NYS SmartGrid Consortium

Response of:
New York State Smart Grid Consortium

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.

INTRODUCTION

The New York State Smart Grid Consortium ("Consortium") is a not-for-profit 501(c)(6) organization formed in July 2009 to address many of the same issues being examined in this proceeding[1]. Its membership represents a unique public-private partnership of largely New York State utilities, authorities, universities, industrial companies, and institutions and research organizations which came together in a collaborative manner to facilitate the development of a Smart Grid in the state and nation.

The early, formative discussions within the Consortium were focused on the opportunities afforded by the American Recovery and Reinvestment Act of 2009 (ARRA) and the U.S. Department of Energy's (DOE) Federal Stimulus Smart Grid Investment Grant Program and its Smart Grid Demonstration program in order to obtain Federal funds to reduce the costs borne by NY rate payers and organizations.

The Consortium appreciates the support given by the Commission in providing an accelerated approval process, after rigorous review, for the applications filed by New York utilities. This application and review process provided all parties involved with a better appreciation for the complexity associated with smart grid planning and deployment.

1 It's membership includes: Advanced Energy Research and Technology Center (AERTC), Brookhaven National Laboratory, City of New York, Clarkson University, Computer Associates, Consolidated Edison, General Electric, IBM, Long Island Power Authority, National Grid, New York Independent System Operator, New York Power Authority, New York State Electric and Gas, New York State Energy Research and Development Authority (NYSERDA), New York State Foundation for Science, Technology and Innovation (NYSTAR), New York University Polytechnic, , Rochester Institute of Technology, State University of New York at Stony Brook, and University of Rochester.

Informed, in part, by this initial experience, and recognizing the need to demonstrate smart grid benefits to the consumer, the Consortium commissioned KEMA/DeSola to develop a benefits/cost whitepaper on smart grid deployment in the state. After sharing the initial whitepaper with its membership, work began on the development of a "Roadmap" to provide a framework for cost benefit decision making and a methodology to prioritize smart grid investments.

The Roadmap takes into consideration and is very sensitive to the smart grid experiences in other states. It has been especially mindful of the success and ongoing challenges in California. These experiences have been included in crafting, developing, and researching the Consortium's Roadmap.

The Roadmap assesses the broad economic, customer and social impacts to New York from a methodical, evolutionary deployment of smart grid technologies. This unique statewide analysis factors in all practical smart grid technologies and applications, and considers all the potential consequences over the next decade.

The Consortium's Roadmap (attached in two parts – narrative and slide presentation):

- Analyzes the relative costs, benefits, and priorities of the various smart grid technologies, business models, and policies in some detail including how different types of customers and geographic regions benefit;

- Describes all of the assumptions and calculations in the analysis of full statewide costs and benefits of a New York Smart Grid, including the use of an interactive model to assess the relationships between investments and savings;

- Analyzes savings to consumers that will accrue from direct impacts on T&D rates; on energy usage and on energy market peak prices; and from other economic benefits that directly flow to consumers; and

- Identifies less direct benefits such as environmental impacts and resulting economic development.

The Consortium believes that its analysis will assist the Public Service Commission, enhance its base of smart grid knowledge and its ability to make well informed, critical decisions regarding investments in smart grid technologies moving forward.[2]

The details included in this formal response and the ensuing Roadmap (narrative and slide show) forms the basis of the Consortium's response in this proceeding[3]. These documents in their entirety are attached as part of its submittal.

[2] The data in this analysis originates from several published and unpublished works or in some cases was developed by the authors. The basic data on technology costs and overall anticipated benefits and the modeling methodology have been reviewed by a number of consortium members and their feedback incorporated. However, these analyses are not presented as being explicitly applicable to any individual New York state utility and should not be interpreted as such. None of these results have been "approved" by any consortium members as being explicitly applicable to their own service territories, filings, or plans. Although the Consortium commissioned the Roadmap and has reviewed with several of its members prior to submitting it for PSC consideration, it does not represent any individual member's particular cases.

[3] Please note that while the NY PSC is a current member of the NYS Smart Grid Consortium, its directors or staff did not in any way review or participate in the drafting or finalizing of this report or to the Consortium's submission response to CASE 10-E-0285.

RESPONSE TO QUESTION #1 — *Vision for the Smart Grid*

The electric grid, as we currently know it, is for the most part very much the same infrastructure that has been in place for the last 50+ years. It transports electricity from centralized points of large-scale generation sources over delivery transmission and distribution networks to consumers. The transmission system delivers electricity from power plants to distribution substations, while the distribution system delivers electricity from those substations to consumers. The flow of energy and information is predominately static and one directional, from the generators to the consumer, limiting the proactive participation of consumers.

Grid-connected wind and solar resources, as well as distributed resources, create new challenges in planning, forecasting, monitoring, and managing the variability of resources that are inherently dependent upon the weather. Managing renewable energy resources economically and reliably can encompass various approaches, including:

- Flexible conventional generation, such as hydropower projects (including pumped storage) and gas-fired combustion turbines can be used to manage the variability of wind and solar power production.

- Advanced technologies for grid-connected energy storage are drawing increasing attention and should be technically and economically feasible for at least some renewable-integration applications in the near term.

- The load side of the supply-demand balance can be managed to adapt demand to the variable levels of renewables' production. For example, effectively managed plug-in electric vehicles (PEV) charging load can serve as a flexible demand resource for integrating renewable energy sources and managing their variability. Overnight PEV-charging could take advantage of peak production periods of wind generation resources. Absent effective management of PEV-charging load, there could be adverse reliability and market impacts.

- Improving communications infrastructure will enable demand response resources to address bulk power system resource and reliability needs even more quickly and efficiently than today.

The existing grid [Exhibit 1] will be challenged by the need to integrate high levels of renewable resources - the successful development of a "Smart Grid" will dramatically enhance the way we interact and use energy moving forward.

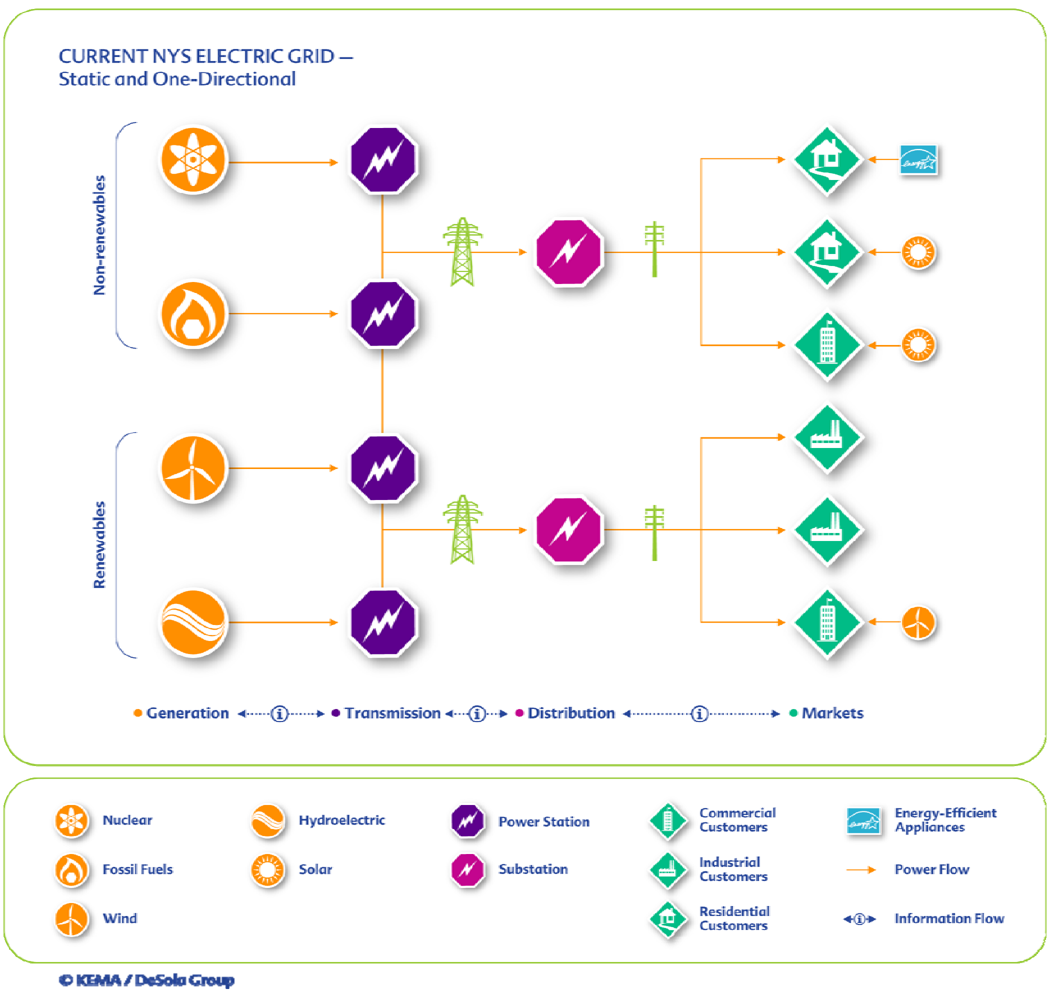

Exhibit 1 – Current NYS Electric Grid

Smart Grid means many things to many people today. It is not a "one size fits all" technology and must be adapted and configured for each region, state, and power utility. Smart Grid is a vision for the electric delivery system of the future.

The Consortium believes that a modern integrated Smart Grid will provide an entirely transformed electrical infrastructure. It will embody a network of devices as vast, interconnected, automated, and interactive as the Internet [see Exhibit 2 below].

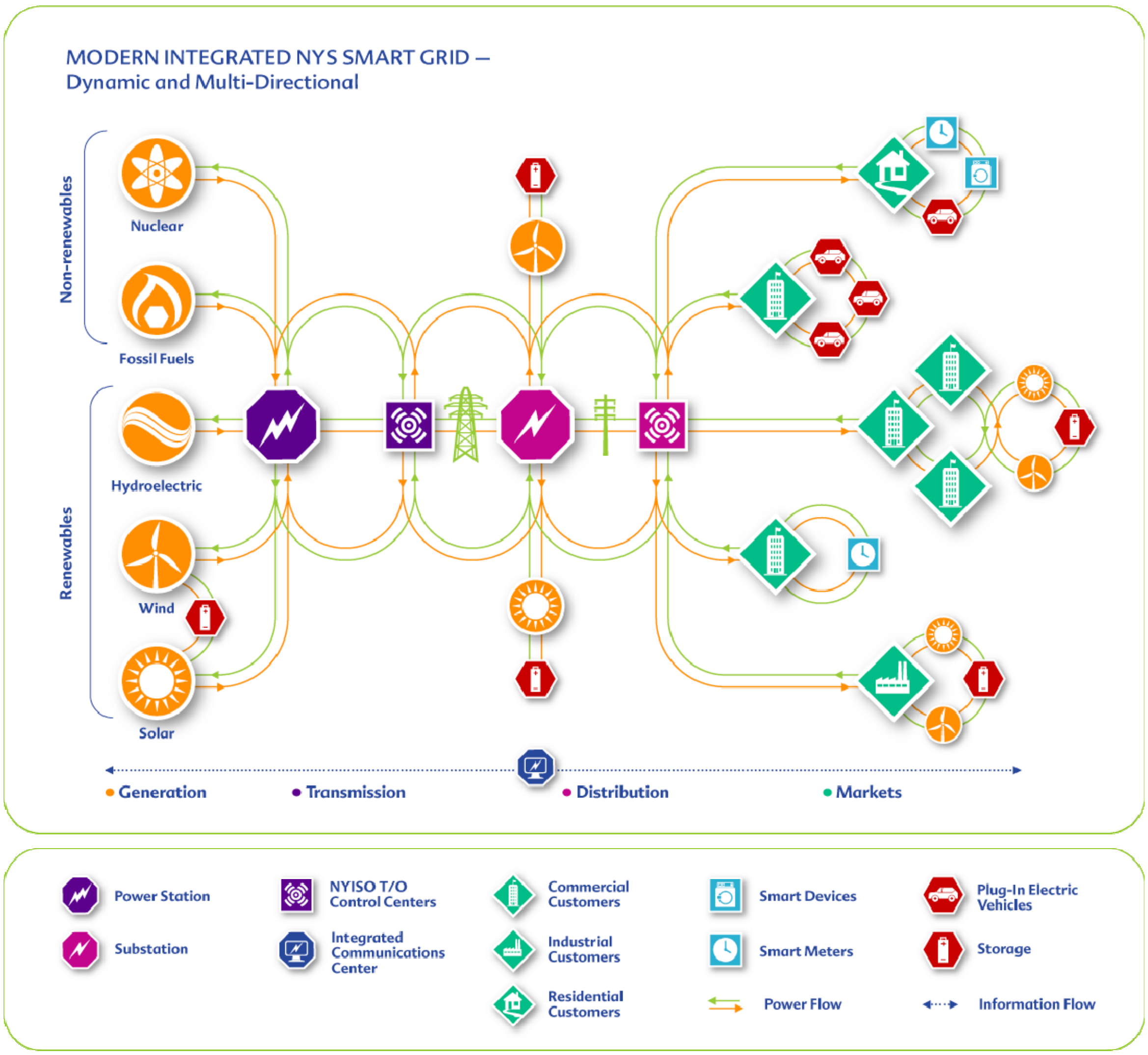

Exhibit 2 – NYS Smart Grid Vision

The Consortium's Roadmap Report provides an initial look at the potential benefits of Smart Grid to the State of New York in the year 2025. This starts with a definition of Smart Grid in the context of New York State and a vision for Smart Grid purpose, functionality, architecture, and technology within the state.

The Consortium believes the fully implemented and realized Smart Grid will benefit the entire state – the public as consumers, homeowners, rate payers, and employees; state businesses and institutions.

The Consortium believes that the Smart Grid can become the enabling technology infrastructure which will make it possible for New York State and the nation to achieve its overarching energy goals while providing a platform which will accelerate the introduction of many new products therein creating a multitude of new companies and thousands of new jobs.

One difficulty that utilities have faced in building a case for Smart Grid is that only a small subset of the benefits flow through the utility costs and rates. Smart Grid projects are often only marginally cost effective if viewed narrowly in terms of the cost impacts on traditional transmission and distribution operations. However, Smart Grid technologies will also result in avoided costs associated with accommodating distributed energy resources, renewable resources, electric vehicles, and other new technologies. An investment in a smart T&D and energy usage (behind the meter) capability enables a Smart Energy User to realize larger savings in energy costs.

Smart Grid is also a key to facilitating a shift in energy resources from fossil fuels to renewable sources such as wind and solar. These latter resources are "variable" – they produce energy when nature dictates, not necessarily when people want it. Smart Grid enables us to adapt our energy consumption to green power production and, through technology advancements, will allow us to store that green energy until we need it. It also will enable us to transmit the power from the renewable generation to the major load centers with less investment in new transmission capacity.

Another key element in the state plan is to shift a significant amount of the transport sector – buses, trucks, and cars – to electric or pluggable hybrid electric vehicles. These vehicles will use dramatically less gasoline and diesel fuel and will be cheaper to operate with electricity as the primary source of power. They will pollute less and our cities and towns will be cleaner.

But converting large numbers of our vehicles to electricity will mean that at the end of the day, for instance, when commuters return home and plug in their cars, the demand for electricity will go up – way up. We can spend money beefing up the power system to support that increased demand, or we can manage the vehicle charging intelligently in conjunction with grid operations (smart charging) and save on major expansions of the power system infrastructure. Energy storage is a key element in managing a transition to renewable resources and electric transportation. Storage will enable us to capture wind and sun energy when it is available and transfer that energy when consumers need to use it . Electric vehicles are both a user of energy and potentially a storage mechanism for wind energy at night when it is strongest.

Many companies, anticipating Smart Grid, are developing new products for consumers and businesses that are anticipated to be "Smart Grid enabled" – able to make use of energy price and availability information to perform their purpose at lowest cost by interacting with the power system intelligently. These include clothes dryers, washers, microwaves, heat pumps, hot water heaters, and other devices.

They also include a new generation of smart building automation systems that manage the HVAC and other systems in large buildings – these can act as miniature power system operators and energy traders, integrating in building distributed generation, energy storage, and energy usage for best comfort and economics.

No one knows today how these products will fare in the marketplace or what use customers will put them to – but they all signal a belief on the part of leading industries that the Smart Grid is coming and will enable vastly expanded customer choice – which in turn will lead to more product and business innovation. We do not know at this time exactly who will develop and sell these products to customers but if we experience only a small degree of the innovation experienced in the telecommunications sector we will well along the way to transforming today's electric grid.

Smart Grid will, of course, also help utilities with the basics – reducing energy losses, managing their assets better, increasing work force productivity, improving service reliability, and saving money.

Finally, New York is already positioned to be a national and world leader in Smart Grid technology development and its business ecosystem. New York universities include world leaders in power systems and energy technologies. New York can boast of being home to the headquarters and research facilities of some of the world's leading Smart Grid technology innovators in GE, IBM, and others, and is also home to the Brookhaven National Laboratory. New York state agencies such as NYSERDA and NYSTAR are among the foremost state agencies in fostering energy R&D including Smart Grid related activities. New York utilities include major global energy companies, one of the world's leading urban utilities, and state power authorities as large as any in the country. In short, the Smart Grid will create thousands of new high value jobs in the United States and NY should garner a healthy share of these.

Smart Grid will ultimately change the nature of the relationship between consumers, state regulators, and utilities for the better. With enabled consumers making independent decisions, and many new businesses developing and offering products to the consumer, the regulators' role will transform – they will need to more closely follow consumer's wishes (made apparent in the marketplace) and ensure a fair and transparent market.

While the Consortium has focused most of its attention on modernizing the electric grid it believes that natural gas will play a significant role in the future of the smart energy grid. Natural gas is the cleanest fossil fuel, and there is an abundant domestic supply. Its use in reducing our dependence on imported oil, distributed generation, repowering of older generating plants and new combined cycle power plants for base load and to handle peaks and the intermittent nature of renewable resources as well as for combined heat and power systems will provide economic benefits to the consumer and provide environmental benefits as well. Smart Grid technologies such as Advanced Metering will provide operational benefits and information to gas utilities and customers just as will be the case on the electric side.

RESPONSE TO QUESTION #2 — *Implementation Priorities*

The Consortium's implementation priorities are based upon the benefits/cost analysis conducted by KEMA/DeSola which is described in greater detail in response to *Question #4 – Benefit-Cost Analysis*.

Based on its review of the benefits/cost analysis, the Consortium's report contained "Key Observations" which it wishes to provide the Commission before discussing the specific "priority" recommendations it makes in this section.

These "Key Observations" are:

- Distribution automation and substation automation investments are most beneficial in terms of reducing outage times, facilitating renewables and distributed generation integration, and reducing T&D operating and capital expenses, and should be a priority in much of the state. These are probably best handled via normal utility investment decisions outside any special Smart Grid processes. There are specific recommendations in the Roadmap document about the importance of considering modern automation capabilities as part of normal asset replacement on a "like for like" basis which would reduce retrofit costs, accrue benefits more rapidly, and avoid stranded cost issues in the future.

- Allowing consumers to select among different paths for adjusting their usage to periods will be a major benefit of smart grid. It will enable those consumers who can benefit from these paths to pick their best alternative and save on energy usage and cost, and in so doing they will help reduce peak market prices for all consumers. It will allow options for low cost supply, renewable supply, including options provided by aggregators, retail energy supply companies, time of use tariffs, or autonomous price response

- Grid storage and use of demand response for avoiding N-2 contingency dispatch is highly beneficial, but storage as a way to alleviate the gas-oil contingency dispatch seems uneconomic as a stand-alone application today. Grid storage for ancillary services is already being developed by private investors under innovative product and services definitions by the NY ISO and should be a continuing area of progress.

- All commercial and industrial customers should be prioritized for AMI. Suburban areas are highest priority for residential AMI for energy price impact and conservation. Absent conservation, demand response and dynamic pricing, AMI economics are still favorable but much reduced. Potential conservation savings from AMI information to consumers is high but needs education and outreach to harvest value.

- The access of consumers to dynamic pricing is a powerful incentive for added Demand Energy Response (DER) penetration. Potential market price impacts of consumer dynamic pricing response is very high. Almost all of this benefit can be captured via a well designed voluntary opt-in program at the cost of consumer incentives to opt in. AMI and Dynamic Pricing (DP) can have significant impacts on DER penetration which benefits Transmission, Distribution, Energy Prices, and RPS attainment. Many Commercial and Industrial customers are already exposed to hourly pricing (those over 1 MW) and more will be in future years as the threshold is reduced. It is worth examining the tradeoffs and benefits of reducing this threshold further or eliminating it altogether.

- The economic benefits of Electric Vehicle Smart Charging are substantial and the costs of not having a state policy that strongly encourages or mandates smart charging are large. The cost of additional AMI point/vehicle is high. Policies to encourage lower cost technical solutions using on-board vehicles electronics, for instance, should be encouraged. Smart Charging overall should be a state policy so that charging spot suppliers and vehicle OEMs can incorporate the appropriate capabilities into their product plans.

  Economic development and environmental benefits are derived from smart grid investments. Jobs are created in both the deployment and full scale stage implementation of Smart Grid contributing significant regional economic benefits. Carbon savings are not insignificant.

- Distributed storage has significant potential benefits as storage costs come down in terms of deferred distribution capital and reduced energy peaking. The correct policies for utility capture of the energy price differential as well as deferred capital expenditures are key to making distributed storage economical.

Implementation Priorities – Years 1-5 (2011-15)

The Consortium has categorized its implementation priorities into two time segments (Initial 5 years and next 15 years) and under seven functional categories.

Below are the Consortium's priorities for the first five years in the following categories:

1) Key Regulatory and Legislative Actions
2) Customer Enablement
3) Modernizing the Grid
4) Diverse Supply Integration
5) Economic Development
6) Technological Development
7) Customer Research

1) Key Regulatory and Legislative Actions

In order to enable all of the benefits associated with the Smart Grid, New York will need to take a series of regulatory and legislative actions. This will include developing the regulatory mechanisms for utilities to make smart grid investments. It will also include enabling customers to be able to respond to prices that change over time and reviewing all possible communications options for AMI. Specific actions the Consortium recommends be taken include:

a) Provide cost recovery for utilities for cost effective Smart Grid installations including T&D investments in demand response and storage technologies that mitigate congestion and locational reserve costs. The benefits from these technologies could be greater as other targeted applications are identified, but technology and application development is needed to realize these proposed effects. These T&D automation investments, in particular, will reap large benefits in integrating renewable and distributed energy resources at lower levels of additional investment in basic infrastructure. They also will be invaluable in accommodating significant numbers of electric vehicles. Improvements in reliability that are well established benefits of these technologies have real economic benefits to consumers. These T&D automation investments include upgrades to Distribution, Transmission, and ISO control systems as necessary to exploit the new communications, monitoring, and control capabilities afforded by Smart Grid.

b) The Commission should examine Smart Grid business cases considering all the economic impacts to the state and ratepayers including several significant effects that do not accrue through the T&D utility rates, as indicated in the illustrative Benefit Cost Analysis submitted with this response.

c) Test key program design options with pilots to prove technologies and consumer value propositions.

d) Allow utilities to replace existing equipment with smart grid enabled equipment as part of normal asset replacement. This reduces the deployment cost of substation and distribution automation as well as reducing forward risks of stranded assets. An estimate of the value of this direction is on the order of $650-700M over the 15 year period as compared with investments in distribution and substation automation not linked to routine asset replacement.

e) Research the possibility of using public networks for AMI. There are significant cost and business model savings to be had, but policy (communications tariff) and technical (security and performance) issues must be addressed. An estimate of the potential savings from this direction, in urban and suburban but not as likely rural areas, is on the order of $350-400M over 15 years.

f) Explore voluntary dynamic pricing for all customer classes on an "opt in" basis linked to planned installation of AMI infrastructure in their locale. The benefits/cost analysis used an estimate that 80% of the benefits of AMI and dynamic pricing for all classes can be obtained when 30% of the customers able to save the most decide to opt in. (This is a calibration for a more sophisticated non-linear model that relates peak shaving amounts and savings to opt-in penetration) This estimate is consistent with some reports from various pilots but should be taken as an illustrative example for the overall computations. All customers benefit as peak load and prices are reduced for all; some of the broader savings can be used to fund additional incentives for customers that opt in accelerating the process and increasing the overall benefits. How varying the incentives can affect opt in penetration and overall net benefits after the cost of incentives is explored and presented in the report.

g) Ensuring that commercial and industrial customers reduce peak load to the maximum feasible and consistent with their commercial objectives and processes is a key to obtaining benefits. Extending mandatory hourly pricing to as low a threshold of peak load as possible should be investigated.

h) Develop programs including outreach for Electric Vehicle Smart Charging and alternatives to additional AMI points. Smart Charging has a potential savings to New York in the order of $ 1.0 B over the period 2011 – 2025.

2) Customer Enablement

Enabling the customer represents an important aspect of developing the New York State Smart Grid. Providing the customer with adequate and timely information and options will encourage them to make informed decisions. The options will come in the form of pricing that more closely reflects the cost to deliver energy (demand response, time of day, variable), simple, interoperable equipment (AMI, smart devices, DG, storage, PHEV) and network automation to manage their energy costs. These decisions will benefit customers and be aligned with state energy policy goals. In essence, the customer becomes an active participant within the grid instead of being a passive user of electric services. Key benefits from customer enablement are the bill reductions from conservation impacts and the shifting of peak load which will benefit all consumers. Another benefit will be increased flexibility in the use of on-site renewable energy which support the NY State Energy Plan goals for renewables.

a) All commercial and industrial customers should have AMI.

b) AMI for these customers should be implemented as cost effectively as possible including the possible use of public networks where coverage is adequate and providing that the necessary security and performance requirements can be addressed.

c) All commercial and industrial customers should have access to time differentiated prices.

d) Utilities and other providers will provide commercial and industrial customers with options to take advantage of time differentiated prices.

e) Suburban residential customers with average and above average usage should have AMI. Use of the public internet for AMI communications for these customers has potential economic benefits in reduced costs provided that security and performance requirements can be met.

f) Residential customers should have access to time differentiated prices on an opt-in basis.

g) Utilities and other providers should provide residential customers with options to take advantage of time differentiated prices.

3) Modernizing the Grid

The grid connects the customer to generation, transmission and distribution in the electric power system. As the infrastructure is upgraded, it will provide significant opportunities to improve cost and reliability through advanced sensors and controls (e.g., PMU) designed to limit outages (self-healing, islanding), linked by integrated communications networks and managed by intelligent advanced systems and operations.

As grid enhancements provide a reliable supply of electricity at reasonable costs, they elevate security risks (cyber and physical) and the importance of managing them. Standards that are being developed by National Institute of Standards and Technology (NIST) with support from the GridWise Architecture Council will enable the safe and efficient operation of the Smart Grid.

The key benefits of upgrading the grid are increased reliability and reduced losses. Distribution Automation and Substation Automation are highly cost effective and are just the start. This is an area where there will be significant technological change over time.

The following are actions that will be needed to ensure the Smart Grid in New York will modernize the grid:

a) Implement Distribution Automation throughout the power system in NYS as part of ongoing utility maintenance and replacement.

b) Implement and/or enhance Substation Automation throughout the power system in NYS on a similar basis.

c) Provide cost recovery for these investments both as part of major rate case projects but also as part of normal asset replacement programs and targeted reliability improvement programs.

d) Continue to monitor new technologies as they become available to make the Grid even more efficient.

4) Diverse Supply Integration

The energy supply portfolio will continue to evolve but several types of renewable generation (wind, solar) tend to be intermittent and less predictable. Incorporation of renewable energy sources into the electric power grid will require a combination of solutions including storage, demand response, and integrated control of distributed resources. This integration will facilitate a more timely and lower cost achievement of renewable portfolio standards.

The following are actions that will be needed to ensure the Smart Grid in New York provides for diverse supply integration:

a) Continue to support the development of large scale and customer side renewables plus other advanced distributed generation as technologies are proven.

b) Explore utility ownership and or utility programs to promote customer side renewables

c) Pilot storage technologies in combination with demand response and renewable technologies.

d) Test use of public networks for AMI including testing cyber security and information / privacy aspects that can provide necessary monitoring of Distributed Energy Resources on a cost effective basis.

e) Explore the economic linkage between dynamic pricing and increased distributed solar penetration.

f) Address recovery mechanisms and incentives for utilities to invest in distributed storage; in particular how utilities can realize the time value gains from energy stored in distributed facilities and benefit consumers from the overall solution.

g) Plan for Automatic Demand Response via Smart Buildings and Virtual Power Plants (integrated load side resources of distributed generation, storage, and demand management) as part of an overall solution, via utilities, aggregators, large end users, or on a fully autonomous basis responding to NY ISO price signals and able to supply ISO ancillary services and other new products as may evolve in the future.

h) Plan for Electric Vehicle Smart Charging as a key component in providing increased demand response, and ancillary services.

5) Economic Development

New York can be a national leader in the implementation of Smart Grid and Smart Grid industries. It is positioned to develop industry and technology clusters in the state which would provide significant economic benefits. This will attract additional industry. The public and private universities must be seen as strategic partners in achieving our economic objectives through our technology and research leadership.

The following are actions that will be needed to ensure the Smart Grid in New York provides long term economic benefits:

a) Continue to support the collaboration between universities, industrials, and utilities at the New York Smart Grid Consortium.

b) Establish priorities for research, product and system testing and validation which can be augmented.

c) Encourage utilities, industrial companies, governmental partners to invest in R&D and communities to be early adopters and test bed partners.

6) Technological Development

Work within the NY Smart Grid Consortium Nexus, the Smart Grid Innovation Center, and other research organizations to reduce the developmental, testing and deployment costs of technologies, products and systems related to grid automation and customer enablement.

a) Design and test interfaces building on the experience of state entities with Smart Grid interface testing. (example, National Grid STC 2009 testing program).

b) Build demonstration homes and businesses with these technologies that are capable of being linked to utility, aggregator, and ISO market systems for demonstration and evaluation.

c) Establish open source Smart Grid testing programs.

d) Encourage and support participation in available DOE ARPA-e and other R&D initiatives as appropriate by utilities, academic institutions, and manufacturers within the state.

e) Develop mechanisms to cross fertilize state R&D activities and commercialize promising technologies. Allowing utilities R&D budgets with cost recovery and/or allocating state funds such as the SBC funds to match utility research, development, and demonstration funding would be a positive step.

f) Allow cost recovery by utilities of costs associated with above.

7) Customer Research

The analysis conducted in the Consortium's study clearly illustrates the large potential benefits of time based pricing and other related customer activities. The research on this topic is not conclusive. Specific areas to explore include:

a) Role of enabling technologies such as displays or behavioral programs.

b) Test new rate options and different ways of opting in (as well as opt-out).

c) Explore the role of dynamic pricing in encouraging adoption of distributed renewable generation and other distributed resources.

d) Research on the future potential roles of retailers and other non regulated firms in developing services related to AMI and Demand Response as participants in real time energy and ancillaries markets in addition to today's capacity markets. Also analyze closely the differences in adoption, practicality, and effectiveness of aggregator based operations versus autonomous price response by consumers.

e) Research on the actual pricing options large C/I customer receive from retailers and what that actually means as it relates to the impact of AMI for these customers.

f) Additional research to confirm the estimates of benefits suggested by this paper.

RESPONSE TO QUESTION #3 — *Engaging Customers*

See the comments above under "2) Customer Enablement" in the response to question #2.

RESPONSE TO QUESTION #4 — *Benefit-Cost Analysis*

As part of its work for the Consortium, KEMA developed a framework to assess the broad economic, customer and social impacts to NY from the deployment of Smart Grid technologies. This unique statewide analysis factored in all practical Smart Grid technologies and applications, and considered all the potential consequences over the next decade. By addressing the interactions between different components, and allowing input assumptions to vary, the model serves as a basis for considering different implementation scenarios. The timing of costs and benefits are linked, and reflects a reasonable prioritization. The full Benefit Cost Analysis with an exploration of a number of alternative scenarios for Smart Grid deployment (that led to the priorities stated above under question #2) is provided as an attachment to this submittal. The benefits can be characterized in terms of overall uncertainty. The overall operational benefits are known and can be quantified easily such as the benefits of distribution automation. Other benefits are less certain such as reducing commodity costs and the potential savings from projected customer behavior. Societal benefits such as jobs are yet again at this point less know and hence less certain.

The Benefit Cost Analysis illustrates in a compelling way that many of the most significant benefits of Smart Grid accrue to customers via reduced energy bills – both from volumetric effects (conservation) and price effects (peak shaving). The price effects are a result of the market operations at the NY ISO and the dollar figures given are net savings in wholesale "LBMP" costs. (In effect, these are the production costs at market prices saved via the market clearing / dispatch process) These benefits do not in general flow through the regulated T&D utility rate structure. Benefit cost analyses that only consider the T&D rate impacts will usually be favorable, but only marginally so, for many Smart Grid technologies. However, when the energy bill impacts are considered the benefits become strongly favorable.

Some Smart Grid technologies can be implemented by third parties, investors, consumers, or unregulated utility operations. The Roadmap discusses this and the general desirability of seeing market forces select technologies and individual consumers elect to make investments based on their own perceived benefits and costs. However, some Smart Grid technologies – especially ones with reliability implications such as Substation Automation and Distribution Automation – are the province of the T&D utilities. Investments in these has to be the domain of the utilities. It is important that the Commission understands the full benefits of these technologies even though they flow "around" and not "through" the utility rate structure. The full Benefit Cost Analysis with an exploration of a number of alternative scenarios for Smart Grid deployment (that led to the priorities stated above under question #2) is provided as an attachment to this submittal.

For each of the cost elements and quantifiable benefits of Smart Grid, projections were made for each of the years 2011-2025, and the total Net Present Value calculated. The results indicate that there are significant savings to be realized from Smart Grid, and a large positive relationship between total benefits and costs. Figures 5-3 and 5-4 show a high level waterfall chart of overall costs and benefits from Smart Grid on a Net Present Value basis over the period 2011 – 2025.

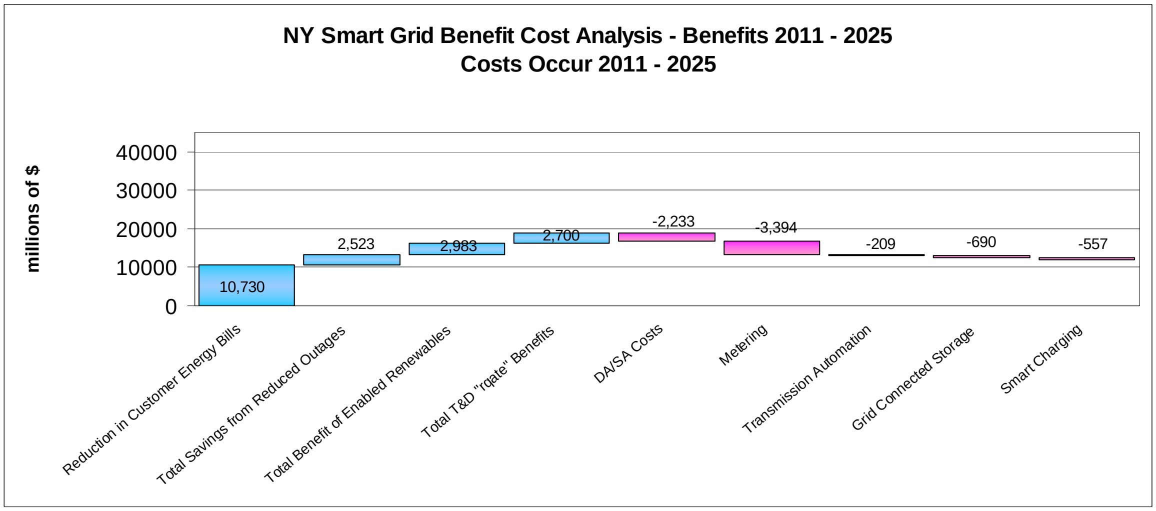

Exhibit 3 - Benefits 2011 – 2025 Cost Occur 2011 - 2025

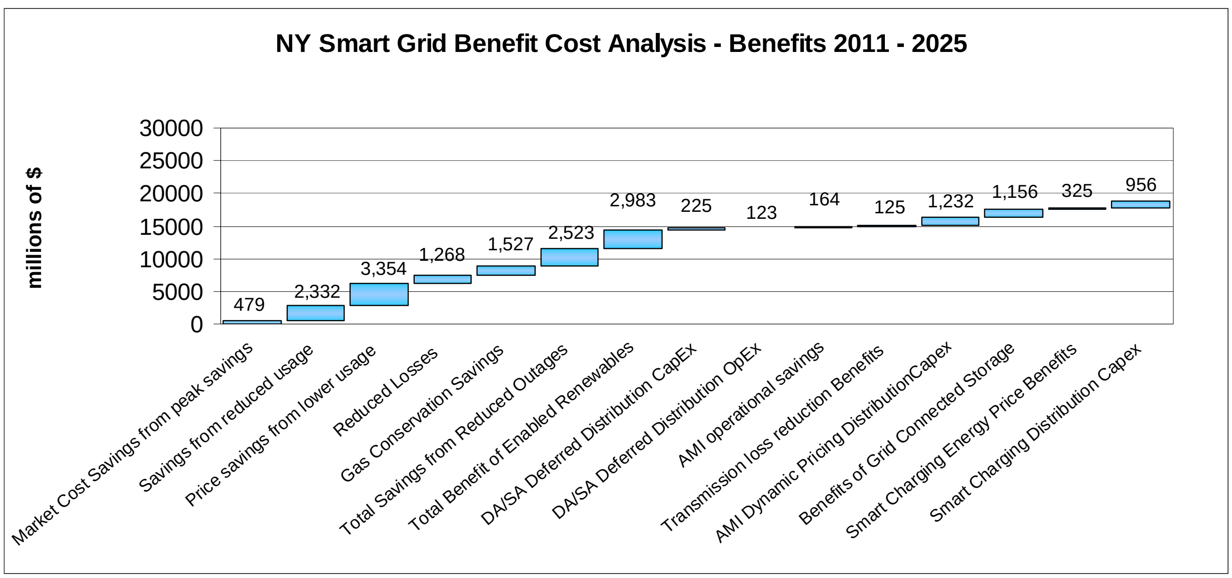

Exhibit 4 – Benefits 2011 - 2025

These benefits build up over time based on the different Smart Grid technology deployments in different hypothetical projects over time. Exhibits 5, 6, & 7 show some of these cost and benefit buildups over the period.

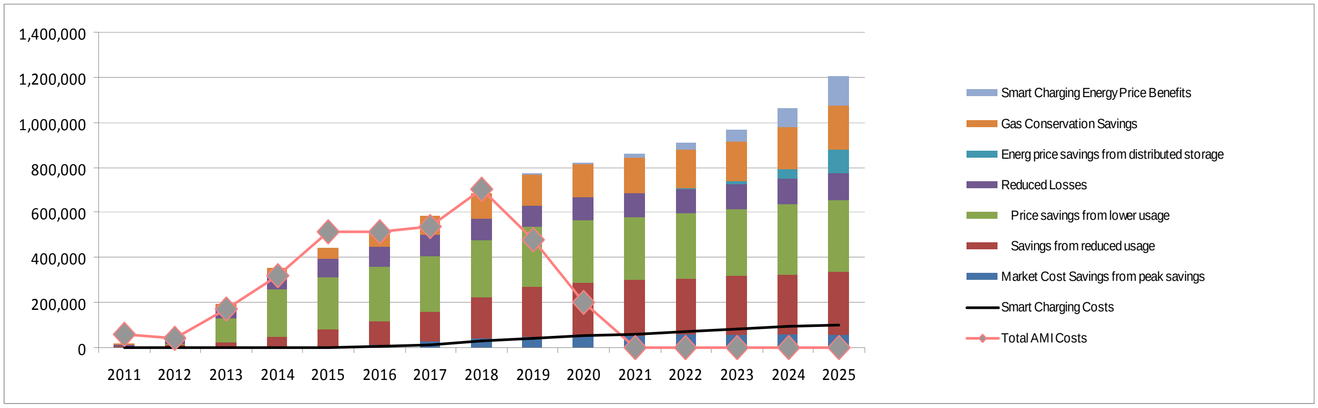

Exhibit 5 – Costs and Benefits Over Time

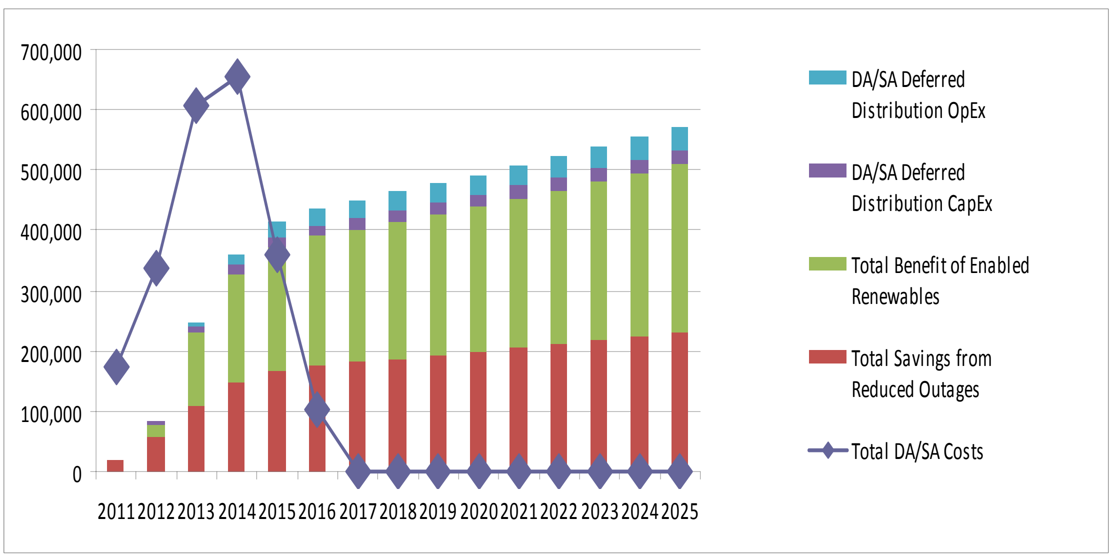

Exhibit 6 – Electric System Costs and Benefits Over time

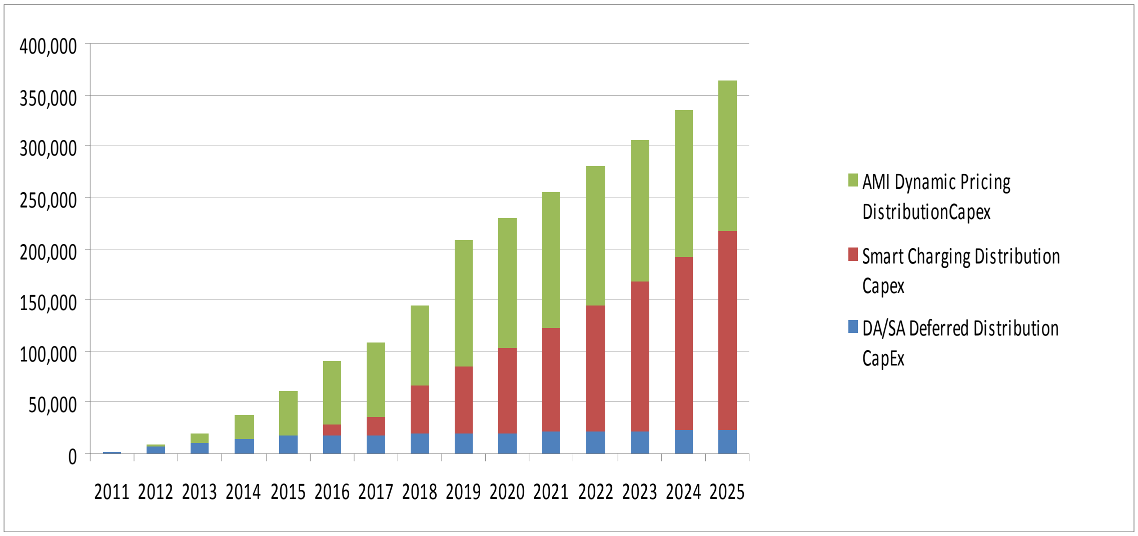

Exhibit 7 Customer Benefits over Time

The Benefit Cost Analysis is extremely complex with interactions among the different technologies and business models deployed over time. It uses best estimates of current technology costs with moderate future cost reductions in some technologies, reflects current state policies with respect to residential dynamic pricing, and estimates of the current state of C&I customer retail supply and utility investment in T&D automation and AMR. Even so, it is necessarily simplified as compared with an aggregation of detailed individual utility plans on the cost side. On the benefit side, the market price impacts in particular as well as consumer adoption rates are estimates based on a limited set of published reports and analyses as well as pilot project evaluations. Its results should be taken as illustrative and not as precise financial projections.

RESPONSE TO QUESTION #9 — *Timing*

The Consortium recognizes that New York State is constrained on the amount of capital and personnel that are available to deploy on the implementation of Smart Grid. While there is broad support for Smart Grid, there are capital and ratepayer impact constraints that impede the pace of the implementation of Smart Grid technologies. The greatest net benefit theoretically would come from the most rapid deployment of Smart Grid technologies state wide. However, this also greatly increases the immediate rate increases necessary to pay for the technology. The scenarios developed and analyzed in the Consortium's "Roadmap" document for the most part consider reasonable deferrals and staging of technology investments so as to allow a matching of benefits to costs with minimal adverse ratepayer impact in the early years. Some scenarios to demonstrate the rate and benefits impact of rapid full deployment are shown for illustration.

It will be a challenge for the State and its consumers to absorb too rapid a pace of change. As such, over the next five (5) years, the State should focus on those elements of Smart Grid that can significantly improve operations and reliability and which will yield the greatest energy market price and conservation savings as AMI and dynamic pricing options are made available to consumers. During this time, the State should facilitate the deployment of proven products and services which provide value to its consumer base, encourage utilities to make the business process and organizational changes necessary to reap the benefits of Smart Grid, educate and support its workforce through this major transformation, and implement the necessary core changes to IT systems. High priority should be given to:

- Automation of the T&D systems as part of ongoing grid modernization with full cost recovery for the utilities, including field equipment, communications, back office systems, and control center upgrades

- Integration of Commercial & Industrial demand response and dynamic pricing in market and grid operations via aggregators, Automatic Demand Response, and autonomous price response.

- Pilot programs to validate residential consumer adoption and value propositions from dynamic pricing, Time of Use pricing, and other innovative business models including voluntary opt-in models for dynamic pricing

- Deployment of AMI guided by pilot project results in New York and nationally with a focus on those customer segments and regions where the largest benefits are expected

- Establishment of policies and standards for Electric Vehicle Smart Charging before adoption is widespread

- Continued research, development, and demonstration of innovative grid technologies aimed at improving grid productivity and reliability including grid connected storage and applications of phasor measurement systems

Plug-in Electric Vehicle (PEV) / Plug-in Hybrid Electric Vehicle (PHEV) Charging – NYS will begin to see PEV/PHEV vehicles being deployed over the next five (5) years but, this is not expected to be a major reliability or market factor in that time frame. However, NYS needs to support Smart Charging and develop tracking and billing systems for PEV/PHEVs since adoption will accelerate in years 6 – 15. Policies for how Smart Charging is integrated with AMI need to be established early so that utilities, ESCOs, parking system operators, and the automotive industry can adapt.

NYS will begin to see micro generation bear fruit over the next five (5) years but, it will not be a major factor. It is also estimated that the utility and consumer adoption of micro storage over the next five (5) years will be limited based on existing and forecast technology costs. Distributed storage becomes a factor in years 6-15 depending upon policy decisions over rate recovery and energy arbitrage allocations.

RESPONSE TO QUESTION 10 — *Other*

The roadmap points out some critical policy questions and needs that will impact the successful realization of the full Smart Grid vision with all attendant benefits. These include the need for the:

- Technical validation of the use of common carrier communications for AMI
- Development of policies for incentives for voluntary consumer opt-in for dynamic pricing. (which are investigated in the BCA)
- Establishment of EV Smart Charging policy and standards in advance of higher penetrations of EV in light of the very large economic impacts of Smart vs. Dumb Charging on market prices, T&D infrastructure, and overall economics.
- Assessment of the impact of dynamic pricing will have on incremental DER penetration which in turn is beneficial to meeting State Energy Plan goals for renewable production with lower impact on T&D infrastructure needs.
- Revised policies for treatment of substation and distribution automation within current state of the art as normal "like for like" apparatus replacement today to encourage utilities to go forward with T&D automation technologies without the onus of additional rate case filings.
- Resolution of whether and under what conditions utilities can make use of remote disconnect switches as part of AMI deployment. Some utilities in the state can make a strong argument for the use of disconnects as a network reliability tool; others can cite historical low rates of disconnects for any reason as cause not to invest in the additional functionality.
- Ensuring that AMI and Smart Grid projects are designed so as to enable DER monitoring and EV Smart Charging without unreasonable additional costs (such as required by additional meters)
- Ensuring the development of Smart Grid technologies which are deemed to have the greatest value. The State should consider an R&D budget in utility rates to provide for testing, piloting, and demonstration of these technologies as they evolve.

CONCLUSION

The Consortium believes that the evolution to a smarter grid is well underway. How this transition continues is dependent on a number of factors – many of which are outside of the normal regulatory process established for the traditional provision of electric services which have been in place for over one hundred years. It is the enablement of new technologies, new user options, new sources of generation, new system integration which come at the convergence of policy and potential.

The Consortium applauds the Commission for its measured movement toward realizing a smarter grid through its active solicitation of input from many parties who will be impacted. The Consortium urges the Commission to identify the short list of priorities which it believes constitute the first phase of smarter grid investments. It believes that there is a sufficient potential supply of pilot projects, including stimulus grid projects in New York State and elsewhere, to document the many cost, feasibility, reliability and added benefit issues to address the Commission's order. However, the cost recovery basis and Commission approval are required before many of these can proceed.

The Consortium also believes that an aggressive approach to field testing and validation of other technologies will well serve the Commission in its decision making and the state in achieving its energy and economic objectives.

The Consortium offers the expertise of its membership and the facilities and capabilities of its companies, organizations and research institutions to move beyond pockets of experimentation to a platform of validation and technology documentation.

The Commission's goal for informed decision making on costs and benefits can best be served by a steady, measured approach to document and validate the contributions of various grid technologies proposed to be deployed. Documentation, validation and decision making must be linked in a timely manner. Traditional models for financing, operating, deploying, integrating and regulating must all be considered.

The Consortium appreciates the opportunity to contribute to this Proceeding.