

NP Office Hours: Nuclear Data Portfolio

Office of Nuclear Physics
August 2024

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Program Manager



U.S. DEPARTMENT OF
ENERGY

Office of
Science

[Energy.gov/science](https://www.energy.gov/science)

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<https://science.osti.gov/SW-DEI/DOE-Diversity-Equity-and-Inclusion-Policies/DOE-Policies-Prohibiting-Discrimination-and-Harassment>

Nuclear Data – A brief introduction

Nuclear Data:

- Information on how nuclei interact and behave
- An active field since the discovery of radioactivity and the Manhattan Project
- Incorporates experiment, theory, computing (modeling and processing), statistics (uncertainty quantification)

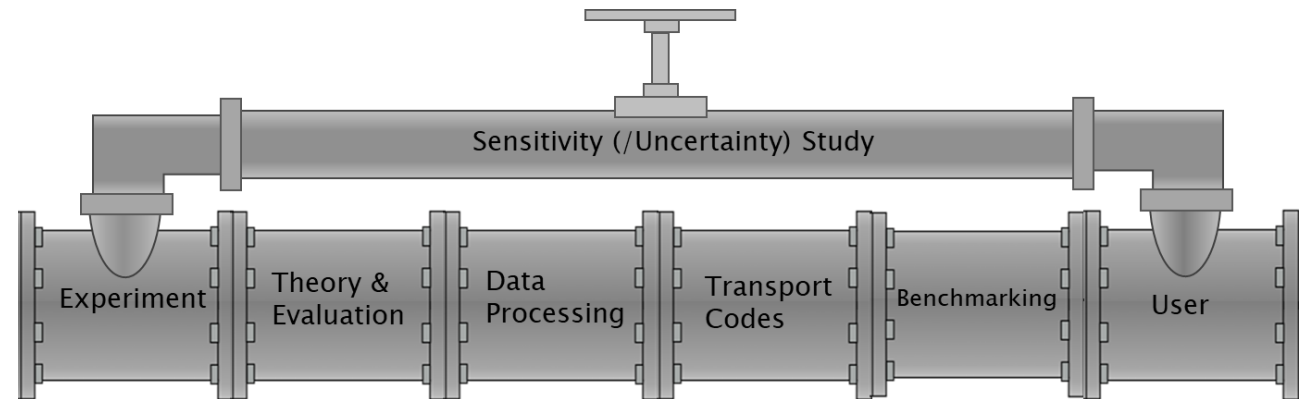


Lise Meitner and Otto Hahn,
Kaiser-Wilhelm Institute, Berlin

Discovery of fission, 1939



Group of interns participating in National Nuclear Data Center
summer programs



Nuclear Data Pipeline

US Nuclear Data Program (USNDP)

- The US Nuclear Data Program (USNDP) is responsible to provide current, accurate, authoritative data for workers in pure and applied areas of nuclear science and engineering and it is stored at the National Nuclear Data Center (<https://www.nndc.bnl.gov/>)
- Experiment and theory of:
 - Cross-sections
 - Reactions
 - Stability and decay



USNDP Network

<https://science.osti.gov/np/Research/Nuclear-Data>

National Nuclear Data Center

- National Nuclear Data Center (NNDC) started in 1952
- Mission:
 - Maintain and update USNDP databases
 - Maintain and update the infrastructure that supports the databases
 - Address gaps in data using theory and experiment

Libraries

Nuclear Science References (NSR)

Nuclear physics articles indexed according to content

EXFOR

Compiled nuclear reaction data

XUNDL

Compiled nuclear structure and decay data

ENSDF

Recommended nuclear structure and decay data

ENDF

Recommended particle transport and decay data, with a strong emphasis on neutron-induced reaction data

Example Application: Space Exploration

- **Recent NP outreach to NASA** led to discovery of needs in space exploration in human spaceflight, electronics protection, and planetary exploration
- **Human Spaceflight** requires high energy data due to galactic cosmic rays hitting spacecraft → dose to astronauts
- **Electronics Protection** requires data on advanced electronics materials
- **Planetary Exploration** requires data on a variety of elements that could be found on the Moon, Mars, and others

FINAL RECOMMENDED REACTIONS

Fe, Si, O, He + H, C, Al, Fe → ^{1,2,3}H, ^{3,4}He (isotopic dd & total reaction σ)

3 GeV/n, 1.5 GeV/n, 800 MeV/n, 400 MeV/n

dd = double differential

Graphics from presentation by J. Norbury (NASA), WANDA2022



Illustration of NASA astronauts on the lunar South Pole. Credit: NASA

Illustration of NASA moon mission

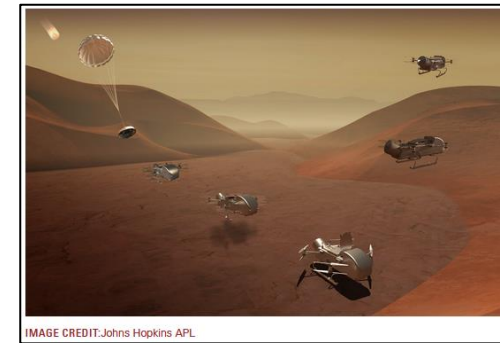
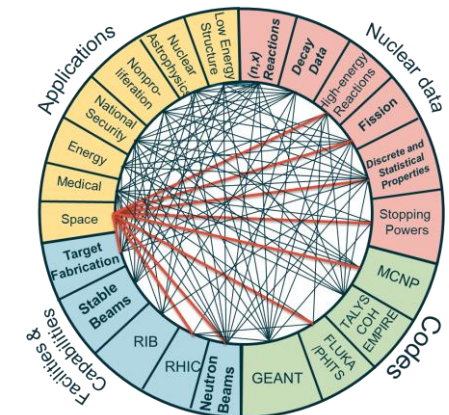


IMAGE CREDIT: Johns Hopkins APL

NASA Dragonfly mission to Saturn's moon Titan

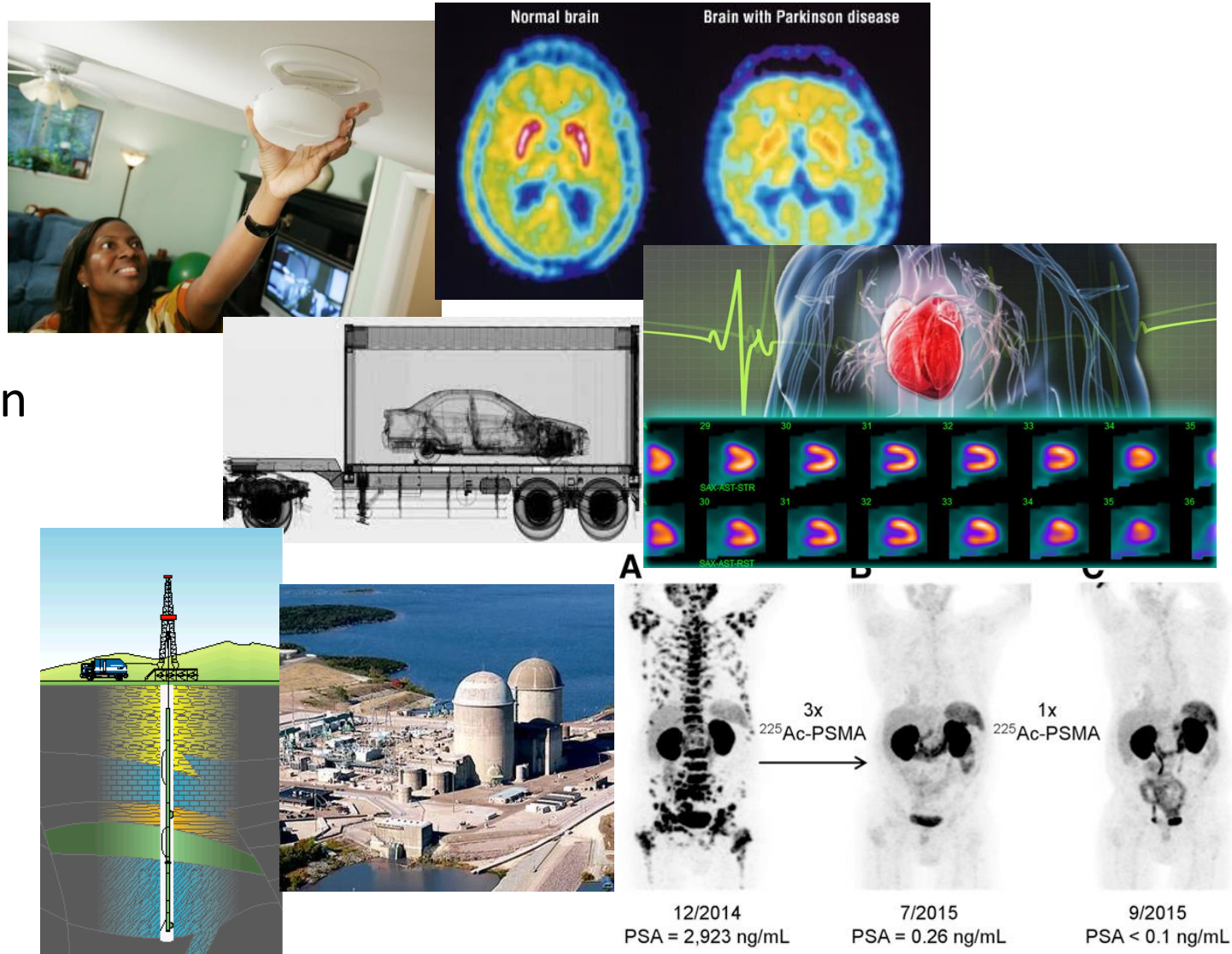


Orion spacecraft crew module

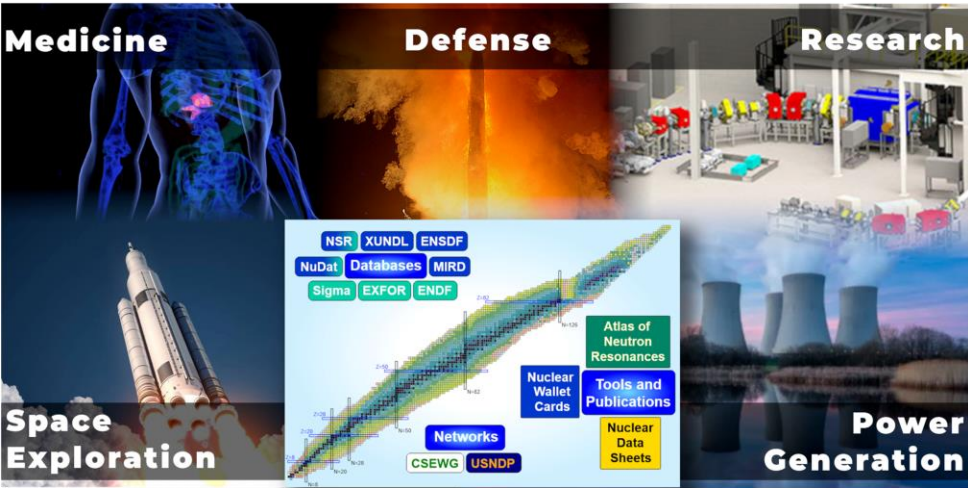


You & “Everyday” Nuclear Data? A Few Examples..

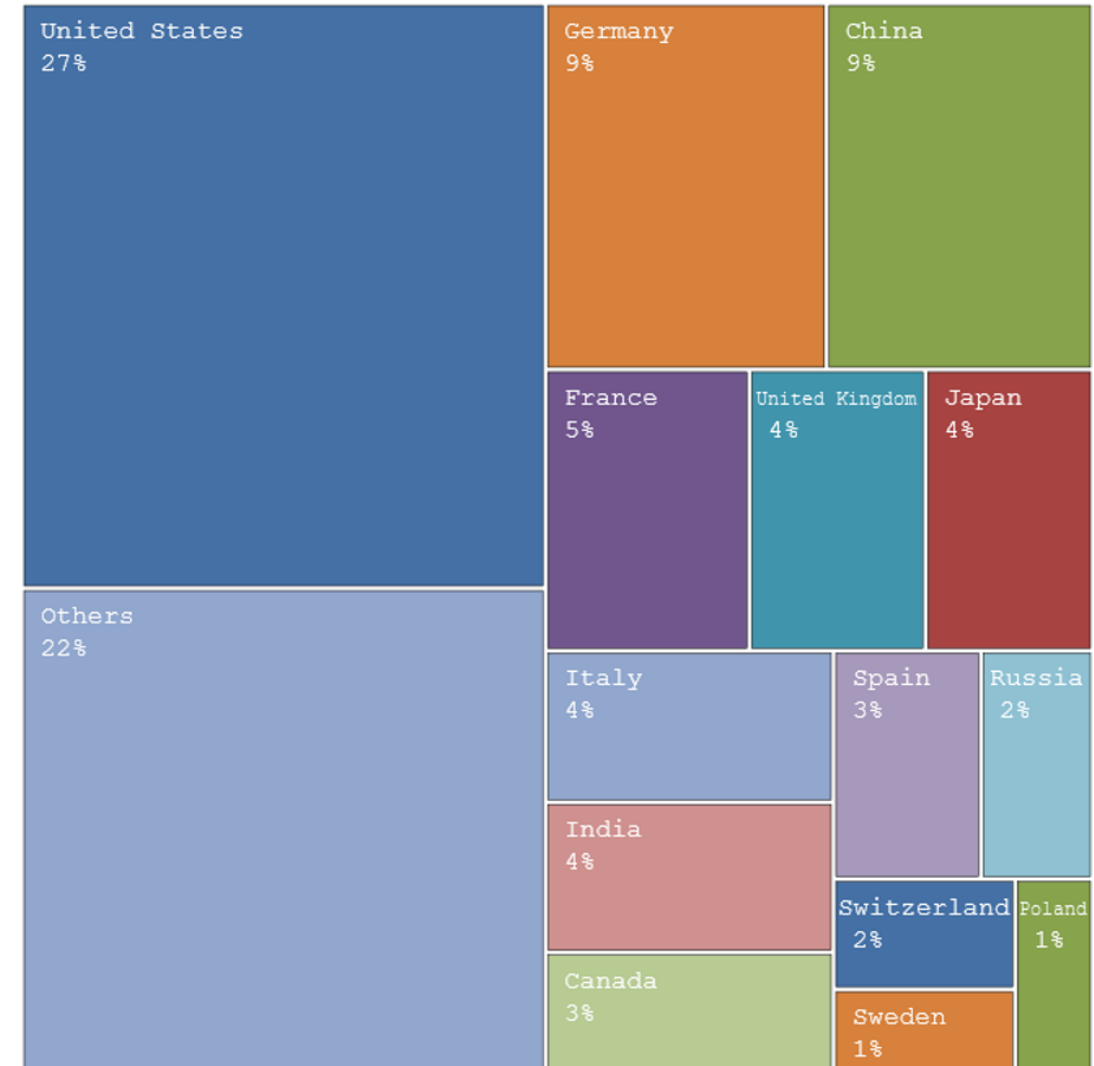
- Fire safety in your house
- Heart Health
- Food safety
- Medical Diagnosis
- Carbon free electricity generation
- Port of entry security
- Metastasized cancer treatment
- Oil and gas prospecting
- Deep space exploration
- National Security



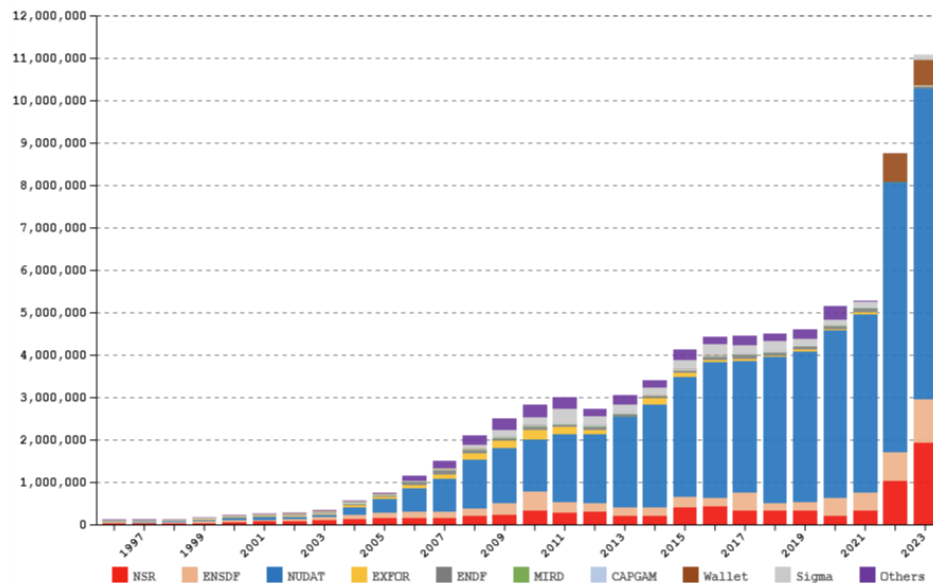
Nuclear Data is a World-Wide Resource



NuDat Web Retrievals By Country (FY 2023)



NNDC Web Retrievals 1996-2023



Examples of International Collaboration

- International Atomic Energy Agency (IAEA)
 - Nuclear Structure and Decay Data
 - Nuclear Reaction Data Center Network
- April 2024 marked 50 years of the NSDD network
- Research projects and training opportunities
- <https://www-nds.iaea.org/>

- Nuclear Energy Agency (France)
- Collaboration focused on applications
- Working groups target specialized nuclear data needs
 - Data formats, evaluation reproducibility, benchmarks, uncertainty quantification
- High Priority Request List
- https://oecd-nea.org/jcms/c_12919/nuclear-data

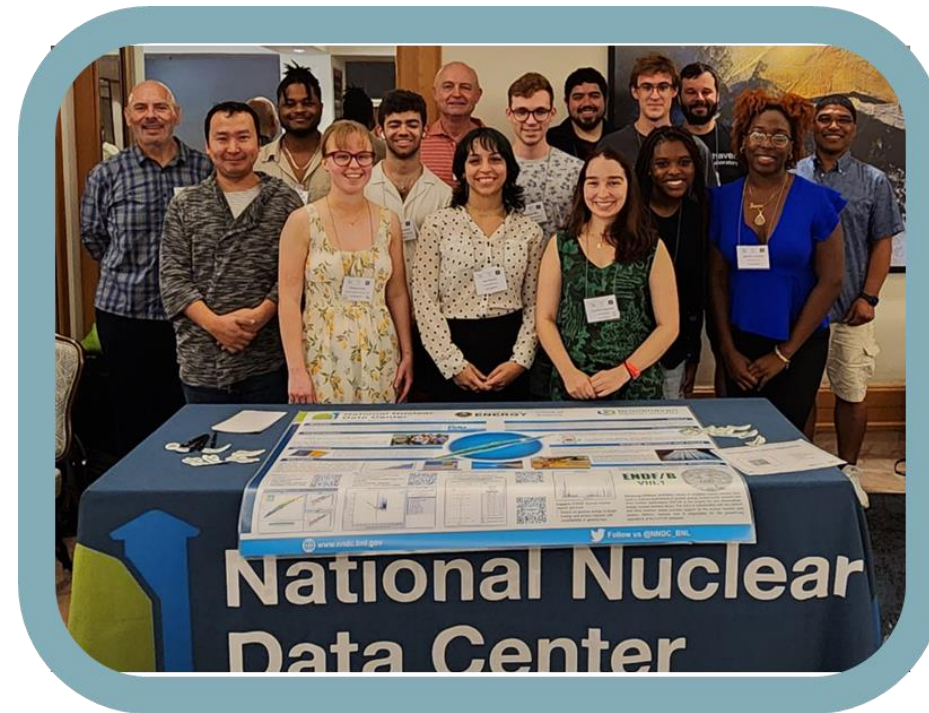
Outreach - Federal

- The Nuclear Data InterAgency Working Group, led by NP, was formed in 2016
- Enables coordination and collaboration at the federal program level.
- Representatives meet twice annually to discuss and provide updates.
- Membership has doubled since 2020

 <ul style="list-style-type: none">- Office of Science- National Nuclear Security Administration- Office of Nuclear Energy- Advanced Research Project Agency - Energy	 <ul style="list-style-type: none">- Countering Weapons of Mass Destruction Office	 <ul style="list-style-type: none">- Human Spaceflight- Electronics- Propulsion/power- Spectroscopy
 <ul style="list-style-type: none">- Defense Threat Reduction Agency- Missile Defense Agency	 <ul style="list-style-type: none">- Nuclear Physics (Experiment and Theory)	 <ul style="list-style-type: none">- Safety and Risk Reduction
 <ul style="list-style-type: none">- National Cancer Institute		

Outreach – End Users

- The nuclear data community attends many conferences and workshops
- Examples:
 - Annual APS/Division of Nuclear Physics meeting
 - American Nuclear Society
 - Specialized workshops such as Nuclear Data for Fusion Roundtable



Outreach – WANDA



- The nuclear data community also hosts an annual Workshop for Applied Nuclear Data Activities (WANDA)
- Gathers federal programs, lab and university scientists, end users, and international colleagues to prioritize nuclear data needs
- Archived WANDA materials and other workshops can be found here:
<https://www.nndc.bnl.gov/ndwg/wanda.html>

Home	WANDA 2023 Crystal City, VA February 27 - March 2, 2023
Resources	<ul style="list-style-type: none">• Presentations
Publications	WANDA 2022 Workshop for Applied Nuclear Data Activities Virtual February 28 - March 4, 2022
Roster	<ul style="list-style-type: none">• WANDA 2022 Presentations
News	WANDA 2021 Workshop for Applied Nuclear Data Activities
Workshops	<ul style="list-style-type: none">• WANDA 2021 Presentations• WANDA 2021 Outcomes Published in Physical Review Research
WANDA Meetings	

Funding Opportunity Announcements (FOA)

PROGRAM ANNOUNCEMENT
TO DOE NATIONAL LABORATORIES

U. S. Department of Energy
Office of Science
Nuclear Physics

Nuclear Data Interagency Working Group / Research Program

DOE National Laboratory Announcement
Announcement Type:

Issue Date:	04/26/2017
Letter of Intent Due Date:	05/12/2017 <i>A Letter of Intent is required.</i>
Encourage/Disencourage Date:	05/26/2017
Application Due Date:	07/21/2017

FY17

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NUCLEAR DATA INTERAGENCY WORKING GROUP
(NDIAWG) RESEARCH PROGRAM

FUNDING OPPORTUNITY ANNOUNCEMENT (FOA) NUMBER:
DE-FOA-0002440

FOA TYPE: INITIAL
CFDA NUMBER: 81.049

Announcement Issue Date:	December 7, 2010
Submission Deadline for Letters of Intent:	January 7, 2011 at 5 PM Eastern Time (A Letter of Intent is required)
Proposal Encourage/Disencourage Date:	January 21, 2011 at 5 PM Eastern Time
Submission Deadline for Applications:	March 8, 2011 at 5 PM Eastern Time

FY18

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OFFICE OF SCIENCE (SC), NUCLEAR PHYSICS (NP)
NATIONAL NUCLEAR SECURITY ADMINISTRATION (NNSA), DEFENSE
NUCLEAR NONPROLIFERATION RESEARCH AND DEVELOPMENT

FY24

**NUCLEAR DATA INTERAGENCY WORKING GROUP
(NDIAWG) RESEARCH PROGRAM**

FUNDING OPPORTUNITY ANNOUNCEMENT (FOA) NUMBER:
DE-FOA-0003238

FOA TYPE: Initial
CFDA NUMBER: 81.049

FOA Issue Date:	January 4, 2024
Submission Deadline for Letters of Intent:	February 5, 2024 at 11:59pm Eastern Time A Letter of Intent is required. Letters of Intent must be submitted by an authorized institutional representative.
Letter of Intent Response Date	February 19, 2024 days at 11:59pm Eastern Time
Submission Deadline for Applications:	April 4, 2024 at 11:59pm Eastern Time

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FY23

NUCLEAR DATA INTERAGENCY WORKING GROUP
(NDIAWG) RESEARCH PROGRAM

FUNDING OPPORTUNITY ANNOUNCEMENT (FOA) NUMBER:
DE-FOA-0002982

FOA TYPE: Initial
CFDA NUMBER: 81.049

FOA Issue Date:	February 1, 2012
Submission Deadline for Letters of Intent:	March 1, 2012 at 5:00pm Eastern Time A Letter of Intent is required. Letters of Intent must be submitted by an authorized institutional official.
Letter of Intent Response Date	March 15, 2012, at 11:59pm Eastern Time
Submission Deadline for Applications:	May 1, 2012 at 11:59pm Eastern Time

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OFFICE OF NUCLEAR NONPROLIFERATION RESEARCH AND DEVELOPMENT

FY19

NUCLEAR DATA INTERAGENCY WORKING GROUP /
RESEARCH PROGRAM

FUNDING OPPORTUNITY ANNOUNCEMENT (FOA) NUMBER:
DE-FOA-0002114

FOA TYPE: INITIAL
CFDA NUMBER: 81.049

FOA Issue Date:	April 19, 2018
Submission Deadline for Letters of Intent:	May 15, 2018, at 5 PM Eastern A Letter of Intent is required
Application Encouragement Date	June 1, 2018, at 5 PM Eastern
Submission Deadline for Applications:	June 28, 2018, at 5 PM Eastern

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FY21

NUCLEAR DATA INTERAGENCY WORKING GROUP /
RESEARCH PROGRAM

DOE NATIONAL LABORATORY ANNOUNCEMENT NUMBER:
LAB 18-1903

ANNOUNCEMENT TYPE: INITIAL

Announcement Issue Date:	March 26, 2018
Submission Deadline for Letters of Intent:	April 13, 2018, at 5 PM Eastern A Letter of Intent is required.
Proposal Encourage/Disencourage Date	April 29, 2018, at 5 PM Eastern
Submission Deadline for Pre-Applications:	N/A
Submission Deadline for Applications:	June 15, 2018, at 5 PM Eastern

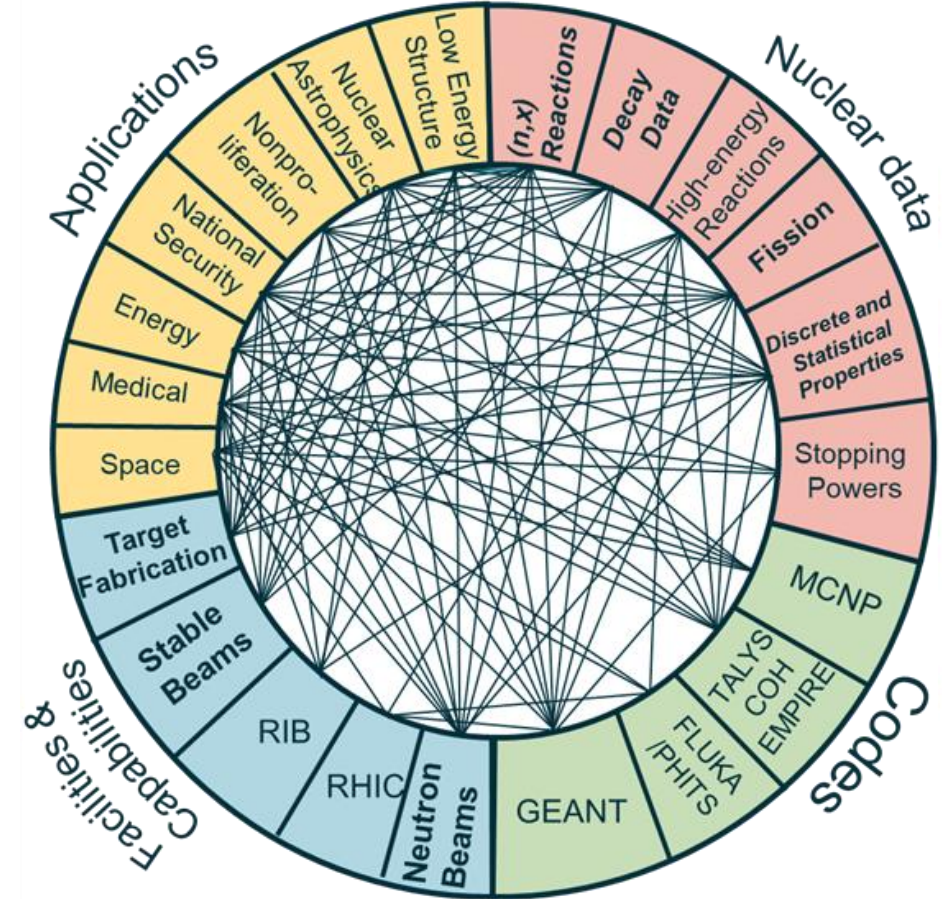
A joint FOA is released annually which includes research topics from prioritized nuclear data needs

Over \$60M has been invested across nearly all DOE labs and universities

Some Federal programs also contribute through their own funding opportunities.

Results from investments

- Reduced uncertainties in predictive models and system designs
- Expanded training of next generation early career scientists.
- Increased opportunities for nuclear data research for graduate students.
- US researchers are taking leading roles in many international working groups (IAEA, NEA) to improve nuclear data.
- Increased awareness of the importance of nuclear data to the larger research and applications community.
- Increased understanding by federal program offices of the need to understand nuclear data and how it impacts mission goals.
- Increased attention from nuclear science community
 - 2023 Long Range Plan for Nuclear Science from NSAC
 - Dedicated Nuclear Data report from NSAC
 - OSTP Roundtable Meeting on Nuclear Data for Fusion



NP Office Hours

- Past slides, recordings, and future NP Office Hours can be found here:
- <https://science.osti.gov/np/officehours>

September Office Hour

SC-wide Tuesday, September 3, 2024

2 pm

**Promoting Inclusive and Equitable Research
(PIER) Plans**



THANK YOU!

