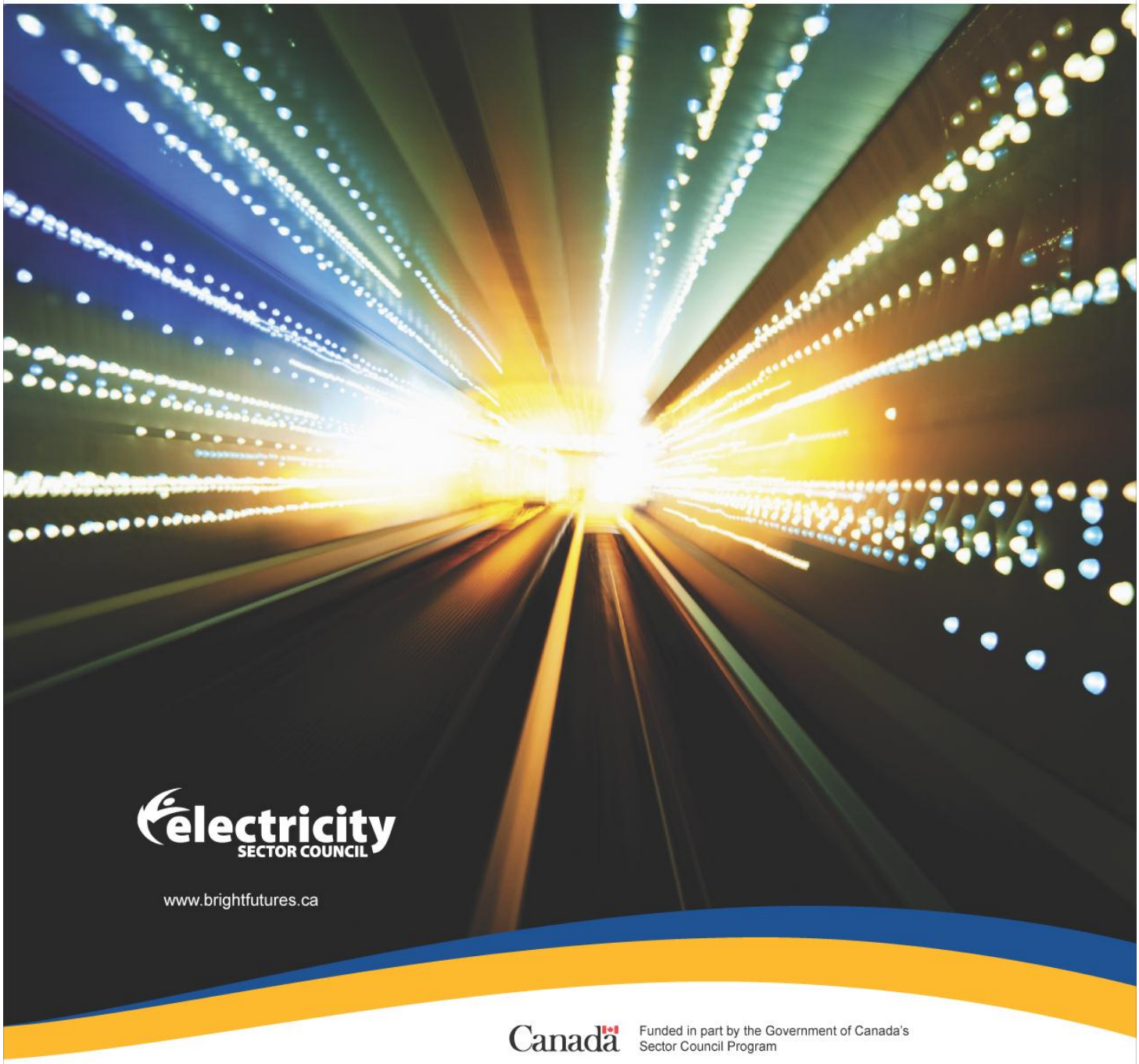
2012 UPDATE

Power in Motion

2011 LABOUR MARKET INFORMATION (LMI) STUDY FULL REPORT



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Executive Summary

Canada's electricity and renewable energy industry will be recruiting over 45,000 new employees between 2011 and 2016. This is almost half of the starting workforce and more than twice the number recruited in the last five years. Recruits will face two major tasks. First, many of them will be filling the ranks behind a wave of specialized and experienced employees who are retiring. Second, all of the new employees will be on the leading edge in integrating the next generation of infrastructure. These tasks require both knowledge of corporate history and new skills that are tied to a very different system of generation, transmission and distribution.

Who are all these new recruits and where will they come from? This report is the 2011 update to the Electricity Sector Council (ESC) 2008 Labour Market Information (LMI) study and the third round of in-depth research addressing these questions. Each successive update has found a higher level of urgency attached to major human resources challenges to renew and rebuild the industry workforce. Findings are gathered into three themes:

- The transition from Legacy to Next Generation Infrastructure
- Labour Requirements for this transition and beyond
- Assessment of future markets using the ESC LMI Model

Legacy to Next Generation

The report studies past trends and creates projections covering the past Legacy and the next generation of infrastructure for the electricity and renewable energy sector. The Legacy goes back to the 1960s when the current infrastructure was started. The next generation of infrastructure began to appear around 2006 when investment began to replace the aging Legacy systems and build renewable energy systems that apply new technologies to meet environmental and regulatory requirements.

The transition from Legacy to Next Generation provides a good roadmap setting out the key features of both the retiring workforce and their replacements. Using 2006 as the turning point provides a detailed profile of the old labour force. At the same time, 2006 marked the start of major policies and plans for the investment projects that will define the next generation of infrastructure. These projects are described in a new Conference Board Study that estimates that the next generation of infrastructure will cost at least $293 billion and construction will last from 2010 to 2030.[1]

Over the transition much of the existing system will be replaced or upgraded and as much as one-third of the generating capacity will switch to renewable sources – especially wind. The report concludes that the electricity and renewable energy industry in 2011 is in the middle of a major investment boom that starts the transition.

These conditions create the most severe skills shortages and labour market challenges that the industry may have ever faced.

[1] See "Canada's Electricity Infrastructure, Building a Case for Investment", Conference Board of Canada, April 2011

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Labour Requirements

Electricity sector employers will need to recruit over 45,000 new workers between 2011 and 2016 which represents over 40% of the current workforce. This massive inflow will be needed to replace retiring workers and needs to be available for building and operating the next generation of infrastructure, which includes renewable energy, refurbished generation, and transmission and distribution systems. Of these new employees, 23,000 will be in the critical occupations covered in this report. A list of key occupations was identified via industry consultation in the earlier LMI reports and includes:

Employment in the Electricity Industry by Occupation, Canada, 2006 and 2010

	Employment	
19 Electrical Occupations	**2006**	**2010**
Engineering Managers	545	628
Utility Managers	3635	4189
Construction Managers	155	179
Financial Auditors and Accountants	1330	1411
Civil Engineers	550	634
Mechanical Engineers	2330	2685
Electrical and Electronic Engineers	4225	4869
Information Systems Analysts and Consultants	1750	1857
Civil Engineering Technicians and Technologists	485	559
Mechanical Engineering Technicians and Technologists	910	1049
Electrical and Electronic Engineering Technicians and Technologists	3535	4074
Contractors and Supervisors, Electrical Trades and Telecommunications	1190	1371
Electricians (Except Power Systems and Industrial)	255	294
Industrial Electricians	315	363
Electrical Power Line and Cable Workers	8395	5313
Power Systems Electricians	4610	10548
Power System and Power Station Operators	6380	6769
Stationary Engineers and Auxiliary Equipment Operators	760	806
Construction Millwrights and Industrial Mechanics	2050	2362
Total Electrical Occupations	**43405**	**50033**
Total Support Occupations	**50345**	**58019**
Total All Occupations	**93760**	**108052**

Source: Statistics Canada, Census 2006,C4SE , 2011 ESC Employer Survey

Based on past behaviour, employers expect to take as many as 30% of these recruits from the ranks of other employers in the electricity and renewable energy industry. But moving the existing workforce among firms will not meet the labour requirements found here. For the industry as a whole, at least 50% of the new hires must be found in other Canadian industries or among immigrants.

Employers in the electricity and renewable energy industry together face an unprecedented recruiting challenge. Individually they will not be able to succeed by following their past human resources strategies. United action is needed.

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Most of the current workforce was trained and recruited at least twenty years ago. Few young people have been added since the early 1990s[2]. In the meantime, labour markets have changed. To fit the new Canadian reality, the electricity sector workforce will soon need to include a far higher proportion of women, Aboriginals, new Canadians and diversity groups.

The pace of change in the mix of the workforce will accelerate as demographics change and investment projects multiply. *Current industry initiatives recruiting youth, diversity groups and immigration will grow larger and more targeted.*

Traditional partners in building the electricity and renewables sector workforce, including post-secondary programs, contractors and consultancies, are adapting to help meet the challenge. But their capacity to support employers in the task ahead is restricted. Government funding will be limited. Other industries are competing for the same support. And the electricity and renewable energy industry has expensive, complex and specialized training and education needs. *It is not certain that the expansion of these supporting groups will meet the growing needs of the sector employers.*

The older age profile of the Legacy workforce and attractive pension benefits will move a very large proportion of the workforce to retirement from 2011 to 2016. While there is a large cohort of 45 to 54 year old workers preparing to take their place, there are many fewer in the 35 to 44 age group. Retirements will create a ripple effect that will soon focus attention on hiring many new workers with five or more years of experience. But other Canadian industries face the same demographics and this group is far more difficult to recruit than new entrants and junior candidates.

If sustained or increased, the traditional industry preference for hiring recent graduates and supporting coop, internship and apprenticeship programs will help fill in these gaps.

Projections from 2011 to 2016 focus attention on attracting immigrants and workers from other industries. These opportunities will open in some labour markets. But more often electricity sector employers will meet other, competing employers who seek skilled, experienced and specialized workers. Like the electricity sector employers, others will be seeking help to find immigrants and investments in post secondary programs. Their HR challenges have much in common. For example, their focus is on the engineers, technicians and technologists, information technology (IT) specialists and skilled trades with five or more years of experience.

Electricity sector employers share common labour requirements that are distinct from those of competing industries. Acting together on initiatives that target these needs will maximize the impact of limited resources.

The industry has unique human resources advantages and distinct strategies to apply.

Electricity sector employers are among the largest and best known employers in many provinces. They are often the employer of choice and can attract new workers through their career opportunities, internal

[2] See Exhibit 2.11. Employment began a steep decline in the early 1990s, shedding workers until 2000. Net new hiring really only resumed early in the millennium.

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training initiatives, strong benefit packages and history of employment security. Renewable energy providers have the important advantage of promising fast growth, green jobs and work with rapidly changing technologies.

Managing the retirement losses will shift attention to existing efforts on transferring knowledge from the retiring group to a relatively large cohort of senior workers poised to fill the gap. Strong industry traditions of supporting licensing and certifications have built a path for new graduates and apprentices. These programs fill in the crucial gaps in middle management, and can provide specialized and experienced technical skill needs.

Building new technical skills into the arriving workforce for the next generation of infrastructure will require a combination of new and expanded post secondary programs, along with internal training and certification. Much has already been accomplished in this area. New courses and certifications are appearing and the industry's relatively strong connection with post secondary programs will help. The biggest challenge will be internal and regulatory barriers related to rising costs. Technology costs were identified by the colleges and universities as the primary barrier. Evidence of the unique and potentially limiting impacts of skill shortages presented in this report may help make a case for new investments.

Findings also highlight how labour requirements, especially for the next generation of occupations and trades involved in construction, will be accessed by contractors and consultancies. Outsourcing shifts the human resource challenges to other employers and allows for flexibility and workforce mobility so available skills are used most efficiently.

These groups face their own challenges related to demographics, skills and tight labour markets. Three companion LMI reports from the Construction Sector Council (CSC), Engineers Canada and the Information and Communications Technology Council (ICTC) provide important insights into these broader and crucial markets. ICTC and Engineers Canada have found much differentiated market conditions for new entrants versus those with over five years of experience. New entrants and recent graduates from post secondary programs often lack the skills required by employers and their job search may lead to work outside their training. Conversely, employers are all searching for candidates with special technical qualifications, and experience or business knowledge related to that particular employer's industry. Markets for these candidates are very tight. Where electricity sector employers anticipate filling vacancies with these candidates they will face stiff competition.

To meet the challenges set out in the 2011 LMI Study, human resource managers in the industry will need to add, expand, target and refine many programs:

- Develop strategies and programs targeting permanent immigrants, including initiatives that integrate new arrivals into the community
- Target temporary foreign workers in key occupations and moving the best candidates into Provincial Nominee Programs
- Work with Provincial governments, colleges and universities to add new programs and certifications for technicians, technologists and specialized trades for work with new technologies

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- Develop a strategy for attracting more women, Aboriginals and diversity groups that take advantage of existing programs offered by individual employers and other groups
- Expand knowledge transfer programs that are preparing candidates for the replacement of skilled retirees
- Work with unions to build the skilled workforce and add specialized and advanced qualifications and certifications
- Work with unions on adding diversity to the workforce and integrating permanent immigrants and temporary foreign workers
- Work with other stakeholders who are participating in initiatives aimed at improving the transition from post secondary training to the workplace. This would include aiming for higher rates of apprenticeship completions, enhanced internship programs for engineers and carefully targeted coop programs for IT grads.

The 2011 LMI Study confirms the findings of the two earlier LMI studies and adds a new degree of urgency to the initiatives that have grown from this research. Changes are accelerating and competitive forces are growing stronger. Further, the 2011 findings suggest new initiatives:

A focus on the requirements of the next generation investments including:

- Tracking construction trades and markets for contractors
- Tracking emerging labour markets for specialized installers, maintenance and related work in solar, wind turbine and geothermal systems

Assessing the competition in other markets including:

- Industries and regions where labour requirements will be rising
- Training and certification programs that compete for resources
- Collaboration with other employer groups with common objectives

Existing electricity sector programs address most of the issues that are raised here. Findings in the 2011 LMI Study highlight a rising urgency as labour market change accelerates. Priority areas are covered in a number of initiatives completed or underway by the Electricity Sector Council (ESC), including the development of National Occupational Standards, the International Trained Workers Project, Labour Market Transition, Succession Planning and Knowledge Transfer research tools, and trades oriented initiatives like the Refresher Training for Powerline Technicians study as part of the Line Trade Development project.

A new ESC Labour Market Tracking System has been prepared to assist the industry as it plans new HR policies and tracks labour markets. Market assessments are provided for both the overall supply / demand gaps across all industries, along with more focused measures for the electricity and renewable industry alone.

For many key occupations the available workforce will not meet the unprecedented labour requirements described in this report. Investment in human resources needs to grow in line with the major new

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infrastructure projects. Canada cannot renew its electricity system and shift to renewable sources on the planned scale without comparable additions to the skills of the workforce.

Reliable and low emission electricity networks are essential to a modern economy. Building these networks depends on renewing Canada's current workforce.

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1. Introduction

Stakeholders in Canada's electricity and renewable energy industry face multiple human resources challenges as they plan for the next five years. Some challenges are familiar (e.g. retirements and competition with other industries), others are new (e.g. hiring and training staff for large, renewable energy projects), the scale increases and the pace of change accelerates. Challenges vary by region, sector and occupation. Consistent, comprehensive and credible analysis is essential to draw practical insights and guide human resource management.

This 2011 Labour Market Study provides new evidence about demographics, major investments and changes in labour markets, training programs, and human resource management practices. Findings are linked to the 2008 "Powering Up the Future" report from the Electricity Sector Council (ESC), and the original 2004 "Keeping the Future Bright" report from the Canadian Electricity Association. New dimensions added to this update include detailed labour supply analysis for key occupations and market assessments that point out potential areas of competition, job opportunities and successful recruiting.

Findings describe overall trends for employers and the workforce (in Section 2) including special results for thirty occupations, conclusions, implications and recommendations for all stakeholders. Section 3 applies a new LMI model to project these trends into the future. Regional results are available in the Appendices to this report.

Results are built up from new employer and post secondary program surveys and over fifty interviews with stakeholders. These consultations have increased the coverage and reliability of the widely consulted and highly regarded earlier studies. The Electricity Sector Council would like to thank the record number of employers, union leaders, trainers and other stakeholders who contributed. This includes the 89 employer organizations that completed a detailed survey and the 47 post-secondary institutions who provided detailed information on key programs. Responses for this 2011 study exceeded the 2008 research and add further depth and credibility to the findings. Insights provided by the industry are the most important source for the report.

Employers and the workforce have begun a major transformation from Legacy Systems to the Next Generation of infrastructure that will expand, replace and refurbish most of Canada's electricity infrastructure by 2030. The transition began as early as 2006 and gained important momentum in 2010. A new infrastructure is emerging, employing a very different workforce. This report describes the next five years of these changes in over 140 labour markets covering 30 occupations and six regions.

In recognition of the fundamental importance of human resources in the electricity and renewables sector, the Electricity Sector Council has commissioned this comprehensive study to aid in developing a labour market information system that will provide accurate information and viable projections of current and future labour supply and demand in the electricity and renewables sector.

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1.a The Electricity Sector Council

The Electricity Sector Council (ESC) was formed in 2005 in response to industry concern about the workforce challenge posed by the high proportion of the existing electricity industry workforce facing retirement by 2010. The Electricity Sector Council is an independent, not-for-profit organization, funded by the Government of Canada's Sector Council Program. ESC brings together key stakeholders to address human resource issues such as recruiting and retaining workers, facilitating school-to-work transitions, and developing sector and career awareness strategies.

The ESC's mission is to develop "sector based initiatives which strengthen the ability of stakeholders in the Canadian electricity industry to meet current and future needs for a skilled, safety focused, and internationally competitive workforce"[3]. More specifically, the key objectives of ESC are to:

- Conduct and disseminate research on the human resources of the electricity industry in Canada
- Develop and implement strategies, programs, educational initiatives and projects that will assist stakeholders in the Canadian electricity industry to achieve and sustain the skilled and diverse labour force that will meet the industry's current and future human resource needs
- Promote awareness of current and future career and employment opportunities in the electricity industry
- Form partnerships that will better enable the sector to meet its human resources needs

Further information on the Electricity Sector Council can be accessed by visiting the website www.brightfutures.ca

1.b Purpose and Objectives of the Study

The current study is designed to provide a labour market information system of the current and future labour supply and demand to assist decision makers in industry, government, and education organizations in planning their human resource strategies accurately and effectively. The immediate purpose of the system is to reduce the impact of the upcoming loss of up to 40% of the electricity industry's existing workforce due to retirements by effective human resource planning. The system is also intended to enable organizations in the electricity sector to have a better understanding of labour supply and demand on an ongoing basis in order to make informed human resource decisions.

To meet these project objectives, the research team adopted a comprehensive approach based on the synthesis of information obtained through a range of activities including an extensive literature review, national surveys, informational interviews and a review of secondary data available from Statistics Canada (including data on college, university and apprenticeship completion/graduation).

[3] Electricity Sector Council. http://www.brightfutures.ca/

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2. Trends in the Electricity and Renewable Energy Industry

This section focuses on the human resource implications of past trends and the current situation.

2.a Employers in Transition

Transition from Legacy Systems to the Next Generation infrastructure has many dimensions that are reshaping the industry. Electricity generation and distribution is a capital intensive process with a large scale, complex, specialized infrastructure and an established workforce. The infrastructure was built over 25 years ago and time and technology have eroded this Legacy. Events are moving more rapidly towards the "Next Generation" of infrastructure. The transition has at least seven aspects that are changing the work environment for employers, post secondary and other training institutions, regulators, suppliers, the workforce and job seekers.

Exhibit 2.1
Legacy to Next Generation

Legacy		Next Generation
Twenty plus years of limited growth	→	Twenty years of rising investment
High concentration of capacity and workforce	→	Distributed generation of renewable capacity
Established support systems in post secondary programs, regulations	→	Deregulation, change to specialized, flexible training and certification
Stable, large scale operations	→	Large number of smaller new entrants
Long asset lives	→	Rapid replacement, high maintenance
Large employers, and a specialized, qualified, experienced workforce	→	Exit of experienced workforce; shortage of entrants with midlevel experience
Dominant, preferred employers in local labour markets	→	Intensifying competition in labour markets, post secondary programs

Source: 2011 ESC Employer Survey

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2.a.i Employers and the Workforce

The transition from Legacy Systems to the Next Generation involves changes for all industry stakeholders. Employers included in the electricity sector system are in the electricity industry (NAICS 2211) and its sub sectors, including electricity generation, transmission and distribution.[4]

This group includes employers building and operating the next generation of infrastructure, the growing renewable energy sector, retailers and their contractors and consultants.

There are just under 700 establishments in Canada in these sectors, varying from large, government owned or regulated utilities to small start-up businesses. Large organizations dominate as the 32 largest employ over 78,000 workers or 78% of the workforce.[5] This concentration places electric utilities among the largest employers in Canada.

Deregulation and restructuring of the industry has been breaking down and decentralizing this structure. For example, deregulation has encouraged retail and wholesale providers to enter most markets. New technologies and government programs have brought many suppliers of renewable energy into the industry at several levels. These changes are examples of the forces moving Legacy Systems to the Next Generation.

Previous Electricity Sector Council (ESC) LMI reports divided the industry's direct employees into two groups: sixteen electricity sector occupations (including managers, engineers, technicians and the skilled trades) and a remaining group of other, support workers. Analysis in the update focuses on an expanded set of electricity sector occupations and their role managing, maintaining and operating the facilities.

Exhibit 2.2 tracks employment in the nineteen occupations in the electricity industry from 2006 to 2010. The 2006 Census estimates are the most reliable starting point. Estimates for 2010 are based on historical growth trends and the Statistics Canada Labour Force Survey and serve as the starting base for this report's assessment of markets over a forecast period from 2011 to 2016.

[4] The definition of this industry is taken from the North American Industrial Classification (NAICS) 2211 covering Hydro-electric Power Generation, Fossil fuel (e.g. coal, gas, oil), Nuclear, and other including renewable sources like solar, wind and geothermal. Activity includes the work of bulk transmission and distribution systems. Some closely related industries are also studied including Utility Construction, Large Civil Construction and Engineering Consulting.

[5] Several sources compile inventories or directories of establishments by industry. The Statistics Canada Business Registry counts 628 establishments (with employees) in NAICS 2211 and 32 employ over 500 people. The Info USA data base counts 852 establishments with just 20 large employers. These 20 large employers have over 78,000 workers.

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Exhibit 2.2
Employment in the Electricity Industry by Occupation,
Canada, 2006 and 2010

	Employment	
19 Electrical Occupations	**2006**	**2010**
Engineering Managers	545	628
Utility Managers	3635	4189
Construction Managers	155	179
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Construction Millwrights and Industrial Mechanics	2050	2362
Total Electrical Occupations	**43405**	**50033**
Total Support Occupations	**50345**	**58019**
Total All Occupations	**93760**	**108052**

Source: Statistics Canada, Census 2006, Centre for Spatial Economics, ESC Employer Survey 2011

The nineteen occupations listed in Exhibit 2.2 are expanded later in the report as the survey results identified power system operators and power station operators as separate occupations in the employer survey. This latter approach is closer to general industry practices. At other points in the research the number of occupations is reduced because of data reliability concerns.

Other key industries are building the Next Generation of infrastructure – often on contract with the industry employers. Employers include engineering consulting firms, information technology and other service firms, construction contractors and others. These firms and their workforce are connected to the Legacy System through complex and changing roles. The 2011 LMI Study considers labour market conditions and human resources implications for Next Generation designers and builders and the key occupations they employ.

Working conditions for the nineteen electricity sector occupations are changing as part of the transition from Legacy to Next Generation. Managing the training, certification and recruiting that will implement these changes is one major HR challenge. The design and construction of the Next Generation

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infrastructure involves most of the electricity sector occupations and another group of trades and specialists. Labour market conditions and skill requirements are another aspect of the transition. Human Resource issues here impact contractors and consulting firms as well as in-house design, management and construction workforces. Construction trades are the largest groups of distinct occupations not included in the electricity sector occupations, required to build the next generation of infrastructure. A group of Next Generation trades and occupations in construction, as described in Exhibit 2.3, is included in the 2011 Study.

Exhibit 2.3
Employment in the Next Generation, Construction and Design

	2006		2010	
Next Generation/Construction Occupations	Construction	All Industries	Construction	All Industries
Boilermakers	7553	10318	8289	11079
Carpenters	122090	143995	120860	143613
Crane operators	4620	13020	5494	14206
Electricians (including industrial and power system)	60800	99005	64303	102874
Heavy-duty equipment mechanics	4125	37535	5187	43534
Heavy equipment operators (except crane)	39985	73405	50262	84342
Ironworkers and structural metal fabricators & fitters	6710	21925	8147	23955
Sheet metal workers	20090	29374	21049	29109
Steamfitters, pipefitters and sprinkler system installers	10305	19925	11416	21118
Trades helpers and labourers	115150	152130	119220	158896
Truck drivers	16035	285005	19733	292606
Welders and related machine operators	8300	96670	10097	102019
Total	415763	982307	444057	1027351

Source: Construction Sector Council (CSC)

These twelve trades and occupations are selected for their roles in building the Next Generation of electricity infrastructure, either with contractors and consultants or with in-house teams working with the electricity sector employers. Labour requirements for work with renewable energy providers are changing and many new training programs are qualifying specialists in, for example, design and installation of solar and wind systems. These occupations are not captured in standard statistical sources and it is not yet possible to assess these emerging labour markets.

Surveys and interviews with stakeholders and the ESC LMI system focus on the labour market issues, training and HR management practices for each of the 19 electricity sector occupations and the 12 Next Generation / Construction occupations.

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2.a.ii Technology and the Environment

Pressure to replace the Legacy infrastructure has been increasing over the past decade with change driven by environmental requirements, advances in technology and the deterioration in the original facilities. Changes impact the major sectors differently.

There are many large scale projects and proposals to add new technologies. Some technologies are uncertain and policy decisions are pending. These uncertainties extend to the needed adjustments to the labour force. What is certain is that there will be significant change.[6] A recent Conference Board study "Canada's Electricity Infrastructure; Building a Case for Investment" analyses the options and projects a specific scenario for the value, timing and distribution of these investments[7].

New investments in *generation* systems are related to replacement demands, environmental concerns and policy. Canada has a relatively low emissions system with large scale historical development in hydro-electric. But Canada is a high emissions jurisdiction in other areas and is bound by international agreements to reduce carbon emissions[8]. Coal generation in Ontario and Alberta has grown to be a significant proportion of supply and plans to replace or upgrade these plants are driven by regulations and the potential of "clean coal" technology. Major investments are also underway to refurbish and upgrade nuclear facilities. Plans for the addition of major base load capabilities with new nuclear technologies are also under consideration. The expansion of the nuclear system is certainly part of the next generation for the industry but major expansion projects are not projected to start, as per the Conference Board Study, until after the five-year planning horizon presented here.

The addition of renewable energy generation systems has accelerated rapidly since the 2008 LMI Study and is poised to expand significantly from 2011 to 2016. These systems include wind, solar, geothermal, bio-fuel and others. This change is partly related to new technologies but is also driven by policy initiatives including the Ontario "Green Economy" strategy and "Feed-in Tariff" program.

An ongoing change in power generation systems has encouraged a shift to smaller scale facilities – including co-generation systems and local, gas-powered generators.

A long list of announced projects anticipates investments in all of these alternatives. The Conference Board Study notes that all the planned capacity and proposed projects are not needed and not all the potential technologies and process are proven reliable. The study applies various criteria and arrives at a projection for the change in the overall mix of generation systems that can be illustrated by Exhibit 2.4 and 2.5. Exhibit 2.4 measures the distribution of the current 118,000 MW of electrical generating capacity in Canada. Legacy investments in large hydro, coal and gas and nuclear dominate.

[6] A summary of these challenges is available in "Facing Challenges Head On", Electricity 2010, Canadian Electricity Association.
[7] See "Canada's Electricity Infrastructure; Making a Case for Investment" Conference Board of Canada, April 2011
[8] For example the Canadian government has committed to reducing Greenhouse gas emissions by 17% below 2005 levels by 2020 as part of the Copenhagen Accord.

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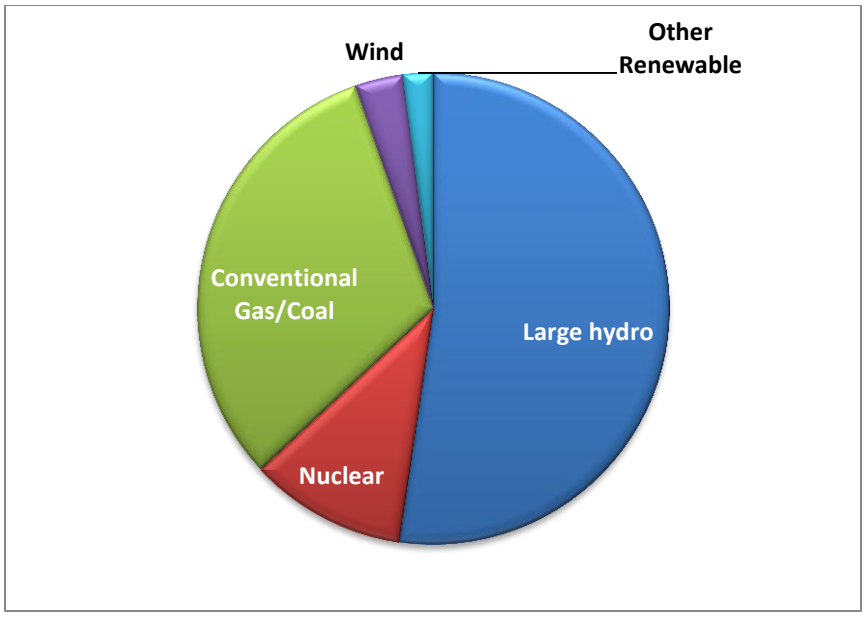
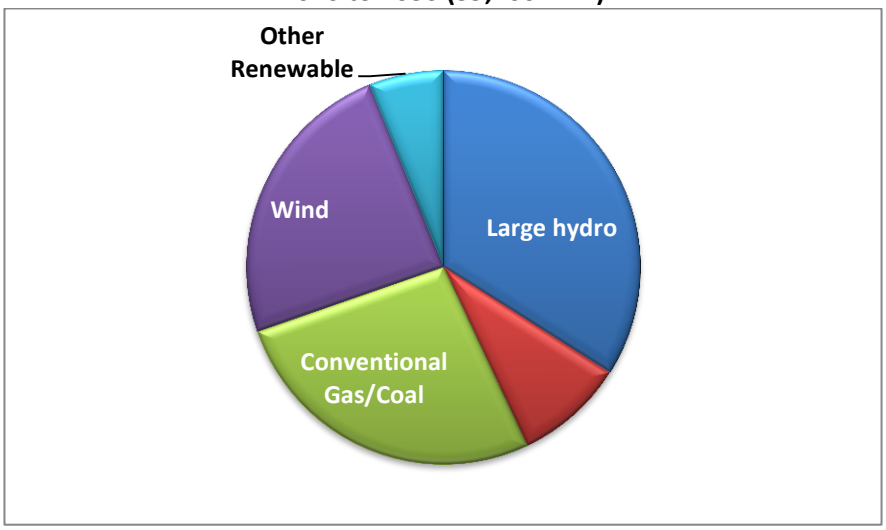
Exhibit 2.4
Distribution of Existing Generation Capacity (118,000 MW)



Source: The Conference Board of Canada, 2011

Exhibit 2.5 summarizes the projected change (a new 39,400 MW of capacity) related to new investments from 2010 to 2030. Most of these investments do not add new capacity – much of the investment replaces coal plants or refurbishes existing nuclear systems. But 30% of the new generation capacity is in renewable sources (12,000 MW) and this is mostly dominated by wind.

Exhibit 2.5
Distribution of Expected Investment in Generating Capacity
2010 to 2030 (39,400 MW)



Source: The Conference Board of Canada, 2011

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Changes to generation systems, reflected in Exhibit 2.4 and 2.5, are just one part of the technology / regulation shift.

These new technologies and changes related to the next generation systems impact investments to repair and refurbish the bulk transmission and distribution systems. Detailed plans for change to the bulk *transmission* have not been fully disclosed. But it is clear that improvements and expansion of the north-south grid are planned and that these changes will focus on the quality of the overall system.

Complex changes are also emerging in local distribution and customer systems. These are not yet well defined by designers and owners but the shift in generation capacity to smaller scale and micro facilities will impose major changes in distribution and consumption patterns. The Conference Board study comments "The growing focus on distributed generation, small and micro renewable generation downstream of the transmission grid will change the way the grid is operated and will require investments.[9]

Three complex and unpredictable changes will impact consumption and distribution:

- Accommodating the distribution of power generated by small facilities and maintaining quality
- Investments associated with the development of the "smart grid"
- Changing electricity requirements related to time of use and major demands (e.g. electric vehicles)

The Conference Board profiles for investments at the transmission and distribution level do not account for most of these latter changes as the extent of investments – even in the short term – is not really known. Significant investments are anticipated, however, to pay for needed repairs and expansion to the existing system. Conclusions in the Conference Board report err on the side of understating the extent of the change that is coming and the magnitude of investment needed. Change may come faster and have larger impacts.

2.a.iii Investments and the Next Generation

The transformation of the Legacy system is unfolding through a massive investment program in generating, transmission and distribution systems. Investments, estimated by the Conference Board, will total $293.8 billion between 2010 and 2030 with details included in Exhibit 2.6.

[9] See "Canada's Electricity Infrastructure; Making a Case for Investment" Conference Board of Canada, Aril 2011, Page 23

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Exhibit 2.6
Electricity Investment Requirements in Canada
2010 to 2030

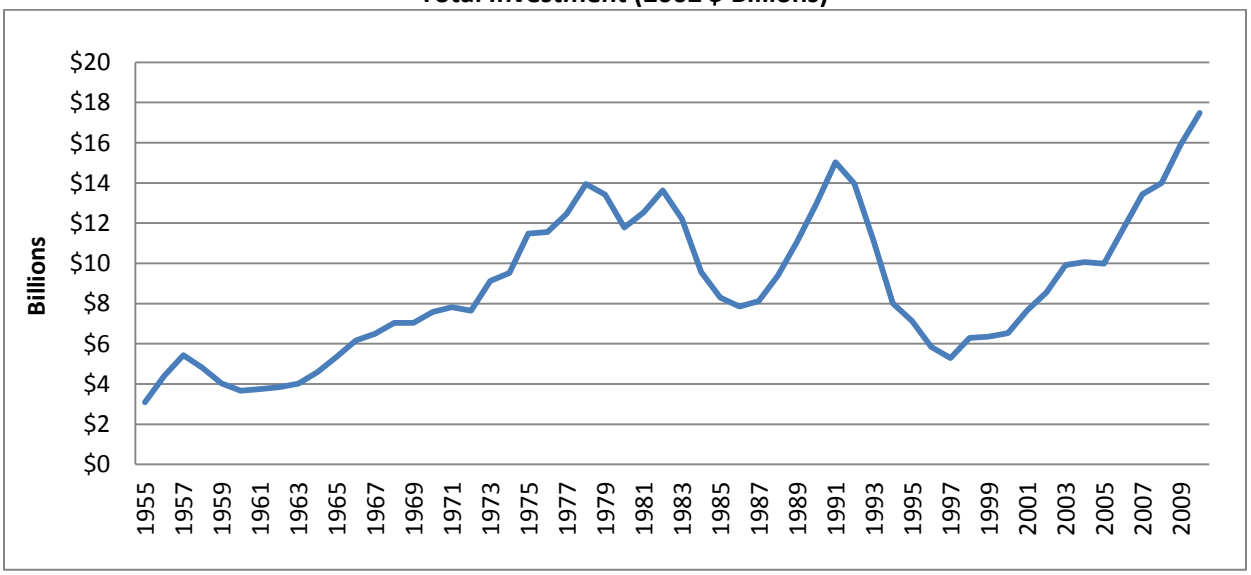
Sector	2010 $ Billions
Generation	195.7
Transmission	35.8
Distribution	62.3
Total	**293.8**

Source: The Conference Board of Canada, 2011

While there is uncertainty about the extent and distribution of all this activity, the magnitude of the change has been anticipated for some time and work has already begun.[10] The expected investment plans are needed to cover an infrastructure deficit that grew up over more than a decade of weak investment.

Exhibit 2.7 captures the essential story, tracking investments in Canada's electricity utilities since the 1950s. History captures the investment build up that peaked in the late seventies and late 1980s. Most of the Legacy system was built at that time. For over a decade, starting in the 90s, investment fell and system improvements were delayed. This created a large, accumulated infrastructure deficit and demand for work to renew or upgrade the system.

Exhibit 2.7
Productive Capital Stock: Electric Power Industry
Total Investment (2002 $ Billions)



Source: Statistics Canada, CANSIM Table 031-0002

[10] For example the International Energy Agency projected that in 2008, Canadian Utilities would need to invest $150 billion by 2030.

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The recent trends captured in Exhibit 2.7 reflect the start of the transition. Investment in electricity infrastructure is on an upward track that will reach annual levels over $15 billion – more than 50% above the levels of the past decades. This investment captures another key dimension of the transition from Legacy to Next Generation.

The extended period of lower investment, from 1991-1992 to 2006, was associated with very limited growth in the demand for electricity and significantly lower employment. Evidence of deterioration of the infrastructure was apparent by 2005 and the process of replacing and refurbishment began in 2006 and 2007.

The Conference Board accounting for the investment of $195.7 billion in generating capacity is dominated by replacement (especially of the coal plants) and refurbishment of nuclear facilities. New capacity includes renewable energy providers (especially wind) and expansion in Alberta to accommodate other energy development there.

Estimates of $35.8 billion for transmission and $62.3 billion for distribution systems reflect mostly repair and upgrades. Few details are available from utilities and private owners on the cost of new technology and upgrades (e.g. smart grid systems) and the study emphasizes that these likely investments are not included. Estimates of $293 billion in investment between 2010 and 2030 exclude these projects and may underestimate coming activity.

2.a.iii Operations

The transition described above suggests that electrical utilities and related businesses operate in a strongly cyclical environment. But these cycles are contained in the ebb and flow of investment. Evidence on the output side shows much more stable growth. Demand for electricity has grown at a steady rate for many years. There are important variations in different markets, but these tend to average out over time, leaving a gradual increase as the rule.

Exhibit 2.8 reports the trends in output, Gross Domestic Product (GDP), for the overall economy and for electrical utilities from 1990. Values are expressed as an index = 100 in 1990 and reflect cumulative growth. GDP in the electrical industry increased slowly through moderate cycles. The total gain is just 11% in over 20 years – far less than the overall economy which grew 62% during the same period. These long term trends show the steady decline in the energy intensity of the economy after the mid 1990s. This shift to energy conservation was the result of many changes.

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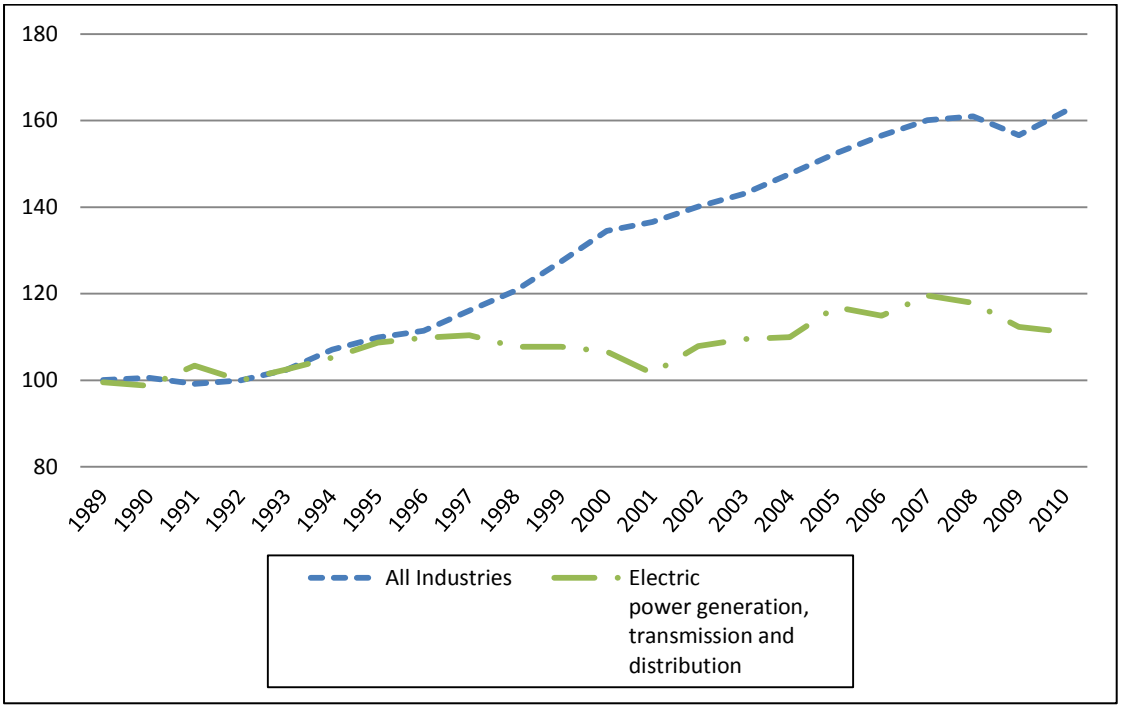
Exhibit 2.8
Trends in GDP
1989-2010



Source: Statistics Canada, Energy Statistics Handbook, Fourth Quarter 2010

A second measure of long term trends in electricity demand reveals some moderate volatility within individual markets. Exhibit 2.9 reports national trends in electricity demand in gigawatt hours for the major markets. Measures are converted to an index = 100 in 1990 to capture cumulative growth. Overall demand rises just 16% with some markets leading and lagging.

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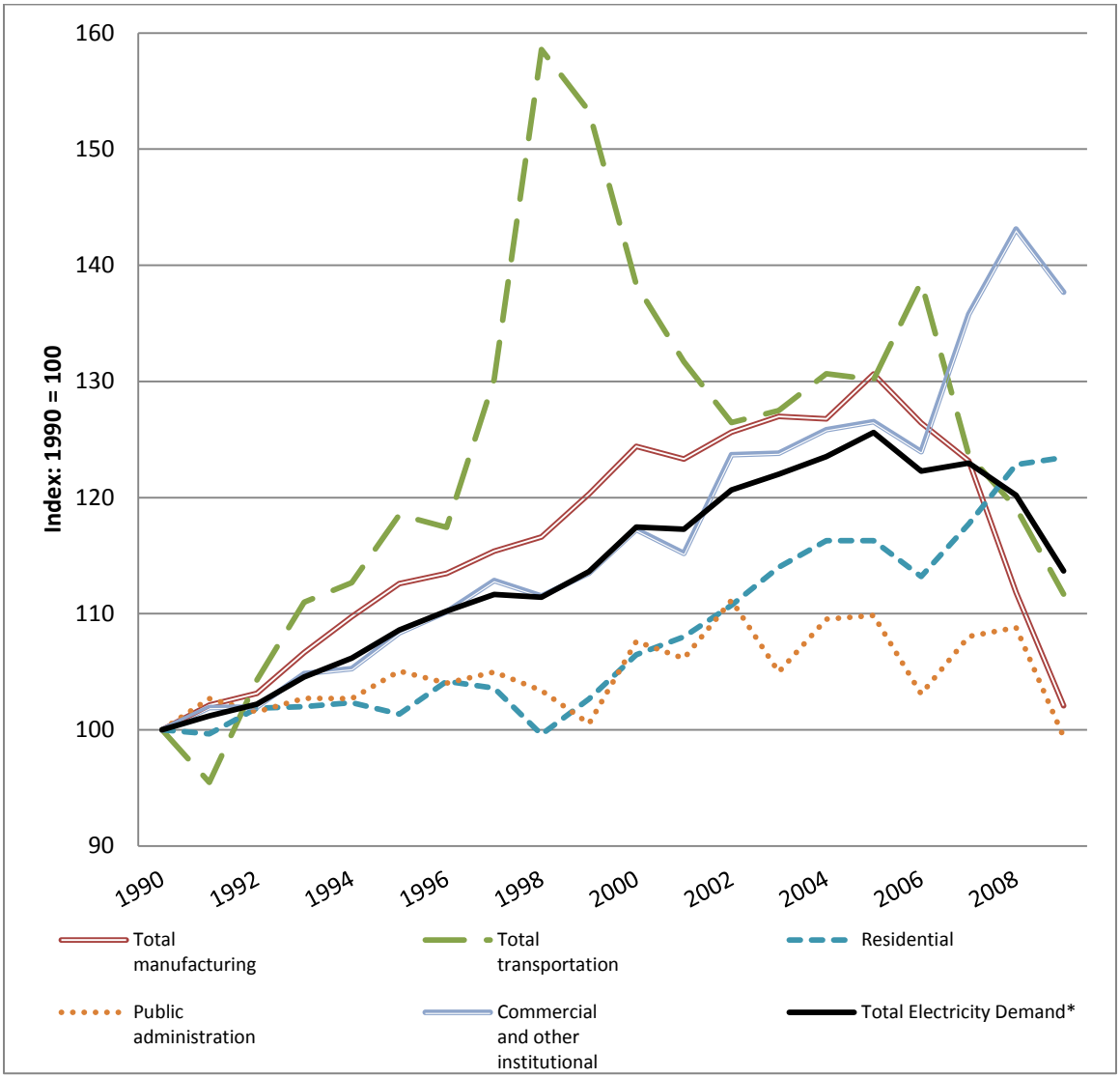
Exhibit 2.9
Trends in Energy Demand
1990-2009



Source: Statistics Canada Energy Statistics Handbook, Fourth Quarter 2010

It is unlikely that shifts in demand across markets impact the general operations of the generation, transmission and distribution system. Employment change, related to operations, has likely been limited and regular. Volatility is concentrated in the investment process.

2.a.iv Consultants and Contractors

The work of operating, maintaining and repairing the facilities as well as building the next generation is divided between the electricity sector employers (establishments in NAICS 2211) themselves and the contractors and consultancies that supply the industry. These two groups together provide the labour needed to build, generate, transmit and distribute electricity. Firms often contract with specialists and call

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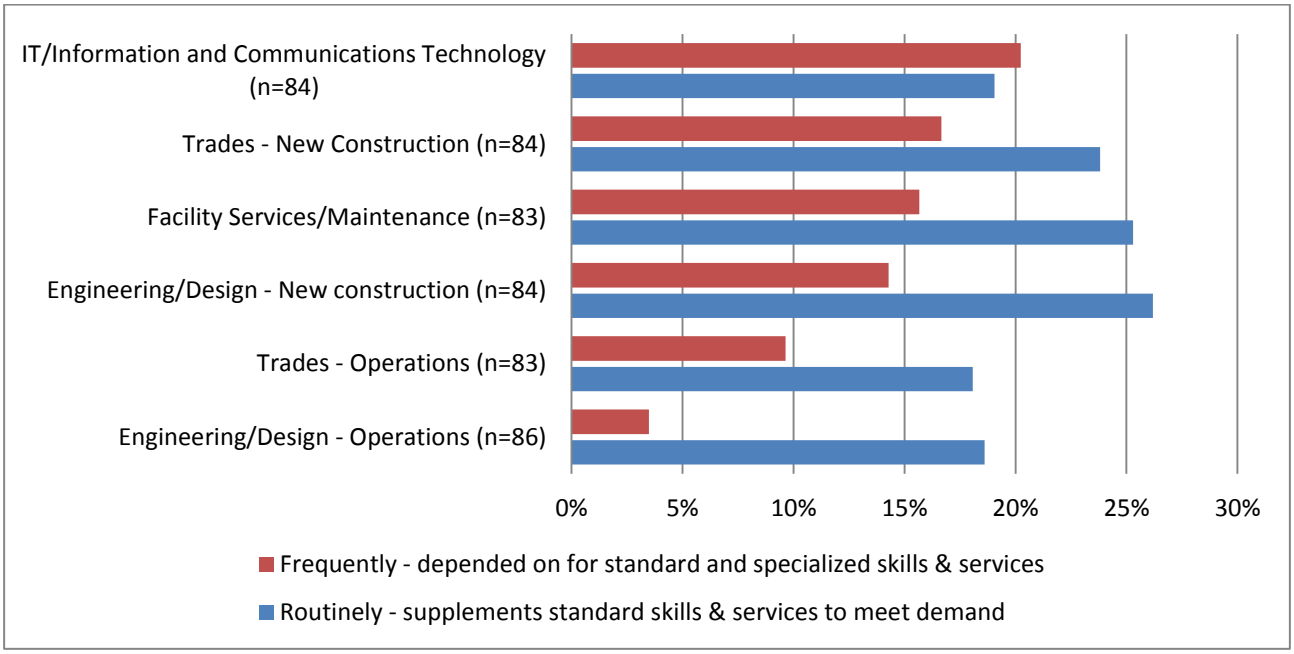
on outside resources for big projects. Plans to build the next generation signal important new specializations and very big projects. Contracting out work is an important aspect of rising investments in new facilities and technologies. Contracting out work may shift the responsibility for managing key human resources to employers outside the electricity industry. The 2011 ESC LMI employer survey investigated this issue.[11]

Survey questions asked industry employers to describe their use of consultants and contractors in Information Technology, Facility Maintenance, Engineering and the Skilled Trades. The intensity of contracting out was assessed as "none", occasionally, routinely or frequently. Exhibit 2.10 reports the results.

Exhibit 2.10
Use of Contractors and Consultants by Electricity and Renewable Energy Providers



Source: ESC Employer Survey 2011

Results suggest that much of the work is done in-house. Well over half of respondents consistently report that work is never or only occasionally contracted out. This leaves room for a large workforce that is recruited and managed outside the industry's employers. Over 25% of work is routinely or frequently contracted. Interviews and survey questions asked about trends in this area but no consensus was apparent. It appears that there is a wide variety of approaches and no uniform approach to consultants and contracting.

Unions play an important role in many cases. Over two thirds of the industry workforce is unionized, over twice the national rate. Many of the trades listed among the electricity sector and Next Generation

[11] The ESC Employer Survey 2011 findings are reported detail in Section 2.b and documented in the Methodology Appendix

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occupations might be dispatched from hiring halls to the firms. In these cases the union will work with employers to plan for labour requirements, including apprentices, special training and advanced certifications.

2.b The Workforce – Human Resources, Demographics and Competition

From this point forward the report focuses on the workforce at progressively higher levels of detail. Attention shifts to the occupations, human resources management and policy.

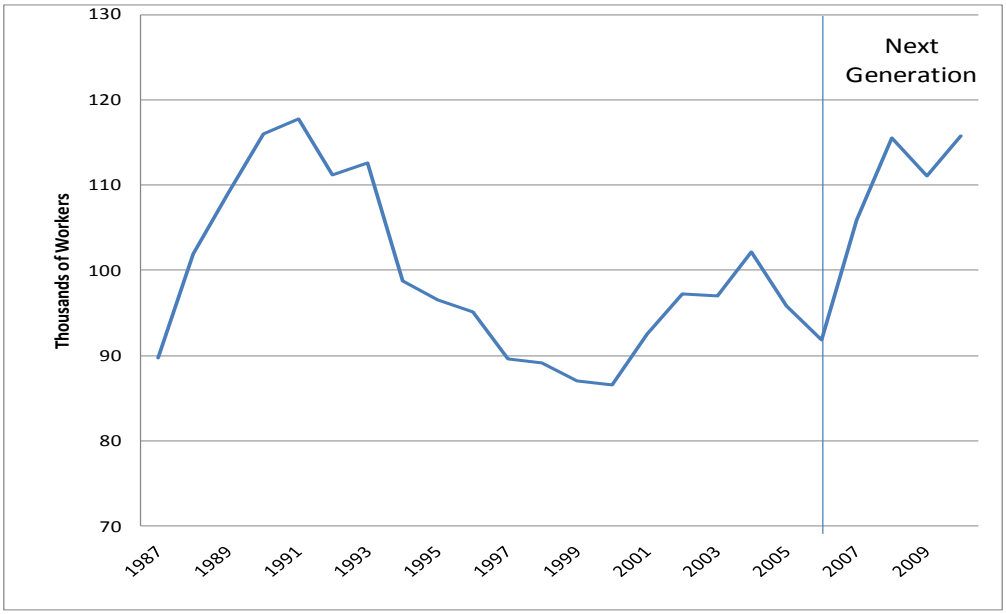
2.b.i Trends in the Workforce

This section describes the history and key characteristics of the workforce drawing on secondary sources and findings from the employer and post secondary program surveys. The age profile, training and qualifications, occupation and gender mix are shaped by the cycles in hiring and key institutional drivers noted above. These elements are described here.

Employment trends and the infrastructure deficit

Employment is driven by the output trends and investment cycles. Employees hired in the 70s and 80s joined the workforce as the Legacy system was built. Employment reached record levels in the early 1990s and then fell, in line with investment, from the mid-1990s remaining well below past peaks until 2006. Sustained employment losses exceeded 25% well into the last decade and remain, in 2010, below the peak reached in the early 1990s. This two decade long HR gap leaves important footprints in the current workforce profile.

Exhibit 2.11
Employment in Electrical Power Generation, Transmission and Distribution
Canada



Source: Statistics Canada, Labour Force Survey, 2010

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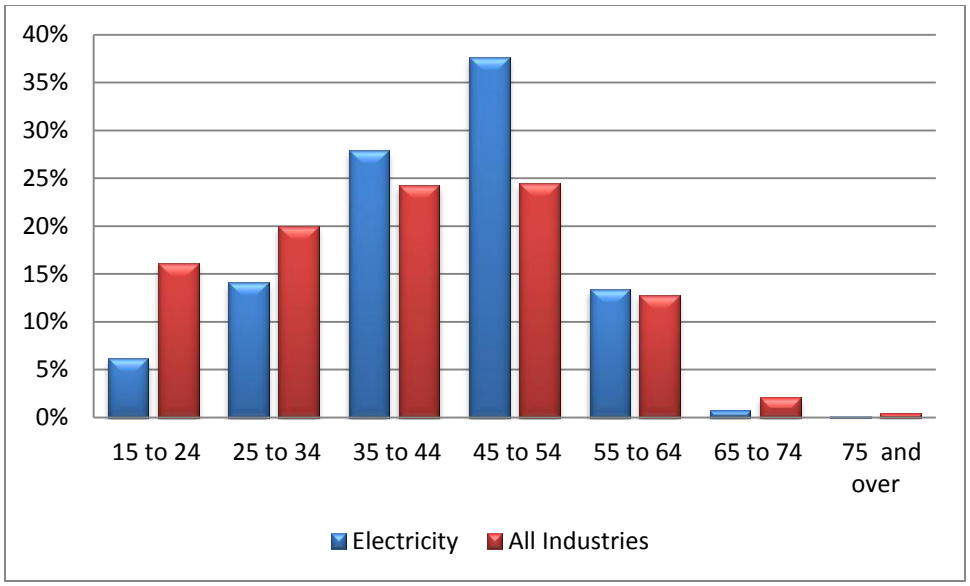
The year 2006 provides a natural turning point, marking the end of the Legacy period. Reliable measures of the workforce are available from the 2006 Census and this data reveals the impact of the investment / employment cycle from the 90s, 80s and earlier.

For example, the age profile of the electricity workforce reflects the surge of new entrants (age 15 to 24) in the 70s and 80s. Many in this generation remained in the industry and now fill the ranks of the 50+ year age group. Exhibit 2.12 tracks these broad trends for electricity and the overall economy. The prominent peak for the 45 to 54 age group is a defining feature. The lower share for the under 25 group tracks the impact of the employment collapse from 1992-93 to 2006.

Exhibit 2.12
Electricity Industry in Canada
Age Distribution of the Workforce



Source: Statistics Canada, 2006 Census

This age profile has important implications for retirement patterns and this report returns to these later.

Two other characteristics can be linked to this employment Legacy. The Census reveals that the electricity workforce has notably higher levels of educational achievement than the general workforce with a concentration of graduates from university, college and apprenticeship programs. These qualifications are further specialized with virtually all of the post secondary education in “Architecture, engineering and related technology” programs. The employment and age profile tells us that a large proportion of this population picked up these skills and training twenty to thirty years ago and few in the workforce completed postsecondary training in the last ten years.

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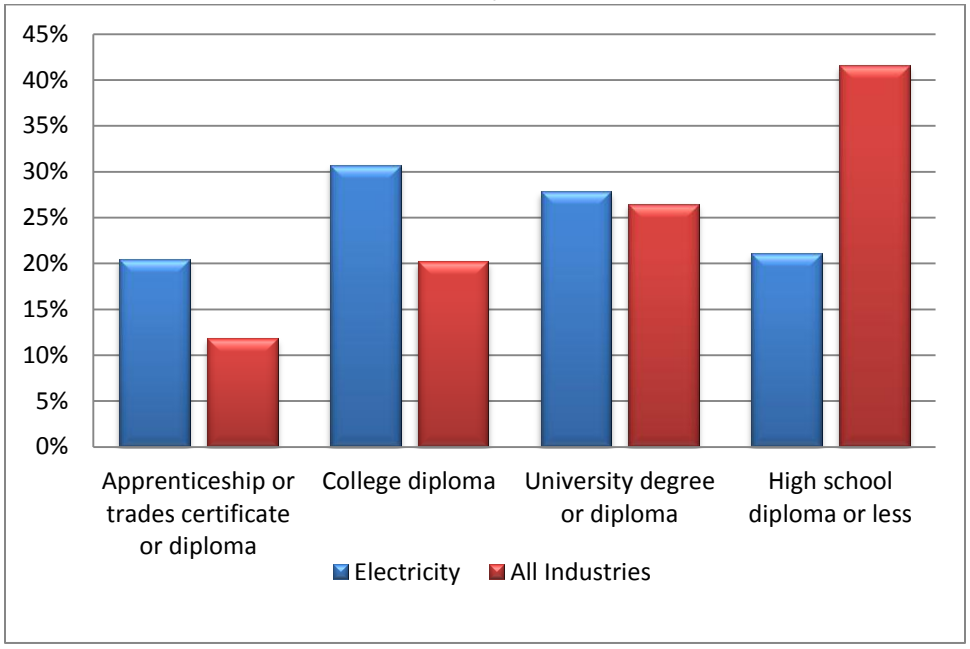
Exhibit 2.13
Highest Educational Achievement
Electricity and All Industries
Canada, 2006



Source: Statistics Canada, Census 2006

The educational qualifications of the workforce are a reflection of the occupational mix which is weighted to professional and technical occupations in natural and applied sciences. Exhibit 2.14 describes the overall profile and compares it with the overall economy.

The key occupations are engineers, engineering technicians and technologists and trades, representing over half of the workforce.

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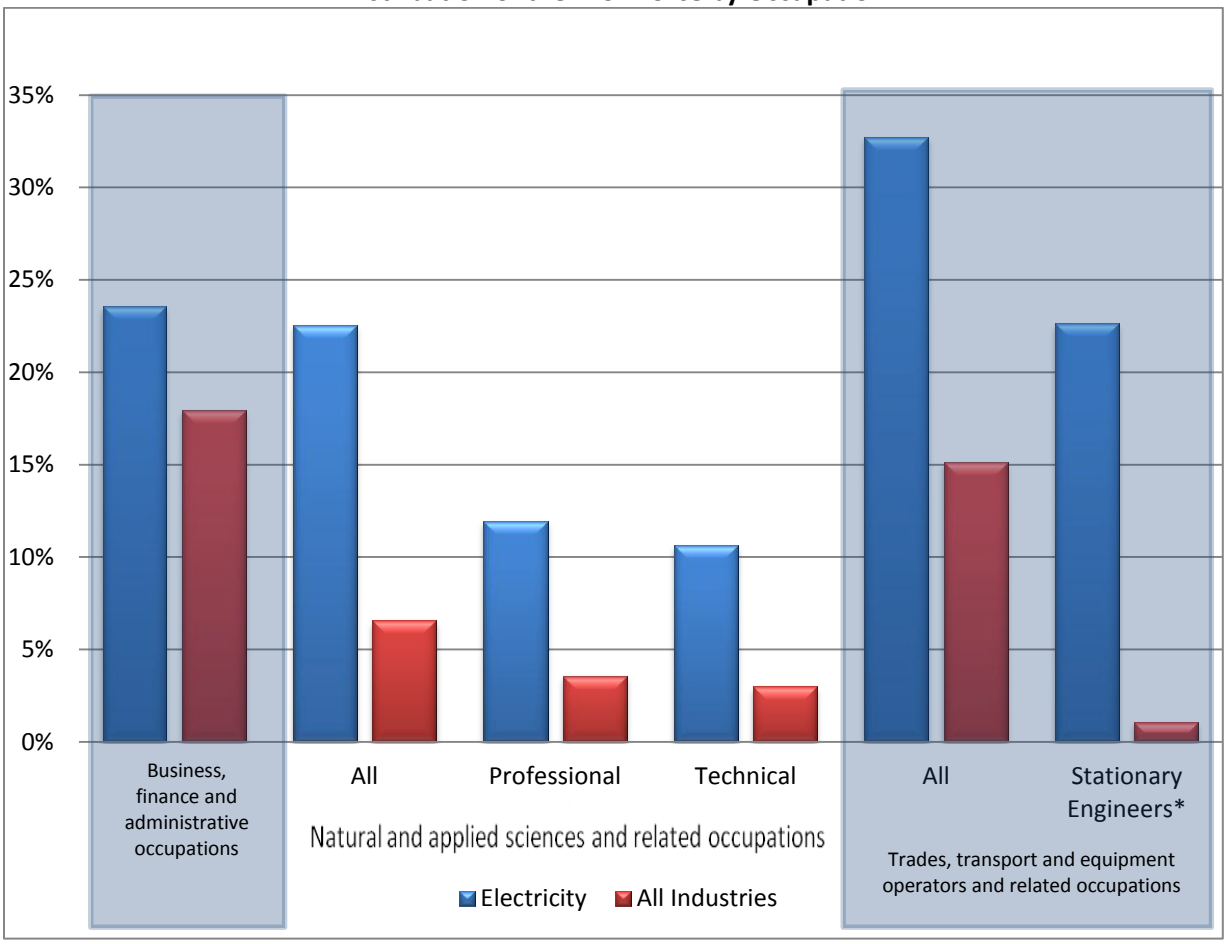
Exhibit 2.14
Distribution of the Workforce by Occupation



*Includes: Stationary engineers, power station operators and electrical trades and telecommunications occupations

Source: Statistics Canada, 2006 Census

The occupation and education mix identify a high skilled and well paid workforce. Average employment income for the workforce was $78,421 in 2006, 53% above the economy average of $51,221.

Census data highlights three other dimensions of the electricity workforce. First, there are fewer women in the workforce. Electricity employers share this feature with other industries where the workforce is concentrated in the professional and technical occupation in the natural sciences and in the trades.

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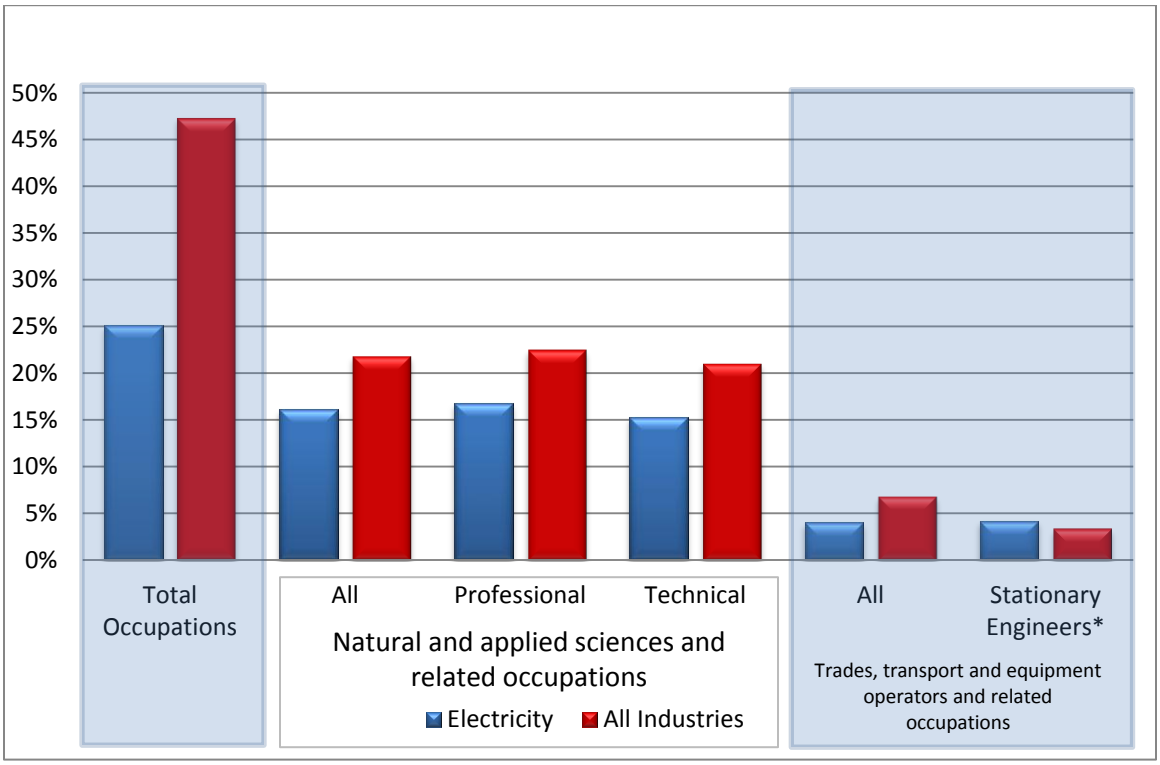
Exhibit 2.15a
Distribution of the Workforce by Gender
Percentage of Women in the Workforce



*Includes: Stationary engineers, power station operators and electrical trades and telecommunications occupations

Source: Statistics Canada, 2006 Census

Findings in the 2011 ESC Employer Survey suggest that these proportions have increased from the 2006 Census results noted in Exhibit 2.15a. Exhibit 2.15b extracts specific proportions for specific occupations from the Census and 2011 ESC surveys. These findings suggest some progress adding women to the workforce.

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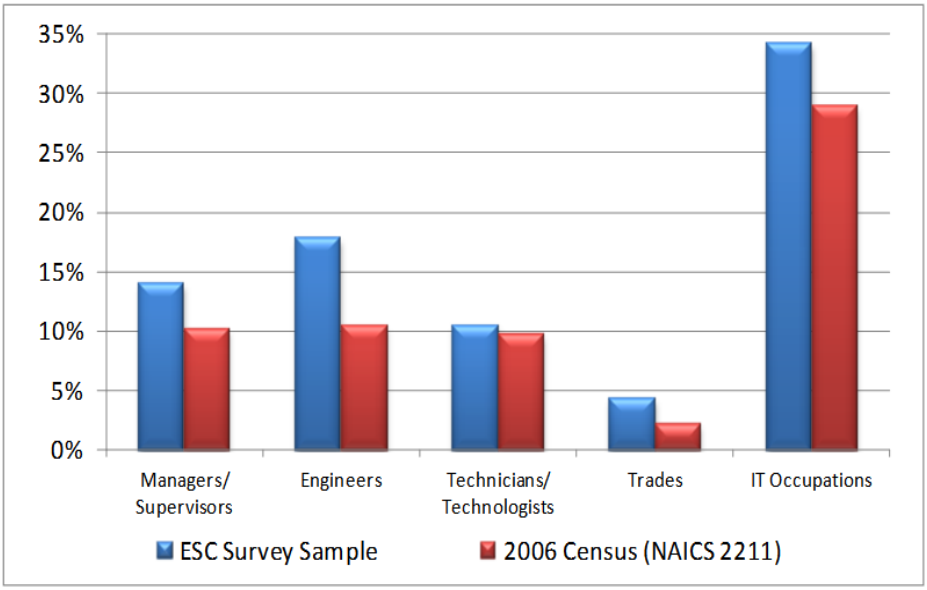
Exhibit 2.15b
Distribution of the Workforce by Gender
Percent of Women in the Workforce Census and 2011 Employer Survey



Source: ESC Employer Survey 2011

While the proportion of women in the industry is rising, it remains well below the average for the Canadian workforce and reflects the general importance of engineers, engineering technicians and technologists as well as skilled trades. Women are traditionally underrepresented in these occupations. Human resource strategies that target recruiting in general could well start with adding to the proportion of women in these key occupations.

An electricity and renewable energy industry initiative targeting women could link to ongoing efforts by engineers and many groups in the skilled trades. There is room for a unique industry program that targets the skilled trades dedicated to electricity generating and distribution (e.g. electrical power line and cable workers) – including the emerging occupations for renewable energy programs. There is also room for a targeted effort to bring women into engineering technician and technologists programs.

Finally the industry has a below average population of immigrants with over 12% of the workforce compared to 21% for all other employers. Further, the history of investment and employment is reflected in the immigrant workforce as over two thirds arrived before 1991 with a second wave of arrivals between 1995 and 2000. In other industries half of Canada's immigrant workforce has arrived since 1991. These immigration patterns are concentrated in engineering and engineering technicians and technologist occupations.

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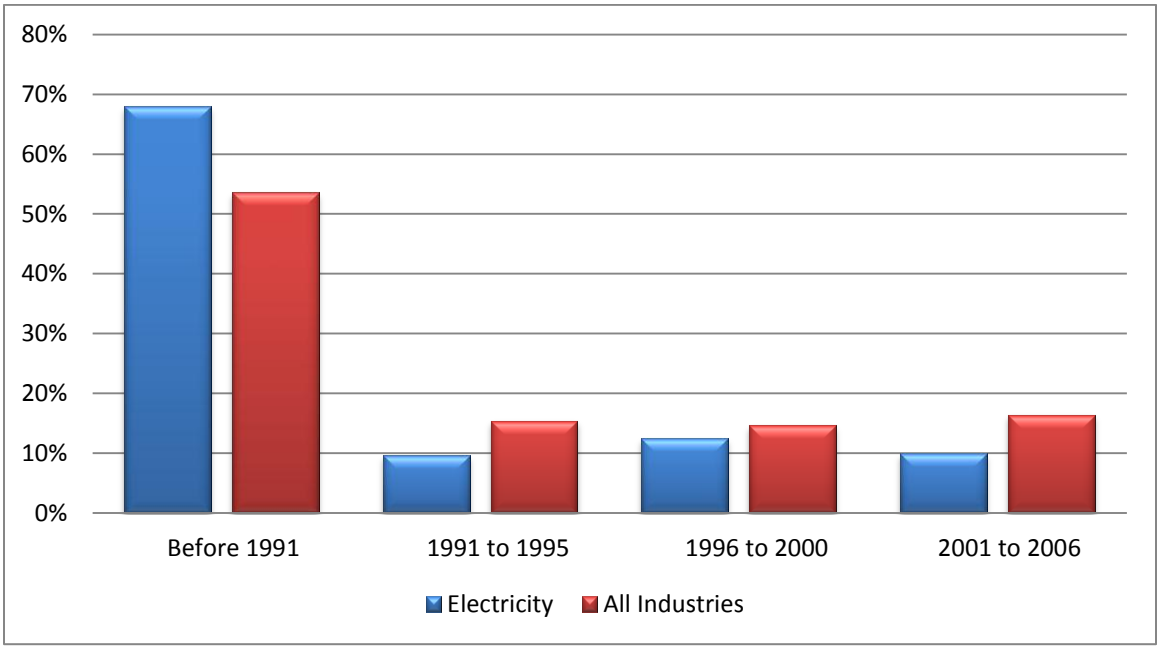
Exhibit 2.16
Distribution of the Workforce by Year of Arrival



Source: Statistics Canada, 2006 Census

In summary, in 2006 the electricity workforce had a distinct make up that captures much of the Legacy period. In particular, the industry has a stake in two key sources of supply:

- Canada post secondary training system in natural and applied sciences
- Immigration

2.b.ii Post Secondary Education.

The industry's Human Resources fortunes are tied to three distinct parts of Canada's post-secondary education system:

- Undergraduate and graduate programs in engineering
- College programs for engineering technicians and technologists
- Apprenticeship

Skills and training to meet the challenges of the next generation will come, in large measure, from these programs. This section reviews evidence on how trends in these programs will satisfy rising demands and the labour requirements.

Apprenticeship and university engineering programs prepare new entrants for ten of the electricity sector occupations listed in Exhibit 2.2. Exhibits 2.17 to 2.27 report recent trends in enrolments and graduations from these programs.

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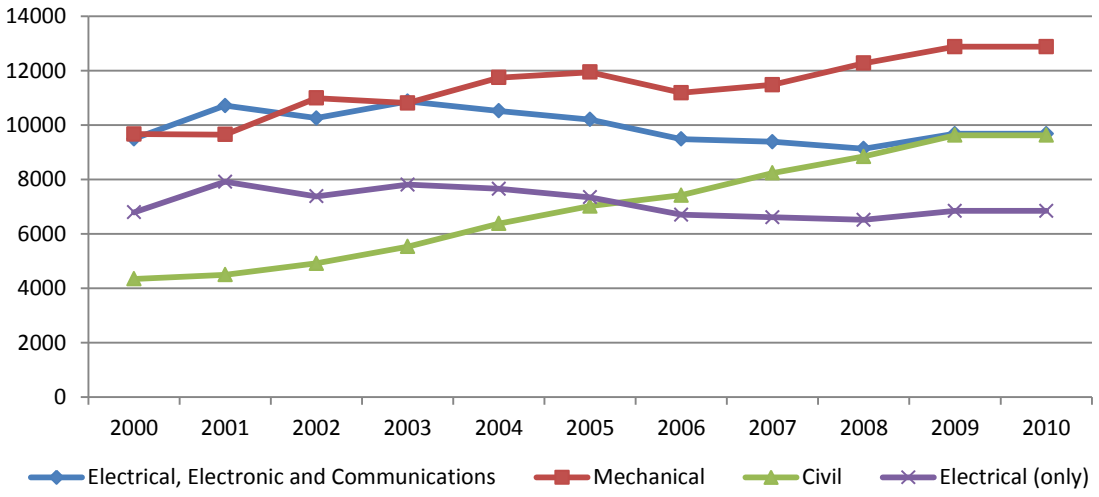
Engineering

Employers are seeking engineers with both the core technical skills that are taught in undergraduate programs and additional business or specialized skills and experience. Trends in graduations from both undergraduate and graduate programs are one leading indicator of future candidates. Total enrolments and subsequent graduations from the program are described here and included in the supply side of the ESC model for electricity sector occupations.

Exhibit 2.17 shows undergraduate enrolments in Canadian accredited engineering programs for the three disciplines in the electricity sector occupations. Programs offered in electrical engineering departments include specializations that might not meet the electrical power industry's needs. Research identified computer, communications, electronics, electrical and biomedical and other courses. Exhibit 2.17 separates these specialities from general electrical engineers. The latter group seems best suited to the needs of the electrical utility industry.

There is a distinct downward trend in the electrical area and a strong upward trend in civil. Indeed enrolments in civil engineering programs rose above electrical, electronic and communications programs for the first time in 2010. Enrolments and degrees awarded in electrical (only) programs have lagged notably behind other engineering programs since 2006.

Exhibit 2.17
Enrolments in Undergraduate Engineering Programs in Canada
2000-2010



Source: Engineers Canada

Exhibit 2.18 reports recent trends in graduations from these three disciplines. There is a predictable decline in graduations from the electrical engineering programs beginning in 2006 and continuing to 2010. Enrolments are, of course, a key leading indicator with the trends in Exhibit 2.17 anticipating that graduations will likely stop their decline in the coming years but there is little prospect of significant increases across the 2011-2016 horizon. The opposite conclusion seems to apply to civil engineers where trends will generate increases in undergraduates in the coming years. Electrical engineering is notably

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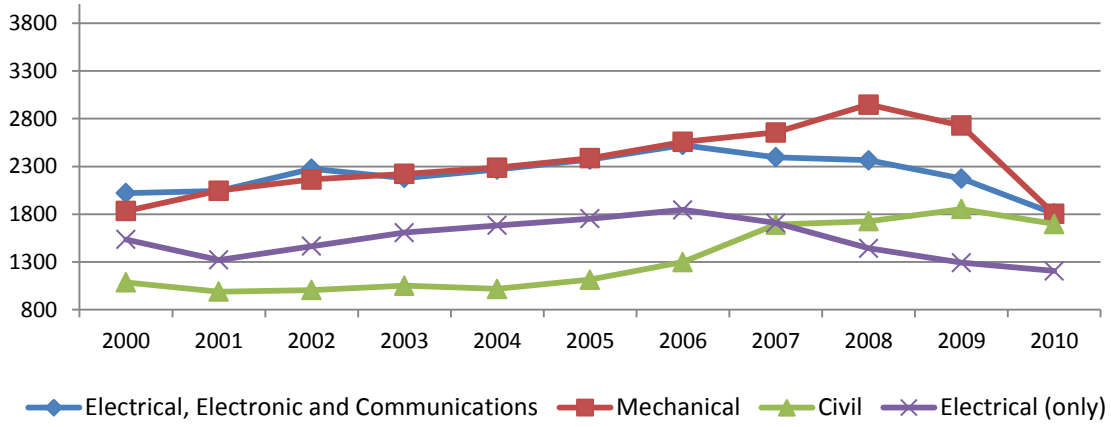
different than the other major disciplines as it has an established downward trend in enrolments and graduations.

Exhibit 2.18
Graduations from Undergraduate Engineering Programs in Canada
2000-2010



Source: Engineers Canada, Canadian Engineering Accreditation Board programs

These same measures are repeated for graduate programs in Exhibits 2.19 and 2.20 reporting trends in enrolments and graduations from Master's and Ph.D. programs. It was not possible to divide graduate programs in electrical and related areas to identify graduates dedicated to electrical alone.

Enrolments have risen steadily across the last decade, driving graduations upward in all the disciplines. There are relatively higher enrolments in electrical, electronic and communications programs than in the other disciplines and this is a good indicator of the potential availability of specialized engineers.

A rising proportion of the graduate programs at Canada's engineering schools are filled with foreign (visa) students. Most of these students will return home after graduation. New government programs do target this group and encourage foreign students to stay in Canada.

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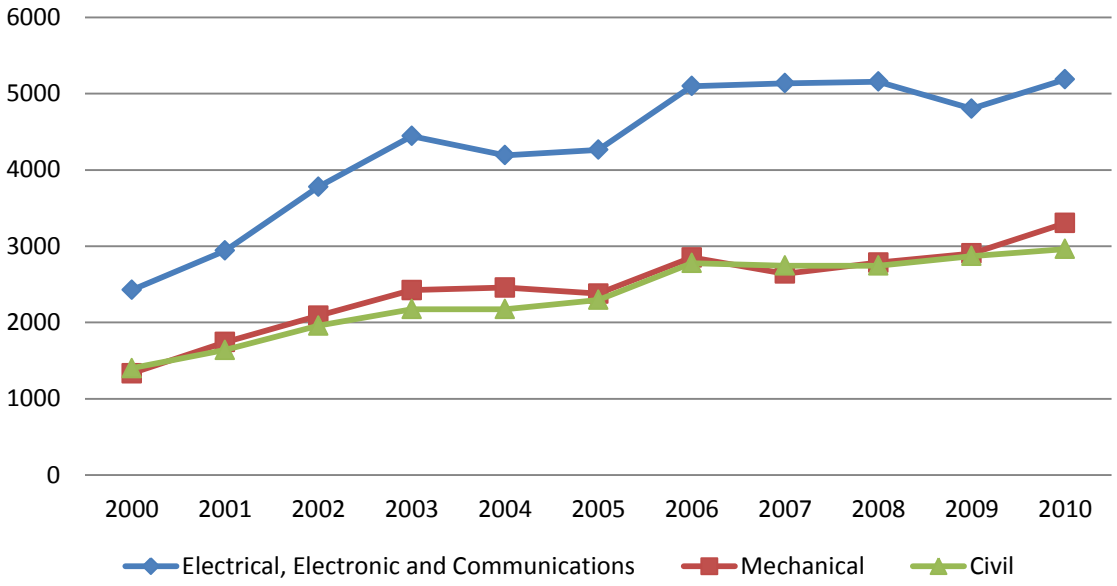
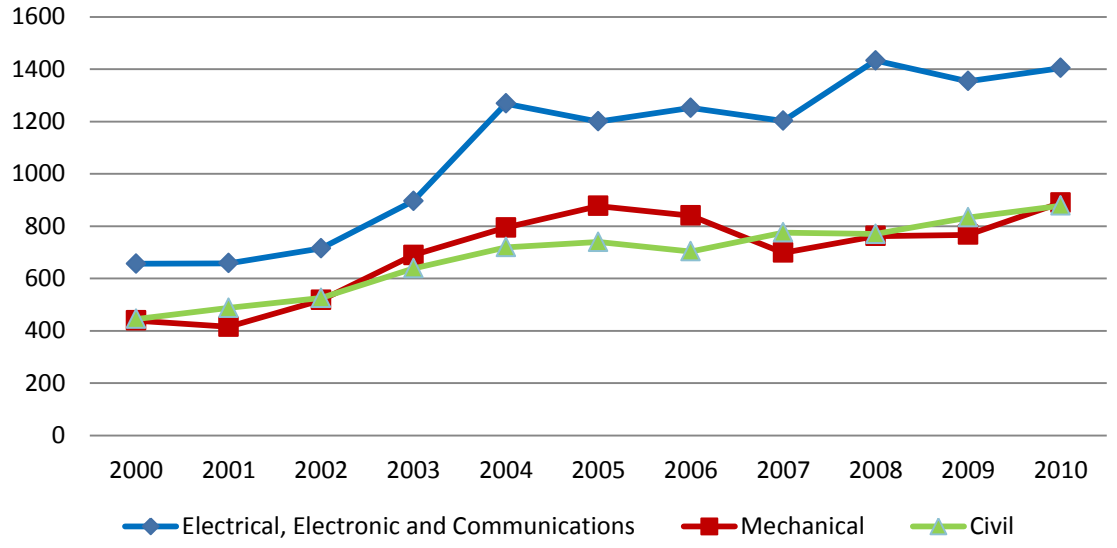
Exhibit 2.19
Enrolments in Graduate Engineering Programs in Canada
2000-2010



Source: Engineers Canada

Exhibit 2.20
Trends in graduations, Graduate Programs
2000-2009



Source: Engineers Canada, CEAB programs

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Not all engineering graduates are headed for the labour market. Exhibit 2.21 maps the progress of graduates from Canadian engineering programs to the workplace and estimates that 50% of undergraduates completing their degree are likely to find a long term placement in an engineering job or in the labour market. The Exhibit draws from different sources and the calculation may not capture outcomes in all areas. But these findings reflect important limitations in the flow of graduates to the available workforce. An equivalent adjustment to the flow of immigrants is included later.

These circumstances reflect the limited number of jobs available to junior engineers as employers have shifted their hiring to engineers with over five years experience.[12] Limited job opportunities for junior engineers create a risk of an oversupply of new undergraduates. At the same time employers report shortages of the professional skills that come with experience. These skills include:

- Specific industry skills
- Business practice experience
- Specific technology skills

[12] More details on these trends are available from the Engineers Canada report "Engineering Labour Market Conditions 2009 – 2018, September 2010" http://www.engineerscanada.ca/etlms/conditions/e/

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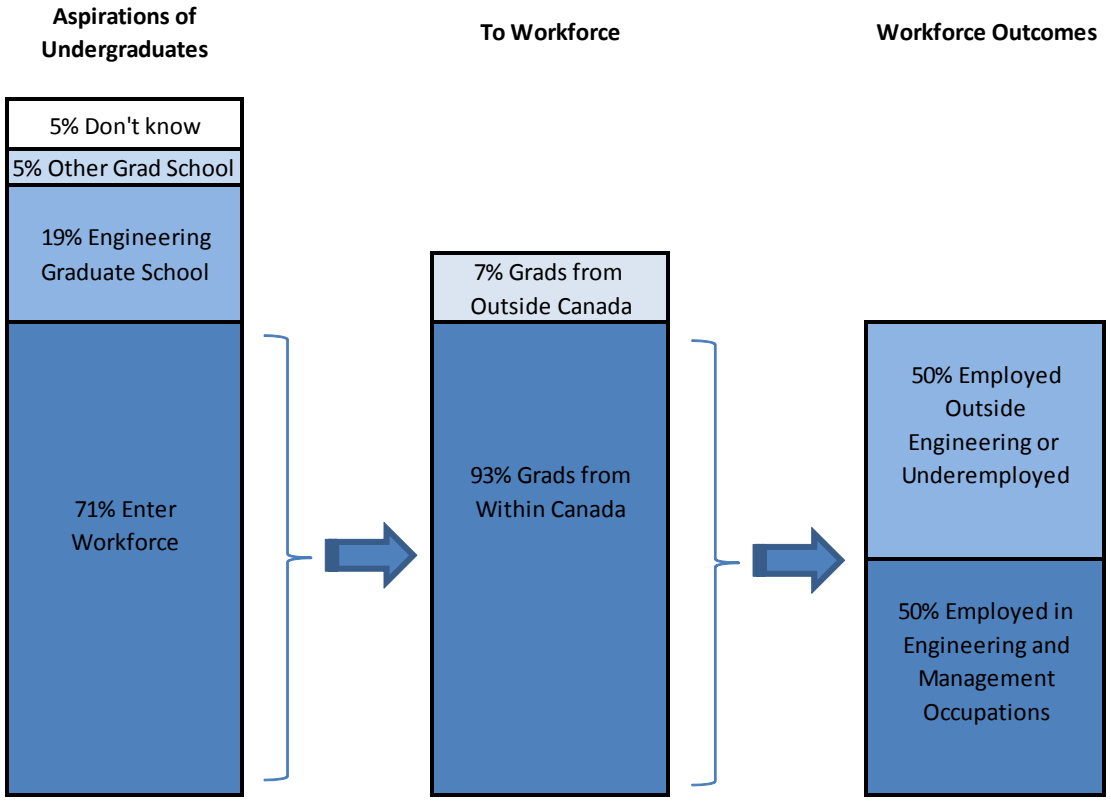
Exhibit 2.21
Progress of Graduates from Canadian Engineering Programs to the Workforce



Source: PEO Survey of Graduates, CEAB Data on Canadian/Foreign Graduates (assumes foreign graduates from Canadian Universities leave Canada), 2006 Census

Labour market outcomes, shown in the third panel of Exhibit 2.21, are taken from the 2006 Census. Just under half of Canadian engineering graduates were working in engineering occupations or related management occupations. The other half are divided between those applying engineering skills in other industries and those "underemployed" in occupations not requiring engineering qualifications.

Job seekers have adapted to this situation by earning additional formal qualifications including continuing on to graduate schools. A second adaptation by undergraduate engineering graduates has been to seek training as engineering technologists in the College system, acquiring specialized skill and experience that better suit them to the job market.

These labour market outcomes have been reflected in reports by human resource managers of relative ease in recruiting new entrants but on-going challenges finding specialized or experienced engineers.

Reliable and consistent data is not available for graduates from college programs for engineering technicians and technologists. Evidence collected in the 2011 ESC Survey of Post Secondary programs

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suggests that graduations from these programs have been rising, perhaps faster than other programs. These findings are reported in the next section.

Skilled Trades

Apprenticeship trends, shown in Exhibit 2.22, indicate large, recent gains in registrations in six electricity sector trades. Significant investments in all apprenticeship programs, in the past decade, are reflected in rising new registrations for most trades and have encouraged the introduction of new trades and related programs. Two large trades, general electricians and industrial electricians, are not common occupations in utilities but are crucial sources for the contractors who serve the industry. These trades also provide prerequisite skills for specialized electrician trades and occupations in the industry. Very large increases in these apprenticeship programs are indicators of the capacity of the trades' workforce to adapt to the needs of the next generation of electrical infrastructure. Labour market conditions for these trades are reviewed in Section 3.

Apprenticeship programs in most provinces have developed a variety of ways to recognize specializations in the trades. It is important for electricity sector employers and their contractors to expand these programs. Programs include recognizing allied trades where core skills and training are applied in more advanced programs. Power system electricians are one important example, in some provinces, where this trade is recognized as an allied trade to electrician. In some cases advanced technological requirements can be added by combining college technician programs with trades qualifications. In other cases advanced qualifications are available to certified journeypersons.

Exhibit 2.22
Registrations and Completions from Apprenticeship Programs in Canada; 2000-2008

Skilled Trades	2000	2001	2002	2003	2004	2005	2006	2007	2008
Construction Millwright and Industrial Mechanic (Millwright)									
Registrations	8265	8859	9039	9624	9714	10155	11391	11415	12342
Completions	909	1005	795	993	1032	900	933	1014	1098
Electrician, Except Industrial and Power System									
Registrations	22128	24597	26547	28305	30849	33990	37980	42249	46062
Completions	2139	2322	2274	1998	2805	2946	3249	3672	4020
Industrial Electrician									
Registrations	7320	8355	9435	10377	10785	11349	11790	12351	6333
Completions	315	510	534	543	444	486	501	546	240
Power Systems Electrician									
Registrations	84	99	123	144	147	186	210	234	279
Completions	12	9	12	12	9	18	27	24	27
Electrical Power Line and Cable Workers									
Registrations	1092	1296	1488	1647	1767	1962	2301	2691	3081
Completions	93	81	108	123	156	174	171	210	279
Stationary Engineers and Auxiliary Equipment Operators									
Registrations	327	357	402	429	396	288	291	285	1032
Completions	18	9	9	3	15	12	6	6	6
Total									
Registrations	39216	43563	47034	50526	53658	57930	63963	69225	69129
Completions	3486	3936	3732	3672	4461	4536	4887	5472	5670

Source: Statistics Canada, Registered Apprenticeship Information System

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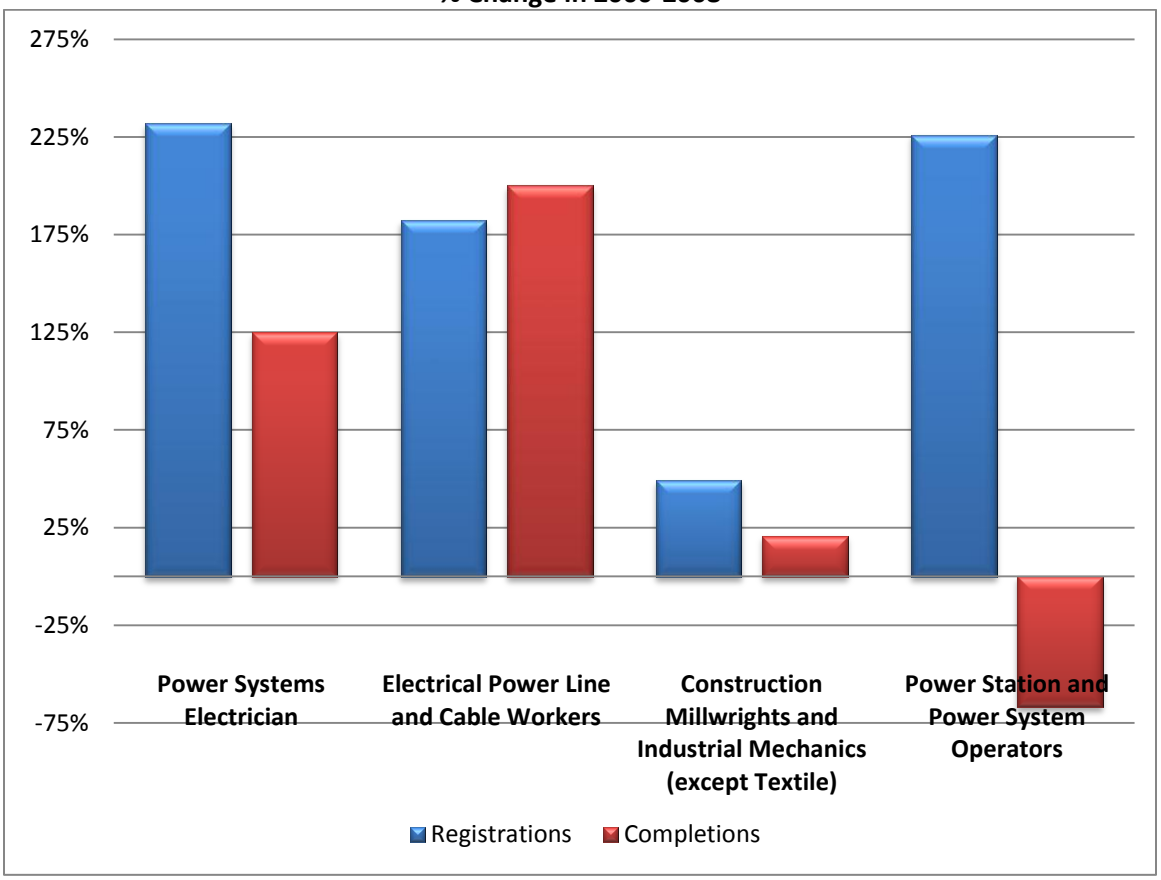
There has been growing evidence of a lag in the rate of completions in apprenticeship. These lags have been the object of much study and government incentives. Exhibit 2.23 isolates the situation for the four key electricity sector trades: millwrights, stationary engineers, electrical power line workers and electrical power system electricians. In three of the four cases growth in registrations has exceeded completions, repeating the situation that is reported for many other trades. Power Line Workers are an important exception to the rule here. This is the largest trade in terms of employment in the utilities and has been the focus of considerable attention as employers experience shortages. Labour requirements related to the repair and refurbishment of distribution systems are the driving force. The apprenticeship system is growing to meet these needs.

Exhibit 2.23
Registration and Completions in Apprenticeship Programs
% Change in 2000-2008



Source: Statistics Canada, Registered Apprenticeship Information System

Delays in completions do not necessarily indicate a failure to add needed new skills to the system, but they will have an important impact on the availability of a certified workforce for the traditional trades.[13] New technology, changing market conditions and career preferences have altered the path that apprentices

[13] For more on this topic see "Delays Not Withdrawals: A New Perspective on the Path Through Apprenticeship" Bill Empey, Canadian Journal of Apprenticeship, Vol 3, Fall 2010

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follow from registration to certification. There is a growing trend to specializations that meet the needs of employers, but do not include all the features of a traditional apprenticeship. These specializations are one reason for lower completion rates as apprentices chose to end or delay their progress once they have a secure work in the specialization.

This trend is directly relevant to the electricity and renewable energy providers. Specializations are a critical feature both for the trades workforce in the utilities and their contractors, and for the renewable energy providers as they refine the processes of installing and operating solar, wind and geothermal systems. This suggests that lower completions and the associated limited availability of certified journeypersons may reflect their plans as they hire and train electrician apprentices in their needed specializations. Many jobs in the workforce employ highly skilled and specialized electricians whose trade is not recognized or certified in their jurisdiction's apprenticeship system.

These conditions reflect a process of change that is altering the skills, specializations and certification for electrical trades. These changes are yet another aspect of the transition from the legacy to the Next Generation of electrical infrastructure.

Supply side survey and interview results

As part of the 2011 LMI update the Electricity Sector Council initiated a survey of post secondary programs. College and university leaders were asked to describe programs and report on enrolments and graduations. They were also asked to comment on challenges, gaps, and relations with the utility industry, and their plans to increase activity.

Respondents from 47 institutions reported over 130 programs with over 8,000 students related to electrical power systems. The sample is divided into university, college and technical institute. Respondents were asked to list and comment on the programs that were related to the needs of the electrical utility industry.

Respondents assessed the growth in their electricity related programs relative to other programs in their institution. Exhibit 2.24 reports expected increases in all categories and particular strength in the college technician and technologist programs as well as apprenticeship.

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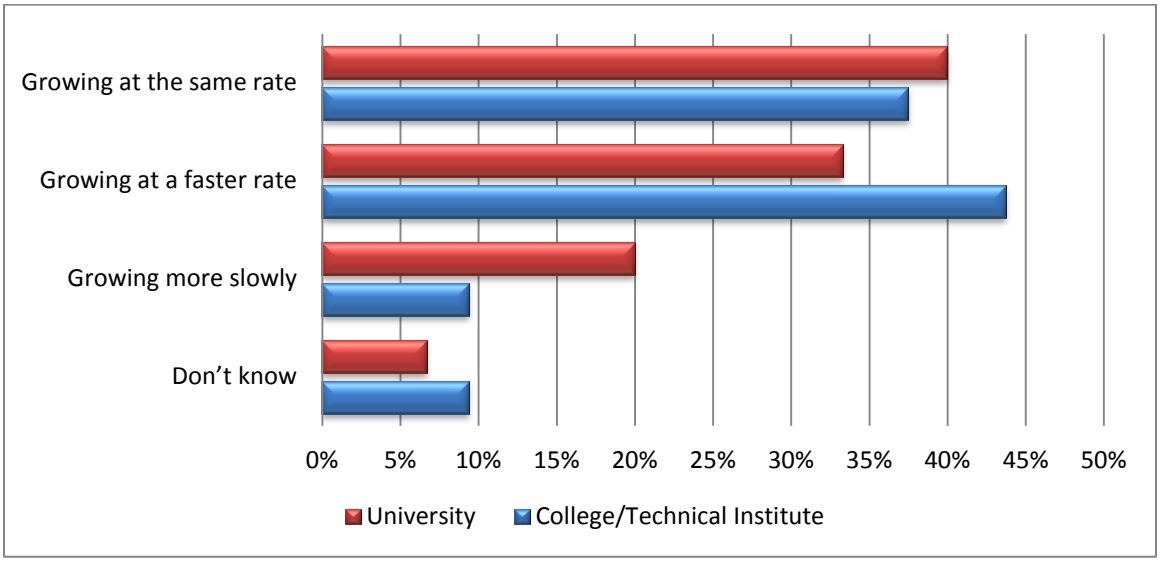
Exhibit 2.24
Post Secondary Training for Electricity Sector Occupations, Expected Enrolment



Source: ESC Survey of Post Secondary Institutions 2011

Results in Exhibit 2.24 suggest that registrations are growing more rapidly in the college programs for engineering technicians and technologists as well as in the trades and apprenticeship area. These findings are consistent with the trends for registrations captured above in the national data. Expanding registrations in these programs is an important first step in meeting future labour requirements. However, there are barriers to building up these programs and adding to the skilled workforce.

These trends have shifted a bit since the ESC completed a similar survey in 2007.[14] A smaller percentage of the colleges reported faster than average growth in programs while many fewer universities report slower than average growth. Overall expectations of growth have balanced out. Colleges still anticipated relatively stronger gains and enrolments in all the programs that link to the electricity sector occupations should grow slightly faster.

Respondents were asked to identify the major challenges that they face in expending programs and Exhibit 2.25 reports the findings.

[14] See "Powering Up the Future" the 2008 LMI Study from the ESC, Page 74.

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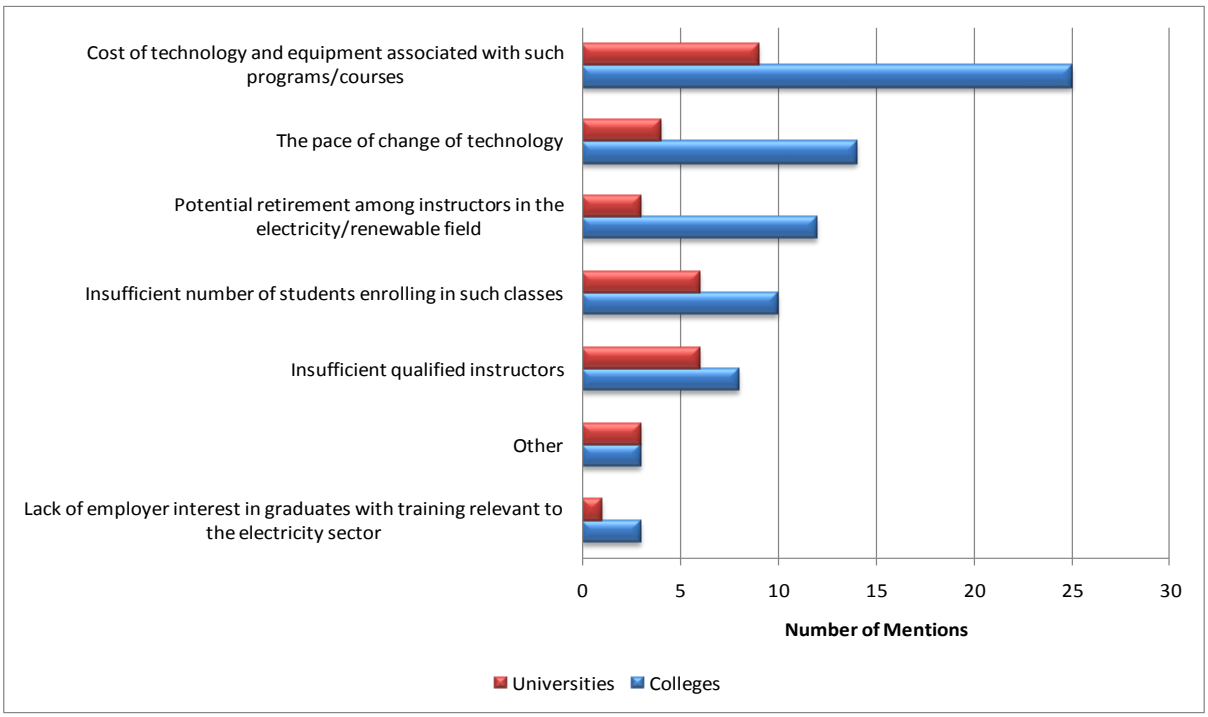
Exhibit 2.25
Post Secondary Training for Electricity Sector Occupations, Challenges facing programs



Source: ESC Survey of Post Secondary Institutions 2011

Technology and demographics create the big challenges. Technology issues lead the list and this is a reflection of the impact of renewable energy systems and the challenge of new smart grid and other changes. Survey respondents in the colleges mentioned new programs targeting solar and wind training. Plans to move the industry to the next generation infrastructure will likely add to these costs. Challenges posed by insufficient numbers of students are related to the recent history of limited hiring and the small cohort between the age of 15 and 24.

There has been a modest shift in the ranking of challenges since the 2007 survey with technology issues rising and the insufficiency of students declining.

The theme of attracting applicants was extended as the survey asked respondents about initiatives at their institution targeting new diversity groups. Two thirds of the responding institutions have programs often targeting women, aboriginals and foreign students. These programs may be connected to a wide range of existing initiatives offered by unions, occupational groups, industries and government.

Focusing more closely on the needs of the electrical industry, respondents were asked about the most effective initiatives to increase the supply of graduates. Findings, reported in Exhibit 2.26, describe the need for more effective communication and shared experiences among industry, schools and the workforce. These priorities are unchanged from 2007.

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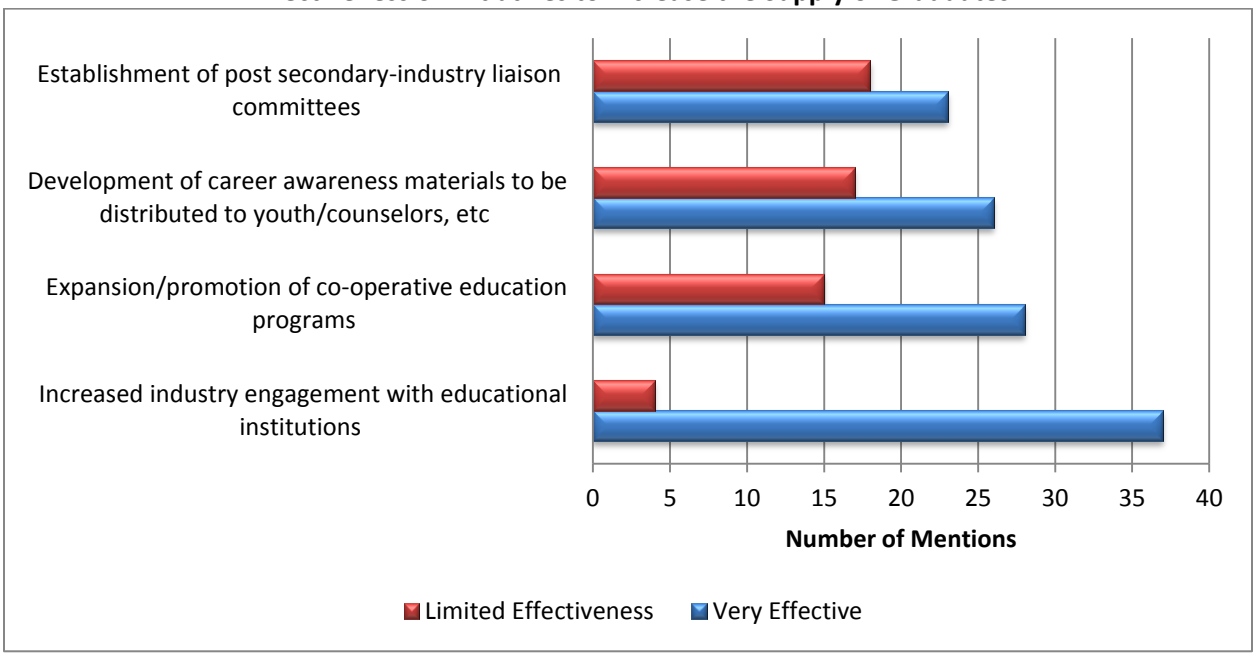
Exhibit 2.26
Post Secondary Training for Electricity Sector Occupations,
Effectiveness of Initiatives to Increase the Supply of Graduates



Source: ESC Survey of Post Secondary Institutions 2011

Finally, respondents described a better relationship linking the institutions with the electricity industry compared to other industries.

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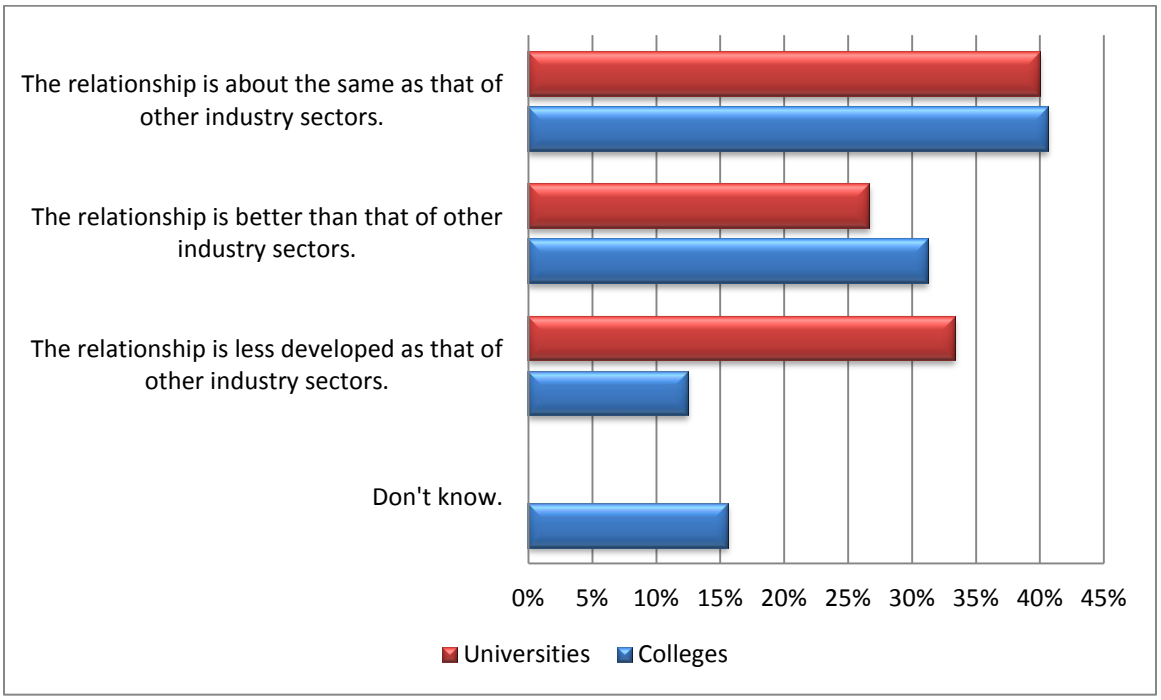
Exhibit 2.27
Post Secondary Training for Electricity Sector Occupations,
Relationships between the industry and the institutions



Source: ESC Survey of Post Secondary Institutions 2011

In summary, this section describes an expansion of all three post secondary programs that are adding to the pool of new graduates seeking work in the electricity sector occupations. But these trends do not extend to all areas and there are many challenges to the continuing improvement of the system. In particular, there is evidence that the path from post secondary programs to the workforce is filled with barriers that will limit the available workforce with credentials, needed skills and experience. Electricity sector employers need more specialized and experienced recruits. Transition from Legacy to Next Generation requires continuing changes at each level of the post secondary system. Many changes are underway and more will be needed.

Findings indicate that electricity sector employers could refine the qualifications of the post secondary grads by expanding and deepening their relationships with the institutions. In particular, new initiatives need to focus on providing new technologies and equipment.

2.b.iii Immigration

The second important external source for the workforce is immigration. Electricity sector employers have a far lower proportion of immigrants in their workforce than other industries and most of these arrived before 1991. This pattern is linked to the investment cycles that built the legacy infrastructure in the 70s and 80s. In particular, the job losses and employment lags from 1993 to 2006 left electricity sector employers out of a major immigration cycle.

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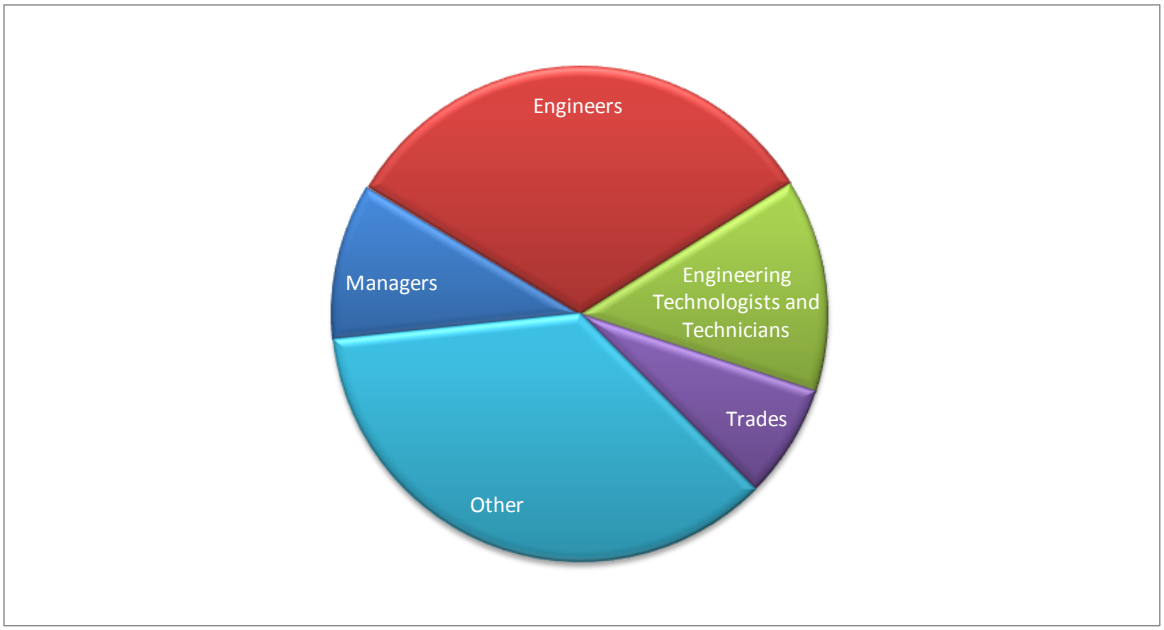
Engineers dominate the electricity sector occupations arriving from abroad. Exhibit 2.28 reports the distribution of permanent immigrants and temporary foreign workers in the electricity sector occupations, arriving and seeking work in all industries in 2009. These foreign workers are classified according to their intended occupations. Permanent immigrants, seeking work as engineers, often had difficulty establishing their credentials and finding engineering jobs. Temporary foreign workers, in contrast, arrive with a job and are authorized to work for two years. In recent years the Federal provision for Temporary Foreign Workers (TFWs) has been associated with Provincial Nominee Programs that have offered permanent residence to many TFWs after their two year term has expired. Recruiting workers through this path has become an important human resources strategy for many technical occupations and trades.

Exhibit 2.28
Immigration* by Intended Occupation, Canada, 2009, Electricity Sector Occupations



*Permanent and Temporary Foreign Workers
Source: Citizenship & Immigration Canada, RDM as of Dec 2010

A cycle of immigration from the mid 1990s to the mid 2000s dominated labour markets for engineers and engineering technicians and technologists. At the cyclical peak, in 2000 and 2001, the wave of immigration exceeded labour requirements and this prompted several years of adjustment as international engineering graduates (IEGs) struggled to find jobs, sometimes outside engineering. The wave of immigration also had an impact on job prospects for Canadians and on registrations in post secondary programs.

This cycle was notably more severe for electrical and electronics engineers and engineering technicians and technologists where the cycle raised immigration from 1,670 in 1990 to 7,290 at the peak in 2001. At the peak electrical engineers and technicians and technologists made up one third of the total immigration of electricity sector occupations to Canada. This surge may have discouraged young Canadians and

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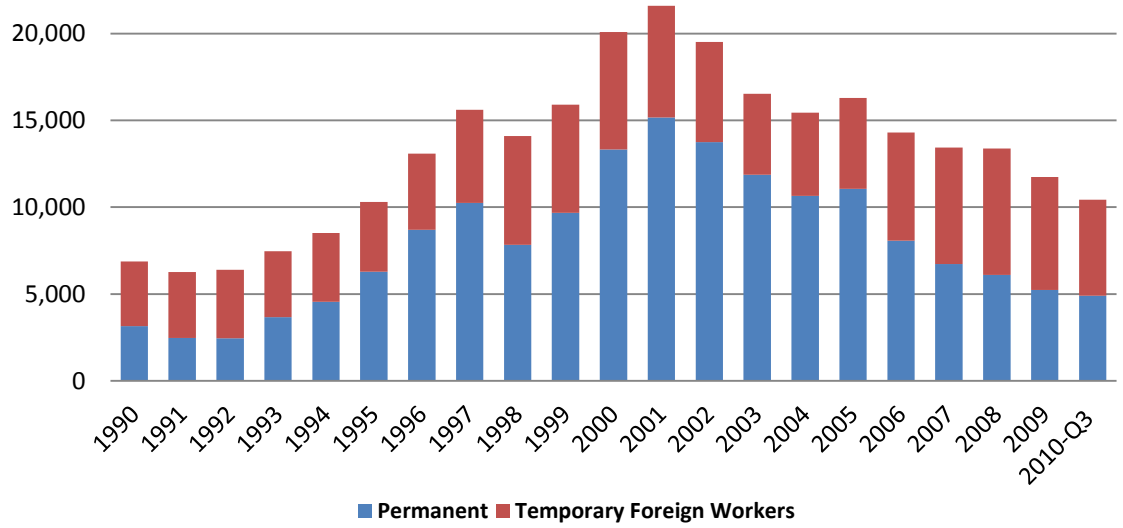
contributed to the drop in post secondary program enrolment in electrical engineering during in the last decade, see Exhibit 2.29.

Exhibit 2.29
Permanent Immigrants and Temporary Foreign Workers in Electricity Sector **Occupations**
Canada, 1990 to 2010



Source: Citizenship and Immigration Canada

The immigration component of the labour supply for electricity sector occupations relates almost exclusively to engineering-related groups in the past. This pattern is likely to change as the industry recruits to build the next generation of infrastructure and replace retiring workers. National demographic patterns will limit the entry of young Canadians. Competition to attract new entrants is intensifying and shortages of skilled and experienced workers are driving employers across all industries to recruit immigrants.

Evidence presented in this section suggests that the electric utility industry is arriving late to this new labour market reality as their labour requirements remained low for many years. The industry will join others in the search for skilled and experienced workers from other countries as this pattern changes. Other industries may have a lead in the development of human resource practices that take advantage of immigration policy.

Industry and corporate human resource strategies targeting immigrations will be needed in the future.

2.c Occupations

This section drills down to the next level, reviewing conditions in the electricity sector workforce in the light of the trends and cycles described above. The principle source for this, more detailed, analysis is the 2011 ESC Employer Survey.

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The 2011 ESC Employer Survey addressed over twenty detailed questions to over eight hundred Human Resource Managers in electric utilities, providers of renewable energy, and the retailers, contractors and consultants who work with these firms. The sample captures a cross section of the very large firms that employ much of the workforce including generation, transmission, distribution and renewable energy providers and contractors and consultants.

The final sample used for this report covers 89 employers with over 75,000 employees or 75% of the industry workforce. More details on the survey methodology and results are available in Appendix A.

Survey questions focused on details for the 19 electricity sector occupations described in Exhibit 2.2. Respondents were asked to provide extensive information on each occupation and in some cases details were not available. Results presented below sometimes draw on small employer samples for specific measures in each occupation. However, these estimates will refer to a large workforce and this enhances their reliability.

In this section the survey results document the current situation and consider implications for human resource management. In Section 3, the results are used to customize labour market assessments for each occupation from 2011 to 2016.

2.c.i The Current Situation

Employer survey results are presented here for 17 electricity sector occupations and other support staff. [15] Findings are reported for retirement, workforce dynamics and recruiting. These areas reflect the impacts of long term trends, short term dynamics and competition with other industries.

Retirement

A wave of retirements from the electricity and renewable energy industry is one component of the Legacy to Next Generation transition. Perhaps the biggest human resources challenge is replacing the workforce retiring now and in the coming years. Employers are firmly caught in the grip of the Baby Boomer experience.

Baby Boomers were born between 1947 and 1965. In 2011 the oldest boomers are in their early 60s and the youngest in their mid 40's. Large numbers of the boomers were recruited by electricity sector employers in the 70's and 80's and began retiring in 2006. This wave of retirements forms one part of the Legacy to Next Generation transition.

Past employment cycles and policies create distinct age profiles that are described in Exhibits 2.30, 2.31 and 2.32. Two age groups stand out from general population patterns: first, the youngest group under 25 and second, the 45 to 54 "young boomer" group. The limited number in the youngest age group is related to

[15] These seventeen occupations are included in the original nineteen noted in Exhibit 2.2 with power station and systems operators broken into two separate occupations. Four occupations (electrician, industrial electricians, stationary engineers and auxiliary equipment operators and financial auditors and accountants) are excluded from the survey analysis because of limited responses. The category "other skilled trades" was added to capture conditions for the three excluded trades.

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the fifteen year employment gap from 1991 to 2006 as jobs were lost and new hiring stopped. Few young people joined the workforce at that time.

The 45 to 54 group, young boomers, reflect hiring in the 70s and 80s. This large group, 38% of the workforce in the sample, is an obvious focus for HR retirement strategy. Much depends on the timing of retirements as the next cohort (old boomers aged 55 to 64, 15% of the sample) move into their retirement years leaving the young boomers in the 45 to 54 group to fill in their jobs. Managing the transition for these two, large groups of boomers is a top priority. Corporate plans to retain and build their skills and transfer knowledge from the oldest boomers help to manage the situation. These challenges have a ripple effect that links to younger groups.

Exhibit 2.30
Age Distribution, Electricity Sector Occupations

		% of Sample By Age					
	n	<25	25 to 34	35 to 44	45 to 54	55 to 64	>65
Engineering Managers	43	0%	4%	22%	49%	24%	1%
Utility Managers	38	0%	4%	19%	58%	19%	0%
Construction Managers	27	0%	4%	18%	48%	29%	1%
Supervisors of Electricians and Electrical Power Line Workers	50	1%	7%	19%	56%	17%	1%
Civil Engineers	23	1%	29%	23%	31%	14%	1%
Mechanical Engineers	19	2%	47%	18%	23%	10%	0%
Electrical and Electronic Engineers	37	4%	29%	24%	27%	14%	1%
Information Systems Analysts and Consultants	33	1%	20%	31%	36%	11%	0%
Civil Engineering Technicians and Technologists	18	2%	20%	23%	38%	16%	1%
Mechanical Engineering Technicians and Technologists	16	2%	20%	25%	34%	18%	1%
Electrical and Electronic Engineering Technicians and Technologists	36	4%	22%	22%	38%	13%	1%
Electrical Power Line and Cable Workers	50	9%	29%	22%	28%	12%	1%
Power Systems Electricians	35	3%	20%	24%	37%	15%	1%
Power System Operators	29	7%	23%	20%	37%	13%	0%
Power Station Operators	20	4%	23%	26%	36%	12%	0%
Millwrights and Industrial Mechanics	21	3%	20%	22%	38%	16%	1%
All Other Trades	29	4%	16%	18%	43%	19%	1%
Total ESC Occupations	38	4%	21%	22%	37%	15%	1%

Source: ESC Employer Survey 2011

Generation X, in the 35 to 44 group, step into the spotlight as they are called on to fill middle management jobs. But Gen-Xers are a relatively small group in comparison to the young boomer group and relative to the distribution of the general workforce. For example, engineers in this group have the crucial five plus years of experience that is so hard to find in most recruiting. Electricity sector employers will likely face relatively severe challenges filling these ranks with outsiders. HR policies that have focused on hiring Generation X as new entrants and supporting apprenticeship, coop programs and engineers-in-training will be rewarded as retirement impacts ripple through the organization.

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These problems are, of course, most acute for utility managers and supervisors. But many other occupations, including millwrights and some engineering disciplines are weighted to young boomers and away from Generation X. The exception is the IT occupations where the age profile is younger, reflecting a pattern of more recent hiring.

The challenges related to the age profile have grown more acute in the three years since the last survey. While the proportion of the over 55 group remains the same the young boomers have grown relatively larger and the Gen-Xers smaller.

The report adopts a five year horizon with projections of retirements, market conditions and other HR matters included for the period from 2011 to 2016. Section 3 includes the age profiles and the related HR implications into the assessments and projected labour market conditions.

Exhibit 2.31 provides survey results that highlight the choices and opportunities for the age groups. Survey respondents reported the number of retirements, their average age and their qualifications for pensions. Two findings are critical. First, the average age at retirement across all the occupations groups was consistently 58 years. Second, a high proportion of those who qualify for a full pension take retirement. These numbers have increased as the workforce has aged, since the findings of the 2008 report. Retirements will run well above the average for other industries creating a distinct human resources challenge.

The major distinction for the electricity sector employers and their workforce is the relatively low average age at retirement, 58, while the average is 61 for the overall labour force. This three year gap separating electricity sector employees and the rest of the economy is very large and will add cumulatively to the retirement losses. Pension provisions will offer full benefits to the large workforce with over 30 years of work experience. All but the youngest boomers will reach age 58 and likely qualify for full pension benefits by 2016. The ESC LMI model, introduced in Section 3, calculates the impacts.

Exhibit 2.31 shows some interesting variations among occupations. For example, electrical engineers and engineering technicians and technologists remain at work longer while managers, supervisors and trades take advantage of pension eligibility.

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Exhibit 2.31
Retirement Patterns, Electricity Sector Occupations

	# in Sample	Average Age at Retirement	# of Retirements - 2010	# of Staff Eligible for Pensions	% of Staff Who Retired on Full Eligibility
Engineering Managers	1033	57.4	50	154	77.3%
	n=48	n=7	n=24	n=23	n=10
Utilities Managers	2268	58.2	135	408	71.7%
	n=58	n=11	n=32	n=29	n=19
Construction Managers	298	57.1	13	40	64.2%
	n=38	n=5	n=19	n=18	n=8
Supervisors of Electricians and Electrical Power Line Workers	1791	57.7	103	326	68.0%
	n=64	n=11	n=32	n=32	n=20
Civil and Other Engineers	1205	59.4	40	138	79.5%
	n=33	n=4	n=17	n=14	n=4
Mechanical Engineers	1540	59.3	8	94	75.5%
	n=33	n=3	n=16	n=14	n=4
Electrical and Electronic Engineers	4019	59.6	97	483	59.3%
	n=46	n=11	n=28	n=21	n=10
IT Occupations	2227	58.3	70	147	75.4%
	n=45	n=10	n=24	n=20	n=10
Civil and Other Engineering Technologists and Technicians	1019	58	37	176	79.0%
	n=29	n=2	n=15	n=15	n=5
Mechanical Engineering Technologists and Technicians	709	55.4	22	120	73.5%
	n=28	n=6	n=18	n=13	n=3
Electrical and Electronics Engineering Technologists and Technicians	4253	57.3	134	560	59.7%
	n=44	n=10	n=29	n=24	n=12
Electrical Power Line and Cable Workers	6460	58.2	104	422	58.0%
	n=59	n=22	n=37	n=32	n=19
Power System Electricians	4010	57.3	132	467	75.5%
	n=43	n=9	n=23	n=24	n=12
Power System Operators	1610	57.9	63	188	64.0%
	n=37	n=8	n=21	n=22	n=11
Power Station Operators	2945	58.1	85	299	61.5%
	n=30	n=7	n=16	n=16	n=7
Millwrights or Industrial Mechanics	2484	58.6	87	215	69.6%
	n=32	n=10	n=20	n=17	n=9
All Other Trades	6132	60.4	274	777	76.3%
	n=40	n=10	n=22	n=19	n=12
Total Electricity Sector Occupations*	44003	58.5	1454	5014	68.7%
	n=707	n=146	n=393	n=353	n=175
*Calculated using a weighted average of responses					

Source: 2011 ESC Employer Survey

The 2011 update reveals large increases in these measures since the 2007 survey. For example, the proportion of the survey sample workforce eligible for full pension has increased from 8.5% to over 11%.

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Survey results shown in Exhibit 2.32 track the proportion of the 2010 workforce retiring as one measure of these impacts. This proportion in 2011 – about 4% – is above estimates for the overall economy which run just below 3% given the general age profile and average age at retirement. The gap in 2011 widens in the future. Respondents report that expected retirements in 2016, within the survey workforce, more than doubles. Comparable calculations for the overall economy workforce rise only moderately from around 3% to approaching 4%.

Survey results include estimates of the expected retirements as a share of the workforce from 2011 to 2016. The equivalent measures, in the 2007 survey, reported that in 2006, 2.4% of the workforce retired and respondents expected that to rise to 6.2% in 2012. This seems to have overstated the problem. The new survey reports that 3.9% of the workforce retired in 2011 – below their 2007 estimate[16].

Comparing the 2007 and 2011 survey, then, shows that the proportion of the workforce retiring rose over 60% from 2.4% to 3.9%. The observed rise was below the increase expected by the respondents. Labour market assessments in Section 3 take advantage of these findings, including significant gains in retirements – by correcting for the possibility that respondents are overstating the problem in the current survey.

In short, the retirement dynamics of the electricity sector workforce are notably skewed towards a high and rising number of retirements. Managers and supervisors have both the highest age and retirement profiles. Findings for each occupation are reported at the end of this section and the LMI model and forecast developed in Section 3 provide projections of retirements.

[16] Similarities in the sample make it likely that these measures are accurate.

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Exhibit 2.32
Retirement Projections, Electricity Sector Occupations

	n	% of Current Workforce Retiring in 2011	% of Current Workforce Retiring in 2016
Engineering Managers	20	4.9%	8.3%
Utilities Managers	27	6.3%	10.6%
Construction Managers	18	7.3%	12.9%
Supervisors of Electricians and Electrical Power Line Workers	28	7.0%	19.8%
Civil and Other Engineers	14	3.3%	9.2%
Mechanical Engineers	13	0.6%	4.0%
Electrical and Electronic Engineers	20	2.7%	5.8%
IT Occupations	20	3.4%	6.9%
Civil and Other Engineering Technologists and Technicians	12	4.1%	9.5%
Mechanical Engineering Technologists and Technicians	13	3.8%	10.9%
Electrical and Electronics Engineering Technologists and Technicians	23	3.4%	10.0%
Electrical Power Line and Cable Workers	33	1.7%	4.5%
Power System Electricians	21	3.8%	9.0%
Power System Operators	24	6.4%	25.4%
Power Station Operators	14	3.2%	7.0%
Millwrights or Industrial Mechanics	17	3.8%	6.4%
All Other Trades	18	5.7%	18.8%
Total Electricity Sector Occupations	335	3.9%	10.0%

Source: 2011 ESC Employer Survey

Workforce Dynamics

Survey respondents were asked to provide details on the turnover of the workforce, covering voluntary separation, unfilled jobs (vacancies) and hiring. Findings are compared to the 2008 LMI Study report and used to guide the labour market assessments in Section 3. There are cyclical, institutional and structural factors driving workforce dynamics in each occupation.

Exhibit 2.33 reports workforce dynamics by major occupational groups. Managers / supervisors have lower voluntary separation rates and fewer unfilled positions reflecting the more stable relationship of this group to employers. Engineers and engineering technicians and technologists have a higher rate of turnover in general, perhaps reflecting competition with other industries for this group of occupations.

Findings for the trades are determined by the role of unions. Union members in the trades are dispatched to work, from hiring halls, on a long or short term basis. Higher separation rates are simply a reflection of this process. At the same time the low proportion of unfilled positions reflects access to the union ranks as the workforce turns over.

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Findings for information technology and communications and related workers emerge as a highlight with a very high proportion of unfilled positions. This is related to rapid growth in these occupations and this, in turn, is driven by the role this group plays in the adoption of new technology. There is also an element of competition with other industries here that is covered in more detail later.

These measures, in the 2011 survey, are notably higher than in the 2007 survey. Separation rates were 1.3% in the earlier survey and have risen to 2.7%. Even larger gains are apparent for vacancy rates, up from 3.2% to 5.7%. Hires have risen as well. Rates are up for managers / supervisors and for engineers / engineering technicians and technologists.

These findings are further evidence of a very tight labour market. Rates reported in 2007 were already well above long term values and this captured the very tight market conditions at that time. Current readings are even higher. These findings are consistent with the continuing ramping up of industry employment during the first stage of the transition to next generation infrastructure.

The tightest markets are for information and communication technology occupations and this is consistent with the findings in 2007 and with the important role that these specialists are playing in the adoption of new technology.

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Exhibit 2.33
Current Conditions, Changes in the Workforce, Electricity Sector Occupations, Major Groups

	# in Sample	Separation Rate (%)	Unfilled Positions (%)	New Hires (%)
Engineering Managers	1033	1.0%	1.7%	4.2%
	n=48	n=30	n=28	n=28
Utilities Managers	2268	1.1%	3.4%	3.7%
	n=58	n=34	n=30	n=33
Construction Managers	298	3.1%	5.4%	9.4%
	n=38	n=26	n=22	n=28
Supervisors of Electricians and Electrical Power Line Workers	1791	1.0%	6.0%	7.4%
	n=64	n=33	n=34	n=34
Civil and Other Engineers	1205	1.4%	16.3%	17.3%
	n=33	n=23	n=21	n=25
Mechanical Engineers	1540	2.5%	0.5%	2.0%
	n=33	n=26	n=21	n=21
Electrical and Electronic Engineers	4019	1.7%	5.0%	10.9%
	n=46	n=33	n=33	n=35
IT Occupations	2227	1.1%	20.6%	19.6%
	n=45	n=31	n=32	n=33
Civil and Other Engineering Technologists and Technicians	1019	0.4%	10.2%	9.8%
	n=29	n=21	n=20	n=21
Mechanical Engineering Technologists and Technicians	709	2.7%	1.4%	2.0%
	n=28	n=21	n=19	n=21
Electrical and Electronics Engineering Technologists and Technicians	4253	0.5%	11.1%	13.4%
	n=44	n=34	n=30	n=36
Electrical Power Line and Cable Workers	6460	6.8%	3.2%	7.1%
	n=59	n=43	n=39	n=44
Power System Electricians	4010	3.3%	3.5%	6.5%
	n=43	n=32	n=27	n=29
Power System Operators	1610	2.3%	3.0%	3.5%
	n=37	n=22	n=24	n=24
Power Station Operators	2945	0.8%	4.3%	6.2%
	n=30	n=22	n=22	n=21
Millwrights or Industrial Mechanics	2484	5.6%	1.2%	2.3%
	n=32	n=23	n=23	n=23
All Other Trades	6132	2.6%	4.4%	8.5%
	n=40	n=30	n=27	n=27
Total Electricity Sector Occupations*	44003	2.7%	5.7%	8.2%
	n=707	n=484	n=452	n=483

* Calculated using a weighted average of responses.

Source: 2011 ESC Employer Survey

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Results for the trades show some tighter markets but gains since the last survey are less than for the other occupations and, in fact, some markets seem weaker. These findings can be attributed to the role of unions and conditions in other labour markets. Economic conditions in manufacturing and in some construction markets, for example, are weaker than in 2007 and trades with portable skills would be available to fill jobs in the electricity and renewable energy industry. Much depends on the degree of specialization required and the capacity of training systems to adjust. In general, the big labour markets for electricians and millwrights, outside electricity, were recovering from recession, but not as tight as in 2007 at the time of the new survey.

Exhibit 2.34 asks the important question: where are the needed workers found? Findings are very similar to the results of the 2007 survey.

Managers and supervisors are mostly found internally and from other electricity employers. This pattern focuses attention on the large contingent of younger boomers who are already in the ranks and the HR challenge of managing their transition to more senior management as the older boomers retire.

The high proportion of engineers, technicians, technologists and trades hired from the post secondary (or from other industry employers) focuses attention on the issues and challenges that were described in 2.b.ii above. Human Resource practices highlighted here include the relative willingness of electricity sector employers to take on apprentices, co-op students, engineers-in-training and other junior positions. These HR practices would be rewarded as the technical skills of new entrants are specialized to industry needs. Alternatively, poaching from other employers may be dictated by the relatively limited ranks of young, skilled workers. Electricity sector employers hiring from post secondary programs will have a big stake in the certification process for all the technology occupations. These processes are changing as part of the transition from legacy to next generation technologies.

Again the most distinctive findings are for the IT occupations where most hiring is from outside the industry. This implies, among other things, that needed skills are not readily available from internal staff or post secondary grads. This pattern is important as the evidence indicates that IT occupations are a key to the introduction of new technologies.

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Exhibit 2.34
Current Conditions, Recruiting Sources, Electricity Sector Occupations

				Distribution of External Hiring by Sources					
	(n)	New Hires (#)	Internal	Recent Post-Secondary Graduates	Recent Immigrants	Electricity Employers	Other Employers	Workers with No Previous Experience	Other
Engineering Managers	28	43	53.6%	4.3%	4.3%	87.1%	4.3%	0.0%	0.0%
Utilities Managers	33	83	46.8%	4.7%	0.0%	56.8%	38.5%	0.0%	0.0%
Construction Managers	28	28	62.8%	29.8%	0.0%	55.4%	15.1%	0.0%	0.0%
Supervisors of Electricians and Electrical Power Line Workers	34	133	76.3%	0.0%	12.2%	87.8%	0.0%	0.0%	0.0%
Civil and Other Engineers	25	208	13.1%	36.8%	11.0%	10.8%	19.4%	14.6%	7.2%
Mechanical Engineers	21	31	0.0%	44.3%	1.7%	45.7%	8.3%	0.0%	0.0%
Electrical and Electronic Engineers	35	437	19.3%	45.6%	10.0%	24.8%	19.7%	0.0%	0.0%
IT Occupations	20	437	13.8%	11.3%	0.0%	4.2%	84.6%	0.0%	0.0%
Civil and Other Engineering Technologists and Technicians	22	100	43.5%	25.7%	0.5%	2.1%	20.5%	52.4%	0.0%
Mechanical Engineering Technologists and Technicians	21	14	20.5%	64.5%	0.6%	2.6%	32.2%	0.0%	0.0%
Electrical and Electronics Engineering Technologists and Technicians	36	570	28.6%	52.9%	0.1%	33.2%	4.9%	8.8%	0.0%
Electrical Power Line and Cable Workers	44	456	16.5%	43.6%	5.0%	38.7%	4.3%	8.5%	0.0%
Power System Electricians	29	261	20.9%	25.7%	0.4%	43.0%	16.3%	14.7%	0.0%
Power System Operators	24	57	34.4%	33.4%	0.8%	40.9%	13.9%	11.1%	0.0%
Power Station Operators	21	184	24.4%	31.3%	1.1%	15.9%	27.1%	24.6%	0.0%
Millwrights or Industrial Mechanics	23	57	21.0%	2.8%	0.6%	1.3%	85.3%	9.9%	0.0%
All Other Trades	27	524	14.8%	6.9%	1.1%	40.7%	49.4%	2.0%	0.0%
Total Electricity Sector Occupations	471	3623	23.4%	29.5%	3.3%	31.1%	28.1%	7.7%	0.4%

Source: ESC Employer Survey 2011

Finally the employer survey asked about the degree of difficulty hiring. Over 40% of responding employers report moderate difficulty and almost 20% report extreme difficulty. Conditions are most severe for filling manager positions and this likely extends to finding experienced or specialized recruits in all occupations.

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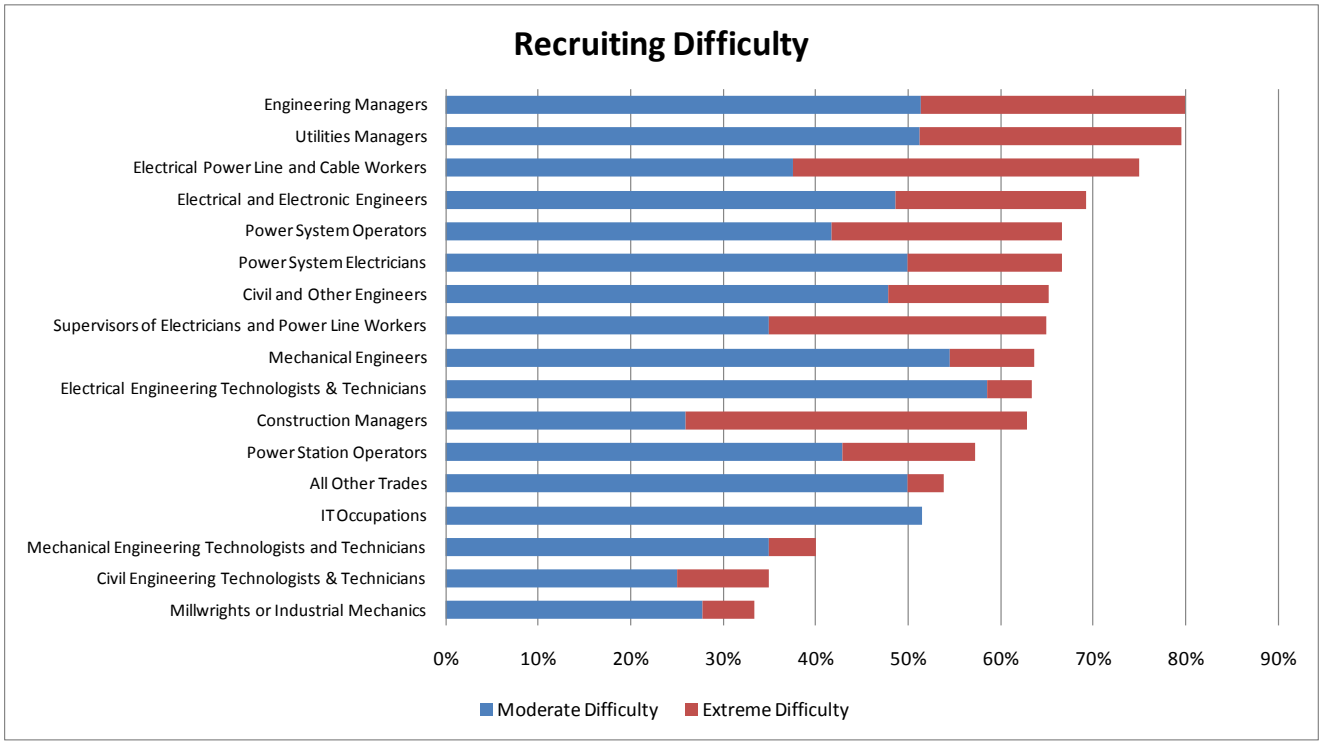
Exhibit 2.35
Current Conditions, Recruiting Difficulty, Electricity Sector Occupations



Source: ESC Employer Survey 2011

Most of the measures gathered from the 2011 ESC Employer Survey are consistent with very tight labour markets and almost unprecedented challenges recruiting. Some relief in this situation may be found recruiting outside the industry. The next section considers these conditions with reference to labour market information gathered for the electricity sector occupations and the next generation occupations by other sources.

2.c.ii Competition with Other Employers

Findings to this point in the report have focused on the circumstances in the electricity and renewable energy industry. This section of the report turns to conditions in broader labour markets and in other industries employing the electricity sector occupations. Most of the workforce in the electricity sector-type occupations in Canada is employed outside the electricity and renewable energy industry. The exception here is the specialized trades dedicated to the industry: power system electricians, power line technicians, power station and system operators and stationary engineers. For the other occupations, to the extent that skills are portable into and out of these jobs, conditions in other markets will play a major role in recruiting conditions.

Exhibit 2.34 reports that a significant percentage of hiring was from outside the industry. Understandably recruiters are looking in other industries and markets for IT workers and trades not specialized to the industry. Much depends on the employers' needs for specialties and work experience in electricity and

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renewable energy and the available workforce. Labour market conditions in other industries are also important for "next generation" occupations working for contractors and consulting firms also outside the industry.

This section introduces three LMI sources that describe these broader labour markets. Labour market information, similar to this report, is available from the Construction Sector Council, the Information and Communication Technology Council, and Engineers Canada. Reports from these councils add important details to the trends noted in this section.

Engineers and Engineering Technicians and Technologists

The Engineering and Technology Labour Market Study, completed by Engineers Canada in 2008, offers a base for tracking labour market trends for engineers across all industries. This study was a major review of engineering and engineering technician and technologists human resources and skills development. The study included reports on:

- Employer issues and projections of labour requirements
- Available workforce, demographics, career paths and postsecondary education programs
- Attitudes and policies towards licensure, certification, continuing competence and work task boundaries
- Diversity in the workforce
- Globalization and engineering consulting

Findings have been consolidated in an Engineering Labour Market Tracking System that monitors conditions across all these areas. Engineers Canada is preparing regular updates of this system. Some of the key findings from this work have been summarized above and a more general account, covering the national workforce is presented here and in Section 3.

The tracking system draws together trends in employment growth and labour requirements, including retirement, and these are compared with supply side estimates of the available workforce from post secondary education programs, immigration and demographic patterns. The labour market gaps that separate demand and supply are mapped out for each discipline and region.

Statistical trends, described above, on the supply side point to a wave of immigration over the last decade and a general flat or modest upward trend in post secondary graduations. Labour requirements have been dominated by estimates of retirements while new jobs related to output growth have been limited. While there are important exceptions in resource markets, the evidence suggests that engineering labour markets had moved from a condition of over-supply through much of the 2000s to more balanced conditions by 2008. The recession in 2008 and 2009 created temporary market weakness but recovery was underway in most engineering labour markets in 2010. In 2011 engineering labour markets generally show a balance of labour requirements with the available workforce.

Discussion with human resources managers to validate these findings added another important dimension. The analysis of labour market statistics misses a key distinction between the market for new entrants and for experienced and specialized engineers. Recruiters attach a high degree of importance to specialized

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skills and work experience in hiring. Indeed, experience is so important that the measurement of supply and demand needs to be broken into experience categories.

Seen from this perspective many markets are characterized by a surplus of recent graduates and a shortage of specialized engineers with over five years experience. The shortage of experienced engineers is associated with both the arrival of engineers as Temporary Foreign Workers and the off-shoring of Canadian work.

New graduates are not a substitute for experienced engineers and increasing enrolment in post secondary programs will not meet employer needs in this situation. Rather, undergraduate programs are becoming a starting point. As graduates move into specific industries they evolve into aerospace, systems, transportation, structural, industrial and other specialized engineers. In some cases information on academic programs and credentials offer some measures of the supply. More often measures of the workforce for broad disciplines like mechanical, electrical, civil and chemical engineers conceal crucial groups of specialized and experienced engineers.

The growth of the engineering consulting sector, where 43% of engineers work, reflects this specialization and promotes the mobility of the workforce.[17] Off-shoring and the general growth in international consulting is another response to these market conditions.

Results in Exhibit 2.35 indicate that many electricity sector employers have adopted a Human Resources strategy that takes advantage of these labour market conditions. Respondents report recruiting 35% to 45% of their engineers from post secondary programs. Labour markets conditions reported here suggest that they should have access to many strong candidates. Other respondents, recruiting from within the industry or from other industries, would likely face the much more difficult market for experienced engineers.

HR plans that emphasize the employment and subsequent in-house development of junior engineers may also explain the relatively low proportion of survey respondents who report extreme difficulty recruiting engineers.

Construction

The Construction Sector Council (CSC), produces an annual "Construction Looking Forward" review of labour markets for 33 occupations in Canadian provinces and regions. This analysis starts with estimates of labour requirements in residential, industrial, institutional, commercial and engineering construction. Provincial construction Labour Market Information committees review the history and eight year projections, adding their input on major projects, market conditions, training programs and other factors.

The system has been adopted by many industry groups and used for analysis of specific situations including the investment plans for the next generation of electricity and renewable infrastructure. Stakeholders have refined and updated lists of major projects that include major generation, transmission and distribution systems and large scale solar and wind installations. Comparable analysis of competing infrastructure,

[17] According to 2006 Census figures, the share of electrical, mechanical and civil engineers working in Professional, Scientific and Technical Services (NAICS 541) is 43%.

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industrial and resource projects are also available and serve as a basis for identifying competition for needed skills. Annual reviews of these projects allows some assessment of schedules and the ramping up or laying off of large numbers of skilled trades. The result is a national mapping of the project cycles that will draw skilled workers to and from major projects. Shortages and recruiting opportunities are revealed, creating an opportunity for industry planning.

This capability has recently been extended to maintenance work on major resource and industrial projects.

Analysis of the labour requirements by trade and occupation reveals the key groups required across all the big engineering and industrial jobs – including electrical and renewable energy. A short list of key trades has emerged over the years and attention in the "Construction Looking Forward" analysis focuses on their availability.

The CSC system reports labour requirements for the key trades and occupations in electrical utility work. This group was identified in Exhibit 2.36 as the next generation occupations who are involved in building infrastructure.

Exhibit 2.36
Next Generation Occupations Involved in Building Infrastructure

Boilermakers
Carpenters
Crane operators
Electricians (including industrial and power system)
Heavy-duty equipment mechanics
Heavy equipment operators (except crane)
Ironworkers and structural metal fabricators & fitters
Sheet metal workers
Steamfitters, pipefitters and sprinkler system installers
Trades helpers and labourers
Truck drivers
Welders and related machine operators

Source: Construction Sector Council (CSC)

CSC analysis of the trades most in demand for the major non-residential projects includes all of the "next generation" electricity sector occupations as well as construction managers. Labour market conditions for all of these occupations have been notably tight across the last decade. Industry stakeholders and government policy makers have invested in many initiatives to attract, train and certify more workers in these areas. Apprenticeship registrations have often more than doubled. Special immigration provisions, including the Temporary Foreign Worker Program have addressed shortages here.

The broader labour market perspective offered by the CSC system suggest that electricity utility projects building the next generation will collide, in some markets, with other major resource and infrastructure projects in competition for these occupations.

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Findings in the ESC surveys and interviews suggest that some industry HR departments have a greater stake in these developments than others. In some cases most of the design and construction work is contracted out, leaving in-house HR departments to manage engineering and project managers. Other electricity sector employers have in-house construction workforce or add this capability for big projects. In either case the many organizations planning and executing major construction projects face a clear HR risk related to project schedules and labour costs in the near future.

Evidence included in the current "Construction Looking Forward" reports indicate tightening labour markets for some of the next generation occupations in 2010 and 2011. Much depends on construction cycles and the timing of major projects.

Impact from the recession in 2008 and 2009 were cushioned by government infrastructure stimulus. In some provinces this spending combined with other factors to sustain construction employment through the recession. In other provinces delays and cancellations in private projects displaced workers and raised unemployment for these key trades. By 2010 and 2011 recovery was well underway and markets are tightening. This is particularly true in Saskatchewan and Newfoundland and Labrador where major projects – including electrical utility work – are underway.

Initiatives targeting the supply side combined with the temporary impact of the recession leave more balanced markets for the next generation occupations in other provinces.

Section 3 reports on future trends.

Information and Communication Technology (ICT)

A new LMI report from the Information and Communication Technology Council (ICTC), updates earlier findings and describes the broader labour market for electricity sector recruiters. The ICTC LMI system identifies ten occupations ranging from database analysts and administrators to computer engineers. *Information Systems Analysis and Consulting* is by far the largest occupation. This occupation was selected by employers as the key for ICT needs in their industry.

The electricity sector needs ICT specialists that will design and implement the next generation systems. Skills include core technical IT systems as well as knowledge of the new electricity systems. The labour market for candidates to fill these jobs will be very different for entry level / recent graduates and experienced or specialized candidates.

The ICTC report describes a growing gap between the needs of employers and the qualifications of recent graduates and internationally educated professionals (IEPs):

> "Over the course of the last decade employers became increasingly dissatisfied with ICT professionals who had suitable technical skills but who lacked soft skills or relevant business experience. As a result a new capabilities profile emerged that combines technical skills with communication, team work and context skills. Employers want new employees to be ready to work on practical problems in their industry and to cooperate with experienced team members.

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This capabilities profile included technical skills, soft skills, i.e. team working ability, communications skills, and context skills, i.e. an understanding of the business needs and processes to which ICT is applied. By the end of the last decade (if not earlier) this broader capabilities profile had become the new norm for employers seeking to fill ICT jobs. As more employers adopted the broader capabilities profile for ICT jobs their difficulty in recruiting candidates who met these expanded requirements increased. At the same time meeting the requirements of the broader capabilities profile also posed increasing problems for recent graduates and IEPs, as well as for laid off ICT professionals seeking employment.

Occupations that require only ICT skills are growing slowly while occupations that require a combination of ICT skills and other domain skills are growing rapidly. ”

This finding with regard to the labour market for ICT occupations and labour markets explains why Information Analysts and Consultants are among the largest and most sought after. Further, the characterization of the markets almost certainly applies to electricity sector employers who face ICT challenges as they integrate next generation infrastructure built on complex information systems that will integrate the operation of the generation, transmission and distribution systems for both the legacy and renewable energy systems.

IT professionals best suited to the needs of the electricity sector employers will certainly require all the non-technical skills included in the ICTC analysis. Recruiters already share in the challenges described above and will join the labour market competition anticipated for these jobs in the coming five years.

One measure of the position of recruiters in these IT labour markets is apparent in Exhibit 2.34 where survey respondents reported that they found just 11% of their external hires from post secondary programs while 85% are hired from outside the industry. These proportions are on the upper and lower boundaries across the other occupations and this suggests that their hiring needs may coincide with other recruiters outside the electricity and renewable energy industry.

Section 3 describes labour markets for the engineers, construction trades and IT workforce the next five years.

2.c.iii Implications for HR Management

Findings in Section 2 cover past trends in labour markets and human resources for the electricity and renewable energy industry. These trends are divided into two broad periods and they describe the transition from the Legacy to Next Generation of infrastructure. This transition began in 2006, as the Next Generation started, and has gained momentum during 2010 and 2011. HR impacts and implications are apparent in four areas:

- Retirement
- Technology
- Certification
- Competition with other Industries

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Retirement

The industry faces a high and rising number of retirements. In fact, this trend is likely among the highest for any Canadian industry. Very high retirement losses are driven by the history of major investment and hiring during the 70s and 80s as the legacy infrastructure was built. This workforce has been stable and employed by large employers with established pension and benefit plans. These plans and the associated age profile of the workforce create strong incentives for a large number of employees to retire. By 2006, baby boomers hired in the 70s and 80s began accumulating over 30 years experience and a steadily rising numbers are becoming eligible for full pensions.

The rising number of retiring boomers creates a ripple effect as replacements are hired to fill in the ranks. Most replacements are hired internally. The immediate HR implication is that plans are needed to transfer the knowledge and experience of the retiring workers to the ranks of the younger boomers aged 45 to 54. Anticipating the pace of retirements and identifying and preparing replacements is the first and possibly largest HR impact.

This process is well underway and programs and systems are available. The workforce legacy leaves a relatively large cohort of young boomers (age 45 to 54) who have worked in the industry and are available to replace the retiring workers. But their promotions reveal a second round of change with unique challenges.

Age profiles for the industry reveal that there is a much smaller cohort of Generation X workers, age 35 to 44, who must now fill in for the younger boomers. The skills required and the challenges for this group will be determined entirely by the next generation of infrastructure. This is the emerging and newest challenge.

Technology

The next generation of infrastructure will bring with it new market conditions and new technologies. These include integrating and operating the new, untested and large scale renewable energy systems. Managing the growing complexity of multiple and widely distributed generation and consumption sites requires new IT systems and infrastructure that connects users and producers. While a new group of IT specialists are the leading edge of these changes, most occupations in the current workforce mix will see their work environment change and will need to learn more about the IT systems that will drive it.

New, post secondary training and related certification programs are emerging for these next generation occupations. These graduates will take on a growing role in the workforce. This group does not always fit into the traditional categories of professional, technical and trade employees. Further, the new skilled Workforce will be distributed across a larger number of smaller and more specialized employers. Many will work with contractors and consultants – perhaps not in Canada. Planning the next generation of training and certification programs to meet the needs of the workforce and the next generation infrastructure is the second challenge.

Certification and Licensure

Traditions in the electricity sector workforce have valued the certification and licensing of trades and occupations. Employers have been active in professional organizations and on advisory committees for the

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skilled trades. Survey results report continuing support through the role of apprentices, engineers in training and coop programs.

The popularity of these practices is a practical matter for HR management. Formal qualifications are a critical tool in assessing candidates. Once started, these practices become a part of the culture and build long term commitments to mentoring and pride in technical expertise.

But traditional certification and licensure is changing as new competitive conditions and technologies undermine the business case. Pressures are increasing for apprentices, interns and other new entrants to abandon or delay their path to a formal qualification. New certifications like the North American Board of Certified Energy Practitioners (NABCEP) system in the United States represent the leading edge of the change. The NABCEP program and many others are introducing a series of new occupations like small wind installer, PV installer and solar thermal installer.

These occupations have potential links to traditional trades and training programs that are offered in Canada. There are many examples of training programs and certification offered by the traditional partners of the electricity sector employers. A new certification program for construction electricians installing Solar Photovoltaic Systems has been launched by CSA Standards, the National Electrical Trade Council (NETCO) and the International Brotherhood of Electrical Workers (IBEW). Similarly, universities and colleges in all provinces are introducing courses and programs for engineers and engineering technicians and technologists in new energy technologies. Tracking labour markets and mapping HR plans for these new occupations is an emerging priority.

Employers have a major investment in these institutions. While change is essential, there are many options available and many decisions have not yet been made.

In particular, the electricity industry as a whole has an important voice in changes to the skilled trades, engineering and technicians / technologists certifications.

Competition with other industries

Analysis in this report points to very tight labour markets where employers have difficulty filling openings and candidates have difficulty qualifying for jobs.

The electricity and renewable energy industry is not alone facing these challenges. Most other Canadian industries have very similar conditions and will be competing with electricity sector employers to attract needed resources. The most immediate competition is for the skilled and experienced technical workforce. At one level HR policy is about devising recruiting strategies that find the needed hires as soon as possible and at the lowest cost. Results in Exhibit 2.34 suggest that recruiters often reach out to other industries. At the same time survey respondents report that they must compete with other local employers to retain skilled technical staff.

Electricity sector employers compete with other industries in other ways. Many industries and occupations have launched broader strategies to meet their labour requirements. These programs cover a wide range of supply side options in labour markets. Initiatives target new entrants from high school and post

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secondary programs. Access to resources that add new curriculum, attract the best students and develop new certifications are one key. Immigration strategies are also working in other industries for technical occupations and focus on both permanent immigrants and tracking Temporary Foreign Workers into Provincial Nominee Programs.

Advantages in this competition depend on many factors including investment cycles, government policies, regulations, incentives and technologies. HR policy for electricity sector employers may be linked to regulatory requirements that impact competitive strength. While traditional electricity sector employers may have an advantage through their established relationships with post secondary programs, professional licensing and trades certification, these advantages may be seen as high cost strategies by regulators.

Competition with other employers and industries is the third major challenge. Any competitive advantage or weakness in the current environment is temporary. Circumstances will change rapidly with economic cycles, political changes and technological advances. Conditions for Next Generation labour markets will be far less certain than during the Legacy period.

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3. Assessing Future Labour Markets and Human Resources Management

This section of the report provides a national overview of labour market conditions for the nineteen electricity sector occupations and describes the key demand and supply side measures across a forecast horizon from 2011 to 2016. Market assessments are summarized with a ranking system. Similar measures and labour market assessments are described for the broader markets where electrical and next generation occupations work in other industries.

3.a Labour Market Assessments

The overview begins with a summary of the national economic and demographic themes that drive the labour market assessments over a forecast horizon from 2011 to 2016. The outlook for each of the nineteen occupations at the regional level can be found in the Regional Reports in the Appendices.

Labour market assessments estimate the changing balance of labour requirements and the available workforce in each year. A smaller gap between supply and demand signals difficulties recruiting and improved opportunities for job seekers with the needed qualifications. Descriptions of the most important factors impacting the market are offered here with a complete accounting available in the appendix on methodology. Findings in this section of the report are taken from a new ESC LMI model that links historical trends for forecasts and combines labour market measures in a ranking of relative market conditions. These labour market assessments are directly linked to the employer survey, the survey of postsecondary programs and the equivalent findings in the 2008 report.

3.a.i Labour Requirements

Measures of labour requirements are divided into expansion demand and replacement demand. The former refers to the change in employment as activity grows or contracts each year in response to economic conditions. The latter refers to recruiting needed to replace the permanent loss of members of the workforce to retirement or death.

Expansion Demand: Approaching the Peak

Industry employment estimates for each occupation, in each region, are projected forward to 2016 using a weighted average of the annual rate of change in output (measured by Gross Domestic Product (GDP)) and investment in electricity and renewable energy industry.[18]

Driven mostly by investment, industry employment in 2010 and 2011 is rising in the early stages of the transition from the Legacy to the Next Generation infrastructure. By our accounting the transition to the Next Generation began in 2006, was delayed in 2009, and has resumed vigorously in 2010 and 2011.

Figure 3.1 shows an index (2006=100) of past and forecast growth in utilities sector investment, GDP and employment. Significant investments in renewable generation and major refurbishments of existing nuclear and hydro generation facilities have contributed to a 63 percent increase in utilities investment between 2006 and 2011. Investment is expected to rise an additional 13 percent over the next five years maintaining pressure in the majority of labour markets.

[18] Projections are based on the January 2011 Provincial Forecast prepared by the Center for Spatial Economics.

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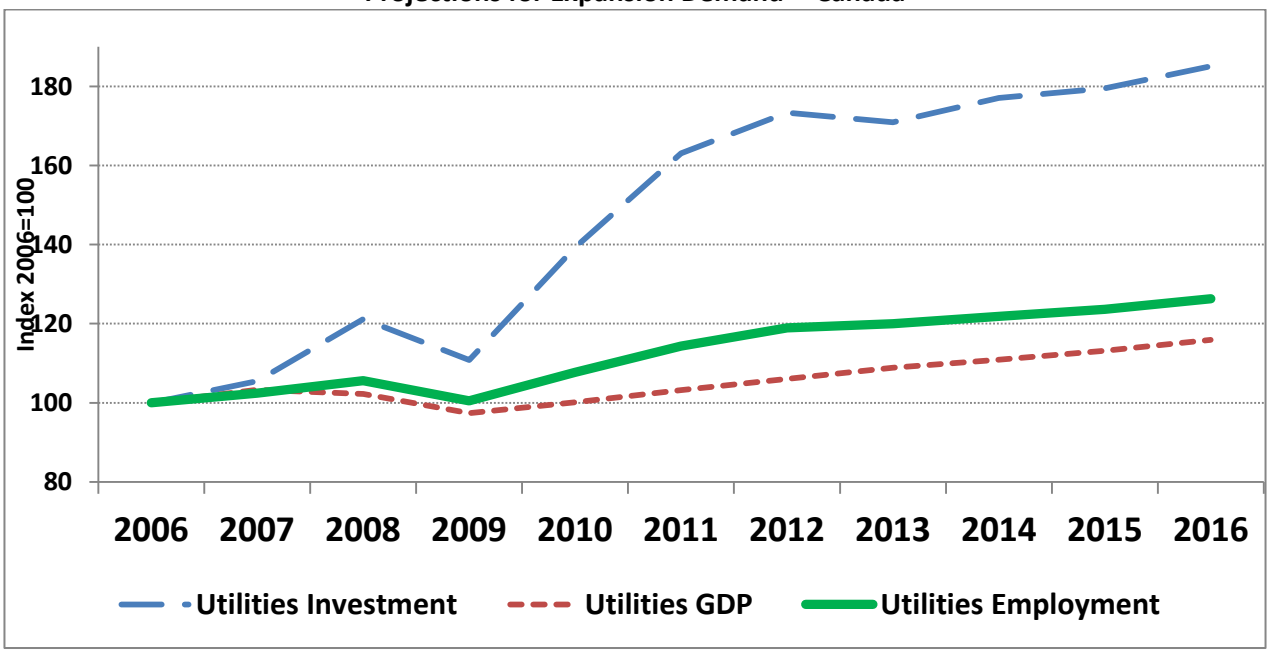
The path of employment growth across the 2011 to 2016 period depends on the timing of large investment projects. Projections used here draw on various industry and government lists and announcements of projects and estimates of new utility investment. The timing of the projects is critical to the employment path and this is very hard to predict. However, as the Conference Board report in Section 2 noted, the full transition to the next generation will involve $293 billion in investment spread over the period from 2010 to 2030. This scenario is just covering the early phase. The current rise in investment will gradually slow down, reaching a high plateau of activity from 2012 to 2016.

Significant growth in investment in the earliest stage, from 2010 to 2012, will raise labour requirements at the fastest pace, placing the most severe burden on labour markets. As these requirements rise to a plateau in 2013 and beyond the pace of new job creation will ease and the expansion component of labour requirements will settle at a more manageable pace. At this stage in the transition employment will have reached record high levels and is expected to grow slowly higher as the next generation investment continues past 2016.

Exhibit 3.1
Projections for Expansion Demand -- Canada



Source: Centre for Spatial Economics, Prism Economics and Analysis, Census 2006

Employment is expected to rise at an annual average rate of 2 percent, a cumulative increase of 10 percent over the 2011–2016 scenario. Growth is concentrated in the near term with the continuing ramping up of the first stage of the transition to next generation infrastructure. The rate of employment growth reflects rising levels of productivity associated with new infrastructure and a modest rise in electricity output (measured by utilities GDP). Notable higher than average growth is expected for IT related occupations reflecting the growing role that these specialists are playing in the adoption of new technology. Employment growth by occupations is summarized in Exhibit 3.2.

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Note that expansion demand related to the trend growth in electricity generation and distribution is quite limited. This is consistent with the slow growth in electricity demand across the last decade that was described in Exhibit 2.9 as well as current energy forecasts. For example, the National Energy Board forecasts for growth in electricity generation from 2010 to 2016 average just over 1.0% each year with total growth at 7.8% in a low price case and 6.9% in a high price case.[19]

Most of the growth in overall employment is related to the role of the electricity employer workforce in the investment projects. Much of the investment activity reported in the scenario would be assigned to contractors and consultants and their role and the associated labour market impacts would be captured in the conditions outside construction. Survey responses suggest that there is a wide variation on the pattern of in-house and contracted out work. Projections used here assume that most of the employment attributed to the investment activity falls outside the industry. To the extent that more activity is kept in house, the expansion demand reported here may be understated.

[19] See National Energy Board 2009 Reference Case Scenario, Canadian Energy Demand and Supply to 2020, an energy market assessment, July 2009.

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Exhibit 3.2

Employment Growth in Expansion Demand

	Employment 2011 to 2016			
Occupations	**2011**	**2016**	**% Growth 2012 - 2016**	**Avg. annual growth rate**
Engineering managers	710	780	9.9%	2.0%
Construction managers	189	206	9.2%	1.8%
Utilities managers	4,029	4,428	9.9%	2.0%
Financial auditors and accountants	1,346	1,462	8.6%	1.7%
Civil engineers	689	760	10.3%	2.1%
Mechanical engineers	2,994	3,319	10.9%	2.2%
Electrical and electronics engineers	5,307	5,830	9.8%	2.0%
Information systems analysts and consultants	2,033	2,417	18.9%	3.8%
Civil engineering technologists and technicians	562	609	8.3%	1.7%
Mechanical engineering technologists and technicians	1,097	1,208	10.1%	2.0%
Electrical and electronics engineering technologists and technicians	4,298	4,739	10.3%	2.1%
Contractors and supervisors, electrical trades and telecommunications occupations	1,584	1,730	9.3%	1.9%
Electricians (except industrial and power system)	320	357	11.5%	2.3%
Industrial electricians	401	441	10.1%	2.0%
Power system electricians	5,156	5,653	9.6%	1.9%
Electrical power line and cable workers	10,015	11,097	10.8%	2.2%
Stationary engineers and auxiliary equipment operators	926	1,023	10.5%	2.1%
Power systems and power station operators	7,089	7,815	10.2%	2.0%
Construction millwrights and industrial mechanics (except textile)	2,670	2,948	10.4%	2.1%
Electricty Sector Occupations	**51,413**	**56,821**	**10.5%**	**2.1%**
Other Occupations	**57,128**	**62,709**	**9.8%**	**2.0%**
Total	**108,542**	**119,530**	**10.1%**	**2.0%**

Source: Centre for Spatial Economics, Prism Economics and Analysis, Census 2006. Growth calculations cover the 5 year period; 2012 to 2016

Replacement Demand

The second demand side component is replacement demand, calculated as the sum of deaths and retirements. The former is estimated for each occupation across all industries using the C4SE analysis. Estimates of retirements are based on the findings of the ESC Employer Survey, in Exhibit 2.31, reporting the proportion of the workers in each occupation expected to retire between 2010 and 2016.

The analysis anticipates that the proportion of workers retiring from the labour force will grow from 3.9% in 2011 to over 7% by 2016. Exhibit 3.3 illustrates the expected rise in the ratio of retirements to the electricity sector labour force from 2009 to 2016. Limited expansion demand is added to a significant increase in the proportion of workers retiring and these forces together will contribute to tighter labour market, especially for occupations with older age demographics. *Replacement demand will represent 73% of labour requirements over the next five years.*

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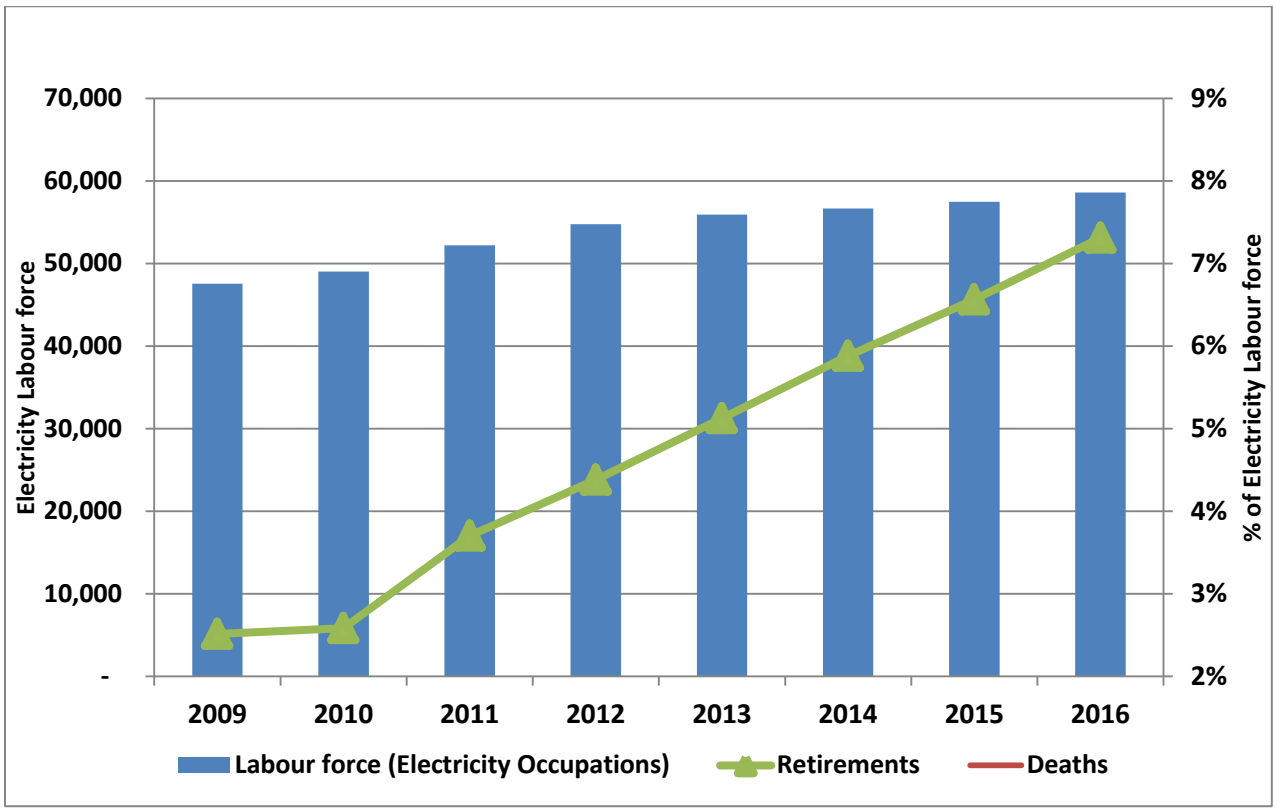
Exhibit 3.3
Retirement projections for Electricity Sector Labour Force



Source: Centre for Spatial Economics, Prism Economics and Analysis, Census 2006

Figure 3.4 illustrates the total annual change in labour requirements by expansion, retirements and deaths. Total labour requirements continue to rise from 2013 to 2016 even as the increase related to expansion slows down.

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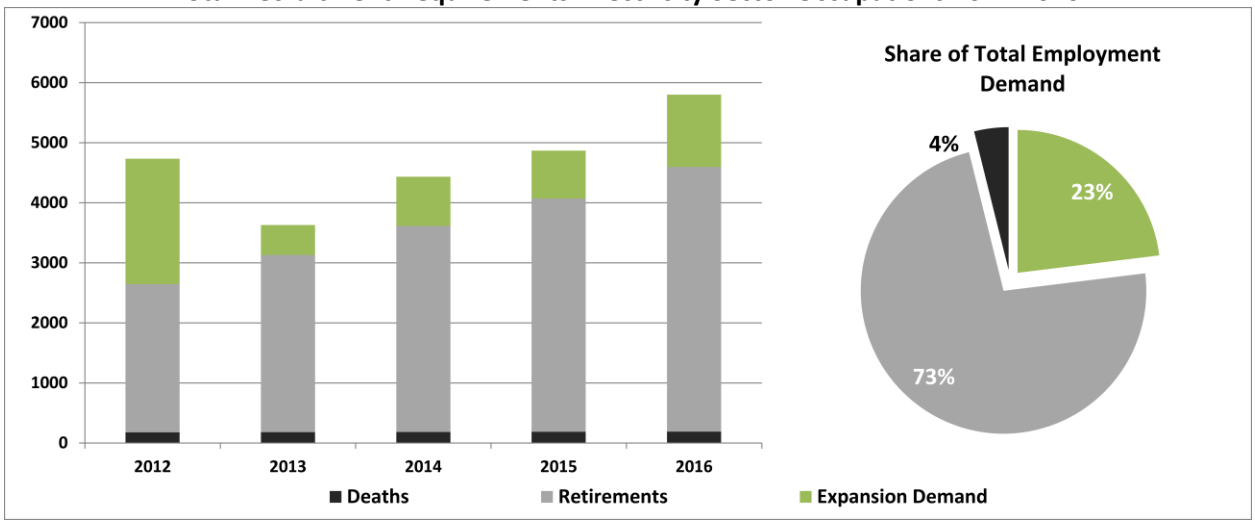
Exhibit 3.4
Total Recruitment Requirements: Electricity Sector Occupations 2012-2016



Source: Centre for Spatial Economics, Prism Economics, 2006 Census. Growth calculations cover the 5 year period; 2012 to 2016

Exhibit 3.5 provides a summary of total labour requirements between 2011 and 2016. *Despite modest expansion related growth, total employment requirements for electricity sector occupations over the next five years represent close to half (44%) the current electricity workforce.*

Of the estimated 23,460 workers in the electricity sector occupations required between 2011 and 2016, 77 percent are attributed to exits related to deaths and retirements and about a fifth to a quarter (23%) to meet the expected expansion requirements.

Exhibit 3.5
Total Labour Requirements 2012 – 2016

Demand Type	Total Requirement 2012 - 2016	Percent of Current Labour Force	Share of Total Requirement
Expansion Demand	5,408	10%	23%
Retirements	17,139	32%	73%
Deaths	913	2%	4%
Total	**23,460**	**44%**	**100%**

Source: Centre for Spatial Economics, Prism Economics and Analysis, Census 2006.
Requirement calculations cover the 5 year period; 2012 to 2016

These labour requirements are very high by historical standards and are front end loaded as gains fall heavily in 2011 and 2012.

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3.b Supply Side Measures

The ability of industry to meet these labour requirements will depend on the availability of new entrants and more senior, experienced candidates. Recruits will be drawn from a variety of sources including new entrants with no experience, post secondary program graduates and candidates from other industries. Employers have been relying on these sources as well as recruiting within the industry and from other markets. Much depends on their ability to compete with other industries and the capacity of the local workforce and training programs.

One measure of labour supply is drawn from the industry's capacity to attract new entrants from the population. This group is estimated as a proportion of population age 15 to 30 entering the workforce for the first time and finding work in the electricity and renewable energy industry. This group represents approximately 2% of this workforce annually. Exhibit 3.6 distributes this new entry group among the electricity sector occupational groups. New entrants hired into the trades represent about 60 percent of all new entrants into the electricity sector workforce, followed by Engineers and Engineering Technicians and Technologists, and Financial and IT related occupations. No new entrants start in managerial and supervisory occupations.

Given their current distribution of sources reported in Exhibit 2.34, employers will hire many fewer inexperienced workers than the available new entrants. Most new entrants will start as helpers in the trades or as installers or sales personnel in the renewable energy sector and may be destined for apprenticeship or the new renewable energy training programs. This group of new entrants will be among the easiest to recruit. Candidates will need to have strong essential skills and some secondary school science and mathematics, but the employers seeking this group will be an attractive target for candidates.

Employers are more likely to turn to graduates from post secondary programs and other sources for the remaining occupations.

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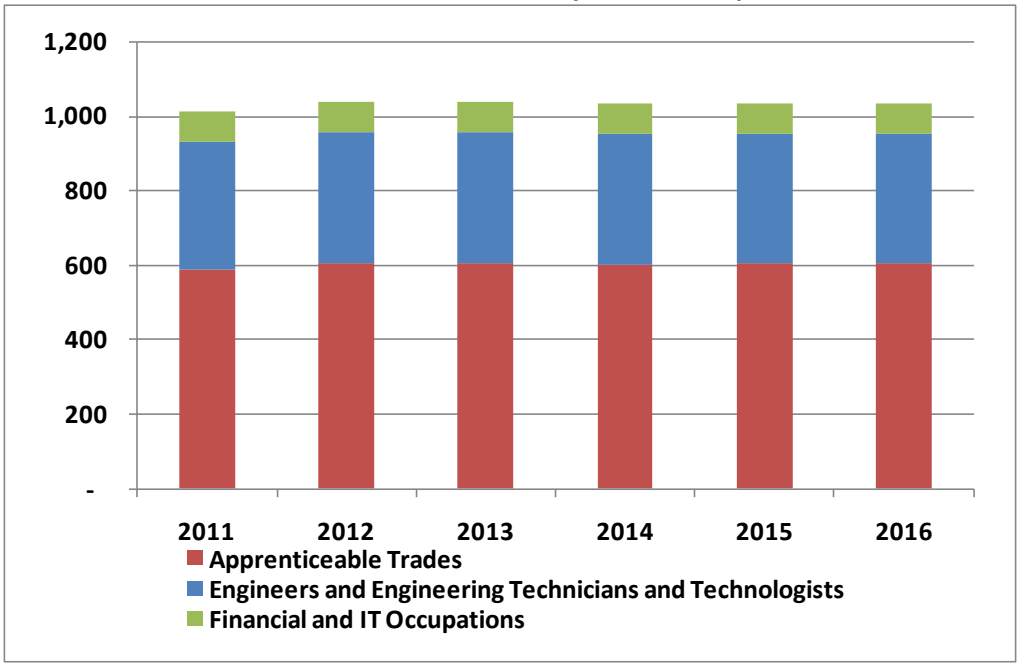
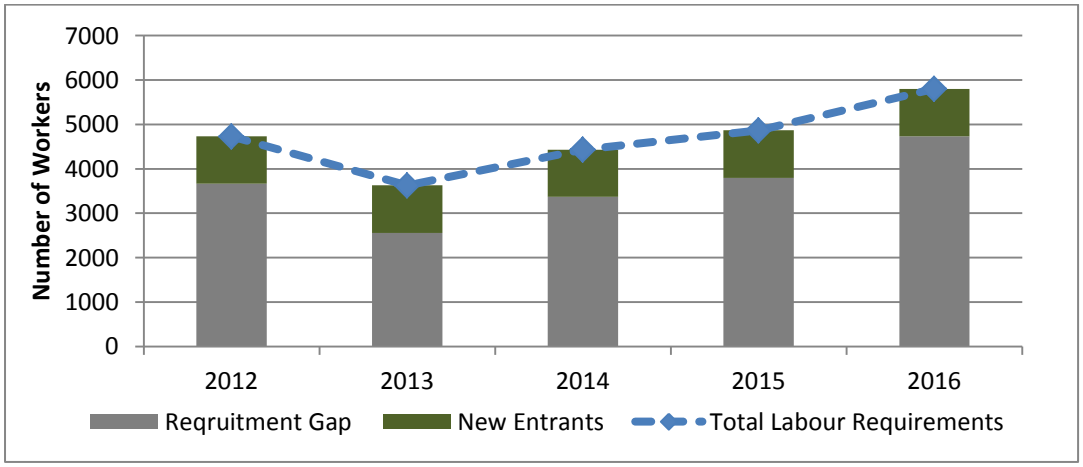
Exhibit 3.6
New Entrants into the Electricity Sector Occupations



Source: Centre for Spatial Economics, ESC Employer Survey 2011, Census 2006

New entrants represent a small proportion of the total labour requirements. The remaining recruits will have to come from other industries. Figure 3.7 illustrates the difference between total labour requirements and the share of available young workers entering the electricity sector workforce. The recruitment gap widens from 2012 to 2016 as retirements grow.

Exhibit 3.7
New Entrants and Labour Requirements



Source: Centre for Spatial Economics, ESC Employer Survey 2011, Census 2006

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Survey results suggest that the industry will fill the recruitment gap set out in Exhibit 3.7 with graduates from post secondary programs and candidates from outside the industry. Note that the survey respondents individually, have recruited almost one third of their new hires from other electricity employers. At the industry level reported here this intra industry movement does not add to labour supply. Hiring plans that reach beyond new entrants, recent graduates and immigrants can only draw candidates from other industries. Thus the electricity and renewable energy industry, taken together, is far more dependent on hiring from other industries. Findings in Exhibit 2.34 might imply *that half of all hiring, for all electricity employers together, is expected to come from other industries.*

Supply side analysis projects the expected number of graduates from engineering programs by tracking past trends in enrolments, graduations and entry into the workforce. Much of this analysis was described in section 2.b.ii above. The number of engineering graduates projected to enter the workforce from 2011 to 2016 is tied to the pattern of enrolments four years earlier.

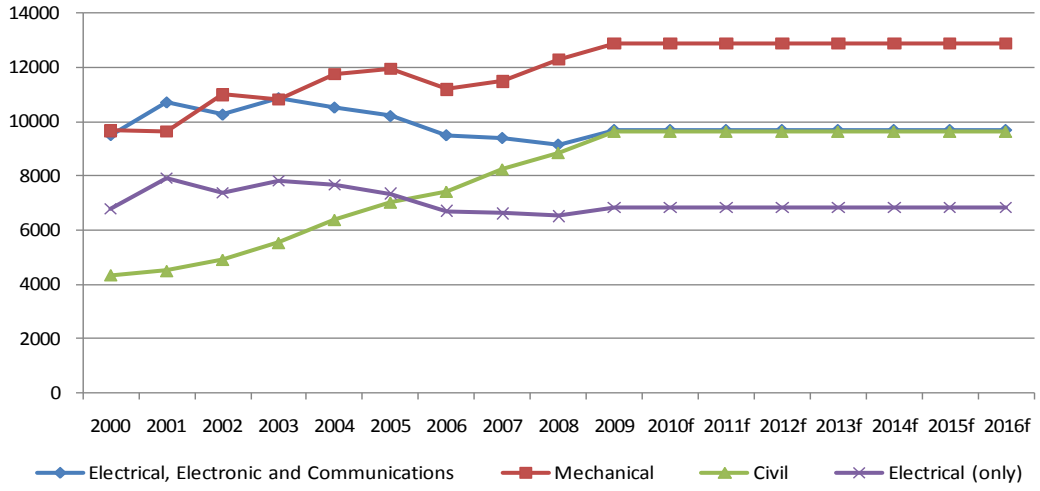
An equivalent calculation for apprenticeship programs starts with national data on registrations and completions available up to 2008. The projections assume that the completions reported in 2008 will continue until 2016.

These supply side calculations, for engineers, are summarized in Exhibit 3.8 which shows the capacity of the post secondary system for engineers to meet expected labour requirements if the recent pattern of enrolment and completion is extended to 2016.

Trends for mechanical and civil engineering are upward and this will bring more new engineers to the workforce during the forecast period. Trends for electrical engineers are flat or downward. This trend will bring fewer graduates to the labour market across the 2011 to 2016 period.

Exhibit 3.8

Enrolments in Post Secondary Programs, Engineering Occupations



Source: Engineers Canada

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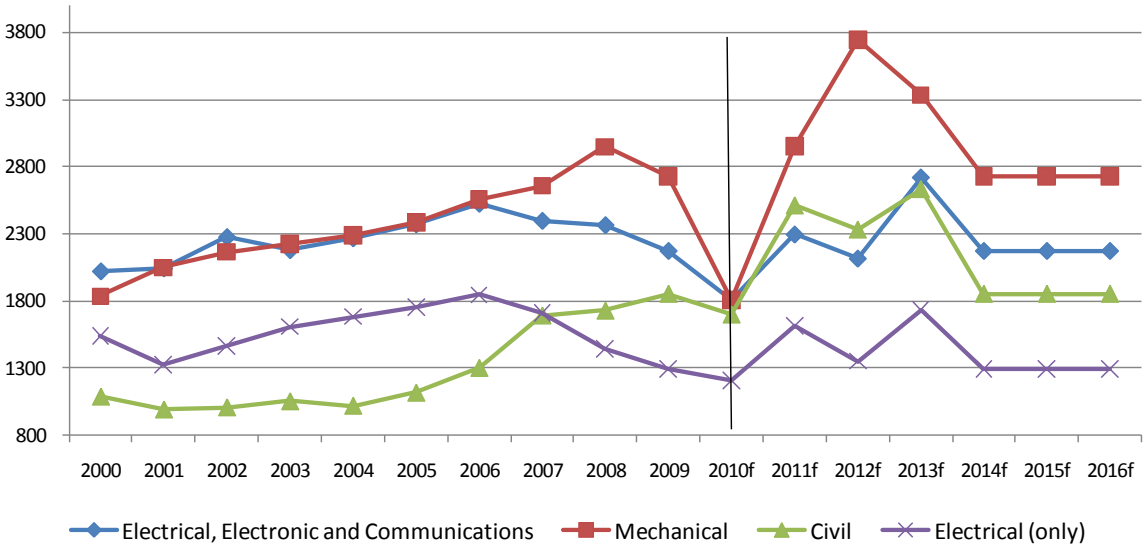
Exhibit 3.9
Graduations from Undergraduate Engineering Programs, 2006 - 2016



Supply side analysis includes a projection of the contribution of immigration from 2011 to 2016. Exhibit 3.10 reports the recent numbers for permanent immigrants and temporary foreign workers arriving in Canada in the electricity sector occupations. Not all of these immigrants will actually enter the labour markets. Temporary foreign workers are by definition entering the workforce but are expected to leave after two years. Not all will leave as provision is made to retaining some under Provincial Nominee and other programs. Projections from 2011 take account of this pattern. Permanent immigrants identify their intended occupation as they enter but research shows that some are not properly qualified and are not able to enter the workforce. Labour force entrants, in the ESC LMI model, are corrected for this effect as well.

Exhibit 3.10
Supply Side Projections Workforce Additions, Immigration

Occupations	2006	2010	2011-2016	Annual Avg
Engineers	#			
Permanent	4405	1420	8520	1420
Temporary Foreign Workers	2725	2390	14340	2390
Total Entering the Workforce	5107	2402	14412	2402
Trades				
Permanent	275	215	1290	215
Temporary Foreign Workers	550	430	2580	430
Total Entering the Workforce	509	389	2331	389

Source: ESC Employer Survey 2011, Citizenship and Immigration Canada

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It is difficult to project the overall change in the number of arriving immigrants so the analysis simply assumes that arrivals recorded in 2010 continue in each year from 2011 to 2016. Thus the numbers in Exhibit 3.9 reflect the capacity of immigration at recent rates to meet industry requirements.

Exhibit 3.10 indicates that the only really large pool of new immigrant labour available to electricity sector employers will be the engineers. At least historically the other occupations are not a large part of the arriving new immigrants. Labour market conditions noted here suggest that recruiting may emphasize immigration more in the future.

Recruitment from other industries emerges as the most important source. But most of these other industries are also facing recruitment challenges. Projections of labour market conditions in outside labour markets are available from the LMI sources described in the last section and are presented below.

The accounting of supply side measures presented in this section suggests that there will be very limited growth in the available workforce and that this supply of labour will be concentrated in new entrants with no experience and graduates from post secondary programs.

Rankings

A new computer based LMI model has been created for the electricity sector occupations that draws the estimates presented in the report together and consolidates them into a market ranking. For each occupation in each region the model calculates labour market conditions for all industries and for the electricity and renewable energy providers. For all industries the model tracks:

- Employment
- Labour Force
- Unemployment
- Retirements
- Deaths
- New entrants
- Net in-mobility (recruiting from outside the market)
- Enrolments and graduations (engineering only)
- Apprenticeship registration and completions (trades only)
- Permanent immigration and temporary foreign workers

For the electricity and renewable energy providers the model includes:

- Employment
- Labour Force
- Unemployment
- Deaths
- Retirements
- New entrants
- Net in-mobility (recruiting from other outside the market)

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Overall market rankings are based on an analysis for the demand and supply measures discussed in the last section. Each occupation is assessed independently using a weighted average of individual rankings for excess supply (unemployment), recruiting from outside employers as a percent of the labour force and the annual change in employment. Each market is assessed across a ranking from 1 to 5. Seen from the recruiter's point of view these rankings are interpreted in Exhibit 3.11.

Exhibit 3.11
Labour Market Rankings Defined

Rankings & Description	
1	**Significant excess of supply over demand** No difficulty in recruiting qualified staff with 0-5 years or 5-10 years of Canadian experience at established compensation norms within the local labour market.
2	**Excess of supply over demand** No difficulty in recruiting qualified staff with 0-5 years or with 5-10 years of Canadian experience at established compensation norms within the local or regional labour market. The geographic range of recruiting and the range of acceptable qualifications is broader than in 1.
3	**Moderate supply pressures** Difficulty in recruiting qualified staff with more than 5 years of Canadian experience, with industry or technology-specific skills, and with appropriate non-technical skills. The time required to fill these positions is typically longer than historic norms. Vacancies sometimes need to be re-posted. Employers actively solicit applications from outside the local and regional labour market and reimburse applicants for travel expenses related to interviews, etc. Recruiting engineering staff with 0-5 years of Canadian experience poses fewer challenges.
4	**Significant supply pressures** Difficulty across the board in recruiting qualified staff in the local and regional labour market. It is normal practice to actively solicit applications from outside the local and regional labour market and to reimburse applicants for travel expenses related to interviews. Employers are generally obliged to improve offered terms of compensation and to assist with re-location costs. Recruitment difficulties lead many employers to increase their use of third-party recruiters and to increase their use of contracting trades work, outsourcing of engineering and technology work to consultancies or staff the assignment with workers from another region. There is a significant increase in the risk of project delays and compensation-driven cost escalations.
5	**Supply constraints** Systemic difficulty in recruiting qualified staff. International recruiting is common among large employers. There is widespread perception that the contracting and consulting sector is working at full capacity and that there is little, if any, remaining scope to outsource construction, engineering and ICT work to qualified suppliers with a known track record.

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It is important to note the distinction, in each ranking, between conditions for new entry workers and experienced or specialized workers. Also note that these rankings are based on conditions in each market alone – before any allowance is made for recruiting outside the market.

This means that a ranking of, say, 2 in a market describes a general excess of the available workforce over labour requirements. This condition may be associated with a decline in labour requirements in one year. This might be caused by the end of a project and the layoff of workers or conditions that temporarily delay retirements. Lower labour requirements would add to unemployment and this would signal a lower ranking. In this situation the "recruiting from outside markets" component would be negative – signalling the *potential* for the workforce to leave the market in search of work elsewhere.

At the national level portrayed here, higher rankings signal the need for employers all across Canada to recruit in other industries. Where conditions in these other labour markets are also tight, the consequence will be a general increase in immigration – the only remaining source. This was a regular outcome for the national labour markets for some of the electricity sector occupations from 2000 to 2008. Immigration became an important source.

Demographic conditions make it likely that immigration will again be a key labour market strategy in tight labour markets. Earlier analysis of electricity sector employers (see Exhibits 2.35 and 2.36) suggests that this group has not yet turned to immigration on the scale of other industries.

Exhibit 3.12 presents the national rankings for the electricity and renewable energy providers by occupation. *Labour market conditions point to very tight markets – perhaps the most difficult recruiting conditions since the new cycle of growth and the transition to the next generation began.*

For example, the very high rankings in 2010 and 2011 are largely driven by the investment cycle and the major projects that are starting up. New capacity, repairs and refurbishments are particularly strong in some provinces and these regional variations on the national theme will be set out in the Regional Reports.

As the investment cycle flattens out in 2012 and beyond, the occupations that are most closely associated with investment (e.g., construction managers, engineers and engineering technicians and technologists) slip down one rank. Growth in labour requirements related to expansion demands ease off and markets will be slightly easier.

Finally at the end of the projection, in 2016, there is a tendency for rankings to rise. This is most often due to rising retirements. Steady additions to the number of retirements dominate the markets and create recruiting challenges.

How electricity sector employers react to these conditions will often be tied to conditions in other markets. The market assessments for individual occupations revisit the LMI reports noted above to consider their assessment of the broader markets and the potential for recruiters to find needed workers there.

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Exhibit 3.12

National Labour Market Rankings for the Electricity Sector Occupations

Electricity Sector Occupations	2010	2011	2012	2013	2014	2015	2016
Engineering managers	5	5	4	4	4	4	4
Construction managers	4	5	4	4	4	4	4
Utilities managers	5	5	4	4	4	4	4
Financial auditors and accountants	3	3	3	3	3	3	3
Civil engineers	4	4	4	3	3	3	3
Mechanical engineers	4	4	4	3	3	3	4
Electrical and electronics engineers	4	4	4	3	3	3	3
Information systems analysts and consultants	4	4	4	4	4	4	4
Civil engineering technologists and technicians	3	4	4	3	3	4	4
Mechanical engineering technologists and technicians	4	4	3	3	3	4	4
Electrical and electronics engineering technologists and	4	4	4	3	4	4	4
Contractors and supervisors, electrical trades and telecommunications	4	4	4	3	4	4	4
Electricians (except industrial and power system)	4	4	4	4	4	4	4
Industrial electricians	4	4	4	4	4	4	4
Power system electricians	4	4	4	3	4	4	4
Electrical power line and cable workers	4	5	4	4	3	4	4
Stationary engineers and auxiliary equipment operators	4	4	4	4	4	4	4
Power systems and power station operators	4	4	4	4	4	4	4
Construction millwrights and industrial mechanics (except textile)	4	4	4	3	3	3	3

Source: ESC Employer Survey 2011

Rankings by occupation

Each ranking in Exhibit 3.12 covers a range of factors that are often quite unique to each occupation. This section highlights these, drawing on the trends and survey findings reported in Section 2.

Managers and Supervisors

The tighter rankings for Engineering, Utilities and Construction Managers, and to some extent supervisors, reflect the older age profile and greater experience requirements for these trades. Not only are the workers in these occupations much older than average, but the knowledge and experience requirements associated with senior positions make recruitment much more challenging.

Retiring managers are generally replaced internally and, as this process intensifies, there is a ripple effect back through the organization. Employers with well established career plans, succession planning, knowledge transfer and flexible pension arrangements will be better placed to cope as these pressures unfold. Organizations and recruiters looking into other markets will face growing frustrations.

Retirements drive the high labour market rankings for all these occupations. But the rankings for engineering and construction managers and for the electrical trade contractors and supervisors are also tied to the investment cycle. This translates into high rankings in 2010 and 2011 and then, there is a bit

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more room to manoeuvre around 2013 as the project demands level out, easing conditions for the supervisors.

Engineering and Engineering Technicians and Technologists

Labour market conditions for engineers and engineering technologist occupations remain tight through the peak in the investment cycle and transition to the next generation infrastructure. Older than average retirement ages, lower than average retirement rates and a rising number of new graduates from engineering programs help restore balanced conditions as investment recedes from peak levels after 2013.

Rankings combine the conditions for both new graduates and older and more experienced engineers. Recruiting the former group will face a wide range of choices as rising enrolments from 2008 to 2010 combine with a limited number of jobs for junior positions to create a loose market. Recruiting more experienced and specialized engineers will be much more difficult. Many engineers are likely to move into the management jobs described above, leaving large gaps in the 35 to 54 age group.

The labour supply for these occupations is also traditionally linked to immigration and Canada became more adept at managing this labour supply during the last boom. Engineers were among the most populous wave of arrivals early in the last decade and these numbers may rise again as demand for experienced engineers rises. The Temporary Foreign Worker program may be a particularly well suited vehicle to fill this market.

Many of the arriving engineers will need specialized skills and experience that can meet the challenge of replacing retired managers and adapting systems to new technologies. It is not clear that candidates with these attributes can be found outside the industry – but it is certain that the industry will have to look there.

The Engineers Canada Labour Market Conditions Report prepares rankings using the same process that has been adopted in the new ESC system. Rankings that apply across all industries are set out in Exhibit 3.13.

Exhibit 3.13
National Labour Market Rankings, for Engineering

Labour Market Rankings	2010	2011	2012	2013	2014	2015	2016
Civil engineers	3	3	4	4	4	4	4
Mechanical engineers	3	3	4	3	3	3	4
Electrical and electronics	3	3	3	3	3	3	4

Source: Engineers Canada

In the initial years of the scenario – 2010 and 2011 – national rankings across all industries are lower than those found for electricity. This is an encouraging signal that electricity sector recruiters will find more

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candidates in the broader workforce pool. The Engineers Canada report points to some highlights for the broader labour markets:

- Recovery in manufacturing and other industries is steady but not strong enough to restore past employment peaks
- Enrolments in post secondary programs have been rising and will add a new wave of graduates across the scenario
- Retirements and the age profile of each workforce drive labour requirements higher later in the period
- Market conditions will vary depending on the experience level of the engineer. Rankings of 3 signal difficulty recruiting qualified engineers with more than five years of Canadian experience

Labour requirements for engineers will be stronger and availability more limited in the electricity industry compared to other industries. Recruiting in other industries may offer some advantages to electricity sector employers but two obstacles remain:

- Experienced and specialized engineers in other industries will also be in short supply
- Skills and experience among engineering candidates from other industries may not fit the criteria needed to fill management or senior jobs vacated by retirement

Detailed information available for engineers has dominated these market assessments. More limited evidence for engineering technicians and technologists suggests slightly tighter market conditions. Expansion demand, see Exhibit 3.2, will be largely the same. The age profiles for the technicians and technologists are older, see Exhibit 2.30, and replacement demand is higher. Survey results for vacancy rates, hiring and other measures are higher and this raises the rankings for 2010 and 2011. On the supply side, there is more limited access to immigration although this may be balanced by the colleges reporting above average gains in enrolments and graduations for these programs.

The skilled trades

The skilled trades covered in this report are divided into two groups for market assessments.

The first group includes the four trades that are specialized to work in the electricity and renewable energy industry. These include power system electrician, electrical power line and cable workers, stationary engineers and auxiliary equipment operators and power systems and power station operators. Conditions for these trades are dominated by the requirements and training initiatives of the industry.

Labour markets are now and will continue to be very tight. For this group expansion demand is strongest for the power line and cable workers where investments to refurbish and upgrade the distribution networks are a priority. The age profile is slightly younger than the rest of the occupations but this is more than balanced by a younger than average retirement age. Overall labour requirements rise strongly across the scenario. Electricity sector employers, in close collaboration with provincial apprenticeship and colleges, have traditionally managed much of the training that renews this workforce. Above average growth in recent enrolment suggests that needed investments are being made to keep pace. Pressures to

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contain costs from provincial governments and regulators may limit the spending needed to increase training and certification programs and keep pace with labour requirements.

The second group of trades include the electricians and millwrights from the electricity sector occupations and all of the next generation construction trades listed in Exhibit 2.3. Labour markets for these trades are dominated by the construction and maintenance activity across all industries.

As noted in section 2.c.i, major investments in next generation infrastructure will have a disproportionately large impact on electricity trade occupations. The national summary for 2011 *Construction Looking Forward* report describes the impact of major projects on specific regional labour markets. This analysis has been adapted here to report labour market rankings for the electrical and next generation trades.

In particular, the *Construction Looking Forward* analysis identified major electricity generation, transmission and distribution projects in Alberta, Saskatchewan, Ontario (the Greater Toronto Area) and Newfoundland and Labrador. The impacts of these projects on labour markets are highlighted as the market rankings change across the regions and the years.

Exhibit 3.14 captures the shifting labour markets that will dominate conditions for these trades, driving demand and moving these skilled workers among markets.

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Exhibit 3.14

Labour Market Rankings for Electrical Next Generation Occupations, All industries, Selected Markets

Labour Markets	2010	2011	2012	2013	2014	2015	2016
Boilermakers							
Alberta	4	3	3	4	3	4	4
Greater Toronto Area (GTA)	3	2	5	4	4	5	5
Newfoundland and Labrador	3	5	3	5	4	2	1
Saskatchewan	4	5	4	3	1	1	1
Carpenters							
Alberta	4	4	4	4	4	3	3
Greater Toronto Area (GTA)	3	2	4	4	4	3	3
Newfoundland and Labrador	2	3	3	3	2	3	2
Saskatchewan	3	4	4	3	2	1	1
Crane Operators							
Alberta	4	4	4	3	3	4	4
Greater Toronto Area (GTA)	3	3	4	4	4	4	4
Newfoundland and Labrador	3	4	3	4	3	2	1
Saskatchewan	3	4	3	2	1	1	1
Electricians							
Alberta	4	4	3	4	3	3	3
Greater Toronto Area (GTA)	3	3	4	4	4	4	4
Newfoundland and Labrador	3	4	3	5	3	2	2
Saskatchewan	4	5	4	3	1	1	1
Heavy-duty Equipment Mechanics							
Alberta	2	3	3	3	2	3	3
Greater Toronto Area (GTA)	3	2	3	4	4	4	4
Newfoundland and Labrador	4	4	3	3	3	2	2
Saskatchewan	3	3	2	2	2	2	2
Ironworkers & Structural Metal Fabricators & Fitters							
Alberta	4	4	4	4	3	4	4
Greater Toronto Area (GTA)	4	2	5	4	4	4	4
Newfoundland and Labrador	4	5	3	5	3	3	2
Saskatchewan	3	5	3	3	2	1	1
Sheet Metal Workers							
Alberta	4	4	4	4	3	4	4
Greater Toronto Area (GTA)	3	3	4	4	4	4	4
Newfoundland and Labrador	3	4	3	4	3	2	2
Saskatchewan	4	5	4	2	1	1	1
Steamfitters, Pipefitters and Sprinkler System Installers							
Alberta	4	4	4	4	3	4	4
Greater Toronto Area (GTA)	3	2	5	4	4	4	5
Newfoundland and Labrador	2	4	3	4	4	3	2
Saskatchewan	3	5	4	2	1	1	1
Trades Helpers							
Alberta	3	4	3	3	3	2	2
Greater Toronto Area (GTA)	4	2	5	4	4	4	4
Newfoundland and Labrador	2	3	2	3	2	2	2
Saskatchewan	3	5	4	3	2	1	1
Truck Drivers							
Alberta	3	3	3	4	3	3	3
Greater Toronto Area (GTA)	3	2	4	4	4	4	4
Newfoundland and Labrador	4	4	3	4	3	2	1
Saskatchewan	3	5	3	2	1	1	1
Welders and Related Machine Operators							
Alberta	4	4	4	4	3	4	4
Greater Toronto Area (GTA)	3	3	4	4	4	4	4
Newfoundland and Labrador	4	5	3	5	3	2	2
Saskatchewan	3	5	3	2	1	1	1

Source: ESC Employer Survey 2011

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Rankings used in *Construction Looking Forward* are constructed in the same manner as in the ESC model. Tight markets (rankings of 4 or 5) in Exhibit 3.14 are associated with the start-up and peak demands of major industrial, resource and utility projects. Electricity projects, including renewable energy systems, are the most common of these major projects. As projects end, markets shift to easier conditions.

These major project cycles are the focus of analysis in the *Construction Looking Forward* reports. Big projects in small regions (e.g. Saskatchewan in 2011 and Newfoundland in 2012) often push ranks to the highest levels and this signals that the local workforce cannot meet requirements. Recruiting from outside markets is needed and attention shifts to where the needed workers might be found. As rankings rise, mobility among provinces and across industries becomes crucial. In some cases mobility will allow employers to access the Canadian labour markets to meet demands. Often the overall magnitude of the expected projects combine with Canadian demographics (retirements and limited new entrants), and the national workforce is often not big enough. Immigration is the remedy.

Virtually all of the electricity and next generation trades are stretched to the limit in at least one market across the *Construction Looking Forward* scenario.

Information and Communication Technology

IT related occupations will remain in high demand through the transition to Next Generation as new technologies require a greater role for IT expertise than Legacy systems. Higher than average employment growth and competition from other industries will maintain tight labour market conditions in most regions over the scenario.

Exhibit 3.15 reports rankings from the Information and Communications Technology Council (ICTC) report for Information Systems Analysts and Consultants. As described for the other occupations, these rankings combine many measures creating an "average" that spans many specific situations. IT occupations are particularly varied and their labour markets are filled with unique conditions that are not covered by broad national measures. The overall message though, is that employer needs will be very hard to fill.

Exhibit 3.15

National Labour Market Rankings, Information Systems Analysts and Consultants

Labour Market Rankings	2010	2011	2012	2013	2014	2015	2016
Information Systems Analysts and Consultants	3	3	3	4	4	4	4

Source: Information and Communications Technology Council

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The ICTC report described above assesses future labour markets as follows:

> "Between 2011 and 2016, Canadian employers will need to hire approximately 106,000 workers.....In light of the specialized skills and the mix of technical skills and business understanding that is sought by the majority of employers, these hiring requirements will pose serious and pervasive challenges.
>
> "In most regions, and for most Information and Communications Technology (ICT) occupations, employers will encounter systemic shortages when recruiting for ICT jobs that require five or more years of experience. The severity of these shortages will increase when employers are looking for leading edge skills or particular combinations of domain experience and ICT expertise. Conversely, most employers will encounter little or no difficulty in recruiting for jobs that require less than five years of experience or for which recent graduates would be qualified.
>
> "Acute and pervasive skills shortages will affect four occupations in particular:
>
> - Computer and Information Systems Managers
> - Telecommunications Carrier Managers
> - Information Systems Analysts and Consultants
> - Broadcast Technicians
>
> "For Information Systems Analysts and Consultants, the primary driver of shortages is increasing demand counterpoised with the limited capacity to train ICT professionals with the mix of business skills that are required in the occupation. In the other three occupations where shortages will be acute, demographic factors are the main explanation.
>
> "Conversely, over much of the forecast period, and in many regions, supply will exceed demand for three occupations:
>
> - Computer Programmers and Interactive Media Developers
> - Computer Network Technicians
> - User Support Technicians"

These general observations for labour markets across all industries certainly apply to the situation for electricity sector employers. Rankings for Information Systems Analysts and Consultants in the electricity and renewable energy industry as shown in Exhibit 3.12 imply that markets will be even tighter in the coming years than the ICTC report implies in Exhibit 3.15. This is because the electricity and renewable energy industry is in the critical stages of the transition to next generation infrastructure. Implementing these new smart grid systems requires ICT skills to develop the new and specialized computer systems to manage the complex information that joins customer demands and distributed generation systems.

Rankings for both the electricity and renewable energy industry and related markets all point to recruiting challenges. These challenges are most often concentrated on the need to find experienced and specialized workers while the prospects for finding qualified new entrants and junior candidates are generally better.

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Section 3 of the report shifted attention to the future. Labour market assessments for the electricity and for the next generation occupations were reviewed for local and broader labour markets. In general these assessments point to tight markets where recruiting will be difficult.

4. Implications, Recommendations and Conclusions for HR Management

Electricity sector employers will need to recruit over 45,000 new workers between 2011 and 2016, up to 50% of the current workforce. This massive inflow will be needed to replace retiring workers and needs to be available for building and operating the next generation of infrastructure, which includes renewable energy, refurbished generation, and transmission and distribution systems. Of these new employees, 23,000 will be in the electricity sector occupations covered in this report.

Based on past behaviour, employers expect to take as many as 30% of these recruits from the ranks of other industry employers. But moving the existing workforce among firms will not meet the labour requirements found here. For the industry as a whole, at least 50% of the new hires must be found in other Canadian industries or among new Canadians.

Employers in the electricity and renewable energy industry together face an unprecedented recruiting challenge. Individually they will not be able to succeed following their past HR strategies. United action is needed.

Most of the current workforce was trained and recruited at least twenty years ago. Few young people have been added since the early 1990s. In the meantime labour markets have changed. To fit the new Canadian workforce reality, the electricity sector workforce will soon need to include a far higher proportion of women, Aboriginals, new Canadians and diversity groups.

The pace of change in the mix of the workforce will accelerate as demographics change and investment projects multiply. ***Current industry initiatives targeting youth, diversity groups and the immigrant population will grow larger and perhaps more targeted.***

Traditional partners in the building of the electricity sector workforce, including post secondary programs, contractors and consultancies, are adapting to help meet the challenge. But their capacity to support employers in the task ahead is restricted. Government funding will be limited. Other industries are competing for the same support. And the electricity and renewable energy industry has expensive, complex and specialized training and education needs***. It is not certain that the expansion of these supporting groups will meet the growing needs of the electricity sector employers.***

The age profile of the Legacy workforce and attractive pension benefits will move a very large proportion of the workforce to retirement. While there is a large cohort of 45 to 54 year old workers preparing to take their place, there are much fewer in the 35 to 44 age group. Retirements will create a ripple effect that will soon focus attention on hiring many new workers with five or more years of experience. But many other Canadian industries face the same demographics and this group is far more difficult to recruit than new entrants and junior candidates.

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If sustained or increased, the traditional industry preference for hiring recent graduates and supporting coop, internship and apprenticeship programs will help fill in these gaps.

Projections from 2011 to 2016 focus attention on attracting immigrants and workers from other industries. These opportunities will open in some labour markets. But more often electricity sector employers will meet other, competing employers who seek skilled, experienced and specialized workers. They will be seeking help to find immigrants and investments in post secondary programs. Their HR challenges have much in common with electricity sector employers. For example, their focus is on the engineers, technicians and technologists, IT specialists and skilled trades with five or more years of experience.

Electricity sector employers share common labour requirements that are distinct from those of competing industries. Acting together on initiatives that target these needs will maximize the impact of limited resources.

The industry has unique HR advantages and distinct strategies to apply.

These employers are among the largest and best known employers in many provinces. They are often the employer of choice and can attract new workers through their career opportunities, internal training initiatives, strong benefit packages and history of employment security. Renewable energy providers have the important advantage of promising fast growth, green jobs and work with rapidly changing technologies.

Managing the retirement losses will shift attention to existing efforts that transfer knowledge from the oldest group who are leaving to a relatively large cohort of senior workers who are poised to fill in the skills gap. Strong industry traditions of supporting licensing and certifications have built a path for new graduates and apprentices. These programs fill in the crucial gaps in middle management, and can provide specialized and experienced technical skills.

Building new technical skills into the arriving workforce for the next generation of infrastructure will require a combination of new and expanded post secondary programs, along with internal training and certification. Much has already been accomplished in this area. New courses and certifications are appearing and the industry's relatively strong connection with post secondary programs will help. The biggest challenge will be internal and regulatory barriers related to rising costs. Technology costs were identified by the colleges and universities as the primary barrier. Evidence of the unique and potentially limiting impacts of skill shortages presented in this report may help make a case for new investments.

Findings also highlight how labour requirements – especially for the next generation of occupations and trades involved in construction will be accessed by contractors and consultancies. Outsourcing shifts the HR challenges to unions and other employers, and allows flexibility and workforce mobility so available skills are used most efficiently.

These groups face their own challenges related to demographics, skills and tight labour markets.

To meet the challenges set out in the 2011 LMI Study, human resource managers will need to add, expand, target and refine many programs:

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- Strategies and programs targeting permanent immigrants; including initiatives that integrate new arrivals into the community
- Systematically targeting temporary foreign workers in key occupations and moving the best candidates into Provincial Nominee Programs
- Working with Provincial governments, colleges and universities to add new programs and certifications for technicians, technologists and specialized trades for work with new technologies
- Developing a strategy for attracting more women, Aboriginals and diversity groups that take advantage of existing programs offered by individual employers and other groups
- Expand knowledge transfer programs that are preparing candidates for the replacement of skilled retirees
- Working with unions to build the skilled workforce and add specialized and advanced qualifications and certifications
- Working with unions on adding diversity to the workforce and integrating permanent immigrants and temporary foreign workers
- Working with electricity sector employers who are participating in initiatives aimed at improving the transition from post secondary training to the Workforce; this would include targeting higher rates of apprenticeship completions, enhanced internship programs for engineers and carefully targeted coop programs for IT grads

The 2011 LMI Study confirms the findings of the two earlier LMI studies and adds a new degree of urgency to the initiatives that have grown from this research. Changes are accelerating and competitive forces are growing stronger. Further, the 2011 findings suggest new initiatives.

A focus on the requirements of the next generation investments including:

- Tracking construction trades and markets for contractors
- Tracking emerging labour markets for specialized installers, maintenance and related work in solar, wind turbine and geothermal systems

Assessing the competition in other markets including:

- Industries and regions where labour requirements will be rising
- Training and certification programs that compete for resources
- Collaboration with other employer groups with common objectives

For many key occupations the available workforce will not meet the unprecedented labour requirements described in this report. Investment in human resources needs to grow in line with the major new infrastructure projects. Infrastructure projects are expected to total $293 billion from 2010 to 2030, raising annual spending by 50% over the past decades. Given the need to replace over 40% of the workforce, comparable HR investments are to be expected. Canada cannot renew its electricity system and shift to renewable sources on the planned scale without comparable additions to the skills of the workforce.

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Reliable and low emission electricity networks are essential to a modern economy. Building these networks depends on renewing Canada's current workforce.

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Acknowledgements

A project such as this requires the help and participation of numerous individuals and organizations. For that reason, we would like to express our sincere gratitude and appreciation to the following individuals who participated on the 2011 LMI Steering Committee.

2011 LABOUR MARKET INFORMATION STUDY STEERING COMMITTEE

Damon Rondeau – Chair, Steering Committee
Human Resources Planner
Manitoba Hydro

Norm Fraser – Chair, ESC Board of Directors
Chief Operating Officer
Hydro Ottawa

John Briegel
Manager
IBEW, Local 254

Michelle Branigan
Executive Director
Electricity Sector Council

Samantha Colasante
Manager, Research and Diversity
Engineers Canada

Debra Beauregard
Project Manager
Electricity Sector Council

Berit Watson
Manager, Careers and Team Effectiveness
New Brunswick Power

Leigh-Anne Donovan
Project Coordinator
Electricity Sector Council

Nathalie Couture
Analyst
Human Resources and Skills Development Canada

Research Consultant
PRISM Economics and Analysis:
Bill Empey
John O'Grady

A special acknowledgement to the companies who made the undertaking of the 2011 LMI Study possible through their partnership and support.

Alberta Electric System Operator

ATCO Electric

ATCO Power

Battle River Rural Electrification Association

BC Hydro

City of New Westminster Electricity Utility

Énergie NB Power

ENMAX Corporation

FortisBC

Guelph Hydro Electric Systems Inc.

Horizon Utilities Corporation

Hydro One Inc.

Hydro Ottawa

Nalcor Energy

Ontario Power Generation

St. Thomas Energy Services

Toronto Hydro Corporation

Yukon Energy

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Appendix A – 1 Ontario

Introduction

This appendix provides selected findings from the 2011 Labour Market Information Study for Ontario. Key exhibits in the national text are reproduced here using Ontario data. Notes and highlights have been added comparing these Ontario results to the trends and conclusions reported for Canada. This Appendix summarizes the key findings in each of three areas:

- Transition from Legacy to Next Generation
- The Workforce Profile and Trends
- Assessing Future Labour Markets and Human Resources Management

Transition from Legacy to Next Generation

In Ontario the transition from Legacy to Next Generation Infrastructure is characterized by several changes.

Exhibit A1.1

Legacy to Next Generation

Legacy		Next Generation
Twenty plus years of limited growth	→	Twenty years of rising investment
High concentration of capacity and workforce	→	Distributed generation of renewable capacity
Established support systems in post secondary programs, regulations	→	Deregulation, change to specialized, flexible training and certification
Stable, large scale operations	→	Large number of smaller new entrants
Long asset lives	→	Rapid replacement, high maintenance
Large employers, and a specialized, qualified, experienced workforce	→	Exit of experienced workforce; shortage of entrants with midlevel experience
Dominant, preferred employers in local labour markets	→	Intensifying competition in labour markets, post secondary programs

Source: ESC Employer Survey 2011

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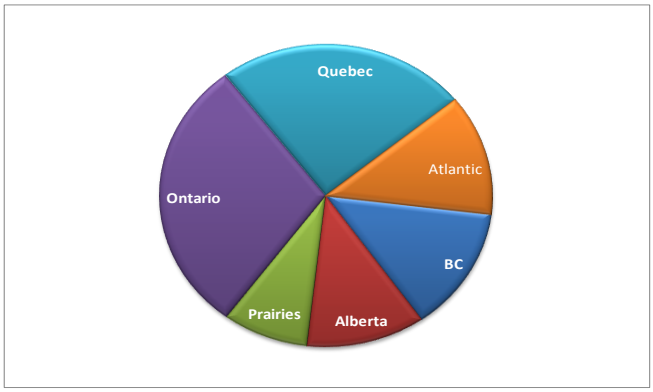
Ontario findings focus on key occupations and:

- Past trends in investment and hiring that determine the Legacy infrastructure and workforce
- The current state of labour markets and workforce
- The investments, demographics and output trends that drive employment from 2011 to 2016

The investments and related labour market impacts are distributed across the Provinces based on the current generating capacity. Ontario is Canada's largest market for electricity and has the largest electricity generating capacity.

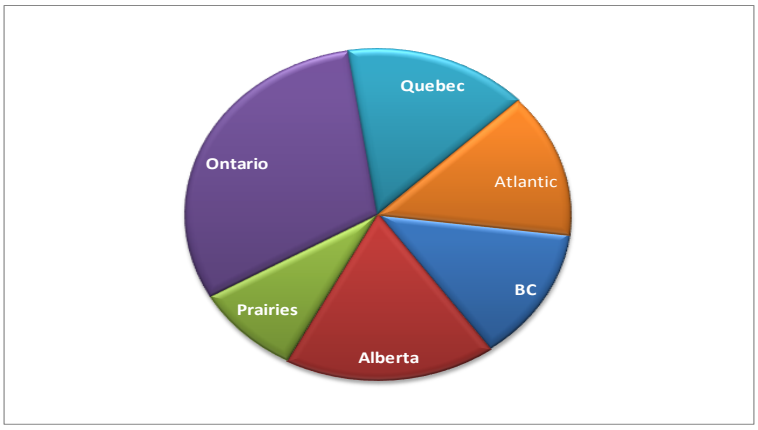
Exhibit A1.2
Provincial Distribution of Electricity Generating Capacity
Percent Distribution, MWs



Source: "Canada's Electricity Infrastructure: Building a Case for Investment" Conference Board of Canada, April 2011

The investments in the next generation facilities that will change Ontario's system will be roughly proportional to its current share in the national capacity.

Exhibit A1.3
Provincial Distribution of New Investment in Electricity Generating Capacity
Percent Distribution of New Investment, MWs



Source: "Canada's Electricity Infrastructure: Building a Case for Investment" Conference Board of Canada, April 2011

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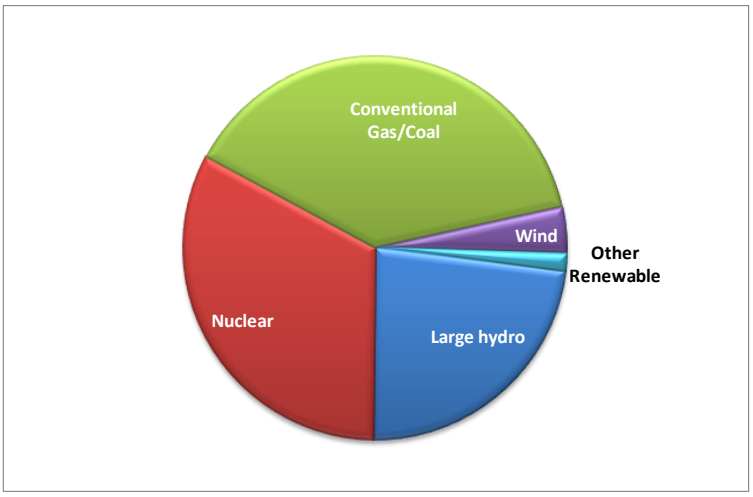
Ontario's current generating systems are concentrated in nuclear and conventional gas/coal facilities

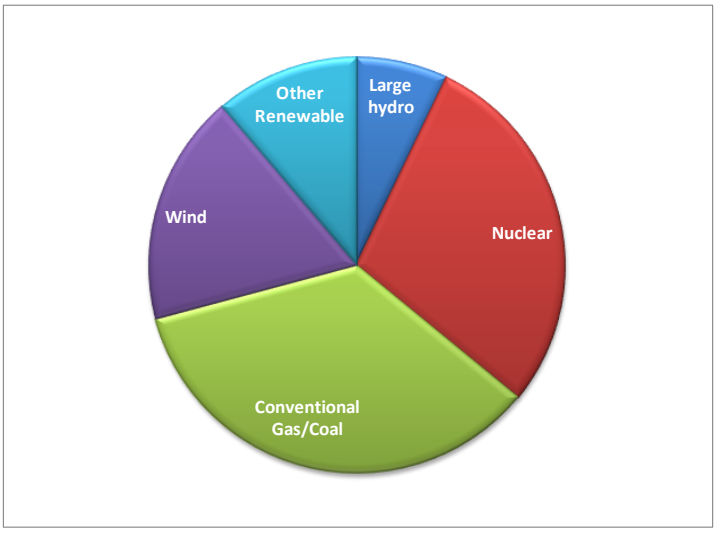
Exhibit A1.4
Existing Electrical Capacity by Type, Ontario, MWs



Source: "Canada's Electricity Infrastructure: Building a Case for Investment" Conference Board of Canada, April 2011

Investment plans for the Ontario system are skewed towards new wind generation and refurbishment of the nuclear and conventional gas/coal systems.

Exhibit A1.5
Investment in New Electrical Generating Capacity, Ontario, MWs



Source: "Canada's Electricity Infrastructure: Building a Case for Investment" Conference Board of Canada, April 2011

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The investment plans for Ontario are concentrated on the generation systems but also include changes to the transmission and distribution systems.

Exhibit A1.6
Investment in Ontario Electricity Infrastructure 2010 to 2030, by Type

Sector	2010 $ Billions
Generation	59.9
Transmission	5.5
Distribution	20.6
Total	85.9

Source: "Canada's Electricity Infrastructure: Building a Case for Investment" Conference Board of Canada, April 2011

Workforce Profiles and Trends

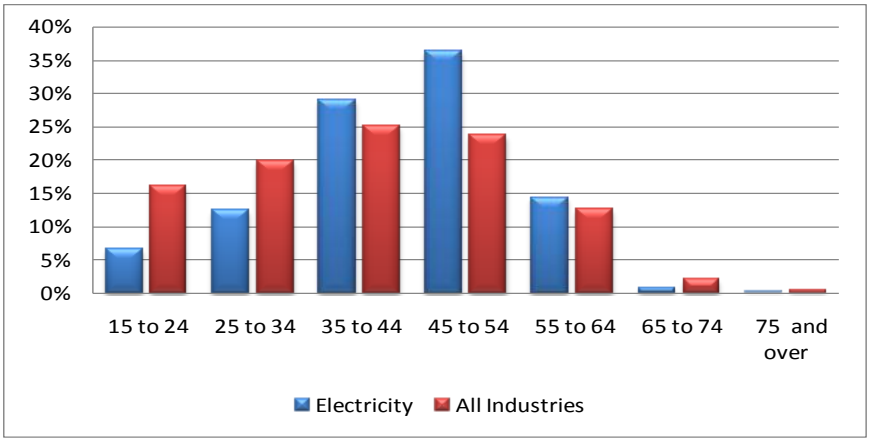
This section reviews Ontario data for the workforce, occupation profiles and related trends.

Workforce Profile

The 2006 Statistics Canada Census reported that there were 34,840 people working in the Electricity and Renewable Energy industry in Ontario, 17,825 of these were in the core electricity sector occupations. By 2010 employment had grown by 8.6% to 37,435.

The age profile of the industry workforce has the distinctive peak for the younger boomers age 45 to 54 and the associated, smaller proportion of the Gen X workforce age 35 to 44. This profile is a consequence of the loss of employment and limited hiring during the 1990s.

Exhibit A1.7
Age Distribution of the Workforce
Electricity and Renewable Energy Providers, All Industries,
Ontario, 2006



Source: Statistics Canada, 2006 Census

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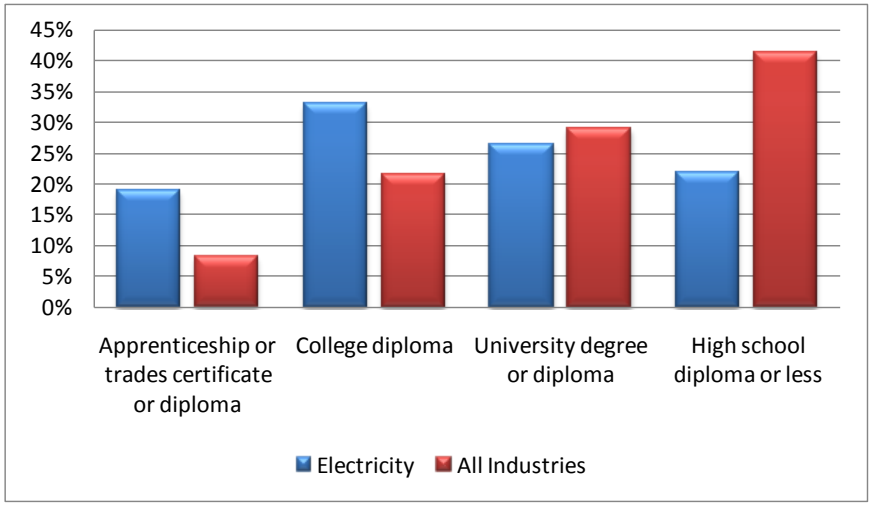
The Ontario workforce also has the characteristic higher education profile with a higher than average concentration of skilled trades and apprentices, technicians and technologists from the colleges and engineers from the universities. Most of the workforce is older workers who graduated from post secondary programs over twenty years ago.

Exhibit A 1.8
Higher Education Achievement
Electricity and Renewable Energy Providers, All Industries
Ontario, 2006



Source: Statistics Canada, 2006 Census

The Ontario workforce is concentrated in the natural and applied sciences (engineering), trades and technical occupations.

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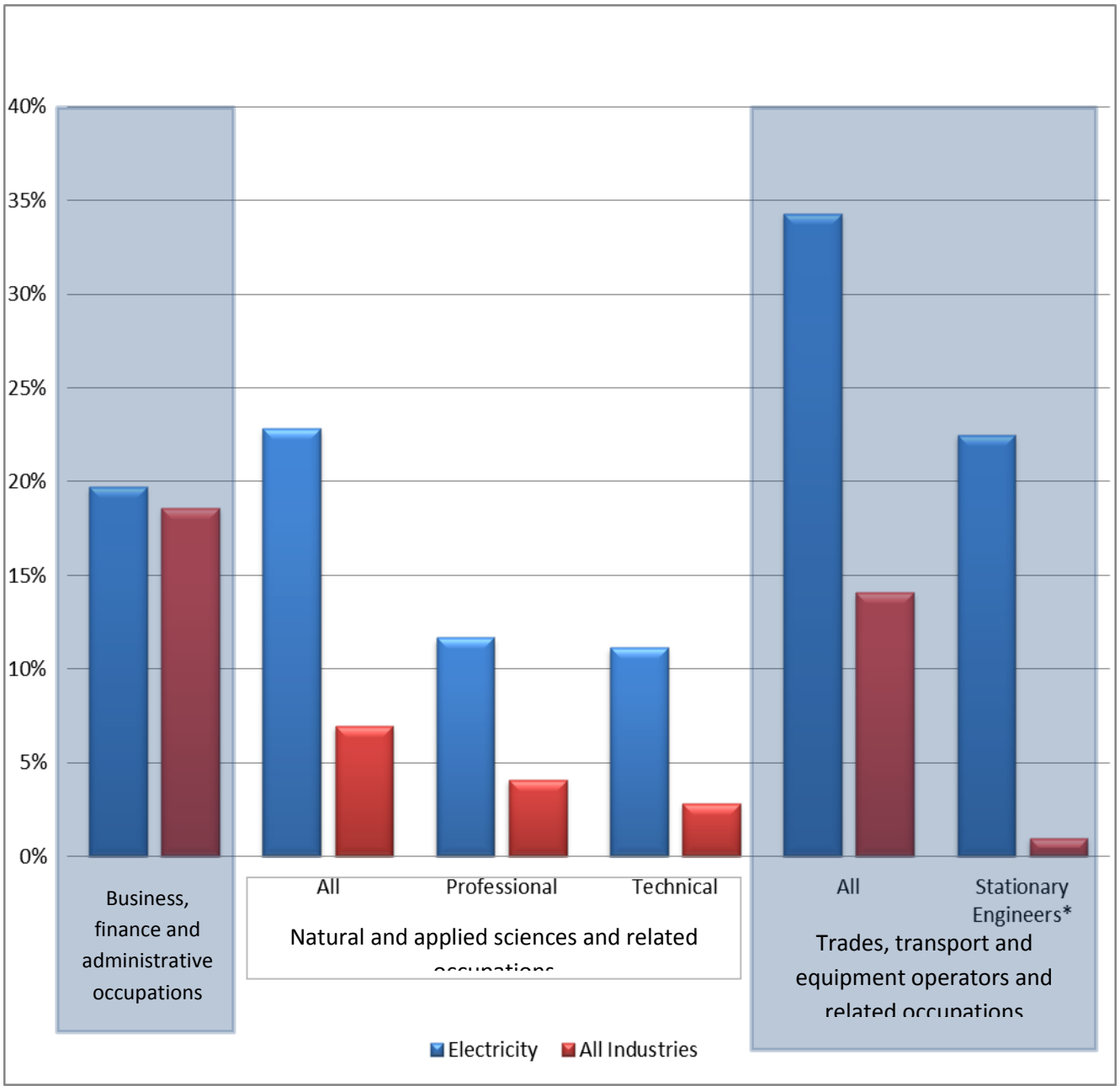
Exhibit A1.9
Distribution of the Workforce by Occupation
Electricity and Renewable Energy Providers, All Industry
Ontario, 2006



*Includes: Stationary engineers, power station operators and electrical trades and telecommunications occupations
Source: Statistics Canada, 2006 Census

Women are a smaller proportion of the workforce than men. This is typical of the gender composition of the key occupations.

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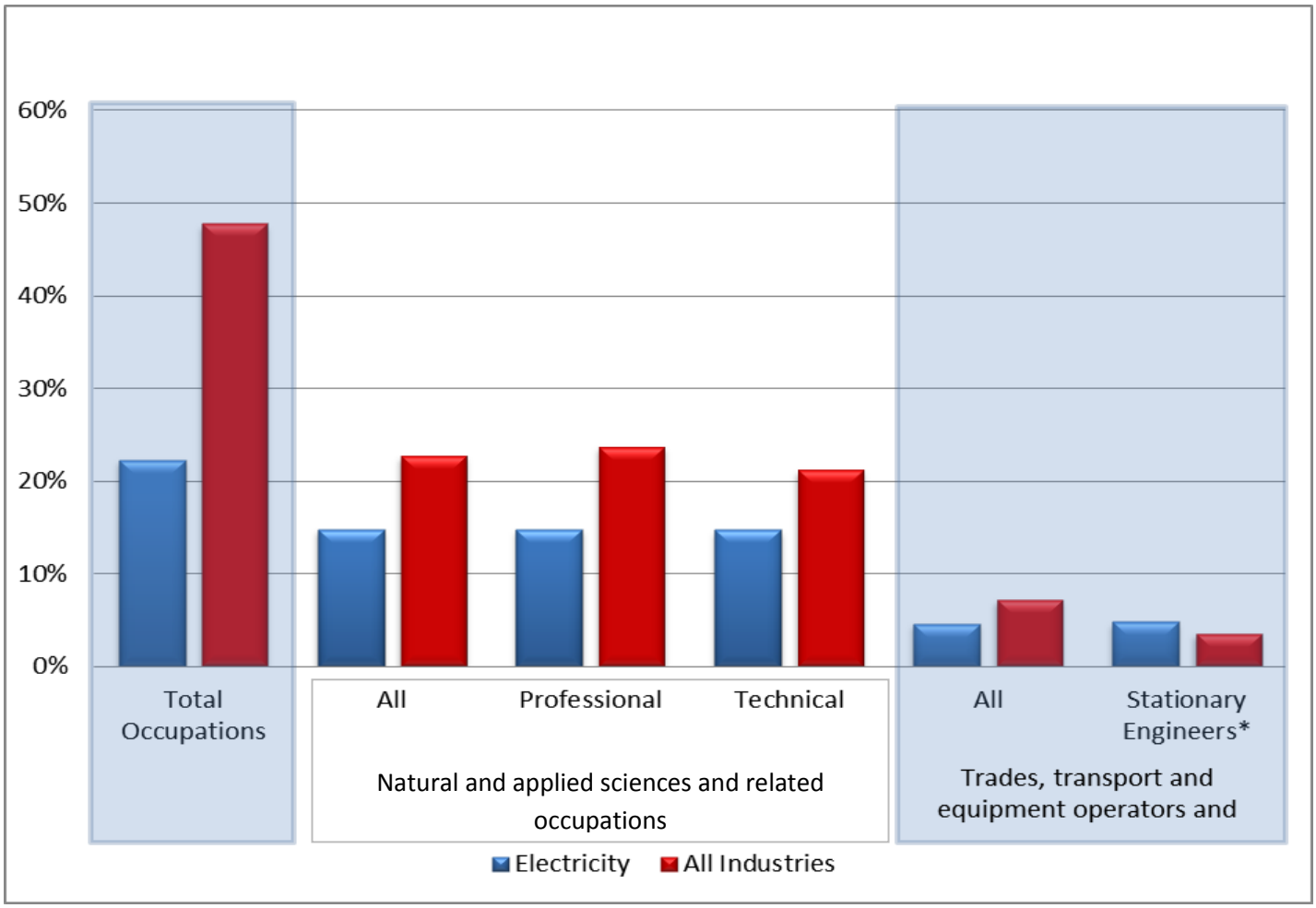
Exhibit A 1.10
Distribution of the Workforce by Gender
Electricity and Renewable Energy Providers, All Industries
Percentage of Women in the Workforce, Ontario, 2006



Source: Statistics Canada, 2006 Census

Like the national workforce, the Ontario electricity sector workforce also has notably fewer immigrants than other industries. This is another consequence of the history of hiring Canadians in the 70's and 80's and employment losses and limited additions during the 1990s when immigration was rising.

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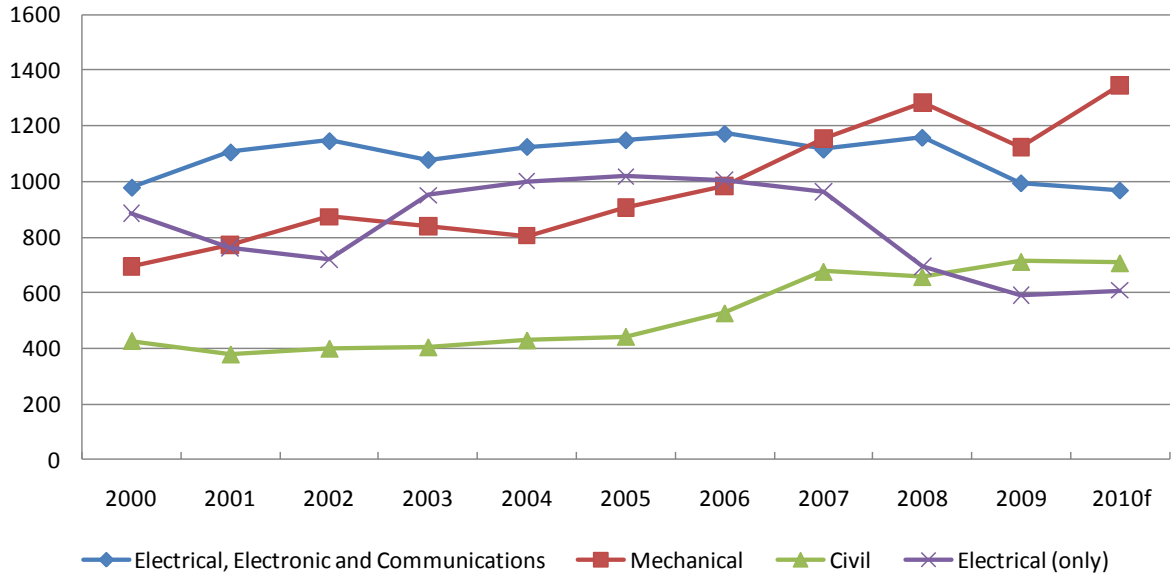
Post Secondary Education and Immigration

There are two principal sources of labour supply: graduates from post secondary training programs and immigration. This section reviews recent trends for the electricity sector occupations.

Ontario shares national trends in post secondary education and training that impact the supply of new workers in the key applied sciences and technical occupations.

Engineering programs in Ontario feature gains for civil but weaker trends in enrolments and degrees awarded for electrical engineers.

Exhibit A1.11
Undergraduate Degrees Awarded in Engineering Programs
Ontario



Source: Engineers Canada

Trends for apprenticeship programs, set out in Exhibit A1.12, show strong gains across the last decade for several skilled trades working in the electricity and renewable energy industry. Ontario apprenticeship programs have expanded during the past decade, adding new registrations but completions – and the emerging number of journeypersons – have increased more slowly.

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Exhibit A1.12

Apprenticeship Programs in Ontario

Ontario									
Engineering Programs	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
Construction Millwright and Industrial Mechanic (Millwright)									
Registrations	4053	4362	4491	5136	5259	5508	5985	5649	6093
Completions	348	450	270	444	513	393	402	522	525
Electrician, Except Industrial and Power System									
Registrations	6429	7050	7497	8160	9183	9807	10434	10980	11739
Completions	630	771	612	378	927	882	1005	1062	1074
Industrial Electrician									
Registrations	2010	2115	2208	2214	2088	2226	2493	2451	2700
Completions	108	162	219	276	168	126	120	168	135
Power Systems Electrician									
Registrations	0	0	0	0	0	0	0	0	0
Completions	0	0	0	0	0	0	0	0	0
Electrical Power Line and Cable Workers									
Registrations	405	462	504	579	657	795	975	1173	1323
Completions	18	15	18	30	18	9	21	51	81
Stationary Engineers and Auxiliary Equipment Operators									
Registrations	0	0	0	0	0	0	0	0	0
Completions	0	0	0	0	0	0	0	0	0
Total									
Registrations	12897	13989	14700	16089	17187	18336	19887	20253	21855
Completions	1104	1398	1119	1128	1626	1410	1548	1803	1815

Source: Statistics Canada, Registered Apprenticeship Information System

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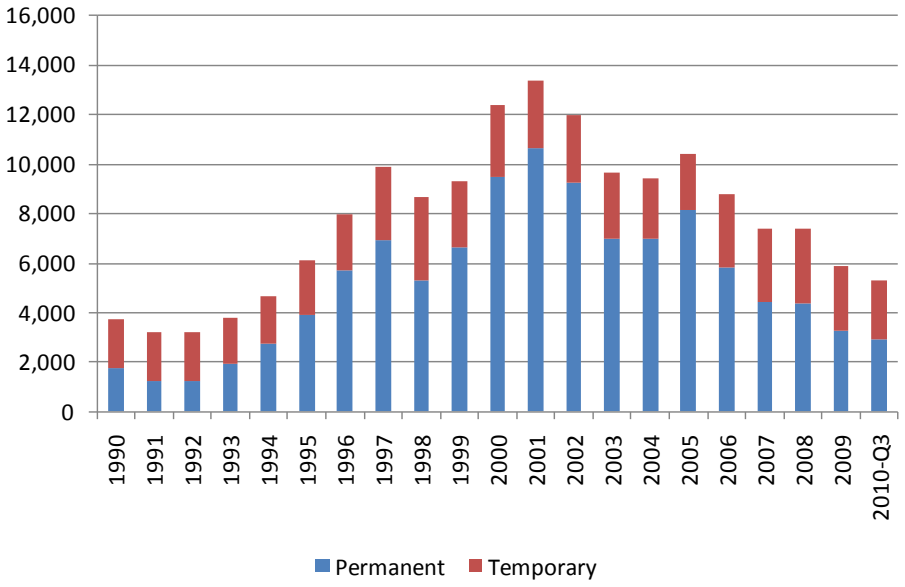
Finally, immigration trends are set out for permanent immigrants and temporary foreign workers arriving in Ontario with jobs or intending to work in the electricity sector occupations. The largest group represented here are engineers. Immigration has been on a downward trend since 2005.

Exhibit A1.13
Immigrants Arriving in Ontario
Electricity Sector Occupations, 1990 to 2010



Source: Citizenship and Immigration Canada

Supply side survey – Ontario findings

23 Ontario post secondary institutions, offering 72 electricity related programs, responded to the ESC survey.

Responses were close to national totals and reported:

- Enrolments in electricity related programs were rising at the same rate as, or faster than other programs
- Expected increases in enrolments from 2011 to 2016 are lower in Ontario than other provinces
- The main barrier to expanding electricity related programs is the cost related to new technologies
- Relative strength in enrolment growth for electricity related technicians and technologists in colleges
- Electricity sector employers have as good or better relations with the programs than other industries

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Occupations

46 Ontario employers (out of a total national response of 89) responded to the ESC survey.

Key findings for Ontario include:

- Retirements
  - Age profiles for the Ontario survey respondents are very similar to the Census profiles
  - The average age at retirement for the Ontario workforce, 58, is close to the national average
  - A high and rising proportion of the workforce are expected to retire
    - 3.9% of the respondents' workforce retired in 2011 and this is expected to rise to close to 10% by 2016
    - Projected retirements for 2012, in the 2008 survey, were well above the new survey results for 2011
  - Findings imply that record high levels of retirements are expected from 2011 to 2016

- Workforce dynamics
  - Hiring rates and other measures of labour market dynamics show very tight markets
  - More than half of responding firms report some or extreme difficulty hiring
  - Respondents routinely report hiring 30% or more recruits from other electricity sector employers

Assessing Future Labour Markets and Human Resources Management

A new labour market model projects market conditions from 2011 to 2016 to determine employment expansion demands. Expansion demands are related to expected investments and the growth in electricity demand. Replacement demands are driven by demographic trends and the employer survey estimates of expected retirements.

Labour Market Assessments

Projections for next generation investments in Ontario grow steadily across the forecast period from 2011 to 2016. Construction of the expected major nuclear facility is delayed until after 2016.

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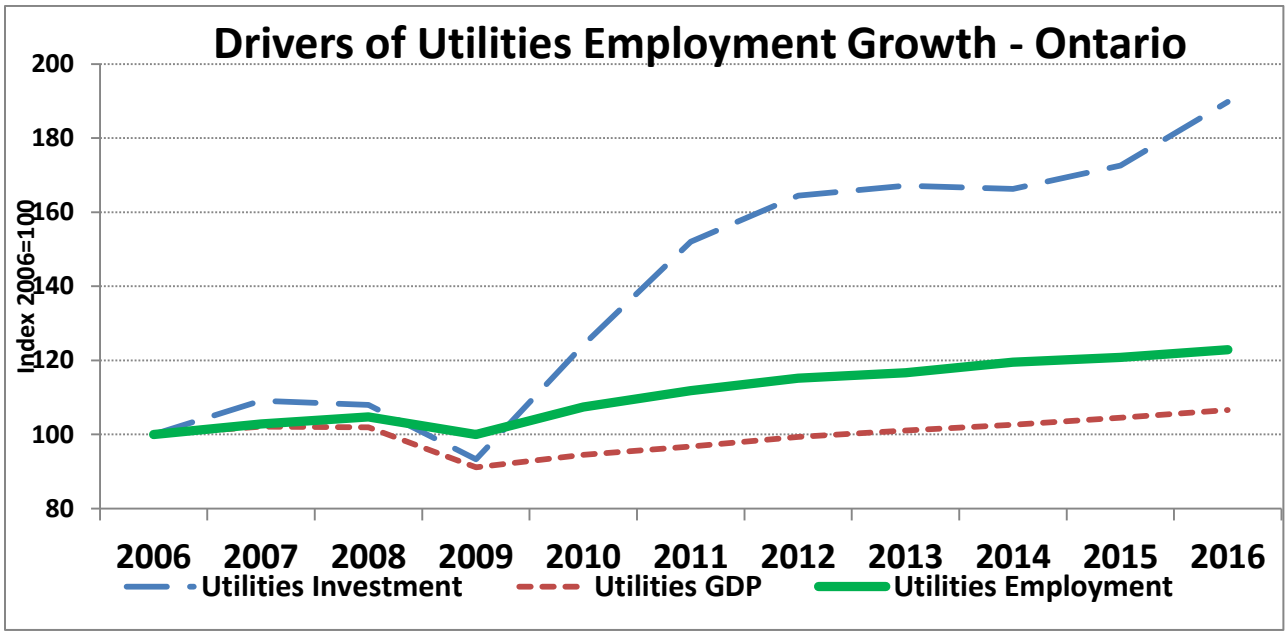
Exhibit A1.14
Projections of Output, Investment and Employment
Ontario, 2011 to 2016



Source: Centre for Spatial Economics, ESC Employer Survey 2011, Census 2006

This pattern of investment and electricity demand is used to calculate employment growth by occupation.

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Exhibit A1.15
Employment Growth by Occupation
Electricity Sector Occupations in Ontario

Occupations	2006	2010	2016	Employment 2011 to 2016 % Growth 2011 - 2016	Employment 2011 to 2016 Avg. annual growth rate
Engineering managers	345	361	430	19.1%	3.8%
Construction managers	20	21	25	19.1%	3.8%
Utilities managers	1,767	1,814	2,112	16.4%	3.3%
Financial auditors and accountants	349	336	365	8.8%	1.8%
Civil engineers	178	187	222	19.1%	3.8%
Mechanical engineers	1,486	1,556	1,853	19.1%	3.8%
Electrical and electronics engineers	1,483	1,554	1,850	19.1%	3.8%
Information systems analysts and consultants	433	445	556	25.1%	5.0%
Civil engineering technologists and technicians	42	43	50	16.4%	3.3%
Mechanical engineering technologists and technicians	665	682	795	16.4%	3.3%
Electrical and electronics engineering technologists and technicians	1,399	1,436	1,672	16.4%	3.3%
Contractors and supervisors, electrical trades and telecommunications occupations	496	519	618	19.1%	3.8%
Electricians (except industrial and power system)	98	102	122	19.1%	3.8%
Industrial electricians	132	138	165	19.1%	3.8%
Power system electricians	1,341	1,405	1,673	19.1%	3.8%
Electrical power line and cable workers	2,905	3,044	3,624	19.1%	3.8%
Stationary engineers and auxiliary equipment operators	460	463	527	13.9%	2.8%
Power systems and power station operators	3,233	3,318	3,864	16.4%	3.3%
Construction millwrights and industrial mechanics (except textile)	1,034	1,083	1,290	19.1%	3.8%
Electrical Occupations	17,865	18,508	21,813	17.9%	3.6%
Other Occupations	16,975	17,995	21,646	20.3%	4.1%
Total	34,840	36,503	43,460	19.1%	3.8%

Source: Centre for Spatial Economics, ESC Employer Survey 2011, Census 2006

Expansion demand

Exhibit A1.16 tracks labour requirements for retirements and death (replacement demands) relative to the projected labour force in Ontario

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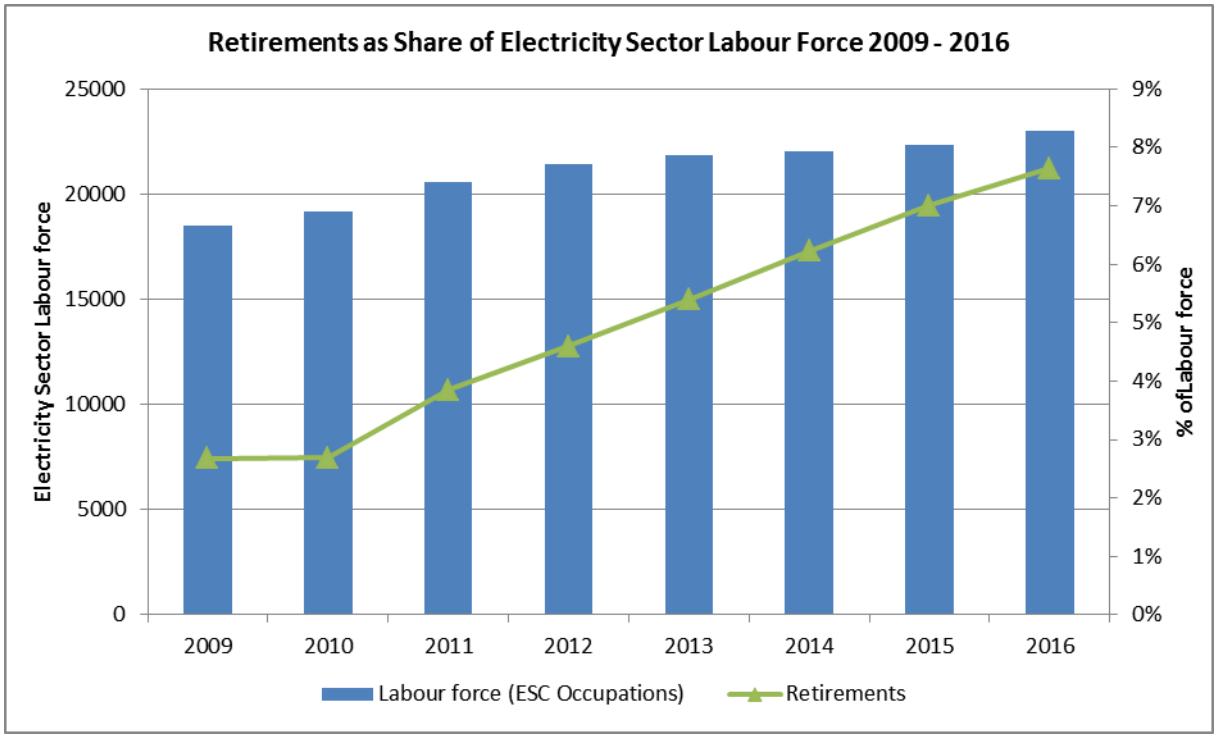
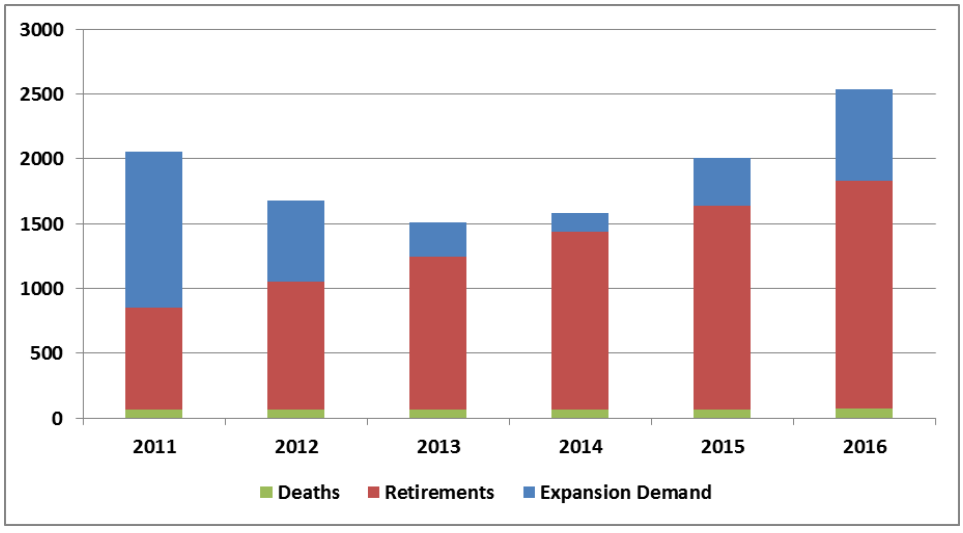
Exhibit A1.16
Retirement Projections for Electricity Sector Occupations



Source: Centre for Spatial Economics, ESC Employer Survey 2011, Census 2006

Exhibit A1.17 adds together replacement and expansion demands for the electricity workforce in Ontario.

Exhibit A1.17
Total Employment Requirements, Electricity Sector Occupations
Ontario, 2011 to 2016



Source: Centre for Spatial Economics, ESC Employer Survey 2011, Census 2006

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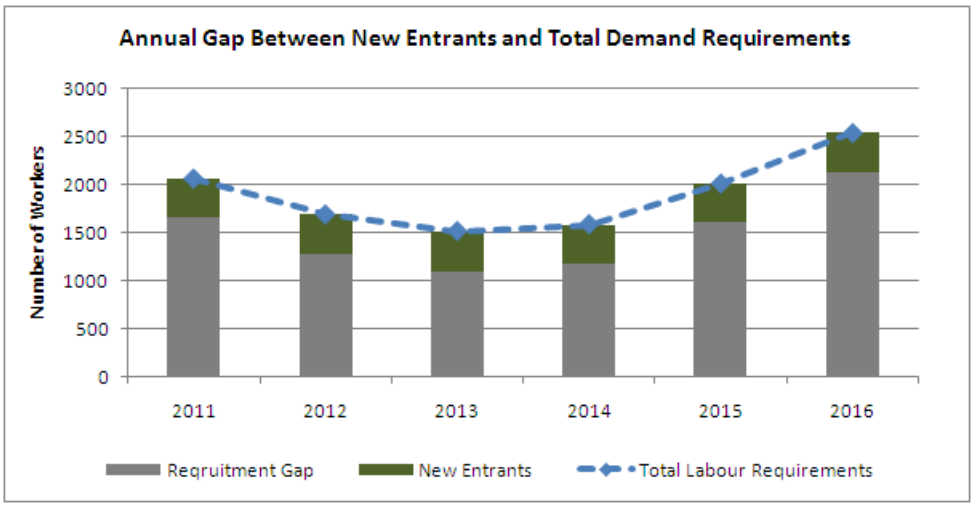
Finally Exhibit A1.18 tracks the potential labour supply from new entrants and net hiring from outside the industry. There are not enough potential new entrants to meet the projected requirements and this implies tight labour markets across the projected period from 2011 to 2016.

Exhibit A1.18

New Entrants and Labour Requirements



Source: Centre for Spatial Economics, ESC Employer Survey 2011, Census 2006

Rankings

Labour Market rankings for each occupation are based on market measures of the supply–demand gap, the change in employment and the age profiles and retirements.

Labour Market Rankings Defined

	Rankings & Description
1	**Significant excess of supply over demand** No difficulty in recruiting qualified staff with 0-5 years or 5-10 years of Canadian experience at established compensation norms within the local labour market.
2	**Excess of supply over demand** No difficulty in recruiting qualified staff with 0-5 years or with 5-10 years of Canadian experience at established compensation norms within the local or regional labour market. The geographic range of recruiting and the range of acceptable qualifications is broader than in 1.

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3	**Moderate supply pressures** Difficulty in recruiting qualified staff with more than 5 years of Canadian experience, with industry or technology-specific skills, and with appropriate non-technical skills. The time required to fill these positions is typically longer than historic norms. Vacancies sometimes need to be re-posted. Employers actively solicit applications from outside the local and regional labour market and reimburse applicants for travel expenses related to interviews, etc. Recruiting engineering staff with 0-5 years of Canadian experience poses fewer challenges.
4	**Significant supply pressures** Difficulty across the board in recruiting qualified staff in the local and regional labour market. It is normal practice to actively solicit applications from outside the local and regional labour market and to reimburse applicants for travel expenses related to interviews. Employers are generally obliged to improve offered terms of compensation and to assist with re-location costs. Recruitment difficulties lead many employers to increase their use of third-party recruiters and to increase their use of contracting trades work, outsourcing of engineering and technology work to consultancies or staff the assignment with workers from another region. There is a significant increase in the risk of project delays and compensation-driven cost escalations.
5	**Supply constraints** Systemic difficulty in recruiting qualified staff. International recruiting is common among large employers. There is widespread perception that the contracting and consulting sector is working at full capacity and that there is little, if any, remaining scope to outsource construction, engineering and ICT work to qualified suppliers with a known track record.

Ontario labour markets for the electricity sector occupations are very tight in 2011 and 2012 as the investments in next generation projects increase. Electricity output regains pre-recession peaks in 2012 and investments continue to grow at a slower pace. Gains in post secondary completions add to the workforce of certified labour after 2013 and some rankings ease off. Where age profiles are high and retirements are rising, rankings are high later in the projection period.

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Exhibit A1.19

Ontario Labour Market Rankings

Occupations	2010	2011	2012	2013	2014	2015	2016
Engineering managers	5	5	4	4	4	4	4
Construction managers	5	5	4	4	4	4	4
Utilities managers	5	4	4	4	4	4	4
Financial auditors and accountants	3	3	3	3	3	3	3
Civil engineers	4	4	3	3	3	3	3
Mechanical engineers	4	4	3	3	3	3	3
Electrical and electronics engineers	4	4	4	3	3	3	4
Information systems analysts and consultants	4	4	4	4	4	4	4
Civil engineering technologists and technicians	4	4	4	4	3	4	4
Mechanical engineering technologists and technicians	4	4	3	3	3	4	4
Electrical and electronics engineering technologists and technicians	4	4	3	3	3	3	4
Contractors and supervisors, electrical trades and telecommunications occupations	4	4	4	4	4	4	4
Electricians (except industrial and power system)	4	4	4	4	4	4	4
Industrial electricians	4	4	4	4	4	4	4
Power system electricians	4	4	4	3	3	3	4
Electrical power line and cable workers	5	5	4	3	3	4	4
Stationary engineers and auxiliary equipment operators	4	4	3	3	3	3	3
Power systems and power station operators	4	4	4	4	4	4	4
Construction millwrights and industrial mechanics (except textile)	4	4	3	3	3	3	3

Source: ESC Employer Survey 2011

Comments on Rankings for Ontario:

- Labour requirements and hiring related to retirements will be concentrated in experienced and specialized workers – not new entries or recent grads
    - Rankings of 3 for some occupations may reflect the supply of junior applicants
    - Competition with other industries for some occupations will be intense
- Ontario has a large and growing immigrant population that will include some older and specialized workers
- Important government decisions with regard to adding renewable energy capacity and new nuclear facilities will be key determinants of coming labour requirements
- In Ontario both expansion and replacement demand continues to grow across the 2011 to 2016 projection period so that rankings rise later in the period as labour force growth slows.

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Appendix A – 2 Quebec

Introduction

This appendix provides selected findings from the 2011 Labour Market Information Study for Quebec.

Key exhibits in the national text are reproduced here using Quebec data. Notes and highlights have been added comparing these Quebec results to the trends and conclusions reported for Canada. This Appendix summarizes the key findings in each of three areas:

- Transition from Legacy to Next Generation
- The Workforce Profile and Trends
- Assessing Future Labour Markets and Human Resources Management

Transition from Legacy to Next Generation

In Quebec the transition from Legacy to Next Generation Infrastructure is characterized by several changes.

Exhibit A2.1
Legacy to Next Generation

Legacy		Next Generation
Twenty plus years of limited growth	→	Twenty years of rising investment
High concentration of capacity and workforce	→	Distributed generation of renewable capacity
Established support systems in post secondary programs, regulations	→	Deregulation, change to specialized, flexible training and certification
Stable, large scale operations	→	Large number of smaller new entrants
Long asset lives	→	Rapid replacement, high maintenance
Large employers, and a specialized, qualified, experienced workforce	→	Exit of experienced workforce; shortage of entrants with midlevel experience
Dominant, preferred employers in local labour markets	→	Intensifying competition in labour markets, post secondary programs

Source: ESC Employer Survey 2011

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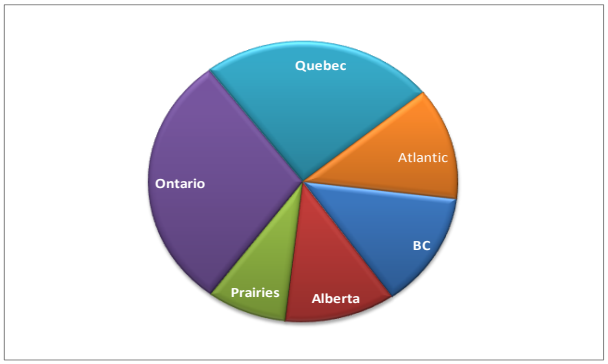
Quebec findings focus on key occupations and:

- Past trends in investment and hiring that determine the Legacy infrastructure and workforce
- The current state of labour markets and workforce
- The investments, demographics and output trends that drive employment from 2011 to 2016

The investments and related labour market impacts are distributed across the Provinces based on the current generating capacity. Quebec is Canada's second largest market for electricity.

Exhibit A2.2
Provincial Distribution of Electricity Generating Capacity
Percent Distribution of MWs

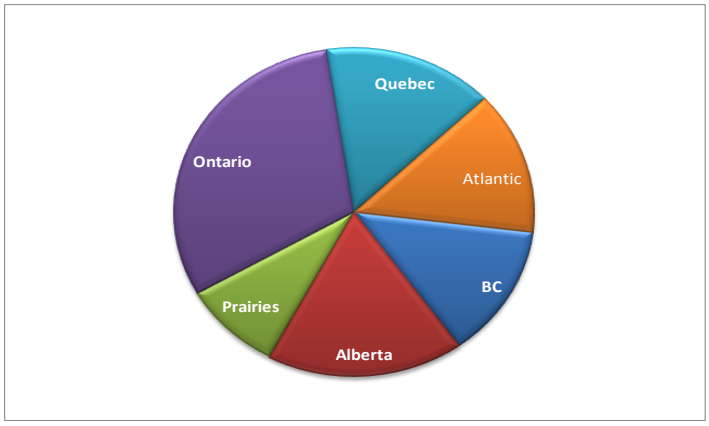


Source: "Canada's Electricity Infrastructure: Building a Case for Investment" Conference Board of Canada, April 2011

The investments in the next generation facilities that will change Quebec's system will be less than proportional to its current share in the national capacity.

Exhibit A2.3

Provincial Distribution of New Investment in Electricity Generating Capacity
Percent Distribution of New Investment, MWs



Source: "Canada's Electricity Infrastructure: Building a Case for Investment" Conference Board of Canada, April 2011

Quebec's current generating systems are concentrated in large hydro facilities

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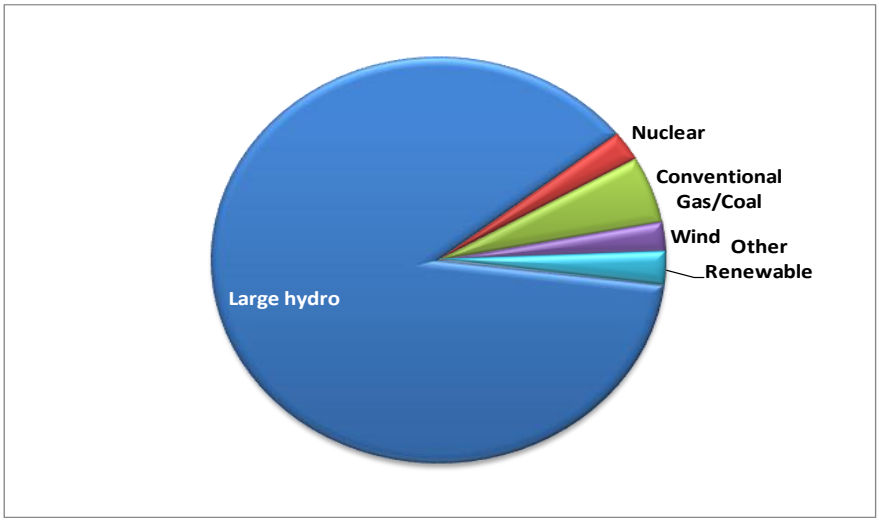
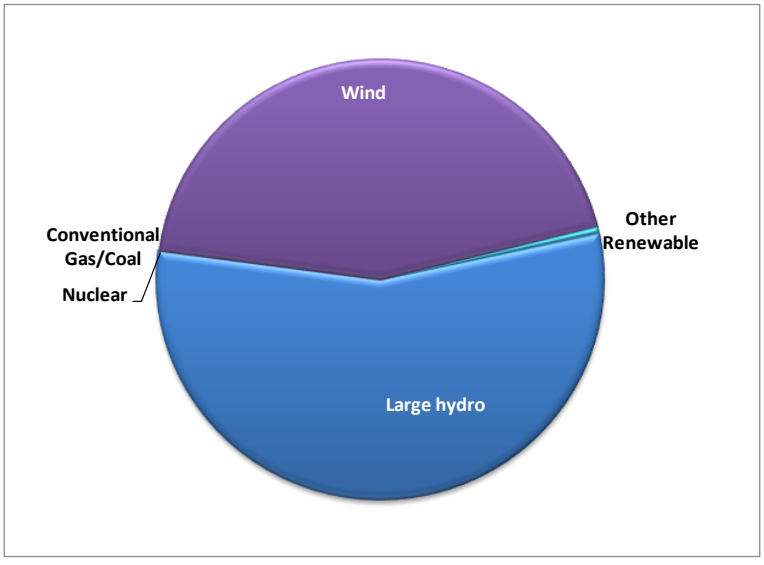
Exhibit A2.4
Existing Electrical Capacity by Type, Quebec
MWs



Source: "Canada's Electricity Infrastructure: Building a Case for Investment" Conference Board of Canada, April 2011

Investment plans for the Quebec system are skewed towards new wind generation and large hydro systems.

Exhibit A2.5
Investment in New Electrical Generating Capacity, Quebec
MWs



Source: "Canada's Electricity Infrastructure: Building a Case for Investment" Conference Board of Canada, April 2011

The investment plans for Quebec are concentrated on the generation systems but also include relatively larger changes to the distribution systems.

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Exhibit A2.6
Investment in Quebec Electricity Infrastructure 2010 to 2030, by Type

Sector	2010 $ Billions
Generation	28.7
Transmission	3.8
Distribution	21.7
Total	54.2

Source: "Canada's Electricity Infrastructure: Building a Case for Investment" Conference Board of Canada, April 2011

Workforce Profiles and Trends

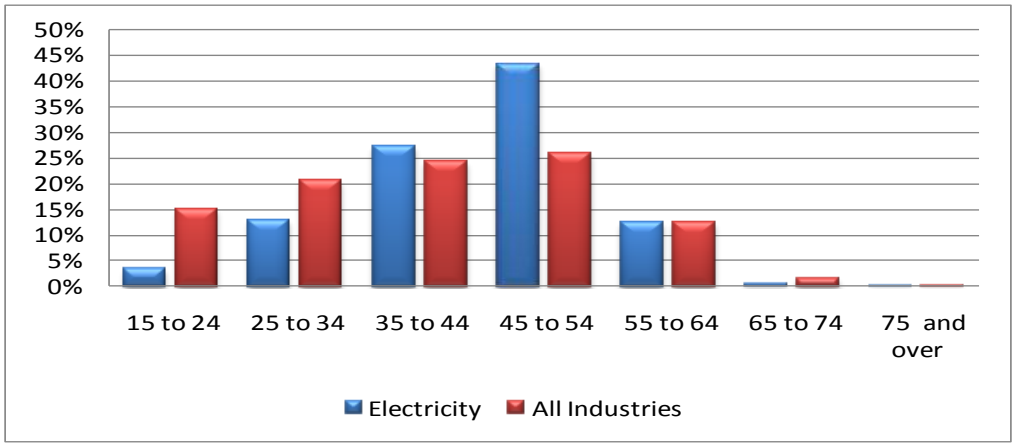
This section reviews Quebec data for the workforce and occupation profiles and related trends.

Workforce Profile

The 2006 Statistics Canada Census reported that there were 27,270 people working in the Electricity and Renewable Energy industry in Quebec, 11,822 of these were in the core electricity sector ccupations. By 2010 employment had grown by 3.0% to 28,042.

The age profile of the industry workforce has an extreme example of the distinctive peak for the younger boomers age 45 to 54 and the associated, smaller proportion of the Gen X workforce age 35 to 44. This profile is a consequence of the loss of employment and limited hiring during the 1990s.

Exhibit A2.7
Age Distribution of the Workforce
Electricity and Renewable Energy Providers, All Industries
Quebec, 2006



Source: Statistics Canada, 2006 Census

The Quebec workforce also has the characteristic higher education profile with a higher than average concentration of skilled trades and apprentices, technicians and technologists from the colleges and

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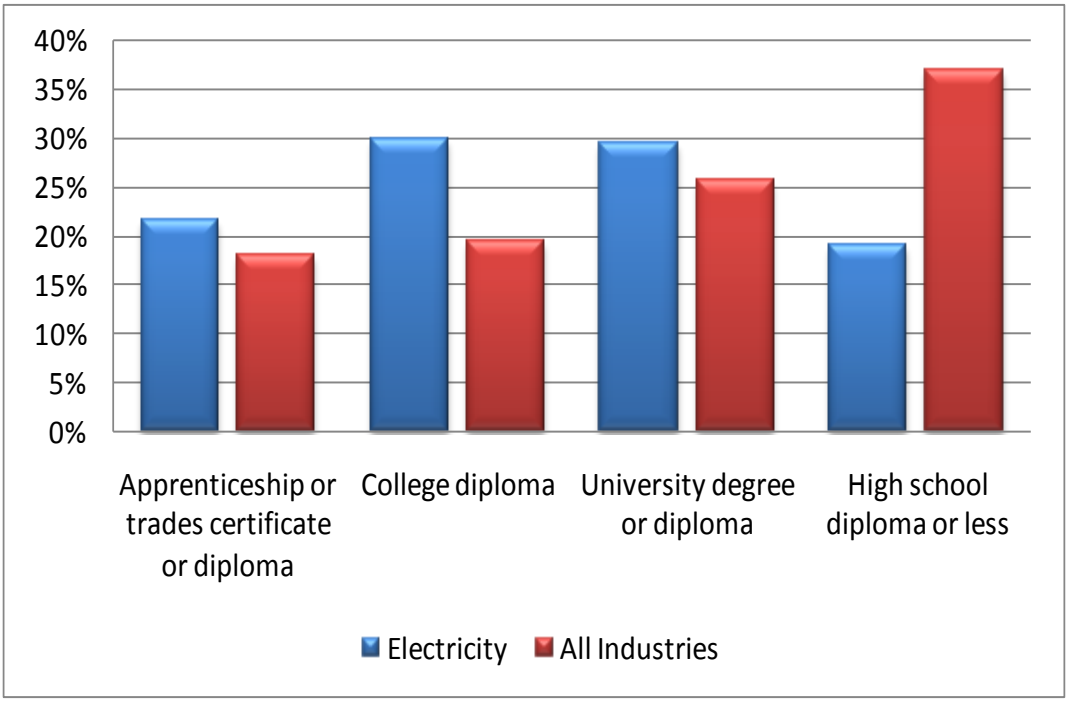
engineers from the universities. Most of the workforce is older workers who graduated from post secondary programs over twenty years ago.

Exhibit A2.8
Higher Education Achievement
Electricity and Renewable Energy Providers, All Industries
Quebec, 2006



Source: Statistics Canada, 2006 Census

The Quebec workforce is more concentrated in the natural and applied sciences (engineering), trades and technical occupations than other provinces.

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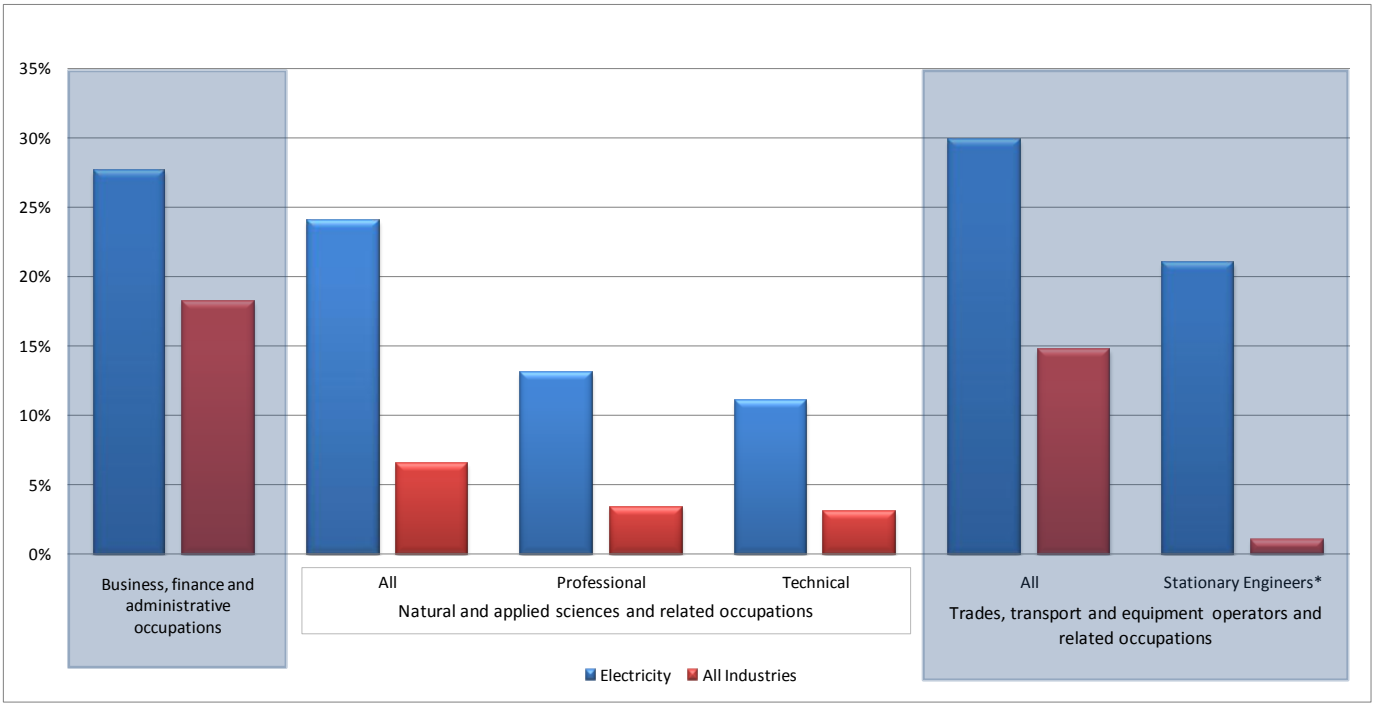
Exhibit A2.9
Distribution of the Workforce by Occupation
Electricity and Renewable Energy Providers, All Industry
Quebec, 2006



*Includes: Stationary engineers, power station operators and electrical trades and telecommunications occupations
Source: Statistics Canada, 2006 Census

Women are a smaller proportion of the workforce than men, but Quebec has a marginally higher proportion of women compared to other provinces. This is typical of the gender composition of the key occupations.

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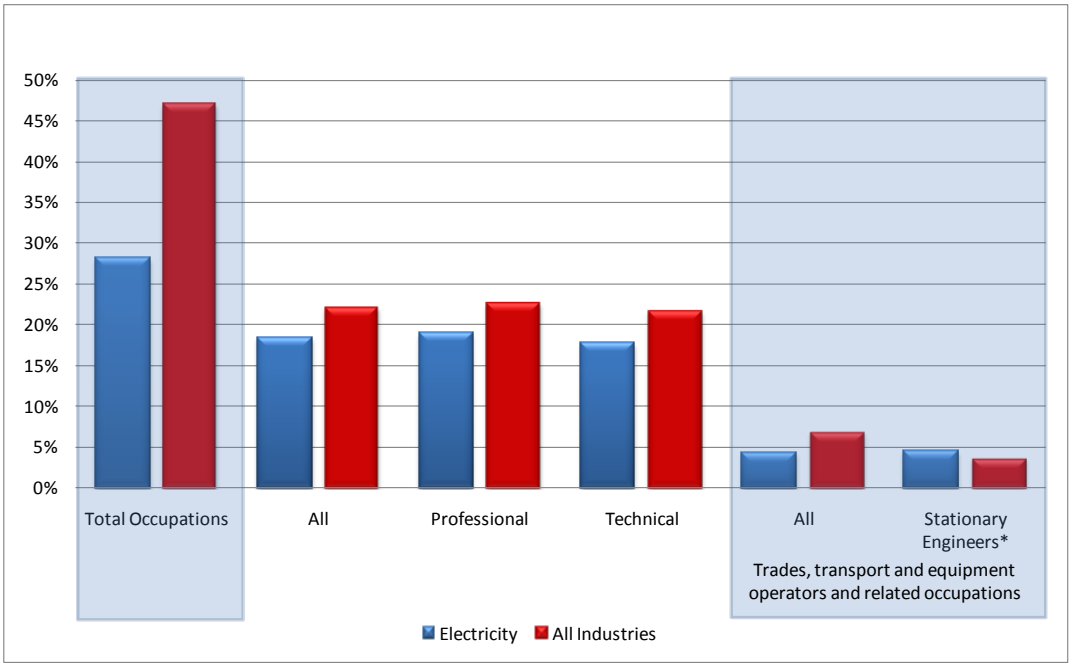
Exhibit A2.10
Distribution of the Workforce by Gender
Electricity and Renewable Energy Providers, All Industries
Percentage of Women in the Workforce, Quebec, 2006



Source: Statistics Canada, 2006 Census

Like the national workforce, the Quebec electricity sector workforce also has notably fewer immigrants than other industries. This is another consequence of the history of hiring Canadians in the 70's and 80's and employment losses and limited additions during the 1990s when immigration was rising.

Post Secondary Education and Immigration

There are two principal sources of labour supply: graduates from post secondary training programs and immigration. This section reviews recent trends for the electricity sector occupations.

Quebec shares national trends in post secondary education and training that impact the supply of new workers in the key applied sciences and technical occupations.

Engineering programs in Quebec feature gains for civil but weaker trends in enrolments and degrees awarded for electrical engineers.

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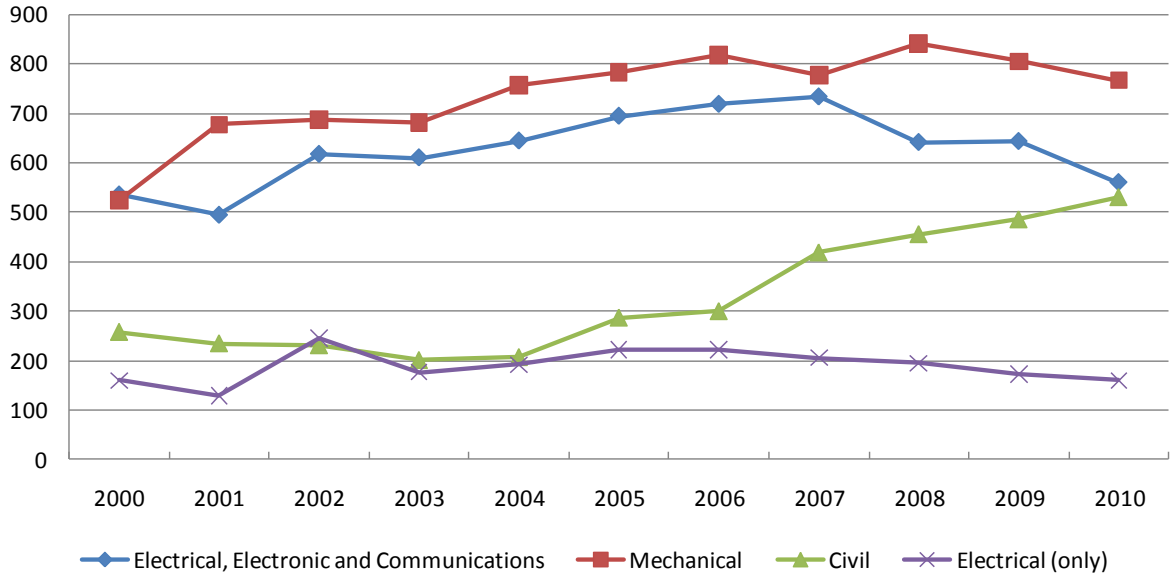
Exhibit A2.11
Undergraduate Degrees Awarded in Engineering Programs
Quebec



Source: Engineers Canada

Trends for apprenticeship programs, set out in Exhibit A2.12, show strong gains across the last decade for several skilled trades working in the electricity and renewable energy industry. Quebec does not offer the specialized trades training in key electricity sector occupations.

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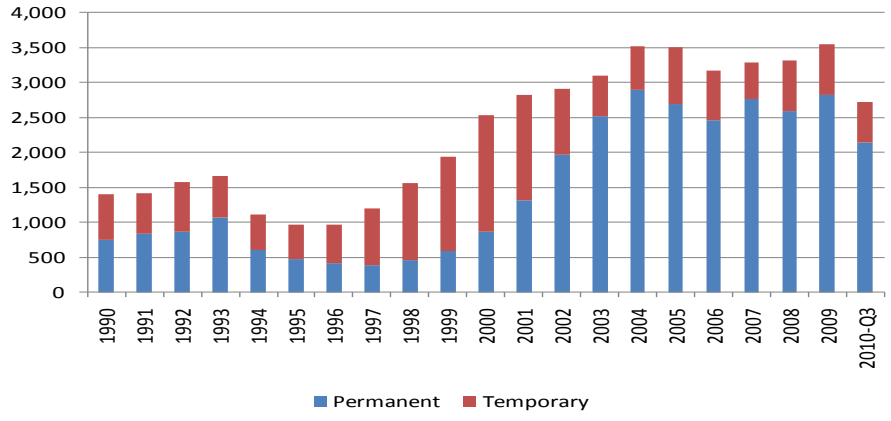
Exhibit A2.12
Apprenticeship Programs in Quebec

Quebec									
Engineering Programs	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
Construction Millwright and Industrial Mechanic (Millwright)									
Registrations	246	249	222	201	219	192	225	210	414
Completions	24	24	21	6	33	15	24	18	42
Electrician, Except Industrial and Power System									
Registrations	3798	3951	4182	4485	5037	5412	5763	5958	6252
Completions	417	378	378	375	450	429	510	543	660
Industrial Electrician									
Registrations	4884	5775	6738	7638	8211	8634	8799	9270	2973
Completions	159	312	291	231	237	324	345	339	48
Power Systems Electrician									
Registrations	0	0	0	0	0	0	0	0	0
Completions	0	0	0	0	0	0	0	0	0
Electrical Power Line and Cable Workers									
Registrations	0	0	0	0	0	0	0	0	0
Completions	0	0	0	0	0	0	0	0	0
Stationary Engineers and Auxiliary Equipment Operators									
Registrations	0	0	0	0	0	0	0	0	771
Completions	0	0	0	0	0	0	0	0	168
Total									
Registrations	8928	9975	11142	12324	13467	14238	14787	15438	10410
Completions	600	714	690	612	720	768	879	900	918

Source: Statistics Canada, Registered Apprenticeship Information System

Finally, immigration trends are set out for permanent immigrants and temporary foreign workers arriving in Quebec with jobs or intending to work in the electricity sector occupations. The largest group represented here are engineers. Immigration has been largely unchanged since 2005.

Exhibit A2.13
Immigrants Arriving in Quebec
Electricity Sector Occupations, 1990 to 2010



Source: Citizenship and Immigration Canada

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Occupations

Key findings for Quebec include:

- Retirements
  - Age profiles for the Quebec survey respondents are slightly older than the profile for other electricity sector employers across Canada
  - The average age at retirement for the Quebec workforce, 57, is notably lower than the national average
  - A high and rising proportion of the workforce is expected to retire
    - Over 4% of the respondents' workforce in Quebec retired in 2010 and this is well above the national experience for electricity sector employers
    - Respondents in Quebec report significant increases in projected retirements for 2012
  - Findings imply that record high levels of retirements are expected from 2011 to 2016 in Quebec.
    - Projected levels of retirement are above the average national experience with a notable, large peak in retirements of skilled trades in Quebec by 2016

- Workforce dynamics
  - Hiring rates and other measures of labour market dynamics show very tight markets
  - Quebec respondents report most measures of turnover, hiring and vacant positions well above levels reported for other electricity sector employers and
    - Respondents report no difficulty hiring, likely due to the dominant position of major employers in the provincial economy.
  - In terms of where Quebec respondents hire, the survey indicates
    - Very limited reliance on immigration
    - Significant variation across occupations with
      - Over 75% of many positions filled internally
      - Reliance on hiring from outside the industry for non-electrical engineers, engineering technicians and technologists, skilled trades and IT support
      - Reliance on hiring from the industry to fill electrical engineering, technician and skilled trades positions.

Assessing Future Labour Markets and Human Resources Management

A new labour market model projects market conditions from 2011 to 2016 to determine employment expansion demands. Expansion demands are related to expected investments and the growth in electricity demand. Replacement demands are driven by demographic trends and the employer survey estimates of expected retirements.

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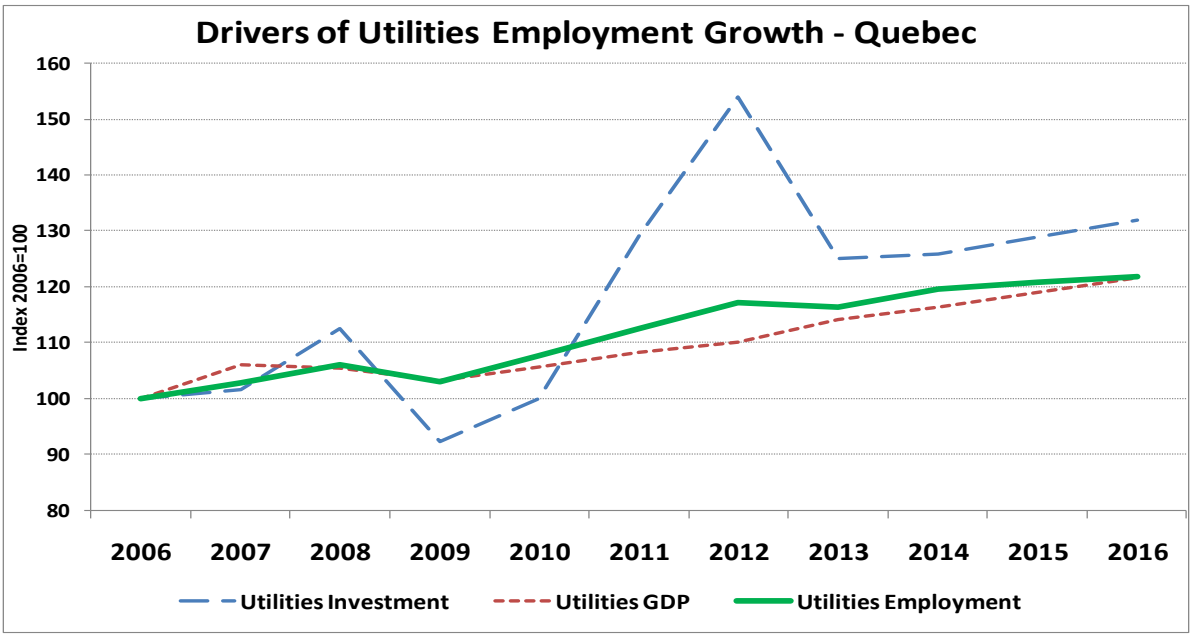
Labour Market Assessments

Electrical utility investments in Quebec have been growing steadily for many years and begin the projection period at a very high level. Investment and output slowed temporarily during the recession in 2009 but resumes expansion across the forecast period from 2011 to 2016. A construction surge is expected in 2012 as new projects begin and activity will remain well above current levels later in the forecast period.

Exhibit A2.14
Projections of Output, Investment and Employment
Quebec 2011 to 2016



Source: Centre for Spatial Economics, ESC Employer Survey 2011, Census 2006

This pattern of investment and electricity demand is used to calculate employment growth by occupation.

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Exhibit A2.15
Employment Growth by Occupation
Electricity Sector Occupations in Quebec

Occupations	2006	2010	2016	Employment 2011 to 2016 % Growth 2011 - 2016	Employment 2011 to 2016 Avg. annual growth rate
Engineering managers	66	68	79	16.3%	3.3%
Construction managers	73	75	87	16.3%	3.3%
Utilities managers	377	389	447	15.0%	3.0%
Financial auditors and accountants	343	357	394	10.4%	2.1%
Civil engineers	240	247	287	16.3%	3.3%
Mechanical engineers	293	302	351	16.3%	3.3%
Electrical and electronics engineers	1,606	1,652	1,922	16.3%	3.3%
Information systems analysts and consultants	853	880	1,080	22.7%	4.5%
Civil engineering technologists and technicians	375	387	445	15.0%	3.0%
Mechanical engineering technologists and technicians	148	152	175	15.0%	3.0%
Electrical and electronics engineering technologists and technicians	991	1,023	1,176	15.0%	3.0%
Contractors and supervisors, electrical trades and telecommunications occupations	602	619	721	16.3%	3.3%
Electricians (except industrial and power system)	71	73	85	16.3%	3.3%
Industrial electricians	107	110	128	16.3%	3.3%
Power system electricians	1,933	1,988	2,313	16.3%	3.3%
Electrical power line and cable workers	2,139	2,200	2,559	16.3%	3.3%
Stationary engineers and auxiliary equipment operators	138	143	162	13.5%	2.7%
Power systems and power station operators	957	988	1,135	15.0%	3.0%
Construction millwrights and industrial mechanics (except textile)	511	526	612	16.3%	3.3%
Electrical Occupations	11,822	12,178	14,157	16.3%	3.3%
Other Occupations	15,448	15,865	18,065	13.9%	2.8%
Total	27,270	28,042	32,222	14.9%	3.0%

Source: Centre for Spatial Economics, ESC Employer Survey 2011, Census 2006

Expansion demand

Exhibit A2.16 tracks labour requirements for retirements and death (replacement demands) relative to the projected labour force in Quebec. The proportion of the workforce expected to retire in each year from 2011 to 2016 has been set below levels implied by survey results. This reflects the findings from comparing the 2008 report to the 2011 update. Respondents correctly projected large increases in retirements but overestimated the extent of the increase. Retirement projections in the 2011 Update have been adjusted to reflect this experience.

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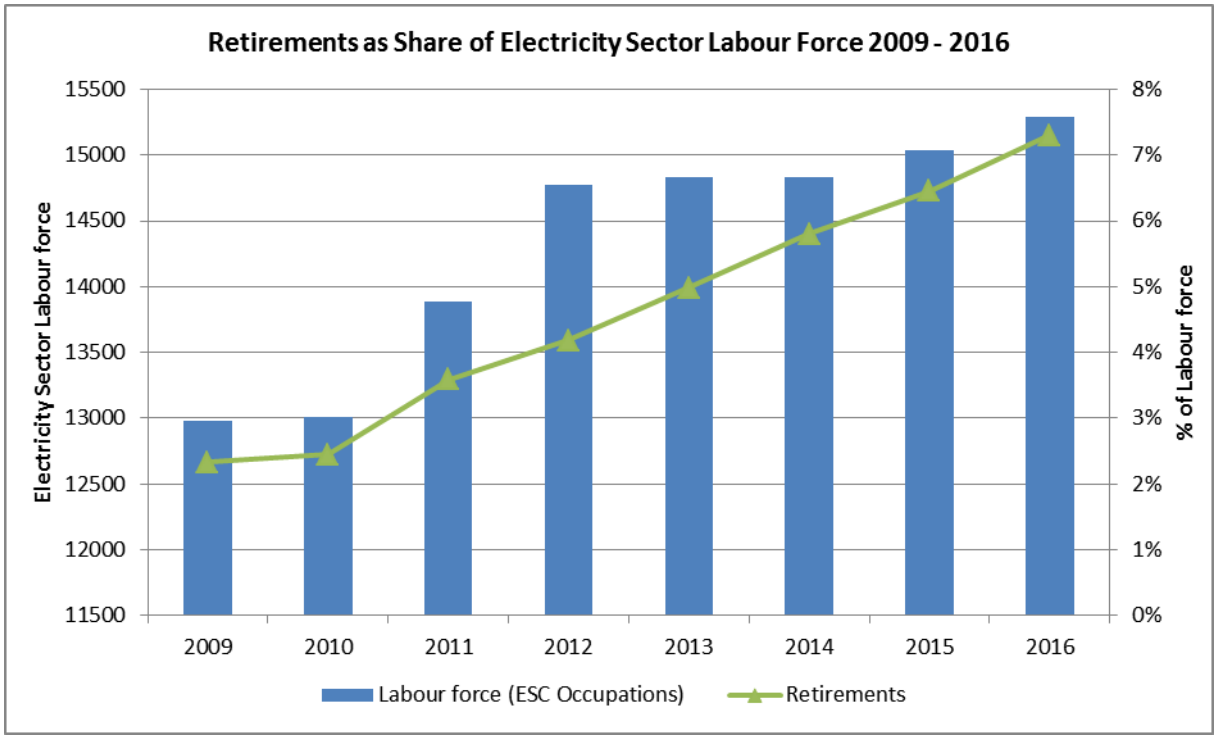
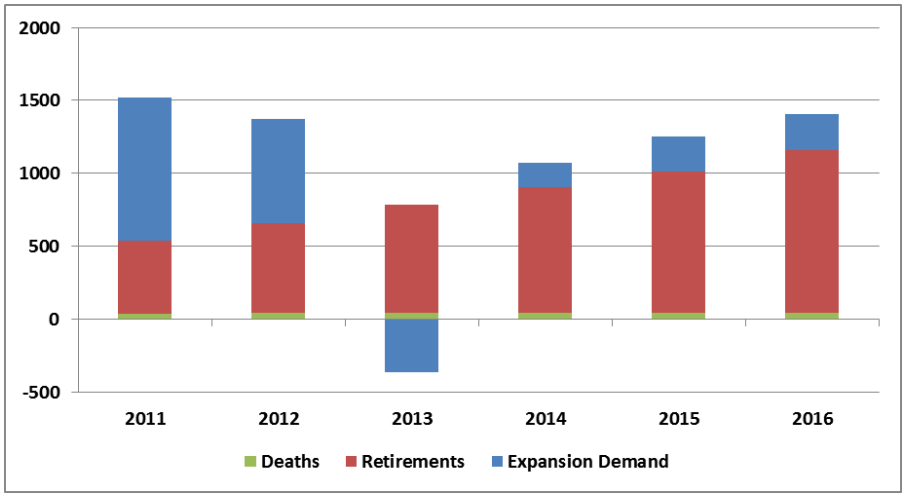
Exhibit A2.16
Retirement Projections for Electricity Sector Occupations



Source: Centre for Spatial Economics, ESC Employer Survey 2011, Census 2006

Exhibit A2.17 adds together replacement and expansion demands for the electricity sector workforce in Quebec.

Exhibit A2.17
Total Employment Requirements, Electricity Sector Occupations
Quebec, 2011 to 2016



Source: Centre for Spatial Economics, ESC Employer Survey 2011, Census 2006

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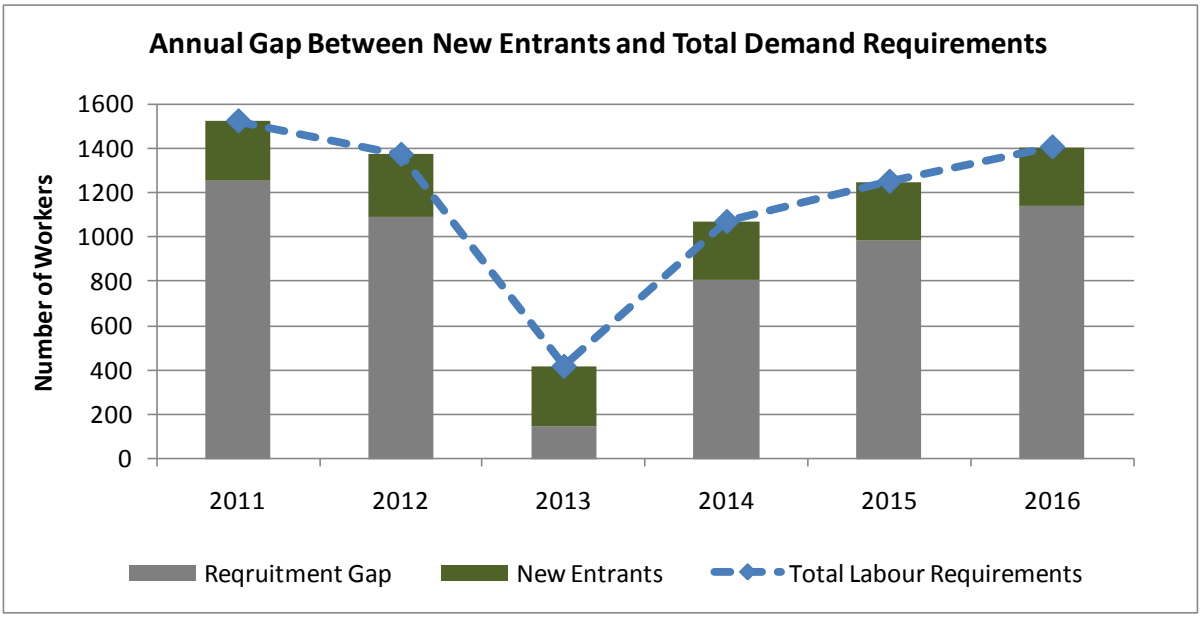
Finally, Exhibit A2.18 tracks the potential labour supply from new entrants and net hiring from outside the industry. There are not enough potential new entrants to meet the projected requirements and this implies tight labour markets across the projected period from 2011 to 2016.

Exhibit A2.18
New Entrants and Labour Requirements



Source: Centre for Spatial Economics, ESC Employer Survey 2011, Census 2006

Rankings

Labour Market rankings for each occupation are based on market measures of the supply–demand gap, the change in employment and the age profiles and retirements.

Labour Market Rankings Defined

Rankings & Description	
1	**Significant excess of supply over demand** No difficulty in recruiting qualified staff with 0-5 years or 5-10 years of Canadian experience at established compensation norms within the local labour market.
2	**Excess of supply over demand** No difficulty in recruiting qualified staff with 0-5 years or with 5-10 years of Canadian experience at established compensation norms within the local or regional labour market. The geographic range of recruiting and the range of acceptable qualifications is broader than in 1.

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3	**Moderate supply pressures** Difficulty in recruiting qualified staff with more than 5 years of Canadian experience, with industry or technology-specific skills, and with appropriate non-technical skills. The time required to fill these positions is typically longer than historic norms. Vacancies sometimes need to be re-posted. Employers actively solicit applications from outside the local and regional labour market and reimburse applicants for travel expenses related to interviews, etc. Recruiting engineering staff with 0-5 years of Canadian experience poses fewer challenges.
4	**Significant supply pressures** Difficulty across the board in recruiting qualified staff in the local and regional labour market. It is normal practice to actively solicit applications from outside the local and regional labour market and to reimburse applicants for travel expenses related to interviews. Employers are generally obliged to improve offered terms of compensation and to assist with re-location costs. Recruitment difficulties lead many employers to increase their use of third-party recruiters and to increase their use of contracting trades work, outsourcing of engineering and technology work to consultancies or staff the assignment with workers from another region. There is a significant increase in the risk of project delays and compensation-driven cost escalations.
5	**Supply constraints** Systemic difficulty in recruiting qualified staff. International recruiting is common among large employers. There is widespread perception that the contracting and consulting sector is working at full capacity and that there is little, if any, remaining scope to outsource construction, engineering and ICT work to qualified suppliers with a known track record.

Quebec labour markets for the electricity sector occupations are very tight in 2011 and 2012 as the investments in next generation projects increase. Electricity output regains pre recession peaks in 2012 and investments continue to grow at a slower pace. Gains in post secondary education and training programs and completions add to the workforce of certified labour after 2013 and some rankings ease off. Where age profiles are high and retirements are rising, rankings are high later in the projection period.

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Exhibit A2.19

Quebec Labour Market Rankings

Occupations	2010	2011	2012	2013	2014	2015	2016
Engineering managers	3	5	4	3	4	4	4
Construction managers	3	5	4	3	4	4	4
Utilities managers	3	4	4	3	4	4	4
Financial auditors and accountants	3	3	3	3	3	2	3
Civil engineers	3	5	4	2	3	3	4
Mechanical engineers	2	5	4	2	3	3	4
Electrical and electronics engineers	3	5	4	2	3	3	4
Information systems analysts and consultants	3	4	4	4	4	4	4
Civil engineering technologists and technicians	3	4	4	3	4	4	4
Mechanical engineering technologists and technicians	2	4	4	3	4	4	4
Electrical and electronics engineering technologists and technicians	3	4	4	3	4	4	4
Contractors and supervisors, electrical trades and telecommunications occupations	3	5	4	3	3	4	4
Electricians (except industrial and power system)	3	4	4	3	4	4	4
Industrial electricians	3	5	4	3	4	4	4
Power system electricians	3	5	4	3	4	4	4
Electrical power line and cable workers	3	5	4	3	3	4	4
Stationary engineers and auxiliary equipment operators	3	4	4	3	3	4	4
Power systems and power station operators	3	4	4	3	4	4	4
Construction millwrights and industrial mechanics (except textile)	3	5	4	2	3	3	4

Source: ESC Employer Survey 2011

Comments on Rankings for Quebec:

- Both structural (i.e. age profiles, retirement patterns) and cyclical (i.e. projected investments and internal dynamics for vacancies and hiring) measures show Quebec markets are tighter than in other provinces
- Labour requirements and hiring related to retirements will be concentrated in experienced and specialized workers – not new entries or recent grads
    - Rankings of 3 for some occupations may reflect the supply of junior applicants
    - Competition with other industries for some occupations will be intense
- Quebec survey respondents target recruiting internally, in the electrical industry or other industries. This source will be more limited during the 2011 to 2016 period.
- Immigration is an important source in other provinces but Quebec has not relied as much on this source. This may have to change.
- The build up in employment in 2011 raises rankings as work on new projects begins
- Projects included in the current investment surge include major hydro electric developments as well as wind farms and major additions to the distribution system.
- In Quebec both expansion and replacement demand continues to grow across the 2011 to 2016 projection period so that rankings rise later in the period as labour force growth slows
- Serious labour market and HR challenges are projected for Quebec. The special status of Hydro Quebec as a very high profile employer will attract many recruits and limit training, hiring and other challenges.

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Appendix A – 3 British Columbia

Introduction

This appendix provides selected findings from the 2011 Labour Market Information Study for British Columbia.

Key exhibits in the national text are reproduced here using British Columbia data. Notes and highlights have been added comparing these British Columbia results to the trends and conclusions reported for Canada. This Appendix summarizes the key findings in each of three areas:

- Transition from Legacy to Next Generation
- The Workforce Profile and Trends
- Assessing Future Labour Markets and Human Resources Management

Transition from Legacy to Next Generation

In British Columbia the transition from Legacy to Next Generation Infrastructure is characterized by several changes.

Exhibit A3.1
Legacy to Next Generation

Legacy		Next Generation
Twenty plus years of limited growth	→	Twenty years of rising investment
High concentration of capacity and workforce	→	Distributed generation of renewable capacity
Established support systems in post secondary programs, regulations	→	Deregulation, change to specialized, flexible training and certification
Stable, large scale operations	→	Large number of smaller new entrants
Long asset lives	→	Rapid replacement, high maintenance
Large employers, and a specialized, qualified, experienced workforce	→	Exit of experienced workforce; shortage of entrants with midlevel experience
Dominant, preferred employers in local labour markets	→	Intensifying competition in labour markets, post secondary programs

Source: ESC Employer Survey 2011

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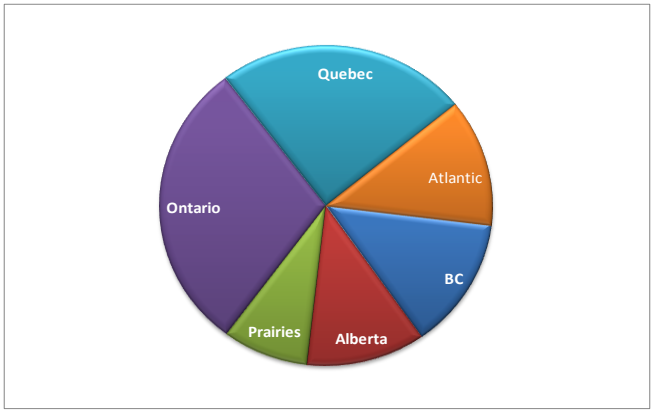
British Columbia findings focus on key occupations and:

- Past trends in investment and hiring that determine the Legacy infrastructure and workforce
- The current state of labour markets and the workforce
- The investments, demographic and output trends that drive employment from 2011 to 2016

The investments and related labour market impacts are distributed across the Provinces based on the current generating capacity. British Columbia is Canada's third largest market for electricity.

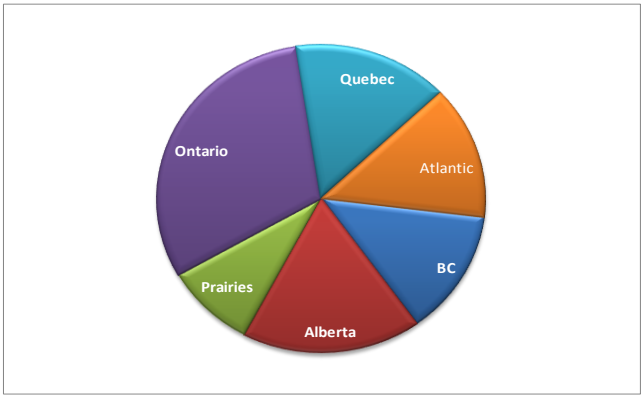
Exhibit A3.2
Provincial Distribution of Electricity Generating Capacity
Percent Distribution of MWs



Source: "Canada's Electricity Infrastructure: Building a Case for Investment" Conference Board of Canada, April 2011

The investments in the next generation facilities that will change British Columbia's system will be proportional to its current share in the national capacity.

Exhibit A3.3
Provincial Distribution of New Investment in Electricity Generating Capacity
Percent Distribution of New Investment, MWs



Source: "Canada's Electricity Infrastructure: Building a Case for Investment" Conference Board of Canada, April 2011

British Columbia's current generating systems are concentrated in large hydro facilities.

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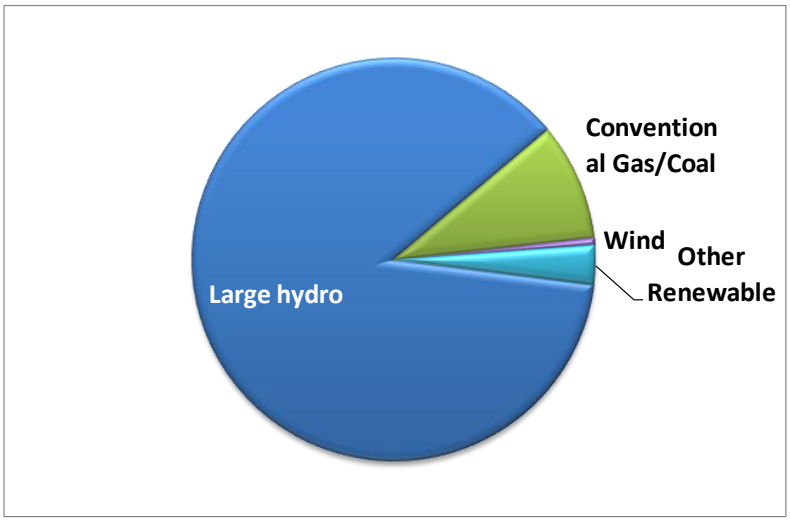
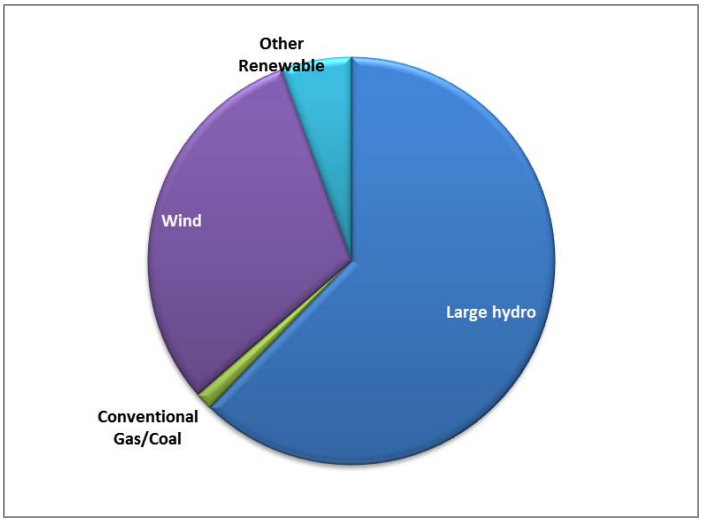
Exhibit A3.4
Existing Electrical Capacity by Type, British Columbia
MWs



Source: "Canada's Electricity Infrastructure: Building a Case for Investment" Conference Board of Canada, April 2011

Investment plans for the British Columbia system are skewed towards new wind generation and large hydro systems.

Exhibit A3.5
Investment in New Electrical Generating Capacity, British Columbia
MWs



Source: "Canada's Electricity Infrastructure: Building a Case for Investment" Conference Board of Canada, April 2011

The investment plans for British Columbia are concentrated on the generation systems.

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Exhibit A3.6

Investment in British Columbia Electricity Infrastructure 2010 to 2030, by Type

Sector	2010 $ Billions
Generation	19.4
Transmission	4.3
Distribution	4.1
Total	27.8

Source: "Canada's Electricity Infrastructure: Building a Case for Investment" Conference Board of Canada, April 2011

Workforce Profiles and Trends

This section reviews British Columbia data for the workforce and occupation profiles and related trends.

Workforce Profile

The 2006 Statistics Canada Census reported that there were 6,285 people working in the Electricity and Renewable Energy industry in British Columbia, 3,053 of these were in the core electricity sector occupations. By 2010 total industry employment had grown by 21.0% to 7,756.

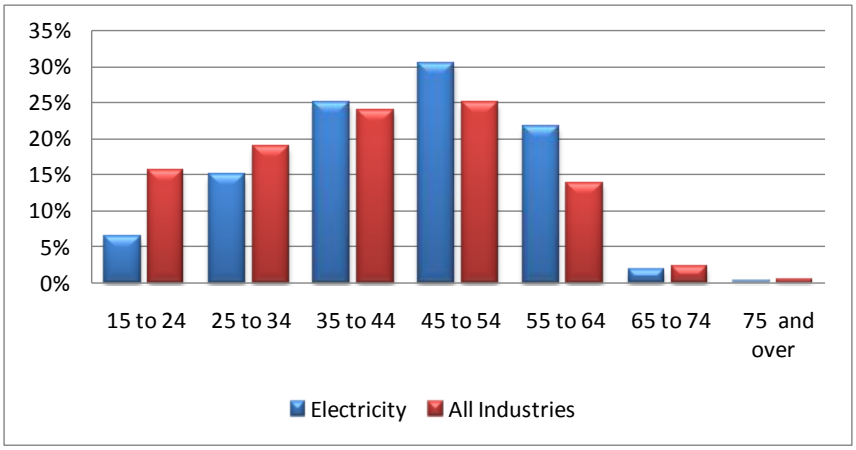
The age profile of the industry workforce is similar to the other provinces with the distinctive peak for the younger boomers age 45 to 54 and the associated, smaller proportion of the Gen X workforce age 35 to 44. The proportion of the workforce aged 55 to 64 is higher than other provinces and anticipates a higher level of retirements. This profile is a consequence of the loss of employment and limited hiring during the 1990s.

Exhibit A3.7

Age Distribution of the Workforce

Electricity and Renewable Energy Providers, All Industries

British Columbia, 2006



Source: Statistics Canada, 2006 Census

The British Columbia workforce has the same higher education profile with a higher than average concentration of skilled trades and apprentices, technicians and technologists from the colleges and

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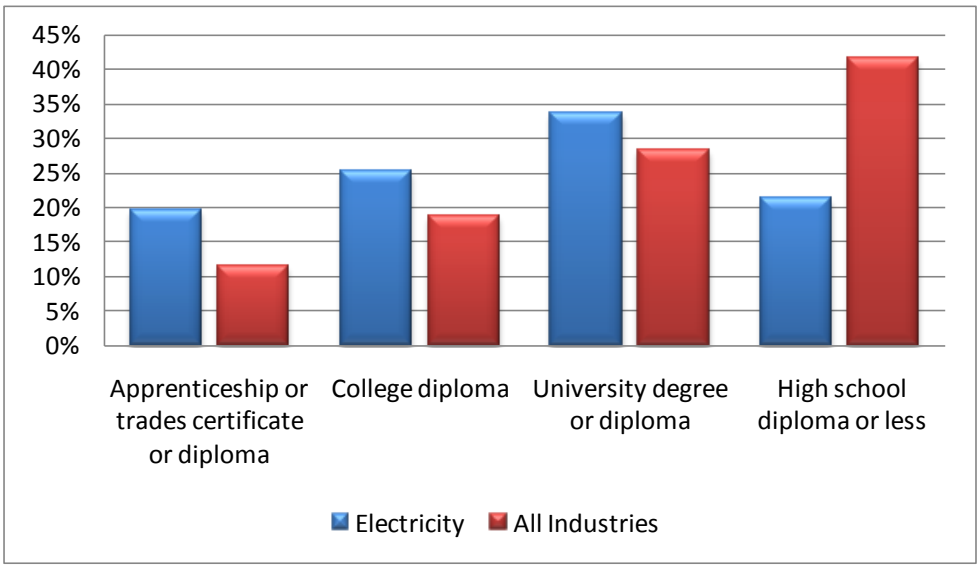
engineers from the universities. Most of the workforce is older workers who graduated from post secondary programs over twenty years ago.

Exhibit A3.8
Higher Education Achievement
Electricity and Renewable Energy Providers, All Industries
British Columbia, 2006



Source: Statistics Canada, 2006 Census

The British Columbia workforce is more concentrated in the natural and applied sciences (engineering), trades and technical occupations than other provinces.

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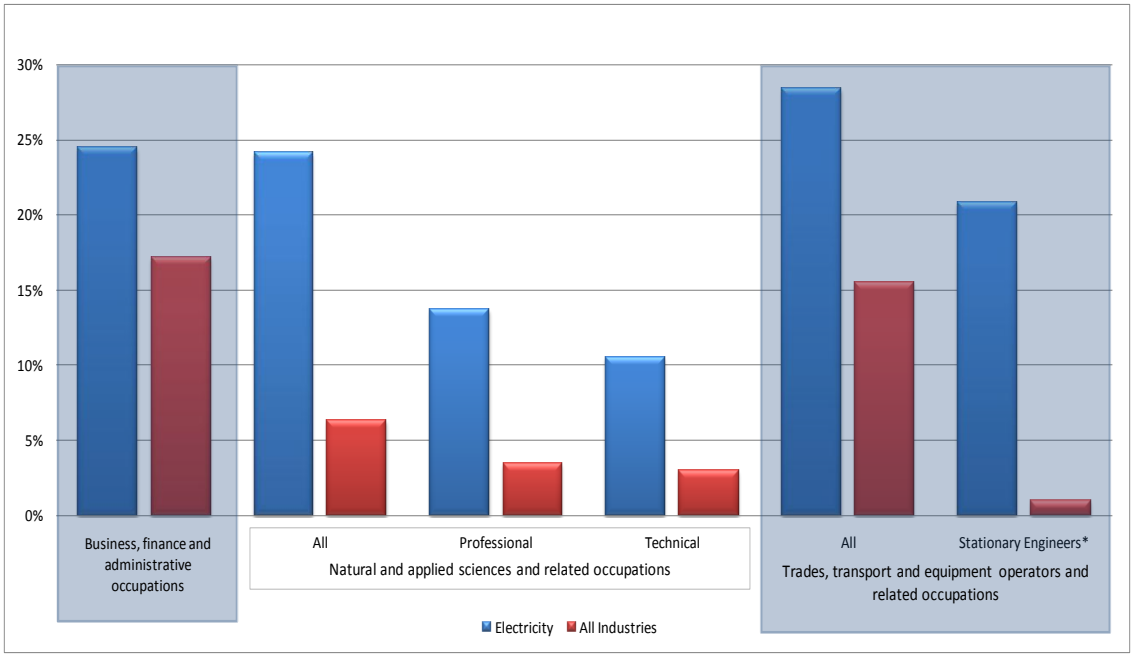
Exhibit A3.9
Distribution of the Workforce by Occupation
Electricity and Renewable Energy Providers, All Industry
British Columbia, 2006



*Includes: Stationary engineers, power station operators and electrical trades and telecommunications occupations
Source: Statistics Canada, 2006 Census

Women are a smaller proportion of the workforce than men, but British Columbia has a marginally higher proportion of women in the electricity industry compared to other provinces. This is typical of the gender composition of the key occupations.

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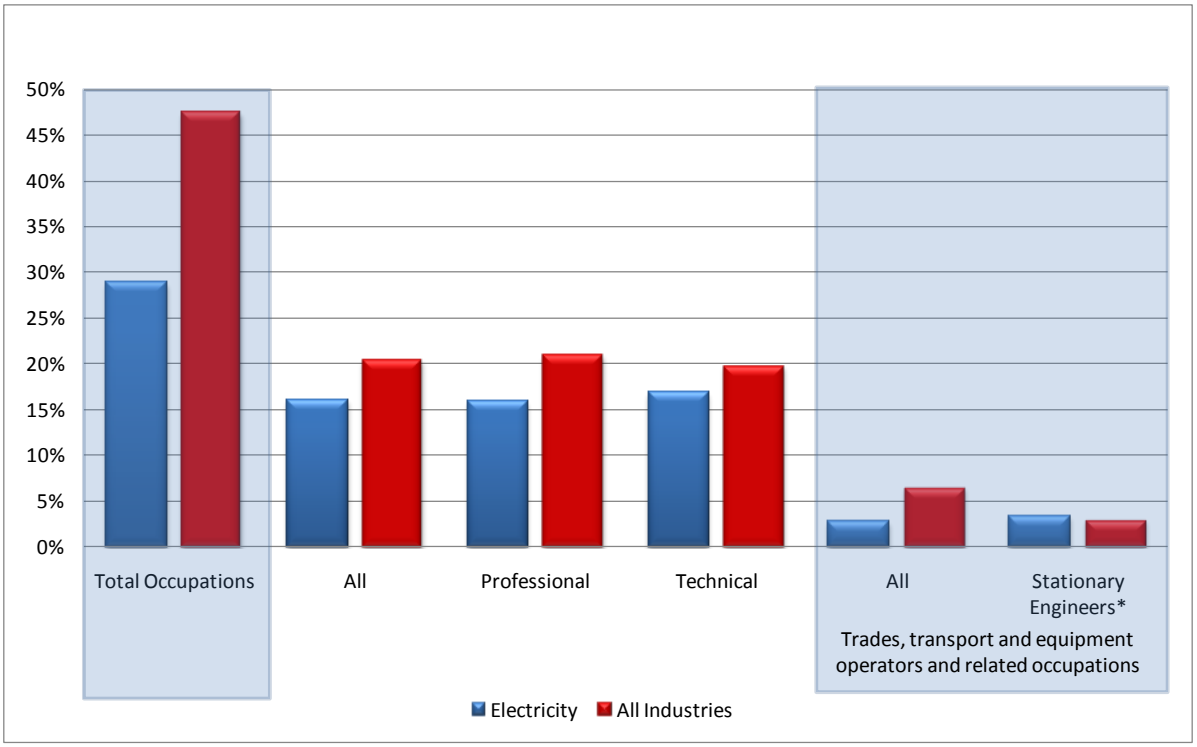
Exhibit A3.10
Distribution of the Workforce by Gender
Electricity and Renewable Energy Providers, All Industries
Percentage of Women in the Workforce, British Columbia, 2006



Source: Statistics Canada, 2006 Census

Like the national workforce, the British Columbia electricity sector workforce also has notably fewer immigrants than other industries. This is another consequence of the history of hiring Canadians in the 70's and 80's and employment losses and limited additions during the 1990s when immigration was rising.

Post Secondary Education and Immigration

There are two principal sources of labour supply: graduates from post secondary training programs and immigration. This section reviews recent trends for the Electricity sector occupations.

British Columbia shares national trends in post secondary education and training that impact the supply of new workers in the key applied sciences and technical occupations.

Engineering programs in British Columbia feature gains for civil and mechanical but weaker trends in enrolments and degrees awarded for electrical engineers.

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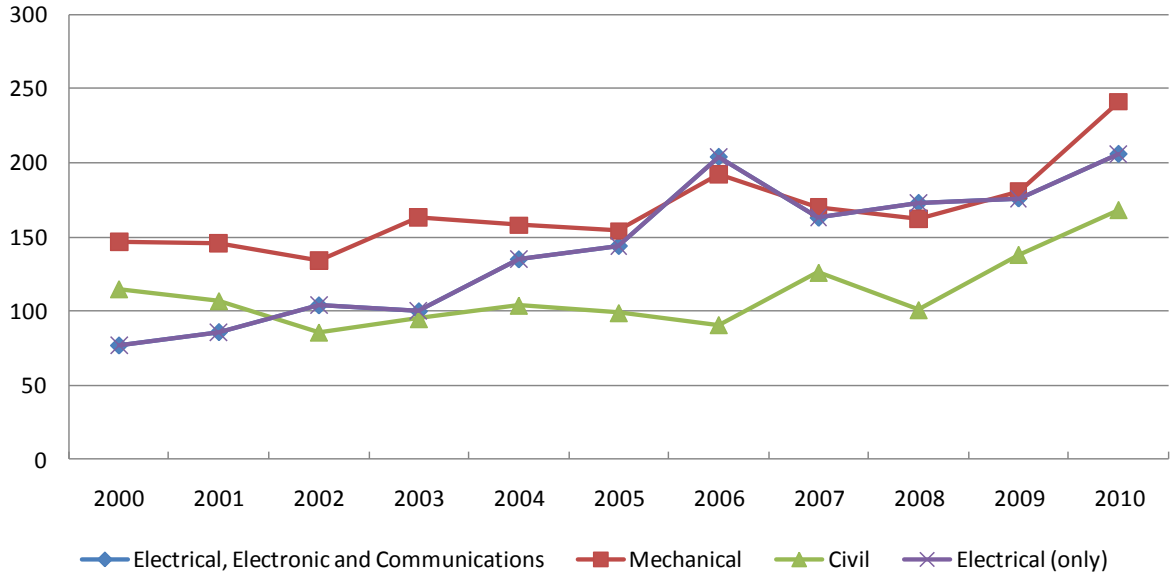
Exhibit A3.11
Undergraduate Degrees Awarded in Engineering Programs
British Columbia



Source: Engineers Canada

Trends for apprenticeship programs, set out in Exhibit A3.12, show strong gains across the last decade for several skilled trades working in the electricity and renewable energy industry. British Columbia apprenticeship programs have expanded during the past decade, adding new registrations but completions – and the emerging number of journeypersons – have increased more slowly.

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Exhibit A3.12

Apprenticeship Programs in British Columbia

British Columbia									
Engineering Programs	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
Construction Millwright and Industrial Mechanic (Millwright)									
Registrations	804	801	780	789	870	1044	1302	1449	1422
Completions	168	150	135	126	138	123	126	141	186
Electrician, Except Industrial and Power System									
Registrations	2676	2871	3048	3273	4041	5040	6321	7680	8325
Completions	375	321	321	297	270	375	321	528	669
Industrial Electrician									
Registrations	0	0	0	0	0	0	0	90	132
Completions	0	0	0	0	0	0	0	0	0
Power Systems Electrician									
Registrations	0	0	0	0	0	0	0	0	0
Completions	0	0	0	0	0	0	0	0	0
Electrical Power Line and Cable Workers									
Registrations	75	96	117	150	159	189	207	255	291
Completions	12	9	12	21	27	36	24	45	51
Stationary Engineers and Auxiliary Equipment Operators									
Registrations	0	0	0	0	0	0	0	0	0
Completions	0	0	0	0	0	0	0	0	0
Total									
Registrations	3555	3768	3945	4212	5070	6273	7830	9474	10170
Completions	555	480	468	444	435	534	471	714	906

Source: Statistics Canada, Registered Apprenticeship Information System

Finally, immigration trends are set out for permanent immigrants and temporary foreign workers arriving in British Columbia with jobs or intending to work in the Electricity sector occupations. The largest group represented here are engineers. Immigration has been on a downward trend since 2005.

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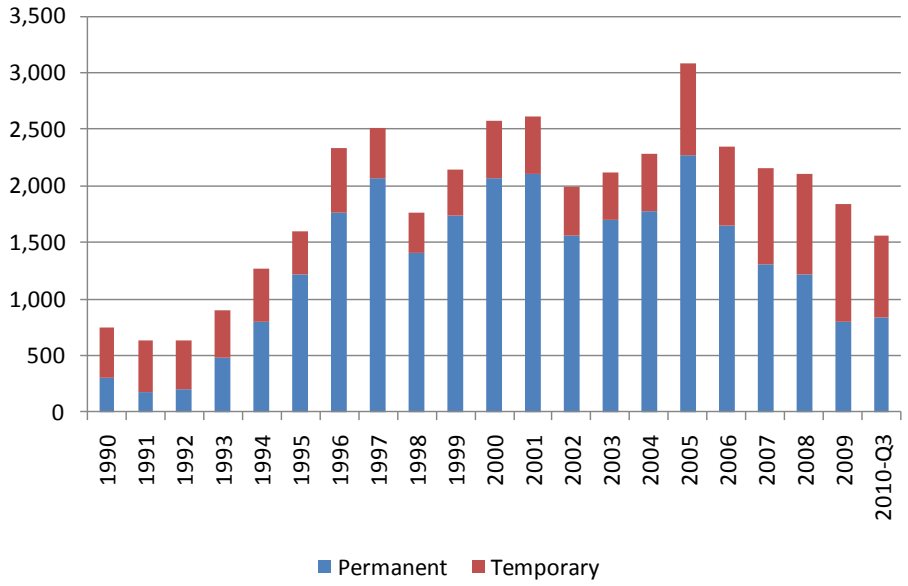
Exhibit A3.13
Immigrants Arriving in British Columbia
Electricity Sector Occupations, 1990 to 2010



Source: Citizenship and Immigration Canada

Occupations

Key findings for British Columbia in the employer survey include:

- Retirements
  - Age profiles for the British Columbia survey respondents are slightly older than the profile for other Electricity sector employers across Canada
  - The average age at retirement for the British Columbia workforce is similar to the national average
  - Detailed data on retirement patterns is not available for British Columbia

- Workforce dynamics
  - Limited BC data on hiring rates and other measures of labour market dynamics show tight markets, similar to other provincial markets

Assessing Future Labour Markets and Human Resources Management

A new labour market model projects market conditions from 2011 to 2016 to determine employment expansion demands. Expansion demands are related to expected investments and the growth in electricity demand. Replacement demands are driven by demographic trends and the employer survey estimates of expected retirements.

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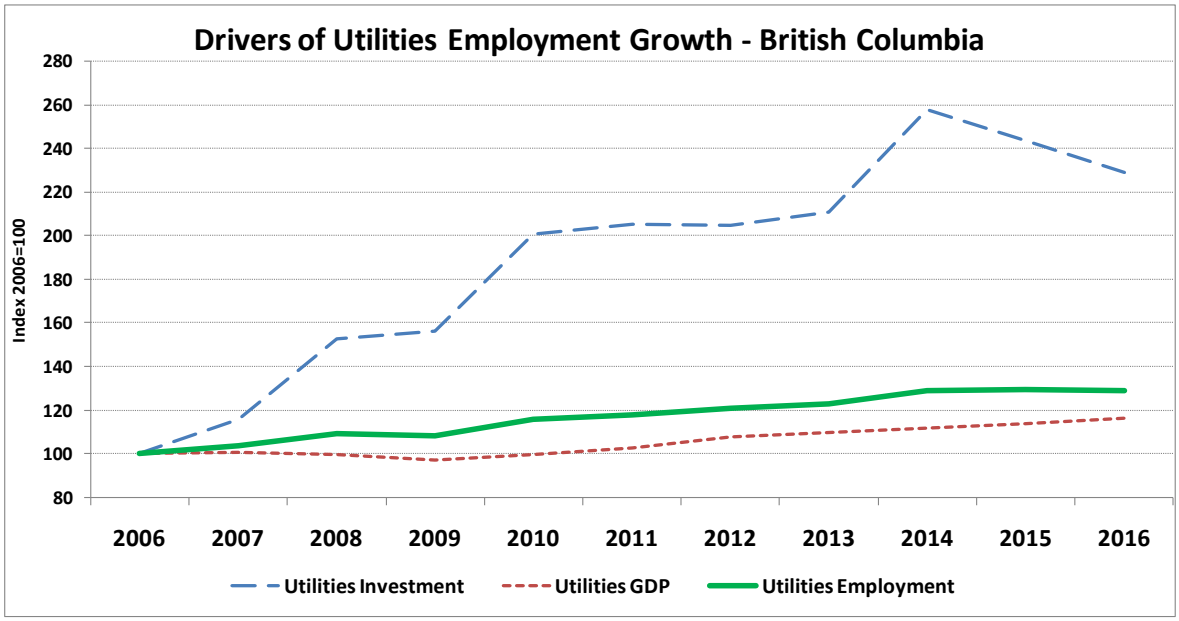
Labour Market Assessments

Electrical utility investments in British Columbia are expected to expand more than in other provinces. Output slowed temporarily during the recession in 2009 but resumes expansion across the forecast period from 2011 to 2016. Construction activity is running at almost twice historical levels as new projects began in the past three years and activity will surge to even higher levels later in the forecast period.

Exhibit A3.14
Projections of Output, Investment and Employment
British Columbia 2011 to 2016



Source: Centre for Spatial Economics, ESC Employer Survey 2011, Census 2006

This pattern of investment and electricity demand is used to calculate employment growth by occupation.

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Exhibit A3.15
Employment Growth by Occupation
Electricity Sector Occupations in British Columbia

Occupations	2006	2010	2016	Employment 2011 to 2016	
				% Growth 2011 - 2016	Avg. annual growth rate
Engineering managers	56	69	77	11.3%	2.3%
Construction managers	34	42	47	11.3%	2.3%
Utilities managers	438	513	571	11.4%	2.3%
Financial auditors and accountants	64	63	71	11.5%	2.3%
Civil engineers	52	64	72	11.3%	2.3%
Mechanical engineers	223	275	306	11.3%	2.3%
Electrical and electronics engineers	384	474	528	11.3%	2.3%
Information systems analysts and consultants	72	84	98	17.1%	3.4%
Civil engineering technologists and technicians	23	27	30	11.4%	2.3%
Mechanical engineering technologists and technicians	21	25	28	11.4%	2.3%
Electrical and electronics engineering technologists and technicians	338	396	441	11.4%	2.3%
Contractors and supervisors, electrical trades and telecommunications occupations	55	67	75	11.3%	2.3%
Electricians (except industrial and power system)	19	24	26	11.3%	2.3%
Industrial electricians	43	53	59	11.3%	2.3%
Power system electricians	322	397	442	11.3%	2.3%
Electrical power line and cable workers	587	724	806	11.3%	2.3%
Stationary engineers and auxiliary equipment operators	11	12	14	11.5%	2.3%
Power systems and power station operators	208	244	271	11.4%	2.3%
Construction millwrights and industrial mechanics (except textile)	103	127	142	11.3%	2.3%
Electrical Occupations	3,053	3,683	4,104	11.4%	2.3%
Other Occupations	3,232	4,074	4,526	11.1%	2.2%
Total	6,285	7,756	8,630	11.3%	2.3%

Source: Centre for Spatial Economics, ESC Employer Survey 2011, Census 2006

Expansion demand

ExhibitA3.16 tracks labour requirements for retirements and death (replacement demands) relative to the projected labour force in British Columbia. The proportion of the workforce expected to retire in each year from 2011 to 2016 has been set below levels implied by survey results. This reflects the findings from comparing the 2008 report to the 2011 update. Respondents correctly projected large increases in retirements but overestimated the extent of the increase. Retirement projections in the 2011 Update have been adjusted to reflect this experience.

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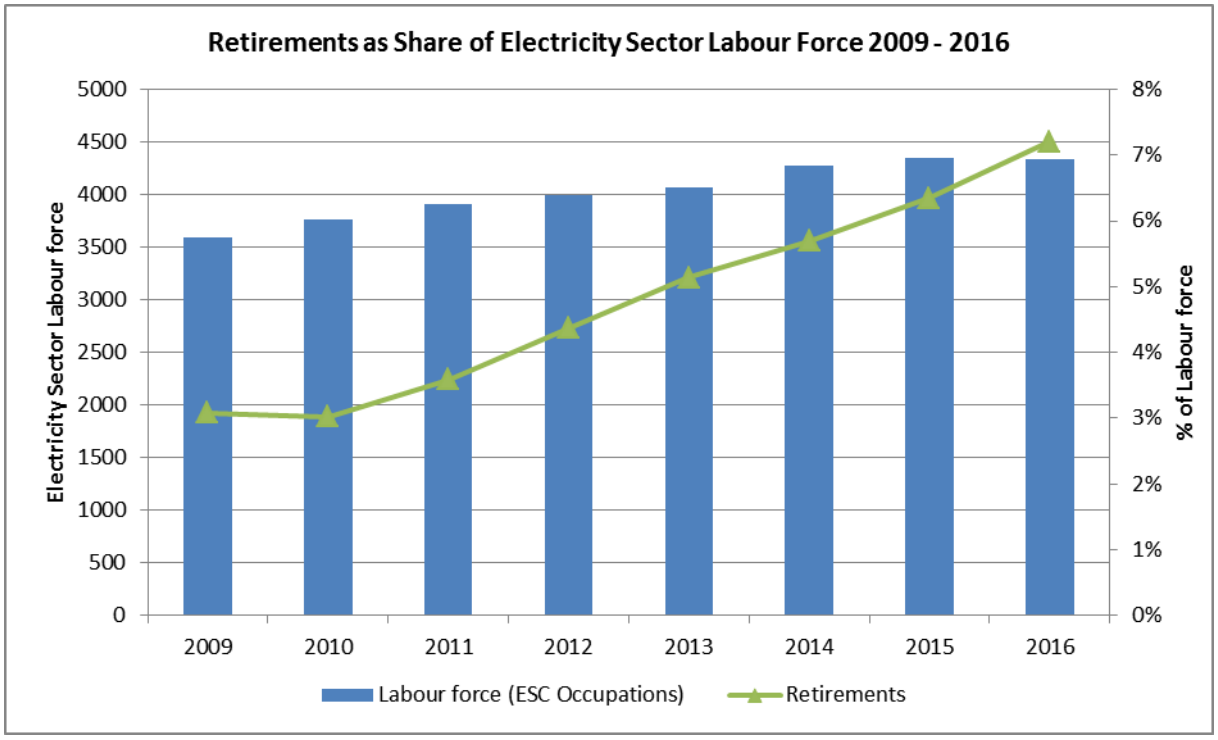
Exhibit A3.16
Retirement Projections for Electricity Sector Occupations



Source: Centre for Spatial Economics, ESC Employer Survey 2011, Census 2006

Exhibit A3.17 adds together replacement and expansion demands for the Electricity sector workforce in British Columbia.

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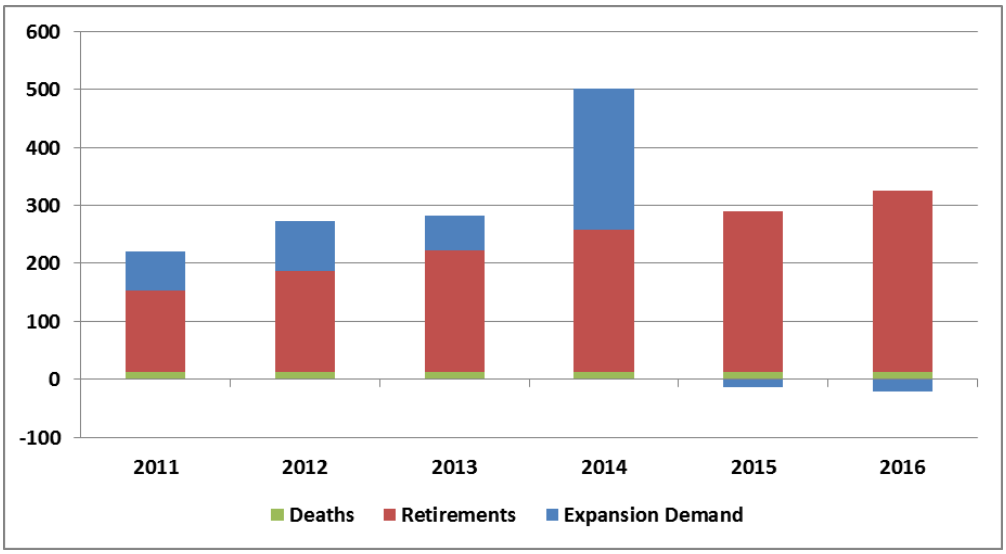
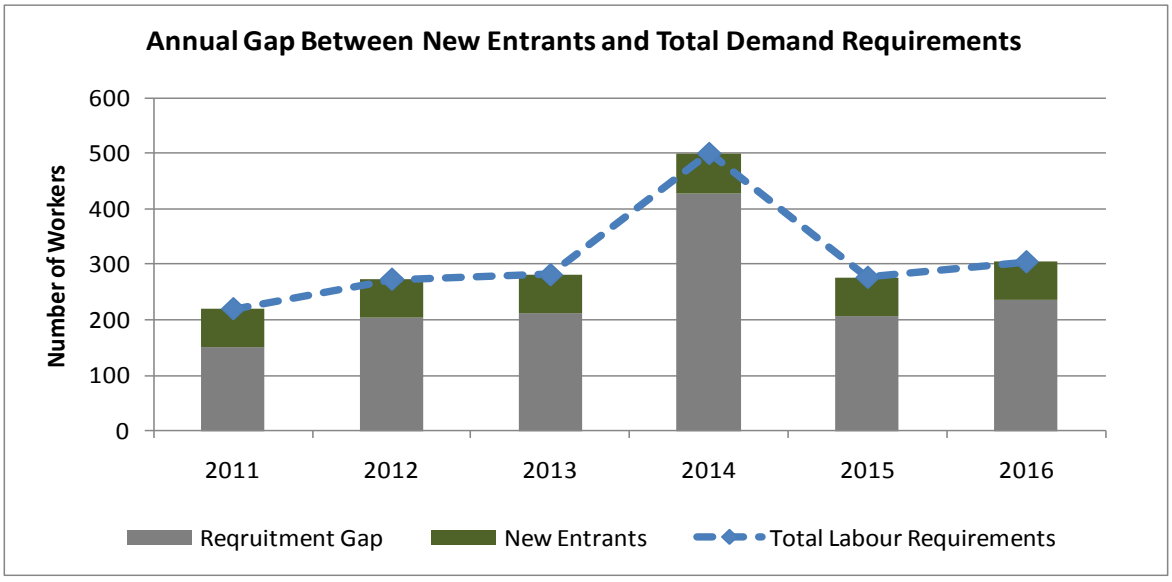
Exhibit A3.17
Total Employment Requirements, Electricity Sector Occupations
British Columbia, 2011 to 2016



Source: Centre for Spatial Economics, ESC Employer Survey 2011, Census 2006

Finally Exhibit A3.18 tracks the potential labour supply from new entrants and net hiring from outside the industry. There are not enough potential new entrants to meet the projected requirements and this implies tight labour markets across the projected period from 2011 to 2016.

Exhibit A3.18
New Entrants and Labour Requirements



Source: Centre for Spatial Economics, ESC Employer Survey 2011, Census 2006

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Rankings

Labour Market rankings for each occupation are based on market measures of the supply–demand gap, the change in employment and the age profiles and retirements.

Labour Market Rankings Defined

Rankings & Description	
1	**Significant excess of supply over demand** No difficulty in recruiting qualified staff with 0-5 years or 5-10 years of Canadian experience at established compensation norms within the local labour market.
2	**Excess of supply over demand** No difficulty in recruiting qualified staff with 0-5 years or with 5-10 years of Canadian experience at established compensation norms within the local or regional labour market. The geographic range of recruiting and the range of acceptable qualifications is broader than in 1.
3	**Moderate supply pressures** Difficulty in recruiting qualified staff with more than 5 years of Canadian experience, with industry or technology-specific skills, and with appropriate non-technical skills. The time required to fill these positions is typically longer than historic norms. Vacancies sometimes need to be re-posted. Employers actively solicit applications from outside the local and regional labour market and reimburse applicants for travel expenses related to interviews, etc. Recruiting engineering staff with 0-5 years of Canadian experience poses fewer challenges.
4	**Significant supply pressures** Difficulty across the board in recruiting qualified staff in the local and regional labour market. It is normal practice to actively solicit applications from outside the local and regional labour market and to reimburse applicants for travel expenses related to interviews. Employers are generally obliged to improve offered terms of compensation and to assist with re-location costs. Recruitment difficulties lead many employers to increase their use of third-party recruiters and to increase their use of contracting trades work, outsourcing of engineering and technology work to consultancies or staff the assignment with workers from another region. There is a significant increase in the risk of project delays and compensation-driven cost escalations.
5	**Supply constraints** Systemic difficulty in recruiting qualified staff. International recruiting is common among large employers. There is widespread perception that the contracting and consulting sector is working at full capacity and that there is little, if any, remaining scope to outsource construction, engineering and ICT work to qualified suppliers with a known track record.

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British Columbia labour markets for the Electricity sector occupations are very tight from 2010 to 2014 as the investments in next generation projects increase. Major projects reach peak employment and begin to ramp down in 2015 and 2016. Electricity output regains pre-recession peaks in 2012 and investment activity holds at a high level until another surge as a major project begins in 2014.

Gains in post secondary education and training programs and completions add to the workforce of certified labour after 2013 but the added workers are not sufficient to meet demand. The provincial workforce is not large enough to accommodate the planned investment until activity passes the 2014 peak. Where age profiles are average and retirements are rising, rankings are high later in the projection period.

Exhibit A3.19

British Columbia Labour Market Rankings

Occupations	2010	2011	2012	2013	2014	2015	2016
Engineering managers	5	4	4	4	4	3	3
Construction managers	5	4	4	4	4	3	3
Utilities managers	4	4	4	4	4	3	3
Financial auditors and accountants	3	3	4	3	3	3	3
Civil engineers	5	4	3	3	4	3	3
Mechanical engineers	5	3	3	3	4	3	3
Electrical and electronics engineers	5	4	4	4	4	3	3
Information systems analysts and consultants	4	4	4	4	4	4	4
Civil engineering technologists and technicians	4	4	4	4	4	3	3
Mechanical engineering technologists and technicians	4	4	4	4	4	3	3
Electrical and electronics engineering technologists and technicians	4	4	4	4	4	3	3
Contractors and supervisors, electrical trades and telecommunications occupations	5	4	4	4	4	3	3
Electricians (except industrial and power system)	5	4	4	4	4	3	3
Industrial electricians	5	4	4	4	4	4	4
Power system electricians	5	4	4	4	4	4	4
Electrical power line and cable workers	5	4	3	3	4	3	3
Stationary engineers and auxiliary equipment operators	4	4	4	4	4	4	4
Power systems and power station operators	4	4	4	4	4	3	3
Construction millwrights and industrial mechanics (except textile)	5	4	4	4	4	3	3

Source: ESC Employer Survey 2011

Comments on Rankings for British Columbia:

- The BC labour force for both the core electricity sector and next generation is not large enough to accommodate the new projects that began in 2010 and continue to hire workers until 2014.
- Structural (i.e. age profile) and cyclical (i.e. projected investments and internal dynamics for vacancies and hiring) measures anticipate that British Columbia markets are tighter than in other provinces
- Labour requirements and hiring related to retirements will be concentrated in experienced and specialized workers – not new entries or recent grads, and
    - Rankings of 3 for some occupations may reflect the supply of junior applicants
    - Competition with other industries for some occupations will be intense

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- Immigration will continue to be an important source of labour in British Columbia.
- Serious labour market and HR challenges are projected for British Columbia
    - The special status of British Columbia Hydro as a very high profile employer will attract many recruits and limit the training, hiring and other challenges.

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Appendix A – 4 Alberta

Introduction

This appendix provides selected findings from the 2011 Labour Market Information Study for Alberta.

Key exhibits in the national text are reproduced here using Alberta data. Notes and highlights have been added comparing these Alberta results to the trends and conclusions reported for Canada. This Appendix summarizes the key findings in each of three areas:

- Transition from Legacy to Next Generation
- The Workforce Profile and Trends
- Assessing Future Labour Market and Human Resources Management

Transition from Legacy to Next Generation

In Alberta the transition from Legacy to Next Generation Infrastructure is characterized by several changes.

Exhibit A4.1
Legacy to Next Generation

Legacy		Next Generation
Twenty plus years of limited growth	→	Twenty years of rising investment
High concentration of capacity and workforce	→	Distributed generation of renewable capacity
Established support systems in post secondary programs, regulations	→	Deregulation, change to specialized, flexible training and certification
Stable, large scale operations	→	Large number of smaller new entrants
Long asset lives	→	Rapid replacement, high maintenance
Large employers, and a specialized, qualified, experienced workforce	→	Exit of experienced workforce; shortage of entrants with midlevel experience
Dominant, preferred employers in local labour markets	→	Intensifying competition in labour markets, post secondary programs

Source: ESC Employer Survey 2011

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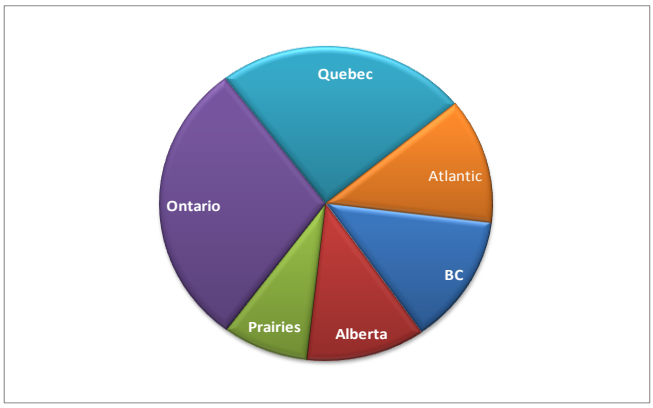
Alberta findings focus on key occupations and:

- Past trends in investment and hiring that determine the Legacy infrastructure and workforce,
- The current state of labour markets and the workforce, and
- The investments, demographics and output trends that drive employment from 2011 to 2016.

The investments and related labour market impacts are distributed across the Provinces based on the current generating capacity. Alberta has Canada's fourth largest provincial electricity generating capacity.

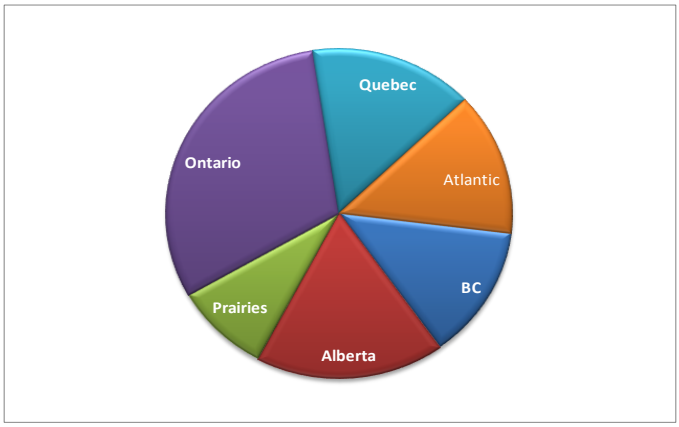
Exhibit A4.2
Provincial Distribution of Electricity Generating Capacity
Percent Distribution of MWs



Source: "Canada's Electricity Infrastructure: Building a Case for Investment" Conference Board of Canada, April 2011

The investments in the next generation facilities that will change Alberta's system will be more than proportional to its current share in the national capacity.

Exhibit A4.3
Provincial Distribution of New Investment in Electricity Generating Capacity
Percent Distribution of New Investment, MWs



Source: "Canada's Electricity Infrastructure: Building a Case for Investment" Conference Board of Canada, April 2011

Alberta's current generating systems are concentrated in conventional coal and gas facilities.

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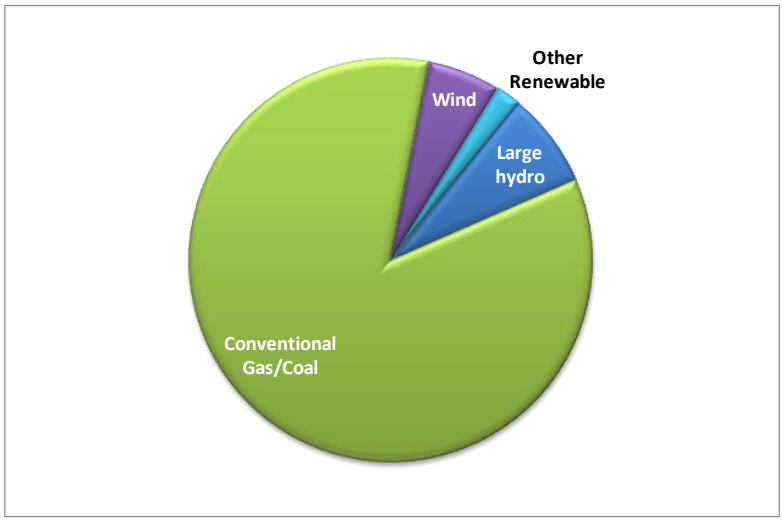
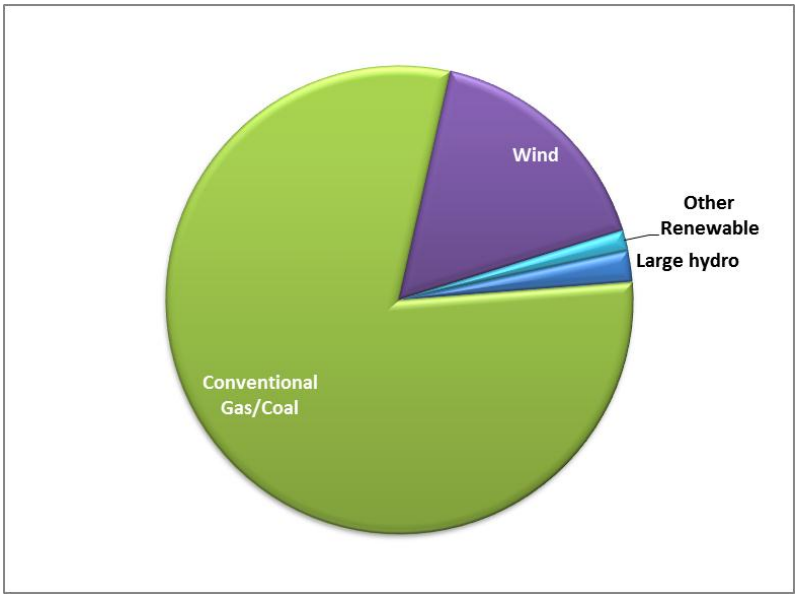
Exhibit A4.4
Existing Electrical Capacity by Type, Alberta
MWs



Source: "Canada's Electricity Infrastructure: Building a Case for Investment" Conference Board of Canada, April 2011

Investment plans for the Alberta system are skewed towards new wind generation and conventional coal and gas systems.

Exhibit A4.5
Investment in New Electrical Generating Capacity, Alberta
MWs



Source: "Canada's Electricity Infrastructure: Building a Case for Investment" Conference Board of Canada, April 2011

The investment plans for Alberta are concentrated on the generation systems.

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Exhibit A4.6
Investment in Alberta Electricity Infrastructure 2010 to 2030, by Type

Sector	2010 $ Billions
Generation	44.0
Transmission	16.7
Distribution	10.8
Total	71.4

Source: "Canada's Electricity Infrastructure: Building a Case for Investment" Conference Board of Canada, April 2011

Workforce Profiles and Trends

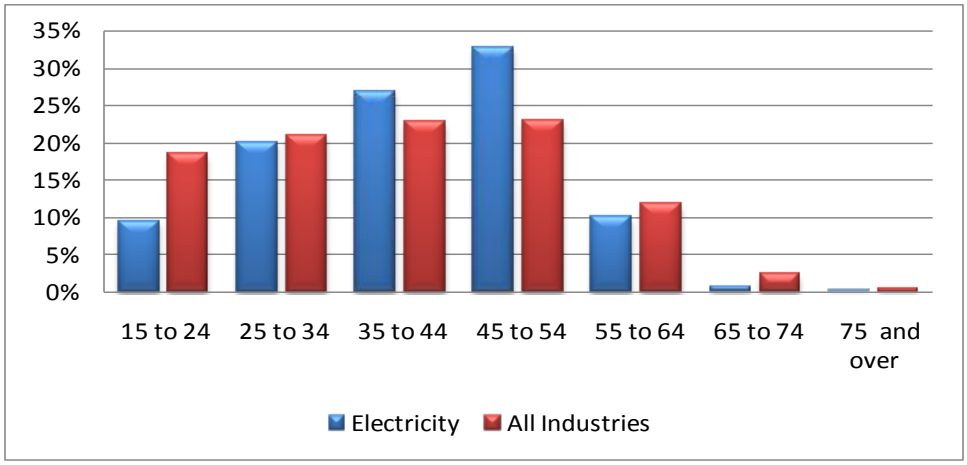
This section reviews Alberta data for the workforce and occupation profiles and related trends.

Workforce Profile

The 2006 Statistics Canada Census reported that there were 9,380 people working in the Electricity and Renewable Energy industry in Alberta, 4,761 of these were in the core Electricity Sector Occupations. By 2010 total industry employment had grown by 26.0% to 12,860.

The age profile of the industry workforce is younger to the other provinces but retains the distinctive peak for the younger boomers age 45 to 54 and the associated, smaller proportion of the Gen X workforce age 35 to 44. The proportion of the workforce aged 55 to 64 is higher than other provinces and anticipates a higher level of retirements. This profile is a consequence of the loss of employment and limited hiring during the 1990s.

Exhibit A4.7
Age Distribution of the Workforce
Electricity and Renewable Energy Providers, All Industries
Alberta, 2006



Source: Statistics Canada, 2006 Census

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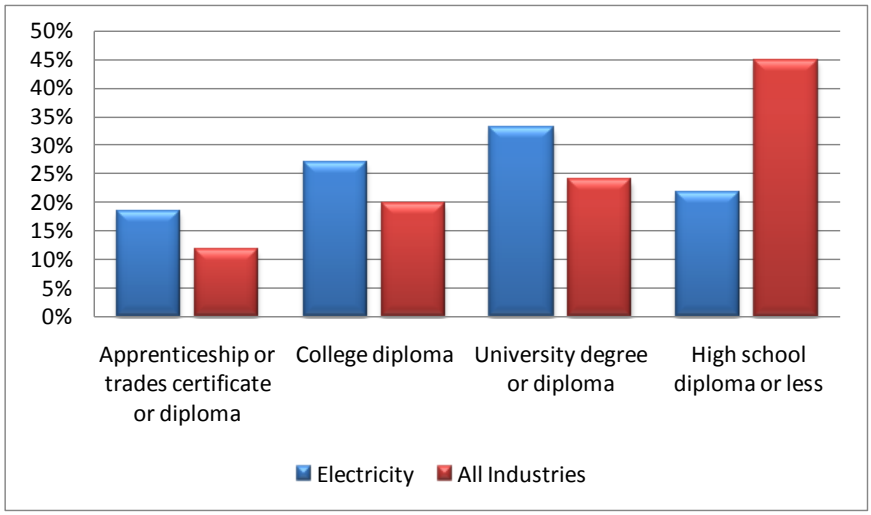
The Alberta workforce has the same higher education profile with a higher than average concentration of skilled trades and apprentices, technicians and technologists from the colleges and engineers from the universities. Most of the workforce is older workers who graduated from post secondary programs over twenty years ago.

Exhibit A4.8
Higher Education Achievement
Electricity and Renewable Energy Providers, All Industries
Alberta, 2006



Source: Statistics Canada, 2006 Census

The Alberta workforce is more concentrated in the natural and applied sciences (engineering), trades and technical occupations than other provinces.

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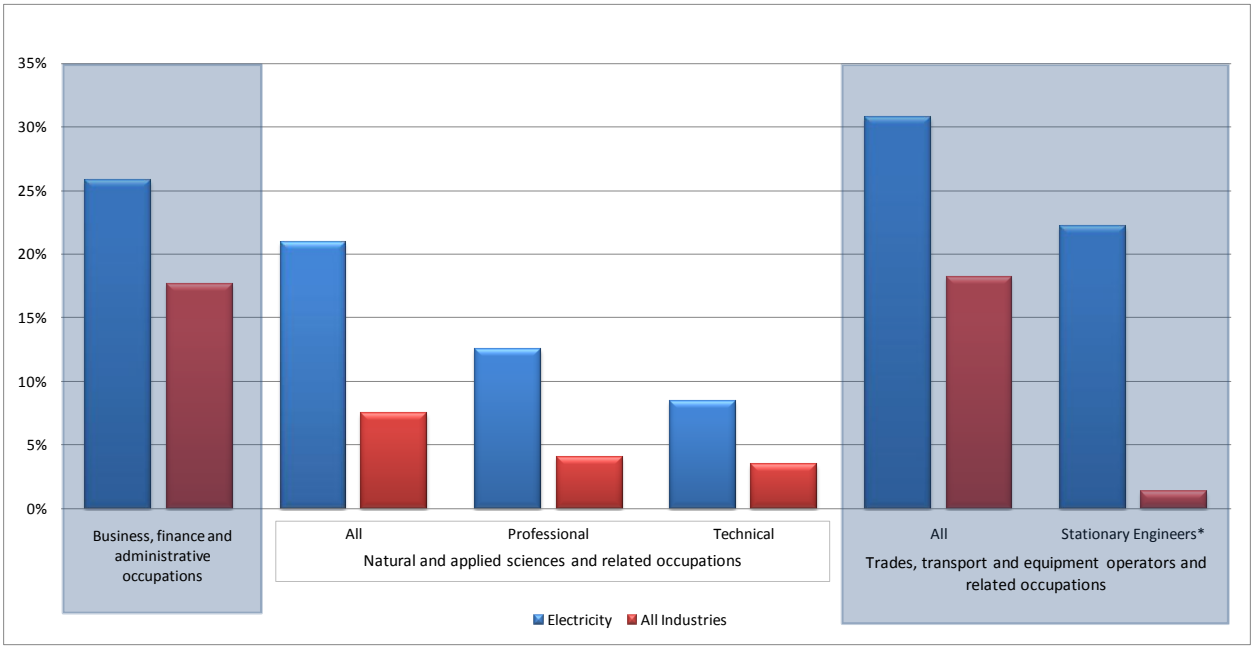
Exhibit A4.9
Distribution of the Workforce by Occupation
Electricity and Renewable Energy Providers, All Industry
Alberta, 2006



*Includes: Stationary engineers, power station operators and electrical trades and telecommunications occupations
Source: Statistics Canada, 2006 Census

Women are a smaller proportion of the workforce than men, but Alberta has a marginally higher proportion of women in the electricity industry compared to other provinces. This is typical of the gender composition of the key occupations.

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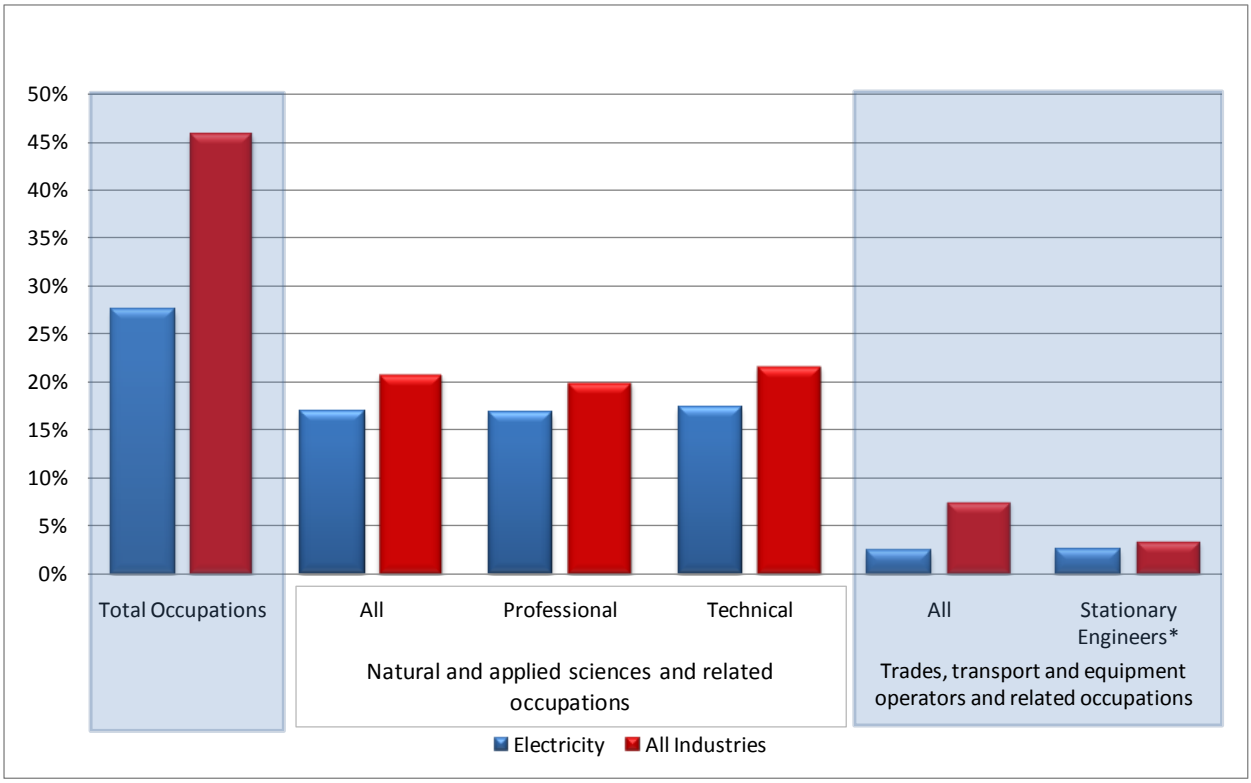
Exhibit A4.10
Distribution of the Workforce by Gender
Electricity and Renewable Energy Providers, All Industries
Percentage of Women in the Workforce, Alberta, 2006



Source: Statistics Canada, 2006 Census

Like the national workforce, the Alberta electricity sector workforce also has notably fewer immigrants than other industries. This is another consequence of the history of hiring Canadians in the 70's and 80's and employment losses and limited additions during the 1990s when immigration was rising.

Post Secondary Education and Immigration

There are two principal sources of labour supply: graduates from post secondary training programs and immigration. This section reviews recent trends for the electricity sector occupations.

Alberta shares national trends in post secondary education and training that impact the supply of new workers in the key applied sciences and technical occupations.

Engineering programs in Alberta feature strong gains for civil and mechanical but weaker trends in enrolments and degrees awarded for electrical engineers.

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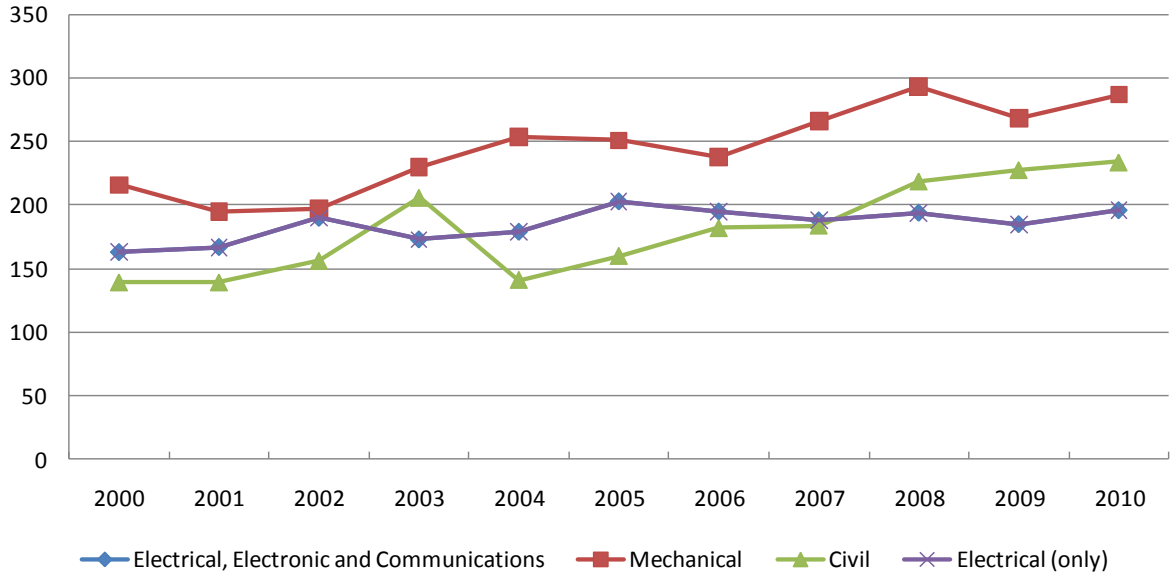
Exhibit A4.11
Undergraduate Degrees Awarded in Engineering Programs
Alberta



Source: Electricity Sector Council

Trends for apprenticeship programs, set out in Exhibit A4.12, show strong gains across the last decade for several skilled trades working in the electricity and renewable energy industry. Alberta has been a national leader in this area. Alberta apprenticeship programs have expanded during the past decade, adding new registrations at a faster pace than the national average. Completions in Alberta – and the emerging number of journeypersons – have increased in line with registrations.

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Exhibit A4.12

Apprenticeship Programs in Alberta

Alberta									
Engineering Programs	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
Construction Millwright and Industrial Mechanic (Millwright)									
Registrations	1599	1710	1782	1770	1719	1947	2319	2556	2784
Completions	156	204	165	204	162	204	228	201	216
Electrician, Except Industrial and Power System									
Registrations	5754	6975	7878	8154	8094	8910	10347	11892	13173
Completions	372	525	630	651	783	894	942	1053	1035
Industrial Electrician									
Registrations	0	0	0	0	0	0	0	0	0
Completions	0	0	0	0	0	0	0	0	0
Power Systems Electrician									
Registrations	84	99	123	144	147	186	210	234	279
Completions	12	9	12	12	9	18	27	24	27
Electrical Power Line and Cable Workers									
Registrations	204	243	291	327	372	429	516	633	732
Completions	18	30	15	18	36	48	45	54	54
Stationary Engineers and Auxiliary Equipment Operators									
Registrations	0	0	0	0	0	0	0	0	0
Completions	0	0	0	0	0	0	0	0	0
Total									
Registrations	7641	9027	10074	10395	10332	11472	13392	15315	16968
Completions	558	768	822	885	990	1164	1242	1332	1332

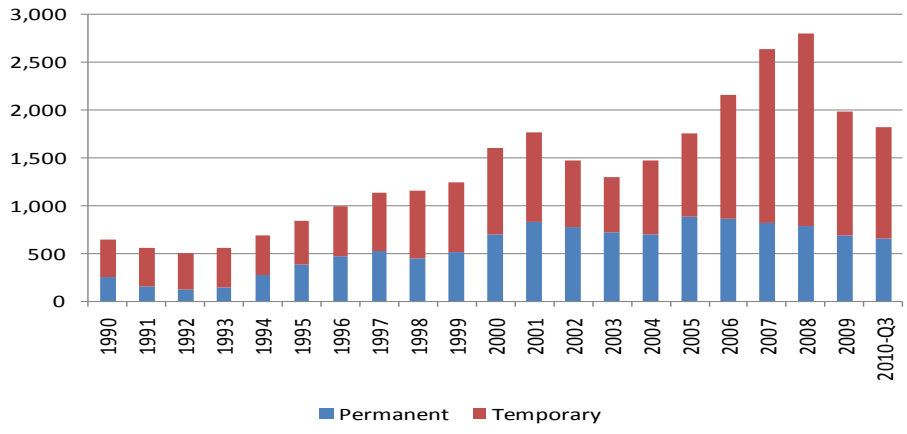
Source: Statistics Canada, Registered Apprenticeship Information System

Finally, immigration trends are set out for permanent immigrants and temporary foreign workers arriving in Alberta with jobs or intending to work in the electricity sector occupations. The largest group represented here are engineers.

Exhibit A4.13

Immigrants Arriving in Alberta

Electricity Sector Occupations, 1990 to 2010



Source: Citizenship and Immigration Canada

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Supply side survey – Alberta findings

4 Alberta post secondary institutions responded to the ESC survey. Responses reported:

- Enrolments in electricity related programs in Alberta are expected to rise faster than other programs and faster than increases reported in other provinces.

Occupations

15 Alberta employers (out of a total national response of 89) responded to the ESC survey.

Key findings for Alberta include:

- Retirements
  - Age profiles for the Alberta survey respondents are similar to the profile for other electricity sector employers across Canada
  - The average age at retirement for the Alberta workforce is similar to the national average
  - Detailed data on retirement patterns is not available for Alberta

- Workforce dynamics
  - Some Alberta respondents reported above average growth expectations for employment
  - Limited Alberta data on hiring rates and other measures of labour market dynamics show tight markets, similar to other provincial markets

Assessing Future Labour Markets and Human Resources Management

A new labour market model projects market conditions from 2011 to 2016 to determine employment expansion demands. Expansion demands are related to expected investments and the growth in electricity demand. Replacement demands are driven by demographic trends and the employer survey estimates of expected retirements.

Labour Market Assessments

Electrical utility investments in Alberta have been on a strong upward path over the past decade. Gains were briefly interrupted during the 2008-2009 recession but growth has resumed. New projects are both starting and reaching completion in the coming years. Strong gains in 2011 will create a temporary surge in employment and then activity settles back to a high but more sustainable level. Activity from 2012 to 2016, while down from the 2011 peak, remains well above the levels of the past decade.

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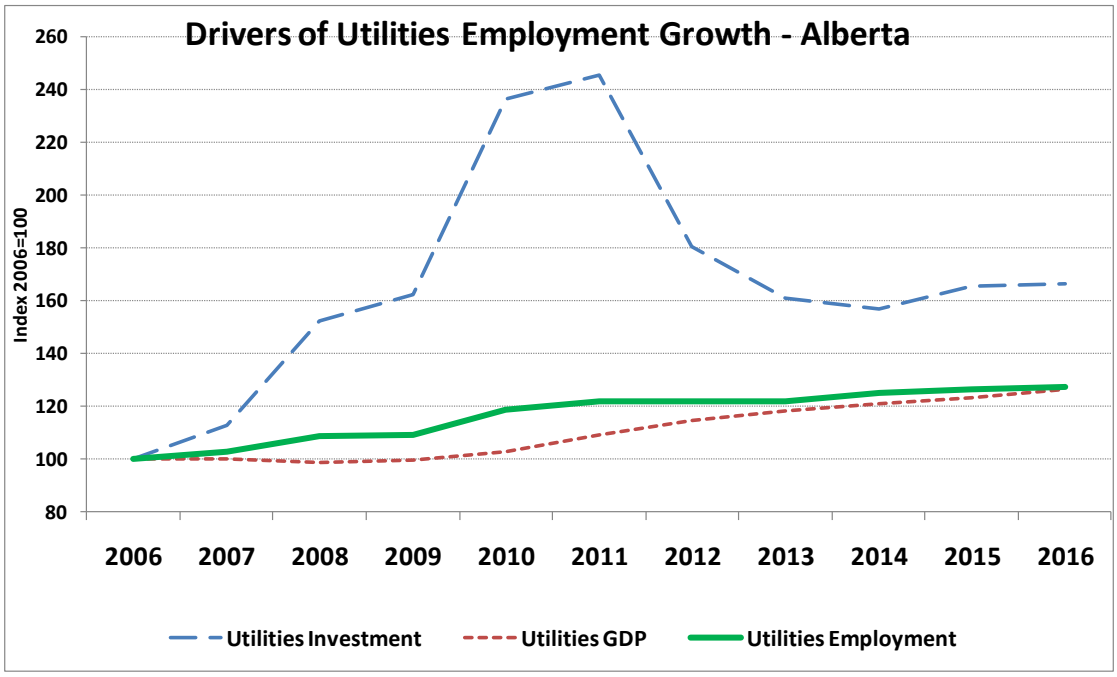
Exhibit A4.14
Projections of Output, Investment and Employment
Alberta 2011 to 2016



Source: Centre for Spatial Economics, ESC Employer Survey 2011, Census 2006

This pattern of investment and electricity demand is used to calculate employment growth by occupation. Employment numbers for the electricity sector occupations in Exhibit A4.15 reflect a peak starting point and modest declines in 2012 and 2013 are a retreat to more sustainable levels.

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Exhibit A4.15
Employment Growth by Occupation
Electricity Sector Occupations in Alberta

Occupations	2006	2010	2016	Employment 2011 to 2016 % Growth 2011 - 2016	Employment 2011 to 2016 Avg. annual growth rate
Engineering managers	81	106	108	1.8%	0.4%
Construction managers	14	18	18	1.8%	0.4%
Utilities managers	485	601	630	4.9%	1.0%
Financial auditors and accountants	306	311	356	14.5%	2.9%
Civil engineers	27	35	36	1.8%	0.4%
Mechanical engineers	238	314	320	1.8%	0.4%
Electrical and electronics engineers	435	573	584	1.8%	0.4%
Information systems analysts and consultants	283	308	330	7.2%	1.4%
Civil engineering technologists and technicians	16	20	21	4.9%	1.0%
Mechanical engineering technologists and technicians	59	73	77	4.9%	1.0%
Electrical and electronics engineering technologists and technicians	334	413	434	4.9%	1.0%
Contractors and supervisors, electrical trades and telecommunications occupations	77	102	103	1.8%	0.4%
Electricians (except industrial and power system)	38	51	52	1.8%	0.4%
Industrial electricians	31	41	42	1.8%	0.4%
Power system electricians	288	380	387	1.8%	0.4%
Electrical power line and cable workers	1,112	1,466	1,493	1.8%	0.4%
Stationary engineers and auxiliary equipment operators	49	57	61	8.1%	1.6%
Power systems and power station operators	609	755	792	4.9%	1.0%
Construction millwrights and industrial mechanics (except textile)	284	374	381	1.8%	0.4%
Electrical Occupations	4,764	5,998	6,226	3.8%	0.8%
Other Occupations	4,616	6,372	6,176	-3.1%	-0.6%
Total	9,380	12,370	12,402	0.3%	0.1%

Source: Centre for Spatial Economics, ESC Employer Survey 2011, Census 2006

Expansion demand

Exhibit A4.16 tracks labour requirements for retirements and death (replacement demands) relative to the projected labour force in Alberta. The proportion of the workforce expected to retire in each year from 2011 to 2016 has been set below levels implied by survey results. This reflects the findings from comparing the 2008 report to the 2011 update.

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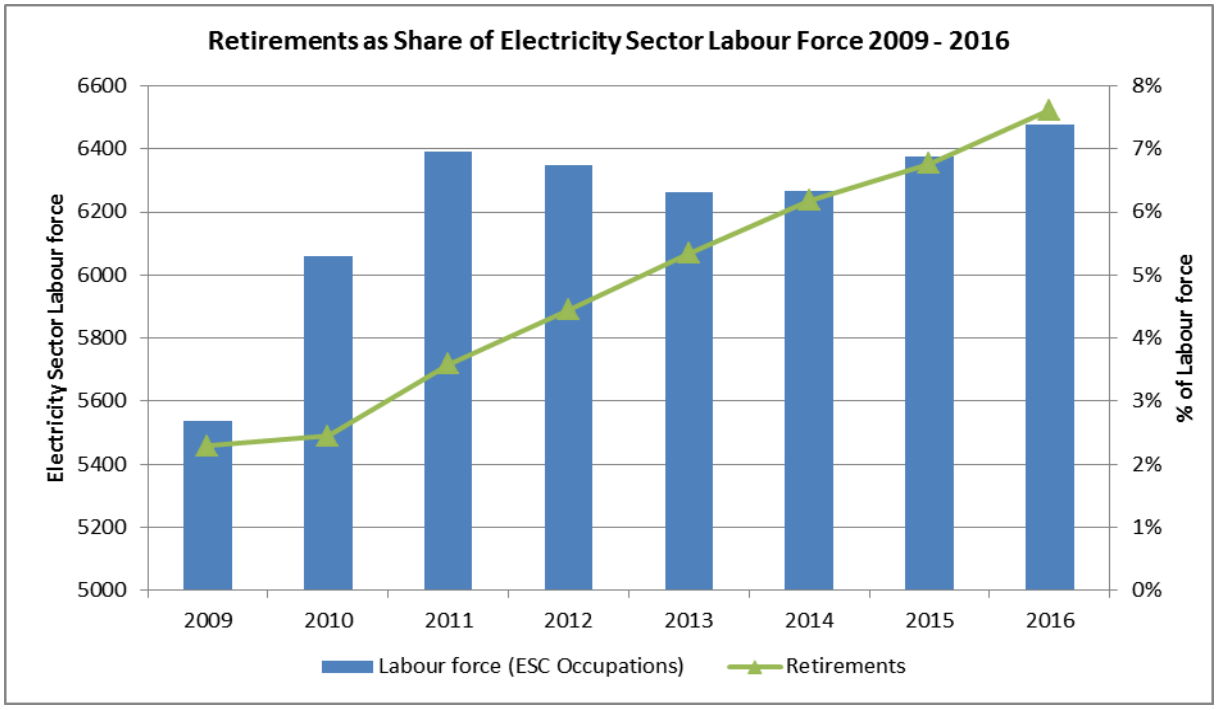
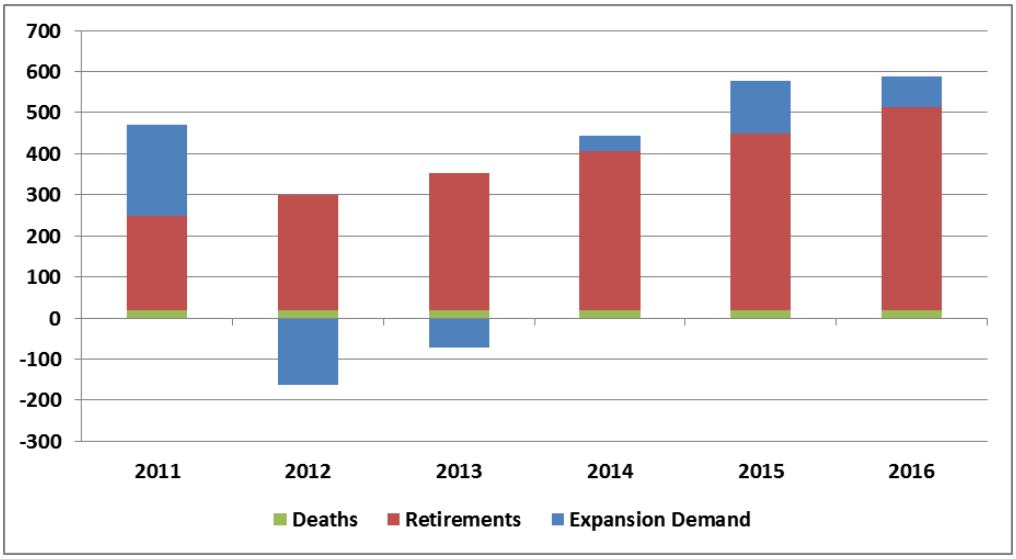
Exhibit A4.16
Retirement Projections for Electricity Sector Occupations



Source: Centre for Spatial Economics, ESC Employer Survey 2011, Census 2006

Exhibit A4.17 adds together replacement and expansion demands for the electricity sector workforce in Alberta.

Exhibit A4.17
Total Employment Requirements, Electricity Sector Occupations, Alberta, 2011 to 2016



Source: Centre for Spatial Economics, ESC Employer Survey 2011, Census 2006

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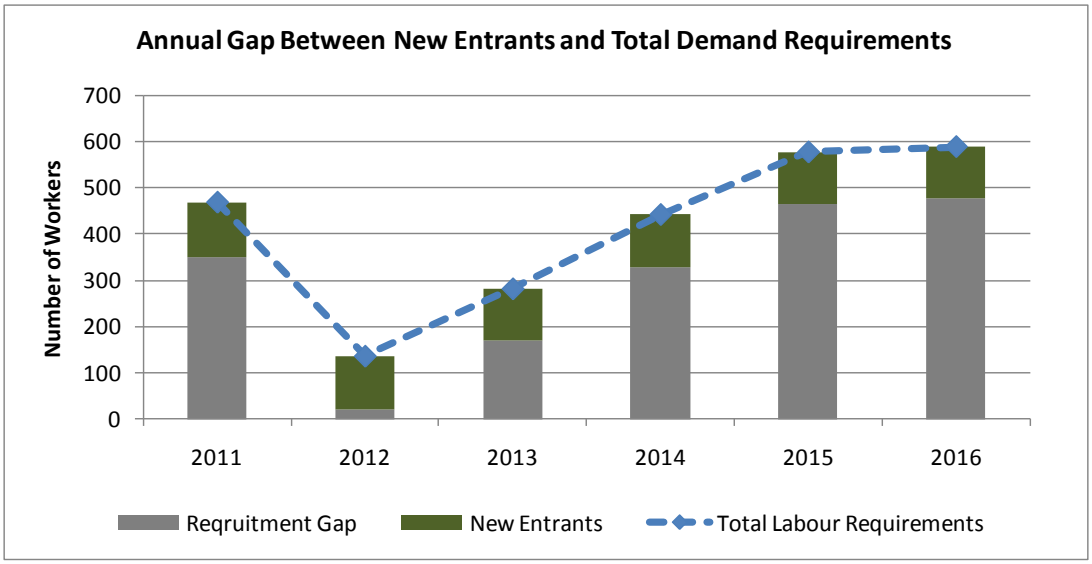
Finally Exhibit A4.18 tracks the potential labour supply from new entrants and net hiring from outside the industry. There are not enough potential new entrants to meet the projected requirements and this implies tight labour markets even in 2012 and 2013 as conditions ease off the peak activity in 2011. The implication here is that recruiting will shift to labour markets in other provinces or outside Canada.

Exhibit A4.18
New Entrants and Labour Requirements



Source: Centre for Spatial Economics, ESC Employer Survey 2011, Census 2006

Rankings

Labour market rankings for each occupation are based on market measures of the supply-demand gap, the change in employment and the age profiles and retirements.

Labour Market Rankings Defined

	Rankings & Description
1	**Significant excess of supply over demand** No difficulty in recruiting qualified staff with 0-5 years or 5-10 years of Canadian experience at established compensation norms within the local labour market.
2	**Excess of supply over demand** No difficulty in recruiting qualified staff with 0-5 years or with 5-10 years of Canadian experience at established compensation norms within the local or regional labour market. The geographic range of recruiting and the range of acceptable qualifications is broader than in 1.

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3	**Moderate supply pressures** Difficulty in recruiting qualified staff with more than 5 years of Canadian experience, with industry or technology-specific skills, and with appropriate non-technical skills. The time required to fill these positions is typically longer than historic norms. Vacancies sometimes need to be re-posted. Employers actively solicit applications from outside the local and regional labour market and reimburse applicants for travel expenses related to interviews, etc. Recruiting engineering staff with 0-5 years of Canadian experience poses fewer challenges.
4	**Significant supply pressures** Difficulty across the board in recruiting qualified staff in the local and regional labour market. It is normal practice to actively solicit applications from outside the local and regional labour market and to reimburse applicants for travel expenses related to interviews. Employers are generally obliged to improve offered terms of compensation and to assist with re-location costs. Recruitment difficulties lead many employers to increase their use of third-party recruiters and to increase their use of contracting trades work, outsourcing of engineering and technology work to consultancies or staff the assignment with workers from another region. There is a significant increase in the risk of project delays and compensation-driven cost escalations.
5	**Supply constraints** Systemic difficulty in recruiting qualified staff. International recruiting is common among large employers. There is widespread perception that the contracting and consulting sector is working at full capacity and that there is little, if any, remaining scope to outsource construction, engineering and ICT work to qualified suppliers with a known track record.

Alberta labour markets for the electricity sector occupations are very tight from 2010 and 2011 as new electricity and renewable energy projects start up. Some major projects reach peak employment and begin to ramp down in 2012 and 2013. Conditions reach more stable levels from 2014 to 2016 and rankings are driven by replacement demands and the rising number of retirements. Rankings are generally higher for the older occupations.

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Exhibit A4.19

Alberta Labour Market Rankings

Occupations	2010	2011	2012	2013	2014	2015	2016
Engineering managers	4	4	5	5	4	4	4
Construction managers	4	4	5	5	4	4	4
Utilities managers	4	4	5	5	4	4	4
Financial auditors and accountants	3	3	3	3	3	2	3
Civil engineers	4	4	5	4	4	3	4
Mechanical engineers	3	3	5	4	3	3	4
Electrical and electronics engineers	3	4	5	4	3	3	4
Information systems analysts and consultants	3	4	4	4	4	4	4
Civil engineering technologists and technicians	3	4	5	4	4	4	4
Mechanical engineering technologists and technicians	3	4	5	4	4	4	4
Electrical and electronics engineering technologists and technicians	3	4	5	4	4	4	4
Contractors and supervisors, electrical trades and telecommunications occupations	4	4	5	4	4	4	4
Electricians (except industrial and power system)	4	4	5	4	4	4	4
Industrial electricians	4	4	5	4	4	4	4
Power system electricians	3	4	5	4	4	3	4
Electrical power line and cable workers	4	4	5	4	4	3	4
Stationary engineers and auxiliary equipment operators	4	4	4	4	4	4	4
Power systems and power station operators	3	4	4	4	4	4	4
Construction millwrights and industrial mechanics (except textile)	3	4	5	4	4	3	4

Source: ESC Employer Survey 2011

Comments on rankings for Alberta

- The Alberta labour force for both the core electricity sector and next generation is not large enough to accommodate the new projects that began in 2010 and continue to hire workers in 2011.
- Structural (i.e. age profile) and cyclical (i.e. projected investments and internal dynamics for vacancies and hiring) measures anticipate that Alberta markets are tighter than in other provinces
- Labour requirements and hiring related to retirements will be concentrated in experienced and specialized workers – not new entries or recent grads, and
    - Rankings of 3 for some occupations may reflect the supply of junior applicants
    - Competition with other industries for some occupations will be intense
- Post secondary programs – especially for the skilled trades – are growing strongly and will help to fill the ranks of entry level and junior workers
- Immigration will continue to be an important source of labour in Alberta
- Serious labour market and HR challenges are projected for Alberta

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Appendix A – 5 Manitoba and Saskatchewan

Introduction

This appendix provides selected findings from the 2011 Labour Market Information Study for Saskatchewan and Manitoba.

Key exhibits in the national text are reproduced here using Saskatchewan and Manitoba data. Notes and highlights have been added comparing these Saskatchewan and Manitoba results to the trends and conclusions reported for Canada. This Appendix summarizes the key findings in each of three areas:

- Transition from Legacy to Next Generation
- The Workforce Profile and Trends
- Assessing Future Labour Markets and Human Resources Management

Transition from Legacy to Next Generation

In Saskatchewan and Manitoba the transition from Legacy to Next Generation Infrastructure is characterized by several changes.

Exhibit A5.1
Legacy to Next Generation

Legacy		Next Generation
Twenty plus years of limited growth	→	Twenty years of rising investment
High concentration of capacity and workforce	→	Distributed generation of renewable capacity
Established support systems in post secondary programs, regulations	→	Deregulation, change to specialized, flexible training and certification
Stable, large scale operations	→	Large number of smaller new entrants
Long asset lives	→	Rapid replacement, high maintenance
Large employers, and a specialized, qualified, experienced workforce	→	Exit of experienced workforce; shortage of entrants with midlevel experience
Dominant, preferred employers in local labour markets	→	Intensifying competition in labour markets, post secondary programs

Source: ESC Employer Survey 2011

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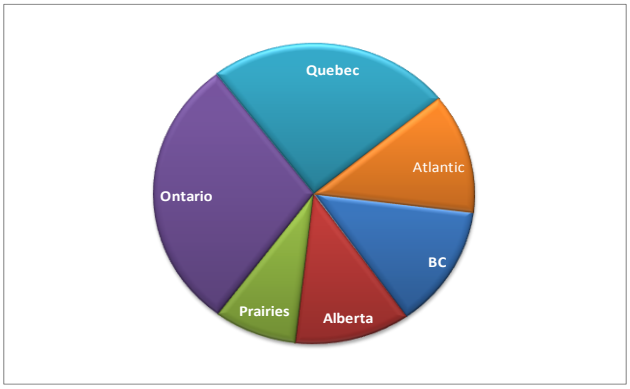
Saskatchewan and Manitoba findings focus on key occupations and:

- Past trends in investment and hiring that determine the Legacy infrastructure and workforce,
- The current state of labour markets and workforce and
- The investments, demographic and output trends that drive employment from 2011 to 2016.

The investments and related labour market impacts are distributed across the Provinces based on the current generating capacity. Saskatchewan and Manitoba represent one of Canada's smaller electricity markets, responsible for less than 10% of Canada's electricity generating capacity.

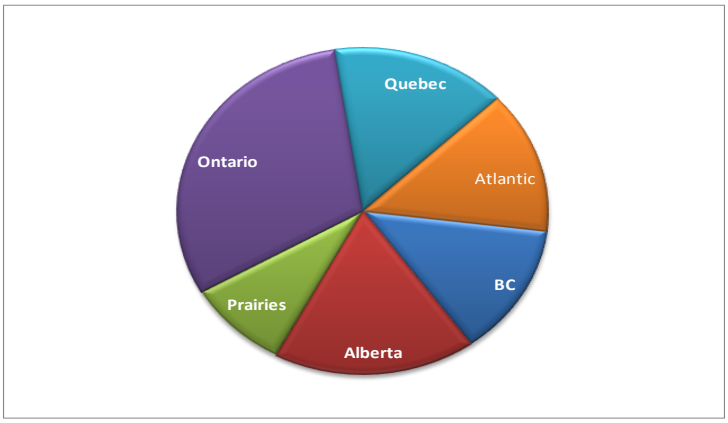
Exhibit A5.2
Provincial Distribution of Electricity Generating Capacity
Percent Distribution of MWs



Source: "Canada's Electricity Infrastructure: Building a Case for Investment" Conference Board of Canada, April 2011

The investments in the next generation facilities that will change Saskatchewan and Manitoba's system will be roughly proportional to its current share in the national capacity.

Exhibit A5.3
Provincial Distribution of New Investment in Electricity Generating Capacity
Percent Distribution of New Investment, MWs



Source: "Canada's Electricity Infrastructure: Building a Case for Investment" Conference Board of Canada, April 2011

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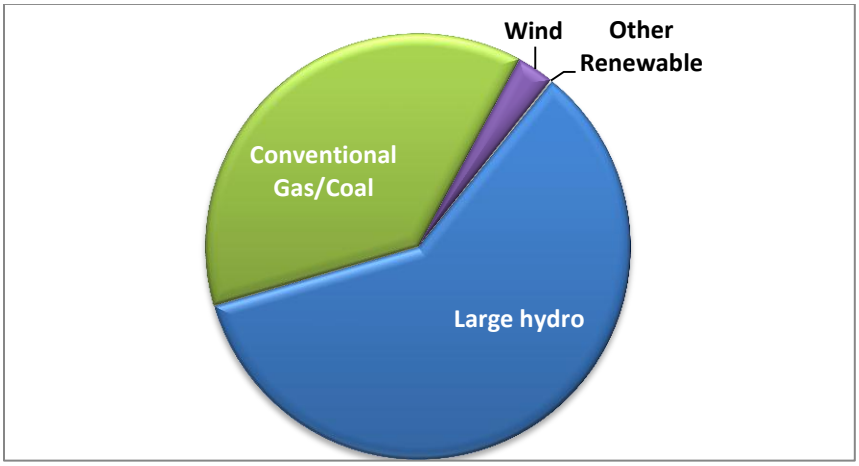
Saskatchewan and Manitoba's current combined generating systems are concentrated in large hydro and conventional gas/coal facilities; large hydro dominates in Manitoba while conventional gas/coal is more prominent in Saskatchewan.

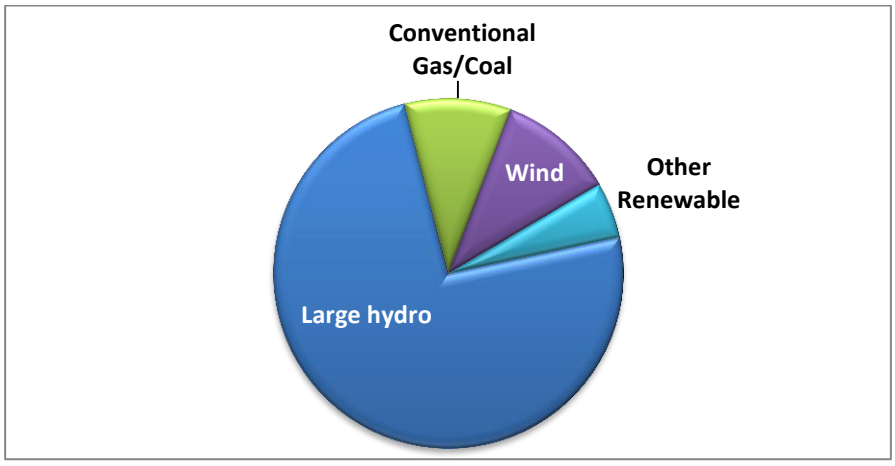
Exhibit A5.4
Existing Electrical Capacity by Type, Saskatchewan and Manitoba
MWs



Source: "Canada's Electricity Infrastructure: Building a Case for Investment" Conference Board of Canada, April 2011

The investment plans for Saskatchewan and Manitoba are dominated by the expansion of large hydro and wind generation systems driven, in part, by rising demand in the US. Modest investments are also planned for the transmission and distribution systems.

Exhibit A5.5
Investment in New Electrical Generating Capacity, Saskatchewan and Manitoba
MWs



Source: "Canada's Electricity Infrastructure: Building a Case for Investment" Conference Board of Canada, April 2011

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Exhibit A5.6
Investment in Saskatchewan and Manitoba Electricity Infrastructure 2010 to 2030, by Type

Sector	2010 $ Billions
Generation	20.5
Transmission*	3.5
Distribution	3.1
Total	27.1

Source: "Canada's Electricity Infrastructure: Building a Case for Investment" Conference Board of Canada, April 2011

Workforce Profiles and Trends

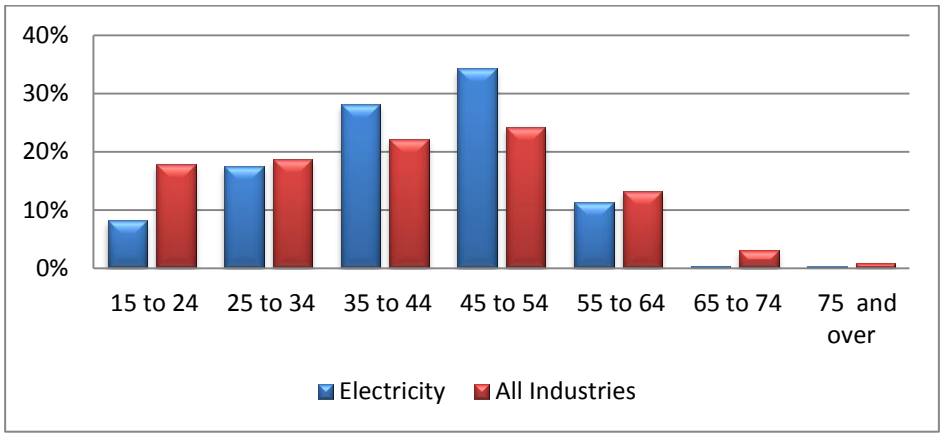
This section reviews Saskatchewan and Manitoba data for the workforce and occupation profiles and related trends.

Workforce Profile

The 2006 Statistics Canada Census reported that there were 8,755 people working in the Electricity and Renewable Energy industry in Saskatchewan and Manitoba, 3,954 of these were in the core Electricity Sector Occupations. By 2010 employment had grown by 11% to 9,979.

The age profile of the industry workforce has the distinctive peak for the younger boomers age 45 to 54 and the associated, smaller proportion of the Gen X workforce age 35 to 44. This profile is a consequence of the loss of employment and limited hiring during the 1990s.

Exhibit A5.7
Age Distribution of the Workforce
Electricity and Renewable Energy Providers, All Industries
Saskatchewan and Manitoba, 2006



Source: Statistics Canada, 2006 Census

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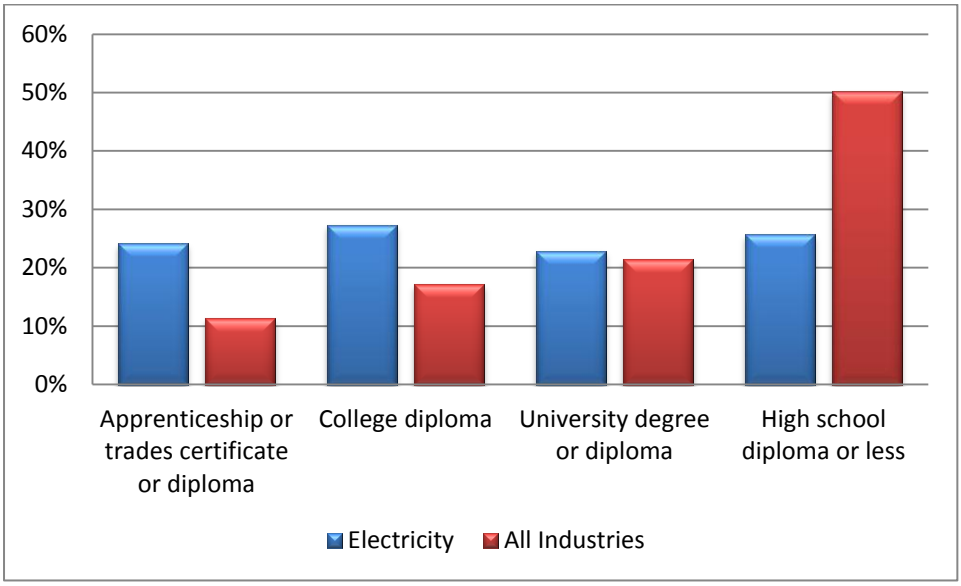
The Saskatchewan and Manitoba workforce also has the characteristic higher education profile with a higher than average concentration of skilled trades and apprentices, technicians and technologists from the colleges and engineers from the universities. Most of the workforce is older workers who graduated from post secondary programs over twenty years ago.

Exhibit A5.8
Higher Education Achievement
Electricity and Renewable Energy Providers, All Industries
Saskatchewan and Manitoba, 2006



Source: Statistics Canada, 2006 Census

The Saskatchewan and Manitoba workforce is concentrated in the natural and applied sciences (engineering), trades and technical occupations. The proportion of the workforce with an apprenticeship or trades certificate or diploma relative to college and university degrees or diplomas is higher than other regions of the country. This may be attributed to the relatively high number of in-house training and apprenticeship programs offered by major employers such as Manitoba Hydro.

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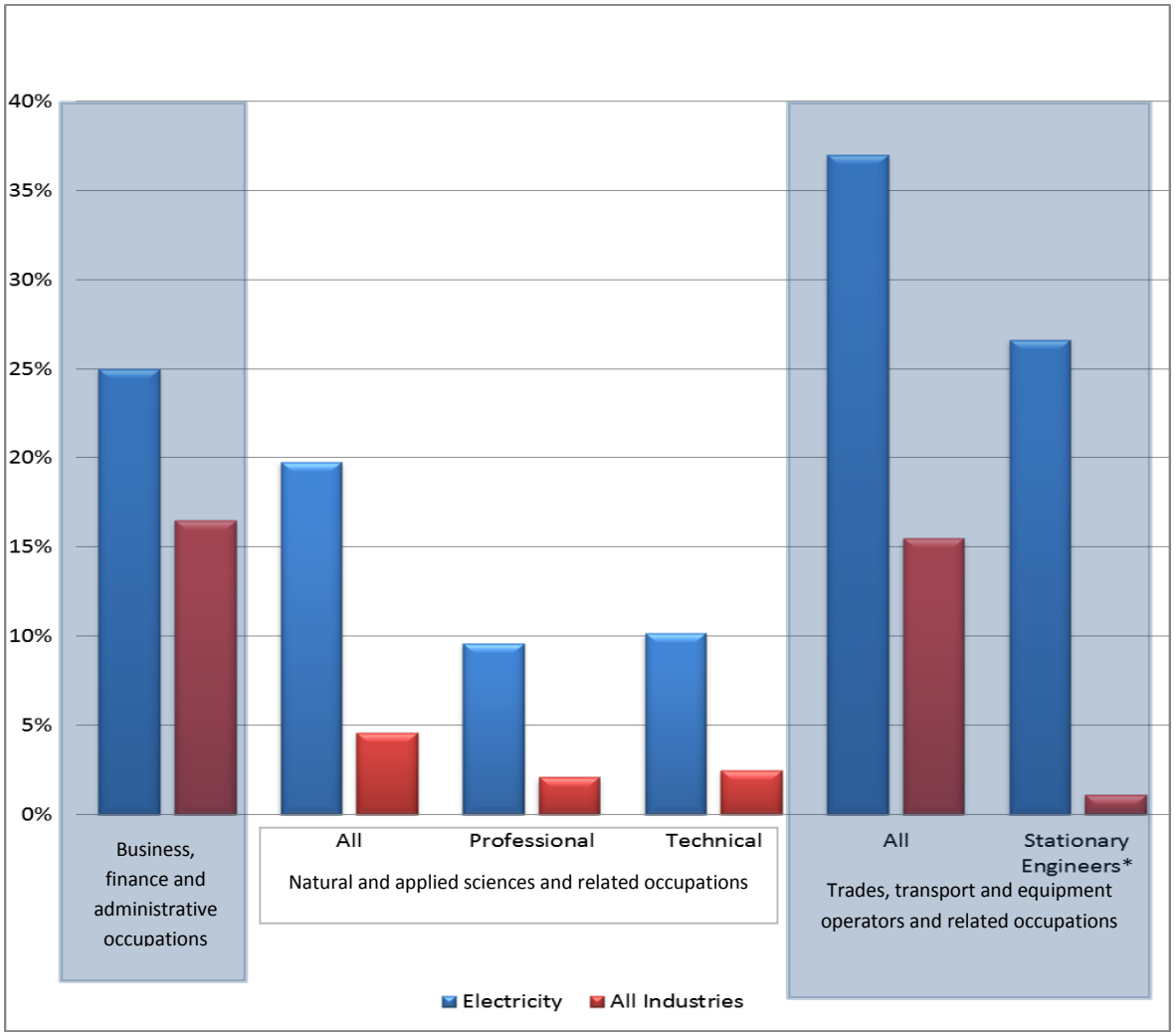
Exhibit A5.9
Distribution of the Workforce by Occupation
Electricity and Renewable Energy Providers, All Industry
Saskatchewan and Manitoba, 2006



*Includes: Stationary engineers, power station operators and electrical trades and telecommunications occupations
Source: Statistics Canada, 2006 Census

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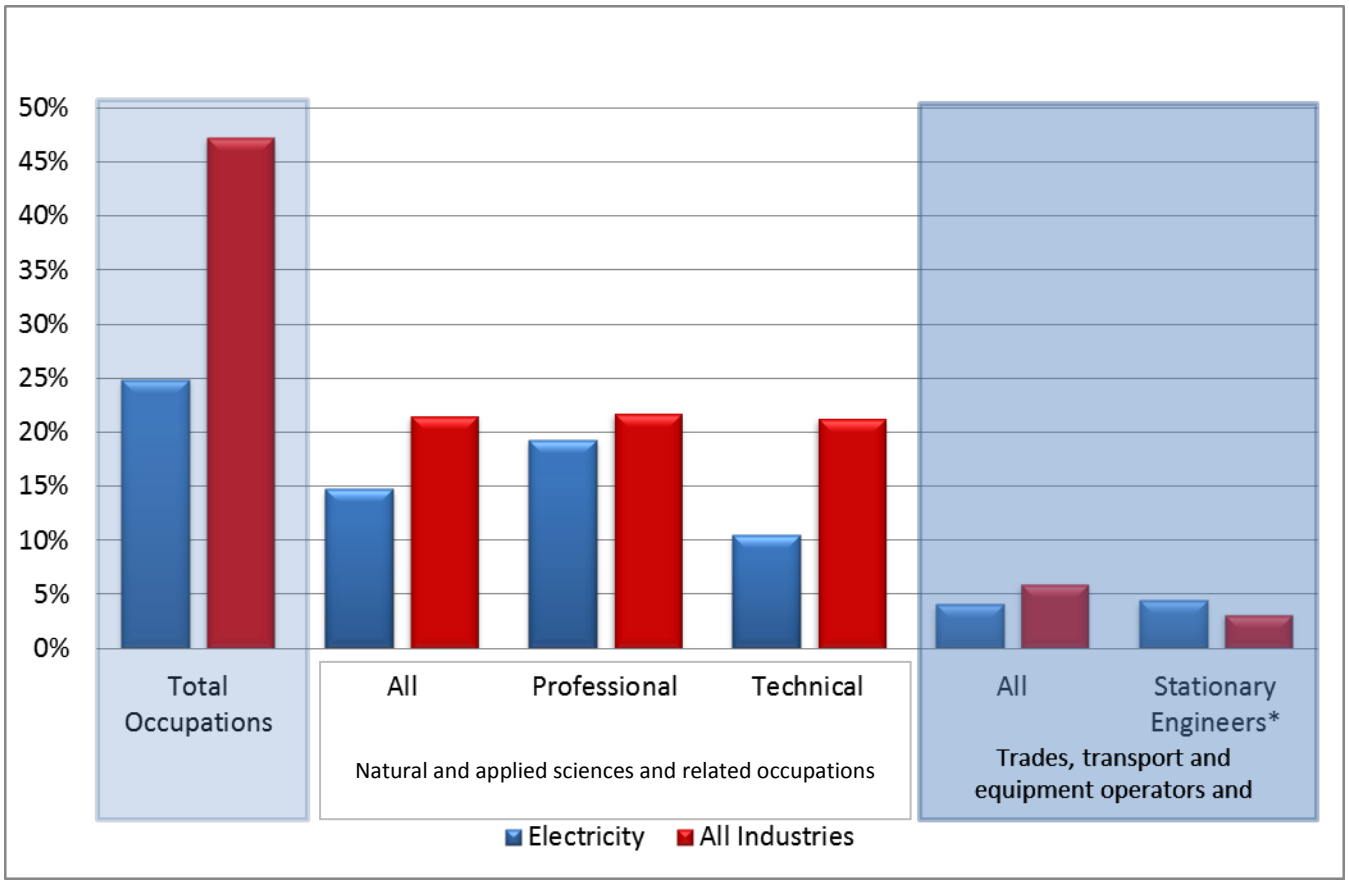
Exhibit A5.10
Distribution of the Workforce by Gender
Electricity and Renewable Energy Providers, All Industries
Percentage of Women in the Workforce, Saskatchewan and Manitoba, 2006



*Includes: Stationary engineers, power station operators and electrical trades and telecommunications occupations
Source: Statistics Canada, 2006 Census

Women in the Prairie Provinces, as in the rest of Canada, are a smaller proportion of the workforce than men. This is typical of the gender composition of the key occupations.

Like the national workforce, the Saskatchewan and Manitoba electricity sector workforce also has notably fewer immigrants than other industries.

This is another consequence of the history of hiring Canadians in the 70's and 80's and employment losses and limited additions during the 1990s when immigration was rising.

Post Secondary Education and Immigration

There are two principal sources of labour supply: graduates from post secondary training programs and immigration. This section reviews recent trends for the electricity sector occupations.

Saskatchewan and Manitoba share national trends in post secondary education and training that impact the supply of new workers in the key applied sciences and technical occupations.

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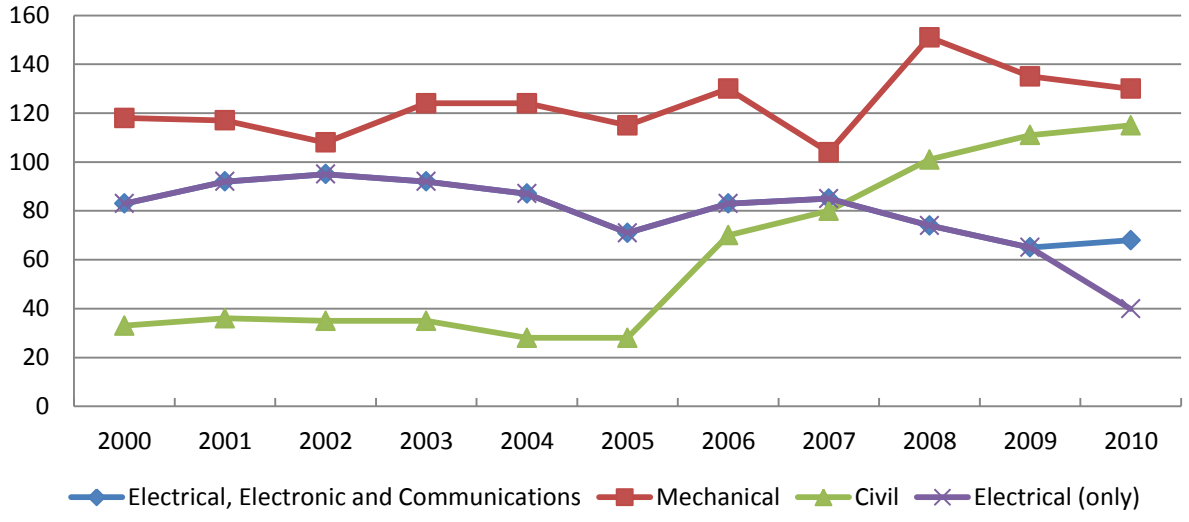
Engineering programs in Saskatchewan and Manitoba feature very strong gains for civil, but weaker trends in enrolments and degrees awarded for electrical engineers.

Exhibit A5.11
Undergraduate Degrees Awarded in Engineering Programs
Saskatchewan and Manitoba



Source: Engineers Canada

Trends for apprenticeship programs, set out in Exhibit A5.12, show strong gains across the last decade for apprenticeship programs in the electricity and renewable energy industry. New registrations and completions have both risen significantly, with strongest growth concentrated in the Electrician and Electrical Power Line apprenticeship programs.

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Exhibit A5.12

Apprenticeship Programs in Saskatchewan and Manitoba

Saskatchewan and Manitoba									
Engineering Programs	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
Construction Millwright and Industrial Mechanic (Millwright)									
Registrations	525	510	510	495	465	486	567	663	828
Completions	81	69	90	102	81	72	78	66	63
Electrician, Except Industrial and Power System									
Registrations	1671	1656	1668	1743	1830	2001	2286	2532	3021
Completions	171	195	222	201	207	195	243	237	303
Industrial Electrician									
Registrations	39	42	39	54	42	45	63	87	99
Completions	6	6	6	9	9	0	9	12	6
Power Systems Electrician									
Registrations	0	0	0	0	0	0	0	0	0
Completions	0	0	0	0	0	0	0	0	0
Electrical Power Line and Cable Workers									
Registrations	177	213	264	291	297	324	381	390	471
Completions	12	9	39	30	36	27	57	39	69
Stationary Engineers and Auxiliary Equipment Operators									
Registrations	0	0	0	0	0	0	0	0	0
Completions	0	0	0	0	0	0	0	0	0
Total									
Registrations	2412	2421	2481	2583	2634	2856	3297	3672	4419
Completions	270	279	357	342	333	294	387	354	441

Source: Statistics Canada, Registered Apprenticeship Information System

Finally, immigration trends are set out for permanent immigrants and temporary foreign workers arriving in Saskatchewan and Manitoba with jobs or intending to work in the electricity sector occupations. The largest group represented here are engineers. The Prairie Provinces have attracted a larger share of Canada's immigrants over the last decade. This has resulted in a strong rise in immigration into Saskatchewan and Manitoba since 2005. It is important to note that the increase is entirely attributed to a rise in the number of temporary foreign workers.

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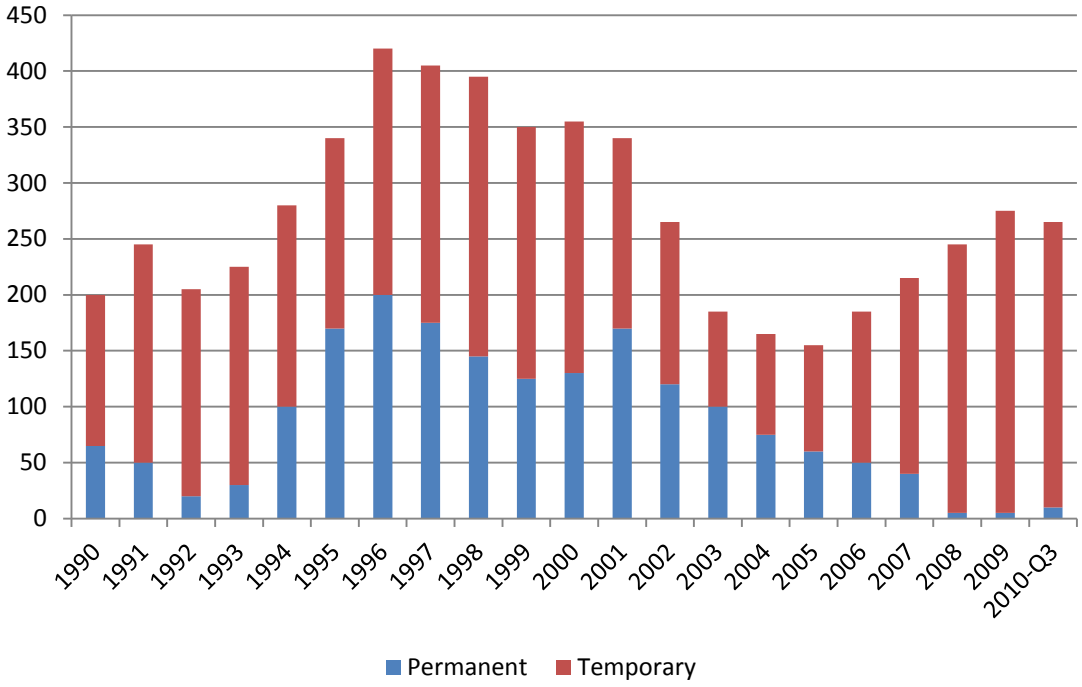
Exhibit A5.13
Immigrants Arriving in Saskatchewan and Manitoba
Electricity Sector Occupations, 1990 to 2010



Source: Citizenship and Immigration Canada

Supply side survey – Saskatchewan and Manitoba findings

3 large Saskatchewan and Manitoba post secondary institutions, offering 23 electricity sector related programs, responded to the ESC survey.

Responses were close to national totals and reported:

- Enrolments in electricity related programs were rising at faster rate than other programs
- Expected increases in enrolments from 2011 to 2016 are higher in Saskatchewan and Manitoba than other provinces
- Institutions reported having programs targeted at aboriginals, women and foreign trained engineers
- The main barrier to expanding electricity related programs is the cost related to new technologies
- Gaps were identified in renewable energy technology programs

Occupations

Key findings for Saskatchewan and Manitoba include:

- Retirements
    - Age profiles for the Saskatchewan and Manitoba survey respondents are very similar to the Census profiles

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- A high and rising proportion of the workforce are expected to retire
  - Projected retirements for 2012, in the 2008 survey, were well above the 2010 results
- Findings imply that record high levels of retirements are expected from 2011 to 2016

- Workforce dynamics
  - Hiring rates and other measures of labour market dynamics show very tight markets
  - Responding firms report moderate difficulty hiring for engineering occupations
  - Strong recruitment competition from construction and mining industries

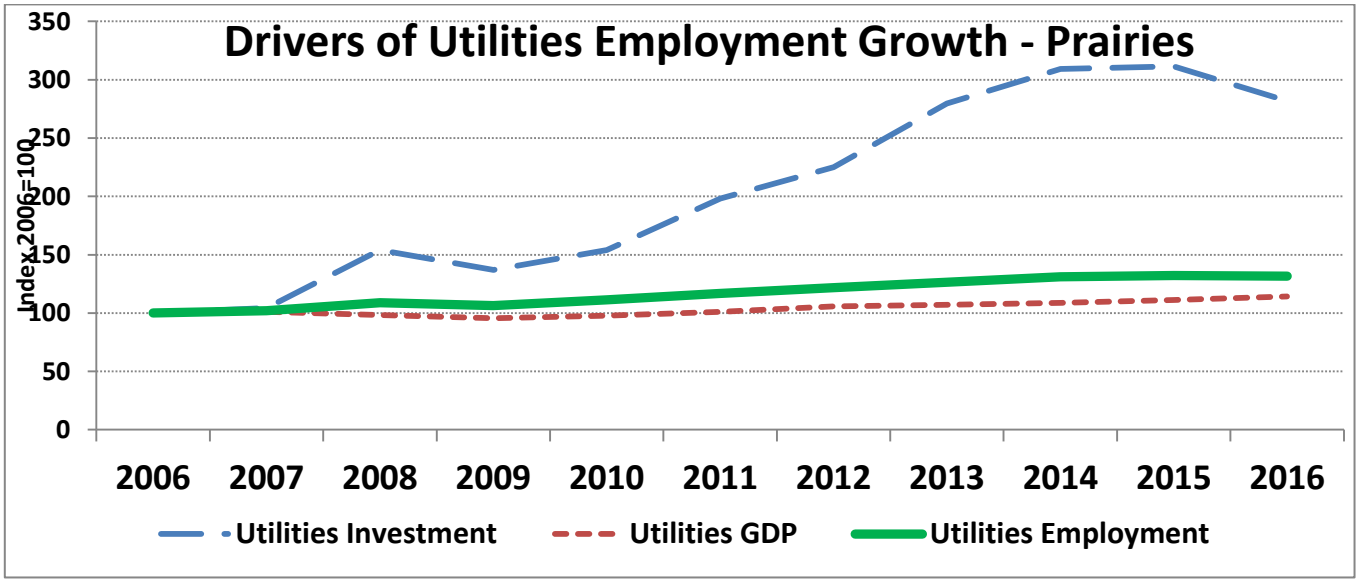
Assessing Future Labour Markets and Human Resources Management

A new labour market model projects market conditions from 2011 to 2016 using expected investments and the growth in electricity demand to determine employment expansion demands. Replacement demands are driven by demographic trends and the employer survey estimates of expected retirements.

Labour Market Assessments

Projections for next generation investments in Saskatchewan and Manitoba grow significantly across the forecast period from 2011 to 2016, driven by large hydro and wind power investments. The pattern of investment and electricity demand as illustrated in Exhibit A5.14 is used to calculate employment growth by occupation.

Exhibit A5.14
Projections of Output, Investment and Employment
Saskatchewan and Manitoba 2011 to 2016



ESC Employer Survey 2011, Census 2006

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Exhibit A5.15
Employment Growth by Occupation
Electricity Sector Occupations in Saskatchewan and Manitoba

Occupations	2006	2010	2016	Employment 2011 to 2016 % Growth 2011 - 2016	Employment 2011 to 2016 Avg. annual growth rate
Engineering managers	22	25	32	28.3%	5.7%
Construction managers	9	11	14	28.3%	5.7%
Utilities managers	197	217	270	24.0%	4.8%
Financial auditors and accountants	152	150	167	11.7%	2.3%
Civil engineers	67	76	98	28.3%	5.7%
Mechanical engineers	159	182	233	28.3%	5.7%
Electrical and electronics engineers	347	395	507	28.3%	5.7%
Information systems analysts and consultants	116	128	173	35.1%	7.0%
Civil engineering technologists and technicians	31	34	43	24.0%	4.8%
Mechanical engineering technologists and technicians	44	48	60	24.0%	4.8%
Electrical and electronics engineering technologists and technicians	453	499	619	24.0%	4.8%
Contractors and supervisors, electrical trades and telecommunications occupations	111	126	162	28.3%	5.7%
Electricians (except industrial and power system)	3	3	4	28.3%	5.7%
Industrial electricians	2	2	3	28.3%	5.7%
Power system electricians	348	397	509	28.3%	5.7%
Electrical power line and cable workers	913	1,040	1,335	28.3%	5.7%
Stationary engineers and auxiliary equipment operators	95	101	121	19.9%	4.0%
Power systems and power station operators	718	790	981	24.0%	4.8%
Construction millwrights and industrial mechanics (except textile)	166	189	242	28.3%	5.7%
Electrical Occupations	3,954	4,414	5,571	26.2%	5.2%
Other Occupations	4,801	5,564	7,231	30.0%	6.0%
Total	8,755	9,979	12,803	28.3%	5.7%

Source: Centre for Spatial Economics, ESC Employer Survey 2011, Census 2006

Expansion demand

Exhibit A5.16 tracks labour requirements for retirements and death (replacement demands) relative to the projected labour force in Saskatchewan and Manitoba

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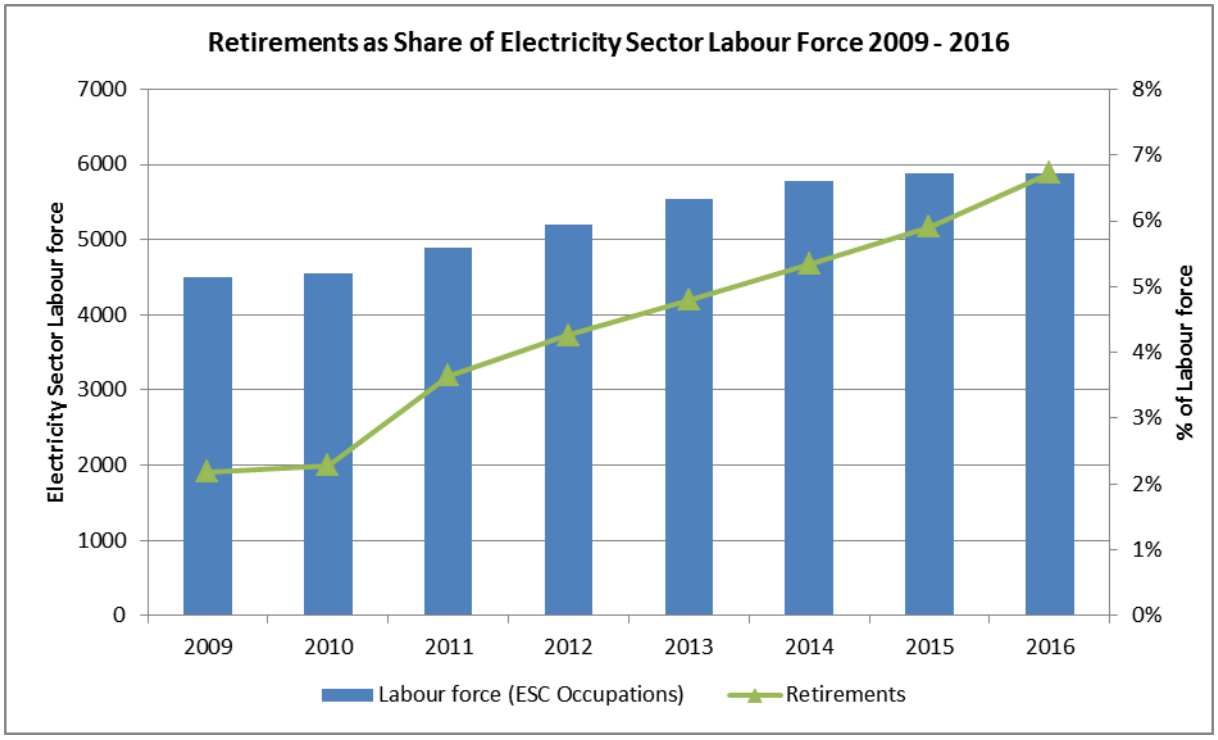
Exhibit A5.16
Retirement Projections for Electricity Sector Occupations



Source: Centre for Spatial Economics, ESC Employer Survey 2011, Census 2006

Exhibit A5.17 adds together the annual change in replacement and expansion demands for the electricity sector workforce in Saskatchewan and Manitoba.

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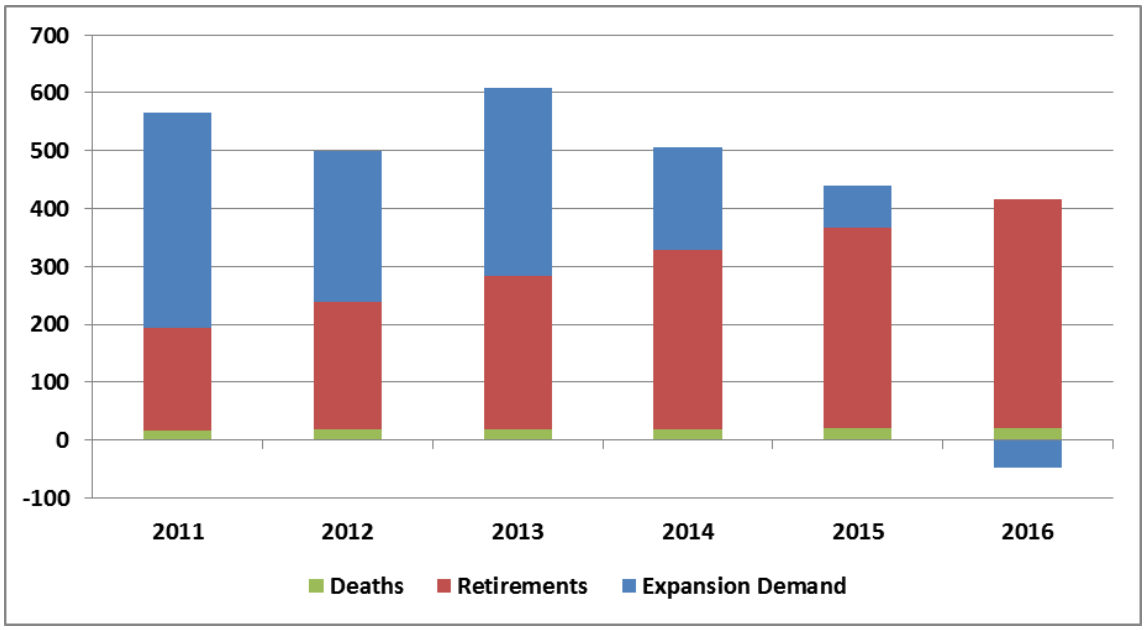
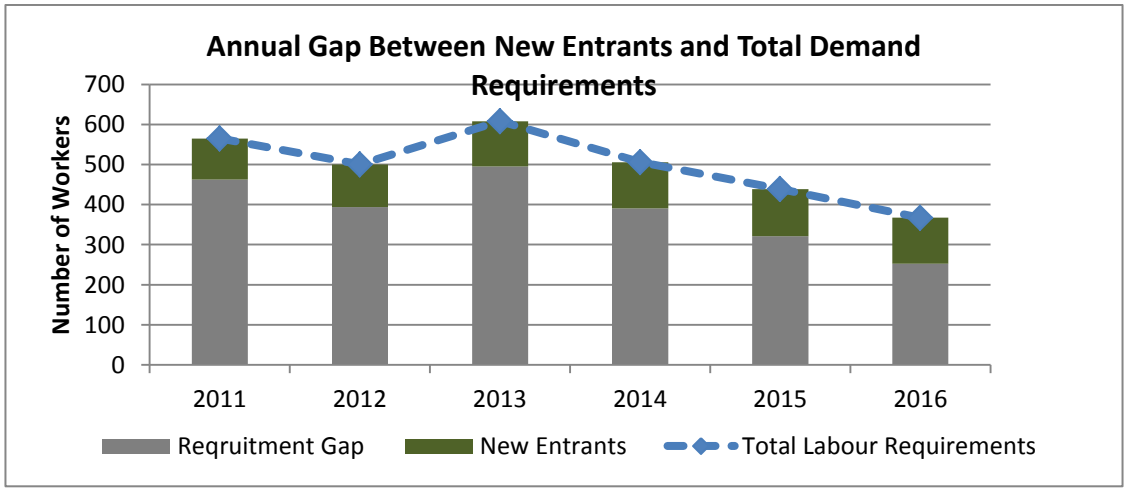
Exhibit A5.17
Total Employment Requirements, Electricity Sector Occupations, Saskatchewan and Manitoba, 2011 to 2016



Source: Centre for Spatial Economics, ESC Employer Survey 2011, Census 2006

Finally Exhibit A5.18 tracks the change in the potential labour supply from new entrants and net hiring from outside the industry. There are not enough potential new entrants to meet the projected requirements and this implies tight labour markets across the projected period from 2011 to 2016. 57% of labour requirements between 2011 and 2016 will need to be met through in-migration from outside the province or from outside the electricity industry.

Exhibit A5.18
New Entrants and Labour Requirements



Source: Centre for Spatial Economics, ESC Employer Survey 2011, Census 2006

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Rankings

Labour Market rankings for each occupation are based on market measures of the supply–demand gap, the change in employment and the age profiles and retirements.

Labour Market Rankings Defined

Rankings & Description	
1	**Significant excess of supply over demand** No difficulty in recruiting qualified staff with 0-5 years or 5-10 years of Canadian experience at established compensation norms within the local labour market.
2	**Excess of supply over demand** No difficulty in recruiting qualified staff with 0-5 years or with 5-10 years of Canadian experience at established compensation norms within the local or regional labour market. The geographic range of recruiting and the range of acceptable qualifications is broader than in 1.
3	**Moderate supply pressures** Difficulty in recruiting qualified staff with more than 5 years of Canadian experience, with industry or technology-specific skills, and with appropriate non-technical skills. The time required to fill these positions is typically longer than historic norms. Vacancies sometimes need to be re-posted. Employers actively solicit applications from outside the local and regional labour market and reimburse applicants for travel expenses related to interviews, etc. Recruiting engineering staff with 0-5 years of Canadian experience poses fewer challenges.
4	**Significant supply pressures** Difficulty across the board in recruiting qualified staff in the local and regional labour market. It is normal practice to actively solicit applications from outside the local and regional labour market and to reimburse applicants for travel expenses related to interviews. Employers are generally obliged to improve offered terms of compensation and to assist with re-location costs. Recruitment difficulties lead many employers to increase their use of third-party recruiters and to increase their use of contracting trades work, outsourcing of engineering and technology work to consultancies or staff the assignment with workers from another region. There is a significant increase in the risk of project delays and compensation-driven cost escalations.
5	**Supply constraints** Systemic difficulty in recruiting qualified staff. International recruiting is common among large employers. There is widespread perception that the contracting and consulting sector is working at full capacity and that there is little, if any, remaining scope to outsource construction, engineering and ICT work to qualified suppliers with a known track record.

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Saskatchewan and Manitoba labour markets for the electricity sector occupations are very tight in 2011 and 2012 as the investments in next generation projects increase. Electricity output remains fairly steady over the forecast period. Conditions return to balance late in the scenario as the pace of investment in new generation infrastructure slows.

Exhibit A5.19

Saskatchewan and Manitoba Labour Market Rankings

Occupations	2010	2011	2012	2013	2014	2015	2016
Engineering managers	4	5	4	4	4	3	3
Construction managers	4	5	4	4	4	3	3
Utilities managers	3	4	4	4	4	3	3
Financial auditors and accountants	3	3	4	3	3	3	3
Civil engineers	4	5	4	4	4	3	3
Mechanical engineers	4	5	4	4	4	3	3
Electrical and electronics engineers	4	5	4	4	4	3	3
Information systems analysts and consultants	3	4	4	4	4	4	4
Civil engineering technologists and technicians	3	4	4	4	4	4	3
Mechanical engineering technologists and technicians	3	4	4	4	4	4	3
Electrical and electronics engineering technologists and technicians	3	4	4	4	4	4	3
Contractors and supervisors, electrical trades and telecommunications occupations	4	5	4	4	4	3	3
Electricians (except industrial and power system)	5	5	4	5	4	4	4
Industrial electricians	4	5	4	4	4	4	4
Power system electricians	4	5	4	4	4	4	4
Electrical power line and cable workers	4	5	4	4	4	4	3
Stationary engineers and auxiliary equipment operators	4	5	5	4	4	4	4
Power systems and power station operators	3	5	4	4	4	4	4
Construction millwrights and industrial mechanics (except textile)	4	5	4	4	4	3	3

Comments on Rankings for Saskatchewan and Manitoba:

- Labour requirements and hiring related to retirements will be concentrated in experienced and specialized workers – not new entries or recent grads, and
    - Rankings of 3 for some occupations may reflect the supply of junior applicants
    - Competition with other industries for some occupations will be intense
- Saskatchewan and Manitoba have a large and growing immigrant population that will include some older and specialized workers
- In Saskatchewan and Manitoba expansion demand growth peaks between 2013 and 2014 while replacement demand continues to grow across the 2011 to 2016 projection period. Immigration along with continued recruitment and training efforts return markets to balanced conditions later in the period.

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Appendix A – 6 Atlantic Canada

Introduction

This appendix provides selected findings from the 2011 Labour Market Information Study for Atlantic Canada.

Key exhibits in the national text are reproduced here using Atlantic Canada data. Notes and highlights have been added comparing these Atlantic Canada results to the trends and conclusions reported for Canada. This Appendix summarizes the key findings in each of three areas:

- Transition from Legacy to Next Generation
- The Workforce Profile and Trends
- Assessing Future Labour Markets and Human Resources Management

Transition from Legacy to Next Generation

In Atlantic Canada the transition from Legacy to Next Generation Infrastructure is characterized by several changes.

Exhibit A6.1

Legacy to Next Generation

Legacy		Next Generation
Twenty plus years of limited growth	→	Twenty years of rising investment
High concentration of capacity and workforce	→	Distributed generation of renewable capacity
Established support systems in post secondary programs, regulations	→	Deregulation, change to specialized, flexible training and certification
Stable, large scale operations	→	Large number of smaller new entrants
Long asset lives	→	Rapid replacement, high maintenance
Large employers, and a specialized, qualified, experienced workforce	→	Exit of experienced workforce; shortage of entrants with midlevel experience
Dominant, preferred employers in local labour markets	→	Intensifying competition in labour markets, post secondary programs

Source: ESC Employer Survey 2011

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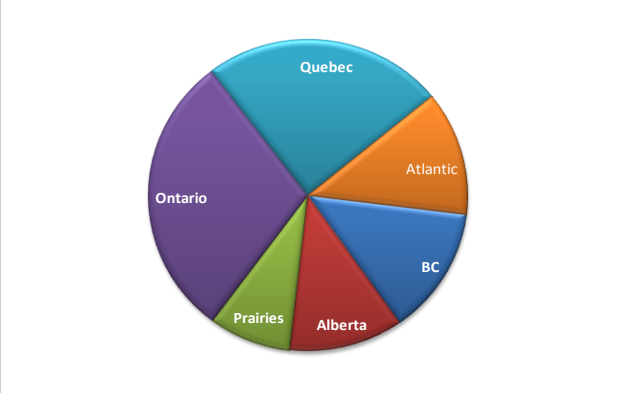
Atlantic Canada findings focus on key occupations and:

- Past trends in investment and hiring that determine the Legacy infrastructure and workforce,
- The current state of labour markets and the workforce and
- The investments, demographics and output trends that drive employment from 2011 to 2016.

The investments and related labour market impacts are distributed across the Provinces based on the current generating capacity.

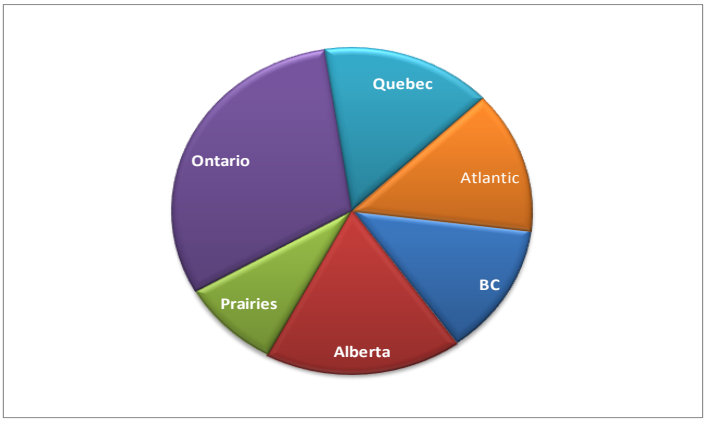
Exhibit A6.2
Provincial Distribution of Electricity Generating Capacity
Percent Distribution of MWs



Source: "Canada's Electricity Infrastructure: Building a Case for Investment" Conference Board of Canada, April 2011

The investments in the next generation facilities that will change Atlantic Canada's system will be more than proportional to its current share in the national capacity.

Exhibit A6.3
Provincial Distribution of New Investment in Electricity Generating Capacity
Percent Distribution of New Investment, MWs



Source: "Canada's Electricity Infrastructure: Building a Case for Investment" Conference Board of Canada, April 2011

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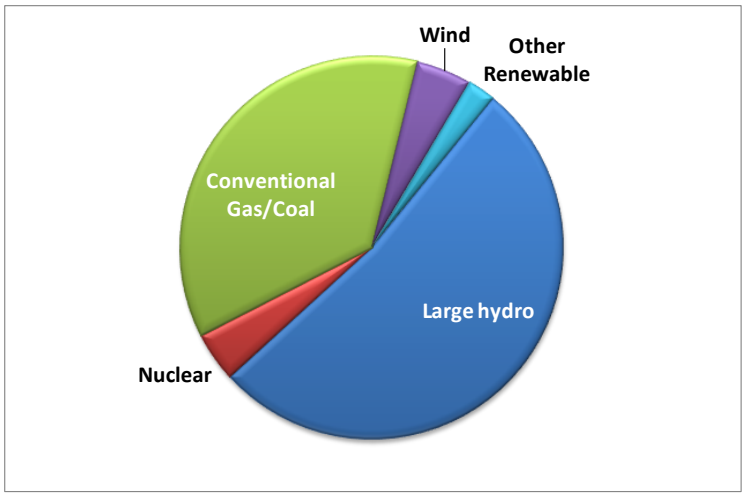
Atlantic Canada's current generating systems are concentrated in conventional coal and gas and large hydro facilities. The former are in the Maritime Provinces and the latter in Newfoundland and Labrador.

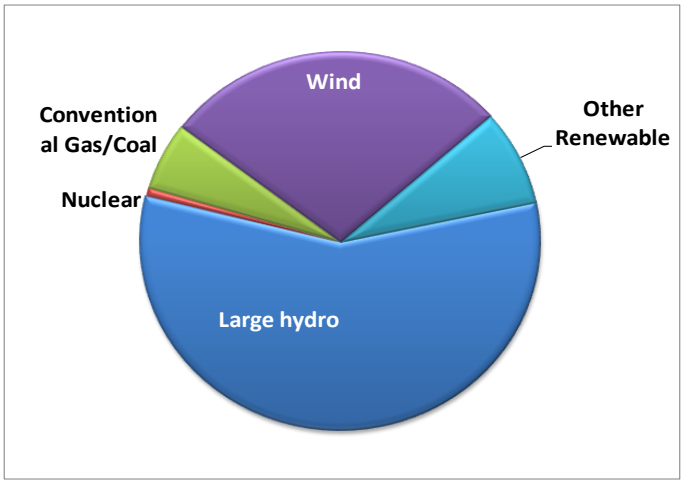
Exhibit A6.4
Existing Electrical Capacity by Type, Atlantic Canada
MWs



Source: "Canada's Electricity Infrastructure: Building a Case for Investment" Conference Board of Canada, April 2011

Investment plans for the Atlantic Canada system are skewed towards new wind generation and large hydro systems.

Exhibit A6.5
Investment in New Electrical Generating Capacity, Atlantic Canada
MWs



Source: "Canada's Electricity Infrastructure: Building a Case for Investment" Conference Board of Canada, April 2011

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The available investment plans for Atlantic Canada are concentrated on the generation systems. Some details are not yet available for major transmission lines.

Exhibit A6.6

Investment in Atlantic Canada Electricity Infrastructure 2010 to 2030, by Type

Sector	2010 $ Billions
Generation	23.1
Transmission*	2.0
Distribution	2.1
Total	27.1

Source: "Canada's Electricity Infrastructure: Building a Case for Investment" Conference Board of Canada, April 2011

*No transmission project costs published for PEI

Workforce Profiles and Trends

This section reviews Atlantic Canada data for the workforce and occupation profiles and related trends.

Workforce Profile

The 2006 Statistics Canada Census reported that there were 6.830 people working in the Electricity and Renewable Energy industry in Atlantic Canada, 3,523 of these were in the core Electricity Sector Occupations. By 2010 total industry employment had grown by 8.6% to 7,422.

The age profile of the industry workforce is very similar to the other provinces and includes the distinctive peak for the younger boomers age 45 to 54 and the associated, smaller proportion of the Gen X workforce age 35 to 44. The proportion of the workforce aged 55 to 64 is the same as other provinces and anticipates a high level of retirements. This profile is a consequence of the loss of employment and limited hiring during the 1990s.

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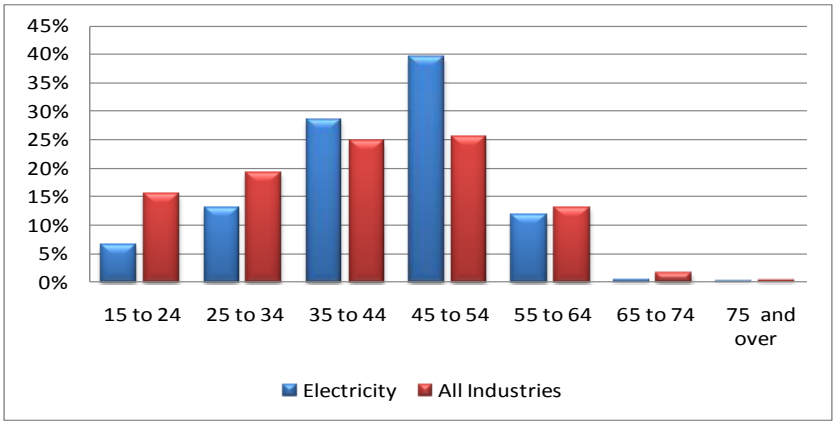
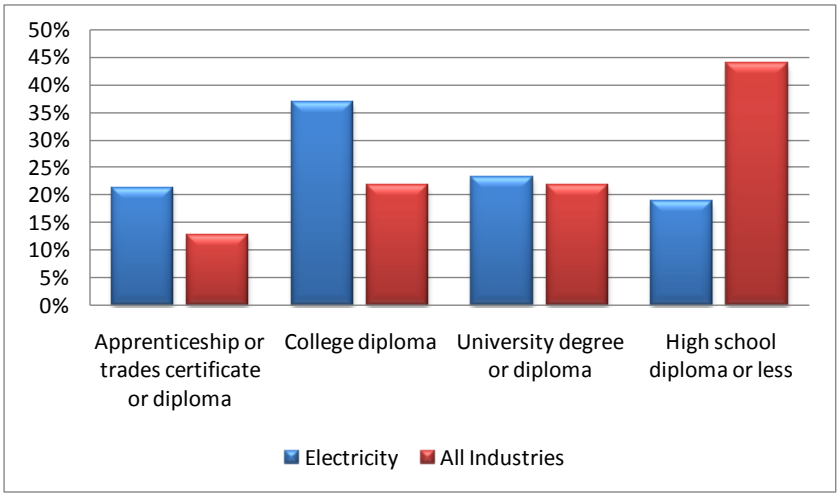
Exhibit A6.7
Age Distribution of the Workforce
Electricity and Renewable Energy Providers, All Industries
Atlantic Canada, 2006



Source: Statistics Canada, 2006 Census

The Atlantic Canada workforce has the same higher education profile with a higher than average concentration of skilled trades and apprentices, technicians and technologists from the colleges and engineers from the universities. Most of the workforce is older workers who graduated from post secondary programs over twenty years ago.

Exhibit A6.8
Higher Education Achievement
Electricity and Renewable Energy Providers, All Industries
Atlantic Canada, 2006



Source: Statistics Canada, 2006 Census

The Atlantic Canada workforce is heavily concentrated in the natural and applied sciences (engineering), trades and technical occupations than other provinces.

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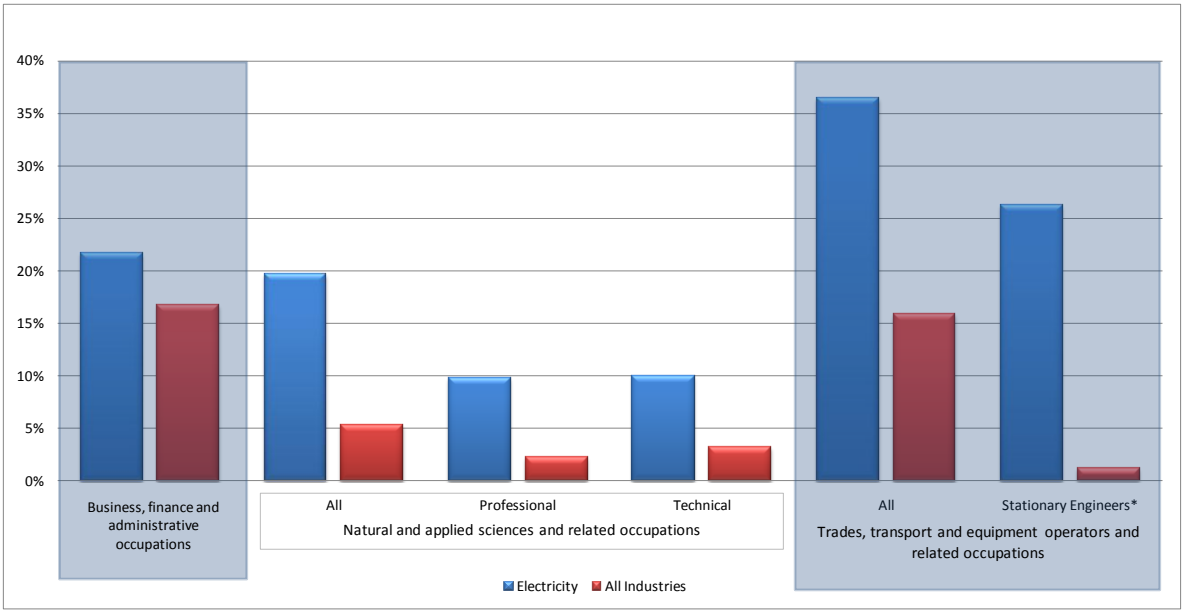
Exhibit A6.9
Distribution of the Workforce by Occupation
Electricity and Renewable Energy Providers, All Industry
Atlantic Canada, 2006



*Includes: Stationary engineers, power station operators and electrical trades and telecommunications occupations
Source: Statistics Canada, 2006 Census

Women are a smaller proportion of the workforce than men, and Atlantic Canada has the same proportion of women in the electricity industry compared to other provinces. This is typical of the gender composition of the key occupations.

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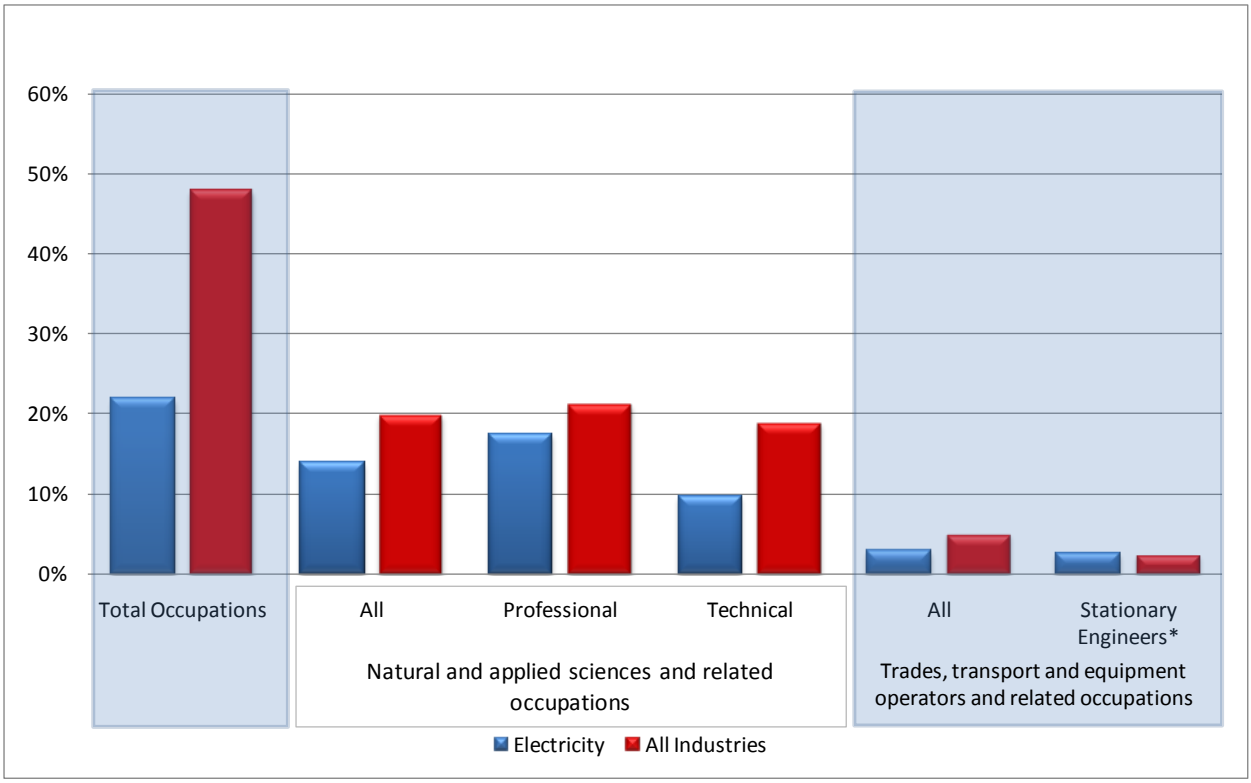
Exhibit A6.10
Distribution of the Workforce by Gender
Electricity and Renewable Energy Providers, All Industries
Percentage of Women in the Workforce, Atlantic Canada, 2006



Source: Statistics Canada, 2006 Census

Like the national workforce, the Atlantic Canada electricity sector workforce also has notably fewer immigrants than other industries. This is another consequence of the history of hiring Canadians in the 70's and 80's and employment losses and limited additions during the 1990s when immigration was rising.

Post Secondary Education and Immigration

There are two principal sources of labour supply: graduates from post secondary training programs and immigration. This section reviews recent trends for the electricity sector occupations.

Atlantic Canada shares national trends in post secondary education and training that impact the supply of new workers in the key applied sciences and technical occupations.

Engineering programs in Atlantic Canada feature strong gains for mechanical but weaker trends in enrolments and degrees awarded for electrical engineers.

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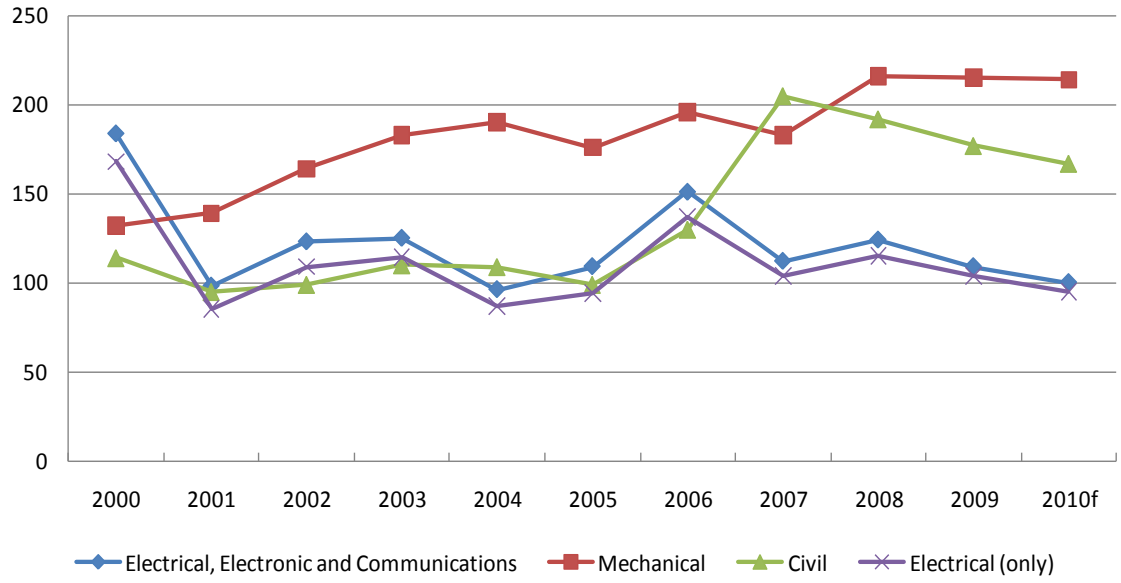
Exhibit A6.11
Undergraduate Degrees Awarded in Engineering Programs
Atlantic Canada



Source: Engineers Canada

Trends for apprenticeship programs, set out in Exhibit A6.12, show gains across the last decade for the electricians and related skilled trades, but declining completions for millwrights and stationary engineers.

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Exhibit A6.12

Apprenticeship Programs in Atlantic Canada

Atlantic									
	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
Construction Millwright and Industrial Mechanic (Millwright)									
Registrations	1038	1227	1254	1233	1182	978	993	888	801
Completions	132	108	114	111	105	93	75	66	66
Electrician, Except Industrial and Power System									
Registrations	1800	2094	2274	2490	2664	2820	2829	3207	3552
Completions	174	132	111	96	168	171	228	249	279
Industrial Electrician									
Registrations	387	423	450	471	444	444	435	453	429
Completions	42	30	18	27	30	36	27	27	51
Power Systems Electrician									
Registrations	0	0	0	0	0	0	0	0	0
Completions	0	0	0	0	0	0	0	0	0
Electrical Power Line and Cable Workers									
Registrations	231	282	312	300	282	225	222	240	264
Completions	33	18	24	24	39	54	24	21	24
Stationary Engineers and Auxiliary Equipment Operators									
Registrations	327	357	402	429	396	288	291	285	261
Completions	18	12	18	24	42	21	6	15	9
Total									
Registrations	3783	4383	4692	4923	4968	4755	4770	5073	5307
Completions	399	300	285	282	384	375	360	378	429

Source: Statistics Canada, Registered Apprenticeship Information System

Finally, immigration trends are set out for permanent immigrants and temporary foreign workers arriving in Atlantic Canada with jobs or intending to work in the electricity sector occupations. The largest group represented here are engineers and new arrivals for all the electricity sector occupations have hit a plateau since 2003.

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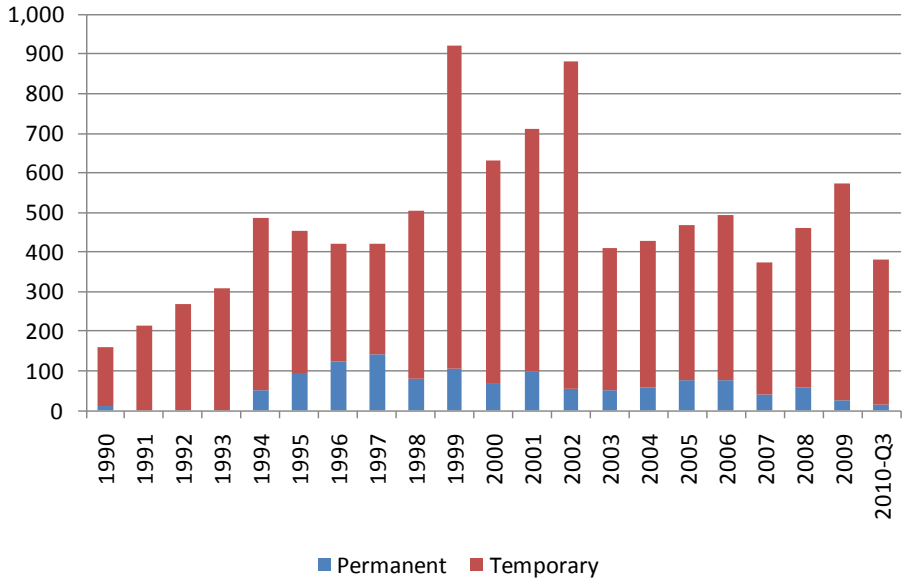
Exhibit A6.13
Immigrants Arriving in Atlantic Canada
Electricity Sector Occupations, 1990 to 2010



Source; Citizenship and Immigration Canada

Supply side survey – Atlantic Canada findings

4 Atlantic Canada post secondary institutions responded to the ESC survey.
Responses reported:

- Enrolments in electricity related programs in Atlantic Canada are expected to rise faster than other programs and faster than increases reported in other provinces.

Occupations

6 Atlantic Canada employers (out of a total national response of 89) responded to the ESC survey.

Key findings for Atlantic Canada include:

- Retirements
  - Age profiles for the Atlantic Canada survey respondents are slightly older that the profile for other electricity sector employers across Canada
  - The average age at retirement for the Atlantic Canada workforce is similar to or slightly older than the national average
  - Some respondents expect rapid growth in the number of retirements

- Workforce dynamics
  - Survey respondents indicated only limited or no growth in staff related to operations

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- Limited Atlantic Canada data on hiring rates and other measures of labour market dynamics show only moderately tight markets.

Assessing Future Labour Markets and Human Resources Management

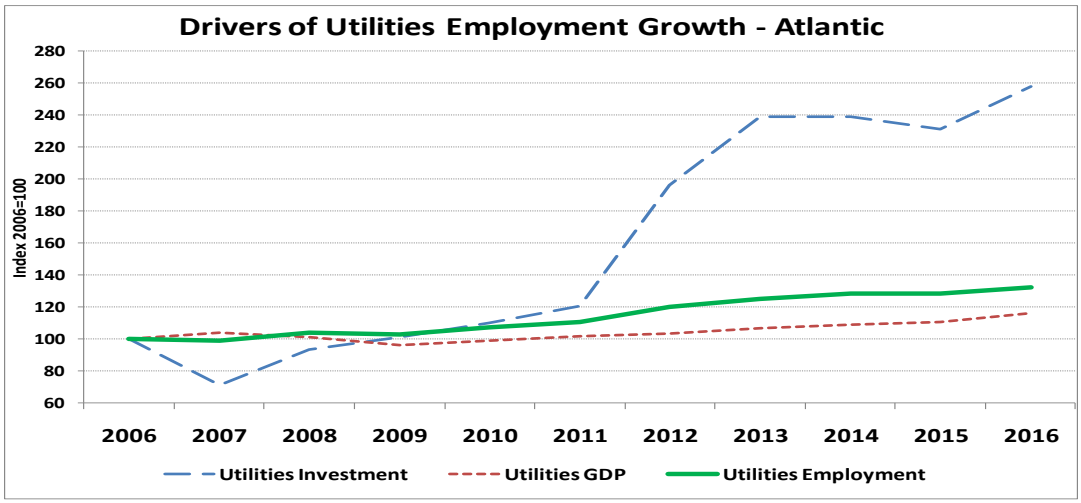
A new labour market model projects market conditions from 2011 to 2016. Labour requirements related to expansion are driven by expected investments and the growth in electricity output. Replacement demands are driven by demographic trends and the employer survey estimates of expected retirements.

Labour Market Assessments

Electrical utility investments in Atlantic Canada have been on a strong upward path over the past decade. The investment profile for the 2011 to 2016 period is dominated by the development of major hydro facilities in Newfoundland and Labrador. There will be associated transmission work that is not yet included in the projections. New projects are starting now and employment continues to ramp up to 2013. There are also several wind projects planned and underway across the region. Construction and related activity will continue at record high levels until 2016.

In contrast the growth in operations and output will be more limited. Industry output will not regain the pre-recession levels until 2012 and then it resumes moderate growth as new capacity comes on stream. Labour requirements related to operating the new capacity are limited. Employment demands will be concentrated on the investment side.

Exhibit A6.14
Projections of Output, Investment and Employment
Atlantic Canada 2011 to 2016



Source: Centre for Spatial Economics, ESC Employer Survey 2011, Census 2006

This pattern of investment and electricity demand is used to calculate employment growth by occupation.

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Exhibit A6.15
Employment Growth by Occupation
Electricity Sector Occupations in Atlantic Canada

Occupations	2006	2010	2016	Employment 2011 to 2016	
				% Growth 2011 - 2016	Avg. annual growth rate
Engineering managers	36	38	53	40.2%	8.0%
Construction managers	10	10	15	40.2%	8.0%
Utilities managers	290	299	398	33.0%	6.6%
Financial auditors and accountants	98	97	109	12.3%	2.5%
Civil engineers	31	32	45	40.2%	8.0%
Mechanical engineers	175	183	256	40.2%	8.0%
Electrical and electronics engineers	299	313	439	40.2%	8.0%
Information systems analysts and consultants	117	121	179	48.4%	9.7%
Civil engineering technologists and technicians	15	16	21	33.0%	6.6%
Mechanical engineering technologists and technicians	54	56	74	33.0%	6.6%
Electrical and electronics engineering technologists and technicians	289	299	398	33.0%	6.6%
Contractors and supervisors, electrical trades and telecommunications occupations	35	37	51	40.2%	8.0%
Electricians (except industrial and power system)	47	49	68	40.2%	8.0%
Industrial electricians	30	32	45	40.2%	8.0%
Power system electricians	224	234	328	40.2%	8.0%
Electrical power line and cable workers	873	913	1,280	40.2%	8.0%
Stationary engineers and auxiliary equipment operators	107	110	138	25.9%	5.2%
Power systems and power station operators	601	613	772	25.9%	5.2%
Construction millwrights and industrial mechanics (except textile)	192	201	281	40.2%	8.0%
Electrical Occupations	3,523	3,651	4,950	35.6%	7.1%
Other Occupations	3,307	3,491	5,063	45.0%	9.0%
Total	6,830	7,142	10,013	40.2%	8.0%

Source: Centre for Spatial Economics, ESC Employer Survey 2011, Census 2006

Exhibit A6.16 tracks labour requirements for retirements and death (replacement demands) relative to the projected labour force in Atlantic Canada. The proportion of the workforce expected to retire in each year from 2011 to 2016 rises steadily but has been set below levels implied by survey results. This reflects the findings from comparing the 2008 report to the 2011 update.

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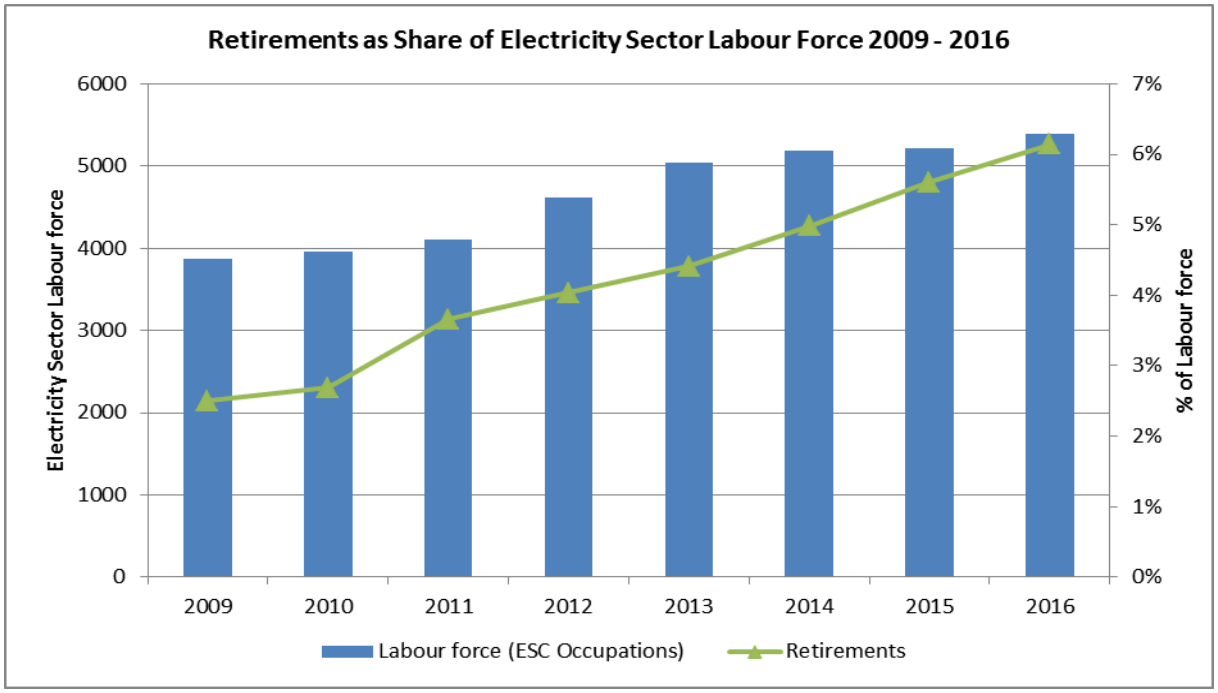
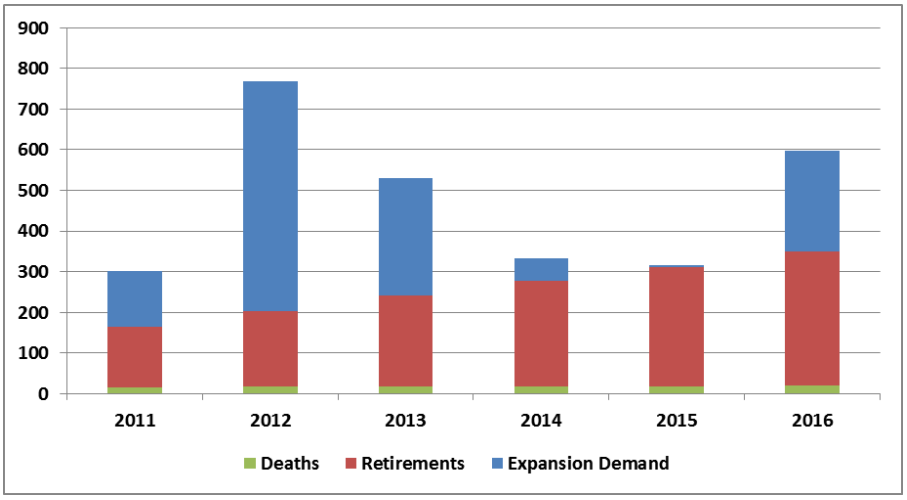
Exhibit A6.16
Retirement Projections for Electricity Sector Occupations



Source: Centre for Spatial Economics, ESC Employer Survey 2011, Census 2006

Exhibit A6.17 adds together the annual change in replacement and expansion demands for the electricity sector workforce in Atlantic Canada. The distinct peaks and troughs in expansion demand reflect the investment cycle and announced project start and ending dates. The smoother rise in replacement demand reflects the steady aging of the workforce and growing numbers of employees reaching retirement age.

Exhibit A6.17
Total Employment Requirements, Electricity Sector Occupations
Atlantic Canada, 2011 to 2016



Source: Centre for Spatial Economics, ESC Employer Survey 2011, Census 2006

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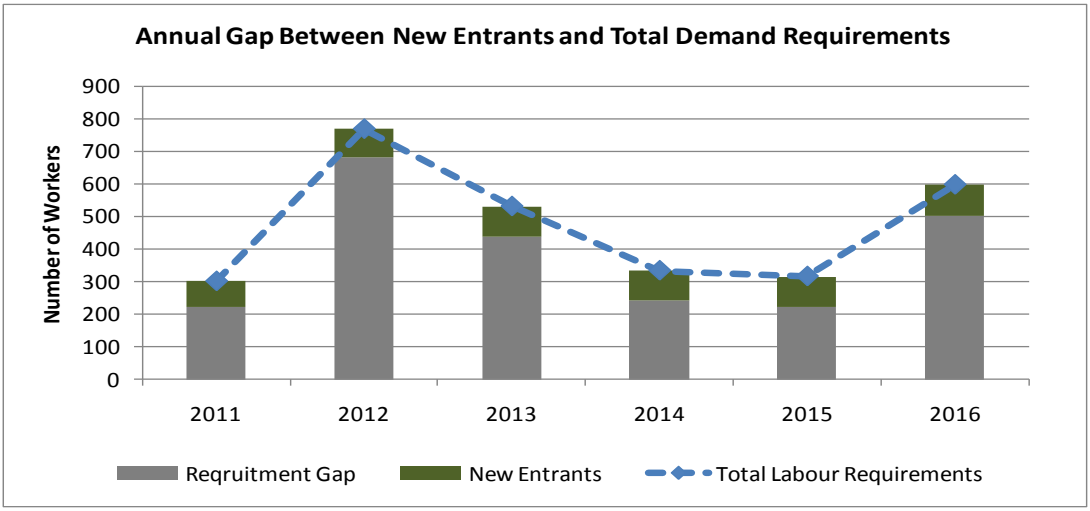
Finally Exhibit A6.18 tracks the change in the potential labour supply from new entrants and net hiring from outside the industry. There are not enough new entrants to meet the projected change in requirements and this implies tight labour markets in 2012 and 2013 as conditions ease off the peak activity in 2010. The implication here is that recruiting will shift to labour markets in other provinces or outside Canada.

Exhibit A6.18

New Entrants and Labour Requirements



Source: Centre for Spatial Economics, ESC Employer Survey 2011, Census 2006

Rankings

Labour Market rankings for each occupation are based on market measures of the supply – demand gap, the change in employment and the age profiles and retirements.

Labour Market Rankings Defined

	Rankings & Description
1	**Significant excess of supply over demand** No difficulty in recruiting qualified staff with 0-5 years or 5-10 years of Canadian experience at established compensation norms within the local labour market.
2	**Excess of supply over demand** No difficulty in recruiting qualified staff with 0-5 years or with 5-10 years of Canadian experience at established compensation norms within the local or regional labour market. The geographic range of recruiting and the range of acceptable qualifications is broader than in 1.

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3	**Moderate supply pressures** Difficulty in recruiting qualified staff with more than 5 years of Canadian experience, with industry or technology-specific skills, and with appropriate non-technical skills. The time required to fill these positions is typically longer than historic norms. Vacancies sometimes need to be re-posted. Employers actively solicit applications from outside the local and regional labour market and reimburse applicants for travel expenses related to interviews, etc. Recruiting engineering staff with 0-5 years of Canadian experience poses fewer challenges.
4	**Significant supply pressures** Difficulty across the board in recruiting qualified staff in the local and regional labour market. It is normal practice to actively solicit applications from outside the local and regional labour market and to reimburse applicants for travel expenses related to interviews. Employers are generally obliged to improve offered terms of compensation and to assist with re-location costs. Recruitment difficulties lead many employers to increase their use of third-party recruiters and to increase their use of contracting trades work, outsourcing of engineering and technology work to consultancies or staff the assignment with workers from another region. There is a significant increase in the risk of project delays and compensation-driven cost escalations.
5	**Supply constraints** Systemic difficulty in recruiting qualified staff. International recruiting is common among large employers. There is widespread perception that the contracting and consulting sector is working at full capacity and that there is little, if any, remaining scope to outsource construction, engineering and ICT work to qualified suppliers with a known track record.

Atlantic Canada labour markets for the electricity sector occupations are very tight from 2011 and 2013 as new electricity and renewable energy projects start up. The overall level of employment remains well above past peaks and market will remain tight.

After 2014 rankings are driven higher by replacement demands and the rising number of retirements. Rankings are generally higher for the older occupations.

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Exhibit A6.19

Atlantic Canada Labour Market Rankings

Occupations	2010	2011	2012	2013	2014	2015	2016
Engineering managers	4	4	5	5	4	4	4
Construction managers	4	4	5	5	4	4	4
Utilities managers	4	4	5	5	4	4	4
Financial auditors and accountants	3	3	3	3	3	2	3
Civil engineers	4	4	5	4	4	3	4
Mechanical engineers	3	3	5	4	3	3	4
Electrical and electronics engineers	3	4	5	4	3	3	4
Information systems analysts and consultants	3	4	4	4	4	4	4
Civil engineering technologists and technicians	3	4	5	4	4	4	4
Mechanical engineering technologists and technicians	3	4	5	4	4	4	4
Electrical and electronics engineering technologists and technicians	3	4	5	4	4	4	4
Contractors and supervisors, electrical trades and telecommunications occupations	4	4	5	4	4	4	4
Electricians (except industrial and power system)	4	4	5	4	4	4	4
Industrial electricians	4	4	5	4	4	4	4
Power system electricians	3	4	5	4	4	3	4
Electrical power line and cable workers	4	4	5	4	4	3	4
Stationary engineers and auxiliary equipment operators	4	4	4	4	4	4	4
Power systems and power station operators	3	4	4	4	4	4	4
Construction millwrights and industrial mechanics (except textile)	3	4	5	4	4	3	4

Comments on Rankings for Atlantic Canada:

- The Atlantic Canada labour force dedicated to the projected investment and construction activity is not large enough to accommodate the new projects that began in 2010 and continue to hire workers until 2013.
- Labour requirements related to output growth are much more limited and will not exceed the available workforce.
- Structural (i.e. age profile) and cyclical (i.e. projected investments and internal dynamics for vacancies and hiring) measures anticipate that Atlantic Canada markets are tighter than in other provinces.
    - Labour requirements and hiring related to retirements will be concentrated in experienced and specialized workers – not new entries or recent grads, and competition with other industries for some occupations will be intense.
- Post secondary programs for the electrical skilled trades are growing strongly and will help to fill the ranks of entry level and junior workers, but other post secondary programs are lagging and will not meet growing requirements.
- Immigration will continue to be an important source of labour in Atlantic Canada, but recent levels are low.
- Serious labour market and HR challenges are projected for Atlantic Canada.

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Appendix B List of Participants

We would like to acknowledge the generous time and support of the employers, educational institutions and other key stakeholders who participated in this study.

Organizations		
A. R. Milne Electrical Ltd.	Central Alberta Rural Electrification Association	Horizon Utilities Corporation
Ace Construction Ltd.	City of Medicine Hat, Electric Utility	Hubbell Canada LP
Advantage Electric Thunder Bay Ltd.	City of New Westminster	Hydro One Inc.
Alberta Electric System Operator	City of Penticton	Hydro Ottawa Holding Inc.
All - Tech Services	City of Red Deer	Hydro-Québec
Allteck Line Contractors	City of Swift Current Light & Power	KEMA Consulting Canada Limited
Anmar Mechanical and Electrical Contractors Ltd.	Commercial Electric (Welland) Limited	Langley Utilities Contracting
Arrow Installations	Cubit Power Systems	Leader Resources Services Corp
ATCO Electric	Dryden Electrix Inc.	Manitoba Hydro
ATCO Power	Electrigaz Inc.	Nalcor Energy
Atikokan Hydro Inc.	Énergie Northland Power Québec S.E.C.	New Brunswick Power Corporation
Battle River Rural Electrification Association	Enersource	Newfoundland Power Inc.
BC Hydro	ENMAX Corporation	Norfolk Power Distribution
Brant County Power	Éolectric Inc.	Nova Scotia Power Inc.
Broder Electric Ltd.	EPCOR	Oakville HE Distribution Inc.
Brookfield Renewable Power	Festival Hydro Inc.	Ontario Power Generation Inc.
Bruce Power	FortisAlberta	OZZ Electric Inc.
Burlington Hydro Inc.	FortisBC	Partner Technologies Inc.
Cambridge & N. Dumfries Hydro Inc.	Guelph Hydro Electric Systems Inc.	Paul Reitzel Industrial
Cartier Énergie Éolienne inc.	Horizon Electric Inc.	Peterborough Utilities Group
	Horizon Power Installations	Powerline Utility Contractors Inc.

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Organizations, cont'd	Saint John Energy	Toronto Hydro Corporation
PowerTel Utilities Contractors Ltd.	SaskPower	Valard Construction Ltd.
Primary Engineering & Construction	Sioux Lookout Hydro	Valley Power Line Contracting Ltd.
PUC Services Inc.	South Alta Rural Electrification Association	Wasaga Distribution Inc.
Renfrew Hydro Inc.	St. Thomas Energy Inc.	Wellington North Power Inc.
Rideau St. Lawrence Distribution Inc.	Sunny Corner Enterprises	Westario Power Inc.
Roberts Onsite	Tetra Tech	Western Pacific Enterprises GP
Rocky Rural Electrification Association	Thunder Bay Hydro Electricity Distribution Inc.	Woodstock Hydro Services
S&C Electric Canada Ltd.	Tillsonburg Hydro Inc.	Yukon Energy
		ZE Power Engineering

Educational Institutions	Lakehead University	Nova Scotia Community College
Algonquin College	Lambton College	Okanagan College
Cambrian College	Loyalist College of Applied Arts and Technology	PWU Training Inc
Cégep de Victoriaville	McMaster University	Red River College
Collège Boréal	Memorial University	Royal Military College of Canada
Collège communautaire du Nouveau-Brunswick Campus de Bathurst	New Brunswick Community College	Saskatchewan Institute of Applied Science and Technology (SIAST)
College of the North Atlantic	Niagara College	Sault College
Confederation College	North Island College	Seneca College
Dawson College	Northern Alberta Institute of Technology	Simon Fraser University
Georgian College	Northern College of Applied Arts and Technology	St.Clair College
Humber Institute of Technology & Advanced Learning	Northern Lights College	Thompson Rivers University

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Educational Institutions, cont'd

Université de Moncton

University of Alberta

University of Calgary

University of Manitoba

University of New Brunswick

University of Toronto

University of Victoria

University of Waterloo

Western University

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Appendix C Methodology

This appendix documents the methodology and primary data used in the 2011 ESC LMI Study. It covers the basic data sources, the surveys and interviews that guided the work and the labour market assessment process that summarizes the analysis into individual market rankings.

The analysis in the report is built on five sources:

1. Interviews
2. A survey of post secondary institutions
3. The employer survey
4. Statistical sources
5. A labour market assessment model

Interviews

Interviews with industry stakeholders were conducted at the start of the assignment. These fifteen interviews asked key industry stakeholders for their views on labour market conditions, their use of existing Labour Market Information provided by the Electricity Sector Council and their expectations for the current round of analysis. Responses were used to fine tune survey questions and to guide the addition of an inquiry into "next generation" occupations that are involved with the construction of new infrastructure by contractors and consultancies outside the electricity sector organizations. Respondents confirmed the general approach to the research and endorsed the value of the earlier studies and the intent to link the 2011 findings to the earlier work.

Stakeholder interviews in the 2011 update appear to have served a different purpose in comparison to the interviews reported in the 2008 report. There are few points of comparison across time for this part of the research.

A Survey of Post Secondary Institutions

The supply side of the labour market analysis is linked, in part, to the trends in registrations and completions of post secondary programs in Canadian institutions. The Electricity Sector Council has assessed key programs for electricity and renewable energy providers with a survey of faculty and administrators. The survey is addressed to university engineering programs, college technology and applied science and apprenticeship programs. Respondents are asked to identify key programs for the industry and to report on trends in enrolment, barriers to expansion, programs related to the industry and the student community. Identical questions were asked in the 2008 and 2011 surveys.

The Employer Survey

Key findings in each LMI Update are based on a detailed survey of employers. A sample of employers was designed to capture a cross section of the population by size, business line and region.

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The sample was drawn from a list of organizations in the electricity and renewable energy industry. A first list was obtained from the Electricity Sector Council and this was an extension of the list used in 2007. The consulting team added names to this list in three categories:

- Construction, maintenance and related contractor organizations working with the industry
- New speciality firms in the renewable energy sector
- Engineering and related consulting firms

The survey questions were modified to address the occupations and circumstances for these new firms. In the end the number of firms responding to the survey from these added groups was very limited. Respondents were drawn mostly from the population that filled in the 2007 survey.

The survey questions and the sample were prepared to maximize the similarity between the 2007 and 2011 results. This was intended to allow a comparison of results and an assessment of how conditions have changed over the intervening period. Comparability was extended to the list of key occupations targeted in the questions.

The final sample included 89 firms employing 75,562 workers. The 2007 survey covered 87 firms employing 76,628 employees.

Statistics from Various Canadian Sources

The core analysis was conducted at a relatively detailed level, focusing on disaggregated definitions of industries and occupations. In terms of Canadian classification systems maintained by Statistics Canada the research targeted the electricity and renewable energy sector which is a four digit classification in the North American Industrial Classification System (i.e. NAICS 2211) and the occupational detail (e.g. civil engineers) was sourced at the four digit level of the National Occupational Classification system.

At this level of analysis the *Statistics Canada 2006 Census* provides the most reliable estimates and this source is used throughout the report as a starting point for estimates and projections. More recent measures of labour requirements, industrial and economic drivers and supply side measures were drawn from; the Business Registry the Labour Force Survey and the Survey of Establishments and Payrolls at Statistics Canada. Supply side measures include immigration data from Citizenship and Immigration Canada and apprenticeship data from the Registered Apprenticeship Information System at Statistics Canada. Finally, data on engineers in post secondary programs was gathered from Engineers Canada.

These data sources were also used during the 2007-2008 research, preserving another aspect of comparability across the years.

Labour Market Assessments

The primary data from the surveys was combined with the secondary sources described above in a detailed labour market assessment of markets for each occupation in each region. These assessments were prepared by combining measures of labour requirements (demand) and workforce availability (supply). The

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difference between these two measures corresponds to unemployment and represents a measure of market tightness as requirements approach and exceed supply of weakness in the opposite case.

A new model of nineteen occupations in six regions was created through these estimates of demand and supply measures. National totals for each of the occupations are also available. The measure of the basic market balance is combined with data on retirements and mortality (replacement demand), immigration and post secondary graduations to complete the assessment.

Each measure is assessed in each year in each market and the final analysis isolates a single ranking; ranging from the lowest value of 1 – signalling a weak marker, to 5 – signalling a very strong market.

A series of economic and demographic models maintained by the Center for Spatial Economics (C4SE) are used to project the historical values of the labour market measures into the future. A five year horizon was chosen to capture current economic and industry cycles and key demographic factors. Four linked economic models that are managed by the C4SE were used in the report.

The first is a series of provincial models that track economic activity for the overall economy (GDP, income and expenditure flows, government revenue and expenditure, etc.) industries (up to thirty separate industries) and demographic detail. The provincial economic and demographic analysis is added to a national total and is used to drive detailed employment and labour force measures. Labour market models have been customized for industry and occupational groups. These include the Information and Communication Technology Council, the Construction Sector Council and Engineers Canada. The Electricity Sector Council Model is a variation on these other models.

The latest addition to the C4SE system is the Provincial Occupation Modelling System (POMS) that applies all the content of the provincial to new and more detailed estimates of employment, labour force, unemployment, retirement, mortality, migration and new entrants. These measures are linked with new dynamic relationships that track the changing age distribution of each occupation and the associated change in retirement, new entrants, mortality and in-mobility.

Labour estimates in the models begin with the 2006 Census values for employment, the labour force and unemployment in each market. These starting measures are extended to 2010 and adjusted with reference to Labour Force Survey results. Projections to 2016 are driven by a series of measures taken from the Center for Spatial Economics Occupations model.

Labour market assessments are available at two levels for each occupation. An overall market assessment is taken from the C4SE analysis and this measures employment, labour force and related concepts for all industries. An electricity market assessment is prepared by Prism Economics starting with Census data measuring employment and labour force for each occupation in the Electricity industry (NAICS 2211). Various assumptions and calculations are made to link the two market assessments.

On the demand side employment in each occupation across all markets is taken from the C4SE model. Estimates in each market for the electricity industry are projected forward using a weighted average of the annual rate of change in output (measured by GDP) in electrical utilities and investment in all utilities.

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Replacement demand is calculated as the sum of deaths and retirements. The latter is estimated for each occupation across all industries using the C4SE analysis. Retirements in the electricity sector are estimated using the findings of the ESC survey reporting the proportion of the workforce in responding employers expected to retire between 2010 and 2016.

Supply side measures are taken from C4SE estimates that decompose the annual change in the labour force into new entries into each occupation and net in-migration from other industries, occupations and regions. These measures are supplemented with Prism Economics analysis of graduates from post secondary programs (where applicable) and immigration.

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Appendix D Survey instrument

Please see separate document.

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