Recent Planning Processes in the US

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European Laboratory Director's Group meeting and Accelerator R&D, June 6-7, 2024, BNL

US Global planning processes in HEP and NP

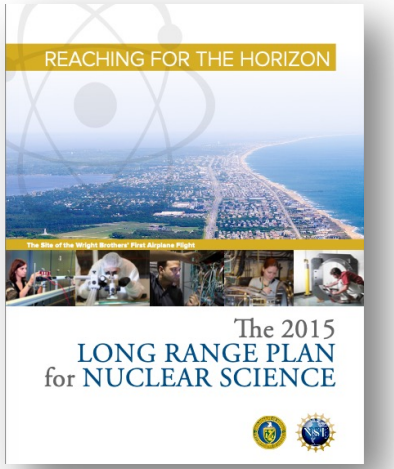
Community-driven processes lay out the strategy for the fields, considering numerous aspects such as science drivers, utilization of existing facilities, future aspirations, research and development (R&D), budget scenarios, workforce, diversity, and more.

The increasing complexity of new facilities requires consideration of global programs worldwide

Since the last LDGs meeting the Long-Range Plan (LRP) in Nuclear Physics (NP) and P5 were released

2014 P5 HEP

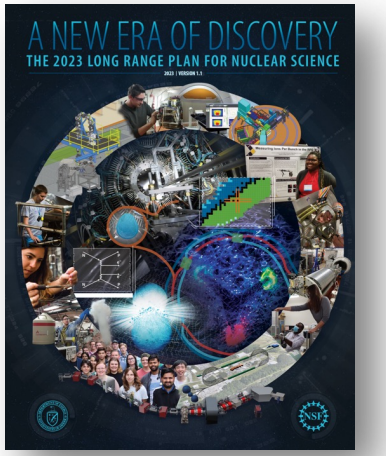
2015 Acc R&D



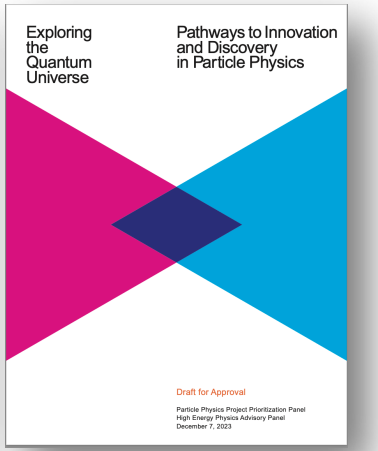
2015 LRP-NP

2020 European Strategy

2022 LDG Accelerator R&D roadmap



2023 LRP-NP



2023 P5 HEP

US Long Range Plan and P5

The **Department of Energy** and **National Science Foundation** launch the planning process by jointly issuing a charge to the Scientific Advisory Committees

	Nuclear Physics	High Energy Physics
Scientific Advisory Committee	Nuclear Science Advisory Committee - **NSAC was charged in July 2022**	HEP Advisory Panel – **HEPAP - was charged in 2020**
APS Unit lead	Division of Nuclear Physics (DNP)	Division of Particles and Fields (DPF)
Process	**Three Town hall meetings**: 1) Hot and cold QCD 2) Nuclear reactions, structure and astrophysics 3) Fundamental symmetries, neutrinos and neutrons	**Snowmass** process organized in frontiers. Each frontier was summarized in a white paper.
Writing committee	Charged by NSAC delivered **the LRP report Oct 4, 2023**. 60 members and 2 international	P5, charged by HEPAP, delivered **the P5 report Dec 7, 2023**. 32 members, including 3 international

Accelerator roadmaps developed under HEPAP for five thrusts: 1) Advanced Accelerator Concepts, 2) Accelerator and Beam Physics, 3) Particle sources and targets, 4) RF accelerator technology, 5) superconducting magnets

2023 LRP Nuclear Physics

Recommendation 1: Invest in research and operations.

The highest priority of the nuclear science community is to capitalize on the extraordinary opportunities for scientific discovery made possible by the substantial and sustained investments of the United States. We must draw on the talents of all in the nation to achieve this goal.

- Increasing the research budgets
- Continuing effective operation of the national user facilities ATLAS, CEBAF and FRIB, and completing the RHIC science program
- Increase salary for graduate students; expand policies and resources to ensure safe and respectful environment for everyone

Relativistic Heavy Ion Collider

2023 LRP Nuclear Physics

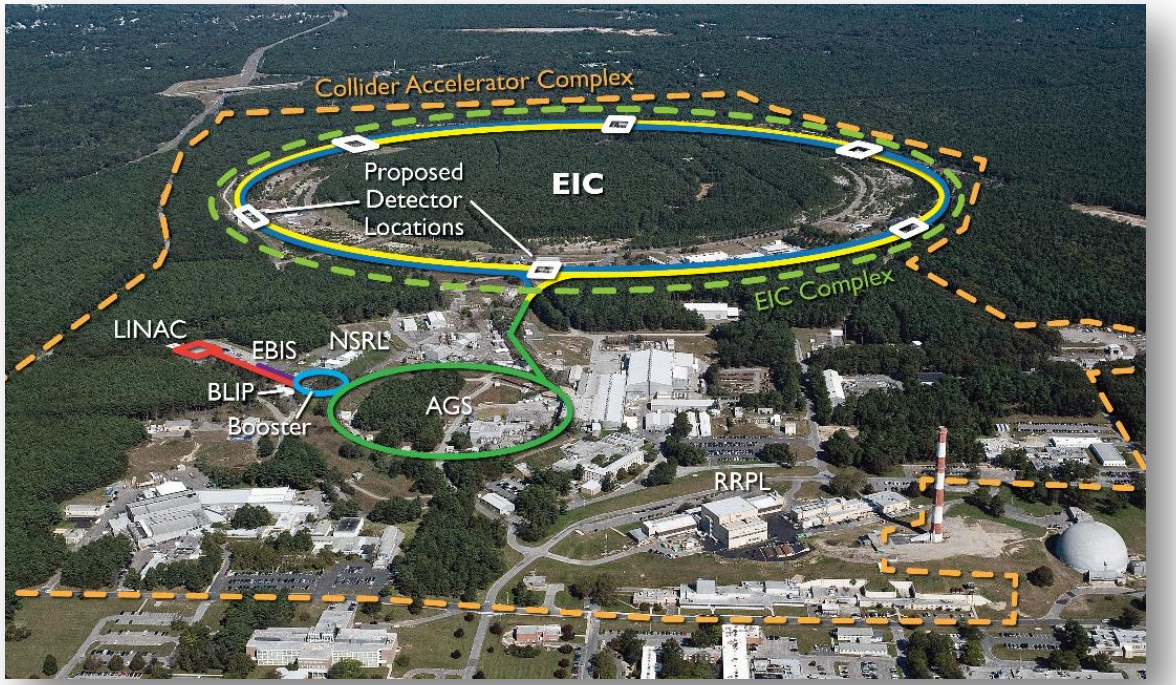
Two high priority investments in new capabilities:

Recommendation 2: Support new experiment construction.

A campaign including expeditious construction of ton-scale neutrinoless double beta decay experiments using different isotopes and complementary techniques is the highest priority for new experiment construction.

Recommendation 3: Complete the EIC construction.

The expeditious completion of the Electron Ion Collider as the highest priority for facility construction. The EIC will elucidate the origin of visible matter in the universe and significantly advance accelerator technology.



Recommendation 4: Invest in Projects and New Capabilities.

Capitalize on the unique ways in which nuclear physics can advance discovery science and applications for society by investing in additional projects and new strategic opportunities.

2021 Snowmass process

The APS Division of Particles and Fields led the 'year-long' community-wide study that preceded the P5 process (delayed due to COVID).

It was organized in 10 frontiers: Accelerator, Cosmic, Community engagement, Computing, Energy, Instrumentation, Neutrino, Rare Processes & Precision Measurements, Theory, Underground Facilities and Infrastructure.

These frontiers comprised a broad array of ground-breaking research topics and the underlying technology and infrastructure to execute them.

Each frontier was divided into topical groups, for a total of 80, and included Early Career Scientists

The Snowmass process concluded at the Community Summer Study meeting in July 2022, and the input was summarized in the Snowmass report.

The P5 panel evaluated the input provided by the Snowmass community process, which resulted in six major recommendations. These recommendations aimed to guide the future direction of high energy physics research and investment over the next decade while maintaining a 20-year overlook.

See K.Heeger presentation on P5

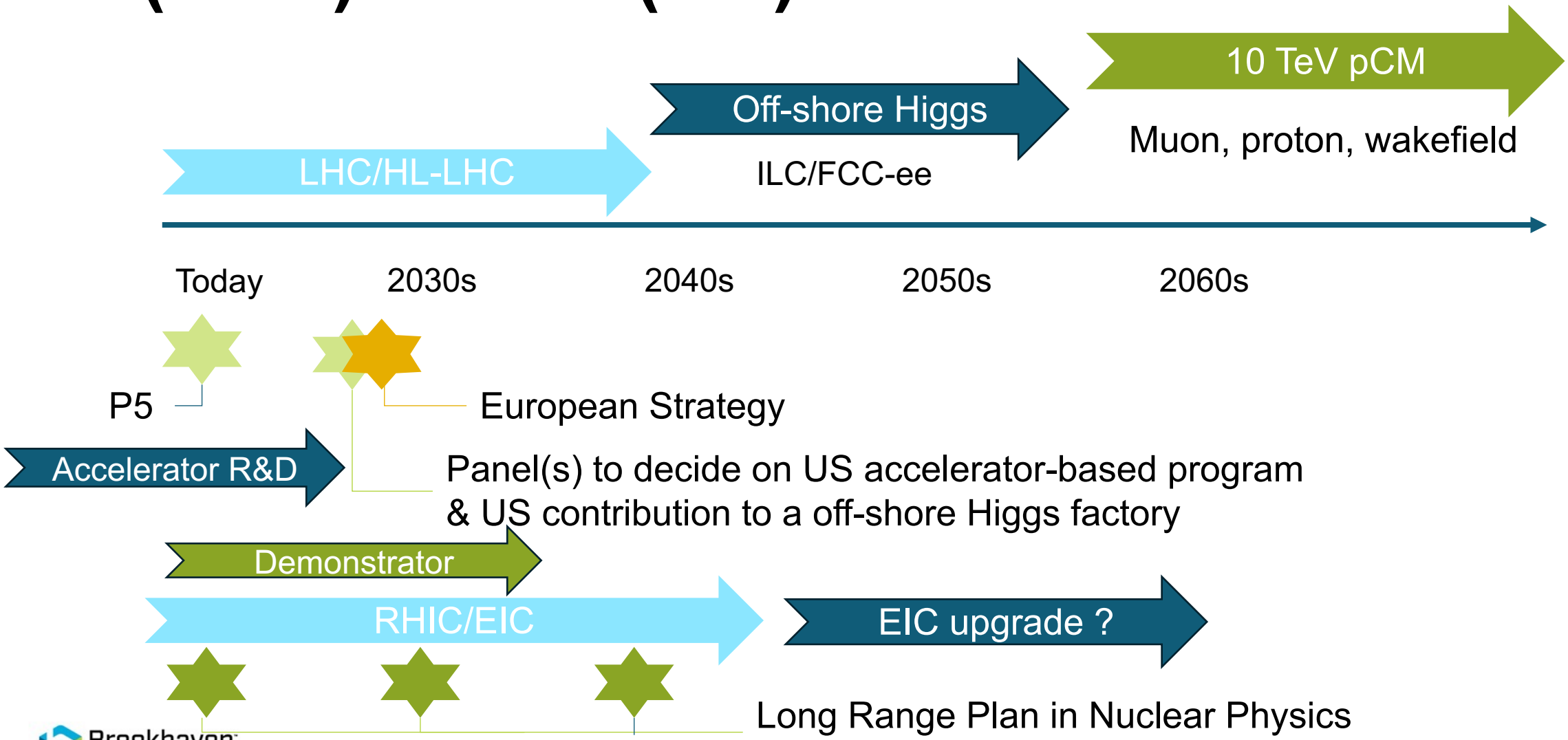
Path to a future collider (from P5)

Realization of a future collider will require **resources at a global scale** and will be built through a **world-wide collaborative** effort where decisions will be taken collectively from the outset by the partners.

In addition to developing the technologies and expertise to build future colliders, it is crucial to **maintain US expertise in their operation** and optimization. Engagement with the LHC and its high-luminosity upgrade at the energy frontier, with SuperKEKB for flavor physics, and with the Relativistic Heavy Ion Collider (RHIC) along with its successor, **the Electron-Ion Collider (EIC), for nuclear physics can provide key pathways to maintaining a vibrant US accelerator and collider workforce.**

There are multiple complementary technologies that could potentially reach the 10 TeV pCM scale, and the work to determine how to economically reach that goal must go forward. This is why we recommend pursuing **revolutionary R&D in areas such as high- field magnets, a multi-megawatt proton driver, wakefield accelerator technology, and muon cooling**

P5(HEP) + LRP (NP) colliders



Post 2023 LRP and P5

In December 2023, the Director of the DOE Office of Science charged the Science advisory committees to identify which new or upgraded facilities will best serve DOE needs in the next ten years.

NSAC and HEPAP, were asked to evaluate facilities with a cost over $100M, based on their potential to contribute to word-leading science and their readiness for construction

Nuclear Physics Facilities To Be Evaluated:

- EIC, High Rigidity Spectrometer, Ton-Scale Neutrinoless double beta decay, Project 8, FRIB400, Solenoid Large Intensity Device (SoLiD), Electron Ion Collider Detector II

HEP Facilities To Be Evaluated: see N.Roe's presentation

- LBNF/DUNE Phase 1-2, DUNE FD4, Accelerator Complex Evolution – Booster Replacement (ACE-BR), Advanced Accelerator Test Facilities – kBELLA, CMB-S4, Spec-S5, Generation 3 Dark Matter, Off-shore Higgs factory, 10TeV pCM collider