2009 Wholesale Power Trends, Cost Inputs, and Influences
ISO on Background

Presented by Bob Ethier, Vice President, Market Development, and Vamsi Chadalavada, Senior Vice President and Chief Operating Operator, ISO New England

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SLIDE No. 1

Good afternoon everyone. My name is Bob Ethier and I am the Vice President of Market Development for ISO New England. I am joined today by Vamsi Chadalavada, ISO New England's Senior Vice President and Chief Operating Officer. We'd like to welcome all of you to the second "ISO on Background" session.

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For those of you not familiar with the ISO, ISO New England is the not-for-profit corporation established by the federal government to oversee the competitive marketplace for electricity and reliably run the regional bulk power system.

From our headquarters in Holyoke, Massachusetts, we run the wholesale electricity markets to ensure they are fair and competitive. We direct traffic on the power system to keep the lights on across New England. And we plan for the future, making sure the resources are in place to meet the growing and changing power needs of our region.

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The bulk power system here in New England consists of more than 300 generators interconnected by 8,000 miles of high voltage transmission lines. Within the six-state region, we have approximately 31,000 megawatts of power supply with an additional 2,000 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 earlier this year.

We intend to hold these briefings periodically to provide members of the media with an informal opportunity to learn more about the trends affecting New England's electricity industry. Although we are calling these sessions "ISO on Background," these are on-the-record conversations.

The sessions will be hosted by ISO New England senior managers and other subject matter experts who will help explain the inner workings of the power grid and wholesale markets. Each presenter will provide objective analysis on timely issues to help convey their impact and the challenges they may pose for regional policymaking, system planning, and power grid operations. We will then open the call to the media's questions. We hope these briefings are informative.

We'll begin today's session with a few remarks from Vamsi and me. My discussion will cover the mechanics of New England's system for pricing wholesale electricity. Vamsi's presentation will cover the practical impacts that the weather, economy, fuel prices, and electricity usage can have on those prices, using this summer's operational experiences as a prime example.

While Vamsi and I cover the slides in our presentations, the phone lines will be muted. After each briefing, we will open the phone lines and take your questions.

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We all watch very closely the ups and downs of electricity prices, perhaps giving some thought to how these prices are established. I plan to describe today the underpinnings of New England's wholesale electricity costs and the system that helps to establish those prices. These concepts are known as the Uniform Clearing Price and Economic Dispatch. Though other pricing approaches can be used to establish wholesale costs such as a pay-as-bid model, the methodology used here has been delivering key benefits to our region for over a decade.

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Though we apply economic concepts to the pricing of electricity on the system, this price-setting is guided first by the need to maintain system reliability. Today, we have very limited ability to store electricity, so—minute-to-minute—power must be produced the instant it is consumed.

This means having available supplies to cover the demands of regional electricity usage, imports, exports, and account for small amounts of electricity that are lost on the transmission lines when electricity travels across long distances. There are three control room tools that help the ISO to evaluate this: the first is called load following, the second is called area control error, or ACE, and the third is called economic dispatch.

The first, load following, allows the control room to make small changes to the output of generators that have the flexibility to increase and decrease their production easily to match the instantaneous consumer demands on the system. Automatic Generation Control sends signals every four seconds to power plants that can automatically adjust output in response to second-to-second changes on the system. The effectiveness of this balancing is measured by the Area Control Error, which reaches zero when perfect balance is achieved.

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Our operators' third balancing tool is known as economic dispatch. And it is on this principle that the New England wholesale pricing system is based.

In its simplest terms, economic dispatch ensures that as our control room operators call upon resources to meet real-time demand for power—and keep the system in balance—the least expensive available resources are used first. In this way, the cost of producing electricity is minimized as much as possible while still maintaining power system reliability.

To determine the resources that can most cost-effectively meet hourly system demands, New England—like all other wholesale power markets in the United States—uses a Uniform Clearing Price, or UCP, auction.

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Many commodity markets operate with a Uniform Clearing Price structure. Corn, soybeans, oil, silver, and gold are all traded with a UCP because, like electricity, one unit of a product is like another unit with similar quality characteristics, regardless of how it is produced.

In the case of electricity, resources offer their capability into the marketplace and the ISO selects the least costly combination of resources needed to satisfy the anticipated electricity demand.

The ISO dispatches generators in the region starting from the lowest-priced bids (this includes generators that bid $0, such as hydro units and nuclear units) and progressing to higher-priced bids, until New England has enough generation to meet consumers' demand for electricity.

The cost of the last resource selected to meet this demand sets the market clearing price for all resources used in a particular hour.

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To illustrate, let's presume electricity use is 499 megawatts. In order to serve the next expected megawatt of electricity use, we must have 500 megawatts of supply available to us. To cost effectively meet that demand, we call upon two resources, Generator A that can provide 300 megawatts of electricity at $10 MW/hour and Generator B that can provide 200 megawatts of electricity at $15 MW/hour.

This level of resources satisfies our needs, so the clearing price is set at the higher of the two resource offers—that is $15 MW/hour is paid for all 500 megawatts, to both Generator A and Generator B. The resources from Generator C were offered in at $20 MW/hour and are therefore not called upon to run.

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The UCP establishes a price for electric energy for each hour of the day. This energy price is the same throughout the entire region. However, there may be some variations in wholesale prices across the region given local system conditions. Locational Marginal Pricing helps us to account for these differences.

In New England, there are eight pricing zones across the region comprised of over 900 more discrete prices points on the system, called “nodes.” Power plants are paid the more specific price at the node. The nodal prices within each of eight zones are then averaged every hour, representing the wholesale price paid for electricity by a load serving entity—which is oftentimes a utility or a supplier.

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There are three key components to the LMP. The first, which we’ve discussed, is the energy component. This price is established hourly through the UCP auction and is the same across all of New England.

However, transmission constraints can prevent megawatts from flowing freely on the system and can create the need to select other resources to meet demand. For example, the ISO may need to turn on a more expensive resource closer to an area of electricity demand to circumvent a transmission bottleneck. The added expense of the costlier, local resource is added to the zonal price in the area where the bottleneck occurs.

The third is transmission losses. As energy flows across transmission lines, small amounts are lost. Though minimal, enough power must still be produced to make up for these losses. As such, the region’s markets price transmission losses as a part of the LMP.

In the example here, we have the regional energy price at $32, with congestion and losses increasing the wholesale prices in New Hampshire to $37 megawatt-hour. These prices are calculated every five minutes across the entire region and then averaged to produce the hourly price.

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These three economic concepts and pricing constructs work together to create efficiencies and the lowest possible prices in New England's wholesale market. Economic dispatch and the UCP auction ensure the lowest cost resources are selected to meet regional electricity demands, while LMP helps to distinguish one area of the grid from another, ultimately providing important price signals for investment in the power system.

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There are other approaches that can be used for pricing in commodity markets, generally, and wholesale power markets, specifically.

For example, a pay-as-bid approach provides compensation to sellers that are selected to produce based on the bid price that each seller offered into the market. So, if a resource offered its energy for sale at $60 MW/hour and then is selected to generate, this resource will be paid $60, even if the next resource offered $70 and is also selected to run – and is then paid its bid price of $70 MW/hour.

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Some speculate that this approach could create savings in the wholesale electricity market. However, cost savings would not result using the pay-as-bid approach.

The simple reason why prices would not go down if generators were paid what they bid is that bidding behavior would change and they would bid in a completely different way in a pay-as-bid environment versus a UCP auction. Specifically, in a pay-as-bid auction, generators would submit price bids that reflect their best guess at what the price will be for the most expensive needed resource, instead of bidding their actual costs as they do currently in a UCP auction. Thus, all of the bids in a pay-as-bid model would reach approximately the same level, and the cost of this auction would be essentially the same as the clearing price in a UCP auction.

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We see several advantages to maintaining a UCP structure in New England. A UCP auction values all electrons at the same price and provides a strong incentive for power plants to bid as close as possible to their marginal cost of production (which are their day-to-day operating costs). This creates competition among resources because bidders are incented to offer the lowest possible price in a UCP auction to help ensure they are selected to run and be paid for their energy. What's more, owners are encouraged to reduce their costs and become more efficient, so they can run.

The UCP also creates transparency and strong incentives for investment in new, low-cost resources when no market or non-market impediments exist. As more low-cost resources enter the market, they can displace more expensive units, resulting in lower prices for consumers over time.

After a decade of experience, wholesale competition has brought about a much-needed renewal in the energy industry, with new development and innovation bringing important advances in New England and beyond. It's unlikely any other market design could have better achieved the benefits and major infrastructure improvements that have already been realized in New England.

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I will now take any questions you may have.

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Hello, I'm Vamsi Chadalavada, senior vice president and chief operating officer of ISO New England. Thanks to all of you who've decided to spend some time learning about some difficult, but important, subjects. Bob's done the heavy lifting by explaining economic dispatch, Uniform Clearing Price auctions, and locational marginal pricing. I'll speak more to the factors that tend to push prices up or down, throughout the day, the seasons, and the year.

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We'll address the effects weather, fossil fuel prices, demand, and supply constraints can have on power prices and usage. We'll look at this past summer in particular, when low demand for electricity and low fossil fuel prices kept wholesale electricity prices down, reflecting wholesale market efficiencies; we'll take a look at 2008, when fuel prices hit historic highs, pushing wholesale energy prices up; and we'll also go back to 2005, when two hurricanes cut into the region's supply of natural gas coming from the Gulf of Mexico, also causing natural gas and electricity prices to rise.

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I'd like to note that in the time ahead, we'll be talking about wholesale prices. So, before we get started, I want to offer some distinctions between the wholesale and the retail markets.

The wholesale side of the business takes place on the bulk power system –the high-voltage highway of transmission lines connecting generators to substations where electricity is delivered to the retail side of the business – the distribution system, which is the wires along streets, delivering electricity to homes and businesses. The wholesale side of the business is regulated by the Federal Energy Regulatory Commission, while the retail side is regulated by the states' public utility commissions.

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While wholesale electricity prices rise and fall in near lockstep with fossil fuel prices, and throughout each day as demand changes, in most states, residential consumers generally see their rates change at set intervals, often twice a year. That's due to the regulatory structures in which public utility commissions retain the jurisdiction to regulate retail rates. Utilities use "laddering" of contracts to smooth out the ups and downs of electricity costs. They make contracts for different lengths of time, at the best prices they can get at the time. These contracts with overlapping terms help even out the volatility in power prices. So high or low wholesale electricity prices in one month aren't likely to show up right away on your bill, but will likely be reflected in your bill the next time residential rates change.

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The wholesale price of electricity closely tracks the prices of natural gas and oil in New England, where gas- and oil-fired power plants generated over 40 percent of the electricity consumed in 2008.

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That compares to a national average of just over 20 percent from natural gas and oil. Coal is the dominant fuel nationally, generating almost 50 percent of U.S. electricity on average. There are some regions of the country, including the South and Midwest, where coal generates an even greater proportion of the electricity consumed. That compares to New England, where about 15 percent of electricity was generated by units fueled primarily by coal.

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Numbers from the U.S. Energy Information Administration show that the prices of gas and oil have risen dramatically, while the cost of coal has remained low and stable.

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New England's heavy reliance on natural gas and oil leaves the region vulnerable to the wide swings in the price of fossil fuels, with obvious effects in 2005 after Hurricanes Katrina and Rita damaged natural gas facilities in the Gulf of Mexico, again in 2008 when gas and oil prices skyrocketed, and this year, when natural gas prices plummeted.

These variations can be seen in this slide, an index showing the relationships of natural gas and electricity prices from March 2003 to June of this year. The green line represents the average price of electricity and the orange line represents natural gas.

You can see the close price relationships by following the lines through time, showing that natural gas and wholesale electricity prices tend to move in lockstep. In fact, power plants fueled by natural gas set the clearing price of electricity in New England about 62 percent of the time in 2008.

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You've seen the bid stack, so I think you'll see that lower demand can help bring wholesale prices down. With lower demand, the output of less expensive power plants, lower down on the bid stack, can be sufficient to meet the need for electricity.

Conversely, if demand is high or plants using high-cost fuels set the clearing price, wholesale prices will rise. The summers of 2005 and 2008 illustrate this particular point.

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New England is far from Louisiana and Texas, but we felt the echoing effects of the devastating hurricanes of 2005 in wholesale electricity prices here. The damage inflicted by hurricanes Katrina and Rita on natural gas and oil production in the Gulf of Mexico in the fall of 2005 pushed natural gas and oil prices higher, resulting in high wholesale power prices in New England.

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Here again, you can see what happened when the supply of natural gas was threatened, in September, 2005, after the hurricanes had passed through. To illustrate, in September 2005, natural gas prices were 142% higher than in September 2004, while No. 6 oil prices were 186% higher. Monthly average locational marginal prices followed suit, increasing between 129% and 146% from their September 2004 levels.

By late winter of 2005/2006, wholesale electricity prices began to fall as those natural gas supplies came back online and by March 2006 were back to the levels of early summer 2005.

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Three years later, in the summer of 2008, we saw similar price volatility, with the price of oil and natural gas rising to historic highs, peaking in July. In fact, average fuel prices were the highest since New England restructured its wholesale electric markets in 1999. Consequently, wholesale electricity prices also went up. Natural gas rose 25% in 2008, and No. 6 oil rose 42%. The average annual price of electric energy rose by 21% in 2008.

These sharp increases were mitigated somewhat by the decline in economic activity throughout the year and the more efficient use of electricity overall, resulting in a 2 percent decrease in energy consumption for the year.

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We've spoken about the rise and fall of fuel and wholesale power prices in 2005 and 2008. Now, let's compare that to the conditions we saw this past summer in New England.

As you will see, this past summer's low demand, and fuel prices, stand in sharp contrast to the conditions we've seen in the recent past, including 2005 and 2008.

New England is a summer-peaking system—that is, consumer demand for electricity in New England reaches its highest point in summer. This is due to primarily to the use of air conditioning. Since AC is the driver of peak demand in New England, electricity consumption in the region soars when the weather is hot. So it's no surprise that demand plummeted this past June and July, which were unusually cold and damp.

The effect of weather on demand can be seen in the 12 percent drop in June's consumption, compared to June 2008, and the 13 percent drop in July demand numbers compared to the same month of 2008. For the entire three-month period (June, July and August), electricity consumption was about 6 percent lower than the amount of electricity consumed in the summer of 2008.

The economic downturn as well as increasing energy efficiency standards also had an effect on demand this summer.

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All these factors – weather, the economy, and energy efficiency – also combined to drive down this summer's peak for electricity use. Each summer's peak usually occurs during a heat wave of three or four really hot, humid days. New England's all-time record for peak demand occurred on August 2, 2006, when the demand hit 28,130 MW. By comparison, this past summer's peak was 25,081 MW.

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While lower demand exerts downward pressure on wholesale electric energy prices, the cost of fuel used to generate electricity is the major factor driving wholesale prices. As we spoke about earlier, the lingering effects of Hurricanes Katrina and Rita drove fossil fuel prices upward, with wholesale power costs closely following suit. We saw the same fuel and wholesale electricity price interplay, but in reverse this year, as 2009 fossil fuel costs fell sharply when compared to the historically high fossil fuel prices in 2008.

For the entire summer of 2009, average electricity prices were down 63 percent compared to summer 2008. Gas prices were down 67 percent, and oil prices were 40 percent lower.

In July 2008, fuel prices were climbing to historic highs and electricity prices followed suit, with an average high at $107.98 per megawatt-hour that month. Fuel prices have dropped dramatically since then. In July 2009 alone, natural gas prices were 70 percent lower than the previous July, and oil prices were 46 percent lower. Wholesale electricity prices were 69 percent lower than in July 2008, at $33.53/MWh.

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As these slides have shown, wholesale electricity prices rise and fall in tandem with rising natural gas and oil prices. Demand, influenced by weather, economic conditions, and energy efficiency efforts, also plays a role in setting wholesale electricity prices.

When demand rises, higher-priced units must be called into the mix of generation needed to meet that demand. Diversifying the mix of resources New England relies upon for power will reduce the vulnerability to the ups and downs of fossil fuel prices. As more resources are added with low or no fuel costs, such as wind and demand-side resources such as demand response and energy efficiency, there will be more low-cost energy available at the bottom of the bid stack.

This close link between fuel costs and wholesale electricity prices actually is a sign that our wholesale markets are efficient and competitive, because the cost inputs are reflected appropriately in prices.

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This concludes my prepared set of remarks. I will now take any questions you may have.