

Understanding the Building Block of the Universe

High Energy Physics Experiments

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Vision for High Energy Physics at BNL

The key goal for HEP is to study the Standard Model, search for Beyond-Standard-Model physics in broadest possible ways, and to understand the Dark Matter and Dark Energy

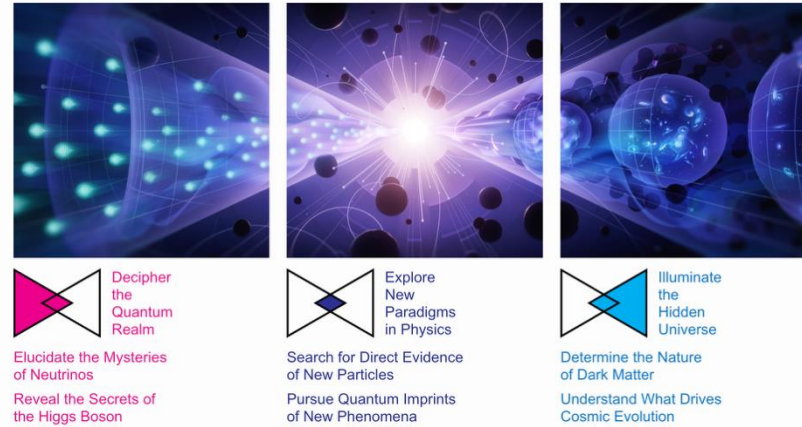
BNL will continue to be one of the lead HEP labs in US and take the leadership roles in the major future HEP science programs and projects

Based on the physics science drivers, BNL should strengthen the appropriate existing and develop new capabilities

- Future colliders and experiments, neutrino physics and precision measurements, cosmic frontier are areas we are actively engaged in

Guided by community planning processes

2023 P5 – Key Strategic Recommendations



Deliver on the Current Program: complete & fully exploit existing facilities/experiments (HL-LHC, neutrino programs, Vera C. Rubin Observatory, Belle II, etc...).

Keep a Healthy Onshore Portfolio: sustain a balanced mix of large/mid/small projects across experiment, theory, instrumentation, and computing.

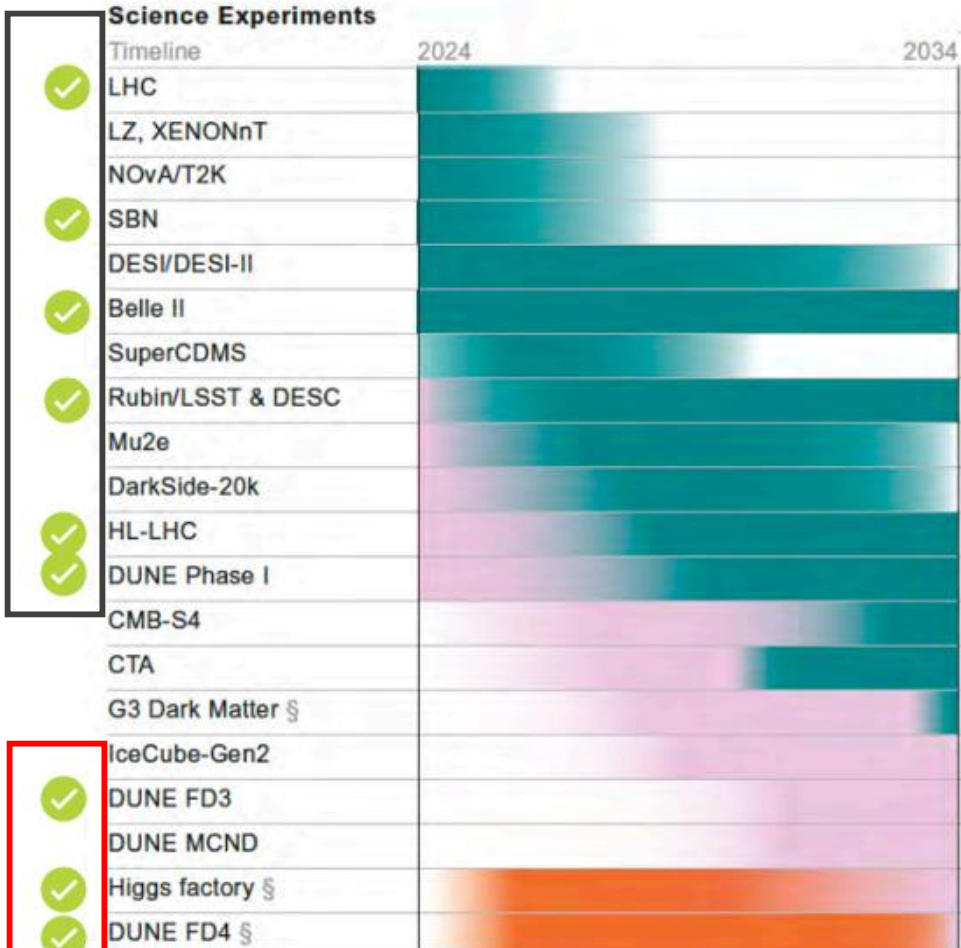
Offshore Higgs Factory: actively engage in feasibility & design studies; be ready to commit at a level commensurate with U.S. LHC/HL-LHC involvement once designs converge.

Build the Long-Term Future: execute aggressive accelerator R&D for a realistic path to a 10 TeV pCM collider; invest in workforce + enabling detector/computing tech.

As requested by DOE, BNL submitted a strategic response to the 2023 P5 Report in August, 2024, and identified which new initiatives BNL wishes to participate in and document the strengths the lab brings to those

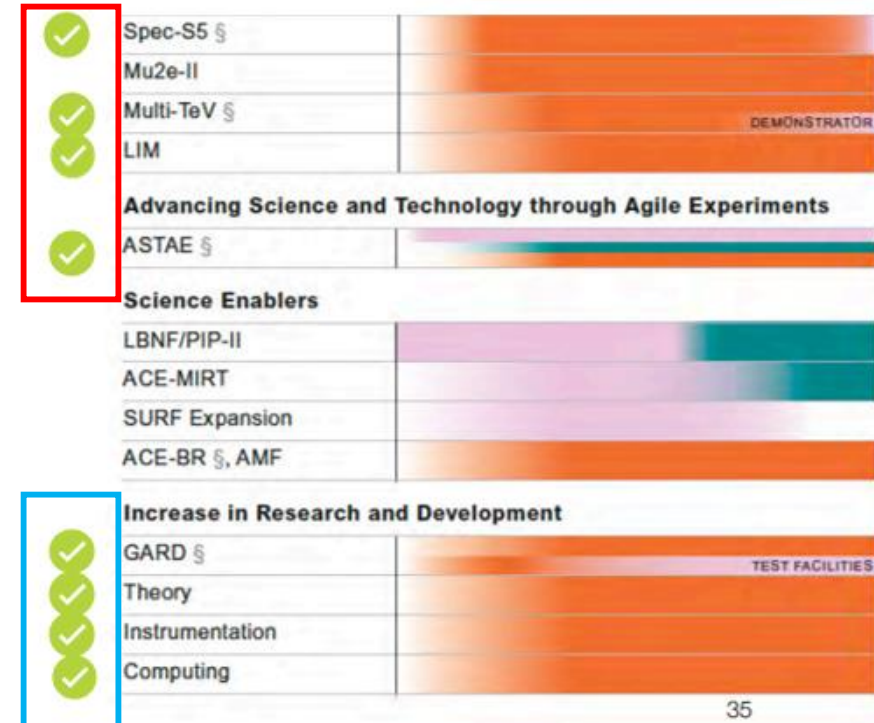
LDRD investments are expected to be aligned with the identified future initiatives and for developing the capabilities

On-going Experiments



Future initiatives

Future initiatives



Capabilities

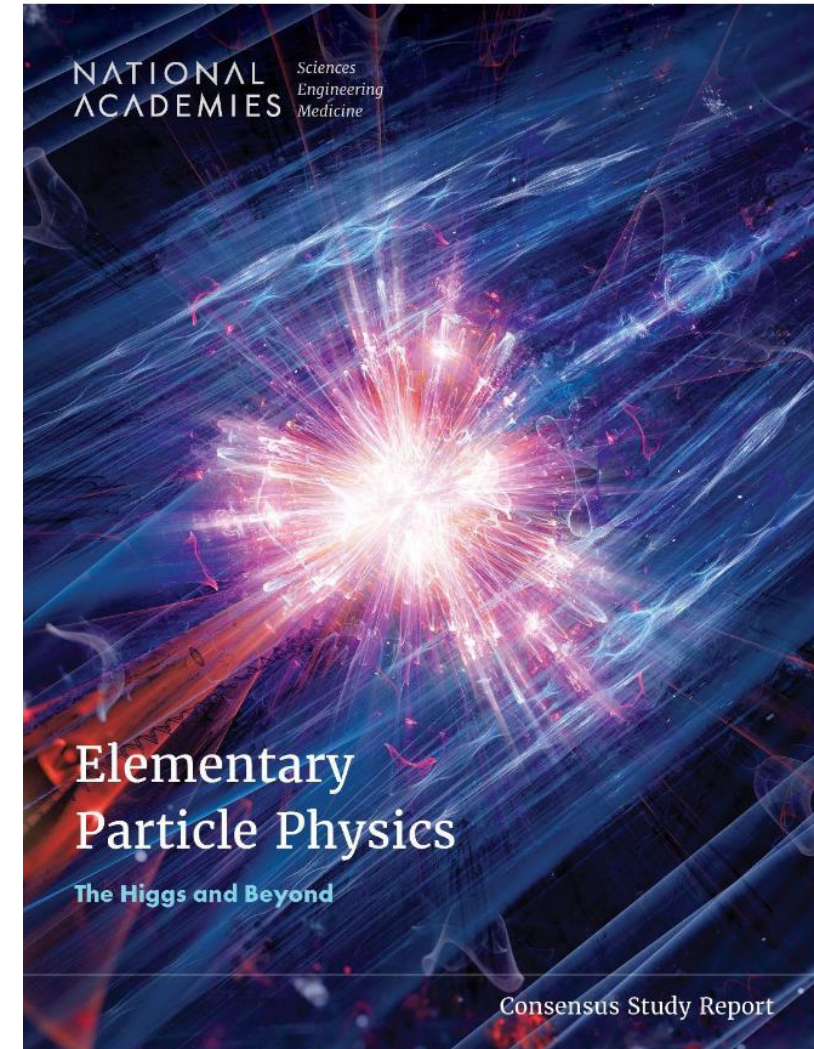
2025 NAS report on EPP, a bold 40-year vision

Recommendations:

The United States should host the world's highest-energy elementary particle collider around the middle of the century. (10 TeV muon collider at FNAL)

The United States should participate in the international Future Circular Collider Higgs factory currently under study at CERN to unravel the physics of the Higgs boson

The United States should continue to pursue and develop new approaches to questions ranging from neutrino physics and tests of fundamental symmetries to the mysteries of dark matter, dark energy, cosmic inflation, and the excess of matter over antimatter in the universe



2026 Update of European Strategy for Particle Physics

European Strategy
for Particle Physics

Recommendations by the European Strategy Group were presented to CERN Council in Dec 2025, to be reviewed in the coming months, and finalized in Budapest in May 2026

Charged to provide the preferred option for the next collider at CERN and prioritized alternative options

A. The electron–positron Future Circular Collider (FCC-ee) is recommended as the preferred option for the next flagship collider at CERN.

B. A descoped FCC-ee is the preferred alternative option for the next flagship collider at CERN.