

## APPENDIX B – EXAMPLES OF REGIONAL TRANSMISSION OPERATORS

## RTOs and ISOs in North America

Approximately two-thirds of the population of the United States and one-half of the population of Canada are now served by transmission systems and organized wholesale electricity markets run by Independent System Operators (ISOs) or Regional Transmission Organizations (RTOs).<sup>1</sup> There are now 10 major RTOs or ISOs in these two nations. These organizations were created to support “open access” to transmission systems in order to promote regional wholesale competition in power markets, but they also now provide several other important services. These ISOs/RTOs also seek to ensure that the wholesale power markets in their regions operate efficiently and treat all market participants fairly, to expand transmission to support growth and integrate remote renewable resources, to provide much greater use of demand-side resources, and to maintain reliability of the bulk power system.

- *Open access to transmission.* In 1996, the US Federal Energy Regulatory Commission (FERC) mandated “open access” to the transmission system. Open access requires transmission owners to make available, at cost-based or market-based fees, available transmission capacity to any generator or power buyer that is or can be connected to the system. The objective is to prevent transmission owners from using their control of the power system from favoring their own generation and stifling competition. To further facilitate open access, in 1999 a FERC order encouraged the creation of RTOs. RTOs take over operation of the transmission network in a region or large state, although utilities continue to own their systems. RTOs ensure open access to the grid, coordinate transmission planning, and establish mechanisms to pay for new transmission lines.
- *Operating wholesale power markets.* Most ISOs/RTOs coordinate competitive wholesale spot markets in which energy providers submit supply offers and purchasers submit demand bids. A market clearing price balances supply and demand, selecting least-cost supplies until demand is met. These wholesale markets further enhance reliability by informing all market participants of real-time grid conditions through the public posting of electricity and ancillary service prices and other key system information. High prices signal to loads and off-line generators able to respond in a timely manner where more low-cost generation or load reduction are needed and valued. Most of these bid-based, centrally-dispatched markets operate seamlessly across state borders and are able to reduce the cost of electric power across fairly wide regions of the US and Canada.
- *Managing reliability services.* One of the most important responsibilities of ISOs/RTOs is to maintain reliable bulk power system operations in real-time. They provide critical reliability services including outage coordination, generation scheduling, voltage management, ancillary services provision, and load forecasting. ISOs/RTOs enhance reliability through their large geographic scope – by dispatching generation over a broad region they reduce the number of decision makers managing the grid, and increase the number of supply and demand-side resources available to meet contingencies. .
- *Promoting end-use demand response to lower system peaks and costs, and to improve reliability.* Demand response is an increasingly important part of the overall resource mix, serving to both reduce costs and enhance reliability. Traditional vertically

1. RTOs and ISOs are quite similar in function and the terms are sometimes used interchangeably. Detailed information on many of the topics noted in this section can be found on the website of the ISO/RTO Council, <http://www.isorto.org>. Some items in this section are taken from the Council’s “State of the Market Report 2009,” posted at <http://www.isorto.org/site/apps/nlnet/content2.aspx?c=jhKQIZPBImE&b=2708737&ct=7511417>

integrated and transmission-dependent utilities have long employed interruptible load to reduce capacity needs and enhance reliability. ISO/RTO dispatch, settlement, and demand response rules accommodate these utility programs. In addition, they have encouraged (and adopted tariffs to pay for) *regional* demand response programs that cut across traditional utility service territories.<sup>2</sup> As a result, 31,695 megawatts (MW) of demand response are presently available in North American ISO/RTO markets, up from 17,146 MW at the end of 2006, and representing 6.6 percent of 2008 peak electricity demand within the combined ISO/RTO regions. With the capacity of an “average” power plant at 500 MW, ISO/RTO demand response resources provide the equivalent of more than 63 power plants.

- **Forward capacity markets.** Two regional power system operators in the United States are running auctions for capacity on a “forward basis” (i.e. several years in advance of need) that enhance reliability and reduce power price volatility by ensuring that capacity is provided in advance of need. These markets also permit energy efficiency and other demand-side resources to compete with traditional generation to meet electricity demand, and pay demand-side and supply-side resources for capacity on an equal basis (for details see Energy Efficiency section above).

- **System planning and greater integration of renewable power.** An increasingly-important role of RTOs is to coordinate the transmission system planning needed to support the development of renewable resources. Several RTO functions inherently support renewable power development, including transmission open access requirements, access to scheduling services and energy spot markets, and integrating many generators and providing demand response programs to help balance load and intermittent generation. In addition, RTOs are now coordinating wide-area transmission-planning processes to evaluate proposed transmission improvements and plan for the addition of large-scale renewable generation. The wider geographic scope of RTO markets, compared with most transmission owner operated control areas, supports the development of the large-scale transmission projects needed to dispatch, deliver and balance renewable generation across broad regions. Large-scale transmission projects spanning the service territories of multiple transmission system owners have been completed or initiated in the US Midwest, Mid-Atlantic states, in New England, and in Texas in the last several years. While wind power is still a small fraction of total generation in the United States and Canada, wind generating capacity located within the 10 ISOs/RTOs has increased four-fold since 2004, and close to 80 percent of total U.S. wind generating capacity is now located within the footprint of the ISOs/RTOs in the United States.

2. For the reasons for, and examples of, regional demand-response programs see “Dimensions of Demand Response: Capturing Customer Based Resources in New England’s Power Systems and Markets” (Report and Recommendations of the New England Demand Response Initiative, July 2003), posted at <http://nedri.raabassociates.org/>.