
U.S. DEPARTMENT OF ENERGY | Office of Science

# Roles & Responsibilities

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# Roles & Responsibilities

- DOE and HEP Missions
- The U.S. HEP Program and Significant Outcomes
- DOE HEP Roles & Responsibilities
  - Universities
  - National Laboratories
- Worked Examples

# Mission of the Department of Energy

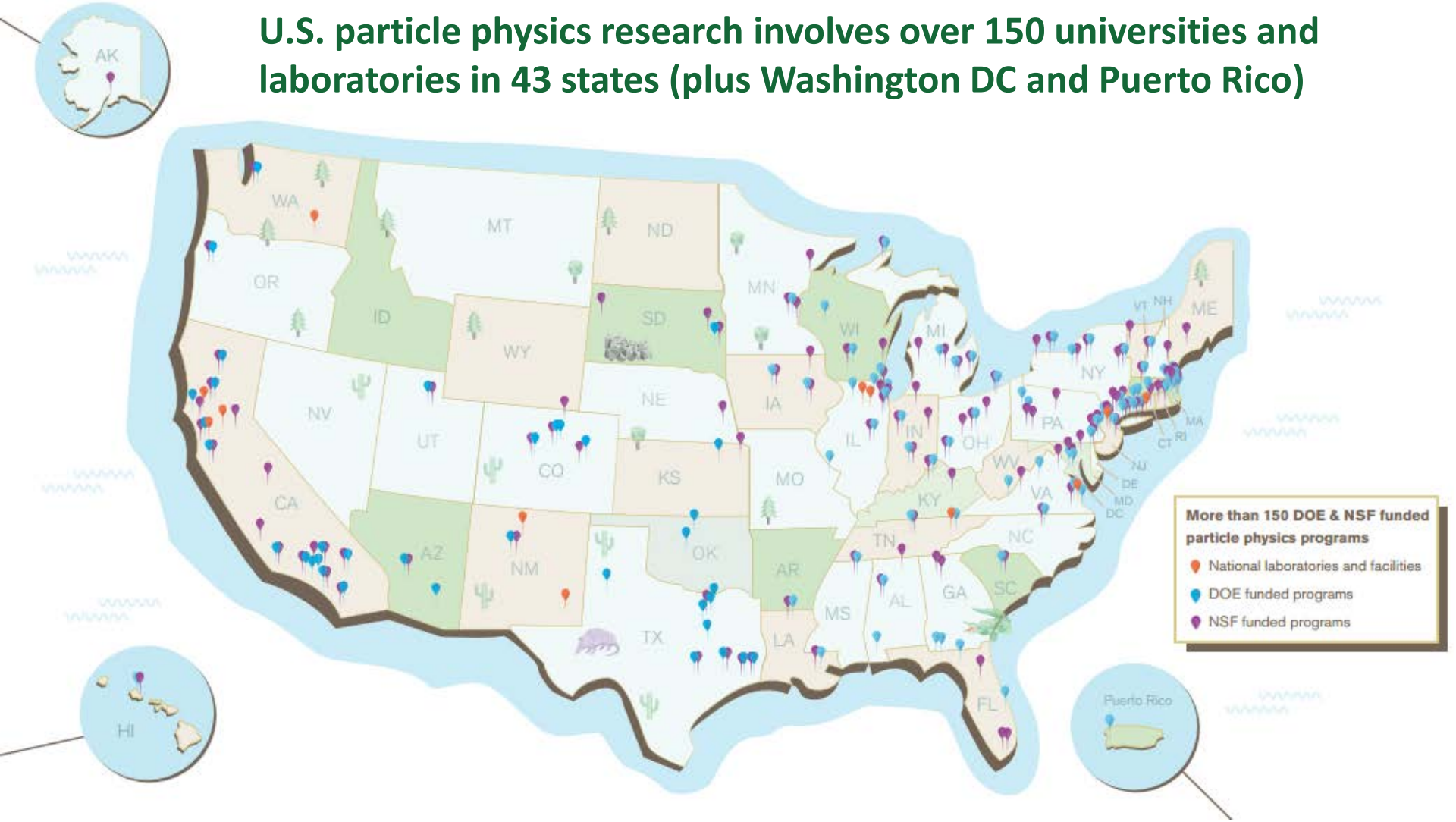
- **The mission of the Energy Department is to ensure America's security and prosperity by addressing its energy, environmental and nuclear challenges through transformative science and technology solutions.**
  - **Catalyze the timely, material, and efficient transformation of the nation's energy system and secure U.S. leadership in clean energy technologies.**
  - ***Maintain a vibrant U.S. effort in science and engineering as a cornerstone of our economic prosperity with clear leadership in strategic areas.***
  - **Enhance nuclear security through defense, nonproliferation, and environmental efforts.**
  - **Establish an operational and adaptable framework that combines the best wisdom of all Department stakeholders to maximize mission success.**

# Mission of the Office of High Energy Physics

- **The mission of the High Energy Physics (HEP) program is to understand how our universe works at its most fundamental level.**
  - **We do this by discovering the most elementary constituents of matter and energy, exploring the basic nature of space and time itself, and probing the interactions between them.**
    - **These fundamental ideas are at the heart of physics and hence all of the physical sciences.**
  - **To enable these discoveries, HEP supports theoretical and experimental research in both elementary particle physics and fundamental accelerator science and technology.**
  - **HEP underpins and advances the DOE missions and objectives through this research, and by the development of key technologies and trained manpower needed to work at the cutting edge of science.**

# The U.S. HEP Program

**U.S. particle physics research involves over 150 universities and laboratories in 43 states (plus Washington DC and Puerto Rico)**



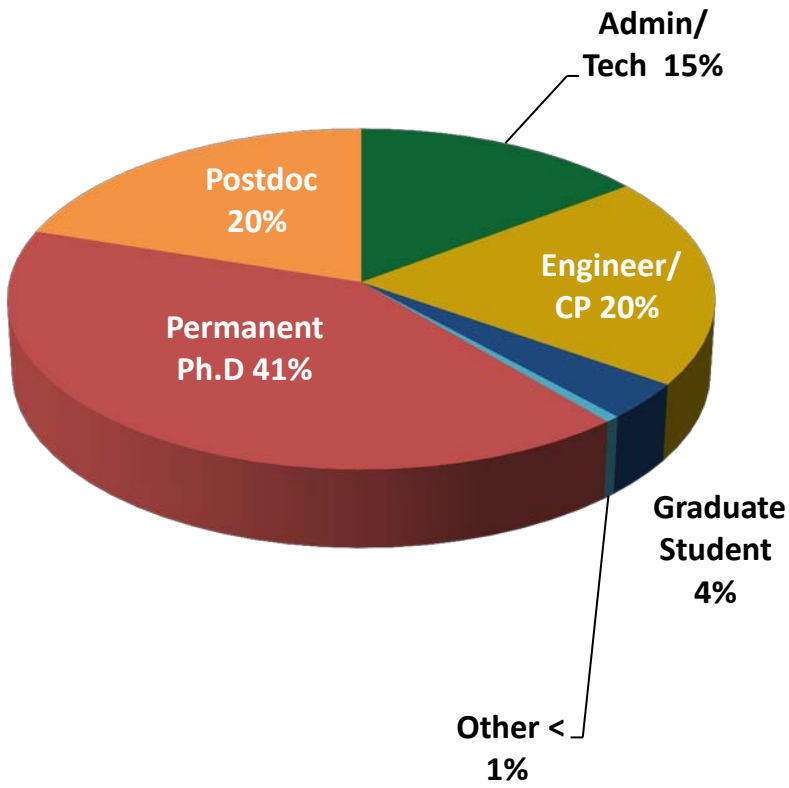
# HEP Workforce Overview

- **In 2013, the entire DOE supported HEP workforce (Universities & Laboratories) consisted of ~4,300 FTEs**
  - **~2,350 engaged in Research across the Energy, Intensity, and Cosmic Frontiers, Theoretical and Computational Physics, and Advanced Technology R&D**
  - **Remaining ~1,950 FTEs provide administrative support and support for facility operations**
- **Major activities at 5 national laboratories, involving ~2,600 FTEs:**
  - **Argonne National Laboratory (ANL)**
  - **Brookhaven National Laboratory (BNL)**
  - **Fermi National Accelerator Laboratory (FNAL)**
  - **Lawrence Berkeley National Laboratory (LBNL)**
  - **SLAC National Accelerator Laboratory (SLAC)**
  - **A few small, specialized research efforts at other SC and NNSA labs**
- **University research program consists of ~250 active grants to >100 institutions, involving ~1,700 FTEs**

# Laboratory Support

- Laboratory research is mission driven and funded through Field Work Proposals
  - Program guidance to the Laboratories is provided by HEP with input from a variety of sources, including:
    - The Laboratories themselves
      - Local strengths and resources
    - Advisory committees
    - Institutional reviews
  - **HEP holds comparative reviews of the Research programs of the labs every 3 years.**
- Research job classifications at Laboratories are similar to those at Universities
  - Major exception is Senior Research Scientists in place of PIs

**2013 HEP Lab Research Workforce (FTEs)**

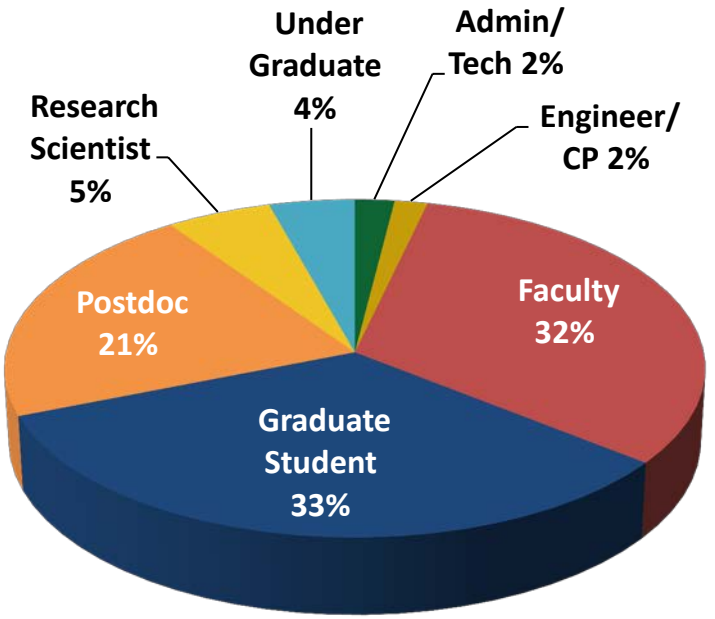



***Rounding in percentages may cause total to be less than 100%***

# University Support

- University research is supported by a competitive, proposal-driven process
  - Grants issued after comparative review of proposals submitted to Funding Opportunity Announcements
- Research job classifications at universities, supported by HEP funding, include the following positions:
  - Principle Investigator (PI)
    - Tenured or tenure-track permanent Ph.D. staff
  - Research scientist
    - Permanent, non-tenured staff
  - Postdoctoral fellow
    - Term employees with Ph.D.
  - Graduate students
  - Administrative staff
  - Engineers
  - Computer professionals

**2013 HEP University Research Workforce (FTEs)**

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# Significant Outcomes

- **Expected outcomes from the DOE HEP program include but are not limited to:**
  - Operation of facilities that enable cutting-edge science
  - Acquisition, management and curation of science data
  - Production of science results documented in research publications
  - Training of students and postdoctoral researchers
  - Development of new concepts and technology for advancing scientific frontiers and serving a broader community
  - Science leadership to enable significant advances in specific science areas
  - Partnerships as needed to leverage additional science and expertise

- **To achieve these outcomes the agency and stakeholders in the HEP community have different roles**

# DOE Roles and Responsibilities

- Certain functions are considered "inherently governmental" and reserved for Federal staff, including:
  - Determination of Federal program priorities for budget requests
  - Determination of budget policy, guidance, and strategy
  - Approving, awarding and administering government prime contracts
    - Including determining what supplies or services are to be acquired with government funds
- Moreover, since Federal staff are normally hired following civil service laws, there is a strong precept that contractors must not act as Federal staff and vice versa, e.g.:
  - Government employees do not directly supervise contractors
  - Federal staff are generally not involved in contractor personnel decisions
- For all intents and purposes, DOE labs are *prime contractors* and lab employees are *contractor employees*.
  - Some specific worked examples follow

# DOE Lab Roles and Responsibilities

- **Facility Operations and Construction**
  - Performance judged against specified metrics (e.g. $pb^{-1}$ ; EVMS)
  - Includes maintenance, upgrades, planning for new facilities
  - User support
- **HEP Research and Technology R&D**
  - Nurture and support HEP research collaborations to enable discovery science
  - **Participation in all phases – from design, construction, operations & analysis**
  - **Particular emphasis on:**
    - **Management, design, construction and operation of HEP experiments**
    - **Integration of cross-cutting activities, *e.g.*: computation, simulation and theoretical research, in support of HEP program**
    - **Exploiting lab infrastructure and resources to develop next-generation particle accelerator and detector technologies for the advancement of HEP and science more broadly**

# University Roles and Responsibilities (DOE Perspective)

- **HEP Research and Technology R&D**
  - Contribute significantly to HEP research collaborations to enable discovery science
  - **Participation in all phases – from design, construction, operations & analysis**
  - Particular emphasis on:
    - **Advanced training of students and postdocs**
    - **Data analysis and comparison with theoretical models**
    - **Vision and theoretical framework for understanding the Standard Model and beyond**
    - **Novel and innovative concepts and approaches**
    - **Design of future HEP experiments**

# Example 1: DOE Budget Formulation Process

- As noted above, this is an inherently governmental function
  - But strongly informed by community via HEPAP/P5
- DOE/HEP proceeds using a few basic guidelines:
  - General science priorities follow HEPAP/P5 recommendations
  - Project-like activities on planned profiles
    - Some flexibility for projects not yet baselined depending on technical readiness and external factors
    - Need detailed input from project management and partners
  - Facility operations based on operations plan
    - Need detailed input from lab/facility management
  - Core research (lab/university) at level-of-effort
    - Generally guided by HEPAP/P5 and program needs
  - If funds remain, they can be used for new initiatives
    - Could be specific HEPAP/P5 items or call for proposals

# Example 2: DOE Projects

- **Successful delivery of construction projects and facilities for science is a central part of the DOE science mission**
  - In particular, Office of Science practice (critical decision [CD] process and Lehman reviews) considered gold-standard in DOE
    - *"Failure is not an option"*
  - SC has *earned* the authority to manage projects flexibly. This authority is only protected by unblemished project execution and is recognized as essential to SC success. This explains why so much attention is paid to project execution.
  - Therefore, we have close Federal oversight and coordination with contractor project managers. *Experienced personnel required.*
- **Extent of oversight tailored to total project cost**
  - Larger projects automatically get higher visibility in DOE due to layered approval levels
- **Complex dance between different project and budget requirements and timelines**
  - DOE Budget Requests *require* appropriate CD's are passed before requesting/spending money
  - Project execution not well suited to university grant funding mechanisms
- **For all these reasons, DOE Labs have a critical role in project management and construction**
  - Universities also play important roles, but must understand and adapt to requirements of DOE project system

# Example 3: DOE Budget Execution Process

- **Another inherently governmental function**
  - Start from the general plan laid out in budget formulation, modified by the actual appropriation
  - Details of the execution strategy informed by *proposals* from labs and universities, and CD process for projects.
  - Write financial plans (labs) and grants (universities, others) based on review of proposals and appropriated budget
- **DOE/HEP proceeds using a few basic guidelines:**
  - Detailed funding allocations should optimize the overall program
  - Make lab and university research reviews as similar and as transparent as possible
  - However, there are some differences due to the inherent differences between competitively-selected financial assistance ***awards (grants)*** and modifications to the lab maintenance and operations ***contracts;*** as well as differences in their primary roles and responsibilities
    - Except in special cases, HEP labs and universities do not compete directly for funding under a single funding opportunity announcement due to their different roles
      - Instead, labs and universities are directly competed against their peers
  - Facility operations and maintenance of infrastructure are generally considered separately due to the different nature of that work

# BACKUP