Office of Nuclear Energy
Nuclear Data Needs

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Workshop for Applied Nuclear Data Activities
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Office of Nuclear Energy – Mission Pillars

• Advance nuclear power to meet the nation's energy, environmental, and national security needs.

• Resolve technical, cost, safety, security and regulatory issues through research, development and demonstration.
Nuclear Beyond Electricity – Advanced Reactors

NOW
Baseload Electricity Generation

FUTURE

Large Light Water Reactors
Small Modular Reactors
GEN IV Reactors
New Chemical Processes

Heat → e− → Electricity

Industrial Applications
Hydrogen Production
Clean Water
Hydrogen Production

Electricity
Examples of Different Advanced Reactor Industry Designs

Gas Reactors
- X-Energy Xe-100
- Framatome SC-HTGR

Fast Reactors
- GE Hitachi PRISM
- TerraPower TWR
- Advanced Reactor Concepts LLC ARC-100

Molten Salt Reactors
- Terrestrial Energy USA IMSR
- TerraPower MCFR
- Elysium USA MCSFR
- Kairos Power UCB PB-FHR
Nuclear Data Needs

- Driven by the anticipated materials and reactor flux spectrum comprising advanced nuclear reactor and fuels technologies
- Materials includes:
  - Coolants (e.g. FLiBe, molten chloride salts)
  - Moderators (e.g. graphite)
  - Control materials
  - Advanced fuels and clad (e.g. UN, SiC, etc.)

### Reactor Coolants

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*Chart not necessarily an exhaustive list*
Nuclear Data Needs Priority

• Data needs priority should be driven by the requirements to accurately predict reactor behavior during steady-state and transient operation as well as postulated accident scenarios
  • Uncertainty quantification in the context of risk important to NRC licensing
  • Depends highly on the quality of covariance data for uncertainty propagation

• Priorities needs to be based on:
  • Identification of isotope data of significance as relates to the prediction of key parameters of interest
  • Parameters of interest include (to name a few):
    • Core reactivity
    • Decay heat
    • Power distribution
    • Feedback response due to material changes during anticipated and postulate transients
    • Source term for offsite dose

• For priority nuclear data, efforts need to generally focus on:
  • Missing data
  • Missing covariance data
  • Large covariance data