Topics

- Electric industry framework
- Existing policies applicable to energy storage
- Current activities to revise existing policies and develop new policies

Please ask questions during slides!
Alberta’s electricity regulations and policies do not specifically address energy storage
You’re wondering where existing policies are sufficient and where more clarity is needed.
The existing electric industry framework does provide some guidance.
The existing framework is evolving to more directly address energy storage
Opportunities exist for you to participate in changes to address energy storage
Energy storage doesn’t clearly fit within today’s electric industry framework
The existing framework reflects a “traditional” electric system structure
In Alberta, the current electric industry structure was created in the late 1990s.

- **1996**: Wholesale competition
  - Legislated hedges and unit obligation prices
  - Transmission Administrator

- **2001**: Retail competition
  - Auction of power purchase arrangements

- **2004**: Independent system operator
Today’s structure reflects traditional electric industry functions

- Generation
- Transmission
- Distribution
- Retail

Costs estimated for 2017

- Competitive Market
  - $2.6 billion
- Cost-of-Service Regulation
  - $2.1 billion
- Performance-Based Regulation
  - $1.5 billion
- Competitive Market
  - $0.4 billion
A set of interrelated acts and regulations establish the industry structure

- Electric Utilities Act
- Hydro and Electric Energy Act
- Alberta Utilities Commission Act
- Electric Utilities Act (specific regulations)
  - Transmission Regulation
  - Micro-Generation Regulation
  - Fair, Efficient and Open Competition Regulation
The two-directional flows associated with energy storage do not align with the one-directional flows underlying the electric industry structure.
In a traditional electric industry structure, electricity flows from generators to loads.
Money flows in the opposite direction, from loads to generators
Energy storage doesn’t clearly fit this one-directional structure

144 kV

Electricity demanded from transmission system

Electricity supplied to transmission system

Battery

Icons made by Freepik from www.flaticon.com
Energy storage must comply with existing requirements even if applicability is unclear
Legislation sets general requirements, although not specifically for energy storage

- *Hydro and Electric Energy Act* requires approval of the Commission to construct and operate a power plant
  - Battery storage facility was found to be a power plant in Commission Decision 2010-012, *Installation of a Battery System at ENMAX Place*

- *Electric Utilities Act* establishes the AESO as the sole provider of system access service on the transmission system to exchange electric energy and ancillary services
Alberta Utilities Commission Rule 007 sets out requirements for facility applications

AUC Rule 007
Applications for Power Plants, Substations, Transmission Lines, Industrial System Designations and Hydro Developments
AESO connection process sets out requirements for system access service

- Market participants must identify the requirements of their projects and assist the AESO in placing the projects into an appropriate project category

- Market participants must apply to the AESO to be registered as a pool participant for the provision of energy or ancillary services or for the purchase of energy
Limitations of policies are being addressed and new policies are being developed.
Legislation can provide some policy guidance
A market participant is generally able to act freely on owned property

- Requirements for construction and operation of a power plant “do not apply to a person generating or proposing to generate electric energy solely for the person’s own use, unless the Commission otherwise directs.”
  — Hydro and Electric Energy Act, section 13(1)

- “The Commission may designate the whole or any part of an electric system as an industrial system.”
  — Hydro and Electric Energy Act, section 4(1)
Regulated functions must be separated from competitive functions

“There would appear to be no barriers to deployment of energy storage facilities as a non-regulated generation asset that could provide energy … and ancillary services …. Legislative or policy changes may be required to clarify whether energy storage technologies would be regulated as transmission or distribution assets or be left unregulated and deployed in the competitive generation market.”

— Alberta Smart Grid Inquiry, 31 Jan 2011, page 15
Costs must be attributed in accordance with legislation and rate design principles

- “The rates … must reflect the prudent costs that are reasonably attributable to each class of system access service.”
  — *Electric Utilities Act*, section 30(2)

- Costs of the transmission system must be wholly charged to loads and exporters
  — *Transmission Regulation*, section 47(a)(i)

- Rate design must satisfy principles of economic efficiency, equity, stability, and practicality
  — Commission Decision 2010-606, section 5
ISO rules set out requirements for participation of energy storage in competitive energy and ancillary services markets
Technical and operating requirements apply to facilities connected to the transmission system.
“Market rules” govern participation in the energy and ancillary services markets

- The AESO has a duty “to facilitate the operation of markets for electric energy in a manner that is fair and open and that gives all market participants wishing to participate in those markets and to exchange electric energy a reasonable opportunity to do so.”
  — *Electric Utilities Act*, section 17(b)

- Rule amendments to facilitate the integration of energy storage facilities are in final stage of consultation
Rules governing participation in competitive markets continue to be reviewed for technology neutrality

- Defined term added in 2016
  - “energy storage facility” means a facility with technologies capable of storing and releasing electric energy

- References to “generating unit” and “load” in operating reserve rules are being replaced with technology-neutral definitions for “resources”
ISO tariff governs a connection to the transmission system for the exchange of energy and ancillary services.
From an operating perspective, different facilities can have a similar impact on the transmission system.

**Generator**

**Load**

**Generator and Load**

**Storage**
Modelling suggests energy storage systems can withdraw from the transmission system to charge at any time.

![Graph showing percentage of hours discharging and charging at ≥95% of rated capacity by hour of day.](image-url)
AESO comparability study found similarities between storage and load-generation sites
Industry participants can help with existing policy revision and new policy development.
Participate in AESO tariff development
ISO tariff proceeding provides opportunity to examine rate treatment

- “[C]ost causation supports the application of Rate DTS [Demand Transmission Service] to energy storage facilities, in hours in which the energy storage facilities are withdrawing electricity from the transmission system (charging).”

- “In hours in which the energy storage facilities are supplying electricity to the transmission system, Rate STS [Supply Transmission Service] would apply.”
Many of the components of Rate DTS can be avoided or reduced through managed operation of an energy storage facility.

- **Average 20 MW Load-Only**: 100%
- **Avoid System Peak**: 37%
- **Own Your Substation**: 22%
- **Contract for Both DTS and STS**: 21%
- **Hold Charge to 10 MW**: 12%

**Monthly Rate DTS Charges**

- Connection Charge
- Ancillary Services Charges

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Energy storage projects in the connection process accelerate identification of issues

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<th>Task</th>
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<td>0</td>
<td>Identify project</td>
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<td>1</td>
<td>Connection study scope</td>
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<td>2</td>
<td>Connection proposal</td>
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<td>5</td>
<td>Construct and prepare to energize</td>
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<tr>
<td>6</td>
<td>Energize, commission and close</td>
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Participate in AESO rule development
AESO is in final stage of amending operating reserve rules

- Section 205.3, *Restatements for Operating Reserve*
- Section 205.4, *Regulating Reserve Technical Requirements and Performance Standards*
- Section 205.5, *Spinning Reserve Technical Requirements and Performance Standards*
- Section 205.6, *Supplemental Reserve Technical Requirements and Performance Standards*
AESO has formal consultation process for rules and standard development

- AESO creates new ISO rules or amends existing ISO rules as needed
  - To facilitate the safe, reliable and economic operation of the Alberta Interconnected Electric System
  - To promote a fair, efficient and openly competitive wholesale market for electricity in Alberta

- Rules consultation process will be inclusive, transparent, fair and efficient and will be understood and accepted by all parties
Opportunities also exist to engage in consultation on capacity market development and other market initiatives.
Continue to explore and advocate for integration of energy storage in the Alberta context
Energy storage may deliver “stacked” value but must be within legislated boundaries

Adapted from *State of Charge: Massachusetts Energy Storage Initiative Study* (Sep 2016)
Declining costs suggest storage will become more economically feasible

Adapted from *Large-Scale Energy Storage Systems* report by GTM Research (Oct 2017)
Some studies suggest optimal storage capacity is 10% of system load

10% = 1,200 MW in Alberta

- Hossein Safaeia and David W. Keith, “How much bulk energy storage is needed to decarbonize electricity?”, *Energy & Environmental Science* (Sep 2015)
The existing electric industry framework does provide some guidance
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Opportunities exist for you to participate in changes to address energy storage
Thank you

John Martin
john.martin@aeso.ca
403-539-2465