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POWERING UP THE FUTURE

2008 Labour Market Information Study

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Funded by the Government of Canada's Sector Council Program

Canada

ABOUT THE ELECTRICITY SECTOR COUNCIL

Approximately 100,000 Canadians are involved in the generation, transmission and distribution of one of our country's essential utilities: electricity. Their work powers homes and businesses across the country, fuelling everything from light bulbs, cell phones and refrigerators to water treatment plants and road vehicle assembly lines.

The Electricity Sector Council provides support to this dedicated team by working with industry employers and other stakeholders to research and resolve human resource and workplace development issues.

This report is also available in French and can be obtained electronically at www.brightfutures.ca.

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Executive Summary

The following document is a summary of *POWERING UP THE FUTURE 2008 Labour Market Information Study*, a comprehensive study of the Canadian electricity industry undertaken by the Electricity Sector Council with the support of Human Resources and Social Development Canada (HRSDC). The full study is available at www.brightfutures.ca

The Canadian electricity industry is on the edge of a perfect storm which puts at risk the future supply and availability of the electrical energy Canadians have come to rely upon so completely.

We are used to simply turning on switches in our homes and places of business to have instant access to an abundant supply of electrical energy. Electricity powers everything from our light bulbs and refrigerators to water treatment plants and automobile assembly lines. It is something we rarely think about or worry about.

The ease, cost and convenience of this source of energy has made Canada a world-leader in the generation, transmission and distribution of electrical power and it is essential to our economic well-being and our future economic progress.

An aging workforce, low recruiting numbers, inadequate infrastructure and a continual increase in demand from domestic and export markets are converging to create a perfect storm in the electrical industry. Although many employers, businesses and educational institutions have started to take action to mitigate the effects of the looming labour shortages in the electricity sector, there remains an increasing threat of an insufficient supply of workers to meet the increasing demand within the sector.

The Electricity Sector Council (ESC) is an independent, not-for-profit organization funded by the Government of Canada with support from industry partners. The 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.

In recognition of the impending labour shortages that pose a threat to the electricity sector, the Electricity Sector Council, in partnership with Human Resources and Social Development Canada (HRSDC), commissioned a study to better understand which areas and occupations are currently most under pressure, and the types of pressure that exist. More broadly, the goal of the study was to determine the extent of the labour supply – demand gap. With the information from the current project, the ESC, employers, and businesses in the electricity sector can take appropriate action to mitigate the effects of the human infrastructure shortages.

1. Summary of Findings

Data from the Electricity Sector Council's 2008 study indicates that despite hiring an increasing proportion of younger workers the supply-demand gap has widened since 2004, when the Canadian Electricity Association (CEA) conducted its Human Resources Study of the Electricity Industry in Canada. Based on employer estimates, 28.8% of the current electricity workforce is expected to retire between 2007 and 2012, a higher annual rate of retirement than was estimated in the 2004 CEA Sector Study. Opportunities within the sector lie in the ability of both establishments and human resource planners to creatively utilize the skills and abilities of people to react to the sector's changing environmental and demographic landscape.

- **Recruitment and retention continue to be a priority for the electricity industry to address existing vacancies and upcoming retirements.**

Similar to other sectors of the economy, Canada's electricity sector faces the prospect of a prolonged period of increasing competition for professional and skilled workers, prompted by an aging labour force and a diminishing supply of suitably trained and educated young workers. In the past, the electricity sector has generally benefited from its ability to attract young talent. Additionally, once employed in the sector, workers tended to remain in the sector throughout their careers. Today these conditions are changing. Competition for staff from within the utilities industry is coming from small but growing independent power producers, as well as organizations outside the electricity industry. As a result of these changes, talented younger workers have considerably more career choices.

Retirement will continue to be a significant issue for human resource planners in the electricity industry in the future. Based on employer estimates, 28.8% of the current electricity workforce is expected to retire between 2007 and 2012, a higher annual rate of retirement than was estimated in the 2004 CEA Sector Study. In addition, despite the fact that employers in the electricity sector have hired a significant number of new staff (nearly 900 staff in 2006), partly to replace the 2.4% of the industry that retired in 2006, 3.2% positions in the industry in 2006 were still unfilled. Employers who responded to the ESC Employer Survey reported 132 unfilled vacancies for Managers and Supervisors (2.2%), 405 unfilled vacancies for Engineers and Technicians/Technologists (3%), and 821 vacancies for Trades occupations (3.5%).

Further, retirements in the electricity sector are expected to increase significantly over the next 5 years, which will further exacerbate the staffing shortages. These findings are consistent with the general trend in the country, where overall there are reported labour shortages in many trades occupations. Projected retirements in 2009 (1,968) represent 4.7% of the estimated non-support workforce. Projected annual retirement climbs to 6.2% by 2012.

The line of business that will be most affected by the retirements is transmission, which will see an increase in retirements of over 750% by 2009 and over 900% by 2012. The sector as a whole is expecting to experience a doubling of retirements by 2009 and an increase of over 160% in retirements by 2012.

In 2006, 33% of employees were eligible for their partial pension; the majority of these were people in trades occupations. This poses a significant challenge to employers to ensure these employees remain on the job rather than taking early retirement.

- **Recruitment strategies will need to change and increased effort will need to be put toward utilizing less commonly accessed pools of labour.**

Employers are always competing with other employers to hire the best and the brightest employees. In the electricity sector, employers compete not only with others in the sector, but also with establishments outside the sector who draw on the same pool of labour (including engineers and trade staff). The most commonly identified source of competition for employees was other utilities. In total, 77% of respondents noted that other utilities were a key source of competition, followed by Contractors (33%) and the Oil and Gas industry (25%).

Overall, respondents reported 897 new hires in 2006; Electrical Power Line and Cable Workers were the largest group of new hires in 2006. Large employers reported the biggest group of these new hires as being from other sectors (38.1%), and small and medium employers reported the largest number of their hires coming from within the electricity industry (48.8%). Overall, 34.2% of new hires were from non-electricity related industries, and 33.6% were from within the electricity sector. Employers also reported hiring co-op students, interns, summer students, and apprentices. On average, 82.7% of employers hired co-op students, 63.2% hired interns, 82.7% hired summer students, and 73.6% hired apprentices.

Relatively untapped sources of labour for the electricity sector include internationally trained workers, women, and Aboriginal people. The least commonly reported source for new hires was recent immigrants (4.3%), followed by individuals with no previous work experience (5.9%). Companies have historically relied on poaching employees from other employers, but given the current vacancy rates, it is expected that more employers will indeed need to look beyond Canada's borders to staff their workforce.

Other under-utilized sources of labour include women and Aboriginal people. Both of these groups are under-represented in the electricity sector, both as employees and as students in training programs that are related to the electricity sector. Employers reported that currently, 16% of Managers and Supervisors are female, but only 8% of Engineers and Technicians and a mere 2% of Trades employees are female.

- **Increasing the supply of trained graduates into the electricity sector will require increased collaboration between industry, employers, and educational institutions.**

Increasing the supply of trained graduates into the electricity sector will be a challenge. Currently, qualitative evidence suggests that the electricity sector is not very popular as a career choice among high school and post-secondary graduates. Representatives from educational institutions reported that students are not attracted to the industry because it does not have a good public image – i.e., it is seen as dull and lacking in career opportunities.

Generally speaking, universities are reporting a decline in enrolment in programs that are closely related to the electricity sector. For example, Statistics Canada reported that enrolment in Electrical Engineering programs decreased by 10% between 2003 and 2005. It is estimated that this trend will continue, given that 40% of university respondents reported that programs related to the electricity sector are growing at a slower rate than the other programs offered by their institution, and an additional 13.3% reported no program growth at all.

Among post-secondary institutions surveyed, colleges reported higher growth than universities. More than 60% of colleges reported that their programs related to the electricity sector are growing at a faster rate than other programs. Additionally, according to Statistics Canada, the number of registrants in apprenticeship training programs for occupations in the electricity sector has increased by 6% between 2003 and 2005. Most significantly, the number of registrants for Power Line Technician training increased by 21% over the same period.

However, drawing graduates from electricity related programs into the industry will require considerable collaboration between industry, employers and educational institutions. Over 75% of respondents reported that increased industry engagement would be the most effective means of increasing the supply of trained graduates.

Increased collaboration will also need to take place concerning programs for internationally trained workers. Educational institutions are well positioned to offer training or upgrading of certain credentials, if they have the external support.

Recommendations

1: Mobilize the industry to take action and get industry stakeholders involved at all levels – addressing the challenges goes beyond simply human resources, and requires a change of cultural attitudes toward a more holistic approach to mitigating the effects of labour shortages.

Strategies:

a. Identify people within companies, specifically people who are not human resource personnel, who are models or champions of change. Recognize people within large corporations who are taking action and breaking new ground with innovative ideas such as creating partnerships with educational institutions or other corporations.

b. Communicate the current report and findings to all industry stakeholders, including government, Boards of Directors, and Labour Leaders. Communication is imperative in paving the way to change and action. The report needs to be actively delivered and presented to other industry stakeholders, especially those with decision-making power.

c. Generate and facilitate an open dialogue between industry stakeholders, including the current workforce (from line workers to engineers). Sharing ideas, concerns, experiences, successes and challenges helps avoid repeating the same errors, and paves the way toward establishing 'best practices' for the industry.

d. Start messaging to businesses that their needs are not being met. Businesses need to be fully aware of the impact of the changing human resource profile on businesses, and specifically on their operating efficiency.

e. Bring human resource planners into the planning of the strategic corporate plan. There needs to be a shift in the corporate culture that currently exists, which shows a disconnect between human resources and other corporate executives. Human resources planners need to be given the opportunity to tell other corporate strategic planners about what is going on "on the ground".

2: The main human resource priority for stakeholders and employers needs to be to focus on filling the supply – demand gap.

Strategies:

a. Human resources (HR) needs to play a significant role in developing a plan to actively recruit (attract), train (develop), and retain workers. In order to do this, HR personnel will require the support of the corporate executive – both financial and in practice. HR will need to develop a realistic plan that would suit the individual company's needs and be within the company's capacity to implement.

b. Increasing training capability and capacity, with the support of government and industry, will contribute significantly to bridging the supply – demand gap. Businesses and employers need to incorporate training and mentoring (knowledge transfer) as an ongoing strategy to filling the supply gap.

c. Intensify messaging to government and industry to increase the number of post-secondary seats in programs that lead to occupations in the electricity sector. Businesses and large corporations can also play a role in funding these seats, and working in collaboration with government and industry to ensure there are enough enrolments and graduates to help bridge the gap.

d. Industry, in conjunction with corporate partnerships, can continually message to government to allow more workers to enter Canada through the Provincial Nominee Program. Corporate partnerships and provincial industry representatives may have more influence on government if working in collaboration.

e. In the short term, accessing and utilizing the 'electrical family' of workers can help stabilize the widening gap. For example, although power line and cable workers have completed a different apprenticeship program than residential electricians, they share common skills and knowledge. Therefore, with some on the job training, these 'family members' can easily learn the specific skills required for the job.

f. Industry can modify its recruitment and marketing strategies to target typically under-represented groups such as women, aboriginal people, members of visible minority groups, and immigrants. Industry and training institutions can develop targeted training courses for these groups to help facilitate entry into the industry among these populations.

g. Creatively market the industry to high school students to peak their interest, curiosity, and awareness of the various occupations and careers options within the electricity sector. Similar awareness and marketing campaigns could also be undertaken in colleges and universities. Creating awareness can encourage students to enroll in courses and programs related to the industry, and graduates to look to the industry for work after convocation.

The combination of the aging workforce, a shortage of trained new workers and rising demand on the electricity system are the factors raising significant concerns about the ability of the electricity sector to meet the needs of Canadians.

The immediate task is the need to focus on closing the supply-demand gap for personnel.

- The current industry workforce is aging and is, or soon will be, retiring. It is estimated that between 2007 and 2012, 28.8 per cent of the workforce will be retiring.
- The supply of trained younger workers is declining and there is increased competition for their services as other industries face similar demographic challenges. Enrolment in electrical engineering programs decreased by 10 per cent between 2003 and 2005 and it is estimated this trend will continue.
- The demand for electricity is increasing and aging infrastructure needs to be replaced.
- As Canadian domestic demand for electricity increases, so does the export demand from the United States of America.

Industry leaders recognize the challenge

Tom Goldie, Chair, Electricity Sector Council: "The workforce is falling behind in terms of the supply/demand gap. I think it's a wakeup call for us and the industry. The numbers show we will continue to fall behind until about 2012."

2. Profile of the Electricity Industry

The Canadian electricity industry is a critical sector of Canada's economy, and electricity is a fundamental input to the efficient operation of almost every industry and sector. Over the past decade, Gross Domestic Product (GDP) in the electricity generation, transmission and distribution sector has grown by 10.8%. In 2006, annual GDP in the sector stood at $23,053 million dollars, up from $20,813 million in 1993.

Canada's electricity industry involves three major functions: generation, transmission, and distribution. Generation has been defined as the "process of producing electric energy by transforming other forms of energy" or the amount of energy that is produced. Transmission refers to the process of moving higher voltage electricity in bulk from the supply source to distribution centres, while distribution refers to the process whereby electricity is moved at lower voltages from major substations to customers.

Damon Rondeau, Chair, Labour Market Information (LMI) Steering Committee: "The industry has been aware of the pending workforce shortage for years, but this time they are supported by the most authoritative set of numbers you can see on this topic today."

The dominant fuels for generating electricity remain hydro, coal, nuclear and gas but new forms of energy are developing quickly in the sector and the operational structure of the sector is changing as well.

Status of the Canadian electricity sector:

- Canada is the world's 6th largest producer of electricity and accounts for approximately 3.4 per cent of the world's total electricity production.
- On a per capita basis, Canada is the world's third largest electricity producer.
- Most electricity is produced by Canada's abundant water resources (hydro), but other forms of electricity production are increasing in importance.
- The form of electricity production in Canada is changing and is expected to change even more because of the growing demand for other sources of energy production.
- Hydro is the most important source of Canadian electricity production, but coal and natural gas are important and growing.
- More electricity will be derived from the growing use of geothermal, wind, solar and biomass as energy sources.

Exhibit 2.16: Electricity Generation by Fuel Type

Fuel Source:	GWh	% of total production
Hydro	363,626	57.9%
Coal	106,188	16.9%
Nuclear	92,040	14.7%
Gas	36,324	5.8%
Oil	19,442	3.1%
Biomass	9,036	1.4%
Wind	1,471	0.02%
Waste	19	0.003%
Solar PV	17	0.003%
Tide	31	0.005%
Geothermal	0	0
Solar thermal	0	0

International Energy Agency, www.iea.org.

- The evolution in electricity production means the skills required of new entrants into the electricity industry will have to evolve as well.

2.1 Structure of the Industry

Traditionally, the vertically integrated monopoly market structure has prevailed in Canada – that is, establishments within the sector-owned and operated generation, transmission, and distribution facilities. Still prevalent in Canada today, this market structure was also adopted by many other countries of the Organisation for Economic Co-operation and Development (OECD), since electricity was, for a long time, regarded as a natural monopoly.

Proponents of the vertical monopoly structure still argue that it is the best model to ensure a reliable and adequate supply of electricity. Although traditional hydro, coal-fired and nuclear generation require large capital investments and long construction lead times, they generally have lower operating costs compared to natural gas-fired generation. Moreover, though several provinces have introduced competition in the generation sector (i.e. at the wholesale level), in many regions, independent power producers (IPPs) and open access transmission tariffs (OATT) development integrated into the market structure retains many attributes of a vertically-integrated unit.

More recently, however, a number of trends have resulted in a shift toward electricity market restructuring. Technological advances in electricity generation, for example, have led to the creation of smaller, more efficient electricity generating units (e.g., gas-fired), which can be built more quickly and cheaply than the traditional nuclear/fossil fuel plants. The deregulation and restructuring of other industries, such as natural gas and telecommunications, has also had an impact on the restructuring of the electricity industry. Also, the restructuring of the electricity industry was a response to pressures to adopt the U.S. model in a context of historically greater North-South instead of East-West interconnections. Another factor influencing the restructuring of the Canadian electricity sector was the growing pressure from independent power producers (IPPs) to have the ability to compete in the market.

Restructuring of the traditional vertically integrated electricity monopoly will continue to transform the Canadian electricity sector. Beginning in the 1990s, this restructuring has resulted in introduction of competition in electricity markets, and the emergence of private (independent) power producers that produce power for sale using various sources, including hydro, wind, coal and gas. In addition, a number of self-generating power producers, such as pulp mills and mines, which produce power primarily for their own consumption, are also becoming more involved in the sale of surplus power to a transmission grid.

As new suppliers of electricity continue to emerge and grow, competition for managers, professional engineers and skilled workers will intensify. Not long ago, the electricity workforce across Canada was largely restricted to public utility operators who faced little difficulty attracting new talent to their operations. This is not necessarily the case today as competition for young talent is also coming from small but growing independent power producers, as well as larger resource operators who are becoming increasingly involved in the sale of surplus electricity. Another part of the story and reason for the utilities' need to catch up on skills is attributable to the overcapacity of the 1980's-90's and under-investment in human capital of the 1990's into the early 2000's.

The survey results, however, continue to show that employees are predominantly working in establishments that are considered integrated. Exhibit 2.4 below shows clearly that the single largest line of business is the generation of electricity.

Information obtained from the employer survey suggests that large employers tend to be engaged in generation, distribution, and other activities (e.g., manufacturing) with smaller employers more likely to be represented in distribution, renewables, and other lines of business.

Exhibit 2.4: Total Staff by Line of Business

Line of Business	Number of Staff	Percent of total
Integrated	48,037	63%
Generation	16,180	21%
Transmission	767	1%
Distribution	5,036	7%
Retail	2	--
Renewable	51	0.1%
Other**	6,555	8%
Total	**76,628***	**100%**

Source: 2008 Employer Survey, n=87

*note: this number does not include imputed employment by region

** organizations engaged in manufacturing, construction, and maintenance; business development and consulting

Employment numbers in the industry vary depending on the source and timeliness of the data available. The survey uses four different sets of data to capture employment in the industry.

The difference between estimates could be attributed in part to the varied currency of the data. For example, although the most recent Electricity Industry Survey Publication was released in 2007, the data is from 2005.

2.2 Estimate of Employment in the Canadian Electricity Sector

Trends in Electricity Sector Employment

Notwithstanding the potential challenges with various existing data sources, it is important to review historical trends in the sector. Using information available from the Labour Force Survey (which provides data between 1993 and 2007), it is possible to create an employment history for the sector.

The electricity sector's labour force experienced a steep decline in employment during the 1990s, with the number of workers falling from 112,600 in 1993 to 85,900 in 2000. The restructuring undertaken by several firms in the sector in the mid-1990s was identified as one of the key reasons for this drop in employment. Another factor affecting the drop in employment may be low levels of hiring in the industry for a prolonged period during this time, and a resulting lower level of interest in the electricity industry on the part of graduates.

Exhibit 2.10: Estimated Employment in the Canadian Electricity Sector – Recent Data

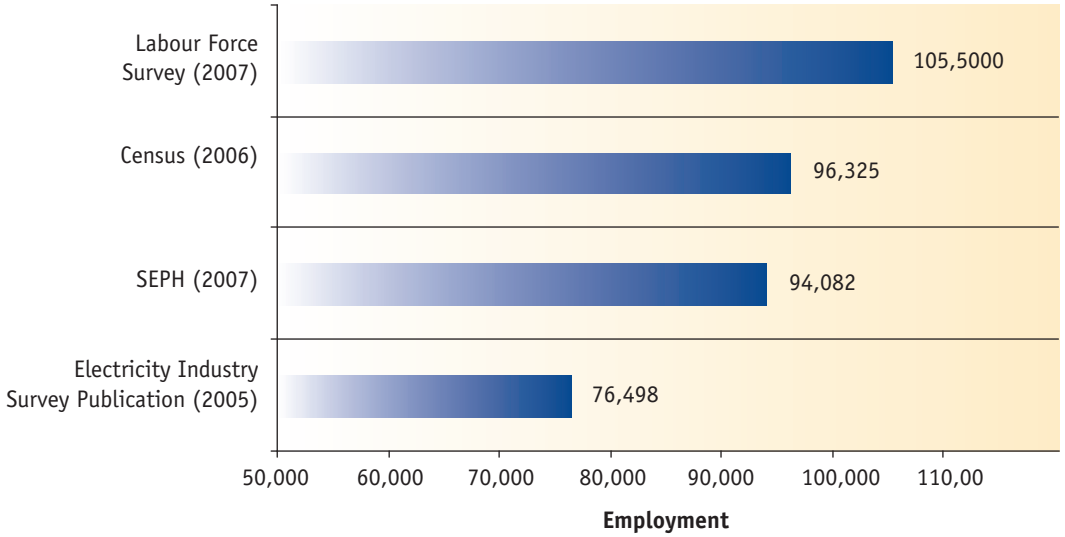
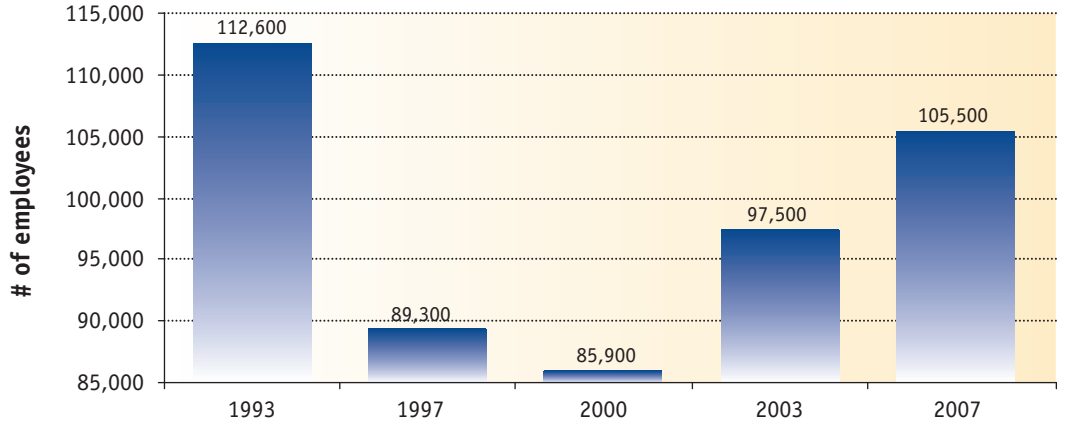


Exhibit 2.12: Employment in the Electricity Sector in Canada (1993, 1997, 2000, 2003, 2007)



Source: Statistics Canada, Labour Force Survey. Total Employment in Canada by Age Group and Gender for NAICS 2211, in thousands, annual (persons), 2007.

Employment increased by more than 8% between 2003 and 2007, resulting in employment levels in 2007 approaching levels not seen since 1993.

2.3 Electricity Production

Canada's total electricity production increased steadily over the past decade, rising from 532,094 gigawatt hour (GWh) in 1993 to 616,566 GWh in 2006. This represents an increase of nearly 16% over the period. It should be noted that the International Energy Agency's estimations of Canada's gross electricity production are slightly higher. Both sources do show consistency in terms of the decrease or increase per year of electricity production. Canada's electricity generation in megawatt hour from 1993 to 2006 as illustrated in Exhibit 2.14 below is sourced from Statistics Canada.

To put this in perspective, it is estimated that one megawatt hour (MWh) is enough energy to supply power to 1,000 typical Canadian households for one hour.

Generation by Fuel Type

Canada is recognized as having one of the most diversified electricity generation bases in the world. The majority (58%) of Canada's electricity is generated by hydro with a significant proportion also generated by coal (17.0%) and nuclear power (14.7%). Hydro has been the dominant source of electricity in Canada over the past decade. In fact, use of hydro power in electricity generation has increased steadily, rising from 320,410 terawatt hour (TWh) in 1993 to 358,446 TWh in 2005. This represents an 11.9% increase over the period. In 2005, Canada was the second largest producer of hydro electricity in the world, producing about 12.1% of the world total – second only to China. Recent literature on the topic indicates that this trend will continue into the next decade.

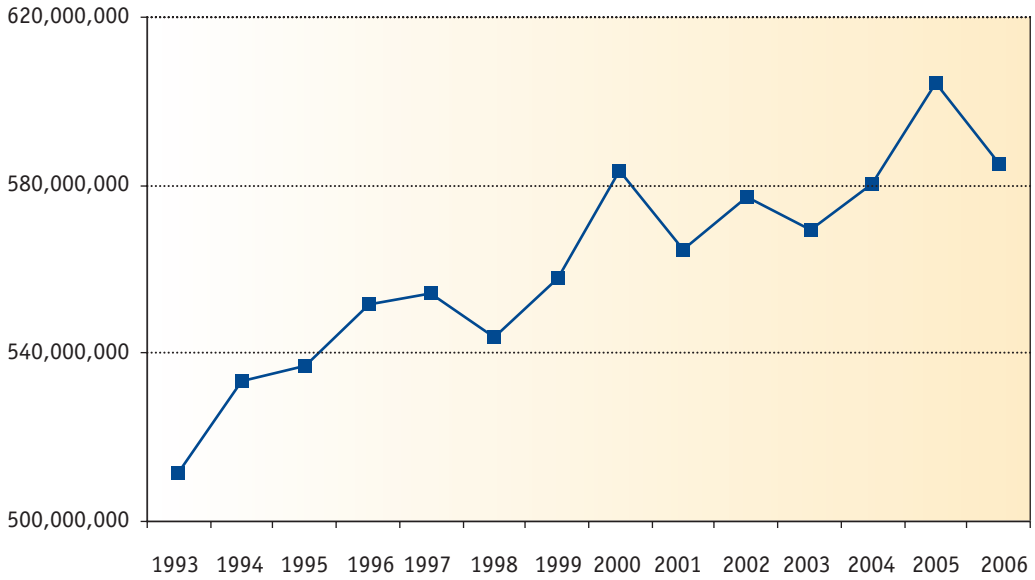
Coal is the second greatest source of electricity in Canada. Despite the fact that coal-fired power plants produce significant quantities of greenhouse gas (GHG) emissions—approximately sixty times more than hydropower—it is anticipated that a significant proportion of the new generation in Canada will likely be fuelled by coal. The fact that it remains an inexpensive energy source has propelled it to a 16.7% growth from 1993 to 2005.

The use of natural gas in electric power generation has had the most significant increase over the past decade. Low capital cost, high energy efficiency, and relatively shorter construction periods for natural-gas plants have been identified as reasons for this significant growth. Industry experts have predicted that the use of natural gas for electric power generation will triple within the next decade. In 2005, Canada produced 628,194 GWh of electricity using a number of different fuel types.

Nuclear Power Trends

The use of nuclear energy in the production of electricity has declined, although the amount generated in 2005 was significantly higher than in 2003. Nuclear power is viewed as a low-cost, reliable source of energy that is free of GHG.

Exhibit 2.14: Canadian Electricity Generation in MWh (1993-2006)



Source: Statistics Canada. August 2007. *Energy Statistics Handbook* January to March 2007. Catalogue no. 57-601-XIE

However, issues surrounding the maintenance of nuclear reactors, waste management/safety requirements (i.e., environmental issues, concerns surrounding public safety) and the costs associated with these have been identified as factors that resulted in this decline.

Furthermore, nuclear power plants are expensive to build and have long lead times. Typically, it takes several years of planning followed by an additional 4 to 6 years for construction to build a new nuclear power plant.

In 2005, Canada was the 7th largest producer of nuclear electricity producing 3.3% of the world's total.

Nonetheless, its use as a fuel source is declining. In comparison, given the shifting priorities and global concerns for environmentally friendly and renewable energy, other sources such as geothermal, wind, and solar sources are increasing in popularity.

Total production of nuclear energy in 2007 was 615,566 GWh. When compared to 2006, total production was higher by 18,299 GWh, or 3.1%. The most significant increase came from Geothermal/Wind/Solar/Other production. This suggests a growing trend toward more environmentally friendly sources of electricity production, and possible changes in technology that would have a significant affect on human resource skills requirements. The associated changes in skills requirements as a result of the possible changes in technology will be a growing consideration for the human resource planners within the electricity sector.

New Infrastructure and Investing in Capital and Energy Efficiency

According to the International Energy Agency, approximately $190 billion US will need to be invested in electricity infrastructure in Canada between 2005 and 2030 in order to meet demand:

- $95 billion in generation
- $27 billion in transmission
- $63 billion in distribution

In 2006, the electricity sector invested $13.1 billion in capital investment. Expected increases in demand in electricity in provinces across the country means that provinces will be required to build significant new generation capacity over the next 20 years.

Energy Efficiency

Primary among concerns for both utilities companies and consumers is the issue of energy efficiency. Utilities will need to upgrade their infrastructure in order to accommodate opportunities for enhanced efficiency in both generation and transmission. Energy efficiency is an effective way to help meet public demand for electricity, especially given rising electricity prices, and to reduce energy use and emissions. Consumers are also more concerned with energy efficiency now than in the past. In efforts to be more 'green' and to reduce their electricity bills, consumers are increasingly expecting utilities companies to provide them with alternatives and energy efficiency information packages. Many electric utilities have programs that can help consumers better manage their electricity consumption and energy use, and are increasing their funding toward such initiatives.

A number of capital projects are either underway or planned which address the need for additional capacity and for greater efficiency. Among the projects are:

- Infrastructure Ontario's Nuclear Procurement Project – a 20 year Energy Plan designed to meet the growing demand for electricity and to stabilize energy supplies;
- Bruce Power is looking to build a nuclear reactor in Saskatchewan, and multiple reactors in Peace River, AB, in order to generate 4,000 MW of capacity. Discussions are still underway, but Bruce Power plans to build and expand its infrastructure in Alberta and Saskatchewan in order to meet the energy demands of the regions;

- Hydro-Quebec recently announced that it would spend $5.5 billion ($1.1 billion to go toward transmission infrastructure) on 15 wind farm projects. The projects will see 2,004 megawatts (MW) of capacity come online between 2011 and 2015;
- Manitoba Hydro is in the midst of building a new hydroelectric generating station, called the Wuskwatim Generation Project, that will provide an additional 200 MW of electricity to the Manitoba grid starting in late 2012. In total, Manitoba Hydro plans to spend almost $20 billion on projects over the next decade upgrading and expanding the energy system within the province. In addition to the Wuskawatim project, Manitoba Hydro has two new generating stations planned for the Nelson River area. The company is also in the midst of a major refurbishment of an old generating station at Pointe du Bois and is building a new high voltage direct current (HVDC) transmission line from the north, along the west side of the province.

While this list is far from an exhaustive list of all projects currently underway, it provides a picture of the amount of funding that is being put toward meeting the consumer demand for electricity, energy efficiency, and green energy. The challenge for the electricity sector will be in hiring the workforce to build and operate the new facilities.

2.4 Consumption: Current and Future Trends

Electricity Consumption

In addition to being a global leader in the production of electricity, Canada is also a top consumer of electric power. In 2005, Canada consumed approximately 559.9 TWh of electricity, which accounted for approximately 3.3% of total world consumption and 12.1% of total North American consumption. Canada is the sixth largest consumer in the world, ranking behind the United States, China, Japan, Russia, and Germany.

The United States, the largest electricity consumer in the world, accounts for approximately 24.2% of the world's total consumption, and 42% of total Organisation for Economic and Co-operation Development consumption. Consuming 4,046 TWh of electric power in 2005, the United States out–stripped its supply by over 67 TWh. Canada has been a key supplier of electricity to the United States to make up for the country's shortfall.

- The United States, the world's largest consumer of electricity, is also increasing its demand and is looking to be an ever-larger importer of electric power from Canada.

Exhibit 2.18: Electricity Consumption : An International Comparison

2.1 Country	Consumption†		Approx. % of World Total Consumption
	Total (TWh)	Per Capita (KWh)	
United States	4,046.6	13,640	24.2
People's Republic of China*	2322.7	1,781	13.9
Japan	1,051.9	8,233	6.3
Russia*	828.8	5,786	4.9
Germany	586.4	6,806	3.5
Canada	559.9	17,307	3.3
France	483.2	7,707	2.9
India*	525.5	480	3.1
United Kingdom	376.6	6,254	2.3

† Termed 'domestic supply' by the International Energy Agency, and defined as 'production + inputs from other sources + imports – exports +/– international marine bunkers +/– stock changes.'

* The most recent IEA data available for these countries are not yet available. Data are for 2005.

Source: International Energy Agency. Key world energy statistics 2007. "Monthly Electricity Survey". June 2007; and the International Energy Agency Online Statistics. http://www.iea.org.

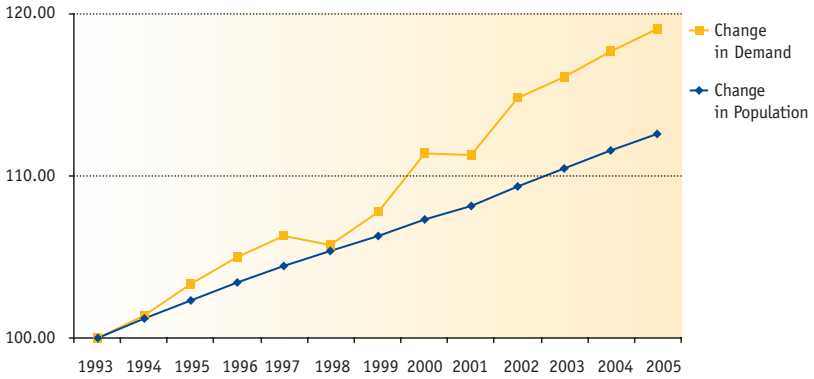
- Energy intensity is gradually increasing. Canada's demand for electricity is steadily outpacing population growth suggesting that demand per person is gradually increasing. (see Exhibit 2.19)

Supply & Demand Projections

Industry experts predict that considerable new capacity will be required to the year 2020 in order to address new demand, plant replacements and exports. Although significant lead time is required to bring new generation and transmission into operations, in most regions, it is difficult as new plants are met with public opposition with regards to public safety or environmental grounds. Electricity demand is expected to grow at 1.5-2% on average each year. It is estimated that an additional 314 TWh must be generated by 2020 to meet system demand growth and plant replacement needs.

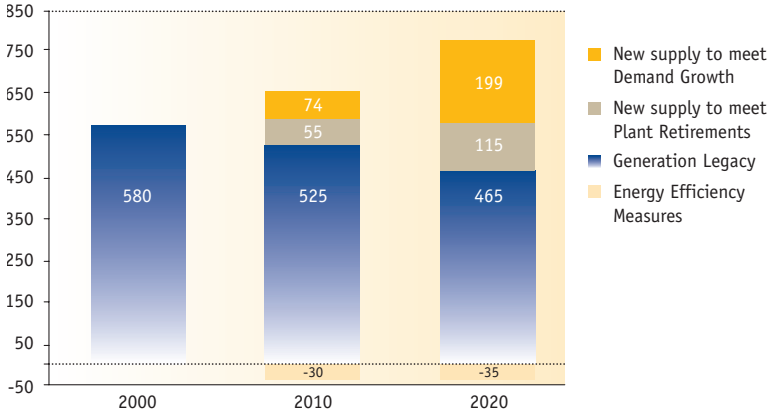
Exhibit 2.20 illustrates the projected Canadian electricity demand to 2020. Demand is expected to rise to 814 TWh by 2020 compared to the 2000 level of 594 TWh. This represents an increase in demand of 37% from 2000 to 2020. Due to increased energy efficiency, however, the future supply required will total 779 TWh in 2020.

Exhibit 2.19: Change in Canadian Population and Electricity Demand from 1993 to 2005 (Index- 1993 = 100)



Source: Statistics Canada. *Energy Statistics Handbook*. January to March 2007. Catalogue no. 57-601-XIE.
Data for 2002 from Statistics Canada, CANSIM Table 128-0003, Catalogue no.57-003-XPB.

Exhibit 2.20: Canadian Electricity Demand Projections to 2020



Source: Canadian Electricity Association, Addressing the Human Resource Challenge in the Electricity Industry, Feb 2007

2.5 Technological Impacts

Technology is already having a considerable impact in the sector and new technologies hold the promise of profoundly changing the face of energy markets. Some of the technologies being implemented by utilities across Canada include:

- Distribution Automation (DA) - operating a self-diagnosing and self-healing electric distribution grid.
- Automated Meter Reading (AMR), which can work in conjunction with DA to automatically report outages, provide additional services such as security systems, broadband, power quality, etc.
- Distributed Generation (DG) - more complex, automated systems involving the use of small-scale power generation technologies located close to the load being served.
- Demand Side Management (DSM) - currently customer-based initiatives, but in the future, DA will have the ability to assist with DSM efforts.
- Power Quality (PQ) - 24 hour monitoring with different levels of service (user pay).

Sources of energy that are considered "clean" and will have a lesser impact on the environment include renewable energies such as wind, solar, geothermal and tidal generating technologies. Also deemed a new "clean" technology are Fuel Cells, which produce only water and heat as emissions while generating electricity. This electricity generation technology may take on more importance as Canada strives to reduce its greenhouse gas emissions.

It is also anticipated that electricity customers will have a wider array of products and energy providers from which to choose.

2.6 Human Resource Implications

Across Canada, the electricity industry is evolving using new and updated infrastructure and equipment using traditional and non-traditional sources of energy. Reliance on the more traditional hydroelectric power is making way for alternative sources of electrical power, particularly natural gas, wind and nuclear power sources. For power producers including both private and public, this means new skill sets and knowledge bases at all levels of the business to help resource changing operations.

Many companies have shifted towards automation and computerized systems.

Results from the environmental scan as well as open-ended comments on the ESC Employer Survey indicate that employers are increasingly in need of employees who have a broader base of knowledge in computing. Therefore, while trades people have traditionally not been required to have the skills and training in new and advanced technologies, Power Line and Cable Workers, Power System Operators, and other trades people are required to have a changed skill set which better reflects the demands of the electricity sector today.

3. Human Resource Profile

3.1 Diversity in the Electricity Sector

According to data provided by Statistics Canada from the 2006 Census, employment in Canada's electricity sector is comprised primarily of Canadian-born, male employees.

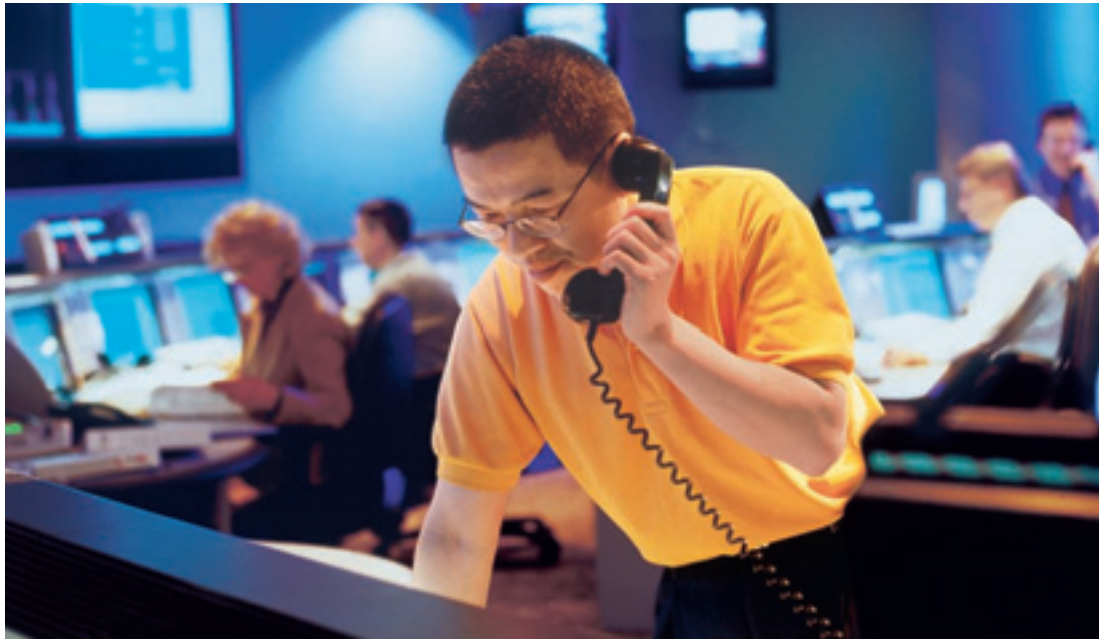
In 2006, employment in the sector totaled 96,320:

- 12,395 (12.8%) were immigrants
- 7,670 (7.9%) were members of a visible minority group
- 2,828 (2.9%) were of Aboriginal identity
- 24,200 (25%) were female.

When compared with the percent that each of these groups comprise of the total labour force, some groups are clearly under-represented in the electricity sector. Exhibit 3.1 illustrates the gaps.

Women in the Electricity Sector

Women continue to be under-represented in all areas of the electricity industry. According to Statistics Canada's annual labour force survey, men comprised 75 percent of the total electricity labour force between 1993 and 2007. Participation by women in the electricity workforce has grown from 28,600 in 1993 to 30,900 in 2007 – representing an 8 percent increase over this period.



If electricity companies want to remain competitive in both the local and the global markets, they will need to tap into these under-utilized sources of labour. Recruitment departments with the companies may need to develop more creative ways of marketing the jobs to non-dominant groups.

Immigrant Employment in the Electricity Sector

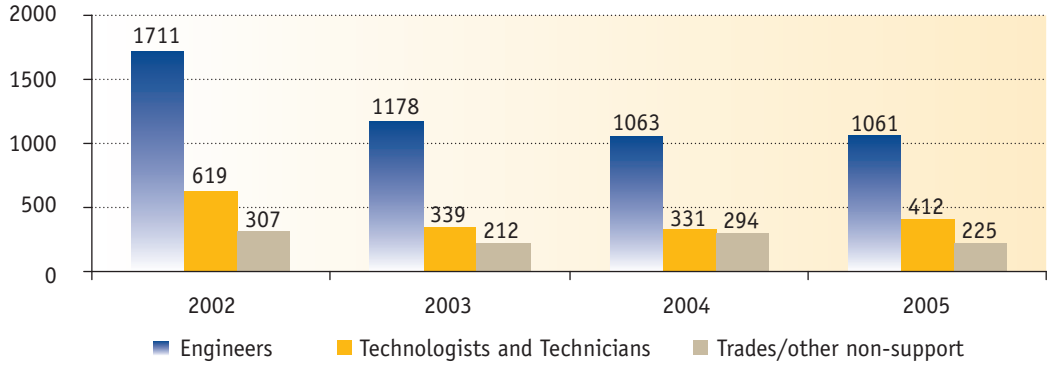
According to Statistics Canada's 2006 Census data, immigrants account for 21.2% of the labour force but only 12.8% of the workers in the electricity sector (12,395). Immigrants and foreign workers are an integral part of the Canadian labour force.

Exhibit 3.1: Representation of Diversity Groups within the Electricity Sector

Group	% Representation of Total Labour Force	% Representation in Electricity Sector
Aboriginal Identity	3%	3%
Immigrants	21%	13%
Visible Minority	15%	8%
Women	51%	25%

Source: Statistics Canada 2006 Census

Exhibit 3.6: Number of Immigrants in Electricity Sector Occupations by Category (2000-2005)



Source: Citizenship and Immigration Canada.

According to information based on administrative data collected by Citizenship and Immigration Canada, about 2.2 million immigrants were admitted between 1991 and 2000, with an average of 200,000 annually.

Canada has continued to increase its average annual admittance of immigrants over the last half decade. Between 2001 and 2006, an annual average of 242,000 individuals were admitted as permanent residents, totalling 1.4 million.

According to the 2006 Census data, there were 1,225 recent immigrants working in the electricity sector. This represents less than 1% of employment for recent immigrants.

Significantly, the largest source of population growth through 2010 will be immigration (68%). Statistics Canada predicts that within 25 years, immigration will be the only source of population growth for Canada.

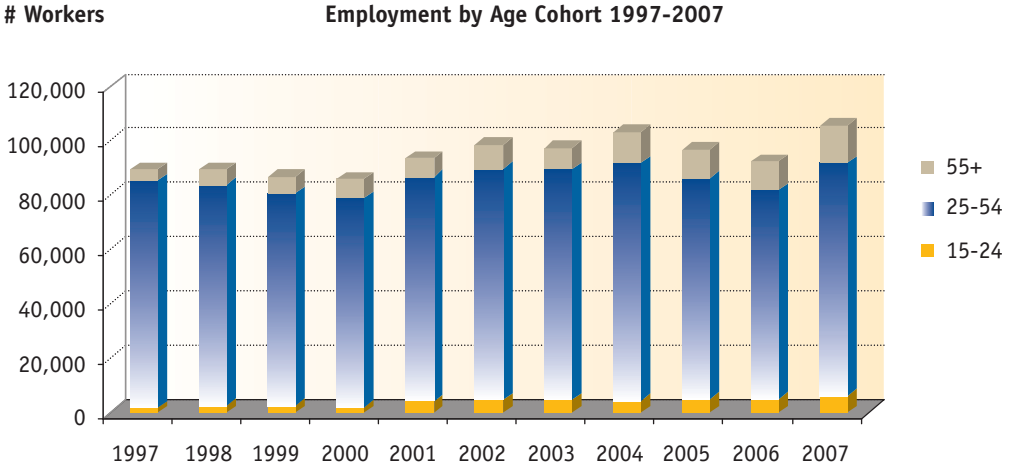
3.2 Age Composition of Workers in the Canadian Electricity Sector

Similar to the general labour force in Canada, the electricity sector faces an aging workforce and the challenge of replacing retirees with a narrowing pool of younger workers. As Exhibit 3.7 illustrates, workers aged 25-54 years make up the large majority of the electricity sector's workforce. However, the share of total employment as represented by this age cohort has declined each year from 94 percent in 1997 to 81 percent in 2007. Over the same period, both the 15-24 cohort and the 55+ cohort increased their share of employment. Specifically, while the number of workers aged 15 to 24 has grown from 1,600 to 6,200, the number of workers 55 or older has grown from 4,100 to 13,800.

While employment among younger workers aged 15-24 has more than tripled over the past decade, the gap between younger and older workers (aged 55+) in the electricity sector workforce has widened substantially. In 1997, less than 5 percent of the workforce was 55 and older, compared to more than 13 percent in 2007. Put another way, the Statistics Canada data would suggest that nearly 14,000 individuals in the electricity sector's workforce – many of whom are seasoned managers and skilled technical personnel – are now 55 or older and assumed to be eligible for retirement.

This increasing gap is particularly concerning for employers as it highlights the challenge of an aging workforce. The trend presented in Exhibit 3.9 illustrates that a growing percentage of the electricity workforce is approaching retirement. In 2004, the Employer survey showed that 52% of employees were 45 years and older. Today, that percentage has increased to 55%. In the graph, employees in the 35 to 44 age group account for 26% of the electricity workforce.

Exhibit 3.7: Employment in the Electricity Sector by Age Group (1997-2007)



Source: Statistics Canada Labour Force Survey Extract. Total Employment in Canada by Age Group and Gender for NAICS 2211, in thousands. 2007.

Exhibit 3.8: Employment in the Electricity Sector by Age Group (1997-2007)

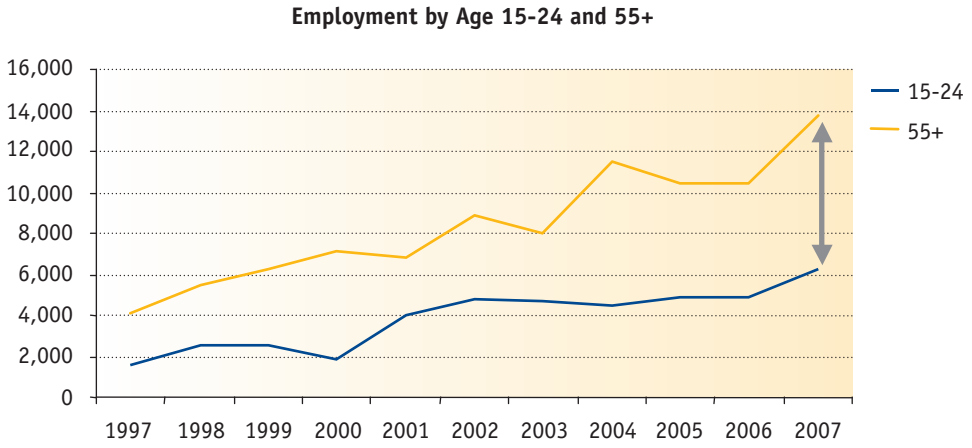


Exhibit 3.9: Age Profile of All Employees Reported by Employers

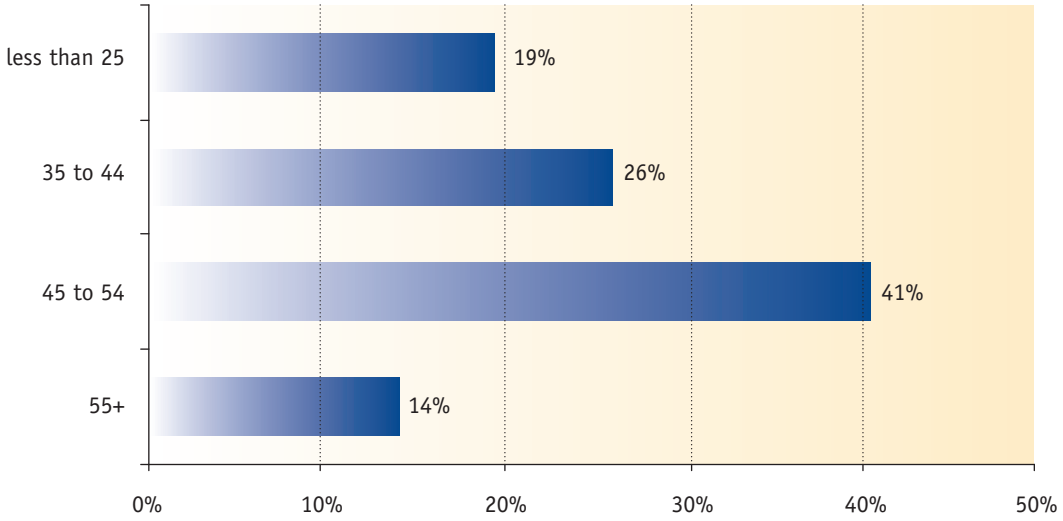
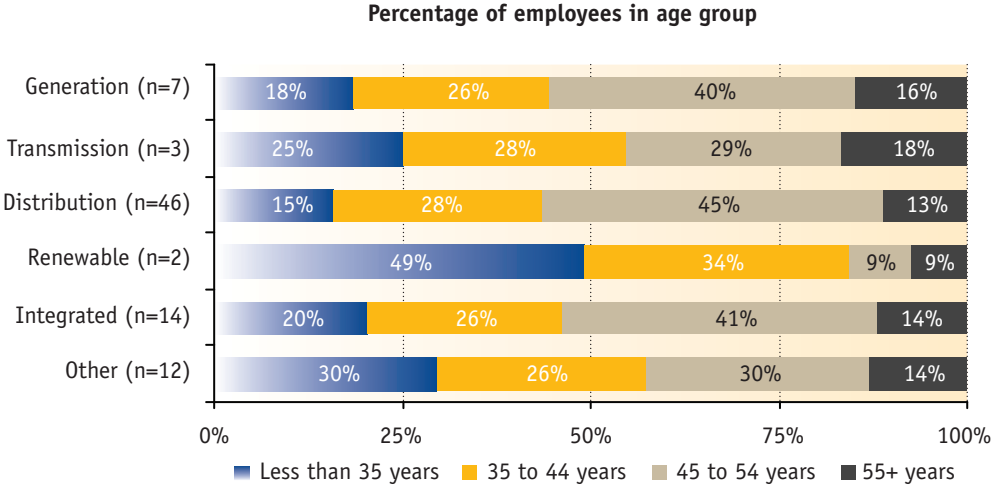


Exhibit 3.10: Age of Employees in Electricity Sector – by Business Line



Source: 2008 ESC Employer Survey, n=84
Note: Data for 'Retail' was suppressed as there was only one respondent in this category.

Age Composition of Employees by Business Line

The age of employees in the electricity sector also varies by business line. As graph 3.10 illustrates, the highest proportion of employees who are between the ages of 45 to 54 currently work in the transmission of electricity.

- The age data shows that the more established lines of business, such as generation (excluding renewables), distribution, and integrated, tend to have a significant proportion of their workforce in the over 45 age group, at 56%, 58%, and 55% respectively.
- Generation and transmission in particular have the highest percentage of their employees in the 55+ age group.
- Conversely, less established or traditional lines of business, such as renewables, transmission, and companies who identified as 'other', have a larger proportion of their employees who are under the age of 44.

Graph 3.10 further illustrates that the largest proportion of younger employees are actually recorded as working in the 'other' line of business. Of the 17 employers that specified they were involved in an 'other' line of business, 16 specified what their line of business was organizations engaged in manufacturing, construction, and maintenance; business development, and consulting.

3.3 Seasonal and Non-Support Contract Staff

Contract staff and seasonal employees comprise an important part of the electricity sector workforce. Data from the ESC Employer survey shows that in total, 27% of non-support staff are hired on contract, and an additional 8% are seasonal workers.

Companies whose only line of business is in the renewables area hire almost half of their total non-support staff on contract. The second largest portion of seasonal and contract staff are employed by companies that are integrated. In total, 42% of all non-support staff who are employed by these companies are hired on contract.

3.4 Human Resource Implications

The data shows that women, aboriginal people, people with disabilities, members of visible minority groups, and immigrants/foreign workers are currently under-represented as employees in the electricity sector, especially when compared with the percentage represented by these groups in the total population and workforce. Both employers within the electricity sector, and the industry as a whole, may need to consider ways of better marketing themselves to these groups.

While women represent a higher percentage of employment in support positions, they are significantly under-represented in trades and engineer/technician positions. Strategic marketing of trades and engineering jobs to women may be one avenue that recruitment departments may choose in filling the labour shortages in these areas.

Many immigrants and foreign trained professionals come to Canada each year with the skills and education required for many occupations in the electricity sector (primarily in engineering). While there are fewer immigrants and foreign trained professionals with the appropriate training in the trades, the data shows that overall immigrants are under-employed, which means that employers are not taking full advantage of their skills and training. Employers and human resource planners may need to consider ways of providing specific or additional training required to ensure that immigrants and foreign trained professionals meet the requirements for appropriate licensing/certification for the electricity sector.

The data from the survey suggests that while the majority of employees in the electricity sector are in the 45 to 54 age range, the percentage of younger workers has increased since 2004. This indicates that already employers are starting to replace their aging workforce with younger employees. However, it also means that human resource planners will need to adapt their recruitment policies and marketing strategies to specifically target the younger cohort. Retention strategies will also need to change to reflect the needs and demands of the younger generation. Employers may need to develop more flexible benefit and compensation packages and human resource policies that will be more attractive to younger workers. This would help employers retain their current younger workers.

4. Supply and Training

4.1 Electricity Related Programs and Courses in Canada

In addition to the identification of the human resource profile for the Canadian electricity sector, a key element of this research was to assess the future supply of trained workers to the electricity sector. There are key sources of labour supply that have been identified: recent graduates and immigrants. The data regarding recent graduates was collected primarily from Statistics Canada, but this chapter is augmented by a survey that was distributed to educational institutions and interviews with representatives from educational institutions.

Exhibit 4.1 below illustrates the breakdown of programs offered by region among institutions that participated in the study.

4.2 Post-Secondary Student Information System (PSIS) and Registered Apprenticeship Information System (RAIS) Data: Program Enrolment and Graduates

University Programs

Engineering programs represent the most common electricity-related university program. Of particular relevance to occupations common in the sector are: Electrical Engineering, Civil Engineering, Mechanical Engineering and Nuclear Engineering. Highlighted in Exhibit 4.2 are the number of graduates by program in 2003 and 2005, as captured by Statistics Canada's survey. Exhibit 4.2 illustrates that electrical engineering programs are the most popular, and generate the highest number of graduates.

Exhibit 4.1: Program Type by Region

	Region	Western	Ontario	Québec	Atlantic
Program Type	Electrical Engineering (University)	6	4	1	2
	Electrical Trades & Apprenticeships	2	1	0	1
	Engineering Technology & Technician	8	10	0	3
	Renewable Energy	1	1	0	0

Source: Educational Institutions Survey, n=45 Note: Totals add to less than 45 because some respondents were from the same educational institute, and so the program offered is not being double counted. However, data from the duplicate responses are not excluded from the rest of the data because they were given by different respondents and thus generate slightly different perspectives.

Enrollment in Electrical Engineering programs has seen a 10% decline over the past few years

However, of particular interest is the growth of nuclear engineering programs. The data show that enrolment in nuclear engineering grew by an astonishing 743%. All enrolments in nuclear engineering programs were in either Ontario or Québec. However, nuclear engineering enrolment in Québec declined from 21 in 2003 to 18 in 2005, whereas in Ontario it increased from 0 in 2003 to 144 in 2004, and 159 in 2005.

Part of the increase in the number of students enrolled in nuclear engineer programs may be attributable to Ontario which saw the creation of the new University of Ontario Institute of Technology (UOIT) with significant investment from the province of Ontario and Ontario Power Generation. The UOIT has created, for the first time in Canada, an undergraduate degree in nuclear engineering with a curriculum and syllabus. UOIT listed 158 students in 2005.

Exhibit 4.2: Student Enrolment and Graduates or Completers in Engineering Programs

Year	2003	2005	% change
Number of Students Enrolled			
Electrical Engineering	17,382	15,693	-10%
Mechanical Engineering	14,742	15,600	6%
Civil Engineering	7,929	9,186	14%
Chemical Engineering	5,124	5,631	9%
Materials Engineering	504	924	83%
Systems Engineering	666	657	-1%
Nuclear Engineering	21	177	743%
Total	**46,368**	**47,868**	**3%**
Number of Graduates/Completers			
Electrical Engineering	2,979	3,849	29%
Mechanical Engineering	1,518	1,710	13%
Civil Engineering	1,083	1,092	1%
Chemical Engineering	120	144	20%
Materials Engineering	153	141	-8%
Nuclear Engineering	3	3	0%
Total	**9,558**	**10,212**	**7%**

Apprenticeship Registrants and Completions

Data from Statistics Canada's Registered Apprenticeship Information System provides the number of registrants and completions for apprenticeship programs across the country. Research identified key apprenticeship programs based on the apprenticeships mentioned in the employer survey, in conjunction with cross-referencing the training required for common jobs within the industry. Exhibit 4.6 shows the number of completions for select apprenticeships between 2003 and 2005.

There were some significant changes in numbers of registrants in key apprenticeship programs over the 2003 to 2005 period. Most significantly, Power Line Technician registrants grew by 20.7%, from 1,500 to 1,810 registrants. On the other hand, both Stationary Engineering and Power Systems Operator programs experienced significant declines of 31.8% and 66.7% respectively.

The precise cause of the sharp decline in registrants in Stationary Engineer and Power Systems Operator apprenticeship programs is not known. However, it should be noted that certification is not mandatory in Newfoundland in order to be a Power System Operator. However, in order to become certified as a Power System Operator in all other provinces, individuals must either complete a 3-5 year apprenticeship program or have 3 or more years of experience in the trade in addition to some courses in electrical or electronic technology. Given the hot job market, it is possible that individuals chose to enter into the field through work experience directly as opposed to registering in an apprenticeship program. Either avenue would allow the individual to become certified within 3-5 years, so it is likely that most chose to get a job first and get the training on the job. As a general trend, when the economy is strong, enrollment in education goes down. When employment numbers are low, people tend to go back to school to get the formal training in order to give themselves an advantage over others who are competing for the same job.

4.3 Educational Institutions Survey Data

Engineers Canada generally refers to the survey conducted by the Canadian Council of Professional Engineers as its data source for trends in enrolment and graduation from engineering programs at universities across the country. The most recent report is from 2005, which shows a similar trend in declining enrolment in electrical engineering programs.

With the exception of British Columbia (BC), all provinces reported declines in enrolment in electrical engineering programs. Overall, there were 17,382 enrolments across Canada in 2003. This number dropped to 16,632 in 2004, and further to 15,693 in 2005.

Exhibit 4.5 illustrates the general trend in enrolment in engineering programs from 2003 to 2005 in each region of the country. With the exception of a few cases, most engineering programs (excluding electrical engineering) have seen some growth over the two year period. The most notable growth is in the civil engineering program, where each region, with the exception

Exhibit 4.5: Number of Students Enrolled in all Programs by Region

Program	Atlantic		Québec		Ontario		Prairies		Alberta		BC	
	2003	2005	2003	2005	2003	2005	2003	2005	2003	2005	2003	2005
Electrical Engineering	894	666	5631	4980	6900	6678	1017	645	2037	1581	903	1143
Mechanical Engineering	960	960	5256	5220	5652	6399	774	753	1347	1488	747	777
Civil Engineering	711	843	1782	2217	3159	3609	513	573	1143	1335	621	603
Chemical Engineering	291	306	1110	1086	2403	2778	177	192	879	924	270	345
Materials Engineering*	0	63	303	339	30	36	0	0	0	270	171	219
Systems Engineering	0	0	9	30	657	627	0	0	0	0	0	0
Nuclear Engineering	0	0	21	18	0	159	0	0	0	0	0	0

Source: Statistics Canada, Postsecondary Student Information System

* The jump in growth in enrolment in Materials Engineering in the Atlantic provinces and Alberta can be attributed to program accreditation. According to the Canadian Council of Professional Engineers, in 2005 there were over 3,000 engineering students attending not-yet-accredited programs. When these students are added to the enrolment figures, there are dramatic increases such as that seen for Materials Engineering.

of BC, saw enrolment increase. These data also suggest that smaller and newer programs such as nuclear, materials, and systems engineering are growing in popularity in many regions. It should be noted that data for renewable/sustainable engineering programs are not yet available because these programs are in the process of being accredited. This means that they have not yet seen their first wave of graduates.

Graduates Entering the Electricity Sector

The Educational Institutions Survey was designed to gather information on the number of graduates who entered into occupations in the electricity sector. Given the difficulty in estimating the number of graduates that gain employment in the electricity sector after graduation, common jobs and occupations in the sector were cross referenced with the training required for the job.

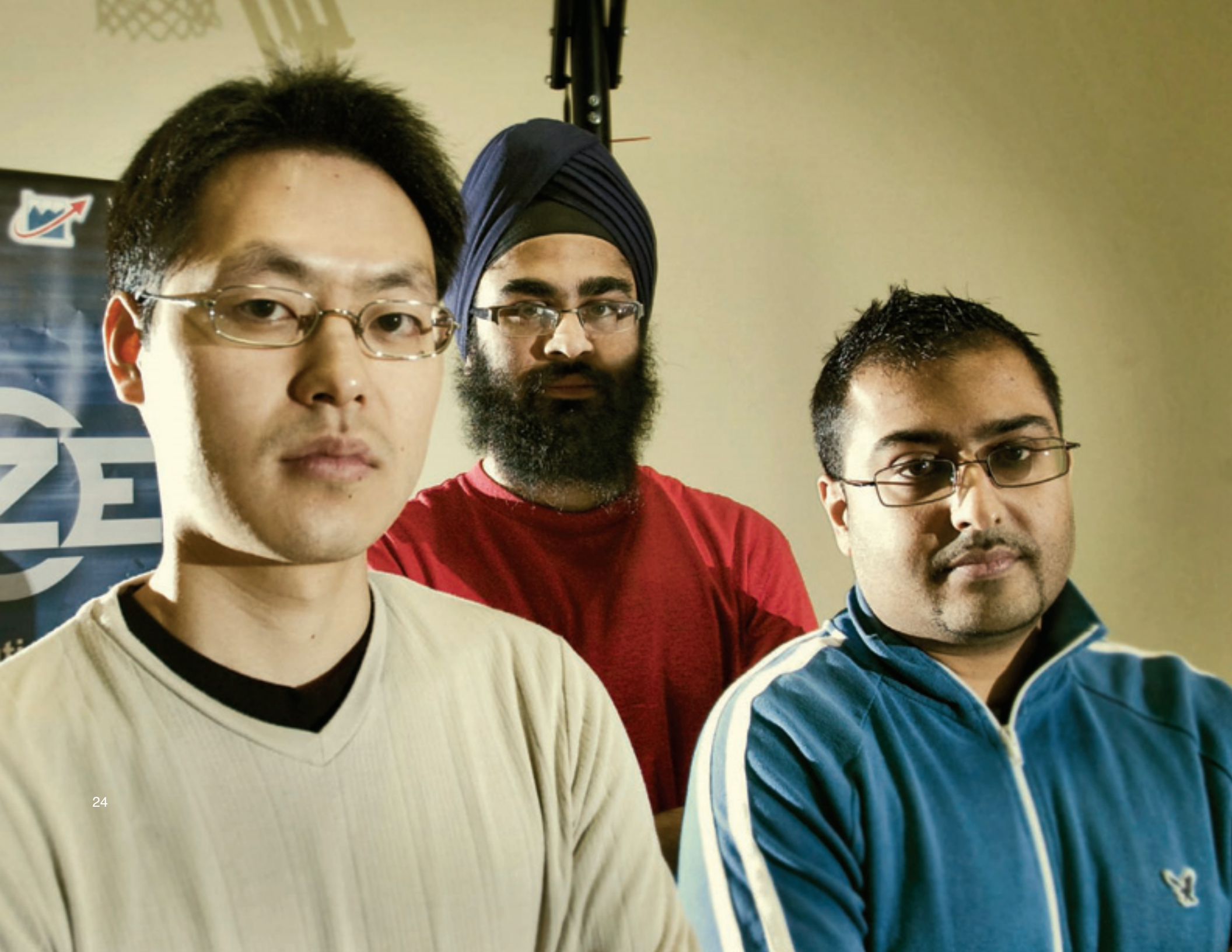
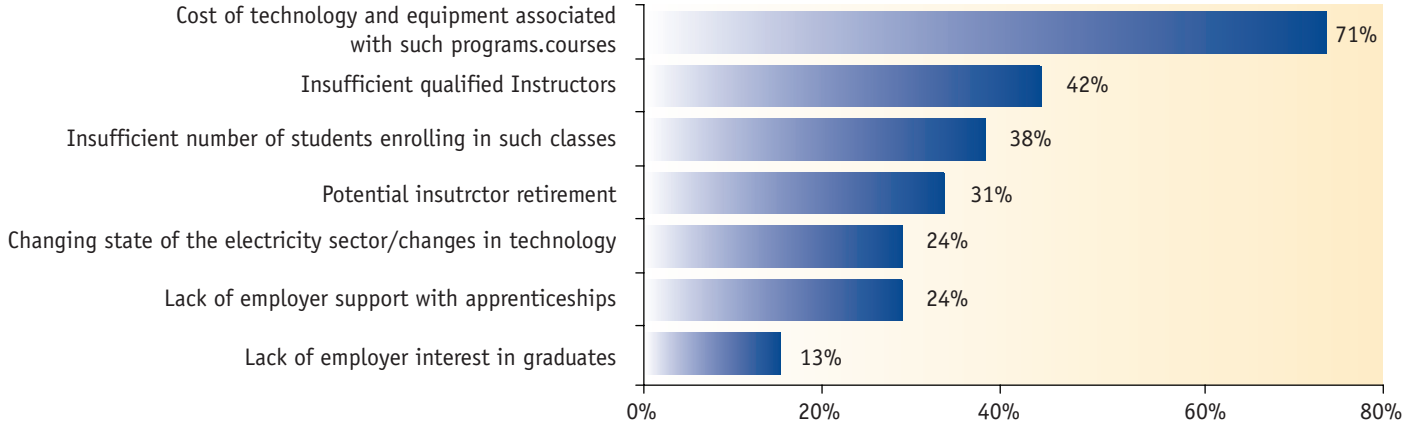


Exhibit 4.6 : Number of Registered and Completed Training in Electricity Related Apprenticeships

Number of Registrants	2003	2005	% change
Industrial Mechanic (Millwright)	9,105	9,595	5%
Power Line Technician	1,500	1,810	21%
Electrician	325	375	15%
Stationary Engineer	425	290	-32%
Power Systems Operator	15	5	-67%
Total	**11,370**	**12,080**	**6%**
Number of Completions			
Industrial Mechanic (Millwright)	925	815	-12%
Power Line Technician	105	170	62%
Electrician	30	30	0%
Stationary Engineer	30	30	0%
Power Systems Operator	Not Available	Not Available	--
Total	**1,090**	**1,045**	**-4%**

Source: Statistics Canada Registered Apprenticeship Information System

Exhibit 4.10 Challenges Faced by PSE Institutions in Providing Electricity-related Programs and Courses



Source: Educational Institutions Survey, n=45

Note: Results add up to greater than 100% due to multiple responses.

While there was great variation in responses from the educational institutions, generally, universities reported lower percentages (10%-40%) and colleges reported higher percentages (60%-100%) of graduates entering the electricity sector after graduation.

4.4 Issues Providing Programs Related to the Electricity Sector in Canada

The top challenge identified by educational institutions surveyed in providing electricity-related courses and programs is the cost of technology and equipment associated with such programs (reported by 71% of respondents). Other commonly identified challenges include insufficient qualified instructors (42%) and insufficient students enrolling in such classes (38%).

4.5 Increasing the Supply of Trained Graduates

One objective of the educational institution survey was to get input on how best to increase the supply of trained workers into the sector. The following graph illustrates respondents' opinion on the effectiveness of various solutions.

Although each of the solutions provided were ranked as being relatively more effective than less effective, increasing industry engagement is seen by most as being the most effective solution, with 76% of respondents feeling that it would be 'very effective' and only 11% feeling it would have 'limited effectiveness'.

4.6 Addressing the Gaps in Training and Increasing the Supply of Trained Workers

Survey respondents were given the opportunity to identify any gaps in education and training that they felt existed. Similar to the challenges that were identified in providing programs and courses, many respondents commented that they would like to offer specific courses and programs that employers are asking for, but due to limited funds, they are not able to do so. Institutions are generally aware of what employers need and expect of graduates, and they report that they are constantly trying to meet employer expectations. Many of the surveyed institutions have program advisory committees that are comprised of employers, industry stakeholders, and program coordinators or program heads, and they meet on a regular basis to ensure that programs are

Exhibit: 4.11: Increasing the Supply of Trained Graduates into the Electricity Sector

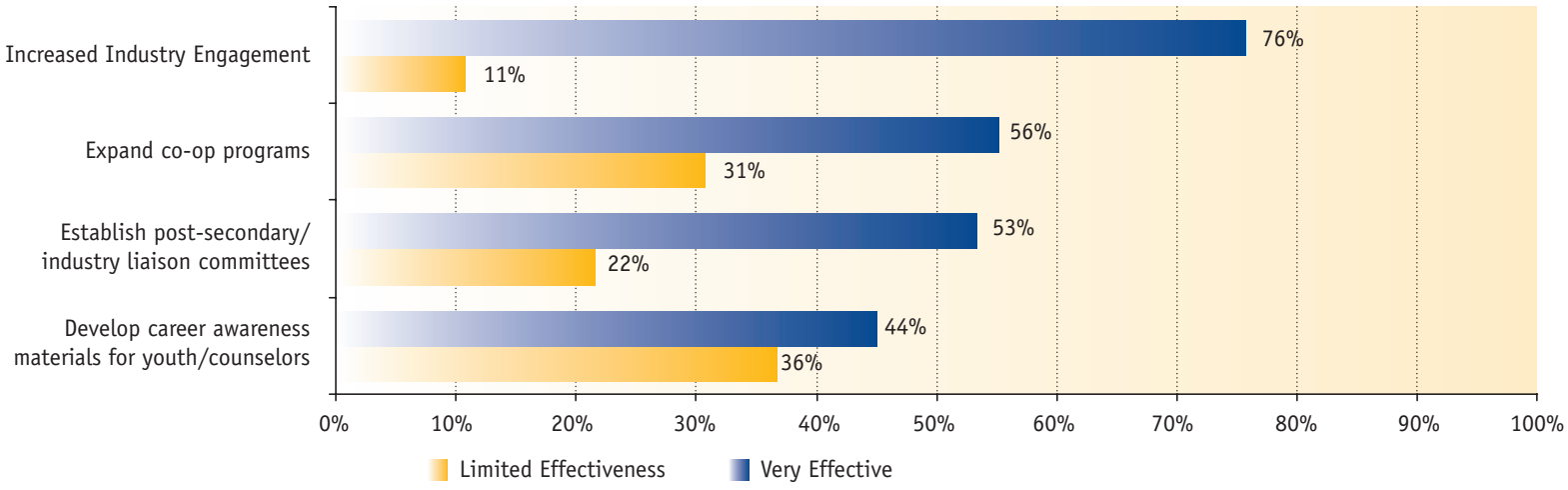
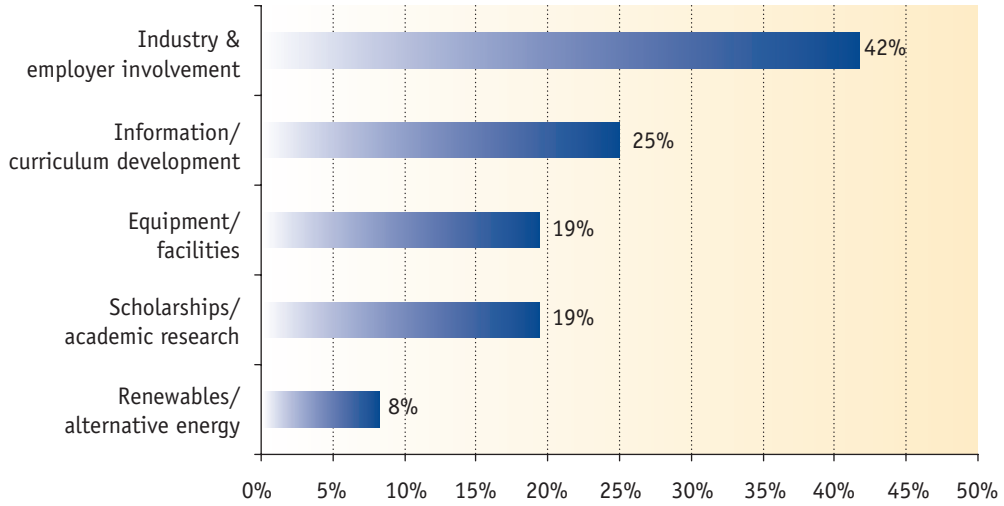


Exhibit 4.12: Addressing the Gaps in Education and Training



Source: Educational Institutions Survey, n=45
*Note: Responses add to more than 100% due to multiple responses.

in line with industry needs and demands. While institutions overall reported that they receive positive feedback from employers who have hired their graduates, there were some specific comments that suggest that institutions are constantly having to change and adapt to meet the dynamic needs of employers.

Institutions are hearing from employers that they need more people – more trained graduates. Employers want graduates who are both 'billable' right after graduation, and who have 'essential skills', such as communication and people skills, and math skills. Employers are in need of and expecting people with broad knowledge.

Data from the 2004 Canadian Electricity Association study shows that there can be a lag of up to 5 years before an individual is considered to be proficient in their position. This time lag clearly exists as a result of individuals requiring on the job experience and dealing with 'real world' issues – neither of which can be taught in a classroom alone.

Respondents were asked to provide recommendations on how best to address the gaps in education and training. The responses fell largely into five categories. The Exhibit 4.12 shows the percentages of respondents whose recommendations fell within the five broad categories.

4.7 Recruitment Strategies Targeting Under-Represented Groups

As is clear from the Statistics Canada data presented earlier in this report, women, Aboriginal people and members of visible minority groups are under-represented in the electricity sector. A key component to increasing the supply of trained graduates into the electricity sector is to increase the number of enrolments into programs that are closely related to the electricity sector. That said, educational institutions were asked whether they had targeted recruitment strategies to attract traditionally under-represented groups. Almost 70% of educational institutions reported having some sort of strategy in place.

Most reported strategies that promoted the program to women and Aboriginal groups. The reported strategies included:

Aboriginal/First Nations

- presentations to Band Councils, high schools with high native populations
- courses offered for students without proper prerequisites or who need to upgrade outreach programs

Women

- providing 'Women in Trades' orientations
- on campus student groups such as 'GO ENG. GIRL'

Immigrants/Foreign Trained Professionals

- credential recognition programs to by-pass first year
- presentations to ethnic community groups to recruit immigrants into programs

4.8 Immigrants and Foreign Trained Professionals

The 2006 Census data shows that immigrants to Canada today are more highly educated than the Canadian-born population. It is estimated that approximately 32% of the foreign-born population in Canada who are between the ages of 25 and 64 have a university degree. Of the 'recent' immigrants – those who immigrated between 2001 and 2006 – 349,800, or 51%, had a university degree. This was more than twice the proportion of degree holders among the Canadian-born population (20%) and much higher than the proportion of 28% among immigrants who arrived in Canada before 2001.

In contrast, only 11% of recent immigrants in this age range had a college diploma and only 5% had a trades certificate. These proportions were considerably less than the 14% of the Canadian-born population who had a trades certificate and the 22% with a college diploma.[1]

4.9 Human Resource Implications

Trends in enrolment and immigration will have a significant impact on human resource strategies, as employers try to attract the best and brightest students from the pool of trained and educated individuals. Human resource planners need to be aware of the following key trends:

Enrolment in university electrical engineering programs is declining.

Both the data from the Post-Secondary Student Information System (PSIS) and the findings from the educational institutions indicate that enrolment in engineering programs is lower than in the past. The most significant drop in enrolment has been in electrical engineering programs. The two key factors cited for this decline in enrolment by some educational institution representatives are: 1) overall fewer students coming out of high school and enrolling in post-secondary programs; 2) a decline in popularity of such programs due to a decline in demand for employees with this training (for example, the boom and bust of the dot.com industry). Students are often drawn into programs where there are good opportunities for securing employment shortly after graduation.

Enrolment in nuclear and renewable/ sustainable engineering programs has increased substantially.

There has been an increase in enrolment in new engineering programs. Registrants in nuclear engineering programs increased from 21 to 177 from 2003 to 2005. Other programs include nuclear engineering and renewable or sustainable engineering.

Attracting prospective employees and recent graduates from electricity related programs will require employers to work with training institutes.

It is difficult to estimate the actual number of graduates from programs that are closely related to the electricity sector who enter into the industry. Data from key informant interviews suggest that graduating students are not fully aware of the career possibilities with the electricity sector and they often do not even consider applying for jobs in the sector because it is essentially 'off their radar screen'.

Employers will need to work in collaboration with the training institutions in order to market the attractiveness of working in the electricity sector to the graduates. A local approach may be most effective, given different regions' needs and differences in institutional structures, priorities and funding.

Utility companies might also have to revisit their policies on educational requirements for new recruits. One possibility includes easing up on some utilities' physics and math requirements for new recruits.

The face of Canada's labour force is changing into a more culturally and ethnically diverse visage.

The increasing number of immigrants and foreign workers coming to Canada means that the pool of labour from which employers are drawing is changing. The two key implications for employers are that they need to fully understand and implement a policy aimed at recognizing foreign credentials. Data suggests that immigrants coming to Canada are having a harder time finding employment, but that their level of education is higher than that of the Canadian-born population.

Furthermore, data shows that immigrants to Canada are highly educated. However, immigration trends show that the overall percentage of immigrants to Canada arriving with university degrees is increasing, while those arriving with trades certificates and technical training is decreasing. As a result, the electricity sector may need to work with government organizations to encourage immigration among qualified trades people.

[1] http://www12.statcan.ca/english/census06/analysis/education/immigration.cfm

5. Projected Retirement Within the Sector

5.1 Retirement Projections

Based on employer estimates, 28.8% of the current electricity workforce is expected to retire between 2007 and 2012, almost 5% per year.

These retirement rates are even higher than the 2004 CEA study, which reported that 15.5% of employees were expected to retire between 2004 and 2009, and almost one-third of employees (29.6%) were expected to retire by 2014 (an average of less than 3% per year). Respondents estimated that annual retirement would represent 4.7% of employees in 2009, and 6.2% in 2012.

Exhibit 5.1 below shows the percentages of expected retirements among non-support staff alone. The findings are further consistent in that the impact of retirements will be greatest among transmission companies. Transmission companies are expecting over 12% of their non-support staff to retire in 2009 and an additional 15% to retire in 2012 alone. The expected retirement percentages present a striking scenario. All lines of business within the electricity sector are expected to experience significant retirements and will require large numbers of new staff to fill the vacancies.

Retirements in the electricity sector are expected to increase significantly over the next 5 years. Already, employers reported an existing 3.3% vacancy rate for non-support occupations. Overall, retirements in non-support occupations are expected to double by 2009 and are expected to increase by an astonishing 164% in 2012.

The Exhibit 5.4 provides a closer analysis of retirements and retirement projections among employers in the electricity sector. The data presented below shows that in 2012, 10.2% of Power Station Operators are expected to retire. A further 9.2% of Supervisors, 8.4% of Information Systems Analysts, and 7.7% of Utilities Managers are expected to retire in that same year.

Exhibit 5.1: Estimated Retirements for all employees – by Business Line

Business Line	Current # of Employees	2006 Retirements		Estimated # to Retire in 2009		Estimated # to Retire in 2012		Total Estimated Retirements Between 2007 and 2012	
		Number	%	Number	%	Number	%	Number	% of total employed
Generation	11,452	190	1.7%	395	3.4%	612	5.3%	2,599	22.7%
Transmission	484	7	1.4%	60	12.4%	71	14.7%	329	68.0%
Distribution	2,908	36	1.2%	186	6.4%	252	8.7%	1,098	37.8%
Retail*	--	--	--	--	--	--	--	--	--
Renewable*	--	--	--	--	--	--	--	--	--
Integrated	26,717	751	2.8%	1,301	4.9%	1,651	6.2%	7,956	29.8%
Other	753	15	2.0%	26	3.5%	56	7.4%	205	27.2%
Total*	**42,350**	**999**	**2.4%**	**1,968**	**4.7%**	**2,642**	**6.2%**	**12,187**	**28.8%**

Source: 2008 ESC Employer Survey, n=82

Note: only includes companies that responded with forecast retirements as well as 2006 retirements

*Data suppressed due to low number of responses.

Exhibit 5.4: Estimated Retirements Reported by Employers by Occupation

Occupation Group	Employment Represented	Retired in 2006		Estimated Retirements in 2009		Estimated Retirements in 2012	
		#	%	#	%	#	%
Managers							
Utilities Mangers (n=64)	2,645	104	3.9%	140	5.3%	203	7.7%
Supervisors of Electricians and Line Workers (n=62)	2,911	97	3.3%	179	6.1%	268	9.2%
Engineers and Technicians/Technologists							
Electrical Engineers (n=46)	3,688	90	2.4%	136	3.7%	206	5.6%
Mechanical Engineers (n=22)	1,564	32	2.0%	48	3.1%	64	4.1%
Civil Engineers (n=19)	620	13	2.1%	29	4.7%	29	4.7%
Electrical Technicians (n=57)	3,824	109	2.9%	183	4.8%	215	5.6%
Mechanical Technicians/Technologists (n=14)	1,657	28	1.7%	70	4.2%	87	5.3%
Civil Technicians/Technologists (n=15)	823	16	1.9%	42	5.1%	38	4.6%
Trades							
Power System Electricians (n=36)	4,594	81	1.8%	186	4.0%	232	5.1%
Electrical Power Line and Cable Workers (n=55)	6,098	90	1.5%	250	4.1%	391	6.4%
Power Systems Operators (n=28)	1,188	19	1.6%	72	6.1%	121	10.2%
Power Station Operators (n=17)	3,301	42	1.3%	118	3.6%	204	6.2%
Millwrights/Industrial Mechanics (n=22)	2,918	63	2.2%	135	4.6%	177	6.1%
Other trades (n=37)	3,050	48	1.6%	99	3.2%	147	4.8%
Other Critical Key Occupations							
Financial Auditors (n=61)	1,483	13	0.9%	89	6.0%	95	6.4%
Information Systems Analysts and Consultants (n=48)	1,986	154	7.8%	194	9.8%	167	8.4%
Total	**42,350**	**999**	**2.4%**	**1,970**	**4.7%**	**2,644**	**6.2%**

Source: 2008 ESC Employer Survey, n=82

Note: only includes companies that responded with forecast retirements as well as 2006 retirements

5.2 Considerations for Human Resource Planners

A full 2.4% of employees retired in 2006, as reported by 83 companies. This number is expected to increase in the coming years. When compared with the 2004 CEA study, the average age of employees is slightly younger which suggests either that some of the retirements have already occurred, or else, companies are making more of a concerted effort to hire younger employees to offset the impact of expected retirements. However, the data from the 2008 ESC survey suggest that there are still a significant proportion of employees who are eligible to retire, either immediately or in the near future. The data also show that an even higher proportion are eligible for their partial pension. This suggests that human resource planners will need to consider strategies and incentives to encourage eligible employees to stay on the job.

6. Demand

6.1 Analysis of Potential Supply/Demand "Gaps"

Analysis of the potential "supply/demand" gap for human resources in the Canadian electricity sector encompasses several analyses, including:

Supply Assumptions: Identification of the number of graduates from Canadian universities/colleges as well as the historical proportion of such graduates that were hired by electrical utilities. Data on immigration is also incorporated.

Demand Assumptions: Demand considerations include new hires required to fill replacement positions (retirement, voluntary separation) as well as new hires required to meet increased demand.

The Exhibit 6.4 presents the projected supply-demand gap for the electricity industry for 2009 and 2012 (Low Growth Scenario).

Given the limited ability to precisely estimate actual supply/demand scenarios, two alternative growth scenarios are projected. The assumptions with each growth scenario are detailed below:

Low Growth Scenario

- electricity demand continues to grow at 1.8% per year, worker productivity matches demand growth

Exhibit 6.4: Estimated Supply and Demand Gap – Low Growth Scenario Engineers and Other Non-Support Positions

Group/Period	Annual Estimates	
	2009	2012
Total Workforce[1]		
Engineers	18,298	18,298
Trades/other non-support	39,847	39,847
Total	**58,145**	**58,145**
Estimated Demand – Low Growth Scenario[2]		
Engineers	1,043	1,317
Trades/other nonsupport	2,271	2,869
Total	**3,314**	**4,186**
Estimated Supply[3]		
Engineers	614	638
Trades/other non-support	485	514
Total	**1,099**	**1,152**
Supply-Demand Gap[4] (per year)		
Engineers	(429)	(679)
Trades/other non-support	(1,786)	(2,355)
Total	**(2,215)**	**(3,034)**

[1] Total estimated workforce in electrical occupations, 2008 ESC Employer Survey.

[2] No additional employment growth required for demand increases or replacement requirements. Retirements based on organization estimate of likely retirements, not the proportion eligible for retirement.

[3] Portion of graduates who secure employment in electricity sector upon graduation as discussed in Section 4.

[4] Difference between estimated demand and current education supply capacity.

- no additional workforce issues associated with the replacement of existing infrastructure
- estimates of retirement patterns based on employer estimates of actual retirements (4.7% in 2009; 6.2% in 2012)
- need to recruit to fill voluntary separations would be minimal (1% per year)
- electricity sector attracts 5% of engineering graduates
- apprenticeship completers represent one fifth of the total apprentices in the electricity industry (data on apprenticeship numbers taken from 2008 Employer Survey)
- among immigrants, 23% are estimated to meet requirements for speedy licensure/certification

High Growth Scenario

- electricity demand continues to grow at 1.8% per year, worker productivity does not match demand growth (0.8% difference)
- replacement infrastructure demands represents approximately 0.9% annual increase in the required workforce
- estimates of retirement patterns based on employer estimates of actual retirements (4.7% in 2009; 6.2% in 2012)
- voluntary separation rates are similar to that reported by employers in 2007 (1.3%)
- electricity sector attracts 5% of engineering graduates
- apprenticeship completers represent one fifth of the total apprentices in the electricity industry (data on apprenticeship numbers taken from 2008 Employer Survey)
- among immigrants, 23% are estimated to meet requirements for speedy licensure/certification

The high growth scenario is presented in Exhibit 6.5.

Exhibit 6.5: Estimated Supply and Demand Gap – High Growth Scenario Engineers and Other Non-Support Positions

Group/Period	Annual Estimates	
	2009	2012
Current Total Workforce[1]		
Engineers	18,924	19,893
Trades/other non-support	41,210	43,321
Total	**60,134**	**63,214**
Estimated Demand – High Growth Scenario[2]		
Engineers	1,459	1,828
Trades/other nonsupport	3,176	3,980
Total	**4,635**	**5,808**
Estimated Supply[3]		
Engineers	614	638
Trades/other non-support	485	514
Total	**1,099**	**1,152**
Supply-Demand Gap[4] (per year)		
Engineers	(844)	(1,189)
Trades/other non-support	(2,692)	(3,466)
Total	**(3,536)**	**(4,655)**

[1] Total estimated workforce in electrical occupations based on the 2008 ESC Employer Survey, plus approximately 1.8% increase in required workforce year-over-year.

[2] Additional employment growth estimated for demand increases and infrastructure replacement requirements and eligible retirements. Separation rate estimated at 1.3%.

[3] Portion of graduates who secure employment in electricity sector upon graduation as discussed in Section 4.

[4] Difference between estimated demand and current education supply capacity.

6.2 Implications for Human Resources

The high age structure of the industry suggests the need for a pro-active human resource strategy for the sector. Key issues to examine include:

- Establishment of mentoring/training programs of existing staff members for promotion into positions being exited by retiring employees.
- Development of a foreign credential recognition strategy to increase the integration of foreign trained workers into the electricity sector. Establishment of closer linkages with post-secondary education institutions to provide more and better information as to current and future industry requirements.
- Marketing and promotional activities to encourage youth/non-traditional source populations (i.e. females, visible minorities, etc.) to consider a career in an electricity-related trade.
- Development of recruitment strategies targeting on-campus students to increase the proportion of graduates who choose a career in the electricity sector. In addition, advising students of the availability to transfer existing course credits into an electricity-related discipline.

7. Recruitment

7.1 Vacancy Rates

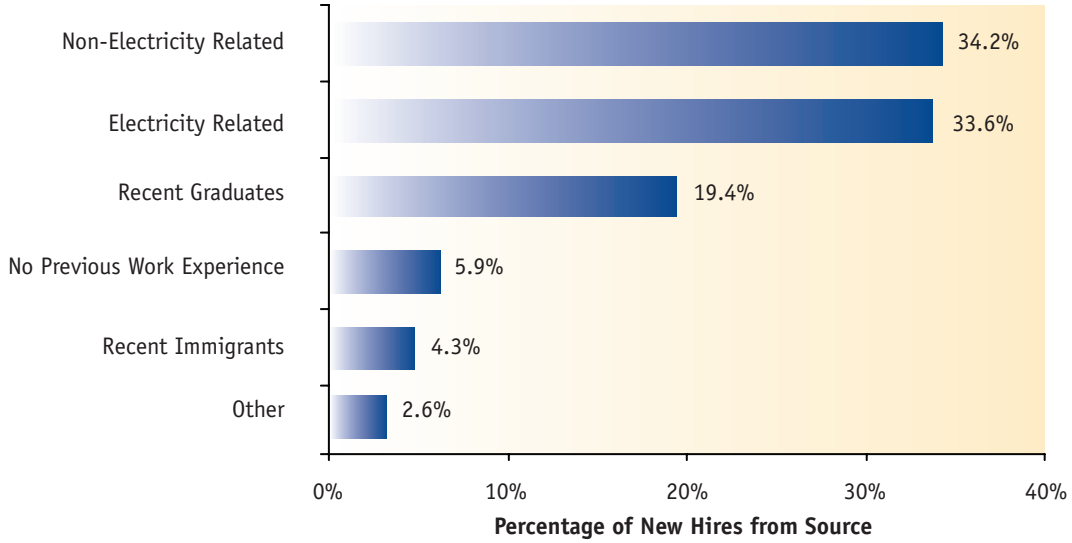
The Exhibit 7.11 below illustrates that current vacancy rates among employers who responded to the 2008 ESC Survey are higher than the national average of 2.6%. Overall, trades occupations have the highest vacancy rates of all non-support occupations. In total, employers reported 132 unfilled vacancies for Managers and Supervisors (2.2%), 405 unfilled vacancies for Engineers and Technicians/Technologists (3.1%), and an astounding 821 vacancies for Trades occupations (3.5%). The findings are consistent with the general trend in the country, where overall there are reported labour shortages in most trades occupations.

Exhibit 7.1: Vacancy Rates by Occupational Group

7.1 Occupation Group	Vacancies	Currently Employed	Vacancy Rate
Managers	132	5,941	2.2%
Utilities Mangers	57	2,714	2.1%
Supervisors of Electricians and Line Workers	75	3,227	2.3%
Engineers and Technicians/Technologists	405	12,466	3.1%
Electrical Engineers	95	3,775	2.5%
Mechanical Engineers	60	1,603	3.6%
Civil Engineers	15	633	2.3%
Electrical Technicians/Technologists	157	3,913	3.9%
Mechanical Technicians/Technologists	57	1,694	3.3%
Civil Technicians/Technologists	21	848	3.5%
Trades	821	22,599	3.5%
Power System Electricians	184	4,699	3.8%
Electrical Power Line and Cable Workers	320	6,231	4.9%
Power Systems Operators	48	1,232	3.8%
Power Station Operators	98	3,372	2.8%
Millwrights/Industrial Mechanics	116	2,982	3.7%
Other trades	55	4,083	1.3%
Total (n=87)	**1,358**	**41,006**	**3.2%**

Source: 2008 ESC Employer Survey, n=82

Exhibit 7.4: Sources of New Hires in the Electricity Sector in 2006



7.2 Sources of New Hires

Most new hires were Electrical Power Line and Cable Workers. The next most common hires were Electrical Engineers, followed by Power Station Operators. Interestingly, Power Station Operators and Electrical Power Line and Cable Workers not only account for the most new hires in 2006, but they also have the largest share of their employees in the youngest age category.

This suggests that employers in the electricity sector are starting to take action to mitigate their aging workforce, and look to younger new hires as a means of building capacity within their establishments.

As a total, the most significant number of hires were apprentices in integrated companies.

Recruitment of Immigrants and Foreign Workers

As mentioned earlier, a substantial portion of the Canadian labour force is comprised of immigrants, and more recently, foreign workers. Immigrants have contributed significantly to the Canadian economy and growth since the early 1900s, and continue to be an invaluable source of knowledge and skills to the country's increasing knowledge based economy.

The recent and rapid economic growth that Canada has undergone has resulted in many companies and industries looking overseas to hire their workforce. However, hiring foreign workers does not come without its obstacles and challenges.

It should be noted that not all occupations within the electricity sector are regulated by external bodies. While engineering occupations are highly regulated, many trades occupations are not. Specific to the electricity sector, Construction Millwrights, Electrical Mechanics, and Power System Electricians are not regulated.

This means that it is entirely the employer's discretion whether or not they choose to recognize a foreign credential. Many employers do not have the time and/or resources to commit to determining the validity or standard of the foreign credential[2], and they will opt not to hire the individual as a result. On the other hand, some employers have also chosen to conduct skills testing to determine an individual's ability[3], established internal policies and regulations for credential recognition, or have relied on external services offered by universities or other commercial operations to assess and verify credentials[4].

Given the recent release of data from the 2006 Census which shows that immigrants to Canada are more likely to be under or unemployed than Canadian-born residents, and that immigrants are on average more highly educated than their Canadian-born counterparts, the recruitment of immigrants into the electricity sector presents itself as a viable option for employers.

Foreign credential recognition programs have been developed by educational institutions, and Human Resources and Skills Development Canada has implemented a foreign credential recognition program as part of its Internationally Trained

[2] Assessing and Recognizing Foreign Credentials in Canada – Employers' Views. CIC and HRSDC funded study of the Canadian Labour and Business Centre. 2001.
[3] Foreign Credential Recognition; An Overview of Practice in Canada. Alliance of Education and Training Organizations
[4] Assessing and Recognizing Foreign Credentials in Canada – Employers' Views. CIC and HRSDC funded study of the Canadian Labour and Business Centre. 2001

Worker Program[5]. These initiatives suggest that the recruitment and hiring of immigrants and foreign trained workers will be essential to the future growth of many companies, and will be significant for the future of Canada's economy.

However, findings from the Foreign Credential Review report conducted for the ESC suggest that while the number of immigrants arriving in Canada with post-secondary education has increased over the past decade, those arriving with trades training has in fact declined. This presents a significant challenge for employers in the sector in finding qualified and skilled labour to meet the anticipated demands in the trades fields.

Findings from the Foreign Credential Review report further suggest that there are insufficient programs and resources available to people who have received their training outside of Canada, which makes it difficult for foreign trained workers to gain access to the electricity sector workforce. Educational and training institutions reported a range of programs for internationally trained workers.

It should be noted though that the ideal situation for recognizing foreign credentials would not necessarily include retraining in the 'Canadian context'. Nonetheless, it is one initiative that educational institutions are undertaking that will help employers recruit and hire immigrants. Employers will also have to take an initiative in implementing their own credential recognition policies and programs in order to fully take advantage of the immigrant labour availability in the country. This is especially true given that the most common type of training that immigrants to Canada report having is engineering.

[5] http://www.hrsdc.gc.ca/en/cs/comm/hrsd/news/2005/050425bb.shtml

Recruitment of Aboriginal Workers

The survey data did not capture information on the current recruitment practices of employers that relate to Aboriginal individuals. Data from the 2004 CEA study shows that, at the time, approximately one third of informants reported that their company had a program to recruit Aboriginal workers.

Data from Statistics Canada shows that Aboriginal employees make up only 2.2% of employees in the electricity sector. However, as reported earlier in section 4, a number of educational institutions reported having targeted recruitment to Aboriginal groups.

These recruitment practices focused on raising the institution's profile among Aboriginal community groups and native populations, in addition to offering courses for individuals without the appropriate prerequisites or who require upgrading.

Data from the 2004 CEA study suggested that some informants believed that there was a lack of Aboriginal students in engineering programs and other technical programs that would lead to employment in the electricity sector.

In order to fully address this issue, employers and educational institutions who have a stake in the electricity sector could work in collaboration to specifically recruit and train Aboriginal students into appropriate training programs, and provide them with employment in the sector post-graduation.

Recruitment of Women

As presented earlier in the report, the participation of women in the electricity sector has increased by 8% between 1993 and 2007. According to the ESC Employer Survey data, only 16% of managers and supervisors are female, and a mere 2% of trades employees are female. Women make up a slightly higher percentage of engineers and technicians (8%) than the trades, but the most significant percentage of female representation is in the support related occupations, at 22%.

The low representation of women in the electricity sector is not terribly surprising. Most occupations within the sector are trades related, and women are not generally as attracted to the trades as males. Speculation as to why this is the case was presented in the 2004 CEA study. Suggested reasons included that women do not like the physical demands of trades occupations and that women are not likely to undertake the training from the educational institutions. Needless to say, more research needs to be done to explore the exact reasons for women's limited participation in the trades. Until then, the electricity sector could benefit from actively recruiting women. Educational institutions have reported having recruitment strategies that specifically target women. Most of the initiatives were focused on encouraging female students around campus to register for programs and courses in engineering and in the trades.

7.3 Implications for the Sector

The sheer number of retirements that employers are expecting in 2009 and 2012 is enough on its own to stunt industry growth. Data from the 2004 CEA study suggests that some employers felt that shifting some of the training requirements to post-secondary institutions would be helpful in offsetting the cost of providing training to new recruits. Although the 2008 ESC study did not capture employer perspectives on training of new recruits, most employers chose to hire employees from within the electricity sector, which represents a savings on training costs over hiring recruits with no electricity experience.

Additionally, as mentioned earlier, employers and utilities in general may need to consider reevaluating the requirements of new recruits. For many jobs in the electricity sector, knowledge of university level physics and mathematics has historically been required. However, this is not necessarily the case any more. Similarly, some provincial regulations require licensed individuals, even if the specific skill is not required by the sector. Employers, sector representatives, and provincial regulatory body representatives will need to work together to determine an effective and systematic strategy to ease requirements where appropriate, without jeopardizing quality and safety.

Finally, one challenge that was identified by some of the educational institution representatives was that, generally speaking, people are not aware of the electricity sector as a potential career destination. In order to address any misconceptions that high school and post-secondary graduates might have about working in the sector, industry and educational institutions will need to collaborate and work together to ensure the proper message is conveyed to the youth and new graduates about the career possibilities within the sector.

8. List of Study Participants

Organizations

AltaLink
ATCO Electric
ATCO Power Canada Ltd.
Atikokan Hydro Inc.
Atlantic Nuclear Services Ltd.
Atomic Energy of Canada Limited (AECL)
Barrie Hydro Distribution
Battle River Rural Electric
BC Hydro
BC Transmission Corp. (BCTC)
Brant County Power
Brookfield Power – Lake Superior Operations
Bruce Power
Burlington Hydro Inc.
Cambridge and North Dumfries Hydro Inc.
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CAREA
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ENMAX Corporation
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Educational Institutions

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Centennial College
Collège Constituant de Joliette
College of New Caledonia
College of the North Atlantic
Confederation College
Dalhousie University
Douglas College
George Brown College
Georgian College
Inuit City College of the North (Keewatin)
Keyano College
Lakehead University
Loyalist College of Applied Arts and Technology
Northern Alberta Institute of Technology (NAIT)
New Brunswick Community College
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Northern Lights College BC
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