2010 State-by-State Power Grid and Policy Outlook
ISO on Background

March 25, 2010

Presented by Gordon van Welie,
President and Chief Executive Officer

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Good afternoon everyone. My name is Gordon van Welie and I am the President and Chief Executive Officer for ISO New England. I am joined today by Anne George, Vice President of External Affairs and Corporate Communications, as well as Steve Rourke, our Vice President of System Planning. We'd like to welcome all of you to the third "ISO on Background" session.

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ISO New England is the not-for-profit corporation established by the federal government to run the wholesale electricity markets to ensure they are fair and competitive and to direct traffic on the high voltage power system to keep the lights on across New England. We also plan ahead, making sure resources will be in place to meet the growing and changing power needs of our region ten years into the future.

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The bulk power system here in New England consists of more than 350 generators interconnected by over 8,000 miles of high-voltage transmission lines. Within the six-state region, we have more than 31,000 megawatts of power supply with an additional 2,300 megawatts of demand-response resources. We are tied to the neighboring power grids in New York and Canada through 13 different interconnections that allow us to import and export electricity among the regions.

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With that background on our organization, I'd like to offer a little background on this new series we launched last year.

We plan to hold these informational briefings periodically to provide members of the media with an informal opportunity to learn more about the trends affecting New England's electricity industry. The sessions will be hosted by ISO New England senior managers and other subject matter experts who will help explain the workings of the power grid and wholesale markets. Although we are calling these sessions "ISO on Background," these are on-the-record conversations.

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Today's presentation will focus on the state of the power system in New England. I'll highlight the challenges ahead for policy, price and economics, and power system reliability. Then Anne and Steve will offer state-by-state details on the status of new projects and insights on energy policy priorities.

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The next few years will see dramatic changes in the way energy is produced, delivered, used, and paid for. The development of the smart grid, building renewable resources, and harnessing the power of the customer are all concepts that have been talked about for some time. To realize this potential, policy, price, and power system reliability must be addressed.

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The single greatest issue facing the operation, expansion, and regulation of the power system is the uncertainty about national energy policy.

Congress has been discussing major changes to the electricity industry to facilitate development of cleaner power supplies, mitigate climate change, and use power more efficiently. On the table are national renewable energy standards and a cap-and-trade mechanism to limit carbon emissions. But final decisions have yet to be made and debate in Washington continues.

As the industry awaits federal policy direction, it is likely that a lot of investment could be on hold. To get off the starting block, clear federal requirements must be established so the environmental, and reliability impacts, as well as the economics, of projects can be fully assessed.

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The one thing everyone seems to agree on is the need to modernize the nation's transmission system. Creating faster, more efficient connections will foster alternative energy development and advance clean energy and grid technologies.

These goals require billions of dollars in new spending. Seed money is being provided through U.S. Department of Energy grants. Federal awards for smart meter installations and energy storage throughout New England topped $230 million.

Among the regional projects, ISO New England and transmission owners will deploy new synchrophasor technology, with federal grant money covering about half of the cost. This project will deliver real-time information on system conditions to our control room thirty times a second, allowing us to monitor, measure, and operate the system more efficiently, and help accommodate the variability of renewable resources as they come online.

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These large grants hint at the costs of transforming the U.S. power grid. A technical analysis the ISO prepared for the New England Governors last year provides another glimpse at the magnitude of these costs.

The governors asked the ISO to help them create a regional blueprint for integrating renewable resources. The ISO's study found that up to 12,000 MW of on- and offshore wind could potentially be developed here.

While higher concentrations of renewable energy would result in lower wholesale electric energy prices and emission reductions, the cost to build the transmission needed to deliver these resources to market would be significant.

Under one scenario, adding approximately 8,500 MW of wind energy within New England and from Canada would require about $10 billion in new transmission infrastructure.

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Given the sizeable potential investment, some complex economic evaluations must be made, but key inputs into that equation are currently unknown.

The first input is resolution of the debate over a national mandate for renewable resource development. Establishing those mandates, plus any national mechanism that puts a price on carbon, tell the markets how much investment is economically feasible. As-yet-undecided federal requirements for renewable energy will ultimately determine the scope of what is needed.

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Only then can regional stakeholders have a meaningful discussion and reach consensus on what the grid of the future will look like.

And then there remains the thorny policy question of who will pay for the massive transmission build out that is being envisioned. For interregional projects, a transparent cost allocation methodology is needed to provide certainty about who pays for what, giving developers and investors a clear understanding of the economics underlying these costly projects.

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Eliminating policy and price uncertainty are the ways to get shovels in the ground. As investment proceeds, operation of the power system will need to evolve.

Shifting from a power system based on large, centrally located power plants that operate predictably to a system that includes a host of smaller, less predictable resources scattered across New England will add significant complexity to the operation and planning of the regional power system.

This will drive the application of increasingly sophisticated technological solutions in order to make it all work.

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Despite these challenges, our region's initiatives have put New England ahead of the curve.

Clear targets are in place for reducing regional emissions. Ten Northeast and Mid-Atlantic states have joined the Regional Greenhouse Gas Initiative to reduce emissions from power plants. RGGI established a cap-and-trade system, imposing an immediate limit on larger power plants' carbon dioxide emissions and mandating a 10-percent reduction in the cap by 2018.

Clear targets are also in place for renewable development, with five of the six New England states enacting renewable portfolio standards that mandate the amount of electricity that must come from renewable sources. Combined, the states' RPS and related targets call for 30 percent of New England's total electric energy demand in 2020 to be met by renewables and energy efficiency. The five New England states with an RPS in place allow for an alternative compliance payment in lieu of meeting an established renewable target.

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New England also has a clear funding mechanism for regional transmission projects that solve for reliability needs on the system. Our region's comprehensive, inclusive transmission planning and cost allocation processes have prompted development of more than $4 billion in needed transmission infrastructure.

While this transmission development has most recently been focused on reliability needs, additional transmission improvements could also provide economic benefits for the system.

We've begun work with stakeholders to assess the potential economic and environmental benefits of various resource additions. The Governor's Blueprint is one example of this. The region has also begun considering how to pay for construction of transmission that provides economic benefits by reducing the overall costs of meeting electricity demands.

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Finally, here in New England, we're looking ahead to the coming changes in the make-up of the grid to ensure we manage it reliably and efficiently.

We've been working on a comprehensive wind integration study for the past year to create a wind model for the region and assess the impact of different wind development scenarios on system operations. It is expected to be concluded this summer.

In addition, demand resources in New England continue to grow, with energy efficiency, distributed generation, and demand-response providers willing to shift or cut their electricity use in times of need. To use demand response most efficiently, we've established distinct power grid zones that allow us to call on demand resources to perform when—and where—they are most needed.

To sum up my discussion this afternoon, it's clear that there are challenges ahead. Fortunately for New England, our history of collaboration and progress will serve us well as we move ahead. With that, I'll hand things over to Steve and Anne to discuss the projects and energy priorities in each of the New England states.

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Presented by Stephen J. Rourke,
Vice President of System Planning

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Thank you, Gordon. I'm Steve Rourke, Vice President of System Planning for ISO New England. We've got a lot of ground to cover, so I'll get started.

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New England is in the midst of a fairly sizeable transmission build-out. Since 2002, our region has invested more than $4 billion in our transmission system to ensure its reliability. On the horizon is another $5 billion worth of investment to continue to ensure that the transmission system keeps up with the demands placed upon it. We'll talk more about specific projects a little later on, but as you can see each state has approved major upgrades.

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As Gordon mentioned, our inclusive planning and clear cost allocation processes for reliability projects have acted as catalysts for moving ahead with some key investments in our energy infrastructure. We allocate the costs of transmission needed for reliability based on the amount of electricity each state uses. That breakdown is shown here.

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What's more, new wholesale market changes are encouraging investment in power supplies at levels unseen for some time. Though not all of the proposals in the ISO's development queue will necessarily be built, nearly 10,000 megawatts of potential new resources—most of which is in the form of natural gas and wind—represents a potential one-third increase from today's levels.

As we go through the next set of slides, Anne George and I will "tag team" each state. I'll provide details on past and coming transmission improvements, as well as the interest in developing new generation in each state. Anne will provide perspective on some of the key policy changes that can affect the bulk power system and competitive wholesale marketplace.

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Our first state for discussion is Maine. Maine currently has a sizeable amount of generation within the state, especially compared to its in-state electricity demand. At the time of New England's record-setting usage in August 2006, Maine's electricity demand topped over 2,000 MW.

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The fuel mix within the state is predominantly natural gas. Maine is also home to the two largest wind farms on New England's bulk power system—Stetson Wind and Kibby Wind. Together, they are capable of producing almost 150 MW of electricity.

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Maine is currently considering a project that could be the single largest transmission investment in New England's history: the Maine Power Reliability Program, a project being developed primarily by Central Maine Power that will upgrade the transmission system within the state.

Studies conducted by ISO New England and Maine's utilities—Central Maine Power and Bangor Hydro—found that the current make-up of Maine's transmission network could not support the long-term reliability of the state's grid. The last major transmission system upgrades in Maine —with the exception of the Northeast Reliability Interconnect project—occurred more than 30 years ago and the existing system is nearing its limits to provide reliable service and keep pace with growing electricity needs.

The project is currently going through siting proceedings in the state. As a needed project for the reliability of the entire system, the costs for the majority of the project as proposed will be regionalized.

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The last major upgrade to Maine's system was the Northeast Reliability Interconnect project completed by Bangor Hydro in 2007. This project provided a second tie line with our neighbors in New Brunswick and enables New England to import an additional 300 megawatts of power into the region.

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Maine's generation development queue tops over 2,300 megawatts. Half of the region's proposals for wind are in Maine.

Presented by Anne George,
Vice President of External Affairs and Corporate Communications

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Thank you, Steve. I'm Anne George, ISO New England's Vice President of External Affairs and Corporate Communications.

Maine's development pipeline serves as a good indicator of the kinds of policy initiatives that are taking hold within the state. Maine has established very aggressive goals for new resource development, especially for wind and tidal power.

Governor Baldacci has formed a task force for Wind Power Development, aiming to add at least 2,000 MW of wind to the system by 2015 and increasing those levels thereafter. In addition, the state's Ocean Energy Task Force is a unique initiative to assess the potential for offshore wind development and investigate the prospects for tidal power.

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Maine has set specific targets for fulfilling electricity demands with renewable resources, requiring that 10% of demand be met by new renewable resources from within New England or an adjacent area by 2017.

Maine has been working to position itself as a renewable energy hub for the region, capable of producing significant amounts of renewable energy. As Steve mentioned, there are a number of transmission upgrades underway that will improve Maine's transmission backbone, allow for the better flow of electricity, with the added benefit of easing wind development.

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New Hampshire currently accounts for about 9 percent of the region's total electricity consumption. In-state electricity demand is most heavily concentrated in the south and on the Seacoast.

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New Hampshire's fuel mix is led by nuclear, due to the 1,200 MW output of the Seabrook station. The 24 MW Lempster Wind farm in Sullivan County began commercial operation in 2008.

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Last year, construction was completed on a key upgrade in the southern part of New Hampshire. The Monadnock-area system serves not only local demand, but it is also an important intersection point for New Hampshire, Vermont and nirth, central Massachusetts. A series of substation and transmission system upgrades helped to bolster reliability for this important tri-state area.

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This year, we expect to complete the second phase of a two-phase study looking at the reliability of the New Hampshire system ten years out. In its first phase, this study showed that there is a need for improvements within the state. The second half of the study will analyze potential transmission upgrades to help solve for these problems.

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There are approximately 500 MW of new generation proposals in New Hampshire, representing 5% of all the proposals in New England. About 400 MW of these resources are for wood-burning plants and wind projects in Coos County.

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Presented by Anne George,
Vice President of External Affairs and Corporate Communications

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New Hampshire's Governor, John Lynch, has set a target to fulfill 25% of the state's electricity needs with renewable resources by 2025.

As the state looks to fulfill its ambitious energy targets, it has taken a proactive stance on working quickly to move new projects ahead, mandating speedier approval processes for new renewable projects. State policymakers have recognized through legislation that to fully capture all the potential renewable development in the region, new transmission will be required to deliver it to market.

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The state established a transmission commission to help consider ways to upgrade existing 115-kilovolt transmission to accommodate the wind and biomass resource potential that exists in Coos County. The commission will continue its work through 2010 to both consider transmission infrastructure build outs, as well as how to pay for this investment because it does not qualify for regionalized cost-sharing.

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New Hampshire's renewable energy targets will go a long way in helping to achieve the governor's 25% by 2025 goal. The state's RPS has in place four different classes of renewable resources. By 2025, suppliers are required to have almost 25% of their energy from all four renewable classes from within New England or an adjacent area, with 16% of that to come from Class I renewables, consisting of new wind, hydro, biomass, and landfill gas resources. Back to Steve, and Vermont.

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Vermont relies on both in-state resources and imports of power over the region's transmission system to serve electricity customers. Transmission, generation and demand resources are being added to ensure that the reliability of the system is maintained.

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Among the upgrades underway in the state is the construction of the Vermont Southern Loop. This project will help to improve the long-term reliability of Vermont's system, helping to meet growing electricity demand and address problems that arise when unexpected outages occur. This project is slated to be completed in late 2010.

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Previous upgrades to Vermont's system near the Burlington area helped to improve the system's strength in this area of high demand. The Northwest Vermont Reliability Project was completed in stages from 2006 through 2009.

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Power plants located in Vermont are capable of producing upwards of 1,200 MW of electricity. At 620 MW, the Vermont Yankee station represents about half of the in-state generating capacity.

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The ISO works in concert with all transmission owners, including VELCO, to evaluate the long-term viability of the system. Recognizing that the Vermont Yankee license is set to expire in March, 2012, this evaluation has considered a variety of long-term grid scenarios with and without Vermont Yankee in service.

Looking out as far as 2018, initial findings from the ISO's assessment reveal potential reliability problems for Vermont if the system were to continue as it is today with Vermont Yankee online. For example, under certain conditions, transmission lines in the state could become overloaded with more electricity than they were designed to carry, which can damage the lines. Loss of the Vermont Yankee nuclear station worsens those effects and creates additional system

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vulnerabilities for Vermont and certain surrounding areas, including portions of New Hampshire and north, central Massachusetts.

We are currently working to identify feasible and effective solutions for the long-term reliability of the system serving Vermont and the region. The ISO will continue working through its stakeholder process in the months ahead to consider the most cost-effective and timely solutions for the state and region whether or not Vermont Yankee stays online past 2012.

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By and large, wind resources represent the most significant share of the over 250 MW of new proposals for generation within the state.

Presented by Anne George,
Vice President of External Affairs and Corporate Communications

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The state of Vermont has a comprehensive system planning process in place. It requires the local transmission owner, VELCO, to evaluate the system twenty years out to assess potential weaknesses and offer transmission solutions. More recently, the state's planning process has evolved to allow non-transmission projects to be considered as an alternative way to solve for reliability problems. In 2007, a state System Planning Committee was formed to ensure that alternative projects—like energy efficiency measures or new generation—are considered as a means to ensure system reliability.

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Vermont has taken a unique approach to encourage the use and development of renewable resources within the state. The SPEED Program – which stands for Sustainably Priced Energy Enterprise Development – creates incentives for in-state, renewable resource construction and long-term power contracts between utilities and developers of renewable resources. This program will help the state to achieve its targets for using renewables, which ultimately require 25% of Vermont's energy consumption to be met by in-state renewable power supplies by 2025.

To help encourage the construction of renewable resources, Vermont amended the SPEED program and established one of the nation's first state-wide feed-in tariffs, which helps to ensure some funding predictability for developers. The program has been very successful to date in attracting project proposals from renewable developers.

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Massachusetts accounts for nearly half of the region's consumer demand for electricity. And demand resources are already in healthy supply, with 650 MW currently available. That total is set to nearly double by 2012 thanks to new wholesale market designs that encourage development of this resource type.

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Connecticut Light & Power and Western Massachusetts Electric have been actively pursuing upgrades to the western Massachusetts system with the Greater Springfield Reliability Project. This project is one of a collection of upgrades for Massachusetts, Rhode Island, and Connecticut, known as the New England East-West Solution. The GSRP begins in Ludlow, Massachusetts, and reaches across the border into the Connecticut town of North Bloomfield. This project is vital to the long-term reliability of the Massachusetts and northern Connecticut systems. It is currently making its way through the siting process and—if approved—would be in service by 2013.

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Underway now is a series of upgrades to the system serving southeastern Massachusetts and the Cape. The Cape's transmission system was built to rely on the ongoing operation of the Mirant plant at Canal Station. However, over time with demand growth and competitive market forces, this combination of transmission and generation resources became inefficient and unreliable. Short-term fixes were put into place in 2009, but for the long-term, a new 345 kilovolt line and associated upgrades will help to maintain system reliability and provide more flexibility to operate the Cape's system without relying on a single source of power.

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Greater Boston is the single largest sub-area of consumer demand on New England's system. The area had limited power supplies available and, prior to 2007, the transmission grid was not able to import additional power supplies needed to meet demand. What's more, as demand grew in the last decade, the transmission lines were quickly reaching their full capacity. Three new, underground 345 kV cables installed by NSTAR in 2007 have helped solve these problems.

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Power plants that use natural gas and oil make up nearly 70% of the state's 13,300 MW of supply.

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Natural gas power plant proposals lead the state's queue, representing about 30% of all the natural-gas-fired proposals for the region. The in-state proposals for wind, which includes Cape Wind, account for 18% of all the wind resources being proposed regionally.

Presented by Anne George, Vice President of External Affairs and Corporate Communications

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In 2008, Massachusetts passed sweeping legislation to hasten the development and use of renewable resources and beef up the state's efforts to achieve higher levels of energy efficiency. Provisions included in the Green Communities Act set the state on track to pursue efficiency, renewable, and alternative resources. These efforts will be key in meeting Governor Deval Patrick's goal to have 2,000 MW of wind in place by 2020 and 250 MW of solar installed by 2017.

The specific energy efficiency provisions of the Green Communities Act require that utilities must seek out and develop all sources of available energy efficiency that prove to be cheaper to develop than new sources of supply.

The Green Communities Act also amends the states' RPS by requiring utilities to pursue alternative sources of energy. This provision establishes specific targets for using new technologies like flywheels.

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Recognizing the state's untapped potential for wind resources and its eventual build out, the state has structured an Ocean Management Plan to lay out regulations that protect marine resources, while still working to identify areas for development, including an area off Cape Cod and another area off Martha's Vineyard.

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Massachusetts renewable portfolio standard calls for 15% of the state's electricity demands to be met with renewable resources from within New England or an adjacent area by 2020.

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Vice President of System Planning

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Rhode Island has approximately 1,800 MW of generating capacity with an additional 135 MW of demand resources.

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Rhode Island is currently in the process of siting a significant upgrade to its system. The Rhode Island Reliability Project is being pursued by National Grid and should be in service by late 2012. This $257 million upgrade will strengthen the state's system considerably.

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Rhode Island's 1,800 MW of capacity is almost solely fired by natural gas. However, a few plants do have dual-fuel capability, meaning they can switch to oil-fired production if it's needed. This switching can be important for the reliability of the system should natural gas supplies become constrained.

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Rhode Island has over 750 MW of potential new resource development, over half of which is in the form of wind energy. Wind proposals in the state represent 15% of all the wind resource proposals in the region. Anne will pick it up now with the overview of Rhode Island's energy policies.

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Rhode Island has set a target to meet 20% of the state's electricity needs with renewable resources from within New England or an adjacent area by 2012, including 15% from wind power. Accordingly, the state has taken steps to move renewable projects forward, including Deepwater Wind's plans to construct and operate offshore wind farms. The first project set to be online in 2013 is a small wind farm off the coast of Block Island that will serve that area directly. A larger project—on the order of 106 turbines—will be considered to provide power to the mainland of the state.

Rhode Island has also worked to ensure clear funding mechanisms for renewable developers, requiring National Grid to enter into long-term contracts by June 2010. An example here is the 20-year contract National Grid and Deepwater Wind have entered into for the Block Island project.

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These measures will prove important for helping the state to meet its renewable energy standard goals, which require 16% of electricity needs to be met by renewable resources before 2020. And now Steve will take over with our last state, Connecticut.

Presented by Stephen J. Rourke,
Vice President of System Planning

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Connecticut is the regional leader for demand resource development, accounting for 33% of the region's total enrollment. By 2012, that total is set to increase to over 840 MW.

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We already spoke about the Greater Springfield Reliability Project. I mention it now because a portion of the project reaches across the Massachusetts border and into Connecticut, ending in North Bloomfield. This project is important for reliability in the greater Springfield area, but also helps improve the flow of power on that area of the grid that runs between the two states.

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Two transmission projects completed in 2006 and 2008 have significantly changed the outlook for the southwest corner of the state. Southwest Connecticut's demand had grown over the years and outpaced the transmission system's ability to fulfill reliability requirements in this heavily populated area of high demand. A new 345 kV transmission loop completed in two phases by Connecticut Light & Power and United Illuminating have largely solved the transmission congestion problems in that area.

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Natural gas power plants are the most common type in the state, with oil-powered plants not far behind.

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Connecticut's proposed projects are heavily dominated by natural gas. In fact, Connecticut projects represent 65% of all the gas-fired generation proposed within the region.

Presented by Anne George,
Vice President of External Affairs and Corporate Communications

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Connecticut has in place Integrated Resource Planning, which takes a holistic approach to meeting electricity demand at the lowest possible costs. In 2010, the state Integrated Resource Plan did not indicate that new resources would be needed in the state, but does encourage the continued development of demand-side resources.

Connecticut is also working to consider non-transmission alternatives for solving reliability problems earlier in its system planning process.

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Connecticut has established targets to meet 20% of electricity needs with renewable resources located within New England or an adjacent area by 2020.

From looking at each of the states, it's easy to see that New England has made progress. We have already built a significant amount of new transmission and we've seen a dramatic increase in participation in the markets from demand-side resources. The states are also promoting

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policies to pursue renewable resource development. The most promising of these resource types is wind, though often wind resources are located far from areas of demand, meaning that new transmission will be needed to deliver it to market.

Though integrating dispersed and more variable resources onto our system is no small task, New England is well-positioned to accomplish this goal given the work we have done up to this point.

Still, challenges remain. Evaluating the economics of new policy and new transmission is no small task. One thing is clear, here, however. That is that a market-based system encourages the very solutions that we seek. Competitive wholesale markets are helping us to get cost-effective resources in place for the long-term reliability of the system.

As new federal policy is formed and related transmission cost allocation formulas become clearer, New England's markets and strengthened transmission backbone will position us well to incorporate new initiatives and develop the grid of the future.

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For more information, please contact the Corporate Communications Department.

Ellen Foley	***(413) 535-4139***
Erin O'Brien	***(413) 540-4565***
Marcia Blomberg	***(413) 540-4555***

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