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The Evolution of Demand Resources in New England

2015 National Town Meeting on Demand Response and Smart Grid

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New England Has A Strong History with Demand Resources

In the Beginning (2002)

- Demand response in New England totaled less than 100 MW

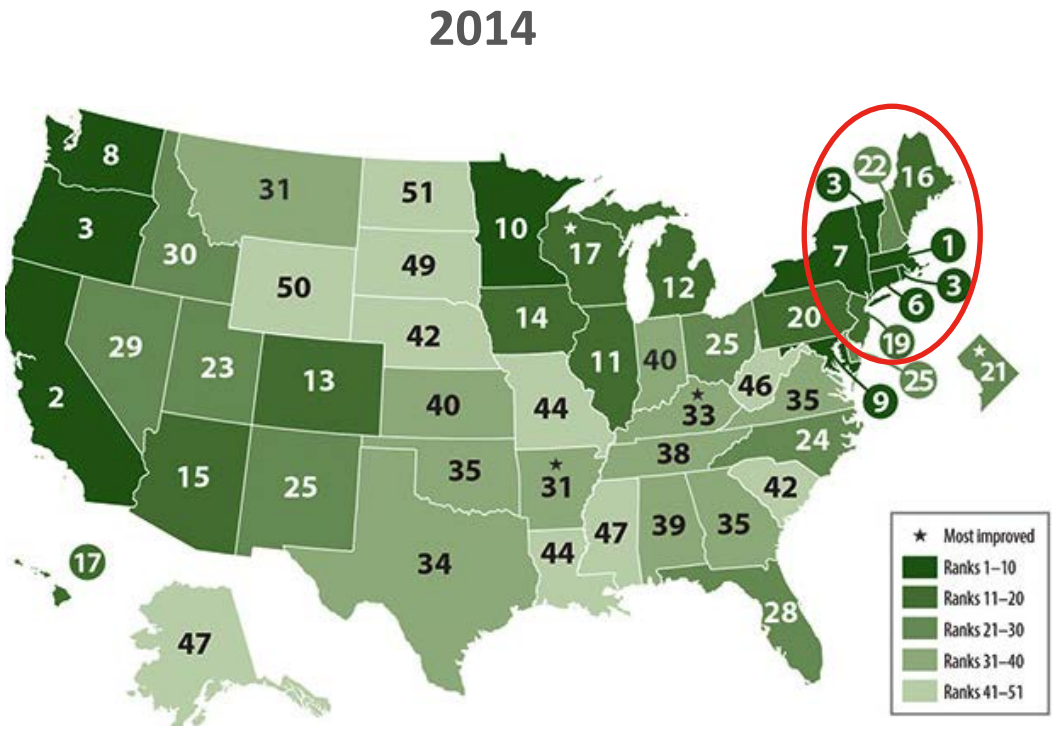
Today

- 3,628 MW of Demand resources cleared the Forward Capacity Market (FCM) in 2012 for delivery in 2015
  - Demand response (1,858 MW)
  - Energy efficiency (1,514 MW)
  - Distributed generation (256 MW)
- Demand response is also paid for reduced energy usage and can participate in the regulation market

Future

- Legal challenges have created uncertainty for demand response and will (at a minimum) delay plans for the full integration of demand response into the region's wholesale markets

Energy Efficiency is a Priority for New England

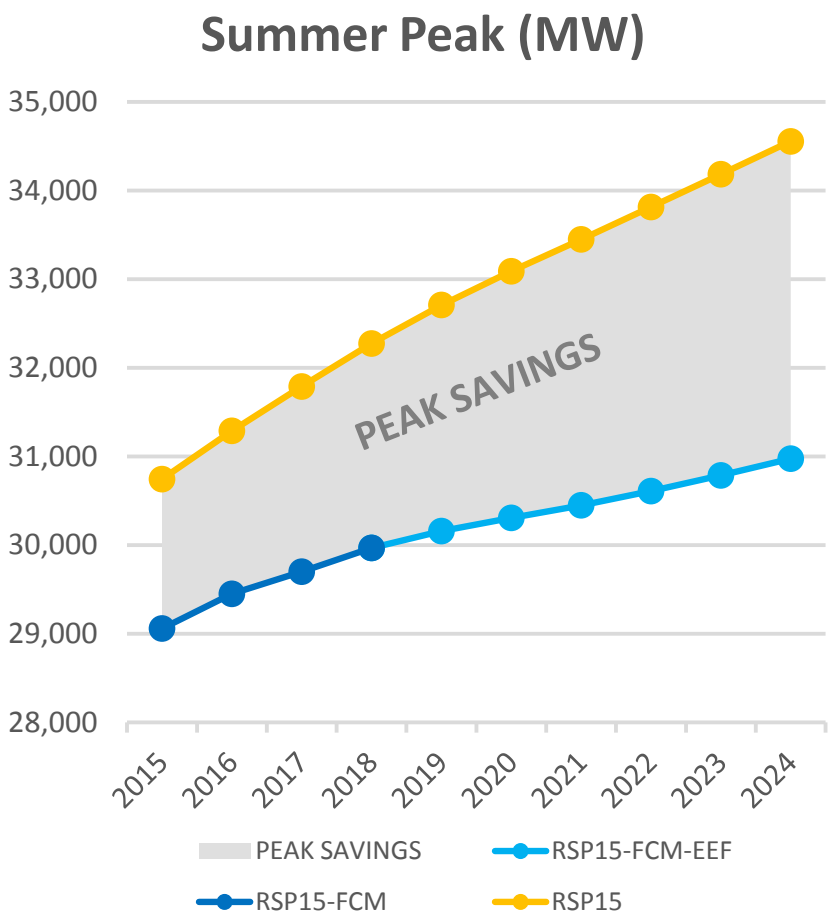


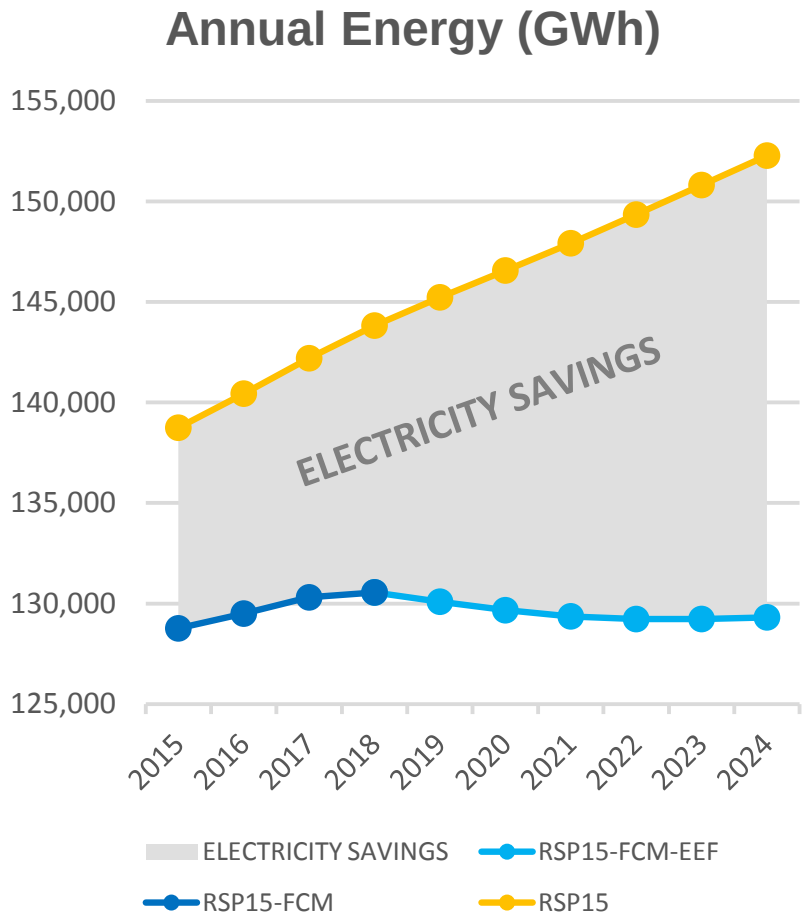
- Ranking of state EE efforts by the American Council for an Energy-Efficient Economy :
  - Massachusetts 1
  - Vermont 3
  - Rhode Island 3
  - Connecticut 6
  - Maine 16
  - New Hampshire 22

- In New England, billions spent over the past few years; more on the horizon
  - 2009 to 2012 = $2.3B
  - 2017 to 2023 states are projected to spend $6.3B
- **EE flattens annual energy usage in New England for the foreseeable future**

EE Affects New England's Electricity Consumption

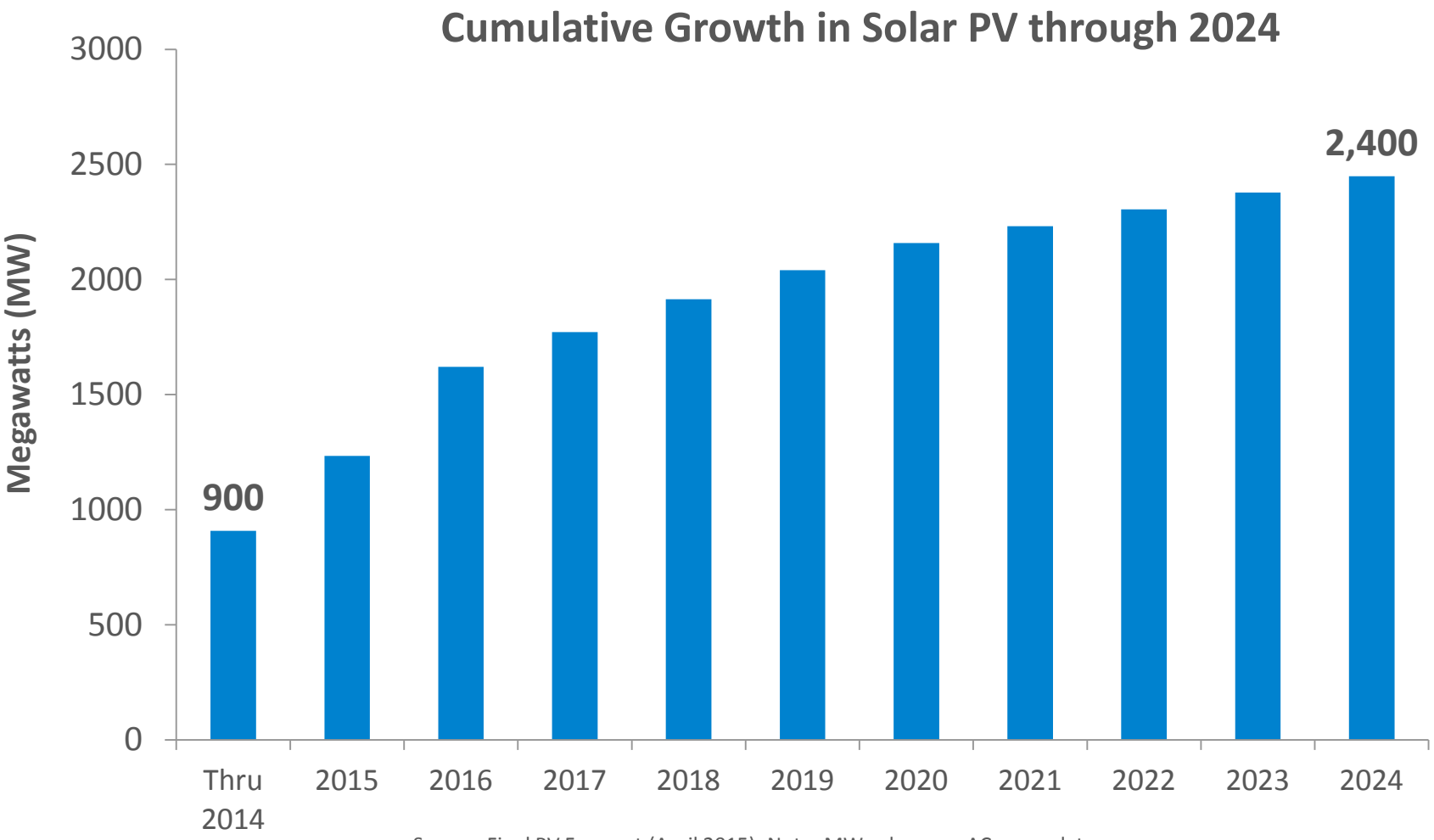
Peak demand growth is lower; energy use is flat





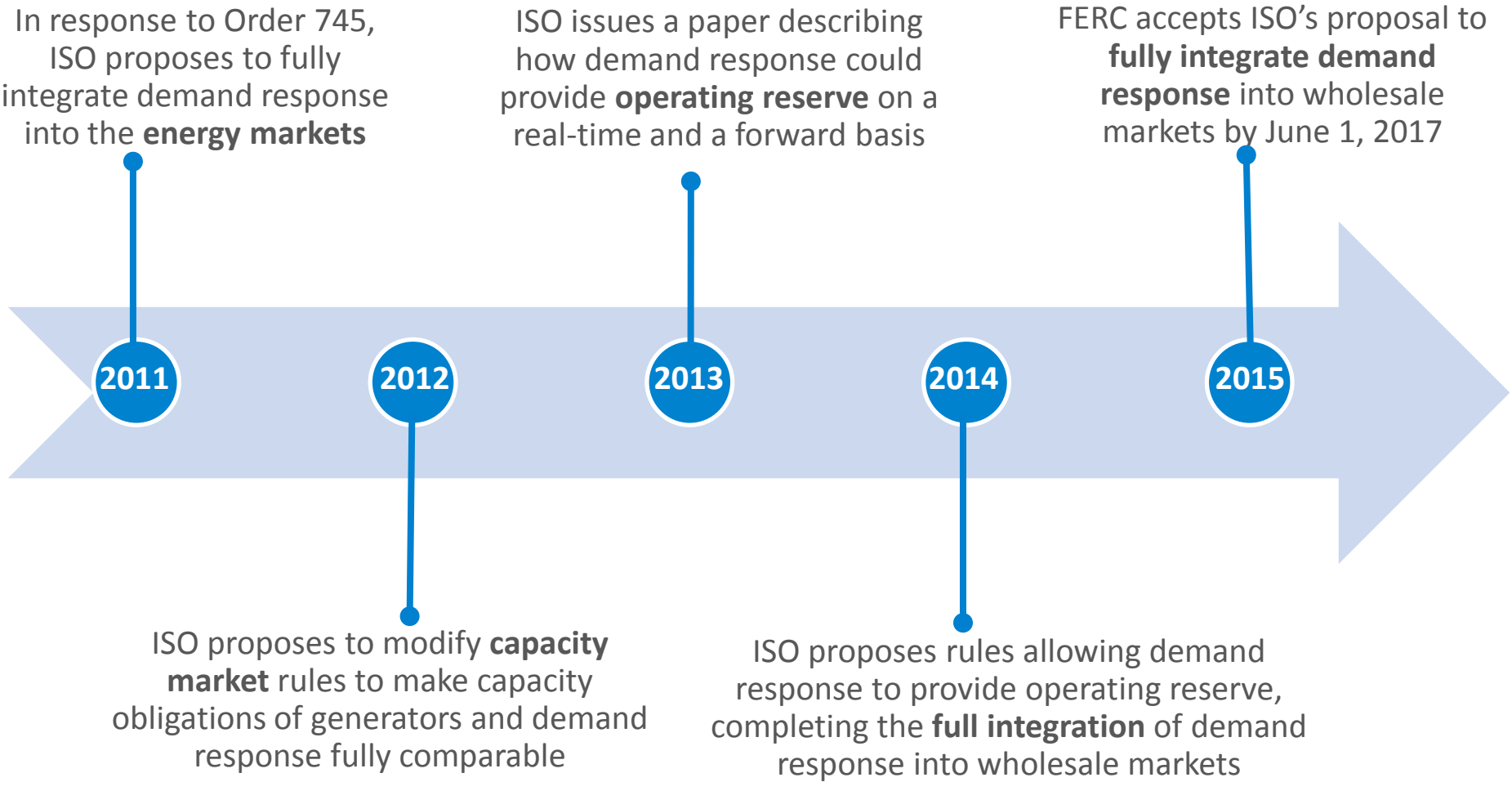
Source: Final ISO New England EE Forecast for 2018-2023 (April 2015)

ISO Forecasts Strong Growth in Solar PV



Source: Final PV Forecast (April 2015); Note: MW values are AC nameplate

ISO Invested Time and Resources to Integrate Demand Response in Wholesale Markets



Grid Modernization Can Be Platform to Expand Demand Response

- The ISO's plan to fully integrate demand response in the wholesale markets will be delayed as FERC jurisdiction over demand response is being reviewed by the U.S. Supreme Court
- In the meantime, states in region are considering **advanced metering infrastructure, time-varying retail rates and associated tools** to facilitate customer response to price and to improve the integration of distributed energy resources
- Some of the states have recognized that:
  - Current **lack of retail customer data** limits the ability of:
    - Load serving entities to offer other retail products
    - Customers to evaluate other retail products such as dynamic retail offers, distributed resources, and/or other smart grid opportunities
  - By designing default service as a **uniform rate**
    - Customers cannot benefit from changing their consumption levels in response to changing real-time wholesale energy prices
    - Smart grid technology is not fully utilized under uniform retail rates

Region Lacks Significant AMI Penetration

- Region lags behind other areas with respect to advanced metering infrastructure
- Recovery Act funding helped spur some investment in advanced metering infrastructure
- Utilities in Massachusetts are working on implementation plans to develop utility-wide "advanced metering functionality"

Comparison of Regional Control Area AMI			
ERCOT 70%	FRCC 52%	WECC 51%	**NPCC 12%**

Advanced Meter Penetration (2012): Source: *FERC 2014 Assessment of Demand Response and Advanced Metering.* Table 2-2.

State	AMI Meters (000)**	% AMI	% Regional KWh Sales
ME	744	54%	9
NH	159	21%	9
CT	169	5%	25
MA	.7	0%	46
RI	.2	0%	6
VT	305	77%	5
Region	1,374	16%	100

Advanced Meter Penetration (through July 2014)
*Source: The Edison Foundation: Institute for Electric Innovation: *Utility-Scale Smart Meter Deployments* (September 2014);
% AMI based on approximate number of meters in each state

States Are Promoting Grid Modernization to Integrate Distributed Energy Resources

- System reliability requires that supply and demand be in perfect balance in real time
- With an increase in distributed generation, net power flows at the T&D interface ("Pnode") become more variable, bi-directional, and less predictable
- Supply is not as controllable
- With potentially more time-varying retail rates, demand becomes responsive to prices and less predictable
- Operations, markets, and planning become more complex



The Growth of Distributed Energy Resources Will Impact Both Wholesale and Retail Markets

- If customers both produce and consume power, net demand becomes less predictable and operations more complex
- Short- and long-term reliability and economic efficiency will be impacted if large penetrations of distributed energy resources are not visible to the ISO
  - A distribution system operator (DSO) that operates and administers localized systems and retail markets may be needed
  - DSOs and ISOs must share system and market information to optimally balance supply and demand in real time and to conduct long-term planning

Many complexities:

- Role of DSO, utilities, LSE?
- Operations, trade and pricing?
- Settlement?
- Communication standards?
- DG interconnection standards?
- Long-term planning?

Progress Has Been Made But …

- Demand resources including demand response have long been a priority for New England stakeholders
- ISO New England was a pioneer in successfully integrating demand resources into the capacity markets as a resource
- If given the opportunity we will actively work with stakeholders to fully integrate demand response into all of our markets
- Distributed energy resources and changes to retail rate structure can provide additional opportunities to customers

