

## Written Consultation | June 4 to July 6, 2020 – Stakeholder Comments

### Posted | July 2020

1. Canadian Wind Energy Association - CanWEA
2. Energy Storage Canada - ESC
3. Heartland Generation
4. Industrial Power Consumers Association of Alberta - IPCAA
5. Lionstooth Energy
6. Pembina Institute
7. TC Energy
8. TransAlta
9. Utilities Consumer Advocate - UCA.

## Stakeholder Comment Matrix – June, 2020

2021 Long-term Outlook Stakeholder Feedback



<p><b>Period of Comment:</b> June 4, 2020 through July 6, 2020</p> <p><b>Comments From:</b> Canadian Renewable Energy Association</p> <p><b>Date:</b> 2020/07/06</p>	<p><b>Contact:</b> [REDACTED]</p> <p><b>Phone:</b></p> <p><b>Email:</b> [REDACTED]</p>
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**Instructions:**

1. Please fill out the section above as indicated.
2. Please respond to the questions below and provide your specific comments.  
Email your completed comment matrix to [forecast@aeso.ca](mailto:forecast@aeso.ca) by **July 6, 2020**

**The AESO is seeking comments from Stakeholders with regard to the following matters:**

	Questions	Stakeholder Comments
a.	<p><b>Long-term Outlook</b></p> <ol style="list-style-type: none"> <li>a. What information do you find most useful within the Long-term Outlook? Is there additional information you would like to see?</li> <li>b. Do you use the Long-term Outlook data file? Which information within the Long-term Outlook data file is most useful to you? What additional data would you like to see within the data file?</li> <li>c. What delivery format of the data file would you find most useful? (Excel file, web query and download, interactive web based data visualization tool, other)</li> </ol>	<ol style="list-style-type: none"> <li>a. The Canadian Renewable Energy Association would like to see further information regarding the deployment of energy storage and distributed energy resources in Alberta included in the 2021 Long Term Outlook.  As well, it would be beneficial to see more detail regarding the development of models used to determine the levelized cost of energy for renewable energy facilities. We acknowledge that the AESO has been engaging with the sector on these issues, but it would be worthwhile to see where the planning team ended up in defining and calculating LCOE at the time of publication.  Furthermore, now that climate policies at both the Federal and Provincial level, additional information about grid intensity and the impacts of carbon pricing would be informative. It may be possible to include these details through the development of climate-related scenarios.</li> <li>b. Members of the Canadian Renewable Energy Association</li> </ol>

		<p>make use of the data file. More information about the inputs into the modelling of levelized costs of various technologies would be helpful to our members, as would further detail about the emissions of the different technologies that are being analysed.</p> <p>c. We support the delivery of this information through the current information. An interactive data visualization tool would also provide some additional context.</p>
b.	<p><b>Macroeconomic variables</b></p> <p>a. The economic outlook could range from a V-shape recovery by Q2 2021 to a longer-term recovery by 2023, with some permanent load loss in the commercial and industrial sectors going forward. What is your view on the Alberta GDP over the medium- (next 5 years) and long-term (5+ years)?</p> <p>b. Oil sector production capacity is expected to increase in 2023 with the completion of pipeline projects (e.g., Keystone XL, etc.).</p> <p>    i. The 2019 CAPP Crude Oil Forecast released in June 2019<sup>1</sup> had oilsands forecast growth from 3.2MM bbls/d in 2020 to 3.6MM bbls/d in 2025 and then 3.9MM bbls/d in 2030.</p> <p>        a. What is your view on oil production in Alberta over these time periods given the market changes over the last year? What is your view post 2030?</p> <p>        b. Do you expect new oil production developments to be in situ or mining, or a combination of both?</p> <p>        c. Do you expect domestic condensate growth, required for transport, to meet the incremental oilsands growth? Will</p>	

<sup>1</sup> Canadian Association of Petroleum Producers <https://www.capp.ca/resources/crude-oil-forecast/>

	<p style="text-align: center;">domestic condensate displace imported condensate?</p> <p>II. What is your view on further oil sector investments over the same timeframe?</p> <p>III. What kind of oil price or other environment would allow for further cogeneration development in the oilsands and/or petrochemical sectors?</p> <p>d. Current forward gas prices are in the \$2.25/GJ range. Post 5 years, do you see gas prices remaining at this level, decreasing, or increasing beyond inflation?</p>	
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<p>c.</p>	<p><b>Policy</b></p> <p>a. What are your expectations of carbon prices in the future? Do you expect any change from a \$30/t rising to \$50/t, inflated by 2% thereafter?</p> <p>b. Other than policy on carbon pricing, what coming policies or policy scenarios do you see impacting load growth and generation development?</p>	<p>a. Our expectations for the carbon price align with the AESO's expectations. However, we request confirmation of the 2% increase prior to its inclusion in the LTO, as we have been unable to find that reference.</p> <p>b. The Federal Government's Greening Government policy will have a minor impact on load growth and generation development. This policy will procure 200,000 – 280,000 MWh per year renewable electricity, in addition to 240,000 – 360,000 MWh per year in RECs to offset Federal electricity emissions. We expect that this will result in minor impact on generation overall.</p> <p>The AUC's ongoing consultation on Power Plant Self-Supply and Export may also have an impact on generation development scenarios. In 2019, the AUC ruled that the "current statutory scheme limits self-supply and export." However, should the Commission decide, following this consultation, to recommend that Alberta Energy permit self-supply and export, it would be expected to have an impact on overall demand, peak loads, integration of renewable resources, line losses and transmission and distribution builds.</p> <p>The treatment of energy storage facilities in the Bulk and Regional Tariff design will have a critical impact on the deployment of those facilities wishing to connect to the transmission system.</p> <p>Furthermore, a review and update of the <i>Transmission Regulation</i>, which may include an update on the treatment of energy storage as a tool for transmission deferral, may have an impact on the deployment of this technology in Alberta. Similarly, it may have an impact on future renewable energy development, should the changes result in less congestion in central east and southern Alberta.</p> <p>We note that the trend of distributed energy resources (DERs) growth, driven by the technology cost competitiveness noted in the AESO's recent Delivered Cost of Electricity Report, may continue to result in changing</p>
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		<p>load/demand patterns. Currently, there are many interrelated engagements that will shape how Alberta responds to the DER evolution at the utility and microgen scale.</p> <p>The AESO's ongoing "Participant-Related Costs for DFOs (Substation Fraction) and DFO Cost Flow-Through" consultation work was intended to provide the clarity and investor confidence around how system upgrade costs will be allocated in the near term. However, it seems unlikely that there will be sufficient investor confidence to move forward with new DCG deployment until there is a clear determination from the AUC on how system upgrade costs will be allocated. Furthermore, any eventual policy changes that come out of the next phase of the AUC's Distribution System Inquiry and any new tariff treatment as AESO works through the Bulk and Regional Tariff (such as 12 CP) will need to be monitored as both of these will have effects on DER development, which in turn may influence the overall outlook.</p>
d.	<p><b>Impact of the COVID-19 pandemic</b></p> <ol style="list-style-type: none"> <li>a. What is your expectation on behaviour changes (e.g., work-from-home practices, online shopping, etc.) and the way Albertans consume electricity going forward?</li> <li>b. How are near-term costs and future generation projects being impacted by covid-19? Do you anticipate long term impacts to generation development?</li> </ol>	<ol style="list-style-type: none"> <li>b. Beyond the impact of COVID-19 on demand in Alberta, as outlined by the AESO in "Impact of COVID-19 and Low Oil Prices on Alberta's Power System", our members have also seen pressures due to supply chain and import constraints, as well as constraints that are the result of getting workers across the border. That is, with some specialized technicians, who are required to cross provincial and international borders, there may be impacts from self-isolation requirements. Note that while these requirements are not required for those who cross into Alberta, there may be requirements in regions where staff is working, prior to coming to Alberta.</li> </ol> <p>While these restrictions seem to be winding down as provinces end their States of Public Health Emergencies (or equivalent) and begin to wind down related measures, there remains some uncertainty regarding the likelihood and timespan of possible future waves of the pandemic.</p>

<p>e.</p>	<p><b>Load growth and modifiers</b></p> <ul style="list-style-type: none"> <li>a. Where do you think load growth will be concentrated –at the System Load (all metered demand) level, or at the Alberta Internal Load (system load plus load served by on-site generating units) level?</li> <li>b. Under what conditions could Alberta see sustained negative system load growth?</li> <li>c. In the 2019 Long-term Outlook, the AESO had a number of economic and technological advances that are expected to impact the load growth in the province (see section 4 of the 2019 LTO and "New Load Modifiers" tab of the 2019 LTO data file). What is your view on load growth and the impact of the following modifiers within the next 5 years, from 5 to 10 years, and after 10 years for:             <ul style="list-style-type: none"> <li>i. Distributed energy resources:                 <ul style="list-style-type: none"> <li>1. Rooftop solar PV</li> <li>2. Electric vehicles and charging stations</li> <li>3. Gas generation</li> <li>4. Wind generation</li> <li>5. Energy storage</li> <li>6. Energy efficiency</li> </ul> </li> </ul> </li> <li>d. What is your view on load growth and the impact of other emerging industries, sectors or technologies (e.g., bitcoin and cryptocurrency mining, cannabis facilities, petrochemical facilities, data centers, others)?</li> </ul>	<p><b>c. Rooftop solar PV</b></p> <p>We take the term “Rooftop” solar PV to here refer to behind-the-meter (BTM) solar in general, which would also include many small-scale ground-mounted installations in Alberta, notably on farms and at larger industrial sites but also some residential properties. With the closure of Energy Efficiency Alberta’s Residential and Commercial Solar Program (RCSP) to new applicants in 2019, there has been a marked downturn in new deployment of BTM solar, a decline that has been exacerbated by widespread economic uncertainty resulting from COVID-19. Whereas under the RCSP approximately 1,500 BTM solar projects (17 MW total) were installed over the two-year run of the program, we anticipate approximately 50% less solar will be installed during the 2020/21 fiscal year. Assuming that longstanding solar PV capital cost decrease trends continue and that the province’s Net Metering framework is maintained, we estimate that over the next 5 to 10 years there will be at approximately 50 MW of additional BTM solar installed in Alberta.</p>
<p>f.</p>	<p><b>Generation Technologies</b></p> <ul style="list-style-type: none"> <li>a. What renewable technologies are likely to be developed by PPA’s?</li> <li>b. What is the potential size of the corporate PPA market for renewables, being funded fully or in part, in Alberta?</li> <li>c. What challenges do you foresee in implementing PPA’s for</li> </ul>	<ul style="list-style-type: none"> <li>a. Corporate power purchase agreements are likely to be a key revenue generator for the development of wind projects, solar projects, and hybrid projects, which may include wind-storage, solar-storage and wind-solar-storage pairings. To get a sense of the growing enthusiasm around this market, in the US, almost 200 major companies and 130 cities have made the commitment to be 100% renewable. As a result,</li> </ul>

<p>renewable development in Alberta?</p> <ul style="list-style-type: none"> <li>d. Recent public announcements indicate all existing coal-fired units will utilize natural gas in the near term. How do you see the operation of the converted units changing compared to operations as a coal-fired unit?</li> <li>e. Outside of existing generation technology in Alberta, what technology will show up in Alberta next?</li> <li>f. What are the challenges surrounding generation development in Alberta and what are the major factors that will determine what gets built?</li> </ul>	<p>the US saw around 8.5 GW of corporate PPA deals in 2019, up from 6.5 GW in 2018. Even in Alberta, we have already seen several of these arrangements in the last year, including a 177 MW wind energy project and a 74MW solar project, both of which are providing energy to an industrial customer. We also note that both the Government of Canada and the City of Edmonton are expected to release RFPs in the coming months, to meet their own electricity demand for the next 20 to 25 years.</p> <ul style="list-style-type: none"> <li>b. It should be noted that the Business Renewables Centre Canada, located in Calgary, currently has over 40 members. These 40 members are divided between buyers, who are investigating opportunities to purchase power from IPPs, and IPP members, who are looking to sell this power. BRC Canada's has set a goal to "help corporations and institutions procure 2000 MW of renewable energy by 2025." This goal provides a reasonable estimate of market expectations for the next five years.</li> <li>c. One challenge facing the PPA markets in Alberta is the current administration of the Alberta Offset Protocol for Wind. The Protocol currently provides for 8 years of offset credit generation, while allowing two five year extensions. While these extensions have historically been granted, the risk of rejection may be reflected in the terms of financing agreements. That is, the cost of financing a renewable energy project may be artificially inflated, because the presumed risks exposure of the project does not reflect the number of years in which generators can actually generate credits.</li> <li>d. <b>NA</b></li> <li>e. It is expected that energy storage will see significant levels of development and investment once the Tariff and other rules surrounding deployment and operations are sorted out.</li> </ul>
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g. **Future technologies**  
 The following table contains generation technologies and specifications on potential future generation development. Do you believe that these are representative of potential future Alberta generation projects? Would you like to share views on additional technologies and specifications that are not included within the table?

Facility Type	Overnight Capital Cost (\$/kW)	Fixed O&M (\$ / kW-year)	Variable O&M (\$/MWh)	Generator Capacity (MW)	Heat Rate (GJ/MWh)
Combined-Cycle Natural Gas	1,667	\$49.71	\$2.49	479	7.03
Simple-Cycle Natural Gas – Aeroderivative	1,159	\$52.83	\$4.24	46.5	9.68
Solar Photovoltaic – 2021-2025	1,643	\$31.85	Credit: grid intensity x carbon price	50	N/A
Solar Photovoltaic – 2026-2030	1,388	\$31.85	Credit: grid intensity x carbon price	50	N/A
Wind Generation - 2021-2025	1,586	\$32.50	Credit: grid intensity x carbon price	50	N/A
Wind Generation - 2026-2030	1,105	\$29.25	Credit: grid intensity x carbon price	50	N/A

According to recent analysis in the renewable energy sector, our industry continues to experience significant and ongoing technological improvements, leading to consistent reductions in pricing. While we are unable to provide verification of the AESO’s cost estimate for future technology at this time, we wish to provide contest for the following trends:

At a utility scale, Lazard has observed the levelized costs of wind dropping by 70% since 2009, along with an 89% drop in solar (source: <https://www.lazard.com/media/451086/lazards-levelized-cost-of-energy-version-130-vf.pdf>). Following this trend, Bloomberg New Energy Finance expects a further 34% drop in solar, 36% drop in wind and 64% drop in storage LCOEs by 2030 (source: <https://bnef.turl.co/story/neo2019>).

It is noteworthy that these projected costs, which are developed using conservative modelling, are often outperformed by real world deployment. As such, we recommend that the AESO consider the development of a scenario reflecting renewable costs that are lower than those in the base case. This scenario may perhaps be more enlightening than a scenario developed with a certain renewable targets in mind.

Likewise, residential solar costs are outpacing predictions. We are rapidly approaching a scenario where, according to the Cost of Delivered Energy report, we may soon see a broad trend where it is more cost effective for a customer to install solar onsite than to purchase from the grid. Such is the rate of cost reductions that it may be worthwhile for the AESO to also prepare a “High DER Penetration” scenario.

Members of the Canadian Renewable Energy Association request that Energy Storage projects be added to this table. Additionally, it may be worthwhile for the AESO to consider specifications for hybrid projects that include wind and solar, wind and storage, solar and storage, or wind, solar and storage included at one site.

<p>h.</p>	<p><b>Other</b></p> <p>a. Is there any information that you would like to share, which would contribute to the Long-term Outlook development (ie. Developing trends)?</p> <p>b. What do you think is likely to disrupt Alberta’s electricity industry in the next 20 years and in what way?</p>	<p>a. Given the importance of this document in communicating the investibility of the Alberta energy market, CanREA members request a statement of clarity from the AESO that this modelling is the result current energy only market rules, and that it is not expected that energy only market rules will be changing in the coming years.</p> <p>b. Among the potential disruptors that could impact the electricity sector over the next twenty years, we would include the following opportunities:</p> <ul style="list-style-type: none"> <li>- Increased opportunities for self-supply and export, which will increase interest in DERs.</li> <li>- Increasing opportunities for corporate power purchase agreements, due to falling costs of wind, solar and storage technology, along with a predictable schedule of carbon prices through TIER.</li> <li>- Reduced costs and increased deployment of storage, as an energy market participant, as a wires deferral or even both.</li> </ul>
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## Stakeholder Comment Matrix – June 2020

2021 Long-term Outlook Stakeholder Feedback



<b>Period of Comment:</b> June 4, 2020 through July 6, 2020 <b>Comments From:</b> ENERGY STORAGE CANADA <b>Date:</b> 2020/07/06	<b>Contact:</b> [REDACTED] <b>Phone:</b> [REDACTED] <b>Email:</b> [REDACTED]
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**The AESO is seeking comments from Stakeholders with regard to the following matters:**

	Questions	Stakeholder Comments
1.	<p><b>Long-term Outlook</b></p> <ol style="list-style-type: none"> <li>a. What information do you find most useful within the Long-term Outlook? Is there additional information you would like to see?</li> <li>b. Do you use the Long-term Outlook data file? Which information within the Long-term Outlook data file is most useful to you? What additional data would you like to see within the data file?</li> <li>c. What delivery format of the data file would you find most useful? (Excel file, web query and download, interactive web-based data visualization tool, other)</li> </ol>	<ul style="list-style-type: none"> <li>• The LTO provides a helpful and informative view of the outlook of the Alberta electricity market. The data provided is a beneficial resource for proponents to use in determining future opportunities in Alberta, in addition to being able to identify risks for existing or planned assets.</li> <li>• Examples of hourly consumption data by region (or area) for the different planning scenarios would be a useful addition to the data file. Energy storage resources perform energy arbitrage and understanding where gaps may form is important.</li> <li>• Excel is the preferred format for input into internal models.</li> </ul>

2.	<p><b>Macroeconomic variables</b></p> <p>a. The economic outlook could range from a V-shape recovery by Q2 2021 to a longer-term recovery by 2023, with some permanent load loss in the commercial and industrial sectors going forward. What is your view on the Alberta GDP over the medium- (next 5 years) and long-term (5+ years)?</p> <p>b. Oil sector production capacity is expected to increase in 2023 with the completion of pipeline projects (e.g., Keystone XL, etc.).</p> <p>I. The 2019 CAPP Crude Oil Forecast released in June 2019<sup>1</sup> had oilsands forecast growth from 3.2MM bbls/d in 2020 to 3.6MM bbls/d in 2025 and then 3.9MM bbls/d in 2030.</p> <p>a. What is your view on oil production in Alberta over these time periods given the market changes over the last year? What is your view post 2030?</p> <p>b. Do you expect new oil production developments to be in situ or mining, or a combination of both?</p> <p>c. Do you expect domestic condensate growth, required for transport, to meet the incremental oilsands growth? Will domestic condensate displace imported condensate?</p> <p>II. What is your view on further oil sector investments over the same timeframe?</p> <p>III. What kind of oil price or other environment would allow for further cogeneration development in the oilsands and/or petrochemical sectors?</p> <p>d. Current forward gas prices are in the \$2.25/GJ range. Post</p>	<ul style="list-style-type: none"> <li>• No comment</li> </ul>
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<sup>1</sup> Canadian Association of Petroleum Producers <https://www.capp.ca/resources/crude-oil-forecast/>

	5 years, do you see gas prices remaining at this level, decreasing, or increasing beyond inflation?	
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3.	<p><b>Policy</b></p> <p>a. What are your expectations of carbon prices in the future? Do you expect any change from a \$30/t rising to \$50/t, inflated by 2% thereafter?</p> <p>b. Other than policy on carbon pricing, what coming policies or policy scenarios do you see impacting load growth and generation development?</p>	<ul style="list-style-type: none"> <li>• No comment</li> </ul>
4.	<p><b>Impact of the COVID-19 pandemic</b></p> <p>a. What is your expectation on behaviour changes (e.g., work-from-home practices, online shopping, etc.) and the way Albertans consume electricity going forward?</p> <p>b. How are near-term costs and future generation projects being impacted by covid-19? Do you anticipate long term impacts to generation development?</p>	<ul style="list-style-type: none"> <li>• COVID-19 has reduced the debt financing rate in general. Lower debt financing is beneficial for long-term capital investments such as renewable generation. The change in cost of capital is expected to support the development of renewables and indirectly benefit energy storage resources that will be used to integrate more renewables onto the power system.</li> </ul>
5.	<p><b>Load growth and modifiers</b></p> <p>a. Where do you think load growth will be concentrated –at the System Load (all metered demand) level, or at the Alberta Internal Load (system load plus load served by on-site generating units) level?</p> <p>b. Under what conditions could Alberta see sustained negative system load growth?</p> <p>c. In the 2019 Long-term Outlook, the AESO had a number of economic and technological advances that are expected to impact the load growth in the province (see section 4 of the 2019 LTO and "New Load Modifiers" tab of the 2019 LTO data file). What is your view on load growth and the impact of the following modifiers within the next 5 years, from 5 to 10 years, and after 10 years for:</p> <p>i. Distributed energy resources:</p>	<ul style="list-style-type: none"> <li>• Distributed energy resources (DERs) can offer end-use customers optionality in managing their electricity needs. The cost of many DERs continues to fall (e.g., solar generation, energy storage), potentially leading to most customers serving part or all of their electricity needs using behind-the-meter DERs. Under this situation, Alberta could see a sustained negative system load growth as existing load is offset by DERs.</li> <li>• Energy storage is an emerging and innovative technology that will have a significant impact on the electricity system. From a load growth and modifier viewpoint, energy storage can reduce peak demand needs and change daily load</li> </ul>

	<ol style="list-style-type: none"> <li>1. Rooftop solar PV</li> <li>2. Electric vehicles and charging stations</li> <li>3. Gas generation</li> <li>4. Wind generation</li> <li>5. Energy storage</li> <li>6. Energy efficiency</li> </ol> <p>d. What is your view on load growth and the impact of other emerging industries, sectors or technologies (e.g., bitcoin and cryptocurrency mining, cannabis facilities, petrochemical facilities, data centers, others)?</p>	<p>patterns as utilization of existing assets change. The 2021 LTO should consider a scenario where the deployment of energy storage, either stand-alone or paired with renewables is large to determine the potential impact on the transmission system and other system needs.</p> <ul style="list-style-type: none"> <li>• In the next 5 years, energy storage applications will be moderate and derived from pilot programs and applications supported by out-of-market payments (e.g., ERA storage projects). Beyond 5 years, the growth of energy storage could accelerate as different market participants seek to deploy the resources to meet their needs. For example, DFOs and TFOs may use energy storage to defer traditional transmission and distribution infrastructure. Large and small end-use customers may deploy energy storage to enhance power quality and manage volatile real-time energy prices. Finally, market participation rule changes within the AESO framework could encourage more hybrid projects (e.g., renewables paired with energy storage) and stand-alone energy storage projects.</li> </ul>
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<p>6.</p>	<p><b>Generation Technologies</b></p> <ol style="list-style-type: none"> <li>a. What renewable technologies are likely to be developed by PPA's?</li> <li>b. What is the potential size of the corporate PPA market for renewables, being funded fully or in part, in Alberta?</li> <li>c. What challenges do you foresee in implementing PPA's for renewable development in Alberta?</li> <li>d. Recent public announcements indicate all existing coal-fired units will utilize natural gas in the near term. How do you see the operation of the converted units changing compared to operations as a coal-fired unit?</li> <li>e. Outside of existing generation technology in Alberta, what technology will show up in Alberta next?</li> <li>f. What are the challenges surrounding generation development in Alberta and what are the major factors that will determine what gets built?</li> </ol>	<ul style="list-style-type: none"> <li>• Energy Storage Canada recommends that energy storage technologies be included in the generation technologies section. There are a number of publications that the AESO can draw upon to populate energy storage attribute and cost assumptions (e.g., Lazard levelized cost of storage (<a href="https://www.lazard.com/perspective/lcoe2019">https://www.lazard.com/perspective/lcoe2019</a>))</li> <li>• While levelized cost of storage can be a helpful metric, the value of energy storage depends with the specific application (e.g., peak demand reduction, ancillary service, renewable participation optimization, etc.). The AESO should consider energy storage resource applications when considering the impact of the different energy storage technologies.</li> <li>• Hybrid projects are especially important consideration for the 2021 LTO. Energy storage paired with renewables could offer clean, consistent energy blocks for sale into forward markets leading to a change in power market dynamics.</li> </ul>
<p>7.</p>	<p><b>Future technologies</b></p> <p>The following table contains generation technologies and specifications on potential future generation development. Do you believe that these are representative of potential future Alberta generation projects? Would you like to share views on additional technologies and specifications that are not included within the table?</p>	<ul style="list-style-type: none"> <li>• Similar to the comment above, Energy Storage Canada recommends that energy storage be included in the future technologies' category</li> </ul>



Facility Type	Overnight Capital Cost (\$/kW)	Fixed O&M (\$ / kW-year)	Variable O&M (\$/MWh)	Generator Capacity (MW)	Heat Rate (GJ/MWh)
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8.	<p><b>Other</b></p> <p>a. Is there any information that you would like to share, which would contribute to the Long-term Outlook development (ie. Developing trends)?</p> <p>b. What do you think is likely to disrupt Alberta’s electricity industry in the next 20 years and in what way?</p>	
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## Stakeholder Comment Matrix – June, 2020

2021 Long-term Outlook Stakeholder Feedback



<p><b>Period of Comment:</b> June 4, 2020 through July 6, 2020</p> <p><b>Comments From:</b> Heartland Generation Ltd.</p> <p><b>Date:</b> [2020/07/06]</p>	<p><b>Contact:</b> [REDACTED]</p> <p><b>Phone:</b> [REDACTED]</p> <p><b>Email:</b> [REDACTED]</p>
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	Questions	Stakeholder Comments
1.	<p><b>Long-term Outlook</b></p> <ol style="list-style-type: none"> <li>a. What information do you find most useful within the Long-term Outlook? Is there additional information you would like to see?</li> <li>b. Do you use the Long-term Outlook data file? Which information within the Long-term Outlook data file is most useful to you? What additional data would you like to see within the data file?</li> <li>c. What delivery format of the data file would you find most useful? (Excel file, web query and download, interactive web based data visualization tool, other)</li> </ol>	<ol style="list-style-type: none"> <li>a. Heartland Generation Ltd. (HGL) finds the load forecast and the underlying assumptions to be helpful in making commercial decisions. Further, HGL believes that the AESO is in best position to provide this information given its access to the complete data set.</li> <li>b. HGL finds the data file to be useful, specifically the information on load, generation by capacity type, etc. Additionally, seeing the AESO’s view of the marketplace as a whole and in the future is insightful.</li> <li>c. HGL prefers the excel file format.</li> </ol>

<p>2.</p>	<p><b>Macroeconomic variables</b></p> <ul style="list-style-type: none"> <li>a. The economic outlook could range from a V-shape recovery by Q2 2021 to a longer-term recovery by 2023, with some permanent load loss in the commercial and industrial sectors going forward. What is your view on the Alberta GDP over the medium- (next 5 years) and long-term (5+ years)?</li> <li>b. Oil sector production capacity is expected to increase in 2023 with the completion of pipeline projects (e.g., Keystone XL, etc.).             <ul style="list-style-type: none"> <li>I. The 2019 CAPP Crude Oil Forecast released in June 2019<sup>1</sup> had oilsands forecast growth from 3.2MM bbls/d in 2020 to 3.6MM bbls/d in 2025 and then 3.9MM bbls/d in 2030.                 <ul style="list-style-type: none"> <li>a. What is your view on oil production in Alberta over these time periods given the market changes over the last year? What is your view post 2030?</li> <li>b. Do you expect new oil production developments to be in situ or mining, or a combination of both?</li> <li>c. Do you expect domestic condensate growth, required for transport, to meet the incremental oilsands growth? Will</li> </ul> </li> </ul> </li> </ul>	<p>Answering these questions could require sharing commercially sensitive information; as such, it should not be disclosed in a public forum.</p>
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<sup>1</sup> Canadian Association of Petroleum Producers <https://www.capp.ca/resources/crude-oil-forecast/>

	<p>domestic condensate displace imported condensate?</p> <p>II. What is your view on further oil sector investments over the same timeframe?</p> <p>III. What kind of oil price or other environment would allow for further cogeneration development in the oilsands and/or petrochemical sectors?</p> <p>d. Current forward gas prices are in the \$2.25/GJ range. Post 5 years, do you see gas prices remaining at this level, decreasing, or increasing beyond inflation?</p>	
<p>3.</p>	<p><b>Policy</b></p> <p>a. What are your expectations of carbon prices in the future? Do you expect any change from a \$30/t rising to \$50/t, inflated by 2% thereafter?</p> <p>b. Other than policy on carbon pricing, what coming policies or policy scenarios do you see impacting load growth and generation development?</p>	<p>a. Alberta's Technology Innovation and Emissions Reduction (TIER) Regulation has only been deemed equivalent to the federal Output-Based Pricing System (OBPS) for 2020. The Alberta system will require review each year to be deemed equivalent.</p> <p>If the system is not deemed equivalent to the federal system, it would be replaced by a ratcheting down of the OBPS allowance for new gas turbines from 0.37 T/MWh to zero by 2030. This would create a difference from the TIER system, which applies 0.37 T/MWh to all generators.</p> <p>The federal carbon price will be reviewed in 2022. The 2% inflation applied thereafter does not seem adequate given that the historic price increase has</p>

		<p>been approximately \$10/Tonne per year for the first 3 years of the program.</p> <p>b. Other than policy on carbon pricing, the AESO should consider the federal Clean Fuel Standards (CFS). These regulations are still being drafted but indications from the consultation process suggest that the CFS may introduce considerable cost to high carbon intensity fuels.</p> <p>The Government of Canada announced commitments to</p> <ul style="list-style-type: none"> <li>• continue to implement the Pan-Canadian Framework on Clean Growth and Climate Change,</li> <li>• strengthen existing measures and introduce new GHG reducing measures to exceed Canada's 2030 emissions reduction goal, and</li> <li>• begin work so that Canada can achieve net-zero emissions by 2050.</li> </ul> <p>The plan to achieve net-zero emissions by 2050 will set legally-binding, five-year emissions reduction milestones based on the advice of experts and consultations with Canadian stakeholders.</p>
4.	<b>Impact of the COVID-19 pandemic</b>	Answering this question could require sharing commercially sensitive information; as such, it should

	<ul style="list-style-type: none"> <li>a. What is your expectation on behaviour changes (e.g., work-from-home practices, online shopping, etc.) and the way Albertans consume electricity going forward?</li> <li>b. How are near-term costs and future generation projects being impacted by covid-19? Do you anticipate long term impacts to generation development?</li> </ul>	<p>not be disclosed in a public forum. At a high level, HGL believes that it may be too early for companies to form an expectation regarding the full impact of the COVID-19 global pandemic.</p> <p>The AESO should consider analyzing other jurisdictions that have since re-opened for possible indications. It is commendable that the AESO has published “An Update on the Impact of COVID-19 and Low Oil Prices on Alberta’s Power System” on June 30, 2020. These updates and analyses are useful to facilitate stakeholder engagement on evolving issues like the COVID-19 pandemic.</p>
5.	<p><b>Load growth and modifiers</b></p> <ul style="list-style-type: none"> <li>a. Where do you think load growth will be concentrated –at the System Load (all metered demand) level, or at the Alberta Internal Load (system load plus load served by on-site generating units) level?</li> <li>b. Under what conditions could Alberta see sustained negative system load growth?</li> <li>c. In the 2019 Long-term Outlook, the AESO had a number of economic and technological advances that are expected to impact the load growth in the province (see section 4 of the 2019 LTO and "New Load Modifiers" tab of the 2019 LTO data file). What is your view on load</li> </ul>	<ul style="list-style-type: none"> <li>a. – b. In HGL’s opinion, the AESO is best suited to make these assumptions after consulting with industrial/commercial loads and conducting related analyses.</li> <li>c. – d. HGL believes the AESO would be able to gain an insight to potential load impacts through reviewing both internal ISO research as well as publicly available information such as the AUC small scale generation applications. The AESO’s reports like the “Micro- and Small Distributed Generation Reporting” have been helpful to HGL when assessing the impact of similar emerging trends.</li> </ul>

	<p>growth and the impact of the following modifiers within the next 5 years, from 5 to 10 years, and after 10 years for:</p> <ul style="list-style-type: none"> <li>i. Distributed energy resources:             <ul style="list-style-type: none"> <li>1. Rooftop solar PV</li> <li>2. Electric vehicles and charging stations</li> <li>3. Gas generation</li> <li>4. Wind generation</li> <li>5. Energy storage</li> <li>6. Energy efficiency</li> </ul> </li>   <li>d. What is your view on load growth and the impact of other emerging industries, sectors or technologies (e.g., bitcoin and cryptocurrency mining, cannabis facilities, petrochemical facilities, data centers, others)?</li> </ul>	
6.	<p><b>Generation Technologies</b></p> <ul style="list-style-type: none"> <li>a. What renewable technologies are likely to be developed by PPA's?</li> <li>b. What is the potential size of the corporate PPA market for renewables, being funded fully or in part, in Alberta?</li> <li>c. What challenges do you foresee in implementing PPA's for renewable development in Alberta?</li> </ul>	<p>a – e. Answering these questions could require sharing commercially sensitive information; as such, it should not be disclosed in a public forum.</p> <p>f. Regulatory certainty will play a key role in determining future generation development. There are key developments regarding Alberta's regulatory agencies and electricity policies that are expected in</p>

	<p>d. Recent public announcements indicate all existing coal-fired units will utilize natural gas in the near term. How do you see the operation of the converted units changing compared to operations as a coal-fired unit?</p> <p>e. Outside of existing generation technology in Alberta, what technology will show up in Alberta next?</p> <p>f. What are the challenges surrounding generation development in Alberta and what are the major factors that will determine what gets built?</p>	<p>the near term that will impact investor confidence and subsequent construction decisions.</p>
<p>7.</p>	<p><b>Future technologies</b></p> <p>The following table contains generation technologies and specifications on potential future generation development. Do you believe that these are representative of potential future Alberta generation projects? Would you like to share views on additional technologies and specifications that are not included within the table?</p>	<p>HGL has found Brattle’s Report – AESO Cost of New Entry Analysis<sup>2</sup> – to be helpful in assessing the costs of generation technologies and the likelihood of development.</p> <p>Alberta will likely see retrofitting opportunities for its aging hydrocarbon fleets. These readily available improvements will act as a stop-gap measure to aid in long-term renewable energy growth. There will continue to be emission regulation and air policy risks for hydrocarbon, which will impact future hydrocarbon improvements, however these projects will help transition the grid.</p> <p>Further, there is the potential for small modular nuclear generation. In HGL’s opinion the time horizon</p>

<sup>2</sup> Accessed at <https://www.aeso.ca/assets/Uploads/CONE-Study-2018-09-04.pdf>



Facility Type	Overnight Capital Cost (\$/kW)	Fixed O&M (\$ / kW-year)	Variable O&M (\$/MWh)	Generator Capacity (MW)	Heat Rate (GJ/MWh)
Combined-Cycle Natural Gas	1,667	\$49.71	\$2.49	479	7.03
Simple-Cycle Natural Gas – Aeroderivative	1,159	\$52.83	\$4.24	46.5	9.68
Solar Photovoltaic – 2021-2025	1,643	\$31.85	Credit: grid intensity x carbon price	50	N/A
Solar Photovoltaic – 2026-2030	1,388	\$31.85	Credit: grid intensity x carbon price	50	N/A
Wind Generation - 2021-2025	1,586	\$32.50	Credit: grid intensity x carbon price	50	N/A
Wind Generation - 2026-2030	1,105	\$29.25	Credit: grid intensity x carbon price	50	N/A

for this kind of development is greater than 10 years away, if at all.

**8. Other**

- a. Is there any information that you would like to share, which would contribute to the Long-term Outlook development (ie. Developing trends)?
- b. What do you think is likely to disrupt Alberta’s electricity industry in the next 20 years and in what way?

HGL generally believes that technological innovation will be the biggest cause of disruption to the Alberta electricity industry. Technological change is all-encompassing and difficult to predict, but the pace of change in electricity generation is increasing and already causing disruption. The emergence of electric vehicles and associated charging/storage technologies, the affordability of distributed generation, and the emergence of energy storage are all examples of some of the known technology innovation in the electricity industry.

The changing financing landscape will also have a direct impact on the electricity industry. For example: increased availability for green bond financing, limited

		<p>financing availability for coal or other carbon intensive projects, federal government PPAs, federal REC procurement, and foreign investment capital for renewable technologies.</p> <p>In the short to mid-term, the Alberta Intertie Restoration project could distort the Alberta market, as it would further enable a BC crown corporation to participate in our competitive market and siphon much needed rents for capital cost recovery away from firm-capacity Alberta generators.</p>
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## Stakeholder Comment Matrix – June, 2020

2021 Long-term Outlook Stakeholder Feedback



<p><b>Period of Comment:</b> June 4, 2020 through July 6, 2020</p> <p><b>Comments From:</b> Industrial Power Consumers Association of Alberta (IPCAA)</p> <p><b>Date:</b> 202/07/06</p>	<p><b>Contact:</b> [REDACTED]</p> <p><b>Phone:</b> [REDACTED]</p> <p><b>Email:</b> [REDACTED]</p>
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**Instructions:**

1. Please fill out the section above as indicated.
2. Please respond to the questions below and provide your specific comments.  
Email your completed comment matrix to [forecast@aeso.ca](mailto:forecast@aeso.ca) by **July 6, 2020**

**The AESO is seeking comments from Stakeholders with regard to the following matters:**

	Questions	Stakeholder Comments
1.	<p><b>Long-term Outlook</b></p> <ol style="list-style-type: none"> <li>a. What information do you find most useful within the Long-term Outlook? Is there additional information you would like to see?</li> <li>b. Do you use the Long-term Outlook data file? Which information within the Long-term Outlook data file is most useful to you? What additional data would you like to see within the data file?</li> <li>c. What delivery format of the data file would you find most useful? (Excel file, web query and download, interactive web based data visualization tool, other)</li> </ol>	<ol style="list-style-type: none"> <li>a) Of immediate interest to IPCAA in the LTO is: <ul style="list-style-type: none"> <li>• The reference case forecast of both demand and energy especially across the next 5-years.</li> <li>• While the AESO tends to put the most focus on the AIL demand forecast, the System Load forecast is of equal or greater importance as System Load is what actually pays the wires charges. In other jurisdictions, they use the term Primary Demand to discuss system load and it is actually the focus of their forecasting efforts.</li> <li>• The 2019 LTO does not include a discussion on System Load or DTS load, which is concerning. It is not defined or included in the glossary.</li> <li>• The data file does contain the System Load peak and separately the DTS energy; however, there is no explanation of what they are nor their derivation.</li> <li>• In the 2019 LTO data file, the AESO forecasts 62,564</li> </ul> </li> </ol>

		<p>GWh of DTS energy consumption for 2019 with a growth rate of 2.6% for 2019. In reality, 2019 DTS energy was 59,588 GWh - a growth rate of <b>-2.3%</b> and this was before the COVID-19 pandemic.</p> <p>b) IPCAA uses the LTO data file – in particular the DTS energy and System Load peak. As discussed above, additional explanations of this data and its derivation would be useful.</p> <p>c) Regarding delivery format, IPCAA uses Excel; however, other stakeholders may find other formats useful as well.</p>
2.	<p><b>Macroeconomic variables</b></p> <p>a. The economic outlook could range from a V-shape recovery by Q2 2021 to a longer-term recovery by 2023, with some permanent load loss in the commercial and industrial sectors going forward. What is your view on the Alberta GDP over the medium- (next 5 years) and long-term (5+ years)?</p> <p>b. Oil sector production capacity is expected to increase in 2023 with the completion of pipeline projects (e.g., Keystone XL, etc.).</p> <p style="padding-left: 40px;">I. The 2019 CAPP Crude Oil Forecast released in June 2019<sup>1</sup> had oilsands forecast growth from 3.2MM bbls/d in 2020 to 3.6MM bbls/d in 2025 and then 3.9MM bbls/d in 2030.</p> <p style="padding-left: 80px;">a. What is your view on oil production in Alberta over these time periods given the market changes over the last year? What is your view post 2030?</p> <p style="padding-left: 80px;">b. Do you expect new oil production developments to be in situ or mining, or a combination of both?</p>	<p>With regard to specific responses to the AESO's macroeconomic variables questions, IPCAA does not plan to weigh in. However, please consider the following: oil &amp; gas producers may be willing to discuss these questions in a one-on-one setting; however, they may not be willing to provide their views in a written AESO Questionnaire.</p>

<sup>1</sup> Canadian Association of Petroleum Producers <https://www.capp.ca/resources/crude-oil-forecast/>

	<p>c. Do you expect domestic condensate growth, required for transport, to meet the incremental oilsands growth? Will domestic condensate displace imported condensate?</p> <p>II. What is your view on further oil sector investments over the same timeframe?</p> <p>III. What kind of oil price or other environment would allow for further cogeneration development in the oilsands and/or petrochemical sectors?</p> <p>d. Current forward gas prices are in the \$2.25/GJ range. Post 5 years, do you see gas prices remaining at this level, decreasing, or increasing beyond inflation?</p>	
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3.	<p><b>Policy</b></p> <p>a. What are your expectations of carbon prices in the future? Do you expect any change from a \$30/t rising to \$50/t, inflated by 2% thereafter?</p> <p>b. Other than policy on carbon pricing, what coming policies or policy scenarios do you see impacting load growth and generation development?</p>	<p>a. IPCAA will not be weighing in on carbon price expectations in the future.</p> <p>b. The continued increases in transmission and distribution costs is not being adequately factored into business growth decisions in Alberta.</p> <p>Ideally, the Alberta electricity sector begins focusing our efforts on how to reduce regulated monopoly utility wires costs. The province needs to support rational investment decisions by Alberta businesses that are striving to remain competitive with their global peers. However, at the very minimum, we need to forecast the impacts of these costs more accurately, which impact the System Load.</p>
4.	<p><b>Impact of the COVID-19 pandemic</b></p> <p>a. What is your expectation on behaviour changes (e.g., work-from-home practices, online shopping, etc.) and the way Albertans consume electricity going forward?</p> <p>b. How are near-term costs and future generation projects being impacted by covid-19? Do you anticipate long term impacts to generation development?</p>	<p>IPCAA does not plan to weigh in on this directly. However, if it would help the AESO, we are willing to schedule some time on a conference call with industrial consumers for the AESO to ask these questions and host a discussion.</p>
5.	<p><b>Load growth and modifiers</b></p> <p>a. Where do you think load growth will be concentrated –at the System Load (all metered demand) level, or at the Alberta Internal Load (system load plus load served by on-site generating units) level?</p> <p>b. Under what conditions could Alberta see sustained negative system load growth?</p> <p>c. In the 2019 Long-term Outlook, the AESO had a number of economic and technological advances that are expected to impact the load growth in the province (see section 4 of the 2019 LTO and "New Load Modifiers" tab of the 2019 LTO data file). What is your view on load</p>	<p>IPCAA would like to thank the AESO for specifically considering System Load (all metered demand). Again, IPCAA encourages the AESO to include a definition of System Load in their LTO glossary, as well as a section on System Load and underlying causes for its change in levels.</p> <p>Negative System Load growth is a function of:</p> <ul style="list-style-type: none"> <li>• The cost of power to the consumer, which is an amalgam of a competitive commodity price and rising transmission and distribution charges caused by both rising costs and reducing demand.</li> <li>• Reducing demand, which we believe is a combination of increased efficiency combined with falling costs of self-</li> </ul>

	<p>growth and the impact of the following modifiers within the next 5 years, from 5 to 10 years, and after 10 years for:</p> <ul style="list-style-type: none"> <li>i. Distributed energy resources:             <ul style="list-style-type: none"> <li>1. Rooftop solar PV</li> <li>2. Electric vehicles and charging stations</li> <li>3. Gas generation</li> <li>4. Wind generation</li> <li>5. Energy storage</li> <li>6. Energy efficiency</li> </ul> </li> <li>d. What is your view on load growth and the impact of other emerging industries, sectors or technologies (e.g., bitcoin and cryptocurrency mining, cannabis facilities, petrochemical facilities, data centers, others)?</li> </ul>	<p>supply and demand destruction due to the high input cost. With regard to the falling cost of supply, the AESO has illustrated (in its Delivered Cost of Electricity report) that new forms of generation keep falling in price and in some cases are now economic to displace system demand.</p>
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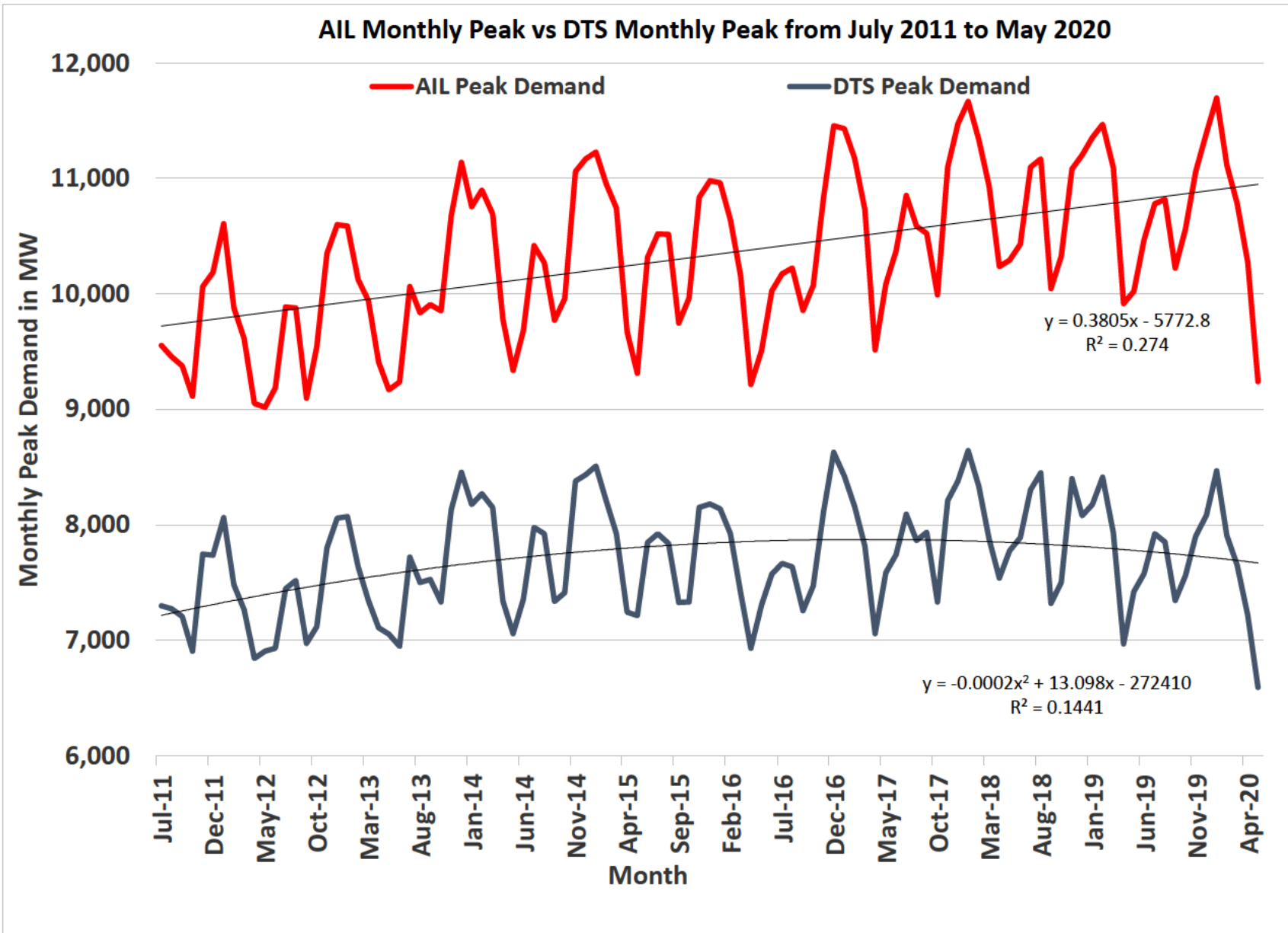
<p>6.</p>	<p><b>Generation Technologies</b></p> <ol style="list-style-type: none"> <li>a. What renewable technologies are likely to be developed by PPA's?</li> <li>b. What is the potential size of the corporate PPA market for renewables, being funded fully or in part, in Alberta?</li> <li>c. What challenges do you foresee in implementing PPA's for renewable development in Alberta?</li> <li>d. Recent public announcements indicate all existing coal-fired units will utilize natural gas in the near term. How do you see the operation of the converted units changing compared to operations as a coal-fired unit?</li> <li>e. Outside of existing generation technology in Alberta, what technology will show up in Alberta next?</li> <li>f. What are the challenges surrounding generation development in Alberta and what are the major factors that will determine what gets built?</li> </ol>	<p>The AESO should consider reaching out directly to the Business Renewables Centre Canada, the (soon to be established) Canadian Renewable Energy Association as well as existing Alberta generators on these topics.</p>
<p>7.</p>	<p><b>Future technologies</b></p> <p>The following table contains generation technologies and specifications on potential future generation development. Do you believe that these are representative of potential future Alberta generation projects? Would you like to share views on additional technologies and specifications that are not included within the table?</p>	<p>No comments at this time.</p>

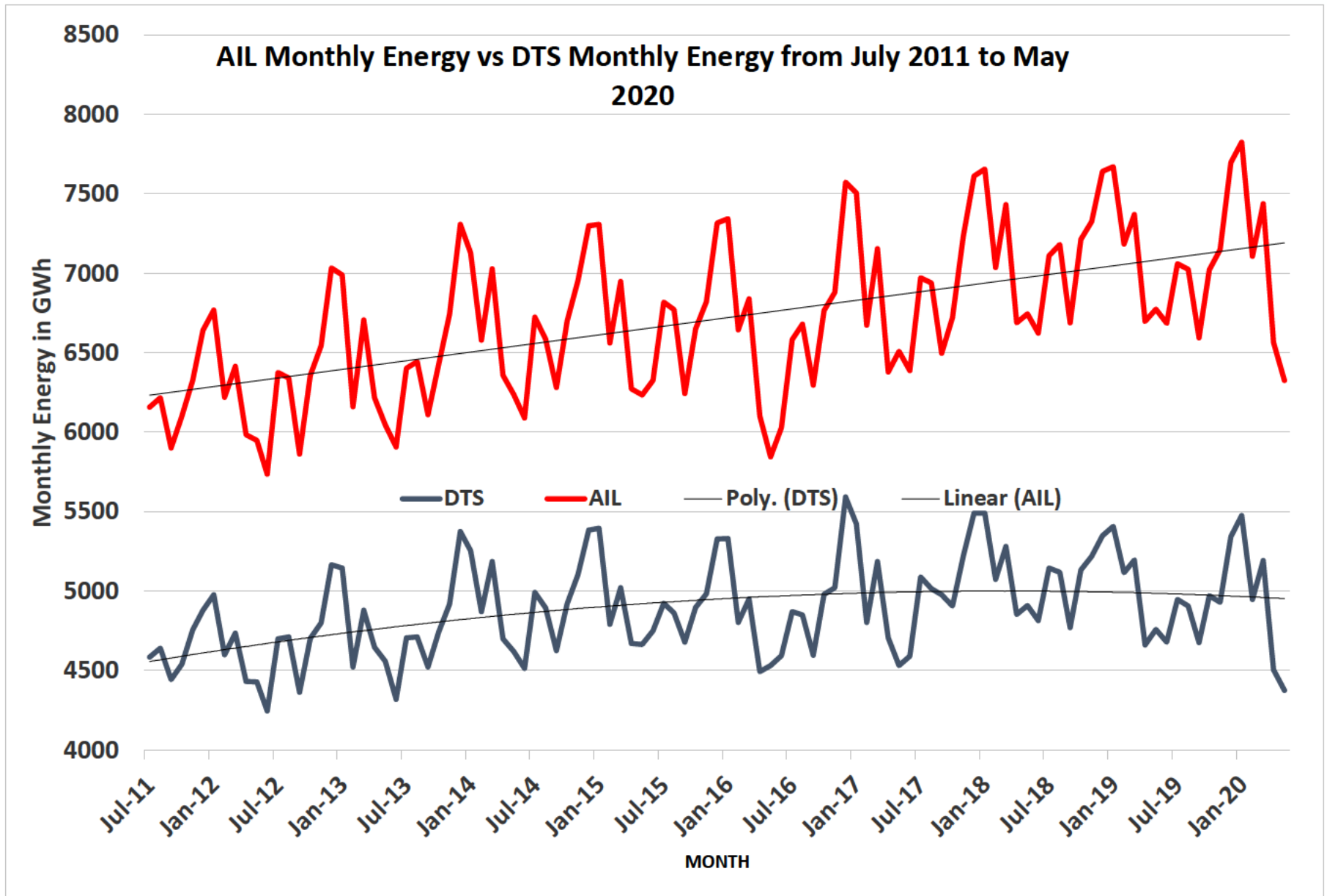


Facility Type	Overnight Capital Cost (\$/kW)	Fixed O&M (\$ / kW-year)	Variable O&M (\$/MWh)	Generator Capacity (MW)	Heat Rate (GJ/MWh)
Combined-Cycle Natural Gas	1,667	\$49.71	\$2.49	479	7.03
Simple-Cycle Natural Gas – Aeroderivative	1,159	\$52.83	\$4.24	46.5	9.68
Solar Photovoltaic – 2021-2025	1,643	\$31.85	Credit: grid intensity x carbon price	50	N/A
Solar Photovoltaic – 2026-2030	1,388	\$31.85	Credit: grid intensity x carbon price	50	N/A
Wind Generation - 2021-2025	1,586	\$32.50	Credit: grid intensity x carbon price	50	N/A
Wind Generation - 2026-2030	1,105	\$29.25	Credit: grid intensity x carbon price	50	N/A

8.	<p><b>Other</b></p> <p>a. Is there any information that you would like to share, which would contribute to the Long-term Outlook development (ie. Developing trends)?</p> <p>b. What do you think is likely to disrupt Alberta’s electricity industry in the next 20 years and in what way?</p>	<p>IPCAA has attached two graphs (all from AESO data) showing the divergence in AIL and DTS growth from both an energy and a peak viewpoint. Please see the graphs below.</p> <p>In both the energy and the peak demand graphs, DTS consumption is falling. This was happening prior to the COVID-19 pandemic. In fact, in 2019, DTS demand <b>fell by 1.6 TWh</b> in comparison to 2018.</p> <p>IPCAA submits that while electricity consumption will likely grow again, with the rising costs of transmission and distribution, there will be a greater focus on self-supply and demand response to mitigate rising costs.</p>
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## Stakeholder Comment Matrix – June, 2020

2021 Long-term Outlook Stakeholder Feedback



<b>Period of Comment:</b> June 4, 2020 through July 6, 2020 <b>Comments From:</b> Lionstooth Energy <b>Date:</b> 2020/07/06	<b>Contact:</b> [REDACTED] <b>Phone:</b> <b>Email:</b> [REDACTED]
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**Instructions:**

1. Please fill out the section above as indicated.
2. Please respond to the questions below and provide your specific comments.  
 Email your completed comment matrix to [forecast@aeso.ca](mailto:forecast@aeso.ca) by **July 6, 2020**

**The AESO is seeking comments from Stakeholders with regard to the following matters:**

	Questions	Stakeholder Comments
1.	<b>Long-term Outlook</b> a. What information do you find most useful within the Long-term Outlook? Is there additional information you would like to see? b. Do you use the Long-term Outlook data file? Which information within the Long-term Outlook data file is most useful to you? What additional data would you like to see within the data file? c. What delivery format of the data file would you find most useful? (Excel file, web query and download, interactive web based data visualization tool, other)	<b>A.</b> Lionstooth finds most components of the LTO useful. As the LTO ultimately impacts Tx system planning, the reference case, scenarios, and supporting analysis are all valuable.  Lionstooth would like to see more information on DERs as defined in the AESO’s DER Roadmap (any energy resource that is connected to and can supply energy to the Dx system) which includes not only rooftop solar, but also DCG.  <b>B.</b> Yes. Lionstooth uses the LTO data file. Most information contained in the file is valuable and Lionstooth would appreciate seeing more / additional data aligned with future LTO analysis.  <b>C.</b> Excel is sufficient.
2.	<b>Macroeconomic variables</b> a. The economic outlook could range from a V-shape recovery by Q2 2021 to a longer-term recovery by 2023, with some permanent load loss in the commercial	<b>A.</b> No comment. <b>B.</b> No comment.

	<p>and industrial sectors going forward. What is your view on the Alberta GDP over the medium- (next 5 years) and long-term (5+ years)?</p> <p>b. Oil sector production capacity is expected to increase in 2023 with the completion of pipeline projects (e.g., Keystone XL, etc.).</p> <p>I. The 2019 CAPP Crude Oil Forecast released in June 2019<sup>1</sup> had oilsands forecast growth from 3.2MM bbls/d in 2020 to 3.6MM bbls/d in 2025 and then 3.9MM bbls/d in 2030.</p> <p>a. What is your view on oil production in Alberta over these time periods given the market changes over the last year? What is your view post 2030?</p> <p>b. Do you expect new oil production developments to be in situ or mining, or a combination of both?</p> <p>c. Do you expect domestic condensate growth, required for transport, to meet the incremental oilsands growth? Will domestic condensate displace imported condensate?</p> <p>II. What is your view on further oil sector investments over the same timeframe?</p> <p>III. What kind of oil price or other environment would allow for further cogeneration development in the oilsands and/or petrochemical sectors?</p> <p>c. Current forward gas prices are in the \$2.25/GJ range. Post 5 years, do you see gas prices remaining at this level, decreasing, or increasing beyond inflation?</p>	<p>C. No comment.</p>
<p>3.</p>	<p><b>Policy</b></p> <p>a. What are your expectations of carbon prices in the future? Do you expect any change from a \$30/t rising to \$50/t, inflated by 2% thereafter?</p> <p>b. Other than policy on carbon pricing, what coming policies or policy scenarios do you see impacting load growth and generation development?</p>	<p>A. No comment.</p> <p>B. No comment.</p>
<p>4.</p>	<p><b>Impact of the COVID-19 pandemic</b></p> <p>a. What is your expectation on behaviour changes (e.g., work-from-home practices, online shopping, etc.) and the way Albertans consume electricity going forward?</p> <p>b. How are near-term costs and future generation projects being impacted by covid-19? Do you anticipate long term impacts to generation development?</p>	<p>A. Lionstooth won't speculate on future load behaviour changes, but notes that the AESO has been producing very interesting analysis on the impact of the COVID-19 pandemic on loads, including individual impacts to AIL, BTF industrial load, and System Load. We find this analysis and ad-hoc reporting valuable. We would support continuation of this</p>

<sup>1</sup> Canadian Association of Petroleum Producers <https://www.capp.ca/resources/crude-oil-forecast/>

		<p>type of analysis and integration of these findings into future LTOs and other AESO studies (i.e. Annual Market Statistics).</p> <p><b>B.</b> Lionstooth anticipates both positive and negative impacts to generation development as a result of the COVID-19 pandemic. On the positive side, surplus equipment and resources have come available that could provide improved CAPEX / OPEX positions for generation development. On the negative side, decreases in longer-term demand expectations as well as more challenging financial times will result in project delays or cancellations. These negative pressures have a greater impact on mega-projects and we have already seen a few cancelled during the pandemic.</p>
<p>5.</p>	<p><b>Load growth and modifiers</b></p> <p>a. Where do you think load growth will be concentrated –at the System Load (all metered demand) level, or at the Alberta Internal Load (system load plus load served by on-site generating units) level?</p> <p>b. Under what conditions could Alberta see sustained negative system load growth?</p> <p>c. In the 2019 Long-term Outlook, the AESO had a number of economic and technological advances that are expected to impact the load growth in the province (see section 4 of the 2019 LTO and "New Load Modifiers" tab of the 2019 LTO data file). What is your view on load growth and the impact of the following modifiers within the next 5 years, from 5 to 10 years, and after 10 years for:</p> <p>i. Distributed energy resources:</p> <ol style="list-style-type: none"> <li>1. Rooftop solar PV</li> <li>2. Electric vehicles and charging stations</li> <li>3. Gas generation</li> <li>4. Wind generation</li> <li>5. Energy storage</li> <li>6. Energy efficiency</li> </ol> <p>d. What is your view on load growth and the impact of other emerging industries, sectors or technologies (e.g., bitcoin and cryptocurrency mining, cannabis facilities, petrochemical facilities, data centers, others)?</p>	<p><b>A.</b> No comment.</p> <p><b>B.</b> There is potential for individual customer demand destruction in the form of business / operation closures but also as a result of sustained high delivered electricity costs which will force certain customers to invest in onsite generation and self-supply, with the potential to defect from the grid entirely. While the larger pressure on demand, at the moment, is recovery from the COVID-19 pandemic, as customers return to more normal business operations and look to recoup recent losses, high delivered electricity costs will likely be an area of focus for many. The AESO's recently published Delivered Cost of Electricity report provide interesting insights in this regard.</p> <p><b>C.</b> Lionstooth has always struggled with DERs being incorporated into the LTO as "New Load Modifiers." The "modifiers" listed in this question are not load, they are generation or energy sources that can supply electricity to the Dx system (i.e. EVs). While we recognize the AESO does not have the best visibility of all DERs at the moment, combining DERs with load further confuses flows on the Dx system and does not provide the individual component analysis (i.e. load vs. generation behaviours) that will ultimately improve Tx system planning.</p>

		<p>We strongly recommend the forthcoming LTO separates DERs from load.</p> <p>The AESO's DER Roadmap has nicely highlighted the value that DERs (ranging from rooftop solar to DCG) can bring to the AIES and the importance of integrating DERs into system modeling to allow for effective Tx planning.</p> <p><b>D.</b> No comment, other than these are actual "New Load Modifiers" unlike the DERs listed in Question C, which are in fact generators or new sources of electric supply (i.e. EVs).</p>
6.	<p><b>Generation Technologies</b></p> <ol style="list-style-type: none"> <li>a. What renewable technologies are likely to be developed by PPA's?</li> <li>b. What is the potential size of the corporate PPA market for renewables, being funded fully or in part, in Alberta?</li> <li>c. What challenges do you foresee in implementing PPA's for renewable development in Alberta?</li> <li>d. Recent public announcements indicate all existing coal-fired units will utilize natural gas in the near term. How do you see the operation of the converted units changing compared to operations as a coal-fired unit?</li> <li>e. Outside of existing generation technology in Alberta, what technology will show up in Alberta next?</li> <li>f. What are the challenges surrounding generation development in Alberta and what are the major factors that will determine what gets built?</li> </ol>	<ol style="list-style-type: none"> <li><b>A.</b> No comment.</li> <li><b>B.</b> No comment.</li> <li><b>C.</b> No comment.</li> <li><b>D.</b> No comment.</li> <li><b>E.</b> In terms of truly new technology to Alberta, the potential for EV energy supply back to the Dx system is something already being explored in other North American jurisdictions (i.e. California).</li> <li><b>F.</b> Market design and rule certainty is the biggest challenge surrounding generation development in Alberta.</li> </ol> <p>Following the confirmation that our market would remain energy-only and not transition to a capacity market, there was direction for a measured and thoughtful pace to change. However, there have been a number of significant decisions, proceedings, consultations, and engagements that have resulted from a lack of measured and thoughtful change that have placed many generation developments at risk, specifically those planning to connect to the Dx system.</p> <p>It is Lionstooth's hope that over the coming months, some of these issues begin to see resolution and a clear path forward established.</p>

<p>7.</p>	<p><b>Future technologies</b> The following table contains generation technologies and specifications on potential future generation development. Do you believe that these are representative of potential future Alberta generation projects? Would you like to share views on additional technologies and specifications that are not included within the table?</p> <table border="1" data-bbox="249 435 1146 948"> <thead> <tr> <th>Facility Type</th> <th>Overnight Capital Cost (\$/kW)</th> <th>Fixed O&amp;M (\$ / kW-year)</th> <th>Variable O&amp;M (\$/MWh)</th> <th>Generator Capacity (MW)</th> <th>Heat Rate (GJ/MWh)</th> </tr> </thead> <tbody> <tr> <td>Combined-Cycle Natural Gas</td> <td>1,667</td> <td>\$49.71</td> <td>\$2.49</td> <td>479</td> <td>7.03</td> </tr> <tr> <td>Simple-Cycle Natural Gas – Aero-derivative</td> <td>1,159</td> <td>\$52.83</td> <td>\$4.24</td> <td>46.5</td> <td>9.68</td> </tr> <tr> <td>Solar Photovoltaic – 2021-2025</td> <td>1,643</td> <td>\$31.85</td> <td>Credit: grid intensity x carbon price</td> <td>50</td> <td>N/A</td> </tr> <tr> <td>Solar Photovoltaic – 2026-2030</td> <td>1,388</td> <td>\$31.85</td> <td>Credit: grid intensity x carbon price</td> <td>50</td> <td>N/A</td> </tr> <tr> <td>Wind Generation - 2021-2025</td> <td>1,586</td> <td>\$32.50</td> <td>Credit: grid intensity x carbon price</td> <td>50</td> <td>N/A</td> </tr> <tr> <td>Wind Generation - 2026-2030</td> <td>1,105</td> <td>\$29.25</td> <td>Credit: grid intensity x carbon price</td> <td>50</td> <td>N/A</td> </tr> </tbody> </table>	Facility Type	Overnight Capital Cost (\$/kW)	Fixed O&M (\$ / kW-year)	Variable O&M (\$/MWh)	Generator Capacity (MW)	Heat Rate (GJ/MWh)	Combined-Cycle Natural Gas	1,667	\$49.71	\$2.49	479	7.03	Simple-Cycle Natural Gas – Aero-derivative	1,159	\$52.83	\$4.24	46.5	9.68	Solar Photovoltaic – 2021-2025	1,643	\$31.85	Credit: grid intensity x carbon price	50	N/A	Solar Photovoltaic – 2026-2030	1,388	\$31.85	Credit: grid intensity x carbon price	50	N/A	Wind Generation - 2021-2025	1,586	\$32.50	Credit: grid intensity x carbon price	50	N/A	Wind Generation - 2026-2030	1,105	\$29.25	Credit: grid intensity x carbon price	50	N/A	<p>No. Lionstooth is of the view, supported by the AESO’s Project List, that there will be a significant increase in the amount of Dx connected generation in the future. DER technologies, ranging from rooftop solar to dispatchable gas-fired DCG and intermittent renewable DCGs, are missing from the table.</p>
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<p>8.</p>	<p><b>Other</b></p> <ol style="list-style-type: none"> <li>Is there any information that you would like to share, which would contribute to the Long-term Outlook development (ie. Developing trends)?</li> <li>What do you think is likely to disrupt Alberta’s electricity industry in the next 20 years and in what way?</li> </ol>	<ol style="list-style-type: none"> <li>The remainder of 2020 will include further discussion and engagement on DERs, as the AUC’s Distribution System Inquiry comes to a close and the AESO consults on the DER Roadmap. In order for effective Tx planning, there is an immediate need to better incorporate, model, and plan for existing and future DERs to allow for their value and benefits to the entire wires system to be realized.</li> <li>Lionstooth’s future vision of our electricity market includes increased adoption of DERs as customers are defining what kind of services they want. This includes electricity consumption and supply becoming increasingly more democratized and personalized. Consistently more and smaller generation will serve individual customers, with energy flowing customer to customer, Dx feeder to Dx</li> </ol>																																										



		<p>feeder, and then to the Tx system. Policy and tariff design, as well as integrated grid planning, will need to focus on what best enables customers to meet their needs and protect those same customers from growth in assets and infrastructure that no longer serves customers' needs.</p>
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# Stakeholder Comment Matrix – June, 2020

2021 Long-term Outlook Stakeholder Feedback



<b>Period of Comment:</b> June 4, 2020 through July 6, 2020	<b>Contact:</b> [REDACTED]
<b>Comments From:</b> Pembina Institute	<b>Phone:</b> [REDACTED]
<b>Date:</b> [2020/07/06]	<b>Email:</b> [REDACTED]

Instructions:

1. Please fill out the section above as indicated.
2. Please respond to the questions below and provide your specific comments.  
Email your completed comment matrix to [forecast@aeso.ca](mailto:forecast@aeso.ca) by **July 6, 2020**

**The AESO is seeking comments from Stakeholders with regard to the following matters:**

	Questions	Stakeholder Comments
1.	<p><b>Long-term Outlook</b></p> <ol style="list-style-type: none"> <li>a. What information do you find most useful within the Long-term Outlook? Is there additional information you would like to see?</li> <li>b. Do you use the Long-term Outlook data file? Which information within the Long-term Outlook data file is most useful to you? What additional data would you like to see within the data file?</li> <li>c. What delivery format of the data file would you find most useful? (Excel file, web query and download, interactive web based data visualization tool, other)</li> </ol>	<ol style="list-style-type: none"> <li>a. The details of the assumptions made to design each scenario are helpful to understanding the projections for renewable energy deployment in Alberta.</li> <li>b. The Pembina Institute uses the data file and we commend the AESO for always publishing it with the report. In particular we frequently use the data on the breakdown of total capacity installed and generation per technology under each scenario. The following is a list of additional data that would be useful: <ul style="list-style-type: none"> <li>• Capacity and generation projection data for every year as opposed to datapoints every five years would provide more granular data to compare progress against and assist with any modelling that may be done for the intervening years.</li> <li>• Past and projected average GHG emissions intensity of Alberta’s grid would give an overall picture of the market’s exposure to carbon pricing.</li> <li>• GHG emissions intensity data by technology (or even by unit) would also give more transparency on the extent to which each technology is going to be exposed to carbon pricing.</li> <li>• The current and projected marginal GHG emissions intensity would help understand the size of the revenues that new renewable energy projects would generate from carbon credits.</li> <li>• Behind-the-fence generation data from cogeneration facilities would give stakeholders a more complete view of Alberta’s electricity system. In the context of oil market shocks like during the coronavirus crisis, it is important to plan for the readjusted role cogeneration can play in the grid as the consistency of its supply could be challenged again in future market shocks.</li> </ul> </li> <li>c. Given the current granularity of the LTO data, an Excel file as previously provided by the AESO, is adequate. However, the addition of interactive visualization tools would make data more accessible to a wider a range of stakeholders and contribute to public education about Alberta’s electricity grid.</li> </ol>

2.	<p><b>Macroeconomic variables</b></p> <p>a. The economic outlook could range from a V-shape recovery by Q2 2021 to a longer-term recovery by 2023, with some permanent load loss in the commercial and industrial sectors going forward. What is your view on the Alberta GDP over the medium- (next 5 years) and long-term (5+ years)?</p> <p>b. Oil sector production capacity is expected to increase in 2023 with the completion of pipeline projects (e.g., Keystone XL, etc.).</p> <p style="padding-left: 20px;">I. The 2019 CAPP Crude Oil Forecast released in June 2019<sup>1</sup> had oilsands forecast growth from 3.2MM bbls/d in 2020 to 3.6MM bbls/d in 2025 and then 3.9MM bbls/d in 2030.</p> <p style="padding-left: 40px;">a. What is your view on oil production in Alberta over these time periods given the market changes over the last year? What is your view post 2030?</p> <p style="padding-left: 40px;">b. Do you expect new oil production developments to be in situ or mining, or a combination of both?</p> <p style="padding-left: 40px;">c. Do you expect domestic condensate</p>	<p>a. N/A</p> <p>I.a. Most reference scenarios (such as those developed by the IEA, BP, McKinsey) show that global oil demand is expected to plateau or start declining in the next five to 15 years, in response to a number of forces – including electrification of transport, reduced plastics demand (e.g. ban on single-use plastics), efficiency gains and low-carbon fuels for aviation and marine sectors.<sup>2</sup> While what the global trend means for Alberta oil production remains to be seen, it should be expected that some of the most expensive and carbon-intensive barrels produced in Alberta will be penalized first. A 2020 report has demonstrated that a significant portion of the Alberta oilsands are at the far end of the global oil cost curve.<sup>3</sup> A 2020 assessment by BP also concluded that new oil prices were making some of their oilsands investments uneconomical.<sup>4</sup> Oil carbon competitiveness – that is, the GHG emissions associated with the production of one barrel of oil for a given crude – is also an increasingly important metric. After 2030, because of changes in consumer habits, adoption of new technologies as well as strong climate policies (such as clean fuel standards) adopted globally, only lower-carbon barrels may remain competitive to supply the market. It must be noted that a number of oilsands producers have announced their ambition of being carbon-neutral by 2050.</p> <p>I.b. The Canada Energy Regulator projects, in its <a href="#">Canada's Energy Future 2019</a> report, the bulk of new oil production to come from in situ oilsands production. Companies will likely prefer to invest in smaller, more agile projects, such as the expansion of existing in situ projects. The bulk of oilsands reserves are located deep underground, therefore requiring in situ technologies for extraction, rather than traditional surface mining operations.</p> <p>I.c. N/A</p> <p>II. The 2014 drop in oil price has initiated a concerning wave of divestment from the Canadian oilsands, motivated by oilsands economics as well as, in some cases, concerns over the industry's climate footprint. In our view, investment in the oilsands will only materialize if producers can show they have <u>credible</u> plans to reduce the carbon footprint of oilsands production, both in intensity and absolute/overall terms – that is in line with Canada's objective to be net-zero emissions by 2050. Failing to demonstrate credible plans may only lead to further divestment.</p>
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<p>growth, required for transport, to meet the incremental oilsands growth? Will domestic condensate displace imported condensate?</p> <p>II. What is your view on further oil sector investments over the same timeframe?</p> <p>III. What kind of oil price or other environment would allow for further cogeneration development in the oilsands and/or petrochemical sectors?</p> <p>d. Current forward gas prices are in the \$2.25/GJ range. Post 5 years, do you see gas prices remaining at this level, decreasing, or increasing beyond inflation?</p>	<p>III. Alberta's current carbon pricing scheme (TIER) could help with the development of cogeneration in the oilsands and/or petrochemical sectors. However, in the medium to long term, development of gas-fired cogeneration (without carbon capture) may be insufficient for both sectors to stay competitive in a low-carbon world (that is, working towards achieving a national net-zero emissions target by 2050).</p> <p>d. The shale gas revolution in the U.S., combined with Alberta's geographic location further from continental markets (located east of the continent) are some of the reasons for the long-standing depreciated natural gas price environment in Alberta that has existed here for more than a decade. Indeed, there is still an oversupply of natural gas across North America. Further, the oil and gas sector is one of the main consumers of natural gas in Alberta. Should the oil production growth forecast not materialize in Alberta, and industry continues to implement technologies to reduce the carbon intensity of the oilsands (and thus, natural gas consumption), there is a possibility that natural gas demand will decrease in the coming years. Only a significant surge in demand could help natural gas price rebound in Alberta. In our view, such demand could come from the large-scale development of blue hydrogen (the conversion of natural gas to hydrogen via steam methane reforming and carbon capture), especially if hydrogen begins to displace natural gas. It requires 1.4 gigajoules of natural gas to produce one gigajoule of blue hydrogen resulting in a 40% increase in gas consumption, assuming all natural gas use is replaced with blue hydrogen. Should a continental blue hydrogen economy emerge, we expect to see its first effects in the second half of the coming decade.</p>
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<sup>1</sup> Canadian Association of Petroleum Producers <https://www.capp.ca/resources/crude-oil-forecast/>

<sup>2</sup> Benjamin Israël, *The oilsands in a carbon-constrained Canada* (Pembina Institute, 2020), 19. <https://www.pembina.org/reports/the-oilsands-in-a-carbon-constrained-canada-march-2020.pdf>

<sup>3</sup> Peter Erickson, Michael Lazarus, *Examining risks of new oil and gas production in Canada* (Stockholm Environment Institute, 2020), 7-8. <https://www.sei.org/wp-content/uploads/2020/06/examining-risks-of-new-oil-and-gas-production-in-canada.pdf>

<sup>4</sup> Ron Bousso, Shadia Nasralla, "BP's stranded Canadian, Angolan assets expose wider industry risks," *Reuters*, June 24, 2020. <https://www.reuters.com/article/us-bp-strandedassets-analysis/bps-stranded-canadian-angolan-assets-expose-wider-industry-risks-idUSKBN23V1ZY>

3.	<p><b>Policy</b></p> <p>a. What are your expectations of carbon prices in the future? Do you expect any change from a \$30/t rising to \$50/t, inflated by 2% thereafter?</p> <p>b. Other than policy on carbon pricing, what coming policies or policy scenarios do you see impacting load growth and generation development?</p>	<p>a. The Canadian government's backstop carbon price is scheduled to increase to \$40 per tonne in 2021 and \$50 per tonne in 2022. The Government of Canada only granted equivalency for the Technology Innovation and Emissions Reduction regulation (TIER) for 2020. This year, the Government of Alberta committed to increase the carbon price under TIER to the same levels as the federal backstop.<sup>5</sup> It is expected that this will be enough to grant Alberta equivalency in 2021 and 2022. Beyond 2022, future equivalencies are at risk if TIER's output-based standard is not lowered. Indeed, while TIER's output-based standard is fixed at 0.370 tonnes per megawatt hour for all technologies, in 2030, the federal output-based standards will be set at the following values:</p> <ul style="list-style-type: none"> <li>- coal: 0.370 tonnes per megawatt hour</li> <li>- existing gas: 0.370 tonnes per megawatt hour</li> <li>- gas commissioned from 2021 onward: 0 tonnes per megawatt hour</li> </ul> <p>With such standards, at a minimum carbon price of \$50 per tonne, the economics of new gas-fired power stations in Alberta will be impacted. In addition to updated standards, the federal government may consider increasing the carbon price beyond \$50 per tonne after 2022 as part of the different measures it needs to take to achieve net-zero emissions by 2050. As the Pembina Institute stated in its <i>Winning on climate</i> report: "To build on the interconnected policies and actions in place in the Pan-Canadian Framework, an effective investment signal must be maintained across the economy by setting an increased price on carbon pollution beyond 2022, and by adopting more stringent emissions-intensity standards for heavy emitters (industrial polluters)."<sup>6</sup> A higher carbon price will diminish the economic case for gas-fired power stations against clean energy portfolios (the combination of renewables, storage, energy efficiency and demand flexibility<sup>7</sup>).</p> <p>b. Upcoming federal and municipal policies to address climate change will lead to more industry changes. The federal Clean Fuel Standard for gaseous fuels is expected to be enforced starting in 2023. It will increase the fuel cost for natural gas-fired power stations and coal-fired power stations with dual fuel capacity or with plans to fully convert to natural gas. While we do not know the extent of that fuel cost increase for these assets, it is reasonable to expect that it will be an additional factor that operators will need to take into account before investment decisions are made for new gas-fired assets. Policies on renewable procurement and incentives will lead to growth in renewable electricity projects. Investments from Emissions Reduction Alberta and Low Carbon Cities Canada may also support deployment of certain technologies, albeit likely at a small scale. Other policies that invest in new technologies such as hydrogen and battery storage will</p>
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<sup>5</sup> Daniel Vollmer, "Alberta to increase industrial carbon tax to \$50/tonne to match federal requirements," *DeMarco Allan LLP*, March 6, 2020.

<https://www.demarcoallan.com/single-post/2020/03/06/Alberta-to-increase-industrial-carbon-tax-to-50tonne-to-match-federal-requirements>

<sup>6</sup> Pembina Institute, *Winning on climate: Action plan for a decarbonized Canadian economy* (2019), 2. <https://www.pembina.org/reports/winning-on-climate.pdf>

<sup>7</sup> Jan Gorski, Binnu Jeyakumar, *Reliable, affordable: The economic case for scaling up clean energy portfolios* (Pembina Institute, 2019).

<https://www.pembina.org/pub/reliable-affordable-economic-case-scaling-clean-energy-portfolios>

		<p>also impact load and generation. Reform to the distribution system regulatory framework will also impact the penetration of Distribution Energy Resources – both behind the fence and grid-connected.</p>
4.	<p><b>Impact of the COVID-19 pandemic</b></p> <ul style="list-style-type: none"> <li>a. What is your expectation on behaviour changes (e.g., work-from-home practices, online shopping, etc.) and the way Albertans consume electricity going forward?</li> <li>b. How are near-term costs and future generation projects being impacted by covid-19? Do you anticipate long term impacts to generation development?</li> </ul>	<ul style="list-style-type: none"> <li>a. N/A</li> <li>b. Depending on the nature of the economic recovery packages from the federal and provincial government, there may be support to certain generation technologies.</li> </ul>



<p>5.</p>	<p><b>Load growth and modifiers</b></p> <p>a. Where do you think load growth will be concentrated –at the System Load (all metered demand) level, or at the Alberta Internal Load (system load plus load served by on-site generating units) level?</p> <p>b. Under what conditions could Alberta see sustained negative system load growth?</p> <p>c. In the 2019 Long-term Outlook, the AESO had a number of economic and technological advances that are expected to impact the load growth in the province (see section 4 of the 2019 LTO and "New Load Modifiers" tab of the 2019 LTO data file). What is your view on load growth and the impact of the following modifiers within the next 5 years, from 5 to 10 years, and after 10 years for:</p> <ul style="list-style-type: none"> <li>i. Distributed energy resources: <ul style="list-style-type: none"> <li>1. Rooftop solar PV</li> <li>2. Electric vehicles and charging stations</li> <li>3. Gas generation</li> <li>4. Wind generation</li> <li>5. Energy storage</li> <li>6. Energy efficiency</li> </ul> </li> </ul> <p>d. What is your view on load growth and the impact of other emerging industries, sectors or technologies</p>	<p>a. N/A</p> <p>b. N/A</p> <p>c. N/A</p> <p>d. Policies will encourage energy efficiency, zero-emission vehicles (fuel cell and battery-electric specifically) and solar. For example, updated building codes with more stringent energy efficiency requirements will reduce the energy consumption of future new buildings compared with current new buildings. The continuation of the federal rebate for electric vehicles as well as a potential national sale mandate will drive the acceleration of growth in electric vehicle sales in Alberta. Changes to the tariff structures that better recognize the value of distributed energy resources will incentivize more adoption of rooftop solar. There are many services and benefits that distributed energy resources can bring to Alberta's grid. These include generation capacity deferral, transmission capacity deferral, distribution capacity deferral, voltage control, ancillary services, energy savings, reduced system losses, improved power quality and emissions reduction. For more information on the benefits of distributed energy resources, check the Pembina Institute's written submission, Module One of the AUC's Distribution Systems Inquiry.<sup>8</sup></p> <p>e. N/A</p>
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	<p>(e.g., bitcoin and cryptocurrency mining, cannabis facilities, petrochemical facilities, data centers, others)?</p>	
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<sup>8</sup> Binu Jeyakumar, Sheila Ify Obi, Sara Hastings Simon, *Pembina Institute's Submission for Module 1* (2019), AUC Proceeding 24116: Distribution System Inquiry, X0175

<p>6.</p>	<p><b>Generation Technologies</b></p> <ul style="list-style-type: none"> <li>a. What renewable technologies are likely to be developed by PPA's?</li> <li>b. What is the potential size of the corporate PPA market for renewables, being funded fully or in part, in Alberta?</li> <li>c. What challenges do you foresee in implementing PPA's for renewable development in Alberta?</li> <li>d. Recent public announcements indicate all existing coal-fired units will utilize natural gas in the near term. How do you see the operation of the converted units changing compared to operations as a coal-fired unit?</li> <li>e. Outside of existing generation technology in Alberta, what technology will show up in Alberta next?</li> <li>f. What are the challenges surrounding generation development in Alberta and what are the major factors that will determine what gets built?</li> </ul>	<ul style="list-style-type: none"> <li>a. An increasing number of businesses and institutions are procuring power from wind and solar projects. The Renewable Energy Buyers Alliance in the United States reported that corporate off takers are now considering procuring power from solar paired with storage projects.<sup>9</sup> This trend could occur in Canada too as the PPA market develops.</li> <li>b. According to Power Advisory,<sup>10</sup> a cumulative minimum of 4,000 gigawatt hours will be procured between by 2025 (based on "well baked" PPA deals). Reasonable expectations for growth indicate that a cumulative 9,000 gigawatt hours will be procured by 2025.<sup>11</sup> The Business Renewables Centre (BRC) Canada's 2025 goal is to achieve two gigawatts of announced deals. The BRC represents over 40 members involved in PPAs.</li> <li>c. Several renewable energy developers have raised concerns about the lack of available transmission capacity as several projects are moving to construction stage shortly. To prevent this and open up for more of these deals, Texas created Competitive Renewable Energy Zones. This is an approach that the AESO could consider.<sup>12</sup> Small corporate buyers are interested in PPAs but the aggregation of their load is a challenge and has not been done in Alberta yet.<sup>13</sup></li> <li>d. N/A</li> <li>e. There will be more battery storage technology brought online as the AESO takes action on its Storage Roadmap. Long-term duration storage and more demand side management technologies may also be deployed as they are developed in other jurisdictions.</li> <li>f. The major factors that will determine what gets built include carbon pricing, changes to distributed energy resources (DER) regulations and market rules, transmission constraints, and support for technologies such as storage and CCUS. There is significant potential for DERs but there are challenges with how the rate structure and regulatory frameworks account for the services they provide. Changing the regulatory framework will unlock their potential and contribute to grid reliability. Additional interprovincial transmission capacity will help improve flexibility in the grid and could help integrate more renewable resources in Alberta.</li> </ul>
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<sup>9</sup> Renewable Energy Buyers Alliance, “REBA Connect: Virtual Member Summit - State of the Market,” presented at the REBA Connect: Virtual Member Summit, May 5-7, 2020. <https://www.youtube.com/watch?v=yMUgQJf2ddg>

<sup>10</sup> Kris Aksomit, Jason Chee-Aloy, “Outlook for Alberta’s Electricity Market Focusing on PPAs with Power Advisory LLC,” webinar presented at BRC Webinar Series: Procuring Renewable Energy in Canada, June 16, 2020

<sup>11</sup> Ibid

<sup>12</sup> Madeline Claire Gould, Everything’s bigger in Texas : evaluating the success and outlook of the Competitive Renewable Energy Zone (CREZ) legislation in Texas (University of Texas at Austin, 2018). <https://repositories.lib.utexas.edu/handle/2152/68613>

<sup>13</sup> Business Renewables Centre Canada, “Deep Dive with BRC Founding Members,” webinar presented at BRC Webinar Series: Procuring Renewable Energy in Canada, June 17, 2020

7.	<p><b>Future technologies</b></p> <p>The following table contains generation technologies and specifications on potential future generation development. Do you believe that these are representative of potential future Alberta generation projects? Would you like to share views on additional technologies and specifications that are not included within the table?</p> <table border="1" data-bbox="306 618 949 1130"> <thead> <tr> <th>Facility Type</th> <th>Overnight Capital Cost (\$/kW)</th> <th>Fixed O&amp;M (\$ / kW-year)</th> <th>Variable O&amp;M (\$/MWh)</th> </tr> </thead> <tbody> <tr> <td>Combined-Cycle Natural Gas</td> <td>1,667</td> <td>\$49.71</td> <td>\$2.49</td> </tr> <tr> <td>Simple-Cycle Natural Gas – Aeroderivative</td> <td>1,159</td> <td>\$52.83</td> <td>\$4.24</td> </tr> <tr> <td>Solar Photovoltaic – 2021-2025</td> <td>1,643</td> <td>\$31.85</td> <td>Credit: grid intensity x carbon price</td> </tr> <tr> <td>Solar Photovoltaic – 2026-2030</td> <td>1,388</td> <td>\$31.85</td> <td>Credit: grid intensity x carbon price</td> </tr> <tr> <td>Wind Generation - 2021-2025</td> <td>1,586</td> <td>\$32.50</td> <td>Credit: grid intensity x carbon price</td> </tr> <tr> <td>Wind Generation - 2026-2030</td> <td>1,105</td> <td>\$29.25</td> <td>Credit: grid intensity x carbon price</td> </tr> </tbody> </table>	Facility Type	Overnight Capital Cost (\$/kW)	Fixed O&M (\$ / kW-year)	Variable O&M (\$/MWh)	Combined-Cycle Natural Gas	1,667	\$49.71	\$2.49	Simple-Cycle Natural Gas – Aeroderivative	1,159	\$52.83	\$4.24	Solar Photovoltaic – 2021-2025	1,643	\$31.85	Credit: grid intensity x carbon price	Solar Photovoltaic – 2026-2030	1,388	\$31.85	Credit: grid intensity x carbon price	Wind Generation - 2021-2025	1,586	\$32.50	Credit: grid intensity x carbon price	Wind Generation - 2026-2030	1,105	\$29.25	Credit: grid intensity x carbon price	<p>Battery storage, already low-cost and feasible,<sup>14</sup> should be added in the table as well as solar paired with storage, which has already won competitive auctions in several jurisdictions like Arizona.<sup>15</sup> Hydrogen storage, while being a longer-term solution, should be added here too. The electricity sector is already considering hydrogen as a serious pathway in other Canadian jurisdictions like Quebec.<sup>16</sup> GHG emissions and carbon costs should be included in the list of specifications in the table, as they will impact the operating costs for these technologies.</p>
Facility Type	Overnight Capital Cost (\$/kW)	Fixed O&M (\$ / kW-year)	Variable O&M (\$/MWh)																											
Combined-Cycle Natural Gas	1,667	\$49.71	\$2.49																											
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<sup>14</sup> Jan Gorski, Binny Jeyakumar, *Reliable, affordable: The economic case for scaling up clean energy portfolios* (Pembina Institute, 2019). <https://www.pembina.org/pub/reliable-affordable-economic-case-scaling-clean-energy-portfolios>

<sup>15</sup> Julian Spector, “First Solar Made Good on Its Promise to Beat Out Gas Peakers With Solar and Batteries,” *Greentech Media*, February 13, 2018. <https://www.greentechmedia.com/articles/read/50-megawatt-battery-will-give-arizona-peak-power-from-the-sun>

<sup>16</sup> Hydro-Québec, “Hydro-Québec will support the clean hydrogen sector in Québec,” media release, December 5, 2019. <http://news.hydroquebec.com/en/news/224/hydro-quebec-will-support-the-clean-hydrogen-sector-in-quebec/>

<p>8.</p>	<p><b>Other</b></p> <p>a. Is there any information that you would like to share, which would contribute to the Long-term Outlook development (ie. Developing trends)?</p> <p>b. What do you think is likely to disrupt Alberta's electricity industry in the next 20 years and in what way?</p>	<p>a. We encourage the AESO to connect with the Business Renewables Centre Canada to get updated information on corporate and institutional procurement of renewable electricity in Alberta.</p> <p>The world's economy is undergoing a shift to rapidly reduce GHG emissions to limit the impact of climate change and achieve the targets agreed upon in the Paris Agreement. The International Energy Agency recently called for governments to invest in decarbonizing their electricity grids.<sup>17</sup> Such investments are already economically feasible in North America as new clean energy portfolios are already more cost-effective than new gas-fired power stations.<sup>18</sup> With more climate-driven investments and the declining costs of battery storage solutions, the Alberta electricity system is only at the beginning of its transformation.</p> <p>b. Corporate procurement of renewable electricity has followed an exponential growth around the world. Alberta will not be indifferent to that trend. The goal of the Business Renewables Centre Canada is two gigawatts of signed deals by 2025. The exponential growth of PPAs is expected to continue after 2025. The federal government has a 2050 target to reduce GHG emissions to net zero. As Canada implements policies to achieve that goal, some will undoubtedly apply to the Alberta electricity sector in addition to the current level of carbon pricing applied by the Government of Alberta. This will drive the development of more renewable energy, energy storage, energy efficiency and demand-side response projects in Alberta. In addition, as these technologies continue to become more economic than gas, their penetration may be further accelerated.</p>
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<sup>17</sup> International Energy Agency, "Sustainable Recovery: World Energy Outlook Special Report – Electricity," June 2020. <https://www.iea.org/reports/sustainable-recovery/electricity#abstract>

<sup>18</sup> Charles Teplin, Mark Dyson, Alex Engel, and Grant Glazer, The Growing Market for Clean Energy Portfolios (Rocky Mountain Institute, 2019). <https://rmi.org/insight/clean-energy-portfolios-pipelines-and-plants/>

## Stakeholder Comment Matrix – June, 2020

2021 Long-term Outlook Stakeholder Feedback



<p><b>Period of Comment:</b> June 4, 2020 through July 6, 2020</p> <p><b>Comments From:</b> TransCanada Energy Ltd. (TCE)</p> <p><b>Date:</b> 2020/07/06</p>	<p><b>Contact:</b> [REDACTED]</p> <p><b>Phone:</b> [REDACTED]</p> <p><b>Email:</b> [REDACTED]</p>
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**Instructions:**

1. Please fill out the section above as indicated.
2. Please respond to the questions below and provide your specific comments.  
Email your completed comment matrix to [forecast@aeso.ca](mailto:forecast@aeso.ca) by **July 6, 2020**

**The AESO is seeking comments from Stakeholders with regard to the following matters:**

	Questions	Stakeholder Comments
a.	<p><b>Long-term Outlook</b></p> <ol style="list-style-type: none"> <li>a. What information do you find most useful within the Long-term Outlook? Is there additional information you would like to see?</li> <li>b. Do you use the Long-term Outlook data file? Which information within the Long-term Outlook data file is most useful to you? What additional data would you like to see within the data file?</li> <li>c. What delivery format of the data file would you find most useful? (Excel file, web query and download, interactive web based data visualization tool, other)</li> </ol>	<ol style="list-style-type: none"> <li>a. TCE finds the reference case and the scenarios to be the most useful. It is important that the Long-term Outlook (LTO) present low and high scenarios and alternative scenarios to bound all possible outcomes. TCE recommends that the reference case be vetted by a reputable third-party and that the AESO consult with stakeholders to determine the appropriate weighting of the scenarios.  All of the Excel sheets/tabs are also of interest.  TCE would also like to see some cogeneration generation costs and battery costs be included in future LTOs.</li> <li>b. Yes, TCE does use the LTO data file. The demand forecast data is useful as well as all of the Excel sheets/tabs. As mentioned in (a) above, we would like to see some cogeneration generation and battery costs be added.</li> <li>c. An Excel file is acceptable.</li> </ol>

<p>b.</p>	<p><b>Macroeconomic variables</b></p> <p>a. The economic outlook could range from a V-shape recovery by Q2 2021 to a longer-term recovery by 2023, with some permanent load loss in the commercial and industrial sectors going forward. What is your view on the Alberta GDP over the medium- (next 5 years) and long-term (5+ years)?</p> <p>b. Oil sector production capacity is expected to increase in 2023 with the completion of pipeline projects (e.g., Keystone XL, etc.).</p> <ol style="list-style-type: none"> <li>I. The 2019 CAPP Crude Oil Forecast released in June 2019<sup>1</sup> had oilsands forecast growth from 3.2MM bbls/d in 2020 to 3.6MM bbls/d in 2025 and then 3.9MM bbls/d in 2030.             <ol style="list-style-type: none"> <li>a. What is your view on oil production in Alberta over these time periods given the market changes over the last year? What is your view post 2030?</li> <li>b. Do you expect new oil production developments to be in situ or mining, or a combination of both?</li> <li>c. Do you expect domestic condensate growth, required for transport, to meet the incremental oilsands growth? Will domestic condensate displace imported condensate?</li> </ol> </li> <li>II. What is your view on further oil sector investments over the same timeframe?</li> <li>III. What kind of oil price or other environment would allow for further cogeneration development in the oilsands and/or petrochemical sectors?</li> </ol> <p>d. Current forward gas prices are in the \$2.25/GJ range. Post 5 years,</p>	<p>a. While TCE expects that a recovery will occur, the pace of the recovery is unknown. TCE recommends that the AESO model a few scenarios (e.g., the V-shape recovery, the longer-term recovery by 2023, and a permanent load loss scenario as suggested by the question).</p> <p>b. TCE recommends that the AESO consult with stakeholders to develop reasonable forecast scenarios and determine the appropriate weighting of these scenarios.</p> <p>d. TCE expects that that prices may trend somewhat higher if LNG exports grow. TCE encourages the AESO to consult with stakeholders to develop reasonable forecast scenarios and determine the appropriate weighting of these scenarios.</p>
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<sup>1</sup> Canadian Association of Petroleum Producers <https://www.capp.ca/resources/crude-oil-forecast/>



	do you see gas prices remaining at this level, decreasing, or increasing beyond inflation?	
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	<p><b>Policy</b></p> <ul style="list-style-type: none"> <li>a. What are your expectations of carbon prices in the future? Do you expect any change from a \$30/t rising to \$50/t, inflated by 2% thereafter?</li> <li>b. Other than policy on carbon pricing, what coming policies or policy scenarios do you see impacting load growth and generation development?</li> </ul>	<ul style="list-style-type: none"> <li>a. The current price expectation is that prices will rise to \$50/t as per the federal system. TCE recommends that the AESO develop reasonable forecast scenarios that include higher and lower prices.</li> <li>b. Electric vehicles and the electrification of industrial or heating demand could be advanced more quickly through government policy. The development of the Federal Clean Fuel Standard (CFS) has the potential to significantly impact supply-demand fundamentals. The 2030 targets set for the CFS are aggressive and could have a material impact on Alberta power consumers and on the future generation mix.</li> </ul>
	<p><b>Impact of the COVID-19 pandemic</b></p> <ul style="list-style-type: none"> <li>a. What is your expectation on behaviour changes (e.g., work-from-home practices, online shopping, etc.) and the way Albertans consume electricity going forward?</li> <li>b. How are near-term costs and future generation projects being impacted by covid-19? Do you anticipate long term impacts to generation development?</li> </ul>	<ul style="list-style-type: none"> <li>a. This is difficult to answer at this point in time, but will likely depend on the likelihood and duration of future waves of the virus and the time required to develop an effective vaccine. TCE recommends that the AESO develop a reference case with a short-term decline followed by a recovery as well as alternate forecast scenarios.</li> <li>b. In the short-term, projects will likely suffer delays, whereas in the long-term, generation development will need to rebalance to whatever new demand level emerges.</li> </ul>
	<p><b>Load growth and modifiers</b></p> <ul style="list-style-type: none"> <li>a. Where do you think load growth will be concentrated –at the System Load (all metered demand) level, or at the Alberta Internal Load (system load plus load served by on-site generating units) level?</li> <li>b. Under what conditions could Alberta see sustained negative system load growth?</li> <li>c. In the 2019 Long-term Outlook, the AESO had a number of economic and technological advances that are expected to impact the load growth in the province (see section 4 of the 2019 LTO and "New Load Modifiers" tab of the 2019 LTO data file). What is your view on load growth and the impact of the following modifiers within the</li> </ul>	<ul style="list-style-type: none"> <li>a. TCE expects that this will be largely driven by government policy with respect to self-supply and AESO tariff design.</li> <li>b. Sustained negative system growth conditions would likely be the result of a weak economy, weak commodity prices, or a failure to diversify the provincial economy. In addition, federal policies such as the CFS may disproportionately impact Alberta and future load growth in Alberta.</li> <li>c. TCE expects that the need for energy storage will grow as more wind and solar is added. Electric vehicles and charging stations as well as distributed resources are expected to play a larger role in the 5-10 year timeframe.</li> <li>d. Load growth would be dependent on commodity prices and whether Alberta is able to diversify into the mentioned emerging industries.</li> </ul>

	<p>next 5 years, from 5 to 10 years, and after 10 years for:</p> <ul style="list-style-type: none"> <li>i. Distributed energy resources:             <ul style="list-style-type: none"> <li>1. Rooftop solar PV</li> <li>2. Electric vehicles and charging stations</li> <li>3. Gas generation</li> <li>4. Wind generation</li> <li>5. Energy storage</li> <li>6. Energy efficiency</li> </ul> </li> <li>d. What is your view on load growth and the impact of other emerging industries, sectors or technologies (e.g., bitcoin and cryptocurrency mining, cannabis facilities, petrochemical facilities, data centers, others)?</li> </ul>	
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	<p><b>Generation Technologies</b></p> <ul style="list-style-type: none"> <li>a. What renewable technologies are likely to be developed by PPA's?</li> <li>b. What is the potential size of the corporate PPA market for renewables, being funded fully or in part, in Alberta?</li> <li>c. What challenges do you foresee in implementing PPA's for renewable development in Alberta?</li> <li>d. Recent public announcements indicate all existing coal-fired units will utilize natural gas in the near term. How do you see the operation of the converted units changing compared to operations as a coal-fired unit?</li> <li>e. Outside of existing generation technology in Alberta, what technology will show up in Alberta next?</li> <li>f. What are the challenges surrounding generation development in Alberta and what are the major factors that will determine what gets built?</li> </ul>	<ul style="list-style-type: none"> <li>a. Both solar and wind projects are currently being developed by PPAs and more is expected in the future.</li> <li>b. Directionally, TCE expects further corporate PPAs.</li> <li>c. No comment.</li> <li>d. TCE anticipates that the owners of these assets will operate them in a manner to maximize profitability.</li> <li>e. No comment.</li> <li>f. A significant challenge facing the development of energy storage in Alberta is the current tariff treatment under Rate DTS.</li> </ul>
	<p><b>Future technologies</b></p> <p>The following table contains generation technologies and specifications on potential future generation development. Do you believe that these are representative of potential future Alberta generation projects? Would you like to share views on additional technologies and specifications that are not included within the table?</p>	<p>TCE recommends that the AESO expand the table to include cogeneration, solar/battery hybrid, and wind/battery hybrid facilities.</p>

Facility Type	Overnight Capital Cost (\$/kW)	Fixed O&M (\$ / kW-year)	Variable O&M (\$/MWh)	Generator Capacity (MW)	Heat Rate (GJ/MWh)
Combined-Cycle Natural Gas	1,667	\$49.71	\$2.49	479	7.03
Simple-Cycle Natural Gas – Aeroderivative	1,159	\$52.83	\$4.24	46.5	9.68
Solar Photovoltaic – 2021-2025	1,643	\$31.85	Credit: grid intensity x carbon price	50	N/A
Solar Photovoltaic – 2026-2030	1,388	\$31.85	Credit: grid intensity x carbon price	50	N/A
Wind Generation - 2021-2025	1,586	\$32.50	Credit: grid intensity x carbon price	50	N/A
Wind Generation - 2026-2030	1,105	\$29.25	Credit: grid intensity x carbon price	50	N/A

<p><b>Other</b></p> <p>a. Is there any information that you would like to share, which would contribute to the Long-term Outlook development (ie. Developing trends)?</p> <p>b. What do you think is likely to disrupt Alberta’s electricity industry in the next 20 years and in what way?</p>	<p>a. No comment.</p> <p>b. Some likely candidates to disrupt Alberta’s electricity industry would be environmental policy, transmission policy, distributed energy resources, electric vehicles, and further electrification.</p>
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## Stakeholder Comment Matrix – June, 2020

2021 Long-term Outlook Stakeholder Feedback



<b>Period of Comment:</b> June 4, 2020 through July 6, 2020 <b>Comments From:</b> TransAlta Corporation <b>Date:</b> 2020/07/06	<b>Contact:</b> [REDACTED] <b>Phone:</b> [REDACTED] <b>Email:</b> [REDACTED]
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**Instructions:**

1. Please fill out the section above as indicated.
2. Please respond to the questions below and provide your specific comments.  
Email your completed comment matrix to [forecast@aeso.ca](mailto:forecast@aeso.ca) by **July 6, 2020**

**The AESO is seeking comments from Stakeholders with regard to the following matters:**

	Questions	Stakeholder Comments
1.	<p><b>Long-term Outlook</b></p> <ol style="list-style-type: none"> <li>a. What information do you find most useful within the Long-term Outlook? Is there additional information you would like to see?</li> <li>b. Do you use the Long-term Outlook data file? Which information within the Long-term Outlook data file is most useful to you? What additional data would you like to see within the data file?</li> <li>c. What delivery format of the data file would you find most useful? (Excel file, web query and download, interactive web based data visualization tool, other)</li> </ol>	<p><b><i>The LTO is helpful and provides insight and transparency about the AESO’s views and planning considerations</i></b></p> <p>TransAlta appreciates the publication of the Long-Term Outlook (LTO).</p> <p>The information that is most useful in the long-term outlook are the details of the AESO’s methodology for forecasting, its key assumptions about economic and policy drivers and how those are translated into the various scenarios, and the details of load and generation changes.</p> <p><b><i>Provide the year-to-year changes for each scenario</i></b></p> <p>The Long-Term Outlook data file is very helpful We would appreciate details on a year-to-year basis for the different scenarios rather than snapshots with only 5 data points.</p> <p><b><i>Additions to the delivery format would be useful</i></b></p> <p>We support the continuation of the existing delivery format: the LTO report and the data file. We would also support further</p>

		<p>augmentation of the delivery format to include a interactive web based data visualization tool. We could also support a web query and download function but do not support the implementation of a tool like the historic market data format – that format is not user friendly and does not accommodate the download of large files in an efficient manner. We would not support a cut-off implementation of any new delivery format i.e. the elimination of the existing delivery format without sufficient time and testing of the new format (in other words, new delivery formats should be done in parallel with trials).</p>
2.	<p><b>Macroeconomic variables</b></p> <ol style="list-style-type: none"> <li>a. The economic outlook could range from a V-shape recovery by Q2 2021 to a longer-term recovery by 2023, with some permanent load loss in the commercial and industrial sectors going forward. What is your view on the Alberta GDP over the medium- (next 5 years) and long-term (5+ years)?</li> <li>b. Oil sector production capacity is expected to increase in 2023 with the completion of pipeline projects (e.g., Keystone XL, etc.).             <ol style="list-style-type: none"> <li>I. The 2019 CAPP Crude Oil Forecast released in June 2019<sup>1</sup> had oilsands forecast growth from 3.2MM bbls/d in 2020 to 3.6MM bbls/d in 2025 and then 3.9MM bbls/d in 2030.                 <ol style="list-style-type: none"> <li>a. What is your view on oil production in Alberta over these time periods given the market changes over the last year? What is your view post 2030?</li> <li>b. Do you expect new oil production developments to be in situ or mining, or a combination of both?</li> <li>c. Do you expect domestic condensate growth, required for transport, to meet the</li> </ol> </li> </ol> </li> </ol>	<p>Even prior the pandemic, Alberta and Canada were grappling with an oil recovery and trade tensions. With the pandemic and the dispute between OPEC and Russia, the economic turmoil was significant. Even now, whether the oil market remains on a recovery path is uncertain and hampered with the prospect of a slow global recovery, continuation of the OPEC+ agreement, and a second wave of the pandemic. We are in the very early stages of the recovery so whether or not we can expect to see a V-shape recovery by Q2 2021 or by 2023 is still a significant question that requires close attention and more data.</p> <p>While the expected negative GDP growth in 2020 is likely to reverse in 2021 if the pandemic can be controlled. It may take until 2022 to achieve the level in 2019. We are hopeful that the recovery will meet or surpass expectation but there are too many unknowns to project even 2-years out. In the medium or long-term, we are also hopeful that we are back to normal (pre-pandemic and without oil trade disputes). However, we do see some directional alignment in views but potentially significant differences in outcomes. For points of reference:</p> <ul style="list-style-type: none"> <li>• The Conference Board of Canada estimates that the effects of travel bans and social distancing could result in “a much deeper and longer-lasting hit to Canadian economic activity” and result in real GDP falling by 1.1% in 2020 instead of growing at 0.3%. They estimated that Canadian real exports of goods and service will decline</li> </ul>

<sup>1</sup> Canadian Association of Petroleum Producers <https://www.capp.ca/resources/crude-oil-forecast/>

	<p>incremental oilsands growth? Will domestic condensate displace imported condensate?</p> <p>II. What is your view on further oil sector investments over the same timeframe?</p> <p>III. What kind of oil price or other environment would allow for further cogeneration development in the oilsands and/or petrochemical sectors?</p> <p>d. Current forward gas prices are in the \$2.25/GJ range. Post 5 years, do you see gas prices remaining at this level, decreasing, or increasing beyond inflation?</p>	<p>2.1% in 2020 as a result of a consumer-led recession in the US decreasing its real GDP by 1%. Their projection of real GDP growth of 3.3% in 2021 is predicated on a view that there will be pent-up consumer demand and household spending will rebound in 4Q2020 and 2021.</p> <ul style="list-style-type: none"> <li>• The OECD's Economic Outlook dated June 2020 provides views of a single and double wave of economic impacts. In the single hit scenario, annual output for Canada (GDP at market price) shrinks by -8% in 2020 and recovers to 3.9% in 2021. In the double hit scenario, annual output shrinks by -9.4% in 2020 and recovers only to 1.5% in 2021.</li> <li>• The World Bank's Global Outlook titled "Pandemic, Recession: The Global Economy in Crisis" dated June 2020 provides a projection of Real GDP for advanced economies of -7.0% and 3.9% for 2020 and 2021, respectively. Their estimate for US Real GDP is -6.1% and 4.0% for 2020 and 2021, respectively.</li> <li>• The International Monetary Fund released its World Economic Outlook Update on June 2020 that projects that the pandemic had a more severe impact on the global economy than their April 2020 forecast. They predict global growth to shrink -4.9% in 2020 and expect a more gradual recovery to 5.4% in 2021. Their forecast for Canadian GDP growth is -7.5% and 4.6% in 2020 and 2021, respectively.</li> <li>• The US Federal Reserve released its economic projection on June 10, 2020 showing median estimates of -6.5%, 5.0% and 3.5% for US real GDP in 2020, 2021 and 2022, respectively. The range of their estimates are -10% to -4.2% in 2020, -1% to 7.0% in 2021 and 2 to 6% in 2022. The real GDP estimate for the US Federal Reserve shows a more negative view than the Conference Board of Canada's view of US GDP in 2020 and potentially in 2021.</li> </ul> <p>The medium and long-term impacts largely depend on the strength of the global economy. More dire economic predictions</p>
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	<p>of US unemployment see it taking up to a decade to fall back to the percentage pre-pandemic. The Bank of Canada Governor also expects a 'prolonged and bumpy' recovery and a likelihood that there could be lasting damage to demand and supply. If these are reflective of the path that Alberta and the global economy might take, it is possible that we may experience a prolonged period of lower GDP growth potentially extending to the medium and long-term.</p> <p>While we agree that the questions the AESO has posed about oilsands and natural gas are important, we find it difficult to answer given the lack of certainty in the near-term and the potential impacts into the medium and long-term. For reference, the IEA noted its Oil Market Report dated April 2020 that global oil demand was expected to fall by 93 million bbl/d in 2020. While they predicted that there would be a gradual recovery from 2Q 2020 they expected demand in December 2020 would still be down by 2.7 million bbl/d year-over-year.</p> <p>Alberta oil production dropped to 3.1 million bbl/d in April 2020 according to Alberta Energy Regulator (AER) statistics mostly in bitumen production. Canadian oil producers could face longer shut-ins or curtailment if global demand or trade tensions within OPEC+ reemerge. We note that while OPEC+ extended its June cuts by an additional month, the agreement is expected to slowly increase production over time and that will play into pricing and the response to that price signal from non-OPEC producers. The questions that remain are how quickly global demand will pick back up and if the pandemic and the government and industry response has fundamentally altered the course over the longer time frame.</p> <p>The AER forecasts a reduction in both in-situ and mining in 2020 under a low price scenario and steadily increasing production from in-situ. Under the base scenario, AER projected high production from in-situ than the low price scenario out until 2029. In contrast, mining production was the same under the base and low price scenarios from 2021 to 2029.</p> <p>What we do know now is that capital investment has already</p>
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		<p>been postponed and cancelled and these conditions will continue until greater certainty about global demand and its path to recovery become clear. This will have an impact on forecasted production. How Alberta oil and gas (convention, in-situ and mining) will stack up in the global market after we reset back to “normal” will also play a significant role in the growth we can expect and the types of investments that will be made. Furthermore, whether additional investment will be made into cogeneration is about the cost savings that will be achieved, the use of scarce corporate capital and the impact to the competitiveness of Alberta oil in the global market; it is not necessarily a trigger point based upon the oil price.</p> <p>We fully support revisiting the LTO and its assumptions but there is not enough information at present to provide predictions about what will unfold. We recommend that the AESO conduct stakeholder sessions over the course of the year to further discuss and share the information as it comes in.</p>
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<p>3.</p>	<p><b>Policy</b></p> <p>a. What are your expectations of carbon prices in the future? Do you expect any change from a \$30/t rising to \$50/t, inflated by 2% thereafter?</p> <p>b. Other than policy on carbon pricing, what coming policies or policy scenarios do you see impacting load growth and generation development?</p>	<p><b><i>Carbon prices should follow the trajectory set by the federal and provincial governments but adjustments may be necessary</i></b></p> <p>The federal government indicated it intends to move ahead with its set carbon prices from \$30 to \$50/tCO<sub>2e</sub> in 2022. At which time there will be a review of the federal program. Our current assumption is the \$50/tCO<sub>2e</sub> cost will remain flat going forward from 2022. However, following the review in 2020, it is possible the carbon price will be escalated going forward.</p> <p>The Alberta government has only agreed to a \$30/tCO<sub>2e</sub>. If the province does not increase its carbon price in line with the Greenhouse Gas Pollution Pricing Act (GGPPA) requirements, the federal indicated it will act to add incremental carbon costs based on the difference between the imposed provincial and federal tax. Our expectation is the province will be required to increase the carbon cost.</p> <p>Currently, some provinces are challenging the federal government's jurisdiction to impose a carbon cost on provinces. The Supreme Court is currently hearing this challenge and expected to rule in the Fall of 2020. This ruling will either maintain the status quo of the GGPPA or lead to significant changes to carbon pricing in Alberta.</p> <p><b><i>Pandemic recovery federal and provincial spending may have a significant impact on load growth and generation development</i></b></p> <p>We expect that the federal and provincial government will develop and implement pandemic recovery plans and programs to restimulate Alberta's provincial economy. These plans are necessary to reduce and mitigate the worst case economic outcomes that could arise due to the significant and adverse impacts of the pandemic. However, the overall global recovery and coordination of global economic recovery plans will also play a significant impact on the efficacy of the federal and provincial programs and the economic path to recovery.</p> <p>For example, without a significant improvement in economic and investment conditions in Alberta unemployment could remain</p>
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		<p>high and weaken expected load growth. Government support of businesses is also seen as critical to ensure the survival and recovery of business near and potentially mid-term to ensure a robust recovery to pre-pandemic levels and the ensuing revival. The prospect of a second wave of the pandemic could extend the the adverse economic impacts further into 2020 and potentially forestall recovery measures and prolong the recovery.</p> <p>We expect that the design of the recovery programs could incent specific forms of generation and alter the normal course and supply mix for generation development. In the near-term, we anticipate that the transition from coal-to-gas will remain on course or hasten. The introduction of new federal or provincial programs to subsidize renewable development would result in accelerated changes in the supply mix; however, there is no certainty if these will be implemented and to what extent these could change trajectory of generation investment.</p>
4.	<p><b>Impact of the COVID-19 pandemic</b></p> <ol style="list-style-type: none"> <li>a. What is your expectation on behaviour changes (e.g., work-from-home practices, online shopping, etc.) and the way Albertans consume electricity going forward?</li> <li>b. How are near-term costs and future generation projects being impacted by covid-19? Do you anticipate long term impacts to generation development?</li> </ol>	<p>The AESO's analysis, "Impacts of the COVID-19 Pandemic and Low Oil Prices on Alberta's Power System", provides historical observations of the initial impact of the pandemic lock-down and low oil supply on electricity demand.</p> <p>We anticipate that the observed reduction in electricity consumption during business hours and evenings and shift of peak consumption to 6 pm will likely change as the pandemic-related measures are relaxed and removed. This will likely result in a return to the historical pattern of electricity consumption.</p> <p>The change in industrial consumption may also change as shut-in oil production could come back on line as the oil market recovers. That said, the recovery will be dependent on the global oil market recovery and is subject to risk of trade tensions and reduced demand.</p> <p>With respect to generation, we have seen limited impacts to supply chains for parts and equipment but we anticipate those will be relieved as the lock-downs globally ease. There are near-term cost impacts due to the implementation of preventative workplace safety and hygiene measures (segregation of spaces to maintain physical distance, protocols of building entry,</p>

		<p>temperature testing, cleaning supplies and enhanced hygiene protocols), requirements for Personal Protective Equipment (PPE), and enabling greater work-from-home capabilities.</p> <p>Generation investment will likely be impacted due to lower prices from demand softening. We also expect that the potential for government programs to stimulate investment could impact generation development. We expect that both types of impacts will have near, mid and potentially long-term impacts.</p>
5.	<p><b>Load growth and modifiers</b></p> <ol style="list-style-type: none"> <li>a. Where do you think load growth will be concentrated –at the System Load (all metered demand) level, or at the Alberta Internal Load (system load plus load served by on-site generating units) level?</li> <li>b. Under what conditions could Alberta see sustained negative system load growth?</li> <li>c. In the 2019 Long-term Outlook, the AESO had a number of economic and technological advances that are expected to impact the load growth in the province (see section 4 of the 2019 LTO and "New Load Modifiers" tab of the 2019 LTO data file). What is your view on load growth and the impact of the following modifiers within the next 5 years, from 5 to 10 years, and after 10 years for:             <ol style="list-style-type: none"> <li>i. Distributed energy resources:                 <ol style="list-style-type: none"> <li>1. Rooftop solar PV</li> <li>2. Electric vehicles and charging stations</li> <li>3. Gas generation</li> <li>4. Wind generation</li> <li>5. Energy storage</li> <li>6. Energy efficiency</li> </ol> </li> </ol> </li> <li>d. What is your view on load growth and the impact of other emerging industries, sectors or technologies (e.g., bitcoin and cryptocurrency mining, cannabis facilities, petrochemical facilities, data centers, others)?</li> </ol>	<p><b><i>Alberta Internal Load will outstrip System Load</i></b></p> <p>Factors related to economic and population growth in Alberta will negatively impact AIL and system load growth. However, the price signal sent from significant transmission development and an increasing burden of transmission cost driving the delivered cost of electricity has resulted in strong signal to shift to self-supply. This signal is already strong and further system expansion will serve to strengthen this signal. This has resulted in a trend of greater Alberta Internal Load (AIL) growth and lower system load growth. The introduction of tariff design structures such as load retention rates could stimulate greater parity between AIL and system load growth.</p> <p><u>Load modifiers</u></p> <p>The load modifiers capture rooftop PV and electric vehicles as well as the relatively nascent cannabis, cryptocurrency and data services industries in Alberta. We expect the impacts will be modest in the near and early mid-term but has potential for accelerating late mid-term and long-term.</p> <p>The trend for growth in rooftop PV and electric vehicles will likely be shaped by the availability of subsidies; at this point, we believe it is fair to assume that the growth is coming from early adopters rather than being more mainstream users. However, this trend and the transition of these to the mainstream could be significantly changed with the availability of subsidy programs or changes to government regulation that require the adoption of electric vehicles. Additionally, the cost competitiveness of electric vehicles will likely improve as car companies focus on transitions to fully electric vehicle fleets that have already been</p>

		<p>targeted by 2030. This could significantly push forward and steepen the curve of electric vehicle adoption.</p> <p>Cannabis, cryptocurrency and data centre customers are price sensitive and highly mobile loads; we expect that these types of load customers will seek out jurisdictions that offer the lowest delivered cost of electricity. While it is possible that Alberta could attract such customers, we anticipate that Alberta is mainly competitive if these operations could be served at a similar cost as self-supply customers. As such, we expect the system load growth contributions from these industries to remain fairly low without a change to tariff that can attract these customers.</p> <p><u>Distributed energy resources</u></p> <p>The only load driver listed is electric vehicles adoption and charging stations could stimulate new load growth. We do not see solar, gas, wind generation and energy storage altering load growth but rather being a choice for these technologies being developed on the transmission system. The availability of transmission credits on the distribution system likely incentivizes these resources to connect on the distribution system and potentially displaces these resources being developed on the transmission system. To the extent that this drives higher wires costs, we expect that this could drive a feedback loop for loads to consider more self-supply as well as pursuing energy efficiency.</p>
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<p>6.</p>	<p><b>Generation Technologies</b></p> <ul style="list-style-type: none"> <li>a. What renewable technologies are likely to be developed by PPA's?</li> <li>b. What is the potential size of the corporate PPA market for renewables, being funded fully or in part, in Alberta?</li> <li>c. What challenges do you foresee in implementing PPA's for renewable development in Alberta?</li> <li>d. Recent public announcements indicate all existing coal-fired units will utilize natural gas in the near term. How do you see the operation of the converted units changing compared to operations as a coal-fired unit?</li> <li>e. Outside of existing generation technology in Alberta, what technology will show up in Alberta next?</li> <li>f. What are the challenges surrounding generation development in Alberta and what are the major factors that will determine what gets built?</li> </ul>	<p><b><i>Wind technology will dominate the PPA market</i></b></p> <p>We expect that the most competitive renewable technologies for PPAs will remain wind generation. However, large solar development projects like Travers show that the continued development of wind generation is likely pushing the wind discount to a point where that the potential captured price for solar generation in the peak hours is overcoming its relative higher cost. Significant increases in solar generation in Alberta's supply mix could reduce these opportunities. The continuation of a decreasing cost trend could however allow solar to be more cost competitive relative to other more dominant technologies over time. We also foresee solar being developed for self-supply and to capture self-supply like benefits through the availability of distribution system transmission credits.</p> <p><b><i>Corporate PPA market</i></b></p> <p>The corporate PPA market is growing but at present is around the 250-500 MW per year range and is likely to expand out as big as 1,000 MW per year depending on corporate interest and load growth. A key challenge for implementing PPAs in Alberta is the electricity markets relatively small size and the predictability of its drivers (competitiveness of Alberta versus other markets, corporate spending on renewable development, and changes in environmental regulation). While the general trend and driver has been corporate environment and sustainability objectives, the interested from parties fluctuates from year to year.</p> <p><b><i>Coal-to-gas conversion</i></b></p> <p>The operations of converted coal units will vary from dual-fuel, full coal-to-gas, and repowered alternatives. Dual-fuel and coal-to-gas conversions will operate more as peaking generation. These units could have shorter cycle times and be more responsive to prices than they were as purely coal-fired units.</p> <p>Coal units that are repowered with gas turbines and converted to combined cycle gas generation will largely operate as baseload generation but could also have the flexibility to operate in various modes.</p>
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		<p><b>New technology</b></p> <p>We anticipate that there will be growing interest and development in hydrogen fuel in the generation space in the mid to long-term in Alberta. In the near, mid and long-term, we anticipate energy storage to be a focal area for new and transformative technology. We expect a wide variety of energy storage technologies including pumped storage and various battery technologies to increase as a share of the overall generation supply mix.</p> <p><b>Development Challenges</b></p> <p>Regulatory processes including interconnections and facilities permitting remain administratively burdensome and long. Additionally, the potential for regulatory changes including greenhouse gas policy and regulation and market and tariff design pose uncertainty that challenges generation development.</p>																			
7.	<p><b>Future technologies</b></p> <p>The following table contains generation technologies and specifications on potential future generation development. Do you believe that these are representative of potential future Alberta generation projects? Would you like to share views on additional technologies and specifications that are not included within the table?</p>	<p>We note that the AESO's estimates in the table for gas technologies are different than those presented in the Brattle Group/Sargent &amp; Lundy Cost of New Entry (CONE) study that was filed with the AESO capacity market application. For reference, see the table below that compares the AESO's table and costs of estimated for combined cycle and aeroderivative presented in the capacity market proceeding:</p> <table border="1" data-bbox="1228 1036 1999 1409"> <thead> <tr> <th rowspan="2"></th> <th colspan="2">Combined Cycle</th> <th colspan="2">Aeroderivative</th> </tr> <tr> <th>2021 LTO</th> <th>CONE Study</th> <th>2021 LTO</th> <th>CONE Study</th> </tr> </thead> <tbody> <tr> <td>Generator Capacity (MW)</td> <td>479</td> <td>479</td> <td>46.5</td> <td>93</td> </tr> <tr> <td>Heat Rate (GJ/MWh)</td> <td>7.03</td> <td>6.81</td> <td>9.68</td> <td>9.68</td> </tr> </tbody> </table>		Combined Cycle		Aeroderivative		2021 LTO	CONE Study	2021 LTO	CONE Study	Generator Capacity (MW)	479	479	46.5	93	Heat Rate (GJ/MWh)	7.03	6.81	9.68	9.68
	Combined Cycle			Aeroderivative																	
	2021 LTO	CONE Study	2021 LTO	CONE Study																	
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Facility Type	Overnight Capital Cost (\$/kW)	Fixed O&M (\$ / kW-year)	Variable O&M (\$/MWh)	Generator Capacity (MW)	Heat Rate (GJ/MWh)
Combined-Cycle Natural Gas	1,667	\$49.71	\$2.49	479	7.03
Simple-Cycle Natural Gas – Aeroderivative	1,159	\$52.83	\$4.24	46.5	9.68
Solar Photovoltaic – 2021-2025	1,643	\$31.85	Credit: grid intensity x carbon price	50	N/A
Solar Photovoltaic – 2026-2030	1,388	\$31.85	Credit: grid intensity x carbon price	50	N/A
Wind Generation - 2021-2025	1,586	\$32.50	Credit: grid intensity x carbon price	50	N/A
Wind Generation - 2026-2030	1,105	\$29.25	Credit: grid intensity x carbon price	50	N/A

Overnight Capital Cost (\$/kW)	1,667	1,371	1,159	1,479
Fixed O&M (\$/kW-year)	49.71	53.90	52.83	57.30
Variable O&M (\$/MWh)	2.49	2.70	4.24	4.60

We note that the simple cycle and combined cycle generator capacities and heat rate values appear to be optimistic. The generator capacities reflect maximum winter ratings and the heat rate are generally lower than what may be expected for a new unit in real operation. With respect to the simple cycle, we also note that the size of the unit in 2021 LTO is half the size that was assumed for the CONE study and yet the costs for the 2021 LTO appear to be significantly lower despite a single unit project having limited economies of scale benefits.

Further, global economic trends could weigh in on how these costs evolve. It may be useful to conduct a long-term cost of generation study after we are further into the pandemic recovery to see if there are observable impacts to these costs.

Additionally, the costs for solar and wind generation appear very aggressive. While wind generation may have cost as low as shown on a kW and kW-year basis, we disagree that a 50 MW project would approach costs this low. We also believe that the unsubsidized cost of solar is significantly understated. Moreover, we view the projections for 2026-2030 of solar and wind costs to be optimistically assuming significant cost reductions - we are not aware of the technological driver(s) that would reduce small scale project costs so low in the mid-term.

<p>8.</p>	<p><b>Other</b></p> <ul style="list-style-type: none"> <li>a. Is there any information that you would like to share, which would contribute to the Long-term Outlook development (ie. Developing trends)?</li> <li>b. What do you think is likely to disrupt Alberta’s electricity industry in the next 20 years and in what way?</li> </ul>	<p>The AESO’s 2019 Long Term Outlook is the basis for its transmission plan and needs to be reviewed to account for the impacts of the pandemic. The key economic forecasts that the forecasts were based upon are being drastically revised. Furthermore, the generation planning scenarios were/are even more unrealistic given the fundamental shift in Alberta’s economy and impacts to capital spending. The impact to transmission cost as a result of lower load growth needs to be updated – this may increase concerns about the affordability and competitiveness of delivered cost of electricity in Alberta.</p> <p>While potential disruption in the 20-year horizon from the introduction of new technologies, changes to Alberta’s economy, or changes in consumption are possible, we are most concerned about the significant disruption to business-as-usual due to pandemic which threatens to have longer term impacts.</p> <p>We expect that the future response in the form of government support and corporate business plans for the recovery to shape developing trends but these are evolving. It is important for the AESO to consider how to effectively gather information and stakeholder views, weigh those considerations, and adjust the forecast for these rapidly changing conditions. This should not be done as a single opportunity for stakeholder written comments at the beginning of recovery but rather as a series of sessions over the course of the recovery on each specific topic raised in this questionnaire.</p>
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## Stakeholder Comment Matrix – June, 2020

2021 Long-term Outlook Stakeholder Feedback



<p><b>Period of Comment:</b> June 4, 2020 through July 6, 2020</p> <p><b>Comments From:</b> Utilities Consumer Advocate (UCA)</p> <p><b>Date:</b> 2020/07/06</p>	<p><b>Contact:</b> [REDACTED]</p> <p><b>Phone:</b> [REDACTED]</p> <p><b>Email:</b> [REDACTED]</p>
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**Instructions:**

1. Please fill out the section above as indicated.
2. Please respond to the questions below and provide your specific comments.  
Email your completed comment matrix to [forecast@aeso.ca](mailto:forecast@aeso.ca) by **July 6, 2020**

**The AESO is seeking comments from Stakeholders with regard to the following matters:**

	Questions	Stakeholder Comments
1.	<p>Long-term Outlook</p> <ol style="list-style-type: none"> <li>a. What information do you find most useful within the Long-term Outlook? Is there additional information you would like to see?</li> <li>b. Do you use the Long-term Outlook data file? Which information within the Long-term Outlook data file is most useful to you? What additional data would you like to see within the data file?</li> <li>c. What delivery format of the data file would you find most useful? (Excel file, web query and download, interactive web based data visualization tool, other)</li> </ol>	<p>a and b) There are other useful information and data that the AESO could provide in Long-term Outlook and consider for modeling purposes. First, the distribution-connected generations should be included for the forecast generation additions in the future. The distribution-connected generation, referred to as the Distributed Energy Resources (DER), is anticipated to grow fast in the future at the distribution level, and the AESO may need to include them to have a more accurate generation forecast. Having a precise estimation of the DERs additions location and the plausible types of new technologies that will develop in the distribution system will help AESO for planning at the transmission level as well.</p> <p>Second, the demand side management tools will</p>

		<p>create an opportunity for both transmission and distribution-connected consumers to have more demand response in the future. The AESO needs to include in its forecast what MW of demand response is available now and how much will be added to the system in the future. Having more demand response in the system will lead to less requirement for generation additions and less investment in transmission infrastructure.</p> <p>c) The UCA prefers the Excel version for the data file.</p>
2.	<p><b>Macroeconomic variables</b></p> <ul style="list-style-type: none"> <li>a. The economic outlook could range from a V-shape recovery by Q2 2021 to a longer-term recovery by 2023, with some permanent load loss in the commercial and industrial sectors going forward. What is your view on the Alberta GDP over the medium- (next 5 years) and long-term (5+ years)?</li> <li>b. Oil sector production capacity is expected to increase in 2023 with the completion of pipeline projects (e.g., Keystone XL, etc.).             <ul style="list-style-type: none"> <li>I. The 2019 CAPP Crude Oil Forecast released in June 2019<sup>1</sup> had oilsands forecast growth from 3.2MM bbls/d in 2020 to 3.6MM bbls/d in 2025 and then 3.9MM bbls/d in 2030.                 <ul style="list-style-type: none"> <li>a. What is your view on oil production in Alberta over these time periods given the market changes over the last year? What is your view post 2030?</li> <li>b. Do you expect new oil production developments to be in situ or mining, or a combination of both?</li> </ul> </li> </ul> </li> </ul>	<p>a) Based on the Alberta Treasury Board and Finance Fiscal Plan published in February 2020, real gross domestic product (GDP) was forecasted to grow 2.5 percent in 2020 and remain stable until 2023. This growth was supposed to follow a period of weakness in 2019 when provincial economy activity declined due to the pipeline delays and a slowdown in the global economy. However, the forecast is being revised due to the Covid-19 pandemic and plunging oil prices. According to the Conference Board of Canada's June 2020 provincial outlook, Alberta's real GDP is forecasted to decline substantially by 6.8 percent in 2020 and not return to its 2014 high at least until 2023. In the short term, if COVID-19 outbreaks begin to flare up as the economy reopens, Alberta will likely reimpose strict lockdown measures and send the economy down more. In the medium to long-term, the growth in the GDP depends on how the small and medium-sized businesses will be recovered as they are at high risk of bankruptcy right now. The future</p>

<sup>1</sup> Canadian Association of Petroleum Producers <https://www.capp.ca/resources/crude-oil-forecast/>

<p>c. Do you expect domestic condensate growth, required for transport, to meet the incremental oilsands growth? Will domestic condensate displace imported condensate?</p> <p>II. What is your view on further oil sector investments over the same timeframe?</p> <p>III. What kind of oil price or other environment would allow for further cogeneration development in the oilsands and/or petrochemical sectors?</p> <p>d. Current forward gas prices are in the \$2.25/GJ range. Post 5 years, do you see gas prices remaining at this level, decreasing, or increasing beyond inflation?</p>	<p>price of oil is another critical factor that will determine whether the large oil and gas producers are able to back to their normal production and enhance the GDP.</p> <p>b and d) a 30 percent reduction in global oil demand and a price war between OPEC members have disrupted the balance between demand and supply and caused already a substantial decline in oil prices. This issue may cause oil and gas companies to struggle to return to their normal production at least for a few years. In order to cope with low prices that have at times fallen below the break-even point for operation, producers may be forced to cut their production. Considering that the global oil markets remain weak due to the demand destruction caused by the COVID-19 pandemic and the oil supply surplus it is anticipated that oil sands facilities may not be back to their normal operations until Western Canadian Select (WCS) prices recover from current levels.</p> <p>Although OPEC+ members are reaching an agreement to curtail production and end the price war, it will take time until the Crude storage around the world depletes as oil demand is much lower than it was before the pandemic.</p> <p>Based on the forecast of the Conference Board of Canada, oil and gas investment will fall by roughly 30 percent in Alberta in 2020. However, Trans Mountain Expansion (TMX) and KXL pipeline projects may provide an opportunity to Alberta to expand its production and attract higher investment in oil and gas</p>
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		<p>sector by taking advantage of access to the greater market, linking them to Pacific markets and to the Gulf Coast, where heavy oil is in high demand. This may help business investment to rebound slowly during the next 5 years.</p> <p>In the gas market, the long-term forecasts show that the AECO, HenryHub, and Union Down prices are expected to continue to fluctuate over the next 10 years.</p>
3.	<p><b>Policy</b></p> <p>a. What are your expectations of carbon prices in the future? Do you expect any change from a \$30/t rising to \$50/t, inflated by 2% thereafter?</p> <p>b. Other than policy on carbon pricing, what coming policies or policy scenarios do you see impacting load growth and generation development?</p>	<p>a) Alberta recently introduced a revised cap and trade system, the Technology Innovation and Emissions Reduction (TIER), which has been approved by the federal government. The TIER will be mandatory starting January 1, 2020, for emitters whose greenhouse gas (GHG) emissions exceed the 100 kilotonnes CO<sub>2</sub>e annual threshold. The TIER will also include an “opt-in” provision for taxpayers who emit certain pre-determined minimum thresholds and/or face competitive and trade-exposed circumstances. It is anticipated that the current \$30/tCO<sub>2</sub>e levy increase to \$40/tCO<sub>2</sub>e in 2021 and \$50/tCO<sub>2</sub>e in 2022.</p> <p>b) There are a number of developing provincial and federal policies that will impact the future of electricity demand and supply in Alberta. At the federal level, the regulation for the phase-out of conventional coal-fired generators and the emission performance standard for gas-fired units may change the generation mix in Alberta over the medium to long-term.</p>

		<p>In the provincial level, the carbon pricing and the required performance standard under the TIER might also change the generation mix in Alberta by creating more incentives for cleaner electricity generation. Also, the possibility of higher DERs penetration and emerging technologies into the distribution system is currently being evaluated on a broad aspect by the AUC and other stakeholders through the Distribution System Inquiry. Any significant policy directions resulted from this inquiry, including the policy framework, the future distribution system roadmap, and a new tariff design that encourages more self-generation, may significantly impact the level of load and mix of generations in Alberta. Moreover, some other initiatives and proceedings are currently in process in Alberta that may have an impact on the load growth and generation development in the future, including the AESO's DERs and energy storage roadmap, coordinated transmission and distribution planning and assigning distribution system operator, changes to the T-Reg, and review of the electricity framework.</p>
4.	<p><b>Impact of the COVID-19 pandemic</b></p> <ol style="list-style-type: none"> <li>a. What is your expectation on behaviour changes (e.g., work-from-home practices, online shopping, etc.) and the way Albertans consume electricity going forward?</li> <li>b. How are near-term costs and future generation projects being impacted by covid-19? Do you anticipate long term impacts to generation development?</li> </ol>	<p>a) The COVID-19 pandemic has had a significant effect on the level of electricity demand in Alberta during the last few months. Based on the AESO's demand data, the power consumption has declined substantially during the last few months compared to the same period in 2019. In response to the lower electricity demand, the price in the wholesale electricity market hit the floor price (\$0/MWh) 19 times during the months of April and May after not dropping that low throughout 2019. In addition, the shape of</p>

		<p>demand curves indicated a change in electricity consumption patterns of consumers following the stay-at-home measures. The morning peak consumption was flattened, and the afternoon peak consumption was shifted to earlier in the day. The power consumption during the weekends was also decreased as malls and other outdoor activities were closed. In the short-term, if COVID-19 outbreaks begin to flare up as the measures lift, Alberta will likely reimpose strict lockdown again, and likely the demand will drop in response. Also, work-from-home was one of the unintended impacts of the lockdown during the last few months. It is possible that in the long-term, working remotely will be an option for people who have been successfully able to work from home during the pandemic. This may change the electricity consumption patterns in Alberta permanently.</p> <p>b) The COVID-19 pandemic might impact generation development and causing a delay in the new generation projects if the economy remains down for a longer period. This will be in response to lower electricity demand, particularly for large consumers (commercial and industrial), if they cannot back to their normal business in the near future.</p> <p>In addition to the effect of COVID-19, oil prices impact the Alberta's oil sands industry, as one of the main drivers of the load growth in Alberta, which may impact expansion plans. This could cause load growth to be flatter in the future and postpone the generation development projects.</p>
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<p>5.</p>	<p><b>Load growth and modifiers</b></p> <ul style="list-style-type: none"> <li>a. Where do you think load growth will be concentrated –at the System Load (all metered demand) level, or at the Alberta Internal Load (system load plus load served by on-site generating units) level?</li> <li>b. Under what conditions could Alberta see sustained negative system load growth?</li> <li>c. In the 2019 Long-term Outlook, the AESO had a number of economic and technological advances that are expected to impact the load growth in the province (see section 4 of the 2019 LTO and "New Load Modifiers" tab of the 2019 LTO data file). What is your view on load growth and the impact of the following modifiers within the next 5 years, from 5 to 10 years, and after 10 years for:             <ul style="list-style-type: none"> <li>i. Distributed energy resources:                 <ul style="list-style-type: none"> <li>1. Rooftop solar PV</li> <li>2. Electric vehicles and charging stations</li> <li>3. Gas generation</li> <li>4. Wind generation</li> <li>5. Energy storage</li> <li>6. Energy efficiency</li> </ul> </li> </ul> </li> <li>d. What is your view on load growth and the impact of other emerging industries, sectors or technologies (e.g., bitcoin and cryptocurrency mining, cannabis facilities, petrochemical facilities, data centers, others)?</li> </ul>	<p>a and b) The economic growth, the expansion of oil sands production, emerging new industries such as cannabis facilities, cryptocurrency mining, data centers, and possible more electric vehicles adoption and charging station installations are the main drivers of the load growth in the future. However, considering the low forecasted GDP in Alberta due to COVID-19 pandemic and slowing down the oil sands production expansion as a result of low oil prices, it is anticipated that Alberta Internal Load (AIL) growth to be flatter at least for the near future. Emerging new industries and adoption of EVs may increase the load at the regional level in large cities such as Calgary and Edmonton. Still, these are also highly dependent on how Alberta's economy will recover in the future. On the other hand, it is expected that more penetration of behind the fence self-generation such as rooftop solar, energy storage, and emerging technologies in energy efficiency could reduce the AIL in the future, which may result in having a sustained negative system load growth.</p> <p>c) Based on the latest data from the AESO (June 2020), there is approximately 78.6 MW of micro-generation capacity installed in Alberta, with about 92% of that solar. The primary motivators for solar PV installations have generally been consumer-centric and linked to priority interests for renewability and energy independence. Solar costs are continuing to decline and improve in efficiency, making them more competitive with other generation sources. Considering the growth of the solar generation in the future, utilities may be able to defer the need for</p>
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	<p>investments in transmission and distribution infrastructure by reducing the peak demand of the system.</p> <p>Energy storage technologies can draw energy from the network during periods of low demand and dispatch it optimally during periods of high demand. Similarly, storage can be used to accumulate over-production from renewable distributed generation, alleviating system constraints for improved reliability and power quality. Applications for energy storage are anticipated to advance rapidly with improvements in battery technologies and cost reductions achieved through materials development and large-scale production. For consumers, on-site storage can be used to shave demand peaks and flatten consumption profiles, reducing demand charges, and the all-in cost of energy. These reductions may contribute to a lower coincident peak on the transmission and distribution network during peak times, reducing the amount of utility infrastructure investment required to maintain adequate delivery capacity.</p> <p>Energy Efficiency (EE) is one of the most mature forms of DER available for reducing demand and consumption growth and related infrastructure expenditures. More than two decades of EE programming across North America has led to significant improvements in the energy performance of equipment used by consumers. Future efforts are anticipated to focus on consumer behavior and the energy performance of integrated energy systems such as residential buildings, commercial buildings, and commercial/industrial processes where</p>
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		<p>considerable opportunities remain.</p> <p>The popularity, interest, and acceptance of EVs have grown year-over-year. This growth is largely attributed to the rapidly evolving technology improvements, price reductions, increased driving range capability, and the growing availability of electric charging infrastructure. In Canada, Alberta has the fourth-largest fleet of EVs behind Quebec, Ontario, and British Columbia. In 2018, there were 93,091 EVs on the road in Canada, which represents growth of 125% compared to 2017, with EV sales accounting for 2.2% of new vehicle sales market share. In the long-term, the EVs adoption will depend on various factors such as EV purchase prices in comparison with internal combustion engine (ICE) vehicle, fuel price, availability of charging infrastructures, and policy mechanisms available to support EV adoption including incentives and rebates. In short to medium-term, the load may increase at the regional level in response to more EV adoption.</p> <p>d) See response to item a.</p>
6.	<p><b>Generation Technologies</b></p> <ol style="list-style-type: none"> <li>a. What renewable technologies are likely to be developed by PPA's?</li> <li>b. What is the potential size of the corporate PPA market for renewables, being funded fully or in part, in Alberta?</li> <li>c. What challenges do you foresee in implementing PPA's for renewable development in Alberta?</li> <li>d. Recent public announcements indicate all existing coal-fired units will utilize natural gas in the near term. How do you see the operation of the converted units changing compared to</li> </ol>	<p>a and b) Alberta has great potential for renewable technologies such as wind and solar to be developed by the power purchase agreements (PPAs). Considering large renewable resources available in Alberta combined with a deregulated electricity market in the province, the PPAs give corporations the ability to procure renewable energy directly from the developers. This may lead to expanding the corporate PPA market for renewable in Alberta as well.</p>

	<p>operations as a coal-fired unit?</p> <p>e. Outside of existing generation technology in Alberta, what technology will show up in Alberta next?</p> <p>f. What are the challenges surrounding generation development in Alberta and what are the major factors that will determine what gets built?</p>	<p>c and d) no comment.</p> <p>e and f) see the response to question 7.</p>
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7.

### Future technologies

The following table contains generation technologies and specifications on potential future generation development. Do you believe that these are representative of potential future Alberta generation projects? Would you like to share views on additional technologies and specifications that are not included within the table?

Facility Type	Overnight Capital Cost (\$/kW)	Fixed O&M (\$ / kW-year)	Variable O&M (\$/MWh)	Generator Capacity (MW)	Heat Rate (GJ/MWh)
Combined-Cycle Natural Gas	1,667	\$49.71	\$2.49	479	7.03
Simple-Cycle Natural Gas – Aeroderivative	1,159	\$52.83	\$4.24	46.5	9.68
Solar Photovoltaic – 2021-2025	1,643	\$31.85	Credit: grid intensity x carbon price	50	N/A
Solar Photovoltaic – 2026-2030	1,388	\$31.85	Credit: grid intensity x carbon price	50	N/A
Wind Generation - 2021-2025	1,586	\$32.50	Credit: grid intensity x carbon price	50	N/A
Wind Generation - 2026-2030	1,105	\$29.25	Credit: grid intensity x carbon price	50	N/A

There are other potential technology developments that should be considered in the future mix generation in Alberta, such as :

- Efficiency: Utilize the advanced technologies that reduce the energy used for each unit of output is the cheapest and cleanest way to meet future electricity demand.
- Geothermal: Alberta is particularly well-positioned to take advantage and develop a geothermal industry considering its existing oil and gas industry and significant accompanying technical expertise relevant to geothermal drilling.
- Hydro: the Canadian Hydro Association estimated that Alberta still has more than 11,500 MW of remaining hydro potential, including both reservoir and run-of-the-river projects.
- Biomass: Energy from agriculture and forest waste could become a sustainable source of fuel for generating electricity in Alberta’s rural areas.
- Aggregated distribution-connected generations, including the rooftop solars, energy storage, combined heat and power (CHP), etc.
- Small Modular Reactors (SMR) - Ontario, New Brunswick and Saskatchewan signed a Memorandum of Understanding in December 2019 to work collaboratively on development and deployment of SMRs. Saskatchewan established a Nuclear Secretariat in June 2020 to develop and execute a plan for the deployment of SMRs in the 2030s. While use of SMRs would require policy changes in Alberta,

		<p>the AESO should monitor its development in other jurisdictions.</p>
<p>8.</p>	<p><b>Other</b></p> <ul style="list-style-type: none"> <li>a. Is there any information that you would like to share, which would contribute to the Long-term Outlook development (ie. Developing trends)?</li> <li>b. What do you think is likely to disrupt Alberta’s electricity industry in the next 20 years and in what way?</li> </ul>	<ul style="list-style-type: none"> <li>a) no comment.</li> <li>b) The power delivery cost, including the distribution and transmission rates, remains one of the main concerns of customers over the past decade. Considering the expected lower load growth in the future, combined with new technologies and business models that allow consumers to manage their power consumption differently through demand response, storage, and/or distributed generation, regulated utility business models may be severely disrupted and require shifts to facilitating bi-directional energy transactions through the grid, rather than one-way delivery of service.</li> </ul>