

# Alberta's Pathways

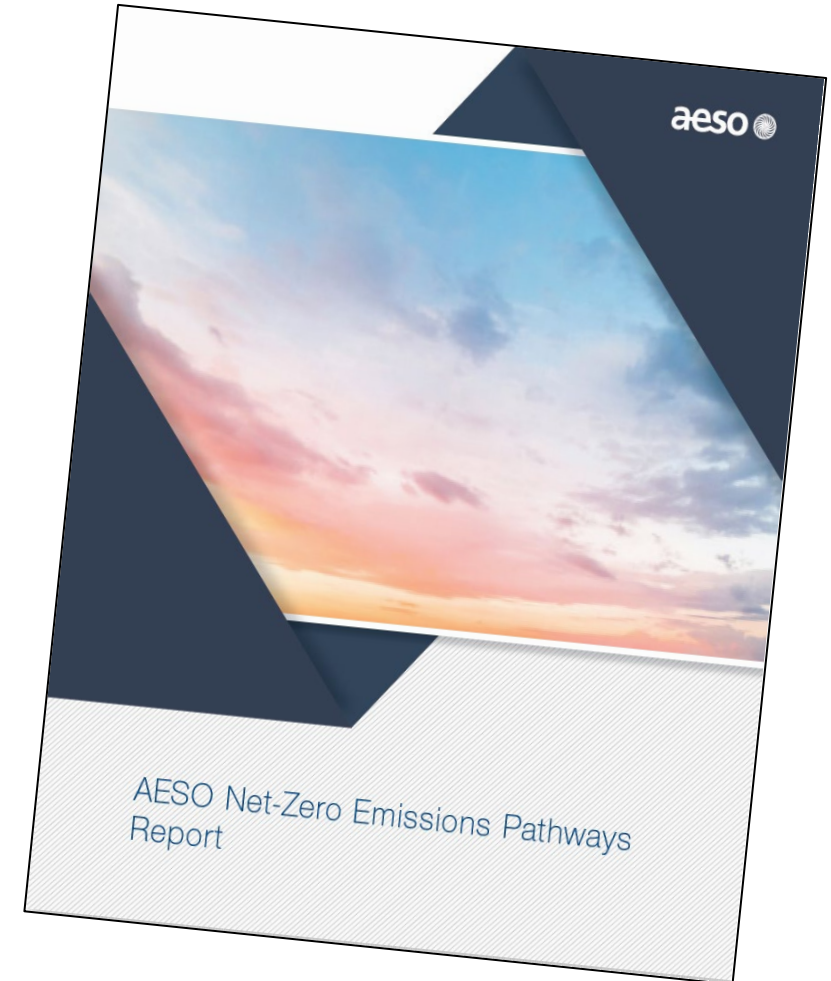
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IPPSA Annual Conference

*November 2022*

## AESO Net-Zero Emissions Pathways Report

- WHY did the AESO do this work?
- WHAT is in the report?
- WHAT did we learn?
- So WHAT?
- WHAT next?



- The intent of the report is to:
  - Provide timely insights regarding the implications of a transforming electric system
  - Focus on operational, market and cost implications of a net-zero transformation by 2035
  - Address uncertainty of future outcomes through the development of scenarios with tangible signposts for future assessment
  - Allow the AESO and stakeholders to identify and prioritize additional work and focus areas
  - Start the conversation now – understanding it will be iterative
  - NOT intended as a policy recommendation

## Included in June 2022 Report:

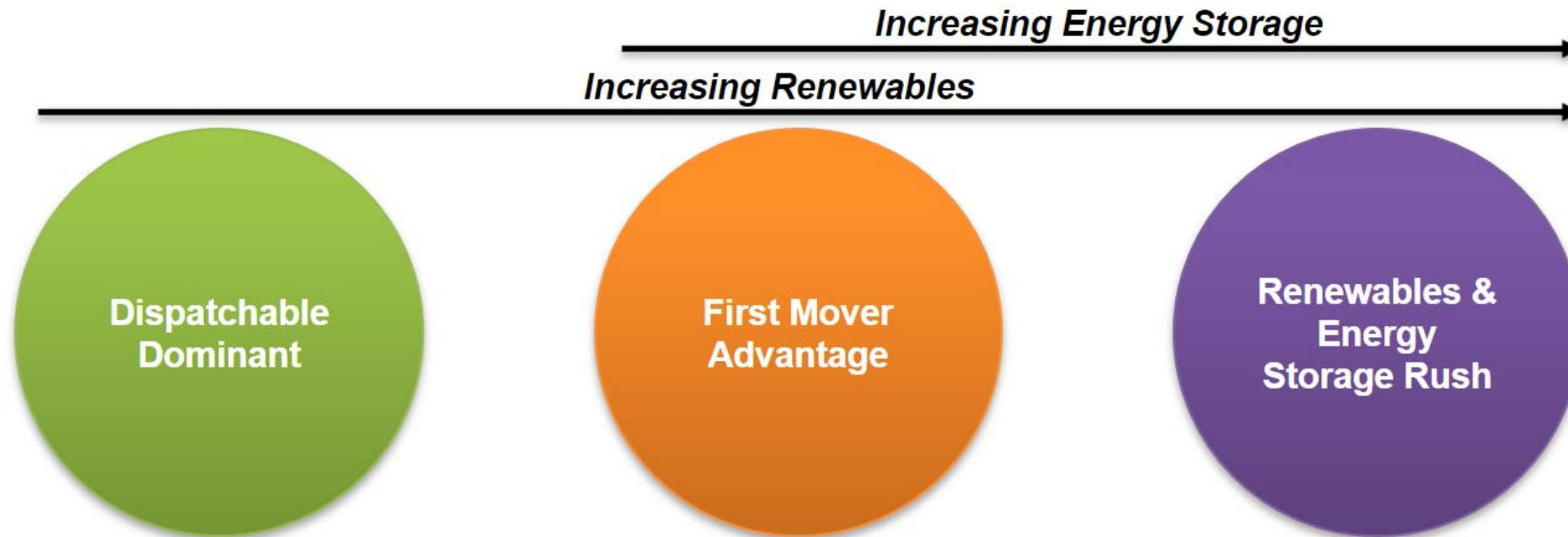
- > Electrification Scenario with sensitivity analysis
- > Three potential supply mix futures
- > Resource adequacy assessment
- > Carbon output (less oilsands)
- > High level generation cost estimates
- > High level transmission cost
- > High-level commentary on potential market and operational challenges

## Not Included in June 2022 Report:

- > Recommendation to Policy Makers
- > Market Enhancements
- > Detailed Delivered Cost of Electricity
- > Flexibility/Reliability Assessments
- > Detailed Transmission Costs and Rate Impacts

Begin conducting  
additional  
analysis starting  
Q3 2022 through  
2023 LTO / 2024  
LTP

- Recognizing our competitive market structure, there are multiple pathways that may achieve net-zero in Alberta's electricity system



1. Multiple pathways but timelines increase net-zero challenge
2. Transitioning to a net-zero electric system with increased electrification will cost \$44 to \$52 billion above baseline
  - Generation capital, O&M and transmission costs only
3. Alberta's market structure can deliver supply adequacy
  - Caveats and considerations exist
4. Offsets will be required to meet 2035 target
5. Demand growth, even considering increased electrification, is expected to be lower than historically observed rates

- There are multiple potential pathways to achieve net-zero, but all of them:
  - Are highly uncertain
  - Face significant risk to achieving the end goal by 2035
- The less than 13-year timeline is ambitious considering:
  - Policy/regulatory uncertainty
  - Layered regulatory approvals for projects
  - Technology commercialization timing and cost curves
  - Supply chain challenges
  - Long development timelines for all energy-related infrastructure

## 2. Projected Future Costs

- \$44 to \$52 billion above non-net-zero baseline represents 30%-36% increase over 20 years
  - Generation capital: 59%-71%
  - Generation Operating costs: 20%-41%
  - Transmission: 1%-10%
  - Normalized across system load, may be \$50/MWh by 2035
- The costs estimated by the AESO represent a subset of electric system costs
  - Additional work and industry discussion is required to better understand potential distribution system and integration costs
- Not an economy-wide assessment
  - Consumers may face higher costs in some areas offset by lower costs in others



### 3. Supply Adequacy and Reliability

- Alberta's market structure can deliver sufficient supply to meet demand (resource adequacy) during the net-zero transformation with the following considerations:
  - Dependent on the timing of generation entry and exit
  - Unacceptable risk exists if legacy unabated gas units exit the market and are not replaced by supply with similar operating characteristics
  - Increased demand response and flexibility can significantly decrease risk
  - Sufficient energy storage is critical to supply adequacy in a high-renewables case
  - Reliability needs (e.g. ramping capability, inertia, frequency response and system-fault response) can be negatively impacted by a net-zero transformation; further study is required

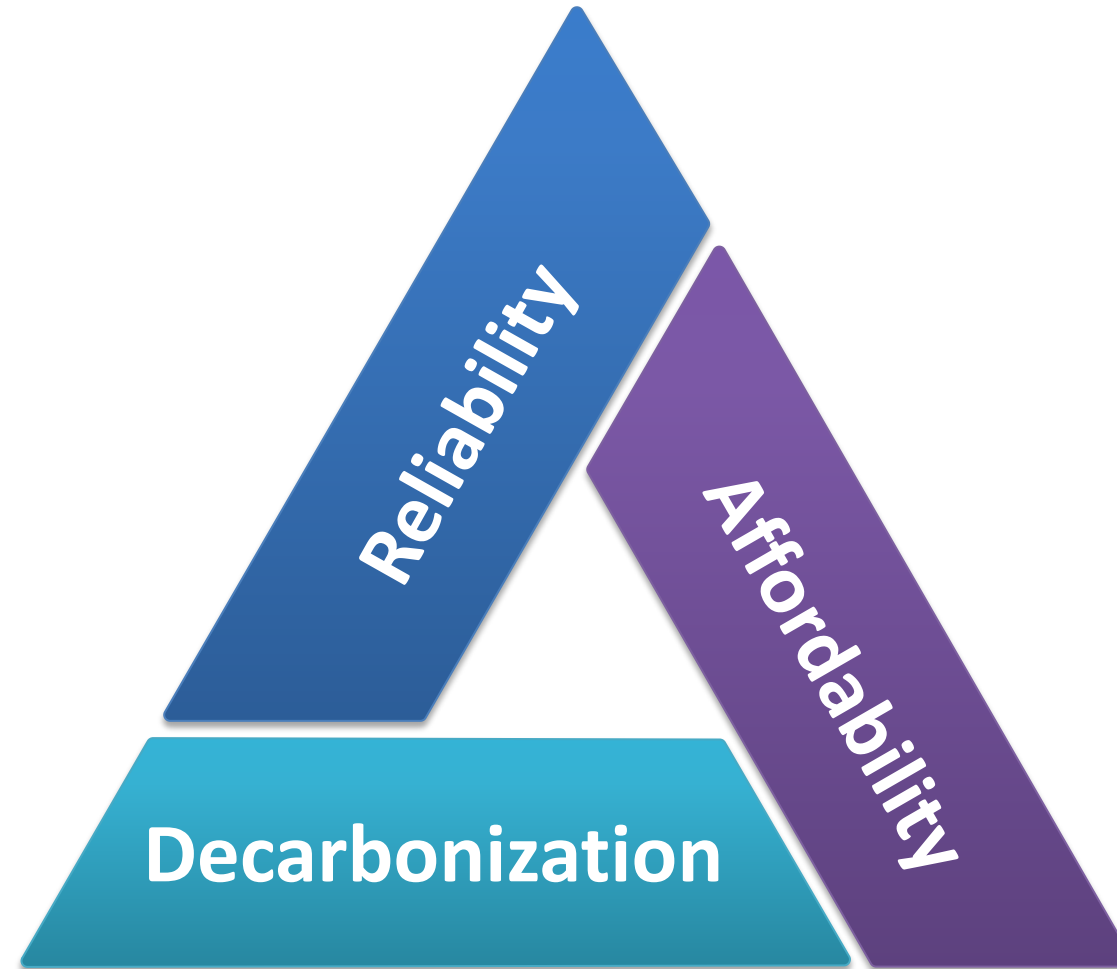
## 4. Electricity Sector Emissions

- The application of offsets will be required to achieve a net-zero electricity system by 2035
  - All scenarios modelled result in residual physical emissions
  - Abating all emissions to zero would come with rapidly increasing costs and is operationally unrealistic
  - Most cogeneration emissions are associated with industries outside the electricity sector
    - Widespread application of carbon capture and storage to these cogeneration assets would increase Alberta load by 5%

2035 Forecast Physical Greenhouse-Gas Emissions by Scenario	
2021 LTO Reference Case	17.7 Mt
Dispatchable Dominant Scenario	4.8 Mt
First-Mover Advantage Scenario	4.3 Mt
Renewable and Storage Rush Scenario	3.8 Mt

## 5. Projected Demand

- Demand growth, even considering increased electrification, is expected to be lower than historically observed rates
  - New load from transportation, heating and new industrial production are partially offset by increased rooftop solar
  - Demand will become considerably more variable over time
  - Demand growth rates accelerate post-2035 as electrification takes hold
  - Demand growth remains most sensitive to oilsands production, but EV adoption rates are expected to become a comparable source of uncertainty during the net-zero transformation
- Alberta has successfully accommodated greater demand growth in the past



- The AESO is committed to continuing to provide timely analysis and insights regarding the net-zero transformation
  - Monitor and participate in the development around policy initiatives (CER, TIER)
  - Develop a reliability requirements roadmap to identify reliability and operational challenges and potential mitigation measures
  - Identify market initiatives to support long-term sustainability and competitiveness of the energy-only market structure based on output from carbon policy analysis and assessments
  - Engage with distribution companies to better understand impacts and potential costs to the distribution system
  - Incorporate carbon policy analysis and assessments into the 2023 Long Term Outlook (LTO), which will inform the 2024 Long-Term Plan (LTP)

# Questions