Why We Need Active Nodal Power Markets

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THE SOURCING, COST AND ENVIRONMENTAL impact of meeting energy needs continues to dominate our headlines and blogs. We all generally want the same thing: access to energy where and when we want it, at the lowest possible cost (both short and long term) and without harming our environment. However, there are many debates about how to achieve this and how to evaluate and balance the trade-offs as they might arise. In general though, it is clear that we will need fair and efficient electric power markets in order to ensure efficient pricing of electricity and to help support the development and maintenance of reliable and effective electricity infrastructure. In particular, the transient nature of electricity dictates a nodal (locational) structure for electricity markets. Only with this nodal market structure can we best achieve the promise of demand response and renewable energy programs. Furthermore, structuring the nodal markets so that entities can properly manage their business risks will be key to ensuring that nodal markets are able to meet our common objectives.

The Transient Nature of Power

Unlike oil, which can be stored for the future in barrels, or natural gas, which can be stored in tanks, electricity is transient. With a few exceptions, such as hydroelectric pump storage systems, electricity is not generally stored and must be consumed as it is generated. Thus, the economics of electricity are intimately linked with the distribution of electricity. Given there are usually significant barriers to locating power generation at the same location as power consumption, the limits of the transmission grid play a key role in determining which power plants must be used to satisfy demand. During peak times, transmission lines connecting less expensive generators to urban centers can often become congested, creating the need to turn on more expensive peaking generators located closer to the urban area—driving up the cost to serve the area. It should also be noted that loss of electric power, which increases in proportion to the distance it travels, is another factor that affects transmission system economics. Managing electricity (and especially the pricing) without nodal markets would be comparable to managing traffic by analyzing cars and never looking at the roads.

Locational Marginal Pricing of electricity has been developed to ensure that the price of electricity at each location on the transmission network properly reflects the limitations of the transmission grid. By considering the congestion and loss factors at every point on the grid, the Locational Marginal Price (LMP) provides an important economic signal for management of the grid. While the system-wide cost of energy on average forms the majority of the notional value of LMP, the variability of LMP is driven as much by the congestion and loss factors as by the variability in energy cost, highlighting the economic effects of the transient properties of electricity.

Nodal Markets

Over the majority of the United States, organized Regional Transmission Organizations / Independent System Operators (RTOs/ISOs) price power on a nodal basis. These markets comprise ISO New England, New York ISO, PJM Interconnection, Midwest ISO and most recently California ISO. More markets, such as the Electric Reliability Council of Texas (ERCOT) plan to go nodal in the near future. These organized markets permit the trading of electricity on a nodal basis. Through con-

ducting both real-time and day-ahead auctions for power on a nodal basis, the RTO/ISO markets price power at thousands of granular locations on their network. These auctions result in Locational Marginal Prices that appropriately reflect the cost of energy, congestion and loss at a given location on the grid.

Demand Response is Locational

Nodal markets are key to enabling the Demand Response concepts that have been put forth as a means to moderate expensive peak demand. Demand Response programs involve managing power consumption on a local basis in response to supply conditions in order to achieve greater efficiency. Rather than simply have supply rise or fall to match demand, electricity consumers can be given price signals that would encourage them to reduce demand at peak times. For example, if demand is peaking in a location, perhaps the electric car in the garage can be re-charged at a later time. Demand Response programs need to be based on a nodal construct (often coupled with a smart grid). Active nodal physical and financial markets will help support the naturally locational perspective involved in demand response.

Scarcity pricing and variable nodal pricing create the best, and perhaps only, incentive for enterprises and individuals to sensibly manage consumption. While we all want low prices, we also need to recognize that prices need to reflect the true economics of marginal production if we expect consumers to efficiently allocate scarce resources. When consumers are given a flat price that is not economically transparent, it should not surprise us to find that we end up with peaks and valleys in consumption which require expensive generation that is often left unused.

Nodal Pricing Supports Efficient Capital Deployment

Nodal pricing is fundamental to having the right electricity pricing. Where to build a plant is a function of nodal prices, not the regional or hub average. How much transmission to build and where to build it is also a function of nodal prices. We want to limit congestion, but it would be a waste of the consumer's money to spend more on transmission than the cost of congestion—for the very same reason that it is uneconomic to build roads to the point that we never have traffic delays. We need a diverse range of generation types and a robust transmission grid to cope with large uncertainties in demand, technology, and fuel costs. Nodal pricing is a key tool in balancing this economic equation.

Nodal Markets Also Support Renewable Energy

Expanding renewable energy sources such as wind and solar are a major element of current energy policy as well as consumer and industry interest, and also demonstrate significant locational qualities. Location is a strong determiner of where renewable energy can be sited: wind farms are best placed in certain locations such as west Texas, and solar energy is most efficiently produced in the deserts of the southwest. The renewably generated power will need to be transmitted to where the key demand load is located and this will mean creating new transmission lines, and/or additional congestion on existing lines. Renewable energy can also be highly intermittent depending on how the wind is blowing or the sun is shining, creating significant management challenges in matching supply to demand and greater LMP risks across the power grid. Active Nodal markets help entities manage these risks and ensures that the proper economic signals are sent to develop the appropriate infrastructure. The creation of innovative and entrepreneurial renewable supply depends upon open access to the market at fair prices which is made possible through nodal markets.

Financial Planning

Allowing owners of generation and those who purchase power to financially manage their risks is an important component of ensuring that robust nodal markets serve their purpose in furthering our energy policy goals. When power is priced on a nodal basis, the most appropriate way to hedge it is also on a nodal basis. In addition to the real-time and day-ahead markets, the RTO/ISOs offer a forward market for financial transmission rights (FTRs) which allows entities to address the congestion component of the LMP. However, to fully support the need to hedge the full LMP, a nodal

futures product is also necessary. Nodal Exchange, which launched in April 2009, is offering nodal futures contracts which financially settle against the day-ahead LMP to meet this need.

In addition to offering additional contract options, an exchange format for trading nodal futures also allows a fuller development of the forward market. Given the complexities of nodal trading, an auction format, such as deployed by the RTO/ISOs and Nodal Exchange, helps to pool liquidity. In addition, exchange-supplied daily marks on nodal contracts can help valuation in mark-to-market accounting. Finally, a cleared exchange, in which a central counterparty replaces bilateral counterparty risk, greatly mitigates credit risk. Greater focus on credit risk is a key element to ensuring viable nodal markets for power. Indeed, there are movements to create legislation, including a letter from Treasury Secretary Geithner to Congress on May 13, 2009, that would require all standardized over-the-counter bilateral trades to be central counterparty cleared in order to avoid the credit risks that have damaged our economy over the past year.

Summary

Active nodal power markets, both physical and financial, are critical to the nation's electricity future. Because electricity is generated and used at a nodal level and cannot be stored, nodal pricing is the key information that is needed to manage demand, supply and investment. It is a fundamental enabler of demand response and the development of renewable energy sources. Fair and efficient nodal markets are part of the foundation for addressing the next generation of electricity challenges. ■