The Energy to Lead

2015—Printer Friendly Version

New York State
Energy Plan
Volume 1

NEW YORK STATE
ENERGY PLANNING BOARD

Contents

Message from the Chairman Richard L. Kauffman

Some like to pit the environment against the economy—as if it's one or the other: You can either create jobs and support a thriving workforce or protect our natural environment. Here in New York, we don't subscribe to this line of thinking.

We can grow our economy, create jobs, and materially reduce harmful carbon emissions. Energy is the invisible engine of our economy—and a clean, resilient, and affordable energy system is critical to achieving our objectives.

In 2014, Governor Andrew M. Cuomo launched New York's signature energy policy, the novel Reforming the Energy Vision (REV) strategy. REV will build an integrated energy network able to harness the combined benefits of the central grid with clean, locally generated power. REV fosters economic prosperity and environmental stewardship—government and industry working together through public-private partnerships to achieve our shared goal of a healthier and stronger New York economy.

This State Energy Plan coordinates every State agency and authority that touches energy to advance the REV agenda. Within this document, you will read how New York State is unleashing groundbreaking regulatory reform to integrate clean energy into the core of our power grid, redesigning programs to unblock private capital, and is actively deploying innovative energy solutions across the State's own public facilities and operations.

This State Energy Plan coordinates every State agency and authority that touches energy to advance the REV agenda.

We're already making progress.

In 2014, we committed $1 billion to the local solar industry—now employing the fourth largest statewide solar workforce in the country—with the expectation that REV will drive a subsidy-free solar market in New York within 10 years. Clean tech incubators from the Hudson Valley to Rochester are helping the next generation of entrepreneurs and innovators build tomorrow's responsible businesses. State agencies are leading by example, and from 2011 through 2014, they have reduced their energy consumption in public buildings by approximately 3% with investments in energy efficiency, resulting in $60 million to $70 million in estimated avoided energy costs for taxpayers.

We must keep moving forward.

In 1882, Thomas Edison built the world's first commercial electrical power grid in his Pearl Street Station in Lower Manhattan. In 1961, we built the then largest hydropower facility in the Western world at Niagara Falls. New York State knows what innovation looks and feels like.

As Thomas Edison himself once said, "If we did all the things we are capable of, we would literally astound ourselves."

The eyes of the nation are looking to New York. And we have the energy to lead.

Richard L. Kauffman
Chairman of Energy and Finance for New York, Office of the Governor
Chairman of the Board, New York State Energy Research and Development Authority

Introduction

The 2015 New York State Energy Plan (the Plan) is a comprehensive roadmap to build a **clean**, **resilient**, and **affordable** energy system for all New Yorkers. The Plan coordinates Governor Andrew M. Cuomo's major new energy initiative, known as *Reforming the Energy Vision* (REV),[1] and other energy policies and initiatives. REV is a novel approach that maps a pathway to a stronger and healthier economy by stimulating a vibrant private sector market to provide clean energy solutions to communities and individual customers throughout New York.

Clean Energy = Economic Opportunity

By focusing on removing market barriers and bridging market gaps, REV will enable a dynamic clean energy economy operating at a scale that will stimulate substantial opportunities for communities across the State to create jobs and drive local economic growth, while protecting our environment by reducing greenhouse gas (GHG) emissions and other pollutants. This Plan embraces that vision.

Under Governor Cuomo's leadership, New York has made great progress toward its clean energy goals. The booming solar power industry on Long Island celebrated its 10,000th rooftop installation in December 2014. Renewable power sources—hydro, solar, wind, and other carbon-free solutions—continue to grow as a share of the total energy produced in the State. More New Yorkers are driving electric vehicles than ever before, supported by an ever-expanding number of public charging stations. At the same time, more recent initiatives are beginning to bear fruit. Since it launched in early 2015, the first-in-the-nation NY Prize microgrid competition has received more than 100 initial applications from communities across every region of the State—a clear indication of grassroots interest in clean, local power solutions.

We must keep moving forward. New York should accelerate its ongoing transition to a clean energy economy in order to capture the benefits of scale that will lower project costs and produce the job growth, increased private investment in local economies, and emissions reductions that the State and its residents need. The Plan will accelerate the State's clean energy transition by applying a set of coordinated and complementary actions and tools, including revising the State's energy regulatory framework, advancing of the State's clean energy programs, and leading by example through the execution of various State and local government operations and initiatives. Ultimately, the Plan will help us make better and more informed business and consumer decisions about how we acquire and

1. The term "REV" was first introduced in a proceeding instituted by the New York State Public Service Commission on April 25, 2014, entitled Proceeding on Motion of the Commission in Regard to Reforming the Energy Vision (Case 14-M-0101). That proceeding is referred to in this Plan as the "REV Regulatory Docket." As used in this document, the term REV refers to the State's signature energy policy, which includes the REV Regulatory Docket as well as the other regulatory, programmatic, and operational activities described herein.

consume energy, enabling new products and services, and adding tangible value to our daily lives.

The Plan acknowledges the significant challenges that we face and recognizes each one also as an opportunity to deploy smarter, cleaner, and more economic energy solutions. The Plan sets out specific initiatives to increase renewables and energy efficiency and decrease GHG emissions. Finally, this Plan establishes expected outcomes as a result of these initiatives.

REV IS INFORMED BY NEW YORKERS

The 2015 New York State Energy Plan builds upon the Draft 2014 New York State Energy Plan (Draft 2014 SEP). The New York State Energy Planning Board (NYSEPB) has received tens of thousands of public comments on the Draft 2014 SEP. The NYSEPB appreciates the time and attention that public stakeholders throughout the State have paid to these matters and has studied the comments carefully. Since the issuance of the Draft 2014 SEP, the State has begun introducing certain elements of the REV strategy, including the opening of the REV Regulatory Docket by the New York State Public Service Commission (PSC), the issuance of a REV Straw Proposal by the New York State Department of Public Service (DPS), the issuance by the PSC of the first implementation order under Track I of the REV Regulatory Docket, the opening of a PSC proceeding to consider a petition by the New York State Energy Research and Development Authority (NYSERDA) to create a Clean Energy Fund (CEF), and the launch of NY Green Bank (NYGB). The 2015 New York State Energy Plan has evolved to reflect the public comments, as well as the progress made and experience gained over the last year since publication of the Draft 2014 SEP.

Where We Are Today

New York's Energy System: Progress, Challenges, and Opportunities

Energy is the engine of any modern economy, providing the means for industry, commerce, technology, and communities to thrive. People rely on energy for comfortable buildings and homes in all seasons; efficient and clean manufacturing; industrial and agricultural processes; light for work and recreation; and the power behind phones, computers, ATMs, and other communication and business devices that keep us productive and connected.

New Yorkers will have cleaner, more resilient, and more affordable energy.

REV will create a dynamic, clean energy economy driven by consumer choice, enabling new energy technologies, products, and services, and adding tangible value to the daily lives of New York businesses and consumers.

Energy powers personal and public transportation and many other activities necessary for economic growth and prosperity. Although New York is among the most efficient states in the nation based on energy use per person, we, like the rest of the country continue to face rising costs, intensifying impacts of extreme weather, and growing environmental and health concerns associated with our dependence on fossil fuel power generation.

New York's energy policy is central to how the State responds to the challenges presented by a changing climate. Mitigating climate change is a global challenge, but New York can seize the opportunity to lead and realize the local benefits from our transition to a cleaner energy system and more productive economy. The Plan also recognizes that extreme weather events demand more resilient energy infrastructure.

Significant Progress to Date

New York State has made significant progress in recent years toward a more cost-effective and clean energy system, through the deployment of renewable energy generation and energy efficiency measures. New York is the largest hydroelectric power producer east of the Rocky Mountains. Thanks to Governor Cuomo's ReCharge NY initiative, low-cost power allocations have contributed to the creation or retention of more than 400,000 jobs, and have induced $34 billion in private capital investment from 2010 through 2014. On a per capita basis, New Yorkers consume nearly the least amount of energy in the country (second only to Rhode Island).[2]

The annual impact of past and ongoing energy efficiency and renewables programs developed in New York with support from the System Benefits Charge, Renewable

2. United States Energy Information Administration Rankings, Total Energy Consumed per Capita, 2012 (MMBtu). http://

Portfolios Standard (RPS), Energy Efficiency Portfolio Standard (EEPS), Regional Greenhouse Gas Initiative (RGGI), and other initiatives, is estimated to be a reduction of 7.7 million tons of carbon dioxide (CO_2) per year, equivalent to taking 1.5 million cars off the road each year. New York has also made great strides in reducing the emissions of air pollutants that are harmful to public health through its leadership and participation in RGGI and other air quality and clean energy initiatives.

Through previous regulatory reform, New York has one of the most progressive electric utility regulatory and policy regimes in the country. In the mid-1990s, New York was among the first states to develop competitive opportunities for energy generation and retailers. The resulting vigorous and competitive independent power producer sector and wholesale markets provide New York State consumers with lower rates and more energy choices, while creating additional jobs.

New York's clean energy transition is at a critical inflection point. Initiatives launched or advanced by Governor Cuomo—including the NY-Sun Initiative, NYGB, RGGI, Cleaner Greener Communities, the New York Energy Highway, Charge NY, BuildSmart NY, RPS, EEPS, and others—have made New York a leader for the deployment of clean energy and transportation options. Through the Plan, New York will build upon the State's existing momentum to accelerate deployment of energy efficiency and renewable energy resources along the path toward the scale that is needed to ensure a clean, resilient, and affordable energy future; however, to do so the State needs to recognize and understand the major challenges it faces, and convert those challenges into opportunities to advance its clean energy mission.

AN ECONOMY IN TRANSITION

Rapidly evolving technologies and business models are reshaping our global and local economies and personal lifestyles. Just as market trends in other sectors have transformed travel and leisure (online trip planning, room- and ride-sharing services, bike-share programs); entertainment (Netflix, Apple TV); and shopping and other consumer services (Amazon, Ebay, mobile banking, and bill payment services), the energy sector is part of a larger economic transition to a more distributed and shared society. The regulatory and programmatic reforms included in REV will enable the energy sector to catch up with and capitalize on these broader trends. This will unlock new value for individuals, businesses, and communities, while facilitating the State's evolution toward a cleaner and more distributed energy future.

www.eia.gov/state/rankings/?sid=NY#series/12

What Could the Future of Energy Look Like?

For New York Residents

- A company offers to make a series of electric and thermal energy improvements to your home at no upfront cost and guarantees your energy bills will go down. The home improvements are paid for over time through a portion of the guaranteed energy savings they deliver, so you save money without ever spending anything.
- You live in a “smart” home. Your appliances and devices are interconnected to allow you to control your lifestyle from your phone, car, or computer. Imagine switching on your heating and cooling systems on your drive home or being able to run dishwashers and laundry machines from work, enabling you to save or even earn money by using energy at different times of the day. In the energy world of the future, the connected home will give you unprecedented control over and optimization of your comfort, safety, entertainment, and energy use.
- Zero Net Energy homes are no longer a concept of the future. A well-sealed and insulated building envelope, renewable thermal heating and cooling, and on-site solar photovoltaic (PV) work together to provide a comfortable living environment while allowing your home to produce as much energy as it consumes every year.
- As a renter, apartment dweller, or homeowner with a roof unsuitable for solar technology, you enjoy newfound access to clean renewable power by participating in a local “Shared Solar” energy project. The Shared Solar array enables you to virtually “purchase” a number of solar panels at a location different from your home, often in areas identified by your community as ideal based on local land use and economic development priorities. You receive a credit on your monthly utility bill for the clean power your panels generate.
- As energy service providers vie for your business in a more robust competitive marketplace, they improve their offerings and customer service. Your energy bills are easier to understand, you choose to receive text alerts when your energy spending exceeds a certain level, and accessible websites create a seamless online experience.

FOR NEW YORK BUSINESSES

- You install on-site combined heat and power (CHP) generation, also known as a cogeneration system, to simultaneously and efficiently provide electricity and useful heat to your business. The CHP system reduces energy costs and improves business continuity by continuing to provide power in the event of a grid outage, or a private company offers to lease space from your company to install an ice or battery storage system on your property that shifts your company’s electric heating, ventilation, and air conditioning (HVAC) demand from peak hours.
- You earn money by installing technologies that allow you to better manage your energy use. For example, technology that enables you to monitor your energy use in real time will alert you to times when demand for electricity is highest. You can reduce your load and sell energy back to the grid, or you are able to store energy on-site in batteries, to reduce your dependence on purchasing energy from the grid at times when demand and prices are high.

- Thanks to new products from large-scale wind developers, you sign a fixed-cost power contract to hedge against the price volatility of conventional fuels. Your fixed price of power makes your monthly business expenses and operating costs more consistent and foreseeable, just as farmers use similar strategies to hedge against agriculture commodity losses caused by weather, and airlines hedge against their volatile fuel costs.

FOR NEW YORK COMMUNITIES

- Your neighborhood participates in the NY Prize competition to take advantage of revised regulations to build a community microgrid that generates carbon-free power, improving the health of your community, and ensuring the local fire department, critical care facilities, and high schools will have power during extreme weather events.
- Your community establishes a Community Choice Aggregation (CCA) 2.0 authority for local energy planning and procurement, which enables your municipality to achieve energy independence and reap economic benefits by making specific clean energy investments and deploying various distributed energy resources, all based on the characteristics of local assets and your community's priorities.
- Your local government takes clean energy action to reduce its budget and local consumer bills, saving taxpayer dollars while making cities and towns more attractive and competitive. More effective government spurs private sector energy investments in the community that create jobs.
- Programs like Community Solar NY enable your neighborhood to take advantage of bulk community purchasing to lower the cost of installing solar technology. A battery, developed with support from Rochester's NY Battery and Energy Storage Technologies (NY-BEST) Consortium, is connected to interested homeowners' solar panels to provide backup power in case of an outage, while maintaining the ability to sell power back to the grid.

Turning Challenges Into Opportunities

Today's energy system is not well-designed to address and overcome the type and magnitude of New York's economic and environmental challenges. Although difficult, these challenges are not insurmountable. By substantially overhauling the structure of the State's energy system, REV will meet the State's energy challenges head on, and in doing so will drive economic growth and develop clean, resilient, and more equitable solutions. These challenges are by no means unique to New York; they are shared by states throughout the country, but New York is leading the way in developing and deploying the comprehensive REV strategy to transform our energy challenges into opportunities. Successful elements of REV will be replicable by states across the U.S.

Affordability

THE CHALLENGE

The State needs to maintain its focus on affordability, so energy bills for the State's residential customers constitute a declining percentage of their disposable income, and more competitive industrial rates contribute to the growing mix of attributes that will attract new businesses to, and retain existing businesses in, New York. More needs to be done

to lower rates given utility costs are frequently cited as barriers to business relocation or expansion across the State.[3]

If we take a business as usual approach, customers' energy costs—in particular, their delivery charges, which reflect the cost of getting electricity from where it is produced to the customer end user—will continue to climb in order to pay for the projected costs of maintaining our central power grid over the coming decade. It is estimated that over the next 10 years, more than $30 billion will need to be invested to replace New York's aging electric transmission and distribution infrastructure just to meet currently projected energy demand.[4] This is nearly double the $17 billion invested in the State's grid over the past decade. Clean energy solutions such as energy efficiency and local renewable power generation can help offset the cost of these infrastructure investments.

While New York State faces upward pressure on capital investments and costs, we also face increased price volatility. As our dependence on natural gas increases and severe weather patterns take hold, the volatility in natural gas and concomitant electric prices are expected to rise. We saw this during the winter of 2014. Customers throughout the State faced higher energy bills and nearly 277,000 residential electric and gas customers statewide incurred service disconnections for nonpayment during 2014.5 This volatility makes it difficult for families to budget their expenses and for businesses to plan and grow with confidence.

THE OPPORTUNITY

One of the fundamental causes of New York's energy affordability challenge is the low rate of capacity utilization of its energy system (also referred to as system efficiency). New York State's system load factors—the ratio of the average load on the system to the system's peak load—have declined from about 59% of total annual capacity 10 years ago to about 55% today. Under a business as usual approach, these factors are expected to decline to about 51% of capacity over the next decade. This is important, as DPS estimates that each 1% improvement in system efficiency will yield between $221 million and $330 million of annual savings to ratepayers across the State because of less need for supply and delivery investments.[6]

The reason for this situation is understandable—the energy system is built to a capacity to meet the peak load demand that occurs during only a limited number of hours each year, typically on hot summer afternoons. Over recent years, New York's overall annual energy demand has flattened, in part due to the success of State and utility energy efficiency programs, yet peak load has continued to increase at a more rapid pace. In order to maintain reliability, we have been making expensive energy infrastructure improvements to

3. In eight of 10 vacation regions surveyed by I Love NY, utility costs were cited as a deterrent to infrastructure investment in tourism-reliant areas. Empire State Development Corporation Tourism Gap Analysis, 2014.

4. Case 14-M-0101, Proceeding on Motion of the Commission in Regard to Reforming the Energy Vision, Order Adopting Regulatory Policy Framework and Implementation Plan, issued February 26, 2015.

5. CASE 14-M-0565 – Proceeding on Motion of the Commission to Examine Programs to Address Energy Affordability for Low Income Utility Customers. ORDER INSTITUTING PROCEEDING (Issued and Effective January 9, 2015).

6. Case 14-M-0101, Proceeding on Motion of the Commission in Regard to Reforming the Energy Vision, Developing the REV Market in New York: DPS Staff Straw Proposal on Track One Issues. Issued August 22, 2014, and updated to reflect most recent results.

satisfy peak demand, but we are using the whole system less over the remaining course of the year. As a result, the overall system is both energy and capital inefficient.

The answer is to spend prudently the required capital on infrastructure improvements, in ways that improve the grid's overall system efficiency. For example, solutions that reduce or shift peak load such as demand management systems, energy efficiency, and energy storage, most often require significantly less capital investment. These solutions should be seriously considered, wherever practical, as complementary to investments in smart transmission and distribution infrastructure to meet the system's reliability needs.

REV will unlock these savings by facilitating and encouraging investment (particularly private capital investment) in cost-effective, clean distributed energy resources and other solutions that will reduce peak load and improve system efficiency as a complement to necessary transmission and distribution infrastructure upgrades. If we are able to reverse course and return to a 59% load factor, at which the system performed 10 years ago, then by 2025 New York's ratepayers will be saving $1.7 billion to $2.6 billion annually versus business as usual.

In addition to the system-wide savings that REV will drive to benefit all customers, the distributed clean energy solutions themselves, in particular energy efficiency, will help customers better manage their energy bills and reduce fuel costs. Renewable distributed generation resources will also help protect customers from unpredictable swings in energy prices by reducing dependence on fuels that have volatile prices.

Environmental Imperatives

THE CHALLENGE

Clean air and clean water are essential to New Yorkers' health and quality of life as well as the State's growing tourism business and other economic development opportunities. The State is also very focused on reducing its GHG emissions, 89% of which stem from New York's energy sector.[7] Cutting these emissions and other pollutants to protect public health and welfare is one of REV's primary objectives. Fueled in part by its leadership role in RGGI, New York State has already substantially reduced air emissions from power plants over the last decade. For example, from 2005 through 2013, the State's power sector has reduced sulfur oxide (SO_X) emissions by roughly 91%, nitrogen oxide (NO_X) emissions by approximately 74%, and CO_2 emissions by 42%, while the State's economy continued to grow.[8] Meanwhile, GHG emissions from the transportation sector declined by 19% between 2005 and 2012.[9] Despite the progress made in reducing emissions, the New York City metropolitan area does not comply with the Federal ozone standard. Because New York will not be able to demonstrate compliance by the deadline of July 2015, it will likely be re-designated as "moderate" non-attainment, which will require New York to develop

7. For purposes of this discussion, "energy sector" refers to activities related to fuel combustion for electricity production, space and water heating, and transportation, as well as emissions from electric power delivery and natural gas extraction, transportation, and distribution. See New York State Greenhouse Gas Inventory and Forecast: Inventory 1990-2011 and Forecast 2012-2030. Prepared by the New York State Energy Research and Development Authority. April 2014. http://www.nyserda.ny.gov/Cleantech-and-Innovation/EA-Reports-and-Studies/Energy-Statistics

8. United States Environmental Protection Agency Air Markets Program Data. http://ampd.epa.gov/ampd/

9. "Patterns and Trends, New York State Energy Profiles 1998-2012," p. 46. Prepared by New York State Energy Research and Development Authority, November 2014.

a State Implementation Plan demonstrating compliance with the ozone standard by July 2018. Because the United States Environmental Protection Agency (EPA) will measure compliance using three years of data (2015 – 2017), New York will have to implement new strategies to further reduce NOX emissions, in addition to seeking reductions in transportation pollution. These strategies will focus primarily on the energy sector, which accounts for the bulk of the State's NO_x emissions.

The new EPA Clean Power Plan regulations under section 111(d) of the Clean Air Act, if adopted as proposed, would require a further reduction of approximately 44% in the CO_2 emission rate of the State's power sector by 2030. Although EPA's targets for New York may be revised in response to public comments, the State will likely have to implement additional actions to meet this challenge, and the State's own GHG emission targets detailed later in this Plan. These steps could include further adjustments to the RGGI program.

THE OPPORTUNITY

While New York has made substantial progress in improving its environment over recent years, the State's environmental imperatives dictate that much more must be done. The Plan sets forth aggressive GHG reduction, renewable energy, and energy efficiency targets. REV's strategies to animate clean energy markets, attract private sector capital investment, and support clean transportation alternatives will combine to enable New York to achieve these targets and deliver the environmental benefits inherent in the State's transition to a clean energy economy. The EPA Clean Power Plan will expand carbon markets, driving down the cost of compliance and further stimulating the clean energy economy. Reducing carbon pollution from transportation extends these benefits. As a leadership state investing in clean energy markets, New York will position itself to draw business to our State for both environmental and economic reasons. Done properly, this transition will result in the needed emissions reductions, clean air, clean water, and better land-use policy that will foster a cleaner environment while improving the health, economy, and quality of life for all New Yorkers.

Reliability and Resiliency

THE CHALLENGE

Reliability is a central objective of the State's energy system. Power outages across the country are lasting longer, resulting in greater economic losses each year.[10] The growth of the digital economy means that even momentary blackouts can have significant impacts on businesses and residents.

New York's energy delivery infrastructure demands attention, as evidenced by the projected $30 billion investment required over the coming decade to maintain reliability.[11] Continued investment to upgrade and modernize the existing transmission and distribution system is critical to REV's success. In addition to investments in delivery infrastructure,

10. Ventyx, PA Consulting Group; http://bigstory.ap.org/article/us-power-grid-costs-rise-service-slips

11. Case 14-M-0101, Proceeding on Motion of the Commission in Regard to Reforming the Energy Vision, Order Adopting Regulatory Policy Framework and Implementation Plan, issued February 26, 2015.

there will continue to be a need for investments in central generation as well, as more than 60% of New York's existing power generating capacity is more than 35 years old.[12]

Furthermore, resiliency is a prerequisite to the reliability of our energy system. While New York does its part to mitigate climate change through reductions in GHG emissions, it must also take measures to adapt to its anticipated near-term consequences. Extreme weather events such as Superstorm Sandy, Hurricane Irene, and Tropical Storm Lee are a compounding threat to the reliability of the State's critical energy infrastructure and the essential public services provided by that infrastructure. Following these storms, Governor Cuomo commissioned panels of experts to study the situation, culminating in the NYS2100 Commission which made a number of recommendations to improve the strength and resiliency of New York's critical energy infrastructure. The threat of extreme weather events and other climate change impacts is multiplied by aging infrastructure systems across the State, posing additional risks to the reliability of energy, transportation, communications, and other critical infrastructure services.

THE OPPORTUNITY

Reliability and resiliency are both closely related and essential to the energy system. REV addresses these elements from several directions. In light of the realities of extreme weather events, a changing climate and the hazards they present, major utilities like Consolidated Edison (Con Edison) have already begun identifying the threats and investing in resources to address them. REV will complement and further other resiliency efforts by promoting the development of clean, local energy resources that strengthen and improve the reliability of the grid. For example, REV will facilitate development of innovative community microgrids, which incorporate clean distributed generation sources that connect critical facilities. This will enable these facilities to operate independently of the central grid during power outages and to operate as a cost-effective complement to the grid under normal circumstances.

Continued investment in the maintenance, repair, and upgrade of the State's generation and transmission systems is an essential component in improving New York's infrastructure reliability and resiliency. While investment in the transmission infrastructure will indeed be necessary, those investments should be optimized through innovative strategies that eliminate waste, improve overall system efficiency, and include private capital investment where practical. Increased emphasis will be placed on the deployment and use of advanced technologies and on finding means to reduce impact on the environment.

REV will guide the required capital investment to effectively address the State's energy challenges and in so doing, develop a cleaner, smarter, modernized, resilient, and more reliable grid, which in turn will help power New York's evolving high-tech economy. REV will also develop innovative public-private partnership models that will induce the private sector to invest much of the needed capital, rather than leaving ratepayers to carry the entire burden.

12. "Power Trends 2011: Energizing New York's Legacy of Leadership," p. 19. Prepared by the New York Independent System Operator, http://www.nyiso.com/public/webdocs/media_room/publications_presentations/Power_Trends/Power_Trends/Power_Trends_2011.pdf

Updating the Utility Business Model

THE CHALLENGE

The present regulatory system was designed with the assumption that customer energy usage is generally inelastic—difficult to influence or alter—and that the most efficient system is one that is almost entirely dependent upon large, central station power plants. Today, that notion is being challenged. Central power plants and the transmission network are, and will remain, the backbone of our electric system. However, technology has significantly advanced, and prices of distributed solutions are rapidly declining, enabling greater customer control and choice over energy consumption, as well as distributed energy resource ownership opportunities for customers and communities. Today's utility business model is not well aligned for the transition to a more distributed energy future; as more consumers adopt distributed energy solutions, utilities' revenue requirements are concentrated on fewer customers, at the same time that load is flattening. This situation has resulted in a need to reform the current utility business model to ensure that it can accommodate, adapt to, and prosper through the integration of advanced technologies and greater levels of distributed energy resources.

THE OPPORTUNITY

By restructuring the State's utility regulatory model, REV will provide New York with the ability to operate its energy system more efficiently and at a lower cost, and will provide utilities with the opportunity to chart a vibrant but changing future.

The REV Regulatory Docket will overhaul New York's utility regulatory structure to:

- Enable utilities to earn returns by advancing markets in energy efficiency and distributed energy resources, and in so doing, transition clean energy from the periphery to the core of the utility business model;
- Deploy price signals that reward investments that improve overall system efficiency; and
- Align the regulatory system to catalyze and leverage innovation, technology advancement, and private investment.

Environmental Justice—Clean Energy for Low- to Moderate-Income Communities

THE CHALLENGE

Environmental Justice communities have been disproportionately impacted by air pollution from fossil fuel power generation facilities and transportation infrastructure that historically have often been sited in these communities. In addition low- to moderate-income (LMI) consumers pay a disproportionate share of their income toward the cost of energy. These consumers also are less likely to be reached in the near term by clean energy market actors and project developers because of perceived credit risks.

THE OPPORTUNITY

Helping communities envision and pursue a clean energy future is a key component of community revitalization, sending an important signal that those communities are planning for a sustainable future. The Plan will increase the State's emphasis on improving energy affordability for LMI consumers, while increasing deployment of distributed energy resources

in LMI communities throughout New York, both as a matter of equity, and as a matter of necessity if the State is to meet its clean energy targets.

REV WILL BENEFIT LMI COMMUNITIES

Clean energy jobs, urban renewal, sustainable development, and affordable energy and transportation options are just a few of the many goals of REV that will benefit LMI communities. Over one quarter of the population of New York State falls into the LMI category (the exact percentage depending on the line of demarcation). In light of the affordability challenges distressed communities face, beginning in 2015 NYSERDA and DPS, in partnership with other State agencies, will undertake a focused effort to bring more clean energy benefits and bridge market gaps to LMI communities throughout the State. This effort will be manifested in current and planned program and regulatory changes, such as the $13 million set aside for the LMI sector within the NY-Sun Initiative, continued support for energy efficiency services through the CEF, and the PSC's January 2015 low income-focused utility regulatory proceeding, including the June 2015 DPS staff report. Other ongoing initiatives include increasing transparency of retail price information to facilitate customer comparison of utility and competitive service providers, which could be enhanced by providing all consumers with access to consumer information in plain language, both in English and other frequently spoken languages. But the needs and burdens of Environmental Justice communities and LMI energy customers cannot be addressed by REV alone. The State will continue to promote efforts to address the negative environmental impacts that energy facilities and transportation sources have on these communities. NYSERDA will also work closely with other State agencies to: (a) coordinate existing LMI support programs and services (e.g., NYSERDA's EmPower NY program, New York Department of Homes and Community Renewal's [HCR] Weatherization Assistance Program, and the New York Office of Temporary Disability Assistance's [OTDA] Heating Emergency Assistance Program), (b) help drive systematic changes to the processes that HCR and other housing assistance agencies use to allocate resources, in order to expand deployment of distributed energy resources to multifamily affordable housing projects, and (c) embed clean energy principles and access into other LMI-focused programs, including New York Department of Labor (DOL) workforce development programs, and New York Department of Health (DOH) regarding the articulation and quantification of the health benefits of clean energy measures.

Clean and Reliable Transportation

THE CHALLENGE

Meeting the mobility needs of New York's growing population and economy requires investment to maintain existing transportation infrastructure, including roadways, bus and rail transit, aviation, and ports, and to expand transportation alternatives such as biking, walking, and Zero-Emission Vehicles (ZEV). New York State invests heavily in its transportation systems, investing roughly $3.5 billion per year in capital improvements to its roads and bridges, and nearly $5 billion per year in capital and operating assistance

to support its transit systems.[13] The State also makes significant investments in intercity passenger rail, bicycle, and pedestrian facilities, and recreational trails. These investments enhance New York's economy and the mobility of its citizens while contributing to meeting the State's GHG reduction goals.

The current transportation funding paradigm also faces difficulties in supporting the State's growing infrastructure and mobility investment needs. Federal, State and local governments wrestle with finding ways to maintain, renew, and modernize the current infrastructure, and the revenues available at both the State and Federal levels for this investment. Alternative approaches must be explored to resolve the inherent conflict between the transportation system's current revenue sources, which rely on continued levels of petroleum consumption, and environmental goals, which necessitate reduced petroleum consumption.

New York has taken significant actions to reduce petroleum consumption. New York is the most transportation fuel-efficient state in the nation on a per capita basis,[14] largely due to New York City's heavy utilization of public transit. However, the use of petroleum in the transportation sector continues to be a significant source of air pollution in New York, exacerbating problems with ozone, particulate matter, and benzene. In addition, the transportation sector accounts for more than one-third of the State's GHG emissions. New Yorkers still spend more than $20 billion each year on gasoline and diesel fuel imported from out-of-state.[15]

THE OPPORTUNITY

New and diversified sources of revenue are needed to maintain and modernize New York's transportation system. New York State must have a reliable transportation system that supports efficient goods movement and provides alternatives that enhance personal mobility, reduces emissions from the transportation sector, and supports the State's economic competitiveness in a changing global market.

One potential source of funding is capturing a portion of the $20 billion that leaves the State through the purchase of transportation fuels. By capturing and investing a portion of this outflow, the State could generate revenue to increase economic activity, create jobs, and increase revenue generated under current tax structures—a "dividend" to the State and its residents from reduced oil consumption and the GHG emissions that cause climate change.

The Plan will reduce petroleum use and emissions from the transportation sector through several strategies, including alleviating bottlenecks in the transportation system that cause congestion; investing in more energy efficient ways to move people and freight; and making strategic investments in ZEV, pedestrian, bicycle, and transit infrastructure. The

13. New York State FY 2016 Capital Program and Financing Plan. http://publications.budget.ny.gov/eBudget1516/capitalPlan/CapPlan.pdf

14. United States Department of Energy, Office of Energy Efficiency and Renewable Energy. http://apps1.eere.energy.gov/states/transportation.cfm/state=NY

15. "Patterns and Trends, New York State Energy Profiles 1998-2012," p. 46. Prepared by the New York State Energy Research and Development Authority, November 2014.

continued implementation of Federal Corporate Average Fuel Economy (CAFE) standards will also provide a significant GHG reduction benefit.

The transportation strategies in the Plan will guide the development and implementation of programs that will help fund or otherwise facilitate the clean transportation system of the future, while also allowing the necessary maintenance of existing transportation infrastructure (e.g., highways, bridges, ports, airports, and passenger and freight rail) to maintain and enhance New Yorkers' mobility, safety, and economic opportunity.

Vision for the Future

Guiding Principles and Strategic Pillars

The boldness of our solutions should match the magnitude of our challenges. The Plan is a call to action, an opportunity for public and private investment in clean energy technologies and resources to boost our economy, create jobs, and protect the environment. New York's transition to a clean economy is a powerful framework for achieving New York's economic development and environmental goals.

The Plan will drive sustainable direct and indirect job growth and local capital investment through the development and deployment of clean energy and transportation resources. Communities will use the development of clean energy systems and infrastructure to drive revitalization. Moreover, a state-of-the-art energy system is an essential element for a high-caliber business environment. A high-quality, affordable energy system will create synergies with the State's emerging high-tech industries (such as nanoscale technology in Albany, optics in Rochester, and solar manufacturing in Buffalo) to retain and attract new businesses to the State. New York can become a major export center for energy innovation and expertise developed by businesses and seeded by academic institutions in the State. A cleaner and safer environment will protect New Yorkers' health and preserve the State's ecosystems and wildlife for future generations.

Guiding Principles

REV, as a core initiative as part of the Plan, is guided by a set of principles that will drive the shift in the State's approach to energy policy. These principles are outlined below and will be applied to the execution of all of the REV elements.

Market Transformation

REV regulatory reforms, initiatives, and programs will focus on market transformation, enabling the entire clean energy supply chain from technology developers to equipment wholesalers to consumers seeking clean energy options, to engage in a new, integrated, and self-sustaining private sector-driven clean energy market. In order to accelerate market transformation, REV initiatives will focus on identifying, mitigating, and removing common market barriers to clean energy deployment (e.g., by reducing soft costs, for instance those related to customer acquisition, permitting, and training), enhancing data sharing and transparency efforts, supporting outreach and education, and encouraging demonstration projects.

Community Engagement

New York is defined by its diverse geography, people, and cultures. Communities across the State—from local towns, villages, and cities, to LMI and Environmental Justice, to academic, business, and industry—will play a vital role in REV. One of the fundamental REV strategies will be for the State to engage with all of these communities, with this engagement running in both directions. NYSERDA, New York Power Authority (NYPA),

the New York State Department of Environmental Conservation (DEC), and other State agencies will provide assistance—and streamlined access to that assistance—to communities and municipalities throughout the State to enable them to develop and implement clean energy solutions that deliver the electricity, heating, water, communications, land-use, and transportation systems that each community values. By embracing a clean energy future, municipalities can achieve meaningful operating savings through energy efficiency and the deployment of other distributed energy resources (DERs). They can also become more resilient by connecting critical facilities to DERs, for instance through innovative community microgrids. For struggling communities, taking a proactive approach toward the development of clean energy resources is a smart economic move that sends a powerful signal of revitalization. New York State is committed to helping its communities and municipalities realize these benefits.

REV envisions community engagement running the other direction as well: communities and their trusted local leaders and stakeholders will serve as important communication and delivery channels to community members, building demand for and scaling deployment of various REV programs and initiatives.

EF·FI·CIENT

adjective \i-´fi-shənt\ : capable of producing desired results without wasting materials, time, or energy.

Efficiency

At its essence, efficiency is about minimizing waste, and the concept of efficiency applies at many levels, all of which are important to REV.

- **Technological Efficiency: a more efficient light bulb or HVAC system requires less energy to produce the same amount of light or heating and cooling.**
- **Building Efficiency: energy efficient buildings incorporate a combination of energy conservation measures in order to waste less energy (both electric and thermal) while delivering the same level of comfort and services to their occupants. Net zero energy buildings are designed to a level of efficiency that enables them to satisfy all of their energy demands (on an annual basis) through on- or off-site clean energy generation.**
- **System Efficiency: improving the energy and capital efficiency of the State's entire electrical grid (e.g., deploying distributed energy resources to modify the system's load shape to reduce peak demand) reduces the need for new delivery infrastructure investments, allowing New York to accelerate its transition to a clean energy economy without overburdening residential, commercial, and industrial ratepayers.**
- **Market Efficiency: in most circumstances, and recognizing the need for appropriate utility sector regulatory oversight, sustainable private sector-driven competitive markets are the most efficient capital allocation mechanisms.**
- **Government Efficiency: more efficient delivery of government energy programs and services means eliminating redundancies, reducing waste, facilitating shared services, and helping State and local governments balance budgets without increasing taxes.**

PRIVATE SECTOR INVESTMENT

It is clear that government and ratepayers cannot fund the cost of New York's clean energy transition alone. By removing market obstacles, REV will facilitate development of competitive markets. These markets will in turn deliver DERs and innovative energy products and services to residents, businesses, and communities across the State. REV will also develop price signals that will better reflect the value of clean energy to the grid, and will guide the market's development of DERs, products, and services in ways that improve overall system efficiency (e.g., by relieving grid congestion points or shifting load profiles). REV will look to increase the leverage of private sector capital investment per ratepayer dollar by working through NYGB to develop innovative public/private partnerships and financing models that bridge clean energy finance market gaps, in order to "crowd in" rather than "crowd out" participation by interested financial institutions. Enabling private capital investment to drive self-sustaining independent clean energy markets is a prerequisite to deliver true scale to the clean energy sector, which in turn is an essential component for meaningful economic development.

INNOVATION AND TECHNOLOGY

REV will align energy innovation with market demand. NYSERDA and NYPA will partner with New York's world-class academic research institutions and the private sector to support the development of not only next generation clean energy technology solutions, but also innovative business and financing models, while training the next generation of talent to support the growth of the clean energy economy. REV will also look to leverage the momentum of broader technology trends, like home automation, home security, and related tech services, to increase penetration of energy efficiency and give consumers insight into and enhanced control over their energy consumption. At the same time, NYSERDA and NYPA will engage with the clean tech innovation sector outside of New York to help import leading and relevant solutions from elsewhere and to help export New York State solutions to receptive markets outside the State.

CUSTOMER VALUE AND CHOICE

REV aims to empower customers and enable the private sector to provide the services and energy options those customers value. Much like the telecommunications industry has developed to offer an extensive range of products and services of which we could not have conceived 20 years ago, REV will enable competitive markets and encourage the entry of private firms to use transparent real-time information to deliver a range of energy related products and services. Residential, commercial, and industrial customers will have the tools to easily and efficiently manage when and how much power they will consume from the grid or distributed resources and at what cost. Energy-intensive and quality-sensitive customers such as manufacturers, university and commercial campuses, hospitals, and data centers will be able to choose to bolster the reliability and resiliency of their energy supply in order to provide business continuity and meet their varying needs.

STRATEGIC PILLARS

REV is comprised of a number of discrete initiatives, actions, and steps (many of which are described below) that together will drive the State's shift to a more market-driven clean energy future and allow for a reduction in collections. While all of these initiatives and actions are potentially highly impactful, REV centers on three strategic pillars:

- **The PSC's Reforming the Energy Vision Regulatory Docket**

- **NYSERDA's Clean Energy Fund (including NYGB and NY-Sun)**
- **NYPA's leadership through operations and programs**

PSC'S REV REGULATORY DOCKET

In April 2014, the PSC commenced the REV regulatory proceeding to reform New York State's electric industry and utility regulatory practices. The REV Regulatory Docket considers an overhaul of New York's utility regulations to give customers greater value from and choice over their energy use, facilitate the rapid expansion and integration of DERs into the State's energy system, and transition clean energy from the periphery to the core of investor-owned utilities' business models. By redesigning price signals, revising utility compensation structures, and opening up access to previously undisclosed data (bearing in mind privacy concerns), the REV Regulatory Docket aims to maximize utilization of all behind-the-meter resources such as demand management, energy efficiency, clean distributed generation, and storage to reduce the need for costly new infrastructure.

Building upon the success of the State's recent regulatory reforms, REV will also aim to further the establishment of robust retail energy markets that recognize and account for the environmental and economic values of energy efficiency and load management. As a result, REV will increase opportunities for existing and new market participants to develop both central and distributed generation resources, which will create value for New York's consumers, more energy sector jobs, and a cleaner energy generation mix.

In December 2014, the PSC approved a first-of-its kind initiative in Con Edison's territory that illustrates certain principles underlying the new regulatory paradigm. Under this program, instead of building a new substation at an estimated cost exceeding $1 billion, Con Edison will be deploying local clean energy resources such as energy efficiency, renewables, and storage to meet system constraints, at a substantially lower total projected cost. This Brooklyn/Queens Demand Management Program serves as a tangible example of how new approaches can create "win-wins." Managing electrical demand (by shifting and reducing consumption) can reduce GHG emissions while improving the efficiency of the overall system and lowering the cost of maintaining the grid for all ratepayers.

While this Con Edison program represents an important step forward in illustrating how clean DERs can offset costly infrastructure investments while simultaneously advancing the State's environmental goals, REV will go a step further. On February 26, 2015, the PSC adopted a regulatory policy framework that will guide a transition for the utilities to play a new role as a distributed system platform (DSP) provider. Rather than choosing solutions and deploying them in a top-down approach, utilities will act as a market platform that enables third parties and customers to be active partners in building a cleaner, more affordable, and resilient energy system. Utilities will provide data, price signals, and system access to enable third parties to innovate and scale clean energy solutions where they can most benefit the system and customers.

Already home to one of the hottest solar markets on the east coast, Long Island will play an integral role in advancing REV's goals. Since the passage of the Long Island Power Authority (LIPA) Reform Act in 2013 and the creation of the DPS Long Island office, regulatory and utility oversight in the region has improved dramatically. Public Service Electric & Gas Company (PSE&G) Long Island, the region's operating utility, has been charged with developing an annual "Utility 2.0 Plan." This document will outline PSE&G Long Island's vision and commitment to reducing costs for its customers, and increasing the

use of energy efficiency, direct load control and demand response, and distributed energy resources. The Utility 2.0 Plan is just part of a series of annual and long-range capital and operating procedures that will serve as a first-of-its-kind model to inspire other utilities around the State to follow suit.

Tangible results of the regulatory changes could include: the emergence of “smart” solar that is not only clean and affordable but also serves as backup during a power outage and participates in grid services; owners of plug-in electric vehicles being paid to support the power grid; and large increases in the market acceptance of energy efficient technologies.

In 2015, the PSC will continue to explore and consider sweeping changes to the utility compensation structure in New York, including new performance metrics and rate plans for utilities and markets to develop a cleaner and more efficient electric system. Critical to this process will be demonstration projects. In a subsequent memorandum and resolution issued in December 2014, the PSC called for private sector entities to partner with utilities to submit proposals for REV demonstrations to advance the development of new utility and third-party service or business models, to gain experience with integration of DER’s into the State’s electrical grid, and identify the regulatory changes necessary to enable a robust marketplace for clean energy products and services here in New York. By so doing, the State is asking relevant market actors to help design and inform regulatory changes and rate structures, in order to provide utilities with the opportunity to learn how best to use these distributed resources in system development, planning, and operations.

NYSERDA’S CLEAN ENERGY FUND

While regulatory changes combined with private sector technology and business model innovations may be sufficient to enable certain segments of the clean energy economy to scale on their own, New York State recognizes that market gaps will remain. NYSERDA will seek to fill those remaining market gaps through the Clean Energy Fund (CEF).

The CEF complements the REV Regulatory Docket to reinforce New York State’s commitment to accelerate the growth of clean energy; improve its economic competitiveness; and protect the environment by reshaping the State’s energy efficiency, distributed renewable energy, and energy innovation programs to reflect a common objective. As proposed by NYSERDA to the PSC in 2014, the CEF would provide $5 billion in new strategic investment in the statewide clean energy economy over 10 years, starting in 2016. The CEF will serve as the primary funding vehicle for NYSERDA’s ongoing and future initiatives.

Over the last few years, New York State has spent more then $1 billion per year from ratepayers, RGGI, and other funding sources to spur the State’s clean energy industry. Over 80% of this spending has been comprised of one-time grants and incentives to reduce the upfront cost of clean energy projects. These investments have been successful in developing a substantial number of energy efficiency and renewable energy projects across the State, but they do not represent the best path to scale and widespread adoption. Under the CEF framework and in order to achieve scale, NYSERDA will gradually transition away from one-time project grants and incentives as its primary deployment tool, toward upstream market-transformative strategies to achieve greater leverage of public to private sector investment. NYSERDA will continue to utilize incentives, but only in well-defined circumstances, such as a bridge to a self-sustaining independent market, or for underserved communities which may take longer to be served by market-based solutions.

The CEF will pursue three long-term outcomes: (a) new market opportunities to attract private capital to invest in clean energy in New York; (b) greater deployment and maturity of clean energy technologies and industries; and (c) significant reductions in GHG emissions. CEF will focus its resources across four portfolios of activity—NYGB, NY-Sun, market development, and innovation and research and development—to spur demand and enable scale by reducing market barriers; catalyzing markets through "bridge" incentives to help them develop self-sufficiency; and influencing policy, codes, and regulations.

NYGB and NY-Sun, NYSERDA's two recent major programs (each of which is described in more detail in the Initiatives and Goals section), exemplify this new approach. NYGB's investments will induce private sector capital investment into clean energy installations throughout the State. Once fully capitalized, NYGB will represent a critical continuing resource for clean energy investment—as NYGB's initial investments are repaid, its capital becomes available for reinvestment into future clean energy projects, and the returns on its investments will enable NYGB to become a self-sustaining entity. NY-Sun takes a similar approach by tracking growing levels of private sector investment in solar. From 2011 – 2013, NYSERDA's solar programs leveraged $347 million in private investment. NY-Sun takes advantage of this activity by utilizing an innovative incentive structure that declines over time as the solar PV industry reaches certain deployment milestones in various regions of the State. NY-Sun will wean the industry off subsidies in a well-defined and transparent manner, providing the market certainty needed for solar providers to make long-term investments to grow their businesses in New York.

NYPA'S LEADERSHIP

NYPA, which provides clean, resilient, and low-cost power to public customers to catalyze economic growth and competitiveness, is well positioned to support the principles and drive the intended outcomes of REV. NYPA recently released its 2014 – 2019 Strategic Vision, outlining its path toward expanding customer energy solutions, modernizing its generation and transmission assets, and aligning its resources, including its workforce, to support the evolution of the energy industry. NYPA's new Strategic Vision will drive its role within REV, informing the deployment of both power supply, and demand side programs and initiatives.

NYPA's power generation assets, and its mandate to promote statewide economic development, provide a strong foundation upon which New York will build a more sustainable and resilient energy grid while driving job creation. Between 2010 and 2013, NYPA's low-cost power programs helped companies commit to retain or create hundreds of thousands of jobs and induced billions of dollars in private investment in the State. ReCharge NY alone resulted in customer cost savings of $60.5 million across the State. NYPA will continue to leverage its hydropower and other supply capacities by exploring innovative financing mechanisms and deployment models for clean energy projects, further stimulating job creation, and economic development.

In addition, NYPA is uniquely positioned to "lead by example" in developing innovative and transparent solutions to reduce energy demand, for which it will hold itself accountable as a model for the rest of the State. Through BuildSmart NY, NYPA continues to make progress toward achieving the Governor's goal of 20% energy reduction by 2020 in State-owned buildings. As part of NYPA's evolution to expand its customer offerings, in 2014 NYPA established NY Energy Manager to provide public facilities with real-time data on their energy use, enabling improvements in building energy performance and facilitating energy efficiency investments. Beyond its work with State-owned buildings, NYPA will

enable markets by working with its municipal and other customers to facilitate clean energy projects and provide “light touch” energy efficiency services, by demonstrating and proving the projects’ potential energy and cost savings, by providing transparent, reliable information and match-making services to customers and clean energy project developers, and by offering financing for municipal clean energy projects. Several new initiatives are already under way that exemplify this ground-breaking customer approach and NYPA’s emerging role as a leader and enabler of private markets.

NYPA is leading by example by investing in advanced smart grid technologies to augment the efficiency, reliability, and resilience of its generation and transmission facilities. Its goal of integrating new technologies to modernize and transform the State’s electric power grid is a critical component of REV and the development of a more customer-oriented, versatile, and robust energy system.

Initiatives and Goals

This Plan Includes Many Distinct Initiatives

They are grouped into the following seven interrelated categories:

- Renewable Energy
- Buildings and Energy Efficiency
- Clean Energy Financing
- Sustainable and Resilient Communities
- Energy Infrastructure Modernization
- Innovation and R&D
- Transportation

All New Yorkers will have more choices.

Like Alan Glustoff, who implemented a solar PV system through Energize New York to support his cheese-making operations at 5 Spokes Creamery in Goshen. Renewable energy resources and initiatives will play a critical role in shaping New York's energy future.

One of REV's hallmarks is a new paradigm of communication and coordination among New York's energy-related agencies and authorities (including PSC/DPS, NYSERDA, NYPA, LIPA, DEC, Department of Transportation [DOT], New York Department of State [DOS], and HCR), which has enabled the development of a single, comprehensive Plan to accelerate New York's transition to a cleaner energy economy. As such, it is important to understand that the following are not a disparate set of initiatives, each operating in a vacuum, but rather a coordinated set of actions and programs that will complement and enhance each other. Taken together, these initiatives add up to REV's comprehensive approach to capture the economic opportunities and environmental benefits of a cleaner New York economy.

The initiatives and actions described below will inevitably evolve as we adopt a continuous improvement (i.e., test, measure, adjust) approach that incorporates periodic assessments to discern what is working from what is not. The State's execution of each initiative will require flexibility and a generally nimble approach to implementation.

Renewable Energy

Conversations about the energy system of tomorrow often start with renewable energy production, and renewable resources will indeed play a critical role in shaping New York's energy future, providing resilient power, reducing fuel cost volatility, and lowering GHG emissions. REV's renewable energy initiatives will aim to accelerate deployment of a broad spectrum of renewable technologies at various scales ranging from rooftop solar PV to grid-scale wind farms, with a consistent emphasis on projects that provide benefits to the grid. Through NY-Sun and other CEF programs, NYSERDA will focus on reducing soft costs of these projects to make renewable energy solutions more competitive in the energy market.

1. Large-Scale Renewables Strategy

New York State has been investing in large-scale renewables (LSRs) since the 1950s, when NYPA developed its first hydroelectric stations. Today, these facilities help power New York's economy, providing low-cost, zero-emissions electricity. While DERs are a major focus of the REV strategy, central generation and transmission will continue to serve as the backbone of our power grid. Pairing LSRs with dynamic DERs such as demand response and energy storage will maximize the benefits of both kinds of resources.

Immediate benefits of LSRs include economic development and jobs for communities across the State, greater stability in customer bills, cleaner air, and compliance with Federal mandates. In the long run, benefits may be similar to those we enjoy from the State's hydroelectric facilities today—below-market electricity prices and a healthier environment.

Since 2004, NYSERDA's current Renewable Portfolio Standard (RPS) program has enabled developers to build nearly 1,900 MW of clean power. This has driven more than $2.6 billion in direct investment in New York's economy over the lifetime of these facilities and has created more than 650 new jobs each year, with statewide benefits exceeding costs by a 5:1 ratio. New strategies can build on this momentum to result in even greater impact at a lower cost.

To accelerate the development of LSRs, NYSERDA has proposed seven design principles for a new program, including:

- Bundled power purchase agreements (PPAs) to reduce costs and electricity price volatility;
- Flexible procurements to increase competition and ensure the selection of the lowest-cost projects;
- Centralized project solicitation and evaluation by a third party;
- Procurements based on planned budgets, system needs, and other considerations;
- New mechanisms to facilitate voluntary market activity;
- Securitization to lower the cost of project debt; and
- A 10-year budget commitment of $1.5 billion to stimulate greater investment in New York and put large-scale renewables on a path to grid-parity, while enabling significant reductions in overall collections.

Modeling and analysis suggest these strategies can reduce cost premiums by $11 – $12/megawatt hour (MWh) relative to current policies and result in 70% – 120% greater deployment for the same level of investment over a 10-year investment horizon. Public investments through this new structure—combined with the incremental voluntary market activity it is designed to stimulate—will play a critical role in meeting New York's clean energy goals and capturing the benefits of LSRs for all customers.

2. NY-Sun Initiative

Designed and launched in 2014, New York State's $1 billion NY-Sun Initiative provides long-term support to the statewide solar industry. Using predictable and transparent declining incentive schedules, NY-Sun will help to create a self-sustaining solar market in New York, with an expected 3,000 megawatts (MW) of solar capacity added to the State's increasingly diversified electricity mix by 2023. Funding and resources will be used to improve access

to the benefits of solar power for all New Yorkers, with $13 million set aside in 2015 for increasing solar deployment among LMI communities. NYSERDA will also help to lower the customer acquisition costs of installing solar through aggregation programs and "solarize" campaigns as part of Community Solar NY, as well as lowering additional soft costs with the PV Training program.

3. K-Solar

NYPA and NYSERDA, in collaboration with the New York State Education Department, and closely tied to Community Solar NY, are providing tools, technical expertise (including free solar feasibility assessments), and access to financing to help K-12 schools cost-effectively go solar. By aggregating hundreds of schools into regional procurement processes, K-Solar will dramatically lower customer acquisition and administrative costs (cost savings that will be passed on to the schools), will help students visualize the science and benefits of solar, and will serve as inspiration for wider community adoption of clean energy. Through May 2015, nearly 270 school districts representing more than 900 individual schools signed up for the program (over 35% of all public school districts in the State). The support provided to school districts through K-Solar is funded by NYPA's Solar Market Acceleration Program (Solar MAP), a $30 million, five-year venture through which NYPA advances solar research and demonstration projects, and reduces soft costs associated with installing solar in public facilities.

4. Shared Renewables

Nationwide, only 22% to 27% of residential rooftop area is suitable for hosting solar PV,[16] leaving a majority of homes without access to the economic and environmental benefits of on-site solar power. Similar technical and structural barriers exist for other renewable energy technologies as well. Earlier this year, NYSERDA and DPS staff began to consult with utilities, clean energy developers, and other stakeholders to develop new community net metering policies to provide customers with the opportunity to participate in Shared Renewables projects in 2015.

Shared Renewables, or community net metering, opens a pathway for customers and entire communities to take advantage of solar and other renewable energy sources for the first time. Interested New Yorkers will be able to participate in local renewable energy projects and receive credit on their utility bills for their portion of the carbon-free power produced. Shared Renewables will also serve as a particularly valuable tool to enhance access to clean energy in LMI communities and will help to ensure all New Yorkers can participate in the State's growing clean energy economy.

5. Offshore Wind Initiative

Offshore wind (OSW) energy has the potential to become a major source of renewable power for New York that strengthens our energy system, reduces GHG emissions, and jumpstarts local economic development. By targeting programmatic and regulatory efforts to create an ecosystem for OSW that enables projects to develop at scale, rather than on a

16. National Renewable Energy Laboratory "Estimating Rooftop Suitability for PV: A Review of Methods, Patents, and Validation Techniques," p. 3. http://www.nrel.gov/docs/fy14osti/60593.pdf

project-by-project basis, New York's strategy will capture OSW's numerous benefits at the lowest possible cost.

New York has already begun laying the groundwork for this ecosystem by conducting a number of studies that inform the State's next steps. Going forward, New York State will take the following actions to advance OSW:

- Work with other Northeastern states to form a regional collaborative and advance a visible market of scale;
- Conduct studies and stakeholder engagement to inform siting and decrease development costs for OSW developers;
- Establish Wind Energy Areas throughout the Atlantic Bight to lower permitting and other administrative costs;
- Study how to recognize and monetize benefits OSW provides to the electricity system; and
- Explore a new financing entity to reduce OSW project costs by providing low-cost capital.

6. Renewable Heat NY / Other Renewable Thermal Technologies

A new generation of advanced technology wood heating equipment has dramatically improved the performance and reduced the emissions profile of wood pellet and cordwood combustion. NYSERDA, in coordination with DEC, launched the Renewable Heat NY Initiative in 2014 as a multi-pronged approach to develop a vibrant and sustainable market for advanced heating technologies. For the next several years, Renewable Heat NY will continue its commitment to: providing support to residential and commercial customers for the installation of advanced wood heating equipment; improving pellet production, storage, and distribution systems; creating a more sustainable forest management and forest products industry; increasing manufacturing, sales, and installation of clean wood heating equipment; supporting R&D efforts to continue advancing the efficiency and emissions profiles of wood pellet and chip heating equipment; and creating new opportunities for workforce training and development.

In addition, NYSERDA will support development of market infrastructure for other renewable heating/cooling technologies and fuels (e.g., solar space and water heating, ground and air source heat pumps). These efforts could include project specific support, providing training and technical support for service providers looking to expand their capabilities, and developing tools and resources to drive consumer demand.

7. Clean Organic Waste Management

Aging infrastructure and the need to reduce GHG emissions and improve resiliency have opened opportunities for the wastewater treatment, agriculture, food processing, and waste management sectors to develop new approaches to treating organic waste. Broad opportunities exist to transform the liability of organic waste into positive energy, environmental, and economic value.

Examples of these opportunities include reducing operating costs at wastewater plants, introducing new revenue streams at farms, and developing community-based energy sources and enhanced resiliency. With these opportunities in mind, NYSERDA and DEC will

work with a subset of New York's largest wastewater treatment facilities to explore models to support their transition toward net energy neutral "water resource recovery facilities." In addition, NYSERDA will work with private partners, regulators, and stakeholders representing the agricultural, food processing, and source separated food-waste management sectors to develop and spur market adoption of innovative and replicable solutions, including anaerobic digester biogas production and use, to deliver operational and energy productivity gains, and additional revenue streams.

8. Sustainable Fuel Production

The Department of Agriculture and Markets, NYSERDA, and DEC will develop a comprehensive, cost-effective strategy to support in-state, sustainable, low-carbon fuel production using agricultural and organic waste feedstock, especially as a substitute for petroleum fuels imported from out-of-state. The agencies' initial focus will be on developing strategies to support the use of organic waste to produce liquid and gaseous bioenergy products.

Buildings and Energy Efficiency

Buildings consume roughly 60% of total energy used in New York State. When buildings use less energy, customers save money and the entire system benefits from reduced strain on our energy infrastructure. These circumstances make energy efficiency (both electric and thermal) the most powerful tool at New York's disposal to achieve the State's aggressive GHG reduction goals. Moreover, in order to maximize the potential benefits of renewable distributed generation resources, end use customers must consume the energy produced in an efficient manner. Finally, targeted efficiency and demand management projects will benefit system efficiency; therefore, REV is particularly focused on electric and thermal efficiency, with a number of initiatives aimed at removing barriers to market adoption of energy efficiency across all market segments and types of building stock, from State-owned buildings, to commercial and residential properties, to affordable housing developments.

9. BuildSmart NY

In 2012, New York State committed to a 20% improvement in energy efficiency in State buildings by 2020, to be administered through the BuildSmart NY Initiative. As the lead agency coordinating BuildSmart NY, NYPA is providing technical assistance, data analysis services, and financing to ensure State buildings meet this goal. This initiative is already saving taxpayers tens of millions of dollars annually through reduced energy costs, while at the same time setting a valuable example for how public and private facilities can benefit from the strategic deployment of both energy efficiency and demand response measures.

10. NYSERDA Energy Efficiency Strategies

While regulatory changes, local laws, and building codes will enable certain energy efficiency services and solutions to scale on their own, NYSERDA recognizes market gaps will persist. Even though investments in energy efficiency can often deliver highly profitable and low-risk returns, barriers to greater market adoption of efficiency do not necessarily relate to project economics.

NYSERDA will seek to address the diverse set of remaining barriers with new programs and strategies that unlock the potential of energy efficiency to reduce operating costs, spur investment, and create jobs throughout the State. Strategies will include benchmarking and building labeling to facilitate measurement and clear comparative disclosure of building energy performance, supporting ongoing workforce training, expanding access to innovative financing tools, serving as a credible information source, helping to demonstrate value propositions, and driving commercial interest toward Zero Net Energy in new construction and renovated buildings. A targeted strategy for on-site renewable thermal solutions to reduce fossil heating fuel consumption will also become part of an integrated approach to promote the efficiency of all sources of energy use within buildings.

To aid in the design and development of these new strategies, NYSERDA has partnered with experts in behavioral science to help inform program planning, including experimentation to ensure it targets the right market gaps with the right interventions to most effectively support a scaled market for energy efficiency.

11. Utility Energy Efficiency Programs

Utility energy efficiency programs will complement NYSERDA's transition under the CEF from a resource acquisition (i.e., incentive based) model to a market transformation approach. To avoid market disruption and prevent backsliding, current utility energy efficiency budgets and program performance targets will be maintained.

Starting in 2016, utilities will design new energy efficiency programs using market-based approaches to drive greater adoption and to provide increased value to customers. Building on the momentum of previous programs, utilities will gradually evolve their strategies to more innovative approaches that align with REV principles to enhance system-wide value by targeting specific system needs; to coordinate with NYSERDA and a larger market transformation plan; and to deploy technologies, tools, and information to facilitate customer load management. Utilities will engage and leverage the efforts of third-party providers, community organizations, local governments, and employers to increase the reach of their new and existing programs.

Current utility efficiency targets represent the minimum that the utilities are expected to achieve going forward. The PSC expects that utility programs established under the REV Regulatory Docket, in addition to NYSERDA initiatives implemented under the CEF, will together achieve statewide energy efficiency savings that exceed current levels. Utilities will be afforded flexibility to enable a nimble response to advances in technology, market signals and REV priorities. Utility programs will provide assurance to market actors that New York remains committed to pursuing energy efficiency gains and supports continuous improvement in the administration of efficiency programs.

12. Energy Efficiency Measures in Affordable Housing Developments

Consistent with the desire to ensure the economic, environmental, and health benefits of clean energy are accessible to New Yorkers most in need, NYSERDA, in conjunction with HCR, will focus on deploying renewable energy in and improving the energy efficiency of the State's affordable multifamily housing stock. In addition to taking immediate steps to expand the reach of existing resources and programs targeted toward these communities, the State

will work to embed systematic changes to affordable housing funding and development processes, including:

- Strengthening efficiency requirements in low-income housing tax credit allocation processes through HCR's Unified Funding Application;
- Reconsidering the utility allowance calculation methodology;
- Developing a standardized green physical needs assessment to inform property owners of the energy saving opportunities available to them upon acquisition, refinance, or recapitalization;
- Supporting low-cost, replicable efficiency measures that can be adopted across affordable housing portfolios;
- Facilitating demonstration projects that incorporate deep energy retrofits into the renovation projects that are typically undertaken to preserve affordable housing stock at the point of refinance or recapitalization; and
- Developing financing alternatives to encourage affordable housing property owners to incorporate efficiency and renewable energy measures into the properties' respective capital events.

13. Combined Heat and Power

More than 500 buildings in New York State already benefit from clean, efficient, resilient, and affordable on-site power produced via combined heat and power (CHP, also known as cogeneration). In addition to daily benefits, CHP kept the lights on at multifamily apartment buildings, hospitals, nursing homes, elementary schools, and college campuses in the aftermath of Superstorm Sandy, Hurricane Irene, and Tropical Storm Lee. CHP has been shown to meet the needs of an individual building and can serve as the heart of a community microgrid.

The PSC is investigating standby tariff policies to ensure that customers who are seeking CHP solutions are supported by appropriate regulations. In the meantime, NYSERDA will continue to support CHP and increase market confidence by vetting equipment, developers, and project designs while expanding customer interest, accelerating uptake, and driving-down soft-costs through standardization. NYSERDA's approach will include rigorously collecting system performance data across the portfolio, use of data analytics to distill compelling design configurations, and demonstrating high-value applications in numerous end-user sectors. These tactics use experience-based learning to guide the market to reduce costs and increase revenues, thereby enabling more projects to meet customers' investment hurdles in light of declining incentive funds.

14. Building Codes

Building codes are a critical strategy for improving the energy efficiency of New York's building stock. Codes address the problematic split-incentive in construction, where oftentimes the party that constructs a building does not benefit from the lifecycle cost-savings of constructing an energy efficient building. To address this split-incentive problem and stay on the cutting edge of building sustainability, DOS will propose an update to the

New York Energy Conservation Construction Code to align with ASHRAE 90.1-2013 and IECC-2015 for both commercial and residential buildings by 2016. Furthermore, to improve compliance and enforcement of the energy code, DOS and NYSERDA will provide in-person and online training for architects, engineers, contractors, and code officials, as well as other support resources such as technical publications. DEC's Climate Smart Communities program will also provide energy code support services for municipalities.

15. Appliance and Products Standards

NYSERDA will work to address supply chain limitations and lack of knowledge of clean and efficient product options that result in a limited supply of efficient products for many equipment/technology categories. Focus will be on helping overcome barriers in the upstream supply chain by working with manufacturers and distributors, forming new partnership opportunities, and providing education, outreach, and training at the retail level. Collaborative efforts by manufacturers, distributors, retail buying groups, and big box retailers will be encouraged to increase market share of targeted novel and important technologies, which will enable adoption of high-efficiency products to reach scale more effectively and result in greater reductions in GHG emissions.

Clean Energy Financing

Insufficient access to financing has been a major barrier to scale in the clean energy sector. New York's taxpayers and ratepayers will not be able to fund the State's clean energy transition alone. The Plan's success hinges upon its ability to animate markets that will attract private capital investment in the envisioned clean energy solutions. The State can, however, provide certain support mechanisms to help induce the required private investment, including the following initiatives.

16. NY Green Bank

Launched in 2014 as a division of NYSERDA, NYGB is a State-sponsored specialty finance entity working in partnership with the private sector to increase investments into New York's clean energy markets. Designed to address gaps and barriers in clean energy financing markets—and to transform those markets as part of the integrated statewide energy transition—NYGB represents an innovative business model at the forefront of comparable institutions nationally and internationally.

To carry out its mission, NYGB utilizes a variety of approaches and transaction structures that are market-focused and responsive. Rather than compete with private sector capital providers, NYGB looks to draw its private sector clients and partners into the marketplace. Overall demand has been robust—as proposals for more than $730 million of NYGB investment have been received, in connection with potential total clean energy investments of between $2 billion – $3 billion (all figures are as of May 31, 2015).

In October 2014, NYGB announced its first seven transactions—agreements in principle reached with global and statewide clients and partners. NYGB's $200 million investment in this initial set of transactions will be recouped over time and available for reinvestment into new clean energy projects in the future, consistent with NYGB's overall

business model, which is based on recycling capital into successive investments over time, effectively leveraging each dollar of ratepayer funding for the benefit of all New Yorkers. Simultaneously, NYGB support for and involvement with several of these previously announced deals have allowed our partners to secure funding from additional financing institutions—demonstrating NYGB's ability to drive market transformation at multiple project stages through crowding in private sector capital providers.

17. Property Assessed Clean Energy

NYSERDA, through its non-profit partner the Energy Improvement Corporation, will continue to work with municipalities in New York State to drive local enabling legislation and adoption of Property Assessed Clean Energy (PACE) financing. PACE financing allows commercial properties in participating municipalities to secure low-cost financing for clean energy projects, funded by private capital sources and repaid through the properties' respective tax bills.

Sustainable and Resilient Communities

Communities are the heart of New York and will play a central role in the REV strategy by serving as entry points for widespread adoption of clean energy. There are 4,720 local governments in New York, including cities, towns, villages, and special districts that provide police, fire, and other public services. Participating in the REV transition to more sustainable local energy systems will help revitalize these localities by saving money, creating jobs and driving environmental and quality of life improvements. Recognizing the current constraints on community-level capacity and resources, REV will simplify and encourage community entry into clean energy and climate programs, by facilitating access to program information and energy data that will help localities make informed energy and smart growth planning decisions and by building peer-to-peer networks that will encourage idea-sharing and transfer of best practices. The State will also provide technical guidance and access to financing to enable communities to translate their clean energy plans into reality by deploying the distributed energy resources that best fit each community's specific needs. Finally, REV will help localities leverage their DER investments to lead by example and demonstrate the benefits of clean energy projects to local residents and businesses.

18. NY Prize Community Microgrids Competition

NY Prize is a first-in-the-nation, $40 million competition to engage communities in advancing plans for local power and resilience. The competition offers awards in three stages: feasibility studies, audit-grade design, and project build. The competition challenges local communities, businesses, entrepreneurs, and electric utilities to design and implement community-based microgrids. Since launching in early 2015, NY Prize has received more than 100 initial applications from every region across the State.

By spurring innovation and community partnerships with local municipalities and the private sector, NY Prize will ensure that vital community assets—such as hospitals, police stations, and schools—stay up and running during future extreme weather events. These

community-led projects will also improve energy affordability for consumers and efficiency for the surrounding power grid. For the first time, the NY Prize "Opportunity Zone Map" has made public the approximate geographic areas that have been identified by local electric distribution companies as locations where microgrids and distributed energy resources may reduce utility system constraints and defer expensive infrastructure investment costs. Community microgrid infrastructure will serve as a foundation for REV objectives, helping communities reduce energy costs, promote clean energy, and build reliability into the electric grid.

19. Five Cities Energy Plans

In 2014, Governor Cuomo launched the Five Cities Energy Plans, an innovative example of State-local collaboration enabling five of the largest cities in the State—Albany, Buffalo, Rochester, Syracuse, and Yonkers (collectively, the Five Cities)—to address their energy priorities and challenges. Working with NYPA, each of the Five Cities has developed a comprehensive energy master plan. NYPA will continue to assist the Five Cities in the execution of their respective energy plans, which will reduce their municipal energy consumption at least 20% by 2020, joining the State in reaching the goals outlined in BuildSmart NY. Just as importantly, the plans provide a roadmap for each city to strengthen the reliability and resiliency of its energy infrastructure, catalyze clean energy investment and economic development, and contribute to a cleaner environment and better quality of life, in concert with private and non-profit stakeholders city-wide.

NYPA will help ensure the cities' successful implementation of the previously developed energy plans by funding an Energy Manager position for each of the Five Cities for five years. Each city's Energy Manager will receive a budget to execute their energy plan's strategies and will have access to information sharing, technical assistance, and "start-up" funding to get energy efficiency and other measures under way quickly. Successful implementation of these plans across the Five Cities is expected to save as much as $400 million annually.[17]

As the next phase in NYPA's Five Cities planning process, NYPA will provide up to $20 million to the most forward-thinking and innovative of the Five Cities in a "Race to the Top" competition. The first round of grants expected in 2015 will award the most advanced cities and showcase innovation and excellence in clean energy deployment and the use of public-private partnerships. NYPA will also create an in-house position to serve as the State's primary point of contact for the Five Cities and other municipalities, which will be able to identify and provide streamlined information and access to State clean energy resources.

20. New York State Community Partnership

NYSERDA, working with and through local governments and organizations, and in close collaboration with NYPA and other State agencies, will implement the New York State Community Partnership (NYSCP), a coordinated approach to drive clean energy action in communities across the State. The approach will better align existing assistance aimed

17. Happold Consulting conducted an analysis of the Five Cities' annual energy usage and related costs reflecting the varying sources of energy for each city. Assuming a 20% reduction in energy use city-wide, the analysis estimated up to $400 million in combined savings annually.

at communities and provide a common point of local access to State energy tools and programs. NYSCP will also develop new interventions and opportunities for local leaders and community stakeholders to take advantage of packaged clean energy resources that will help them save energy costs, stimulate their local clean economies, and reduce GHG emissions.

In so doing, the NYSCP will scale elements of the successful State-local collaboration of the Five Cities model by providing all New York State communities with the technical support, policy expertise, and enabling tools that will allow them to address their energy needs. These resources will be aimed at helping localities take simple and cost-effective steps to invest in clean energy to accomplish their specific goals and pave the way for wider private sector adoption of energy efficiency and renewable energy generation resources.

NYSERDA's Cleaner, Greener Communities Program currently supports sustainability planning and projects throughout New York State, and more than 150 New York communities are participating in DEC's Climate Smart Communities program. The NYSCP will integrate these and other ongoing community initiatives into a new delivery framework. These initiatives will support the objectives of the NYSCP by providing local governments with additional resources and clear adoption frameworks through which they can accomplish their clean energy and climate objectives, earning recognition for their achievements as they do so.

21. REV Campus Challenge

The REV Campus Challenge is a joint NYSERDA-NYPA initiative to encourage and recognize New York institutions of higher education that are taking clean energy ideas from the classroom and putting them to work—both on campus and in their communities.

Just as the NYSCP will interface with municipalities and local organizations to support community-oriented clean energy solutions throughout the State, the Campus Challenge will work with and through institutions of higher learning to advance clean energy solutions based on values and priorities that the State's colleges and universities share with their respective local communities. The Campus Challenge will provide participants with streamlined tools, resources, and technical assistance to help them succeed, augmenting in-house expertise and knowledge with State support to turn sustainability ideas into action. It will also identify and publicly recognize colleges and universities that have made the greatest strides along a number of criteria related to on-site sustainability, innovation, and community clean energy engagement.

22. Community Choice Aggregation

Community Choice Aggregation, or CCA, is a mechanism for municipalities and the residents and businesses they serve to take unprecedented levels of control over their energy purchasing and usage. At its basic level, CCA allows a municipality to aggregate the customers in its territory (on an opt-out basis) and solicit bids from third-party energy retailers competing to provide power to the community. Participating CCA communities can prioritize the purchase of clean, renewable power and potentially secure lower or less volatile energy costs through group purchasing and fixed-price contracts. DPS approved the first pilot of CCA in New York State in early 2015, which enabled cities and towns in Westchester County to advance CCA projects. The Westchester CCA pilot will inform the PSC's ongoing proceeding to consider enabling implementation of CCA on a statewide

basis. The State will also actively explore a more advanced form of CCA, often referred to as CCA 2.0, wherein municipalities would take a proactive role, in partnership with their local utility, in planning and designing community-scale deployment of distributed energy resources, as well as implementing collective energy procurement strategies.

23. Smart Growth Initiative

Smart growth and transit-oriented development (TOD) have many benefits, including improved quality of life, reduced commuter times, and reduced energy use and GHG emissions. By promoting compact, mixed-use design in downtown areas served by robust public transit systems, smart growth and TOD can reduce dependence on personal vehicles and can revitalize urban areas.

The State will implement a multi-faceted approach to facilitating and unlocking private sector investment in smart growth. DOS will continue to support the development of smart growth plans that incorporate principles contained in the New York State Smart Growth Public Infrastructure Policy Act of 2010. NYSERDA, Empire State Development (ESD), HCR, and DOT will provide investment incentives for smart growth and TOD projects that align with regional and local sustainability plans developed with NYSERDA support. Finally, an inter-agency TOD Working Group led by DOS will identify and coordinate the development of programs to further support TOD related to areas such as: land-use planning, housing, economic development, tax policy, and connecting TOD developments with parks and nature trails.

24. Access Floodplain Data

The New York State Climate Change Science Clearinghouse, currently under development with NYSERDA, will provide users with immediate, interactive access to the best available FEMA floodplain maps. The Clearinghouse's ability to overlay digital flood insurance rate maps with other data, including DOS's coastal risk maps, will give utilities and emergency preparedness groups a common platform for designing hazard mitigation and response plans. DEC, in consultation with DOS, will provide guidance on the use of flood-hazard maps, climate-change information, and resilience design criteria as a part of the guidance it prepares pursuant to the Community Risk and Resilience Act.

Energy Infrastructure Modernization

New York's aging energy transmission and distribution infrastructure requires substantial investment in repair and modernization over the coming years. As previously noted, central generation facilities will continue to be the foundation of the State's energy system for the foreseeable future—the transmission network must be well maintained, secure, and in some cases enhanced in order to provide reliable service and to accommodate the addition of new large-scale renewable resources. The Plan will guide this required investment toward projects that improve overall system efficiency. The REV Regulatory Docket will also overhaul local distribution systems by establishing a Distributed System Platform (DSP) in each investor-owned utility jurisdiction. These infrastructure initiatives will modernize our energy delivery system to improve safety and reliability, reduce GHG emissions, and stimulate economic development.

25. Energy Highway

New York's Energy Highway Blueprint is upgrading and modernizing New York's electric grid to deploy greater levels of renewables, increase capacity, and improve flexibility. The Blueprint includes 13 action items, half of which have been completed, with the remainder in progress. Transmission projects to reduce congestion from upstate to downstate and prepare for potential power generator retirements are moving forward with in-service dates in summer 2016. Proposals to upgrade the transmission system are being evaluated, with guidance to minimize or avoid community impacts. DPS is holding a technical conference on these proposals in July and planning to complete its evaluation by year-end.

26. Smart Generation and Transmission

Through a series of projects and investments, NYPA is transforming New York's energy infrastructure into a modern, flexible, and resilient power grid. Investments include the integration of sophisticated software and high-speed fiber optics to create best-in-class power-grid protection and control. NYPA is also addressing congested transmission lines in Central NY to allow additional energy to flow to the downstate region as part of the Energy Highway Blueprint with the Marcy-South Series Compensation project, being built in collaboration with NYSEG. This smart-grid project will enable an additional 440MW of power flow without new lines or rights-of-way by summer 2016. In 2015, by pursuing such breakthrough initiatives as Substation Automation Modernization and Controls, Flexible Alternating Current Transmission System upgrades, and Dynamic Thermal Circuit Ratings technology, NYPA will continue to invest in and provide technical resources to smart generation and transmission projects as part of its Strategic Vision.

27. Distribution System Platform Providers

As part of the REV regulatory docket, clean energy integration will become a core business function of utilities serving as the distribution system platform (DSP) providers. New York's evolving grid will rely on greater investment in distributed energy resources—clean, local power to provide reliability and resiliency benefits to individual customers and communities and to strengthen the entire energy system. Rather than picking and choosing solutions, utilities will act as a market platform for third parties and customers to actively engage with in building a clean, resilient, and more affordable energy system. Utilities will provide data, price signals, and access to spur innovation and support wider-scale adoption of clean energy solutions where they can most benefit the system and customers as a whole.

28. Reduce Reliance on Petroleum Heating Products

DPS and utilities are developing programs to encourage customer conversions from carbon-intensive petroleum products, such as #6 heating oil and other distillate fuels, to cleaner fuel alternatives, while emphasizing the use of high-efficiency heating equipment. Home heating applications using petroleum distillate fuels produce higher levels of carbon dioxide, sulfur dioxide, and particulate matter than natural gas or renewable thermal solutions and can adversely affect the health of their surrounding communities. Due to the infrastructure costs associated with increasing access to cleaner heating alternatives, DPS will utilize regulatory approaches to align these activities with the State's environmental policy goals.

29. Limit Methane Emissions

Given the State's use of natural gas in meeting its electric and thermal needs, DPS is updating its regulations and ratemaking processes to require gas utilities to accelerate replacements of leak-prone pipelines, map and publish known leaks online, and strengthen public awareness campaigns encouraging the public to report gas odors for investigation. Further, DEC will work with other agencies, as appropriate, to develop standards to reduce methane emissions that will complement Federal regulations under development.

30. Emissions Standards for Clean Distributed Resources

New York's future energy system will increasingly rely on distributed energy sources to reduce costs to the consumer and improve power reliability. While these resources could include emitting sources powered by natural gas or diesel fuel, new emissions standards will ensure priority is given to clean and non-emitting generation and thermal energy sources such as solar power and ground/air source heat pumps. DEC will establish regulatory standards to foster increased use of distributed energy resources and to ensure that those DERs do not jeopardize air quality.

31. Strengthen Cyber Security

DPS will convene a utility industry focused "Cyber Security Summit" in 2015 to identify best practices and next steps related to timely sharing of information and coordination in response to cyber threats.

32. Low-Cost Power for Economic Development

Governor Cuomo's ReCharge NY, Western NY, and Preservation Power programs provide resilient, low-cost power to reduce electricity costs for businesses that commit to job creation and capital investments in New York. Combined, these programs created or retained more than 400,000 jobs from 2010 – 2014 and leveraged more than $30 billion in cumulative private investment. NYPA has set a goal to grow this number to more than $35 billion in 2015.

Innovation and R&D

Harnessing cutting edge business models and technology solutions from the private sector, research institutions, and entrepreneurs is a fundamental component of REV. Programs to support innovation and R&D will enable New York to accelerate adoption of tomorrow's energy solutions within the State's energy system, while also attracting jobs and investment to New York as a global capital for clean tech. State R&D support will focus particularly on energy storage, smart grid technologies, and other products that will facilitate and reduce the cost of New York's transition to a REV-based energy system. Market-based demonstrations of innovative utility/third-party business models will play an important part in the design and evolution of the REV end state.

33. Core Innovation and R&D

NYSERDA will continue its investments in energy innovation to deliver market-ready solutions that can produce meaningful reductions in GHG emissions and provide for greater energy affordability, system resiliency, and consumer choice. These investments facilitate the development, commercialization, and market entry of new clean energy technologies, and aim specifically to grow the clean energy market sector in New York. NYSERDA's comprehensive innovation/R&D strategy includes: direct investment in both early-stage and more advanced-stage clean energy companies; development of sustainable multi-use assets in the State; and engagement with key stakeholders such as researchers, established corporate entities, and the investment community.

NYSERDA's direct innovation investments help recipients determine technical/business feasibility, assess market opportunities, achieve key product development milestones, and validate new technologies at scale in "real world" applications. Strategic investments in statewide multi-use assets provide business incubation, manufacturing support, mentorship, and access to private sector investors and potential development and commercialization partners. This enables key sectors in New York to reduce energy use and emissions, and facilitates wider adoption of low-carbon energy sources. Specific outcomes include more efficient and load-flexible buildings, a more resilient and adaptive grid, a cleaner transportation system, greater penetration of distributed energy resources, and a growing and vibrant clean energy business ecosystem. Taken together, these investments will result in the deployment of the next generation of clean energy products and solutions that advance REV principles and address the State's key environmental, energy, and economic challenges.

34. REV Business Model Demonstrations

In December 2014, the PSC formally issued a challenge to utilities and technology and clean energy innovators to come forward and introduce groundbreaking new solutions that illuminate the REV future, improve customer value, create jobs, and lower emissions. These demonstration projects will show how new products and services can capture latent value on the grid, and how new business models can monetize and distribute that value among customers, third parties, and utilities. New York's investor-owned utilities have been directed to partner with third parties to develop a first round of REV demonstration projects by July 1, 2015. These projects will inform utilities' future business models as well as required regulatory changes. After July 1st, the utilities will continue to undertake demonstration projects until these kinds of products and services are fully integrated into core system operations. As projects are approved and deployed over the coming months, New Yorkers will start to see what tomorrow's energy system looks like today, with new advancements in sectors such as home automation, renewable energy, storage, and other technologies making their global debuts here in New York.

35. Energy Storage R&D and Commercialization Through NY-BEST and Brookhaven National Laboratory

Before new business models can be crafted to deliver innovative energy solutions, first they must be developed and commercialized. Energy storage technology will play a critical role in the REV energy future by helping to improve reliability, reducing peak load, and enabling greater integration of intermittent renewable resources such as solar and wind. In addition,

energy storage can be deployed within microgrids to enhance resiliency, help prevent damage, and allow critical facilities to continue operating during extreme weather events.

New York is actively engaging with experts in the energy sector to establish the energy storage technologies and business models that will support the future grid. This includes researchers at academic institutions, R&D facilities, and complementary initiatives being run through the New York Battery and Energy Storage Technology Consortium (NY-BEST) and Brookhaven National Laboratory (BNL).

NY-BEST was established in 2009 with $25 million in seed funding through NYSERDA to position New York State as a leader in energy storage solutions. NY-BEST has grown to include over 140 organizations ranging from Fortune 500 companies to startups and universities.

NY-BEST helps grow New York's energy storage sector by facilitating new partnerships among its diverse membership of technology developers, systems integrators, and electric utilities to validate new technologies, remove regulatory impediments, and increase deployment. In 2014, the NY-BEST Test and Commercialization Center opened in Rochester as one of the few locations in the country able to independently validate the performance of new storage technologies in one location. Future NY-BEST priorities will focus on increasing cost-effective energy storage solutions for the electric grid and heavy duty transportation applications (electrified rail, subway, and buses), as well as expanding the NY-BEST Test Center to provide system safety testing.

To accelerate research efforts and expedite the deployment of battery storage across the State, New York will also commit a total of $65 million to BNL to allow commercial developers to test battery and storage research in real time, provide better information on how intermittent and stored power fluctuates on the grid, and take advantage of BNL's internal grid and Stony Brook University's research in this field.

These partnerships will ensure New York remains the nation's leader for clean energy and battery storage R&D, encouraging homegrown innovation to promote economic development opportunities while helping mitigate global climate change.

36. Advanced Grid Innovation Laboratory for Energy

The global smart grid market is estimated to grow to $400 billion by 2020, and will provide many of the solutions powering the grid of tomorrow.[18] To support the development of these solutions and establish New York State as a global hub for advanced grid technology, NYPA, in collaboration with SUNY Polytechnic Institute Colleges of Nanoscale Science and Engineering (CNSE), will invest $35 million in the new Advanced Grid Innovation Laboratory for Energy (AGILe) in the Capital Region.

This state-of-the art laboratory will leverage the successful business model of CNSE—public-private collaborative research and flexible intellectual property management—in an open innovation and commercialization hub that will be publicly owned and managed. The facility will be a dynamic ecosystem of innovation R&D focused on deploying technology

18. David Groarke, Ben Kellison, and Zack Pollock, "Global Smart Grid Technologies and Growth Markets 2013-2020," Greentech Media Research (July 25, 2013). Available at: http://www.greentechmedia.com/research/report/global-smart-grid-technologies-and-growth-markets-2013 – 2020

and supporting the REV vision by attracting private sector technology companies in the energy, information, and communications sectors. AGILe participants will strengthen New York's vibrant clean energy industry by commercializing technology products and services while creating a new generation of high-paying, energy-related technology jobs. AGILe will complement New York's existing array of resources supporting clean and advanced energy technologies, including the New York State Smart Grid Consortium (NYSSGC), NY-BEST, and NYSERDA's ongoing R&D/Innovation programs.

AGILe will represent a quantum leap forward in realizing the full value of integrating central generation and transmission with distributed energy resources. This initiative will demonstrate how ongoing collaboration between academia, government, and the private sector can bring about innovative solutions to complex challenges.

37. Southern Tier Clean Energy Business Competition

New York State is rapidly establishing itself as a national leader in clean energy innovation and investment. To advance and accelerate this progress, NYSERDA will launch 76West, a $10 million clean energy business competition to catalyze new employment opportunities with an additional $10 million for clean energy business support services in the Southern Tier. The competition will take advantage of the region's burgeoning advanced manufacturing sector, strong energy research and tech-transfer capabilities, first-class academic institutions, as well as business training and improvement programs already in place.

This exciting competition will attract investment and ideas from around the world to the region. As part of the competition, entrepreneurs and companies will be challenged to present their ideas and compete for funding, technical assistance, and other business services.

Transportation

Transportation accounts for 34% of the State's GHG emissions, and $26.7 billion in fuel costs each year. Building a cleaner, more efficient, and sustainable transportation system is a critical component of the State's energy strategy. A cleaner transportation system will include more vehicles using clean transportation fuels (especially plug-in electric vehicles [PEV]) on the road, public transportation systems that use less energy per passenger mile and provide enhanced service to a broader customer base, transportation management infrastructure that integrates the latest communications technologies to enhance traffic flow, and clean fuel infrastructure that supports and scales the use of these new technologies. The build-out of this infrastructure and technology will be complemented by policies and programs that encourage the use of alternative transportation modes and better trip planning to reduce GHG emissions. The following initiatives will enable New York State to engage private capital to fund the transition to cleaner vehicles and to build the market for investment in a cleaner and more efficient transportation system. In addition to these initiatives, New York State recognizes that coordinated actions with our neighboring states offer significant potential to transform the transportation sector, as it has transformed the electric generation sector through RGGI. To meet its 2030 GHG reduction targets, New York State will look for opportunities to join with other states to implement successful regional solutions to the emissions reduction challenges in this sector.

38. ChargeNY

The ChargeNY initiative seeks to build a bridge to a self-sustaining market for PEVs. NYSERDA, NYPA, and DEC will collaborate to advance ChargeNY's goal of 3,000 PEV charging stations to support an expected 40,000 PEVs on the road in New York by 2018. Since the program's inception in 2013, New York has undertaken activities such as:

- Supporting the installation of nearly 500 charging stations (bringing the statewide total to more than 1,100);
- Implementing the multi-state Zero Emissions Vehicle Action Plan, which New York helped develop in May 2014;
- Supporting projects that demonstrate new policies and business models for PEVs and charging stations that enhance their value propositions;
- Developing best practices guides for municipal regulation of charging stations, such as permitting, zoning rules, and building codes;
- Reducing regulatory obstacles preventing parking lot owners from installing charging stations;
- Encouraging utilities to implement voluntary time-of-use tariffs to promote vehicle charging at times of least impact to the grid; and
- Educating electricians, code inspectors, and municipal planners about PEVs and charging stations.

New York will continue encouraging market growth through new programs, including:

- Lowering the total installation cost of charging stations through tools such as bulk purchasing collaboratives, coupled with targeted purchase incentives;
- Engaging and encouraging the private sector, such as employers and car dealers in the PEV market to more directly collaborate and promote PEVs to their employees, customers, and the general public;
- Expanding access to fast PEV charging on major travel corridors;
- Establishing consistent building codes and standards that make it cheaper and easier to install PEV charging infrastructure; and
- Integrating PEVs into the State fleet and encouraging State agencies to offer workplace charging to employees.

39. Clean Fleets NY and Innovative Ownership Models

Governor Cuomo has made a strong commitment to support the adoption of clean vehicles through the ChargeNY initiative and the multi-state ZEV Memorandum of Understanding (MOU). But these vehicles are no longer just a part of the future; they are on the roads in New York today, already reducing fuel and maintenance costs for thousands of drivers while also reducing emissions and improving air quality.

In light of innovations in clean vehicle technologies and business models, New York State is committing to lead by example with select agency vehicles through Clean Fleets NY. In 2016, DEC, NYPA, and NYSERDA, among other agencies and as part of a pilot program, will ensure that at least 50% of new, administrative-use vehicles will be ZEVs, including battery electric, plug-in electric hybrid, or hydrogen fuel cell vehicles. These agencies

will initiate a pilot to explore innovative ZEV acquisition models (such as leasing) to take advantage of Federal tax incentives and lifecycle savings to reduce costs. This program will serve as a model to inform procurement decisions throughout State agencies.

Local governments will be encouraged to adopt similarly innovative arrangements and save money through New York State's Climate Smart Communities program, which will facilitate the aggregation of purchases and provide procurement templates; an education campaign; and a unified point of contact for municipalities, vendors, vehicle manufacturers, and leasing companies.

40. Financial Mechanism to Capture Value of Alternative Transportation

Increasing investment in alternative clean transportation infrastructure that supports increased use of bicycle, pedestrian, public transit, and intercity passenger rail modes can reduce the consumption of petroleum imported from out-of-state. DOT, NYSERDA, and DEC will collaborate with other states in the region through the Transportation and Climate Initiative to develop innovative financial strategies that would capture the value from increased local economic activity as a result of reduced consumer spending on petroleum fuels imported from out-of-state. Potential mechanisms to reap this "clean transportation dividend" that could be evaluated include a market-based program like RGGI or a bond issuance that would be repaid out of increased income tax revenues attributable to the clean transportation dividend.

41. Smart Mobility through Improved Information and Communication

Optimizing how travelers, vehicles, and transportation infrastructure communicate can significantly reduce fuel consumption and emissions. Tested technologies, such as those that provide travelers with information about alternative routes or synchronize traffic signals, have already shown the potential to save fuel and reduce travel times. Emerging technologies, such as sensors on city streets and vehicles that are designed to communicate with the infrastructure and with each other, offer additional promise for fuel savings.

Work under way includes DOT's 511NY program, a free comprehensive traveler information system and mobile app. DOT will enhance the newly designed app by expanding the use of real-time data to help travelers avoid congestion, maximize use of transit and rideshare options, and be alerted to air quality conditions.

Moving forward, NYSERDA will work with DOT and other partners to develop and demonstrate new technologies through collaborations with private sector leaders to build smart and efficient mobility into the State's transportation system. Partners will seek to implement and test large-scale demonstration projects, which if successful, can lead to broader integration of cutting-edge information technologies.

42. Efficient Public Transportation

Public transportation and electric rail present major opportunities for transportation energy savings. The New York City subway system is the largest consumer of electricity in the NYC metropolitan area (more than 2 billion kWh annually), a significant portion of which is lost due to aging equipment and infrastructure. NYSERDA, Metropolitan Transportation Authority (MTA), and NYPA will collaborate with private sector partners to develop new

energy-saving products, as well as test and validate existing products focused on reducing the MTA's energy use.

43. Expanding Transportation Demand Management Programs

Transportation Demand Management (TDM) is the application of strategies and policies that emphasize the movement of people and goods, rather than motor vehicles, and gives priority to walking, cycling, ride and bike sharing, public transit, and telecommuting. NYSERDA and DOT will support the growth of shared mobility providers and the implementation of bicycle- and pedestrian-friendly street design policies through collaborations with municipalities, metropolitan planning organizations, and large employers. NYSERDA, NYPA, DOT, MTA, and other public transportation agencies will support the development and demonstration of products that reduce operating costs for smaller transit agencies and help expand service to more customers.

Clean Energy Goals

The 2015 State Energy Plan establishes three statewide clean energy targets to be met by 2030.* Yet, government cannot meet these ambitious objectives on its own. The initiatives outlined in this Plan will reduce approximately half of the emissions targeted for 2030. REV, as a policy framework designed to jumpstart innovation and investment and create economic incentives for entrepreneurs and industries to build a clean energy future, will place New York on a solid pathway to realize the balance of these goals. Together, public institutions working with and alongside private sector markets can deploy the levels of energy efficiency and renewables necessary to accomplish our economic and environmental goals.

Since 1990, New York State has reduced its emissions by 12%. We must keep moving forward. To ignite movement and support our collective ability to achieve these new goals, New York State will commit to progressive energy regulatory changes, dedicate $5 billion in new strategic investment through the Clean Energy Fund, and execute on each of the initiatives included in this Plan.

* In comments filed with EPA on the Clean Power Plan, New York State agencies noted the emission reduction goal identified in the draft State Energy Plan would require significant advances in policy, regulation, and market developments across the entire energy sector, including the transportation and building sectors not covered by EPA's proposal. Some of the strategies to reduce emissions from the transportation and building sectors could put upward pressure on the Clean Power Plan's electricity sector target for New York as the State moves toward greater electrification. New York has therefore urged EPA to avoid setting a Clean Power Plan target at a level that inhibits the State's ability to obtain the most cost-effective reductions needed economy-wide. Although the targets that are included in this final State Energy Plan for energy efficiency and renewables will achieve substantial emissions reductions from the electricity sector, these energy sector targets should not be construed by EPA to be enforceable requirements to be embodied in EPA's Clean Power Plan target for New York.

New York's 2030 Targets

40% REDUCTION IN GHG EMISSIONS FROM 1990 LEVELS

Reducing GHG emissions from the energy sector—power generation, industry, buildings, and transportation—is critical to protecting the health and welfare of New Yorkers.

50% OF ELECTRICITY GENERATION FROM RENEWABLE ENERGY SOURCES

Renewable resources, including solar, wind, hydropower, and biomass, will play a vital role in reducing electricity price volatility and curbing carbon emissions.

600 TRILLION BTU INCREASE IN STATEWIDE ENERGY EFFICIENCY

Energy efficiency results in lower energy bills and is the single most cost-effective tool in achieving clean energy objectives. Six hundred trillion British thermal units (Btu) in energy efficiency gains equates to a 23% reduction from 2012 in energy consumption in buildings.

REV will provide the foundation to unlock the power of private capital and competition to grow the clean energy economy, meet the Plan's 2030 targets, and build a healthier and stronger New York.

For the people of New York, tomorrow is bright, because we're acting today with the energy to lead.

Abbreviations/Acronyms

AGILe
Advanced Grid Innovation Laboratory for Energy

ASHRAE
American Society of Heating, Refrigerating, and Air-Conditioning Engineers

BNL
Brookhaven National Laboratory

Btu
British Thermal Unit

CAFE
Corporate Average Fuel Economy

CCA
Community Choice Aggregation

CEF
Clean Energy Fund

CHP
Combined Heat and Power Generation

CNSE
SUNY Polytechnic Institute's Colleges of Nanoscale Science and Engineering

CO_2
Carbon Dioxide

CON EDISON
Consolidated Edison Company of New York

CUNY
City University of New York

DEC
New York State Department of Environmental Conservation

DER
Distributed Energy Resources

DOE
U.S. Department of Energy

DOH
New York State Department of Health

DOL
New York State Department of Labor

DOS
New York State Department of State

DOT
New York State Department of Transportation

DPS
New York State Department of Public Service

DSP
Distributed System Platform

EEPS
Energy Efficiency Portfolio Standard

EPA
U.S. Environmental Protection Agency

ESD
Empire State Development

GHG
Greenhouse Gas

HCR
New York State Homes and Community Renewal

HVAC
Heating, Ventilation, and Air Conditioning

IECC
International Energy Conservation Code

kWh
Kilowatt-Hour

LIPA
Long Island Power Authority

LMI
Low-to-Moderate Income

MMBtu
One Million British Thermal Units

MOU
Memorandum of Understanding

MTA
Metropolitan Transportation Authority

MW
Megawatt

NGO
Non-Governmental Organization

NO_x
Nitrogen Oxides

NY-BEST
New York Battery and Energy Storage Technology Consortium

NYISO
New York Independent System Operator

NYGB
NY Green Bank

NYPA
New York Power Authority

NYSCP
New York State Community Partnership

NYSEPB
New York State Energy Planning Board

NYSERDA
New York State Energy Research and Development Authority

OSW
Offshore Wind

OTDA
New York State Office of Temporary and Disability Assistance

PACE
Property Assessed Clean Energy

PEV
Plug-In Electric Vehicle

PLAN or SEP
New York State Energy Plan

PSC
New York State Public Service Commission

PSE&G

Public Service Electric & Gas Company

PV or SOLAR PV
Solar Photovoltaic, also known as solar electric

R&D
Research and Development

REV
Reforming the Energy Vision

RGGI
Regional Greenhouse Gas Initiative

RPS
Renewable Portfolio Standard

SO_x
Sulfur Oxides

SOLAR MAP
Solar Market Acceleration Program

SUNY
State University of New York

TBtu
One Trillion British Thermal Units

TDM
Transportation Demand Management

TOD
Transit-Oriented Development

ZEV
Zero-Emissions Vehicle

Glossary

A

Alternative Fuel Vehicles
Vehicles that use fuels other than gasoline or diesel. Alternative fuels include electricity, natural gas, propane, ethanol, vegetable- and waste-derived fuels, and hydrogen. These fuels may be used in a dedicated system that burns a single fuel, or in a mixed system with other fuels including traditional gasoline or diesel, such as in hybrid-electric or flexible fuel vehicles.

B

Bioenergy
Biomass and its derivative products, such as biogas and liquid biofuels, are organic, non-fossil plant materials initially produced through photosynthesis that are collectively known as bioenergy and may be liquid, solid, or gaseous.

Biogas
The gasified product of biomass or the methane produced from the anaerobic decomposition of biomass from sources such as landfills, wastewater treatment plants, farms with manure and other agricultural byproducts, and food processing facilities.

Biomass
Solid organic, non-fossil plant materials initially produced through photosynthesis. The types of biomass are diverse and can include wood and scrap forest materials; waste material from the forestry, food, and pulp and paper industries; specialized energy crops; and crops such as corn, sugar cane, and soybeans.

British Thermal Unit (Btu)
The amount of heat required to raise the temperature of one pound of water one degree Fahrenheit. This unit provides a common denominator for quantifying all types of energy on an equivalent energy content basis.

C

Capacity
The maximum capability of an energy system or component of that system to either produce or move energy at or within a specific time frame. Within the context of electricity, capacity is commonly expressed in megawatts (MW), and means the maximum amount of power that can be generated at any given time. Natural gas capacity usually refers to the maximum cubic feet of gas that can be transported by a pipeline within an hour or within a day. In the context of petroleum, capacity can refer to either the maximum amount of product that can be moved through a pipeline or the maximum product that can be processed in a refinery.

Carbon Dioxide (CO_2)
A colorless, odorless noncombustible gas with the chemical formula CO2 that is present in the atmosphere. It is predominantly formed by the combustion of carbon and carbon compounds (such as fossil fuels and biomass), and by the gradual oxidation of organic matter in the soil.

Climate Change
As defined by the Intergovernmental Panel on Climate Change (IPCC), climate change refers to any change in climate over time, whether due to natural variability or as a result of human activity. It is extremely likely that human influence has been the dominant cause of observed warming since the mid-20th century.

Combined Heat and Power Generation (CHP)
Also known as cogeneration and is the simultaneous production of electricity and

heat from a single fuel source, such as natural gas, biomass, biogas, coal, waste heat, or oil.

Community Choice Aggregation (CCA)
A mechanism for municipalities and the residents and businesses that they serve to take unprecedented levels of control over their energy purchasing and usage.

D

Demand
In economic terms, demand refers to the amount of any product, including electricity, natural gas, petroleum products, or other fuel, that is required to meet customer needs. Electricity demand is also known as load, and can refer to the amount that is needed by customers within a specific period of time, such as an hour or month or year. In the context of electricity, the term “demand” is also used to refer to the highest amount of electricity that a customer may require within a short period such as a 15-minute interval for the purpose of determining the demand charge component of electricity rates paid by customers.

Demand Response
Temporarily reducing electricity usage in response to a request from the system operator to do so, typically to maintain system reliability, and typically in exchange for a financial incentive.

Diesel Fuel
The primary refined petroleum fuel used by heavy trucks, construction equipment, and emergency power generators. Diesel fuel, along with heating oil, is a major component of the category of fuels known as distillates.

Distributed Generation
Small electric-generating facilities fueled with renewable or nonrenewable resources located near the end consumer, such as solar panels installed on residential buildings, fuel cells located in office buildings, or fossil-fuel-burning back-up assets.

Distribution
The delivery of energy to end-users or customers. The distribution component of New York State’s electric system generally uses power lines to carry electric power from the transmission component to the locations of end-use consumers. The distribution component of the natural gas system transfers natural gas from the large interstate pipelines through a network of various sizes of “mains” to individual customer locations. The distribution component of petroleum products includes pipelines, barges, railroads, trucks, and service stations.

Distribution System Platform Providers
The distribution system platform (DSP) providers will modernize electric distribution systems to create a flexible platform for new energy products and services, to improve overall system efficiency and to better serve customer needs. The DSP providers will incorporate distributed energy resources into planning and operations to achieve the optimal means for meeting customer reliability needs.

E

Energy
The capacity for doing work as measured by the capability of doing work (potential energy) or the conversion of this capability to motion (kinetic energy). Energy has multiple forms, which vary widely in their ability to be convertible and to be changed to another form useful for work. A large amount of the world’s convertible energy comes from fossil fuels that are burned to produce heat that is then used as a transfer medium to mechanical or other means to accomplish tasks. Commonly used forms of energy include natural gas, petroleum, coal,

hydro power, nuclear, wind, solar, biomass, and biofuels. Heat energy is usually measured in British thermal units (Btu). Energy converted to electricity is usually measured in kilowatt-hours (kWh). See also primary energy, net energy, fossil fuels, renewable energy, Btu, and kWh.

Energy Efficiency
Any technology or activity that results in using less energy to provide the same level of service, work, or comfort. End-use energy efficiency takes place at the customer's location and means that individual customers use less energy to complete the same task. System-level efficiency means that improvements are made in either producing or transporting energy such that less energy is used in the process of providing energy to end-use customers.

Environmental Justice
The fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no group of people should bear a disproportionate share of the negative environmental consequences resulting from industrial, governmental, and commercial operations or policies. Meaningful involvement means that: (1) people have an opportunity to participate in decisions about activities that may affect their environment and/or health; (2) the public's contribution can influence the regulatory agency's decision; (3) their concerns will be considered in the decision making process; and (4) the decision makers seek out and facilitate the involvement of those potentially affected.

F

Feedstock
The raw material input to an industrial process. Fossil fuels are often used as feedstocks to industrial processes because of their chemical properties rather than their energy values.

Floodplain Maps
A floodplain is an area of land that is prone to flooding. People realize it is prone to flooding because it has flooded in the past when a river or stream overflowing its banks. Floodplain maps show flood risk areas and floodplains to reduce severe storms and frequent flooding damage.

Fossil Fuel
Fuels derived from organic material formed by the compression in the Earth's crust of ancient plants and animals over millions of years. The most common fossil fuels are petroleum products, coal, and natural gas.

G

Gasoline
Highly refined petroleum product used primarily to fuel highway vehicles. Gasoline is a complex mixture of relatively volatile hydrocarbons, often containing various additives that have been blended to form a fuel suitable for use in internal combustion engines.

Generation
Generation refers to both the mechanical units and the process of producing electricity by transforming other types of energy, including fossil fuels, hydro, nuclear, wind, photovoltaic, etc. Generation is commonly expressed in kilowatt-hours (kWh) or megawatt hours (MWh).

Greenhouse Gas (GHG)
A gas in the atmosphere that absorbs or emits radiation within the thermal infrared range. GHGs prevent radiant energy from leaving the Earth's atmosphere or trap the heat of the sun, producing the greenhouse or warming effect. The primary GHGs include carbon dioxide, methane, nitrous oxide, hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride. However, water vapor is the most abundant greenhouse gas in the

atmosphere. Changes in its concentration are also considered to be a result of climate feedbacks related to the warming of the atmosphere rather than a direct result of industrialization. Increases in the amount of GHGs in the atmosphere enhance the greenhouse effect and leading to more heat being trapped. This extra heat is causing climate change.

H

Hydroelectric Power
Electricity generated by turbines turned by moving water, and is often shortened to "hydro."

K

Kilowatt-hour (kWh)
A measure of electricity defined as a unit of work or energy, measured as 1 kilowatt (1,000 watts) of power expended for 1 hour. One kWh is equivalent to 3,412 British thermal units (Btu).

L

Load
The power and energy requirements of users on the electric power system in a certain area or the amount of power delivered to a certain point.

M

Megawatt (MW)
A unit of electrical power equal to 1,000 kilowatts or one million watts.

Methane
A gas with the chemical formula CH_4. It is the simplest alkane and the main component of natural gas.

Microgrid
A group of interconnected loads and distributed energy resources within clearly defined electrical boundaries that acts as a single controllable entity with respect to the grid.

Million British Thermal Unit (MBtu or MMBtu)
One million British thermal units. Unit of energy that represents energy required to heat or cool one million pounds of water one degree.

N

NYPA's Strategic Vision
Outlines New York Power Authority's path toward expanding customer energy solutions; modernizing its generation and transmission assets; and aligning its resources, including its workforce, to support the evolution of the energy industry. As part of REV, this Vision will inform the use of both power supply and demand side programs and initiatives.

Natural Gas
A colorless, tasteless, nonrenewable clean-burning fossil fuel, widely used to generate electricity and also used directly by end-use customers to provide space heat, water heating, and cooking.

Net Energy
The energy consumed by customers at the end-use location (i.e. building or vehicle, including electricity as well as the fuel burned on-site to provide space heat, water heat, etc.). Net energy use accounts for electricity based on the heat content of energy at the plug (3,412 Btu per kWh), and excludes the heat losses incurred during generation, transmission, and distribution of electricity. Adding the heat losses associated with electricity to net energy use results in "primary energy use."

Net Metering, or Shared Renewables
Allowing a customer's electric meter to measure both the reverse and forward flow of electricity, allowing the meter to register when a customer is producing more energy on-site than it is using (which will cause the meter to reverse), as well as when a customer is producing less energy than it is using (which will cause the meter to move forward). The combined effect of the

reverse and forward flows results in net metering.

Nitrogen Oxides
Nitrogen oxides (NO_x) consist of nitric oxide (NO), nitrogen dioxide (NO_2), and nitrous oxide (N_2O) and are formed when nitrogen (N_2) combines with oxygen (O_2). Nitrogen oxides occur naturally and also are produced by human activities. In nature, nitrogen oxides result from bacterial processes, biological growth and decay, lightning, and forest and grassland fires. The primary source of man-made nitrogen oxides is burning fossil fuels.

O

Organic Waste
"Green waste" or biodegradable material that is high in nitrogen content such as food, garden, and lawn clippings. It can also include animal- and plant-based material and degradable carbon such as paper, cardboard, and timber.

P

Petroleum
Generally refers to crude oil or the refined products obtained from the processing of crude oil (gasoline, diesel fuel, heating oil, etc.) Petroleum also includes lease condensate, unfinished oils, and natural gas plant liquids.

Primary Energy
Total consumption of fuels, including the fuels used to generate electricity. Primary energy accounts for electricity based on the equivalent heat content of fuel at the generator. Subtracting the heat losses associated with electricity generation, transmission, and distribution from primary energy use results in "net energy use."

R

Reliability
Bulk electric system (i.e., generation and transmission) reliability consists of a series of very specific engineering-based metrics that measure both resource adequacy and transmission operating reliability. Resource adequacy measures the degree to which system resources are sufficient to be able to meet customer load when and where needed. Transmission operating reliability measures the ability of the delivery system to get the power to the load and its ability to withstand various contingencies such as generators or transmission lines being out of service without dire consequences. Electricity distribution (i.e., service) reliability is measured by utility-filed data on frequency and duration of service interruptions. The term reliability also applies to the performance of natural gas and petroleum delivery systems, but the metrics for measurement and system design criteria are far less formalized by regulatory processes.

Renewable Energy
Energy derived from sources that are capable of being continuously restored by natural or other means, or are so large as to be usable for centuries without significant depletion, and include but are not limited to solar, wind, plant and forest products, organic wastes, tidal, hydropower, and geothermal. Although renewable energy resources are virtually inexhaustible in duration, they may be limited in the amount of energy that is available per unit of time. In contrast, fossil fuels such as coal, natural gas, and petroleum take millions of years to develop naturally and are considered nonrenewable.

Repowering
Repowering refers to the retirement of a power plant and the reconstruction of a new, cleaner, and more efficient plant on the same property.

Resiliency
Ability of the energy system to reduce the impact and duration of disruptive events. Resiliency encompasses the capability to anticipate, prepare for, respond to,

and recover from significant multi-hazard threats with minimum damage to the energy system, environment, economy, and social well-being.

Regional Greenhouse Gas Initiative (RGGI)
A mandatory, market-based effort to reduce greenhouse gas emissions in nine Northeastern and Mid-Atlantic States, including New York. It is implemented in New York by DEC and NYSERDA.

S

Smart Grid
According to the U.S. Department of Energy (DOE), smart grid generally refers to "a class of technology people are using to bring utility electricity delivery systems into the 21st century, using computer-based remote control and automation. These systems are made possible by two-way communication technology and computer processing that has been used for decades in other industries." Smart grid technology can enable system operators to more quickly identify the location and cause of an outage as well as enable customers to adjust their energy usage patterns in response to pricing information from the grid.

Smart Growth
Development that serves the economy, community, and the environment. It provides a framework for communities to make informed decisions about how and where they grow. Smart growth makes it possible for communities to grow in ways that support economic development and jobs; create strong neighborhoods with a range of housing, commercial, and transportation options; and achieve healthy communities that provide families with a clean environment.

Smart Home
The use of control systems and information technologies to reduce the need for human work in the home.

Solar Photovoltaic
Also known as PV or solar electric, this technology directly converts the energy radiated by the sun as electromagnetic waves into electricity by means of solar panels.

Sulfur Oxides
Also abbreviated as SOx to refer to all sulfur oxides, which are compounds consisting of sulfur and oxygen. The two major compounds are sulfur dioxide (SO2) and sulfur trioxide (SO3).

T

Ton or Short Ton
A unit of weight equal to 2,000 pounds often used to measure amounts of coal and air emissions of various pollutants. A metric ton or long ton equals 2,200 pounds.

Transmission
Refers to the high-voltage, long-distance lines through which electrical power is transported from generation units to end-use customers.

Transportation Demand Management (TDM)
The application of strategies and policies that emphasize the movement of people and goods, rather than motor vehicles, and gives priority to walking, cycling, ridesharing, public transit, and telecommuting.

Transportation Sector
The part of the energy-using economy related to vehicles, fuels, and systems that move people and goods from one place to another. The transportation sector is made up of automobiles, buses, trucks, trains, and ships, and all fuels and systems that power and control them.

U

Utility 2.0 Plan
Document outlining PSE&G Long Island's vision and commitment to reducing costs for its customers, and increasing the use

of energy efficiency, direct load control and demand response, and distributed energy resources. The Utility 2.0 Plan is part of a series of annual and long-range capital and operating procedures that will serve as a first-of-its-kind model to inspire other utilities around New York State to follow suit.

W

Wind Energy
A renewable source of energy used to turn turbines to generate electricity.

Z

Zero Net Energy Building
A building where the total amount of energy used on an annual basis is roughly equal to the amount of renewable energy created on the site. These buildings consequently do not increase the amount of greenhouse gases in the atmosphere. They do at times consume nonrenewable energy and produce greenhouse gases, but at other times reduce energy consumption and greenhouse gas production elsewhere by the same amount. They may be referred to as zero net energy (ZNE) building, net-zero energy building (NZEB), or net zero building.

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The Energy to Lead

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