

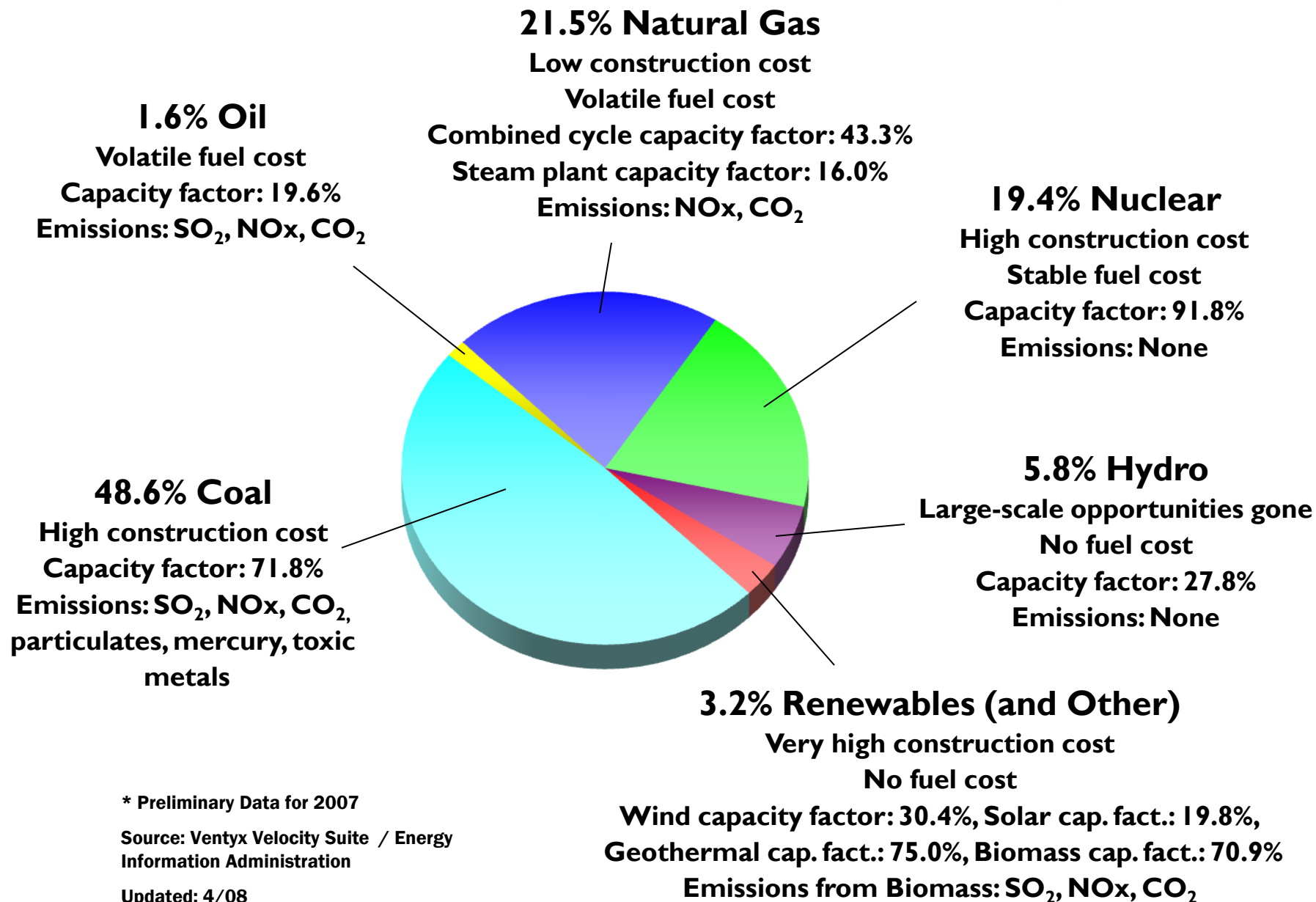
# **THE FUTURE OF NUCLEAR POWER IN THE UNITED STATES**

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# Outline

- Factors affecting domestic interest in nuclear power
- Challenges that must be overcome
- The international dimension

# Sources of U.S. Electricity 2007\*



\* Preliminary Data for 2007

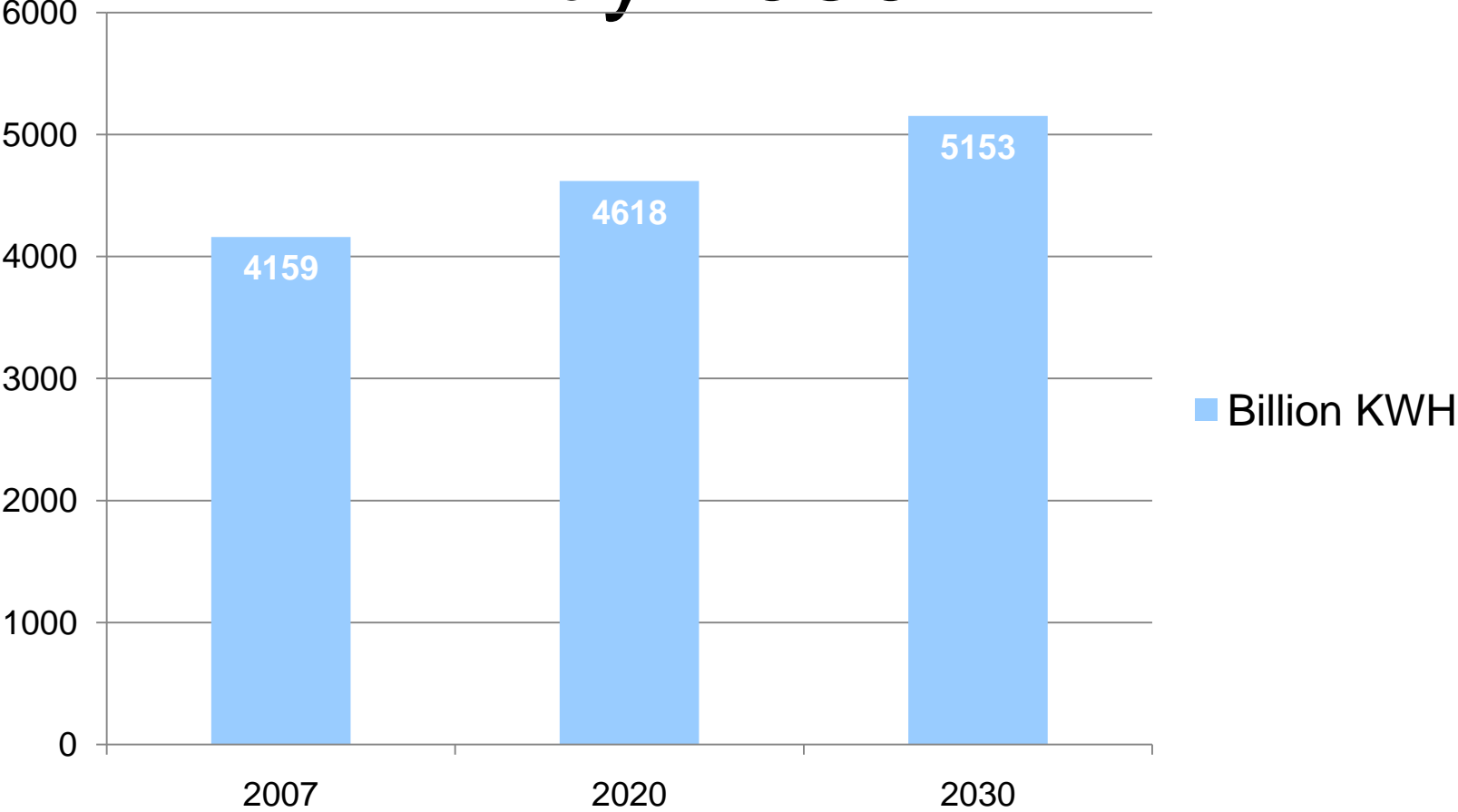
Source: Ventyx Velocity Suite / Energy Information Administration

Updated: 4/08

# Factors Driving Interest in New Nuclear Construction

- Growing need for baseload power

# US Needs 23% More Power by 2030



Source: EIA, Annual Energy Outlook 2009

# Near-Term Need for New Capacity

Projected Excess Capacity by NERC Region, 2005–12, Including Power Plants Under Construction  
(megawatts)

Region	2007	2008	2009	2010	2011	2012
<i>ISO-NE</i>	861	213	0	0	0	0
<i>NYISO</i>	1,353	0	0	0	0	0
<i>MAAC</i>	1,583	0	0	0	0	0
<i>ECAR</i>	12,344	9,970	8,686	6,441	4,169	1,869
<i>MAIN</i>	6,740	7,390	5,661	4,884	4,367	3,024
<i>MAPP-US</i>	3,621	2,939	2,422	1,575	690	0
<i>VACAR</i>	0	0	0	0	0	0
<i>Southern</i>	2,738	1,029	0	0	0	0
<i>TVA</i>	1,317	236	0	0	0	0
<i>Entergy</i>	16,330	15,691	15,109	15,184	14,586	13,977
<i>FRCC</i>	2,472	1,488	145	0	0	0
<i>SPP</i>	5,729	4,690	3,746	2,750	1,759	750
<i>ERCOT</i>	0	0	0	0	0	0
<i>WECC-US</i>	20,731	17,931	15,945	14,140	11,547	8,900

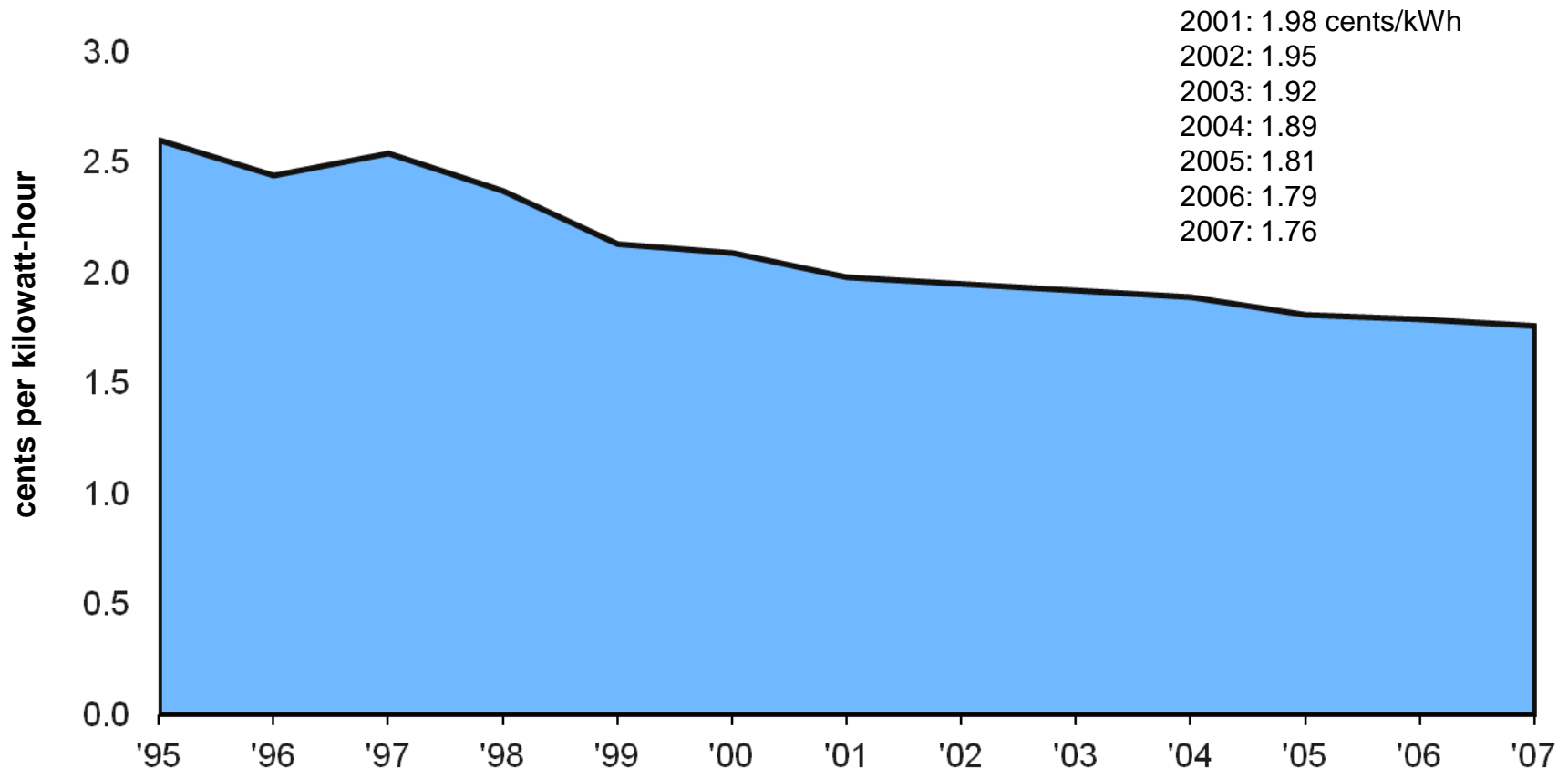
Source: Cambridge Energy Research Associates and EV Power®, Global Energy Decisions, Inc. Notes: (1) Required reserve margin assumed to be 18 percent in New England, New York, PJM, WECC, and FRCC; otherwise it is 15 percent; (2) Includes only known scheduled retirements.

# Factors Driving Interest in New Nuclear Construction

- Growing need for baseload power
- Current performance of nuclear power plants

# Economic Performance

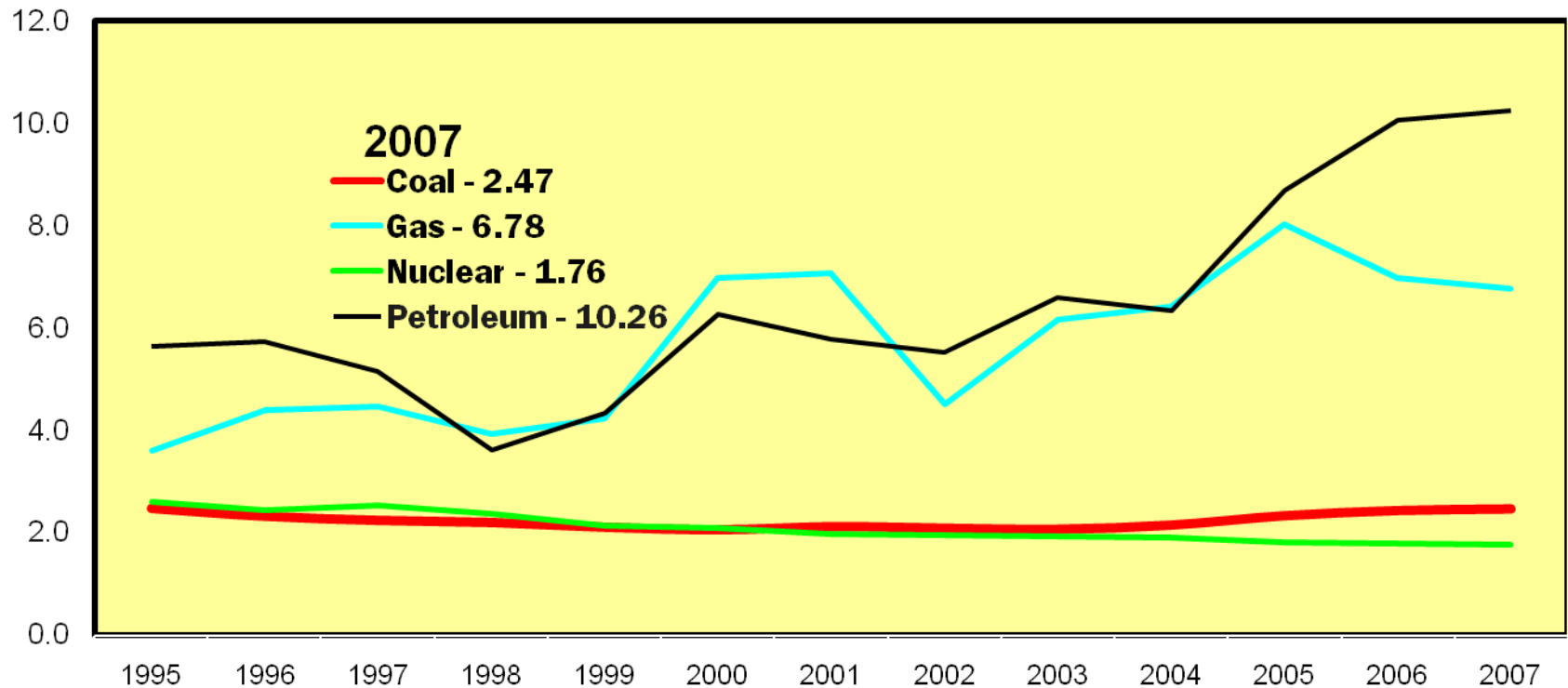
U.S. Nuclear Production Cost, *in 2007 cents/kWh*



Source: Ventyx Velocity Suite, May 2008

# U.S. Electricity Production Costs

*1995-2007, in 2007 cents per kilowatt-hour*



Production Costs = Operations and Maintenance Costs + Fuel Costs

Source: Ventyx Velocity Suite, May 2008

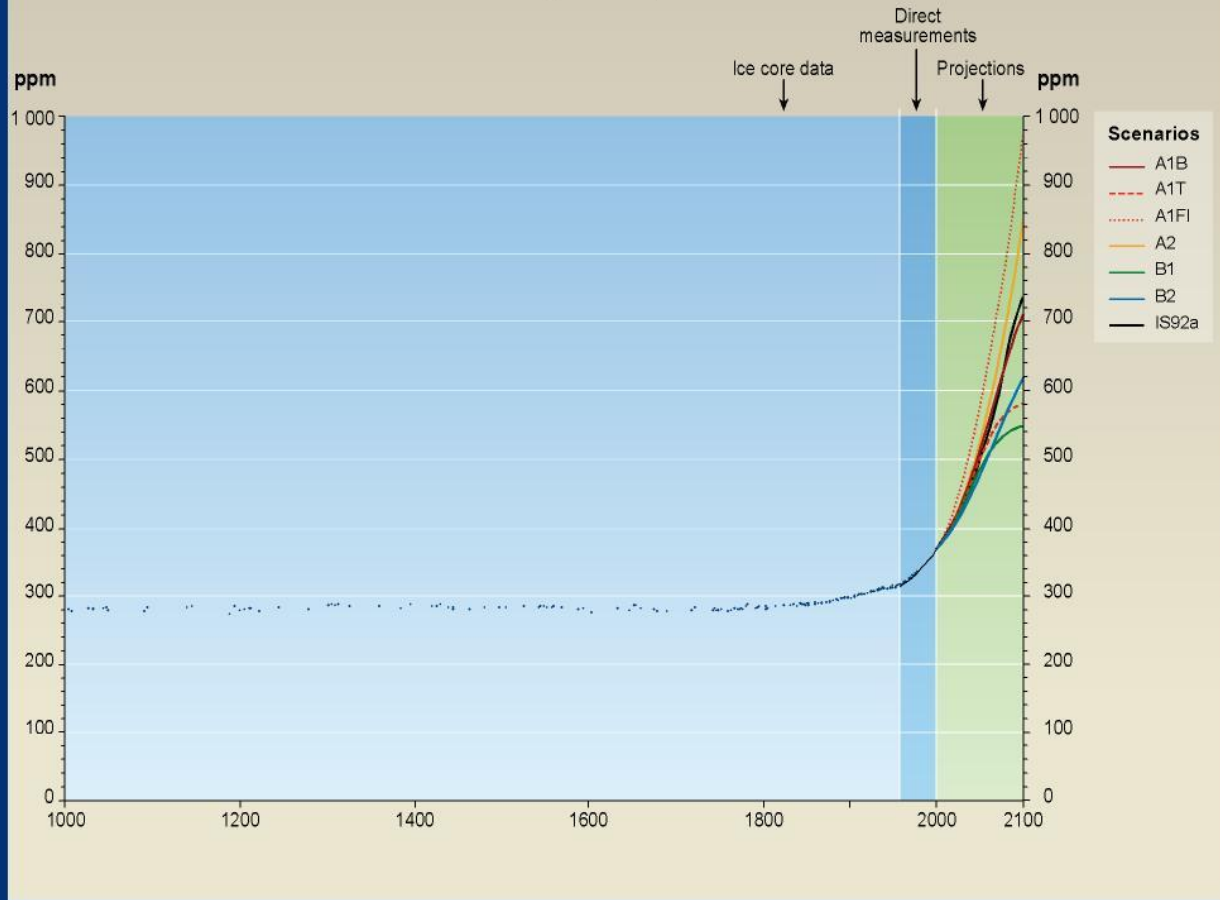
# U.S. Capacity Factors by Fuel Type 2007

Fuel Type	Average Capacity Factor (%)
Nuclear	91.8
Coal (Steam Turbine)	71.8
Gas (Combined Cycle)	43.3
Gas (Steam Turbine)	16.0
Oil (Steam Turbine)	19.6
Hydro	27.8
Wind	30.4
Solar	19.8

# Factors Driving Interest in New Nuclear Construction

- Growing need for baseload power
- Current performance of nuclear power plants
- Inevitability of carbon controls

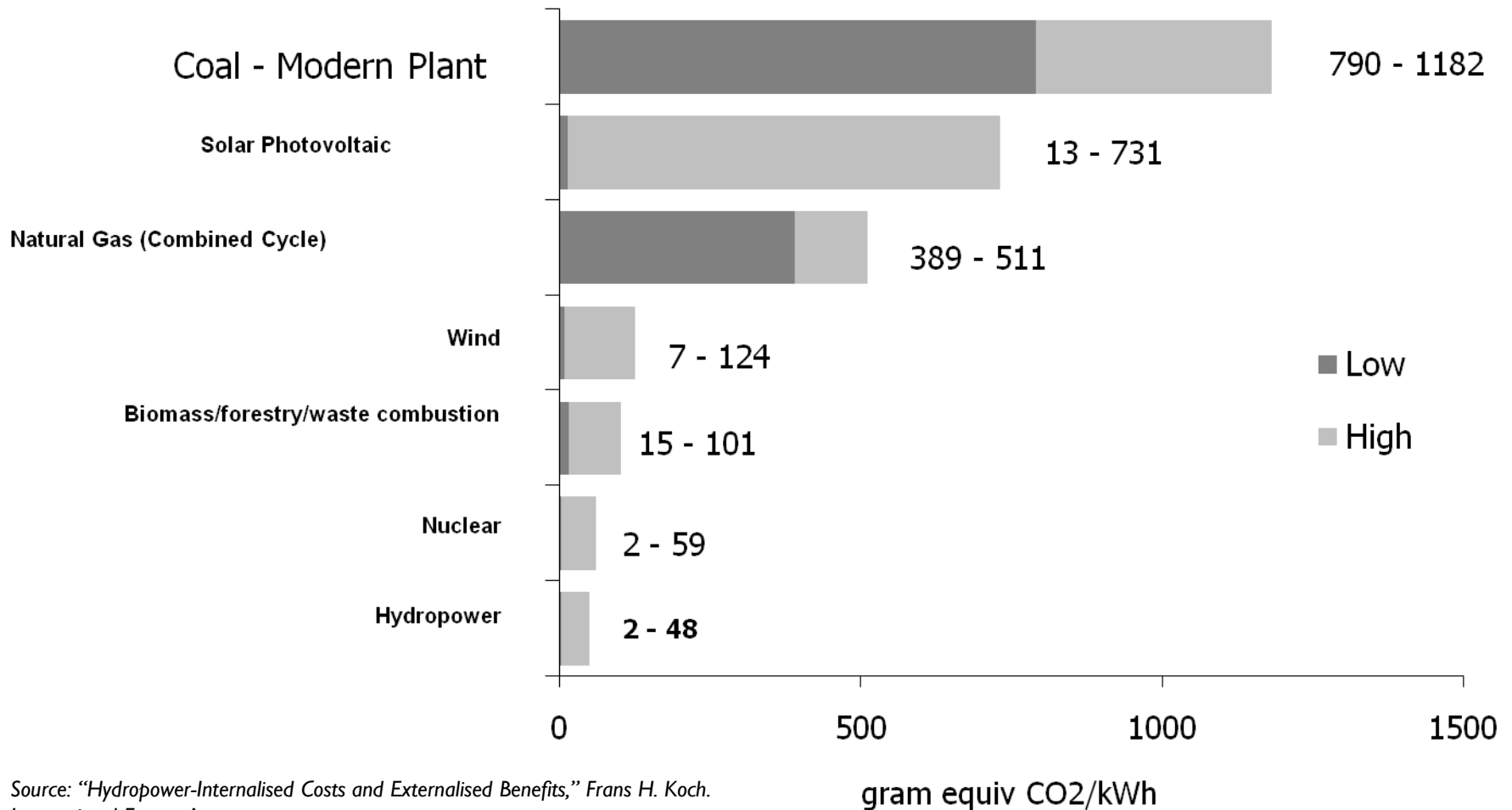
# Past and future CO<sub>2</sub> atmospheric concentrations



SYR - FIGURE 9-1a

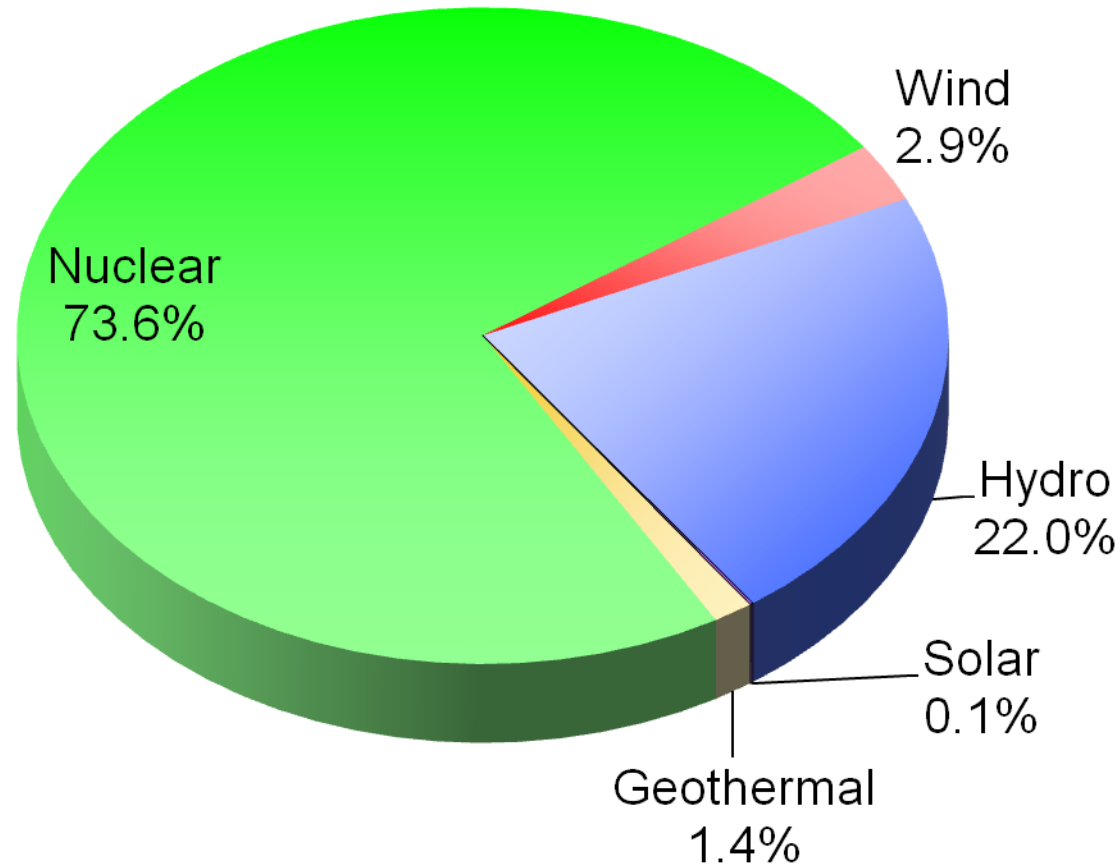
# Carbon Emissions

## *Life Cycle Emissions for Various Electricity Sources*



Source: "Hydropower-Internalised Costs and Externalised Benefits," Frans H. Koch.  
International Energy Agency

# U.S. Electricity Sources That Do Not Emit Greenhouse Gases



Source: Ventyx Velocity Suite / Energy Information Administration  
Updated 4/08

# Factors Driving Interest in New Nuclear Construction

- Growing need for baseload power
- Current performance of nuclear power plants
- Inevitability of carbon controls
- Energy security

# Energy Security

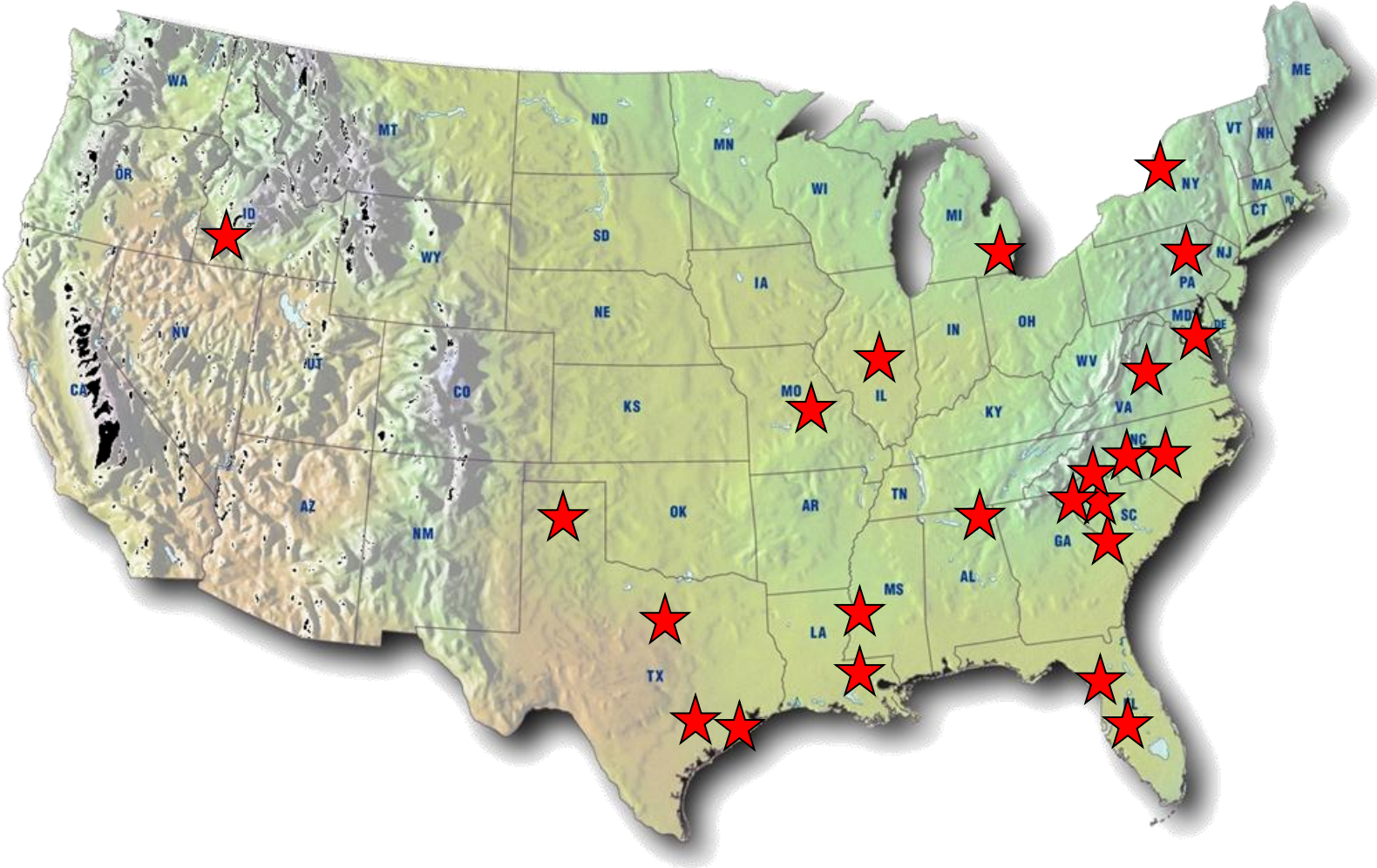
- Uncertain availability of coal given environmental concerns
- Natural gas – subject to price volatility and possible supply interruption

**Expected New Nuclear Power Plant Applications**  
**Updated February 4, 2009**

<b>Company*</b>	<b>Date of Application</b>	<b>Design</b>	<b>Date Accepted</b>	<b>Site Under Consideration</b>	<b>State</b>	<b>Existing Operating Plant</b>
<b>Calendar Year (CY) 2007 Applications</b>						
NRG Energy (52-012/013)***	09/20/2007	ABWR	11/29/2007	South Texas Project (2 units)	TX	Y
NuStart Energy (52-014/015)***	10/30/2007	AP1000	01/18/2008	Bellefonte (2 units)	AL	N
UNISTAR (52-016)***	07/13/2007 (Envir.) 03/13/2008 (Safety)	EPR	01/25/2008 06/03/2008	Calvert Cliffs (1 unit)	MD	Y
Dominion (52-017)***	11/27/2007	ESBWR	01/28/2008	North Anna (1 unit)	VA	Y
Duke (52-018/019)***	12/13/2007	AP1000	02/25/2008	William Lee Nuclear Station (2 units)	SC	N
<b>2007 TOTAL NUMBER OF APPLICATIONS = 5</b>						
<b>TOTAL NUMBER OF UNITS = 8</b>						
<b>Calendar Year (CY) 2008 Applications</b>						
Progress Energy (52-022/023)***	02/19/2008	AP1000	04/17/2008	Harris (2 units)	NC	Y
NuStart Energy (52-024)***	02/27/2008	ESBWR	04/17/2008	Grand Gulf (1 units)	MS	Y
Southern Nuclear Operating Co. (52-025/026)***	03/31/2008	AP1000	05/30/2008	Vogtle (2 units)	GA	Y
South Carolina Electric & Gas (52-027/028)***	03/31/2008	AP1000	07/31/2008	Summer (2 units)	SC	Y
Progress Energy (52-029/030)***	07/30/2008	AP1000	10/06/2008	Levy County (2 units)	FL	N
Exelon (52-031/032)***	09/03/2008	ESWBR	10/30/2008	Victoria County (2 units)	TX	N
Detroit Edison (52-033)***	09/18/2008	ESBWR	11/25/2008	Fermi (1 unit)	MI	Y
Luminant Power (52-034/035)***	09/19/2008	USAPWR	12/2/2008	Comanche Peak (2 units)	TX	Y
Entergy (52-036)***	09/25/2008	ESBWR	12/4/2008	River Bend (1 unit)	LA	Y
AmerenUE (52-037)***	07/24/2008	EPR	12/12/2008	Callaway (1 unit)	MO	Y
UNISTAR (52-038)***	09/30/2008	EPR	12/12/2008	Nine Mile Point (1 unit)	NY	Y
PPL Generation (52-039)***	10/10/2008	EPR	12/19/2008	Bell Bend (1 unit)	PA	Y
<b>2008 TOTAL NUMBER OF APPLICATIONS = 12</b>						
<b>TOTAL NUMBER OF UNITS = 18</b>						
<b>Calendar Year (CY) 2009 Applications</b>						
Florida Power and Light (763)		AP1000		Turkey Point (2 units)	FL	Y
Amarillo Power (752)		EPR		Vicinity of Amarillo (2 units)	TX	UNK
Alternate Energy Holdings (765)		EPR		Hammett (1 unit)	ID	N
<b>2009 TOTAL NUMBER OF APPLICATIONS = 3</b>						
<b>TOTAL NUMBER OF UNITS = 5</b>						
<b>Calendar Year (CY) 2010 Applications</b>						
Blue Castle Project		TBD		Utah	UT	N
Unannounced		TBD		TBD	TBD	UNK
<b>2010 TOTAL NUMBER OF APPLICATIONS = 2</b>						
<b>TOTAL NUMBER OF UNITS = 2</b>						
<b>Calendar Year (CY) 2011 Applications</b>						
No Letters of Intent have been received from applicants expressing their plans to submit new COL applications in CY 2011.						
<b>2007 – 2011 Total Number of Applications = 22</b>						
<b>Total Number of Units = 33</b>						

\*Project Numbers/Docket Numbers    \*\*Yellow – Acceptance Review Ongoing    \*\*\*Blue – Accepted/Docketed

# Potential Locations for New Nuclear Plants



# Essential Preconditions

- Adequate protection of public health and safety.
- Continued focus on and assurance of security.

# Financial Barriers

- Special risk with the first few plants.
- Incentives in the Energy Policy Act of 2005.

# Legal Barriers

- Need to reduce legal risk after significant funds have been expended.
- Part 52 serves to reduce financial risk, but is new.

# Infrastructure

- Need to rebuild network of suppliers.
- Challenge in meeting human-resource needs.

# Spent Fuel

- Yucca Mountain derailed as disposal site.
- Need for an interim storage option.
- Avoid creating a needless barrier to new construction.

# The International Dimension

- Need for serious diplomatic and technical advances to achieve non-proliferation objectives
- Need for continuing attention to safety around the globe
- Engage India and China
- Need for international harmonization of licensing requirements

# Nuclear Units Under Construction Worldwide

<b>Country</b>	<b>Units</b>	<b>Total MWe</b>
<b>Argentina</b>	<b>1</b>	<b>692</b>
<b>Bulgaria</b>	<b>2</b>	<b>1,906</b>
<b>China</b>	<b>9</b>	<b>7,520</b>
<b>Taiwan</b>	<b>2</b>	<b>2,600</b>
<b>Finland</b>	<b>1</b>	<b>1,600</b>
<b>France</b>	<b>1</b>	<b>1,600</b>
<b>India</b>	<b>6</b>	<b>2,910</b>
<b>Iran</b>	<b>1</b>	<b>915</b>
<b>Japan</b>	<b>2</b>	<b>2,191</b>
<b>Pakistan</b>	<b>1</b>	<b>300</b>
<b>Russia</b>	<b>8</b>	<b>5,809</b>
<b>South Korea</b>	<b>5</b>	<b>5,180</b>
<b>Ukraine</b>	<b>2</b>	<b>1,900</b>
<b>United States</b>	<b>1</b>	<b>1,165</b>
<b>Total</b>	<b>44</b>	<b>38,888</b>

Source: *International Atomic Energy Agency*

# Conclusion

- World is on the edge of a nuclear renaissance.
- The barriers to new construction in the US can be overcome, but much work remains.