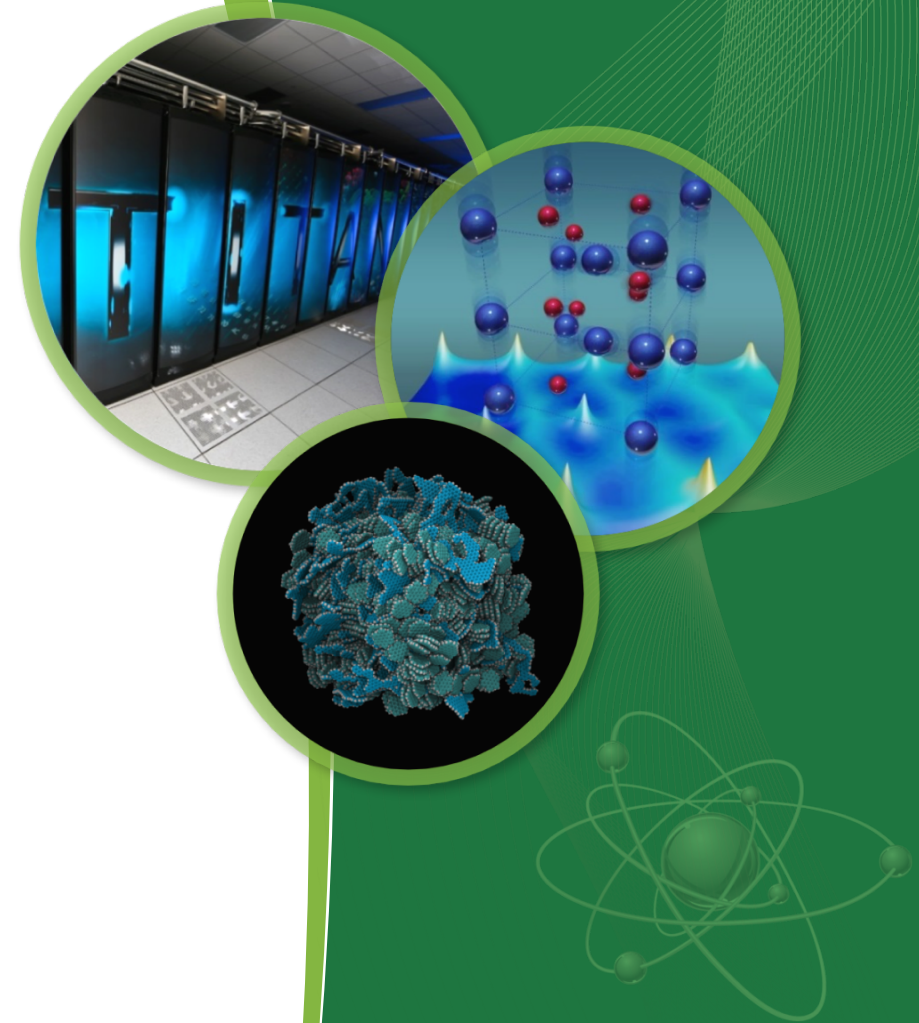


Only the best models are in VALID

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Outline

1. Purpose of VALID
2. Procedure philosophy
3. Procedure highlights
4. Future plans for VALID
5. Conclusion

Purpose of VALID

- VALID is the Verified, Archived Library of Inputs and Data
- VALID fulfills several purposes for different groups of people
- Original purpose at ORNL
 - To generate high quality, reliable models under a quality assurance (QA) plan independent of particular projects
 - Review models to ensure correctness
 - Eliminate duplication of effort and files

Purpose of VALID (continued)

- Global reach of VALID
 - Experiments archived in VALID are provided to ICSBEP for inclusion with the handbook (input, output, SDF)
 - Almost 300 cases from VALID are in the 2016 ICSBEP handbook
 - Provided for screening, user is responsible for QA review of files used in safety analysis
- Expanded purpose at ORNL
 - Forms the basis for criticality safety (KENO) validation
 - Also used extensively in data testing
 - Updates to nuclear data, e.g., ENDF/B-VIII
 - Updates to processing codes, e.g., CENTRM MOC solver

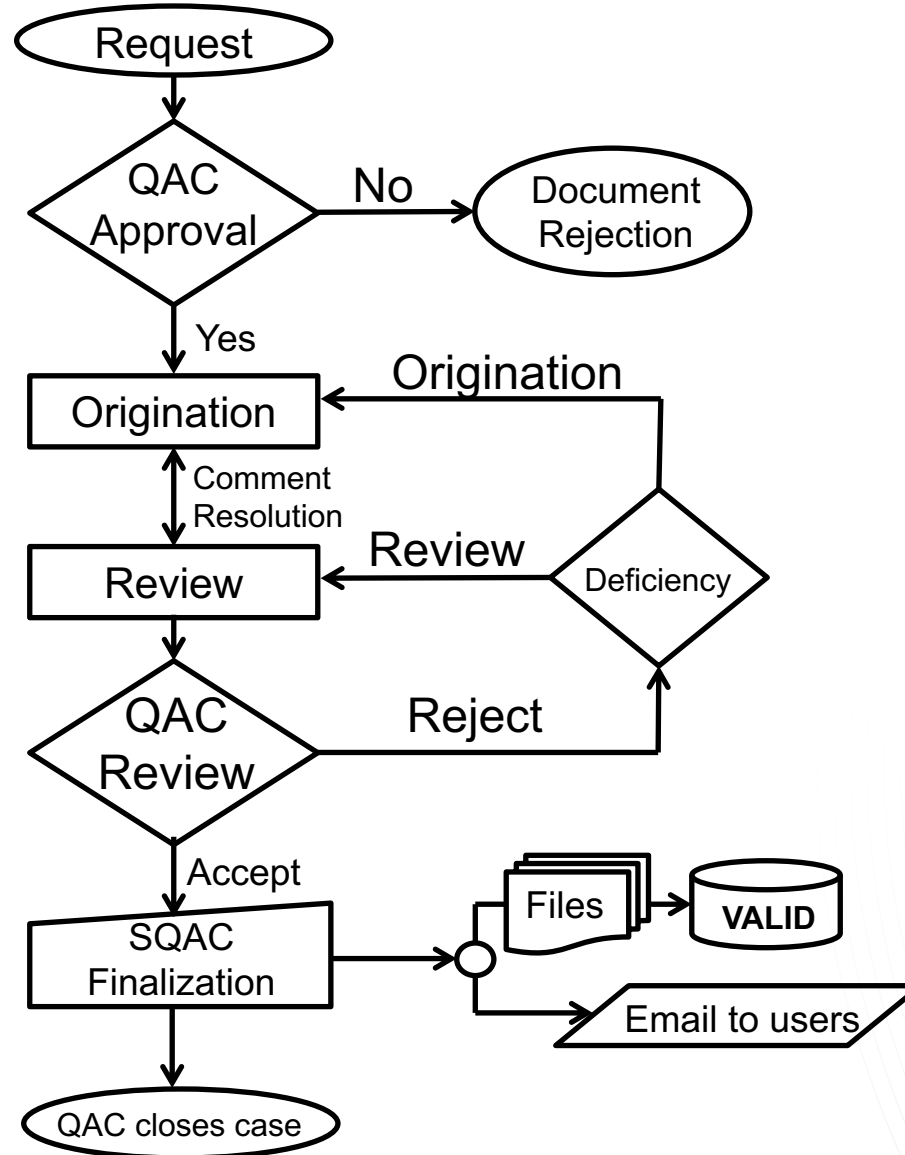
Procedure philosophy

- The principle is for two independent, qualified people to prepare and review the model
- This is the same as 10CFR50 Appendix B, DOE Order 414.1D
- Dual, independent check is primary barrier to errors in the library
- Qualification is controlled by the QA Coordinator (QAC)
 - Individuals must also meet SCALE QA requirements
 - Qualification guidelines included in Revision 2 of procedure (introduced 2013)
- Performers are independent from line management

Procedure highlights

- Process overview/responsibilities
 - The requestor can be anyone; just ask for an experiment
 - The originator builds a high-quality model using acceptable references
 - The reviewer performs a thorough review of models and documentation
 - The QAC has overall responsibility, assignment of people to roles
- Parameters typically included and checked (ICSBEF evaluation)
 - Composition inputs match specifications in evaluation
 - Dimensions match evaluation
 - k_{eff} value for each case, checked to expected and sample results
 - Sensitivities checked with direct perturbations
 - Modeling approximations, especially unit cell modeling in MG calcs

Procedure overview



User responsibilities

- There are two primary user responsibilities
 - Appropriate use of models and data from the library
 - Notification to QAC if errors or discrepancies are identified
- External users must provide QA and/or justification for using files from VALID distributed in the ICSBEP handbook
- Files are *not* covered for use in safety analysis

Qualification

- No fixed process or direct testing is required for qualification
- The originator must meet the following criteria
 - Experienced user of the code(s) being used
 - Review of VALID procedure and overall SCALE QAP
 - Unqualified person can do work if it is reviewed and officially submitted by a qualified originator
- The reviewer must meet the following criteria
 - More experienced user of code(s), also familiar with methodologies and potential vulnerabilities
 - Typically will have been an originator at least once

Future plans for VALID

- More ICSBEP evaluations
 - Some added through other projects for various sponsors
 - Potentially leverage work being done at OECD/NEA data bank (Ian Hill et al. paper from ANS 2013 winter meeting)
 - Leverage graduate and summer students when possible (note qualification difficulties on this path)
- Additional data types
 - Currently TRITON models for radiochemical assay data from Yucca Mountain work are in VALID
 - Shielding benchmarks, ORIGEN (ARP) libraries, applications?

Conclusions – VALID inventory (ICSBEP experiments)

Experiment Class	Evaluations Included	Total Number of SDFs Available
TSUNAMI-3D Cases from KENO V.a		
HEU-MET-FAST	-015, -016, -017, -018, -019, -020, -021, -025, -030, -038, -040, -065	18/22*
HEU-SOL-THERM	-001, -013, -014, -016, -028, -029, -030	52
IEU-MET-FAST	-002, -003, -004, -005, -006, -007, -008, -009	8/11*
LEU-COMP-THERM	-001, -002, -008, -010, -017, -042, -050, -078, -080	140
LEU-SOL-THERM	-002, -003, -004	19
MIX-COMP-FAST	-005, -006	2
MIX-COMP-THERM	-001, -002, -004	21
MIX-SOL-THERM	-002	3
PU-MET-FAST	-001, -002, -005, -006, -008, -010, -018, -022, -023, -024	10
PU-SOL-THERM	-001, -002, -003, -004, -005, -006, -007, -011, -020	81
TSUNAMI-3D Cases from KENO-VI		
HEU-MET-FAST	-005, -008, -009, -010, -011, -013, -024, -080, -086, -092, -093, -094	27
IEU-MET-FAST	-019	2
MIX-COMP-THERM	-008	28

*Includes detailed and simple models for the same evaluation in some cases.

Conclusions – VALID inventory (RCA models)

Reactor	Measurement Laboratory	Experimental Program	Assembly Design	No. of Samples/ Fuel Rods	Enrichment (wt % ²³⁵ U)	Burnup (GWd/MTU)
Trino Vercellese	Ispra, Karlsruhe	JRC	15 × 15	15/5	2.72, 3.13, 3.897	7.2–17.5
	Ispra, Karlsruhe	JRC	15 × 15	16/5	3.13	12.9–25.3
Obrigheim	Ispra, Karlsruhe	JRC	14 × 14	10/6	3.00	17.1–37.5
	ITU, IRCh, WAK, IAEA	ICE	14 × 14	5/5	3.13	27.0–29.4
H. B. Robinson-2	PNNL	ATM-101	15 × 15	4/1	2.561	16.0–31.7
Turkey Point-3	Battelle-Columbus	NWTS	15 × 15	5/1	2.556	30.5–31.6
Calvert Cliffs-1	PNNL, KRI	ATM-104	14 × 14	3/1	3.038	27.4–44.3
	PNNL	ATM-103	14 × 14	3/1	2.72	18.7–33.2
	PNNL, KRI	ATM-106	14 × 14	3/1	2.453	31.4–46.5
Takahama-3	JAERI	JAERI	17 × 17	13/3	2.63, 4.11	17.4–46.2
TMI-1	ANL	DOE YMP	15 × 15	11/1	4.013	44.8–55.7
	GE-VNC	DOE YMP	15 × 15	8/3	4.657	22.8–29.9
Gösgen	SCK•CEN, ITU	ARIANE	15 × 15	3/2	3.5, 4.1	29.1–59.7
GKN II	SCK•CEN	REBUS	18 × 18	1/1	3.8	54.1

Conclusions

- VALID allows for the development and retrievability of high quality models for a range of data types
- VALID currently contains more than 400 critical experiments with SDFs distributed with DICE and more than 100 TRITON models for RCA samples
- Potential for expansion in the future to include more types of data
- Inputs and SDFs will soon be available via the SCALE web site

Questions?