Brookhaven National Laboratory

U.S. DEPARTMENT of ENERGY

NNDC Report

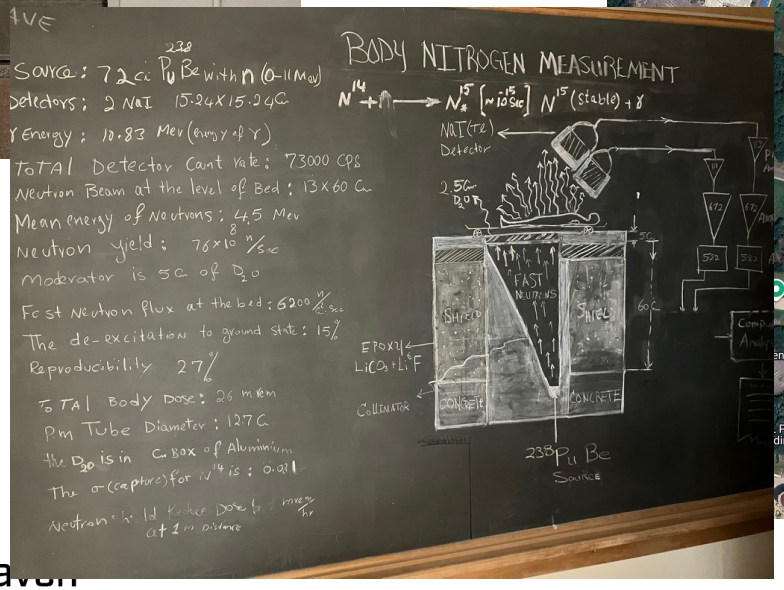
David Brown,
National Nuclear Data Center,
Brookhaven National Laboratory, Upton NY, USA

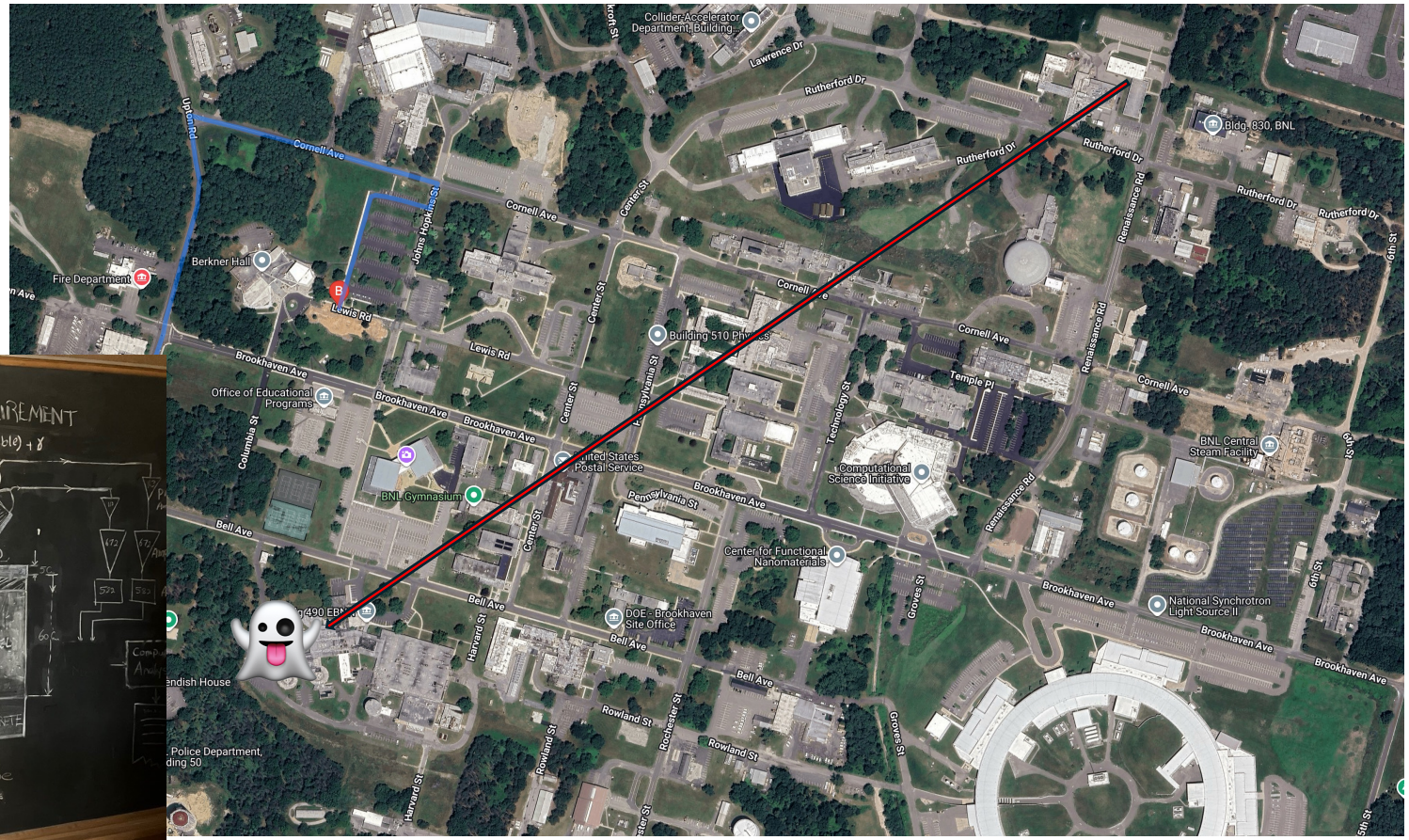
USNDP Meeting

28-31 October 2025

@BrookhavenLab

NNDC moved to a new, seasonally appropriate building





FY25 Staffing Summary

- **For FY 25, the NNDC supported**
- 3 IT professionals (**Arcilla**, **Mason,** & **Shu**),
- 2 administrative staff (**Dunn** & Frejka)
- 11 permanent scientists (Brown, Chimanski, Coles, Mattera, Morse, Nobre, Ota, Pritychenko, Ricard, Sonzogni, & **Wu**)
- 1 postdocs (Waniganeththi)
- no contractors

Legend

NNDC member, partly funded by USNDP

NNDC member, fully funded by USNDP

Non-NNDC member, partly funded by USNDP

You heard about these projects from the rest of the NNDC

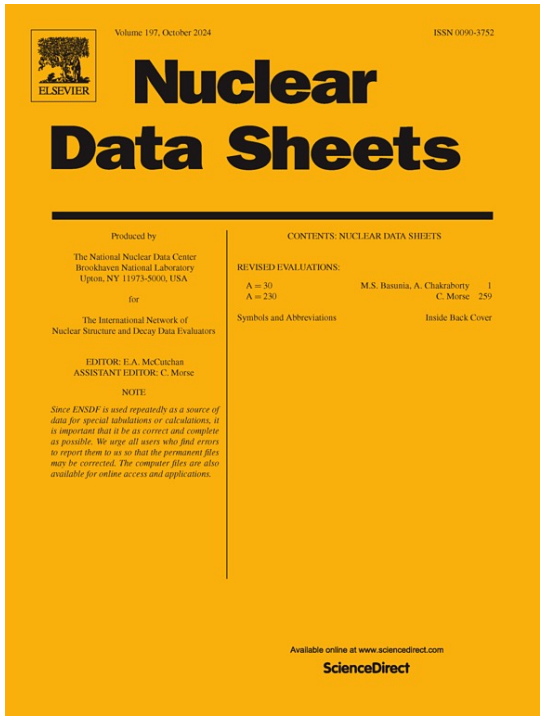
Gustavo Nobre

ENDF/B VIII.1

Boris Pritychenko

NSR and EXFOR

Libby Ricard



Donnie Mason, Ben Shu, & Ramon Arcilla

Modernization Efforts

Brookhaven National Laboratory

ENDF/B Status

ENDF/B-VIII.1

- ✓ Data released in August 2024
- ✓ DOI's minted
- ○ Big Paper in 2nd review, hopefully publish early in 2026

Next ENDF/B

- ✓ Contributions beginning to roll in
- ✓ Reactor Graphite Workshop 8-9 July
- ✓ Hackathon, 5-7 Aug, @ORNL
- ○ Beta release delayed

ENDF/B VIII.1

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

G.P.A. Nobre,[1,*] R. Capote,[2] M.T. Pigni,[3] A. Trkov,[4] C.M. Mattoon,[5] D. Neudecker,[6] D.A. Brown,[1] M.B. Chadwick,[6] A.C. Kahler,[6] N.A. Kleedtke,[6] M. Zerkle,[7] A.I. Hawari,[8] C.W. Chapman,[3] N.C. Fleming,[8] J.L. Wormald,[7] K. Ramić,[3] Y. Danon,[9] N.A. Gibson,[6] P. Brain,[9] M.W. Paris,[6] G.M. Hale,[6] I.J. Thompson,[5] D.P. Barry,[10] I. Stetcu,[6] W. Haeck,[6] A.E. Lovell,[6] M.R. Mumpower,[6] G. Potel,[5] K. Kravvaris,[5] G. Noguere,[11] J.D. McDonnell,[3] A.D. Carlson,[12] M. Dunn,[13] T. Kawano,[6] D. Wiarda,[3] I. Al-Qasir,[14,3] G. Arbanas,[3] R. Arcilla,[1] B. Beck,[5] D. Bernard,[11] R. Beyer,[15] J.M. Brown,[3] O. Cabellos,[16] R.J. Casperson,[5] Y. Cheng,[3] E.V. Chimanski,[1] R. Coles,[1] M. Cornock,[17] J. Cotchen,[7] J.P.W. Crozier,[8] D.E. Cullen,[2,†] A. Daskalakis,[10] M.-A. Descalle,[5] D.D. DiJulio,[18] P. Dimitriou,[2] A.C. Dreyfuss,[5] I. Durán,[19,20] R. Ferrer,[21] T. Gaines,[17] V. Gillette,[14] G. Gert,[5] K.H. Guber,[3] J.D. Haverkamp,[10] M.W. Herman,[6] J. Holmes,[7] M. Hursin,[22] N. Jisrawi,[14] A.R. Junghans,[15] K.J. Kelly,[6] H.I. Kim,[23] K.S. Kim,[3] A.J. Koning,[2] M. Koštál,[24] B.K. Laramee,[8] A. Lauer-Coles,[1] L. Leal,[3,25] H.Y. Lee,[6] A.M. Lewis,[10] J. Malec,[4] J.I. Márquez Damián,[18] W.J. Marshall,[3] A. Mattera,[1] G. Muhrer,[18] A. Ney,[10] W.E. Ormand,[5] D.K. Parsons,[6] C.M. Percher,[5] V.G. Pronyaev,[20] A. Qteish,[26] S. Quaglioni,[5] M. Rapp,[10] J.J. Ressler,[5] M. Rising,[6] D. Rochman,[27] P.K. Romano,[28] D. Roubtsov,[29] G. Schnabel,[2] M. Schulc,[24] G.J. Siemers,[9] A.A. Sonzogni,[1] P. Talou,[6] J. Thompson,[10] T.H. Trumbull,[10] S.C. van der Marck,[30] M. Vorabbi,[1,31] C. Wemple,[21] K.A. Wendt,[5] M. White,[6] and R.Q. Wright[3,†]

[1] *Brookhaven National Laboratory, Upton, NY 11973-5000, USA*
[2] *International Atomic Energy Agency, Vienna A-1400, PO Box 100, Austria*
[3] *Oak Ridge National Laboratory, Oak Ridge, TN 37831-6171, USA*
[4] *Jožef Stefan Institute, Jamova 39, SI-1000, Ljubljana, Slovenia*
[5] *Lawrence Livermore National Laboratory, Livermore, CA 94551-0808, USA*
[6] *Los Alamos National Laboratory, Los Alamos, NM 87545, USA*
[7] *Naval Nuclear Laboratory, West Mifflin, Pennsylvania 15122-0079, USA*
[8] *North Carolina State University, Department of Nuclear Engineering, Raleigh, North Carolina 27695*
[9] *Rensselaer Polytechnic Institute, Troy, NY 12180, USA*
[10] *Naval Nuclear Laboratory, Schenectady, New York 12301-1072, USA*
[11] *CEA, DEN, DER, SPRC, Cadarache, 13108 Saint-Paul-lèz-Durance, France*
[12] *National Institute of Standards and Technology, Gaithersburg, MD 20899-8463, USA*
[13] *Spectra Tech, Inc., Oak Ridge, TN 37830, USA*
[14] *Department of Nuclear, University of Sharjah, Sharjah, United Arab Emirates*
[15] *Helmholtz-Zentrum Dresden - Rossendorf e.V., Dresden, Germany*
[16] *Universidad Politécnica de Madrid, José Gutiérrez Abascal, 2 28006, Madrid, Spain*
[17] *AWE.plc Aldermaston, Reading, Berkshire, RG7 4PR.*
[18] *European Spallation Source ERIC, Lund, Sweden*
[19] *IGFAE-Universidad de Santiago de Compostela, 1782 Spain*
[20] *International Atomic Energy Agency (consultant), Vienna A-1400, PO Box 100, Austria*
[21] *Studsvik Scandpower, Inc., 1070 Riverwalk Dr., Idaho Falls, ID 83401, USA*
[22] *Ecole Polytechnique Fédérale de Lausanne (EPFL), 1015 Lausanne, Switzerland*
[23] *Korea Atomic Energy Research Institute, Daejeon, Republic of Korea*
[24] *Research Centre Řež Ltd, Husinec-Řež, Czech Republic*
[25] *Institut de Radioprotection et de Sûreté Nucléaire, 92262 Fontenay aux Roses, Cedex, France*
[26] *Physics Department, Yarmouk University, Irbid, Jordan*
[27] *Laboratory for Reactor Physics Systems Behaviour, Paul Scherrer Institut, Villigen, Switzerland*
[28] *Argonne National Laboratory, Argonne, IL 60439-4842 USA*
[29] *Canadian Nuclear Laboratories, Chalk River, Ontario, Canada*
[30] *NRG Westerduinweg 3, 1755 LE Petten, Nederland*

Brookhaven National Laboratory

NSR

- Total number of keyworded entries: 1,254
- Total number of corrected entries: 717
- No contractors, but…
- Experimentation with LLMs show promise!
  - Copyright issues => must use underpowered internal services

NSR is becoming our testbed for modernizing workflows and integrating LLMs

EXFOR, Area #1

- 118 new (Often in consultations with authors) and 385 corrected entries
- 23 preliminary and 17 final transmissions (Refereed compilations)
- B. Pritychenko: 84 new and 9 corrected
- Help from friends!
  - O.Gritzay (no longer available): 34 new
  - O.Schwerer: 372 corrected
  - N.Otsuka: 4 corrected

NSR

- Total number of keyworded entries: 1,254
- Total number of corrected entries: 717
- No contractors, but…
- Workflow speedups and Experimentation with LLMs show promise!
  - Copyright issues => must use underpowered internal services

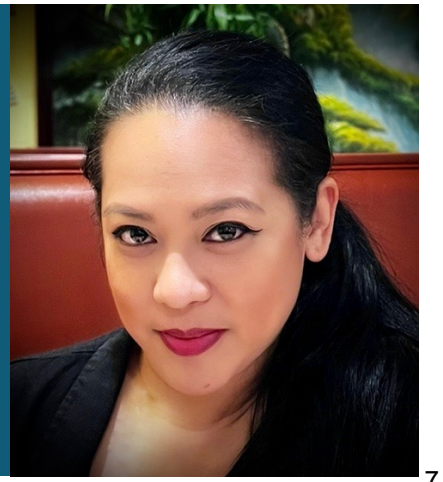
NSR is becoming our testbed for modernizing workflows and integrating LLMs

EXFOR, Area #1

- 118 new (Often in consultations with authors) and 385 corrected entries
- 23 preliminary and 17 final transmissions (Refereed compilations)
- B. Pritychenko: 84 new and 9 corrected
- H
  -
  -
  -

Cat can help with library requests

cdunn@bnl.gov



NSR Modernization is proceeding!

A Data Model for NSR

- How do we build an NSR data model?
  - *Separate data from its original format*
    - Enables translation into other formats (like JSON)
    - Also enables **Object-Relational Mapping (ORM)**

Note: We already have a copy of NSR in JSON!

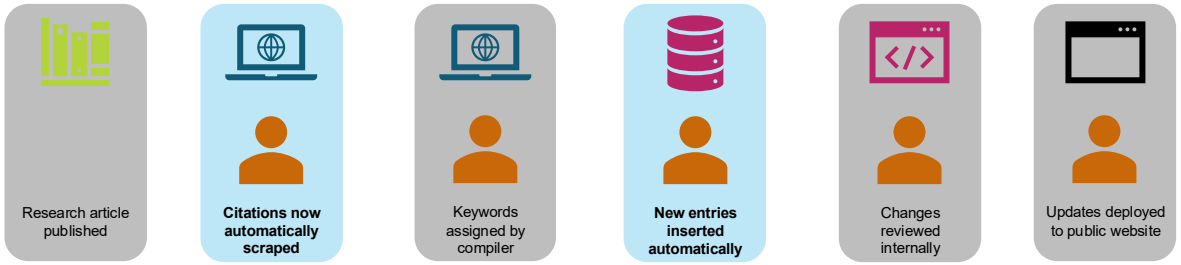
NSR 80-column text files

NSR concepts defined using strings, enums, numbers, etc.

Executable code (Java, Python) for reading/writing NSR data

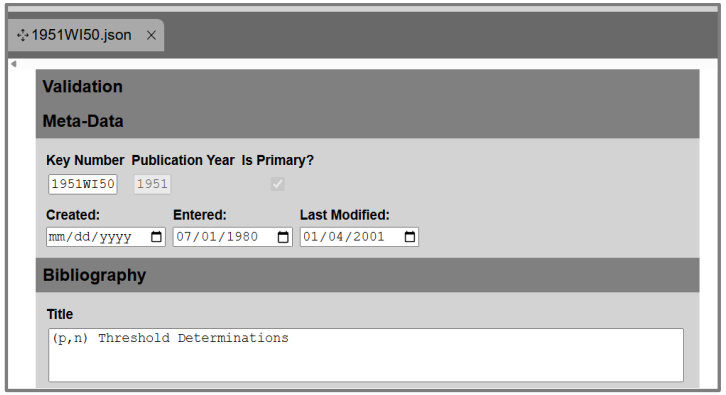
Ability to recreate NSR database in different formats

Workflow With Automation



- **update-nsr-sql** shows that NSR's workflow can be streamlined
  - We could deploy this framework today, if we wanted to

Editor & validator



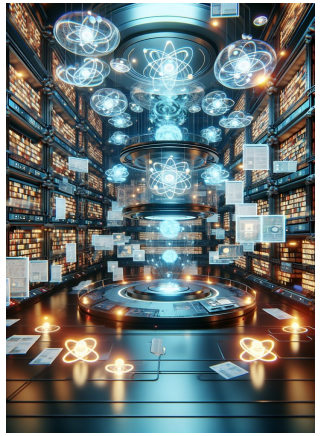
chatNSR

LLM capability and size
Move to more advanced Qwen3, 235B (full precision) for higher accuracy.

Training Dataset
Increase volume from 682 to 5,000

Multi-modal support

Computational resources
Perform fine-tuning on NN's GPU server.
- 8 Nvidia H100 GPUs (8 x 80 GB = 640 GB)



XUNDL Metrics

FY 24

Compiled

674 datasets from

382 papers

FY 25

Compiled

710 datasets from

368 papers

(3 papers from Bulgarian Center)

BNL FY25 contribution:
246 papers & 532 datasets

Full database is **11918** datasets for **2957** nuclides**

Brookhaven National Laboratory

** As of October 29, 2025

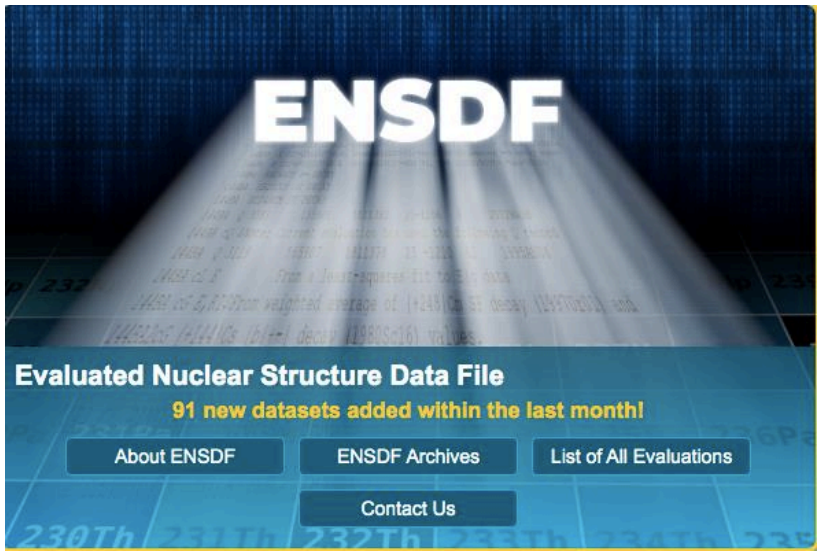
ENSDF Metrics

FY 24

Evaluated 145 nuclides, 12 mass chains

FY 25

Evaluated 155 nuclides, 10 mass chains (includes several large mass chains)



All submissions to ENSDF from USNDP

BNL FY25 contribution:
3 mass chains
(A=46, 185, 216),
50 nuclides & 6 reviews

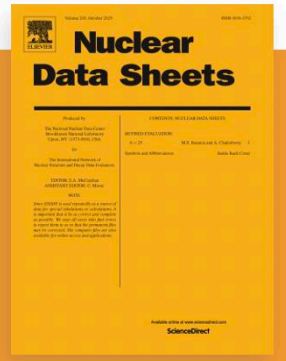
Full database is **20089** datasets for **3443** nuclides

** As of October 29, 2025

Brookhaven National Laboratory

Nuclear Data Sheets for “FY25”

- 8 issues – up from 6 past few years
- 14 mass chains – up from 10 last FY
- 3 traditional manuscripts
- 1 “in memorandum” for R. Firestone



Nuclear Data Sheets

Supports open access

- ENDF Big Paper to be published early 2026

Citation metrics as expected, but will look really good next year when the ENDF paper is published!

Latest published | Top cited | Most downloaded | Most popular

The most cited articles published since January 2022. Source: Scopus ↗

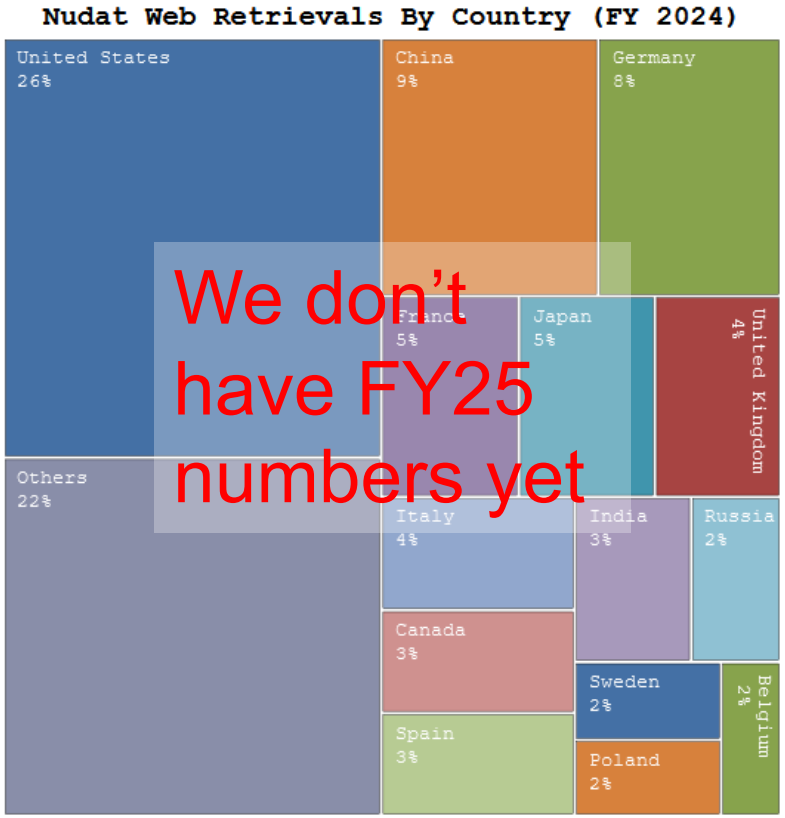
Research article ○ Abstract only
FENDL: A library for fusion research and applications
G. Schnabel, ... A. Žohar
February 2024

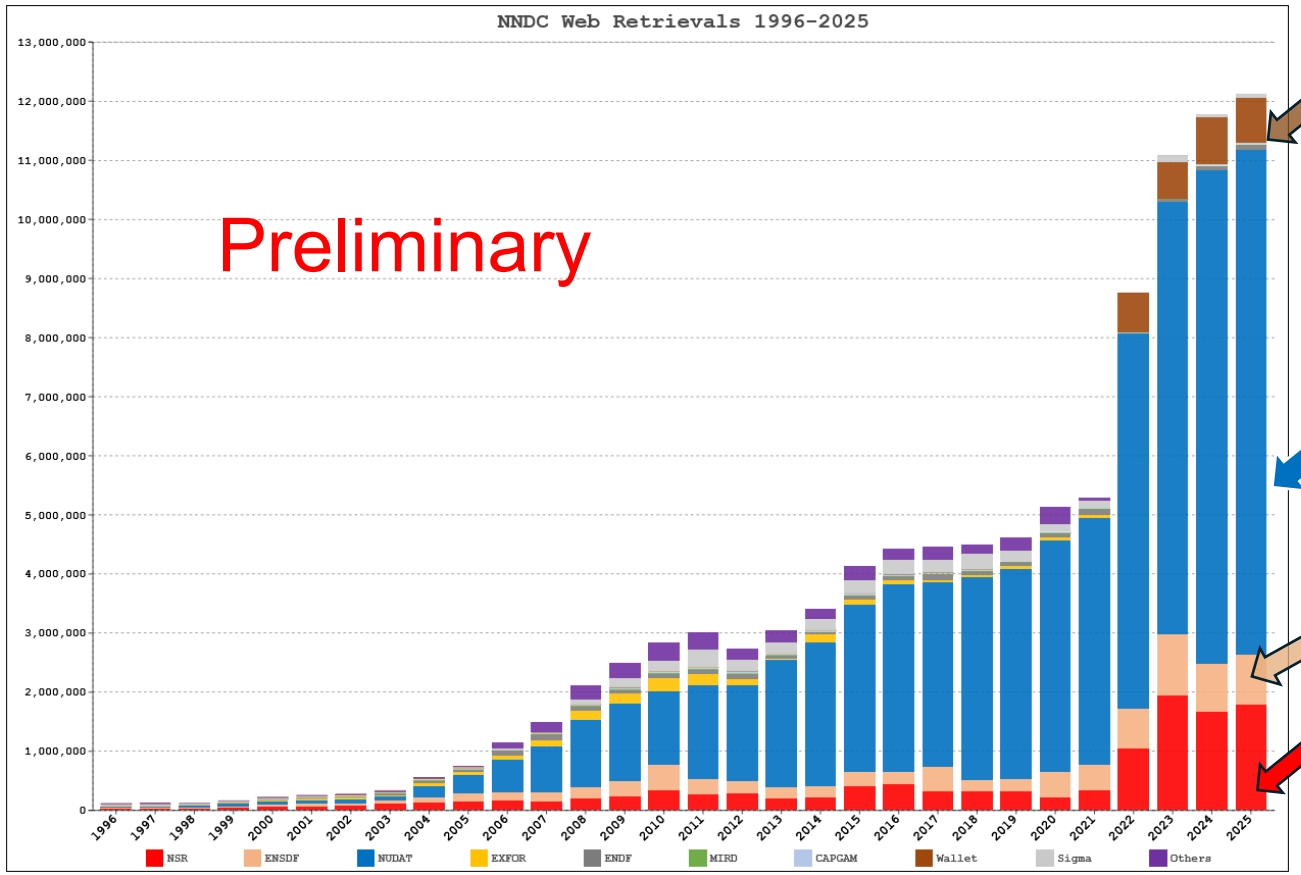
Research article ○ Abstract only
Nuclear Data Sheets for A=48
Jun Chen
January 2022

Research article ○ Abstract only
Nuclear Data Sheets for A=24
M. Shamsuzzoha Basunia, Anagha Chakraborty
December 2022

Research article ○ Abstract only
Nuclear Data Sheets for A=126
H. Iimura, ... S. Ohya
February 2022

Web Analytics





Wallet

NuDat

ENSDF

NSR

Brookhaven National Laboratory

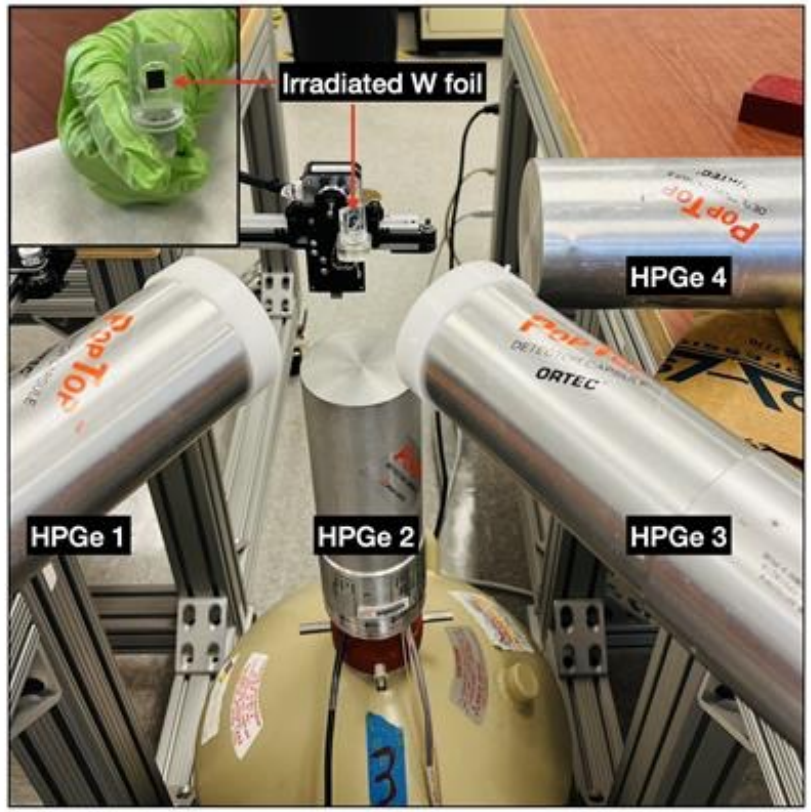
Nuclear Wallet Cards & CapGam are available on your phone!

Wallet Cards for Android

Wallet Cards for iOS

CapGam for Android

NDIAWG funded fusion research, beginning FY26 – decay data for fusion



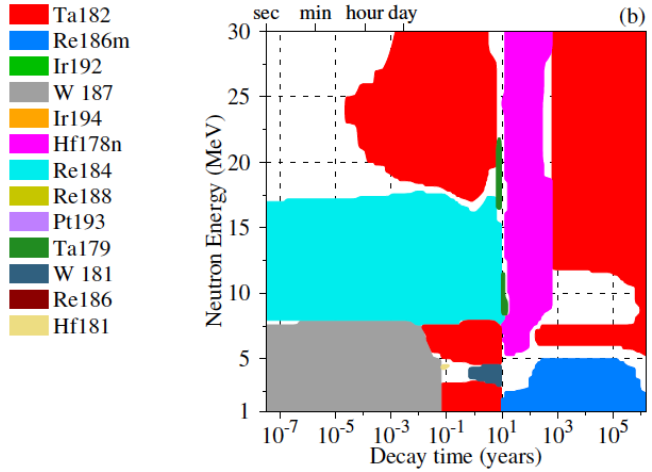
Configuration of the NNDC decay station during data acquisition for the initial 187W decay measurement

Two tungsten foils were irradiated at the UMass Lowell reactor for few minutes and subsequently shipped to the NNDC decay station at BNL.

The measurement was performed using the four-detector array shown below.

One week of data collection was sufficient to match the statistics of the prior publication.

Following the first exploratory trial, a second experiment will be carried out with optimized settings.



Gilbert, M.R., Sublet, J.C. and Turner, A., 2016. Handbook of activation, transmutation, and radiation damage properties of the elements and of ITER materials simulated using FISPACT-II & TENDL-2015; ITER FW armour focus. *See http://www.ccfe.ac.uk* .

^{184}Re, ^{183}Os, ^{194,196}Au in FY27 & FY28

A. Mattera, E. Ricard, S. Waniganeththi

NNDC Vision & Mission

The National Nuclear Data Center (NNDC) vision is to be the premier global resource for nuclear data and plan to:

- ❑ Implement AI/ML algorithms to reduce the time from data publication to integration in a recommended library to less than two years.
- ❑ Establish an open data repository for low-energy nuclear physics.
- ❑ Advance dissemination efforts with modern and efficient software tools.
- ❑ Sustain a robust nuclear physics research portfolio, including the development of an experimental program to accelerate isotope production science.

The NNDC is the lead and largest unit of the U.S. Nuclear Data Program (USNDP), whose mission is to provide current, accurate, authoritative data for workers in pure and applied areas of nuclear science and engineering. This is accomplished primarily through the compilation, evaluation, dissemination, and archiving of extensive nuclear datasets. USNDP also addresses gaps in the data, through targeted experimental studies and the use of theoretical models.