



# ENDF Library Update

G.P.A. Nobre

January 6, 2026



@BrookhavenLab

2025 Nuclear Data Week  
CSEWG Meeting  
January 6-9, 2026

# Outline

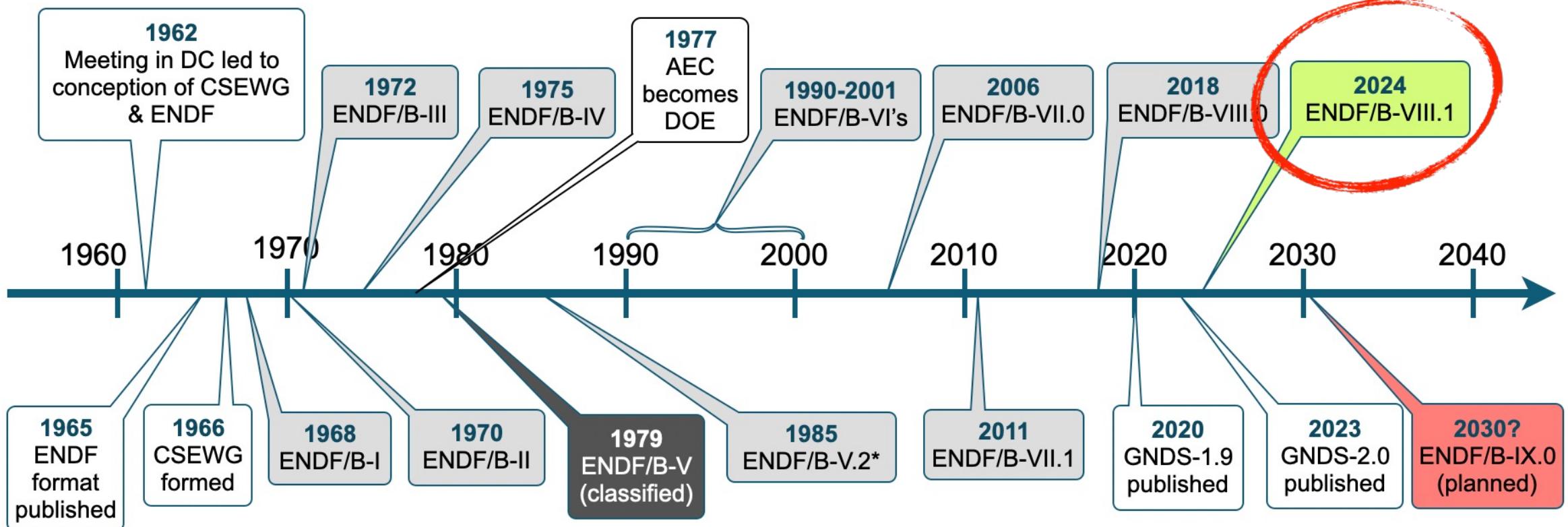
- ENDF/B-VIII.1
  - Data access
  - Big paper
- ENDF Library activities
  - ReGra workshop
  - Repository scheme
  - Status and plans

**ENDF/B**  
**VIII.1**

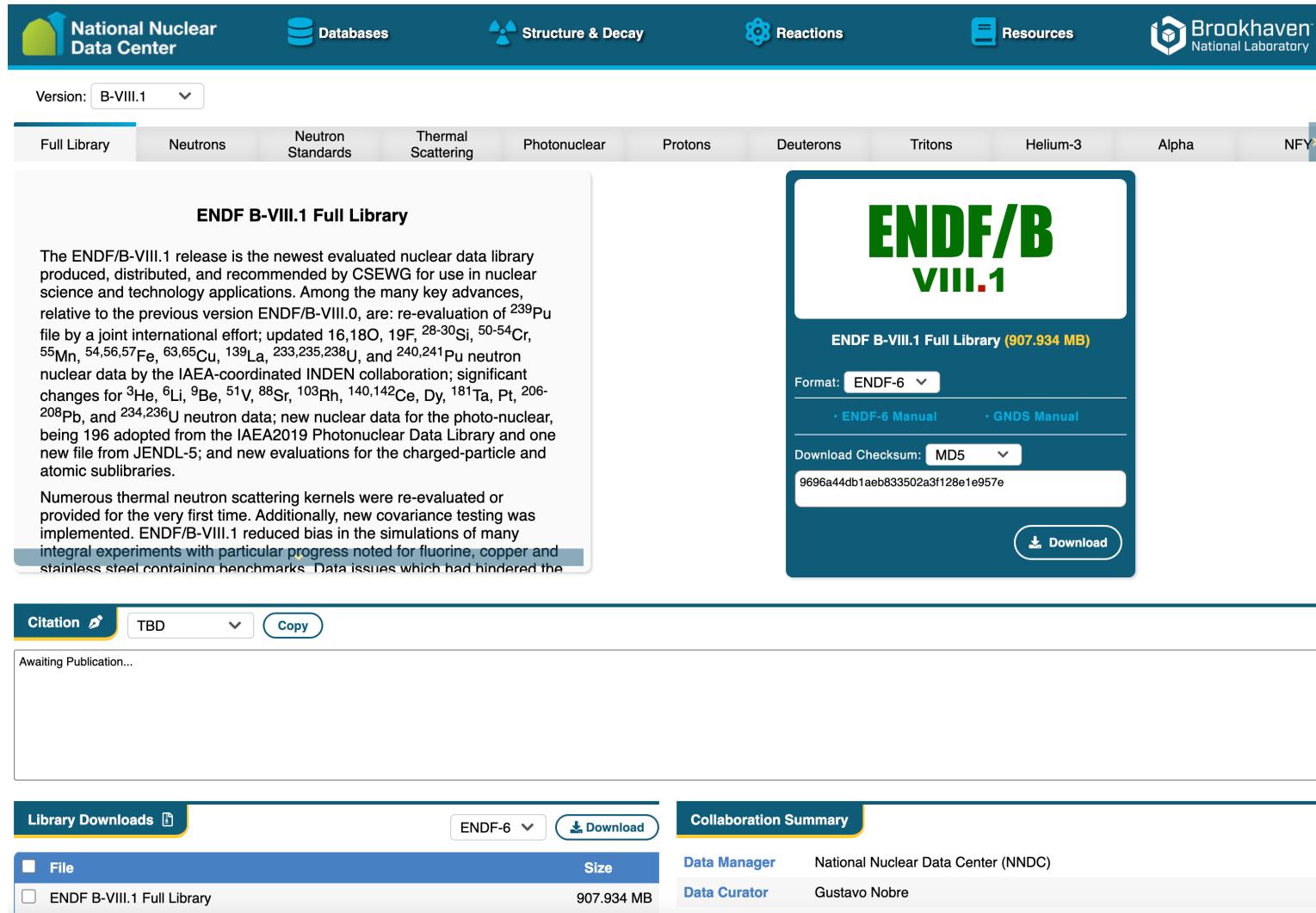


**National Nuclear  
Data Center**  
A DOE PuRe Data Resource Facility

# ENDF Timeline



# DOIs for ENDF/B-VIII.1 data



The screenshot shows the ENDF/B-VIII.1 Full Library page. At the top, there are navigation links for National Nuclear Data Center, Databases, Structure & Decay, Reactions, Resources, and Brookhaven National Laboratory. A dropdown menu shows 'Version: B-VIII.1'. Below the header, a navigation bar includes 'Full Library' (selected), 'Neutrons', 'Neutron Standards', 'Thermal Scattering', 'Photonuclear', 'Protons', 'Deuterons', 'Tritons', 'Helium-3', 'Alpha', and 'NFY'. A large central box displays the 'ENDF/B VIII.1' logo and the 'ENDF B-VIII.1 Full Library (907.934 MB)' with a download link. Below this, there are dropdown menus for 'Format: ENDF-6', 'ENDF-6 Manual', 'GNDS Manual', and 'Download Checksum: MD5'. A 'Download' button is at the bottom. At the bottom of the page, there are sections for 'Citation' (TBD), 'Library Downloads' (ENDF-6, Download), 'Collaboration Summary' (Data Manager: National Nuclear Data Center (NNDC), Data Curator: Gustavo Nobre), and a table showing a single file: 'ENDF B-VIII.1 Full Library' (Size: 907.934 MB).

“ENDF/B-VIII.1 release.” <https://doi.org/10.11578/endf/2571019> (2024).

“ENDF/B-VIII.1 release – alphas sublibrary.” <https://doi.org/10.11578/endf/2571012> (2024).

“ENDF/B-VIII.1 release – atomic relaxation sublibrary.” <https://doi.org/10.11578/endf/2571013> (2024).

“ENDF/B-VIII.1 release – decay sublibrary.” <https://doi.org/10.11578/endf/2571014> (2024).

“ENDF/B-VIII.1 release – deuterons sublibrary.” <https://doi.org/10.11578/endf/2571015> (2024).

“ENDF/B-VIII.1 release – electrons sublibrary.” <https://doi.org/10.11578/endf/2571016> (2024).

“ENDF/B-VIII.1 release – photonuclear sublibrary.” <https://doi.org/10.11578/endf/2571020> (2024).

“ENDF/B-VIII.1 release – helions sublibrary.” <https://doi.org/10.11578/endf/2571021> (2024).

“ENDF/B-VIII.1 release – neutrons sublibrary.” <https://doi.org/10.11578/endf/2571022> (2024).

“ENDF/B-VIII.1 release – neutron-induced fission product yields sublibrary.” <https://doi.org/10.11578/endf/2571023> (2024).

“ENDF/B-VIII.1 release – photo-atomic sublibrary.” <https://doi.org/10.11578/endf/2571024> (2024).

“ENDF/B-VIII.1 release – protons sublibrary.” <https://doi.org/10.11578/endf/2571025> (2024).

“ENDF/B-VIII.1 release – spontaneous fission product yields sublibrary.” <https://doi.org/10.11578/endf/2571026> (2024).

“ENDF/B-VIII.1 release – standards sublibrary.” <https://doi.org/10.11578/endf/2571027> (2024).

“ENDF/B-VIII.1 release – thermal scattering law sublibrary.” <https://doi.org/10.11578/endf/2571028> (2024).

“ENDF/B-VIII.1 release – tritons sublibrary.” <https://doi.org/10.11578/endf/2584305> (2024).

# DOIs for ENDF/B-VIII.1 data

Library Downloads 

ENDF-6  Download

File	Size
ENDF B-VIII.1 Full Library	907.934 MB
Alpha Reaction Sublibrary	181 KB
Atomic Relaxation Reaction Sublibrary	1.397 MB
Decay Reaction Sublibrary	10.358 MB
Deuteron Reaction Sublibrary	208 KB
Electron Reaction Sublibrary	7.544 MB
Photonuclear Sublibrary	141.016 MB
Helium-3 Reaction Sublibrary	203 KB
Neutron Reaction Sublibrary	343.487 MB
Neutron Induced Fission Product Yields Sublibrary	1.502 MB
Photoatomic Reaction Sublibrary	33.635 MB

Collaboration Summary

Data Manager	National Nuclear Data Center (NNDC)
Data Curator	Gustavo Nobre
Contact Person	Gustavo Nobre
Project Leader	David Brown
Hosting Institution	Brookhaven National Laboratory (BNL)
Producer	Cross Section Evaluation Working Group (CSEWG)

Deposition Summary

Depositor	Gustavo Nobre
Contact	gnobre@bnl.gov
Deposition Date	10/21/2024
Last Modified	10/21/2024
DOI	10.11578/endf/2571019

Resources

 ENDF-6 Manual

 GNDS Manual

 Summary

 GNDS

 POINT

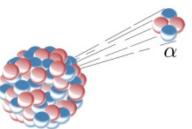
 Criticality Validation

**ENDF/B VIII.1**

ENDF B-VIII.1 Full Library (907.934 MB)

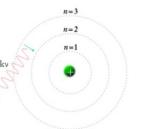
Format: ENDF-6 

[ENDF-6 Manual](#) [GNDS Manual](#)

 Alpha Reaction Sublibrary (181 KB)

Format: ENDF-6 

[Release Notes](#) [Changelog](#) [Material List](#)

 Atomic Relaxation Reaction Sublibrary (1.397 MB)

Format: ENDF-6 

[Release Notes](#) [Changelog](#) [Material List](#)

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- “ENDF/B-VIII.1 release – decay sublibrary.” <https://doi.org/10.11578/endf/2571014> (2024).
- “ENDF/B-VIII.1 release – deuterons sublibrary.” <https://doi.org/10.11578/endf/2571015> (2024).
- “ENDF/B-VIII.1 release – electrons sublibrary.” <https://doi.org/10.11578/endf/2571016> (2024).
- “ENDF/B-VIII.1 release – photonuclear sublibrary.” <https://doi.org/10.11578/endf/2571020> (2024).
- “ENDF/B-VIII.1 release – helions sublibrary.” <https://doi.org/10.11578/endf/2571021> (2024).
- “ENDF/B-VIII.1 release – neutrons sublibrary.” <https://doi.org/10.11578/endf/2571022> (2024).
- “ENDF/B-VIII.1 release – neutron-induced fission product yields sublibrary.” <https://doi.org/10.11578/endf/2571023> (2024).
- “ENDF/B-VIII.1 release – photo-atomic sublibrary.” <https://doi.org/10.11578/endf/2571024> (2024).
- “ENDF/B-VIII.1 release – protons sublibrary.” <https://doi.org/10.11578/endf/2571025> (2024).
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- “ENDF/B-VIII.1 release – tritons sublibrary.” <https://doi.org/10.11578/endf/2584305> (2024).

# Big Paper Timeline

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- **December 23, 2024:** Final manuscript submitted to Nuclear Data Sheets
- **August 11, 2025:** Referee reports received
- **October 21, 2025:** Revised manuscript resubmitted



## ENDF/B-VIII.1: Updated Nuclear Reaction Data Library for Science and Applications

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<https://doi.org/10.48550/arXiv.2511.03564>



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**ENDF/B-VIII.1: Updated Nuclear Applications**

[Submitted on 5 Nov 2025]

**ENDF/B-VIII.1: Updated Nuclear Reaction Data Library for Science and Applications**

G.P.A. Nobre,<sup>1,\*</sup> R. Capote,<sup>2</sup> M.T. Pigni,<sup>3</sup> A. Kleedtke,<sup>4</sup> M.J.L. Wormald,<sup>7</sup> K. Ramí, <sup>3</sup> Y. Danon,<sup>9</sup> N.A. Gibbs,<sup>10</sup> D.P. Barry,<sup>10</sup> I. Stetcu,<sup>6</sup> W. Haack,<sup>6</sup> A.E. Lovell,<sup>6</sup> N.J.D. McDonnell,<sup>3</sup> A.D. Carlson,<sup>12</sup> M. Dunn,<sup>13</sup> T. Kawamura,<sup>14</sup> J.D. McDonnell,<sup>13</sup> A.D. Carlson,<sup>12</sup> M. Dunn,<sup>13</sup> T. Kawamura,<sup>14</sup> B. Beck,<sup>5</sup> D. Bernard,<sup>11</sup> R. Beyer,<sup>15</sup> J.M. Brown,<sup>3</sup> O. Coles,<sup>1</sup> M. Cornock,<sup>17</sup> J. Cotchen,<sup>7</sup> J.P.W. Craddock,<sup>18</sup> P.W. Crozier,<sup>6</sup> D.E. Cullen,<sup>1</sup> A. Daskalakis,<sup>1</sup> M.-A. Desclae,<sup>19</sup> D.D. DíJulio,<sup>20</sup> P. Dimitriou,<sup>1</sup> A.C. Dreyfuss,<sup>1</sup> I. Durán,<sup>1</sup> R. Ferrer,<sup>1</sup> T. Gaines,<sup>1</sup> V. Gillette,<sup>1</sup> G. Gers,<sup>1</sup> K.H. Guber,<sup>1</sup> J.D. Haverkamp,<sup>10</sup> M.W. Herman,<sup>6</sup> K.J. Kelly,<sup>6</sup> H.I. Kim,<sup>24</sup> K.S. Kim,<sup>3</sup> A.J. Kon, <sup>1</sup> L. Leal,<sup>3,26</sup> H.Y. Lee,<sup>1</sup> A.M. Lewis,<sup>10</sup> J. Malec,<sup>4</sup> G. Muhrer,<sup>19</sup> A. Ney,<sup>10</sup> W.E. Ormand,<sup>5</sup> D.K. P. S. Quaglioni,<sup>3</sup> M. Rapp,<sup>10</sup> J.J. Ressler,<sup>5</sup> M. Risi,<sup>1</sup> G. Schnabel,<sup>2</sup> M. Schulz,<sup>25</sup> G.J. Siemers,<sup>9</sup> A.A. S. C. van der Marck,<sup>31</sup> M. Vorabbi,<sup>1,32</sup> C. Wen,<sup>1</sup> Brookhaven National Laboratory,<sup>1</sup> International Atomic Energy Agency,<sup>2</sup> Oak Ridge National Laboratory,<sup>3</sup> Jozef Stefan Institute,<sup>4</sup> Lawrence Livermore National Laboratory,<sup>5</sup> Los Alamos National Laboratory,<sup>6</sup> Naval Nuclear Laboratory,<sup>7</sup> Department of Nuclear Engineering, Texas A&M University,<sup>8</sup> National Nuclear Energy Agency of the Czech Republic,<sup>9</sup> Nuclear Energy Agency of the Czech Republic,<sup>10</sup> Nuclear Energy Agency of the Czech Republic,<sup>11</sup> CEA, DEN, DER, SPRC, Cadarache,<sup>12</sup> National Institute of Standards and Technology,<sup>13</sup> Spectra Tech, Inc.,<sup>14</sup> Department of Nuclear, University of Technology Dresden,<sup>15</sup> Helmholtz-Zentrum Dresden-Rossendorf,<sup>16</sup> Universidad Politécnica de Madrid, <sup>17</sup> AWE plc, Aldermaston, Reading,<sup>18</sup> North Carolina State University, Department of Physics,<sup>19</sup> European Spallation Source,<sup>20</sup> IGFAE-Universidad de Santiago de Compostela,<sup>21</sup> International Atomic Energy Agency (consultant), Vienna A-1400, PO Box 100, Austria,<sup>22</sup> Studsvik Scandpower, Inc., 1070 Riverwalk Dr., Idaho Falls, ID 83401, USA,<sup>23</sup> Ecole Polytechnique Fédérale de Lausanne, 1015 Lausanne, Switzerland,<sup>24</sup> Korea Atomic Energy Research Institute, Daejeon, Republic of Korea,<sup>25</sup> Research Centre Rež Ltd, Husinec-Řež, Czech Republic,<sup>26</sup> Institut de Radioprotection et de Sûreté Nucléaire, 92265 Fontenay aux Roses, Cedex, France,<sup>27</sup> Physics Department, Yarmouk University, Irbid, Jordan,<sup>28</sup> Laboratory for Reactor Physics Systems Behaviour, Paul Scherrer Institut, Villigen, Switzerland,<sup>29</sup> Argonne National Laboratory, Argonne, IL 60439-1843, USA,<sup>30</sup> Canadian Nuclear Laboratory, Chalk River, Ontario, Canada,<sup>31</sup> NRG Westerholtweg 3, 1755 LE Petten, Netherlands,<sup>32</sup> University of Surrey, Guildford, Surrey, GU2 7XH, United Kingdom

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Comments: Article as tables, 22 Subjects: Applied Physics Cite as: arXiv:2511.03564v1 [physics.app-ph] 5 Nov 2025

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**ENDF/B-VIII.1: Updated Nuclear Applications**  
[Submitted on 5 Nov 2025]

**ENDF/B-VIII.1: Updated Nuclear Reaction Data Library for Science and Applications**

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The ENDF/B-VIII.1 library is the newest recommended evaluated nuclear data file by the Cross Section Evaluation Working Group (CSEWG) for use in nuclear science and technology applications, and incorporates advances made in the six years since the release of ENDF/B-VIII.0. Among key advances made are that the  $^{239}\text{Pu}$  file was reevaluated by a joint international effort and that updated  $^{16}\text{O}$ ,  $^{19}\text{F}$ ,  $^{28-30}\text{Si}$ ,  $^{30-34}\text{Cr}$ ,  $^{54-55}\text{Mn}$ ,  $^{54-55}\text{Fe}$ ,  $^{63-65}\text{Cu}$ ,  $^{139}\text{La}$ ,  $^{232-235}\text{U}$ , and  $^{240-241}\text{Pu}$  neutron nuclear data from the IAEA coordinated INDEN collaboration were adopted. Over 60 neutron dosimetry cross sections were adopted from the IAEA's IRDF-II library. In addition, the new library includes significant changes for  $^{3}\text{He}$ ,  $^{14}\text{Li}$ ,  $^{19}\text{Be}$ ,  $^{31}\text{V}$ ,  $^{88}\text{Sr}$ ,  $^{103}\text{Rh}$ ,  $^{140-142}\text{Ce}$ ,  $^{147}\text{Ce}$ ,  $^{181}\text{Ta}$ ,  $^{182}\text{Pt}$ ,  $^{206-208}\text{Pb}$ , and  $^{234-236}\text{U}$  neutron data, and new nuclear data for the photonuclear, charged-particle and atomic sublibraries. Numerous thermal neutron scattering kernels were reevaluated or provided for the very first time. On the covariance side, work was undertaken to introduce better uncertainty quantification standards and testing for nuclear data covariances. The significant effort to reevaluate important nuclides has reduced bias in the simulations of many integral experiments with particular progress noted for fluorine, copper, and stainless steel containing benchmarks. Data issues hindered the successful deployment of the previous ENDF/B-VIII.0 for commercial nuclear power applications in high burnup situations. These issues were addressed by improving the  $^{239}\text{U}$  and  $^{239}\text{Pu}$  evaluated data in the resonance region. The new library performance as a function of burnup is similar to the reference ENDF/B-VII.1 library. The ENDF/B-VIII.1 data are available in ENDF-6 and GNDS format at this [arXiv URL](#).

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Hopefully, it will get published early 2026!

# Library activities beyond ENDF/B-VIII.1

# 1st Reactor Graphite Workshop (ReGra)

July 8-9 @ BNL

# 1st Reactor Graphite (ReGra) Workshop

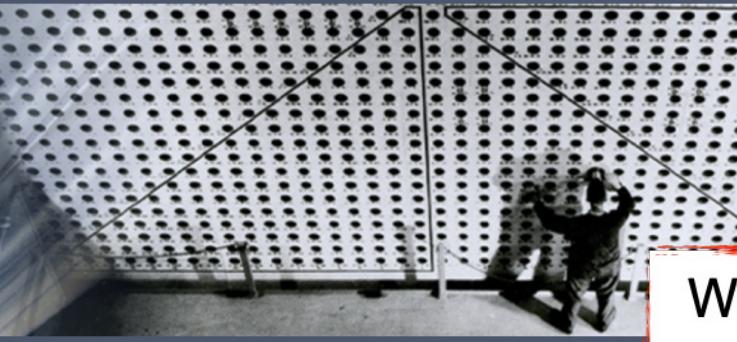
Bringing together experts in the nuclear data community

Hosted by Brookhaven National Laboratory

July 8–9, 2025

## Reactor Graphite Workshop

Jul 8–9, 2025  
Berkner Hall (Bldg. 488)  
US/Eastern timezone

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✉ [gnobre@bnl.gov](mailto:gnobre@bnl.gov)



Within the community, there were **different perspectives** on what should the thermal-neutron scattering law libraries associated with reactor graphite.

- This motivated the organization of an **in-person, highly-focused workshop**.
- Participants from BNL, RPI, ORNL, NCSU, TAMU, Kairos Power, BWXT Advanced Technologies, Foster & Associates, JAEA, INL, LLNL, U. Michigan, LANL, NNL, Studsvik Scandpower

# Meeting minutes published

- Published meeting minutes as a BNL lab report:
  - <https://doi.org/10.2172/2998877>
  - Report is **NOT** a scientific paper
  - Report is a description of **what happened** at the meeting:
    - What was presented
    - What was discussed: Comments, objections, replies, agreements and disagreements; past, present, future on the topic
    - Key takeaways: discussed, edited in real time, and agreed upon by ALL participants in the last session, before meeting ended
  - Feedback was positive:**
    - There will likely be a follow-up edition (2027?)



Report # BNL-229060-2025-INRE

## ***Summary of the 1st Reactor Graphite Workshop,***

**8-9 July, 2025**

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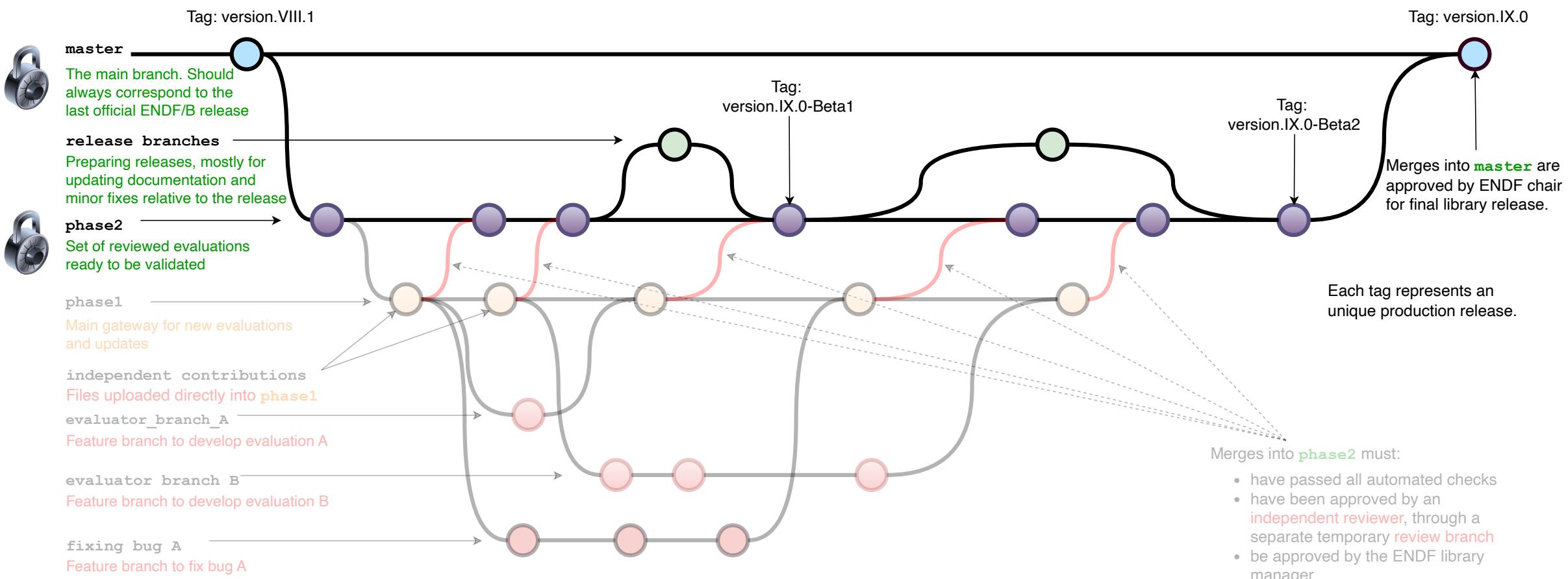
<sup>1</sup>Brookhaven National Laboratory, <sup>2</sup>Rensselaer Polytechnic Institute, <sup>3</sup>Oak Ridge National Laboratory, <sup>4</sup>Foster & Associates, LLC, <sup>5</sup>North Carolina State University, <sup>6</sup>Texas A&M University, <sup>7</sup>Kairos Power, <sup>8</sup>BWXT Advanced Technologies, LLC, <sup>9</sup>Japan Atomic Energy Agency, <sup>10</sup>Idaho National Laboratory, <sup>11</sup>Lawrence Livermore National Laboratory, <sup>12</sup>University of Michigan, <sup>13</sup>Los Alamos National Laboratory, <sup>14</sup>Naval Nuclear Laboratory, <sup>15</sup>Studsvik Scandpower, Inc.

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on behalf of the U.S. Department of Energy

# The ENDF repository

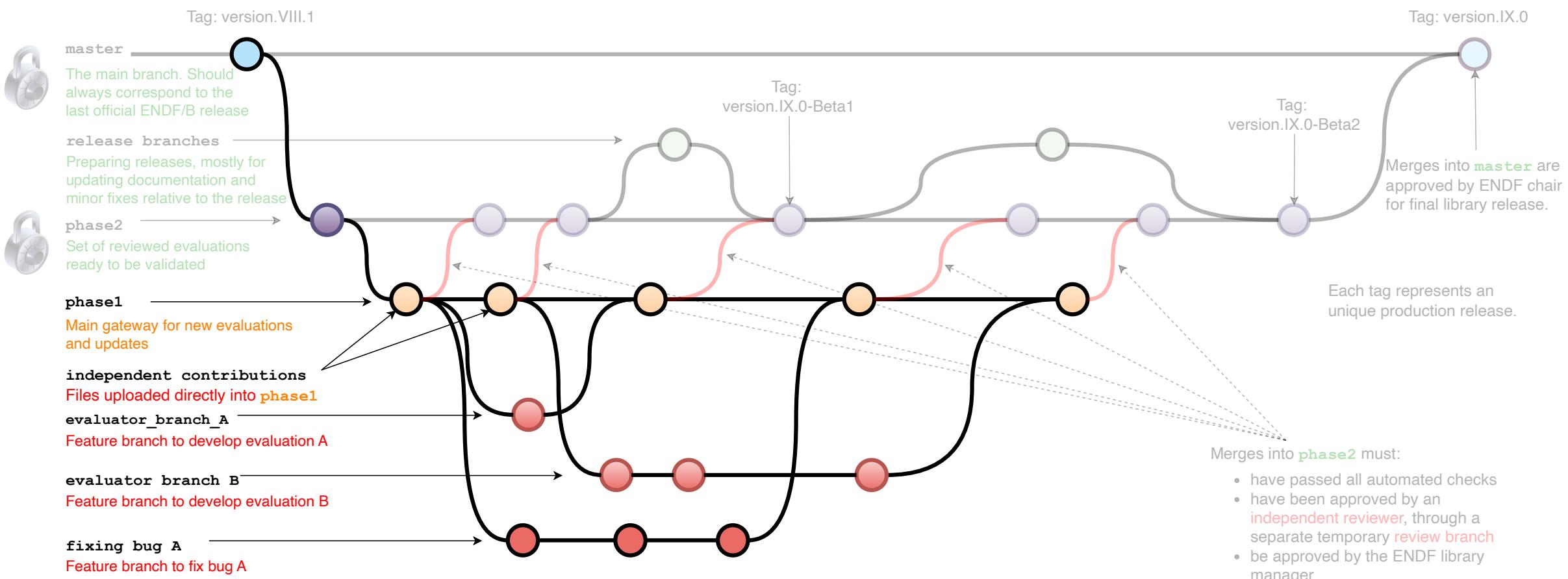
# ENDF repository scheme

ENDF Library Repository Diagram



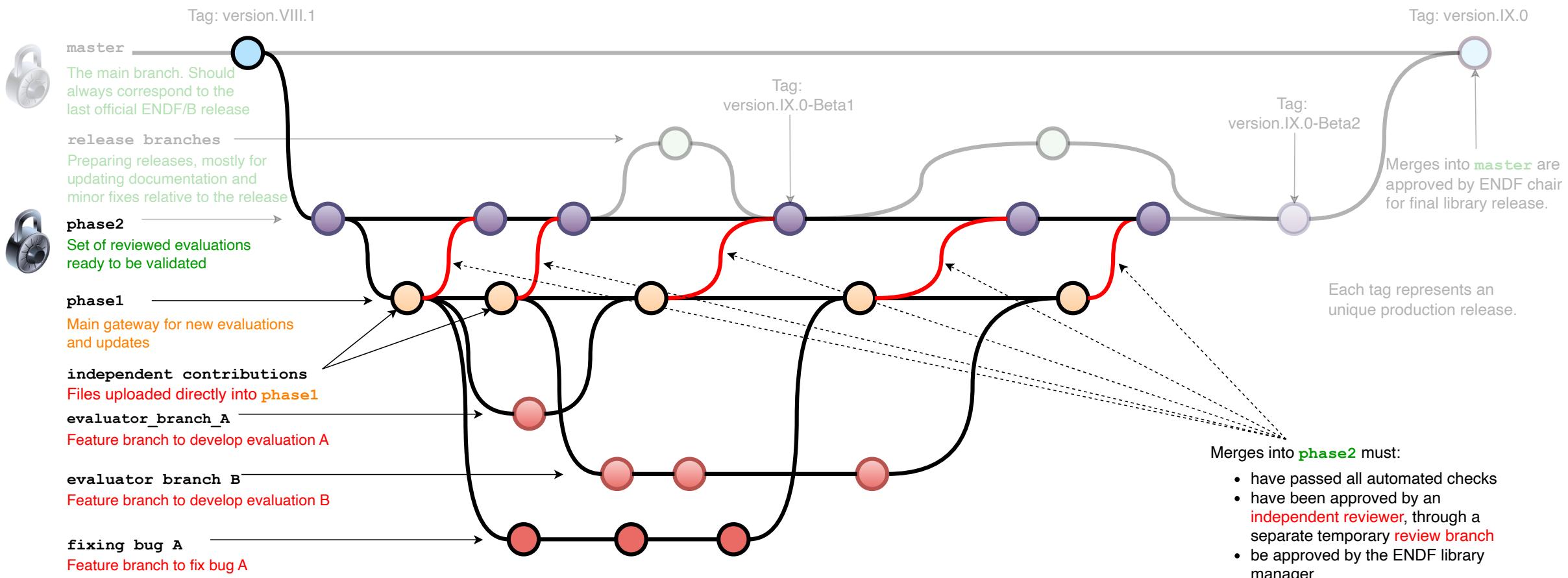
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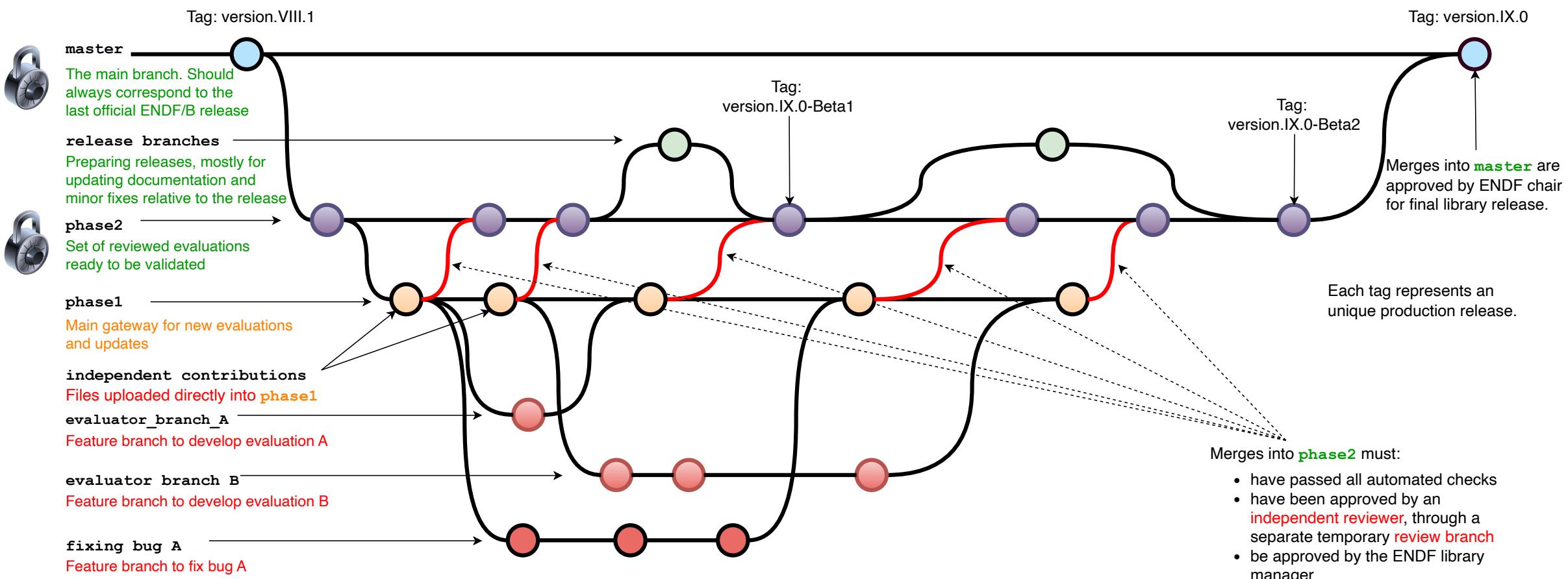
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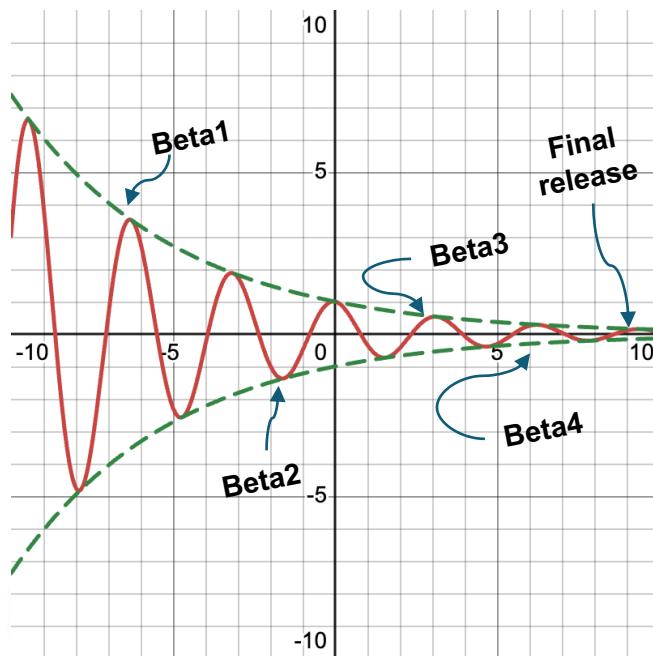


# Importance of review process

- We learned many lessons from the VIII.1 review process:
  - Identified several issues:
    - Current **review form** is **not very useful**
    - Wiki page and **report tarballs** are **not very helpful** either
    - **Issues** with integration with **processing codes**
  - On the **positive side**:
    - GitLab's **merge request GUI environment** for review was **great** for discussions, documentation, tracking of updates, etc., **all integrated with commits and issue trackers**
- For the ENDF/B-IX.0 cycle, we are planning a **complete re-work** of the review process, aiming to make it more user-friendly
  - In the meantime, we will keep working as we have been doing...

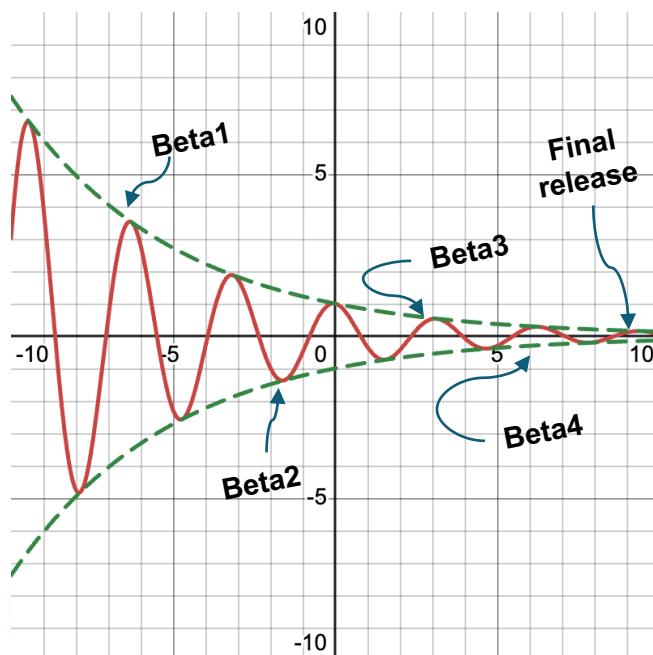
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- Still, reviews are essential!
- Allied with consistent validation, **review system** allows for a **predictable, progressively-convergent** path towards a **final ENDF release!**



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- **However**, we have been relying substantially on the good will of reviewers

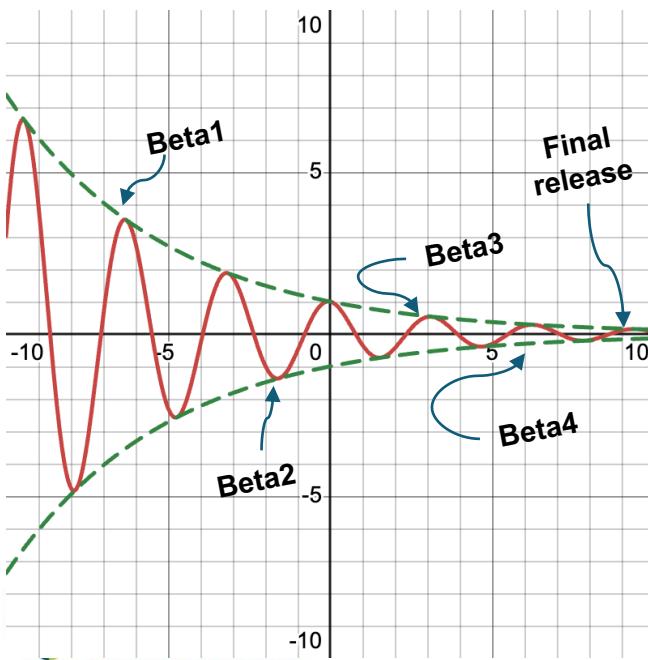


*"I will be happy to review it, but I have to wait until I get home and do it in the evening because I can't do it during work hours."*

*"Sure, I'd love to, but I need to find free time to do this because it's an unfunded activity..."*

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I encourage everyone to bring up with their program manager the importance of the review effort as an **efficient**, **cost-effective** way to improve the quality of the final product.

A small-time allocation can really go a long way!

# Status of the library

What has changed since ENDF/B-VIII.1

# Neutrons sublibrary

- = Submitted
- = Under review
- = Not submitted
- = Approved

n-004\_Be\_009.endf: GRIN capture gammas update  
n-006\_C\_012.endf: GRIN updates to inelastic and capture gammas  
n-007\_N\_014.endf: GRIN inelastic gamma updates  
n-007\_N\_015.endf: GRIN inelastic gamma updates  
n-008\_O\_016.endf: Fixes to elastic covariance issues introduced in Dec. 2022  
n-008\_O\_017.endf: GRIN inelastic gamma updates  
n-011\_Na\_022.endf: GRIN inelastic gamma updates  
n-011\_Na\_023.endf: GRIN inelastic gamma updates  
n-012\_Mg\_024.endf: GRIN updates to inelastic and capture gammas  
n-012\_Mg\_025.endf: GRIN updates to inelastic and capture gammas  
n-013\_Al\_027.endf: GRIN inclusion of branching ratios (needs to address a double-counting issue)  
n-014\_Si\_028.endf: GRIN inclusion of branching ratios  
n-014\_Si\_029.endf: GRIN inclusion of branching ratios (needs to fix an unintended change)  
n-014\_Si\_030.endf: GRIN inclusion of branching ratios (needs to fix an unintended change)

n-014\_Si\_031.endf: GRIN inclusion of branching ratios  
n-014\_Si\_032.endf: GRIN inclusion of branching ratios (There's a small change in MF/MT=6/800, was that intentional?)  
n-016\_S\_032.endf: GRIN capture gammas update and interpolation flag fix in MT102 – Additional flag fix needs to be reviewed  
n-017\_CI\_035.endf:

- LANL/Terrapower
- ORNL

n-017\_CI\_037.endf:

- LANL/Terrapower
- ORNL

n-025\_Mn\_055.endf: GRIN inclusion of branching ratios  
n-026\_Fe\_054.endf: Patch to fix negative elastic cross sections  
n-057\_La\_139.endf: ORNL/LANL evaluation  
n-073\_Ta\_181.endf: Fix of URR covariances  
n-092\_U\_234.endf: ORNL update to the two resonances & parameter transformation from MLBW to Reich-Moore  
n-092\_U\_238.endf: LANL new PFNS eval. including Chi-Nu data

# TSL sublibrary

[tsl-Cu.endf](#) - NJOY+NCrystal

[tsl-HinCH2.endf](#) - NCSU extension of VIII.0 evaluation (updated temperature grid and masses/free atom cross sections)

[tsl-Mo.endf](#) - NJOY+NCrystal

[tsl-Ni.endf](#) - NJOY+NCrystal

[tsl-Pb.endf](#) - NJOY+NCrystal

[tsl-V-metal.endf](#) - NJOY+NCrystal

[tsl-W-metal.endf](#) - NJOY+NCrystal

These bookkeeping slides may be boring, but they are a helpful tool to quickly visualize what's changing from one ENDF version to another

# Photonuclear sublibrary

[g-004\\_Be\\_009.endf](#): Updated NNL evaluation

# Additionally...

- There are many fixes from the 2025 Hackathon (ORNL) sitting on separate branches.
  - I'm slowly going through them, and they should be gradually incorporated into **phase1/phase2** branches.
- I'm searching for **reviewers** to speed up the acceptance of the already-submitted files
- Planning Beta1 release for the Spring, hopefully in sync with the Standards



**ENDF/B**  
**IX.0- $\beta$ 1**

vs.

**ENDF/B**  
**VIII.2- $\beta$ 1**

*will depend whether standards will be updated in time*

# Conclusion

- **Wrapping up ENDF/B-VIII.1 business**
  - Big Paper:
    - Revised version submitted
    - Should be published in NDS early 2026
    - Manuscript is available at arXiv
    - DOIs and landing page for data are available now
- **Beginning of next ENDF cycle:**
  - Organized Reactor Graphite workshop
  - Sorting out the review of submitted files and Hackathon fixes: **NEED REVIEWERS!**
  - Working on next Beta release: aiming for Spring, hopefully in-sync with Standards

# Acknowledgements

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