




# **Advanced Nuclear Technology (ANT) Program**

## **New Nuclear Technologies**

Jeff Hamel

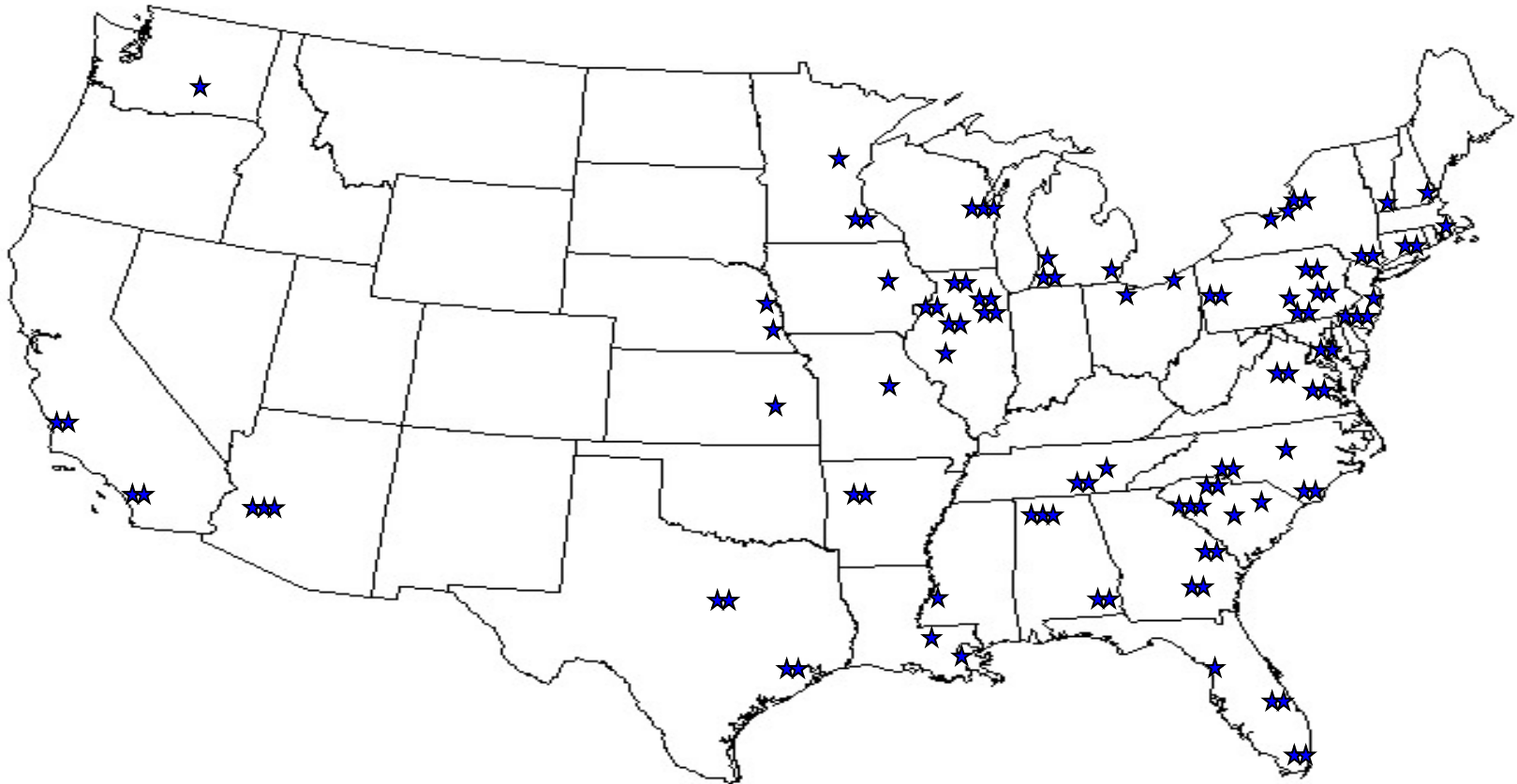
May 17, 2012

# Why Nuclear...Why *New* Nuclear?

- 
- Proven Performance
  - Competitive Economics
    - Today and Long-Term
  - Zero-Emission

## Current U.S. Nuclear Plants

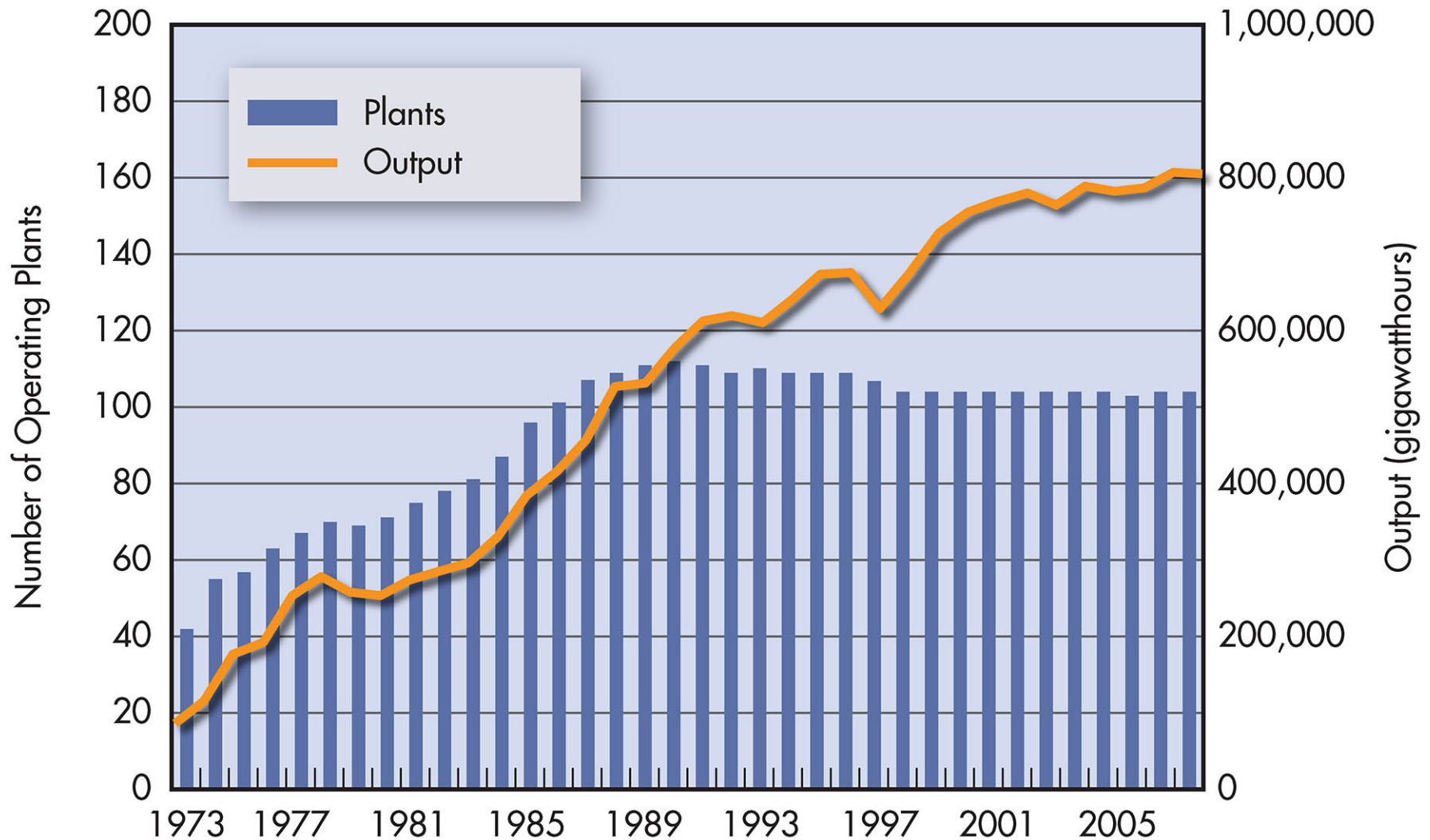
*104 Plants in 31 States*



*Source: Nuclear Energy Institute*

# 30 Years of U.S. Nuclear Industry Efficiency Gains

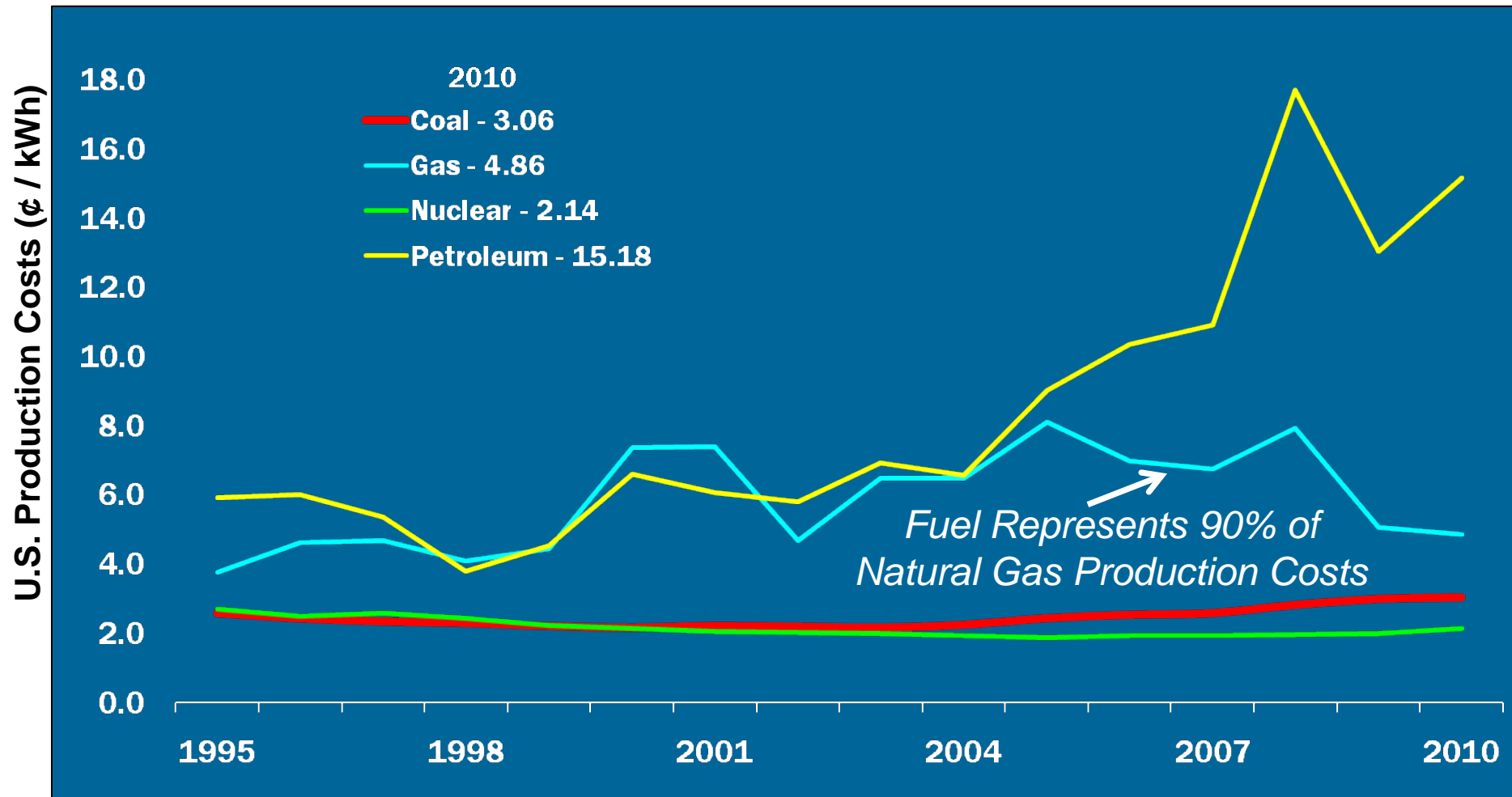
## *Equivalent to Adding 27 New Nuclear Plants*



Sources: Nuclear Energy Institute & Energy Information Administration

# Economic Performance Is Solid

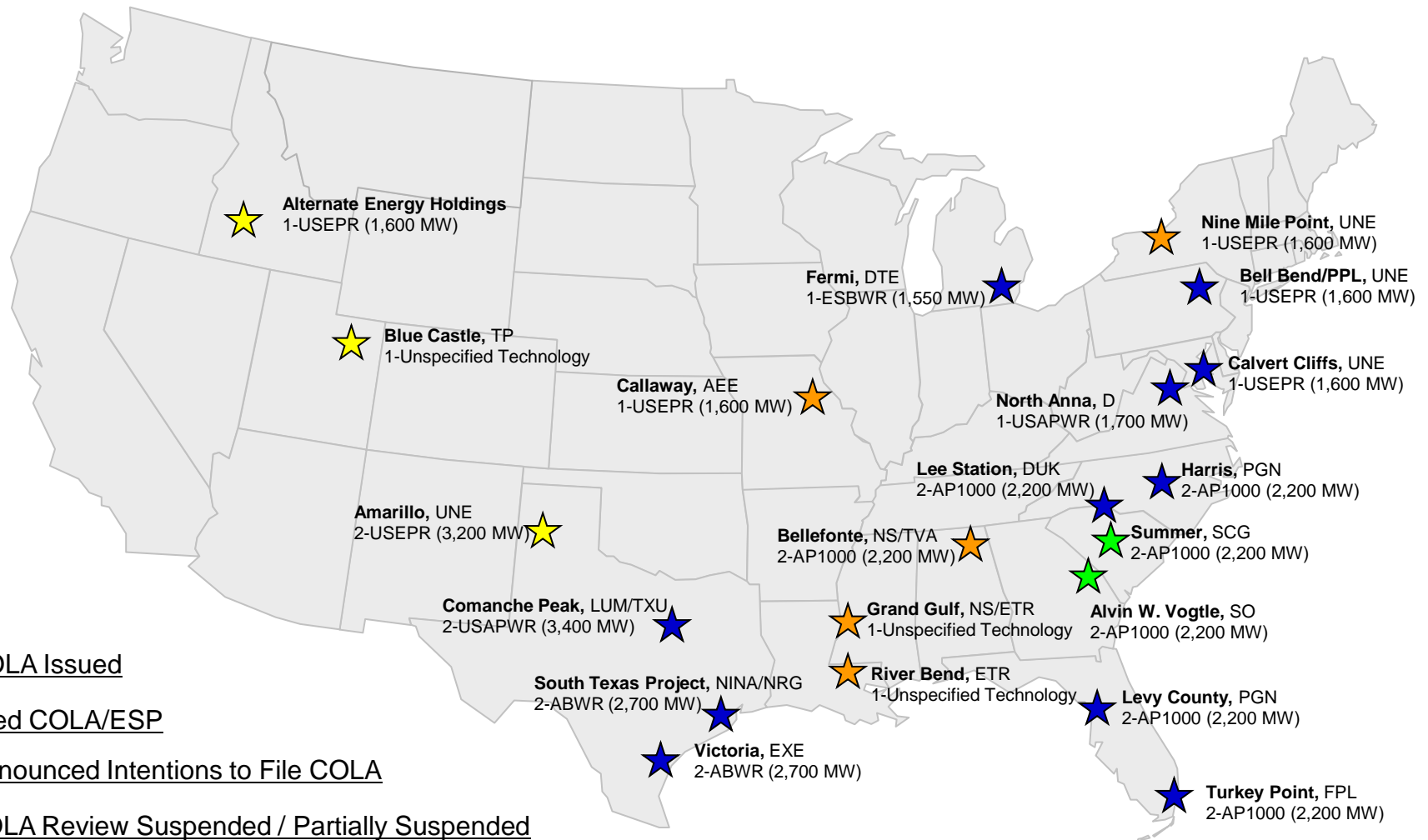
*Fuel Represents 30% of Nuclear's Production Costs*



Source: Nuclear Energy Institute

# Status of New Nuclear Plants In The United States and Worldwide

# New Nuclear Plants Under Consideration in U.S.



Source: NRC Expected New Nuclear Power Plant Applications (October 2011) / U.S DOE Nuclear Power Deployment Scorecard

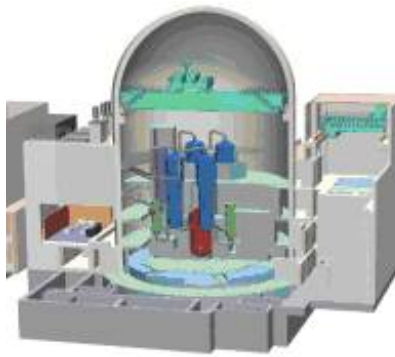
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# Advanced Light Water Reactor Designs



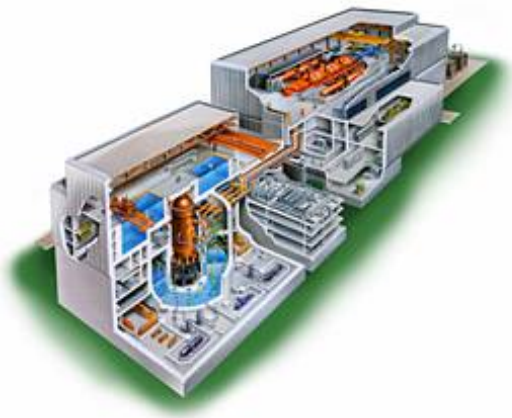
\*Westinghouse  
AP1000 (1115 MWe)



MHI APWR (1700 MWe)



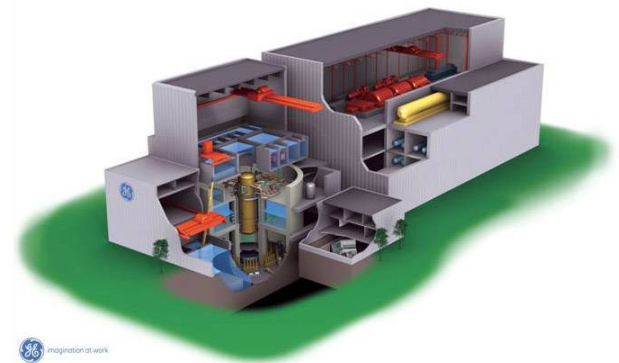
AREVA US EPR (1600 MWe)



\*ABWR (1371 MWe)



KEPCO APR-1400 (1400 MWe)



GEH ESBWR (1535 MWe)

\* **Design Certified**



# Work Started at Vogtle Site in Georgia

*ESP and LWA Received in August 2009; COL Approved February 2012*



Aerial view of Vogtle 3 and 4 construction site – Unit 3 on left, Unit 4 on right

March 29, 2012

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Photos Courtesy of Southern Nuclear

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# Work Started at VC Summer Site in S.C.

*COL Approved March 2012*



Source: SCANA



# New Nuclear Projects Under Construction Today

*435 currently in operation; 66 under construction*



Source: World Nuclear Association – April 2012

\*Watts Bar 2, Summer 2,3 & Vogtle 3,4

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# Sanmen in China - October, 2011



Source: Shaw Group



# Flamanville 3 in France – December, 2011



© EDF Médiathèque- Alexis Morin

Source: EDF

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# Angra 3 in Brazil – December, 2011



Source: Christyam de Lima

# New Nuclear Projects Planned Today

COUNTRY	REACTORS PLANNED
China	51
Russia	17
India	16
USA	11

COUNTRY	REACTORS PLANNED
Belarus	2
Czech Republic	2
Indonesia	2
Iran	2

PLUS – 329 Proposed Reactors

UAE	4
United Kingdom	4
Vietnam	4
Canada	3
Bangladesh	2
Argentina	2

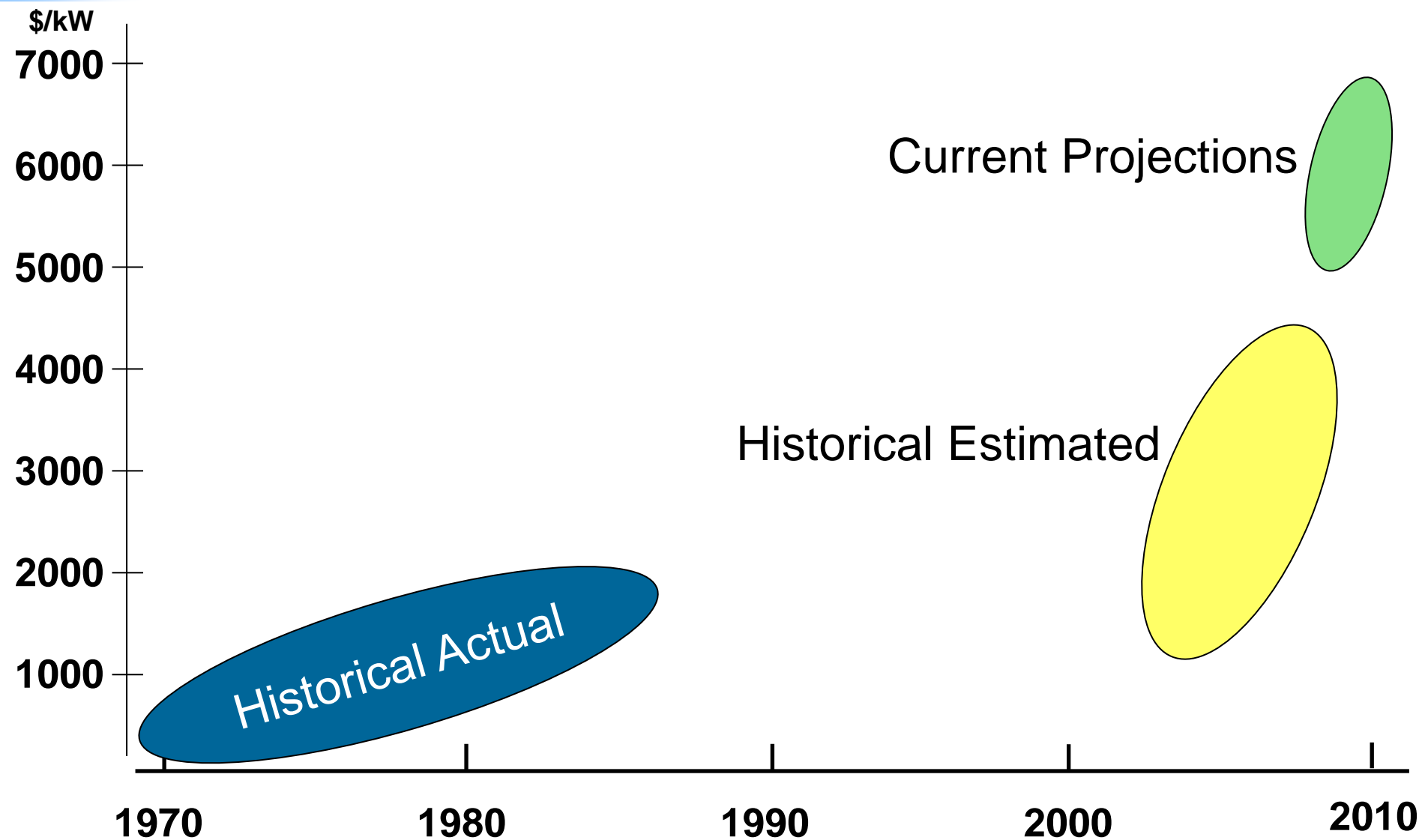
Armenia	1
Egypt	1
France	1
Jordan	1
Lithuania	1
	160



# The Biggest Challenge With New Nuclear



# Confidence in Cost Projections?



# Balance Sheet Risk – Average 2 Unit Site - \$14B

Utility	Country	Market Cap
E.ON	Germany	63B
EdF	France	55B
Duke	US	23B
Exelon	US	27B
Southern	US	32B
PG&E	US	16B
Progress	US	13B
DTE	US	7B
Constellation	US	7B
<i>Apple (computers)</i>	<i>US</i>	<i>500B</i>
<i>Exxon (oil)</i>	<i>US</i>	<i>380B</i>

# Possible Solutions

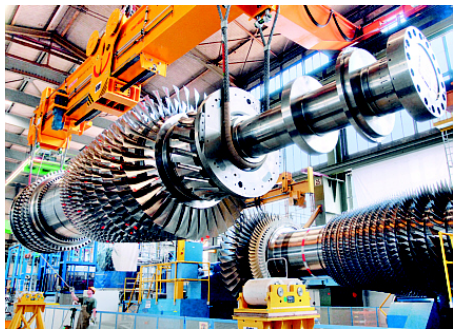
1.



Duke + Progress = 36B

Exelon + Constellation = 34B

2.



Smaller Generation

- Natural Gas Combined Cycle
- Small Modular Nuclear?

# The SMR Future – 2012-2019

DOE Program  
Starting in FY12



FOAKE / Design Certification  
2012-2014



Requirements Development  
2012-2014



First Deployment?  
2012-2019



# A Variety Of Variables In Play...





# Together...Shaping the Future of Electricity



**EPRI**

ELECTRIC POWER  
RESEARCH INSTITUTE