INTRODUCTION

The Advanced Projects Department undertakes the design and construction of experimental facilities to study innovative magnetic confinement concepts, such as the compact stellarator. The Department conducts design studies and R&D to define major next-steps for the fusion program, including burning plasma devices and long-pulse advanced tokamaks, which would be carried out via international collaboration. The Department also conducts general energy studies to better establish the role of fusion in the future energy strategy for the U.S and the world.

RESPONSIBILITIES

Stellarator:

- The Department leads the effort by the Laboratory, in partnership with the Oak Ridge National Laboratory, to design and construct a compact-stellarator proof-of-principle experiment, the National Compact Stellarator Experiment, NCSX. The Department supports ORNL in the design and construction of a smaller compact stellarator experiment, the Quasi-Poloidal Stellarator, QPS.

ARIES:

- PPPL will take the lead in developing the physics basis for an attractive stellarator reactor. The configurational basis for these studies will be a low aspect ratio compact option. The physics study objectives will be to maximize physics performance in a compact configuration with emphasis given to optimizing the engineering in areas such as magnet constructability and remote maintenance of the core. PPPL engineering will contribute to the overall studies in the areas of systems integration and magnet design.

Advanced Reactor Concepts:

- PPPL will strengthen the physics basis for burning plasma devices, and advanced reactor concepts. Emphasis will be given to physics opportunities for cost reduction. PPPL will work with the community to define the rationales, metrics, and operating scenarios and to specify the design requirements for engineering systems. Initially, engineering design work will assess the technical feasibility and approximate costs. As the machine parameters are refined, the engineering design work may move toward a deeper study of a narrower set of options.

Energy Studies:

The purpose of the PPPL Socio-Economic studies has two elements:

1. The development of the scientific basis for future fusion power implementation scenarios.
2. The exposure of the broader energy planning community to the characteristics and promise of fusion implementation scenarios.

Element 1 includes pure fusion and also consideration of fusion/fission combination devices as input to fusion community consideration of the benefits and detractions of these scenarios.

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