New York Power Authority

Strategic Vision 2014-2019

Strategic Vision

From the President and CEO

The electric power industry stands on the brink of transformational, perhaps revolutionary, change.

For much of its history, the industry has been based on a fundamental operating model: electricity, produced at large central power plants, is carried by long-distance transmission lines and local distribution lines to residential and business customers. But now, thanks to advances in technology and cost reductions in small-scale, clean generation, we are able to boldly reimagine the power system to meet the needs of an environmentally sustainable, energy-driven economy of the 21st century.

The new, integrated system will combine the traditional elements with innovative features such as microgrids serving individual communities, clean distributed power sources at or near customer locations and sophisticated Smart Grid devices. This will create a stronger, more reliable and more resilient grid; strengthen environmental protection; and enable customers to better manage their power use or, in some cases, generate their own electricity.

The New York Power Authority (NYPA), the nation's largest state-owned electric utility and one of New York State's major power suppliers, is poised to play a vital role under Gov. Andrew M. Cuomo's leadership in making the reimagined power grid a reality in our state. We believe that the Strategic Vision set out in the following pages will position us to use our current strengths and to adapt and add to our capabilities, helping to make New York a leader in forging the new power industry and in attracting the businesses and jobs that will be required to meet the demand for new energy products and services.

NYPA is already at the forefront of a number of sweeping energy, environmental and economic development initiatives spearheaded by Governor Cuomo, among them the multi-faceted Energy Highway program to strengthen and revitalize New York's power infrastructure; BuildSmart NY, intended to cut energy use in state-owned facilities by 20 percent by 2020; and ReChargeNY, in which allocations of our low-cost hydroelectric power, along with economical electricity we obtain from other sources, have helped to create or maintain hundreds of thousands of jobs. We're also working with our customers to encourage development of the microgrids and distributed generation sources that will be hallmarks of the new power system.

Beginning with the construction of its massive hydroelectric projects on the St. Lawrence and Niagara rivers more than half a century ago, NYPA has met some of New York State's most formidable energy challenges, at times taking on assignments that others couldn't or wouldn't accept. It was NYPA, for example, that built a major transmission line from the Quebec border to Marcy, near Utica; extended that power pathway by building the still-longer Marcy-South line into the Hudson Valley; constructed an underground and underwater transmission cable linking Westchester County and Long Island; and, in a matter of months, installed 11 small, clean power plants at seven sites to avert threatened power shortages in the New York City Metropolitan area.

Now, with new challenges arising, we have the opportunity—and the desire—to aggressively confront them and to help New York State show the way in the smart, sustainable use of energy, technology and natural resources.

This Strategic Vision sets out a roadmap for success in that critical effort. We hope that it will also mark the beginning of a dialogue with our customers, our other stakeholders and all interested New Yorkers. Together, we can do much to ensure that our state seizes the economic and environmental opportunities that the transformed power industry will present and that we derive maximum benefit from them.

Gil C. Quiniones
President and Chief Executive Officer

A revolution has begun.

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1 Summary

The energy industry is in the early stages of transformative change that is expected to dramatically alter the way electric power is generated, delivered and used. Experts differ on how long that transformation might take and how disruptive it might be to incumbent providers of energy services, but most agree that it is simply a matter of time before it accelerates.

Key factors driving the transformation of the energy industry include:

- The acceleration in development and commercialization of new technologies such as solar power, electric vehicles and smart grid.
- A growing awareness of environmental issues and concerns that policy makers, energy consumers and providers must address.
- Changes in the structure of energy markets, growth of the economy, and new ways to use energy.

The New York Power Authority (NYPA), with its strong financial foundation, unique generation and transmission assets across the state and long history of achievements in customer-side energy services, is well positioned to help turn uncertainty in the industry into opportunity and to deliver still greater benefits to the people and businesses of New York.

We will do this through:

- Leading change where required.
- Thinking big with our ideas and expectations.
- Working collaboratively with our stakeholders.
- Transforming our own organization to better assist New York in its effort to transform the state's energy industry.
- Finding new ways to improve sustainability of our operations and those of our customers.

Context for the NYPA Strategic Plan

Governor Andrew M. Cuomo's Energy Highway Blueprint and the 2014 draft State Energy Plan articulate a path for New York State to maximize economic development and minimize environmental impact while bringing more value to customers and communities during the changes that are occurring in the energy industry. NYPA conducted extensive interviews with industry leaders, experts and stakeholders who echoed the challenges detailed in those reports and were supportive of the actions and recommendations New York State has begun to implement.

We envision a future where customers increasingly have new choices in energy technologies and services that enable them to improve the value they receive from their use of energy. Whether they want to reduce costs, lessen their carbon footprint, or improve the resiliency and quality of the power they use, there are providers and markets for the products and services to help achieve their goals. Increasingly, customers are able to generate their own electricity using technologies such as solar power or combined heat and power (CHP). Batteries are coming down in cost, and are approaching commercial viability for use by customers in storing power and matching the timing of their power demand. Smart meters and other information technologies are enabling customers to understand and manage their energy usage more efficiently. Manufacturing customers are able to use these and many other technologies and energy management tools to improve the quality and reliability of power that is critical to their operations.

About NYPA

The New York Power Authority (NYPA), with 16 generation facilities and more than 1,400 circuit-miles of transmission lines, is the nation's largest state public power organization and one of New York's leading electricity suppliers. NYPA provides lower-cost power to government agencies; to municipally owned and rural cooperative electric systems; to job-producing companies and non-profit organizations; to private utilities for resale—without profit—to their customers; and to neighboring states, under federal requirements. NYPA is also a national leader in promoting energy efficiency and the development of clean energy technologies and electric vehicles. A non-profit energy corporation, NYPA does not use tax revenues or state credits. It finances its projects through bond sales to private investors and cash from operations.

NEW YORK ENERGY HIGHWAY
The time for powerful ideas

Energy Highway

The Energy Highway Initiative, initiated in early 2012 by Governor Cuomo, focuses on strengthening New York's aging infrastructure and modernizing the energy system to provide clean, affordable and reliable energy for generations to come. The Energy Highway Blueprint includes 13 recommended actions that together help modernize the state's energy infrastructure while encouraging private sector investment, promote development of in-state energy resources, protect the environment and support jobs.

The Energy Highway Blueprint includes four strategic areas to transform the existing energy infrastructure to the Energy Highway of the future: (1) Expand and Strengthen the Energy Highway, (2) Accelerate Construction and Repair, (3) Support Clean Energy, and (4) Drive Technology Innovation.

NYPA, as an organization charged with stewardship of many of the state's critical generating plants and transmission lines, is acutely aware of challenges facing the power grid. The transmission grid requires major investments in key areas in order to relieve bottlenecks that raise the cost of delivering power where it is most needed. Several large generating plants as well as transmission facilities in the state are aging, potentially requiring replacement in the next several years. Renewables such as wind farms and solar plants are being built, providing environmental benefits but also generating power in a more intermittent manner than hydropower or other base load plants, thus requiring grid operators to adapt in new ways. This challenge will be even greater when a large number of customers are generating their own electricity, and if regulatory changes allow, selling power back to the grid.

Like many other industries, the utility industry including NYPA is facing changes in their workforce driven by demographics, changes in the economy, and cultural factors. NYPA's ability to do its job of operating its power plants and transmission facilities and delivering innovative energy services to its customers depends greatly on the skills and experience of its employees, many of whom have specialized technical training or advanced degrees in technical fields. And yet, we have seen the evolution of our workforce such that over 30 percent of our employees are within five years of retirement, while a similar percentage have less than five years of experience. Retention of early career employees with technical skills is challenging as these skills are increasingly in demand in the private sector.

NYPA's Strategic Vision was developed around three key themes that reflect the many changes in the energy industry and the economy. These themes—Customer Empowerment, Infrastructure Modernization and Resource Alignment—in turn are composed of six specific and actionable strategic initiatives that entail a continued leadership role for NYPA in helping reach the state's vision of a transformed energy system for the benefit of its residents and businesses.

Customer Empowerment

Customers are becoming increasingly sophisticated about their consumption of energy; they are demanding products and services tailored to their needs and desired outcomes. Our customers have many motivations to customize their energy products. These include:

- a desire to reduce energy costs
- a need for additional resiliency to guard against severe weather or other threats
- a commitment to environmental and sustainability goals

Understanding and satisfying our customers' requirements is the focus of this theme. We will become our customers' key trusted adviser on their energy needs, particularly in the development and management of innovative, cost-effective and resilient energy systems.

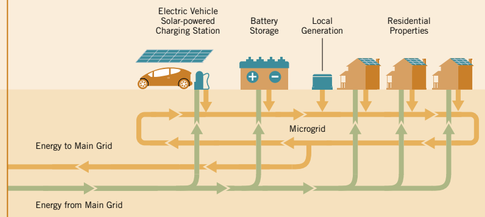
The Customer Empowerment Theme comprises a single, comprehensive initiative—the Customer Solutions initiative:

Initiative 1: Customer Solutions

Through this initiative, we will provide our customers with choices that enable them to achieve their energy goals in new ways. We recognize that our customers have varying motivations for exploring alternative energy services and we will strive to tailor solutions that fulfill their expectations while minimizing impacts on their day-to-day operations. Examples of these drivers and the types of solutions that we could offer to our customers include the following:

What is a Microgrid?

A microgrid is a group of interconnected loads and distributed energy resources with clearly defined electrical boundaries that acts as a single, controllable entity with respect to the grid. It can connect and disconnect from the grid, as needed, to enable it to operate in both grid-connected or island mode.



Cost reduction: energy efficiency measures or demand management activities whereby customers consciously choose to use energy during lower cost (e.g. off-peak) times.

Resiliency: a range of solutions including energy storage, on-site customer generation or microgrid projects.

Power quality: technologies or energy management methods that improve power quality and eliminate the risk of even minor fluctuations.

Environmental improvement: installation of clean, renewable energy systems, as well as analytical tools that help improve resource efficiency or provide other environmental benefits.

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environment

The Role of Sustainability

The world is becoming more attuned to the impact of our actions on the environment. This is leading to questions about the sustainability of the way we live, particularly in the energy sphere as we recognize the potential carbon impacts of traditional generation sources. In New York, there is movement toward more sustainable generation and use of energy through the installation of renewables, adoption of energy efficiency measures and participation in demand management programs. Customers are becoming more aware of their impact on the environment and the need to run their homes and businesses in a more sustainable fashion.

At NYPA, the commitment to sustainability is reflected in the way we run our assets and operate our organization. Sustainability pervades our investment decisions, operational practices and human resource policies. Our objective is to continue to promote economic development while minimizing negative impact on the external environment.

Infrastructure Modernization

There is an opportunity to become increasingly sophisticated about how we operate and maintain our generation and transmission facilities. The Infrastructure Modernization Theme is focused on NYPA's role as stewards of key power generation and transmission facilities. As the number of smaller and less predictable generation sources grows, those central facilities will need to operate differently. The transmission grid will have to become more intelligent and flexible in responding to demand variations and extreme weather events. NYPA will identify better ways to design, operate and maintain our assets so that they deliver optimal outcomes for customers in an increasingly unpredictable environment. The Infrastructure Modernization Theme includes two initiatives: Asset Management and Smart Generation and Transmission.

Initiative 2: Asset Management

NYPA will establish a flexible enterprise asset management process that will strengthen investment planning through enhanced use of technology, data, people and processes. Among other deliverables, this initiative will create a comprehensive, centralized repository of asset information, enabling us to optimize maintenance, operation and planning processes throughout the asset life cycle. The ultimate goal will be to focus operations and maintenance activities and investment in transmission and generation facilities where they will best support the reliable, flexible, safe and efficient generation and transmission of low-cost energy.

Initiative 3: Smart Generation and Transmission

NYPA will lead in the development and implementation of the next generation transmission grid, including continued support of Governor Cuomo's Energy Highway. This will be done through the deployment of advanced technologies that ensure that grid operations become increasingly intelligent—with real-time insight into rapidly changing conditions—thus continuing to secure grid stability and reliability. With this new intelligence, the grid will be more flexible, adapting instantly and precisely to changing demand and supply in the energy markets while maintaining security of supply.

In pursuing this aim, we will explore options to modernize the grid, including acquisition of real-time, more accurate data from sources in the field, implementation of enhanced system monitoring and data analysis tools, and development of advanced control software to enable automated responses.

As part of this strategic initiative, we will also explore the opportunity to enhance coordination among transmission owners by joining with them and the New York Independent System Operator (NYISO) to determine how best to expand these new technologies throughout the New York State grid system.

PICTURED RIGHT: Aurubis AG Buffalo, one of the world's largest manufacturers of copper and brass, has received a low-cost power allocation from NYPA.

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environment

Sustainability at NYPA

This Strategic Vision contains numerous references to sustainability. That is because the concept of sustainability is integral to NYPA's strategic vision. You will see clean and sustainable energy and energy efficiency appear prominently in our new mission and vision statements. Sustainability is explicitly included as a corporate value; these values define how we will conduct ourselves as we strive to fulfil our mission and achieve our vision. Each of our Strategic Themes embodies an aspect of sustainability. Customer Empowerment focuses on how we can assist our customers to make the most efficient and cost-effective use of energy to achieve their productivity goals thus minimizing the environmental impact of their energy use. Infrastructure Modernization turns attention on streamlining our own assets to run as efficiently as possible and to facilitate the inclusion of renewables on the grid. The Resource Alignment Theme includes a focus on process improvement principles; and, in NYPA's case, improvement is defined as the balance of cost effectiveness and environmental considerations. This will result in sustainability principles being built in to every NYPA process.

PICTURED ABOVE: Stakes, netting and fencing protect new plantings from wildlife until they mature along the shore of the Niagara River's Little Beaver Island. NYPA completed the wetland restoration project as part of its Niagara Power Plant relicensing agreement.

Resource Alignment

The two prior themes focus on gaining a deeper understanding of our customers' needs and optimizing infrastructure so that we can provide the sophisticated, targeted services our customers deserve. The third theme is to build our organizational capability to deliver the change envisioned in the first two themes. We intend to build on the tremendous skills and experience of our employees to make our workforce as skilled and flexible as possible; improve access to the information and knowledge that enable effective delivery; and streamline the business processes that promote efficiency and sustainability.

The Resource Alignment Theme includes three initiatives—workforce planning, knowledge management and process excellence—that will provide the necessary foundation for the Customer Empowerment and Infrastructure Modernization Themes.

Initiative 4: Workforce Planning

Our most important resource is our employees. Given the increasing complexity of our core functions, a highly skilled workforce is essential. The challenge is that the skills we will need in the future are also the ones in demand by many companies involved in energy technology and customer service. The Workforce Planning initiative is intended to address this challenge by identifying and acquiring the skills we will need to succeed. We will determine where we may have gaps that need to be filled, and identify strategies to fill those gaps such as internal training, succession planning, employee retention, and external recruiting.

Initiative 5: Knowledge Management

Knowledge is essential to provide clarity about day-to-day processes and operations and the rationale for decisions; ultimately, it is the basis for effective coordination and collaboration across the organization. However, due to employee retirement and other turnover, critical knowledge leaves NYPA on a regular basis.

The objective of this strategic initiative is to facilitate cultural change across the organization that promotes enhanced sharing of information and knowledge as part of day-to-day operations. This will be supported by creation of a knowledge repository to capture, organize and distribute our intellectual work products. Once collated, this knowledge will ensure that our employees are easily able to access accurate, up-to-date and comprehensive information about processes, assets, and businesses across the organization.

Initiative 6: Process Excellence

Implementing our strategic initiatives will require a transformation of our organization. Recognizing this, we need to ensure that existing processes and procedures are aligned effectively to the efficient delivery of services to our customers. Given the significant internal and external change anticipated, it is critical that current processes are as efficient as possible and do not have unclear, inflexible or redundant steps that could add cost or delay.

The Process Excellence strategic initiative will focus on enhancing existing processes to optimize costs and reduce environmental impacts while ensuring associated risks remain neutral or are reduced. It is intended that the potential efficiency improvements made as a result of this strategic initiative will free up resources to be redeployed to other strategic priorities.

2 Vision

In recent years, there has been steady and accelerating evolution of the energy industry worldwide. There are now signs domestically and abroad that change will be revolutionary rather than evolutionary and will fundamentally impact the ways in which energy is produced, transported and consumed.

The use of renewable energy, while still a relatively small part of the energy mix, is steadily increasing. This growth, particularly when it is located at the customer site, will lead to new spikes and volatility in the electricity load requirements being served by traditional generating stations. Power outages caused by severe weather events and equipment failures on the grid have prompted customers to consider grid independence options. Consumers partially

"As we move aggressively towards meeting the needs of an environmentally sustainable and energy-driven economy, we hold in our hands the power to pave the way for our customers to meet head-on the challenges that their day-to-day operations and a 'reimagined grid' will bring. Even though challenging, the New York electricity market is full of opportunities; and I am confident that we have a team in place that can maximize those opportunities by continuing to provide the level of service that our customers have come to expect from our organization."

Jim Pasquale
Senior Vice President
Economic Development and Energy Efficiency

or completely leaving the grid will skew transmission and distribution cost recovery models that are based only on full service business models. Sensor and other technology advances and a greater ability to manage large data volumes will permit more sophisticated management of the grid by utilities or third parties and enable consumers to tailor their energy usage to lower-cost time periods.

Conditions in New York State are expected to mirror the changes in global energy markets, resulting in a shift toward customer empowerment, decentralized energy generation and greater use of data in the operation and maintenance of the transmission network. The key uncertainty for energy companies everywhere is the precise form and timing these changes will take.

This anticipated change in the fundamental structure of the electric industry will enable customers to have more choice and greater benefits related to their energy usage. However, these benefits will only be realized if the infrastructure and service providers adapt by becoming more agile and flexible.

Utility companies will need to incorporate more sophisticated technology that can provide immediate insight into the status of centralized and customer components. Empowered customers may call on the grid for backup power due to need that exceeds their ability to generate locally or they may generate excess power that they sell back to the grid. The grid, which was constructed to send power effectively, must expand its capabilities to manage receiving power as well. To accommodate the volatility introduced by renewables and backup service consumers,

the grid will require large-scale generation that can be brought online rapidly and cycled on and off as needed. This requirement can fundamentally change how central plants need to be constructed, operated and maintained.

The magnitude of these changes can be visualized by comparing the current configuration of the electricity system, which has largely been in place since the industry was invented in New York more than 100 years ago, with the expected future model. The illustration below depicts the electric power industry of today, in which large power plants, seen on the left side of the diagram, generate electricity that flows in one direction through long-distance transmission lines and substations to the local distribution utility and then to customers who use the power.

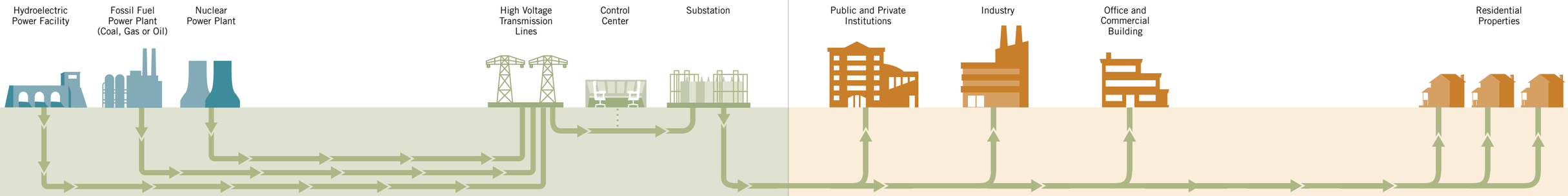
This configuration developed on the premise that power is cheaper when produced centrally and on a large scale, notwithstanding the additional expense of sending it over long distances. Furthermore, by maintaining central control of the electric grid, operators are able to provide safe and reliable service; outages that do occur are primarily due to extreme weather events. In this model, consumers have limited options for managing their energy needs. Beyond basic energy-efficiency measures, the consumer has little influence on their overall energy costs.

In the future, the distinction between generators and consumers is blurred. New technologies and expanded uses of power at the customer level have increased the number and complexity of choices individuals and businesses have for consuming—and generating—power.

"Transmission upgrades benefit the entire state and industry—improving power flows opens the door for more generation which leads to greater fuel and generation diversity."

Ed Welz
Chief Operating Officer
and Executive Vice President

The Power Industry of Today



> **Most manufacturers want local generation, that is, more generation near the business load.**
>
> **Patrick Jackson**
> Director, Global Energy Management, Corning Incorporated

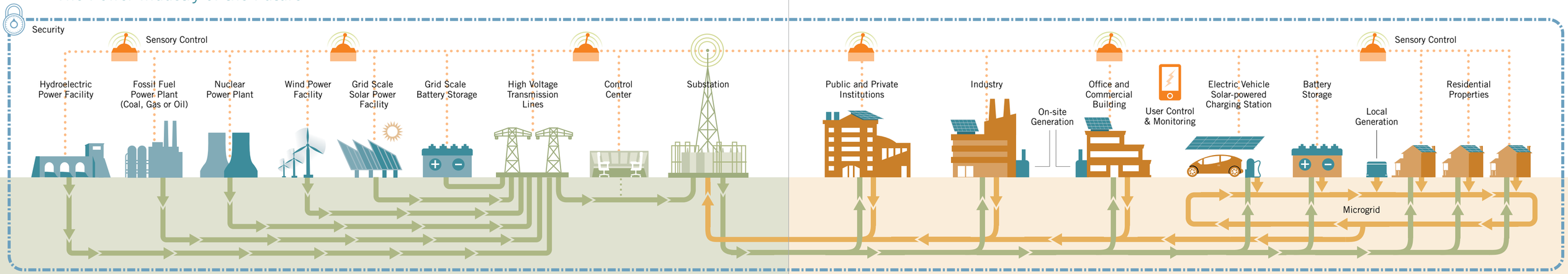
The illustration below shows the power industry of the future and again depicts large, central generating plants on the left of the diagram. They are now augmented by a variety of generation capabilities at customers' premises on the right side. This locally-generated power may be consumed directly by the customer/generator; but, as markets and regulations permit, it may also be sold as excess back to the central utility through the grid or even sold to neighbors through a microgrid. The longstanding paradigm of one-way flow of electricity is succeeded by two-way and multi-way power flow, much like the flow of communications over the Internet today.

Sense and control mechanisms will be deployed throughout the system and this will place new demands on operators of generating plants and transmission networks to ensure the highest levels of safety and reliability despite the proliferation of generating points and the volatility in demand that such expansion could bring.

This new system of distributed (non-centralized) energy generation will provide customers with additional ways to reduce their power costs, satisfy their desire for cleaner power choices and manage their energy production to ensure it meets their quality and availability requirements. At the same time, the market will become more complicated and present new choices of technical and financial products and services that some customers may not understand.

NYPA plans to expand its business so it will be able not only to help ensure that the promise of customer benefit is realized in this opportunity-rich future, but also to offer knowledgeable guidance to its customers and other stakeholders as they navigate the risks and challenges that emerge. Along with these new services, NYPA will, of course, continue its historical stewardship of natural resources and provide the critical benefit of central generation and transmission.

The Power Industry of the Future



3 Trends in the Current NY Energy Market

Trends

Overview

One of NYPA's roles in the energy industry in New York State, as defined by statute, is to provide governmental, institutional and certain industrial customers with electric power and energy efficiency services. We serve that market using our generating plants and our statewide transmission system. NYPA sells energy to customers through local electric distribution utility companies around the state.

NYPA, together with other state energy and environmental agencies, recently conducted outreach to a broad group of industry experts, academics, stakeholder groups and customers. The purpose was to clearly understand the trends that are most relevant to the electric power industry in New York State. In order to do that, we felt that we also needed to understand the changes occurring throughout the United States and globally.

What resulted was an informed view of emerging trends, the scale of change expected and the potential timing of these changes. No one knows with certainty the precise form the future energy industry will take; obtaining multiple views from a range of experts therefore provided great benefit in envisioning the spectrum of possibilities.

Our findings reaffirmed the expectation that the energy industry will undergo a transformation in coming years and were used to inform the vision of the future, as outlined in the previous chapter.

Several major trends emerged that are driving change not just in New York, but throughout the United States, in Europe and in other areas of the world. These trends are described below.

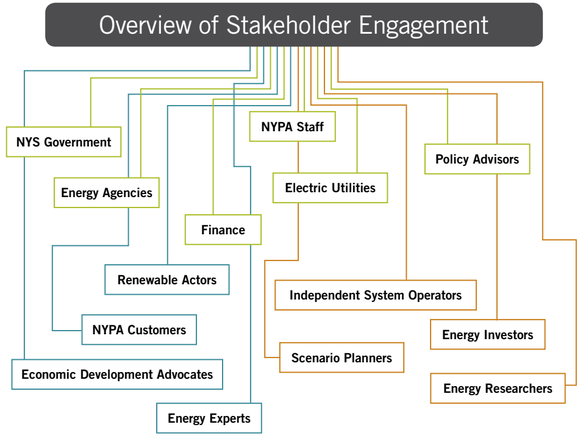
While views differ about the direction that the energy industry will take, some common topics emerged in many of our external discussions; these can be grouped into several areas, each of which is discussed here.

Global and U.S. Trends

Changes in the energy business are occurring sooner in some places than others, allowing us to see the effects of those changes. This is particularly true regarding the adoption of alternative forms of energy, such as distributed generation.

For example, Germany leads the world in total residential solar power generated, with over 4,000 megawatts (MW) of installed capacity, while Australia leads in solar penetration, with 7.5 percent of households having solar panels installed. The two countries' leadership is driven by government policy, a steady reduction in technology costs and widespread public support of alternative, sustainable forms of energy production. Some observers have noted, however, that Germany's policies are creating unintended consequences, including increased rates and carbon emissions, and reduced reliability.

These changes have enabled many customers to optimize their use of power from the central grid, reducing the need for continuous supply from the grid, but increasing the requirements for quick response fossil plants that can operate flexibly to fill in the gaps in supply when solar power is not available.



In California, rapid adoption of large-scale and rooftop solar is helping the state meet its renewable energy and carbon reduction goals and providing customers with sustainable energy choices. GTM Research shows the steady reduction in Photovoltaic (PV) system price and the corresponding increase in installed PV megawatts across the United States.

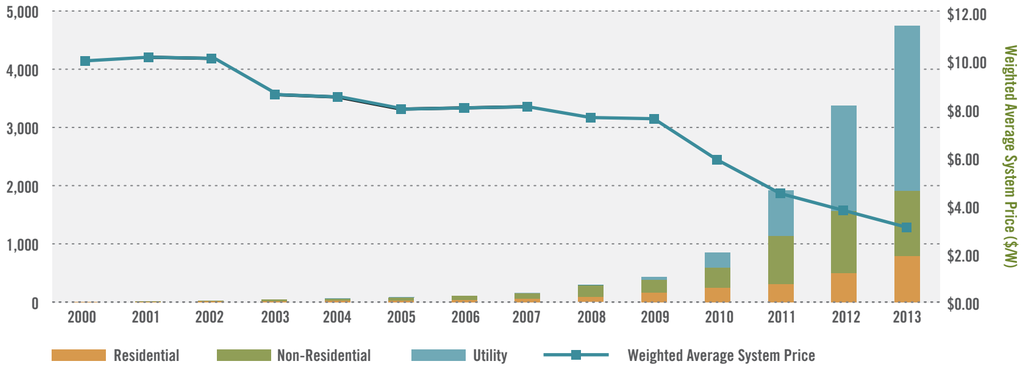
The acceleration of solar adoption is placing pressure on infrastructure in many states such as Arizona, California and Hawaii. This, in turn, is requiring increased need for maintenance of gas turbines due to frequent cycling of the turbines to more fluctuations on the power grid.

One way that the industry is responding is through investment in energy storage system technologies—paving the way to reduce pressure

on the traditional electric power infrastructure and helping to address short term challenges concerning reliability, power quality and spikes in consumption created by the increased presence of renewables on the grid. These technologies have long promised to be the key link between a reliable and clean energy system, but significant cost and reliability challenges have prevented them from providing game-changing innovation. As researchers continue to address the shortcomings in current storage technologies, they will play a more prominent role in the energy system of the future.

These examples suggest that the energy production and consumption landscape is likely to become increasingly complex and dynamic. Utilities, and the grid itself, will have to become much more flexible in order to enable a diverse generation mix, more local siting of generation and a variable demand curve.

U.S. PV Installations and Average System Price, 2000-2013



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Key Indicators that the NY Energy Market Is Changing

Every energy market is unique. Understanding trends in the local market place is vital if we are to identify those key factors that will drive both the transformation of New York's' electric power industry and role NYPA plays.

Customer Trends

Customer energy priorities are changing. Understanding and expectations of energy services are also evolving. Traditionally the main priority for customers has been the receipt of low-cost, reliable power. While this remains essential, demand for other services is beginning to emerge.

Customer choice is escalating in energy technologies and services that enable customers to improve the value they receive from their use of energy. Whether our customers want to reduce costs, lessen their carbon footprint or improve the resiliency and quality of the power they use, there are providers and markets emerging for the products and services that will help them achieve their goals. Many customers are already able to reduce their overall energy use, particularly at times of peak load in the energy system, using a variety of energy efficient products and services.

Increasingly, customers are able to generate their own electricity using technologies such as solar power or combined heat and power (CHP). Batteries are coming down in cost and are approaching commercial viability for use by customers to store power sufficient to match their demand. Smart meters and other information technologies are enabling customers to understand their energy usage and manage it more efficiently. Manufacturing customers are using these and other technologies and energy management tools to improve the quality and reliability of the power that is critical to their operations.

With these new opportunities for customers, service providers are entering the market, sometimes in competition with local utilities in serving customers' power needs.

Utilities that seek customer insights to understand and respond to their customers' needs will be more effective in delivering value. The key challenge for utilities is to understand diverse needs across a range of customer sectors and associated priorities.

Generation and Transmission Trends

NYPA, as an organization charged with stewardship of many of the state's vital power generating plants and transmission lines, is deeply aware of challenges facing the power grid. The transmission system requires major investments in key areas in order to relieve bottlenecks that raise the cost of delivering power to where it is most needed. In New York State, large generating plants as well as transmission facilities are aging and will require replacement in the next several years.

Is Energy Storage the Missing Link?

Renewable resources, such as solar, wind and hydro, help reduce dependency on fossil fuel and provide more diversity in an energy portfolio; but, the energy they produce is intermittent in nature. The challenge is finding a way to harness this energy when it is produced and save it for later use. Energy storage devices capture generated energy and then discharge it when the renewable source is not available. In addition to helping to balance generation and load, energy storage devices can also provide a stand-alone source of electricity when grid power is interrupted.

Although there are diverse opinions about the future role of these centralized assets in a more decentralized energy system, there appears to be consensus that the generation mix will change significantly over time. Projections define a greater role for renewables and distributed generation. The impact of growth in renewables will not be limited to the generation mix, but will also affect the transmission system. Both the location of the investment required and the way the system is operated will need to become more flexible to accommodate distributed load and intermittent generation.

Under Governor Cuomo's Energy Highway Blueprint, New York State is addressing key transmission bottlenecks and plan for the expected retirement of major power plants in the state, while also pursuing the application of new technologies for the generation and transmission systems.

Like other established generation and transmission operations in New York State, a large proportion of our assets will need to be upgraded in the coming decades to remain safe and reliable. As we invest in

upgrading our assets, we will also be presented with opportunities to build in a new way to deliver optimal value to our customers.

Organizational Trends

The significant changes anticipated in the energy industry underscore the need to assess our current skills and capabilities with the intent of aligning our resources to meet the emerging challenges.

Like many other industries, the utility industry is facing challenges in its workforce driven by shifts in demographics, the economy and cultural factors. NYPA is experiencing this change as well. Our ability to operate our power plants and transmission facilities and to deliver innovative energy services to our customers depends profoundly on the skills and experience of our employees. Many of these employees have specialized training or advanced degrees in technical fields and are retirement eligible or otherwise at risk of leaving. In fact, more than 30 percent of NYPA's workforce is within five years of becoming eligible for retirement. Another 30 percent have been at NYPA for less than five years, creating separate retention risks.

Throughout the economy, employees, especially younger employees, are no longer seeking or expecting employment at one organization for their entire careers. The U.S. Department of Labor estimates that today's learner will have 10-24 jobs by the age of 38. The result is increased turnover, particularly among engineers and other employees with specialized skills that are in high demand in the energy industry and in other technology-driven industries. Instead of seeking job security, prospective employees are looking to improve their employability by pursuing continuous training and by gaining access to networking opportunities. While employers have attempted to combat the attrition in order to reduce the cost of replacing employees and training new ones, many organizations are also learning new ways to attract highly skilled workers and ensure that they are productive and motivated throughout their tenure, however brief it may be.

In the energy industry of the future, these concerns are likely to become more acute as the changing energy paradigm creates a need for new knowledge and skills to effectively serve our customers.

> **Fast ramping generation, demand-response, new transmission, and system optimization are far more important than storage to make renewables and distributed generation work.**
>
> **Hal Harvey**, CEO, Energy Innovation LLC

The Importance of Power Quality

Power quality is a term used to refer to the consistency of the voltage of the energy delivered.

With innovation in manufacturing and modern day reliance upon technology, the quality of the power supply is becoming an increasingly important factor for industry, businesses and other consumers.

Poor power quality can disrupt or even damage sophisticated manufacturing equipment making the quality of power an important factor for businesses deciding where to locate.

Developments in New York State Energy Plan

During 2013 and early 2014, the New York State Energy Planning Board and staff worked to create the 2014 New York State Energy Plan (the State Energy Plan). The intent was to develop analyses and policy recommendations to guide the state in reliably meeting its future energy needs in a cost effective and sustainable manner while fostering an innovative clean energy economy.

The 2014 State Energy Plan sets forth a vision for New York's energy future connecting a vibrant private sector market with communities and individual customers. It acknowledges the progress already made toward this goal but recognizes the need to do more. It sets objectives for New York State including the provision of clean, reliable and affordable power, the creation of jobs, and other economic and environmental benefits.

The 2014 State Energy Plan outlines five strategies that will support the state in meeting these goals:

- Improving energy affordability.
- Unleashing the power of private sector energy financing.
- Providing a more resilient and flexible power grid.
- Giving customers more control over their energy use.
- Aligning energy innovation with market demand.

A common concept that runs through the draft State Energy Plan is a focus on the provision of tools to empower customers to make more informed decisions about their energy choices and services.

Renewables and Intermittency

Renewable energy sources such as wind farms are providing environmental benefits; however, they also generate power in a more intermittent manner than hydropower or other baseload plants. This requires grid operators to change operating protocols and utilities to manage the resulting complexities around load management.

> 2014 New York State Energy Plan Vision
>
> **New York envisions a flexible and clean energy system that empowers communities and customers to receive the reliability and affordability they value.**

4 The Role NYPA Will Play in Delivering the Vision

There is a spectrum of strategic approaches—from the conservative to the visionary—that we can take in this fast-changing environment. We can commit only to technologies and offer services that have a proven track record or we can lead by also adopting promising new energy technologies and delivering cutting-edge customer services.

We recognize there are risks inherent with a more visionary approach but believe the scale of the opportunity warrants re-imagining our business so that we may empower our customers and deliver services they value.

The role that NYPA will play in the transformation of New York State's electric power industry is evidenced in the five components of our strategy.

Mission Statement	Vision Statement	Values	Strategic Themes	Goals
Who is NYPA and what is its charter?	What does NYPA want to be known for and what does success look like?	What are the values that NYPA will apply to everything it does?	What are the initiatives that NYPA will undertake to help achieve its goals?	How will NYPA measure success against its proposed vision?

Mission

NYPA's mission has evolved significantly since our inception in 1931, yet key focus areas have remained constant. These areas include low-cost power, environmental awareness, economic development and reliability. In light of the comprehensive nature of this strategy review, we approached our new mission statement as a blank canvas. We considered our statutory authority, the outcomes we wanted to deliver for our customers and New York State and what means we would use to facilitate those outcomes.

Through the power generation and transmission system as well as our growing energy services activities, we influence a variety of results. There are, however, two all-encompassing outcomes that articulate the intent behind all of our activities: to enhance economic development and to solidify New York State as a great place to live and do business. These outcomes are achieved through both the generation of sustainable, reliable, low-cost power and the delivery of innovative customer services. We believe our new mission statement, below, succinctly and effectively captures these concepts and provides a bold statement as to where our focus will be for the coming years.

Our mission statement:

Power the economic growth and competitiveness of New York State by providing customers with low-cost, clean, reliable power and the innovative energy infrastructure and services they value.

Our History of Sustainability

The New York Power Authority was established in 1931 with the ideal of responsible stewardship of the state's hydropower resources, instituting practices that keep future generations in mind.

These early efforts at sustainable development, using natural resources wisely, have expanded in recent years to include the use of energy efficiency and clean energy technologies that preserve the environment and promote economic growth. Equally important are NYPA policies that encourage the input of customers and communities in major decisions.

Our mission, vision and values statements all articulate our continuing commitment to the founding principles of sustainability.

PICTURED ABOVE: High-efficiency lighting installed by NYPA throughout 1,750 classrooms in nine buildings of SUNY Albany's Uptown Campus will save about $225,000 annually. The project is in line with Gov. Andrew Cuomo's Build Smart NY campaign to lower state building energy costs 20 percent by 2020.

Vision

The purpose of our vision statement is to create a common understanding of the desired end goal for the organization. It is intended to be inspirational to both internal and external stakeholders; yet, it is also grounded and specific so as to embody focus and facilitate the development of measurable goals.

Within the context of the energy industry undergoing revolutionary change, we agreed that a blank canvas was the appropriate starting point for our new vision statement as well.

Many of the concepts captured within the mission statement are also relevant to our vision, including the focus on making New York a great place to live and do business, the provision of high quality, innovative customer services and the need to operate sustainably. Some additional concepts are also incorporated to reflect the broader role that we play and to invoke an inspirational message of leadership, stewardship and support for innovative technology.

Our vision statement:

Our vision is a Power Authority that enables a thriving New York state through the provision of sustainable, affordable energy, stewardship of the state's natural resources, and leadership in innovative technologies and energy efficiency services.

We believe our vision statement is inspirational while clearly focusing on the role we will assume in the transformed energy industry.

Values

Our mission and vision statements articulate our charter and our aspirations. Our values illustrate how we will conduct ourselves as we endeavor to fulfill the mission and vision. We define each value here because we want our stakeholders to understand our commitment to these principles.

NYPA has long incorporated these values into its day-to-day activities and these values will continue to be integral to NYPA as we commence our transformational journey, particularly as we navigate the challenges and pressures of change.

Integrity: We will operate at the highest level of honesty, ethical conduct, and public trust in all of our activities.

Safety: We will always strive to encourage and support an accident-free workplace for our employees.

Employee Development: We value our employees and will invest in their development.

Job Development: We will utilize our power resources to support the creation and retention of New York State jobs.

Sustainability: We will manage all aspects of our business through the lens of sustainability, which holistically integrates business objectives with environmental and social concerns.

Clean Energy: We are committed to the efficient use of energy and promoting clean power supply technologies.

Sustainability and Environmental Justice

NYPA's Environmental Justice group is the liaison for low-income communities and communities of color and speaks up for them at NYPA. Environmental Justice is involved with these silent communities where we have existing facilities as well as in the planning stages for new facilities. We work with communities on how to conserve energy and look to alternative energy sources as a way to help themselves. Environmental Justice demonstrates another aspect of the focus that NYPA has on the environment.

PICTURED ABOVE: Ruth N. Colón, Director of Administration and Environmental Justice

Stakeholder Management: We will aggressively build awareness of NYPA's Mission and purpose by cultivating positive relationships with our stakeholders—customers, public officials, regulatory agencies, community representatives, and other opinion leaders—to build understanding and support for our efforts and commitments.

Financial Strength: We will maintain NYPA's financial strength so as to have the financial resources needed to fulfill our Mission.

5 Exploring the Strategic Themes

The emerging energy industry shift presents investment opportunities that will enable us to deliver services that our customers value while also securing benefits for New York State. We are focusing our efforts on successfully pursuing three key strategic Themes that will ensure NYPA capitalizes on the emerging opportunities that we see in the market. Each Theme is unique and focuses on discrete outcomes that will impact key parts of NYPA's core business; combined, the Themes will lead to a transformation of our business and ensure results that support greater prosperity in New York State.

Customer Empowerment

Overview

How can we help our customers anticipate and understand the full spectrum of energy options that will emerge and, further, make the choices most appropriate for achieving their goals?

Our customers are becoming increasingly sophisticated with respect to their consumption of energy; they are demanding products and services tailored to their needs and desired outcomes. They have many reasons for wanting to customize their energy products; these may range from a desire to reduce energy costs to a need for additional energy system resiliency to a commitment to environmental or sustainability goals. Understanding and satisfying our customers' requirements with knowledgeable solutions is the focus of our Customer Empowerment Theme. Through this theme, we intend to become our customers' trusted adviser on energy use and environmental issues, particularly in relation to the development and management of innovative, intelligent and customer-controllable energy systems.

Objectives

Understanding our customers' needs and their evolution over time will be critical to the success of this initiative. Therefore, we will actively carry out a program of continuous, meaningful engagement to enhance the constructive two-way dialogue between NYPA and our customers. This will support a broader understanding of the drivers that motivate our customers and the energy solutions that will meet their evolving needs.

Key Elements of the Theme

The Customer Empowerment Theme comprises a single, comprehensive initiative—the Customer Solutions initiative:

Initiative 1: Customer Solutions

Expand NYPA's customer solution offerings through the provision of a seamless bundle of services aligned to customer needs.

"By building on our relationships across New York, we can uncover innovative, tailored solutions that provide value for the varying needs of our customer base."
– Tabitha Robinson, Account Representative

Under this initiative, we will provide our customers with choices that enable them to achieve their energy goals in new ways. We will do this in two ways: first, by building on our existing strengths in designing and managing energy efficiency solutions for our customers and, second, by facilitating customer understanding of, and access to, the private sector service providers that can bring their expertise to bear to benefit our customers. We will manage these relationships, and integrate the products and services in a way that is seamless for the customer.

We recognize that our customers have varying motivations for exploring alternative energy services and we will strive to tailor solutions that fulfill their expectations while minimizing impacts on their day-to-day operations. Examples of these drivers and the types of solutions that we could offer to our customers include the following:

energy
economy
environment

Sustainability in our Themes

Each of our Strategic Themes embodies an aspect of sustainability. Customer Empowerment focuses on how we can assist our customers to make the most efficient and cost-effective use of energy to achieve their productivity goals thus minimizing the environmental impact of their energy use.

Infrastructure Modernization turns attention on stream-lining our own assets to run as efficiently as possible and to facilitate the inclusion of renewables on the grid.

The Resource Alignment Theme includes a focus on process improvement principles; but, in NYPA's case, improvement is defined as the balance of cost effectiveness and environmental considerations. This approach will result in sustainability principles being built in to every NYPA process.

PICTURED ABOVE: On rooftops throughout SUNY's Brockport College campus, NYPA solar photovoltaic panels, along with LED street lights and high efficiency parking lights, will save close to $610,000 a year.

Cost reduction: Energy users may want to reduce their energy costs, without affecting daily operations. We can help them achieve this through energy efficiency measures or demand management activities whereby customers consciously choose to use energy during lower cost (e.g. off-peak) times.

Resiliency: Customers may want to ensure that their facilities can continue to operate in the event of an interruption to grid-supplied electric service resulting from events such as extreme weather or cyber attack. Depending on the specific needs of our customers, we can explore a range of solutions including energy storage, on-site customer generation and microgrid projects.

Power quality: Users of complex electrical equipment, especially large industrial customers, often need their power service to have a level of quality that exceeds what is typically provided by the power grid. For these users, seemingly minor fluctuations in voltage that would go unnoticed by most users can cause their manufacturing equipment to fail, resulting in major production losses. For them, the cost of technologies or energy management methods that eliminate this risk and improve power quality is small in comparison to the potential losses.

Environmental improvement: Consumers increasingly have the ability to manage their use of energy and other resources in a more sustainable way, for example, by reducing their carbon footprint or their use of water. New monitoring tools collect large amounts of data that can be used to analyze and improve resource efficiency. Newly cost-effective distributed energy technologies can be combined with clean transportation choices, energy efficient building materials and environmentally-informed operating methods to make operations more sustainable.

Newly cost-effective distributed energy technologies can be combined with clean transportation choices, energy efficient building materials and environmentally-informed operating methods to make operations more sustainable.

By further developing our valued relationships with our customers and private sector partners, we can offer a full range of energy products and services and tailor these solutions to ensure that they achieve those customers' unique goals. These solutions could utilize combinations of technologies and services.

The approach to this initiative will include:

- Detailed research into future needs of the customer base.
- Development of a revised catalogue of services and products.
- Demonstration and testing of these new service and products, for example combined heat and power (CHP) installations, microgrid pilots, electric vehicle (EV) charging stations at public sites, and solar installations for public schools.

Benefits

We anticipate that the successful implementation of this strategic initiative will empower our customers through a greater choice in energy products and services. It will allow customers to access energy services that deliver in line with their own organizational objectives related to the environment, reliability or cost. Furthermore, this will enable them to use the value we generate through available natural resources in the most effective and sustainable way.

Envisioning the Future for Our Customer

The year is 2030, and one out of every ten cars on the road is an electric vehicle (EV). Our electricity customer, a commuter railroad, has installed charging stations at 100 of its 1,000 reserved parking spots. An EV owner parks and plugs in his car but charging does not begin. The railroad has arranged for a variable pricing and demand management program in which the station receives a discounted electricity rate for allowing NYPA to select the time of day and the speed at which the car is charged as long as the car is fully charged by day's end. The charging station uses sophisticated sensors in an intelligent handshake to determine the amount of energy in the vehicle when it arrives, the time of day when demand and rates are low, and when the vehicle has been fully charged.

PICTURED ABOVE: Kala Henry, Assistant R&TD Engineer II
Renewable Energy Resources & Technology

Infrastructure Modernization

Overview

What is the changing role of energy infrastructure—the central generating stations and transmission facilities—in this future energy system, and what does that mean for NYPA's role as stewards of those assets?

Emerging technologies and techniques suggest that there is now an opportunity to be more innovative and sophisticated about how we operate and maintain our generation and transmission facilities. We believe that a combination of our Asset Management and Smart Generation and Transmission strategic initiatives will enable our staff to identify better ways to operate and maintain our assets to deliver optimal outcomes for customers in the dynamic environment ahead. We aspire to lead in these areas; to explore options and find solutions that can be shared with other utilities to improve services to customers throughout New York State.

Objectives

There are differing views about the role that centralized transmission and generation assets will play in the energy industry of the future. However, energy industry experts generally acknowledge that large-scale infrastructure will continue to be needed in some capacity to provide base load power, backup capabilities or a combination of the two. In this uncertain future, informed decisions will be needed about the best way to manage assets to ensure that money invested is targeted to the right areas and that the assets are flexible enough to accommodate a range of potential outcomes. Specific requirements will continue to depend on customer needs.

Both central and distributed generation will be important for the foreseeable future and we will make strategic investments in our central plants while helping New York State and our customers take advantage of distributed opportunities.

Key elements of the Theme

There are two initiatives that comprise this theme:

Initiative 2: Asset Management

Develop an asset management capability and process to improve the efficiency and effectiveness of our O&M and capital investments.

"In any industry, and especially for a company like NYPA, it is extremely important to have a good handle on your assets, their condition, as well as changes to industry standards and guidelines. We are always striving to be a better NYPA."
– Trish Lombardi, Project Engineer I
Hydro/Transmission

"Continuous improvement and consistency in categorization are critical to the success of any asset management program."
– Katie O'Toole, Associate Engineer
Electrical Engineering

As steward of major New York State resources, we must manage our assets with an awareness of the volatility introduced by changing technology, market opportunities, regulations, unplanned large-scale events and customer needs. Systematic and coordinated activities and practices permit an organization to manage its assets and their systems, associated performance, risks and expenditures in an optimal and sustainable manner over the asset life cycle.

The objective of this strategic initiative is to establish an Enterprise Asset Management Program to strengthen investment planning through enhanced use of technology, data, people and processes. The program will identify areas to enhance asset data and information which will, in turn, support creation of a centralized repository accessible to all authorized personnel. We will be able to analyze this information to optimize maintenance, operation and planning processes. Operating and maintenance activities and investment decisions will target to transmission and generation facilities that they will deliver the most value by supportingreliable, flexible, safe and efficient generation and low-cost energy transmission.

Generating and transmission facilities are aging, and will need upgrade, repair or replacement to maintain reliable operations well into the future. For example, NYPA has made significant investments already in life extension and modernization of its major hydroelectric generating facilities. Since replacement costs could greatly exceed the original costs of the infrastructure, employing best-in-class asset management techniques to reduce the operating, maintenance and replacement costs of our facilities may allow us to avoid or mitigate a negative impact on rates.

A number of key next steps will be critical to the successful launch and implementation of this initiative. These will include:

- Cataloging existing and new asset data and information
- Identifying and implementing the right technologies to support asset management decision making
- Continuously improving prioritization of existing capital and operations and maintenance expenditures

Creating the 21st Century Infrastructure

NYPA is continuing to advance its efforts in support of the Energy Highway Blueprint. Our Transmission Life Extension and Modernization (T-LEM) project supports the repair, upgrade and expansion of our transmission infrastructure including; transmission lines, switchyards and substations. These transmission system upgrades will provide a stronger foundation for Smart Grid implementation. NYPA is also furthering its Research and Development (R&D) goals with its exploration of the Advanced Grid Innovation Lab for Energy (R&D Lab) project. The R&D Lab project would create an independent R&D facility that will plan and prepare for the grid of the future by integrating real-time operational data with real-time power system simulation equipment. As new technologies such as large scale renewables and micro-grids become part of the energy landscape, quicker response to grid fluctuations will be necessary to ensure power quality and prevent system instability. The R&D Lab will simulate the potential impact of these and other expected changes to the grid and will help to design system improvements.

PICTURED ABOVE: At the Electric Power Research Institute's Lenox, Mass. research facility, a NYPA-EPRI Smart Grid program will evaluate dynamic thermal ratings for NYPA's transmission lines.

Initiative 3: Smart Generation and Transmission

Make the generation and transmission system more flexible, resilient, and agile utilizing existing and emerging technologies.

"Anytime we add intelligence to the grid, NYPA's actions benefit the state at large. The benefits achieved can then be deployed elsewhere to help everyone ['s infrastructure] get smarter."
– Lindsey McCloy, Assistant R&TD Engineer II, Research & Technology Development

The objective of the Smart Generation and Transmission strategic initiative is to develop and implement the next-generation transmission grid through the deployment of advanced technologies on the bulk transmission system. In pursuing this aim, we will explore options to modernize the grid, including acquisition of real-time, accurate data from sources in the field, implementation of enhanced system monitoring and data analysis tools, and development of advanced control software to enable automated responses.

Intermittency in supply, resulting from an increase in distributed and renewable generation on the grid, and variability of demand, attributable to customers engaging in energy efficiency activities, are likely to cause challenges for operators of transmission lines and large generating plants. Energy customers choosing on-site generation such as solar power or CHP, rather than continuing to rely on the centralized grid, may even generate excess power that can be exported back to the grid. In aggregate, this variability in demand and supply could cause challenges for operators tasked with maintaining grid reliability.

Therefore, grid operations must embed much more intelligence in the system to provide real-time insight on rapidly changing conditions in order to secure ongoing grid stability and reliability. With enhanced intelligence, the grid can become more flexible and adapt instantly and precisely to changing demand and supply in the energy markets, while securing the supply. There are additional benefits that could result from the comprehensive and coordinated deployment of smart grid assets across New York and, more broadly, the United States. Integrated deployment would allow system operators, through remote and automated tools, to visualize, manage and optimize the entire network operation in real-time.

Regardless of the ultimate operating model selected, all smart grid initiatives depend on the development and roll-out of network technologies, equipment and controls to respond effectively to the 21st century demand for electricity. Successful smart grid endeavors require substantial capital investment as well as cooperation with a number of key stakeholders.

The following initial steps will be critical to the successful launch and implementation of this initiative:

- Continue to explore and establish the Advanced Grid Innovation Lab for Energy (R&D Lab) project.
- Install sensors and software for NYPA's generation and transmission via R&D projects for NYPA Operations.
- Maintain the on-going collaboration with the Electric Power Research Institute (EPRI) related to emerging techniques and technologies.

Benefits

Successful implementation of the two Infrastructure Modernization strategic initiatives could deliver multiple benefits to NYPA and its customers:

- Maximum generation and operational efficiency as a result of streamlined data capture and the formalization of analyses related to assets and their life expectancies. This will make it easier to determine when assets should be replaced and what spares are readily available.

- Enhanced system reliability due to reduced power outages and improved restoration time.
- Increased resiliency of the system with respect to both physical and cyber attacks.
- Improved system economics due to reduced congestion and lower operation and maintenance costs.
- More efficient and effective utilization of system assets in response to customer demands.
- Enhanced safety through automated diagnostics that will reduce catastrophic failures.
- Reduced environmental impacts due to lower system losses and the integration of renewable generation.
- Fewer unplanned outages, which will reduce operating costs, and thereby support rate stability and increased reliability.

These benefits will also lead to enhanced overall customer satisfaction as a result of the improved reliability and resiliency of the system, reduced costs and increased environmental protection, as well as the improved ability of the transmission operator to respond to customized requests for transmission support.

Resource Alignment

Overview

What new capabilities must NYPA have to predict, embrace and even help shape these energy changes to the benefit of our customers and the state as a whole?

Discussions regarding the Customer Empowerment and Infrastructure Modernization Themes in the preceding sections illustrate that we are approaching a period of rapid transformation. We are developing a deeper understanding of the needs of our customers and delivering services that align to those needs. We are becoming more attuned to data-led operations for infrastructure operation and maintenance.

We must ensure that we are in a position to build on these efforts, to respond to ongoing change in the energy industry and to take advantage of new opportunities. We see three essential elements needed to support these objectives:

- Access to a skilled, flexible workforce that can deliver the outcomes envisioned.
- Access to the relevant information and knowledge that supports effective delivery.
- Streamlined business processes that provide structure as well as promoting efficiency and sustainability.

Our Workforce Planning, Knowledge Management and Process Excellence initiatives—collectively the Resource Alignment Theme—provide a necessary foundation for the Customer and Infrastructure Themes.

Objectives

The Resource Alignment theme will help us transform ourselves in a way that is commensurate with the changes occurring in the energy industry.

The objectives of this theme are to:

- Develop a strategic workforce plan that identifies gaps in skills and competencies, determines which new capabilities to develop internally and which to acquire externally and improves NYPA's competitiveness in terms of attracting, retaining and developing employees.
- Establish an enterprise-wide framework to capture, organize, distribute and enable the effective use of NYPA intellectual work products and relevant information / insights.

- Create a business process excellence function to work across the business with the intent of streamlining activities; reducing cost, risk, waste and inconsistencies; clarifying roles; reducing environmental impact; and strengthening communication.

Key elements of the Theme

Initiative 4: Workforce Planning

Develop and implement a strategic workforce plan that ensures that NYPA attracts, retains, and develops employees with the skills competencies to achieve our goals.

"The utility workforce has changed dramatically over the last several years. The retirement of experienced workers in the trades and STEM fields, combined with the integration of new technologies, has resulted in the need to recruit, train and retain a highly skilled and adaptive workforce. The Workforce Planning Strategic Initiative will position NYPA to be successful in developing the workforce necessary to meet the needs of our customers in the 21st century."
– Phil Toia, VP Transmission, Clark Energy Center

Our most important resource is our employees. Given the complexity of our core functions and the changing nature of the external environment, a highly skilled workforce is essential. Further, the importance of our employees will only increase over time as NYPA strives to deliver on this strategic vision and becomes increasingly responsive to demands from our customers and the energy industry.

The Workforce Planning initiative will address this need by focusing, initially, on:

- Assessing the current and projected skill and competency requirements.
- Identifying the gaps in skills and competencies that need to be filled.
- Determining the gaps that can be addressed by succession planning and retention of individuals with critical skills and training.
- Targeting the skills that need to be acquired for future successful operation.

Initiative 5: Knowledge Management

Establish an enterprise wide system to capture, organize, distribute, and adopt NYPA intellectual assets.

"Knowledge Management will fundamentally affect how we share knowledge across the organization in the future."
– Gerry McGill, Senior Analyst/Programmer, Application Development & Support, IT, Niagara

"Things change fast in this industry. To cope with that we have to manage what we know, who knows it, and how we share it— or it's gone."
– Dennis Willette, Conservation Engineer I Energy Efficiency

The Knowledge Management initiative is a complement to the Workforce Planning initiative. Knowledge Management focuses on ways to ensure that the information and data needed to manage the organization effectively are accurate, meaningful and accessible while Workforce Planning emphasizes the skills and expertise our personnel need to ensure a high

performing organization. The two initiatives are inherently linked. Knowledge is essential to provide clarity about day-to-day operations and the rationale for decisions and it ensures effective coordination and collaboration across the organization. However, with retirement and employee turnover, valuable experience and expertise may not be fully captured during the transition to new personnel and critical knowledge may leave the organization.

The objective of this strategic initiative is to facilitate cultural change across the organization that promotes structured sharing of information and knowledge as part of day-to-day operations. This will be supported by creation of a sophisticated knowledge repository to capture, organize and distribute our intellectual work products. Once collated via this strategic initiative, this knowledge will ensure that our employees have access to accurate, up-to-date and comprehensive information about processes and functions across the organization.

Initiative 6: Process Excellence

Create a business process improvement function to increase productivity; reduce cost, and minimize environmental impact.

"Process excellence is about creating a culture of 'How can we do this better?"
– Chris Carey, Operations Supervisor/Outage Coordinator, Niagara Project

The implementation of the strategic initiatives outlined in this chapter will require a transformation of our organization to meet the new challenges in advanced technology implementation, creation of new service offering and heightened customer expectations. Recognizing this, we need to ensure that existing processes and procedures form effective building blocks for the efficient delivery of desired outcomes. NYPA has evolved significantly over time as external demands have changed; we want to be confident that our current processes remain relevant and effective and do not contain any redundant provisions.

The Process Excellence strategic initiative will focus on an analysis of existing processes to identify potential improvements that will help us to optimize costs and reduce environmental impacts while ensuring associated risks remain neutral or are reduced. The streamlined processes are expected to release resources for reallocation to new initiatives.

energy
economy
environment

Building Sustainability into Every Process

Many organizations undertake process improvement initiatives to focus on cost reduction. NYPA is basing its Process Excellence efforts on the balancing of a triad of objectives: reducing environmental impact, optimizing cost-effectiveness and avoiding heightened risk.

This approach helps to ensure that sustainability efforts will not be merely layered on established processes. Sustainability is being designed into our processes, ensuring that it is at the center of our actions and decisions.

PICTURED ABOVE: At the Clark Energy Center, an infrared leak detection camera is used to visualize possible leakage of Sulfur Hexafluoride (SF6), a gas used to insulate circuit breakers and switchgear.

Benefits

We anticipate that the three Resource Alignment strategic initiatives will facilitate a range of benefits including:

- Improved quality of service to our customers due to streamlined response times and informed decision-making.
- Streamlined processes will free staff to focus on activities that support the new initiatives. This flexibility in resourcing will allow employees more opportunities to pursue their career goals and create an engaged and productive workforce. This will lead to improved employee satisfaction and retention as well as an improved external perception of our organization as a trusted and respected employer that delivers high quality outcomes.
- A more flexible organization that is responsive to changing market forces and customer needs.
- Expanded training of employees, which be augmented by greater accessibility of required information.
- Enhanced communication across the business as a result of giving employees the materials and associated knowledge to engage meaningfully on a range of issues.

Achieving longer-term transformational change will require us to put in place a robust and flexible internal foundation as we focus on delivering a range of services and products to customers. None of the Themes can be fully realized in isolation; a number of Theme activities are interdependent. In some areas, earlier activities will develop the necessary knowledge, capability and infrastructure to ensure effective implementation of further out initiative components. All of the initiatives and Themes have components that will be addressed in the near term and others that are planned for longer term. Some examples along the time-scale follow:

Short-Term	Medium-Term	Long-Term
The short-term focus is on near term actionable opportunities with minimal complexity and capital investments	The medium-term focus is on optimizing processes and activities within the current operating structure	The long-term focus is on incorporating large strategic ideas into the organizational direction
Examples: ▪ Quick win process improvements ▪ Life cycle asset management ▪ Workforce planning and better use of knowledge / data	Examples: ▪ Business process optimization ▪ Sensory monitoring of the grid	Examples: ▪ Innovative R&D and technology integration i.e. integration of renewables ▪ Process optimization business function ▪ Customer suite of services and technologies

Strategic Theme	Strategic Initiative	Description
Customer Empowerment	Customer Service	Expand NYPA's customer solution offerings through the provision of a seamless bundle of services aligned to customer needs
Infrastructure Modernization	Asset Management	Develop an asset management capability and process to improve the efficiency and effectiveness of our O&M and capital investments
	Smart Generation and Transmission	Make the generation and transmission system more flexible, resilient, and agile utilizing existing and emerging technologies
Resource Alignment	Workforce Planning	Develop and implement a strategic workforce plan that ensures that NYPA attracts, retains, and develops employees with the competencies required to achieve our goals
	Knowledge Management	Establish an enterprise wide system to identify, capture, organize and distribute NYPA intellectual assets
	Process Excellence	Create a business process improvement function to increase productivity; reduce cost, and minimize environmental impact

6 Measuring Success

We plan to measure successful delivery of our vision, values and strategic Themes through three key strategic goals.

- Financial Effectiveness
- Operational Effectiveness
- Value From Energy

Meeting customer needs and supporting New York State through the expected transformation of the power industry is at the heart of our vision. By focusing on achievement of these three goals, we believe NYPA can both live up to expectations of our customers (through providing low-cost, clean, reliable power) and ensure that our actions successfully contribute to transforming the electric power industry in New York State.

Financial Effectiveness:

This goal is defined as maximizing the financial capacity of NYPA to make capital investments that help achieve our goals.

We have earned a reputation for stability and prudence in managing our financial assets. We intend to retain and further strengthen this reputation, recognizing that a secure financial position will allow us to serve our customers and the state by capitalizing on opportunities as they emerge in the transformed energy industry.

The main concept that we will look to measure within this goal is the debt service coverage ratio. This ratio is a measure of annual cash flow available relative to payments for debt service. Maintaining an adequate debt service coverage ratio helps NYPA retain its strong credit rating enabling ready access to the capital markets and allowing us to issue debt at lower costs to help customers save and to foster flexibility around NYPA investment decisions.

Operational Effectiveness:

This goal is defined as maximizing the efficiency, reliability and flexibility of our assets and organization.

Innovative approaches to asset stewardship will be needed to target maintenance of the transmission and generation infrastructure in areas of greatest need and optimal value to customers. These assets also need to become more flexible and responsive to accommodate the changing use patterns that will result from increased deployment of renewable and distributed generation and new customer demand patterns. Smarter generation and transmission assets will support this transition, utilizing data from system sensors and facilitating greater remote operation / automation in response to real-time conditions. We want to be at the forefront of changes in our approach to asset management and Smart Grid deployment, both of which will deliver efficiency in the operation of new and existing assets. Operating in these areas will necessitate advances in technology while also requiring that we have access to specific resources, skills, capabilities and knowledge to support desired outcomes.

Given NYPA's desired vision and strategic Themes, there are several key concepts that we will look to measure within this goal:

- The operational performance of NYPA's generation and transmission assets.
- The carbon intensity of NYPA's operations.
- How well NYPA is meeting customer needs through the provision of its energy services and technologies.

Value from Energy:

This goal is defined as maximizing the benefit and minimizing the negative impact of each unit of energy delivered to the state / customer.

Since the 1980s, NYPA has assumed an ever increasing role in providing energy services. Further expansion of these services will help to maximize customer value and empowerment. We will explore the potential to offer a range of differentiated products tailored to the requirements of individual customers. We value our relationships with our customers and intend to pursue ongoing, active engagement to understand their needs in still greater depth. Targeted energy services can support a more sustainable operating model for our customers, potentially reducing overall consumption and supporting the increased deployment of distributed renewable technologies.

energy
economy
environment

Measuring Sustainability Efforts

NYPA is ensuring that a culture of carbon emission management and energy efficiency is embedded within the organization through the implementation of key sustainability metrics focused on our carbon footprint. To facilitate measurement of how effectively we are managing carbon emissions, NYPA has initiated the Carbon Footprint program to benchmark our carbon baseline.

Using the inventory produced by the benchmark, we will identify additional improvements to business practices that will reduce our footprint. These will include greening business processes, improving resource efficiency, and exploring emerging technologies that enable further carbon reductions at facilities.

NYPA is also committed to finding non-generation related opportunities to reduce its carbon footprint for example, encouraging carpooling and utilization of public transportation, replacing travel with remote technologies such as Smart Boards and video conferencing, and installing electric vehicle charging stations and distributed solar systems at our facilities.

We will also measure how effectively our customers are managing carbon emissions to ensure we are offering the right energy services and incentives.

PICTURED ABOVE: Atop NYPA's White Plains office parking garage, employee-owned electric vehicles line up at EV charging stations.

In essence this goal focuses on looking at the success of our relationships with customers. Given this, there are several key concepts that we will look to measure within this goal:

- The carbon intensity of NYPA's customers' consumption of electric and thermal energy.
- The extent to which economic development is stimulated as a result of NYPA's low-cost energy products and energy optimizing services.
- NYPA's penetration within the customer base that we are authorized to serve by statute.

Conclusion

There is no question that the energy industry has seen tremendous changes in the last few years as natural gas prices have plunged, solar power installations have skyrocketed, and dozens of new technologies have begun revolutionizing the way we generate and use energy. These changes are only likely to accelerate, due not only to technological advances but also to regulatory and market changes that will enable greater customer empowerment. As the timing and direction of these changes become clearer, we intend to periodically reassess and adapt our plan accordingly.

The changes in markets and technology create the potential for profound benefits to be created for users of energy, as this Strategic Vision has described. However, it also creates the need for the electric grid and the large power generating stations to become more tightly integrated into the distribution network. The grid must become more adaptable, intelligent, and agile in responding to the massive number of individual decisions made by consumers as they use and generate electricity. This document has described how NYPA, together with the other owners and operators of the facilities comprising the New York power grid, must and will anticipate and stay ahead of that need.

NYPA has historically helped lead change in situations when the private sector has been unable to do so. Part of our challenge will be to continue, and even increase, our collaboration with the private sector, as well as with our sister agencies such as NYSERDA, the Public Service Commission, and many others to maximize the benefits we can provide to our customers and the residents of the State of New York.

With its many strengths and resources, New York State is well-positioned to play a leadership role in the exciting transition occurring in the energy industry. It has extensive hydroelectric power resources, including the Blenheim-Gilboa Power Station, one of the largest pumped storage facilities in the nation. It has major centers of technological and service innovation and finance. And it has a track record of taking bold steps such as the Energy Highway and Build Smart NY that will help New York's economy grow in the 21st Century.

Not least among New York's strengths are NYPA's ability to provide power at very low-cost, its operational excellence in the generation and transmission of electric power, and its provision of the highest quality service to our customers. Through the skills and dedication of our employees, we intend to build on those strengths and fulfill our mission to:

Power the economic growth and competitiveness of New York State by providing customers with low-cost, clean, reliable power and the innovative energy infrastructure and services they value.

New York Power Authority

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