



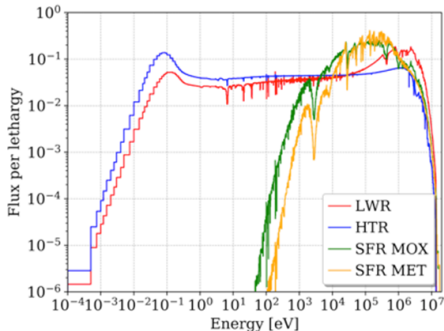
Workshop on Applied Nuclear Data Activities (WANDA)

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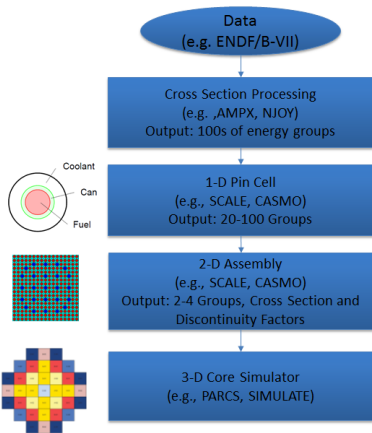
U.S. Nuclear Regulatory Commission
Office of New Reactors

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
 - Propagation 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

3.1 REACTIVITY CONTROL SYSTEMS

3.1.2 Core Reactivity

LCO 3.1.2 The measured core reactivity shall be within $\pm 1\% \Delta k/k$ of predicted values.

- **Advanced Reactors:**
 - Changes in graphite data from ENDF/B-VII.0 to B-VII.1 (capture cross section) has a $1\% \Delta k/k$ impact
 - Changes in $^{35}\text{Cl}(n,p)$ cross section from ENDF/B-VII.0 to B-VII.1 has a $2\% \Delta k/k$ impact
 - No data for FLiBe/FLiNaK thermal scattering, possible $2\% \Delta k/k$ 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