



*Maximizing the synergies of multi-state tax cooperation*

To: Robynn Wilson, Income and Franchise Tax Uniformity Committee Chair  
Uniformity Committee Members

From: Bruce Fort, Counsel, and Ken Beier, Training Director, Multistate Tax Commission

Date: July 3, 2014

Re: Electric Utility Industry--References and Reminder on Survey

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To support our discussion of income apportionment for electric suppliers on July 28 in Albuquerque, we hope that you can

- return the survey on this topic that was sent via email on June 25—we would like to see these by the end of next week—July 11.
- take some time to review some of the videos and background materials on the electric utility industry prior to the meeting. The basic materials (below) should take less than 30 minutes to review. If you want to dig a little deeper, there are additional materials (below) for your review.

At the Income and Franchise Tax Subcommittee on July 28, Bill Smith, Executive Director of the Organization of MISO States (OMS), [www.misostates.org](http://www.misostates.org), will be giving a presentation on the electric utility industry and adding his expertise to this discussion. OMS is a non-profit organization of representatives from each state with regulatory jurisdiction over entities participating in the Midcontinent Independent System Operator, Inc. (MISO), a regional transmission organization. The purpose of the OMS is to coordinate regulatory oversight among the states, including recommendations to MISO and other organizations that regulate the electric utility industry.

#### Basic Materials

1. Energy Information Administration Glossary of Energy and Electricity Terms (refer to as needed)  
See <http://www.eia.gov/tools/glossary/>
2. Alstom Video--Understanding the Electric Grid—Duration 9:11  
[https://www.youtube.com/results?search\\_query=alstom+understanding+the+electric+grid](https://www.youtube.com/results?search_query=alstom+understanding+the+electric+grid)  
This explains some electricity basics—it does have some bias toward high voltage DC (HVDC), since this is an Alstom product line.

3. PJM Interconnection Learning Center—How PJM’s Market Ensures Enough Power for the Future—  
Duration 3:30  
<https://www.youtube.com/watch?v=137c26kRhL8&feature=youtu.be>  
PJM is a regional transmission organization that coordinates the movement of wholesale electricity in all or parts of 13 states and the District of Columbia. The video explains how PJM, as the grid operator, meets peak capacity needs through 1, 2, and 3 year auctions using the Reliability Pricing Model.
4. PJM Learning Center—Electricity Basics  
<http://www.pjm.com/about-pjm/learning-center/pjm-overview.aspx>  
Review the section “Market for Electricity” (Wholesale Markets, Retail Markets and PJM in wholesale markets). (A link to the video identified in #3 (above) is also on this page.)

In addition, you may want to look at regulations addressing sourcing for sales of electricity in Massachusetts and Oregon:

Massachusetts has adopted 830 CMR 63.38.10 which explains the allocation and apportionment of income derived from sales of electricity and unforced capacity and from ancillary, transmission and distribution services.

See <http://www.mass.gov/dor/businesses/help-and-resources/legal-library/regulations/63-00-taxation-of-corporations/830-cmr-633810-apportionment-of-income-of.html>

Oregon has also adopted some basic electricity sourcing rules, treating electricity as tangible personal property subject to a “transfer point” destination test (but not “ultimate” destination). See Oregon Administrative Rules, Section 314 150-314.665(2)-(C) for the application of Oregon statutes to sourcing of sales of electricity.

[http://arcweb.sos.state.or.us/pages/rules/oars\\_100/oar\\_150/150\\_314.html](http://arcweb.sos.state.or.us/pages/rules/oars_100/oar_150/150_314.html); but see: *Powerex Corp. v. DOR*, 2012 Tax Court, *below*).

*Powerex Corp. v. Department of Revenue*, Oregon Tax Court, NO. TC 4800, Sep. 17, 2012 (currently on appeal to the Oregon Supreme Court.)

The Oregon Tax Court held that the sale of electricity is a sale other than a sale of tangible personal property for the purpose of corporate income tax apportionment; and applied the cost of performance rule and confirmed that a majority of the costs incurred by the taxpayer in carrying on the income producing activity of its wholesale electricity sales business are incurred in British Columbia. In the natural gas aspect of the case, the court found that the taxpayer appropriately sources the sale to the ultimate destination rather than the initial point of delivery in Oregon.

[http://www.ojd.state.or.us/tax/taxdocs.nsf/\(\\$All\)/6ADB15FC3D55A2C88257A7C0064EFAF/\\$File/Powerex4800Opinion091712.pdf](http://www.ojd.state.or.us/tax/taxdocs.nsf/($All)/6ADB15FC3D55A2C88257A7C0064EFAF/$File/Powerex4800Opinion091712.pdf)

Additional Materials

5. PJM Learning Center—Electricity Basics  
<http://www.pjm.com/about-pjm/learning-center/pjm-overview.aspx>  
Same resource as Item 4 (above)—the following topics also may be helpful  
    Generation Sources  
    Transmission and Distribution  
    Industry Groups  
    Interconnections Advantages
  
6. PJM Learning Center—What’s Behind Electricity Prices—Duration 4:11  
<https://www.youtube.com/watch?v=hIKPB042Rcl>  
Explains how “locational marginal pricing” and other strategies are used to manage congestion on the electric grid.
  
7. Electric Power Supply Association Electricity Primer  
[http://www.epsa.org/industry/primer/EPsAs\\_Electricity\\_Primer\\_May\\_2007\\_.pdf](http://www.epsa.org/industry/primer/EPsAs_Electricity_Primer_May_2007_.pdf) (and attached)  
One of the strengths of this paper is that it describes the regional variations in power markets.  
Review of the following sections is suggested  
    What is a Wholesale Electric Market?  
    How Is Electricity Sold At Retail?  
    What Are RTOs and Organized Markets?  
    How Wholesale Electricity Prices Are Set
  
8. The New Energy Revolution: Disruptive technologies—from micro-grids to solar panels and energy storage—are transforming the electric system, Glen Andersen, State Legislatures, February 2014 (see attached pdf)

# The New Energy Revolution

Disruptive technologies—from micro-grids to solar panels and energy storage—are transforming the electric system.

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BY GLEN ANDERSEN

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**T**he nation's electricity system is entering a new era. Technology has fueled dramatic strides in efficiency, natural gas extraction, locally generated energy and smart grid technologies. These advances stand to fundamentally alter how policymakers, utilities and energy businesses approach all aspects of the industry, from production and delivery to regulation.

Consumers and businesses have a growing array of choices to help them manage their energy needs. Some are choosing to install rooftop solar panels or combined heat and power units. Others are investing in vastly more efficient building technologies and appliances to lower their monthly utility bills, while the smart grid is enabling them to monitor and optimize their electricity use, an innovation that has huge potential to change the energy landscape.

Energy users are increasingly interested in emissions, sustainability and control over electricity sources, and they're pushing policies to improve efficiency, localized electricity generation and renewable energy. Policymakers are working to ensure access to these new resources and technologies, many of which reduce utility electricity sales and revenues.

Ultimately, the traditional model of the centrally managed and controlled utility, in which its profits are largely based on how much energy it sells, may need to be altered to address the growth of these technologies. "The utility model does need to change to reflect the realities of distributive generation and people wholly or partially leaving the grid (unless they need back-up power)," says Kansas Representative Tom Sloan (R), who serves on two U.S. Department of Energy advisory committees and has been active in grid technology issues.



*Representative  
Tom Sloan (R)  
Kansas*

## Do-It-Yourself-Electricity

An overview of some of the developments that are driving the electricity revolution follows.

**Energy Efficiency** has continued to improve in televisions, refrigerators, air conditioners and other devices. The Energy Information Administration reports that household energy use has fallen for the past three years, and usage in 2013 fell to a level not seen since 2001—a remarkable figure considering the dramatic increase in home computers, large screen TVs, game consoles and other electronics. A 2014 refrigerator will use about half the electricity of a 2001 model, while a new 50-inch LED television consumes just one-quarter the power of a 46-inch LCD from 2008. LED lighting, which uses 75 percent less energy than incandescent, is likely to play a

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*Glen Andersen is director of NCSL's Energy Program.*

major role in further lowering electricity consumption.

Such technologies are helping business and industry cut operating costs and become more competitive. Efficiency is essential to making distributed resources cost-competitive, since it reduces the size and cost of the power system. Twenty-five states have binding energy efficiency targets for utilities.

**Combined Heat and Power (CHP)** systems, which create their own heat and electricity, are used in a growing number of industrial buildings because they are reliable and cost effective. Heat produced during electricity generation is usually wasted, but CHP systems capture and use it, resulting in dramatically increased efficiency. CHP systems, which can run on natural gas micro-turbines, fuel cells or other technologies, gained visibility during Hurricane Sandy, when hospitals and other buildings with CHP maintained operations despite extended power outages. Smaller, residential versions are also being introduced.

Most CHP systems use low cost natural gas, which can make them very competitive with utility electricity rates. About 12 percent of U.S. electricity comes from combined heat and power systems, but the potential is much higher—more than half of the electricity produced in Denmark, for example, comes from such systems. States are encouraging CHP with loans, tax incentives and inclusion in energy efficiency or renewable electricity requirements. In North Carolina, CHP qualifies for the energy efficiency portion of its renewable electricity standard, while Texas allows CHP owners to sell electricity at retail rates without regulating them as retail electric utilities.

**Solar Panels** have been dropping in price for decades due to mass production and growing competition in the global market. Since 2011, costs have plunged 60 percent, increasing the number of U.S. solar installations by 76 percent from 2011 to 2012. This pace continued in the first three quarters of 2013, with solar accounting for a record 20 percent of all new power added to the nation's grid—second only to natural gas. Twenty-nine states require utilities to produce a certain percentage of their power from renewable energy, and 16 have mandates that specifically target solar or distributed generation. Minnesota created its 1.5 percent solar mandate with the passage of HF 956 in May 2013. Representative Will Morgan (DFL), who worked on the bill, feels it will help drive down costs and "position Minnesota as a leader in solar energy production, which will attract jobs to our state and give suburban and urban consumers a personal stake in the fight against climate change." Prices are forecast to continue declining. In Germany, streamlined regulations and economies of scale have helped cut the installed cost of a solar system to about half what it is in the United States.



*Representative  
Will Morgan  
(DFL)  
Minnesota*

**Energy Storage**, which includes batteries, flywheels and other technologies, can benefit both end users and utilities. Storing energy from variable energy sources, such as wind and solar, so it can be used when it is most needed, increases its value and decreases the cost of integration into the power grid. “Storage acts as generation, as well as smoothing the natural ‘blips’ due to wind speeds changing and clouds passing over the solar collector,” says Sloan. Utilities can save money by storing low-cost energy at night for use during the day, when wholesale electricity charges are high. Storage can also reduce the need for expensive transmission upgrades and new power plants.

Storage can reduce local grid instability and could eventually free energy users from the power line. Storage is still too costly to be beneficial for many distributed generation uses, but there may be a time soon when it’s installed as routinely as rooftop solar. In 2013, California became the first state to require energy storage. Its public utilities commission has proposed a 1.3 gigawatt energy storage mandate for utilities by 2020. California utilities must integrate a variety of storage technologies, half of which they can own. The other half must be owned by a third party or the customer. Some states also qualify storage for renewable credit. In Kansas, “We already define renewable energy that enters a storage device as being renewable when it is discharged,” says Sloan.

**Micro-grids**, self-sustaining subsystems of the larger electric grid, can serve single residences or universities and large developments. One of the nation’s largest is in Co-op City, a housing cooperative of 60,000 people in northeast New York City. Co-op City’s CHP system provides all the power and 95 percent of the heating to 35 buildings, shopping centers and schools in the community. Although it is connected to the larger grid system, like most micro-grids, it can operate on its own. The complex chose to generate its own power to save money, but discovered an added benefit during Hurricane Sandy. Co-op City’s lights stayed on while surrounding areas went without power.

## Federal Actions

The U.S. Department of Energy and the White House have also been working in new energy technology.

- ◆ Since 2009, the U.S. Department of Energy has managed a \$7.8 billion grant program to promote smart grid technologies.
- ◆ In 2012, the energy department created a \$120 million Center for Energy Storage Research, combining the research capabilities of five national laboratories, five universities and four private firms to improve battery performance.
- ◆ In 2013, the department set aside \$60 million to support innovative solar energy research.
- ◆ In August 2013, solar panels were installed on the roof of the White House.
- ◆ In August 2013, the energy department proposed rules to improve efficiency standards for commercial refrigeration equipment and walk-in coolers and freezers, and in October released regulations for conserving energy from consumer and residential heating and cooling products.
- ◆ In September 2013, the U.S. EPA proposed rules for limiting carbon dioxide emissions from future power plants and will propose regulations for existing plants this June.
- ◆ In December 2013, the president directed the federal government to use renewable energy sources for at least 20 percent of the electricity it consumes by 2020.

—Ben Husch

## Abundant Natural Gas: Catalyst for Change

Accelerating technological advances and recent developments may result in a seismic change in the electricity market, similar to what began in the telecommunications industry 15 years ago. Few had any idea cell phones would replace the wired telephone, while becoming profoundly more useful and powerful. And just 10 years ago, it was inconceivable the United States would become one of the world’s largest producers of natural gas.

The nation’s pioneering work in natural gas extraction has opened up vast amounts of previously inaccessible reserves and shaken the electric industry. The country’s wealth of natural gas suggests prices may continue

## The home power plant

**Small Wind Turbine** – Use of these systems is site-specific, depending on local wind resources and space for siting the turbines.

**Solar Panels** – Solar systems can be used in all areas of the U.S. Costs tend to be more competitive in sun-rich regions and vary based on state incentives and other factors.

**Energy Efficiency** – A building owner can significantly reduce energy use by improving insulation, installing more efficient heating and cooling technologies, and using more efficient windows, lighting and appliances.

**Batteries** – Although not essential for a grid-tied system, battery storage allows the flexibility to operate during power outages and can assist utilities in integrating energy into the grid.

**Smart Meter** – Modern communications technology allows meters to indicate varying electricity prices during the day, allowing owners to use less during peak hours and to receive more credit for the electricity they produce during these periods.

**Electric Car or Plug-in Hybrid** – An electric car can be charged using the onsite electric system. The car’s battery can serve as an additional source of backup power for the home or grid.

## Power Words

**Electric Power Grid:** The network of power lines, transformers and electrical components that transmit and distribute power from power plants to electricity users.

**Smart Grid:** An electric grid that uses information and communications technology to deliver electricity more efficiently and reliably, adapting to consumer behavior and integrating new technologies such as energy storage.

**Distributed Generation:** Power-generating technologies—such as rooftop solar, natural gas micro-turbines and small wind turbines—located at the site where the electricity is consumed.

**Micro-Grid:** A small version of the larger power grid that distributes locally produced energy and can operate independently. A hospital with a combined heat and power system can operate as a micro-grid, for example.

**Decoupling:** A state regulatory approach that ends the correlation between a utility's profits and the amount of power it sells. The aim is to decrease the utility's resistance to customer-sited energy efficiency and distributed generation.

to be very competitive for at least the next few decades. Lower capital costs and emissions have made gas an attractive choice, while plans for new coal plants are being cancelled and older plants are retired. Cheap natural gas is also putting the squeeze on nuclear energy.

Less expensive gas also puts pressure on wind and solar, although it has an upside for these technologies, making them cheaper to integrate into the electric grid. New gas plants can be more easily adjusted to follow the electricity production of wind and solar, which can vary depending on the time of year and the weather. Looming EPA carbon standards also favor gas over coal and

make distributed generation technologies, which are often highly efficient or have low or no emissions, more attractive. Further, low-cost gas makes it easier for business and industry to make their own electricity with CHP or natural gas generators, possibly at lower cost than buying it from the utility.

### Time for a Change?

The regulatory structure in most states often makes utilities focus on the business of selling electricity, giving them little or no incentive to embrace energy efficiency and technologies—such as combined heat and power systems—that reduce their sales. This puts their goals at odds with those of many policy makers, businesses and consumers. Utilities also have substantial infrastructure costs, regardless of energy sales. If recession or increased efficiency reduces sales, utilities must raise rates to cover their fixed costs. “Utilities do have concerns about the impact of distributed generation on their business models. Policymakers should listen to those concerns,” says Morgan.

To address the conflicting goals of utilities, lawmakers and customers, some policymakers are exploring ways to move away from the consumption-based regulatory model. A handful of states with strong efficiency and distributed generation policies have broken the link between profit and the amount of energy sold through a policy called “decoupling.” This allows utilities to pursue aggressive energy efficiency programs without the fear of losing money due to decreased sales. Some states, such as Massachusetts, also allow utilities a higher rate of return if they meet energy efficiency, renewable energy, reliability or customer service goals. Decoupling allows utilities to focus on investments that keep ratepayer costs low, such as efficiency and demand reduction. But decoupling can shift the risks of weather

and economic downturns to consumers. Fourteen states now have some degree of electricity decoupling in effect.

Other solutions include adjusting rates to compensate utilities when they lose revenue due to efficiency and distributed generation, an approach allowed in 18 states.

One of the challenges of distributed generation is determining the value of the grid system that supports it. Most small energy producers, including CHP and rooftop solar owners, rely on the grid as backup or to transmit the energy to where it's needed, if it is not used on site.

In states such as Arizona and Colorado, utilities are pushing back against state net-metering rules that require utilities to credit owners of rooftop solar for the energy they produce. "The tension on this issue is between making sure customers with distributed generation capacity are compensated for the value of the energy they produce while ensuring they pay their share of the fixed costs utilities have from providing reliable electricity to all customers in their service area," says Morgan. Part of the solar legislation he helped author asks the Minnesota Department of Commerce to work with utilities and the Public Utilities Commission to determine fair compensation for rooftop solar producers.

These may be early signs that distributed technologies pose a threat to utilities under the current utility regulatory model in many states. One day, a good portion of the energy we consume could be produced on-site or within a number of integrated micro-grids, while some users may opt for stand-alone power systems. Just as cell phone technology transformed the communications sector, these developments could turn the centralized energy model upside down.

"This period of transition from a traditional utility to one in which there is two-way communications, customer generation options, and opportunities for third parties to engage in traditional utility-customer interactions will be difficult for all parties, including legislators," says Representative Sloan. "Once technology and customer expectations raise new preferences, it is impossible to go back. The utilities that thrive in the future will be those that can manage their systems and customer desires effectively; the rest will be acquired by the successful utilities or slowly succumb to third-party innovators." 



# ***Electricity Primer***

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# Electricity 101

## How It's Generated

As we learned at a young age, electricity is generated when a turbine is spun thus creating an electric current. There are a number of ways to fuel this process, be it from burning coal, natural gas, harnessing the wind to rotate a windmill's blades, nuclear power, or capturing heat from the earth itself (geothermal energy). Regardless of how this process begins, once electricity is generated it must be transported. Competitive suppliers use all these fuels and others in providing reliable service to millions of consumers.

## How It's Transmitted

Electricity must be generated and consumed at nearly the same time. To maintain a reliable and secure electricity transmission grid, an intricate physical balance must constantly be maintained between the amount of power that is generated and the amount that is consumed since storage of electricity – like other commodities such as airline seats and hotel rooms – is not a practical reality at this time. The conveyance of electricity from a generating station to end-use customers relies on complex transmission and distribution networks.

Transmission lines are generally of a higher voltage to carry more power across longer distances. They can be thought of as a highway system for electricity. As a matter of fact, transmission line towers often track along side actual highways. Distribution lines are those often seen above or below city streets, and carry power to individual consumers. Both sets of networks are critical to delivery of power to consumers.

## Where It's Transmitted

The continental United States is divided into three almost entirely separate electricity "interconnections." These interconnections function on different frequencies making transfers of power between them difficult. The Eastern Interconnection generally includes everything east of the Rocky Mountains. The Western Interconnection includes everything from the inter-mountain states to the Pacific. The Electric Reliability Council of Texas (ERCOT) includes most of Texas.

Within these three interconnections differing regulatory and market structures exist (discussed further below). The physics of generating electricity, however, remains the same in all regions.

## What Is a Wholesale Electricity Market?

In many cases, electricity is generated by a power company that ultimately will not deliver it to the end-use customer. A single megawatt (MW – the most common unit of electricity used in discussions – is generally enough power to light 750 to 1,000 homes), like any other commodity, is frequently bought and re-sold a number of times before finally being consumed. These transactions are considered “sales for re-sale,” and make-up the wholesale electricity market.

The wholesale market is open to anyone who, after securing the necessary approvals, can generate power, connect to the grid and find a counterparty willing to buy their output. These include competitive suppliers and marketers that are affiliated with utilities, independent power producers (IPPs) not affiliated with a utility, as well as some excess generation sold by traditional vertically integrated utilities. All these market participants compete with each other on the wholesale market.

To be a participant in the wholesale market, however, one does not need to either own any generation or serve any end-use customers. Just as with many other commodities – pork bellies, oil or stocks – individual traders (or power marketers) exist who buy power on the open market and re-sell it.

Trades in the wholesale market are understood to be occurring within a multi-state interconnection, and thus are interstate sales. Due to the interstate nature of the sales, the wholesale market is regulated across the country – except in ERCOT – by the Federal Energy Regulatory Commission (FERC). ERCOT functions as an exception due to the fact – as described above – that the entire interconnection lies in a single state, Texas.

Within regional wholesale markets, however, there exists a split structure. A number of regions – including the Northeast, Mid-Atlantic, much of the Midwest, ERCOT and California – organize their markets under an independent system operator (ISO) – sometimes also referred to as a regional transmission organization (RTO). Most states in these regions also allow for retail competition (further discussed below). By adopting this ISO/RTO structure, these regions have moved to expand competition in electricity. In fact, two-thirds of the electricity consumed in the U.S. is by consumers in an ISO/RTO.<sup>1</sup>

Other regions – including the Southeast, Southwest, Inter-Mountain West and Northwest – chose to retain the traditional regulatory model. Under this regime, vertically-integrated utilities retain functional control over the transmission system and therefore choose what generator is dispatched when. Such a model, however, has led to preferential treatment by these utilities for their own generation rather than more affordable and environmentally responsible generation available from competitive suppliers and marketers.

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<sup>1</sup> “The Value of Independent Regional Grid Operators,” The ISO/RTO Council, November 2005.

## How Is Electricity Sold At Retail?

The retail side of electricity involves the final sale of power from an electricity provider to an end-use consumer. These sales range from the service for a large manufacturing facility to small businesses and to individual households.

In every state, regardless of whether they allow retail competition or not, supply for end-use customers is obtained either through the open, competitive wholesale market, from utility-owned rate-based (cost-plus) generation, or some combination of the two.

In states where full retail competition (often called “retail choice”) is provided, customers may choose between their incumbent utility supplier and an array of competitive suppliers, as opposed to being a captive customer to a single provider. Competitive retail suppliers provide a variety of service plans that give consumers and businesses flexibility in their energy purchases. They may also offer services to hedge against price fluctuations, more choices for alternative energy resources, and newer energy efficiency projects, among others. These opportunities allow consumers and businesses to choose the services that best meet their needs.

In most states providing retail competition, customers who don't choose a supplier are served by their incumbent utility through a service called “provider of last resort” (POLR - also sometimes referred to as standard offer service, SOS). The POLR or SOS supplier will then secure its needed power on the wholesale market through a competitive bid process.

Retail markets are regulated at the state level. State regulatory commissions are most often called the state “Public Utility Commission” or “Public Service Commission.” In every state, these commissions regulate a distribution utility's costs and rate of return for use and upkeep of the distribution system.

In retail choice states, the commissions approve any alternative competitive supplier before they can serve customers. The commissions also oversee a POLR or SOS utility's power procurement, and approve the results of the process if the process was fair.

In states not offering retail competition, the commissions regulate the expenditures of the monopoly utilities by allowing a rate of return on most costs. In these states, utilities are vertically-integrated and may construct, own and operate power plants – at the ratepayers' expense. To curb inefficiencies that occur under any monopoly system, many states with vertically-integrated utilities require utility power resources to be acquired through a competitive bid process - similar to how government contracts are filled.

## What Are RTOs and Organized Markets?

A regional transmission organization or independent system operator (RTO or ISO) serves as a third-party independent operator of the transmission system. There is an inherent conflict of interest when the same single company owns all of the transmission and distribution system and some of the generation. These third-party independent operators, however, ensure that no preference is given in the dispatch of a utility-owned generator over a competitive generator. ISO/RTOs also conduct "spot" (also called "Day 1" or real-time) markets and "day-ahead" (or "Day 2") markets.

ISO/RTOs provide fair transmission access to facilitate competition for the benefit of consumers. They provide transaction support as part of their market duties and engage in regional planning to ensure that the right infrastructure gets built in the right place, at the right time. They accomplish all of this over a large regional area providing greater value to customers at every level of the supply chain than would be seen in the more piecemeal utility-by-utility approach.

This wide, regional approach also improves the reliability and coordination of what has been called the "most complex machine ever devised by man." ISO/RTOs have worked to eliminate "seams" between regions. This has helped to facilitate more efficient power flows and transactions, which previously may have had to cross numerous individual utility areas and had to pay transaction charges for every utility border crossed.

As previously noted, ISOs and RTOs cover many regions of the country with two-thirds of the United States' economic activity occurring within their boundaries. Current organized markets include:

1. ISO New England;
2. New York ISO;
3. PJM (Mid-Atlantic, a portion of the Midwest);
4. Midwest ISO;
5. Southwest Power Pool;
6. ERCOT (most of Texas); and the
7. California ISO.

Taking such a regional planning approach allows for the pooling of resources and therefore the need for fewer plants than on a state-by-state basis. By cutting the need for more power plants, ISO/RTOs help save consumers money and substantially reduce emissions.

ISO/RTOs conduct vigorous oversight of both their market and transmission functions and are regulated by the Federal Energy Regulatory Commission (FERC). As a further check, each organized market is overseen by an independent market monitor. All stakeholders in the market have input into ISO/RTO activities while the transparency of a fluid and liquid market also helps to make sure markets are fair.

## How Wholesale Electricity Prices Are Set

ISO/RTOs use a uniform (or single) clearing price auction in which electricity generators place bids with an independent market administrator for a particular time period. The independent administrator then dispatches the generators from lowest to highest bids until all power demand is met. Each generator that is dispatched is then paid the same price as what was paid to the last unit of electricity needed to meet total demand.

Uniform price auctions are used for the “spot” (or real-time) markets of all federally approved and independently run regional electricity markets. In practice, the spot market is used to serve only a portion of demand. Like a mutual fund, retail electricity suppliers serve their customers through a diverse portfolio of long-, medium- and short-term contracts, as well as the spot market.

The uniform clearing price auction drives generators to reduce their operating costs so that their bids can be lower and, hence, will be accepted – the generators that set the clearing price, and therefore meet the last increment of demand, earn little or no contribution to their fixed costs. The lower cost generators in turn are able to recover some of their long-term debt and other expenses under this auction design.

Because the last increment of demand set the clearing price, an explicit price signal to conserve electricity is established. For certain customers who can reduce their demand, a price incentive can be transparently seen.

By contrast, under a pay-as-bid auction design, the selection process for which generators will run at a given time is the same as in a uniform clearing price construct with the difference being that each auction winner is paid exactly what it bid - a significant distinction.

In a pay-as-bid auction, generators will roll all their costs into a single bid and attempt to guess what the highest price selected will be, and then bid to match it. Inevitably, some lower cost generators will bid too high – because all generators will be bidding above their operating costs, market transparency is lost and the risk of manipulation is raised.

For these simple reasons, economists – and some critics<sup>2</sup> – agree that uniform clearing price auctions generally result in lower prices for consumers than pay-as-bid auctions.<sup>3</sup>

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<sup>2</sup> Lester Lave of Carnegie Mellon University and Kenneth Rose of Michigan State University speaking at the American Public Power Association's "Assessing Restructured Electricity Markets" Symposium, Feb. 5, 2007 in Washington, DC.

<sup>3</sup> "Pricing in the California Power Exchange Electricity Market: Should California Switch from Uniform Pricing to Pay-as-Bid Pricing?" Peter Cramton, Alfred E. Kahn, Robert H. Porter, and Richard D. Tabors, Blue Ribbon Panel Report, California Power Exchange, January 2001.

## Competition in Electricity Markets

Competition in electricity markets – as with competitive market structures for other commodities – creates incentives for efficiency and innovation while providing the most affordable prices consistent with long-term investments. From 1995-2004, significant gains in efficiency, attributable to competitive markets, were seen in coal and nuclear plants in the eastern United States.<sup>4</sup> Competition also led to the innovation and increased deployment of new gas-fired generation technologies providing significant new efficiencies and environmental controls. These efficiency gains translate to reduced fuel use, lower costs, lower emissions and fewer power plants needed to meet demand.

Competitive markets also transfer much of the risk of a costly and long-term power plant investment from the captive rate-payers of a vertically-integrated utility to competitive suppliers. In states with ISO/RTOs and in regions that hold independently overseen competitive bidding for generation resources, the days when a rate-based plant was built 200 or 300 percent or more over the initial cost projections, with the excess costs footed by captive ratepayers, are over so long as robust competitive electricity markets discipline plant development costs.

The decision to move to increased competition in electricity markets was not made by Congress and the states in a vacuum. It was no accident that competitive electricity markets were developed after electricity rates skyrocketed in the 1970s and 1980s due to a number of factors, including large cost overruns in building traditional utility-owned capital intensive baseload power plants. As the nation faces a situation again where the need for new baseload plants is looming, it is important to remember the past to avoid repeating costly mistakes.

Today, rates are rising everywhere because of significant input cost increases such as for fuel, labor, and construction materials, as well as regulatory uncertainty. It is important to note, however, that these costs are rising in all regions of the country regardless of market structure. In fact, states that have chosen to further pursue competitive markets have seen a comparative decrease in their power costs when compared to other states.<sup>5</sup>

The path to competitive power markets has been one affirmed numerous times by both state and federal governments. As stated by the Federal Energy Regulatory Commission in a June 5, 2006 press release, “The Energy Policy Act of 2005 represents the third major federal law enacted in the past 30 years to promote wholesale competition... These laws promoted competition by lowering barriers to entry and increasing transmission access.” While refinements are necessary as these markets evolve and mature, competition is bringing real benefits to consumers across the country.

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<sup>4</sup> Global Energy Decisions, Inc., “Putting Competitive Power Markets to the Test,” 2005

<sup>5</sup> Howard J. Axelrod, David W. DeRamus and Collin Cain, “The Fallacy of High Prices,” *Public Utilities Fortnightly*, November 2006