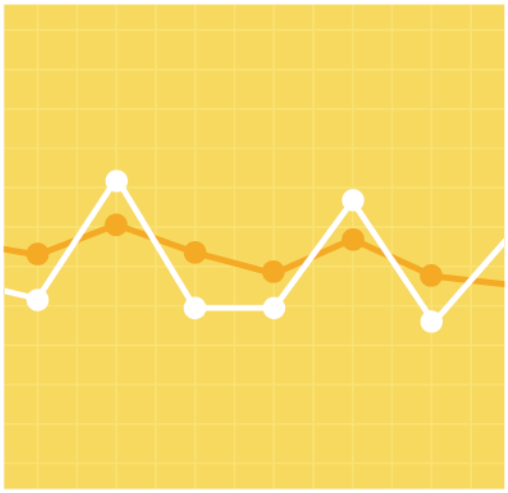
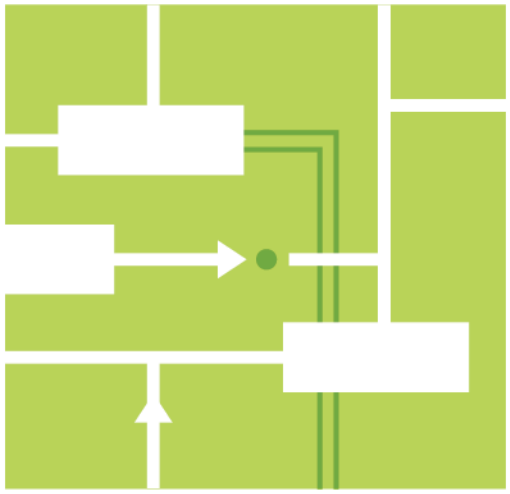
Consumer Liaison Group
Coordinating Committee

2019 Report of the Consumer Liaison Group

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

MARCH 11, 2020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Statement from the Consumer Liaison Group Coordinating Committee

Dear Reader,

Welcome to the *2019 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 tenth annual CLG report, the first 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 ISO New England, 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 2019, new Coordinating Committee members were added to replace members from Connecticut, Maine, 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 CLGCC.

ISO New England's information flow to the CLG is instrumental to fulfilling CLG's mandate to provide for greater understanding of the ISO's activities and decision-making processes and the potential cost impacts of its decisions and initiatives on consumers. 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.

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.

The CLGCC's goals for 2020 are as follows:

1. Increase dialogue and improve communication between ISO New England and the CLG, as well as between the CLGCC and CLG members at large
    - Heighten efforts to provide the ISO, particularly board members and staff, with a greater understanding of consumer issues, needs, and concerns regarding reliability, costs, and carbon impacts of the electric power system
    - Continue to update methods of communications, including through social media
2. Continue to provide a platform for CLG members to learn about proposed and newly enacted wholesale market and state policy actions and the impact these actions may have on issues of concern to consumers
    - Explore proposals for an ISO consumer ombudsperson to review the cost implications of regional proposals under the ISO's consideration.

3. 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
    - Consider exploring the challenges of electricity supply options available to residential consumers
4. Support ISO New England efforts to reduce carbon emissions
5. Attract new CLG members from a diverse pool of backgrounds, interests, and representative organizations
6. Revise CLG governance documents

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 improves its 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, which sets the agenda for four meetings each year, including featured topics and speakers. 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.[1]

2.1 Objectives

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

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 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.

[1] The Planning Advisory Committee is an open stakeholder forum that provides input and feedback to ISO New England on the regional system planning process. More information on the PAC is available at http://www.iso-ne.com/committees/planning/planning-advisory. The New England Power Pool 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.

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
- An update, by a representative from the ISO, on regional energy issues and initiatives that may have an impact on electricity prices, which have or will be taking place at NEPOOL and ISO stakeholder meetings
- 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)

Time is reserved during each meeting for audience questions and answers.

2.3 Governance

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.[2]

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. The chairperson fills any vacancies on the committee with the approval of a majority of the remaining members. Current CLGCC members are listed on page 2. The ISO designates a point of contact within its External Affairs Department to work with the CLGCC.

2.4 Information and Communications

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.[3] This practice ensures that the body of information developed through the CLG is transparent, easily accessible, and available to all interested consumers and industry participants.

[2] The "CLG Purpose and Structure" document (December 29, 2009) fully explains CLG governance; see https://www.iso-ne.com/static-assets/documents/committees/comm_wkgrps/othr/clg/consum_lias_grp_gov/clg_structure_document_revised_12_29_09.pdf.

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

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.[4]

Since 2012, ISO New England has provided a mobile application offering smartphone access to frequently viewed real-time data on the ISO website and data portal, ISO Express.[5] In 2018, the ISO launched the latest version of the app, known as "ISO to Go 2.0" with the following features:

- A map of pricing data, including day-ahead and real-time prices for each of the region's eight load zones
- Demand curves providing a simple visual of New England's actual consumer demand for electricity and how it tracks with the forecast
- An enhanced fuel-mix section detailing the energy sources powering New England at any given moment
- Customizable push notifications for users who want to be alerted when the power system is operating under abnormal or emergency conditions or when prices cross certain thresholds

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.[6] 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.[7] Each month, ISO New England's External Affairs Department issues a memo that provides timely updates on regional energy issues, stakeholder meetings, and other information that may be of interest to consumers.[8] These memos are available on the External Affairs page of the ISO website, along with presentations and speeches delivered by ISO technical experts and senior management.

Section 3
Consumer Liaison Group Meeting Summaries for 2019

In 2019, the Consumer Liaison Group held quarterly meetings on issues of importance to electricity consumers in New England. The members of the CLG Coordinating Committee selected the topics, special guest speakers, moderators, and panelists featured at these meetings.

The topics discussed in 2019 were wide-ranging, diverse, and featured issues relating to the changing wholesale electricity markets, the evolution of energy efficiency (EE), and the electrification of the heating sector, as follows:

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

[5] *ISO to Go 2.0* 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/.

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

[7] ISO New England, *2019 Regional Electricity Outlook* (March 2019), https://www.iso-ne.com/about/regional-electricity-outlook. The latest version of the report is available at https://www.iso-ne.com/about/regional-electricity-outlook/.

[8] The ISO's "Government and Industry Affairs" webpage is available at https://www.iso-ne.com/about/government-industry-affairs.

- **March 14**: The evolution of New England's wholesale and retail electricity markets and their impacts on consumers

  Meeting location: Providence, Rhode Island

- **June 20**: Energy efficiency in the Forward Capacity Market (FCM): The changing landscape and implications for consumers

  Meeting location: Westborough, Massachusetts

- **September 5**: The role of carbon in state and regional planning

  Meeting location: Portland, Maine

- **December 5**: 10 Years of CLG: What We Learned in Our First Decade and What We Can Expect in the Second

  Meeting location: Boston, Massachusetts

The following summaries capture the general discussions that took place at CLG meetings in 2019. They are not intended to capture every discussion and do not necessarily reflect the views of the ISO or the CLG Coordinating Committee. Section 5 contains further information about the ISO New England updates presented at each meeting.

3.1 March 14: Transforming the Power Sector: Customer Choice in a Changing Energy Landscape

Meeting objective: Discuss transforming the power sector and customer choice in a changing energy landscape

Welcoming Remarks: **Rebecca Tepper**, the chair of the Consumer Liaison Group Coordinating Committee (CLGCC) and chief of the Energy and Telecommunications Division at the Massachusetts Attorney General's Office, offered welcoming remarks. She noted that 2019 is the tenth anniversary of the CLG and that members of the CLGCC are always open to suggestions on ways to plan and organize CLG meetings. She also introduced the newly elected members of the CLGCC.

3.1.1 Keynote Speaker: Jeffrey Grybowski, Co-Chief Executive Officer of Ørsted US Offshore Wind

Jeffrey Grybowski, co-chief executive officer of Ørsted US Offshore Wind, delivered the keynote address. He said that Ørsted is the largest developer of offshore wind in the world, with more than 5,100 megawatts (MW) of offshore wind in operation and 3,000 MW under construction. Ørsted is unique among renewable energy companies because of its high concentration of offshore wind deployment; most energy companies that have invested in wind have focused on onshore wind, not offshore, Grybowski said. However, investments in offshore wind are increasing.

"It's not really a niche market anymore," Grybowski said. "It's something that every major global renewable energy company is integrating into its portfolio now." Worldwide, 17.8 gigawatts (GW) of offshore wind are in operation, with 2.7 GW added in 2018 alone. These investments are taking place worldwide, particularly in Europe and Asia. "The Chinese are building gigawatt upon gigawatt upon gigawatt of offshore wind," Grybowski said.

He said the growth is powered in part by advances in the size of the turbines. As the turbines grow larger, fewer will be needed to produce a given amount of electricity. Also, developers face fewer constraints related

to permitting and construction than those developing onshore wind, because there are fewer visual impacts and logistical challenges, he said.

The northeastern area of the United States is one of the best places in the world to build offshore wind, Grybowski said, because of its population density, public policies, geography, and meteorology.

The eastern seaboard of the United States is densely populated, he said, which means a demand exists for electricity produced offshore. Also, seven Eastern states have a policy that supports offshore wind, including three in New England: Massachusetts, Connecticut, and Rhode Island, which is home to the first offshore wind farm in North America. [9]

The depth of the water off the Northeast is ideal for offshore wind, Grybowski said, as it is neither too deep nor too shallow. And perhaps most importantly, the Northeast is also at the convergence of several weather patterns, with prevailing winds coming down the coast and up the coast, which creates strong wind gusts in the region.

"We have world class offshore wind speeds," Grybowski said.

Grybowski then took questions from the audience on topics including the performance of offshore wind during the times of peak electricity demand, the capacity factors of offshore wind turbines, and the time needed to acquire the permits necessary for construction.

3.1.2 Panel Discussion

Douglas Gablinske, Executive Director of the Energy Council of Rhode Island and a member of the CLG Coordinating Committee, moderated a panel of energy industry representatives to discuss customer choice in a changing energy landscape.[10]

Panelists included **Jonathan Schrag**, deputy administrator, Rhode Island Division of Public Utilities and Carriers; **Erika Niedowski**, Rhode Island director and policy advocate, Acadia Center; **Timothy Hebert**, chief operating officer, Energy New England; and **Meg Lusardi**, executive vice president, PowerOptions.

Jonathan Schrag explained the ongoing power sector transformation efforts in Rhode Island.[11] He said managing peak electricity demand in Rhode Island is particularly costly, noting that in 2016 alone, the top 1% of energy use caused 9% of total consumer energy costs, whose value that year was $23 million. He said the state's goals include giving customers more energy choices and building a flexible grid to integrate more clean energy. Their priorities include evaluating the benefits of advanced meter functionality; leveraging distribution system information; carefully incorporating the demand of electric vehicles into the state's load profile; and aligning incentives for utility, market participants, and customers.

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[9] Subsequently, Massachusetts, Maine, and New Hampshire became a part of an intergovernmental Bureau of Ocean Energy Management task force pursuing offshore wind development in the Gulf of Maine. The task force held its first meeting on December 12, 2019.

[10] Jeffrey Grybowski, "Creating the Leading Offshore Wind Company in the U.S.," presentation (March 14, 2019), https://www.iso-ne.com/static-assets/documents/2019/03/clg_meeting_grybowski_keynote_presentation_march_14_2019_final.pdf.

[11] Jonathan Schrag, "Presentation to the Consumer Liaison Group," (March 14, 2019), https://www.iso-ne.com/static-assets/documents/2019/03/clg_meeting_schrag_panelist_presentation_march_14_2019.pdf.

Erika Niedowski said solar photovoltaic (PV) energy will be an important part of the clean energy future, along with energy efficiency, demand management, and wind resources.[12] She said that land conservation efforts can conflict with the siting of solar energy but the two goals need not conflict. She explained that diverse factors can influence solar siting, including local permitting processes and the economics and size of the project.

Timothy Hebert explained the different ways municipal energy utilities are adapting to the changing energy markets and needs of their consumers.[13] For example, they are investing in renewable and low-carbon resources even though they do not necessarily need to follow state renewable energy laws. They also work closely with their customers on conservation measures, such as energy audits and rebate programs, as well as the deployment of new technologies, such as electric vehicles.

Meg Lusardi said investments in renewable energy, distributed energy resources, and energy efficiency have been increasing in New England. These changes have a variety of impacts on the wholesale energy markets, including lower prices in the capacity and energy markets. The growing concerns regarding winter energy security have also led to new programs and costs by the ISO, which she said could cause additional costs for consumers. She explained how these combined changes are affecting the ways energy supply companies negotiate procurements and contracts for its customers.

A question and answer session followed, touching on municipal energy supplier prices, the effects of negative energy prices in power purchase agreements, and the impacts of increased electric vehicle deployment on peak energy loads.

3.1.3 ISO New England Update

Anne George, vice president for External Affairs and Corporate Communications at ISO New England, provided the ISO New England update, including the following highlights:[14]

- Publications—Several ISO New England publications are now available, including:
    - ***2019 Regional Electricity Outlook***, which provides an in-depth look at New England's biggest challenges to power system reliability and the solutions the region is pursuing[15]
    - **New England Power Grid Profile**, which provides key grid and market stats on how New England's wholesale electricity markets are securing reliable electricity at competitive prices[16]

[12] Erika Niedowski, "Smart Solar Siting in New England," presentation (March 14, 2019), https://www.iso-ne.com/static-assets/documents/2019/03/clg_meeting_niedowski_panelist_presentation_march_14_2019.pdf.

[13] Timothy Hebert, "Transforming the Power Sector: Customer Choice in a Changing Energy Landscape, A (Municipal) Utility Perspective," presentation (March 14, 2019), https://www.iso-ne.com/static-assets/documents/2019/03/clg_meeting_hebert_panelist_presentation_march_14_2019.pdf.

[14] Anne George, "ISO New England Update," presentation (March 14, 2019), https://www.iso-ne.com/static-assets/documents/2019/03/clg_meeting_hebert_panelist_presentation_march_14_2019.pdf.

[15] ISO New England, *2019 Regional Energy Outlook* (2019), https://www.iso-ne.com/static-assets/documents/2019/03/2019_reo.pdf. The latest version of the report is available at https://www.iso-ne.com/about/regional-electricity-outlook/.

[16] Also see the 2019–2020 profiles for the New England power and states at the ISO's "Key Grid and Market Stats," webpage (2020), https://www.iso-ne.com/about/key-stats.

- **New England State Profiles**, which provide state-specific facts and figures relating to supply and demand resources tied into the New England electric grid and state policies transforming the resource mix in the region
- ***2018 Report of the Consumer Liaison Group***, which includes meeting summaries, priorities of the CLGCC, and an analysis of wholesale and retail electricity rates[17]

- **Forward Capacity Auction #13 (FCA #13)**
  The ISO conducted its thirteenth Forward Capacity Auction (FCA #13) on February 4. The auction procured 34,839 MW of capacity for the 2022–2023 timeframe. The auction acquired 29,611 MW of generation and 4,040 MW of energy-efficiency (EE) and demand-reduction (DR) measures. The auction clearing price was $3.80/kilowatt-month (kW-month) for all resources within New England and imports from New York.

  The first Competitive Auctions with Sponsored Policy Resources (CASPR) substitution auction was held in conjunction with FCA #13 for state-sponsored resources seeking commitments in the 2022–2023 timeframe. The CASPR design is intended to accommodate sponsored policy resources into the Forward Capacity Market over time and preserve competitively based capacity pricing for other resources. The substitution auction closed with Vineyard Wind, an offshore wind project in development off the coast of Massachusetts, assuming an obligation of 54 MW from an existing resource that will retire in 2022–-2023.

- **Update on Regional Energy-Security Discussions**
  The ISO is pursuing short- and long-term solutions to address energy-security challenges, and in December 2018, the Federal Energy Regulatory Commission (FERC) accepted ISO New England's proposed tariff changes to retain resources seeking retirement on the basis of a fuel-security reliability need, a change that will be in place for FCAs #13, 14, and 15.[18] The ISO also proposed an interim compensation mechanism intended to serve as a bridge until a long-term solution is put in place. The proposed interim solution provides compensation for inventoried energy during cold winter conditions during the capacity commitment periods associated with FCAs #14 and 15. The ISO estimates direct program costs in the range of $112 million to $158 million/year.[19]

  Regarding a long-term solution, the ISO is working toward making a filing with FERC on April 15, 2020. For additional information, see Section 5, ISO New England Activities and Initiatives.

- **Update on Demand-Side Resources, Enhanced Storage Participation, and Planning Advisory Committee Activities**
  - Demand-side resources
    - Active demand response: On June 1, 2018, ISO New England became the first in the nation to fully integrate active demand response into its wholesale electricity markets. A review of the first six months of the program showed that active demand

[17] ISO New England, 2018 Report of the Consumer Liaison Group (March 12, 2019), https://www.iso-ne.com/static-assets/documents/2019/03/2018_report_of_the_consumer_liaison_group_final.pdf.

[18] *ISO New England Transmission, Markets, and Services Tariff* (2020), https://www.iso-ne.com/participate/rules-procedures/tariff/ (ISO tariff). See Section 5.1 of this report for additional information regarding the Energy-Security Initiative.

[19] Subsequently, on March 25, 2019, the ISO filed its interim proposal with FERC for review and approval. On August 6, 2019, FERC announced that it did not act on the ISO's filing, and it became effective by operation of law. For more information, see ISO New England, "Winter energy-security update: Interim compensation program for inventoried energy filed with FERC," *ISO Newswire* article (March 26, 2019), http://isonewswire.com/updates/2019/3/26/winter-energy-security-update-interim-compensation-program-f.html.

response has increased in both number of resources and amount of capacity since implementation and its inclusion in economic dispatch allows these resources to set prices and improves price formation.

        - Passive demand response: The ISO is evaluating current measurement and verification (M&V) practices in light of changes in New England's energy-efficiency landscape. To date, the ISO has not proposed any changes to its M&V requirements for energy-efficiency resources participating in the Forward Capacity Market, and it will vet with stakeholders any changes to applicable ISO tariff or market manual provisions.

    - Enhanced storage participation

        - In February, FERC accepted revisions to the ISO's market rules that enable batteries and other emerging storage technologies to more fully participate in the region's wholesale electricity markets.[20] These rules took effect in April 2019. The ISO is also waiting for FERC approval on proposed tariff changes submitted in December 2018. Once approved, these changes will demonstrate full compliance with FERC Order 841.[21]

    - Planning Advisory Committee

        - In May, the ISO is planning a day-long "grid transformation" event for the PAC, touching topics including the integration of renewable and distributed resources (refer to Section 5.2.1).
        - Every two years, the ISO (in collaboration with PAC) develops a Regional System Plan (RSP) that identifies the region's electricity needs and plans for meeting these needs over a 10-year planning horizon. The draft 2019 RSP will be released for PAC review in July, a page turn with the PAC will be held in August, and a public meeting will be held in September. (See Section 5.2.2)

- **Wholesale Electricity Costs for 2018**
  The total value of New England's wholesale electricity energy markets in 2018 was $6 billion, up 34% compared with 2017's near-record low value of $4.5 billion, but down 19% from the first full year of wholesale market operations in 2004.
- Wholesale prices rose last year primarily because the cost of natural gas used to produce electricity was higher, consumer demand increased year over year, and an extreme cold spell that covered the region during the first week of 2018 raised prices during that time. (Section 5.4.2 contains more information about the total value of wholesale markets.)

3.2 June 14: Energy Efficiency in the Forward Capacity Market: The Changing Landscape and Implications for Consumers

Meeting objective: Discuss energy efficiency in the Forward Capacity Market and what its changing landscape means for consumers.

[20] FERC, *Order Accepting Tariff Revisions,* Docket No. ER19-84-000 (February 25, 2019), https://www.iso-ne.com/static-assets/documents/2019/02/er19-84-000.pdf.

[21] FERC, *Electric Storage Participation in Markets Operated by Regional Transmission Organizations and Independent System Operators*, final rule (February 15, 2018), https://www.ferc.gov/whats-new/comm-meet/2018/021518/E-1.pdf.

Opening Remarks: **Elizabeth Mahony**, senior policy advisor for energy in the Energy and Telecommunications Division at the Massachusetts Attorney General's Office, offered welcoming remarks. She encouraged attendees to follow the CLG on Twitter, to submit possible topics for future meetings, and to provide feedback to the CLGCC by filling out the post-meeting surveys.

3.2.1 Keynote Address: David Littell, Senior Advisor, Regulatory Assistance Project

David Littell, senior advisor of the Regulatory Assistance Project, delivered remarks titled, "Value on the Table."[22]

Littell said restructured markets were not designed to operate with grid-scale and distributed advanced energy technologies, and they were not designed to price the modern capabilities these technologies now offer at very affordable prices and sometimes no energy market price. The costs of key technologies, such as wind and solar, have dropped dramatically, and the cost of battery storage is following suit. The costs of building new renewable technologies have dropped so much such that building them can be less expensive than continuing to operate an existing fossil-fired or nuclear unit, he said.

Restructuring has enabled the region to lower some of the costs associated with generating electricity, Littell said, and has successfully moved the risk of generation investment away from ratepayers. However, Littell said, New England's capacity market is not the best way to meet the region's needs because it has not successfully anticipated the types of developments that have affected the markets, such as distributed energy resources and other new technological capabilities. Littell also said capacity markets enable natural gas-fired power plants, but not renewable energy resources, to access private financing.

Littell said the industry is changing, with new technologies and new grid operational needs. However, he argued, the current wholesale markets are not accessing these new capabilities and needs. He discussed the challenges in the current capacity markets and said more of a focus is needed on the capability of a resource and not so much on its capacity. Inverter-based technologies, such as wind and solar, can offer the grid important capabilities but are presently underutilized. For example, inverter-based resources can respond to grid conditions very quickly.

Littell also highlighted new services that demand-side resources can provide to the electric power system. He said traditional demand-response programs focus only on shedding load during times of grid stress. Instead, demand response should focus on incentivizing energy efficiency and behavior change, softening the ramping up and down of demand in order to capture surplus renewable energy, managing contingency events, and using fast demand response to smooth out load and support frequency response.

Topics discussed during a question and answer period included the costs of natural gas pipelines, the rates of municipal power companies, and the definition of capacity.

3.2.2 Panel Discussion

Mary Usovicz, principal at MU Connections and a Massachusetts representative on the CLGCC, moderated a panel of energy industry representatives to discuss the changing landscape for energy efficiency's participation in the Forward Capacity Market and potential impacts on consumers.

[22] David Littell, "Value on the Table," presentation (June 20, 2019), https://www.iso-ne.com/static-assets/documents/2019/06/clg_meeting_littell_keynote_presentation_june_20_2019_final.pdf.

Panelists included **Henry Yoshimura,** director, Demand Resource Strategy, ISO New England; **Maggie McCarey,** director, Energy Efficiency Division, Massachusetts Department of Energy Resources; and **Stefan Nagy,** product manager, Distributed Energy, National Grid.

Henry Yoshimura provided a brief history (1990 to 2019) of the treatment of energy efficiency in New England and explained the evolving rules governing distributed energy resources' (including energy-efficiency's) participation in the region's wholesale markets.[23] He explained that new standards and technologies are prompting a conversation regarding the way the Forward Capacity Market treats energy efficiency.

Maggie McCarey said Massachusetts' three-year energy-efficiency plans consistently set aggressive goals, and efficiency plays a significant role in the state's plan to reduce emissions in compliance with the state's *Global Warming Solutions Act*.[24] Every $1 invested in efficiency results in $3 of benefits, McCarey said. She also explained the causes of greenhouse gas emissions in the state and the major new initiatives in the state's three-year energy-efficiency plan.

Stefan Nagy provided an overview of the requirements for the efficiency programs in Massachusetts and Rhode Island and discussed how National Grid delivers efficiency measures to customers.[25] He showed the ways efficiency measures are funded and are screened for cost effectiveness, the impact efficiency has had on capacity market's prices, and the possible changes to the way the capacity market treats efficiency.

A question and answer session that followed touched on how the cost-benefit analyses of efficiency programs are calculated, the development of a net-zero building code, and the role energy efficiency plays during shortage conditions.

3.2.3 ISO New England Update

Anne George, vice president for External Affairs and Corporate Communications at ISO New England, provided the ISO New England update.[26] Highlights include the following:

- **ISO New England issued the 2019 summer outlook, which states that New England is expected to have sufficient resources during the summer to meet peak demand for electricity:**
    - The peak demand forecast for typical summer weather is 25,323 MW. The peak demand forecast for "extreme" summer weather is 27,212 MW. Both forecasts take into account the demand-reducing effects of energy efficiency (about 2,900 MW) acquired through the Forward Capacity Market and the behind-the-meter (BTM) solar (about 700 MW).
    - New England has more than 32,000 MW of total capacity available for summer 2019.
    - New capacity additions in 2019 include:

[23] Henry Yoshimura, "Energy Efficiency in the Forward Capacity Market: The Changing Landscape and Implications for Consumers," presentation (June 20, 2019), https://www.iso-ne.com/static-assets/documents/2019/06/clg_meeting_yoshimura_panelist_presentation_june_20_2019_final.pdf.

[24] Maggie McCarey, "Massachusetts 2019-2021 Energy Efficiency Plan," presentation (June 20, 2019), https://www.iso-ne.com/static-assets/documents/2019/06/clg_meeting_mccarey_panelist_presentation_june_20_2019_final.pdf.

[25] Stefan Nagy, "Energy Efficiency in the Forward Capacity Market," presentation (June 20, 2019), https://www.iso-ne.com/static-assets/documents/2019/06/clg_meeting_mccarey_panelist_presentation_june_20_2019_final.pdf.

[26] Anne George, "ISO New England Update," presentation (June 20, 2019), https://www.iso-ne.com/static-assets/documents/2019/06/clg_meeting_george_iso_update_presentation_june_20_2019_final.pdf.

        - Three new dual-fuel, natural-gas-fired power plants (about 1,050 MW)
        - Five new solar farms (about 90 MW)
        - Two new onshore wind facilities (about 50 MW)
    - The region also saw a key generator retirement with Pilgrim Nuclear Power Station (680 MW) which is located in Plymouth, Massachusetts and retired on May 31, 2019.

- **ISO New England's internal market monitor released the *2018 Annual Markets Report*, which concludes that wholesale markets operated competitively in 2018:**[27]
    - The internal market monitor functions independently of ISO management and reports directly to the ISO board of directors. The annual report assesses the state of competition in the wholesale electricity markets administered by the ISO during the most recent operating year.
    - The total cost of wholesale electricity in 2018 was **$12.1 billion**, representing a 32% (or $2.9 billion) increase over 2017, largely due to higher energy and capacity market costs.
    - Energy costs totaled **$6.0 billion** in 2018, representing a 34% (or $1.5 billion) increase over 2017, due largely to higher natural gas prices, particularly during the winter, and higher electricity demand during a hot and humid summer. Natural gas prices averaged $4.95/million British thermal units (MMBtu) in 2018, up by $1.23/MMBtu on 2017 prices (representing a 33% increase).
    - Capacity costs totaled **$3.6 billion** in 2018, representing a 61% (or $1.4 billion) increase over 2017, due to higher clearing prices in the eighth and ninth auctions.

- **ISO New England continues discussions with stakeholders on its Energy-Security Improvements (ESI) Project:**
    - The ISO's long-term, market-based solution is under development and aims to optimize the use of limited energy over extended periods (refer to Section 5.1). Also, the ISO launched a formal quantitative and qualitative analysis this spring, with completion expected this fall. (Note: The impact analysis work would extend to early 2020.)
    - The ISO will file a formal proposal with FERC for review by October 15, 2019. (Note: FERC subsequently extended this deadline to April 15, 2020.)
    - This is a multiyear implementation effort, with a targeted implementation schedule of 2024–2025, which aligns with the capacity commitment period for FCA #15.

- **ISO New England continues its focus on grid transformation** by adapting grid operations, market rules, and system planning to accommodate new resource types and technologies entering the marketplace while preserving reliability:
    - Through the **Planning Advisory Committee**, ISO New England recently hosted a "Grid Transformation Day," which was focused on the ongoing transition to an electric grid powered by renewable and distributed energy resources (refer to Section 5.2.1).

[27] ISO New England, Internal Market Monitor, *2018 Annual Markets Report* (May 23, 2019), https://www.iso-ne.com/static-assets/documents/2019/05/2018-annual-markets-report.pdf.

- **The ISO is making continuous enhancements to its forecasting methods:**
    - For example, in 2012, ISO New England staff developed the first multistate, long-term energy-efficiency forecast in the nation, and in 2014, the first, multistate, long-term forecast for behind-the-meter solar installations.
    - In 2019, the ISO launched a new method of predicting solar PV output regionally that is integrated into the existing day-ahead and seven-day operational load forecasts (see Section 5.2.3)
- **The ISO has adapted its markets, operations, and planning to prepare for the grid of the future:**
    - For example, in 2015, the ISO introduced an "energy-neutral" dispatch signal to integrate new energy-storage technologies, such as batteries and flywheels, into the Regulation Market to provide real-time frequency-regulation services.
    - In 2018, the ISO fully integrated demand-response resources into the energy and reserve markets, adding to the long-standing ability of demand resources to participate in the capacity market.
    - In 2019, the ISO implemented its Enhanced Storage Participation rules, allowing storage technologies to be dispatched in the Real-Time Energy Market in a way that recognizes their ability to transition continuously and rapidly between a charging state and a discharging state and providing a means for simultaneous participation in the energy, reserves, and regulation markets.
- **Going forward, the ISO is focused on three elements essential to a reliable transition:**
    - Support the rapid transformation of the region's electricity supply and demand mix
    - Maintain a robust transmission system
    - Ensure energy security

Topics of discussion during the question and answer session included the costs of transmission in New England when compared with other areas of the United States and the reliability requirements underpinning capacity markets.

3.3 September 5: The Role of Carbon in State and Regional Energy Planning

Meeting objective: Discuss the role of carbon in state and regional energy planning

Welcoming Remarks: **Rebecca Tepper**, chair of the Consumer Liaison Group Coordinating Committee and chief of the Energy and Telecommunications Division at the Massachusetts Attorney General's Office, offered welcoming remarks. She explained the role of the group and encouraged participants to take the post-meeting surveys they will receive in their email and to suggest discussion topics for future meetings. She also noted that the upcoming quarterly meeting in December will mark the 10-year anniversary of the establishment of the Consumer Liaison Group (see Section 2.3).

3.3.1 Keynote Address: Dan Burgess, director of the Maine Governor's Energy Office

Dan Burgess provided an update on energy policy developments and related activity in Maine.[28] He described the state itself, noting it is the largest in the region in terms of landmass and that one county alone is the size of Rhode Island and Connecticut combined. He also noted that the state will celebrate its bicentennial in March 2020.

He noted that Governor Janet Mills, who was inaugurated in January 2019, has made renewable energy and home weatherization priorities for her administration. He cited endeavors such as joining the US Climate Alliance, ending the state's moratorium on wind power development, withdrawing the state from an offshore drilling coalition, establishing rebate programs for electric vehicle investments, and setting a goal of installing 100,000 heat pumps by 2025.

Burgess explained that the majority of Maine's emissions come from the transportation and home heating sectors. Regarding heating, he said Maine is more dependent on oil for home heating than any other state in the country. Altogether, more than 70% of Mainers depend on oil or propane for their heating. The goal to install 100,000 heat pumps will help residents diversify their options for heating, and this, Burgess said, is especially important in a rural state such as Maine where residents face challenging weather conditions. Burgess said he knows firsthand of this need for diversification because he grew up on a farm in Maine where his family relied on an oil boiler, a wood boiler, a wood stove, and a heat pump.

Burgess also said there are economic reasons to decarbonize the transportation sector, estimating that approximately $5 billion leaves the state for fossil fuels annually. He said some of the $21 million the state received from the Volkswagen (VW) settlement will be used on various transportation initiatives, including charging infrastructure. Additional state settlement funds from VW will go toward rebates for plug-in hybrid and electric vehicles. The state is monitoring the Transportation and Climate Initiative (TCI), a regional collaboration of 12 Northeast and Mid-Atlantic states and the District of Columbia that seeks to reduce carbon emissions from the transportation sector.

The state is also increasing its efforts to incorporate more renewable energy sources, Burgess said, highlighting the latest change to the state's Renewable Portfolio Standard (RPS), which increases the amount of retail electric sales that must come from renewable energy sources to 80% by 2030 and a goal of 100% by 2050. The state's previous RPS goal was 40% by 2030. The new law also requires the state's Public Utilities Commission to procure up to 14% of the state's retail electricity load via 20-year contracts and included the creation of thermal Renewable Energy Credits.

"This legislation took a long time to negotiate," he said, noting that the final bill had bipartisan support and support from the business community. "We had a real focus on cost-containment mechanisms," Burgess said.

Other 2019 legislation supported the Maine Aqua Ventus offshore wind floating platform, the first of its kind in platform technology. "We see a potential opportunity for offshore wind development in Maine," Burgess said. "We think an opportunity exists to do more and that Maine's energy future will be bright."

He also said the legislature established a stakeholder group that will address transmission system needs to support renewable energy in the state. Current constraints on the grid have created barriers to renewable energy development, he explained, and the goal of the group is to find opportunities for regional coordination and potential funding strategies to address these barriers.

[28] Dan Burgess, "Maine Governor's Energy Office," presentation (September 5, 2019), https://www.iso-ne.com/static-assets/documents/2019/09/clg_meeting_burgess_keynote_presentation_september_5_2019.pdf.

Audience questions were on the use of natural gas for home heating, the cost-effectiveness of heat pumps, and the possibility of increased electricity demand from strategic electrification of the heating and transportation sectors.

3.3.2 Panel Discussion

Liz Wyman, senior counsel at the Maine Office of the Public Advocate, moderated a panel of energy industry representatives to discuss the role of carbon in state and regional energy planning.

Panelists included **Jordan Stutt,** Carbon Programs director, Acadia Center; **Michael Macrae,** PhD, energy analytics manager, Harvard University; and **Michael Stoddard,** executive director, Efficiency Maine.

Jordan Stutt said the New England states have economy-wide goals to reduce greenhouse gases but face challenging questions regarding how to meet these goals.[29] He said a carbon tax would be an efficient way to pursue carbon reductions. He noted that the Regional Greenhouse Gas Initiative (RGGI) has essentially set a price on carbon, the New York ISO (NYISO) and PJM interconnection are both considering a carbon-pricing mechanism for their energy markets, and carbon-pricing legislation was introduced in all six states in 2019.

Michael Macrae said ISO New England should change the way it reports on the electric power sector's air emissions.[30] He said the ISO should incorporate the emissions associated with New York and Canadian imported energy into its regular emissions reporting and that the ISO overestimates the contribution of marginal units in small, local, export-constrained areas and should adopt the internal market monitor's methodology going forward for marginal emission rate reporting.

Michael Stoddard described the various demand-side policies driving carbon reductions in Maine, such as the *2009 Efficiency Maine Trust Act*.[31] He also described the programs the state plans to scale up to meet its newest renewable energy and carbon-reduction goals, such as the Home Energy Savings Program (HESP) and various electric vehicle rebate initiatives. He explained the state's ongoing efforts to reach its goal of installing 100,000 heat pumps statewide.

A question and answer session touched on topics such as home weatherization, the role of biofuel, and the cost savings associated with heat pumps.

3.3.3 ISO New England Update

Anne George, vice president for External Affairs and Corporate Communications at ISO New England, provided the ISO New England update.[32] Highlights include the following:

- ***2019 Regional System Plan* Public Meeting**—She shared that the ISO would hold the 2019 RSP public meeting at the Westin Copley Place in Boston, Massachusetts on September 12 from

[29] Jorden Strutt, "The Role of Carbon in State and Regional Energy Planning" presentation (September 5, 2019), https://www.iso-ne.com/static-assets/documents/2019/09/clg_meeting_stutt_panelist_presentation_september_5_2019.pdf.

[30] Michael Macrae, "Improving ISO-NE's Reporting on the Electric Power Sector's Air Emissions," presentation (September 5, 2019), https://www.iso-ne.com/static-assets/documents/2019/09/clg_meeting_macrae_panelist_presentation_september_5_2019.pdf.

[31] Michael Stoddard, "The Role of Carbon in State and Regional Energy Planning," presentation (September 5, 2019), https://www.iso-ne.com/static-assets/documents/2019/09/clg_meeting_stoddard_panelist_presentation_september_5_2019.pdf.

[32] Anne George, "ISO New England Update," presentation (September 5, 2019), https://www.iso-ne.com/static-assets/documents/2019/09/clg_meeting_george_iso_update_presentation_september_5_2019_final.pdf.

11:30 a.m. to 4:00 p.m. At the meeting, she explained that the ISO would present the final draft of, and receive feedback on, the 2019 RSP. The ISO develops an RSP every other year in collaboration with the Planning Advisory Committee. The 2019 meeting also included a keynote address and a panel discussion titled, "Transition to the Grid of the Future: Adapting to Disruptive Technologies"(see Section 5.2.2)

- **ISO New England Is Working Steadily to Meet FERC's Directive on Energy Security**

    - In July 2018, the Federal Energy Regulatory Commission directed the ISO to develop longer-term market solutions to the region's energy-security challenges. Since then, the ISO has been actively engaged with stakeholders through the NEPOOL Markets Committee to meet this directive. In July 2019, ISO New England presented its proposal and information on the ongoing impact analysis at a FERC public meeting, and the following month, FERC granted an extension for the filing of a long-term solution from October 15, 2019, to April 15, 2020 (refer to Section 5.1).

    - **ISO New England's Proposal Is Focused on Optimizing Limited-Energy Supplies**

        - The focus of the design has been on three new ancillary services (energy options) in the Day-Ahead Energy Market: replacement-energy reserves; generation-contingency reserves; and energy-imbalance reserves.

        - Two other components of the ISO's proposed solution include a Multi-Day-Ahead Market for Energy (M-DAM) and a Seasonal Forward Market.

    - **Impact Analysis of Proposed Design**—The objective of the impact analysis is to help stakeholders understand the market and reliability impacts of the proposed solution. The quantitative analysis will provide specific information on market and reliability impacts across a range of potential future system conditions. The analysis is ongoing, and preliminary results show that the design will likely impact net revenues in the capacity market, may impact entry and exit decisions in the capacity market, and may shift the region's resource mix toward those that improve energy security.

    - **Next Steps**—The ISO will continue stakeholder discussions and will file its proposal with FERC by April 2020. In September, the ISO discussed design ideas for the Seasonal Forward Market with NEPOOL stakeholders at the Markets Committee.

- **Planning is Well Underway for the Fourteenth Forward Capacity Auction (FCA #14)**

    - The annual auction procures resources to meet New England's forecasted capacity needs three years in the future, selecting a portfolio of supply and demand resources through a competitive Forward Capacity Auction (FCA) (See Section 5.4.3 for additional information. regarding FCA #14).

        - Retirement delist bids for FCA #14 were due to the ISO by March 15, 2019, and retirement delist bids for roughly 250 MW of capacity were submitted, mostly in the Maine (ME) and Connecticut (CT) load zones.

        - Four capacity zones will be modeled in FCA #14, with Maine as a "nested" capacity zone within the Northern New England zone. ISO New England has a process for determining the appropriate number and boundaries of capacity zones over time as

conditions change in the region. The four capacity zones in FCA #14 are Northern New England (export constrained); Maine "nested" capacity zone (export constrained); Southeast New England (import constrained); and rest-of-pool.

- **Next Steps**—In September, the NEPOOL Reliability Committee will vote on the ISO's zonal determinations and projected capacity need for the region, as well as other auction-related values. In October, the NEPOOL Participants Committee will vote on the ISO's determinations and calculations. In November, the ISO will submit a pre-FCA information filing with FERC for review. FCA #14 is scheduled to take place in February 2020 to procure the capacity resources needed during the 2023–2024 capacity commitment period.

- **ISO New England's proposed budget for 2020**—The ISO is a not-for-profit corporation that collects revenue from wholesale electricity market participants to fund its operational expenses. Each year, the ISO develops an operating budget and capital budget to fund the administrative services and capital projects it has planned for the next calendar year. These administrative services include major ISO responsibilities, such as operating the bulk power system and administering the competitive wholesale electricity markets for the region. (See Section 5.5 for additional information regarding the ISO New England 2020 budget.)

  - ISO New England presented its proposed 2020 budget to New England state agencies in August. The proposed capital budget for 2020 is projected to be $28 million, the same as the 2019 capital budget. The proposed operating budget for 2020, before depreciation and true up, is projected to be $174.2 million, which is $5.3 million or 3.1% higher than the 2019 operating budget. After depreciation and true up, the revenue requirement for 2020 is projected to be $199.5 million, which is $10.8 million or 5.8% more than the 2019 revenue requirement. If the ISO's projected revenue requirement for 2020 were fully passed through to end-use customers, their cost would average $1.02/month, based on average consumption.

  - **Next steps**—ISO New England plans to file its proposed 2020 budget with FERC in October. Under the formal budget review process, the New England states have the opportunity to submit questions and comments on the proposed budget following the August presentation. In September, the ISO's board of directors will review the budget, along with stakeholder feedback and the states' comments. In October, the ISO's board will vote on the proposed budget, and the ISO plans to file the budget with FERC for review in mid-October, requesting approval by January 1, 2020.

- **ISO New England emissions tracking and reporting**—The ISO provides regular updates on emissions through the Environmental Advisory Group (EAG).

  - The EAG is open to all interested stakeholders. Its core functions include tracking and evaluating state, regional, and federal environmental regulations and legislation that could affect the reliability and operation of the power system. The EAG also develops and updates environmental studies of the power system.

  - Each year, working with stakeholders through the EAG, the ISO issues an Electric Generator Air Emissions Report, which is a comprehensive analysis of New England electric generator air emissions, including nitrogen oxides (NO_X), sulfur dioxide (SO_2), and carbon dioxide (CO_2).

- The ISO's Electric Generator Air Emissions Report provides information on aggregate emissions (kilotons; kTons) and marginal emission rates (pounds/megawatt-hour; lb/MWh) for native generation inside New England. The report does not yet account for air emissions of imported energy into the ISO New England Control Area.

Audience questions touched on the value of biodiesel and offshore wind in winter months and NEPOOL's role and history as an advisory body to the ISO.

3.4 December 5: Ten Years of CLG: What We Learned in Our First Decade and What We Can Expect in the Second

Meeting objective: Discuss the first decade of the Consumer Liaison Group and what to expect of its second decade.

3.4.1 Welcoming Remarks: Rebecca Tepper, the chair of the Consumer Liaison Group Coordinating Committee and chief of the Energy and Telecommunications Division at the Massachusetts Attorney General's Office

Rebecca Tepper told the group the goal of the day's meeting was to talk about trends in energy—where the region has been and where it may be headed. She also offered what she called a "bit of a history lesson" for attendees who were less familiar with the CLG and its mission.

She noted the CLG was formed pursuant to a directive from the Federal Energy Regulatory Commission (FERC Order 719) whose focus was on enhancing the responsiveness of Regional Transmission Organizations to electricity consumers. In response to this order, stakeholders in New England formed a working group whose eventual agreements included the establishment of the CLG. Since that time, the CLG has held dozens of meetings and become a place for a two-way conversation between the ISO and consumers, Tepper said.

Tepper mentioned the next quarterly meeting of the CLG will take place in Vermont and encouraged attendees to suggest possible meeting topics. She also encouraged attendees to fill out a survey regarding the meeting and to suggest options for possible meeting topics in the future.

3.4.2 Keynote Speaker: Matthew Nelson, chair of the Massachusetts Department of Public Utilities

Matthew Nelson, chair of the Massachusetts Department of Public Utilities, delivered the keynote address.

In the past 20 years, Nelson said, markets have been successful in what they set out to do, "which is keep costs pretty low." However, 10 years ago, Massachusetts passed the *Green Communities Act*, which established objectives for the state's energy policy that included reducing demand for energy and increasing the amount of large-scale renewable energy resources on the system.[33] Because of this, the markets face additional considerations that did not exist when they were initially designed.

"I don't think markets are broken," he said. "It's that the world has changed around the markets." Nelson likened energy policy in Massachusetts to a three-legged stool that seeks to balance three interests: the environment, costs, and reliability.

Nelson said there is a role for fossil-fuel-fired generation as the region makes a transition to a cleaner electric grid. He also said he is closely monitoring the electrification of the transportation and heating sectors. He said he thinks the time of the gas-powered car is ending, but the transition to electric vehicles will take longer in

[33] State of Massachusetts, *An Act Relative to Green Communities* (Chapter 169) (July 2, 2008), https://malegislature.gov/laws/sessionlaws/acts/2008/chapter169.

rural areas. He said the increase in electricity load that results from electrification will need to be addressed, and the costs associated with the increasing load need to be examined. Nelson pointed to the Transportation and Climate Initiative (TCI) (see Section 3.3), which he said will be a good forum and opportunity to address the costs associated with the increased electricity load for EVs.

Regarding reliability, Nelson said the current distribution systems are not sufficient for increased distributed generation. Building the transmission upgrades necessary to accommodate the solar-seeking interconnection is not going to be a quick investment, he said. He also referenced a docket his agency has opened (DPU Docket No. 19-55) to address the issues arising with increased levels of distributed generation on the electric grid.[34]

Nelson noted the discussions regarding infrastructure investments in the state and said siting remains a challenge. He said people often do not understand why investments in infrastructure are necessary and that more communication regarding the state's energy policies is needed.

"If the consumer doesn't understand what we are trying to achieve and what policymakers are trying to achieve, we've done something wrong," he said. He also said low-income consumers must have better access to the clean energy incentives the state is pursuing.

"We can't lose sight of equity as we think about that clean energy future," he said.

Audience questions were on FERC's actions on natural gas pipelines, stranded costs, the deployment of solar in constrained areas of the electric power grid, the export of solar power to New York State, the role of natural gas in home heating, and smart meter deployment in Massachusetts.

3.4.3 Featured Speaker: Judy Chang, Principal, The Brattle Group

Judy Chang, principal at The Brattle Group, offered remarks titled, "Power Sector Trends: Customers Driving the New System."[35]

Chang explained the Brattle Group had recently released a report exploring the role consumers are playing in the trends transforming the power industry. These trends include reduced growth in traditional electricity consumption, increased customer preferences for clean energy, and the increasing electrification of transportation. She also discussed the costs of resources driving investments in energy and the relationship between renewable energy and energy storage.

A question and answer period touched on topics including the role of markets and long-term contracts with corporate efforts to offset their carbon footprints and consumer adoption of electric vehicles.

3.4.4 Panel Discussion

Peter Howe, senior advisor at Denterlein, moderated a panel of energy industry representatives to discuss the first decade of the CLG and what to expect in its next decade.

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[34] Massachusetts Department of Public Utilities, "Inquiry by the Department of Public Utilities on its own Motion into Distributed Generation Interconnection," Docket No. 19-55 (opened May 22, 2019), https://eeaonline.eea.state.ma.us/DPU/Fileroom/dockets/bynumber/19-55.

[35] Judy Chang," Power Sector Trends: Customers Driving the New System," presentation (December 5, 2019), https://www.iso-ne.com/static-assets/documents/2019/12/clg_meeting_chang_featured_speaker_presentation_december_5_2019.pdf.

Panelists included **Cal Bowie**, ISO Policy Group, Eversource Energy; **Robert Dostis**, vice president of Stakeholder Relations, Green Mountain Power (GMP)**; Brian Forshaw**, principal, Energy Market Advisors LLC; **Mary Beth Gentleman**, board member, FirstLight Power and E4TheFuture; and **Lisa Linowes**, executive director, The WindAction Group.

Howe asked each panelist what has surprised them about restructuring in New England and what has worked well with restructuring. The following are highlights of the discussion:

Robert Dostis said Green Mountain Power has committed to a 100% carbon-free portfolio by 2025 and an entirely renewable portfolio by 2030. He said so much solar has been deployed in the state, that GMP's distribution system has substations that cannot host additional solar. He also said Vermont chose not to restructure its retail electricity market, and he believes this was the right policy decision.

Brian Forshaw said ISO New England's market design does not value important attributes such as fuel diversity, local resilience, or economic development. He said the roots of the ISO's markets can be found in the 1965 Northeast Blackout. He said he did not think the introduction of markets would be successful and has been surprised to see the ISO's markets last as long as they have.

Cal Bowie said he believes restructuring has worked well in the energy market but not in the capacity market. He said here are many out-of-market agreements for state-sponsored resources, and the ISO must create new markets that more effectively capture the needs of the system. He said he is surprised the region has not taken steps to undo restructuring.

Mary Beth Gentleman said we are running out of time to address climate change and the region needs to move faster on adopting renewable energy resources and other technologies. She said the restructuring of New England's wholesale markets has led to lower emissions, but the region's markets must find a way to incorporate additional renewable resources.

Lisa Linowes said the CLG has a huge responsibility to warn consumers who do not understand why their electricity bills are so high. She said consumers do not know enough about the state policies that drive prices. She said deregulation has had a positive impact on New England because air emissions have declined and competition has been significant.

A question and answer session touched on the cost of renewable energy to the consumer.

3.4.5 ISO New England Update

Anne George, vice president for External Affairs and Corporate Communications at ISO New England, provided the regional update.[36] Highlights of her presentation are as follows:

- A Look Back and a Look Ahead at 10 Years of the Consumer Liaison Group
    - Since 2009, the CLG has hosted 43 meetings that have grown in attendance over time.
        - For example, 47 people attended the first meeting, and the CLG hit its all-time high for attendance on December 1, 2016, with 121 participants.

[36] Anne George, "ISO New England Update," presentation (December 5, 2019), https://www.iso-ne.com/static-assets/documents/2019/12/clg_meeting_george_iso_update_presentation_december_5_2019_final.pdf.

        - The group has hosted 22 ISO New England subject matter experts.
        - The group has visited 18 cities and towns throughout New England.
    - The region's energy mix has changed significantly since the CLG's establishment, and new technologies, such as battery storage, have connected to the system.
    - The region's annual generator emissions have declined significantly since 2008.

- Winter 2019/2020 Outlook
    - The ISO expects to have adequate energy supplies to meet demand for electricity this winter and has procedures in place to help maintain reliability on the coldest winter days.
    - In 2018, changes were made to one particular operating procedure (OP 21) to improve situational awareness and encourage proactive measures to avoid forecasted energy deficiencies.[37]

- Preparations for Forward Capacity Auction #14
    - FCA #14 is scheduled to take place in February 2020. Its goal is to procure resources needed to meet the demand for electricity, plus reserve requirements, from June 1, 2023 to May 31, 2024.
    - In November, the ISO submitted a pre-FCA informational filing with FERC for review. The filing includes the capacity zones to be modeled in the auction and the resources that qualified to participate in the auction.
    - The ISO qualified a total of 34,905 MW of existing capacity resources to participate in the auction:
        - 31,054 MW from existing generating resources
        - 83 MW from existing import resources
        - 3,768 MW from existing demand resources
    - The ISO qualified 516 new capacity resources, totaling 7,314 MW, to participate in the auction.
    - The net Installed Capacity Requirement is 32,490 MW.[38]

[37] ISO New England, *Operating Procedure No. 21, Energy Inventory Accounting and Actions during an Energy Emergency* (October 19, 2018), https://www.iso-ne.com/static-assets/documents/rules_proceds/operating/isone/op21/op21_rto_final.pdf.

[38] FERC subsequently accepted the FCA#14 values in a January 3, 2020 Order; https://www.iso-ne.com/static-assets/documents/2020/01/er20-311-000_1-3-20_order_accept_icr_for_fca_14.pdf.

- The ISO qualified 14 demand bids, totaling 446 MW, and 344 supply offers, totaling 749 MW, to participate in the substitution auction under the Competitive Auctions with Sponsored Policy Resources (CASPR) framework.

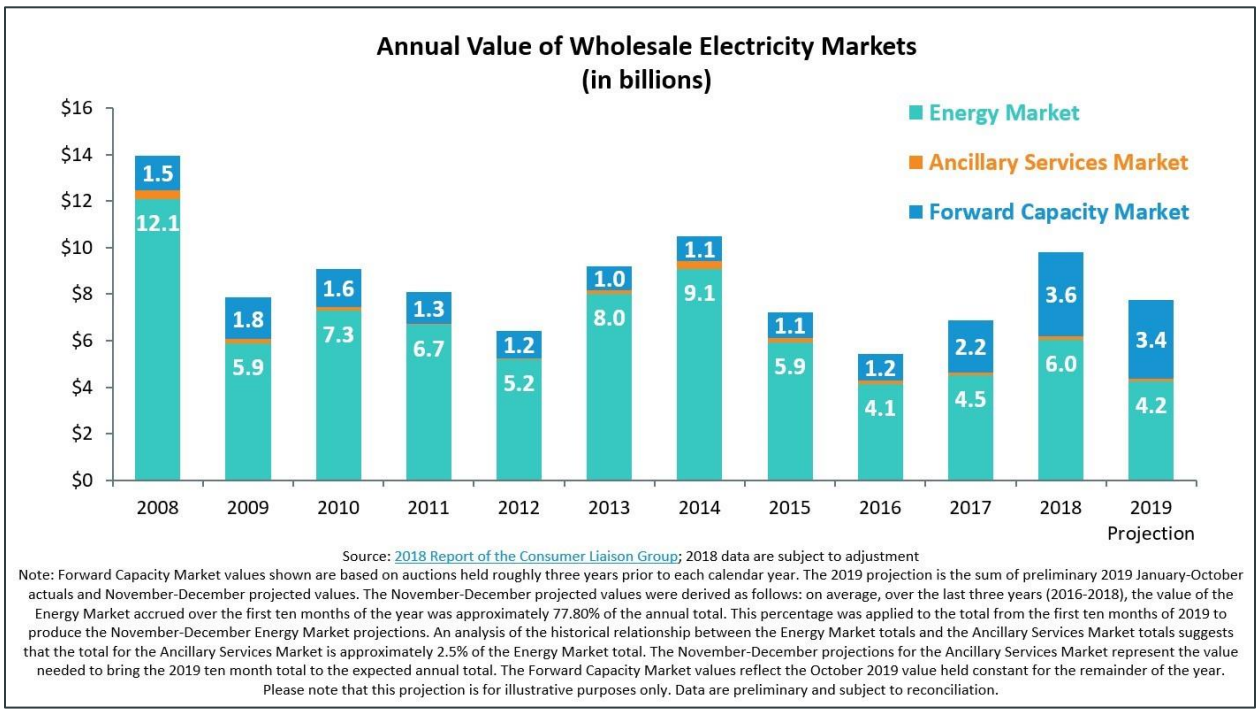
- Projected Wholesale Costs for 2019

  - The projected annual value of the region's wholesale electricity markets in 2019 is approximately $7.8 billion, down about $2 billion from the 2018 value of approximately $9.8 billion.

  - The cost of the energy market is projected to be $4.2 billion, a $1.8 billion reduction compared with the year prior. This reduction is due primarily to milder winter weather conditions than the previous year.

  - The projected cost of the capacity market in 2019 is $3.4 billion, down from $3.6 billion the year prior. This reduction is largely attributed to lower clearing prices in the related Forward Capacity Auction.

Figure 3-1 shows the value of New England's wholesale electricity markets from 2008 to 2019.



Source: 2018 Report of the Consumer Liaison Group; 2018 data are subject to adjustment

Note: Forward Capacity Market values shown are based on auctions held roughly three years prior to each calendar year. The 2019 projection is the sum of preliminary 2019 January-October actuals and November-December projected values. The November-December projected values were derived as follows: on average, over the last three years (2016-2018), the value of the Energy Market accrued over the first ten months of the year was approximately 77.80% of the annual total. This percentage was applied to the total from the first ten months of 2019 to produce the November-December Energy Market projections. An analysis of the historical relationship between the Energy Market totals and the Ancillary Services Market totals suggests that the total for the Ancillary Services Market is approximately 2.5% of the Energy Market total. The November-December projections for the Ancillary Services Market represent the value needed to bring the 2019 ten month total to the expected annual total. The Forward Capacity Market values reflect the October 2019 value held constant for the remainder of the year. Please note that this projection is for illustrative purposes only. Data are preliminary and subject to reconciliation.

Figure 3-1: Annual value on wholesale electricity markets in New England, 2008 to 2019 (billions of $).

Audience questions were on the role of markets in New England's emissions reductions, the ISO's methodology to calculate emissions in the region, and the nature of the new capacity participating in FCA #14.

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.

After celebrating the tenth year of the CLG in 2019, a special focus in 2020 will be on updating the CLG bylaws and governance documents.

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

To identify and select topics of interest to address at future CLG meetings for fully engaging consumers and consumer advocates, the members of the CLG Coordinating Committee meet before each of the quarterly meetings. In particular, the CLGCC attempts to identify market or policy issues 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 in the course of their other professional responsibilities.

The locations of the CLG quarterly meetings rotate among the New England states, and Coordinating Committee members from the host state typically recommend people who might deliver the keynote address and others who might contribute to the panel discussion. The remaining CLG Coordinating Committee members provide additional assistance and approvals, when necessary. Before the CLG meeting, confirmed panelists participate in a planning call with the panel moderator (a CLGCC member) and ISO New England 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 CLGCC encourages all interested participants to recommend potential topics, via either the participant survey or direct communication with the CLG Coordinating Committee.

Section 5
ISO New England Activities and Initiatives

This section highlights the major topics presented by the ISO at CLG meetings in 2019. In addition to these presentations, the ISO'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 relevant to consumers.[39]

[39] The monthly memos are posted at the ISO's CLG webpage at http://www.iso-ne.com/committees/industry-collaborations/consumer-liaison.

5.1 Energy Security: Challenges and Opportunities Facing the New England Power System amid a Transforming Resource Mix

Driven by public policy and technological innovation, the electricity grid in New England is undergoing a major transformation. Now and for the foreseeable future, much of New England's electricity is likely to come from natural-gas-fired plants, nuclear power, and renewable energy resources. While this change could comport well with policy goals for the New England power grid, it also presents new challenges because the emerging resource mix relies on the "just-in-time" delivery of energy sources (i.e., in the form of fuel or solar and wind energy).

New England's wholesale markets were designed when most resources had on-site fuel. For example, in 2000, oil-burning resources met 19% of the region's energy demand; in 2019, this figure fell to less than 1%. In 2000, natural-gas-burning resources met 13% of the region's demand for electricity. In 2019, this figure was 40%. In 2000, less than 40 MW of PV was installed in New England. In 2019, PV installations surged to 3,400 MW.

Figure 5-1 shows that in 2019, natural gas, nuclear, imported electricity (mostly hydropower from Eastern Canada), renewables, and other low- or non-carbon-emitting resources met most of the region's energy needs.

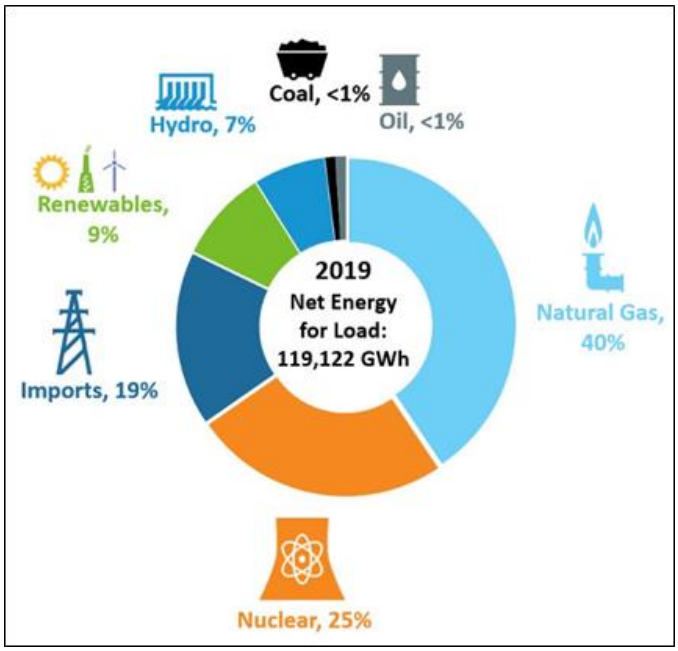


Figure 5-1: New England power resources in 2019.

Source: ISO New England Net Energy and Peak Load by Source; data for 2019 is preliminary and subject to adjustment. Renewables include landfill gas, biomass, other biomass gas, wind, grid-scale solar, municipal solid waste, and miscellaneous fuels. This data does not include behind-the-meter resources, such as BTM solar.

The risks associated with these changes increase when the fuel-delivery system is constrained, such as in extended cold weather or when renewable resources experience adverse weather. While no loss of load has been attributable to insufficient energy supplies to date, ISO New England anticipates this risk to increase

over time as the grid's transformation continues. It is therefore developing proactive solutions for the evolving grid.

ISO New England has taken several steps to address this reliability challenge, including the following:

- Improvements to communications with the natural gas industry
- Better alignment between the natural gas industry and electricity markets
- Enhanced situational awareness tools in the control room
- Improvements to energy emergency forecasting and reporting to provide the marketplace with greater information on fuel inventories and expected system conditions
- Changes to the rules regarding the calculation of opportunity costs
- Temporary inventoried energy program
- Pay for performance (PFP)
- Retention of resources on the basis of a fuel-security need

However, in a July 2018 order, FERC wrote that the ISO's tariff "may be unjust and unreasonable" because it "fails to address specific regional fuel-security concerns."[40] Since then, the ISO has been working with stakeholders through the NEPOOL Markets Committee to develop a sustainable, market-based solution to address the energy-security challenges posed by the region's evolving resource mix.

On April 1, 2019, the ISO released a white paper discussing energy-security challenges and the ISO's perspective on the causes and longer-term market solutions to them.[41] The ISO argues that current market designs also fail to efficiently coordinate the use of limited stored energy, such as oil or LNG, to meet demand for power across multiple days. The paper proposed a set of market design improvements to address these problems, providing a series of specific, numeric examples to illustrate the proposed design changes.

Broadly, the ISO is recommending the expansion of the existing energy and ancillary service markets to reliably and cost-effectively address a power system becoming more reliant on limited-energy supplies. Members of the ISO's Market Development team have been working with the NEPOOL Markets Committee to develop the market rule changes.

In a July 15, 2019, FERC public meeting, members of ISO New England's Market Development team discussed proposed market changes and the impact analysis examining these changes. The session included members of FERC staff, representatives of ISO New England, NEPOOL, and the New England States Committee on Electricity (NESCOE). ISO chief economist Matt White and director of Market Development Chris Parent gave a presentation on the ISO's ongoing market-design efforts and answered questions from commissioners and

[40] FERC, *Order Denying Waiver Request, Instituting Section 206 Proceeding, and Extending Deadlines* (July 2, 2018), https://www.iso-ne.com/static-assets/documents/2018/07/er18-1509-000_7-2-18_order_deny_waiver_request.pdf.

[41] ISO New England, "Energy-Security Improvements," white paper (April 2019), https://www.iso-ne.com/static-assets/documents/2019/04/a00_iso_discussion_paper_energy_security_improvements.pdf.

commission staff.[42] All related materials and presentations from the session, including a recording of the webcast, are available on the FERC website.[43]

The desired change of the Energy-Security Improvement (ESI) project is to reward resources that take action to provide reliability during periods of system stress—a reliability service that can be accomplished in different ways. For example, a solar facility with battery storage has the same opportunity to provide these reliability services as a natural gas plant with a contract for liquefied natural gas or an offshore wind farm that operates at a high capacity factor during winter. All may be rewarded under the ESI design, and ESI may actually accelerate the transition to reliable zero carbon, renewable resources, and storage technologies by recognizing and compensating these resources for the reliability attributes they provide.

As the ISO works on its ESI project, it is also completing an impact analysis intended to inform stakeholders about the expected impacts of the proposed rules on a variety of market outcomes. Preliminary results from the impact analysis stated that ESI would create incentives for resources to maintain more secure energy supplies, improve efficiency and lower production costs under certain stressed market conditions, and improve reliability outcomes by increasing incentives to ensure deliverability of energy supplies in real-time.[44] The ISO plans to file its long-term proposal at FERC by April 15, 2020, with the changes implemented on June 1, 2024.

5.2 Regional System Planning

Two key aspects of the ISO's planning process in 2019 included developing forecasts of energy use and preparing the 2*019 Regional System Plan*.

5.2.1 Grid Transformation Day

In May 2019, the Planning Advisory Committee hosted a special day of presentations and discussions on the theme of grid transformation.[45] The ISO System Planning team moderated three expert panels to explore the pathways for transforming the grid into a more decentralized and decarbonized system. Experts ranging from national laboratory engineers, to transmission operators, to renewable energy service companies explored the challenges and benefits of deploying and integrating greater amounts of renewable electricity into the grid while maintaining a high level of reliability. The audience included state officials, policy and regulatory stakeholders, and market participants, in addition to regular PAC members. The September 5, 2019 CLG meeting, which focused on the role of carbon in state and regional planning, also addressed this topic.

5.2.2 *2019 Regional System Plan* and Public Meeting

A core part of ISO New England's mission is ensuring that the regional transmission system can reliably deliver power to consumers under a wide range of future system conditions. The ISO conducts comprehensive regional power system planning through an open stakeholder process and publishes a Regional System Plan (RSP) that summarizes the long-term (10-year) reliability needs of New England's

[42] Matthew White and Christopher Parent, "Energy Security Improvements: Market Solutions for New England," presentation (ISO New England, July 15, 2019), https://www.iso-ne.com/static-assets/documents/2019/07/07_12_2019_ferc_white_final_web.pdf.

[43] FERC, Public Meeting, July 15 2019, webpage, https://www.ferc.gov/EventCalendar/EventDetails.aspx?ID=13418&CalType=%20&CalendarID=116&Date=&View=Listview.

[44] All materials regarding the ESI project and the related impact analysis are available at the NEPOOL Markets Committee page on the ISO website: https://www.iso-ne.com/committees/markets/markets-committee/.

[45] All the speaker presentations and biographies from Grid Transformation Day are available on the ISO's website: https://www.iso-ne.com/committees/planning/planning-advisory/?eventId=137649.

transmission system. Stakeholders, including state policymakers, market actors, and consumer advocates, have opportunities to provide input to the planning process and the RSP through the Planning Advisory Committee.

The RSP is published every other year, with the *2019 Regional System Plan* (RSP19), released on November 1, 2019.[46] In addition to the regular PAC meetings and updates to the CLG, the ISO hosts a biennial public meeting to review the final draft RSP. The ISO hosted the RSP19 Public Meeting on September 12 in Boston, Massachusetts.[47] The event, attended by state public officials, industry stakeholders, and members of the public, included a keynote speech from Damir Novosel, a power systems expert and President of Quanta Technology; an overview of the RSP19 report; and a panel discussion about grid transformation.

5.2.3 Energy-Efficiency and Distributed Generation Forecasts

Since 2012, the ISO has developed an energy-efficiency (EE) forecast to equip system planners with information about the long-term impacts of energy efficiency investments on the region's peak and overall demand for energy. Energy efficiency is a key topic experts and policymakers at the CLG have addressed since its inception. At the September 5, 2019, meeting (see Section 3.3), Michael Stoddard, executive director of Efficiency Maine, discussed various EE efforts underway in Maine, and at the June meeting (see Section 3.2), Maggie McCarey, director of the Energy Efficiency Division at the Massachusetts DOER discussed state policy drivers and developments for EE.

Through the Forward Capacity Market, the ISO identifies EE resources that will be developed in the near term (i.e., in approximately the three-to-four-year timeframe), if these resources take on a commitment through the capacity auction. The ISO develops the EE 10-year forecast to identify EE resources it anticipates will be developed beyond the FCM timeframe, which is input into long-term transmission and economic planning studies.

Developing this forecast is a collaborative process led by the ISO with input from the Energy-Efficiency Forecast Working Group (EEFWG).[48] The process incorporates input from state-sponsored EE programs and state regulatory agencies. State policies are the major drivers of EE investments, and thus the forecast model is built using state policy information on EE statutory targets, funding levels, and economic trends, as well as FCM inputs such as clearing prices.

The most recent 2019 EE forecast was released on May 1, 2019, with the next one scheduled for release in May 2020.[49] The ISO forecasts that the region will have approximately 5,400 MW of EE resources by 2028, up from 2,500 MW through 2018.[50]

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[46] ISO New England, *2019 Regional System Plan* (October 31, 2019), https://www.iso-ne.com/static-assets/documents/2019/10/rsp19_final.docx.

[47] All the materials for the RSP19 Public Meeting, including the keynote presentations, are available on the RSP Public Meeting event page: https://www.iso-ne.com/committees/planning/planning-advisory/?eventId=138858.

[48] More information about the EEFWG is available at the ISO's "Energy-Efficiency Forecast Working Group," webpage (2020), https://www.iso-ne.com/committees/planning/energy-efficiency-forecast/.

[49] ISO New England, *Final 2019 Energy-Efficiency Forecast for 2019–2028* (May 1, 2019), https://www.iso-ne.com/system-planning/system-forecasting/energy-efficiency-forecast. More information on the ISO's 2020 draft energy-efficiency forecast is available at the EEFWG webpage: http://www.iso-ne.com/committees/planning/energy-efficiency-forecast.

[50] ISO New England, *Final 2019–2028 Forecast Report of Capacity, Energy, Loads, and Transmission* (2019 CELT Report) (May 1, 2019), https://www.iso-ne.com/static-assets/documents/2019/04/2019_celt_report.xls.

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.[51] For purposes of this forecast, DG resources are 5 MW or less in nameplate capacity and are interconnected to the distribution system. Solar PV resources represent the largest share of DG resources throughout New England.

The final 2019 PV forecast shows steady growth in PV through 2028, with approximately 6,744 MW of solar PV (AC nameplate rating) to be installed by 2028 throughout New England.[52] The forecast also reported that about 2,884 MW of solar PV had been installed throughout New England through the end of 2018.

Table 5-1 shows the 2019 PV forecast for New England and a breakout for each state.

Table 5-1
ISO New England 2019 PV Forecast (Nameplate Capacity, MW_{ac})

States	Annual Total MW (AC nameplate rating)											
	Thru 2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	Totals
CT	464.3	68.4	91.1	97.5	97.5	71.6	71.6	71.6	71.6	43.5	42.1	**1,190.9**
MA	1,871.3	292.0	288.0	272.0	272.0	272.0	204.0	176.0	170.7	165.3	160.0	**4,143.2**
ME	41.4	7.1	7.1	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	**109.7**
NH	83.8	12.7	12.7	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	**205.6**
RI	116.7	51.3	51.3	48.5	42.4	42.4	42.4	42.4	42.4	42.4	42.4	**564.6**
VT	306.3	31.5	22.5	21.3	21.3	21.3	21.3	21.3	21.3	21.3	21.3	**530.3**
Regional—Annual (MW)	**2,883.8**	**463.1**	**472.8**	**458.0**	**451.9**	**426.0**	**358.0**	**330.0**	**324.7**	**291.3**	**284.6**	**6,744.4**
Regional—Cumulative (MW)	**2,883.8**	**3,346.9**	**3,819.8**	**4,277.8**	**4,729.7**	**5,155.7**	**5,513.8**	**5,843.8**	**6,168.5**	**6,459.8**	**6,744.4**	**6,744.4**

Source: ISO New England, *Final 2019 PV Forecast*, presentation (April 29, 2019), https://www.iso-ne.com/static-assets/documents/2019/04/final-2019-pv-forecast.pdf.

The ISO develops the EE and solar PV forecasts with input from stakeholders; the forecasts are published in the ISO's annual *Capacity, Energy, Loads and Transmission* (CELT Report).[53]

5.2.4 Heating and Transportation Electric Forecast

As part of the 2020 CELT Report, ISO New England will begin to include forecasted impacts of heating and transportation electrification on state and regional electric energy and demand. The 10-year projections provided in the CELT Report are used in power system planning and reliability studies. The electrification of

[51] Information about the DGFWG is available at the ISO's "Distributed Generation Forecast Working Group," webpage (2020), https://www.iso-ne.com/committees/planning/distributed-generation/. Information about the latest DG forecast is available at https://www.iso-ne.com/system-planning/system-forecasting/distributed-generation-forecast/.

[52] ISO New England, *Final 2019 Solar PV Forecast* (April 29, 2019), https://www.iso-ne.com/static-assets/documents/2019/04/final-2019-pv-forecast.pdf. More information on the ISO's PV forecast is available at the ISO's "Distributed Generation Forecast," webpage (2020), https://www.iso-ne.com/system-planning/system-forecasting/distributed-generation-forecast/.

[53] The ISO's CELT Reports and related materials are available at https://www.iso-ne.com/system-planning/system-plans-studies/celt/.

the heating and transportation sectors is expected to play a pivotal role in meeting state mandates and goals for reducing greenhouse gases (GHG) and to increase overall demand for electricity in the coming decades, as discussed by various CLG presenters throughout 2019.

The ISO will initially focus its transportation electrification forecasting efforts on light-duty vehicles (LDV), including cars and light-duty trucks. Its heating electrification forecasting will focus on consumer adoption of air-source heat pumps (ASHPs) and the resulting regional impacts on demand and energy during winter months (i.e., January through April and October through December).

Draft heating and transportation electrification forecasts were presented at the December 20, 2019, meeting of the NEPOOL Load Forecasting Committee.[54] The final heating and transportation electrification forecasts will be included in the 2020 CELT Report.

5.3 Competitive Solicitation, Planning Transmission for Public Policy under FERC Order 1000

In December 2019, ISO New England issued the region's first competitive solicitation to address a reliability need in the transmission system, and in early 2020, the ISO initiated a process to evaluate the potential need for transmission required to meet public policy objectives. Both actions were taken pursuant to FERC's *Final Rule on Transmission Planning and Cost Allocation*, known as Order 1000. FERC issued the final rule in July 2011 and subsequently issued a series of orders from 2013 to 2015 specific to New England. Order 1000 also reformed regional and interregional electric power transmission planning, as well as cost-allocation requirements, building on the previous reforms of FERC Order 890.[55]

For reliability transmission projects, the planning process starts with the development of a study scope for a particular region within New England, followed by a needs assessment (NA). If the NA reveals violations of reliability standards or other regulated criteria during the study period, potential solutions must be developed to address these needs. If the identified need is less than or equal to three years out (i.e., time-sensitive needs), solutions are developed with the incumbent transmission owner through a solutions study. If the identified needs are non-time sensitive, the ISO will issue an RFP for a competitive solution(s) and will evaluate any proposals submitted by Qualified Transmission Project Sponsors (QTPSs). In October 2019, FERC issued an order instituting a proceeding (Docket EL19-90-000) to "consider how the exemption for immediate-need reliability projects [under Order 1000]… is being implemented," and the ISO filed responses to the initial questions in that proceeding.[56]

On December 20, 2019, ISO New England issued the region's first request for proposals (RFP) for competitively developed transmission solutions to address non-time-sensitive reliability needs in the Boston area. The ISO identified these needs in its 2028 Boston Needs Assessment (this includes the Boston 2028 NA Update and the Boston 2028 NA Addendum), initiated after the announced retirement of Mystic Generating

[54] Materials for the December 20, 2019, NEPOOL Load Forecasting Committee meeting are available at https://www.iso-ne.com/committees/reliability/load-forecast/?eventId=140325.

[55] FERC, *Preventing Undue Discrimination and Preference in Transmission Service*, final rule (February 17, 2007), https://www.ferc.gov/whats-new/comm-meet/2007/021507/E-1.pdf.

[56] FERC, *Order Instituting Section 206 Proceedings,* Docket Nos. EL 19-90-000, 19-91-000, and 19-92-000 (October 17, 2019), https://www.ferc.gov/whats-new/comm-meet/2019/101719/E-3.pdf. ISO New England, *Response of ISO New England, Inc. to Order Instituting Section 206 Proceedings*, Docket NO. EL19-90-000 (December 27, 2019), https://www.iso-ne.com/static-assets/documents/2019/12/el19-90_206_proceeding.pdf.

Station. Proposals were due on March 4, 2020.[57] There was a robust response to the RFP and further information will be provided to stakeholders at the PAC.

For public policy and market-efficiency transmission, FERC Order 1000 requires a competitive process. The ISO initiated a transmission planning for public policy process for the first time in 2017 and the ISO determined, in consultation with the states and stakeholders, that a need did not exist at that time for transmission infrastructure to meet public policy objectives.[58] This process commenced again on January 14, 2020, beginning with a notice to the Planning Advisory Committee, and it continues with an assessment of the need from the states through NESCOE and stakeholder comments. The ISO will keep stakeholders apprised of this effort through the Planning Advisory Committee.

5.4 Wholesale Electricity Markets

In 2019, ISO New England provided updates to the CLG regarding the markets it designs and operates, with key points summarized below.

5.4.1 The Role of Energy-Efficiency Resources in the Forward Capacity Market

Throughout 2019, the ISO, NEPOOL, and state stakeholders discussed the role of energy efficiency in the FCM, and specifically how EE resources with a capacity supply obligation (CSO) should be treated during capacity-scarcity conditions under the FCM's pay-for-performance provisions. EE resources with a CSO are currently only assessed and measured during on-peak periods. A capacity-scarcity event that triggered PFP on September 3, 2018 (Labor Day) raised concerns about how EE was being assessed in light of how financial credits and penalties were levied across all resources with a CSO.

ISO director of Demand-Resource Strategy, Henry Yoshimura, discussed this situation at the September 5, 2019, CLG meeting (see Section 3.3). In a March 5, 2019 referral, the NEPOOL Markets Committee (MC) directed the Demand-Resources Working Group (DRWG), which Yoshimura chairs, to explore options for assessing EE performance in all hours for existing and new energy-efficiency.[59] The DRWG was also directed to assess whether any additional methodological standards and reporting mechanisms are required to accommodate such a change.

The DRWG considered five options to assess EE resource performance in all hours. Many DRWG participants expressed interest in one option among those considered that would estimate hourly EE resource performance as a function of established on-peak EE resource savings and system load levels, which are correlated. This option "shapes" the EE resource performance in off-peak hours on the basis of known system load in all hours and EE resource performance in on-peak hours. This option is referred to as "Shaping Option

[57] Up-to-date information regarding the Greater Boston Key Study Area is available on the ISO website at https://www.iso-ne.com/system-planning/key-study-areas/greater-boston/.

[58] NESCOE, "NESCOE Submission Regarding Transmission Needs Driven by State and Federal Public Policy Requirements," submission to ISO New England (May 1, 2017), https://www.iso-ne.com/static-assets/documents/2017/05/nescoe_submission_public_policy_transmission_upgrades.pdf.

[59] ISO New England, "Actions of the Markets Committee," (March 6, 2019), https://www.iso-ne.com/static-assets/documents/2019/03/03_05_06_mc_actions_final.pdf. For more information on the DRWG, refer to the ISO's "Demand Resources Working Group," webpage (2020) at https://www.iso-ne.com/committees/markets/demand-resources/.

A." The final report of the DRWG for assessing the performance of energy-efficiency resources in all hours was released in July 2019.[60]

Although MC stakeholders did not come to a consensus recommendation, NESCOE proposed to modify the ISO tariff to implement Shaping Option A as the method for EE performance and the treatment of energy-efficiency resources during capacity-scarcity conditions. In February 2020, NESCOE presented a revised proposal to the MC and said it would continue to work with stakeholders to find a solution that can achieve broader NEPOOL support.[61]

5.4.2 Annual Markets Report from ISO New England's Market Monitors

The ISO regularly reports on the performance of the region's wholesale electricity markets.[62] 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.[63]

In May 2019, the internal market monitor published the *2018 Annual Markets Report*.[64] 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, 2018, and determined that New England's capacity, energy, and ancillary service markets performed well and exhibited competitive outcomes, with an "overall improvement in the structural competitiveness of the real-time energy market." Anne George summarized the report results during her ISO update at the June CLG meeting (see Section 3.2).

Among other observations, the report noted that the total wholesale cost of electricity in 2018, at $12.1 billion, was considerably higher than 2017, increasing by 32%, or by $2.9 billion. This increase was substantially due to higher energy and capacity market costs, which accounted for 98% of the overall increase from 2017. Energy costs were up 34%, or $1.5 billion, from 2017, largely due to higher natural gas prices in the winter and higher electricity demand during a hot and humid summer. Capacity costs increased by $1.4 billion, or by 61%, over 2017 costs. Up until FCA #8, capacity prices were relatively low and set administratively at the market floor prices due to surplus capacity conditions. Significant generator retirements in FCA #8 triggered a capacity deficiency and raised the clearing prices for both existing and new resources. In FCA #9, the clearing price reached $9.55/kW-month, which incented new entry. The report also noted that capacity costs represent an increasing share of overall wholesale costs.

5.4.3 Forward Capacity Auction #14

The fourteenth Forward Capacity Auction was held on February 5, 2020, and concluded with the lowest clearing price in the auction's history. The auction closed at a clearing price of $2.00/kW-month across New

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[60] ISO New England, *Assessing Energy Efficiency Resource Performance in All Hours* final report (July 12, 2019), https://www.iso-ne.com/static-assets/documents/2019/07/reportofthedrwgonassessingeerperformanceinallhours_final2.pdf.

[61] NESCOE, *Energy Efficiency Resources and Capacity Obligations during Scarcity Conditions*, presentation (February 11, 2020), https://www.iso-ne.com/static-assets/documents/2020/02/a3_a_nescoe_ee_cso_during_scarcity_conditions_presentation.pptx.

[62] The ISO's various market reports are posted at its "Market Performance Reports," webpage (2020), http://www.iso-ne.com/markets-operations/market-performance/performance-reports.

[63] 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.

[64] ISO New England, *2018 Annual Markets Report* (May 23, 2019), https://www.iso-ne.com/static-assets/documents/2019/05/2018-annual-markets-report.pdf.

England, compared with $3.80/kW-month in the 2019 auction. The ISO filed finalized results of the auction with FERC on February 18.[65]

Resources totaling 42,219 MW, including 34,905 MW of existing capacity and 516 new resources totaling 7,314 MW, qualified to participate in the FCM, while the regional capacity target for 2023–2024 is 32,490 MW.

The primary auction concluded with commitments from 33,956 MW to be available in 2023–2024, with 1,466 MW of surplus supply over the net installed capacity requirement. The auction rules allow the region to acquire more or less than the capacity target, providing flexibility to acquire additional capacity and enhanced reliability at a cost-effective price.

More than 600 MW of new resources within New England secured obligations during the primary auction. Of this total, approximately 317 MW received their obligations under the renewable technology resource (RTR) designation. The RTR designation allows a limited amount of renewable resources to participate in the auction without being subject to the minimum offer-price rule. Resources receiving an obligation under the exemption included onshore and offshore wind, solar photovoltaic systems, and solar PV systems paired with batteries. Approximately 19 MW remain under the exemption for next year's capacity auction, which will be the last to include the RTR exemption.

No capacity supply obligations were traded this year under auction rules that allow existing resources interested in retiring to trade their obligations with new state-sponsored resources that did not clear in the primary auction.

Before the auction, ISO New England retained two units, Mystic 8 and 9, needed for fuel security in the 2023–2024 capacity year.

The annual FCM auction is held three years before each capacity commitment period to provide time for new resources to be developed. Capacity resources can include conventional power plants, renewable generation, imports, and demand resources such as load management and energy-efficiency measures. Resources that clear in the auction receive a monthly capacity payment in that future year in exchange for their commitment to provide power or curtail demand when called on by the ISO.

Resources that fail to meet their capacity commitment during a shortage event must refund part of their capacity payment; this refunded money goes to resources that overperformed during the shortage event. The capacity market is separate from the energy market, where resources with and without a capacity commitment compete on a daily basis to provide power and are paid for the electricity they produce.

[65] "ISO New England Inc., Docket No. ER20-___-000, Forward Capacity Auction Results Filing," FERC filing (February 18, 2020), https://www.iso-ne.com/static-assets/documents/2020/02/fca_14_results_filing.pdf.

5.5 The ISO's Budget Review Process

After an extensive review process with state regulators, on October 15, 2019, the ISO filed its proposed 2020 operating and capital budgets with FERC for review and approval, effective January 1, 2020.[66] The commission accepted the ISO's budget on December 19, 2019.[67]

5.5.1 Proposed Operating Budget

The proposed operating budget for 2020, before depreciation and true up (i.e., overcollection), is projected to be $174.2 million, which is $5.3 million or 3.1% higher than the 2019 operating budget. After depreciation and true up, the revenue requirement for 2020 is projected to be $198.8 million, which is $10.1 million or 5.4% higher than the 2019 revenue requirement ($188.7 million). The 2020 revenue requirement reflects a $2.9 million true up of revenues from 2018. If the ISO's projected revenue requirement for 2020 were fully passed through to end-use customers, their cost would average $1.02/month (up from $0.97/month for the 2019 revenue requirement).

Major items driving the increase over the 2019 operating budget include expenses related to cybersecurity, North American Electric Reliability Corporation (NERC) Critical Infrastructure Protection (CIP) compliance costs, network modeling and Energy Management System maintenance, Forward Capacity Market enhancements, and energy security market improvements. Also included are costs associated with FERC Order 1000 implementation and management of competitive transmission proposals to address needs in Boston after the retirement of Mystic Generating Station.

The 2020 operating budget does not include new full-time-equivalent employees.

5.5.2 Proposed Capital Budget

The proposed capital budget for 2020 is projected to be $28 million, the same as the 2019 capital budget. The capital budget includes major projects already in development (e.g., the Energy Market Offer Caps Project pursuant to FERC Order 831) and projects in the planning/conceptual design stage (e.g., energy security and cybersecurity improvements).[68]

5.5.3 Budget-Review Process

The ISO's budget-development process begins in January of each year with stakeholder discussions on priorities in planning, operations, and capital projects. In the June to August timeframe, the ISO presents preliminary operating and capital budgets to its stakeholders for review. By the end of October, the ISO submits its final operating and capital budgets to FERC for review. 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 October.

The ISO's formal budget-review process includes a preliminary budget presentation at the annual New England Conference of Public Utilities Commissioners (NECPUC) Symposium in June and an additional budget

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66 ISO New England Inc., *Filing of 2019 Capital Budget and Revised Tariff Sheets for Recovery of 2020 Administrative Costs*, Docket No. ER20-106-000 (October 15, 2019), https://www.iso-ne.com/static-assets/documents/2019/10/2020_admin_and_capital_budget.pdf.

[67] FERC, *2020 Capital Budget and Revised Tariff Sheets for Recovery of 2020 Administrative Costs*, Docket No. ER20-106-000, letter order (December 19, 2019), https://www.iso-ne.com/static-assets/documents/2019/12/er20-106-000.pdf.

[68] FERC, Offer Caps in Markets Operated by Regional Transmission Organizations and Independent System Operators, final rule (November 17, 2016), https://www.ferc.gov/whats-new/comm-meet/2016/111716/E-2.pdf.

presentation with the New England states in August.[69] After the budget presentation in August, the New England states can submit questions and comments on the proposed budget, for which the ISO issues formal responses. The comments submitted by the New England states and the ISO's responses are filed with FERC in October alongside the proposed budget.

More information regarding the ISO's budget is available on the ISO website.[70]

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 each utility's and state's procurement practices for retail power. Understanding these differences is essential when comparing the two markets.

Table 6-1 shows the range of average wholesale market costs for calendar years 2012 to 2019 among the New England states and the range of residential retail power supply rates in effect immediately thereafter (i.e., on January 1 of each year) for each of the states with unbundled retail electricity markets.

[69] 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.

[70] ISO New England, "The ISO's Budget," webpage (2020), is https://www.iso-ne.com/about/corporate-governance/budget/.

Table 6-1
Wholesale Market Costs and Residential Retail Power Supply Rates (¢/kWh)[a]

	Wholesale Market Costs (¢/kWh)	Date Residential Retail Power Supply Rates in Effect	Residential Retail Power Supply Rates[b] (¢/kWh)
2012	4.82 – 5.10	**January 1, 2013**	7.19 – 9.08
2013	6.75 – 7.23	**January 1, 2014**	6.81 – 9.56
2014	7.53 – 8.27	**January 1, 2015**	7.56 – 15.56
2015	5.43 – 5.78	**January 1, 2016**	6.56 – 11.85
2016	4.11 – 4.37	**January 1, 2017**	6.64 – 10.36
2017	5.36 – 5.68	**January 1, 2018**	7.83 – 12.61
2018	7.48 – 7.81	**January 1, 2019**	8.92 – 13.51
2019	6.13 – 6.20	**January 1, 2020**	7.24 – 13.11

(a) The analysis is based on a hypothetical residential consumer that uses 750 kWh/month. The values indicate a range of lowest-to-highest costs among the states. Wholesale markets costs for 2019 are preliminary.

(b) The ranges for residential retail power supply rates include 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 2018 to 2019, wholesale market costs decreased 18% to 21% in all the New England states, largely because of decreases in wholesale energy market costs during 2019, due to a milder winter and lower natural gas prices compared with those in 2018. All the states with unbundled retail electricity markets (Connecticut, Maine, Massachusetts, New Hampshire, and Rhode Island) saw a decrease in retail power supply rates in effect on January 1, 2020, compared with retail power supply rates in effect on January 1, 2019.
- Three of the six states saw an increase in total residential retail electricity rates in effect on January 1, 2020, compared with total residential retail electricity rates in effect on January 1, 2019. These rates include costs for power supply, transmission, distribution, and all other delivery service charges.[71]
- The estimated regional transmission rate decreased by approximately 1% from 2018 to 2019 (from 1.7584 ¢/kWh in 2018 to 1.7344 ¢/kWh in 2019) and is equivalent to 7% to 11% of total residential retail electricity rates in effect on January 1, 2020, which ranged from 15.48 ¢/kWh to 25.43 ¢/kWh.[72]

[71] Total residential retail electricity rates in effect on January 1, 2019, ranged from 17.17 to 25.28 ¢/kWh among the New England states. Total residential retail electricity rates in effect on January 1, 2020, ranged from 15.48 to 25.43 ¢/kWh among the New England states.

[72] 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 and tariff-based reliability services for the specific period, divided by the total net energy for load for the same period. For 2019, the period is based on the 12 months ending December 31, 2019. 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. Information on net energy for load is available at http://www.iso-ne.com/isoexpress/web/reports/load-and-demand/-/tree/net-ener-peak-load.

- A review of actual transmission rates for residential retail consumers in Connecticut, Maine, Massachusetts, New Hampshire, and Rhode Island in effect on January 1, 2020 shows that transmission represents 11% to 22% of total residential retail electricity rates.[73]

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 12 years, total annual costs have ranged from a low of $7.7 billion in 2016 to a high of $14.9 billion in 2008.

Table 7-1 summarizes New England's wholesale electricity costs for 2008 to 2019.

[73] 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.

Table 7-1
New England Wholesale Electricity Costs, 2008 to 2019 (in Millions and ¢/kWh)[a]

	2008		2009		2010		2011		2012		2013		2014		2015		2016		2017		2018		2019[b]	
	$ Mil.	¢/kWh	$ Mil.	¢/kWh	$ Mil.	¢/kWh	$ Mil.	¢/kWh	$ Mil.	¢/kWh	$ Mil.	¢/kWh	$ Mil.	¢/kWh	$ Mil.	¢/kWh	$ Mil.	¢/kWh	$ Mil.	¢/kWh	$ Mil.	¢/kWh	$ Mil.	¢/kWh
Wholesale market costs																								
Energy (LMPs)[c]	$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	$4,130	3.2	$4,498	3.5	$6,041	4.7	$4,105	3.3
Ancillaries[d]	$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	$132	0.1	$147	0.1	$81	0.1
Capacity[e]	$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	$1,160	0.9	$2,245	1.8	$3,606	2.8	$3,401	2.7
Subtotal	*$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*	*$5,437*	*4.2*	*$6,875*	*5.4*	*$9,794*	*7.6*	*$7,586*	*6.0*
Transmission charges[f]	$869	0.6	$1,115	0.8	$1,417	1.0	$1,368	1.0	$1,493	1.1	$1,822	1.4	$1,828	1.4	$1,964	1.5	$2,081	1.6	$2,199	1.7	$2,250	1.7	$2,146	1.7
RTO costs[g]	$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	$193	0.2	$196	0.2	$184	0.1
Total	**$14,949**	**10.5**	**$9,073**	**6.6**	**$10,657**	**7.6**	**$9,577**	**7.0**	**$8,063**	**6.0**	**$11,189**	**8.4**	**$12,459**	**9.5**	**$9,358**	**7.1**	**$7,698**	**5.9**	**$9,267**	**7.3**	**$12,240**	**9.4**	**$9,915**	**7.9**

(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 2019 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 from June 2010 forward.

(f) Transmission charges reflect the collection of transmission owners' revenue requirements and tariff-based reliability services, including blackstart capability, voltage support, and FCM reliability. In 2019, the cost of payments made to these generators for reliability services under the ISO's *Open-Access Transmission Tariff* (OATT) was $42.2 million. Transmission charge totals for 2010 forward reflect the refund of OATT, Schedule 1 through-or-out (TOUT) service charges to regional network load.

(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 power system planning process, and provide market-monitoring oversight of participant behavior and in-depth market analysis and reporting. Between 2008 and 2019, the ISO's annual costs have ranged from $116 million to $196 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 2019, the total value of all wholesale electricity costs, including the cost of regional transmission upgrades and ISO operations, was approximately $9.9 billion. Allocating this cost across the load served at a wholesale level (real-time load obligation) in 2019 yields a rate of 7.9 ¢/kWh. Wholesale values for 2019 are preliminary and subject to reconciliation.