

Wholesale/Retail Pricing: Can the Disconnected Realities Be Bridged?



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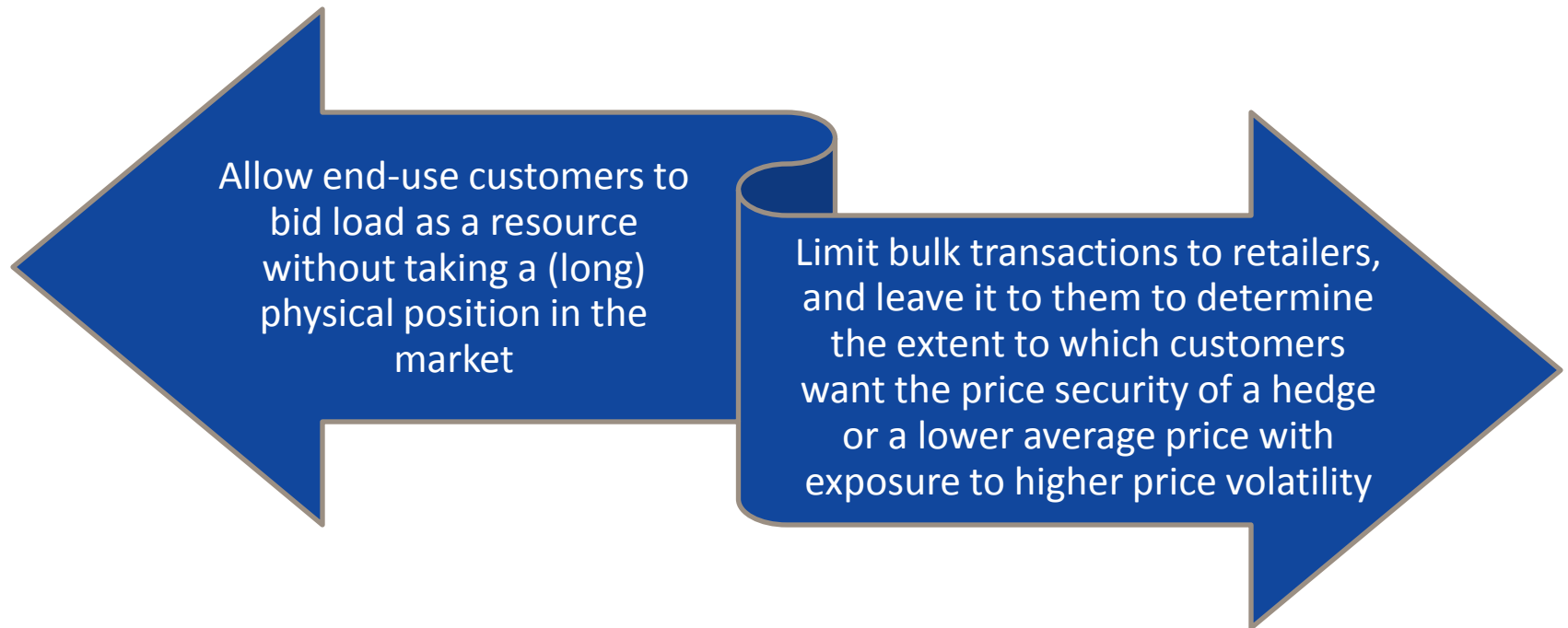
Progress Has Been Made ... But Additional Things Can be Done

- While enormous progress has been made in the wholesale markets ...
 - ... Retail pricing, with very few exceptions, has retained its non-dynamic, average cost reflective characteristics



Options (“Both Ends of the Spectrum”)

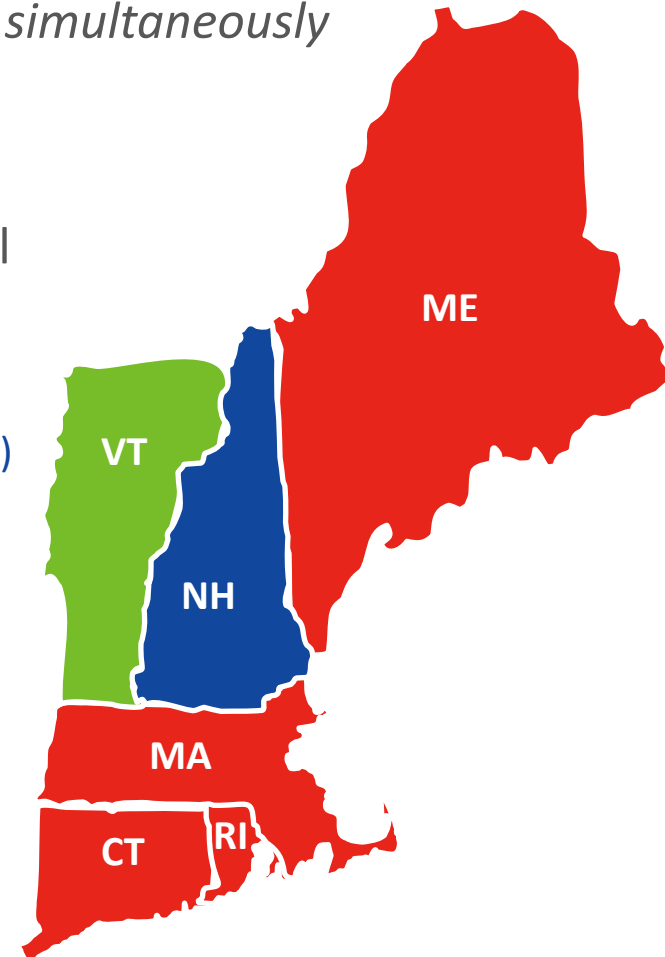
- What is the path toward a higher value retail regime where the prices reflect time-varying costs and customers choose products consistent with their preferences and budgets?



Where is New England?

Region has implemented both ends of the spectrum simultaneously

- Vast majority of region has “retail choice”
 - About 96% of region’s load can purchase retail service from competitive supplier
 - Retail Choice and Restructured Utilities
 - Hybrid (retail choice with utilities owning generation)
 - Vertically Integrated Utilities
- ISO New England is one of first RTOs to integrate “Demand Resources” – demand response, energy efficiency, distributed generation – into wholesale market structure
 - ~10% of peak-demand needs served by Demand Resources participating in wholesale markets



Treating Demand Response as Supply-Side Resource

Challenge	Description and Details
Product definition	Capacity, energy, ancillary services
Eligibility	Size requirements, location and aggregation of customers, use of behind-the-meter generation
Metering and communication	Metering interval, communication and telemetry, metering (delivery) point
Quantifying demand reductions	Baseline determination
Demand reduction offer parameters	Day-ahead and real-time offers: price, quantity, inter-temporal parameters
Scheduling and dispatch	Should demand response be committed and dispatched like a generator?
Settlement and cost allocation	What price should be paid for demand response, and who should pay?



When Demand is Treated Like Supply

Potential for economically inefficient outcomes

- The goal of the markets administered by the ISO is to meet consumer demand using the least-cost resources available in each moment of time
- If a demand resource is treated like supply, the reduction in a customer's retail electricity bill must be taken into account to achieve least-cost dispatch of resources
- Payment of the full Locational Marginal Price ("LMP") for reduced energy consumption without considering the impact of retail savings could result in higher-cost resources being used to meet consumer demand



Inefficient Demand Resource Implementation

Example

- Retail rate is \$80/MWh
- LMP is \$90/MWh
- The customer has a \$150/MWh demand resource
- Dispatching the demand resource will reduce the customer's bill by \$20/MWh
 - + \$80 bill savings
 - + \$90 full LMP payment
 - \$150 demand resource cost
 - = \$20 net gain

What does example illustrate?

- Paying a consumer like a supplier could result in an inefficient outcome:
 - Higher total resource costs as individual customers use demand resources to reduce their net bill
 - Behind-the-meter resources are given a competitive advantage over lower-cost, in-front of meter resources
 - Potential for greater pollution if behind-the-meter resource is a generator



When Demand is Treated Like Demand

- Helps increase efficiency and reduce customer energy bills
 - Increases system productivity by encouraging storage and shifting use from peak to off-peak periods
 - Reduces risk premiums in rates
 - Eliminates cross-subsidies
- Increases system reliability
- Treats customers as customers
 - Avoids treating customers as suppliers with obligations
 - Avoids estimating customer baselines
 - Supports retail choice—services customized to each customer



Barriers to Customer Response to Prices in New England

- New England lacks advanced metering infrastructure and associated tools to assist customers respond to prices
 - Results in default service being based on a uniform rate
 - Consumers cannot benefit from changing their consumption levels in response to changing real-time wholesale energy prices
 - Smart grid technology makes little sense under uniform retail rates
 - Limits ability of retail suppliers to offer other retail products
 - Limits the ability of consumers to evaluate other retail products (e.g., dynamic retail offers) or the cost-effectiveness of smart grid investment opportunities

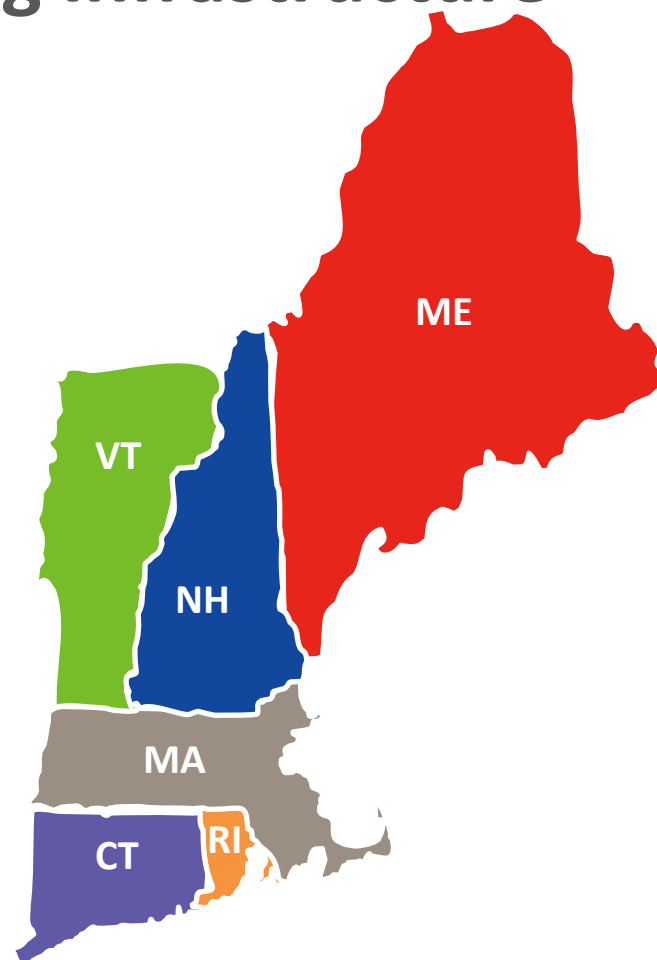


Region Lacks Advanced Metering Infrastructure

Advanced Meter Penetration (2012)*

State	AMI Meters (000)	Total Meters (000)	% AMI	% Regional KWh Sales
ME	671	1,373	49	9
NH	77	743	10	9
CT	101	2,045	5	25
MA	71	3,385	2	46
RI	0	477	0	6
VT	0	398	0	5
Region	920	8,421	11	100

Comparison of AMI Penetration		
California 70%	USA 23%	New England 11%



*Source: *FERC 2012 Assessment of Demand Response and Advanced Metering*. (December 2012), Table 2-3.

Challenges to Investment in a Smarter Grid

- Utility distribution companies risk disallowance of cost recovery associated with improved infrastructure investments
 - Use of historic test year
- Incremental benefits of improved infrastructure accrue mostly to customers and society, not to the utility
 - Customers benefit from service improvement and bill reductions
 - Society benefits from an improved environment
 - Savings in utility operating costs may have already been captured through infrastructure upgrades with limited functionality made at the time of industry restructuring



What Can be Done to Breakdown the Barriers?

- Revise the ratemaking process so as to encourage broader, more forward-thinking concerning the future electric grid
- Conduct comprehensive analysis of the benefits and costs of advanced metering and other infrastructure improvements
- Comprehensive stakeholder discussions and participation needed



Questions



APPENDIX: BACKGROUND ISO NEW ENGLAND AND REGIONAL MARKETS

About ISO New England

- Not-for-profit corporation created in 1997 to oversee New England's restructured electric power system
 - Regulated by the Federal Energy Regulatory Commission
- Regional Transmission Organization
 - Independent of companies doing business in the market



ISO New England's Responsibilities

Operating the Regional Power System

- Balance electricity supply and demand every minute of the day by centrally dispatching the generation and flow of electricity across the region's transmission lines.

Administering Wholesale Electricity Markets

- Develop and administer the region's marketplace through which wholesale electricity is bought and sold.

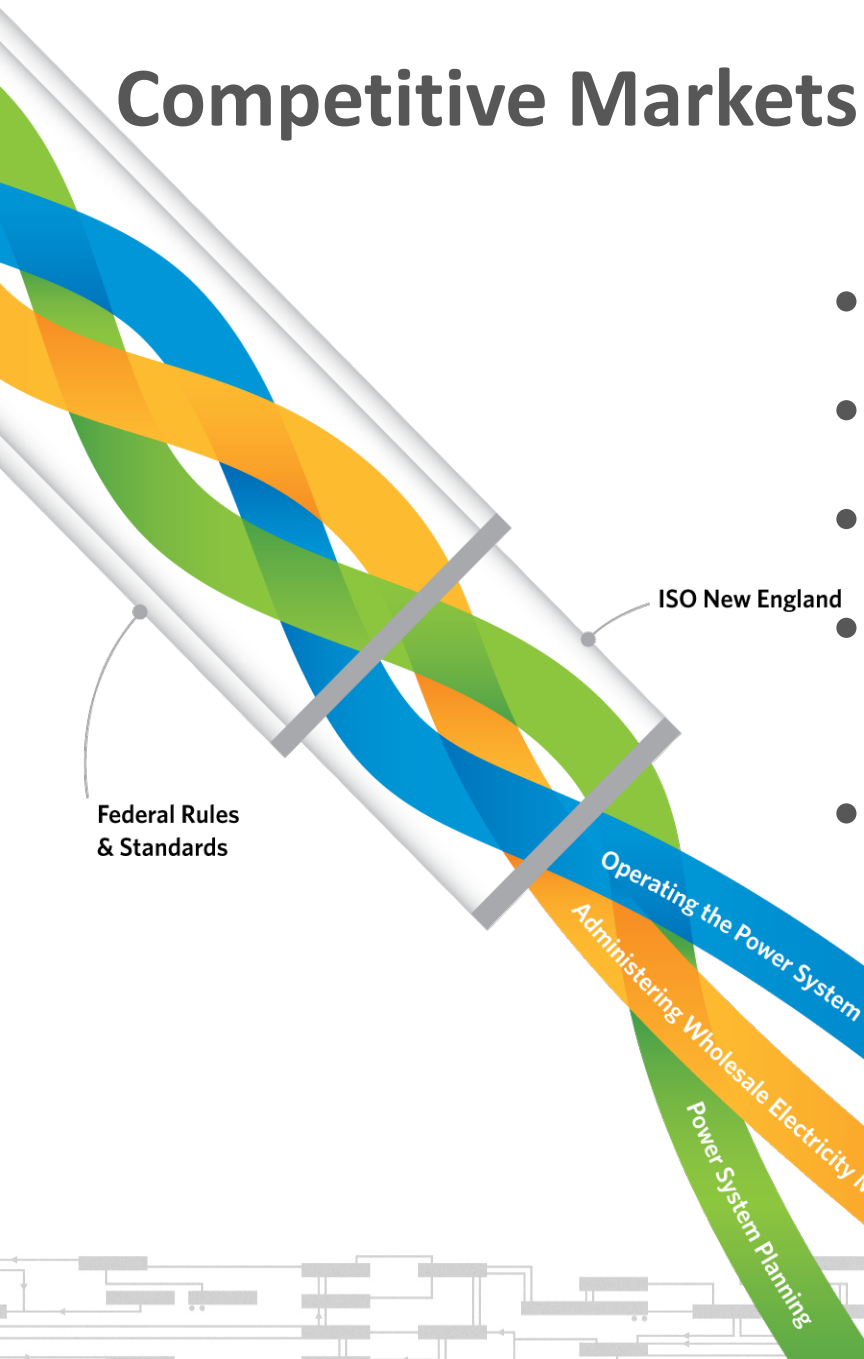
Regional Power System Planning

- Ensure the development of a reliable and efficient power system to meet current and future electricity needs.



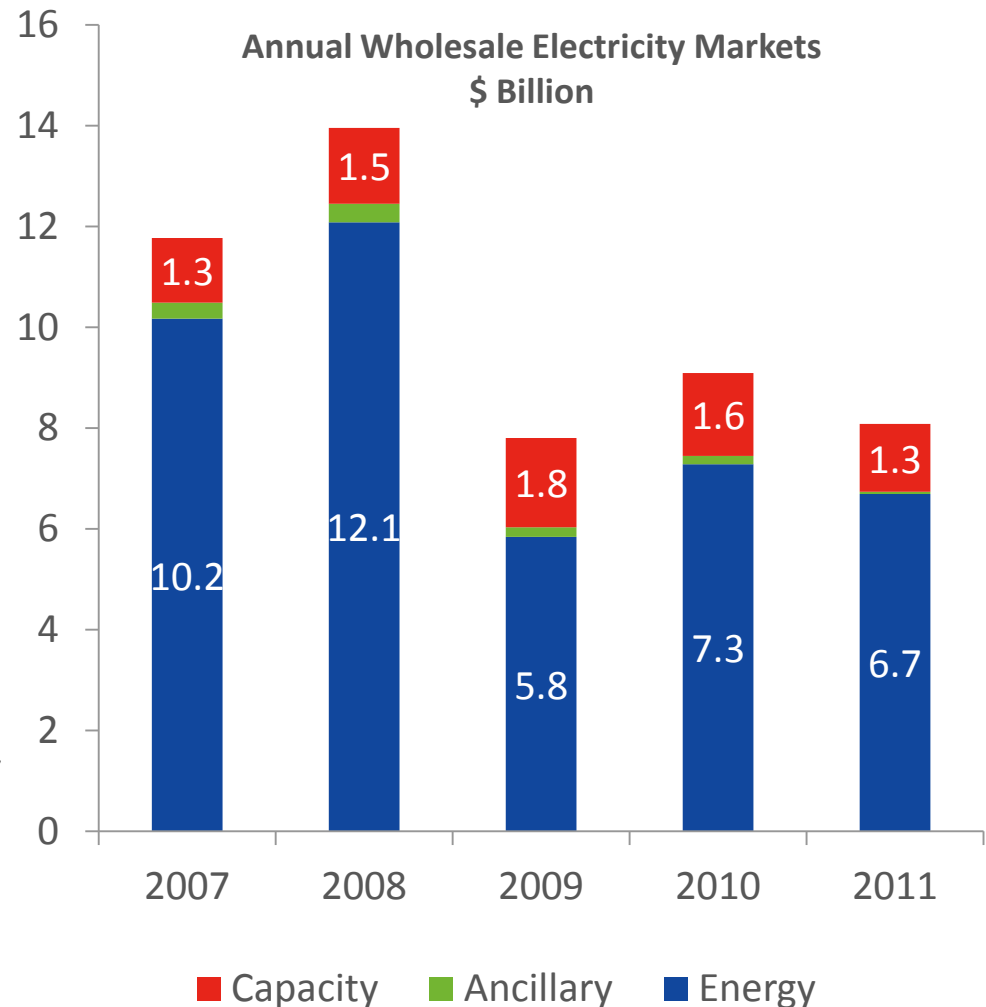
Competitive Markets Have Provided Benefits

- Growth in demand resources
- New generation added
- Generator availability improvements
- Economic and environmental improvements
- Expanded transmission development

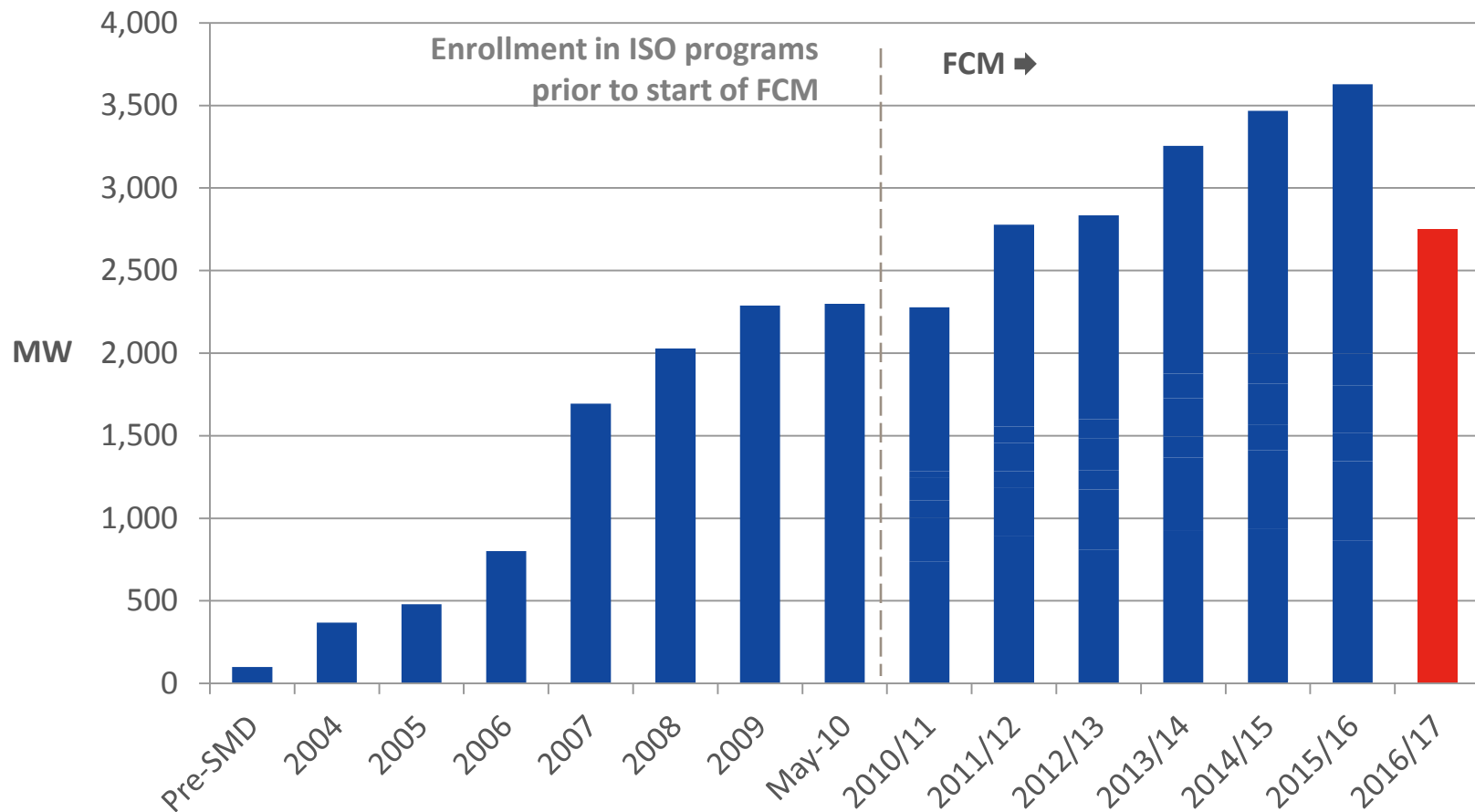


Regional Wholesale Electricity Markets Provide Economic Incentives for Market Participants

- Energy market is largest portion of wholesale electricity market
 - 2007-2010: Between \$6 billion and \$12 billion annually
 - 2011: Approximately \$7 billion
- Capacity market
 - 2007-2010: Between \$1 billion and \$2 billion annually
 - 2011: Approximately \$1.3 billion



Demand Resources Growing in New England

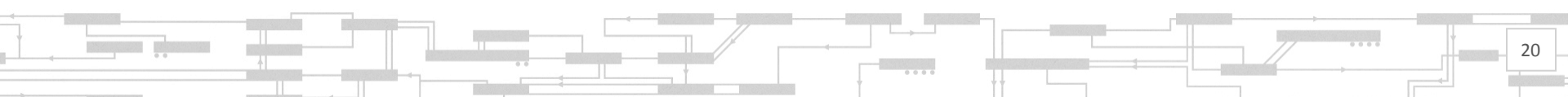


2010/11–2014/16: Total DR cleared in FCAs 1–6 (New and Existing); Real-Time Emergency Generation capped at 600 MW

2016/17 Preliminary Results

Energy-Efficiency Forecast Model Developed in 2012

- Previously, no well-established metrics for determining how much electricity will not be consumed in the future as a result of EE measures
- ISO-NE developed a forecast of “EE savings”—how much electric energy will not be used—beyond the 3-year FCM horizon (2016-2022)
- Forecast model based on future state EE budgets and amount of energy savings per dollar spent
 - Data provided by states and/or EE program administrators (PA’s)



Regional EE Forecast Results

(2016 to 2022)

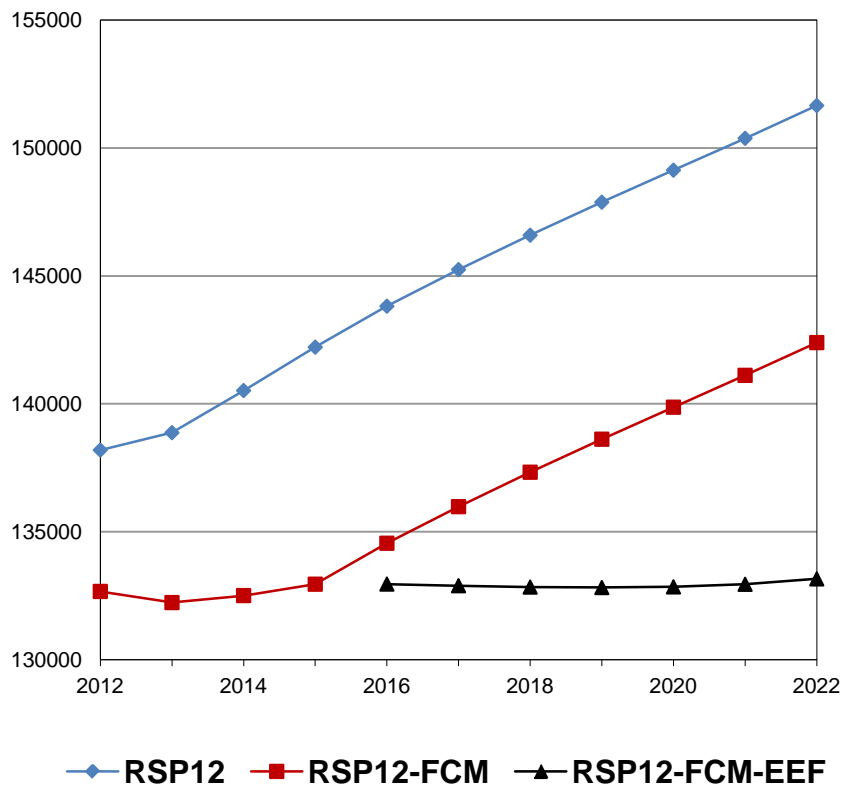
- Total projected spending on energy efficiency: **\$5.6 billion**
- Peak demand rises more slowly than with traditional forecast
 - Average annual reduction in peak demand: **188 MW**
 - Total projected reduction over seven years: **1,314 MW**
 - In VT, forecasted peak demand declines
- Annual electricity consumption remains flat compared to traditional forecast
 - Average annual energy savings: **1,319 GWh**
 - Total projected reduction over seven years: **9,233 GWh**
 - RI and VT forecasts show declining annual electricity consumption



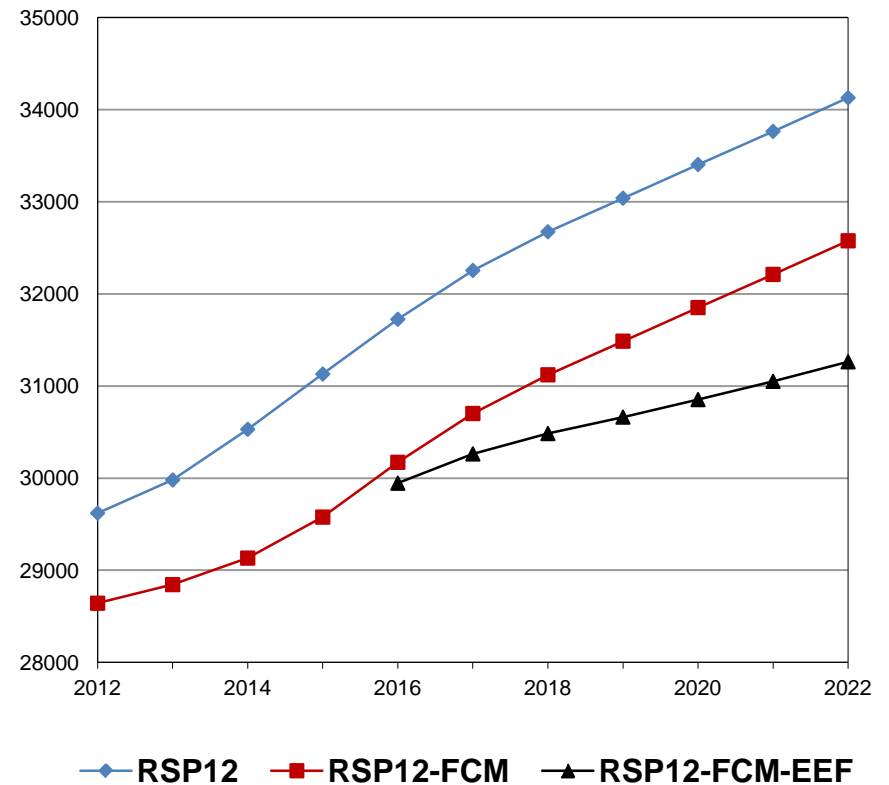
New England Results:

Level Energy Demand, Lower Peak Demand Growth

New England: Annual Energy (GWh)



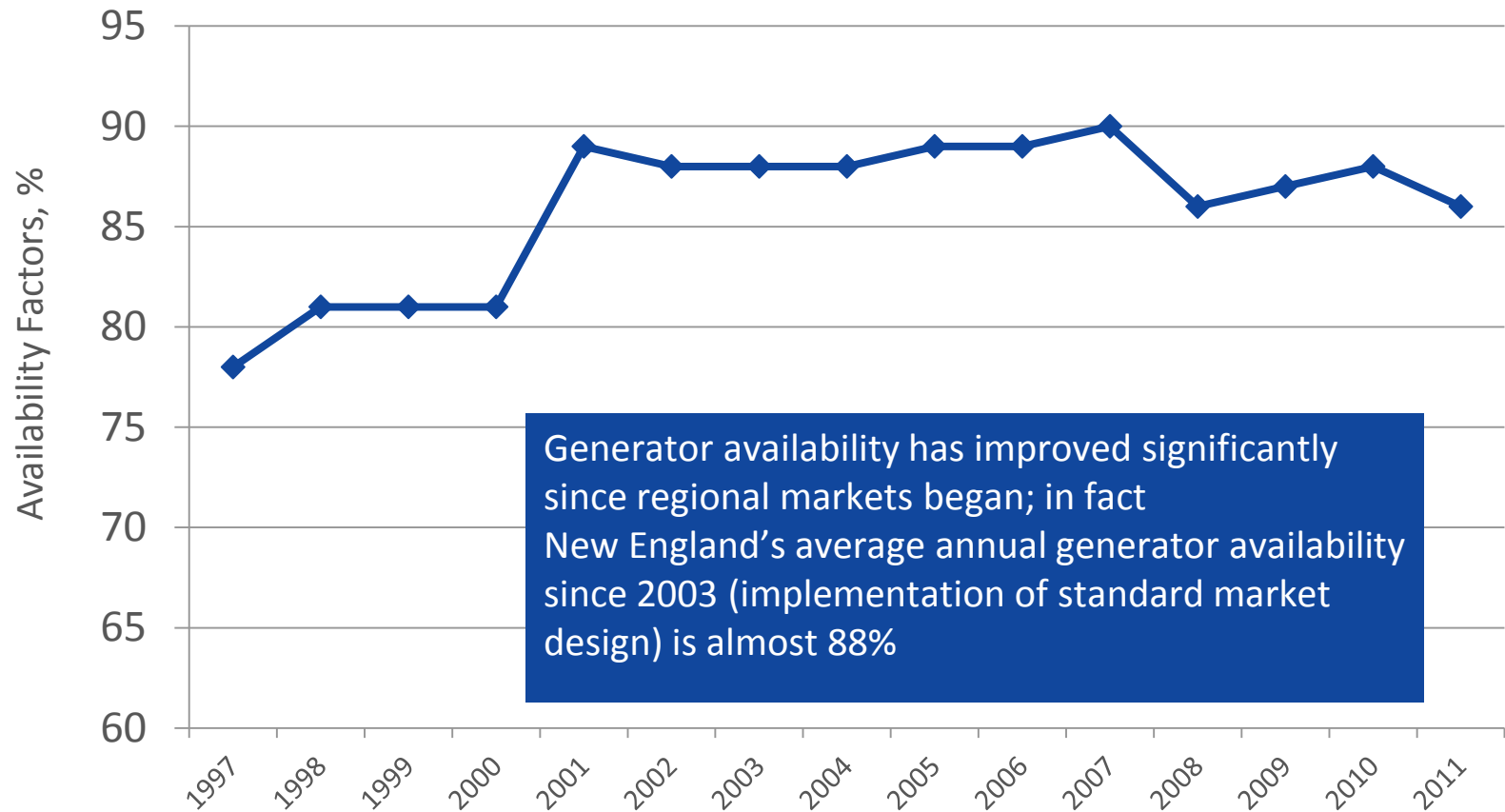
New England: Summer 90/10 Peak (MW)



Generator Availability Improvements

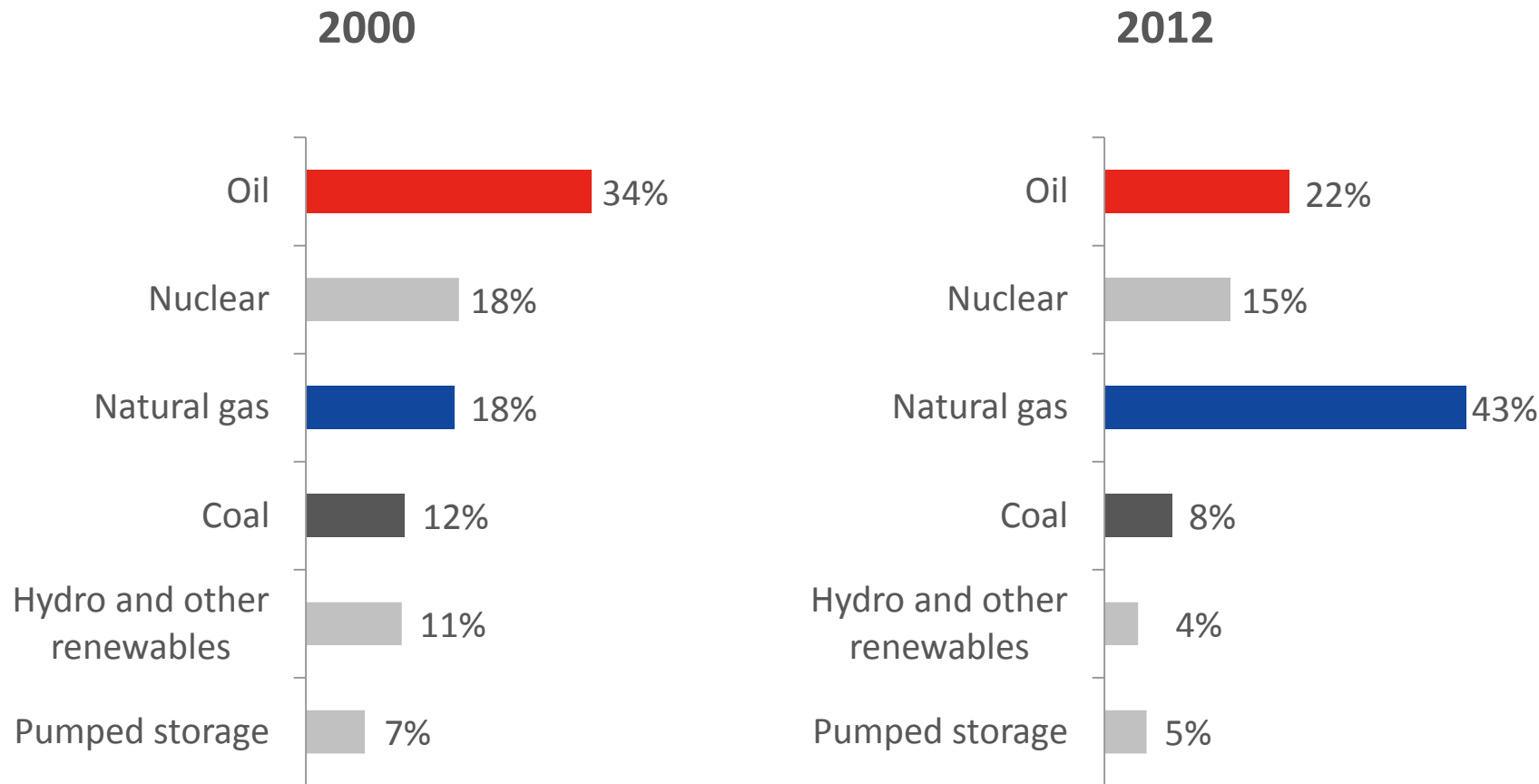
Wholesale Markets provide strong incentives to improve resource availability

New England System Weighted Equivalent



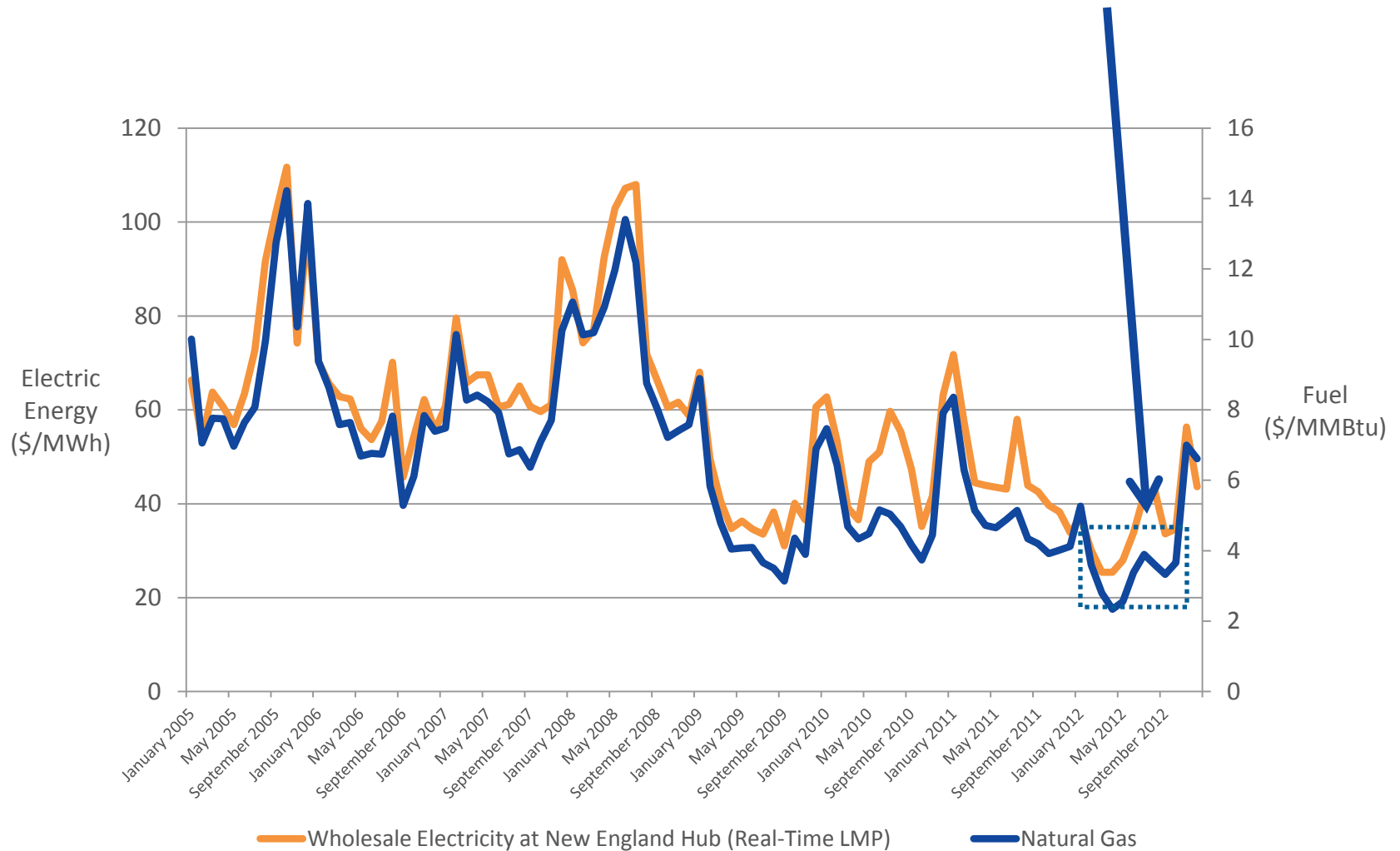
Regional *Capacity* Shift from Oil to Natural Gas

Almost 14,000 MW of Natural Gas fired generation developed since late 90's



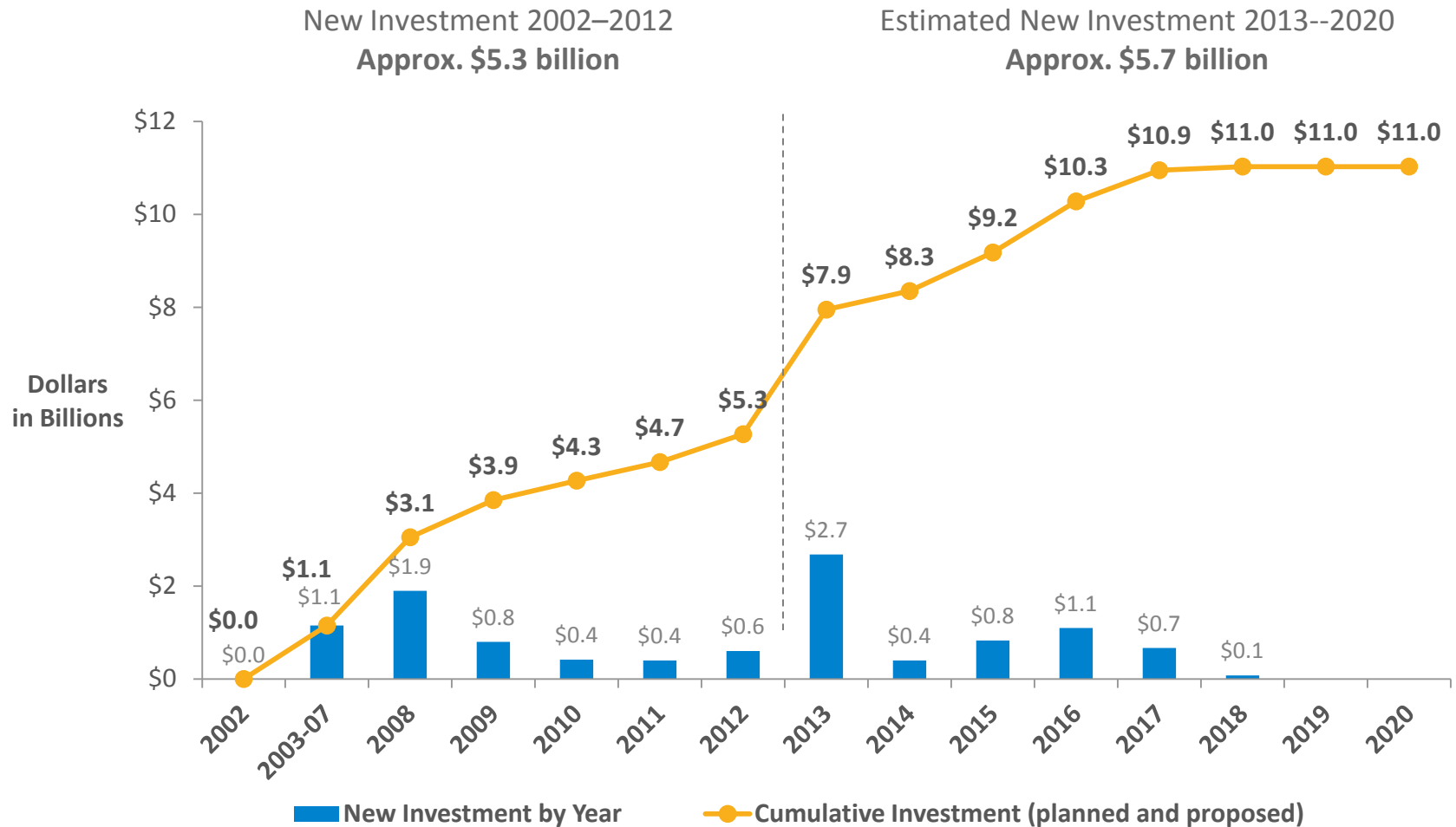
Other renewables include landfill gas, biomass, other biomass gas, wind, solar, municipal solid waste, and misc. fuels.

Gas Reliance Resulted in Low Energy Prices in 2012



Transmission Investment in New England

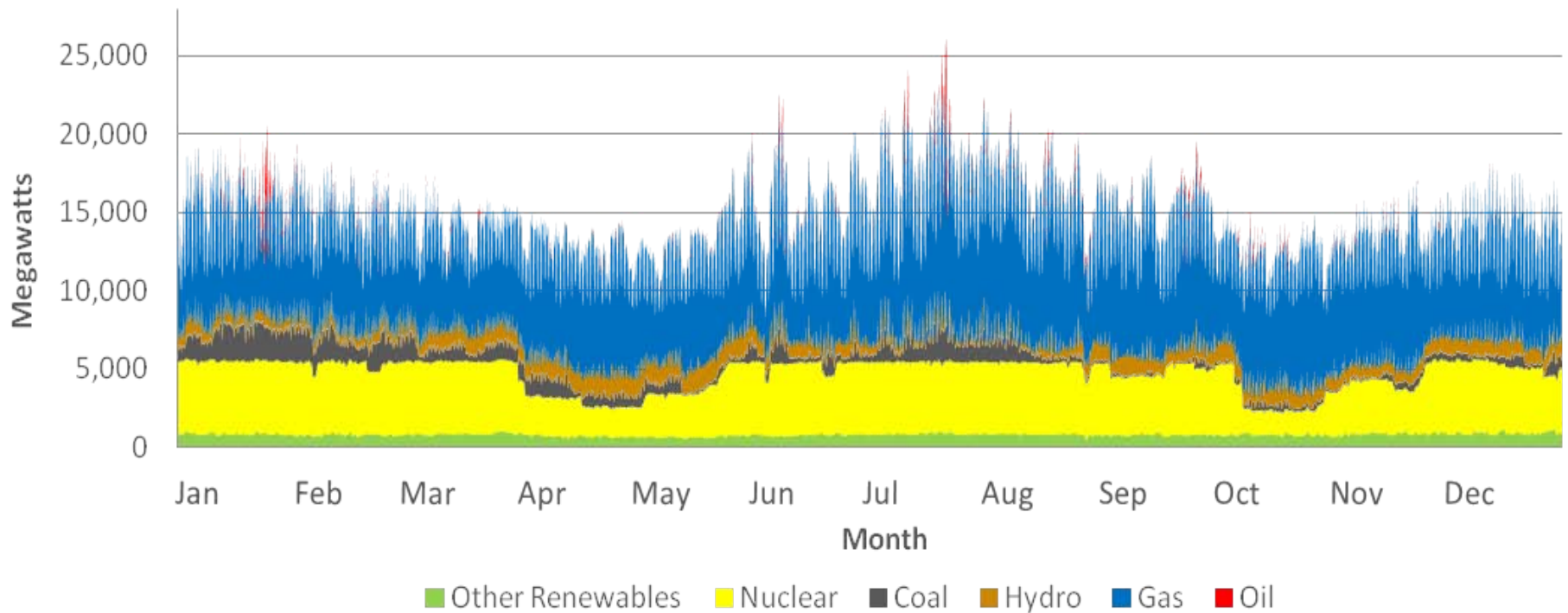
Robust transmission system allows system operators to dispatch most economic resources



Source: ISO New England Transmission Project List, through October 2012 Update.

Less Efficient, More Expensive, Older and Dirtier Units Dispatched Less Frequently

- In 2011, oil resources were rarely dispatched, and generally only at times of seasonal peaks



Emissions have Declined with Fuel Mix Change

Reduction in Aggregate Emissions (ktons/yr)

Year	NO _x	SO ₂	CO ₂
2001	59.73	200.01	52,991
2009	27.55	76.85	49,380
% Reduction, 2001–2009	↓ 54%	↓ 62%	↓ 7%

Source: Calculated Annual Emissions of NO_x, SO₂, and CO₂ for 2001 to 2009 (ktons/yr), RSP11.

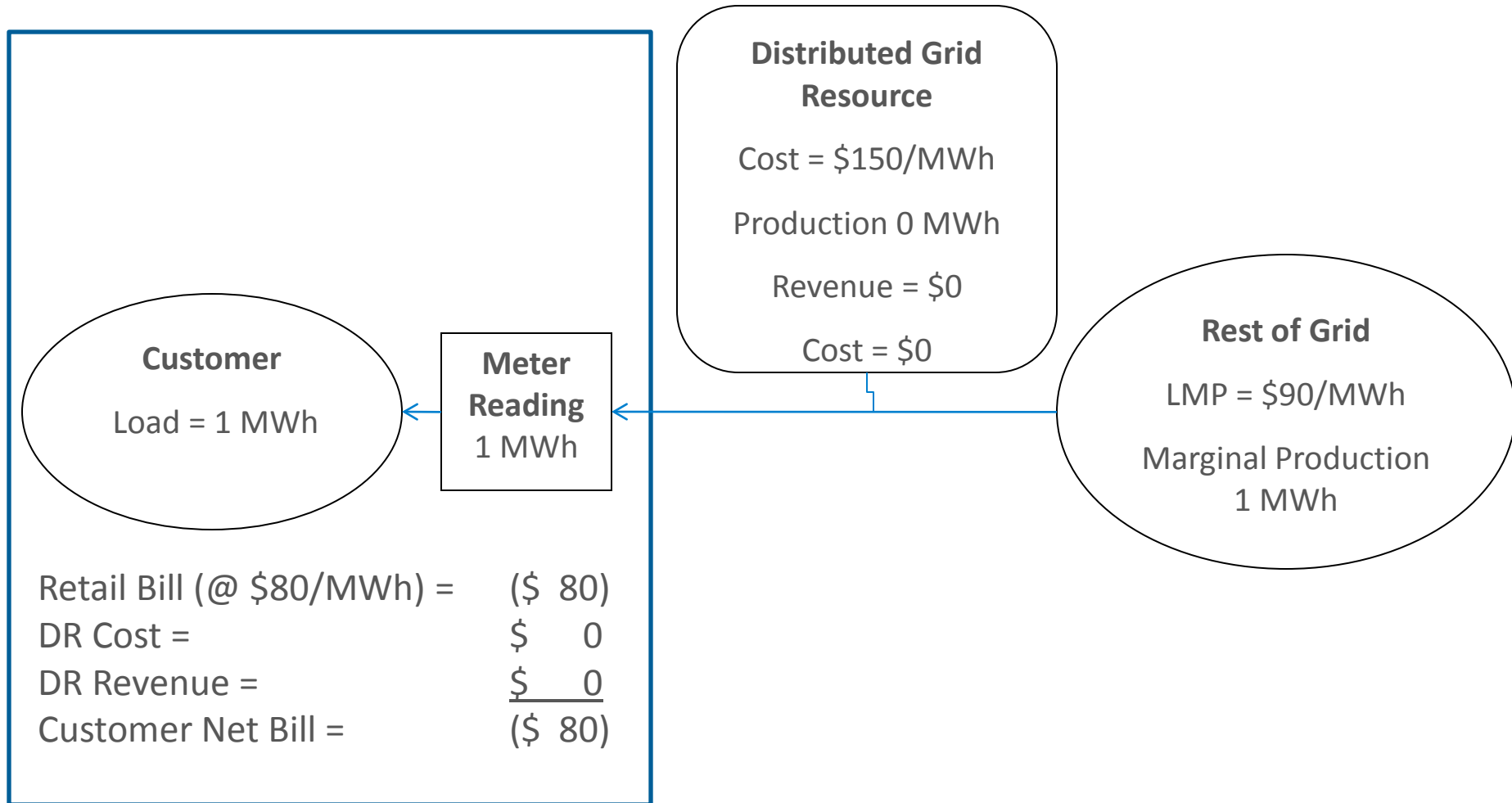
Reduction in Average Emission Rates (lb/MWh)

Year	NO _x	SO ₂	CO ₂
2001	1.36	4.52	1,009
2009	0.46	1.29	828
% Reduction, 2001–2009	↓ 66%	↓ 71%	↓ 18%

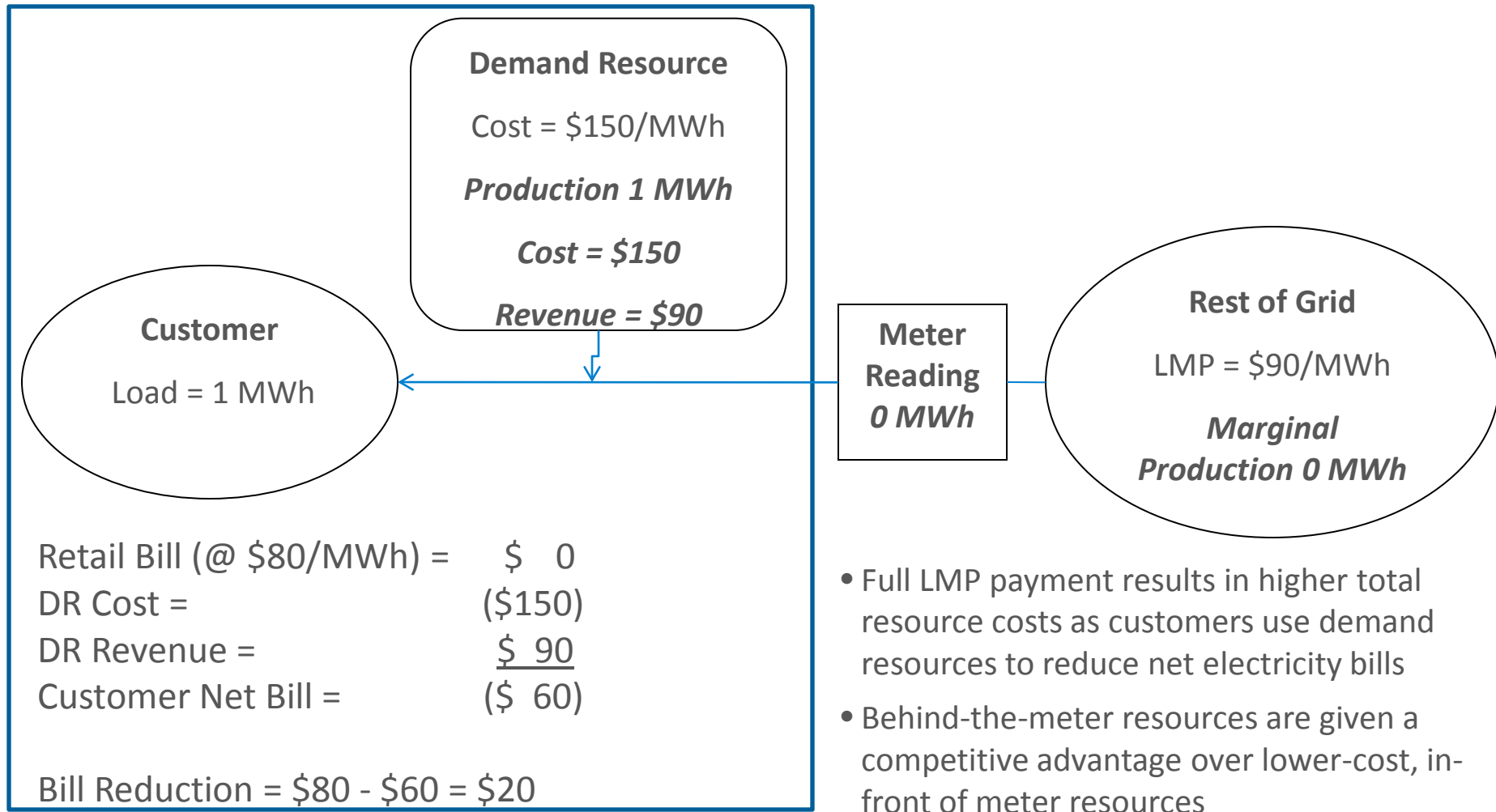
Source: Annual Average Calculated NO_x, SO₂, and CO₂ Emissions Rates, 2001 to 2009 (lb/MWh), RSP11.

APPENDIX: ADDITIONAL DR, SMART GRID AND RATE ILLUSTRATIONS

Least-Cost Dispatch of Energy Resources

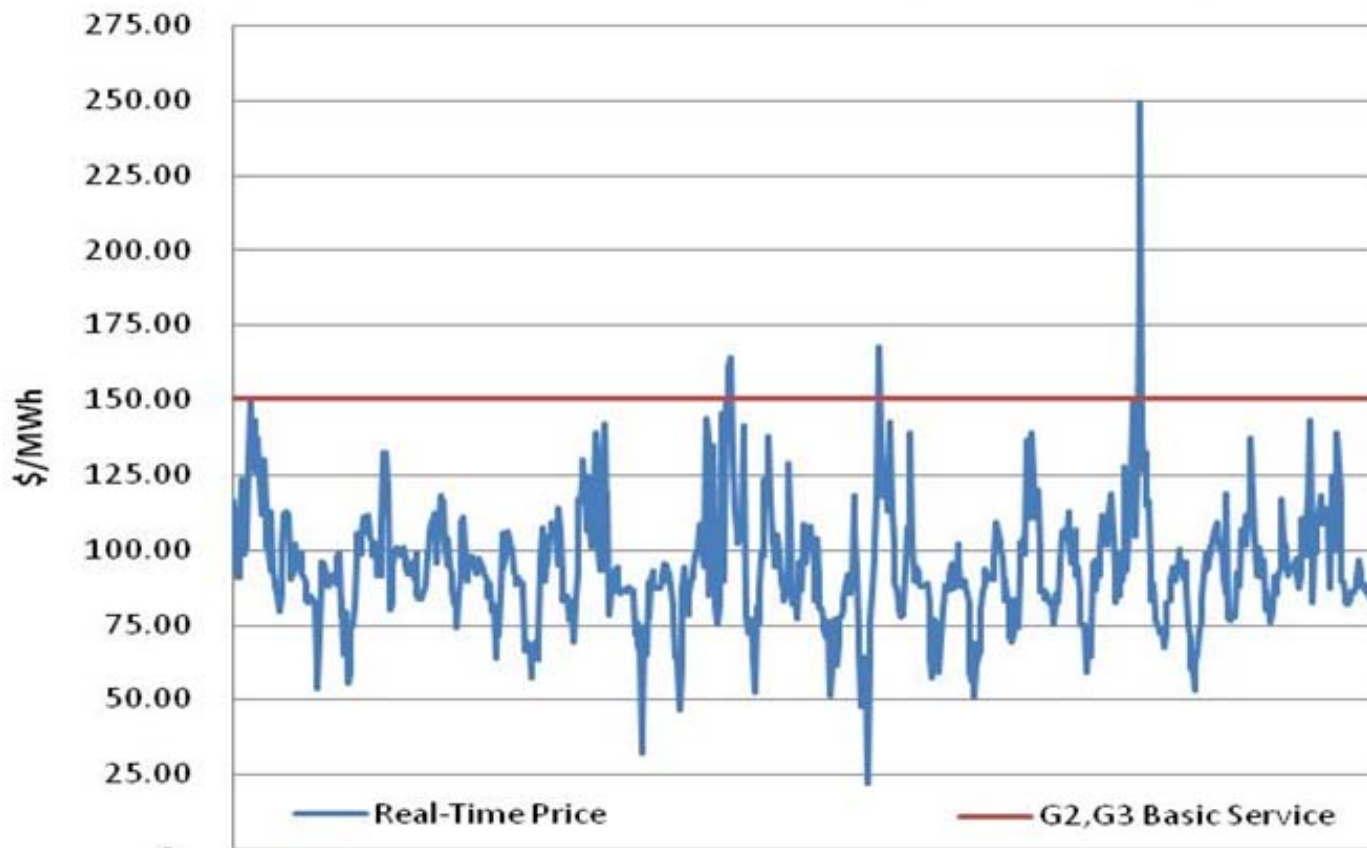


Impact of Full-LMP Payment for DR



Smarter Grid Allows Customers to Use Energy More Wisely While Saving Money

G3 Generation Supply Costs August 2008



G3 Basic Service:
\$38,133.81

Real-Time Price:
\$24,367.70

One-Month Savings: 36%

Customer Savings Under Real-Time Prices Exceed Full-LMP Payment For Demand Response

Comparison of Typical Customer Bills Under National Grid Basic Service and Real-Time Price (NEMA Load Zone) -- January 1, 2005 to December 31, 2009

Rate Class	Basic Service	Real-Time Price ("RTP")	Savings	RTP with Price Response	Savings	Basic Service With Full LMP Payment for Price Response	Savings
R1	\$ 4,043	\$ 3,533	13%	\$ 3,284	19%	\$ 3,678	9%
G1	\$ 8,190	\$ 7,247	12%	\$ 6,742	18%	\$ 7,455	9%
G2	\$ 124,378	\$ 106,217	15%	\$ 98,871	21%	\$ 113,330	9%
G3	\$ 1,370,674	\$ 1,140,709	17%	\$ 1,064,680	22%	\$ 1,255,703	8%

Note: This comparison includes generation commodity only – state-regulated wires charges (i.e., T&D costs) are not included



IDENTIFIED BENEFIT RANGES

Meter / Month from North America Business Cases

	Traditional AMR	AMI/ Smart Grid
Operational Savings:		
Meter Reading/Operations	\$ 0.69 - 1.33	\$ 0.22 - 1.47
Field Service Savings	.10 - .28	.03 - .65
Back Office/Administrative	.20 - .68	(.01) - .34
Non-Tech	.07 - .62	.01 - 3.30
Avoided Capital	.04 - 1.0	.02 - 2.40
Peak Load Reduction/		
Energy Savings	- -	.43 - 1.79
Reliability	- -	.05 - 2.00
Environmental	- -	.07 - 11
Total Identified Benefits	\$ 1.14 - 2.20	\$.72 - 7.34
System Costs/Meter:		
AMR Metering System	\$ 61 - 133	
AMI Metering System		\$ 107 - 296
AMI/Smart Grid		\$ 194 - 477

Notes

- Hi/low values used for each category
- “- -” ≠ No value
- AMI/SG includes:
 - AMI w/existing AMR
 - AMI w/out AMR
- Cost total includes:
 - AMR or AMI
 - Integration
- Itron & non-Itron business cases & deployments
- Bridge business case:
 - Supports both AMR and AMI



Source: Husta, Bruce. “Massachusetts Electric Grid Modernization.” Itron Smart Grid Solutions. January 9, 2013.
http://magrid.raabassociates.org/Articles/Itron_GridMod_01-09-2013_Final.pdf