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Chairman Jeff Bingaman
Ranking Member Lisa Murkowski
Committee on Energy and Natural Resources
United States Senate
Washington, D.C. 20510-6150

Dear Chairman Bingaman and Ranking Member Murkowski:

PJM appreciates the opportunity the Committee provided us to testify at the December 10, 2009, "Hearing on the Role of Grid-Scale Energy Storage in Meeting the Nation's Energy and Climate Goals." We stand ready to continue to serve as a resource to the Committee on this and other energy issues.

We are in receipt of the written questions submitted by the Chairman and the Ranking Member and are pleased to provide the following responses:

Chairman Bingaman Question for the Record:

Question:

"Mr. Huber, in your testimony you state that 34 megawatts of battery storage have been put in the PJM generation queues for 2010. Given that storage has inherently different capabilities and characteristics than generation resources, can the generation queue process appropriately and expeditiously accommodate energy storage technologies (especially since storage technologies rely on a two-way flow of energy) or does storage need its own process?"

Response:

PJM's current interconnection process accommodates both generation technologies and storage technologies. To date, one battery and four flywheel storage systems have gone through this interconnection process. The one battery storage system, a 1 MW system, has been interconnected with the PJM grid. Recently, two battery systems (one 20



MW and one 14 MW) have entered into the PJM generation queues and are being evaluated by PJM to determine their impact, if any, on the transmission grid.

The PJM System Planning interconnection process is a three-phase process utilizing network studies to test for a proposed project's impact on the grid in meeting reliability standards promulgated by the North American Electric Reliability Corporation (NERC) and approved by the Federal Energy Regulatory Commission (FERC). Phase one, the Feasibility Study, consists of analyses of deliverability and short circuit reliability. PJM's FERC-approved tariff allows, as a guideline, that this phase be completed within three months of the end of the queue in which the project is submitted. For storage system requests below 10 MW, this would likely be the conclusion of the analyses, thus providing the developer with critical information on system impacts and costs, which it can consider in deciding whether to proceed with entering into a formal interconnection agreement. Larger and more complex systems would proceed to phase two, the Impact Study. Here the analyses are expanded to include stability and multiple contingency studies; with guidelines for completion in 150 days (30 days for signatures on an agreement to proceed and 120 days for analyses). There is a third phase, the Facilities Study, that would likely not be required for storage systems unless significant network upgrades are identified during the Impact Study phase. In short, although there is no separate expedited process for storage analyses and an interconnection agreement can be completed within a half-year of the close of the queue in which the application is received.

PJM does not believe that establishing a separate interconnection queue for energy storage would be beneficial to the development of innovative cost-effective solutions that benefit the grid and consumers. Specifically, a common queue allows for all resource solutions to be considered without artificially "choosing" one technology solution over the other. As directed by FERC, PJM maintains a common queue that is available to all resources and options including generation and merchant transmission, as well as energy storage solutions. This reflects the fact that all generators have a two-way flow of energy that must be considered. (In the case of traditional generation technologies, the two-way flow is represented by the energy used for auxiliary power and for unit start-up and shutdown). By considering all projects in a given queue, the value of each resource can then be recognized through the awarding of financial transmission rights to reflect the value, in the form of congestion relief, associated with the particular upgrade in question. A separate queue for energy storage would disrupt the analysis of various competing resources that is inherent in the existing queue process and would advance one technology over others without the benefit of analysis of the site-specific facts and circumstances that are so important to the location of generation or energy storage devices.



The generator interconnection process was established by FERC based on the assumption that resources interconnecting to the grid should bear the costs of any grid upgrades needed to accommodate their request while maintaining system reliability in accordance with NERC standards. The FERC is presently considering whether to modify its present cost allocation policies. Proponents of socializing interconnection costs argue that the present system, which is grounded in principles of cost causation, may be an impediment to the development of renewable technologies. On the other hand, opponents of broad socialization of such costs argue that ratepayers should not bear the costs of facilities and resources that cannot be shown to be beneficial to them. Any changes ordered by FERC to its present cost allocation policies could affect whether energy storage resources remain subject to the cost allocation policies inherent in the queue process.

Ranking Member Murkowski Questions for the Record:

Question:

“In your written testimony, you indicated that variable renewable energy sources present a reliability challenge. You also indicate that the lack of storage is already causing concern for PJM.

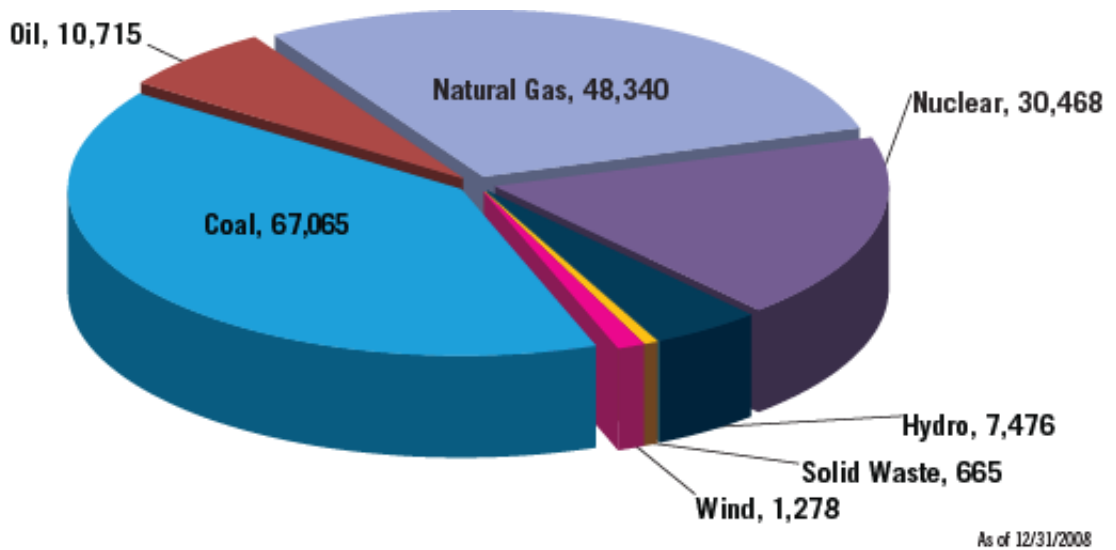
- a. What is the current percentage of renewable electricity produced in the PJM region?*
- b. Will development and deployment of energy storage technologies in PJM proceed at a pace sufficient to match the need for meeting a federal renewable electricity standard or will the utilities in the PJM region utilize more fossil-based backup to renewable energy sources?”*

Response:

PJM embraces the growth of renewable generation as it satisfies a number of public policy goals, including existing state renewable portfolio standards which already exist in 10 of our 13 states. More than half of the new generation in the PJM Interconnection Queue can be categorized as renewable generation, with a particular heavy emphasis on wind generation. However, renewable sources such as wind and solar are a challenge and concern because of their intermittent nature — particularly in a region with the wind and weather patterns that we see in the PJM Mid-Atlantic and Midwest footprint. PJM is encouraging the installation of storage technologies to make the power generated by renewable resources available to consumers during times when it is most needed.

- a. The current total generation capacity in PJM is 165,000 megawatts. Renewables including wind, run-of-river hydro, pumped hydro and solid waste currently total 9,419 megawatts or approximately 6% of PJM's total capacity.

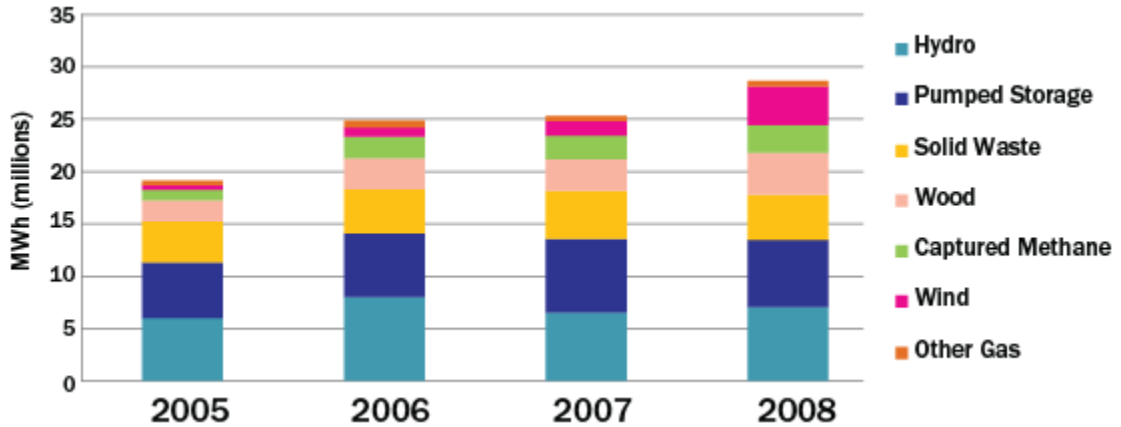
PJM Capacity by Fuel Source (MW)



The 2008 annual energy produced in PJM is 735,244 gigawatt-hours. Renewables including wind, run-of-river hydro, pumped hydro and solid waste total 28,635 gigawatt-hours or approximated 4% of PJM's total annual energy produced.

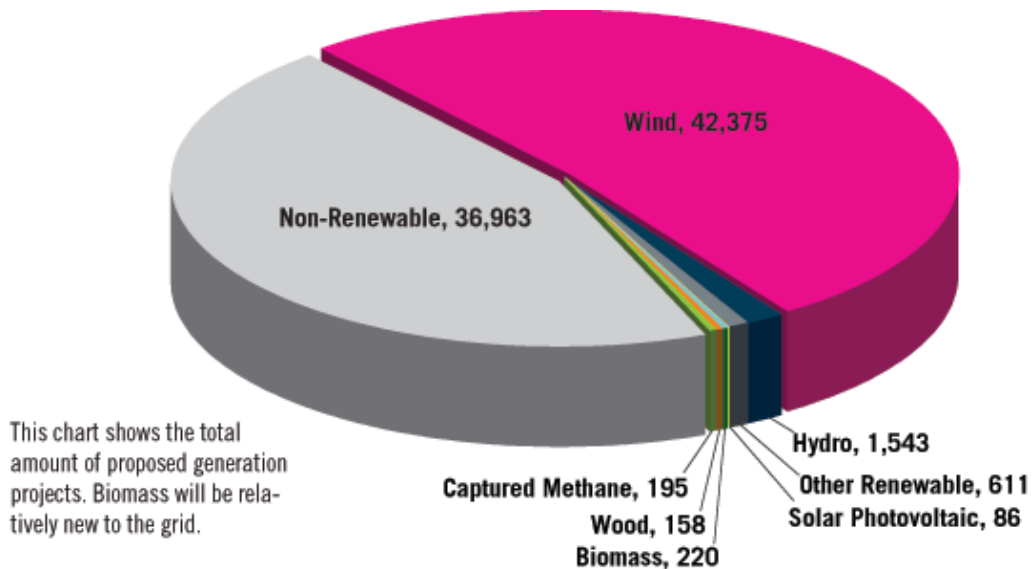
The chart below shows the amount of megawatt-hours of renewable energy by fuel source produced in PJM for each year since tracking began in late 2005.

Renewable Energy in PJM



The future generation currently being proposed in the PJM generation queues is 82,151 megawatts with over 55% being renewable generation.

Proposed Generation (MW)





- b. PJM is aggressively working with energy storage providers and our member companies to facilitate the delivery of energy storage systems in the PJM territory. We are actively pursuing and assisting in pilots of storage technologies that include flywheels, various types of battery systems, compressed air, large building controls, hot water heaters, plug-in hybrid electric vehicles and refrigeration. Renewable generation and energy storage systems are in their early adoption phase. The growth and maturity of both will depend on technology advances, economics and government policy. Forecasting the pace of these many variables is difficult. Current discussions with storage technology entrepreneurs, vendors and venture capitalists provide some insight of expected future storage systems to be installed in PJM: 1) near-term implementations, one to three years out, will likely be battery and flywheel systems with capacity amounts in the 500 MW to 700 MW range; 2) mid-term implementations, four to six years out, should see compressed air storage systems and the aggregation of building and residential energy systems in the 1,000 MW to 1,500 MW range; and 3) beyond 6 years PJM anticipates plug-in hybrid electric vehicle storage within PJM will be available in significant amounts that could provide an additional 1,000 MW to 1,500 MW. If the storage systems are not available in the volume needed, PJM will utilize both its demand resources, as well as its fossil based resources to maintain system reliability.

PJM is pleased to provide these additional responses. If you seek additional information or clarification, please contact us through Craig Glazer, PJM Vice President - Federal Government Policy at 202-423-4743 or by e-mail at glazec@pjm.com.

PJM thanks you again for the opportunity to serve as a resource to the Committee.

Very truly yours,

Ken Huber

Cc: Craig Glazer, PJM Interconnection