PSEG is a hybrid energy company consisting of a regulated utility and a merchant generation business.

$32.5B Assets; $1.3B Operating Earnings (2013)

**Electric & Gas Delivery and Transmission**

**Regional Competitive Generation**

**Operational Services**

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*Includes New Jersey coal units that fuel switch to gas.*
Our focus on customers, community, employees, the environment, innovation and operational excellence is widely recognized.

**World's Most Admired Companies**

PSEG was recognized by FORTUNE in 2014 as the 4th most admired U.S. electric and gas company.

**ReliabilityOne Award**

PSE&G won the Mid-Atlantic region’s ReliabilityOne Award for the 13th consecutive year in 2013 and has been named America’s Most Reliable Utility 5 of the past 10 years.

**Dow Jones Sustainability Index**

In 2014, PSEG was named to the DJSI North American Index for the 7th consecutive year.

**2014 Energy Star® Partner of the Year**

PSEG Long Island was the recipient of the 2014 Energy Star® Partner of the Year - Sustained Excellence Award from the U.S. Environmental Protection Agency (EPA), for its commitment to energy efficiency and the Energy Star program.

**Innovation In Customer Service Award**

PSEG was recognized by J.D. Power & Associates in 2013 for its “industry-leading communications success” during Superstorm Sandy.

**Customer Satisfaction**

PSE&G residential customer satisfaction ranked 2nd among large Eastern utilities by J.D. Power and Associates in 2012.

**Solar Top 10**


**Healthcare Hero**

PSE&G was recognized by NJBIZ in 2012 for making a significant impact on the quality of healthcare in New Jersey through PSE&G’s innovative energy efficiency program for hospitals.

**Top 50 Employers**

PSEG was recognized as an employer of choice by Equal Opportunity magazine, being named to its list of “Top 50 Employers” in the country in 2013.

**G.I. Jobs Top Military Employers**

PSEG was ranked 29th in the G.I. Jobs Top 100 Military-Friendly Employers in 2014 for its diversity outreach and inclusive workplace for military professionals and veterans.
The US power system is designed to serve demand for electricity reliably – whenever it is needed.

Competitive markets efficiently dispatch units according to their variable operating cost. Approximately 40% of US wholesale power is sold within competitive markets.

Source: World Nuclear Association

Source: SNL (Variable costs estimated using implied heat rate and fuel costs).
Though less than recent years, coal remains the single largest source of electricity and, with natural gas, fossil fuels comprise ~2/3 of US generation.

Nuclear comprises ~10% of capacity, but due to its low operating costs and high utilization rates, provides ~20% of generation.

Source: EIA; derived from preliminary 2013 data.
Natural gas prices were historically higher and more volatile than coal, owing in part to tight supply/demand fundamentals and vulnerability to extreme weather-related supply disruptions along the Gulf Coast.

The boom in US shale gas production has fundamentally altered the economics of natural gas since 2009, reducing price volatility and enabling it to compete with and displace coal as a low-cost fuel source.

Renewable energy has grown in recent years due to policy support, but only represents ~5% of overall supply.
North American gas production has dramatically increased largely driven by the Marcellus/Utica Shale.

Marcellus/Utica Shale: From 0 in 2009, to 14Bcf/day in 2014 and doubling over the next five years, leading to this region being a net exporter, reversing pipeline flows.

Source: IHS Inc. This content is extracted from IHS Energy’s recent report and was developed as part of IHS Energy’s service North American Natural Gas. No part of this content was developed for or is meant to reflect a specific endorsement of a policy or regulatory outcome. The use of this content was approved in advance by IHS. Any further use or redistribution of this content is strictly prohibited without written permission by IHS. All rights reserved.
A number of factors - most notably cost of plant, utilization rate and fuel costs - shape the economics of generation supply.

**Levelized Cost of Electricity (LCOE)**

LCOE calculations use estimated capital costs, capacity factors, fuel costs, O&M and other factors to determine the revenue / mWh required to recover the cost of and return on a generation investment. It is a useful tool to compare the relative economics of different technologies.

Generation costs and utilization rates can vary significantly based on project location.

While certain conventional generation costs do not reflect environmental externalities, renewable generation costs do not reflect reliability-related considerations (e.g. back-up generation requirements due to intermittency).

Source: Lazard’s 2014 Levelized Cost of Energy Analysis – Version 8.0; See notes on slide 10.
Despite recent cost declines, unsubsidized distributed generation (DG) is still uncompetitive with generation rates.

Costs and utilization rates vary widely by region and estimates for fuel cells and microturbines are more variable than other more mature technologies.

Rate comparison is against total wholesale energy costs, though these DG technologies often compete against retail rates in states that allow net metering rules (which includes the cost of transmission, distribution and various state programs and fees).

Source: Lazard’s 2014 Levelized Cost of Energy Analysis – Version 8.0; See notes on subsequent slide.

* Approximate local total generation rates.
Generation costs are highly sensitive to capital costs, fuel costs, utilization rates, public policy and economic incentive assumptions.

<table>
<thead>
<tr>
<th>LCOE Technology Cost and Performance Assumptions (a)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Capital Cost ($/kW)</strong></td>
</tr>
<tr>
<td>$3,000-$8,400</td>
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<tr>
<td><strong>Capacity Factor (%)</strong></td>
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<tr>
<td><strong>Heat Rate (Btu/kWh)</strong></td>
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<tr>
<td><strong>Fuel Price ($/MMBtu)</strong></td>
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<tr>
<td><strong>Emissions (lbs/mWh; Hg in mg/mWh)</strong></td>
</tr>
<tr>
<td>CO2</td>
</tr>
<tr>
<td>SO2</td>
</tr>
<tr>
<td>NOx</td>
</tr>
<tr>
<td>Hg</td>
</tr>
<tr>
<td>Other</td>
</tr>
<tr>
<td><strong>Fuel Supply</strong></td>
</tr>
</tbody>
</table>

Source: Lazard’s 2014 Levelized Cost of Energy Analysis – Version 8.0

(a) Presented on an unsubsidized basis without consideration for the Production Tax Credit (PTC) or the Investment Tax Credit (ITC).
(b) High end incorporates 90% carbon capture and compression. Does not include cost of storage and transportation.
(c) Does not reflect decommissioning costs or potential impact of federal loan guarantees or other subsidies.
(d) Low end represents single-axis tracking and high-end represents fixed-tilt installation. Assumes 10MW system in high insolation jurisdiction (e.g. Southwest U.S.) Not directly comparable for baseload.
Policy support for renewables

Externalities for NO\textsubscript{x} and SO\textsubscript{x} have been recognized, but CO\textsubscript{2} has not effectively been valued in the market. Absent a comprehensive Federal carbon policy, a patchwork of subsidies were created at both the Federal and State level to incent renewable generation – some with unintended consequences.

Primary renewables subsidies:
- Federal Investment Tax Credit (declines from 30% to 10% in 2017).
- Federal Production Tax Credit (expired, but efforts underway to retroactively extend).
- Federal accelerated depreciation (MACRS).
- State-level incentives driven by renewable portfolio standards (RPS), such as rebates and renewable energy certificates (RECs).
- Net-metering (utility customers with on-site electric generation exported to the local distribution network are credited at the retail rate).

Net-metering challenge:
- Net-metering customers do not pay for the services they utilize, specifically the distribution infrastructure.
- Fixed costs are shifted to customers who do not generate their own electricity and do not benefit from the net-metering subsidy. These customers are often less affluent, further broadening the issue.

Conclusions:
- Net-metering policies were originally designed when there was limited distributed generation (“DG”).
  penetration on the network. DG, such as solar, is becoming more common across the country and we are beginning to see the unintended consequences of this policy.
- Subsidies should be transparent to all parties, including customers and regulators.
- Costs should reflect each customers usage of the network, rather than the usage of other customers.
Energy Efficiency: The Forgotten Option
Although the rate of growth in electricity demand is slowing, Americans are consuming more electricity than most of their international peers.

Though many of the factors which drive electricity consumption are structural, this suggests that Americans inefficiently consume electricity.
Electricity rates and residential electricity consumption in the US exhibit regional differences.

More consistent policies that price externalities into the market for electricity would serve to levelize rates across the US and encourage the more efficient use of electricity.

Note: Electricity consumption was adjusted to account for variations in the number of high temperature days.
Sources: 2010 EIA-826 Database, National Oceanic and Atmospheric Administration, MJB&A Analysis
There exists a considerable amount of additional cost-effective energy savings potential in the US economy.
Energy efficiency provides an economic means to meet incremental electricity demand.
However, there are several structural and behavioral challenges that cause us to leave much of energy efficiency’s potential untapped.

<table>
<thead>
<tr>
<th>Barrier</th>
<th>Description</th>
<th>Potential Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Limited Capital</strong></td>
<td>Limited discretionary capital, high implied discount rates, non-core investments</td>
<td><strong>Utility Rate Base:</strong> provide universal access</td>
</tr>
<tr>
<td><strong>Agency</strong></td>
<td>Incentives split between parties, e.g., landlord-tenant; potential for ownership transfer</td>
<td><strong>Leverage Third Parties:</strong> ESCOs, electricity retailers, community groups, utilities</td>
</tr>
<tr>
<td><strong>Awareness - Information</strong></td>
<td>Limited energy knowledge, perceived risk of receiving return on investment, availability of trustworthy contractors, “top of mind” challenge</td>
<td><strong>Education and Availability:</strong> outreach and education efforts, impose efficiency standards, clearer labeling/pricing</td>
</tr>
<tr>
<td><strong>Lack of Price Signals</strong></td>
<td>Relatively low electricity prices not capturing externalities, limited link between energy usage and billing data</td>
<td><strong>More Accurate Pricing and Information:</strong> price carbon and other pollutants, smart meters and appliances, real-time-pricing</td>
</tr>
</tbody>
</table>

Capturing more value from energy efficiency will require a comprehensive effort and overarching policy changes, but potential solutions exist.

Customer needs, recent storms and an aging infrastructure have prompted investments to harden and modernize the grid and make it more resilient.

**Increasing customer dependence and expectations:** Even though customers are not using more electricity, our economy and individual customers are more dependent upon it. Current reliability is ~99.99%.

**Climate change and increasing storms:** The four worst storms in PSE&G’s history were in 2010-2012.

PSE&G commenced Energy Strong, a $1.2 billion program that will relocate substations that were damaged in recent storms, replace vulnerable cast iron gas mains and install smart grid technologies to swiftly deploy repair teams.

DG/microgrids are being explored, but applications are costly and likely limited.

**Transmission:** With aging equipment and change in topology of the grid (coal units retiring, new units coming on), substantial investments have been required. Nationally, investments are peaking, and PSE&G is in the midst of a ten-year, ~$7 billion investment program to ensure system reliability.
Conclusions

- An exciting, challenging, rapidly evolving industry with opportunities to meet customer needs and achieve environmental objectives cost-effectively.

  - Conventional generation technologies provide a mix of trade-offs between cost, environmental sustainability and fuel supply.

  - Supply diversity is critical. While policy support and cost declines are enabling growth in renewables to ~5% of supply, absent a technology breakthrough, renewable generation technologies will remain a fraction of overall supply.

  - Policy objectives will continue to support low-emission technologies. Having a level playing field and transparency is important to meet customer needs cost-effectively and allocate costs fairly.

  - The increasing frequency of extreme weather events has prompted increased interest in electric system resiliency, as well as distributed generation. Technology and cost hurdles currently inhibit widespread deployment.

- Research focused on reducing the cost of new technologies, their efficient integration into the network, as well as balanced policy design is important (e.g., *MIT Utility of the Future Study)*.

- Energy efficiency provides a vast resource of untapped potential that can economically reduce the rate of growth in energy consumption, but a range of targeted policies are needed to overcome real barriers to achieving cost-effective energy savings.