

# Proposed Market Development Priorities for IAM Workplan



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# Agenda

1. Proposed IAM Market Development Priorities
2. Efficient Pricing
3. Expansion of Ancillary Services
4. Energy Storage Integration
5. Valuing Clean Attributes

IESO MDAG

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# 1. Proposed IAM Market Development Priorities

# Proposed Market Development Priorities to Evolve IAM

- As requested by Independent Electricity System Operator (IESO), based on June 13, 2019 submission to Market Development Advisory Group (MDAG), listed below are proposed priorities to evolve IESO-Administered Markets (IAM) beyond scope of Market Renewal Program (MRP)
  - Efficient Pricing
  - Expansion of Ancillary Services (A/S)
  - Energy Storage Integration
  - Valuing Clean Attributes
- For each proposed priority recommended for IAM Workplan, following slides will
  - Define recommended priority, with rationale and directional benefits
  - Provide examples of proposed priority within other jurisdictions

# 2. Efficient Pricing

# Improvements to Wholesale Energy and OR Pricing

- Wholesale energy and operating reserve (OR) prices should accurately reflect locational supply/demand balance in real-time
- Since electricity is volatile with relatively limited ability to store supply, energy and OR prices can be very volatile and rise to very high levels
- As a consequence, wholesale energy and OR prices can be overly mitigated – not reflecting actual supply/demand balance
- Therefore, 'out of market' mechanisms needed to 'proxy' lost revenues from wholesale energy and OR markets, not able to reflect actual supply/demand balance
  - Customers end up paying in totality – no matter which mechanisms used to provide revenues commensurate with meeting power system needs

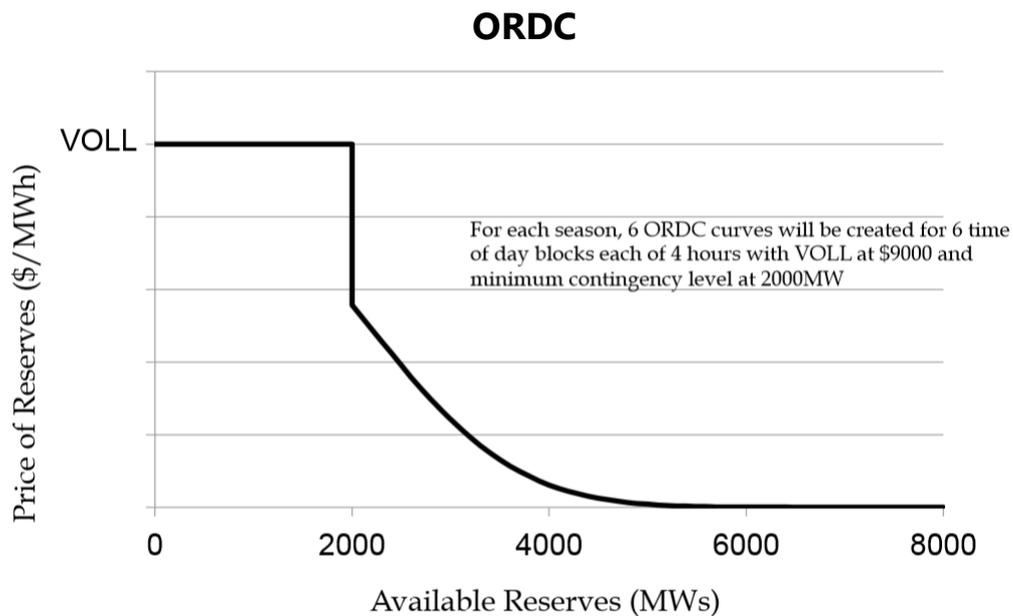
***Recommendation – implement shortage/scarcity energy and OR pricing, and consider use of OR demand curve***

# Improvements to Wholesale Energy and OR Pricing

- Shortage/scarcity pricing for energy and OR, combined with OR demand curve (ORDC), enhances MRP Energy Workstream reforms and provides multiple benefits
  - Most accurate price signals
  - Best pricing benchmark to design customer rates
  - Efficient supplier and customer responses to real-time system conditions
  - Lessens need for 'out of market' mechanisms/payments
  - Increases operational and economic efficiencies for producers and customers, therefore lower costs to customers
- Governments, regulators, system operators recognizing benefits to efficient pricing through wholesale energy and OR shortage/scarcity pricing
  - U.S. Federal Energy Regulatory Commission (FERC) issued Order 825 (2016) regarding shortage/scarcity pricing
  - New York ISO (NYISO) and Electricity Reliability Council of Texas (ERCOT) administer specific rules/protocols for shortage/scarcity pricing, ERCOT administers ORDC
  - On July 25, 2019, Government of Alberta directed Alberta Electricity System Operator (AESO) to explore shortage/scarcity pricing within Alberta's wholesale energy market

# Improvements to Wholesale Energy and OR Pricing – ERCOT Shortage/Scarcity Example

- ERCOT shortage/scarcity pricing methodology – under specific conditions, applicable LMPs increased by Real-Time Reserve Price (determined based on available OR and ORDC to reflect incremental value of scarce OR)
  - Value of ORDC for any level of available OR determined by Loss of Load Probability (LOLP) at that OR level multiplied by Value of Lost Load (VOLL)



# 3. Expansion of Ancillary Services

# Expanding Supply of A/S and Creation of New A/S

- Non-traditional resources (e.g., variable (i.e., wind and solar) generators (VGs), demand response, energy storage, etc.) are proving to have technical capabilities to supply OR and other A/S (e.g., regulation, etc.)
- For example, following jurisdictions/utilities permit some VGs to supply OR, regulation, and/or reactive support and voltage control (RSVC)
  - California ISO (CAISO) – some wind generators provide regulation
  - Southwest Power Pool (SPP) – some wind generators provide regulation
  - Xcel Energy Public Service of Colorado (PSCo) – some wind generators provide regulation
  - Germany – some wind generators provide OR
  - Ireland – some wind generators provide OR and RSVC

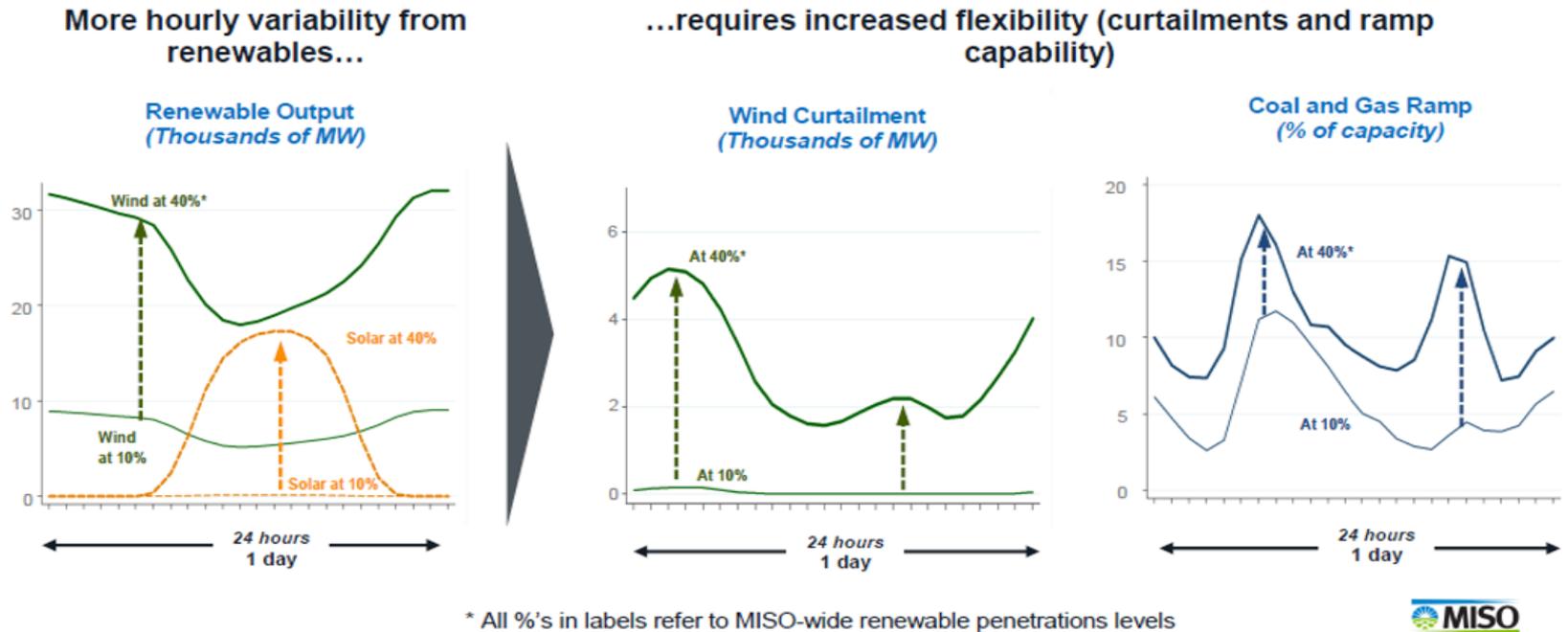
# Expanding Supply of A/S and Creation of New A/S

- Due to increasing flexibility power system needs, driven by changing supply/demand balance and resource mix, some jurisdictions have created or exploring new A/S
  - CAISO – implemented ramp A/S
  - Midcontinent MISO (MISO) – implemented ramp A/S
  - SPP – continues to explore potential implementation of ramp A/S
- IESO identified need for increased power system flexibility (*2016 IESO Operability Assessment – Summary Review of the Operability of the IESO-Controlled Grid to 2020*), expanding supply of multiple A/S and creation of new A/S provides multiple benefits
  - Increased supply from multiple resources (traditional and non-traditional)
  - Better ensures power system needs will be met
  - Increased competition
  - Increased competition can lead to lower A/S prices, lowering costs to customers

***Recommendation – broader number of resources should be able to supply A/S within IAM, and IESO should create new A/S to meet specific power system needs (e.g., flexibility)***

# Expanding Supply of A/S and Creation of New A/S – MISO Example

- Graphic below provides rationale for MISO's decisions to create ramp A/S, Ontario has very similar power system flexibility needs



# 4. Energy Storage Integration

# Integrating Energy Storage Including Hybrid Projects

- Energy storage (e.g., battery) uptake outpacing other resources in development and integration – distribution systems, transmission networks, wholesale electricity markets
- Energy storage uptake exponentially increasing due to
  - Technological improvements
  - Rapidly declining costs
  - Flexible application ‘behind-the-meter’ or ‘front-of-the-meter’
  - Operational attributes enable fastest ‘ramp up’ and ‘ramp down’
  - Meeting increasing power system flexibility needs
  - Balancing energy supply from VGs
- Precedence to integrate energy storage within wholesale electricity markets set with FERC Order 841 (2018)
  - NYISO, ISO New England (ISO-NE), PJM, MISO, SPP, CAISO complied with Order 841 by filing plans (December 2018) to evolve their wholesale electricity market designs, rules, and systems to integrate energy storage

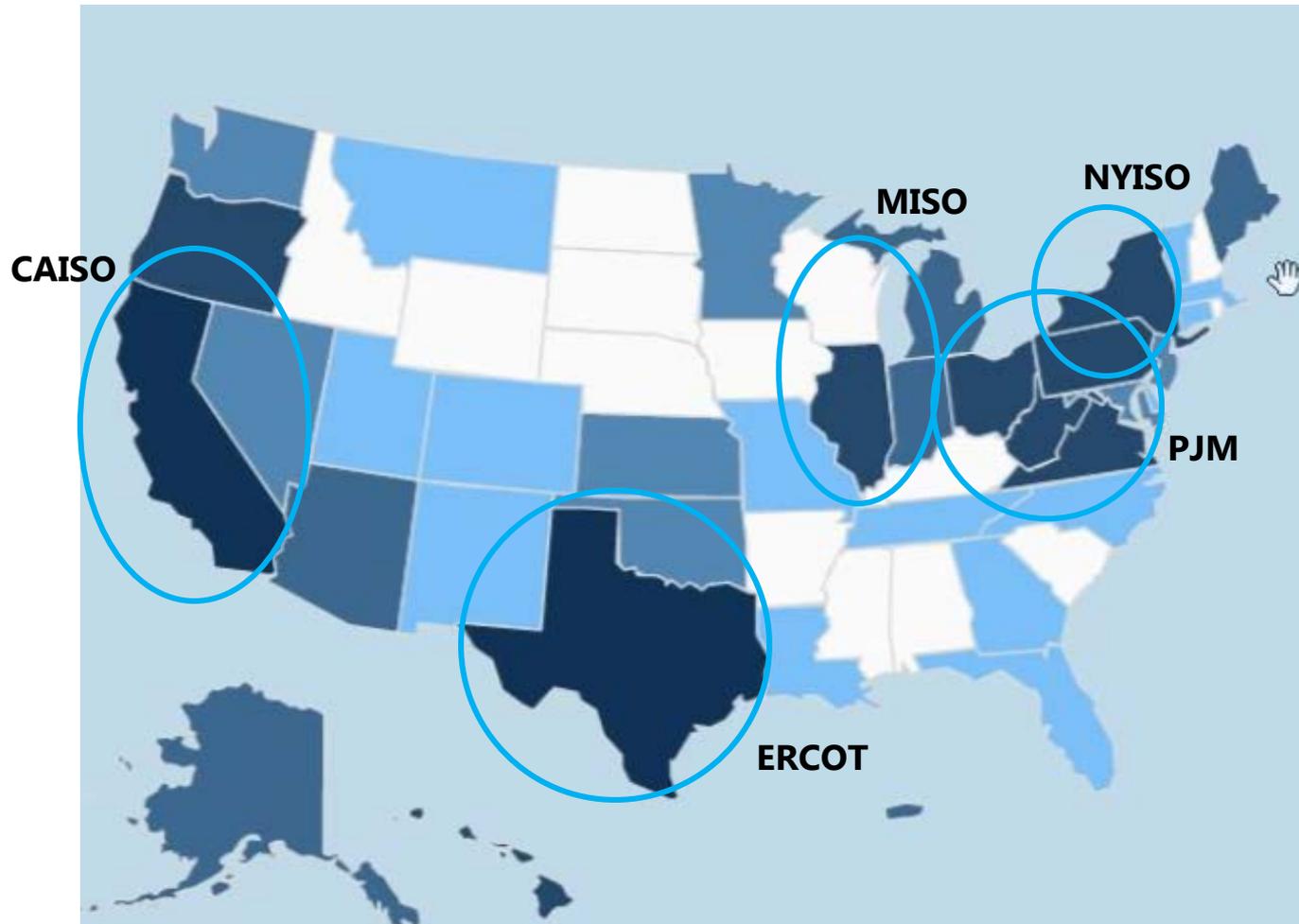
# Integrating Energy Storage Including Hybrid Projects

- Uptake of 'hybrid' projects rapidly increasing, U.S. examples
  - Los Angeles Department of Water and Power – 25-year contract for storage (1.3¢/kWh (\$US)) + solar (1.997¢/KWh (\$US)) (cheaper than 'peaking' gas-fired generation)
  - NextEra Energy – storage + solar project in Florida, storage + solar + wind project in Oregon
  - Storage + solar projects beginning to replace gas-fired generators in California
- Considering volume of Ontario VGs, 'hybrid' projects at existing sites likely to increase (especially as contracts expire)
- Integrating storage, including 'hybrid' projects, provides multiple benefits
  - Cost-effectively meets specific power system needs (e.g., flexibility, resource adequacy)
  - Potential to re-purpose existing VG facilities
  - Creates additional supply sources from distribution systems creating stronger linkages to IAM

***Recommendation – as defined through IESO initiatives (e.g., Energy Storage Advisory Group, Innovation Roadmap, etc.), IESO should undertake commitments to change systems, market design, rules, protocols to integrate multiple energy storage technologies, including 'hybrid' projects, into IAM***

# Integrating Energy Storage Including Hybrid Projects – Increases in Energy Storage Project Development

- Graphic below indicates storage project 'pipeline' in U.S. states



# 5. Valuing Clean Attributes

# Valuation of Clean Attributes through Distinct Markets and Directly within Wholesale Energy Markets

- Markets exist for clean attributes (e.g., Environmental Attributes (EAs), such as Renewable Energy Certificates (RECs)) across Canada and U.S.
  - Compliance markets (state policy driven, bilateral contracts between suppliers and utilities/customers)
  - Voluntary markets (customer driven, bilateral contracts between suppliers and customers)
- Compliance and voluntary markets for EAs/RECs increasing across North America
  - Partially due to customer demand (e.g., 'corporate Power Purchase Agreements (PPAs)')
- Precedence being set in New York, NYISO proposing to implement carbon pricing directly within their wholesale energy market
- For various reasons, limited ways for Ontario renewable generators to sell EAs/RECs (in and outside Ontario), yet demand for EAs/RECs project to continue increasing
  - For nearly all contracted renewable generators, IESO retains ownership of all EAs/RECs, these EAs/RECs have never been 'monetized'

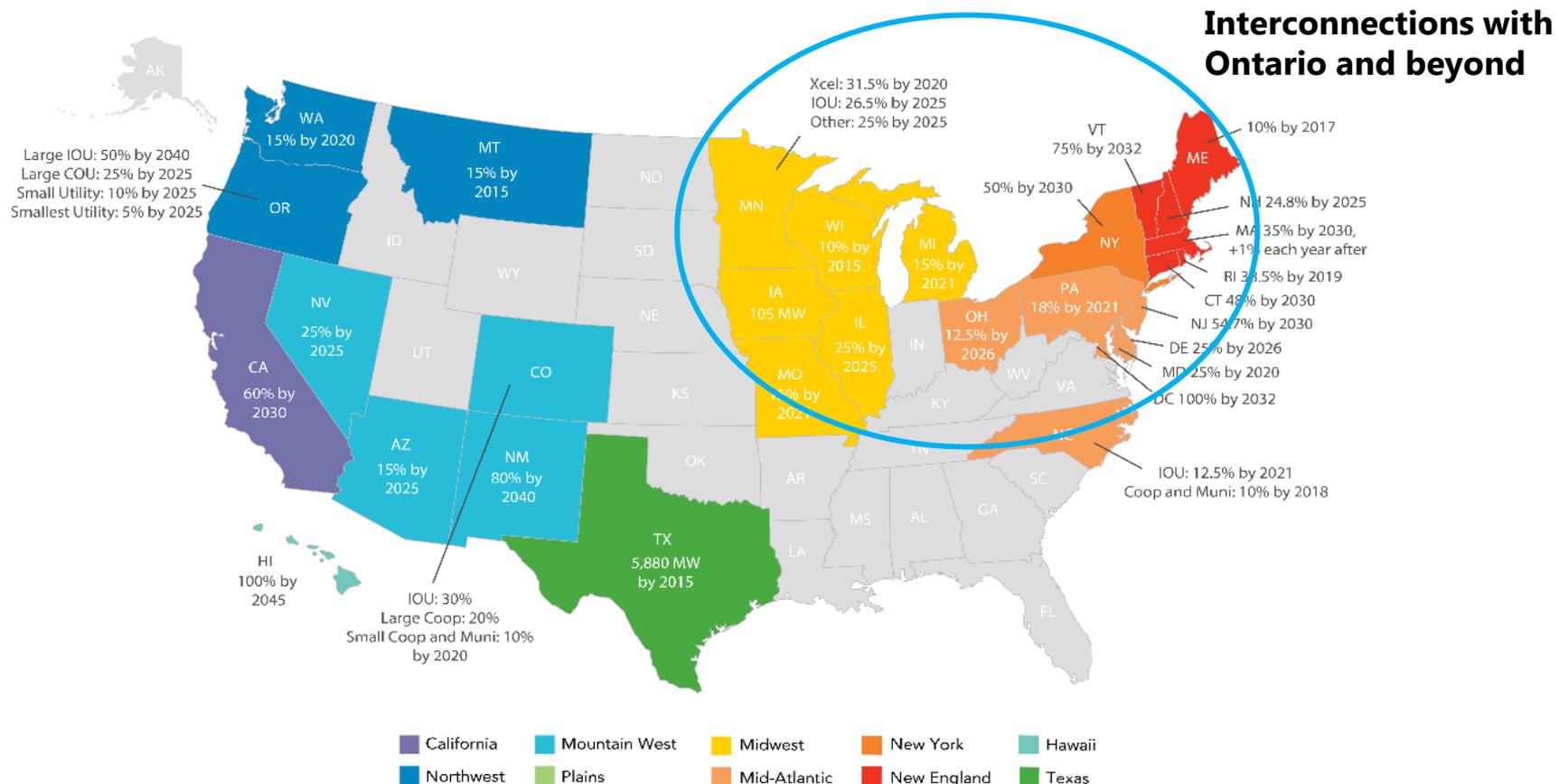
# Valuation of Clean Attributes through Distinct Markets and Directly within Wholesale Energy Markets

- Valuing clean attributes (e.g., EAs, RECs) provides multiple benefits
  - Sale of contracted EAs will provide revenues that could help lower electricity costs to customers
  - 'Monetizing' clean attributes should drive decision-making (i.e., suppliers and customers) to economically lower emissions within Ontario
  - Market-based solutions should result in efficient outcomes linked to electricity market

*Recommendation – IESO should work with market participants/stakeholders, including government and regulator, towards determining an Ontario-specific strategy to value clean attributes within Ontario's electricity market, with considerations regarding impacts and potential mechanisms, resulting in lowering costs to customers*

# Valuation of Clean Attributes through Distinct Markets and Directly within Wholesale Energy Markets – U.S. RPS Requirements

- Graphic depicts Renewable Portfolio Standards (RPS) by U.S. states – Ontario interconnected to states with buyers that purchase REC's from Canadian suppliers





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