

WHITE PAPER

THE NEW ENGLAND ELECTRIC POWER MARKET

William Cratty

Senior Technical Engineer, CPower



INTRODUCTION

In the New England electric power market, sharply rising capacity costs and energy volatility will increase the cost of electricity despite the relatively low fuel prices and flat usage trends. This white paper explores the reasons behind this and what commercial and industrial end users can do to mitigate these cost increases.

ISO New England (ISO-NE) is responsible for keeping electricity flowing across the six-state New England region: Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont. In so doing, ISO-NE's core mission is system reliability.

To ensure reliability ISO-NE oversees the day-to-day operation of New England's electric power generation and transmission system to keep the energy that generators supply to the grid in near-perfect balance with consumers' energy demand. To ensure the system maintains adequate generating and transmission capacity to serve current and future needs ISO-NE manages a comprehensive regional power system planning process and the region's competitive wholesale electricity markets.

THE CHALLENGE

More than 4,200 MW of the region's non-gas generating capacity has retired or plans to retire soon. This includes several oil- and coal-fired units, as well as two nuclear plants that were part of the region's baseload generation. "At risk" for closing are another 6,000 MW from additional coal- and oil-fired generators, which are displaced from the electric energy market on most days by gas-fired units. But they are still critical for meeting the region's demand in winter, particularly when natural gas supplies are limited. In total, about 30% of the region's generating capacity could be gone by 2020. These retiring resources are likely to be replaced by more natural-gas-fired resources¹.

At least 28 generating stations totaling over 8000 MW providing capacity to the New England power system today are considered "at risk to close" resources by the grid operator.

This "restructuring" of New England's electricity generation fleet has created significant challenges to maintaining a reliable and competitive wholesale electricity market in New England.

- Inadequate natural gas pipeline infrastructure is limiting the performance of gas-fired resources, which is creating reliability concerns and price volatility in winter,
- Substantial non-gas generating capacity is retiring, limiting the options for reliable grid operation when natural gas infrastructure is constrained,
- The weather-dependent output from wind and solar resources and the increase in distributed generation adds complexity to how ISO-NE must operate the power system to maintain reliability,

¹ ISO New England 2016 Regional Electricity Outlook

- Expensive transmission infrastructure upgrades are needed to connect more wind and hydro resources, and
- State efforts to inject more green energy into the system outside of the markets may undermine confidence in the markets and future investment in competitive power resources.

NEW ENGLAND WHOLESALE ELECTRICITY MARKETS

The wholesale cost of electricity in New England comprises the following components:

- Energy – The cost of procuring the actual electrons comprising electricity.
- Capacity – Designed to provide system reliability and ensure enough generation is available.
- Ancillaries – Small administrative charges billed to load serving entities (utility companies) by ISO-NE for day-to-day operation of the electric power generation and transmission system.
- Line Losses – Included to make up for the energy lost over transmission and distribution lines due to heating caused by resistance to the flow of electrons.
- Renewable Portfolio Standards – Mandates set by individual states for load-serving entities to purchase a certain amount of renewable energy. Determined by state regulated compliance percentages and the financial market for renewable energy certificates (RECs).

The region's Energy Market, where buyers and sellers trade electricity daily, is by far the biggest component of the region's wholesale electricity marketplace. The market's value has been rising and falling due to changes in both electricity demand and fuel costs for the region's generating fleet. The major force behind these ups and down is the region's inadequate natural gas delivery infrastructure which can cause price spikes driven by strong winter demand from the electricity and heating sectors for limited supplies of low-cost fuel deliverable from the Marcellus shale regions¹.

Future capacity charges are expected to increase 2x or more next year with the congested geography in Northeast MA already seeing the increase...

The second biggest component is the region's Capacity Market. The Capacity Market structure is based on a three-year forward acquisition horizon via the Forward Capacity Auction. This allows for a long enough planning cycle and cost certainty for retirements to be programmed out and new capacity planned to be installed. Prices in this market have historically reflected lower values due to previous excess supply. However, capacity prices are now on the rise reflecting the tightening in capacity resources due to the pending loss of about 30% of the region's generating capacity from retirements, which in turn is driving new investments in generation as intended by market forces. The prices set by Forward Capacity Auctions reflect today's cost to build and finance new generation.

Recent studies have shown that the elevated capacity values will be with us for the next 10 to 15 years². All of ISO-NE will see significantly higher prices beginning with the June 2017 power year (see table below). The congested Boston area is already experiencing such increases.

FCA	Commitment Period	\$/kW-mth	\$/MW-year
6	6/1/2015 to 5/31/2016		
	NEMA	\$ 3.129	\$ 37,548
	Rest of System	\$ 3.434	\$ 41,208
7	6/1/2016 to 5/31/2017		
	NEMA	\$ 6.661	\$ 79,932
	Rest of System	\$ 3.150	\$ 37,800
8	6/1/2017 to 5/31/2018		
	NEMA	\$ 15.000	\$ 180,000
	Rest of System	\$ 7.025	\$ 84,300
9	6/1/2018 to 5/31/2019		
	SEMA/RI	\$ 11.080	\$ 132,960
	Rest of System	\$ 9.550	\$ 114,600
10	6/1/2019 to 5/31/2020		
	Total of System	\$ 7.030	\$ 84,360

ECONOMICS

In New England, energy and capacity charges account for 80% of the wholesale cost of commodity electricity. Fuel cost is the biggest portion of a power plant's operating cost, particularly for New England's natural-gas-, oil-, and coal-fired generators. Natural-gas-fired resources now comprise the majority of New England's generating capacity. When their access to low-priced gas from the Marcellus shale is unrestricted, New England has reliable, low-priced electricity.

However, wintertime access to natural gas has grown tight over recent years because the regional fuel transportation network has not kept up with demand from both generation and heating sectors. These natural gas constraints have led to grid reliability challenges and spikes in wholesale electricity prices. The situation is exacerbated by other market dynamics: low gas prices during most of the year except winter are putting economic pressure on coal, oil, and nuclear resources.

² Capacity Watch, ESA I Power LLC, October 2015

By 2020, resources representing about 30% of regional capacity have committed to cease operation or are at risk of retirement. Taking their place are even more natural-gas-fired units—currently, more than 60% of new generation being proposed by private investors across the six states will be primarily or exclusively fueled by natural gas.¹

Every month consumers are charged a fee called a capacity charge or peak charge whether they buy from a third party or the local utility company. ISO-NE assesses capacity costs based upon each end user's kW consumed during the peak consumption hour of the entire New England system on an annual basis. The basic value of capacity, in \$/kW month, is determined by the Forward Capacity Auction process and these values are known 3 years in advance of any given year. Capacity charges can account for up to 30% of the monthly bill for electricity -- not to be confused with the local utility company demand charges for distribution which are separate and apart from ISO-NE capacity charges. These charges are not a short term aberration given the forward capacity price projections.

WHAT TO DO ABOUT IT

Business owners or operators can offset energy price volatility and rising capacity prices by participating in the various ISO-NE Forward Capacity Market Load Response programs -- a collaboration of options providing financial opportunities for electricity users to appropriately manage down total energy spend by incorporating avoided cost or offset strategies. Both active demand resources (like the practice of powering down machines or switching to an on-site generator) and passive demand resources (like energy-efficiency measures and distributed generation) have been participating in the Forward Capacity Market since the market began in 2010. ISO-NE has the most demand resources as a percentage of peak demand compared with other ISOs/RTOs in the country³.

A fundamental part of any facility's energy strategy is to also understand and evaluate specific demand management actions that can help offset or fully mitigate the impact of rising energy costs

Active Demand Response

The purpose of the Real-Time Demand Response (RTDR) program is to facilitate load reduction during a "capacity deficiency" on the electric power grid in the New England Control Area. Capacity deficiencies can occur whenever the grid is stressed due to then existing conditions, including weather, unplanned generation outages, system mechanical conditions, etc. Participants in the RTDR program agree to a certain level of load reduction equal to or greater than 100 kW within 30-minutes notice at the discretion of the ISO-New England. Participants earn monthly capacity payments for being on standby to reduce electrical load when called by the ISO-NE. The number of events and hours called since 2010 are shown in the table below.

³ Assessment of Demand Response and Advanced Metering Staff Report, FERC, December 2015

YEAR	# EVENTS	HOURS
2010	1	2:45
2011	2	6:45
2012	0	0:00
2013	3	13:10
2014	0	0:00
2015	0	0:00
2016	1	3:30
AVG.	1	3:44

Some examples of RTDR measures at commercial, industrial and institutional facilities that have heating, ventilation and air conditioning (HVAC) systems are adjusting environmental temperature set points, expanding set point dead bands, reducing fan and pump speeds, resetting chilled water temperature set points, adjusting variable air volume (VAV) static air pressures, locking out the 2nd stage of A/C compressors, shutting down non-essential equipment and lights, etc.

For manufacturing and other industrial and process loads, participants effect controlled or partial shutdown of production lines and processes, defer production batch steps, or selectively shut off non-essential equipment, lights and other electric loads making up production by transferring manufacturing and processes activities to subsequent work shifts.

Hospitals, data centers, commercial and institutional facilities that have standby generators permitted for non-emergency use can participate in RTDR by activating and transferring electrical load to the generator(s).

Passive Demand Response

The purpose of the On-Peak Hours (OPHR) program is to permanently reduce electricity drawn from the electric power grid during certain seasonal performance hours. OPHR participants can earn monthly capacity payments for implementing projects or measures that reduce demand on the grid during On-Peak Performance Hours defined as 1:00 pm to 5:00 pm non-holiday weekdays in June, July and August (Summer Season) and 5:00 pm to 7:00 pm non-holiday weekdays in December and January (Winter Season). OPHR participants can earn monthly capacity payments 12 months of the year for the life of the measure up to 25 years depending on the type of measure installed.

On-Peak Hours projects and measures include:

- Distributed generation: Defined as generation resources directly connected to end-use customer load and located behind the end-use customer's meter, which

reduce the amount of energy that would otherwise have been produced by other capacity resources on the New England electricity grid during Demand Resource On-Peak Hours. Cogeneration, Solar PV, Wind Turbines and other on-site electricity generating systems not having emissions restrictions are eligible.

- Energy efficiency: Defined as measures and/or systems installed by end-use customers that reduce the total amount of electrical energy that would otherwise have been needed to deliver an equivalent or improved level of end-use service over the Demand Resource On-Peak Hours. Examples of energy efficiency measures include lighting retrofits, upgrading chillers and motors, installing heat pumps and other HVAC upgrades as well as manufacturing and process equipment upgrades.
- Load management: Defined as measures, systems, and/or strategies installed by end-use customers to shift electrical usage from the Demand Resource On-Peak Hours to other hours and reduce the amount of capacity needed to deliver an equivalent or acceptable level of service at those end-use customers. Examples of load management measures include load control end-use cycling, chilled water storage, storage batteries and rescheduling of manufacturing operations and processes.

Price Responsive Demand

ISO-NE operates real-time and day-ahead energy markets. Real-Time Demand Response participants (“RTDR Assets”) in the Transitional Price Responsive Demand (TPRD) program can earn energy payments by reducing electricity usage for daily operations. For example, on Monday a participant could offer to curtail electricity demand by a certain Megawatt (MW) amount on Tuesday if the hourly “Day-Ahead Price” for Tuesday should equal or exceed a specified price per Megawatt hour (\$/MWh) for a minimum number of consecutive hours (“offer duration”). If Tuesday’s Day-Ahead Prices meet these conditions the participant will be credited the Day-Ahead Price for the offered demand reduction amount that was curtailed on Tuesday. The participant receives payments based on the \$/MWh price for the amount of electricity purchases avoided during the awarded offer duration.

Capacity Tag Management

Every month consumers are charged a fee called a capacity charge or peak charge whether they buy from a third party or the local utility company. ISO-NE assesses capacity costs based upon each end user’s kW consumed during the peak consumption hour of the entire New England system on an annual basis. Capacity charges can account for up to 30% of the monthly bill for electricity.

If a consumer can curtail energy consumption during periods of peak system load, it will lower its capacity value (“Cap Tag”) which in turn will potentially reduce power costs. Since the peak hour can only be confirmed after the summer peak periods are over, any end user consumption reduction made during the peak hour will be recognized with reduced charges on their power bill in

the following year. While capacity costs are determined by the ISO-NE, the charges displayed on the electricity bill are determined by the supplier. These charges, therefore, vary from supplier to supplier.

Regulation

In 2015, ISO-NE redesigned the Regulation Market to allow advanced storage technologies, such as batteries and flywheels, to compete to provide frequency regulation services for New England. Frequency regulation is the capability of specially equipped resources to increase or decrease their energy output every four seconds in response to ISO signals. This fine-tuning balances supply levels against small second-to-second variations in electricity use and helps maintain the power system's frequency. The participant receives monthly payments based on the amount of energy increased or decreased each dispatch and the times they are available to be dispatched.

CONCLUSION

The energy strategy business owners and operators employ is increasingly important and perhaps more complex than they realize. A well thought out energy strategy goes beyond procurement. A truly comprehensive strategy takes advantage of demand side initiatives around controlling peaks to reduce capacity charges and multiple load response programs to earn capacity and energy credits. Commercial and industrial end users that take advantage of multiple Load Response programs such as RTDR, TPRD, and Cap Tag Management during the summer can earn year around capacity payments, event energy payments and savings in the form of a reduction in the capacity charges included in their commodity electricity bill.

Business owners and operators should review their ability to participate in each of the above Load Response programs with their energy advisor or Curtailment Services Provider who specializes in such activities.

[Learn more](#) about New England's power market transformation and [contact CPower today](#)...our energy experts have helped hundreds of organizations manage rising energy costs.

About CPower: CPower is an energy management company. We create optimized energy management strategies that help businesses streamline their energy usage, offset costs through demand response participation and reach their sustainability goals. CPower is a leading provider of demand side management services to commercial and industrial customers across the U.S. with 25+ years of knowledge and experience in helping customers implement intelligent energy management programs.

Follow CPower on Twitter [@cpowerenergy](#) or at www.CPowerEnergyManagement.com