STATE OF NEW YORK
PUBLIC SERVICE COMMISSION

At a session of the Public Service Commission held in the City of Albany on July 15, 2010

COMMISSIONERS PRESENT:

Garry A. Brown, Chairman
Patricia L. Acampora
Robert E. Curry, Jr.
James L. Larocca

CASE 10-E-0285 – Proceeding on Motion of the Commission to Consider Regulatory Policies Regarding Smart Grid Systems and the Modernization of the Electric Grid.

CASE 09–M–0074 – In the Matter of Advanced Metering Infrastructure.

ORDER INSTITUTING INQUIRY INTO SMART GRID

(Issued and Effective July 16, 2010)

BY THE COMMISSION:

INTRODUCTION

The Commission, along with electric utilities and many other stakeholders across the state is looking to realize the promise of the smart grid. The programs funded through the American Recovery and Reinvestment Act of 2009 (ARRA) offered a unique opportunity to leverage federal dollars to invest in advanced technology and communications to improve the grid's operation right away. Before making further significant investments, however, we want to learn from the first generation investments and ensure that future investments are based on a sound and reasoned strategy for achieving the state's energy goals. We therefore seek parties' comments on appropriate regulatory policies that will encourage electric utilities to develop smart grid systems that can facilitate the integration of new intelligent technologies, while optimizing their

efficient use of facilities and resources, and producing equitable rates for electric consumers.

BACKGROUND

The ARRA included a program administered by the U.S. Department of Energy (DOE) for investment in smart grid[1] initiatives. ARRA appropriated $4.5 billion for the Electric Delivery and Energy Reliability (EDER) program, to be disbursed by DOE through a competitive grant process.[2] Due to the cost sharing requirements of ARRA, federal grants only cover a portion of eligible project costs and utilities required another source of funding for these projects. All six of New York's investor-owned electric utilities filed project proposals with the Commission seeking ratepayer funding for the balance of project costs, in connection with and in advance of their applications to DOE for EDER grants.

The purpose of the ARRA is to reinvigorate the American economy by, among other things, investing in projects that test and deploy smart technology for the electric grid, promote investment in renewable energy sources, drive innovation in the fossil fuel industry, and adapt electric facilities to the needs of the future. President Obama signed ARRA into law on February 17, 2009. The DOE issued final funding announcements for the Smart Grid Investment Grant Program and Smart Grid Demonstration Program on June 25, 2009 and set an initial application deadline of August 6, 2009.[3]

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[1] A smart grid may employ advanced technology and two-way communications at all levels of the electric grid, from generation source to end-user, to systematically improve grid operation and efficiency.

[2] Prior to the ARRA, in accordance with the Energy Independence and Security Act of 2007, Department Staff has been interacting with the electric utilities through rate cases and other forums to assess their consideration of smart grid technologies when making new infrastructure investments.

[3] DOE Investment Grant Program – Funding Opportunity Announcement (DE-FOA-0000058), issued June 25, 2009; DOE Demonstration Program – Funding Opportunity Announcement for (DE-FOA-0000036), issued June 25, 2009. The Demonstration Program announcement carried an initial application deadline of August 25, 2009.

On July 27, 2009, after an accelerated but rigorous regulatory review, the Commission approved a wide-range of smart grid initiatives proposed by the six major investor-owned electric utilities in New York.[4] The Commission approved projects totaling $825 million, including ratepayer-matching funding of approximately $390 million, with the expectation that this commitment would place New York electric utilities in a favorable position at the DOE to secure an appropriate portion of the available smart grid competitive grants.

In October 2009, Consolidated Edison Company of New York, Inc. (Con Edison) received notice of a DOE award of $136.2 million for transmission and distribution (T&D) projects under the DOE's Smart Grid Investment Grant Program. Also, the New York Independent System Operator (NYISO), on behalf of its transmission owners, received notice of a DOE award of $37.4 million for statewide capacitor banks and phasor measurement units (PMUs) under the Smart Grid Investment Grant Program. Coupled with the Commission's approval of matching ratepayer funding, the Con Edison award will broaden the scope of the Company's existing efforts to modernize its electric grid.[5] Paired with ratepayer funding, the NYISO grant will improve the NYISO and the transmission owners' ability to detect bulk system problems and help avoid potential blackouts. The NYISO grant also includes the installation of capacitors to improve the control and coordination of voltage on the grid, which can increase efficiency and decrease the amount of power losses.

New York utilities also received several awards under the DOE's Smart Grid Demonstration Program. Con Edison received a DOE award of $45.4 million to help fund a scalable smart grid model. With the Commission's approval of matching ratepayer funding, the project is designed to demonstrate a secure and interoperable smart

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[4] Cases 09-E-0310, *et al*., In the Matter of the American Recovery and Reinvestment Act of 2009, Order Authorizing Recovery of Costs Associated with Stimulus Projects (issued July 27, 2009).

[5] Con Edison was already testing various technologies in a smart grid pilot project in Queens.

grid prototype. Niagara Mohawk Power Corporation d/b/a National Grid (National Grid) and its partners, Premium Power Corporation and the Sacramento Municipal Utility District, were awarded $7.3 million by DOE, that (again, with the addition of ratepayer funding approved by the Commission) is designed to demonstrate competitively priced advanced flow batteries. New York State Electric and Gas Corporation (NYSEG) received $29.6 million from DOE to help fund a utility-scale energy storage project. NYSEG's project is designed to demonstrate an advanced 150 MW compressed air energy storage facility.[6]

National Grid also received a DOE award of $2.2 million for workforce development. It plans to use the grant to train 4,900 employees in its New York and Massachusetts service territories and to broadly disseminate best practices and lessons learned to community colleges, universities, and energy industry associations.

Nationwide, the requests for ARRA funding far exceeded the funds available. As a result, DOE did not select many projects proposed by New York utilities for matching federal funding. For New York utilities, proposals totaling approximately $370 million of the $825 million approved by the Commission were not selected, with utility proposals for advanced metering pilots representing the bulk of those projects.

The ARRA stipulates that a smart grid information clearinghouse will be established to make data from smart grid projects and other sources available to the public. The clearinghouse will serve as a repository for public smart grid information and will facilitate direct sharing and dissemination of smart grid information among various stakeholders on knowledge gained, lessons learned, and best practices. The clearinghouse should also serve as a tool regulators can use to evaluate the impact of utility investments in smart grid technologies.

The ARRA also allocated $10 million for the National Institute of Standards and Technology (NIST) to support collaborative efforts to develop a comprehensive framework for smart grid standards. Interoperability -- the integration,

[6] The Compressed Air Storage project was not among the projects for which NYSEG sought or received approval of matching ratepayer funds from the Commission.

effective cooperation, and communication among the many interconnected elements of the electric grid -- is vitally important to the performance of the smart grid. Properly developed standards are essential to enable diverse systems and their components to work together. In addition, standards are needed to address the cyber security aspects of the smart grid. Over the past year, NIST has launched the initial stages of a broad effort to accelerate the development of interoperability and cyber security standards.

In Case 09-M-0074, we took a number of steps related to advanced metering infrastructure (AMI) systems. These include considering utility AMI filings, establishing AMI minimum functional requirements, and initiating an inquiry into the benefit-cost analysis of AMI systems. We also noted that AMI is one component of the smart grid.[7] In this proceeding, we incorporate the information collected in that effort and extend our inquiry beyond AMI and into the larger context of the smart grid.[8]

CURRENT STATUS

Given the DOE's aggressive implementation schedule, New York electric utilities moved swiftly to take advantage of the ARRA funding, and we swiftly approved the proposed projects we deemed appropriate.[9] Although we approved more projects than DOE selected for matching funds, we expect that valuable knowledge and experience will be gained from the projects by the New York utilities that received awards, as well as from the nationwide clearinghouse and standards efforts that have been established.

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[7] Case 09-M-0074, In the Matter of Advanced Metering Infrastructure, Order Adopting Minimum Functional Requirements For Advanced Metering Infrastructure Systems And Initiating An Inquiry Into Benefit-Cost Methodologies (issued February 13, 2009).

[8] For these reasons, this order closes Case 09-M-0074.

[9] Our July 27, 2009 order approved utility projects contingent upon receipt of matching DOE funding.

Now that the urgency of responding to the ARRA funding opportunities has passed, we turn our attention to a longer term vision for the electric grid and the need for strategic planning to maximize the benefits of our efforts to achieve it. New York's economic competitiveness and quality of life depend on the availability of reliable, reasonably priced and efficiently consumed electric power. We currently rely on a power delivery infrastructure that is aging and needs to be modernized to maintain a reliable and secure electric infrastructure that can meet future demand. Recently, New York utilities have been making strides to modernize their T&D infrastructures, after a number of years of relatively flat infrastructure investments. Overall capital investment by New York utilities is expected to reach approximately $2 billion in 2010, nearly double that in 2004 ($1.1 billion).

We are, however, concerned about layering smart grid capital expenditures on top of already-expanding capital expenditure budgets. This concern is exacerbated by the current state of the economy.

We should approach grid modernization in a way that supports important policy goals, including ensuring and enhancing system reliability, reducing greenhouse gas emissions, increasing energy efficiency and demand response, and expanding the use of renewable energy. Smart grid technologies offer the promise of saving energy by increasing efficiency; enabling greater use of intermittent energy sources, including renewable sources and storage options; reducing the frequency and duration of power interruptions; and providing the ability for consumers to better manage their energy bills.

It is also important to set policies that will ensure functionality and interoperability with newer technologies such as distributed generation, energy storage, demand-side technologies, and electric vehicles. Implementation of smart grid technologies should lead to a seamless integration of all of these technologies, from the generation side to devices connected to the customer's home area network (HAN).

It will likely require years or decades to fully modernize the existing electric grid into a smart grid. This process began even before the term "smart grid" was coined, as utilities made capital investments in technologies such as supervisory control

and data acquisition (SCADA) systems, protection and control relays, and distribution and substation automation.

On the other hand, many grid investments, such as a pole replacement or grid extension, are routine matters and tasks that utilities still must perform. For the foreseeable future, much of the distribution network infrastructure (such as poles and conduit) will not need to be smart. Furthermore, many utilities have recently made significant investments in advanced technologies, such as automated meter reading (AMR). While the next generation of meters may be smarter than AMR meters, it is not yet clear when the additional benefits of smart meter investments will outweigh the costs of investing in smart meters and the costs associated with stranding relatively new AMR assets. For combination utilities, this issue is further complicated by the fact that any meter reading costs savings from implementing a smart grid cannot be achieved without the simultaneous implementation of compatible meters (whether AMR or AMI) for natural gas.

We are therefore instituting this inquiry to determine to what extent further development of regulatory policies should be made to encourage electric utilities to develop smart grid systems that can facilitate the integration of new technologies while optimizing their efficient use of facilities and resources, and producing equitable rates for electric consumers.

Even absent a fully developed vision for smart grid design, utilities can and should continue to make grid modernization proposals as part of their capital expenditure plans in rate cases supported by appropriate benefit-cost analyses. Smart grid proposals made outside of utility rate cases and without appropriate benefit-cost support (excepting those we have already approved in connection with the ARRA projects) should be deferred until after we have concluded this inquiry.[10]

[10] On January 14, 2010, National Grid submitted a "New York Smart Program Proposal" in Case 09-E-0310. We will undertake consideration of National Grid's proposal following further development of answers to the policy questions we pose here.

QUESTIONS FOR SMART GRID POLICY

To address these issues, we pose questions in the following topic areas (while all interested parties are invited to submit comments, we direct New York's six investor-owned electric utilities to file responses to these questions):

1. Vision for the Smart Grid Design. The smart grid vision has evolved in recent years through the work of the DOE, the New York Smart Grid Consortium and other efforts, but we have yet to see a comprehensive strategic plan for achieving the smart grid vision and its anticipated benefits. Implementation of the smart grid can be simplified by long term planning and the creation of a smart grid technology road map. What should the smart grid look like? Should it be utility specific, or a state or regional design? What are the interoperability implications of smart grid systems and the software and hardware components chosen? What are the security implications of the various approaches? How does each utility's overall vision of the smart grid harmonize with those steps the utility has already taken toward modernizing its electric grid? At what point should further investment in technologies that may be incompatible with the end-state (e.g., AMR) be discouraged? Utilities in their responses are directed to provide a listing and description (including type, cost, and functionality) of any investments in smart grid type technologies or equipment currently being utilized.

2. Implementation Priorities. The smart grid must, by necessity, be achieved through evolution rather than revolution. We expect that there are cost-effective and incremental steps that can have a large impact on achieving the benefits of the smart grid and put utilities on a path to achieve the end-state. For example, smart grid functions could be added first to core system operations through wider use of sensors in the T&D network and automation of substations to enhance system operability and flexibility, streamline business operations and lower costs. Recent experience with smart meter installations in California and Texas further suggests that starting at the customer end seems to increase customer resistance. Each

utility needs to thoroughly assess what sequence and pace of deployment of smart grid technology is best for its service territory and customers. It is likely that ubiquitous deployment of smart grid technology is not needed—perhaps sensors and monitors need not be deployed on every single transformer in a territory, for example. In implementing the smart grid, how can we best ensure that benefits are maximized, costs are minimized, and obsolescence is avoided? Is it better to focus on T&D systems first and investments in smart meters later? Should we study smart meter applications in pilots prior to fully deploying them, to better ascertain end-use customer benefits and costs? What is the optimal approach to improving demand response? At what pace should we develop capabilities to handle distributed energy resources? At what pace should we develop charging capabilities for electric vehicles?

3. Engaging Customers. A key part of a fully optimized smart grid is customer adoption and satisfaction. A related issue is the need for robust customer education campaigns to explain what the smart grid is, how it can be leveraged to cut electricity bills, and why it has potentially long-term benefits for utilities and those it serves. Proponents of smart meters postulate that redesigning electric rates to vary by time of use for all electricity users, and providing cost and use information to users on a real time basis, would enable customers to make informed decisions about when and how they can reduce their electricity use. What evidence is available to estimate customer response to such rates in terms of reduced usage and shifted usage? What is the likelihood some customer segments cannot or will not provide sufficient response to justify the costs of their smart meters? Is this information likely to be gained from the ARRA projects? Are New York-specific rate design trials needed in this area, given that mandatory time-varying rates may not be imposed on residential customers in New York? What kinds of marketing plans are needed to educate consumers and provide transparency around smart grid projects?

4. Benefit-Cost Analysis. Estimating future costs and the benefits of AMI and other smart grid technologies has proven to be difficult. In making decisions about smart grid deployment, it is crucial to have a well-developed benefit-cost analysis, along with a solid and viable business model. We need to have a well understood and agreed upon framework to ascertain and assess the potential benefits and costs. In addition, the smart grid potentially holds benefits for myriad stakeholders, including the NYISO, transmission owners, generators, renewable generation providers, energy retailers, energy traders, regulators, and third-party service providers, as well as customers. On the other hand, many of those benefits, such as avoided environmental externalities, are diffuse, which suggests that the costs of the smart grid should be allocated broadly across all customers. How should the Commission consider the value of a smart grid? How should the costs of the smart grid be allocated? To what degree should the Commission try to ensure that the direct beneficiaries of smart grid capital expenditures are the stakeholders carrying the cost burdens? Which stakeholder(s) should bear the risks if expected benefits do not materialize?

5. Cost Uncertainties. Some utilities are experiencing cost overruns related to early smart grid adoption, such as the "Smart City" project in Boulder Colorado. Part of the issue with smart grid cost overruns is undoubtedly due to the fact that smart grid technology is new, and still in the research-and-development, trial-and-error stage. Furthermore, given the enormous expectations of the modernized, digitized grid, the temptation to do too much too soon could translate into spending too much as well, especially as smart meters and other smart grid devices are likely to become less expensive through economies of scale. While some uncertainty in costs of new technologies can be expected, the current economic climate leaves little room for gross miscalculation. As utilities plan multiyear smart grid deployments with costs estimated in the billions, cost overruns could well test the patience and support for those programs by all stakeholders. Solid estimates and accountability to those estimates will become increasingly crucial for smart grid

projects going forward. What can be done to reduce the risk of cost overruns? What are the prospects that substantial cost overruns will occur in New York implementations? How does deferring deployment in New York to a later date affect the likelihood of substantial cost overruns? What mechanisms, whether cost recovery mechanisms or otherwise, should be considered as a way of addressing the cost overrun concern? Which stakeholder(s) should bear the risks of cost overruns?

6. Interoperability/Cyber-Security Standards. Smart grid implementation depends on numerous software, hardware, and communications applications operating in harmony. Such seamless interoperability depends on a common semantic framework for enabling effective communications at numerous interfaces, from legacy utility systems to customer equipment. A similarly overarching issue is system security. As the smart grid is built out, the number of accessible nodes that can potentially be breached will rise by many multiples at newly introduced points—smart meters, sensors, and an increased number of people. The Federal Bureau of Investigation has identified multiple sources of threats to the critical electric infrastructure, including foreign nation states, domestic criminals, hackers, and disgruntled employees. In February 2010, NIST issued its second draft of Smart Grid Cyber Security Strategy and Requirements, identifying more than 120 top-priority interfaces, linking devices and systems in two-way communications, and classifying them according to degree of damage that could stem from a security breach at those interfaces. Securing all of these physical and cyber assets from tampering or attack will likely become a tremendous task for utilities. Security will loom as an ever-growing concern as the smart grid extends beyond smart meters and into customers' HANs, distributed energy generation, electric vehicles, and charging infrastructures. How can we move forward in the development of the smart grid without compromising interoperability or security? Should software models be developed cooperatively or left to the markets? Who will be (or should be) the final arbiter of what level of interoperability is

sufficient? How do we ensure the investments in the smart grid will not lead to a decrease in T&D system safety and reliability and, in turn, make it easier for hackers or terrorists to do harm? Should we wait for NIST standards to be fully developed before undertaking significant implementation of smart grid technology? How long is that likely to take?

7. Consumer Data Privacy/Access. Given the prospect of potentially millions of smart meters in the field, utilities will need to prepare for a deluge of data gathered from those meters. Beyond smart meters, data in a ubiquitous smart grid will be emitted from points along the entire electric grid -- sensors, network routers, transformers, automated substations, digitized transmission, distribution, and generation facilities. Customer interfaces, such as through a customer's computer, must also be protected against undetected changes because they are conduits to critical customer equipment and systems. Questions persist about how that data will be used and who will own and have access to it. Who should own energy consumption data? When and with whom can it be shared? How will energy use data be accessed by customers, with data accessibility standards still being hammered out? How do we address issues of privacy and data access? How can we prevent unauthorized people from buying or otherwise having access to smart grid data? Can we be sure that smart grid communication networks won't allow unauthorized access to information between customers on the same network? How can we address the vulnerability of customer systems and "gateways" to incoming tampering efforts? Should utilities be provided sole control of the potential commercial opportunities of the HAN? Should utilities encourage new players such as home energy management device and services companies—as well as grid-enabled appliance makers—to develop and control the HAN market?

8. Communications. The essence of the smart grid lies in digital control of the power delivery network and two-way communication with customers and market participants. This infrastructure is what allows the multitude of energy services

envisioned for the smart grid. Should utilities build dedicated communications networks for smart grid applications, leverage existing commercial networks, or deploy a hybrid approach? Are commercial broadband solutions adequate to address smart grid requirements such as: cost, scalability, bandwidth, reliability, coverage and security? Are changes to traditional investment recovery schemes necessary to overcome financial incentives that favor utility owned communications networks? What policy changes or initiatives are necessary to facilitate better cooperation and partnerships between electric utilities and telecommunications providers? Is a single communication "backbone" the most cost-effective approach for all smart grid applications? Should certain smart grid functions have separate requirements (for security, latency, bandwidth, etc.) and dedicated communications segments? How do we address the convergence of electric and telecommunications networks? In considering HANs and other technologies that reach beyond the meter, how do we pursue policies that do not supplant private investments and encourage commercial and utility partnerships?

9. Timing. Momentum for the smart grid is increasing and is clearly not a passing fad. As utilities replace aging infrastructure, deal with capacity constraints, and strive to meet the demands of increasingly environmentally conscious and sophisticated end-use customers, smart grid technology inevitably comes into consideration. We want to adopt smart grid technology at a pace that makes sense based on availability of the technology and customer requirements. What are the ramifications of delaying significant further New York investment until the learning from the nationwide ARRA programs is substantially complete? What topics are well settled and need no significant learning? What areas are unsettled and could benefit substantially from the learning that will come from the national clearinghouse? What questions need to be answered but are not likely to be answered in the ARRA projects? Of these, what questions are unique to New York, and unlikely to be answered by out-of-state projects?

10. Other. Are there other significant aspects of formulating smart grid policies for the state that are not addressed in the questions above? Are there significant benefits that have not been identified, or significant concerns that are not addressed?

CONCLUSION

Utilities are moving to modernize the state's power grid at an accelerated pace, but the sheer size and complexity of developing the "smart grid" should not be underestimated. The challenges, if not properly managed, could potentially disrupt or delay smart infrastructure investments, estimated to be in the billions of dollars. While utilities should continue to make grid modernization proposals in rate cases with appropriate cost benefit support, we must address the emerging challenges related to deployment of these nascent technologies that, in many cases, have never been used on the scale that utilities envision. These challenges range from securing cyber assets to forecasting demand for grid access, to accommodating power and charging infrastructure for electric vehicles, to engaging customers to use smart grid technology.

As we grapple with the challenges, and welcome the potential benefits, that come with modernizing the electric grid, it is important to be mindful that many ARRA projects are being carried out at an accelerated pace in compressed time schedules. Growing pains will inevitably result – some benefits may be captured at an earlier time than estimated, and some anticipated benefits may arrive later—not in months, but rather in years or decades.

The ARRA programs offered a unique opportunity to leverage federal dollars to invest in the use of advanced technology and communications to improve the grid's operation right away, however, before making further significant investments, we want to ensure that such investments are based on a sound and reasoned strategy for achieving the state's energy goals. We therefore seek the parties' comments on appropriate regulatory policies that will encourage electric utilities to develop smart grid systems that can facilitate the integration of new technologies while optimizing their efficient use of facilities and resources and producing equitable rates for electric

consumers. While we are directing New York utilities to file responses, we are interested in hearing from a broad spectrum of stakeholders, including telecommunication companies, academia, and consumer representatives.

The Commission orders:

1. This proceeding is instituted to consider regulatory policies regarding smart grid systems and the modernization of the electric grid.

2. Interested parties are invited to file responses addressing the questions identified in this order by September 15, 2010. Central Hudson Gas & Electric Corporation, Consolidated Edison Company of New York, Inc., Niagara Mohawk Power Corporation d/b/a National Grid, New York State Electric and Gas Corporation, Orange and Rockland Utilities, Inc., and Rochester Gas and Electric Corporation are directed to file such responses. Parties may file replies to responses by October 15, 2010.

3. The Secretary may modify the schedule identified herein as needed.

4. Case 09-M-0074 is closed; Case 10-E-0285 is continued.

By the Commission,

Jaclyn A. Brilling

Digitally Signed by Secretary
New York Public Service Commission

JACLYN A. BRILLING
Secretary