# Comprehensive Market Design Overview

IEAC

February 2, 2018

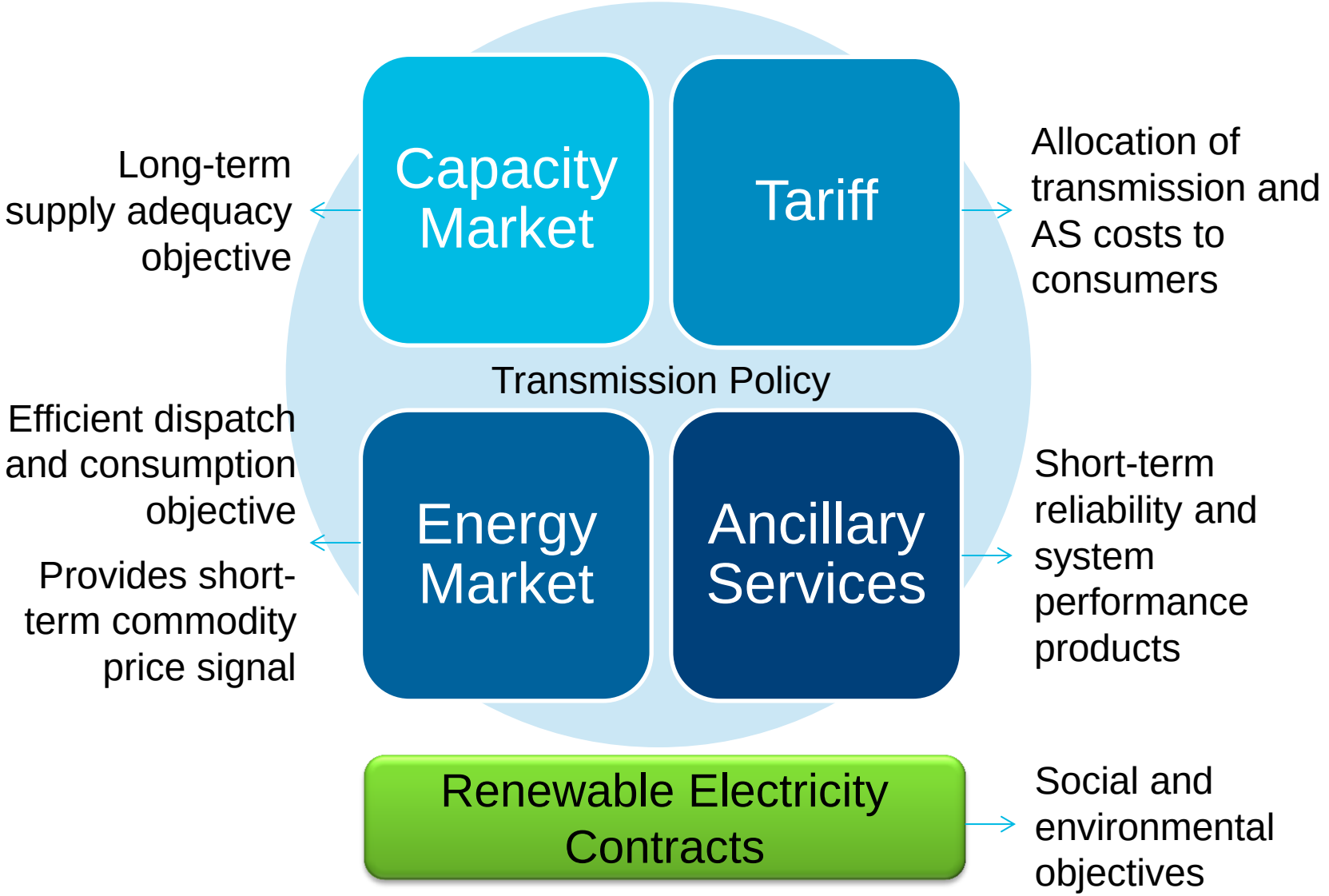
# The Need for Change

- Current energy-only market was not sustainable
  - Lack of investor confidence
  - Reduced access to capital
  - Developers needed more revenue sufficiency, certainty and stability
  - Not designed to achieve low-carbon outcomes
- GoA objectives
  - Protect consumers from volatile price swings
  - Ensure a stable, reliable electricity supply
  - Keep pace with the global transition to low-carbon electricity
  - Provide the price stability or revenue certainty needed to attract investment

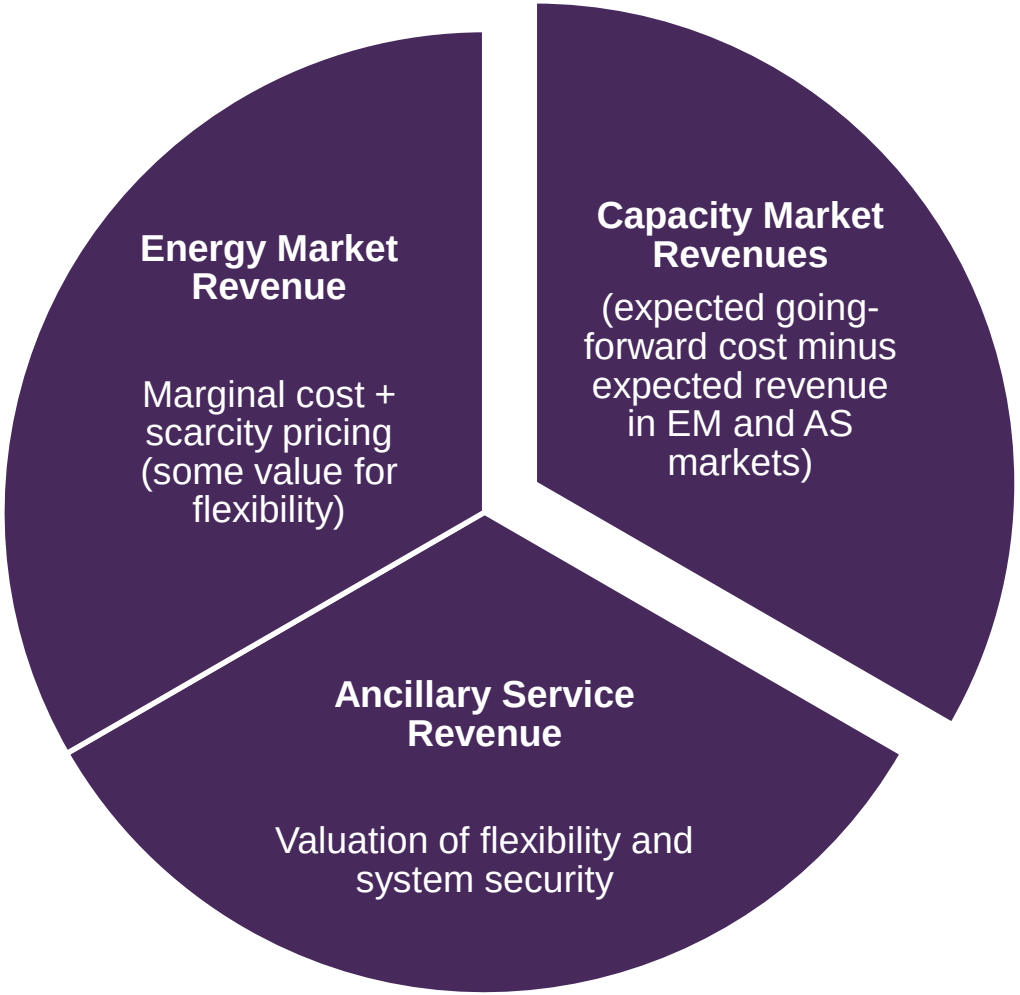
# About Capacity Markets

- Capacity markets primarily provide assurance that supply adequacy will be maintained
- Capacity is the capability of a resource to
  - Generate electricity as required; or
  - In some jurisdictions, willingly reduce consumption as required
- Main characteristics of a capacity market structure typically include
  - A forward market for capacity which provides a forum for the exchange of capacity as a product
  - Energy and ancillary services market(s)
- Capacity markets create the opportunity for capacity suppliers to monetize their ability to provide energy when required to maintain system reliability
- Capacity markets operate in several jurisdictions but each has its own unique features

# Our Future Market



# Pricing dynamic post-implementation



# Desired End State of Capacity Market Development

"The desired end state is a stable and transparent capacity market that relies on competitive market forces, and works efficiently with the energy and ancillary service markets, to achieve sufficient investment to maintain supply adequacy and reliability at the lowest cost for consumers, while working effectively within Alberta's unique electricity structure."

*April 25, 2017 AESO capacity market design stakeholder session*

# Key structural questions

1. Resource adequacy requirement (How much capacity needs to be procured? Includes demand curve)
2. Cost allocation (How will capacity costs be allocated?)
3. Obligation to procure (Who will buy the capacity? Includes question of cogeneration treatment/self-supply)
4. Procurement timing and frequency (When/how often will capacity be purchased?)
5. Term (How long will the capacity delivery period be?)
6. Eligibility (Who can provide capacity? How much can they provide?)
7. Performance assessments (How do we know that capacity has been provided?)
8. Market mechanics (How will capacity market work?)
9. Capacity market settlement (How will capacity providers be paid?)
10. Inter-operability implications (How will capacity market impact the energy and ancillary services markets?)
11. Governance/role of agencies (How is regulatory oversight applied?)

# The Demand Side of the Equation

# Key structural questions – demand side

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# Question 3 – Who will buy the capacity?

- In many markets, demand is established by a resource adequacy target on Load Serving Entities (LSEs)
  - For example, Loads or Retailers on their behalf are required to procure capacity to 115% of their estimated peak load
- Government policy decision
  - In Alberta the capacity will be centrally procured through the establishment of a demand curve by the AESO
  - The AESO will be the counterparty
- Option to self supply
  - More on this later in the supply section

# Question 1 – How much capacity?

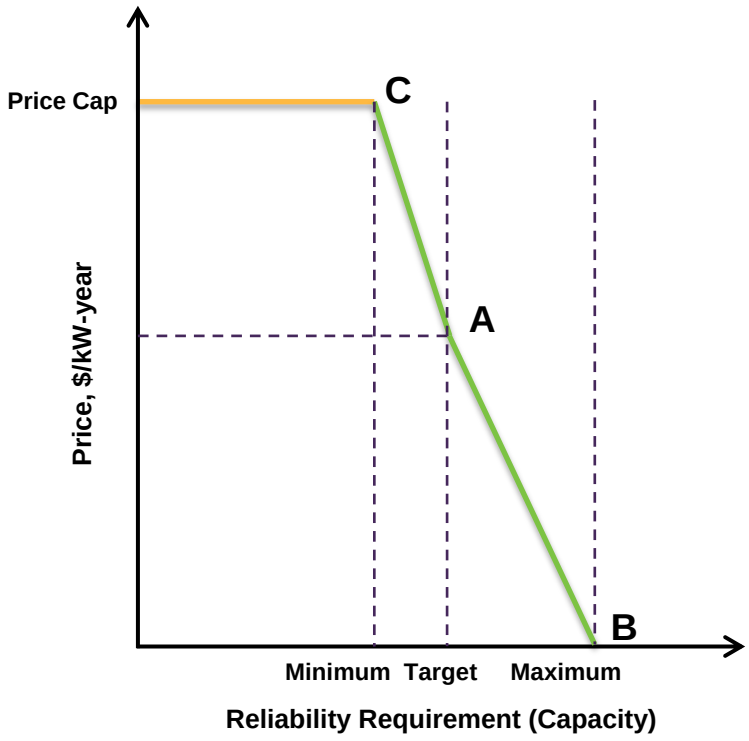
- In the energy market, demand is instantaneous as energy needs change due to weather, season, time of day and industrial requirements
  - Energy demand is met by dispatch of capacity that is online
- With the introduction of a capacity market, anticipated demand in future years is met by first procuring sufficient capacity to serve that future need
- In the capacity market, demand reflects a target based on probabilistic modelling to meet a legislated standard (a resource adequacy standard – a measure of society's tolerance for load shed events)
  - A capacity target is set to reflect a future forecast of energy needs
  - Awaiting final decision on standard by GoA; AESO has assumed a physical standard
- Target level of capacity is used in determination of the demand curve

# The volume and price cap are set by an administrative demand curve

- The demand curve sets the upper limit on price plus the value as volumes increase over target
  - A standard downward sloping demand curve
- This reflects the trade-off to be made between reliability and cost, on behalf of consumers
- Key Terminology
  - Elasticity – reflected in the slope of the demand curve
  - Net CONE – net Cost of New Entry
    - Gross CONE to be determined by an independent study based on a reference unit; our recommended reference unit for Alberta is simple-cycle gas
    - Net CONE considers expected revenues from Energy and Ancillary Services markets

# Demand Curve

- Price cap is set at a multiple of Net CONE
- The slope of the demand curve in excess of the target amount, **AB**, is made flatter to assign less value to increasing amounts of capacity beyond that target amount (decreasing marginal benefit of extra capacity)
- The slope of the demand curve is made steeper below the target amount, **CA**, to assign a higher value when capacity supplies are short (marginal benefit of capacity as less of it procured is increasing)
- The capacity clearing price ($/kW-year) is set at the intersection of the demand and supply curves
- Prices are higher at lower reserve margins and lower at higher reserve margins



# Question 2 – How will costs be allocated?

- Awaiting government policy decision
  - Determines how costs of capacity are shared among loads
  - Considerations include how costs are split between consumers and the options available to different consumers to manage these costs
  - Technical implementation then to be determined by the AESO, approved by the Alberta Utilities Commission
- What are the alternatives under consideration
  - Coincident Peak: The capacity cost allocated based on a consumers' contribution to a measure of coincident peak demand
  - Weighted Energy: The capacity cost is allocated based on consumers' energy usage, weighted by a factor that reflects the impact that consumption has on the need for capacity in that hour
  - Total Energy: The capacity cost is allocated based on consumer's share of total energy used during the year
- Cost causation is related economic principle

# Question 4 – When / how often will capacity be purchased?

- The forward period is the time between the auction and the start of the commitment period
- Long forward periods tend to facilitate new generation investment but are a challenge for some other resources, such as demand response
- Long forward periods expose the capacity buyer (and ultimately consumers) to forecast risk and the capacity seller to regulatory risk (if rules change between auction and delivery period)
- A common framework is to adopt a three year main forward period (on the basis that this allows for facility construction within the forward period and provides a signal to manage expected retirements), often complemented by annual “update” or “rebalancing” auctions within that three year period
- Current proposal
  - The auction should be held three years prior to the obligation period
  - Alberta will clear as a single capacity region with one capacity price
  - Two rebalancing auctions to be held at 18 and 3 months before the delivery period

# The Supply Side of the Equation

# Key structural questions – supply side

1. Resource adequacy requirement (How much capacity needs to be procured? Includes demand curve)
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# Question 3 cont'd – what about self-supply?

- Can consumers "opt-out" of the capacity market and supply their own capacity
  - Allows some loads to manage capacity costs and mitigate risks
- Current proposal
  - Consistent with Question 3, the AESO is the central procurer of capacity, therefore physical bilateral capacity procurement is not permitted
  - A site may choose to self supply capacity provided the load is capable of being served, in whole or in part, by generation that is physically located on the same site, and at the same point of interconnection to the electric system
  - Sites with onsite generation that cannot physically flow their gross volumes due to system connection limitations must self-supply
  - Self-suppliers may be connected to either the transmission or the distribution system
  - The City of Medicine Hat will be treated as a self-supplied load
  - Self-suppliers who intend to change from participating on a net basis to a gross basis or vice versa must declare their intention; changes permitted only every three years
  - No net-settlement instructions (NSI) for capacity; consumers may financially hedge their capacity outside of the market, but unlike the energy market will not be facilitated by the AESO

# Question 5 – How long will the capacity delivery period be?

- The commitment period is the period during which the capacity resource is required to meet its performance obligations
- The most typical commitment period across jurisdictions is one year, but this is subject to variations; several markets permit new generators to secure multi-year commitment periods
- Impacts investment decisions, ratio of incumbents to new players in market
- Current proposal
  - Tentative proposal is one year for all resources, running from November 1 through October 31 of the following calendar year
  - Existing assets generally favour 1 year; many new developers say they need longer to finance new projects
  - Fairness question – same delivery period for all, or differentiated between existing and new assets?
  - More information to be gathered prior to finalizing proposal

# Question 6 – Who can provide capacity?

- The supply side of the capacity market will comprise of all eligible capacity resources – current resources plus new entrants – all competing to provide capacity into a future delivery year and meet obligations for energy delivery
- Generally, all resources that meet eligibility requirements can participate in capacity markets
  - Includes variable and non-variable supply resources, demand-side resources, aggregators, storage, interties
  - No energy efficiency participation in first auction
  - All existing capacity must offer into the capacity market
  - Current resources will compete against new future capacity
- The capacity market will capture a significant portion of the investment and retirement signal

# What about market power?

- Defining market power
  - The ability to unilaterally or collusively affect market prices through the withholding of capacity from the market (or on the demand-side withholding demand)

- Market Power Mitigation is a means to ensure efficient pricing outcomes when market power is deemed to be present
  - In Alberta's energy-only market with a low price cap, offers above marginal cost were deemed an acceptable exercise of market power if the direct result was that necessary investment would occur (capturing an effective investment signal)
  - This was a trade-off between static and dynamic efficiency
  - With the addition of a capacity market, this is no longer an appropriate trade-off
  - Most jurisdictions with a capacity market mitigate market power in both the capacity and the energy markets

# Market Power Mitigation: Screens Structural, Conduct and Impact

- Structural approaches to market power consider whether the market structure itself is conducive to the inappropriate exercise of market power; when it is (e.g. when the market is found to be sufficiently concentrated) mitigation may occur
  - Limitations on Market Share
  - Pivotal Supplier Tests

- Conduct-and-impact approaches to market power mitigation consider whether market participant behaviour reflects the exercise of market power (conduct) in a manner that inappropriately affects market outcomes (impact)
  - Will market power be exercised (or has it already been exercised)?

# Mitigation of Market Power – Proposal

- A number of measures are proposed to be implemented to mitigate supply side market power in the capacity market
  - Must-offer requirement
  - Must-offer requirement exemption (capacity delisting)
  - Market power screen
  - Default offer cap
  - Unit-specific offer mitigation

- No mechanisms proposed for mitigating buyer-side market power at this time
- After each forward capacity auction and rebalancing auction, public reports will be provided assessing auction results and market competitiveness

# Question 6 cont'd – How much can they provide?

- In order to measure how much capacity (MW), adjusted for outages and derates, a resource contributes to system reliability during high demand periods, an Unforced Capacity (UCAP) is measured for each resource type in the pre-qualification process
  - UCAP refers to the amount of reliable capacity that can be attributed to each resource that clears the capacity auction
  - This allows for capacity values of all resources to be accounted for on a comparable basis
    - Resources with the same UCAP value provide equivalent contributions to resource adequacy needs; 1 MW of UCAP is a comparable product/service across all technology types
  - UCAP creates stronger alignment between the product procured in the auction and the product expected to be delivered to ensure supply adequacy
  - For existing assets, calculated based on historical performance during tight supply cushion hours (availability / capacity factor); for new assets, reference calculations by technology type (and location for variable resources)

# Question 7 – How do we know that capacity has been provided?

- Performance assessment model is a capacity market design element that is essential in order to ensure resource adequacy in times of system emergency
- To meet the supply adequacy objective, the volume of procured capacity and associated energy must be delivered when required by the system
  - The capacity market design must contain sufficient standards for performance and associated payment adjustment mechanisms to protect against firm load shed but balances appropriate risk so as not to discourage investment or increase overall cost
  - The “missing money” that a capacity market provides should depend on performance during tight system conditions
- Most common performance model used in jurisdictions with capacity markets consist of two elements:
  - Capacity resource’s expected performance evaluated against actual performance
  - Rate of payment adjustment (can be negative or positive)

# Proposed Performance Assessment Model

- All capacity resources that cleared in the capacity auction will have a capacity obligation in exchange for the capacity payment, i.e. auction clearing price, in every settlement period
  - Expected performance is equal to the committed UCAP, adjusted proportionally for the level of system demand during a given shortage event
- There will be two assessments during the obligation period
  - Availability assessment
    - Assessed annually, carried out over the 100 tightest hours of each delivery year
    - Payment adjustments assessed on a $/MWyr basis, capped
    - Adjustments reduce costs to consumers
  - Performance assessment
    - Assessed during a performance event (all Energy Emergency Alert hours)
    - Payment adjustments calculated on a $/MWh basis, capped
    - Revenue-neutral mechanism between negative and positive adjustments

# Pricing and Market Mechanics

# Key structural questions – pricing

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# Question 8 – How will capacity market work?

- There are two common auction processes in capacity markets
  - Sealed bid
    - Resource owners provide sealed bids at the closing date and time
    - Bids are assembled into a supply curve, and matched to the demand curve to establish a clearing price
    - All offers below the clearing price are accepted and become capacity obligations
  - Declining clock
    - The auctioneer posts a starting price (the price cap level in the demand curve); participants specify the capacity they would provide at that price
    - If that quantity exceeds the capacity demand at that price, the auctioneer repeats the process at a lower price, and participants update their capacity supply quantities at the reduced price
    - The process continues until the supply quantity drops below the demand curve quantity, thus establishing a clearing price and the resources cleared
- Payment to all cleared capacity is at the clearing price
- Proposal: A sealed-bid, single-round, uniform pricing auction will be utilized for forward and rebalancing capacity auctions

# Question 9 – How will capacity providers be paid?

- Current proposal for settlement and credit requirements
  - New capacity resources and resources looking to buy back in rebalancing auctions will need to demonstrate sufficient credit
  - Credit requirements are consistent with those already in ISO Rules
  - Consistent with existing practices in the Energy Market, capacity market statements will be issued on a monthly basis
  - Capacity resources do not have to provide financial security to cover payment adjustment (penalty) risk; to minimize the credit risk the settlement system will only claw back up to 100% of the capacity market payment in any one month until fully paid
  - Payments will not be made to providers prior to the start of the delivery period

# Question 10 – How will capacity market impact the energy and ancillary services markets?

- Energy & AS markets continue to provide the economic incentives related to operations and performance characteristics
- Depending on capacity market design choices, there may be energy & AS market rule changes needed to accommodate the capacity market
  - Review of must offer  provisions and any associated price mitigation
  - Provide the system operator the right to call on capacity resource at time of need
  - Outage management processes as they relate to capacity resources
- Current proposal involves minimal changes to the energy and AS markets
  - Introduction of some changes to assist in managing net demand variability with the addition of more variable resources
  - Introduction of *ex-ante* market power mitigation
  - Updates to mothball rules to align with capacity market delivery obligation term

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# Current Methods of Market Power Mitigation

- Fair Efficient and Openly Competitive (FEOC) Regulation
  - Prohibits conduct that does not support fair, efficient and open competition
  - Market Share Cap – measure of concentration
  - Transparency of Availability and Outage Records
- MSA oversight
  - AUC remedy
- Offer Cap and Floor
- Economic Withholding
  - No collusion (administered on an *ex-post* basis)

# Mitigation of Market Power – Proposal

- A pivotal supplier screen will be evaluated, calculated hourly, based on company offer control as a share of the market
  - The pivotal supplier calculation used provides adjustments for certain resource types such as dedicated supply (supplier purchases to serve its load), and suppliers with only wind/solar variable type resources
  - Companies that fail the screen must submit offers that are capped to 3 times short run marginal cost by fuel type (with some exceptions)
    - Market participants will have the opportunity to submit actual short-run marginal cost for approval and if approved, these costs will be included as part of the 3x conduct threshold evaluation for associated relevant assets
    - For non-thermal resources, market participants will have the ability to submit opportunity cost for approval and these costs if approved will be included as part of the 3x conduct threshold for associated company assets

# Summary

| | Energy Market | Capacity Market |
|---|---|---|
| Demand | • Market is dispatched to meet demand in instantaneous fashion<br>• No bids required<br>• Loads pay for energy as delivered MWh | • AESO acts as buyer<br>• Customers may self supply<br>• Capacity charges apply to loads |
| Supply | • Suppliers deliver energy to loads through the market<br>• Prices are bid mitigated to reflect separate payment for capacity | • Suppliers now sell capacity through separate market |
| Pricing | • Single clearing price – Pool Price paid to suppliers for delivered energy, and charged to loads (measured in $/MWh)<br>• Bid mitigation<br>• Scarcity & shortage pricing | • Pricing represents a secured revenue stream (measured in $/kW-yr) for a fixed term<br>• Price cap is a multiple of net-CONE |

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# Thank you