

## **SHORT SUMMARY OF TESTIMONY**

**GORDON VAN WELIE, PRESIDENT & CEO, ISO NEW ENGLAND  
BEFORE THE HOUSE ENERGY & COMMERCE COMMITTEE, SUBCOMMITTEE ON ENERGY**

### ***“POWERING AMERICA: A REVIEW OF THE OPERATION AND EFFECTIVENESS OF THE NATION’S WHOLESALE ELECTRICITY MARKETS.”***

**WEDNESDAY, JULY 26, 2017**

- ISO New England operates New England’s *wholesale* electricity markets, including Day-Ahead and Real-Time energy markets, the Forward Capacity Market (FCM), and markets for ancillary services. These markets continue to operate efficiently and provide significant benefits to customers.
- Total expenditures in these wholesale electricity markets in Calendar Year 2016 fell to \$5.44 billion (down from a high of \$13.96 billion in 2008). However, the region is challenged with natural gas pipelines constraints that cause reliability concerns and price volatility. From December 2013-February 2014, wholesale energy markets reflected these shortages with costs of roughly \$5.05 billion (with natural gas averaging over \$19/MMBtu) over the winter months.
- The Forward Capacity Market is achieving the objective of ensuring an adequate supply of capacity (both electric generation and demand resources) and investment in new capacity resources was incentivized when capacity was short. Competition between existing and new capacity resources in the most recent auction returned prices to their lowest level in the last four auctions.
- Wholesale energy market prices have decreased due to the lower prices of fuel (when gas pipelines are not constrained) and increasing amounts of state-sponsored, low marginal cost energy resources. This trend is expected to continue as more state-sponsored resources are added. As a result, all wholesale resources in New England will gradually become more dependent on capacity market revenues, which consequently will increase over time.
- New England is preparing for the impact of significant additional quantities of state-sponsored resources. The ISO is working with stakeholders to propose changes to the FCM to ensure appropriate price formation and allow the substitution of existing resources with state-sponsored resources.
- The region is experiencing a major shift in the generation mix due to the steady retirement of uneconomic, non-gas generation (we expect this ongoing transition could lead to the retirement of approximately a third of the generation fleet within the next decade). Non-gas generators that are good performers are crucial to maintaining power system reliability during the winter due to gas pipeline constraints. The lowered energy market revenues and changes to the FCM to accommodate state-sponsored resources will likely accelerate the retirement of those resources – exacerbating the negative effects of gas pipeline constraints during the winter. The ISO is studying this fuel security risk and will report preliminary results in October of this year.
- The ISO is working to safeguard our control center and business system infrastructure from an ever-increasing cyber threat that is growing in sophistication.

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Chairman Upton, Ranking Member Rush, and members of the subcommittee, thank you for the opportunity to appear before you this morning. I’d also like to express my appreciation to Congressmen Welch and Kennedy, as well as their staffs, for their ongoing interest and attention to the challenges facing the New England region.

My name is Gordon van Welie, and I am the president and chief executive officer of ISO New England (ISO-NE). ISO New England is the independent system operator of the New England power grid and wholesale electricity markets. We have three major areas of responsibility: We operate the bulk electric system on a 24-hour, seven-day-a-week basis, we administer the region’s wholesale electricity markets, and we are responsible for long-term planning of the transmission system.

2017 marks the 20<sup>th</sup> anniversary of ISO New England. During the last two decades, the region has undergone (and continues to undergo) a monumental change in how electricity is produced and consumed. Since the ISO was created, New England has invested approximately

\$30 billion in capacity and transmission infrastructure.<sup>1</sup> Perhaps most relevant to my testimony today is the region's commitment to investing in critical capacity resources. Since Forward Capacity Auction #7 was conducted in February 2013 (for commitments to provide capacity starting June 2016), over 3,600 megawatts (MW) in new generation and over 2,000 MW in new demand resources (including energy efficiency) have taken on capacity supply obligations (CSO). This investment has been critical as older oil, coal and nuclear plants continue to retire.

In addition, wholesale markets continue to harness the benefits of low cost natural gas, and combined with regional investments in energy efficiency and behind-the-meter solar/photovoltaic resources, have returned demonstrable benefits for New England electricity consumers. For instance, in 2016 New England's *wholesale* electricity markets (\$5.44 billion) fell to their lowest level since 2003<sup>2</sup> -- down from a high-water mark of nearly \$14 billion in 2008. During this period, emissions have decreased substantially.

In prior testimony before the subcommittee, I highlighted "serious operational challenges facing New England's power system."<sup>3</sup> Specifically, I called attention to "a major shift that has occurred in the region's generation mix" and the reliability concerns stemming from "limitations of the current market design and the consequent inadequate fuel arrangements." I submitted that testimony on March 19, 2013.

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<sup>1</sup> This investment includes approximately \$14 billion in natural-gas fired generation, \$12 billion in existing and upcoming electric transmission, and state-sponsored investment in energy efficiency, solar/photovoltaic resources and wind (\$4 billion).

<sup>2</sup> New England's wholesale electricity markets include the region's energy markets (Day-Ahead and Real-Time), the Forward Capacity Market, and ancillary services markets.

<sup>3</sup> ISO New England testimony before the US House Energy & Power Subcommittee on March 19, 2013

Since that time, ISO New England has undertaken many improvements to address specific reliability concerns. Most significantly, ISO New England has filed, and the Federal Energy Regulatory Commission (FERC) approved<sup>4</sup>, changes to the Forward Capacity Market (FCM) known as Pay for Performance (PFP). Under PFP, resources are required to provide energy during times of system stress. Failure to perform (regardless of the reason) will dramatically reduce a resource's capacity payment while performance in excess of the obligation is rewarded. In addition, we have made energy market changes to strengthen resource performance (including hourly offers, sub-hourly settlements, and increased scarcity pricing); new situational awareness and forecasting tools; improved communication with pipeline operators; and the winter reliability programs to boost fuel inventories.

Moving forward, ISO New England is focused on initiatives that address three distinct challenges: The impact of greater levels of state-sponsored resources on wholesale markets, identifying and quantifying the shortcomings of the fuel delivery system in New England and the continued strengthening of cybersecurity staffing, systems and controls at the ISO.

*Challenge 1: State Sponsorship for New Resources Drives the Need for Capacity Market Changes*

The New England states have aggressive goals with respect to de-carbonization of their economies. Consequently, they have been focused on reducing emissions from existing fossil-fired generation, increasing the efficiency of energy usage and adding non-carbon-emitting forms of electric energy, typically referred to as "renewable energy." Although state-sponsored resources currently represent a small portion of the overall energy production, the New

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<sup>4</sup> FERC regulates wholesale markets and thus must approve any changes to our markets.

England states are planning to accelerate their efforts as they strive to meet their renewable portfolio standards, greenhouse gas reduction and environmental goals, and other specific policy objectives. With many of these resources having the potential to provide capacity to the region, markets need to accommodate their presence while still providing just and reasonable rates for other new and existing resources needed to ensure reliability. We expect that an anticipated influx of energy resources with very low operating costs will lower prices in the wholesale energy market, thereby gradually making all wholesale resources more dependent on revenue from the Forward Capacity Market. This makes appropriate price formation in the capacity market crucial to ensuring regional resource adequacy.

In response to this challenge, in August 2016, the New England Power Pool initiated a process known as *Integrating Markets and Public Policy* (IMAPP). The IMAPP process focuses on the integration of greater levels of state-sponsored energy projects into the New England markets and the potential for adverse impacts on price formation critical to maintaining a high-performing fleet of power system resources (including both generation and demand resources).

One of the more prominent challenges is that the FERC-approved capacity market rules that govern minimum bids for new resources in order to protect price formation (known as the Minimum Offer Price Rule) may result in some new state-sponsored resources failing to clear Forward Capacity Auctions. However, since these resources will nonetheless be built (having already entered into long-term contracts with utilities driven by state clean energy mandates), there is concern that some New England ratepayers may pay to “over-procure” capacity –

paying both for resources that clear the capacity market as well as for the resources developed to meet public policy requirements.

### *Competitive Auctions with Sponsored Policy Resources (CASPR) Solution*

For several years, ISO New England has voiced support for pricing carbon as an efficient means to meet carbon reduction goals while continuing to harness the benefits of competition through wholesale markets. However, through participation in IMAPP and discussions in other forums, the New England states have clearly articulated significant concerns with this approach.

Given the pressing need to accommodate state public policy priorities in the near-term<sup>5</sup> while the IMAPP process plays out, in April 2017, the ISO introduced a concept for changes to the Forward Capacity Market. We call this concept *Competitive Auctions with Sponsored Policy Resources (CASPR)*.<sup>6</sup> Under the CASPR proposal, the primary capacity auction would operate much as it does now. However, CASPR creates a secondary, or “substitution” auction following the primary auction to bring together new, state-sponsored resources that did not clear the primary auction with capacity resources that cleared the primary auction but, given the opportunity, would choose to retire.<sup>7</sup> The Minimum Offer Price Rule would not apply in the substitution auction, potentially allowing a retiring resource to transfer its capacity supply

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<sup>5</sup> In addition to market changes to accommodate the states’ near-term goals, New England stakeholders continue to discuss longer-term options to potentially achieve state policies through wholesale markets (e.g., a Forward Clean Energy Market).

<sup>6</sup> [https://www.iso-ne.com/static-assets/documents/2017/04/caspr\\_discussion\\_paper\\_april\\_14\\_2017.pdf](https://www.iso-ne.com/static-assets/documents/2017/04/caspr_discussion_paper_april_14_2017.pdf)

<sup>7</sup> These resources are likely to be aging oil- and coal-fired resources that have signaled that they wish to permanently retire from the capacity market if the capacity price clears below a level that allows them to remain economic.

obligation to a new state-sponsored resource and dividing the capacity payment in a mutually-beneficial manner.

The substitution auction will accommodate state-sponsored resources over time (thereby reducing over-procurement) and likely help the New England states achieve their carbon-reduction goals by incentivizing older, higher-emitting resources to retire sooner. (As I discuss below, this will likely accelerate the need for a solution to New England's fuel security challenges.)

We are working through our stakeholder process to further develop the CASPR proposal and we plan to file the proposal with FERC in the December–January timeframe. Our goal is to have the tariff changes in place by March 2018 for resources seeking to qualify in the 13<sup>th</sup> Forward Capacity Auction (which will be run in February 2019 to secure capacity for the capacity supply obligation year beginning in June 2022).

### *Challenge 2: The Transformation of the Resource Mix is Creating a Fuel Security Risk*

New England relies on the Forward Capacity Market to ensure an adequate supply of capacity and thus far, has allowed the region to continue to meet its capacity needs while facilitating the transformation of the resource mix. In the past few years, the capacity market has incentivized – through a market-based investment signal – a substantial amount of new

capacity resources, including highly efficient natural-gas fired power plants, as well as investments in renewable energy and demand resources, including energy efficiency.<sup>8</sup>

In 2000, oil- and coal-fired generators produced a combined 40% of New England's electricity, while natural gas produced 15%. Since that time, the shale gas revolution has lowered gas prices resulting in a much heavier reliance on relatively cleaner and cheaper gas-fired resources in New England. In 2016, natural gas produced nearly half of the electricity in New England (49%); by contrast coal and oil combined only produced 3% of the regional electricity needs – mostly during peak winter and summer days – while still representing over a quarter of the production capacity in the region.

As the regional grid continues to evolve, low fuel prices have led to lower wholesale energy prices. Wholesale prices are further reduced by injections of energy from state-sponsored resources that typically have very low production costs, as well as lower overall demand stemming from investments in energy efficiency and behind-the-meter solar-photovoltaic (PV) resources. While low wholesale energy market prices certainly benefit consumers, they eventually lead to economic stress on power plants that were designed to operate on a near continuous basis and garner the majority of their revenues from the energy market (such as steam generators powered by oil, coal and nuclear). And as expected, we have seen retirements in these classes of resources.

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<sup>8</sup> For Calendar Year 2016 (CY16), \$1.16 billion in Forward Capacity Market payments translated to roughly .9-cents/kWh (\$.009) on a retail bill. To put that in context, the all-in *wholesale* electricity price for CY16 was 6-cents/kWh (which includes supply costs and transmission costs). Capacity payments will increase in coming years in order to pay for the increased investment in new resources and the reduction in revenues in the wholesale energy market.



This trend will accelerate significantly in the coming years as New England states contract for substantial amounts of policy driven resources (primarily carbon-free, low marginal cost resources). This acceleration will have a pair of consequences: First, it makes the remaining merchant generation fleet in New England, which is needed for reliability, more dependent on revenues from the Forward Capacity Market and consequently on appropriate pricing in that market. Second, it increases dependence on gas-fired generators, thereby exacerbating regional concerns relating to reliable system operations in the winter, in particular due to constraints on the transportation of natural gas to the region.<sup>9</sup>

In my March 2013 testimony, I noted that for “power-grid reliability to be maintained, we need to have adequate levels of fuel inventory within the region, either through storage or reliable transportation arrangements so that the electric sector is ready to respond whenever called on by the ISO.” We now have an additional four years of operational experience to further underscore how important fuel security is to New England.

As New England has increased its reliance on natural gas, we have not seen a corresponding increase in the region’s natural gas transportation and storage infrastructure, which is currently stressed to meet demand for natural gas for both home heating and power generation during the coldest weeks of the year. The shift from power plants with on-site fuel supply (e.g., oil, coal and nuclear) to plants relying on the natural gas transportation network to deliver fuel when needed has exposed the limitations of New England’s fuel infrastructure

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<sup>9</sup> In addition to reliability concerns, constraints on the natural gas pipeline network result in price increases as well. From December 2013-February 2014, cold weather resulted in constraints on natural gas pipelines and wholesale markets reflected these shortages with costs of roughly \$5.05 billion (with the cost of natural gas averaging over \$19/MMBtu) over these three months.

system and highlights the challenge of securing fuel in advance of power system demands. New England's inability to reliably and consistently import sufficient levels of natural gas leads to several consequences, in particular reliability risks, price volatility and an increased use of oil- and coal-fired resources that are traditionally more carbon-intensive, less efficient, and more expensive to operate than most natural gas plants.

For several winters, ISO New England has implemented (with FERC's approval) short-term winter reliability programs to incentivize more robust fuel security arrangements heading into the winter season. From Winter 2018 onwards, we will be relying on market rules that incentivize generator performance, notably the abovementioned Pay-For-Performance incentives. However, when the PFP incentives were developed in 2013, they were structured to incent gas-fired generators to install dual-fuel capability (to make it economic for gas generators to switch from pipeline gas to locally stored oil when gas pipelines become constrained) and phased in over multiple years. Since that time, additional changes have occurred that cause us to be concerned that the PFP incentives, as presently formulated, may not be sufficient to ensure fuel security during the winter. These changes include significant opposition to the siting and permitting of new dual-fuel facilities and additional emission limits that restrict the amount of time generators can operate on oil, which is likely to create greater dependency on imported liquefied natural gas (LNG).

While we have had the ability to rely on non-gas generators (including oil, coal and nuclear resources) when gas pipelines become constrained, we have seen a large number of

these resources retire in recent years. We expect that many more of these resources will retire in the coming years due to the aforementioned economic realities and environmental policies.

To add some detail – since 2013, about 4,200 megawatts (MW) of oil, coal and nuclear capacity have either already retired or signaled retirement plans through our Forward Capacity Market. Beyond the retirements we have already seen, we believe an additional 5,500 MW of oil- and coal-fired facilities remain “at-risk” of retirement in the coming years and the owners of the larger of the two remaining nuclear facilities (the 2,100 MW Millstone Power Station) are evaluating the long-term viability of that facility. Although the precise timing of future retirements is uncertain, we know New England is on a course to turn over nearly one third of its generating capacity.

Any region that experiences a similarly dramatic shift – whether the region utilizes the competitive benefits of wholesale markets or remains vertically-integrated – must bring forward new investment in power system resources to replace those resources that are retiring. To ensure that power system reliability is not compromised, further investment is required in fuel infrastructure and supply, which includes investments in both physical infrastructure and in forward arrangements for the supply of these fuels. Investments in variable forms of renewable energy will help offset overall energy production from fossil generators *on average* during the course of the year, but cannot be relied upon to produce energy *in the moment, or over extended periods*, when the sun does not shine and the wind does not blow. Currently, there are no technologies that can provide large scale, seasonal

electricity storage, which is what would be required to avoid the additional fuel arrangements (LNG, natural gas or oil) needed to supply the natural gas and remaining oil generation fleet.

### *ISO New England is Undertaking a Fuel Security Analysis*

To better understand and quantify this risk, the ISO is conducting a fuel security analysis to study the ability of generators to obtain the fuel they need to produce electricity during the winter peak season.<sup>10</sup> The study is examining more than twenty cases of generating resource and fuel-mix combinations in the year 2025 and will quantify each case's fuel security risk. In particular, we want to examine the reliability risks resulting from additional non-natural gas generator retirements, with the addition of more renewable resources and the assumption that no new additional gas infrastructure is built.

Fuel security risk will be measured by the number and duration of operating reserve and energy shortfalls that could occur during the entire winter period in 2025 and that would require implementation of emergency procedures to maintain reliability. Completion of the study is expected in October, and in consultation with stakeholders, the ISO will determine whether further operational or market design measures will be needed to address the region's fuel security risk. While not an exhaustive list, options for mitigating fuel security risk can range from creating market incentives to incent individual generators to make adequate fuel storage and resupply arrangements (essentially creating a virtual pipeline to supply oil and/or LNG to the gas generation fleet), to investing in new pipelines, to investing in additional transmission

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<sup>10</sup> [https://www.iso-ne.com/static-assets/documents/2017/05/20170522\\_fuel\\_security\\_study\\_update\\_final.pdf](https://www.iso-ne.com/static-assets/documents/2017/05/20170522_fuel_security_study_update_final.pdf)

to access greater amounts of dependable clean energy from our neighbors (with corresponding contractual arrangements to ensure deliveries when needed).

*Challenge 3: Continued Vigilance on Emerging Security Threats*

As this subcommittee is well aware, the volume and sophistication of the digital and physical threats to the bulk power system are steadily increasing. We are the only industry that owns and operates critical digital infrastructure that is subject to mandatory and enforceable security standards – the North American Electric Reliability Corporation’s Critical Infrastructure Protection (CIP) standards. The industry has already undertaken several updates since the advent of these standards a decade ago (with CIP Version 5 being the current baseline).

Beyond CIP, I would like to highlight several steps taken by ISO New England in this regard. To be able to detect, withstand, and recover from cyberattacks, the ISO has implemented an extensive system of process controls, advanced detection and response systems, and redundancy in systems and control centers. Building on existing tools, we launched the 24/7 Security Operations Center in 2015 to provide round-the-clock monitoring of the ISO network, and a 2017 project will apply best practices for isolating access to internal networked services and systems. In compliance with revised CIP standards, we’ve tightened security controls for cyber assets and visitors to ISO facilities. We’ll also be tightening security controls for hardware, software, and services associated with system operations, in response to anticipated NERC standards for supply-chain management.

ISO New England will again participate in the NERC-led GridEx exercise on cyber and physical security in November. This is in addition to the annual cybersecurity training undertaken by all ISO New England employees.

For security reasons we do not discuss the details of our cyber and physical defenses publicly, although I can assure you that we are actively engaged with other grid operators and the appropriate state and federal authorities to share information in this area. We recognize the importance of the infrastructure we operate and are constantly working to identify and address these dynamic and evolving challenges.

### *Conclusion*

Since I last appeared before the subcommittee, New England has made many operational and market-based changes to meet the needs of the region. However, we are fully immersed in a major transformation of how electricity is produced and consumed in New England. Market forces and public policy decisions are impacting both operations and markets, and require solutions in order to fully realize their reliability, economic and environmental potential. However, I believe that the collaborative wholesale market and power system governance and risk management structures in place in New England will keep us on course to navigate and meet these challenges.

Thank you.