U.S. DEPARTMENT OF ENERGY | Office of Nuclear Energy

Versatile Advanced Test Reactor (VATR)

Briefing to

Nuclear Energy Advisory Committee

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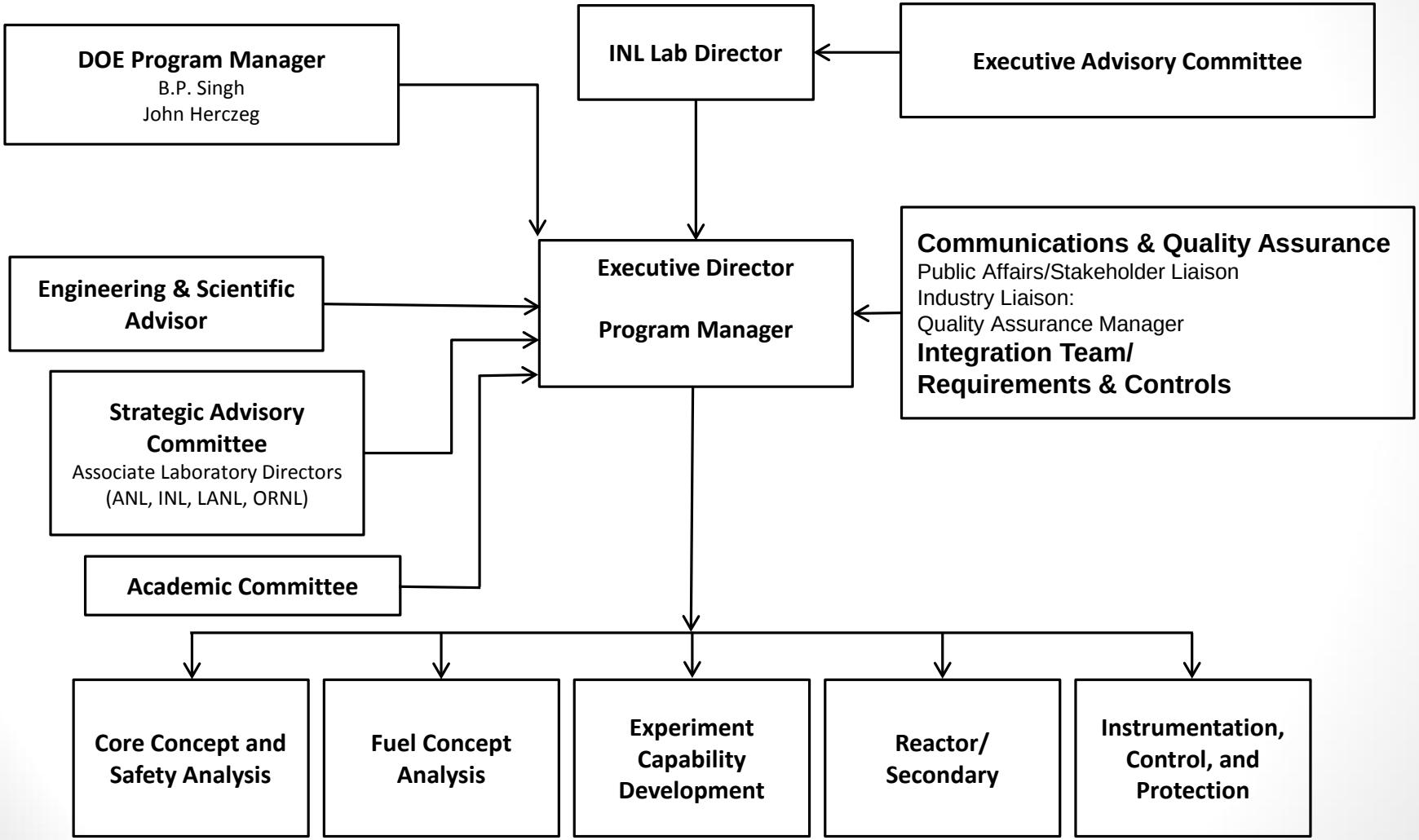
Need for a Fast Neutron Source

- The need has been established through a series of independent surveys of the potential U.S. user community (industry, DOE programs) resulting in a NEAC report ("Assessment of Missions and Requirements for a new U.S. Test Reactor" 2/2017); it states that "The Ad Hoc NEAC subcommittee recommends that DOE-NE proceed immediately with pre-conceptual planning activities to support a new test reactor (including cost and schedule estimates)."
- From the discussions with users, the laboratories have established:
  - Draft generic requirements
  - Some specific requirements
- The laboratory team has initiated (3/2017) work towards delivering by 12/15/17 a R&D plan that addresses three aspects of our future activities
  - **Short-term R&D**: Work needed to start procurement and construction after 3 years (this includes confirmatory work beyond 3 years)
  - **Long-term R&D**: Work needed for future (post startup) operational and experimental improvements
  - **Prospective R&D**: High risk/ high reward activities

Versatile Advanced Test Reactor Research and Development Organization



Draft Requirements/Assumptions

1. Reactor needs to be operational within approximately 10 years
2. Reach fast flux of approximately 4.E15 n/cm^2-s, with prototypical spectrum
3. Load factor: as large as possible *(maximize dpa/year to > 30 dpa/year)*
4. Existence of a pathway for driver fuel disposal
5. Provide flexibility for novel experimental techniques
6. Be capable of running at the same time loops representative of typical fast reactors *(Candidate Coolants: Na, Lead, LBE, Gas, Molten Salt)*
7. Effective testing height: evaluate the range defined by users
8. Ability to perform large number of experiments simultaneously
9. Metallic driver fuel (possible options: LEU, Pu, LEU+Pu)

Development Principles for the Versatile Advanced Test Reactor

1. **Use simple and robust designs** and well demonstrated technologies; take risk only if necessary
2. **All technologies** *(except for experimental instrumentation and devices)* should have a **very high TRL**
3. **All technologies** should be able to **develop a reliable supply chain** with sufficient margins to avoid adverse effects on reactor construction and startup schedules
4. **Concepts should include comfortable margins to allow for:**
   - **for easy operability**
   - **reliable operations**
5. **Built in margins should allowing for future experimental flexibility**
6. Safety case should facilitate experimentation

Three Year R&D Plan Overview