

Impacts from Peak Load Reductions in Markets and Long-Range Planning



MA Energy Efficiency Advisory Council

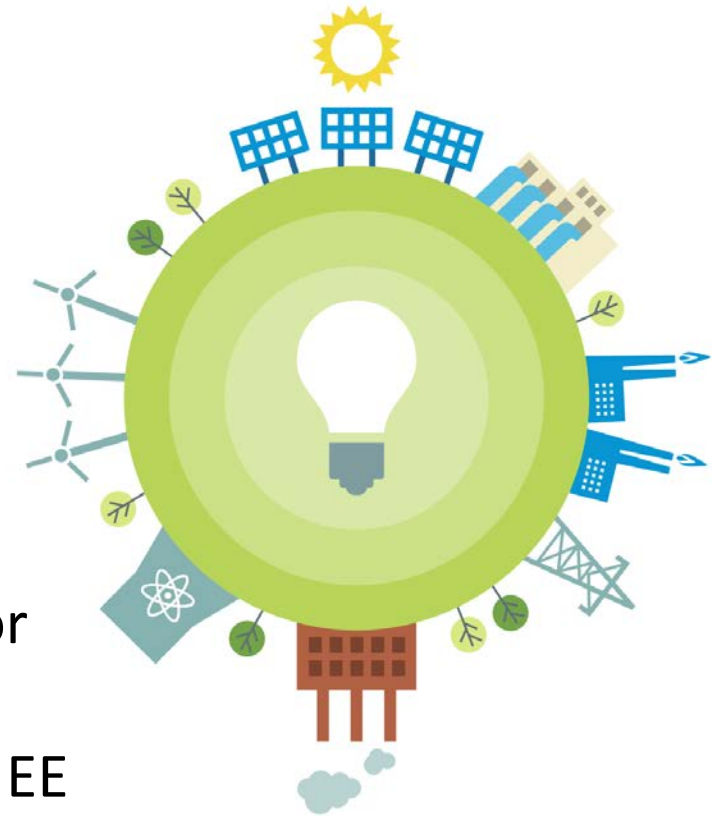
Eric Winkler, Ph.D.

TECHNICAL MANAGER, SYSTEM PLANNING



Overview of Presentation

- Installed Capacity Requirement (ICR) and the Forward Capacity Market (FCM)
- The impact of forecasts on long-range planning (transmission and economic studies)
- Opportunities and challenges for peak demand reduction and ongoing ISO efforts to integrate EE and DR in planning and markets



INSTALLED CAPACITY REQUIREMENT AND THE FORWARD CAPACITY MARKET



Forward Capacity Market: Overview

- A **locational** market that procures capacity to meet New England's forecasted Installed Capacity Requirement (ICR) three years in the future
 - Capacity Zones are developed to align with system transmission constraints and are a mechanism to signal areas of need to the market place
- Allows **new capacity projects** to compete in the market and set the price for capacity in the region
- Selects a portfolio of **generation** and **demand** side resources through a competitive Forward Capacity Auction (FCA) process
 - Resources must be pre-qualified to participate in the auction
 - Resources must clear in the auction and perform to be paid for capacity during the Capacity Commitment Period (CCP)
- Provides a **long-term** (up to 7-year) **commitment** to new supply and demand resources to encourage investment



FCM Objectives and Results

- New England's capacity market has **two main objectives**:
 1. Ensure sufficient resources to meet New England's electricity demand and reliability standards, and
 2. Ensure that sufficient resources are procured in appropriate locations a cost-effective manner
- Capacity market aims to foster **competition** by creating a level playing field with respect to technology, investors, and existing versus new entrants
- Ten Forward Capacity Auctions have been conducted and five commitment periods completed
 - Market has generated participation from **diverse** types of resources, including demand-response and energy-efficiency resources
 - Lowest-cost resources have been developed and brought to market
 - Capacity market has eliminated reliance on reliability arrangements with generators



Installed Capacity Requirement (ICR)

- ICR is the amount of installed capacity that New England needs to meet the ISO New England resource planning reliability criterion
- The reliability criterion requires that the interruption of firm customer loads, due to insufficient resources, be expected no more than one day in ten years
 - This is the Loss-of-Load Expectation (LOLE) criterion of 0.1 interruption per year or one interruption in 10 years (1-in-10 LOLE)
- The NET ICR is the amount of capacity ISO procures in the FCA to meet the reliability criterion after accounting for the capability contribution of the Hydro Quebec Interconnection Capability Credits towards meeting ICR

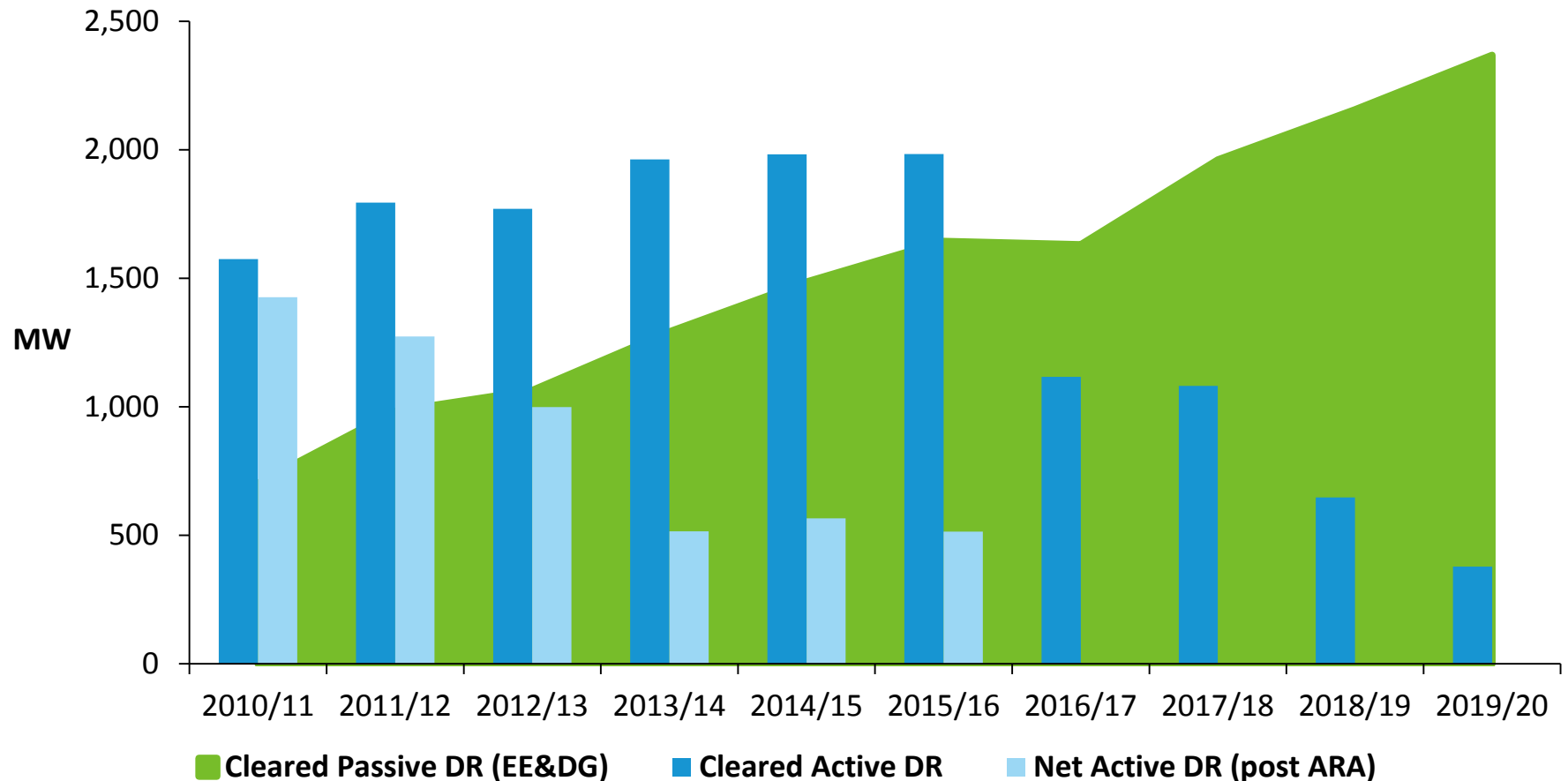


Annual ICR Process and Inputs

- The ICR is established by ISO New England annually
 - Three years into the future for the applicable Forward Capacity Auction (FCA)
 - Recalculated for Annual Reconfiguration Auctions (ARAs)
 - Open to NEPOOL stakeholder process (Power Supply Planning, Reliability and Transmission Committees) and filed with the Federal Energy Regulatory Commission
- Assumptions are reviewed during the annual calculation
 - Load Forecast
 - Capacity resource characteristics
 - Maintenance outages
 - Forced outages
 - Existing Qualified Capacity resource rating values
 - Load relief available through Operating Procedure 4 actions (emergency procedures) including Tie Benefits



FCM has Attracted a Significant Amount of Demand Resources (DR) and the Mix has Changed Over Time



Notes: *Cleared Active DR* represents Real-Time DR and Real-Time Emergency Generation that cleared in the FCA. *Net Active DR* represents Active DR remaining at the start of the CCP, net of resources that shed Capacity Supply Obligations after the FCA in reconfiguration auctions.



Recent Forward Capacity Auction Results

Auction Commitment Period	Total Capacity Acquired (MW)	Capacity Required (MW)	Surplus/Deficit (MW)	New Demand Resources ¹ (MW)	New Generation (MW)	Auction Capacity Zones	Clearing Price (\$/kW-month)
FCA 6 2015/2016	36,918	33,456	3,362	314	79	ROP	\$ 3.43 (floor price)
						ME	
FCA 7 2016/2017	36,220	32,968	3,252	245	800	ROP	\$3.15 (floor price)
						CT	
						ME	
FCA 8 2017/2018	33,712	33,855	-143	355	27	NEMA/Boston	\$14.99/new & \$6.66/existing
						ROP	
						CT	
						ME	
FCA 9 ² 2018/2019	34,695	34,189	506	367	1,060	NEMA/Boston	\$15.00/new & \$7.025/existing
						ROP	
						CT	
						ME	
FCA 10 2019/2020	35,567	34,151	1,416	371	1,459	ROP	\$9.55
						SEMA/RI	
						SENE	
						Quebec imports	
						New York imports	
New Brunswick imports	\$7.03						
							\$6.26
							\$4.00

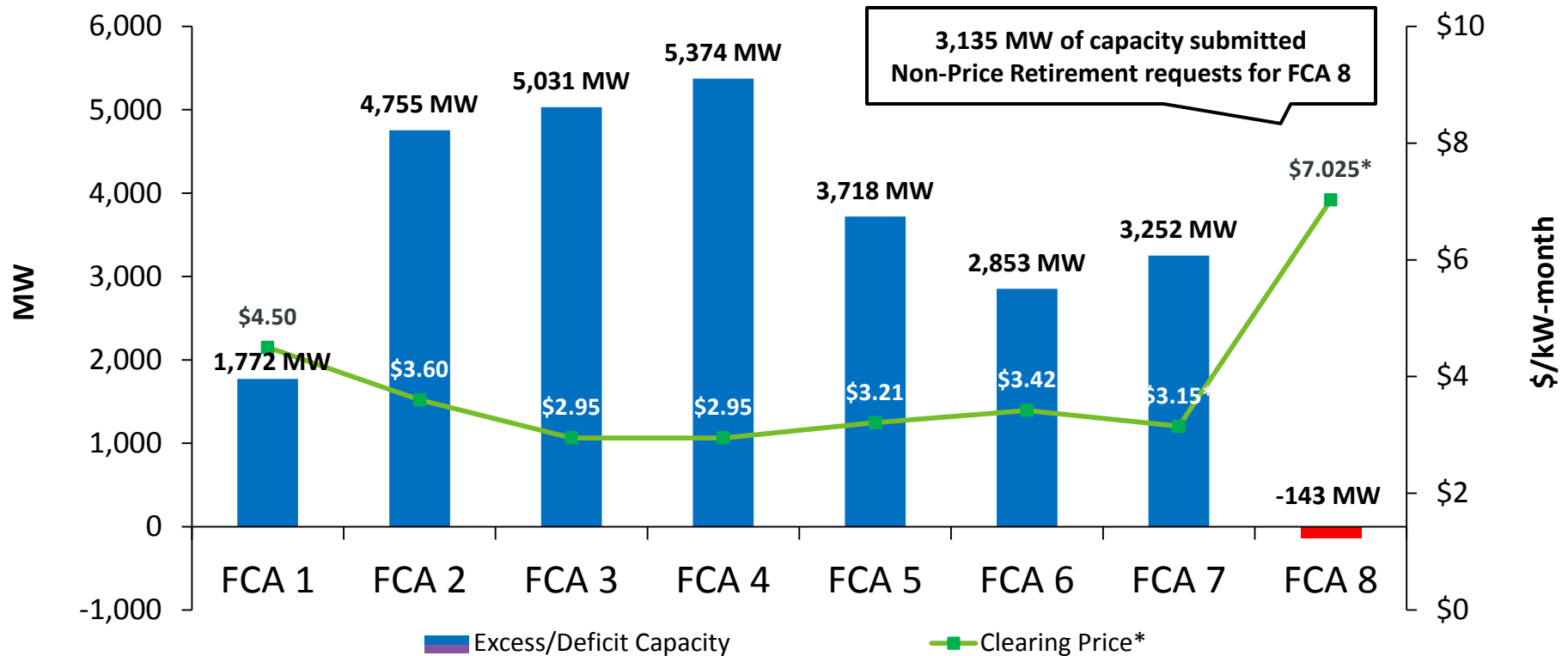
¹ Demand resources include energy efficiency, demand-response resources, and real-time emergency generation (RTEG).

² From **FCA 9 on**, a sloped demand curve has been used, allowing more or less than the capacity requirement to be procured, depending on price and reliability needs.



Capacity Prices Increase as Supply Resources Decrease

Capacity Surplus or Deficit (MW) Against Auction Clearing Prices (\$/kWh-month)



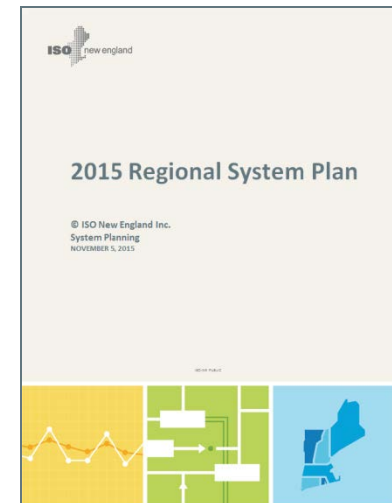
* Prices cleared at the floor price in the first seven auctions due to excess capacity; therefore, resources were paid a slightly lower prorated price. The clearing price in NEMA/Boston Capacity Zone was \$14.999/kW-month for FCA 7 (new capacity received \$14.999/kW-month and existing capacity received an administrative price of \$6.66/kW-month). The clearing price in FCA 8 was \$15.00/kW-month (new capacity in all Capacity Zones and existing capacity in the NEMA/Boston Capacity Zone received \$15.00/kW-month and existing capacity in all other Capacity Zones received an administrative price of \$7.025/kW-month).

THE IMPACT OF FORECASTS ON LONG-RANGE PLANNING

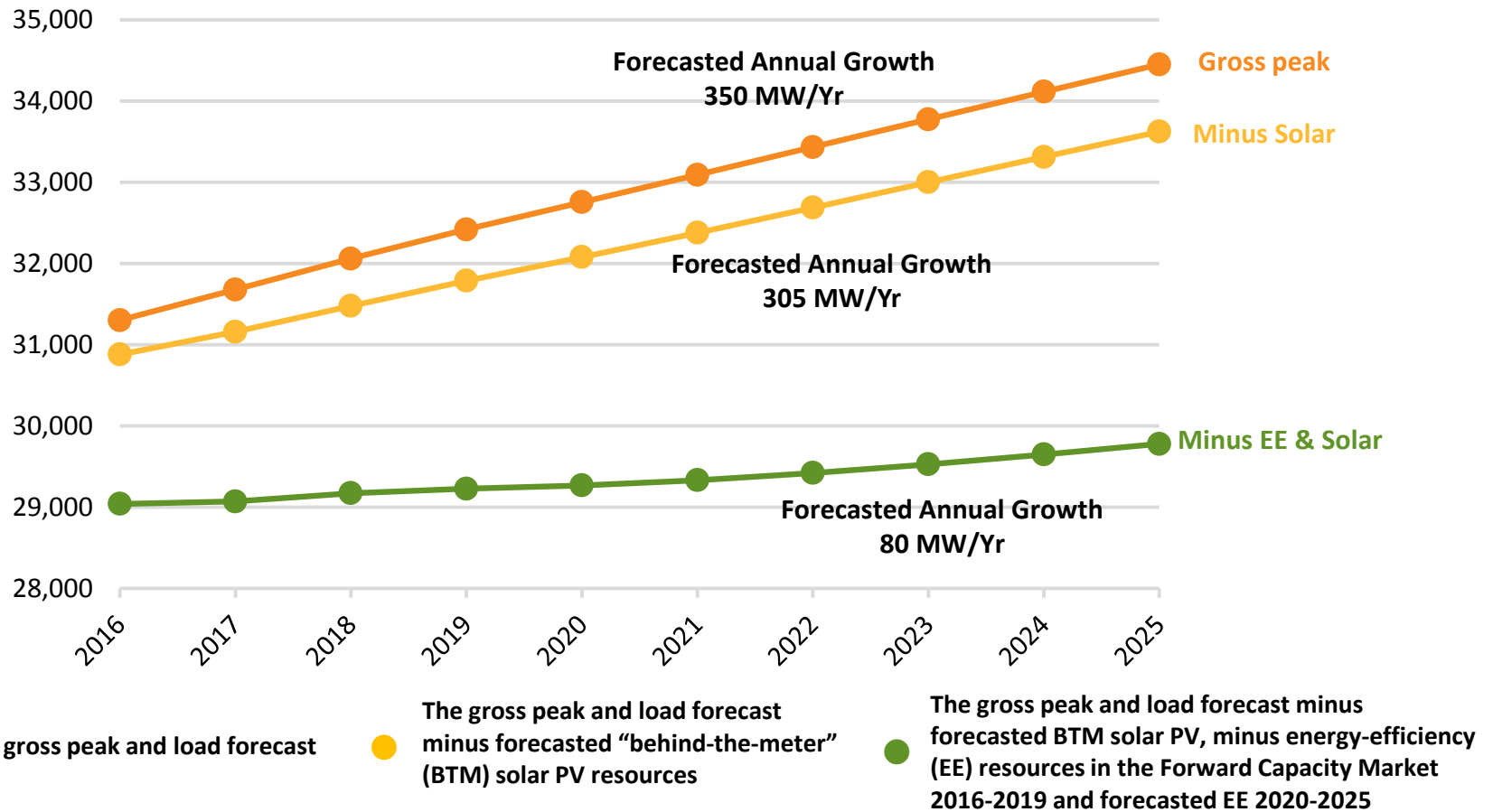


Overview of Transmission Planning

- As the **Regional Transmission Organization**, the ISO is required to identify transmission infrastructure solutions that are essential for maintaining power system reliability in New England
- Through an **open stakeholder process**, the ISO develops long-range plans for the region's networked transmission facilities to address future system needs over the ten-year planning horizon
 - Summarized in a **Regional System Plan (RSP)**
- The transmission planning process is governed by a **FERC-approved tariff**
- The transmission planning process has been revised to comply with the Federal Energy Regulatory Commission's (FERC) **Order 1000**, which requires planning for public policy

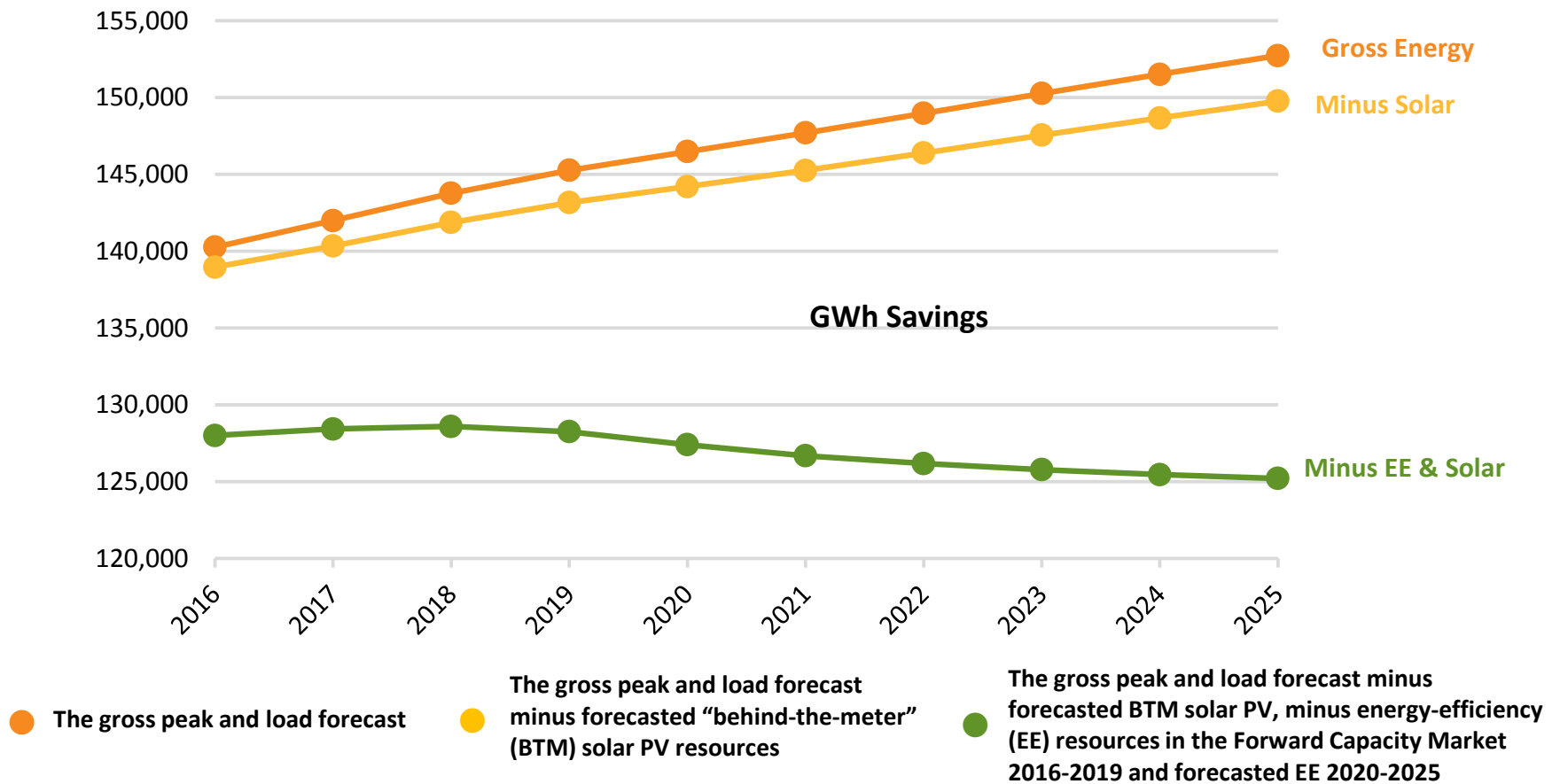


Forecast of Energy Efficiency and Solar Impact on Peak Demand



Note: Summer peak demand is based on the "90/10" forecast, which accounts for the possibility of extreme summer weather (temperatures of about 94° F).
 Source: [Final ISO New England Energy-Efficiency Forecast 2020-2025](#) and [Final 2016 Solar PV Forecast Details](#) (May 2016)

Forecast of Energy Efficiency and Solar Impacts on Energy Use

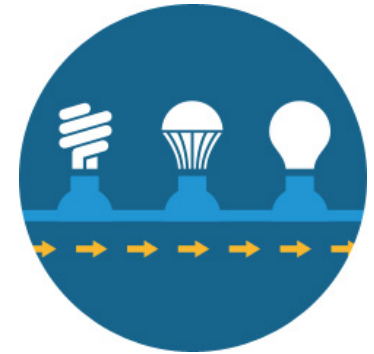


Note: Summer peak demand is based on the “90/10” forecast, which accounts for the possibility of extreme summer weather (temperatures of about 94° F).
 Source: [Final ISO New England Energy-Efficiency Forecast 2020-2025](#) and [Final 2016 Solar PV Forecast Details](#) (May 2016)

OPPORTUNITIES AND CHALLENGES FOR PEAK DEMAND REDUCTION AND ON-GOING ISO EFFORTS TO INTEGRATE EE AND DR IN PLANNING AND MARKETS

Peak Demand Reduction Impacts on Bulk Power and Distribution Systems

- Impact ICR for future FCAs
- Impact positions for demand and generation in reconfiguration auctions
- Lower 90/10 load forecast influencing transmission system upgrades
- Potential to improve capacity factor of system
 - Reduce amount of peaking generators operating for very few hours
- ICR cost allocation to load in area of demand reduction transferring cost to areas with higher demand
- Reduce need for distribution system upgrades



Potential Technical and Financial Challenges from Peak Load Reduction

Bulk Power System

- Increase transmission import/export constraints creating zones of separation and changes to transfer limits
- Capacity factor changes with corresponding large energy reductions from energy efficiency
- Shift in system peak due to variable generating resources
- Impacts to existing supply and new market entrants

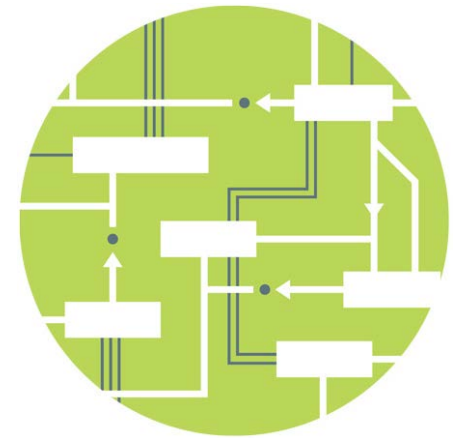
Distribution System

- Increased fixed costs due to lower volumetric sales and stranded infrastructure
- Increased costs at distribution level due to more variable load and distributed generation
 - More sophisticated monitoring and controls
 - Investment in technology to handle two way flow of energy with increased penetration of distributed generation



On-Going Efforts at ISO-NE to Manage Future System Changes

- Real-time forecasting of variable generating resources (Wind and Solar)
- Long-range EE and solar forecasting
- Integration of demand response into energy and reserve markets (FERC Order 745)
- Improvements to FCM
 - Zonal Demand Curves, Retirement Reforms, FCM Performance Incentives
- Transmission planning for public policy (FERC Order No. 1000)
- Integration of storage and other electrification initiatives



Questions



FCM Participation Guide



FCM Participation Guide

- ISO-NE recently launched a new on-line guide to participation in the Forward Capacity Market.
- The guide has easy to use navigation and takes you step by step through FCM, from submitting project proposals to post auction activities.

ISO New England website:

www.iso-ne.com

For More Information...



- Subscribe to the **ISO Newswire**
 - [ISO Newswire](#) is your source for regular news about ISO New England and the wholesale electricity industry within the six-state region
- Log on to **ISO Express**
 - [ISO Express](#) provides real-time data on New England's wholesale electricity markets and power system operations
- Follow the ISO on **Twitter**
 - [@isonewengland](#)
- Download the **ISO to Go App**
 - [ISO to Go](#) is a free mobile application that puts real-time wholesale electricity pricing and power grid information in the palm of your hand

