



# Flexibility Enhancements

Alberta Needs and Experience from Other Jurisdictions

PREPARED FOR

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August 15, 2017

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# Meeting Alberta's Growing Flexibility Needs

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- Alberta has an outlook for growing flexibility needs due to coal retirements and increasing renewable penetration
  - Intermittent supply will replace dispatchable supply, increasing net load volatility
  - Creates a new reality for system operations not anticipated at the time the current energy and ancillary service markets were designed
  - Many resource entry, exit, and gas repowering decisions over the coming years. Decisions should be incentivized to adequately consider future system flexibility needs
- Questions in the context of capacity market design are:
  - What are the biggest flexibility concerns and when will they arise?
  - How will flexibility needs be met reliably and cost-effectively in the operational timeframe (energy and ancillary markets)?
  - How do operational needs translate into ensuring sufficient incentives at the investment timeframe (capacity market)?
  - How can the energy, ancillary, and capacity markets work together to meet flexibility needs?
  - When should the chosen market design options be implemented?
- Ultimately, a coherent energy, ancillary, and capacity market design can work together to address flexibility challenges across both the operations timeframe and the investment timeframe

# Framework for Approaching Flexibility Reforms

- Start with a clear definition of flexibility needs
- The need can be translated into products/revenue streams that create efficient incentives in two timeframes:
  - **Operational Incentives:** Ensure that Alberta is making the best possible use of existing resources (including inerties, gas plants, DR)
  - **Investment Incentives:** Created partly through E&AS markets, and reinforced through capacity market design choices that align with the underlying need for operational capability
- Recommend starting design effort by examining the operating timeframe, even though capacity market elements may be implemented first:
  - Reduce barriers to resources participating in E&AS markets
  - Ensure flexible resources can be deployed effectively (e.g. enable inerties and DR to respond quickly)
  - Ensure flexible capacity design elements (if any are needed) focus on actual, unmet flexibility requirements
  - Consider a capacity product defined as resources' ELCC, so it can evolve to address flexibility-related loss of load events when they develop



# Defining Flexibility Needs

The first step is to identify if a flexibility concern exists. The nature and quantity of flexibility needs can be determined through a combination of reliability and economic analysis:



## Reliability Analyses

- Security analyses of inertia, frequency control, voltage support needs
- Estimate load-shed quantities classified by shortages of peak supply, multi-hour ramp, 10-min ramp, etc.
- Estimate load-shed and intermittent resource curtailments vs. quantity of AS for each product type considered
- Evaluate reliability value of resources with different technical capabilities
- Evaluate total quantity of installed capability needed for each AS and energy product to meet reliability standard

## Economic Analyses

- Evaluate total cost of investments, fuel, wind curtailments, emissions, and reliability events
- Examine costs at different quantities of AS products, as well as varying quantities of generic capacity and flexible capacity
- Review investment incentives for generic capacity and “flexible” capacity realized from energy and AS markets
- If a deficit of AS-capable resources would exist, translate AS need into a flexible capacity requirement

**If insufficient flexibility is a concern, define products and qualification standards in both E&AS (for operational dispatch) and, if needed, capacity markets (for investments)**

# Flexibility Needs: Are E&AS Markets Sufficient?

**A key question for Alberta is whether a flexible resource requirement should be imposed in the capacity market. Decision is analogous to the choice between an energy-only or capacity market design**

## Rationale for Relying Only on Energy and Ancillary Markets

- If sufficient resources exist, reducing barriers and E&AS reforms should be able to address operational flexibility needs. E&AS reforms may also be enough to attract new flexible resources
- Strong signals for flexibility are needed for efficient operations (with or without a flexible capacity requirement)
- Create the most targeted incentives for the exact nature of flexibility services needed (flexible resource requirements are a more blunt instrument)
- Contribute investment incentives favoring more flexible resources (making them more competitive in the capacity market)
- If energy and ancillary service price formation are perfectly efficient and reflect shortage costs from lack of flexibility, then the optimal quantity of flexible resources should be attracted or retained in the market
- Roadmap of future E&AS reforms will be considered in investment decisions today (e.g. gas retrofits)

## Rationale for Introducing Flexible Capacity Requirements

- Without sufficient physical resources, flexible capacity requirements might be needed.
- No guarantee of what quantity of flexible resources will be attracted (efficient quantity may be less than desired from a reliability perspective)
- Forward planning certainty that flexible resources will be installed
- Forward market supports orderly entry and exit of flexible supplies at coordinated times (e.g. may support better market-wide decisions on the share of gas retrofits that should proceed vs. the share to be replaced by more flexible new resources)
- Reformed energy and ancillary markets that adequately incentivize flexibility will not be in place before irreversible investment decisions are being made
- Although flexible capacity products have been tried, no RTO has yet implemented a product that is properly designed to meet the most urgent flexibility needs

# Flexibility Reforms in Other Jurisdictions

**Other jurisdictions are pursuing flexibility enhancements through a variety of E&AS and capacity product reforms. To date, there has been more collective activity and experience with E&AS reforms than capacity product reforms**

Timeframe	U.S.	Europe	Australia NEM
<b>Operations (E&amp;AS Reforms)</b>	<ul style="list-style-type: none"> <li>• New A/S products (such as ramp products) and unbundling existing products to meet new needs and enable more resource types</li> <li>• Move to 5-min energy and A/S pricing and settlements</li> <li>• Enhanced administrative scarcity pricing, price look-ahead period, and co-optimization</li> <li>• Move toward 5- and 15-min inertia scheduling, with better coordination and pricing</li> </ul>	<ul style="list-style-type: none"> <li>• Move from 1-hour to 15-minute settlement intervals</li> <li>• “Market coupling” and AS product consistency to enable pan-European competition</li> <li>• Introduction of pan-European 15-min intraday market</li> <li>• Policies to improve scarcity pricing and increase price caps</li> <li>• Reforms to balancing mechanisms to adopt market-based approaches</li> </ul>	<ul style="list-style-type: none"> <li>• Effort to define new products (inertia, fast frequency response)</li> <li>• Proof-of-concept trials to develop rules/standards enabling new resource types (e.g. DR and DER) for all products</li> </ul>
<b>Investments (Capacity Product Reforms)</b>	<ul style="list-style-type: none"> <li>• California flexible capacity requirement in resource adequacy construct</li> <li>• ISO-NE and PJM implemented large penalties to capacity resources for non-performance during scarcity events (and bonus payments for over-performers)</li> </ul>	<ul style="list-style-type: none"> <li>• Policies to open competition to all resource types (demand, generation, storage, interconnectors)</li> <li>• Greece interim flexible capacity requirement to prevent gas retirements (permanent solution not finalized)</li> </ul>	<ul style="list-style-type: none"> <li>• Capacity or strategic reserve being considered to augment energy-only incentives (may focus only on flexibility needs or also on resource adequacy)</li> </ul>

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