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Distinguishing Qualified Capacity by Performance

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Drivers for package of reforms

Good market design is needed to accelerate decarbonization in New England by recognizing new state policy resources, using existing resources differently, enhancing system reliability, and eliminating inefficient surplus

New England States seek to decarbonize energy supply

All New England states are taking steps to increase the supply of renewable energy with some taking large steps to change the energy mix.

Accommodating state policy resources

The region seeks reform of the MOPR to recognize the capacity contributions of state policy resources while preserving competitive capacity market outcomes.

Enabling Fleet Evolution

The current Forward Capacity Market design is not supporting efficient retirement today. With commitment for significant new state policy entry introducing new supply, improved retirement signals and ease of exit are needed.

Maintaining a strong grid

Variable output renewable resources will require resources that provide backstop and balancing services. Their contributions must also be recognized through market signals that support initial investment and reinvestment to reliably deliver grid support

Single capacity price but not a single product – not all megawatts supply the same obligation

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FCM market rules require more valuable resources to supply greater value under their CSO

Market Rule 1	Obligation under a CSO
Section III.13.6.1.1	• Requires that resources "having a Capacity Supply Obligation shall be offered into both the Day-Ahead Energy Market and Real-Time Energy Market at a MW amount equal to or greater than its Capacity Supply Obligation whenever the resource is physically available." • Resources with high availability and greater energy output duration capability required to supply greater demand support capability. • Market mitigation rules can also require some resources to supply lower priced energy offers (i.e. , energy call option with a lower strike price).
Section III.13.6.1.1.2	• Energy offers "for the listed portion of a resource must reflect the then-known unit-specific operating characteristics (taking into account, among other things, the physical design characteristics of the unit)" • Resources with high availability and greater flexibility required to supply greater demand support capability.

How does that impact value to consumers?

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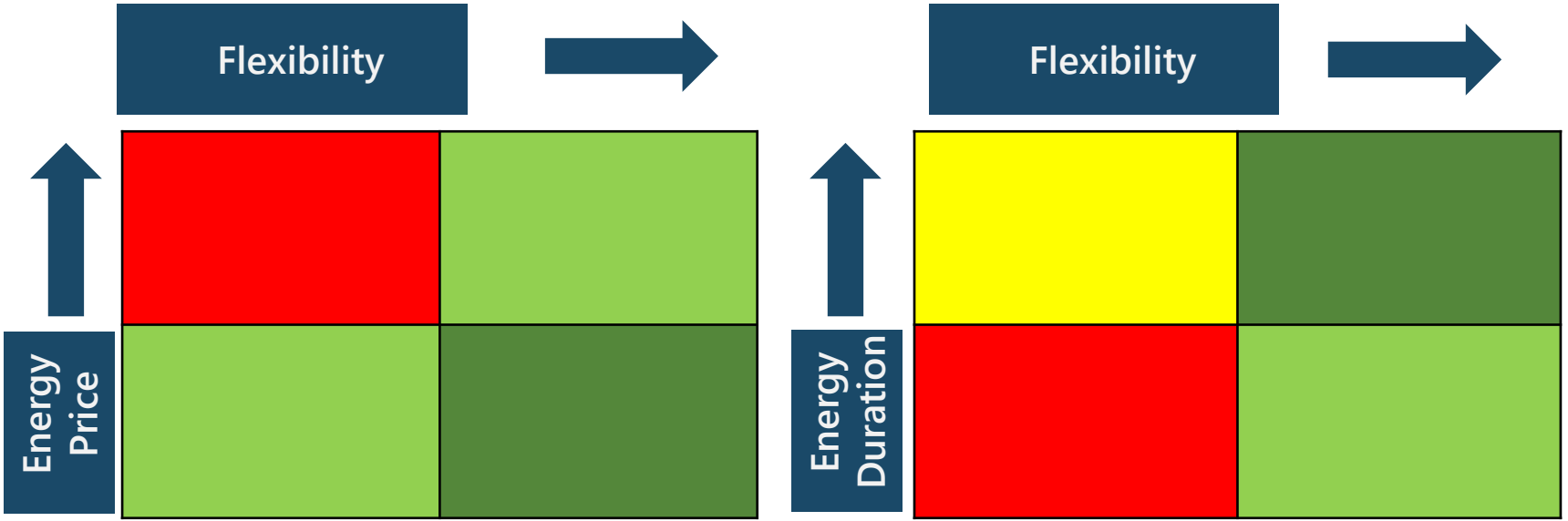
Higher option value presents greater probability that the resource will be useful in dispatch support on the system



Most expensive energy offered under inflexible characteristics is least likely to be dispatched. High energy duration capability that is generally not in economics and not accessible in time to address changed system conditions is least likely to be requested to provide system support.

Why is this relevant to MOPR reform?

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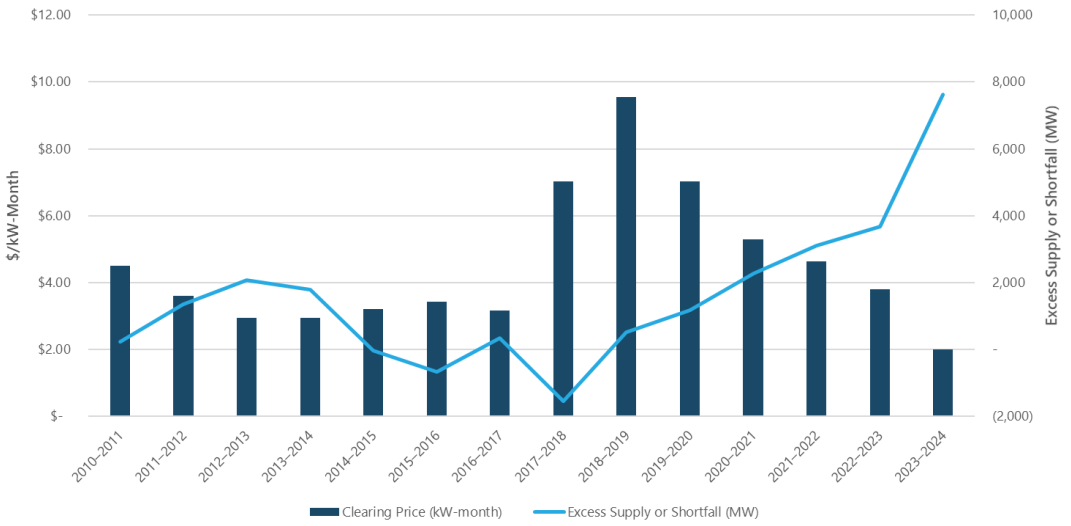
Persistent decreases in capacity prices are indicative of inefficient retirement signals

FCA clears and excess supply

- Entry (including behind-the-meter) without offsetting retirements since FCA 8 are revealing poor retirement signals.
- The FCM design as implemented is not efficiently signaling exit under current conditions and significant new entry would only exacerbate that flaw.
- This flaw may also explain the limited paired entry/exit MWs in CASPR.

FCA clearing price and supply imbalance by delivery year

Clearing price and ICR per ISO-NE; System capacity per S&P Market Intelligence



Better retirement signals are needed

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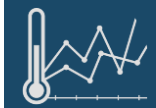
Restoring a meaningful retirement signal is fundamental to efficient market function and achieving state policy goals

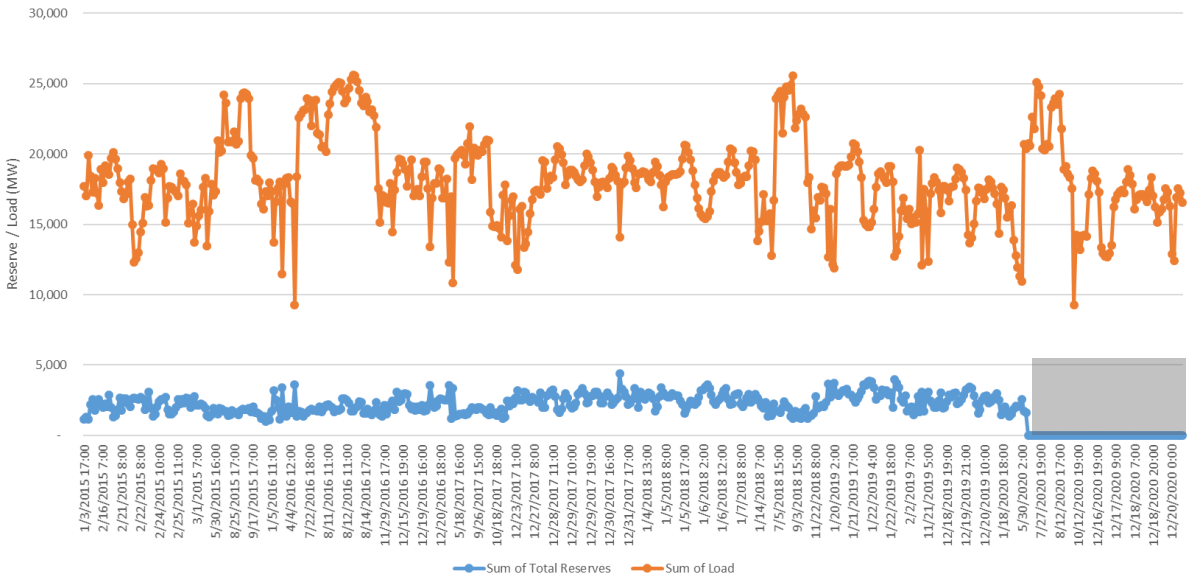
Benefits of retirement reform	
 Supplier equity	Capacity providing economic support to dispatch in periods of greatest need provide more service and incur more costs than resources that rarely, if ever, provide dispatch support.
 Interconnection	Encouraging obsolete resource retirement frees valuable, underutilized interconnection space for new clean energy projects.
 Consumer value	Capacity providing economic support to dispatch in periods of greatest need provides more value to consumers than resources that rarely, if ever, provide dispatch support.
 Climate-aligned Reliability	Market rules encouraging efficient retirements are needed to support the market outcomes that attract and retain the resources needed to meet state policy objectives and back-up/balancing resources needed to integrate them.

There is a surplus in *something*, but not in the core capacity resources used to reliably support demand in dispatch

Generation and operating reserve supply in hours with highest 1% of RTLMP[1]

- Contributions across seasons and technologies.
- Historical performance as energy or operating reserve is reflective of resources' relative call option value.
- Absent sufficient capacity revenue support for performing resources, consumers could experience higher costs through:
  - **Decreased reliability** as inadequate revenue support leads to deferred reinvestment.
  - Retirement of core resources means **higher cost** to provide energy or operating reserve in the future.

Energy and Operating Reserve during Mass Hub Highest 1% of RT LMPs



1. Data for hours with top 1% of Mass Hub RTLMPs in each of 2015 through 2020

Distribution of highest 1% of Mass Hub RTLMP hours

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1 year	3.4%	0.0%	0.0%	0.0%	9.1%	2.3%	8.0%	11.4%	5.7%	8.0%	1.1%	51.1%
3 years	40.9%	1.1%	2.3%	0.4%	3.4%	1.1%	4.2%	6.1%	4.9%	3.0%	2.7%	29.9%
5 years	26.4%	1.8%	1.4%	0.7%	3.9%	0.9%	5.2%	8.9%	6.1%	3.4%	2.3%	39.1%

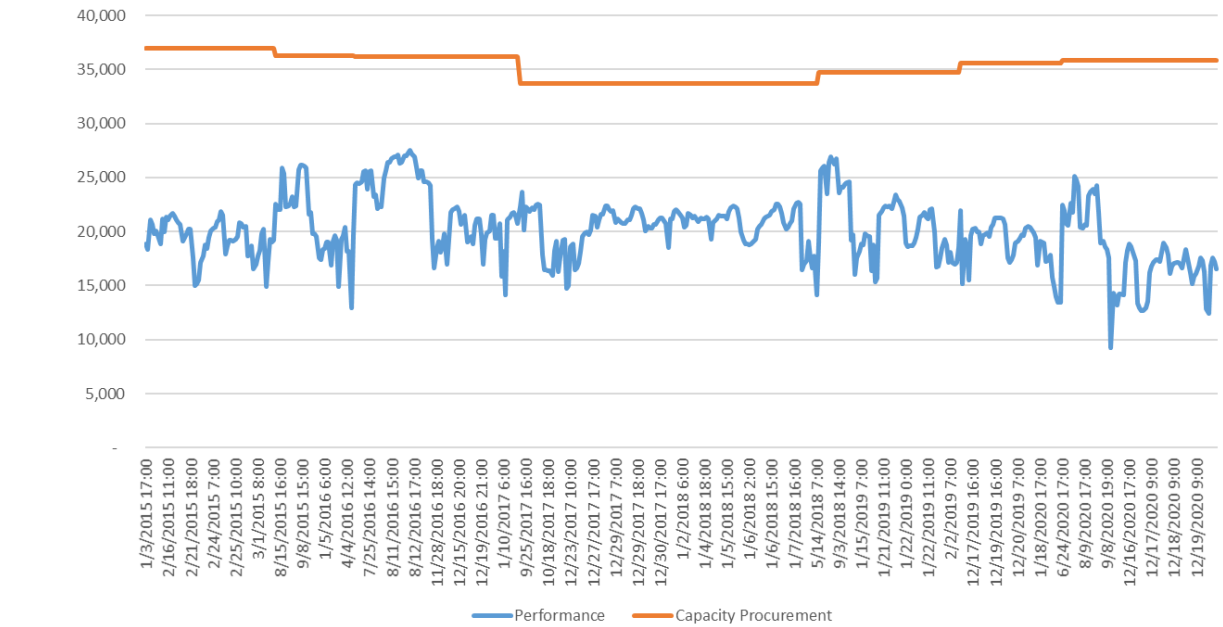
Surplus is comprised of CSOs that rarely provide energy or operating reserve

True surplus does not provide the same value to consumers

- Rarely, if ever, in economics:
  - Very inflexible
  - Expensive energy price
- These Capacity Supply Obligations (CSOs) supply the least call option value to consumers.

Capacity performance at highest energy prices vs. total CSO

Generation and designated operating reserve in MWh per ISO-NE



1. Data for hours with top 1% of RTLMPs at the Mass Hub in each of 2015 through 2020

Performance Capacity Rating Concept

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Basic Concept – How PCR and CCR ratings differ

Performance Capacity Rating (PCR)

- Qualification based on performance as energy or operating reserve during top 1% of RTLMP hours in each of past 5 years.
- PCR rating based on average contribution as energy or operating reserve in those hours.
- Performance-based value is reflective of each resource's relative call option value supplied to consumers under its CSO.
- Discourages delayed COD and provides better market entry & exit signals.

Common Capacity Rating (CCR)

- Qualification based on current methods.
- An audit-based value – the level of support that could be provided.
- CCR >= PCR.

Basic Concept – How supply curves & clearing differ

Performance Capacity Rating (PCR)

- PCR supply curve only applies at FCA prices below Net CONE. At and above Net CONE, *all* capacity is needed to meet criteria.
- Below Net CONE, PCR supply curve clears against an adjusted MRI demand curve.
- PCR does not require additional de-list bids or new supply offers. Same existing rules would apply.

Common Capacity Rating (CCR)

- CCR supply curve applies in all FCA rounds against MRI demand curve as occurs today.
- CCR supply curve consists of all qualified capacity and all PCR CSO megawatts are used toward CCR requirement.
- De-list of PCR CSO in CCR round is possible:
  - De-List applied first to non-PCR megawatts then to PCR megawatts.
  - Any PCR CSO shed is not replaced and PCR clearing price remains as determined in auction.

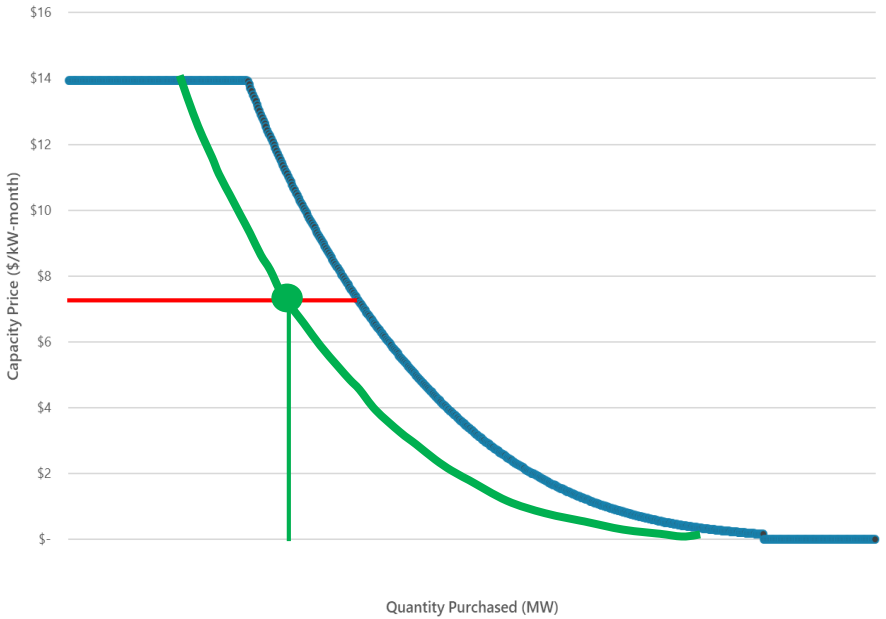
Basic Concept – PCR Demand Curve

Performance Capacity Rating (PCR)

- PCR demand curve adjusts the MRI Demand Curve at Net CONE based on the average 5-year energy plus operating reserve performance in the top 1% of Mass Hub RTLMP hours.

- Example: 5-year history with average performance across top 1% RTLMP hours at 61% of then existing Net ICR:

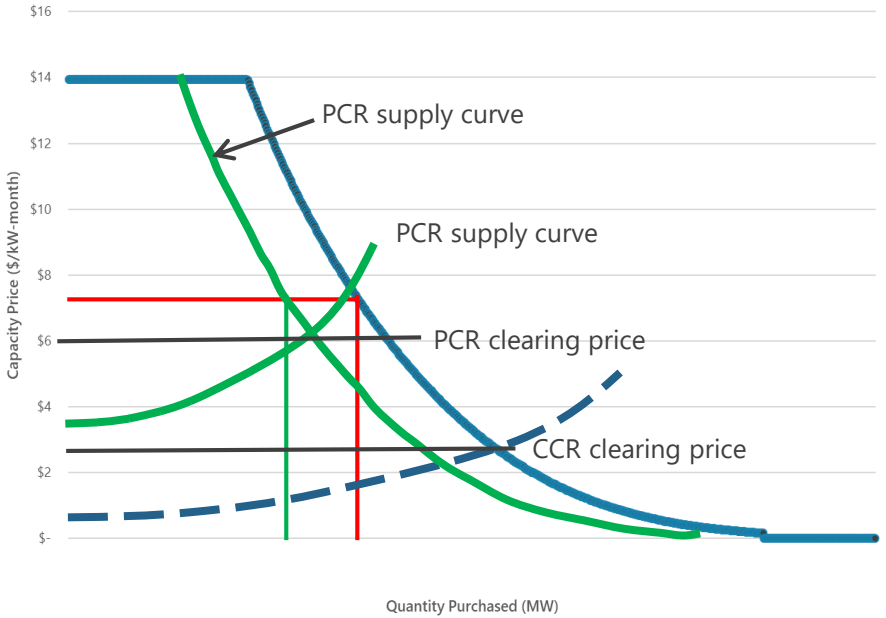
FCA 15 Net ICR	33,270 MW
Times	61%
PCR Demand at Net CONE =	**20,295 MW**



Basic Concept – Illustrative PCR clearing process

Performance Capacity Rating (PCR)

- PCR supply curve only applies at FCA prices below Net CONE. At and above Net CONE, *all* capacity is needed to meet criteria.
- Below Net CONE, PCR supply curve clears against the adjusted MRI demand curve.



Higher performance obligations required of PCR CSOs

Performance Capacity Rating (PCR)

PCR Capacity Supply Obligations (CSOs) face a higher FCM Pay-for-Performance (FCM-PFP) Capacity Balancing Ratio determined as follows:

Capacity Balancing Ratio equals:

$$\frac{\text{PCR clearing price} * \text{Total PCR CSO}}{(\text{PCR clearing price} * \text{PCR CSO} + \text{CCR clearing price} * \text{CCR CSO})}$$

Example with PCR clearing of 20,000MW at $6.50/kw-mo and CCR clearing of 14,000MW at $2/kw-mo.:

Capacity Balancing Ratio (PCR) = 82.28%

Common Capacity Rating (CCR)

CCR CSOs face a lower FCM Pay-for-Performance (FCM-PFP) Capacity Balancing Ratio determined as follows:

Capacity Balancing Ratio equals:

$$\frac{\text{CCR clearing price} * \text{Total CCR CSO}}{(\text{PCR clearing price} * \text{PCR CSO} + \text{CCR clearing price} * \text{CCR CSO})}$$

Example with PCR clearing of 20,000MW at $6.50/kw-mo and CCR clearing of 14,000MW at $2/kw-mo.:

Capacity Balancing Ratio (CCR) = 17.72%

MOPR Reform Package