



AUC

Alberta Utilities Commission

AUC inquiry into the ongoing economic, orderly and efficient development of electricity generation in Alberta

Module B Report

March 28, 2024

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Proceeding 28542

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1 Executive summary

1. This is the report of the Alberta Utilities Commission (AUC or the Commission) on the reliability and affordability issues in the inquiry into the ongoing economic, orderly and efficient development of electricity generation in Alberta. The Commission determined that the inquiry would be separated into two modules to explore the issues identified in the order-in-council. In Module B, the Commission considers the impact the increasing growth of renewables has to both generation supply mix and electricity system reliability.
2. The Commission issued a notice on October 24, 2023, outlining its process for Module B. As part of the process, the AUC commissioned two expert reports to assist it in considering the issues. The process was completed on February 29, 2024, with parties providing written submissions on the AUC-sponsored expert reports.
3. The transition of the electricity system is often described as a balance between three pillars: decarbonization, affordability and reliability. Each pillar is crucial but often interlinked with the other pillars. Alberta is currently working to decarbonize its electric system while minimizing the impacts to affordability and reliability.
4. The Commission recognizes that renewables will play an important role in transitioning Alberta's electric system to net zero. However, the intermittent nature of renewables, as well as other characteristics of inverter-based resources, will have increasing impacts to the grid as they make up a larger portion of Alberta's generation supply mix.
5. Based on the expert reports and the submissions made by participants in Module B, the Commission makes the following observations:

Observations:

- Renewables are impacting many different aspects of system reliability. The Alberta Electric System Operator (AESO) is currently assessing options to address key areas of reliability in the short term.
- Under the current market design, expected unserved energy in the late 2030s is significant and there is potential for unprecedented load-shed events. An increased rate of decarbonization, i.e., net zero by 2035 instead of by 2050, will exacerbate supply adequacy issues.
- Under the current energy market design, increased renewables will exacerbate supply adequacy issues.

- Renewables lower pool prices and increase volatility, reducing the signal for dispatchable generation to enter the market.
- Newer low-carbon technologies could be considered first-of-a-kind and have a greater level of associated risk, particularly under a target to decarbonize by 2035.
- Energy storage can play a role in reducing supply adequacy issues but is not a complete solution and is not expected to be economic under the current energy market and AESO tariff.
- Given the scale of expected unserved energy, minor changes to supply mix assumptions do not alleviate supply adequacy concerns.
- Under the current market design, pool prices are initially stable, but are then expected to increase at a rate above inflation in the 2030s. An increased rate of decarbonization, i.e., net zero by 2035 instead of by 2050, will exacerbate affordability issues.
- Demand response has some potential to mitigate supply adequacy impacts and reduce future costs to electricity consumers.
- Investors are concerned about the current level of policy uncertainty.
- By the late 2030s, under the existing market framework, consumers would be paying significantly higher rates for electricity, while receiving a substantially lower level of reliability. Given this, changes to the market design and policy framework are necessary.

6. The Commission also makes the following commitment:

AUC Commitment:

- The Commission will explore demand response opportunities, including exploring time varying rates as a priority item in the near term.

7. The Commission has attached the two expert reports. All submissions from parties on those reports have been available throughout on the Commission's public electronic filing system in Proceeding 28542.

8. On March 11, 2024, the Minister of Affordability and Utilities directed the AESO to work with industry and stakeholders to design a restructured energy market.¹

9. The Commission will ultimately be the adjudicator of proposed rule changes put forward by the AESO and, as such, it will not comment on the merits of potential changes proposed. But

¹ Direction Letter from the Minister of Affordability and Utilities, March 11, 2024.
<https://www.aesoengage.aeso.ca/37884/widgets/156642/documents/125532>.

as stated above, and for the reasons set out in this report, the Commission considers that changes to the market and policy framework are necessary.

10. While the most extreme effects on reliability and affordability may not appear until the late 2030s, the Commission recognizes that changes to markets and policy will take time. It assumes the government, the AESO, the Market Surveillance Administrator (MSA) and stakeholders will move forward in a timely manner so investors and participants have the necessary policy certainty going forward to confidently make decisions and allow Alberta's market to succeed in a way that will protect Albertans' interests.

2 Background

11. On August 2, 2023, the Government of Alberta issued an order-in-council directing the AUC to hold an inquiry into the ongoing economic, orderly and efficient development of electricity generation in Alberta. The order-in-council can be found in [Appendix 1](#).

12. The order-in-council directed the Commission to inquire into and report to the Minister of Affordability and Utilities on the following:

1. Considerations on development of power plants on specific types or classes of agricultural or environmental land.
2. Considerations of the impact of power plant development on Alberta's pristine viewscales.
3. Considerations of implementing mandatory reclamation security requirements for power plants.
4. Considerations for development of power plants on lands held by the Crown in Right of Alberta.
5. Considerations of the impact the increasing growth of renewables has to both generation supply mix and electricity system reliability.

13. The Commission determined that the inquiry would be separated into two modules to explore the issues identified in the order-in-council. Module B addresses issue 5.

14. Following the order-in-council, the Ministry of Affordability and Utilities issued a press release and fact sheet that emphasized the government's interest in also considering the affordability impacts of increasing renewable generation.² The Commission has also incorporated that into the scope of this report.

15. In addition to the Commission's inquiry, the Minister of Affordability and Utilities has requested that the AESO and the MSA consider whether potential changes to Alberta's energy-only market are required. On March 11, 2024, the Minister of Affordability and Utilities

² Alberta Ministry of Affordability and Utilities. AUC approvals pause for renewable projects, August 25, 2023. <https://www.alberta.ca/release.cfm?xID=88843C2191BF5-097B-B1C7-82E755C07EF645A1>

requested the AESO to work with industry and stakeholders to design a restructured energy market.

2.1 Process

16. On October 24, 2023, the Commission issued a notice for Module B of the inquiry, outlining its proposed process. As part of the process, the AUC commissioned and made public two expert reports to assist it in considering the issues. The list of experts and scope of their reports is set out below.

Expert	Scope of report
London Economics International LLC (LEI)	<ul style="list-style-type: none"> • Review and assess prior studies that evaluate the evolution of the Alberta electric system from a technical and/or economic perspective in order to inform reliability and affordability questions. • Following stakeholder engagement, development of a technical, simulation-based assessment of future wholesale market fundamentals under the current energy market design over the long term to evaluate future system reliability (e.g., resource adequacy) and consider electric utility bill impacts for retail customers.
FGS Longview	<ul style="list-style-type: none"> • Using targeted stakeholder engagement and other means, gauge current perception of Alberta’s power market by relevant generation developers (incumbent and non-incumbent) and sources of capital to review attractiveness of Alberta's market structure, views on potential market structure changes, and appetite for merchant power risk. • Identify the drivers behind stakeholder perception of Alberta’s power market.

17. The AUC held two technical meetings as part of the process. The first, held on November 9, 2023, was to discuss and obtain feedback on LEI’s simulation-based assessment. At the second technical meeting, held on February 14, 2024, the experts presented a summary of their reports and interested parties had the opportunity to ask questions of the experts.

18. The AUC published the expert reports on February 7, 2024. The final step of the process occurred on February 29, 2024, with parties providing written submissions on the expert reports.

2.2 Ministry and agency roles

19. In October 2022, the Government of Alberta established the Ministry of Affordability and Utilities. Its responsibilities include managing and developing policy for the utilities sector and overseeing a reliable and affordable electricity system for Albertans. The ministry is responsible for several agencies that oversee the utilities sector including the AUC, the AESO and the MSA.

20. The AUC is an independent quasi-judicial agency responsible for ensuring that the delivery of Alberta’s utility services takes place in a manner that is fair, responsible and in the public interest. The AUC regulates the utilities sector to protect social, economic and environmental interests of Alberta where competitive forces do not. The AUC, among other

responsibilities, ensures that electric generation and transmission facilities are constructed and operated in a safe, reliable, efficient and environmentally responsible way, and provides regulatory oversight of issues related to the development and operation of the wholesale electricity market in Alberta.

21. The AESO is responsible for the safe and reliable operation of the Alberta Interconnected Electric System. It serves a number of specific functions including:

- Managing and operating the provincial power grid.
- Planning and operating the electricity market.
- Planning the future of the electricity system and its infrastructure.
- Connecting generators and large power consumers to the transmission system in a safe and reliable manner.

22. The MSA is a public agency that protects and promotes the fair, efficient and openly competitive operation of Alberta's electricity market. The MSA monitors the performance of Alberta's electricity market to ensure that market participants comply with all applicable legislation, the Alberta reliability standards and the independent system operator's rules.

3 System reliability

Observation: Renewables are impacting many different aspects of system reliability. The AESO is currently assessing options to address key areas of reliability in the short term.

23. System reliability is a broad topic including many different components. The AESO is the agency primarily responsible for the reliability of the transmission system. Last year, the AESO released the *2023 Reliability Requirements Roadmap*,³ which focuses on three key areas of reliability: frequency stability, system strength and frequency capability. The Commission recognizes that increasing renewable generation is impacting each of those areas and the AESO has indicated that addressing each area is a high priority.

24. Given the AESO is currently assessing options to address those areas, the Commission decided that considering those aspects of system reliability would ultimately be duplicative. Accordingly, the Commission scoped LEI's work to focus primarily on supply adequacy. LEI defined supply adequacy as "having enough electricity generation supply to meet hourly demand, taking into account planned and unplanned outages and other factors that may impact demand or supply." Many parties submitted that because of this limited scoping, the LEI Report underestimates system reliability issues. The Commission acknowledges this and emphasizes that the absence of discussion within this report on other aspects of reliability is not intended to imply a lower level of importance of those aspects or that there is less urgency to addressing them. The Commission encourages the government to consider the AESO's work, in conjunction with this report, to fully appreciate the impact of renewables on system reliability.

³ AESO 2023 Reliability Requirements Roadmap.

3.1 Supply adequacy

25. London Economics International LLC (LEI) conducted a forward-looking analysis to project future market outcomes and analyze the impact of renewable energy generation on supply adequacy.

26. The decarbonization of the electricity sector will have a profound impact on the generation supply mix with renewables expected to significantly increase. LEI's analysis began with two base cases representing two different decarbonization policy pathways for the Alberta electricity sector: decarbonization by 2035 and decarbonization by 2050. The 2035 Base Case was designed to reflect the federal draft *Clean Electricity Regulations*;⁴ the 2050 Base Case was designed to be consistent with the province's Alberta Emissions Reduction and Energy Development Plan.⁵

Observation: Under the current market design, expected unserved energy in the late 2030s is significant and there is potential for unprecedented load-shed events. An increased rate of decarbonization, i.e., net zero by 2035 instead of by 2050, will exacerbate supply adequacy issues.

27. The LEI Report⁶ finds that reliability is expected to be worse under the 2035 Base Case than the 2050 Base Case. However, under both cases, by the late 2030s the level of reliability is expected to be materially worse than the level Albertans have been accustomed to for decades. The LEI Report indicates that insufficient supply levels result in the potential for unprecedented load shed in Alberta under the current electricity market design, even under normal weather conditions.⁷ Under abnormal weather events, that expected load shed is even higher.

28. LEI's analysis forecasted expected unserved energy, which measures the number of megawatt hours (MWh) of load that will not be served in a given year as a result of insufficient available capacity. As shown in the figure below, the expected unserved energy is expected to peak in 2038 once the last of the coal-to-gas power plants retires and is significantly above the AESO's resource adequacy threshold.⁸

⁴ Government of Canada. Canada Gazette, Part I, Volume 157, Number 33: *Clean Electricity Regulations*. August 19, 2023. The Commission notes that since the release of the LEI Report, the federal government has provided an update proposing to relax some of the restrictions in the regulations.

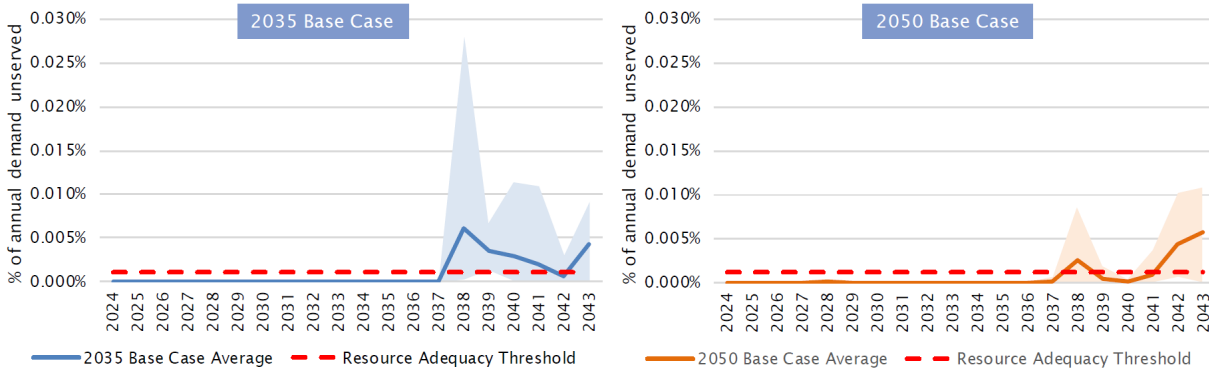
⁵ Government of Alberta. Alberta emissions reduction and energy development plan. April 2023 (updated January 2024).

⁶ Exhibit 28542-X0049.01, Expert Report - London Economics International - Cover Report; Exhibit 28542-X0050, Expert Report - London Economics International - Annex 1 - Scenario Analysis; Exhibit 28542-X0051, Expert Report - London Economics International - Annex 2 - Projection of Residential Electric Bills; Exhibit 28542-X0052.01, Expert Report - London Economics International - Annex 3 - Probabilistic Supply Adequacy Analysis.

⁷ LEI stated that it used "actual weather data in its long term energy market modeling, in order to ensure realistic conditions. LEI chose to use 2021 weather conditions (which impacted hourly renewable generation and hourly variation in load) to represent "normal" weather, because 2021 conditions were closest to longer term averages and were neither mild nor abnormally extreme in terms of weather factors that could skew the scenario analysis results towards low likelihood events."

⁸ The AESO defines the Resource Adequacy Threshold as the one-hour average Alberta internal load for a year divided by 10.

Figure 1. Comparison of levels of demand unserved under the base cases with normal weather⁹



Notes:

- LEI ran its simulation model 10 times (seeds) for each year and scenario, with varying patterns of generation outage schedules. The shaded areas in the charts above represent the range of modeled outcomes caused by these different patterns of generation outages. The solid lines represent the average across the 10 seeds.
- AESO defines the Resource Adequacy Threshold as the 1-hour average Alberta internal load for a year divided by 10. Converting to percentage terms is calculated as $1/8760/10 = 0.00114\%$.

29. LEI developed additional scenarios based on five years of historic data to evaluate supply adequacy during abnormal weather events. These weather scenarios, combined with different scenarios for generation outages, resulted in an average expected unserved energy in 2038 of 30,491 MWh for the 2035 Base Case or 16,793 MWh for the 2050 Base Case. As to be expected, these levels are higher than those in the modelling under normal weather conditions shown in the figure above, and well above the AESO’s resource adequacy threshold of 1,135 MWh.

30. Albertans have long enjoyed high reliability in terms of supply adequacy, and even levels of unserved demand at the AESO’s resource adequacy threshold would be unprecedented. For context, the AESO’s most recent long-term adequacy metrics indicate a probability of supply adequacy shortfall of approximately zero MWh for the next two years.¹⁰ The Commission notes that the number of grid alerts¹¹ has increased in recent years but that even the most severe events, such as the one that occurred on January 13, 2024, have not yet resulted in any unserved load.

31. Parties identified that the AESO currently has the authority to take preventative actions including procuring load-shed services, backup generation and emergency portable generation. The emergency alert issued on January 13, 2024, in which Albertans responded by quickly reducing approximately 200 megawatts (MW) of demand, is a prime example. Parties submitted that the LEI analysis did not use these tools to mitigate supply loss and, as such, overestimates the extent of the issue. The Commission agrees that such tools could be used to mitigate issues, however, given the scale of expected unserved energy, the Commission considers that those tools on their own would not be sufficient.

⁹ Exhibit 28542-X0049.01, Expert Report - London Economics International - Cover Report, PDF page 15.

¹⁰ Exact number is 0.06 MWh. AESO Long-term adequacy metrics – February 2024. https://www.aeso.ca/download/listedfiles/2024_02_LTA.pdf.

¹¹ The AESO issues a Grid Alert when the power system is under stress and we’re preparing to use emergency reserves to meet demand and maintain system reliability.

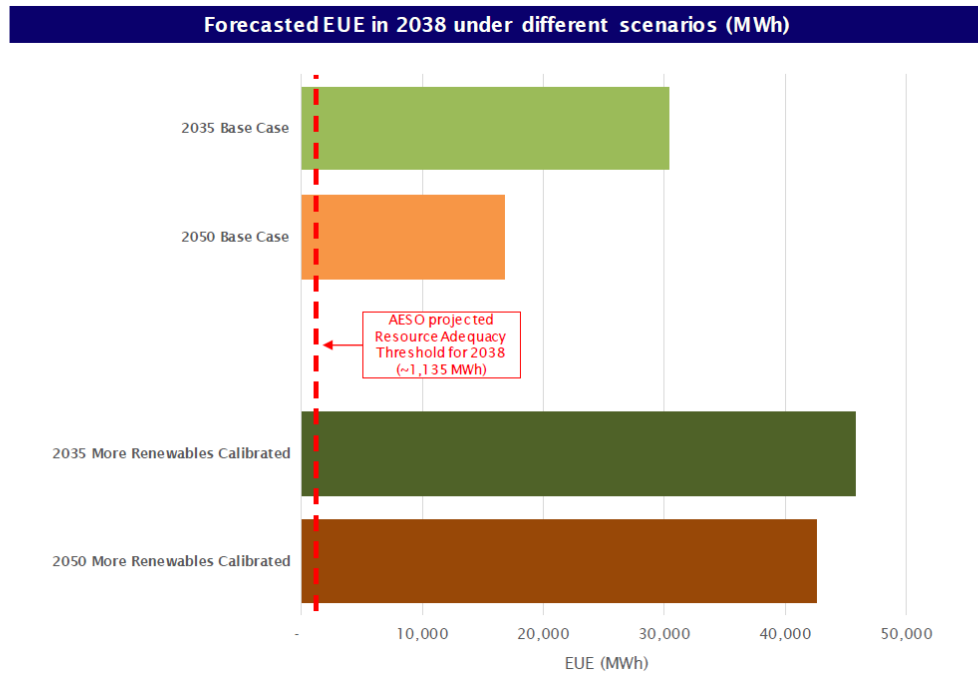
32. The LEI Report states that in the five per cent most severe supply adequacy events, nearly 10 per cent of demand would not be met, with unserved load events that last for almost an entire day (23 hours). The system is projected to have the highest reliability risk during evening hours in the winter months, arguably when electricity is needed most.

33. The addition of more than 2,000 MW of natural gas generation in 2024 is expected to largely address supply adequacy concerns in the near term. However, the LEI Report identifies that there is a potential for unserved load in the next five years under abnormal weather conditions if low prices result in the significant retirement of coal-to-gas power plants.

34. Parties criticized the LEI Report for assuming that the current energy-only market and policy would remain unchanged in its modelling. Parties were eager to suggest changes that would alleviate or mitigate the impacts that LEI identified. However, the Commission emphasizes that LEI's scope was intentional. The Commission recognizes that in addition to the AUC's inquiry, the government directed both the AESO and the MSA to consider potential changes to the market, while also consulting on policy changes itself. As such, the Commission recognized that any work it conducted on potential changes was not only outside the scope of its mandate but would be duplicative of other work. As such, the Commission chose to focus its inquiry on the current framework.

Observation: Under the current market design, increased renewables will exacerbate supply adequacy issues.

35. To better understand the impact of renewables on supply adequacy, LEI also developed cases with additional renewable generation. Its More Renewables cases included an additional 2,100 MW in the near term and an additional 2,400 MW in the longer term (2034-2040). The additional renewables decreased pool prices resulting in existing dispatchable generation being more likely to retire and new dispatchable generation less likely to enter the market. As shown in Figure 2, this exacerbated supply adequacy issues, resulting in higher levels of expected unserved energy.

Figure 2. Expected unserved energy under base cases vs More Renewables Calibrated cases for 2038¹²

36. Some parties indicated that LEI's More Renewables cases are not realistic. They submitted that the cases add immature projects that are unlikely to all be constructed, that current levels of transmission congestion are likely to delay some renewable additions, and that since additional renewables will depress the price that renewables receive, that it will become more difficult to finance new renewable projects. The Commission accepts that the level of renewable integration in LEI's More Renewables cases is unlikely to occur at the rate modelled. Nonetheless, the Commission finds it to be a helpful illustration of the directional impacts of additional renewables.

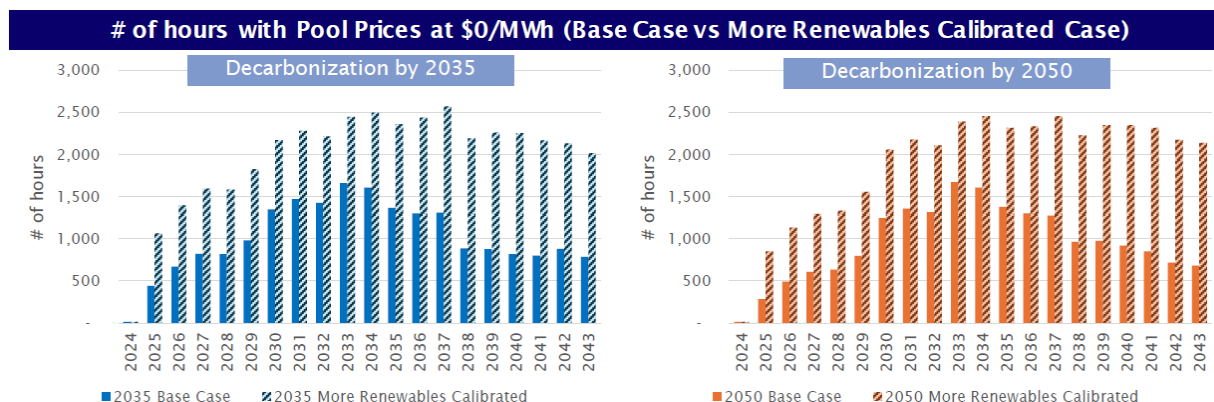
Observation: Renewables lower pool prices and increase volatility, reducing the signal for dispatchable generation to enter the market.

37. The LEI Report finds that the current energy-only market design does not provide sufficient economic incentives to ensure adequacy of supply in all hours. Growing levels of renewable generation result in lower pool prices, which dampens the investment signal for dispatchable generation.

38. Increased renewables lead to a greater frequency of zero-priced hours, as shown in Figure 3.

¹² Exhibit 28542-X0049.01, Expert Report - London Economics International - Cover Report, PDF page 18.

Figure 3. Number of hours with pool prices at zero under normal weather conditions¹³



39. Increased zero-priced hours, and lower pool prices generally, reduces the profitability of thermal generators, with existing thermal generators becoming more likely to retire and new thermal generators less likely to enter the market. With less dispatchable generation, there is greater potential for supply adequacy shortfalls.

40. LEI’s model tracks the revenues earned and costs incurred by generation assets in the energy market, comparing the forecasted net profits of the generation assets against the capital costs. The results confirm the findings of the AESO’s preliminary 2024 Long-term Outlook (LTO) that additional investment cannot be supported by the forecast market prices. In addition, LEI’s modelling shows that under the forecast conditions, dispatchable new generation is generally not earning a robust return on investment until the late 2030s.

41. Parties raised concerns that LEI’s modelling had overly relied on the AESO’s LTO. Stakeholders identified the draft nature of the LTO and submitted that LEI failed to question the AESO’s assumptions.

Observation: Newer low-carbon technologies could be considered first-of-a-kind and have a greater level of associated risk, particularly under a target to decarbonize by 2035.

42. Parties commented that the LTO’s inclusion of new generation technologies such as hydrogen-based generation, carbon capture and storage technology, and small modular nuclear reactors pose significant risks as the timing and costs of those technologies are uncertain. LEI’s analysis indicates that even with the currently assumed costs, hydrogen-based generation and natural gas with carbon capture and storage would under earn in the first 10 years of the forecast period. The Commission acknowledges that these newer technologies are not yet commercially proven in power generation applications and have a greater level of risk associated with them, which is particularly acute under a target to decarbonize by 2035.

43. Other parties submitted that the AESO has historically been overly cautious in its forecasting and has failed to accurately predict how quickly new technologies may be adopted. In particular, parties focused on the potential for energy storage to play a significant role in mitigating impacts to supply adequacy. They submitted that while the AESO’s LTO contains

¹³ Exhibit 28542-X0049.01, Expert Report - London Economics International - Cover Report, PDF page 17.

approximately 500 MW of battery storage, there is 7,000 MW of proposed storage currently in the AESO's connection process. Parties identified that storage could be used to transfer energy from periods of supply surplus, where renewables may be curtailed, to times of supply shortage. They identified that storage would be able to take advantage of the price volatility shown in the LEI Report, which indicated an increase in the number of hours with \$0/MWh prices and hours with prices greater than \$500/MWh.

Observation: Energy storage can play a role in reducing supply adequacy issues but is not a complete solution and is not expected to be economic under the current energy market and AESO tariff.

44. The Commission notes that the LEI Report finds that under the current market design, additional storage would generally not be profitable based on energy market revenues and that storage would rely on revenues from the ancillary services markets.¹⁴ The Commission accepts that storage has the potential to play a significant role in mitigating issues related to supply adequacy, however, for the benefits of storage to materialize, changes to the current market design and framework will likely be required. Stakeholders identified increasing the price cap, decreasing the price floor and creation of a storage-specific tariff as potential means to incentivize storage development.

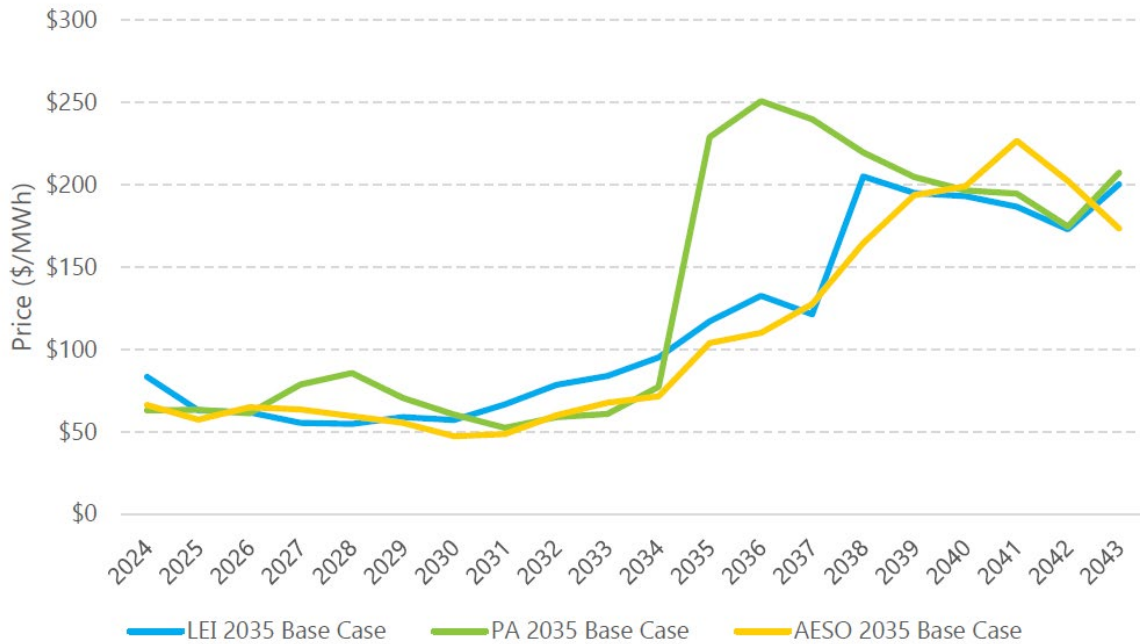
45. The Commission also recognizes that the LEI Report forecasts the potential for extreme supply adequacy events that could last up to 23 hours; currently, the most economic forms of energy storage are short term (approximately four hours in duration) and would not, on their own, be able to resolve these types of events. As such, the Commission cautions that storage is not a complete solution to the forecasted supply adequacy issues.

Observation: Given the scale of expected unserved energy, minor changes to supply mix assumptions do not alleviate supply adequacy concerns.

46. The Renewable Generators Alliance retained Power Advisory to prepare models responding to the LEI Report. Power Advisory first modelled the system using the same assumptions as LEI and the AESO and found that the results were largely in line with those of LEI and the AESO. One notable difference is that Power Advisory's model has significantly higher prices in its 2035 base case between 2035 and 2038.

¹⁴ Exhibit 28542-X0050, Expert Report - London Economics International - Annex 1 - Scenario Analysis, PDF pages 33 and 34.

Figure 4. Power Advisory 2035 base cases average annual pool price¹⁵



47. Power Advisory then modelled five different scenarios in which it added: (1) incremental gas generation, (2) incremental energy storage, (3) incremental wind and solar generation, (4) incremental gas generation and incremental energy storage and (5) incremental wind and solar generation and incremental energy storage. The different scenarios had varying degrees of impacts but generally resulted in both lower levels of expected unserved energy and lower pool prices. The hybrid scenario with incremental gas generation and incremental energy storage, in which Power Advisory included an additional 330 MW of gas generation, 795 MW of long-term (pumped hydro and compressed air) storage and 180 MW of short-term (battery) energy storage, was the most effective at reducing expected unserved energy.

48. However, it is unclear to the Commission if the additional assets that Power Advisory included would be economic. The additional generation contrasts with LEI’s findings that dispatchable generation is not earning a robust rate of return until the late 2030s. There is no analysis of the costs of the long-term energy storage in Power Advisory’s report. Further, the ability to add incremental generation may be reliant on the increased prices in Power Advisory’s base case between 2035 and 2038. Power Advisory stated that, in accordance with the draft *Clean Electricity Regulations*, it restricted fossil fuel assets to run no more than 450 hours in a year after 2035, whereas the AESO and LEI appeared to exempt coal-to-gas units from this restriction until their retirement in 2037. Power Advisory stated it was not aware of such an exemption, and thus their model restricts those units, resulting in higher prices.

¹⁵ Exhibit 28542-X0088, Renewable Generators Alliance - Attachment - Expert Report of Power Advisory LLC, PDF page 8.

49. The Commission understands that the AESO and LEI's exemption of coal-to-gas units is consistent with the current draft of the *Clean Electricity Regulations*. Annex 1 of the draft *Clean Electricity Regulations* states:

A unit that ceased burning coal and has been "significantly modified": **Starting on the latter** of January 1, 2035, or January 1st of the year after its life extension under the *Regulations Limiting Carbon Dioxide Emissions from Natural Gas-fired Generation of Electricity*, the proposed performance standard would apply. [emphasis added]

50. Because the regulations state that the performance standards could potentially start on a later date than January 1, 2035, the Commission considers that some coal-to-gas units may be able to run for more than 450 hours beyond 2035 and, as such, places greater weight on the price forecasts in the LEI Report relative to the Power Advisory Report.

51. Most importantly, Power Advisory's scenarios do not completely eliminate expected unserved energy. Expected unserved energy under the hybrid gas and storage scenario was still 2,049 MWh in 2038; above the AESO's resource adequacy threshold of 1,135 MWh. The Commission observes that even this smaller amount would be an unprecedented amount of load being shed and the Commission considers it would not be acceptable to Albertans in any category of consumer.

52. Overall, the Commission recognizes that the scenarios identified in the AESO's LTO, and therefore modelled in LEI's analysis, are unlikely to occur exactly as forecast. Ultimately, the retirement of existing assets and construction of new generation will be determined by the market, including commercial incentives in contracts. However, the Commission is satisfied that the scenarios provide relative and directional guidance on issues that may arise under the existing market design. Several parties agreed with LEI's results and confirmed they are consistent with their own modelling. Further, Power Advisory's analysis provides important evidence that even with different assumptions around supply mix, supply adequacy remains an issue.

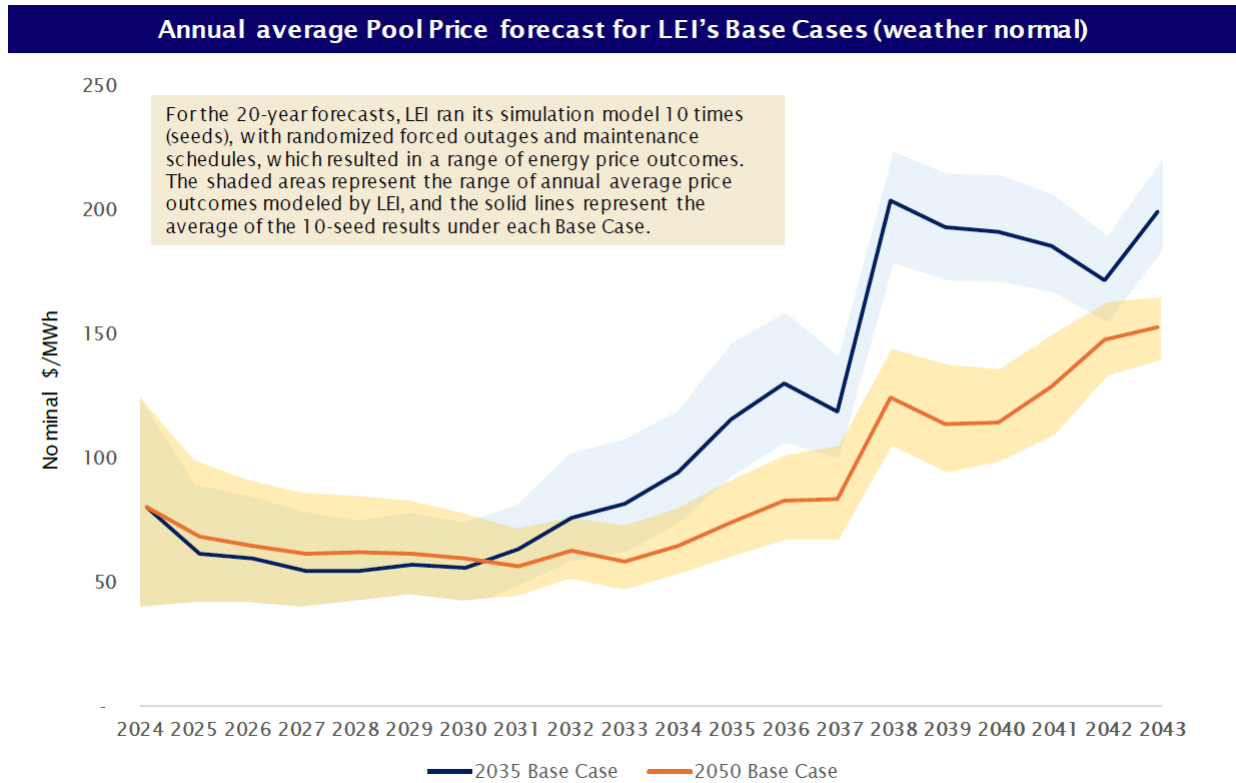
4 Affordability

53. LEI's forward-looking analysis was also used to analyze the future cost of electricity.

Observation: Under the current market design, pool prices are initially stable, but are then expected to increase at a rate above inflation in the 2030s. An increased rate of decarbonization, i.e., net zero by 2035 instead of by 2050, will exacerbate affordability issues.

54. In the short term, the LEI Report shows prices declining from the recent high levels; this is a result of the more than 2,000 MW of natural gas generation anticipated to come online in 2024. The LEI Report finds that pool prices will increase sharply in the late 2030s. It states that this increase is primarily driven by two factors: carbon costs and reliability events. The report also identifies that pool prices will become more volatile over time. While increased renewables will result in an increase in the number of zero-priced hours, a tightening capacity reserve margin will result in more frequent price spikes. As shown below, the LEI Report finds that affordability, based on pool prices, is expected to be worse under the 2035 Base Case than the 2050 Base Case.

Figure 5. Comparison of pool price forecast under 2035 and 2050 base cases¹⁶

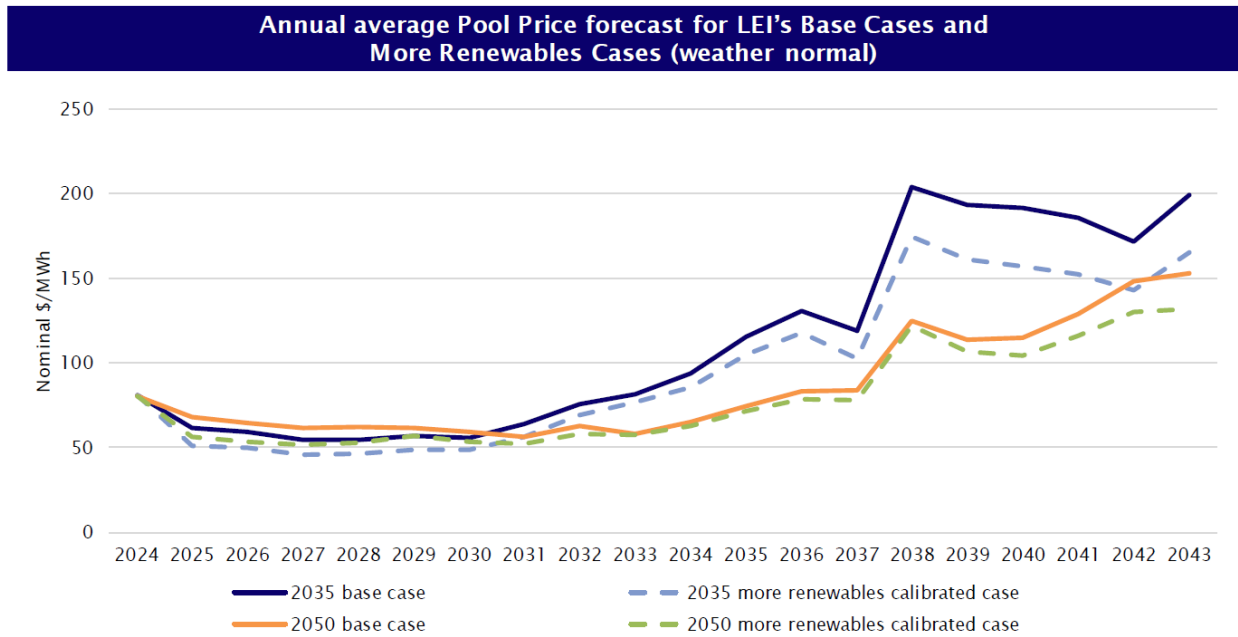


55. The LEI Report finds that residential electric bills are expected to increase at a rate greater than inflation in the later years of the forecast period. Under the 2035 Base Case, residential electric bills are expected to increase at a province-wide average compound annual growth rate of 1.9 per cent per year from 2025 to 2030 and then a much higher rate of 6.8 per cent per year from 2030 to 2040. Under the 2050 Base Case, residential electric bills increase by a compound annual growth rate of 1.6 per cent per year from 2025 to 2030 and 4.3 per cent per year from 2030 to 2040. These increases are primarily driven by the increase in pool prices rather than costs associated with transmission and distribution. Despite these higher prices, as mentioned above, consumers face a lower level of service reliability.

56. Wind and solar generally offer their energy in the market at \$0/MWh. As previously discussed, LEI developed cases with additional renewable generation. As shown below, the LEI Report finds that the increased renewables cases decrease pool prices.

¹⁶ Exhibit 28542-X0088, Renewable Generators Alliance - Attachment - Expert Report of Power Advisory LLC, PDF page 19.

Figure 6. Pool prices assuming more renewable capacity¹⁷



57. Residential bills also decreased with additional renewable generation. For example, under LEI’s 2035 More Renewables Calibrated Case, residential bills had a province-wide compound annual growth rate of 3.7 per cent, down from 4.2 per cent under the 2035 Base Case. The LEI Report showed that the estimated \$1.9 billion in additional transmission costs that would be needed to integrate the additional renewables would be more than offset by the decrease in pool prices.

58. Several parties supported LEI’s conclusion that renewables assist with affordability and emphasized that the growth of renewables has benefited the provincial economy.

59. Some parties submitted that LEI’s affordability analysis is primarily focused on residential bills, with no analysis of costs to commercial or industrial consumers. Industrial customers highlighted that transmission costs are a significant concern. They submitted the importance of changes to policies and regulations that would enable the principle of cost causation to be reflected in transmission tariffs to ensure fair and equitable cost recovery of transmission infrastructure.

60. Currently in Alberta, with few exceptions, load pays for the costs of transmission infrastructure. However, the Commission recognizes that the transition to a net-zero electric sector will continue to drive transmission costs that are not being caused by load. The AESO’s most recent Long-Term Plan identifies several major transmission projects required to integrate additional renewable generation onto the system. As such, generators, rather than load, may be in the best position to make decisions that would mitigate transmission costs. However, there is

¹⁷ Exhibit 28542-X0088, Renewable Generators Alliance - Attachment - Expert Report of Power Advisory LLC, PDF page 20.

currently little incentive and, in the Commission's view, insufficient locational signals to lead generators to make such decisions.

61. The LEI Report includes an illustrative analysis comparing the cost of acquiring electricity from the grid as opposed to installing an off-grid solution, i.e., a combined cycle gas turbine with peaker backup, for a large industrial consumer. It shows that under the 2035 Base Case, an off-grid solution will have lower levelized costs than acquiring electricity from the grid. Under the 2050 Base Case, an off-grid solution is lower in the early years but grid services would have a lower cost beyond 2031.

62. The Commission recognizes that the Minister of Affordability and Utilities has already communicated that changes to the allocation of transmission costs should be expected.¹⁸

5 Role of demand response

Observation: Demand response has some potential to mitigate supply adequacy impacts and reduce future costs to electricity consumers.

AUC Commitment: The Commission will explore demand response opportunities, including exploring time varying rates as a priority item in the near term.

63. Many parties identified that demand response could play a role in mitigating both supply adequacy and affordability issues. Parties indicated that the identified issues highlighted the need for policies that provide consumers with enhanced choice and flexibility in managing their electricity costs. They stated there is a need for improved price signals for load to respond to reliability events and to optimize the transmission and distribution systems. Parties also identified time-of-use rates as a method used in other jurisdictions that could result in significant savings.

64. While LEI did not explicitly study demand response, it did study the impacts of decreased demand in single years. These "demand-shock" scenarios, where supply mix was held constant, showed significant decreases to costs and supply adequacy events in response to decreased demands.

65. Under the 2035 Base Case, a 3.5 per cent decrease in demand, decreased annual average pool prices by 15 to 18 per cent. Under the 2050 Base Case, a similar demand decrease resulted in annual average pool prices decreasing by 13 to 16 per cent.

66. Further, the LEI Report estimated that if the supply mix were held constant, between 850 to 1,200 MW of additional dispatchable demand-side resources by 2038 could reduce unserved energy events to levels within the AESO's resource adequacy threshold.

¹⁸ Policy Guidance to the Alberta Utilities Commission, February 28, 2024.
<https://www.alberta.ca/system/files/au-minister-neudorf-letter-to-auc-20240228.pdf>

6 Stakeholder perception of the Alberta power market

67. The AUC retained FGS Longview to conduct a market perception study to review the attractiveness of Alberta's power market from an investor perspective and identify the drivers behind changes in stakeholder perceptions. The report is representative of some viewpoints but should not be taken as a comprehensive scan of all stakeholder perceptions.

Observation: Investors are concerned about the current level of policy uncertainty.

68. The FGS Longview's Report¹⁹ indicates that stakeholder perception of Alberta's power market is highly varied and changing rapidly. However, the report highlights that policy uncertainty stands out as a key factor of changing stakeholder perception among all participant groups. It states that "[p]olicy uncertainty is leading to a reduction in appetite for investment from both incumbent and non-incumbent generators as well as from providers of capital." This uncertainty has increased over the past decade, which is preventing investors from being able to accurately project future market and policy environments, and accordingly, model project revenues.

69. The FGS Longview Report states that most participants indicated that their primary concerns were short term, stemming from the unfinalized *Clean Electricity Regulations*, the provincial pause on renewables and other policy proposals being considered at the federal and provincial levels.

70. The FGS Longview Report found that participants generally agreed "that the existing energy-only model is well positioned to deliver on concurrent goals of emissions reduction and affordability, but many participants indicated that the existing market framework was not set up to deliver on reliability."

7 Conclusion

Observation: By the late 2030s, under the existing market framework, consumers would be paying significantly higher rates for electricity, while receiving a substantially lower level of reliability. Given this, changes to the energy market and policy framework are necessary.

71. The transition to a net-zero electricity sector must balance decarbonization with affordability and reliability. The large amount of expected unserved energy and the steep rise in residential bills in the 2030s shown by the LEI Report demonstrate that higher levels of renewables will have significant impacts on reliability and affordability under the existing market design. The forecast amount of expected unserved energy far exceeds what Albertans have experienced historically. This is not an acceptable outcome, particularly given the higher rates that consumers would be paying for electricity.

¹⁹ Exhibit 28542-X0047, Expert Report - FGS Longview - Market Perception Study.

72. On March 11, 2024, the Minister of Affordability and Utilities directed the AESO to work with industry and stakeholders to design a restructured energy market. As the adjudicator of changes to the AESO market rules, the Commission takes no current position on what specific market changes are required. However, the Commission finds that the current market is not sustainable in the long term.

73. Changes to the energy market were outside the scope of LEI's analysis, however, it asserted that the reliability events and large price increases identified could be averted with balanced and thoughtful modifications to the current market design. Many stakeholders supported this statement and expressed support for a continued energy-only market. The FGS Longview Report similarly found that most participants preferred maintaining the energy-only market, with minor revisions to address reliability issues.

74. Parties also emphasized the importance of consultation when considering any changes to the market. The Commission anticipates the AESO, acting on stated government policy advice, to immediately begin the consultation process to implement changes to the market in a timely manner.

Dated on March 28, 2024.

Alberta Utilities Commission

Carolyn Dahl Rees
Chair

Michael Arthur
Commission Member

Appendix 1 – Order-in Council 171/2023

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Appendix_1_Order-in
-council 2023-171.pdf

(consists of 3 pages)

Appendix 2 - London Economics International LLC expert report



Appendix 2_LEI_AUC
Renewables Inquiry C

(consists of 24 pages)



Appendix
2_LEI_Annex 1 - Scena

(consists of 49 pages)



Appendix
2_LEI_Annex 2 - Projec

(consists of 31 pages)



Appendix
2_LEI_Annex 3 - Proba

(consists of 26 pages)

Appendix 3 – FGS Longview expert report



Appendix
3_Market-Perception-
(consists of 24 pages)