



Southeast Alberta Energy Diversification Report

Our Region, Our Jobs, Our Communities

March 2017

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Sandra Moore

March 2017

Published by:



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Website: www.edalliance.ca Email: info@edalliance.ca

In collaboration with:



Funding provided by:



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Recommended Citation:

Moore, Sandra. (2017). Southeast Alberta energy diversification report: Our region, our jobs, our communities. *Economic Development Alliance of Southeast Alberta*: Medicine Hat, Alberta.

The **Economic Development Alliance (EDA) of Southeast Alberta** is a non-profit organization representing the economic development interests of the Town of Redcliff, Cypress County, Town of Bow Island, and County of Forty Mile. The EDA provides relevant industry knowledge and support to companies in four key sectors: Agriculture and greenhouses; Advanced technology and manufacturing; Energy including renewables; and Tourism. The EDA was represented by Executive Director, Theresa Hardiker. **For more information, visit www.edalliance.ca**

Medicine Hat College (MHC) annually provides education that prepares over 8,000 learners for further studies, careers, and life. For over 50 years MHC has been committed to the communities of Southeast Alberta with a main campus in Medicine Hat and an additional campus in Brooks. MHC is a proud member of Campus Alberta and welcomes partnerships to benefit our students and communities. MHC was represented by the Manager of Business Development, Tracy Stroud. **For more information, visit www.mhc.ab.ca**

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ACKNOWLEDGEMENTS

We would like to thank each of the project partner organizations for their feedback and support. We would also like to thank **Alberta Labour** for providing funding to the EDA to develop this report.

The author would also like to thank Michelle Amos for editing, and acknowledge the input of the many individuals who contributed to the development of this report. To respect the anonymity of those who participated in such candid discussions, no names or organizations will be directly quoted, apart from any data or information discussed in this report that is derived from published documents or websites.

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REPORT SUMMARY

For over a century, non-renewable energy sources from fossil fuels have produced most of Alberta's energy. Renewable energy sources – namely solar and wind – are increasingly being utilized to diversify Alberta's energy supply. As solar and wind energy projects increase in Alberta, new economic and employment opportunities are being created.

Broad estimates and general equations are often used to quantify the potential economic and employment impacts of large-scale solar and wind energy projects in Alberta. However, limited analysis exists on the impacts associated with these projects in specific regions within Alberta. Hence, the purpose of this report is to **explore the potential direct, indirect, and induced economic and employment-related impacts of proposed large-scale solar and wind projects in Southeast Alberta (SE AB).**

This report has been developed based on an analysis of proposed solar and wind projects for SE AB, a review of the literature on solar and wind energy projects in Alberta, and a series of discussions with diverse stakeholders. From this information, the following four themes emerged:

1. **OPPORTUNITY** – The opportunity exists for SE AB to emerge as a leader in solar and wind energy due to the region's vast solar and wind resources, extensive energy history, abundance of skilled energy workers, and the number of jobs that proposed solar and wind projects in the region could create.
2. **AWARENESS** – Greater awareness is needed throughout SE AB to inform communities, landowners, and job seekers of the broad impacts associated with investing in solar and wind energy projects.
3. **READINESS** – As an increase in solar and wind energy projects is anticipated in SE AB, it is important for stakeholders in the region to develop a prepared workforce for these projects.
4. **INNOVATION** – Capitalizing on these opportunities, raising awareness, and preparing a workforce for proposed solar and wind projects in SE AB may facilitate innovation in renewable energy and attract additional demonstration projects, research and development, distribution centers, training, and manufacturing facilities to the region.

This *Southeast Alberta Energy Diversification Report: Our Region, Our Jobs, Our Communities* indicates that **the increased development of solar and wind projects in SE AB may have significant employment and economic impacts for the region.** Over the next few years, as both large and small-scale solar and wind energy projects are developed, thousands of permanent and temporary jobs may be created, hundreds of local contractors may be contracted, and millions of dollars may be invested into local economies.

Investing in solar and wind energy will not only create employment opportunities and help diversify the region's economy, but may also lead to the emergence of SE AB as a provincial and national leader in solar and/or wind energy development and innovation.

INTRODUCTION

Alberta is currently experiencing high unemployment rates associated with low global oil and gas prices and production levels. Over the last two years, many oil and gas companies in Alberta have ceased or decreased their operations, leaving tens of thousands of Albertans unemployed and many worried about the province's energy and economic future. SE AB relies heavily on the oil and gas industry and is one of the regions in Alberta that has been hit the hardest by the oil and gas downturn.

As unemployment rates remain high in Alberta, diversifying Alberta's energy sector may create new jobs and supplement Alberta's growing energy needs. Currently 18.9% of Canada's primary energy comes from renewable sources; **solar photovoltaic and wind energy are the fastest growing sources of electricity in Canada**¹. In June of 2016, CBC reported that over the next decade up to \$50 billion dollars will be invested into renewable energy in Alberta and Saskatchewan².

A recent report by the federal government think tank *Policy Horizons Canada* states that the global dominance of fossil fuels could wane faster than previously expected, with renewable energy being cheaper than non-renewable energy in the next 10-15 years, which would then threaten Canada's status as an "energy superpower"³. Alberta is often referred to as an energy superpower, but the commodity nature of non-renewable fossil fuels leads to unpredictable cycles of boom and bust. However, recent plans, policies, and regulations from Alberta's government for encouraging renewable energy development in Alberta could help supplement the provinces' energy sources and lead to a more stable energy economy.

Alberta's *Climate Leadership Plan* illustrates the Alberta government's commitment to developing the provinces' renewable energy sector. This plan involves phasing out coal, diversifying energy sources with at least 30% of electricity coming from renewable energy by 2030, keeping the cost of renewables down, and reducing greenhouse gas emissions (GHGEs) from coal-fired electricity⁴. This plan shows the governments' commitment to creating new opportunities and getting Albertans back to work.

In 2016, 41% of proposed solar and wind projects in Alberta were in SE AB⁵.

The growing realization that solar and wind energy are emerging industries in Alberta led to a collaboration between **Alberta Labour**, the **Economic Development Alliance (EDA) of SE AB**, and **Medicine Hat College (MHC)** to explore the potential employment-related impacts of these industries in SE AB. A local research and development consultant, Sandra Moore (the author), from Sandra Moore Consulting, was contracted to review the proposed solar and wind projects for SE AB, the available literature on renewable energy in Alberta, and engage in discussions with stakeholders throughout SE AB to prepare this report.

¹ Natural Resources Canada. (2016). About renewable energy. <https://www.nrcan.gc.ca/energy/renewable-electricity/7295>

² CBC News. (2016). Billions expected to be spent on green energy in Alberta, Saskatchewan <http://www.cbc.ca/beta/news/business/alberta-saskatchewan-renewable-energy-wind-solar-1.3612775>

³ Robson Fletcher (2016). Canada's energy superpower status threatened as world shifts off fossil fuel, federal think-tank warns. CBC News Calgary. <http://www.cbc.ca/news/canada/calgary/canada-super-power-oil-decline-renewables-policy-horizons-1.3601400>

⁴ Gridworks Energy Solar Training. (2016). Course schedule. <http://www.gridworksenergy.com/pdf/courseschedule.pdf>

⁵ See Figure 2.

REPORT METHODOLOGY

Defining Southeast Alberta

The boundaries of the geographical region referred to as SE AB in this report are defined using the following four *Alberta Electric System Operator* (AESO) planning areas (circled in **Figure 1.**).

- **Area 4** includes Medicine Hat, Schuler, and Seven Persons
- **Area 47** includes Brooks and Bassano
- **Area 48** includes Jenner and Oyen
- **Area 52** includes Vauxhall, Burdett, and Bow Island

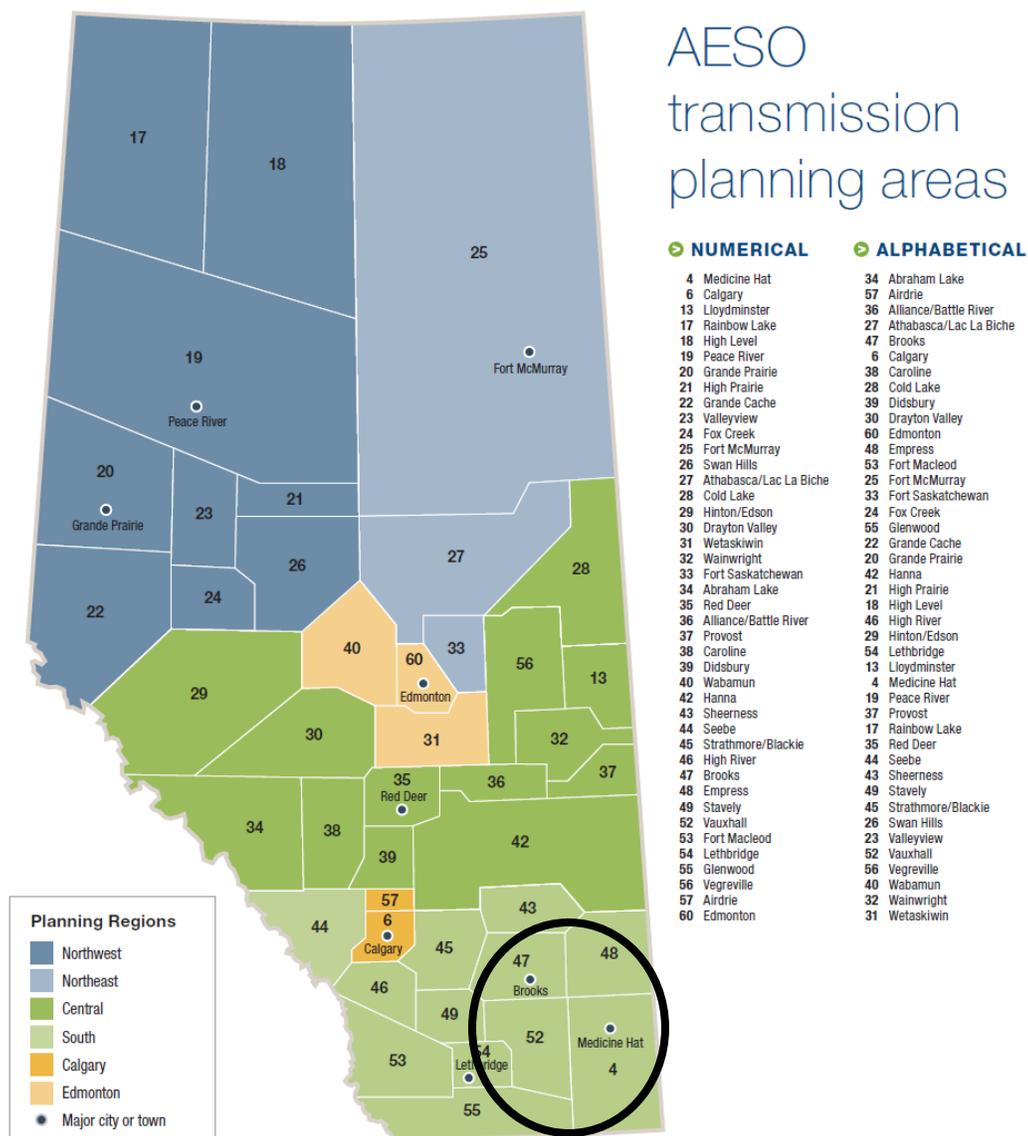


FIGURE 1. AESO Transmission Planning Areas⁶

⁶ AESO (2016). AESO transmission planning areas. <https://www.aeso.ca/assets/Uploads/PlanningRegions-Nov26-PRINT.pdf>

Proposed Solar and Wind Projects for Southeast Alberta

Though there are numerous types of renewable energy projects currently operating in, or proposed for, Alberta (geothermal, biomass, co-generation, etc...), this report will focus on the **35-proposed solar and wind energy projects over 1 megawatt⁷ (MW) in SE AB** as identified on the AESO *Connection Project List* as of December 31, 2016. A summary of these 35 wind and solar projects is provided in **Appendix A**.

As of December 31, 2016, the AESO *Connection Project List* listed 85-proposed projects over 1MW for solar (33) and wind (52) energy throughout Alberta (**Figure 2**).

- **41% of all proposed WIND AND SOLAR projects in Alberta are in SE AB** (35 out of 85 total);
- **37% of proposed WIND projects in Alberta are in SE AB** (19 out of 52 total); and,
- **48% of proposed SOLAR projects in Alberta are in SE AB** (16 out of 33 total).

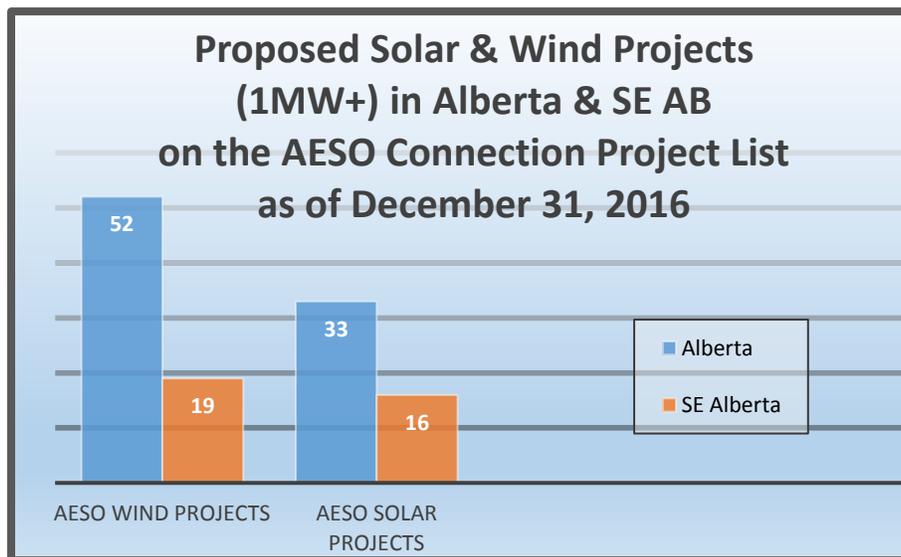


FIGURE 2. Proposed Solar & Wind Projects Over 1MW on the AESO Connection Project List December 31, 2016.

Energy Generating Capacity of Proposed Solar and Wind Projects

In Alberta, a total of **9,781.5 MW** of energy could be generated from these 85-proposed solar (1,461.1 MW) and wind (8,320.4 MW) projects.

In SE AB, a total of **3,720.6 MW** of energy could be generated from these 35-proposed solar (640 MW) and wind (3,080.6) projects.

Of the total 85-proposed wind and solar projects in Alberta, the 35-proposed **SE AB projects account for:**

- 38% of the total MW generation for all proposed **SOLAR AND WIND** energy projects in Alberta.
- 44% of the total MW generation for all proposed **SOLAR** projects in Alberta.
- 37% of the total MW generation for all proposed **WIND** projects in Alberta.

⁷ MW = a unit of power equal to one million watts.

Impacts of These Projects for Southeast Alberta

From September to November of 2016, to develop a qualitative understanding of the impacts these 35-proposed solar and wind energy projects would have on SE AB, the author conducted a review of available information on these projects and engaged with diverse stakeholders including land agents, project developers, recruiters, project managers, municipal and provincial representatives, development organizations, and advocacy groups (all hereinafter referred to as “**stakeholders**”).

To develop a quantitative understanding of the impact these 35-proposed solar and wind energy projects would have on SE AB the author used formulas from the *Canadian Solar Industries Association* (CanSIA) and the *Canadian Wind Energy Association* (CanWEA) to quantify the employment and economic impacts (see **Table 4.** on page 17).

The *Southeast Alberta Energy Diversification Report: Our Region, Our Jobs, Our Communities* uses this qualitative and quantitative information to explore, primarily from stakeholder perspectives, the direct, indirect, and induced (**Table 1.**) employment and economic impacts of proposed solar and wind energy projects in SE AB.

Direct impacts	The immediate impacts directly related to the project being evaluated, such as employment of workers and tax revenues for communities.
Indirect impacts	The additional impacts that stem from purchases of goods and services required for the project being evaluated, such as purchases from suppliers.
Induced impacts	The increase in spending of earnings by those directly or indirectly impacted by the project being evaluated, such as increased personal spending for goods and services by employees of the direct and indirect businesses involved in the project.

TABLE 1. Definitions of Direct, Indirect, and Induced Impacts

This report is divided into **FOUR** main sections.

1. **The Alberta Overview** provides an overview of solar and wind energy in Alberta.
2. **Energy Diversification in Southeast Alberta** explores the four areas that emerged from the qualitative and quantitative analysis mentioned earlier in this section;
 - Opportunity
 - Awareness
 - Readiness
 - Innovation
3. **Key Findings** summarizes the main points from these four areas.
4. **Recommendations** lists the author’s suggestions for building on the key findings and utilizing the information collected in this report to capitalize on the development of the emerging solar and wind industries for economic development and job creation in SE AB.

THE ALBERTA OVERVIEW

Alberta is a national and global leader in fossil fuel energy development. Over 160,000 jobs in Alberta (or 6.9% of total employment) are in the energy sector, and 21.7% of Alberta's Gross Domestic Product (GDP) is attributable to the energy sector, the highest percentages associated with energy in any province or territory in Canada⁸. In the past, Alberta's energy sector has focused on non-renewable fossil fuel energy sources, while barely utilizing Alberta's abundant renewable energy resources such as solar and wind.

Alberta's solar resource is 25% better than Ontario's and 30% better than Germany's⁹, yet Alberta has not capitalized on this energy resource. Dr. James Sandercock, Chair of Alternative Energy Technologies in the *Northern Alberta Institute of Technology (NAIT) School of Sustainable Building and Environmental Management*, asserts that Alberta is lagging behind other provinces in sustainable energy. Ontario has installed solar power generators with several thousand MWs, whereas in 2016 Alberta's solar power generators amount to a mere 9 MWs¹⁰.

As Alberta's annual demand for energy rises, more energy will be required. A 2014 report states that AESO expects peak electrical demand in Alberta to hit 18,194 MW by 2032, up from the 10,599 MW peak demand in 2012¹¹. Not only will Alberta require more energy, but the province will also require increased transmission assets. In the coming years, multiple transmission lines will be erected throughout southern Alberta¹² and \$13 to 15 billion will be invested into transmission assets¹³.

Fossil fuels, such as coal from Alberta's 18 coal power units, provide approximately 85% of the power to Alberta's energy grid; these coal power units also contribute more than half of Canada's total carbon pollution from electricity generation¹⁴. Based on recommendations from the Climate Change Advisory Panel, the Alberta government released the **Climate Leadership Plan** in late 2016¹⁵. This plan includes a focus on reducing GHGs, ending pollution from coal-generated electricity by 2030, and developing more renewable energy. The plan also outlines that renewable energy will replace one-third of Alberta's coal generating capacity, and natural gas will replace the other two-thirds, by 2030.

⁸ Natural Resources Canada. (2016). Energy fact book 2016-2017.

http://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/energy/pdf/EnergyFactBook_2016_17_En.pdf

⁹ KPMG. (2014). Alberta's future energy mix: Exploring the potential for renewables.

<https://www.kpmg.com/Ca/en/IssuesAndInsights/ArticlesPublications/Documents/KPMG-Issue3-Alberta-FINAL-web-Jul2014.pdf>

¹⁰ Doug Johnson. (2016). A look into the role renewable energy could play in Alberta's job market and economy. Edmonton Examiner.

<http://www.edmontonexaminer.com/2016/03/30/a-look-into-the-role-renewable-energy-could-play-in-albertas-job-market-and-economy>

¹¹ KPMG. (2014). Alberta's future energy mix: Exploring the potential for renewables.

<https://www.kpmg.com/Ca/en/IssuesAndInsights/ArticlesPublications/Documents/KPMG-Issue3-Alberta-FINAL-web-Jul2014.pdf>

¹² Alta Link. (2016). Southern Alberta transmission reinforcement: Overview. <http://www.altalink.ca/projects/view/192/southern-alberta-transmission-reinforcement>

¹³ KPMG. (2014). Alberta's future energy mix: Exploring the potential for renewables.

<https://www.kpmg.com/Ca/en/IssuesAndInsights/ArticlesPublications/Documents/KPMG-Issue3-Alberta-FINAL-web-Jul2014.pdf>

¹⁴ James Glave and Ben Thibault. (2014). Power to change: How Alberta can green its grid and embrace clean energy. Pembina Institute.

<http://www.pembina.org/reports/power-to-change-pembina-cec-2014.pdf>

¹⁵ Alberta Government. (2016). Climate leadership plan. <https://www.alberta.ca/climate-leadership-plan.aspx>

SOLAR ENERGY IN ALBERTA

Alberta's solar photovoltaic (PV) industry is small, but has been growing steadily since 2009 when micro-generation regulations came into effect removing many regulatory barriers and costs¹⁶. CanSIA estimates that by 2030 solar electricity could meet 7.5-15% of Alberta's electricity needs and result in the construction of 2,900-4,300 MW of new installed solar capacity¹⁷. In 2016, the *Solar Energy Society of Alberta* (SESA) stated that Alberta was the only province or state in North America with no specific incentive programs for solar energy¹⁸. However, this changed near the end of 2016 when the Alberta government announced a solar investment of \$5 million for municipalities and farmers to help build Alberta's renewable energy sector and create jobs¹⁹.

In response to the release of the Alberta government's 2016 budget CanSIA President and CEO John Gorman stated,

Not only will Alberta's climate leadership reap environmental benefits and recognition, every one gigawatt ^[20] of solar electricity generation capacity installed represents more than 12,500 construction jobs and \$2 billion dollars of investment in the province.²¹

The high costs of solar infrastructure have been an impediment to developing utility-scale projects. However, solar costs have rapidly decreased in recent years with the United States Department of Energy stating a **64% decrease in utility-scale solar PV costs** from 2008 to 2014²². Less expensive solar energy systems facilitate projects such as **the largest solar energy farm in Western Canada** built recently on the *Green Acres Hutterite Colony* (population 80 people) just outside of Bassano in SE AB²³. This 2MW system cost \$4.8 million and has over 7,600 south-facing solar modules lined up in rows (**Figure 3.**).

In 2015, this single solar energy project represented 25% of Alberta's total solar energy generation of 8 MW. David Vonesch, Chief Operating Officer at SkyFire Energy, the company responsible for installing the Green Acres solar system, states that SE AB is one of the best solar producing areas in Canada,

systems installed in SE AB will produce approximately 50-60% more than similar systems installed in Germany,

where there is the most installed solar in the world (**Figure 4.**)²⁴.

¹⁶ Lakeland College. (2016). Is solar PV worth the cost? *Limitless: A celebration of research and innovation at Lakeland College*. Lakeland College: Lakeland, AB.

¹⁷ CanSIA. (2016). Alberta's Budget 2016 creates jobs, decarbonizes and diversifies energy sector. http://myemail.constantcontact.com/Alberta-s-Budget-2016-Update.html?soid=1102701457567&aid=rWs0_P1NvRY

¹⁸ Solar Energy Society of Alberta. (2016). FAQ's. <https://solaralberta.ca/content/faqs>

¹⁹ Government of Alberta. (2016). Alberta is leading on climate change and creating jobs with solar power. <http://www.alberta.ca/release.cfm?xID=40188F89C489E-F1D6-D4E8-995432A76BC9E7A4>

²⁰ 1 gigawatt (GW) = 1,000 MW

²¹ CanSIA. (2016). Alberta's Budget 2016 creates jobs, decarbonizes and diversifies energy sector. http://myemail.constantcontact.com/Alberta-s-Budget-2016-Update.html?soid=1102701457567&aid=rWs0_P1NvRY

²² U.S Department of Energy. (2016). Revolution Now 2016. https://www.energy.gov/sites/prod/files/2016/09/f33/Revolution%20Now-%20One%20Pager_1.pdf

²³ Dodge, D. & Thompson, D. (2015). Green Acres, The Largest Solar Farm in Western Canada. Green Energy Futures. <http://www.greenenergyfutures.ca/episode/hutterite-solar-western-canada-biggest>

²⁴ Dodge, D. & Thompson, D. (2015). Green Acres, The Largest Solar Farm in Western Canada. Green Energy Futures. <http://www.greenenergyfutures.ca/episode/hutterite-solar-western-canada-biggest>



FIGURE 3. Green Acres Solar Farm
- Bassano, Alberta²⁵

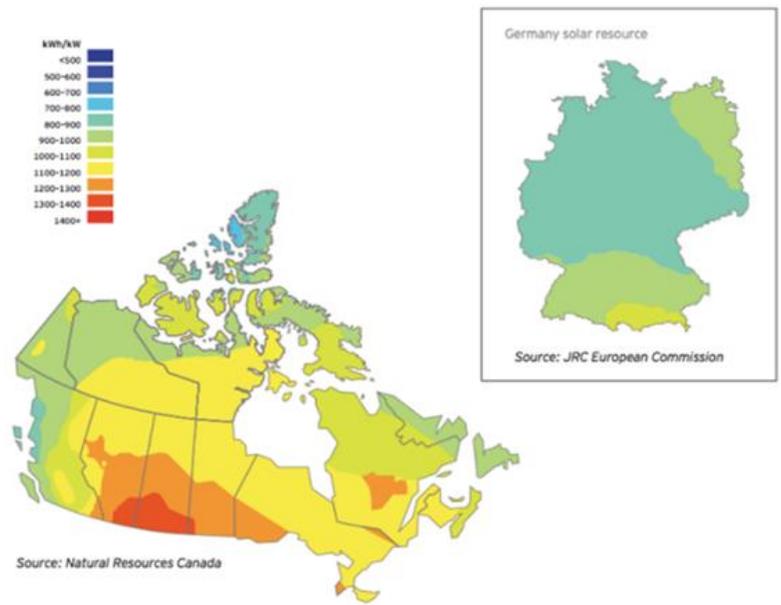


FIGURE 4. Solar Resources Canada vs. Germany

WIND ENERGY IN ALBERTA

Large-scale wind energy projects have a longer history in Alberta than large-scale solar projects. **The Cowley Ridge wind project in Pincher Creek, Alberta^{26,27} was Canada’s first commercial wind farm.** This 57-turbine project began in the early 1990s in response to utilities deregulation from the Alberta government to encourage independent power generation. This site had the capacity to generate 16 MW of energy until it completed its life cycle and was decommissioned by TransAlta in 2016.

Since Cowley Ridge was developed in the early 1990s, Alberta now has the third largest installed wind generation capacity in Canada²⁸. Costs for wind energy projects have also decreased since Cowley Ridge was built; **since 2008 costs for land-based wind projects have decreased by 41%**²⁹. Today, one large wind turbine is anywhere from \$2-4 million, and the cost to develop a 300 MW wind farm is around \$600 million³⁰.

From an exploration of information available online, **Table 2.** lists a few of the large-scale wind projects currently in operation in Alberta, and the associated company-identified impacts of these projects.

²⁵ SkyFire Energy (2016). <http://www.skyfireenergy.com/case-study-business/2-mw-solar-farm-bassano-alberta/>

²⁶ TransAlta. (2016). Cowley Ridge. <http://www.transalta.com/facilities/plants-operation/cowley-ridge>

²⁷ SAAEP. (n.d). Harness the wind of Southern Alberta. <http://www.saaep.ca/WindPower.pdf>

²⁸ Alberta Electric System Operator. (2015). AESO 2015 long-term transmission plan. http://www.aeso.ca/downloads/2015_Long-termTransmissionPlan_WEB.pdf

²⁹ U.S Department of Energy. (2016). Revolution now 2016. https://www.energy.gov/sites/prod/files/2016/09/f33/Revolution%20Now-%20One%20Pager_1.pdf

³⁰ David Dodge and Dylan Thompson. (2016). Financing critical for renewable energy projects. <http://www.greenenergyfutures.ca/episode/canada-germany-renewable-financing>

SAMPLE OF OPERATIONAL LARGE-SCALE WIND ENERGY PROJECTS IN ALBERTA

Project Information	Job Creation	Impacts
<p>Blackspring Ridge Wind Farm^{31, 32} Vulcan</p> <p>166 turbines 300 MW capacity</p> <p>Completed in 2014</p>	<ul style="list-style-type: none"> • 350 temporary construction. • 20 permanent maintenance & operations. 	<ul style="list-style-type: none"> • \$600 million-dollar project, co-owned by EDF EN Canada and Enbridge. • The site generates enough emissions-free electricity to power 140,000 homes. • As of 2014, companies involved have awarded nearly \$20,000 to local organizations. • Innovative revenue sharing with landowners across the 48,000-acre project site.
<p>Summerview Phase I&II^{33, 34, 35} Municipal District of Pincher Creek</p> <p>39 turbines Phase I 22 turbines Phase II Combined generating capacity of 136.2 MW</p> <p>Phase I started in 2004 Phase II started in 2010</p>	<ul style="list-style-type: none"> • Construction created 45 person-years of employment & used 28 local contractors. • 8 FT employees. 	<ul style="list-style-type: none"> • \$12 million invested into the local economy during construction from TransAlta. • Produces enough electricity to power 55,000 Alberta homes and to offset more than 257,000 tonnes of CO2 a year. • Over \$5.8 million annually to the Municipal District of Pincher Creek with \$1.2 million in tax revenue, over \$500,000 in royalty payments, employment of 8 full time staff, and community donations.
<p>Halkirk Wind Farm^{36, 37} Halkirk, County of Paintearth</p> <p>83 turbines 150 MW generating capacity</p> <p>Began producing electricity in November 2012</p>	<ul style="list-style-type: none"> • 270 temporary construction. • 18 permanent maintenance & operations. 	<ul style="list-style-type: none"> • \$375 million-dollar project, owned/financed by Capital Power. • Project sits on 15,000 acres of private land. • \$40 million in tax revenue to municipalities and schools over 25 years.
<p>Bull Creek Wind Farm^{38, 39} Provost</p> <p>17 turbines 29 MW generating capacity</p> <p>Began operating in December 2015</p>	<ul style="list-style-type: none"> • 60 temporary construction or 60,000 worker hours. • 4 permanent maintenance & operations. 	<ul style="list-style-type: none"> • Project invested over \$25 million into the Alberta economy. • Supplies 500 schools in Alberta with 100% of their electricity. • Long-term contracts for purchasing the energy produced by the project were signed by 25 school districts, including Prairie Rose School Division in SE AB, to provide a fair priced, reliable source of electricity over the next 25 years. • Having the long-term commitment of these 25 schools allowed the developer, BluEarth Renewables, to secure competitive financing from ATB Financial for the project's capital costs.

TABLE 2. Sample of Large-Scale Operational Wind Energy Projects in Alberta

³¹ EDF. (2016). Blackspring Ridge Wind. http://www.edf-en.ca/projects/project_display/blackspring-ridge-wind-project

³² CanWEA. (2014). Wind. For my community. <http://canwea.ca/wp-content/uploads/2014/01/canwea-AB-brochure-e-web-v1.pdf>

³³ CanWEA. (2014). Wind. For my community. <http://canwea.ca/wp-content/uploads/2014/01/canwea-AB-brochure-e-web-v1.pdf>

³⁴ TransAlta. (2016). Wind facilities: Summerview I. <http://www.transaltarenewables.ca/facilities/plants-operation/summerview-1>

³⁵ TransAlta. (2016). Wind facilities: Summerview II. <http://www.transaltarenewables.ca/facilities/plants-operation/summerview-2>

³⁶ PowerTechnology. (2016). Halkirk Wind Project. <http://www.power-technology.com/projects/halkirk-wind-project/>

³⁷ CanWEA. (2014). Wind. For my community. <http://canwea.ca/wp-content/uploads/2014/01/canwea-AB-brochure-e-web-v1.pdf>

³⁸ David Dodge and Dylan Thompson. (2016). Wind farm powers 500 Alberta schools. <http://www.greenenergyfutures.ca/episode/bull-creek-powers-schools>

³⁹ BluEarth Renewables Inc. (2016). BluEarth celebrates commissioning at Bull Creek Wind Facility near Provost, Alberta.

<http://www.blueearthrenewables.com/news/blueearth-celebrates-commissioning-bull-creek-wind-facility-near-provost-alberta/>

SOLAR AND WIND ENERGY PROJECT PHASES

Listed below (**Table 3.**) are three commonly identified project phases of solar and wind energy projects as identified in the literature and from stakeholders. Potential direct, indirect, and induced economic and employment impacts of each phase are also listed.

POTENTIAL ECONOMIC AND EMPLOYMENT IMPACTS OF SOLAR & WIND ENERGY PROJECT PHASES		
PROJECT PHASE	ECONOMIC IMPACTS (most often indirect and induced impacts)	EMPLOYMENT IMPACTS (most often direct and indirect impacts)
Development (1-2 years)	<p>Many positions created in the development phase of solar and wind energy projects are temporary and require specific skill sets that may not be available in the communities where the projects are located.</p> <p>Thus, there are often indirect economic impacts for accommodation and food service industries within communities.</p>	<p>During the development phase, diverse temporary jobs are created. These jobs often require people with highly-specialized skill sets including:</p> <ul style="list-style-type: none"> • land agents; • contractors to construct MET towers⁴⁰; • environmental and engineering consultants; • wind and solar farm designers; • budget analysts; • lawyers; and • marketing and community consultation consultants.
Construction (8-12 months)	<p>Similar to the economic impacts listed for the development phase, increased activity and workers in the region during this phase will have indirect economic impacts for accommodation and food service industries in the region.</p>	<p>Within the construction phase there are temporary direct jobs created in multiple stages including:</p> <ol style="list-style-type: none"> 1. Site preparation - building access roads and preparing turbine bases) <ul style="list-style-type: none"> • Project managers • Labourers • Contractors/tradespeople 2. Transportation – shipping wind turbines and solar panels to main transport hubs and then using local transport companies to deliver them to project sites. <ul style="list-style-type: none"> • Truck drivers 3. Installation - once all the materials and supplies arrive at the project site multiple workers are involved in the process to install each wind turbine or solar panel. <ul style="list-style-type: none"> • Crane operators • Welders • Engineers • Safety Inspectors • On-site medical 4. Connection – Certified tradespeople are required to install the electrical collection network and ensure the wiring is safe and securely connected to the grid through the substation. <ul style="list-style-type: none"> • Electricians

⁴⁰ Also known as Wind Measurement Towers or Meteorological Evaluation Towers (MET) - used to verify the wind characteristics at a potential site for a wind farm.

<p>Operations & Maintenance (ongoing)</p>	<p>In addition to creating jobs, solar and wind energy projects in SE AB may provide a variety of indirect and induced long-term economic benefits for communities and regions which may include:</p> <ul style="list-style-type: none"> • Increased municipal tax revenue from these projects; • Assistance with upkeep to municipal infrastructure (i.e. roads); • Donations from the wind or solar companies to community organizations; • Additional income for landowners from lease payments for housing the solar panels or the wind turbines. 	<p>Though fewer jobs are created in this phase, these jobs are often long-term direct jobs that require local skilled workers. As they begin operating, large-scale solar and wind energy projects require regular:</p> <ul style="list-style-type: none"> • performance monitoring and analysis; • environmental surveys; • land maintenance (weed spraying, snow clearing); • preventative maintenance and routine repairs; and • general administrative duties. <p>As many of these projects are in rural areas, long-term jobs created in the operations and maintenance stage provide additional opportunities for non-farm employment for rural residents.</p>
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TABLE 3. Potential Economic and Employment Impacts of Solar & Wind Energy Project Phases

ENERGY DIVERSIFICATION IN SOUTHEAST ALBERTA

Based on an analysis of the collected data mentioned under *Report Methodology* earlier, the following four thematic areas for energy diversification in SE AB emerged:

1. **Opportunity**
2. **Awareness**
3. **Readiness**
4. **Innovation**

OPPORTUNITY

Many stakeholders believe that an opportunity exists for SE AB to emerge as a prosperous and competitive region for solar and wind energy development and innovation. Multiple factors contribute to this belief including:

- SE AB’s abundant solar and wind resources;
- SE AB’s lengthy history with energy development; and
- the potential economic and employment impacts associated with solar and wind projects in SE AB.

Solar and Wind Resources in SE AB

SE AB is well known for its strong steady winds and abundance of sunny days, as indicated below (**Figure 5. & Figure 6.**). SE AB is also a sparsely populated grasslands region with large amounts of open, uninhabited land that is ideal for large-scale solar and wind projects.

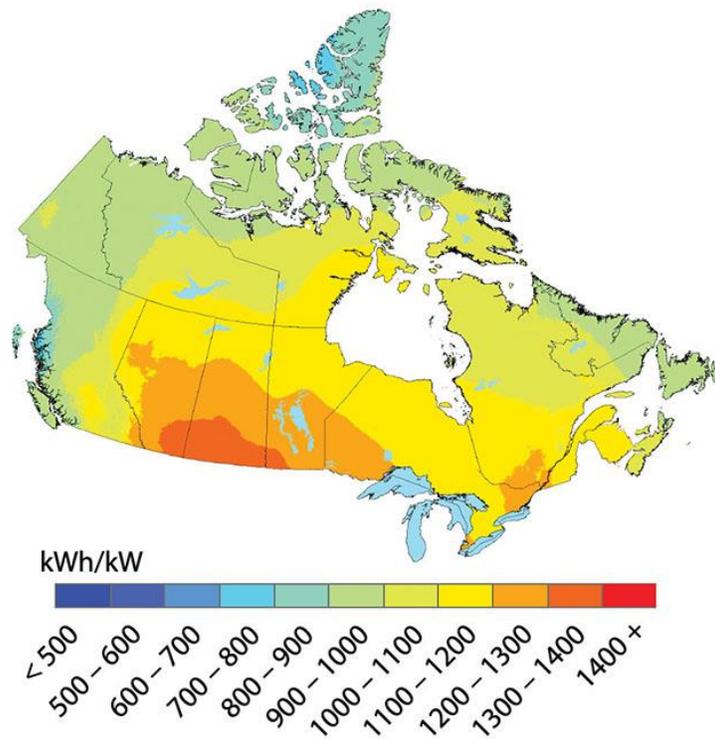


FIGURE 5. Solar Generation Potential in Canada⁴¹

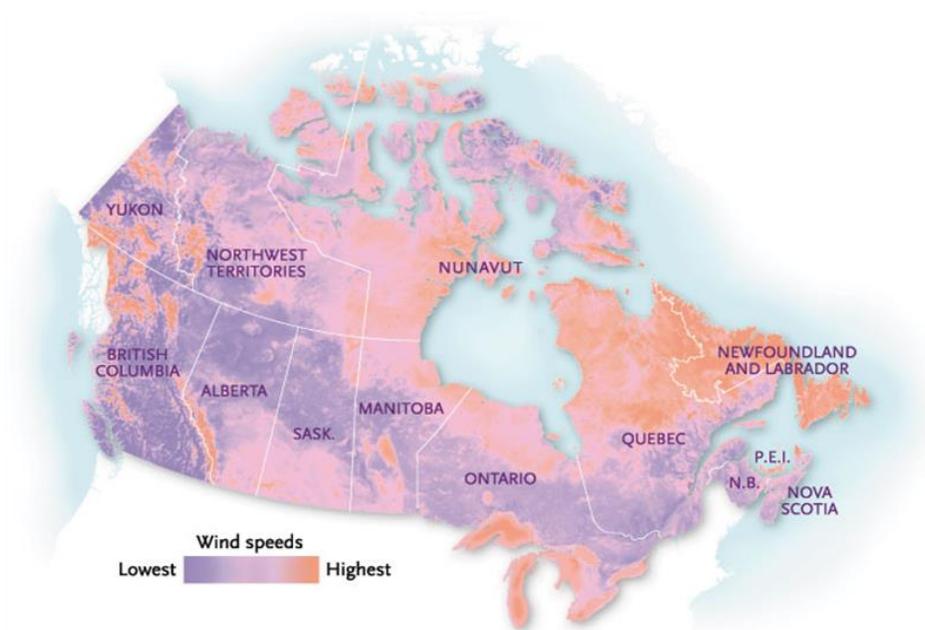


FIGURE 6: Wind Speeds in Canada⁴²

⁴¹ Argon Solar (2016). <http://argonsolar.ca/wp-content/uploads/2014/06/solarmapcanada.jpg>

⁴² Canadian Geographic. (2009). On with the wind: Wind energy in Canada timeline http://www.canadiangeographic.ca/magazine/jun09/wind_power_timeline.asp

Energy History in SE AB

Energy is one of the main sectors that helped build Alberta. **Stakeholders identified that an advantage of working in SE AB is the lengthy history of landowners and communities working with the oil and gas energy industries.** In SE AB, there is a general awareness and acceptance of the oil and gas industry and their processes. Municipalities and landowners are often already familiar with property rights, lease negotiations, and contracts; many see energy projects on their land as a business opportunity that provides them with supplemental income. Conversely, as a strong oil and gas region, stakeholders expressed concerns about resentment arising in SE AB towards solar and wind industries out of a fear that it will replace the oil and gas energy industry.

Furthermore, stakeholders indicated that SE AB has developed a character of rural resourcefulness and self-reliance because of its isolated location away from the province's main cities of Calgary and Edmonton. People in this region are often identified as being willing to try things differently and adopt new technologies.

Solar and Wind Energy Economic and Employment Impacts in SE AB

The lengthy history of the fossil fuel energy industry in SE AB has resulted in a skilled energy workforce with the potential to transition into renewable energy industries (see **Readiness Section**). However, the recent global downturn in fossil fuel prices and production has left many of these workers unemployed, and some concerned about being employed in an industry with a boom-and-bust cycle. Thus, transitioning into solar or wind energy industries is appealing to some oil and gas workers looking for a more stable career.

The Alberta government estimates the creation of up to 7,200 jobs across the province in the renewable energy industry by 2030⁴³. These estimated jobs vary in duration (short term, long term) and are in a variety of renewable energy industries including bio-mass, energy efficiency, hydro, solar, and wind. The government's estimation of 7,200 renewable energy jobs created by 2030 can be broken down to assume **500 full-time equivalent (FTE) jobs will be created annually, whereas others estimate the annual creation of 900 to 2,500 FTE jobs annually** in Alberta's renewable energy industries⁴⁴.

A common concern expressed in discussions with stakeholders was that **these estimates may create an unrealistic expectation for communities and job seekers regarding job creation from renewable energy projects in the region.** As one stakeholder identified,

it is important to remember that developing the renewable energy industry in Alberta is a long game and expectations need to be framed around this reality.

⁴³ Alberta Government. (2016). Renewable electricity plan to create jobs, spur investment. <https://www.alberta.ca/release.cfm?xID=43752ABFE959B-9AD9-9E3C-DBFCF5B5CA13C24C>

⁴⁴ Jeyakumar, Binu. (2016). *Job Growth in Clean Energy: Employment in Alberta's emerging renewables and energy efficiency sectors*. The Pembina Institute.

Solar and Wind Industry Estimated Impacts

The **Canadian Wind Energy Association (CanWEA)** and the **Canadian Solar Industries Association (CanSIA)** have developed formulas to estimate the impacts associated with wind and solar energy projects⁴⁵. Using the CanSIA and CanWEA formulas, the **35**-proposed SE AB solar and wind projects (over 1MW) listed on the AESO *Connection Project List* as of December 31, 2016, (see **Appendix A**) would result in the following **estimated** potential employment and economic impacts (**Table 4**).

POTENTIAL IMPACTS OF PROPOSED WIND & SOLAR PROJECTS ON THE AESO PROJECT LIST FOR SE AB AS OF DECEMBER 31, 2016					
	CanWEA Impact Estimation per 150 MW of Wind Energy	SE AB PROPOSED WIND 19 projects = 3,080.6 MW⁴⁶	CanSIA Impact Estimation per 150 MW of Solar Energy	SE AB PROPOSED SOLAR 16 projects = 640 MW⁴⁷	TOTAL PROPOSED WIND/SOLAR IN SE AB
Investment	\$316,000,000	\$6,489,797,333	\$310,000,000	\$1,322,666,667	\$7, 812, 464,000
Direct FTE construction jobs	140	2,875	1,875	8,000	10,875
Permanent direct jobs in operations	10	205	45	192	397
Lease payments to rural landowners (over 20 years)	\$17,000,000	\$349,134,667	\$54,000,000	\$230,400,000	\$579,534,667
Property tax payments to rural municipalities (over 20 years)	\$31,000,000	\$636,657,333	\$30,000,000	\$128,000,000	\$764,657,333

TABLE 4. CanWEA and CanSIA Formulas for Estimating Impacts of Wind & Solar Development

⁴⁵ CanWEA & CanSIA. (2015). Submission to the Alberta Climate Change Advisory Panel. https://solaralberta.ca/sites/default/files/canwea_-_cansia_final_submission_sept_30.pdf

⁴⁶ To use the **CanWEA formula** outline in **Table 4**., the total MW for SE AB proposed **wind** projects 3,080.6 was divided by 150 = 20.53733333333333. Each CanWEA estimation was timed by 20.53733333333333 e.g. every 150 MW of installed wind energy = \$316 million investment. 20.53733333333333 x 316,000,000 = \$6,489,797,333

⁴⁷ To use the **CanSIA formula** outline in **Table 4**., the total MW for SE AB proposed **solar** projects 640 was divided by 150 = 4.266666666666667. Each CanSIA estimation was timed by 4.266666666666667 e.g. every 150 MW of installed solar energy = \$310 million investment. 4.266666666666667 x 316,000,000 = \$1,322,666,667

It is important to note that the numbers in [Table 4](#):

- are **general formulaic estimates** that do not consider individual project realities or community contexts;
- assume that all these projects will be developed and will proceed as they are currently proposed on the AESO Connection Project List;
- indicate **estimated impacts over decades** from multiple proposed projects. Even if all 35 solar and wind projects proposed for SE AB on the AESO list progressed as planned, they would not all occur at the same time. Each of these proposed projects is at a different stage of development on the AESO queue, and many are years away from development ([Appendix A](#)).

Thus, attempting to quantify the potential direct, indirect, and induced employment and economic benefits of these proposed projects using one standard equation may lead to unrealistic numbers that are either highly inflated or extremely conservative. **To avoid unrealistic expectations, it is important for communities and project developers to view these estimates as guidelines.**

Stakeholder Identified Impacts

Comparing the industry derived estimates in [Table 4](#). to estimates from stakeholders interviewed for this report, on average stakeholders estimated the following job creation numbers ([Table 5](#)):

Stakeholder Estimated Employment Impacts of Large-Scale Solar and Wind Project Development		
Job Type	Solar (80 MW project)	Wind (100 MW project)
Temporary Construction Jobs	60	150-300
Permanent Operations and Maintenance Jobs	5-10	6-15

TABLE 5. Stakeholder Estimated Employment Impacts of Solar & Wind Development

Stakeholder wind estimates are similar to CanWEA estimates, but stakeholder identified solar estimates are much lower than CanSIA estimates. As stated earlier, Alberta has more experience with wind energy projects, and stakeholders may be conservatively estimating their numbers for job creation from solar projects based on job creation numbers from wind energy projects. **As more solar projects develop in Alberta, these estimates may start to align better.**

Stakeholders also provided the following suggestions of direct, indirect, and induced economic impacts for communities during the various phases of solar and wind energy projects ([Table 6](#)):

STAKEHOLDER IDENTIFIED ECONOMIC IMPACTS FOR COMMUNITIES FROM SOLAR & WIND ENERGY PROJECTS	
Local Business	<ul style="list-style-type: none"> • Increased hotel/motel accommodations. • Increased restaurant/bar sales. • Increased local coffee shops/convenience stores sales. • Increased local hardware/supply sales (cement companies). • Increased activity for local transport companies (semi-trucks, and bus transport for getting workers to site in some instances). • Increased local trades activity (electricians, crane operators, welders, etc...). • Increased revenues for recreational activities (bowling, movie theatre, etc...). • Decreased rental vacancies (residential and commercial).
Community Infrastructure	<ul style="list-style-type: none"> • Road upgrades and maintenance. • Weed spraying. • Snow clearance.
Community Social Organizations	<ul style="list-style-type: none"> • Donations to community organizations from solar and wind companies. • Capacity-building support.
Municipalities	<ul style="list-style-type: none"> • Incentives from solar companies to install solar panels on municipal buildings. • Increased tax revenues.
Landowners	<ul style="list-style-type: none"> • Increased income from land leases. • Increased income from contract opportunities with solar or wind companies (snow removal, weed spraying, etc...).

TABLE 6. Stakeholder Identified Economic Development Impacts of Solar and Wind Energy Projects

Many stakeholders indicated that economic and employment impacts of solar and wind energy projects need to be individually assessed based on the unique contexts of each project and project location. For example, some stakeholders identified that **if projects double in size – from 100 MW to 200 MW – the number of jobs created may not increase, but rather, the length of time these people are employed for may increase.** Additionally, projects that are located in rural, sparsely populated areas may need to bring in workers from outside the area, resulting in increases for the accommodation and food service industries in the area. Whereas, projects located near densely populated centers, like Medicine Hat, may be able to hire local workers who can commute daily to the project site.

AWARENESS

As illustrated in the previous Opportunity section, proposed solar and wind energy projects in SE AB have the potential to provide numerous employment and economic development impacts for the region. However, **a challenge identified by stakeholders for working on renewable energy projects in SE AB is the limited awareness and understanding in the region of how solar and wind energy works, and the associated impacts of developing these industries.** What many stakeholders felt was necessary for helping SE AB emerge as a leader in renewable energy was a focus on increasing awareness of solar and wind energy in the region, or developing the “energy literacy” of the region.

Awareness for Communities and Landowners

A common challenge to working in SE AB identified by stakeholders was a limited understanding and awareness of solar and wind energy in the region. Most solar and wind energy companies are invested in engaging with communities in the development phase of projects to discuss and address the community's needs and concerns. However, many municipal stakeholders felt that their limited understanding of solar and wind energy **inhibits their ability to make informed decisions** regarding proposed projects.

If communities do not know what the issues could be, how will they know what to ask or what to be concerned about?

The same can be said for landowners. Solar and wind energy companies may engage with landowners and attempt to help them understand the impacts of solar or wind infrastructure on their land, but **if landowners have limited understanding of large-scale solar and wind energy projects they may not know what they need to ask.**

Most stakeholders indicated that the NIMBYism - "Not in My Backyard" - mentality that often exists for some energy projects is not as prevalent for solar and wind projects in SE AB. However, solar and wind in SE AB are emerging energy technologies and some common concerns identified are:

- Increased traffic during the construction phase.
- Noise levels (wind turbines).
- Changes to the visual landscape from solar and wind farms.
- Impact on wildlife – birds, bats, etc...

As these challenges and concerns imply, there is a need to develop an enhanced understanding of the benefits and challenges of solar and wind energy for landowners, communities, and the region. **Information on solar and wind energy, from impartial sources, is needed in SE AB to help communities understand the unique challenges and opportunities associated with large-scale solar and wind energy projects.**

Some stakeholders also identified the need for individuals to develop greater awareness as to how small-scale solar or wind could meet their energy needs. Most individual households do not need renewable energy, their homes are already hooked up to gas and electrical lines that provide them with an adequate supply of energy. However, those who need or want commercial or residential solar or wind energy are often unaware as to how these systems work and the costs and savings involved. As well, they may be unaware of municipal restrictions or by-laws regarding installation of renewable energy systems which often vary among municipalities.

Awareness for Job Seekers

Awareness needs to be brought to the fact that **developing solar and wind energy industries in Alberta will not occur overnight**. As one stakeholder noted,

Inflated renewable energy job creation estimates create a false sense of urgency for the renewable energy industry and jobseekers.

Additionally, **the jobs associated with the 35-proposed solar and wind projects in SE AB cannot be created until the projects have financing in place and AESO approval; a process that can take years.** However, as the solar and wind industries continue to develop in Alberta space exists to give jobseekers time to obtain relevant training, and companies and recruiters time to find the right jobseekers.

Hence, it is an ideal time to proactively begin promoting solar and wind energy career opportunities to high school students and job seekers looking to make a career transition. Investing in raising awareness now will ensure that SE AB has interested and skilled people to work on solar and wind energy projects in the region as these projects are developed.

Awareness for Government

As interest in solar and wind energy increases in Alberta, the continued growth of these industries requires a comprehensive policy framework. As per a 2014 report from the Pembina Institute,

meaningful policy could decrease barriers to renewable energy development and open up opportunities for using Alberta's abundant, and largely overlooked, renewable resources as sources of clean energy⁴⁸.

A joint submission by CanSIA and CanWEA for the Alberta Climate Change Advisory Panel in the Fall of 2015 suggests that,

Alberta needs renewable energy policies that provide certainty to renewable energy investors, whose projects are often long-lived and capital intensive⁴⁹.

As discussions with stakeholders for this report were taking place in the Fall of 2016, the Alberta Government began announcing initiatives for renewable energy. Many of the stakeholders expressed appreciation for the government's commitment to advance renewable energy in the province. However, because the announcements were so new, stakeholders could only speculate as to the impacts these announcements would have on their organizations or projects. **One resounding concern was the need for the Alberta Government to have a long-term vision for the renewable energy sector.** This vision should provide clear direction to industry, investors, institutions, communities, and Alberta residents.

READINESS

Though there are 35-proposed large-scale solar and wind projects as of December 31, 2016, renewable energy in Alberta is a long-game and construction of many of these projects will not begin for years. This gives stakeholders in SE AB time to consult with industry and ensure a trained workforce is ready for when solar and wind energy projects do commence. As one stakeholder identified,

skill bases develop around regions where the industry is.

⁴⁸ James Glave and Ben Thibault. (2014). Power to change: How Alberta can green its grid and embrace clean energy. Pembina Institute. <http://www.pembina.org/reports/power-to-change-pembina-cec-2014.pdf>

⁴⁹ CanWEA & CanSIA. (2015). Submission to the Alberta Climate Change Advisory Panel. https://solaralberta.ca/sites/default/files/canwea_-_cansia_final_submission_sept_30.pdf

SE AB already has a well-developed energy workforce from decades of oil and gas development in the region. Many of these oil and gas workers may have transferable skills for the solar and wind energy industries. In addition to ensuring a trained solar and wind energy workforce exists in Alberta, stakeholders also identified a strong need for greater industry regulations for both solar and wind.

Transitioning Energy Workers

For decades, the oil and gas industry has been one of the main employers in SE AB. However, the recent downturn in the oil and gas industry had negative impacts on many oil and gas workers in SE AB.

Stakeholders commonly identified that an advantage of working on renewable energy projects in SE AB is the skilled non-renewable energy workforce that already exists in the region. Individuals employed in the oil and gas industry often have transferable skills to solar and wind energy. Currently, many of these workers are unemployed due to the oil and gas downturn, or are no longer interested in being part of a boom-and-bust industry, and could transition into the solar or wind energy industries. However, stakeholders indicated a concern that as the oil and gas industry picks back up, the availability of workers for renewable energy projects may decrease.

Enhanced knowledge and supports are needed to help transition interested oil and gas workers into careers in the solar or wind energy industries. Detailed job descriptions of careers available in Alberta's solar and wind energy industries, and career planning tools, could be helpful for identifying transferability of skills or additional training required for jobseekers looking to transition into, or start a career, in these industries.

This transition need not only occur with an aim to work in the large-scale renewable energy industry. **Many stakeholders identified the key to rapid economic growth in the solar industry will be from small-scale projects such as residential and commercial solar.** Large-scale projects can take many years to develop; whereas, small-scale projects, like residential and commercial solar, are quicker to develop and often lead to more long-term, consistent jobs.

Industry Regulation

Another concern expressed by stakeholders was certification and regulation of solar and wind industry professionals. According to *Alberta Advanced Education Apprenticeship and Industry Training* solar photovoltaic systems must be installed by qualified workers related to electrical installation such as certified electricians, power system electricians, or powerline technicians⁵⁰.

However, **stakeholders commonly stated that a “gray area” currently exists for identifying who is qualified to work on solar and wind energy projects, from land agents to residential solar installers.** Some stakeholders suggested that the Government of Alberta should develop clear, formal regulations regarding who is qualified to build and install renewable energy technologies in the province. Additionally, some stakeholders suggested that the solar and wind energy industries need to do more to develop and enforce industry standards around worker qualifications.

⁵⁰ Alberta Apprenticeship & Industry Training. (2016). Photovoltaic Systems. https://solaralberta.ca/sites/all/libraries/pdf.js/web/viewer.html?file=/sites/default/files/solar_pv_systems_installation_info_sheet_-_2016_05_11.pdf&width=80%25&height=80%25&iframe=true

Training Programs

In Alberta, few formal programs currently exist for solar specific training programs. SESA lists five organizations offering solar training in Alberta including⁵¹:

- **SESA;**
- **NAIT Alternative Energy Technology Program;**
- **Light Up the World;**
- **Lakeland College; and**
- **Gridworks Energy Solar Training Center.**

This last company, Gridworks Energy Solar Training Center, in Edmonton offers 1-5 day courses ranging in price from \$350 to \$1695⁵².

Most jobs in renewable energy industries require specific skills and accreditation, from conducting environmental assessments and dealing with land acquisitions to installing and maintaining equipment. However, many **stakeholders suggested that more individuals should possess accreditation that provides them with diverse skills for working in various renewable energy industries.** Some stakeholders indicated that formal renewable energy training should focus on multiple sources of renewable energy (solar, wind, geothermal, etc...) and diverse aspects of renewable energy technology, from design to installation.

A common model that stakeholders identified for this type of diverse training was NAIT's 2-year *Alternative Energy Technology* diploma program. Since this program began in 2011 **applications to the program have almost tripled**⁵³. Many of their applicants are former tradespeople from the oil and gas industry looking for a new career, few are students straight out of high school. On the website for this program, NAIT states that 78.6% of students are employed one-year post-graduation with a median starting salary of \$40,500⁵⁴.

Wage expectations from energy workers looking to transition into careers in renewable energy are a concern for renewable energy recruiters. Average hourly wages for labourers on solar and wind projects is between \$16 and \$24 per hour. Whereas the average hourly wage for oil and gas well drilling and related workers and services operators in Alberta is \$36.02 per hour⁵⁵. Hence, renewable energy companies often worry that oil and gas workers may only take positions with them until oil and gas activity starts up again.

Additionally, stakeholder suggestions for developing a skilled renewable energy workforce in SE AB include **augmenting current relevant trades training programs to include a focus on renewable energy technologies.** Qualified trades people could also have the option of adding a supplementary certification to their trades qualification that allows them to be recognized as having a renewable energy designation.

In southern Alberta, renewable energy training is limited. Lethbridge College in Southwest Alberta offers a one-year *Wind Turbine Technician* certificate that trains students to diagnose and maintain mechanical and

⁵¹ Solar Energy Society of Alberta. (2016). Renewable energy providers. <https://solaralberta.ca/directory/renewable-energy-education>

⁵² Gridworks Energy Group (2016). Training. <http://www.gridworksenergy.com/index.php>

⁵³ CBC News. (2016). Edmonton's NAIT alternative energy program sees spike in registration as oil sector declines. <http://www.cbc.ca/news/canada/edmonton/edmonton-s-nait-alternative-energy-program-sees-spike-in-registration-as-oil-sector-declines-1.3404313>

⁵⁴ NAIT. (2017). Alternative Energy Technology. http://www.nait.ca/program_home_76007.htm

⁵⁵ Alberta Government. (2016). Wage profile: Oil and gas well drilling and related workers and services operators. <http://occinfo.alis.alberta.ca/occinfopreview/info/browse-wages/wage-profile.html?id=8412>

electrical wind turbine equipment⁵⁶. Many of the 300 workers who built the Blackspring Ridge Wind Farm near Vulcan were local welders, labourers, and graduates of this program⁵⁷.

In SE AB, Medicine Hat College (MHC) is the primary post-secondary institution with a main campus in Medicine Hat and an additional campus in Brooks. MHC currently offers nine apprenticeship trades training programs and houses the *Cenovus Power Engineering* facility. Though many of the MHC trades programs incorporate components of installing and maintaining renewable energy infrastructure, MHC currently has no programs specific to renewable energy. Yet, **many stakeholders identified that the location of MHC in the solar rich region of SE AB makes it the ideal institution to offer solar training in Alberta.**

Stakeholders identified a need for the Alberta government to start investing in education and training for the renewable energy industry. As well, government efforts to invest in training need to be promoted broadly. Few stakeholders were aware of training incentives for employees such as the Canada-Alberta Job Grant, but many were interested in considering this grant once they knew more about it.

Offering training programs in SE AB that focus on renewable energy industries in the region would help to keep the workforce local. Stakeholders identified that training programs in SE AB like NAIT's would be valuable in helping develop a local, skilled renewable energy workforce in the region. This type of program would help future employees for various renewable energy industries gain an enhanced understanding of renewable energy technologies, how they work, how they interact with and complement other forms of energy, and how they are regulated both by industry and government.

INNOVATION

SE AB is currently at the early stages of both solar and wind energy development; an enhanced focus on innovation will help further develop and grow these industries. One stakeholder suggested that,

both government and industry need to move away from the status quo and be more embracive of innovation in renewable energy.

Some stakeholders identified that **the key to renewable energy innovation is greater collaboration with diverse stakeholders.** One such collaborative project in development is the *Community Renewable Energy Microgrid Demonstration Project (CREMDP)* led by MHC and BluEnergy Solar Wind Canada Inc. (BSWC), in partnership with the City of Medicine Hat. The CREMDP provides an opportunity for MHC to construct an energy microgrid for training purposes and collaboration with industry partners, like BSWC who plan to test their patented wind and solar hybrid UrbaVento™ technology on the microgrid (**Figure 7.**).

⁵⁶ Lethbridge College. (2016). Wind turbine technician. <http://www.lethbridgecollege.ca/program/wind-turbine-technician>

⁵⁷ Quinn Campbell. (2013). A Southern Alberta wind farm is well underway. <http://globalnews.ca/news/846834/a-southern-alberta-wind-farm-is-well-underway/>

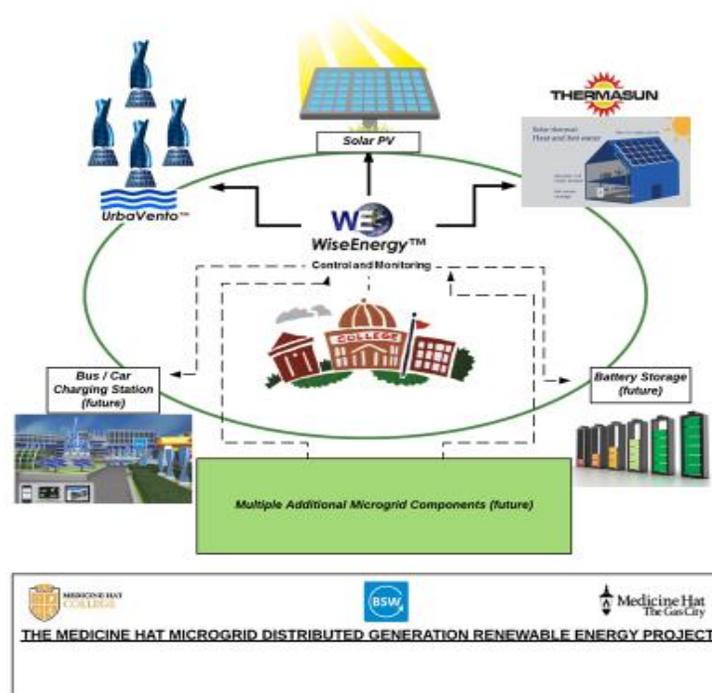


FIGURE 7. Proposed Community Renewable Energy Microgrid Demonstration Project⁵⁸

The combination of the 35 large-scale solar and wind projects proposed for SE AB and collaborative projects like the CREMDP **provides an opportunity for SE AB to forge ahead as an innovative leader in renewable energy.** Companies like BSWC can use the microgrid to display how their technologies would interact with mainstream grids. This would attract investors and clients from all over the world to come to MHC, visit the CREMDP, and tour SE AB to see first-hand the region’s solar and wind resources and projects.

Developing SE AB as a region for renewable energy research and development would also provide an opportunity for MHC to emerge as a training leader in renewable energy and innovation. This would in turn **facilitate promoting SE AB as an ideal location for renewable energy manufacturing, distribution centers, and technology development.**

A 2016 report published by the Pembina Institute states that,

manufacturing or supply chain facilities related to the renewable energy industry could increase indirect jobs by 25%-65%⁵⁹

As solar and wind energy industries develop in Alberta, some stakeholders suggested that the provincial government and municipalities should make it easier for companies to move manufacturing factories or distribution centers into Alberta. As well, some stakeholders suggested enhanced supports for current companies in the region to diversify/transition their current operations into ones that service solar and wind energy industries.

⁵⁸ Supplied by Tracy Stroud, Business Development Manager at Medicine Hat College.

⁵⁹ Jeyakumar, Binu. (2016). *Job growth in clean energy: Employment in Alberta's emerging renewables and energy efficiency sectors.* The Pembina Institute.

CanSIA and CanWEA are confident that if Alberta commits to investing in solar and wind energy development, solar and wind manufacturers may be interested in setting up manufacturing facilities in Alberta⁶⁰. New manufacturing facilities would contribute annually to the municipal tax base and create quality jobs in the region. SE AB's proximity to the Northern United States provides excellent market access to both the United States and Mexico⁶¹. Major national roadways run through SE AB including the TransCanada highway that also make the region an ideal area for manufacturing to access national markets.

KEY FINDINGS

From this report, the following four main areas and findings emerged specific to growing the solar and wind industries in SE AB.

<p>1. An OPPORTUNITY exists for SE AB to capitalize on the region's abundant solar and wind resources.</p>	<ul style="list-style-type: none"> • Of the 85 solar and wind projects proposed for development in Alberta as of the end of 2016, 41% are in SE AB. Specifically, 37% of proposed wind energy projects and 48% of proposed solar energy projects are in SE AB. • SE AB has been an energy region for decades; skilled energy and trades workers could augment their skills and transition into solar and wind industries. • Over the next decade, as solar and wind projects are developed, there is the potential for thousands of permanent and short-term jobs to be created, hundreds of local contractors to be contracted, and millions of dollars to be invested into local economies throughout SE AB.
<p>2. Increased AWARENESS is needed in SE AB regarding the impacts of growing the solar and wind energy industries in SE AB.</p>	<ul style="list-style-type: none"> • Stakeholders within the region need to develop and promote a better understanding of the opportunities and challenges of large-scale solar and wind energy development. This greater awareness and understanding of the realities of solar and wind energy development (timeframes, project realities, etc...) could be used to help support communities make more informed decisions about solar and wind development projects.
<p>3. Developing the solar and wind industries in SE AB is a long-game process and SE AB needs to ensure a READINESS in the region of a skilled workforce.</p>	<ul style="list-style-type: none"> • In preparation for developing a skilled workforce to meet the needs of the growing solar and wind energy industries in SE AB career development professionals need more information and resources to guide or transition interested workers into careers in the solar and wind energy industries. • As well, training institutions, industry, and other regional partners need to work together to develop relevant training programs and courses. • The solar resources of SE AB make it an ideal location for solar training programs.
<p>4. Investing as a region in solar and wind energy industries will help spur INNOVATION in SE AB.</p>	<ul style="list-style-type: none"> • Many stakeholders identified the key to innovation in solar and wind energy is greater collaboration among diverse stakeholders. • Investing in solar and wind development may not only create employment opportunities and help diversify and grow SE AB's economy, but may also lead to the emergence of the region as a provincial and national leader in renewable energy development and innovation.

⁶⁰ CanWEA & CanSIA. (2015). Submission to the Alberta Climate Change Advisory Panel. https://solaralberta.ca/sites/default/files/canwea_-_cansia_final_submission_sept_30.pdf

⁶¹ SAEPP. (2009). Solar Energy: Southern Alberta. <http://www.saaep.ca/solarenergy.pdf>

RECOMMENDATIONS

Based on a summary of the key findings and the information collected in this report from various sources the author suggests the following two recommendations for consideration:

Recommendation	Suggested Activities
<p>1. Create a Regional Development Strategy for Renewable Energy in SE AB.</p>	<p>Form a collaborative network of diverse industry partners and stakeholders to focus on raising awareness and promoting investment and development of solar and wind energy projects in SE AB, and other relevant renewable energy industries in SE AB (geothermal, microgrids, electric vehicle infrastructure, etc.).</p> <p>This network could focus on developing a regional strategy around key findings mentioned in this report such as:</p> <ul style="list-style-type: none"> • Increasing community awareness and understanding of the impacts of renewable energy now (development) and in the future (decommissioning), and how communities or individuals in SE AB can capitalize on or mitigate these impacts. • Developing an understanding of what supports communities need to prepare for renewable energy development (e.g. working with developers, developing and/or amending bylaws, impact of land-leases on landowners, local procurement of workers and supplies, etc...). • Exploring the value chain impacts and multi-effect linkages of the solar and wind energy industries in SE AB (supply chain, manufacturing, distribution centers, tourism, etc...). • Creating job descriptions and career planning tools to help career development professionals transition non-renewable energy workers into renewable energy careers. • Developing renewable energy training programs and awareness campaigns in SE AB to prepare students and workers for careers in these industries. • Exploring the possibility of developing a Center of Excellence in SE AB for renewable energy training and research.
<p>2. Revisit this report in one or two years to assess if/how planned solar and wind projects in SE AB progressed.</p>	<p>Collect baseline data from the solar and wind projects that are developed in SE AB over the next year or two.</p> <p>Assess whether job creation and economic impact estimates included in this report, associated with solar and wind projects, in SE AB were close to actual job creation and economic impacts created by these projects.</p> <p>Explore whether Government of Alberta renewable energy announcements in 2016/2017 impacted the SE AB solar and wind industries in regards to jobs and training.</p>

CONCLUSION

The current Government of Alberta is invested in developing renewable energy in Alberta. Nevertheless, investments in new industries take time. To put it in context, the government's target of reaching 5,000 MW of renewable energy could provide half of Alberta's electricity needs, but the target date to reach 5,000 MW in Alberta stretches to 2030. Stakeholders are confident that there will be many opportunities in the next few years for the solar and wind energy industries to develop in SE AB, but it will start small. Alberta's first procurement round announced in November 2016 was for 400 MW of renewable energy, a small start on the way to 5,000 MW by 2030.

However, **a legacy opportunity exists for SE AB to emerge as a provincial and national leader in renewable energy research, development, and innovation – specifically in solar and wind.** Proposed solar and wind projects for SE AB have the potential to grow the economy, create jobs, diversify energy sources, facilitate innovation, and encourage the development of manufacturing and distribution sectors. As the solar and wind industries grow in SE AB, demand will increase for workers who can develop, construct, operate, and maintain solar and wind projects. In addition, the solar and wind energy industries will need workers up and down the supply chain to manufacture, assemble, and transport solar and wind energy components and provide financial, legal, environmental assessment, and other support services. These workers will stimulate the SE AB economy through their spending, which will encourage additional hiring and business growth in the region.

Alberta's energy needs are increasing. Diversifying Alberta's energy sources with energy from solar and wind to supplement the energy we receive from the fossil fuel industry, will help ensure a stable energy economy in Alberta. As this report indicates, diversifying Alberta's energy sources may also provide solar and wind resource rich areas like SE AB with new industries that create jobs and stimulate local economies.

Appendix A - List of Proposed Solar and Wind Energy Projects on AESO for Southeast Alberta

Proposed Solar and Wind Energy Projects for Southeast Alberta – as of December 31, 2016.

The following legend explains each of the heading categories for the chart below.

Project Name & #	Name of Project and it's corresponding AESO assigned project number <i>if applicable</i>
Company	Name of main developer
Project Type	Wind, Solar, Co-Gen/CHP (combined heat and power)
Project Location	Nearest community
Queue Type	Connection = governed by the AESO connection process BTF = Behind the Fence, not governed by the AESO connection process
Stage (as outlined on the AESO website)	<p>CONNECTION PROJECTS</p> <ol style="list-style-type: none"> IDENTIFY PROJECT – Stage 0 is the initiation and identification stage of the Connection and BTF Process. In this stage, the market participant identifies a request for a new project by submitting a System Access Service Request (SASR) to the AESO Customer Connections. The SASR is reviewed by the AESO for completeness and the project is initiated. Target Timeline = 2 weeks. CONNECTION STUDY SCOPE - Stage 1 represents the scoping stage of the Connection Process. This stage begins with a project kick-off meeting and discussions regarding the Connection Plan and Connection Study Scope commence. Also in this stage, an assessment will be made to determine AESO, TFO, market participant/Study Consultant responsibilities and involvement for the project. Target Timeline = 8 weeks. CONNECTION PROPOSAL – Stage 2 is where the connection alternatives are assessed and the Connection Proposal is submitted. The Connection Proposal is reviewed and, if approved, accepted by the AESO. Target Timeline = 14 weeks. NEEDS IDENTIFICATION DOCUMENT (NID) AND FACILITY APPLICATION - Stage 3 is where the AESO will make a determination on the filing strategy with the Alberta Utilities Commission (AUC). The AESO will direct the TFO to complete the Facility Application (FA). Target Timeline = 32 weeks. APPLICATION FILINGS AND AUC APPROVALS - Stage 4 is where the AESO and the TFO file project applications with the Alberta Utilities Commission (AUC) for review. If the AUC approves the application, it issues Permit and License (P&L) for the project. Target Timeline = 24 weeks. CONSTRUCT AND PREPARE TO ENERGIZE – Stage 5 is where the construction of the transmission facilities commences. The market participant and the AESO are required to sign the System Access Service (SAS) Agreement. Target Timeline = 16 weeks. ENERGIZE, COMMISSION AND CLOSE - STAGE 6 marks the in-service date of the project and the final stage of the Connection Process. The TFO provides final project costs and a true-up of costs occurs so close-out can take place. <p>BTF PROJECTS</p> <ol style="list-style-type: none"> IDENTIFY PROJECT - Stage 0 is the initiation and identification stage of the Connection and Behind-the-Fence Process. In this stage, the market participant identifies a request for a new project by submitting a System Access Service Request (SASR) to the AESO Customer Connections. The SASR is reviewed by the AESO for completeness and the project is initiated. Target Timeline = 2 weeks. BTF STUDY SCOPE – Stage 1 is the scoping stage of the project. At the beginning of this stage, a project kick-off meeting takes place and discussions for the BTF Plan and BTF Study Scope commence. Also in this stage, an assessment will be made to determine AESO, TFO, Market Participant/Study Consultant responsibilities and involvement for the project. Target Timeline = 8 weeks. BTF ESR - Stage 2 is when the BTF studies are completed. The BTF Engineering Study Report (ESR) is reviewed and, if approved, accepted by the AESO. Target Timeline = 14 weeks. FUNCTIONAL SPECIFICATION - STAGE 3 & 4 is the stage where the Functional Specification is written for the project and generators file a Generator Application with the AUC. Target Timeline = Customer Driven. See #3. CONSTRUCT AND PREPARE TO ENERGIZE - STAGE 5 is where any equipment change, modification or maintenance occurs. The market participant and AESO are required to sign the corresponding System Access Service (SAS) Agreement. Target Timeline = Customer Driven. ENERGIZE, COMMISSION AND CLOSE - STAGE 6 marks the final stage of the BTF Process.
Planning Area	Numbered areas throughout the province https://www.aeso.ca/assets/Uploads/PlanningRegions-Nov26-PRINT.pdf

	SE AB is primarily located in the following planning area: <ul style="list-style-type: none"> • Area 4 includes Medicine Hat, Schuler, Seven Persons • Area 47 includes Brooks, Bassano, and Jenner • Area 48 includes Jenner and Oyen • Area 52 includes Vauxhall, Burdett, and Bow Island
Gen MW	Maximum potential energy production
Load MW	Power required to run the on-site facility
In-Service Date	Planned date to start operating the project
Date App Received	Date application received by AESO

List of Proposed Wind and Solar Projects Generating over 1MW – SE AB on the AESO Project Connection List as of December 31, 2016

Project Name & Number	Company Listed Information	Project Location	Project Type	Stage	Queue Type	Planning Area	Gen MW	Load MW	In-service date	Date App received
Naturener Wild Rose Wind Farm #479	Naturener http://www.naturener.us/wildrose1	45 km SE of Medicine Hat and 20 km S of Irvine	Wind	5	Connection	4	210	6	Aug 1 2018	May 12, 2005
Naturener Wild Rose Wind Farm Phase 2 #693	Naturener http://www.naturener.us/wildrose2	Cypress County	Wind	5	Connection	4	189	6	Aug 1 2018	April 3, 2007
Pteragen Peace Butte Wind Farm #513	http://www.auc.ab.ca/applications/decisions/Decisions/2014/2014-166.pdf	Seven Persons	Wind	5	Connection	4	116	0.1	Dec 31 2018	Oct 14, 2005
Joss MPC WAGF #1533	http://www.josswind.com/projects/jenner/	Jenner	Wind	4	Connection	48	120	0	Oct 2, 2017	Mar 1, 2014
BluEarth Burdett Solar New POS, #1696	http://www.bluearthrenewables.com/portfolio/burdett/	1.5km south of Burdett	Solar	2	BTF	52	15	0	Dec 1 2017	Aug 27, 2015
Fortis BluEarth Yellow Lake Solar New POS, #1697	http://www.bluearthrenewables.com/portfolio/yellowlake/	19 km south of Burdett	Solar	2	BTF	52	16.8	0.0	Dec 1 2017	Aug 27 2015
Joss Jenner WAGF – Phase 2, #1698	http://www.josswind.com/projects/jenner/	Jenner, AB	Wind	3	BTF	48	180	0.0	Aug 1 2018	Sept 8 2015

AltaGas Glenridge WAGF #1727			Wind	2	Connection	48	150	1.0	Sept 6 2018	Jan 4, 2016
Suncor Schuler Wind Project New POS, #1729		Schuler	Wind	2	Connection	4	80	0.3	Nov 1 2019	Jan 6, 2016
Suncor Forty Mile PV, #1733		County of Forty Mile	Solar	3	BTF	4	80	0.3	Jun 1 2019	Jan 6, 2016
Suncor Forty Mile WAGF, #1734		County of Forty Mile	Wind	3	Connection	4	200	0.3	Jun 1 2019	Jan 6, 2016
Suncor Schuler PV, #1737		Schuler	Solar	2	Connection	4	80	0.3	Nov 1 2019	Jan 6, 2016
RESC Forty Mile WAGF #1767	http://www.fortymilewindfarm.ca	Whitla	Wind	3	Connection	4	400	0.0	Sept 25, 2019	Mar 9, 2016
Invenergy Schuler Wind Farm #1777		Schuler	Wind	2	Connection	4	100	2.0	Dec 1, 2018	Mar 29, 2016
Sequoia Schuler WAGF (MPC) #1786		Schuler	Wind	2	Connection	4	100	1.0	Dec 31, 2019	Apr 13, 2016
Capital Power Whitla Wind Power Facility #1800	http://capitalpower.com/generationportfolio/CA/Pages/Whitla-Wind.aspx	Whitla	Wind	2	Connection	4	300	1.0	Nov 1, 2019	May 25, 2016
Suncor Forty Mile WAGF Phase 2 #1812		County of Forty Mile	Wind	2	Connection	4	200	0.3	May 1, 2020	Jul 4, 2016
HEP Capital Alderson PV #1828		Alderson	Solar	1	Connection	4	100	1.0	Apr 1, 2020	Jul 29, 2016
Fortis Tilley 498S DG Gas #1833		Tilley	Solar	1	BTF	47	11	0.0	Jul 1, 2018	Aug 5, 2016
Fortis 498S Tilley DG PV #1837		Tilley	Solar	2	BTF	52	17	0.0	Jun 3, 2019	Aug 5, 2016
Fortis 895S Suffield DG PV #1838		Suffield	Solar	2	BTF	4	11	0.0	Jun 3, 2019	Aug 5, 2016
Fortis 421S Hays DG PV #1839		Hays	Solar	1	BTF	52	15	0.0	Feb 12, 2018	Aug 5, 2016
Fortis 275S Jenner C&B PV D.E.R #1840		Jenner	Solar	1	BTF	48	23	0.0	Jan 3, 2018	Aug 5, 2016
Fortis 257S Hull DG PV #1841		Hull	Solar	1	BTF	52	8	0.0	Oct 13, 2017	Aug 5, 2016

Fortis 158S Vauxhall DG PV #1842		Vauxhall	Solar	1	BTF	52	11	0.0	Feb 12, 2018	Aug 5, 2016
Fortis Burdett 368S DG PV #1849		Burdett	Solar	2	BTF	52	9.5	0.0	Oct 31, 2018	Aug 24, 2016
Fortis Buffalo Atlee Cluster 1 WAGF #1853		Atlee	Wind	1	BTF	48	18.3	0.0	Mar 1, 2019	Aug 30, 2016
NaturEner Buffalo Trail WAGF #1856			Wind	1	Connection	4	100	3.0	Sep 13, 2019	Sep 1, 2016
NaturEner Ross Creek WAGF #1857			Wind	1	Connection	4	100	3.0	Sep 13, 2019	Sep 1, 2016
Fortis Enchant 447S DER Solar #1869		Enchant	Solar	1	BTF	52	68.2	0.0	Dec 20, 2018	Oct 3, 2016
EDF EN Red Rock WAGF #1875		Seven Persons	Wind	1	Connection	4	250	3.6	Mar 1, 2019	Oct 14, 2016
Perimeter Sunset Solar #1877			Solar	1	Connection	52	150	0.2	Jun 30, 2020	Oct 20, 2016
Fortis Krafte 257S Hull DER Solar #1878			Solar	1	BTF	52	24.5	0.0	Dec 20, 2017	Oct 24, 2016
Fortis Buffalo Atlee Cluster 3 WAGF DER #1892		Atlee	Wind	1	BTF	48	17.3	0.0	Dec 25, 2017	Nov 15, 2016
EDF EN Cypress WAGF #1896		Irvine	Wind	1	Connection	4	250	3.6	Mar 20, 2019	Nov 22, 2016

The AESO Project Connection List is updated regularly and can be accessed on this AESO webpage

<https://www.aeso.ca/grid/connecting-to-the-grid/>

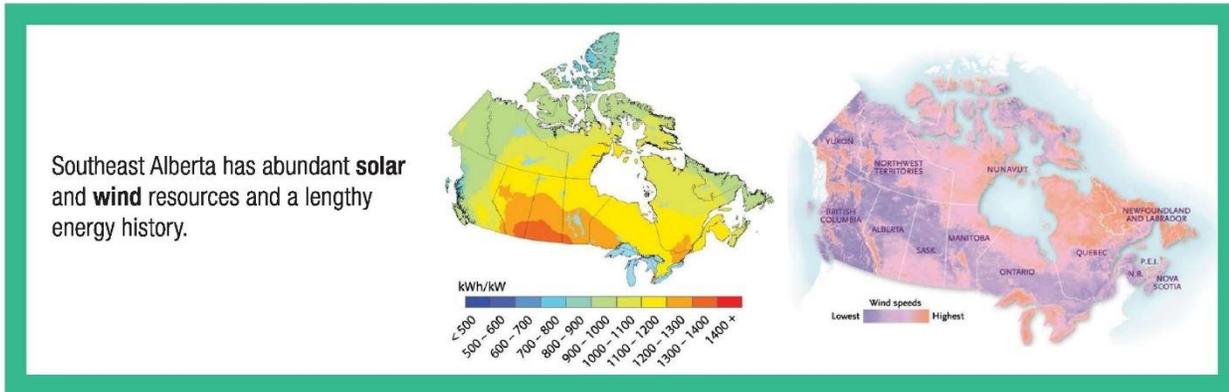
Appendix B – Acronyms Used

AESO	Alberta Electric System Operator
BSWC	BluEnergy Solar Wind Canada
CanGEA	Canadian Geothermal Energy Association
CanSIA	Canadian Solar Industries Association
CanWEA	Canadian Wind Energy Association
CREMDP	Community Renewable Energy Microgrid Demonstration Project
EDA	Economic Development Alliance (EDA) of Southeast Alberta
GDP	Gross Domestic Product
GHGE	Greenhouse Gas Emissions
FTE	Full-time Equivalent
MHC	Medicine Hat College
MW	Megawatt
NAIT	Northern Alberta Institute of Technology
NIMBY	Not in My Backyard
PV	Photovoltaic
SE AB	Southeast Alberta
SESA	Solar Energy Society of Alberta

Appendix C - List of renewable energy organizations in Canada

Alberta Renewable Energy Alliance	www.abrenewableenergy.ca
British Columbia Sustainable Energy Association	www.bcsea.org
Calgary Economic Development	www.calgaryeconomicdevelopment.com
Canadian Association for Renewable Energies	www.renewables.ca
Canadian Earth Energy Association	www.earthenergy.ca
Canadian Environmental Network	www.rcen.ca
Canadian Geothermal Energy Association	www.cangea.ca
Canadian Renewable Energy Alliance	www.canrea.ca
Canadian Solar Industries Association	www.cansia.ca
Canadian Wind Energy Association	www.canwea.ca
Clean Energy Canada	www.cleanenergycanada.org
Green Alberta Energy	www.greenalbertaenergy.ca
Green Communities Canada	www.greencommunitiescanada.org
Green Energy Futures	www.greenenergyfutures.ca
Ocean Renewable Energy Group	www.oreg.ca
Pembina Institute	www.pembina.org
Solar Energy Society of Alberta	www.solaralberta.ca
The Canadian Energy Efficiency Alliance	www.energyefficiency.org

Appendix D - One-page summary report



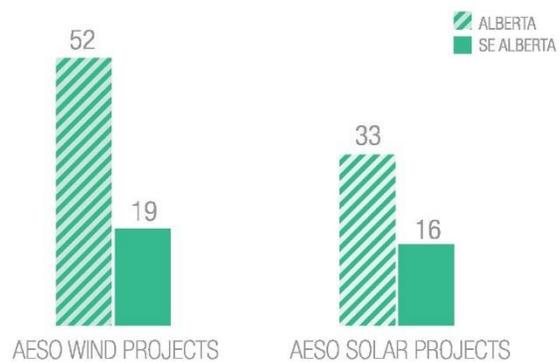
In Alberta, at the end of 2016 there were **85** proposed **solar** (33) & **wind** (52) energy projects over 1 MW on the AESO Connection Project List

37% OF PROPOSED* **WIND** PROJECTS IN ALBERTA ARE IN SE AB (19 OUT OF 52 TOTAL)

48% OF PROPOSED* **SOLAR** PROJECTS IN ALBERTA ARE IN SE AB (16 OUT OF 33 TOTAL)

41% OF ALL PROPOSED* **WIND AND SOLAR** PROJECTS IN ALBERTA ARE IN SE AB (35 OUT OF 85 TOTAL)

PROPOSED SOLAR & WIND PROJECTS (1MW+)



*Proposed Solar & Wind Projects (1MW+) in Alberta & SE AB on the AESO Connection Project List as of December 31, 2016

Using CanSIA & CanWEA estimates, over the next two decades these 35 projects could result in over:

\$7.8 billion in investment

10,875 temporary construction jobs

397 permanent operations and maintenance jobs

\$580 million in lease payments to landowners

\$765 million in property tax revenue for municipalities in SE AB.

Investing in solar and wind energy will create employment opportunities, help diversify SE AB's economy, and may also lead to SE AB emerging as a provincial and national leader in renewable energy development and innovation.

Visit www.mhc.ab.ca/seeds to download the entire report



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Published by: Economic Development Association (EDA) of SE AB, in partnership with Medicine Hat College and funding from Alberta Labour