Stakeholder Comment Matrix – June, 2020

2021 Long-term Outlook Stakeholder Feedback

Period of Comment:	June 4, 2020	through	July 6, 2020	**Contact:**	[redacted]
Comments From:	Pembina Institute			**Phone:**	[redacted]
Date:	[2020/07/06]			**Email**:	[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 by **July 6, 2020**

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

	Questions	Stakeholder Comments
1.	**Long-term Outlook** 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)	a. The details of the assumptions made to design each scenario are helpful to understanding the projections for renewable energy deployment in Alberta. 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: • 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. • Past and projected average GHG emissions intensity of Alberta's grid would give an overall picture of the market's exposure to carbon pricing. • 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. • 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. • 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. 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.

2.	**Macroeconomic variables** 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)? b. Oil sector production capacity is expected to increase in 2023 with the completion of pipeline projects (e.g., Keystone XL, etc.). I. The 2019 CAPP Crude Oil Forecast released in June 2019[1] 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. 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? b. Do you expect new oil production developments to be in situ or mining, or a combination of both? c. Do you expect domestic condensate	a. N/A 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.[2] 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.[3] A 2020 assessment by BP also concluded that new oil prices were making some of their oilsands investments uneconomical.[4] 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. I.b. The Canada Energy Regulator projects, in its Canada's Energy Future 2019 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. I.c. N/A 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 credible 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.

	growth, required for transport, to meet the incremental oilsands growth? Will domestic condensate displace imported condensate? II. What is your view on further oil sector investments over the same timeframe? III. What kind of oil price or other environment would allow for further cogeneration development in the oilsands and/or petrochemical sectors? 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?	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). 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.

[1] Canadian Association of Petroleum Producers https://www.capp.ca/resources/crude-oil-forecast/

[2] 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

[3] 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

[4] 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.	**Policy** 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? b. Other than policy on carbon pricing, what coming policies or policy scenarios do you see impacting load growth and generation development?	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.[5] 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: - coal: 0.370 tonnes per megawatt hour - existing gas: 0.370 tonnes per megawatt hour - gas commissioned from 2021 onward: 0 tonnes per megawatt hour 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 *Winning on climate* 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)."[6] 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[7]). 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

[5] 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

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

[7] 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

		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.
4.	**Impact of the COVID-19 pandemic** 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? b. How are near-term costs and future generation projects being impacted by covid-19? Do you anticipate long term impacts to generation development?	a. N/A b. Depending on the nature of the economic recovery packages from the federal and provincial government, there may be support to certain generation technologies.

5.	**Load growth and modifiers** 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? b. Under what conditions could Alberta see sustained negative system load growth? 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: i. Distributed energy resources: 1. Rooftop solar PV 2. Electric vehicles and charging stations 3. Gas generation 4. Wind generation 5. Energy storage 6. Energy efficiency d. What is your view on load growth and the impact of other emerging industries, sectors or technologies	a. N/A b. N/A c. N/A 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.[8] e. N/A

		(e.g., bitcoin and cryptocurrency mining, cannabis facilities, petrochemical facilities, data centers, others)?	

[8] Binnu Jeyakumar, Sheila Ify Obi, Sara Hastings Simon, *Pembina Institute's Submission for Module 1* (2019), AUC Proceeding 24116: Distribution System Inquiry, X0175

6.	**Generation Technologies** a. What renewable technologies are likely to be developed by PPA's? b. What is the potential size of the corporate PPA market for renewables, being funded fully or in part, in Alberta? c. What challenges do you foresee in implementing PPA's for renewable development in Alberta? 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? e. Outside of existing generation technology in Alberta, what technology will show up in Alberta next? f. What are the challenges surrounding generation development in Alberta and what are the major factors that will determine what gets built?	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.[9] This trend could occur in Canada too as the PPA market develops. b. According to Power Advisory,[10] 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.[11] 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. 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. [12] Small corporate buyers are interested in PPAs but the aggregation of their load is a challenge and has not been done in Alberta yet.[13] d. N/A 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. 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.

[9] 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

[10] Kris Aksomitis, 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

[11] Ibid

[12] 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

[13] 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.	**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?	Battery storage, already low-cost and feasible,[14] should be added in the table as well as solar paired with storage, which has already won competitive auctions in several jurisdictions like Arizona.[15] 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.[16] 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.

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

[14] 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

[15] 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

[16] 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/

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?	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. 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.[17] 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.[18] 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. 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.

[17] International Energy Agency, "Sustainable Recovery: World Energy Outlook Special Report – Electricity," June 2020. https://www.iea.org/reports/sustainable-recovery/electricity#abstract

[18] 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/