

Written Consultation | Dec. 15 to Jan. 15, 2021 – Stakeholder Comments

Posted | January 2021

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2021 Long-term Outlook Scenarios – December, 2020

2021 Long-term Outlook Stakeholder Feedback



Period of Comment: December 15, 2020 through January 15, 2021

Comments From:

Date: 2021/01/15



Keeping with the mandate of providing safe, reliable and economic operation of the Alberta electricity system while facilitating a fair, efficient and competitive market for electricity, the AESO is developing the 2021 Long-term Outlook (LTO).

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	Questions	Stakeholder Comments
1.	Do the proposed LTO scenarios cover a reasonable range of plausible future outcomes? Which scenario do you think is more likely? Which one is less likely?	
	Does the “Clean-Tech” scenario focus on the appropriate technologies and policies?	<ul style="list-style-type: none"> - <i>Include federal proposed Healthy Environment Healthy Economy – e.g. carbon price of \$170/t in 2030 and CFS based December 2020 proposed regulations</i> - <i>Allow model to repower of GN1, GN2, SD5 if economically feasible</i> - <i>Additional storage capacity could be considered – Canadian Infrastructure Bank has a large project funded in Ontario.</i>
	Are there different scenarios that warrant inclusion?	<ul style="list-style-type: none"> - <i>Increased transmission capacity with BC</i> - <i>Include case with significant hydrogen production and electrification of oil and gas (see BC LNG)</i> - <i>We could see these as stand-alone scenarios or part of existing scenarios</i>
4.	What long-term hydrocarbon demand projections do you think are reasonable for the Robust and Stagnant Global Oil & Gas Demand scenarios?	
5.	Are there additional generation technologies that warrant inclusion in the 2021 Long Term Outlook Scenarios?	
6.	Do you disagree with any of the assumptions in Slide 4 for any of the scenarios? If so, what would you propose?	

7.	<p>The AESO has not yet determined the quantum of change in the scenario variables. Do you agree directionally with the scenario assumptions? Do you have insights regarding the magnitude of scenario changes?</p>	<ul style="list-style-type: none"> - <i>For technology assumptions see NREL ATB database</i> - https://atb.nrel.gov/electricity/2020/data.php <p><i>Increased BC inertia could reference RECSI Study located here:</i></p> <ul style="list-style-type: none"> - https://www.aeso.ca/market/market-updates/regional-electricity-cooperation-and-strategic-infrastructure-initiative-recsi/
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Period of Comment: December 15, 2020 through January 15, 2021	[REDACTED]
Comments From: AirdrieZero.org	[REDACTED]
Date: [2021/01/08]	[REDACTED]

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1.	<p>Do the proposed LTO scenarios cover a reasonable range of plausible future outcomes? Which scenario do you think is more likely? Which one is less likely?</p>	<p>High RE. I put some non-zero probability on OBPS output based pricing system benchmark being changed from best gas, to best gas with CCS carbon capture and storage. In other words, full pricing of emissions (not OBPS).</p> <p>I say that in part because Biden had EICDA energy innovation and carbon dividend act on his climate page, and EICDA includes BCA border carbon adjustments, which have a domino effect—like William Nordhaus ‘Carbon Club’ – a tariff of 3% on all goods from any country with a carbon price less than X—and I expect Canada to implement the BCA when/as USA does, eliminating the need for OBPS for EITEs, as the BCAs will be stopping the ‘leakage’ of industry to low emissions stringency domains. And that means OBPS in electricity will look funny. Consumers get rebates, so they don’t need it – as carbon pricing in power sector trickles down to them, they’ll have rebates to offset. So it will be more embarrassing to explain why power sector is priced with OBPS against ‘best gas’ – there won’t be a good reason.</p> <p>Except that Deep Decarbonization gurus say there are 2 steps to decarbonize an economy:</p> <p>STEP 1) convert everything to run on electricity</p> <p>STEP 2) clean the electricity grid</p> <p>And if electricity prices are spiking in #2, that reduces economic motivation to do #1, Unless there are ways to avoid the price spike, via demand management and co-generation to heat pumps with higher COP / efficiency above 1.</p>
2.	<p>Does the “Clean-Tech” scenario focus on the appropriate technologies and policies?</p>	<p><i>TOD/TOU/dynamic pricing – we need to know if behind-the-meter demand management / load shifting / peak shaving / load sequencing / seasonal peak shaving / seasonal load shifting is going to be important as equipment / replacement cycles come up in the 2020s. A major cost of rapid decarbonization is ‘stranded assets’ and avoiding stranding means knowing what equipment to buy on the next replacement cycle which depends on knowing demand management pricing/incentives in the equipment life cycle</i></p> <p><i>SO I would say the availability of smart meters that can get instant/dynamic pricing – from AESO? Would there be a separate url for dynamic pricing? – and behind the meter automated demand management -including V2G vehicle to grid, load sequencing and shifting of stove, clothes dryer, heat pumps, EV charging – you need to have a scenario with the smart meter / dynamic pricing mechanism.</i></p> <p><i>Rethinkx.com EnergyReport shows Mark Jacobson style high variable RE scenario can be done with 4 x average capacity plus short term storage. That curtailed extra RE will be another incentive to load shift. Something has to tell us when that otherwise curtailed power is available (and when its not). It’s a High-RE+High-Info scenario.</i></p> <p><i>Besides dynamic demand pricing, there will likely need to be better price signals to encourage just the right amount of battery TOD arbitrage, and that would include adjustments for ‘avoided transmission costs’ – transmission cost into a distribution</i></p>

		<i>branch should only be charged once, and it should probably be the battery arbitrage who gets credit when returning power to the local distribution branch, provided the branch avoids transmission costs as a result. And that depends on how much local generation and battery arbitrage is coming onto the branch at that time of day – if its less than demand, then no curtailment or transmission out. Etc I'm not an expert, it needs to be as sophisticated as necessary to encourage / maximize common good / social utility / net economic gains to society.</i>
3.	Are there different scenarios that warrant inclusion?	<p><i>Fridays for Future / Greta scenaro – investment fund managers calculate stopck price by NPV of future earnings divided by number of shares. As Fridays for Future reach voting age, in general investors put a non-zero stochastic weight on higher emissions regulatory stringency. So one scenario is this ‘investment fund manager’ view of future emissions stringency and its impacts on future earnings potential.</i></p> <p><i>DNV GL Energy Transition Outlook 2020 doesn't include those speculative regulatory tightenings – just what's on the books. And your estimate of tightening under high RE scenario falls short. I expect Paris NDC escalation as countries find viable pathways. And besides carbon pricing escalation I expect escalation of equipment ‘Replacement Mandates’ -like banning sale of natgas appliances and ICE passenger cars, or ramping to 100% Replacement mandate with FeeBates. See RewiringAmerica.org Handbook p.13 graph of carbon tax and replacement mandates. Carbon tax is ramped slowly, to signal ahead so as to minimize asset stranding. Replacement mandates only apply to new equipment sales, so don't strand equipment already in use.</i></p> <p><i>In consumer sector, if appliances / cars last 15 years, then implementing 100% Replacement Mandate now would eliminate consumer sector emissions by 2035.</i></p>
4.	What long-term hydrocarbon demand projections do you think are reasonable for the Robust and Stagnant Global Oil & Gas Demand scenarios?	<p><i>Stagnant should be going down, not flat. DNV GL Energy Transition Outlook 2020 shows global oil demand already peaked in 2019 – pulled ahead 3 years by pandemic. And Biden / EICDA variant with BCA border carbon adjustment with international domino effect will accelerate decline from DNV GL 2020 projection.</i></p> <p><i>That means oil sands would need to replace conventional in a declining market in order to grow, while suffering from higher emissions intensity, in a world with likely more CFS/LCFS clean/low carbon fuel standards / stringency being implemented. Would that increase or decrease their grid power demand?</i></p>
5.	Are there additional generation technologies that warrant inclusion in the 2021 Long	<i>High interprovincial interconnect scenario – then more hydro and solar spread over more hours.</i>

	Term Outlook Scenarios?	
6.	<p>Do you disagree with any of the assumptions in Slide 4 for any of the scenarios? If so, what would you propose?</p>	<p><i>All Scenarios > carbon price 170 by 2030 maybe 350 by 2040, 500 by 2050 – enough to get to net zero 2050 on smooth long-taile finish And when I run a policy simulator at Pembina.org/eps And use only broad based carbon pricing, I need 200 by 2032, 350 by 2042, (projecting) 500 by 2052 to stay on Pairs 1.5C net zero 2050 pathway. Ecofiscal.ca 210 by 2030 IPCC 185 (US) needed Navius research (interpolating an infographic) 383 by 2030 PBO parliamentary budget office 116 by 2030 Summary: I don't see that 170 going lower, and with Paris agreement asking for NDC escalation every 5 years, I won't be surprised to see it go up. I personally sensed the anti-carbon-tax movement lost steam in AB after everyone got their fed backstop rebate. It will be hard for a future gov to take away a rebate from 3/5 60% of voters. I expect it to stick. I expect USA to adopt a variant of EICDA perhaps as a fed backstop like Canada, so California / WCI cap & trade can continue like QC in Canada. I put non-zero stochastic weight on the idea of revenue recycling to rebates to dominate carbon price increases in BC, QC and California permit auction revenue also start being recycled to rebates. The complaints I hear from BC now are not the carbon price level, but that people didn't get a rebate. Rebate envy sweeps the world. And it being progressive -meaning low income come out ahead- in a time when nations are facing increasing income disparity and the political problems that causes, will likely jump on it gladly.</i></p>
7.	<p>The AESO has not yet determined the quantum of change in the scenario variables. Do you</p>	<p><i>I'm a concerned/puzzled/curious citizen trying to figure out what the future will look like, to help people around me avoid stranded assets as replacement cycles come up in the 2020s.. It's easy to get into an 'info bubble' and not put good weights / likelihoods / stochastic probabilities on things. Hypothesis: investment funds – that are diversified / not specializing in Fossil Fuels – are a good source of stochastic estimates of future regulatory stringency and technology learning curve impacts. There's evidence against that too – lots of failed</i></p>

	agree directionally with the scenario assumptions? Do you have insights regarding the magnitude of scenario changes?	<i>investment funds when markets crash. But also well disciplined funds; what would Warren Buffet do?</i>
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2021 Long-term Outlook Scenarios – December, 2020

2021 Long-term Outlook Stakeholder Feedback



Period of Comment: December 15, 2020 through January 15, 2021	[REDACTED]
Comments From: ATCO Electric	[REDACTED]
Date: 2021/01/15	[REDACTED]

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1.	Do the proposed LTO scenarios cover a reasonable range of plausible future outcomes? Which scenario do you think is more likely? Which one is less likely?	<p>The reference case is based on IHS outlook, which is a provincial wide forecast. ATCO suggests that the reference case should recognize the differences among regions and provide forecast break-down for each region (it's probably included in the detailed LTO document).</p> <p>The reference case forecasts generation based on types, which introduces inherent regional specificity in generation forecast. Similarly, load forecast should also consider inherent regional specificity. It's appreciated that certain regional specificity has been considered in the high growth scenario (such as condensates in NW), ATCO believes that such regional specificity should be included in the reference case.</p>
2.	Does the "Clean-Tech" scenario focus on the appropriate technologies and policies?	<i>No comments.</i>
3.	Are there different scenarios that warrant inclusion?	Refer to Question 1. As the DFO in the NW area, ATCO has been seeing customer needs for electricity in that area that drive growth. ATCO also observes criteria violations and system constraints when customers need connections in the NW area. These all indicate that the reference case should recognize higher growth in NW due to the mix of O&G and condensates activities in that area.
4.	What long-term hydrocarbon demand projections do you think are reasonable for the Robust and Stagnant Global Oil & Gas Demand scenarios?	<i>No comments.</i>
5.	Are there additional generation technologies that warrant inclusion in the 2021 Long Term Outlook Scenarios?	AESO may consider more discussion on Energy Storage.

<p>6.</p>	<p>Do you disagree with any of the assumptions in Slide 4 for any of the scenarios? If so, what would you propose?</p>	<p>Since the slides do not have the details typically included in the published LTO, ATCO suggests more clarifications in the following areas:</p> <p>Slides 6 & 7: How is 'range' defined? It's interesting to observe that the 2021 LTO has a growth rate that's no more than the low range of the 2019 LTO reference case. What's the basis for such change given that the forecast is for the next 20 years?</p> <p>Slide 8: What's the criteria for project inclusion?</p> <p>Slides 9 & 10: how to correlate the DER forecast values on the two slides?</p> <p>Slide 9: Rooftop solar and less than 5 MW gas offsets is subtracted from the Average Load forecast. What's the impact of doing this and is there any distortion to the load forecast?</p>
<p>7.</p>	<p>The AESO has not yet determined the quantum of change in the scenario variables. Do you agree directionally with the scenario assumptions? Do you have insights regarding the magnitude of scenario changes?</p>	<p><i>Directionally agree. However, low end of the forecast range is suggesting negative growth for the reference case, which means even lower growth than the stagnation assumption. What are the bases for such scenario? ATCO is of the view that stagnation should be the lower end of the forecast and negative growth would be too pessimistic.</i></p>

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Comments From: Canadian Renewable Energy Association
Date: 2021/01/15



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1.	Do the proposed LTO scenarios cover a reasonable range of plausible future outcomes? Which scenario do you think is more likely? Which one is less likely?	<p>The proposed scenarios do not cover a plausible range of future outcomes. This is due primarily to the fact that they do not reflect two key climate policies, which are likely to have an impact on the generation mix. These policies include:</p> <ul style="list-style-type: none"> - The Federal Carbon Price <ul style="list-style-type: none"> o In December, the Federal Government announced their “Healthy Environment and Healthy Economy” climate plan, which includes a commitment to increase the carbon price to \$170/tonne by 2030. o This will have several impacts across scenarios, including, but not limited to, increased competitiveness of renewable energy, increased deployment of storage and increased interest in corporate power purchase agreement. o It is also worth noting that the plan has cancelled the planned deployment introduction of a Clean Fuel Standard for gaseous and solid fuels, and thus will no longer apply to Alberta’s electricity sector. - Provincial Renewable Energy Act <ul style="list-style-type: none"> o The Government of Alberta’s <i>Renewable Energy Act</i> legislates a target that 30% of the electric energy produced in the province be produced from renewable energy resources. o As a result, this level of renewable penetration should be reflected as a <i>minimum</i> across all scenarios. <p>Given these two policies, it is most likely that the Clean-Tech (Energy Transformation) scenario occurs by 2030. In fact, it may be the case that the Reference Case should more closely match</p>

		<p>what is now called the Clean Tech Scenario, and the Clean Tech Scenario be more aligned with a grid that is 90% non-emitting by 2040, along with higher levels of electrification.</p>
<p>2.</p>	<p>Does the “Clean-Tech” scenario focus on the appropriate technologies and policies?</p>	<p>Policies</p> <p>It is difficult to understand which policies are included in this scenario. It is evident that there are impacts from these policies, but it is unclear which specific policies are included.</p> <p>Reiterating our points from above, this scenario should <i>at the very least</i>, include the scheduled increase to carbon prices, and the 30% provincial renewable target. As well, it is recommended that the models be more explicit about recent announcements pertaining to accelerated coal facilities phase outs and federal limits on life extensions for coal to gas conversions.</p> <p>Technologies</p> <p>We have several comments to offer on the treatment of technologies in the “Clean-tech” scenario:</p> <ul style="list-style-type: none"> - We are pleased to see wind, solar and energy storage included in the analysis. However, in addition to “utility scale” energy storage, the additional inclusion of solar/storage and wind/storage hybrid projects would better reflect the ways these technologies will be deployed in the future. - The “Supply” column on slide 13, “Proposed scenario narratives”. refers to “current policies, technology costs, [and] industry trends”. Though this phrasing is found in relation to the Reference Case, CanREA requests more transparency on the reports and research being used to inform current policies, costs and trends in the “Clean-Tech” scenario. - It is requested that the AESO share the updated AWS Truepower “Renewable Capital Cost” report mentioned in the table on page 14. Without transparency on the forecasted technology costs, it is difficult to understand how well the models align with the reality of the cost of project deployment in the field. The 2019 LTO was based on LCOE calculations that were nearly two times as high as those being achieved

		<p>in the field at that time, possibly skewing deployment models. It will be critical for capital costs in the 2021 LTO be more accurate than previous figures, so that the capacities deployed in the model are not artificially depressed.</p> <ul style="list-style-type: none"> - Given the transformations that are currently occurring around the world, it is not appropriate to refer to the changes under the scenario as “radical”. Rather, they are the direction in which the electricity sector is moving and will be commonplace in 2030. - The assumptions for corporate PPA growth underestimate the deployment that is expected by industry. In fact, the projected growth in the Reference Case has already been eclipsed by projects announced for deployment in the next 24 months. By our calculations, there is 326.5 MW of wind and solar capacity supported by renewable PPAs expected to come online in 2021-2022. These calculations do not include ongoing renewable contract procurements being undertaken by the City of Edmonton and the Federal Government, which together could more than 200 MW of wind and/solar to the grid (depending on the winning configurations). It is recommended that the AESO revisit this assumption, and revise the number upward.
3.	Are there different scenarios that warrant inclusion?	
4.	What long-term hydrocarbon demand projections do you think are reasonable for the Robust and Stagnant Global Oil & Gas Demand scenarios?	We have no comment on the hydrocarbon demand, but we would expect that this scenario should result in higher renewable corporate PPAs, as additional growth in the sector will result in a higher demand for clean electricity.
5.	Are there additional generation technologies that warrant inclusion in the 2021 Long Term Outlook Scenarios?	

6.	Do you disagree with any of the assumptions in Slide 4 for any of the scenarios? If so, what would you propose?	
7.	The AESO has not yet determined the quantum of change in the scenario variables. Do you agree directionally with the scenario assumptions? Do you have insights regarding the magnitude of scenario changes?	<p>Overall, we agree with the directions of the scenario assumptions. However, it is recommended that climate policy assumptions be updated to more clearly reflect the landscape, as elaborated upon in the answers for questions two or three. Without these updates, it is unlikely that the magnitude of growth for renewables, utility scale storage, or renewable corporate PPAs will be reflected in the resulting LTO.</p> <p>This issue is particularly clear with the treatment of energy storage. According to Slide 4, the AESO's modelling forecasts only 65 MW of energy storage by 2030 and 145 MW of energy storage by 2040. Discussions with CanREA members indicate that the AESO estimate is an order of magnitude too low.</p> <p>The AESO estimate is inconsistent both with the current observable level of deployment and with other changes made between the 2019 and 2021 LTOs. In the past year, 30 MW of utility scale energy storage has been installed. Further more, the 2021 LTO generation forecast suggests an increase of 1,000 MW of variable renewable generation, and a reduction of 500 MW of simple cycle generation. The resulting increased demand for flexible resources suggests a much larger increase in storage deployment, especially considering we are almost halfway to the 2030 forecast in 2021.</p>

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Comments From: Chapman Ventures	[REDACTED]
Date: 2021/01/25	[REDACTED]

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1.	Do the proposed LTO scenarios cover a reasonable range of plausible future outcomes? Which scenario do you think is more likely? Which one is less likely?	<p><i>The proposed LTO scenarios suggest some prospective scenarios; however, we believe that the most plausible future outcomes are not adequately captured in these scenarios. The primary foundational concern is related to the Reference Case, as the Reference Case serves as a basis for all comparisons and a source of inputs for many of the key economic drivers and assumptions for the alternative scenarios. The Reference Case table on page 9 critically underestimates the 2030 and 2040 values for solar and energy storage.</i></p> <p><i>The Clean-Tech Scenario is the most likely, but there are other elements that deserve consideration, such as:</i></p> <ul style="list-style-type: none"> - <i>Carbon Price to align with Federal announcement.</i> - <i>Significantly higher values for utility-scale solar, DER and DCG solar, renewable corporate PPAs, and energy storage deployment for both 2030 and 2040.</i>
2.	Does the “Clean-Tech” scenario focus on the appropriate technologies and policies?	<p><i>The “Clean-Tech” scenario narratives on Slide 13 seem directionally reasonable. It is difficult to either validate or deny whether the oilsands outlook would remain intact, as per the reference case.</i></p> <p><i>Although difficult to model, increasingly smart and flexible technologies across the electricity production and delivery chain (from generation through consumer) are likely to support technical and transactional flexibility, removing bottlenecks to increase electrification of the electric grid and other energy intensive sectors (i.e. transportation).</i></p>
3.	Are there different scenarios that warrant inclusion?	<p><i>Climate change policy direction at the global, North American, and Canadian levels suggest that clean tech (including renewable generation, energy storage, alternative transportation, DERs, and smart grid solutions) will be deployed in significantly</i></p>

greater volumes and broader applications than suggested by both the status quo and the AESO's current 2021 LTO Reference Case.

It is our belief that the Clean Tech (Energy Transformation) scenario is inevitable and should therefore serve as the Reference Case for the 2021 AESO LTO. Consideration should be given to the recent Federal carbon tax increase, \$50/tonne in 2023 followed by incremental annual increases of \$15/tonne from 2023 until the tax hits \$170/tonne in 2030. Such a reference case should contain much higher assumptions for utility-scale solar, energy storage, and rooftop PV. The following are some Generation Capacity quantities that deserve consideration for the base case. Please note that these are not aggressive assumptions in our opinion.

- *Solar: 2,000 MW (2030), 4,000 MW (2040)*
- *Energy Storage: 1,500 MW (2030), 4,000 MW (2040)*
- *Rooftop Solar: suggest engaging with some local experts in the space for an indication of prospective provincial growth (i.e. Skyfire Energy, Kuby, etc.)*

With this Clean-Tech scenario serving as the reference case, it would be reasonable to include the following alternative cases:

- 1. Clean Tech – Low AB Load Growth / Stagnating Global Oil and Gas Demand*
- 2. Clean Tech – Oil Status Quo (using the oil and gas industry related assumptions from the AESO's current proposed 2021 LTO Reference Case)*
- 3. Clean Tech – Aggressive Robust Clean Tech Growth. This would include significantly higher deployments of renewable generation, energy storage, electric and autonomous vehicles, smart grid devices and networks, etc.*

4.	What long-term hydrocarbon demand projections do you think are reasonable for the Robust and Stagnant Global Oil & Gas Demand scenarios?	
5.	Are there additional generation technologies that warrant inclusion in the 2021 Long Term Outlook Scenarios?	<p><i>It is not entirely clear what energy storage technologies were included in the AESO's 2021 LTO Scenarios slide deck. Based on the Reference Case generation forecast values for 2030 and 2040 (on slide 9), one could assume that limited deployments of lithium-ion batteries and pumped hydro are assumed. If this is the case, it would be worth considering some other long duration energy storage technologies, such as CAES and flow batteries. It may also be worth considering prospective impacts of the growth of clean hydrogen and other zero-GHG (or low GHG) combustion fuels.</i></p>
6.	Do you disagree with any of the assumptions in Slide 4 for any of the scenarios? If so, what would you propose?	<p><i>It is assumed that this question is referring to the assumption in slide 14 rather than slide 4.</i></p> <p><i>It does not seem prudent to assume that the carbon price will remain at current levels, reaching \$50/tonne and then remaining at that level in perpetuity. This is the assumption in the current AESO Reference Case.</i></p> <p><i>It is of our opinion that the Reference Case should reflect the announced government carbon tax plans, which is to apply incremental annual increases of \$15/tonne from 2023 until the tax hits \$170/tonne in 2030.</i></p> <p><i>Please refer to our response to Question 3 for further commentary regarding the scenario assumptions. The foundational point is that the AESO Reference Case should reflect a Clean Tech scenario.</i></p>
7.	The AESO has not yet determined the quantum of change in the scenario variables. Do you agree directionally with the scenario assumptions? Do you have insights regarding the magnitude of scenario changes?	<p><i>It is our opinion that the existing AESO 2021 LTO Reference Case is not realistic, and thus using it as a point of reference for the alternative scenarios does not serve to provide productive feedback to the AESO. The Reference Case should reflect a Clean-Tech case. Please see the comments provided in the response to Question 3.</i></p>

		<p><i>Chapman Ventures would be happy to engage further with the AESO (outside of this matrix feedback) to provide constructive input regarding a new Reference Scenario and new associated alternative scenarios. In the meantime, here are some general comments:</i></p> <p><i>Reference Case:</i></p> <ol style="list-style-type: none"> <i>1. Carbon Policy: Consider announced Federal carbon tax.</i> <i>2. Generation Capacity:</i> <ul style="list-style-type: none"> <i>- Solar: 2,000 MW (2030), 4,000 MW (2040)</i> <i>- Energy Storage: 1,500 MW (2030), 4,000 MW (2040)</i> <i>- Rooftop Solar: suggest engaging with some local experts in the space for an indication of prospective provincial growth (i.e. Skyfire Energy, Kuby, etc.)</i> <i>3. Renewable Capital Cost – wind/solar: Can the AESO please share the AWS Truepower estimates for 2021-2030? How is the AESO forecasting capex beyond the AWS Truepower estimate, from 2030 to 2040? What are the capacity factor assumptions, particularly for wind?</i> <i>4. Renewable corporate PPAs. Suggest increasing to 500 MW by 2030 and 1500 MW by 2040.</i> <i>5. Energy Storage – Utility Scale. Explosive growth is highly probable both this decade and out to 2030. This is reflected in the assumptions of 1500 MW (2030) and 4000MW (2040).</i> <i>6. DERs and DCGs. Historical trends are likely to underestimate the deployment growth of these resources, particularly solar.</i> <i>7. Electric Vehicles. Deployment growth should be higher based on combined impact of technological advances, increased carbon tax, and cost reductions.</i>
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2021 Long-term Outlook Scenarios – December, 2020

2021 Long-term Outlook Stakeholder Feedback



Period of Comment: December 15, 2020 through January 15, 2021	[REDACTED]
Comments From: EDF Renewables Development Inc	[REDACTED]
Date: 2021/01/15	[REDACTED]

Keeping with the mandate of providing safe, reliable and economic operation of the Alberta electricity system while facilitating a fair, efficient and competitive market for electricity, the AESO is developing the 2021 Long-term Outlook (LTO).

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Further stakeholder engagement on LTO scenarios and preliminary results can be expected as the AESO makes progress toward the anticipated publication date in Q2 of 2021.

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The AESO thanks you for your time and appreciates your input.

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

	Questions	Stakeholder Comments
1.	Do the proposed LTO scenarios cover a reasonable range of plausible future outcomes? Which scenario do you think is more likely? Which one is less likely?	<p>The proposed scenarios may not fully cover the reasonable range of options given the recent federal announcement of higher carbon tax from 2022 onwards, reaching \$170/tonne by 2030. While this is not yet implemented, it clearly suggests the potential for a very strong carbon price signal in the Alberta market.</p> <p>Given this reasonable scenario, the Clean-Tech scenario is the most likely. EDF suggests a 'Clean-Tech Plus' scenario should be added that explores a much in-depth transformation of the electricity sector, including high levels of energy storage and other de-carbonization options like carbon capture and hydrogen production.</p>
2.	Does the "Clean-Tech" scenario focus on the appropriate technologies and policies?	The Clean-Tech scenario is reasonable, though it does not appear to contemplate larger penetration of storage. EDF suggests this scenario should include more storage. Further, as noted, the Clean-Tech scenario may no longer go far enough given the potential for much higher carbon prices.
3.	Are there different scenarios that warrant inclusion?	Please see above.
4.	What long-term hydrocarbon demand projections do you think are reasonable for the Robust and Stagnant Global Oil & Gas Demand scenarios?	
5.	Are there additional generation technologies that warrant inclusion in the 2021 Long Term Outlook Scenarios?	

6.	Do you disagree with any of the assumptions in Slide 4 for any of the scenarios? If so, what would you propose?	
7.	The AESO has not yet determined the quantum of change in the scenario variables. Do you agree directionally with the scenario assumptions? Do you have insights regarding the magnitude of scenario changes?	<p>As noted, the Clean-Tech scenario may no longer represent a test of potential upside in de-carbonization.</p> <p>EDF suggests that the AESO should use carbon reduction targets (and the associated supply mix required) for the electricity sector (and Alberta broadly) that align with federal targets for one or more of its scenarios. This suggests material carbon reductions for Alberta, both in electricity and other sectors, that may drive higher load growth for electrification as well as large amounts of renewable generation to support this effort.</p>

2021 Long-term Outlook Scenarios – December, 2020

2021 Long-term Outlook Stakeholder Feedback



Period of Comment: December 15, 2020 through January 15, 2021	[REDACTED]
Comments From: ENMAX Corporation	[REDACTED]
Date: 2021/01/13	[REDACTED]

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The AESO thanks you for your time and appreciates your input.

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

	Questions	Stakeholder Comments
1.	Do the proposed LTO scenarios cover a reasonable range of plausible future outcomes? Which scenario do you think is more likely? Which one is less likely?	No comment.
2.	Does the “Clean-Tech” scenario focus on the appropriate technologies and policies?	ENMAX expects the “clean-tech” scenarios to evolve as the federal government progresses its new climate plan and hydrogen strategy, in addition to provincial plans such as Alberta’s natural gas vision and strategy.
3.	Are there different scenarios that warrant inclusion?	<p>The impacts of the new federal government climate plan should also be taken into account, including how the proposed new carbon price (which is expected to reach \$170/tonne by 2030) may be applied both federally and provincially in Alberta. It will be important to understand the AESO assumptions used for such scenarios.</p> <p>It is understood that there will likely be a significant increase in renewables and ENMAX seeks to better understand how much of each technology and why?</p> <p>Will the AESO forecast LCOE, demand for offsets/RECs etc., and then continue to build the forecast from there?</p> <p>A projection of Transmission build and potential costs may also be useful to understand which may accompany the renewable builds.</p>
4.	What long-term hydrocarbon demand projections do you think are reasonable for the Robust and Stagnant Global Oil & Gas Demand scenarios?	No comment.
5.	Are there additional generation technologies that warrant inclusion in the 2021 Long Term Outlook Scenarios?	No comment.
6.	Do you disagree with any of the assumptions in Slide 4 for any of the scenarios? If so, what would you propose?	No comment.

7.	The AESO has not yet determined the quantum of change in the scenario variables. Do you agree directionally with the scenario assumptions? Do you have insights regarding the magnitude of scenario changes?	No comment.
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2021 Long-term Outlook Scenarios – December, 2020

2021 Long-term Outlook Stakeholder Feedback



Period of Comment: December 15, 2020 through January 15, 2021	[REDACTED]
Comments From: Energy Storage Canada	[REDACTED]
Date: 2021/01/15	[REDACTED]

Keeping with the mandate of providing safe, reliable and economic operation of the Alberta electricity system while facilitating a fair, efficient and competitive market for electricity, the AESO is developing the 2021 Long-term Outlook (LTO).

Given the challenges faced as a result of the COVID-19 pandemic and the low oil price, feedback provided to the AESO will be an important input into how we forecast Alberta's the near to long-term electricity. The AESO will use scenarios as a means of stress testing various market, technological, consumer behaviour, policy and economic outcomes, to assist stakeholders in understanding potential long-term future outcomes in the Alberta electricity market.

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The AESO thanks you for your time and appreciates your input.

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

	Questions	Stakeholder Comments
1.	Do the proposed LTO scenarios cover a reasonable range of plausible future outcomes? Which scenario do you think is more likely? Which one is less likely?	Yes, the LTO scenarios cover a reasonable range of plausible future outcomes. The Clean-Tech scenario appears most likely due to federal government policy announcements, prolonged low oil prices and continued drop in renewable energy costs.
2.	Does the “Clean-Tech” scenario focus on the appropriate technologies and policies?	Yes, it is clear from recent announcements that corporate PPAs for renewables are growing rapidly. The amount of energy storage is understated. To integrate all of the variable renewable energy resources, more energy storage resources will be required. In addition, energy storage can offer services directly to customers requiring higher than average power quality more cost-effective than large electricity system expansions.
3.	Are there different scenarios that warrant inclusion?	Changes to the components of the three scenarios are more appropriate than a new different scenario.
4.	What long-term hydrocarbon demand projections do you think are reasonable for the Robust and Stagnant Global Oil & Gas Demand scenarios?	No opinion.
5.	Are there additional generation technologies that warrant inclusion in the 2021 Long Term Outlook Scenarios?	Large imports from neighbouring jurisdictions (e.g., Site C) may be prudent to consider in the 2021 LTO.
6.	Do you disagree with any of the assumptions in Slide 4 for any of the scenarios? If so, what would you propose?	Yes, under the robust global Oil and Gas demand, there may be a potential for the electricity sector to become less emissions intensive (i.e., increased use of renewables and storage) to offset emissions from new oil & gas development. Higher electricity demand in the robust global oil & gas demand will offer more opportunities for low-cost renewables and storage to meet customer electricity needs.

7.	The AESO has not yet determined the quantum of change in the scenario variables. Do you agree directionally with the scenario assumptions? Do you have insights regarding the magnitude of scenario changes?	ESC believes that there is more potential for growth in energy storage over the next 20 years, especially with the need for firming capacity if renewable corporate PPAs grow as expected.
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2021 Long-term Outlook Scenarios – December, 2020

2021 Long-term Outlook Stakeholder Feedback



Period of Comment: December 15, 2020 through January 15, 2021	[REDACTED]
Comments From: Greengate Power Corporation	[REDACTED]
Date: 2020/01/15	[REDACTED]

Keeping with the mandate of providing safe, reliable and economic operation of the Alberta electricity system while facilitating a fair, efficient and competitive market for electricity, the AESO is developing the 2021 Long-term Outlook (LTO).

Given the challenges faced as a result of the COVID-19 pandemic and the low oil price, feedback provided to the AESO will be an important input into how we forecast Alberta's the near to long-term electricity. The AESO will use scenarios as a means of stress testing various market, technological, consumer behaviour, policy and economic outcomes, to assist stakeholders in understanding potential long-term future outcomes in the Alberta electricity market.

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The AESO thanks you for your time and appreciates your input.

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

	Questions	Stakeholder Comments
1.	Do the proposed LTO scenarios cover a reasonable range of plausible future outcomes? Which scenario do you think is more likely? Which one is less likely?	<i>The proposed scenarios cover a reasonable range of outcomes. Greengate believes that the Clean-Tech scenario is the most likely, as the cost of renewables and storage decline and the carbon tax increases.</i>
2.	Does the “Clean-Tech” scenario focus on the appropriate technologies and policies?	<i>A Clean-tech focus will also lead to economic growth; therefore the GDP outlook should be improved from the reference case. It warrants consideration to change the \$100/t carbon price by 2030 to \$170/t, as per the current federal government’s stated intentions. In fact, the \$170/t should be used in the reference case. The reference case has very little storage being added by 2030 (65 MW), this is too low and should likely be multiples of this amount. The Clean-Tech scenario should therefore have an even larger level of storage. Storage projects will be constructed as the cost of storage declines, similar to the growth rates for wind and solar.</i>
3.	Are there different scenarios that warrant inclusion?	<i>The scenarios describe a reasonable future outlook possibilities.</i>
4.	What long-term hydrocarbon demand projections do you think are reasonable for the Robust and Stagnant Global Oil & Gas Demand scenarios?	<i>Greengate can support the alignment to the most optimistic scenario for oil and gas development. Global demand levels for oil and gas are likely to remain strong, Alberta can benefit from a robust oil and gas sector and at the same time, significant development of renewables.</i>
5.	Are there additional generation technologies that warrant inclusion in the 2021 Long Term Outlook Scenarios?	<i>There is limited inclusion of storage technologies. In slide 9, 65 MW of storage is forecasted by 2030. The AESO should examine the impact of substantial decreases in costs for storage, as well as the impact of the inclusion of storage projects in current applications to the AESO. Further storage growth should be included in scenarios besides the clean</i>

		<i>tech scenario.</i>
6.	Do you disagree with any of the assumptions in Slide 4 for any of the scenarios? If so, what would you propose?	<i>It does not seem prudent to assume a \$50/t carbon price as the reference case (as well as the other scenarios besides clean-tech). Greengate believes it warrants consideration that carbon prices or equivalent regulation is likely to increase the costs of emissions by 2030 beyond \$50/t, likely to \$170/t (as per intentions of the current federal government).</i>
7.	The AESO has not yet determined the quantum of change in the scenario variables. Do you agree directionally with the scenario assumptions? Do you have insights regarding the magnitude of scenario changes?	<i>In regard to Storage, Greengate would support, at a minimum, an assumed 500 MW of storage being in service by 2030. Greengate supports the increase in wind and storage in the scenarios, however given trends in carbon pricing, this level is likely still understated.</i>

2021 Long-term Outlook Scenarios – December, 2020

2021 Long-term Outlook Stakeholder Feedback



Period of Comment: December 15, 2020 through January 15, 2021	[REDACTED]
Comments From: Heartland Generation Ltd. ("Heartland Generation")	[REDACTED]
Date: [2021/01/15]	[REDACTED]

Keeping with the mandate of providing safe, reliable and economic operation of the Alberta electricity system while facilitating a fair, efficient and competitive market for electricity, the AESO is developing the 2021 Long-term Outlook (LTO).

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Please fill email your completed questionnaire to forecast@aeso.ca by January 15, 2021.

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The AESO thanks you for your time and appreciates your input.

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

	Questions	Stakeholder Comments
1.	Do the proposed LTO scenarios cover a reasonable range of plausible future outcomes? Which scenario do you think is more likely? Which one is less likely?	<p>On Slide 8, the AESO indicates the key generation assumptions for the reference case. The reference case assumes most of coal converts to gas generation and operates until late 2020s; the AESO should reconcile these assumptions with recent industry and carbon policy announcements. There is a possible disconnect between the expected high carbon price in those years and the operation of a high heat rate generation technology, like coal-to-gas converted units.</p> <p>Further, the reference case does not include the Suncor Boiler Replacement, GN1/2 repowering, or SD 5 repowering. It would be helpful to stakeholders to understand the reason for the exclusion of these units from the AESO LTO. Additionally, whether these units are, or should be, included in any of the other scenarios.</p>
2.	Does the “Clean-Tech” scenario focus on the appropriate technologies and policies?	
3.	Are there different scenarios that warrant inclusion?	<p>This may not require an additional scenario, but just an adjustment or clarification of the existing scenarios. Heartland Generation is concerned with how the greater penetration of renewables over the forecast period will deal with the need for expanded transmission capacity. Under most of the scenarios, the carbon policy will incentivize the construction of renewable energy technology, and this will have to be reconciled with the limited transmission capacity to accommodate these forecasted projects.</p>
4.	What long-term hydrocarbon demand projections do you think are reasonable for the Robust and Stagnant Global Oil & Gas Demand scenarios?	

5.	Are there additional generation technologies that warrant inclusion in the 2021 Long Term Outlook Scenarios?	
6.	Do you disagree with any of the assumptions in Slide 4 for any of the scenarios? If so, what would you propose?	<p>On Slide 14, the AESO indicates the carbon pricing assumptions for the LTO scenarios. Heartland Generation believes there is new additional information that should be accommodated: the federal carbon policy direction was announced in December 2020 that should be considered in the development of the AESO 2021 LTO. These items include:</p> <ul style="list-style-type: none"> • The Government of Canada released a strengthened climate plan on December 11, 2020. “A Healthy Environment and a Healthy Economy” sets out new measures to help Canada achieve economic and environmental goals. The plan proposes carbon pricing post 2022 increase by \$15 each year from \$50/tCO₂e to \$170/tCO₂e in 2030. • The Government of Canada published the draft Clean Fuel Regulations in Canada Gazette 1 on December 19, 2020. <p>Given these recent announcements, it would make sense to revisit the assumptions surrounding the carbon pricing and Clean Fuel Standard in the reference case and other scenarios.</p>
7.	The AESO has not yet determined the quantum of change in the scenario variables. Do you agree directionally with the scenario assumptions? Do you have insights regarding the magnitude of scenario changes?	

2021 Long-term Outlook Scenarios – December, 2020

2021 Long-term Outlook Stakeholder Feedback



Period of Comment: December 15, 2020 through January 15, 2021	[REDACTED]
Comments From: Industrial Power Consumers Association of Alberta (IPCAA)	[REDACTED]
Date: 2021/01/13	[REDACTED]

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	Questions	Stakeholder Comments
1.	Do the proposed LTO scenarios cover a reasonable range of plausible future outcomes? Which scenario do you think is more likely? Which one is less likely?	<p>The AESO continues to forecast and focus on Alberta Internal Load (AIL), not Alberta’s primary demand. The AESO focuses on oilsands production as the leading driver of load growth in Alberta. IPCAA agrees that oilsands production is an important element; however, the DTS load is no longer as synchronized with oilsands production as it was 5 years ago.</p> <p>DTS load actually flows on the wires system and influences the need for new transmission. This load also pays the transmission costs and impacts reliability of the system. It should be the focus of the AESO’s forecasting.</p> <p>Within the AESO document it is acknowledged that “electric vehicle charging is expected to add to winter peak load over time”. Thus, the AESO is expecting DTS peak to grow; however, there is no separate analysis on this.</p> <p>It would be worthwhile for the AESO to break out the components of the AIL into:</p> <ol style="list-style-type: none"> 1. Behind-the-fence load 2. DTS load <p>When undertaking its analysis, the AESO should provide both assumptions and explanations of why changes are occurring in both components.</p>
2.	Does the “Clean-Tech” scenario focus on the appropriate technologies and policies?	No comments at this time.
3.	Are there different scenarios that warrant inclusion?	On Slide 8 the AESO is predicting \$50/T by 2022 and escalating at 2% per year. This implies that by 2030 the Alberta carbon price will be close to \$60/T. Currently, the Federal Government is

		<p>proposing \$170/T by 2030.</p> <p>Due to the huge consequences of the discrepancy between the two visions, the AESO should consider either deferring its analysis or developing additional scenarios to address the difference possibilities.</p> <p>One of the scenarios should address the Federal Government's \$170/T carbon price and its myriad of implications on both new generation and load - such as boiler replacements and increased co-generation.</p>
4.	What long-term hydrocarbon demand projections do you think are reasonable for the Robust and Stagnant Global Oil & Gas Demand scenarios?	No comments at this time.
5.	Are there additional generation technologies that warrant inclusion in the 2021 Long Term Outlook Scenarios?	The Clean-Tech scenario should be adjusted to \$170/T by 2030 and should investigate the incentives created by the tradability of RECs across Canada. One option for the AESO would be to provide two Clean-Tech scenarios: one with the 2% escalation, the other with the \$170/T carbon price.
6.	Do you disagree with any of the assumptions in Slide 4 for any of the scenarios? If so, what would you propose?	The AESO should review the economic outlook in light of the proposed \$170/T carbon price.
7.	The AESO has not yet determined the quantum of change in the scenario variables. Do you agree directionally with the scenario assumptions? Do you have insights regarding the magnitude of scenario changes?	No comments at this time.

2021 Long-term Outlook Scenarios – December, 2020

2021 Long-term Outlook Stakeholder Feedback



Period of Comment: December 15, 2020 through January 15, 2021 Comments From: Lionstooth Energy Date: 2021/01/15	[Redacted] [Redacted] [Redacted] [Redacted] [Redacted]
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Keeping with the mandate of providing safe, reliable and economic operation of the Alberta electricity system while facilitating a fair, efficient and competitive market for electricity, the AESO is developing the 2021 Long-term Outlook (LTO).

Given the challenges faced as a result of the COVID-19 pandemic and the low oil price, feedback provided to the AESO will be an important input into how we forecast Alberta's the near to long-term electricity. The AESO will use scenarios as a means of stress testing various market, technological, consumer behaviour, policy and economic outcomes, to assist stakeholders in understanding potential long-term future outcomes in the Alberta electricity market.

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

	Questions	Stakeholder Comments
1.	Do the proposed LTO scenarios cover a reasonable range of plausible future outcomes? Which scenario do you think is more likely? Which one is less likely?	With a couple tweaks, outlined below, the proposed LTO scenarios would cover a reasonable range of plausible future outcomes. <ul style="list-style-type: none"> Reference Case: The scenario assumptions outline that DER / DCG assumptions are “based on economics and historical trends.” Over the past couple of years, the AESO has repeatedly pointed to the large number of DCG

in the Connection Queue as something that is concerning to the AESO and has required AESO intervention into market design specific to DCG. Our expectation would be that the reference case assumptions are based on a forward-looking view of DER / DCG potential, not just historical trends. We note the detailed assumptions for the Reference Case shown on slide 8 do not list any generation contributions from DER / DCG despite the numerous projects advancing through the queue.

- **Energy Transformation:** Our concern with this scenario is that as our market transitions to one where there is increased two-way energy flows, that the narrative and assumptions of the Energy Transformation scenario may be a more accurate representation of the Reference Case, especially as it relates to DER / DCG. Given that the AESO has noted that the Energy Transformation scenario will support tariff and market design studies, perhaps the concepts of Energy Transformation and Clean Tech / Green Future should be separated. While DER / DCG would certainly be a significant component of a Clean Tech / Green Future, there would also need to be other, relatively significant, and quick changes in our market to accommodate some of the announced carbon scenarios, including: Clean Fuel Standard, a \$170t/MWh carbon price by 2030, or Net Zero by 2050.
 - **Most Likely Scenario:** This scenario is most likely in our opinion, based on increased penetration of renewables, storage, DER / DCG which is more consistent with the current Connection Queue and announced projects.
- **High Growth:** This scenario appears to focus on change in only a couple assumptions, leaving the rest the same as the Reference Case. This would certainly not be the case. In a High Growth scenario, our market would see increased investment in renewables, storage, DER / DCG, in addition to more cogeneration.
 - **Least Likely Scenario:** Given current micro and macro-economic conditions, including global oil prices and pandemic recovery, a High Growth scenario is least likely in our opinion. Further, policy and market uncertainty impacting the Alberta economy, and specific to the electricity market, has created investor uncertainty that complicates investment in a High Growth scenario, even if the economic signals are there.
- **Economic Headwinds:** In a low growth scenario, again the change in assumption is limited only the economic drivers. Consideration should be how customers would respond in a weaker economy. We would expect there would

		be increased investment in technologies and solutions that reduce the delivered cost of electricity.
2.	Does the “Clean-Tech” scenario focus on the appropriate technologies and policies?	Somewhat. As outlined above, the Clean Tech / Energy Transformation scenario should be separated, so that an Energy Transformation scenario can be explored, independent of a Clean Tech / Green Future scenario. This will allow for a greater understanding of the impacts of an Energy Transformation future to be explored, all other things being equal.
3.	Are there different scenarios that warrant inclusion?	<p>If the Clean Tech / Energy Transformation scenario are separated into two, together these five scenarios (Reference, Energy Transformation, Clean Tech / Green Future, High Growth, Economic Headwinds) cover a reasonable range of plausible future outcomes.</p> <p>Given the seemingly inevitable changes coming to Bulk & Regional Tariff design, the AESO may want to consider a scenario incorporating loads response to changes in the B&R tariff design.</p>
4.	What long-term hydrocarbon demand projections do you think are reasonable for the Robust and Stagnant Global Oil & Gas Demand scenarios?	No comment.
5.	Are there additional generation technologies that warrant inclusion in the 2021 Long Term Outlook Scenarios?	<p>Lionstooth reiterates the importance of including a realistic current and future view of DER / DCG in all of the LTO scenarios, especially the Reference Case which forms the basis for system planning, and the Energy Transformation Case which would be used for tariff and market design studies.</p> <p>The AESO should avoid, wherever possible, excluding DER / DCG from scenarios. For example, on slide 10, the comment that total DCG capacity excludes biomass, gas cogen, hydro and other DCG types is confusing and we are uncertain why these generation types would be excluded.</p>
6.	Do you disagree with any of the assumptions in Slide 4 for any of the scenarios? If so, what would you propose?	See comments above.

7.	The AESO has not yet determined the quantum of change in the scenario variables. Do you agree directionally with the scenario assumptions? Do you have insights regarding the magnitude of scenario changes?	See comments above.
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2021 Long-term Outlook Scenarios – December, 2020

2021 Long-term Outlook Stakeholder Feedback



Period of Comment: December 15, 2020 through January 15, 2021	[REDACTED]
Comments From: Maxim Power Corp	[REDACTED]
Date: [2021/01/15]	[REDACTED]

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	Questions	Stakeholder Comments
1.	Do the proposed LTO scenarios cover a reasonable range of plausible future outcomes? Which scenario do you think is more likely? Which one is less likely?	<p><i>MAXIM believes the proposed scenarios will provide a reasonable range of outcomes to form the basis of the LTO. Based on signals from the Federal Government regarding carbon pricing to 2030 and net-zero 2050 target, MAXIM believes an outcome lying somewhere in between the Ref Case and the Clean-Tech scenario has the highest likelihood of coming to fruition – with the Robus O&G Demand scenario being the least likely. Having said that, given lags in policy changes and current limitations of transformative technologies, key assumptions around timing of grid transformation will have to be closely vetted.</i></p>
2.	Does the “Clean-Tech” scenario focus on the appropriate technologies and policies?	<p><i>MAXIM believes it would be of value for the AESO to assume the carbon price profile currently suggested by the Federal Government (\$50/tonne in 2022 escalating up to \$170/tonne by 2030) as part of the “Clean-Tech” scenario.</i></p> <p><i>MAXIM believes the “Clean-Tech” scenario will result in significant renewables (wind/solar) penetration into the market and that any such scenario must also contemplate a regulatory change to the energy-only market such as negative pricing, which may in turn have an impact on the scenario outcome.</i></p> <p><i>MAXIM agrees that energy storage technologies are likely to accompany the “Clean-Tech” scenario.</i></p>
3.	Are there different scenarios that warrant inclusion?	<p><i>MAXIM wishes to point out the Clean-Tech and Stagnating Global O&G demand scenarios are not necessarily mutually exclusive and, as such, suggests the AESO consider reviewing a Clean-Tech scenario with stagnating oilsands outlook.</i></p>
4.	What long-term hydrocarbon demand projections do you think are reasonable for the Robust and Stagnant Global Oil & Gas Demand scenarios?	<p><i>No comment</i></p>

5.	Are there additional generation technologies that warrant inclusion in the 2021 Long Term Outlook Scenarios?	<i>No comment</i>
6.	Do you disagree with any of the assumptions in Slide 4 for any of the scenarios? If so, what would you propose?	<p><i>Although the AESO is showing increases (albeit small) in peak AIL load from 2030 to 2040, there is a significant net decrease in total generation with an increased penetration of renewables and a decrease in conventional dispatchable generation (see slide 9) over the same time period. At face value, this implies that either the system is oversupplied in 2030 or the system will be undersupplied in 2040. Both cases have implications for market conditions, particularly overall system <u>reliability</u>. In the past LTO the AESO determined required generation additions by assuming a given reserve margin would be required. The AESO has said they are not developing their scenarios in the 2021 LTO on reliability measures but instead on economic considerations. MAXIM supports this approach with the caveat that the AESO still provide some form of review of market reliability across the various scenarios. To this end, key metrics that the AESO should consider sharing with stakeholders include anticipated power prices and price duration curves as well as a general description of anticipated market conditions over the forecast horizon.</i></p> <p><i>MAXIM acknowledges the AESO's reference to Alberta Internal Load (AIL) throughout the presentation. Although AIL is a key metric to evaluate, with increasing numbers of commercial/industrial customers looking to build behind the fence generation, tracking and forecasting AIES load is of increasing critical importance. Particularly as it relates to transmission cost borne by those customers that remain connected to the AIES. MAXIM recommends that the AESO include AIES metrics as part of its forecast so stakeholders can evaluate risks of potential declines in system load.</i></p>

7.	The AESO has not yet determined the quantum of change in the scenario variables. Do you agree directionally with the scenario assumptions? Do you have insights regarding the magnitude of scenario changes?	<i>No comment</i>
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2021 Long-term Outlook Scenarios – December, 2020

2021 Long-term Outlook Stakeholder Feedback



Period of Comment: December 15, 2020 through January 15, 2021	[REDACTED]
Comments From: Pembina Institute	[REDACTED]
Date: 2021/01/14	[REDACTED]

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	Questions	Stakeholder Comments
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<p>1.</p>	<p>a) Do the proposed LTO scenarios cover a reasonable range of plausible future outcomes? b) Which scenario do you think is more likely? c) Which one is less likely?</p>	<p>a) <i>While the proposed scenarios offer a wide range of future outcomes, edits to the reference scenario and the addition of new scenarios would cover a greater reasonable range of plausible future outcomes.</i></p> <p><i>According to slide 9, the reference scenario of the 2021 LTO results in a renewable generation percentage of 22% in 2030. This contradicts Alberta's legislated target to generate 30% of its electricity from renewable sources by 2030, as set by the Renewable Electricity Act.¹ Given the existence of this legislated target, all the LTO scenarios adopted by the AESO should achieve or exceed 30% renewable generation in 2030.</i></p> <p><i>The federal government's A Healthy Environment and a Healthy Economy² includes significant measures such as an increase in the carbon price by \$15 / tonne per year from 2022 to 2030, reaching \$170 / tonne then. The federal government also committed to review and strengthen the output-based standards applied to all industrial sectors, which include electricity generation.³ This could impact the output-based allocation in TIER, currently set at 0.370 tonne / MWh. The federal government is also exploring a potential "clean electricity performance standard."⁴ Such measures, along with the continuing fall in the price of wind, solar and storage, would accelerate the deployment of zero- and low-emitting technologies in Alberta.</i></p> <p>b) <i>Among the current scenarios listed by the AESO, the "Clean Tech" scenario is more likely. This scenario assumes a carbon price reaching \$100/tonne in 2030, whereas the federal climate plan announced on December 11, 2020 sets the carbon price at \$170/tonne in 2030.</i></p> <p><i>It is difficult to comment on the AESO's assumptions on the cost projections of wind and solar because the AESO has not released these quantitative estimates. To validate assumptions on the cost projections for</i></p>
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¹ Province of Alberta, *Renewable Electricity Act*, S. 2016, R-16.5. <https://www.qp.alberta.ca/documents/Acts/r16p5.pdf>

² Environment and Climate Change Canada, *A Healthy Environment and a Healthy Economy* (2020). https://www.canada.ca/content/dam/eccc/documents/pdf/climate-change/climate-plan/healthy_environment_healthy_economy_plan.pdf

³ Environment and Climate Change Canada, *A Healthy Environment and a Healthy Economy Annex: Pricing carbon pollution* (2020), 3. https://www.canada.ca/content/dam/eccc/documents/pdf/climate-change/climate-plan/annex_pricing_carbon_pollution.pdf

⁴ Environment and Climate Change Canada, *A Healthy Environment and a Healthy Economy Annex: Clean electricity* (2020), 3. https://www.canada.ca/content/dam/eccc/documents/pdf/climate-change/climate-plan/annex_clean_electricity.pdf

		<p><i>renewable electricity, we recommend the AESO compare AWS Truepower cost projections with other sources such as the Annual Technology Baseline of the National Renewable Energy Laboratory.⁵</i></p> <p><i>The reference case scenario significantly underestimates the growth of renewable corporate PPAs. Based on the corporate deals announced in 2019 and 2020, we know that 117.6 MW of wind and 278.5 MW of solar (totaling 396.1 MW of renewables) will be installed in 2021-2022. These announcements exceed the AESO's current assumption for the reference scenario (250 MW by 2030). In addition, given the momentum in the corporate procurement world along with the growth in ESG interests, it is reasonable to expect more corporate PPAs to be announced in 2021 and beyond. The Business Renewables Centre Canada, a joint initiative of the Pembina Institute and the Rocky Mountain Institute, is a non-profit initiative seeking to catalyze the market for non-utility procurement in Canada. Its goal is to see 2 GW of announced deals by 2025. The fact that the Clean Tech scenario assumes a higher number of renewable corporate PPAs also makes it a more likely scenario.</i></p> <p>c) See answer to question 4.</p>
2.	Does the “Clean-Tech” scenario focus on the appropriate technologies and policies?	<p><i>Overall, the “Clean-Tech” scenario focuses on the right technologies. To refine the scenario, we recommend the addition of greater energy efficiency improvements. A more significant growth in the adoption of demand-side management technologies (including heat pumps) should be included in the scenario.</i></p>

⁵ National Renewable Energy Laboratory, “ATB Electricity Data Overview.” <https://atb.nrel.gov/electricity/2020/index.php?t=in>

3.	Are there different scenarios that warrant inclusion?	<p><i>There is currently no scenario in line with Canada’s target to reduce greenhouse gas (GHG) emissions across the economy and the electricity grid to net-zero by 2050 as outlined in the federal climate plan announced on December 11, 2020 and in line with Canada’s goal of 90% emissions-free electricity by 2030.</i></p> <p><i>For example, Nova Scotia Power’s latest Integrated Resource Plan⁶ includes scenarios that “achieve between 87 and 95 percent reductions in greenhouse gas emissions from the Nova Scotia Power electricity system by 2045.”⁷ In addition, major organizations with extensive experience in developing forward-looking analyses such as the International Energy Agency⁸ and BP⁹ developed scenarios that meet the goals of the Paris Agreement. While the LTO does not project to 2050, we recommend the addition of a scenario to 2040 in which the trajectory the GHG emissions from Alberta’s electricity generation is on track to reach net-zero by 2050.</i></p>
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⁶ Nova Scotia Power, Integrated Resource Plan (2020). <https://irp.nspower.ca/>

⁷ Nova Scotia Power, *Powering a green Nova Scotia together: 2020 Integrated Resource Plan Summary*, 5. https://irp.nspower.ca/files/key-documents/E3_NS-Power-2020-IRP-Report_Summary_Nov-27-2020.pdf

⁸ International Energy Agency, “World Energy Model – Sustainable Development Scenario,” 2020. <https://www.iea.org/reports/world-energy-model/sustainable-development-scenario>

⁹ BP, “Energy Outlook,” 2020. <https://www.bp.com/en/global/corporate/energy-economics/energy-outlook.html>

4. What long-term hydrocarbon demand projections do you think are reasonable for the Robust and Stagnant Global Oil & Gas Demand scenarios?

Oil companies like BP and Equinor, as well as consultancy McKinsey, all predict oil demand peaking within the next few decades, even without more ambitious climate action. And each year the projections of peak oil demand edge closer and closer. More importantly, a number of scenarios suggest oil demand might have already reached its peak and could experience a steep drop in coming years, in no small part due to co-ordinated action to limit global warming to 1.5°C and prevent irreversible damage to ecosystems and communities. If this restructuring happens at the faster pace needed to achieve net-zero GHG emissions, as the IEA's recent World Energy Outlook shows (see Figure 1 below), demand for oil will drop over time. Either way, the oil and gas sector is unlikely to experience the rapid growth of decades past.

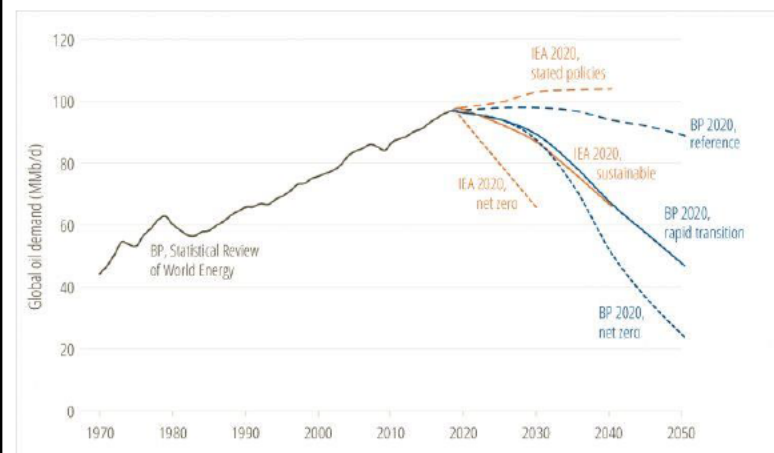


Figure 1. Global oil demand outlooks from the IEA and BP¹⁰

The Robust Global Oil & Gas Demand (High Growth) scenario, if it comes to pass, is likely to result in an increased electricity demand from Alberta's oil and gas sector. With the pressure from investors requiring better ESG (environmental, social,

¹⁰ Benjamin Insräel, "For Canadian oil companies, time to decarbonize is running out," *Pembina Institute*, November 23, 2020.
<https://www.pembina.org/blog/canadian-oil-companies-time-decarbonize-running-out>

		<p><i>governance) performance from all businesses, it is reasonable to expect a higher number of oil-industry-led corporate PPAs supporting more renewable electricity projects.</i></p>
5.	<p>Are there additional generation technologies that warrant inclusion in the 2021 Long Term Outlook Scenarios?</p>	<p><i>The following generation and grid flexibility technologies could be included in any LTO scenario, especially the “Clean-Tech” scenario, a “net-zero” scenario, and the reference scenario.</i></p> <ul style="list-style-type: none"> • <i>Geothermal power, particularly with the new Geothermal Resource Development Act receiving royal assent on December 9, 2020,¹¹</i> • <i>Demand-side response and vehicle-to-grid technologies,</i> • <i>Increased transmission capacity to adjacent jurisdictions should also be examined in some of the scenarios.</i> <p><i>Additionally, the development of long-duration storage such as vanadium redox flow batteries should be included in the “Clean-Tech” and “net-zero” scenarios.</i></p>
6.	<p>Do you disagree with any of the assumptions in Slide 4 for any of the scenarios? If so, what would you propose?</p>	<p><i>Our understanding is that the question refers to slide 5, titled “Key drivers of AIL growth: economic indicators, oilsands, COVID-19.”</i></p> <p><i>See answer to question 4 regarding the assumption of oil and gas supply.</i></p> <p><i>We particularly agree with the assumption that increasing energy efficiency leads to a lower electricity demand growth correlated with economic growth.</i></p>

¹¹ Government of Alberta, “Clearing a path for geothermal resource development,” 2020. <https://www.alberta.ca/clearing-a-path-for-geothermal-resource-development.aspx>

<p>7.</p>	<p>The AESO has not yet determined the quantum of change in the scenario variables. Do you agree directionally with the scenario assumptions? Do you have insights regarding the magnitude of scenario changes?</p>	<p><i>Under emerging trend assumptions, the adoption of demand-side response technologies should be added. In conjunction with electric vehicle adoption growth, the adoption of vehicle-to-grid technologies should be added. Electric vehicle adoption is expected to occur not only for passenger vehicles, but also for public/mass transit and freight.</i></p> <p><i>The growth in the adoption of heat pumps should be considered.</i></p> <p><i>Increased interprovincial trade should be added as well, in line with the federal climate plan and the Canada Infrastructure Bank's program.</i></p>
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2021 Long-term Outlook Scenarios – December, 2020

2021 Long-term Outlook Stakeholder Feedback



Period of Comment: December 15, 2020 through January 15, 2021
Comments From: Sara Hastings-Simon and Blake Shaffer, School of Public Policy
Date: [2021/01/08]

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1.	Do the proposed LTO scenarios cover a reasonable range of plausible future outcomes? Which scenario do you think is more likely? Which one is less likely?	As written the “Cleantech” scenario is the most plausible reference case. For example the current Canadian policy is net zero by 2050. Given the importance of electrification a highly decarbonized electricity sector is already a part of the “current understanding of policy” and compatible with “technology landscapes”.
2.	Does the “Clean-Tech” scenario focus on the appropriate technologies and policies?	It should consider a much faster (2030/2035) timeframe for deep decarbonization. The most recent Canadian climate plan involves a \$170/t CO2 price by 2030, well above both the reference and clean-tech scenarios. The stated Canadian policy should be used. Also, renewables’ LCOE assumptions used tend to be conservative; the clean-tech scenario should include at least a 30% reduction in LCOE costs, as evidenced by persistent over-forecasting of renewable LCOE costs in the past.
3.	Are there different scenarios that warrant inclusion?	Transmission line build out. A 1000-1500MW expansion of AB/BC and/or 300-500MW expansion of AB/SK interties.
4.	What long-term hydrocarbon demand projections do you think are reasonable for the Robust and Stagnant Global Oil & Gas Demand scenarios?	The robust demand scenario as described (most optimistic for growth of pipelines/projects) has a much lower likelihood of happening than the stagnant scenario.
5.	Are there additional generation technologies that warrant inclusion in the 2021 Long Term Outlook Scenarios?	Not generation technology, but large scale battery storage (flow batteries, CASE, thermal storage)
6.	Do you disagree with any of the assumptions in Slide 4 for any of the scenarios? If so, what would you propose?	Significantly higher corporate procurement Carbon price that matches federal schedule as announced.

7.	<p>The AESO has not yet determined the quantum of change in the scenario variables. Do you agree directionally with the scenario assumptions? Do you have insights regarding the magnitude of scenario changes?</p>	<p>The reference scenario should be the most likely outcome, the magnitude of scenario changes in either direction should represent steps of equal outcome likelihood</p> <p>EV scenarios should include the potential implementation of a ZEV mandate with EV only sales by 2035.</p>
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2021 Long-term Outlook Scenarios – December, 2020

2021 Long-term Outlook Stakeholder Feedback



Period of Comment: December 15, 2020 through January 15, 2021	[REDACTED]
Comments From: Suncor Energy	[REDACTED]
Date: [2021/01/14]	[REDACTED]

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1.	Do the proposed LTO scenarios cover a reasonable range of plausible future outcomes? Which scenario do you think is more likely? Which one is less likely?	<p>In principle we agree with the approach of developing scenarios that test different trajectories and levels of the more critical variables while providing a reasonable range of outcomes. This tends to spark more useful and meaningful conversations than simple high/low cases.</p> <p>The three chosen cases: robust global oil, weak global oil and energy transformation, seem adequate.</p> <p>Scenario probabilities are inherently subjective and would change as political, technological and societal changes unfold. One suggestion that can help to tackle this issue is to develop a set of signposts that are revised periodically and that indicate which of the scenarios is materializing or whether a completely new one is needed.</p>
2.	Does the “Clean-Tech” scenario focus on the appropriate technologies and policies?	<p>From the summary document provided, it seems that this scenario relies heavily on renewables, energy storage and distributed generation. These are not exclusive to the scenario, so it is really a matter of the degree and the speed of adoption by the grid. Focusing in these technologies is reasonable.</p>
3.	Are there different scenarios that warrant inclusion?	<p>The three proposed scenarios are adequate and provide a reasonable range. Overall however, some of the assumptions could be more differentiated and scenario-specific. We discuss some of these in our response to questions 6 and 7.</p>
4.	What long-term hydrocarbon demand projections do you think are reasonable for the Robust and Stagnant Global Oil & Gas Demand scenarios?	<p>Leveraging long-term outlooks from reputable sources such as IHS is probably a good approach, however it seems that the “worst” outcome considered for oil sands growth is a flat profile. It would be interesting to explore a future where oil production peaks, either in the “stagnant” or the clean technology scenario.</p>
5.	Are there additional generation technologies that warrant inclusion in the 2021 Long Term Outlook Scenarios?	<p>The role of hydrogen within a greener economy is a topic gaining traction recently and should be explored.</p>

6.	Do you disagree with any of the assumptions in Slide 4 for any of the scenarios? If so, what would you propose?	<p>The recent federal announcement of \$170/t carbon price by 2030 should be acknowledged in either the reference case or one of the scenarios.</p> <p>There may be differences in the coal to gas conversion choices depending on the scenario, which should be investigated.</p>
7.	The AESO has not yet determined the quantum of change in the scenario variables. Do you agree directionally with the scenario assumptions? Do you have insights regarding the magnitude of scenario changes?	<p>All of the “Renewables and Storage” and “Emerging Trends” assumptions are unchanged in the robust and weak growth scenarios. We are not convinced this is accurate as there may be differences in the speed and level of adoption of technologies under different scenarios. For instance, a stagnant global oil demand could be paired with a higher and faster conversion to electric vehicles.</p> <p>At a minimum, maintaining unchanged assumptions would require a thorough explanation.</p>

2021 Long-term Outlook Scenarios – December, 2020

2021 Long-term Outlook Stakeholder Feedback



Period of Comment: December 15, 2020 through January 15, 2021	[Redacted]
Comments From: TransCanada Energy Ltd. (TCE)	[Redacted]
Date: 2021/01/15	[Redacted]

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	Questions	Stakeholder Comments
1.	<p>Do the proposed LTO scenarios cover a reasonable range of plausible future outcomes? Which scenario do you think is more likely? Which one is less likely?</p>	<p><i>In general, the scenarios are generally well thought-out and has addressed a concern with the 2019 LTO that it was too light on solar additions. The Clean Tech scenario is more likely; the Robust Global Oil and Gas Demand scenario is less likely and could be revised to a High Load Scenario due to emerging load from decarbonization.</i></p> <p><i>TCE is concerned that the Reference Case does not include projects that appear to be well-advanced including Suncor's boiler replacement, the Genesee 1 & 2 Repowering, and the Sundance 5 Repowering.</i></p> <p><i>In addition, it is not clear to TCE whether the Reference Case includes the recent TransAlta announcement that the Sundance and Keephills generating assets will transition to gas-only operations effective January 01, 2022. As a result, the maximum capability for Keephills 1 will decrease from 395 MW to approximately 70 MW and the maximum capability for Sundance 4 will decrease from 406 MW to approximately 113 MW. These changes are significant and should be incorporated into the Reference Case, if not already.</i></p>
2.	<p>Does the "Clean-Tech" scenario focus on the appropriate technologies and policies?</p>	<p><i>TCE recommends that the Clean Tech scenario test the \$170/tonne carbon price and also consider more stringent regulations on new gas power plants. In other words, it should consider what technologies/market structure/policies are required to maintain system reliability in the environment of high carbon price and a stringent performance standard for new gas (i.e., 0.37 declining to 0 mt/MWh by 2030 as proposed in the Federal Output Based Pricing System). In terms of new technologies, TCE further recommends that the Clean Tech scenario also consider hydrogen and carbon capture.</i></p>

3.	Are there different scenarios that warrant inclusion?	<i>Please refer to TCE's comments in Questions #1 and #2 above.</i>
4.	What long-term hydrocarbon demand projections do you think are reasonable for the Robust and Stagnant Global Oil & Gas Demand scenarios?	<i>TCE has no comment at this time.</i>
5.	Are there additional generation technologies that warrant inclusion in the 2021 Long Term Outlook Scenarios?	<i>Please refer to TCE's comments in Question #2 above.</i>
6.	Do you disagree with any of the assumptions in Slide 4 for any of the scenarios? If so, what would you propose?	<i>Please refer to TCE's comments in Questions #1 and #2 above.</i>
7.	The AESO has not yet determined the quantum of change in the scenario variables. Do you agree directionally with the scenario assumptions? Do you have insights regarding the magnitude of scenario changes?	<i>TCE has no comment at this time.</i>

2021 Long-term Outlook Scenarios – December, 2020

2021 Long-term Outlook Stakeholder Feedback



Period of Comment: December 15, 2020 through January 15, 2021
Comments From: TransAlta Corporation
Date: 2021/01/15



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	Questions	Stakeholder Comments
1.	Do the proposed LTO scenarios cover a reasonable range of plausible future outcomes? Which scenario do you think is more likely? Which one is less likely?	<p><i>The proposed Reference and Clean Tech cases do not reflect the New Federal Climate Plan</i></p> <p>The Federal Government plans to increase carbon pricing by \$15/tonne each year starting in 2023 with carbon pricing reaching \$170/tonne by 2030. The current Clean Tech and reference case scenarios do not reflect this expected change in carbon pricing levels. More important, the impact of assuming a much lower carbon pricing level is that both cases are likely to underestimate the level of renewable and cogeneration development that would occur in response to the climate plan.</p> <p>It is more likely that the levels of solar, wind, and energy storage that are currently projected to occur by 2040 in the reference case could occur by 2030 or earlier. Likewise, the Clean Tech scenario should see an even faster adoption and higher penetration level of of renewables and energy storage if supported by government spending and greater interest and growth in the corporate PPA market.</p>
2.	Does the “Clean-Tech” scenario focus on the appropriate technologies and policies?	<p><i>The Clean Tech case should consider a larger corporate PPA market and a higher penetration of energy storage</i></p> <p>The Clean Tech case indicates that it assumes higher renewable corporate PPAs and energy storage than the reference case. We would suggest that a conservative estimate even for the Clean Tech case would be 100 MW per year, which would be four times greater than the projected growth in the reference case (i.e. 1,000 MW by 2030 and 3,000 MW by 2040). We had previously estimated that the PPA market could stand to grow by 200-300 MW per year (in our comments to the previous LTO).</p> <p>We expect that interest in energy storage may also reflect a similar magnitude of growth as the corporate PPA market (4 x greater than the reference case assumptions). While the level of</p>

		<p>energy storage development will be highly contingent on tariff treatment and rule requirements, we would anticipate that the Government and AESO would encourage energy storage growth through policy and regulatory treatment under the Clean Tech scenario. Energy storage could help to address the constrained transmission capacity that limits wind renewable development today and, as such, we expect its development will correlate with renewable development more generally.</p> <p>The level of solar and wind development in the reference case appear very low – as mentioned above we would expect that the 2040 scenario will be achieved well before or by 2030. It is plausible that in a Clean Tech case we could see 3 to 4 times the growth to even the adjusted (stated above) reference case level.</p> <p>We also expect that the level of cogeneration is likely underestimated as the focus of the cogeneration assumption is largely on oil sands generation. At very high carbon prices, cogeneration is likely to be considered by many non-oil sands industrial operations.</p> <p>The Clean Tech case should also consider the impacts of additional demand side management and energy conservation (on the load forecast). This could be at the transmission customer level but also from an accelerated adoption of smart metering/grid and distributed energy resource adoption at the distribution level.</p>
3.	Are there different scenarios that warrant inclusion?	<p><i>An “unlimited self-supply and export” scenario warrants inclusion</i></p> <p>The Government of Alberta is currently conducting a consultation that is considering changes to the legislative framework that may permit unlimited self-supply and export. Under such a scenario, we may see significant generation development in response to out-of-market transmission costs signals.</p> <p>Given that this is a possible scenario that could have very significant impacts on future development, we recommend that the AESO model the generation development impacts that would likely occur in response to avoiding transmission costs that are</p>

		\$40/MWh or greater.
4.	<p>What long-term hydrocarbon demand projections do you think are reasonable for the Robust and Stagnant Global Oil & Gas Demand scenarios?</p>	<p><i>The near and mid-term projections may be reasonable but the long term assumptions are optimistic and do not adequately capture the low end range</i></p> <p>Canada Energy Regulator (CER) provides two relevant scenarios in its <i>Canada's Energy Future 2020</i> report:¹ a reference energy system and evolving energy system albeit at lower carbon pricing assumption in both cases that that proposed under the Federal Climate Plan.</p> <p>In the CER report, carbon price under the evolving scenario is modeled at \$75/tonne by 2040 and projects that Canadian crude oil production will peak by 2038 at 5.8 million barrels per day. In the reference case scenario, which projects a \$50/tonne carbon price by 2022 and remains at the level for the forecast, Canadian crude oil production peaks in 2045 at a level above 7.2 million barrels per day. While in-situ production is expected to grow through to 2040 in the evolving scenario, with more aggressive carbon pricing this may too flatten out earlier than 2040.</p> <p>With respect to natural gas, Western Canadian Sedimentary Basin production shows robust growth under both scenarios. Under the evolving scenario, Canadian natural gas production peaks in 2040 at 18.4 Bcf/d and decreases to 16.8 Bcf/d by 2050 under the assumption that prices will be too low to keep up with well declines. Under the reference scenario, natural gas production peaks in 2045 at 23.5 Bcf/d and levels off (rather than declining). The significant driver of the production growth is expected to be tight gas in BC's Montney and the export demand will come from Liquefied Natural Gas.</p> <p>If these present representative book ends, we would likely see the peak crude oil production and natural gas emerge quicker than 2038 and 2040 given the Federal Climate Plan's carbon pricing and under both the Robust and Stagnate Global Oil &</p>

¹ <https://www.cer-rec.gc.ca/en/data-analysis/canada-energy-future/2020/canada-energy-futures-2020.pdf>

		Gas Demand scenarios Canadian crude oil production and economic growth related to the oil sands would need to be modeled in decline at least by the end of the LTO's 20 year forecast horizon. In other words, the current scenarios do not appear to reflect the lower range of possible outcomes. While in the near and medium terms the Robust Global Oil & Gas Demand scenarios may be realistic, it appears to be more optimistic in the long term than may be realistically achieved.
5.	Are there additional generation technologies that warrant inclusion in the 2021 Long Term Outlook Scenarios?	<p>The LTO captures the generation technologies that are likely to be significant in the forecast horizon.</p> <p>As suggested in our comments to question 2 above, the impacts to load from the adoption of smart metering/grid technologies with respect to demand side management and distributed energy resources should be considered in the 2021 LTO scenarios.</p>
6.	Do you disagree with any of the assumptions in Slide 4 for any of the scenarios? If so, what would you propose?	Please see our comments above.
7.	The AESO has not yet determined the quantum of change in the scenario variables. Do you agree directionally with the scenario assumptions? Do you have insights regarding the magnitude of scenario changes?	Please see our comments above.

2021 Long-term Outlook Scenarios – December, 2020

2021 Long-term Outlook Stakeholder Feedback



Period of Comment: December 15, 2020 through January 15, 2021	[REDACTED]
Comments From: Utilities Consumer Advocate (UCA)	[REDACTED]
Date: 2021/01/15	[REDACTED]

Keeping with the mandate of providing safe, reliable and economic operation of the Alberta electricity system while facilitating a fair, efficient and competitive market for electricity, the AESO is developing the 2021 Long-term Outlook (LTO).

Given the challenges faced as a result of the COVID-19 pandemic and the low oil price, feedback provided to the AESO will be an important input into how we forecast Alberta's the near to long-term electricity. The AESO will use scenarios as a means of stress testing various market, technological, consumer behaviour, policy and economic outcomes, to assist stakeholders in understanding potential long-term future outcomes in the Alberta electricity market.

Please fill email your completed questionnaire to forecast@aeso.ca by January 15, 2021.

We value stakeholder input and thank you for sharing your perspective. In alignment with our Stakeholder Engagement Framework (link) all stakeholder submissions, in their original state with personal information redacted, will be published online at www.aeso.ca

Further stakeholder engagement on LTO scenarios and preliminary results can be expected as the AESO makes progress toward the anticipated publication date in Q2 of 2021.

Preliminary results will be based in part from stakeholder feedback received in June 2020.

The AESO thanks you for your time and appreciates your input.

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

	Questions	Stakeholder Comments
1.	Do the proposed LTO scenarios cover a reasonable range of plausible future outcomes? Which scenario do you think is more likely? Which one is less likely?	<p>The UCA appreciates the publication of the preliminary results for the 2021 Long-Term Outlook (LTO) and introducing scenarios that the AESO is considering for the next LTO. This will allow discussing the main drivers of Alberta's future electricity market from the early stage.</p> <p>The UCA supports the inclusion of the Clean-Tech scenario and considering higher penetration of distributed energy resources (DER) at both the distribution and transmission levels. Because of the fast-paced changes in the market, including various ongoing policy reviews, it is hard to anticipate the most likely LTO scenario for Alberta's future electricity market. However, the global movement toward the clean energy policy, reducing the cost of DER technologies, and increasing burden of the delivered energy costs in Alberta are sending signals to shift to a higher level of DER in the future and to encourage customer classes to install economic generation options to reduce their overall bills.</p>
2.	Does the "Clean-Tech" scenario focus on the appropriate technologies and policies?	<p>The AESO's "Delivered Cost of Electricity" report published in May 2020 indicated the continuation of the DER growth driven by technologies' cost competitiveness. Given the significant increase in the delivered costs of grid-supplied electricity during the past decade driven mostly by the distribution and transmission costs, the DER solution would be the more cost-effective option for the consumers.</p> <p>In order to have an accurate load/generation forecasting for Alberta, the AESO may need to clearly outline which technologies will be included in the Clean-Tech scenario and which ones are more plausible in Alberta's future electricity system. Providing data regarding the forecasted MW of capacity for each technology at both levels of distribution and transmission will be critical for the distribution and transmission systems</p>

	<p>planning.</p> <p>In addition to some of the technologies mentioned in these preliminary results document, the AESO may include information regarding the level of existing and forecasted demand response at the distribution/transmission levels. Advanced demand response (DR) can use the flexibility of customer-owned technologies to meet the balancing challenges of the changing supply mix and be a cost-effective solution for the system's reliability. According to a study by The Brattle Group regarding the U.S. potential for load flexibility, technologies such as adjustable smart thermostats for air conditioning (A/C) and heating, grid integrated water heating, and managed electric vehicle (EV) charging will be gateways to a DR market that adds residential DER to traditional commercial/industrial customers' DR.</p> <p>https://brattlefiles.blob.core.windows.net/files/16639_national_potential_for_load_flexibility_-_final.pdf).</p> <p>Energy Efficiency (EE) is also another forms of DER available for reducing demand and consumption growth and related infrastructure expenditures. More information regarding the level of EE potential in Alberta for reducing the demand would be beneficial.</p> <p>Furthermore, in a scenario with growing renewables, clean hydrogen may play a key role in the world's transition to a sustainable energy future. It can be used to reduce carbon emissions from industry and heavy transport and also to provide long-term energy storage at scale. The clean or green hydrogen is generated by renewable energy sources without producing carbon emissions in the first place. It has the potential to help with variable output from renewables, such as solar and wind, whose availability is not always well matched with demand. Clean hydrogen can become one of the leading options for storing energy from renewables.</p> <p>Currently, there are many interrelated engagements and consultations that could change the way of responding to the DER evolution, such as:</p> <ol style="list-style-type: none"> 1- In 2019, the AUC submitted that the statutory scheme limits
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		<p>self-supply and export and, through the Bulletin 2019-16, asked stakeholders to comment on three options for addressing the issue in the future, including status quo, limited self-supply and export, and unlimited self-supply and export. The AUC shared these submissions with the Department of Energy (DOE) for further discussion with the parties. The decision that comes out from this consultation will impact the integration of DER, overall demand, and generation development scenarios.</p> <p>2- The ongoing Bulk and Regional tariff design and DER market participation stakeholder engagements by AESO will have a critical impact on the level of DER adoption in Alberta's electricity system. Especially, the outcomes of DER market participation engagement regarding the opportunities for increase DER aggregation, changing the market participation threshold (5MW), and specifications for hybrid projects (e.g., variable energy sources and storage) need to be monitored as these will have effects on DER development.</p> <p>3- Any eventual policy changes or new tariff treatment that come out of the AUC's Distribution System Inquiry (DSI) may alter the incentives to adopt more DER in the system. Currently, stakeholders are waiting for the final AUC's report on the DSI and possible suggestions for further investigation or initiating some policy changes.</p> <p>4- Review and update of the transmission regulation, which may include an update on the treatment of the technologies as a tool for transmission deferral, may impact the deployment of DER, especially energy storage in Alberta.</p> <p>5- The AUC is considering whether distribution-connected generation (DCG) credits should continue to be included in a distribution utility's tariff. The AUC's decision in this regard will affect the distributors, customers, and the owners and operators of DCG units that receive benefit from DCG credit mechanisms set out in each of those utilities' distribution tariffs.</p>
3.	Are there different scenarios that warrant inclusion?	It may be worthwhile that the AESO monitor and include information regarding the existing and forecasted level of hybrid projects such as wind and storage, solar and storage, wind and

		<p>solar, or solar and wind and storage included at one site. The outcome from energy storage and DER market participant rules engagement held by AESO could encourage more hybrid projects in addition to stand-alone energy storage developments.</p>
4.	<p>What long-term hydrocarbon demand projections do you think are reasonable for the Robust and Stagnant Global Oil & Gas Demand scenarios?</p>	<p>According to the Conference Board of Canada report published in January 2021, waves of COVID-19 pandemic and returning strict measures across the world are hurting the gasoline demand. The oil producers will have to deal with lower prices, at least for the near future when the pandemic waves are contained. The report emphasized that oil production will not fully recover until late 2022, and investment in new projects will be postponed as producers are trying to recover and carrying out maintenance activities that had been delayed. The risk of changing policy regarding the KXL project from the U.S. new government would be another barrier for the oil producer as it limits access to other markets.</p> <p>In the long-term, changes in consumer behavior for utilizing energy-efficient technologies, electrification of transportation, including the popularity of electric vehicles (EV), and adopting strong climate policies globally may reduce the hydrocarbon demand and production in the future. As a large portion of Alberta's oil supply contains expensive and carbon-intensive productions, it may not remain competitive to supply the market in the long-term.</p> <p>The growing use of grey and blue hydrogen as a cleaner source of energy around the world may increase the demand for natural gas as the main input to produce the hydrogen. The grey and blue hydrogen are mainly produced industrially from natural gas, but in the cleaner version, blue hydrogen, the carbon emissions are captured and stored, or reused. Among the wide usage of hydrogen in refining petroleum and treating metals, it can also be used in fuel cells to produce electricity or as a transportation fuel.</p>
5.	<p>Are there additional generation technologies that warrant inclusion in the 2021 Long Term Outlook Scenarios?</p>	<p>See question 2.</p>

6.	Do you disagree with any of the assumptions in Slide 4 for any of the scenarios? If so, what would you propose?	The UCA agrees with the presented scenario assumptions; however, the ongoing consultation/engagements that are mentioned in question 2 should be monitored closely as their outcomes may change these assumptions.
7.	The AESO has not yet determined the quantum of change in the scenario variables. Do you agree directionally with the scenario assumptions? Do you have insights regarding the magnitude of scenario changes?	The AESO may provide information regarding how the Clean-Tech scenario will be modeled as most of these technologies can be used either for self-generation, which reduces the system demand and new transmission/distribution infrastructures, or exporting the excess energy back to the grid that may require expansion of the grid to accommodate these generations.