

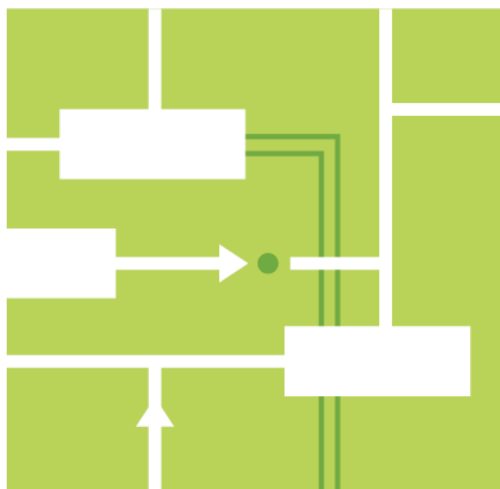
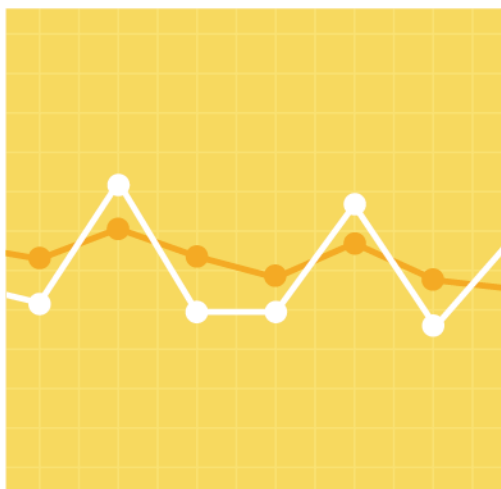
# 2016 Report of the Consumer Liaison Group

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Joint Report of the Consumer Liaison Group Coordinating Committee  
and ISO New England

MARCH 1, 2017

ISO-NE PUBLIC





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## Section 1

### Statement from the Consumer Liaison Group Coordinating Committee

Dear Reader,

Welcome to the *2016 Report of the Consumer Liaison Group* (CLG) prepared jointly by the Consumer Liaison Group Coordinating Committee (CLGCC) and ISO New England (ISO). This is the eighth annual CLG report, the first having been published in 2010 summarizing 2009 activities, the year the CLG was established.

The CLG was formed to meet the need, as cited in the Federal Energy Regulatory Commission's (FERC) Order No. 719, for heightened communication between Regional Transmission Organizations (RTOs) and their stakeholders, with a particular focus on electricity consumers, consumer advocates, and state government regulators. Like other RTOs across the country, ISO New England is responsible for the reliable operation of the region's bulk power system, administration of the region's wholesale electricity markets, and regional power system planning.

The CLG bylaws, formulated by stakeholders and the ISO, require the organization to be governed by a Coordinating Committee of up to 12 members. These members represent various stakeholder groups, with no more than four members coming from any one New England state. In 2016, the CLGCC held a Coordinating Committee election for the 2017–2018 term. New Coordinating Committee members were added to represent Connecticut and Rhode Island. Rebecca Tepper, Chief of the Energy and Telecommunications Division of the Massachusetts Attorney General's Office, continues to serve as Chair of the Coordinating Committee.

ISO New England's information flow to the CLG has been instrumental in fulfilling the mandate to afford stakeholders a greater understanding of the ISO's activities and decision-making processes and the potential cost impacts of its decisions and initiatives on end users. The CLG and the ISO have worked collaboratively to identify issues of importance to end-use consumers and have provided information at the quarterly CLG meetings that include a range of cost implications for certain regional initiatives.

Because New England's wholesale electricity markets are continually evolving, the CLG also serves as a forum for consumers to provide input and information to the ISO and to each other regarding what is working well and what may need to be changed. Looking to the future, members of the CLGCC recognize that the CLG's full mandate cannot be fulfilled without greater participation from consumers on the issues that concern them, including potential changes to the power system and the wholesale markets that might allow consumers to participate more profitably, purchase less expensively, and operate more efficiently.

For 2017, the CLG has the following goals:

1. To attract more commercial and nonprofit end users to actively participate in the organization
2. To attract greater attendance from each New England state

3. To heighten efforts to provide the ISO with a greater understanding of consumer issues, needs, and concerns relative to the electric power system and its costs by further developing the flow of information and advocacy among consumers and other stakeholders to and from ISO New England
4. To engage the ISO in providing assistance to the CLG to enhance the CLG's presentation of the impacts on consumer costs and energy choice, as well as the New England electric power system, of proposed and newly enacted wholesale market and state policy actions
5. To ensure that CLG meeting topics and presentations address consumer cost impacts and, where possible, provide information on potential mechanisms to mitigate increased costs in an understandable and useful manner

We invite you to take an interest in the Consumer Liaison Group and to play a role in achieving these goals, which can lead to a better electricity industry in New England and an improved price structure for consumers.

Please feel free to contact any one of us for more information.

Sincerely,

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## Section 2

### Purpose and Structure of the Consumer Liaison Group

The Consumer Liaison Group is a forum for sharing information between ISO New England and those who ultimately use and pay for electricity in New England. Through this forum, the ISO develops a better understanding of consumer issues, needs, and concerns relative to the electric power system and its costs. Similarly, consumers and their representatives gain a better understanding of regional electricity issues.

The Consumer Liaison Group is governed by a Coordinating Committee that sets the agenda for four quarterly meetings each year. The Coordinating Committee selects the topics and speakers featured at these meetings. ISO New England facilitates the meetings and communications among CLG participants. Consumer Liaison Group meetings provide a forum to share information on regional electricity issues, but they are not intended to be a substitute for end-user or consumer groups that wish to weigh in on items under discussion at the Planning Advisory Committee (PAC) or the New England Power Pool (NEPOOL) committees.<sup>1</sup>

#### 2.1 Objectives

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The objectives of the CLG are as follows:

- Be generally informed of the operation of the power system and industry issues, which includes having access to ISO subject matter experts
- Be made aware of market changes, in advance of final consideration by the ISO when feasible, which can have an impact on consumers
- Work with the ISO to ensure that it provides timely quantitative and qualitative information on the cost impacts of important initiatives
- Have the ISO assist consumers in identifying the issues that can affect them economically
- Be informed of and participate in the stakeholder process that determines wholesale power market rules and power system needs
- Be informed of the results of any economic analysis conducted and presented to stakeholders in the regional stakeholder process
- Provide the ISO with a greater understanding of the specific issues of interest to consumers

#### 2.2 Participation and Meeting Format

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The Consumer Liaison Group is open to the public. Participants generally include consumers and consumer representatives (including state consumer and ratepayer advocates), state business and industry associations, chambers of commerce, individual businesses, trade groups, nonprofit

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<sup>1</sup> The Planning Advisory Committee (PAC) is an open stakeholder forum that provides input and feedback to ISO New England on the regional system planning process. More information on the Planning Advisory Committee is available at <http://www.iso-ne.com/committees/planning/planning-advisory>. The New England Power Pool (NEPOOL) is a group formed in 1971 by the region's private and municipal utilities to foster cooperation and coordination among the utilities in the six-state region for ensuring a dependable supply of electricity. Today, NEPOOL members are ISO stakeholders and market participants. More information on NEPOOL is available at [www.nepool.com](http://www.nepool.com).

organizations, and other end users. Because the CLG is an open forum, several NEPOOL members and state regulators are also regular, active participants in CLG discussions.

CLG meetings attract a diverse group of approximately 75–100 attendees, both in person and via teleconference. CLG meetings follow the same general format:

- Opening remarks from a keynote speaker—typically, an industry or business executive, policymaker, or regulator—who provides a unique perspective on a particular topic or issue
- A representative from the ISO, who provides an update on regional energy issues and initiatives that have or will be taking place at NEPOOL and ISO stakeholder meetings that may have an impact on electricity prices
- A panel discussion that provides different perspectives on a particular issue, facilitated by a moderator (panelists have included representatives from industry, the ISO, regulators, and consumer groups)

## 2.3 Governance

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The Consumer Liaison Group Coordinating Committee is the governing body that works closely with the ISO to identify issues of importance to the CLG membership, sets the agenda for CLG meetings, and generally guides the work of the CLG.<sup>2</sup>

The CLGCC consists of up to 12 members (six members and six alternates) with no more than four members from any one of the New England states. Specific membership requirements ensure that consumers (residential, commercial and industrial) are represented from a majority of the New England states and that a range of consumer interests is considered when determining CLG priorities. The committee has at least one representative of residential ratepayers and one representative of commercial and industrial ratepayers, and members must be either a ratepayer (or directly represent ratepayers), a member of a consumer organization, or a government consumer or ratepayer advocate.

CLGCC members are selected by vote of the CLG at one of its quarterly meetings in an even-numbered calendar year and serve for a term of two years or until successors are selected. The Coordinating Committee annually designates a chairperson from its membership. Should a vacancy occur on the committee, the chairperson fills the vacancy with the approval of a majority of the remaining members. Current CLGCC members are listed on pages 9-10. The ISO designates a point of contact within its External Affairs Department to work with the CLGCC.

## 2.4 Information and Communications

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ISO New England facilitates the meetings and communications among CLG participants. A dedicated section of the ISO's website has been established for all CLG materials, communications, annual reports, and other valuable information.<sup>3</sup> This practice ensures that the body of information

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<sup>2</sup> Governance of the Consumer Liaison Group is fully explained in the "CLG Purpose and Structure" document available at [http://www.iso-ne.com/static-assets/documents/committees/comm\\_wkgrps/othr/clg/consum\\_liaison\\_grp\\_gov/clg\\_structure\\_document\\_revised\\_12\\_29\\_09.pdf](http://www.iso-ne.com/static-assets/documents/committees/comm_wkgrps/othr/clg/consum_liaison_grp_gov/clg_structure_document_revised_12_29_09.pdf).

<sup>3</sup> ISO New England's Consumer Liaison Group webpage is available at <http://www.iso-ne.com/committees/industry-collaborations/consumer-liaison>.

developed through the CLG is transparent, easily accessible, and available to all interested consumers and industry participants.

A glossary defining electricity market and power system terms is available on the ISO's website to assist CLG members in understanding frequently used electricity market or power system terms and acronyms.<sup>4</sup>

Additionally, in 2012, the ISO launched *ISO to Go*, a free mobile application that provides smartphone access to the most frequently viewed real-time data on the ISO website and data portal ISO Express.<sup>5</sup> Through the "app," users can view current system conditions; the five-minute load graph, which compares forecasted demand and real-time consumer demand; the fuel mix by resource type currently providing electricity; and an array of real-time wholesale price data.

CLG participants are also encouraged to follow the ISO's online newsletter—the ISO Newswire—and subscribe to the mailing list to receive a monthly email highlighting some of the most recent articles.<sup>6</sup> Likewise, ISO New England's Regional Energy Outlook, issued at the beginning of each year, is a valuable source of information on current trends and issues affecting the regional electric power grid.<sup>7</sup>

Finally, ISO New England's External Affairs Department issues a memo each month that provides timely updates on regional energy issues, stakeholder meetings, and other information that may be of interest to consumers.<sup>8</sup>

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<sup>4</sup> ISO New England's glossary of terms is available at <http://www.iso-ne.com/participate/support/glossary-acronyms>.

<sup>5</sup> *ISO to Go* is available at <http://www.iso-ne.com/about/news-media/iso-to-go>. *ISO to Go* is available for free for the iPhone or iPad at the Apple App store or for Android devices at Google Play. ISO Express is available at <http://www.iso-ne.com/isoexpress/>.

<sup>6</sup> The ISO Newswire is available at <http://isonewswire.com/>. To subscribe, send a blank email to [isolist-isonewswire-subscribe@mail.iso-ne.com](mailto:isolist-isonewswire-subscribe@mail.iso-ne.com).

<sup>7</sup> The 2017 Regional Electricity Outlook is available at [https://www.iso-ne.com/static-assets/documents/2017/02/2017\\_reo.pdf](https://www.iso-ne.com/static-assets/documents/2017/02/2017_reo.pdf).

<sup>8</sup> The ISO's monthly memos are posted at <http://www.iso-ne.com/committees/industry-collaborations/consumer-liaison>.

## Section 3

### Consumer Liaison Group Meeting Summaries for 2016

In 2016, the Consumer Liaison Group held quarterly meetings on issues of importance to electricity consumers in New England. The topics, special guest speakers, moderators, and panelists featured at these meetings were selected by the CLG Coordinating Committee.

The topics chosen for discussion in 2016 were as timely as they were diverse, including issues relating to distributed energy resources (DERs), advanced technology and cybersecurity, energy infrastructure, and the New England states' clean energy initiatives.<sup>9</sup> A major area of focus was the growth of renewable resources and their impact on both the electric power grid and consumers. At the first quarterly meeting, attendees heard from energy industry and ISO representatives on the large growth in solar photovoltaic (PV) resources in Connecticut and New England. In June, the CLG explored electricity security for consumers and how advancements in technology are changing the way utilities detect and protect against cybersecurity threats. Later in the year, the CLG discussed energy infrastructure projects progressing in Rhode Island, notably the nation's first offshore windfarm, and the impact of the New England states' clean energy initiatives on regional power markets and customer bills.

The four CLG meetings held in 2016 featured the following topics:

- **March 10:** Solar Development in New England—Consumer Protection, Costs and Benefits, and What it Means for the Wholesale Market
  - Meeting location: Cromwell, Connecticut
- **June 17:** Electricity Security for Consumers—How Rapidly Changing Technology Deployment Is Altering the Way Consumers Use Electricity and What They Need to Plan for in Terms of Security and Resiliency
  - Meeting location: Westborough, Massachusetts
- **September 15:** Energy Infrastructure Projects Progressing in Rhode Island—Challenges and Consumer Impacts Regionwide
  - Meeting location: Providence, Rhode Island
- **December 1:** New England States' Clean Energy Initiatives—How Will Mandated Wind and Hydro Procurements Impact Customer Bills and the Regional Power Markets?
  - Meeting location: Boston, Massachusetts

Each meeting allowed time for attendee questions and answers.

The following summaries capture the general discussions that took place at CLG meetings in 2016. They are not intended to capture every discussion and do not necessarily reflect the views of the ISO or the CLG Coordinating Committee.

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<sup>9</sup> Distributed energy resources are on-site, "behind-the-meter" sources of electric energy.

### **3.1 March 10: Solar Development in New England—Consumer Protection, Costs and Benefits, and What it Means for the Wholesale Market?**

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Meeting objective: Discuss the development of solar PV resources in New England and the impact these resources have on consumers and the wholesale electricity market

#### **3.1.1 Special Guest Speaker: Elin Katz, Consumer Counsel, Connecticut Office of Consumer Counsel**

Elin Katz focused her remarks on the growth of solar in Connecticut and the impact of solar policy on other aspects of the electric power industry. With more than 10,000 solar installations across the state, Katz applauded the success of solar programs and policies in Connecticut. She encouraged the state, however, to take a detailed look at the incentives driving solar development with an eye toward reducing costs now that the solar industry has matured. She laid out six principles to consider moving forward:

- Support robust solar development with reasonable and declining incentives
- Do not undermine investments made in response to state policies by making major changes
- Ensure equitable sharing of the benefits and burdens of solar policy
- Ensure rooftop solar is being fairly marketed with regard to costs and potential benefits
- Ensure solar is accounted for in regional planning
- Maintain a balance to avoid premature retirements of fossil and nuclear capacity

Katz noted that the Office of Consumer Counsel is monitoring developments in other states and engaging with stakeholders to strike the proper balance with solar incentives. Solar policy, she said, impacts virtually every aspect of the electric power industry, including costs, emissions, jobs, economic development, and consumer choice.<sup>10</sup>

#### **3.1.2 Panel Discussion**

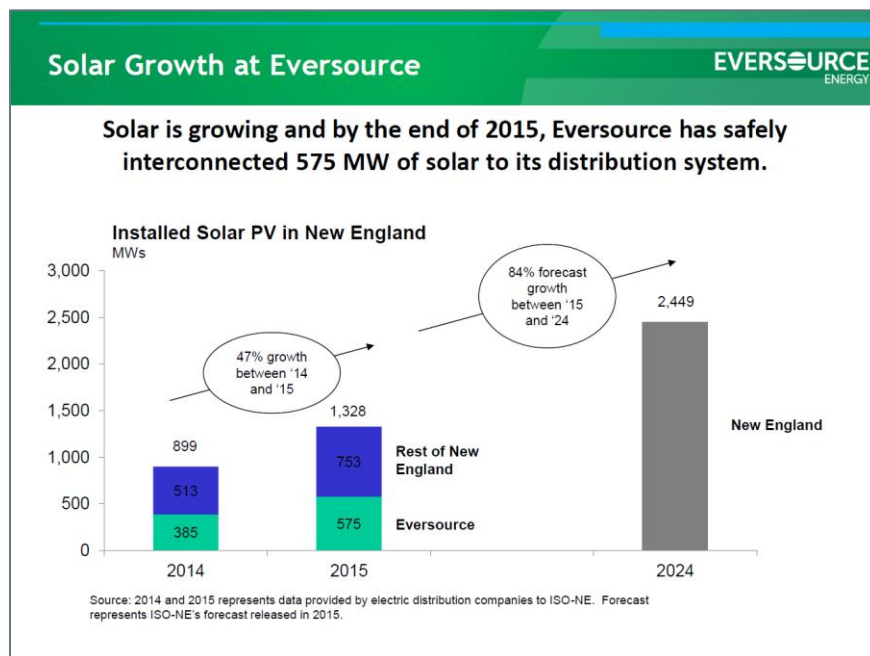
Joseph Rosenthal, principal attorney for the Connecticut Office of Consumer Counsel, moderated a panel of energy industry and ISO representatives, including Camilo Serna, vice president of Strategic Planning and Policy for Eversource Energy; Dan Hendrick, director of External Affairs for NRG Energy; Mackey Dykes, vice president of Commercial and Industrial Programs for the Connecticut Green Bank; Carissa Sedlacek, director of Resource Adequacy, System Planning, for ISO New England; and Paul Peterson, principal associate for Synapse Energy Economics, Inc.

Camilo Serna focused his remarks on the work Eversource is doing to integrate distributed energy resources, particularly solar PV resources. He said that Eversource processed a record number of solar interconnection applications in 2015 (88% more than the prior year) and that Eversource believes dynamic DER integration is a fundamental component of the modern electricity distribution system. Serna also highlighted Eversource's participation in the Connecticut Department of Energy and Environmental Protection's solicitation for demonstration projects (pilot

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<sup>10</sup> Elin Katz, "Solar Development in New England," CLG presentation (March 10, 2016), [https://www.iso-ne.com/static-assets/documents/2016/03/clg\\_meeting\\_katz\\_keynote\\_march\\_10\\_2016.pdf](https://www.iso-ne.com/static-assets/documents/2016/03/clg_meeting_katz_keynote_march_10_2016.pdf).

projects) for grid-side system enhancements to integrate greater levels of DERs.<sup>11</sup> Figure 1 shows the growth of solar energy in New England and on Eversource's distribution system.



**Figure 1: Solar PV resources installed in New England and on Eversource's distribution system.**

Dan Hendrick reviewed the different net-metering programs in New England and highlighted some of the changes the states are considering. For instance, the Maine legislature considered a bill that would replace net metering with a market-based program through which new customers would receive a 20-year contract at a set price for net exports from solar PV systems. He encouraged the states to move beyond the caps associated with net metering and establish a sustainable growth framework for solar.<sup>12</sup>

Mackey Dykes reviewed the programs in place in Connecticut promoting solar PV development, including the Solar Home Renewable Energy Credit (SHREC) program, the Zero Emission Renewable Energy Credit (ZREC) program, net metering, and the state's shared clean energy pilot program. He also discussed efforts by the Connecticut Green Bank to inform and protect consumers about the economics of solar.<sup>13</sup>

Carissa Sedlacek discussed the growth of solar in New England and the ISO's efforts to forecast long-term incremental solar PV growth in the region. Sedlacek noted that, through the end of 2015, the region had installed more than 1,300 MW of solar PV, with the large majority installed in

<sup>11</sup> Camilo Serna, "Solar Development in New England—Eversource's Perspective," CLG presentation (March 10, 2016), [https://www.iso-ne.com/static-assets/documents/2016/03/clg\\_meeting\\_serna\\_panel\\_presentation\\_march\\_10\\_2016.pdf](https://www.iso-ne.com/static-assets/documents/2016/03/clg_meeting_serna_panel_presentation_march_10_2016.pdf).

<sup>12</sup> Dan Hendrick, "New England's Changing Net-Metering Landscape," CLG presentation (March 10, 2016), [https://www.iso-ne.com/static-assets/documents/2016/03/clg\\_meeting\\_hendrick\\_panel\\_presentation\\_march\\_10\\_2016.pdf](https://www.iso-ne.com/static-assets/documents/2016/03/clg_meeting_hendrick_panel_presentation_march_10_2016.pdf).

<sup>13</sup> Mackey Dykes, "Connecticut Green Bank: Sparking a Movement to Accelerate the Growth of Green Energy," CLG presentation (March 10, 2016), [https://www.iso-ne.com/static-assets/documents/2016/03/clg\\_meeting\\_mackey\\_panel\\_presentation\\_march\\_10\\_2016.pdf](https://www.iso-ne.com/static-assets/documents/2016/03/clg_meeting_mackey_panel_presentation_march_10_2016.pdf).



Massachusetts. Sedlacek also explained how the ISO incorporated behind-the-meter solar into the Installed Capacity Requirement (ICR) calculation for the tenth Forward Capacity Auction (FCA #10), resulting in a 390 MW reduction in the ICR.<sup>14</sup> Table 1 shows the statewide installed solar PV capacity as of the end of 2015.

**Table 1**  
**Aggregated Statewide Installed Nameplate Solar PV Data**  
**as of December 31, 2015**

State	Nameplate Capacity (MW <sub>ac</sub> ) <sup>(a)</sup>
Connecticut	188.01
Maine	15.34
Massachusetts	947.11 <sup>(b)</sup>
New Hampshire	26.36
Rhode Island	23.59
Vermont	124.57 <sup>(b)</sup>
<b>Total</b>	<b>1,325.00</b>

(a) Source: ISO New England, “December 2015 Distributed Generation Survey Results,” presentation (February 24, 2016), [http://www.iso-ne.com/static-assets/documents/2016/02/pvsurveyresults\\_20160224.pdf](http://www.iso-ne.com/static-assets/documents/2016/02/pvsurveyresults_20160224.pdf).

(b) Massachusetts and Vermont values are based on Massachusetts’ Solar Renewable Energy Credit (SREC) data associated with 43 Massachusetts municipalities and Vermont’s Sustainably Priced Energy for Economic Development (SPEED) data for three Vermont municipalities that did not provide individual responses.

Paul Peterson discussed the impacts of solar PV on the region’s load profile with varying levels of solar penetration. He noted that annual growth rates in peak demand have been declining over the years, which he said means system planners have substantially more time to plan for and build transmission solutions. He also warned that overestimating peak load growth can put consumers at risk of paying for transmission upgrades that may never be needed.<sup>15</sup>

### 3.1.3 ISO Update

Anne George, vice president of External Affairs and Corporate Communications for ISO New England, provided an update on the results of FCA #10, the US Supreme Court’s January 2016 ruling on the participation of demand response in the wholesale electricity markets, and wholesale electricity costs for 2015.

FCA #10, held on February 8, 2016, procured the capacity resources needed to meet electricity demand in New England for the 2019/2020 capacity commitment period. As George explained, FCA #10 concluded with sufficient resources to meet electricity demand in 2019/2020, at a lower price

<sup>14</sup> A Forward Capacity Auction (FCA) is an annual “descending-clock” auction of the Forward Capacity Market during which the price for capacity decreases until the quantity of capacity remaining in the auction equals the quantity of capacity needed.

Carissa Sedlacek, “The Growth of Solar in New England and its Impact on the Wholesale Market,” CLG presentation (March 10, 2016), [https://www.iso-ne.com/static-assets/documents/2016/03/clg\\_meeting\\_sedlacek\\_panel\\_presentation\\_march\\_10\\_2016.pdf](https://www.iso-ne.com/static-assets/documents/2016/03/clg_meeting_sedlacek_panel_presentation_march_10_2016.pdf).

<sup>15</sup> Paul Peterson, “Solar Development in New England,” CLG presentation (March 10, 2016), [https://www.iso-ne.com/static-assets/documents/2016/03/clg\\_meeting\\_peterson\\_panel\\_presentation\\_march\\_10\\_2016.pdf](https://www.iso-ne.com/static-assets/documents/2016/03/clg_meeting_peterson_panel_presentation_march_10_2016.pdf).



than the previous auction, and with more than 1,400 MW of new generating capacity to help replace recently retired generators and generators that have announced retirement.

Regarding the US Supreme Court's January 25, 2016, ruling on demand response, George summarized the court's finding that FERC was acting within its authority under the *Federal Power Act* when it issued Order No. 745. The order requires that demand-response resources participating in organized wholesale energy markets be compensated for the service they provide at the market price for energy (referred to as the locational marginal price). George explained that, with the court's decision, the ISO can move forward with plans for the full integration of demand-response resources into the region's wholesale electricity markets.

Finally, George reviewed preliminary wholesale electricity costs for 2015, which were lower than wholesale electricity costs for 2014 and 2013 due to fewer price spikes in the winter and record low energy prices in the spring and summer of 2015.<sup>16</sup>

Section 5, ISO New England Activities and Initiatives, includes more information on these developments.

### **3.2 June 17: Electricity Security for Consumers—How Rapidly Changing Technology Deployment Is Altering the Way Consumers Use Electricity and What They Need to Plan for in Terms of Security and Resiliency**

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Meeting objective: Discuss electricity security for consumers and how advancements in technology are changing the way utilities detect and protect against cybersecurity threats

#### **3.2.1 Special Guest Speaker: Congressman James McGovern, 2<sup>nd</sup> Massachusetts District, US House of Representatives**

Congressman McGovern focused his remarks on the issue of climate change and what the nation must do to combat it. He supported the consideration of all options and resource types for meeting New England's energy needs but warned against expanding the region's natural gas pipeline system. Investing billions of dollars on natural gas infrastructure, he said, would lock the region into an energy source it may not prefer in 20 years. McGovern went on to say that New England, and the resources it selects to meet its energy needs, should serve as a model for the rest of the country.

#### **3.2.2 Panel Discussion**

Bob Espindola, energy systems program manager for Acushnet Company, moderated a panel of energy industry representatives to discuss the challenges associated with deploying advanced technologies while securing infrastructure and protecting consumers. The panel included Christine Hallquist, chief executive officer of Vermont Electric Cooperative; Anjan Bagchee, director of Information Technology for EnerNOC; and Mukund Ravipaty, director of Enterprise Security Architecture for National Grid.

Christine Hallquist discussed the deployment of smart-grid technologies on the Vermont Electric Cooperative (VEC) system. VEC installed two-way meters in 2005 and introduced software in 2009 to give consumers the ability to monitor their own electricity usage. Hallquist said that, from the

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<sup>16</sup> Anne George, "ISO New England Update," CLG presentation (March 10, 2016), [https://www.iso-ne.com/static-assets/documents/2016/03/clg\\_meeting\\_george\\_iso\\_update\\_presentation\\_march\\_10\\_2016.pdf](https://www.iso-ne.com/static-assets/documents/2016/03/clg_meeting_george_iso_update_presentation_march_10_2016.pdf).

beginning, cybersecurity was identified as a key component of effectively deploying these technologies. Hallquist also expressed her view that robust cybersecurity is a means of growing distributed renewable energy resources on the VEC system.

Anjan Bagchee discussed the scale and magnitude of the challenges associated with cybersecurity when considering the number of smart devices being used today. He said that one of the pillars of security is protecting end points. Bagchee also discussed the lack of baselines or minimum standards that must be met and the lack of regulatory oversight of cybersecurity for consumer devices.

Mukund Ravipaty discussed the importance of utilities evolving as technologies change, while also securing infrastructure and protecting consumers. Ravipaty noted that utilities have a responsibility to ensure that consumers have secure and reliable electricity service, but consumers are responsible for doing their due diligence when making use of advanced technologies.

### **3.2.3 ISO Update**

Anne George, vice president of External Affairs and Corporate Communications for ISO New England, provided information on the ISO's work to protect against cybersecurity threats. George explained that the ISO is already subject to mandatory North American Electric Reliability Corporation (NERC) Critical Infrastructure Protection (CIP) standards that address both physical and cyber security. The ISO also participates in bi-annual grid security exercises organized by NERC to test the readiness of the electricity subsector to respond to physical and cybersecurity threats. In addition, at the end of 2015, the ISO launched a 24/7 Security Operations Center to provide round-the-clock cybersecurity monitoring of the ISO New England network.

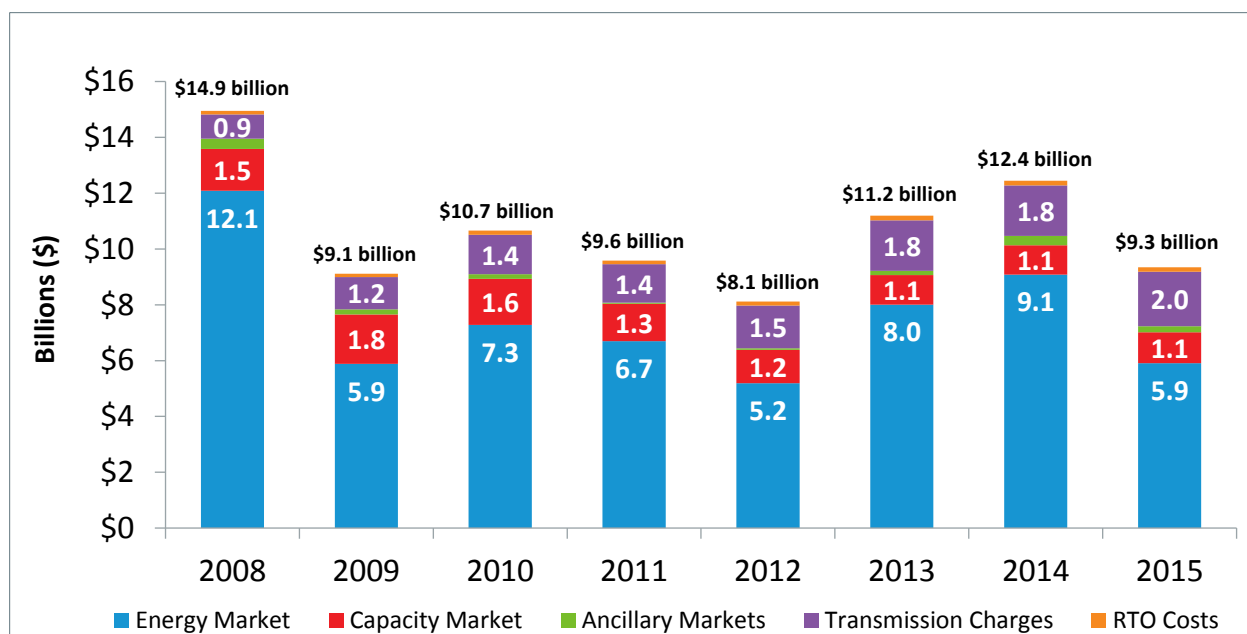
Following her remarks on cybersecurity, George discussed the *2015 Annual Markets Report* (AMR) released by the ISO's Internal Market Monitoring Department on May 25, 2016.<sup>17</sup> The AMR assesses the state of competition in the wholesale electricity markets administered by ISO New England during the most recent operating year. According to the internal market monitor, the region's energy, capacity, and ancillary services markets performed well in 2015, with prices that reflected the cost of fuel in New England.

As shown in Figure 2, the total wholesale cost of electricity in 2015 was \$9.3 billion, down from \$12.4 billion in 2014, reflecting a 25% decrease.<sup>18</sup>

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<sup>17</sup> ISO New England Internal Market Monitor, *2015 Annual Markets Report* (May 25, 2016), [http://www.iso-ne.com/static-assets/documents/2016/05/2015\\_imm\\_amr\\_final\\_5\\_25\\_2016.pdf](http://www.iso-ne.com/static-assets/documents/2016/05/2015_imm_amr_final_5_25_2016.pdf).

<sup>18</sup> Section 7, New England Wholesale Electricity Costs, includes preliminary wholesale electricity costs for 2016.



**Figure 2: Total wholesale cost of electricity in New England from 2008 to 2015.**

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% from 2014 to 2015, 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% from year to 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.

The cost of capacity rose by 5% in 2015, 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). In FCA #8, capacity market prices increased, reflecting the need for additional capacity resources due to significant retirements.

Finally, the cost of ancillary services fell by 39%, to about \$144 million, as a consequence of lower fuel costs in 2015. 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 also compensated for providing regulation services to balance supply and demand and maintain system frequency.<sup>19</sup>

Section 5, ISO New England Activities and Initiatives, includes more information on these developments.

<sup>19</sup> Anne George, "ISO New England Update," CLG presentation (June 17, 2016), [http://www.iso-ne.com/static-assets/documents/2016/06/clg\\_meeting\\_george\\_iso\\_update\\_presentation\\_june\\_17\\_2016.pdf](http://www.iso-ne.com/static-assets/documents/2016/06/clg_meeting_george_iso_update_presentation_june_17_2016.pdf).

### **3.3 September 15: Energy Infrastructure Projects Progressing in Rhode Island—Challenges and Consumer Impacts Regionwide**

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Meeting objective: Discuss the challenges and consumer impacts of energy infrastructure projects progressing in Rhode Island and the larger New England region

#### **3.3.1 Special Guest Speaker: Seth Magaziner, General Treasurer, State of Rhode Island**

General Treasurer Seth Magaziner focused his remarks on the Rhode Island Infrastructure Bank (RIIB), a centralized hub for energy efficiency and renewable energy financing initiatives in the state. He spoke of three different programs RIIB administers: the Efficient Buildings Fund, the Commercial Property Assessed Clean Energy (PACE) Program, and the Residential PACE Program. The Efficient Buildings Fund is a program that helps municipalities finance energy-efficiency projects for public buildings. The Commercial and Residential PACE programs are financing mechanisms that fund the up-front cost of energy-efficiency and renewable energy projects on commercial and residential properties, which property owners pay back over time. Magaziner expressed his desire to continue to nurture and build on these programs in the future.

#### **3.3.2 Panel Discussion**

Douglas Gablinske, executive director of The Energy Council of Rhode Island (TEC-RI), moderated a panel of energy industry representatives, including Jeffrey Grybowski, chief executive officer of Deepwater Wind; John Niland, director of Development for Invenergy; Richard Kruse, vice president of Regulatory and FERC chief compliance officer for Spectra Energy; and Bill Malee, vice president of Regulatory Affairs for National Grid.

Jeffrey Grybowski updated attendees on the status of the Block Island Wind Farm project, the nation's first offshore wind farm located three miles off the coast of Block Island. The wind farm consists of five, 6 MW turbines with a total nameplate capacity of 30 MW. The project includes the installation of an underwater transmission cable connecting Block Island to the mainland for the first time. Turbine installation for the project was completed in August 2016, after which Deepwater Wind worked with General Electric to test and commission the project. The scheduled in-service date for the project was November 2016. The project officially went live, delivering power to the regional electric grid, on December 12, 2016.<sup>20</sup> Figure 3 shows the five Block Island Wind Farm turbines.

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<sup>20</sup> Jeffrey Grybowski, "Deepwater Wind," CLG presentation (September 15, 2016), [https://www.iso-ne.com/static-assets/documents/2016/09/clg\\_meeting\\_grybowski\\_panelist\\_presentation\\_september\\_15\\_2016\\_final.pdf](https://www.iso-ne.com/static-assets/documents/2016/09/clg_meeting_grybowski_panelist_presentation_september_15_2016_final.pdf).



**Figure 3: Block Island Wind Farm project off the coast of Block Island, Rhode Island.**

John Niland discussed Invenergy's \$700 million proposal to build the Clear River Energy Center, a dual-fuel, natural-gas-fired power plant in Burrillville, Rhode Island. The project consists of two combined-cycle units with a total output of 1,000 MW. The commercial operation date is planned for June 1, 2019, for the first unit and June 1, 2020, for the second unit.<sup>21</sup>

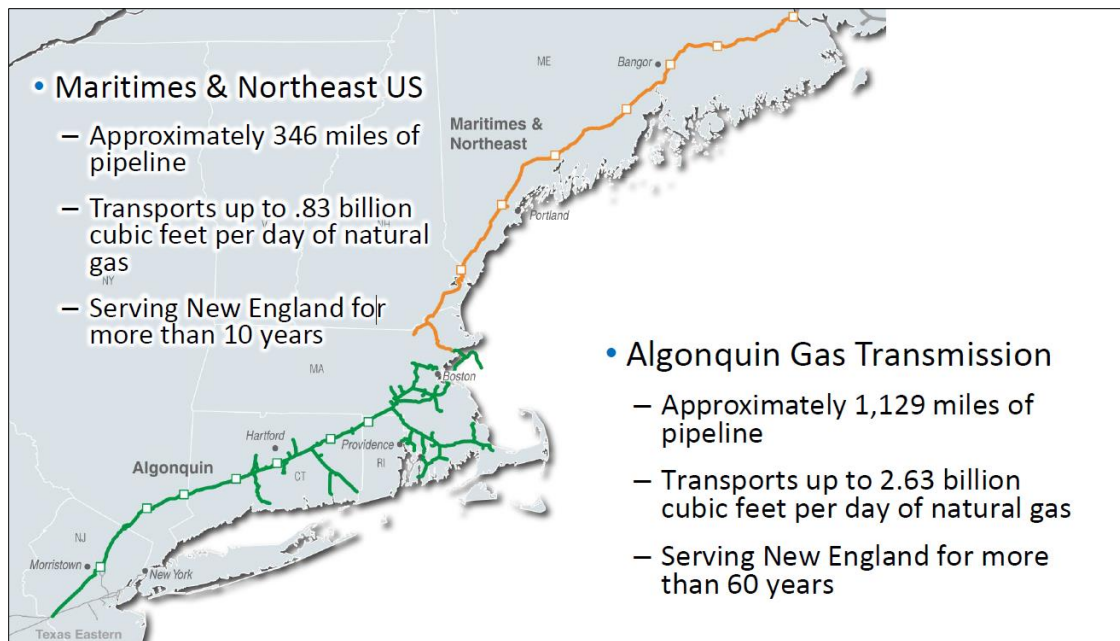
Richard Kruse discussed Spectra Energy's gas pipeline facilities in New England, including the Algonquin Gas Transmission (AGT) pipeline system and the Maritimes and Northeast (M&N) pipeline system (see Figure 4). The AGT pipeline system consists of approximately 1,129 miles of pipe, transporting up to 2.63 billion cubic feet of natural gas per day. The M&N pipeline system consists of approximately 346 miles of pipe, transporting up to 0.83 billion cubic feet of natural gas per day. Kruse explained that the AGT and M&N pipeline systems connect to roughly 60% of New England's gas-fired generators.<sup>22</sup>

Attendees discussed the proposed expansion of New England's interstate pipeline system, with some expressing concern over greenhouse gas emissions from natural-gas-fired generators and the transport of fracked natural gas into the region.

<sup>21</sup> John Niland, "Invenergy Clear River Energy Center," CLG presentation (September 15, 2016), [https://www.iso-ne.com/static-assets/documents/2016/09/clg\\_meeting\\_niland\\_panelist\\_presentation\\_september\\_15\\_2016.pdf](https://www.iso-ne.com/static-assets/documents/2016/09/clg_meeting_niland_panelist_presentation_september_15_2016.pdf).

<sup>22</sup> Richard Kruse, "Energy Infrastructure Projects Progressing in Rhode Island: Challenges and Consumer Impacts Regionwide," CLG presentation (September 15, 2016), [https://www.iso-ne.com/static-assets/documents/2016/09/clg\\_meeting\\_kruse\\_panelist\\_presentation\\_september\\_15\\_2016\\_final.pdf](https://www.iso-ne.com/static-assets/documents/2016/09/clg_meeting_kruse_panelist_presentation_september_15_2016_final.pdf).





**Figure 4: Spectra Energy’s natural gas pipeline facilities in New England.**

Finally, Bill Malee discussed transmission owner investments in the region’s electric transmission infrastructure. These investments, he noted, have led to reduced congestion on the system, benefitting customers regionwide. Malee also discussed National Grid’s Connect 21 Strategy—an initiative to create a more customer-centric, resilient, responsive, efficient, and environmentally sound energy network to meet the needs of the 21st century.<sup>23</sup>

### 3.3.3 ISO Update

Mary Louise Nuara, an external affairs representative for ISO New England, gave the ISO update, providing information on NEPOOL’s Integrating Markets and Public Policy (IMAPP) Initiative, Forward Capacity Auction #11 (FCA #11), and wholesale electricity costs.

The IMAPP Initiative, Nuara explained, is a formal, NEPOOL-led stakeholder process to identify potential changes to the region’s wholesale electricity markets for accommodating the public policy goals of the New England states. The states’ environmental and renewable energy goals go beyond the objectives of the region’s wholesale electricity markets, Nuara explained. These markets are designed to maintain reliability through the selection of the most economical set of resources, not necessarily the least carbon-intensive resources. She explained that NEPOOL has held several stakeholder meetings to discuss potential changes to the region’s wholesale electricity markets and that, at this stage, the ISO’s role has been to monitor the discussion. She noted that the ISO plans to weigh in on these various proposals later in 2016.<sup>24</sup>

<sup>23</sup> Bill Malee, “National Grid Infrastructure Projects,” CLG presentation (September 15, 2016), [https://www.iso-ne.com/static-assets/documents/2016/09/clg\\_meeting\\_malee\\_panelist\\_presentation\\_september\\_15\\_2016.pdf](https://www.iso-ne.com/static-assets/documents/2016/09/clg_meeting_malee_panelist_presentation_september_15_2016.pdf).

<sup>24</sup> ISO New England, “ISO Comments on IMAPP: Perspectives and Observations on Stakeholders’ IMAPP Proposals,” ISO presentation (January 25, 2017), [http://www.nepool.com/uploads/IMAPP\\_20170125\\_ISO-NE\\_Comments.pdf](http://www.nepool.com/uploads/IMAPP_20170125_ISO-NE_Comments.pdf).

ISO New England, “NEPOOL 2016 IMAPP Proposals: Observations, Issues, and Next Steps,” ISO discussion paper (January 2017), [http://www.nepool.com/uploads/IMAPP\\_20170125\\_ISO-NE\\_Discussion\\_Paper\\_Rev.pdf](http://www.nepool.com/uploads/IMAPP_20170125_ISO-NE_Discussion_Paper_Rev.pdf).

Nuara also provided an update on developments associated with FCA #11, which, at the time of the meeting, was planned for February 2017.<sup>25</sup> The auction procured the capacity resources needed to meet demand for electricity during the 2020/2021 capacity commitment period. Nuara explained that three capacity zones would be modeled in the auction:

- Northern New England Capacity Zone, including Vermont, New Hampshire, and Maine
- Southeastern New England Capacity Zone, including Northeast Massachusetts (NEMA)/Boston and Southeast Massachusetts (SEMA)/RI
- Rest-of-Pool Capacity Zone, including Western Central Massachusetts (WCMA) and Connecticut

The Northern New England Capacity Zone would be modeled as an export-constrained zone, and the Southeastern New England Capacity Zone would be modeled as an import-constrained zone.

Nuara concluded her update with information on future Forward Capacity Market (FCM) costs and future transmission costs. To estimate future FCM costs, the ISO used the results of recent Forward Capacity Auctions. To estimate future transmission costs, the ISO used the forecasted Regional Network Service (RNS) rates presented by the region's transmission owners at the NEPOOL Reliability Committee and Transmission Committee 2016 Summer Meeting.<sup>26</sup> The region's transmission owners develop the RNS rates, which are charged to transmission customers to recover the costs associated with owning, maintaining, and upgrading transmission facilities in the region.

The ISO has no role in setting or approving RNS rates, Nuara explained. They are filed by the region's transmission owners with FERC for review and approval. The ISO's only role is to provide the settlement function and act as a clearinghouse, collecting the amounts due from transmission customers and turning them over to transmission owners according to the terms of the *Open Access Transmission Tariff*.<sup>27</sup>

Section 5, ISO New England Activities and Initiatives, includes more information on these developments.

### **3.4 December 1: New England States' Clean Energy Initiatives—How Will Mandated Wind and Hydro Procurements Impact Customer Bills and the Regional Power Markets?**

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Meeting objective: Discuss the impacts of the New England states' clean energy initiatives on the region's wholesale electricity markets and retail customers' bills

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<sup>25</sup> FCA #11 was held on February 6, 2017. Section 5, ISO New England Activities and Initiatives, contains the results of the auction.

<sup>26</sup> Participating Transmission Owners Administrative Committee Rates Working Group, "RNS Rates: 2016–2020 PTF Forecast," (August 9, 2016), [https://www.iso-ne.com/static-assets/documents/2016/08/2016\\_08\\_09\\_10\\_tc\\_a02\\_5\\_yr.pptx](https://www.iso-ne.com/static-assets/documents/2016/08/2016_08_09_10_tc_a02_5_yr.pptx).

<sup>27</sup> Mary Louise Nuara, "ISO New England Update," CLG presentation (September 15, 2016), [https://www.iso-ne.com/static-assets/documents/2016/09/clg\\_meeting\\_nuara\\_iso\\_update\\_presentation\\_september\\_15\\_2016\\_final.pdf](https://www.iso-ne.com/static-assets/documents/2016/09/clg_meeting_nuara_iso_update_presentation_september_15_2016_final.pdf).

### 3.4.1 Special Guest Speaker: Cheryl LaFleur, Commissioner, Federal Energy Regulatory Commission

Commissioner Cheryl LaFleur discussed the work of the Federal Energy Regulatory Commission, commenting on some of the challenges she sees on the horizon. She stated that most of the commission's work is driven by the changing energy landscape, highlighting the recent natural gas revolution and the growth in demand-side resources. She noted that a major challenge for the commission will be the potential integration of environmental policy objectives into the nation's wholesale electricity markets. She reaffirmed her belief in competitive markets, stating that they have worked well for consumers. LaFleur acknowledged the work of New England stakeholders to develop potential wholesale market changes to accommodate the New England states' public policy objectives (via NEPOOL's IMAPP initiative). She suggested that carbon pricing may be the most efficient way to achieve the states' goals, noting a general consensus among economists, but stated that it may not be the most likely path forward and recognized that other proposals are also being considered. She recommended strongly that the region continue with the IMAPP process, stating that consumers stand to benefit from harnessing the powers of competitive markets in achieving the states' clean energy goals.

Commissioner LaFleur responded to questions from residents of Sudbury, Massachusetts and West Roxbury, Massachusetts who expressed concerns over the Sudbury-to-Hudson transmission line project, which the Greater Boston Reliability Study identified as the preferred solution to the transmission needs in the area, and the pipeline expansion project in West Roxbury, a component of Spectra Energy's Algonquin Incremental Market (AIM) project approved by FERC.<sup>28</sup>

### 3.4.2 Panel Discussion

Mary Smith, associate director of Energy Supply and Utility Administration at Harvard University, moderated a panel of energy industry representatives, including Jim Bride, president of Energy Tariff Experts; Ron Gerwatowski, advisor on Energy Policy and Utility Regulation; and Greg Cunningham, vice president and director of the Clean Energy and Climate Change Program for the Conservation Law Foundation. Panelists discussed the New England states' clean energy initiatives and their impacts on both consumers and the wholesale power markets.

Jim Bride discussed current trends in the costs of renewable energy mandates in the New England states and reviewed some of the policy-driven charges on retail electricity bills. He explained that charges for renewable energy have risen significantly in recent years and stated that while decarbonization of the electric power grid is an important societal priority, the integration of public policy goals into the markets is critical to minimizing unintended consequences (e.g., distorting price signals and compromising revenue adequacy for existing units).

Bride reviewed the requirements of the New England states' Renewable Portfolio Standards (RPS) (see Table 2) and illustrated how these requirements translate into charges on retail electricity bills. He explained that retail customers pay for RPS compliance through the supply side of their bill and that customers cannot avoid this charge regardless of whether they choose default service or service through a competitive supplier. He also explained that charges associated with net metering, energy-efficiency programs, and long-term contracting for renewables appear on the distribution side of the bill. He cautioned that consumers may grow less tolerant of these charges

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<sup>28</sup> More information on the Greater Boston Reliability Study can be found at <https://www.iso-ne.com/system-planning/key-study-areas/greater-boston>.



should natural gas prices increase, leading to increases in wholesale electricity prices and, ultimately, retail electricity prices.<sup>29</sup>

**Table 2**  
**New England RPS Mandates for Compliance Year 2016**

# 2016 New England RPS Mandates

Summary of New England Renewable Portfolio Standards that Use RECs							
MA	Class I (Adj for Solar)	SREC I	SREC II	Class II (Pre '98, Small Hydro)	Waste to Energy	Alternative Energy Standard	
	8.458%	1.757%	0.785%	2.532%	3.500%	4.000%	21.0%
CT	Class I	Class II (WTE/Biomass)	Class III (CHP/EE)				
	14%	3%	4.00%				21.0%
RI	New	Existing					
	8%	2%					10.0%
NH	Class I	Class II (Solar)	Class III (Biomass)	Class IV (Small Hydro)			
	6.90%	0.30%	0.50%	1.50%			9.2%
ME	Class I	Class II (Existing)					
	9%	30%					39.0%

- “Class 1” renewable eligibility requirements are largely similar across states
- Purpose is to spur development of new resources or help maintain existing resources (e.g., small hydro, pre-2000s facilities)

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consultant Cost, Profit, Better Decisions

Ron Gerwatowski discussed the New England Renewable Energy Credit (REC) market and whether it is effective in reducing greenhouse gas (GHG) emissions. Gerwatowski explained that RECs are purchased to show compliance with steadily increasing RPS requirements. An RPS, he noted, is a state requirement imposed on sellers of electricity to purchase a certain annual amount of renewable energy within their supply portfolio. A seller is credited with having purchased renewable energy measured by the number of RECs it buys in a given year.

Gerwatowski stated that a major policy assumption behind increasing state RPS requirements is that purchasing RECs leads to reductions in GHG emissions. He challenged this policy assumption, suggesting that an increase in state RPS requirements may result in a reshuffling of RECs for existing renewable energy already on the grid. To address this concern, Gerwatowski called for a study to assess the link between RPS increases and incremental emissions reductions.<sup>30</sup>

Greg Cunningham discussed the IMAPP initiative and the work New England stakeholders have done to develop potential wholesale market changes to accommodate the New England states’ public policy objectives (e.g., state RPS requirements, renewable procurement requirements, and GHG reduction targets). Cunningham outlined two different IMAPP proposals: (1) a price on carbon in the energy market, and (2) a forward capacity market for clean energy. A price on carbon in the energy market, Cunningham suggested, would serve as an efficient, resource-neutral market

<sup>29</sup> Jim Bride, “New England CLG,” CLG presentation (December 1, 2016), [https://www.iso-ne.com/static-assets/documents/2016/11/2016\\_12\\_01\\_clg\\_meeting\\_jim\\_bride\\_panelist\\_presentation.pdf](https://www.iso-ne.com/static-assets/documents/2016/11/2016_12_01_clg_meeting_jim_bride_panelist_presentation.pdf).

<sup>30</sup> Ron Gerwatowski, “How Effective is the New England REC Market as a Means to Reduce GHG Emissions?” CLG presentation (December 1, 2016), [https://www.iso-ne.com/static-assets/documents/2016/11/2016\\_12\\_01\\_clg\\_meeting\\_ron\\_gerwatowski\\_panelist\\_presentation.pdf](https://www.iso-ne.com/static-assets/documents/2016/11/2016_12_01_clg_meeting_ron_gerwatowski_panelist_presentation.pdf).

mechanism to reward low- and zero-carbon-emitting resources. Alternatively, a forward capacity market for clean energy, he explained, would support clean energy resources by creating zero-emission credits for the production of carbon-free megawatt-hours of electricity. Cunningham argued that both proposals would maintain the region's robust wholesale electricity market structure and drive technology innovations.<sup>31</sup>

### 3.4.3 ISO Update

Anne George, vice president of External Affairs and Corporate Communications for ISO New England, delivered the ISO update, providing information on the 2016/2017 winter season, FCA #11, the implementation of FERC Order No. 1000, and projected wholesale market costs for 2016.

George informed attendees that the ISO expects sufficient electricity supplies to meet consumer demand during the 2016/2017 winter season, barring any unexpected resource outages or fuel-delivery constraints. She stated the ISO's view that natural gas pipeline constraints have been and continue to be a major reliability concern but that increased pipeline capacity resulting from Spectra Energy's AIM project would provide temporary relief during the winter. George explained that the ISO is administering its fourth Winter Reliability Program to address fuel-delivery constraints into the region by providing compensation for some of the costs associated with unused oil inventories and unused LNG contract volumes at the end of the winter, as well as supplemental demand response.

George also provided an update on the resources qualified to participate in FCA #11. The ISO qualified 34,505 MW of existing capacity resources and 5,958 MW of new capacity resources to compete in the auction to meet the capacity target of 34,075 MW for the 2020/2021 capacity commitment period.<sup>32</sup>

George also gave attendees an update on how ISO New England is continuing to implement and comply with FERC Order No. 1000. As George explained, Order No. 1000 is a federal order that institutes competition and the consideration of public policy objectives in transmission planning. George informed attendees that the transmission planning process has been revised to comply with this order and that, starting in 2017, the ISO will work with the New England states and stakeholders to begin identifying public policies driving transmission needs.

Attendees raised concerns over the Greater Boston Reliability Study, particularly the Sudbury-to-Hudson transmission line project identified as the preferred solution to the transmission needs in the area. George noted that the Greater Boston study was discussed extensively at the Planning Advisory Committee, an open stakeholder forum where environmental and consumer representatives are regular and active participants.

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<sup>31</sup> Greg Cunningham, "Integrating Markets and Public Policy: Using Competitive Markets to Achieve New England's Public Policy Goals," CLG presentation (December 1, 2016), [https://www.iso-ne.com/static-assets/documents/2016/11/2016\\_12\\_01\\_clg\\_meeting\\_greg\\_cunningham\\_panelist\\_presentation.pdf](https://www.iso-ne.com/static-assets/documents/2016/11/2016_12_01_clg_meeting_greg_cunningham_panelist_presentation.pdf).

<sup>32</sup> FCA #11 was held on February 6, 2017. Section 5, ISO New England Activities and Initiatives, contains the results of the auction.

Finally, George shared the ISO's projection of wholesale market costs for 2016, anticipated to be the lowest since 2003, when the markets were launched in their current form.<sup>33</sup> Section 7, New England Wholesale Electricity Costs, includes preliminary wholesale electricity cost data for 2016.

Section 5, ISO New England Activities and Initiatives, includes more information on these developments.

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<sup>33</sup> Anne George, "ISO New England Update," CLG presentation (December 1, 2016), [https://www.iso-ne.com/static-assets/documents/2016/11/2016\\_12\\_01\\_clg\\_meeting\\_george\\_iso\\_update\\_presentation.pdf](https://www.iso-ne.com/static-assets/documents/2016/11/2016_12_01_clg_meeting_george_iso_update_presentation.pdf).

## Section 4

### Consumer Liaison Group Future Initiatives

ISO New England, working with the CLG Coordinating Committee and CLG members, will continue to conduct outreach in the states to inform consumers and consumer advocates of the existence, role, and information provided by the Consumer Liaison Group.

Additionally, the CLG Coordinating Committee will continue striving to attract more end-user participation, to increase participation from all New England states, and to increase the consumers' presence in ISO New England stakeholder discussions and initiatives. The CLG Coordinating Committee will also explore more ways to educate end users about industry institutions, such as NEPOOL and FERC, and about how consumers can advocate before industry institutions, government bodies, and elected officials.

Additional efforts will be made to pinpoint and explain to end users the basic policy dilemmas and choices currently facing the energy industry, the public, and government.

In an effort to fully engage consumers and consumer advocates, the members of the CLG Coordinating Committee meet in person before each of the quarterly meetings to identify and select topics of interest to address at future CLG meetings. In particular, the CLG Coordinating Committee attempts to identify market or policy issues that are likely to have a direct impact on consumers. The objective is to provide information and perspectives on a topic that consumers and consumer advocates may not otherwise acquire due to their other professional responsibilities.

Typically, CLG Coordinating Committee members from the state in which the upcoming CLG meeting is to be held assist ISO New England and the Chair of the CLG Coordinating Committee in recommending individuals to deliver the keynote address and contribute to the panel discussion. Remaining CLG Coordinating Committee members provide additional assistance and approvals, when necessary. Prior to the CLG meeting, confirmed panelists participate in a planning call with the panel moderator (a CLG Coordinating Committee member) and ISO New England in order to plan for a robust, diverse, and well-organized discussion.

When choosing a topic for discussion, the CLG Coordinating Committee relies on conversations with and recommendations from the CLG membership as well as the participant survey conducted after each quarterly CLG meeting. The CLG Coordinating Committee encourages all interested participants to recommend potential topics, either via the participant survey or direct communication with the CLG Coordinating Committee.

## Section 5

### ISO New England Activities and Initiatives

This section highlights major topics presented by the ISO at CLG meetings in 2016. The ISO provided updates throughout the year on challenges facing the New England power system, regional power system planning developments, and wholesale electricity costs in New England.

#### 5.1 Challenges Facing the New England Power System

The New England power system is undergoing a dramatic transformation, presenting challenges and opportunities for the region. Over the last 16 years, New England has seen a major shift toward natural-gas-fired generation. In 2016, natural gas accounted for roughly 50% of electric energy production in New England, up from 15% in 2000 (see Figure 5).<sup>34</sup> The combined use of coal and oil has fallen dramatically over the same 16-year period—from 40% to 3%—and these resources usually only operate during the summer when electricity demand is high and in the winter when natural gas pipelines are constrained. Because natural gas is the fuel source for so much of the region's electricity, the price of this fuel sets the price for wholesale electricity about 70% of the time.

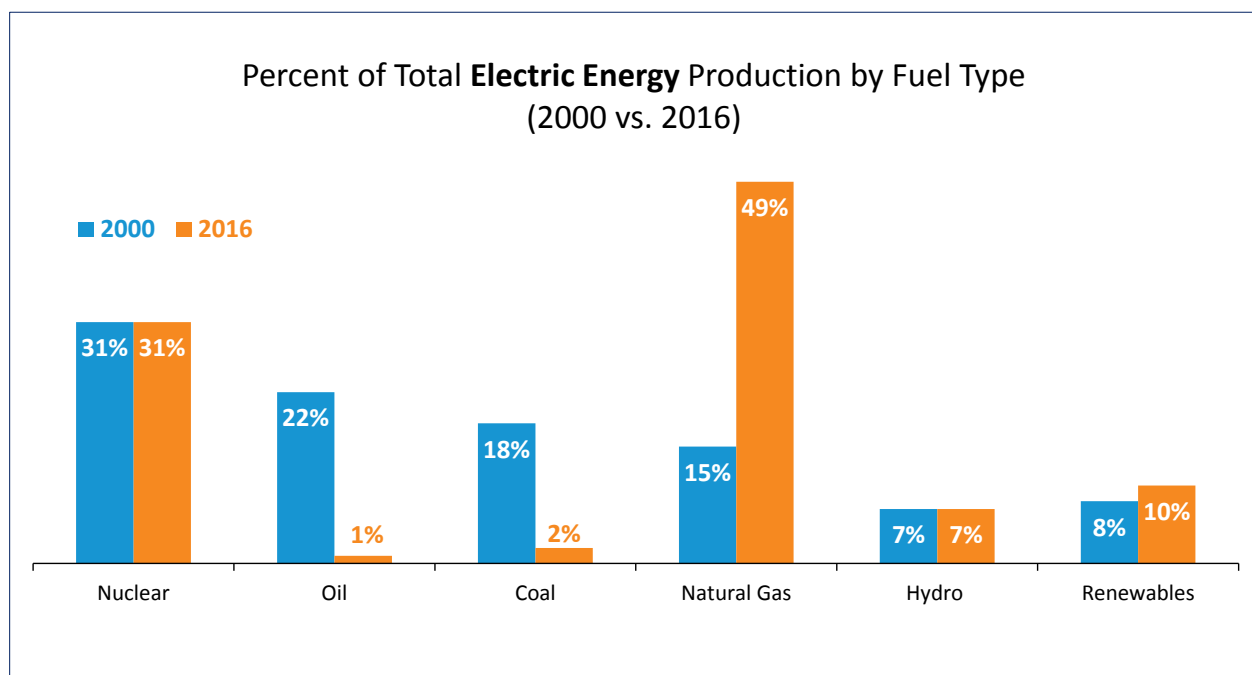


Figure 5: Percentage of total electric energy production by fuel type within New England, 2000 and 2016.

##### 5.1.1 Winter Reliability and Fuel Security

Operational concerns regarding fuel adequacy during the 2012/2013 winter prompted the ISO to take out-of-market action to mitigate the reliability risks associated with inadequate fuel supplies during the 2013/2014 winter. The ISO developed a temporary winter reliability program to

<sup>34</sup> ISO New England, *Net Energy and Peak Load by Source*, <https://www.iso-ne.com/isoexpress/web/reports/load-and-demand/-/tree/net-ener-peak-load>.

provide incentives to oil-fired generators to firm up their fuel supplies before the start of the winter. The program also included a demand-response component and incentives for gas-fired generators to invest in dual-fuel capability. The generators that participated in the program procured roughly 4 million barrels of oil (the equivalent of nearly two million megawatt-hours of energy), almost all of which was needed that winter. The program proved invaluable to power system operations during extreme cold weather conditions, particularly during the Polar Vortex because generators had the fuel they needed to run when dispatched by the ISO.

To improve fuel neutrality, the program was expanded to include a liquefied natural gas (LNG) component during the 2014/2015 winter. Compensation under the program was also modified. Rather than paying for inventory upfront, as was done under the 2013/2014 program, payments were made to offset some of the costs associated with unused oil inventories and unused LNG contract volumes at the end of the season. Demand response and incentives for gas-fired generators to invest in dual-fuel capability remained components of the program. Indeed, more than 1,000 MW of dual-fuel capability have been commissioned through the winter programs to date.

In September 2015, FERC approved a winter reliability program for use during the 2015/2016 winter, the 2016/2017 winter, and the 2017/2018 winter. The costs associated with the 2015/2016 winter reliability program totaled \$38.7 million (\$35.91 million for the oil inventory component, \$2.58 million for the LNG component, and \$210,316 for the demand-response component).<sup>35</sup>

Like previous programs, the 2016/2017 winter program was administered from December 1, 2016, to February 28, 2017, and included an oil inventory component, an LNG component, and a demand-response component. The deadline for submitting requests to the ISO to participate in the program was by October 1, 2016. Initial submissions from program participants indicated that the total maximum cost exposure for the program is approximately \$32 million.

## 5.2 Regional System Planning

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The ISO conducts comprehensive regional power system planning pursuant to a FERC-approved tariff and publishes a regional system plan (RSP) that summarizes the long-term (10-year) reliability needs of New England's transmission system.<sup>36</sup> Stakeholders, including state consumer advocates, provide input to the planning process and the RSP through the Planning Advisory Committee.<sup>37</sup> The ISO and stakeholders have agreed to the issuance of the RSP every other year. The next RSP will be issued in late 2017.

### 5.2.1 Energy-Efficiency and Distributed Generation Forecasts

Since 2012, the ISO has developed an annual energy-efficiency (EE) forecast to equip system planners with information about the long-term impacts of state-sponsored EE investments on the region's peak and overall demand for electricity. The ISO uses this information in long-term

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<sup>35</sup> ISO New England, Winter Program Payment Rate webpage, <https://www.iso-ne.com/markets-operations/markets/winter-program-payment-rate>.

<sup>36</sup> ISO New England, *2015 Regional System Plan* (November 5, 2015), [http://www.iso-ne.com/static-assets/documents/2015/11/rsp15\\_final\\_110515.docx](http://www.iso-ne.com/static-assets/documents/2015/11/rsp15_final_110515.docx).

ISO New England, *2017 Regional System Plan Scope of Work*, Planning Advisory Committee presentation (January 18, 2017), [https://www.iso-ne.com/static-assets/documents/2017/01/a8\\_rsp17\\_scope\\_of\\_work.pdf](https://www.iso-ne.com/static-assets/documents/2017/01/a8_rsp17_scope_of_work.pdf).

<sup>37</sup> ISO New England's *Open Access Transmission Tariff* (OATT) is available at <http://www.iso-ne.com/participate/rules-procedures/tariff/oatt>.

planning studies beyond the three-year Forward Capacity Market timeframe. The 2012 EE forecast was the nation's first regional EE forecast. A final 2016 EE forecast for the 2020–2025 timeframe was released in May 2016.<sup>38</sup> According to the forecast, the New England states plan to spend \$6.6 billion on energy efficiency between 2020 and 2025. These investments are forecasted to yield an average of 1,608 gigawatt-hours of energy savings per year and an average of 214 MW of peak demand savings per year.

Since 2013, the ISO has also led a regional Distributed Generation Forecast Working Group (DGFWG) to collect data on distributed generation (DG) policies and implementation and to forecast long-term incremental DG growth in New England.<sup>39</sup> Currently, solar photovoltaic (PV) resources represent the largest share of DG resources throughout New England and are the focus of the forecast. The final 2016 solar PV forecast, issued in April 2016, shows steady growth in solar PV resources through 2025, with roughly 1,300 MW of AC nameplate capacity installed through 2015 and nearly 3,300 MW of AC nameplate capacity anticipated by 2025.<sup>40</sup>

### 5.2.2 FERC Order No. 1000

In July 2011, FERC issued Order No. 1000, a final rule pertaining to intra- and interregional transmission planning and cost-allocation practices. The rule requires ISOs and RTOs to (1) participate in a regional transmission planning process that produces a regional transmission plan; (2) amend its transmission tariff to consider local, state, and federal policies in the regional transmission planning process; and (3) remove the federal right of first refusal for certain new transmission facilities.

The ISO, working with stakeholders, developed and submitted multiple filings to comply with the new requirements. The ISO developed significant new processes for competitive solicitations for transmission projects that address reliability needs expected to emerge more than three years out, as well as planning for transmission projects to meet public policy objectives. The ISO also updated existing interregional planning and transmission development protocols with neighboring power systems (PJM and NYISO).

At the end of 2016, ISO New England updated CLG members that, starting in 2017, it will work with the New England states and regional stakeholders to begin identifying public policies driving transmission needs.

On January 11, 2017, ISO New England issued a public notice initiating the public policy transmission planning process under FERC Order No. 1000 and requesting input on state, federal, and local public policy requirements (PPR) that drive transmission needs.<sup>41</sup> The ISO requested that interested stakeholders submit their input to the New England States Committee on Electricity

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<sup>38</sup> ISO New England's *Final 2016 Energy-Efficiency Forecast for 2020–2025* is available at [https://www.iso-ne.com/static-assets/documents/2016/04/ISO\\_NE\\_2016\\_EE\\_Forecast\\_2020\\_2025\\_Final.pdf](https://www.iso-ne.com/static-assets/documents/2016/04/ISO_NE_2016_EE_Forecast_2020_2025_Final.pdf). More information on the ISO's energy-efficiency forecast is available at <http://www.iso-ne.com/committees/planning/energy-efficiency-forecast>.

<sup>39</sup> For purposes of this forecast, DG resources are 5 MW or less in nameplate capacity and are interconnected to the distribution system.

<sup>40</sup> ISO New England's *Final 2016 Solar PV Forecast* is available at [https://www.iso-ne.com/static-assets/documents/2016/04/2016\\_pvforecast\\_20160415.pdf](https://www.iso-ne.com/static-assets/documents/2016/04/2016_pvforecast_20160415.pdf). More information on the ISO's solar PV forecast is available at <http://www.iso-ne.com/committees/planning/distributed-generation>.

<sup>41</sup> ISO New England, Public Notification for Public Policy Requirements Submittals (January 11, 2017), [https://www.iso-ne.com/static-assets/documents/2017/01/a10\\_2017\\_public\\_policy\\_transmission\\_upgrade\\_process\\_announcement.pdf](https://www.iso-ne.com/static-assets/documents/2017/01/a10_2017_public_policy_transmission_upgrade_process_announcement.pdf).



(NESCOE) and the ISO by February 25, 2017. All information associated with public policy transmission upgrades is posted on the ISO New England website.<sup>42</sup>

### 5.3 Wholesale Electricity Markets

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In 2016, the CLG discussed the *2015 Annual Markets Report* and ISO decisions leading up to FCA #11, as summarized below.

#### 5.3.1 Reports on Market Performance

The ISO regularly reports on the performance of the region's wholesale electricity markets.<sup>43</sup> In addition to detailed quarterly, monthly, and weekly reports, the ISO's internal and external market monitors prepare comprehensive annual reports on the development, operation, and performance of the markets.<sup>44</sup>

In May 2016, the internal market monitor published the *2015 Annual Markets Report*.<sup>45</sup> The report assessed the state of competition in the wholesale electricity markets administered by the ISO during the prior operating year, January 1 to December 31, 2015, and found that the markets operated competitively, with prices that reflected the cost of production.

#### 5.3.2 Forward Capacity Auction #11

The eleventh Forward Capacity Auction (FCA #11) was held on February 6, 2017, to procure the capacity resources needed to meet demand for electricity in New England during the 2020/2021 capacity commitment period (June 1, 2020, through May 31, 2021). The ISO modeled three capacity zones in FCA #11:

- Northern New England Capacity Zone, including Vermont, New Hampshire, and Maine
- Southeastern New England Capacity Zone, including NEMA/Boston and SEMA/RI
- Rest-of-Pool Capacity Zone, including Western Central Massachusetts and Connecticut

The Northern New England Capacity Zone was modeled as an export-constrained zone, and the Southeastern New England Capacity Zone was modeled as an import-constrained zone.

Finalized results indicate that the auction concluded with 35,835 MW of capacity acquired regionwide, including more than 600 MW of new demand-side resources.<sup>46</sup> The net Installed Capacity Requirement (ICR) for the 2020/2021 commitment period is 34,075 MW; however, with the sloped demand curve, the region can acquire more or less than the ICR, providing flexibility to

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<sup>42</sup> ISO New England, "Public Policy Transmission Upgrades," webpage (2017), <https://www.iso-ne.com/system-planning/system-plans-studies/public-policy-transmission-upgrades>.

<sup>43</sup> The ISO's various market reports are posted at <http://www.iso-ne.com/markets-operations/market-performance/performance-reports>.

<sup>44</sup> The internal market monitor's annual reports are posted at <http://www.iso-ne.com/markets-operations/market-monitoring-mitigation/internal-monitor>. The external market monitor's annual reports are posted at <http://www.iso-ne.com/markets-operations/market-monitoring-mitigation/external-monitor>.

<sup>45</sup> ISO New England, *2015 Annual Markets Report* (May 25, 2016), [https://www.iso-ne.com/static-assets/documents/2016/05/2015\\_imm\\_amr\\_final\\_5\\_25\\_2016.pdf](https://www.iso-ne.com/static-assets/documents/2016/05/2015_imm_amr_final_5_25_2016.pdf).

<sup>46</sup> ISO New England, *Forward Capacity Auction Results Filing*, Docket No. ER17-\_\_\_\_-000 (February 28, 2017), [https://www.iso-ne.com/static-assets/documents/2017/02/fca\\_11\\_results.pdf](https://www.iso-ne.com/static-assets/documents/2017/02/fca_11_results.pdf).



acquire additional capacity and enhanced reliability at a cost-effective price. No major generators announced retirement in FCA #11, and no new large-scale generators cleared in the auction.

The auction concluded systemwide after six rounds of competitive bidding, with a clearing price of \$5.30 per kilowatt-month (kW-month), lower than the \$7.03/kW-month clearing price in the previous auction (FCA #10). The \$5.30/kW-month clearing price will be paid to new and existing resources in all three capacity zones, with the exception of imports from New Brunswick, which will receive \$3.38/kW-month.<sup>47</sup> At \$5.30/kW-month, the total value of the capacity market for the 2020/2021 commitment period will be approximately \$2.4 billion, down from the estimated \$3 billion for the 2019/2020 commitment period.<sup>48</sup>

#### 5.4 The ISO's Budget Review Process

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ISO New England's budget development process begins well before the budget takes effect. The ISO's commitment to cost accountability and transparency starts with judicious internal budget development. In January of each year, the ISO's board of directors and senior management create a business plan that defines objectives for the next five years, as well as the projects and activities needed to achieve those objectives. The ISO also develops a work plan that details planning and operations-related activities, market-related activities, and capital projects for the year. The work plan is shared with stakeholders in the spring timeframe.<sup>49</sup> In June and August, the ISO presents proposed operating and capital budgets to its stakeholders for review and comment. By the end of October, the ISO submits its final operating and capital budgets to FERC for review and approval by the start of the following year. The ISO's board of directors plays an active role throughout the budget review process, taking into account feedback from stakeholders before voting on the proposed budget.

In May 2013, the ISO filed a settlement agreement with FERC on the ISO's 2013 budget, formalizing the budget review process with state regulators.<sup>50</sup> This process includes a preliminary budget presentation at the annual New England Conference of Public Utilities Commissioners (NECPUC) Symposium in June and an additional budget presentation with the New England states in August. After the budget presentation in August, the New England states have the opportunity to submit questions and comments on the proposed budget, and the ISO formally responds to any questions and comments received. All comments submitted by the New England states and the ISO's responses are included in the budget filing to FERC in October.

After an extensive budget review process with state regulators, the ISO filed its proposed 2017 budget with FERC on October 17, 2016.<sup>51</sup> On December 6, 2016, FERC approved the ISO's budget for

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<sup>47</sup> Existing capacity resources that chose to "lock in" their capacity price from a previous auction (for up to seven years) will receive their locked-in capacity price, not the clearing price in FCA #11.

<sup>48</sup> An ISO New England press release, "Finalized Results Confirm 11th Capacity Auction Procured Sufficient Resources, at the Lowest Price in Four Years, for 2020-2021" (February 28, 2017), details the results of the auction [https://www.iso-ne.com/static-assets/documents/2017/02/20170228\\_pr\\_fca11\\_final\\_results.pdf](https://www.iso-ne.com/static-assets/documents/2017/02/20170228_pr_fca11_final_results.pdf).

<sup>49</sup> ISO New England, *Updated 2016 Work Plan Discussion*, NEPOOL Participants Committee March 4, 2016, Meeting Agenda Item #6, [https://www.iso-ne.com/static-assets/documents/2016/03/npc\\_20160304\\_composite3.pdf](https://www.iso-ne.com/static-assets/documents/2016/03/npc_20160304_composite3.pdf).

<sup>50</sup> ISO New England, *Settlement Agreement*, Docket Nos. ER13-185, ER13-192 (May 13, 2013), [https://www.iso-ne.com/static-assets/documents/regulatory/ferc/filings/2013/may/er13\\_185\\_000\\_5\\_9\\_13\\_settlement\\_agreement.pdf](https://www.iso-ne.com/static-assets/documents/regulatory/ferc/filings/2013/may/er13_185_000_5_9_13_settlement_agreement.pdf).

<sup>51</sup> ISO New England, *Filing of 2017 Capital Budget and Revised Tariff Sheets for Recovery of 2017 Administrative Costs*, Docket No. ER17-116-000 (October 17, 2016), <https://www.iso-ne.com/static-assets/documents/2016/10/er17-116-000.pdf>.

2017.<sup>52</sup> The 2017 revenue requirement, after depreciation and true-up for actual expenses and collections in 2015, is \$192.3 million. The 2016 revenue requirement, which was reduced by a slightly larger overcollection, was \$184.5 million. If the ISO's 2017 revenue requirement was fully passed through to end-use customers, the cost to an average residential customer would be about \$1.12 per month (compared to \$1.08 per month for the 2016 revenue requirement). The 2017 capital budget is projected to be \$28 million, \$1 million more than the 2016 capital budget.

The ISO's budget review process is open and transparent. All materials are posted on the NEPOOL Budget and Finance Subcommittee page of the ISO New England website.<sup>53</sup> The ISO also maintains a separate webpage for budget information and materials.<sup>54</sup>

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<sup>52</sup> FERC, *Letter Order Accepting 2017 Capital Budget and Revised Tariff Sheets for Recovery of 2017 Administrative Costs* (Docket No. ER17-116-000) (December 6, 2016), <https://www.iso-ne.com/static-assets/documents/2016/12/er17-116-000.pdf>.

<sup>53</sup> The NEPOOL Budget and Finance Subcommittee webpage is available at <http://www.iso-ne.com/committees/participants/budget-finance>.

<sup>54</sup> The ISO's budget webpage is available at <http://www.iso-ne.com/about/corporate-governance/budget>.

## Section 6

### Analysis of Wholesale Costs and Retail Rates

One of the primary goals among CLG participants when the group first formed was to better understand how a typical retail consumer's bill reflects wholesale market costs. The ISO first conducted this analysis in 2009 and has subsequently updated it each year for the annual CLG report.

The analysis concluded that wholesale costs and the rates for residential retail power supply can vary dramatically among the states and from year to year, mainly because wholesale electricity markets and retail electricity markets are used to obtain different products. Wholesale markets reflect the short-term spot market for electric energy, whereas retail rates reflect longer-term, fixed-price contracts. The relationship between wholesale costs and retail rates will also vary with the retail power procurement practices of each utility and state. Understanding these differences is essential when comparing the two markets.

Table 3 shows the range of wholesale market costs for the 12 months ending December 2012, December 2013, December 2014, December 2015, and December 2016 (effectively, calendar years 2012, 2013, 2014, 2015, and 2016) among the New England states and the range of residential retail power supply rates in effect immediately following these time periods (January 1, 2013; January 1, 2014; January 1, 2015; January 1, 2016; and January 1, 2017) for each of the states with unbundled retail electricity markets.

**Table 3**  
**Wholesale Market Costs and Residential Retail Power Supply Rates<sup>(a)</sup>**

	Wholesale Market Costs (¢/kWh)	Residential Retail Power Supply Rates in Effect on Date Specified Below	Residential Retail Power Supply Rates <sup>(b)</sup> (¢/kWh)
<b>January–December 2012</b>	4.82–5.10	<b>January 1, 2013</b>	7.19–9.08
<b>January–December 2013</b>	6.75–7.23	<b>January 1, 2014</b>	6.81–9.56
<b>January–December 2014</b>	7.53–8.27	<b>January 1, 2015</b>	7.56–15.56
<b>January–December 2015</b>	5.43–5.78	<b>January 1, 2016</b>	6.56–11.85
<b>January–December 2016</b>	4.11–4.37	<b>January 1, 2017</b>	6.64–10.36

(a) The analysis is based on a hypothetical residential consumer that uses 750 kWh per month. The values indicate a range of lowest-to-highest costs among the states. January–December 2016 wholesale markets costs are preliminary.

(b) The range of residential retail power supply rates includes the states that have unbundled retail electricity markets. Vermont has not unbundled its retail electricity market; therefore, its rates are not included as part of this analysis.

Additional results of the analysis are as follows:

- From 2015 to 2016, wholesale market costs decreased 24 to 25% in all the New England states, largely because of decreases in wholesale energy costs during 2016. Connecticut, Massachusetts, and Rhode Island saw a decrease in power supply rates in effect on January 1, 2017, compared with power supply rates in effect on January 1, 2016. Maine and New Hampshire saw a slight increase in power supply rates in effect on January 1, 2017, compared with power supply rates in effect on January 1, 2016.

- Connecticut and Massachusetts saw a decrease in total residential retail electricity rates from January 1, 2016, to January 1, 2017. Maine, New Hampshire, and Rhode Island saw a slight increase in total residential retail electricity rates from January 1, 2016, to January 1, 2017. These rates include costs for power supply, transmission, distribution, and all other delivery service charges.<sup>55</sup>
- The estimated *regional* transmission rate increased by approximately 9% from 2015 to 2016 (from 1.4754 ¢/kWh in 2015 to 1.6071 ¢/kWh in 2016) and is equivalent to 8 to 11% of total residential retail electricity rates in effect on January 1, 2017, which ranged from 15.02 ¢/kWh to 21.18 ¢/kWh.<sup>56</sup>
- A review of *actual* transmission rates for residential retail consumers in Connecticut, Massachusetts, Maine, New Hampshire, and Rhode Island in effect on January 1, 2017 shows that transmission represents 11 to 19% of total residential retail electricity rates.<sup>57</sup>

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<sup>55</sup> Total residential retail electricity rates in effect on January 1, 2016, ranged from 14.45 ¢/kWh to 21.53 ¢/kWh among the New England states. Total residential retail electricity rates in effect on January 1, 2017, ranged from 15.02 ¢/kWh to 21.18 ¢/kWh among the New England states.

<sup>56</sup> The regional transmission rate reflects the costs of reliability projects identified through the regional transmission planning process as providing a regional benefit. These costs are considered part of the regional network service (RNS). The regional transmission rate is calculated as the sum of all RNS charges for the specific period, divided by the total net energy for load for the same period. For 2016, the period is based on the 12 months ending December 31, 2016. The regional transmission rate is established by the region's transmission owners and is collected through ISO New England's *Transmission, Markets, and Services Tariff*. For more information, see <http://www.iso-ne.com/participate/rules-procedures/tariff> and <http://www.iso-ne.com/participate/support/faq/oatt-iso-tariff>.

The concept of net energy for load is detailed at <http://www.iso-ne.com/isoexpress/web/reports/load-and-demand/-/tree/net-ener-peak-load>.

<sup>57</sup> The difference between actual transmission rates for residential consumers and the regional transmission rate is the inclusion of local transmission costs and projects in the residential transmission rates. Additionally, methodologies to allocate transmission costs to residential customers are likely to vary by state and utility.

## Section 7

### New England Wholesale Electricity Costs

The annual wholesale costs of meeting consumer demand for electricity in New England can vary significantly. Over the past nine years, total annual costs have ranged from a low of \$7.5 billion in 2016 to a high of nearly \$15 billion in 2008. Table 4 summarizes New England's wholesale electricity costs for 2008 to 2016.

**Table 4**  
**New England Wholesale Electricity Costs, 2008 to 2016**  
**(in Millions and ¢/kWh)<sup>(a)</sup>**

	2008		2009		2010		2011		2012		2013		2014		2015		2016 <sup>(b)</sup>	
	\$ Mil.	¢/kWh	\$ Mil.	¢/kWh	\$ Mil.	¢/kWh	\$ Mil.	¢/kWh	\$ Mil.	¢/kWh	\$ Mil.	¢/kWh	\$ Mil.	¢/kWh	\$ Mil.	¢/kWh	\$ Mil.	¢/kWh
<b>Wholesale market costs</b>																		
<b>Energy (LMPs)<sup>(c)</sup></b>	\$12,085	8.4	\$5,884	4.3	\$7,284	5.2	\$6,695	4.9	\$5,193	3.9	\$8,009	6.0	\$9,079	6.9	\$5,910	4.5	\$4,127	3.2
<b>Ancillaries<sup>(d)</sup></b>	\$366	0.3	\$190	0.1	\$164	0.1	\$39	0.0	\$56	0.0	\$152	0.1	\$331	0.3	\$210	0.2	\$146	0.1
<b>Capacity<sup>(e)</sup></b>	\$1,505	1.1	\$1,768	1.3	\$1,647	1.2	\$1,345	1.0	\$1,182	0.9	\$1,039	0.8	\$1,056	0.8	\$1,110	0.8	\$1,161	0.9
<b>Subtotal</b>	\$13,956	9.8	\$7,842	5.8	\$9,095	6.5	\$8,079	5.9	\$6,431	4.8	\$9,200	6.9	\$10,466	8.0	\$7,229	5.5	\$5,433	4.2
<b>Transmission charges<sup>(f)</sup></b>	\$869	0.6	\$1,115	0.8	\$1,418	1.0	\$1,369	1.0	\$1,494	1.1	\$1,823	1.4	\$1,822	1.4	\$1,954	1.5	\$1,902	1.5
<b>RTO costs<sup>(g)</sup></b>	\$124	0.1	\$116	0.1	\$145	0.1	\$130	0.1	\$139	0.1	\$167	0.1	\$165	0.1	\$165	0.1	\$180	0.1
<b>Total</b>	\$14,949	10.5	\$9,073	6.6	\$10,658	7.6	\$9,578	7.0	\$8,064	6.0	\$11,190	8.4	\$12,453	9.5	\$9,348	7.1	\$7,515	5.8

- (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 and do not reflect actual charge methodologies.
- (b) **The wholesale values for 2016 are preliminary and subject to reconciliation.**
- (c) Energy values are derived from wholesale market pricing, and represent the results of the Day-Ahead Energy Market plus deviations from the Day-Ahead Energy Market reflected in the Real-Time Energy Market.
- (d) 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.
- (e) Capacity charges are those associated with the transitional Installed Capacity (ICAP) Market through May 2010 and the Forward Capacity Market (FCM) from June 2010 forward.
- (f) Transmission charges reflect the collection of transmission owners' revenue requirements and tariff-based reliability services, including black-start capability and voltage support. FCM reliability totals are not included in this value. In 2016, the cost of payments made to these generators for reliability services under the ISO's tariff was \$37.5 million.
- (g) RTO costs are the costs to run and operate ISO New England and are based on actual collections, as determined under Section IV of the *ISO New England Inc. Transmission, Markets, and Services Tariff*.

Total wholesale costs include the cost of traditional supply resources and demand resources and the annual cost of transmission investment to serve all the region's power needs. These costs also include the cost of all ISO functions to operate the power grid; administer the markets; implement the 10-year system planning process, including the interconnection of new generators and the qualification of new demand resources; and provide market monitoring oversight of participant behavior and in-depth market analysis and reporting. Between 2008 and 2016, the ISO's annual costs have ranged from \$116 million to \$180 million.

Market participants that purchase electricity from the wholesale market for their own use or to supply to retail customers pay wholesale electricity costs. In turn, suppliers and utilities provide electricity to retail customers according to the retail market structures and requirements of the six New England states. Utilities charge retail customers for power supply through their monthly bills using the rates approved by the state or local public utilities commissions. Retail customers share in the cost of regional transmission upgrades for reliability and generally pay for it over a 35- to 40-year period through the transmission rates in their retail bill.

In 2016, the total value of all wholesale electricity costs, including the cost of regional transmission upgrades and ISO operations, was approximately \$7.5 billion. Allocating this cost across the load served at a wholesale level (real-time load obligation) in 2016 yields a rate of 5.8 ¢/kWh.