

Nuclear Energy Overview

Ralph Andersen, CHP
**Director – Radiation Safety, Low-Level Waste
Management , & Environmental Protection**
Nuclear Energy Institute

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Status of the Nuclear Energy Industry



U. S. Nuclear Industry

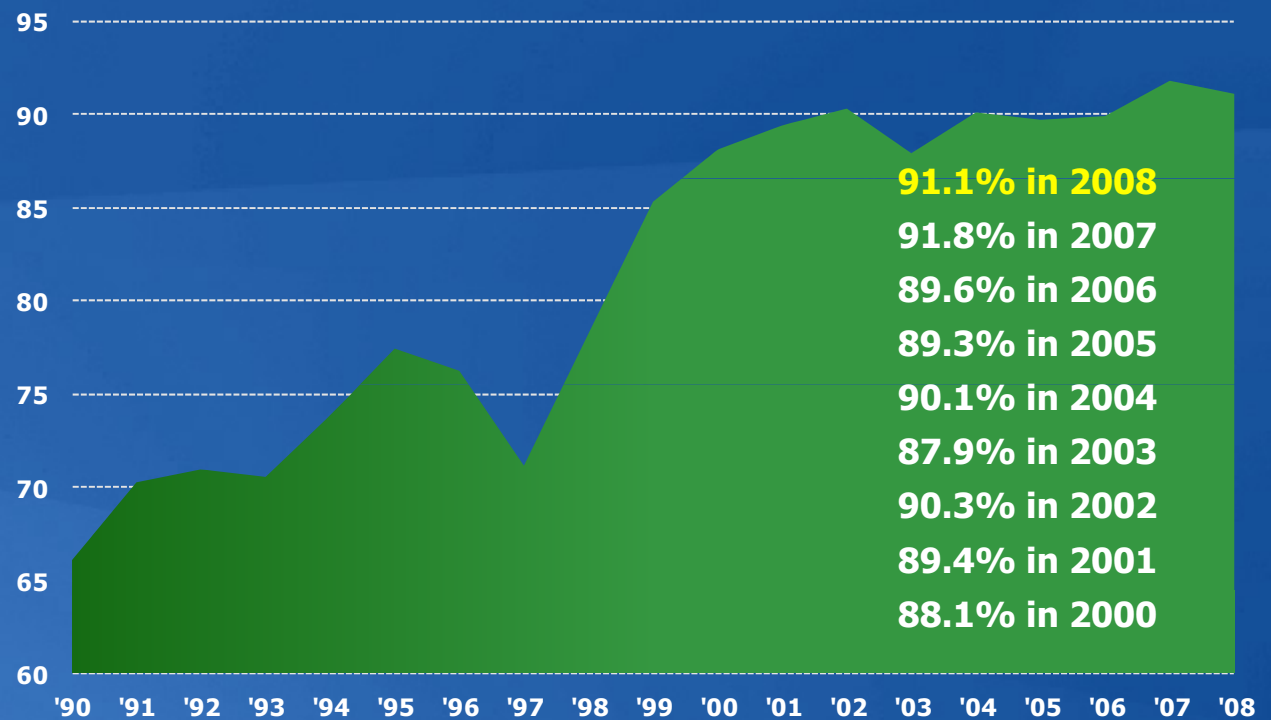
- **104 commercial operating units in 31 states**
- **1 unit under construction (completion of Watts Bar 2)**
- **25 units in licensing phase**

Sustained Reliability

U.S. Nuclear Plant Average Capacity Factor

Highlights

- Refueling outages: 66 in 2008, 56 in 2007
- Average refueling outage duration: 37.6 days in 2008, 40.4 days in 2007

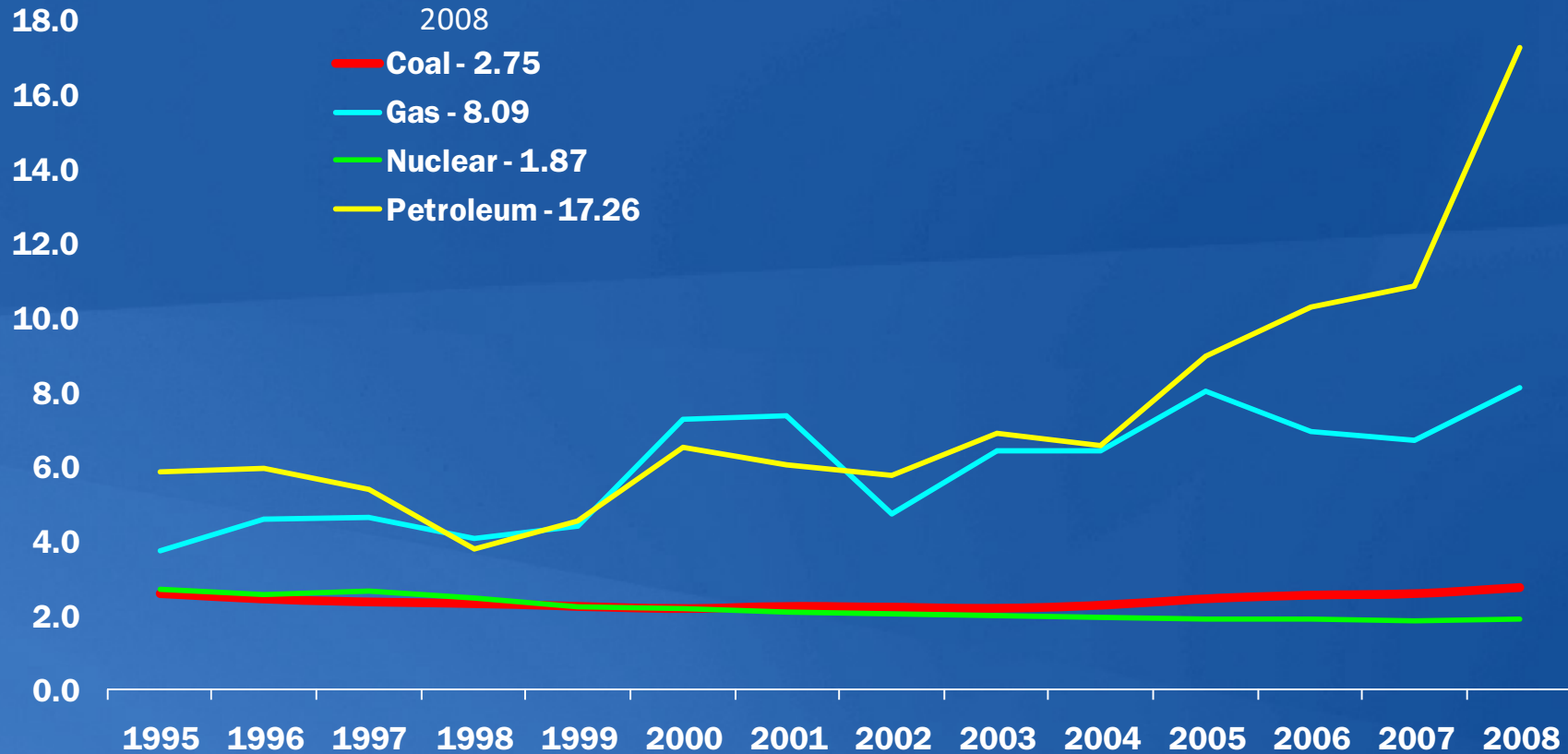


Sources: Ventyx Velocity Suite, U.S. Energy Information Administration,
U.S. Nuclear Regulatory Commission, NEI estimate for 2008



U.S. Electricity Production Costs

1995-2008, in 2008 cents per kilowatt-hour



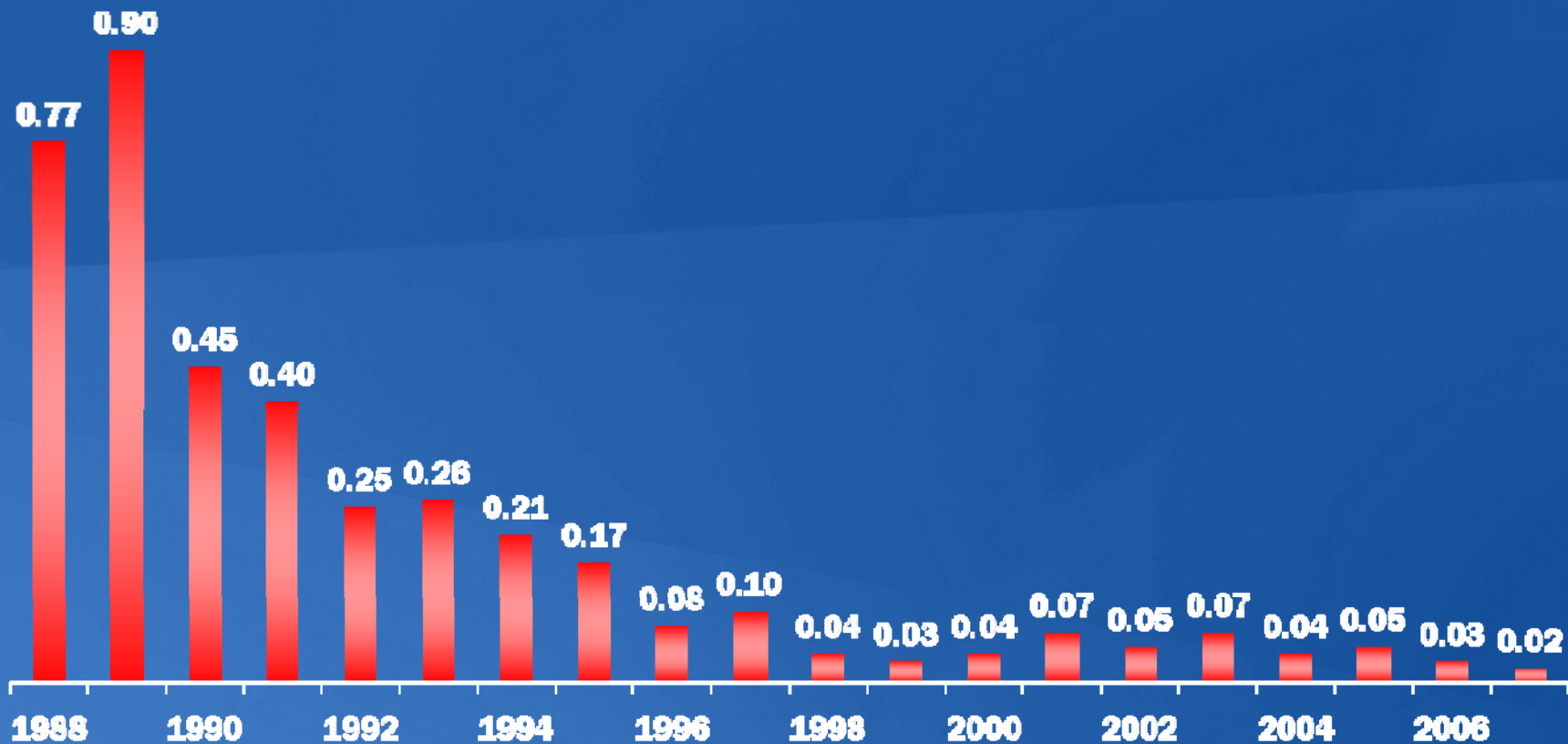
Production Costs = Operations and Maintenance Costs + Fuel Costs. Production costs do not include indirect costs and are based on FERC Form 1 filings submitted by regulated utilities. Production costs are modeled for utilities that are not regulated.



Source: Ventyx Velocity Suite

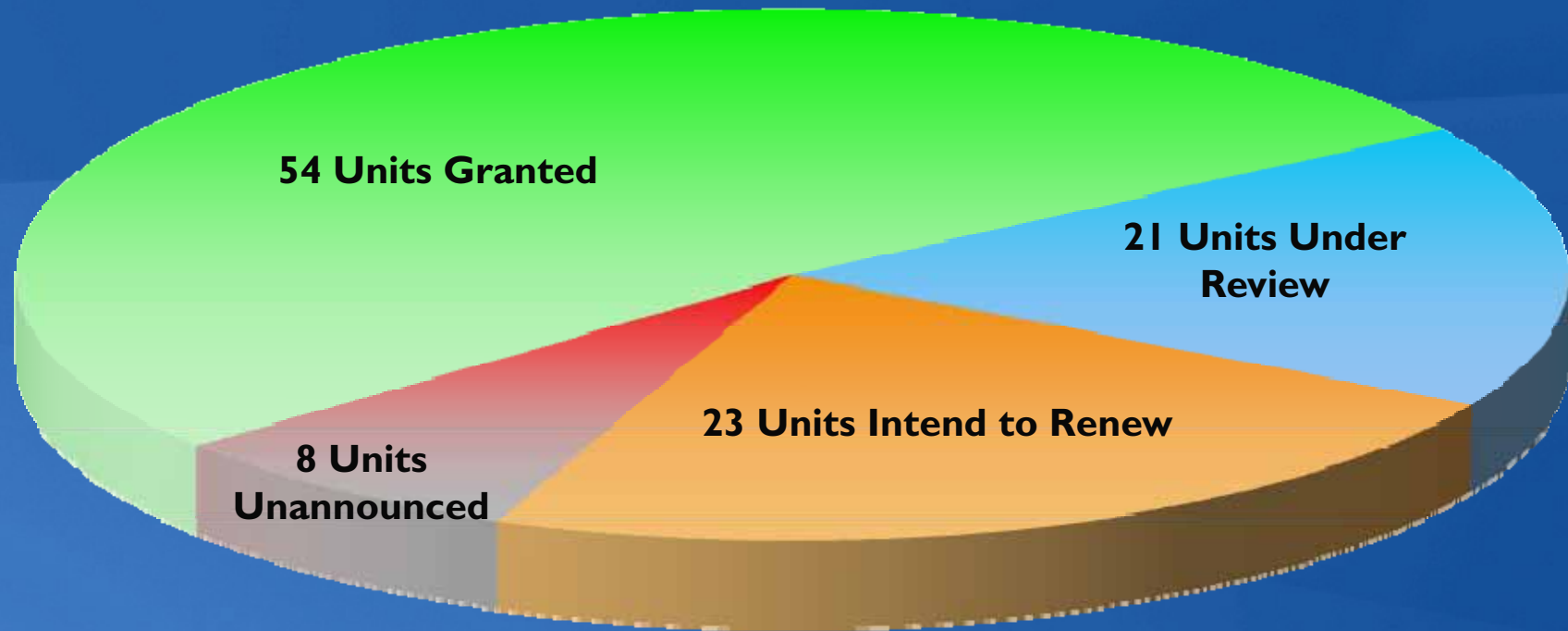
Significant Improvement in Safety

Annual Industry (Unit) Significant Events: Fiscal Year 1988-2007



Source: NRC Information Digest, 1988 is the earliest year data is available

Applications for License Renewal



Source: Nuclear Regulatory Commission

Updated: 8/09

New Nuclear Plants: Competitiveness and Financing



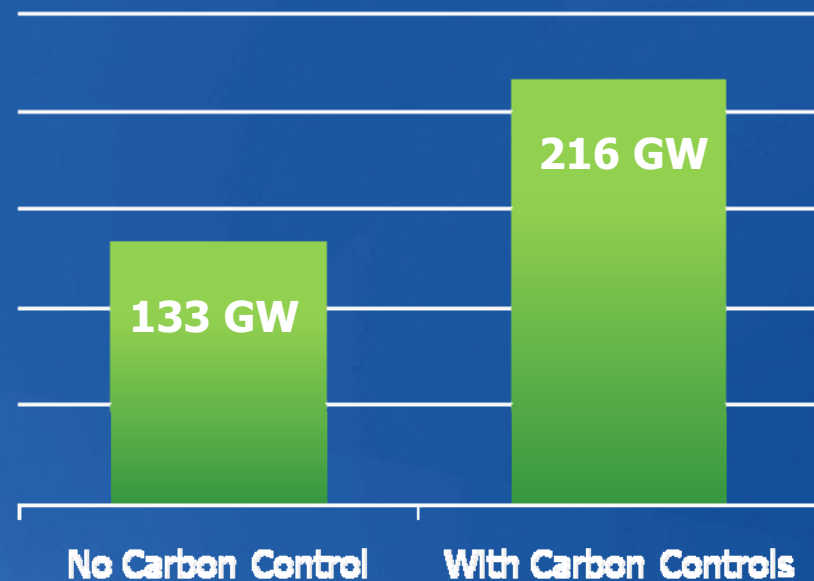
Why New Nuclear Power Plants?

- Need for new baseload capacity
- Constraints on carbon emissions
- Need for fuel, technology diversity
- Solid business case for new nuclear plants at commercial operation in 2016 and beyond



New Generating Capacity Needed By 2030

*Assumes 0.7% Annual Growth in Peak Load
1996-2006: Peak Load Growth 2.1%
EIA Forecast of Peak Load Growth: 1.5%*



Source: The Brattle Group, "Transforming America's Power Industry: The Investment Challenge 2010-2030," November 2008

Nuclear Energy Cost Competitive

Estimated Levelized Cost of New Electric Generation in 2016

Plant Type	Capacity Factor (%)	Average Levelized Costs for Power Plants Entering Service in 2016 (2007 dollars/megawatt-hour)				
		Levelized Capital Cost	Fixed O&M	Variable O&M (including fuel)	Transmission Investment	Total System Levelized Cost
Conventional Coal	85	64.5	3.7	23.0	3.5	94.6
Advanced Coal with CCS	85	87.4	6.2	25.2	3.8	122.6
Natural Gas-fired						
Conventional Combined Cycle	87	23.0	1.6	55.7	3.7	83.9
Advanced CC with CCS	87	43.6	2.6	65.8	3.7	115.7
Advanced Nuclear	90	84.2	11.4	8.7	3.0	107.3
Wind	35.1	122.7	10.3	0.0	8.5	141.5
Wind – Offshore	33.4	193.6	27.5	0.0	8.6	229.6
Solar PV	21.7	376.6	6.2	0.0	12.9	395.7
Solar Thermal	31.2	232.1	21.3	0.0	10.3	263.7
Geothermal	90	86.0	20.7	0.0	4.8	111.5
Biomass	83	71.7	8.9	23.0	3.9	107.4
Hydro	52	97.2	3.3	6.1	5.6	114.1



Source: Energy Information Administration, Annual Energy Outlook, April 2009 SR-OIAF/2009-03

Financing New Nuclear Capacity

- Nuclear is competitive but has a structural challenge: very large projects relative to the size of the companies building them
- This challenge can be managed
 - Supportive rate policies at the state level
 - Loan guarantees from the federal government

Exelon	\$30.2 billion
Southern	\$23.9 billion
Dominion	\$18.5 billion
FPL	\$21.2 billion
Duke	\$18.6 billion
Entergy	\$13 billion
Two-unit nuclear power station	\$12-16 billion
PPL Corp.	\$11.3 billion
Progress	\$10.04 billion
AmerenUE	\$4.95 billion
DTE Energy	\$4.62 billion
NRG	\$4.16 billion
SCANA	\$3.75 billion

Loan Guarantees: Key Facts

- **Help manage financial risk:**
 - Non-recourse project financing
 - Project sponsor's balance sheet protected
- **Allow higher leverage (80% debt/20% equity)**
 - Electric utilities typically more conservative (50% debt/50% equity)
- **Lower cost of capital = lower cost electricity**
- **Not a subsidy: Project sponsor pays cost to federal government of providing guarantee**

Status of Loan Guarantee Program

- **\$18.5 billion in loan guarantee volume for nuclear power projects available**
 - \$78.5 billion for renewables
- **DOE negotiating term sheets with top 4 projects (7 reactors) = \$38 billion in loan volume**
- **Co-financing from export credit agencies in France and Japan will stretch existing U.S. loan guarantee authority**
- **Additional loan volume necessary**
- **Major difficulties with implementation**
 - Impact on nuclear and renewables



New U.S. Nuclear Plants: Progress Report

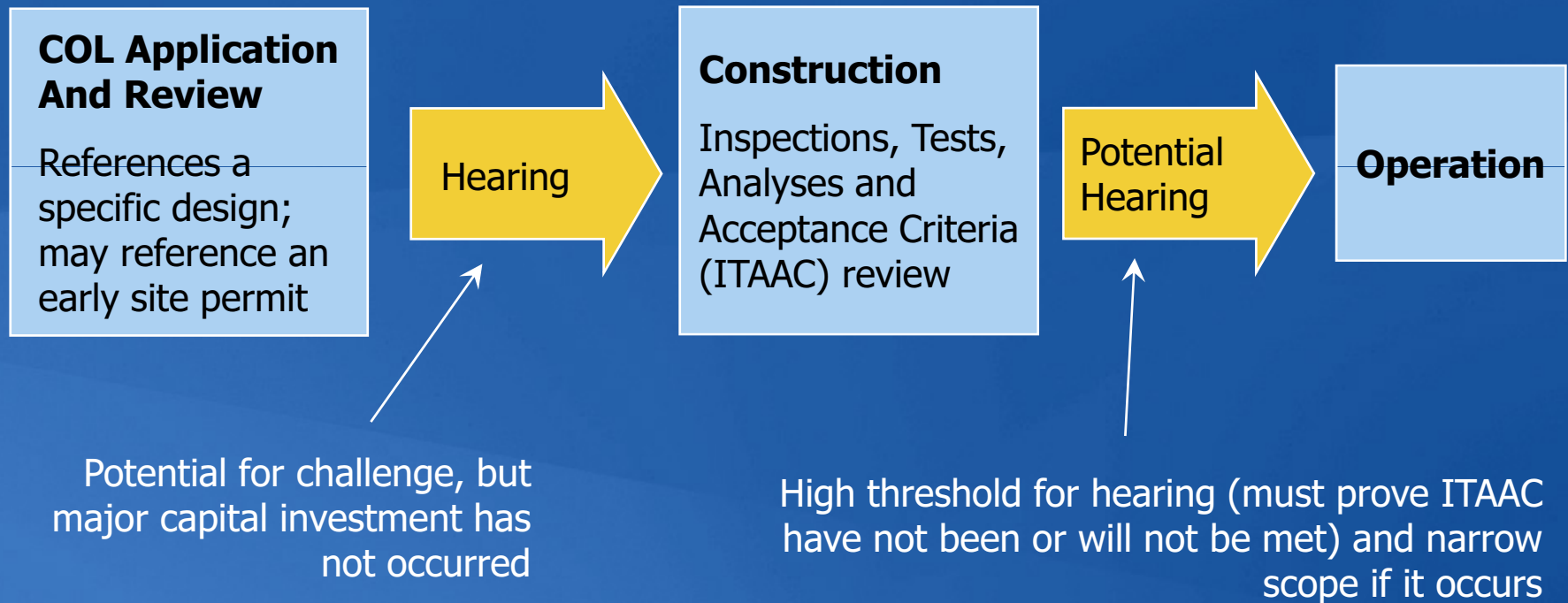


Then and Now: The Biggest Difference

- **The 1970s and 1980s**
 - Cost overruns, schedule delays
 - Capacity factors in mid-50% range
 - Refueling outages 100-plus days
- **Today**
 - Major overhauls, plant restarts on time, on budget
 - Capacity factors in the 90% range
 - Refueling outages 30-40 days

The industry operating to today's high standards is the industry that will build new nuclear plants.

New Licensing Process Reduces Uncertainty and Financial Risk



Removing Risk From the Licensing Process

- **Restructured licensing process**
- **Mature technology, stable regulatory requirements**
- **More efficient hearing procedures**
- **Design-centered review groups and standardization**
- **“Sign-as-you-go” ITAAC verification**
- **Definitive thresholds for intervention after license approval**



New Reactor Development

- **17 NRC license applications for 26 reactors**
- **Expect 4 to 8 reactors online by 2017**
- **First movers:**
 - Georgia Power/Southern Co @ Vogtle (GA)
 - SCANA/Santee Cooper @ Summer (SC)
 - NRG/CPS Energy @ South Texas Project (TX)
 - Constellation Energy @ Calvert Cliffs (MD)



Vogtle site preparation

State Policies Favoring Nuclear



Legislation in place that helps secure financing



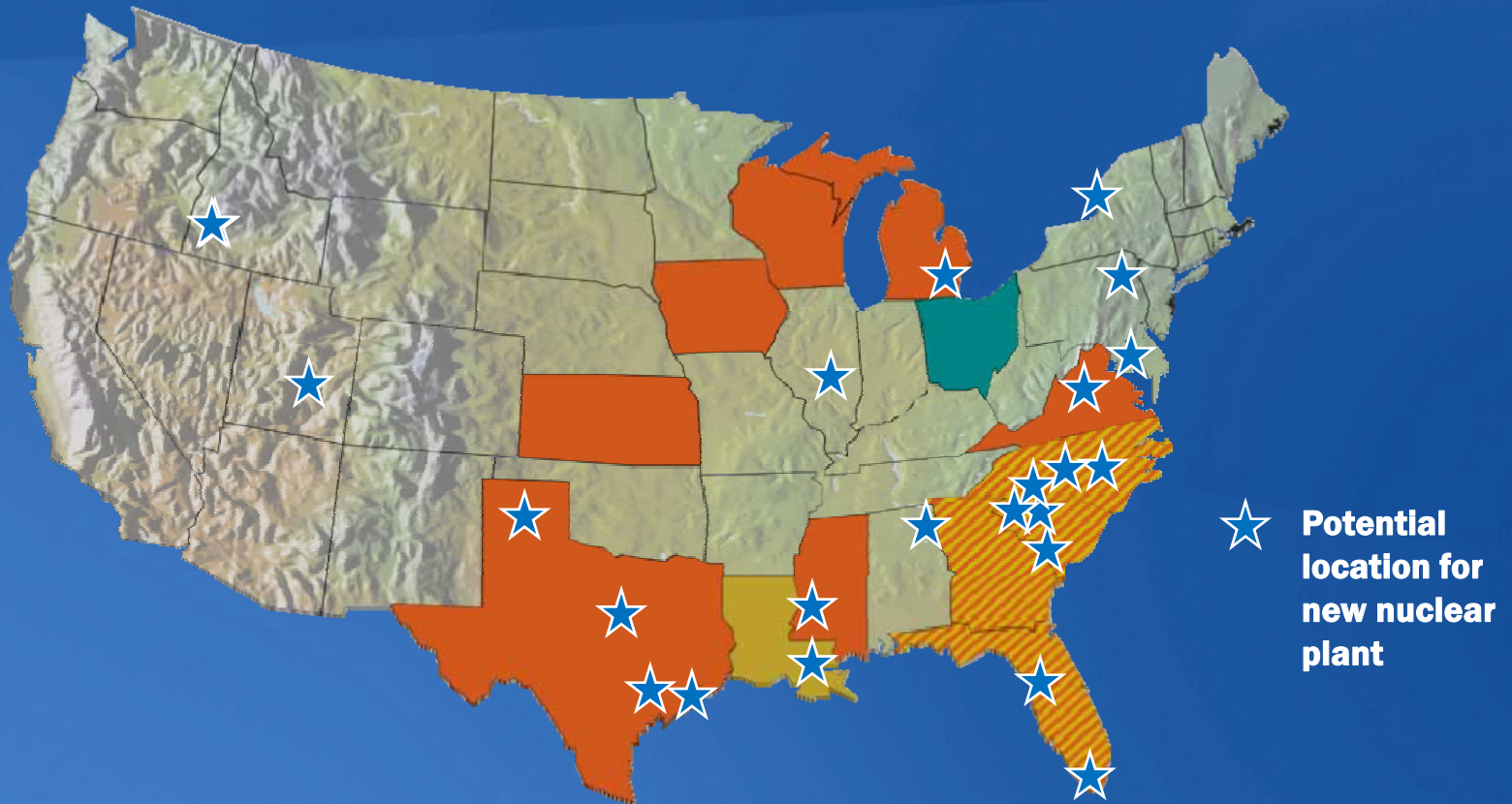
Legislation that includes nuclear in clean portfolio standard



Regulation in place that helps secure financing



Legislation and regulation in place that help secure financing



Developing Opportunities

- **Build support for industry agenda through national organizations**
 - **National Association of Regulatory Utility Commissioners**
 - **National Conference of State Legislatures**
 - **National Association of Attorneys General**
 - **National Governors Association**
- **Support regional groups focused on new plant development**
- **Establish state and regional workforce and supply chain initiatives**
- **Establish support for integrated used fuel management strategy**
 - **Maine, NARUC Resolutions**
 - **NCSL Policy**

U.S. Manufacturers Ramping Up

Supply Chain and Fuel Supply Expansion Plans

- AREVA and Northrop Grumman Newport News, Va.
- Shaw Group and Westinghouse Lake Charles, La.
- Curtis Wright Cheswick, Pa.
- Alstom Chattanooga, Tenn.
- National Enrichment Facility Eunice, N.M.
- American Centrifuge Project Portsmouth, Ohio
- GE Hitachi Nuclear Energy Wilmington, N.C.



Rebuilding the Work Force: Supply Responds to Demand



- 42 community college nuclear partnership programs
- 16 state-based work force development initiatives
- 500 percent increase since 1999 in nuclear engineering enrollment

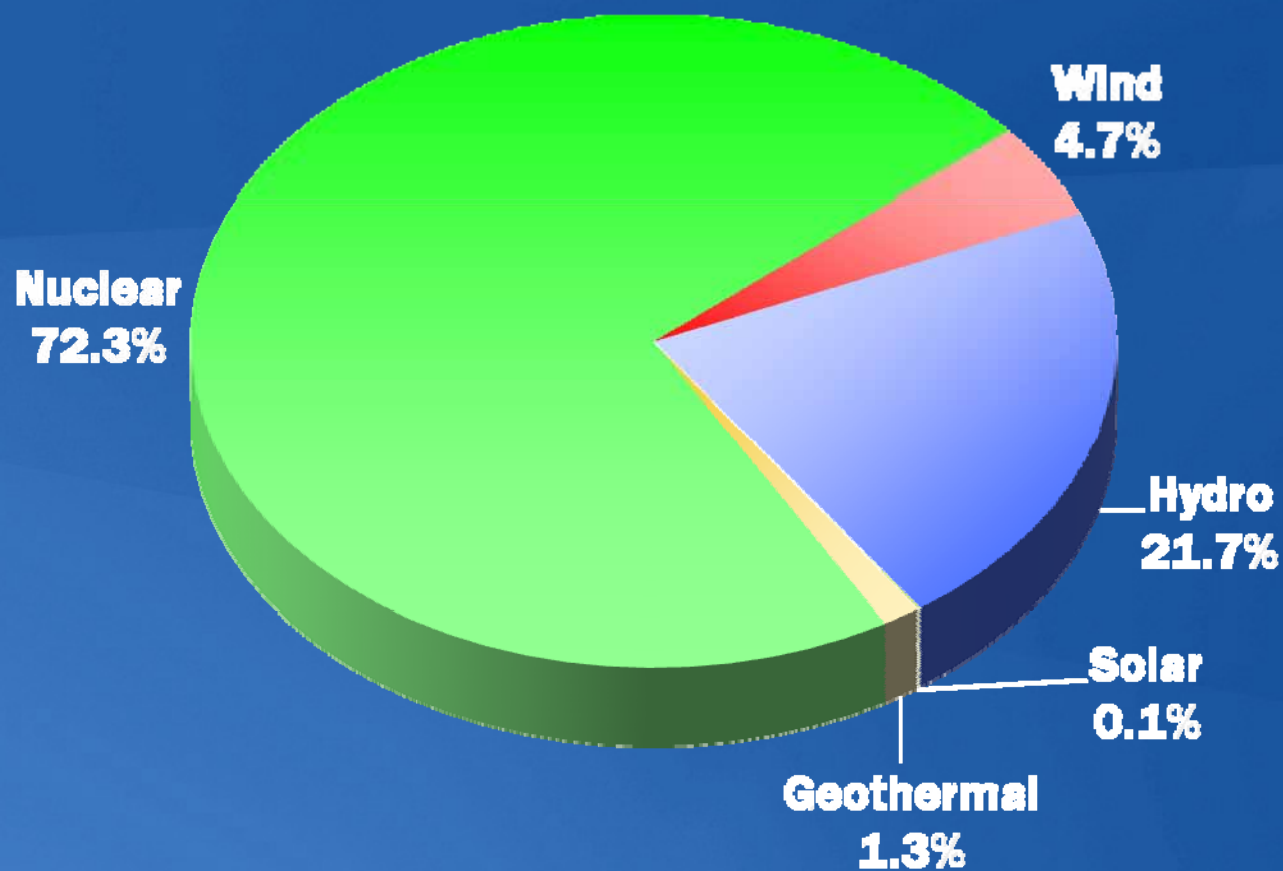
Nuclear Energy in a Carbon-Constrained World

Environmental Characteristics of Nuclear Generation



Nuclear Energy: Largest Source Of Carbon-Free Electricity in U.S.

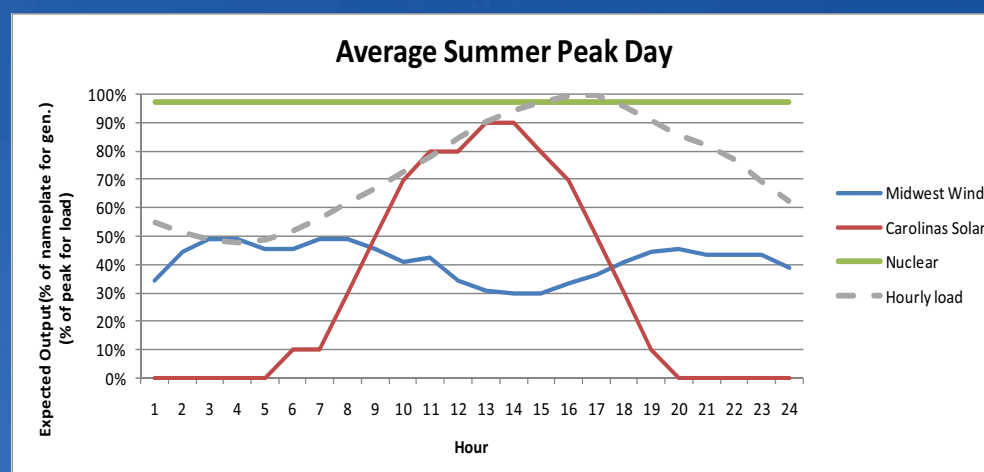
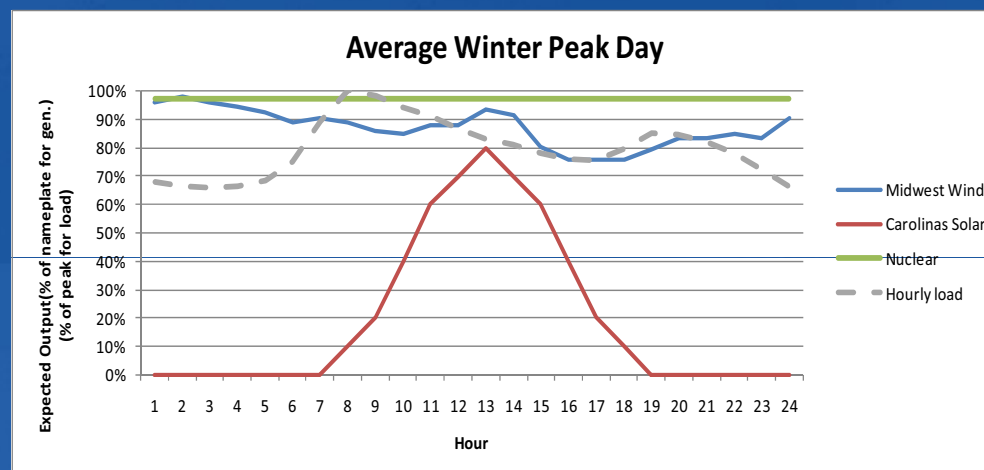
2008



Source: Energy Information Administration

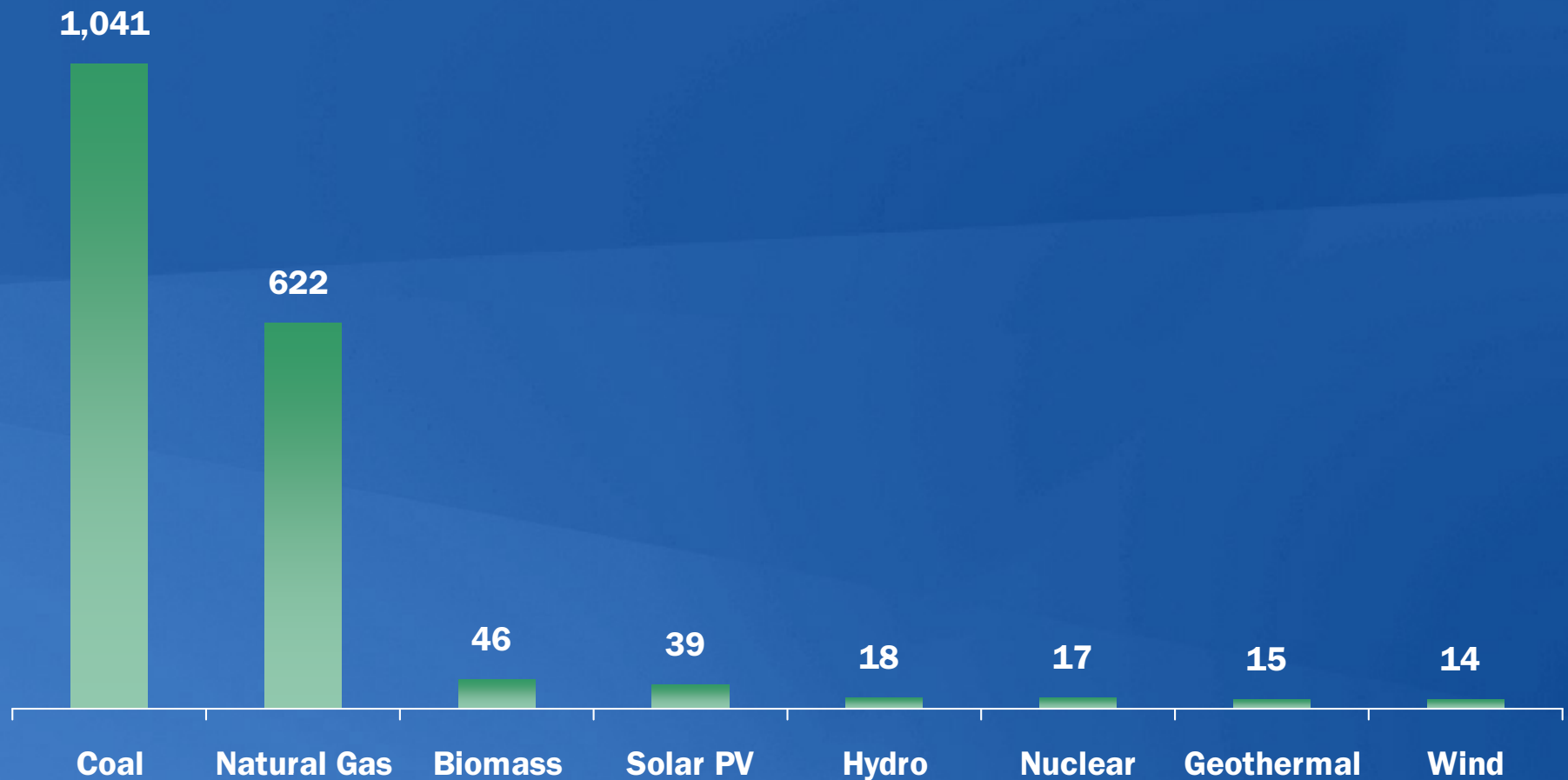
Baseload Nuclear Energy Essential To Meet Peak Electricity Demand

- Renewable resources are highly variable day-to-day and hour-to-hour.
- Reliable generating capacity with a renewable energy-dependent portfolio requires supplemental investments:
 - Energy storage technology
 - Backup gas capacity
 - Demand-side peak-shaving and load-shifting systems
- Nuclear energy essential for:
 - Countering the variability of renewable sources
 - Ensuring that power is available to meet peak demand



Nuclear and Renewables: Comparable Life-Cycle Emissions

Tons of Carbon Dioxide Equivalent per Gigawatt-Hour



Source: "Life-Cycle Assessment of Electricity Generation Systems and Applications for Climate Change Policy Analysis," Paul J. Meier, University of Wisconsin-Madison, August 2002.

New Nuclear Power Plants Necessary To Meet Waxman-Markey CO₂ Goals

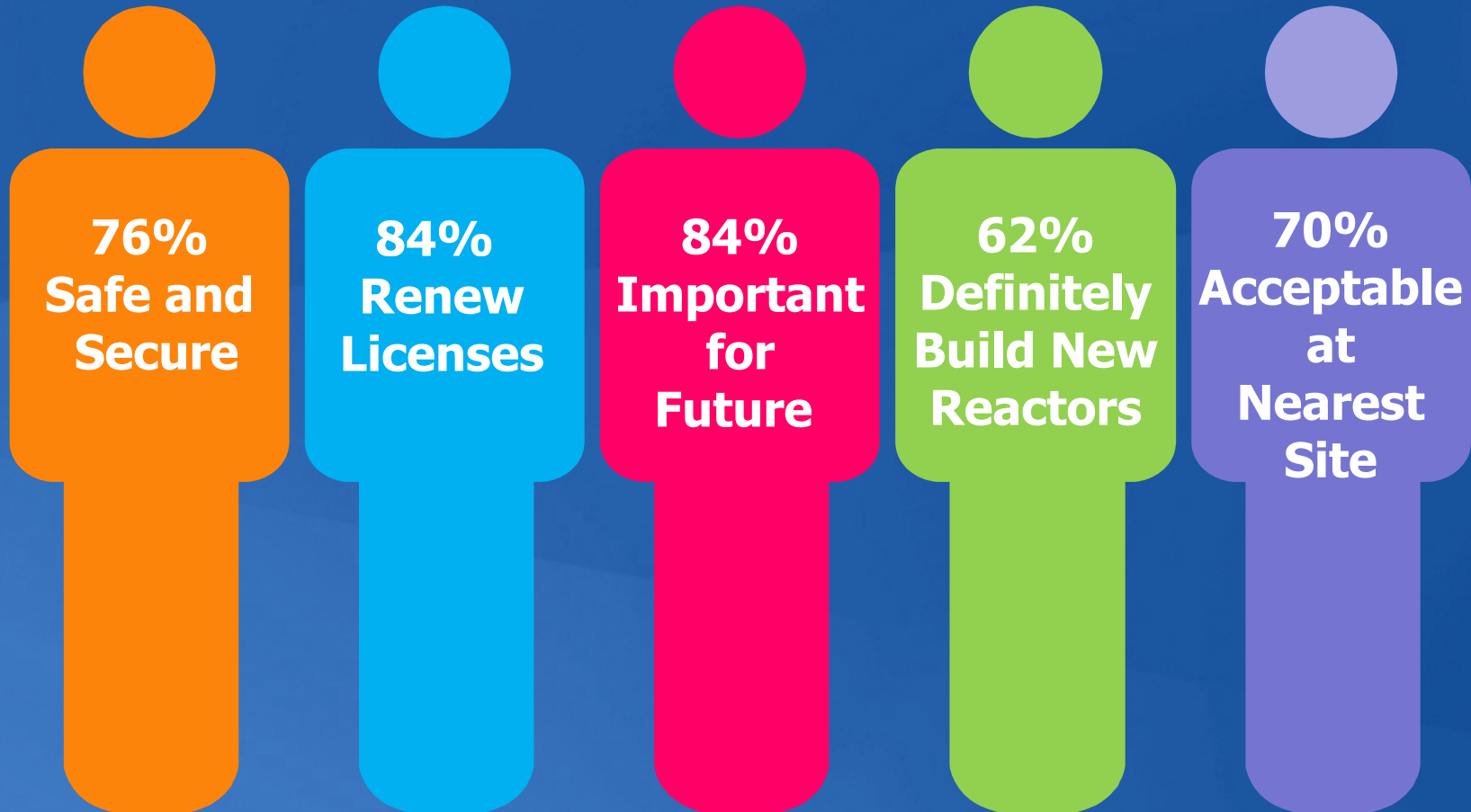
		2030	2040	2050
	Output (billion kWh)	1,154 1,257	1,758	2,081
Assumes all existing U.S. nuclear power plants continue to operate	Number of New Plants	31 - 41	86	108
Assumes all U.S. nuclear power plants retire after 60 years	Number of New Plants	34 - 44	121	187



Public Opinion on Nuclear Energy

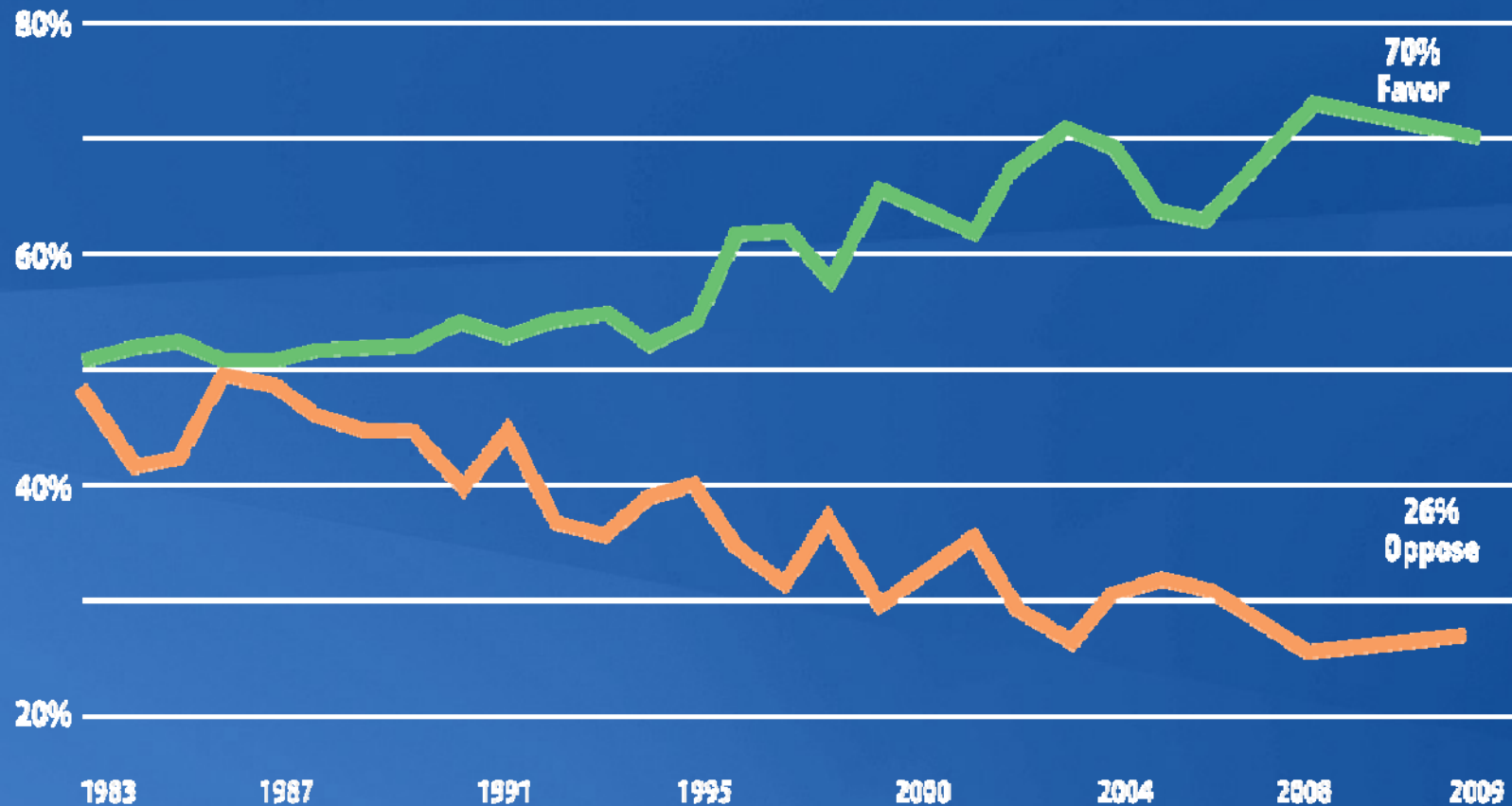


Public Support for Nuclear Energy



Source: Bisconti Research Inc.
March 2009 poll of 1,000 U.S. adults; margin of error is +/- 3%

Steady Growth in Public Favorability of Nuclear Energy



Source: Bisconti Research Inc.

Energy Policy Low Among Public's Most Important Issues

- "Which of the following is the most important issue facing the country today?"

	(Percent)
The economy	51
The federal budget deficit	14
Health care	13
The wars in Iraq and Afghanistan	8
Terrorism	5
Education	4
Energy policy	4*

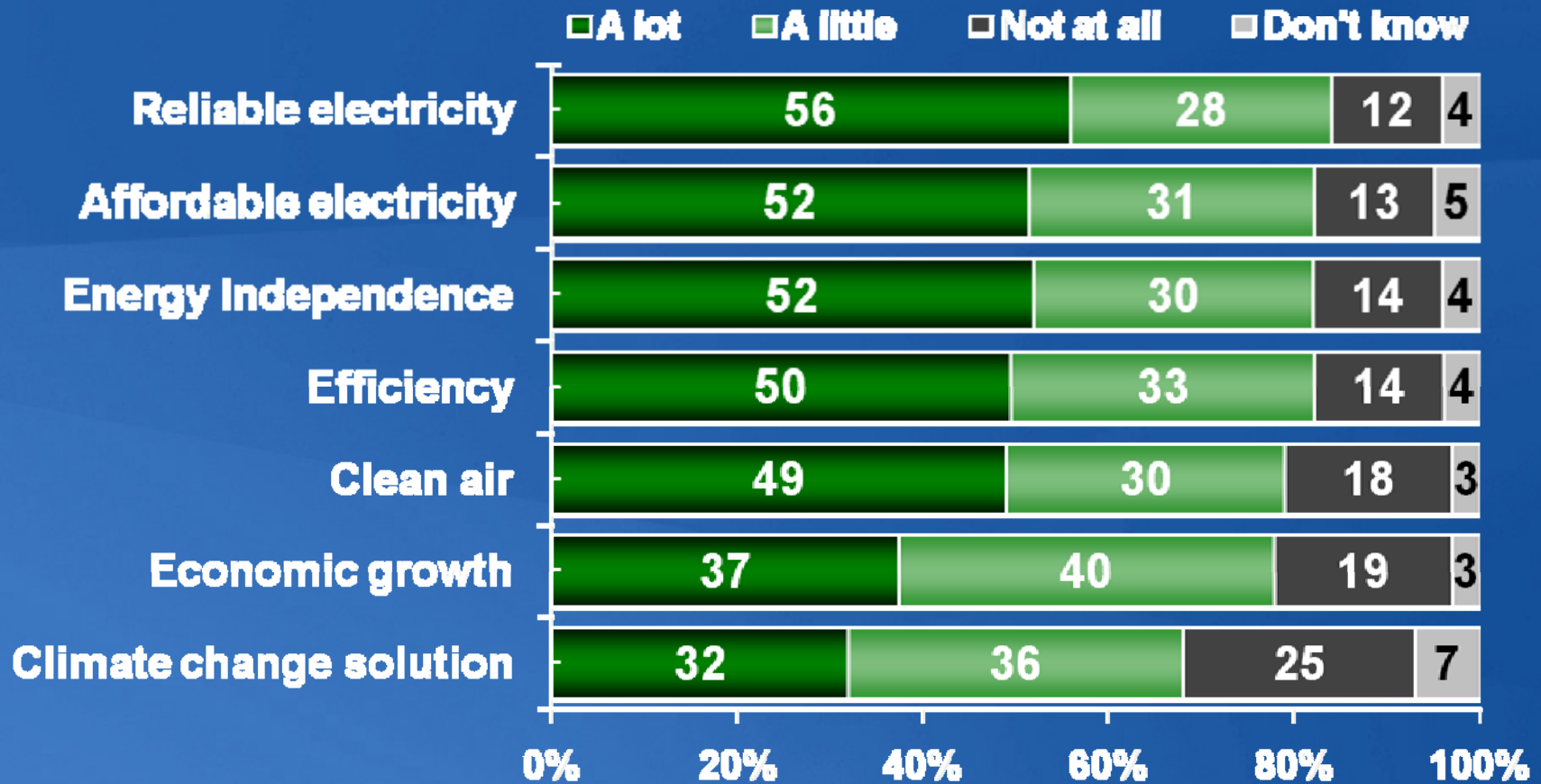
CNN/Opinion Research Corp. poll. June 26-28, 2009. 1,026 U.S. adults

* Increase from 2 percent in March 2009



High Association of Nuclear Energy With Benefits

“Do you associate nuclear energy a lot, a little, or not at all with...” (%)



Views of Nuclear Energy's Future



- **“We must harness the power of nuclear energy on behalf of our efforts to combat climate change, and to advance opportunity for all people.” — President Obama**



- **“My message to you is a simple one: Nuclear energy is part of the solution.”— House Majority Leader Steny Hoyer**

- **“The sober warning is that if more is not done, nuclear power will diminish as a practical and timely option for deployment at a scale that would constitute a material contribution to climate change risk mitigation.”
— 2009 Update of MIT Future of Nuclear Power Study**



Senator Boxer on Nuclear Energy



Sen. Barbara Boxer

- **Sen. Boxer to Sen. Alexander: “ You are suggesting a command and control: We order you to build 100 nuclear power plants. \$700 billion cost to the ratepayers. No tax credits for them whatsoever. ... All I’m saying is, it is our belief that, if we do this right, we’re going to have those plants built – more plants than you want – and believe me, I’m not the biggest fan of nuclear energy. I believe it has to be part of the solution.” – July 14, 2009**



Sen. Lamar Alexander