NCSX Project Overview

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NCSX Project Control Systems Review

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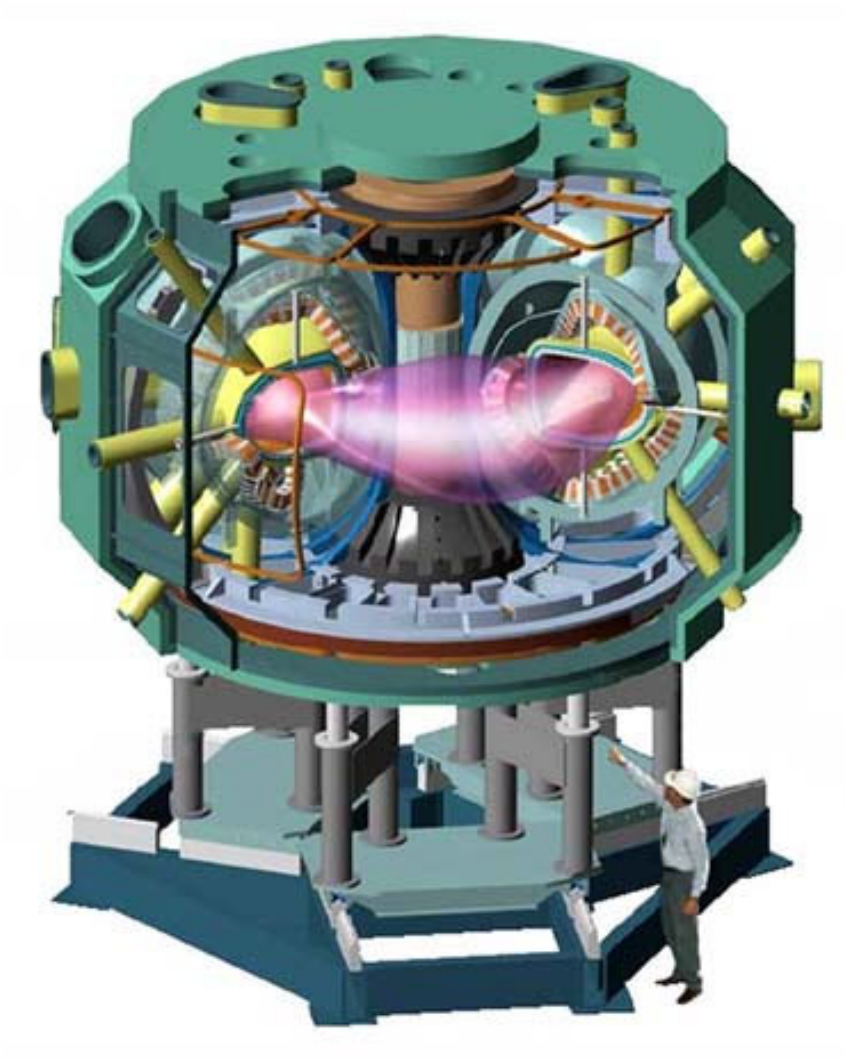
NCSX Project Overview: Outline

- Mission.
- Description.
- Organization.
- History, Status, and Plans.
- Summary.



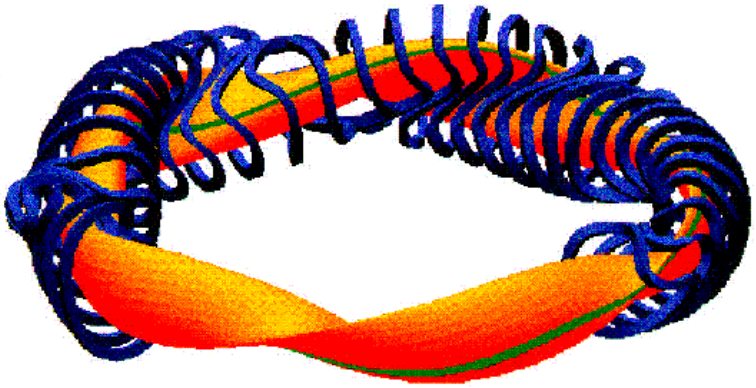
NCSX Offers Solutions for Critical Fusion Issues

Mission: Test the physics of Compact Stellarators, a new magnetic configuration that can improve the vision of magnetic fusion reactors.

- Steady State (confining fields don't rely on plasma currents.)
- Passively stable (simpler, more reliable system.)
- 3D plasma physics understanding (important for magnetic fusion generally.)

Stellarator physics benefits stem from their 3D geometry.

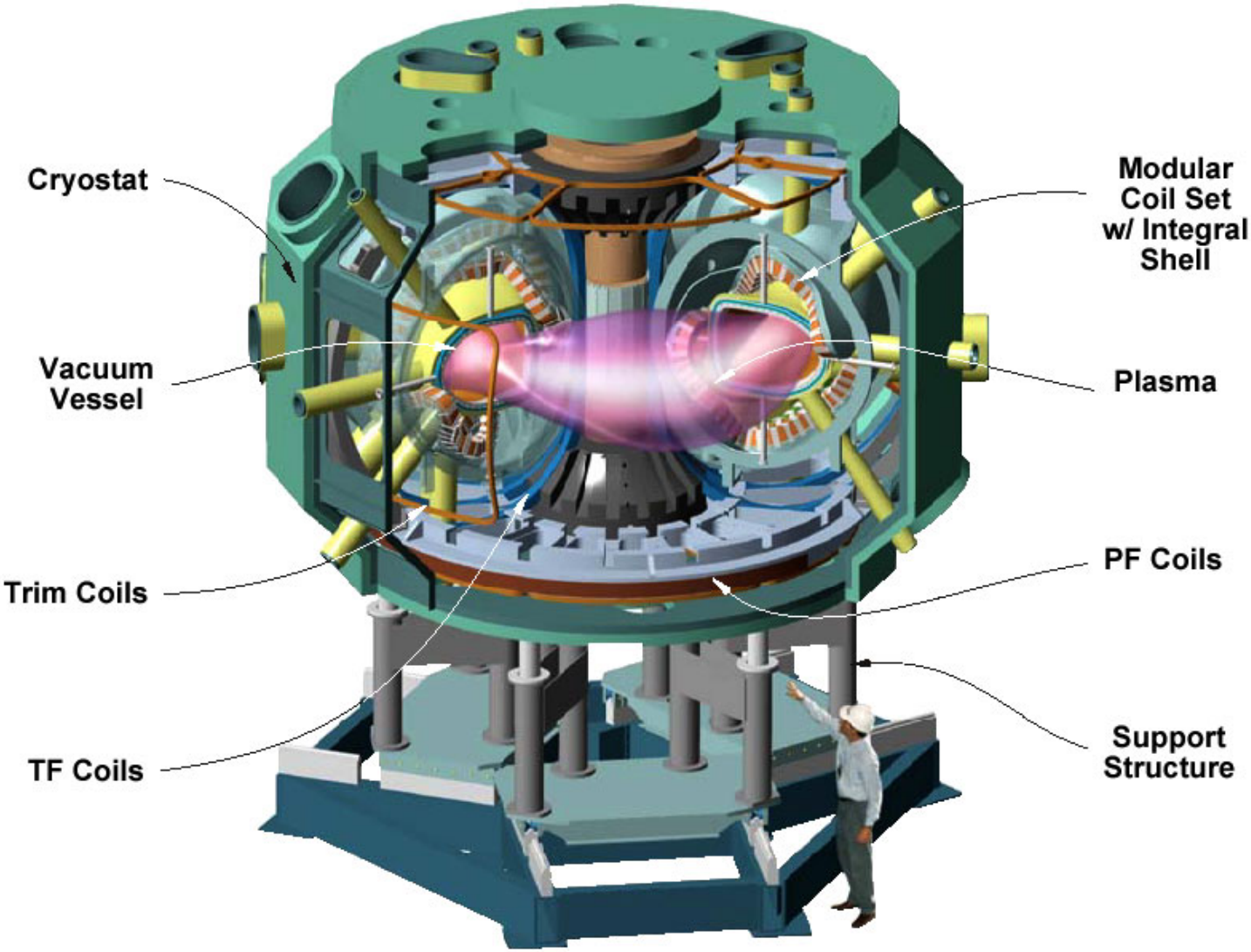
- More design freedom lets us design for better plasma properties.
- Cost: more complex coil and structure geometry.
  - Research goal: test physics, quantify benefits *vs* costs, assess overall merit.



Stellarator Plasma and Coils (Germany)

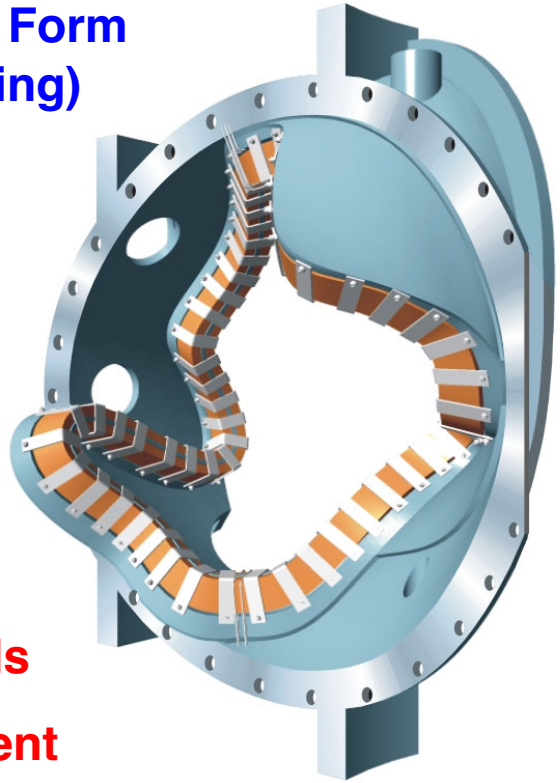
U.S. Program Aims at a Lower Aspect Ratio ("Fatter") Design

The NCSX Stellarator Core Device is the Heart of the System



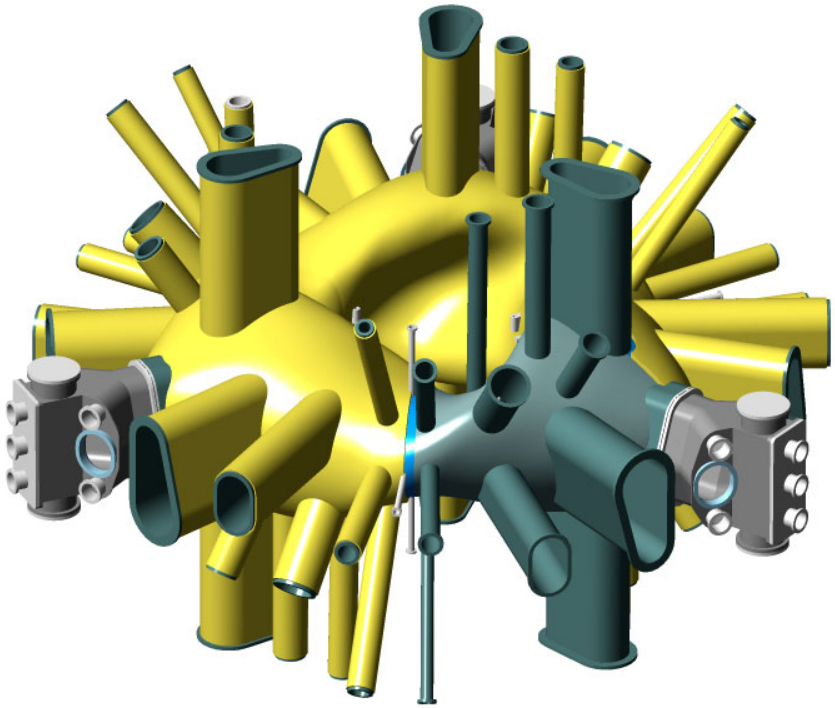
The Modular Coils and Vacuum Vessel are the Most Critical Components

Modular Coil (Winding Form + Winding)



18 coils

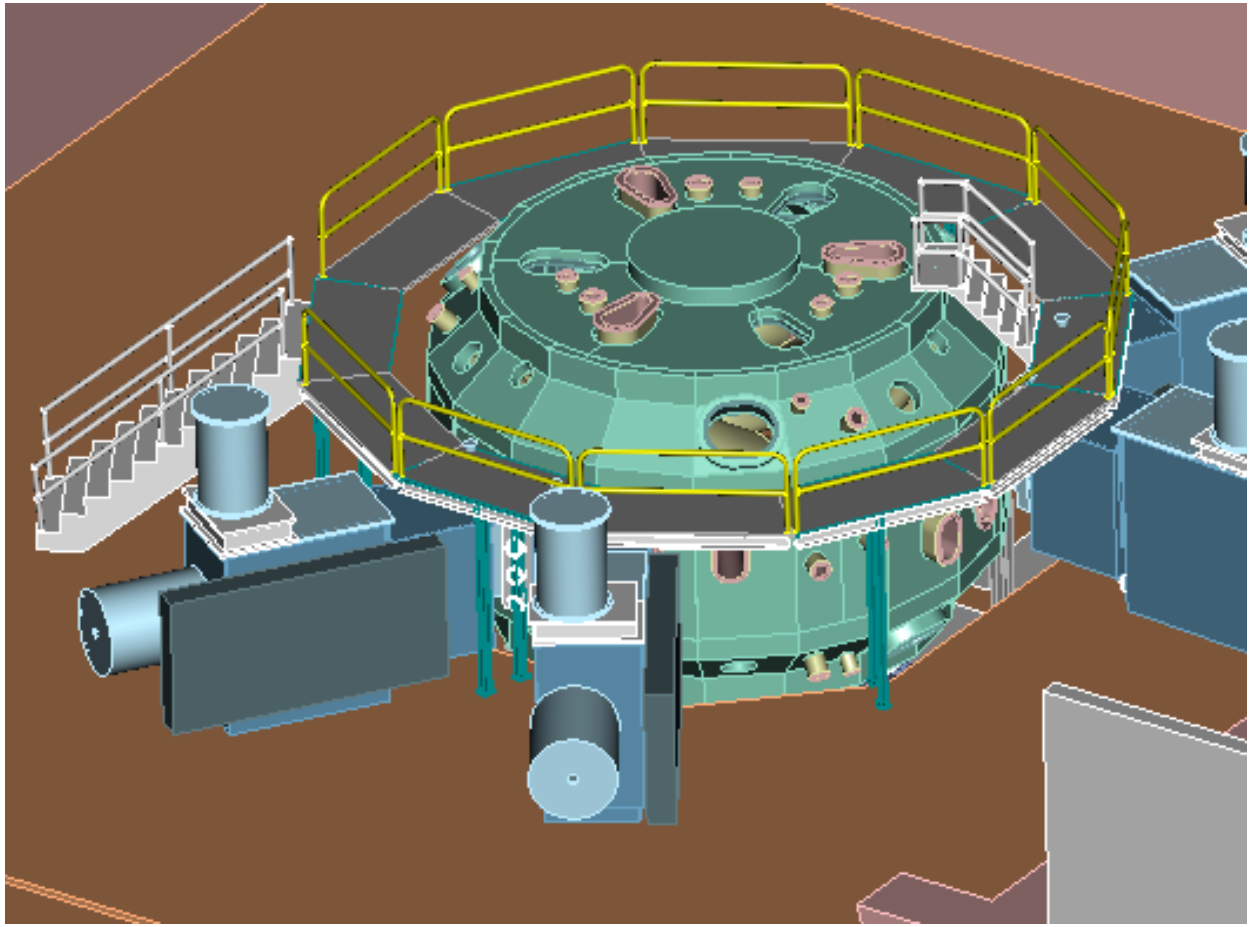
3 different shapes



Vacuum Vessel (shown with insulation)

- Winding forms and vacuum vessel will be built by industry.
- Coil winding, machine assembly, and installation will be done by PPPL.

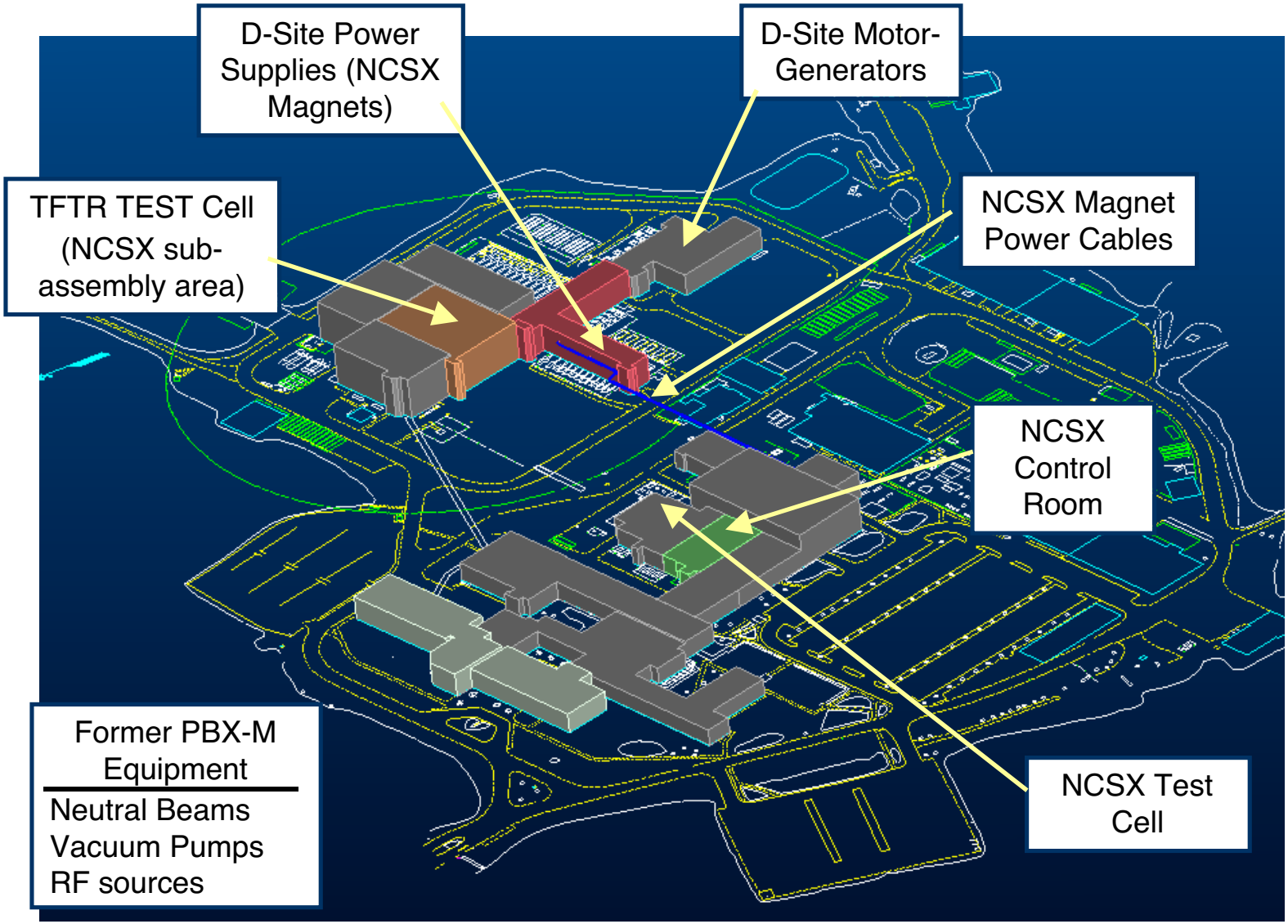
The Device Will Be Sited at PPPL in the former PLT / PBX-M Test Cell



Shown with neutral beam heaters and access platforms

Site is being cleared now with excess facilities disposal funds.

NCSX Makes Use of Many Existing Site Assets



Project Involves Equipment Reconfiguration and Installation, not Construction.

NCSX Conceptual Design Review (CDR)
Cost Estimate: $73.5M

Subsystem	Cost ($M)
Stellarator Core	30.2
Heating, Fueling, & Vacuum	2.3
Diagnostics	2.5
Power Systems	5.6
Central I&C	4.1
Facility Systems	1.8
Machine Assembly	3.4
Management and Integration	7.3
Total Base Estimate	57.2
Contingency (28%)	16.3
Total	73.5

- Most of the cost, risk, and new construction are in the stellarator core and machine assembly.
- Other subsystems are modifications of existing equipment or duplicates based on proven designs. Risk is low.

NCSX History and Status

Program History

- NCSX proposed as key element in the U.S. stellarator program, 1998.
- Passed a physics validation peer review, 2001.
- Received programmatic approvals from FESAC and OFES (CD-0), 2001.

Design and Management

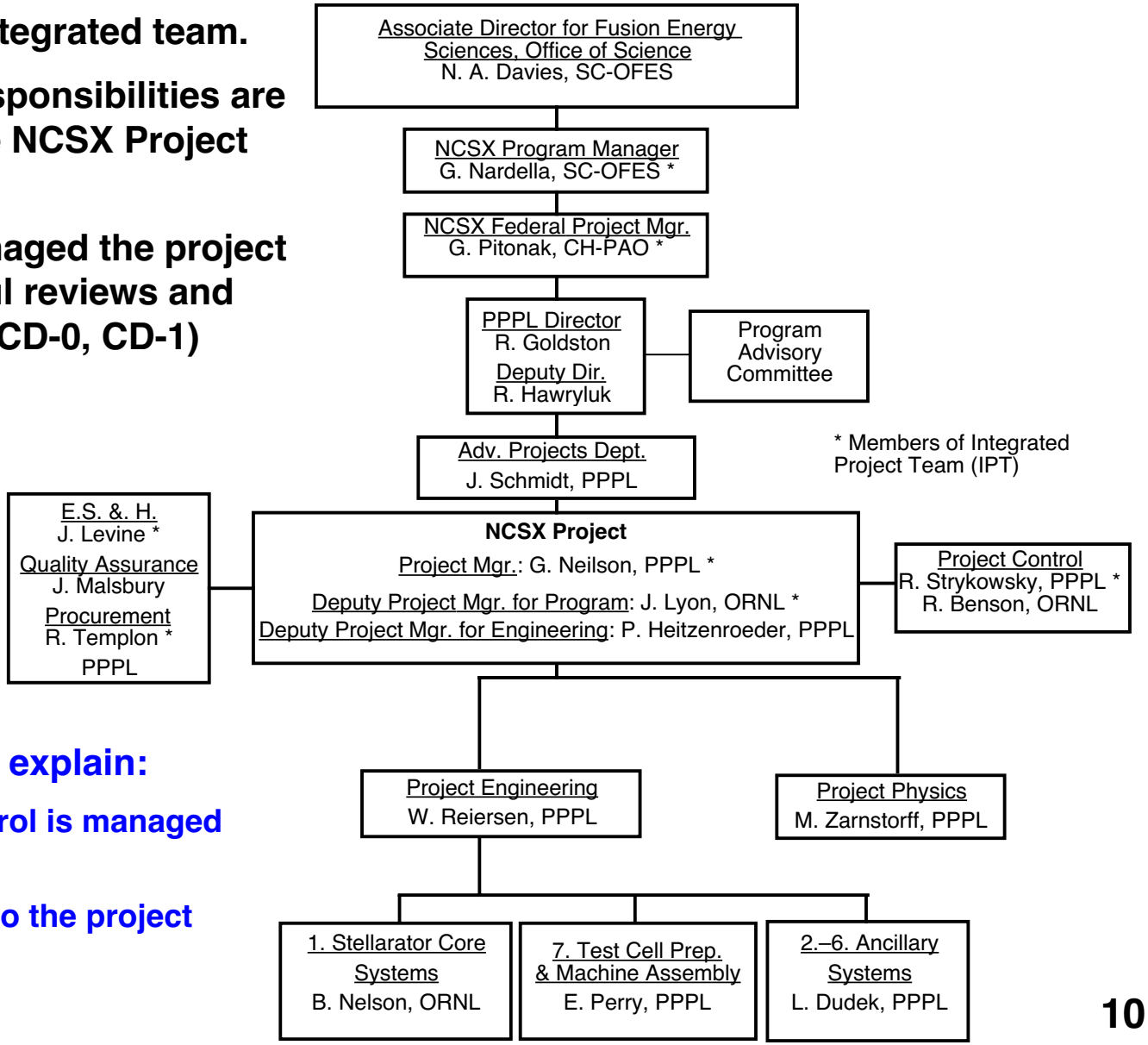
- Passed comprehensive DOE Project Review (CDR), 2002.
- Acquisition Execution Plan (AEP) and Preliminary Baseline Range (CD-1) approved by DOE, 2002.
- FY-03 funding and FY-04 request are following AEP profile.

Project is now set to start April 1.

First Plasma schedule for 2007.

PPPL and ORNL Manage the Project As Partners

- **Functions as an integrated team.**
- **Clear roles and responsibilities are documented in the NCSX Project Execution Plan.**
- **Partners have managed the project through successful reviews and critical decisions (CD-0, CD-1) since 1998.**



- **R. Strykowsky will explain:**
  - **how project control is managed seamlessly.**
  - **how WBS maps to the project organization.**

Project Control on NCSX

NCSX uses the PPPL Project Control System

- Has been developed over the last 20 years and many projects.
  - Including projects similar to NCSX in cost, complexity, collaborative aspects.
- Documented in 1996 and approved by DOE.

NCSX PCS Implementation History and Plans

- NCSX resource-loaded schedule was compiled July, 2002 to support CDR, Acquisition Execution Plan, and CD–1.
  - Was developed based on expected Project Start date of Oct., 2002.
- Project start was delayed due to Continuing Resolution (CR). OFES directed that we use the time to resolve design issues and start R&D activities.
  - Project Control (PC) procedures were implemented from Oct., 2002, using the July baseline as a roadmap, albeit imperfect due to CR restrictions.
  - This enabled us to tailor PC processes and reporting formats to our needs and start up the learning curve. **Examples from CR period will be shown.**
- Project Start now set for April, 2003.
- Will re-baseline to support upcoming reviews and CD-2 this summer.
  - CD-2 approval will establish performance baseline.

Summary

- NCSX is a major new start for the OFES program and is being accorded high priority.

- PPPL-ORNL partnership benefits the project. Team has functioned successfully since 1998.
  - Accomplished major milestones.
  - Made significant scientific and technical advances.
  - Developed a sound project plan.

- We are implementing a project management approach that has been used successfully on several PPPL-managed projects in the last 20 years.
  - Ron Strykowsky will describe the project control approach.