U.S.NRC

United States Nuclear Regulatory Commission

Protecting People and the Environment

Selected Technical Issues for Long-Term Operations

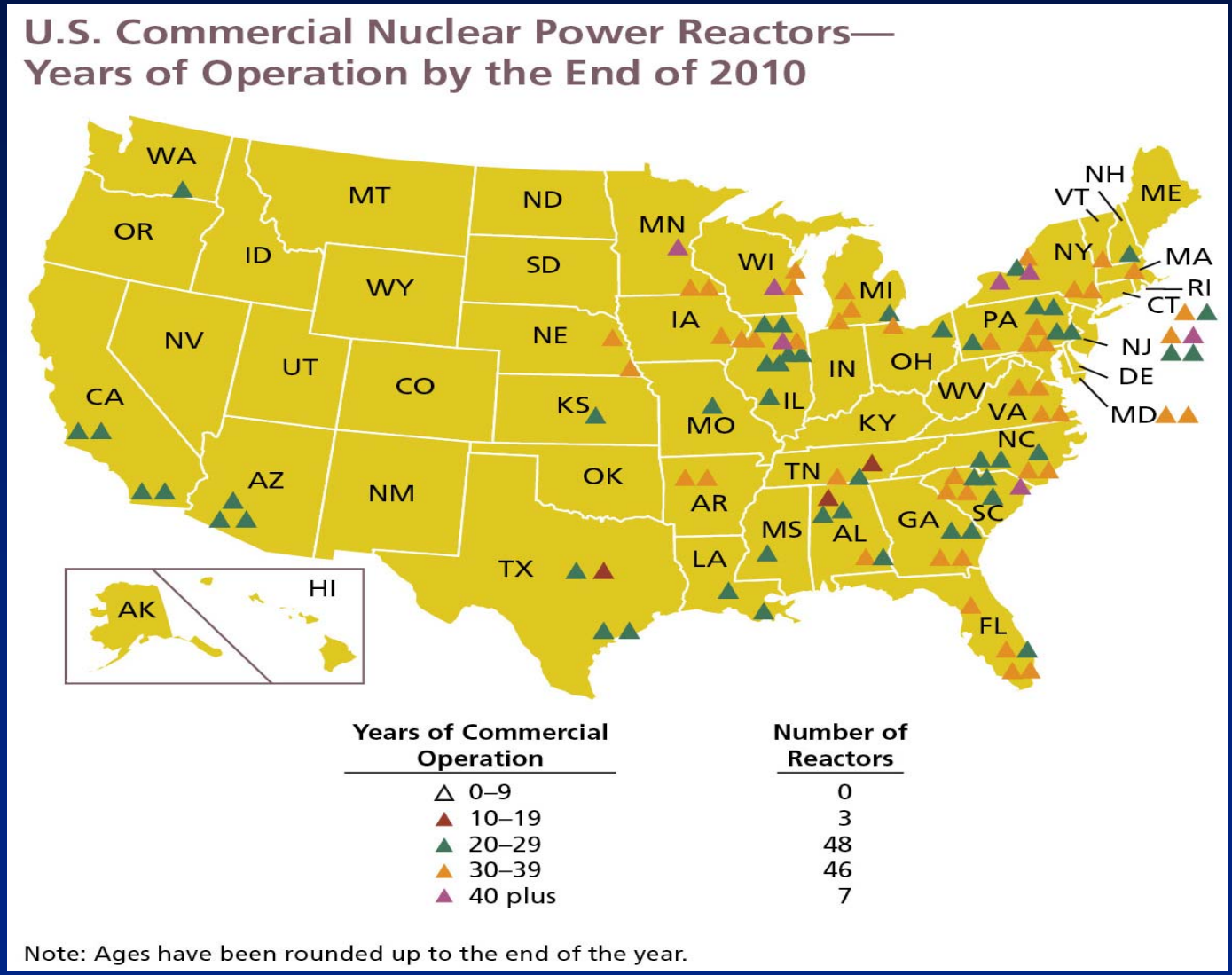
Bill Borchardt

Executive Director for Operations

January 20, 2011

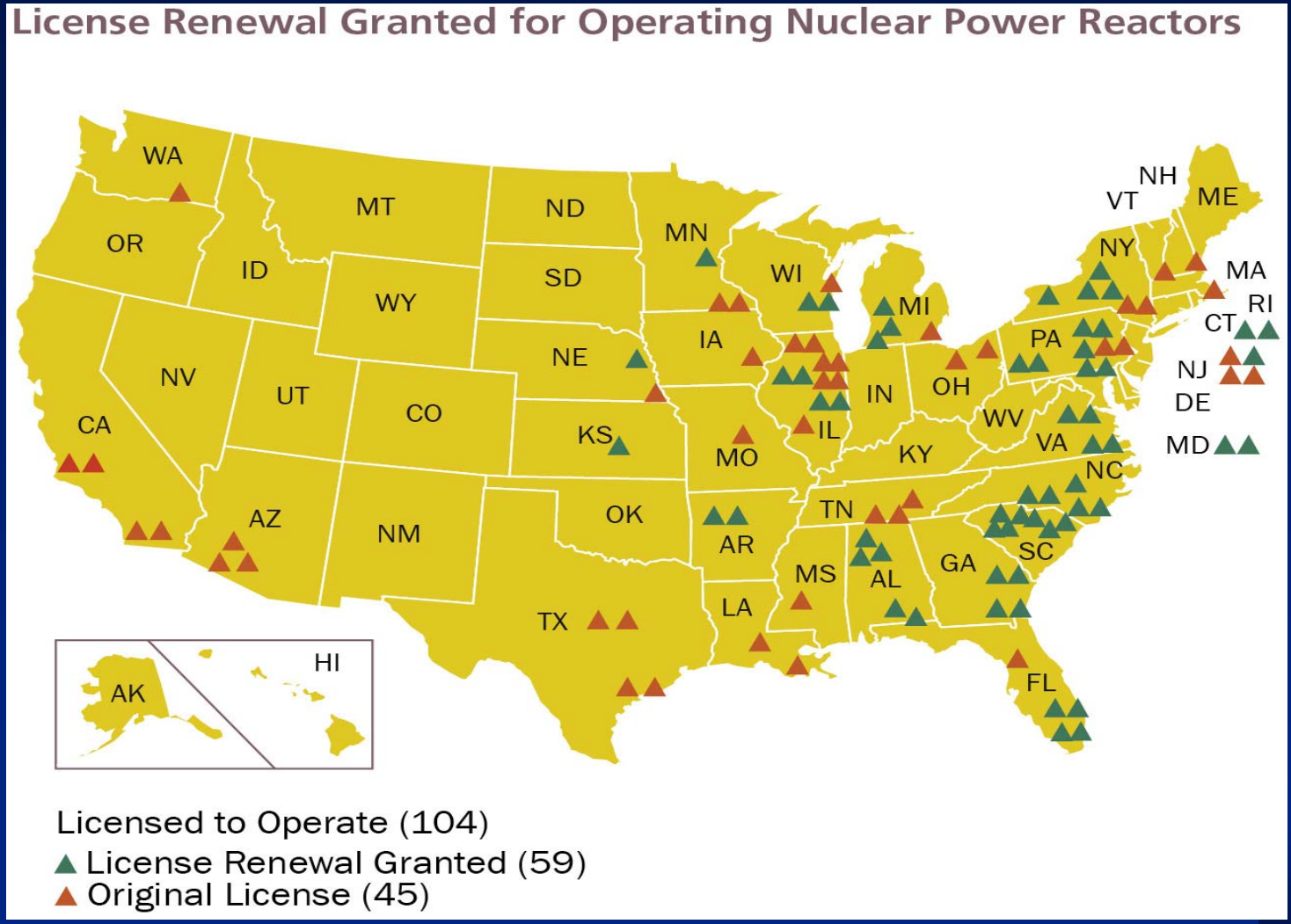
U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

Current U.S. Fleet Performance



U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

Current Status of License Renewal



U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

Selected Technical Issues in License Renewal

- Metal fatigue
- Submerged electrical cables
- Steel containment and liner plate degradation
- Neutron absorber degradation
- Refueling cavity/spent fuel pool leakage
- Buried piping

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

Metal Fatigue

- Analysis methodology could yield non-conservative results
- Potential delay in implementation of planned corrective actions to address aging
- Requiring license renewal applicants to demonstrate that their analysis results are conservative

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

Submerged Electrical Cables

- Cables not designed for continuous submerged service in electrical manholes
- Cable failure can disable safety systems
- Revised inspection procedures and program guidance to increase and expand inspection and test frequencies

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

Steel Containment and Liner Plate Degradation

- Corrosion due to water leakage or contact with wood or foreign objects
- Potential impacts on structural integrity and leak tightness
- Obtained applicant commitments for additional inspections and increased maintenance; issuing advisory to other licensees

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

Neutron Absorber Degradation

- Long-term use of neutron absorbers in spent fuel pools leads to deformation and degradation of the materials
- Potentially reduce safety margins and violate subcriticality requirement
- Developed new aging management program for neutron absorbing materials degradation

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

Refueling Cavity/Spent Fuel Pool Leakage

- Concerns regarding the impacts of historical water leakage from concrete walls and floors
- Potential effect on structural integrity and leak tightness
- Obtained commitments from license renewal applicants

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

Buried Piping

- Corrosion on soil side of piping
- Potential effects on system safety, releases of hazardous material
- Enhanced agency guidance to increase inspections and focus on key preventive measures

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

Life Beyond 60

- 2008 NRC/US Department of Energy (DOE) "life beyond 60" workshop
- Developing domestic and international partnerships to share expertise, capabilities, and resources related to aging management research
  - US DOE
  - Electric Power Research Institute (EPRI)
  - International Forum for Reactor Aging Management (IFRAM)

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

Integrated Aging Management Long-Term Research Plan

- Electric cable insulation
- Prolonged concrete exposure to high temperature and radiation
- Reactor vessel and internals

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

Electric Cable Insulation

- Cable failures worldwide increasing with plant age
- Cables provide power needed to operate equipment and transmit signals to and from the various controllers
- Research to confirm whether requirements for electrical equipment are being met through an extended period

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

Prolonged Concrete Exposure to HighTemperature and Radiation

- Prolonged exposure to elevated temperatures and radiation facilitates chemical interactions and induces strains
- Compromise concrete performance
- Research on sufficiency of current methods to evaluate effects and the effects themselves

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

Reactor Vessel and Internals

- Irradiation embrittlement of vessels and internal components
- Life-limiting factor for the reactor vessel and internals
- Compiling a comprehensive database of worldwide embrittlement information and conducting research on conditions to which reactor vessel internals are exposed

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

Summary

- We must effectively utilize operating experience to identify technical issues
- Training and knowledge management are critical
- Significant research required to address potential operation beyond 60 years