OAK RIDGE National Laboratory

Status of the Verified, Archived, Library of Inputs and Data (VALID)

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Outline

1. Brief project overview
2. A note on sponsors
3. Reminder of cases added in FY2021 and FY2022
4. Cases currently in progress
5. Future plans for VALID

Brief project overview

- VALID is a QA-like process to generate high quality models from reliable reference descriptions and make those models available to users.
  - Separate origination and review by qualified individuals
  - Documentation of model generation, results, and checks
  - Results are controlled to prevent inadvertent modification
- Primarily used for ICSBEP Handbook evaluations
- Most models include both KENO and TSUNAMI models
- Basis for SCALE/KENO validation reports, papers, and studies since SCALE 6.1 in 2011

Brief project overview

- Cases included in VALID are documented in validation reports
  - 6.2.4 had 618 KENO models in 14 different ICSBEP categories
    - 428 cases also had SDFs
  - 6.3.1 has 810 KENO models in 21 different ICSBEP categories
    - 620 cases also have SDFs
- Discussed in WPEC SG45 (VaNDaL) final report

Brief project overview

- Funding requested for FY 2020 – 2024
  - $140k in FY20 and $50k per year for FY21 – FY24
- Proposal accepted but deferred a year
- $139k NCSP funding spent in FY21 on VALID expansion
  - Some support also provided by NRC for systems of interest
  - AM2 also provides some funding for work in VALID
- $50k NCSP funding in FY22 and FY23
- Other participants include: M.N. Dupont, J.B. Clarity, E.M. Saylor, and Midshipmen in FY21–FY23

A note on sponsors

- NCSP funding for VALID expansion in FY22–FY24
- NCSP funding had been provided in the mid-2010s to generate TSUNAMI models and associated SDFs for NCSP-sponsored additions to the ICSBEP Handbook
- NRC also has interest in expanding VALID for uranium-fueled systems in the 5 – 20 wt% ^{235}U enrichment range
  - LEU+ (5 – 10 wt%) and HALEU (<20 wt%)
  - DOE/NRC Collaboration for Criticality Safety Support for Commercial-Scale HALEU Fuel Cycles Project (DNCSH)
- Synergistic here to combine funding and accomplish more

2021 VALID Expansion: 192 Benchmarks

Experiment class	ICSBEP experiment numbers	Number of configurations
HEU-COMP-THERM	17	9
HEU-MET-FAST	1, 63, 72, 73, 84, 85	40/41[a]
HEU-MET-INTER	6	4
HEU-SOL-INTER	1	2
HEU-SOL-THERM	4, 20	9
IEU-SOL-THERM	2, 3	59
LEU-COMP-THERM	25	4
LEU-MET-THERM	1, 2, 15	35
PU-MET-FAST	9, 11, 27, 28, 29, 30, 31, 32, 35, 36, 39, 40, 41	13
PU-MET-MIXED	2	5
PU-SOL-THERM	16	11

[a]Includes both the "Godiva" and "shell" models for HMF-001.

2022 VALID Expansion: 131 Benchmarks (in review)

Experiment class	ICSBEP experiment numbers	Number of configurations
PU-MET-FAST	1	5
HEU-COMP-FAST	3	4
HEU-COMP-INTER	6	1
HEU-COMP-MIXED	2	11
HEU-COMP-THERM	18	1
HEU-MET-FAST	28	1
IEU-MET-FAST	22	2
LEU-COMP-THERM	79, 93, 96, 97	73
LEU-MET-THERM	3	6
LEU-SOL-THERM	7, 8, 9, 10	16
MIX-SOL-THERM	3	10
U233-COMP-THERM	4	1

2023 VALID Expansion: 629 Benchmarks (in progress)

- Progress in FY23 mainly incremental
- Many new cases started, significant TSUNAMI work

Experiment class	ICSBEP experiment numbers	Number of configurations
PU-MET-FAST	3, 4, 16, 33, 37	37
PU-MET-THERM	4	4
PU-SOL-THERM	31, 34	35
HEU-MET-FAST	2, 3, 4, 10, 16, 34	23
ICT/ICM/ICI	Multiple cases and cross references	135
IEU-SOL-THERM	4, 5	2
LEU-COMP-THERM	9, 22, 23, 24, 39, 53, 57, 60, 61, 70, 74, 79, 101	204
LEU-MET-THERM	7	6
LEU-SOL-THERM	11, 12, 13, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25	76
MIX-COMP-THERM	6, 7	77
MIX-SOL-THERM	3, 6	30
U233	Sensitivities only – various categories	190

Future plans for VALID

- Revision 3 of SCALE computational procedure that governs VALID
  - Migrate to GitLab for tracking
  - Use GitLab repository for library
- Internal repository implementation and tracking to simplify documentation and review – less time and money per case
- Complete qualifications per procedure for A. Lang, L. Fassino, and V. Karriem
- Mirror of internal repository to external site to facilitate sharing with external users
- Develop models based on sponsor needs

Conclusions

- VALID continues as a library of high-quality models used for testing SCALE and nuclear data
- Expansion in FY23 was limited by staff availability and training requirements
- Large number of cases in the pipeline
  - Lack of qualified staff and funding to complete reviews
  - Three additional staff should complete training and qualification in FY24
- Future plans include simplifying the process for adding cases and increase the availability of models and results for external users

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Questions?