



ISO New England Update

Consumer Liaison Group Meeting

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CYBERSECURITY



ISO New England Adheres to Mandatory Reliability Standards That Address Cybersecurity

- Safeguarding physical and cyber security is a **top priority** for ISO New England
- The nine Independent System Operators and Regional Transmission Organizations (ISOs/RTOs) in North America are subject to **mandatory** NERC Critical Infrastructure Protection (CIP) reliability standards that address cybersecurity
- The ISO is actively engaged in NERC grid security exercises that test the readiness of the electricity subsector to respond to physical and cybersecurity threats (e.g., **GridEx III**)



Note: The North American Electric Reliability Corporation (NERC) develops and enforces mandatory standards to ensure reliability of the bulk power system in North America.



ISO New England Has Initiated Round-the-Clock Cybersecurity Monitoring

- To be able to **detect, withstand, and recover** from a cyber attack, the ISO has implemented an extensive system of process controls, advanced detection and response systems, and redundancy measures to protect the ISO New England network
- Building on existing tools, the ISO launched the 24/7 Security Operations Center in late 2015 to provide **round-the-clock cybersecurity monitoring** of the ISO New England network

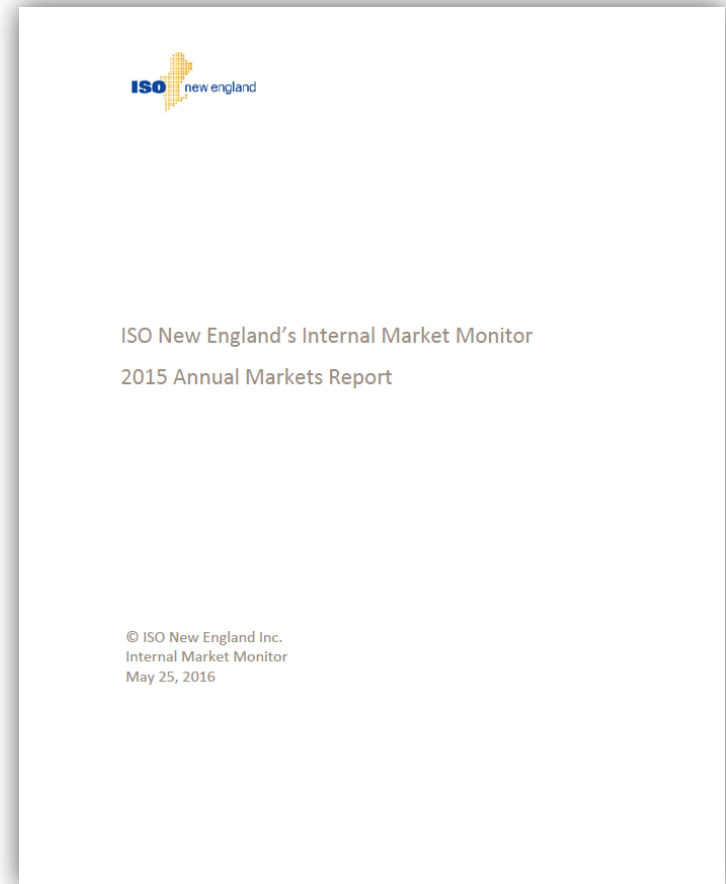


2015 ANNUAL MARKETS REPORT



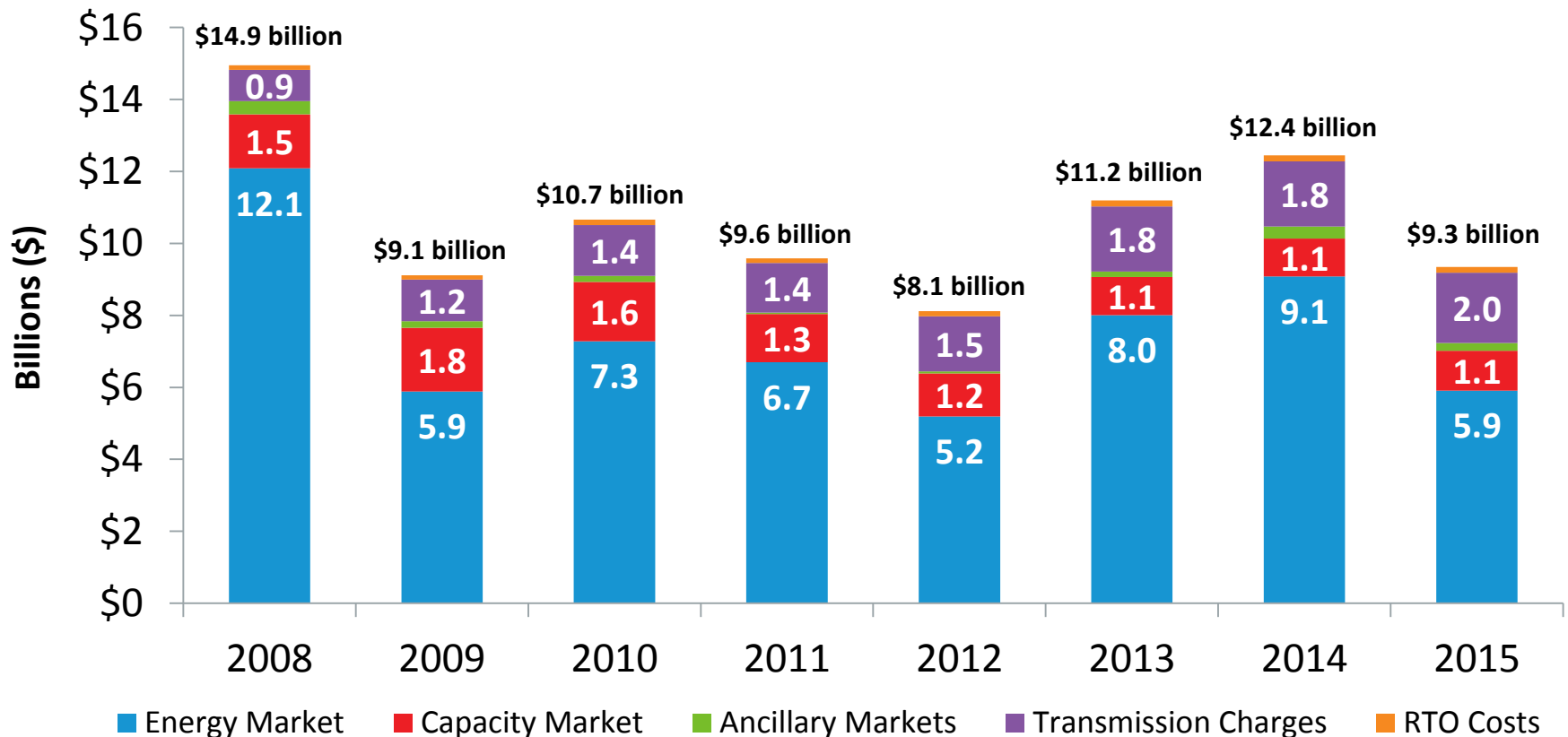
Wholesale Electricity Markets Operated Competitively Last Year According to *2015 Annual Markets Report*

- Last month, ISO New England's **Internal Market Monitor (IMM)** issued the *2015 Annual Markets Report (AMR)*
- The AMR assesses the **state of competition** in the wholesale electricity markets administered by ISO New England during the most recent operating year
- The IMM functions **independently** of ISO management and reports directly to the ISO Board of Directors



Key Findings of the *2015 Annual Markets Report*

- The total wholesale cost of electricity in 2015 was **\$9.3 billion**, down from **\$12.4 billion** in 2014 (25% decrease)



Key Findings of the *2015 Annual Markets Report*



Energy Market

- Overall, the region's energy, capacity, and ancillary services markets performed well in 2015
 - **Energy Market:** Electric energy comprised **\$5.9 billion** of the total wholesale cost of electricity in 2015, down from **\$9.1 billion** in 2014
 - The average real-time price of wholesale electric energy fell by 35% last year, from **\$63.32/MWh** in 2014 to **\$41/MWh** in 2015, reflecting lower natural gas prices in 2015
 - The average price of natural gas fell by 41% last year, from **\$7.99/MMBtu** in 2014 to **\$4.73/MMBtu** in 2015
 - Natural gas is a key factor in the price of wholesale electric energy because it generates **49%** of the electricity produced in New England

Key Findings of the *2015 Annual Markets Report*

- Overall, the region's energy, capacity, and ancillary services markets performed well in 2015
 - **Capacity Market:** The cost of capacity in 2015 rose by 5% to \$1.1 billion
 - Total wholesale costs to date have been influenced by low capacity market prices (ranging from \$2.95/kW-month to \$4.50/kW-month) due to **excess supply**
 - This influence will continue until the 2017-2018 Capacity Commitment Period (associated with Forward Capacity Auction #8) when capacity market prices increased, reflecting the **need for additional capacity resources** due to significant retirements

Forward
Capacity
Market

Key Findings of the *2015 Annual Markets Report*

- Overall, the region's energy, capacity, and ancillary services markets performed well in 2015
 - **Ancillary Services Market:** Ancillary services ensure the reliable operation of the regional power system
 - Resources are compensated for providing **operating reserves** so that the system can recover from the unexpected loss of a resource or transmission facility
 - Resources are compensated for providing **regulation services** to balance supply and demand and maintain system frequency
 - The cost of ancillary services fell by 39% to about \$144 million as a consequence of lower fuel costs in 2015



WHOLESALE ELECTRICITY COSTS FOR NEW ENGLAND AND BY STATE

New England Wholesale Electricity Costs^(a)

	2008		2009		2010		2011		2012		2013		2014		2015	
	\$ Mil.	¢/kWh	\$ Mil.	¢/kWh	\$ Mil.	¢/kWh	\$ Mil.	¢/kWh	\$ Mil.	¢/kWh	\$ Mil.	¢/kWh	\$ Mil.	¢/kWh	\$ Mil.	¢/kWh
Wholesale Market Costs																
Energy (LMPs)^(b)	\$12,085	9.1	\$5,884	4.6	\$7,284	5.6	\$6,695	4.9	\$5,193	3.9	\$8,009	6.0	\$9,079	6.9	\$5,910	4.5
Ancillaries^(c)	\$366	0.3	\$190	0.1	\$164	0.1	\$39	0.0	\$56	0.0	\$155	0.1	\$331	0.3	\$210	0.2
Capacity^(d)	\$1,505	1.1	\$1,768	1.4	\$1,647	1.3	\$1,345	1.0	\$1,195	0.9	\$1,057	0.8	\$1,056	0.8	\$1,110	0.8
Subtotal	\$13,956	10.5	\$7,842	6.1	\$9,095	7.0	\$8,079	5.9	\$6,444	4.8	\$9,220	6.9	\$10,466	8.0	\$7,229	5.5
Transmission Charges^(e)	\$869	0.7	\$1,155	0.9	\$1,417	1.1	\$1,378	1.0	\$1,532	1.1	\$1,806	1.3	\$1,815	1.4	\$1,954	1.5
RTO Costs^(f)	\$124	0.1	\$116	0.1	\$145	0.1	\$130	0.1	\$139	0.1	\$167	0.1	\$165	0.1	\$165	0.1
Total	\$14,949	11.3	\$9,113	7.1	\$10,657	8.2	\$9,588	7.0	\$8,115	6.0	\$11,193	8.3	\$12,446	9.5	\$9,348	7.1

(a) Average annual costs are based on the 12 months beginning January 1 and ending December 31. Costs in millions = the dollar value of the costs to New England wholesale market load servers for ISO-administered services. Cents/kWh = the value derived by dividing the dollar value (indicated above) by the real-time load obligation. These values are presented for illustrative purposes only.

(b) Energy values are derived from wholesale market pricing.

(c) Ancillaries include first- and second-contingency Net Commitment-Period Compensation (NCPC), forward reserves, real-time reserves, regulation service, and a reduction for the Marginal Loss Revenue Fund.

(d) Capacity charges are those associated with the Forward Capacity Market.

(e) Transmission charges reflect the collection for transmission owners' revenue requirements and tariff-based reliability services, including black-start capability and voltage support. In 2015, the cost of payments made to these generators for reliability services under the ISO's tariff was \$41.9 million.

(f) RTO costs are the costs to run and operate ISO New England Inc. and are based on actual collections as determined under Section IV of the ISO New England Inc. Transmission, Markets, and Services Tariff.

2015 Wholesale Electricity Costs By State

	2015 \$ Millions						TOTAL
	CT	ME	MA	NH	RI	VT	
Wholesale Market Costs							
Energy (LMPs)	\$1,427	\$545	\$2,755	\$543	\$378	\$261	\$5,910
Ancillaries	\$51	\$19	\$98	\$19	\$13	\$9	\$210
Capacity	\$268	\$102	\$517	\$102	\$71	\$49	\$1,110
Subtotal	\$1,746	\$667	\$3,370	\$664	\$462	\$319	\$7,229
Transmission Charges	\$490	\$165	\$906	\$186	\$128	\$78	\$1,954
RTO Costs	\$40	\$15	\$77	\$15	\$11	\$7	\$165
Total	\$2,276	\$847	\$4,353	\$865	\$601	\$405	\$9,348
% of Total	24.3%	9.1%	46.6%	9.3%	6.4%	4.3%	100%

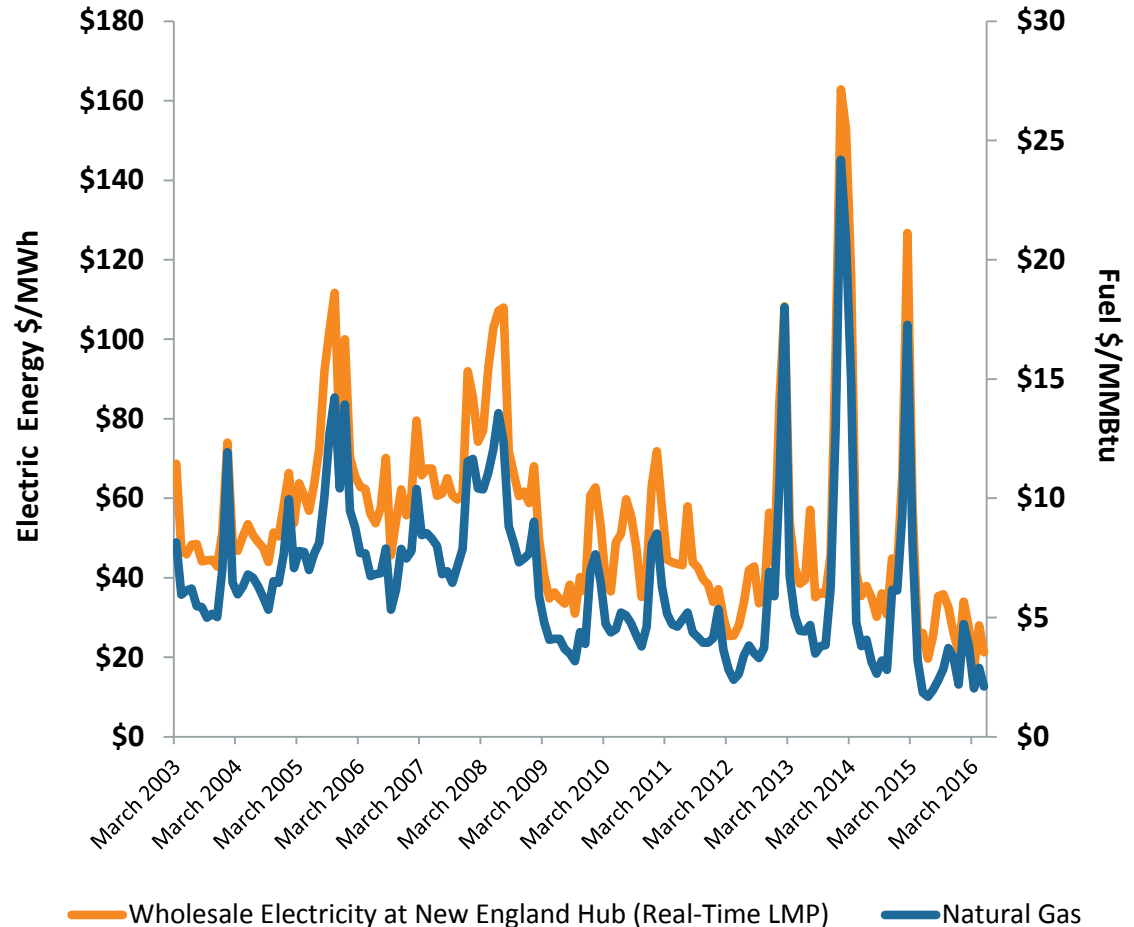
Note: The Energy, Ancillaries, Capacity, and RTO costs were determined based on the state's portion of the total Real-Time Load Obligation (RTLO) associated with the six New England states. The Transmission Charges were determined based on the state's portion of the Regional Network Load costs.

2016 HIGHLIGHTS

Average Wholesale Electricity Prices for March Were the Lowest Since 2003

- The six-state region's average monthly wholesale electricity price during March was **\$17.20/MWh**, the lowest monthly price since March 2003, when the wholesale electricity markets were launched in their current form
- Natural gas prices averaged **\$2.03/MMBtu** for the month of March

Monthly Average Natural Gas and Wholesale Electricity Prices in New England



Summer Outlook for 2016



- Under normal weather and power system conditions, New England is expected to have **adequate** electricity supplies to meet consumer demand this summer
 - ISO issued its Summer Outlook [press release](#) on April 26, 2016
- Normal summer weather peak demand forecast: **26,704 MW**
 - 90 degrees Fahrenheit (90° F), normal summer weather
- Extreme summer weather peak demand forecast: **29,042 MW**
 - 94° F and above, heat wave conditions
- Both forecasts take into account the demand-reducing effect of **1,839 MW** of energy-efficiency measures acquired through the FCM
- Total capacity available this summer: **30,247 MW**
- Total capacity with a capacity supply obligation (CSO): **29,734 MW**
- Work on Spectra's Algonquin Incremental Market (AIM) natural gas pipeline expansion project will limit delivery of natural gas to some power plants

Note: A Capacity Supply Obligation (CSO) is a requirement to provide capacity acquired through the ISO's Forward Capacity Market (FCM).

Questions



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
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