

## LA-UR-20-29256

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Title: Los Alamos Benchmark Suite Update

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Haeck, Wim

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# Los Alamos Benchmark Suite Update

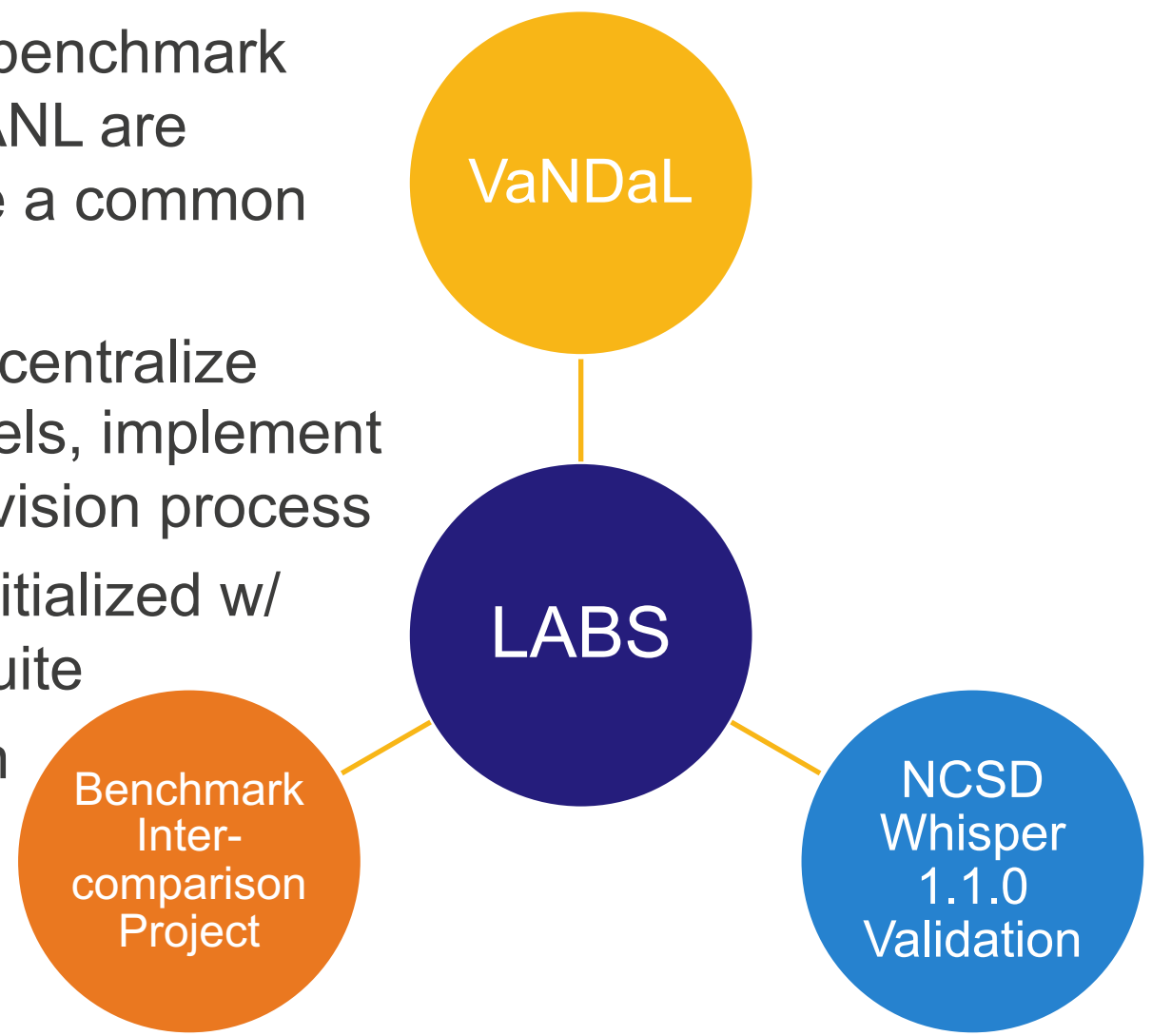
WPEC Subgroup 45

**Kristy Spencer, Jen Alwin, and Wim Haeck**

November 13, 2020

# Los Alamos Benchmark Suite, LABS

- Multiple MCNP benchmark collections at LANL are believed to have a common origin
- LABS – effort to centralize benchmark models, implement formal review/revision process
- LABS is being initialized w/ Whisper 1.1.0 Suite
- Reviews done in NCSD Whisper 1.1.0 SQA



# Whisper 1.1.0 Benchmark Reviews

- Two-person reviews on every input file in Whisper Suite
- Reviews began 12/2016, **completed** 09/2020
- Note: HMF-077 in Whisper Suite did not align with ICSBEP Handbook (8 cases)
  - Handbook example input files reviewed for this benchmark (3 cases)
  - 5 additional cases reviewed for ICT-002
  - This would keep the total cases at **1101**

# Whisper 1.1.0 Benchmark Reviews

Status	# Experiments	% of Total
Completed:	218	100.0%
Acceptable:	78	35.8%
Requires revision:	140	64.2%
• NCS Policy-only changes:	43	19.7%
• Benchmark $k_{eff} \pm \sigma$ changes:	15	6.9%
• All other changes:	82	37.6%

# LABS GitLab Repository



**lanl-mcnp**   
Project ID: 4324

Star 0
 Fork 0

303 Commits 11 Branches 0 Tags 272.7 MB Files 272.7 MB Storage

LANL MCNP input file suite


master | lanl-mcnp / + | History | Find file | Web IDE | | Clone

Merge branch 'pu-met-fast-019-initial-upload' into 'master' ... 5e1eb02c   
 Kristina Diane Yancey Spencer authored 1 week ago

- README
- Add LICENSE
- Add CHANGELOG
- Add CONTRIBUTING
- Add Kubernetes cluster
- Set up CI/CD

Name	Last commit	Last update
heu-comp-inter/heu-comp-inter-003	Corrected json format issue in multi-material balance ta...	5 months ago
heu-met-fast	HEU-MET-FAST-036, revision	1 week ago
heu-met-mixed	HEU-MET-MIXED-015	5 months ago
heu-sol-therm	Changed keff and uncertainty values for benchmark ca...	2 months ago
leu-comp-therm/leu-comp-therm-027	LEU-COMP-THERM-027 Revision	3 months ago

# Whisper Benchmark Revisions

**Closed** Opened 3 months ago by  **Kristina Diane Yancey Spencer**

Reopen issue

New issue

## Fix HEU-SOL-THERM-001



Revision to be done after [!110 \(merged\)](#) is complete.

- The stainless steel material in cases 001 & 002 used only S-32 for Sulphur. This is an unnecessary simplification, and the natural abundance should be used to set the Sulphur isotopic quantities.
- The benchmark cases should use the keff and uncertainty values reported in Table 18 of the ICSBEP handbook (revision 3).
  - *If you don't have a copy of the handbook, please let me know.*

See [Review\\_Documentation/HEU-SOL-THERM-001.pdf](#) for more information.

Editor: [@eordonez](#)


Reviewer: [@kspencer](#)





Edited 3 months ago by Kristina Diane Yancey Spencer

←

1 person to revise,  
1 person to review revision

 Drop or [upload](#) designs to attach

**Related merge requests**  2

 HEU-SOL-THERM-001, initial upload <a href="#">!110</a>	<p>Initialize w/ original input &amp; review files, Stage 0: revise inputs “in place”</p>	
 HEU-SOL-THERM-001, revision <a href="#">!125</a>		

# Benchmark Folders

master | lanl-mcnp / heu-sol-therm / heu-sol-therm-001 | History | Find file | Web IDE | Download | Clone

**Changed keff and uncertainty values for benchmark cases as reported in Table...** Ernesto Andres Ordonez Ferrer authored 2 months ago | 7dc3bcd4

Name	Last commit	Last update
..		
Review_Documentation	HEU-SOL-THERM-001, initial upload	3 months ago
Revision_Documentation	Changed keff and uncertainty values for benchmark c...	2 months ago
heu-sol-therm-001-001-rev3-materialba...	HEU-SOL-THERM-001, initial upload	3 months ago
heu-sol-therm-001-001-rev3.i	Changed keff and uncertainty values for benchmark c...	2 months ago
heu-sol-therm-001-002-rev3-materialba...	HEU-SOL-THERM-001, initial upload	3 months ago
heu-sol-therm-001-002-rev3.i	Cha	2 months ago
heu-sol-therm-001-003-rev3-materialba...	HEU	3 months ago
heu-sol-therm-001-003-rev3.i	Changed keff and uncertainty values for benchmark c...	2 months ago

Documentation Folders

Input files and Material Balance Tables

# Review Documentation



**HEU-SOL-THERM-001, initial upload**  
 Kristina Diane Yancey Spencer authored 3 months ago

6b982b7d

Name	Last commit	Last update
..		
Review	HEU-SOL-THERM-001, initial upload	3 months ago
HEU-SOL-THERM-001.docx	HEU-SOL-THERM-001, initial upload	3 months ago
HEU-SOL-THERM-001.pdf	HEU-SOL-THERM-001, initial upload	3 months ago
HEU-SOL-THERM-001_Material_Number_De...	HEU-SOL-THERM-001, initial upload	3 months ago
HEU-SOL-THERM-001_Total_Number_Densiti...	HEU-SOL-THERM-001, initial upload	3 months ago
Review_Radii_Check.xlsx	HEU-SOL-THERM-001, initial upload	3 months ago
Review_heu-sol-therm-001-001.pdf	HEU-SOL-THERM-001, initial upload	3 months ago

# Review Documentation

## Whisper V1.1.0 Benchmark Validation

<b>Experiment:</b>	<b>HEU-SOL-THERM-001</b>
Cases:	001, 002, 003, 004, 005, 006, 007, 008, 009, 010
References:	R1. ICSBEP Handbook, NEA/NSC/DOC(95)03/II, Volume II, HEU-SOL-THERM-001, Revision 3, September 30, 2004 R2. LA-UR-13-21822, Listing of Available ACE Data Tables, 2014-06-26 (rev. 4)
Geometry review (incl. figures):	G1. The geometry in all cases consists of a hollow cylinder with an open top which has been partially filled with an aqueous solution. The height, radius, and aqueous solution level varies cases by case. The MCNP model accurately uses Table 14 from the ICSBEP handbook to define each surface. The system created with cells cards is in agreement with the handbook. G2. No figures were included due to the simplicity of the model.
Material review:	M1. The aqueous solution for each case is found in Table 15 of the ICSBEP handbook. The aluminum and steel tanks holding solution in each case can be found in Tables 16 and 17 respectively. Elements requiring separation of number densities by isotope can be found in the file HEU-SOL-THERM-001_Material_Number_Densities.xlsx. All nuclide number densities are in agreement with the handbook for every case except for (1) the Nitrogen in material 1 which only differs because the calculations used to determine it rounded the abundance to the fourth decimal instead of the fifth used in the excel file (S1), and (2) the Sulphur in the stainless steel. <b>The stainless steel material in cases 1 &amp; 2 used only S-32 for Sulphur; this is an</b>

# Revision Documentation



Changed keff and uncertainty values for benchmark cases as reported in Table... ⋮

Ernesto Andres Ordonez Ferrer authored 2 months ago

7dc3bcd4

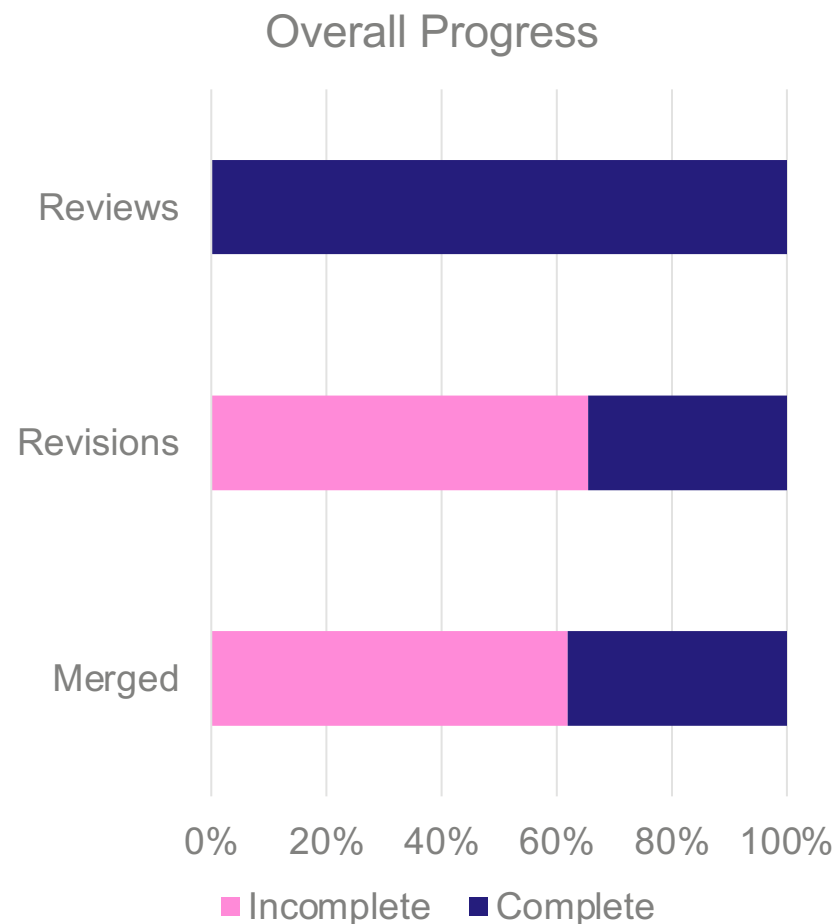
Name	Last commit	Last update
..		
HEU-SOL-THERM-001_Revision.docx	Changed keff and uncertainty values for benchmark cas...	2 months ago
HEU-SOL-THERM-001_Revision.pdf	Changed keff and uncertainty values for benchmark cas...	2 months ago

Isotopics\_hst-001.xlsx

Whisper V1.1.0 Benchmark Revision	
<b>Experiment:</b>	<b>HEU-SOL-THERM-001</b>
Cases:	001, 002, 003, 004, 005, 006, 007, 008, 009, 010
Review PDF:	HEU-SOL-THERM-001.pdf
Identified Issues & Errors:	<p>E1. The stainless steel material in cases 001 &amp; 002 used only S-32 for Sulphur. This is an unnecessary simplification, and the natural abundance should be used to set the Sulphur isotopic quantities</p> <p>E2. The benchmark cases should use the <math>k_{eff}</math> and uncertainty values reported in Table 18 of the OCSBEP handbook (revision 3).</p>
Modifications:	<p>M1. Updated the Sulphur isotopics in material 2, cases 001 and 002, to reflect the natural abundance of Sulphur.</p> <p>M2. Changed <math>k_{eff}</math> and corresponding uncertainties for all cases to reflect values reported in Table 18 of the ICSBEP handbook (revision 3).</p>
Supporting work:	S1. Isotopics_hst-001.xlsx
Assumptions:	A1. None.
Comments:	C1. None.

# November LABS Status

- Summer FY20 collaboration between NCS and NEN-2
  - More than 1/3 revisions complete
- **FY21 projections:**
  - Merge 26 – 40 more benchmarks into LABS
  - 136 total benchmarks left as of Nov. 1 (736 cases)



# What's after Whisper 1.1.0?

- SG45 MCNP inputs are available to us
  - IAEA Nuclear Data Section
  - NRG (Steven Van der Marck)
  - These represent ~3500 input files
  - There is overlap with LABS though
- Keep LABS up to date with ICSBEP
  - New LANL benchmarks: work with NEN-2
  - New external benchmarks need to be modelled
  - Tracking revisions (e.g. 2020 revision of PMF1-S)

# Summary

- **LABS** – central repository for LANL benchmark input files
- Benchmark **reviews completed** in SQA
- Collaboration between NCS & NEN-2 very productive in summer 2020
- The reviews were the heavy lift; almost 40% of the Whisper Suite added!

# Thanks! Questions?

- Department of Energy, NA-50, ASC-PEM
- **NCS:** Bill Crooks, Bruce Dewald, Ray Sartor
- **XCP:** Bob Little, Forrest Brown, Mike Rising
- **NEN-2:** Joetta Goda, Jesson Hutchinson, Nick Thompson
- **Our 19 reviewers,** including Jennifer Arthur, Ethan Moll, and Andrew Smiley
- **Our 10 revision contributors,** including Cole Kostelac, Mariah Ramirez, and Dalton Wise