Forward Enhanced Reserves Market

Presented by Rebecca Hunter, Senior Analyst of Government and Regulatory Affairs

July 2019

Introduction

- Calpine firmly believes that in 2018 the existing market products and penalties were sufficient to respond the changes from generator retirements.
- ISO-NE has identified that New England's evolving resource mix and constrained natural gas delivery infrastructure are not properly addressed or compensated under the existing market structure.
- Calpine suggests that there be a forward market design put in place that
  - properly values the existing fuel secure resources and
  - incentivizes fuel supply arrangements and investments
  - recognizing the same timeframe for when a decision to retain a resource would occur.

Allow resources to compete and markets to produce cost efficient solutions for winter fuel security

Design Changes and Updates

- Natural gas only resources with firm transportation and a gas supply contract would qualify for FERM with proof of contracts.
- Considering to remove the cap for eligible amount of MWhs, but establish a minimum MWh amount to manage varying starting fuel inventory levels.
  - Suppliers submit offers into the auction based on the MW value of the MWhs they plan to commit on stored fuel during an Operating Procedure-21 Energy Emergency Event over the commitment period.
- Illustrative example of demand curve and oil-only resource offer.
- More information on performance obligations and penalties. Looking for stakeholder feedback on set penalty rate.
- Settlement will occur after the winter months obligation. ISO will share a weekly FERM MWh obligations to help resource better manage obligation.

Market Design Fundamentals

- The Forward Enhanced Reserves Market (FERM) procures fuel secure MWhs for December 1st – March 15th three years prior to the obligation year.
- ISO qualifies resources based on their ability to contract for stored fuel or readily use stored energy.
  - Stored fuel is used throughout the presentation, but is meant to imply stored fuel or energy.
- Suppliers submit offers into the auction for a minimum or maximum amount of MWhs they will commit to offer of stored fuel during an Operating Procedure-21 Energy Emergency Event during the commitment period.
- Cleared suppliers with a FERM obligation will be required to offer and provide when dispatched on stored-fuel-backed MWhs during a Emergency Event or will be subject to penalty.

Production Definition

- The ISO is buying a forward commitment for fuel secure energy to satisfy system operations under multiple winter scenarios. The ISO will first determine the amount of MWs needed under an emergency event and then solve for the amount of MWhs over the course of a winter. ISO will have a diverse pool of assets of varying durations to address different levels of fuel contingencies.
  - A soft constraint for MWs to solve for the depth of a winter event gains a diverse pool of MWhs.
    - Cannot buy all MWhs from a few units if on average the event requires a set amount of capacity.
    - ISO may need some units that can provide during the worst conditions, but cannot sell many MWhs for the winter period.
  - ISO will leverage its fuel security reliability review set out in Planning Procedure 10 in Appendix I to solve for the amount of MWs and MWhs needed to avoid violations of trigger criteria across multiple scenarios.
    - This would be translated into a “MRI-like” curve of MWh as the procurement amount
- The resource is selling the assured capability to generate energy from an unconstrained fuel source to avoid exacerbating constraints on the pipeline system. The resource will be obligated to offer the stored fuel MWhs until the total amount sold is dispatched.
  - The resource will still be subject to all other obligations as applies, e.g. Capacity Supply Obligation, and must manage fuel inventories appropriately.
  - FERM obligation would be separate from CSO, but a resource could have both.

WHAT IS THE ISO GETTING OUT OF THIS DESIGN?

- *Resources economically incented to provide stored fuel when the ISO needs it the most.*
- *Resources responding to the ISO OP-21 Emergencies by offering unconstrained MWhs to the ISO during those events.*
- *The ability to alleviate the system constraints based on the depth (MW) and duration (MWhs) of the event.*

Qualifying Resources

- Resource must be under dispatch control of the ISO, and can follow dispatch instructions up and down within their physical limits.
- Resource must have the ability to contract for fuel or ability to readily use stored fuel/energy.
- Intermittent resources are not eligible.
- Imports are not eligible.

Resource Technology	FERM Eligibility
Nuclear	Yes
Pumped/Battery Storage (dispatchable)	Yes
Biomass/Refuse	Yes
Coal	Yes
Hydro	If on-site or upstream reservoir/pondage controlled by participant
Natural Gas	Yes, with LNG and/or firm transportation and gas supply.
Oil	Yes
Active Demand Response	Yes

Qualification and Verification

- Resource offers are reviewed by ISO prior to running of the auction for
  - Resource's rated generation
    - Winter capacity in MWs
  - Known or planned storage capacity
    - Minimum MWhs based off of MW rating
      - Current thinking is to prorate MW rating based on a starting inventory level
    - Maximum MWhs offered by resource owner
  - Credibility of quantity offered
    - Officer Certification
    - Inventory levels and replenishment plans for oil
    - Minimum hourly run time requirement for storage facilities based off of 16 hour peak. Looking for stakeholder feedback.
  - Planned outages
    - Not allowed during winter period or must be deducted from offered FERM quantity
- Contract eligible resources must provide Officer Certification of intent to contract prior to FERM auction. These resources will be subject to contract review by the ISO.
- Contract verification must be completed prior to October 1st of the Obligation Year.
- Resources that do not meet Contract Verification upon ISO review will refund 150% of FERM payment back to load.

Auction Timing and Clearing

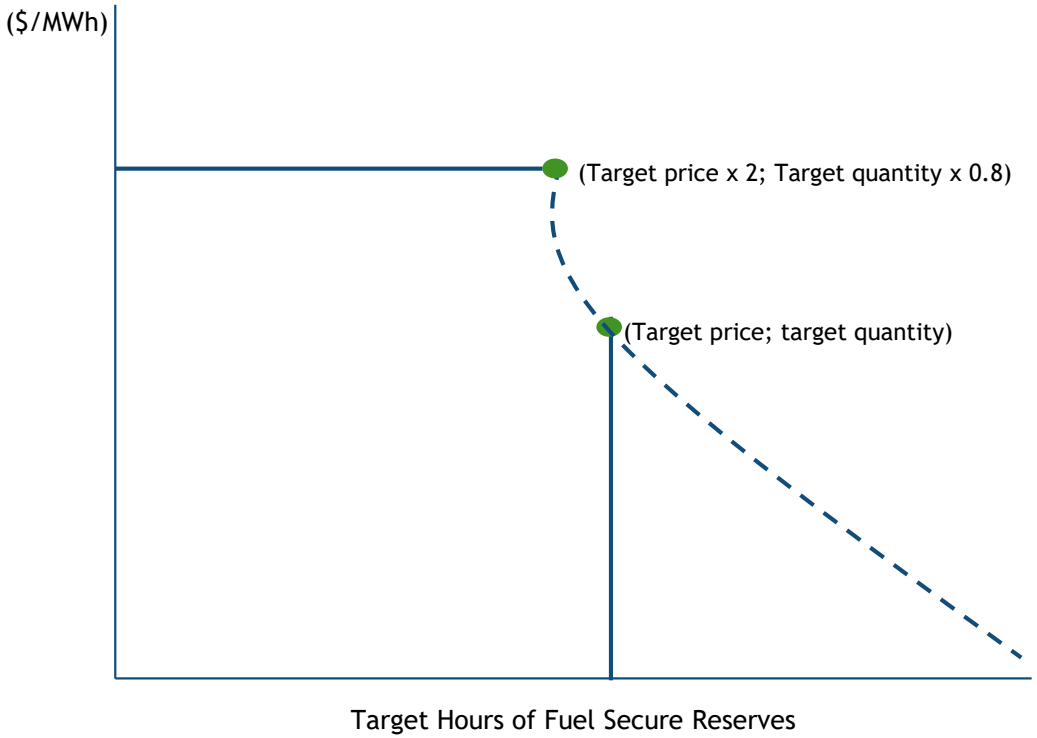
- Auction is held three years prior to the winter obligation year.
  - For example, the FERM Auction for Dec. 1 – Mar. 15, 2026 is run Spring 2022.
  - FERM aligns with the planning horizon for ISO operations group to retain a fuel secure resource.
- FERM Auction is run separately and after the Forward Capacity Auction.
  - This way fuel secure attributes are kept out of the capacity market although, a fuel security constraint is a simple solution to solve for a target amount of capacity.
  - ISO will sunset Fuel Security RMR tariff language after FCA 15. It will not be able to retain a resource in the capacity market for its stored fuel/energy attributes.
  - For example, going forward a resource that static de-lists from the FCA could clear in FERM.
    - As a result, FERM may clear a little higher than typical, providing an investment price signal to some resources and allowing for a timely transition as resource exits the market.
    - Conversely, if fuel secure resources are plenty then FERM will clear primarily to provide payment for forward fuel arrangements.
- Resources will submit sealed-bid offers for FERM after the results of its Capacity Supply Obligation are known.

Participation in FERM is voluntary.

Auction Demand Curve

- ISO will leverage its fuel security reliability review set out in Planning Procedure 10 in Appendix I to solve for an amount of MWs and MWhs needed to avoid violations of trigger criteria across multiple scenarios.
- A sloped demand curve is set for a total MWh portfolio requirement over the winter with a soft constraint on total MWs per event.
  - "Soft Constraints" are those that can be violated in the optimization (if needed) in order to reach a solution with a penalty factor to allow the optimization to try and comply with the constraint.
  - Each MWh of stored fuel/energy enhances fuel security, but after a certain point at a declining rate- similar to the MRI curve.
- The market price is set by the intersection of the demand curve and supply stack.
- All suppliers to clear the auction are paid the auction clearing price, subject to penalties for non-performance.

Illustrative Auction Demand Curve



Illustrative Resource Offer in Auction

A	What is your resource Type	Oil Only	
B	Do you plan to participate in FERM	Yes	
C	Generator Capacity (MW)	300	
D	What is your maximum amount of RT energy invertory in days	3	
E	How many days of RT energy inventory do you want to sell into FERM	2	
F	How large is your storage tank (bbl)	28,200	
G	What is your assumed fuel heat content (mmbtu/bbl)	5.8	
H	What is your unit heat rate (mmbtu/MWh)	7.5	
I	Calculated maximum amount of inventoried energy (MWh)	21,808	= F*(G/H)
J	Max amount of RT energy inventory in Days	3.03	= I/(C*K)
K	Peak hours required each day for FERM (hr)	24	
L	Capacity allowed to offer into FERM (MW)	200	= MIN(J,D,E)/3,* C

M	Winter Reliability Payment Rate ($/bbl)	$10.33	
N	Total storage	28,200	
O	Total Cost to Fill	$291,306	= M*N
P	Carrying Costs (Tank Lease + Maintenance)	$600,000	
Q	Risk Adder	$43,696	
R	Cost per MWh	$43	= (O+P+Q)/12

S	Capacity allowed to offer into FERM (MW)	200	
T	Real-Time Inventory MWh	21,808	
U	FERM Offer	$43	
V	Base Revenue	$935,002	= T*U
W	Base Revenue converted to $/ Kw-mo	$0.89	= V/C/3.5/1000

WHAT IS A RESOURCE GETTING FROM THIS DESIGN?

- *Revenue up-front to defray the costs of supply arrangements.*
- *Forward price signal for investment decisions.*
- *Clear signals for when those stored fuel MWhs are most valuable.*

Performance Obligations

- A FERM resource is obligated to offer sold MWhs upon ISO declaration of a forecasted Operating Procedure-21 Energy Emergency Event, but it is not necessary that all FERM resources be committed to produce energy.
- A resource is not selling the energy itself, only the assured capability to generate the offered energy with stored fuel or from a stored source.
  - The ISO will continue to pay energy at the LMP.
- If a resource's offer is in merit during an emergency event, and the ISO wants to utilize it from the pool of FERM resources it has procured, then it will be committed to run on the stored fuel.
  - As a clarification, a FERM designation is only for settlement/ tracking of obligation. It does not interfere with proper RT price formation.
  - ISO may also dispatch a resource within EcoMin or EcoMax limits.
  - For example, ISO may dispatch a resource at or down to min level to posture a resource in an effort to preserve inventory. This action is recognized as a commitment and total MWh used will count toward total MWh sold forward.
- ISO is responsible for FERM MWhs management and settlement. It will notify resource at Day Ahead Awards/Close that it is committed for part of its FERM obligation.
  - Once a resource has been committed and run for total MWhs sold forward, its obligation to FERM is over.
- A resource is responsible for fuel inventory management up until FERM obligation is over.
  - Resource can run on stored fuel during winter if economic to do so, but it will need to preserve or replenish inventory levels to support FERM obligation.
  - ISO is not responsible for fuel inventory management, but will enforce penalty if resource violates FERM obligation.
- As applies, all other obligations, e.g. CSO, are in place even after FERM obligation is over.

Performance Obligations

Questions around the performance obligations of the Oil-fired resource from the Resource Auction Offer Example in a previous slide:

1. How would they offer into the market under 'normal' conditions?
   - Same as today. If they have sold FERM MWhs and have a CSO obligation it is up to the resource to manage offers and inventory under normal conditions.
2. How they would offer into the market under 'OP-21' conditions?
   - ISO will declare an OP-21 event. Resource must offer energy cost curve from fuel secure or stored energy MWhs. These offers can be informed of the opportunity cost to use if they have limited inventory.
3. What happens when the OP-21 condition happens for two days and they are committed for a FERM run for both days?
   - Resource has met its FERM obligation for the winter. All other obligations, e.g. CSO, are still in place.
4. What happens when the OP-21 condition happens for two days and they are designated for a FERM run for one of the two days?
   - Resource is obligated to offer oil back MWhs for both days. Resource will know if it running under FERM designation at close of Day Ahead.
   - If resource does not have enough fuel or stored energy to offer on second day it is required to pay penalty plus buy back energy at nodal RT LMP.
5. What happens when the OP-21 condition happens for five days in a row (and they run out after two days, even though they put in a high LOC)
   - Resource has met its obligation. ISO must use other MWhs in FERM pool.
   - Resource can still be dispatched to run, just not under FERM.
6. What happens if their tank collapses just before December, how will they 'shed' this obligation? They would be subject to extreme penalties.
   - Resource is subject to the uncontracted penalty. It will refund 150% of FERM payment back to load.
   - We are currently working on an annual reconfiguration auction concept.

Penalties and Settlement

- Current thinking is that penalty rate would be set prior to the auction and not based off of the clearing price.
  - Variable penalties could have high and low swings in risk for a resource
  - Set penalty rate makes it easier to formulate offer
- Penalty rate should be high enough that people do not bid zero, but low enough that resources can manage it.
- Settlement will occur at the end of the winter months obligation.
  - ISO will tallying total FERM MWhs against any penalties for not making fuel secure or stored energy MWhs available
- Resource will know of FERM dispatch at Day Ahead Awards.
- ISO will also provide a weekly report of FERM designated runs for resources to manage inventories around.

WHAT DOES THE MARKET GET FROM THIS DESIGN?

- *Fuel security through a diverse pool of MWhs.*
- *Timely transition of the evolving resource mix.*
- *Investment in the existing fuel infrastructure.*
- *Market design changes in critical winter months only.*

Next Steps

- Bring more details of the FERM design for
  - Defined Penalties
  - Reconfiguration Auctions
- Follow up on Stakeholder Questions and Feedback

In Conclusion

- The Forward Enhanced Reserves Market is run three years forward to align with the decision to retain resources at risk of retirement.
- FERM procures a diverse pool of MWhs and ties the obligation to offering the stored energy under OP-21 energy emergencies.
- FERM strives to bridge a missing gap in today's existing products by providing:
  - The ISO-NE operations group with the appropriate in-market tools to manage the grid reliably around forecasted fuel system constraints.
  - The evolving resource mix a forward price signal to properly invest and manage risk around fuel supply arrangements.