Delaware IEEE Briefing

July 30, 2012

Jamie Mallon, Nuclear Development Manager

PSEG Power LLC

Agenda

Introductions

National / Regional Energy Overview

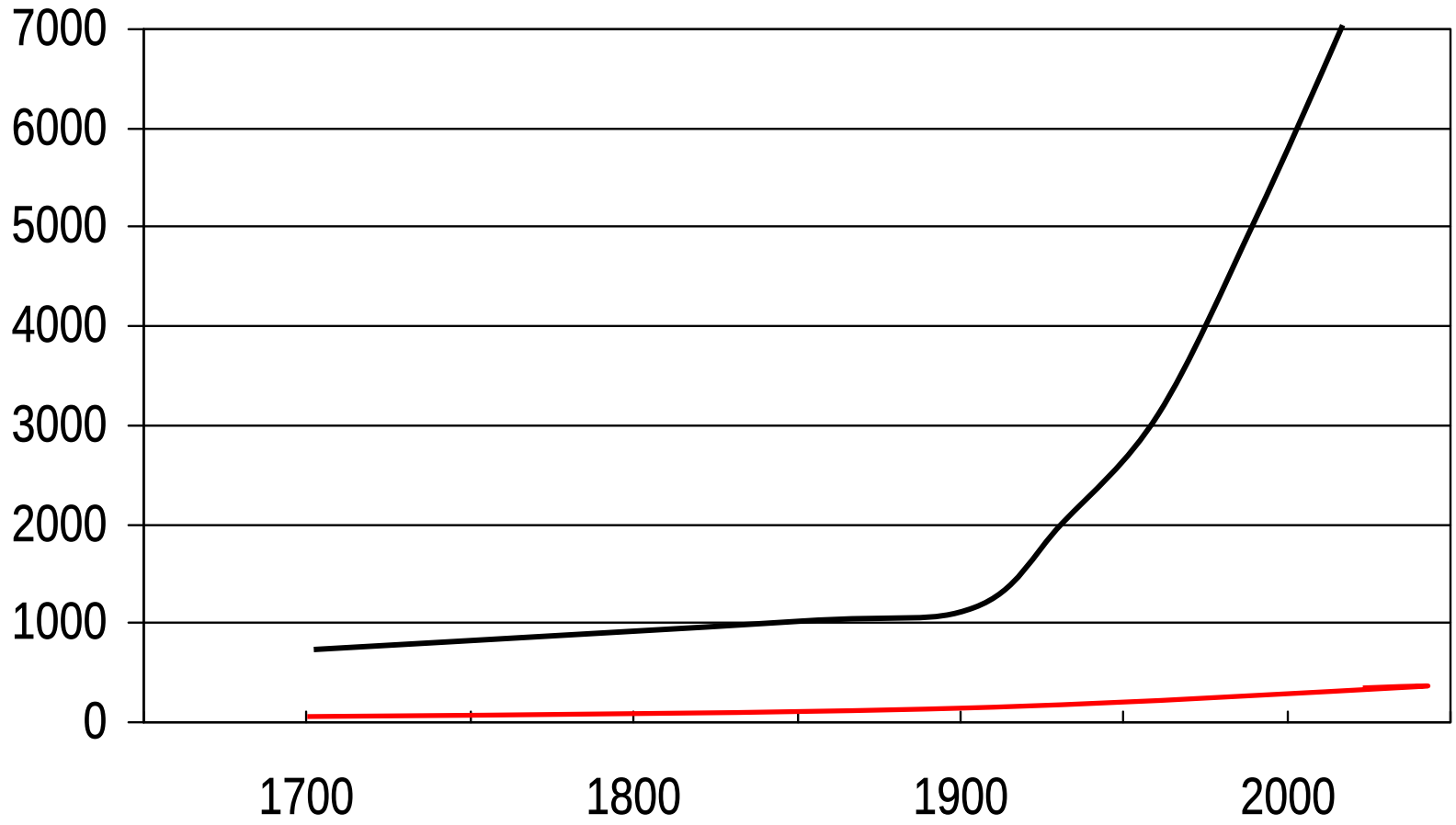
PSEG Power / PSEG Nuclear Overview

Fukushima Update

New Nuclear Development

Total United States vs. World Population (millions)

Although less than 5% of the world's population, the U.S. consumes 19% of the world's total energy annually (21% in 2007)



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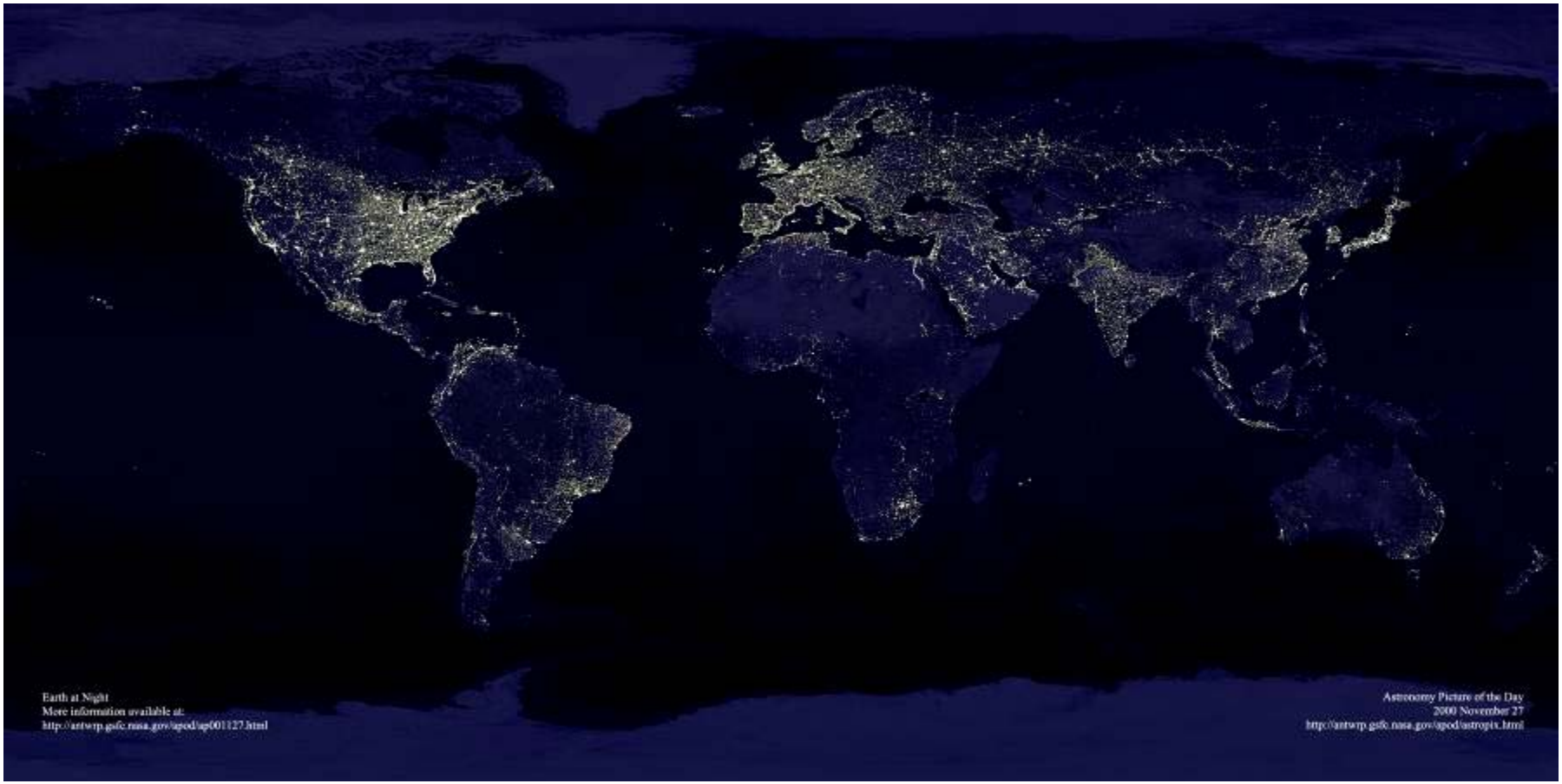
The Earth at Night



International demand for electricity will continue – indefinitely!

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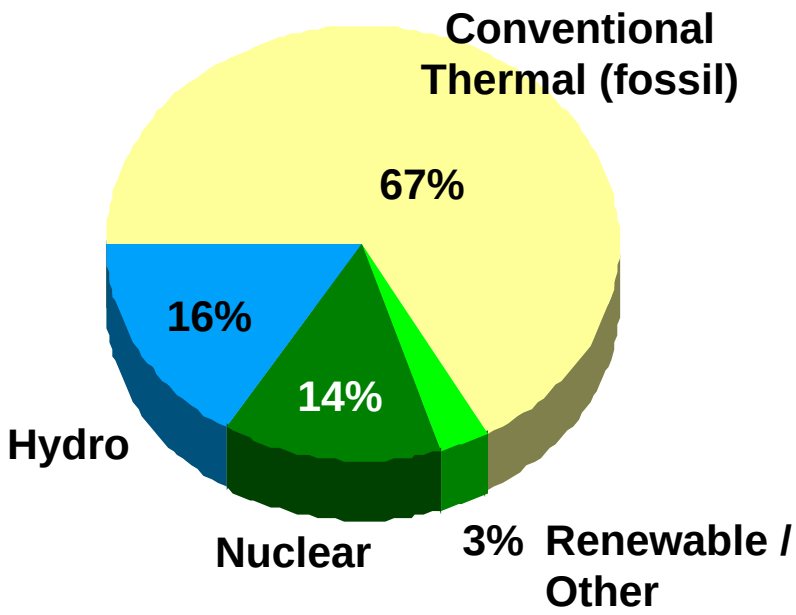
International vs. United States Energy Produced

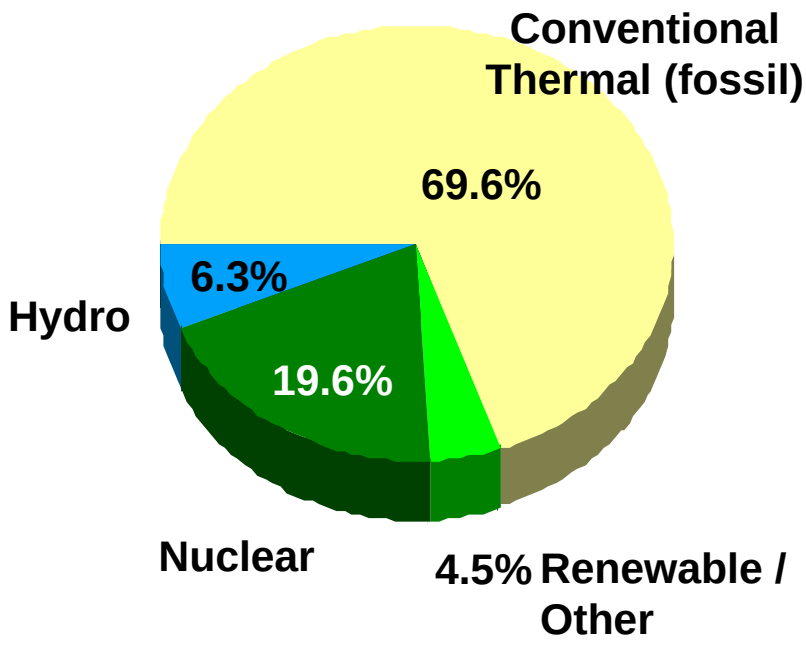
International Electricity Produced – 2008

Total GWh: 19,103,196



United States Electricity Produced – 2010

Total GWh: 4,125,060



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The World at Night

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The World at Night

436 Operating Nuclear Power Plants

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Source: IAEA

The World at Night

67 Nuclear Power Plants Under Construction

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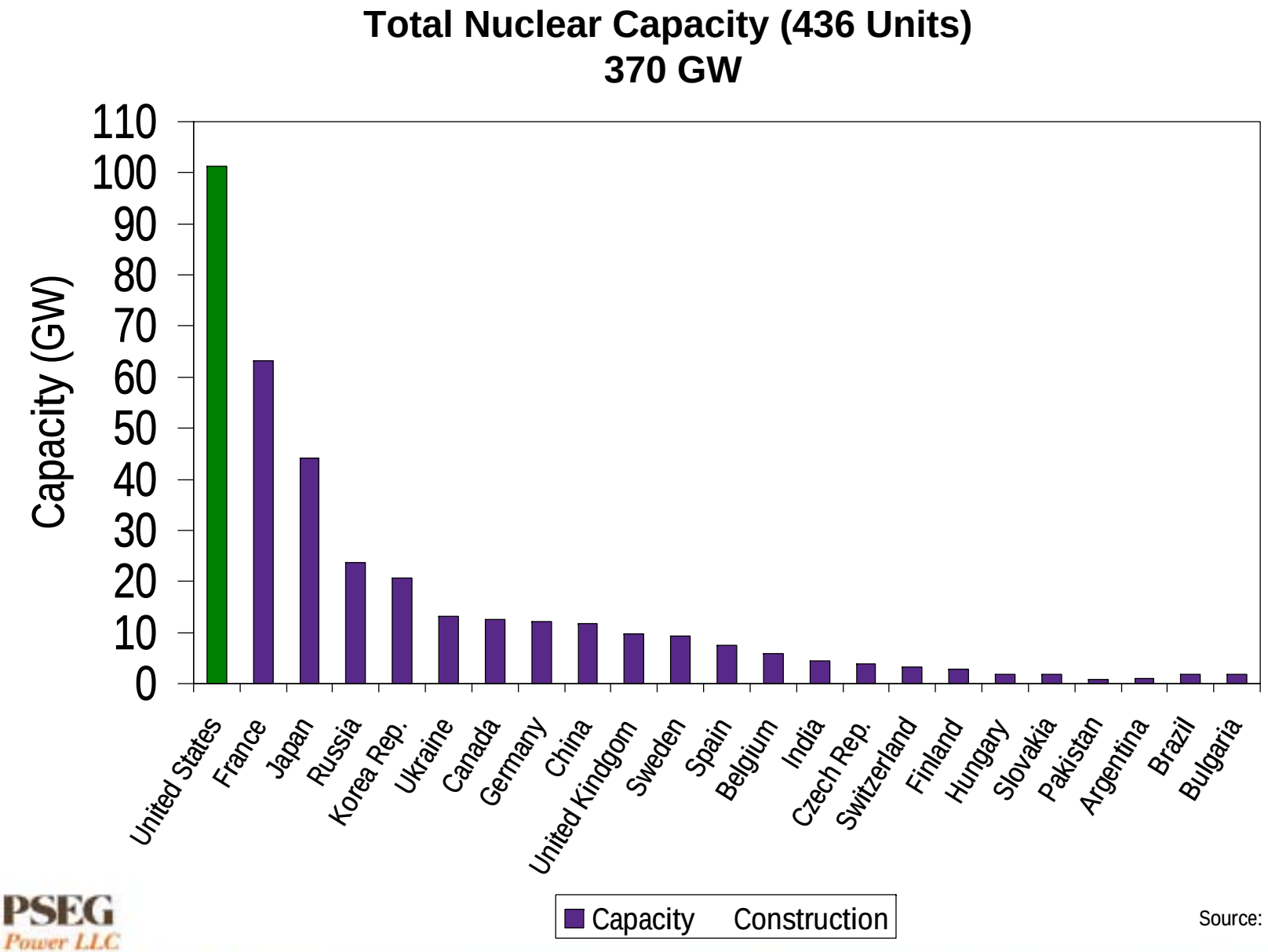
Source: IAEA
*Includes 4 AP1000

Worldwide Nuclear Capacity (Feb '12)



Source: IAEA

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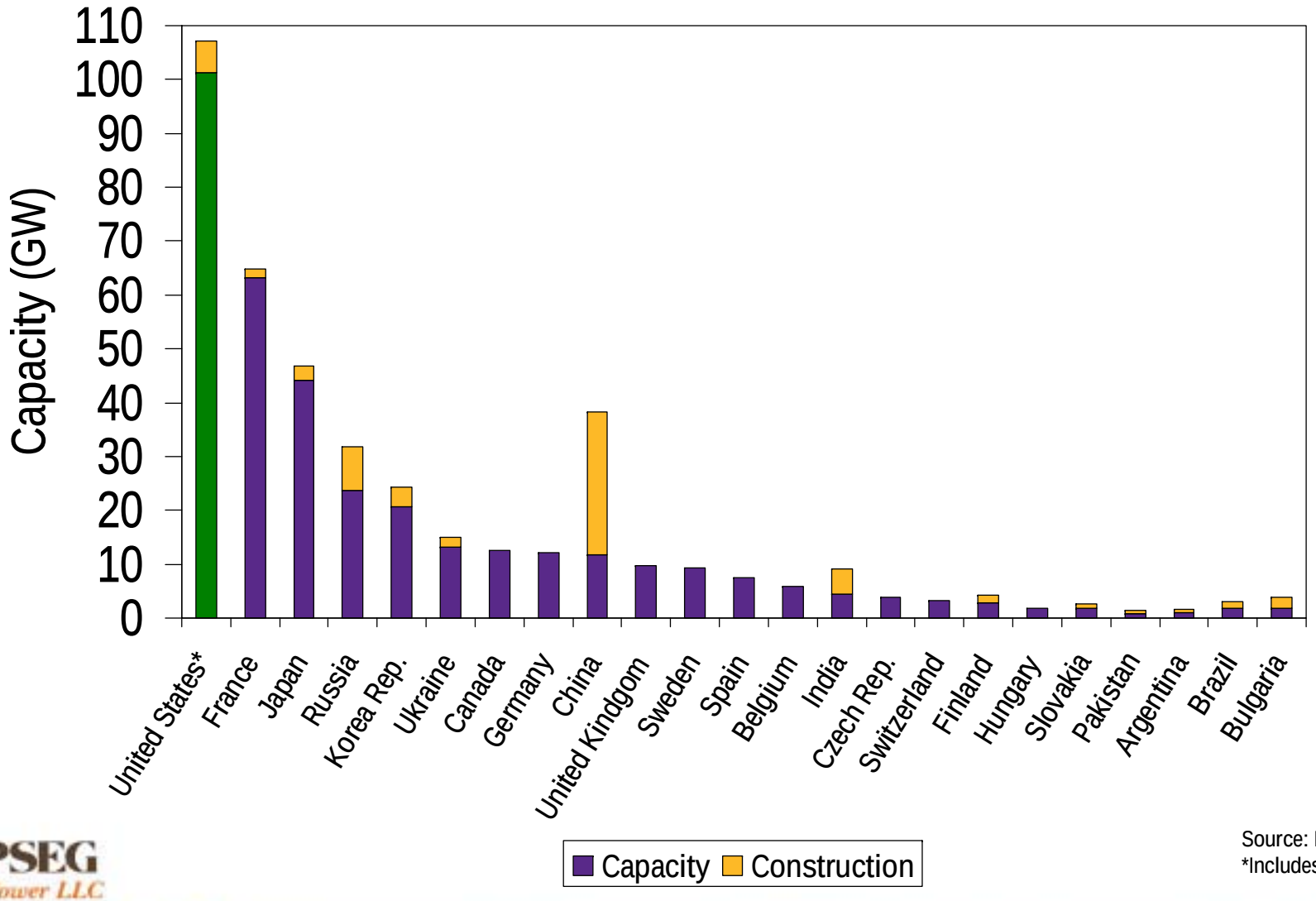
Worldwide Nuclear Capacity / Construction (Feb '12)

Total Nuclear Capacity (436 Units / 67 Construction)



Source: IAEA
*Includes 4 AP1000

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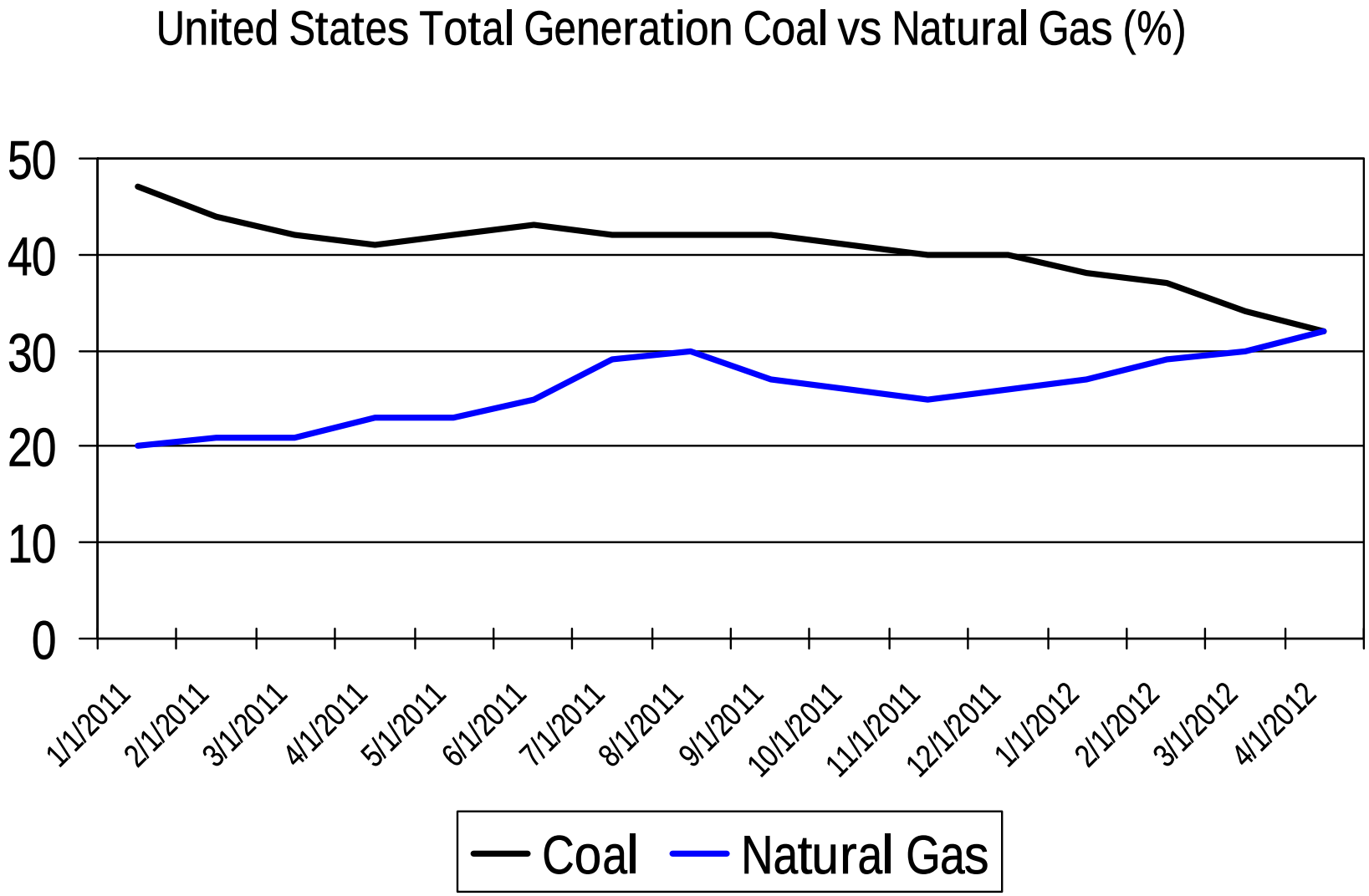
Changing United States Energy Picture



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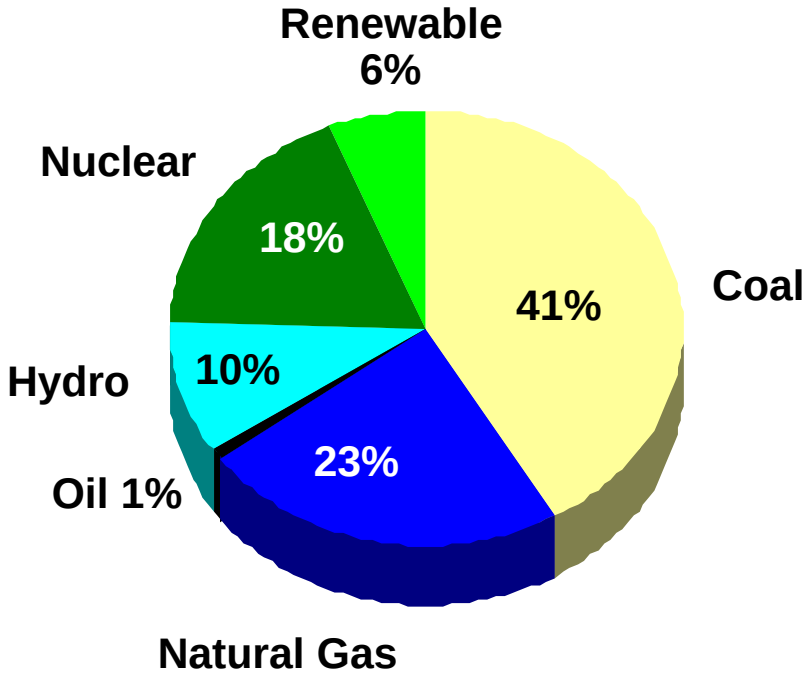
Changing United States Energy Picture

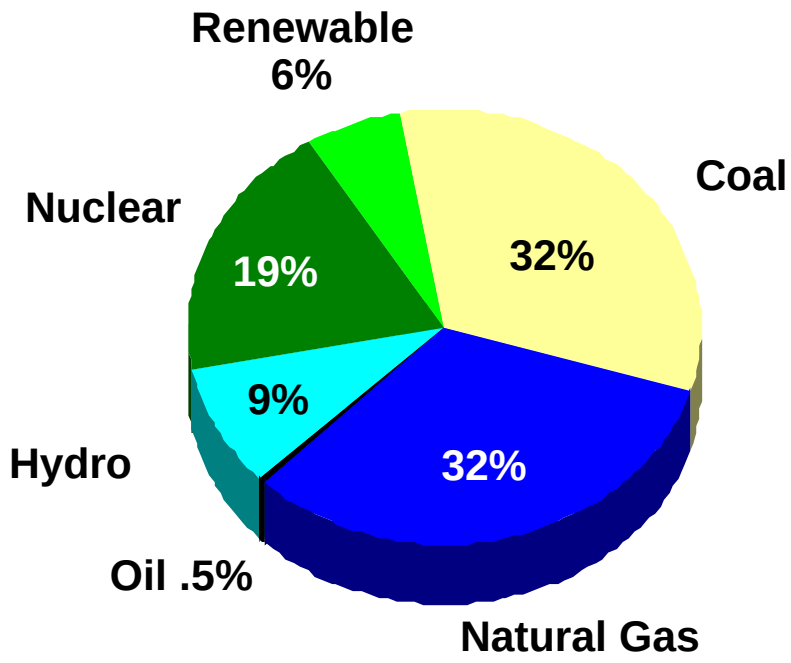
United States Electricity Produced – 4/2011

Total GWh: 302,994



United States Electricity Produced – 4/2012

Total GWh: 296,101



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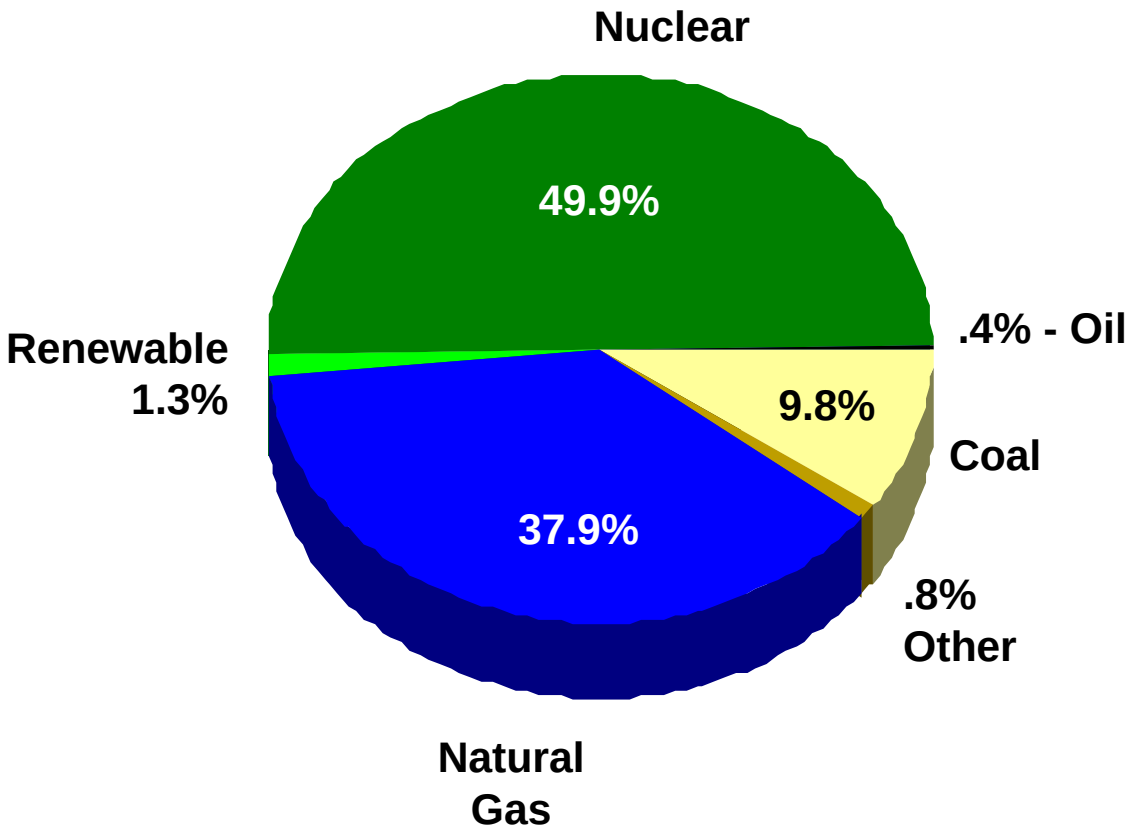
New Jersey Electricity Generation

Electricity Produced – 2010

Total GWh: 65,682



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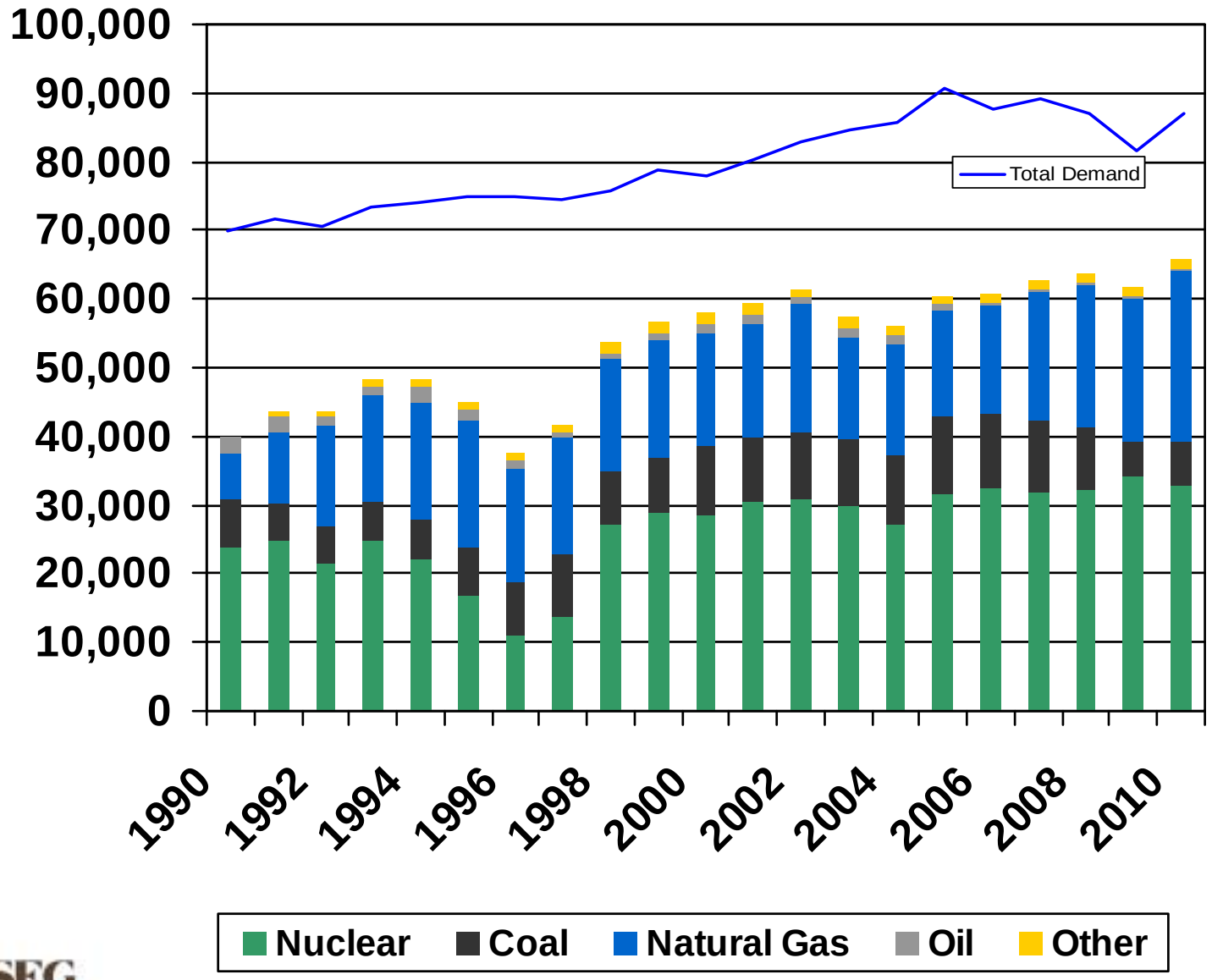
Total New Jersey Generation Output (GWh)



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PSEG Power Generation Portfolio

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PSEG Corporate Overview

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Traditional T&D

Electric Customers: **2.2M**
Gas Customers: **1.8M**

6,110 – Employees

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Regional Wholesale Energy

Nuclear Capacity: **3,661 MW**
Total Capacity: **13,060 MW**

Nuclear – 1,500
Fossil – 1,200
ER&T and Power Support – 110

Total – 2,810

PSEG Energy Holdings

PSEG Global

Domestic/Int'l Energy

20 – Employees

PSEG Resources

Leveraged Leases

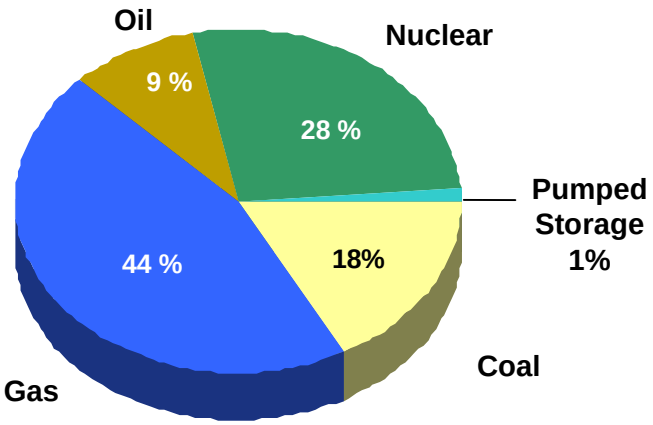
Services Company – 1,030 Employees

Total – 9,970

PSEG Power Portfolio

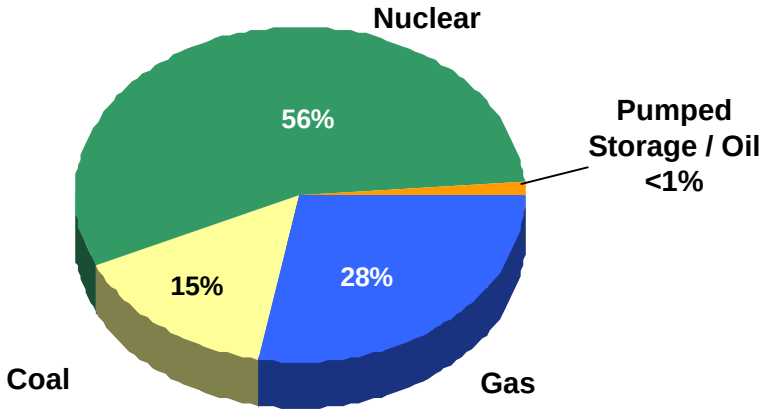
Fuel Diversity – 2011

Total MW: 13,060



Energy Produced – 2011

Total GWh: 53,980



- 4th largest generator in PJM
- Generating assets in four states – New Jersey / New York / Connecticut / Pennsylvania

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Salem and Hope Creek Nuclear Generating Stations

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PSEG Nuclear – Salem and Hope Creek

Second largest site in country

- Approximately 3,575 MWe
- Enough electricity for ~3 million homes

Each unit licensed for 60 years (license renewal completed)

- Salem Unit 1 (PWR, 1180* MW) – August 2036
- Salem Unit 2 (PWR, 1175* MW) – April 2040
- Hope Creek (BWR, 1219* MW) – April 2046

Each unit on an 18 month refueling cycle

- Spent fuel dry cask storage facility on property
- Enough space for 200 casks – all 3 units, 60 years

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*Mean Annual Net Rating

Fukushima Update

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Japan Nuclear Power Plants

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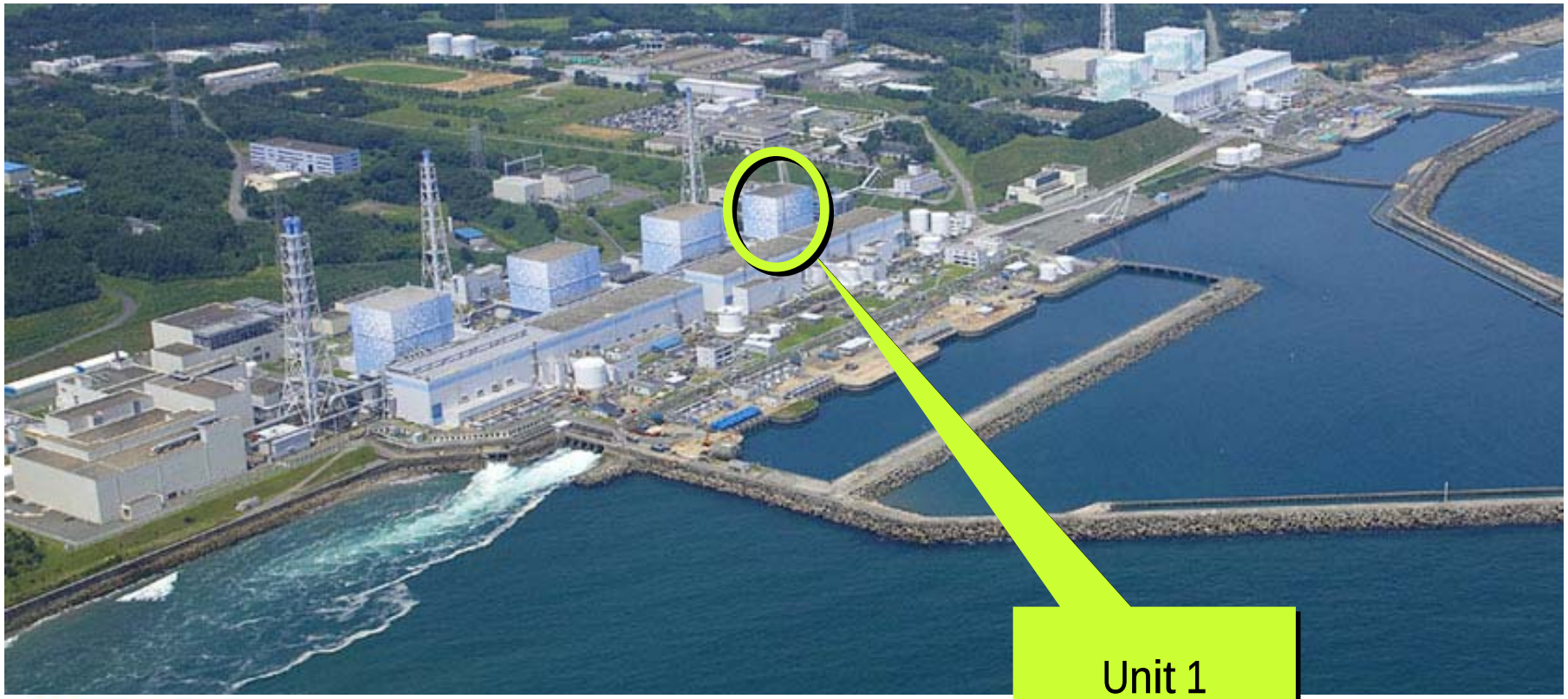
Fukushima Daiichi Nuclear Station

Six BWR units at the Fukushima Nuclear Station

- Units 1, 2, 3 in operation prior to event
- Units 4, 5, 6 in outage prior to event



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Design Criteria – Japan

Fukushima Daiichi Seismic

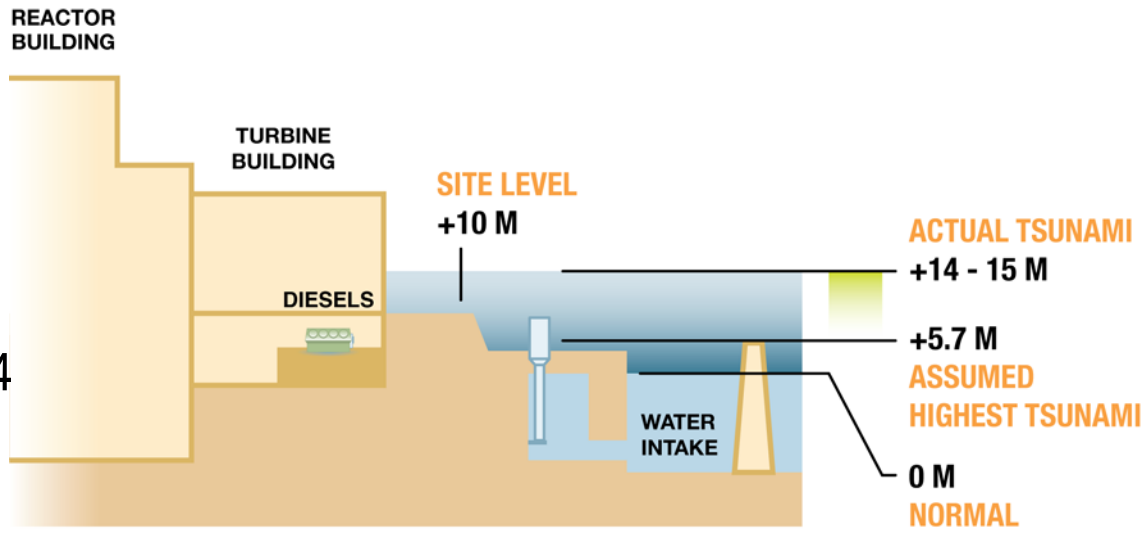
- .47g design (.53g actual)

Fukushima Daiichi Flood

- 5.7 m design (14 m actual)

Emergency power lost units 1 – 4

- Diesels not protected in water tight structures



Units 5, 6 maintained one air cooled diesel for emergency cooling

- Minimal safety impact at station

Daiini, Onagawa, Tokai safely shutdown

- Plants designed at higher elevations with onsite generators protected during flood / earthquake event
- Emergency onsite AC power remained available throughout event

Tsunami – 1 minute

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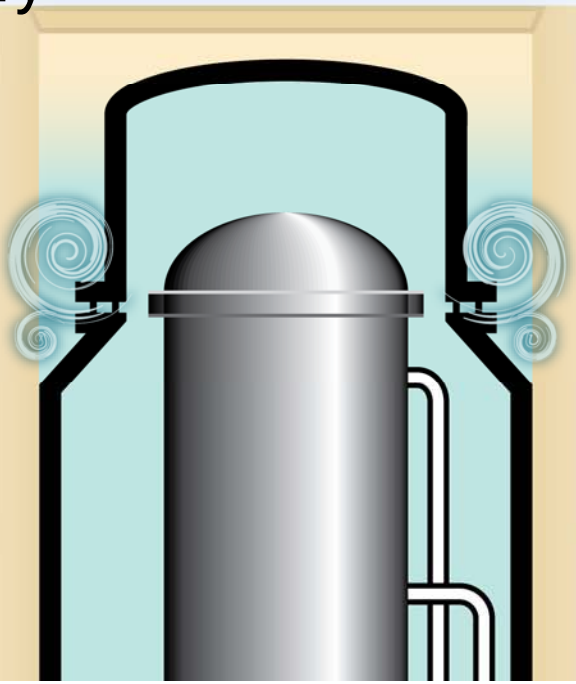
Post Accident Japanese Operator Actions

Command / control challenges

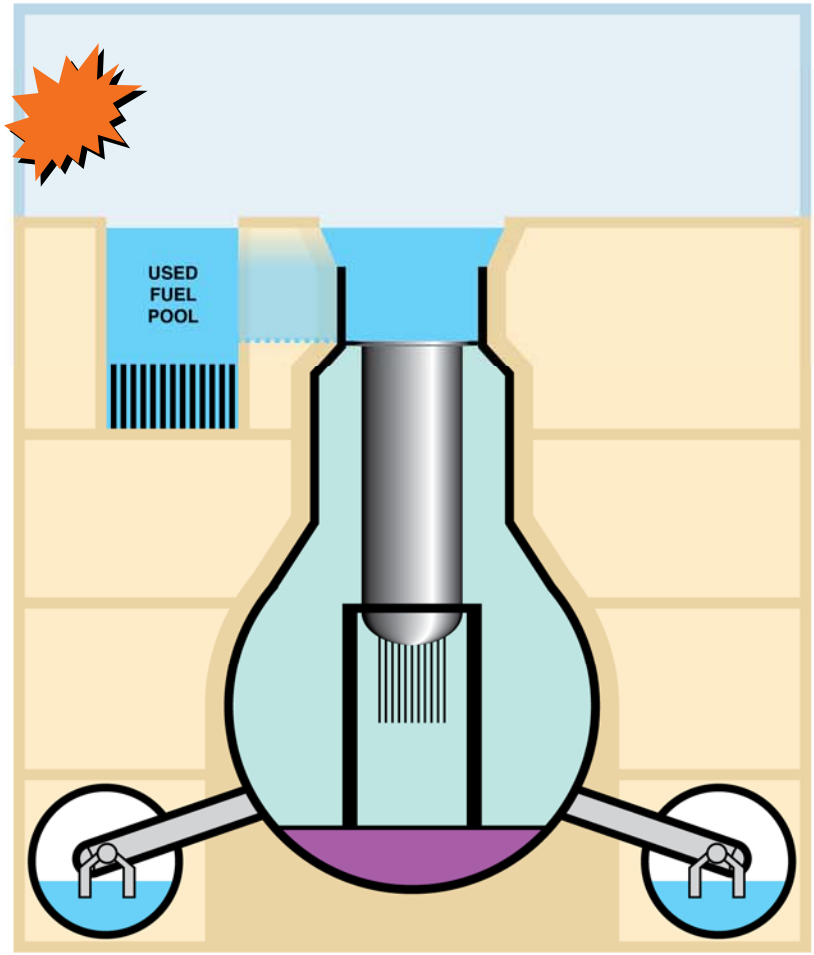
- Drywell pressure reaches 120 psi (~4x US operator threshold)
  - Design limited ability to vent containment
- Rapid cool down suspended on unit 1

Uncontrolled hydrogen release to secondary containment

- Containment possibly vented through drywell head / ventilation system
- Hydrogen detonation causes extensive damage to plant
- Unit 3 hydrogen release results in explosion in Unit 4 (shared ventilation)



Fukushima Unit 4 – Hydrogen explosion on refuel floor



Unit in maintenance outage

- Reactor head off – cavity flooded to level of fuel pool
- All fuel moved to spent fuel pool

Hydrogen explosion occurred in reactor building

- Assumed hydrogen formed from fuel damage in fuel pool
- Immediate questions regarding fuel pool level
- Actions taken to ‘recover’ fuel pool level

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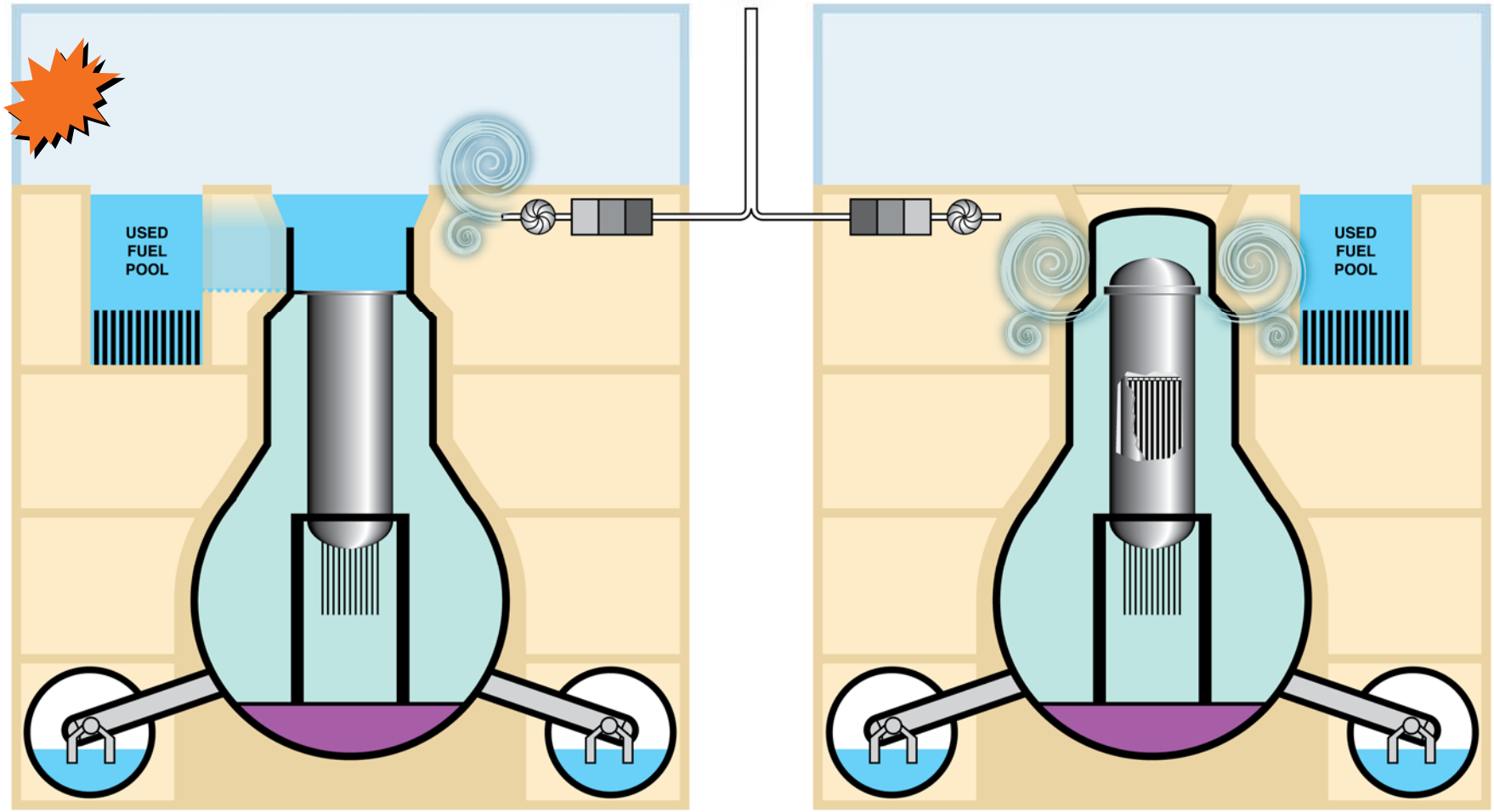
Hydrogen path from Fukushima Unit 3 to Unit 4

Shared ventilation results in Hydrogen explosion in Unit 4



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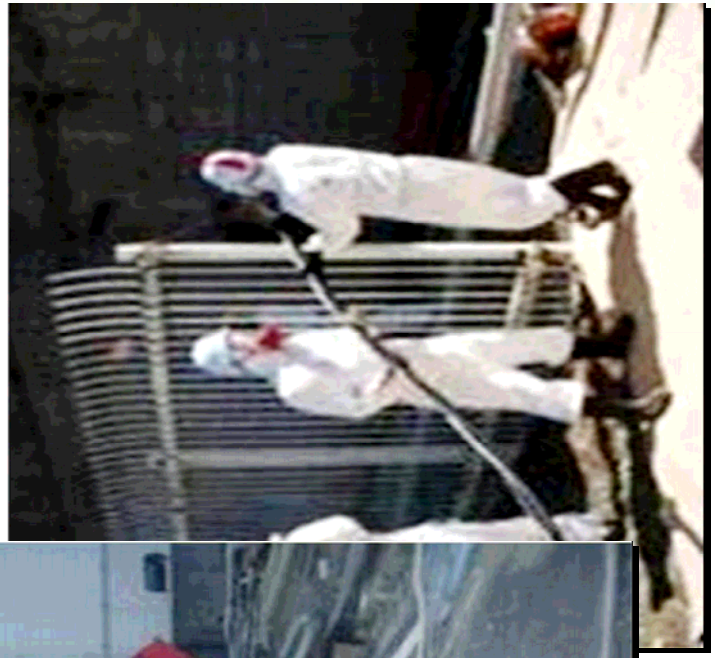
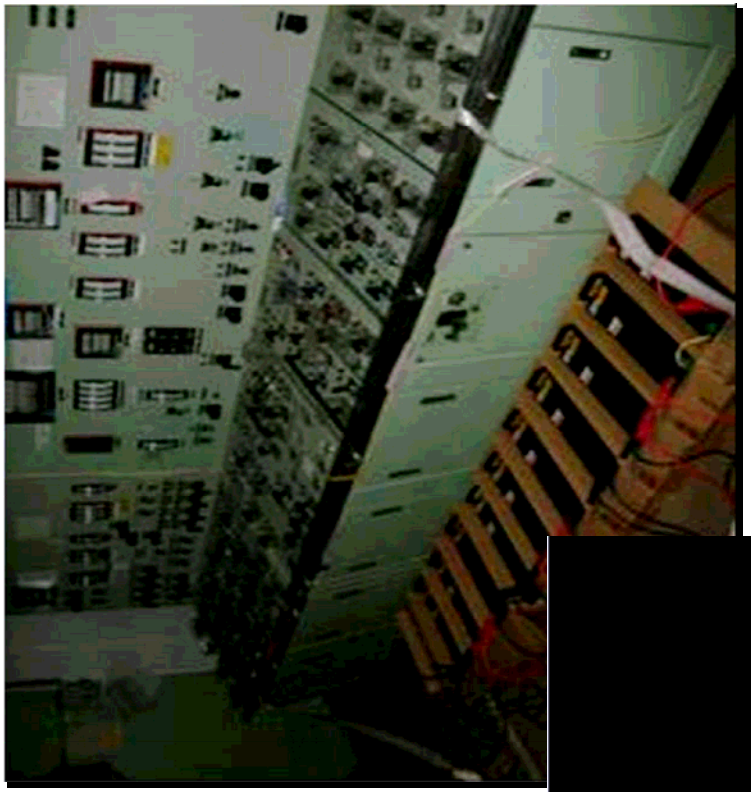
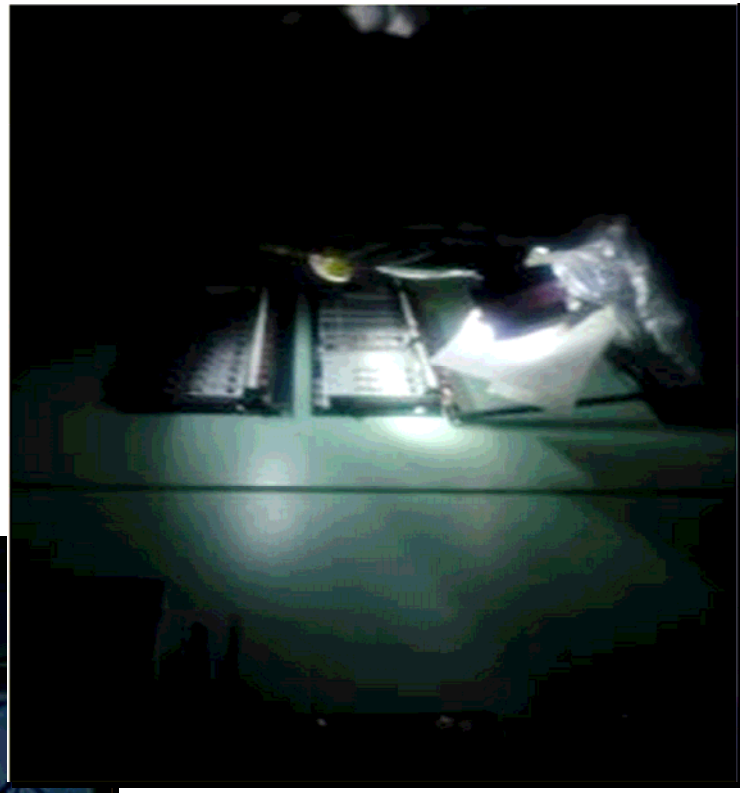
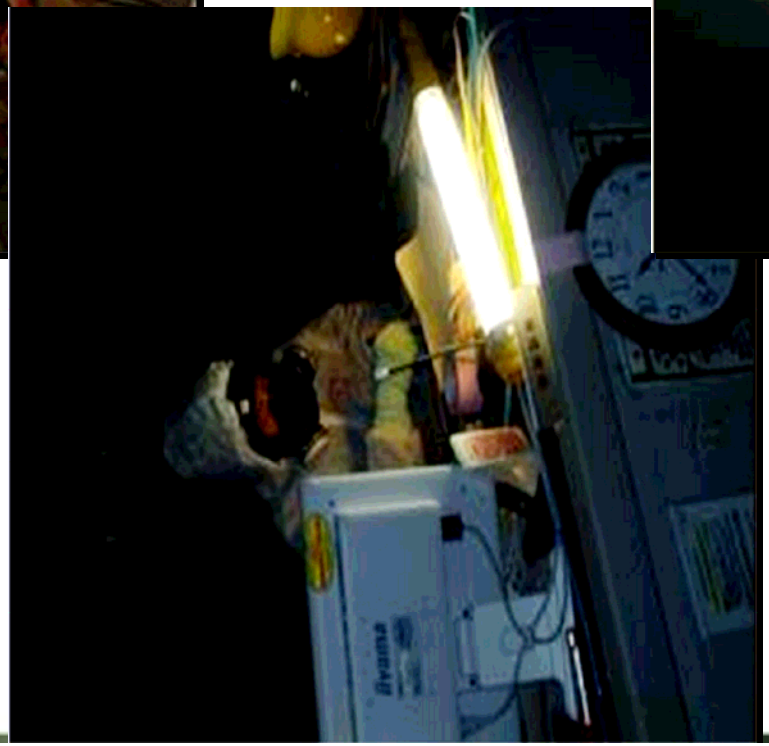
Site Damage Challenged Emergency Operations



Plant Conditions Challenged Emergency Operations







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Salem / Hope Creek Site Specific Information

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United States Design Improvements

Spare Diesel / Pump – 2002

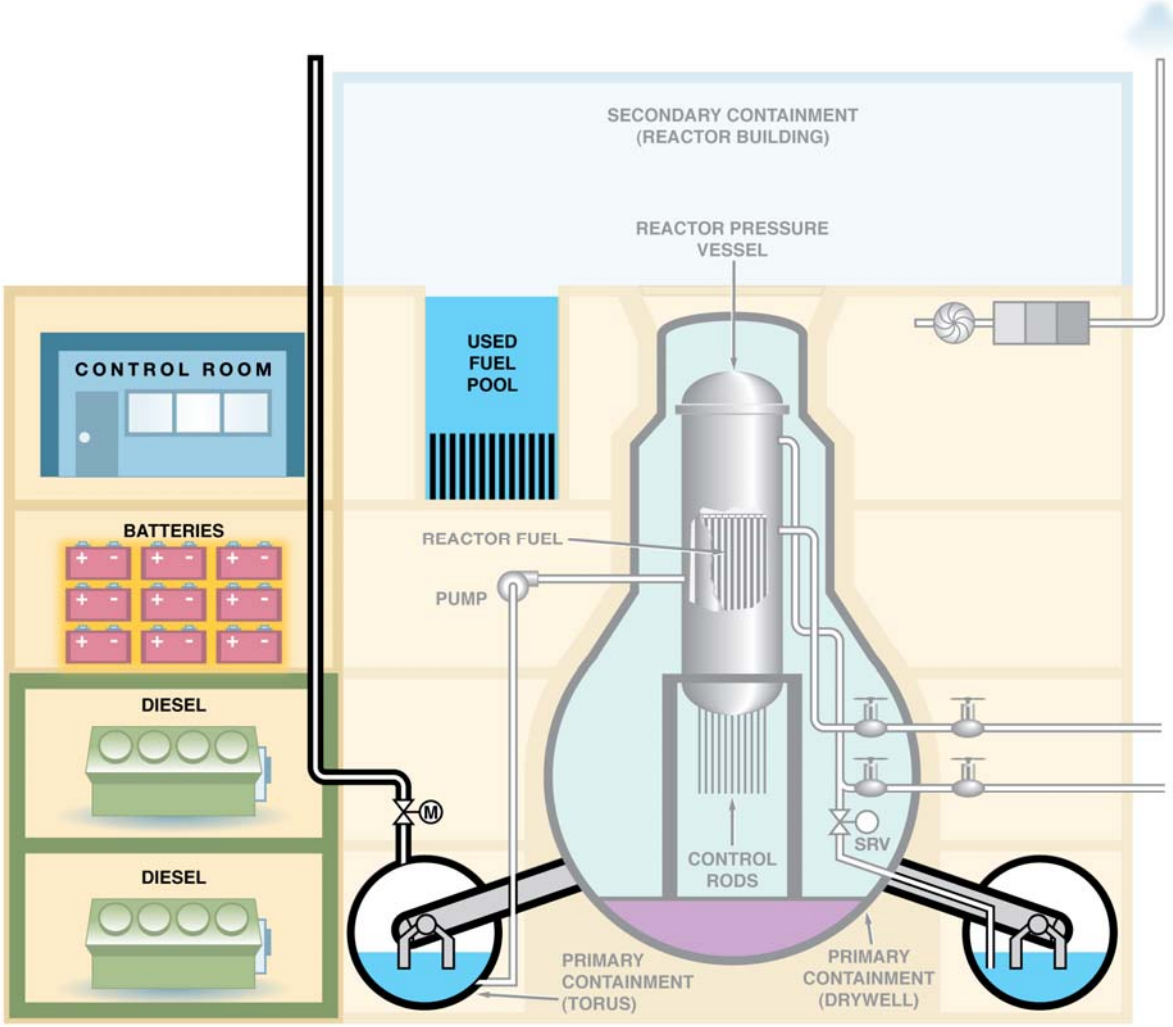
Station Black Out – 1988

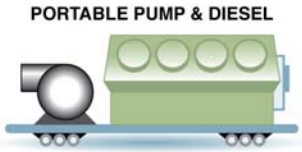
Containment Vent – 1989

Fire Protection – 1979

Strengthened Torus – 1980

Control Room TMI – 1980





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Salem – Hope Creek Seismic Design

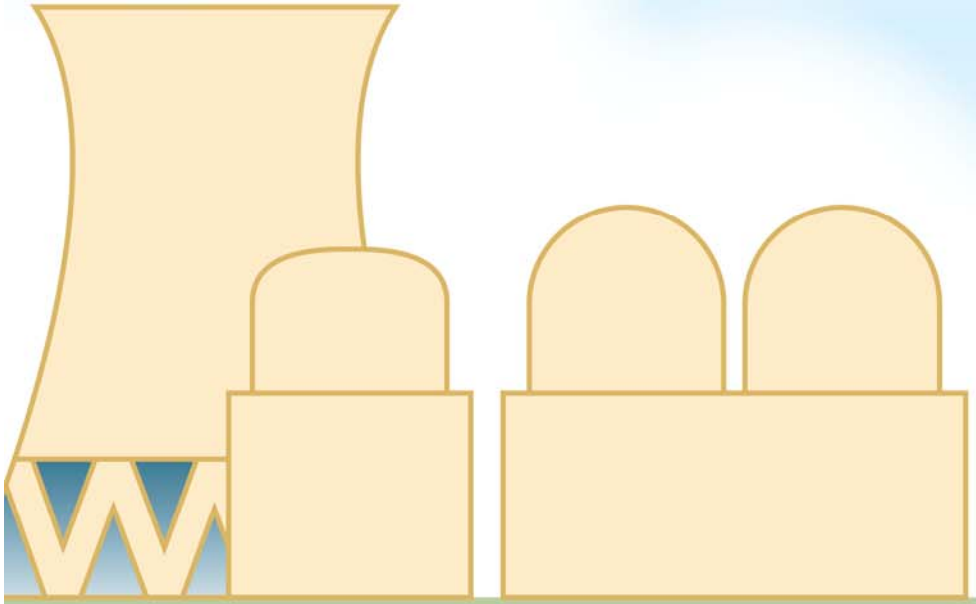
Seismic Design – .2 g (~6.5 Richter Scale)

- All structures, systems, and components important to plant safety will perform safety function to keep plant cool
- Re-evaluated during current License Renewal review

The largest earthquake in New Jersey occurred in 1783

- Magnitude 5.3
- Felt from New Hampshire to Pennsylvania

Salem/Hope Creek Flood Design



HOPE CREEK
134 FT - SERVICE WATER
132 FT - DIESEL INTAKE

SALEM
127 FT - SERVICE WATER
126 FT - DIESEL INTAKE

DESIGN BASIS
>120 FT

HIGHEST LEVEL
97.5 FT

SITE GRADE
100 FT

NORMAL
89 FT

NJ HURRICANES SINCE 1900

SEVERITY	SPEED (MPH)	OCCURANCES
Category 1	74 – 95 MPH	1
Category 2	96 – 110 MPH	0
Category 3	111 – 130 MPH	0
Category 4	131 – 155 MPH	0
Category 5	> 155 MPH	0

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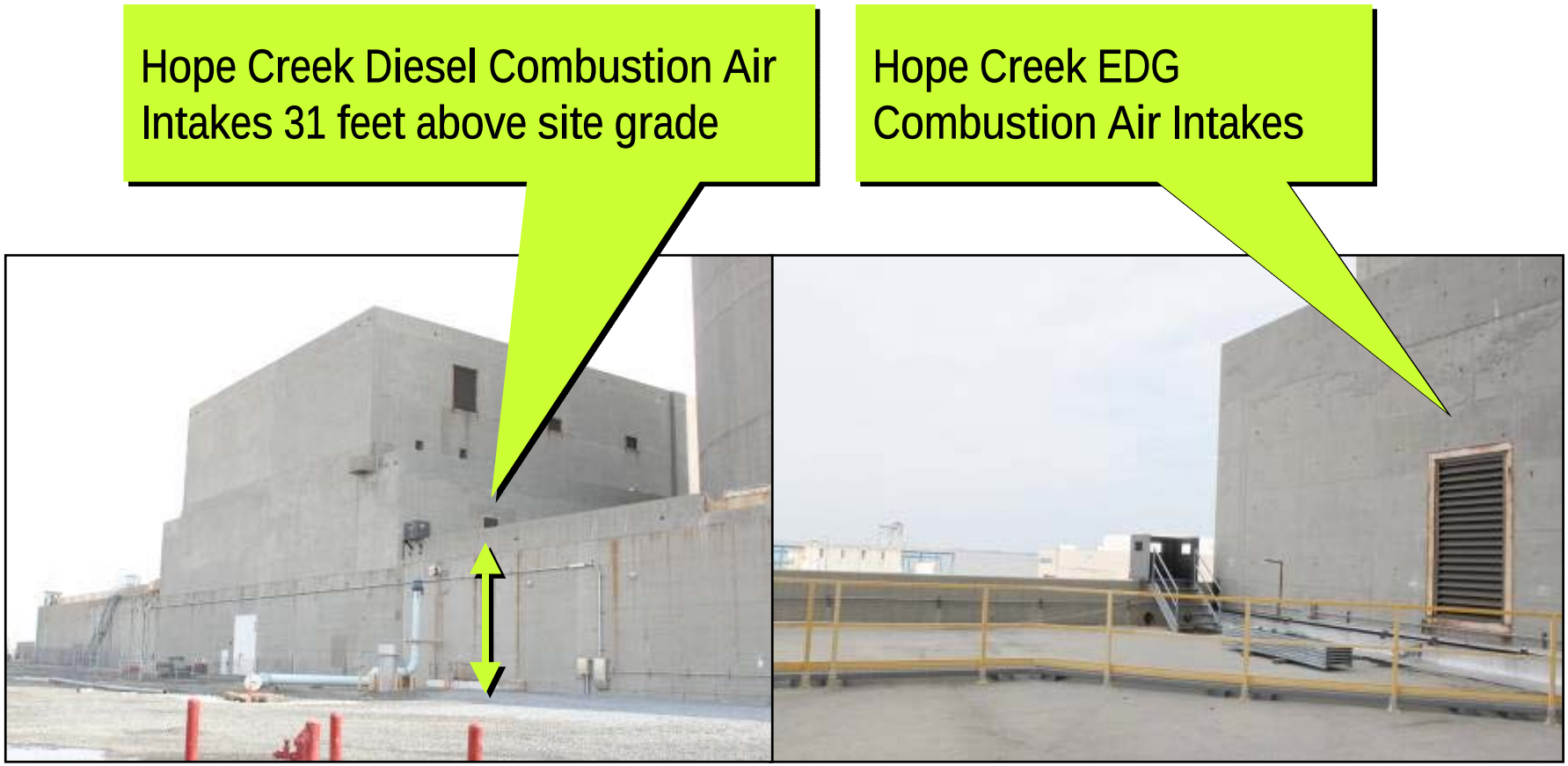
Hope Creek EDG Flood Protection Design

Hope Creek 4 Dedicated Emergency Diesel Generators protected from flooding up to 31 feet above site grade



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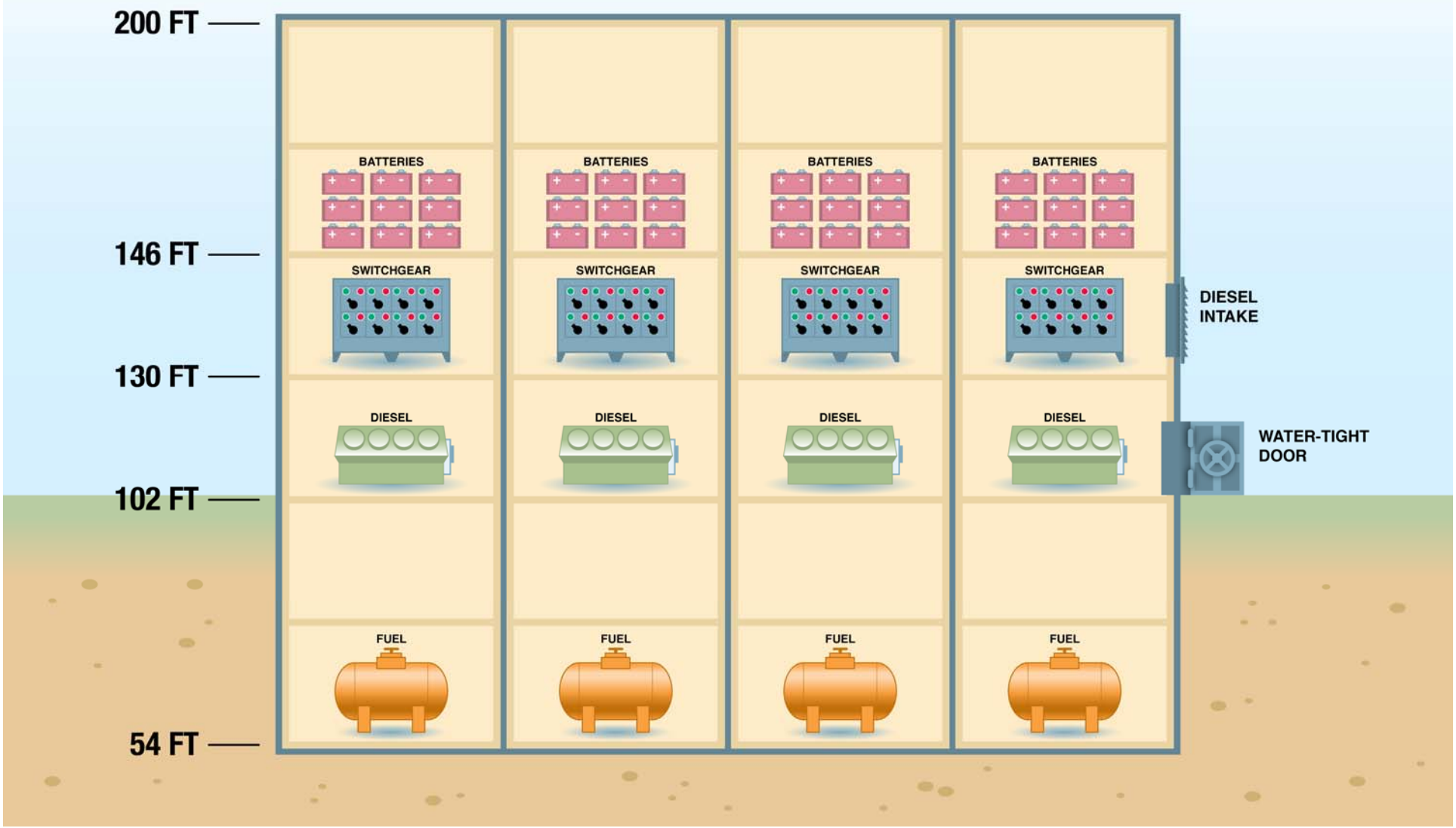
Auxiliary Building – Emergency Electrical Power



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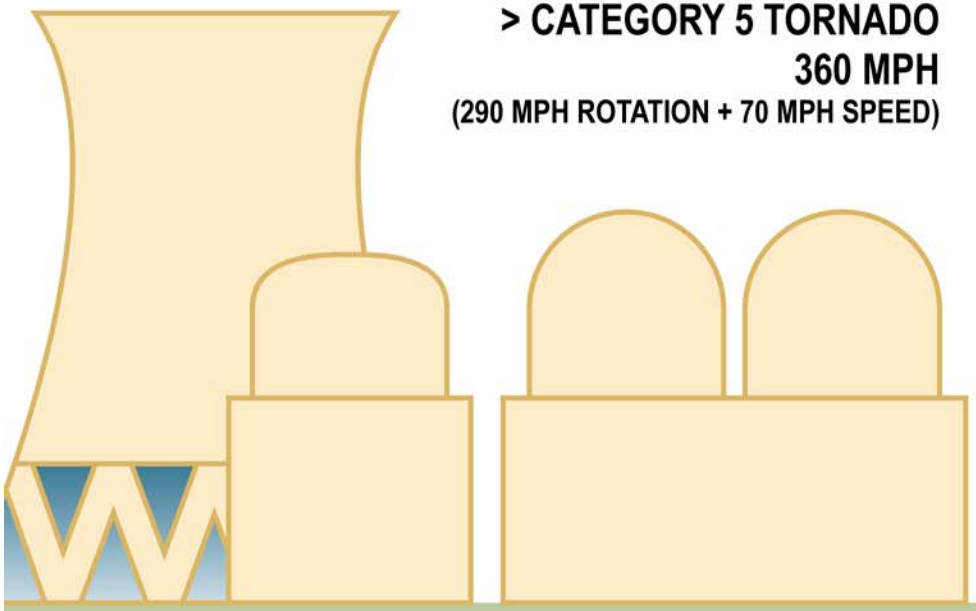
Salem and Hope Creek Tornado Design

DESIGNED TO WITHSTAND
> CATEGORY 5 TORNADO
360 MPH
(290 MPH ROTATION + 70 MPH SPEED)



NEW JERSEY TORNADO HISTORY

F-SCALE	SPEED (MPH)	OCCURANCES
F0	40 – 72	50
F1	73 – 112	62
F2	113 – 157	30
F3	158 – 206	4
F4	207 – 260	0
F5	261 – 318	0

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NRC Near-Term Actions

Assess flooding mitigation and validate results against plant's criteria to protect against worst case flooding

Assess protection against earthquakes and verify structures and components meet NRC criteria and are able to mitigate severe accidents initiated by external events

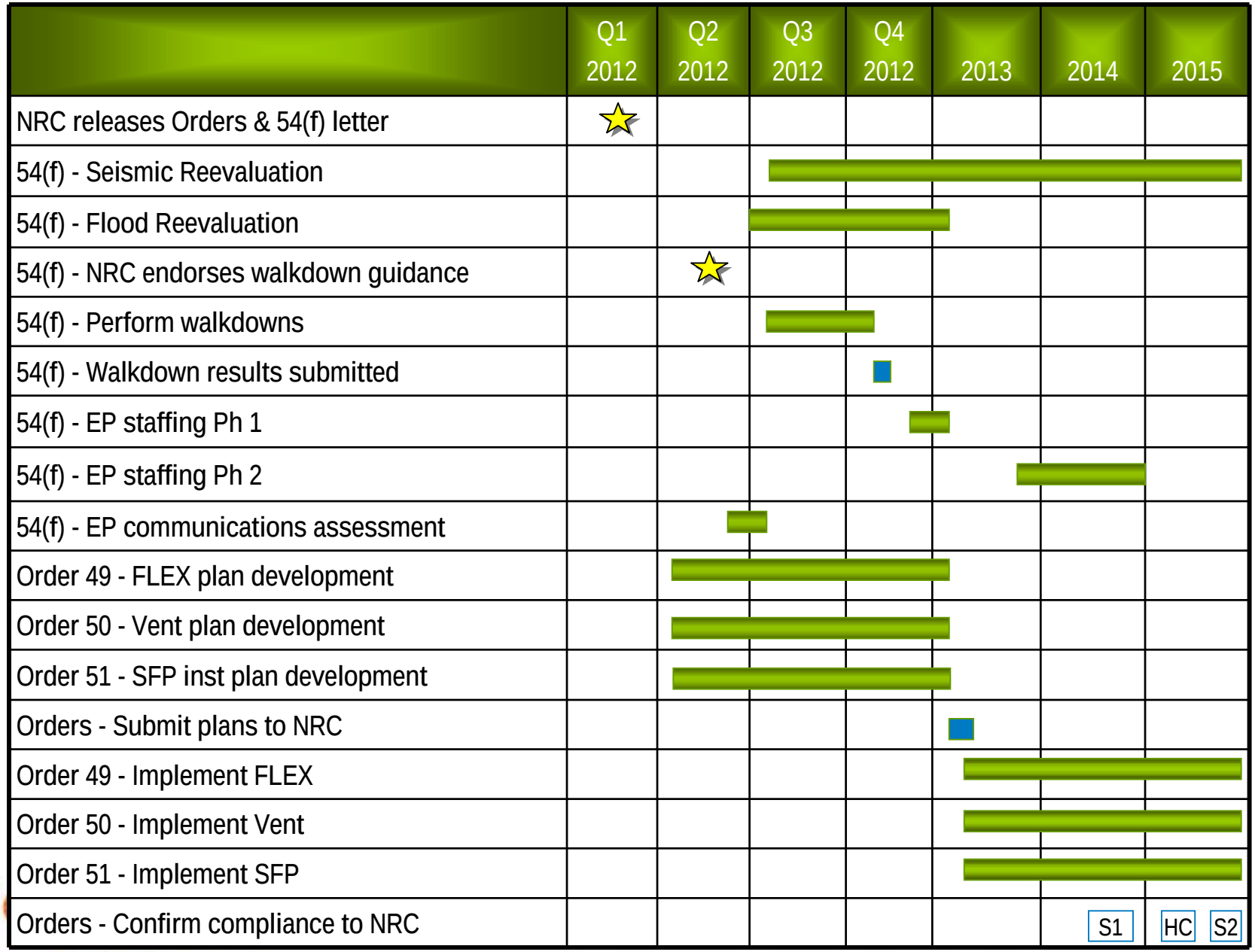
Purchase additional equipment to protect nuclear facilities from natural hazards affecting more than one reactor at a site

Review procedures for hardened vents designs in Mark I and applicable Mark II boiling water reactors and ensure operation during loss of AC power event

Evaluate instrumentation and equipment needed to monitor spent fuel pools

Validate each site's capability to implement emergency operating procedures and guidelines to manage severe accidents

Fukushima Response



New Nuclear Development

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United States Nuclear Development activities

Renewed Construction (old licensing process)

- Watts Bar (Tennessee) Unit 2 refurbishment underway
  - Expect commercial operation in 2Q 2013
- Bellefonte Unit 1 (Alabama) refurbishment approved August 8/18
  - Expect commercial operation in 2020

New Nuclear Construction (new process)

- Construction of AP1000 reactors in South Carolina and Georgia continues
- Vogtle and VC Summer construction licenses approved
- More than $2.5 B spent to date
- Approximately 2500 people working today

Vogtle Construction

Aerial photograph of Vogtle 3 and 4 construction site. Unit 3 is located at left and top of photo and Unit 4 to the right and bottom. Heavy lift derrick crane foundation in center. August 11, 2011

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Vogtle Nuclear Island Basemat

Vogtle Unit 3 "nuclear island," with water proofing work in progress; location where containment vessel and associated nuclear components will be placed.
August 11, 2011

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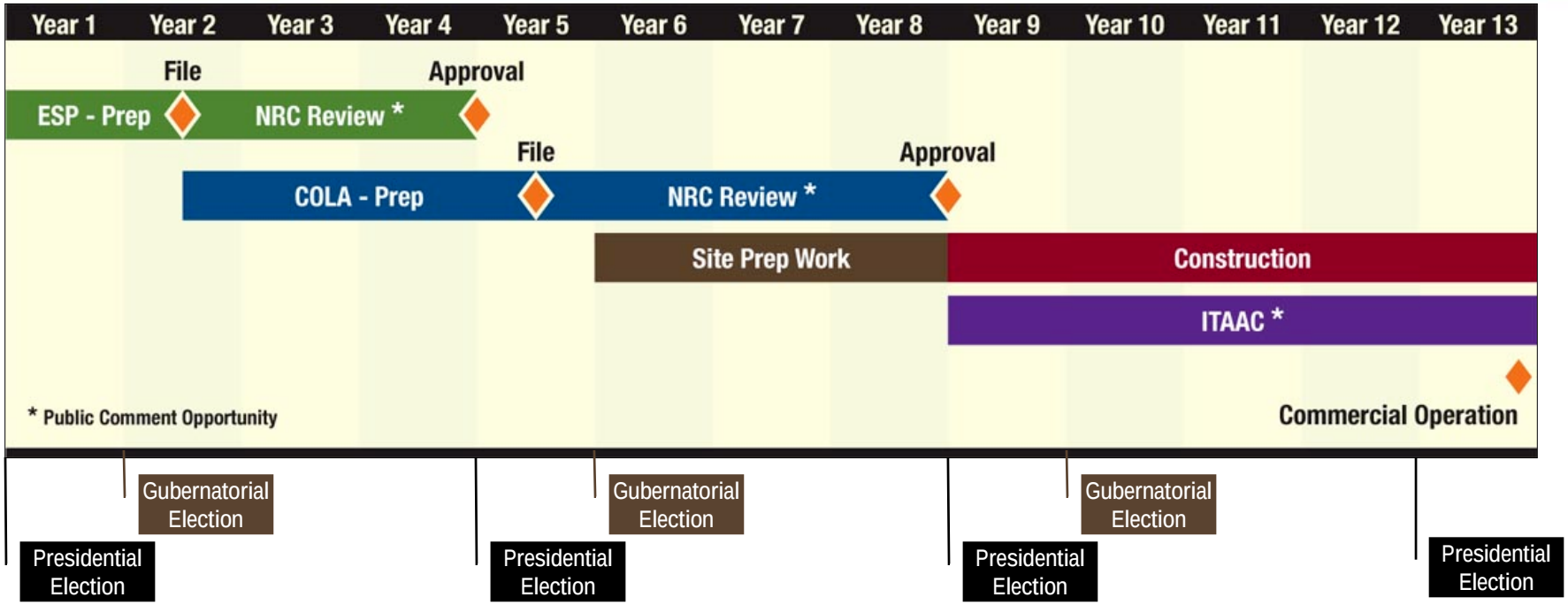
Generic Nuclear Development Timeline



Five technologies available in United States

- 2 Design Certifications issued
- 3 Design Certification Applications under review

2,500 – 4,000 construction jobs; 400 – 700 permanent jobs

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New Nuclear Development at PSEG

PSEG Power submitted Early Site Permit application in May

- PSEG Board authorized $100 M for ESP / COLA development
- ESP developed including four plant technologies

The ESP route is logical next step for PSEG

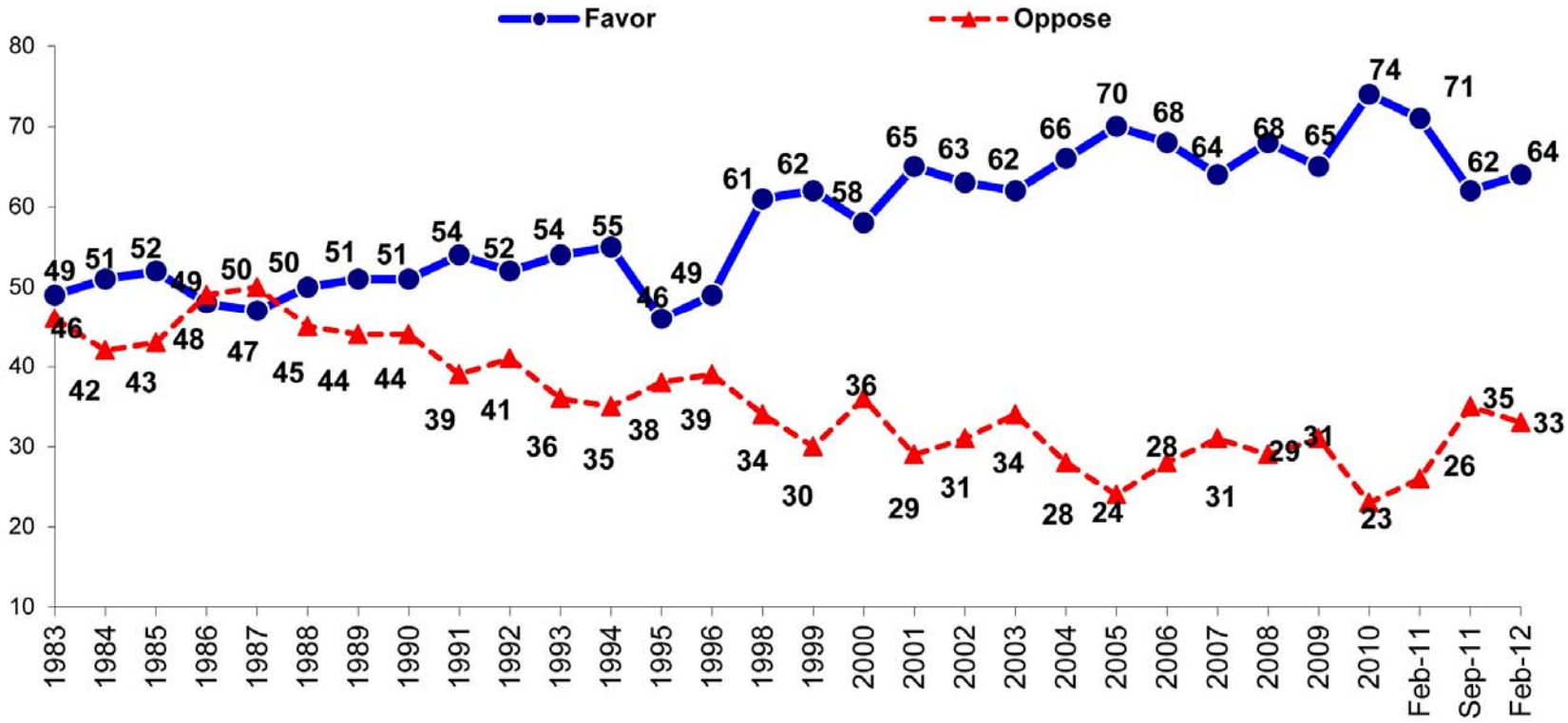
- Starts the application process while deciding on reactor technology
- Engages local public, political, regulatory and environmental stakeholders early in the process

Significant local and state stakeholder support

- Energy and Environmental Resource Center developed after benchmarking trips

Public Perception

Do you strongly favor, somewhat favor, somewhat oppose or strongly oppose the use of nuclear energy?



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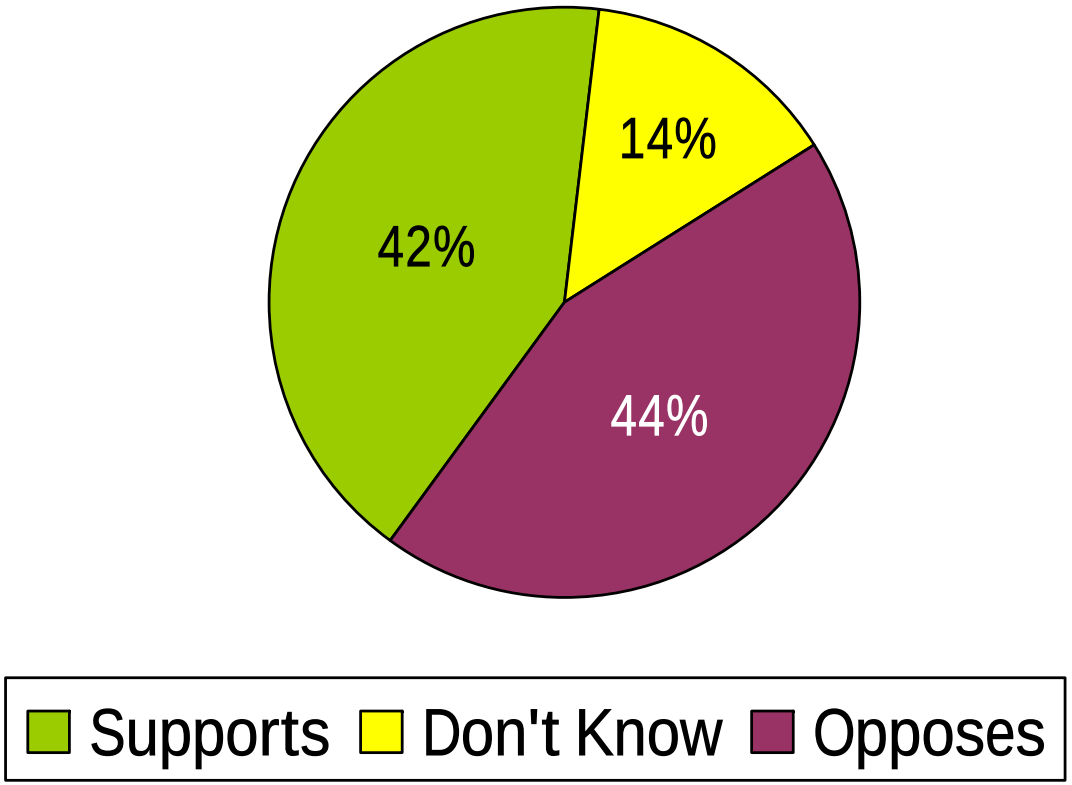
Perceptions of Public Opinion

Does the American Public generally support or oppose building more nuclear power plants?



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Resources

International Atomic Energy Association (IAEA)

Nuclear Regulatory Commission (NRC)

Energy Information Administration (EIA)

Department of Energy (DOE)

Federal Emergency Management Agency (FEMA)

Nuclear Energy Institute (NEI)

World Nuclear Association (WNA)