



Sandia  
National  
Laboratories

*Securing the future of Nuclear Energy*

**ELCOR**

# Advanced Nuclear Energy Safety Research

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# Technology Neutral Safety Analysis Platform



SCALE (ORNL)

## Neutronics Modeling

- Criticality
- Shielding
- Depletion analysis
- Burnup credit

MELCOR (SNL)

## Integrated Accident and Source Term Modeling

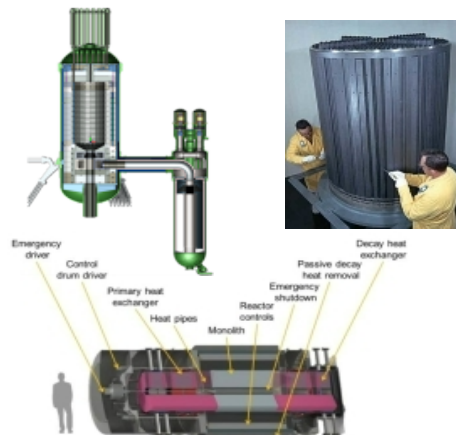
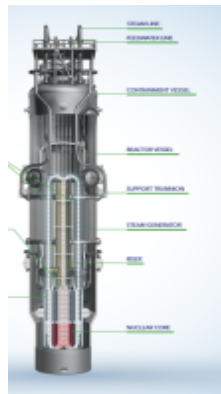
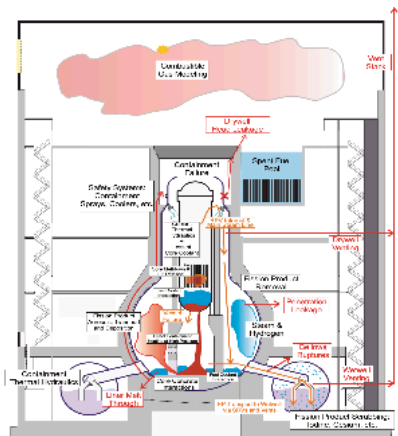
- Hydrodynamics for range of working fluids
- Accident response of plant structures, systems and components
- Generalized fission product transport modeling inside facilities

MACCS (SNL)

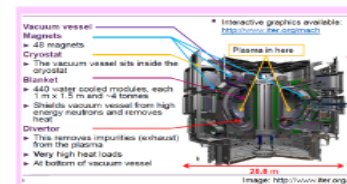
## Consequence Assessment

- Near- and far-field atmospheric transport and deposition
- Assessment of health and economic impacts of radiological accidents

## Nuclear Reactor System Applications



## Non-Reactor Applications

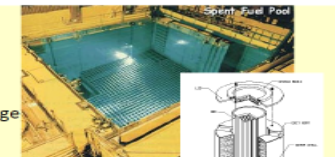


### Fusion

- Neutron Beam Injectors (LOVA)
- Li Loop LOFA transient analysis
- ITER Cryostat modeling
- Helium Lithium
- Helium Cooled Pebble Bed Test Blanket (Tritium Breeding)

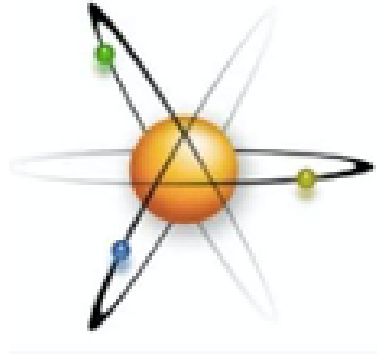
### Spent Fuel

- Spent fuel pool risk studies
- Multi-unit accidents (large area destruction)
- Dry Storage



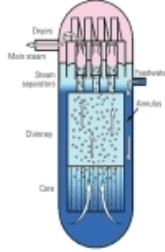
### Non-Nuclear Facilities

- Leak Path Factor Calculations (LPF)
  - Release of hazardous materials from facilities, buildings, confined spaces
- DOE Safety Toolbox code
  - DOE nuclear facility users
    - Pantex
    - Hanford
    - Los Alamos
    - Savannah River Site

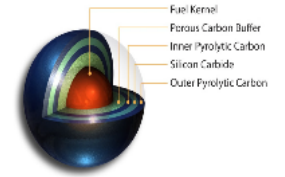


Neutronics

Thermal hydraulics



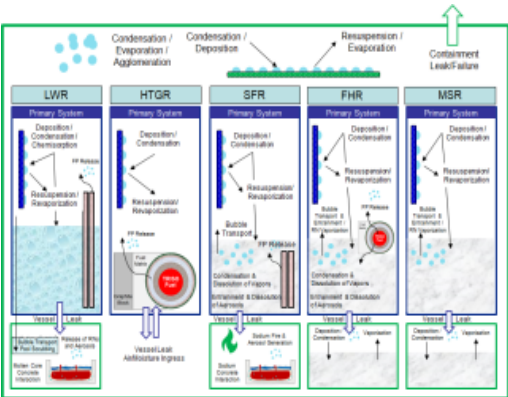
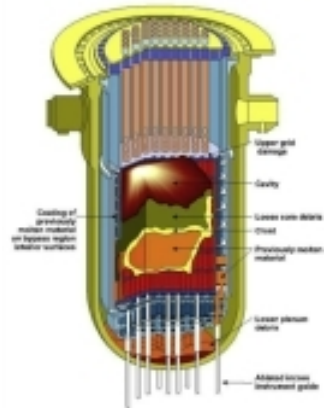
Fuel thermal-mechanical response



Fission product release and transport

Ex-vessel damage progression

Core degradation





# International Nuclear Safety

## International Collaboration

Cooperative Severe Accident Research Program (CSARP) – June/U.S.A

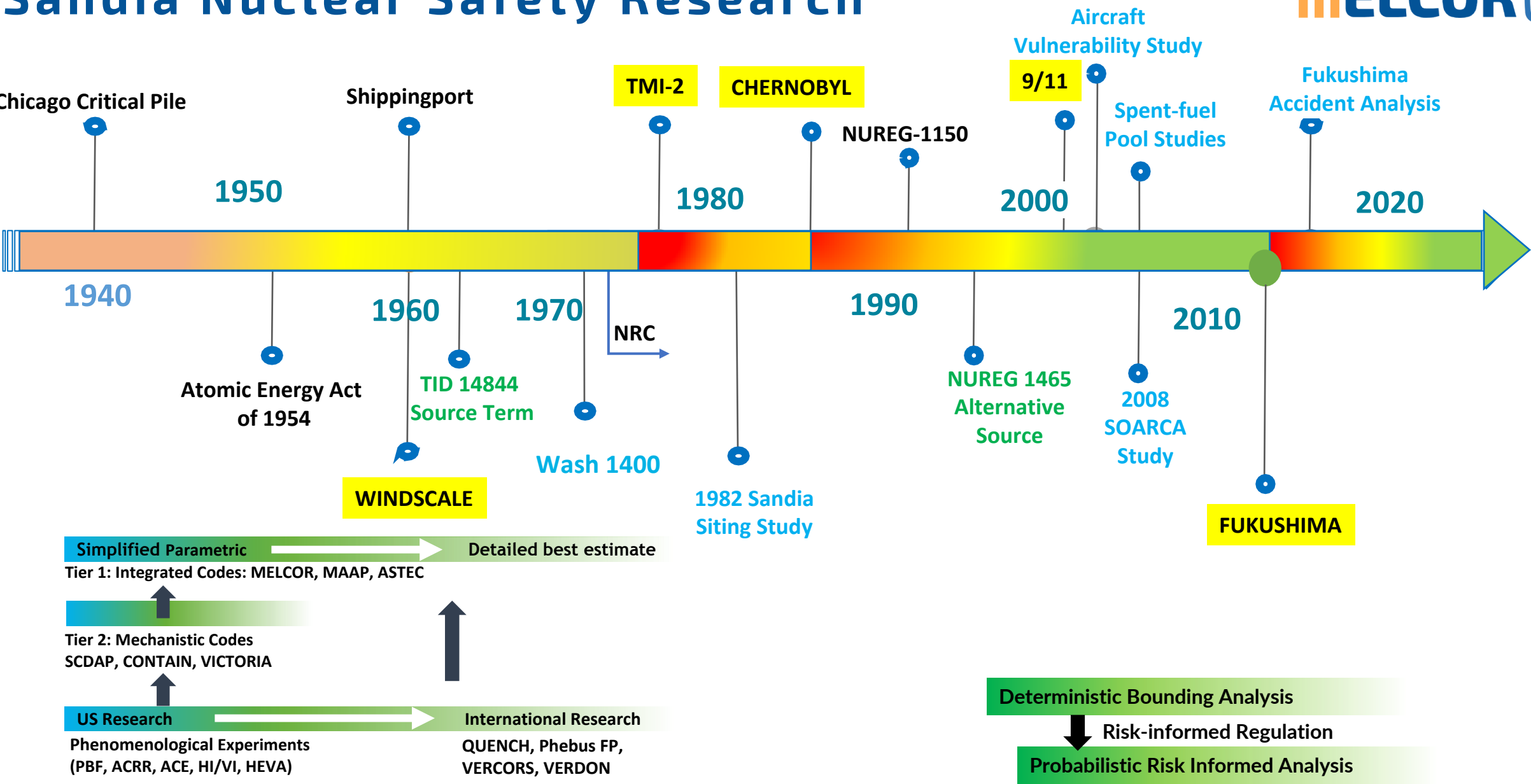
MELCOR Code Assessment Program (MCAP) – June/U.S.A

European MELCOR User Group (EMUG) Meeting – Spring/Europe

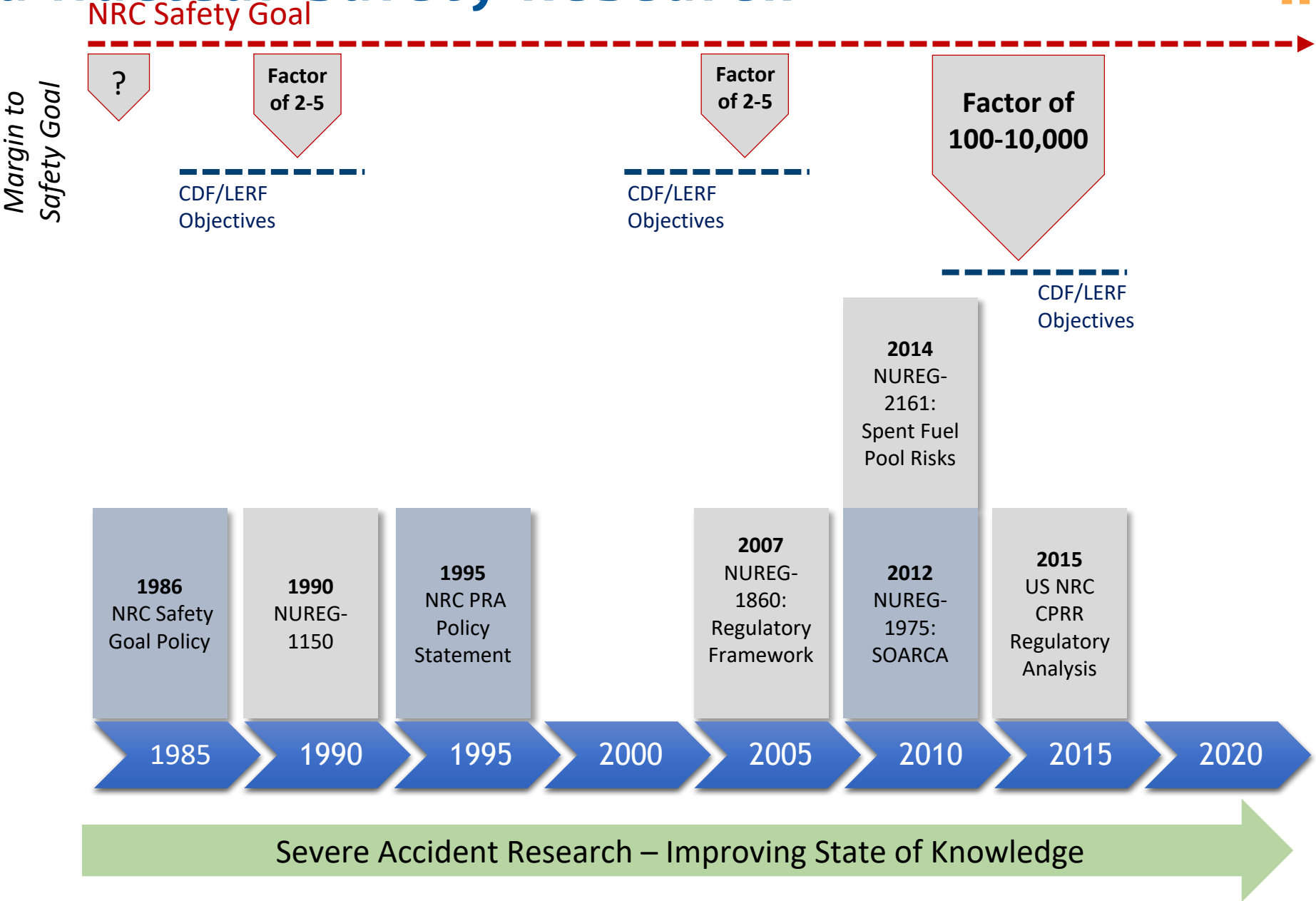
Asian MELCOR User Group (AMUG) Meeting – Fall/Asia



# Sandia Nuclear Safety Research



# Sandia Nuclear Safety Research



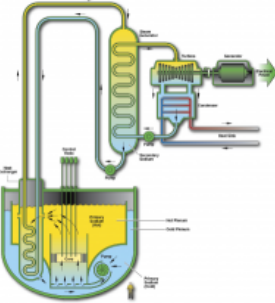
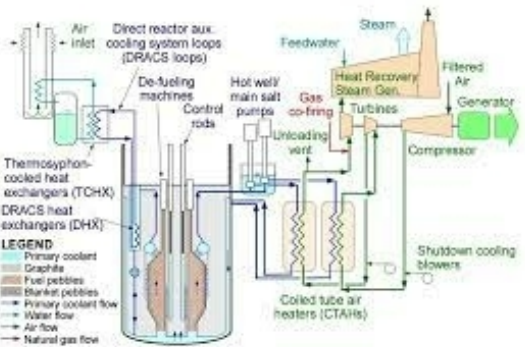
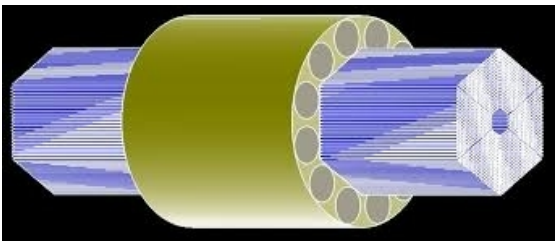
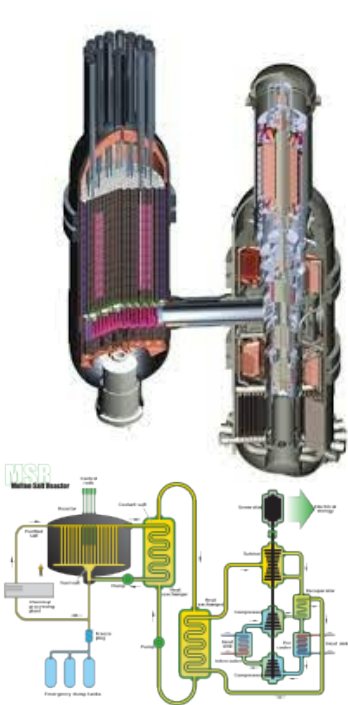
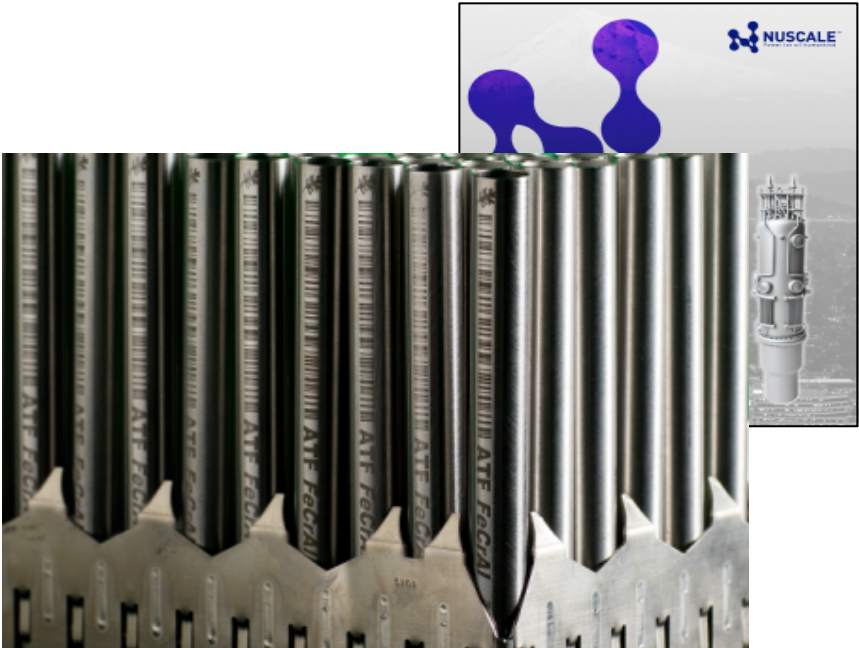
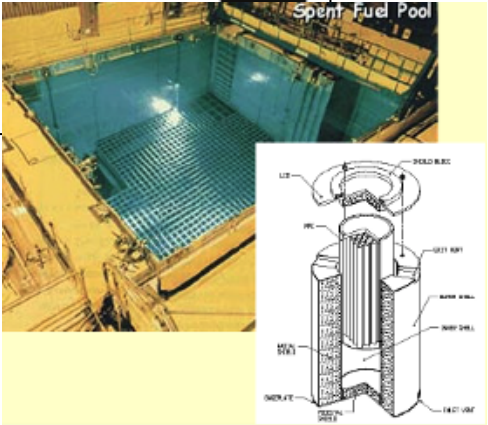
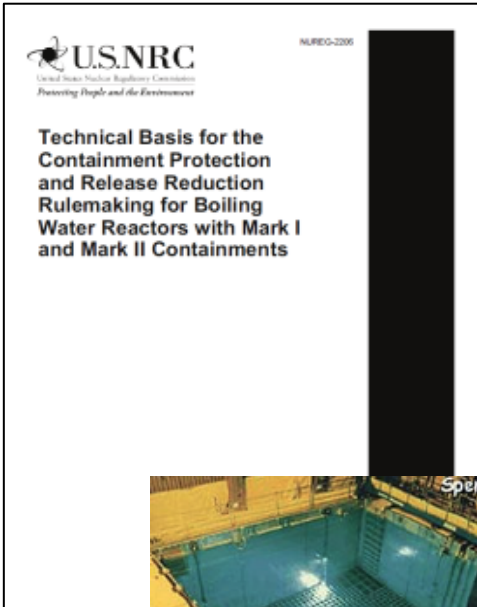
# Enabling Nuclear Energy to Combat Climate Change



Current Light Water Reactors

Near-term Advanced Technologies

Advanced Reactors



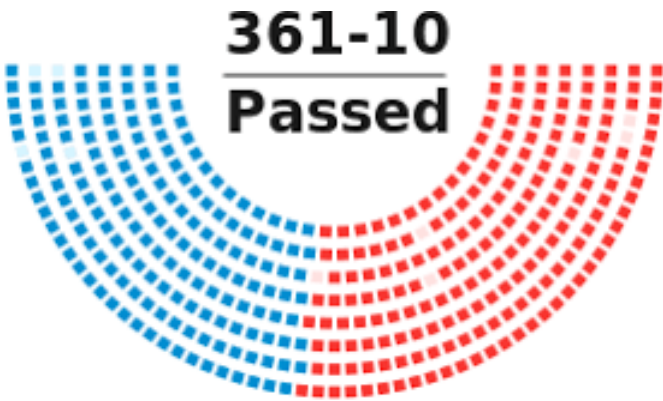
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# Enabling Regulation of Advanced Reactors



S. 512



One Hundred Fifteenth Congress  
of the  
United States of America

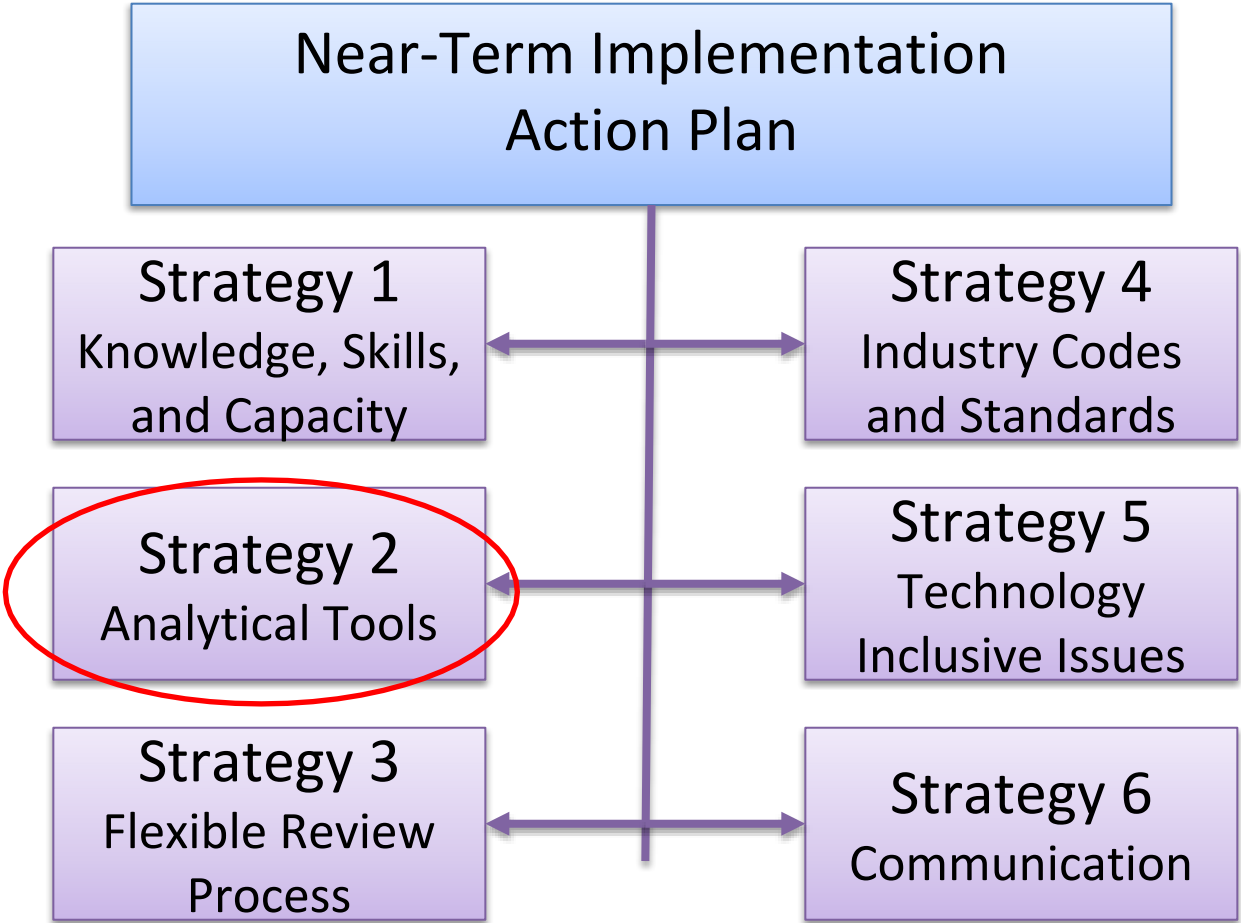
AT THE SECOND SESSION

*Begun and held at the City of Washington on Wednesday,  
the third day of January, two thousand and eighteen*

An Act

To modernize the regulation of nuclear energy.

*Be it enacted by the Senate and House of Representatives of  
the United States of America in Congress assembled,*





# Safety Analysis Capability Readiness

