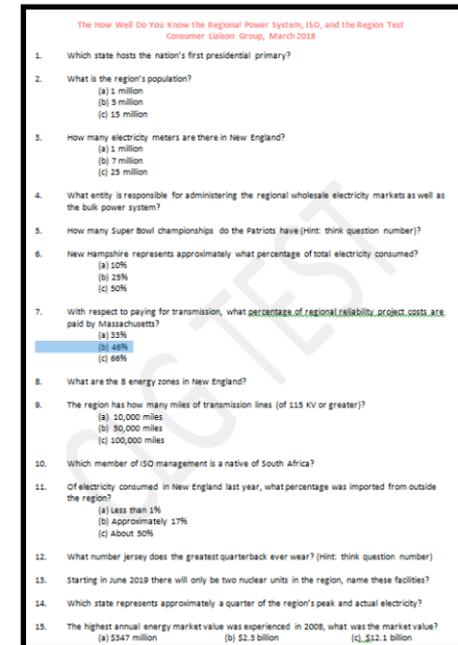


OBSERVATIONS FROM THE PAST DECADE:
A LOOK AT THE CLG and
THE REGIONAL POWER SYSTEM

Michael. S. Giaimo
New Hampshire Public Utilities Commission

Presentation Outline

1. Historical context and perspective on the CLG
2. Consider the regional power system and changes in the region over the CLG's lifetime, and
3. Test your knowledge of the region and the power system



HISTORICAL CONTEXT AND PERSPECTIVE ON THE CLG

CLG Background

- ▶ The Consumer Liaison Group (CLG) was created in 2009, in the wake of [FERC Order 719](#)
- ▶ Intention of FERC Order 719 was, among other things, to achieve greater responsiveness and transparency from Independent System Operators (ISOs) and Regional Transmission Organizations (RTOs)
- ▶ The Maine PUC and Public Advocate's Office, and the Massachusetts Attorney General's Office were vocal advocates for the CLG and took lead in creating

125 FERC ¶ 61,071 UNITED STATES OF AMERICA FEDERAL ENERGY REGULATORY COMMISSION	
Wholesale Competition in Regions with Organized Electric Markets	Docket Nos. RM07-19-000 AD07-7-000
FINAL RULE	
Order No. 719	
(Issued October 17, 2008)	
<u>TABLE OF CONTENTS</u>	
	<u>Paragraph Numbers</u>
I. Introduction.....	1.
II. Background.....	10.
III. Discussion.....	15.
A. Demand Response and Pricing During Periods of Operating Reserve Shortages in Organized Markets.....	15.
1. Background.....	16.
2. Ancillary Services Provided by Demand Response Resources.....	20.
a. Ancillary Services Market.....	21.
b. New Bidding Parameters.....	64.
c. Small Demand Response Resource Assessment.....	90.
3. Eliminating Deviation Charges During System Emergencies.....	100.
a. Deviation Charges.....	100.
b. Virtual Purchasers.....	122.
4. Aggregation of Retail Customers.....	128.
a. Commission Proposal.....	128.
b. Comments.....	132.
c. Commission Determination.....	154.
5. Market Rules Governing Price Formation During Periods of Operating Reserve Shortage.....	165.
a. Price Formation During Periods of Operating Reserve Shortage.....	169.
b. Four Approaches.....	208.
c. The Commission's Proposed Criteria.....	238.

CLG Is Forum for Information Sharing

Interested Stakeholders and Consumers Include:

- End-Use Customers
- State Regulators
- State and Federal Policy Makers
- Consumer Advocates
- Business and Trade Associations

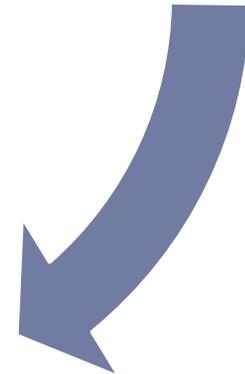
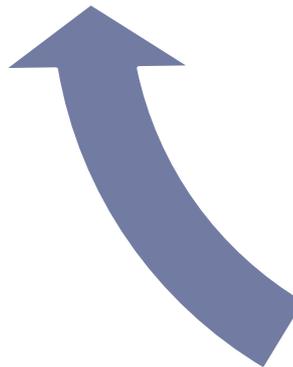


NEW ENGLAND POWER POOL

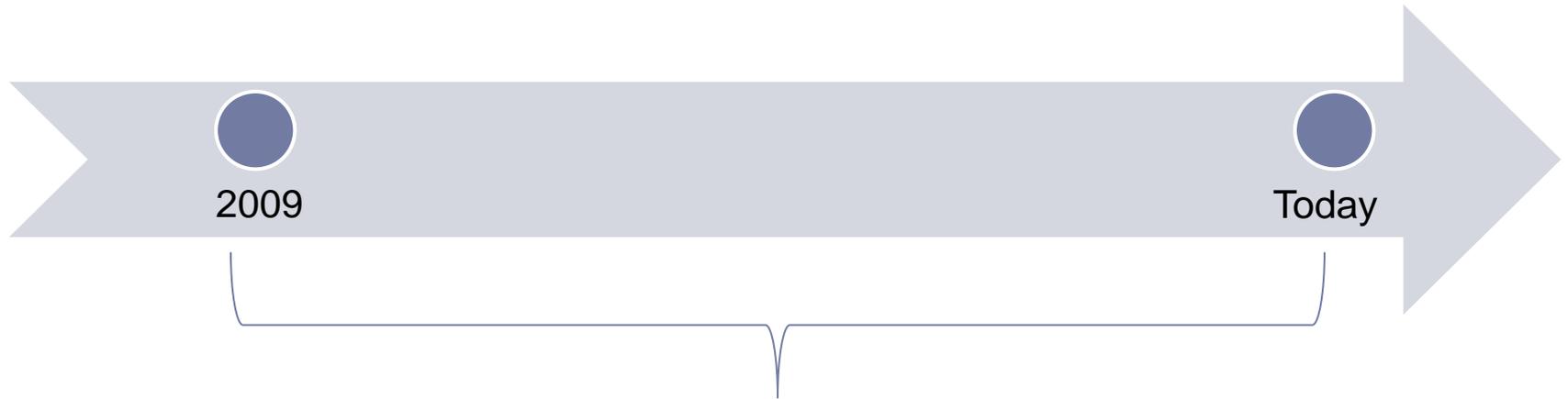
Interested Stakeholders



Consumers



CLG by the Numbers ... They're Impressive



9 years

36 meetings and counting

Approximately 2,000 attendees

150 speakers and presentations

Participation by federal regulators

Participation by elected officials

Federal Regulator CLG Participation

- ▶ FERC Commissioner Philip Moeller (2009)



- ▶ FERC Commissioner Marc Spitzer (2010)



Federal Regulator CLG Participation

▶ FERC Commissioner
Cheryl LaFleur (2012)



▶ FERC Commissioner
John Norris (2013)



Federal Regulator CLG Participation

▶ FERC Commissioner
Cheryl LaFleur (2016)



▶ FERC Commissioner
Neil Chatterjee (2017)



Elected Officials CLG Participation

- ▶ Vermont Governor
Phil Scott



- ▶ Rhode Island Governor
Lincoln Chafee



Elected Officials CLG Participation

- ▶ Massachusetts
U.S. Rep. Jim McGovern



- ▶ Rhode Island
Treasurer Seth Magaziner



Elected Officials CLG Participation

- ▶ Massachusetts
Attorney General
Martha Coakley



Annual Report of the CLG

- ▶ Released every spring
- ▶ Report includes:
 - ▶ CLG Coordinating Committee Priorities
 - ▶ Overview of CLG
 - ▶ Meeting Summaries
 - ▶ ISO Activities and Initiatives
 - ▶ Analysis of wholesale and retail rates
 - ▶ New England wholesale cost details
- ▶ Latest report for 2017 just released yesterday
- ▶ Report and additional CLG information (including monthly issue memos) on the CLG website



Some Suggestions for the CLG

- ▶ As you rotate locations throughout the region, try co-hosting with state and local chambers of commerce
- ▶ Consider outreach to members of the local energy bar associations and renewable and sustainable energy associations, and other pertinent groups
- ▶ Consider inviting members of germane legislative committees

In considering these suggestions please recall that free advice is not always worth the price

CHANGES TO THE REGIONAL POWER
SYSTEM AND TRENDS EXPERIENCED
OVER THE CLG's LIFETIME

Customer Choice

- ▶ Customers now have the ability to purchase their energy through a competitive supplier
- ▶ Competitive suppliers can customize contracts for consumer
- ▶ Suppliers can offer consumers options with respect to:
 - ▶ duration of contract;
 - ▶ fixed or variable pricing;
 - ▶ percentage of renewables within the consumer's portfolio;
 - ▶ demand-side management; and
 - ▶ hedging strategies.



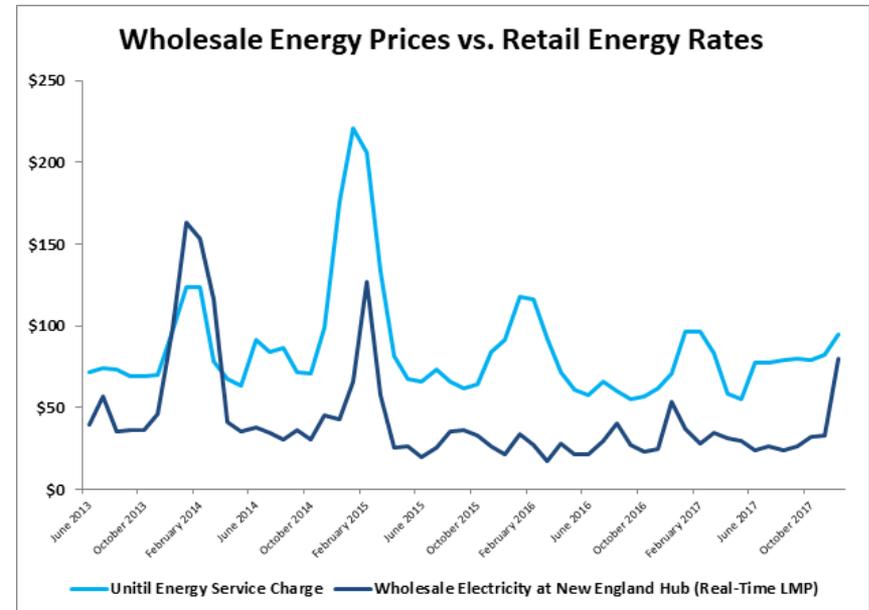
Competitive Supplier Options Exist

	Aggregators		Suppliers
5Linx Enterprises, Inc.	Diversegy, LLC	NAUP Brokerage, LLC	Agera Energy LLC
Abworth Energy, LLC	EarlyBird Power LLC	Neighborhood Energy of New England, LLC	Ambit Northeast, LLC
Accenture LLP	Eisenbach Consulting, LLC	NORESCO, LLC	Calpine Energy Solutions, LLC
Acclaim Energy Advisors, Ltd.	Electricity NH, LLC d/b/a Provider Power	NRG Kiosk LLC d/b/a Power Kiosk	Champion Energy Services, LLC
Achieve Energy Solutions, LLC	EMEX, LLC	Ollinger Global Power Consultants	CleanChoice Energy, Inc.
Alternate Power Source Inc.	Empire Energy	Patriot Energy Group, Inc.	Clearview Electric, Inc. d/b/a Clearview Energy
Ameresco, Inc.	Energy Auction House, Inc.	Power Target, LLC	Consolidated Edison Solutions, Inc.
Amerex Brokers, LLC	nergyWize	Progressive Energy Consultants, LLC	Constellation NewEnergy, Inc.
America Approved Commercial, LLC	The Energy Executives LLC	Reliable Power Alternatives Corp.	Direct Energy Business, LLC
Anderson Energy Solutions, LLC	Energy New England, LLC	Resident Power Natural Gas and Electric Solutions	Direct Energy Services, LLC
ANE American New Energy LLC	Energy Professionals, LLC	Resource Energy Systems, LLC	EDF Energy Services, LLC
Arcadia Power, Inc.	Energy Trust, LLC	RexCal Energy LLC	Electricity N.H., LLC d/b/a E.N.H. Power
Atlantic Group Energy, Inc.	EnerNOC, Inc.	RSG Energy	ENGIE Resources LLC
Atlas Commodities, LLC	ENGIE Insight Services Inc.	RJT Energy Consultants, LLC	ENGIE Retail, LLC d/b/a Think Energy
Atlas Commodities II Retail Energy, LLC	Fidelity Energy Group, LLC	Satori Enterprises, LLC	Everyday Energy, LLC d/b/a Energy Rewards
AvidXchange, Inc.	Freedom Energy Logistics	Secure Energy Solutions, LLC	FairPoint Energy, LLC
Axess Energy Group, LLC	Front Line Power Solutions, LLC	Single Source Energy Solutions, Inc.	First Point Power, LLC
Balanced Rock Energy, Inc.	Global Energy, LLC	SourceOne Energy	Mega Energy of New Hampshire, LLC
Beacon Energy Solutions LLC	Global Energy Market Services, LLC	Sprague Energy Solutions, Inc.	Mint Energy, LLC
Best Practice Energy, LLC	GoldStar Energy Group, Inc.	Standard Power of America, Inc.	NextEra Energy Services New Hampshire, LLC
Better Cost Control, LLC	Good Energy, L.P.	Stanley Energy, LLC	Nordic Energy Services, LLC
BidURenergy, Inc.	H. P. Technologies, Inc.	Strategic Energy Partners, LLC	North American Power and Gas, LLC
BKE Energy	HealthTrust Purchasing Group, LP	Summerview Energy, LLC	PNE Energy Supply, LLC
Blitz Ventures LLC	HomeADE, LLC	Summit Energy Services, Inc.	Reliant Energy Northeast LLC
Bold Coast Energy, LLC	Hospital Energy Services, LLC	Taylor Consulting and Contracting, LLC	SmartEnergy Holdings, LLC
Bradley R. Lewis	Hovey Energy, LLC	625 Main St.	South Jersey Energy Company
Bridge Energy Services, LLC	inCharge LLC	TDL Energy Solutions	Summer Energy Northeast, LLC f/k/a REP Energy LLC
Broker Online Exchange, LLC	Incite Energy LLC	Telco Pros Inc.	Town Square Energy, LLC
Capital Energy, Inc.	Infinity Power Partners, LLC	TFS Energy Solutions, LLC	TransCanada Power Marketing Ltd.
Charity+Power, Inc.	Intelligen Resources LP	Titan Energy-New England Inc	Viridian Energy, LLC
Choice! Energy Services Retail, LP	Kevin J. Cobb & Associates, Inc	Trianglenergy L.L.C.	XOOM Energy New Hampshire, LLC
Choose Energy, Inc.	KWH Savings, LLC	Trusted Energy LLC	
C.N. Brown, LLC	L5E, LLC	Ultimate Energy Advisors, LLC	
Comm. & Ind. Energy Solutions, LLC	Lakes Region Planning Commission	UMG, Inc.	
Competitive Energy Services, LLC	The Legacy Energy Group, LLC	Unified Energy Services, LLC	
Consumer Energy Solutions, Inc.	Legend Energy Advisors, LLC	US Grid Energy, LLC	
Convenient Venture, LLC	Maryland Energy Advisors, LLC	Usource, L.L.C.	
CASA-North American Energy Advisory	MSI Utilities, Inc.	Utility Choice Savings, LLC	
Definitive Energy Group, Inc.	Nashua Regional Planning Commission	Utiliz LLC	
Demco Energy LLC	National Utility Service, Inc.	Vervantis, Inc.	
Devaney Energy, Inc.	Navigate Power LLC	Yolon Energy, LLC	

► In NH there are over 30 competitive suppliers and 120 aggregators registered to market electricity in the state

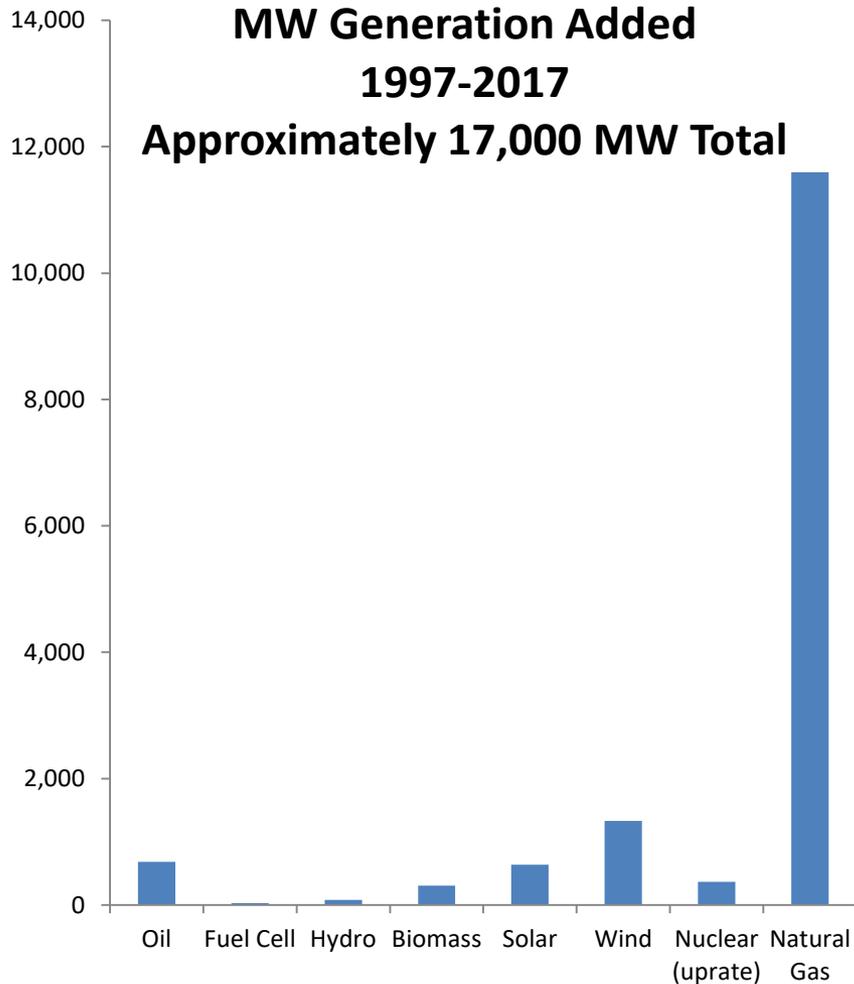
Opportunities in Wholesale Market

- ▶ Customers have ability to buy wholesale – however there is risk and price volatility associated with this energy procurement strategy
- ▶ There can be savings to be had by strategic purchases directly from the wholesale market as well as utilization of suppliers and default services



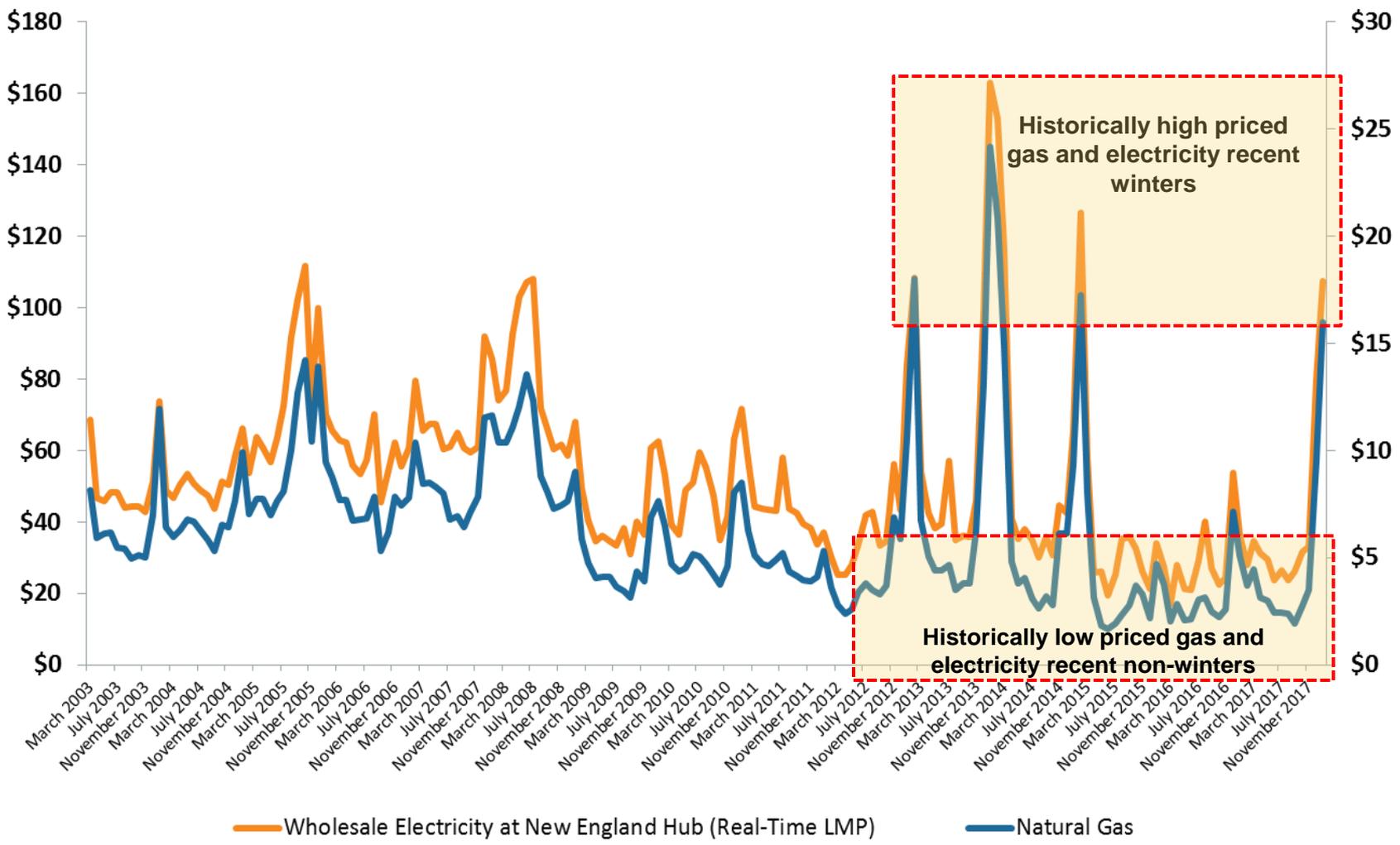
Note: Default service charges above include FCM costs whereas wholesale energy prices do not

Last 20 Years: 17 GW Merchant Generation Built



- ▶ Billions spent in private investment on generation over past two decades
- ▶ Region has added 17,000 MWs of new or planned generation
- ▶ Restructuring has shielded ratepayers from bad investment decisions and has spurred development of a more efficient and flexible fleet

Electricity Prices Track Natural Gas Prices



Developers Have Responded to FCM

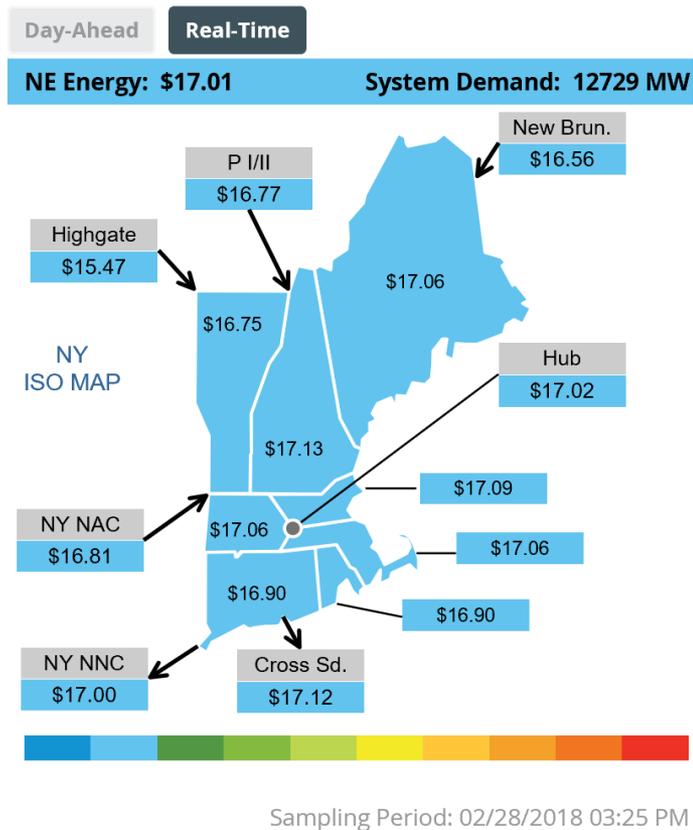
- ▶ Map to the right indicates where generator retirements were announced
- ▶ Region saw capacity market price separation (higher prices) in SEMA/RI and NEMA/Boston with these retirements
- ▶ Market responded with new generation proposed in areas where prices were high (areas of retirements)



Locational Prices Provide Market Signals

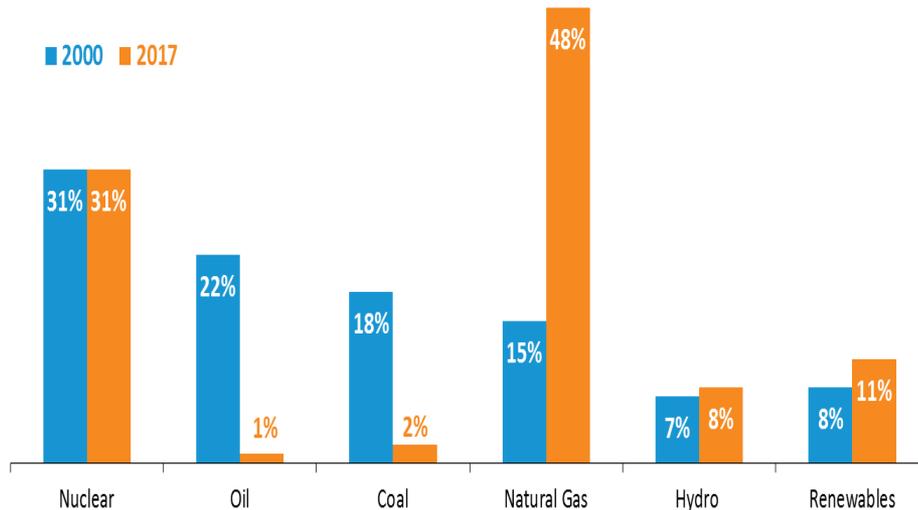
- ▶ Both the capacity and energy markets are locational
- ▶ Prices can differ by zone and these differentials reflect supply and demand as well as constraints on the system
- ▶ Zonal prices send price signals to developers and consumers
 - ▶ For example:
 - A generator looking to develop may want to locate in a high-priced energy and capacity zone
 - Transmission developers may want to build transmission to get power from low-cost area to a high-cost area

▲ LMP MAP: REAL-TIME



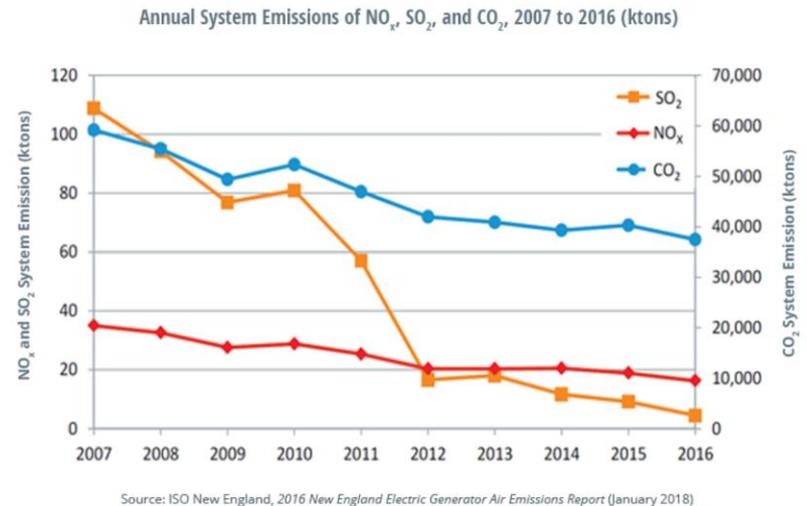
Evolution of the Region's Energy Mix

- ▶ Over past 17 years the region's fuel mix has shifted from coal and oil to natural gas and renewable
- ▶ Nuclear still represents about 30% of generation
 - ▶ Vermont Yankee recently closed and Pilgrim is closing in 2019
- ▶ Coal and oil once represented 40% of generation; last year collectively 3%



Emissions Down Over Past Decade

- ▶ Air emissions from regional generators have decreased over the last two decades
- ▶ From 2001 to 2016, annual emissions for SO₂, NO_x, and CO₂ declined by 98%, 73%, and 29%, respectively
- ▶ More efficient generation, and the addition of renewables including solar has helped lower emissions region-wide
- ▶ Winter emissions are a function of weather and the colder the weather the greater the emissions



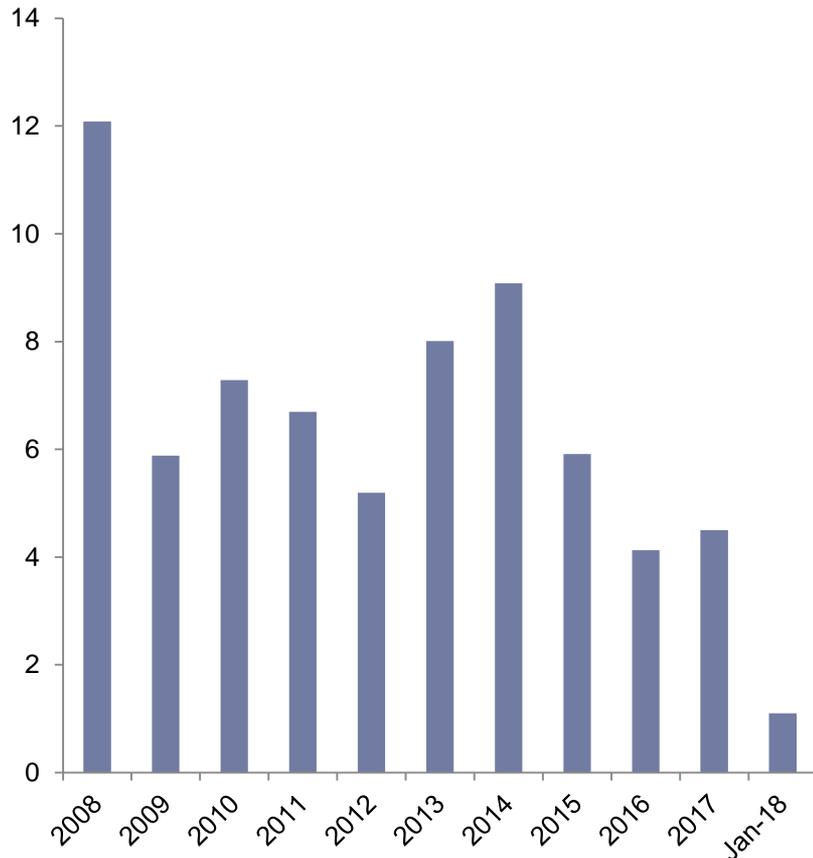
Coal and Oil This Winter

- ▶ This winter (2017-2018) New England utilized coal and oil generation to help reliably serve the electricity demands of the region
- ▶ In the early part of this winter the region utilized approximately 1.1 million barrels of oil pursuant to the Winter Reliability Program
- ▶ Winter Reliability Program provided insurance policy for electric system reliability when weather got cold
- ▶ While coal and oil resources help reliability they come at a cost



January 2018 Expensive Month

**Annual Energy Market Value
(\$ Billion)**



- ▶ Energy market value for three weeks in January 2018 was about \$1.1 billion**
- ▶ For the entire 2016 year the energy market value was just over \$4 billion – three cold weeks in January 2018 was a quarter of 12-months of 2016)
- ▶ Region experienced similar high winter pricing during polar vortex (winter 2013-14)

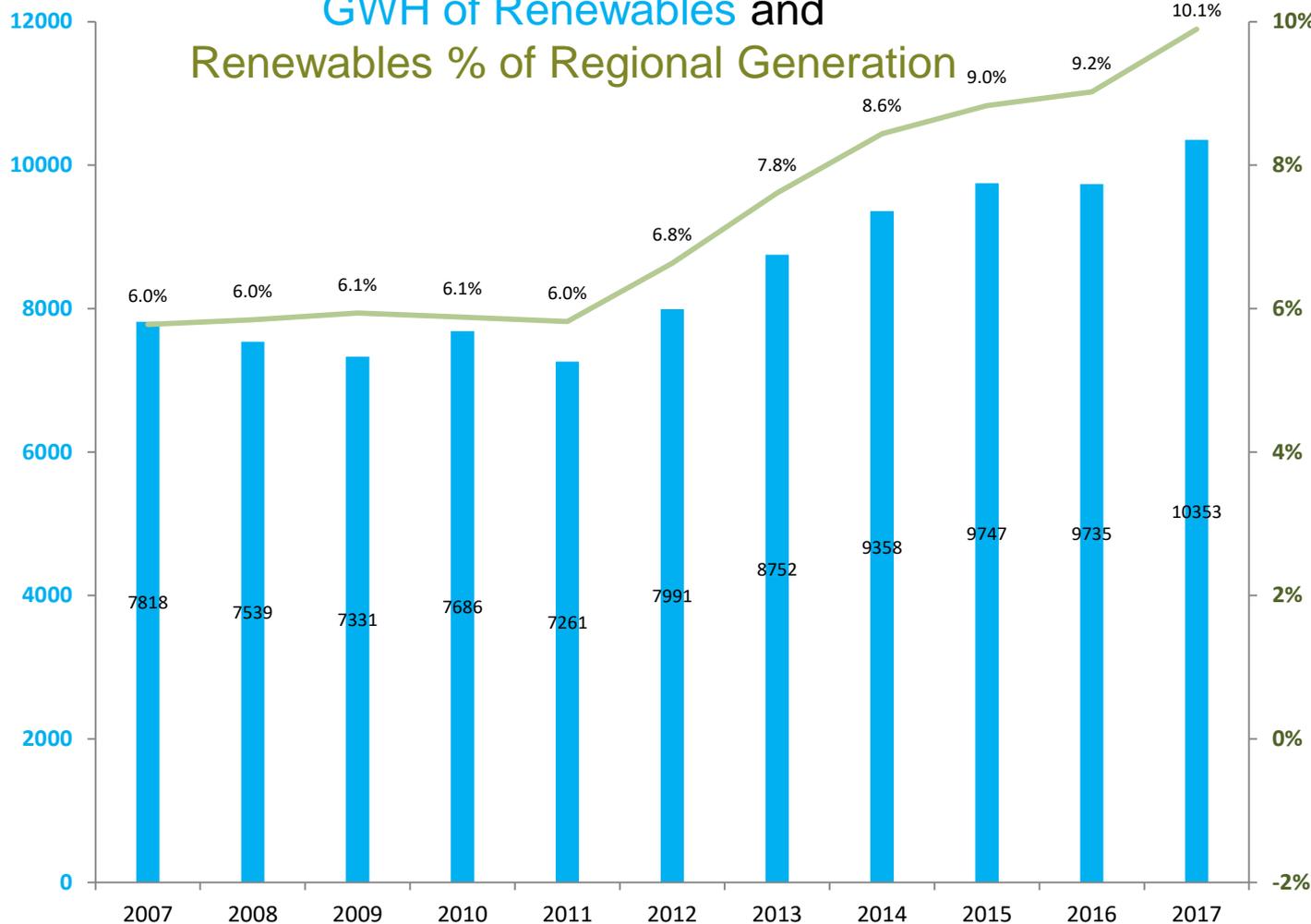
Public Policies Have Helped Shape Power System

- ▶ The regional power system has changed significantly due to public policies including:
 - ▶ Carbon reduction mandates
 - ▶ Emission reduction goals,
 - ▶ Renewable Portfolio Standards,
 - ▶ Distributed generation including solar,
 - ▶ Demand-side management,
 - ▶ Energy efficiency, and
 - ▶ RGGI

The Regional Greenhouse Gas Initiative
an initiative of the Northeast and Mid-Atlantic States of the US

Renewables More Prevalent Than Ever

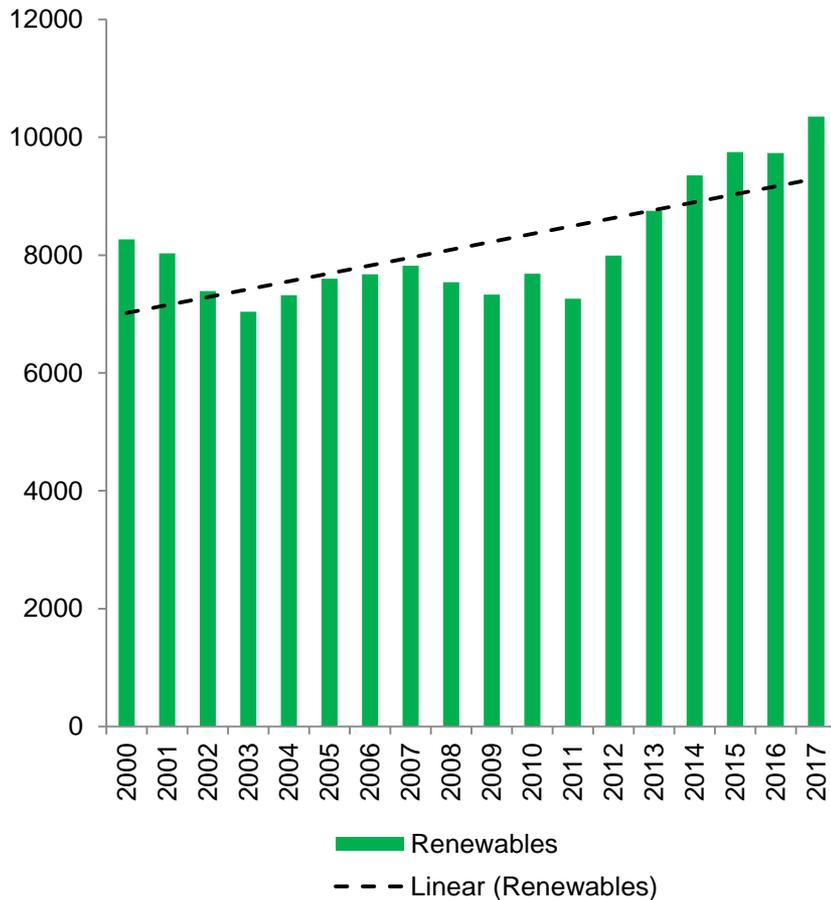
GWH of Renewables and
Renewables % of Regional Generation



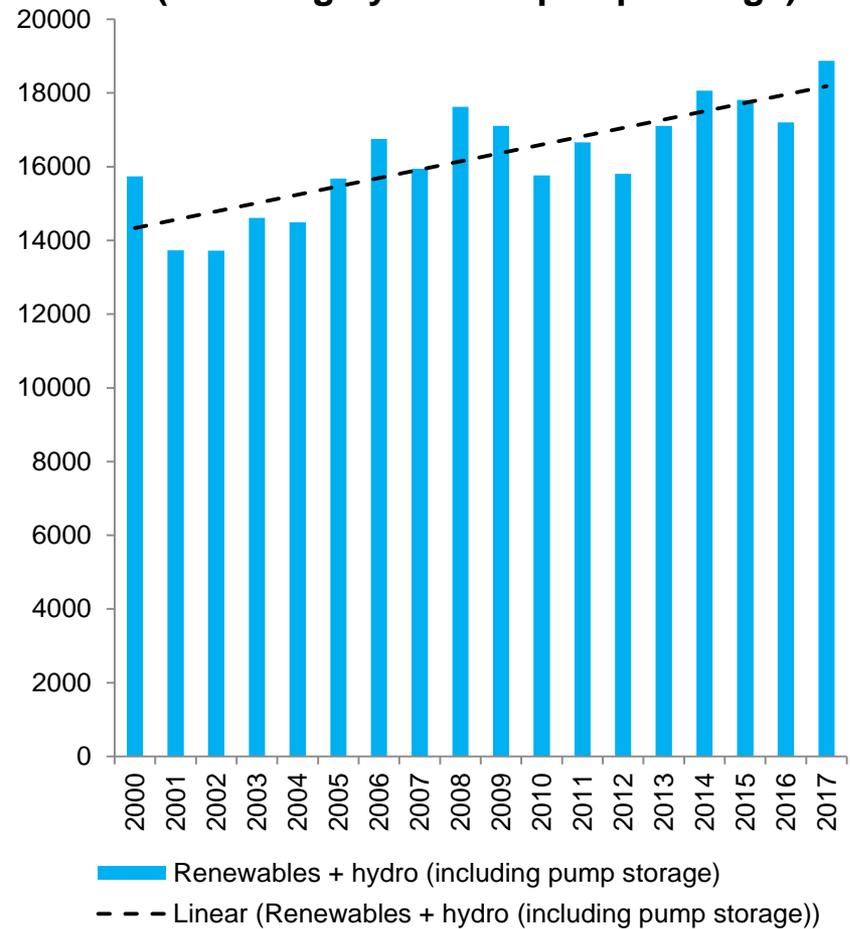
- ▶ Renewables as a % of regional generation and GWHs of energy produced have increased
- ▶ Renewables have helped displace older, dirtier, and less efficient power plants

Renewables Are Trending Upward

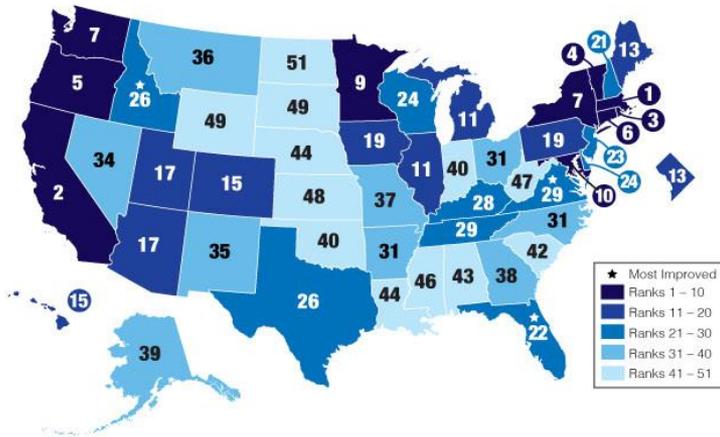
Annual GWH Renewables



Annual GWH Renewables (including hydro and pump storage)



Region Has Made Energy Efficiency a Priority

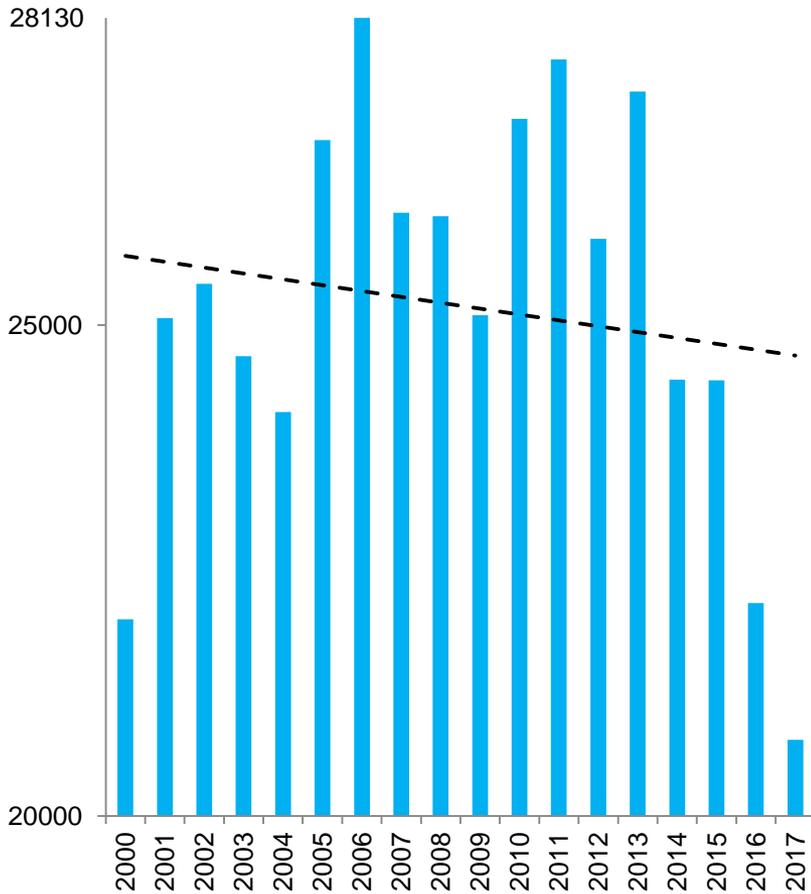


- ▶ New England continues to be at the front of the curve with respect to state energy efficiency (EE)
 - ▶ Massachusetts, Rhode Island, Vermont and Connecticut hold four of top six spots in a national ranking
- ▶ Energy efficiency has been incorporated into capacity market
- ▶ States have reinvested RGGI, system benefits charges, and FCM money into EE

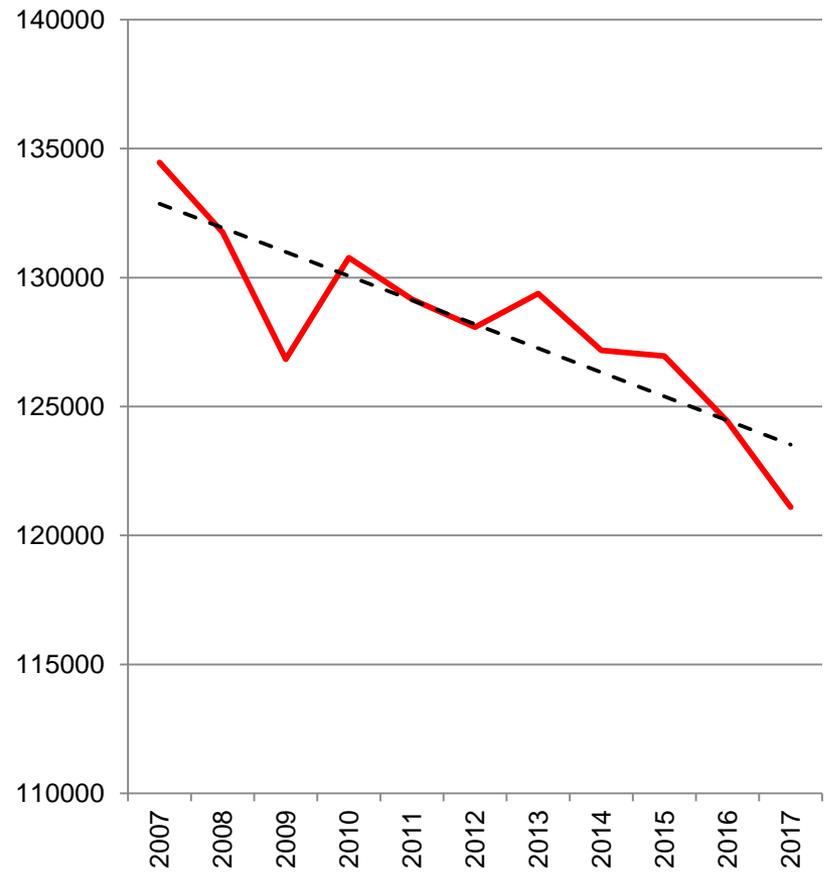
- ▶ ISO estimates the region invests \$1 billion annually on EE

EE Has Helped Mitigate Growth

**Annual Regional
Peak Demand (MW) and Trendline**



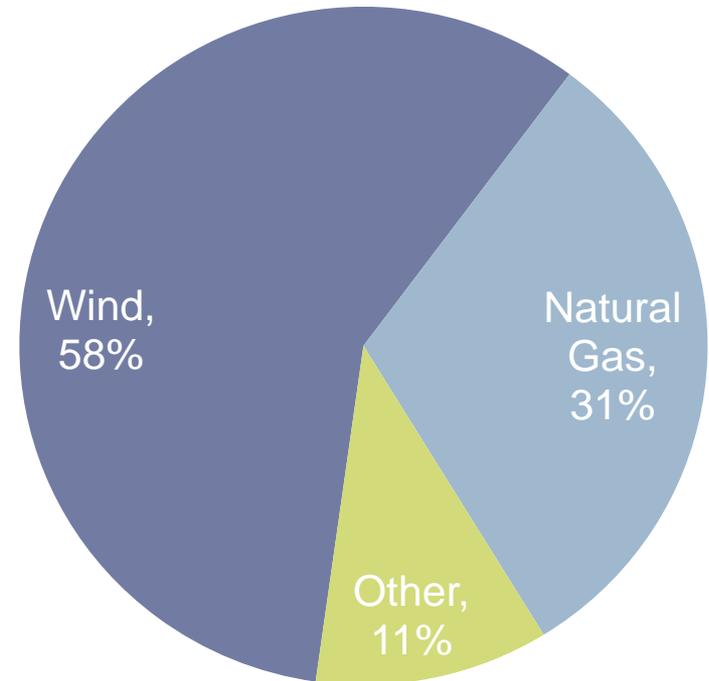
**Net Energy Load GWH
(Actual and Trendline)**



The Winds of Change

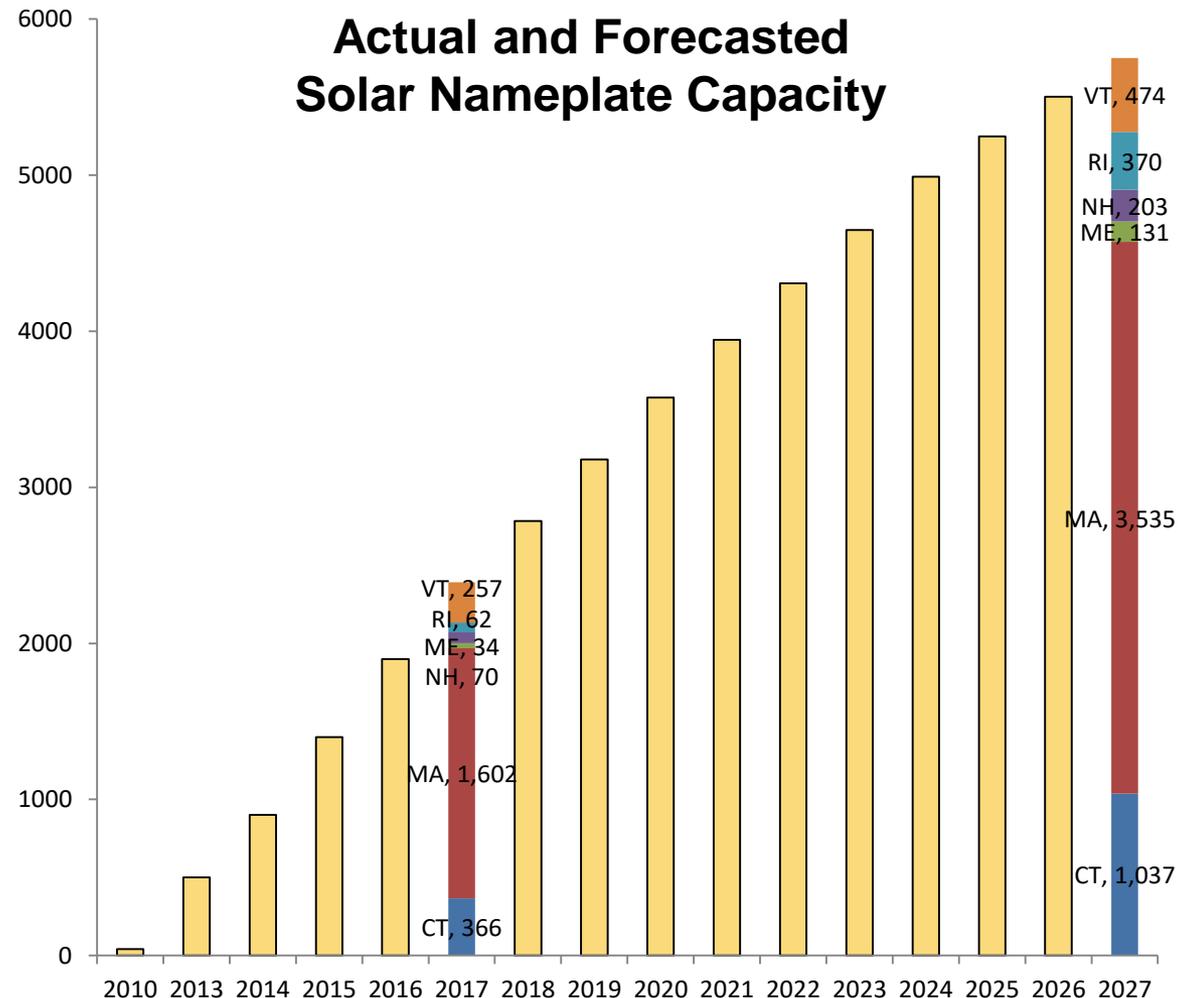
- ▶ 1,400 MW of wind has been connected to the regional power system over past decade
- ▶ In 2017 about 3% of regional generation was from wind
- ▶ Almost 9,000 MW of wind is proposed to be built (both on- and off-shore)
- ▶ Additional transmission needed to interconnect wind to regional system

**14,800 MW of
Proposed Generation
in Interconnection Queue**



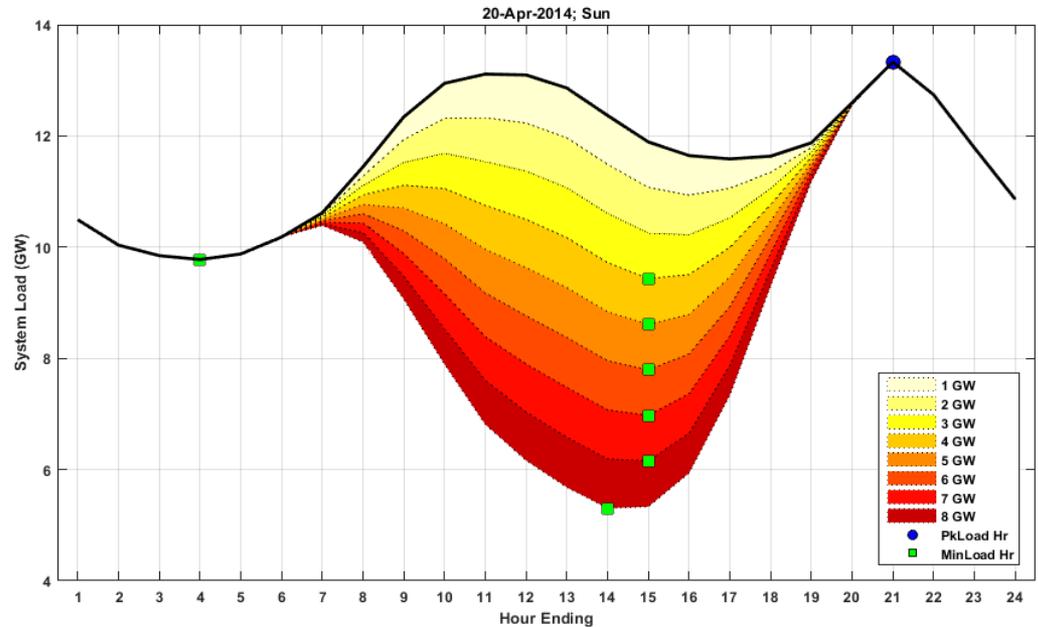
Sun Is A Bright Spot in Region's Future

- ▶ Solar growth has been significant and continued growth is forecasted
- ▶ Region can see upwards of 6 GW of solar by 2027
- ▶ Region will need quick-responding resources to complement intermittent nature of solar



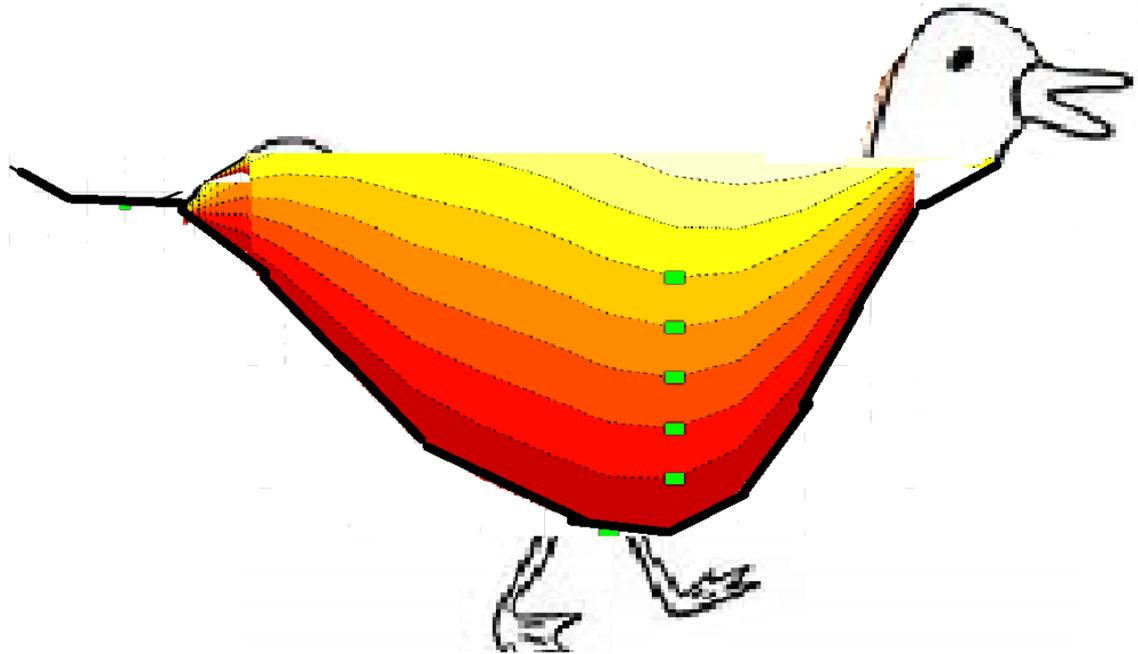
The Duck Curve

- ▶ Graph to right illustrates how regional demand is impacted by various levels of solar penetration
- ▶ As more solar is added, the curve more and more resembles the profile of a duck



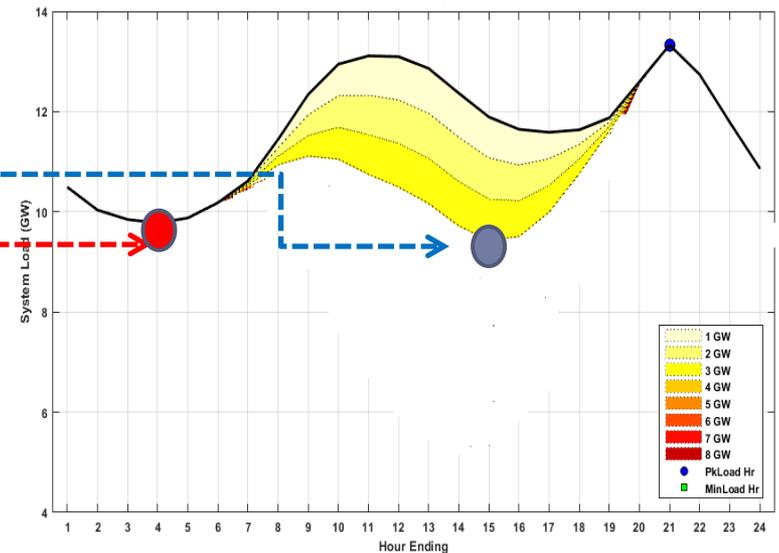
Can you see the duck?

Can You See It Now?

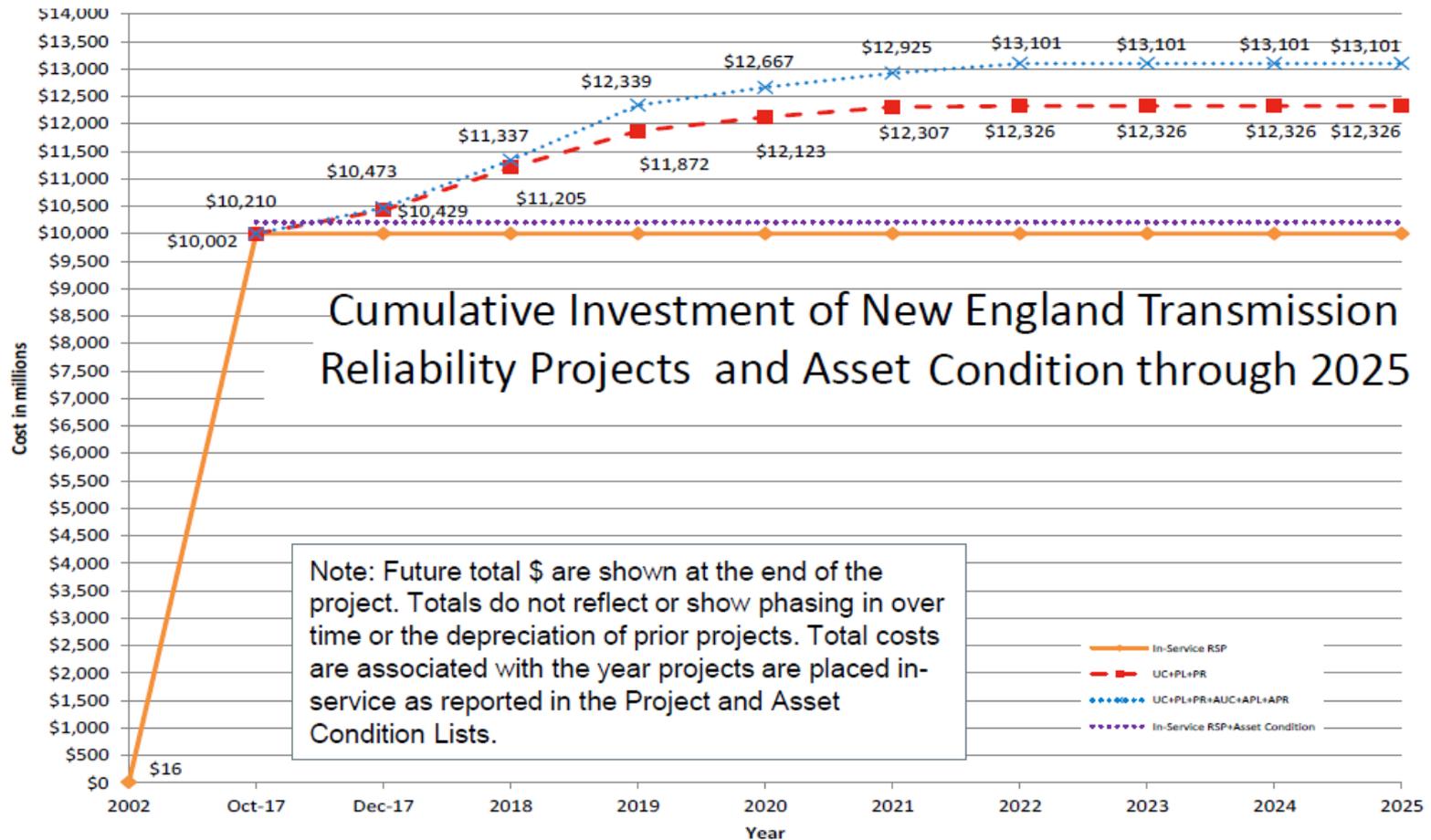


Bold Prediction: No April Fool's Day Joke

- ▶ This April 1 is Easter Sunday: if it is a fairly mild day, with moderate temperatures, and sunny, then I am predicting an historic event (something that has not happened absent a major storm):
- ▶ **I predict the lowest demand for the entire 24-hour day will be in the afternoon and not in the morning**
- ▶ Stated another way, we would use more power as a region at 3 A.M. then at 3 P.M.



Cost of Reliability Projects: \$10 Billion



RSP - UC – Under Construction, PL – Planned, PR – Proposed,
 Asset Condition - AUC – Under Construction, APL – Planned, APR - Proposed