WHITE PAPER

Pilgrim Retires, Prices Decline: What Happened in the ISO-NE FCA 10 Auction?

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The Bottom Line

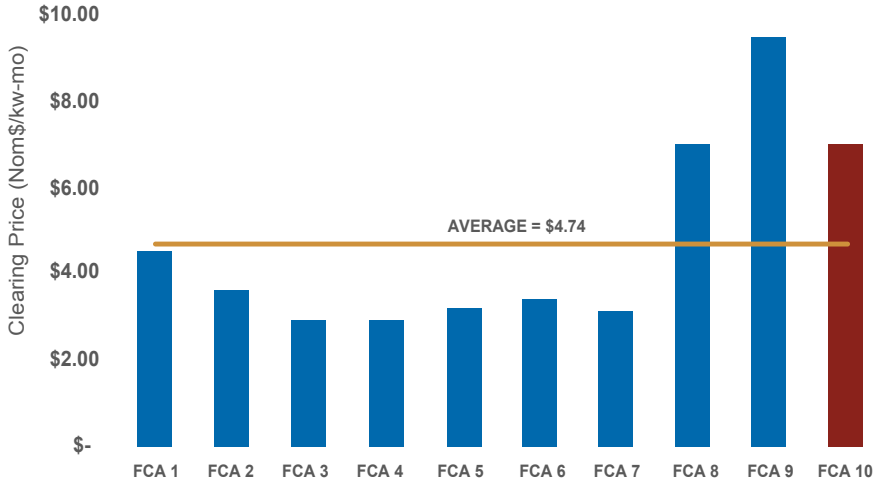
1. Rest-of-system capacity prices for existing resources decreased from $9.55/kW-mo in FCA#9 to $7.03/kW-mo in FCA#10, a 25 percent decline.
2. Prices in this auction declined due to significant new capacity additions that bid at lower than expected prices. These lower bids may reflect some combination of the following: (a) an optimistic view on gas prices and an expectation of higher energy margins, (b) discounted cost of capital due to brownfield development/lower financing costs/bonus depreciation, and/or (c) an expectation of higher capacity prices in the future with increasing penalty rates.
3. The decrease in capacity prices does not necessarily imply a new era of lower prices for the ISO-NE capacity market. The market is quite small and is very sensitive to changes in supply/demand balance and expected going-forward energy margins.

Introduction

On February 11, 2016, ISO-NE concluded its tenth Forward Capacity Auction (FCA10). This was the second auction under the redesigned capacity market structure that includes an ISO-wide demand curve (variable reserve requirement) and the pay for performance initiative.

FCA10 capacity prices cleared at $7.03/kW-mo, higher than the historical average of $4.74/kW-mo but lower than the previous auction, which cleared at $9.55/kW-mo (Exhibit 1). Capacity prices were also lower than market expectations, including ICF's latest projections in the range of $8–9/kW-mo.

Exhibit 1: ISO-NE Rest of System Auction Capacity Prices



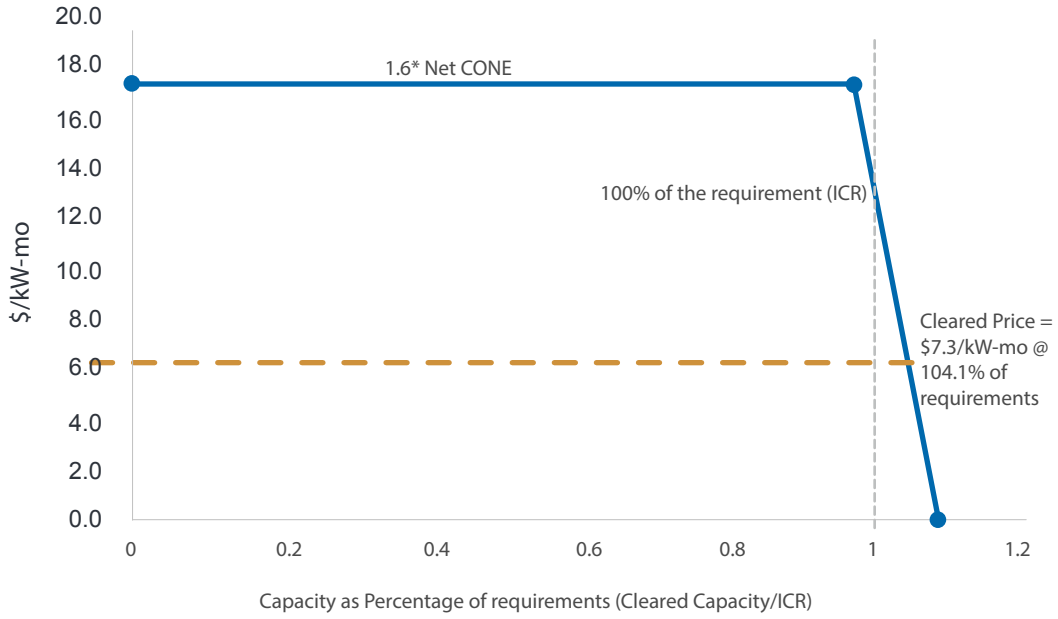
Source: ICF International, ISONE Forward Capacity Auction Results

Note: Pre-FCA9, the capacity market structure was very different in that demand curves were vertical with no significant value for reserves or excess capacity, and prices during shortages were set administratively at predefined levels for new and existing resources. In addition, there were no penalty structure or performance initiatives. In FCA8, existing resources received a capacity payment of $7.025/kW-mo, while new resources received a capacity payment of $15.00/kW-mo. Exhibit 1 provides the capacity prices for existing resources.

Key Outcomes and Lessons Learned

Excess capacity cleared, resulting in a high reserve margin: As shown in Exhibit 2, the retirement of the Pilgrim nuclear power plant and the associated withdrawal of 680 MW was not enough to compensate for the excess supply that engulfed the market, leading to a pronounced decrease in capacity prices. The total supply of 35,567 MW cleared the auction, as shown in Exhibit 3. This is 1.4 GW more than the installed capacity requirement (ICR) of 34,151 MW. With projected net peak demand of 29,851 MW, the capacity that cleared led to a reserve margin of approximately 19.1 percent, dwarfing the 14.4 percent reserve margin target.

Exhibit 2: ISO-NE FCA 10 Demand Curve, Capacity Cleared as Percent of ICR and Resulting Price



Source: ICF International, ISONE Parameters for FCA 10, ISONE Forward Capacity Auction Results

Exhibit 3: Cleared Resources by Type – FCA9 Actual and FCA10 Estimates

	FCA9	FCA10 (Est.)
Existing generation resources	29,382	29,912
New generation resources	1,060	1,459
Imports	1,449	1,450
Demand Resources	2,803	2,746
Total	**34,694**	**35,567**

Source: ISONE Forward Capacity Auction Results

The revamped incentive structure continues to lure new, more reliable generation into the market: Similar to the last auction, FCA10 saw significant economic thermal capacity additions of approximately 1.3 GW, with all the new thermal generators clearing in the import constrained capacity zones. Additions included Invenergy's Burrillville Energy Center 3 in Rhode Island (485 MW), PSEG's Bridgeport Harbor 6 in Connecticut (484 MW), and NRG's Canal 3 in SEMA (333 MW). All of these units are reported to have dual-fired capabilities, partially addressing concerns related to the availability of gas for power generation under scarcity conditions. Beyond thermal generation, 27 MW of new wind and 44 MW of new solar reserve capacity cleared the auction.

New thermal capacity cleared at a fraction of net CONE: ISO-NE's net cost of new entry (net CONE[1]) approved by FERC for FCA10 was $10.81/kW-mo. This is significantly higher than the auction-clearing price of $7.03/kW-mo, implying that new thermal capacity cleared at a significant discount of 35 percent to net CONE, which was not expected.

For a number of reasons, the existence of such a significant near-term discount to net CONE in PJM would not be uncommon, even with the capacity performance mechanism in place.

Reasons for this include: (a) discounted gas-basis differentials and lower gas prices across parts of PJM that could result in strong energy margins for select projects, thereby decreasing the capacity price requirements of new units in these locations;[2] (b) larger power plants resulting in lower cost due to economies of scale; and (c) utility development of new power plants that have lower cost of capital.

In contrast to PJM, natural gas prices in ISO-NE are relatively uniform across the sub regions and are generally higher than those in PJM due to gas supply constraints. These conditions limit the potential for arbitrage opportunities in terms of discounted gas pricing and higher energy margins for new units in ISO-NE. The remaining factors that could explain new units clearing at a discount to net CONE in ISO-NE are: (a) discounted development costs (construction, capital cost, and operations and maintenance (O&M); (b) lower internal rate of return (IRR) expectations[3]; and (c) expectations for higher energy margins and higher capacity prices in the long run due to increasing penalty rates.

While two of the three new thermal units that cleared the ISO-NE FCA10 auction are brownfield development projects to be constructed on existing sites, there is no evidence for significant discounts on capital cost for these units. For example, Bridgeport Harbor 6, which is being developed by PSEG, is expected to cost around $550M (or approximately $1,135/kW). This is just $65/kW lower than the capital cost assumption underlying net CONE. Furthermore, the size of the units is inconsistent with discounted O&M costs.

After ruling out these possible explanations, it becomes highly likely that the new resources cleared the auction at a substantial discount due to an optimistic outlook for energy margins and lower financing costs driven by the current low interest rate environment along wit the recent extension of bonus depreciation by the federal government in December **2015.**[4] Current market forwards and lower gas prices could justify the expectations of higher energy margins. For example, based on the

[1] Net CONE = CONE – E&AS Revenue

[2] For example, a discount of $0.50/MMbtu for a new power plant at a heat rate of 6800 Btu/kWh could result in a higher energy margin of roughly $3.4/MWh. This would translate to a capacity price discount of approximately $2.00/kW-mo. or one-fifth of the 2018/2019 PJM Net CONE.

[3] ISO-NE's net CONE estimate assumes an approximately 13.8 percent return on equity and 7 percent debt rate.

[4] Bonus depreciation originally expired in 2014; however, in December 2015, the federal government extended the program until 2019. As a result, any capital expense incurred during the 2015 to 2019 period will have an accelerated depreciation ranging from approximately 50 percent in 2015 to 30 percent in 2019. ICF's analysis shows that as a result of the one year accelerated depreciation for new generators coming online in 2019, the annual capital charge rates could decrease by approximately 1 percent resulting in a $1/kW-mo decrease in the bids of new generators.

ISO-NE power price and gas price forwards traded in the month of January 2016 for the 2016 to 2020 period, the expected average spark spread (energy margin) for a new combined cycle with a heat rate of 6800 Btu/kWh is approximately $8.00/MWh. This translates to $4.70/kW-mo at an 80 percent capacity factor in contrast to $3.48/kW-mo that ISO-NE assumes in their Net CONE. Furthermore, the forward spark spreads traded in January 2016 for the 2018 to 2020 period are higher than forward spark spreads traded for the same period in January 2015 (Exhibit 4). This implies that the economics of new power plants have improved relative to the prior year, partially explaining why some new units like Bridgeport Harbor did not clear in the last auction, when capacity prices were higher, but cleared in this auction, even at lower capacity prices.

Exhibit 4: Forward Spark Spreads

	All Hours		
	2018	2019	2020
2015 January forward gas price ($/MMBtu)	4.95	5.08	5.18
2015 January implied heat rate (btu/kWh)	9194	8797	8654
2015 January forward spark spread ($/MWh)	8.1	6.9	6.7
2016 January forward gas price ($/MMBtu)	3.76	3.82	3.97
2016 January implied heat rate (btu/kWh)	10537	10368	9991
2016 January forward spark spread ($/MWh)	8.6	8.0	7.2
Delta [2016–2015] spark spread ($/MWh)	**+0.6**	**+1.2**	**+0.4**

Note: Forward spark spreads are estimated for a 6800 Btu/kWh unit. The calculations also account for $2.00/MWh of variable O&M and Regional Greenhouse Gas Initiative (RGGI) CO_2 cost.

These higher energy margins are unlikely to last for long because forwards are driven by current market conditions and may not account for the 1.3 GW of new thermal capacity that is expected to come online by 2019. This new capacity will put downward pressure on energy prices and resulting energy margins. For example, all else equal, a new 500 MW combined cycle facility can decrease all-hour energy prices in ISO-NE by approximately $1.00/MWh (or approximately $0.80/kW-mo) in the year when the facility is added.

Source: ICF International, SNL

No separation across the capacity zones: ISO-NE has not yet developed demand curves for local capacity zones. Instead, in FCA10 local capacity zones continued to be modeled with vertical demand curves by virtue of the rules of Insufficient Competition (IC), Inadequate Supply (IS) and the Capacity Forward Rule.

As a result of a shortage in capacity and the inadequate supply rule, SEMA/RI in FCA9 cleared at higher prices than the rest of the pool, whereas in FCA10 there was no separation across the regions for the following three main reasons:

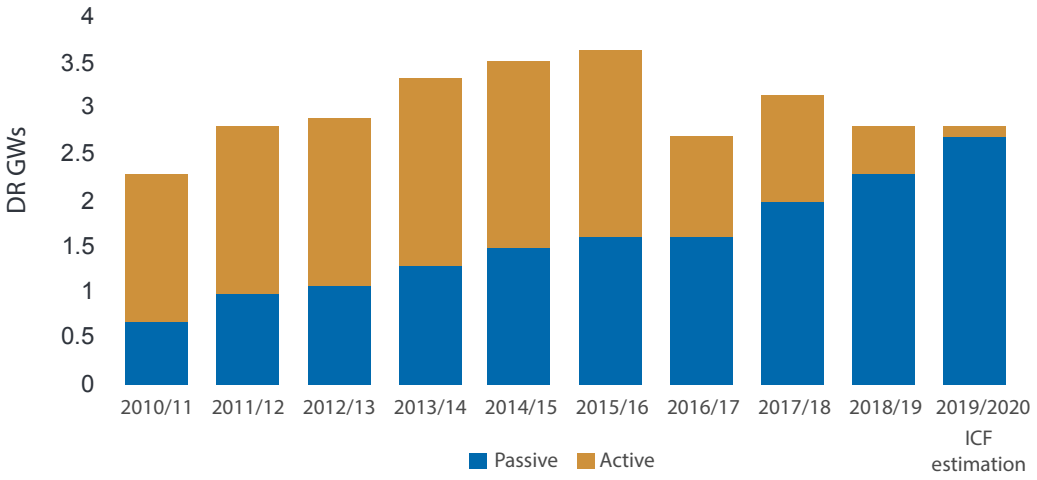
1. Approximately 800 MW of new capacity was added in SEMA/RI, an import-constrained region.
2. Implementation of the new import-constrained capacity zone, which combined NEMA/Boston with SEMA/RI.

3. Lower peak demand projections due to the inclusion of retail solar Photo Voltaic (PV).

For these same reasons, ICF does not expect any separation across regions going forward. However, ICF would like to add the caveat that regional separation will also depend upon the location of future retirements and the final shape of the regional demand curves that ISO-NE will implement in FCA11. ISO-NE is still in the process of finalizing these regional demand curves.

Demand resources (DRs), specifically active DRs, continue to decrease: Although 371 MW of new DRs cleared in FCA10, overall, DR marginally declined from 2.8 GW in FCA9 to 2.75 GW in FCA10 (Exhibit 5). ICF estimates that approximately 428 MW of existing DR de-listed in this auction. Based on trends observed over the last few auctions and the risk of significant penalties under performance initiative, ICF expects that the majority of the de-listing happened with active DR and all the new incremental DR cleared is mostly passive DR. Since almost all of the active DR has now been de-listed from the auction, going forward, ICF expects DR to increase because of continuous increase in passive DR participation and no offsets from de-listing of active DR.

Exhibit 5: Cleared GWs of DR in ISO-NE Auctions



Source: ICF International, ISONE Capacity Supply Obligations

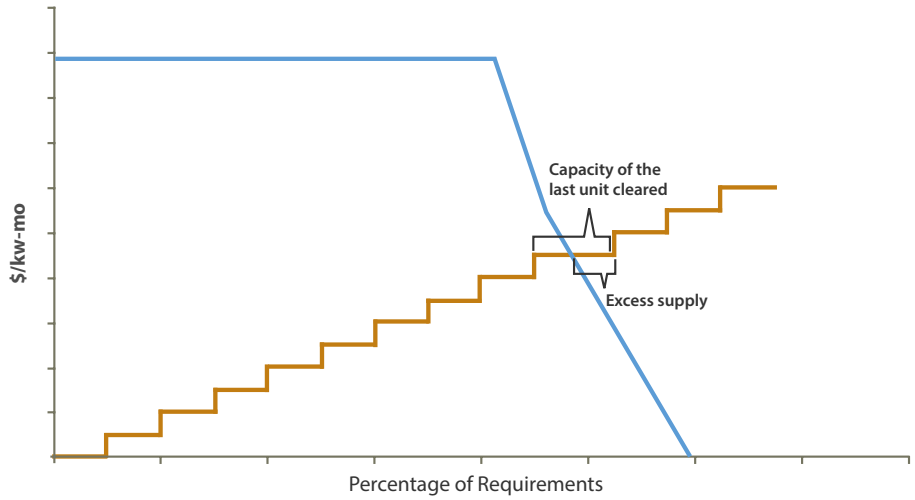
New transmission did not clear: New transmission does not appear to have cleared the market. This could be because the combination of transmission and generation costs are too high, the volume of the cleared capacity required might be too high because of the substantial size of the transmission projects, or additional incentives associated with potential new CO_2 regulations may be required to improve the economics of transmission projects. Alternatively, some transmission projects may not have qualified.

55 MW of renewable capacity cleared under the 200 MW exemption: As part of the demand curve negotiations, beginning with the 2018/2019 auction ISO-NE market participants agreed on an exemption that allows up to 200 MW (reserve capacity) of new capacity from renewable resources (renewables exemption) to participate in each auction without being constrained by buyer-side mitigation rules. This capacity can accumulate and carry over up to a cumulative limit of 600 MW. Approximately 55 MW of new renewable capacity was exempted from the buy–side mitigation rule in this auction. This was similar to the 50 MW that was exempted in the last auction.

As of 2019/2020, out of 400 MW of total exemption, 105 MW has been utilized and the remaining 295 MW of exemption will carry over to the next auction. This means that about 495 MW of renewable capacity will be exempt in the 2020/2021 auction. However, it is important to note that renewable resources need to be qualified to receive this exemption and not all renewable resources qualify. Also, ISO-NE has not yet done an analysis to see if new transmission lines designed to bring hydro generation from Canada will qualify for this exemption.

130 MW of estimated excess capacity will put downward pressure on prices in the upcoming auctions: Using the auction clearing prices, the shape of the demand curve, and the reported cleared capacity, ICF estimates that approximately 130 MW of "excess" supply cleared the auction (Exhibit 6).[5] Assuming no change in the parameters from FCA10 (installed capacity requirements, de-list bids, etc.) by placing the supply from new resources at the bottom of the supply curve, the maximum impact of the excess capacity in FCA11 prices will be around $0.70/kW-mo. The impact may be less depending on the response from supply and the supply curve (i.e. the de-list bids of existing power plants).

Exhibit 6: Illustrative Supply and Demand Curve for FCA#9



Source: ICF International

Looking Ahead

We can draw several preliminary conclusions from these results for the short and medium terms:

- The dynamic de-list price of $5.5/kW-mo that is the current implied floor is an average price estimated by Independent Market Monitor (IMM) for the marginal resources of the system. This implies that there are units that have higher de-list bids than $5.5/kW-mo, and such units could be marginal at the $7.03/kW-mo capacity price. Any further reduction in the price, increasing penalties in the long run, or decreasing energy margins due to new resources could put further pressure on these units, resulting in potential retirement and providing support to capacity prices.
- Any new capacity resource (including renewables and DRs) that comes online in the future, unless

[5] In the previous auction, the amount of excess capacity cleared was minimal, i.e., 3.6 MW

it is offsetting incremental demand, will likely prompt system retirements, limiting any further significant decline in capacity prices. A potential for demand degradation could also prompt retirements of existing marginal units.

- The fact that new cleared capacity is dual fired indicates that the new units are firming fuel supply to minimize penalties under performance initiative. This will improve the reliability of the system during scarcity hours.
- We believe that due to the 162 MW of "excess" capacity that cleared in this auction, there will be downward pressure in the next auction of up to $0.70/kW-mo. Demand growth, de-list bids, and retirements will provide support if capacity prices decrease further with additional supply entering the market—in the form of passive demand response, unmitigated renewable capacity, or development projects that can be economic with capacity prices lower than $7.00/kW-mo.
- With the new efficient capacity additions that cleared, energy prices and market heat rates are likely to see downward pressure in the 2019–2020 period.

Beyond the conclusions drawn above, the proposal to redesign ISO-NE's system-wide demand curve by replacing the existing linear shape with a convex curve could negatively affect capacity prices in the upcoming forward capacity auction. ICF is closely following these developments and will provide an update when these changes are finalized.

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George Katsigiannakis is an expert in U.S. electricity markets and has a deep understanding of all factors affecting U.S. wholesale electric markets, including market design, environmental regulations, fuel markets, transmission, renewables, energy efficiency, and demand-side management. Mr. Katsigiannakis joined ICF in 1997 and has been involved in a large number of projects, including several forward price curve assessments, development support, and financial performance of generation assets. He works in the areas of energy modeling, wholesale market assessments, asset valuations, restructuring, and litigation support as well as contract evaluation and risk assessments. Mr. Katsigiannakis earned a B.S. in Industrial Engineering from Technical University of Crete, Greece, an M.Sc. in Operations Research from The George Washington University and completed the doctoral course work on stochastic modeling and optimization.

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portfolios; energy markets advisor for the EFH 1st Lien committee, Dynegy and Calpine Unsecured Creditor committees, and NRG Energy in the bankruptcy and restructuring processes; financing and development due diligence support including for gas, coal, nuclear, hydro, and wind projects and portfolios; litigation and regulatory support to utilities; and advisingto power companies in contracting and asset optimization for new or existing power plants. Ms. Muthiah holds an M.S. in Technology and Policy, an M.S. in Environmental Engineering, and a B.S.in Electrical Engineering, all from the Massachusetts Institute of Technology (MIT).

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