NEAC Nuclear Technologies R&D Subcommittee Report

Presentation to the

Nuclear Energy Advisory Committee

Washington, D.C.

October 13, 2017

Al Sattelberger

Fuel Cycle Technologies Subcommittee Members

- Carol Burns
- **Michael Corradini**
- Margaret Chu
- Raymond Juzaitis
- Chris Kouts
- Ron Omberg
- Joy Rempe
- John Stevens
- Dominique Warin
- Al Sattelberger (Chair)

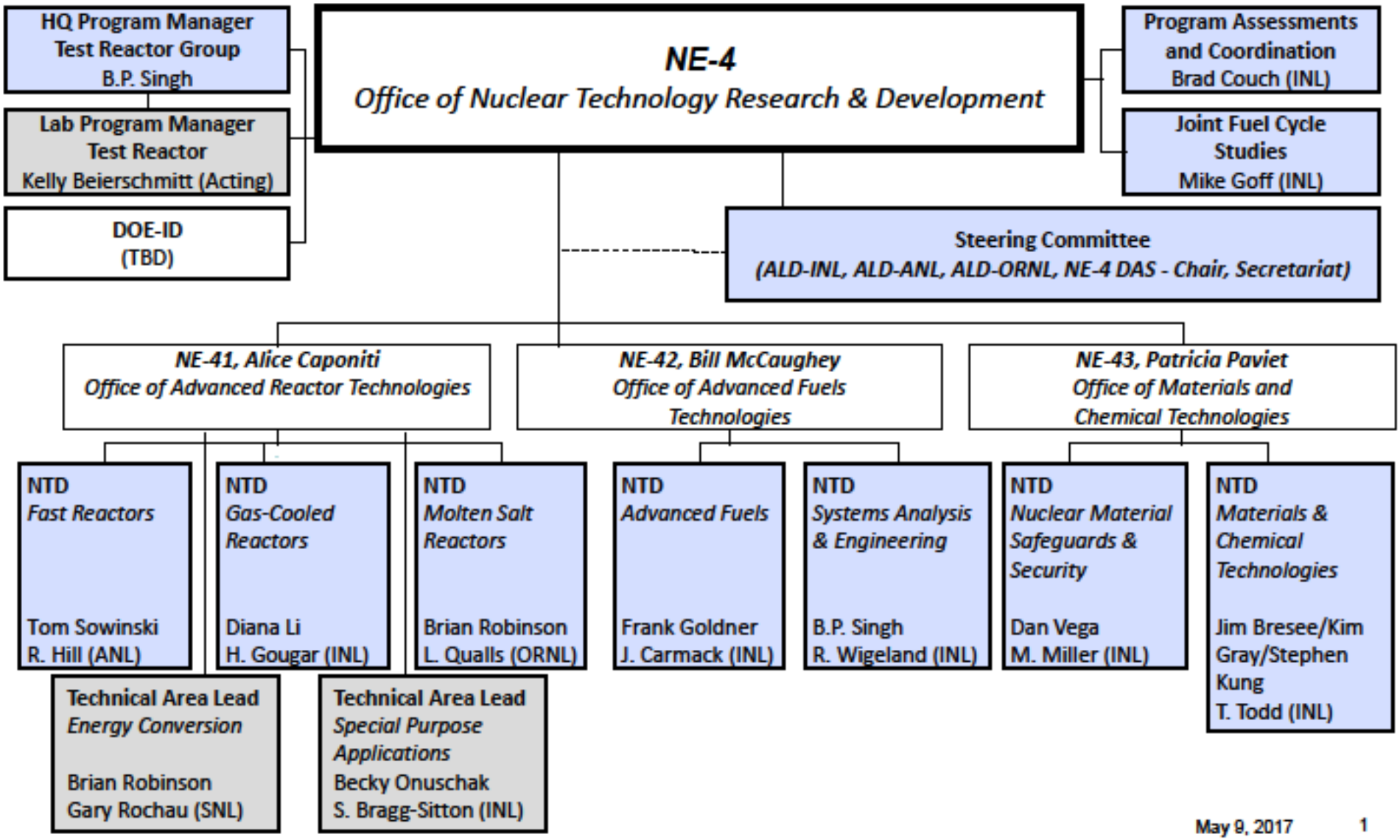
Fuel Cycle Technologies Subcommittee

- One day meeting on May 10, 2017
- Highlights:
  - NE-4 Organizational Overview
  - Advanced Reactor Programmatic Overview
    - Advanced Materials
    - Fast Reactor R&D and Future Direction
    - Gas Cooled Reactor R&D and Future Direction
    - Molten Salt Reactor R&D and Future Direction
    - Energy Conversion R&D and Future Direction
  - Office of Science “BRN Workshop”, August 9-11, 2017
  - Test Reactor – R&D Path Forward
  - Round Table Discussion - Spent Fuel & Waste Disposition

U.S. DEPARTMENT OF ENERGY

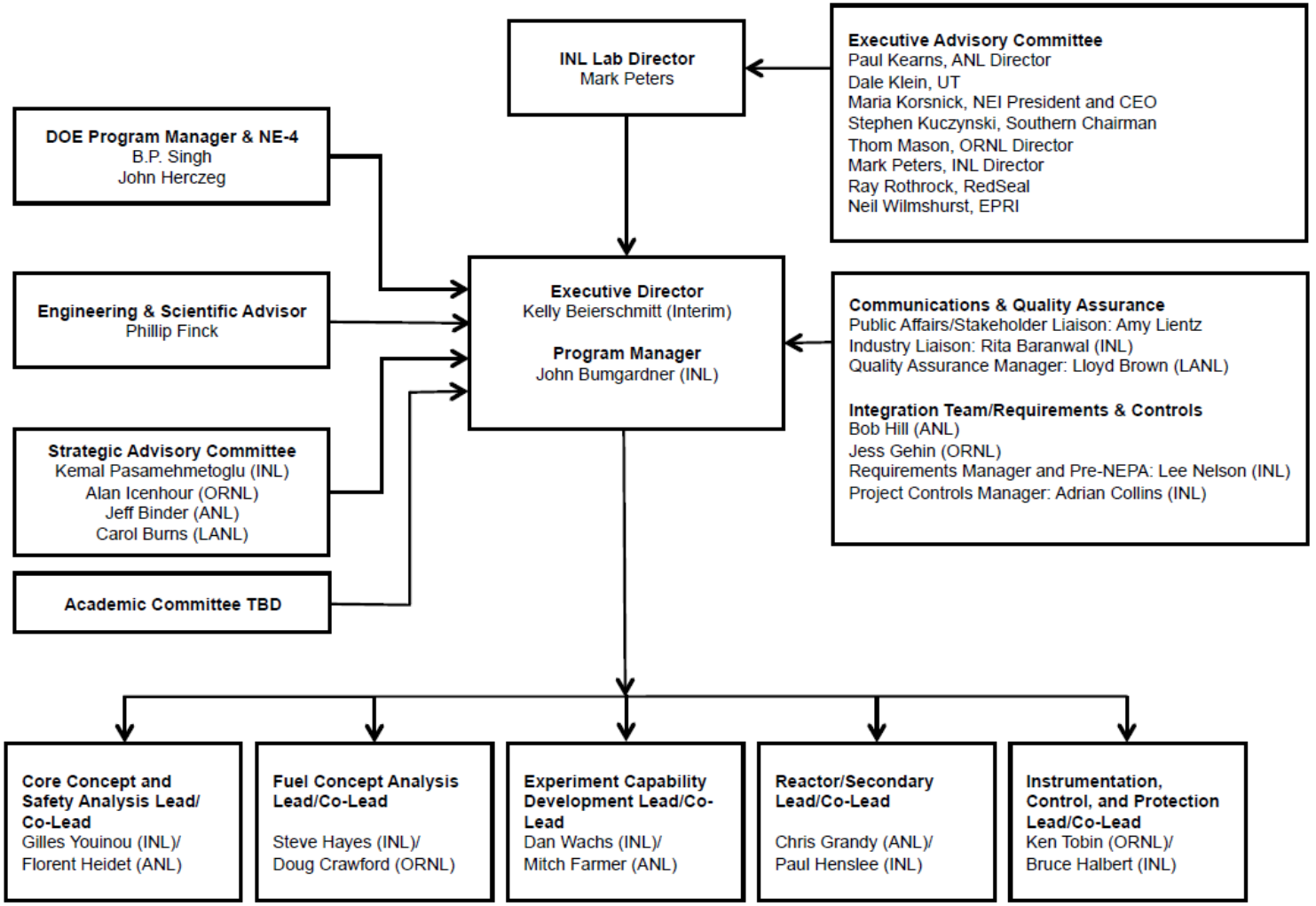
Nuclear Energy

Functional Management Structure for the Office of Nuclear Technology Research & Development



Versatile Reactor-based Fast Neutron Source Research and Development Organization

April 26, 2017



PRE-DECISIONAL

NE-4 Organizational Overview

Observations:

- **Merging Advanced Reactors with Fuel Cycle Technologies in NE-4 is an excellent organizational option for enabling the conceptualization and planning of full "nuclear energy systems"**
- **Interfaces between NE-4 and NE-5 will require managed coordination and careful budget planning to achieve desired outcomes. Also, activities pursued by NE-4 should be informed by industry plans for deployment.**

Recommendation:

- **The stand-up of a Test Reactor organization is timely and in sync with a recent NEAC recommendation. We recommend that the proposed organization be phased in gradually. This large management organization is more appropriate for a major program/project rather than the conceptual design effort currently planned for FY17 and FY18.**

Advanced Reactors Technology Program Mission

- Identify and resolve the technical challenges to enable transition of advanced non-light water reactor technologies and systems to support **detailed design, regulatory review and deployment** by the early 2030's.

Advanced Reactors Technology Program Objectives

- Conduct focused research and development to **reduce technical barriers** to deployment of advanced nuclear energy systems.
- Develop technologies that can enable new concepts and designs to achieve enhanced **affordability, safety, sustainability and flexibility of use**.
- **Collaborate with industry** to identify and conduct essential research to reduce technical risk associated with advanced reactor technologies.
- **Sustain technical expertise and capabilities** within national laboratories and universities to perform needed research.
- Engage with Standards Developing Organizations (SDO's) to **address gaps in codes and standards** to support advanced reactor designs.

Advanced Reactor Technologies Focus Areas

- Fast Reactor Technologies
  - For actinide management and electricity production
  - Current focus on sodium coolant
- Gas Reactor Technologies
  - For electricity and process heat production
- Molten Salt Reactor Technologies
  - Multiple R&D technologies
- Advanced Reactor Demonstration and Industry Awards
  - Continued support for ARC 15 awards
- Technology Areas Leads for Energy Conversion and Special Applications
  - Super critical CO2 Brayton Cycle
  - Space and other remote applications

Priority Research Directions:

(1) Enable the design of revolutionary molten salt coolants and liquid fuels
(2) Master the hierarchy of materials design and synthesis for complex reactor environments
(3) Taylor interfaces to control the impact of nuclear environments
(4) Reveal multiscale evolution of special and temporal processes for coupled extreme environments
(5) Identify and control unexpected behaviors from rare events and cascading processes

Roundtable Discussion on Spent Fuel and Waste Disposition

- It appears that the Department is pivoting back to restart Nuclear Waste Policy Act (NWPA) activities associated with the Yucca Mountain license application
- The Subcommittee recommends that available NE resources should be marshalled and focused on assisting the Yucca Mountain licensing effort.

Thank you –
Questions