

# Implementation Plan Discussion

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Chair of too many things



National Nuclear  
Data Center

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Nuclear Data Week 2023, 13-17 Nov. 2023



@BrookhavenLab

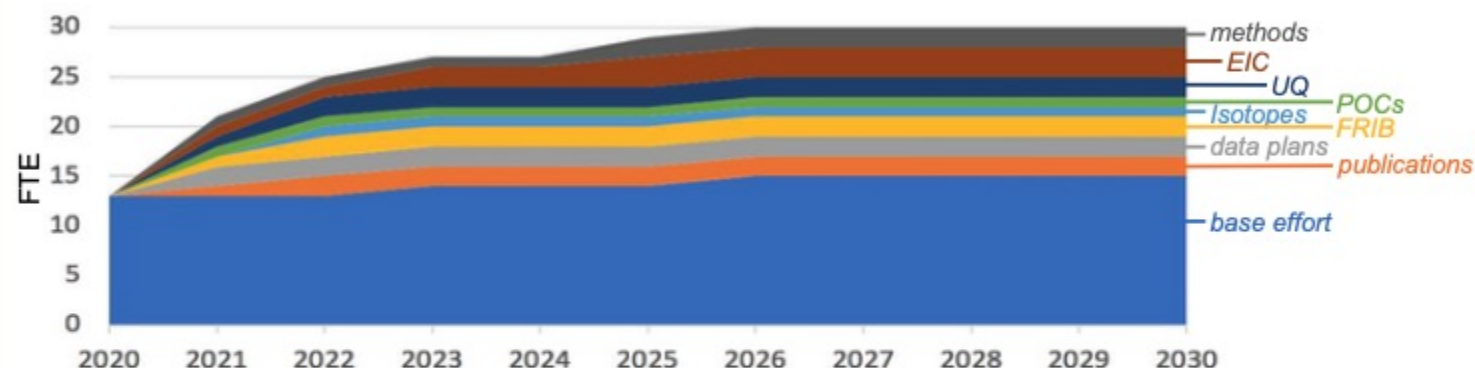


## Possibilities for Future Annual USNDP Meetings

- Lab Reports posted online as reference to save time for discussion
- Brainstorming session with all participants
  - How to grow data program
  - How to recruit and train new evaluators
  - How to retain current Evaluators / Centers
  - How much emphasis on experimental work
  - How much emphasis on NDIAG/WANDA efforts
  - Metrics for evaluations
  - NDAC role and USNDP response
  - Rotating USNDP leadership between centers
  - Budget Briefing strategies and necessity
  - Standardization / streamlining of evaluations
  - Pipelines/workflow creation
  - Take advantage of Quantum Computing resources
  - Take advantage of AI / Machine Learning developments
  - Interfaces between reaction and structure evaluations

**We've been thinking about growing the USNDP base funding for a while**

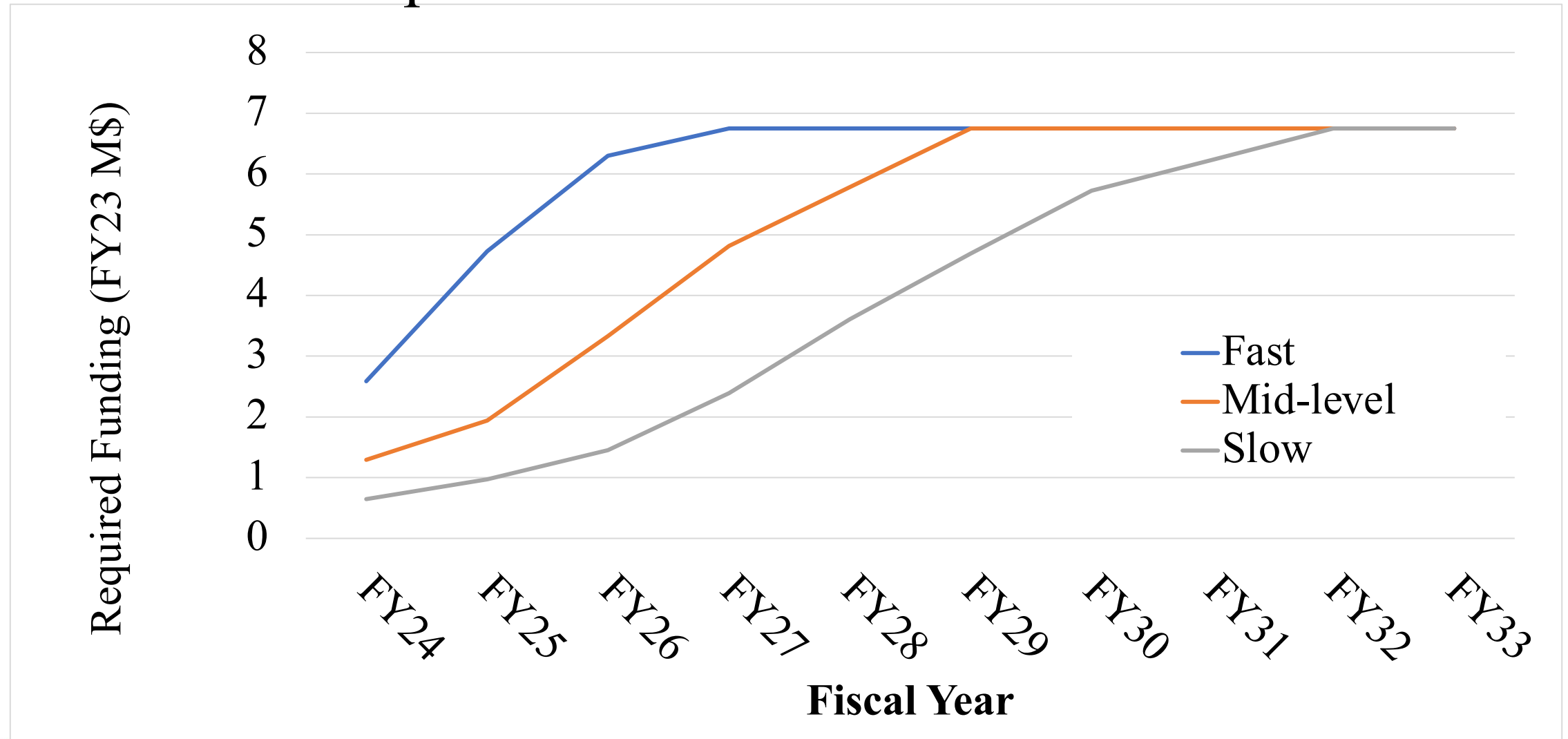
## Approach



- double effort in 10 years by 2030 to address new issues mentioned above
- phased approach by adding targeted efforts as indicated
- recruit & train new generation of targeted evaluators and specialists
- prepares data program for 10 years and beyond

Slides from Michael Smith

The time scale of this expansion can be adjusted to fit funding and recruitment profiles



# Soon



- **Long term plan: how we will accomplish our mission (in broad strokes)**
  - Take from NSAC reports and NP-LRP when appropriate
- **Define OUR plans and priorities**
- **Couple tasking to mission & vision**
- **A chance to rethink how we organize ourselves**

# **Keith informally requests an “Implementation Plan” by WANDA 2024**

# From the NSAC Report

# Fourteen Nuclear Data Thrust Areas were presented including eleven new initiatives

1. Supporting Structure Evaluation Capabilities
  2. Enhance Reaction Evaluation Capabilities
  3. Maintain Atomic Mass and Nuclear Property Evaluation
  4. Nuclear Astrophysics Evaluation
  5. Develop Statistical Nuclear Structure Data Evaluation and Databases
  6. Establish Methods for Continuous Fission Evaluation
  7. Targeted Accelerated Decay Data Evaluations
  8. Provide Comprehensive, Consistent Neutron Reaction and Structure Data
  9. Charged-particle stopping powers measurement and evaluation
  10. Comprehensive reaction measurement and evaluation to  $E/A \leq 10$  GeV/amu
  11. Provide Nuclear Data for Fusion Energy
  12. Continue Development of Modern Data Formats
  13. AI/ML for Modern Nuclear Data Compilation, Evaluation, and Dissemination
  14. Create an Infrastructure for Data Preservation and Open Data
- Existing USNDP Efforts
- ✓ - Covered at a WANDA
- Topical USNDP Initiatives
- Part of a new Space Nuclear Data Initiative
- A workshop took place at the White House in May 2023 and will be a topic at WANDA 24
- Enabling USNDP Initiatives

# The NSAC Reports offer lots of ideas

- Which ones can we do?
- Which ones should we do?
- Which ones do we want to do?
- When should we do it?



# What topics are missing from the NSAC report?

# The First Three Topics Support Existing Core Programs

1. Support the *nuclear structure evaluation* workforce to improve the currency, consistency, and accessibility of the Evaluated Nuclear Structure Data File (ENSDF);
2. Enhance *nuclear reaction evaluation* within the USNDP in support of the Evaluated Nuclear Data File (ENDF) through expansion of the workforce and integration of high-performance computing, automation, and machine learning;
3. Continue atomic *mass evaluation* in support AME and NUBASE databases.

Continued support for these foundational activities is essential

# About ENSDF, ENDF and AME

- Do we have enough effort for each of these?
- What level workforce are we missing?
- Where should they be situated? FRIB/ATLAS/NNDC easy to justify
- Special topic areas may need duplication/backup
- ENSDF & AME are “unique” (in US) to USNDP
- ENDF has a lot of external interest

# Notes

# These are followed by 8 new initiatives

4. Establish a coordinated effort to improve evaluation and modeling in *nuclear astrophysics* for stellar dynamics, multi-messenger astronomy and nucleosynthesis;
5. Initiate and maintain an effort to develop and maintain nuclear structure evaluation beyond discrete states, including *nuclear level densities*, *photon strength functions and photonuclear data* for improved reaction modeling, and exploring nuclear structure at finite temperature;
6. Maintain an ongoing effort for *correlated fission data evaluation*, including cross sections, fragment yields,  $v(A)$ ,  $v(E_\nu)$  for nuclear energy, national security, nonproliferation and basic science;



# Notes

# These are followed by 8 new initiatives (cont.)

7. Form a panel of experts to annually update *key evaluated decay data* for targeted high-value nuclides for national security, nonproliferation and medical applications;
8. Maintain *comprehensive, consistent (n,x) structure and reaction data* for energy, national security, nonproliferation & planetary nuclear spectroscopy;
9. Develop and maintain *evaluated charged-particle stopping power data* for detector design, space effects, isotope production and ion beam therapy;
10. Extend *reaction evaluation to higher energies* for space exploration and medical nuclide production.
11. Address *Nuclear Data for fusion energy systems* including tritium production and materials damage cross section.

# Notes

The last three initiatives build a robust nuclear data infrastructure for the 21<sup>st</sup> century

12. The continued *development of new data formats* to accommodate all nuclear data types and improve access by modern software systems.
13. The *design and incorporation of artificial intelligence and machine learning* tools to improve the nuclear data evaluation process.
14. The creation of an infrastructure for *open data and data preservation* for use by the entire nuclear physics community.

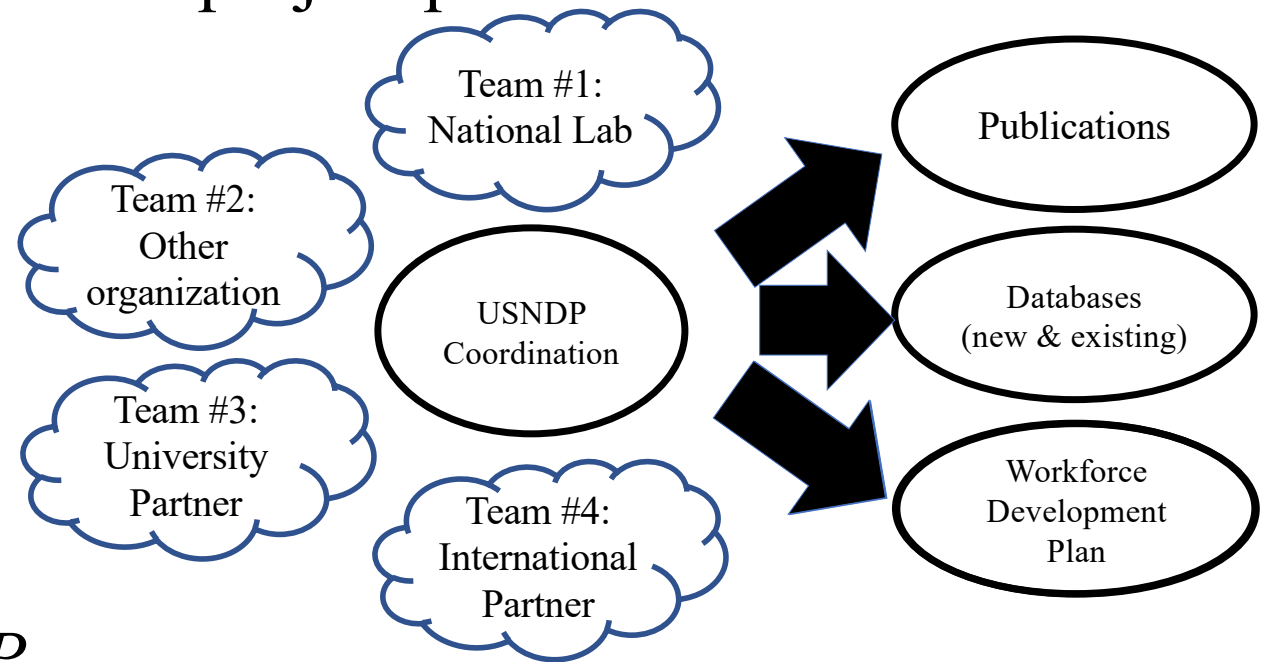
Each new initiative requires 1-2 FTE an ongoing basis

# Notes



# A key finding is that USNDP members should be part of *Topical Nuclear Data Collaborations (TNDC)*

1. The TNDC brings together application and data subject matter experts and includes workforce development in its project plan.
2. Data would be published in appropriate peer-reviewed journals as well as being incorporated into new or existing databases.



*This paradigm is already used by NP (e.g., FIRE) and by NA-22 (e.g., ventures)*

Think of the evaluators on these teams as being *embedded*

# Notes