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2008 Labour Market Information Study

FULL REPORT

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This project was funded by the Government of Canada's Sector Council Program
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Preface

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

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Table of Contents

SUMMARY OF FINDINGS 7

SECTION 1: BACKGROUND 13
1.1 The Electricity Sector Council 13
1.2 Purpose and Objectives of the Study 14
1.3 Research Methodology 14
1.4 Study Limitations 17
1.5 Data and Definitions 18
1.6 Report Overview 19

SECTION 2: PROFILE OF THE ELECTRICITY INDUSTRY 20
2.1 Definition of the Canadian Electricity Industry 20
2.1.1 Statistics Canada Definition of the Industry 20
2.1.2 Occupations in the Electricity Industry 21
2.2 Structure of the Industry 24
2.2.1 Overview of Market Structure 24
2.2.2 Establishments in the Canadian Electricity Market 26
2.3 Estimate of Employment in the Canadian Electricity Sector 28
2.3.1 Statistics Canada Sources 28
2.3.2 The Labour Market Information Project 31
2.3.3 Trends in Electricity Sector Employment 32
2.3.4 Number of Employees by Occupation 33
2.4 Electricity Production 34
2.4.1 National Production 34
2.4.2 Generation by Province 35
2.4.3 Generation by Fuel Type 36
2.4.4 New Infrastructure and Investing in Capital and Energy Efficiency 39
2.5 Consumption: Current and Future Trends 40
2.5.1 Electricity Consumption 40
2.5.2 Investment 42
2.5.3 Supply & Demand Projections 43
2.6 Technological Impacts 44
2.6.1 Generation 45
2.6.2 Transmission and Distribution 45
2.6.3 Power Line Networking 46
2.6.4 Alternative Electricity Sources 46
2.7 Human Resource Implications 46

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SECTION 3: HUMAN RESOURCE PROFILE 48
3.1 Diversity in the Electricity Sector 48
3.1.1 Gender Profile of Workers in the Electricity Sector 48
3.1.2 Immigrant Employment in the Electricity Sector 51
3.2 Age Composition of Workers in the Canadian Electricity Sector 53
3.2.1 Age Composition of Employees by Business Line 56
3.2.3 Age Composition by Selected Occupation in the Electricity Sector 58
3.3 Seasonal and Non-Support Contract Staff 61
3.4 Human Resource Implications 62

SECTION 4: SUPPLY AND TRAINING 64
4.1 Electricity Related Programs and Courses in Canada 64
4.2 Post-Secondary Student Information System (PSIS) and Registered Apprenticeship Information System (RAIS) Data: Program Enrolment and Graduates 65
4.2.1 University Programs 65
4.2.2 Apprenticeship Registrants and Completions 69
4.2.3 Graduates Entering the Electricity Sector 72
4.3 Educational Institutions Survey Data 73
4.3.1 Enrolment and Program Growth Trends 73
4.4 Issues Providing Programs Related to the Electricity Sector in Canada 75
4.5 Increasing the Supply of Trained Graduates 76
4.6 Addressing the Gaps in Training and Increasing the Supply of Trained Workers 77
4.7 Recruitment Strategies Targeting Under-Represented Groups 80
4.8 Immigrants and Foreign Trained Professionals 81
4.9 Human Resource Implications 83

SECTION 5: PROJECTED RETIREMENT WITHIN THE SECTOR 85
5.1 Retirement Projections 85
5.2 Pension Eligibility 88
5.3 Considerations for Human Resource Planners 90

SECTION 6: DEMAND 92
6.1 Employment Projections 92
6.1.1 Canadian Occupational Projection System - COPS 92
6.1.2 Industry Estimates of Labour Shortages/Future Demand 94
6.2 Staff Turnover 95
6.3 Analysis of Potential Supply/Demand “Gaps” 96
6.4 Implications for Human Resources 99

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SECTION 7: RECRUITMENT 101
7.1 Vacancy Rates 101
7.2 Sources of New Hires 103
7.2.1 Recruitment of Immigrants and Foreign Workers 110
7.2.2 Recruitment of Aboriginal Workers 112
7.2.3 Recruitment of Women 113
7.3 Implications for the Sector 113

SECTION 8: ISSUES AND ACTION ITEMS 115

ACKNOWLEDGEMENTS 118
APPENDIX A 119
LISTING OF STUDY PARTICIPANTS 119
APPENDIX B 123
SURVEY INSTRUMENT 123
APPENDIX C 140
DEFINITIONS OF SELECTED OCCUPATIONS 140
BIBLIOGRAPHY 143

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Summary of Findings

The Canadian electricity sector is about to enter into the eye of the perfect storm, whereby the supply of trained workers is decreasing just at the same time that a significant proportion of the current workforce is retiring, and the demand for electricity and investment in new capital and infrastructure projects is increasing. Although many employers, businesses, and educational institutions have started to take action to mitigate the effects of projected labour shortages on the electricity sector, there remains an increasing threat of an insufficient supply of workers to meet growing demand within the sector.

An aging workforce, impending retirements of 28.8% of the workforce between 2007 and 2012, competition from other industries and utilities, and a growing economy, coupled with aging infrastructure and the need to build new facilities, threatens the reliable generation, transmission and distribution of electricity to Canadians across the country. The inability to provide Canadians with electricity, however, is not the only issue. A significant portion of Canada's GDP relies on the export of electricity to the United States, and Americans are demanding and consuming more electricity than ever before. Thus, ensuring an adequate supply of workers into the electricity sector is imperative on all levels of the Canadian economy.

According to the Critical Infrastructure Protection Program report published in November 2006, there is an explicit "linkage between critical 'human infrastructure' – the men and women who have provided the North American electricity grid with engineering and technical expertise – and reliability"[1]. Given this undeniable linkage, the North American Energy Reliability Council (NERC), as of 2006, includes a section in its annual Long-Term Reliability Assessment publication focused entirely on the impacts of an aging workforce. In its most recent publication, NERC states that:

> *The capacity of the bulk power system is nearing its limits. New construction and rejuvenation of the bulk power system is required, using a variety of new technologies. This will require a substantial increase in the workforce. Yet the industry is dealing with a shrinking workforce[2].*

According to Wanda Reder, President-Elect of IEEE's Power Engineering Society, "we are getting to the point where the physical infrastructure and human expertise in the system are stretched to a critical point"[3]. NERC has flagged manpower as a major reliability issue.

In recognition of the impending labour shortages that pose a threat to the electricity sector, the Electricity Sector Council (ESC), in partnership with Human Resources and Social Development Canada (HRSDC), commissioned a study to better understand more precisely 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] CIP Report, November 2006, pg. 2. http://cipp.gmu.edu/archive/cip_report_5.5.pdf
[2] NERC 2007 Long-Term Reliability Assessment, pg. 20 ftp://ftp.nerc.com/pub/sys/all_updl/docs/pubs/LTRA2007.pdf
[3] CIP Report, November 2006, pg. 11. http://cipp.gmu.edu/archive/cip_report_5.5.pdf

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The main findings of the 2008 Labour Market Information Study completed for the Electricity Sector Council by R.A. Malatest & Associates Ltd. are summarized below.

Key Findings

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 that 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, there remained 3.2% of positions within the industry in 2006 were still unfilled. Employers who responded to the 2008 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[4]. 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.

[4] http://www.hrsdc.gc.ca/en/publications_resources/research/categories/labour_market_e/sp_615_10_06/shortages.shtml

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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 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 sized 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%). Of all the respondents, 12 reported that they had hired a Temporary Foreign Worker (TFW), 8 reported that they had not but they would in the future, and 54 reported that they had not hired any TFWs and they did not plan to do so in the future. Companies have historically relied on poaching employees from other employers, but given the current vacancy rates, it is expected that more employers will 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 to the ESC Educational Institutions survey reported that programs related to the electricity sector are

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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 to the ESC Educational Institution Survey 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 non-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 strategic corporate plans. There needs to be a shift in the corporate culture that currently exists within many

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businesses, which shows a disconnect between human resources and other corporate executives. Human resource 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.

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 executives – 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 can 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.

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Source of Findings

In recognition of the impending labour shortages that pose a threat to most industries across the country, the Electricity Sector Council (ESC), in partnership with Human Resources and Social Development Canada (HRSDC), commissioned a comprehensive study of human resources in the sector. This sector study provides a comprehensive overview of the human resource issues, challenges and opportunities for the Canadian electricity sector. This study is also intended to assist in the development of a forward-looking human resource strategy for the Canadian electricity sector.

The results presented in this document are based on the following research activities, including:

- surveys with 87 employers, of which 23 were large employers and 64 were small or medium sized employers, or whose primary business was not electricity;
- a survey of 35 educational and/or training institutions offering courses/programs related to the electricity sector;
- 12 interviews with training institution representatives; and
- an extensive review of secondary data sources and published documents about the electricity sector.

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Section 1: Background

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 industry throughout their careers. Today these conditions are changing, as talented younger workers have considerably more career choice and a different approach to work-life balance.

Compounding the issue of an aging workforce and the threat of retirement among baby boomers is the necessity to continually upgrade and build new infrastructure. Canadians rely on businesses in the electricity industry to supply their personal and business needs with a reliable and efficient source of electricity, 24 hours a day, 7 days a week, uninterrupted. A number of studies show that the infrastructure that both citizens and businesses rely on to generate, transmit and distribute electricity, is in serious need of either repairs or upgrades. Furthermore, as Canada's economy is growing and as our consumption of electricity increases, so too does the demand for electricity from the grid. In order to keep up with demand, new generation, transmission and distribution facilities need to be built, which will require additional labour and skilled workers – both to build and operate the facilities.

To ensure the current and future stability of the supply of electricity, it is critical that industry, education and training institutions, regulatory authorities and policy makers have an in-depth understanding of the human resource challenges that can affect the generation, transmission and distribution of electricity. An adequate pool of trained and experienced workers is of utmost importance in terms of ensuring the long-term stability of Canada's electricity supply.

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

1.1 The Electricity Sector Council

The Electricity Sector Council (ESC) was formed in 2005 in response to industry concern about the workforce challenge posed by the high proportion of the existing electricity industry workforce facing retirement by 2010. Specifically, a study completed for the Canadian Electricity Association in 2004 by R.A. Malatest & Associates Ltd. revealed that over 17% of the electricity industry workforce would be eligible for retirement by 2010 and 37% by 2014. The Electricity Sector Council is an independent, not-for-profit organization, funded by the Government of Canada's Sector Council Program. The Council brings together key stakeholders to address HR issues such as recruiting and retaining workers, facilitating school-to-work transitions, and developing sector and career awareness strategies.

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The ESC's mission is to develop "sector based initiatives which strengthen the ability of stakeholders in the Canadian electricity industry to meet current and future needs for a skilled, safety focused, and internationally competitive workforce"[5]. More specifically, the key objectives of ESC are to:

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

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

1.2 Purpose and Objectives of the Study

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

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

1.3 Research Methodology

Completion of the 2008 Electricity Sector Council Labour Market Information Study was based on an extensive research and consultation process. The information presented in this document is a synthesis of information obtained through a range of research activities. The various activities completed in developing this report included:

Survey of Employers Engaged in the Electricity Sector. Employers engaged in the Electricity Sector were classified as such if all or part of their business involves electricity

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

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generation, transmission or distribution. Employers were classified as either large employers or small/medium sized employers. This distinction and classification was made by the Electricity Sector Council. Employers were included in the sample if their primary business was either the generation, transmission and/or distribution of electricity, or if part of their operations involved the generation, transmission or distribution of electricity.

Survey of Education and Training Institutions. Education and Training Institutions that offer courses or programs related to the electricity industry comprised the sample for this on-line survey. Institutions were classified as either universities, colleges, university-colleges, or technical institutes.

Key Informant Interviews. Key Informants were representatives from the educational and training institutions. The key informant was a person who was knowledgeable about the programs and courses offered by their institution that relate to the electricity industry. Key informants were usually program or department heads, or held positions as academic chairs in programs related to the industry.

Secondary Research including a review of existing literature and statistical databases, as well as analysis of Statistics Canada data on graduation trends from college and university programs related to the electricity industry, and analysis of data on the number of registrants and completions in apprenticeships related to the electricity industry.

Highlighted in Exhibit 1.1 are the completions, valid response rates and associated sample error with each survey component. In total, of the valid sample, 42.4% of employers responded to the survey, and a further 2.4% organizations originally not responding answered a short survey concerning the number of employees at the organization who were engaged in activities related to the electricity industry. Based on initial contact from the Electricity Sector Council, 40 organizations either were disqualified or refused to participate.

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Exhibit 1.1: Rates – 2008 Electricity Sector Council Labour Market Market Information Study – Employer Survey

Call Status	Count	Valid Survey Response Rate
Companies Included in Survey Sample		
Survey Completion	87	**42.4%**
Completed a Short Non-Responder Survey	5	2.4%
Refusal	59	28.8%
Willingness to Complete (working on filling out survey, requested new copy of survey, indicated will send in survey)	9	4.4%
Other (left message, appointment, other callbacks)	45	22.0%
Non-qualifier Identified in Survey Administration* (duplicate, not in industry, etc.)	16	excluded
Survey Total	**221**	**100.0%**

Highlighted in Exhibit 1.2 are the valid response rates for the employer survey by employer group. Notably, large employers represent both a higher response rate and overall more employees. Thus, while large employers represent just under 18% of the total sample, they account for almost 95% of all employees represented in the sample.

Exhibit 1.2: Participation Rates of by Employer Size – 2008 Electricity Sector Council Labour Market Information Study

Employer Size	Valid Sample*	Refusals	Completions	Valid Response Rate	Employees Represented	Percent Representation
Large Employers**	36	9	23	63.9%	72,622	94.8%
Small and Medium Employers and Employers whose primary business is not electricity	169	59	64	37.9%	4,006	5.2%
Total	**205**	**68**	**87**	**42.4%**	**76,628**	**100%**

*Excludes firms omitted from the survey administration sample due to refusal to ESC prior to survey administration, non-qualifiers, multiple cases, and wrong numbers

**Large employers were identified as such by the Electricity Sector Council

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As highlighted in the table above, the results of this study should be viewed with reasonable confidence, given the participation rates for the employer survey, and more importantly, the number of employees in the electricity industry represented by survey respondents. This report relies upon primary research as well as extensive use of published secondary data sources. The use of these "multiple lines of evidence" help ensure that the report and recommendations reflect the input of industry and educational stakeholders, as well as published research on the industry.

The following Exhibit highlights the response rate to the educational institution survey, as well as the number of educational institutions contacted and responding to a key informant interview. In total, 47 representatives from educational institutions completed either a survey or interview.

Exhibit 1.3: Overall Participation Rates – 2008 Electricity Sector Council Labour Market Information Study for Educational Institution Survey and Interviews

Activity	**Valid Sample**	**Refusals**	**Completions**	**Valid Response Rate**
Educational Institutions Survey	129	0	35	27.1%
Key Informant Interviews	15	0	12	80.0%

1.4 Study Limitations

In reviewing the information presented in this report, it is important to recognize the limitations of the study. Limitations include:

- 2008 ESC Employer Survey Administration Challenges. Despite the challenges associated with administering the survey, the number of respondents was nonetheless higher than the number of survey respondents for the 2004 CEA Sector Study (87 versus 63 in 2004). Still, some of the surveys did not reach the identified contacts as they were screened out by the mail room or by reception. There was also some difficulty in reaching contacts, and in some cases identifying alternate contacts. The timing of the survey posed a problem for some companies, as the company was already participating in another survey. This caused confusion for some, and non-participation for others.
- 2008 ESC Employer Survey Data Quality Issues. The size and scope of the employer questionnaire proved to be very complex for some respondents. The two key issues that arose were: 1) missing or inconsistent data, and 2) misinterpretation or misunderstanding of survey questions. Some employers did not provide information for certain questions in the survey, either because they do not track their data in the same format as the survey, or they simply do not track the data. Where the employer data were either incomplete or inconsistent, employers were contacted and requested to provide the correct or missing data.
- Imputation of Missing Employer Survey Data. Not all organizations that responded to the survey were able to provide answers for all questions. Where possible, follow up

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was undertaken with organizations to clarify survey responses, obtain the correct information, or seek direction on how to interpret the missing data. For certain questions with missing data where analysis of a complete set of responses was necessary, missing values may have been imputed based on the average response across all organizations that responded to the question, or on the average response for responding organizations with similar characteristics to the non-responding organization, scaled relative to total employment or employment in a given occupation.

- Educational Institution Data Quality Issues. There were 35 valid responses to the Educational Institution survey, and an additional 12 key informant interviews conducted. Two of the key informant interview respondents had also completed the survey, resulting in a total of 45 respondents. Although there were no refusals to participate in the key informant interviews, the overall sample is relatively small. Survey respondents were largely from Ontario. This has an impact on the data given the provincial variation in program administration, policies, demand, and priorities. In order to ensure high quality data on graduation and enrolment in electricity-related programs, data from Statistics Canada was used to augment the educational institution survey.
- Emphasis on technical occupations. Given the volume of information to be collected, a decision was made by the Steering Committee to concentrate resources on issues/requirements associated with technical/production occupations. While general employment data were collected for all occupations, detailed information pertaining to skills requirements, retirement trends and hiring intentions was collected only for the technical/production occupations (i.e., key/critical non-support occupations excluding most support occupations).
- Comparisons between the 2004 Canadian Electricity Association sector study. Given the differences between the sample used for the 2004 CEA sector study (referred to in Section 1.1) and the current study, caution should be used in making comparisons between the 2004 CEA study and the current report.

1.5 Data and Definitions

Analysis of employment and industry trends in the Canadian electricity industry is complicated. While the NAICS code of 2211 (Electric Power Generation, Transmission and Distribution Industry) would appear to encompass the electricity industry, there are problems with the use of this NAICS. For example:

- The electricity industry is characterized by a number of establishments whose primary business activity is not electricity, yet have a significant number of employees who are involved in the generation, transmission or distribution of electricity. For example, there are a number of organizations that would not be classified in NAICS industry 2211 that still have significant electricity-related generations. Alcan and the Greater Toronto Airport Authority Canada Limited exemplify such organizations that have an interest in human resource issues for electricity-based occupations.

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- Outsourcing of support functions is becoming more commonplace. Outsourcing would effectively result in the transfer of employment from the electricity NAICS (2211) to business service industries (i.e., typically NAICS code 5611). In analyzing statistical data from the Labour Force Survey (LFS), it is important to recognize that changes in employment may well reflect outsourcing activities rather than actual reductions in employment.
- Problems with the use of National Occupational Classification (NOC) codes. Many of the occupations in the electricity industry are not unique to the industry. For example, electricians, electrical engineers and utilities managers can be found in a variety of industries. Unlike some industries in which occupations are unique to the industry, the electricity industry has only a limited number of occupations that can be defined as "electricity only" occupations. Given the overlap with other industries, it was not possible to identify electricity-based employment using NOC coding alone.

For the purposes of this study, the research team has utilized multiple data sources to document the structure and dynamics of employment in the industry. For example:

- Statistics Canada data was accessed including data from the 2006 Census, Labour Force Survey, as well as information from the Survey of Employment, Payroll and Hours (SEPH).
- Primary data collection was also undertaken to obtain employment/occupational data from employers in the electricity sector.

1.6 Report Overview

The remainder of this report is divided into the following sections:

Section 2: profile of the electricity sector and the human resource implications associated with the sector

Section 3: demographics and characteristics of the current workforce in the electricity industry

Section 4: supply of labour for the electricity industry – estimated number of students going through education and training programs in place for the electricity industry, as well as immigration trends

Section 5: projected retirement estimates associated with non-support positions within the electricity industry

Section 6: future demand for skilled workers in the electricity industry

Section 7: recruitment options available to employers in the electricity industry

Section 8: human resource recommendations for the electricity sector arising from this report

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Section 2: Profile of the Electricity Industry

This section provides an overview of the Canadian electricity generation, transmission, and distribution sector. The information presented is based on a comprehensive review of the most recent literature and statistical data available on the electricity industry in Canada and other selected countries.

Topics reviewed in this section include:

- a definition of the Canadian electricity sector;
- an overview of the changing structure of the industry;
- an estimate of employment in the Canadian electricity sector; and
- anticipated future directions in the Canadian electricity sector.

2.1 Definition of the Canadian 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[6].

The current section provides a detailed description of the electricity industry.

2.1.1 Statistics Canada Definition of the Industry

For the purposes of this report, the Statistics Canada definition of the Electric Power Generation, Transmission and Distribution industry group will be used. The sector has been coded as 2211 of the North American Industrial Classification System (NAICS) 2007, and is defined as:

> *"Establishments primarily engaged in the generation of bulk electric power, transmission from generating facilities to distribution centres, and/or distribution to end users. Establishments in this industry group may: (1) operate generation facilities that produce electric energy; (2) operate transmission systems that convey the electricity from the generation facility to the distribution system; and (3) operate distribution systems that convey electric power received from the generation facility or the transmission system to the final consumer."*[7]

[6] Statistics Canada. August 2007. *Energy Statistics Handbook January to March 2007*. Catalogue no. 57-601-XIE.
[7] U.S. Census Bureau. "2007 NAICS Definitions". http://www.census.gov/naics/2007/def/NDEF221.HTM#N2211. (Last Accessed: October 5, 2007)

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The Electric Power Generation, Transmission and Distribution industry group is composed of the following NAICS:

Exhibit 2.1:	North American Industrial Classification System (NAICS) Codes For the Electricity Sector
NAICS (2007)	**NAICS Title**
221111	Hydro-Electric Power Generation
221112	Fossil-Fuel (e.g., coal, oil, gas) Electric Power Generation
221113	Nuclear Electric Power Generation
221119	Other Electric Power Generation (e.g., solar, tidal, wind)
221121	Electric Bulk Power Transmission and Control
221122	Electric Power Distribution

Another related NAICS classification is 23713 Power and Communication Line and Related Structures Construction.

The traditional NAICS classification of the electricity sector is useful for the capturing, tracking, and comparing of key statistics on the electricity industry. However, the NAICS classification may not capture the full scope of activities associated with the electricity sector. Companies involved in aspects of the electricity industry may also be classified in other NAICS classifications than those listed above if their primary business line is something other than electricity related.

Examples include organizations that operate co-generation plants, such as oil and gas operations, aluminum producers, or pulp and paper mills that generate electricity either to power their own equipment or to put back into the electrical grid. Other types of companies that have close relationships and economies with the electricity industry may include manufacturers of equipment and providers of services to the industry (e.g., support services, electrical contractors, etc.).

2.1.2 Occupations in the Electricity Industry

Based on Statistics Canada data, a list of the most common occupations in the Utilities sub-sector (NAICS 221) was developed. The National Occupational Classification (NOC) codes for these occupations are identified in Exhibit 2.2.

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Exhibit 2.2: Electricity Sector: Representative Occupations & National Occupational Classification (NOC) Codes	
NOC (2006)	***NOC Title***
0912	**Utilities Managers**: include managers who plan, organize, direct, control and evaluate the operations of utility companies or services or of heating oil distribution companies.
2132	**Mechanical Engineers:** research, design, and develop machinery and systems for heating, ventilating and air conditioning, power generation, transportation, processing and manufacturing.
2133	**Electrical and Electronics Engineers**: design, plan, research, evaluate and test electrical and electronic equipment and systems.
2241	**Electrical and Electronics Engineering Technologists and Technicians:** may work independently or provide technical support and services in the design, development, testing, production and operation of electrical and electronic equipment and systems.
7212	**Contractors and Supervisors, Electrical Trades and Telecommunications:** include telecommunications and electrical trade contractors who own and operate their own businesses; also includes supervisors of Electricians, Industrial Electricians, Power System Electricians, Electrical Power Line and Cable Workers, Telecommunications Line and Cable Workers, Telecommunications Installation and Repair Workers, and Cable Television Service and Maintenance Technicians.
7311	**Construction Millwrights and Industrial Mechanics (Except Textile):** install, maintain, troubleshoot and repair stationary industrial machinery and mechanical equipment.
7243	**Power System Electricians:** install, maintain, test and repair electrical power generation, transmission and distribution system equipment and apparatus.
7244	**Electrical Power Line and Cable Workers:** construct, maintain and repair overhead and underground electrical power transmission and distribution systems.
7351	**Stationary Engineers and Auxiliary Equipment Operators:** operate and maintain various types of stationary engines and auxiliary equipment to provide heat, light, power and other utility services for commercial, industrial and institutional buildings and other work sites.
7352	**Power Station Operators:** monitor and operate switchboards and related equipment in electrical control centres to control the distribution of electrical power in transmission networks.
7352	**Power System Operators:** operate and monitor the distribution of electrical power in the transmission networks; coordinate the generation and transmission of energy between energy authorities

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Other occupational classifications that have been identified as key for many organizations in the electricity sector include:

1111 Financial Auditors and Accountants

2131 Civil Engineers

2171 Information Systems Analysts and Consultants

2231 Civil Engineering Technologists and Technicians

2232 Mechanical and Civil Engineering Technologists and Technicians

While the occupational classifications common to the industry are useful standards for comparison of data on employment in the sector, it may be noted that certain NOC definitions may not fully align with the real-world job descriptions at specific companies. For some NOCs, such as Power Systems and Powers Station Operators (NOC 7352), the NOC definition may not reflect the evolution of the job tasks to include new technologies (e.g., computer automation and control) and expanding/changing job responsibilities. The emergence of independent power systems operators engaged in coordinating the generation and transmission of energy between energy authorities has also resulted in Canadian companies using certain job descriptions based on North American Reliability Corporation (NERC) standards that again do not precisely match the traditional NOC definitions available. Given the increasing difference between the two jobs, the 2008 Electricity Sector Council Employer Survey split NOC 7352 into two separate categories, and gathered data on Power Systems Operators and Power Station Operators as two distinct occupations.

Furthermore, it should be noted that certain types of workers in the industry increasingly have job duties that straddle two or more of the traditional NOC definitions, making classification by NOC a challenge for certain positions.

Please refer to “Occupation Name in Survey Job Descriptions and Other Common Names for the Occupation” in Appendix C for a more detailed description of each occupation.

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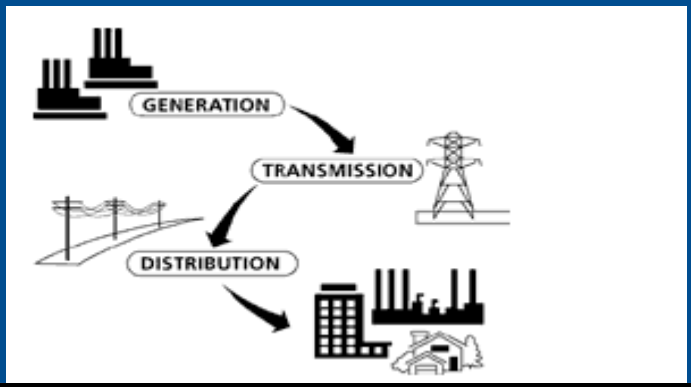
2.2 Structure of the Industry

2.2.1 Overview of Market Structure

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[8]. 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[9]. Exhibit 2.3 below provides an illustration of these key functions of the electricity sector.

Exhibit 2.3: The Electricity Generation, Transmission, & Distribution Sector



Source: Canadian Clean Power Coalition. http://www.canadiancleanpowercoalition.com (Last accessed: October 6, 2007)

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: "lowest [generation] costs could be achieved by building large scale power plants… the nature of long-distance transmission systems and local distribution systems also fit the natural monopoly model"[10].

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

[8] Ibid.
[9] www.canadiancleanpowercoalition.com. (Last Accessed October 5, 2007)
[10] National Energy Board. *Canadian Electricity: Trends and Issues.* May 2001, p.8. http://www.neb-one.gc.ca/clf-nsi/rnrgynfmtn/nrgyrprt/lctrcty/lctrctytrndssscnd2001-eng.pdf.

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level), in many regions, independent power producers (IPPs) and open access transmission tariffs (OATT) development integrated into the market structure and retain many attributes of a vertically-integrated unit[11].

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[12].

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 the introduction of competition to 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 the transmission grid.

British Columbia and Alberta, in particular, are promoting alternative suppliers of electricity to meet long-term demand. The number of independent power producers in these provinces has increased rapidly since the late 1990s, with new suppliers operating across a range of energy sources (e.g., small hydro, gas and wind). Today, roughly 10 percent of domestic electrical energy in these two provinces is now supplied by IPPs[13].

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.

[11] National Energy Board. *Outlook for Electricity Markets 2005-2006, an Energy Market Assessment*. June 2005, p. 6. http://www.neb-one.gc.ca/clf-nsi/rnrgynfmtn/nrgyrprt/lctrcty/lctrctymrkts20052006-eng.pdf.
[12] Ibid. p.8.
[13] Independent Power Producers Association of British Columbia, http://www.ippbc.com/EN/about_ippbc/

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2.2.2 Establishments in the Canadian Electricity Market

Results from the 2008 ESC Employer Survey show that the largest proportion of employees are 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.

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	9%
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

As integrated electricity organizations have multiple lines of business, respondents to the survey were also asked how many of their employees worked in each of their lines of business. As indicated in the Exhibit below, it appears that about one third (32%) of employment in the electricity sector is associated with generation activities, whereas 31% is associated with distribution. Transmission accounts for 14% of employment and other business lines account for 23%.

Exhibit 2.5: Distribution of Staff Across Line of Business for Survey Respondents

Line of Business	Number of Companies Reporting	Number of Employees Accounted for	Percent of total
Generation	23	24,944	32%
Transmission	19	10,447	14%
Distribution	61	23,625	31%
Retail	8	639	1%
Renewable	9	61	<.01%
Other	21	17,538	23%
Total	**86**	**76,524**	

Note: some companies did not provide breakdowns by line of business and are excluded from this table. Data for a small number of employers was imputed from other responses. It should also be noted that survey response from the renewables sector was relatively low, therefore employment in this line of business is likely under-represented in the table.

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The following Exhibit provides a breakdown of the respondents by size and line of business. As a generalization, establishments involved in the distribution of electricity tend to be small or medium sized, whereas establishments that are integrated are more likely to be large employers.

Exhibit 2.6: Responders by Size and Line of Business

Line of Business	Small/ Medium	Large
Generation	4	3
Transmission	1	2
Distribution	43	4
Retail	1	0
Renewable	2	0
Integrated	2	13
Other	11	1
Total	**64**	**23**

Source: 2008 ESC Employer Survey, n=87

Exhibit 2.7 below outlines the number of establishments by line of business per region. While the majority of employees work in the generation of electricity, the majority of establishments deal with the distribution of electricity. This suggests that most establishments involved in the distribution of electricity are small employers, whereas those involved in the generation of electricity are large employers. Furthermore, the vast majority of establishments that are engaged in the distribution of electricity are in Ontario.

Exhibit 2.7: Number of Establishments by Line of Business per Region

Region	Generation	Transmission	Distribution	Retail	Renewable	Other	Integrated
Atlantic	1	0	0	0	1	0	5
Québec	0	0	0	0	1	0	1
Ontario	5	1	39	1	0	10	2
Prairies	0	0	1	0	0	1	2
Alberta	1	1	5	0	0	1	4
BC/ Territories	0	1	2	0	0	0	1
Total	**7**	**3**	**47**	**1**	**2**	**12**	**15**

Source: 2008 ESC Employer Survey (n=87).

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, as illustrated in the Exhibit below:

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Exhibit 2.8: Number of Non-Support Employees by Business Line and Size of Organization*							
Size	**Generation (n=7)**	**Transmission (n=3)**	**Distribution (n=47)**	**Renewable (n=2)**	**Other* (n=12)**	**Integrated** (15)**	**Total (n=87)**
Large	11,188	407	2,354		3,584	28,552	46,085
Small and Medium Employers and Employers whose primary business is not electricity	202	4	1,069	43	1,230	130	2,678
Totals***	**11,390**	**411**	**3,423**	**43**	**4,814**	**28,682**	**48,764**

Source: 2008 ESC Employer Survey, n=87
*'Other' included businesses involved in manufacturing, construction, consulting, and business development
**Integrated includes all respondents who identified involvement in more than one line of business associated with the electricity sector
***Totals not extrapolated to reflect non-reporting organizations, and do not include 'retail' as there was only one respondent in that category reporting one non-support employee.

It should be noted that the figures presented above do not include contractors[14]. The data also does not include seasonal workers, as employers were asked not to include these employees in their reporting.

2.3 Estimate of Employment in the Canadian Electricity Sector

There are numerous data sources that could be utilized to identify employment in the Canadian electricity sector. Detailed below are descriptions of each source.

2.3.1 Statistics Canada Sources

Statistics Canada publishes four different estimates of employment in the electricity sector. These estimates consist of:

2006 Census Data. Employment by industry is available from the 2006 census. Only individuals who answer the long form (Form B – 1 in 5 individuals) are asked detailed questions as to their occupation and industry. Census data is considered to be the most reliable of data, but it relies on the individuals' perception of the industry that they work in.

Labour Force Survey (LFS) Data. Labour force survey information is collected from individuals; approximately 55,000 individuals are surveyed on a monthly basis. The relatively small size of the sample limits the use of LFS for electricity sector employment, as data for the NAICS sector (2211) is not published (data for the utilities sector as a whole is published on a monthly and annual basis).

[14] Contractor definition - A person or entity who, as part of an independent business, becomes obligated to provide goods and/or services for a price. May work in a temporary or contingent capacity as required by the firm hiring them.

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Survey of Employment, Payroll and Hours (SEPH). The unit of measurement for this survey is the individual business establishment which is surveyed on a monthly basis. Using administrative tax (tax remittances), estimates of employment by industry can be generated, including estimates at the electricity sector level. SEPH tends to over count employees as payroll deductions for all employees – including casual, temporary – would be counted in terms of the determination of total employment. Data are available at the industry NAICS level (2211); occupational data are not available from SEPH.

Electric Power Generation, Transmission & Distribution Annual Publication. This publication presents statistics on the supply and disposition of electric energy compiled from a quarterly survey of all power producers in Canada (approximately 300 producers operating some 1,100 stations) from utilities and industrial establishments which generate and /or distribute electric energy. Installed generating capacity data are obtained from an annual survey of electric utilities and industrial establishments which have at least one plant with total generating capacity of over 500 KW. The survey covers some 900 generating stations. Additionally, data is presented on sales and revenues by class of customers. Also presented are balance sheet and income statement data from utilities, information on direct taxes paid, employees, wages and salaries.

As detailed in Exhibit 2.9 below, it appears that employment in the Canadian electricity sector is subject to considerable variation – ranging from the LFS estimate of 105,500 in 2007 to the SEPH estimate of 94,082 in the same year.

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Exhibit 2.9: Estimated Employment in the Canadian Electricity Sector – Statistics Canada and Other Sources

Data Source	Year(s)	Total Estimated Employment in industry	Notes
2006 Census (NAICS 2211) (May 2006)[15]	2006	96,325	- Total labour force - information fairly recent
SEPH[16]	2003 2006 2007	88,469 94,062 94,082	- based on employer payroll remittances (average monthly counts) - no occupation data - not FTE basis
LFS	2003 2007	97,500 105,500	- special request information - based on a very small sample - provincial data is not generally published at the 4-digit NAICS level
Electric Power Generation, Transmission & Distribution annual publication (Pub. 57-202-XIB)[17]	2005	76,498	- employees engaged in generation, transmission, distribution establishments (approximately 300 producers operating approx. 1,100 stations) - includes industrial plants with generation of 500 KW or more

[15] http://www12.statcan.ca/english/census06/data/topics/RetrieveProductTable.cfm?ALEVEL=3&APATH=3&CATNO=97-559-XCB2006009&DETAIL=0&DIM=&DS=99&FL=0&FREE=0&GAL=&GC=99&GK=NA&GRP=0&IPS=97-559-XCB2006009&METH=0&ORDER=&PID=92102&PTYPE=88971&RL=0&S=1&SUB=&ShowAll=&StartRow=&Temporal=2006&Theme=74&VID=&VNAMEE=&VNAMEF=
[16] http://cansim2.statcan.ca/cgi-win/CNSMCGI.PGM
[17] Statistics Canada (2005) http://www.statcan.ca/english/freepub/57-202-XIE/57-202-XIE2005000.pdf

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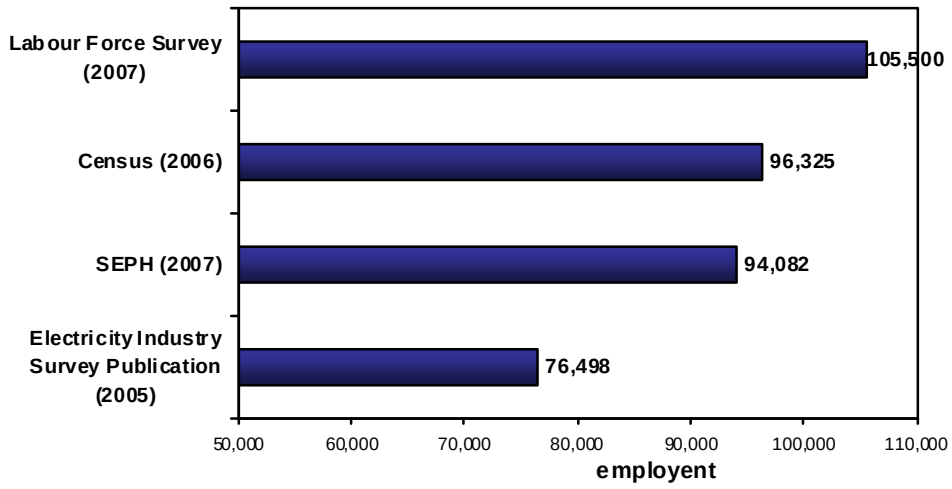
As further highlighted in Exhibit 2.10, there is considerable range in employment estimates.

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



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.

2.3.2 The Labour Market Information Project

The 2008 Electricity Sector Council Employer Survey obtained data from 23 large employers, representing almost 95% of employees in the sample. Overall, the survey of employers involved in the production, generation, or transmission of electricity indicated that the participating firms had a total of almost 77,000 employees, including technical and support staff. The break-down of sector staff is presented in Exhibit 2.11 below. Including estimates for non-responding organizations, the total employment in the electricity sector is estimated at 88,318.

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Exhibit 2.11: Estimates of Current Employment in Electricity Activities: Survey Data and Extrapolation

Group	Number of Organizations				
	Initial Universe	Provided Data for the Survey	RAM[1] Estimate for 2004 Survey Responders	RAM Estimate for Non-Participating Organizations	Total Estimated Employment
Large Employers[2]	36	23	6	6	35
Technical/Production Staff		46,085	2,905 (e)	1,476 (e)	50,466
Support Staff		26,537	993 (e)	741 (e)	28,271
Total		72,622	3,898 (e)	2,217 (e)	78,737
Small_Medium Sized Employers	168	64	18	83	165
Technical/Production Staff		2,679	2,136 (e)	2,864 (e)	7679
Support Staff		1,327	575 (e)	0 (e)	1,902
Total		4,006	2,711 (e)	2,864 (e)	9,581
Total Electricity-Related Employees	204	87	24	89	200
Technical/Production Staff		48,764	5,041 (e)	4,340 (e)	58,145
Support Staff		27,864	1,568 (e)	741 (e)	30,173
Total		**76,628**	**6,609 (e)**	**5,081** (e)[3]	**88,318**

[1] RAM = R.A. Malatest & Associates Ltd., consultant preparing report
[2] primary line of business is electricity generation, transmission or distribution
[3] estimates for all non-responders was not possible, as InfoCanada did not provide employment estimates available for 100% of non-responding organizations. Non-responding employers (primarily engaged outside of the electricity industry) who completed a follow-up survey were not able to estimate the number of support staff associated specifically with electricity.

It should be noted that the estimate above provides a relatively conservative employment estimate for non-responding organizations. This estimate was informed to some extent by a short follow-up survey with five organizations (primarily engaged outside the electricity industry) who did not complete the initial survey, and who were contacted to determine the number of employees engaged in activities related to electricity industry.

2.3.3 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.

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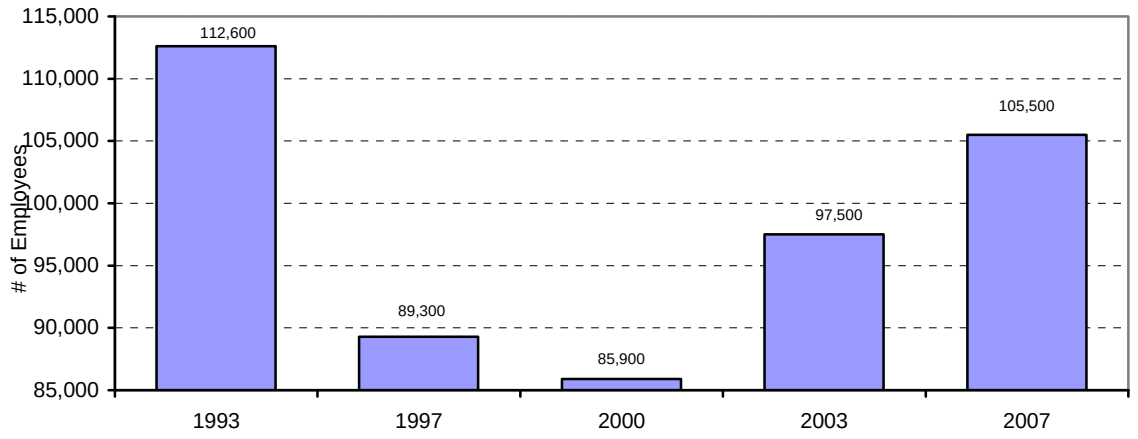
Exhibit 2.12: Employment in the Electricity Sector in Canada (1993, 1997, 2000, 2003, 2007)



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.

2.3.4 Number of Employees by Occupation

According to the data from the 2008 ESC Employer Survey, non-support employment accounted for approximately 63.6% of employment across key occupations in the sector. The following Exhibit provides a breakdown of the number of employees captured in the 2008 ESC Survey, by key non-support occupation.

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Exhibit 2.13: Number of Non-Support Employees Captured in the 2008 ESC Employer Survey by Occupation	
Occupation	**Number of Employees Captured in Survey**
Managers	**6,537**
Utilities Mangers	2,714
Supervisors of Electricians and Line Workers	3,227
Other Managers	596
Engineers and Technicians	**15,346**
Electrical Engineers	3,775
Mechanical Engineers	1,603
Civil Engineers	633
Electrical Technicians/Technologists	3,913
Mechanical Technicians/Technologists	1,694
Civil Technicians/Technologists	848
Other Engineers and Technicians	2,880
Trades	**22,599**
Power System Electricians	4,699
Electrical Power Line and Cable Workers	6,231
Power Systems Operators	1,232
Power Station Operators	3,372
Millwrights/ Industrial Mechanics	2,982
Other trades	4,083
Other critical non-support staff	**4,282**
Total	**48,764**

Source: 2008 ESC Employer Survey

2.4 Electricity Production

2.4.1 National Production

Canada's total electricity production increased steadily over the past decade, rising from 532,094 GWh in 1993 to 616,566 GWh in 2006.[18] 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.[19] Canada's electricity generation in MWh from 1993 to 2006 as illustrated in Exhibit 2.14 below is sourced from Statistics Canada.

[18] International Energy Agency. RD & D Database. Beyond 2020 Web Server. Refers to gross electricity production.
[19] Comparison of data from the two sources from 1993-2006.

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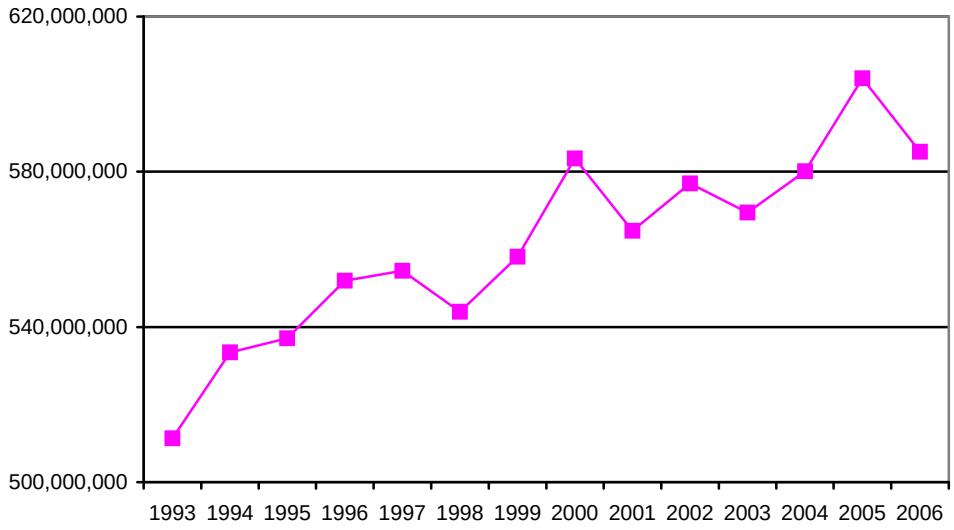
To put this in perspective, it is estimated that one Megawatt-hour is enough energy to supply power to 1,000 typical Canadian households for one hour.[20]

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.

Canada is the world's 6th largest producer of electricity and accounts for approximately 3.4% of the world's total electricity production. Generating approximately 628 TWh (terra-watt hours) of electricity in 2005, Canada produces more electric power than such other OECD countries as Germany, France, Brazil and the United Kingdom.[21] On a per capita basis, Canada is the third largest electricity producer in the world.

2.4.2 Generation by Province

Québec and Ontario are Canada's two largest producers of electricity, accounting for 31% and 27% respectively of the country's total electricity generation. British Columbia (11%) Alberta (10%), and Newfoundland and Labrador (7%) are also significant generators of electricity. Smaller producers of electricity include: Manitoba (6%); New Brunswick (3%); Saskatchewan (3%); Nova Scotia (2%); the Territories (0.1%); and Prince Edward Island (0.1%).

[20] Government of Alberta. "Introduction to Electricity". 2003. http://www.energy.gov.ab.ca. (Last accessed: October 4, 2007)
[21] International Energy Agency. "Key World Energy Statistics, 2007".

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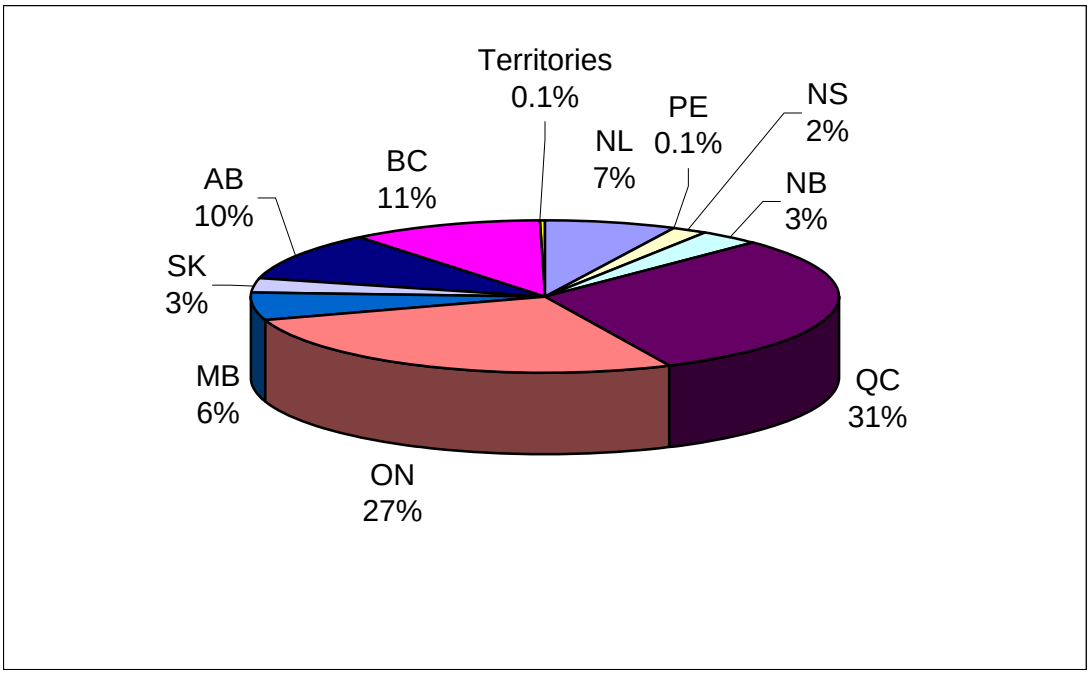
Exhibit 2.15: Proportion of Canada's Electricity Generated by Province/Territories (2005)



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

Manitoba and New Brunswick, relatively small producers in terms of MWH, lead in electricity production growth by percentage, with 36.4% and 34.2% growth respectively, from 1993-2005.[22] While Prince Edward Island shows negative growth overall from 1993 this is due to a drop in production between 1993 and 1996. Since 1996, Prince Edward Island has shown significant growth. The provinces of Nova Scotia (27.4%), Saskatchewan (24.3%), Alberta (22.5%), Québec (16.3%) and British Columbia (15.4%) also experienced significant growth in electricity generation over the same period. Ontario (12.6%) joined Yukon and Newfoundland and Labrador (3.1%) with smaller percentage growth

2.4.3 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 TWh in 1993 to 358,446 TWh in 2005. This represents an 11.9% increase over the period.23 In 2005, Canada was the

[22] Statistics Canada. August 2007. *Energy Statistics Handbook January to March 2007*.
[23] International Energy Agency. *Key World Energy Statistics 2007*. 2007, p. 19.

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second largest producer of Hydro electricity in the world, producing about 12.1% of the world total – second only to China24. 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[25]—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.[26] Industry experts have predicted that the use of natural gas for electric power generation will triple within the next decade.[27] In 2005, Canada produced 628,194 GWh of electricity using a number of different fuel types. The following table illustrates the number of GWh produced from different methods.

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, http://www.iea.org/Textbase/stats/electricitydata.asp?COUNTRY_CODE=CA

[24] International Energy Agency. "Key World Energy Statistics, 2007" p. 19. http://www.iea.org/textbase/nppdf/free/2007/key_stats_2007.pdf
[25] Canadian Hydropower Association. *Quick Facts*. http://www.canhydropower.org/hydro_e/pdf/Quick_Facts_2004.pdf.
[26] National Energy Board. *Canadian Electricity: Trends and Issues*. May 2001, p. 3. http://www.canelect.ca/en/Pdfs/Electricity_07_an_72dpi.pdf.
[27] U.S. Department of Energy. "APEC Energy Issues and Trends". http://www.eia.doe.gov/emeu/cabs/apec/electricity.html. (Last Accessed: October 5, 2007)

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As the above table indicates, Hydro remains the primary source of production of electricity (57.9%), followed by Coal (16.9%) and Nuclear (14.7%).

The use of nuclear energy in the production of electricity has declined from 2005 to 2007, 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 greenhouse gas (GHG) emissions. 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 the 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[28]. In 2005, Canada was the 7th largest producer of Nuclear electricity, producing 3.3% of the world's total[29]. Nonetheless, its use as a fuel source is declining. By 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 (although they still comprise a relatively minute portion of total electricity production). Exhibit 2.17 below illustrates the changing trends in fuel source for electricity production in Canada.

Exhibit 2.17 Production of Electricity by Fuel Type (2005-2007)

Fuel Type	2005	2006	2007	% change between 06/07
Combustible Fuels	170,990	152,755	161,411	5.7
Nuclear	92,040	90,758	87,064	-4.1
Hydro	363,626	351,864	364,526	3.6
Geoth./Wind/Solar/Other	1,519	1,490	2,165	45.3

Source: International Energy Agency "Monthly Electricity Statistics" December, 2007
http://www.iea.org/Textbase/stats/surveys/mes.pdf

Total production 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.

[28] http://www.gotfocus.de/texte/REO-Uranium_summary.pdf
[29] International Energy Agency. "Key World Energy Statistics, 2007" p. 17.
http://www.iea.org/textbase/nppdf/free/2007/key_stats_2007.pdf

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2.4.4 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, and $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.

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.

There are currently a number of new capital projects underway in the electricity sector that will contribute further to Canada's overall production of electricity. Some of the projects that are currently underway include:

- Infrastructure Ontario's Nuclear Procurement Project – a 20 year Energy Plan designed to meet the growing demand for electricity and to stabilize energy supplies;
- 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 MW of capacity come online between 2011 and 2015;
- TransCanada is building a new generation facility in Halton Hills, Ontario in response to the Ontario Power Authority's planned procurement for new generation in the Greater Toronto Area to help meet Ontario's increasing power needs. The new facility will be capable of generating approximately 680 MW of capacity;
- A new generating facility called the Portlands Energy Centre is currently under construction in Toronto's waterfront area. The facility is estimated to generate 550 MW, and will help supply the city's downtown energy demand;
- 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;
- Between 2010 and 2014, SaskPower plans to invest in up to 400 MW of electricity generation using simple cycle nature gas. SaskPower also plans to generate an additional 100 MW of electricity by 2012 using wind generation; and

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- 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.

2.5 Consumption: Current and Future Trends

2.5.1 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[30]. 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 Co-operation and Development (OECD) consumption[31]. Consuming 4,046 TWh of electric power in 2005, the United States outstripped 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

[30] International Energy Agency. *Key World Energy Statistics 2007*. (Based on 2005 data). p. 48-57. *The European Union was included as a "country" in this data.
[31] Ibid.

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Exhibit 2.18: Electricity Consumption : An International Comparison

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.

However, as seen in Exhibit 2.18, in terms of per capita consumption, Canada consumes more electricity than the United States, consuming 17,307 KWh per person in 2005, compared with 13,640 KWh per person in the United States. Canada is the world's third largest per capita consumer, ranking behind Iceland (28,057 KWh/capita) and Norway (25,145KWh/capita), respectively[32].

Canadian electricity demand has grown steadily from 1993 to 2005, with annual consumption rising from approximately 451,776 GWh to 537,963 GWh over the period.[33] Electricity demand has increased by 19% from 1993 to 2005. There were two surges of growth in demand over this period. The first was a 6.3% growth from 1998-2000, which has been attributed to more concretization of restructuring policies and recovery of the sector from the 1998 ice storms. The second period of growth was from 2001 to 2002 at 3.1%. This has been credited to the return to normal economic activities after a significant slow-down in the economy following the

[32] Ibid.
[33] International Energy Agency. *Key World Energy Statistics 2007*. p. 50.

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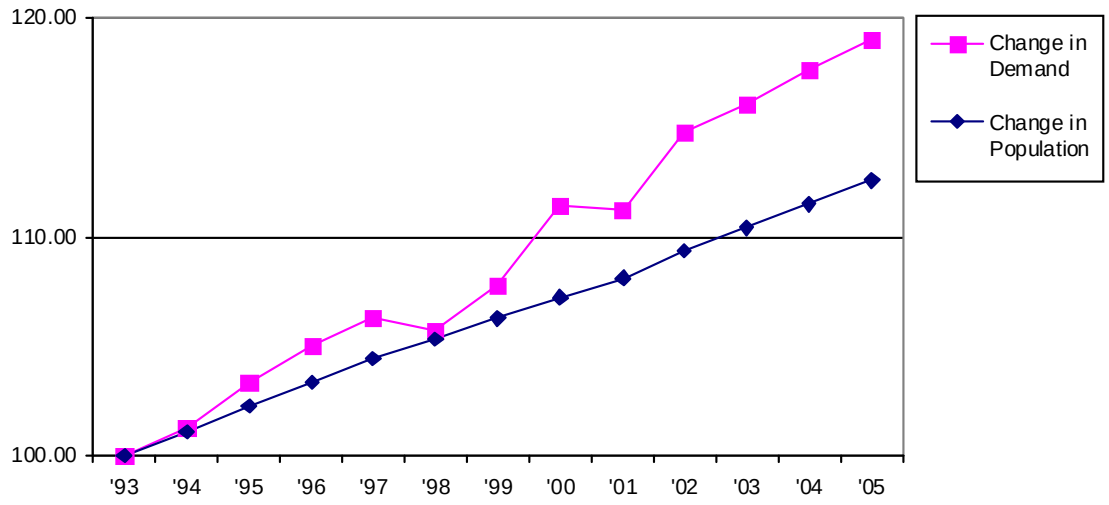
September 11th terrorist attacks[34]. Over the period from 2002 to 2005, electricity demand showed an average growth of approximately 1.3% per annum. Between 1993 and 2005, average annual growth in demand was 1.7%.

As seen in Exhibit 2.19, Canada's population growth has remained steady at an average of approximately 1% per year.

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.

The above Exhibit illustrates that Canada's demand for electricity is outpacing its population growth, which suggests that demand per capita is increasing at a steady pace.

2.5.2 Investment

According to the International Energy Agency (IEA), total Research and Development (R&D) investment in the energy sector dropped from approximately USD$326 million in 1993 to USD$298 million in 2005[35]. This represents an 8.6% decline over the period. Literature suggests R&D has been substantially reduced as utilities in Canada and worldwide move

[34] Statistics Canada. "Energy Statistics Handbook, Quarter 1, 2003". Catalogue no. 57-601-XIE. Data for 2002 from Statistics Canada, CANSIM Table 128-0003, Catalogue no.57-003-XPB.
[35] International Energy Agency. RD & D Database. Beyond 2020 Web Server.

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toward more competition, prompting cost-cutting strategies, and as governments reduce their funding support.

In the electricity sector, investment (in capital assets and capacity) as a percentage of total Canadian investment has declined over the past 13 years. Investments declined in the mid-1990s in part due to the accumulation of surplus capacity in the 1990s. Recently, spending in capital has increased as utilities reach the end of their useful lives and infrastructure has to be refurbished to anticipate demands. The IEA estimates total electricity infrastructure investment required in Canada by 2030 would be approximately USD$250 billion[36].

As indicated in section 2.4.4, government and utilities companies are starting to take steps to catch up with the lagging investment from the previous decade. In response to both consumer and global demand to reduce greenhouse gas emissions and global warming, investments have increased particularly in alternative and green sources of energy production. For example, the government of British Columbia has enacted its Energy Plan, which outlines a number of action items and strategies, including increased funding and investment, to move toward greener and more sustainable energy practices[37].

2.5.3 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.38 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[39].

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[40].

[36] Canadian Electricity Association. "Canada's Infrastructure Challenge: Building Our Electricity Future". Vol. 8:1. *Electricity 2007.* http://www.canelect.ca/en/Pdfs/Electricity_07_an_72dpi.pdf.
[37] BC Energy Plan, http://www.energyplan.gov.bc.ca/PDF/BC_Energy_Plan.pdf
[38] National Energy Board. *Outlook for Electricity Markets 2005-2006: An Energy Assessment*. June 2005, p.3.
[39] Canadian Electricity Association, Addressing the Human Resource Challenge in the Electricity Industry, Feb 2007.

[40] Ibid.

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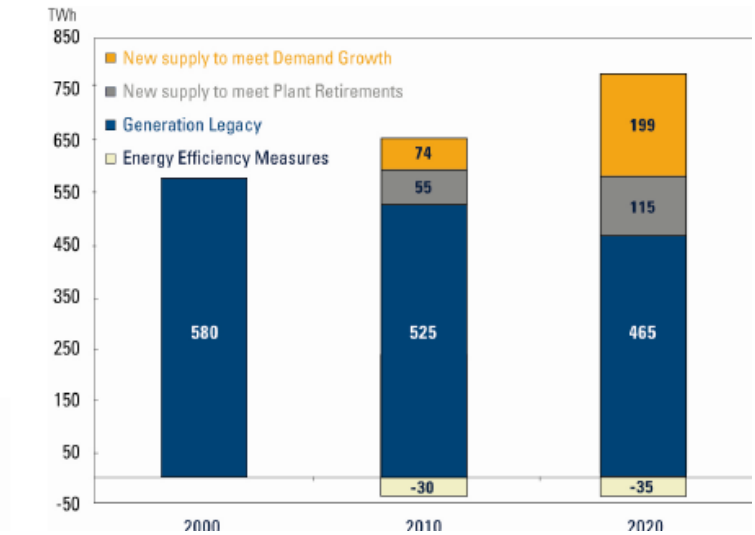
Exhibit 2.20: Canadian Electricity Demand projections to 2020



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

2.6 Technological Impacts

Recent literature on the Canadian electricity sector suggests that technology will have a considerable impact on the sector in the near future: "New energy technologies hold the promise of profoundly changing the face of energy markets"[41]. Already, significant advances in technology have taken place in the sector. 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).

[41] Commission for Environmental Cooperation of North America. P.21

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The following section provides an overview of key changes that are occurring, or that are expected to occur, within the Canadian electricity sector.

2.6.1 Generation

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.

Other examples of new generation technologies include: hybrid systems; distributed generation/small-scale generation; fluidized bed combustion; supercritical steam generators; co-generation[42]; integrated gasification combined cycles[43] (IGCC); high-efficiency combustion turbine units[44], and natural gas-fired turbines[45]. In addition, recent initiatives in Ontario have included efforts to upgrade existing nuclear facilities and to increase nuclear power production. Nuclear generation, while not popular in all provinces, will likely increase in the coming years, as large companies such as Bruce Power look to build new facilities in Saskatchewan and Alberta.

With the changes to the industry in Canada and abroad, such as restructuring and re-regulation, there is a potential scenario where industry experts predict that there will be a convergence of service companies, fossil fuel suppliers and electric generators in order to create "energy providers". Some industry analysts predict that these energy providers will effectively replace Canadian gas and electric utilities[46]. It is also anticipated that electricity customers will have a wider array of products and energy providers from which to choose.

2.6.2 Transmission and Distribution

In the area of transmission and distribution, there is already a wide array of technology products available. For example, Supervisory Control and Data Acquisition (SCADA) systems are becoming increasingly more sophisticated.[47] Advances in satellite communications, wireless communication and Internet are increasing the sector's ability to monitor the transmission and distribution infrastructure/systems. By 2020, industry experts have suggested that the transmission system will be an automated "intelligent system", reducing the role of human operators: humans will be required only on a "management-by-exception basis"[48].

Distribution automation is being implemented by Canadian utilities such as Hydro Québec and Enmax. The operation of a self-diagnosing and self-healing distribution grid is expected to

[42] the generation of electric and heat energy from the same plant
[43] IGCC converts solid fuel to combustion gas and waste products which can be captured and disposed of
[44] Ibid. p.15-19
[45] According to naturalgas.org, this type of distributed generation is commonly used by medium and large sized establishments, such as universities, hospitals, commercial buildings, and industrial plants, and are typically 21 to 40 percent efficient, http://www.naturalgas.org/overview/uses_eletrical.asp
[46] Ibid. p.9
[47] Industry Canada. "Canadian Electric Power Technology Roadmap" Forecast. p.21
[48] Ibid. p.23

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reduce workforce requirements for operations for transmission and distribution companies. Further, micro generation, expected to become common on the distribution system, will require management of multi-directional power flows with customers.

2.6.3 Power Line Networking

A new technology that has recently emerged is that of power line networking. This technology provides high-speed Internet access over power lines, and has the potential to make the Internet more widely accessible, particularly in rural and remote areas.[49] The new technology represents a possible new line of business for electricity companies, and may change how companies within the sector operate.

2.6.4 Alternative Electricity Sources

Emerging renewable and alternative electricity sources include wind, solar, tidal, bio-mass, bio-gas and solid waste. More than 2,000 MWh were generated by emerging renewable and alternative energy sources in 2002, representing 2% of the total Canadian capacity. The most common sources of renewable and alternative generation included bio-mass (1,011.4 MW) and wind (234.2 MW).[50]

2.7 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.

Results from the environmental scan as well as open-ended comments on the 2008 ESC Employer Survey indicate that employers are increasingly in need of employees who have a broad base of knowledge about and skills involved in computers and computerization. Many companies have shifted towards automation and computerized systems. 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 slightly different skill set which better reflect the demands of the electricity sector today.

One technological change that is having an affect on the industry is the development of the Smart Meter. The Smart Meter is currently used in Ontario, and it tracks the amount of electricity consumption of a household at any given time. The idea is to allow consumers the

[49] William Glantz. "Electric Companies Begin Offering Broadband Service". The Washington Times. http://washingtontimes.com/business/20040404-100425-2213r.htm
[50] CIEECAC Annual Renewable Energy Review, March 2003.

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option of using electricity more during off-peak hours. The price the consumer pays for the electricity is based on the wholesale market, and is generally higher during peak hours than during off-peak hours. Thus, the consumer can effectively reduce their electricity bill by consuming less during peak hours and more during off-peak hours. The impact this will have on employers will be a reduced need for meter readers, but an increased need for Smart Meter repair and maintenance staff.

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Section 3: Human Resource Profile

The following section of the report presents a profile of the workforce involved in the generation, transmission and/or distribution of electricity. In this context, where possible, data are presented primarily for production/technical occupations, and excludes analysis of administrative support positions.

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. Of these, 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, and 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. The following Exhibit illustrates the gaps.

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

3.1.1 Gender Profile of Workers in the Electricity Sector

Women continue to be under-represented in all areas of the electricity sector. According to Statistics Canada's annual labour force survey, men comprised 75 percent of the total electricity labour force between 1993 and 2007 (see Exhibit 3.2). 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.

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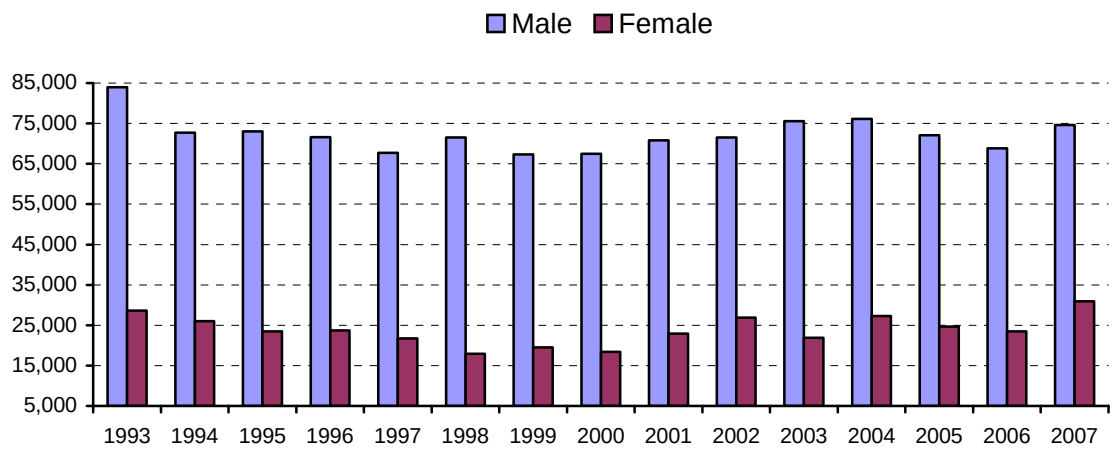
Exhibit 3.2: Employment in the Electricity Sector, by Gender (1993-2007)



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

Of the occupations selected for this study, the smallest proportion of women exist in the electrical power line and cable worker, stationary engineer and auxiliary equipment operator, and power system electrician occupation categories. In contrast, the Utilities Manager occupation has the greatest female participation (13%). Exhibit 3.3 below provides an overview of gender representation by selected occupation within the sector.

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Exhibit 3.3: Gender Profile of Workers by Selected Occupation			
NOC	**NOC Title**	**Male**	**Female**
0912	Utilities Managers	83.3%	16.7%
2133	Electrical and Electronic Engineers	90.1%	9.9%
2132	Mechanical Engineers	91.1%	8.9%
2241	Electrical and Electronics Engineering Technologists and Technicians	87.8%	12.2%
2243	Industrial Instrument Technicians and Mechanics	95.3%	4.7%
7243	Power System Electricians	96.6%	3.4%
7244	Electrical Power Line and Cable Workers	97%	3%
7352	Power Systems and Power Station Operators	93.5%	6.5%
7351	Stationary Engineers and Auxiliary Equipment Operators	97%	3%
7212	Contractors and Supervisors, Electrical Trades and Telecommunications	95.1%	4.9%
7311	Construction Millwrights and Industrial Mechanics	98.5%	1.5%

Source: Statistics Canada. Census 2006.

Consistent with the table presented above, employers reported that 16% of managers and supervisors in the electricity sector in 2007 were women, with lower levels of female participation in engineering occupations (8%) and trades (2%). The percentage of female staff by occupational group is presented in the table below.

Exhibit 3.4: Percentage of Female Staff by Occupational Group	
Occupational Group	**Percentage of Female Staff**
Managers/ Supervisors	16%
Engineers/ Engineering Technologists and Technicians	8%
Trades	2%
Other Critical Occupations	22%

Source: 2008 Employer Survey, n=83

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The highest percentage of female staff is in 'other critical occupations'. Increasing the female share of employment in the sector beyond the growth between 1993 and 2007 will be dependent on the sector's ability to attract younger females into education and training programs which traditionally attract males (e.g., trades, technology and engineering).

3.1.2 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).[51]. Immigrants and Foreign Workers are an integral part of the Canadian labour force. 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[52].

Compared to the total number of employees in each main occupation in the electricity sector, immigrants and foreign workers make up a relatively small proportion. The following Exhibit illustrates a high number of permanent residents and foreign workers in engineering occupations (over 6,000), but less than 400 permanent residents or foreign workers in trades positions. Immigration, therefore, does not contribute significantly to the workforce for key trades in the electricity sector. The following Exhibit illustrates the number of immigrants and foreign workers in select occupations, compared to the total number of employees in each occupation currently employed in the Electricity Sector. It should be noted that while there are many Electrical and Mechanical Engineers who are immigrants and foreign workers, these occupations are not exclusive to the industry.

[51] 'Immigrants' includes not only recent immigrants, but also immigrants who have been in Canada since prior to 1991; Aboriginal people are those who self identify as Aboriginal
[52] Canadian Labour and Business Centre "Trends in Immigration" http://www.clbc.ca/files/Reports/IHB_section_a.pdf

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Exhibit 3.5: Number of Immigrants and Foreign Workers as a Percentage of the Total Number of Employees			
	Total Employed	*Permanent Residents and Foreign Workers Employed (2005)*	*Percentage*
NOC			
Managers			
0912 – Utilities Managers	3,598	15	0.4%
Engineers			
2133 – Electrical/ Electronic Engineers	5,005	3,165	63.2%
2132 – Mechanical Engineers	2,125	3,030	142.6%
Trades			
7243 – Power System Electricians	6,229	34	0.5%
7244 – Electrical Power Line and Cable Workers	8,259	62	0.8%
7352 – Power Systems and Power Station Operators	6,104	9	0.1%
7311 – Construction Millwrights and Industrial Mechanics	3,954	218	5.5%

Source: Citizenship and Immigration Canada, *Facts & Figures 2005*; 2008 ESC Employer Survey, n=87

In the electricity sector occupations, most immigrants arriving in Canada are engineers (Mechanical Engineers, Electrical and Electronics Engineers and Metallurgical and Materials Engineers). In fact, Electrical and Electronics Engineers as well as Mechanical Engineers are listed among the top ten common occupations of skilled immigrants entering Canada[53]. Fewer immigrants can be categorized into technicians and technologists and very few immigrants arriving in Canada are trained in Electrical Trades and other related non-support occupations in the sector. As seen in Exhibit 3.6, in addition to the already low level of immigration in the categories technicians/technologists and trades, immigration numbers for all three occupation categories in the electricity sector are declining.

[53] Citizenship and Immigration Canada. "Immigrant Occupations: Recent Trends and Issues". Ottawa, ON, Canada. 2003

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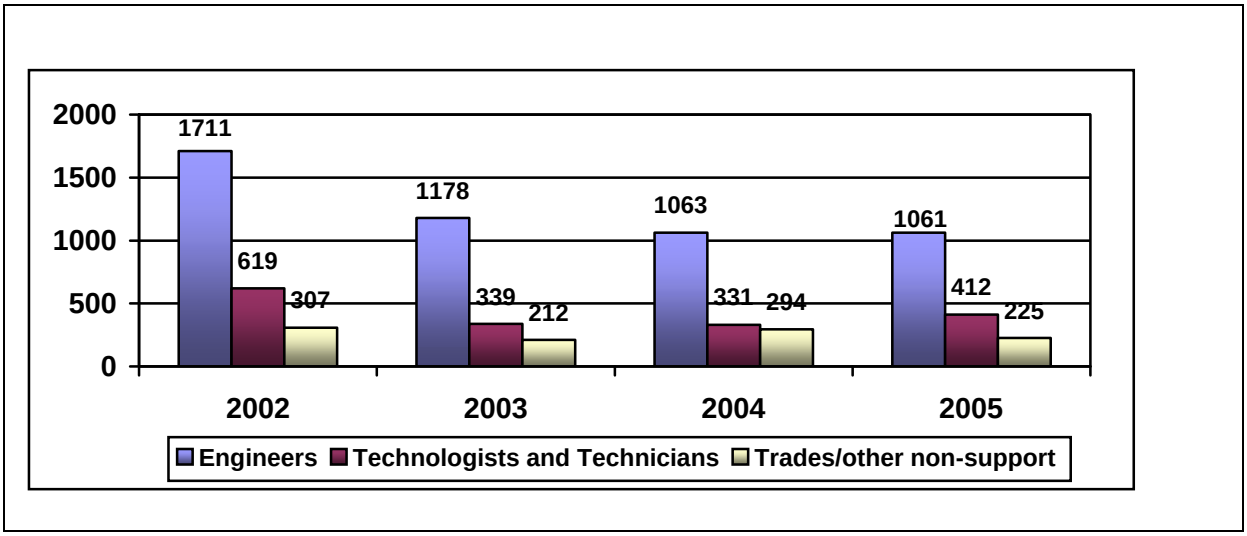
Exhibit 3.6: Number of Immigrants in Electricity Sector Occupations by Category (2000-2005)



Source: Citizenship and Immigration Canada.

It should be noted that the figures provided by Citizenship and Immigration Canada are based on information disclosed by the immigrants themselves. As reported in a study conducted by R.A. Malatest & Associates for the Electricity Sector Council on foreign credential recognition. It is not known whether immigrants stating a specific training and/or occupation are actually qualified and trained to work in the stated occupation. Differences in training and educational standards in their country of origin as well as translational aspects of supplying information about one's occupation title may lead to a new classification of the stated occupation some time after arrival in Canada. Statistics reported by the engineering regulatory body in Ontario, Professional Engineers Ontario (PEO) suggest a possible mismatch between self-reported occupation titles and skill requirements for the reported occupation. In 2006, the Academic Requirements Committee reported that of 2,258 applications for assessment of academic credentials received outside of Canada, only 517 applicants or 23% were deemed to have met PEO's academic requirements for licensure. The other applicants were assigned additional exams to provide proof of the academic qualification for the engineering profession[54].

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 make up the 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

[54] 2007. Association of Professional Engineers of Ontario. 2006 Committee and Task Force Reports.

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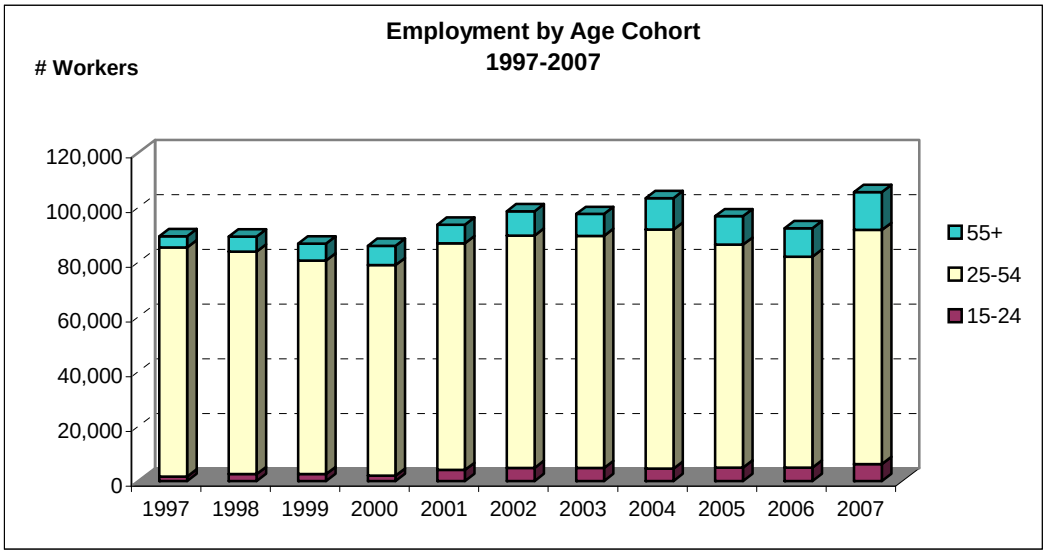
cohort and the 55+ cohort increased their share of employment. Specifically, while the number of workers aged 15 to 24 has grown from 1,600 to 6,200, the number of workers 55 or older has grown from 4,100 to 13,800.

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.

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.

The following Exhibit presents the widening gap between the number of employees in the electricity workforce aged 15 to 24 and those 55 or older.

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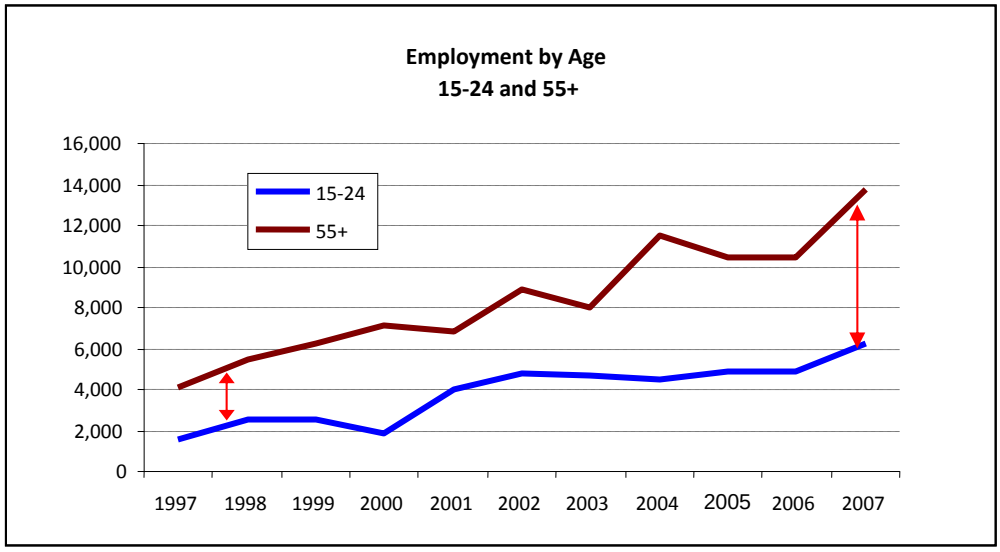
Exhibit 3.8: Employment in the Electricity Sector by Age Group (1997-2007)



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

This increasing gap is particularly concerning for employers as it highlights the challenge of replacing an aging workforce. The trend presented in the preceeding Exhibit 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%.

Data from the employer survey shows that workers in the Electricity Sector fall overwhelmingly in the 45 to 54 years age range. The graph below illustrates the distribution of workers by age group, as reported by employers in the electricity sector in 2008. Employees in the 35 to 44 age group account for 26% of the electricity workforce.

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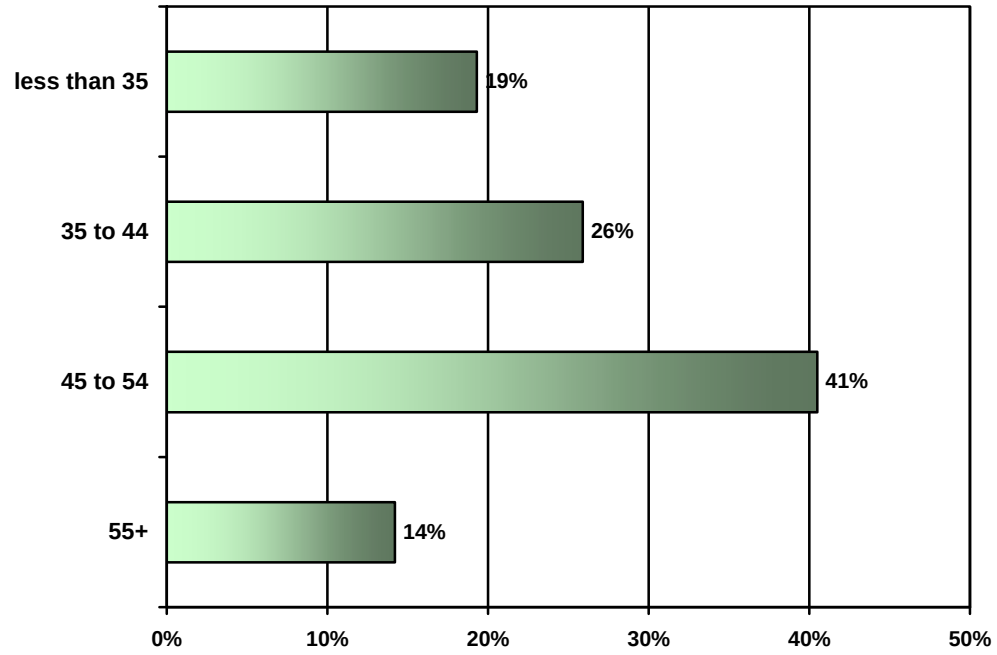
Exhibit 3.9: Age Profile of All Employees Reported by Employers



Source: 2008 Employer Survey, n=84

According to the 2006 Census data, 20% of employees were less than 35 year old, 28% were between the ages of 35 and 44, 37% were between 45 and 54, and the remaining 15% were 55 and older.

3.2.1 Age Composition of Employees by Business Line

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

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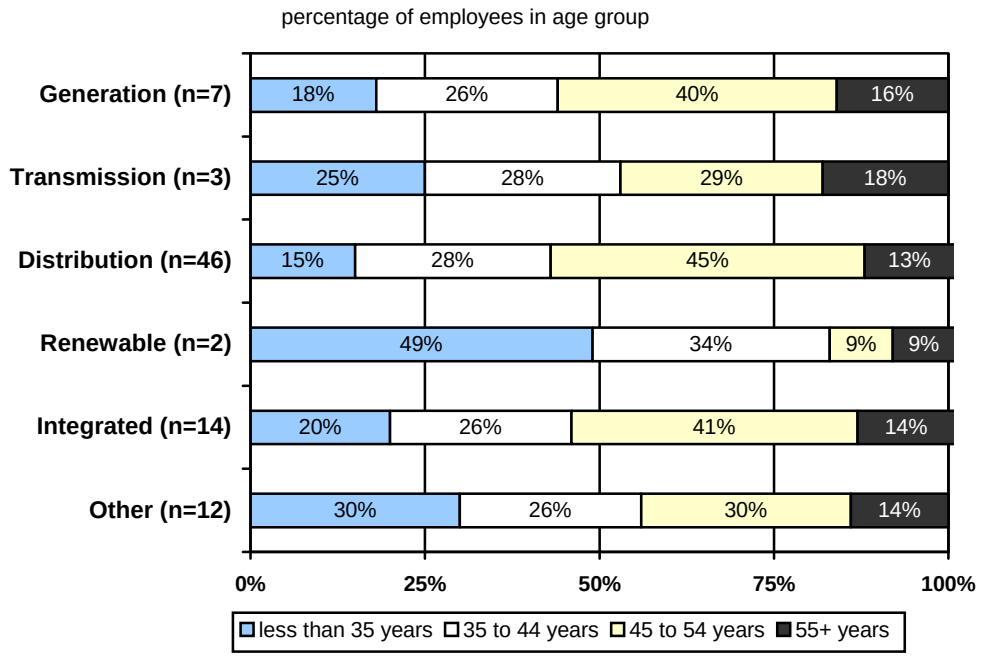
Exhibit 3.10: Age of Employees in Electricity Sector – by Business Line



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

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.

As the above graph further illustrates, 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, only 16 specified their business line. The 'other' category within the electricity sector included organizations engaged in manufacturing, construction, and maintenance; business development and consulting.

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3.2.3 Age Composition by Selected Occupation in the Electricity Sector

The age composition of employees also varies significantly by occupation. The table below outlines the percentage of managers and supervisors falling into various age categories. As can be seen from the Exhibit below, 16% of utilities managers and 19% of supervisors of electricians and powerline workers are 55 years of age or older.

Exhibit 3.11: Age of Employees in Electricity Sector – Managers/Supervisors

Occupational Group	Less than 35	35 to 44	45 to 54	55+
Utilities Managers	5%	23%	57%	16%
Supervisors of Electricians and Power Line Workers	3%	21%	57%	19%
Average of All Managers and Supervisors	4%	22%	57%	17%

Source: 2008 Employer Survey, n=67

The graph below presents the age of managers and supervisors compared to all other employees in the sector. Overall, 74% of managers and supervisors are 45 years of age or older. This is markedly higher than the 55% among all employees. Given that managers and supervisors tend to require significant experience and expertise in their field in order to take on management or supervisory roles, it is not surprising that they tend to be older. However, it is important nonetheless to note the proportion of managers and supervisors who are in the older age group, as this will inevitably have an effect on the human resource planning undertaken by employers.

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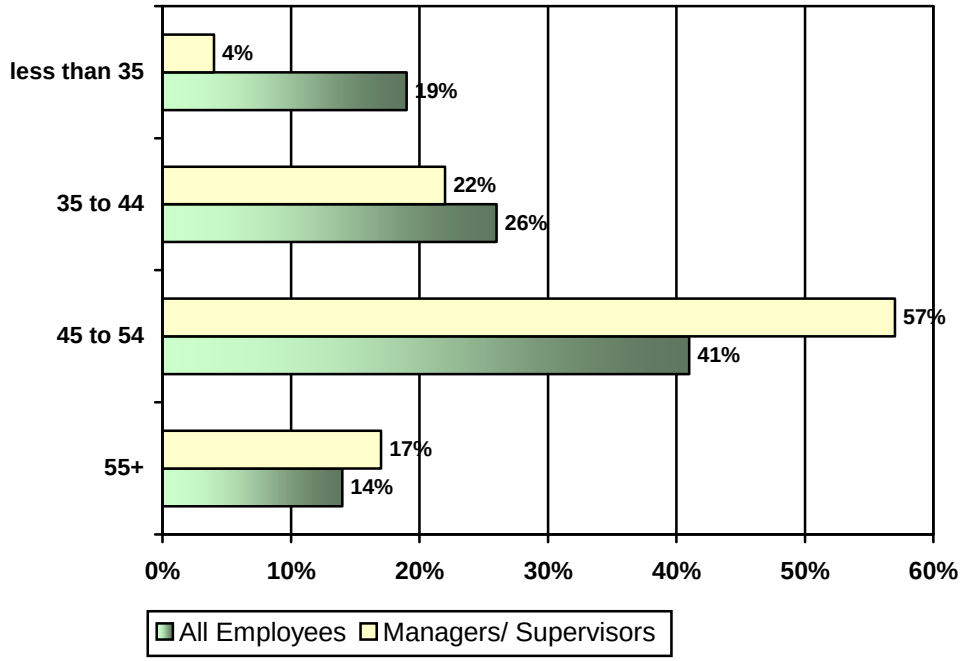
Exhibit 3.12: Age Profile of Employees Reported by Employers



Source: 2008 Employer Survey, n=84

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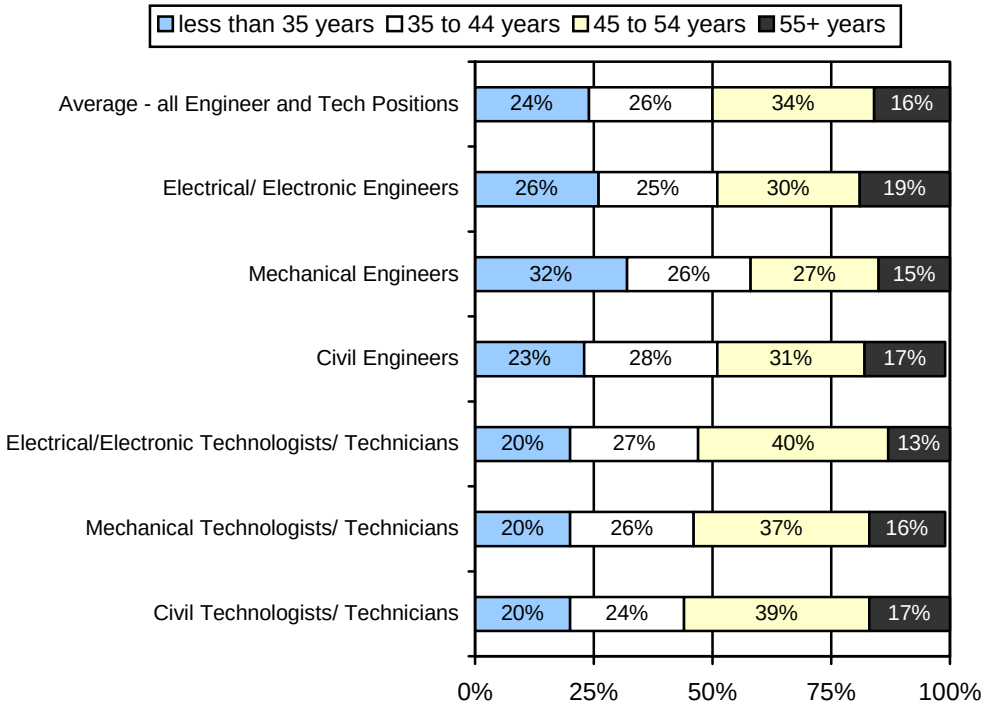
Overall, employees in engineer and engineer technician/technologist occupations in the Electricity Sector tend to be younger than the industry average. As illustrated in the Exhibit below, exactly 50% of the employees in these occupations are under 44 years old. Particularly noteworthy is the high proportion of mechanical engineers – 32% - who are under the age of 35.

Exhibit 3.13: Age Of Employees in Electricity Sector by Occupation (Engineers and Engineering Technologists/ Technicians)



Source: 2008 Employer Survey, n=17 to 53, depending on the occupation

Exhibit 3.14 below shows the age distribution of employees in trades occupations as reported in 2008. In 2008, 13% of employees in all trades positions were aged 55 or older, and 21% were under the age of 35. In comparison, the 2004 CEA Labour Market Study found that 11% of trades people were 55 years of age or older and 16% of trades people were under the age of 35[55]. This indicates that there is a growing number of younger employees in the trades, signaling that the electricity sector is adding younger employees to its workforce. At the same time, the number of older employees has also grown with the aging of the electricity workforce.

[55] Further analysis was conducted of the 2004 CEA employee survey in order to allow for consistent age categories to those captured in the 2007 Electricity Sector Council survey. Furthermore, in conducting this analysis, only those respondents who provided data for both employees in trades occupations and age groups were included (n=42).

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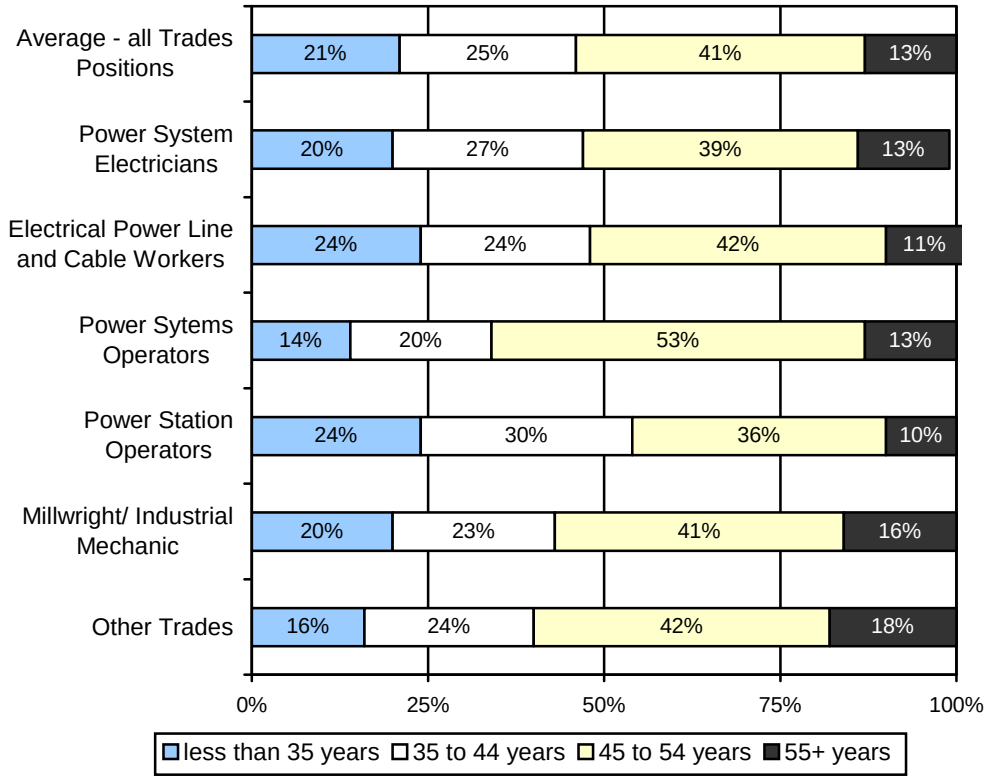
Exhibit 3.14: Age Of Employees in Electricity Sector by Occupation (Trades)



Source: 2008 Employer Survey, n=17 to 57, depending on occupation

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 2008 ESC Employer survey shows that in total, 27% of non-support staff are hired on contract, and an additional 8% are seasonal workers.

The number of staff that are hired on contract and seasonally varies depending on the line of business. As Exhibit 3.15 below illustrates, establishments 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 employed by companies that are integrated. In total, 42% of all non-support staff are who are employed by these companies are hired on contract.

The data also shows that companies involved in the generation of electricity are most likely to hire staff on a seasonal basis (11%). Establishments in the renewable and integrated lines of business also show a higher percentage of seasonal staff than the overall average, at 9% and 8% respectively.

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Exhibit 3.15: Employee Status by Line of Business					
Line of Business	**Total Non-support Staff**	**Non-support contract Staff**		**Seasonal Staff**	
	Number of Employees	**Number of Staff**	**As % of Non-support Employees**	**Number of Staff**	**As % of Non-support Employees**
Generation	11,390	351	3%	1,218	11%
Transmission	411	2	<1%	25	6%
Distribution	3,423	135	4%	72	2%
Retail	1	0	0%	0	0%
Renewable	43	20	47%	4	9%
Integrated	28,682	12,061	42%	2,436	8%
Other	4,814	448	9%	35	1%
Total*	**48,764**	**13,017**	**27%**	**3,790**	**8%**

Source: 2008 ESC Employer Survey, n=87

The difference in proportion of non-support contract and season staff between integrated companies and single line business companies is particularly noteworthy. While it is difficult to understand unequivocally the reason for the variation, we can speculate that companies that are involved in more than one line of business need to be more dynamic and responsive to changing market conditions. They are not likely to be specialized in one area and are consequently forced to contract out different aspects of their business.

3.4 Human Resource Implications

Encourage more diversity within the electricity sector.

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. 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 within the companies may need to develop more creative ways of marketing the jobs to non-dominant 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 professional 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

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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.

Look to younger workers as a key source of labour and target recruitment and retention strategies accordingly.

The data from the 2008 ESC Employer 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 HR policies that will be more attractive to younger workers. This would help employers retain their current younger workers.

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Section 4: Supply and Training

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. The employer survey gathered data on the sources of new recruits for positions that were filled in 2006. Data from the employer survey was further informed by Statistics Canada information on immigration.

4.1 Electricity Related Programs and Courses in Canada

The survey of training/educational institutions offering electricity-related courses/programs was distributed by the Electricity Sector Council. It collected information about program growth and enrolment trends, and recruitment practices. As well, post-secondary institutions were asked to comment on issues and challenges faced by educators in providing electricity sector-related programs/courses, and to provide suggestions on how to address gaps in training and increase the supply of trained graduates to the electricity sector.

In total, 129 post-secondary institutions were sent the survey using Survey Monkey. Institutions were asked to fill in the survey online. Of the 129 institutions that were sent the survey, 35 institutions completed the survey. Additionally, the consultant conducted 12 key informant interviews with representatives from different institutions. In total, data from 45 institutions was captured[56]. Exhibit 4.1 below illustrates the breakdown of programs offered by region among institutions that participated in the study.

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.

[56] 2 out of the 12 interviews were conducted with institutions that had already completed the survey

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The most common type of program captured in the survey is Engineering Technology and Technician (22) followed by Electrical Engineering (13)[57].

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

4.2.1 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 below 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. It should be noted that engineering programs are typically 4 years in length; therefore, a graduate in 2005 typically enrolled in 2001.

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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	3,702	3,849	4%
Mechanical Engineering	2,979	3,849	29%
Civil Engineering	1,518	1,710	13%
Chemical Engineering	1,083	1,092	1%
Materials Engineering	120	144	20%
Systems Engineering	153	141	-8%
Nuclear Engineering	3	3	0%
Total	**9,558**	**10,212**	**7%**

Source: Statistics Canada PSIS Data

As illustrated in the above table, enrolment in Electrical Engineering programs has seen a ten percent 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.

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.

Engineers Canada conducts a regular survey of engineering students and graduates to determine 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. However, the data from the survey reports enrolment in electrical engineering programs to have declined by only 5%, compared with the

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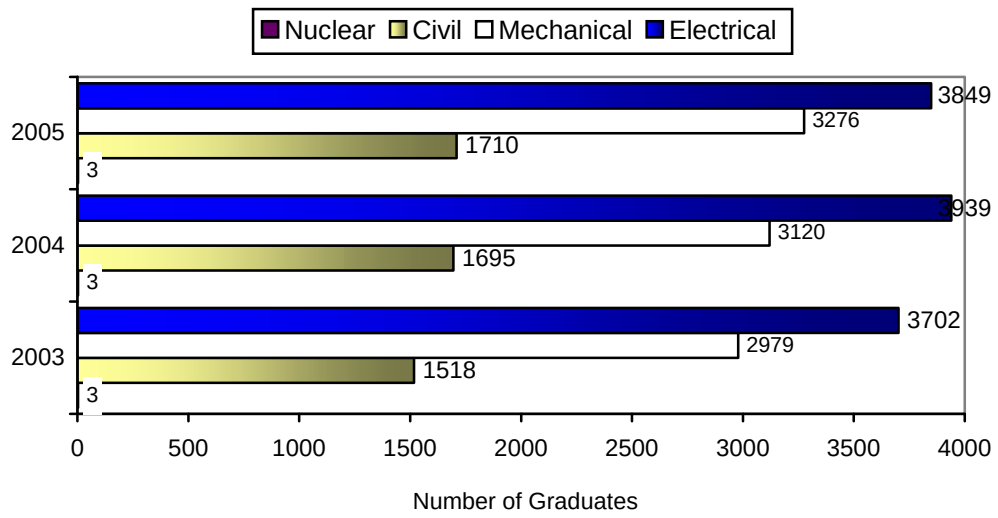
10% decline seen from the PSIS data. The discrepancies between the two data sources could be attributed to the different methods of data collection, in addition to the possible differences in classification guidelines set out by both Statistics Canada's PSIS reporting system and the Engineers Canada survey. The Engineers Canada report only includes programs that are accredited by the Canadian Engineering Accreditation Board, whereas Statistics Canada's data includes all engineering programs.

The following Exhibit presents the number of graduates from engineering programs in Canada using Statistics Canada data.

Exhibit 4.3: Graduation Trends from Engineering Programs in Canada



Source: Statistics Canada, Postsecondary Student Information System

Enrolment and graduation trends also vary by region. The following table shows the total number of enrolments and graduates in Electrical Engineering by region. Interestingly, the BC region has experienced the only increase in enrolment throughout the country. In terms of graduates, all regions experienced increases between 2003 and 2005 with the exception of Manitoba/ Saskatchewan and Alberta.

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Exhibit 4.4 : Student Enrolment and Graduates or Completers in Electrical Engineering Programs by Region

Year	2003	2005	% change
Number of Students Enrolled			
Atlantic	894	666	-26%
Québec	5,631	4,980	-12%
Ontario	6,900	6,678	-3%
Manitoba/ Saskatchewan	1,017	645	-37%
Alberta	2,037	1,581	-22%
BC	903	1,143	27%
Total	**17,382**	**15,693**	**-10%**
Number of Graduates/ Completers			
Atlantic	192	237	23%
Québec	1,032	1,236	20%
Ontario	1,611	1,659	3%
Manitoba/ Saskatchewan	120	108	-10%
Alberta	495	372	-25%
BC	189	219	16%
Total	**3,702**	**3,849**	**4%**

Source: Statistics Canada, Postsecondary Student Information System

With the exception of British Columbia, 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 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.

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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.

4.2.2 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. The consultant 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.

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Exhibit 4.6 : Number of Registered and Completed Training in Electricity Related Apprenticeships			
	2003	**2005**	**% change**
Number of Registrants			
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

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 in 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 some 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[58]. 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.

[58] Canadian Millennium Foundation "The Price of Knowledge: Access and Student Finance in Canada" Third Edition, pg. 36 http://www.millenniumscholarships.ca/images/Publications/POK07_e.pdf

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There was also significant variation in overall registrants by region. Atlantic provinces saw the biggest decline of 24.3%. The most significant increases were seen in BC, with a 32.2% increase; followed by Alberta and Ontario, which recorded increases of 14.3% and 10.5% respectively. It should be noted that the numbers below may under-estimate the number of apprenticeship completers overall in Canada, since only specific occupations were included. For instance, the numbers for electrician include power electrician, power system electrician, power maintenance electrician, and workers in electrical metering in the electrician category; as a result, the total number of apprenticeship completers available to the electricity industry is expected to be higher than what is presented below.

Exhibit 4.7: Registered and Completed Training in Electricity Related Apprenticeships by Region

Year	2003	2005	% Change
Number of Registrants			
Atlantic	1,975	1,495	-24%
Québec	200	190	-5%
Ontario	5,265	5,815	10%
Prairies	775	810	5%
Alberta	2,240	2,560	14%
BC/ Territories	915	1,210	32%
Total	**11,370**	**12,080**	**6%**
Number of Completions			
Atlantic	160	180	13%
Québec	5	15	200%
Ontario	425	320	-25%
Prairies	135	105	-22%
Alberta	230	275	20%
BC/ Territories	130	155	19%
Total	**1,085**	**1,050**	

Source: Statistics Canada Registered Apprenticeship Information System

In terms of distribution by region, Power Line Technician apprenticeships are common across the country. However, Stationary Engineer apprenticeships are concentrated exclusively in the Atlantic Provinces (Nova Scotia and New Brunswick, specifically), and Electricians are more common in the Western provinces. This is not particularly surprising given the growth reported by the Western educational institutions in the Trades programs and courses. This last trend is reflective of the Western economy, where demand for electricians can be attributed to an increase in construction. It should also be noted that this data is based on percent change between 2003 and 2005. Anecdotal information suggests that enrolment in programs in Atlantic provinces has not decreased in more recent years. This data is reflected

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in the findings of the survey of Educational Institutions, where increased program growth was reported most frequently by Atlantic institutions (see section 4.3)

4.2.3 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, the consultant referenced published estimates of the percent of graduates who ultimately are employed in the electricity sector.

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. Thus, the average percent of graduates that enter the electricity sector is very difficult to estimate. However, a review of existing literature on graduate outcomes does provide a more in-depth understanding of the percentage of graduates from each program that ultimately work in the electricity sector. For example,

- the 2006 Canadian Engineers for Tomorrow: Trends in Engineering Enrolment and Degrees Awarded 2001-2005 study found a general decline in undergraduate enrolment in Electrical engineering programs. Interestingly though, in each year there were more degrees awarded in electrical engineering than any other engineering discipline, with the exception of mechanical engineering. In 2005, electrical engineering degrees accounted for 22.8% (2,371) of all engineering degrees awarded[59].
- a national survey of the Canadian engineering profession in 2002 (updated information will be made available in summer/ fall 2008) suggests that 16% of professional engineers in Canada are electrical/electronics engineers, and only 9% of engineers work in the utilities sector[60].
- in a 2003 survey of Alberta university and college graduates, less than 2% of recent electrical engineering or mechanical engineering graduates were hired to work in the electrical utility sector. A higher proportion of electrical technologists (8%) graduates (electrical engineering technology, electronics service technician, electronics engineering) were working in the electrical utilities sector[61].

Anecdotally, respondents from the educational institutions indicated that they were well aware of the looming labour shortages facing the electricity sector as a result of increasing retirements and insufficient numbers of trained graduates coming out of post-secondary institutions. There was some indication that institutions felt that there needs to be a concerted effort put forth to attract high school students into electricity related programs, and for the industry to attract the graduates of these same programs into the sector.

[59] Canadian Council of Professional Engineers, Canadian Engineers for Tomorrow: Trends in Engineering Enrolment and Degrees Awarded 2001 to 2005. http://www.engineerscanada.ca/e/files/report_enrolment_eng.pdf
[60] Canadian Council of Professional Engineers, 2002 National Survey of Professional Engineers, p.4-5. http://www.engineerscanada.ca/e/files/surveysummary2002.pdf
[61] 2004 Alberta Outcome Survey of 2002 Graduates.

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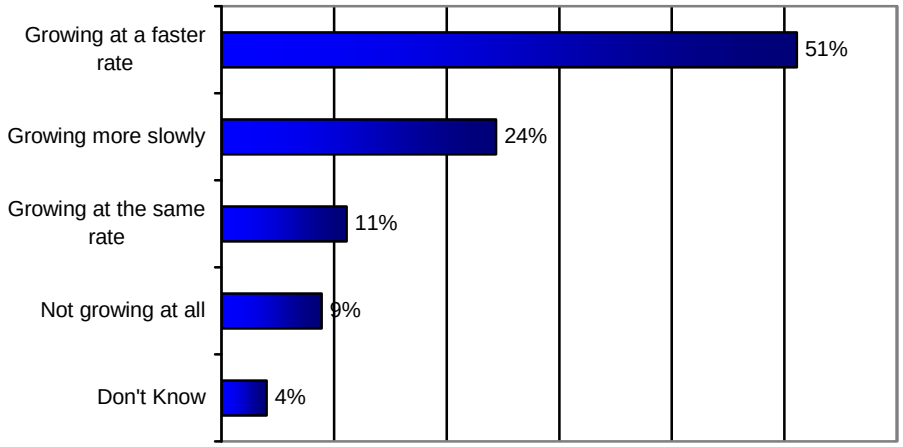
4.3 Educational Institutions Survey Data

4.3.1 Enrolment and Program Growth Trends

One of the key elements of the Educational Institution survey was to determine perceptions on enrolment trends for programs that are closely related to the electricity sector. Overall, 51.1% of institutions reported that their programs were growing at a faster rate than other programs offered by their institution. The following graph illustrates overall responses.

Exhibit 4.8: Enrolment Trends Reported by Educational Institutions



Source: Educational Institutions Survey, Q3, n=45

Although overall, programs were considered to be growing at a faster rate, when we look at the data by region, the Western and Atlantic institutions account for the highest growth. In total, 83% of Atlantic institutions and 61% of Western institutions reported faster growth rates. Conversely, only 39% of Ontario institutions reported faster growth rates, and 100% of Québec institutions reported slower growth rates, compared to other programs offered by the institution.

More significantly, however, is that the growth of programs related to the electricity sector depends on the type of program offered. Anecdotal data gathered from the interviews, in conjunction with data from the survey suggests that the programs experiencing the most significant growth are trades and apprenticeship programs and new programs such as renewable energy programs.

The findings from the survey are consistent with the data from the PSIS and RAIS. These data indicate a decline in enrolment in Electrical Engineering programs, and an increase in enrolment in new engineering programs and apprenticeship registrants.

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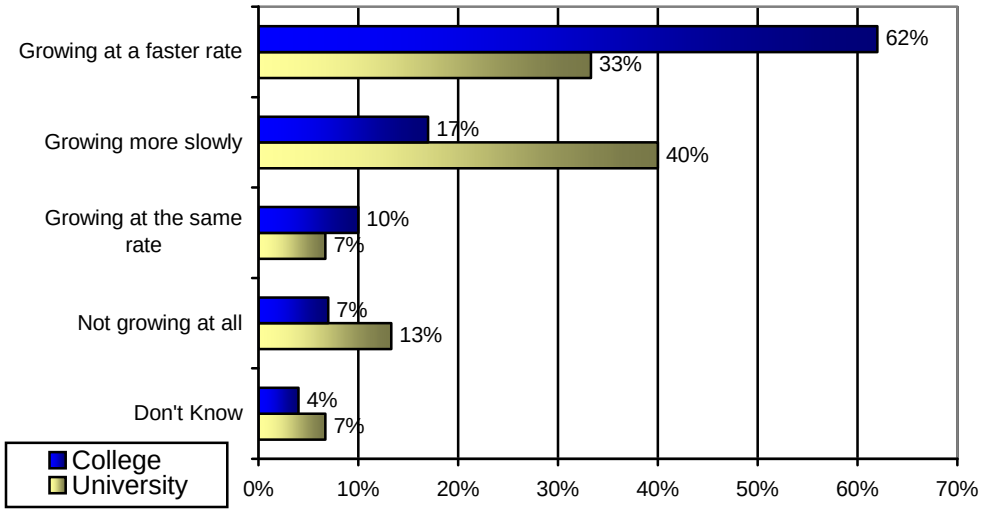
Data from the educational institutions further suggest that college programs are growing at a faster rate than university programs. Exhibit 4.9 below shows the reported growth trends by universities and colleges.

Exhibit 4.9: Growth Trends by Institution Type



Source: Educational Institutions Survey: n=39; 'college' includes technical institutes and university-colleges

These findings are consistent with the overall findings that electrical engineering programs (typically offered at universities) are growing more slowly, and that trades and apprenticeships programs (typically offered at colleges) are growing faster. Information obtained by the Consultant during key informant interviews provides some context to these percentages. Informants mentioned that program expansion is often supported by provincial governments and is often dictated by the provincial government. Therefore, as provincial priorities shift, so too does financial support for specific educational programs. Some institutions reported overall declines in enrolment due to changing demographics (fewer high school graduates) and a booming economy (students are opting to work when finished high school as opposed to enrolling in post-secondary education).

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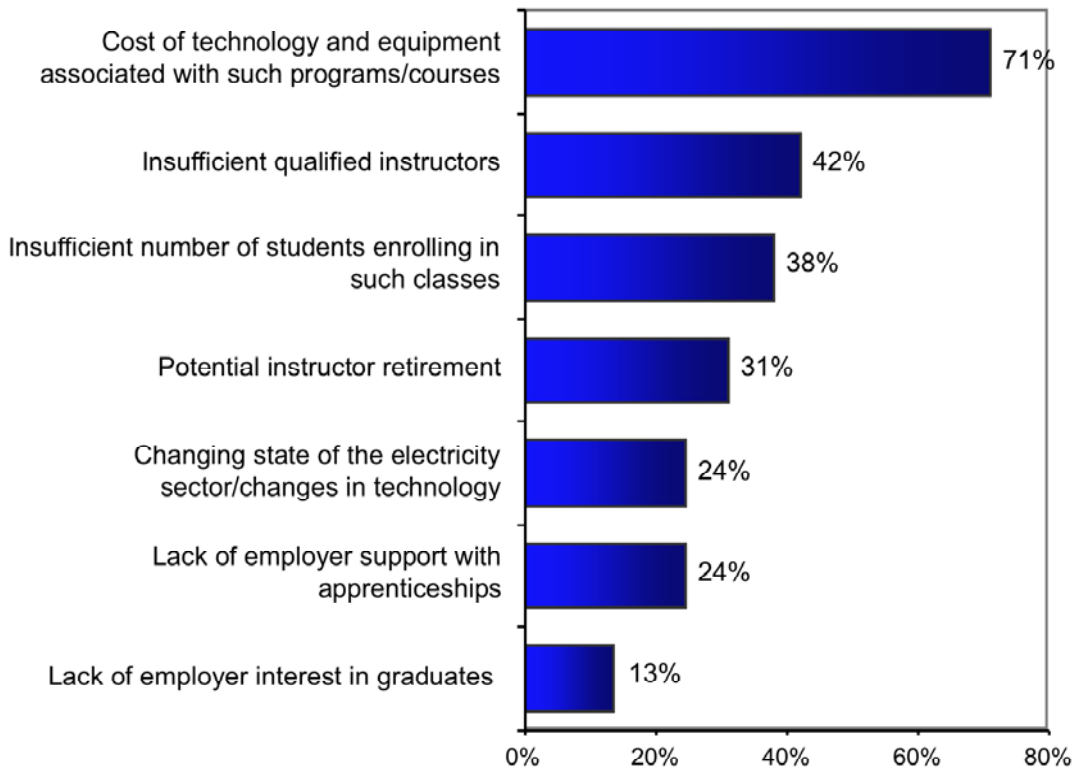
4.4 Issues Providing Programs Related to the Electricity Sector in Canada

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%).

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.

Clearly, overall employer support of and interest in graduates were not considered to be key issues (24% and 13% respectively). This is in stark contrast to the 2004 findings that showed employer support and interest as a significant challenge.

Regionally, Atlantic institutions reported cost as the biggest challenge (83%), and potential instructor retirement as the next biggest challenge (50%). In Québec, 100% of respondents cited insufficient students as the biggest challenge, with insufficient qualified instructors as

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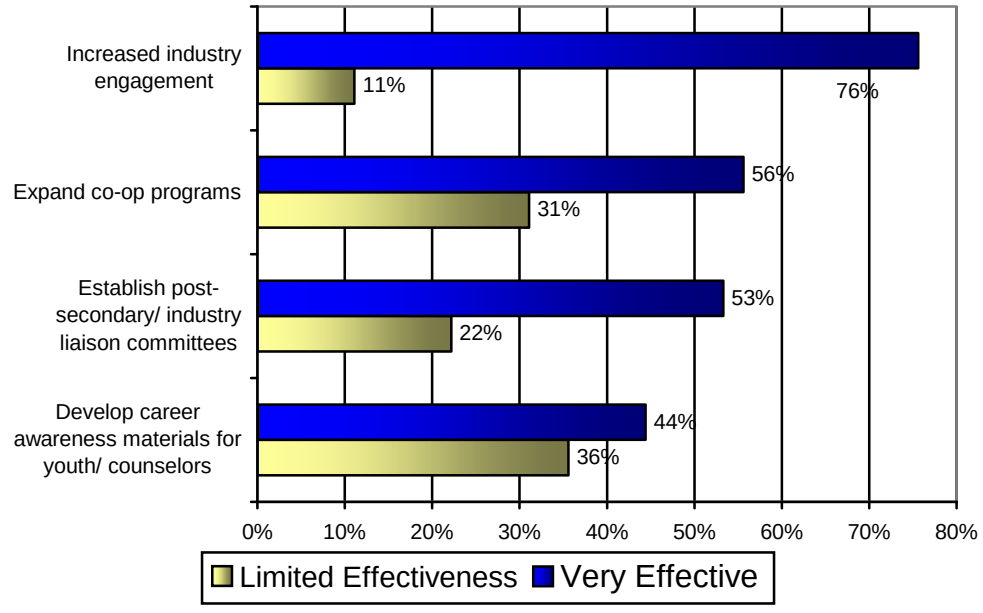
the second biggest challenge (67%). Both Ontario and Western institutions cited cost as the biggest challenge, at 78% and 67% respectively, and insufficient qualified instructors at 39% and 44% respectively.

The key informant interviews provided some insight into the challenge of high cost and lack of funds available. Some respondents felt that there is not enough support at the government or industry level in terms of supporting research and providing funds for scholarships for students and academic chairs. For example, one individual suggested that big energy companies could sponsor an academic Chair in Power Engineering to build up the program. Funding for lab equipment and the availability of financial resources to purchase the needed equipment to deliver relevant programming are significant barriers. Additionally, funding for students is significantly less than it used to be. One respondent noted that students used to have funds from the province and funds from power companies, but the power companies withdrew their funds, and now there is only NSERC.

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.

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



Source: Education Institutions Survey, n=45
*Note: Percentages do not add up to 100%. The remainder of participants selected "somewhat effective".

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Although each of the solutions provided were ranked as being relatively more effective than less effective, increasing industry engagement is by far 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'. The expansion of co-op programs and the establishment of post-secondary/ industry liaison committees ranked fairly close in terms of effectiveness. Although slightly more respondents felt that expanding co-op programs would be 'very effective' (56% compared to 53%), significantly fewer respondents felt that establishing liaison committees would have 'limited effectiveness'. This is most likely the case because some respondents may have interpreted liaison committees an example of industry engagement.

Specific suggestions on how to increase industry engagement included having professionals from the industry do presentations to high school students, encouraging university and college instructors to spend time in the industry thereby providing them current and practical experiences in the industry that they can pass on to their students, and allowing professionals to teach courses in post-secondary institutions thereby increasing student awareness of prospective employers. One respondent from a key informant interview spelled it out quite aptly when he said, "Careers in the electricity sector are not seen as being 'sexy', but rather as a bunch of geeks sitting around".

4.6 Addressing the Gaps in Training and Increasing the Supply of 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 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. One respondent noted that, "with the changing business model, you don't just have publicly operated, vertically-integrated utilities. There are more players in the business environment, and there is more of a need to teach the business side of the industry – how to be profitable".

The mention of employers expecting graduates to be "billable" right after graduation is important to highlight. While this is not necessarily the case, it does highlight the fact that there is a lag between a new graduate's first day on the job and that individual being a fully productive employee. Data from the 2004 Canadian Electricity Association (CEA) study shows that there can be a lag of up to 5 years before an individual is considered to be

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proficient in their position. According to the 2004 CEA study, it takes an individual 4 years on average to become proficient in their position. Among Managers and Trades positions it takes on average 5 or more years to become proficient, and among Engineers it takes 4 years. For individuals in support positions, it only takes about 2 years to become 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 following Exhibit shows the percentages of respondents whose recommendations fell within the five broad categories. The Exhibit also shows the degree to which educational institutions feel that collaboration between industry, employers, and the institutions themselves is necessary to meet the future needs of the sector and employers.

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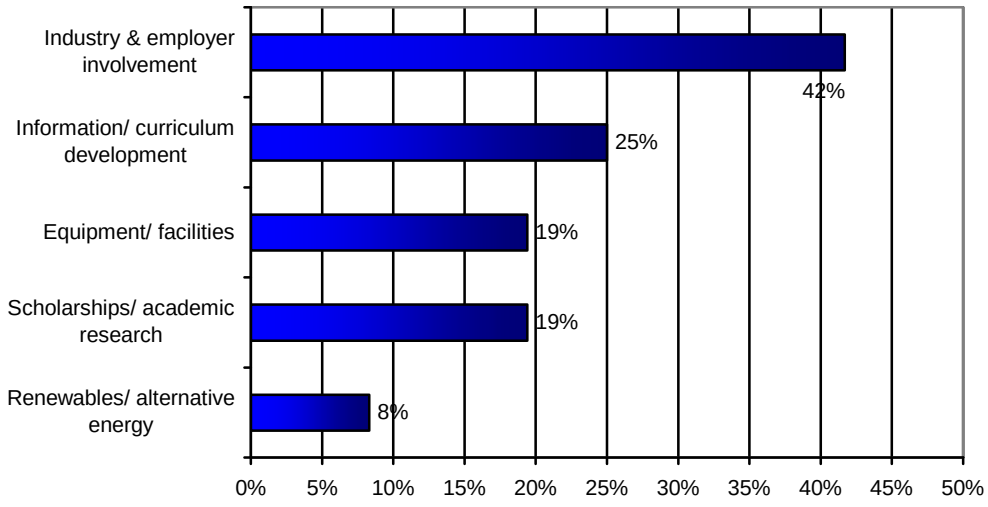
Exhibit 4.12: Addressing the Gaps in Training and Education



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

Specific suggestions from educational institutions included a call for employers and/or industry to provide scholarships to new immigrants to Canada who have electrical engineering training. There were also some suggestions that employers should provide more support to educational institutions to help identify training needs, and provide internship, and co-op positions. Finally, there were comments that in universities, not many electrical engineering graduates go into the electricity sector; therefore, more recruitment may be needed on the part of the electricity sector.

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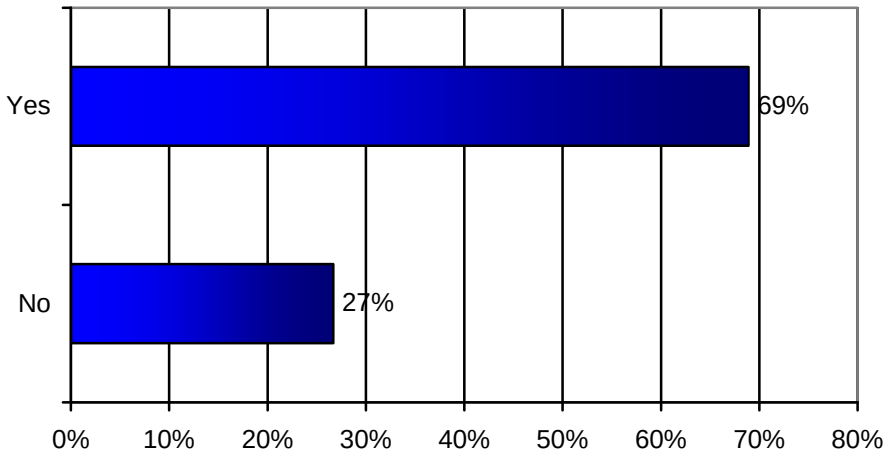
4.7 Recruitment Strategies Targeting Under-Represented Groups

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.

Exhibit 4.13: Recruitment Strategies Targeting Under-represented Groups



Source: Educational Institutions Survey, n=45

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

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• 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 (those who arrived between 2001 and 2006) in the 25 to 64 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[62].

Data from Citizenship and Immigration Canada provides some insight into the immigrant status of workers in selected occupations that are closely related to the electricity sector. The Exhibit below illustrates the number of Permanent Residents[63] in selected occupations across Canada. Equally relevant to the composition of the electricity sector labour force is the number of Foreign Workers that are currently employed in occupations relating to the sector. Exhibit 4.15 below outlines the number of Foreign Workers that were employed in 2005 in occupations that are closely associated with the electricity sector. Overall, there were increases in the number of permanent residents in managerial occupations related to electricity (utilities manager, supervisors of electrical trades), declines in the number of permanent residents in engineering fields, and little change in the numbers of trades people admitted to Canada as permanent residents or foreign workers in occupations related to the electricity sector.

[62] http://www12.statcan.ca/english/census06/analysis/education/immigration.cfm
[63] Permanent residents are immigrants to Canada who can receive certain rights and privileges, excluding the right to vote, but remain citizens of their home country.

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Exhibit 4.14: Permanent Residents and Foreign Workers in Selected Occupations Pertaining to the Electricity Sector

	Permanent Residents			Foreign Workers		
NOC	2003	2005	% Change	2003	2005	% Change
Managers						
0912 – Utilities Managers	**5**	**10**	**100.0%**	**9**	**5**	**-44.4%**
7212 – Contractors/ Supervisors, Electrical Trades and Telecommunications	**17**	**38**	**123.5%**	**28**	**30**	**7.1%**
Engineers						
2133 – Electrical/ Electronic Engineers	**3,551**	**2,713**	**-23.6%**	**442**	**452**	**2.3%**
2132 – Mechanical Engineers	**3,373**	**2,477**	**-26.6%**	**697**	**553**	**-20.7%**
Trades						
7243 – Power System Electricians	**25**	**27**	**8.0%**	**--**	**7**	**--**
7244 – Electrical Power Line and Cable Workers	**56**	**55**	**-1.8%**	**--**	**7**	**--**
7352 – Power Systems and Power Station Operators	**--**	**9**	**--**	**0**	**--**	**--**
7311 – Construction Millwrights and Industrial Mechanics*	**49**	**47**	**-4.1%**	**184**	**171**	**-7.1%**

Source: Citizenship and Immigration Canada, Facts & Figures 2005
* these numbers are significantly lower than the numbers reported for the period between 1996 and 2001

Immigrants possessing a bachelor's, Master's and Doctoral degrees have been increasing in numbers since 1998. The number of immigrants with trades certificates, however, has been gradually declining over the same period of time. In 1998, the total number of immigrants with trade certificates upon landing stood at 12,201 (or 9.1% of total immigration). By 2002, this figure stood at 7,706 (only 4.3% of total immigration). While the figure slightly increased to 9,953 (or 5% of total immigration) in 2006, the overall numbers still indicate a trend that has significant implications for sectors such as the electricity sector, already experiencing shortages in trades-related occupations.

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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 PSIS and the findings from the educational institutions indicate that enrolment in electrical 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, and 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. It should be noted that increases were noted by representatives of educational institutions. Some newer engineering programs might not yet be accredited, which would account for the lack of Statistics Canada data regarding enrolment trends in renewable or sustainable engineering programs.

Employers will need to consider how best to harness the skills, talent, and interest of the students who are graduating from engineering programs, and look at creative ways of developing trainees and new hires accordingly.

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.

Utilities 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. Some utilities companies have already considered doing this if company-stated

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requirements are currently not central to the job. At the same time, safety considerations are paramount in the electricity sector, so impacts on safety of changing requirements should be considered and addressed.

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.

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. As was recognized in a recent study done for the Electricity Sector Council on foreign credential recognition (FCR)[64], FCR is a significant challenge to integrating internationally trained workers into the electricity sector workforce. Some educational institutions reported having foreign credential recognition programs in place, but employers and industry will need to be actively engaged in these programs if they are to reap the benefits.

[64] R.A. Malatest & Associates Ltd., *Review of Foreign Credential Recognition in Canada's Electricity Sector,* 2008.

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Section 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 between 2004 and 2014 (an average of less than 3% per year). As Exhibit 5.1 below illustrates, respondents estimated that annual retirement would represent 4.7% of employees in 2009, and 6.2% in 2012.

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%	1098	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=83
Note: only includes companies that responded with forecast retirements as well as 2006 retirements
*Data suppressed due to low number of responses.

Exhibit 5.1 above 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[65]. 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.

[65] If between 2% and 10% of staff retire in every year, this means that over the next 5 years, a total of between 10% and 50% of staff in the electricity sector will retire.

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Retirements in the electricity sector are expected to increase significantly over the next 5 years. Already, employers in the 2008 ESC Employer Survey reported an existing 3.3% vacancy rate for non-support occupations. Exhibit 5.2 below details the number of reported retirements in 2006 and projected retirements in 2009 and 2012 by non-support occupation groups.

Exhibit 5.2: Retirements in 2006, 2009 and 2012, for non-support occupation groups

Occupation	Number of Retirements in 2006	Estimated # to Retire in 2009		Estimated # to Retire in 2012	
		Number	% increase	Number	% increase
Managers and Supervisors	201	319	58.7%	471	134.3%
Engineers and Technicians/ Technologists	288	508	76.4%	639	121.9%
Trades	343	860	150.1%	1,272	270.8%
Other Critical Occupations*					**suppressed**
Total	**999**	**1,968**	**97%**	**2,642**	**164%**

Source: 2008 ESC Employer Survey, n=83
*Suppressed due to low number of responses.

As seen in the numbers reported by employers, non-support occupations will be significantly affected by retirements. Overall, retirements in non-support occupations are expected to double by 2009, and are expected to increase by an astonishing 164% in 2012.

Exhibit 5.3 below details the number of reported retirements in 2006 and projected retirements in 2009 and 2012 for all employees, by line of business.

Exhibit 5.3: Retirements in 2006, 2009, 2012 – By Business Line

Business Line	Number of Retirements in 2006	Estimated Annual Retirement in 2009		Estimated Annual Retirement in 2012	
		Number	% increase	Number	% increase
Generation	190	395	108%	612	222%
Transmission	7	60	757%	71	914%
Distribution	36	186	417%	252	600%
Integrated	751	1,301	73%	1,651	120%
Other	15	26	73%	56	273%
Total	**999**	**1,968**	**97%**	**2,642**	**164%**

Source: 2007 ESC Employer Survey, n=83
*excludes Renewables, which accounts for 2 employees in 2009 and 2 in 2012; and Retail, which accounts for 0 in both 2009 and 2012.

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The following Exhibit 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 5.4: 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%

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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**	
Information Systems Analysts and Consultants (n=48)	1,986	154	7.8%	194	9.8%	167	8.4%
Total*(n=82)	**42,350**	**999**	**2.4%**	**1,970**	**4.7%**	**2,644**	**6.2%**

Source: 2008 ESC Employer Survey

5.2. Pension Eligibility

Exhibit 5.5 below outlines the percentage of employees by occupation that was eligible to retire on full eligibility and partial eligibility in 2006. It should be noted that the numbers reported below are based on data provided by only 49 employers. Therefore, it cannot be considered representative of the sector as a whole. According to the data, over 8% of employees were eligible for their full pension in 2006, and an additional 33% were eligible for partial pension. Given that approximately 2% of employees retired in 2006, this suggests that there are an additional 6% of employees who are currently eligible to retire with a full pension.

Exhibit 5.5: Eligibility for Pension – by Occupation						
Occupation Group	**Number of Companies Responding**	**Employment Represented**	**Eligible for Full Pension in 2006**		**Eligible for Partial Pension in 2006**	
			#	%	#	%
Managers						
Utilities Mangers	36	2,186	219	10%	662	30.3%
Supervisors of Electricians and Line Workers	29	2,333	226	9.7%	989	42.4%
Engineers and Technicians/ Technologists						
Electrical Engineers	19	2,745	266	9.7%	614	22.4%%
Mechanical Engineers	8	820,	14	1.7%	8	1.0%
Civil Engineers	10	457	59	12.9%	171	37.4%
Electrical Technicians/Technologists	26	2,366	250	10.6%	1,130	47.8%
Mechanical Technicians/Technologists	5	1,522	110	7.2%	452	29.7%
Civil Technicians/Technologists	8	699	81	11.6%	405	57.9%

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Exhibit 5.5: Eligibility for Pension – by Occupation

Occupation Group	Number of Companies Responding	Employment Represented	Eligible for Full Pension in 2006		Eligible for Partial Pension in 2006	
Trades						
Power System Electricians	21	3,593	213	5.9%	1,341	37.3%
Electrical Power Line and Cable Workers	30	3,354	226	6.7%	1,563	46.6%
Power Systems Operators	13	652	49	7.5%	104	16.0%
Power Station Operators	6	2,807	180	6.4%	877	31.2%
Millwrights/ Industrial Mechanics	7	2,565	187	7.3%	969	37.7%
Other trades	13	1,979	37	1.9%	9	0.5%
Other Critical Key Occupations						
Financial Auditors	27	1,048	53	5.1%	322	30.7%
Information Systems Analysts and Consultants	19	1,639	467	28.5%	524	32.0%
Total*	**49**	**30,732**	**2,637**	**8.6%**	**10,140**	**33.0%**

Source: 2008 ESC Employer Survey (n=49) – all staff, including support staff
*Only respondents who provided data for both full and partial eligibility were included in the table. There were a total of 56 respondents who provided data for full eligibility, but only 49 who provided data for both fields.

Looking exclusively at the non-support occupations, the largest percent of employees who were eligible for their full pension in 2006 were Civil Engineers (12.9%) followed by Civil Engineer Technicians (11.6%), Electrical Technicians (10.6%), Utilities Managers (10.0%) and Electrical Engineers (9.7%).

The percentage of employees eligible for partial retirement presents a slightly different picture. While Civil Technicians still ranked among the highest percentages eligible for partial retirement in 2006, with 57.9% of employees being eligible for partial retirement, almost half of Electrical Technicians and Power Line and Cable Workers were also eligible for partial retirement in 2006, with 47.8% and 46.6% eligible respectively. The Exhibit shows a trend whereby there are a larger percentage of employees in trades occupations than the other occupations who are eligible for their partial pension. Informal discussions with employers in the electricity sector revealed that employees in the trades and technician occupations tend to "do their time and get out". Thus, although they are younger than the employees in other occupations, their expected retirement numbers are significantly higher. The data suggest that employers expect their employees in trades occupations to retire at a younger age, possibly due to the physically demanding nature of the jobs.

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According to the data from the 49 employers, while 8% of employees were eligible for their full pension in 2006, an additional 33% were eligible for their partial pension in that same year. Again, these data should be considered with caution since the number of respondents is quite low relative to the rest of the survey. Nonetheless, the data should raise the awareness of employers to the threat of early retirement among workers in the electricity industry.

5.3 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 is 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.

In addition to the high percentage of expected retirements, employers are already experiencing high vacancy rates. As presented in Section 7, the vacancy rate for non-support occupations is hovering around 3%. According to Statistics Canada, in 2000, the overall national vacancy rate was 2.6%[66]. However, all sectors of the Canadian economy are experiencing or expect to experience higher vacancy rates, both as a result of retirements and a fewer qualified recruits coming up through the ranks of educational institutions [67].

Human resource officers must plan for transitions to retirement for the exiting workforce. Human resources departments might also need to think creatively about ways of mitigating the effects of the transition from full-time work to full-time retirement among many of the current workers. Some areas of reconsideration might include encouraging people to stay on the job longer by offering flexible and part-time work schedules, or redeveloping pension options and legislation to provide more incentives for older workers to continue working beyond pension eligibility.

The physical aspects of many of the trade related occupations means that companies and human resource planners need to consider the health and wellness of their employees. Highly physical jobs generally lead to faster 'burn-out' than jobs that are less physically demanding. Thus, the threat of early retirements due to deteriorating health will compound the current predicted losses due to retirements. This could have significant impacts on the industry.

Given the sheer number of expected retirements, it is conceivable that the vast majority of training for new positions or new skills will be for new hires. Employers will therefore need to think about ways of providing the new training required, both for new hires and existing

[66] Statistics Canada, http://www.statcan.ca/english/freepub/71-584-MIE/71-584-MIE2001002.pdf, accessed June 08, 2008
[67] http://cmte.parl.gc.ca/Content/HOC/committee/392/huma/reports/rp3369345/humarp03/12-appa-e.htm

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employees. Employers may consider looking into hiring employees from other sectors that are not experiencing the same degree of growth as the electricity sector – such as the manufacturing sector. Some retraining of employees will be required, but given the current situation, training will be a necessity regardless of where the new hires are coming from.

The opportunity for employers lies in the fact that they can work in collaboration with educational institutions to ensure that graduates from electricity related programs have the basic training and skill set required when they enter into the workforce. Both industry and educational institutions need to keep pace with the changing technologies, and need to work in collaboration to mitigate the impact of retirements in the sector.

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Section 6: Demand

An important component of the research was to estimate the current and future demand for workers in the electricity sector. In order to accomplish this, a supply-demand model was developed for the purposes of this project. Demand for workers was seen to reflect the following considerations:

- demand to fill replacement positions created by retirement or voluntary separation;
- demand to fill new positions that would reflect the general expansion of the industry (demand growth) or work that would be required to replace/upgrade existing infrastructure.

Analysis of labour demand incorporates several data sources, including:

- Canadian Occupational Projection System (COPS) data;
- employer estimates of replacement/voluntary separation; and
- other factors (i.e., industry demand growth, capital investment, etc.).

6.1 Employment Projections

6.1.1 Canadian Occupational Projection System - COPS

The Canadian Occupational Projection System (COPS), maintained by Human Resources and Social Development Canada (HRSDC), provides insight as to expected employment market for employees in various occupations. As detailed in Exhibit 6.1, most of the representative occupations in the electricity sector have been rated fair to good by labour market analysts.[68] The only occupation receiving a limited rating is NOC 2241, Electrical and Electronics Engineering Technologists and Technicians. Although COPS data does not reflect demand in the electricity sector specifically, the occupations mentioned above are common to the electricity sector. Nonetheless, caution must be used in interpreting the data, as it refers to the occupation across all industries and sectors in general, and therefore does not describe the electricity sector specifically.

[68] "FAIR" – jobs and salaries are slightly lower on average than "GOOD" but better than those which are rated "LIMITED".

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Exhibit 6.1: Projected Employment Outlook of Representative Occupations in the Electricity Sector – based on HRDC estimates			
NOC	**JOB TITLE**	**Job Outlook to 2009**	**Average Unemployment Rate**
0912	Utilities Managers	FAIR	3%
2132	Mechanical Engineers	GOOD	4%
2133	Electrical & Electronics Engineers	FAIR	2%
2241	Electrical & Electronics Engineering Technologists and Technicians	LIMITED	4%
2243/7212	Industrial Instrument Technicians and Mechanics/Contractors & Supervisors Electrical Trades & Telecommunications	FAIR	2%
7311	Construction Millwrights and Industrial Mechanics (except Textile)	FAIR	4%
7243/7244	Electrical Trades and Telecommunications Operators	FAIR	6%
7351/7352	Stationary Engineers/Power Station and System Operators	FAIR	4%

Source: www.jobfutures.ca (Last accessed: October 15, 2007)
Ratings: "FAIR" – jobs & salaries slightly lower on average than "GOOD" but better than "LIMITED".

Human Resources and Social Development Canada (HRSDC) has implemented a new expedited Temporary Foreign Worker program. The purpose of the program is to expedite visa applications for individuals who have training that is directly associated with specific jobs that are considered to be under considerable pressure (i.e., where there are serious labour shortages). HRSDC has released a list of occupations for selected provinces for which the new rules apply.[1] Among these occupations are a number that are relevant to the electricity sector. Below is a list of selected occupations by province for which employers can apply for an expedited temporary foreign worker permit. Exhibit 6.2 below outlines the occupations under pressure, and denotes the provinces in which employers can apply for the expedited TFW permit.

[1] HRSDC Regional Lists of Occupations Under Pressure, accessed April 15th, 2008. http://www.hrsdc.gc.ca/en/workplaceskills/foreign_workers/occunderpres.shtml

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Exhibit 6.2: Occupations Under Pressure Relevant to the Electricity Sector						
NOC – Occupation Title	*AB*	*BC*	*MB*	*NS*	*ON*	*QC*
Managers						
0211 – Engineering Managers	☑	☑				
Engineers						
2133 – Electrical/ Electronic Engineers	☑	☑				☑
2132 – Mechanical Engineers	☑	☑			☑	☑
2131 – Civil Engineers	☑	☑			☑	☑
2232 – Mechanical Engineering Techicians	☑	☑	☑	☑		☑
2231 – Civil Engineering Techicians	☑	☑				☑
2241 – Electrical and Electronics Engineering Technologists and Technicians	☑					
Trades						
7244 – Electrical Power Line & Cable Workers	☑	☑				
7311 – Construction Millwrights & Industrial Mechanics	☑		☑			
7242 – Industrial Electricians	☑	☑				
Other Key Occupations						
1111 – Financial Auditors	☑	☑	☑			☑

Source: Human Resources and Social Development Canada, Regional Lists of Occupations Under Pressure. http://www.hrsdc.gc.ca/en/workplaceskills/foreign_workers/occunderpres.shtml

The implication of these new rules and regulations will have the most significant impact on BC, Alberta, and Québec, as these are the provinces that are showing the most electricity sector related occupations under pressure. The key finding of this analysis is that there will be significant demand for employees in occupations that are directly related to the electricity sector. While COPS and HRSDC do not present industry-level detail for the Canadian electricity industry, it would be safe to assume that there will be significant demand from this industry (as well as from other competing industries) for a range of technical/trades occupations.

6.1.2 Industry Estimates of Labour Shortages/Future Demand

Employers were asked to provide estimates of future employment requirements. Further, employers were asked about the number of unfilled positions in their organization. This information was used to estimate the expected change in employment requirements in the electricity sector. The following sections present the level of staff turnover, as well as the anticipated number of employees needed in 2009 and 2012.

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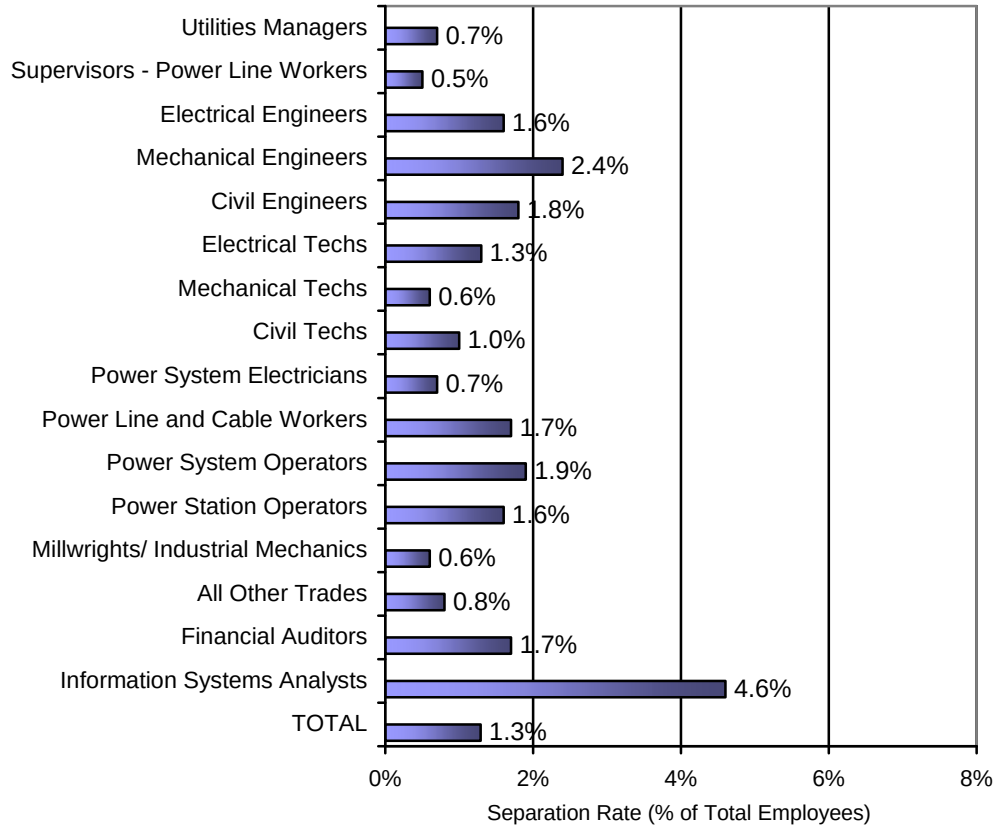
6.2 Staff Turnover

Primary producers reported that 1.3% of total staff left the company voluntarily in 2003 (voluntary turnover excluding retirements). The highest rate was reported among mechanical engineers (2.4%) and information systems analysts (4.6%). Turnover rates by key occupation are presented in Exhibit 6.2. Higher turnover rates were also reported for power system operators (1.9%), civil engineers (1.8%), and power line and cable workers (1.8%).

Exhibit 6.3: Separation Rates by Occupation (excluding retirements)



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6.3 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.

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%/year, worker productivity matches demand growth
- 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%/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%/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 2008 (1.3%)
- electricity sector attracts 5% of engineering graduates

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- 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 following Exhibit presents the projected supply-demand gap for the electricity industry for 2009 and 2012.

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

The high growth scenario presented following in Exhibit 6.5 includes several key assumptions:

- That there will be additional growth in employment due to demand increase and infrastructure replacement requirements.
- Separation rate is expected to be 1.3%, consistent with 2008 ESC Employer Survey.

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

Group/Period	Annual Estimates	
	2009	2012
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

As highlighted in Exhibit 6.6 below, the supply-demand gap is estimated to range between 2,215 and 3,536 per year in 2009, rising to between 3,034 to 4,655 in 2012.

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Exhibit 6.6: Estimated Supply-Demand Gap – Annual Positions/Year				
Group	**2009**		**2012**	
	Low	**High**	**Low**	**High**
Engineers	290	680	596	1,071
Trades/other non-support	1,786	2,692	2,355	3,466
Total	2,215	3,536	3,034	4,655

It should be emphasized that the projected supply-demand "gap" represents a hypothetical gap between industry needs and the capacity of the education and training and immigration systems to produce sufficient numbers of qualified graduates. In reality, electricity employers will access other potential labour pools to address hiring needs. These other labour pools include:

- existing staff to be promoted into management/supervisory roles;
- trained staff currently working in other sectors;
- contractors that act as a "contingent workforce" for the electricity industry;
- use of contract positions for recently retiring staff; and
- increased proportion of recent graduates who decide to work in the electricity sector.

Nevertheless, the extent of the supply-demand gap (estimated to be as high as 7% of the current workforce) suggests that there will be an immediate need for employers and education/training institutions to develop a coordinated strategy to address current and potential hiring needs in this sector.

6.4 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/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.

Overall, employers need to think about long-term strategies and recruitment practices in order to maintain employment equilibrium within their establishments. Historical employment

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numbers over the past 20 years show marked peaks and valleys in terms of the number of employees in the sector in any given year. These trends suggest that employers in the electricity sector are either undergoing hiring freezes and lay-offs, or else they hiring substantial numbers of staff. The result is large numbers of employees in certain age cohorts – either very young or very old. Maintaining sustained levels of employment would mean that employers would not be as negatively impacted by the large numbers of employees all retiring at once. Employers would benefit by recognizing the need for long-term recruitment plans, particularly for occupations within the sector that are specific to electricity. Failure to maintain more consistent numbers of employees across all age groups can create difficulties in financial planning, as well as human resource planning.

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Section 7: Recruitment

Given the significant current and future demand for both professional, trades and managerial staff in the Canadian electricity sector, an important element of the research was to assess current recruitment practices utilized in the sector and to identify opportunities/changes that would enhance the effectiveness of recruitment practices. This chapter presents the vacancy rate by occupation in the electricity sector.

Information collected in this section of the study includes an examination of the extent to which organizations hire interns through co-op positions, internship positions and apprentice positions. In addition, research presented in this section addresses methods/initiatives used by both employers and training institutions to recruit individuals from groups that are traditionally underrepresented in the electricity sector, including women in non-traditional occupations, Aboriginals and immigrants.

7.1 Vacancy Rates

According to the data current vacancy rates among employers who responded to the 2007 ESC Survey are higher (3.2%) than the national average (2.6%). Overall, trades occupations have the highest vacancy rates (3.5%) 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 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.

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Exhibit 7.1: Vacancy Rates by Occupational Group			
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	2.4%
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%

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Exhibit 7.1: Vacancy Rates by Occupational Group			
Occupation Group	**Vacancies**	**Currently Employed**	**Vacancy Rate**
Total (n=87)	**1,358**	**41,006**	**3.2%**

Closer examination of the data revealed that the highest vacancy rates are among power line and cable workers, at 4.9%, electrical technicians and technologists at 3.9% and power system electricians, at 3.8%. Power systems operator, millwright/industrial mechanic and mechanical engineer positions are also showing vacancy rates well above the average.

It should be noted that there is a natural or common vacancy rate of about 2% to 3% at any given time. In 1999, Statistics Canada commissioned a survey on vacancy rates, which found an average vacancy rate of 2.7% across all industries. In the communications and other utilities industries, the vacancy rate was only about 2.2%[70]. This is the natural result of worker movement. It is similar to the notion of "frictional unemployment", which refers to short-term unemployment associated with the movement of workers from one job to the next. Highly seasonal sectors might have higher than average frictional unemployment rates, but this in no way reflects a weak labour market. Nonetheless, as the data shows, trades occupations are well above the normal 3% vacancy rate, as are a number of engineer and technician occupations.

Compounding the issue of higher than normal vacancy rates are vacation entitlements and sick leaves. The limited number of available staff can be further exacerbated when staff go on vacation or take long sick leaves or leaves of absence. These are real issues in the electricity sector, as the amount of electricity that available to consumers often depends heavily on whether there is staff available to do the work. Insufficient staff coupled with high demand can result in damaging consequences,

7.2 Sources of New Hires

One aspect of the 2008 Electricity Sector Council survey was to collect information on the number of new hires per occupation in 2006, and the most common source of recruitment of those new hires. This information is important for human resource planners to address the looming retirements in the industry. Not all respondents provided data on the number of new hires, and even fewer provided data on the source of the hires. Nonetheless, the data is interesting.

In total 68 employers provided data on the number of new hires they had in 2006. Overall, these respondents reported 1,607 new hires in 2006. Slightly fewer employers (53) provided data on the sources of 897 new hires in 2006, which is reported in Exhibit 7.2.

[70] Statistics Canada, 2001 "Which Firms Have Highest Job Vacancy Rates in Canada?" http://www.statcan.ca/english/research/11F0019MIE/11F0019MIE2001176.pdf

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As illustrated most new hires were Electrical Power Line and Cable Workers. Strikingly, this occupation also showed the highest vacancy rates. Looking at the non-support occupations, 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 highlighted in Exhibit 3.13, 24% of Power Line and Cable workers and 24% of Power Station Operators were 35 years old or less. Furthermore, as illustrated in Exhibit 7.1 below, electrical engineers also accounted for a large proportion of new hires. Similarly, 26% of employees in this occupation were aged 35 or less – the second largest proportion of all engineer and technician/technologist occupations (see Exhibit 3.12).

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Exhibit 7.2: Number and Source of New Hires in 2006 – by Occupation Groups Weighted by employment

Occupation Group	# of Employees	# of New Hires	Source in Percent					
			Recent Grads	Recent Immigrant	Electricity Related	Non-Electricity Related	No Previous Work Experience	Other
Utilities Mangers (n=15)	558	35	0	5.1%	64.0%	28.0%	0%	2.9%
Supervisors of Electricians and Line Workers (n=11)	586	14	14.3%	7.1%	57.1%	7.1%	0%	14.3%
Electrical Engineers (n=23)	983	109	28.7%	8.8%	34.1%	19.0%	9.3%	0%
Mechanical Engineers (n=8)	479	49	31.1%	8.6%	21.8%	28.5%	10.1%	0%
Civil Engineers (n=5)	83	9	8.7%	6.8%	37.3%	25.8%	21.4%	0%
Electrical Technicians/Technologists (n=23)	1075	54	25.9%	4.9%	41.9%	27.34%	0%	0%
Mechanical Technicians/Technologists (n=6)	230	26	44.2%	7.1%	24.4%	24.2%	0%	0%
Civil Technicians/Technologists (n=11)	65	11	8.2%	12.3%	32.7%	46.8%	0%	0%
Power System Electricians (n=22)	876	90	3.5%	2.3%	25.4%	68.8%	0%	0%
Electrical Power Line and Cable Workers (n=7)	1664	143	21.1%	1.2%	56.2%	7.5%	13.9%	0%
Power Systems Operators (n=9)	314	31	19.3%	0%	41.9%	6.5%	0%	32.3%
Power Station Operators (n=5)	982	94	20.8%	3.9%	18.3%	53.3%	3.7%	0%
Millwrights/ Industrial Mechanics (n=12)	547	70	24.2%	1.3%	11.8%	61.3%	1.4%	0%
Other trades (n=12)	893	54	20.7%	6.1%	36.4%	24.4%	12.4%	0%
Financial Auditors (n=15)	334	59	10.5%	5.2%	25.5%	55.4%	3.4%	0%
Information Systems Analysts and Consultants (n=19)	365	49	10.3%	1.3%	22.2%	39.7%	6.1%	20.4%
Total*(n=53)	**10,034**	**897**	**19.4%**	**4.3%**	**33.6%**	**34.2%**	**5.1%**	**2.6%**

Source: 2008 ESC Employer Survey (n=53)

Note: Actual new hires is slightly higher than the number represented above because only the data from employers who included the source of their hires was included.

Employers were also asked to identify the source of the new hires as an estimated percentage.

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The totals for each source show that the largest group of new hires came from within the electricity sector. This suggests that companies generally resort to 'poaching' employees from other companies. The data from the 2004 CEA study reported that one of the main challenges that employers will face is ensuring that their new staff hired to fill the vacancies created by retirees are adequately trained and skilled. One of the issues mentioned was that many occupations within the electricity sector typically require significant training and experience before the employee is considered an expert in the field. It is therefore not surprising that employers today are focusing their recruitment and human resource strategies on people who already have some years of experience in the industry.

The two least common sources were immigrants and individuals with no previous work experience. This is striking and illustrates that there are avenues and sources of untapped labour that employers in the electricity sector could access.

The following Exhibit provides a breakdown of source of recruitment by size of company.

Exhibit 7.3: Source of New Hires by Size of Establishment

			% of new hires					
Size	**Current employees in occupations with new hires reported**	**# of new hires reported**	**Recent Grads**	**Recent Immigrants**	**Within Electricity**	**Other Sector**	**No Previous Work experience**	**Other**
Large (n=14)	9037	727	20.5%	4.6%	30.1%	38.1%	4.0%	2.8%
Small/Medium (n=39)	997	170	14.7%	2.9%	48.8%	17.6%	14.1%	1.8%
TOTAL (n=53)	10,034	897	19.4%	4.3%	33.6%	34.2%	5.9%	2.6%

Source: 2008 ESC Employer Survey (n=53)

The data presented in this table suggests that larger employers appear to be more likely to recruit workers with experience from other sectors. Small and medium sized companies are more likely to draw from experienced individuals who are already working within the electricity sector, and they are less likely to hire recent immigrants and recent graduates. One possible explanation for this could be in part due to the fact that larger employers have more resources to put toward recruitment and training. They have more flexibility in being able to hire employees and train them in house. Employers might perceive both recent graduates and recent immigrants as needing significant training, which might be a disincentive for smaller employers who may not have either the time or resources available to put toward the training. Conversely, small and medium sized employers are more likely to hire employees with no previous work experience. An individual with no previous work experience and who is not a recent graduate is likely fairly young, and without any post-secondary education.

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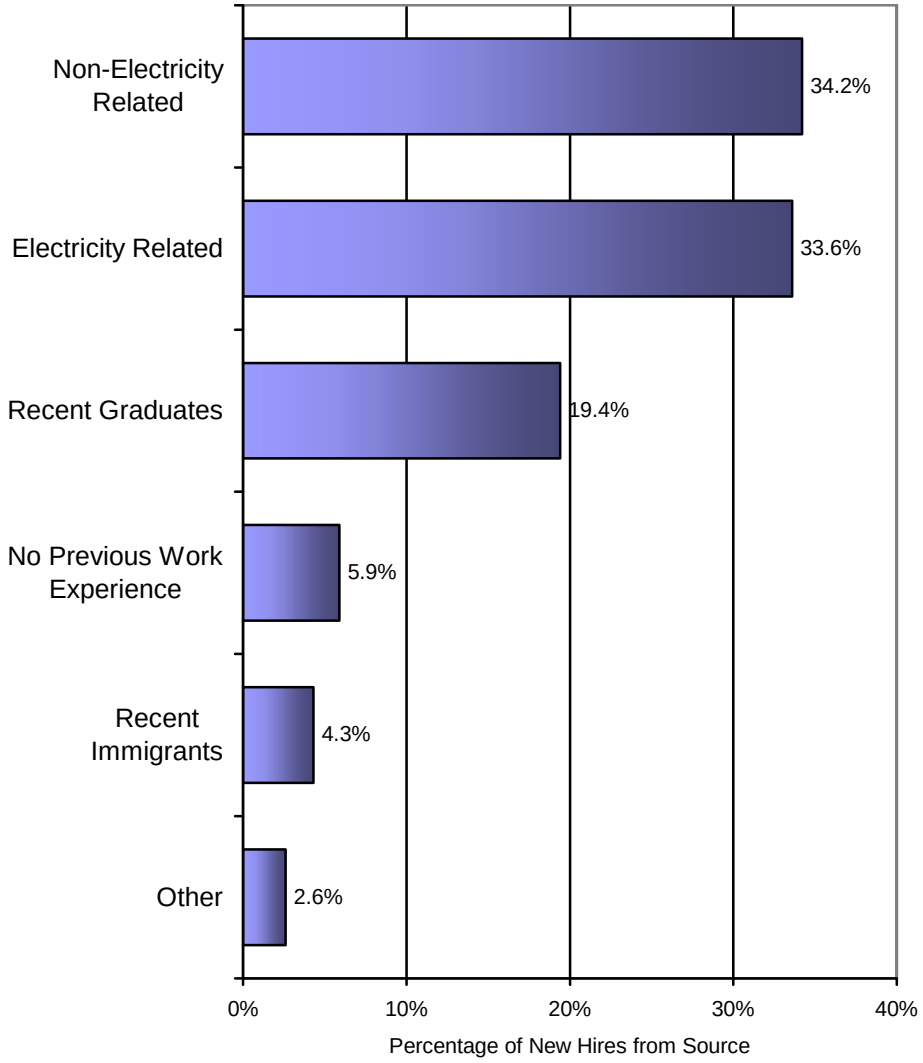
Given this trend, it is possible that individuals with higher education become employed at larger companies because the companies can offer better compensation or benefits or career opportunities. However, the numbers also show that the overwhelming majority of new hires to smaller companies come from within the electricity sector itself, which suggests that smaller employers are more likely to poach employees from other companies.

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



Source: 2008 ESC Employer Survey (n=53)

These findings were consistent with the data from the educational institutions with respect to employer support of and interest in graduates. As mentioned earlier in the report, the 2004 CEA study found that lack of employer support and interest in graduates was a significant

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challenge reported by post-secondary institutions. The data from this year's study shows that while the majority of new hires came from either the electricity sector or another sector, 19.4% were recent graduates.

Exhibit 7.4 below further illustrates employers' willingness to hire co-op students, interns, and summer students. The data shows that on average, employers hired 17 co-op students, 3 interns, and 17 summer students, and employed 45 apprentices per company in 2006. When we look at the data in terms of percentages, 82.7% hired co-op students, 63.2% hired interns, 82.7% hired summer students, and 73.6% employed apprentices. These percentages show significant increases from the 2004 CEA data, where of the primary producers, the numbers were 78.1%, 18.6%, 81.3%, and 56.3% respectively.

As a total, the most significant number of trainee workers' were apprentices in integrated companies. In fact, integrated establishments accounted for the vast majority of co-op, intern, summer student, and apprentice employment, with a total of 3,126. Establishments in generation accounted for a total of 718 co-op students, interns, summer students, and apprentices, distribution accounted for 636, and 'other' accounted for 357. The fewest trainee workers were employed by companies in transmission – a mere 60.

Exhibit 7.5: Number of Co-op Students, Interns, Apprentices and Summer Students Hired by Business Line

Line of Business*	Co-op Students (n=72)	Interns (n=55)	Apprentices (n=64)	Summer Students (n=72)	Total
Generation	272	107	142	197	718
Transmission	31	2	10	17	60
Distribution	187	3	266	180	636
Integrated	581	39	1,902	604	3,126
Other	130	5	13	209	357
Total	**1,201**	**157**	**2,333**	**1,207**	**4,898**

Source: 2008 ESC Employer Survey (n=.64-72). Does not include imputed values – only employers who provided data are included in the 'n'.
*Note: Averages not included where they add up to less than one person per company.

The following table illustrates the occupations for which 2,333 apprentices were employed by employers in 2007, most of these being powerline and cable workers. In total, 18% of the powerline technician workforce is composed of apprentices.

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Exhibit 7.6: Apprentices Employed in 2007 for Key Trades

		Companies responding	Total Employees in Occupation at Responding Companies	Apprentices Taken on in 2007	Apprentices as % of Total Employees in Occupation
System Electricians		29	4,103	829	20.2%
Power Line and Cable Workers		50	5,660	1,033	18.3%
Power Systems Operators*		18	746	234	31.4%
Power Station Operators*		7	1,319	237	18.0%
Total		**60**	**11,828**	**2,333**	**19.7%**

Source: 2008 ESC Employer Survey (n=60)
* Interpret figures for Power Systems Operators and Power Station Operators with caution due to lower n on this question relative to the number of respondents with employees in these categories. While the majority of respondents that employ system electricians and power line and cable workers provided a response, 18 out of 31 companies with Power Systems Operators and only 7 out of 18 companies that employ Power Station Operators provided responses.

The data shows that apprentices account for a significant proportion of total employment in key trades occupations in the electricity sector. Power system electrician and power systems operator apprentices account for the largest percentage of total employment in the key trades positions. This is significant in that enrolment in apprenticeship programs, as shown in Exhibit 4.6, increased by 6% between 2003 and 2005, but enrolment in Power Systems Operator apprenticeships declined significantly. On the other hand, enrolment in Power Line Technician programs increased between 2003 and 2005 by 21%. These data suggest that employers might have to work in collaboration with educational institutions to ensure that there is an adequate number of apprentices registered for key trades occupations, to supply the industry with the required labour.

Competition among employers to hire the best and the brightest employees is always a challenge. For employers in the electricity sector, the competition is not only among employers within the sector, but with employers from other industries who draw on similar pools of labour, such as engineers and trade staff. The following Exhibit illustrates the most common sources of competition for employers in the electricity sector.

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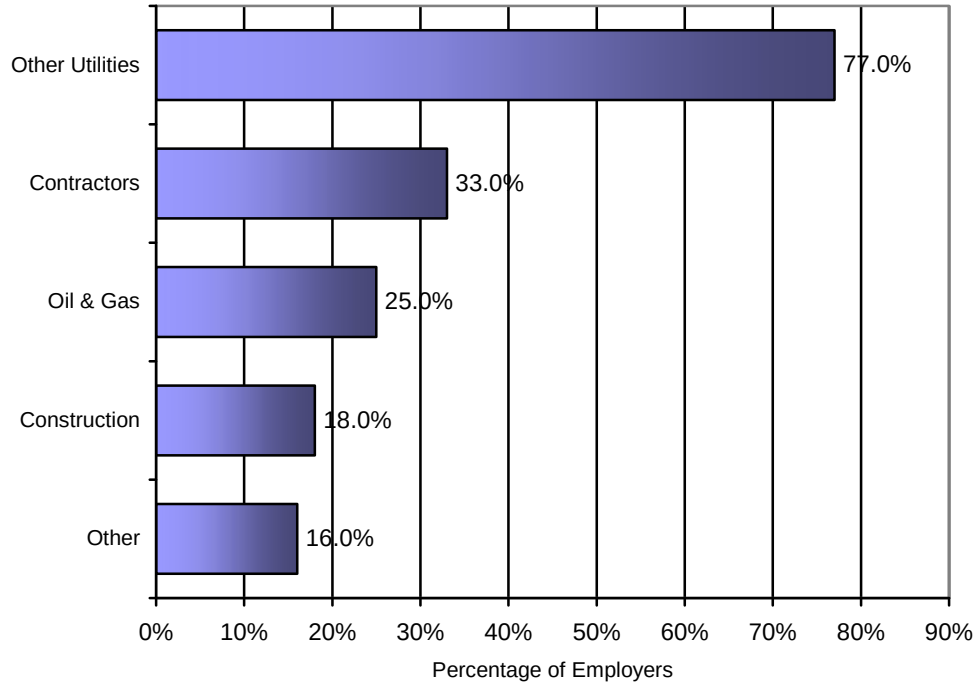
Exhibit 7.7: Sources of Competition for New Hires to the Electricity Sector



Source: 2008 ESC Employer Survey, n=87
*note: percentages do not add up to 100% due to multiple selections

The data from this graph supports the data from Exhibit 7.3. Exhibit 7.4 illustrates that most new hires come from electricity and other sectors (non-electricity related). The data in the above Exhibit shows that there is significant competition among all utilities sectors, to hire the same employees. This is of particular significance to the electricity sector as it seeks to market itself to prospective employees.

7.2.1 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. Respondents to the 2008 ESC Employer Survey were asked whether or not they had ever or would ever hire a Temporary Foreign Worker. Out of 87 respondents, 12 (13.8%) reported that they had, 8 (9.2%) reported that they had not but that they planned to in the future, and 54 (62%) reported that they had not and that they did not plan on hiring any in the future.

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This latter percent may be more an indication that employers do not find hiring foreign workers an easy process. The same can be said for hiring immigrants – particularly recent immigrants who have no or little Canadian work experience and foreign credentials.

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 for these occupations, 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 (particularly smaller establishments) to commit to determining the validity or standard of the foreign credential[71], 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[72], have 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[73].

As mentioned earlier, only 1,225 recent immigrants are employed in the electricity sector, which represents approximately 1% of all employees in the sector. Given the recent release of data from the 2006 Census which shows that recent immigrants to Canada are more likely to be under or unemployed than Canadian-born residents, and 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. Although none of the employer data captured employer perspectives on the challenges of recruiting immigrants, there have been a number of studies done on the overall challenges associated with hiring immigrants. The 2004 CEA study gathered data from industry representatives who reported that some of the key challenges to hiring immigrants are foreign credential recognition and language barriers. Significant efforts have been made to address the former challenge.

Foreign credential recognition programs have been developed by educational institutions, and Human Resources and Social Development Canada has implemented a foreign credential recognition program as part of its Internationally Trained Worker Program[74]. 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 Electricity Sector Council 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.

[71] Assessing and Recognizing Foreign Credentials in Canada – Employers' Views. CIC and HRSDC funded study of the Canadian Labour and Business Centre. 2001.
[72] Foreign Credential Recognition; An Overview of Practice in Canada. Alliance of Education and Training Organizations
[73] Assessing and Recognizing Foreign Credentials in Canada – Employers' Views. CIC and HRSDC funded study of the Canadian Labour and Business Centre. 2001
[74] http://www.hrsdc.gc.ca/en/cs/comm/hrsd/news/2005/050425bb.shtml

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Findings from the Electricity Sector Foreign Credential Recognition study, conducted by R.A. Malatest & Associates 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.

7.2.2 Recruitment of Aboriginal Workers

The 2008 ESC Employer Data did not capture information on the current recruitment practices of employers as they relate to Aboriginal people. 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 in 2006 Aboriginal employees accounted for 3% of employees in the electricity sector. This is a slight increase from 2004, where approximately 2% of employees in the sector were of Aboriginal identity (according to the data from the 2004 CEA Study). 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. The extent to which targeted recruitment practices actually correlate to the increase in percent is unknown. Nonetheless, it remains clear that both educational institutions and employers need to continually strive to increase Aboriginal employee representation within the sector.

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7.2.3 Recruitment of Women

As presented earlier in the report, the participation of women in the electricity sector has increased by 8 percent between 1993 and 2007. According to the 2008 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%.

Most occupations within the sector are trades related, and historically, women are not as attracted to the trades as men. 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. Other reports suggest that women do not enter into the trades because there are no role models for them, and those who do enter the trades often experience harassment and discrimination. Needless to say, more research needs to be done to explore the exact reasons for women's limited participation in the trades.

In order to address this issue, some educational institutions 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. Data from the 2006 Census shows that while 19% of all male employees in the electricity sector are under 35 years old, a slightly higher percent – 23% - of female employees are under the age of 35. The degree to which targeted recruitment is correlated to the higher percent of younger female employees is not known. Nonetheless, the data suggests that employers are increasingly hiring women to staff their establishments.

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 to companies who are hiring, 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. As mentioned earlier, some utilities companies are already easing up on either math or physics requirements, for occupations where these skill sets are not required. Employers, sector representatives, and provincial regulatory body representatives will need to work together to

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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.

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Section 8: Issues and Action Items

The electricity sector is on the verge of entering into the perfect storm unless serious efforts are made to prepare the workforce of the future. The electricity sector needs to ensure that it has enough skilled workers, from engineers to line technicians, to deliver clean, reliable electricity to the market, and it must start planning now. According to Ralph Izzo, Chairman and CEO of the Public Service Enterprise Group, not only do retiring workers need to be replaced but additional workers are required to build and maintain new infrastructure projects to support the increasing demand for energy. Additionally, there will be new jobs created by the burgeoning 'green' economy, which will require workers to install solar panels, build wind turbines, lay insulation, do energy audits, and bring more energy efficient lighting, cooling and heating to homes and businesses across the country. Electricity companies will feel the pressure on a number of fronts: growing demand for energy in general, consumer demand for green energy and energy efficient options, aging infrastructure, and changing technology.

The human resource challenges facing the electricity sector have repercussions across the entire country, from coast to coast, and they affect all citizens in every community, from large corporations to small self-employed business operators, to one degree or another.

The following recommendations and strategies take into consideration not only businesses, but also individual consumers who will be affected by the labour shortage in the electricity sector. The recommendations have been divided into two broad themes, each with 5 strategies that will help pave the way toward implementing the recommendations.

Based on the findings from the current study, the following recommendations and strategies have been developed in collaboration with the ESC Workforce Planning Steering Committee. The purpose of these recommendations and strategies is to curb or mitigate the negative economic impacts of the impending labour shortages in the electricity industry. High levels of retirements, current unfilled vacancies, and declining enrolment in post-secondary training, all threaten the supply side of workers to the sector. Additionally, increasing demand for electricity and the need to invest in new capital and build new infrastructure, mean that employers in the electricity industry are faced with an urgent call to action to fill the supply – demand labour gap.

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 non-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.

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b. 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 a 'best practices' for the industry.

c. 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.

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.*

a. Human resources 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 can 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.

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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. In conjunction with training institutions, industry 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 career 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.

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Acknowledgements

The Electricty Sector Council Labour Market Information Study was made possible by the following.

The Labour Market Information Project Steering Committee:

Damon Rondeau, Chair
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Robert Malatest
Heather MacDonald
Andreas Rose
Airlie McCann
R.A Malatest & Associates Ltd.

In addition, we would like to acknowledge the generous time and support of the employers, associations, educational institutions, unions and other key stakeholders who participated in this study.

Completion of this study was made possible through funding from:

The Government of Canada's Sector Council Program
The Electricity Sector Council

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Appendix A

Listing of Study Participants

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Canada

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.
Canlyte Inc.
CAREA
Centre Wellington Hydro Ltd.
Chapleau Public Utility Corp.
City of Medicine Hat, Electric Utility
City of New Westminister
City of Penticton, Electric Utility
City of Red Deer
C-K Energy Inc.
Collingwood Utility Services
Deer Lake Power (Kruger Inc)
Enersource Corporation
ENMAX Corporation
Entegrity Wind Systems Inc.
EPCOR Utilities Inc.
Espanola Regional Hydro Distribution Corporation
Essex Powerlines Corp.
Festival Hydro Inc.
Five Nations Energy Inc.
Fort Albany Power
Fort Frances Power Corporation
FortisAlberta
FortisOntario Inc.
GPCo
Greater Sudbury Utilities
Grimsby Power Incorporated
GTAA Pearson
Guelph Hydro Electric Systems Inc.
Hammond Power Systems Inc.
Hearst Distribution Co Ltd.
Hydro 2000
Hydro Hawkesbury Inc
Hydro One Networks
Hydro Ottawa Limited
Hydro-Québec

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Independent Electricity System Operator (IESO)

Innisfil Hydro Distribution Systems Ltd.

Laker Energy Products Ltd.

Manitoba Hydro

Maritime Electric Company Limited (part of Fortis)

Midland Power Utility Corp.

NB Power Group of Companies

Newbury Power Inc.

Newfoundland and Labrador Hydro

Newfoundland Power Inc.

Newmarket-Tay Power Distribution Ltd.

Northern Ontario Wires Inc.

Northland Power Inc.

Nuclear Safety Solutions Ltd.

Ontario Power Generation

Oshawa PUC Networks Inc.

Partner Technologies Incorporated

Patriot Forge Co.

Peterborough Utilities Group

Kinectrics Inc.

K-Line Maintenance & Construction Limited

Powertel Utilities Contractors Limited

R.L. Brews Ltd.

Renfrew Hydro Inc

Rocky Rural Electrification Association Ltd.

Saskatoon Light and Power

SaskPower

Sioux Lookout Hydro Inc.

St. Thomas Energy Services Inc.

Thunder Bay Hydro Electricity Distribution Inc.

Toronto Hydro

Wasaga Distribution

Welland Hydro Electric System Corp.

Wellington North Power Inc.

West Coast Huron Energy Inc

Westario Power Inc.

Woodstock Hydro Service Inc.

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Educational Institutions

British Columbia Institute of Technology (BCIT)

Canadore College

Carleton University

Collège Communautaire du Nouveau Brunswick (CCNB)

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

Niagara College

Northern Lights College BC

Queen's University

Red River College

Southern Alberta Institute of Technology (SAIT) Polytechnic

Saskatchewan Institute of Applied Science and Technology

Sault College of Applied Arts and Technology

Selkirk College

Sheridan College

Sir Sandford Fleming College

St. Clair College of Applied Arts and Technology

Université de Moncton

Université Laval

University of Alberta

University of Calgary

University of Guelph

University of Manitoba

University of Ontario Institute of Technology

University of Saskatchewan

University of Waterloo

Vancouver Island University (Malaspina)

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Appendix B

Survey Instrument

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Your information will help us to provide data to the electricity industry that is unique and not available from other sources. Thank you for your involvement in this important study!

Objective of the Study:	To develop a labour market information system and subsequent web-based application that will provide accurate information and viable predictions of current and future labour supply and demand in the electricity sector.
Use of Data from the Study:	The information from this study will be used to produce a web-based reporting tool that employers in electricity sector can use to help plan their future HR requirements. Individual data pertaining to any specific firm will not be published.
Who Should Complete the Survey:	Each regional office of an organization should complete a separate survey. This will ensure that data can be tabulated for each region of the country in the electricity industry.
Sponsor of the Research:	The Electricity Sector Council, with funding provided by the Government of Canada, has commissioned a study to identify the current and future human resource needs of organizations in the electricity sector.
Questions:	If you have any questions about the survey or the research in general, please call the survey coordinators at *1-800-665-5848*.
How to respond:	You have a number of options for returning your survey: ➢ by **mail** using the enclosed postage-paid envelope ➢ by **fax** toll-free at 1-888-384-2774 ➢ by **phone** using our toll-free number: **1-888-274-1700**

Please provide the name and job title of the person filling out this survey:

Name: O Mr. O Mrs. O Ms. O Dr. (First) _____ (Last) _____

Job Title: _____

Company name: _____

Email: _____ _____Phone _____

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DEFINITIONS OF OCCUPATIONS

This survey asks questions ask about the number of staff your organization employs in different occupational categories. The following definitions of non-support staff are intended as a guide to assist respondents in estimating the number of staff by occupation (for more information about common names for occupations, please see http://www23.hrdc-drhc.gc.ca/2001/e/generic/welcome.shtml).

Occupation Name in Survey	Job Descriptions and Other Common Names for the Occupation
Managers/Supervisors	
Utilities Managers	Managers who plan, organize, direct, control and evaluate the operations of utility companies. They manage the operations of electrical power distribution systems including generating stations, transmission stations and distribution networks. They may also plan and direct the distribution activities of a municipal electrical power establishment. Also known as operations managers or electric power plant managers (National Occupational Classification 0912).
Supervisors of Electricians & Supervisors of Electrical Power Line Workers	Includes supervisors of Electricians, Industrial Electricians, Power System Electricians, Electrical Power Line and Cable Workers and Maintenance Technicians. Also known as Foreman/Woman or Subforeman/Woman and Power Line Technician Foreman/Woman or Subforeman/Woman (NOC 7212).
Engineers/Engineering Technologists	
Electrical and Electronics Engineers	These engineers design, plan, research, evaluate and test electrical and electronic equipment and systems. Also referred to as design or process control engineers (NOC 2133).
Mechanical Engineers	Mechanical engineers research, design and develop machinery and systems for power generation, heating, ventilating and air conditioning, transportation, processing and manufacturing. They also perform duties related to the evaluation, installation, operation and maintenance of mechanical systems. Also includes nuclear engineers (NOC 2132).
Civil Engineers	Civil engineers plan, design, develop and manage projects for the construction or repair of buildings, powerhouses, earth structures, roads, airports, railways, rapid transit facilities, bridges, tunnels, water distribution and sanitation. Civil engineers may also specialize in foundation analysis, building and structural inspection, surveying, geomatics and municipal planning (NOC 2131).

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DEFINITIONS OF OCCUPATIONS, PART 2

(Continued) The following definitions are intended as a guide to assist respondents in estimating the number of staff by occupation:

Occupation Name in Survey	Job Descriptions and Other Common Names for the Occupation
Electrical and Electronics Engineering Technologists and Technicians	Provide technical support and services in the design, development, testing, production and operation of electrical and electronic equipment and systems. Also known as electronics design technologists, electricity distribution network technologists (NOC 2241).
Mechanical Engineering Technologists and Technicians	Provide technical support and services in the design, development, testing and maintenance of machines, components, tools, heating and ventilation systems, power generation and power conversion plants, and manufacturing plants and equipment (NOC 2232)
Civil Engineering Technologists and Technicians	Provide technical support and services to scientists, engineers and other professionals, may develop engineering designs and drawings from preliminary concepts and sketches, conduct or supervise inspection and testing of construction materials (NOC 2231).
Trades	
Power System Electricians	Install, maintain, test and repair electrical power generation, transmission and distribution system equipment and apparatus. Also known as electricians/power electricians (NOC 7243).
Electrical Power Line and Cable Workers	Construct, maintain and repair overhead and underground electrical power transmission and distribution systems. Also known as Power Line Technicians, Cable Splicers, Trouble Technicians (NOC 7244).
Power Systems Operators	Monitor and operate switchboards and related equipment in electrical control centres to control the distribution of electrical power in transmission networks. They are responsible for coordinating and scheduling power loads and line voltages to meet demands during daily operations, system outages and repairs. Also known as Apprentice Power Dispatcher (NOC 7352).
Power Station Operators	Operate reactors, turbines, boilers, generators and other related equipment in electrical generating stations and substations. Also known as Diesel Station Operator, Electrical Station Operator, Nuclear Station Operator (NOC 7352).
Millwrights or Industrial Mechanics	Install, maintain, troubleshoot and repair stationary industrial machinery and mechanical equipment. This category includes mechanics, millwrights, plant equipment mechanics (NOC 7311).

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DEFINITIONS OF OCCUPATIONS, PART 3

(Continued) The following definitions are intended as a guide to assist respondents in estimating the number of staff by occupation:

Occupation Name in Survey	Job Descriptions and Other Common Names for the Occupation
Other Key Critical Occupations	
Financial Auditors and Accountants	Examine and analyze the accounting and financial records of individuals and establishments to ensure accuracy and compliance with established accounting standards and procedures. Accountants plan, organize and administer accounting systems for individuals and establishments (NOC 1111)
Information Systems Analysts and Consultants	Develop and implement information systems development plans, policies and procedures, and provide advice on a wide range of information systems issues (NOC 2171)

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YOUR COMPANY

Please Note: Non-support employees include management/supervisor, engineering/engineering technologists and trades staff but exclude secretarial, customer service, call centre, accounting, etc.

A1. What is your organization's scope of operations? (Use the location of your offices to establish the scope of operations. Check only one option)

- O Local
- O Provincial
- O Regional (more than one province, but not national)
- O National
- O International

A2. Is your office a branch or head office? (Please check only ONE option)

- O Head Office
- O Branch Office – If a branch, in what province is your head office located? _____

A3. How many seasonal staff do you employ (that work part of the year only)?

All non-support employees (please see top of page for definition) ☐

A4. How many employees does your organization employ in total (full-time and part-time)? Please exclude temporary staff.

Total employees in Canada:	
All non-support employees	
Support (Support staff includes Secretarial, Customer Service, Accounting, Call Centre, etc.)	

A5. For organizations whose primary business is not electricity generation, transmission, or distribution, please indicate the number of employees employed by your organization related to electricity only.

Total employees in Canada:	
All non-support employees	
Support (Support staff includes Secretarial, Customer Service, Accounting, Call Centre, etc.)	

A6. In what business line of the electricity industry is your organization (please check all that apply)?

O	Generation
O	Transmission
O	Distribution
O	Retail ("direct access", where consumers are able to purchase electricity directly from suppliers)
O	Renewables (wind, solar, geo-exchange)
O	Other (please specify:

A7. How many contractors or consultants (contracted externally with your organization) do you employ in the following employee categories (electricity business line only)?

All non-support employees	
Support (Support staff includes Secretarial, Customer Service, Accounting, Call Centre, etc.)	

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YOUR EMPLOYEES

Please note, for organizations whose primary business is not electricity generation, transmission, or distribution, please indicate the number of employees related to electricity only (including employees related to the wholesale electricity market) for the remainder of the survey. . .

ALSO NOTE: For the remainder of the survey, please exclude seasonal staff who work only part of the year.

B1. Please indicate how many employees you have in each of the following business lines. Please exclude contractors and consultants contracted externally with your organization and employees outside of Canada, and please exclude seasonal staff who work only part of the year.

Business Line	Current full- and part-time employees (2007)	Anticipated number of employees (BOTH FULL AND PART-TIME)	
		In 2 years (2009)	In 5 years (2012)
Generation			
Transmission			
Distribution			
Retail ("direct access", where consumers are able to purchase electricity directly from suppliers)			
Renewables (wind, solar, geo-exchange)			
Other (please specify: _____)			
Total			

B2. What percentage of your staff is female?

Occupational Group	Female Staff
Managers/ Supervisors	%
Engineers/Engineering Technologists	%
Trades	%
Other Key Critical Occupations (financial auditors and information systems analysts/consultants)	%

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B3. **Please fill in your current and forecasted employee numbers for the next two and five years in the following general categories. Again, for organizations whose primary business is not electricity generation, transmission or distribution, please fill in the number of employees related to electricity only.** Please exclude contractors and consultants contracted externally with your organization and employees outside of Canada, and please exclude seasonal staff who work only part of the year.

Occupational Category	Current full- and part-time employees (2007)	Current number of unfilled positions (FULL AND PART-TIME)	Anticipated number of employees (BOTH FULL AND PART-TIME)	
			In 2 years (2009)	In 5 years (2012)
Managers/Supervisors				
Utilities Managers (e.g., electric power plant manager)				
Supervisors of Electricians & Supervisors of Electrical Power Line Workers				
Engineers/Engineering Technologists				
Electrical and Electronics Engineers				
Mechanical Engineers				
Civil Engineers				
Electrical and Electronics Engineering Technologists and Technicians				
Mechanical Engineering Technologists and Technicians				
Civil Engineering Technologists and Technicians				
Trades				
Power System Electricians				
Electrical Power Line and Cable Workers				
Power Systems Operators				
Power Station Operators				
Millwrights or Industrial Mechanics				
All Other Trades (excluding the trade staff listed above)				
Other Key, Critical Occupations.				
Financial Auditors / Accountants				
Information Systems Analysts and Consultants				
TOTAL (all trade, management, and engineering staff)				
Total Employees (ALL employees including support)				

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B4. How many of your staff falls into the following age categories?

Occupational Group	Less than 35 years old	35 to 44 years of age	45 to 54 years of age	55 years or more	Total
Managers/Supervisors					
Utilities Managers (e.g., electric power plant manager)					
Supervisors of Electricians & Supervisors of Electrical Power Line Workers					
Engineers/Engineering Technologists					
Electrical and Electronics Engineers					
Mechanical Engineers					
Civil Engineers					
Electrical and Electronics Engineering Technologists and Technicians					
Mechanical Engineering Technologists and Technicians					
Civil Engineering Technologists and Technicians					
Trades					
Power System Electricians					
Electrical Power Line and Cable Workers					
Power Systems Operators					
Power Station Operators					
Millwrights or Industrial Mechanics					
All Other Trades (excluding the trade staff listed above)					
Other Key Critical Occupations					
Financial Auditors / Accountants					
Information Systems Analysts and Consultants					

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B5. Please fill in the current and future estimated number of retirements as well as staff eligibility for retirement, and the percentage of staff who retire on eligibility for a full pension.

Occupational Category	Number of Retirements (2006)	Estimated Number of Retirements (2009)	Estimated Number of Retirements (2012)	Number of Staff Eligible for Full Pension (2006)	Number of Staff Eligible for Partial Pension (2006)	% of Staff Who Retire on Full Eligibility
Managers/Supervisors						
Utilities Managers (e.g., electric power plant manager)						
Supervisors of Electricians & Supervisors of Electrical Power Line Workers						
Engineers/Engineering Technologists						
Electrical and Electronics Engineers						
Mechanical Engineers						
Civil Engineers						
Electrical and Electronics Engineering Technologists and Technicians						
Mechanical Engineering Technologists and Technicians						
Civil Engineering Technologists and Technicians						
Trades						
Power System Electricians						
Electrical Power Line and Cable Workers						
Power Systems Operators						
Power Station Operators						
Millwrights or Industrial Mechanics						
All Other Trades (excluding the trade staff listed above)						
Other Key, Critical Occupations.						
Financial Auditors / Accountants						
Information Systems Analysts and Consultants						
TOTAL (trade, management and engineering staff)						
Total Employees (ALL employees including support)						

For organizations whose primary business is not electricity generation, transmission or distribution, please respond to questions for employees related to electricity only.

nada

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STAFF TURNOVER

C1. **We are interested in the portion of employees by key occupations that voluntarily left your organization in 2006 (quits initiated by the employee, excluding retirements or disability).** The separation rate is defined as the following ratio:

$$\frac{\text{total number of voluntary (employee-initiated, excluding retirement, maternity, or disability) terminations of employment}}{\text{average number of employees with your organization over the course of the year}}$$

Number of Voluntary Separations (2006) by key occupation	Separation Rate (2006) %
Managers/Supervisors	
Utilities Managers (e.g., electric power plant manager)	
Supervisors of Electricians & Supervisors of Electrical Power Line Workers	
Engineers/Engineering Technologists	
Electrical and Electronics Engineers	
Mechanical Engineers	
Civil Engineers	
Electrical and Electronics Engineering Technologists and Technicians	
Mechanical Engineering Technologists and Technicians	
Civil Engineering Technologists and Technicians	
Trades	
Power System Electricians	
Electrical Power Line and Cable Workers	
Power Systems Operators	
Power Station Operators	
Millwrights or Industrial Mechanics	
All Other Trades (excluding the trade staff listed above)	
Other Key, Critical Occupations.	
Financial Auditors / Accountants	
Information Systems Analysts and Consultants	
Total Employees (ALL employees including support)	

organizations whose primary business is not electricity generation, transmission or distribution, please respond to questions for employees related to electricity only.

C2. Looking ahead to the future, given your changing workforce demographics/local labour market conditions, to what extent do you foresee the voluntary separation rate changing for the key occupations and your overall workforce?

Occupation	Estimated separation rate in 2009			Estimated separation rate in 2012		
	No Change	Higher Rate	Lower Rate	No Change	Higher Rate	Lower Rate
	Please check which category applies)			Please check which category applies)		
Managers/Supervisors						
Utilities Managers (e.g., electric power plant manager)	O	O	O	O	O	O
Supervisors of Electricians & Supervisors of Electrical Power Line Workers	O	O	O	O	O	O
Engineers/Engineering Technologists						
Electrical and Electronics Engineers	O	O	O	O	O	O
Mechanical Engineers	O	O	O	O	O	O
Civil Engineers	O	O	O	O	O	O
Electrical and Electronics Engineering Technologists and Technicians	O	O	O	O	O	O
Mechanical Engineering Technologists and Technicians	O	O	O	O	O	O
Civil Engineering Technologists and Technicians	O	O	O	O	O	O
Trades						
Power System Electricians	O	O	O	O	O	O
Electrical Power Line and Cable Workers	O	O	O	O	O	O
Power Systems Operators	O	O	O	O	O	O
Power Station Operators	O	O	O	O	O	O
Millwrights or Industrial Mechanics	O	O	O	O	O	O
All Other Trades (excluding the trade staff listed above)	O	O	O	O	O	O
Other Key, Critical Occupations as defined in B2 (please exclude support staff). Please specify.						
Financial Auditors / Accountants	O	O	O	O	O	O
Information Systems Analysts and Consultants	O	O	O	O	O	O
Total Workforce (all Employees)						

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RECRUITMENT

C3. Looking back at the last year (2006), please provide your best estimate as to the number of new hires in your organization and the "source" of new hires. Please refer to the following definitions:

Post-secondary education graduates	Refers to new hires who recently (within the last year) graduated from a relevant post-secondary education program related to the electricity sector (i.e., Power Lineman, Electrical Engineer, etc.)
Recent Immigrants	Individuals who are foreign-trained and recently arrived in Canada within 24 months of being hired
Other electricity related organizations	Refers to the number of new hires that were previously employed in another electricity related industry prior to joining your organization
Other non-electricity related industries	Refers to the number of new hires that were previously employed in another non-electricity related industry prior to joining your organization
No previous work experience	Youth and/or other workers with no significant work experience
Other	All other new hires that are not covered by the above categories

Occupational Group	Total # of new hires (2006)	Estimated Recent PSE Grads	Recent Immigrants	Electricity Related	Non-Electricity Related	No Previous Work Exp.	Other	
Managers/ Supervisors								
Utilities Managers (e.g., electric power plant manager)		%	%	%	%	%	%	100%
Supervisors of Electricians & Supervisors of Electrical Power Line Workers		%	%	%	%	%	%	100%
Engineers								
Electrical and Electronics Engineers		%	%	%	%	%	%	100%
Mechanical Engineers		%	%	%	%	%	%	100%
Civil Engineers		%	%	%	%	%	%	100%
Electrical and		%	%	%	%	%	%	100%

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Occupational Group	Total # of new hires (2006)	Estimated Recent PSE Grads	Recent Immigrants	Electricity Related	Non-Electricity Related	No Previous Work Exp.	Other	
Electronics Engineering Technologists and Technicians								
Mechanical Engineering Technologists and Technicians		%	%	%	%	%	%	100%
Civil Engineering Technologists and Technicians		%	%	%	%	%	%	100%
Trades								
Power System Electricians		%	%	%	%	%	%	100%
Electrical Power Line and Cable Workers		%	%	%	%	%	%	100%
Power Systems Operators		%	%	%	%	%	%	100%
Power Station Operators		%	%	%	%	%	%	100%
Millwrights or Industrial Mechanics		%	%	%	%	%	%	100%
All Other Trades (excluding the trade staff listed above)		%	%	%	%	%	%	100%
Other Key, Critical Occupations								
Financial Auditors / Accountants		%	%	%	%	%	%	100%
Information Systems Analysts and Consultants		%	%	%	%	%	%	100%
Total (all trade, management and engineering staff)								
		%	%	%	%	%	%	100%
Total Employees								
		%	%	%	%	%	%	100%

C4. Have you hired Temporary Foreign Workers (TFWs) in the past? If no, please indicate whether you plan to in the future.

- O Yes
- O No, but plan to in the future
- O No, and do not intend to hire TFWs in the future

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C5. **Are there any other employers with which you compete to hire the same pool of labour (e.g., engineers, trade staff)?** If yes, please check all the types of employers below that apply.

- O Other utilities
- O Contractors

Employers in other Industries (please check the specific industry that applies)

- O Oil and Gas
- O Construction
- O Other – Please specify which industry:_____

C6. **Please identify any recruitment challenges that you face as an organization.**

- ❍ No identified challenges

_____

_____

APPRENTICESHIP OR APPRENTICESHIP EQUIVALENT

D1. **We are interested in the extent to which your organization supports apprenticeship for several key trades. Please provide information as to the number of apprentices in your organization in 2006, the number currently employed (2007) and projections for 2009, by key occupation.**

Key Trades	Total Apprentices / Apprenticeship Equivalent Trainees		
	2006	2007	2009*
Power System Electricians			
Electrical Power Line and Cable Workers			
Power System Operators			
Power Station Operators			
Total – all apprenticeable trades			

*Projected

D2. **What barriers, if any, does your organization encounter in terms of utilizing a apprenticeship model to train employees in your organization?**

- O 1. No Barriers
- O 2. Yes – Please explain.

_____

_____

- O 3. Not applicable – we do not have apprenticeable occupations

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PRE-EMPLOYMENT TRAINING

E1. How many co-op students, interns, and summer students did your organization employ in 2006, currently (2007), and how many do you project you will employ in 2009?

	Number employed		
	2006	2007	2009*
Co-op students			
Interns			
Summer students			

*Projected

OTHER HUMAN RESOURCE ISSUES

F1. Have any emerging/changing technologies impacted the skills/occupations that your organization requires? If so, please describe the technology and the impact on your organization.

- ❍ No
- ❍ Yes - Please explain.

_____

_____

F2. Is your organization planning on redefining any of its job descriptions or occupations? If yes, please explain how you are planning on redefining the job descriptions.

- ❍ No
- ❍ Yes - Please explain.

_____

_____

F3. On average, how many overtime hours are worked per month in each of the following staff categories?

Occupational Group	Average number of overtime hours worked per month
Managers/ Supervisors	
Engineers/Engineering Technologists	
Trades	
Other Key Critical Occupations	

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CONCLUSION

G1. What labour market information would you find useful as an employer? Would there be particular tools that would help you with your human resource planning?

_____

_____

G2. Are there any other major occupations that you would like the Electricity Sector Council to collect information on and produce statistics on?

_____

_____

THANK YOU FOR COMPLETING THIS IMPORTANT SURVEY.

YOUR PARTICIPATION IS VERY MUCH APPRECIATED!

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Appendix C

Definitions of Selected Occupations

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Managers/Supervisors

Utilities Managers: Managers who plan, organize, direct, control and evaluate the operations of utility companies. They manage the operations of electrical power distribution systems including generating stations, transmission stations and distribution networks. They may also plan and direct the distribution activities of a municipal electrical power establishment. Also known as operations managers or electric power plant managers (National Occupational Classification 0912).

Supervisors of Electricians & Supervisors of Electrical Power Line Workers: Includes supervisors of Electricians, Industrial Electricians, Power System Electricians, Electrical Power Line and Cable Workers and Maintenance Technicians. Also known as Foreman/Woman or Subforeman/ Woman and Power Line Technician Foreman/Woman or Subforeman/Woman (NOC 7212).

Engineers/Engineering Technologists

Electrical and Electronics Engineers: These engineers design, plan, research, evaluate and test electrical and electronic equipment and systems. Also referred to as design or process control engineers (NOC 2133).

Mechanical Engineers: Mechanical engineers research, design and develop machinery and systems for power generation, heating, ventilating and air conditioning, transportation, processing and manufacturing. They also perform duties related to the evaluation, installation, operation and maintenance of mechanical systems. Also includes nuclear engineers (NOC 2132).

Civil Engineers: Civil engineers plan, design, develop and manage projects for the construction or repair of buildings, powerhouses, earth structures, roads, airports, railways, rapid transit facilities, bridges, tunnels, water distribution and sanitation. Civil engineers may also specialize in foundation analysis, building and structural inspection, surveying, geomatics and municipal planning (NOC 2131).

Electrical and Electronics Engineering Technologists and Technicians: Provide technical support and services in the design, development, testing, production and operation of electrical and electronic equipment and systems. Also known as electronics design technologists, electricity distribution network technologists (NOC 2241).

Mechanical Engineering Technologists and Technicians: Provide technical support and services in the design, development, testing and maintenance of machines, components, tools, heating and ventilation systems, power generation and power conversion plants, and manufacturing plants and equipment (NOC 2232)

Civil Engineering Technologists and Technicians: Provide technical support and services to scientists, engineers and other professionals, may develop engineering designs and drawings

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from preliminary concepts and sketches, conduct or supervise inspection and testing of construction materials (NOC 2231).

Trades

Power System Electricians: Install, maintain, test and repair electrical power generation, transmission and distribution system equipment and apparatus. Also known as electricians/power electricians (NOC 7243).

Electrical Power Line and Cable Workers: Construct, maintain and repair overhead and underground electrical power transmission and distribution systems. Also known as Power Line Technicians, Cable Splicers, Trouble Technicians (NOC 7244).

Power Systems Operators: Monitor and operate switchboards and related equipment in electrical control centres to control the distribution of electrical power in transmission networks. They are responsible for coordinating and scheduling power loads and line voltages to meet demands during daily operations, system outages and repairs. Also known as Apprentice Power Dispatcher (NOC 7352).

Power Station Operators: Operate reactors, turbines, boilers, generators and other related equipment in electrical generating stations and substations. Also known as Diesel Station Operator, Electrical Station Operator, Nuclear Station Operator (NOC7352).

Millwrights or Industrial Mechanic: Install, maintain, troubleshoot and repair stationary industrial machinery and mechanical equipment. This category includes mechanics, millwrights, plant equipment mechanics (NOC 7311).

Other

Financial Auditors and Accountants: Examine and analyze the accounting and financial records of individuals and establishments to ensure accuracy and compliance with established accounting standards and procedures. Accountants plan, organize and administer accounting systems for individuals and establishments (NOC 1111)

Information Systems Analysts and Consultants: Develop and implement information systems development plans, policies and procedures, and provide advice on a wide range of information systems issues (NOC 2171)

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