Energy for a Predictable Future

-the case for new nuclear power capacity and the environment-

by
Dr. Nils J. Diaz
Managing Director, The ND2 Group

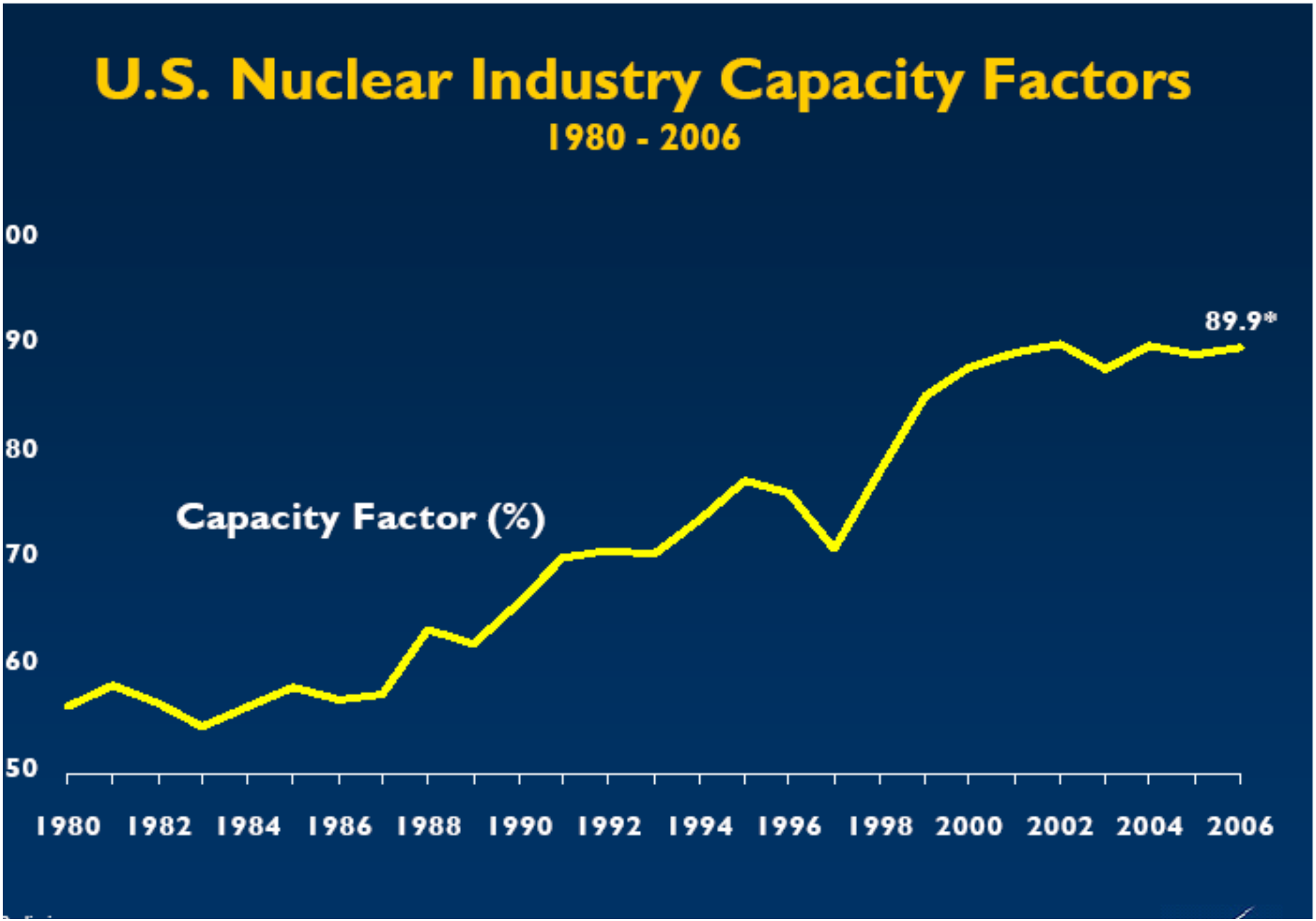
Progress Energy Lecture Series
University of South Florida, St. Petersburg
February 26, 2008

Major Existing Developments Supporting US Deployment of New Nuclear Generation

- A mature nuclear industry, with a strong and sustained record of safe, reliable and economic electrical generation
- A mature nuclear regulator, with the capability to discharge its licensing authority with predictable safety, security and schedule
- Advanced, standardized reactor technologies and proven construction techniques for schedule and cost control
- Safe and secure used fuel management, with new strategic direction for comprehensive resolution of fuel recycling and final disposal of radioactive wastes
- Multiple favorable factors, including regional and global environmental issues, public and political support, long term reliability and cost of electrical supply

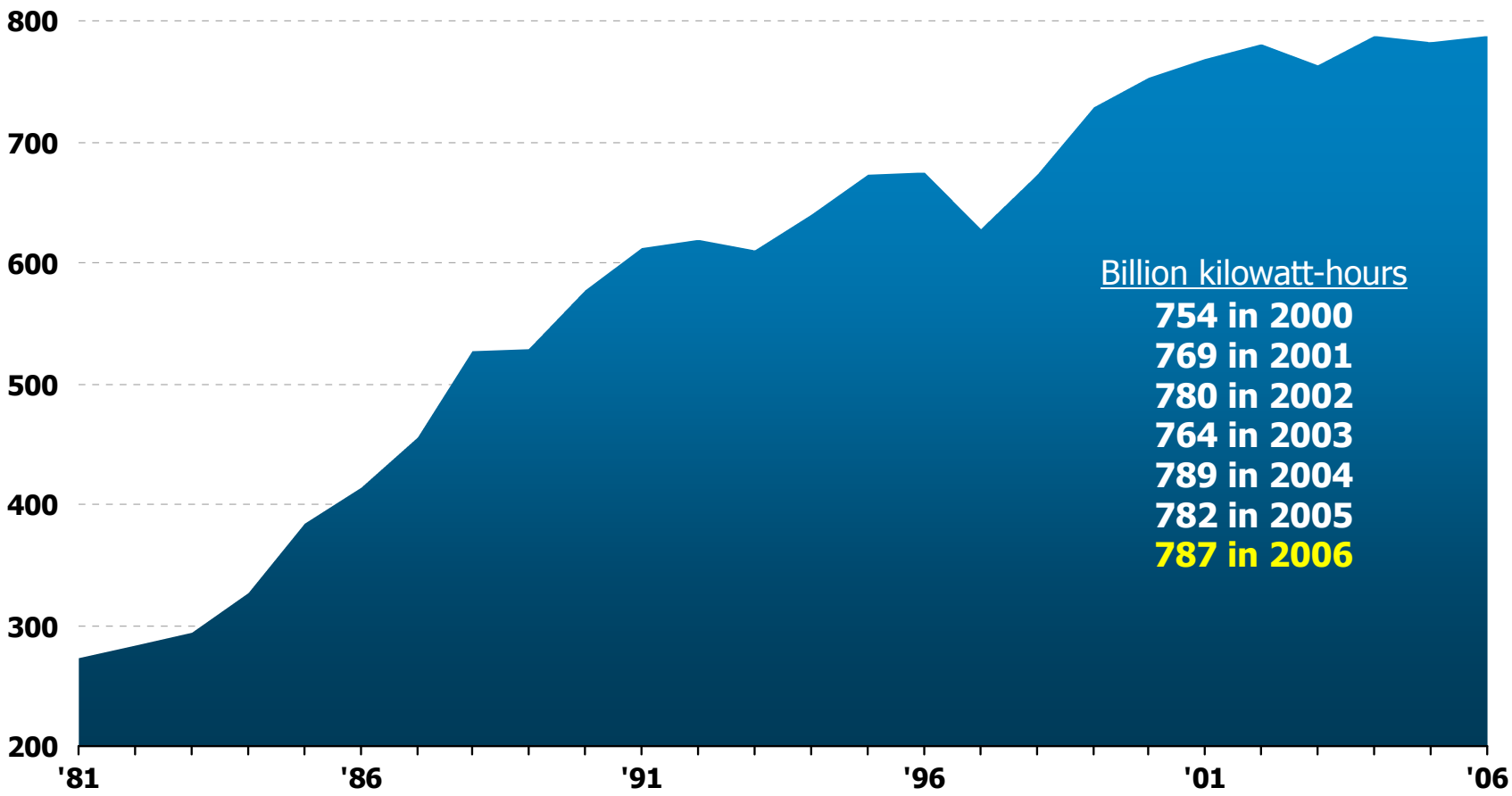
2008 U.S. NUCLEAR ELECTRICAL GENERATION

- 104 Operating Reactors in 30 States. Last Construction Permit in ‘78, last Operating License in “96.
- Combined record of more than 2615 reactor years of safe and secure operation. Provided about 16,000 Billion kw-hrs of emission-free energy since 1980.
- Large, reliable base-load power generation, 60 years licensed ops.
- Provides diversification to energy portfolio w/o air pollutants or carbon dioxide emissions during operation.
- Reliable, economical fuel supply independent of fossil fuel market.
- Stable and low production costs.
- Mature technology and industry with proven operational safety record
- Emerging need for new nuclear capacity; volatility in gas prices and environmental concerns support business case for new nuclear.
- 40 years plus of commercial nuclear power operations without a harmful radioactive release to the public


U.S. Nuclear Industry Capacity Factors
1980 - 2006
00
90
80
70
60
50
Capacity Factor (%)
89.9*
1980 1982 1984 1986 1988 1990 1992 1994 1996 1998 2000 2002 2004 2006

Output Near Record Levels

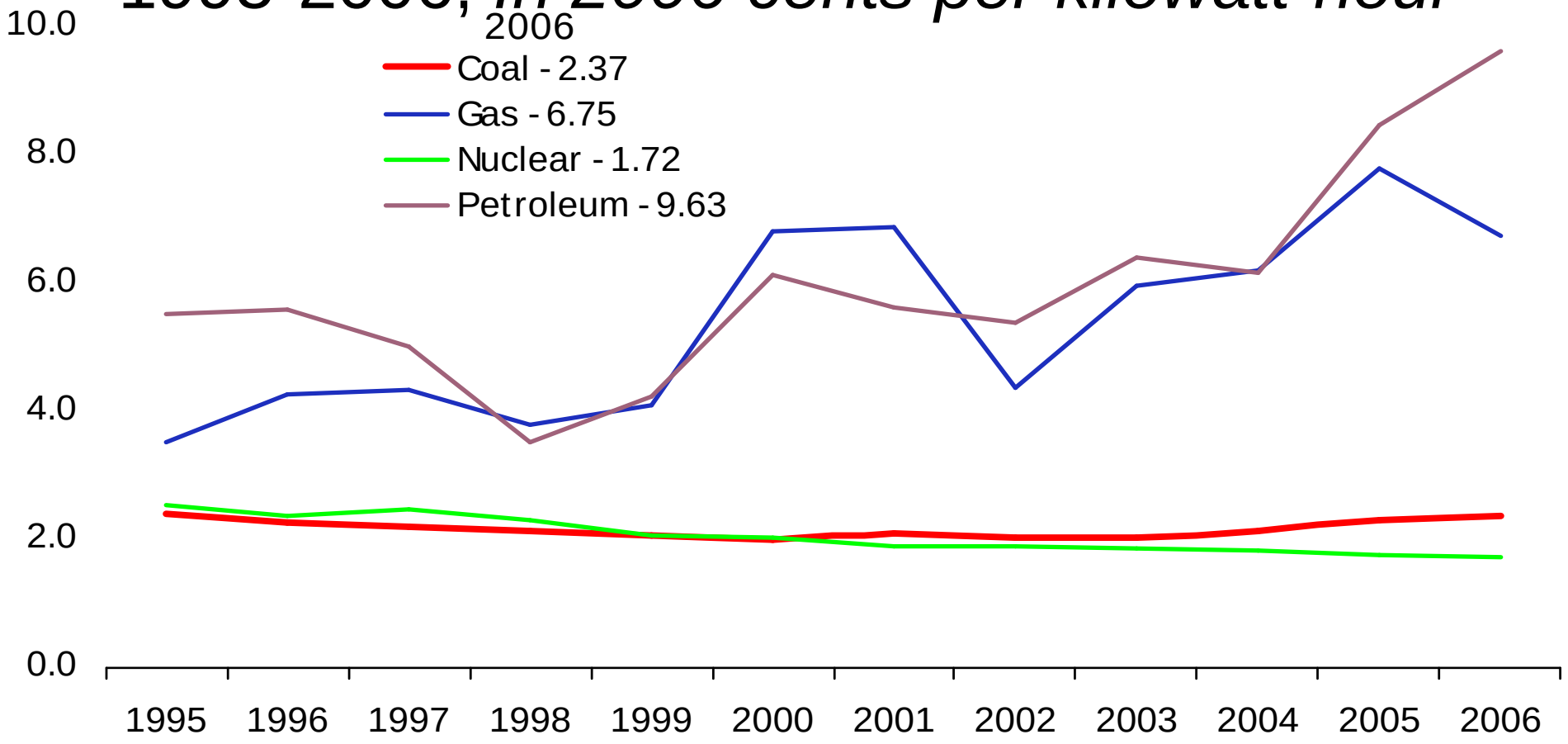
U.S. Nuclear Generation, B-kWh



Source: Global Energy Decisions / Energy Information Administration

U.S. Electricity Production Costs

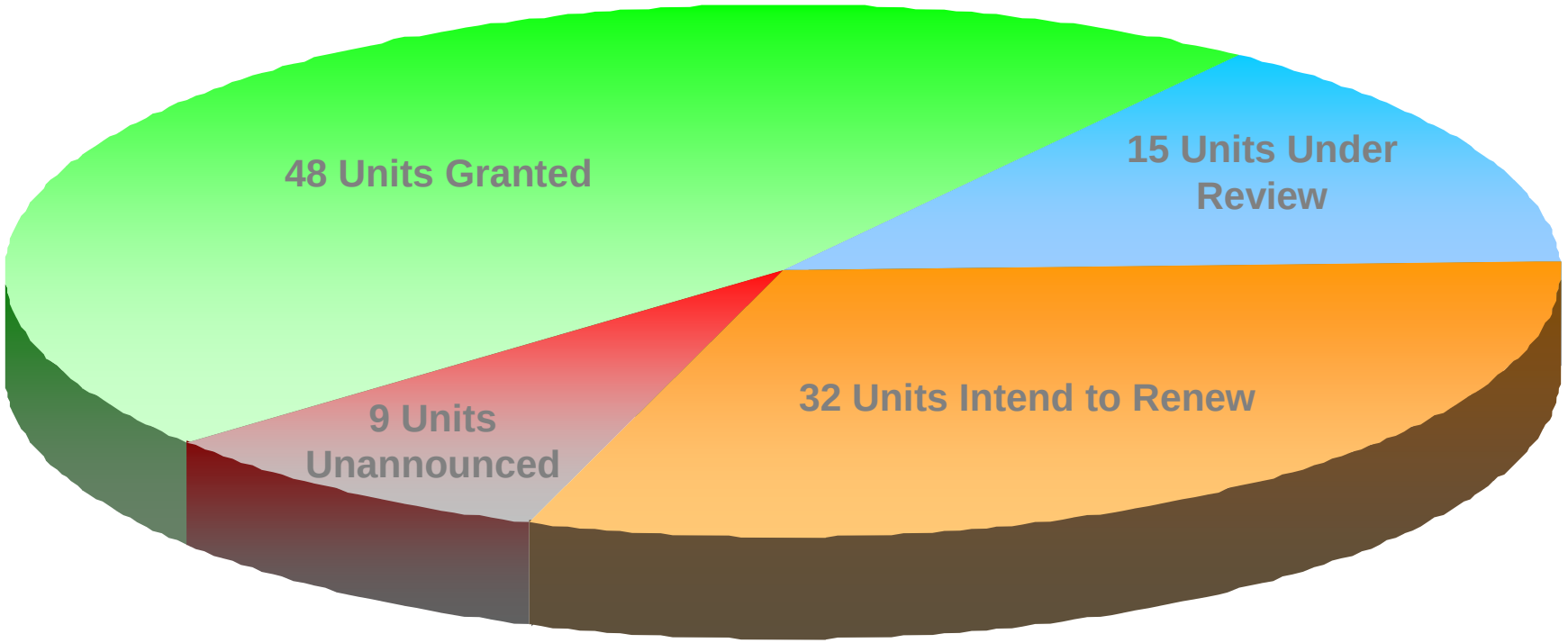
1995-2006, *In 2006 cents per kilowatt-hour*



Production Costs = Operations and Maintenance Costs + Fuel Costs

Source: Global Energy Decisions
Updated: 6/07

Applications for License Renewal

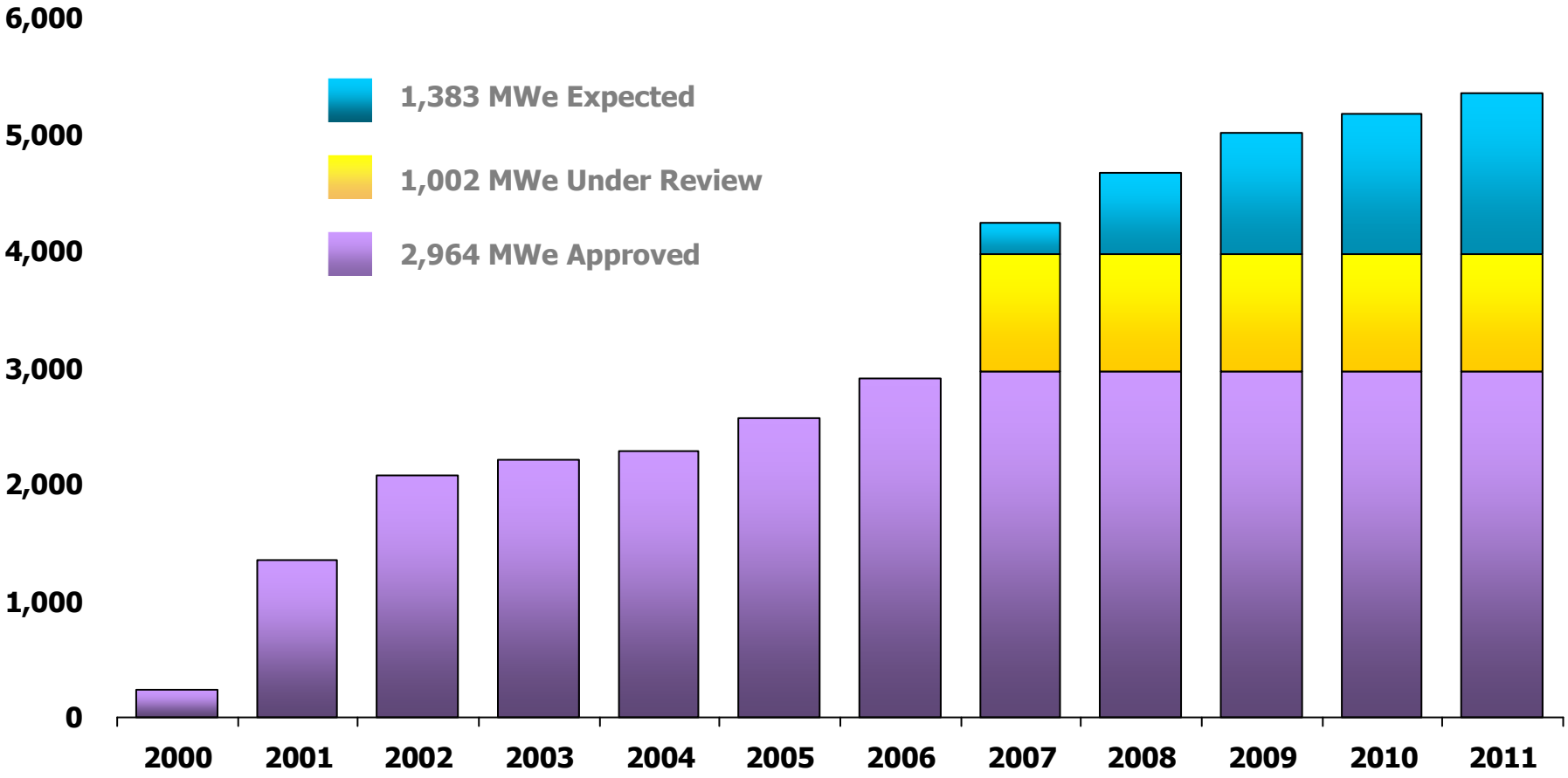


Source: Nuclear Regulatory Commission

Updated: 1/08

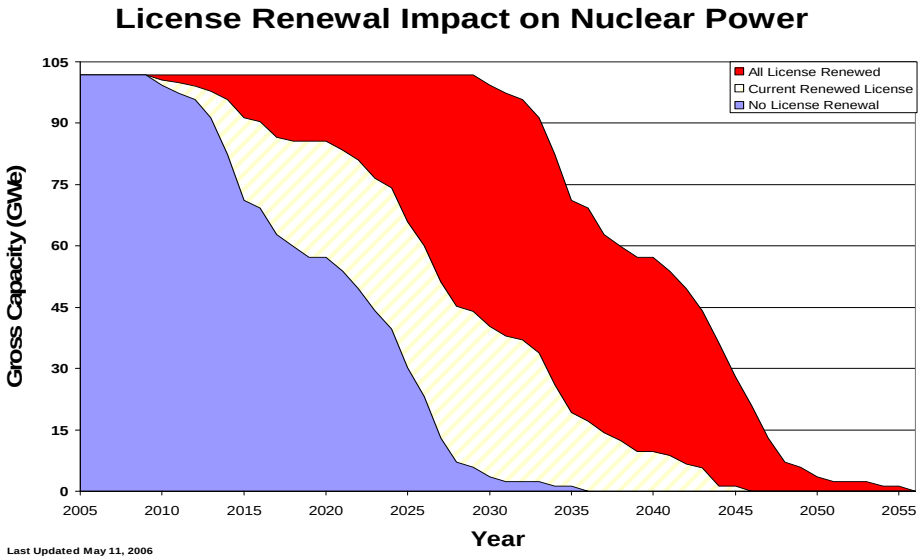
U.S. Nuclear Plants

Cumulative Capacity Additions at Existing Plants 2000-2011



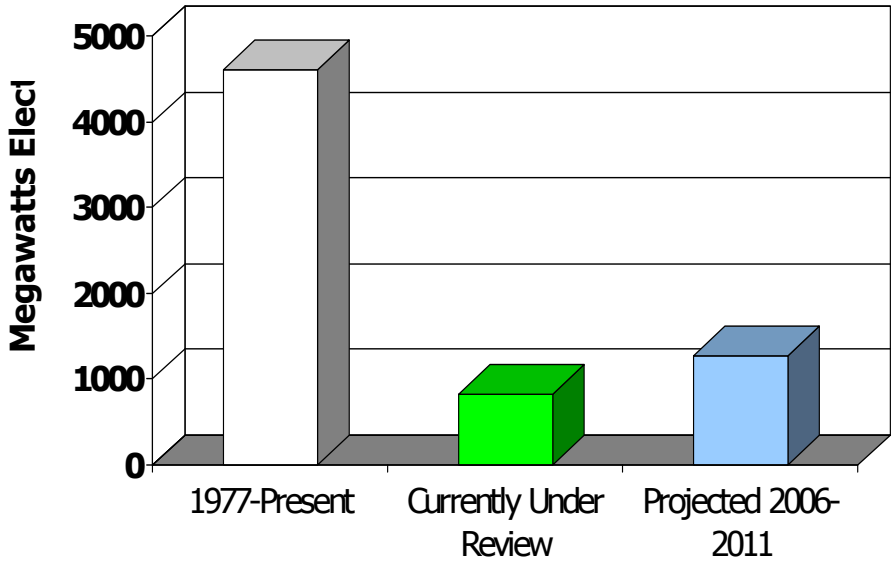
Source: Nuclear Regulatory Commission

USA License Renewals and Power Uprates



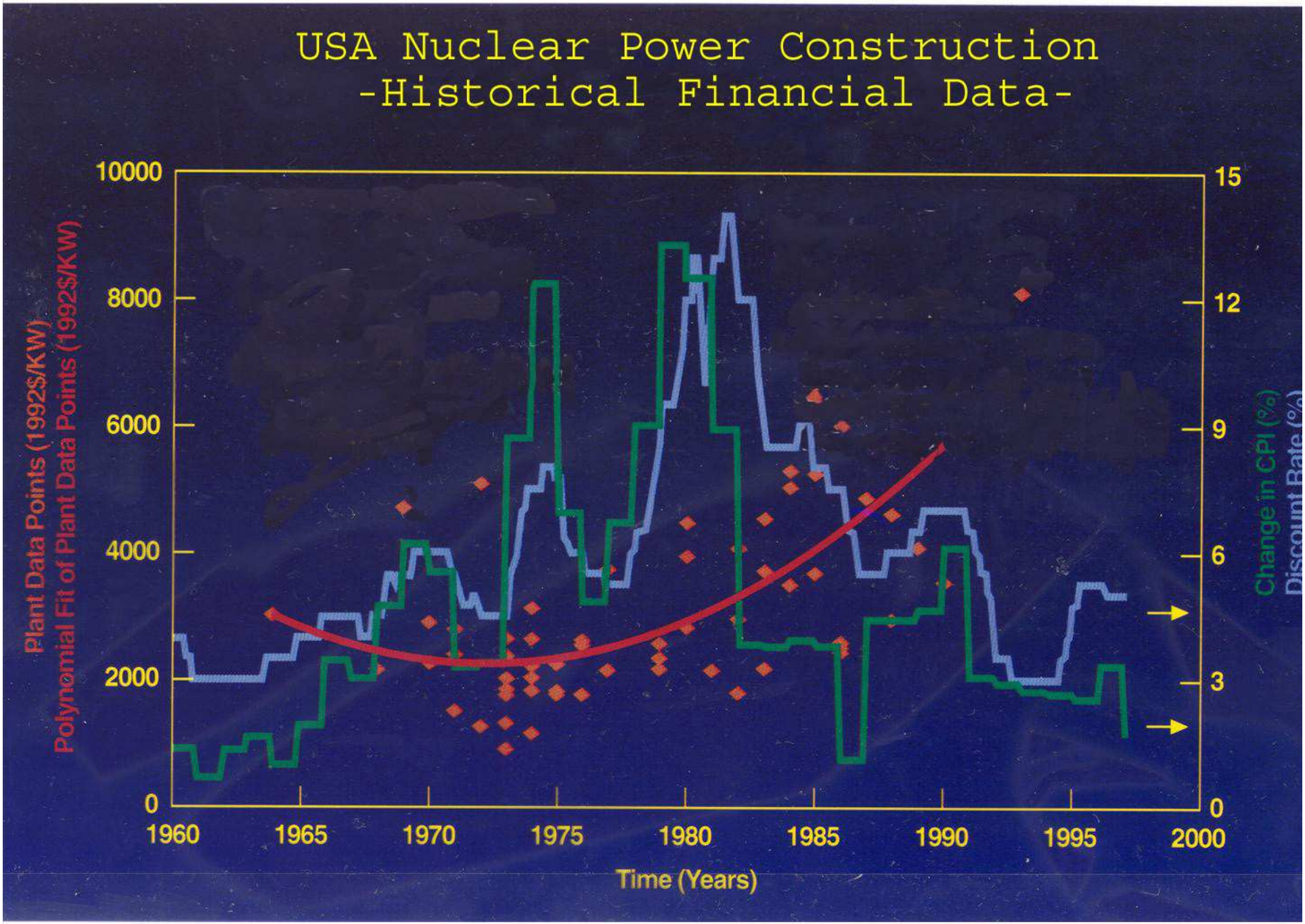
- 48 licenses renewed
- Equivalent to 840 reactor years

- 110 power uprates approved
- Added about 4600 MWe
- Equivalent to more than 4 new reactors



But, poor memories of last growth cycle…….
1970-1985

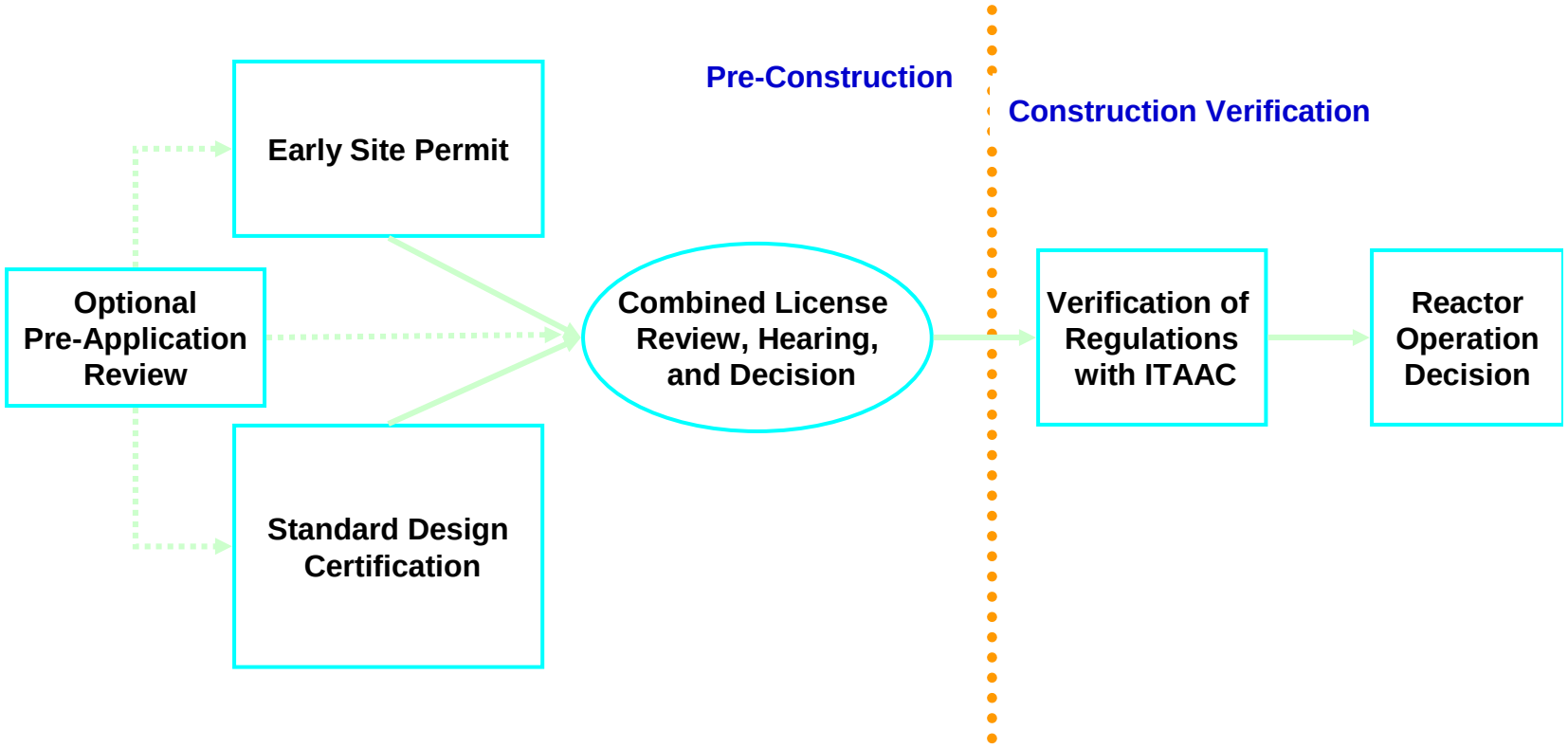
- Evolving technology
- Design as you build practices
- Changing regulatory standards
- No design standardization
- Two step licensing, with multiple opportunities for intervention
- Negative impact of cost escalation, with double digit inflation and interest rates
- Impact of Three Mile Island (TMI): 54 reactors constructed in 5.4 years aver. prior to, and 50 reactors in 11.2 years after TMI
- Many reactor projects cancelled
- Lack of sustained fleet operation at high capacity until early 1990's
- Large uncertainty for financial investments


USA Nuclear Power Construction
-Historical Financial Data-
Plant Data Points (1992$/KW)
Polynomial Fit of Plant Data Points (1992$/KW)
Change in CPI (%)
Discount Rate (%)
10000
8000
6000
4000
2000
0
15
12
9
6
3
0
1960
1965
1970
1975
1980
1985
1990
1995
2000
Time (Years)

2008 Nuclear Power Deployment Factors

- Interest rates and inflation are low and have been low for many years
- Electrical demand is increasing and base load generation is needed
- Socio-political climate and public confidence are good and improving
- Technical maturity is high and proven, supported by reliable operations
- Licensing and regulatory framework are predictable and effective
- Safety and security are good and proven
- Importance to national security, energy security and economy are high
- Environmental performance is sound and environmental expectations of favorable impact on global warming are high
- Financial risk due to high initial capital cost needs more predictability
- Production costs balance high capital costs, and make nuclear generation competitive

New NRC One-Step Licensing Processes



- ***Licensing decisions finalized before major construction begins***
- ***Utilities would order plants when regulatory/financial risks are reduced***
- ***Limited work may be authorized before COL issuance***

Standard Advanced Reactors, Construction Technology and Management

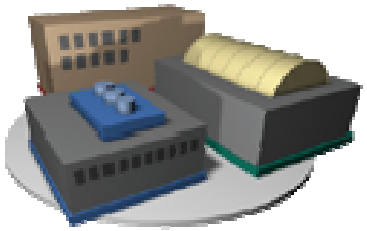
- New reactors are safer, simpler, more secure and easier to operate and maintain
- New technologies encompass state of the art design, risk-analysis, materials, modular construction and supply chain management
- Plant fully designed before construction begins
- Experience with foreign reactor construction is being integrated with US operating experience, life extension, power uprates and security improvements
- Federal and State licensing working together should enable sound decision-making from nuclear reactor vendors and utilities

CLOSING THE NUCLEAR FUEL CYCLE

- A viable and credible permanent solution to closing the nuclear fuel cycle is needed, but is not needed immediately, and therefore, it must not be a prerequisite for the growth of nuclear power.
- Commercial used or spent fuels have been and are safely and securely stored, and safely transported, as needed.
- The safe and secured disposition of used/spent fuels and high level radioactive wastes is not strongly coupled with the safety, operability or economics of nuclear power plants.
- A more global framework for stable fuel supply, processing of used fuels and ultimate disposal of wastes, with non-proliferation safeguards, is needed and should be develop. The US is developing such a program, including the new technologies for closing the fuel cycle.

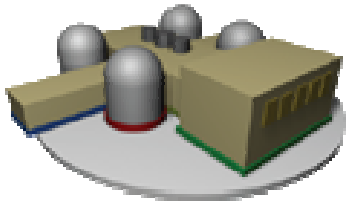
Used Fuel Management: New Strategic Direction

Used Fuel



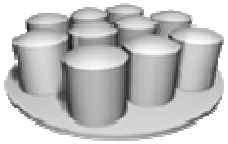
Used Fuel Recycling, Interim Storage

Recycled Nuclear Fuel



Advanced Recycling Reactors

Nuclear Waste

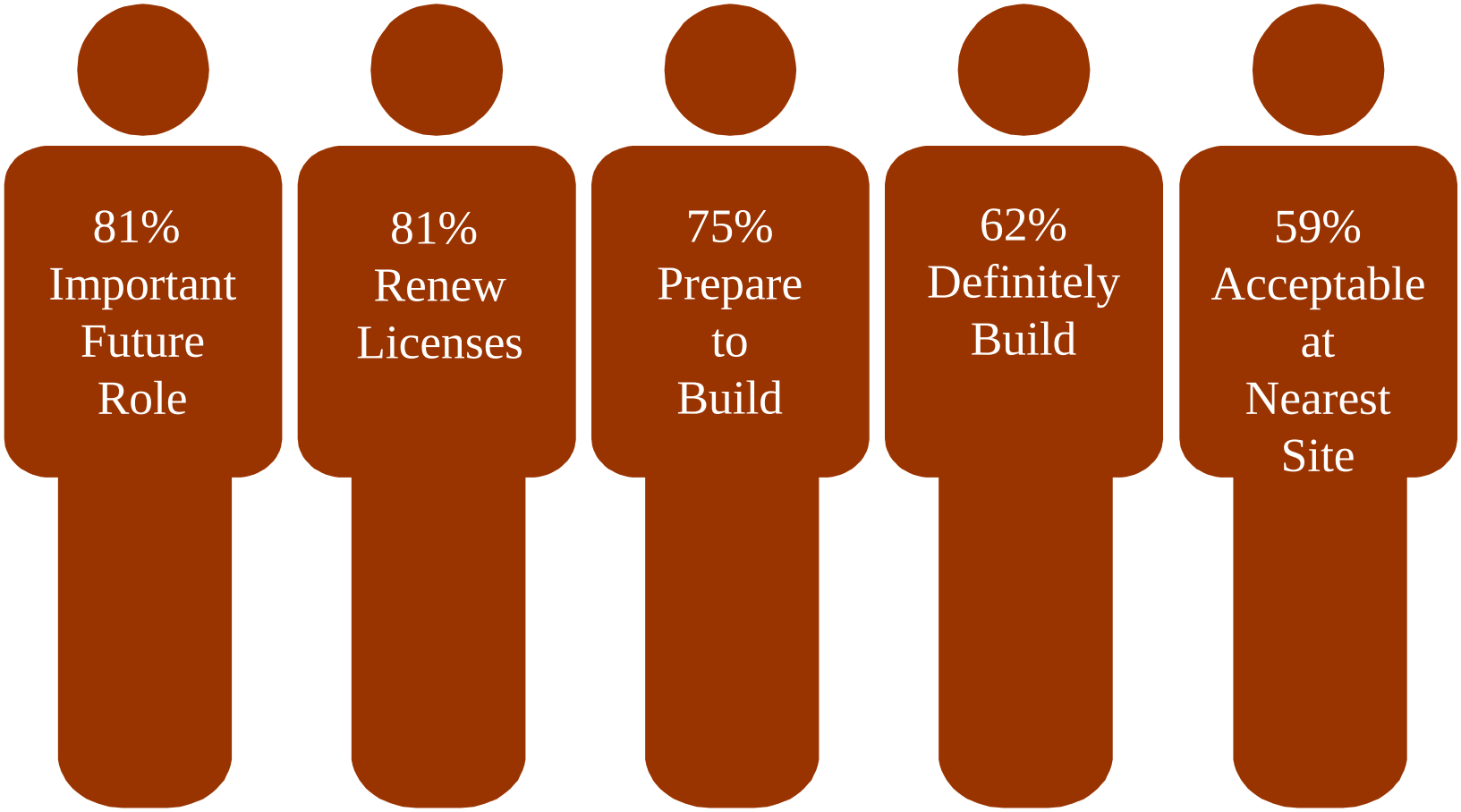


Yucca Mountain

Environmental Stewardship

- The environmental footprint of nuclear power plants is small and strict Federal and State controls ensure protection of the environment
- The carbon footprint for a nuclear power plant is small. The International Energy Agency found that nuclear power's life-cycle emissions, which do not generate green house gases during operation, are in the same range as hydroelectric plants, generally lower than wind and photovoltaic, and much lower than coal and natural gas.

Strong Public Support Continues



Source: Bisconti Research Inc.

October 2007 poll of 1,000 U.S. adults; margin of error is +/- 3%

Summary Conclusions

- Many major predictability components are favorable to the deployment of new nuclear power plants.
- Licensing processes are placing the risk at the front end, prior to construction and the major financial investments.
- Need to continue to promote political support and to address public perceptions.
- High initial capital cost needs to be considered in the full context of plant life generation costs, and the added value of fuel diversification and stable kw-hr price to the economy.
- Carbon taxation is favorable to renewables and nuclear.
- Large capacity, fission-powered generation should be added to the nation’s energy portfolio for the security, long term economic benefits, sound environmental stewardship and the well-being of our people