

Air & Waste Management Association
Climate Change Resiliency and Mitigation
Strategies Workshop
PSEG Perspective and Actions
OCTOBER 25, 2018

We have the
energy
to make things better
... for you, for our investors
and for our stakeholders.



PSEG

We make things work for you.

The PSEG Org Chart



PSEG Climate – Issue Identification

PSEG Has Recognized & Adapted to the Impacts of Climate Change

PSEG has recognized for several decades that climate change is a real phenomenon that impacts our Earth. Inclusion of climate change in our business plans has been a part of the PSEG culture since 1990. PSEG recognizes that there is no simple or short-term solution to address both mitigation and adaptation of global climate change. As new challenges arise, we have adapted our business plans to develop cost-effective solutions to meet these challenges.

Mitigation

- New Jersey – In 1991 PSEG embraced the goals of the First NJ Energy Master Plan (EMP) and actively sought actions to support these goals.
- United Nations Framework Convention on Climate Change (UNFCCC) in 1992 - PSEG accepted the challenge and was the first electric utility in the United States to volunteer to participate in President Clinton’s Climate Challenge Program in 1993.
- PSE&G signed on to the EPA’s voluntary Natural Gas STAR Program in 1993 & joined EPA’s WasteWise Program in 1995.
- Building on the success of the Climate Challenge Program, PSEG joined EPA’s Climate Leaders program in 2002 to reduce the six greenhouse gases (GHGs) covered under the Kyoto Protocol. Under this program, PSEG committed to reduce its CO₂ equivalent GHG emissions on a pound per megawatt-hour basis by 18% from 2000 levels by December 31, 2008. PSEG surpassed this goal by achieving a 31% reduction, due primarily to the fact that more than half our power comes from nuclear generation.

Mitigation to Adaptation

- Governor Corzine's Executive Order No. 54 and the subsequent passage of the Global Warming Response Act of 2007 (GWRA) established goals to reduce GHG emissions by 80% below 2006 levels by 2050. In response PSEG established a new goal of reducing economy-wide GHG emissions by 25% from 2005 levels by 2025. PSEG met this goal 14 years ahead of schedule.
- This goal was achieved through implementation of energy efficiency programs, deployment of renewable energy, increasing nuclear output and building clean, efficient natural gas plants.
- In 2012, New Jersey was hit by Superstorm Sandy. The storm's ferocity revealed the vulnerability of our infrastructure to damage from severe storms. This event prompted PSEG to consider climate change adaptation into our business plans in addition to mitigation. PSE&G received approval from NJBPU to invest in resilient electricity and natural gas infrastructure in the wake of Superstorm Sandy (Energy Strong Program).

New Goal

Earlier this year PSEG announced a new goal of eliminating 13 million metric tons of CO₂ equivalent emissions from 2005 levels by 2030. Activities to reach this goal include:

- Avoided emissions from post-2005 uprates at our nuclear facilities
- Retirement of our coal units in New Jersey and Connecticut
- Efficiency upgrades of our existing natural gas combined cycle fleet
- Solar and energy efficiency investments and programs
- Replacement of old cast-iron and unprotected steel gas mains with new plastic pipelines
- Continued replacement of traditional fleet vehicles with hybrid vehicles and the installation of idle mitigation technology
- Electric vehicle charging programs for our employees and our commercial/industrial customers
- Recycling of industrial waste under EPA's WasteWise program
- Emission reductions in fulfilling PSEG Power's REC commitments

Extreme Weather Conditions

- Sandy, Irene and the October 2011 snowstorm are evidence that extremes of weather are becoming more commonplace
- These recent weather patterns, along with an increased dependency on energy, led PSE&G to propose a re-thinking of the energy infrastructure and systems even though current investments provide reliable service

Energy Strong – Building a more resilient energy infrastructure

Electric Distribution and Energy Strong

Energy Strong Program delivered reliability improvements through remote automation, communication and control; elevated sub-stations

- **\$1 Billion program** expected to be completed in 2018

Energy Strong II program a request to invest ~\$2.5 Billion has been submitted the NJ BPU for approval

- **\$1.5 Billion Electric:** Continuation of infrastructure programs
 - **Hardening** – raise 16 stations in flood zones, pole and circuit upgrades, and smart grid reclosers
 - **Aging Infrastructure** – lifecycle projects at 84 substations with an average age of 73 years
 - **Technology** – advanced distribution management system (ADMS) and fiber/mesh communication network
- **\$1 Billion Gas:** Resiliency and lifecycle projects

Energy Strong - Electric

Electric Station Flood Mitigation subprogram:

- **26** substations and switching stations are being raised and rebuilt or eliminated (original scope of 29 stations, 2 were removed and 1 canceled)
 - **25** electric substations and switching stations are fully in-service as of May 2018
 - **1** additional station is partially in-service and is scheduled to be fully in-service by the end of 2018
- **490,200** customers in total will benefit when the program is complete
 - **489,900** customers have benefitted from the stations completed to date



Electric Station Flood Mitigation

Sewaren Switching Station – Before



Sewaren Switching Station – After



Energy Strong - Gas

Activities to harden the gas infrastructure

- Metering & Regulating Station Flood Mitigation
- Utilization Pressure Cast Iron Main Replacement

M&R Station Flood Mitigation



Harrison M&R – Before



Harrison M&R -- After

NJ Clean Energy Act of 2018 & Energy Master Plan 2019

NJ has advanced a new Clean Energy agenda

Energy Policy

Description

Energy Efficiency (EE)

- Requires electric utilities to reduce energy consumption by 2% and gas utilities to reduce energy consumption by 0.75% from average annual usage over prior 3-year period within 5 years
- Allows utilities to recover “reasonable and prudent costs” including return of and on capital and revenue impact of lost sales

Renewable Portfolio Standard (RPS)

- Increases percentage of energy to be supplied from renewable energy resources to 50% by 2030

Solar

- Annual solar requirement increases to 4.8% in 2025 before declining to 4.5% in 2026 and 1.1% in 2033 as net metering cap increased to 5.8% from 2.9%
- BPU must complete a study on how to modify/replace SREC program by 24 months after enactment

Community Solar

- BPU must develop rules and regulations establishing a “Community Solar Energy Pilot Program”

Offshore Wind (OSW)

- BPU to establish Offshore Renewable Energy Certificate (OREC) to support 3,500 MW by 2030
- Allows OSW projects to receive tax credits from the Energy Development Agency (EDA)
- NJ Dept. of Labor directed to develop job training programs to support OSW development

Energy Storage

- BPU to provide Governor and Legislature with analysis of “energy storage needs and opportunities”
- BPU to initiate process within six months of delivering report that establishes a process and mechanism for achieving 600 MW of energy storage by 2021 and 2,000 MW by 2030

EV Infrastructure

- Charging stations and related infrastructure for workplace, multi-family and travel corridors

Clean Energy Filing

PSEG has filed its Clean Energy Future (CEF) proposal with the New Jersey Board of Public Utilities (BPU). The CEF has the potential to far exceed our new goal of eliminating 13 metric tons of CO2 equivalent emissions if approved by the BPU as filed.





PSEG's future direction aligned with customer needs and NJ's Clean Energy agenda

2012-2017	2018 - 2022	Utility of the Future
<p>Transmission expansion</p> <p>Storm hardening and resiliency</p> <p>New peaking generation and generation uprates</p> <p>Regulated & Unregulated Renewables</p>	<p>Upgrade aging infrastructure and Transmission</p> <p>Storm hardening and resiliency</p> <p>New, efficient CCGTs</p> <p>Clean Energy Legislation</p> <ul style="list-style-type: none"> • Expanded Energy Efficiency • EV Infrastructure • Energy Storage • Energy Cloud - AMI <p>Regulated & Unregulated Renewables</p>	<p>Clean Energy Legislation</p> <ul style="list-style-type: none"> • Expanded Energy Efficiency • EV infrastructure • Battery storage <p>Greater use of technology to enhance 2-way customer communication</p> <p>Regulated Renewables</p>

Partnership for a Clean Energy Future:

~\$3.6 Billion investment program to provide cost-effective and innovative solutions supporting NJ's clean energy goals

- **Energy Efficiency:** Residential and C&I programs to lower energy bills and combat climate change
 - Savings targeting 2% electric and 0.75% gas savings consistent with NJ Clean Energy Legislation
 - Customer benefits exceed costs
- **Electric Vehicles:** “Smart” electric vehicle infrastructure: residential, workplace, multi-family, travel corridors
- **Energy Storage:** Utility-scale systems to defer traditional distribution investment, enable additional solar, and enhance critical infrastructure resiliency
- **Energy Cloud: Advanced Metering Infrastructure (AMI):** Accelerated roll-out of 2.2 million electric meters and supporting infrastructure. Compelling customer benefits

Program Investment	\$ Billion
 Energy Efficiency	\$2.5
 Electric Vehicles	\$0.3
 Energy Storage	\$0.1
 Energy Cloud – AMI	\$0.7
Investment Total	\$3.6

- 6-year investment program starting in 2019
- Seeking contemporaneous recovery
- Contingent on approval of lost revenue recovery mechanism