Nuclear Data Needs

Workshop for Applied Nuclear Data Activities (WANDA) 2023

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- Founded 1958, 34 members**, 8 technical committees + Data Bank Management Board

- 74 Working Parties and Expert Groups, 26 international joint projects, multiple treaty-based organizations (e.g. GIF)

- Host for JEFF library project, core EXFOR center, WPEC and Subgroups (CIELO, HPRL, GNDS, and more)

- International software distribution and benchmark dev/distribution

**Russian membership suspended 11 May 2022
Some reminders

• Nuclear data is an applications-driven program, primarily focused on delivery of information for modelling and simulation solutions – library adoption is an important metric.

• After decades of effort, nuclear data library projects have already achieved impressive results for their stakeholders, who use them in daily operations.

• It is remarkably difficult to create new evaluations that retain stakeholder satisfaction while also making substantive improvements.

• Data/knowledge preservation is crucial for making incremental progress and even more necessary given demographic realities.
The Dave Brown pipeline is exceptionally relevant for illustrating how data projects develop products – but let’s build in the user community more:

- Work with users to identify ND-related issues
- Quantify needs in terms of targets
- S/U analysis to prioritize exp/eval
- Integrate into simulation systems
- Adjust or provide support for it
- Document the application impact(s)
- Preserve everything required to understand and reproduce the evaluation

End-user community
Stakeholder / user engagement

• Last user engagement in 2019 Stakeholder meeting
  • Several user communities engaged for the first time
  • New issues raised and bilateral exchanges to quantify/address problems
  • Request: maximize participation from end-user communities to bring new perspectives / needs

• Next stakeholder meeting will be held Q3 2023
  • Topics TBF considering:
    – Advanced reactors / fusion
    – Materials modelling
    – Source facilities
    – Waste and handling
    – Medical applications / isotopes
    – More
  • US participation welcome on programs of mutual interest
  • In-person event at NEA
Target accuracy requirements

- Target Accuracy Requirements have been championed by M. Salvatores and updated through WPEC
  - Requires definition of systems, parameters of interest and sufficient information to translate (typically by S/U) into specific nuclear data requirements
  - Several (any) parameters can be considered, $k_{eff}$, power peaking, reactivity swing, transmutation and responses...

- Example SG46 systems/requirements considered include:
  - Accelerator-driven subcritical systems and materials facilities
  - Sodium fast reactors including the EU ALFRED project
  - Japanese SFR-750 project
  - Low-sodium-void SFR concept
  - Molten salt reactor designs
  - SMR designs
  - An update to the SG27 LWR TAR data
S/U and prioritization

• High-Priority Request List is a process for creating requests requiring system, TAR and S/U analysis

• Rigorous international peer-review with experimentalists and other experts (including feasibility)

• Long-term WPEC Expert Group with IAEA partnership

• Examples (c.f. oecdnea.org/dbdata/hprl/) include:
  • U8 inelastic E-dep. targets for 5 different advanced concepts with different targets
  • K(n,*p) for Ar production @10% above 10MeV for material testing
  • Cl(n,p) and related data for MSR (c.f. WANDA22 presentation by O. Cabellos)
  • Er-167 capture and RPs for sHBRs
  • 27 other active high-priority and 100+ others of lower priority
Demonstrating the impacts

- NEA hosts ICSBEP, IRPhE, SINBAD, SFCOMPO, TIETHYS, and more, as well as RDBs for (meta)data complete with GUIs (APIs in pipeline) and sensitivity databases

- Sensitivities offer the window into the application domain, even if/where systems are sensitive (commercial or otherwise)

- 2023 goal: nuclear data and S/U data API for automated results on isotope basis in real time

oecd-nea.org/janis
oecd-nea.org/dice
oecd-nea.org/ndast
Automated integration with simulation system

- Data centers have done a good job creating ACE files and running a suite of ICSBEP experiments
- NNDC and Data Bank have moved to GitLab pipelines with trivial extensibility for other software systems (ideally with dev integration)
- Downstream testing can/must be automated and can offer two- or one-way feedback
Automated integration with simulation system (II)

- This is practical: Serpent-2 (VTT) source repository linked to JEFF and suite of ICSBEP inputs all in VC with pipelines and available for licensees (in DB member countries)

- Direct value for developers, nuclear data community, and all users

- 10 CFR 810 is a challenge, since it excludes software from our NEA / US DOE bilateral agreement – now applying to MCNP and SCALE
Parting thoughts

• Challenging to create better data libraries that can convince users to update

• Target accuracies from end-users and peer-reviewed priority requests give concrete objectives that can direct data development and provide evidence for adoption

• Maximizing the direct, automatic, reproducible link between data development and testing processes in all user communities is possible and necessary

• The NEA Data Bank has a broad international mission, and is open to strengthening collaborations with US organisations for mutual benefit of its members
Thank you for your attention

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