



# Evaluation of Capacity Market Alternative Designs

Discussion of Scope and Approach

Todd Schatzki

November 7, 2023

# Agenda

- Assignment and Scope
- Overview of Prompt Market Assessment
- Overview of Seasonal Market Assessment
- Description of Quantitative Analysis: Capacity Market Model
  - Model Description
  - Assumptions
- Stakeholder Feedback and Next Steps

# Assignment and Scope

## Context

### Changes in Region's Grid Prompting Consideration of Capacity Market Changes

- ISO-NE is considering whether to develop proposals for two potential changes to its capacity market:
  - Timing of the primary capacity auction (i.e., forward vs. prompt market)
  - Number of market/products in each year (i.e., annual vs. seasonal market)
- These options are being evaluated in light of multiple changes to the region's electricity system and markets arising in part from state policies aimed at decarbonizing the region's grid, as well as technological innovation that increases performance and decreases costs of new technologies
  - Changes in the mix of resources in and entering the system, with increases in non-emitting resources and new technologies (e.g., intermittent renewables, storage) and reductions in dispatchable fossil resources
  - Changes in the process by which new resources enter the system (with development timelines that may not align with 3-year forward timeline)
  - Changes in the profile of resource adequacy risks across the year, with growing winter risks (both longer duration energy constraints and increasing winter peaks relative to summer peaks)

# Assignment

## Assess Prompt and Seasonal Capacity Market Approaches

- Analysis Group was asked to evaluate two potential design concepts for ISO-NE's Forward Capacity Market (FCM) – a prompt market and a seasonal market
- The report will:
  - Describe the general features of prompt and seasonal markets (but not develop detailed designs for either alternative)
  - Provide information on the tradeoffs involved in switching to a prompt and/or seasonal market to ISO-NE, stakeholders and the New England states
  - Identify issues that would need to be addressed if the region pursues these alternatives
  - Provide recommendations

# Approach

## Analytic, Quantitative and Non-quantitative Approaches

- The study will provide information relevant to evaluating prompt and seasonal markets:
  - Analytic and non-quantitative assessment of different impacts and consequences:
    - Draw on experience from ISO-NE and other RTOs (MISO, NYISO, PJM) and economic principles
    - Draw on quantitative modeling (described below)
    - Evaluate impacts on resource costs and risks, demand for capacity (and associated demand curves), market-clearing and alignment with and support for State policy goals
      - Include consideration of quantitative metrics and information related to new resource entry, resource development timelines, retirements, existing resource participation, price volatility, price formation, resource accreditation, and ICR values
    - Preliminary factors and considerations to be evaluated for the prompt and seasonal markets are provided in subsequent sections
    - Evaluation reflects multiple criteria, including economic efficiency, costs, reliability and alignment with and support for State policy goals
  - Modeling analysis to quantify changes in certain market outcomes, including prices, quantities and costs – *not* a full analysis of a complete design proposal

# Approach

## Additional Issues to Be Addressed

- The study will consider potential combinations of prompt and seasonal markets, given opportunity to adopt one but not the other:
  - Forward-annual market (status quo)
  - Prompt-annual market
  - Forward-seasonal market
  - Prompt-seasonal market
- Study will consider options to transition in one or multiple phases (in particular, first adopting a prompt market and later adopting a seasonal market)
- The study will assume Resource Capacity Accreditation (RCA) market enhancements
  - Assume basic RCA design principles are developed
  - Empirical assessments will assume proxy values for accreditation (rMRI) factors consistent with design principles and available analyses (from multiple RTOs); however, values do not reflect on-going work in the RCA project

# Approach

## Today's Presentation

- Today, we will provide an overview of our approach to the study, including preliminary thinking on key factors for the region to consider as it evaluates a potential move to a prompt and/or seasonal market
- Our assessment is on-going, including analytic, quantitative and non-quantitative analysis
- We welcome stakeholder feedback on other issues that may be important to consider and will do our best to incorporate them into our assessment
- We have heard stakeholder feedback provided at earlier meetings and plan to incorporate this feedback where possible – however, given the limited time to complete the study, we may not be able to incorporate every request or stakeholder suggestion into the analysis

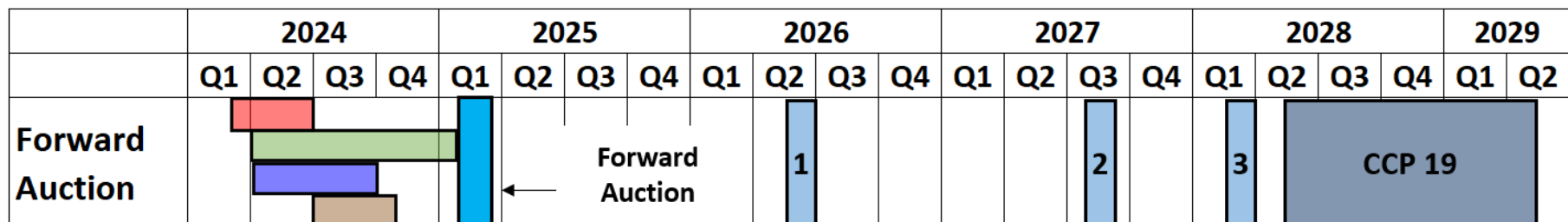
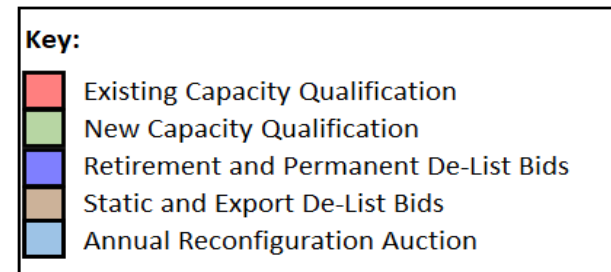


# Overview of Prompt Market Assessment

# Existing Forward Capacity Market

## Procurement 3+ Years Prior to Capability Period

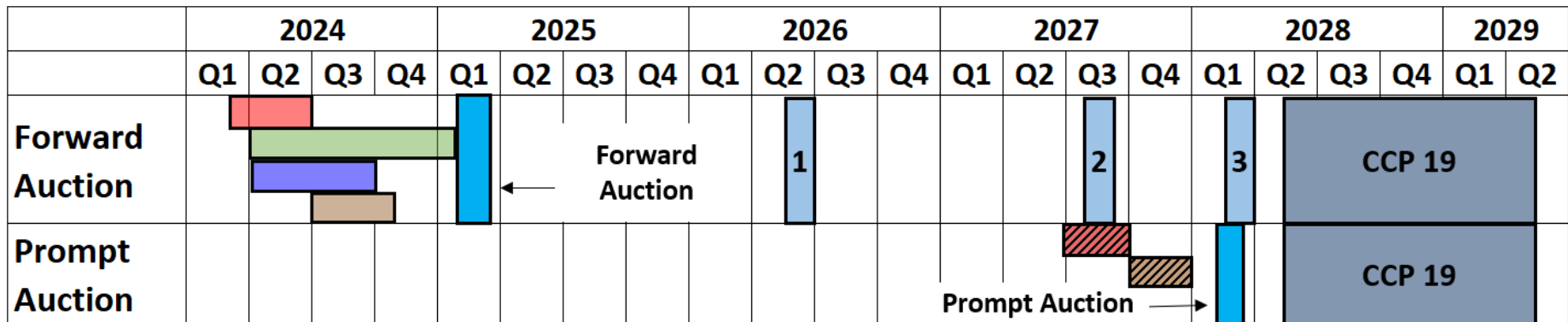
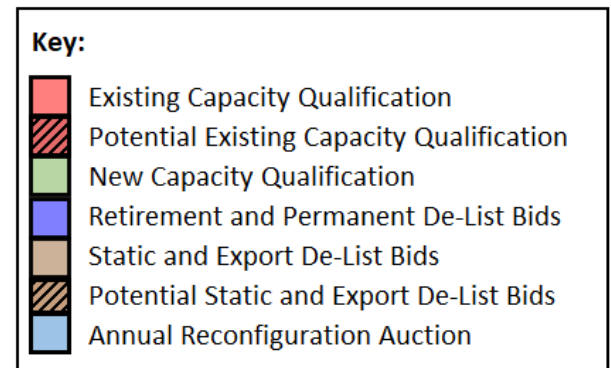
- In the current capacity market, capacity is procured in an auction 3+ years ahead of the capability period (current timetable provided below)
  - Rebalancing (“reconfiguration”) auctions are run in subsequent years to re-balance the market for changes in supply and demand
  - Developed in part to provide new resources the opportunity to clear in capacity market prior to development decision
  - Market and system conditions have changed, with many different types of resources entering the market (gas-fired, storage, DR/EE/DER, intermittent renewables) and increased development complication and uncertainty (from external factors, such as siting and supply chain constraints)



# Prompt Market

## Shifts Auction Timing Prior to Capability Period

- Under a prompt market, capacity is procured shortly prior to the commitment period (prompt market timetable below is illustrative, reflecting potential options, subject to further design if the prompt market is pursued)
  - No annual reconfiguration auctions because prompt auction clears final demand and available supplies
  - Market features would require development, including qualification process and timing, auction timing, product definition (annual, seasonal, monthly), auctions/rebalancing within the commitment period (e.g., existing monthly reconfiguration auctions), etc.



# Prompt Market Assessment

## Considerations for Supply Offers

- Impact of prompt market on supply offers (relative to a forward market) will reflect multiple considerations:
  - New capacity resources
    - Alignment of forward market with development timelines of various technologies
    - Increase in financial costs and risks under a forward market (e.g., financial risk from a failure to deliver capacity, reduction in optionality due to forward commitment of resource)
    - Increase in revenue certainty and entry contingent on market-clearing (i.e., “coordination” of new resources entering the market) under a forward market
    - Differences in potential first-year offer prices for new resources
  - Existing capacity resources
    - Increase in financial costs and risks under a forward market (e.g., financial risk from a failure to deliver capacity, reduction in optionality due to forward commitment of resource)

# Prompt Market Assessment

## Implications of Supply Offer Impacts and Other Potential Consequences

- Certain supply offer changes may have other consequences – for example:
  - Changes in costs and risks would affect cost-based offers
  - Tradeoffs to potential changes in deactivation notice requirement (e.g., improved capital utilization, any change in need for/use of out of market (Reliability Must Run, or RMR) agreements)
  - Price volatility and price formation
- Improved demand representation
  - Prompt market reduces demand variability associated with need to forecast demand (ICR) prior three years in advance
- More accurate resource accreditation given annual adjustment to rMRI values
- Market mitigation
- Administrative and operational considerations

# Prompt Market Issues

## Key Design Areas to be Addressed if Pursuing a Prompt Market

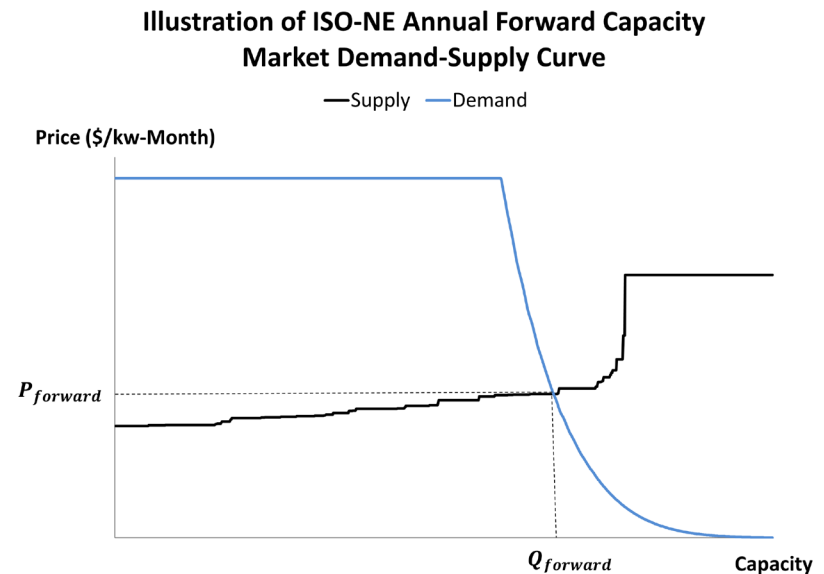
- Modification of qualification process
  - With a prompt auction, simpler (and potentially shorter) qualification process
- Modifications to retirement notification processes and requirements
  - Potentially including processes for RMRs
- Modification of auction mechanism
  - With a prompt auction, simpler mechanisms (e.g., sealed bid) might be advantageous compared to current descending clock auction

# Overview of Seasonal Market Assessment

# Existing Forward Capacity Market

## Annual Capacity Product

- In the current capacity market, capacity is procured through a single annual auction procuring an annual capacity product
- Limited intra-year variation in obligations and limited intra-year rebalancing
- Annual product designed to address resource adequacy risks, which occurred primarily (if not exclusively) in summer
- System and market conditions have changed given increased heating and transport electrification and persistent winter fuel/energy security risks, resulting in winter resource adequacy risks (relative to summer risks) growing over time

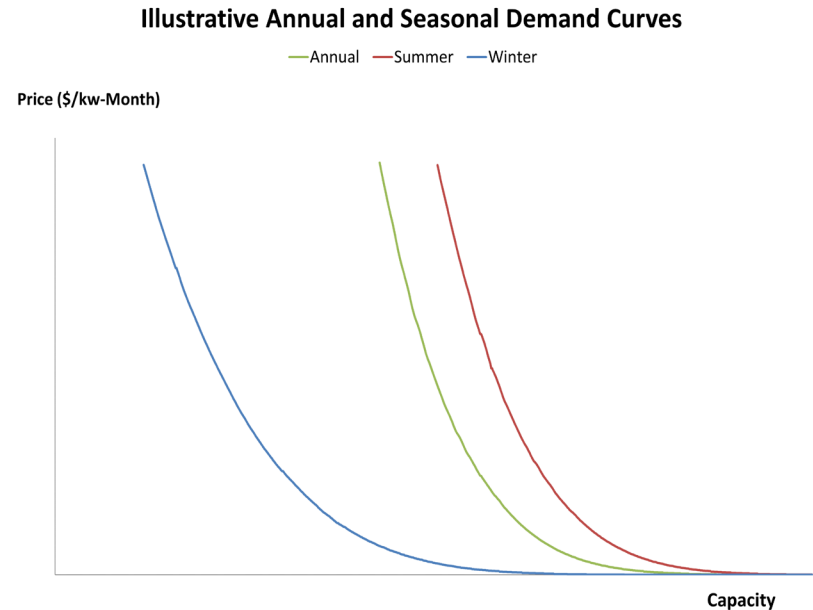




# Seasonal Market

## Accounting for Differences in Seasonal Resource Adequacy Risks

- Under a seasonal market, capacity is procured through multiple seasonal products
  - Seasonal product creates obligation to supply capacity in that season (but not others)
  - Demand for seasonal product can reflect value of capacity in addressing resource adequacy risks during that season
  - Supply of resource adequacy can reflect season-specific contributions
  - In principle, a capacity market that more accurately accounts for seasonal demand and supply can increase market efficiency, with improvement to cost-effectiveness and reliability



# Seasonal Market Assessment

## Multiple Impacts to Demand and Supply

- Demand for capacity (through the demand curves) can reflect:
  - The value of capacity in reducing resource adequacy risks given season-specific (marginal) reliability impacts
  - Seasonal differences in contributions to resource adequacy given the need to ensure sufficient revenues for new entry at the reliability criteria
    - That is, seasonal demand curves must ensure that revenues across seasons cover the cost of new entry if sum of reliability impacts (LOLE) across seasons (given cleared capacity in each season) exceeds the 0.1 days/year reliability criterion
- Supply offers for capacity can reflect:
  - Seasonal differences in resource contributions to resource adequacy
  - Seasonal differences in going-forward costs given seasonal differences in operating cost, net energy market revenues and costs per unit of capacity (given resource accreditation differences)

# Seasonal Market Assessment

## Other Considerations

- Consequences for market mitigation
- Revenue adequacy (e.g., given potential that resources clear in one season but not the other)
- Administrative and operational considerations
- Key market design issues:
  - Markets features to make seasonal (i.e., including seasonality in demand, offer quantities, offer prices)
  - Simultaneous v. sequential auctions
  - Number (and length) of seasons
  - Methodology to derive seasonal demand curves

# Description of Quantitative Analysis: Capacity Market Model

# Model Overview

## Capacity Market Simulation Model Structure

- The capacity market model simulates capacity auction outcomes
  - Market outcomes reflect the market-clearing price and quantity given a supply curve comprising offers from existing and new resources at their net going forward cost (GFC) and the administratively determined demand curve
  - Analysis reflects static scenarios, and is not a forecast and does not account for dynamic market responses (across commitment periods)
- The demand curve is based on the current demand curve construct, adjusted to anticipate future conditions and forecast net ICR, and scaled to reflect change from qualified capacity to QMRIC
- Market-clearing in the model consistent with general auction mechanism
- The assumed supply of resources reflects resources that have recently bid into the FCA as well as state legislated procurements and additional assumed resources (to meet state environmental goals)
- The analysis will be performed in two years: 2028/29 (FCA 19) and 2034/35

# Model Overview

## Market Simulation Clears Estimated Supply Offers Against Demand Curve

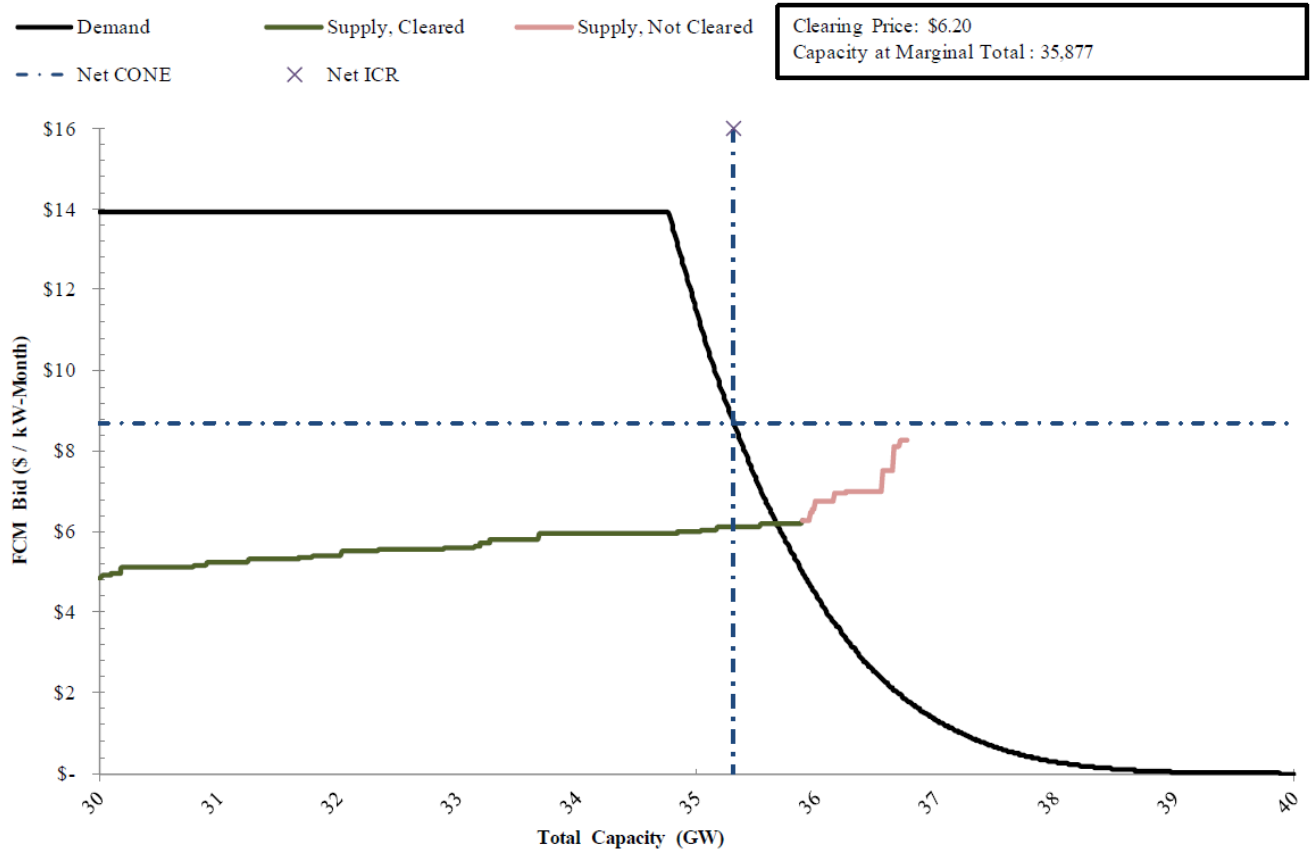


Figure from prior Analysis Group report (2016 Economic Analysis)

# Supply Offer Curve

## Offer Price Components for All Cases

- The supply curve comprises offers from individual resources and reflects several components:

$$\text{Net GFC} = \text{Fixed Costs} + \text{Taxes} - \text{Net EAS Revenues} - \text{Expected PFP Revenues}$$

- Fixed costs reflect:
  - Fixed Operation and Maintenance (O&M) from publicly available sources (e.g., S&P Capital IQ, Velocity Suite, EIA)
  - On-going investment costs derived from FERC Form 1 as collected by Velocity Suite
- Net EAS (Energy and Ancillary Service) Revenues derived from market simulation (production cost model) to reflect estimated energy and ancillary service revenues net of variable and fuel costs
- Expected Net PFP (Pay for Performance) Revenues – Offers include the expected PFP payments (receipts) based on posted PFP parameters (expected balancing ratio, expected reserve shortage hours, etc.) and unit-specific output during reserve shortages (based on historical data)
- Taxes reflect public tax rates and property assessments

# Supply Offer Curve

## Quantity Supplies Reflect Capacity Accreditation

- The quantity supplied will reflect resource-specific capacity accreditation – that is:

$$QMRIC = rMRI * QC \text{ (non-intermittent)}$$

$$QMRIC = rMRI * Nameplate \text{ (intermittent)}$$

- Technology-specific rMRI proxy values are assumed for each resource
- Proxy rMRI values are consistent with design principles and available analyses (from multiple RTOs) but *are not* forecasts of rMRI values and do not reflect on-going work in the RCA project
- Assumed values reflect (1) RCA principles but not actual rMRI values from the on-going RCA process and (2) multiple sources of information, including prior ISO-NE analysis and marginal reliability impact analyses from other RTOs
- Offer quantity will differ for annual vs. winter vs. summer based on different rMRI values



# Supply Offer Curve

## Resources Offering Supply into the FCM Will be the Same Across Cases

- For Capacity Commitment Period 19, we assume:
  - Existing units that offered into FCA 17 without announced retirement dates
  - New units that cleared FCA 17
  - Additional storage and renewables consistent with state legislated procurements
- For 2034/35, retirements and additional resources added to meet resource adequacy requirements and align with State policies

# Demand Curve

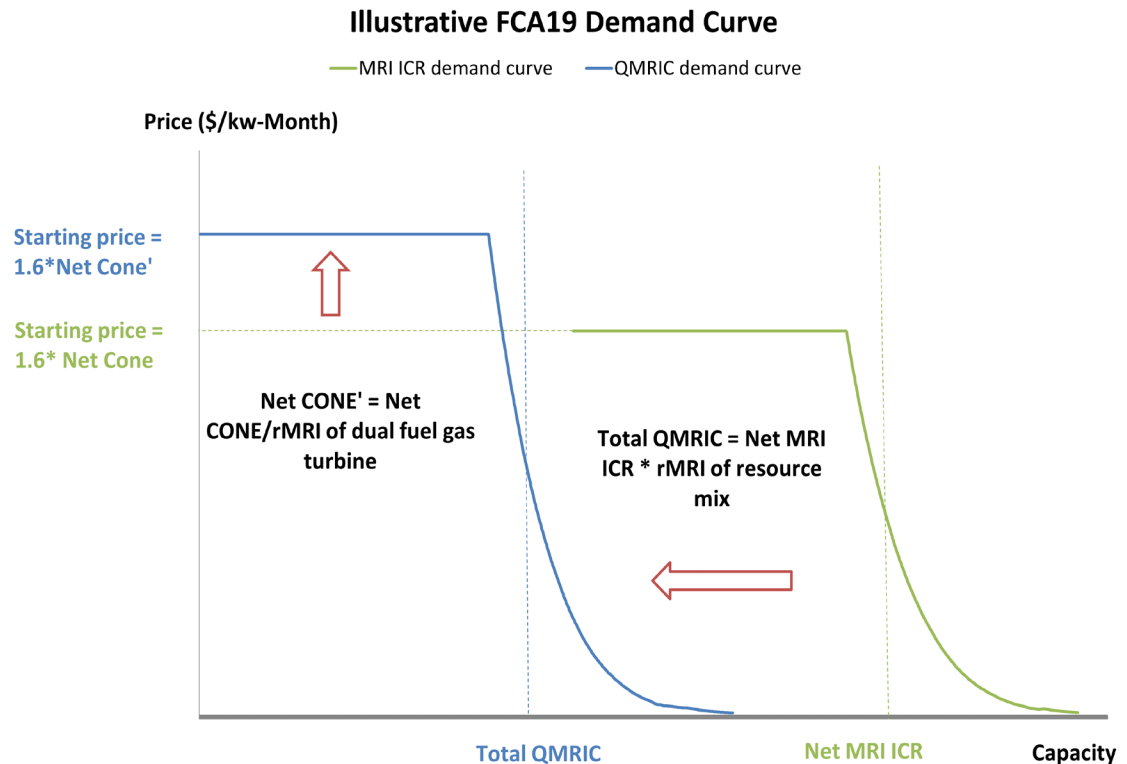
## Based on Current Demand Curve Approach

- Demand curve reflects current FCA demand curve adjusted for assumed values for future capability years
  - Starting point is the most recent parameters for FCA 18
  - Parameters are updated for future capability years (e.g., net ICR values based on ISO-NE 2021 Regional System Plan and extrapolations)
  - The curve is scaled to create a QMRIC-based demand curve
    - The curve is anchored given (1) the at-criteria capacity requirement (i.e., net ICR multiplied by the system-average rMRI) and (2) the marginal cost of new capacity (i.e., net CONE of a dual fuel gas turbine)

# Demand Curve

## QMRIC-based Capacity

- The figure on the right illustrates the impact of the shift from QC to QMRIC on the demand curve
- rMRI will generally decrease the quantity offered by each resource, resulting in:
  - Decrease in ICR and a shift to the left in the demand curve
  - Increase in Net CONE and a shift upward in the demand curve



# Supply Curve – Changes Under Alternatives

## Changes Under Prompt and Seasonal Markets

- To account for the impact of alternative market designs on supply offers, the analysis quantifies certain differences in costs associated with each alternative
  - These adjustments reflect some but not all impacts of prompt and seasonal markets
  - We keep all other data and assumptions unchanged (e.g., resource mix)
- With a prompt market:
  - Reduced deficiency risk – i.e., financial risk that unit is unable to meet its forward commitment to supply capacity
  - Reduced forward premium due to reduced optionality from committing resources three years in advance
  - Potential change in capacity accreditation (rMRI) between forward and prompt auction
  - New resources may not include annualized capital costs that have been incurred before auction
- With a seasonal market:
  - Assume greater share of annual fixed costs attributed to winter than summer due to winterization costs
  - Net EAS revenues, expected PFP revenues differ based on performance in each season

# Demand Curve – Changes Under Alternatives

## Prompt and Seasonal Demand Curve

- With a prompt market, demand curve will adjust to reflect updated rMRI values and potentially different ICR values
- With a seasonal market, demand curve will adjust to reflect the season-specific value of capacity in mitigating seasonal reliability impacts
  - Analysis will consider winter and summer seasons
  - Analysis will reflect current annual MRI curve shape, as seasonal MRI curves have not been estimated, with summer/winter differentiation based on relative reliability risks in each season
  - Maintain an equal scaling factor across seasons
  - Seasonal demand curves adjusted to ensure “at criteria” conditions – that is, the market revenues need to ensure sufficient revenues to incent new capacity when market is at the (0.1 LOLE/year) resource adequacy criterion given (1) reliability outcomes (lost load) across both seasons and (2) revenues across both seasons

# Market-Clearing

## Market-Clearing Reflects Intersection of Supply and Demand

- Auction determines CSOs and prices through optimization of the objective function (cost-minimization)
- Result is market-clearing where offer curve intersects demand curve
- Price intersection of supply curve (offers and vertical components) with demand curve
- Quantity reflects quantity of resources in offer stack needed to meet demand
- Costs reflect quantity times price

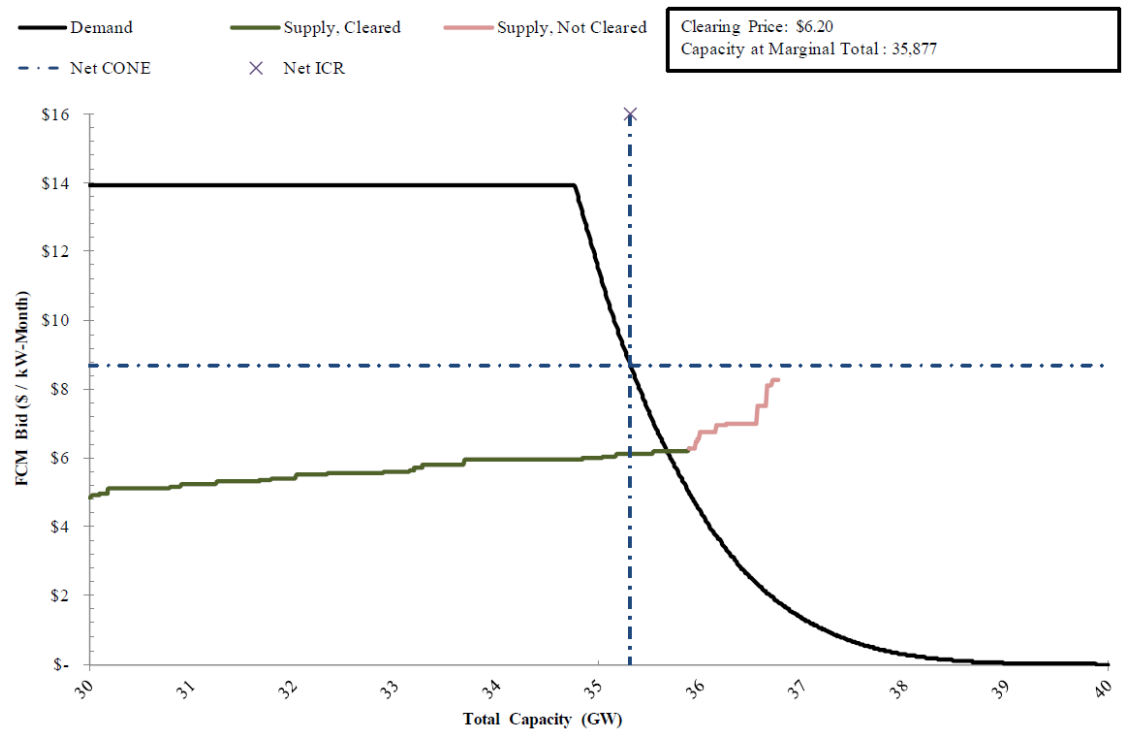


Figure from prior Analysis Group report (2016 Economic Analysis)

# Proposed Scenarios

## Sensitivity Analysis to Evaluate Sensitivity of Results

- Alternative Differences between Net ICR values in Forward and Prompt Markets
  
- Alternative 2034/35 resource mix reflecting more aggressive decarbonization
  - Scenario described previously (on prior slides) primarily reflects known state-level procurements

# Stakeholder Feedback and Next Steps



# Feedback and Requests from Stakeholders

## Prior Feedback and Requests

- Feedback and requests have been made in prior NEPOOL MC meetings and through other communications
  - Analysis Group has been listening to prior NEPOOL MC meetings and thus is aware of requests for certain factors to be considered within the analysis
  - We aim to be responsive to these requests and this feedback to the extent we are able given the limited time frame for the analysis

## Timeline for Additional Requests

- We ask that stakeholders submit any additional comments/questions/requests regarding the report no later than Monday, 11/13
- This deadline will allow us for adequate consideration given the report's accelerated timeline
- However, submitting by this deadline does not ensure that the feedback will be addressed in the report, but that it will be considered and addressed if time constraints allow
- Please send requests to James Woods at [jwoods@iso-ne.com](mailto:jwoods@iso-ne.com)

## Next Steps

- Complete the assessment of prompt and seasonal markets
- Provide stakeholders with draft Report
- Present draft results at December stakeholder meeting

## Contact

Todd Schatzki

Principal

617-425-8250

[Todd.Schatzki@analysisgroup.com](mailto:Todd.Schatzki@analysisgroup.com)