

STANDARDIZATION CONTROLS THE FUTURE OF NUCLEAR POWER

Rob Zuppert

CMGT-564

July 25, 2007



Agenda

- ▣ Why are nuclear power standards important?
- ▣ History of nuclear power
- ▣ Early NRC licensing process
- ▣ Need for standardization
- ▣ Standardization of licensing
- ▣ Recommendations
- ▣ Conclusion
- ▣ Questions



Worldwide Operating Nuclear Power Plants



Why are Standards important to Nuclear Power?

- ▣ Nuclear power industry lacked standards
 - Application process
 - Equipment
 - Processes
 - Procedures
 - Training
- ▣ Reactors were being built without approved applications
- ▣ Standards development process was being performed in parallel with the licensing process
- ▣ Each nuclear power plant was unique
 - NRC was faced with detailed issues for each plant



History of Nuclear Power



- ▣ Accidents
 - 1979 - TMI
 - 1986 - Chernobyl
- ▣ 20% of all US electricity is from nuclear power
 - 78% of France's power is nuclear
- ▣ After TMI, 35 plants stopped construction due to technical or political reasons
 - Most plants took 5 to 10 years to complete
- ▣ Watts Bar Unit 2 (1997)
 - Last plant to be started in the US
 - Began operating 23 years after construction (1974)

Early NRC licensing process

- ▣ Licensing of current plants occurred between 1960s and 1970s
- ▣ Standardization process was developed with the emergence of the industry
- ▣ Concerns with safety features were not addressed until construction was complete
 - ▣ *Restricted public involvement*
 - ▣ *Companies incurred significant costs*
- ▣ Lack of a formal standardized application and review process continued until 1989
 - 1992 Energy Policy Act

Early NRC licensing process

- ▣ Process
 - ▣ Submitted a preliminary safety analysis report (PSAR)
 - ▣ Received construction permit
 - ▣ Invested capital for construction
 - ▣ License of operation was possible, however not certain
 - TMI delayed all construction
 - Projects experienced delays and significant additional costs
- ▣ *If there was not a problem with the standard design, process or procedures, construction could have continued as scheduled*

Need for Nuclear Power Standardization

- ▣ History
 - NRC failed to require a standard design
 - ▣ Caused significant problems
 - Risks for each reactor design
 - Vendor selection
 - ▣ Led to significant inefficiencies
 - Schedule delays
 - Cost increases



Standardization of Licensing

- ▣ NRC licensing process
 1. Design certification
 2. Early site approval (ESA)
 3. Combined license for construction and operation (COL)

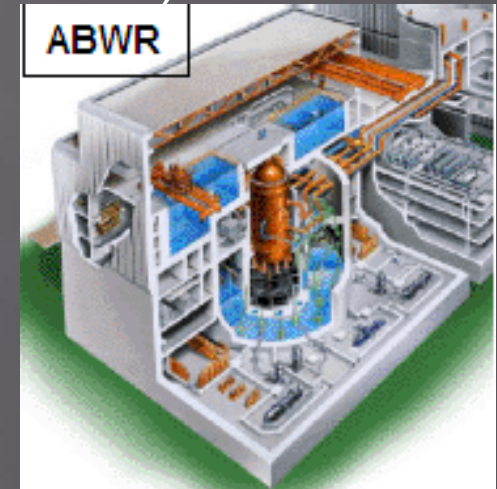


Design Certification

- ▣ NRC decides if the plant meets standard plant design (36 to 60 months)
- ▣ Standard nuclear reactor designs
 - Identifies safety concerns
 - Analyzes technical issues
 - Design is certified for 15 years
- ▣ *Benefits*
 - Reduction in costs
 - Increase in efficiency
 - Standardization of all processes and parts

Four Certified Reactor Designs

1. Advanced Boiling Water Reactor (ABWR)
 - GE Nuclear Energy
 - 1997
2. System 80+
 - Westinghouse
 - 1997
3. AP600 design
 - Westinghouse
 - 1999
4. AP1000
 - Westinghouse
 - 2006



Early Site Approval

- ▣ Gain approval for a specific site (12 to 24 months)
- ▣ Consists of:
 - Site safety analysis
 - Environmental report
 - Emergency planning
- ▣ *Benefits*
 - Reduces time required to start operation
 - Allows NRC to determine if site is suitable for the reactor design



Combined License

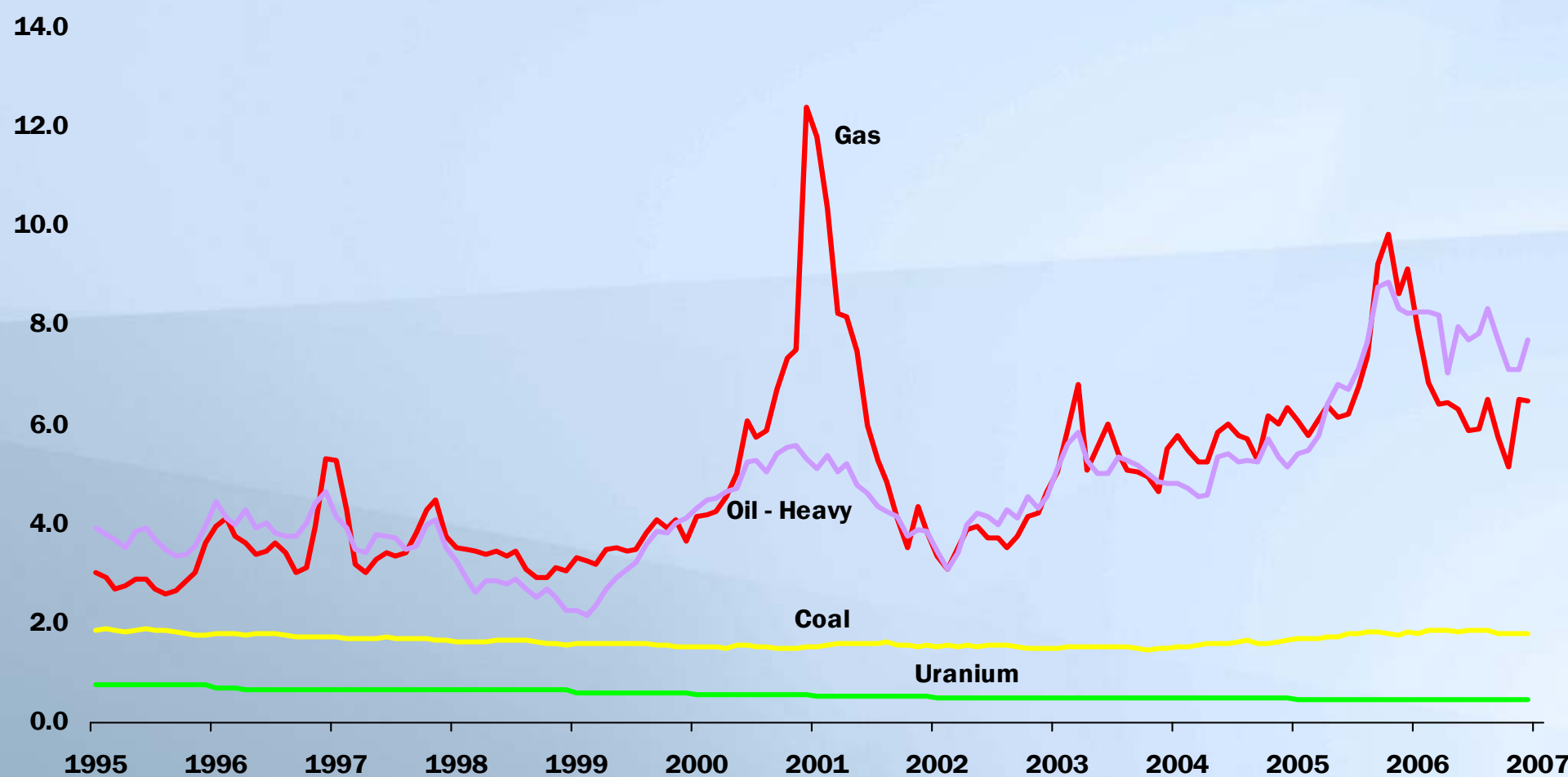
- ▣ Consists of a construction and operating license
- ▣ Focuses on:
 - Plant ownership
 - Operational programs
 - Any safety or design issues not resolved
 - ITAAC
 - ▣ Inspections, tests, analyses and acceptance
- ▣ *No company has completed the new NRC licensing process*

Recommendations

- ▣ Educate the public on the benefits and risks
- ▣ IAEA must standardize nuclear reactors worldwide
 - Gain acceptance
 - Create economies of scale
- ▣ Create forward-looking nuclear reactor designs
 - Prepare for global warming effects
 - Adaptive for the increase in terrorism
 - Increase safety standards
 - Counters the possible risk of failure that would be catastrophic to US nuclear power
 - Gain further public acceptance

Monthly Fuel Cost to U.S. Electric Utilities

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

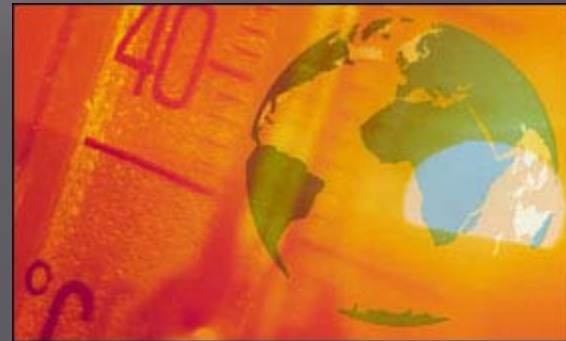


Source: Global Energy Decisions

Updated: 6/07

Further Research

- ▣ Reduction in worldwide dependency on oil
 - Political and economic impacts
- ▣ Reduction in costs of production
 - Increase in affordability by other countries
- ▣ Reduction in the production of greenhouse gases
 - Effects on global warming



Conclusion

- ▣ Standardization is the key to the future for nuclear power
- ▣ Once the process is standardized, public acceptance will follow
- ▣ NRC must adapt to change in a timely and efficient manner
- ▣ Development of standards must come first in every organization

Questions

