Workshop on Applied Nuclear Data Activities (WANDA)

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Data Challenges for Advanced Reactor Licensing

- Confidence in current cross-section data:
  - Unique materials and neutron spectra
  - Nontraditional fuel forms
  - Limited integral validation data

- Lack of experienced analysts:
  - Adequacy of current cross-section data
  - Propogation of cross-section uncertainty to figures of merit (FOMs)
Current Approach (Light Water Reactors)

- Starts with simplified geometry and detailed energy group structure, and ends with simplified group structure and 3-D geometry.

Apply biases and uncertainties to calculated FOMs:
- Reactivity balance
- Shutdown margin
- Feedback coefficients
- Power distribution
Impact of Data Uncertainty

- FOMs verified via (1) startup physics testing, and (2) surveillance requirements

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3.1 REACTIVITY CONTROL SYSTEMS
3.1.2 Core Reactivity

LCO 3.1.2 The measured core reactivity shall be within ± 1% Δk/k of predicted values.
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- Advanced Reactors:
  - Changes in graphite data from ENDF/B-VII.0 to B-VII.1 (capture cross section) has a 1%Δk/k impact
  - Changes in $^{35}$Cl(n,p) cross section from ENDF/B-VII.0 to B-VII.1 has a 2% Δk/k impact
  - No data for FLiBe/FLiNak thermal scattering, possible 2% Δk/k impact for thermal spectrum
Data Uncertainty and Licensing

- New data not expected in time to support advanced reactor licensing activities:
  - NRC is currently engaged in pre-application activity with several advanced reactor vendors
- NRC review expected to emphasize uncertainty management:
  - Appropriate application/justification of design margin into FOMs
  - Uncertainty update methodologies
  - Commitment to measurements/surveillances to verify design margin
  - Commitment to required actions in the event that measurements/surveillances fail to meet acceptance criteria
- NRC staff engaged with DOE labs to enhance understanding data needs