Princeton Plasma Physics Laboratory and the Fusion Industry

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National Need – Commercial Fusion

• $1B private investment in fusion in 5 years. Injection of ideas and enthusiasm. Realizing the NAS vision requires working with private sector

• PPPL is supporting new FES program INFUSE to enable companies to benefit from the National Lab

• Working to develop a public-private funded innovative concept at PPPL. We are not going to simply watch others do it!

What can we, a national lab do for the fusion industry?
 Supporting the Industry

• National lab could provide: (PPPL capabilities)
  – Physical facilities:
    • Electrical power: fast (2.2GJ - seconds) and slow power supplies (50MW steady).
    • Cryogenics: liquid helium (1kW @4.5K), nitrogen (11000 gallons).
    • Cooling water. (MWs)
    • Radio frequency power: microwaves. (5-7MW @MHz)
    • Diagnostics: lasers, x-rays, microwaves.
    • Tritium handling.
  – Expertise, consultancy
    • Design engineering capability (Virtual engineering)
    • Safety expertise (Electrical, radiation)
    • Fusion science. (World class)
    • Modelling and high performance computing
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Advanced Instrumentation and Control capability

- Custom Electronics
- Real-time capable Diagnostic systems
- Machine Protection Systems
- Prototype development
- Process control systems
- Software Design
Facility Needs Drive Long-Term Campus Plan

2. FLARE User Facility (2021)
3. Compact Permanent Magnet Stellarator (2023)

Home for new private ventures?

4. Future Liquid Lithium Lab (2023)
5. Princeton Plasma Innovation Center (PPIC) (2025)
   - Modern medium bay laboratories for large and precision research needs
   - Remote Participation and Collaboration center external experiments
   - State-of-the-art visualization center for leveraging Exascale computing

6. Next large fusion experiment (2030) (Private Public Partnership?)
New Computer Facilities

- Princeton University to fund and manage new computer to enable high performance computing
  - 1.5 petaflops
  - 7 racks of Summit
Princeton Plasma Innovation Center (P-PIC) Capabilities

- LSB West
- Collaboration Space
- Visualization and Remote Participation Room
- Medium Bay Lab Space
PPPL will provide the expertise to facilitate fusion

- Commercial Fusion will be delivered by private industry
- PPPL is open for an optimal partnership

Please feel free to contact me: adiallo_at_pppl.gov