# Creating a 21st Century Electricity System for New York State

## An Energy Industry Working Group Position Paper


February 26, 2014

Process facilitated by Advanced Energy Economy

## About this Document and the Working Group

This document summarizes the work, conducted over a three-month period, by an informal Working Group formed following an Advanced Energy Economy (AEE) and MIT-Industrial Performance Center (IPC) led CEO Forum on the *21st Century Electricity System* in November 2013.[1] Representatives from the following companies and organizations participated in the Working Group:

Advanced Energy Economy*
BRIDGE Energy Group
Central Hudson Gas & Electric
Conservation Services Group
Consolidated Edison Company of NY Inc. and Orange & Rockland Utilities, Inc.
EnerNOC
Environmental Defense Fund
General Electric
Gridco Systems
Iberdrola USA
Johnson Controls, Inc.
Landis+Gyr
National Grid USA
New England Clean Energy Council
New York Independent System Operator
New York Power Authority
New York Smart Grid Consortium
Opower
PSEG Long Island
Verizon

* AEE served as the facilitator of the Working Group.

The purpose of this document is to provide leadership and input to regulators, policymakers and other stakeholders on the goals, objectives and considerations that will facilitate the implementation of a vision for the future electricity industry in New York State. This document is a preliminary step prior to what is expected to be a detailed regulatory process. It is not meant to be a substitute for or preempt any aspects of that process. The information contained herein is not based on detailed analysis conducted specifically by the Working Group during the development of this document. Such analysis will need to be done to validate the viability of the vision, as well as the roles of the different stakeholders and the regulatory models to be considered and developed in the future.

[1] For more about the CEO Forums, go to https://www.aee.net/initiatives/21st-century-electricity-system.html.

## Executive Summary

The electricity industry is in the midst of dynamic change, with many of the underlying assumptions that have shaped it for decades in transition. This document summarizes the collective thinking of an informal Working Group (WG) that was formed to provide input to New York State policymakers, regulators and other stakeholders on potential changes to the electric utility industry that:

- Better align the state's utility regulatory framework with the state's energy, environmental, and economic policy objectives
- Successfully address the underlying technology and market forces shaping the "Utility of the Future"

The forces affecting the electric power industry are creating both challenges and opportunities. Technology developments include increasing deployment of distributed generation (DG), energy efficiency (EE), demand response technologies (DR), and smart grid technologies, products and services. At the same time, customer needs and expectations are changing, including the desire for more self-generation, better control over energy use and costs, and expectations for a more resilient system. New York State also has energy, environmental and economic policy objectives that can only be met with a modernized, efficient electricity system.

These technology, market and policy-driven trends will continue to put pressure on the existing utility business model, yet there is also an opportunity to build upon them to meet the policy objectives of New York State in the most cost-effective and equitable way possible. Achieving this future begins with exploring changes to electricity markets and existing utility business models.

The WG envisions a future electric industry model in New York in which a modernized grid serves as a platform for enabling new capabilities, customer-driven products and services, and creates value for utilities, non-utility companies and customers. This vision is one that:

- Aligns the electricity sector with state policy objectives
- Improves the customer experience and gives customers tools and options for managing electricity costs
- Creates sustainable utility business models that recognize the value of the grid
- Improves market design, operation and coordination
- Encourages innovation
- Moderates future customer bill increases relative to what would otherwise be experienced

To implement this vision, the WG identified three "pillars" that will serve as the foundation for this new model. These are:

- Customer products and services
- The network infrastructure and operational model
- The regulatory framework

**Customer Products and Services**

The 21st Century Electricity System will drive improvements in core functions such as operations and reliability, additional customer services and greater levels of customer engagement and choice. Grid modernization infrastructure, increased customer participation, and services provided by and to utilities will enhance the core operational capability of the electricity system. As explained below, compared to today, basic services will provide incremental capabilities and services to customers and will be included as part of traditional utility rates. Additional value-added products and services will be provided by utilities and/or non-utility companies. Value-added products and services will allow customers to actively engage more in managing their energy usage or hand off this management to utility or non-utility service providers. Value-added services will typically be market-priced for services such as enhanced reliability or resiliency.

The WG outlined an initial set of basic and value-added services, but there are numerous unresolved policy issues that will need to be addressed, including the roles of utilities and non-utility providers, what is included in competitive markets, and how these markets will function. Issues surrounding rate design for regulated services, metering services and the associated data will also be important considerations for the future industry model.

**Network Infrastructure and Operational Model**

As New York's distribution utilities plan and invest for the future, their network infrastructure requirements will be shaped by a number of industry dynamics and emerging technologies. The ability of the grid to accommodate a high volume of distributed energy resources (DER), smart grid technologies, demand response, and additional loads from electric vehicles require an evaluation of necessary network infrastructure and operational requirements. Moreover, certain customers and customer classes will seek increased access to more information and empowerment regarding their energy usage. Reliability and grid resiliency also need to be addressed as a result of changing customer and community expectations as well as an ever-growing reliance on electricity, in light of an anticipated increase in severe weather events. All of these requirements must be delivered while maintaining data security in the face of a rising threat of cyber events. To effectively manage these dynamics, the Utility of the Future must build out an infrastructure that provides the network operator with a fundamentally new set of functions and capabilities. Managing this complex system will require development or expansion of two-way, low-latency communication infrastructure and control schemes to integrate distributed resources and controllable loads.

Deploying the infrastructure required to enable the future industry model will entail significant investment over a sustained period of time. This raises numerous questions and considerations with respect to cost recovery, prioritization of which capabilities to deploy first, and to which customers and which parts of the network. Valuing DER is a key consideration, as DER is expected to play an important role in providing grid services to the utility. It will be important to assess the costs as well as the direct and indirect broad benefits of this new model, and to move forward in a way that provides net benefits to customers.

**Regulatory Framework**

Many jurisdictions, including New York, have made adjustments to traditional ratemaking to adapt to the changing industry dynamic with mechanisms such as capital trackers, revenue decoupling and flexible alternative regulation schemes. To foster increasing investment in grid modernization, these methodologies can be broadened and enhanced. The WG envisions advancing to an increasingly flexible and performance-oriented regulatory system that is designed to accomplish the following core objectives:

- Facilitate the attraction of capital and investment in advanced grid infrastructure
- Support continued resource diversity, e.g., demand response, energy efficiency, renewable supply, distributed generation
- Empower consumers with the information and tools to better manage their energy consumption, especially peak demand, and enable value-added products and services
- Enhance the reliability and resiliency of the grid
- Ensure the long-run financial viability of the distribution utility franchise
- Moderate future customer bill impacts through efficient utility investment and operations

The WG recommends that any changes to the regulatory approach in New York should be based on the following guiding principles:

1. Maintain effective aspects of the current regulatory approach that will serve as the foundation for the future
2. Modify the regulatory approach to realize the future model, in particular:
    - Supplement traditional cost of service regulation with symmetric performance incentives
    - Align utility investments to the achievement of state policy objectives
    - Create greater clarity for long-term investments and cost recovery
3. Adjust ratemaking, including rate design, to allocate costs equitably, reflect the true value of the grid, and address structural changes in utility load profiles
4. Improve rate design to allow customers to make informed choices to enhance their value of service, aligned with policy objectives

In the future, utilities may be expected to meet a broader range of performance outcomes in order to successfully transition to the evolving utility model. As the industry transforms, today's existing measures can be the building blocks for future measures. Currently, utilities' base level of service is primarily measured on safety, reliability and adequate service. As the definition of base level of service expands, measures will evolve and perhaps even new ones could be introduced. Where today the focus is on maintaining a certain level of service, tomorrow the focus may shift to enhancing that level of service. The WG identified five broad categories of outcomes that may be established. The categories should focus not only on the outcome – whether we achieved what we set out to achieve – but should also focus on how we get there. The broad "outcome" categories and some possible measures of success that may be considered include:

| Outcome Category | Description of Possible Measures of Success |
|---|---|
| **Customer Engagement** | Social media channels, managing energy use/conservation & access to new energy services. Additionally, customer awareness, ability to propagate information & anticipate customer needs. |
| **Advancement of Clean Energy Goals** | Clean energy policies, providing support to accommodate significant DER & further reductions in GHG emissions. |
| **Operating Safe, Reliable, & Resilient Systems** | Network resiliency, self-healing capabilities, adaptability, customer-initiated resiliency solutions. |
| **Operational Efficiency** | Utilization of the network, e.g., efficient asset utilization & load factor management. |
| **Innovation** | Utilities measured on portfolio of projects, ability to be forward looking & processes for looking at new ideas. |

**A New Benefit-Cost Analytical Framework**

The current regulatory framework establishes specific guidance on the rationale for making capital investments. That is, investments are justified on the basis of reliability, risk reduction, safety, and economic and environmental benefits to customers. A broader business-case, considering value to customers and societal benefits that meet State policy goals, would more fully account for the effects of new technologies and justify support for the investments that may be needed to support overall state policy objectives. Many of the benefits of the investments necessary to realize the vision described in this document will accrue to others – energy service and technology providers and local economies – and not directly to utilities or the customers they serve. As a result, traditional benefit-cost analysis that compares estimated consumer savings to estimated consumer costs may not capture all of the claimed benefits, thus limiting a utilities' ability to justify the investments necessary to make this vision a reality. Consideration should also be given to risk and uncertainty within the broader framework.

**The Path Forward**

The utility industry model is at a crossroads: it will have to adapt to (1) meet future customer expectations and needs, (2) promote and integrate clean energy, (3) adopt new technologies, and (4) drive economic growth. A long-term view is essential to maintain the proper alignment and reinforce these elements. It should also set the customer at the center of the new paradigm. The new industry model will need to provide sufficient clarity and certainty such that both utilities and non-utility companies can develop and implement business plans that serve the customer and achieve the desired outcomes. The WG invites a dialogue with other stakeholders to further refine its vision.

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# Introduction

## Overview and Objectives

Over the last century, the U.S. electric power sector has undergone significant changes in response to developments in technologies, markets, regulations and policies. The sector is once again entering a period of significant change, driven by new technology changes, evolving customer needs, environmental imperatives and an increased focus on grid resiliency. These forces are being felt to varying degrees across the country, including New York. With these developments come challenges, but also new opportunities to create an electricity system that meets the changing requirements of consumers and society for the coming decades.

This document summarizes the collective thinking of an informal Working Group (WG) composed of New York utilities, the New York Power Authority (NYPA), the New York Independent System Operator (NYISO), some New York State NGOs, several national non-utility companies,[2] the New England Clean Energy Council,[3] and Advanced Energy Economy (AEE).[4] The goal of this WG was to provide leadership and input to New York State policymakers, regulators and other stakeholders on potential changes to the electric utility industry that:

- Better align the state's utility regulatory framework with the state's energy, environmental, and economic policy objectives
- Successfully address the underlying technology and market forces shaping the "Utility of the Future"

In that regard, the WG is encouraged by early guidance from the New York State Energy Planning Board (NYEPB) and the New York State Public Service Commission (NYPSC). On January 7, 2014, the NYEPB issued the draft State Energy Plan (*Shaping the Future of Energy*) for public comment. That document focuses on the future of the electric power industry in New York, particularly on the future role of distribution utilities. It notes:

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[2] In this document, the term "non-utility" refers to clean and advanced energy and technology companies that provide various technologies, products and services to the electric power sector and electric power customers. This includes companies that provide these directly to utilities, to utility customers on behalf of utilities (contracted agents) and directly to customers (third-party providers). Where appropriate this document makes distinctions between these different categories, but also refers to them as a group.

[3] NECEC is a regional non-profit organization representing clean energy companies and entrepreneurs throughout New England and the Northeast through programs and initiatives that help clean energy businesses at all stages of development to access the resources they need to grow.

[4] AEE is a national association of business leaders who are making the global energy system more secure, clean, and affordable. Advanced energy encompasses a broad range of products and services including energy efficiency, demand response, natural gas electric generation, solar, wind, hydro, nuclear, electric vehicles, biofuels and smart grid.

*While there has been progress in many facets of New York's energy industry, challenges and opportunities remain, including the need to replace aging infrastructure; to improve our regulatory model to match technological advances; to ensure that quality, reliability, and resiliency of the energy system meet the demands of an increasingly connected society to manage energy costs; and to protect our environment and health. If one thing is clear, it is that we must be proactive and forward-thinking in our planning and policies.*

Many of the initiatives set forth in the Draft Energy Plan will enable and facilitate the industry's ability to respond productively to the key drivers of change the WG has identified.

Similarly, the goals set forth here are consistent with a recent NYPSC ruling[5] in which the NYPSC announced its intention to pursue more comprehensive changes to the regulatory framework. In that ruling the NYPSC stated:

*Consequently, we conclude that the time has arrived for a fundamental refocus of, not only the system benefit programs, but also comprehensive consideration of how our regulatory paradigm and the retail and wholesale market designs either effectuate or impede progress of our policy objectives underlying these programs. In order to effectuate this more comprehensive approach, we are directing Staff to develop a proposed scope for a proceeding that will result in timely decisions regarding how we can best realize our regulatory framework and improve the retail and wholesale markets to assure that the success of the post-2015 course of energy efficiency and other clean energy programs.*

The NYPSC further articulated the following five core policy outcomes that it wishes to achieve in both the near term and through a more comprehensive inquiry. These outcomes are intended to serve the NYPSC's overall mission of ensuring economic, efficient, reliable electric service, while reducing emissions, including greenhouse gases:

1. Customer knowledge and tools that support effective management of their total energy bill
2. Market animation and leverage of ratepayer contributions
3. System-wide efficiency
4. Fuel and resource diversity
5. System reliability and resiliency

[5] Case No. 07-M-0548 – Proceeding on Motion of the Commission Regarding and Energy Efficiency Portfolio Standard. Order Approving EEPS Program Changes (Issued and Effective December 26, 2013), pages 20-25, and page 43, Item 1.

The WG focused its efforts on describing potential changes to customer products and services, network infrastructure, and the New York regulatory framework that would promote the desired outcomes and facilitate the necessary investments, while ensuring a viable long-term utility business model that identifies and supports the role of the utility and non-utility companies and adequately values the grid. Despite the diversity of participating organizations and the range of perspectives within the WG, there was significant alignment across a number of issues. In instances where there were divergent viewpoints, these are noted in the document.

## Document Contents and Organization

The section *Drivers of Future Industry Change* lays out industry-wide and New York State-specific drivers that affect the electric power sector and serving as the catalysts for change. Although the WG believes that these are relatively well understood, this section provides a high-level review.

The section *Goals and Objectives of the Future Industry Model* lays out a broad vision for the future New York State electric power sector.

The section *Pillars of the Future Industry State* goes into greater detail on three areas that are critical for achieving the vision: (i) customer products and services, (ii) the network infrastructure and operational model of the future electricity system, and (iii) the regulatory framework. This section also identifies considerations that could be addressed in any future NYPSC proceeding. To the extent practical, the considerations were defined and alternatives/options presented.

*The Path Forward* discusses how this process could evolve in the coming years.

Finally, the appendix provides some additional considerations on the potential value propositions for the WG participants.

## Other Key Considerations

The efforts of this WG are expected to support a more formal regulatory process that will include contributions from a wider range of stakeholders and entail more detailed analysis (financial, technical, etc.). This document and the efforts of the WG are intended to provide input to such proceedings that may be initiated by the NYPSC in the first quarter of 2014, as indicated in the recent order in PSC Case No. 07-M-0548. This work is not intended to replace such a process or preempt input from any stakeholders in that process, including from individual WG members.

Also, a number of initiatives and activities are ongoing within New York State addressing various aspects of the Utility of the Future. Any future regulatory proceeding in New York to address this issue in a more comprehensive manner should not interfere with these ongoing efforts, which can continue in parallel. As a formal regulatory process unfolds, it may eventually influence these ongoing activities, but these ongoing activities should not be delayed nor should they preclude or limit the flexibility for further changes that may result from the more formal regulatory process. For example, the use of non-traditional methods to meet load growth and system needs should continue to evolve at each utility as appropriate, including but not limited to, energy efficiency, smart grid technologies, microgrids and demand response. Several utilities are considering such options in load-constrained areas and would expect to proceed with plans in parallel with this proceeding. Moving forward with such options would facilitate learning and experience with new technologies and implementation of alternative solutions to meet reliability needs, and will help identify potential customer benefits.

## Drivers of Future Industry Change

Several forces are affecting the electric power industry, creating both challenges and opportunities. These forces are exerting financial and other pressures on existing utility business models and regulatory frameworks and are strong enough to fundamentally transform the electric power industry in the coming years. To ensure a sustainable industry and best position utilities for the future, now is the time to consider regulatory and other changes that will appropriately value the benefits of new technologies, products and services, for customers and the system as a whole. Inaction, or more limited action on individual issues is likely to lead to conflicting and confusing results, even higher costs for consumers, unsustainable utility business models, inappropriate subsidies and suboptimal outcomes with respect to the various energy, economic, and environmental policy objectives of New York State.

Broadly speaking, the changes facing the industry can be grouped into three areas: technology, markets and customers, and policy, although there are important linkages among them. For example, the success of existing renewable energy and energy efficiency policies and customer demand and adoption of these technologies contribute to some of the financial and technical challenges facing utilities. At the same time, new technologies offer important solutions to these challenges and to meeting policy objectives, such as improving integration of variable renewable generation and making the grid more reliable and resilient.

### Technology Developments

Deployment of new and existing technologies, including those supported by state and federal policies, continues to reshape the electricity industry. Some of the key technology developments are discussed below.

**Rising deployment of distributed generation (DG)**

The increasing affordability of, and desire for, self-generation options by commercial, industrial and residential customers have the potential to impact the current utility business and operational model. Distributed solar photovoltaics (PV) are becoming increasingly cost-effective and enjoys policy support at the Federal and state levels. In 2012, distributed PV additions exceeded 1.5 GW nationally, and are projected to exceed 5 GW by 2016.[6] Although the New York PV market is relatively small compared to some other states, it is already in the top ten based on annual market size.

Other forms of DG include small wind turbines, combined heat and power (CHP), fuel cells and microturbines. While the markets for these technologies are small, they are growing, and the technologies are relatively mature and cost-effective in many applications. Some of these

[6] *U.S. Solar Market Insight: 2013 Q3,* Greentech Media and the Solar Energy Industries Association, December 2013. Distributed PV represents about half of total PV capacity additions – total 2012 PV additions exceeded 3 GW and is projected to grow to about 9 GW by 2016.

technologies also benefit from low natural gas prices, and thus have implications for the natural gas network, and highlight the growing interdependencies between electricity and natural gas.[7]

**Increasing adoption of energy efficiency (EE) and demand response (DR)**
EE represents a large, diverse basket of technologies, products and services with significant untapped potential. Some notable technology developments include LED lighting (and associated intelligent lighting controls), building management systems that can respond in real time to improved electricity price signals, and IT-enabled behavioral EE programs. Increased EE deployment helps meet environmental objectives, reduces customer bills, and may help defer investment in new generation and delivery infrastructure. EE deployment has also contributed to the flattening or even declining retail sales of electricity in some jurisdictions. In New York, 2011 annual electricity consumption was just 3% higher than the recession-induced low in 2009, and was about 1% below the pre-recession peak in 2007. Looking ahead, New York's demand growth, including energy efficiency, is projected to be less than 7% from 2011 to 2022.[8]

Even as EE is impacting total electricity consumption, peak demand continues to grow, resulting in deteriorating load factors. From 2009 to 2011, average demand in New York grew by about 3%, but peak demand grew by 10%. Nevertheless, DR is already being used successfully in New York to alleviate stress on the grid during system emergencies. But the rise in peak demand suggests that DR is an underutilized resource in New York. As noted in the 2014 draft New York State Energy Plan, *Shaping the Future of Energy*,[9] there remains additional potential to use DR to improve overall grid efficiency and reliability, and potentially avoid or mitigate the need for investment in additional infrastructure to meet peak demand. To date, DR has participated mainly in wholesale power markets. In the future, DR could also become an important tool for managing demand at the distribution level, when it can be done so cost effectively.

**The deployment of smart grid technologies, products and services**
The smart grid, or more generally, the use of information and communication technologies, is creating new opportunities for customers to manage energy use and more actively participate in management and operation of the grid, such as in demand response programs. Central to this is the ability to generate, collect and act upon detailed, more-timely energy data. Smart grid technologies also give utilities greater ability to target high-use customers for energy efficiency measures, monitor system conditions and improve grid management and operations by providing greater visibility into – and control over – conditions at the local distribution level. This includes the availability of a new class of active grid infrastructure based upon innovations in power electronics, enabling utilities to maintain system reliability through fine-grained end-to-end control of power flow in the face of increasingly dynamic grid conditions. It is the

[7] Although this paper deals primarily with electric distribution system, additional analysis to the impact of the gas systems may need to be considered in the regulatory proceeding.
[8] Consumption and demand figures are taken from *Power Trends 2012 State of the Grid*, NYISO.
[9] 2014 Draft New York State Energy Plan. Volume 1. Initiative 02.

combination of such IT and OT (operational technologies) that uniquely creates the opportunity to build systemic business cases that could exhibit strong benefit-to-cost ratios for investment, and thus the ability to contain long-term rate increases. Additionally, smart grid investments will result in improved grid efficiency, such as through Volt-VAR optimization.

**Other technologies to watch**

Two other technologies to watch and prepare for are plug-in electric vehicles (PEVs) and battery energy storage. Sales of PEVs (plug-in hybrids and all-electric) are rising rapidly in the United States: more than tenfold from 2011 to 2013, from about 9,000 units to nearly 97,000.[10] With sales approaching 1% of total vehicle sales, the market is still relatively small, but increasingly stringent fuel economy standards and falling technology costs will continue to drive the market. In New York, the current electricity fuel mix results in significant GHG benefits when comparing electricity to gasoline or diesel for transportation, and PEVs figure prominently in the 2014 draft New York State Energy Plan, *Shaping the Future of Energy*. If widespread adoption of PEVs were to occur, it would have significant implications for volumetric electricity sales, peak vs. off-peak demand pattern changes, build-out of public and private charging infrastructure, and utility network operations. Even before this occurs, clustering of PEVs (due to demographics and likely adoption patterns) will result in localized grid impacts. Beyond the need to be prepared for these changes, smart charging and "vehicle to grid" (V2G) technologies will also offer utilities new possibilities for advanced grid management and control.

Battery energy storage for deployment behind the meter and on the T&D network is just now emerging as a commercial market, and expectations are that it will become more widespread. As examples, California is embarking on a plan to deploy 1.3 GW of storage by 2020, and SolarCity, in partnership with Tesla, is beginning to offer PV-battery systems to customers interested in better managing their load profiles.

## Market and Customer Developments

Market developments are centered on changing customer needs and expectations. Expectations are changing based in part on customers' experience with other industries as well as a greater dependence on electricity to meet their everyday needs. Specific drivers include:

- An interest in improved clarity and simplicity in the pricing and value of energy services
- Expectations for a more resilient system, more rapid outage restoration, and better information and communication about outages, especially during severe weather events
- A desire for more environmentally sustainable energy options, whether through greater energy efficiency, clean distributed generation, or purchases of renewable energy
- Changes in reliability and power quality expectations based on the proliferation of electronic devices and the digital economy

[10] http://www.electricdrive.org/index.php?ht=d/sp/i/20952/pid/20952. Accessed February 10, 2014.

- A desire for greater control of energy use and costs, including rising interest in customer-sited supply options and energy control measures

Non-utility companies are also part of the changing energy marketplace and are playing a larger role in providing certain energy services, including energy efficiency, energy management, demand response and customer-sited DG. This, along with the changing needs and expectations of end-use customers suggests that definitions of customer classes, and even who is the customer, will need to change in the future.

The adoption of new technologies by customers is also affecting the flow of energy on the distribution system, away from its traditional one-way flow (from power plant to customer) to two-way or multi-way flows. The ability to self generate also creates opportunities for customers to provide energy and other services to the grid. This expanded pool of market participants will have implications for traditional central station generation, dispatch and operation. It will also require examination of wholesale market design and operation, and T&D network planning, design, investment and operation.

Distribution utilities will need greater system visibility and control through the application of information technology and automatic distribution system controls. Not only will this be important for distribution system planning and operations, but also for the functioning of the wholesale electricity market. As more generation is embedded within the distribution network and as customers may become more responsive to price signals, tighter coordination between wholesale markets and distribution system operations will be needed. This dynamic will also have implications for utility cost recovery and billing mechanisms, as customers become more active market participants.

## Policy Developments

Reinforcing the technology- and market-driven trends are more aggressive public policy efforts, including:

- Continued state focus on reducing GHG emissions from the power sector. New York's participation in the Regional Greenhouse Gas Initiative, its Renewable Portfolio Standards (RPS), New York Sun Initiative, System Benefit Charge (SBC), and Energy Efficiency Portfolio Standards (EEPS) programs, are key programs for achieving GHG reductions and other policy objectives.
- Policies to promote DG, such as net metering, typically compensates qualifying customer-sited DG at the full retail rate, but are causing growing concern about customer cross-subsidization issues and utility recovery of fixed costs under current rate structures and the potential for misallocation of costs among customers. New policies need to be considered to address industry transparency and equity among participants.
- A growing emphasis on improving grid resiliency, driven by climate change and increased frequency of extreme weather events. This emphasis has increased the interest in utility

system resiliency investments and self-supply and grid configurations such as microgrids. The recently announced NYPrize program, which is intended to promote community-driven microgrid projects in New York State, is an indicator of the growing public interest in new approaches for achieving a more resilient and reliable power grid.

- Supporting economic growth and competitiveness, and encouraging private sector investment in energy services, clean energy deployment, and the clean energy economy (e.g., via the newly formed and capitalized New York Green Bank).
- An increasing interest in encouraging utilities to modernize the grid to facilitate the use of distributed energy resources (DER)[11] and capture the system benefits they can provide.

As articulated in the Draft State Energy Plan and the recent NYPSC ruling, there is also interest in:

- Providing a greater variety of service options to all customers in a fair, affordable and sustainable manner
- Helping customers better manage their total energy costs
- Increasing system-wide efficiency
- Increasing fuel and resource diversity

## Implications for the Future

New York's electricity system has served the state well for the past century and already plays an important role in meeting certain policy objectives. Nevertheless, continued growth of DG, EE, DR, and renewable energy, as well as the more emergent technologies, will continue to put pressure on the existing utility business model. The existing regulatory framework and its ability to support and encourage the needed investments to address all the above challenges and opportunities may not be optimal. The expectations of what the grid will need to deliver in the future is at odds with current rate designs and a regulatory model built on volumetric tariffs.

To address these challenges and meet the energy, environmental and economic development policy objectives of New York State in the most cost-effective and equitable way possible, changes to electricity regulation, electricity markets, and the existing utility business model, need to be explored. This is the focus of the remainder of this paper.

[11] "Distributed energy resources" are broadly defined to include distributed generation (DG), energy efficiency (EE), demand response (DR), energy storage and microgrids.

# Goals and Objectives of the Future Industry Model

## Overview

The preceding discussion described the drivers of change and articulated specific policy objectives, technology challenges and opportunities, and market changes affecting the electricity sector in New York. The ability to address them all will require a future industry model that will look different from the one we have today. In this section, a broad vision of this future industry model is put forth, which forms the basis for the more detailed exploration of potential solutions in the next section, *Pillars of the Future Industry State*. The goals and objectives of the future industry model also reflect the notion that any future industry model must work for all stakeholders, and at times must balance competing interests.

## Specific Goal and Objectives

**Better align the electricity system with state policy objectives**

New York State has numerous policy objectives related to energy, the environment and economic development that can only be met with a robust, efficient electricity system. A core goal of the new industry model is to achieve better alignment between these policy objectives and the investments in and operation of the electricity grid. These must all be achieved while maintaining safe, reliable, affordable and equitable electricity service to all customer classes.

To help achieve this alignment, the grid will need to be modernized to allow for a high degree of DER, renewable energy generation, smart grid technologies, and other related customer behavioral changes. In the future this could also include the ability to accommodate large numbers of PEVs. The modernized grid would then integrate and optimize the use of distribution system assets and DER technologies, products and services, and value those products and services using market mechanisms.

Effective integration of DER is expected to improve reliability and resiliency. Nevertheless, additional investments will also likely be needed to meet overall reliability and resiliency needs.

**Improving the customer experience and managing electricity costs**

Most electricity customers currently have limited options with regards to their electricity service. In the future industry model, customers will have more product and service options to meet more differentiated needs and will be able to receive greater value for the money spent. Part of this change will be to empower customers to take more control over their energy use and costs and offer them opportunities to be more active participants in energy markets, and therefore be part of the means to meeting policy objectives. Engaging with customers early on in the planning process will also be important. This will ensure that new products and services are properly designed to meet their needs and expectations.

Significant investment will be needed to provide customers with the level of service that will meet their changing expectations. This includes investments in generation, transmission, distribution, information technology, and DER. At the same time, a key goal of the future industry model is to moderate customer bill impacts and provide customers with more tools to manage their usage and bills. Although distribution costs and the total bill may increase over time, the goal is to keep such increases lower than they would otherwise be under the current model. For example, investments that raise one component of the bill may lower costs in other areas. These costs will also be further offset by the incremental value provided to customers under the future model. The ability to create new customer services and customer classes will help to meet this goal as the incremental cost for these services would match the value that customers receive from the services. Indeed, addressing the needs of multiple customer classes will provide the impetus for the delivery of services covering multiple points on the consumer demand curve, rather than the single point currently constrained by today's fixed-price, fixed cost-recovery revenue model. New customer services will be aided in the future by being able to provide more accurate and timely price signals and more accurate cost allocation through rate design reform that considers all customer classes.

One emerging option – that of self-generation – may currently benefit primarily those individual customers, but the ability to leverage this DG to fully capture its benefits for the entire network needs to be further developed. Today, utilities may need to make redundant investments because they are unable to tap this resource, or it may become necessary for utilities to limit DG deployment, neither of which is desirable. In the future industry model, not only will customers have an enhanced experience and be able to exercise more control over their energy usage – including installing DG – but if they choose to, they will be able to be active participants in a more dynamic electricity market, and utilities will have the visibility and control they need to leverage DG for system benefit.

**Creating sustainable utility business models**

Utilities will need to be encouraged, via business model and regulatory changes, to embrace a more policy- and customer-centric approach and make the necessary investments in the new capabilities that will be required. The future industry model needs to recognize the value of the grid in the deployment of new energy products, technologies and services. The role of the electric utility is likely to evolve to include that of facilitator/enabler of the future structure. In this role the electric utility will need to provide infrastructure that is flexible and provides benefits to customers and other stakeholders that justifies the utility investments. The future industry model must also accommodate diverse customer needs and values across and within the various service territories of the state.

Achieving long-term viability for New York's electric utilities will require a regulatory framework that adapts to prevailing conditions and is flexible and supports the evolution of the roles of utilities, non-utility companies and customers. Specifically, the new framework should recognize that the current trend of low to flat load growth is likely to persist. It will need to include appropriate compensation mechanisms for both existing and future utility assets, thus enabling the necessary investments to be made in the system. It should also support utility investments in non-wires alternatives (or procurement of non-wires services from third parties), if those alternatives are cost-effective relative to, and provide benefits beyond, traditional T&D build-outs.

**Improving market design, operation and coordination**
Although the focus of this vision for a new industry model is on distribution utilities and the distribution network, it will also be necessary to refine and enhance existing wholesale and retail markets to facilitate incorporation of new technologies. For example, DG, DR and energy storage may be located primarily on the distribution network or behind the meter, but have important implications for long-range state-wide system planning including generation and transmission investments as well as wholesale market planning and operations, such as sales and demand forecasting. The New York Independent System Operator (NYISO) will need to coordinate with local utilities, wholesale market participants, and other industry stakeholders to take into account DER in its system planning.

The WG also recognizes the growing linkages between electricity and natural gas, at both the wholesale and local distribution level (e.g., via DG), and the importance of both in meeting state policy objectives. The future industry model must be developed with this recognition in mind.

The future industry model should rely on competitive forces when possible, and use direct incentives only in a targeted fashion when and where they are needed to meet state policy objectives.

**Encouraging innovation**
Transformation of today's energy network will require innovation. The current regulatory framework provides utilities very little incentive to take risks or to innovate, particularly if the benefits are longer-term in nature. This is the case even if the benefits to utilities, the network, and their customers may be significant. At the same time, non-utility companies that can be more adept at product and service innovation, have a limited role today in providing related energy services. The new industry model will need to encourage collaboration and innovation by utilities and non-utility companies in developing new products and services, and to bring those services to customers. It is the nature of innovation to have successes and failures. Utilities should be supported in innovation and collaboration without fear of disallowance of cost recovery, within well-specified limits.

**Developing a more comprehensive approach to benefit-cost analyses**
Any modified regulatory framework will need a fresh approach to determining what expenditures are in the public interest. Specifically, the benefit-cost paradigm will need to be broadened from today's "utility bill" impact, to that of "total customer value." Benefit-cost analysis should reflect all of the State's desired outcomes including those that accrue directly to customers (e.g., enhanced reliability) and those that reflect broader policy objectives (e.g., reduced GHG emissions, improved economic competitiveness).

Before going too far down the road of regulatory and industry reform, it will be important for the NYPSC and the array of stakeholders to reconsider cost-effectiveness and public interest screening methods early in the process to help guide the overall effort. This is discussed further in the “Regulatory Framework” part of the section, *Pillars of the Future Industry State*.

## Pillars of the Future Industry State

In order to implement the vision of the future industry model, the WG identified three "pillars" that will serve as the foundation of this new model. These are:

- Customer products and services
- The network infrastructure and operational model
- The regulatory framework

Each is discussed in more detail below.

### Customer Products and Services

#### *Introduction*

The 21st Century Electricity System is expected to result in improvements in core delivery such as operations and reliability, and additional services and greater levels of customer engagement and choice. Grid modernization infrastructure, increased customer participation, and other services provided by and to utilities will enhance the core operational capability of the utility system. Compared to today, basic services will provide incremental capabilities and services to customers and will be included as part of traditional utility rates. Additional products and services will be provided as value-added services by utilities and/or non-utility companies (e.g., aggregators, ESCOs, technology companies). Value-added services will allow customers to engage more in managing their energy usage or hand off this management to utility or non-utility service providers. These services will typically be market-priced, although some could be offered by utilities to select customers and may therefore be tariff or market priced as optional services.

This section offers some consideration as to which services might be appropriate for Basic Service versus Value-Added Customer Services in the future industry model. Additional discussion and analysis will be needed to better define the attributes of the various services provided.

**<u>Basic Service from the Utility</u>**

The purpose of this section is to identify initial elements of basic service, and to describe those at a high level. It is not meant to be exhaustive and may not be complete. Rather, it is intended as a starting point for discussion. There are several considerations for customers, utilities and non-utility companies. For example, while basic services are paid for by customers to utilities, utilities often contract with non-utility companies when it is cost effective and meets utility needs and requirements. This is expected to continue in the future under the new industry model. Under basic service, the utility's role would include helping customers understand and manage evolving service options.

At the core of the new industry model is the basic bundle of services that all customers would pay for in their rates. While conceptually similar to how utility service is provided today, the future will be more complex because what constitutes a basic bundle of service is likely to be dynamic and will change over time. For example, basic service would include new ways for customers to interact with the utility using digital platforms such as iOS and Android Apps. A value-added service may evolve into components of basic service over time, in much the same way that some optional features on automobiles eventually become standard on all vehicles (e.g., antilock brakes). This will not be the case for all services but will be the case for some, as technologies evolve. Moreover, basic service may be different for different types of customers. For example, large Commercial and Industrial (C&I) customers have access to interval meter data today as part of their basic service, but that functionality is not currently available to residential or smaller commercial customers. Subject to a benefit-cost evaluation and state policy goals, residential and small commercial customers may have access to interval data as part of basic service, or may initially have access as a value-added service, potentially migrating to a basic service over time.

It is also important to note that the underlying infrastructure that delivers service to customers will be increasingly sophisticated and dynamic. Historically, investment in the distribution infrastructure was in well-understood and long-lived assets (e.g., poles, wires, substations). By comparison, modern grid infrastructure will be increasingly dynamic (e.g., information systems, two-way communication capabilities, digital meters, and switches), with the need to address cost recovery for shorter-lived assets.

***Ensuring access to the distribution system and DG interconnection.*** As part of basic service, all customers will have the ability to connect to the distribution system. This will include the ability to purchase and sell electricity. Interconnection costs may be included in basic service for smaller systems, but may also be provided at an additional cost to interconnect larger systems. Customers with DER will be credited or compensated for the services or value they provide to the utility. The value the DER will provide to the distribution system will depend on the potential size of such flows and whether the flow is back to a network or radial system. Further inquiry is necessary to understand how DER benefits can be monetized and captured for system benefit.

***Meeting reliability standards (including EE, DR, and other DER).*** As part of basic service, utilities will continue to plan for system peak demand needs. Today, utilities primarily meet these needs by installing new traditional capital assets (i.e., wires, substations, transformers, switches and related equipment) In the future this will include greater use of non-traditional approaches such as DER/local supplies, demand response (DR), energy efficiency (EE) and other measures that prove to be cost-effective for all customers while meeting state policy goals. It is important to note that as part of basic service, utilities may directly install or implement non-traditional assets and resources, or they may utilize non-utility vendors/aggregators to secure such resources, or they may provide a grid platform where third parties pay for and install equipment. Utilities may also leverage existing assets from some of the value-added services noted below. In any case, the costs of these assets, where paid for by the utility, would be recovered in rates, and the regulatory model may include metrics and balanced incentives to achieve desired results.

***Billing and collection services and customer service relating to utility billing and services***. Utilities will continue to provide billing and collection services, offering a variety of financing and payment options that are compliant with regulations.[12] Billing line items should be standardized to the extent practicable, and explained on the bill in a straightforward manner that provides clarity to the customer. Utilities will maintain the systems needed to bill retail customers for delivery services, and to compensate DER for energy provided to the grid. Utilities will maintain a customer service organization and the technical staff and systems to meet customer needs. Billing services will include transmission and supply costs for default utility customers, and could also include on-bill repayment and leveraging of public dollars with customer contributions or private lending for EE and renewable energy projects. Non-utility companies may also provide some of these billing and collection services in the 21st Century Electricity System.

***Metering services and associated data***. Utilities will own, install and maintain meters needed to monitor customer usage, and will collect and maintain data. These data will be provided to customers and their third-party providers, in accordance with privacy requirements, although this may not be the only way data are available to the customer and their third-party agents. Data will support billing and could also include additional data based on the type of meter the customer has installed. Legal and privacy issues, as well as data integrity, must also be considered. Data will need to be presented to customers in a usable and understandable format, which may include integration of other data as well.

Meters, as well as other forms of communication media devices such as HAN Hubs, or in-home display devices, can provide information on granular customer usage. The prime function of this metering-communications interface is to give the customer access to data and enable the customer, whether through utility services or third-party services, to take action. One way, although not the only way, to think of this interface is as a gateway between the utility, customers and third-party providers. As noted below, whether the services are enabled by the utility, a contracted agent to the utility, or a third party, and whether gateways are part of basic service or value-added service, are still to be determined.

Advanced meter deployment and (near real-time/real-time) data access should be provided to customers as part of basic service, subject to state policy goals and benefit-cost analysis by utility service territory and customer class. Depending on the benefit-cost results and state goals, certain customer classes will have advanced meters and (near real-time/real-time) data access as part of their basic service while others will be able to obtain these services as a value-

[12] As part of the process of moving to a new industry model, regulations should be revisited and, if needed, amendments proposed.

added service initially. To the extent these services are not provided to all customer classes as part of basic service immediately, these services may migrate to a base level service over time. Any benefit-cost analysis should account for state policy goals and capture the full extent of the benefits, including customer, utility and societal, that result from better access and understanding of energy use data. Examples of economic benefits include but are not limited to deferred T&D investment, lower system peak demands, and increased load factors. Societal benefits could include reduced GHG emissions, improved customer satisfaction, and the ability to improve outage management.

Customers and customer-designated third parties should have easy and convenient access to granular energy usage, subject to customer privacy limitations. The majority of customers do not directly derive immediate value from granular data access; instead, customers may need utilities and/or third parties to provide them with insights from the data and access to services leveraging the data. These strategic engagements with the customer may include but are not limited to unusual usage alerts and demand response program participation. Data are expected to enable customers to make informed decisions about their energy consumption, as well as support product and service offerings from utilities and/or third parties.

While the WG parties agree to the need for customer and third-party access to (near real-time/real-time) data and the objectives of enabling the associated operational value, consensus was not reached on committing to a specific technical approach. Certain parties strongly believe that customers and their designated third parties should have direct access to customer data, and that without it, operational value of data will be limited. These parties recognize that there are important details to address as to how this access should be provided, including privacy and security concerns. Other parties, while open to discussing the concept, believe the security, technical and operational concerns warrant a more thorough assessment to determine whether or not such access can be provided in the future. This assessment was not feasible in the timeframe of preparing this paper.

***Cyber security, data security and meter data access***. Utilities will include cyber and physical protection of assets and information as part of basic service. With the increase of two-way communication and access to advanced metering, the threat of cyber-related events increases significantly and must be managed proactively. Consideration should be given to increased security measures and planning to the system endpoints.

***Outage services (restoration and anticipated outages).*** Under basic service, utilities will continue to provide customers, government agencies, municipalities and others with information about restoration activities during outages. This includes information about estimated restoration times.

***Enhanced customer notifications and energy intelligence***. Utilities will continue to provide customers with information about existing and expected weather events, and suggestions for energy conservation measures. Utilities will continue to seek to utilize all new approaches to communicate with customers in ways that are convenient and easy for the customer, which includes social media and other electronic channels. Utilities may provide these services directly, or under contract with non-utility companies, as is the case today.

***Buy and sell from the grid, new transactions***. As part of basic service, all customers will have the ability to connect to the distribution system. This will include the ability to purchase and sell electricity. Utilities will offer new opportunities for transactions with DER directly to end-use customers or through third parties that wish to participate with the utility in the management of the grid.

***Significant fees and taxes collected by utilities.*** Utilities act as collectors of taxes and fees for the State as part of its basic service today, as required by state, local and federal governmental agencies and authorities. It is anticipated that this function will continue, although it may need to be modified in the future to assure equitable distribution of those costs to customers. Moreover, steps should be taken so that taxes and fees do not skew benefit-cost analysis when comparing alternatives.

**Potential Value-Added Services**

Value-added services are those services that customers must pay for separately from their basic service, and would be available to any customer who wishes to access these services. For example, customers may procure a value-added service that enhances only their reliability, or a value-added service that enhances broader grid reliability. Certain value-added services could also be one option for encouraging innovation in regulated utility services. Additionally, value-added service offerings may differ across the state based on service territory characteristics, differing customer values, and differences in previous utility investments.

To foster competitive markets and a robust clean energy economy, care needs to be taken so as to create a level playing field for third-party providers. A key element in this regard is the concept of market pricing. There are many approaches that can be considered to accomplish this, ranging from the utility providing the services directly to the customer using market-based pricing, utilities partnering with non-utility companies to provide services to the customer, and/or third parties providing services directly to the customer.

In scenarios where markets do not exist and no third-party solution is forthcoming, utilities could offer services on a cost basis, until such time as a market evolves. Depending on the specific service, the evolution of the market and many other factors, it is likely that a combination of these approaches will be necessary. Further consideration is warranted on this issue.

Potential value-added services that can be provided by the utility, contracted agents of the utility, and/or third parties include:

***Billing and collection services relating to utility billing and services***. If it is not part of basic service, value-added services could also include on-bill repayment and leveraging of public dollars with customer contributions or private lending for EE and renewable energy projects.

***Billing services for third parties, such as ESCOs, as the utility companies do today.*** This would be an added fee-for-service for additional third-party billing.

***Metering services and associated data***. Where state policy goals and benefit-cost analysis do not initially justify advanced meters/data access being part of basic service for a certain customer class in a utility territory, these customers may be able to obtain these services as a value-added service.

***Enhanced customer and grid management services.*** These services, in the aggregate, advance customer engagement, responsiveness, and willingness to participate with the utility in its management of the grid, either from an energy efficiency, demand management or DG perspective. For utilities, the provision of some of these services may be a regulated service and may include performance incentives. An example of such a value-added service could be a customer who wishes to install DG.

The utility, a contracted agent or a third party can provide customer support such as servicing power equipment, including generators, energy storage facilities, power quality devices, static VAR compensators, and variable rectifiers. The utility, contracted agent or third party can also install and service customer-sited IT, including data communication and computer control systems.

***Commodity supply services and behind the meter supplies.*** Commodity services will continue to be available to customers through third parties. For behind-the-meter supplies, customers will decide what to install and can work with third parties and possibly with the utility. The utility's role will, at a minimum, be related to interconnection and the ability for the customer to offer output if the utility can make use of it.

***Enhanced reliability and resiliency.*** Providing reliability and resiliency beyond what is required in basic service will be a value-added service, and there are several technology options for achieving this. One option is via microgrids. Microgrid customers maintain the flexibility to either support the grid for compensation or take power from the grid, subject to applicable tariffs. To the extent that microgrid customers impose costs on the distribution utility, they should be charged. Likewise, where they provide benefits or services to the distribution utility/system, they should be compensated. The utility may provide microgrid-related services by using its wires and other resources as part of the microgrid, or the customer may implement a microgrid behind the meter and engage with the utility similarly to a DG provider. There are many challenges with microgrids, including load density, space and environmental requirements and restrictions, and building wiring configurations, that all need to be considered.

***Customer-sited energy storage facilities.*** With deeper penetration of renewable power, customer-sited energy storage will serve to stabilize output variability and also provide peak shaving and load-shifting capability. Storage can be placed on the utility side of the meter, as well, as part of basic or value-added services.

***Emergency and non-emergency operational services.*** These include such services as customer-sited emergency generation and advanced technologies that facilitate load and frequency control. For example, if a customer wished to install a building management system or emergency generator, this would not be part of the basic service provided by the utility.

***Distribution-level ancillary services.*** If a customer wished to deploy technologies in order to provide balancing, energy, voltage control or regulation service to the grid, the provision of such technologies would likely be a value-added service. The ability for a customer to isolate from the electric system, black start and self-sustain for a predetermined period may also be a valuable service.

## *Policy Considerations*

The table below delineates some of the policy issues surrounding basic and value-added services that should be addressed to achieve the goals and objectives outlined in this paper.

| Topic | Issue |
| --- | --- |
| **Definition of the Customer** | • Basic service: end consumer of a service<br>• Value-added services: customer could be an intermediary |
| **Delineation Between Basic and Value-Added Services** | • How does delineation change over time, e.g., level of reliability<br>• How does the regulatory framework support that change |
| **Definition of Advanced Metering** | • Penetration and definition of real-time data access<br>• Who provides advanced meters and real-time data<br>• What is the timing and ability to provide data<br>• What are the benefits & costs<br>• How are customer privacy requirements met |
| **Utility Compensation** | • Future rate design structure<br>• How is utility compensated for its value-added services, e.g., charges for the utility role in microgrids<br>o Regulated recovery, new incentive compensation, unregulated revenue recovery, or hybrid models |
| **Services in a Competitive Market** | • What is included in the competitive market, or priced as such<br>• How can unregulated and regulated entities compete |

## Network Infrastructure and Operational Model

### *Introduction*

As New York's distribution utilities plan and invest for the future, their network infrastructure requirements will be shaped by a number of converging industry dynamics and emerging technologies. The ability of the grid to accommodate a high degree of distributed assets (e.g., distributed generation, energy storage, microgrids), smart grid technologies, demand response, new loads such as electric vehicles, and other related customer behavioral changes, requires an evaluation of necessary network infrastructure and operational requirements. Moreover, certain customers and customer classes will seek increased access to more information and empowerment regarding their energy usage. Reliability and grid resiliency also need to be addressed as a result of changing customer and community expectations, as well as an ever-growing reliance on electricity, in light of an anticipated increase in severe weather events. All of these requirements must be delivered while maintaining data security in the face of a rising threat of cyber events. To effectively manage these dynamics, the "Utility of the Future" must build out an infrastructure that provides the network operator with a fundamentally new set of functions and capabilities.

### *System Requirements*

Utilities play a critical role in planning, constructing, operating and maintaining the T&D infrastructure necessary to enable the functions and capabilities identified above. The infrastructure must be designed for interoperability of devices meeting standardized requirements. The network must also accommodate bi-directional power flows and provide utilities with greater ability to monitor and control devices both on the utility side and customer side of the meter. The system will require an appropriately designed near-real-time communications network to support the increased monitoring and control of the system.

***DER integration.*** An expanding requirement of the future industry model will be an ability to integrate higher levels of DG and variable renewable generation in a manner that supports system stability and contributes to system operations. Today, DG – wind or solar in particular – can create a number of operational challenges as their penetration increases on a particular feeder or circuit. For example, voltage-level fluctuations due to rapid changes in the output of wind or solar generation can jeopardize the acceptable voltage limits at customer locations. The ability to better monitor and control distribution system voltage and manage power flows will be critical to the successful integration of increased levels of distributed resources. More importantly, a modernized grid should be able to take advantage of the services and support these resources can provide to the distribution system. Effective management of voltages at the point of interconnection will require utilities to adopt power regulation solutions on the edge of the feeder system that not only observe local voltage fluctuations, but also dynamically regulate voltage in response to such fluctuations.

***Communications, sensing and monitoring.*** To manage this complex system, the Utility of the Future will need to develop or expand two-way, low-latency communication infrastructure and control schemes to integrate DER and controllable loads. Inputs into the control scheme will likely come from new sensors within devices connected to the utilities' systems or devices located within customer premises (at the DER and controllable loads), as well as advanced meters to the extent they are deployed. More active control of switched capacitors, voltage regulators, and load tap changers will be necessary, as well as control of new devices like advanced inverters on DG and customer loads participating in DR programs. Distributed resources that are inverter-based will need to deploy advanced inverters that provide localized control over reactive power, frequency and voltage levels. Such capabilities will allow these resources to be counted toward meeting system capacity requirements, and also enable the full value of these resources as a source of ancillary services.

***Management and control.*** The number of devices to be controlled, and the precision to which the system will be optimized, will define the complexity and breadth of the control schemes necessary. These may include Advanced Metering Infrastructure (AMI), centralized Energy Management Systems (EMS) and Distribution Management Systems (DMS) as well as more localized control schemes at the feeder and substation level. EMS and DMS are important systems that will enable utilities to leverage AMI data to provide better services to their customers. In a very complex system it is likely that a hierarchical DMS would be necessary in which many of the control decisions to optimize localized issues on the electric power system are done at the feeder or substation level without backhaul to a centralized DMS system. In contrast, control decisions that impact areas beyond the parameter of normal local control would be communicated to a higher level control system and controlled and/or supervised centrally.

***Reliability and resiliency.*** Another key capability of the Utility of the Future will be to improve grid resiliency in the face of more frequent severe weather and other disruptive events. The perceptions of resiliency have changed with the proliferation of the digital economy and as communities and households become more reliant on electricity. Utilities have a long history of designing, operating and maintaining their networks to ensure the delivery of reliable service. Traditional measures include the upgrading of equipment or substations to meet future load growth, as well as "hardening" of the system through vegetation management, more robust design and construction standards for the T&D system, better protection of critical substation equipment and undergrounding of vulnerable assets. Ongoing technological innovations have allowed most utilities to install Outage Management Systems (OMS) as well as expand their system automation capabilities into the distribution grid with varying degrees of coverage. Continued, and in some cases, increased investment in these traditional measures will be a vital component to achieving improved grid reliability and resiliency.

In the future, utilities will be expected to identify and diagnose fault conditions on the network more quickly and accurately, and to respond to those conditions to minimize customer impact. To improve this performance, utilities may need to consider integrating their OMS with a significant number of additional SCADA-enabled field devices. In addition, to the extent that near-real-time operational meter data may become available and integrated with the OMS, these improvements will provide the Utility of the Future with much more granular insight into the status of its systems and customers. The increased automation of the distribution system, including the increased deployment of automated switches and the proliferation of distributed assets, including microgrids, distributed generation, and energy storage, may also provide utilities with a greater ability to minimize the number and duration of customer outages. For example, Fault Detection, Isolation and Restoration (FDIR) utilizes remotely controllable switches that can be opened automatically or at the direction of the utility to isolate a fault and restore service to those customers outside the isolated section of the network. Similarly, Automated Feeder Reconfiguration (AFR) is a technique used to automatically reroute power flows across portions of the distribution network in response to changing conditions (e.g., load, current, voltage) that could otherwise cause an overload or fault. Both FDIR and AFR could be integrated into the Utility of the Future's Advance Distribution Management Systems (ADMS). Such enhancements will require a robust communications infrastructure capable of providing real-time analytics and control of distribution assets.

***Metering, data collection, access and use.*** To safely, reliably, and efficiently operate a distribution system of increased complexity, utilities will require visibility into all network data and revenue meter data inclusive of specific behind the meter resources and assets (e.g., distributed generation, demand response, smart loads). The requisite meter data would be collected and managed by the utilities with supplemental data both supplied by and available to customers and their designated third parties to the extent they provide other services, such as demand response. Customers or market participants would be provided access to such data and information subject to appropriate customer information protection and cyber security requirements.

Utilities will need new and expanded data systems to collect and manage distribution system and customer use data. The expanded distribution automation system will provide near-real-time data streams that must be parsed for use in the proposed ADMS and captured for new analytical uses in enhancing utility grid management. This IT infrastructure must be planned with a long-term perspective to ensure the systems are adaptable and scalable to meet changing distribution system, market and customer needs.

Usage data for residential customers have typically only included a monthly consumption reading while metering for larger industrial and commercial customers has evolved into complex arrangements to support time-of-use rates and existing demand management efforts. To provide customers and their designated third parties with the granular interval data that will be needed to support some of the services proposed above in the "Customer Products and Services" section, New York utilities may need to enhance their metering infrastructure and their Meter Data Management systems.

***Coordination with and participation in the wholesale market.*** As the future industry model further evolves, customers may have expanded opportunities to participate in wholesale market economic programs for energy and ancillary services through the NYISO. Today these markets include products for day-ahead and real-time energy, ten- and thirty-minute operating reserves, regulation, and DR programs, such as the Special Case Resources (SCR) program, to provide load reductions when needed. Central to these markets is the need for a robust, secure, and affordable metering and communications infrastructure between the utility and the end-use customer, or through a third-party services provider. While the economic markets have different metering and communications requirements (e.g., hourly interval metering for day-ahead energy bidding, 6-second 2-way communication for regulation), depending on how the markets develop, the Utility of the Future will need to consider development of systems that include the integration of metering and communications platforms that simplify integration. Likewise as markets evolve, customer meter data will need to be available to parties involved in the economic bidding process (the NYISO, utility, end-use customer, and third-party service providers where used) in a timely manner. Where the utility provides meter data directly to the NYISO, suitable software platforms may need to be developed or enhanced to provide the most accurate and timely submission of customer data.

The utilities will need to work collaboratively with the NYISO to manage the changing dynamics of the grid resulting from the forecasted growth in distributed and variable generation resources, DR and variable customer loads. Today the NYISO operates and administers capacity, energy and ancillary services markets to manage the reliability and economics of the system. Under the future industry model, the utility will take on a similar role in the management of local reliability. For some services under this new model, the utility or third-party intermediaries could serve as an aggregator and/or interface for other aggregators to NYISO markets. An example of this today is the utility aggregator role in the NYISO DR program.

In theory, this role could be expanded to other ancillary service areas such as regulation services, operating reserves, etc. In other cases, where the utility is dispatching or controlling DER to manage local reliability or resiliency, tariffs or markets will need to be developed to compensate DER for these services. This situation will require coordination between the local utility and market participants and NYISO markets to ensure that the market risk remains in the marketplace and to ensure that the dispatch ensures statewide system efficiency. Additionally, new capabilities will need to be developed to provide accurate day-ahead and real-time load forecasting, as inaccurate forecasts could result in either system resource deficiencies or higher costs due to over-commitments. The NYISO and the utilities will also need to explore changes to the long-term system planning processes on the transmission and distribution systems to account for increased levels of distributed energy resources while maintaining system reliability.

***Demand forecasting and management.*** The Utility of the Future will need enhanced forecasting tools capable of predicting and optimizing customer demand requirements in response to changing customer preferences and new services. It will need to be able to analyze large quantities of usage data from field devices, advanced meters, distributed resources and other behind-the-meter information to more precisely forecast load, segment customers based on consumption patterns, and better understand future system loading conditions on T&D system assets. Additionally, the utility will need to incorporate DR into system planning and operations, either directly through the use of a Demand Response Management System integrated with the DMS, or through partnerships with third-party demand response service providers. The utility will need a mechanism to qualify DER and DR contributions to load forecasting based on expected availability in response to needs. Further improvements in grid efficiency and demand reductions can be obtained through feeder-wide voltage control, and its associated load reduction, without explicit reliance on behavior change.

As utilities qualify and validate this availability, they will incorporate DER and DR into system planning and scheduling. These resources will be expected to improve reliability and may defer the need for some load growth-related T&D investments. This will include the identification of locations where DER is most needed and of greatest value, and the establishment of tariffs or market mechanisms that encourage investments in these locations. Customers that allow utilities to control their resources (e.g., install smart inverters with communication, EV charging) could receive added incentives for providing a higher level of availability.

### *Policy Considerations*

Deploying the infrastructure required to enable the future industry model will entail significant investment over a sustained period of time. This raises numerous questions and considerations for the NYPSC with respect to cost recovery, prioritization of which capabilities to deploy first, and to which customers and which parts of the network. Some specific items for consideration are provided in the table below.

| Topic | Issues |
| --- | --- |
| **Metering** | • Meter data requirements and data collection behind the meter |
| **Planning** | • What is the role and interface of the utility and the NYISO in addressing short-term and long-term system planning and operational needs?<br>• As DG deployment grows, what does this mean for the business of central station plants, especially with respect to reliability and resource diversity as variable generation increases on the system. |
| **Payment Mechanisms** | • Which market or payment mechanisms are most appropriate for DER, e.g., wholesale markets with supplemental payments for distribution system benefits through distribution-level markets or retail tariffs; all payments through distribution-level markets; others? |
| **Valuing DER** | • How do we call upon and value DER? Market or tariff?<br>• Can DER be called upon more frequently and maybe in real time? Will DER be called upon for reactive power?<br>• How will DER pay for using the system and for the costs they impose on the system, and how will DER be paid for the value they bring to the system?<br>• Are deployment strategies tied to benefit/cost analyses? |
| **Grid Reliability** | • How do we ensure reliability of the grid as the penetration of DER |

| Topic | Issues |
| --- | --- |
| | increases?<br>▪ What are the planning implications of this, given the clear need to ensure reliability at both the T and D level.<br>▪ DG does not necessarily increase reliability & resilience (at the system level). The degree to which it will is a function of visibility and control of the asset (and knowing how it is going to perform).<br>▪ What options should be considered: (i) utility ownership, (ii) utility control, or (iii) third-party contracted? Each raises technical issues as well as customer willingness issues. |
| **Cost Recovery** | • How do utilities get cost recovery for the infrastructure requirements to collect data and meet future basic and value-added service levels (e.g., for the DMS)?<br>▪ Which components are definitely going to be needed versus still to be determined?<br>▪ What are the implications for resource flexibility, including energy storage and use of natural gas-fired capacity? |

## Regulatory Framework

### *Introduction*

The regulated electric utility industry is in the midst of dynamic change with many of the underlying assumptions of ratemaking in transition. The existing model, which presumes the regulated utility will serve all customers within its service territory and that load growth over time will help absorb the cost of system investment, is becoming obsolete. Many utilities are seeing limited to declining load growth due to the effect of energy efficiency and increasing penetration of distributed generation, among other things. We are seeing the fruition of decades of evolving energy policy to diversify the energy system away from a singular focus on large centralized generation solutions to meet consumer demand. In addition, demand response, energy efficiency and the fostering of clean and renewable energy sources have been a response to increasing concern about the environmental effects of fossil generation. The embedded presence of energy efficiency in the energy industry and the increasing penetration of both grid-scale and distributed renewables show that long-run energy policy is succeeding in reshaping the system.

The implications of an “energy efficient society” and a distributed grid are a fundamental change in the utility revenue equation. While the top-line revenue of the utility system is in decline the costs of maintaining the system and serving customers remains, a growing trend that is being recognized within the utility industry and environmental community.[13] Increasingly, it is clear that the cost of operating the distribution grid is largely driven by fixed costs while revenue is a function of a volumetric charge. The continued decline in utility revenue would suggest that fundamental rate designs need to be updated. In addition, there are capital requirements to address aging infrastructure and address increasing expectations with respect to reliability and resiliency. The need to bolster resiliency is especially strong in New York post Sandy, with an expectation of continued extreme weather events in the future. Further, as indicated throughout this paper, there will be further financial pressures to accommodate the capital demands of modernizing the grid.

Many jurisdictions have made adjustments to traditional ratemaking to adapt to the changing dynamic with mechanisms such as capital trackers, revenue decoupling and flexible alternative regulation schemes. New York is a good example of this adaptation with the "Revenue Decoupling Mechanism" (RDM), use of future test years and negotiated multi-year capital plans. As we look at the dynamic environment of today's electric industry and the desire to foster increasing investment in grid modernization, these methodologies can be broadened and enhanced. The WG envisions advancing to an increasingly flexible and performance-oriented regulatory system that is designed to accomplish the following core objectives:

- Facilitate the attraction of capital and investment in advanced grid infrastructure
- Support continued resource diversity, e.g., demand response, energy efficiency, renewable supply, distributed generation
- Empower consumers with the information and the tools to better manage their energy consumption, especially peak demand, and enable value-added products and services
- Enhance the reliability and resiliency of the grid
- Ensure the long-run financial viability of the distribution utility franchise
- Moderate future customer bill impacts through efficient utility investment and operations

It is the collective view of the WG that it is necessary to foster a balancing of interests where utility investment over time will move New York increasingly towards the electric grid of tomorrow, while ensuring a vibrant utility business model. No matter what form the evolving utility business model may take (poles and wires or fully-immersed customer delivery), the distribution network will be the platform upon which all will rely.

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[13] For example, see the recent joint statement from The Edison Electric Institute (EEI) and the Natural Resource Defense Council (NRDC) regarding policies that will foster a modernized grid. http://www.eei.org/resourcesandmedia/newsroom/Pages/Press%20Releases/EEINRDC%20Agreement%20Supports%20Policies%20To%20Benefit%20Electricity%20Consumers%20and%20the%20Environment.aspx

The current regulatory framework in its entirety in New York may not result in the level of innovation and investment, nor the pace of change required to deliver the future industry model described above. There is increasing interest in performance-oriented regulation across the industry in the United States and across the globe. Examples of approaches that are in use today exist in the United Kingdom, Europe, Australia, and Canada, and can be examined to inform the discussion in New York. Each is a comprehensive model that works holistically within its respective regulatory environment and can be considered as a framework as it is evaluated for New York. The WG recommends a more innovative approach to regulation that would start with an evaluation of the current regulatory model, and consider changes that will provide alignment with state energy policy, provide long-term financial viability for the distribution companies by continuing to attract investors, build a platform for a dynamic energy market, and provide more customer options.

Variations of performance regulation have been used for many years and in many different regulatory jurisdictions, including New York. Alternative approaches typically have been used to complement cost-of-service regulation and overcome some of its shortcomings. These alternative approaches commonly allow utilities greater flexibility, more current cost recovery and financial incentives if certain objectives are met. The WG believes that an important component of performance regulation is the ability to align policy and customer objectives to long-term capital investment by utilities. As noted above, there are frameworks in place in the United Kingdom, Europe, Australia, and Canada, where utilities present their spending plans and discuss how their investments will achieve desired outcomes. The alignment is accomplished because regulators and stakeholders can see that objectives are being pursued, while utilities are provided assurance that capital spending is consistent with regulator expectations. The WG believes this is a critical principle as New York embarks on the road towards the future industry model. It is imperative that capital markets and ratings agencies can see clear alignment between the State and utilities, to ensure access to competitively priced capital.

Moreover, these elements tend to be more focused on outcomes or services provided. In the future, New York’s continued use of many of the performance regulation elements such as a forward test year, negotiation of multi-year plans, a statutory limit to the length of the rate process, the use of reconciliation mechanisms, and importantly, the additional implementation of symmetrical performance incentives as opposed to the “penalty only” mechanisms that are used today, could facilitate achieving and or accelerating the goals and objectives of the future industry model described in this paper. When we consider the complex and challenging nature of grid modernization infrastructure it is vital that utilities be incented to pursue increasing value over time. Ultimately the framework envisioned here will be cost based with an overlay of financial incentives tied to performance.

## *Guiding Principles*

The WG recommends that any changes to the regulatory approach in New York should be based on the following guiding principles:

1. *Maintain effective aspects of the current regulatory approach that will serve as the foundation for the future*
2. *Modify the regulatory approach to realize the future model, in particular:*
    - *Supplement traditional cost of service regulation with symmetric performance incentives*
    - *Align utility investments to the achievement of state policy objectives*
    - *Create greater clarity for long-term investments and cost recovery*
3. *Adjust ratemaking, including rate design, to allocate costs equitably, reflect the true value of the grid, and address structural changes in utility load profiles*
4. *Improve rate design to allow customers to make informed choices to enhance their value of service, aligned with policy objectives*

**Principles in Action**

***Maintain effective aspects of the current regulatory approach that will serve as the foundation for the future***

Some aspects of the current New York regulatory model are among some of the most advanced in the country and will be needed to deliver on the vision. This includes the use of forward test years, the ability to negotiate multi-year arrangements and the statutory length of time for the rate process. As discussed earlier within this document, a core component of an enhanced industry model is the provision of a basic bundle of services that all customers would pay for in base rates. The provision of the basic bundle of services is conceptually similar to how utility service is provided today and the continuation of the cost of service model can effectively continue to recover costs associated with the basic bundle of services. The current cost of service model is time-tested, is intended to bolster the long-term financial viability of the distribution utility and to provide utilities a reasonable opportunity to earn a fair return on investments, and is familiar to the financial markets. Other tools are needed as part of this process, including reconciliations and adjustment mechanisms for material costs not subject to reasonable estimation, in order to facilitate multi-year rate plans by protecting the interests of both customers and the utilities, some of which are in place and some of which may need improvements. Moreover, consideration ought to be given to the going-forward regulatory process to determine if it can be streamlined to improve its efficiency and outcomes.

***Supplement traditional cost-of-service regulation with symmetric performance incentives***
The cost-of-service model does not, in and of itself, encourage innovation, incent superior customer service, or align utilities with state policy objectives. In order to accomplish these goals the current regulatory approach should be expanded to include symmetrical performance incentives. Symmetrical performance incentives provide a basis for utilities to not only meet targets in order to avoid a penalty, but also to incent performance to exceed pre-defined targets, to be innovative and to enhance outcomes. Properly developed performance incentives should be: (i) symmetrical regarding associated rewards and penalties, (ii) aligned to state policy objectives, (iii) changed as the definition of basic and other services changes, (iv) designed to encourage utilities to be financially efficient, and (v) based on metrics the utility can influence. Symmetrical performance incentives would represent a significant change from the traditional approach to managing utility performance. Symmetrical performance incentives should be applied to many of the utility's existing service quality metrics, where today only penalties exist. Additionally, new performance metrics will need to be established and evolve as the NYPSC and utilities learn more regarding customers' expectations, needs and responsiveness to greater choices, technology performance, and the development of new products and services with third parties.

As the base level of service and value-added services evolve, incentives would also need to change. The recovery of costs associated with value-added services requires further discussion, but depending on the service provided may be tariff based, market priced as an optional service, and/or provided by non-regulated entities. These value-added services could also encourage utility innovation, increase customer engagement and satisfaction, and accelerate the achievement of state policy objectives.

***Align utility investments to the achievement of state policy objectives***
The ultimate achievement of state policy goals will require investment in advanced grid infrastructure and technologies.[14] To accomplish public policy objectives, utilities are in the best position to link customer needs and public policy goals with technology and market solutions. Therefore, the future industry model requires a modified regulatory model that will redefine the role of the utility and increase alignment with state policies. This could represent the most cost-effective avenue to policy implementation. The future industry model should facilitate the alignment of state policy objectives with utility investment and operations.

The nature and type of investment will also likely evolve as this new model evolves. For example, the use of "non-wires" solutions, such as energy efficiency, distributed energy resources, and technology enhancements, as well as non-capital intensive alternatives should be considered, provided that such programs not only help achieve state policy goals, but also

[14] There are numerous examples of how grid modernization is needed to support the energy system that is consistent with prevailing policy goals. More distributed and dynamic generation at the edge of the grid requires enhanced sensing, data collection and operational control while increasing expectations regarding reliability (resiliency, outage restoration) requires greater grid intelligence and systems integration.

are cost effective and meet reliability requirements. As utilities use a wider range of solutions and new technologies, traditional asset useful lives and capital recovery periods will also need to be reevaluated in order to encourage and stimulate continued investment in these new technologies, which are subject to more rapid change.

The types of investments may also need to include marketing programs, development of information tools, and other investments necessary in the new industry structure, to meet the intended goals. Not every proposed solution will work as intended and a greater stance on innovation is needed. The innovation required will come from a wide range of market participants. A program that funds innovation projects would provide utilities an opportunity to explore new solutions with external partners.

***Create greater clarity for long-term investments and cost recovery***

Critical to achieving alignment is a regulatory structure that sends clear signals to utilities regarding expectations while providing a clear and predictable recovery of investment that advances policy objectives. Greater clarity on utility long-term investment and assurance of recovery at reasonable returns to investors, including appropriate capital recovery periods for more advanced, time-limited technologies, will help create a more robust investment environment and allow investment outputs to manifest that benefit customers and non-utility companies. Additionally, timely recovery of prudent costs will ensure adequate cash flows and credit metrics while reducing the utilities' exposure to large regulatory assets and liabilities. As the use of the grid changes, it is important to recognize that it is critical to achieving our long-term vision of an advanced energy economy. As such, traditional utility infrastructure investments will still be needed to meet the needs of all customers. This is especially the case if utilities are predominantly managing an advanced network that connects and enables diverse two-way flows instead of delivering one-way electricity flow.

New York's current approach in developing forward-looking, multi-year rate plans in consultation with stakeholders and approved by regulators provides a clear roadmap for utilities and a level of certainty to market participants. A longer-term view, which still allows for negotiation and the development of new tools/mechanisms to acknowledge and address potential risks will encourage even broader investment to deliver energy solutions to customers. This would include forward funding of foundational investments in the grid backbone and communications infrastructure that will provide the ability for customers to choose the value-added services that appeal to their unique needs and values.

An approach that values short-term rate considerations at the expense of longer-term rate stability should be reconsidered. Utilities will continue to need strong assurances that investments will not be disallowed in future rate proceedings if expected benefits do not materialize, so long as the decision to make the investment was prudent based on what was known at the time, and the utility can demonstrate that reasonable efforts were made to implement the investment as planned. There are a variety of approaches to address this concern. Moreover, obsolescence of technologies at a faster rate than traditional utility investments must be considered and addressed.

***Adjust ratemaking, including rate design, to allocate costs equitably, reflect the true value of the grid, and address structural changes in utility load profiles***

Consideration must be given to how a utility charges customers for delivery service. Volumetric pricing in an environment where customers implement energy efficiency and demand response and self-generate, using and providing energy to/from the grid does not enable the utility to recover its costs for the value that its grid provides. While volumetric pricing may have been a fair allocation scheme when all customers generally used the grid in the same manner and to the same degree, in the future, some users may begin to use the grid in new and different ways, which may not equate to using the grid more, in terms of net volumetric delivery, than other customers. Future pricing changes, possibly including fixed charges, minimum monthly charges, demand charges, volumetric charges, or any combination thereof, need to be considered**.**

***Improve rate design to allow customers to make informed choices to enhance their value of service, aligned with policy objectives***

Rate design considerations should also include analysis and implementation of time-varying rates where they can provide benefits for customers (e.g., mitigate bill increases), the system (e.g., reduce peaks), and utilities (e.g., facilitate recovery of investment). While energy efficiency has contributed to a decline in consumption, recent trends indicate that even as peak demand increases, New York's load factor may continue to decline, leading to idle capacity that must be supported by consumers that rely on the grid for all or part of their service, as well as the economy as a whole. The combination of demand response programs and dynamic pricing that sends a clear signal to consumers, married with enabling technologies, may help reduce peak demand.[15]

A redesign of customer and service classifications may be necessary to provide different levels of services to customers and to allocate costs appropriately to these customers. Classifications are generally linked to residential vs. commercial vs. industrial. However, more granular segmentation is needed, for example, splitting up existing classifications such as residential into segments. In addition, as the base level of service and value-added services are defined, these may differ by these more granular segments.

## *A New Benefit-Cost Analytical Framework*

Within the current regulatory framework there is specific guidance regarding the rationale for making capital investments. That is, investments are justified on the basis of reliability, risk reduction, safety, and economic and environmental benefits to customers. A broader business case, considering value to customers and societal benefits that meet State policy goals, would more fully account for the effects of new technologies and justify support for the investments

[15] The level of consumer response to time-varying prices is greatly enhanced by having enabling technologies (in-home displays, automated thermostats, etc.) in addition to advanced metering platforms and other communication channels.

that may be needed to support overall state policy objectives. Many of the benefits of the investments necessary to realize the vision described in this document will accrue to others – energy service and technology providers and local economies – and not directly to utilities or the customers they serve. As a result, traditional benefit-cost analysis that compares estimated consumer savings to estimated consumer costs may not capture all of the claimed benefits, limiting utilities' ability to justify the investments necessary to make this vision a reality. Consideration should also be given to risk and uncertainty within the broader framework.

A jointly developed analytical framework will need to be considered for more comprehensive benefit-cost assessment. The model will need to take into consideration and value societal benefits that are key drivers of New York State policies. These broader benefits should also include the traditional economic, environmental and reliability benefits. A standardized and agreed approach to the framework will help ensure alignment across stakeholders. Established models such as those developed by the U.S. Department of Energy or Electric Power Research Institute (EPRI) could be considered as the baseline for development to support a consistent methodology and alignment.[16] Others rethinking cost-effectiveness methodology include the Energy Efficiency Screening Coalition, which recommends reforms for energy efficiency benefit-cost analysis in the United States.[17]

### *Potential Unbundling of Transmission and Distribution Assets*

It may be desirable to consider functional unbundling of transmission assets from distribution assets as part of the Utility of the Future effort, including unbundling the retail rates for transmission service. Doing so would allow the needed focus of both utilities and state regulators to be on the distribution system and regulatory models for the distribution system, with utilities being able to make the investments in distribution assets to support the future model. Moreover, unbundling would allow transmission to have a separate and specialized focus geared more toward bulk power system needs, including intra- and interstate transactions. Unbundling of transmission and distribution assets could alleviate the tension between distribution and transmission asset investment decisions, and should be considered as part of this process to establish the future utility model for New York. Among other benefits, it could allow a clearer alignment of state and federal regulatory responsibilities.

[16] The DOE model can be found at: http://www.icecalculator.com/ice/ and http://certs.lbl.gov/pdf/lbnl-2132e.pdf. The EPRI model is: *The Integrated Grid: Realizing the Full Value of Central and Distributed Energy Resources;* http://www.epri.com/abstracts/Pages/ProductAbstract.aspx?ProductId=000000003002002733.

[17] Tim Woolf, et al, "Summary of Recommendations for Reforming Energy Efficiency Cost-Effectiveness Screening," Energy Efficiency Screening Coalition, February 2014, www.nhpci.org.

## The Path Forward

The utility industry model is at a crossroads. The utility model will have to adapt to (1) meet future customer expectations and needs, (2) promote and integrate clean energy, (3) adopt new technologies, and (4) drive economic growth. In order to achieve these goals and objectives two major industry changes will occur. First, the definition of base level service and value-added services will evolve and change over time. Second, the utility role is going to change. Utilities may be expected to meet a broader range of performance outcomes in order to successfully transition to the evolving utility model. As the industry transforms, today's existing measures can be the building blocks for future measures. Currently, utilities' base level of service is primarily measured on reliability and adequate service. As the definition of base level of service expands, measures will evolve and perhaps even new ones could be introduced. Where today the focus is on maintaining a certain level of service, tomorrow the focus may shift to enhance that level of service. In order to achieve the expanded utility role, there are five broad categories of outcomes that may be established. The categories should focus not only on the outcome – did we achieve what we set out to achieve – but also should focus on how we get there.

The broad "outcome" categories and some possible measures of success that may be considered include:

**Customer Engagement** – Examples of current utility measures center around customer transactions, response to complaints, and customer satisfaction. In the future, new proactive measures may emerge which focus on increased customer engagement through social media channels, customer involvement in managing energy use/conservation, and access to new energy services. Additionally, measures may also include customer awareness, the ability to propagate information, and anticipate customer needs.

**Advancement of Clean Energy Goals** – Examples of current utility measures include energy efficiency programs and building management systems. In the future, new measures may involve clean energy policies, reducing peak demand, providing support to accommodate and integrate significant distributed renewable resources, and further reduction of greenhouse gas emissions.

**Operating a Safe, Reliable, and Resilient System** – Examples of current utility measures include CAIDI and SAIFI for reliability, OSHA for safety, and vegetation management for maintenance. In the future, new measures may emerge around network resiliency, self-healing capabilities, adaptability, as well as customer-initiated resiliency solutions.

**Operational Efficiency** – Currently operational efficiency is measured in terms of "costs of operations." In order to promote long-term value, future measures may emerge that concentrate on "utilization of the network." These measures may focus on efficient asset utilization and load factor management.

**Innovation** – Currently utilities have limited research and development programs capabilities and funding which could be leveraged to support experimentation and innovation with new technologies. Most of this work is performed by NYSERDA. In the future, utilities should be allowed to test new technologies, experiment, learn and share results with others in a collaborative environment. Utilities should be measured on their portfolio of projects, the ability to be forward looking, and processes for evaluating new ideas. The role of NYSERDA may also warrant reassessment in conjunction with any process that attempts to re-define the role and business model of the utilities, to ensure it remains complementary.

## Utility of the Future Timeline

In this section the WG seeks to illustrate the timeframe within which the Utility of the Future can be realized in New York. Broadly speaking the timeline refers to a series of policy and regulatory actions that will give rise to both structural changes in the market system, i.e., business models, and investments in advanced grid infrastructure that are required to enable the new market system to flourish.

This timeline is presented for illustrative purposes with the understanding that multiple formal and informal steps by state government, utilities and other market participants will follow this document. The WG does not seek to prescribe a particular timing or duration to the phases of the timeline but instead provides this timeline to give the reader a sense of what steps are required, their possible duration and when the benefits of a modernized grid can be realized.

### *Phases of the Timeline*

#### Foundation Setting (2008-2014)

In the view of the WG, New York State has been laying the foundation for the Utility of the Future for some time. Within the policy and regulatory arena we have seen numerous steps taken to increasingly move the New York electricity system progressively forward. In the Regulatory section of this paper the WG spoke to the elements of the ratemaking process that are supportive of utility investment. In addition, the NYPSC has already conducted extensive investigations regarding policies related to grid modernization.[18] Further, the individual utilities have begun to add increasingly advanced functionality to their systems, from microgrids to ground-breaking energy efficiency and demand response programs.

#### Exploration (2014-2016)

The WG's expectation is that the NYPSC will be opening a formal investigation this year into the future industry model and that all interested stakeholders will be a part of that process. We

[18] 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.

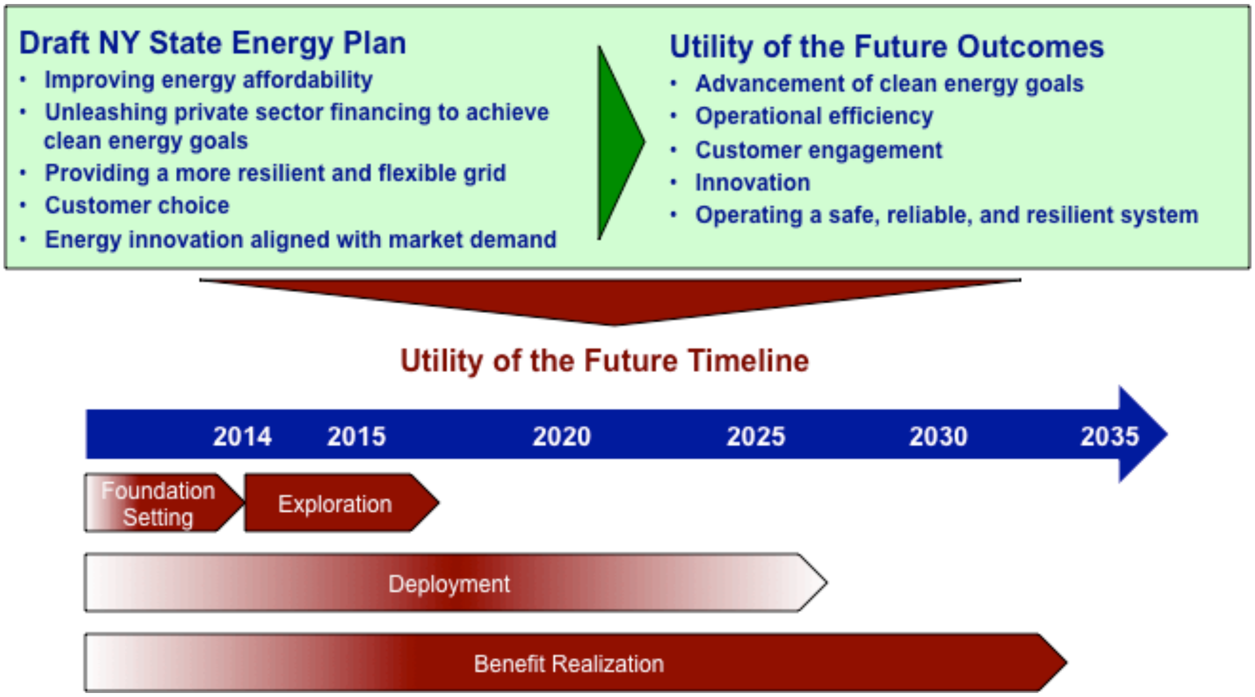
anticipate that process will be 12-24 months in duration, and hope that the ideas, principles and objectives outlined here can inform that process.

**Deployment (2014-2030+)**
The deployment phase represents the actual installation of hard and soft grid modernization infrastructure (switches, systems, hardware, IT) and implementation of programs (energy efficiency, demand response), and may initially include demonstration-scale projects. While some of this deployment is already occurring it is expected that a larger-scale deployment will follow the formal direction provided by the PSC review of the 21$^{st}$ Century Electricity System. In the more immediate term, utilities will initiate new energy efficiency and demand programs, as well as continue to deploy and enhance existing programs.

The duration or pace of this added infrastructure deployment is dependent upon a range of factors and can be as short as five years or as long ten years. The WG is not recommending a particular timeframe for deployment but instead providing an illustrative example. A scan of grid modernization deployments across the United States and globally reveals a healthy variation in the timeframe for deployment, and the WG encourages deliberative consideration of a timeframe that makes the most sense for New York, the distribution utilities, and most importantly, customers.

**Benefit Realization (2014-2030+)**
The benefits from broad grid modernization investment will be realized over an extended period of time that will follow the actual deployment of both less capital intensive programs and more capital intensive equipment, switches, and information systems and communications networks. Initially, new opportunities for and greater use of DER and EE along with enhanced customer and grid management value-added services will provide benefits to both utilities (more flexible operational tools, better utilization of existing resources) and customers (access to new energy services). Significant additional benefits will follow the actual deployment of equipment, switches, and information systems and communications networks. However, different from more traditional system investments such as substations, transformers or cabling, the impact of the new infrastructure on the system and customers is not as immediate. Early on there will be immediate effects of distribution automation or advanced metering systems. But grid modernization's long-run and greatest value is the result of leveraging cross-functional capability through system integration where multiple components are brought together to improve reliability and customer service. For example, an advanced metering system that is integrated with the utility Outage Management System (OMS) and other critical systems such as the Distribution Management System (DMS) and Geographic Information System (GIS) together can reduce the number, duration and number of customers affected by system outages.

Given this long-run value creation from grid modernization investment it is important to set expectations regarding the timing and nature of value that can be realized. The Regulatory Framework section of this report calls for a long-term view and inducements to attract cost-effective capital that can fund the foundational platform of investments that are characterized in the Infrastructure section of this report.




## In Conclusion

The WG hopes that the process of establishing a foundation for the future industry model will be aided by the development and release of this position paper by the New York utilities in collaboration with the non-utility companies, other WG members, and Advanced Energy Economy. The WG expects that this document will foster formal and informal dialogue across the industry and stakeholders, and the WG invites this dialogue to refine this roadmap moving forward.

## Appendix A: Stakeholder Value Propositions

The WG developed some more detailed characterizations of the possible value propositions for the participating stakeholders under the future industry model. In the tables that follow, value includes both what the stakeholders have to offer (e.g., services to customers) and what stakeholders may receive (e.g., new business opportunities).

**The Distribution Company Value Proposition**

| | |
|---|---|
| **Robust, sustainable utility business model** | • Opportunity to earn regulated returns by providing a modernized grid<br>  ○ Provision of a new, higher "base level of service" to all customers (safe, reliable, affordable)<br>  ○ New investment and services opportunities, including value-added services that lead to realization of the future vision and customer engagement<br>• Infrastructure investment to ensure long-term viability of the network<br>• More resilient, reliable and efficient network that limits impact of extreme weather events and improves recovery times |
| **Utility-enabled dynamic market** | • Build and manage an intelligent, flexible network that accommodates customer generation and helps deliver on diverse customer choices<br>• Provide information technology and data to support customer choices<br>• Use DSM and other customer-sited resources to manage demand and reduce the need for other infrastructure investment<br>• Provide a network that is a delivery platform for additional energy services<br>• Provide opportunities for new services and technologies |
| **Improved value & benefits to customers** | • Increased speed and flexibility in addressing customer needs<br>• Enhanced, closer customer relationship and value-added services that lead to customer engagement<br>• Ability to leverage existing customer relationship with utility for expanded services<br>• Improved customer/stakeholder satisfaction<br>• Empowered customers that are better energy consumers - more efficient and responsive to system needs |
| **Improved market operations** | • Better understanding of the local network<br>• Ability to manage operational complexity and maintain critical operational control, e.g., from high penetration of DER<br>• Increased operational efficiency and higher load factors, reducing need for costly investments<br>• Able to accommodate more DG (e.g., PV) and more remote resources (e.g. wind) |

**The Transmission Company Value Proposition**

| | |
|---|---|
| **Continue in current role** | • Continue to provide traditional value proposition of reliable, adequate, open-access transmission services |
| **New Business Opportunities** | • Increased investment to connect renewable resources<br>• New opportunities to provide new, more sophisticated transmission investment and services |
| **Increased quality and value** | • Improved customer/stakeholder satisfaction<br>• Ability to provide greater transmission system resiliency |

**Non-Utility Company Value Proposition**

| | |
|---|---|
| **Continue core business** | • Develop, offer and monetize technologies and applications for customer and system benefit<br>• Leverage existing customer relationships and customer engagement expertise |
| **New business opportunities** | • Access to new markets for growth; reach customers in new ways<br>• Partnership opportunities<br>• Uncover and develop new sources of DR, EE and other DER<br>• Combine technology, market and stakeholder insights with private capital to bring technologies and services to market |
| **Provide benefits to customers** | • Business development opportunity to enhance the customer experience<br>o Transparency<br>o Customer satisfaction<br>o Customer engagement<br>o Customer control of energy needs<br>o Unlocking intelligent consumption<br>• Opportunity to work in partnership with utilities |
| **Provide benefits to the grid, utility and society** | • Enable customer participation & aggregation that leads to resilient, interactive, agile grid and allows customers to provide firm resources<br>• Partner with utilities to provide them with technologies and services to leverage existing infrastructure to greatest extent possible and reduce uneconomic investment<br>• Reduce integration costs by providing easily integrated products and services<br>• Quickly and competitively respond to the needs of the electric grid and the utility<br>• Enable market transformation to meet policy objectives |

**The NYISO Value Proposition**

| | |
|---|---|
| **Coordinate system-wide planning** | • NYISO offers a unique perspective on the entire state-wide grid<br>• More intelligent and engaged customer base offers more reliable source of DR<br>• NYISO's transparent and non-discriminatory market structure will enable application of new DER technologies in the wholesale market<br>• Closer alignment of environmental objectives with planning process |
| **Enhanced system operations** | • Enhanced operational flexibility<br>• Greater efficiency and reduced costs from increased visibility into system at distribution level, , and greatly improved load forecasts<br>• Ability to better integrate all sizes and forms of intermittent supply (distributed solar to grid scale wind)<br>• New technologies, particularly information and communications technologies, could increase real-time visibility/performance verification, including behind-the-meter resources.<br>• Access to increased resources for supplying system needs |
| **Reduced costs and increased value** | • Coordination of retail and wholesale market structures has the potential for cost savings to ratepayers, improved market efficiencies, improved value propositions for DER, and promotes efficient, market-based investments in retail and wholesale markets.<br>• Improved load profiles that reduce system peaks and the need for costly, less efficient peaking units<br>• Potentially improved black start response (e.g., via increased customer capability for self supply and islanding)<br>• Potentially reduced reserve requirements or increased reserve resources as a result of greater DER penetration or other technologies More efficient grid where flexible demand better responds to economic signals.<br>• More efficient supply insight and hard asset planning<br>• Marketplace that incentivizes new technologies that can offer new products and contribute to reliability |