

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

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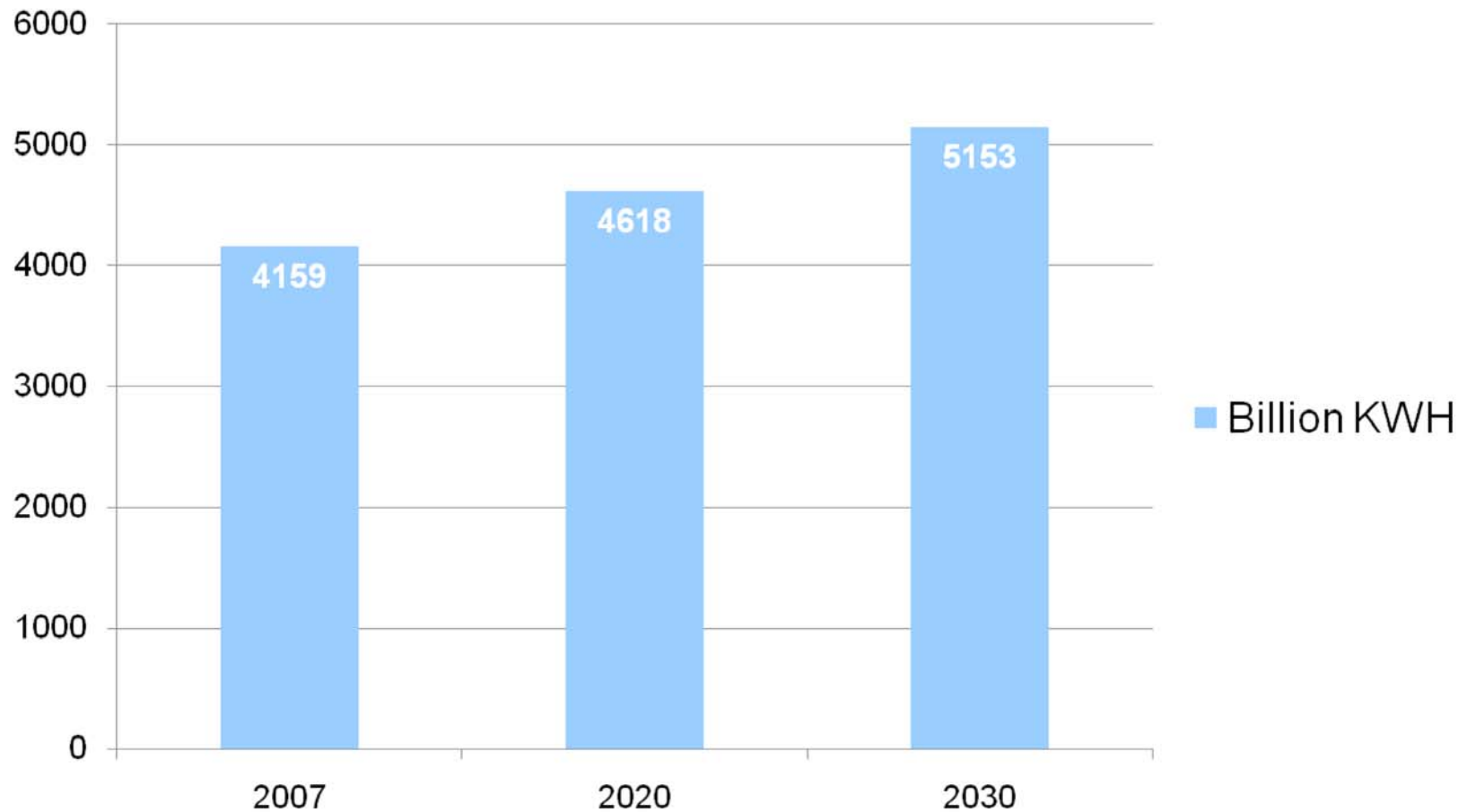
# Outline

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

# Factors Driving Interest in New Nuclear Construction

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

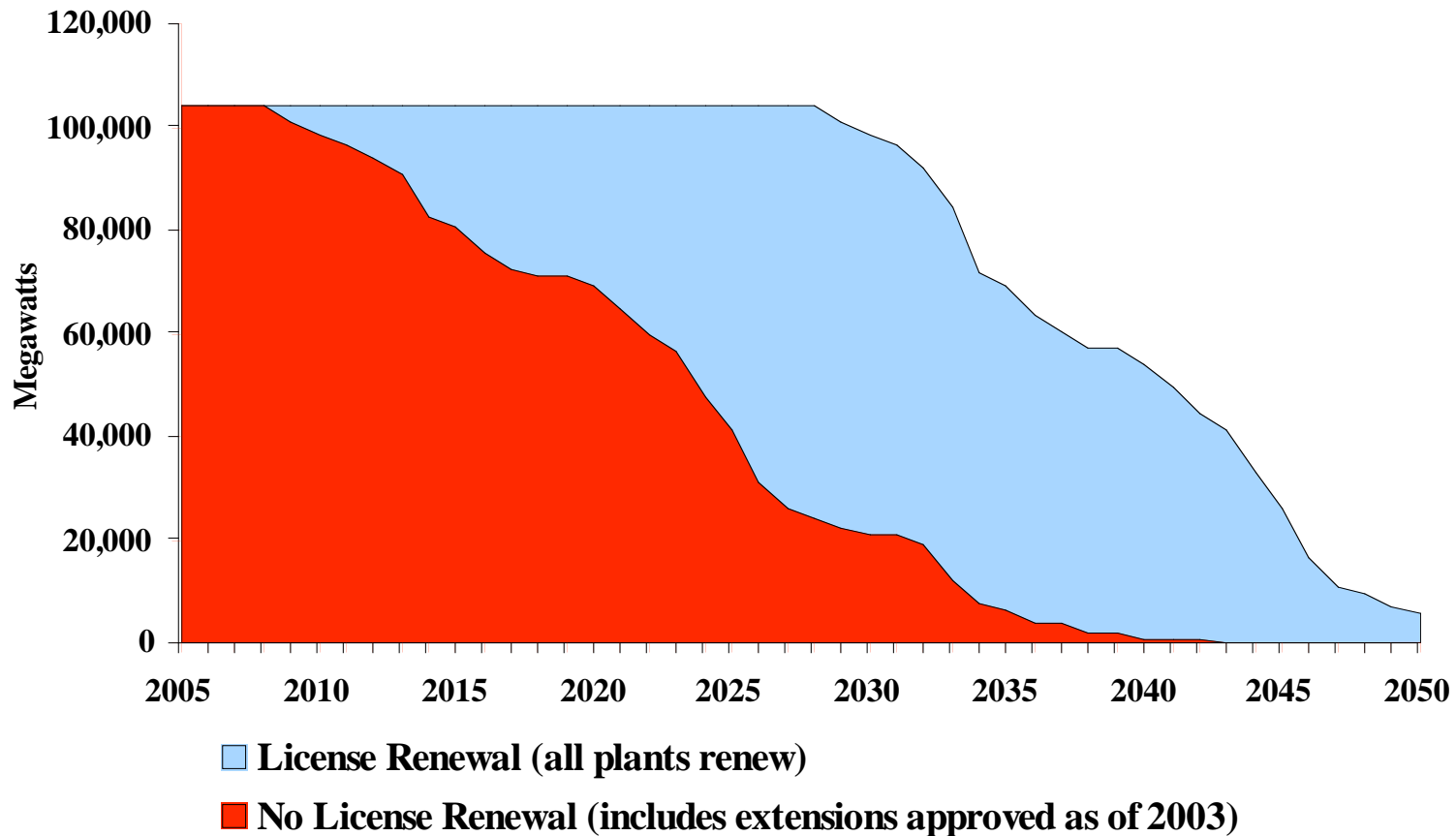
# Total Electricity Generation



Source: EIA, Annual Energy Outlook 2009

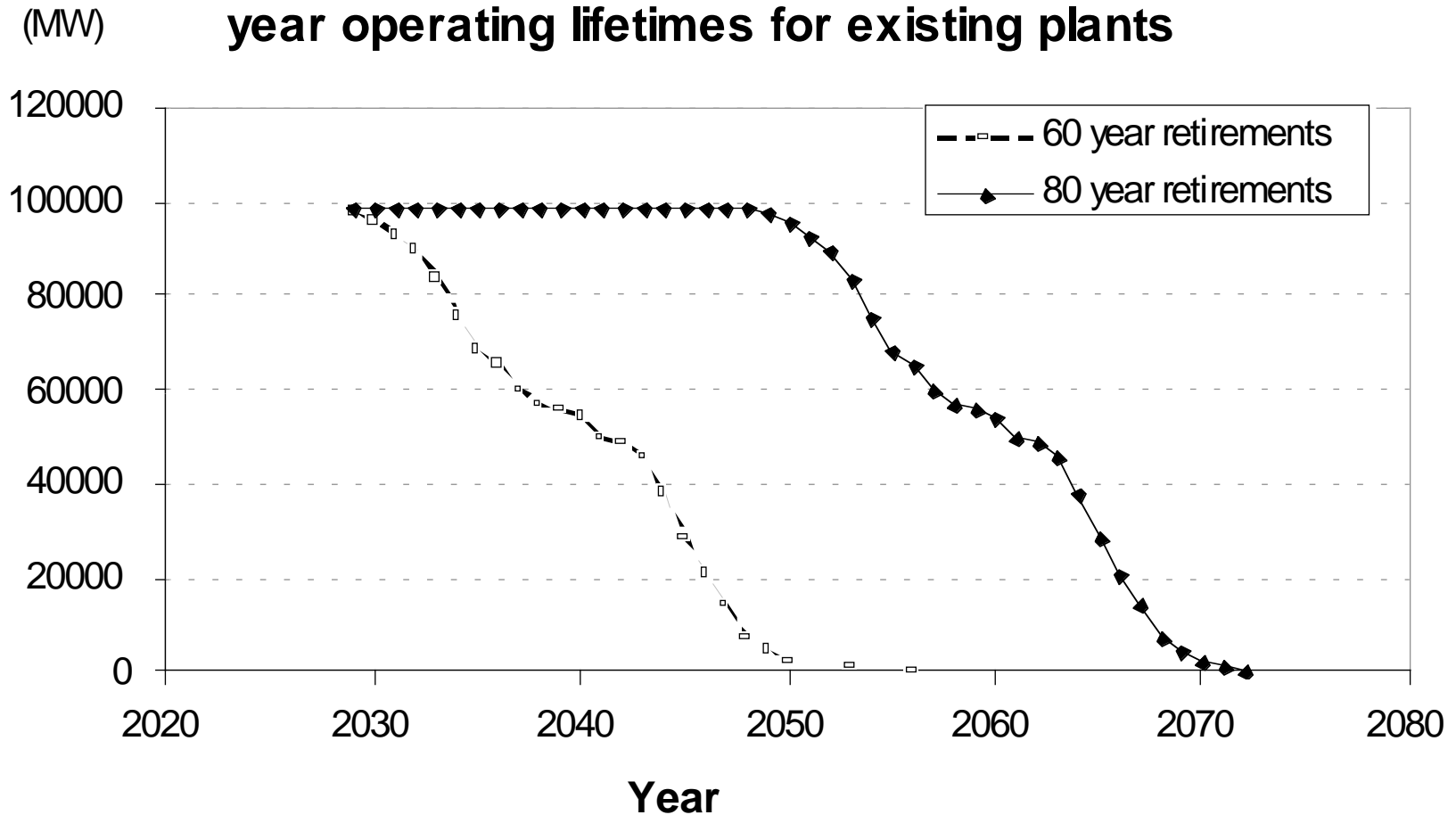
# Nuclear Capacity with and without License Renewal

(2005-2050)



Source: Platts POWERdat

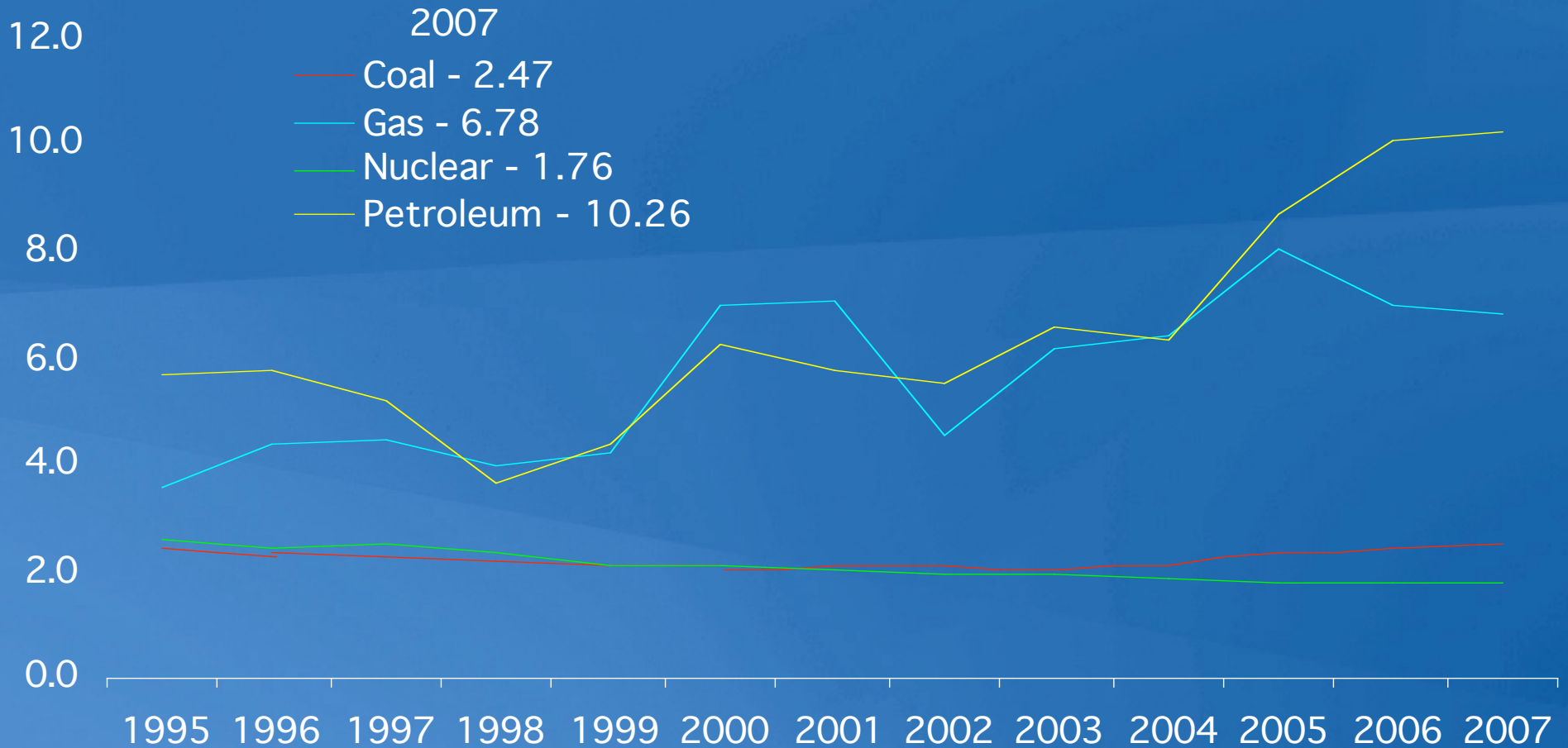
## Operating U.S. Nuclear Capacity with 60 and 80 year operating lifetimes for existing plants



Effect of Operating Life Extensions on Current U.S. Nuclear Generating Capacity. Open symbols represent the electric generating capacity available from currently operating nuclear power plants with extensions to 60 year operating lives. The dark gray symbols represent the electricity available from the current fleet of plants assuming all 104 plants receive lifetime extensions to 80 years. SOURCE: USNRC, 2008.

# U.S. Electricity Production Costs

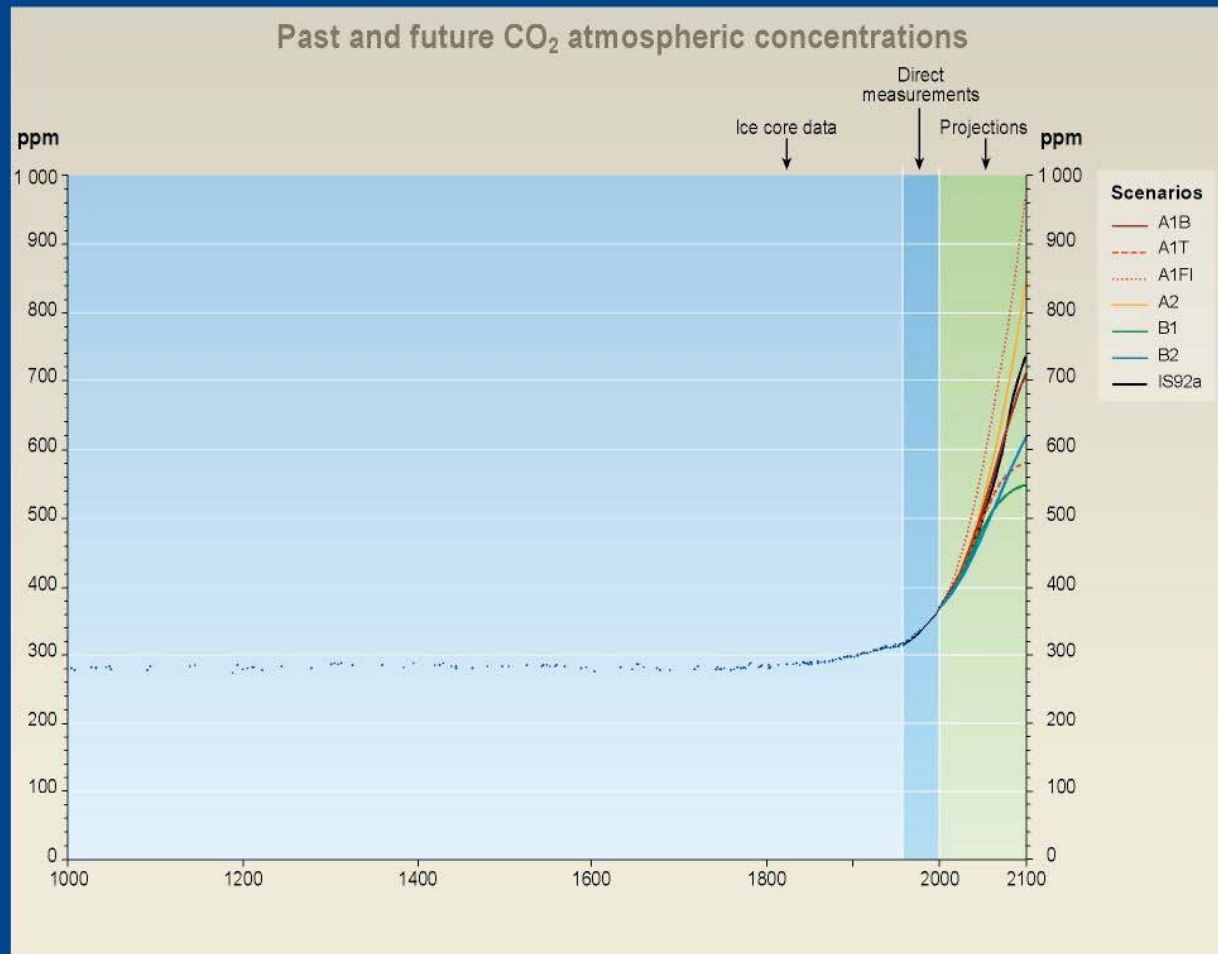
1995-2007, In 2007 cents per kilowatt-hour



Production Costs = Operations and Maintenance Costs + Fuel Costs

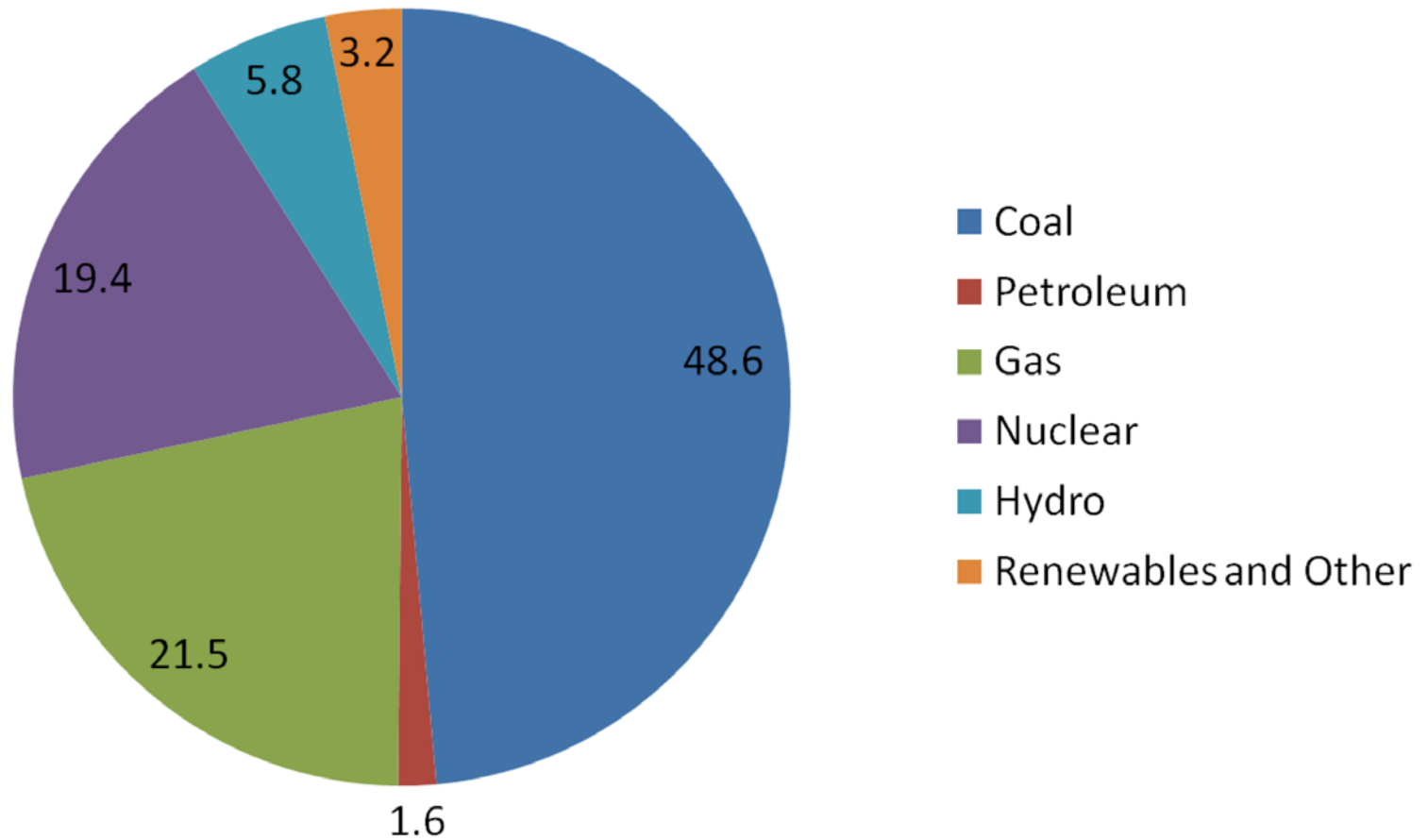


Source: Global Energy Decisions  
Updated: 5/08



SYR - FIGURE 9-1a

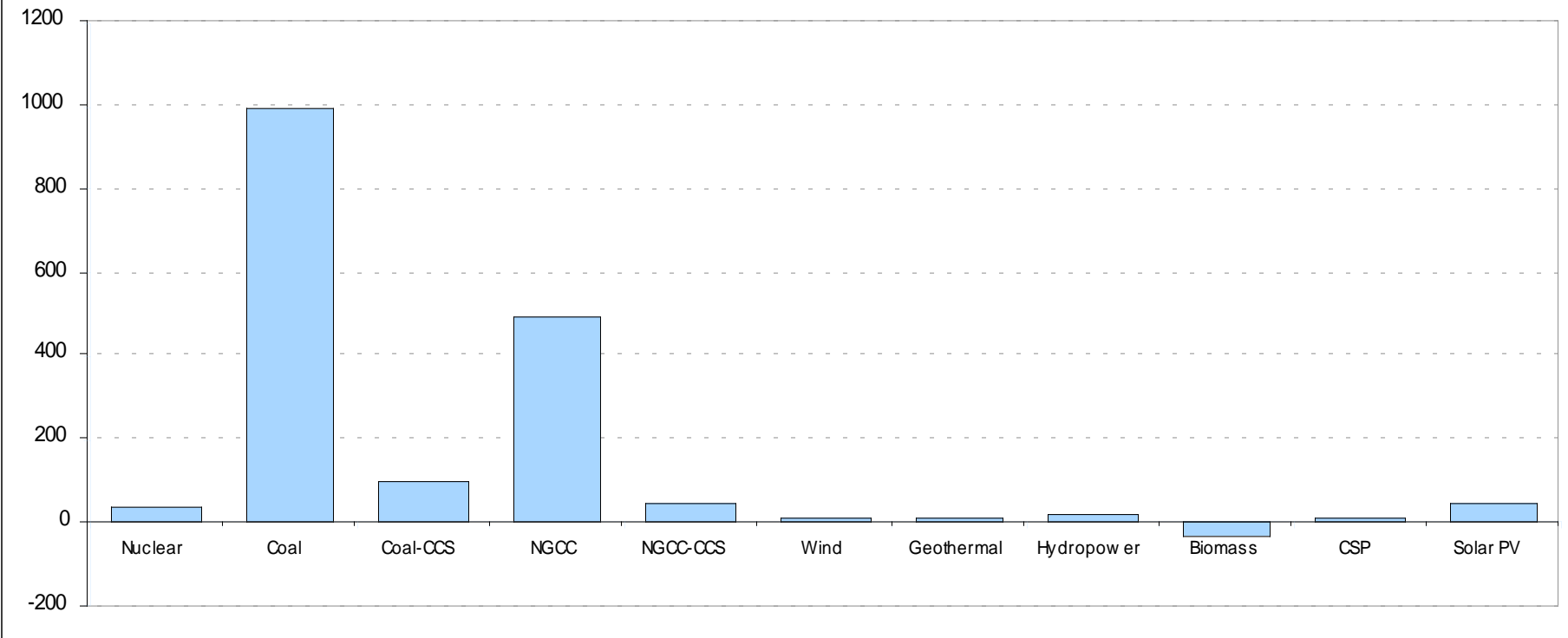
# Electricity Generation by Fuel Source (2007)



Source: Global Energy Decisions/EIA

(g CO<sub>2</sub>-  
eq/kWh)

### Life-cycle CO<sub>2</sub> emissions per kilowatt-hour of generated electricity



# 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>						

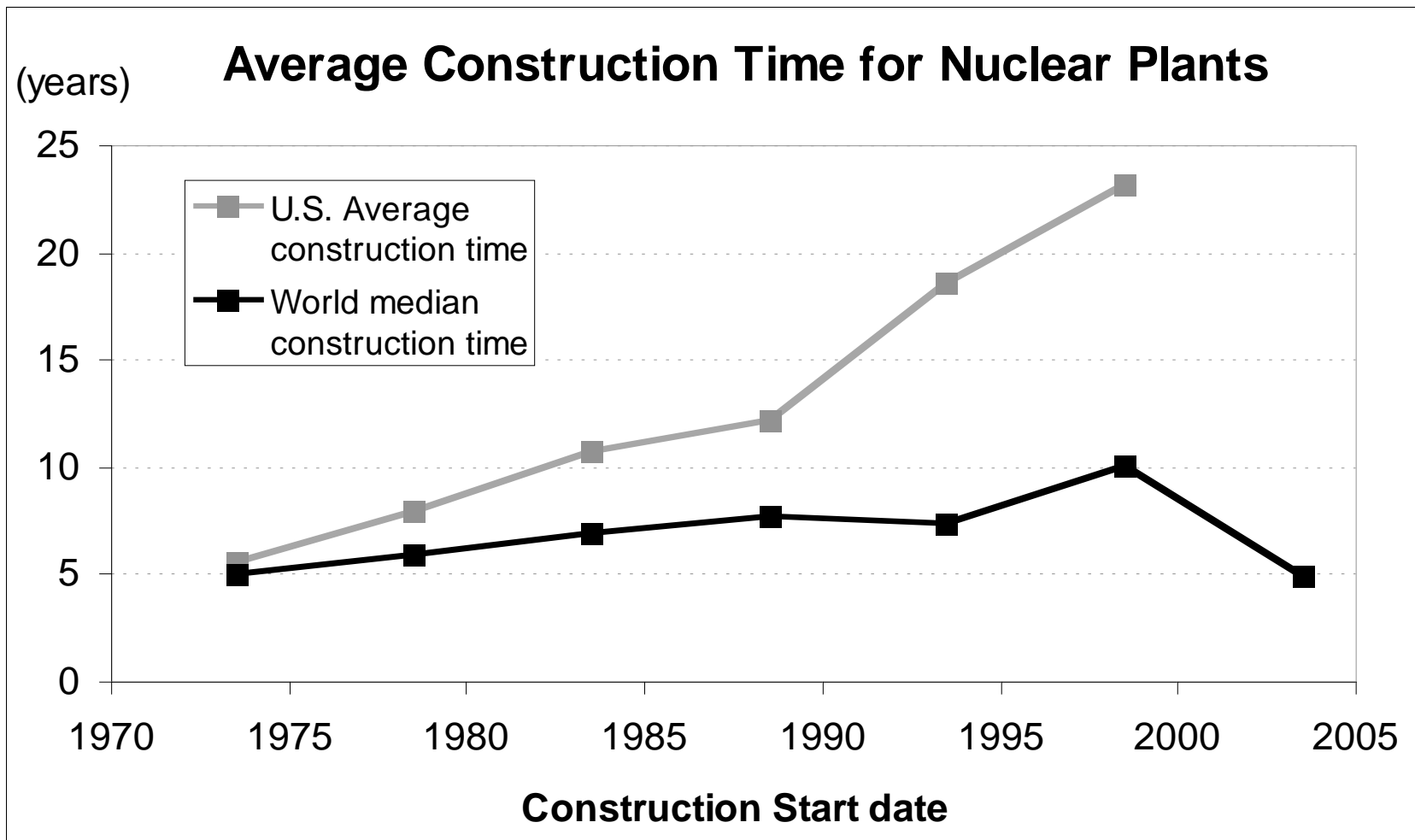
\*Project Numbers/Docket Numbers    \*\*Yellow – Acceptance Review Ongoing    \*\*\*Blue – Accepted/Docketed

# 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.



Average Construction times for nuclear plants, 1996-2001. The dark gray symbols show average construction time for all plants completed across the world in a given year. Light gray symbols show average construction time for all plants completed in the United States in a given year. SOURCE: IAEA, 2007.

# Legal Barriers

- Need to reduce legal risk before 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 is derailed.
- Some states bar new construction until there is a disposal site.
- From a policy perspective, absence of a disposal site should not be a barrier to new construction.

# Conclusion

- There is the prospect of substantial new construction in the US.
- The barriers to new construction can be overcome, but much work remains.