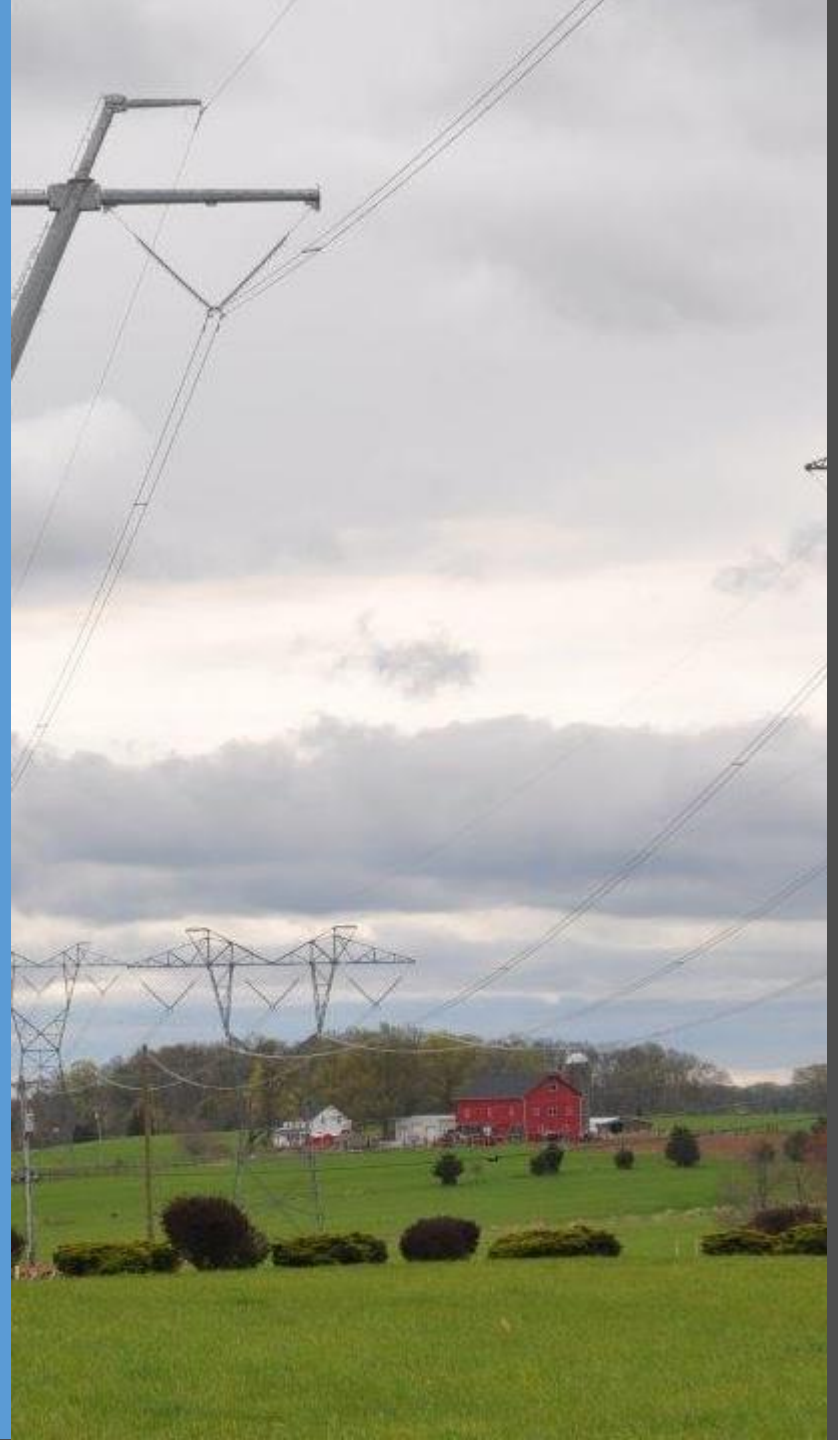


LBI Foundation

Power Generation and Transmission Development

David Hinchey

Sr Manager Environmental Projects & Srvcs

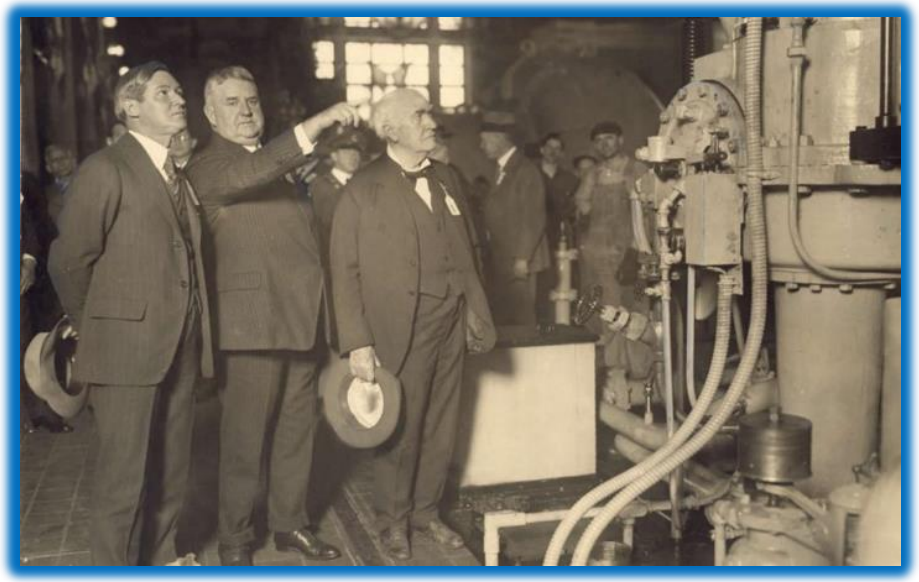
February 25, 2023

Public Service Enterprise Group

- Public Service Corporation was formed in 1903, by amalgamating more than 400 gas, electric and transportation companies in New Jersey. Thomas McCarter was named the corporation's first president and held the position until 1939.
- Public Service Transit was sold to the State in the ‘70s, which formed New Jersey Transit as we know it today.
- In 1971, we changed our logo to the iconic sunburst to better reflect in the company’s commitment to nuclear power and a healthy environment.

PSEG’s Powering Progress Vision:

A future in which people use less energy, that energy is cleaner and delivered more reliably than ever.



Core Commitments:

1. Safety
2. Integrity
3. Continuous Improvement
4. Diversity & Inclusion
5. Customer Service

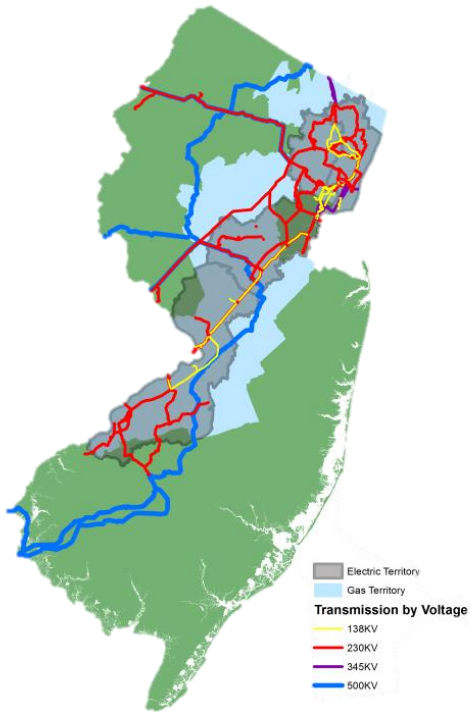
Public Service Enterprise Group

(PSEG) is a publicly traded (NYSE:PEG) diversified energy company headquartered in Newark New Jersey.

- PSEG was founded in 1903, Approximately 12,500 employees
- Ranked 318 on Fortune 500, Total assets (2020): $51.1B
- Generates over 90% of New Jersey's Carbon Free Energy
- Net Zero Goal by 2030, setting science based targets for the reduction of greenhouse gases across all three scopes.

PSE&G | PSEG | PSEG LONG ISLAND | PSEG Power LLC

Powering Progress



PSE&G's vision is to power a future where people use less energy, and it's cleaner, safer and delivered more reliably than ever.

	Electric	Gas
Customers 5-Year Annual Customer Growth*	2.3 Million 0.8%	1.9 Million 0.7%
2021 Electric and Gas Sales	40,163 GWh	2,422M Therms**

Best in class regulated utility and New Jersey's largest:

- Electric and gas distribution utility
- Transmission business
- Investor in renewables and energy efficiency
- Appliance service provider

Topics for Discussion

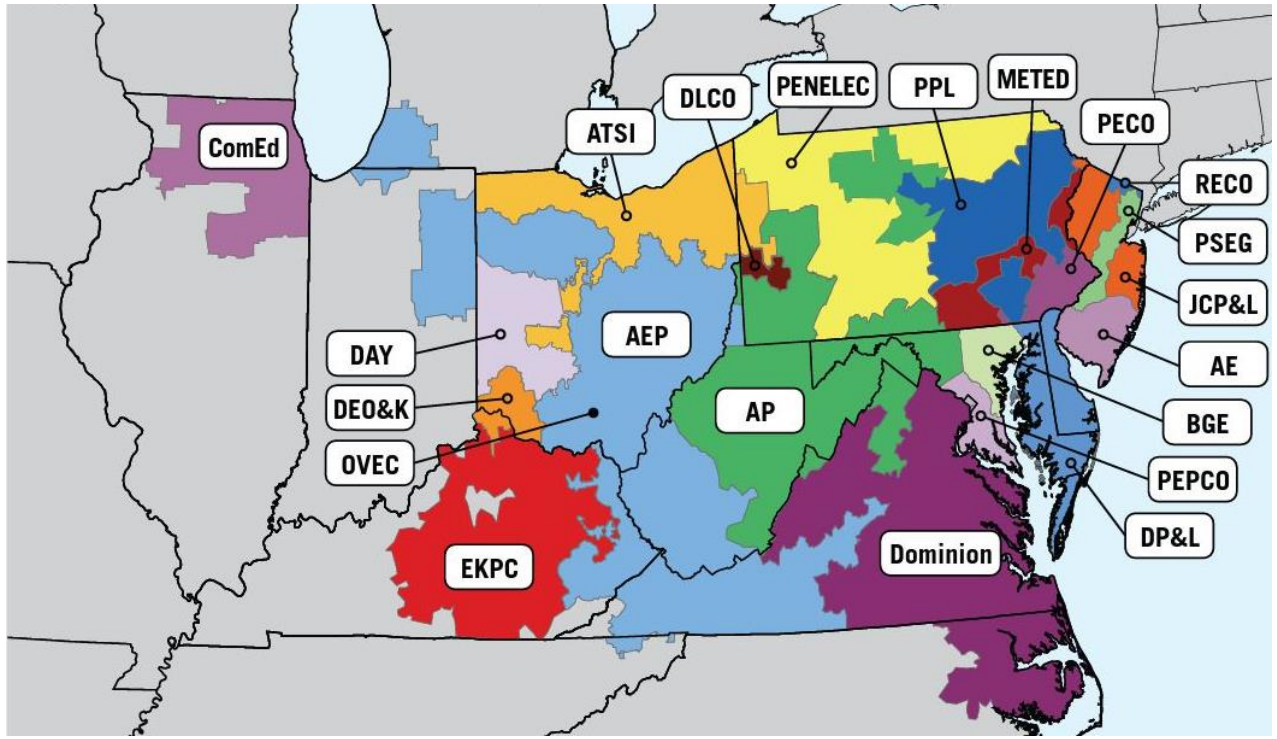
- Power Grid
- Power Generation
- Offshore Wind
  - Generation
  - NJ Wind Port
  - Offshore Planned Transmission
- Hydrogen and Storage

Power Grid

Transmission & Distribution

Overview

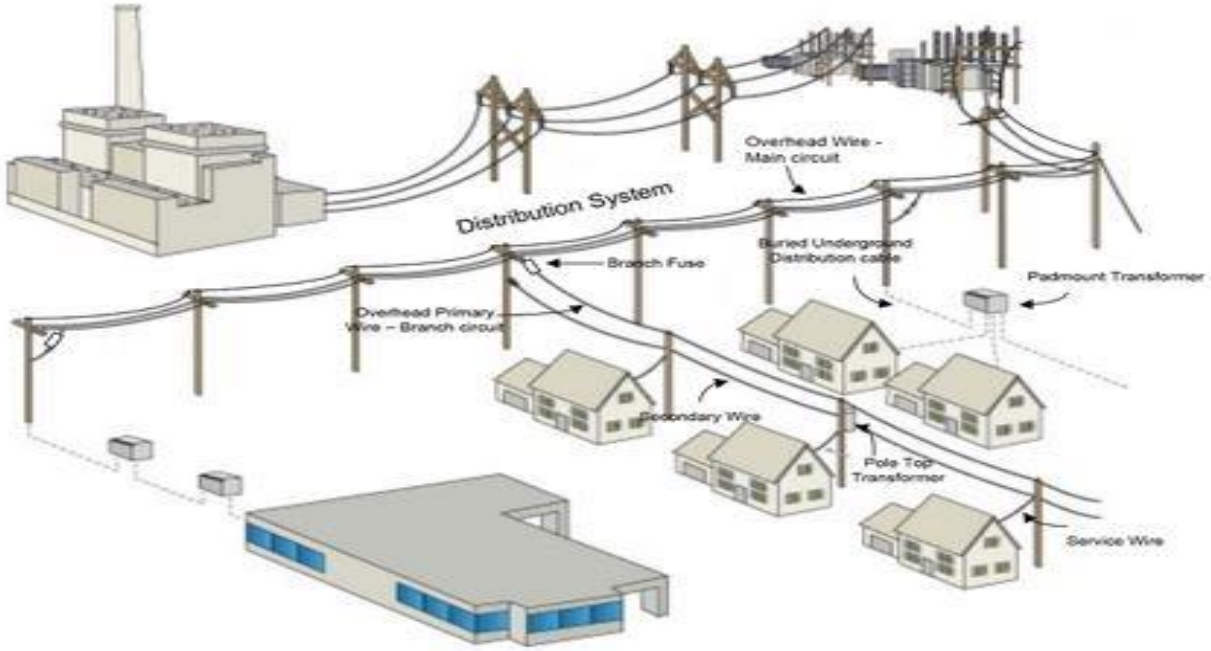
What is PJM?

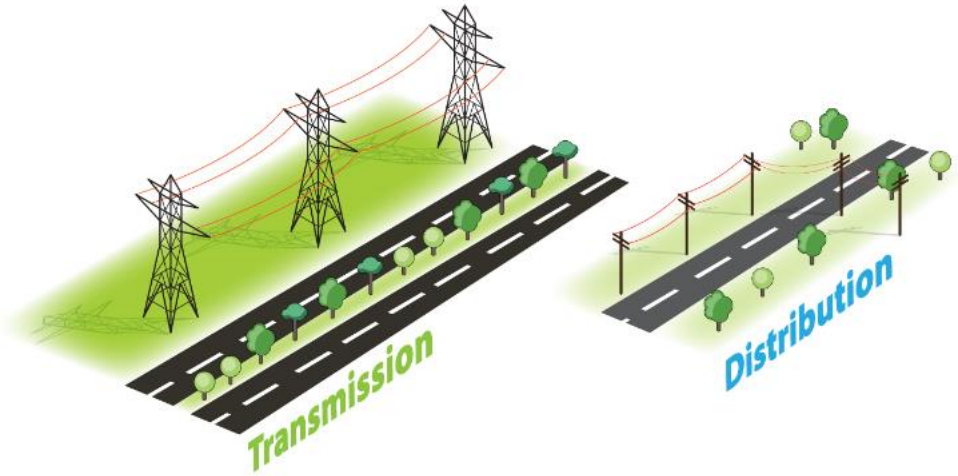


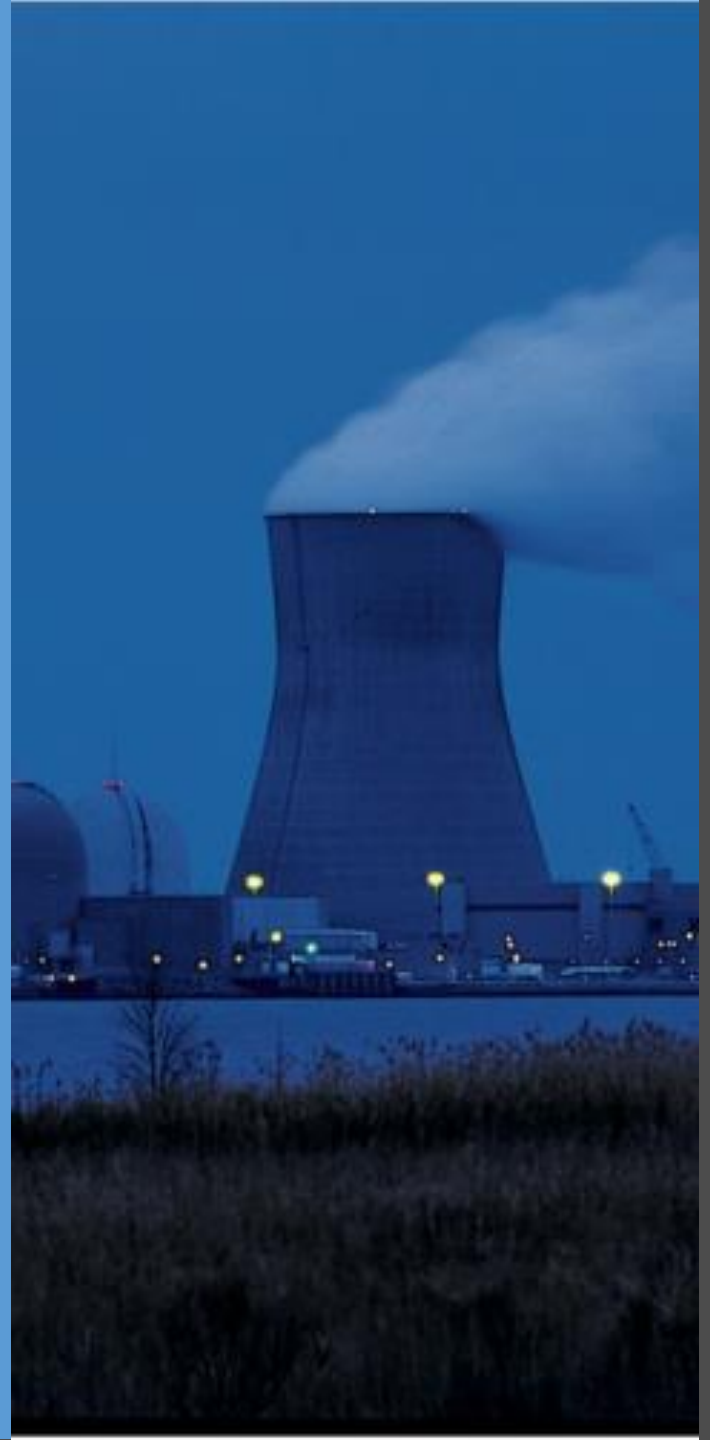
PJM is an abbreviation of Pennsylvania, New Jersey, and Maryland after the territories where the first utilities joined together.

PJM works to coordinate and direct the flow of electricity to keep the lights on for 65 million people. PJM does not own power lines or generators. Instead, it is an independent, regulated organization that directs the operation of power lines and generators for many different owners.

How the Grid Works – Transmission & Distribution





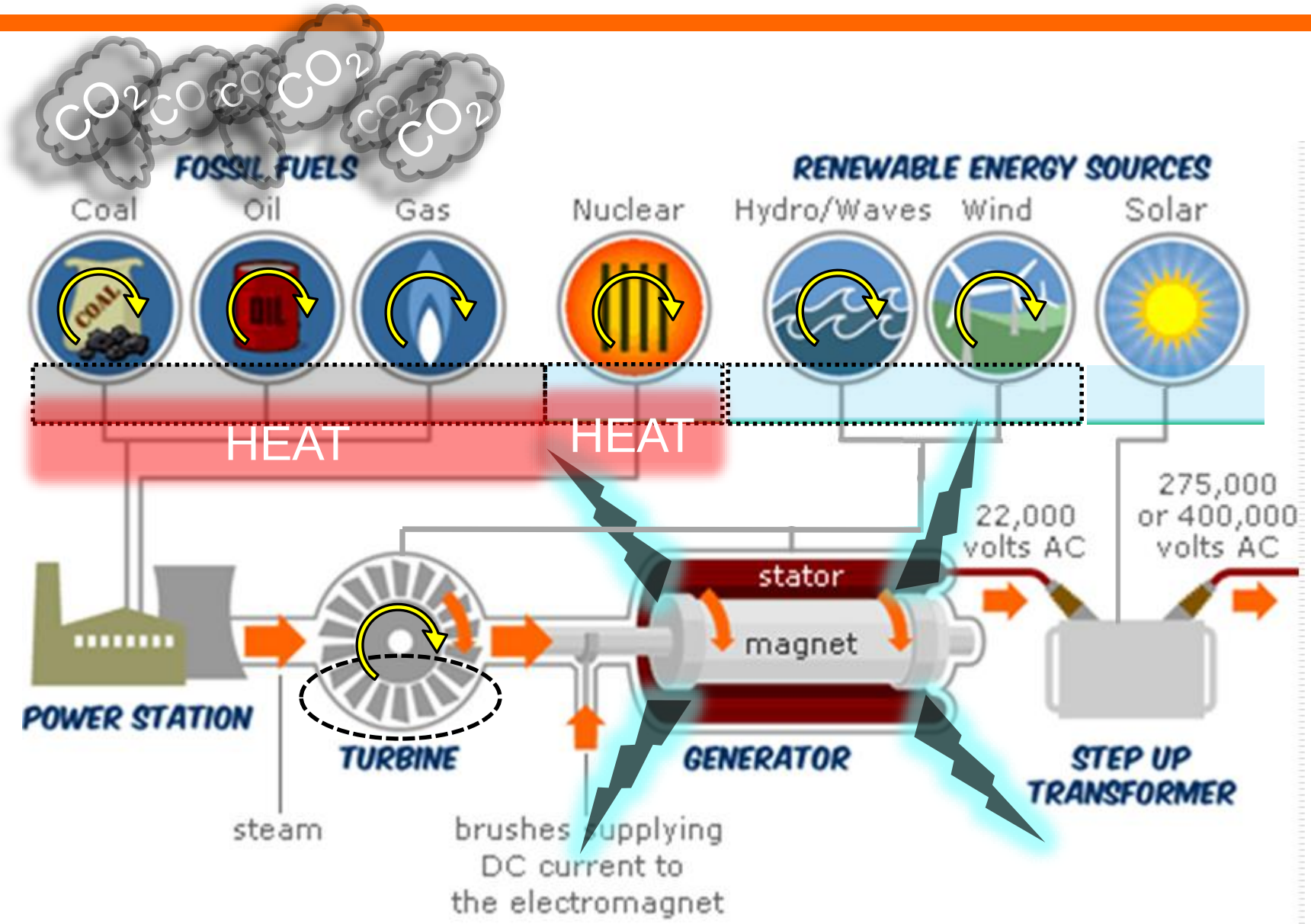


PSEG

Power Generation

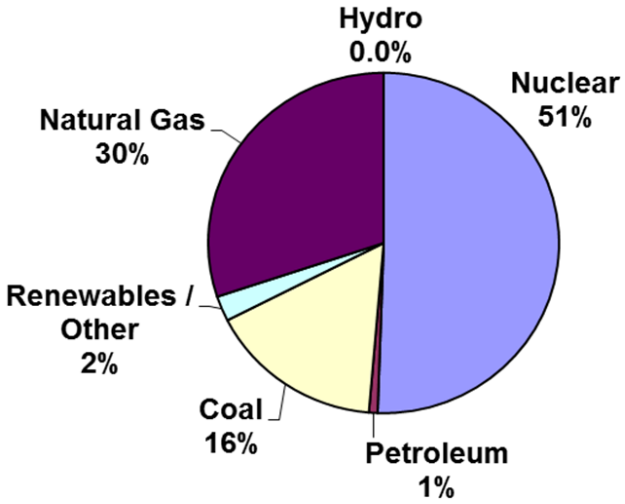
Overview

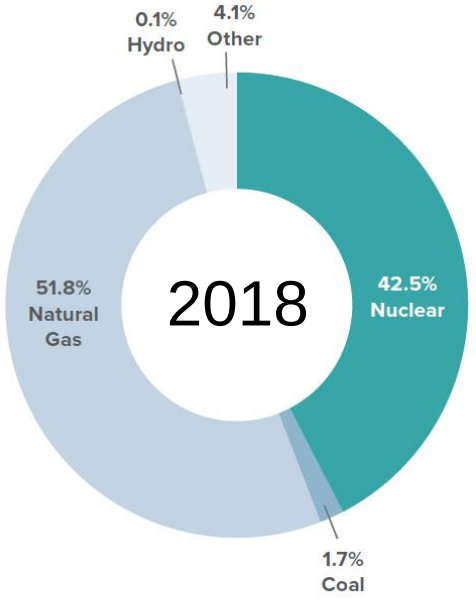
Power Generation



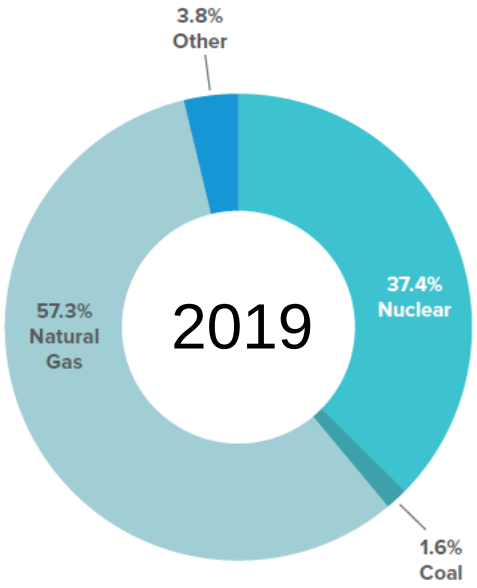
New Jersey Electricity Generation – 2007 vs. 2018-2020

2007



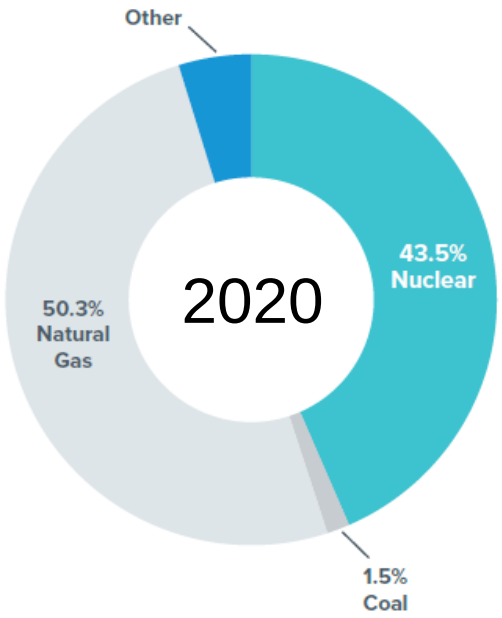


Other includes petroleum, biomass and geothermal along with hydro, wind and solar if they account for less than 3% of electricity generated.



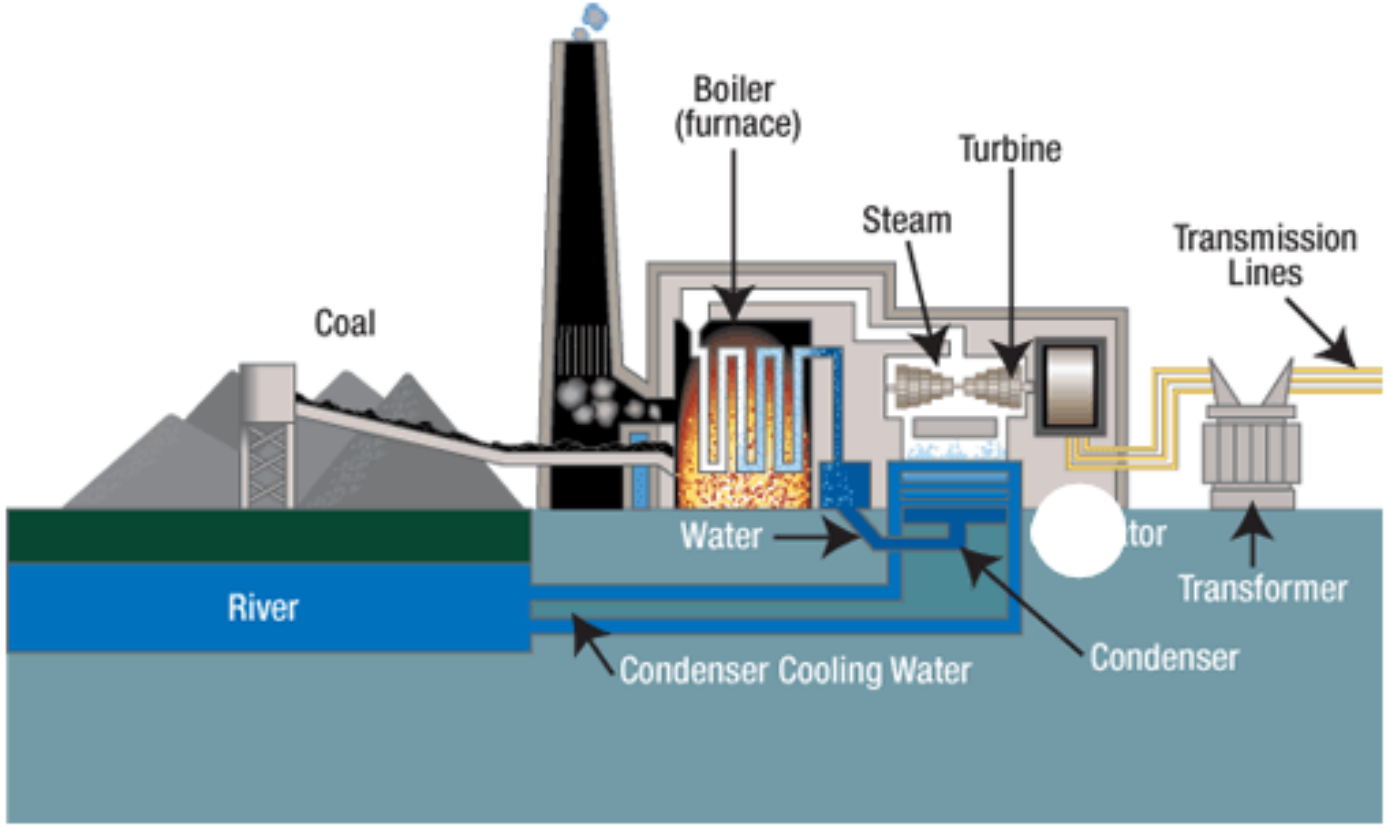
Other includes petroleum, biomass and geothermal along with hydro, wind and solar if they account for less than 3% of electricity generated.

Source: ABB Velocity Suite / U.S. Energy Information Administration

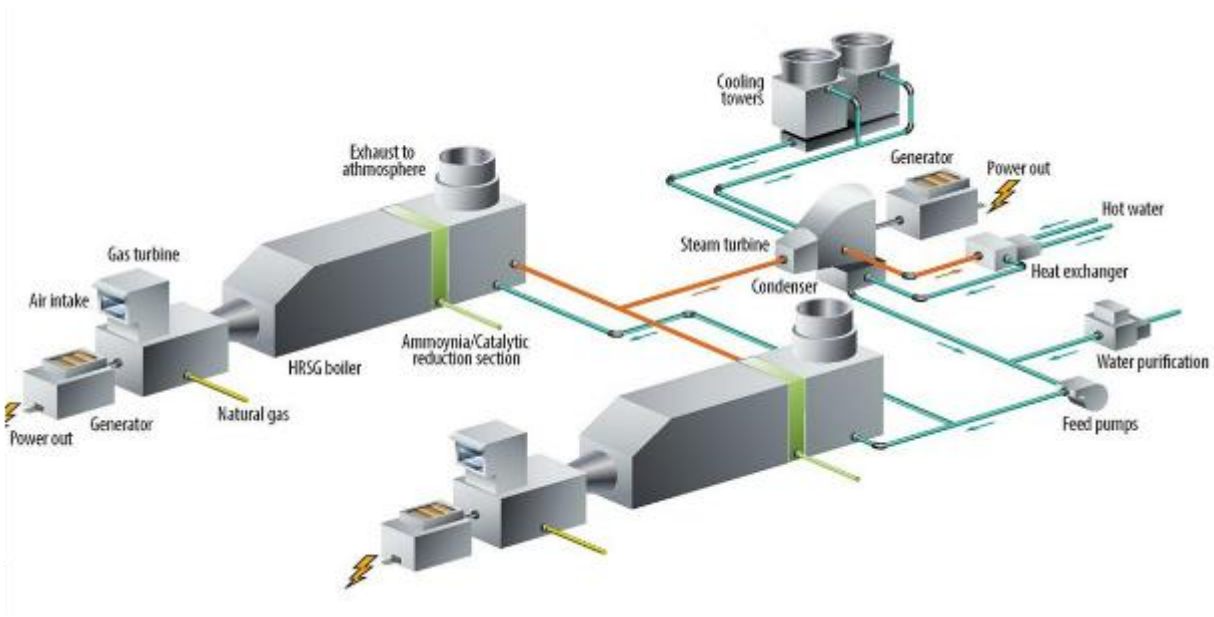


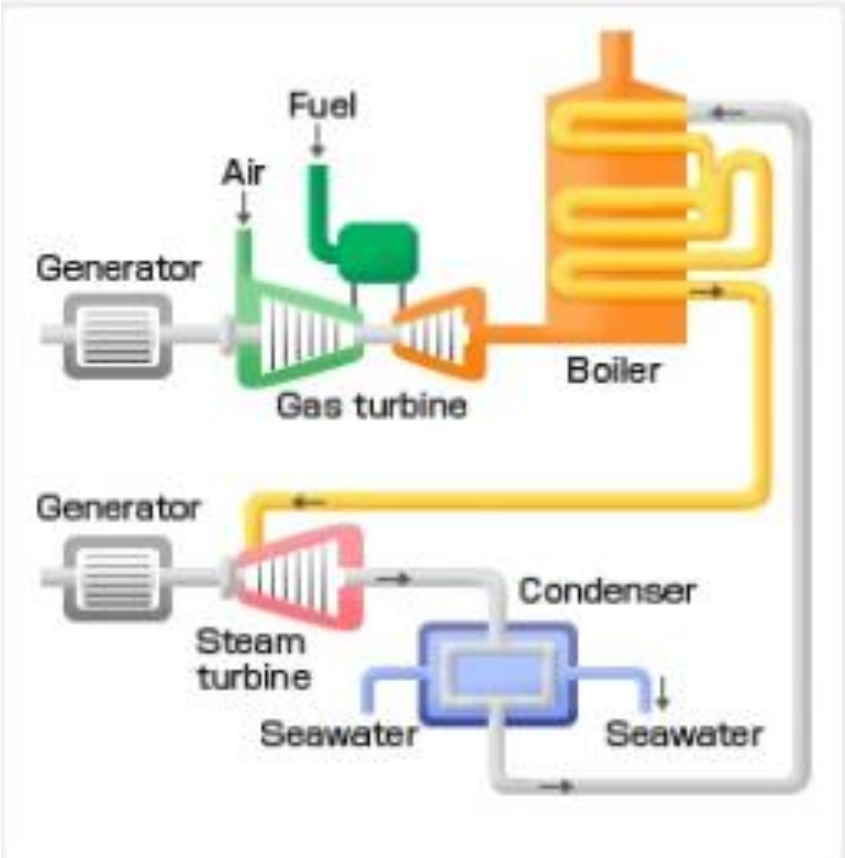
Other includes geothermal and other generation along with petroleum, biomass, hydro, wind and solar if they account for less than 3% of electricity generated.

Power Generation – Coal / Oil Boiler

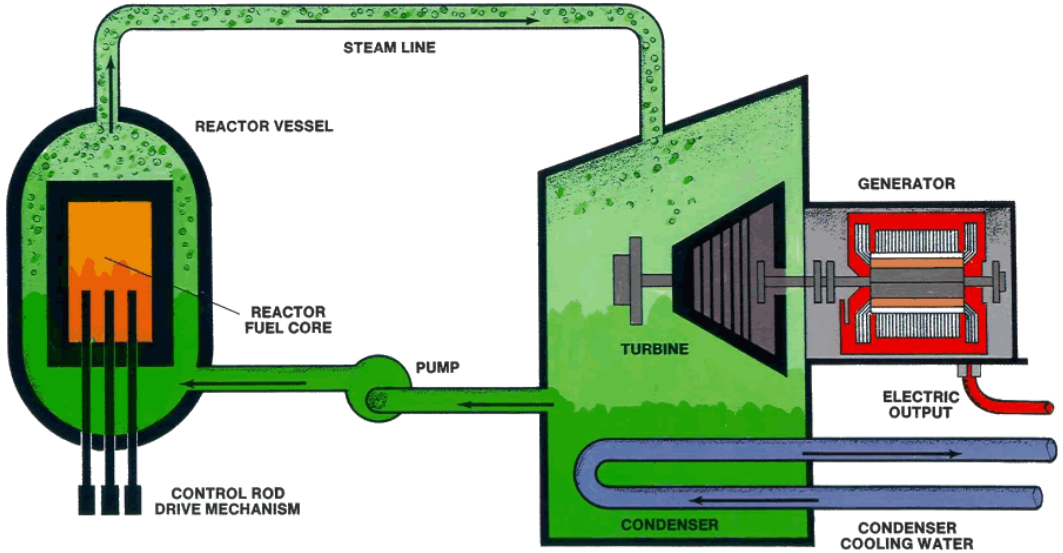


Power Generation - Gas Combined Cycle



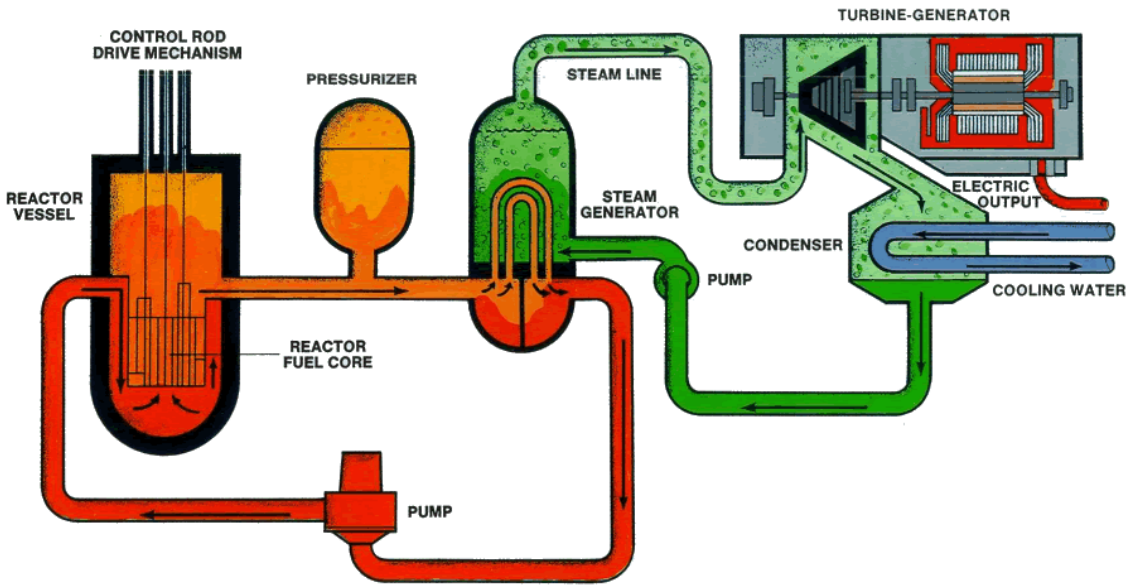


Power Generation - Nuclear



Boiling Water Reactor

Pressurized Water Reactor



PSEG

Offshore Wind

Industry Overview

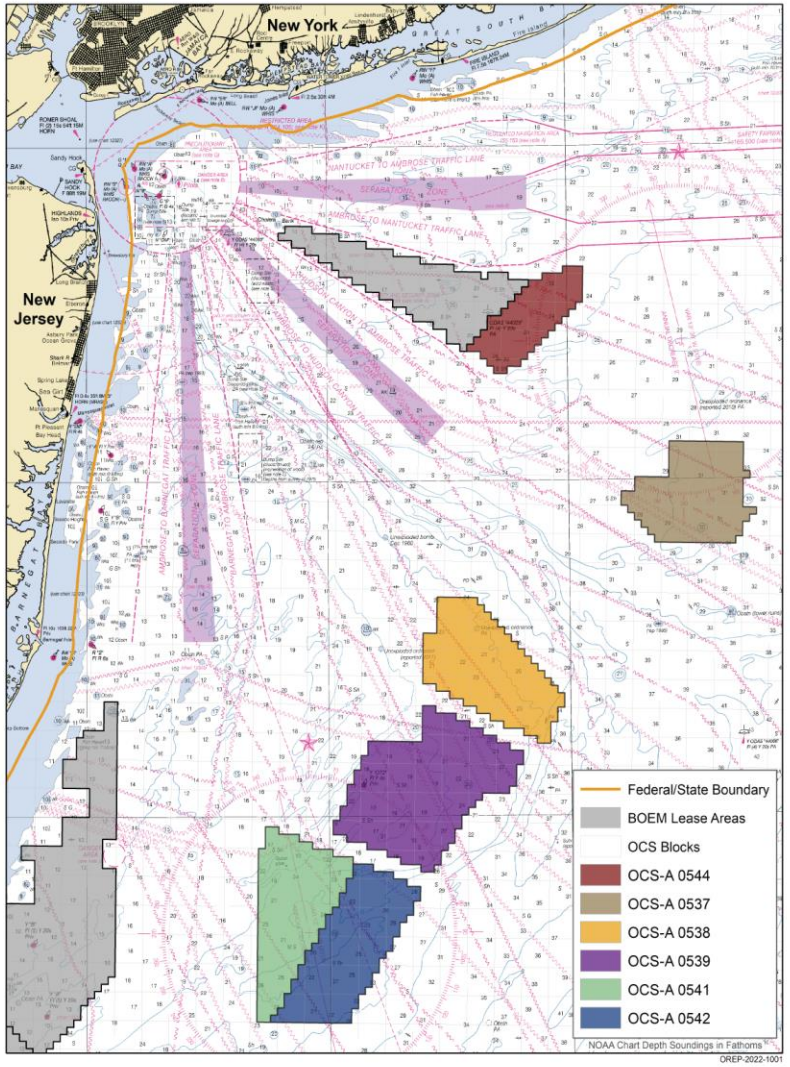
Offshore Wind Engineering and Construction

Offshore Wind Market Update

OSW Lease Areas

Market Targets			
ISO	State	Target	Awarded or Built
PJM	NJ	7,500 MWs by 2035	1,100 MWs – Ocean Wind 1 (Ørsted) 1,148 MW – Ocean Wind 2 (Ørsted) 1,510 MW – Atlantic Shores
	MD	1,200 MWs by 2030	1,014 MWs – Skipjack Wind 1&2.1 (Ørsted) 269 MWs – U.S. Wind (U.S. Wind) 808 MWs – U.S. Wind (U.S. Wind)
	VA	5,200 MWs by 2034	12 MWs – Coastal VA Offshore Wind (Dominion) 2,640 MWs – (Dominion)
NY-ISO	NY	9,000 MWs by 2035	130 MWs – South fork (Ørsted & Eversource) 880 MWs – Sunrise NY (Ørsted & Eversource) 816 MWs – Empire Wind (Equinor) 1260 MWs – Empire Wind 2 (Equinor) 1230 MWs – Beacon Wind (Equinor and bp)
ISO-NE	MA	5,600 MWs by 2035	800 MWs – Vineyard Wind (Avangrid & CIP) 804 MWs – Mayflower Wind (Shell & EDP Renew.) 1,232 MWs – Commonwealth Wind (Avangrid) 400 MWs – Mayflower Wind (Shell and Ocean Winds)
	CT	2,000 MWs by 2030	304 MWs – Revolution Wind (Ørsted & ES) 804 MWs – Park City Vineyard Wind (Avangrid & CIP)
	RI	1,000 MWs by 2025	30 MWs – Block Island (Ørsted) 400 MWs – Revolution Wind (Ørsted & ES)
	Total	31,500 MWs by 2035	17,591 MWs

BOEM - NY Bight Lease Areas



Winners of the New York Bight Lease Areas, $4.37 Billion in High Bids

OCS-A 0544	Vineyard Mid-Atlantic LLC, $285,000,000
OCS-A 0537	OW Ocean Winds East, LLC, $765,000,000
OCS-A 0538	Attentive Energy LLC, $795,000,000
OCS-A 0539	Bight Wind Holdings, LLC, $1,100,000,000
OCS-A 0541	Atlantic Shores Offshore Wind Bight, LLC, $780,000,000
OCS-A 0542	Invenergy Wind Offshore LLC, $645,000,000

BOEM
Bureau of Ocean Energy Management

Major Components of the Turbine

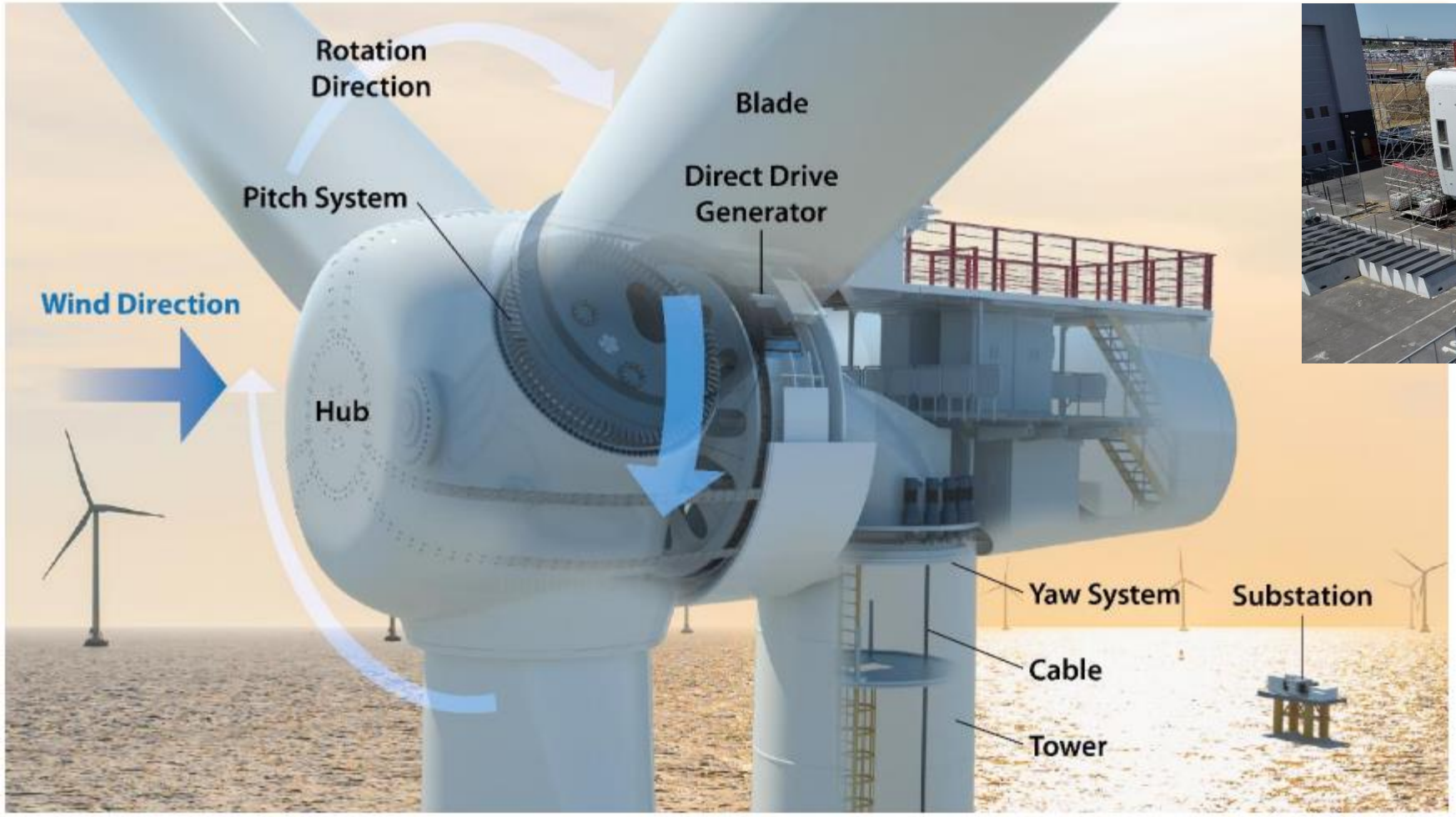
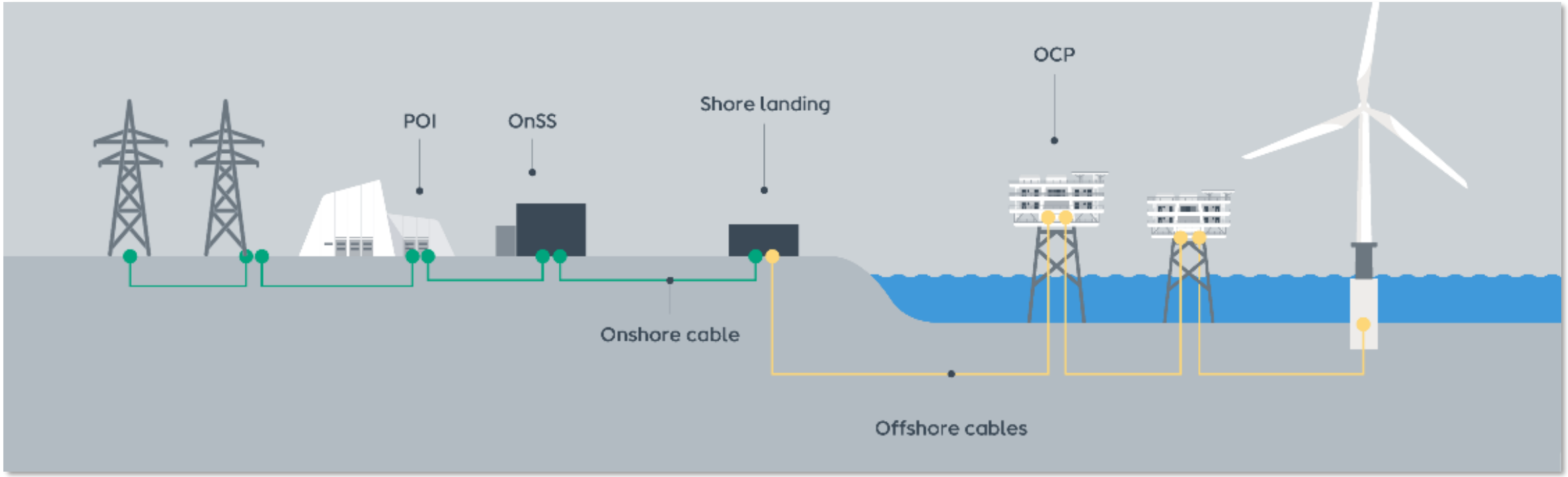


Figure credit: Joshua Bauer, NREL

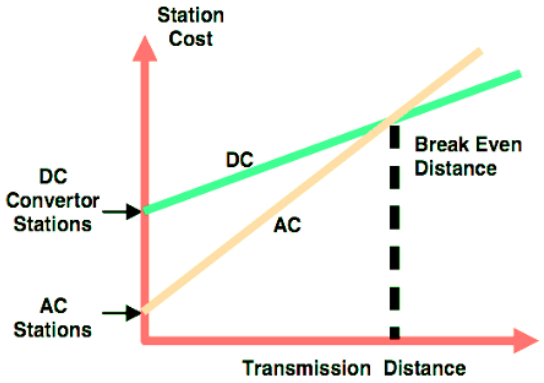
Offshore Wind Transmission

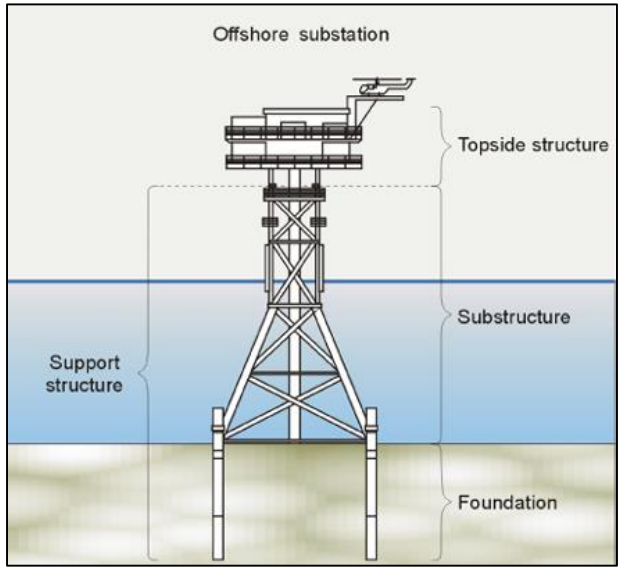


Offshore Substation (AC) / Converter Station (DC)

Source: Siemens

Source: https://www.offshorewind.biz/2021/06/04/hitachi-abb-launches-floating-wind-transformers-portfolio/

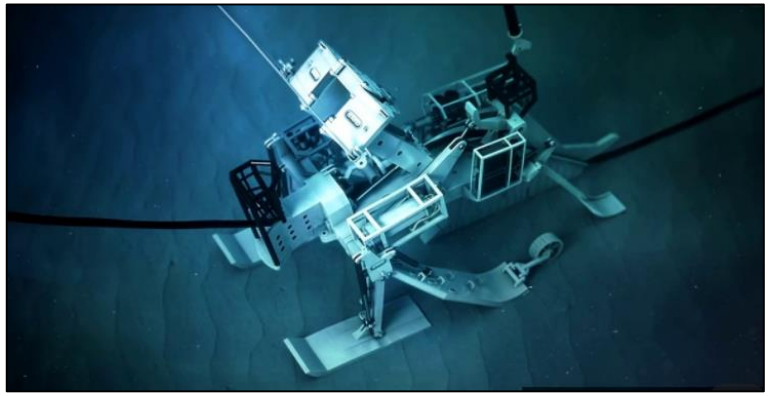




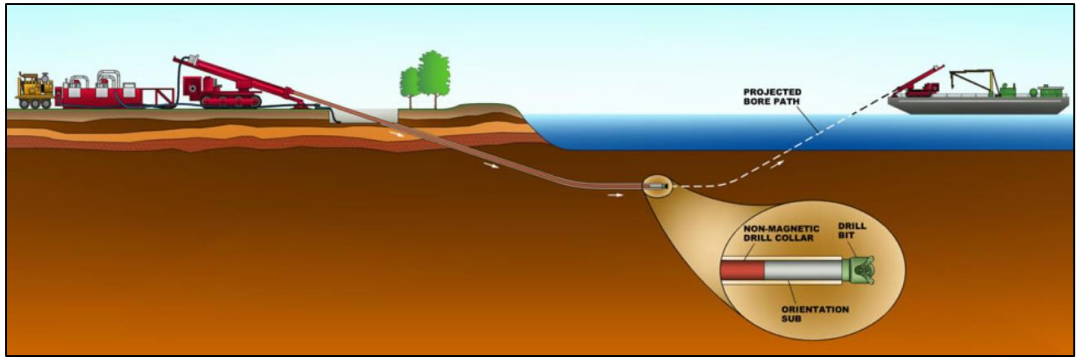
Source: "Substations for offshore wind farms: a review from the perspective of the needs of the Polish wind energy sector", S. Robak & R.M. Raczkowski, Bulletin of the Polish Academy of Sciences, 2018

Source: https://ramboll.com/projects/re/substation%20design%20for%20sheringham%20shoal%20wind%20farm

Onshore / Offshore Cables



Jet Plow
Source: SMD



Horizontal Directional Drill (HDD)
Source: https://www.hadleeandbrunton.co.nz/what-is-horizontal-directional-drilling/

Duct Bank with Open Trench

Overall Project Agency Jurisdiction and Permitting Sequence

NEPA Process: BOEM COP → COP Approval &NOI → Draft EIS → Final EIS → Record of Decision → One Federal Decision

Federal (offshore) : • *EPA OCS Air Permit* • *US Coast Guard Coordination & Permits* • *NMFS/NOAA Incidental Take* • *FAA permits*

Federal (entire project): • *Army Corp Section 404, Section 10 & Section 408* • *Endangered Species Act Section 7* • *Section 106 Review (historic properties)*

State (nearshore): •*NJDEP CAFRA/Waterfront* •*Coastal Wetlands* • *NJDEP T&E* •*Flood Hazard Area* •*Tidelands License NJ*

State (onshore): • *State Park Diversion* • *NJDCA building permits* • *NJDEP Dewatering Permit* • *SHPO Review*

State: ***Site Remediation Reform Act***

County/Local Permits (onshore):
• *County Site Plan Approval* • *County Road Opening Permit* • *Soil Erosion Sediment Control Plan* •*County Highway Occupancy Permit*

NOTE: Every agency will utilize and comment on the National Environmental Policy Act (NEPA) process.

New Jersey Wind Port

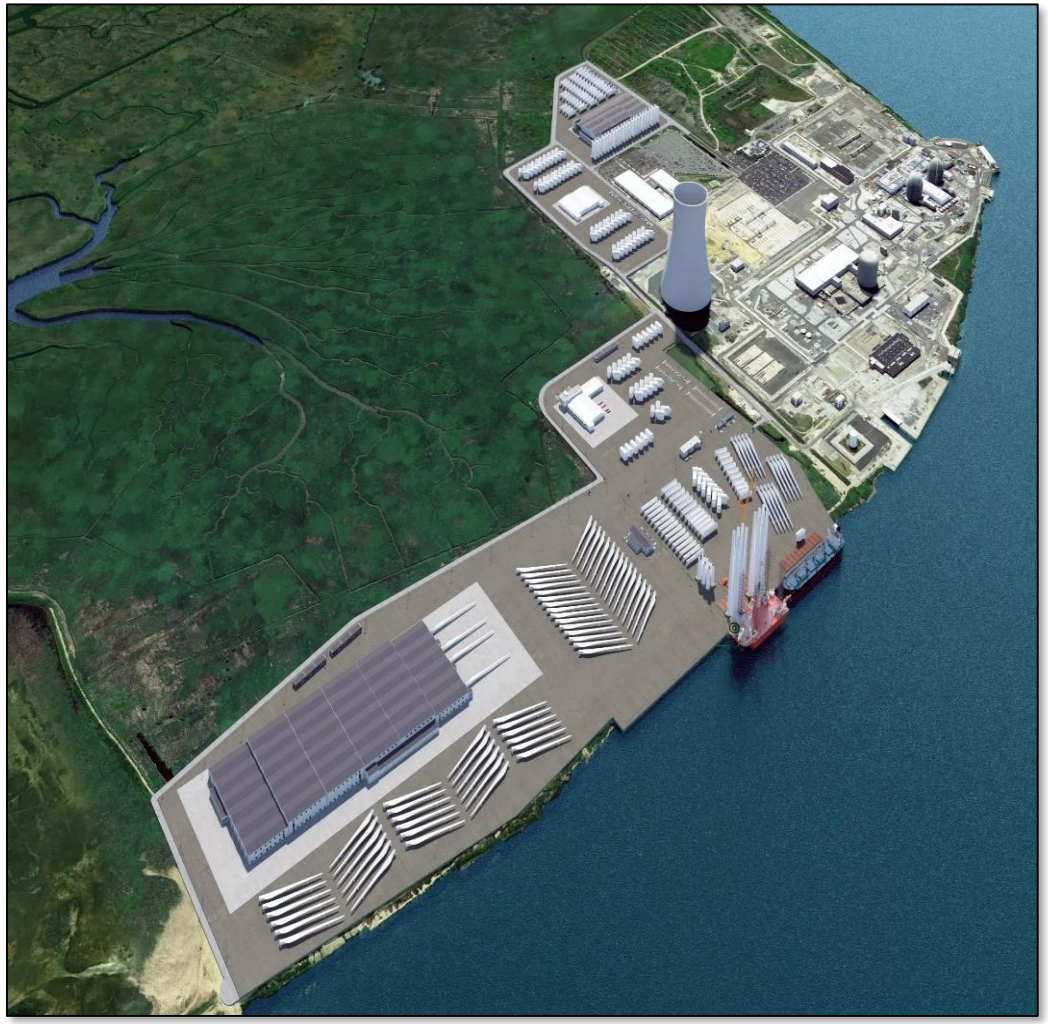
New Jersey Wind Port

The New Jersey Wind Port is the nation's first purpose-built offshore wind marshaling port, promising to position New Jersey as a hub for the U.S. offshore wind industry.

- Purpose-built marshalling space
- Heavy-lift wharfs and component laydown areas
- Open access to the Atlantic Ocean (free of vertical restrictions)
- Short steaming distances to more than 50 percent of US offshore wind lease areas

Construction started late 2021

NJ Wind Port in Salem County



In 2019, the NJEDA with support from PSEG, determined that areas adjacent to the Salem and Hope Creek nuclear power plants on Artificial Island provided a feasible location for a marshalling and manufacturing port for Offshore Wind

- In April, 2020, PSEG and the NJEDA executed a Letter of Intent to advance the port concept and to enter into a lease for the land. Under the terms of the agreement, signed in September 2021, the NJEDA will construct, own and operate the port, and PSEG's role will be that of Landlord
- PSEG provided early development and ongoing permitting support to the NJEDA. PSEG does not have equity interest or other investment in the port

With its expansive footprint, lack of height restrictions, and easy access to the Atlantic Ocean's wind farm lease areas, the Wind Port is one of a select few ports on the East Coast that can house offshore wind turbine marshalling and manufacturing

PSEG

Offshore Planned Transmission

Overview

Coastal Wind Link

COASTAL WIND*link*

A PSEG and Ørsted project

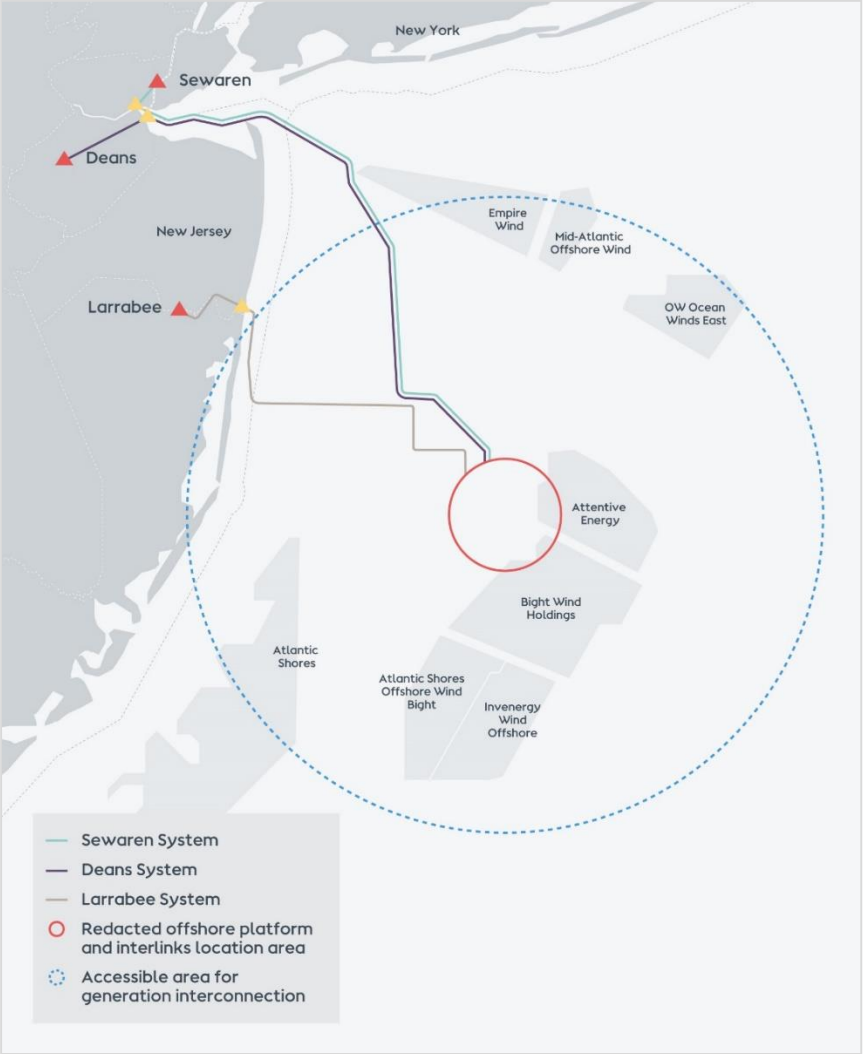
Designed to connect multiple **offshore wind projects** to the grid using HVDC technology

POIs minimize upgrades, reduce environmental impacts and **target dense load pockets**

Offshore meshed grid provides **highest level of reliability and reduces curtailment risk** to offer maximum value

Ratepayer protections encompassing realistic cost and schedule commitments are at the heart of our proposals

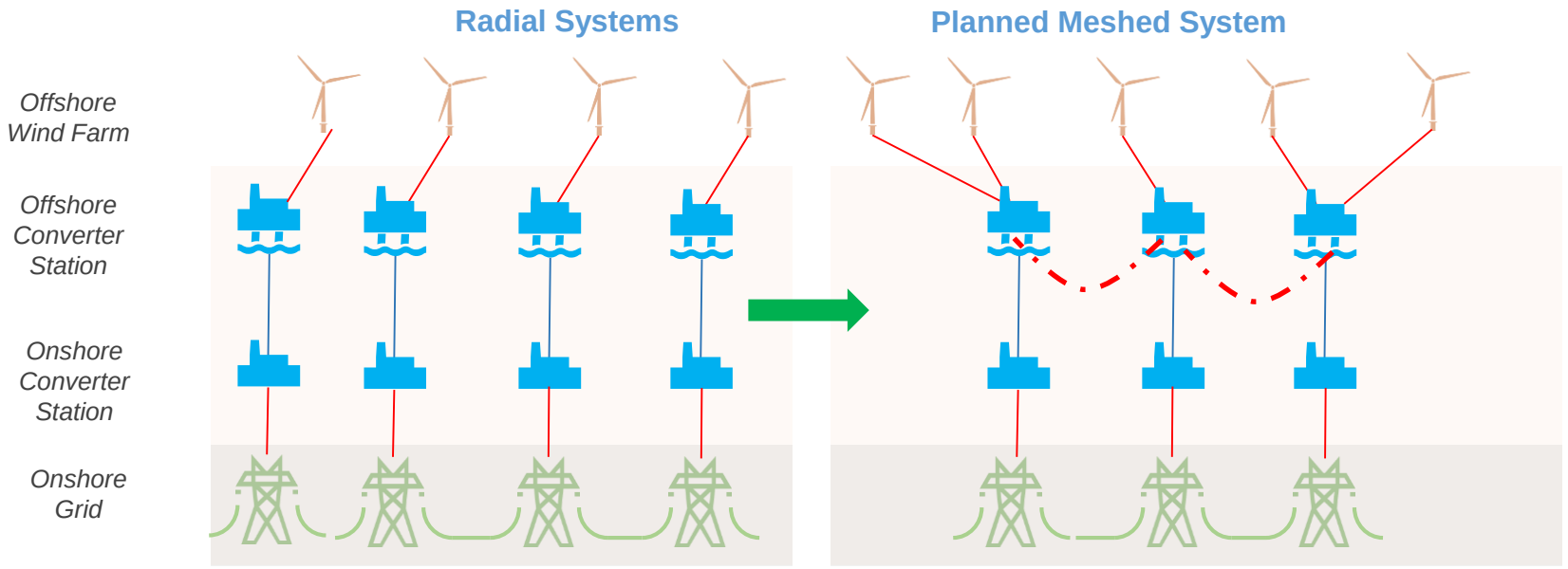
Technology and platform locations **uniquely promote competition** for OSW generation



Transmission System Design

OSW Situation

- US has a goal of 30GW OSW by 2030
- NJ has a target of 11GW OSW by 2040
- States agree that interregional offshore transmission planning is necessary; however, no entity is leading the effort
- OSW goals cannot be reached without significant changes to transmission planning and operational standards

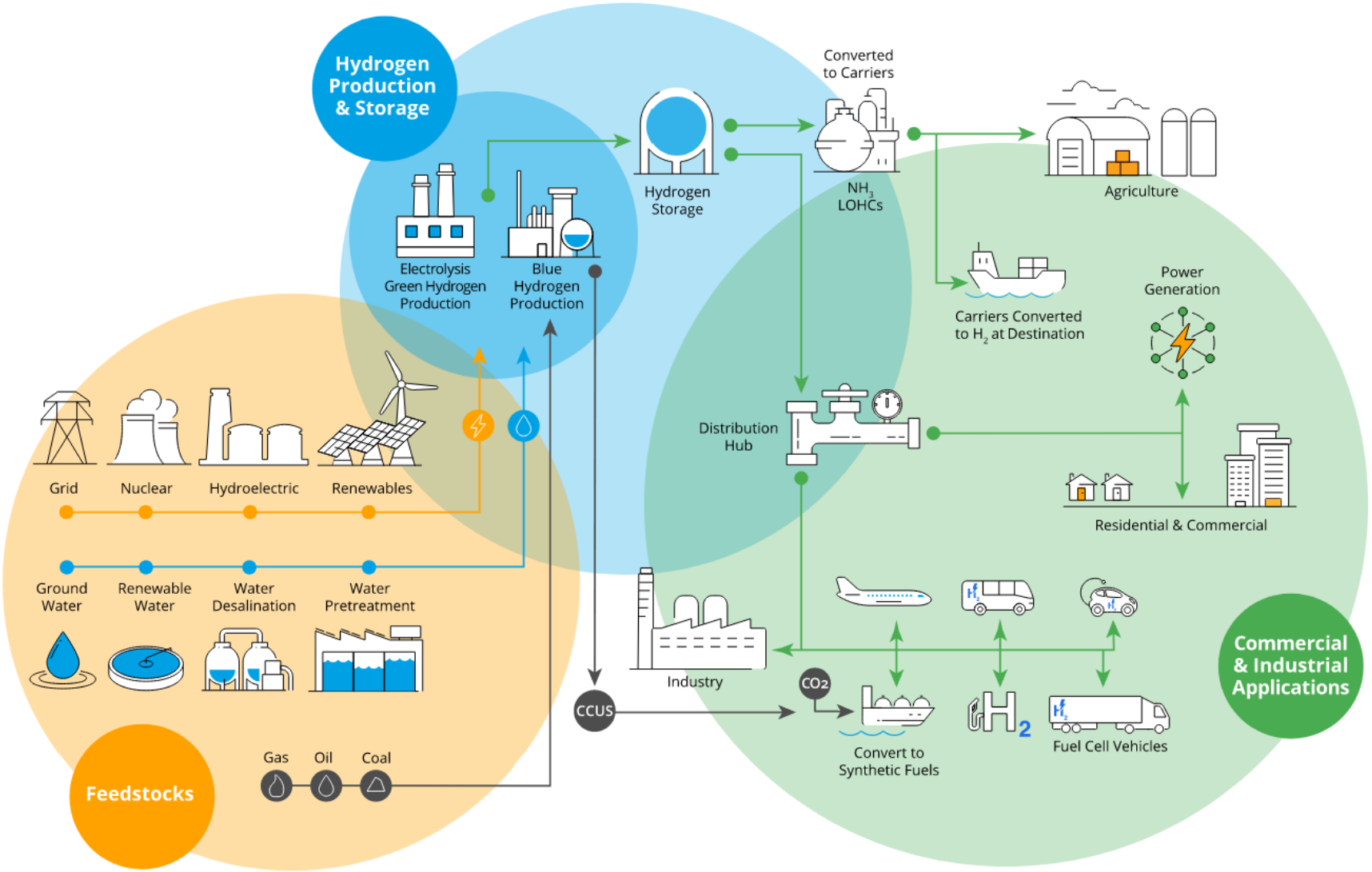


PSEG

Hydrogen

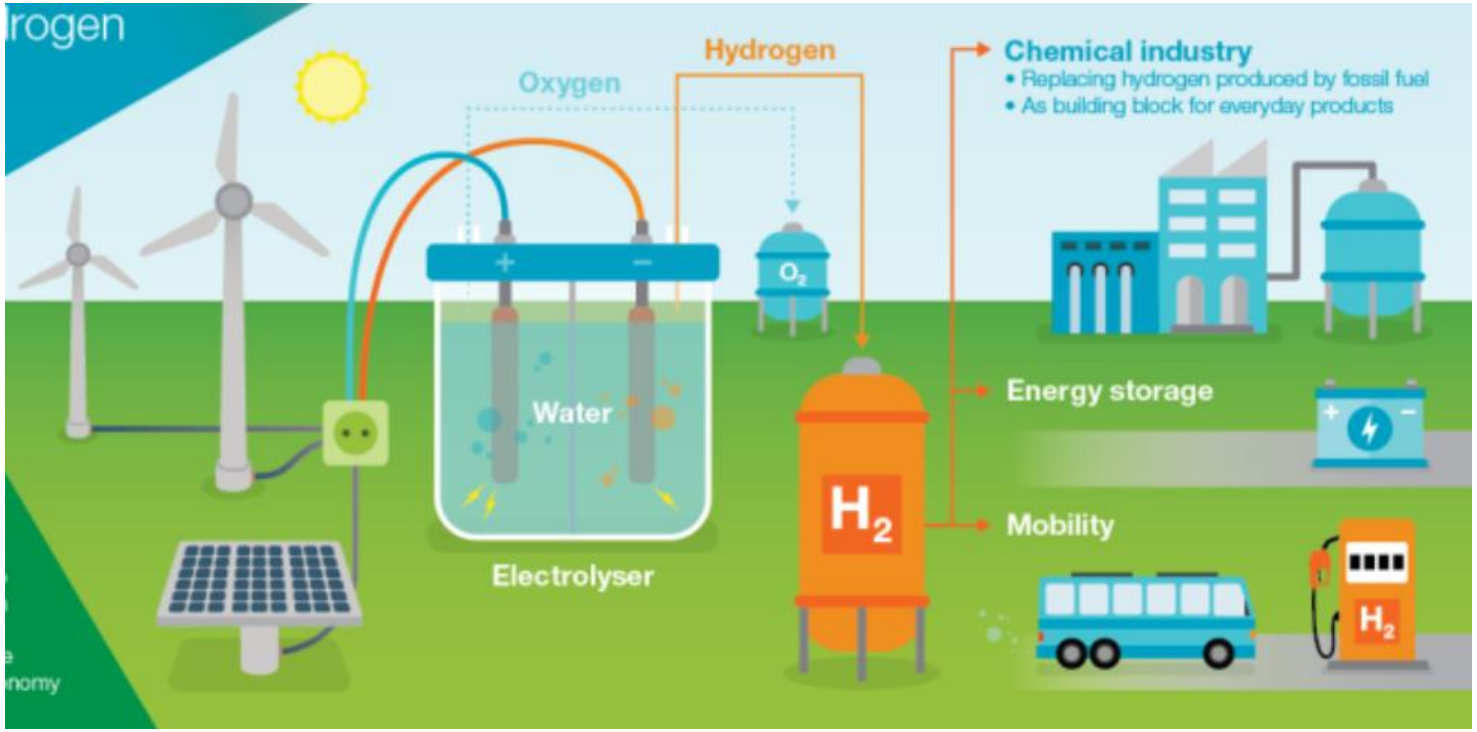
Overview

Hydrogen Generation



Hydrogen – Potential Uses

1. Industrial customers:
   - Steel plants
   - Glass factories
   - Paper factories
   - Fertilizer factories
   - Refineries
2. Energy Storage: Stationary fuel cells
3. Transportation: Fuel cells for vehicles including cars, trucking, and ships.
4. Energy: This would be achieved by converting existing fossil fuel turbines to operate on hydrogen.
5. Heating: Large commercial and industrial customers, as well as residential
6. Blending: Hydrogen can be blended with natural gas to help in the decarbonization effort.
7. Alternative Forms: Convert the green H2 into different product such as ammonia or methane that is easier to transport/handle.



Thank You

David Hinchey
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Appendix

Blades

- Mostly woven fiberglass construction
- Some blades are now incorporating carbon fiber at the tips
- GE utilizes a two piece mold where the blade is molded in two pieces then affixed together
- Siemens has a proprietary single piece blade
- Lightening protection is added to the blades
- Leading edge protection technology is very important for blade wear

The first 107 meter (351 ft) Haliade-X blade at the factory in Cherbourg,

Agenda (update)

- Industry Overview
- Offshore Wind Engineering and Construction
- PSEG’s Engagement in Offshore Wind