

Labour Market Intelligence for Alberta's Energy Sector

WORKFORCE TRANSITIONS | MARCH 2018

SUMMARY

Canada

Alberta

The Province of Alberta is working in partnership with the Government of Canada to provide employment support programs and services.

electricity
HUMAN RESOURCES CANADA



RESSOURCES
HUMAINES, INDUSTRIE
DU CANADA

électrique

Executive summary

Alberta's electricity and renewables industry is operating in an evolving environment guided by the *Climate Leadership Plan* and *Renewables Electricity Program*. A mandatory phase-out of coal-fired generation means the province's electricity sector must transition to lower-emission sources of generation to meet continuing demand while adhering to government policy and regulations.

Past research commissioned by Electricity Human Resources Canada (EHRC) focused on the transition from legacy to next-generation infrastructure and workforce. This report examines the landscape in which the next-generation workforce will find itself over the next five years.

Building on the 2011 *Power in Motion* report from EHRC, this current study looks at how the transitions underway — including the adoption of new and emerging technologies — will affect Alberta's electricity workforce. It provides new information on best practices for supporting workforces in transition along with insights into the growth of Alberta's renewable energy sector. It also serves as a call to action, supporting sector human resource management planning.

The landscape is changing

The Alberta electricity sector is complex, made up of 230 organizations representing numerous sub-sectors involved in power generation, transmission and distribution.¹ Today, 47% of the province's electricity is generated from coal, 40% from natural gas and 13% from renewable energy sources including wind, hydro and biomass.² It is estimated that 2,400 megawatts of coal-fired generation will be converted to natural gas by the early 2020s. By 2030, 30% of Alberta's electricity will come from renewable sources such as wind, hydro and solar. Alberta electricity sector employers are preparing to transition upwards of 3,000 workers who will be affected by these changes. Human resource management will play a significant role in supporting their efforts.

Increased reliance on renewables and new technology will also significantly alter the electricity sector, changing the nature of many occupations. In recent years, the province has begun to see advances in the use of smart grids, electrical vehicles, battery storage, community generation, LED lighting and drone technology. This marks a shift after more than a decade of relative stability and few technological changes. These changes call for more and higher-level skills, and the demand for workers with multi-disciplinary and cross-functional skills will only increase.

As yet, automation has not significantly affected Alberta's electricity workforce. With the exception of certain roles like power system operator and information systems analyst, the percentage of automation associated with tasks for key occupations was less than 10% between 2011 and 2017.

Almost all stakeholders consulted as part of this study identified challenges for the sector regarding technology, particularly to address risks associated with cybersecurity and other information technology requirements.

How stakeholders are preparing

Sector employers in Alberta are readying for the transition away from coal by enhancing current workers' skillsets, supporting employees in the pursuit of dual certification, and cross-training and upskilling workers for redeployment. Some have formalized initiatives for work transition through transition teams.

The Government of Alberta and sector employers also support recognized best practices for worker transitioning workers to new occupations, including:

- Redeployment of affected workers to other jobs
- Education, training and career counselling
- Financial support for transitions to other work or retirement
- Community support
- Program and service coordination

Meanwhile, academic institutions are introducing course modules and overview courses in renewable energy that provide training on new technologies. They are also delivering content on energy storage, smart grid technology, cybersecurity, drone technology, artificial intelligence and electric charging stations.

Meeting the demands of the evolving workforce

More than 13,000 people work in Alberta's electric power generation transmission and distribution industry,³ which accounts for 0.6% of Alberta's total employment in 2018.⁴ This industry is part of the overall utilities sector, which employs upwards of 21,000 workers and includes natural gas distribution and water, sewer and irrigation systems, and is expected to grow by 2.1% between 2017 and 2021.⁵

1 The definition of this industry is taken from the North American Industrial Classification (NAICS) 2211 covering Hydro-electric Power Generation, Fossil fuel (e.g. coal, gas, oil), Nuclear, and other including renewable sources like solar, wind and geothermal.
2 National Energy Board. (2018) 'Provincial and Territorial Energy Profiles – Alberta'. Available at: <https://www.neb-one.gc.ca/nrg/ntgrtd/mrkt/nrgsstmprfls/ab-eng.html> [Accessed 30 January 2018]
3 Data tables, 2016 Census. Available at: [http://www12.statcan.gc.ca/census-recensement/2016/dp-pd/dt-td/Rp-eng.cfm?TABID=2&LANG=E&APATH=3&DE-TAIL=0&DIM=0&FL=A&FREE=0&GC=0&GK=0&GRP=1&PID=110695&PRID=10&PTYPE=109445&S=0&SHOWALL=0&SUB=0&Temporal=2017&THEME=124-&VID=0&VNAMEE=&VNAMEF="](http://www12.statcan.gc.ca/census-recensement/2016/dp-pd/dt-td/Rp-eng.cfm?TABID=2&LANG=E&APATH=3&DE-TAIL=0&DIM=0&FL=A&FREE=0&GC=0&GK=0&GRP=1&PID=110695&PRID=10&PTYPE=109445&S=0&SHOWALL=0&SUB=0&Temporal=2017&THEME=124-&VID=0&VNAMEE=&VNAMEF=)
4 Statistics Canada, Labour Force Survey, CANSIM Table 282-0008, 2017. Available at: <http://www5.statcan.gc.ca/cansim/a47> [Accessed April 5, 2018]
5 Government of Alberta. (2018) 'Industry Profiles 2018: Utilities Industry'. Available at: <http://work.alberta.ca/documents/industry-profile-utilities.pdf> [Accessed 3 February 2018]

Designing, constructing and maintaining Alberta's electricity infrastructure as it moves forward involves engaging most electrical occupations as well as a group of support tradespeople and specialists. EHRC's 2011 LMI divided the industry's direct employees into two groups: occupations in the electricity sector (a total of 19, including managers, engineers, technicians and the skilled trades workers) and other relevant support workers. The analysis that was part of this study focused on an expanded set of electricity sector occupations and their associated roles managing, maintaining and operating the facilities within Alberta's changing energy landscape. That expanded set of occupations included the integrations of cybersecurity specialists and smart grid, wind technicians, wind station operators and solar PV installers.

Table 1 tracks employment in 23 electricity industry occupations from 2017 to 2022. Estimates for each occupation in Alberta are projected to 2022 using a weighted average of the annual rate of change in output (measured by GDP) and investment in the sector. As illustrated, employment in Alberta's electricity and renewable industry by key occupation is expected to grow at a rate of 0.5% annually, with a cumulative increase of 2.5% between 2017 and 2022. This rate reflects the transition from coal to new forms of electricity generation, such as natural gas and renewables. The highest rates of employment growth are expected for software engineers and designers and engineering managers. Demand for highly skilled workers will continue to increase as more technological improvements are researched, developed and applied to the sector.

TABLE 1 – Current and forecasted employment in Alberta's electricity industry by occupation, 2017 and 2022

Occupation	2017	2022	% Growth 2017–2022*	Average annual Growth Rate
Engineering managers	131	135	3.0%	0.6%
Construction managers	74	75	1.4%	0.3%
Utilities managers	599	614	2.5%	0.5%
Civil engineers	158	162	2.5%	0.5%
Mechanical engineers	252	259	2.8%	0.6%
Electrical and electronics engineers	999	1,024	2.5%	0.5%
Information systems analysts and consultants (includes cybersecurity)	363	372	2.5%	0.5%
Database analysts and data administrators	53	54	1.9%	0.4%
Software engineers and designers	21	22	4.8%	1.0%
Computer programmers and interactive media developers	53	54	1.9%	0.4%
Civil engineering technologists and technicians	58	59	1.7%	0.3%
Mechanical engineering technologists and technicians (includes wind technicians)	37	38	2.7%	0.5%
Electrical and electronics engineering technologists and technicians	315	323	2.5%	0.5%
Engineering inspectors and regulatory officers	32	32	0.0%	0.0%
Computer network technicians	79	81	2.5%	0.5%
Contractors and supervisors, electrical trades and telecommunications occupations	163	167	2.4%	0.5%
Electricians	16	16	0.0%	0.0%
Power system electricians	410	420	2.4%	0.5%
Electrical power line and cable workers	1,109	1,137	2.5%	0.5%
Construction millwrights and industrial mechanics	216	221	2.3%	0.5%
Residential and commercial installers and servicers (includes solar PV installers)	11	11	0.0%	0.0%
Public works maintenance equipment operators and related workers (includes utility arborists)	74	75	1.4%	0.3%
Power engineers and power systems operators (includes power system and power station operators, smart grid specialists, wind technicians and wind station operators)	936	959	2.4%	0.5%
Electricity sector occupations	6,159	6,310	2.5%	0.5%
Other occupations**	7,741	7,940	2.6%	0.5%
Total	13,900	14,250	2.5%	0.5%

Source: C4SE forecast

* % growth 2017-2022 reflects total growth from 2017 to 2022.

** Other occupations includes all occupations in the electricity sector not listed in the table.

Despite sector growth, women and younger workers remain underrepresented compared to all other industries in Alberta. Contractors and consultants make up just under a quarter of all sector employees.

Key workforce issues

Based on the research conducted to prepare this report, the following are the main issues facing Alberta's electricity sector over the next five years:

- **Diversity:** Diversity, which concerns those characteristics that make individual workers different from one another (e.g., race, gender, ethnicity), is an important issue within the electricity industry. Lifestyle, location, education or training requirements and work culture can act as barriers to entry and transition for underrepresented groups, including women, visible minorities and Indigenous people. Despite informal work to ensure workforce diversity, only 20% of electricity industry employers surveyed have or are working to develop a formal diversity strategy or plan to broaden representation of these groups. More attention is therefore needed to engage workers of varying cultures, abilities and genders in the sector.
- **Aging workforce:** As older workers retire, the sector loses workers with years of experience and training that cannot be easily replaced. The current retirement rate for the sample of electricity industry employers surveyed was 2% and is expected to increase to 2.5% in 2019 and 6.2% in 2022. The majority of employers surveyed (87%) did not have early retirement programs or other incentives to alter retirement patterns for their organization.
- **Succession planning and knowledge transfer:** Succession planning is most commonly in place for managers and supervisors (73%) and least for information and communication technology occupations (20%) and renewable energy occupations (20%). Knowledge transfer planning is most commonly in place for managers and supervisors (73%) and least for renewable energy occupations (27%). For management positions, corporations are completing talent assessments with internal staff and implementing development plans for high-performing employees to address succession.
- **Staff turnover and retention:** Due to the most recent economic downturn and resulting low worker turnover, employers are tending to focus on worker retention versus recruitment. Retention strategies include promoting worker wellness, work-life balance, flexible benefit packages and accommodating flexible work schedules. The voluntary separation rate for electricity industry employers in Alberta who reported such departures as part of this study averaged 4%, and was most frequently for renewable energy jobs (8%).
- **Recruitment:** In 2017, the most difficult vacancies for electricity industry employers in Alberta to fill included managers, solar photovoltaic installers, smart grid specialists, and information and communication technology personnel. For the most part, these roles should become easier to fill by 2022 — with the exception of ICT positions. Vacant positions for electrical and electronics engineers, construction managers, and information and communication technologists — including cybersecurity specialists — are likely to become harder to fill.
- **Training:** Employers in the sector are identifying new and emerging competency requirements and building internal talent to meet future needs. Staff receive training through a variety of methods, including formalized courses, job shadowing, mentoring, project-based learning and cross-training. Depending on the organization, talent is also supported through leadership training and soft skills development, as well as post-secondary training and apprenticeship (including dual certification in the trades).

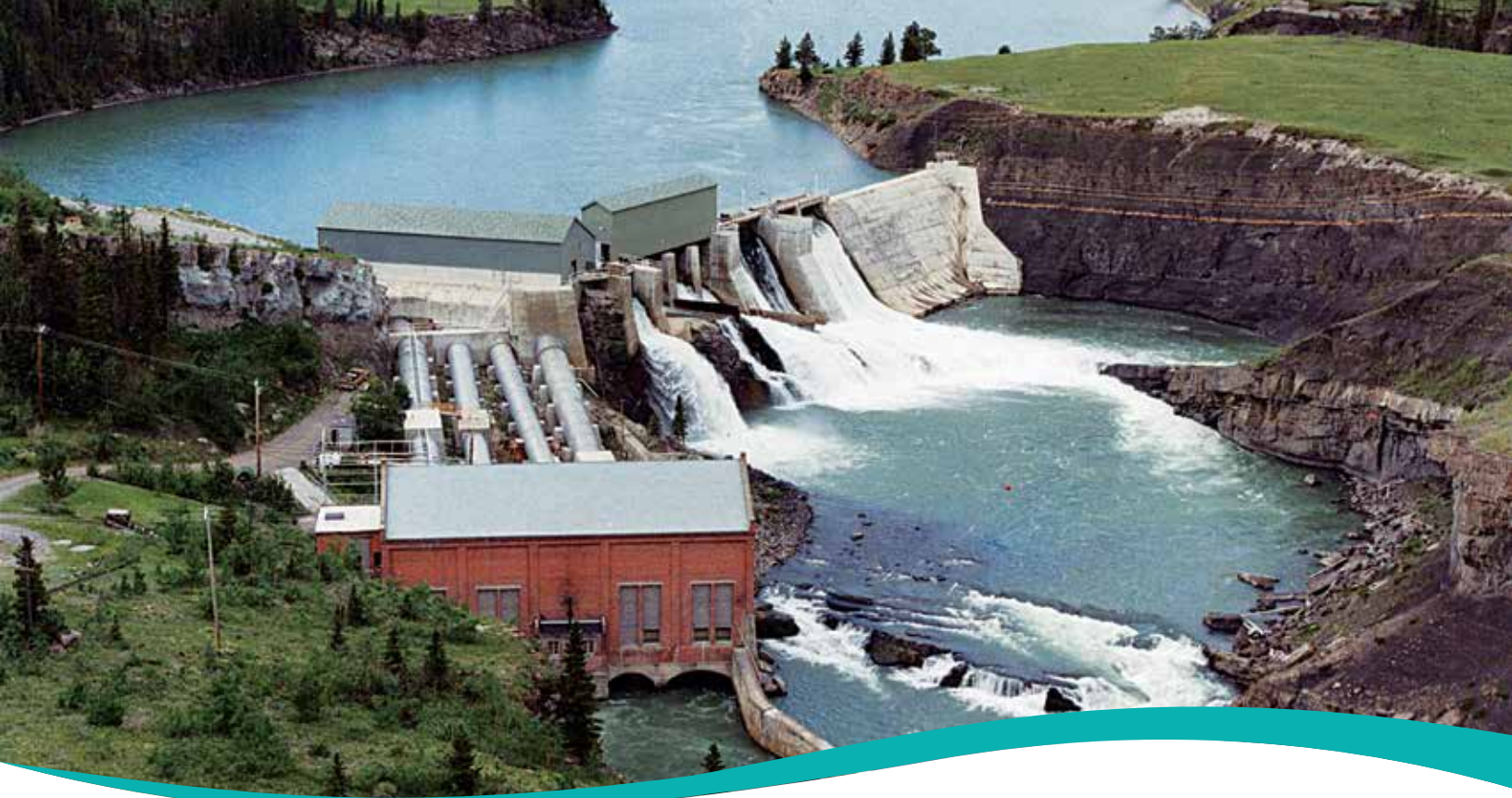
- **Future training needs:** Three trends are converging to produce game-changing disruptions in the electricity sector: electrification of large sectors of the economy such as transportation; decentralization through distributed energy resources, distributed storage, distributed generation, demand flexibility and energy efficiency; and digitalization of both the grid and other digital network technologies. Employers foresee increased need for both technical and soft skills in all occupations to be prepared in advance of these changes.

Key education and training issues

The electricity and renewables sector workforce is tied directly to three streams of post-secondary education: 1) undergraduate and graduate engineering programs, 2) college programs for engineering technicians and technologists, and 3) apprenticeships. Key findings related to the supply of new employees for the electricity and renewables sector workforce include:

- **Student recruitment:** Electricity programming generally does not have specific outreach strategies for attracting students to the electricity and renewable energy programs: outreach occurs for the institutions overall. Where formal outreach strategies do exist, they tend to target international (43%) and Indigenous students (43%), visible minorities (29%), female students (29%) and students with disabilities (14%).
- **Student enrollment:** Institutions have seen generally steady or increasing enrollment in electricity-related programming over the years as a result of program promotion and the job opportunities available to graduates. Growing recognition of the renewable energy industry has increased enrollment in related educational streams. These include training programs for electricians, electrical engineers, wind turbine technicians, power system analysts and solar installation. Institutions did not report significant differences in male versus female enrollments in STEM (science, technology, engineering, mathematics) or clean energy programs. However, between 2012 and 2016, fewer individuals entered skilled trades apprenticeship programs relevant to the electricity and renewables sector — but those who did had higher rates of completion than in the past.⁶
- **Student retention rates:** Student retention is influenced mainly by interest in program content, which in turn affects degree completion. Quality instruction and flexible program delivery also support degree completion. Completion rates in electricity/renewable sector programs are historically similar to or higher than other programs, with minimal differences by gender.
- **New programming:** Enrollment in renewable energy programming continues to grow. Over the past five years, demand has also risen for graduates who are cross-trained or hold more than one certification — to support interdisciplinary work in the energy sector. There is a need for joint business and trades training because many trades work as small contractors servicing the electricity sector; as a result, some institutions have developed multidisciplinary curricula (e.g., electrical courses for mechanical engineers, incorporating business or architectural components into renewable energy programs, etc.). Future employees will need to be continuous learners, learning quickly and more dynamically as provincial/federal energy policies continue to evolve and new technologies change how work is done. Modular training can support this continuous learning by allowing

⁶ Programs include engineering, certified engineering, industrial instrument technicians, power station operator, engineering certification, instrumentation and control certification, and solar panel technician.



Horseshoe Facility, courtesy of TransAlta Corporation

people already in the middle of their careers to upskill. It also allows workers to continue contributing to the labour force while acquiring skills for the transitioning operational environment.

Furthermore, incorporating “design thinking” into university curricula will provide opportunities to study problems and develop solutions taking multiple perspectives into account, including consumer preferences, social benefits, technology and economics. Students need to learn how to challenge preconceptions, add new technologies into the electrical grid/system (e.g., distributed energy/community energy, storage, electric vehicles and blockchain), and bring context and ethical judgment to workplaces that depend increasingly on artificial intelligence.

- **Soft skills:** The sector has a growing need for workers with soft skills such as communication, leadership, project management, critical thinking and problem solving. Alberta’s educational institutions are responding by integrating soft skills into programming through team and group work, capstone projects, formal courses, tutorials, support programs and project and lab work. Work ethics, teamwork and leadership skills are commonly taught informally, if at all, while written and verbal communication, time management and problem solving are formally taught by some institutions.

Recommendations

The following recommendations are made to support Alberta’s changing electricity and renewables sector workforce:

1. Update labour market and career information regularly

For employers to have a suitable supply of workers with the correct mix of skills, labour market and career information must be updated frequently to reflect the changing structure of the sector and future job opportunities. At the same time, outreach programs should be developed to draw students to relevant academic programs.

2. Engage in united action to support education and training

Government, electricity industry employers and academic institutions in Alberta will need to work together to understand and define emerging occupations and to prepare appropriate training or retraining pathways. These pathways could include adopting work-integrated learning programs or promoting work placements and co-op educational programs.

3. Encourage apprenticeship

Funding programs that incentivize employers to hire first-year apprentices should be researched and implemented to support the transition of new workers into the emerging renewable sector.

4. Develop future-ready regulations and standards

Regulations and formalized industry standards for renewable energy occupations — based on an understanding of how the requisite skills will be practically applied in the workplace — are needed to facilitate the evolution of Alberta’s electricity sector workforce. Stakeholders recommend developing occupational standards, certifications and essential skills profiles for new and emerging occupations, as well as establishing common training outcomes that align with them.

5. Embrace diversity

Future skill gaps and workforce needs may be filled by hiring from non-traditional labour pools. Opportunities also exist to recruit more Indigenous workers, as much of the work in renewable energy takes place in rural locations and sometimes in close proximity to Indigenous communities. Employers should aim to establish more formal diversity hiring strategies, particularly for women, Indigenous peoples, and visible minorities.

6. Establish succession planning, retirement and pension-bridging programs

A large retirement cohort will require that employers implement comprehensive succession planning, retirement or pension-bridging programs. These efforts will not only help workers transition as a result of the coal phase-out but also ensure replacement workers possess the right skills and experience to manage the loss of older workers.

Acknowledgements

A project such as this requires the help and participation of numerous individuals and organizations. We express our sincere gratitude and appreciation to the following individuals who participated on the Alberta LMI Steering Committee, as well as to the Province of Alberta for its work with the Government of Canada to provide employment support programs and services.

Lisa Nadeau

Chair, Steering Committee
VP Human Resources
Alberta Electric System Operator

Richard Lemaire

Industry Workforce Partnerships Officer
Government of Alberta

Heide Stauffer-Hill

Senior Advisor
AltaLink Management Ltd.

John Briegel

Business Manager Local 254
IBEW Local Union 254

Patrick Bateman

Director of Policy & Market Development
Canadian Solar Industries Association

Lynne Allan

Dean, MacPhail School of Energy
Southern Alberta Institute of Technology

Evan Wilson

Regional Director, Calgary
Canadian Wind Energy Association

Lora Brenan

Managing Director, HR
TransAlta Corporation

Angela Bourbonnais

Senior Manager, Talent Management
Capital Power Corporation

Hamid Zareipour

Professor, Department of Electrical and Computer Engineering
University of Calgary

Eric Fadden

President/Owner, Electri-Can Installations Ltd.
Rep., Electrical Contractors Association of Alberta

Michelle Branigan

CEO, Electricity Human Resources Canada

Jim Kellet

Chair, Electricity Human Resources Canada

Denise Burke

HR, Employee and Labour Relations Specialist
ENMAX Corporation

Julia Aitken

Project Manager, Electricity Human Resources Canada

Research Consultants

EHRC would also like to thank our research consultants

R.A. Malatest & Associates Ltd.

300-10621 100th Ave.
Edmonton, AB T5J 0B3

Centre for Spatial Economics

336 Bronte St. S.
Milton, ON L9T 7W6