

# Transmission System Developments Stakeholders Update Session

October 27, 2021

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## *OUR ENGAGEMENT PRINCIPLES*

**Inclusive and Accessible**

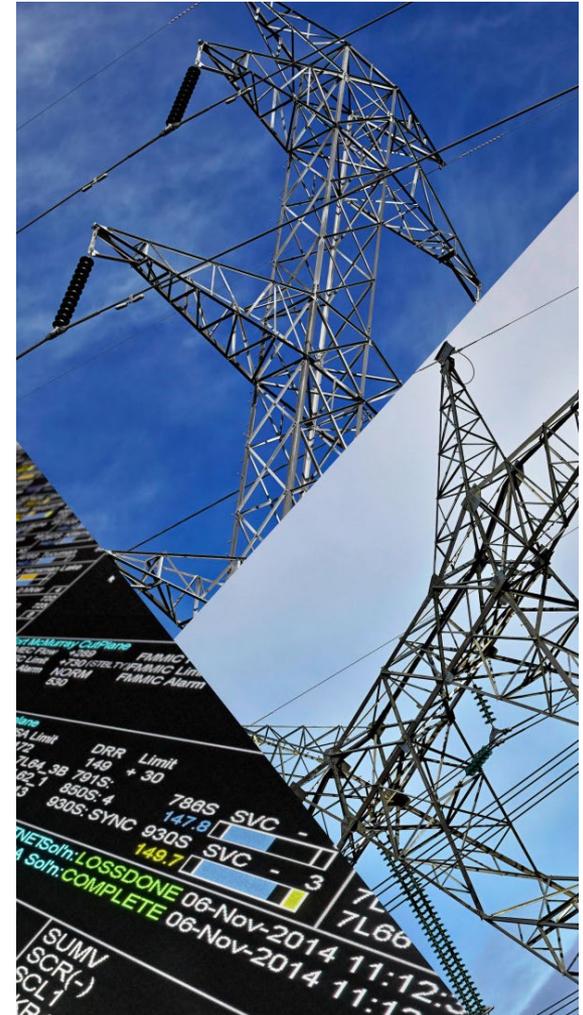
**Strategic and Coordinated**

**Transparent and Timely**

**Customized and Meaningful**

- Objective and background
- PENV status update
- CETO status update
- CRPC status update
- Alberta-BC intertie restoration status update
- Southeast area transmission need
- Mitigation for double circuit contingency
- City of Edmonton transmission reinforcement
- Transmission access and managing congestion

- Responsible for safe, reliable, economic planning and operation of Alberta Interconnected Electric System (AIES)
- AESO is a not-for-profit, statutory corporation; independent of government and industry:
  - Governed by independent board appointed by Minister of Energy
  - Must operate in the public interest
  - No financial interest in any generation unit, transmission or distribution infrastructure
  - No government funding; costs recovered from Alberta ratepayers
- Highest visibility of Alberta electricity sector



- Provide updates on the status of major transmission projects and identify the next opportunity for stakeholder involvement
- Outline the potential cost savings to ratepayers in deferring major transmission projects while maintaining system reliability
- Create awareness of current challenges on the transmission system as it continues to evolve

- Considerable transmission investment has been made in past years to enable continued system reliability and to support a fair, efficient, and openly competitive wholesale electricity market
- The AESO is seeking ways to defer transmission infrastructure to maintain or reduce transmission rates while maintaining system reliability within the current market and policy framework
  - Optimize the use of existing transmission system
  - Closer timing of new transmission infrastructure to when it is needed
- Deferral of some of the major transmission projects will save ratepayers in the range of \$100M to \$150M
- The AESO will continue to keep stakeholders informed on the next steps of major system projects
- The AESO remains open to additional feedback on our journey to continuously improve in this area

# Transmission System Developments

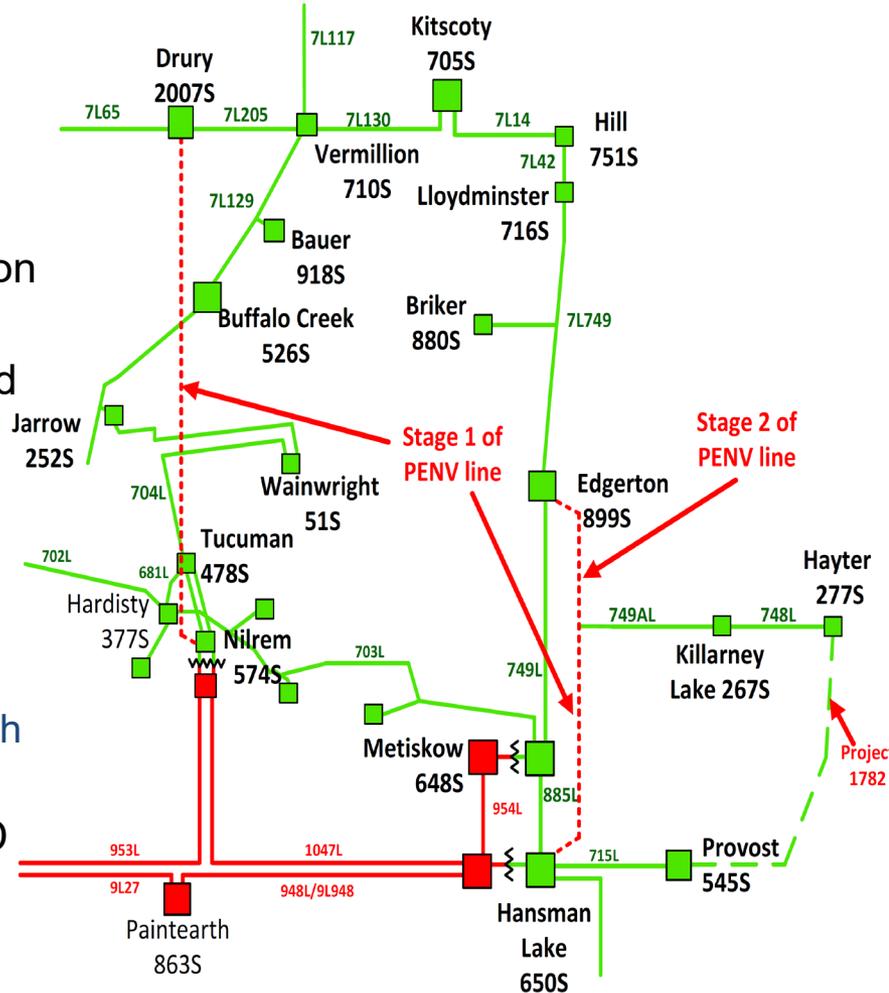
## Status Update

## **PENV Status Update**

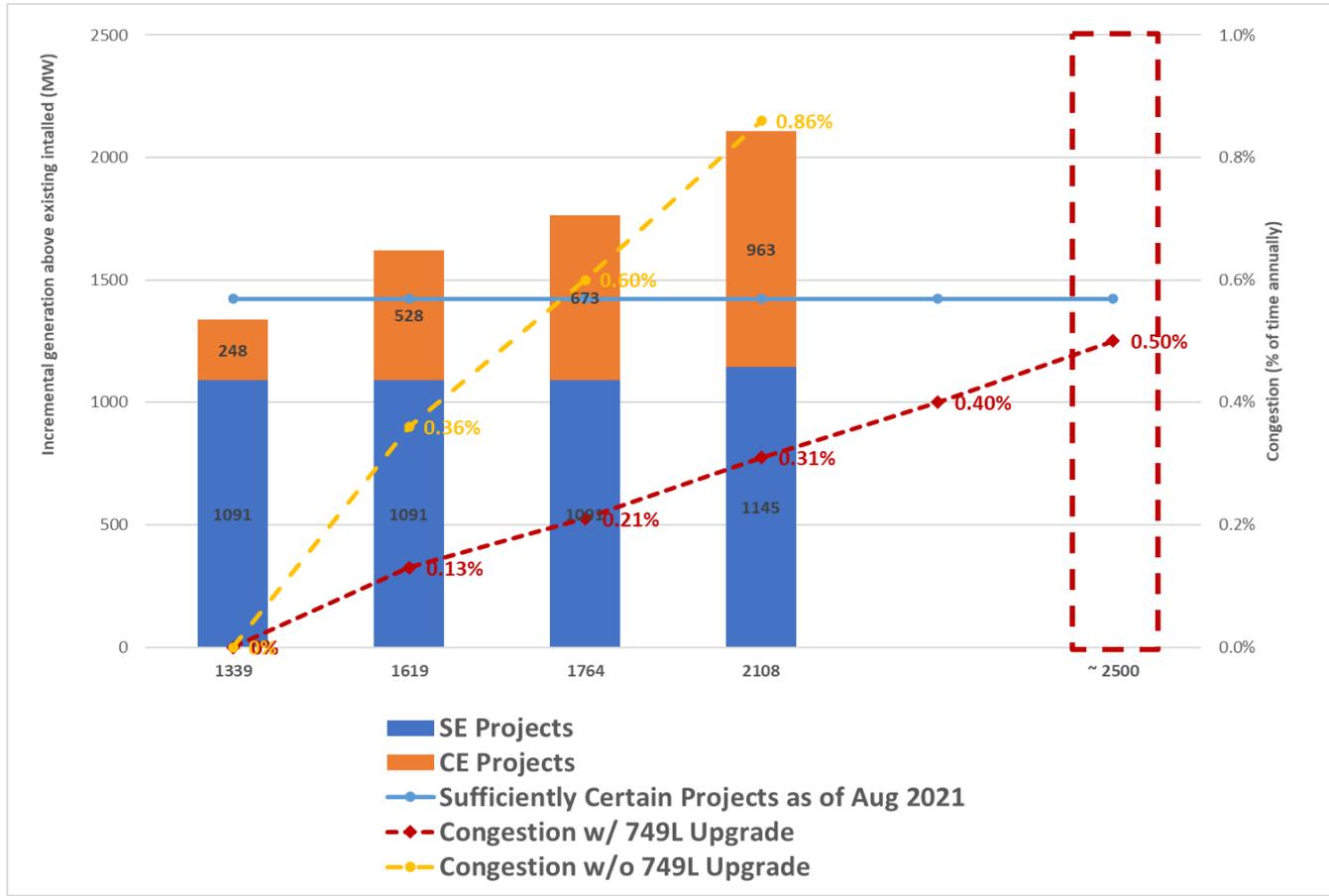
Provost to Edgerton and Nilrem to Vermilion  
(PENV)

# Deferring construction of \$300M PENV project by 2 to 3 years until congestion is expected

- PENV NID filed in 2018, using deterministic approach
- No congestion-based construction milestone trigger was used for Stage 1
- TFOs Permit and License (“P&L”) approvals denied by AUC in September
- Assessing timing of requesting TFOs to re-engage on P&L process
- Congestion analysis completed using size, type, and location of projects in connection process
- AESO not triggering construction until congestion levels confidently forecasted to exceed 0.5%
  - When sufficiently certain generation reaches approx. 2500 MW, currently at 1400 MW
  - Directing TFO to upgrade 749L for \$500K to push timing out by at least 2 to 3 years
- Updated load forecasts 20% lower than in 2018 NID
- Stage 2 trigger based on 749L overloads
- Saves ratepayers \$30M - \$50M



# Congestion analysis confirms ability to defer, and 749L upgrade provides 800 MW+ additional integration



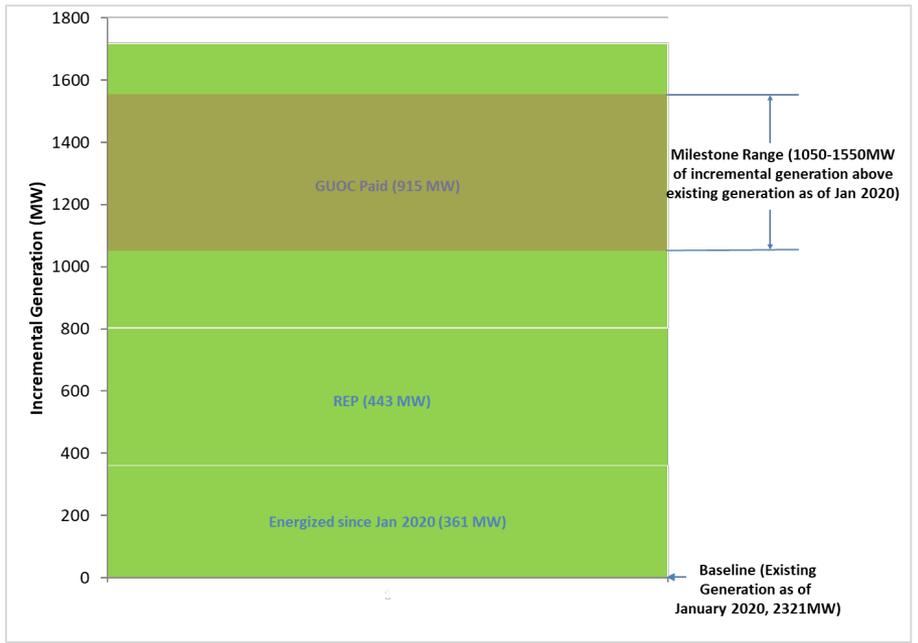
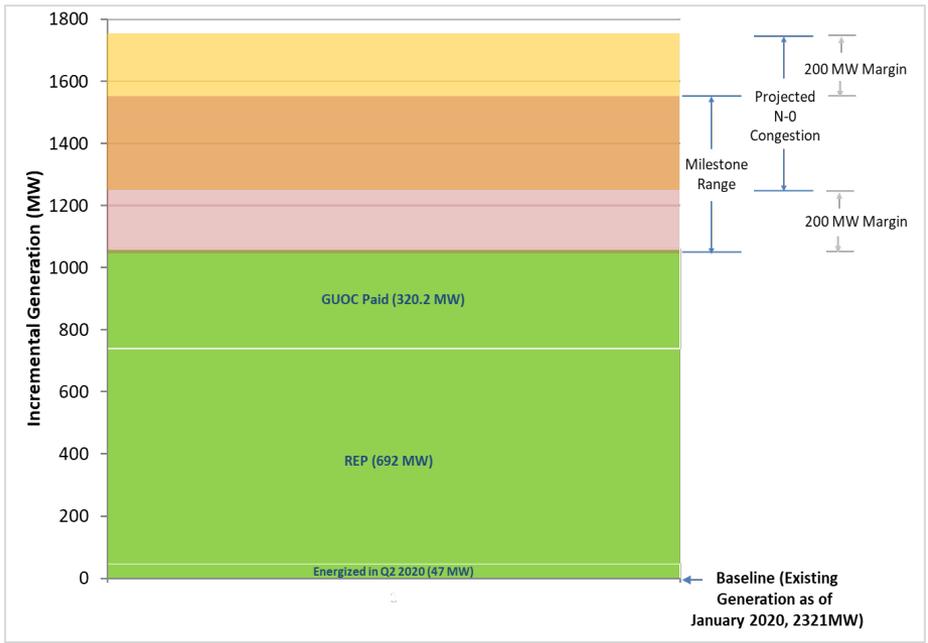
- The pace of actual load growth has also been slower compared to the NID forecast

	PENV Application (2017LTO)				AESO's 2021LTO			
	2021SP	2021WP	2027SP	2027WP	2022SP	2022WP	2026SP	2026WP
PENV area load (MW)	477	536	494	545	424	482	466	512

# CETO Status Update

Central East Transfer Out (CETO)

# CETO upper limit milestone has been reached, initiating re-affirmation study in Q4



Projects meeting certainty criteria as of August 2020 (CETO NID Application)

Projects meeting certainty criteria as of October 2021

# AESO will engage stakeholders on key re-affirmation study assumptions

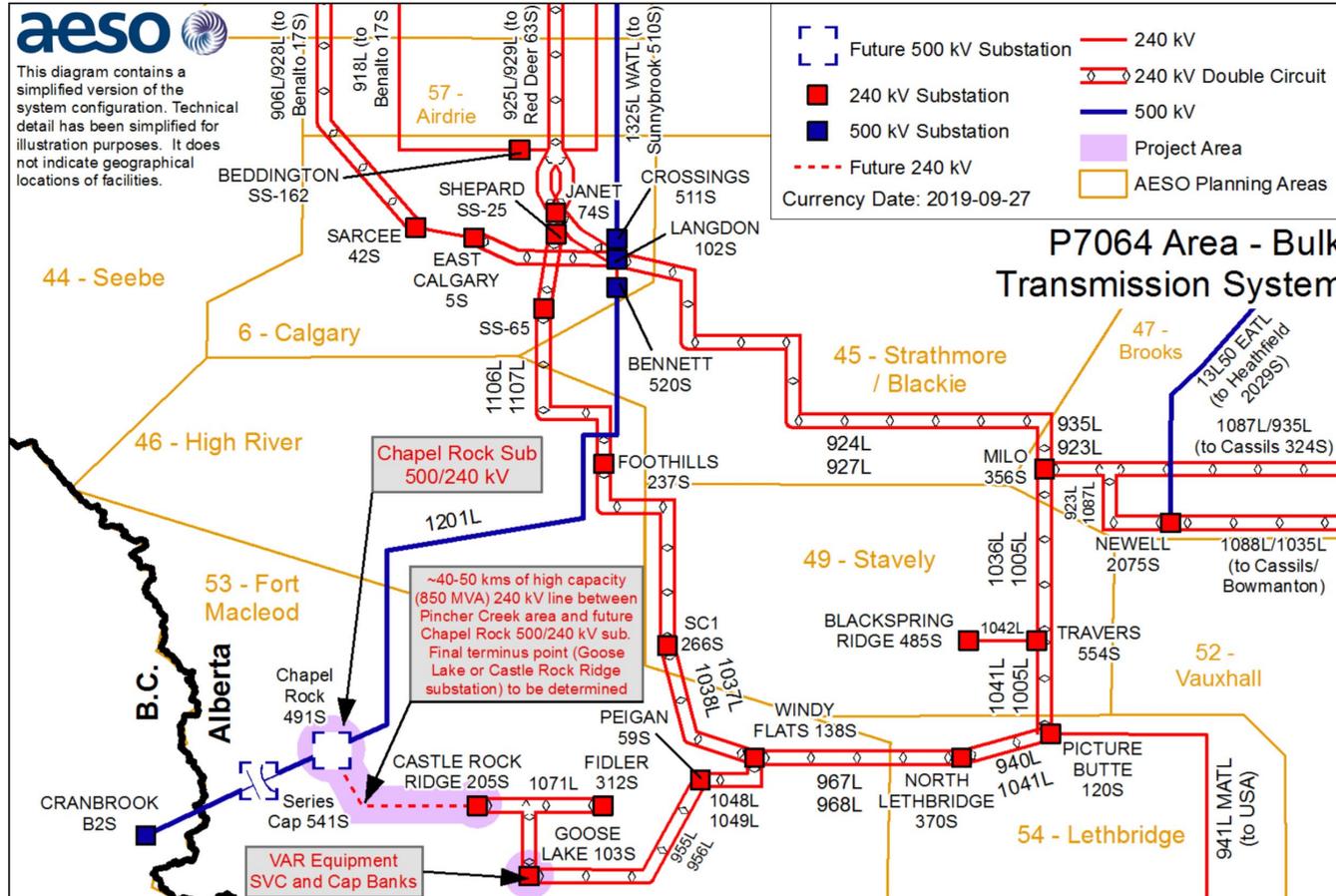
- The AESO's NID and the TFOs' FA were approved in August 2021
- The AESO will engage stakeholders in late Nov/early Dec to share and seek input on the re-affirmation study assumptions and complete the congestion reaffirmation study in Q1 2022
- The re-affirmation study will provide an updated forecast of congestion in the region and assist in determining timing of construction trigger
- Preliminary analysis has been performed and indicates additional generation can be accommodated prior to triggering construction
- The re-affirmation study results will be provided to the AUC and published on our website

# CRPC Status Update

Chapel Rock to Pincher Creek (CRPC)

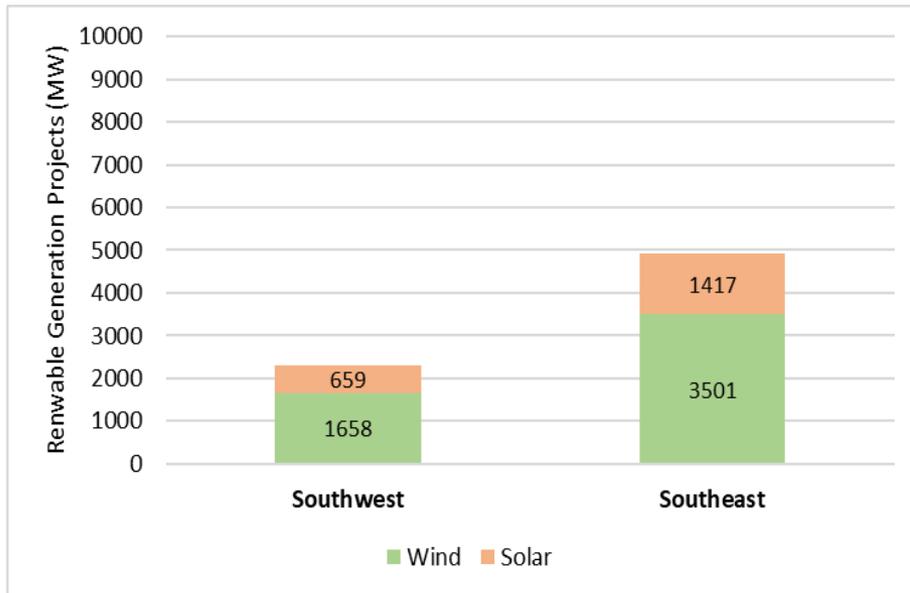
# The proposed CRPC Tx development

- CRPC is primarily needed to integrate generation in the SW

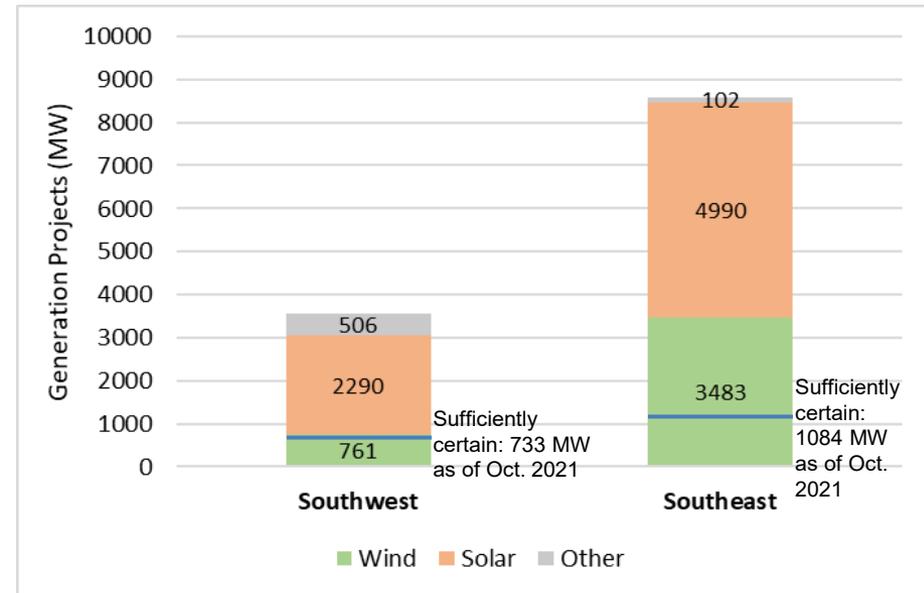


# Generation supply mix changing in CRPC area

- The need for CRPC is less urgent due to changes in the type and location of renewables generation in the past few years:
  - The change in mix of solar and wind provides diversity in generation pattern
  - Pace of renewable generation development reaching sufficiently certain criteria is slower than other regions such as the SE even though total generation in connection list increased



Wind and solar generation projects in May 2017



Currently active generation projects as of October 2021

# Preliminary congestion analysis confirms time is still available

Total Generation	Congestion
Existing gen. + sufficiently certain projects as of July 2021	0%
Existing gen. + sufficiently certain projects as of July 2021 + 2000 MW of projects in SW & SE	0.25%
Existing gen. + sufficiently certain projects as of July 2021 + 2000 MW of projects in SW & SE + 650 MW of projects in SW & SE	0.9%

# CPRC timing will depend on pace of generation developments

- The AESO continues to monitor generation developments in the area and plans to file the CRPC project approximately 3 to 4 years in advance of the need
  - 2 to 3 years will be required to construct the transmission facilities
  - Approximately 1 year will be required for NID and FA approvals
- The AESO has delayed filing CRPC NID already by a year, and will delay filing by at least one more year based on congestion analysis and pace of generation moving to sufficient certainty
  - a 2-year delay will save ratepayers \$70M
- The AESO will file the project with a construction milestone tied to sufficiently certain generation, using congestion analysis to set the milestone ranges

- Alberta-BC intertie restoration entails increasing transfer capability up to or near the path rating
- The existing constraints are voltage stability, equipment ratings, and the frequency performance of the Alberta system
  - The frequency performance limit depends on the availability of Load Shed for Import (LSSi) services, which can restrict available transfer capability (ATC)
  - The Bennett transformer rating limits total transfer capability (TTC) to the current value
  - The voltage stability limit is very close to the current equipment rating limit
- The AESO's considerations for intertie restoration include:
  - Improving the system's frequency performance
  - Increasing the ratings of the Bennett transformer
  - Increasing voltage stability using a series capacitor or lower-cost alternative
  - A further increase in voltage stability occurs when CRPC is in service
- We are investigating opportunities for reducing the cost of intertie restoration

# SE Development Update



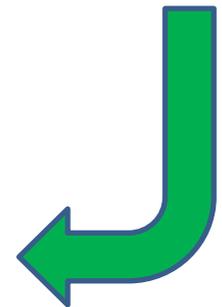
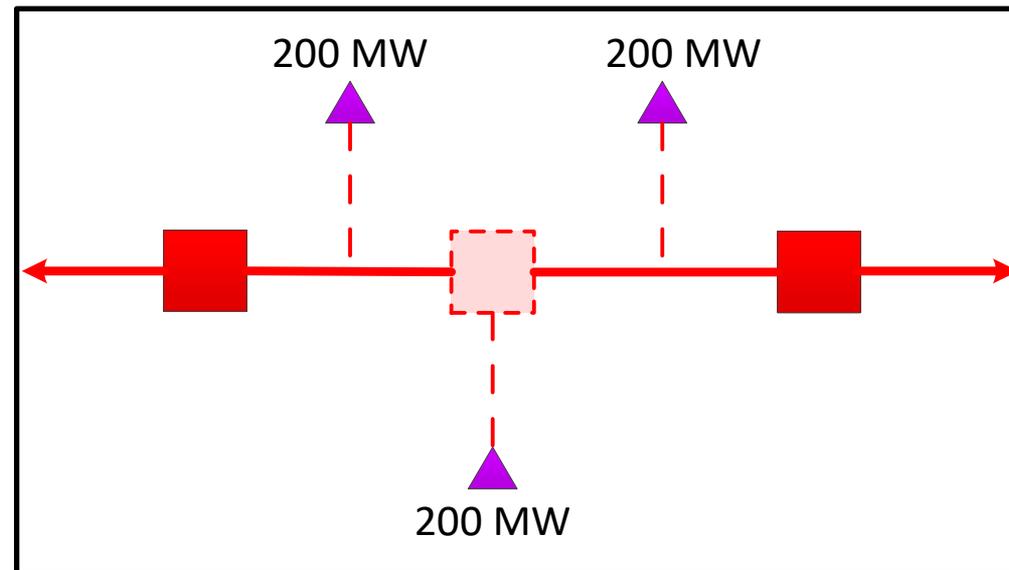
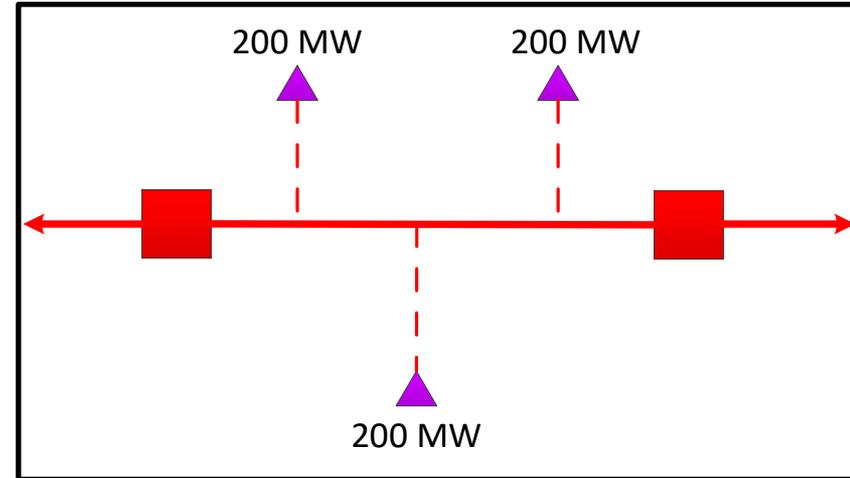
- Integrate additional generation in the SE
- Address double circuit contingency reliability risk on 240kV Cassils/Newell – Bowmanton – Whitla (CBW) path
- Offload 138 kV local network to enable generation connections to constrained 138 kV path

# Reliability challenges emerging in the SE as more generation connects

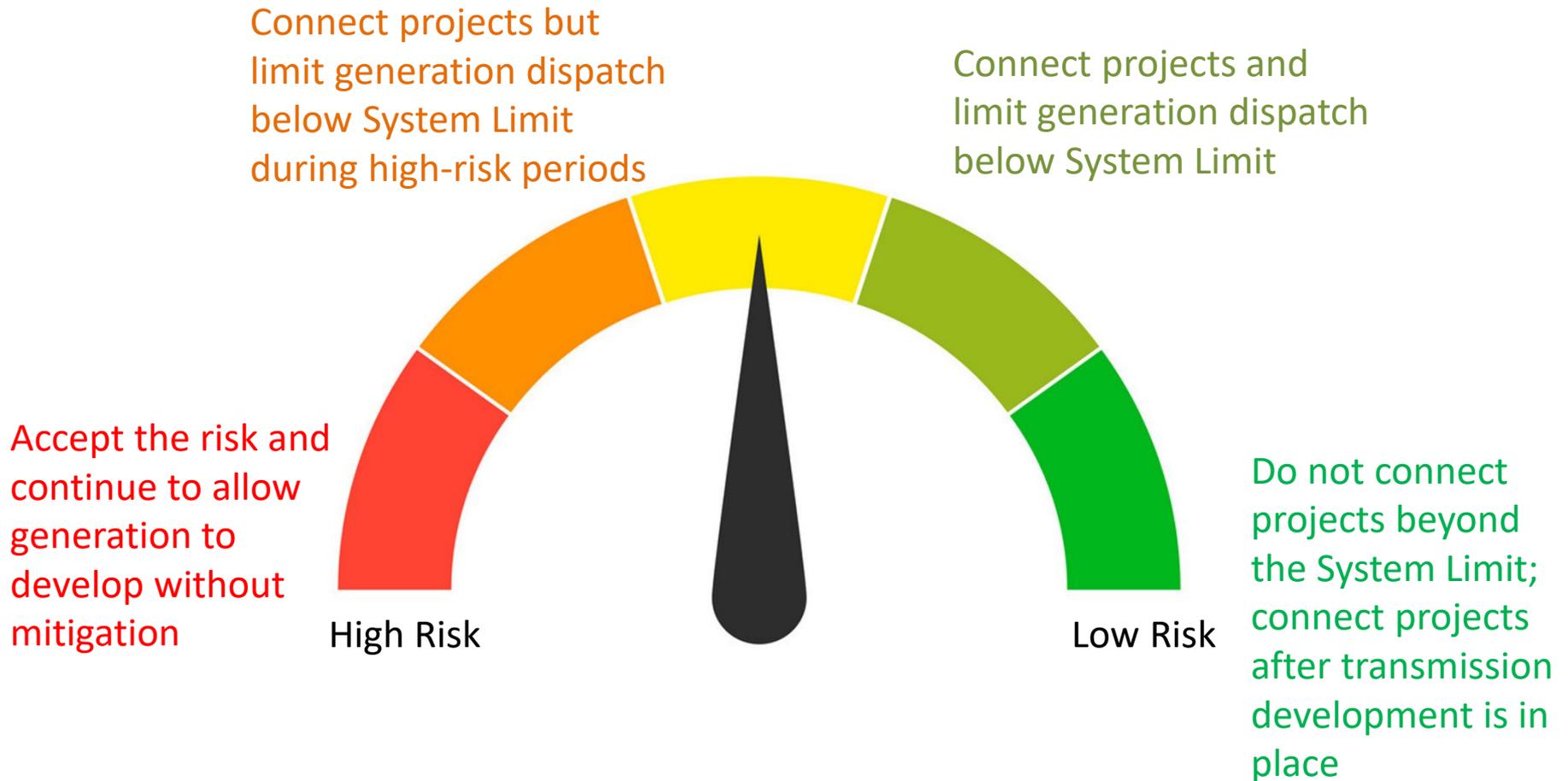
- As more and more generation connects to the 240 kV CBW east of Milo substation, reliability concerns start to emerge
  - Potential voltage violation at Bowmanton
  - Potential stability challenge
  - Loss of the double circuit 240 kV line (C5 Event) results in a large loss of generation that could lead to large system collapse
  - Loss of line segments with generation in excess of MSSC
- The AESO is considering different ways to mitigate potential near-term reliability challenges due to the loss of the 240 kV double circuit line

# Most Severe Single Contingency (MSSC) applies to total generation connected to lines

- MSSC is currently 466 MW under normal condition
- Important for system reliability and reserve planning
- In-and-out configuration with new substation is the most common solution to ensure total generation loss is  $<$  MSSC

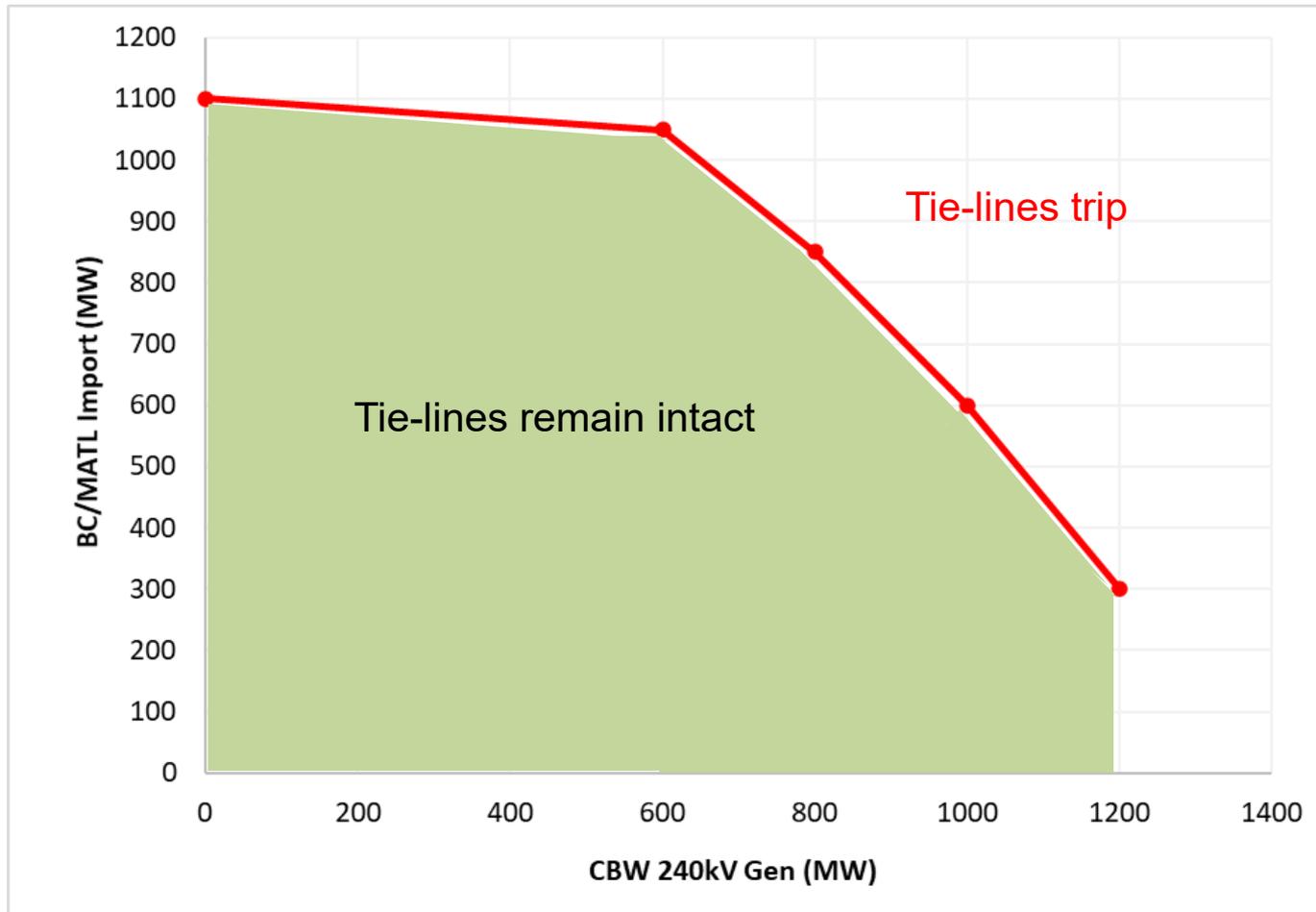


# Potential approaches to mitigate risks of a double circuit contingency

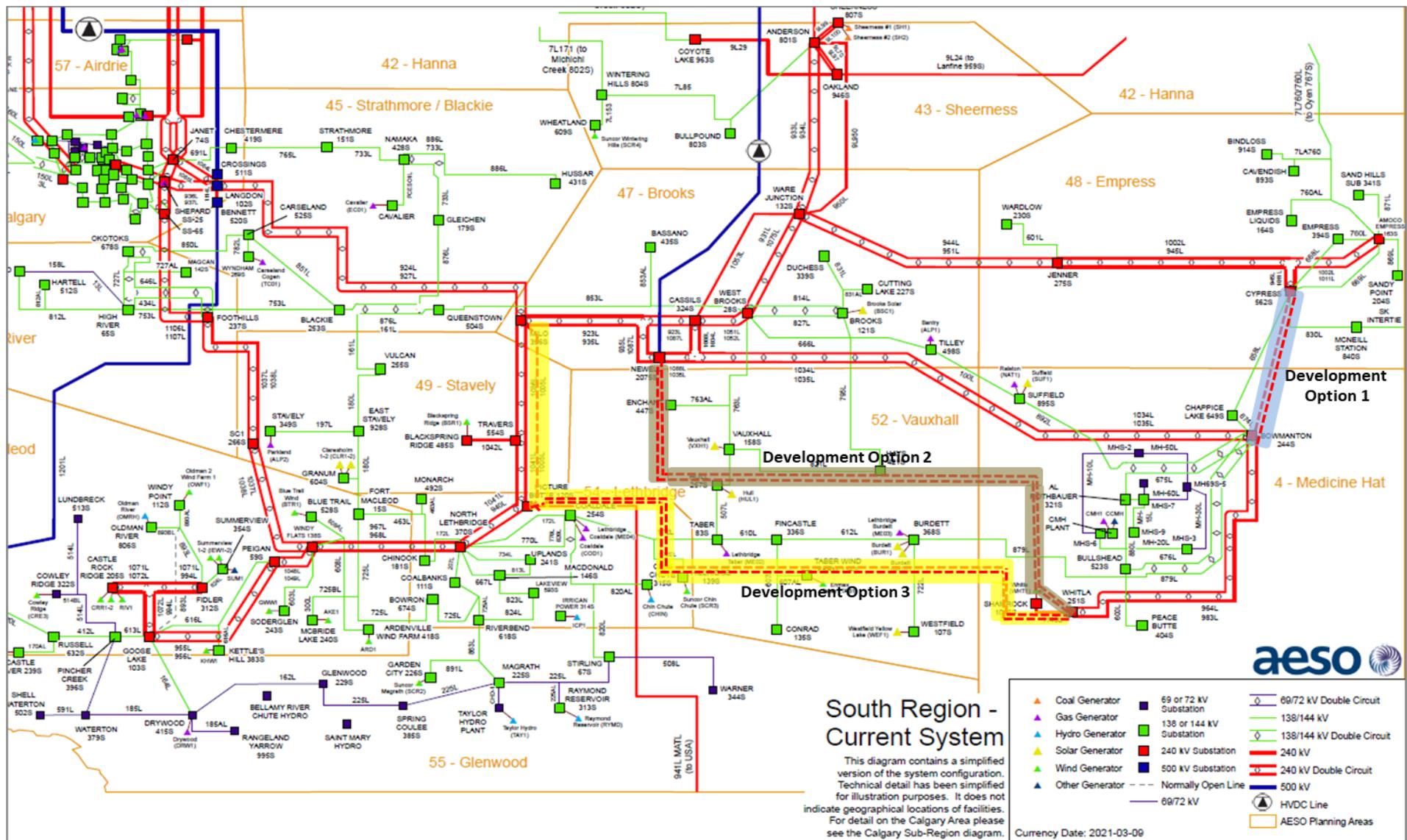


# C5 risk envelope based on combination of loss of CBW generation and BC/MATL Import level

- If the tie-lines trip, large load shedding will occur, essentially equal to the combined loss of generation and intertie flows



# Three initial conceptual transmission options under consideration



## South Region - Current System

This diagram contains a simplified version of the system configuration. Technical detail has been simplified for illustration purposes. It does not indicate geographical locations of facilities. For detail on the Calgary Area please see the Calgary Sub-Region diagram.

▲ Coal Generator	■ 69 or 72 kV Substation	○ 69/72 kV Double Circuit
▲ Gas Generator	■ 138 or 144 kV Substation	○ 138/144 kV Double Circuit
▲ Hydro Generator	■ 240 kV Substation	○ 240 kV Double Circuit
▲ Solar Generator	■ 500 kV Substation	○ 500 kV
▲ Wind Generator	--- Normally Open Line	○ HVDC Line
▲ Other Generator	○ 69/72 kV	○ AESO Planning Areas

Currency Date: 2021-03-09

# High level comparison of the conceptual transmission options

Option	Line Length (km)	Prelim. Cost (\$M)	Address voltage concern on CBW path	Address system frequency instability concern under CBW C5 contingency	Other benefits and detractions
1	65 D/C	200	√	<b>X</b>	<ul style="list-style-type: none"> <li>• Lower potential land and environmental impact</li> <li>• Additional transmission reinforcement may be required in areas served by 138 kV network</li> </ul>
2	160 D/C	450	√	√	<ul style="list-style-type: none"> <li>• Provide transmission system access for future generation in the area</li> <li>• Higher potential land and environmental impact</li> </ul>
3	140 (Whitla-Picture Butte D/C) + 80 (Picture Butte – Milo S/C)	500	√	√	<ul style="list-style-type: none"> <li>• Provide transmission system access for future generation in the area</li> <li>• Relieve potential congestion along Picture Butte – Milo path</li> <li>• Higher potential land and environmental impact</li> </ul>

# Edmonton Development Update

- Kennedale substation requires near-term mitigation to address load growth and thermal overloads
- The 72 kV underground cables supplying Kennedale substation are at end-of-life
- The AESO and EPCOR are working together to develop an integrated solution
  - A distribution feeder (\$1M) is being constructed to transfer load away from Kennedale as short-term relief, deferring transmission by 3 years saving \$30M
  - Transmission alternatives being assessed to determine optimal solution to address underground cables end-of-life and load growth requirements

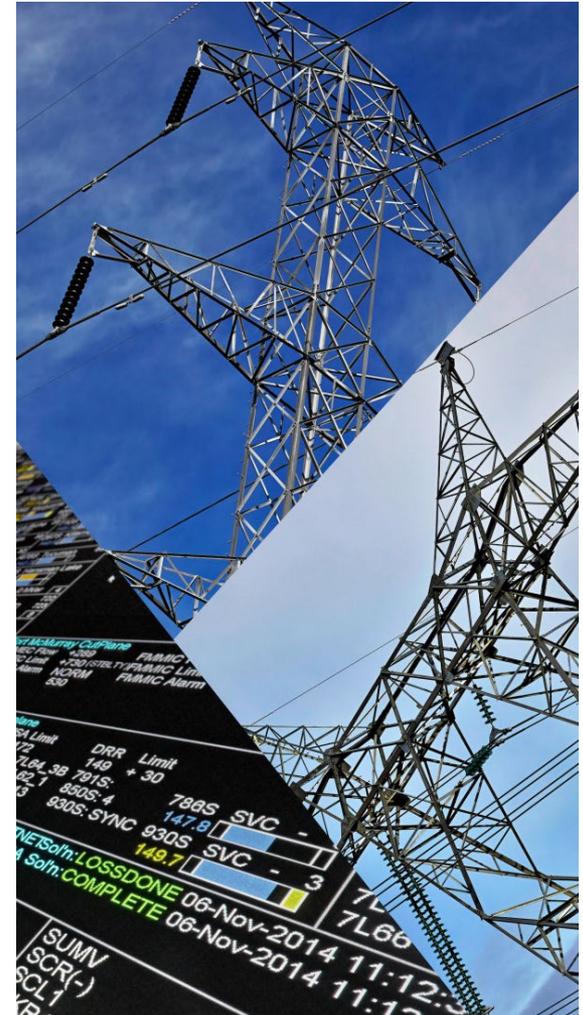
- Rebuild the existing 72 kV system using the same configuration with higher rated facilities
- Rebuild the existing 72 kV system using the same configuration with much higher rated facilities and operate them normally closed
- New 240 kV substation supplied from the east with a future extension to Victoria substation
- New 240 kV substation supplied from the north
- New 138 kV substation supplied from the north
- New 240 substation supplied from the east with a future extension to Victoria substation, and re-configure the 72 kV system in the NE
- New ring bus at Kennedale substation

# Transmission Access & Managing Congestion

- The AESO plans the transmission system and operates the AIES
- The AESO must also provide system access service on the transmission system in a manner that gives all market participants (MPs) wishing to exchange electric energy and ancillary services a reasonable opportunity to do so (EUA, s. 29)
- The AESO is the sole provider of system access service (service obtained by MPs through a connection to the AIES)
- The AESO has established its Connection Process to respond to requests received from MPs for system access service
- If the AESO determines that a project requires the development of transmission facilities, a needs identification document (NID) will be submitted to the Commission for approval

# No Transmission Rights

- There are no transmission rights or rights to reserve transmission capacity in Alberta at any stage of the AESO's connection process or after a project is energized
- The Supply Transmission Service (STS) confirms the ability to supply to the STS level at the connection point
- Forecasted future congestion risk may exist at the time of connection or may occur after the connection as other supply or load connections occur in the future
- Congestion risk is managed in real time using the Transmission Constraint Management rule and process



The AESO assesses the following as part of the AESO's Connection Process:

- how best to address the market participant's request for SAS, including whether transmission development is needed
- In its assessment the AESO studies the MP's STS request, determines the preferred connection alternative and potential mitigation measures (e.g. RAS) based on the results of its studies
- the capacity that the connection and AIES can accommodate

- When needed, AESO uses congestion analysis to identify the congestion risk and/or system development need to address the congestion in planning horizon
- A MP should take congestion risks into consideration when submitting a SASR and progressing through the connection process
- If the AESO determines there is forecasted congestion that needs to be addressed, the AESO will proceed with a system plan

Thank you

# Contact the AESO

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