supply are not appropriate for our analysis, such as high school graduates and private training completers. The second factor is associated with lack of data.

4.2 Incremental Supply

The incremental labour supply for the occupations identified in the previous section is summarized in Table 10 below. Single year values have been extrapolated to year 2011 using population growth rates forecast by BC Stats.

It should be noted that many of the occupations in question do not have formal apprenticeships or college programs, therefore, available data sources may underestimate future labour supply. Further analysis might be undertaken in the future to scope out the career paths for these occupations.

[10] This include both individuals who successfully complete an apprenticeship training program and credential as well as those who received certification by "challenging" the certification exam. Challengers are tradespeople with prior experience who have not previously been formally accredited. Challengers who successfully get certification may not be incremental sources of supply, since they are already working in their trade.

Table 10
Incremental Supply from University and College Graduates, Trade Certifications, In-migration and Immigration in BC, 2002 to 2011

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
0112 Human Resources Mgrs	78	79	80	81	82	84	85	86	88	89
0210 Engr, Arch. & Science Mgrs	63	64	65	66	67	68	69	70	71	72
0711 Constr. Mgrs	113	114	116	118	120	121	123	125	127	129
0713 Transportation Mgrs	99	101	102	104	105	107	109	111	112	114
0811 Primary Production Mgrs	48	49	49	50	51	52	53	53	54	55
1225 Purchasing Agnts & Officers	79	80	81	83	84	85	87	88	89	90
1411 General Office Clrks	998	1,011	1,027	1,043	1,060	1,077	1,094	1,110	1,127	1,143
1475 Dispatchers & Radio Ops	76	77	78	79	81	82	83	84	86	87
2113 Geolog., Geochem. & Geophys.	69	70	71	72	73	74	76	77	78	79
2114 Meteorologists	4	4	4	4	4	4	4	4	5	5
2121 Biologists & Rel. Scientists	155	157	159	162	164	167	169	172	175	177
2131 Civil Engrs	278	281	286	290	295	299	304	309	313	318
2132 Mechanical Engrs	159	161	164	166	169	171	174	177	180	182
2133 Electr & Electrs Engrs	158	160	163	165	168	171	174	176	179	181
2134 Chemical Engrs	42	42	43	44	45	45	46	47	47	48
2141 Industrial & Manu. Engrs	39	40	41	41	42	43	43	44	45	45
2142 Metallurg. & Materials Engrs	9	9	9	9	9	9	9	10	10	10
2145 Petroleum Engrs	17	17	17	18	18	18	18	19	19	19
2148 Other Prof. Engrs, NEC	45	46	47	47	48	49	50	50	51	52
2212 Geological & Mineral Techs	45	45	46	47	47	48	49	50	50	51
2233 Ind. Engr. & Manu. Techs	48	49	50	50	51	52	53	54	54	55
2243 Ind. Instrument Techs	45	45	46	46	47	48	49	49	50	51
2253 Drafting Techs	299	303	308	313	318	323	328	333	338	343
2255 Mapping & Rel. Techs	116	117	119	121	123	125	127	129	131	132
2261 Nondestruct. Tstrs & Insptrs	4	4	4	4	4	4	4	5	5	5
2263 Ins. in Pub. & Env. Health	138	139	142	144	146	148	151	153	155	158
2271 Air Pilots, Engrs & Instruct	148	150	152	155	157	160	162	165	167	170
2273 Deck Officers, Water Trans	25	26	26	26	27	27	28	28	29	29
2274 Engineer Off., Water Trans	9	9	9	9	9	10	10	10	10	10
3152 Registered Nurses	1,371	1,389	1,410	1,433	1,456	1,479	1,503	1,525	1,548	1,570
4161 Nat/App Sci Pol Rsrchrs	113	114	116	118	120	121	123	125	127	129
6241 Chefs	250	254	257	261	266	270	274	278	283	286
6242 Cooks	1,264	1,280	1,299	1,320	1,341	1,363	1,385	1,405	1,426	1,446
6453 Food & Beverage Servers	1,014	1,027	1,042	1,059	1,076	1,093	1,111	1,127	1,144	1,160
7242 Industrial Electricians	45	46	46	47	48	49	49	50	51	52
7246 Telecom Install & Repair	91	93	94	96	97	99	100	102	103	105
7252 Steamfitters & Pipefitters	96	97	99	100	102	104	105	107	108	110
7263 Structural Metal & Platework	125	127	129	131	133	135	137	139	141	143
7272 Cabinetmakers	73	74	75	76	77	78	80	81	82	83
7282 Cement Finishers	18	18	19	19	19	20	20	20	21	21
7311 Const Millwrts (Ex. Text)	323	327	332	337	342	348	353	359	364	369
7315 Aircraft Mech. & Insptrs	372	377	382	388	395	401	407	413	420	426
7371 Crane Ops	15	15	16	16	16	16	17	17	17	17
7422 Pub Works Maint Equip Ops	143	145	147	150	152	155	157	159	162	164
8222 Supers-Oil & Gas Drilling	12	12	12	12	12	12	13	13	13	13
8232 Oil & Gas Well Drillers	17	17	17	17	18	18	18	18	19	19
8412 Oil & Gas Well Drilling Wrks	11	11	11	11	11	11	12	12	12	12
9232 Gas & Chemical Process Ops	37	37	38	38	39	40	40	41	42	42
9496 Painters & Coaters, Manu.	22	22	22	22	23	23	24	24	24	25
9497 Plating, Metal Spray & Rel	9	9	9	9	9	9	9	9	10	10
9510 Welding & Solder Machine Ops	637	645	654	665	676	686	697	708	718	729
Total of Selected Occupations	9,460	9,583	9,727	9,883	10,041	10,201	10,365	10,520	10,678	10,827

Source: Roslyn Kunin & Associates, Inc.

Note, however, these supply figures do not provide any indication of the degree of their applicability to potential offshore oil and gas activity in BC.

5. POTENTIAL LABOUR DEMAND/SUPPLY GAPS AND BARRIERS

This section attempts to provide an "order of magnitude" projection of potential labour supply gaps based on limited labour market supply data. It then focuses on more qualitative potential labour and human resources gaps.

5.1 Potential Labour Demand-Supply Gaps

Using the five potential sources of labour supply by occupational category, they can now be compared with the corresponding additional demand in the previous section, resulting in Table 11 below. It is important to note that this demand-supply comparison includes only projected base demand for labour and not incremental demand from offshore oil and gas development. Therefore, if an offshore development employment demand scenario could be added to these numbers, the projected supply-demand gap (i.e., shortages) would be significantly larger and the projected surpluses would be significantly smaller.

Table 11
Potential Labour Gaps in Occupations Closely Associated with
Potential Offshore Oil and Gas Activity

	Growth Rate Demand	Total Demand 2002-2011	Total supply 2002-2011	Potential Gap D-S	Gap as % of Demand
2255 Mapping & Rel. Techs	3.3%	482	1,239	-757	-157%
2145 Petroleum Engrs	2.8%	113	180	-67	-59%
2133 Electr & Electrs Engrs	2.7%	1,723	1,695	28	2%
2261 Nondestruct. Tstrs & Insptrs	2.6%	105	43	62	59%
2134 Chemical Engrs	2.5%	385	449	-64	-16%
2273 Deck Officers, Water Trans	2.5%	563	271	292	52%
2132 Mechanical Engrs	2.3%	1,396	1,703	-307	-22%
2121 Biologists & Rel. Scientists	2.3%	503	1,656	-1,152	-229%
2113 Geolog., Geochem. & Geophys.	2.3%	455	738	-283	-62%
2148 Other Prof. Engrs, NEC	2.2%	635	486	150	24%
7371 Crane Ops	2.2%	664	163	502	76%
2131 Civil Engrs	2.1%	1,989	2,973	-985	-50%
2274 Engineer Off., Water Trans	2.0%	213	95	118	55%
2253 Drafting Techs	1.9%	1,630	3,205	-1,575	-97%
2271 Air Pilots, Engrs & Instruct	1.7%	623	1,587	-964	-155%
2233 Ind. Engr. & Manu. Techs	1.6%	374	517	-143	-38%
8232 Oil & Gas Well Drillers	1.5%	140	178	-38	-27%
8222 Supers-Oil & Gas Drilling	1.5%	186	124	62	33%
2141 Industrial & Manu. Engrs	1.5%	419	423	-3	-1%
7242 Industrial Electricians	1.4%	1,410	482	928	66%
2243 Ind. Instrument Techs	1.4%	372	477	-104	-28%
7252 Steamfitters & Pipefitters	1.3%	743	1,028	-286	-38%
0713 Transportation Mgrs	1.3%	1,289	1,064	225	17%
1475 Dispatchers & Radio Ops	1.3%	1,347	813	534	40%
0210 Engr, Arch. & Science Mgrs	1.2%	1,151	672	480	42%
7263 Structural Metal & Platework	1.2%	309	1,339	-1,030	-334%
2142 Metallurg. & Materials Engrs	1.0%	158	92	67	42%
8412 Oil & Gas Well Drilling Wrks	1.0%	131	113	18	14%
2212 Geological & Mineral Techs	0.9%	399	478	-79	-20%
9510 Welding & Solder Machine Ops	0.9%	3,698	6,815	-3,117	-84%
7311 Const Millwrts (Ex. Text)	0.5%	2,583	3,453	-870	-34%
0811 Primary Production Mgrs	0.4%	304	514	-210	-69%
7246 Telecom Install & Repair	0.2%	633	979	-346	-55%
Total				-8,915	

Source: Roslyn Kunin & Associates, Inc.

The results reveal likely worker shortfalls and surpluses and comprise the gap analysis in this report. The analysis indicates that the potential sources of supply identified are likely to provide enough "counts" of workers to satisfy demand in many occupations; however potential shortages are projected in 13 of the 33 occupational categories considered.

There are a number of caveats that should be kept in mind in understanding these figures:

- On the demand side – what has been shown here is the total number of workers required during the period of analysis. It does not indicate the year-to-year variations, which mean there could be substantial demand for an occupation in a specific year.

- On the supply side – what has been shown here is to extend single year values of supply from five sources to the future based on general population growth in the province. This could mean over- or under-estimation of actual supply, especially when entrants to university or college programs make their decision based on their perceived outlook of a particular industry and/or occupation.

- On the surplus side – this may not necessarily mean that there will not be any concerns about training, recruitment or retention capacities. There could still be substantial mismatches between those who want to enter an occupation and the actual requirements of the occupation.

- On the deficit side – this definitely points to areas where more training capacity may be required. Of the 13 occupations where potential deficits are indicated, Crane Operators, Industrial Electricians, Non-destructive Testers and Inspectors, and Marine Officers are likely to face a deficit well over 50% of their respective demand. This is important to know as any major industrial development activities in the provinces such as the 2010 Olympics and other major projects could further exacerbate the gaps. As such, such projects could put more pressure on recruitment for these personnel should the offshore oil and gas develop activity take place concurrently.

- These estimates of gaps have been derived from comparing base demand and existing sources of labour supply. They have not taken into account the incremental labour demand associated with potential offshore oil and gas activities in the province. Should those activities occur, the estimated surpluses could be lessened, while estimated gaps could be elevated.

- The role of certification and self-regulating bodies will have a significant impact in terms of the array of options for addressing potential gaps. Certification will be an issue where federal or provincial regulations require it for employment in an occupation, and self-regulating professions are a determinant of the number of professionals working in BC at any given time.

In terms of labour gaps in the East Coast experience, the *Labour Market Assessment of the Oil and Gas Industry Supply and Service Sector in Newfoundland and Labrador* (Strategic Directions, Inc., 2002) identified the following "difficult to recruit" positions:

- Senior engineering and science positions with project owners/operators such as Reservoir Engineer and Geophysicist;
- Marine positions for floating production storage and offloading systems and semisubmersible drilling rigs;
- Marine positions for supply vessels and shuttle tankers, due to the international shortage of marine navigation and engineering positions;
- Senior drilling positions such as Offshore Drilling Superintendent, Toolpushers and Drillers;

- Well services positions which, for the most part, are "offshore as needed" positions;
- Engineering positions including reservoir, well planning, drilling, process, loss control, structural, instrumentation, electrical, mechanical, piping, inspections, and subsea construction. The lack of or insufficient oil industry experience, in the range of 10 to 15 years remains a concern;
- Panel and process operators, technicians, quality control and quality assurance managers who require industrial/heavy industry experience;
- Emerging occupations such as Health, Safety and Environment professionals;
- Trades such as welders and pipefitters with recent experience in exotic metals;
- Senior technical managers with experience in electrical, instrumentation and piping;
- Environmental consulting positions such as weather forecasters and marine biologists;
- Inspection services positions such as experienced Non-destructive Testing (NDT) Technicians and Tubular Drill Pipe Inspectors;
- Specialty services positions such as experienced Offshore Radio Operators, and IT/Telecommunications Technicians; and,
- Supply and service positions such as Account Managers and Freight Forwarders.

The findings of this Newfoundland and Labrador assessment of labour market gaps reveals shortages in a diversity of highly skilled engineering, technical, trades, marine, administrative and onshore job categories.

5.2 Labour Gaps from the East Coast Experience

The following points are what the East Coast has learned in terms of labour demand/supply gap issues and other human resource issues associated with offshore oil and gas. It is based on a major study by the Petroleum Industry Human Resources Committee[11] as well as information from some of the key informants.

Training Issues

- Demand Size

It is important to put the absolute demand for workers in many of the positions involved in the exploration and production phases of the industry in perspective. Even in best-case scenarios, there is a low requirement for workers in many occupations. This is particularly true for many of the highly skilled positions. For example, in literature specific to Newfoundland and Labrador, even if the province invested in a program of chemical engineering, it is projected that the oil and gas industry would only require approximately five chemical engineers by 2010. The province has hundreds of people with the basic skills required to work as wellhead technicians but demand estimates will not exceed approximately seven positions at any time. In contrast, by the year 2010, the industry will require about 100 people engaged in material handling, and about 70 each of cooks and cleaners. Without exception, all the positions involving an advanced level of education and training are only required in small numbers.

[11] From *Analysis of Gaps and Issues Related to Labour Supply and Demand in Offshore Exploration and Production in Newfoundland*. Petroleum Industry Human Resources Committee, 2001.

- Skill Exportability

The value of a skill is enhanced by its transferability. Given the opportunities that a global petroleum industry provides, it is possible for workers who have acquired skills and experience in one province to compete for jobs in other labour market jurisdictions and/or in similar industries. It would therefore be beneficial if trainees were equipped with skills that could be exported to many other jurisdictions. This is particularly important in this very global industry. Some positions have higher export value than others. For example, experienced Helicopter Pilots with specific aircraft and offshore experience are sought after internationally. This usually follows higher levels of skill and technical education but there are some exceptions: a competent driller could work around the globe based on experience developed offshore Newfoundland.

- Cross-Sector Applicability

Skills that have application to sectors other than just the oil and gas industry bring an added value to the worker. It is also beneficial when provincial training providers are considering the development and/or expansion of capacities in this industry. For example, Newfoundland and Labrador has training programs in the area of instrumentation, even though the oil industry demand may be small, since these skills also satisfy demand in the marine/shipping industry, the high-technology sector, aviation and the manufacturing sector.

On the negative side, skills transferability among sectors could also mean a potential hardship in recruiting for offshore oil and gas when workers are also in high demand due to other major projects in the province.

- Term of Position

Some of the positions involved in the industry are long term (e.g., reservoir engineer, geologist); other positions are more cyclical and may be of shorter duration and are only in demand for specialty operations on a rig (e.g., mud technicians, well testers). These are very important considerations when making training decisions.

- Multi-skill Training

There is a growing trend in the petroleum industry toward employing multi-skilled trades people. An individual must be prepared to diversify his/her skills in several trades to enhance employability. Apprenticeship training providers will need to keep this in consideration in future program design.

Competency Development in the Workplace

There is also a growing trend in the petroleum industry to use competency acquisition in determining career progression. In addition to the more traditional competencies such as years of education and experience, there are also the softer competencies such as teamwork and interpersonal skills. This is in keeping with the increased demand for company/equipment specific knowledge. Competency development can be best accomplished through workplace training (i.e., by hiring graduates with basic skills)), which can be then tailored to the needs of a particular company, process or system. Workplace training can be a system similar to apprenticeship training across Canada for training trades people.

There are no formal competency development programs for the offshore industry in Canada's East Coast. The current involvement of the petroleum industry in workplace training in Newfoundland, for example, is on an ad hoc basis. Some positions with low education requirements, such as drilling equipment operators, are taken on as workplace trainees.

Information Technology graduates, for example, do not have intimate knowledge of the specialized information systems used in this industry or on a specific project, and this has become an obvious workplace training responsibility. On the higher end, the industry has recently begun to recruit graduates in instrumentation, making a commitment to workplace training, after having difficulty finding people with relevant industry experience.

The demand for workplace training is increasing, as employers demand more 'relevant workplace experience.' Workers who have worked elsewhere and have acquired the right combination of training and experience are obviously an asset, but most often they are hard to find. The oil and gas industry should make it a commitment to take on graduates and train them in-house as a longer-term investment.
In some cases, there may be institutional interest in taking some of the basic skill training further with industry partnership. For example, with ballast control operators, the Marine Institute (in St. John's) has taken on some specialized ballast control training beyond its basic program.

Global Demand for Highly Skilled Oil and Gas Occupations

The petroleum industry is a global industry and many of its workers will work in several different jurisdictions during their careers. This is particularly true of some of the highly skilled professionals working offshore on the East Coast, such as drilling supervisors and superintendents, where about 80% of the existing pool are foreigners.

This trend is increasing as companies see their workers as part of a global pool that can service a project in any part of the world. In many occupations, workers will move around in response to compensation and career development goals.

This has resulted in high turnover and increased competition in certain positions, such as drillers, toolpushers, and offshore installation managers on the East Coast offshore. In addition, there is a global shortage of many of these high-end positions, such as process supervisors and operators, making it a very competitive field.

The global nature of some of the positions in the industry means that there is only so much labour market intervention possible to fill such positions locally. There is a global pool, and global factors, that determine labour supply in many parts of this industry.

Offshore Environment

There are some occupations where the absolute supply may well be strong but it is difficult to convince candidates to work offshore. On the East Coast, it has been identified that attracting nursing and paramedic staff has proven difficult for the offshore petroleum industry. Others may be comfortable with a marine environment but not the oil and gas industry.

General purpose marine officers, for instance, are trained on the East Coast but they are not always a good fit for the unique working environment of a platform or FPSO, which are stationary 'vessels' that often involves non-traditional marine duties. Therefore, while there may be an adequate supply for some of these positions, other issues create difficulties in finding qualified candidates willing to work offshore. This particular point has also been echoed by one of the key informants that were interviewed.

Increased Education Requirements

Across all industries, there have been increased educational requirements for many occupations over the years. The oil and gas industry is no exception. Increased safety and liability requirements and the increased use of technology, in all jobs in the industry, have prompted a corresponding increase in educational requirements. Traditionally, some positions such as drillers and testers did not require completion of secondary school. This has now changed. On the East Coast offshore, some positions that could be filled by secondary school graduates are now demanding some type of technical training, diploma, or degree.

Information Deficiencies

When the East Coast industry stakeholders pursued research of labour supply assessment, they found that there is limited information about graduates from education institutions. The present tracking system only allows for a one-year follow-up. On the demand side, there was reluctance on the part of some employers to share information about specific employees and basic job requirements. A sense of confidence and trust between key stakeholders is essential to build a better understanding of the dynamics of the petroleum industry labour market.

5.3 Human Resources Gaps

While it did not focus on offshore activity or the BC West Coast environment because its time-horizon was 10 years, the major human resources study completed by the Petroleum Human Resources Council of Canada (PHRCC, 2003) identified the following major human resource issues:

- Need for the promotion of careers in the industry to young people, educators and others;
- Lack of access to non-traditional workforce such as women, Aboriginal people and immigrants;
- Skills shortages in selected occupations and sectors with indications that these will continue and/or increase;
- Labour market information gaps, particularly for the Western Canada Sedimentary Basin and the West Coast, and the lack of a regular industry-wide forecast of labour demand and supply;
- Shifting skill requirements and competencies including the following trends:
  - the need for e-learning, computer-based training and self-study options for the "24/7" facilities in offshore work;
  - Technology skills spans all positions;
  - Interpersonal/problem-solving and leadership skills are needed in all jobs;
  - Cross-functional skills and a need for multi-disciplinary skills and teams
  - Mechanisms for demonstrating competencies;
  - Building "essential skills" developed by Human Resources and Skills Development Canada and other stakeholders
- Facilitating the mobility of the workforce through credentialing and consistent standards; and,
- Need for creative human resources practices.

The PHRCC study (2003), concluded that there are shortages in a number of occupations already and these will increase in light of construction cycles in oil and gas and other industries. It predicted that significant shortages of heavy equipment operators, process operators, heavy duty mechanics and power engineers will occur with the growth of the Oil Sands. This is expected to occur on top of, and exacerbate existing shortages in drilling and seismic and service sectors.

In the research for the *Nova Scotia Offshore Labour Demand Model Final Report* (Brown, Foster and Whiteside, 2002), company representatives were asked to identify the main human resource issues facing them over the next three to five years, as well as their experience with hiring employees in Atlantic Canada. The researchers found three themes among the company responses:

- Difficulty in attracting qualified people, particularly senior people due to worldwide competition for labour;
- Small local firms find it difficult to compete with large multinational firms for labour when these large firms have better compensation packages; and,
- Difficulty attracting new entrants due to nature of work (i.e., short term unsustained employment opportunities).

Companies were also asked to indicate if they had difficulty hiring professional workers in the East Coast. Only two firms stated that they had no difficulty. For those firms experiencing difficulty, some positions listed as difficult to fill included: safety manager, medics, persons with contract administration skills, processing engineers, subsea engineers, control engineers, IT specialists, rig supervisor, drilling engineer, drilling superintendent and on-shore people with geo-technical skills (i.e., geologist, geophysicist, reservoir engineers).

Some of these gaps and issues will be discussed further in the next two sections of this report.

6. LESSONS LEARNED FROM OTHER JURISDICTIONS

6.1 Key Overview Points

The following key points emerge from the literature review, and were reinforced by key informants interviewed. These points are lessons that can be learned from the offshore oil and gas industry on the East Coast (e.g., Jacques Whitford Environment Ltd., 2001), and other jurisdictions.

- Organizations involved in the monitoring and control of activities are beginning to recognize that the cyclical nature of offshore oil and gas activities can very much restrict what can be done locally. For example, it is counter-productive to develop elaborate training programs for cyclical or short-term opportunities. Either graduates will leave the area to seek work, or the programs will be unable to attract learners who see no long term career options.

- Local communities still see the oil and gas industry as a way to diversify their economy, but they often have unrealistic expectations. Local communities tend to become primarily a supply base for a relatively small number of offshore jobs and that number decreases as technology advances. Hence, offshore developments should be seen as only a part (albeit an important one) of an area's economic development strategy.

- Keeping expectations in check is a major challenge for all concerned . Related to this, is the fact that many people are poorly informed about the nature of offshore oil and gas activities. This represents a major challenge for the companies, regulatory boards and government.

- Local economic benefits, especially jobs and associated economic development, are important agenda items for many people. Key informants interviewed in BC emphasized the need to maximize local employment. Those individuals from other jurisdictions emphasized that high proportions of local employment in other than supply and support services can only be justified when the oil and gas sector reaches a critical mass and has a long-term expected duration. They reminded the project team that it has taken the Newfoundland oil and gas sector 25 years to reach its present position and it now is looking at 50 years of further continued operation.

- Local companies in other communities that now have enough experience in supplying or attempting to supply the offshore realize that they must be able to compete globally to get involved. In other words, just being local is not good enough.

6.2 Evolution of Policies in Other Countries

The evolution of relevant policies in other countries is worth noting. For example, the United Kingdom (UK) and Norway were originally very interventionist, although they used very different methods.

The UK approach was based largely on maximizing government revenue and expediting development in part to resolve balance of payment problems. This meant a heavy reliance on foreign companies with few checks on their use of domestic suppliers, which in turn limited the ability of domestic UK suppliers to develop offshore capacity. This decreased the direct benefits of projects, and ultimately limited the ability of UK firms to compete internationally. To this day, few UK firms participate significantly in offshore development at the global level.

Norway used a strong interventionist approach that intentionally slowed the pace of development to ensure maximum local involvement. Notable observations about the Norwegian experience include the following:

- An initial development policy that nurtured a fully integrated indigenous oil sector through partnering, state interventions and technology transfer was very successful. The slow pace of development matched project supply needs with the increasing capacity of the Norwegian supply sector.
- A subsequent policy reconciled the realties of globalization with the need to nurture a strong domestic base.
- Polices have consistently been designed from a long-term perspective, with the goal of extending the life, and maximizing the value of the oil sector beyond the life of Norwegian oil reserves.

Now most countries have evolved away from intervention to facilitation to bring together all parties to develop a common vision for the long-term development of the industry. Using a collaborative approach appears to be more successful and leads to countries that can compete internationally and be sustainable. However, this process can only be successful where there is a high level of understanding and trust.

6.3 Lessons from the East Coast

The Petroleum Industry Human Resource Committee in Newfoundland and Labrador provides a comprehensive review of human resources issues in that jurisdiction. Below is a summary of its key findings related to recruitment, retention and addressing skill shortages.[12]

Recruitment Strategies

A number of recruitment strategies are used by the oil and gas industry in Newfoundland and Labrador (NL), including:

- Companies with entry-level positions that require high school graduation only, often have enough ample candidates from which to select;
- Companies with entry-level positions that require post-secondary diplomas mainly participate in co-operative education programs and/or graduate recruitment programs with NL post-secondary institutions (e.g., Memorial University and the College of the North Atlantic). Some companies recruit from these institutions not only for their local office, but for international placements as well;
- It is a common practice in the industry to hire entry-level and train people internally to aid career development, particularly in the well services and drilling activity;
- For skill shortage areas or highly specialized jobs positions which require international staffing, international companies recruit internally and second the candidates to the local office for two or three years;
- The emerging oil and gas industry in NL is a small "community", so word of mouth is often used to recruit workers;
- Several companies use a casual labour pool to fill short-term absences of permanent employees. Generally, recruitment for vacancies then occurs internally first from the casual labour pool and then from the external market; and,

[12] Strategic Directions Inc. *Labour Market Assessment of the Oil and Gas Industry Supply and Service Sector in Newfoundland and Labrador*. Petroleum Industry Human Resource Committee (PIHRC), December 2002. http://www.noianet.com/pihrc/docs/finalreport/pihrc-LMAR-complete.pdf.

- For very difficult to recruit positions, companies use recruitment companies; and many companies publish career information and opportunities on their websites.

Employee Retention

In general, it was found that retention issues are less frequent when NL companies have long term contracts in place as it offers a stable employment environment (e.g., drilling). There is limited competition within the offshore sub-sectors; and since the NL offshore oil and gas industry is relatively small, there is little opportunity for staff that wish to remain in the province to move within the industry.

Companies that did report retention issues, identified several occupations including Offshore Drilling Superintendent, Marine Crew, Engineering Technologist/Technician and CAD Technicians.

Some firms were concerned about the upward pressure on salaries for those occupations that were in demand across the industry or have specialist skills that are in short supply in the local labour market. Larger and/or international companies pay higher salaries, and to retain employees with opportunities such as engineering technologists or technicians, the smaller companies increase salaries.

Several reasons were given by NL companies for a difficulty in retaining people recruited from outside the province. These included: compensation is often lower than other international areas; lifestyle issues, in terms of climate, isolation from other major urban centres; family preferences; and high rates of taxation.

An interesting result of the retention difficulties experienced with people recruited from outside NL is that many firms indicated a preference to recruit people from the province or with a close family connection to the province.

Current Initiatives to Address Skills Shortages

Companies, educational institutions and government agencies in NL have implemented initiatives to address some skills shortages. The following initiatives are offered as examples.

Internal training programs. Many of the participating NL companies use internal training programs to develop the necessary competencies for jobs where labour supply is short. They hire into entry-level positions and provide the experience and internal training to facilitate the movement of the employees into positions that are in short supply.

Co-operative Education. For skills shortages that require an undergraduate degree or a college diploma program, many NL oil and gas companies participate in the co-operative education programs at Memorial University, the Marine Institute, and the College of the North Atlantic. They most often recruit from the engineering, business, technology, technician and marine programs. Many international companies have internal development and promotional programs, and frequently transfer employees to projects around the world.

Customized Training. Other NL companies partnered with educational institutions to develop programs specifically to train their recruits. One company worked with Memorial University to develop a course in remote medicine for registered nurses who accepted positions as offshore medics. The four-month course was offered in part through distance education with two weeks practical training for each medic in a lab setting. Developing and providing customized specialist training is an expensive undertaking for companies.

Work Experience. In response to increased demand due to the addition of new projects, the owners/operators identified a possible shortage in Process Operators; the FPSO planned for the White Rose field will require 12 of these positions.

One strategy to address this shortage was to recruit entry-level instrumentation technicians from the College of the North Atlantic in each of the last two years and develop required competencies through work experience and internal training.

6.4 Other Themes

Provinces on the East Coast that have seen offshore oil and gas development and production are now in a position to assess various human resource issues related to the industry. Their research work will no doubt help British Columbians in the understanding of current practices in other jurisdictions in dealing with their challenges. [13]

One theme that emerged concerning training was the movement to competency-based training and selection systems. There has been a significant focus on the use of competencies to better understand the skills, knowledge, experience and education levels needed to effectively perform in the offshore environment.

OPITO, UK's Oil & Gas Extraction National Training Organization, uses competencies extensively to track progress for their training programs and for the selection processes.[14]

Concerning selection, the Exxon Mobile Sable project has developed useful prescreening totals that have been successfully used to select and retain workers.

These researchers also noted the importance of non-technical competencies. For example, the shortage of management skills is not unique to the oil and gas sector, but that sector has found good ways of dealing with it. All managers had to take the role of a safety representative before taking a management role. This experience allowed them to develop managerial competencies (i.e., leadership, project management, communication skills, etc.) before the company would move them into a management role.

A second theme that emerged was the concept of partnerships. This theme was demonstrated in three ways. The first was union-management-government partnerships. The researchers cited that one of the unique features of the offshore environment in the UK and Norway is the collaboration of union and management stakeholders, particularly in the area of offshore safety training (Hart, 2000a; 2000b). For example, OPITO uses a process where unions and employers are involved in the needs analysis for training programs, definition of training objectives and evaluation of training programs. The union partners with employers on all aspects of the training process. These partnerships ensure that training programs incorporate the experience and expertise of employees, via their union, into the training process (Hart, 2000a). The success of these partnerships suggests that similar partnerships among employees (and their unions where employees are unionized), employers and governmental bodies could be beneficial in Canada. On safety issues, such partnerships are already developing in BC's onshore oil and gas sector involving workers, employers and the Workers' Compensation Board of BC.

The second form of partnerships is the formation of non-profit organizations designed to advance the needs of offshore employees, employers and communities. The researches also cited OPITO as a good example.

[13] See *Nova Scotia Offshore Labour Demand Model Final Report,* Petroleum Research Atlantic Canada, 2002
[14] OPITO is the UK-based National Training Organisation for Oil &Gas Extraction, formerly British Offshore Petroleum Industry Training Organisation. See http://www.opito.com.

This government-sanctioned organization is designed to meet the needs of the industry. Some of its key activities include: industry-wide training, career road shows demonstrating the value of offshore careers to school-aged students (i.e., near the grade 6-7 level), as well as labour market analyses to assess the current labour force and identify potential shortfalls at an industry level. The use of a common organization conducting this kind of research over the longer term also helps ensure consistency in methodology, learning from the strengths and weaknesses of past studies, as well as ensuring a sole location of historical data. In Canada, several offshore oil and gas-related industry associations, in partnership with governments and educators, have formed in the East Coast. Also, the national oil and gas sector council, the Petroleum Human Resources Council of Canada, is a broad stakeholder partnership of research and planning activities.

A third form of partnership, particularly in other jurisdictions including Canada's East Coast, is reflected in collaboration on education and training programs between post-secondary education institutions and industry groups. First steps in this direction are being taken by the University of Northern British Columbia and Northwest College who are undertaking research, soon to be forthcoming, and working with high school students to provide information about future opportunities.

A third theme in reviewing best practices by the East Coast is the movement to apprenticeship, co-operative education and internship programs. In both their literature review conducted on competencies as well as the best practices interviews, there is evidence in the UK of a movement to sponsor apprenticeships for technicians to help minimize the potential shortage of skilled technicians. Key informants and literature emphasize the importance of practical on-the-job experience as a requirement for developing offshore oil and gas workers.

For example, these researchers cited that OPITO manages a four-year program where they select apprentices, with the assistance of training college networks, place them in training programs for two years and then place them on two year apprenticeships with member companies. During this entire four-year period they are paid by OPITO. These apprenticeships help ensure an ongoing flow of qualified technicians. However, these apprentices are given a generalist skills set (electrical, mechanical, etc.) rather than a traditional journeyperson apprenticeship program. Similarly, in our own interviews of key industry informants, several of the interviewees have moved to promoting and using interns and co-op students in engineering, geology and business. The advantage of these programs is that they provide students with valuable experience—a key competency found in this project—as well as exposure to offshore careers.

Several other best practices were seen or heard about in this project. Canadian firms on both coasts could implement each of these practices.

A first example is 'targeted' Emergency Response Training (ERT). At one time, on East Coast offshore sites, all employees were given identical ERT. This resulted in excessive training. Now, firms in the East Coast have developed an analysis of all jobs and employees are only trained for the skills, knowledge and abilities required for their job. This has resulted in better training utilization. While this has focused on safety training, clearly the concept of training targeted to the roles of employees rather than generic training for all employees is important and has been highlighted as a key factor in successful training programs (Tannenbaum & Yukl, 1992).

Second, literature that was reviewed cited that OPITO has a clearly defined process for assessing post-training performance. All training participants are assessed based on the competencies and outcomes that should have been learned in training. Trained assessors, who were not the trainers of the original program, conduct this assessment and a record of the assessments is kept. A cumulative decision is then made based on this assessment. In fact, one of the companies interviewed also uses a similar competency-based evaluation process.

Third, there is growing evidence of employers moving to multi-skilling. The rigs of today require far fewer people than those of 10 years ago; thus, there has been a movement to a multi-skilled workforce. In addition to the 'generalist' apprenticeship program highlighted above, many of the participants interviewed in previous research studies discussed the movement to a broadening of the required skills set; for example, equipping deck hands with welding skills.

Fourth, previous research studies indicated that OPITO emphasizes the need for effective delivery of training programs. As such, all trainers must pass an internal training standard before they can deliver a training course. This ensures a consistent standard of training and trainers across the industry. The need for up-to-date, industry-relevant training for trainers was a recurrent theme in conducting this project.

Fifth, given the difficulties associated with shift work, previous research indicated that some oil production companies are moving to, when possible, alternative work arrangements such as working from home and telecommuting for offshore workers. This is also consistent with the general movement towards 'family-friendly' policies found in Canadian workplaces (Brown, 2000; Templer et al., 1999).

Finally, non-conventional training formats such as e-learning are now being used more frequently (e.g., see www.BBPOffshore.com). Given the nature of the offshore environment, traditional stand-up delivery may not be feasible; nor do many employees wish to be away from their families on their 'off-time" to take training courses. As such, e-learning could be well suited to the offshore environment where traditional classroom delivery may not be possible. E-learning or modular training could be well-suited to the offshore environment for employees who work shifts.

6.5 Supply of Education and Training

A critical factor in the human resources success in the East Coast offshore activity is the degree to which post-secondary education institutions responded to the industry's training and research needs. Starting in the 1960s, Atlantic Canada's institutions have developed national and world-class oil and gas programs and partnerships. Some examples including the following post-secondary institutions:

- College of the North Atlantic – One of Atlantic Canada's largest post-secondary institutions with 17 campuses throughout Newfoundland and Labrador (e.g., a national accredited Petroleum Engineering Technology Diploma Program).
- Dalhousie University's Faculty of Engineering – Oil and Gas Engineering Program with a Petroleum Engineering Program and Petroleum Research Group.
- The Marine Institute of Memorial University – Providing training and research in offshore oil and gas since 1964. Its Marine Institute has contracted for $2.5 million of training for operations personnel on the White Rose FPSO vessel.
- Holland College – This PEI institution provides Dynamic Positioning training at its marine centre in Summerside; its training is backed by the Nautical Institute in London and all equipment, instructors and facilities are Transport Canada approved.
- Nova Scotia Community College Through its diverse programming, NSCC can prepare students for one of over 250 careers in the energy sector. Customized training is underway in support of Sable Tier II construction, all of the offshore production operations in Eastern Canada, and ExxonMobil operations in Angola and Russia, in collaboration with the University College of Cape Breton.

- Memorial University's Oil & Gas Development Partnership - Since 2000, Memorial's Oil and Gas Development Partnership (OGDP) is a partnering with industry and service companies in meeting challenges in the oil and gas industry, including the need for highly qualified workers.
- The Centre of Excellence in Petroleum Development at UCCB – This program was developed in response to the training needs of the region's offshore petroleum industry and it is involved in research, development and commercialization activities with industry partners and other institutions.

Alberta institutions such as the Northern Institute of Technology, Keyano College, the Southern Institute of Technology, the Petroleum Industry Training Services, and the universities are heavily involved in oil and gas training and research. These can provide sources of workers with specialized skills, partners with BC institutions and companies, and best practices to learn from.

Also, larger companies in the Oil Sands and in the Northeast region of BC (e.g., Duke Energy) are increasingly involved in training and recruitment programs. This is a base upon which offshore oil and gas development can build as initial activity starts up.

While BC post-secondary institutions are not involved in offshore-specific training, most coastal and northern institutions have long-standing trades, technical and science programs which can be expanded to generate incremental workers for offshore oil and gas. Other programs can be adapted or upgraded to provide offshore-related training. BC's institutions also have an excellent track record of responding to emerging regional skill requirements, and can respond to market signals in a timely fashion to develop and deliver offshore oil and gas training in energy, marine and support service occupations and skill sets.

In addition to all BC universities, Northwest Community College (NWCC), Northern Lights College, College of New Caledonia, and North Island College are best geographically positioned to respond to offshore oil and gas development. BCIT and its Marine Campus also offer programming in related areas.

NWCC is an example of an institution being proactive in offshore oil and gas planning. It is pursuing the idea of a partnership with Newfoundland and Labrador training institutions, and is planning to build on its professional diving for aquaculture and adding add subsea robotics and underwater welding training. NWCC has also completed training needs analysis in partnership with the University of Northern BC. This will soon be completed but was not available for this project.

When to Start Education and Training?

During the literature review and with key informant interviews with stakeholders—including industry experts working in the offshore oil and gas sector in the East Coast—the issue of appropriate timing, nature, and sequencing of training provision to meet the needs of potential offshore oil and gas activities in BC was explored.

Drawing on experiences from many of the industry experts, there is an expectation that there will likely be an influx of experienced professional engineers, skilled trades workers, and even labourers from outside the province, during initial seismic testing and exploration stages of offshore activities. Training highly technical and specialized engineers, technicians, and tradespersons should only be undertaken when the long-term prospect of on-going production is favourable. In the interviews and the literature, the East Coast experience showed the companies started by bringing in talent from outside the region and companies and governments would send workers to onshore oil and gas sites in Alberta to obtain experience. As the testing, engineering and exploration demonstrated a case for construction and production, the provinces and companies were more likely to invest in training local workers.

That being said, governments can still take coordinated steps to ensure the public, especially those making career decisions, is aware of the many employment opportunities available from such industry development. It also can provide channels for the oil and gas industry and education and training providers to ensure that basic, generic skills are well incorporated in relevant program design and execution. Governments can also take measures to ensure an ample supply of specialized engineering, technical, and trades workers, as well as skilled labour to sustain onshore oil and gas activities in BC.

Planning and development of education and training programs and strategies should begin half a decade in advance of offshore exploration, first focusing on adapting existing onshore oil and gas and marine programs, and generic skill sets that can be transferred between offshore and onshore development and across major occupational categories and other industries. This initial stage of education and training planning and development should also include programs and opportunities for training institutions and instructional staff to become orientated to offshore oil and gas development, practices and technology.

7. POLICY AND PROGRAM CAPACITIES

Appropriate polices are necessary to ensure that the offshore oil and gas industry is developed in a way that will be attractive to the operators in this global industry and in a way that benefits the economy, communities and workers of BC. Ensuring that there is an adequate supply of suitably trained and experienced workers is an important part of those policies.

Sources of information reflected varying views about the potential supply of labour for a new offshore oil and gas sector in BC. Some felt that there was and will be an adequate amount of labour arising from the downsizing of BC's traditional resource industries, and who could transfer to the offshore oil and gas sector with minimal upgrading.

A more common view found during this project is that BC's labour market currently is not adequately meeting its own needs with respect to trades workers, technicians and some professions, although BC's post-secondary education system has or could develop the capacity to do so, especially if current and future workers were informed and encouraged to enter offshore oil and gas career paths.

Policy decisions are also needed concerning the extent of local hiring requirements that are to be put into place. While some interviewees expressed a strong preference for the most local training possible and hence hiring, others felt that the highly specialized nature of many jobs and their relatively short duration, especially in phases other than production, mean that it would be advantageous to attract labour from outside the province. This argument is strengthened by the need for workers with specific oil and gas and indeed offshore experience.

The above does not mean that there will be no jobs for BC workers; workers for the marine sector as well as the onshore support components can be locally supplied. This will provide a considerable number of jobs. Also, offshore oil and gas construction and production, according to the experience in Atlantic Canada, has a significantly higher multiplier effect than many other industries leading to a high ratio of induced employment from the increase in overall spending in the economy.

Bringing in more specialized labour for shorter term positions does not mean that training programs and policies are not needed in BC at this time. On the contrary, increased training in the basic trades, technical occupations, marine occupations and relevant professions such as engineering should be promoted now to service present general labour market requirements and provide a labour force with the skill base that can be upgraded and adapted as the demand for specialized offshore oil and gas workers grows. However, providing highly specific and specialized training now, given the time lag until actual production is likely to start, would merely result in producing workers who have to move out of the province in order to use their skills.

A full range of public policy options should be considered in order to assist companies, First Nations, and community organizations to maximize offshore employment opportunities. These options should expand options beyond simply training-related measures to address other human resource issues, including scheduling, compensation, recruitment, short-term hires, work restructuring within firms, possible disincentives created by government policy/regulation, recruitment and retention, etc.

Some of the public policy implications related to human resources for offshore oil and gas development but for which there was not time in this project to consider and offer recommendations, include incentives for employers and workers, local hiring agreements, accessing non-traditional labour pools, education and training funding.

8. IMPLICATIONS OF FINDINGS AND CONCLUSIONS

One of the most insightful researchers on offshore oil and gas socio-economic analysis interviewed for this project was Mark Shrimpton, Jacques Whitford Environmental Ltd., of Newfoundland and Labrador. In a speech he delivered on community benefits, Dr. Shrimpton highlighted the complex and relative nature of the impacts of offshore oil and gas development:

> The examples discussed above indicate that considerable benefits, far outweighing the costs, can accrue to communities as a result of oil and gas activity. However, the potential for this is dependent of the nature of the activity and of the local context, and achieving this potential requires the use of measures to both minimize the risks and potential negative impacts, and to make the most of the potential benefits. There must be a balance and strategic assessment of the effects of the project or the industry as a whole, taking into account the range of optimization measures available and their likely effectiveness. This assessment must be wide-ranging and imaginative in exploring the ways in which oil and gas activity can be harnessed to local goals and aspirations.[15]

Two major points from interviewing experts and reviewing literature for this report relate to technology and the global nature of offshore oil and gas. First, it was stressed by many sources that the combination of rapidly changing technology and the expected timelines of offshore production in BC mean that work and skills could look very different several years from now; and it is virtually an "unknown." Other unknowns are the uncertainty regarding geology, supply and demand for products, and regulatory environmental issues.

Second, planning and strategizing for offshore development needs to take into account the fact that the industries, companies and workers are very much part of a global industry. This directly affects recruitment, retention, training, and other human resource-related considerations. Therefore, companies and institutions need to train for global markets and use global markets, especially in the short term.

Other key issues that demonstrate the complexity human resources planning for offshore oil and gas development include the following:

- Skills requirements and the nature and extent of human resources will depend on negotiating to maximize economic benefits.
- Many of the trades, technical, marine and professional occupations required for offshore oil and gas development require several years of education and training. It takes four years to train tradespersons and several years to train engineers, scientists and specialists. This has to be factored into front-end implementation of strategies before the offshore development starts in earnest in BC.
- Image of the industry affects the ability to attract and retain workers and efforts to clarify and improve this, without creating unrealistic expectations, can start early.
- There is tension in viewpoints regarding local employment impacts. Expectations of communities, workers and small businesses need to be reasonable, particularly in the early stages of oil and gas activity. Local impacts will vary by phase and will be affected by the nature and extent of agreements forged between jurisdictions, companies and communities. Also, there is some evidence in the literature that there are lower economic impacts and multipliers for communities in rural areas.

[15] Shrimpton, Mark, of Community Resource Services Ltd. *Benefiting Communities: Lessons from Around the Atlantic.* Society of Petroleum Engineers Inc. 2002. Presented at the SPE International Conference on Health, Safety and Environment in Oil and Gas Conference in Kuala Lumpur, Malaysia. March, 2002.

- There are differing views on the extent of transferability between offshore and onshore skills. Some sources believe there is a lot of transferability between onshore and offshore oil and gas and that marine and ocean services and skills can be used in the offshore environment.
- Interviewees and literature resulted in differences of viewpoints on the timelines for BC offshore oil and gas development and production and on when training and local hiring would be feasible and useful.

This report shows that developing BC's offshore oil and gas resources will result in a significant increase in demand for workers, although the exact numbers and occupational mix of such workers can only be determined once the nature and extent of the resources to be developed are specified and the technologies to be used to extract and deliver them is determined. The report gives some preliminary measures of demand for certain production methods using today's technologies as a starting point.

In Table 4, information from several sources is analyzed to determine the mix of occupations that will be required by the development of offshore oil and gas in BC, assuming that the developments in the province occur before major technology changes are implemented in the industry.

For short term and/or highly specialized occupations, the most likely source of supply, at least in the earlier stages of the industry's development in BC, labour will be brought in from other parts of Canada and abroad. This was strongly confirmed by experts who have gone through the offshore oil and gas phases in other jurisdictions. It will be especially true for the non-production phases, which are by their nature, of limited duration. As the industry becomes established and for the longer-term jobs in production, more local labour can be used. This could take decades, based on the experience in Newfoundland and elsewhere.

There are several components of the skills required for such workers. The first component is the more basic or generic skills, which would not be specific to offshore oil and gas activity. These would include engineering, technology, trades and support functions. Especially with respect to trades and technology jobs, shortages in these occupations already exist.

For these skills, training and increased training capacity should be put into place now as there is a time lag of years between entering and completing training and the completers of such training would have ample employment opportunities in other sectors should offshore oil and gas development be delayed or not occur.

The next component of skills applies to oil and gas production in a land-based setting. Land-based producers are presently facing difficulty finding and retaining workers and have started to implement some of the suggestions mentioned in this report, such as recruiting females and other non-traditional labour sources. More information about job openings, increased training capacity and opportunities for work experience (e.g., co-op programs) put into place in the on-land oil and gas sector would not only alleviate labour gaps there, but this would also provide a source of future production workers for off-shore activity.

This leads to the third level of skills—those specific to the offshore sector. These include marine skills, and high levels of quality control and quality assurance and safety measures. They cover not only the important safety and environmental issues, but the much higher transportation and other costs of working on an isolated work site. Most key informants interviewed indicated that experienced oil and gas workers could relatively easily acquire offshore-specific skills.

In addition to direct employment, offshore oil and gas production generates high levels of indirect employment in the supplying and supporting industries, as well as induced employment created by the spending of the well-paid workers in this sector. This effect is larger than for other resource-based industries.

The shortages most likely to be experienced in staffing an offshore oil and gas sector are for trades workers, technicians and production workers experienced in oil and gas production. Since these workers are currently in short supply, every effort should be made to increase their numbers now.

Many key informants suggested that need for more specialized workers can be addressed by recruiting workers from out-of-province. Training such people before the jobs appear or where there are no local long term career opportunities will lead to such workers leaving for out-of-province work given the high global demand and worker mobility in this sector.

A concerted effort on the part of the employers, labour organizations, training institutions and government is needed to:

- Accurately define the specific and evolving skills that will be needed;
- Examine the potential sources of labour supply, including seasonal workers, in order to identify persistent vacancy pressures. These pressures can determine the training requirements and not just the overall labour demand.
- Determine the numbers and occupations of required workers as projects are defined;
- Ensure that training capacity exists or can be developed;
- Provide the appropriate mix of training capacity including classroom, electronic and apprenticeship;
- Avoid duplication and oversupply of training capacity;
- Work with industry to identify potential uptake of firm-level tactics for alleviating shortages, and the potential impact of those tactics; and,
- Ensure that the timing of training is appropriate and will provide workers at the time the opportunities will exist.

This report mentions several best practices that have worked elsewhere with respect to policy and human resource issues. Training the trainers, co-op education and modular training components were among those mentioned. Pitfalls included training too many, too soon and excessive expectations about local future jobs opportunities in the shorter term.

This report relied heavily on information gathered from offshore operations on Canada's East Coast. Most sources indicated that lessons learned there would largely be transferable to the West Coast, although differences in geography, geology, etc., would have to be allowed for. This assumes that development will be occurring reasonably soon. Should there be a long time span before development and production, changing technologies will have a dramatic effect on the quantity and quality of labour required.

9. BROAD STRATEGIC RECOMMENDATIONS AND NEXT STEPS

Many of the key informants and much of the literature reviewed in this project are instructive in terms of approaches for BC offshore stakeholders and leaders to consider for the short and long term future. The studies by the PHRCC (2003) and Brown, Foster and Whiteside (2002), in particular, provide comprehensive sets of recommendations, which can be considered for West Coast relevance and application.

Based on the analysis and findings of this project, recommendations which follow are provided within eight broad categories of activities. The recommendations reflect an immediate priority of further research, analysis, labour demand and supply modelling, and human resource planning. The suggestions also call for collaborative planning among government, industry, community and education and training stakeholders, leading to decisions on how far in advance of each anticipated offshore oil and gas development phase that education, training, strategic information, labour adjustment, and other human resource actions should be taken.

While each category of recommendations and each recommendation will come into play at various points along the way to preparing for and during offshore oil and gas development, Chart 1 suggests some general timelines for consideration. The listed activities relate only to required labour market, education and training, human resources, and adjustment and employment actions measures. In other words, "research," "planning," "development," "delivery," etc. refers here only to human resource-related issues and measures (i.e. not other types of research, planning, development, etc.) The arrows (➡➡➡) at the far right of some rows mean that these activities need to continue throughout the different phases of offshore development.

Chart 1

BC Offshore Oil and Gas Human Resources Development-Related Activities
Before and During the Start of Offshore Oil and Gas Development

Activity	6 Years Out	5 Years Out	4 Years Out	3 Years Out	2 Years Out	1 Year Out	Develop. Begins	1 Year In
Research & Analysis								➡➡➡
Planning								➡➡➡
Info. & Communication								➡➡➡
Development								➡➡➡
Initial/Pilot Delivery								
Evaluation								
On-Going Delivery								➡➡➡

9.1 Research and Analysis

- Continue labour market research in this area as more details emerge and more specific supply and demand forecasts can be developed. The dearth of specific, detailed information about the extent of potential offshore oil and gas development has limited the extent to which this project can provide concrete findings, conclusions and recommendations. As more information becomes available, it will be possible to better estimate the timing and nature of the demand for labour, to determine labour force gaps and to produce economic models that will allow one to conduct sensitivity analyses to determine the outcomes of different possible scenarios.

- Undertake a labour/skills sensitivity analysis to manage uncertainty and identify key variable and milestones. As well as planning tools, this can be used as a communications vehicle for raising awareness and educating about offshore oil and gas activities and implications.

- Move toward the development of a made-in-BC labour demand model. Build on the work of Atlantic provinces and the PHRCC. Ensure as much possible that labour market data is relevant to regional and local planning needs. Build on the findings of the soon to be completed Northwest Community College training needs analysis. Involve expert labour economists and offshore oil and gas analysts.

- Develop more comprehensive and reliable sources of labour supply data relevant to offshore oil and gas in BC, including scoping out career paths for occupations without formal apprenticeships or other training programs. Work with government agencies, post-secondary institutions and industry groups to develop useful labour supply information.

- Develop a comprehensive understanding of current hiring patterns of offshore-related businesses to identify opportunities for changing those patterns, considering hiring agreements, and otherwise proactively address.

- Consider opportunities to stimulate social science research and development related to BC offshore oil and gas human resource planning and education and training. While the obvious oil and gas research, development and engineering relate to natural sciences and technology, social science research can be used to study and develop skills and human resource strategies for the future.

- Identification of core competencies or "essential skills" associated with offshore oil and gas development. This could involve developing connections among agencies working with Aboriginal people, income assistance and Employment Insurance clients, immigrants, etc. to develop foundation skills on which companies can develop specific skills as needed. This work could tap into the work underway by Human Resources and Skills Development Canada on an essential skills framework.

Research and analysis activities need to start several years in advance of offshore development.

9.2 Planning

- Initiate multi-stakeholder collaboration. Establish a multi-stakeholder planning and/or advisory committee to oversee and provide input on labour demand and supply information and long-term human resources planning. This would include government, industry, community, academic, training, worker, Aboriginal and other stakeholders.

- Undertake long-term human resources planning. Build on existing infrastructure like the Council of Marine Carriers, Western Marine Community Coalition, the Pacific Offshore Energy Association, Pacific Coast Offshore Oil and Gas Association, national groups such as PHRCC, etc.

- Sponsor an annual planning session. Sponsor an annual offshore oil and gas labour market symposium or planning session.

- Review the full range of public policy and industry options for addressing offshore-related skill requirements. Work with offshore industry sectors to review all options including non-training (e.g. removing regulatory barriers, recruitment and retention, work restructuring, etc.), and plan accordingly.

Long-term planning should begin soon after some more labour market research is completed; and planning should continue leading up to offshore development and be undertaken on an annual basis thereafter.

9.3 Provision of Information

- Inform public and future workers about the industry and potential employment opportunities. The basic levels of trades, technical, managerial and marine competencies that will be needed in BC's offshore oil and gas development is also needed in many other sectors. Active programs to inform students, parents and older workers about these opportunities are needed. Steps in this direction have been started by Northwest Community College and other organizations.

- High school promotion of offshore oil and gas awareness. Sponsor projects to distribute information on offshore oil and gas to K-12 students, teachers, counselors and administrators.

Provide information on offshore oil and gas labour market development to local communities using regional associations and groups. Communication with and information to various stakeholders and users should start once there are useful and conclusive research and planning outputs, and far enough in advance of offshore development to enable stakeholders to adequately prepare for and implement human resource development measures.

9.4 Training Providers

- Inventory relevant education and training programs in BC and elsewhere. Work with post-secondary institutions and the Ministry of Advanced Education to develop a plan regarding adding new programs, expanding existing ones as is, adapting existing ones to offshore, delivering in new ways, and targeting certain groups and regions.

- Ensure that the Industry Training Authority is involved in the planning and development stages leading up to offshore development. The ITA provides significant funding to training providers for trades and technical training. It could play a strategic role in preparing for offshore oil and gas development.

- Ensure co-ordination among educational institutions to minimize costs, avoid duplication and provide specialized training only at a time when there will be fairly long-term demand. This will require co-ordination and co-operation among educational institutions. It will also necessarily involve the relevant ministries and especially the employers and investors in the industry who are the ultimate source of knowledge about the quality, quantity and timing of labour that will be demanded.

- Increase capacity to produce trades and technical workers and inform potential learners. Once potential workers are aware of the opportunities, it must be ensured that the training capacity exists for them. This capacity could take the form of competency-based training, as described earlier in this report, as well as more traditional apprenticeship training. For the latter, active employer involvement is needed since they provide the workplace training spaces.

- Lever a strong Ministry of Advanced Education role. Establish expertise within the Ministry on offshore oil and gas training and human resources and reinforce its role in coordinating initiatives among post-secondary education institutions. Consider special funding incentives for the future to stimulate institutional innovation and expansion in oil and gas training.

- Transition to a post-secondary offshore focus. Develop an action plan to start to upgrade training institutions and instructors to offshore practices and standards. Initiate this through a pilot project involving a few staff in a few institutions.

- Private training institution role. Encourage private post-secondary institutions to learn about and explore opportunities for partnerships in offshore oil and gas training. Study the Petroleum Research Services of Canada's Petroleum Industry Training Services in Alberta model with a view to use, build on or model it in the BC offshore environment.

Appropriate government agencies and education and training providers should be involved in the research and planning and lead the education planning and development work leading up to offshore development.

9.5 Program Models

- Bridging programs for workers in other industries. Study the use of bridging training programs in offshore skills with unemployed workers from other resource industries in offshore communities. Work with post-secondary trainers to develop and pilot modules for this transition.

- Encourage co-operative education programs. Such programs have proved to be very successful in providing job-ready workers especially at the professional level. Co-ordination with employers is needed to ensure that the programs offer the appropriate training and that student placements are available.

- Work experience components. In addition to co-op models, experiment with ways to integrate work experience components into training programs for offshore oil and gas occupations.

- Safety and core skills. Start to work with training providers and industry groups to develop specialized and standardized modules for offshore safety and other core skills, especially for construction and production phases.

- In short-term, pursue employment that can be used in other sectors. Due to the volatility in the initial stages of offshore oil and gas exploration and development, consider the expansion of less-risky training programs that will provide workers with competencies that can be used in other industries.

- Countercyclical training strategies during downtime cycles. For when BC's offshore industry is in the development stages, start to develop countercyclical training strategies to prepare workers for when projects re-start or new ones start up.

Program modeling should begin at the start of the training development stage, three or four years before offshore development begins.

9.6 Labour Supply Pools

- Research best practices and critical success factors in offshore oil and gas companies attracting, recruiting and retaining labour force groups under-represented in the industry. While offshore is the least diverse part of Canada's petroleum sector, there is still much literature and experiences from which to draw on in this regard.[16] This information needs to be synthesized, after which work on it can be included as part of long-term human resources planning recommended above.

- Learn from other industries. While the offshore oil and gas work environment has distinctive qualities, stakeholders can also learn from successes and failures in other industries regarding recruiting and retaining under-represented groups.

This type of activity should be part of the planning and development stages leading up to the start of offshore development. This will also be an ongoing task as offshore oil and gas development moves into construction and production phases, and they will require different training models as will new emerging technologies.

9.7 Credentials and Standards

- Work with appropriate bodies, including the new Industry Training Authority, in credential recognition for trades, technical and professional workers from out-of-province and out-of-country. Research indicated that dealing with credential recognition issues across provinces and countries and for trades workers as well as professionals is part of the solution to ensuring an adequate labour supply in offshore oil and gas and other industries.

- Analysis/inventory of transferable/portable skills. Based on the experiences in other jurisdictions, develop a list of occupations and training programs that may be relevant to offshore oil and gas skill requirements and identify which offshore occupations they relate to and how individuals can go through bridging and laddering training programs to move into such jobs.

- Central registration system for skills and qualifications. Develop and pilot a computer-based central registry of workers with offshore-related skills and experience and offshore companies and service providers. Prepare such a system to use as offshore oil and gas projects start up.

Standards and credentialing need to be conceived during the planning and development stages and because new credentials can take more time, this activity needs to start as soon as possible in the development stage leading up to offshore development.

9.8 Marine Activities

- Work with the marine industry to attract, train and retain a growing marine labour supply. In this sector, on-the-job training is a larger component than in other occupations and working at sea is the entry point. Even more so than in other sectors, employers must be involved in labour supply issues.

[16] For example, see Husky Energy. *White Rose Project Diversity Plan.* Husky Energy, June 2003; Hart, S. and M. Shrimpton. "Women's Training and Equity on the Hibernia Construction Project." In M.G. Cohen (ed.), *Excluded from Work: Access and Equity for Women, Immigrants, First Nations, Youth and People with Low Income.* University of BC Press, Vancouver, BC. 2003; Government of Northwest Territories. *Maximizing Northern Employment Private Sector Partnership Fund Training and Development Initiatives Guidelines.* April 30, 2002.

- Work with marine and offshore industries to ensure that there is the capacity to provide specific safety and related training. An offshore work environment has very unique safety and worksite-specific requirements. As the technology moves to more sub-sea activity, these will be increased. Industry groups, employers, unions, professional organizations and the Workers' Compensation Board will need to be involved in dealing with these issues, including training for trainers and management and supervisors.

Ensuring that the marine part of offshore development is an integral part of training and human resource measures it needs to start during the research and planning stages of this process.

As indicated at the beginning of this report, within the short timeframes and limited resources, this report represents a very preliminary analysis and is a first small step in building blocks towards 2010 and the provincial government goal of facilitating the start up and development of "scientifically sound and environmentally responsible" offshore oil and gas development in British Columbia.

It is hoped that this report, the literature surveyed, the findings from interviews, and the limited analysis of labour demand and supply data will provide a foundation on which the BC Offshore Oil and Gas Team can build and sponsor more comprehensive research, analysis and planning in the near future.

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[17] Note – The authors received the paper by G.E. Bridges & Associates Inc. after completing this study. While it provides some new information and is cited in these References, there was not time to incorporate its findings into this study.

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APPENDICES

APPENDIX A

Chronological History of BC Oil and Gas Development[18]

1949
Drilling for oil in the Queen Charlotte Island region.

1959
British Columbia declares a Crown reserve over oil and gas resources in the area east of a line running north-south three miles seaward of Queen Charlotte Islands and Vancouver Island. Under the Petroleum and Natural Gas Act, exploration permits over oil and gas in a Crown reserve can only be granted through public auction.

1962-1966
British Columbia Crown reserve over offshore oil and gas resources is cancelled to encourage companies to apply for exploration permits.

1966
British Columbia reinstates the Crown reserve over offshore oil and gas resources to the area beginning at the low-water mark seaward to the outer limits of Canada's Territorial Sea and to that area of the Continental Shelf capable of being exploited.

1966-1969
Canada withholds exploration approval in the Strait of Georgia until a federal-private study on the effects of seismic exploration on fish stocks is complete.

1967
British Columbia declares a Crown reserve over offshore mineral and placer minerals in same area as offshore oil and gas Crown reserve.

1967
The Supreme Court of Canada decides that the Territorial Sea off British Columbia, outside of bays, harbours and inland waters, belongs to Canada.

1967
Shell Canada begins a drilling program off Barkley Sound, Vancouver Island. Over the next two years, 14 wells are drilled in the offshore in the region from Barkley Sound north through Queen Charlotte Sound and Hecate Strait. The drilling rig was built in Victoria, British Columbia. During the exploration program, the rig reportedly experienced seas of 80 feet and winds of 70 miles per hour off Vancouver Island, and seas of 65 feet (with one rogue wave of approximately 100 feet) in Hecate Strait. Non-commercial levels of oil were found off the Queen Charlotte Islands. Some gas shows were found off Tofino.

1969
Shell Canada leases its exploration rights to Chevron.
In Santa Barbara, California, an offshore rig experiences a blow-out. In the Arctic, the U.S. vessel Manhattan transits the Northwest Passage to assess a route for oil transport from Alaska. The U.S. makes proposals to ship Alaska oil south by tanker through British Columbia coastal waters and the Strait of Juan de Fuca.

[18] From BC Offshore Oil & Gas Team website: http://www.offshoreoilandgas.gov.bc.ca/offshore-oil-and-gas-in-bc/chronology.htm.

1970
Canada declares that no drilling or exploration will occur in the Strait of Georgia. British Columbia suspends work obligations on provincial permits in the same region until the question of ownership of the seabed in Strait has been addressed.

1971
The British Columbia legislature passes a resolution opposing tanker traffic off the West Coast.

1972
Canada makes a policy decision to not approve any new exploration permits or programs in the West Coast offshore and to suspend all work obligations under existing permits (federal moratorium).

1976
British Columbia Court of Appeal decides the Strait of Georgia is owned by British Columbia.

1981
Without limiting its earlier Crown reserve, British Columbia designates that all oil and gas in the area landward of a line drawn off the west coast of Queen Charlotte Islands south to the west coast of Vancouver Island is reserved to British Columbia.

1984
Supreme Court of Canada decides Strait of Georgia is owned by British Columbia.

1984-1986
Independent Federal-Provincial Environmental Review Panel established to assess potential environmental and socio-economic effects of offshore oil and gas exploration. Final report recommends exploration could proceed if 92 specific recommendations were met.

1986-1989
British Columbia and Canada conduct negotiations on management and jurisdiction over offshore oil and gas exploration and development (the Pacific Accord).

1989
British Columbia and Canada conduct negotiations on management and jurisdiction over offshore oil and gas exploration and development (the Pacific Accord). British Columbia makes a policy announcement that there will be no drilling offshore for at least five years (the provincial moratorium). Canada announces it will not consider any development in the offshore until requested to by British Columbia.

2001
British Columbia appoints an independent scientific panel to examine whether offshore oil and gas can be extracted in a scientifically sound and environmentally responsible manner. An Offshore Oil and Gas Task Force visits nine northern coastal communities to listen to views of communities, local residents and First Nations.

2002
The scientific panel concluded: "there is no inherent or fundamental inadequacy of the science or technology, properly applied in an appropriate regulatory framework, to justify a blanket moratorium on offshore oil and gas activities." The task force concluded that Northern communities, including First Nations want to have a strong voice in the contemplation of offshore oil and gas. The panel and task force made a number of recommendations of further work that needs to been done before any activity begins. In response, the Province of British Columbia enlisted the University of Northern British Columbia to carry out scientific and technical research and develop a work plan that responds to these recommendations.

2004
A panel of experts assembled by the Royal Society of Canada concluded the restrictions imposed by the federal and provincial drilling moratoriums are now unnecessary, even destructive, in oil and gas development. The size of the oil and gas reserve is estimated 1.3 billion barrels of oil and 9.8 trillion cubic feet of gas. The panel pegged economic spin-offs at $110 billion.

APPENDIX B

Detailed Project Methodology

The research process for this project entailed both secondary and primary research methodologies. On the secondary research, an extensive literature review and limited data gathering was performed. Primary research involved in-depth personal interviews with key industry informants. Synthesis and analysis of research findings are provided in this report.

Literature Review

This project component entailed a review of key relevant reports, studies and other literature from jurisdictions within and outside Canada. Note that there was not time for an exhaustive search of all available literature. Nevertheless, the most important and relevant pieces have been covered by the literature review, including that referred to us by the BC Offshore Oil and Gas Team and experts who were interviewed.

Government, private sector, academic and educational sources of literature were reviewed to quickly identify the most important publications. Sources of such literature involved both print media and web-based material. Additional material was collected throughout the project as new information was found.

The literature and document review was used to develop the historical context and overview of the industry sectors and occupations of interest; to identify demographic characteristics of the workforce; to determine trends in and key forces affecting labour demand and supply; and to identify the labour demand and supply issues. Materials were also reviewed to examine the range of relevant education and training courses/programs available; to establish current human resource training practices within the industry; to examine existing/trends in recruitment and retention practices within the industry sectors; and to identify issues, needs/gaps and best practices in skills development and human resources practices in BC and other jurisdictions.

The literature review also yielded findings from experiences in other jurisdictions in terms of how they went about planning for offshore oil and gas development; and on best practices, practices that did not work well, and critical success factors.

The emphasis of literature review was on the synthesis of quality information within the available time and resources, rather than repeating volumes of existing material.

Data Gathering and Analysis

The data gathering component involved a review of impact studies, occupational and industrial employment data, occupational forecasts, and skills development data.

Data analysis included use of Statistics Canada labour market data (e.g. Census, Labour Force Survey), Canadian Occupational Projections System (COPS) data, other government data (e.g. British Columbia Ministry of Advanced Education, BC Stats, and from other provincial and territorial jurisdictions on the East Coast), private sector and community data, and data from post-secondary educational institutions. As much as possible, occupational data were reconciled with the National Occupational Classification (NOC) codes.

The labour demand analysis was based mainly on COPS data, while the labour supply analysis was based on available data on university and college graduates, apprenticeship training, and high-level in-migration and immigration trends. High school graduates, income assistance recipient (welfare) and Employment

Insurance claimant data were not be used because the scope of the offshore oil and gas occupations being mainly highly skilled; the labour pools in these supply categories possess mainly entry skills or if they have more advanced skills they are not related to offshore oil and gas competencies. Private training institution graduate data in BC is dated and is no longer available. An inter-occupational analysis was not considered given timelines and the lack of available data.

To the extent possible, the data analysis included relevant training program participation and outputs. Specific areas covered included:

- Relevant education and training courses/programs and graduation outcomes within the context of the supply of skilled workers;
- Potential qualitative gaps between the actual and desired training capacity of the institutions (present and future);
- Best practices in training institutions and industry-related training; and,
- Training gaps and changes required in the development, design and delivery of training and occupational/industry certification policies to meet the needs of the industry sectors.

Due to time constraints, this preliminary analysis involved data analysis at a highly aggregated level, and the approach was one of balancing qualitative (i.e., findings from other jurisdictions and key informant interviews) and quantitative (i.e., occupational and skill development data analysis) information.

Key Informant Interviews

Primary data collection involved conducting a set of key informant interviews of industry, education and government stakeholders in BC, as well as industry experts in the Atlantic offshore oil and gas sector. Based on an initial sample of 25 names collected by the project team and suggested by the client and the BC Offshore Oil & Gas Team, 23 interviews were initiated, resulting in 17 completed interviews. The primary purpose of the interviews was to collect information on labour demand and supply associated with potential offshore oil and gas activities in BC, occupational distribution during different phases of offshore oil and gas activity, perceived skill shortages, and human resource issues faced by the industry (i.e., challenges, occupations difficult to find in the local market, etc). Questions concerning problem areas and best practices were also included.

A list of key informants interviewed can be found in Appendix C. Sources of information and key informants included the following organizations:

- Petroleum Human Resources Council of Canada;
- Canadian Association of Petroleum Producers;
- Petroleum Research Atlantic Canada;
- Newfoundland Ocean Industries Association;
- Offshore/Onshore Technologies Association of Nova Scotia;
- Atlantic Resource Industries Association;
- Relevant government agencies (e.g. Ministry of Advanced Education);
- Education and training institutions in BC, including:
  - BCIT;

  - Northern Lights College;
  - Northwest Community College; and,
  - University of Northern BC
- BC (e.g., northeast) oil and gas experts;
- Other oil and gas industry associations in BC; and,
- Contacts with offshore projects (e.g., service companies in Newfoundland and Nova Scotia).

The interview questionnaire is in Appendix D. As shown in the appendix, a semi-structured interview process containing mostly open-ended questions was used. The advantage of this interview structure is that it ensured that all interviewers captured the key elements needed for the report, while ensuring that the interviewees were sharing their knowledge and experiences rather than being forced to "choose' from a set of alternatives.

APPENDIX C

Key Informant Interviewee List

NAME	ORGANIZATION
1. Mark Shrimpton, Principal	Community Resource Services Ltd. (Newfoundland and Labrador)
2. John Clarkson, Associate Dean, Marine Programs	BCIT
3. Kate Pelletier, Associate Dean, Manufacturing & Industrial/Mechanical	BCIT
4. Rick Bryant, CEO	Chamber of Shipping of BC
5. Phil Chatters	Northern Lights College (Dawson Creek)
6. Beth Davies	Northwest Community College (Terrace)
7. Linda Kaivanto, Coordinator	Ministry of Advanced Education
8. Cheryl Knight, Executive Director & CEO	Petroleum Human Resources Council of Canada (PHRCC)
9. Dr. Robert Tait, Dean of Graduate Studies	University of Northern British Columbia (Prince George)
10. Ken Hicks, Manager, Modeling & Technical Analysis	Department of Finance, Government of Newfoundland & Labrador
11. Jeff O'Keefe, Petroleum engineer with Industrial Benefits Division, Dept. of Natural Resources, and also with PIHRC	Newfoundland Energy & Mines
12. Dave McGuigan	Pacific Coast Offshore Oil and Gas Association (Prince Rupert)
13. Chris Campbell	Pacific Offshore Energy Association (Nanaimo)
14. Carey Ryan, Project Director and Treasurer	Petroleum Research Atlantic Canada (Halifax)
15. Rob Strong	ConPro Services (service company)
16. Phil Nelson	Council of Marine Carriers
17. Doug MacLaren, Business Development Manager, Energy Department	Southern Alberta Institute of Technology (Calgary)

APPENDIX D

Key Informant Interview Questionnaire

This questionnaire was emailed to key informants before they were interviewed via telephone. Note a summary of each key informant interview, with attribution (to maintain research confidentiality), can be provided to the client upon request.

Introduction/Background Information for Key Informants

The Innovation and Science Council of BC has contracted with Human Capital Strategies to complete a preliminary analysis of labour demand and supply and implications for future human resources development associated with the possible BC offshore oil & gas development. This would be an initial building block in the staged development of a plan and strategies to support BC's offshore oil and gas development. This project is funded by the BC Offshore Oil & Gas Team.

Human Capital Strategies has partnered with Roslyn Kunin & Associates, Inc. to complete this project. The research to be conducted includes literature review, key informant interviews, and analysis of quantitative and qualitative data.

You and/or your organization have been identified as having useful information and insight on labour demand and supply associated with offshore oil and gas development. We would like to talk to you for about 20 minutes to get your ideas on any of the attached questions you may wish to discuss. We will be in touch with you shortly to conduct the interview or to determine a suitable time to do so.

Thank you in advance for your time and assistance. If your would like to contact us please call Roslyn Kunin & Associates, Inc. (Dr. Roslyn Kunin, phone: 604-736-0783, email: rkunin@rkunin.com, or Lee Gan, phone: 604-736-0783 and email: lgan@access.victoria.bc.ca. If you would like further information on the project itself, please see the contact information below.

Contact for background information:

Innovation and Science Council of BC – Andrew Walls (phone 250- 438-2752 and email: awalls@scbc.org)
BC Offshore Oil & Gas Team – Ron Burleson (phone: 250-952-0619 and email: Ron.Burleson@gems7.gov.bc.ca)
Human Capital Strategies – Kerry Jothen (phone: 250-213-9231 and email: kjothen@humancapitalstrategies.ca)

QUESTIONS

The types of questions in the interviews will vary by the type of organization. Below is an example of some of the questions. Each question will be tailored to the specific stakeholder group: industry; education and training providers; government; academic experts and others. Each interviewee will be asked most of the following questions, however the weight and probing will vary with their expertise and organization.

Preamble on the study and purpose of the call

1. What kind of incremental[19] demand for workers do you foresee because of offshore oil and gas development?

[19] Demand above the level of demand for skills expected without oil and gas development.

2. What is the likely mix of occupations you see applicable to British Columbia's offshore oil and gas development? For each type of occupation groupings, where do you think the likely source of supply will come from?

3. Please comment on indirect impact (spin-offs, supplier industries that are busier because of the offshore oil and gas development) and induced impact (general effects of a busier economy, with people spending more, fuller employment, etc).

4. What skills are in short supply now, including in marine, energy and onshore oil and gas? (*We are looking for more qualitative background information here.*) Do you see a trend emerging in this regard? How are your agency and others addressing these skill shortages now?

5. What human resource issues do you foresee are critical in this industry? Who would you suggest/recommend should do more in addressing these issues?

6. Are you aware of/have you encountered any good human resource practices in the offshore oil and gas industry that you want to share with us, or in other similar industries? Also, pitfalls to avoid, etc.?

7. Do you see the kind of drilling/development/production activity similar to that in the East Coast applicable to British Columbia? What type of drilling/development/production technology do you see applicable to British Columbia's offshore oil and gas development?[20]

8. How can an appropriate supply of university and college graduates be ensured so that they have the skills the industry needs?

9. How do you think the needs for increased skill requirements that may occur in the event of offshore oil and gas development can be met?

10. Here are some suggestions for dealing with potential shortages associated with the offshore oil and gas development. Can you please assess them? (Rank 1-5 for not useful to most useful)

[Ask this question once for each "shortage" that has been identified.]

	Import people? Rest of Canada? Other countries?	Train people now?	Credential recognition?	Upgrade skills for Workers with Related skills	Other?
serious shortage	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	
mild shortage	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	
balance	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	

11. Can you foresee varying impacts at different phases of offshore oil and gas development (e.g. exploration, construction, production, etc.)?

12. How much transferability of skills exists between on- and off- shore oil and gas development, and between oil and gas development and other industries?

[20] For a description of the technical variables/scenarios please refer to Appendix A.

13. Are there any specific education and training programs in BC or elsewhere that would address the skill requirements of offshore oil and gas development?

14. Do you have any materials (i.e. figures, charts, reports, etc.) that you could to share with us regarding the topic of offshore oil and gas labour demand and supply?

15. Is there anything you recommend we obtain from the internet?

16. Do you have any other ideas or information or suggestions or names of other contacts to interview?

Attachment A (Interview Questionnaire)

Offshore Oil & Gas - Technical Variables/Scenarios

The description below has been taken from *Nova Scotia Offshore Labour Demand Model Final Report*, available from http://www.pr-ac.ca/files/Labour_Demand_Model_-_Final_Report.pdf

3.2.2 Exploration

Presently, there are three main methods of exploration: (1) self-elevation (Jack-up) rigs that are typically used for shallow water, (2) fully dynamically positioned semisubmersibles (DPSs), usually used for deep water and, (3) drill ships, also used for deep water. In the present study, exploration activity is modeled under the first two major categories. Drill ships were not modeled due to a lack of available data. However, indications are that the human resource requirements for drill ships are similar to DPSs.

Self-Elevating (Jack-up) Platforms

'Jack-ups' comprise about half of all the mobile rigs in the world and are used for shallow-water drilling. They are self-contained platforms resembling a flat-bottomed barge hull with three or more vertical legs fitting through openings on the outer edges of the hull. These legs have 'teeth' notched into them and can be raised or lowered by a jacking mechanism on the deck that usually employs a hydraulic or electric rack and pinion arrangement.

On arrival at its location, these legs are jacked down until they touch the seabed. When the hull is high enough to be clear of the highest waves expected at the location, the legs are locked and remain in this position until the well has been completed. Thus, in its drilling mode the barge hull is raised on its legs well out of the water and serves as the drilling, storage and living platform. As it is well above the water, it is firm and stable, experiencing none of the sea motions that affect DPSs.

While conventional jack-ups have vertical legs, several designs incorporate legs that slant outwards at the bottom to obtain a wider standing 'spread' and improved stability. The legs are all independently jacked, and their position can be adjusted so that the barge stands horizontal on a sloping seabed. The legs can be fitted with a large, flat steel frame at their lower ends, called a 'mat'. This affords better stability on some bottom soil types and reduces the danger of capsize.

Semi-submersibles

Because they can operate in deep or relatively shallow water, semi-submersibles are probably the most versatile of all drilling platforms. For this reason they have become a hallmark of the marine drilling industry. The semis considered in this report are fitted with 'dynamic positioning' (DP) equipment. DP units are more expensive to build and operate, but are sought after for drilling in deep water far beyond the reach of either a jack-up rig or a conventionally moored semi. With a DP system, the rig, by means of computer-controlled thruster propellers, can maintain a fixed position relative to the seabed without the use of anchors. These vessels can, therefore, be used for drilling in very deep water where an anchored unit would experience problems staying on location.

Drill Ships

Several marine drilling contractors operate drill ships as well as semis and jack-ups. Because of its conventional ship-shaped hull, the drill ship is more prone to movement in a seaway than the semi-submersible. Therefore, they are subject to longer periods of downtime due to wind and wave action. For this reason, drill ships are typically used in calmer waters of the world, whereas, semis can drill in the most hostile environments. This drill ship disadvantage is partially offset by its ability to move from one location to the next rapidly and under its own power, with considerable economic advantage.

Development and Production from section 3.3

Table 1: Summary of the 14 Technology Scenarios

Name	Gas or Oil	Water Depth (m)		Pipeline (km)	Reserves (tcf)		Reserves (mmbbls)	
		Lower	Upper		Lower	Upper	Lower	Upper
Staffed Platform (small/shallow)	gas/oil	25	100	200	0.20	1.00	30	150
Staffed Platform (large/shallow)	gas/oil	25	100	200	1.00	3.00	150	500
Staffed Platform (small/deep)	gas/oil	100	200	200	0.40	1.00	75	175
Staffed Platform (large/deep)	gas/oil	100	200	200	1.00	3.00	175	500
Unstaffed Platform (shallow)	gas/oil	25	100	100	0.10	1.00	20	150
Unstaffed Platform (deep)	gas/oil	100	200	100	0.20	1.00	45	175
FPSO (small)	oil	100	1500	N/A	N/A	N/A	50	100
FPSO (large)	oil	100	1500	N/A	N/A	N/A	100	300
TLP (small)	gas/oil	200	1500	200	0.30	0.60	50	100
TLP (large)	gas/oil	200	1500	200	0.60	3.00	100	300
Spar (small)	gas/oil	200	2000	N/A	0.30	0.60	50	100
Spar (large)	gas/oil	200	2000	N/A	0.60	3.00	100	300
Subsea Tieback (shallow)	gas/oil	25	400	20	0.10	0.20	10	30
Subsea Tieback (deep)	gas/oil	400	3000	50	0.20	0.60	30	100

APPENDIX E

Detailed Description of Offshore Oil and Gas Occupations

(See separate addendum)

Appendix E Descriptions of Major Occupations in Offshore Oil and Gas Exploration, Development and Production by Industry Sub-sector

(Combined from *Nova Scotia Offshore Labour Demand Model Final Report* and *Labour Market Assessment of the Oil and Gas Industry Supply and Service Sector in Newfoundland and Labrador*)

This is an addendum to "Future Human Resources Development in BC's Offshore Oil & Gas Industry: A Preliminary Analysis" by Human Capital Strategies (Victoria, BC, March 31, 2004)

Owner/Operator

Engineering Management

Key Responsibilities and Skill Requirements

- Manages engineers and staff in department
- Manages financial resources
- Ensures compliance

Educational Requirements (Formal and On-the-Job):

- Bachelors of Engineering (with specialist relevant to the area)
- Professional Engineering Designation (preferred)

Experience Requirements:

- 10 or more years in senior management position petroleum experience and 2 years offshore experience
- Experience with multiple-project integration
- Experience working on multiple installations in different environments

Previous Roles:

- Engineering Manager
- Senior Engineer

Competencies:

- Communication (oral/written)
- Multi-project Integration
- Teamwork
- Negotiation Skills (Senior)
- Contract Administration (Senior)
- Problem Solving

Relevant NOC Reference: 0210 Engineering, Science and Architecture Managers

Reservoir Manager

Key Responsibilities and Skill Requirements

- Develops and executes the operator's reservoir management strategy in order to maximize recoverable reserves, predict and improve reservoir performance, and increase reserve additions.
- Develops reservoir descriptions and determines well placement and related functional requirements; well inventories and forecasts; well intervention schedules; depletion processes; production and injection strategies and allocations; production and injection profiles; data acquisition requirements; contingency plans; and well operating plans.
- Conducts reserve tracking and economic modeling.
- Develops investments decisions and predicts potential reservoir/production problems such as gas and water breakthrough, low reservoir pressure, gas flaring, and well performance.

Education, Experience and Certification Requirements

- Requires 15 or more years of increasingly responsible leadership and senior technical experience in the geoscience and/or reservoir engineering disciplines with application to complex, multi-fault, offshore reservoir development. Formal education will typically include a minimum an undergraduate and/or masters degree in a geosciences or related engineering discipline.

Typical Entry Level or Career Path

- This senior leadership role requires great knowledge of reservoirs and probability-based calculations concerning oil and gas in place and probable recovery. The role encompasses many years of progressively responsible international experience in these areas, typically in a variety of fields.

Relevant NOC Reference: 2145, Reservoir Engineer, Petroleum

Reservoir Engineer

Key Responsibilities and Skill Requirements

- Conducts feasibility assessment studies for developing new oil and gas fields
- Directs and monitors oil and gas drilling operations.
- Provides technical input for maximization of reserves recovery and optimization of production.
- Directs and monitors the completion and evaluation of wells, well testing and well surveys.
- Reservoir Characterization, Production, Modeling and Simulation experience is required.
- Integration of geophysical, geological, petrophysical, reservoir engineering and production data for reservoir modeling and as a consequence, production rate prediction.
- Analyzes reservoir rock and fluid data to design optimum recovery methods and to predict reservoir performance and reserves.
- Monitors and forecast oil and gas reservoir performance and recommend oil recovery techniques which extend the economic life of field.
- Designs and selects artificial lift machinery and well and surface production equipment and systems and specify programs for corrosion control and oil and gas treatment.

Education, Experience and Certification Requirements

- A Bachelor degree in petroleum engineering or related engineering discipline is required. A Master's degree in a related engineering discipline may be required.
- Licensing by a provincial association of professional engineers is required to approve engineering drawings and reports and to practice as a Professional engineer (P. Eng.)
- Engineers often work in a multidisciplinary environment and acquire knowledge and skills through work experience that may allow them to practice in associated areas of science engineering, sales or management

Relevant NOC Reference: 2145, Reservoir Engineer, Petroleum

Petrophysicist

Key Responsibilities and Skill Requirements

- Provides analysis, interpretation and recommendations regarding hydrocarbon pore volumes and the quality of past and present oil and gas well bores in relation to reservoir development and reserve determinations.
- Analyzes and catalogues al data obtained from open hole operations through wireline, tubing-conveyed, and other tools for the purpose of analyzing reservoir structure, conducting deposit analyses, and formulating net pay estimates.
- Compiles and maintains all pertinent petrophysical data and interpretations in a form that can be integrated with geological, geophysical, reservoir and production engineering disciplines. Interfaces with offshore personnel, including contractor representatives, regarding the use of cost-effective logging and data acquisition operations.
- Contributes to the design of formation evaluation plans.

Education, Experience and Certification Requirements

- Undergraduate degree in Engineering or Geology, combined with 7-10 years of related experience in the field of geophysics, reservoir engineering, or reservoir geology.

Relevant NOC Reference: 2113, Petrophysicist

Geophysicist

Key Responsibilities and Skill Requirements

- Processes and interprets three-dimensional seismic data to determine the structural framework of and oil and gas fields.
- Identifies and incorporates seismic attributes to help refine reservoir models used in mapping primary and secondary reservoirs. Builds and maintains 2D and 3D earth models for use in the reservoir management process and in the determination of drilling locations.
- Builds and maintains velocity models required for accurate depth conversion and prediction.
- Extracts information from seismic data which, when combined with well-bore data, will optimize the reservoir models used for reservoir management and predicting reserve additions.

Education, Experiences and Certification Requirements

- A university degree in geophysics or a related discipline is required, combined with several years of experience in geophysical interpretation and 3D interpretation on workstations. Requires knowledge of the latest seismic data processing techniques, and a familiarity with statistical methods, seismic attribute analysis, computer mapping, and data management methods/tools.

Relevant NOC Reference: 2113, Geophysicist

Geologist (Petroleum)

Key Responsibilities and Skill Requirements

- Catalogues, maintains and analyzes data from open and cased hole operations with existing data sets from delineation or development wells to assist in the generation of structural and stratigraphic interpretations of multiple hydrocarbonbearing reservoirs.
- Generates quantitative maps and simulations of 3D reservoir distribution.
- Assesses the performance of drilling and production/injection activities with respect to regulator-approved pooling, data acquisition, and field development plans.
- Contributes to the generation and documentation of drilling proposals and the monitoring of drilling activities.

Education, Experience and Certification Requirements

- A university degree in Geology with a minimum of 10 years of petroleum experience in exploration or production environments.

Relevant NOC Reference: 2113, Petroleum Geologist

Corrosion Engineer

Key Responsibilities and Skill Requirements

- Supervises staff
- Performs corrosion engineering tasks

Educational Requirements (Formal and On-the-Job):

- Bachelor Engineering (Mechanical)

Experience Requirements:

- General corrosion engineering knowledge
- 2-3 years general and offshore experience (Intermediate)

Previous Roles:

- Intermediate (Senior)
- Junior (Intermediate)

Competencies:

- Communication (oral/written)
- Teamwork

Relevant NOC Reference: 2142 Metallurgical and Materials Engineers

Drilling Manager

Key Responsibilities and Skill Requirements

- Generally responsible for leading the Operator's drilling, completions and well servicing operations; overseeing the operations of the drilling and well services contractors; and delivering capable wells to the owner/operator.
- Develops well construction design and execution plans in liaison with the Reservoir function.
- Develops and delivers well operating plans for all wells.
- Develops and delivers all well servicing programs.
- Negotiates on behalf of the owner/operator all commercial agreements with drilling, oil field service, and other contractors.

Education, Experience and Certification Requirements

- Completion of an undergraduate degree, typically in Engineering or a related discipline, plus 15 or more years of increasingly responsible experience in offshore drilling and completions leadership, with a broad base of experience in drilling engineering and well operations engineering.

Typical Entry Level or Career Path

- This senior leadership role encompasses asset-level accountability for all aspects of offshore drilling and completions, and several many years of progressively responsible international experience in these areas, typically in a variety of fields and project locations around the world.

Relevant NOC Reference: 0811, Primary Production Managers

Rig Superintendent

Key Responsibilities and Skill Requirements

- Generally responsible for coordinating and leading rig-site staff in providing safe, technically sound and cost-effective oil and gas well constructions.
- In consultation with the Drilling Superintendent (onshore), ensures that all materials, services and equipment are available on site when needed, and that rig operations are conducted in accordance with operational objectives, environmental regulations, and industry best practices.
- Coordinates the execution of well construction activities, ensures the availability of all facilities and hardware systems needed for construction, completion and recompletion purposes, and ensures the maintenance of well equipment integrity and well control processes.
- Forecasts, reports and manages well construction costs, and ensures that well construction time, cost and quality targets are met by the drilling contractor.

Education, Experience and Certification Requirements

- Completion of an undergraduate degree, typically in Engineering or a related discipline, plus 10 to 15 years of increasingly responsible experience in well drilling and completions, preferably in an offshore environment. Completion of an IWCF Well Control Certificate.

Typical Entry Level or Career Path

- There is no typical path for this role, although many incumbents are individuals who have worked their way up through the entire ladder of rig operations positions. Typically, incumbents are promoted from the position of Driller or Toolpusher.

Relevant NOC Reference: 8222, Supervisors, Oil and Gas Drilling and Service

Offshore Installation Manager

Key Responsibilities and Skill Requirements

- Generally responsible for overseeing and directing all aspects of the operation of an offshore oil and gas production facility.
- Ensures that all oil storage, processing and off-loading activities are carried out in a safe and environmentally compliant manner.
- Ensures the achievement of business objectives through the ongoing establishment and review of installation priorities, the efficient and cost-effective execution of production operations, and ensuring maximum production and injection system availability.
- Maintains effective communications among different groups across the installation and with onshore support organizations.
- Provides platform crisis management and emergency response leadership when required.
- Ensures the effective ongoing operation of SH&E management systems.
- Ensures the effective implementation and ongoing administration of the Operator's training and competency assurance program.

Education, Experience and Certification Requirements

- Completion of an undergraduate degree; 15 or more years of increasingly responsible leadership experience in offshore operations; and completion of an appropriate program of certification related to emergency response and crisis management.

Typical Entry Level or Career Path

- This position is normally an Operator's most senior offshore role and entails accountability for all aspects of oil and gas production operations on a given offshore facility. Incumbents typically accumulate many years of progressively responsible international experience in these areas, usually in a variety of fields and project locations around the world.

Relevant NOC Reference: 0811, Primary Production Managers

Process/Field Operator

Key Responsibilities and Skill Requirements

- Operates a wide variety of equipment used in the production and processing of oil and gas on an offshore production installation.
- Starts, operates and shuts down processing and utility equipment in accordance with established operating and control of work procedures.
- Monitors and operates production equipment and processes as a control panel operator in a centralized, highly automated DCS environment.
- Performs routine maintenance of equipment and assists Maintenance Technicians.

Education, Experience and Certification Requirements

- At least five years of operating experience in the oil and gas industry or in a closely related industrial processing environment, with a working knowledge of DCS, ECS, and FGS operating environments. Either a journeyman trade certification (e.g., electrical, mechanical, instrumentation) or a Technologist qualification is preferred.

Typical Entry Level or Career Path

- Junior Operator or Operator Trainee.

Relevant NOC Reference: 9232, Process Technician, Refinery

Master - Marine

Key Responsibilities and Skill Requirements

- Acts as the owner's representative in relation to all aspects of the operations of the vessel with ultimate responsibility and authority to make decisions on their behalf.
- Commands and operates a supply vessel, oil tanker, or other ship engaged in offshore oil and gas operations.
- Plans and executes safe navigational passage using navigational aids such as instruments, maps and charts in accordance with national and international regulations, codes and guidelines, company/owner instructions, and practices of safe seamanship.
- Ensures the seaworthiness and safety of the crew, ship and cargo.
- Supervises and coordinates the activities of desk crews, and directs and oversees the loading and unloading of cargo.
- Ensures the Chief Officer and Chief Engineer are well trained and informed of the Master's duties and work.
- Keeps all certificates and class surveys, records, files and drawings up to date.
- Maintains the ship's log of vessel progress, crew activities, and weather and sea conditions.

Education, Experience and Certification Requirements

- Completion of a Deck Officer Cadet program from an approved nautical institute and certification as a Master Foreign Going by Transport Canada. Certification at this level typically requires a minimum of 36 months of experience as a Chief Officer.

Typical Entry Level or Career Path

The progression to Master (Foreign Going) would normally be as follows:
- Completion of Nautical Science Program (three years + 12 months marine experience)
- Second Mate (3 years ocean-going experience + TC certification)
- First Mate (Chief Officer) (5 years ocean-going experience + TC certification)
- Master (3 years experience as a Chief Officer + TC certification)

Relevant NOC Reference: 2273, Deck Officers, Water Transport

Chief Engineer - Marine

Key Responsibilities and Skill Requirements

- Operates main engines, machinery and all auxiliary equipment aboard ships, including boilers, steering and deck machinery, motors, pumps, generators, and condensers.
- Supervises and coordinates the activities of engine room crew, the monitoring of engine and machinery performance, and the inspection, maintenance and emergency repair of engines, machinery and auxiliary equipment.
- Inspects and records fuel, bunkers and stores used for operations and maintenance.
- Oversees the vessel's preventive maintenance and spare part control systems.
- The Chief Engineer reports to the Master.

Education, Experience and Certification Requirements

- Completion of a Marine Engineering program from an approved nautical institute and certification as a Marine Engineer, 1st Class by Transport Canada. Certification at this level requires a minimum of number years of experience in a marine engineering environment.
- The requirement for formal post-secondary training may not apply if the employee has the requisite years of directly related marine engineering experience and has been appropriately certified by Transport Canada.

Typical Entry Level or Career Path

The progression to Chief Engineer would normally be as follows:

- Completion of a Marine Engineering Program (three years)
- 4th Class Marine Engineer (36 months of related experience + TC certification)
- 3rd Class Marine Engineer (48 months experience + TC certification)
- 2nd Class Marine Engineer (minimum 4th class + 12 months experience + TC certification)
- Chief Engineer (minimum 3rd class + 24 months experience + TC certification)

Relevant NOC Reference: 2274, Engineer Officers, Water Transport

Installation Management

Key Responsibilities and Skill Requirements

- Supervises staff
- Manages installation

Educational Requirements (Formal and On-the-Job):

- Bachelor Engineering
- Company specific training

Experience Requirements:

- 7 years general experience

Previous Roles:

- Management positions

Competencies:

- Leadership
- Communication (oral/written)
- Teamwork

Relevant NOC Reference: 0711 Construction Managers

Drilling

Instrumentation-Electronics Technician

Key Responsibilities and Skill Requirements

- Installs, calibrates and modifies electronic systems and components in an offshore production or marine environment, including those used in oil and gas production and processing; drilling and subsea operations; communication; data acquisition; computer system operations; dynamic positioning; and navigation.
- Inspects electronic instruments and systems to diagnose faults, calibration errors, and defective parts, and repair/adjust as required.
- Performs scheduled preventive maintenance and repair of electronic systems.

Education, Experience and Certification Requirements

- Completion of a College level program in Instrumentation/Electronics Technology, plus a minimum of 12-18 months of practical workplace experience in an industrial setting.
- Certification of familiarity with offshore/marine systems and processes in accordance with the operator's competence assurance process.

Typical Entry Level or Career Path

- If the employee does not possess relevant industrial experience, a period of apprenticeship of up to two years is required in order to obtain journeyperson certification, prior to operating independently as a Technician.

Relevant NOC Reference: 2243, Industrial Instrument Technicians and Mechanics

Electrical Technician (Marine)

Key Responsibilities and Skill Requirements

- Generally responsible for the operational integrity, maintenance, installation/removal, and repair of electrical equipment in an offshore marine or oil and gas production environment.
- Maintains, troubleshoots, repairs, tests and installs electrical motors, generators, industrial storage batteries and hydraulic and pneumatic electrical control systems for marine vessels and other marine-related applications.
- Performs diagnostic tests and troubleshoots system faults and failures to ensure that electrical power if provided where and when needed.

Education, Experience and Certification Requirements

- Completion of a four year industrial electrician apprenticeship program; a valid journeyperson certification; plus a minimum of 6-12 months experience in a marine electrical maintenance/repair environment.

Typical Entry Level or Career Path

- Industrial Electrician.

Relevant NOC Reference: 7272, Industrial Electricians

Mechanical Technician

Key Responsibilities and Skill Requirements

- Responsible for the operational integrity, maintenance, installation/removal, and repair of mechanical system components and drilling systems such as drawworks; pipehandling units; rotary tables/bushings and other rotary components on the drilling system; and blow-out preventer (BOP) control system and stack components.
- Responsible for the operational integrity, maintenance, installation/removal, and repair of auxiliary and support equipment such as air compressors; pump and water systems; pipes, fittings and vales; and waste disposal units.
- Performs repairs and preventive maintenance on mechanical system components and drilling systems such as drawworks; pipehandling units; rotary tables/bushings and other rotary components on the drilling system; and blow-out preventer (BOP) control system and stack components.
- Assists in the inspection of mechanical installations and construction projects.

Education, Experience and Certification Requirements

- Completion of a two or three-year college program in mechanical engineering technology. A period of supervised work experience, usually two years, is required for certification through provincial association of engineering/applies science technicians, and may be require for some positions.

Typical Entry Level or Career Path

- Motorman or Mechanic Trainee, or direct hire with current experience as a Mechanic on a semi-submersible or jack-up drilling rig.

Relevant NOC Reference: 7311, Industrial Mechanic

Subsea Technician

Key Responsibilities and Skill Requirements

- Generally responsible for installing, maintaining, monitoring and operating subsea wellhead and production equipment.
- Maintains the operational integrity of various subsea equipment including all subsea running tools; choke and kill valves; BOP stack; annular preventers; flow diverter and control systems; motion compensator; and BOP handling and moving equipment.
- Ensures the proper maintenance of subsea equipment in accordance with established preventive maintenance standards and carries out timely repairs as needed.
- Operates artificial lift machinery and well and surface production equipment and systems.

Education, Experience and Certification Requirements

- Completion of high school diploma, plus 3-5 years experience in the offshore industry.
- Training with the necessary instruments, tools and methods to be used in the position.

Typical Entry Level or Career Path

- Employees typically enter as Subsea Technician/Engineer Trainees.

Relevant NOC Reference: 2145, Subsea Engineer

Materials Coordinator (Rig Operations)

Key Responsibilities and Skill Requirements

- Coordinates the rig's materials requisitions, organizes and controls the warehouse, and maintains the warehouse inventory levels within established guidelines.
- Maintains adequate stock levels of equipment spares and consumable to facilitate the continuous operations of the offshore units(s). Receives materials into the warehouse stock and issues parts and other items to departments as required.
- Maintains accurate records of received and outstanding requisitions and cargo manifests, and tracks the progress of purchase orders.
- Performs cyclical inventories of stock and maintains the physical security of the inventory at all times.
- Supervises stores activities ensure they are conducted safely at all times.

Education, Experience and Certification Requirements

- Minimum requirement is a high school diploma with demonstrated oral and written communication abilities, supplemented with rig-based work experience. Preferable education is a 2 or 3 year business diploma and information technology experience.

Typical Entry Level or Career Path

- Employees may enter this position with previous experience as a Warehouse Shipper or Receiver/Receiver in either an onshore or offshore-based environment. Also recruiting from the marine and drill crews as they are familiar with the rig, the equipment and the material system.

Relevant NOC Reference: 1215, Supervisors Recording, Distributing and Scheduling[1]

[1] There is no NOC code 1215. The appropriate coding should be 1225 Material Management Officers.

Offshore Installation Manager (Drilling)

Key Responsibilities and Skill Requirements

- Generally responsible for overseeing and directing all aspects of the operation of an offshore oil and gas drilling unit.
- Ensures the achievement of business objectives through the ongoing establishment and review of installation priorities, the efficient and cost-effective execution of drilling operations, and ensuring maximum drilling system availability.
- Manages all activities either directly or indirectly through department managers in the areas of safety; environment; rig management; operations; personnel and training; information; regulatory compliance; and budget management.
- Provides unit crisis management and emergency response leadership when required.
- Ensures the effective ongoing operation of SH&E management systems.

Education, Experience and Certification Requirements

- This position is the drilling operator's most senior offshore role and promotion to the OIM role typically occurs for employees with significant experience as Stability Technicians or as senior or chief mates on a drillship.

Relevant NOC Reference: 0811, Primary Production Managers

Drilling Superintendent

Key Responsibilities and Skill Requirements

- Supervises safe and efficient operation
- Manages and schedules activities of staff
- Coordinates materials needed by staff
- Interfaces with other departments as needed

Educational Requirements (Formal and On-the-Job):

- Bachelors or Diploma in Engineering preferred (Mechanical or Petroleum)
- Company-specific training (equipment, processes, procedures)

Experience Requirements:

- Seven or more years petroleum and offshore experience
- Previous managerial experience (Toolpusher, Drilling Coordinator, Rig Manager)

Previous Roles:

- Drilling Engineer (Senior) or Drilling Technician (Senior)
- Driller (Drilling Coordinator, Toolpusher)
- Drilling Coordinator (Rig Manager, Senior Toolpusher)

Competencies:

- Communication (oral/written)
- Computer Literacy (Office products, Company-specific programs)
- Teamwork
- Leadership
- People Management
- Problem-solving
- Conflict Resolution (Rig Manager, Toolpusher, Drilling Coordinator)
- Safety Assurance

Relevant NOC Reference: 8222 Supervisors, Oil and Gas Drilling and Service

Toolpusher

Key Responsibilities and Skill Requirements

- Supervises the work activities of all rig drilling department personnel in carrying out the objectives established by the O.I.M or onshore rig management for the completion of successful oil and gas wells within compliance of necessary regulations.
- Ensures through effective planning, scheduling, problem solving, inspections,
- operational meetings, and interactions with night personnel that the necessary equipment, materials and resources are available to ensure efficient and safe operations.
- Liaises with representatives from oil companies who visit and inspect the site.

Education, Experience and Certification Requirements

- Incumbents are normally promoted from the position of Night Toolpusher and will typically have accumulated 12-15 years of progressively responsible experience in drilling department operations.

Typical Entry Level or Career Path

- Several years of experience onboard a rig is usually needed for entry to this job.
- Toolpushers often begin at basic laboring level (Roughneck), and progress through to Derrickman/woman and Driller.

Relevant NOC Reference: 8222, Toolpusher, Offshore Drilling Rig

Driller

Key Responsibilities and Skill Requirements

- Operates and monitors all drilling systems and equipment and supervises all drill work activities and routine drilling operations from a control console.
- Pre-plans the equipment, materials and proper sequence of constricting a well from start to finish, and obtains necessary approvals from the Toolpusher and the client.
- During drilling operations, directs the installation of the BOP on the wellhead and coordinates pressure testing of the BOP stack; operates the rig's hoisting equipment and rotary table, and supervises the drill crew in running the required drill stem components; monitors drilling instruments to ascertain drill stem and well bore performance; and reviews drilling options with the toolpusher to ascertain the most economic and efficient method of drilling the well to the client's specifications.

Education, Experience and Certification Requirements

- Incumbents are normally promoted from the position of Assistant Driller or Derrickman, and would typically have 10 or more years of progressively responsible experience in offshore drilling operations.

Typical Entry Level or Career Path

- Formal qualifications are not always required for entry, although it can be useful to have a t least some Standard Grades or the equivalent. Several years of experience (10 +) onboard a rig is usually needed for entry to this job. Drillers often begin at basic laboring level (Roughneck), and progress through to Derrickman/woman and Assistant Driller.

Relevant NOC Reference: 8232, Driller, Oil and Gas

Assistant Driller

Key Responsibilities and Skill Requirements

- Assists the Driller with operating and monitoring all drilling systems and equipment and with the supervision of all drill work activities and routine drilling operations from a control console.
- Assists the Driller with pre-planning the equipment, materials and proper sequence of constricting a well.
- During drilling operations, assists the Driller with directing the installation of the BOP on the wellhead and coordinating pressure testing of the BOP stack; operates the rig's hoisting equipment and rotary table, and supervises the drill crew in running the required drill stem components; monitors drilling instruments to ascertain drill stem and well bore performance; and reviews drilling options with the toolpusher to ascertain the most economic and efficient method of drilling the well to the client's specifications.

Education, Experience and Certification Requirements

- Incumbents are normally promoted from the position of Derrickman or Pipe Handling Technician, and would typically have 5-7 years of progressively responsible experience in offshore drilling operations.

Typical Entry Level or Career Path

- Formal qualifications are not always required for entry, although it can be useful to have at least some Standard Grades or the equivalent. Several years of experience onboard a rig is usually needed for entry to this job. Derrickmen often begin at basic laboring level (Roughneck), and progress through the ranks.

Relevant NOC Reference: 8232, Assistant Driller, Oil and Gas Drilling

Ballast Control Operator

Key Responsibilities and Skill Requirements

- Generally responsible for the safe, efficient and effective operation of all functions of the ballast control room.
- Maintains the proper trim of the of the drilling unit utilizing approved ballast control methods for draft and trim corrections, operates all ballast system pumps and vales, both locally and remotely.
- Participates in all marine operations including rig moves, and supply boat and helicopter operations.

Education, Experience and Certification Requirements

- Diploma in Marine Studies
- Ballast Control experience
- Safety training is required in aspects such as: first aid, hydrogen sulphide awareness, blowout prevention, well control, workplace hazardous materials information system (WHMIS), transportation o dangerous goods and pressure control

Typical Entry Level or Career Path

- Entrants to this position are typically experienced Mates or Ballast Control Trainees.

Relevant NOC Reference: 8412, Ballast Control Operator, Offshore Drilling[2]

[2] Based on the description of education and experience requirements, it should be more appropriately coded as NOC 2273 Deck Officers, Water Transport.

Dynamic Positioning/Stability Technician

Key Responsibilities and Skill Requirements

- Maintains drilling unit/vessel stability and positioning while on station.
- Monitors and records mooring tensions and the rig's position relative to the wellhead, and ensures that mooring winches are in a state of readiness to adjust anchor tensions as required.
- Ensures that any available propulsion is ready to assist in position keeping, and operates dynamic positioning equipment for this purpose when required.
- Monitors variable load on a daily basis to calculate and maintain unit stability.

Education, Experience and Certification Requirements

- A high school diploma, supplemented by a 2nd Mates Ticket, plus three to five years of related experience in offshore drilling operations, is typically required for this position.

Typical Entry Level or Career Path

- This job is typically filled by promoting Mates or Ballast Control Operator Trainees.

Relevant NOC Reference: 8412, Dynamic Positioning Operator, Offshore Drilling[3]

[3] Based on the description of education and experience requirements, it should be more appropriately coded as NOC 2273 Deck Officers, Water Transport.

Chief Engineer – Marine (Drill Rig)

Key Responsibilities and Skill Requirements

- Generally responsible for the management, maintenance, repair and operation of all mechanical and electrical equipment on board the drilling unit.
- Supervises and coordinates al repair and preventative maintenance activities, and advises the O.I.M. on all engineering, maintenance and repair matters.
- Supervises the activities of Junior Engineers in engine room operations.

Education, Experience and Certification Requirements

- Completion of a Marine Engineering program from an approved nautical institute and certification as a Marine Engineer, 1st Class by Transport Canada.
- The requirement for formal post-secondary training may not apply if the employee has the requisite years of directly related marine engineering experience and has been appropriately certified by Transport Canada.

Typical Entry Level or Career Path

The progression to Chief Engineer would normally be as follows:

- Completion of a Marine Engineering Program (three years)
- 4th Class Marine Engineer (36 months of related experience + TC certification)
- 3rd Class Marine Engineer (48 months experience + TC certification)
- 2nd Class Marine Engineer (minimum 4th class + 12 months experience + TC certification)
- Chief Engineer (minimum 3rd class + 24 months experience + TC certification)

Relevant NOC Reference: 2274, Engineer Officers, Water Transport

Offshore Crane Operator

Key Responsibilities and Skill Requirements

- Operates deck cranes utilized in the lifting and movement of all operations equipment, systems, supplies, containers, tubulars and other materials used in the daily functioning of the drilling unit.
- Inspects the condition of cranes and associated equipment to ensure operational integrity to handle heavy workloads.
- Inspects and makes available safe and proper rigging for the movement of materials. Ensures materials, equipment, and supplies are unloaded and backloaded to supply vessels in an efficient manner.
- Performs routine maintenance work such as cleaning and lubricating cranes.

Education, Experience and Certification Requirements

- Some secondary school education or licensing in the area of heavy equipment operations or equivalent is preferred.

Typical Entry Level or Career Path

- Crane Operator Trainees from the Roustabout level are typically promoted into this position.

Relevant NOC Reference: 7371, Crane Operator, Offshore Drilling

Well Services

Fishing Tools Supervisor

Key Responsibilities and Skill Requirements

- Supervises, co-ordinates and schedules the activities of fishing tool technicians.
- Requisition materials and supplies.
- Trains workers in job duties.
- Sets up machines and equipment.
- Analyzes conditions of unserviceable oil or gas wells and directs use of special well- fishing tools and techniques to recover lost equipment and other obstacles from boreholes of wells.
- Supervises technicians and confers with them to gather information regarding size of pipes and tools and borehole conditions in wells.
- Ensures techniques used do not compromise well control.
- Ability to draw upon experience to design tools on-site to deal with unexpected situations in the well.

Education, Experience and Certification Requirements

- Completion of secondary school is preferred. Completion of college or Petroleum Industry Training Service (PITS) courses is desired. 5 - 10 years of experience as a fishing tool specialist. Safety training is required in aspects such as: first aid, hydrogen sulphide awareness, blowout prevention, well control, workplace hazardous materials information system (WHMIS), transportation of dangerous goods and pressure control.

Typical Entry Level or Career Path

- This supervising role requires knowledge of well services primarily dealing with fishing tool techniques. It is possible for a fishing tool technician to be promoted to fishing tool supervisor. Fishing tool technicians typically gain well services experience by working up through the drilling positions (roughneck, derrickman, assistant driller, and driller). They then specialize in fishing operations.

Relevant NOC Reference: 8232, Fishing Tool Operator, Oil Field Services[4]

[4] Based on the description of education and experience requirements, it should be more appropriately coded as NOC 8222 Supervisors, Oil and Gas Drillers and Services.

Completions Tool Technician

Key Responsibilities and Skill Requirements

- Prepares and services downhole completion equipment and service equipment used in well completions.
- Operates company specific equipment, tools and software necessary for well servicing.
- Works as part of the completion team running oil and gas well completions.
- Maintains equipment data books.

Education, Experience and Certification Requirements

- Completion Tool Technicians usually require completion of a 1 to 2 year college program in a related field. Good mechanical aptitude and the ability to visualize what is happening downhole is required. Computer literacy is a must. A period of supervised work experience, usually two years, is required before certification. Safety training is required in aspects such as: first aid, hydrogen sulphide awareness, blowout prevention, well control, workplace hazardous materials information system (WHMIS), transportation of dangerous goods and pressure control.

Typical Entry Level or Career Path

- This position requires training and understanding of the well services sector and of company specific completion equipment. A completions tool technician typically learns about the completion equipment by preparing it in the shop. After gaining that experience, s/he becomes part of the completion team that installs the equipment downhole. The completion technician could be promoted to the position of completions supervisor with the proper training, competence and initiative.

Relevant NOC Reference: 2212, Geological and Mineral Technologists and Technicians (Petroleum Technician)

Liner Hanger Technician

Key Responsibilities and Skill Requirements

- Prepares and services downhole liner hanger equipment and related service equipment.
- Supervises running of liner string and setting of liner hanger.
- Operate company specific equipment, tools and software necessary for well serving.
- Types of skill capabilities include rig services, connector make-up services, computerized make-up analysis, a variety of standard and customized pipe handling techniques, and liner equipment.
- Maintains records related to service industry.
- Perform limited data interpretation.
- Applies understanding of cementing equipment and techniques.
- Performs hydrostatic calculations.

Education, Experience and Certification Requirements

- Completion of secondary school is usually required.
- Well services such as this require company specific training (equipment, processes and procedures), three to six month of formal on the job training, college or Petroleum Industry Training Service (PITS).
- Offshore work requires several years of experience in an equivalent position.
- Safety training is required in aspects such as: first aid, hydrogen sulphide awareness, blowout prevention, well control, workplace hazardous materials information system (WHMIS), transportation of dangerous goods and pressure control.

Typical Entry Level or Career Path

- This position requires training and understanding of the well services sector and of company specific equipment. A liner hanger tool technician typically learns about the liner hanger equipment by preparing it in the shop. After gaining that experience, s/he becomes part of the team that installs the equipment downhole. A liner hanger technician could be promoted to the position of supervisor with the proper training, competence and initiative.

Relevant NOC Reference: 2212, Petroleum Technician

Thread Inspector

Key Responsibilities and Skill Requirements

- Inspects threads on joints of steel casings, tubing, drill pipes and other tubular oil well equipment to detect defects.
- Determines conformance to specified tolerances in taper, lead and threads per inch, using precision gauges and instruments.
- Measures machined threads and outside diameter of pipes to determine thread size, taper, threads per inch and size of pipe.
- Applies knowledge of standard and obsolete thread forms.
- Applies understanding of specific thread design and relevant parameters affecting thread performance.
- Applies understanding of metallurgy, torque machines and thread preservation techniques.

Education, Experience and Certification Requirements

- Completion of secondary school is usually required. Well services such as this require three to six month of formal on the job training, college or Petroleum Industry Training Service (PITS) Also requires specific training from each threading company on their thread designs. Safety training is required in aspects such as: first aid, hydrogen sulphide awareness, workplace hazardous materials information system (WHMIS), transportation of dangerous goods.

Typical Entry Level or Career Path

- This position requires training and understanding of the well services sector. A thread inspector could be promoted to the position of supervisor with the proper training, competence and initiative.

Relevant NOC Reference: 2261, Non Destructive Testers and Inspectors

Casing Running Technician

Key Responsibilities and Skill Requirements

- Operates company specific equipment, tools and software necessary for making up tubular connections.
- Types of skill capabilities include conductor and caisson driving services, connector make-up services, computerized make-up analysis, a variety of standard and customized pipe handling techniques, and casing centralizers and cementation equipment.
- Maintains records related to service industry.
- Performs limited data interpretation.

Education, Experience and Certification Requirements

- Completion of secondary school is usually required. Well services such as this require three to six month of formal on the job training, college or Petroleum Industry Training Service (PITS) Offshore work requires several years of experience in an equivalent position. Safety training is required in aspects such as: first aid, hydrogen sulphide awareness, blowout prevention, well control, workplace hazardous materials information system (WHMIS), transportation of dangerous goods and pressure control.

Typical Entry Level or Career Path

- This position requires training and understanding of the well services sector and company specific equipment. A casing running technician typically learns about the tubular make-up equipment by preparing it in the shop. After gaining that experience, s/he becomes part of the team that installs runs the tubulars downhole. A casing running technician could be promoted to the position of supervisor with the proper training, competence and initiative.

Relevant NOC Reference: 2212, Petroleum Technician

Cementing Engineer – Well Services

Key Responsibilities and Skill Requirements

- Designs casing cementing programs.
- Coordinates and manages QA/QC of cement designs through laboratory analysis.
- Must be able to perform hydraulic calculations, tubing stress analysis.
- Specifies equipment requirements.
- Performs analysis with company specific software and interpret results.
- Chemical engineering capabilities.

Education, Experience and Certification Requirements

- Completion of an undergraduate degree in Engineering plus a minimum of two years of related well services experience (Engineer-in-Training Phase). Requires a full understanding of company specific pumping equipment and downhole tools. A chemical aptitude and understanding of how chemicals react is required. Offshore work requires several years of experience in an equivalent position. Safety training is required in aspects such as: first aid, hydrogen sulphide awareness, blowout prevention, well control, workplace hazardous materials information system (WHMIS), transportation of dangerous goods and pressure control.

Typical Entry Level or Career Path

The progression for Cementing Engineers typically occurs in the following sequence.
- Engineer-in-Training (entry level)
- Jr. Cementing Engineer
- Sr. Cementing Engineer
- Cementing Supervisor/Manager

Relevant NOC Reference: 8412, Oil and Gas Well Drilling Workers and Service Operators[5]

[5] Based on the description of education and experience requirements, it should be more appropriately coded as NOC 2134 Chemical Engineer or 2145 Production Engineer, Oil and Gas.

Coil Tubing Supervisor

Key Responsibilities and Skill Requirements

- Supervises, co-ordinates, and schedules the activities of the coil tubing team on location.
- Mentors coil tubing technicians and trains them in job duties, safety procedure and company policies.
- Establishes methods to meet work schedule and co-ordinate work activities with other departments.
- Requisitions materials and supplies.
- Prepares production and other reports.
- Sets up machines and equipment for coil tubing.
- Interprets real time data gathering information to predict and mitigate problems prior to occurrence.
- Runs coil tubing software associated with fluid displacement and associated parameters.
- Troubleshoots job problems.

Education, Experience and Certification Requirements

- Completion of secondary school is required. Completion of college or Petroleum Industry Training Service (PITS) courses is required. 8 years of experience as a service supervisor. Safety training is required in aspects such as: first aid, hydrogen sulphide awareness, blowout prevention, well control, workplace hazardous materials information system (WHMIS), transportation of dangerous goods and pressure control.

Typical Entry Level or Career Path

- This supervising role requires knowledge of well services primarily dealing with coil tubing. Career progression typically begins as a Service Assistant and progressing up through various positions requiring additional experience and responsibility until the supervisor position is attained. It is possible for a coil tubing supervisor to be promoted to coil tubing coordinator with the proper training, competence and initiative.

Relevant NOC Reference: 8412, Oil and Gas Well Drilling Workers and Service Operators[6]

[6] Based on the description of education and experience requirements, it should be more appropriately coded as NOC 8222 Supervisors, Oil and Gas Drillers and Services.

Completions Engineer – Well Services

Key Responsibilities and Skill Requirements

- Designs well completions.
- Specifies completion equipment based upon equipment function, wellbore conditions.
- Develops well completion and well intervention programs.
- Coordinates and manages the running of the completion and/or well intervention.
- Basic reservoir and production understanding is required.
- Competence with tubing stress analysis programs and a good understanding of metallurgical properties.

Education, Experience and Certification Requirements

- Completion of an undergraduate degree in Engineering plus a minimum of two years of related well services experience (Engineer-in-Training Phase). Requires a full understanding of company specific completion equipment and service equipment. Good mechanical aptitude and the ability to visualize what is happening downhole is required. Offshore work requires several years of experience in an equivalent position. Safety training is required in aspects such as: first aid, hydrogen sulphide awareness, blowout prevention, well control, workplace hazardous materials information system (WHMIS), transportation of dangerous goods and pressure control.

Typical Entry Level or Career Path

The progression for Completions Engineers typically occurs in the following sequence.
- Engineer-in-Training (entry level)
- Jr. Completions Engineer
- Sr. Completions Engineer
- Completions Supervisor / Manager

Relevant NOC Reference: 8412, Oil and Gas Well Drilling Workers and Service Operators[7]

[7] Based on the description of education and experience requirements, it should be more appropriately coded as NOC 2145 Drilling Engineer, Oil and Gas.

Directional Drilling Engineer

Key Responsibilities and Skill Requirements

- Monitors and directs drilling operations.
- Develops drilling programs including selection of sites, and specification of drilling fluids.
- Designs well paths.
- Directs and monitors the completion and evaluation of wells, wells testing and well surveys.
- Provides guidance to Well Technicians.

Education, Experience and Certification Requirements

- Completion of an undergraduate degree in a related discipline such as Engineering, Science or Geology, or an equivalent substitute of progressively responsible experience in drilling and rig operations.

Typical Entry Level or Career Path

- Completion of an undergraduate degree in Engineering plus a minimum of two years of related well services experience (Engineer-in-Training Phase). Requires a full understanding of company specific completion equipment and service equipment. Good mechanical aptitude and the ability to visualize what is happening downhole is required. Offshore work requires several years of experience in an equivalent position. Safety training is required in aspects such as: first aid, hydrogen sulphide awareness, blowout prevention, well control, workplace hazardous materials information system (WHMIS), transportation of dangerous goods and pressure control. The progression for Directional
- Drillers typically occurs in the following sequence:
  - Well Planner
  - Directional Drilling Engineer
  - Directional Drilling Supervisor

Relevant NOC Reference: 8232, Oil and Gas Well Drillers, Servicers, Testers, and Related Workers Operators[8]

[8] Based on the description of education and experience requirements, it should be more appropriately coded as NOC 2145 Drilling Engineer, Oil and Gas.

Permanent Downhole Gauges Coordinator

Key Responsibilities and Skill Requirements

- Supervises, co-ordinates, schedules the activities of the downhole gauge team.
- Mentors downhole gauge technicians and trains them in job duties, safety procedure and company policies.
- Establishes methods to meet work schedule and co-ordinate work activities with other departments.
- Requisitiosn materials and supplies.
- Prepares production and other reports.
- Operates company specific equipment, tools and software necessary for well serving and installation of gauges.
- Types of skill capabilities include testing and continuous improvement, calibration, repair, data processing and testing.
- Performs limited data interpretation.
- Must be computer literate.

Education, Experience and Certification Requirements

- Diploma in Engineering (Mechanical, Electrical or Petroleum).
- Well services such as this require company specific training (equipment, processes and procedures), three to six month of formal on the job training, college or Petroleum Industry Training Service (PITS).
- Offshore work requires several years of experience in an equivalent position.
- Safety training is required in aspects such as: first aid, hydrogen sulphide awareness, blowout prevention, well control, workplace hazardous materials information system (WHMIS), transportation of dangerous goods and pressure control.

Typical Entry Level or Career Path

- This supervising role requires knowledge of well services primarily dealing with downhole gauges. Career progression typically begins as a Service Assistant and progressing up through various positions requiring additional experience and responsibility until the supervisor position is attained. It is possible for a downhole gauge supervisor to be promoted to downhole gauge coordinator with the proper training, competence and initiative.

Relevant NOC Reference: 8232, Downhole Tool Operator Operator[9]

[9] Based on the description of education and experience requirements, it should be more appropriately coded as NOC 8222 Supervisors, Oil and Gas Drillers and Services.

Slickline Supervisor

Key Responsibilities and Skill Requirements

- Supervises, co-ordinates and schedules the activities of the slickline team on location.
- Mentors slickline technicians and trains them in job duties, safety procedure and company policies.
- Establishes methods to meet work schedule and co-ordinate work activities with other departments.
- Requisitions materials and supplies.
- Prepares production and other reports.
- Sets up equipment for Slickline operations.
- Troubleshoots slickline tool problems as required.

Education, Experience and Certification Requirements

- Completion of secondary school is required. Completion of college or Petroleum Industry Training Service (PITS) courses is desired. 5+ years of experience as a service specialist. Safety training is required in aspects such as: first aid, hydrogen sulphide awareness, blowout prevention, well control, workplace hazardous materials information system (WHMIS), transportation of dangerous goods and pressure control.

Typical Entry Level or Career Path

- This supervising role requires knowledge of well services primarily dealing with Slickline services and completions. Career progression typically begins as a Service Assistant and progressing up through various positions requiring additional experience and responsibility until the supervisor position is attained. Experience is typically gained on land operations prior to shifting to the offshore environment. It is possible for a slickline supervisor to be promoted to slickline coordinator with the proper training, competence and initiative.

Relevant NOC Reference: 8232, Downhole Tool Operator[10]

[10] Based on the description of education and experience requirements, it should be more appropriately coded as NOC 8222 Supervisors, Oil and Gas Drillers and Services.

Well Planning/Drilling Engineer

Key Responsibilities and Skill Requirements

- Projects the well drilling path to the target depth coordinates established for an offshore oil and gas well.
- Provides in town support to drilling personnel who are responsible for operating drilling facilities engaged in the creation of an offshore well bore, as monitors the progress of the well path in reference to the pre-established well plan and well target coordinates.
- Selects fit for purpose bottom-hole assemblies including motors, stabilizers and drill bits.

Education, Experience and Certification Requirements

- Completion of a Bachelors of Engineering (Mechanical or Petroleum), plus 3-5 years general and offshore experience. Professional Engineering Designation is preferred. Company specific training regarding equipment, processes, and procedures.

Typical Entry Level or Career Path

- Completion of an undergraduate degree in Engineering plus a minimum of two years of related well services experience (Engineer-in-Training Phase). Requires a full understanding of company specific drilling equipment. Good mechanical aptitude and the ability to visualize what is happening downhole is required. Offshore work requires several years of experience in an equivalent position. Safety training is required in aspects such as: first aid, hydrogen sulphide awareness, blowout prevention, well control, workplace hazardous materials information system (WHMIS), transportation of dangerous goods and pressure control.
- The progression for Well Planners typically occurs in the following sequence:
  - Well Planner
  - Directional Drilling Engineer
  - Directional Drilling Supervisor

Relevant NOC Reference: 2145, Offshore Drilling Engineer

Marine Logistics and Transportation

Master - Marine

Key Responsibilities and Skill Requirements

- Acts as the owner's representative in relation to all aspects of the operations of the vessel with ultimate responsibility and authority to make decisions on their behalf.
- Commands and operates a supply vessel, oil tanker, or other ship engaged in offshore oil and gas operations.
- Plans and executes safe navigational passage using navigational aids such as instruments, maps and charts in accordance with national and international regulations, codes and guidelines, company/owner instructions, and practices of safe seamanship.
- Ensures the seaworthiness and safety of the crew, ship and cargo.
- Supervises and coordinates the activities of desk crews, and directs and oversees the loading and unloading of cargo.
- Ensures the Chief Officer and Chief Engineer are well trained and informed of the Master's duties and work.
- Keeps al certificates and class surveys, records, files and drawings up to date.
- Maintains the ship's log of vessel progress, crew activities, and weather and sea conditions.

Education, Experience and Certification Requirements

- Completion of a Deck Officer Cadet program from an approved nautical institute and certification as a Master Foreign Going by Transport Canada. Certification at this level requires a minimum of three years of experience as a Chief Officer.

Typical Entry Level or Career Path

The progression to Master (Foreign Going) would normally be as follows:
- Third Mate (completion of Nautical Science Program + 12 months marine experience)
- Second Mate (3 years ocean-going experience + TC certification)
- First Mate (Chief Officer) (5 years ocean-going experience + TC certification)
- Master (3 years experience as a Chief Officer + TC certification)

Relevant NOC Reference: 2273, Deck Officers, Water Transport

Second Mate

Key Responsibilities and Skill Requirements

- Under the direction of the first mate.
- The second mate carries out daily operations of the vessel.
- Assumes the duties of the first mate in his/her absence.
- Responsible for volunteer training in the first mate's absence.
- Must act as designated engineer in the engineer's absence.
- Maintains all navigation equipment, publications and charts.
- Prepares information for the bridge.
- Performs bridge watch shifts.
- Plots voyage track.
- Verifies that all charts, bridge electronics, navigational and alarm systems are in order.

Education, Experience and Certification Requirements

- Completion of a Deck Officer Cadet program from an approved nautical institute or an equivalent amount of related marine experience and certification as a Second Mate by Transport Canada.

Typical Entry Level or Career Path

The progression within the deck officer ranks would normally be as follows:
- Third Mate (completion of Nautical Science Program + 12 months marine experience)
- Second Mate (3 years ocean-going experience + TC certification)
- First Mate (Chief Officer) (5 years ocean-going experience + TC certification)
- Master (3 years experience as a Chief Officer + TC certification)

Relevant NOC Reference: 2273, Deck Officers, Water Transport

Third Mate

Key Responsibilities and Skill Requirements

- Functions as the ship's safety officer.
- Maintains lifesaving, fire fighting and other emergency equipment.
- Assists in training the crew in emergency drill procedures.
- Responsible for condition and repair of lifeboats, life rafts, life rings, life jackets.
- Performs bridge watch shift.
- Carries out scientific operations as directed.

Education, Experience and Certification Requirements

- Completion of a Deck Officer Cadet program from an approved nautical institute or an equivalent amount of related marine experience and certification as a Third Mate by Transport Canada.

Typical Entry Level or Career Path

The progression within the deck officer ranks would normally be as follows:

- Third Mate (completion of Nautical Science Program + 12 months marine experience)
- Second Mate (3 years ocean-going experience + TC certification)
- First Mate (Chief Officer) (5 years ocean-going experience + TC certification)
- Master (3 years experience as a Chief Officer + TC certification)

Relevant NOC Reference: 2273, Deck Officers, Water Transport

Second, Third and Fourth Engineer

Key Responsibilities and Skill Requirements

- Operates main engines, machinery and all auxiliary equipment aboard ships, such as boilers, steering and deck machinery, motors, pumps, generators and condensers.
- Stands engine room watch, monitoring and noting performance of engines, machinery and all auxiliary equipment.
- Inspects and conducts maintenance and emergency repair to engines, machinery and all auxiliary equipment.
- Supervises and co-ordinates activities of engine room crew.
- Maintains records and prepares reports on engine performance and failures.

Education, Experience and Certification Requirements

- Completion of three-year cadet program in marine engineering from an approved marine training institute and/or credit in some cases for prior related marine experience on an equivalency basis, and certification by Transport Canada at the appropriate level competency.

Typical Entry Level or Career Path

The progression of Marine Engineers would normally be as follows:
- Completion of a Marine Engineering Program (three years)
- 4th Class Marine Engineer (36 months of related experience + TC certification)
- 3rd Class Marine Engineer (48 months experience + TC certification)
- 2nd Class Marine Engineer (minimum 4th class + 12 months experience + TC certification)
- Chief Engineer (minimum 3rd class + 24 months experience + TC certification)

Relevant NOC Reference: 2274, Engineer Officers, Water Transport

Helicopter Pilot

Key Responsibilities and Skill Requirements

- Flys twin-engine helicopters to transport people and small freight.
- Provides services such as search and rescue and aerial surveying.
- Maintains safe flight operations.
- Manages base crews (Base Manager, Assistant Base Manager).
- Tests new aircraft to evaluate aircraft performance.
- Plans and coordinates flight logistics.

Education, Experience and Certification Requirements

- Must contain a Department of Transportation License (ATPL(H)) as well as experience rating for aircraft in question. A person must also attain an Instrument Flight Rating (IFR) and a Visual Flight Rating (VFR). 1000 hours of flying experience as a pilot and 500 flying hours as a co-pilot are also required. Previous experience with large, multiengine helicopters is preferred, along with experience operating in an offshore environment.

Typical Entry Level or Career Path

- First Officer

Relevant NOC Reference: 2271, Helicopter Pilot

Aircraft Technician

Key Responsibilities and Skill Requirements

- Maintains aircraft to specifications and established procedures
- Repairs any damaged parts of aircraft (i.e., hydraulic, mechanical, or structural)
- Performs preventative maintenance

Educational Requirements (Formal and On-the-Job):

- College Diploma (Aviation Mechanics)
- Certification for the aircraft in question
- Aircraft Maintenance Engineer license (AME)

Experience Requirements:

- Experience working with the aircraft in question
- Completed apprenticeship (for all non-apprentice roles)

Previous Roles:

- Apprentice (Aviation Mechanic) (in British Columbia apprentices need to go to Manitoba or complete technical schooling by correspondence.)

Competencies:

- Teamwork
- Flexibility/Adaptability
- Safety Assurance
- Procedures Compliance

Relevant NOC Reference: 7315 Aircraft Mechanics and Aircraft Inspectors

Logistics Superintendent

Key Responsibilities and Skill Requirements

- Tracks and coordinates the movement of materials
- Manages staff and financial resources
- Liaises with internal company employees and suppliers concerning status of materials

Educational Requirements (Formal and On-the-Job):

- High School
- Diploma or undergraduate degree in business or materials management (preferred)

Experience Requirements:

- 5-10 years experience and five or more years offshore experience (Senior Coordinator)

Previous Roles:

- Materials Clerk or Coordinator

Competencies:

- Communication (oral/written)
- Computer Literacy (Office products)
- Planning/Organizational Skills
- Problem-solving skills
- Cargo Loading Practices
- Tracking

Relevant NOC Reference: 0713 Transportation Managers

Diver

Key Responsibilities and Skill Requirements

- Performs diving construction work
- Dives
- Inspects work

Educational Requirements (Formal and On-the-Job):

- High School
- Diver's Certificate

Experience Requirements:

- Ability to work in harsh environments
- 1 year general and offshore experience

Relevant NOC Reference: 7382 Commercial Divers

Engineering Design and Fabrication

Process Engineer

Key Responsibilities and Skill Requirements

- Oversees technical design work related to the construction, modification, operation and/or maintenance of processing units and other facilities related to the development and production of offshore oil and gas.
- Evaluates client requests and contract tenders, and prepares contracts.
- Provides direction and supervision as necessary to process engineering and drafting personnel to ensure that technical solutions are delivered in accordance with technical, cost and quality standards.
- Approves Process data sheets, drawings, reports and other Process deliverables.
- Provides process engineering advice and support to offshore oil and gas clients.

Education, Experience and Certification Requirements

- An undergraduate degree in a related engineering discipline (e.g., process, petroleum), plus 3-5 years experience in a petroleum/offshore processing environment, or in a related industrial processing setting.

Typical Entry Level or Career Path

- Junior Process Engineer to Intermediate Process Engineer to Senior Process Engineer.

Relevant NOC Reference: 2134, Process Engineer

Loss Control Engineer

Key Responsibilities and Skill Requirements

- Conducts economic and technical feasibility studies in areas related to chemical and petroleum processing.
- Conduct research into the development or improvement of petroleum and chemical engineering processes, reactions and materials.
- Designs, tests and evaluates process technologies and equipment and determines production specifications.
- Oversees the construction, modification, operation and maintenance of pilot plants, processing units or processing plants.
- Establish and conduct quality control programs, operating procedures and control strategies to ensure consistency and adherence to standards for raw materials, products and waste products or emissions.
- Prepares contract documents and evaluate tenders for the process aspects of industrial construction.
- Supervises technicians, technologists and other engineers.

Education, Experience and Certification Requirements

- Completion of an undergraduate degree in Chemical or Petroleum Engineering, plus 5- 10 years of project management experience, including 3-5 years of experience in a petroleum processing or offshore production environment.

Relevant NOC Reference: 2134, Chemical Engineers

Structural Engineer

Key Responsibilities and Skill Requirements

- Plan and design major civil projects such as buildings, roads, bridges, dams, water and waste management systems and structural steel fabrication.
- Confers with clients and other members of the engineering team and conduct research to determine project requirements, develops construction specifications and procedures.
- Interprets, reviews and approves survey and civil design work. Prepares contract documents and review and evaluate tenders for construction projects.
- Ensures construction plans meet guidelines and both client and regulatory specifications. Establishes and monitors construction work schedules.
- Conduct feasibility studies, economic analyses, environmental impact studies or other investigations.
- Acts as project or site supervisor, supervises technicians, technologists and other engineers and reviews and approves designs, calculations and cost estimates.

Education, Experience and Certification Requirements

- Completion of and undergraduate degree in civil, mechanical, or other related engineering discipline (a Master's degree may be required); registration as a Professional Engineer by a provincial or territorial association of Professional Engineers; and 3-5 years of related general and offshore/petroleum sector experience.

Relevant NOC Reference: 2131, Civil Engineers

Instrumentation Engineer

Key Responsibilities and Skill Requirements

- Conducts research into the feasibility, design, operation and performance of electrical generation and distribution networks, electrical machinery and components and electronic communications, instrumentation and control systems, equipment, and components.
- Prepares material cost and timing estimates, reports and design specifications for electrical and electronic systems and equipment.
- Designs electrical and electronic circuits, components, systems and equipment.
- Supervises and inspects the installation, modification, testing and operation of electrical and electronic systems and equipment.
- Develops maintenance and operating standards for electrical and electronic systems and equipment.
- Investigate electrical or electronic failures.
- Prepares contract documents and evaluates tenders for construction or maintenance.
- Supervises technicians, technologists, programmers, analysts and other engineers.

Education, Experience and Certification Requirements

Completion of and undergraduate degree in electronics, electrical or other related engineering discipline (a Master's degree may be required); registration as a Professional Engineer by a provincial or territorial association of Professional Engineers; and 3-5 years of related general and offshore/petroleum sector experience.

Relevant NOC Reference: 2133, Electrical Engineers

Draftsperson (Senior)

Key Responsibilities and Skill Requirements

- Operates CADD software
- Designs and interpret blueprints

Educational Requirements (Formal and On-the-Job):

- College Diploma in Drafting
- CADD training

Experience Requirements:

- 5-7 years experience
- Previous experience with offshore fabrication projects
- Some project management experience

Competencies:

- Computer Literacy (CADD)
- Teamwork

NOC Reference: 2253 Drafting Technologists and Technicians

Instrumentation/Electronics Technician

Key Responsibilities and Skill Requirements

- Installs, calibrates and modifies electronic systems and components in an offshore production or marine environment, including those used in oil and gas production and processing; drilling and subsea operations; communication; data acquisition; computer system operations; dynamic positioning; and navigation.
- Inspects electronic instruments and systems to diagnose faults, calibration errors, and defective parts, and repair/adjust as required;
- Performs scheduled preventive maintenance and repair of electronic systems.

Education, Experience and Certification Requirements

- Completion of a College level program in Instrumentation/Electronics Technology, plus a minimum of 12-18 months of practical workplace experience in an industrial setting.
- Certification of familiarity with offshore/marine systems and processes in accordance with the operator's competence assurance process.

Typical Entry Level or Career Path

- If the employee does not possess relevant industrial experience, a period of apprenticeship of up to two years is required in order to obtain journeyperson certification, prior to operating independently as a Technician.

Relevant NOC Reference: 2243, Industrial Instrument Technicians and Mechanics

Welder (Exotic Metals)

Key Responsibilities and Skill Requirements

- Reads and interprets blueprints or welding process specifications.
- Operates manual or semi-automatic welding equipment to fuse metal segments using processes such as gas tungsten arc (GTAW), gas metal arc (GMAW), fluxcored arc (FCAW), plasma arc (PAW), shielded metal arc (SMAW), oxyacetylene (OAW), resistance welding and submerged arc welding (SAW).
- Operates manual or semi-automatic flame-cutting equipment.
- Operates brazing and soldering equipment.
- Operates metal shaping machines such as brakes, shears and other metal straightening and bending machines.
- Repair worn parts of metal products by welding on extra layers.

Education, Experience and Certification Requirements

- Completion of a three-year apprenticeship program or a combination of over three years of work experience in the trade and some college or industry courses in welding is usually require to be eligible for trade certification. Inter-provincial trade certification (Red Seal) is also available to qualified welders. Canadian Welding Bureau (CWB) certifications may be required in relation to specialized techniques.

Typical Entry Level or Career Path

- It is possible to enter directly into this position with a college diploma or trade certificate.
- The position can also be attained after completing an apprenticeship or by having adequate work experience in the trade. Progression to supervisory positions is possible with experience.

Relevant NOC Reference: 7265, Welders and Related Machine Operators[11]

[11] Coding should be NOC 9510 Welders and Soldering Machine Operators.

Pipefitter (Exotic Materials)

Key Responsibilities and Skill Requirements

- Install supports, valves, piping and control systems.
- Reads and interprets drawings, blueprints and specifications to determine layout requirements.
- Measures, cuts, threads and bends pipe to required shape using hand and power tools. Welds, brazes, cements, solders and threads joints to join pipes and fabricates sections of piping systems.
- Tests systems for leaks using testing equipment.
- Cleans and maintains pipe units and fittings; flushes systems; removes and replace worn components; and reactivates systems.

Education, Experience and Certification Requirements

- Completion of a four to five year apprenticeship program or a trade certification program (mandatory in certain provinces). Inter-provincial trade certification (Red Seal) is also available to qualified steamfitters/pipefitters, and Canadian Welding Bureau (CWB) certifications may be required in relation to specialized techniques.

Typical Entry Level or Career Path

- It is possible to enter directly into this position with a college diploma or trade certificate. The position can also be attained after completing an apprenticeship or by having adequate work experience in the trade. Progression to supervisory positions is possible with experience.

Relevant NOC Reference: 7252, Steamfitters, Pipefitters

Platter

Key Responsibilities and Skill Requirements

- Metal/steel plate fabrication and fitting
- Liaison with machinists and millwrights
- Operate cutting and rolling equipment

Educational Requirements (Formal and On-the-Job):

- College diploma
- Company specific training

Experience Requirements:

- 5 years in trade (intermediate/senior)
- 1 year (apprentice)

Previous Roles:

- 2 years marine/heavy industrial
- Management experience (senior/foreperson)

Competencies:

- Leadership (senior/foreperson)
- Communication (oral/written)
- Planning/organizational skills (senior/foreperson)
- Attention to details

Relevant NOC Reference: 7263 Structural Metal and Platework Fabricators and Fitters

Industrial Painter

Key Responsibilities and Skill Requirements

- Operates equipment to clean, wash, strip, sand, remove corrosion; fills dents or otherwise prepares items for application of paint, lacquer or other protective or decorative coatings in an industrial setting.
- Operates automated spray paint, dip or flow coating equipment or other mechanized painting or product coating application equipment.
- May clean and prepare metal parts for coating.
- May prepare and mix metallizing solutions; operate electroplating equipment to coat metal and other objects; and operate hot-dip metal plating equipment to galvanize metal and other objects.
- May operate spray equipment to build up worn or damaged parts or to bond protective or decorative coatings on metal objects.

Education, Experience and Certification Requirements

- Three to five years of related experience in industrial painting and coating applications is desired, and specialized courses or post-secondary training may be required in certain specialized areas.

Relevant NOC Reference: 9496, Painters and Coaters – Industrial. 9497, Plating, Metal Spraying & Related Operators

QA/QC Manager

Key Responsibilities and Skill Requirements

- Develops, documents and implements quality assurance standards and processes in such areas as engineering design, modifications and construction, production/processing, procurement, safety and environmental compliance, or other functional business areas.
- Designs and implements surveillance processes for the ongoing monitoring and measuring quality outcomes against established standards.
- Plans and conducts audits and inspections to determine compliance with quality specifications, standards and procedures.
- Writes Non Conformance Reports as required and works with accountable personnel to ensure remediation plans are documented to rectify issues or to implement improvement opportunities.

Education, Experience and Certification Requirements

- An undergraduate degree in Engineering, Business or a discipline related to the area of technical knowledge and expertise involved, combined with a minimum of 5-7 years of professional experience, including three years experience in a QA/QC function. A working knowledge of ISO 9000 quality standards or some other comparable quality management system is usually required.

Relevant NOC Reference: 2141, Quality Control Engineer. 0211, Engineering Service Quality Control Manager

QA/QC Inspector

Key Responsibilities and Skill Requirements

- Conducts audits and inspections to determine compliance with quality specifications, standards and procedures in such areas as engineering design, modifications and construction, production/processing, procurement, safety and environmental compliance, or other functional business areas.
- Often uses visual inspection or precision measuring instruments and calibration tools to perform first article and final inspections, as well as tests of raw materials used in construction or production applications.
- Maintains quality records.

Education, Experience and Certification Requirements

- Must have excellent interpersonal and communication skills. Ability to multi-task and work in a highly organized fashion with attention to detail and accuracy. Good understanding of QC tools and procedures.
- Two years minimum QC experience.

Relevant NOC Reference: 2233, Quality Assurance Technologist

QA Inspector

Key Responsibilities and Skill Requirements

- Performs dimensional inspections on all machined parts as per drawings.
- Writes Non Conformance Reports as required and works with engineering and purchasing to rectify any issues.
- Works within documentation system and identifies improvements opportunities.

Education, Experience and Certification Requirements

- Must have excellent interpersonal and communication skills. Ability to multitask and work in a highly organized fashion with attention to detail and accuracy. Good understanding of downhole and QA tools.
- Two years minimum QA experience.

Relevant NOC Reference: 2233, Quality Control Technologist

Health, Safety and Environment Manager

Key Responsibilities and Skill Requirements

- Develops, implements and maintains policies, processes and systems to ensure compliance with regulatory and organizational standards related to health, safety and the environment.
- Ensures the effective development and implementation of Emergency Response/Emergency Preparedness systems in both onshore and offshore oil and gas industrial settings.
- Establishes and tracks measures of safety and environmental performance, ensures the timely implementation of internal and external audits.
- Documents non-conformance situations and liaises with company or client representatives in the development and implementation of remedial actions.
- Work closely with operator and major contractor representatives in the development and execution of clear SH&E plans and Key Performance Indicators (KPI's) in relation to activities on offshore oil and gas project.
- Supervises SH&E Advisors or other junior personnel involved in the administration and execution of SH&E systems and plans.

Education, Experience and Certification Requirements

- The ideal candidate for this position will possess an undergraduate or Master's degree in science or a related engineering discipline and post-graduate qualifications in safety management. Related certification from agencies such as NEBOSH / British Safety Council, and/or certification in auditing (e.g., ISO 14001) may be required depending on the organization's requirements.
- A minimum of 5-7 years of relevant working experience, including two years working experience in an offshore or petroleum-related setting would be required.

Relevant NOC Reference: 0112, Occupational Health & Safety Manager

Electrical and Instrumentation

Electrical Engineer

Key Responsibilities and Skill Requirements

- Conduct research into the feasibility, design, operation, and performance of electrical generation and distribution networks, electrical machinery and components and electronic communications, instrumentation and control systems, equipment, and components.
- Prepare material cost and timing estimates, reports and design specifications for electrical and electronic systems and equipment used in an oil and gas environment.
- Design electrical and electronic circuits, components, systems and equipment that are used in an oil and gas environment.
- Supervise and inspect the installation, modification, testing and operation of electrical and electronic systems and equipment that is used in an oil and gas environment.
- Develop maintenance and operating standards for electrical and electronic systems and equipment that is used in an oil and gas environment.
- Investigate electrical or electronic failures.
- Prepare contract documents and evaluate tenders for construction or maintenance for an oil and gas environment.
- Supervise technicians, technologists, programmers, analysts, other engineers.

Education, Experience and Certification Requirements

- A bachelor's degree in electrical or electronics engineering or in an appropriate related engineering discipline is required. A masters or doctoral degree in a related engineering discipline may be required. Licensing by a provincial or territorial association of professional engineers is required to approve engineering drawings and reports and to practice as a Professional Engineer (P.Eng.).

Typical Entry Level or Career Path

- Engineers are eligible for registration following graduation from an accredited educational program, three to four years of supervised work experience in engineering and passing a professional practice examination. Supervisory and senior positions in this unit group require experience.

Relevant NOC Reference: 2133, Electrical Engineer

Piping Engineer

Key Responsibilities and Skill Requirements

- Prepare material, cost and timing estimates, reports and design specifications for machinery and systems.
- Supervise and inspect the installation, modification and commissioning of mechanical systems at constructions sites or in industrial facilities.
- Investigate mechanical failures or unexpected maintenance problems.

Education, Experience and Certification Requirements

- A bachelor's degree in mechanical engineering or in an appropriate related engineering discipline is required. Registration as a Professional Engineer (P.Eng.) by a provincial or territorial association of professional engineers is often required for employment and to practice as a mechanical engineer.

Typical Entry Level or Career Path

- Engineers are eligible for registration following graduation from an accredited educational program and after at least two years of supervised work experience in engineering and, in some provinces, after passing a professional practice examination. Supervisory and senior positions in this area require experience.

Relevant NOC Reference: 2132, Piping Engineer

Vibration Specialist

Key Responsibilities and Skill requirements

- Conducts tests and analysis to determine extent and causes of vibration in rotating equipment used in industrial marine and offshore drilling and oil and gas production settings.
- Performs dynamic balancing and other corrective measures as required.

Education, Experience and Certification Requirements

Level 1
- One year experience as a vibration data collector/analyst. Three years experience as a mechanical, electrical or instrumental technician in a process plant (chemicals, refinery, paper mill, etc.). Certification as a Level 1 specialist by the Vibration Institute and the completion of a basic vibration analysis course.

Level 2
- Three years experience as a vibration specialist with five years work experience in a process plant (chemicals, refinery, paper mill, etc.). Certified as a Level 2 specialist by the Vibration Institute. Must have completed an advanced course in vibration analysis.

Typical Entry Level of Career Path:

- Certified Engineering Technologist.

Relevant NOC Reference: 2261, Nondestructive Testers and Inspectors

Environmental Consulting

Weather Forecaster

Key Responsibilities and Skill Requirements

- Analyzes and interprets data obtained from meteorological stations, radar and satellite imagery and computer model output.
- Produces weather forecasts and acts as a consultant to those engaged in weather sensitive activities.
- Analyzes the impact of industrial projects on the climate and quality of the air.

Education, Experience and Certification Requirements

- A Bachelor or Master of Science degree in meteorology, physics, mathematics or in a related field. Formal training of nine months is provided by the Atmospheric Environment Service for weather forecasters.

Typical Entry Level or Career Path

- A doctorate is usually required for employment as a research scientist in meteorology. Membership in the Canadian Meteorological and Oceanographic Society is available for qualified meteorologists.

Relevant NOC Reference: 2114, Weather Forecaster

Physical Oceanographer

Key Responsibilities and Skill Requirements

- Studies the physical environment of the ocean (currents, temperature, salt and gas content).
- Studies how the ocean and atmosphere affect each other.
- Studies physical oceanographic processes and their influence on the structure and dynamics of the marine ecosystem.

Education, Experience and Certification Requirements

- Ph.D. or equivalent in a physical science, preferably in oceanography, plus extensive practical knowledge of standard oceanographic data collection, analysis and interpretation techniques.

Relevant NOC Reference: 2113, Physical Oceanographer

Marine Biologist

Key Responsibilities and Skill Requirements

- Studies salt water plants and animals and how they relate to their environment.
- Relates how findings determine how marine ecosystems will cope with changes such as global warming, pollution, pressure from fisheries and damage caused by tourism in sensitive areas.

Education, Experience and Certification Requirements

- Job seekers need the broadest possible undergraduate background in the sciences. Recommended coursed include biology, chemistry, computer science, physics and calculus. A Ph.D. is usually required for independent research, but a master's degree is sufficient for some jobs in applied research or product development; a bachelor's degree is adequate for some non-research jobs. To understand marine organisms and their behaviors completely, marine biologists must have a basic understanding of other oceanography disciplines.

Relevant NOC Reference: 2121, Marine Biologist

Acoustic Engineer

Key Responsibilities and Skill Requirements

- Prepares conceptual designs for proposal and bids including feasibility analysis of various noise abatement scenarios.
- Works with other disciplines to provide detailed design.
- Performs field data acquisition including data analysis and interpretation, acoustic modeling and preparation of reports.
- Reviews software applications.

Education, Experience and Certification Requirements

- A Bachelor of Science in Mechanical Engineering, to specialize in Acoustics is required. Must be familiar with MS Office products, and acoustic analysis software. Experience with mechanical systems within industrial environments; i.e. generators, turbines, fans, ventilation systems, etc. is also necessary.

Relevant NOC Reference: 2132, Acoustics Engineer

Environmental Observer

Key Responsibilities and Skill Requirements

- Ensure environment safeguards
- Observe environmental activities

Educational Requirements (Formal and On-the-Job)

- Bachelor Arts

Experience Requirements:

- 3 years general experience, 1 year offshore experience

Competencies:

- Communication (oral/written)

Relevant NOC Reference: 2263 Inspectors in Public and Environmental Health and Occupational Health and Safety

Inspection Services

Mechanical Engineer

Key Responsibilities and Skill Requirements

- Designs, develops, maintains and tests machines, components, tools and equipment.
- Prepares cost and material estimates, project schedules and reports.
- Supervises, monitors, and inspects mechanical installations and construction.
- Prepares contract and tender documents.
- Prepares engineering designs, drawings and specifications.
- Prepares standards and schedules and supervises mechanical maintenance programs or operations of mechanical plants.

Education, Experience and Certification Requirements

- Requires Bachelors Degree in Engineering, prefer P.Eng. or eligibility to register, 5+ years experience in mechanical and structural design. Familiarity with upstream oil and gas production equipment would be an asset.

Relevant NOC Reference: 2132, Mechanical Engineer

Certified Industrial Hygienist

Key Responsibilities and Skill Requirements

- Manages indoor air quality studies.
- Monitors mid-level staff.
- Prepares project proposals and sample plans.
- Evaluates indoor air quality data.
- Provides peer review of project reports.
- Performs building evaluations.

Education, Experience and Certification Requirements

- A B.S. degree in a Scientific or Public Health Discipline is required. A master's in Industrial Hygiene or C.A.C. is preferred along with C.I.H. Certification. 5 years experience in industrial hygiene or indoor air quality and experience in bioaerosol evaluations (including models) are essential.

Relevant NOC Reference: 4161, Industrial Hygienist

NDT Technician

Key Responsibilities and Skill Requirements

- Carries out non-destructive testing on plant, equipment or structures using processes such as radiographic, infra-red, ultrasonic, x-ray, liquid penetrant, and magnetic particle inspections.
- Produces detailed reports of inspections and identifies any defects or anomalies found. Maintains records of inspection results, logs and inspection reports.
- Determines the size and location of flaws and establishes the acceptability status of parts through evaluation to applicable quality standards. Takes actions to prevent the occurrence of non-conformities.
- Maintains inspection equipment, and ensures that equipment calibration or testing is kept up to date.

Education, Experience and Certification Requirements

- Five years of related experience in the oil and gas industry or a technical equivalent, or an equivalent combination of education, professional certification, and experience. Secondary training and certification in a variety of non-destructive testing methods, including radiography, ultrasonic, magnetic particle, and dye penetration inspection is required. Additional certification in visual welding inspection may also be required.

Relevant NOC Reference: 2261, Non Destructive Testers and Inspectors

Tubular - Drill Pipe Inspector

Key Responsibilities and Skill Requirements

- Conducts various destructive and non-destructive inspections of drill pipe and casing used in offshore oil and gas well development and construction.
- Applies knowledge of the various weights and grades of tubulars, metallurgical differences, service limitations and the impact of corrosive environmental effects in determining conformance with established standards and specifications.
- Use software applications to determine tubular stresses and to understand the effects of tri-axial stresses on tubular string.

Education, Experience and Certification Requirements

- Completion of Grade 12, plus the successful completion of a recognized training program in the understanding and application of DS-1 and applicable API (American Petroleum Institute) codes and standards, including the completion of prescribed practical examinations and documented field competence. Must also possess a current certification in various non-destructive testing techniques, such as liquid penetrant, magnetic particle, and ultrasonic inspection.

Relevant NOC Reference: 2261, Non Destructive Testers and Inspectors

Inspection Engineer

Key Responsibilities and Skill Requirements

- Carries out on-stream condition monitoring of plants and QA/QC of all maintenance activities to ensure safe and reliable operations.
- Conducts internal, external planned and unplanned inspections on all static equipment/facilities.
- Coordinates with NDT group after determining the appropriate NDT method applicable to assess the equipment condition.
- Maintains inspection files, keep records up-to-date.
- Identifies the type of corrosion/deterioration to equipment or piping and initiates appropriate monitoring methods in consultation with Process and Corrosion Groups.

Education, Experience and Certification Requirements

- The minimum requirement for this job is a B.Sc. in Mechanical Engineering, Metallurgical Engineering or Corrosion Engineering as well as over 11 years experience. Sound knowledge of international codes/standards as applicable to inspection (ASTM, API, ASME, TEMA, NACE, ANSI, etc). Thorough knowledge and experience in various forms of corrosion and their identification along with monitoring and mitigation methods. Full understanding of different NDT methods and their application of equipment and piping, monitoring and inspection. Good verbal and written communication skill including technical report writing. And finally, the ability to adapt to new work situations is all important requirements and necessary.

Relevant NOC Reference: 2131, Civil Inspection Engineer

Specialty Services

ROV Technician

Key Responsibilities and Skill Requirements

- Operates remotely operated vehicle for inspection, construction activity.
- Understands Workplace Safety, Hydraulics, Electronics and Electrical systems.
- Underwater Navigation.
- Launch and Recovery.

Education, Experience and Certification Requirements

- There are no specific training requirements for ROV pilots other than the general requirement that all offshore personnel are competent to perform their tasks. Company specific training is available. To enter the ROV labour market one must have 3 years general experience in a related field.

Typical Entry Level or Career Path

- This position can be obtained after enough experience is obtained in the industry. Training can be done in the US or UK. Instead of this training one could apprentice with a ROV company.

Relevant NOC Reference: 2255 Mapping and Related Technologists and Technicians

Medic/Offshore Nurse

Key Responsibilities and Skill Requirements

- Assesses extent of injuries or illness of trauma victims/patients.
- Administers pre-hospital care, i.e. cardiopulmonary resuscitation (CPR), oxygen, bandaging and splinting.
- Establishes and maintains intravenous treatment (IV).
- Transports patients by air, land or water to medical facility for further treatment.
- Documents nature of injuries and treatment provided.
- Maintains emergency medical equipment and supplies.

Education, Experience and Certification Requirements

- Nursing degree or diploma (Nurse, Physician's Assistant)
- Paramedic diploma (Paramedic)
- ABS certificate
- ACLS certificate
- Basic Trauma certificate
- Remote nursing course desirable
- 5 years general experience in critical care areas (emergency, trauma, advanced cardiac, or intensive care)
- 2 years working in an occupational/industrial setting
- Previous experience working in remote or isolated environments
- 1 year offshore experience.

Previous Roles:
Contract Nurse, Critical Care Nurse, Industrial/Occupational Health and Safety Nurse

Relevant NOC Reference: 3152, Industrial Nurse

Marine Geologist

Key Responsibilities and Skill Requirements

- Studies and maps the ocean floor.
- Collects information using remote sensing devices aboard surface ships or underwater research crafts.
- Ability to work in laboratory.
- Efficiency recording data.
- Ability to do field work.
- Ability to analyze, compare and interpret facts and figures.

Education, Experience and Certification Requirements

- A bachelor's degree in geology or geophysics is adequate for entry into some lower level geology jobs. A master's degree in geology or geophysics is preferred along with some background experience in oceanography.

Relevant NOC Reference: 2113, Marine Geologist

Geophysicist

Key Responsibilities and Skill Requirements

- Generally responsible for processing and interpreting seismic data to determine the structure of oil and gas fields.
- Maps oil and gas reservoirs based on an interpretation of three dimensional seismic data, incorporates seismic attributes to refine reservoir models, and builds and maintains the two dimensional and three dimensional earth models for these reservoirs as required for reservoir management and the determination of drilling locations.
- Builds and maintains velocity models required for depth conversion and prediction.
- Identifies and implements geophysically related technologies and the latest seismic data processing techniques to improve seismic interpretation and overall reservoir management.

Education, Experience and Certification Requirements

- An undergraduate degree in Geophysics, Geology, Engineering or a related discipline, plus a minimum of 2-3 years of industry-related experienced related to the development and use of seismic interpretation and reservoir modeling.

Typical Entry Level or Career Path

- University graduate.

Relevant NOC Reference: 2113, Geophysicist

Health Safety Environment Quality Officer (HSEQ)

Key Responsibilities and Skill Requirements

- Trains staff on health and safety and environmental regulations.
- Ensures regulations are adhered to.

Educational Requirements (Formal and On-the-Job):

- Bachelor Arts
- Safety
- Environment

Experience Requirements:

- 3 years general health safety experience, 3 years offshore experience

Competencies:

- Communication (oral/written)

Relevant NOC Reference: 2263 Inspectors in Public and Environmental Health and Occupational Health and Safety

Naval Architect

Key Responsibilities and Skill Requirements

- Estimates bid packages
- Consults staff engineers
- Designs marine components
- Liaises with clients
- Certifies marine design

Educational Requirements (Formal and On-the-Job):

- University degree - Professional architect (marine/naval)
- Engineering degree
- Company specific training

Experience Requirements:

- 10 years of related experience
- 2 years senior management

Previous Roles:

- Staff Architect
- Junior Management

Competencies:

- Attention to detail
- Communication (oral/written)
- Professional attitude – working with clients

Relevant NOC Reference: 2148 Other Professional Engineers, N.E.C.

Radio Operator

Key Responsibilities and Skill Requirements

- Processes and transmits information and instructions to coordinate the activities of vehicle operators, crews and equipment.
- Operates a two-way radio and a variety of computer-aided communications and dispatching equipment.
- Receives and transmits dispatches.
- Contacts the appropriate personnel to be dispatched, giving all pertinent information.

Education, Experience and Certification Requirements

- Must be eligible for the necessary licenses prescribed by the Federal Communications Commission. Must be able to type minimum of twenty (20) words per minute.

Typical Entry Level or Career Path

- Entry-level position followed by company specific training. Advancement to supervisory role possible with experience.

Relevant NOC Reference: 1475, Marine Radio Operator

IT/Telecommunications Technician

Key Responsibilities and Skill Requirements

- Installs, operates, maintains and repairs telecommunications and broadcasting networks and equipment.
- Puts network equipment and new telecommunications services into place.
- Ensures that equipment and circuit installations are of good quality.
- Installs cables, jumpers, wires and strappings.
- Provides cost estimates to customers for installation of equipment.

Education, Experience and Certification Requirements

- High School Diploma is required. A Degree or the equivalent technical certificates is also required. 3 years experience installing cable for telephones and data networks. Must have experience working with customers.

Relevant NOC Reference: 7246, Telecommunications Technician

Seismic Interpreter

Key Responsibilities and Skill Requirements

- Interpretation of seismic data

Educational Requirements (Formal and On-the-Job):

- Bachelor of Science
- Company specific training

Experience Requirements:

- 2 years offshore experience

Competencies:

- Teamwork

Relevant NOC Reference: 2212 Geological and Mineral Technologists and Technicians

Seismic Navigator

Key Responsibilities and Skill Requirements

- Navigation coordination for seismic surveys

Educational Requirements (Formal and On-the-Job):

- Bachelor of Science
- Company specific training

Experience Requirements:

- 2 years offshore environment experience

Competencies:

- Teamwork

Relevant NOC Reference: 2212 Geological and Mineral Technologists and Technicians

Seismic Observer

Key Responsibilities and Skill Requirements

- Coordinates seismic lines
- Ensures quality seismic fieldwork
- Operates equipment that records seismic data

Educational Requirements (Formal and On-the-Job):

- Bachelor of Science
- Company specific training

Experience Requirements:

- 2 years offshore experience

Competencies:

- Teamwork

Relevant NOC Reference: 2212 Geological and Mineral Technologists and Technicians

Seismic Processor

Key Responsibilities and Skill Requirements

- Organize layout of survey
- Coordinates survey activities

Educational Requirements (Formal and On-the-Job):

- Bachelor of Science
- Company specific training

Experience Requirements:

- 2 years offshore experience

Competencies:

- Teamwork

Relevant NOC Reference: 2212 Geological and Mineral Technologists and Technicians

Seismic Supervisor

Key Responsibilities and Skill Requirements

- Supervises seismic survey
- Coordinates and supervises seismic staff

Educational Requirements (Formal and On-the-Job):

- Bachelor of Science
- Company specific training

Experience Requirements:

- 4-6 years offshore experience

Competencies:

- Leadership
- Teamwork

Relevant NOC Reference: 2212 Geological and Mineral Technologists and Technicians