# NSAC CHARGE: INTERNATIONAL BENCHMARKING FOR NP

## BUILDING ON THE LRP2023




**IAN CLOËT**
Physics Division
Argonne National Laboratory

15 August 2025

LECM
LOW ENERGY COMMUNITY MEETING

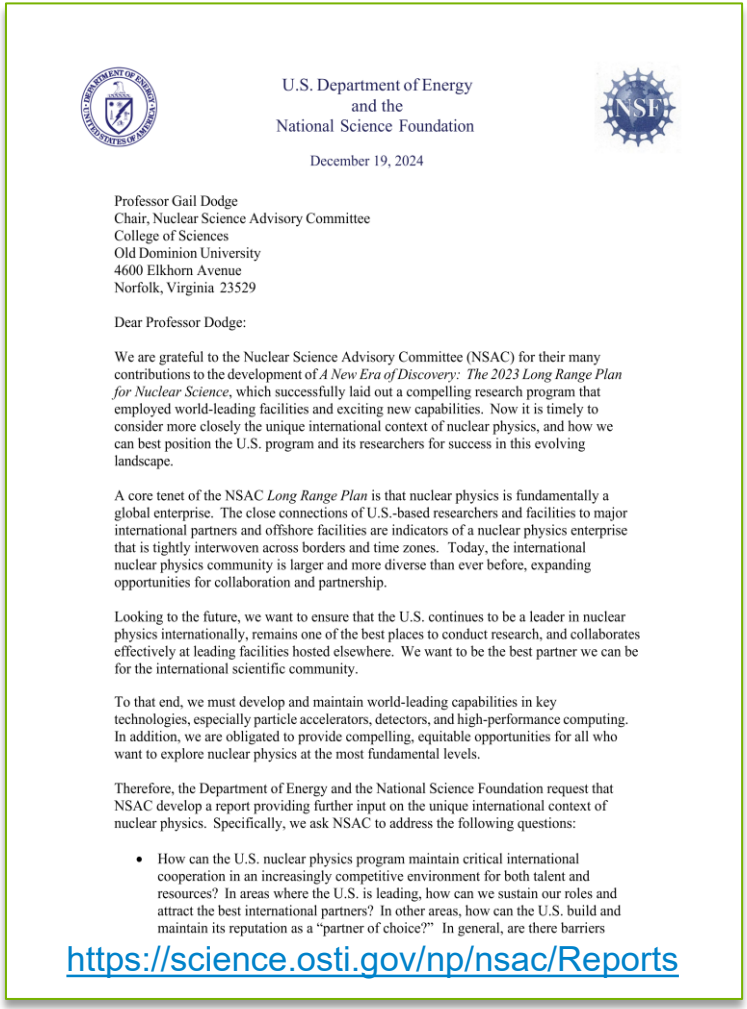
# NSAC CHARGE LETTER

## International Benchmarking

"timely to consider more closely the **unique international context of nuclear physics**, and how we can best position the U.S. program and its researchers for success in this evolving landscape"

"we want to ensure that the **U.S. continues to be a leader in nuclear physics internationally**, remains one of the best places to conduct research, and collaborates effectively at leading facilities hosted elsewhere. We want to be the **best partner we can be for the international scientific community**"

"we **must develop and maintain world-leading capabilities** in key technologies, especially particle accelerators, detectors, and high-performance computing"



U.S. Department of Energy
and the
National Science Foundation

December 19, 2024

Professor Gail Dodge
Chair, Nuclear Science Advisory Committee
College of Sciences
Old Dominion University
4600 Elkhorn Avenue
Norfolk, Virginia 23529

Dear Professor Dodge:

We are grateful to the Nuclear Science Advisory Committee (NSAC) for their many contributions to the development of *A New Era of Discovery: The 2023 Long Range Plan for Nuclear Science*, which successfully laid out a compelling research program that employed world-leading facilities and exciting new capabilities. Now it is timely to consider more closely the unique international context of nuclear physics, and how we can best position the U.S. program and its researchers for success in this evolving landscape.

A core tenet of the NSAC *Long Range Plan* is that nuclear physics is fundamentally a global enterprise. The close connections of U.S.-based researchers and facilities to major international partners and offshore facilities are indicators of a nuclear physics enterprise that is tightly interwoven across borders and time zones. Today, the international nuclear physics community is larger and more diverse than ever before, expanding opportunities for collaboration and partnership.

Looking to the future, we want to ensure that the U.S. continues to be a leader in nuclear physics internationally, remains one of the best places to conduct research, and collaborates effectively at leading facilities hosted elsewhere. We want to be the best partner we can be for the international scientific community.

To that end, we must develop and maintain world-leading capabilities in key technologies, especially particle accelerators, detectors, and high-performance computing. In addition, we are obligated to provide compelling, equitable opportunities for all who want to explore nuclear physics at the most fundamental levels.

Therefore, the Department of Energy and the National Science Foundation request that NSAC develop a report providing further input on the unique international context of nuclear physics. Specifically, we ask NSAC to address the following questions:

- How can the U.S. nuclear physics program maintain critical international cooperation in an increasingly competitive environment for both talent and resources? In areas where the U.S. is leading, how can we sustain our roles and attract the best international partners? In other areas, how can the U.S. build and maintain its reputation as a "partner of choice?" In general, are there barriers

https://science.osti.gov/np/nsac/Reports

# CHARGE QUESTION I

## Critical International Cooperation & Partner of Choice

1. How can the U.S. nuclear physics program maintain critical international cooperation in an increasingly competitive environment for both talent and resources? In areas where the U.S. is leading, how can we sustain our roles and attract the best international partners? In other areas, how can the U.S. build and maintain its reputation as a "partner of choice?" In general, are there barriers that can hinder our ability to form effective and enduring international partnerships?

# CHARGE QUESTION II

## Leadership Roles in Nuclear Physics

2. What are the key areas where the U.S. currently has, or could aspire to, leadership roles in nuclear physics via its unique or world-leading capabilities (i.e., advanced scientific facilities and tools), or leading scientific and technical resources, including highly trained personnel and supporting infrastructure? This may include emerging areas or opportunities that offer significant promise for leadership. To preserve and foster U.S. leadership roles within reasonable resource constraints, are there particular technical areas or capabilities that could be emphasized? Are there other technical resources and capabilities that could be leveraged to achieve these goals, possibly through collaborations within and beyond the nuclear physics community?

# CHARGE QUESTION III

## Recruiting and Retaining Talented People

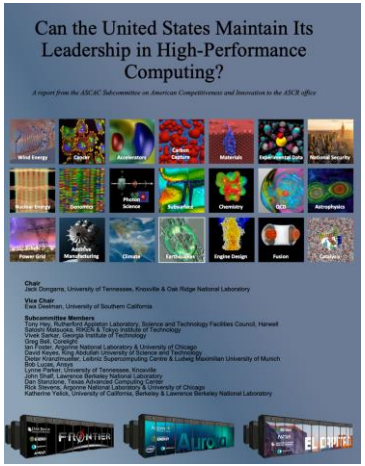
3. How can programs and facilities be structured to attract and retain talented people? What are the barriers to successfully advancing careers of scientific and technical personnel in nuclear physics and related fields, and how can U.S. funding agencies address those barriers? A complete answer to these questions must address how we can ensure that we are recruiting, training, mentoring, and retaining the best talent from all over the world.

# NSAC SUB-COMMITTEE

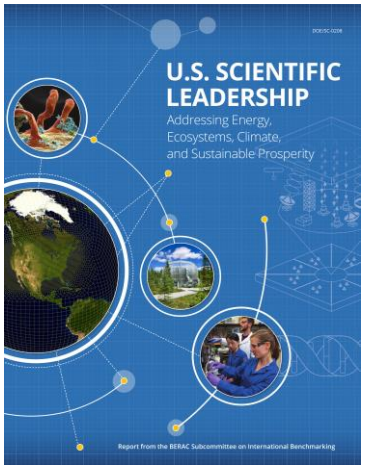
**Committee Members**

Ian Cloët (Chair), *Argonne National Laboratory*
Jeff Blackmon, *Louisiana State University*
Vincenzo Cirigliano, *Institute for Nuclear Theory*
Raffaella Da Vita, *Thomas Jefferson National Accelerator Facility*
Evangeline Downie, *George Washington University*
Alexandra Gade, *Michigan State University*
Haiyan Gao, *Duke University*
Edmundo Garcia, *Chicago State University*
Oliver Kester, *TRIUMF*
Andreas Kronfeld, *Fermi National Accelerator Laboratory*
Krishna Kumar, *University of Massachusetts Amherst*
Kyle Leach, *Colorado School of Mines*
Jen-Chieh Peng, *University of Illinois Urbana-Champaign*
Daniel Phillips, *Ohio University*
Dinko Počanić, *University of Virginia*
Sofia Quaglioni, *Lawrence Livermore National Laboratory*
Lijuan Ruan, *Brookhaven National Laboratory*
Martin Savage, *University of Washington*
Phiala Shanahan, *Massachusetts Institute of Technology*

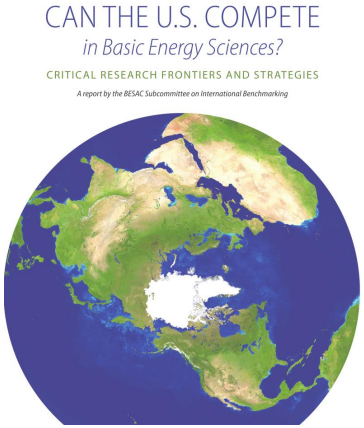
# SIMILAR REPORTS FOR OTHER DOE OFFICES



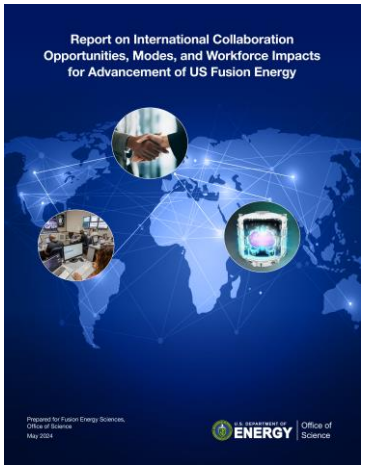

ASCR 2023



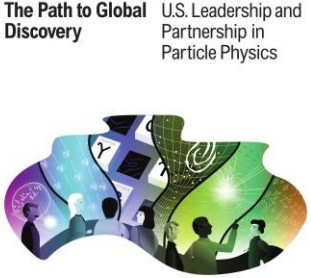

BER 2022




BES 2021




FES 2023

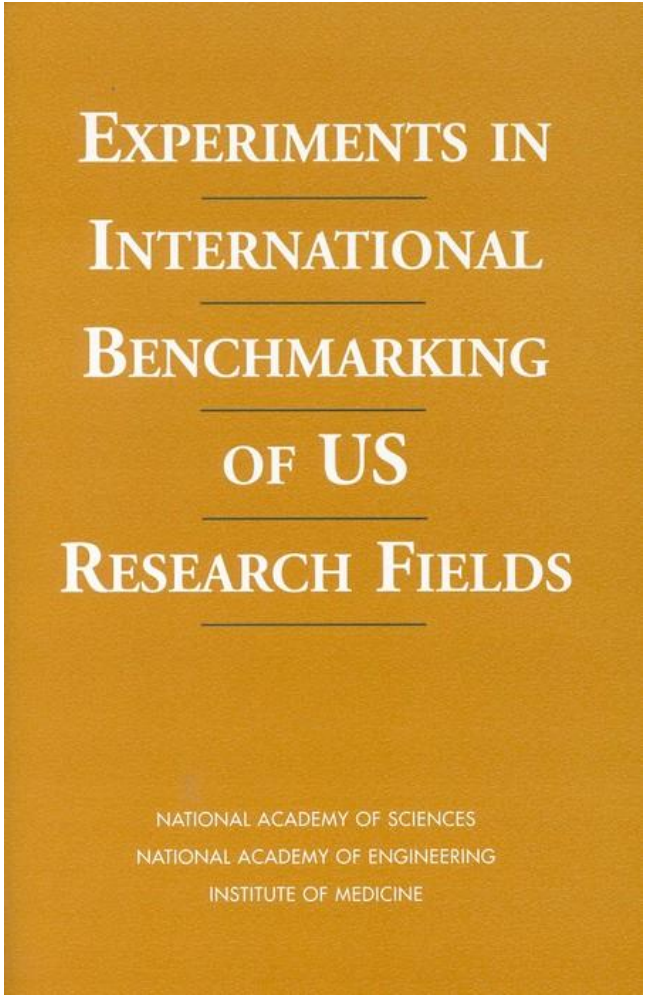



HEP 2023

# METHODS & METHODOLAGY

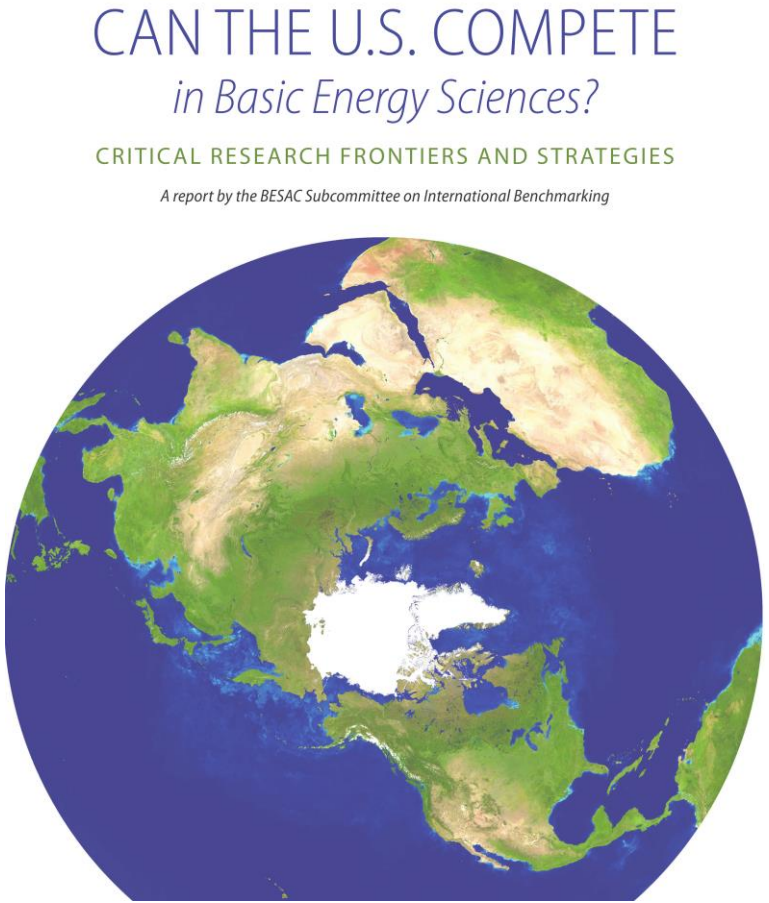
"***International benchmarking*** *compares the quality and impact of research in one country (or region) with world standards of excellence."* [NAS Report 2000]

- Must develop **Quantitative Metrics** for **Benchmarking**
- NAS Report Suggests:
  - Citation analysis
  - Journal-publication analysis
  - Quantitative data analysis, e.g., number of graduate students, degrees, and employment status
  - Prize analysis
  - Virtual Congress (i.e. Invited Speaker analysis)
- NSAC Sub-Committee also considering:
  - International Users at U.S. National User Facilities
  - Idea generation metrics
  - Spokespersons at US and International Facilities



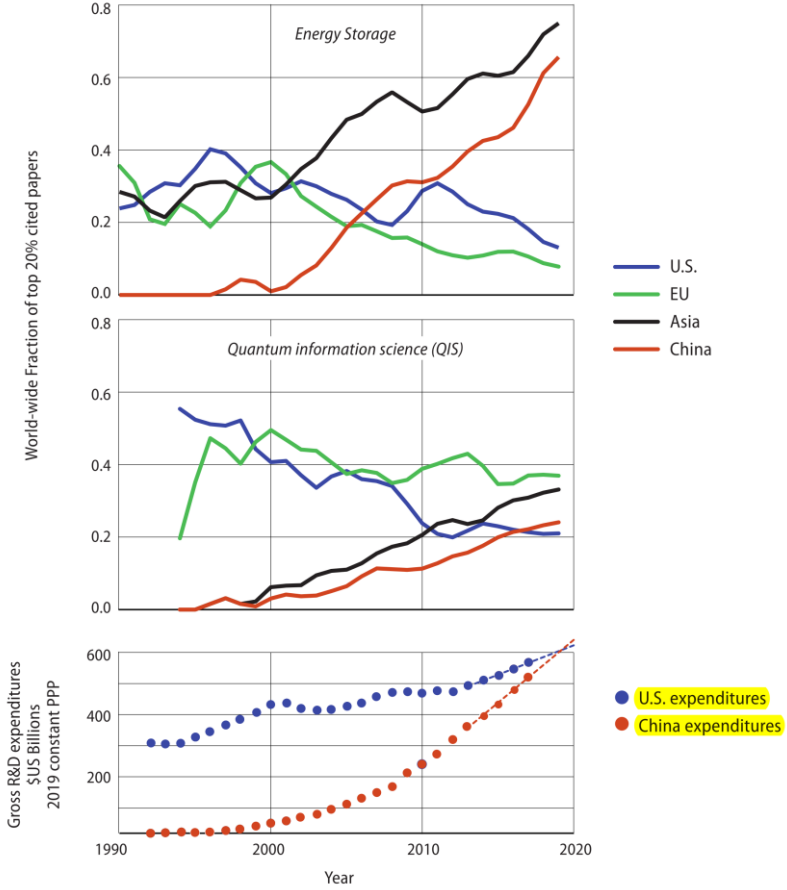
# BESAC BENCHMARKING REPORT

- Key difference between Basic Energy Sciences and Nuclear Physics is that NP has a stronger component of international cooperation
- BESAC report identified 5 broad areas as critical fundamental scientific topics for leadership in BES
  - Quantum Information Science
  - Science for Energy Applications
  - Matter for Energy and Information
  - Industrially-Relevant Science for Sustainability
  - Advanced Research Facilities
- BESAC Report made 6 recommendations:
  - "Stronger investments in advanced research infrastructure, including laboratory-based and large-scale instrumentation, would bolster U.S. competitiveness"
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# SUB-COMMITTEE ORGANIZATION

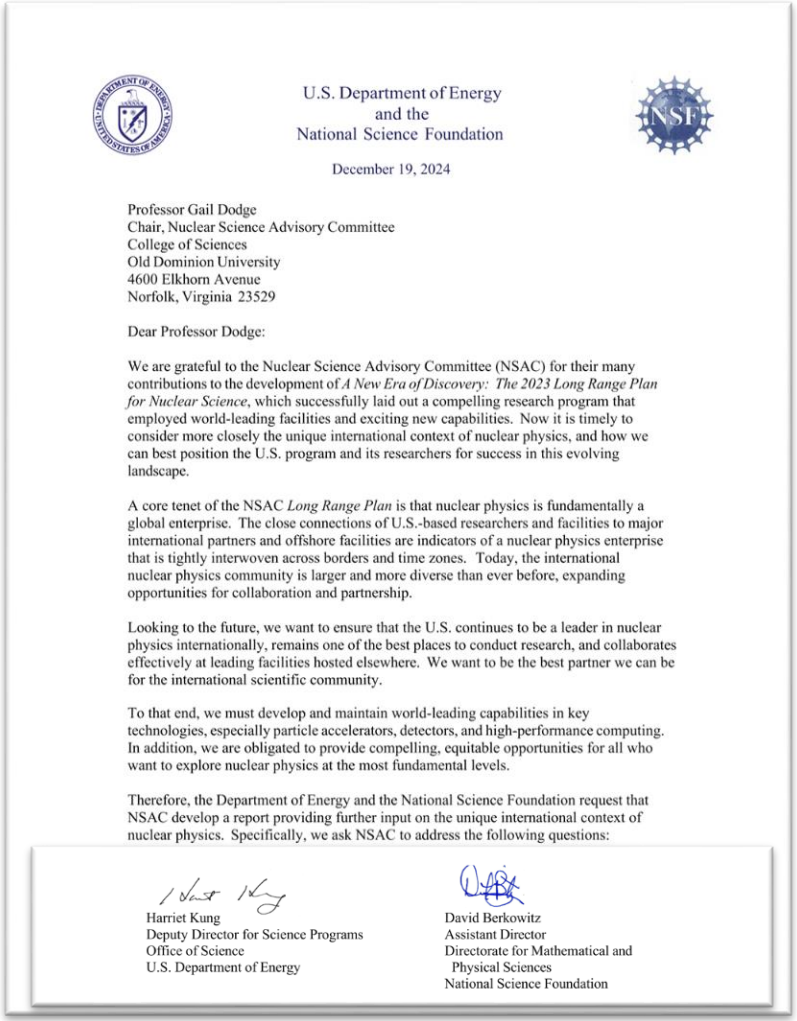
- Sub-Committee is working together as a whole and via several sub-groups:
  - QCD and Hadron Structure
  - Nuclear Structure and Reactions & Nuclear Astrophysics
  - Fundamental Symmetries
  - Nuclear Theory
  - Advanced Technologies
  - Applications
  - Talent
- Whole Sub-Committee is meeting at least weekly, and in addition, the sub-groups are also meeting frequently

# SUB-COMMITTEE ACTIVITIES

- The whole sub-committee has hosted group meetings with community representatives from across NP:
  - ATLAS, FRIB, Jefferson Lab, and RHIC/EIC
  - Nuclear Theory
  - ARUNA
  - Nuclear Data
  - Hot QCD
  - Neutrino Physics
  - Symmetry Violation and Precision Tests
- Compiling metric data, e.g., using Inspire, Scopus, and Web of Science for publication and citation analysis

# REPORT STATUS

- Sub-committee is writing a report that makes a strong unified case for the Nuclear Physics program, and addresses:
  - How the US can maintain and expand its international partnerships
  - Identifies areas where the US has a leadership position or could aspire to one
  - Strategies for recruiting and retaining talented researchers
- More outreach activities are planned, e.g., talk at DNP Business Meeting
- Sub-committee is working hard to finish report as soon as possible



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Harriet Kung
Deputy Director for Science Programs
Office of Science
U.S. Department of Energy

David Berkowitz
Assistant Director
Directorate for Mathematical and Physical Sciences
National Science Foundation

