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Revised CPP Proposal

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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

Overview

Review the market design gap driving the need for change and explain why this gap value cannot be expressed through an energy or operating reserve market price.

Review the revised CPP design:

- Requires all CSO resources to supply their share, either physically or financially, of a comparable energy call option in the highest 1% of hourly Real-Time LMPs.
- CSOs that do not physically provide a comparable call option as CSO resource's supplying energy or operating reserve value in those hours would pay the performing CSOs for the difference in value between the energy & operating reserve calls they provided relative to the value of the calls provided by performing CSO resources.
- Much like Pay-for-Performance (PFP), these under-performance charges would be distributed to CSO resources providing more than their share of real-time energy and operating reserve.

Another look at the market design gap



FCM market rules require some CSO resources to supply greater energy/reserve option value under their CSO

Market Rule 1

Section III.13.6.1.1

Obligation under a CSO

- 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.

Obligation to provide insurance protection against higher energy and operating reserve prices varies by resource

CSO obligates each resource to:

- Offer its energy consistent with the operating characteristics its design enables.
- Offer its energy subject to market mitigation

Minimum deductible for each CSO-based insurance policy is the higher of:

- Its energy offer price, or
- RTLMP (all inframarginal resources are paid the LMP for their energy)

Restrictions on permissible claims under each CSO insurance policy differ:

- Fast Start-based policies offer protection in DA and RT
- Non-Fast start CSO that is scheduled in DA can also protect in RT
- Non-Fast start CSO not scheduled in DA only available as RAA and only if lead time not too long.

Since the collective CSO obligations bound future energy and operating reserve revenue opportunity (and energy and operating reserve costs for capacity buyers), resources' unique CSO-based energy/reserve call options cannot be valued through the spot energy and operating reserve market price outcomes they limit.

Some CSOs are required to provide more insurance value

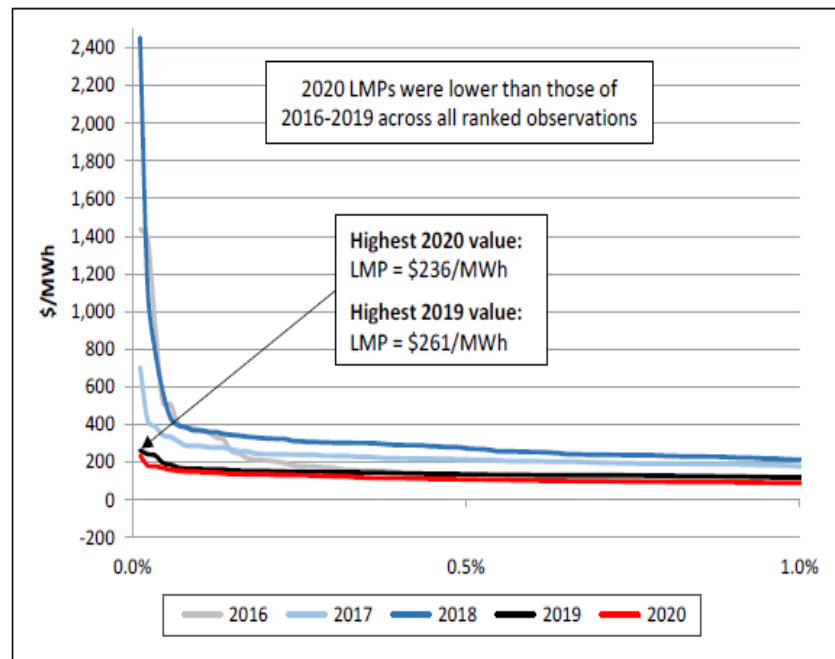
CSO resources with high energy offers provide less energy price insurance value.

CSOs that are unavailable in those hours, including the slowest start, longest minimum run time CSO resources not scheduled in those hours, do not provide real-time CSO-based energy price insurance.

When the FCA extends into surplus territory on the MRI demand curve, consumers should not be indifferent to which CSO stays or leaves. Consumers deserve the best CSO value for their FCM dollar.

Yet, the least performing (least energy/reserve insurance value) resources currently face the lowest costs of selling a CSO today.

Figure 3-26: LMP Duration Curves for Top 1% of Real-Time Hours



Yet, FCM *assumes* each CSO resource is perfectly substitutable

Qualified capacity rating: Considers only whether a resource could reach a specific level in order to avoid unserved energy. Does not consider:

- Performance impacts associated with restrictions on fuel/energy delivery. (possible ELCC focus)
- Performance impacts of the resource's economics and inflexibility that could reduce the occasions where it could be scheduled to meet the system need. (possible ELCC focus)
- Whether one CSO resource provides greater energy and operating reserve call option value than another CSO. (not likely to be addressed by ELCC)

MRI demand curve: Assumes each capacity resource provides the same contribution toward reducing electric energy not served. Does not consider:

- Whether one CSO resource provides greater premium energy and operating reserve call option value than another CSO. (not likely to be addressed by ELCC)

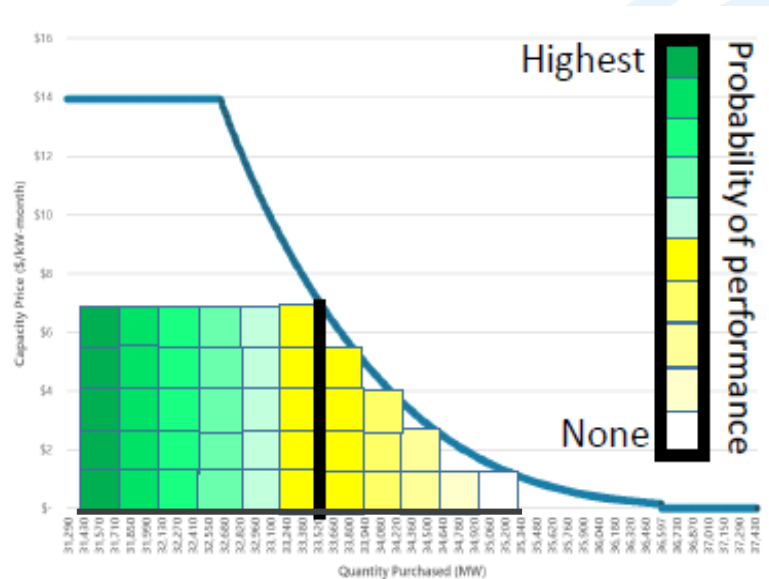
The result - current FCM rules sustain inefficient surplus

At *theoretical* equilibrium (Net ICR), all CSO policies are needed and the Net CONE payment to all may make sense.

Beyond NICR, not all CSO insurance value is the same yet the FCA clearing price set as if it is.

Performing CSOs continue to provide valuable energy & operating reserve insurance *even in surplus*.

CSO resources least likely to be asked to run (i.e., lower insurance value) sustain FCM surplus, keeping revenues below levels performing resources need for reinvestment.



PFP helpful but leaves an important wholesale market gap

PFP requires equal work for equal pay, but *only when the system experiences a deficiency in operating reserve*. That is, PFP applies when the common CSO strike is \$1000/MWh.

PFP does not recognize the significant differentiating value provided by certain CSO resources performing as energy or operating reserve to *avoid* operating reserve deficiencies and deliver lower energy and operating reserve prices (i.e., common CSO strikes below \$1000/MWh).

In non-scarcity periods, performing CSOs provide energy and operating reserve price insurance that non-performing CSOs do not.

This market value gap cannot be addressed through energy or operating reserve markets because CSO requires aggregate of capacity resources to offer in a way that limits their future energy and operating reserve price opportunity.

Spot market opportunity bounded by CSOs

Resources generating or providing operating reserve at the same RTLMP provide a comparable value CSO-based insurance.

While generating resources supplied the energy, CSOs supplying operating reserves make that RTLMP possible (i.e., without their service, redispatch would have been necessary to maintain reliability, resulting in a higher RTLMP).

Compensation in the Real-Time Operating Reserve Market (RTOR) only reflects:

- Lost opportunity cost incurred under redispatch to reduce the economic energy output of an economic generating resource in order to supply operating reserve.
- Binding Reserve Constraint Penalty Factor (RCPF) when the full operating requirement cannot be met (PFP events).

By definition, the CSO-based energy and operating reserve insurance provided by performing resources cannot be valued through spot energy or operating reserve prices bounded by their aggregate CSO obligations. That energy and operating reserve price protection value must be reflected at the point of sale, the CSO.

Market diagnosis

FCM is not functioning well. Sustained surplus as FCM only values:

- Ability to avoid unserved energy (perfect substitution assumption),
- Energy call performance when the common generation strike is \$1000/MWh (i.e., when a PFP event occurs).

Yet, FCM requires some CSOs to provide greater value when PFP does not apply.

This situation understates the value of high performing resources and weakens the retirement signal.

Changes to recognize this value distinction between CSOs are needed.

Revised CPP concept



Revised CPP design - summary

Would require all CSO resources to supply their share, either physically or financially, of a comparable energy call option in the highest 1% of hourly Real-Time LMPs.

- In order to better recognize seasonal diversity, the highest 1% of Real-Time LMP hours would be determined based on the RTLMP history in the current and preceding 3 months.

CSOs that do not *physically* provide a comparable call option by supplying energy or operating reserve in those hours would financially achieve that comparability by paying the performing CSOs for the difference between the value of their real-time call on energy & operating reserve relative to the value provided by performing CSO resources.

Much like Pay-for-Performance (PFP), CPP under-performance charges would be distributed to CSO resources providing more than their share of economic energy and operating reserve calls.

Revised CPP design - detail

Replaces earlier voluntary capacity buyer Capacity Performance Transactions design with a defined performance obligation requiring all CSOs to provide a comparable physical (or financial) call option in each of the top 1% RTLMP hours.

$$\text{Performance Balancing Ratio (PBR)} = \frac{\text{Energy} + \text{operating reserve credit supplied by CSOs}}{\text{Total CSO MWs}}$$

Resources not supplying energy or operating reserve in the hour are charged for under-performance based on the extent to which their real-time energy option is more expensive than the RTLMP. Resources that are not available in real-time dispatch assessed as if they were accessible at \$999/MWh.

Much like Pay-for-Performance (PFP), under-performance charges fund payments to over-performers.

Since the revised CPP continues to rely on intra-Commitment Period settlements, it retains the longer lead time flexibility to achieve design details and implementation.

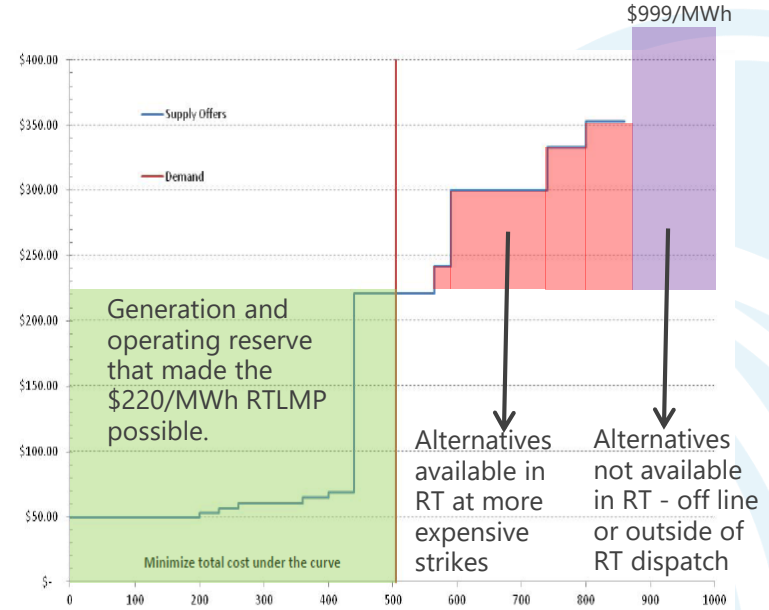
Requires CSOs to provide comparable insurance

A Fast Start or online CSO resource with an energy offer that is \$500/MWh higher than the \$200/MWh CSOs supplying energy provide less energy insurance value than the performing CSOs in that hour. That resource would be charged $\text{CSO} \times \text{PBR} \times (\$500 - \$200/\text{MWh})$.

CSOs not providing energy or operating reserve in the hour and not providing a real-time call option, get charged an amount equal to the $\text{CSO} \times \text{PBR} \times (\$999 - 200/\text{MWh})$:

- CSO derates and outages
- Offline, non-Fast Start resources¹

If a new requirement for longer lead time operating reserve were implemented (e.g., 240-minute), that new category of operating reserve would be reflected in the CPP design.



¹ Post day ahead ISO commitment of non-Fast Start resources with no day ahead schedule only occurs if needed to achieve a reliable operating plan for the day (e.g., load forecast increase). Absent such an intraday commitment, those resources are not scheduled in real-time dispatch.

Example CPP charges/payments

Capacity revenues net of CPP charge/payment compensates resources for their relative CSO-based real time insurance.

Provides improved market signal to efficiently address FCM surplus.

PBR	Resource Strike	RTLMP	1% Hours	CPP Charge (\$/kw-mo)	Example Surplus Mix
70%	\$999	\$200	88	\$4.10	20%
70%	\$899	\$200	88	\$3.59	10%
70%	\$799	\$200	88	\$3.07	5%
70%	\$699	\$200	88	\$2.56	5%
70%	\$599	\$200	88	\$2.05	5%
70%	\$499	\$200	88	\$1.53	5%
70%	\$399	\$200	88	\$1.02	10%
70%	\$299	\$200	88	\$0.51	20%
70%	\$250	\$200	88	\$0.26	20%
100% performer payment for 30% over-performance					\$0.81

CPP values performance as operating reserve

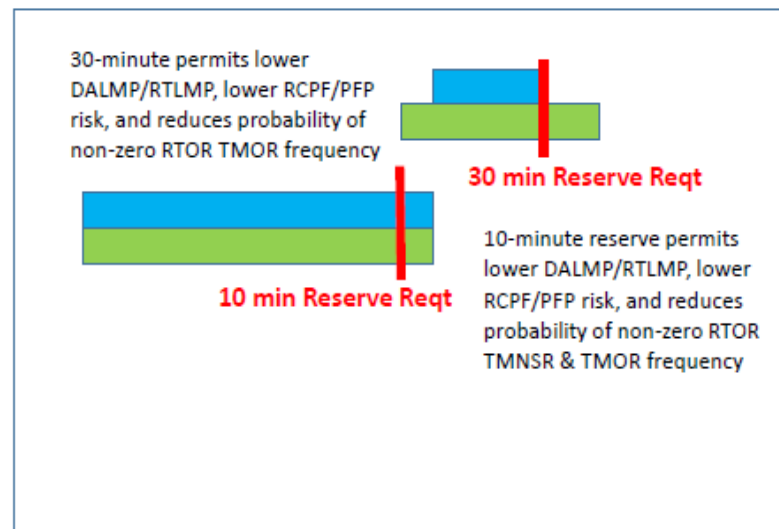
All Fast Start resources (FSR) provide day ahead and real-time energy options, some as operating reserve, when available.

- 30-minute reserve provides option to avoid higher RT energy prices (whether due to contingency or missed forecast).
- 10-minute reserve provides an even higher value real-time dispatch option (10-minute can substitute for 30-minute but not vice versa).

RTOR does not compensate for RT energy or operating reserve price insurance and currently there is no day ahead market to compensate operating reserves.

CSOs performing as real-time operating reserves would not face CPP charges and would get a distribution of CPP collections, except for the extent to which that class of operating reserve supply exceeds requirements.

- If 10-minute supply \leq total operating reserve supply, no ten minute reserve charged for CPP under-performance.
- If 10-minute $>$ total operating reserve, then CPP credit prorated
- If 30-minute reserve $>$ total requirement less 10-minute supply, then CPP credit prorated



Impact of import-constraints on performance

When import constraints bind in the energy market, the RTLMP inside the import-constrained zone exceeds the Hub RTLMP.

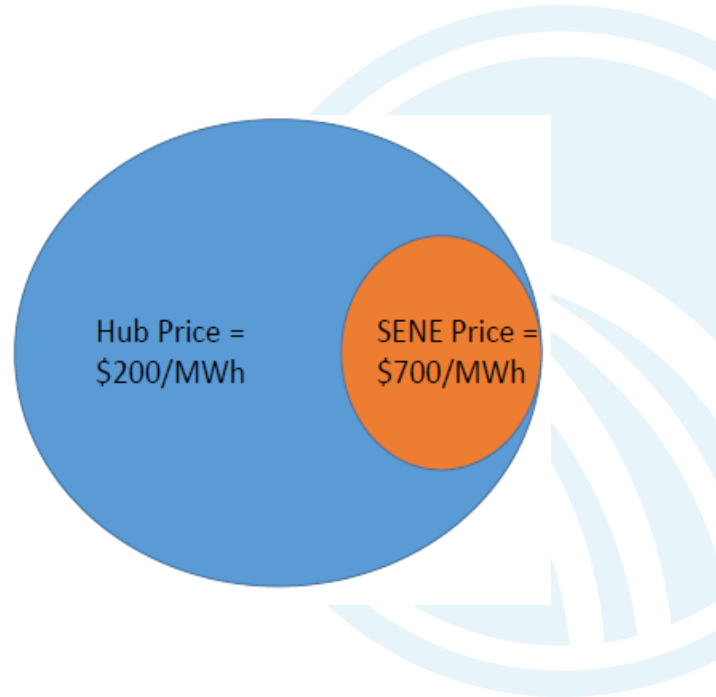
CPP performance is attributed to all CSO-based generation and operating reserve supplied inside zone.

However, the allocation of CPP distributions of collections from system-wide non-performers to over-performers located inside the import-constrained zone is limited to collections from resources with an energy cost above the import-zone RTLMP. Its higher RTLMP compensates for the rest.

Example:

- Hub RTLMP = \$200/MWh
- SENE Zone RTLMP = \$700/MWh
- Collections from resources priced > \$700/MWh distributed among all performing CSO.
- Collections from resources price between \$200-699/MWh distributed only to performing CSO outside the import-constrained zone.
- Value of CSO local calls between \$200-699 valued through the local RTLMP.

All local non-performing CSOs treated the same as if located in Rest of System (ROS).



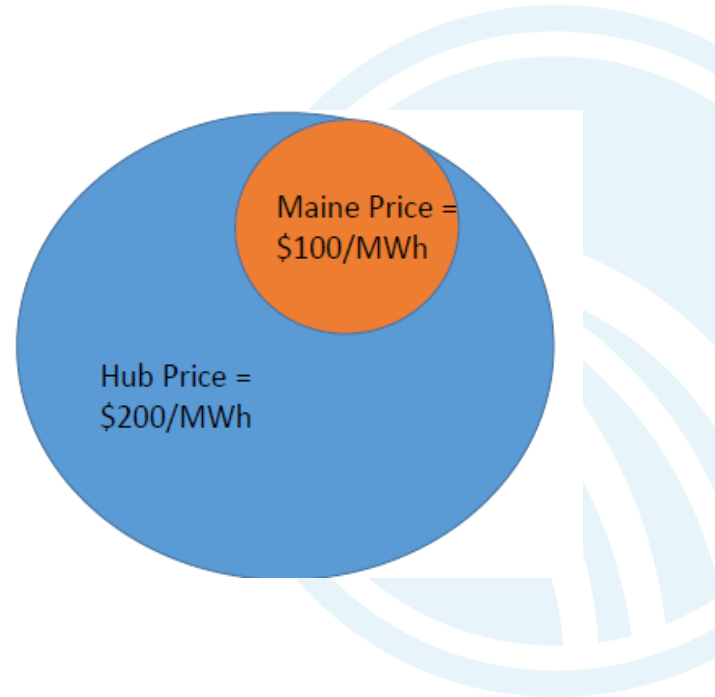
Impact of export-constraints on performance

When export constraints apply in this energy market example, there is more capability inside the zone to supply from energy calls below \$200/MWh than there is transportation to move that energy to serve system-wide demand.

In this example, CPP would provide performance credit to all CSO resources inside the export-constrained zone with energy bids below \$200/MWh, prorata to the actual amount of in-zone CSO-based generation.

- In-zone CSO-based generation = 3,000MW
- In zone-CSO MW < \$200/MWh = 4,000MW
- Each such CSO would get 0.75MW performance per 1MW of CSO because of the export constraint.

All other CSOs are considered non-performing and treated the same as if located in Rest of System (ROS).



Conclusion

Market changes are needed to value the differences in energy call options each capacity seller is required to provide by virtue of their CSO. By definition, this value cannot be realized through spot energy and operating reserve prices.

The revised CPP design accomplishes this distinction by defining a common strike price for all CSOs enforced in the highest 1% RTLMP hours.

- CSOs with higher strikes (or restrictions on use) would be required to buy the gap between their strike (or effective strike) and the common strike level with those proceeds used to compensate the CSOs that made the RTLMP, the common strike value, possible.

The revised CPP design would be a complement to, not a replacement of, ELCC.

MOPR Reform Package

