



For a sustainable,  
clean energy future.

**Climate**  
REPORT

2020

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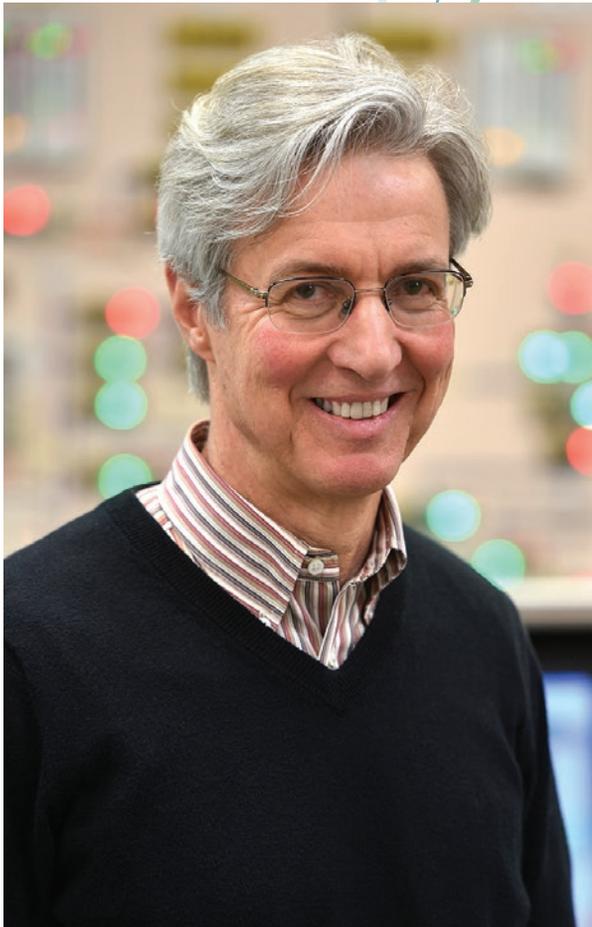
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# A letter from Ralph Izzo

Chairman, President and CEO



AS PSEG'S INAUGURAL CLIMATE REPORT was undergoing its final revisions, we found ourselves amid a new and unexpected crisis: the COVID-19 pandemic. To navigate this unprecedented public health and economic emergency, however, we were guided by the same playbook that has served us throughout our 117-year history: To provide safe, reliable energy to millions of homes and businesses while safeguarding the health and well-being of our employees, our customers and the diverse communities we serve.

The coronavirus outbreak highlights many of the same issues society faces in addressing climate change, including and importantly the need to examine the impact on vulnerable communities and correct any structural inequities. Above all, the coronavirus outbreak gives us the opportunity to see how we can come together to tackle a global problem.

Just as millions of customers rely on PSEG to continue to provide safe, reliable power to sustain them through a public health crisis, our company also has a special role to play in confronting the threat of climate change.



As New Jersey's largest energy utility, we play an important part in mitigating the potential impacts of a warming climate. PSEG is committed to continuing its leadership role in decarbonizing our economy and transitioning to a cleaner, more equitable and resilient energy system – as we have for several decades. Beyond the ambitious vision for net-zero carbon emissions from our power fleet by 2050 that we announced in 2019, PSEG has a number of successes and firsts dating back decades, some of which include:

- In 1993, PSEG became the first electric utility in the U.S. to volunteer to participate in the Climate Challenge Program; PSEG successfully met this goal and stabilized carbon dioxide (CO<sub>2</sub>) emissions from its New Jersey plants to 1990 levels by 2000.



- In 2002, PSEG joined EPA's Climate Leaders program to reduce the six greenhouse gases covered under the Kyoto Protocol. Under this program, PSEG committed to reduce its CO<sub>2</sub>-equivalent greenhouse gas (GHG) emissions on a pound-per-megawatt-hour basis by 18% from 2000 levels by Dec. 31, 2008. PSEG surpassed this goal by achieving a 31% reduction, due primarily to the fact that more than half our power came from nuclear generation.
- In 2009, PSEG established a new goal of reducing company-wide GHG emissions by 25% from 2005 levels by 2025. PSEG met this goal 14 years ahead of schedule. PSEG achieved this goal through implementation of energy efficiency programs, deployment of renewable energy, increasing nuclear output and building clean, efficient natural gas generation.

Today and for well over a decade, PSEG's generation fleet has had one of the lowest carbon emissions intensity rates, 50% less than the national average. What's more, PSEG Power is on a path that, by 2021, will see our complete withdrawal from coal as a generation resource.

As we travel on this journey toward a cleaner energy future, it is critical that we have signs and guideposts along the way. This report follows the recommendations of the [Task Force on Climate-Related Financial Disclosures \(TCFD\)](#), providing analysis for our stakeholders of the reliability and resiliency of our businesses as we transition to a cleaner, more equitable energy future and address those impacts of climate change that are already occurring.

In this report, we discuss the progress we have made to date and we highlight where we plan to focus our future efforts. We discuss our commitment to continue reducing GHG emissions from our generation fleet, our effort to preserve nuclear generation that provides zero-emitting energy to the entire region, and our focus on driving energy efficiency and other strategies through our utility to reduce and avoid GHG emissions. We discuss the role we will continue to play in advocating for effective climate policies at the state, regional and national levels as we have for more than two decades.

Make no mistake, we also see opportunities in the transition to a net-zero clean energy economy – for our company and our customers. Clean energy is one of the most effective tools we have to reduce the impacts of climate change for all of our customers and communities.

Moreover, we are committed to ensuring a promise of a clean energy future is made available to all, and that the transition to this future carefully considers the principle of equity and the opportunity for evolution of our workforce.

Yet we recognize that achieving net-zero emissions across the economy will require actions far beyond our own – by government, innovators, academia and the public.

It is our hope that this report helps to foster important dialogue and expands opportunities for collaboration with our stakeholders and communities, across New Jersey and the nation, as we explore the best strategies to address climate change and transition to a clean energy future.

Ralph Izzo  
Chairman, President and CEO, PSEG

April 17, 2020



# Executive summary

**AT PSEG WE RECOGNIZE** the urgent need for immediate action to address the threat of climate change. We have adopted an ambitious set of targets for our own operations and we will continue to be actively engaged in state and federal policy discussions. Specifically, we have set a goal of cutting PSEG Power fleet's carbon emissions by 80%, from 2005 levels, by 2046 and we are aiming for net-zero emissions by 2050, assuming advances in technology and public policy, as well as changes in customer behavior. We have no plans to add new fossil plants to the PSEG Power fleet, and we expect to gradually retire our existing gas-fired facilities as they reach the end of their useful lives. As New Jersey's largest provider of electric and natural gas service, we recognize the vital role that we must play in the transition to a low carbon energy system. PSEG is committed to supporting the clean energy goals across the states in which we operate, including NJ Governor Murphy's goal of achieving 100% clean energy in New Jersey by 2050.

The objective of this report is to detail how we are preparing for the opportunities and risks associated with climate change while helping New Jersey and the region achieve a sustainable future. This report is aligned with the recommendations of the [TCFD](#), which provides guidance on voluntary climate risk disclosure. Following a review of how PSEG incorporates climate change considerations in its governance structure and risk management processes, the report outlines how climate change is integrated in the organization's corporate strategy and highlights how PSEG tracks progress on climate change goals through metrics and targets. The report also summarizes an assessment PSEG conducted to evaluate the potential business implications of a scenario to limit global average temperature increases to less than 2°C.

## **GUIDED BY SOUND GOVERNANCE**

Integration of climate strategy and environmental, social, and governance (ESG) considerations permeates all levels of our organization. At the board level, our Corporate Governance Committee has been overseeing our net-zero transition. Ralph Izzo has been a leading voice for comprehensive climate action, including the need for a nationwide price on carbon. Climate change considerations are incorporated throughout all levels of our governance structure, ensuring it is front of mind during execution of everything from daily performance to high-level strategic decisions.



## ASSESSING AND MITIGATING CLIMATE RISK

Risk management is an integral part of our power generation and utility operations. Our Enterprise Risk Management (ERM) is guided by five processes: Risk Governance, Risk-Aware Culture, Risk-Informed Decision-Making, Managing Execution Risk, and Risk Reporting and Communication. Led by the Corporate Risk Management Committee, climate change is one of the key considerations that guides our decision making.

## OPERATIONALIZING AN EFFECTIVE CLIMATE STRATEGY

In 2019, PSEG introduced its “Powering Progress” vision for the future of our company – a future in which we help our customers use less energy, ensure that the energy they use is cleaner and deliver that energy more reliably than ever before. To achieve such an outcome, we propose to: (1) significantly increase our investments in energy efficiency, the most cost-effective strategy for reducing greenhouse gas (GHG) emissions; (2) deliver cleaner mix of energy to the grid, including renewables and carbon-free nuclear; (3) deploy technology to provide customers with greater insight on their energy usage; and (4) continue to invest in modern energy infrastructure, particularly through our Gas System Modernization Plan and Clean Energy Future filings.

## FORESIGHT THROUGH 2 ° C SCENARIO PLANNING

Following TCFD's recommendation to use climate-related scenarios to assess an organization's business strategy, we evaluated the International Energy Agency's (IEA) “2DS” Scenario for the purposes of this report. This scenario is not a projection or preferred outcome but provides a basis to assess potential climate-related risks and opportunities. The IEA scenario assumes virtual decarbonization of the U.S. electric system by 2050 with substantial electrification of end-use sectors, such as transportation, heating, and industrial processes. The IEA 2DS also assumes significant improvements in energy efficiency throughout the economy and deployment of carbon capture and sequestration technology, biofuels, and energy storage technologies. Although New Jersey and other states in the Northeast have reduced their GHG emissions over the past decade, our analysis highlights that transformational changes throughout the region's economy and energy systems will be required to meet the ambition of a 2°C scenario.

## ACCELERATING OPPORTUNITIES WHILE MANAGING RISKS

Analysis of the IEA 2DS highlights PSEG's critical role in helping enable the transition to a low-carbon economy in New Jersey and throughout the region. Many of the climate change-related risks and opportunities will be shaped by ongoing policy development. These policies can open new business



opportunities for both our regulated utility PSE&G and PSEG Power's merchant power business. Maintaining electric and natural gas affordability will also require that PSEG harness already existing zero-carbon generation, such as our nuclear power generation fleet, and continue to invest in cost-effective energy efficiency opportunities. We believe a national price on carbon is an important climate policy that will help enable many of the opportunities we identify in this report.

The degree and pace of change also present operational, compliance, reputational, strategic, and financial risks for the company and our ability to maintain safe, reliable, and affordable energy services. The effects of climate change also will increase the physical risks to our transmission and distribution system and our generation assets. It is imperative that we continue to study these changing risks as they are shaped by global climate dynamics.

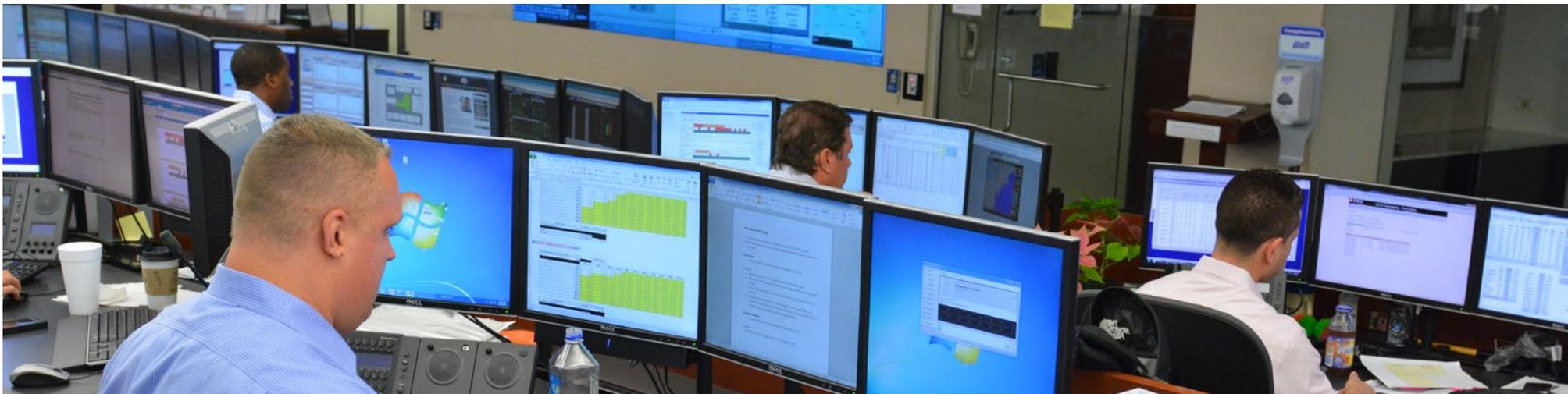
## TRACKING PROGRESS

Establishing metrics and targets allow us to maintain focus as we embark on a net-zero path. Tracking year over year performance offers insight into how all aspects of our business contribute to our long-term climate vision. We rely on several annual reporting mechanisms that are publicly available on [PSEG's sustainability webpage](#) or the [investor section of PSEG's website](#) as we seek to provide timely and transparent access to our ESG data reporting to all our stakeholders.

PSEG's generation emissions intensity is projected to be reduced by approximately 60% from 2005 through 2020 (Fig. 4) and is about half the national average. However, we recognize that we have more work to do. We are committed to working with our stakeholders as we evaluate future strategies, including how we

manage our high-efficiency gas-fired generating units, for transitioning to a net-zero future. PSEG also tracks the total GHG benefits from our investments and programs that extend to activities outside of our direct control.

Based on actions we have taken since 2017 along with new approved investments, we anticipate avoiding 3.4 million tons by 2030. This estimate would increase to 7.6 million tons of avoided GHG emissions if PSE&G's proposed energy efficiency and electric vehicles/energy storage programs were approved by state regulators in their entirety. We will continue to advance programs and policies that help to reduce our emissions, maximize energy efficiency, promote electrification and decarbonization opportunities across the economy, and support resilient infrastructure.





## INTRODUCTION

PSEG RECOGNIZES CLIMATE CHANGE as one of the most important environmental issues of our time, requiring a concerted global response to help mitigate and adapt to this significant threat. Closer to home, our company and our customers face important challenges in confronting the threat of climate change. At the same time, we see tremendous opportunities in transitioning to a clean energy economy. That is why climate change has been a key consideration in our long-term strategy for decades, why we plan to continue reducing GHG emissions, why we support the preservation of nuclear generation that provides zero-carbon emitting energy to the entire region, why we are implementing energy efficiency and other strategies through our utility to reduce – and avoid – GHG emissions, and why we will continue to advocate for effective climate policies at the state, regional, and national levels.

Since establishing our first climate goal in 1993, we have focused on improving and adapting our approach to managing climate risk. This ongoing effort has led us to our most progressive vision yet. In the summer of 2019, we articulated our vision of achieving net-zero emissions from our PSEG power fleet by 2050 assuming advances in technology, public policy, and customer behavior. This report outlines not only how PSEG is working to achieve our company's vision but also how we can act as a partner and resource to support New Jersey and the region in reducing economy-wide GHG emissions.

Transparency is one of the central elements of our climate strategy and is how we hold ourselves accountable. We provide a variety of voluntary reports and disclosures as we engage with our investors and various stakeholders, including the joint-reporting initiative between the Edison Electric Institute and American Gas Association. This Climate Report is designed to supplement these efforts but also moves beyond them by outlining our climate commitment and strategy as well as our vision for creating the utility of the future as our climate continues to change. We have aligned this report with the recommendations of the [Task Force on Climate-Related Financial Disclosures \(TCFD\)](#), which provides guidance on voluntary climate risk disclosure.

PSEG is committed to continuing its leadership role in working to decarbonize our economy and transitioning into an even cleaner, more resilient energy system – a synopsis of which can be found in our [Transitioning to a net-zero future](#). The magnitude of this climate challenge requires both a global and national response. That is why we have long advocated for national policies, particularly a price on carbon, which offers an efficient, economy-wide response to tackle climate change.





Nicholas Doherty on Unsplash

In the absence of coordinated federal action, many states are advancing their own programs. PSEG is committed to supporting the clean energy goals across the states in which we operate. We support NJ Governor Murphy's goal of achieving 100% clean energy in New Jersey by 2050. There is much to be done, but, in collaboration with our board, executive officers, dedicated employees, community stakeholders and policymakers, PSEG will work continuously to reduce our emissions, support energy efficiency and advance clean energy. In January 2020, Governor Murphy unveiled the state's [Energy Master Plan \(EMP\)](#), which outlines key strategies to achieve this ambitious goal. The plan seeks to achieve 100% carbon-neutral electricity generation and maximum electrification of the transportation and buildings sectors. As New Jersey's largest provider of electric and natural gas service, we have a unique role to play in facilitating the transition to a low-carbon future across our service territory and beyond, but we cannot do it alone. Nor can we do it without careful consideration of the cost implications for our customers and attention to ensuring that a clean energy future is accessible to all customers regardless of income. We must champion an approach that is flexible and allows us to best harness technology innovation but does not sacrifice resilience or impose untenable cost.

We look to our partnerships with groups like the [NJ Climate Change Alliance](#), a broad-based stakeholder group focused on evaluating and developing recommendations, to prepare New Jersey for the impacts of climate change. As we learn through these partnerships and dialogues, we intend to be a catalyst

to influence and encourage our industry peers. We know the powerful role we can and must play in a clean energy transition, and we are ready to partner with those who are on the same path. We also recognize the importance of education and advocacy in helping stakeholders better understand our vision and the benefits of clean energy.

Developing our first Climate Report enables PSEG to showcase the progress we have made to date and highlight where we plan to focus our future efforts. We are cutting carbon emissions from our generation fleet; we are expanding initiatives that will support a stronger, more resilient grid; and we are pursuing opportunities such as energy efficiency, electric vehicles, storage, and advanced metering infrastructure (AMI), which will help to reduce carbon emissions beyond the electric sector.

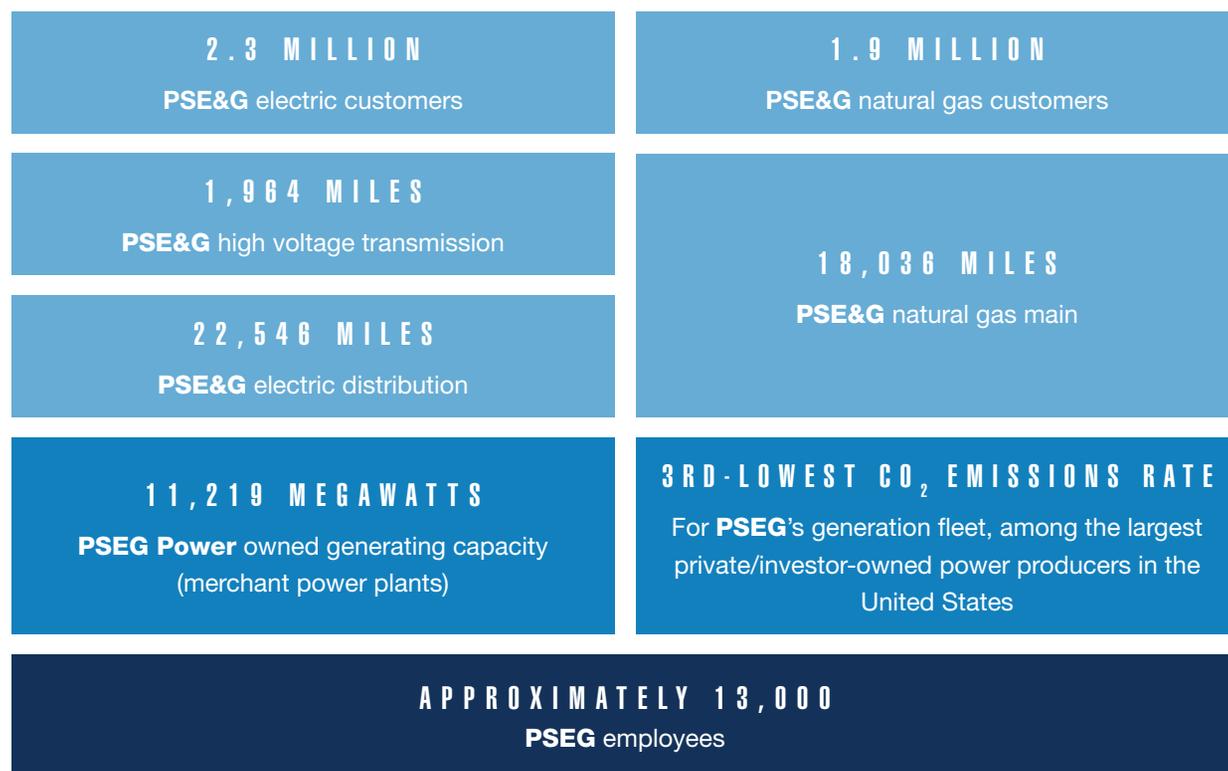
There is no one-size-fits-all approach to addressing climate change, but rather a portfolio of opportunities to be pursued and a range of challenges to overcome. This Climate Report is just one step that PSEG has taken to better communicate our climate strategy and the climate-related risks and opportunities facing our organization and to facilitate discussion with external stakeholders.

We hope this report helps to foster important dialogue and collaboration with our stakeholders and communities across New Jersey that are also exploring how to approach the threat of a climate-challenged world while transitioning to a clean energy future. We look forward to the feedback and conversations stimulated by this report.



## PSEG BY THE NUMBERS

**PUBLIC SERVICE ENTERPRISE GROUP (PSEG)** is a publicly traded diversified energy company headquartered in New Jersey, and one of the 10 largest electric companies in the United States. As described below, each of our operating subsidiaries is structured differently from the others, and each has risks and opportunities discussed in this report.



## PSEG POWER

**PSEG POWER** operates a fuel-diverse fleet consisting mainly of nuclear and natural gas generating plants, with a growing renewables portfolio. Our plants are located in New Jersey, New York, Connecticut, Maryland and Hawaii. PSEG Power has four main subsidiaries: PSEG Nuclear, PSEG Fossil, PSEG Energy Resources & Trade and PSEG Power Ventures.

## PUBLIC SERVICE ELECTRIC AND GAS CO. (PSE&G)\*

**PUBLIC SERVICE ELECTRIC AND GAS CO. (PSE&G)** is New Jersey's largest provider of electric and natural gas service – serving 2.3 million electric customers and 1.9 million gas customers. PSE&G was recognized by PA Consulting with the 2019 ReliabilityOne™ Award for Outstanding Reliability Performance in the Mid-Atlantic Region for the 18<sup>th</sup> consecutive year.

\*As you review this report, please keep in mind that PSEG's regulated operations account for over 75% of 2019's non-GAAP operating earnings.

Our other direct wholly owned subsidiaries are: PSEG Long Island LLC, which operates the Long Island Power Authority's (LIPA) electric transmission and distribution system under a contractual agreement; PSEG Energy Holdings LLC, which earns its revenues primarily from its portfolio of lease investments; and PSEG Services Corp., which provides PSEG and its operating subsidiaries with certain management, administrative and general services at cost.



## HIGHLIGHTS

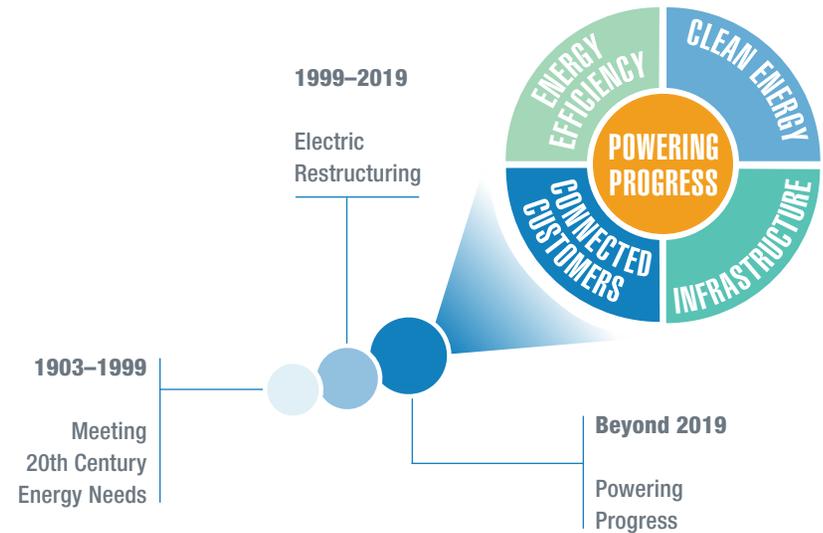
PSEG HAS ESTABLISHED A LEGACY of leadership on climate change and delivering a more sustainable, low-carbon energy supply. For more than a century, PSEG's mission has been to provide universal access to an around the-clock supply of reliable, affordable power. Today, the role of the utility is evolving as we adjust to meet the changing needs and demands of our customers. Over PSEG's 117-year history, our ability to adapt to disruptive forces has allowed us to lead the industry into this pivotal new reality. The following elements make us uniquely suited to help lead our customers and our state on this path forward:

- **Powering Progress vision:** PSEG's vision for the utility of the future is one where customers use less energy, the energy they use is cleaner, and its delivery is as reliable and as resilient as ever. Here's how we will do it:
  - **Energy Efficiency:** Realigning the utility business model to help customers use less energy and shrink their carbon footprint while also saving money.
  - **Clean Energy:** Getting to net-zero carbon by generating electricity from cleaner sources and preserving existing carbon-free sources.
  - **Connected Customers:** Using technology to increase reliability and help customers manage their energy use.
  - **Modernizing Infrastructure:** Upgrading the existing electric grid to increase reliability and resiliency.
- **Clean energy leadership:** PSEG's generation fleet has the third-lowest carbon emissions intensity

rate among the largest private/ investor-owned power producers in the United States, thanks to our Salem and Hope Creek nuclear plants, which provide more than 90% of New Jersey's carbon-free electricity, as well as our highly efficient gas units and the sale or retirement of our coal units. Further, in 2019, we announced a plan to cut carbon emissions 80%, from 2005 levels, by 2046, with a vision that PSEG Power can achieve net-zero emissions by 2050, assuming advances in technology, public policy and customer behavior. We have no plans to build or acquire new fossil fuel generation.

- **Renewable investments across the country:** PSEG has invested more than \$1.9 billion to develop, own and operate solar energy farms in New Jersey and 13 other states, including award-winning programs to reclaim dormant landfills and brownfields for use as green energy centers. We also have been a longtime supporter of New Jersey's efforts to become a national leader in offshore wind generation.
- **Innovation in methane reduction technologies:** In June 2019, PSE&G completed Phase I of its Gas System Modernization Program (GSMP), which replaced approximately 450 miles of cast-iron and unprotected steel gas infrastructure over three years. Phase II, which began in January 2019, calls for replacement of an additional 875 miles of gas pipes

## EVOLUTION OF PSEG STRATEGY



through 2023. As part of GSMP, PSE&G became the first utility in the country to use methane emission data in planning its accelerated cast-iron gas main replacement programs through our Google Earth partnership with Colorado State University and the Environmental Defense Fund.

- **Clean Energy Future filings:** PSE&G has proposed a comprehensive program in its Clean Energy Future filings to support our Powering Progress vision. These filings represent a comprehensive \$3.5 billion investment proposal consisting of energy efficiency, electric vehicle charging infrastructure, energy storage and AMI investments.

<sup>1</sup> Throughout this report, when we refer to our net-zero vision the scope covers PSEG Power's generation fleet assuming advances in technology, public policy and customer behavior.



# Governance



## GOVERNANCE

**MAINTAINING A SOUND GOVERNANCE** structure is fundamental in our approach to and preparation for climate change. To ensure consistent operational excellence while we strive to reach our aggressive climate goals and vision, PSEG upholds strong corporate governance standards and practices that serve to structure and provide for effective management and oversight not only by our Board of directors and executives, but also by individuals throughout all levels of our organization.

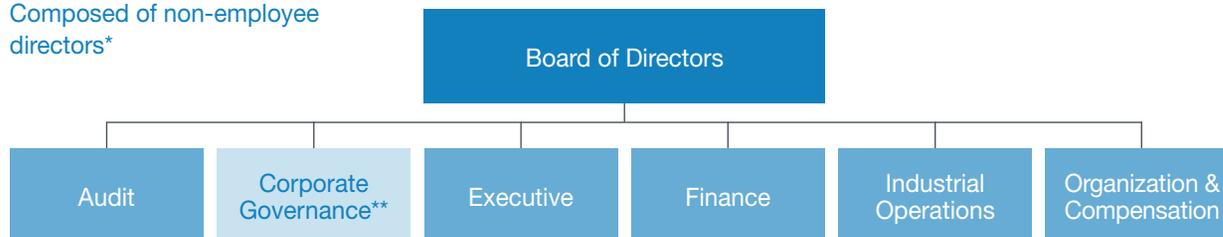
## BOARD OF DIRECTORS AND BOARD COMMITTEES

**OUR BOARD OVERSEES** how PSEG integrates sustainability, environmental, social and governance (ESG) matters and corporate citizenship commitments into our overall corporate strategy. Board members are responsible for oversight of key aspects of climate strategy. Our board understands the importance of this focus for PSEG's future growth as well as how we prepare our business to adapt to the effects of a changing world.

Representing a diverse skill set, our board members have considerable environmental and scientific expertise. This background and experience are particularly useful to the members who serve on the Corporate Governance Committee. This committee holds the primary responsibility, as outlined in its charter, of overseeing matters related to sustainability and our ESG practices, including climate change risk

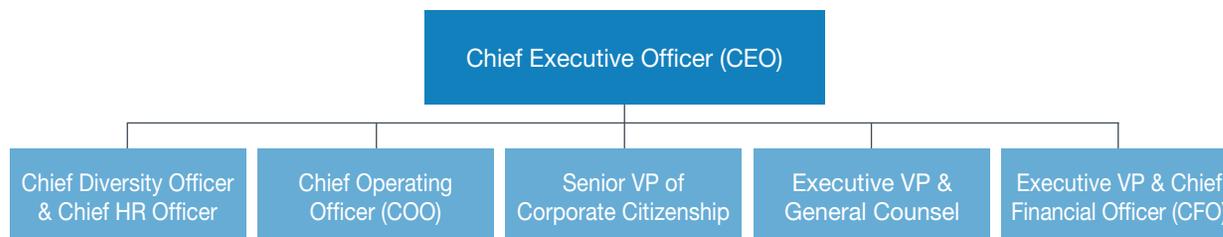
Fig. 1  
**PSEG'S CLIMATE CHANGE GOVERNANCE STRUCTURE**

**Board level committees**  
Composed of non-employee directors\*



### CORE EXECUTIVE OFFICERS LEADING CLIMATE AND ESG RESPONSIBILITIES

Operating under oversight of the Board



### ENTERPRISE-WIDE AND STAKEHOLDER-FOCUSED INITIATIVES



\* Apart from Ralph Izzo, our Chairman, President & CEO \*\* Primary responsibility to oversee sustainability matters including climate change.

and also has oversight of enterprise responsibility for risk policies and practices. The committee is specifically responsible for overseeing PSEG's transition to a net-zero future and discusses ESG and climate issues regularly at its meetings.

Our board has overseen the evolution of PSEG into an industry leader in delivering low-carbon energy. Looking ahead, the board understands that climate change is of growing importance to our investors and other stakeholders.



## EXECUTIVE OFFICER GROUP

PSEG'S EXECUTIVE OFFICER GROUP is responsible for providing the sound leadership and management that contributes to the company's long-term success and sets the right example for employees. PSEG Chairman, President and CEO Ralph Izzo has been a catalyst for climate action since assuming this position in 2007. He has been a respected voice among energy industry leaders on the need for comprehensive climate change policies, such as a nationwide price on carbon. As chairman of the Nuclear Energy Institute, he has advocated

*"Climate change challenges us to think and act in new ways regarding how we use and provide energy...an unmatched opportunity to grow the economy, promote innovation, and create new jobs while protecting the planet for future generations."*

*– Ralph Izzo, Forbes (September 2007)*

for policies to preserve the nation's fleet of existing nuclear power plants, which provide more than half of our carbon-free electricity. Izzo also advocates for climate action through organizations such as the CEO Climate Dialogue and has testified before Congress on the role of the power sector in driving a clean energy economy. In recent testimony, he affirmed our commitment to advocate for policies that are

consistent with achieving net-zero decarbonization goals from the power generation sector by mid-century.

In 2018, PSEG's senior vice president for Corporate Citizenship became a direct report to the CEO and has responsibility for the company's advocacy agenda at the local, state and federal levels, as well as our sustainability and ESG initiatives, philanthropy, volunteerism and the PSEG Foundation, and our climate change engagement strategy. Our Corporate Citizenship group places a leadership focus on the key role PSEG plays as a corporate citizen and elevates the priorities of the diverse communities we serve.

PSEG's executive vice president and general counsel is responsible for corporate governance, including our ethics and compliance program as well as state, federal, energy and environmental regulatory policy. PSEG's executive vice president and chief financial officer is responsible for enterprise risk management, corporate strategy, investor and credit rating agency relations, internal audits and external financial reporting. PSEG's chief human resources officer and chief diversity officer is responsible for human resources and talent acquisition, development, retention, total rewards and diversity and inclusion. PSEG's COO is responsible for the operation of our businesses, execution of our business strategy, and external and internal communication.

## ENVIRONMENTAL HEALTH AND SAFETY POLICY

Our Environmental Health and Safety (EH&S) policy is an integral part of our company culture and operations. Since its approval in 1996, PSEG has adhered to a corporate EHS policy, which reflects the principles according to which PSEG operates in eight areas:

- Associate health and safety
- Nuclear safety
- Climate change
- Pollution prevention and resource conservation
- Environmental compliance
- Risk reduction
- Open communication
- Continuous improvement

Employees at PSEG support its implementation through a collaborative effort across various lines of our business. For example, reporting to the general counsel, our environmental counsel oversees the implementation of the environmental and climate compliance components of our EHS policy.



## SUSTAINABILITY AND ESG STEERING COMMITTEE AND COUNCIL

Recognizing the urgency of climate change, our commitment to climate action is a core pillar of how we operate. The Sustainability and ESG Steering Committee, consisting of our executive officers that meet regularly, assists both the board and executive management in developing strategies, overseeing internal and external stakeholder communications, and incorporating ESG-related initiatives into PSEG's long-term business strategy. To ensure climate and other ESG considerations are integrated into all facets of our organization, the steering committee works in tandem with, and is supported by, the Sustainability and ESG Council, which is composed of a wide representation of individuals appointed by executive officers to bring together cross-functional expertise. The council is tasked with coordinating and implementing, to advance the company's multiple streams of ESG data requests, corporate commitments, external disclosures and external stakeholder engagement on sustainability and ESG.

## STAKEHOLDER ENGAGEMENT COUNCIL

The Stakeholder Engagement Council facilitates our understanding of the interests and concerns of our key stakeholder groups. Led by an executive of the Corporate Citizenship organization and representatives from across our company, the council facilitates constructive and open dialogue with our

stakeholders, devising engagement strategies to find areas of commonality and advance mutually beneficial strategies. The council actively solicits feedback from our stakeholders, making sure voices in our community are heard and can better inform our understanding of our material issues. These stakeholder conversations are essential in shaping our understanding of the risks and opportunities of the business landscape and our approach to addressing climate change.

## EXECUTIVE COMPENSATION

It is important that we evaluate the progress and performance of our leadership by measuring their ability to execute our goals related to climate change management and disclosure, particularly attainment of emission reduction targets. The achievement of our ESG goals is a component of annual compensation for senior executives and employees throughout the organization. Performance is evaluated on achieving annual goals and targets in areas such as developing low-carbon infrastructure, managing energy efficiency programs, and implementing and developing programs such as electric vehicles. The Organization and Compensation Committee of the board of directors is tasked with evaluating our leaders and providing oversight on the alignment of sustainability goals with compensation metrics.

## EMPLOYEE ENGAGEMENT

AT PSEG, WE RECOGNIZE that our full workforce must rise to the challenge climate change presents. We work hard to instill our values across the entire company and to ensure that all employees are empowered to implement our clean energy initiatives. To set a tone that upholds our mission and values, our leaders rely on tools such as employee engagement and culture surveys and employee-focused initiatives like People Strong, our human resources development program, to hear from all associates across the company. PSEG maintains a broad range of engagement programs servicing various levels of employee development that begins with a recently refreshed on-boarding process, in addition to several high-potential and leadership academy programs designed to support and foster continuing education and skills acquisition.



## RISK MANAGEMENT

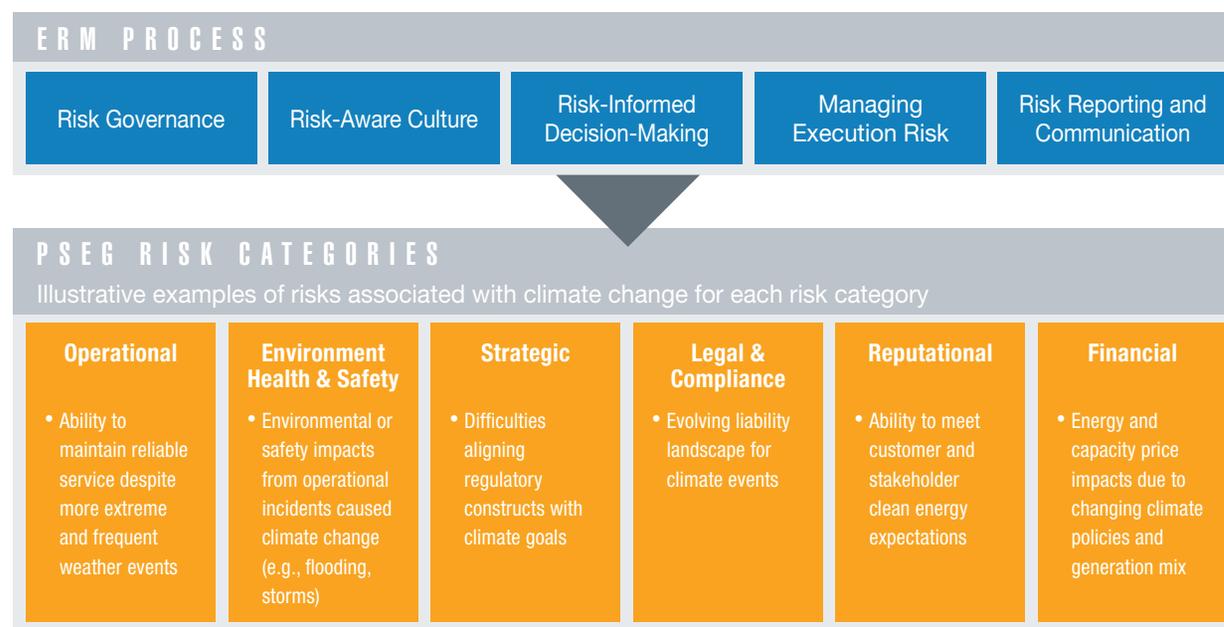
THE BUSINESS ENVIRONMENT in which we operate is complex, and the pace of change is accelerating. The transition to a low-carbon energy system along with the physical risks associated with climate change compound the uncertainties we face as a company. We must understand and respond to the risks posed to our assets and operations, as well as to our employees, customers and our broader community. To do so, we have developed an Enterprise Risk Management (ERM) process which, combined with specific incremental management activities, promotes effective management of enterprise-level risks, informs the prudent allocation of capital, and ultimately supports growth and the achievement of business objectives with acceptable risk levels.

## ENTERPRISE RISK MANAGEMENT (ERM) PROCESS

The ERM process identifies and assesses both enterprise risks and opportunities, including those relating to the emerging impacts of climate change. The ERM process is centered on five key components (see Fig. 2):

- Ensure appropriate **risk governance** across all levels of our organization
- Promote a **risk-aware culture** where all employees have a responsibility in identifying and communicating risks
- Enable **risk-informed decision-making** and objective setting

Fig. 2  
PSEG ENTERPRISE RISK MANAGEMENT PROCESS COMPONENTS AND TOP RISK CATEGORIES



- **Manage execution risk** through regular identification and assessment of risks, as well as risk response review and monitoring
- **Report and communicate** risks appropriately

## RISK GOVERNANCE

The board of directors provides strategic oversight of the ERM process, while the Corporate Risk Management Committee has oversight of the process at the executive level. PSEG's ERM team, led by the chief risk officer, is responsible for coordinating

the ERM process throughout the company. It is essential that risk assessment and risk-informed decision-making is integrated across all levels of our organization – from the board of directors through oversight of the risk management policy and program to executive leadership through the Risk Management Committee and to business operations.

We have mapped the key enterprise risks identified by management to the board and committees based on the committees' respective areas of oversight.



This mapping of risks serves to clarify the oversight responsibilities of each committee and ensure proper oversight of each identified risk. Operational risks associated with climate impacts are mapped to the board and the Industrial Operations Committee; strategic risks associated with policies designed to address climate change are mapped to the board; and governance of climate change risk oversight is mapped to the Corporate Governance Committee.

#### RISK-AWARE CULTURE

Promoting a successful risk-aware culture means supporting and encouraging employees to recognize risk, understand impacts and speak up when they identify potential risks and opportunities. PSEG's leadership recognizes the global risk of climate change and communicates its impact on future strategic and sustainability objectives to all employees.

#### RISK-INFORMED DECISION MAKING

To achieve our business objectives and performance goals, we must ensure that our business strategies are aligned with the risks we face. The awareness and analysis of enterprise risks and opportunities contribute to inform our business strategy, our sustainability goals and our investments in resiliency. Climate transition and the emerging impacts of climate are identified as enterprise-level risks and are considered as part of PSEG's future strategy and goals.

#### MANAGING EXECUTION RISK

Execution risks are those that may impact the achievement of strategy and business objectives. Effectively managing execution risk requires regular identification, assessment and monitoring to ensure an appropriate risk response. Potential risks are assessed across all categories of risk, including strategic, financial, environmental health and safety, legal and compliance, reputational and operational risks (see Fig. 2), all of which may be impacted by climate change.

Given the dynamic nature of risks, the ERM team leads an effort to annually update the view of enterprise-level risks and emerging risks, informed by consultations with risk owners and subject matter experts, external scanning, and similar risk assessments conducted by individual operating businesses.

Once risks are identified, the ERM process works to identify specific actions that can help manage and mitigate risks. Examples of mitigating actions we assess related to climate change include tracking the progress of our investment projects designed to further strengthen our electric and gas systems to better withstand storms, improve reliability and significantly enhance resilience.

#### RISK REPORTING AND COMMUNICATION

Underlying all the other components of the ERM process is the need for effective risk reporting and communication. Reporting enables effective governance, both at the executive management and board levels, by ensuring appropriate teams manage and execute their respective roles. For example, risk reviews have been presented to the board and to committees of the board on topics that included: the strategic implications of policies designed to address climate change; PSEG's potential role in new offshore wind projects; customers' evolving expectations regarding energy efficiency, clean energy and resiliency; the risk of prolonged electric distribution outages due to major storms and flooding; and the ability of PSEG's nuclear operations to handle extreme storms, extreme temperatures and flooding. An overall review of climate change risks is scheduled to be presented to our Risk Management Committee and the board.

Effective risk management aligns planning and strategy processes with key insights from the ERM process. The following Long-term Strategy section describes the activities closely affected by climate change in more detail.



# Long-term strategy





## LONG-TERM STRATEGY

WE BELIEVE THAT CLIMATE CHANGE is one of the most important challenges of our time and, as a leading energy company, we are compelled to respond to the challenge by facilitating the transition to a clean energy future in each of our businesses. We support New Jersey's efforts to achieve 100% clean energy by 2050 and cut statewide emissions to 80% below 2006 levels by the same year, as laid out in the updated Global Warming Response Act and signed by New Jersey Gov. Phil Murphy in July 2019.

## OUR CLIMATE STRATEGY – POWERING PROGRESS

Our current climate strategy is guided by our Powering Progress vision, which establishes a future of our company in which we help our customers use less energy, to ensure that the energy they use is cleaner, and to deliver that energy as reliably and resiliently as ever. We are committed to reducing our emissions, maximizing energy efficiency, supporting vehicle and building electrification and decarbonization opportunities across the economy, and investing in resilient infrastructure. We embrace the opportunity to work with policymakers and stakeholders to shape the path ahead. PSE&G and PSEG Power each have a distinct role to play in delivering on this strategy, which we highlight throughout this discussion.

We are proud to operate in a region that is striving to establish a low-carbon economy and committed to transforming our energy system. PSEG's infrastructure and the customers we serve have experienced the

### PSEG POWER GENERATION FLEET TARGETS

**80%** **REDUCTION** in PSEG Power's generation fleet's carbon emissions **by 2046**  
Below 2005 levels

**Net-Zero** vision **by 2050**  
assuming advances in technology, public policy and customer behavior

impacts of climate change firsthand. New Jersey's extended coastline and dense population leave the region particularly vulnerable to the effects brought by climate change, and we have been adapting our infrastructure to better withstand the physical risks associated with climate change.

We also have been working to reduce the impacts of climate change by transitioning to a low-carbon generating fleet. Table 1 outlines our progress throughout the company. We made our most recent and ambitious commitment in 2019 by committing to cut PSEG Power's generation fleet's carbon emissions by 80%, from 2005 levels, by 2046 and aiming for net-zero emissions by 2050, assuming advances in technology and public policy, as well as changes in customer behavior.



Table 1  
**HISTORY OF PSEG CLIMATE COMMITMENTS**

YEAR ESTABLISHED	DESCRIPTION OF GOAL	SCOPE OF GOAL	PROGRESS
1993	Stabilize CO <sub>2</sub> emissions to 1990 levels by 2000 (part of President Clinton's Climate Challenge Program, designed to effectuate the United Nations Framework Convention on Climate Change)	PSE&G – New Jersey plants	Completed 2000 – first electric utility to participate in Program
2002	Reduce GHG emissions intensity 15% from 2000 levels (voluntary commitment to the Environmental Protection Agency (EPA)'s Climate Leaders Program)	PSEG Power – fossil plants	Reduced 31% by 2008
2007	Reduce Scope 1 and 2 GHG emissions 25% by 2025 (from 2005 levels) <sup>1</sup>	PSEG enterprise-wide – avoided emissions (through electric utility programs) and emission reductions (lower carbon generation portfolio)	Completed 14 years ahead of schedule
2018	Eliminate 13 million metric tons of CO <sub>2</sub> -equivalent by 2030 (2005 levels)	PSEG enterprise-wide – avoided emissions (through utility programs) and emission reductions (lower carbon generation portfolio)	On track
2019	Cut carbon emissions 80%, (2005 levels) by 2046  Aim for net-zero emissions by 2050, assuming advances in technology, public policy, and customer behavior	PSEG Power's generation fleet	On track

1. Scope 1 emissions are direct emissions from owned or controlled sources. Scope 2 emissions are indirect emissions from the generation of purchased energy. Greenhouse Gas Protocol, FAQ, [https://ghgprotocol.org/sites/default/files/standards\\_supporting/FAQ.pdf](https://ghgprotocol.org/sites/default/files/standards_supporting/FAQ.pdf).

In New Jersey, where we are the largest utility company, we are committed to expanding clean energy opportunities to all our customers through PSE&G's electric and natural gas services – through the Clean Energy Future filings and Gas System Modernization

Plan, respectively – and support carbon reductions across New Jersey's economy. Fulfillment of New Jersey's climate goals is contingent upon our ability to step up to the challenge and deliver a reliable, nimble and cost-effective clean energy system.

## CLIMATE POLICY ADVOCACY

As a leader in low-carbon energy production, PSEG has long advocated for federal legislation to reduce GHG emissions. Beginning in the mid-1990s, PSEG has been advocating for a federal cap-and-trade program to drive reductions in GHG emissions and other air pollutants from power plants. We have supported the development and implementation of carbon policies including New Jersey's aggressive Renewable Portfolio Standard (RPS) and the Regional Greenhouse Gas Initiative (RGGI) and have been a leading participant in these programs.

In the absence of comprehensive federal carbon pricing legislation, we have supported using the existing U.S. Clean Air Act to achieve meaningful GHG reductions. In September 2019, PSEG joined a coalition of power companies in filing a petition for review of the Affordable Clean Energy rule, the current administration's replacement of the previously adopted Clean Power Plan. The petition challenges the U.S. Environmental Protection Agency's narrow interpretation of the agency's ability to reduce GHG emissions under the Clean Air Act. We are working to ensure that states and the EPA have the flexibility to use the Clean Air Act to achieve greater reductions at lower costs.



## PSEG AND CARBON PRICING

PSEG HAS LONG ADVOCATED for a price on carbon. In fact, a carbon price is one of **5 Things to Tackle Climate Change** that PSEG Chairman, President and CEO Ralph Izzo advocates are urgently needed to reduce the most damaging impacts of climate change.\* There are two primary reasons for this: flexibility and fairness.

**Flexibility:** A carbon price sends an economic signal to companies and individuals to take action on climate and reduce their emissions, without dictating the form of the action. This flexibility allows for innovative solutions to emerge that we might never have anticipated at the outset of the program. It also encourages cost-effective reductions, whether through energy efficiency investments, renewables investments or redispach of the generating fleet. Rather than picking and choosing preferred solutions, a carbon price encourages investment in the most cost-effective solutions, delivering the greatest reductions at the lowest possible cost. Making smart

investment decisions, guided by economics, is critically important given the scale of the challenge that lies ahead.

**Fairness:** A carbon price is fair because companies and households that have taken actions to reduce their emissions will benefit from their actions, while the sources that continue to emit are encouraged to change their behavior. Policies that are fair and effective tend to stand the test of time.

A national carbon price would be the most cost-effective solution to drive economy-wide reductions, whether in the form of a cap-and-trade program, a cap-and-dividend approach, or an upstream carbon fee. Izzo made this case in public testimony to the House Energy Committee in October 2019, and we will continue to press for a national price on carbon.

\* In addition to a price on carbon, the “5 Things” that we believe are essential for a national climate strategy also include: energy efficiency, preserving carbon-free nuclear energy, development of renewable energy at scale, and electrifying transportation.

## CLIMATE ALLIANCES

As New Jersey and other Northeastern states focus on deep decarbonization goals, stakeholder collaboration and coordination will become increasingly important. Coupled with fostering dialogue and exchanging information with stakeholders, we also aim to prepare our partners for a clean energy future through workforce- and skill-development programs. Some of the initiatives we are engaged in include:

- PSEG is a founding member of the [New Jersey Climate Change Alliance](#), which was formed in 2011 by a diverse group of stakeholders to focus on climate preparedness across the state.
- PSEG has been part of [Sustainable Jersey's](#) development and success since its formation in 2011 and has provided funding for small grants to municipal and school programs to foster the next generation of informed citizens.

**5 THINGS to tackle CLIMATE CHANGE**

- PRICE ON CARBON** (Icon: Car with exhaust)
- RENEWABLE ENERGY** (Icon: Wind turbine and solar panels)
- NUCLEAR** (Icon: Nuclear reactor)
- ENERGY EFFICIENCY** (Icon: Lightbulb)
- ELECTRIFY TRANSPORTATION** (Icon: Electric car and charging station)



- The PSEG Foundation supports environmental education programs that are essential to addressing climate change and current ecosystems. We provide major support to the National Wildlife Federation's [Eco-Schools program](#) in collaboration with the [New Jersey Audubon Society](#) and the New Jersey School Boards Association and have been instrumental in the impact and reach of the program statewide. The Eco-Schools Program provides practical, problem-based learning and inspires students to take ownership of a challenge within their own community. Additionally, the program interconnects the environment and human activities through innovation and sustainable learning. With this partnership, PSEG is taking an active role to encourage young people to take steps to care for the environment and inspire them to learn about future careers in our industry.
- In addition, we have worked with New Jersey-based academic institutions to promote STEM education and clean energy skill development, including Montclair State University – home to the [PSEG Institute for Sustainability Studies](#) – and [Princeton's Andlinger Center for Energy and the Environment](#) through the E-filates Partnership. Furthermore, through a partnership with Stevens Institute of Technology, PSEG and the PSEG Foundation is working towards advancing energy innovation and research in harvesting, storage and conversion as well as helping to increase the diversity pipeline of students from underserved communities to attend

pre-college programs in energy related topics. Funding from the PSEG Foundation provided scholarship opportunities for underrepresented students from eleven high schools throughout New Jersey to attend summer pre-college programs. Through this advanced research and student engagement PSEG is collectively working towards decreasing carbon emissions, encouraging energy efficiency behavior, addressing sustainability and educating the next generation of our skilled workforce.

- PSEG serves 19 of the 23 cities in New Jersey with [Climate Mayors](#) who have signed an agreement committing to adopt, honor and uphold the Paris Climate Agreement goals.
- PSEG's CEO Ralph Izzo is part of the [CEO Climate Dialogue](#) and has presented our long-term strategy as part of the [Chief Executives for Corporate Purpose \(CECP\)](#).
- PSEG engages with companies across multiple sectors on climate and sustainability strategies as a member of the [Center for Climate and Energy Solutions Business Environmental Leadership Council](#).
- PSEG actively participates in the stakeholder committees of our industry associations, Edison Electric Institute (EEI) and American Gas Association (AGA) to develop industry climate policies, improve disclosure and benchmark our sustainability and ESG practices with our industry peers.



## STRATEGY — PSEG POWER

Transitioning to a Cleaner and More Efficient Generating Fleet; preserving Zero CO<sub>2</sub> Nuclear Generation

PSEG POWER continues to transform its already low-carbon generating fleet to be even cleaner and more efficient (see Fig. 3). PSEG's generation emissions intensity is projected to be reduced by approximately 60% from 2005 through 2020 (see Fig. 4). Our power fleet's emission rate is roughly half the U.S. electric industry average. This accomplishment has been achieved by maintaining our nuclear units, investing in high-efficiency gas-fired generating units and renewables, and closing coal-fired generation assets. Among the largest private/investor-owned power producers in the United States, we have the third-lowest carbon emissions intensity rate, but we recognize that our journey is far from complete. The following discussion outlines our strategy for our power generating fleet.

## STRATEGIES FOR PSEG POWER

- Continue to advocate for the preservation of PSEG Power's Salem and Hope Creek nuclear plants – together these two plants account for more than 90% of New Jersey's zero-carbon electricity
- Retire our last coal-fired generating facility and older, less efficient gas-fired units
- No plans to build or acquire new fossil fuel generation
- Integrate clean energy technologies, including solar
- Continue to assess the viability of an investment in offshore wind

Fig. 3  
PSEG POWER GENERATION FUEL MIX (% MWH): HISTORIC AND PROJECTED

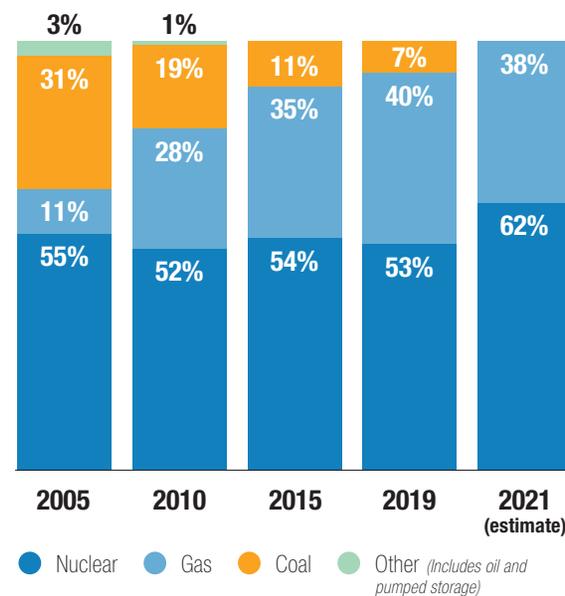
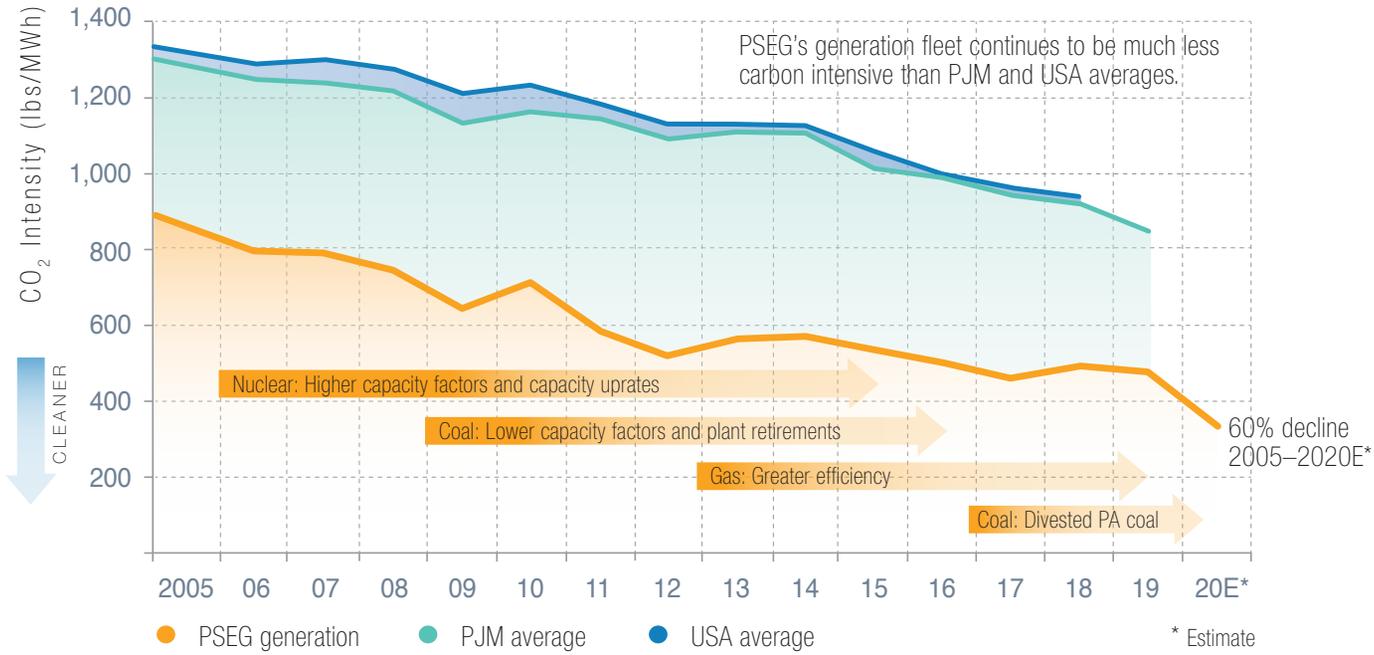




Fig. 4  
**PSEG GENERATION CARBON EMISSION INTENSITY VS. PJM AND USA**



PSEG's generation carbon footprint is projected to be reduced by approximately 60% from 2005 through 2020





## NUCLEAR PRESERVATION

For more than 40 years, nuclear energy has powered millions of New Jersey homes and businesses with safe, reliable and affordable electricity. At the same time, the state's nuclear reactors produce no carbon emissions. We will need to rely on a host of zero-carbon resources, including nuclear and renewable energy resources, to decarbonize PSEG Power's fleet and support New Jersey's Energy Master Plan. Today, the Salem and Hope Creek nuclear generating plants supply approximately 40% of the state's electricity and more than 90% of the state's carbon-free electricity. The loss of this capacity would translate to more than 12.7 million tons of CO<sub>2</sub> emissions each year, year after year, assuming replacement with natural gas combined-cycle facilities. That would increase electric sector CO<sub>2</sub> emissions in New Jersey by almost 70% in opposition of the state's goals and our own.

Maintaining the financial viability of our nuclear generating resources is key to supporting additional renewable resources, since the plants provide critical grid reliability support. In addition, preserving the nuclear fleet is important in finding the most economic pathways for the state to achieve net-zero carbon emissions. According to an analysis by Rocky Mountain Institute (RMI), a scenario in which New Jersey retires its nuclear assets and does not develop new natural gas generation could cost over \$20 billion more than the least-cost approach for achieving net-zero by 2050.<sup>3</sup> Our nuclear generating plants also support millions of dollars in local and statewide investment along with more than 1,600 full-time, high quality jobs. Preserving the plants enables us to preserve this critical economic engine.

In April 2019, the New Jersey Board of Public Utilities (BPU) awarded three-year Zero Emission Certificates (ZECs) to the Salem and Hope Creek nuclear plants, implementing the Legislature's intent to preserve nuclear power plants, and ensuring that their clean air attributes, job benefits, low-cost energy and fuel diversity continue to play a vital role in New Jersey's energy portfolio. Maintaining these facilities will be critical to cost-effectively meeting New Jersey's GHG goals. Preserving nuclear offers one of the lowest-cost

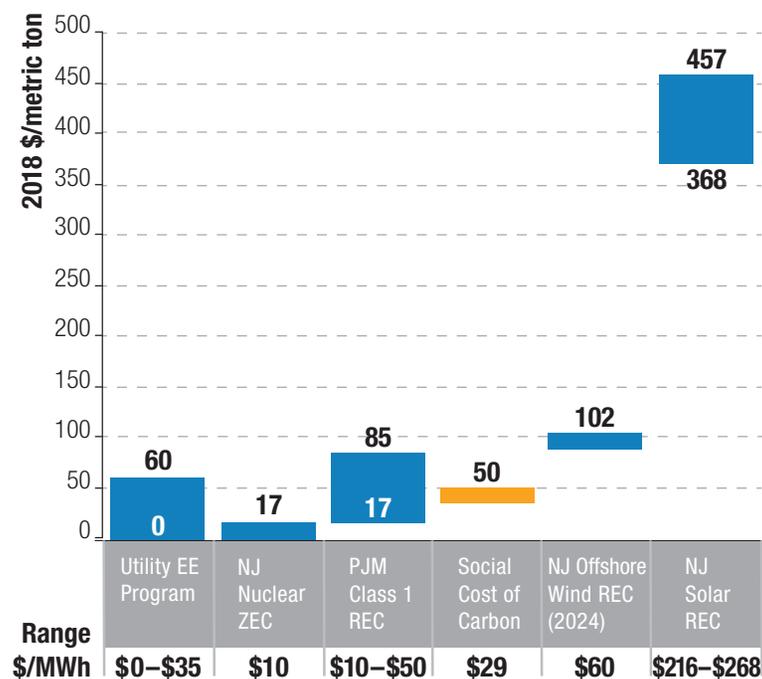
options for reducing greenhouse gas emissions. At \$10/MWh, the ZEC incentives translate to a carbon abatement cost of \$17 per metric ton of CO<sub>2</sub>. As illustrated in Fig. 5, next to energy efficiency, preserving nuclear remains among the most cost-effective strategies for achieving long-term decarbonization goals.

3. Rocky Mountain Institute (commissioned by NJBPU), *New Jersey Integrated Energy Plan: Public Webinar*, Nov. 1, 2019, <https://nj.gov/emp/pdf/NJ%20IEP%20Public%20Webinar%20Nov1%20Final.pdf>.

Fig. 5

### NEW JERSEY'S COMPARATIVE CO<sub>2</sub> ABATEMENT COST

(Based on PJM's Marginal CO<sub>2</sub> Emissions Rate)



Energy Efficiency reflects the cost of PSE&G's proposed CEF-EE program offset by expected reductions in customer bills related to lower energy usage. Nuclear ZEC reflects N.J.'s Zero Emissions Certificate (ZEC) payments and does not reflect any additional carbon removal from the continuing operation of the facilities.

Sources: Interagency Working Group's 2020 social cost of carbon. PJM 2018 Marginal Carbon Intensity. Class 1 & SREC low end is the energy year 2018 cost (BPU compliance report), upper end is the non-compliance cost for energy year 2019. Offshore wind subsidy is the difference between the OREC price for 2024 and the calculated value of PJM energy and capacity using the BPU reference prices. Utility Energy Efficiency (EE) program high-end cost is based on the \$35/MWh average lifetime cost of PSE&G's CEF filing.



## COAL RETIREMENTS

By mid-2021, PSEG Power will have retired or exited through sales more than 2,400 megawatts (MW) of coal-fired generating capacity since 2017. This will mark the completion of PSEG Power's coal exit strategy, which began in 2016. In June 2017, PSEG Power retired the Hudson and Mercer coal-fired generating stations. These were our last coal plants operating in New Jersey. In October 2019, PSEG Power sold its interest in the Keystone and Conemaugh coal plants in western Pennsylvania. We plan to retire our coal unit at the Bridgeport Harbor Station in Connecticut in 2021. This is the last coal plant in PSEG Power's portfolio.

## NATURAL GAS-FIRED GENERATION

Combined with other changes in our generating portfolio, PSEG's high-efficiency, combined-cycle power plants have enabled a significant reduction in the company's carbon emissions intensity over the past decade, declining from an average of 714 lb/MWh in 2010 to 477 lb/MWh today.<sup>4</sup> This shift to high-efficiency gas generation has also benefited the broader PJM region, with a significant reduction in the region's carbon emissions intensity. The PJM average emissions rate has declined from 1,092 lbs/MWh in 2012<sup>5</sup> to 851 lbs/MWh in 2019 (22% reduction).<sup>5</sup>

We continue to make improvements to our existing plants to make them more fuel-efficient, and our recent investments in Keys Energy Center (Maryland), Sewaren 7 (New Jersey) and Bridgeport Harbor

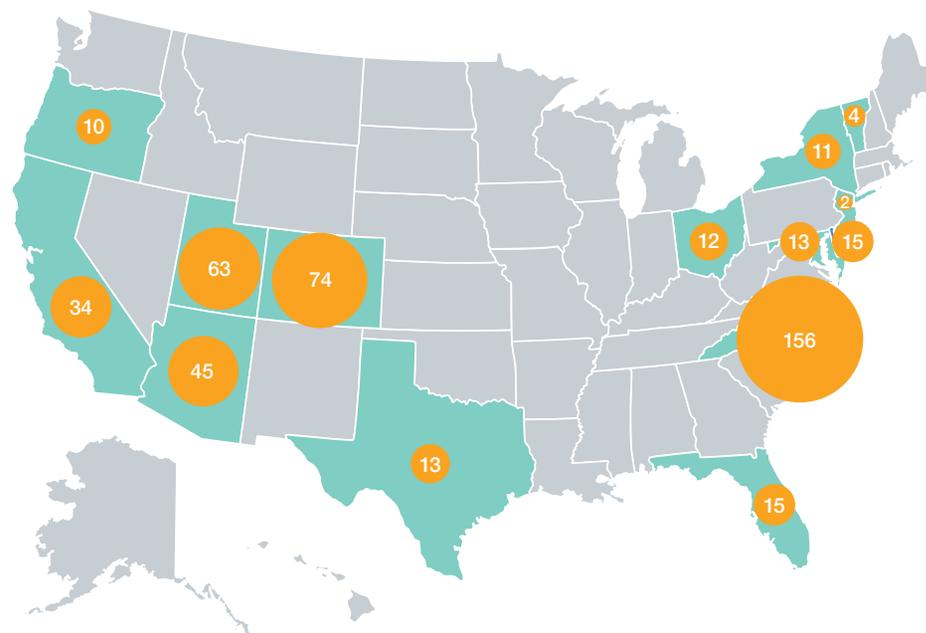
Station Unit 5 (Connecticut) further advance our overall efficiency. These state-of-the-art facilities are the most efficient in the company's fossil fleet, displacing higher-emitting units in the region's power markets and supporting electric system reliability. Looking to the future, PSEG Power has no plans to add new fossil plants to its fleet, and we expect to gradually retire our existing gas-fired facilities as they reach the end of their useful lives. This will keep us on track to reduce PSEG Power's carbon emissions 80% by 2046, from 2005 levels.

## RENEWABLE DEVELOPMENT

PSEG Solar Source, a subsidiary of PSEG Power, develops, constructs, owns and operates utility-scale solar facilities, including large-scale solar farms. Its portfolio includes 25 facilities in 14 states with a total capacity of 467 MW.

PSEG is working to help realize New Jersey's offshore wind potential, including our active consideration of an

## PSEG SOLAR SOURCE PORTFOLIO — 467 MW-DC



equity investment in Ørsted's 1,100 MW Ocean Wind project. The Ocean Wind project is expected to power roughly 500,000 New Jersey homes and generate \$1.17 billion in economic benefits over its lifetime, according to the New Jersey BPU. We are excited to be exploring how offshore wind can make our energy system more sustainable. These projects can help achieve the state's GHG and clean energy goals due in part to offshore wind's higher capacity factors relative to other renewables. New Jersey aims to have 7,500 MW of offshore wind capacity by 2035, an ambitious goal that would put New Jersey at the forefront of U.S. offshore wind development in the U.S.

4. Ceres et al. Benchmarking Air Emissions of the 100 Largest Electric Power Producers in the United States (2010) and PSEG DJSI Summary (Estimated for 2019).

5. <https://www.pjm.com/-/media/library/reports-notices/special-reports/20170317-2016-emissions-report.ashx>. PJM. <https://insidelines.pjm.com/emissions-continue-to-drop-throughout-pjm-footprint/>



## STRATEGY — PSE&G

Helping our Customers Save Energy and Integrating Clean Energy Technologies

PUBLIC SERVICE ELECTRIC AND GAS CO. (PSE&G) is focused on bringing the clean energy future to our customers through energy efficiency, advanced meters, storage, and solar, where PSE&G was an early mover. We invest in the electric transmission and distribution systems, making them smarter, more efficient and more resilient.

### STRATEGIES FOR PSE&G

- Continue to expand PSE&G's energy efficiency offerings, which we believe are one of the most important measures that we can take as a company to reduce emissions, create jobs and save our customers money.
- Integrate clean energy technologies including solar and offshore wind, as well as emerging technologies, such as electric vehicles, energy storage and smart grid technology.

## CLEAN ENERGY FUTURE (CEF) PROGRAMS

As New Jersey's largest electricity provider, we know the state's ambitious climate agenda cannot succeed without our investment and bold action. Outlined in our strategy the integration and adoption of smart technology is a fundamental component of our climate approach. That is why we proposed the suite of Clean Energy Future programs, a six-year, \$3.5 billion historic investment that would focus on four strategies:

- **Energy Efficiency (\$2.5 billion)** – By far the largest component of CEF, these energy efficiency investments would help customers reduce their energy usage and combat climate change. Projects range from providing free energy audits and installation of efficient products for our income eligible customers, to LED streetlights across our entire service territory, to incentives for deep energy efficiency projects for commercial and industrial customers. These programs would benefit our hard-to-reach customers, such as low-income, multi-family, small business and local governments.
- **Electric Vehicles (\$0.3 billion)** – *The transportation sector is the largest source of GHG emissions in New Jersey.* To support GHG reductions through the adoption of electric vehicles, the proposed investment will support the deployment of nearly 40,000 chargers across a wide range of customers and sectors:

- 1) residential smart charging;
- 2) Level 2 mixed-use charging at multi-family buildings, businesses, fleet facilities, municipal facilities and hotels/motels;
- 3) public DC fast-charging;
- 4) electric school buses and charging infrastructure at school districts; and
- 5) electrification projects at ports, airports and transit facilities.

- **Energy Storage (\$0.1 billion)** – The proposal calls for building 35 MW of storage capacity to defer additional distribution investment, enable additional solar, and enhance resiliency.
- **Energy Cloud (AMI) (\$0.6 billion)** – The proposal calls for an accelerated roll-out of approximately 2 million electric smart meters and supporting infrastructure throughout our electric service territory. In addition to the storm-response and reliability benefits of smart meters, this technology is critical for advancing energy efficiency opportunities and integration of other clean energy technologies.

We aim to provide cost-effective and innovative solutions that help propel New Jersey's role as a national leader in energy efficiency and jumpstart other clean energy priorities. We believe our Clean Energy Future proposal has the potential to transform the way we think about energy in New Jersey. These programs remain under consideration by the NJ BPU.



## ENERGY EFFICIENCY

Energy efficiency is the most cost-effective strategy for reducing GHG emissions (see Fig. 5). It saves money for consumers and is available today. With the electrification of homes, businesses and transportation increasing our reliance on electricity, energy efficiency can help to moderate overall demand and maintain affordability. Over the past dozen years, PSE&G has invested over \$480 million in energy efficiency initiatives targeting hospitals, multi-family housing, government buildings and nonprofits, which avoid emissions while creating jobs and saving customers money. These efforts have saved enough electricity to power 40,000 homes and enough natural gas to supply 10,000 homes. Participants also benefit from \$275 million a year in energy cost savings.

PSE&G believes that there is significantly more untapped potential for energy efficiency among New Jersey's residential and business customers. The most practical, reliable and affordable way to ensure universal access to energy efficiency is public policy that recognizes utilities' unique role as a link to all customers and encourages utilities to work alongside technology partners to meet energy efficiency goals. This is why we consistently advocate for approaches that make the most of PSE&G's low-cost capital, our brand, our expertise, our relationships and our duty to serve everyone.

We also have advocated for regulatory reforms like decoupling, which remove incentives for utilities to maximize electricity sales. In fact, the nine top-ranked states for energy efficiency have all adopted revenue decoupling.<sup>6</sup> We will continue to advocate for energy efficiency, providing a strong foundation for New Jersey's clean energy transition.

## INDUSTRY RECOGNITION FOR ENERGY EFFICIENCY EFFORTS

Customer adoption of energy efficiency measures helps both their budget and their environmental impact. In April 2019, PSE&G received an Innovation Award from Smart Energy Decisions for our energy efficiency work at 36 New Jersey hospitals. Through our \$199 million Hospital Efficiency Program, we provide up-front funding for the total cost of the energy efficiency improvements and interest-free, on-bill repayment for the hospital's share of the costs (typically between 30 and 40%). So far, the program has helped save more than \$400,000 in annual energy cost savings

per hospital and enough kilowatt-hours of electricity to power more than 10,000 homes and enough natural gas to supply more than 3,000 homes. Coupled with this success, PSEG won the 2019 ENERGY STAR Partner of the Year award for its efforts to help lower our Long Island customers' energy usage and reduce their carbon footprint.

The American Council for an Energy-Efficient Economy (ACEEE) ranked New Jersey 17th in energy efficiency policy and program efforts for 2019. This is an improvement over previous years but serves as a reminder that we have more to do.

*"The most effective first step must be to reduce demand for electricity in the first place by using less of it. Whether it's from a coal plant or a wind farm – the cheapest and greenest kilowatt hour of electricity is the one that's not used."*

*– PSEG Chairman, President and CEO Ralph Izzo*

6. American Council for Energy-Efficient Economy (ACEEE), The 2019 State Energy Efficiency Scorecard, October 2019, <https://aceee.org/sites/default/files/publications/researchreports/u1908.pdf>.



## ELECTRIC VEHICLES

The transportation sector is New Jersey's leading source of GHG emissions, accounting for 42% of the state's emissions. The state's Energy Master Plan looks to electrification as the key strategy for transportation. According to the plan, "the transportation sector should be almost entirely electrified by 2050, with an early focus on light-duty (passenger) vehicles and short-range, medium- and heavy-duty vehicles, particularly in environmental justice communities."<sup>7</sup> To support this goal, PSE&G has proposed a significant investment across four customer segments: 37,000 Level 2 residential chargers, 2,200 mixed-use Level 2 chargers, 450 public fast-chargers, and 60 chargers for electric school buses or other customized electrification projects.<sup>8</sup>

This program will build on our previous pilot program to install electric vehicle charging stations at various business customer locations as part of our Customer Workplace Charging initiative. To date, PSE&G has provided 145 chargers through this program. In addition, PSE&G has partnered with EVgo, a leading EV charging provider, to install fast-charging stations at five rest areas along the New Jersey Turnpike and

the Garden State Parkway. We also have positioned ourselves as an active partner in transportation electrification initiatives, such as ChargeEV, to identify programs and policies to accelerate electric vehicle growth in New Jersey.

To maximize environmental benefits while minimizing grid impacts as a result of EV adoption, PSE&G and stakeholders will need to develop and optimize EV charging rate structures to encourage off-peak charging and invest in an expanded charging infrastructure to deploy solutions such as direct-current fast-charging stations. PSE&G also can provide significant insight into consumer charging behavior and trends, allowing us to identify optimal charging locations and potential bottlenecks that will require additional transmission and distribution upgrades to allow for growing EV demand.

PSE&G is working to lead by example on EVs. We have taken steps to reduce GHG emissions from automobiles through the Employee Workplace Charging program we launched in 2013. To promote early adoption, employees who commute in an electric vehicle receive no-cost charging and parking for three years at three company locations.

7. New Jersey BPU et al. 2019 New Jersey Energy Master Plan: Pathway to 2050. January 2020.

8. Level 2 chargers offer 10 to 20 miles of range per hour of charging while fast-chargers provide 60 to 80 miles of vehicle range in 20 minutes.



## ENERGY STORAGE

Energy storage technology will play an important role in balancing the electric grid as we increase our reliance on intermittent renewable resources, such as offshore wind and solar. In addition to building several energy storage facilities to support our solar project integration, PSE&G has proposed 35 MW of storage that would work with a variety of customers to deploy storage systems for storm preparedness and resiliency: 10 MW to reduce the intermittency of solar; 13 MW that would help avoid the need for additional distribution infrastructure; 6 MW for outage management; 2 MW for microgrids for critical facilities; and 4 MW for peak-reduction for public sector facilities. Through partnerships with the municipal public works departments and university medical centers, PSE&G

will be positioned to support operations in times of crisis. This array of early stage projects helps deepen PSE&G's understanding of storage and positions us to do more as technology matures and prices fall. These projects will help New Jersey meet its energy storage goal of 600 MW of energy storage by 2021 and 2,000 MW by 2030.

With the right rules and regulations in place at the state, federal and regional regional transmission organization (RTO) levels to support increased investment and deployment of battery storage technologies, PSE&G can leverage energy storage technologies to strengthen the grid. Assuming continued innovation and cost reductions, energy storage can become increasingly important to the grid in maintaining reliability as we come to rely even more on electricity to power our economy.

## SMART METERS

Smart grid technology is a critical enabler as we work to build a cleaner, more dynamic system. Digital technologies will not only facilitate integration of new resources, but also create a more resilient system in the face of more extreme weather events. Smart meters enable real-time communication that supports faster restoration times and helps customers save money and shrink their carbon footprint. For that reason, PSE&G has proposed an accelerated roll-out of approximately 2 million electric smart meters in New Jersey. We will continue to work to provide equal access to money-saving technologies to all our customers as we expand advanced services and develop smart energy homes.





## SOLAR

Distributed solar, whether on rooftops or through community aggregation, can help meet future renewable energy needs, especially as costs decline and smart grid technologies allow for improved communication between PSE&G and nodes on the grid. PSE&G has been working to encourage solar for our customers in New Jersey through our Solar 4 All<sup>®</sup> and Solar Loan programs. These programs were developed by PSE&G and approved by state regulators:

- Through Solar 4 All<sup>®</sup>, we develop grid-connected solar farms to serve PSE&G electric customers. The projects are primarily sited at landfills and brownfields so we can increase renewable energy without sacrificing green space. Our Solar 4 All<sup>®</sup> program has developed 153 MW of solar within PSE&G's service territory. As part of these projects, we have also developed five solar/battery storage projects that total nearly 3 MW.
- PSE&G's Solar Loan program makes solar ownership more affordable by financing a major portion of the solar system and providing a unique repayment option that locks in a guaranteed value of the Solar Renewable Energy Certificates the system is expected to generate. Since 2008, PSE&G has approved more than \$317 million in loans and helped more than 1,600 PSE&G customers to finance over 132 MW of solar on homes and businesses.



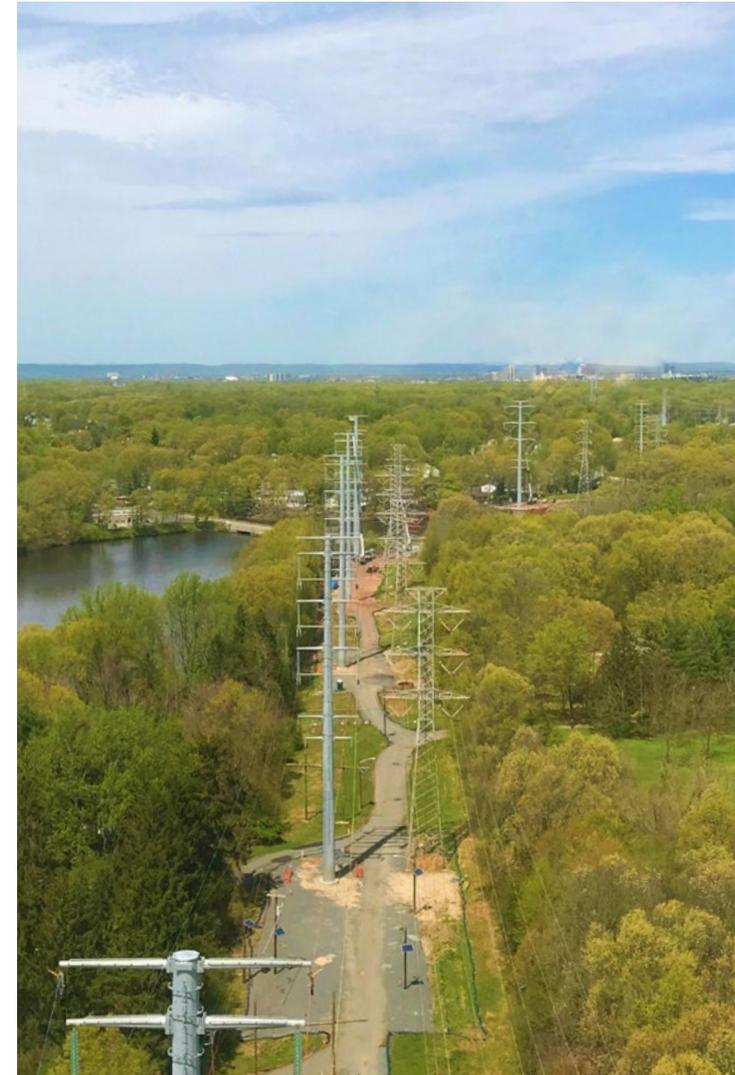
## STRENGTHENING AND MODERNIZING NEW JERSEY'S ELECTRIC TRANSMISSION AND DISTRIBUTION SYSTEM

**THE TRANSMISSION AND DISTRIBUTION** network is the backbone of New Jersey's electric system. PSE&G has made substantial investments in the transmission and distribution system in New Jersey over the past several years, eliminating congestion and improving reliability. These investments have laid the foundation for the types of changes envisioned by the Energy Master Plan. Additionally, BPU modeling in support of the New Jersey Energy Master Plan highlights the need for additional transmission and distribution system investments. The least cost scenario includes more than 2 GWs of transmission investment (expanding from 7 GW to 9 GW). PSE&G is nearing the successful completion of a decade-long effort focused on upgrading and replacing higher-voltage transmission lines that, in some instances, dated back to the early 20th century. Our investments have contributed to an 80% reduction in transmission outages since 2009. However, for customers to enjoy the full benefits of the improved regional transmission system, it is necessary to improve the local lower-voltage transmission system as well as our distribution network. Our transmission capital program will continue replacing older 26 kilovolt (kV) station facilities with 69kV stations and will accommodate anticipated load growth from data centers and the electrification of buildings and vehicles.

At the distribution level, our ongoing Energy Strong infrastructure resiliency program is designed to ensure that our distribution system can withstand extreme weather events. Phase I of the program focused on storm hardening by investing \$628 million between 2013 and 2018 and raising and rebuilding or eliminating 26 substations damaged by flooding in recent storm events. During Phase II, PSE&G expects to invest \$842 million between 2019 and 2023, specifically focusing on storm hardening, improved resiliency and grid modernization. Phase II also will include the new Advanced Distribution Management System and communication network to improve resiliency and meet future grid needs.

As one of the first companies to introduce live-line maintenance of high-voltage lines, we continue to explore new innovative solutions that will protect our infrastructure during extreme weather events.

PSE&G has been recognized as the most reliable electric utility in the Mid-Atlantic region for the past 18 years by PA Consulting, and we are doing everything we can to make sure that we maintain this leadership position as part of our preparation for climate change.





## RESPONDING TO THE INCREASING RISK OF SEVERE STORM EVENTS — ENERGY STRONG

PSE&G is focused on hardening our infrastructure to support more resilient electric and natural gas systems. In 2012, Superstorm Sandy severely impacted New Jersey, New York and the wider region, knocking out power to 90% of our customers. Only a year before Sandy, New Jersey suffered significant damage from Hurricane Irene and a rare October snowstorm.

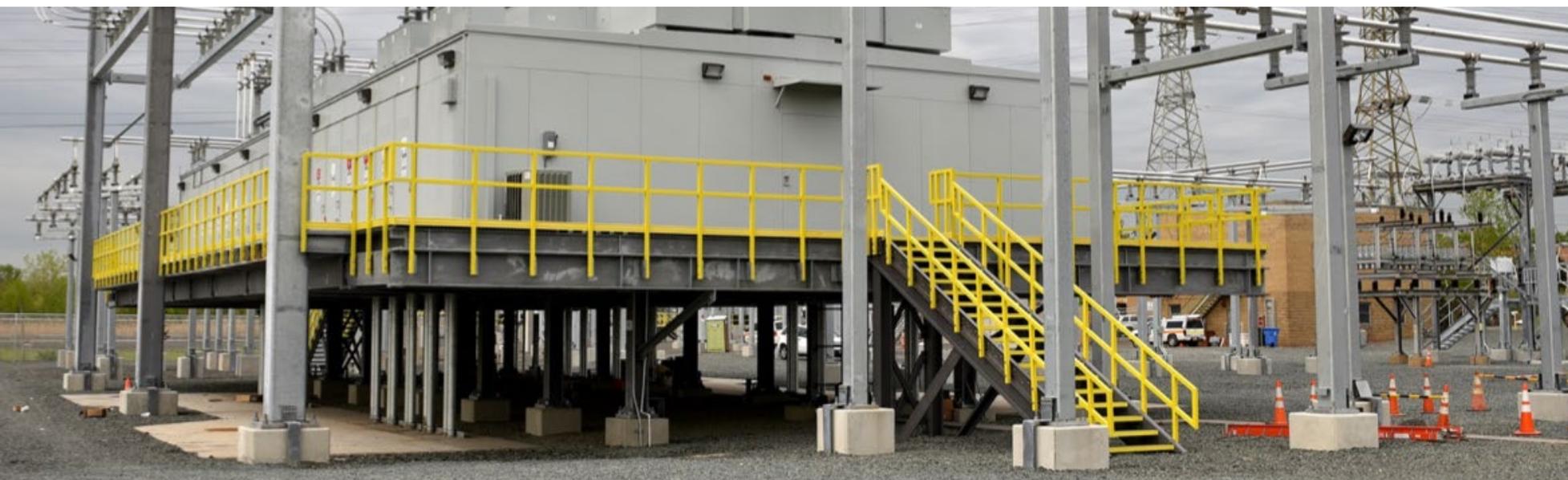
In response to these events, PSE&G established the Energy Strong infrastructure resiliency program. The first phase of which was completed in 2018. During the first phase, with an investment of \$1 billion, PSE&G upgraded all of its electric substations that were

damaged by water in recent storms; made investments that will create redundancy in the electric distribution system, reducing outages when damage occurs; and deployed technologies to better monitor system operations, enabling PSE&G to restore customers more quickly in the event of an electric outage.

PSE&G upgraded five natural gas metering stations, two liquid propane air plants and a liquefied natural gas plant affected by severe weather or located in flood zones. We also completed the replacement and modernization of 240 miles of low-pressure cast-iron gas mains in or near flood areas. Energy Strong II launched at the end of 2019 and will

continue similar investment projects through 2023 to harden electric and gas infrastructure and improve reliability and resiliency.

The efforts we have taken to date have helped us mitigate the effects of these storms. After Hurricane Irma in 2017, EEI awarded PSE&G with its Emergency Assistance Award for outstanding work assisting customers impacted by the storm. As PSE&G and our customers are confronted with more frequent and intense storm events, we are committed to investing in a more resilient, reliable grid to mitigate the effects to the extent we can.





## MODERNIZING NEW JERSEY'S NATURAL GAS SYSTEM

AS ONE OF THE NATION'S FIRST and oldest natural gas utilities, PSE&G also has the oldest, largest cast-iron main natural gas distribution system. Approximately 75% of our customers rely on natural gas for home use, including heat. Modernizing our natural gas distribution system is essential for supporting New Jersey's GHG goals. While cast-iron and unprotected steel gas pipes are less than 25% of the utility's natural gas infrastructure, they account for 70% of distribution system leaks each year, excluding third-party damages. Gas leaks release methane, a powerful greenhouse gas, into the air. Our Gas System Modernization Program (GSMP) was designed to accelerate the replacement of these aging pipes. Phase I was completed in 2018, and Phase II is currently underway. Upon completion of Phase II, we will have invested \$2.8 billion to convert more than 1,450 miles of aging cast-iron and unprotected steel pipes to more durable materials.

PSE&G is a long-time participant in EPA's Natural Gas STAR program, a voluntary initiative that encourages natural gas companies to adopt cost-effective technologies and practices that reduce methane emissions. Continued pipeline replacements will help us achieve our commitment to annually replace 1.5% of our cast-iron gas mains and associated service lines as part of EPA's STAR Methane Challenge, of which we are a founding member.

We rely on partnerships to better understand the opportunities to target methane reduction in our natural

gas system and explore innovative solutions. Through our collaboration with the Environmental Defense Fund, we used data gathered by Google Earth and Colorado State University to map methane emissions throughout our service territory using Google Street View vehicles. PSE&G became the first utility in the country to use this data in planning its replacement work, and we continue to use methane mapping results to prioritize replacements in our system.

Achieving the goals of New Jersey's Global Warming Response Act will require more significant changes to natural gas services that go beyond modernizing the distribution system and reducing methane leaks. Significant work is required to advance cost-effective approaches to decarbonizing heating services and other sectors of New Jersey's economy.

Greater electrification will be a key component of future climate strategies. In the building sector, new construction provides the most cost-effective opportunities for electrification. At the same time, the natural gas system also has a significant role to play in delivering a clean energy future. For that reason, we are continuously exploring measures to reduce the carbon intensity of our gas operations while maintaining performance expectations of reliability, safety and affordability. Important areas of focus include energy efficiency gains through emerging natural gas direct-use technologies and carbon intensity reductions offered by renewable natural gas and advanced technologies including hydrogen and power-to-gas.



# Climate scenario analysis





## CLIMATE SCENARIO ANALYSIS

PSEG USES LONG-TERM OUTLOOKS to inform its business planning, including analysis of changing market conditions, customer preferences, technologies and public policy. We consider this approach to be essential for understanding the strategic implications of key market trends and uncertainties, including climate-related risks and opportunities. [The Task Force on Climate-related Financial Disclosures \(TCFD\)](#) encourages organizations to use scenario analysis in the assessment and disclosure of climate-related risks and opportunities, with specific guidance provided in a Technical Supplement document dedicated to the topic.<sup>9</sup> For the purposes of this report, we evaluated our business strategy against a scenario to limit global average temperature increases to less than 2°C, as recommended by TCFD guidance.

PSEG considered several third-party climate scenarios and decided to use the International Energy Agency's (IEA) 2°C Scenario (2DS) to analyze the business implications of a "deep decarbonization" scenario. IEA published the 2DS as part of its Energy Technology Perspectives series. The IEA 2DS limits global average temperature increases to less than 2°C<sup>10</sup> from pre-industrial levels by setting out a rapid, global decarbonization pathway.

We selected the IEA 2DS because the analysis is well-documented and provides detailed U.S.-specific results. According to the IEA, "the 2DS has been the main climate scenario in the [Energy Technology Perspectives] series for many years, and it has been widely used by policymakers and business stakeholders to assess their climate strategies." The 2DS encompasses all sectors

of the global economy. This economy-wide approach is critical to understanding the full implications of these ambitious carbon reduction goals, including the new demands being placed on the electric sector to support these goals.

*"For many organizations, the most significant effects of climate change are likely to emerge over the medium to longer term, but their precise timing and magnitude are uncertain... To appropriately incorporate the potential effects of climate change into their planning processes, organizations need to consider how climate-related risks and opportunities may evolve and their potential business implications under different conditions. One way to assess such implications is through the use of scenario analysis."*

—TCFD

In addition to this analysis, PSEG has been an active stakeholder in the New Jersey BPU's modeling of an integrated energy plan, which was an input into the state's Energy Master Plan. The BPU modeling evaluated an 80% reduction in GHG emissions, from 2006 levels, by 2050, consistent with the state's Global Warming Response Act.

9. Task Force on Climate-related Financial Disclosures. *Technical Supplement: The Use of Scenario Analysis in Disclosure of Climate-Related Risks and Opportunities*. June 2017.

10. The Electric Power Research Institute (EPRI) emphasizes that there are many scientific uncertainties associated with climate forecasting, and there are many potential pathways to avoid global temperature increases. The IEA 2DS CO<sub>2</sub> emissions trajectory is said to be consistent with at least a 50% chance of limiting the average global temperature increase to 2°C by 2100.



Louis Pined on Unsplash

## IEA'S 2°C SCENARIO

THE IEA 2DS sets out a very ambitious scenario for transforming energy systems and reducing emissions reductions on a global scale. The scenario entails virtual decarbonization of the U.S. electric system by 2050, while end-use sectors, such as transportation, heating and industrial processes, are converted to electricity. Electricity use increases more than any other energy source, becoming the largest final energy carrier in the IEA 2DS, surpassing both oil and natural gas. In addition to widespread electrification, the IEA 2DS also assumes significant improvements in efficiency, reducing total energy use. For example, in transportation, the IEA 2DS assumes that better urban planning and public transportation significantly reduce overall transportation demand. Other technologies assumed to be deployed in the IEA 2DS include carbon capture and sequestration, biofuels and battery storage technologies.

There are significant uncertainties in developing a long-term outlook. Technologies and markets can evolve in unexpected ways. The IEA scenario provides only one pathway to achieve an 80% emissions reduction goal by mid-century. Public policy decisions, customer preferences and future technology innovations, among other factors, will shape future market conditions and abatement strategies. However, the IEA scenario provided a reasonable basis for helping us think through the possible implications of a broad decarbonization effort.

To better understand the implications of the IEA 2DS on our operations, we evaluated the scenario's 80%

economy-wide emission reduction across the PJM region and within the state of New Jersey. While we are specifically examining this region, the same level of emissions reductions, consistent with the IEA 2DS, are assumed to happen across the United States. This is an ideal strategy where all regions and sectors across the country contribute to economy-wide GHG emissions reduction goals based on the relative economics of carbon abatement opportunities.

It is important to recognize that the IEA 2DS is very different from the current landscape in the United States. In absence of federal climate policy, states and regions are moving forward with disparate goals and targets, potentially leading to less-than-optimal outcomes. For example, unintended emissions increases can occur within a regional electricity market if targets are not harmonized across the market footprint.

The discussion that follows focuses on the implications for New Jersey, where we are the largest provider of electric and natural gas service.

## ASSESSMENT APPROACH

PSEG assembled an internal multidisciplinary team drawn from several business units for this analysis. We reviewed IEA's 2DS to understand it in detail.<sup>11</sup> Using the IEA 2DS as a guide, we worked with M.J. Bradley & Associates and its State Emission Pathways (STEP) Tool to understand the more localized implications of

11. The IEA analysis includes U.S.-level results; it does not provide state-level detail.



the IEA 2DS on New Jersey (referred to as “NJ2DS” in this report). The assumptions for this state-specific analysis were developed based on M.J. Bradley’s expert review of the IEA report and IEA’s U.S.-level results. This scenario is not a prediction of the future but reflects the technology and infrastructure changes required to meet a very ambitious carbon abatement pathway. The team evaluated the implications of IEA’s 2DS for the regional power markets in which the company operates (PJM, ISO-NE and the NYISO) and considered the risks and opportunities for the various parts of its business.

## ANALYTICAL FRAMEWORK

New Jersey has significantly reduced its GHG emissions over the past decade. The New Jersey Department of Environmental Protection’s GHG inventory reports a 29% reduction in emissions between 2005 and 2018.<sup>12</sup> Significant further reductions from all sectors of the economy would be required to meet the ambition of the IEA 2DS. The IEA 2DS models a future in which U.S. CO<sub>2</sub> emissions are reduced 80% by 2050 and 90% by 2060 (see Appendix for summary of IEA’s U.S.-level results). Consistent with the IEA scenario, the project team modeled:

- Near total decarbonization of the electric power sector in the state (and PJM) by 2050 (requiring the preservation of the state’s nuclear units) and significant energy efficiency savings.
- Substantial electrification of passenger vehicles (cars and light trucks). Nearly all passenger cars and

IEA also publishes a Beyond 2°C Scenario (B2DS) that aims to push clean energy technologies beyond the levels assumed in the 2DS to meet the more ambitious aspirations of the Paris Agreement. There has been increased focus on “beyond 2-degree” scenarios since the publication of the Intergovernmental Panel on Climate Change (IPCC) Special Report on Global Warming of 1.5°C (SR15) in October 2018. The B2DS assumes net negative

emissions from the electric sector by 2050 in the U.S. by increasing reliance on renewables and biomass with carbon capture. The scenario also accelerates emissions reductions in other sectors of the economy. While this report focuses on the IEA 2DS, PSEG will continue to stay abreast of the scientific literature on decarbonization pathways, including scenarios intended to achieve reductions that go well below 2°C.

more than half of light trucks are assumed electric by 2050; the scenario also assumes reductions in vehicle miles traveled.<sup>13</sup>

- Significant conversion of medium- and heavy-duty trucks from diesel fuel to biofuels.
- Electrification of residential and commercial buildings with heat pump retrofits, energy efficiency improvements and renewable natural gas use (e.g., natural gas derived from landfills, wastewater treatment and other sources).
- Further declines in industrial sector CO<sub>2</sub> emissions from energy efficiency measures, lower-carbon fuels and feedstock, and other technology changes.

Based on this combination of abatement measures, the NJ2DS achieves about a 40% reduction in economy-wide emissions by 2030 and about an 80% reduction in emissions by 2050, from 2005 levels. This is consistent with the U.S.-level results of the IEA 2DS.

12. New Jersey Department of Environmental Protection, *New Jersey Climate Data*, <https://www.nj.gov/dep/climatechange/data.html>.

13. Aviation fuel was excluded from the analysis (both the baseline and the projection) because it falls outside the state’s legal jurisdiction.



## SCENARIO ANALYSIS RESULTS

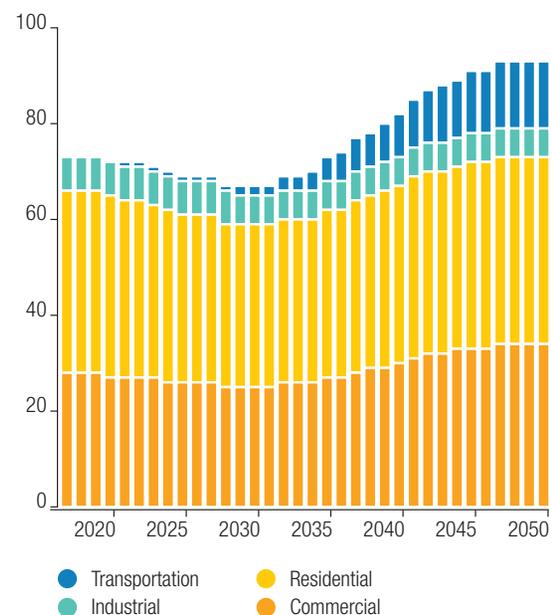
**THE FOLLOWING** describes some of the highlights from translating the IEA 2DS to New Jersey (NJ2DS). The scenario highlights important cost and feasibility considerations for reaching these targets, but the exercise was to remain consistent with the sector-by-sector changes modeled in the IEA 2DS.

**Electricity:** In the NJ2DS, gas-fired generation gradually declines, the state's nuclear fleet remains in operation to maintain a base of zero-carbon generation, and a significant level of new zero-carbon emitting resources are added. Decarbonizing the electric generating fleet provides the foundation for reducing carbon emissions from transportation and other sectors of the economy. By 2050, the NJ2DS generation mix is virtually all zero-carbon generation, including 30% nuclear. The scenario assumes that only a small amount of conventional fossil generation remains but leaves room for innovative technologies. Maintaining our nuclear generation fleet through 2050

would require a license extension to 80 years for PSEG's three NJ units and long-term public policy support. Additions of zero-carbon generation accelerate after 2030, when the electrification of motor vehicles and buildings is expected to begin to significantly increase electricity demand. In the near-term, the state's existing renewable policies drive the need for capacity additions.

Aligning with the IEA 2DS, the NJ2DS features a significant increase in energy efficiency to limit the growth in electricity demand even as end uses, like transportation, are converted to electricity. The NJ2DS assumes that the state can achieve a 2.0% annual savings rate for electricity by 2025, which is consistent with legislation adopted by New Jersey in 2018. PSE&G has proposed a plan to help meet this target. In the NJ2DS, electricity demand increases 1.5% (average annual growth rate) from 2030 to 2050 as more electric vehicles and heat pumps are deployed within the state. Fig. 6 illustrates the increased electricity demand and the changing use by sector. Other scenarios have shown even steeper increases in electric demand by 2050.<sup>14</sup>

Fig. 6  
**HISTORIC AND PROJECTED ELECTRICITY DEMAND IN THE NJ2DS (TWh) 2017-2050**



Transitioning to a low-carbon electric system will also require significant investment in energy storage technologies and other electric system upgrades to maintain reliability. For example, distribution system upgrades will be required to support the charging of electric vehicles and transmission system upgrades will be required to accommodate offshore wind projects. Advanced metering infrastructure will also be needed to manage the grid and maintain reliability. These innovative technologies and supporting investments are key to the transformation of electricity infrastructure in the PSE&G territory.

14. Rocky Mountain Institute. New Jersey Integrated Energy Plan: Public Webinar. Nov. 1, 2019.

## NEW JERSEY'S ELECTRIC SECTOR AMONG LEAST CARBON INTENSIVE IN THE COUNTRY

New Jersey ranks 34th in terms of its power sector CO<sub>2</sub> emissions and 41st in terms of its CO<sub>2</sub> emission rate (CO<sub>2</sub> per MWh).

Natural gas and nuclear account for roughly 50% and 40%, respectively, of the state's total electricity generation.

PSEG Power's Salem and Hope Creek nuclear generating plants supply more than 90% of the state's air

emissions-free power.

Only two small coal plants (owned by other companies) remain in operation within the state, accounting for less than 2% of the state's total generation.

New Jersey produces enough electricity to satisfy virtually all its demand, although there is significant trade in electricity across the PJM market.



**Transportation:** Transportation is the leading source of GHG emissions in New Jersey, accounting for 42% of statewide emissions in 2018.<sup>15</sup> In January 2020, Gov. Phil Murphy signed legislation (S2252) that establishes a goal of 330,000 registered light-duty electric vehicles by 2025 and a rebate program to encourage the purchase of electric vehicles. The NJ2DS assumes rapid electrification of the vehicle fleet. There are more than 7 million vehicles registered in New Jersey, but only about 25,000 electric and plug-in hybrid vehicles. Given the turnover rate of the vehicle fleet in New Jersey (the average life of a private vehicle in New Jersey is about 10 years), nearly all passenger cars sold in the state would need to be electric by around 2030 and gasoline vehicles would need to be replaced earlier than historic trends. Cars have tended to last longer as technology has improved, running counter to the objectives of the scenario. Fig. 7 details the EV adoption curves that were assumed for passenger cars and light trucks in New Jersey (i.e., vehicles in use). The NJ2DS assumes a rapid adoption of electric vehicles after 2030 to keep pace with the emissions reduction targets.

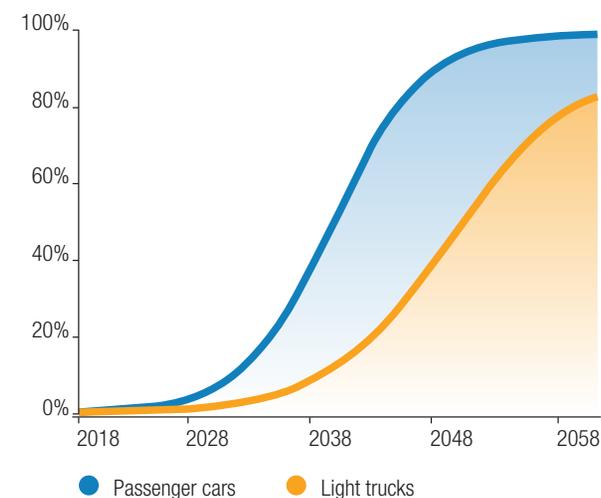
The NJ2DS also assumes that thousands of buses are converted to electricity and heavy-duty trucks substitute diesel fuel for biofuels. NJ Transit is planning to pilot a small number of electric buses in 2021. PSE&G also has proposed a school bus electrification program as part of its Clean Energy Future- Electric Vehicle filing. The NJ2DS would require NJ Transit and other bus operators to significantly ramp up fleet conversion efforts.

To support the widespread electrification of vehicles, New Jersey and the region would need to dramatically accelerate investment in charging infrastructure to support workplace charging, charging along transportation corridors, and other public charging options.

**Buildings:** In New Jersey, energy use in buildings, accounts for more than 20% of carbon emissions, making it the second leading source of emissions after transportation. Residential and commercial buildings are assumed to require a combination of strategies to reduce emissions: energy efficiency upgrades, weatherization, renewable natural gas and heat pump retrofits for heating and cooling. Converting to electricity can be an expensive process. The up-front cost to install a residential 4 zone ductless mini-split heat pump system is estimated to range from \$8,500 to \$10,000, which may be cost-prohibitive in many cases despite future cost savings.<sup>16</sup> These investments may be more cost-effective for new home construction, customers switching from propane or heating oil, and customers who need to replace a furnace and air conditioner at the same time. The NJ2DS assumes that about 50% of residential units and 50% of commercial floor space in New Jersey are converted to air source heat pump technologies by 2050.

**Industry and Manufacturing:** The industrial sector accounts for roughly 10% of CO<sub>2</sub> emissions in New Jersey. The IEA Energy Technology Perspectives emphasizes the challenges in addressing industrial

Fig. 7  
**ASSUMED LIGHT-DUTY ELECTRIC VEHICLE ADOPTION RATES**



sector emissions due to the need for significant thermal energy and raw fossil fuel inputs. IEA suggests that the industrial sector can achieve emissions reductions through enhanced industrial efficiency processes, fuel switching to natural gas and biofuels, material recycling and carbon sequestration. The IEA also emphasizes the need for continued research and development in order to achieve deeper, long-term emission reductions in the industrial sector, with a particular emphasis on cross-company collaboration and accelerated pilot and commercialization of low-carbon fuels and technologies that are not yet commercially viable.

15. New Jersey Department of Environmental Protection (DEP), 2018 *Statewide Greenhouse Gas Emissions Inventory*, October 2019.

16. Modernize, *How Much Does it Cost to Install a Ductless Heat Pump?* <https://modernize.com/hvac/heating-repair-installation/heat-pump/ductless>.



## IMPLICATIONS FOR PSEG'S BUSINESS

**PSEG IS WORKING** to implement our vision for a clean energy future to enhance reliability, reduce emissions and make the states where we operate better places to live and work. The types of changes analyzed in the NJ2DS highlight the critical role for PSEG to help enable the transition to a low-carbon economy and to meet New Jersey's emissions goals. We are committed to significantly reducing emissions from our merchant generating fleet, which is not price-regulated and is subject to commodity power market variances. We are on a path toward eliminating all coal generation and our vision is to achieve net-zero carbon emissions from PSEG Power's generating fleet by 2050, assuming advances in technology, public policy and customer behavior. In this section, we discuss the opportunities as well as the risks that our company might face as we transition to a low-carbon economy.

Analysis of the NJ2DS also highlights the critical role for policy to provide clear market structures, price signals, and regulatory frameworks for the scale of change envisioned by the scenario. For regulated utilities like PSE&G, policy at the state and federal level is necessary to provide the regulatory certainty and guidance necessary for long-term business planning. Many of the opportunities and risks outlined in this section are, and will continue to be, shaped by ongoing policy development. These policies can open new business opportunities for both our regulated utility PSE&G and PSEG Power's merchant power business that support New Jersey's clean energy and emission reduction goals. Maintaining electric and natural gas affordability will also require that PSEG harness already existing zero-carbon generation, such as our nuclear power generation fleet, and continue to invest in cost-effective energy efficiency opportunities.

## ENSURING A JUST TRANSITION

Efforts to reduce statewide emissions in line with the IEA 2DS will require across-the-board emissions reductions, touching on every sector of the economy. While the cost of unmitigated climate change is substantial, PSEG also acknowledges that there will be significant costs in transitioning to a low-carbon economy. An effective transition must ensure broad access to clean energy technologies with benefits to all the communities we serve. It must also ensure that

services such as mass transit, electricity and natural gas, and transportation do not dramatically increase in cost with disproportionate impacts on low- and moderate-income residents and that New Jersey's economy remains strong.

PSEG also is committed to a just transition for all our dedicated employees, ensuring that we continue to provide good-paying jobs, workforce development and continued growth opportunities for all our employees.



## OPPORTUNITIES IN TRANSITIONING TO A LOW-CARBON, MORE RESILIENT ENERGY SYSTEM

THE OPPORTUNITIES DISCUSSED in this section are centered around our focus on preserving zero-carbon nuclear energy, expanding energy efficiency and renewable investments, and integrating zero-carbon emitting resources into the grid. By helping our customers realize the benefits of a clean electric grid and advances in technology, including tools to help manage their energy use, we are empowering our customers to reduce costs and emissions, including our low-income customers. Consistent with our long-term policy positions, we believe a national price on carbon is an important climate policy that will help enable many of the opportunities we describe in this section.

TOPIC	OPPORTUNITY	KEY ENABLERS	PSEG POWER	UTILITY <sup>1</sup>
Nuclear	Preserving the Salem and Hope Creek nuclear plants, supplying low-cost, carbon-free energy to the PJM market	<p>Policies that appropriately value carbon-free nuclear energy for long-term preservation</p> <p>License extensions to continue nuclear plant operations</p>	●	
Gas-Fired Generation	Available on short notice and able to flexibly ramp up and down, our existing high-efficiency combined-cycle facilities (1) enable greater reliance on renewable energy resources and (2) displace less efficient, more carbon-intensive generating sources	<p>Power market rules that value key market services needed for transitioning to a low-carbon power system</p> <p>Carbon price across PJM so more efficient units displace less efficient, higher-emitting units</p>	●	
Solar	<p>Investment in solar energy projects through PSEG Solar Source, our competitive solar business</p> <p>Investment in utility-owned solar that maximizes societal benefits, such as landfill / brownfield, public facilities, low-to moderate-income and community solar</p>	<p>Market-based policies to incentivize zero-carbon emitting resources, such as carbon pricing</p> <p>Growing demand from corporations and other large customers with sustainability commitments</p> <p>Regulatory approvals are required to continue investment in utility solar projects</p> <p>Continued cost declines</p>	●	●
Energy Storage	Investment in stand-alone energy storage (in front of or behind the meter) or solar and storage projects	<p>Continued cost declines and technology advances for longer-term storage solutions</p> <p>Appropriate regulatory and market structures</p>	●	●
Offshore Wind	New Jersey's and other Eastern Seaboard states' offshore wind policies create new investment and business opportunities	<p>Appropriate regulatory and market structures</p> <p>Continued cost declines and technology advances</p>	●	
Offshore Wind Infrastructure	Transmission system investments to support nascent offshore wind industry in New Jersey	<p>Appropriate regulatory and market structures</p> <p>Continued cost declines and technology advances</p>		●

1. Utility applicable for both PSE&G and PSEG Long Island.

(Table continued on the next page)



(Continued from previous page)

TOPIC	OPPORTUNITY	KEY ENABLERS	PSEG POWER	UTILITY <sup>1</sup>
End Use Electrification	Load growth from building and transportation electrification Investment in electric charging infrastructure to support rapid expansion of EVs	Regulatory approvals are required for utility companies to support rapid expansion of electric vehicle charging infrastructure in New Jersey Rebate programs to encourage EV adoption	●	●
Energy Efficiency	Expanded investment in energy efficiency programs to reduce emissions and save customers money on their utility bills	Regulatory reforms like decoupling, which separate rate revenue from the amount of energy used by customers, remove a major obstacle to energy efficiency and regulatory return on investment Continued innovations encouraging technology adoption and behavioral change		●
Electric Grid Enhancements	Investments to modernize and harden the electric distribution system, improving resiliency to the effects of climate change, meeting increased reliability expectations with greater electrification, and managing changes in power flows resulting from decentralized generation	Regulatory approvals are required to continue investing in the transmission and distribution system to improve reliability Continued advances in technology		●
Natural Gas Distribution	Investment in the natural gas distribution system to reduce methane emissions and enhance safety	Regulatory approvals are required to continue investing in the natural gas distribution system, including continuation of GSMP to replace aging cast-iron infrastructure and reduce methane leaks		●
Alternative Gas Resources	Potential investments that reduce carbon intensity of natural gas including infrastructure to connect renewable natural gas supply in the near-term and advanced technologies such as hydrogen in the longer-term	Supportive regulatory programs to invest in innovative technologies and carbon reduction opportunities		●

1. Utility applicable for both PSE&G and PSEG Long Island.



## RISKS IN MANAGING LOW-CARBON TRANSITION AND PHYSICAL IMPACTS

WHILE PSEG SEES many strategic opportunities associated with the NJ2DS and similar scenarios, the degree and pace of change also present operational, compliance, reputational, strategic and financial risks for the company and our ability to maintain safe, reliable and affordable energy services. The pace and degree of change illustrated in the NJ2DS would require significant investment and could increase consumer bills. Achieving emission reductions while maintaining affordability is critically important and we are committed to seeking to reduce emissions in the most cost-effective manner.

In addition to transition risks, the effects of climate change also will increase the physical risks to our transmission and distribution system and our generation assets. It is imperative that we continue to study these changing risks as they are shaped by the global climate dynamics. We must understand and plan for these physical impacts in order to maintain safe, reliable and affordable service.

In this section, we highlight some potential risks to PSEG as a result of the transition laid out in the NJ2DS and the heightened physical risks from climate change.

### ASSESSING PHYSICAL RISKS

Most of the discussion in this report focuses on the operational and financial risks of climate change (the so-called transition risks). However, the region in which we operate faces serious physical risks from a changing climate. The Fourth National Climate Assessment, produced by the U.S. Global Change Research Program, explores the potential impacts of climate change on different regions of the United States, including the Northeast. Some of

RISK CATEGORY	RISK	PSEG POWER	UTILITY <sup>1</sup>
Operational	<b>Transition Risk</b>		
	Maintain reliable operations with integration of distributed energy resources (including solar and storage) and multi-directional power flows. Issues such as voltage and frequency regulation could become more challenging.		●
	Keep pace with grid enhancements (transmissions and distribution) to support EVs while managing costs and maintaining reliability		●
	Maintain cybersecurity as more Internet of Things (IoT)-enabled resources interact with the grid		●
	Ability to maintain well-trained workforce for new clean energy economy, including re-training programs	●	●
	<b>Physical Risk</b>		
	Extreme weather events (high wind, precipitation, storm surge) may affect infrastructure	●	●
	Prolonged drought could disrupt cooling water supplies	●	
	Extreme temperatures could affect generation operations	●	
	Assets at risk from sea level rise	●	●
Asset deterioration, increased peak load and decreased system reliability from extreme heat and humidity		●	
EH&S	<b>Physical Risk</b>		
	Rising temperatures and extreme weather events could threaten worker safety	●	●

1. Risks under "Utility" are applicable for both PSE&G and PSEG Long Island.

(Table continued on the next page)

the physical risks highlighted in the report, which are particularly relevant for New Jersey and New York, include (1) sea level rise and coastal flooding, (2) more frequent and more intense storms, including higher rainfall intensity, and (3) extreme heat during the summer months. The Northeast has experienced some of the highest rates of sea level rise in the United States, and this trend is expected to continue through the end of the century.

The Northeast region has been experiencing increases in precipitation and rainfall intensity and this trend is also expected to continue, particularly in the winter and spring. By 2050, average annual temperatures in the Northeast are expected to increase between 4.0°F (2.2°C) and 5.1°F (2.8°C), with several more days of extreme heat occurring throughout the region each year.



These physical changes could have significant implications for our infrastructure, as well as the customers and communities that we serve. We will continue to evaluate these trends and adapt to these changing conditions.

### CUSTOMER RISK

Mitigating the risks of climate change is a priority for our company as well as the communities we serve. Risks vary based on geography, income or other factors – and we must be sensitive to the fact that the communities we serve will experience the effects of climate change in different ways.

Some of our most vulnerable customers may be disproportionately impacted by climate change with fewer resources to adapt to these changes. During Superstorm Sandy for instance, senior citizens living in high rise buildings were among those severely impacted by extended power outages. At the same time, these customers will also be least able to bear the cost increases that result from our climate change mitigation efforts. Therefore, keeping rates affordable is paramount. For instance, as we explore the role and pace of building electrification, we must be particularly mindful of strategies to maintain affordability. Expanding access to energy efficiency measures that put downward pressure on bills is one of our highest near-term priorities in our approach to climate change. Similarly, transportation electrification will benefit all residents of New Jersey but could be particularly beneficial for urban communities disproportionately burdened by poor air quality. Our customers' needs must be a chief priority as we look forward and explore the best combination of solutions and the optimal pathway for achieving our long-term climate goals.

(Continued from previous page)

RISK CATEGORY	RISK	PSEG POWER	UTILITY <sup>1</sup>
Legal & Compliance	<b>Transition Risk</b>		
	Command and control policies could create a compliance risk, if chosen as a policy path over carbon pricing	●	●
	Enhanced emission-reporting and regulatory compliance obligations	●	●
Reputational	<b>Transition Risk</b>		
	Meeting potentially conflicting stakeholder expectations for clean energy and affordability, absent decoupling	●	●
	Risk that climate strategies will be perceived as too expensive or disruptive and will invite criticism		●
	<b>Physical Risk</b>		
	Extreme weather events could impact reliability and increase cost of service		●
Strategic/Financial	<b>Transition Risk</b>		
	A patchwork of policies could jeopardize the competitive position of specific generating assets. Consistent regional or national approaches such as a national carbon price help level the playing field	●	
	Reduced revenue from electric market transformation, including reduced sales volumes and prices. For example, greater reliance on high capital cost, but low operating cost generating resources will put downward pressure on power prices and the profitability of our merchant generating resources. Risk of Energy Efficiency implementation if regulators do not adopt new regulatory mechanisms to recover lost revenues resulting from proposed EE programs	●	●
	Nuclear units do not receive a long-term structure where they would be compensated appropriately for their carbon-free, reliable generation during the transition to low-carbon energy and therefore shut down, which could cause a dramatic increase in New Jersey GHG emissions	●	
	Rapid adoption of distributed energy resources, energy efficiency and other changes without appropriate policy changes pose risks to the electric utility business model		●
	Widespread electrification poses risks to the natural gas utility business model. Sales volumes may decline significantly, while the need to maintain an extensive natural gas distribution system will likely remain.		●

1. Risks under "Utility" are applicable for both PSE&G and PSEG Long Island.



# Metrics and targets





## METRICS AND TARGETS

METRICS AND TARGETS ARE CRITICAL for tracking progress toward our climate goals and holding ourselves accountable to our stakeholders and investors. In disclosing our performance, we rely on several annual reporting mechanisms:

1. SEC disclosures and investor conferences;
2. Sustainability Report;
3. Carbon Disclosure Project (CDP) response;
4. the Edison Electric Institute's (EEI) and the AGA's ESG Reporting and Sustainability Framework;
5. Powering Progress updates; and
6. Global Reporting Initiative.

These reports are publicly available on [PSEG's sustainability webpage](#) or the [investor section of PSEG's website](#) as we seek to provide timely and transparent access to our ESG data reporting to all our stakeholders.

## TARGETS

In July 2019, we announced our current goal to reduce CO<sub>2</sub> emissions from PSEG Power's generation fleet by 80%, from 2005 levels, by 2046. This equates to a reduction from 23 million metric tons per year to about 5 million metric tons per year. We are partway to this goal. As of 2019, our emissions from our power generation fleet are almost 50% below our baseline (or less than 13 million metric tons per year) (Fig. 8). We also have a vision of attaining net-zero carbon emissions from our fleet by 2050, assuming advances

in technology and public policy, as well as changes in customer behavior.

As we work to achieve our current goals and continuously improve our performance, we monitor and report on several key metrics (Table 2, next page).

Fig. 8  
**NET-ZERO BY 2050: PROGRESS TO DATE AND FUTURE GOALS**  
(MILLION METRIC TONS PER YEAR)

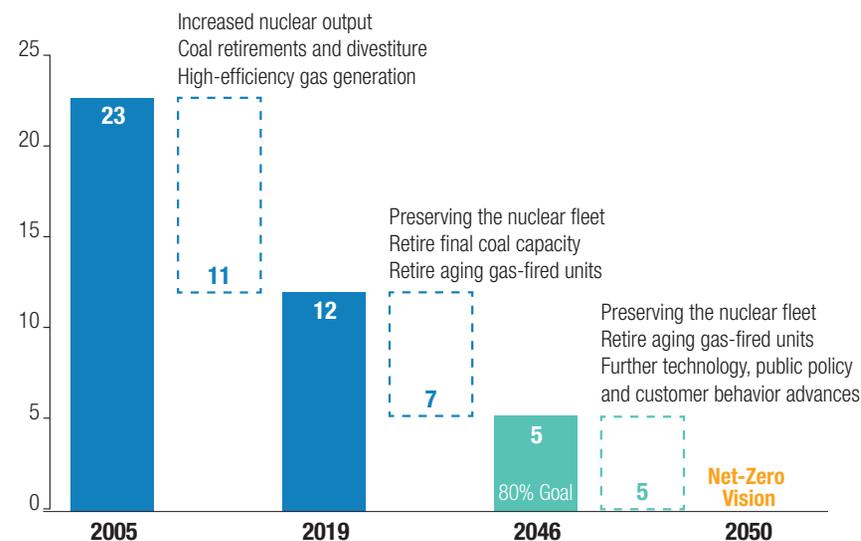




Table 2  
**CLIMATE METRICS**<sup>17</sup>

GREENHOUSE GASES (Metric Tons CO <sub>2</sub> e)	2016	2017	2018	2019
<b>Scope 1 Emissions Total<sup>1</sup></b>	<b>13,090,960</b>	<b>12,052,151</b>	<b>13,623,965</b>	<b>13,378,214</b>
Power Generation & Other Combustion <sup>2</sup>	12,141,731	11,215,723	12,886,757	12,688,161
Gas System and Coal Pile Methane <sup>3</sup>	835,111	757,829	666,655	625,833
Substations and Circuit Breakers <sup>4</sup>	62,135	33,568	24,150	18,882
<b>Scope 2 Emissions Total<sup>5</sup></b>	<b>1,013,141</b>	<b>971,109</b>	<b>965,720</b>	<b>865,741</b>
<b>Scope 1 and 2 Emissions Total</b>	<b>14,104,101</b>	<b>13,023,260</b>	<b>14,589,685</b>	<b>14,243,955</b>
<b>Emissions Intensity</b>				
Power Generation Emissions (metric tons of CO <sub>2</sub> e)	12,106,871	11,183,819	12,848,654	12,661,224
Electricity Production (MWh, gross)	52,535,571	52,527,904	57,286,175	58,315,765
Emissions Intensity Rate (lbs/MWh)	508	469	494	479

1. The categories listed under Scope 1 emissions total are not a comprehensive list of what PSEG tracks for Scope 1 emissions but includes applicable information for this report. For a full list of Scope 1 emissions components, please see our most recent CDP filing.
2. Includes CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O emissions from power generation combustion as well as our small combustion sources reported under Subpart C of EPA's Mandatory Reporting Rule
3. Methane emissions from PSE&G's natural gas system and coal pile methane
4. SF<sub>6</sub> emissions from substations and circuit breakers
5. Includes line losses, purchased facility electricity and natural gas use (Fossil facilities not included).

## CARBON EMISSIONS INTENSITY

CARBON EMISSIONS INTENSITY measures the quantity of emissions per megawatt-hour of electricity generation. Carbon emissions intensity reveals our performance even as total generation increases or decreases. PSEG's generation emissions intensity is projected to be reduced by approximately 60% from

2005 through 2020 (see Fig. 4), and is about half the emissions intensity of the national average. We have accomplished this by maintaining our zero-carbon emitting nuclear plants, investing in highly efficient gas-fired generation and renewables, and moving away from coal generation. Retiring PSEG Power's remaining coal plant by 2021 will further

reduce our emissions. However, our net-zero vision requires actions that go beyond eliminating coal-fired generation from our portfolio. With the necessary advances in public policy, carbon-capture technology and customer behavior, we can achieve this vision. We are committed to working with our stakeholders as we evaluate future strategies, including how we manage our high-efficiency gas-fired generating units, for transitioning to a net-zero future.

## METHANE

Methane emissions from our natural gas system are reported as part of our sustainability reporting. As a natural gas provider, curbing methane leaks is a top priority. To hold ourselves accountable, we aim to reduce our methane emissions by 21.7%, from 2018 levels, by 2023, upon completion of the second phase of our Gas System Modernization Program. This is in addition to the 159,710-metric ton reduction (CO<sub>2</sub>e) PSE&G has achieved since 2011.

Our participation in EPA's Natural Gas STAR program, a voluntary initiative that encourages natural gas companies to adopt cost-effective technologies and practices that reduce methane emissions, will help us continue a path of declining emissions. Continued pipeline replacements will also help us achieve our commitment to annually replace 1.5% of our cast-iron gas mains and associated service lines by 2021 as part of EPA's STAR Methane Challenge, of which we are a founding member.

17. For metrics on air emissions, please see our 2019 Sustainability Report [https://corporate.pseg.com/-/media/pseg/corporate/corporate-citizenship/environmentalpolicyandinitiatives/sustainability/pseg\\_sustainability\\_report.ashx](https://corporate.pseg.com/-/media/pseg/corporate/corporate-citizenship/environmentalpolicyandinitiatives/sustainability/pseg_sustainability_report.ashx)



## SULFUR HEXAFLUORIDE (SF<sub>6</sub>)

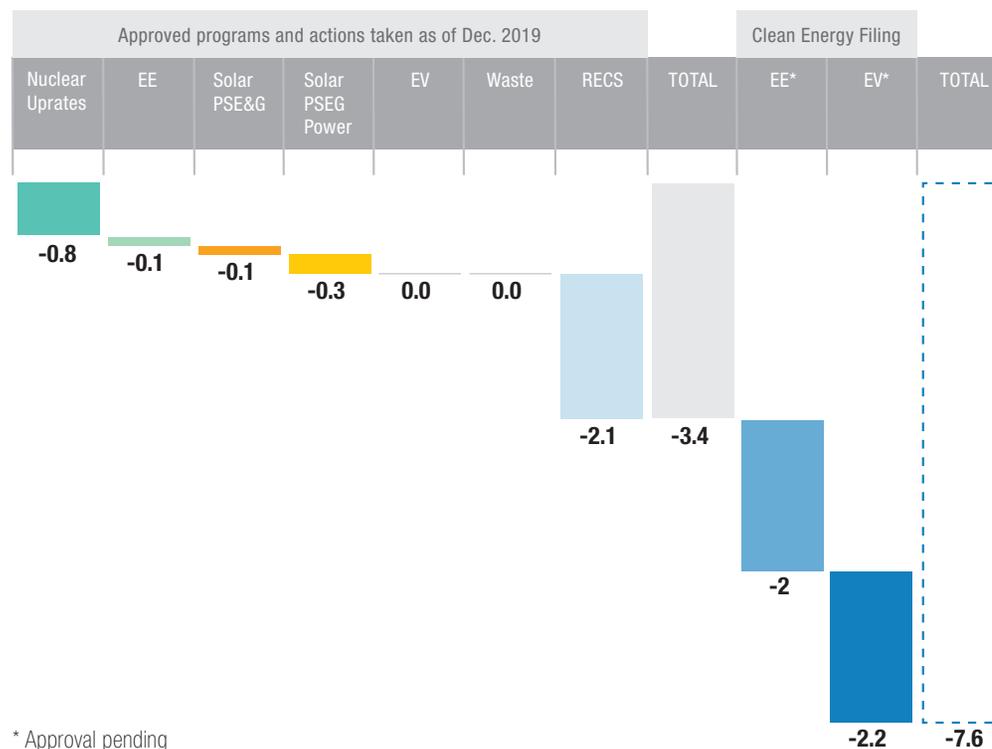
SF<sub>6</sub> emissions from our high-voltage circuit breakers and gas-insulated substations are also reported as part of our sustainability reporting. Since 2016, PSE&G has increased the total size of our gas insulated system by approximately 64%, but with routine maintenance, the company has been successful at maintaining SF<sub>6</sub> emissions to less than 1% of the total in-service assets.

## AVOIDED EMISSIONS

In addition to tracking our progress in reducing GHG emissions from our own operations, PSEG also tracks the total GHG benefits from our investments and programs that extend to activities outside of our direct control. These are called avoided emissions. For example, uprates at our zero-carbon emitting nuclear plants offset GHG emissions by reducing the demand for power from other emitting resources. Similarly, adoption of electric vehicles helps offset emissions from traditional vehicles.

Our 2017 goal of eliminating 13 million tons of GHG emissions by 2030 included a projected 3 million tons of avoided emissions. Based on actions we have taken since 2017, we can increase this avoided emissions projection to 3.4 million tons by 2030. Moreover, this estimate would increase to 7.6 million tons of avoided GHG emissions if PSE&G's proposed energy efficiency and electric vehicles/energy storage programs were approved by state regulators in their entirety. This shows the magnitude of what can be accomplished with these concrete steps (see Fig. 9).

Fig. 9  
**PSEG AVOIDED EMISSIONS 2005 AND 2030 PROJECTION (MILLION TONS)**



### ADDITIONAL DISCLOSURE INFORMATION CAN BE FOUND AT:

- Investor Relations Page: <https://investor.pseg.com/home/default.aspx>.
- Corporate Citizenship / Sustainability Transparency Page <https://corporate.pseg.com/corporatecitizenship/sustainability/commitmenttotransparency>.
- SEC Filings <https://investor.pseg.com/financial-information/sec-filings/default.aspx>.
- 2019 Sustainability Report: [https://corporate.pseg.com/-/media/pseg/corporate/corporate-citizenship/environmentalpolicyandinitiatives/sustainability/pseg\\_sustainability\\_report.ashx](https://corporate.pseg.com/-/media/pseg/corporate/corporate-citizenship/environmentalpolicyandinitiatives/sustainability/pseg_sustainability_report.ashx).
- 2019 CDP Response [https://s24.q4cdn.com/601515617/files/doc\\_downloads/PSEG\\_CDP\\_2019\\_FINAL.pdf](https://s24.q4cdn.com/601515617/files/doc_downloads/PSEG_CDP_2019_FINAL.pdf).
- 2018 Edison Electric Institute's (EEI) ESG Reporting and Sustainability Framework <https://corporate.pseg.com/corporatecitizenship/sustainability/-/media/23aaf0d4d-43b440aabe8974559494096.ashx>.
- Powering Progress updates <https://www.psegpoweringprogress.com/>.
- Global Reporting Initiative <https://corporate.pseg.com/corporatecitizenship/sustainability/-/media/1365DAC79F-55445CA176A8576EDFB52F.ashx>.



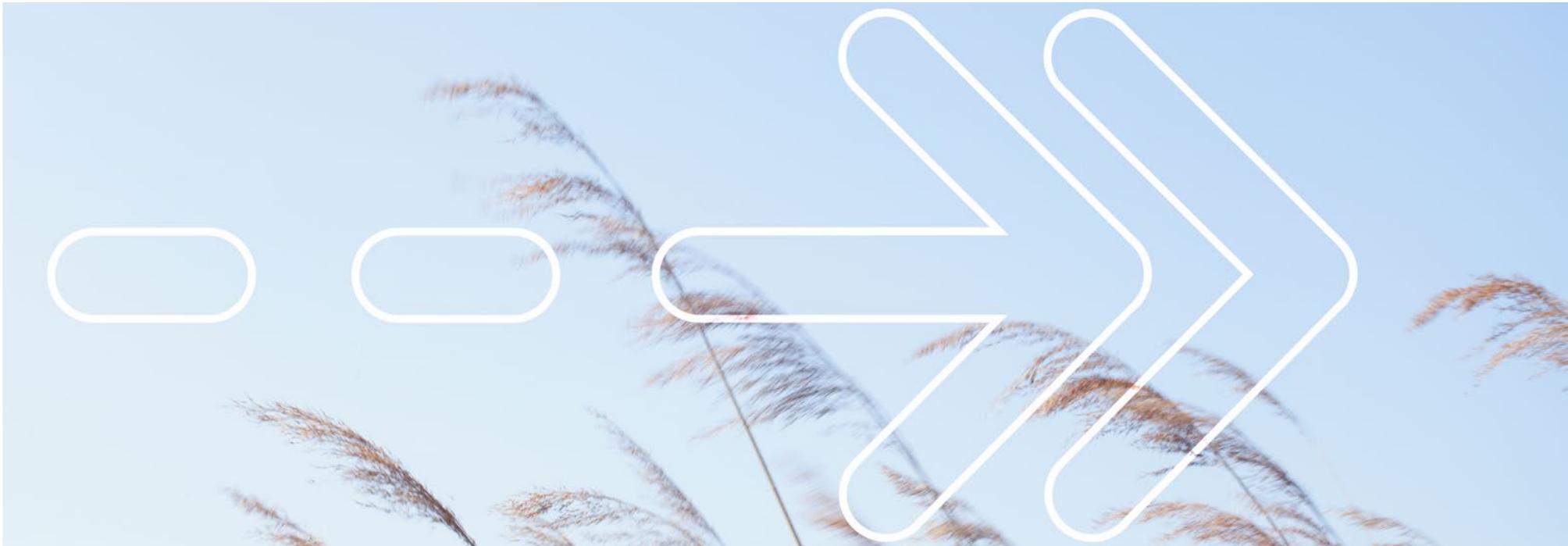
## NEXT STEPS

**TACKLING CLIMATE CHANGE** requires all of us to do our part. PSEG is committed to achieving our emission reduction goals while supporting national and regional efforts to cut emissions and advance clean energy. There is no one-size-fits-all approach to addressing climate change, but rather a portfolio of opportunities to be pursued and a range of challenges to overcome. This Climate Report is just one step that PSEG has taken to better communicate our climate strategy and the climate-related risks and opportunities facing our organization and to facilitate discussion

with external stakeholders. There is much to be done, but, in collaboration with our board, executive officers, dedicated employees, community stakeholders and policymakers, PSEG will work continuously to reduce our emissions, support energy efficiency and advance clean energy.

As New Jersey's oldest and largest publicly owned utility, the provision of safe, reliable, affordable, and clean energy is our paramount priority. We are committed to empowering New Jersey to support a cleaner and more productive 21st century economy as outlined in the state's Energy Master Plan. We

understand the need to work collaboratively to achieve New Jersey's clean energy vision. Going forward, we will work to shape and support key policy enablers that will help bring our clean energy vision to fruition. Expanding our tool kit to address climate change hinges on effective policy. We look forward to the conversations that result from this report that will, in turn, influence our role in New Jersey and beyond. We aim to convey the learnings from these conversations in our annual Sustainability Report and Climate Report updates going forward.





## FORWARD-LOOKING STATEMENTS

CERTAIN OF THE MATTERS discussed in this report about our and our subsidiaries' future performance, including, without limitation, future revenues, earnings, strategies, prospects, consequences and all other statements that are not purely historical constitute "forward-looking statements" within the meaning of the Private Securities Litigation Reform Act of 1995. Such forward-looking statements are subject to risks and uncertainties, which could cause actual results to differ materially from those anticipated. Such statements are based on management's beliefs as well as assumptions made by and information currently available to management. When used herein, the words "anticipate," "intend," "estimate," "believe," "expect," "plan," "should," "hypothetical," "potential," "forecast," "project," variations of such words and similar expressions are intended to identify forward-looking statements. Factors that may cause actual results to differ are often presented with the forward-looking statements themselves. Other factors that could cause actual results to differ materially from those contemplated in any forward-looking statements made by us herein are discussed in filings we make with the United States Securities and Exchange Commission (SEC), including our Annual Report on Form 10-K and subsequent reports on Form 10-Q and Form 8-K. These factors include, but are not limited to:

- fluctuations in wholesale power and natural gas markets, including the potential impacts on the economic viability of our generation units;
- our ability to obtain adequate fuel supply;
- market risks impacting the operation of our generating stations;
- increases in competition in wholesale energy and capacity markets;
- changes in technology related to energy generation, distribution and consumption and customer usage patterns;
- economic downturns;
- third-party credit risk relating to our sale of generation output and purchase of fuel;
- adverse performance of our nuclear decommissioning and defined benefit plan trust fund investments and changes in funding requirements;
- the impact of changes in state and federal legislation and regulations on our business, including PSE&G's ability to recover costs and earn returns on authorized investments;
- PSE&G's proposed investment programs may not be fully approved by regulators and its capital investment may be lower than planned;
- the impact on our New Jersey nuclear plants if such plants are not awarded Zero Emission Certificates (ZEC) in future periods, there is

an adverse change in the amount of future ZEC payments, the ZEC program is overturned or modified through legal proceedings or if adverse changes are made to the capacity market construct;

- adverse changes in energy industry laws, policies and regulations, including market structures and transmission planning;
- the impact of state and federal actions aimed at combating climate change on our natural gas assets;
- risks associated with our ownership and operation of nuclear facilities, including regulatory risks, such as compliance with the Atomic Energy Act and trade control, environmental and other regulations, as well as financial, environmental and health and safety risks;
- changes in federal and state environmental regulations and enforcement;
- delays in receipt of, or an inability to receive, necessary licenses and permits;
- the impact of any future rate proceedings;
- adverse outcomes of any legal, regulatory or other proceeding, settlement, investigation or claim applicable to us and/or the energy industry;
- changes in tax laws and regulations;
- the impact of our holding company structure on our ability to meet our corporate funding needs, service debt and pay dividends;
- lack of growth or slower growth in the number of customers or changes in customer demand;
- any inability of PSEG Power to meet its commitments under forward sale obligations;
- reliance on transmission facilities that we do not own or control and the impact on our ability to maintain adequate transmission capacity;
- any inability to successfully develop, obtain regulatory approval for, or construct generation, transmission and distribution projects;
- any equipment failures, accidents, severe weather or other incidents, including pandemics such as the current coronavirus outbreak, that impact our ability to provide safe and reliable service to our customers;
- our inability to exercise control over the operations of generation facilities in which we do not maintain a controlling interest;
- any inability to recover the carrying amount of our long-lived assets and leveraged leases;
- any inability to maintain sufficient liquidity;
- any inability to realize anticipated tax benefits or retain tax credits;
- challenges associated with recruitment and/or retention of key executives and a qualified workforce;
- the impact of our covenants in our debt instruments on our operations;

- the impacts of war or terrorism, pandemics, including the current coronavirus outbreak, cybersecurity attacks or intrusions.

All of the forward-looking statements made in this report are qualified by these cautionary statements and we cannot assure you that the results or developments anticipated by management will be realized or even if realized, will have the expected consequences to, or effects on, us or our business, prospects, financial condition, results of operations or cash flows. Readers are cautioned not to place undue reliance on these forward-looking statements in making any investment decision. Forward-looking statements made in this report apply only as of the date of this report. While we may elect to update forward-looking statements from time to time, we specifically disclaim any obligation to do so, even in light of new information or future events, unless otherwise required by applicable securities laws.

The forward-looking statements contained in this report are intended to qualify for the safe harbor provisions of Section 27A of the Securities Act of 1933, as amended, and Section 21E of the Securities Exchange Act of 1934, as amended.

## LEGAL DISCLAIMER

The forward-looking analysis in this report is based on specific assumptions made by the International Energy Agency for a 2°C Scenario (2DS). The IEA 2DS does not represent a projection or a preferred outcome for PSEG.

The type of scenario used in this analysis models a future environment where GHG emissions are significantly reduced to limit global average temperature increases to less than 2°C. Guidance from the Task Force on Climate-Related Disclosures (TCFD) recommends that organizations evaluate scenarios that are, at a minimum, 2°C. As TCFD states, "It is important to remember that scenarios are hypothetical constructs; they are not forecasts or predictions nor are they sensitivity analyses."<sup>18</sup>

The process of modeling future energy market conditions, policy changes, and decarbonization pathways is highly uncertain. Caution is needed in considering the future changes outlined in the IEA 2DS and potential implications of the IEA 2DS for PSEG

18. Task Force on Climate-Related Financial Disclosure (TCFD), The Use of Scenario Analysis in Disclosure of Climate-Related Risks and Opportunities, June 2017, <https://www.fsb-tcfcd.org/wp-content/uploads/2017/06/FINAL-TCFD-Technical-Supplement-062917.pdf>.



## SUMMARY OF IEA'S 2DS

THE IEA 2DS outlines a wide-ranging portfolio of technologies, deployed throughout the economy, to achieve deep reduction goals.<sup>19</sup>

- **Electricity:** In IEA's 2DS, the electric sector facilitates emissions reductions through decarbonization of electric generation and electrification of other end-use sectors such as transportation, heat, and industrial processes. Electricity use increases more than any other energy source, becoming the largest final energy carrier in both the 2DS and the B2DS, surpassing both oil and natural gas. The fuel mix to generate electricity in the 2DS is vastly different from today's mix. In the U.S., renewables account for more than 60% of generation in 2050, nuclear accounts for 18%, fossil-fueled power plants with CCS account for 16%, and biomass with carbon capture and storage (CCS) and natural gas account for a small percentage of total generation. Conventional coal is virtually eliminated by 2035.
- **Transportation:** In addition to decarbonizing the power system, electrification is a key strategy, particularly within the transportation sector with

90% of all cars on the road estimated to be electric by 2060. IEA emphasizes that accelerating the electrification of transportation “will require major technological developments and infrastructure investments based on strong policy support.” Additionally, better urban planning and public transportation are assumed to reduce overall transportation demand in the 2DS. By 2050, energy use in the transportation sector has been reduced about 50% and final energy demand is 50% oil and 50% electricity and biofuels, with a small amount of hydrogen.

- **Residential and Commercial Buildings:** IEA's 2DS emphasizes the importance of energy efficiency in establishing a more sustainable building stock. The agency warns that new construction and renovations that deliver only marginal efficiency improvements risk locking-in a long-term stock of inefficient buildings. Deep energy renovations (moving toward near-zero energy buildings) are a key priority in developed countries where the existing building stock accounts for most of the energy use. High-efficiency lighting, cooling, and appliances support the energy system transformation by moderating energy demand and

reducing the burden placed on the power sector from the electrification of end-uses (heat pumps and electric vehicles). In the IEA 2DS, natural gas use in residential buildings is reduced 40% by 2050, while electricity use in the residential sector remains relatively flat due to efficiency improvements. Together, natural gas and electricity account for 85% of energy use in the IEA 2DS within the residential sector in 2050.

- **Industrial Sector:** IEA cautions not to underestimate the scale of the challenge involved in decarbonizing the industrial sector. For sectors such as chemical and plastics manufacturing, achieving significant carbon reductions will require improvements in manufacturing efficiency, maximizing the use of locally available resources, and optimizing materials use. This requires technologies that are not yet commercially available. The U.S. industrial sector (including transformation sectors) is estimated to reduce carbon emission 70% by 2050 (from 2014 levels).<sup>20</sup> In New Jersey, industrial sector CO<sub>2</sub> emissions declined by more than 58% between 2005 and 2018, according to the state's GHG inventory.<sup>21</sup>

19. In the B2DS, IEA assumes that negative emissions technologies (e.g., bioenergy with carbon capture and sequestration) — among other strategies — will enable the country to meet the more ambitious goals of the scenario.

20. Transformation sectors include petroleum refineries, biofuel production, and hydrogen production. These sectors convert primary energy sources into a form that can be used in other sectors of the economy (e.g., crude oil to motor gasoline or electricity to hydrogen).

21. State of New Jersey Department of Environmental Protection. 2018 Statewide Greenhouse Gas Emissions Inventory. October 2019.



# Appendix





## LIST OF ACRONYMS AND DEFINITIONS

<b>2DS</b>	IEA's 2°C Scenario - a global energy sector carbon abatement scenario aimed at limiting future global average temperature increases to 2.0°C above pre-industrial levels	<b>IEA</b>	International Energy Agency
<b>ACEEE</b>	American Council for an Energy-Efficient Economy	<b>IoT</b>	Internet of Things
<b>AMI</b>	Advanced Metering Infrastructure (aka Smart Meters)	<b>IPCC</b>	Intergovernmental Panel on Climate Change
<b>B2DS</b>	IEA's Beyond 2°C scenario - a global energy sector carbon abatement scenario aimed at limiting future global average temperature increases to 1.75°C by 2100	<b>ISO</b>	Independent System Operator
<b>BPU</b>	New Jersey Board of Public Utilities	<b>kV</b>	Kilovolt
<b>CCS</b>	Carbon Capture and Storage	<b>kW</b>	Kilowatt
<b>CDP</b>	Carbon Disclosure Project	<b>kWh</b>	Kilowatt hour
<b>CEF</b>	Clean Energy Future, PSE&G's suite of clean energy programs proposed to the NJ BPU	<b>LEED</b>	Leadership in Energy and Environmental Design
<b>EE</b>	Energy Efficiency	<b>LIPA</b>	Long Island Power Authority
<b>EEI</b>	Edison Electric Institute	<b>MW</b>	Megawatt
<b>EERC</b>	Energy and Environment Resource Center	<b>NJ2DS</b>	New Jersey 2°C Scenario
<b>EH&amp;S</b>	Environmental Health and Safety		Paris Agreement
<b>EMP</b>	New Jersey Energy Master Plan 2019	<b>PSEG</b>	Public Service Enterprise Group Incorporated
<b>EPA</b>	U.S. Environmental Protection Agency	<b>PSE&amp;G</b>	Public Service Electric & Gas Company, our regulated transmission and distribution public utility
<b>ESG</b>	Environmental, Social, and Governance	<b>RGGI</b>	Regional Greenhouse Gas Initiative
<b>ERM</b>	Enterprise Risk Management, PSEG's risk management approach	<b>RPS</b>	Renewable Portfolio Standard
<b>GHG</b>	Greenhouse Gas	<b>RMI</b>	Rocky Mountain Institute
<b>GSMP</b>	Gas System Modernization Program, PSE&G's natural gas distribution replacement program	<b>RTO</b>	Regional Transmission Organization
<b>GW</b>	Gigawatt	<b>SF<sub>6</sub></b>	Sulfur Hexafluoride
		<b>STEP Tool</b>	STate Emission Pathways Tool, developed by MJ Bradley & Associates
		<b>TCFD</b>	Task Force on Climate-Related Financial Disclosures
		<b>ZECs</b>	Zero Emission Certificates