Comment period:	**Jan. 3, 2023 to Jan. 20, 2023**[1]	Contact:	Robert Tremblay
Comments from:	Energy Storage Canada	Email:	robert.tremblay@energystoragecanada.org
Date:	2023/01/24		

Updated Instructions

1. Please fill out the section above as indicated.
2. Please respond to the questions below and provide your specific comments. We welcome your expertise and input and should some of the questions not be applicable to your area of expertise please feel free to leave those responses blank.
3. **Please upload one completed comment matrix per organization**.
4. **To upload your completed comment matrix:**
   i. You will need to be registered and signed in on the AESO Engage platform
   ii. You will need to be on the Forecasting Insights page (www.aesoengage.aeso.ca/forecasting-insights), which can be found on the AESO website at www.aeso.ca and follow the path: AESO Engage (found on very top navigation bar) > Forecasting Insights > Stakeholder Feedback > Request for Feedback | Scope & Input Assumptions Jan.3-20, 2023
   iii. Please click on the "Complete Stakeholder Feedback" box to upload your completed comment matrix
5. **Stakeholder Feedback results will be published on AESO Engage, in their original state.**

Introduction

To continue to support the AESO's mandate to provide for the safe, reliable, and economic operation of the Alberta electricity system while facilitating a fair, efficient, and openly competitive market for electricity the AESO is initiating the development of the 2023 Long-term Outlook (LTO) with an anticipated release date in the fall of 2023. This work will look to build on and integrate learnings from our 2022 *Net Zero Emissions Pathways* report as well as the *AESO 2021 Technology Forward Publication* and the AESO Technology Summit 2021 – Power Tomorrow.

[1] Extended to Jan 24, 2023 via email

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The 2023 LTO is the AESO's forecast of Alberta load and generation requirements over the next 20 years and is used as one of many inputs to guide transmission system planning, resource adequacy assessments and market evaluations.

This report is being developed during a period of global uncertainty, and the outlook will cover a significant period of transformation of Alberta's electricity industry. Changes in technology, government regulation and policy, economics and the way power is produced and consumed will significantly impact load growth and development of the resources to support and manage Alberta's power needs.

At its core, the 2023 LTO will be grounded in market fundamentals including demographics and employment, existing industrial energy needs, core economic sectors, utilization of existing resource mix and economic additions based on decarbonization-oriented policies. Additionally, further decarbonization of the supply mix, electrification of high-emitting sectors, and energy efficiency improvements will also be explored as part of the 2023 LTO scenarios. Carbon pricing and regulation, technological innovations, and new ways to generate, store and consume electricity as well as support from various levels of government around federal zero-emission vehicle credits and mandates, carbon capture, and other low emission technology tax treatment are anticipated to continue to grow and support the energy transition, which will drive additional emissions reductions economy wide.

Request for Feedback

The AESO is seeking feedback from interested stakeholders on their perspectives as it relates to the proposed scope and input assumptions of the 2023 LTO. Please be as specific as possible with your responses. Thank you.

Stakeholder engagement, dialogue, and feedback will be key to framing the AESO's analysis and calibrating modeling parameters to ensure that the information provided to stakeholders via this analysis is valuable. The AESO would like to thank stakeholders in advance for their ideas, thoughts, and perspectives related to electric system transformation in Alberta.

	Questions	Stakeholder Comments
1	***2023 Long-Term Outlook Scope*** Alberta's Electricity industry continues to evolve due to the transition away from coal generation, stemming from carbon regulation and policy, lower emission natural gas generation, and proliferation of renewable generation, particularly wind and solar. The 2023 LTO will consider these factors along with anticipated impacts from carbon policy implementation, economic growth, load growth, energy efficiency, distributed energy resources, changes in electrical energy use patterns and proliferation of new types of uses (electrical vehicles (EV) for example), and the evolution of generation and emission reducing technologies. The 2023 LTO will provide the AESO and external stakeholders with valuable insights, information, and data to help inform decisions aligning with the AESO's *2022 Strategic Plan*. The AESO intends to review load and generation scenarios that reflect current trends in decarbonization, with the intention of illustrating possible cases and scenarios. With respect to supply the AESO intends to review three scenarios as part of the LTO framework supply scenarios in greater quantitative detail to gain further insight on potential market and operational implications. These are:	

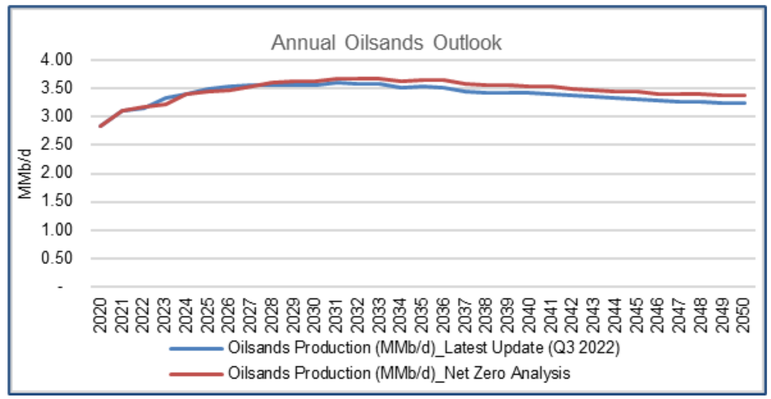
Questions	Stakeholder Comments
• **Reference** – Pace of changes are incremental and aligned with current understanding of federal and provincial policy, economic expectations, and technology landscape. o Using historical trends and current economic outlooks for the energy sector to forecast future growth. As well account for trends in EV adoption, energy efficiency, distributed energy resources (DERs), building electrification, heavy industry, and flexible loads. o Based on current policies (*Technology Innovation and Emissions Reduction Regulation* (TIER), *Clean Electricity Regulations* (CER), etc.), technology costs and industry trends (e.g., Corporate Power Purchase Agreements (PPAs), Carbon Capture Utilization and Storage (CCUS), and Hydrogen). Near-term additions based on certainty criteria; long-term additions based on economics. • **High Electrification** – With the anticipated decarbonization of the grid, the pace and scale of electrification is increased to take advantage of the potential to reduce emissions. The pace and scale of transportation electrification, building electrification, energy efficiency, and heavy industry are sped up to take advantage of a lower emission power grid. • **Alternate Decarbonization** – Qualitatively and quantitatively explore the benefits and challenges of increased capacity of interties with neighboring jurisdictions. Anticipated technological costs and development timelines associated with CCUS and Hydrogen development are delayed, and performance is below expectations. Explore what alternate additional low emission technologies (i.e., additional wind, solar, storage, small modular reactors, hydro, etc.) are able to bridge the gap (sensitivities around additional cost declines, policy support).	
a) What is your view on the magnitude and structure with regards to interconnection with neighbouring jurisdictions that the AESO should explore?	A more flexible grid will be critical to achieving net-zero electricity in Alberta. As interties provide flexibility to the grid, we support more connections between Alberta with British Columbia, Saskatchewan and the United States. However, we believe storage will also be a critical technology in providing firm capacity and flexibility as well as augmenting existing and new interconnections. Storage allows a scalable and actionable path towards grid flexibility in Alberta that can be deployed on short timescales. Additionally, we caution that fair competition is vital to the success of Alberta's electricity market. Participation of publicly owned and regulated entities in Alberta's market must be done in a way that allows fair competition with market interests inside the Alberta market.
b) What is your view with regards to additional low emission technologies (i.e., wind, solar, storage, small modular reactors, hydro, etc.) around penetration levels, pace of adoption, opportunities, and challenges to implement/integrate within the Alberta electric system that the AESO should model?	Low emission technologies will be a critical ingredient for a prosperous Alberta as evidenced by the unprecedented levels or corporate investment in Albertan renewable energy. As the lowest cost source of energy, variable renewables will likely be the dominant electricity supply added on to the grid going forward. This is evidenced by the AESO connection que. When looking at the

	Questions	Stakeholder Comments
		January 2023 project list for approved or under review projects, we see nearly 20GW of solar, solar+storage, and wind project compared to nearly 6GW of cogeneration and gas projects. This suggests that the penetration of low emission technologies could be very high, potentially providing a majority of Albertan electricity. Consequentially, high penetrations of variable generation will need an increasingly flexible grid, which can be provided by investments in energy storage. The queue also hints at this opportunity with nearly 3GW in storage projects approved or under review for connection.[2] Within the category of "low emission technologies" it is notable that there are no hydro or small modular reactor proposals and thus they should be assessed accordingly in all scenarios, especially the "alternate decarbonization" scenario. *We are excited to see a more prominent role for low emission technologies in this year's LTO and strongly support the AESO's decision to include the Alternate Decarbonization scenario. We view this scenario as critical to establishing a more complete range of outcomes for electricity generation in Alberta.*
	c) Is there any additional feedback that you would like to provide to the AESO with respect to the intended scenarios and analysis?	We note that both interties and storage require more than just physical infrastructure to successfully serve Alberta's grid. They need supporting regulatory and market structures to be able to participate maximally. This is a critical piece of creating a more flexible, resilient Alberta electrical system.
2	***Macroeconomic Context*** **a) Economic Outlook**	No comment.

[2] https://www.aeso.ca/grid/transmission-projects/connection-project-reporting/

<table>
<tr><th>Questions</th><th>Stakeholder Comments</th></tr>
<tr><td>Recent economic outlooks suggest Alberta’s economy will grow between 2.4 - 4.9 per cent in the near-term and then return to a long-term trend of around 1.5 per cent.[3]

• What is your view of the 5- to 20-year economic outlook of the province?

• How will decarbonization and electrification policies impact the Alberta macroeconomic landscape?</td><td></td></tr>
<tr><td>b) Oil Sands Outlook
Oil sands production is a key driver of Alberta’s load growth. The latest IHS (S&P Global) outlook notes that Canadian oil sands output will rise to ~3.5 MMb/d by 2030, indicated by the blue line in Figure 1. In the AESO’s Net-Zero Emissions Pathways report, the AESO adopted an earlier version of this outlook, where it assumed oil sands production would rise up to 3.6 MMb/d by 2030 (as indicated by the red line in Figure 1).</td><td>Figure 1: Oil Sands Outlook Assumptions

</td></tr>
<tr><td>• What is your view of long-term oil sands output?

• What is your view on whether/how carbon policies will impact the sector and its load?</td><td>No comment</td></tr>
<tr><td>c) Natural Gas Outlook
Current forward gas prices are in the $4.25/GJ range.</td><td>No comment.</td></tr>
</table>

[3] https://www.conferenceboard.ca/e-library/abstract.aspx?did=11811

	Questions	Stakeholder Comments
	• Five years into the future, do you see gas prices remaining at this level, decreasing, or increasing beyond inflationary rates? • What do you see as key drivers of gas prices going forward? • If a natural gas price sensitivity is completed, what is an appropriate range to consider (i.e., +/- $1/GJ)?	
3	***Policy and Electricity Value Chain Impact*** a) What further changes do you expect to see in the *Technology Innovation and Emissions Reduction Regulation* (TIER) framework that will impact electricity supply and demand in Alberta in the medium and long term? **Note:** For the purpose of modelling the 2023 LTO, the AESO intends to assume that the high-performance benchmarks for electricity and hydrogen tighten at 2 per cent per annum until 2030, per the amendments to the *TIER Regulation,* released Dec. 14, 2022[4] . The AESO intends to assume the 2 per cent tightening continues until 2034. Thereafter, the AESO intends to assume a high-performance benchmark for electricity that is commensurate with the emissions from a combined-cycle natural gas unit with 90 per cent post combustion carbon capture and sequestration.	It is reasonable to assume that the price on carbon will go to $170/tonne as is planned and will be backed up with carbon contracts for difference supplied by the Canada Growth Fund, as announced in the federal 2022 Fall Economic Statement[5]. Additionally, as the CER begins to take effect, it is reasonable to assume that the Output Based Pricing System will require more stringent benchmarks in service of the goals of the CER. Notably, the 2% tightening per year will result in a ~0.3t/MWh benchmark carbon intensity by 2030, from the current 0.37t/MWh. The CER will very likely require a maximum of 0.037-0.1t/MWh by 2035, so the 2% tightening does not appear to line up with trajectory that is being introduced by the CER and net-zero by 2035.
	b) How should the AESO reflect the Federal *Clean Electricity Regulations* (CER) within its modelling assumptions to account for its impact on the electricity supply mix in Alberta?	We believe that both the full ramifications of CER should be accounted for in all scenarios. It is critical to note that any cogeneration unit that sells electricity into the Alberta market will be covered under the ramifications of the CER and will not represent

[4] https://kings-printer.alberta.ca/documents/Orders/Orders_in_Council/2022/2022_403.html

[5] https://www.budget.canada.ca/fes-eea/2022/doc/gf-fc-en.html#:~:text=Contracts%20for%20difference,investments%20by%20CGF.

	Questions	Stakeholder Comments
		non-emitting generation as was modelled in the Net-Zero LTO from 2022.[6]
	c) With regards to the recently announced Investment Tax Credits (ITC) impacting carbon capture technologies, clean energy technologies, and clean hydrogen technologies: • Given limited detail on the structure of the ITC, do you have potential insights to the mechanics of the credit? • Do you foresee that these investment tax credits will be pivotal in their capacity to change the electricity generation landscape in Alberta? • Which technologies do you expect will benefit the most from these incentives? Which technologies do you expect will face challenges?	We believe the ITCs should be modelled into all scenarios as completely as possible. The Clean Technology ITC, in particular, will be significantly influential in the future by providing a up to 30% of refundable value to wind, solar, SMRs and storage. Language from the 2022 Fall Economic Statement details below that renewable and SMR generation as well as storage will receive a 30% refundable tax credit (pending certain labour conditions). The LTO should factor this into the cost of all applicable technologies. "The 2022 Fall Economic Statement proposes a refundable tax credit equal to 30 per cent of the capital cost of investments in: • Electricity Generation Systems, including solar photovoltaic, small modular nuclear reactors, concentrated solar, wind, and water (small hydro, run-of-river, wave, and tidal); • Stationary Electricity Storage Systems that do not use fossil fuels in their operation, including but not limited to: batteries, flywheels, supercapacitors, magnetic energy storage, compressed air storage, pumped hydro storage, gravity energy storage, and thermal energy storage; • Low-Carbon Heat Equipment, including active solar heating, air-source heat pumps, and ground-source heat pumps; and, • Industrial zero-emission vehicles and related charging or refueling equipment, such as hydrogen or electric heavy duty equipment used in mining or construction.

[6] https://www.canada.ca/en/environment-climate-change/services/canadian-environmental-protection-act-registry/publications/proposed-frame-clean-electricity-regulations.html

Questions		Stakeholder Comments
		“[7] Solar, wind and storage are especially poised to proliferate under the ITC as they are already the dominant interest in the AESO project queue and will all have their economics improved drastically. The Clean Hydrogen ITC is currently undergoing consultation surrounding how lifecycle carbon intensity should factor into the magnitude of the tax credit. It is notable that electrolytic hydrogen using Albertan average grid intensity would not be applicable for this tax credit. As an emerging electricity storage medium, ESC has advocated that electrolytic hydrogen production not have the carbon intensity of the grid included when calculating the lifecycle carbon intensity of a project. This is with the intention that electrolytic hydrogen projects be treated like stationary storage (where grid carbon intensity is not considered) and may tap into the Clean Hydrogen ITC to provide a potential source of grid flexibility in provinces with rapid renewable uptake, such as Alberta’s. Additionally, the CCS ITC should also be included as fully as possible.
	d) Are there any other related policy or regulatory considerations that you would like to provide feedback on?	Access to the grid will likely be a key constraint in further renewable additions. Radial transmission on MSC will specifically limit renewable development. Storage can likely play a key role in augmenting radial transmission to allow for higher line utilization.

[7] https://www.budget.canada.ca/fes-eea/2022/report-rapport/chap2-en.html#a16:~:text=The%202022%C2%A0Fall%20Economic%20Statement%20proposes%20a,duty%20equipment%20used%20in%20mining%20or%20construction.

	Questions	Stakeholder Comments
4	***Electrification and Electricity Demand Drivers in Alberta*** **a) Energy efficiency** • What is your view on the potential penetration, impact and/or pace of greater energy efficiency across sectors (residential, commercial, and/or industrial)? What would trigger more energy efficiency or conservation efforts?	No comment
	b) Distributed Energy Resources (DERs) • What is your view on how current policies and capital costs will impact DERs (e.g., gas-fired generation, solar, wind, small-scale energy storage systems, demand-side management technologies, load aggregator technologies, micro-grids, etc.) going forward?	ESC believes that DERs can play a large role in the future Alberta electricity system. DERs allow many customers to determine how they will use grid delivered energy to meet their energy needs; potentially avoiding higher priced hours or higher carbon intensive hours (if those hours are not aligned). Small-scale energy storage located behind the meter provides a unique option for customers to control their grid delivered energy quantities in a way that was not previously possible. Under a net-zero pathway, small-scale storage can allow customers to meet their specific emission reduction goals depending on the regulatory framework and market design. The role and participation of DERs is a critical element of determining Alberta's future grid mix and function.
	c) Transportation Sector • What is your view on the potential penetration and pace of electrification of the transportation sector (e.g., passenger vehicles and light-duty trucks, commercial fleets, heavy-duty trucks, rail, other)? • How effective do you expect the policy and financing programs announced in the federal 2030 emissions reduction plan will be in incenting electrification of different vehicle classes?	EV adoption is growing rapidly in many jurisdictions across the world. In 2022, EVs already made up 10% of global market share of new vehicles, an increase of 68% year over year, with projections that up to 40% market share may be achieved within the decade. Notably, in 2021 the IEA predicted that EV market share would not reach this level until 2030.[8]

[8] https://www.businessinsider.com/electric-vehicles-accounted-global-auto-sales-could-quadruple-2030-report-2023-1

Questions	Stakeholder Comments
	The AESO should include the announced Zero Emissions Vehicle Mandate into account in all scenarios.[9]
d) Buildings • What is your view on the potential penetration and pace of electrification of space heating/cooling and/or water heating? • What is your view on increased adoption and energy consumption of air conditioning in the province?	As a major GHG emissions source, we expect that climate policy will move towards the electrification of building heating. As nighttime low temperatures increase on average, more Albertans will likely reach for air conditioning.[10] ESC notes that air conditioning may be provided by heat pumps which also provide electrified heating. Although ESC does not have any specific predictions around the nominal amount building electrification or additional air conditioning load, we note that small-scale storage can be used to help manage peak building loads during constrained electricity grid operating hours (i.e., either high prices or reliability issues).
e) Industrial Sectors • Deployment of carbon capture, utilization and storage (CCUS) and hydrogen production (especially if based on electrolysis) could increase industrial load. What is your view on the expected increase in load (either served on-site or from the grid) from these industrial processes? • What is your view on load growth and the impact of net-zero targets on other industries, sectors or technologies (e.g., cryptocurrency mining, data centers, petrochemical facilities, cement, steel, others)?	No comment.

[9] https://www.canada.ca/en/environment-climate-change/news/2022/12/let-it-roll-government-of-canada-moves-to-increase-the-supply-of-electric-vehicles-for-canadians.html

[10] https://www.cbc.ca/news/canada/calgary/calgary-heat-wave-weather-alberta-climate-change-1.5690957

	Questions	Stakeholder Comments
5	***Generation Technologies*** a) What generation technologies do you perceive as being the most economic electricity supply options in Alberta?	ESC believes that a mixture of generation technologies will be present in the future electricity supply in Alberta. Renewables are likely the most economic means of adding new energy supply to the Alberta grid. In 2021, Lazard found that unsubsidized lifecycle costs of new wind and solar energy are competitive with the marginal costs of energy from combined cycle gas facilities. With the Clean Technology ITC coming into effect, this dynamic will be exaggerated, and we will likely see renewables capture a greater share of Alberta's electricity mix. However, as renewable market share grows, grid flexibility and firm capacity will become more important. Regardless of the generation technology, enabling energy storage resources will increase the effectiveness, efficiency, and utilization of the generation fleet. ESC believes energy storage resources will play a significant role in all future paths for the electricity system in Alberta.
	b) Which generation technologies do you expect to become competitive in the long-term outlook?	No comment.
	c) What technologies do you expect will receive advantages or hinderances due to the implementation of government policies?	Fossil fuel powered technologies will likely continue to face both regulatory and economic headwinds. Even outside of Canadian policy, international initiatives, like the American Inflation Reduction Act, or the European Green Deal and REPower EU programs will work to systemically reduce the cost of competitor technologies to fossil fueled ones.
6	***2023 LTO Future Generation Technology Costs*** The following table contains anticipated generation technologies and operational specifications pertaining to potential future generation developments. The data herein has been primarily derived from three sources: 1. The US Energy Information Administration's *Capital Cost and Performance Characteristic Estimates for Utility Scale Electric Power Generating Technologies*[11], for nuclear and gas-fired generation	

[11] https://www.eia.gov/analysis/studies/powerplants/capitalcost/

Questions	Stakeholder Comments
	2. Pacific Northwest National Laboratory's *2022 Grid Energy Storage Cost and Performance Assessment*[12], for pumped hydro and compressed air energy storage

3. A third-party consultant report prepared for the AESO for wind generation, solar generation, and battery energy storage

Certain other technology cost and characteristics were derived from recent regional developments such as recent estimates of hydroelectric development.

In all cases, the dollar values have been escalated to represent 2022 dollars and converted to Canadian currency, where applicable. The costs represented in the table below do not include adjustments for grants, tax credits, or other incentives.

Generation Type	Plant Capacity, MW	Capital Cost (2022), $/kW	Fixed O&M Costs, $/kW-yr	Variable O&M Costs, $/MWh	Heat Rate (HHV) or Efficiency, GJ/MWh or %
Advanced Nuclear Fission Reactor	2,156	8,653	174.23	3.39	11.19 GJ/MWh
Small Modular Reactor – Nuclear Fission	600	8,867	136.07	4.30	10.60 GJ/MWh
Hydroelectric	1,100	14,545	42.77	-	-
Battery Energy Storage	50 (200MWh)	2,104	57.28	-	83% round trip efficiency
Pumped Hydro Energy Storage	100 (1,000MWh)	3,543	38.05	-	80% round trip efficiency
Compressed Air Energy Storage	100 (1,000MW)	1,648	21.76	-	52% round trip efficiency
Wind Generation	100	1,563	107.32	-	-
Solar Photovoltaic Generation	50	1,687	27.05	-	-
Combined-Cycle Natural Gas	418	1,553	20.20	3.65	6.79
Combined-Cycle Natural Gas with CCUS	377	3,554	39.53	8.36	7.52
Hydrogen-Fired Combined Cycle	418	1,553	20.20	3.65	6.79

[12] https://www.pnnl.gov/sites/defa ult/files/media/file/ESGC%20Cost%20Performance%20Report%202022%20PNNL-33283.pdf

Questions		Stakeholder Comments			
Simple-Cycle Natural Gas – Aeroderivative	105	1,683	23.35	6.73	9.63
Simple-Cycle Natural Gas – Frame	233	1,021	10.03	6.45	10.45
Hydrogen-Fired Simple-Cycle – Aeroderivative	105	1,683	23.35	6.73	9.63
Hydrogen-Fired Simple-Cycle – Frame	233	1,021	10.03	6.45	10.45

Questions	Stakeholder Comments
a) Do you believe that these are representative of the costs associated with potential future Alberta generation technologies? How do you expect the cost of these technologies to change by 2030?	No. Many of these cost assumptions do not seem reflective of real world costs of project being built or proposed in Alberta today, let alone in the future. The Battery Energy Storage cost appears inflated. For example the below projects show much lower capital cost per unit than the stated $2,104/kW (and implied $526/kWh). Notably the third party report which provides data for wind, solar and battery values is not provided here and is not able to be assessed. • WaterCharger (Proposed 2022)[13] ○ Stated Cost: $120M | Capacity: 180MW, 360MWh | Implied unit cost: $667/kW, $333/kWh The National Renewable Energy Laboratory finds that battery costs for a 4-hour duration lithium battery energy storage system will be $1166USD/kW ($1565CAD/kW) in 2023 and projects that this will decline to $895USD/kW ($1200CAD/kW) by 2030.[14] Additionally, it is critical for the AESO to recognize that storage technologies have been shown to follow a learning curve with cost

[13] https://majorprojects.alberta.ca/details/WaterCharger-Battery-Storage-Project/8540

[14] https://atb.nrel.gov/electricity/2022/utility-scale_battery_storage

	Questions	Stakeholder Comments
		declines being strongly related to deployment. The more storage is deployed, the cheaper it will be. The same relationship has been found for wind and solar. The AESO should include the dynamics of learning curves in its cost assumptions for the next 20 years. Bloomberg New Energy Finance found that while lithium battery costs have risen 7% to $151USD/kWh in 2022, that cost should decline by 33% to under $100USD/kWh by 2026. As short term material constraints revert to the mean, cost projections will return to the learning curve observed for lithium batteries.[15] Finally, it is essential that the ITCs be included in the pricing assumptions, with the Clean Technology ITC specifically applying to nuclear, wind, solar and all storage technologies.
	b) What is your expectation of the retrofit costs to existing thermal generators to enable CCUS or hydrogen-fired generation?	No comment.
	c) Please share any additional views on technologies and specifications that are not included within the table (please include the cost and operational characteristics applicable to the generation technology in the format of the provided table).	Additionally, other assumptions that will affect resource costs such as assumed project lifetime, capacity factor and fuel price are not stated and stand to be significant determinants of resource cost and competitiveness. Without being stated, we cannot comment on them but we request AESO state these assumptions in future consultations.
7	***2023 LTO Materials and Data*** Previous Long-term Outlooks have provided a range of material and formats for general usage. This includes a detailed report, graphics and detailed appendices, stakeholder presentations and webinars, highlights providing a high-level overview of the report providing key	The 2019 LTO presented figures that were more explicit that the 2021 and Net-Zero LTOs. Please ensure to clearly state the % and nominal MW values for resource shares and capacity additions.

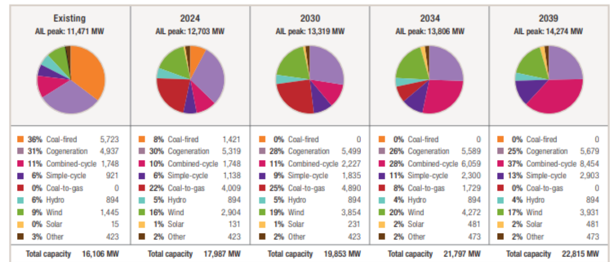
[15] https://about.bnef.com/blog/lithium-ion-battery-pack-prices-rise-for-first-time-to-an-average-of-151-kwh/

	Questions	Stakeholder Comments
	insights, as well as a comprehensive data visualization tools with charts and data that can be downloaded[16]. The AESO would like to better understand how stakeholders utilize and consume the LTO information and data. Please provide any additional comments or insights around items that are valued and should continue as well as input on what else can be included, removed, enhanced, or altered for the 2023 LTO and future iterations.	2019 – Values explicitly stated

[16] https://www.aeso.ca/grid/grid planning/forecasting/

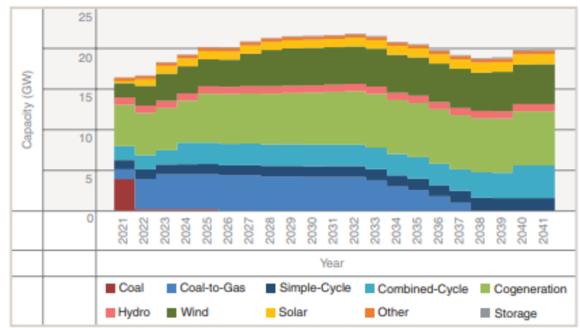
	Questions	Stakeholder Comments

FIGURE 7: Reference Case Generation Scenario Capacity



2021 – values implied from figure

FIGURE 14: Reference Case: Capacity by Fuel Type



8	***Other*** Please provide any additional information that you would like to share, which may contribute to the 2023 LTO analysis development.	