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Good morning, Madam Chairman White and Chairman Tomlinson, Ranking Members Musto and Boscola, and Committee Members. PJM appreciates the opportunity to testify today to inform your consideration of an energy policy for Pennsylvania. As the operator of a regional transmission network stretching from northern New Jersey through Baltimore and Washington D.C. to North Carolina, and westward to and encompassing Chicago, PJM provides the platform linking Pennsylvania's electric energy infrastructure to the broader region, and enables the Commonwealth's energy suppliers and consumers to engage in regional commerce. Critically, it provides the platform which assures short-term and long-term reliability of the bulk power system serving the Commonwealth and the region.

PJM is one of seven regional entities in North America known as Regional Transmission Organizations (RTOs) or Independent System Operators (ISOs). As do the nation's other RTOs/ISOs, PJM operates under the jurisdiction of the Federal Energy Regulatory Commission (FERC), which holds PJM responsible for electric transmission grid operations, electric system reliability, and the provision of transmission service within its footprint. PJM also actively participates in the North American Electric Reliability Organization (NERC), the Electric Reliability Organization designated by FERC to enforce mandatory reliability standards for all participants in the North American bulk



power transmission system. In addition to fulfilling its responsibility to enforce the reliability standards mandated by NERC, PJM votes with other NERC members to approve or reject newly proposed reliability standards.

As I explain how PJM performs its critical functions and provides the wholesale electricity platform enabling state energy policy to be implemented, it may be useful to think of PJM as akin to both the New York Stock Exchange in facilitating competitive electricity trading, and to UPS in assuring the efficient delivery of electricity.

In the short-term, PJM assures system reliability by serving in effect as an independent “air traffic controller” responsible for the reliable delivery of power from its source point to its delivery point over the high voltage electric transmission grid. PJM’s enterprise is complicated by the fact that electricity travels over the transmission network at the speed of light, that electricity cannot be stored like natural gas, and that the transmission network is subject to catastrophic and cascading failure in the event that supply and demand are not kept in balance instantaneously. PJM employs electricity markets to assure that resources are available for dispatch on a moment by moment basis to keep supply and demand in balance while preserving grid reliability.

In the long-term, PJM assures system reliability by anticipating the balance of supply and demand over a fifteen year horizon, providing for the efficient interconnection of generating resources to the transmission network, and determining what improvements to the bulk power transmission system are necessary in order to assure ongoing system reliability. PJM is authorized by FERC to require its member transmission owners to build the transmission facilities that PJM, as an independent organization, deems necessary to preserve system reliability.

For the most part PJM fulfills its responsibilities through a detailed set of business rules authorized by FERC, which addresses the broad scope of PJM’s activities associated with the maintenance of short- and long-term reliability.



To set the stage for my remarks, please consider PJM’s history and its current enterprise. PJM has operated the electric transmission grid in the Mid-Atlantic Region of our nation since 1927. Initially, PJM was an association of transmission owners formed for the purpose of coordinating the efficient mutual use of utility resources. Subsequently, PJM has evolved into an independent operator of the transmission grid, regulated by FERC and overseen by an independent Board of Managers. PJM’s Board is responsible for all aspects of PJM’s operations and has exclusive authority to seek amendments to PJM’s Tariff and Reliability Assurance Agreement. PJM’s Board is advised by means of a collaborative and active stakeholder process which provides electric market participants and other stakeholders a voice in considering reliability and market design issues. Stakeholders include participants who produce, buy, sell, or transmit wholesale electricity, as well as policy makers engaged in the retail electricity regulatory arena. For example, through a collaborative process, PJM adopted the rules and procedures to facilitate power plant interconnection to the grid. Those rules treat all power plants comparably, provide market certainty, preserve the integrity of the power grid, and allocate the costs of transmission system enhancements necessary to accommodate interconnection on a “beneficiary-pays” basis. While state regulators including the Pennsylvania Public Utility Commission (PPUC) are encouraged to participate directly in PJM’s stakeholder process, PJM and its Board also interact with the fourteen retail regulatory utility commissions in the PJM footprint through the Organization of PJM States, known as OPSI. PPUC Chairman Wendell Holland was previously the President of OPSI and is currently a member of OPSI’s Executive Committee.

PJM operates – it does not own - the regional bulk power system comprised of the high-voltage transmission assets owned by its members. By virtue of its independence, PJM assures non-discriminatory access to the transmission grid and thereby supports the development of a diverse energy infrastructure. PJM also takes no position or stake in the market it operates in the interest of maintaining neutrality and system reliability.



Today, PJM is responsible for maintaining reliable system transmission grid operations for approximately 51 million people in 13 states and the District of Columbia. Last summer, PJM experienced an all-time peak load of 144,644 megawatts. Over 164,000 megawatts of generating capacity are connected to PJM's grid. PJM annually bills approximately \$21 billion, an indication of the substantial size of its market. The reliability services PJM provides supports an economy in the PJM footprint responsible for about 19 percent of the nation's gross domestic product. PJM operates on a non-profit basis under a stated rate approved by FERC. The typical residential consumer pays a total of about \$3 a year for the services PJM provides, which includes an administrative fee of about three-hundredths of a cent per kilowatt-hour. Pursuant to PJM's FERC-authorized stated rate, PJM's administrative fee declined this year and will continue to decline for the next four years.

PJM's Core Mission: Maintaining the Reliability of the Bulk Power System

PJM's mission is set forth in its FERC-approved Operating Agreement. It is: to 1) promote the safe and reliable operation of the bulk power facilities in the PJM region; 2) create and operate a robust, competitive and non-discriminatory electric power market in the PJM region; and 3) avoid undue influence over the operation of the bulk power facilities by any market participant or group of market participants. PJM's competitive wholesale power market, the world's largest, provides PJM's system operators with a more effective means of managing congestion on the electric system, and thereby maintaining system reliability, than is the case absent a wholesale market. At the same time, PJM's wholesale market provides transparent pricing information that market participants can use to manage their energy market transactions more effectively.

PJM ensures short-term bulk power system reliability by 1) receiving, confirming and implementing all interchange schedules; 2) ordering the redispatch of generators connected to PJM-controlled transmission facilities; 3) approving all scheduled outages of transmission facilities; 4) scheduling generator maintenance outages; 5) monitoring the electrical system on a real-time basis; and 6) implementing emergency procedures



required to maintain system reliability. PJM's world-class system-management tools enable it to run a "security analysis" every 30 seconds, processing 68,000 data points every ten seconds and evaluating almost 4000 contingencies. PJM maintains long-term reliability by assuring that the nation's reliability standards are met through its long-term planning process.

PJM's Regional Transmission Expansion Plan (RTEP) Process

PJM's comprehensive Regional Transmission Expansion Plan (RTEP) Process examines the three interrelated components of system reliability: load, generation, and transmission. PJM's RTEP Process employs a range of planning study tools and methodologies to analyze and assess load, generation, and transmission over a 15-year planning horizon to ensure that reliability remains on a firm footing. Recently FERC has modified PJM's RTEP process to provide for analyses of cost-beneficial transmission system enhancements to address persistent and costly transmission system congestion. PJM has recently begun to perform market efficiency studies which will enable it to recommend the acceleration or modification of existing RTEP reliability-justified plans or new plans to mitigate economic constraints. I've provided a description of PJM's RTEP process and a copy of PJM's 2006 Regional Transmission Expansion Plan as attachments to my testimony today.

PJM's RTEP is responsive to a variety of "drivers". Forecasted load is a key driver, along with anticipated demand-side management efforts and additions of distributed generation facilities. The RTEP also takes into account interconnection requests by developers of new generating resources and merchant transmission facilities, planned generation additions and retirements, and requests for long-term firm transmission service. It assesses the potential risk of aging infrastructure and the impact of transmission-owner-initiated system improvements.

Requests for the interconnection of new generating resources are a key component of the RTEP plan. Any entity that requests interconnection of a generating facility or merchant



transmission facility to PJM's transmission grid must do so in accordance with PJM's established interconnection process. PJM's independent interconnection analysis assures that interconnection facility enhancements and cost responsibilities are developed in a fair and non-discriminatory manner, free of any market sector's influence. Since the inception of PJM's non-discriminatory planning process in 1997, more than 180,000 megawatts of new generation requests have been processed through PJM's interconnection request queues. Of those requests, over 19,000 megawatts of generating capacity have been accommodated through transmission system enhancements, representing 157 projects. Although early requests for generator interconnections were primarily for natural gas-fired units, more recent requests include wind, clean-coal and methane gas resources as well. Over the past decade, proposed generation investment within PJM has shifted from about 95 percent natural gas to a more diversified mix of fuels. That mix now includes wind at nearly 25 percent; natural gas at nearly 30 percent; coal at 25 percent and nuclear at nearly 15 percent. Overall, a generation portfolio of diverse fuel sources reduces the risk to system reliability from degraded availability or higher cost of individual fuels. It also protects against the impact on generation dispatch from fuel price variations and consequent generation loading patterns.

PJM provides for the expedited processing of requests for the interconnection of new resources of less than 20 megawatts pursuant to its Open Access Transmission Tariff. PJM also provides for the expedited processing of requests for the interconnection of new resources of 2 megawatts or less through the use of pre-certified generation equipment and systems that meet IEEE Standard 1547 technical requirements.

The non-discriminatory nature of PJM's RTEP process has permitted significant growth in renewables in recent years. Interconnection request totals through 2006 include 19,500 megawatts of wind generation, 410 megawatts of methane, 400 megawatts of biomass and 1,200 megawatts of hydro. PJM has been a leader in facilitating the interconnection of intermittent resources such as wind, by developing procedures for consideration of the



megawatt-capacity value of intermittent resources which are difficult to schedule because they do not run at pre-specified times.

PJM has also worked to accommodate the interconnection of “behind-the-meter” generation, which is comprised of generating units that serve load at a single location without relying on utility transmission or distribution facilities. Behind-the-meter generation which desires to participate in PJM’s energy market or capacity market must submit a generation interconnection request. PJM’s behind-the-meter rules permit load-serving entities in PJM to “net” operating, behind-the-meter generation against load in the calculation of charges for energy, capacity, transmission service, ancillary electricity services and PJM administrative fees. This approach encourages the use of behind-the-meter generation during times when wholesale electricity prices are high, and in so doing increases the opportunity for load to compete in PJM’s markets.

The majority of interconnection requests from distributed generation developers are for distribution-level system interconnection, rather than interconnection to the bulk power transmission system. Those requests are subject to state jurisdiction rather than the federal jurisdiction of FERC. Nevertheless, entities can apply to take part in wholesale sales of energy and/or capacity in PJM’s markets. They must execute a PJM Wholesale Market Participation Agreement, and after doing are placed in the interconnection queue process so PJM may assess the impact of their wholesale power transactions on the PJM bulk power system.

As of the end of 2006, PJM has received interconnection requests for 338 new generating resources proposed for Pennsylvania since 1999, comprising 77,412 megawatts. Of those, 77 projects comprising 11,875 megawatts are in-service. Eleven projects comprising 1,155 megawatts are under construction, and another 73 comprising 11,392 megawatts are active and under study. Of the facilities under construction or study, 7,927 megawatts are coal-fired; 3,604 MW are wind generators; 771 megawatts are natural gas-fired; 585 megawatts are nuclear; and 201 megawatts are hydro, methane, or diesel. Of



the 338 generating resources proposed for Pennsylvania since 1999, 177 projects comprising 52,989 megawatts have withdrawn from PJM's generation interconnection process.

PJM's Board of Managers is charged with authorizing transmission system upgrades which the RTEP identifies as necessary. Under the terms of PJM's Operating Agreement, transmission-owning members are required to construct the transmission facilities that the Board deems necessary for maintaining system reliability. PJM does not reject or recommend any market-driven solutions, be they generation, merchant transmission, or demand response. When system constraints exist, market participants initially determine cost-effective solutions, based largely on the operational, planning, and market data that PJM routinely makes available. When PJM proposes a transmission upgrade as the means to resolve a reliability issue or transmission constraint, it does so by virtue of the market's inaction regarding other potential solutions.

FERC has also recently required PJM to institute an economic planning component in its regional transmission expansion planning process. In undertaking economic planning, PJM identifies cost-effective solutions to alleviate costly, persistent and unhedgeable congestion of the transmission system that no market participant has proposed to resolve. Projects recommended by PJM to resolve such circumstances are taken to the Board of Managers for endorsement. If a "volunteer" emerges to build the recommended project, it will be included in subsequent regional planning analyses; if no market participant steps forward to construct the project, PJM will file a report with FERC.

Since the RTEP's inception in 1999, PJM's Board has authorized more \$4.2 billion of transmission upgrades and additions. Of that amount, over \$3.5 billion has been for baseline transmission network upgrades, including more than \$2.3 billion in 2006 alone. In addition to these baseline transmission network upgrades which are necessary to maintain system reliability, PJM's Board has authorized \$673 million for network upgrades and attachment facilities, enabling the interconnection of more than 24,000



megawatts of new generating resources and several merchant transmission projects to PJM's transmission network.

The significant investment in backbone transmission infrastructure is a response to reliability challenges posed in eastern PJM by steady load growth, lagging generation additions and generation retirements. Since 2004, over 4600 megawatts of generating capacity in PJM has retired, and another 732 megawatts of capacity is scheduled to retire in 2007. More retirements are likely to be announced from among the aging generation fleet in PJM, where 75 percent of the steam generators in-service are 30 years or older, and 20 percent are 50 years or older.

PJM's Wholesale Energy Market

PJM operates both a day-ahead and a real-time wholesale energy market, which is also known as a spot market. Market participants may self-schedule to meet their native load obligations, may engage in bilateral transactions, or may choose to transact in PJM's wholesale market. Although all electricity transactions are scheduled through PJM's wholesale market, purchases in PJM's day-ahead and real-time market account for only about seven percent of all scheduled transactions. As I have noted, PJM's markets are instrumental to its core mission of maintaining system reliability.

In the day-ahead market, sellers submit offers to sell and buyers identify their loads and any maximum prices at which they will elect not to purchase energy. PJM uses this information and its analysis of expected system conditions to calculate the marginal "clearing price", at each load and generation location, or "bus", for each hour of the following day. This price is known as the "locational marginal price", or LMP. The LMP pricing system enables PJM to maintain system reliability, by providing for the instantaneous dispatch of the set of generating resources which simultaneously serves load and alleviates reliability-threatening congestion on the transmission system. As PJM operators observe system conditions in real time, the LMP system enables them to establish different marginal prices at specific grid locations. Those price signals reflect



the cost of congestion on the system by considering the actual physics of electricity flow and the feasibility of dispatching location-specific generation to maintain reliable operations of the grid. Importantly, PJM operators can send LMP price signals that encourage generators to increase or decrease generation at specific locations on the grid as is necessary to manage the flow of energy on transmission facilities.

When there is congestion on the grid, transmission customers have the option of avoiding curtailment by agreeing to pay transmission congestion charges, generally calculated as the difference in LMPs on either side of the constrained transmission element. PJM's market transparently displays the energy prices at each demand and supply location, so that all wholesale market participants can react more efficiently to price signals. The LMP system also provides for the assignment of congestion costs to the cost-causer, rather than socializing the costs of congestion to all customers.

In addition to its energy market, PJM also operates capacity and ancillary service markets. Like PJM's day-ahead and real-time energy markets, the capacity and ancillary services markets also contribute to PJM's core mission of maintaining reliability. FERC recently authorized PJM to improve its capacity market by instituting the Reliability Pricing Model (RPM). RPM provides incentives for the construction of additional generating capacity in specific geographical regions within PJM where future reliability is threatened by a lack of generation. With respect to short-term reliability, PJM's capacity market and its capacity adequacy protocols assure that actual capacity is available to meet native load obligations. PJM's ancillary service markets for regulation and synchronized reserves facilitate short-term reliability by providing for the matching of generation with very short-term changes in demand.

PJM's markets are continually monitored by PJM's Market Monitoring Unit, which provides close, well-informed and continuous scrutiny of the markets PJM administers. Each year, PJM's Market Monitoring Unit prepares and submits to the Board a comprehensive "State of the Market" Report. That Report identifies specific market



issues and recommends market design modifications to improve the competitiveness and efficiency of PJM's markets.

PJM's Market Encourages the Development of Demand-Side Resources

A fundamental purpose of RTOs is to ensure that every resource has an equal opportunity to meet customers' energy needs. PJM has no financial interest in any particular energy technology on the supply or the demand side. Nor does it have a financial interest in the logistics of energy delivery, whether delivered from near or far, or over regulated or merchant transmission lines. PJM is committed to market neutrality, to optimizing market performance, and to supporting the policy alternatives under consideration by national and state legislators. As such, PJM has expanded opportunities for the participation of its members in PJM's demand response programs, and developed systems to track the environmental and emissions characteristics of generators. PJM's goal is to see demand response fully integrated into the retail market. That will happen when a large number of retail customers have access to demand-response options. PJM is working with state commissions and other stakeholders to move toward that goal. This effort includes collaborative groups such as the Mid-Atlantic Distributed Resource Initiative, which is working to find ways to increase the deployment of time-of-use meters and to integrate distributed generation and demand-response products into state retail rate designs.

Demand response, the ability of customers to see the cost of electricity and adjust their use accordingly, is central to the effectiveness of the wholesale power markets that underpin system reliability. PJM's demand-side programs enable customers to receive revenue for reducing their electricity consumption when wholesale prices are high or when electric grid reliability is in jeopardy.

More than 6000 commercial and industrial customers and more than 45,000 small commercial and residential customers participate in PJM's demand-side resource programs. Since 2003, the load participating in those programs has doubled, to 2,803



megawatts. The number of customer sites participating has increased tenfold to about 5000. PJM is working to provide opportunities for demand-side respondents to capture the economic value of their actions, comparable to those afforded generation and transmission providers in PJM's markets. The basic premise is that, to the extent demand-side measures decrease the cost of electricity, those decreases should be transparent and available to demand-response providers and their customers. To that end, PJM has instituted rules to allow demand response to provide certain ancillary electricity services while allowing the higher value of those services to be passed on to the demand-response customer. PJM has also instituted rules to allow demand responders to participate as an emergency resource on either a voluntary or mandatory basis, and to be compensated for the value of their actions.

The value of demand-response programs is strikingly illustrated by voluntary reductions in energy use by customers in the PJM region on August 2nd 2006, the day PJM established its current peak demand record of 144,644 megawatts. On that day alone, voluntary reductions in electricity use resulted in wholesale price reductions estimated to be equivalent to more than \$230 million in payments for energy. A study recently completed by the Brattle Group for PJM indicates that a mere three percent reduction in the energy usage of utility customers of five Mid-Atlantic utilities during the top twenty five-hour peak use periods in 2005 would have resulted in as much as \$182 million savings for customers served by those utilities.

PJM's Generation Attributes Tracking System (GATS)

In 2005, PJM Environmental Information Services, a for-profit subsidiary of PJM, implemented the Generation Attributes Tracking System. GATS tracks the environmental and emissions characteristics of generators by creating a certificate for each megawatt-hour of generation produced. Data in GATS includes megawatt-hours produced, emissions data, fuel source, location, state program qualification and ownership of generation attributes. GATS provides state regulatory commissions, environmental agencies, market participants and customers with a single regional



integrated system to document and track power generation attributes. The system is intended to increase the liquidity of clean power markets, by enabling buyers and sellers to transact at prevailing market prices.

Whether a state requires electric suppliers to include a specific percentage of renewable resources in the electricity they sell to customers or requires suppliers to disclose fuel sources or emissions profiles to customers, GATS enables suppliers to demonstrate compliance with state requirements. It also allows clean-power suppliers to prove to customers that their power sources are in fact clean. Finally, GATS allows owners of renewable generators to obtain the full value of their resource by letting them use the energy produced, and then separately selling the renewable energy certificate associated with it to suppliers who need clean energy, or certificates, to comply with state renewable portfolio standards.

Conclusion

Thank you for your attention. I hope my remarks have persuaded you that PJM can play a significant role in facilitating the development and commercial success of Pennsylvania's traditional and alternative energy resources. PJM's wholesale market platform supports a spectrum of state policy choices by providing for non-discriminatory interconnection procedures, renewable portfolio standards, fuel emission disclosure requirements, and participation of demand-side resources in PJM's market. PJM's markets operate to buttress bulk power system reliability, while providing revenue streams to support investment in the Commonwealth's abundant electric energy resources. On behalf of PJM, I invite each of you to tour our facilities in Valley Forge and to learn more about how PJM assures electric system reliability today and for the future.