


SC Project Review
of the
National Compact Stellarator Experiment
at PPPL

Jeffrey Makiel
DOE Federal Project Director
Princeton Site Office

April 2008

The Review charge...

The proposed Baseline Package



Department of Energy
Washington, DC 20585

February 12, 2008

MEMORANDUM FOR Daniel R. Lehman, Director
Construction Management Support Division

FROM: Raymond Fenck *RJ Fenck*
Associate Director for Fusion Energy Sciences


SUBJECT: Cost and Schedule Review of Revised Baseline for the
National Compact Stellarator Experiment (NCSX) at
Princeton Plasma Physics Laboratory (PPPL)

I would like to request that your office organize and lead an Office of Science (SC) review of the NCSX project.

The purpose of this review is to evaluate the project's proposed cost and schedule re-baseline, and the project's path forward.

The review is planned to be held on April 8-10th, 2008, at PPPL. In carrying out its charge, the review committee should evaluate the following:

1. Is the project's bottoms-up estimate to complete credible? Is there an adequately mature design available on complex activities, such as machine assembly, to support the estimate?
2. Is the contingency supported by and consistent with an appropriate project-wide risk analysis based on the use of a comprehensive Risk Registry? Is there adequate cost and schedule contingency in the proposed baseline to achieve a high level of confidence in completing the project successfully?
3. Has the project adequately incorporated developmental, fabrication, and component assembly experiences in the bottoms-up estimate to increase the success of final machine assembly and improve reliability during research operations?
4. Is the project being properly managed and organized at this point, and are future staffing plans at both PPPL and Oak Ridge National Laboratory (ORNL) adequate? What is the level of confidence that the NCSX project team can complete the project within the proposed baseline? Is there adequate support from PPPL and ORNL management?

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1. Proposed cost & schedule OK?
2. Adequate contingency?
3. Sound basis for estimate?
4. Project management OK?
5. CD-4 requirements met?

What's been done so far?

Modular Coils

Winding forms

Wound coils

Vacuum Vessel

TF Coils Received

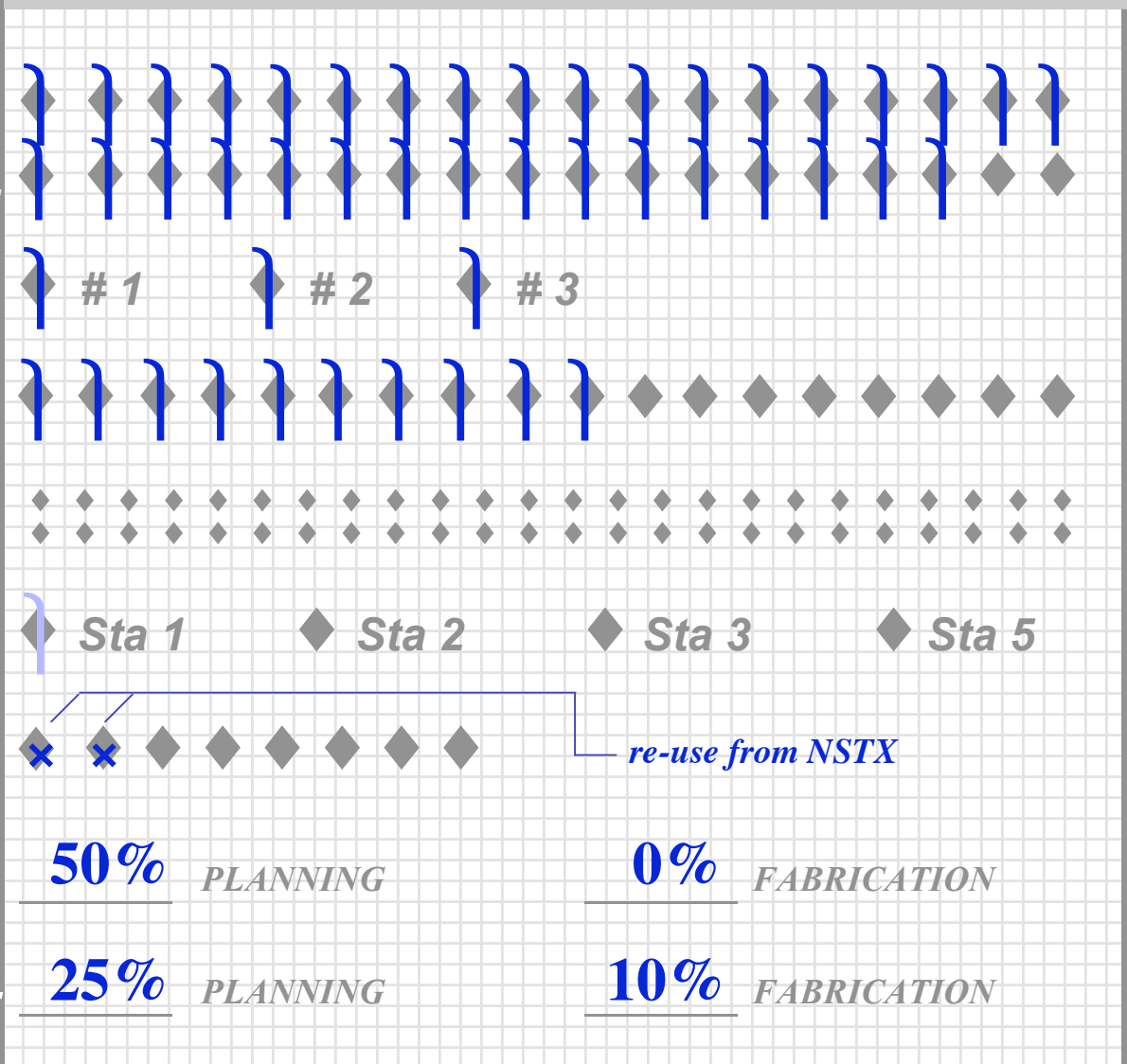
Trim Coils Received

Field Period Assy

PF Coils Received

Machine Assembly

Other Systems
(I&C, diag, pwr, aux, etc)



Spent to date = ~\$80M

Completed = ~55%

What's the Project proposing?

	<i>Current</i>		<i>Proposed</i>
TPC ▶	\$101.2M	▶	\$170.2M
TEC ▶	\$92.4M	▶	\$160.6M
CD-4 ▶	July 2009	▶	Aug 2013
Contingency	25% & 5 mo. (\$12.8M)	▶	36% & 19 mo. (\$22.4M)

♣ ***About a 70% overall increase to TEC***

♣ ***About a 4 year delay to the schedule***

FPD thoughts...

- ♣ This project has been ‘yellow’ for 16 months and ‘red’ for 9 months so far. Project has not had a sound baseline to measure performance against for **over 2 years**.

- ♣ The design effort has significantly moved forward in the last 8 months.
 - *More design = better understanding of work = better cost & schedule estimates.*
 - *Get away from “Just-in-time” design. This method simply doesn’t work.*
 - *More design required, but the new baseline accounts for this condition.*

- ♣ Contingency estimate was formulated in detail using improved methodology. But, is it adequate based on what we’ve experienced to date?
 - *Practical ‘bounding conditions’ exempt project from addressing disastrous risk.*
 - *Restraining the contingency estimate are other research programs that will likely suffer further if more contingency is set aside for this project.*
 - *What about the unknown unknowns? We’ve had our share.*

- ♣ A complex prototype.
 - *A lot of high risk work has been achieved . . . but . . . at significant cost & delay.*
 - *Design and engineering talent has been exemplary to date. Timeliness was the issue.*
 - *There is still a lot of high risk work in field period assembly and machine assembly. Much of this work is sequential and at or near the critical path.*

Changes by the FPD...

♣ Improved performance milestones...

- *Triple the amount of level 2 milestones...about 3 to 5 per year vs 1 or 2.*
- *Access to level 3 and newly established 4 milestones at the working level.*
- *Milestones are based on when work is accomplished...not began.*

♣ Perform EACs (or ETCs) up to twice a year either for the entire project or for WBS elements of concern (*Requirement established in the revised PEP*).

♣ Enhanced communication to restore transparency and partnership:

- *Detailed monthly reports well beyond EVMS data.*
- *Attend weekly 'working level' project meetings.*
- *Weekly one-on-one meetings with the NCSX Project Manager.*
- *Continue to attend peer, preliminary and final design reviews.*
- *Continue with IPT meetings every three weeks focusing on issues (risk registry).*
- *Continue to attend weekly senior management meetings with PPPL.*
- *Continue routine walkthrus of fabrication facilities and vendor visits.*

♣ Monitor PPPL and ORNL resource levels (people). Encourage using external technical expertise.

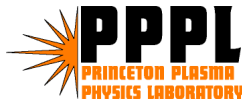
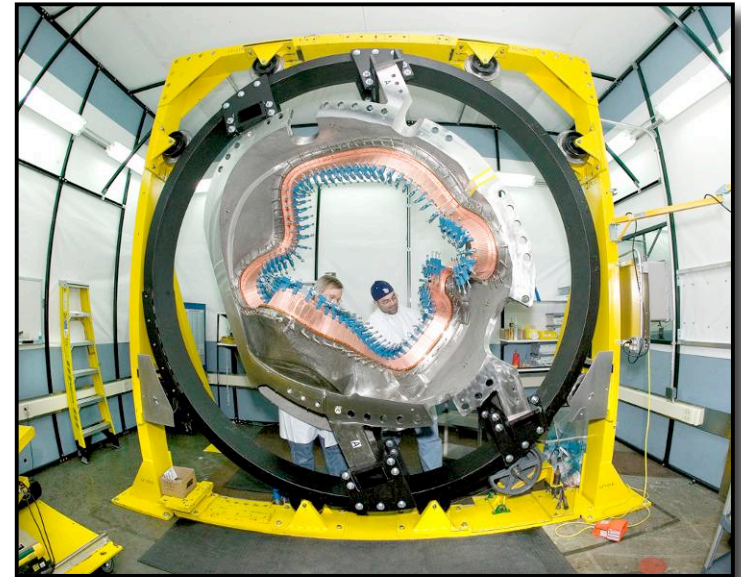
FPD Final Thoughts . . .

Technical progress of this complex project is outstanding!

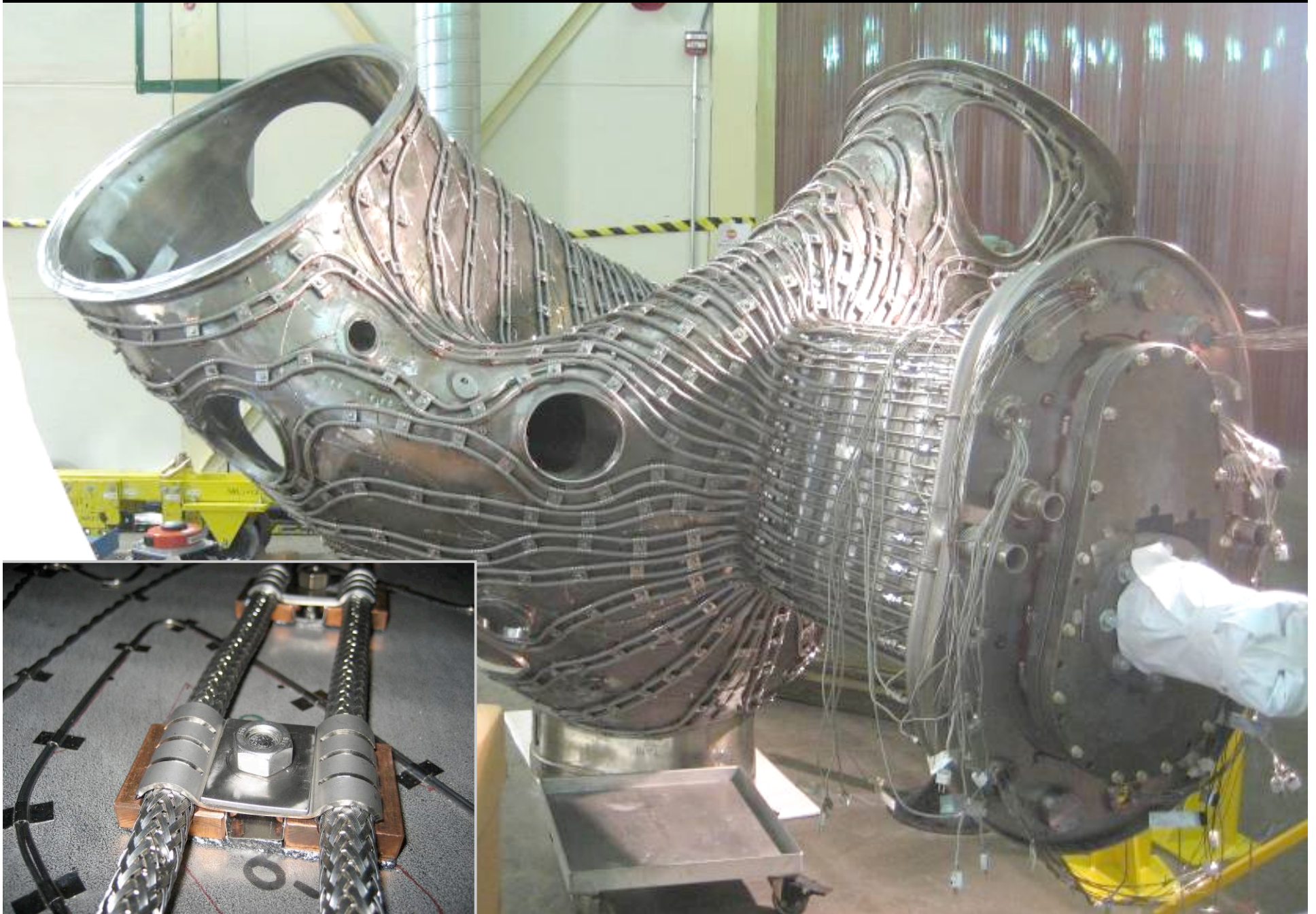
Quality is paramount and remains high.

The bottoms-up estimate-to-complete is much more detailed and the contingency analysis is intensive.

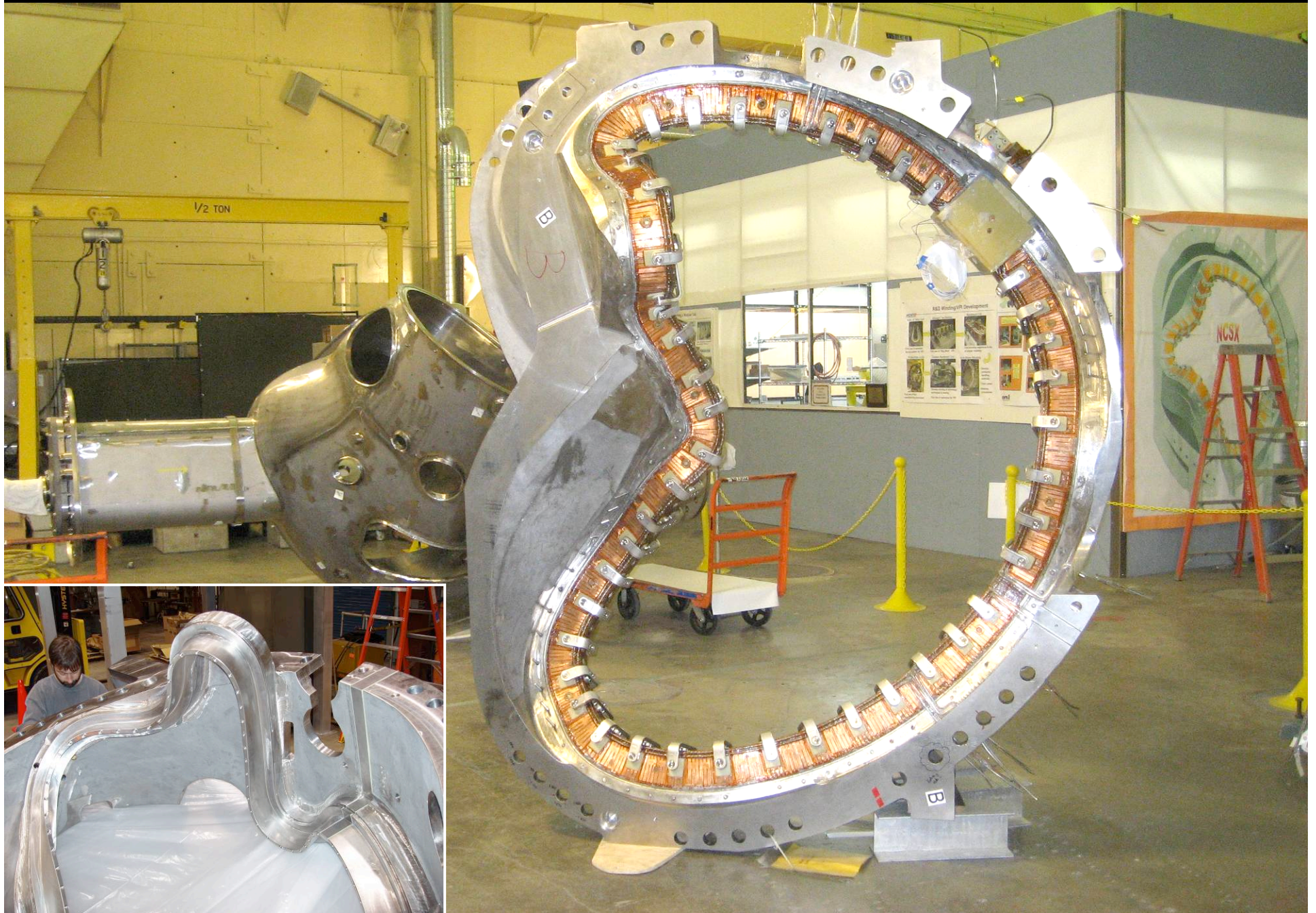
NCSX safety record has been very good.



Field Period Station #1



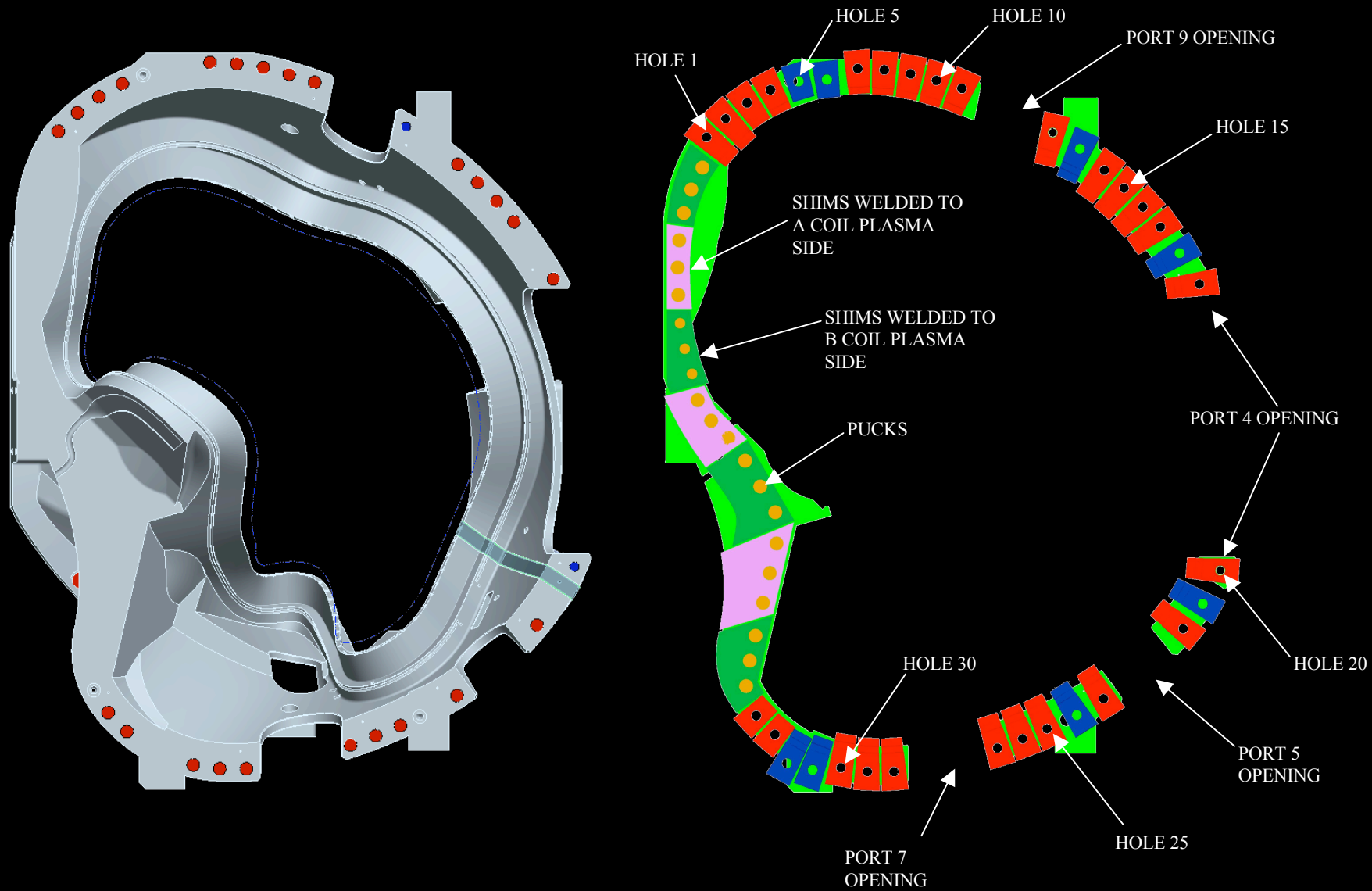
Completed Modular Coil



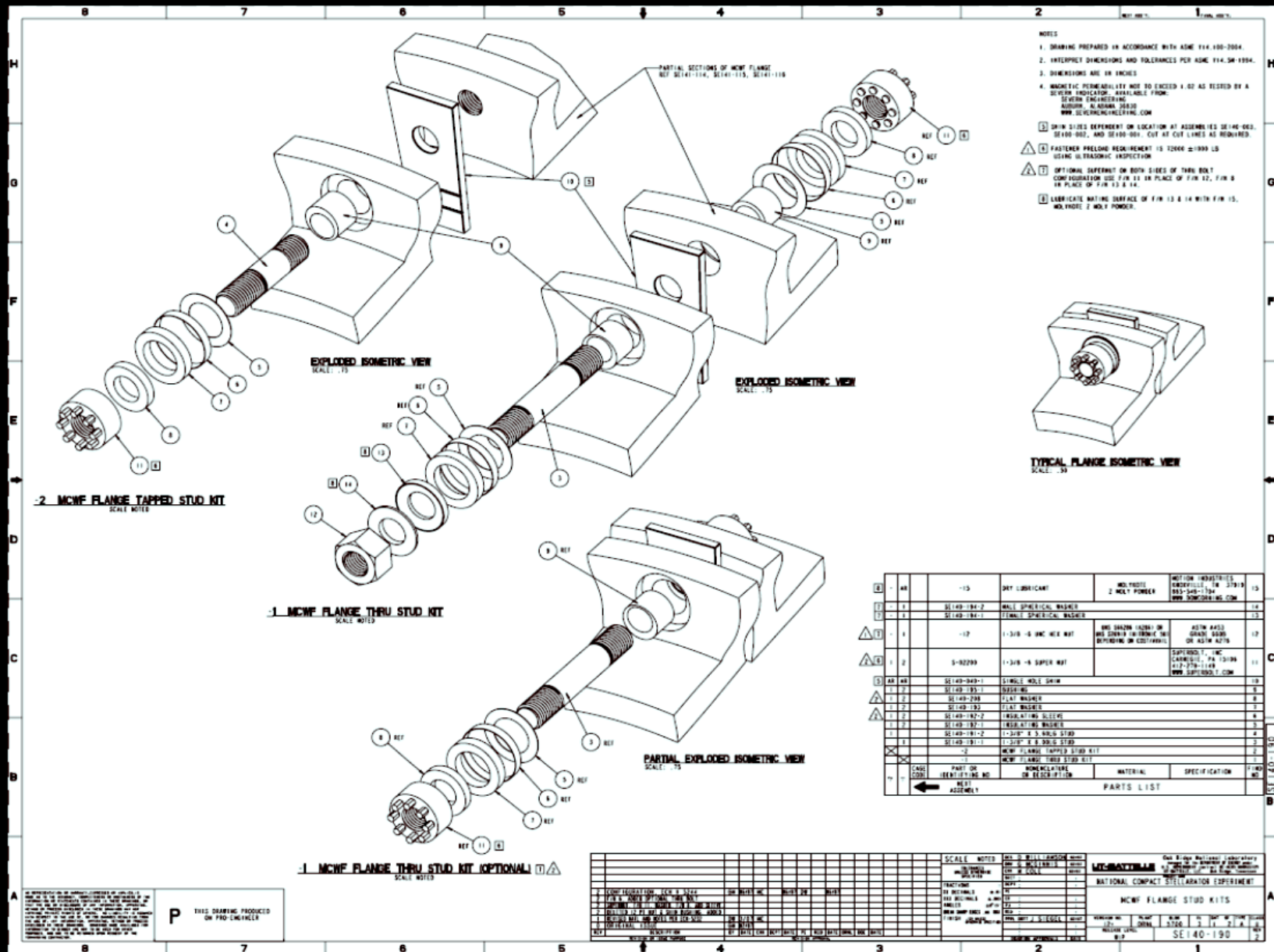
Field Period Station #2



Coil Interface: Bolted & Welded

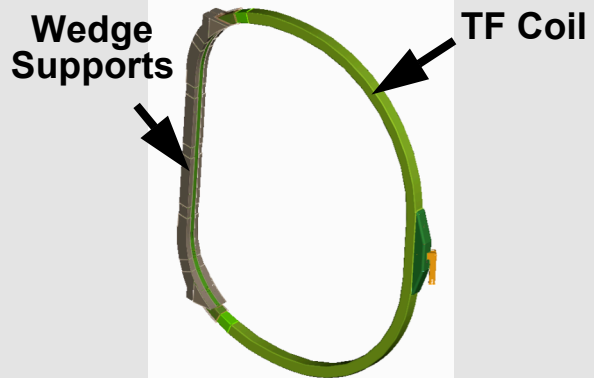
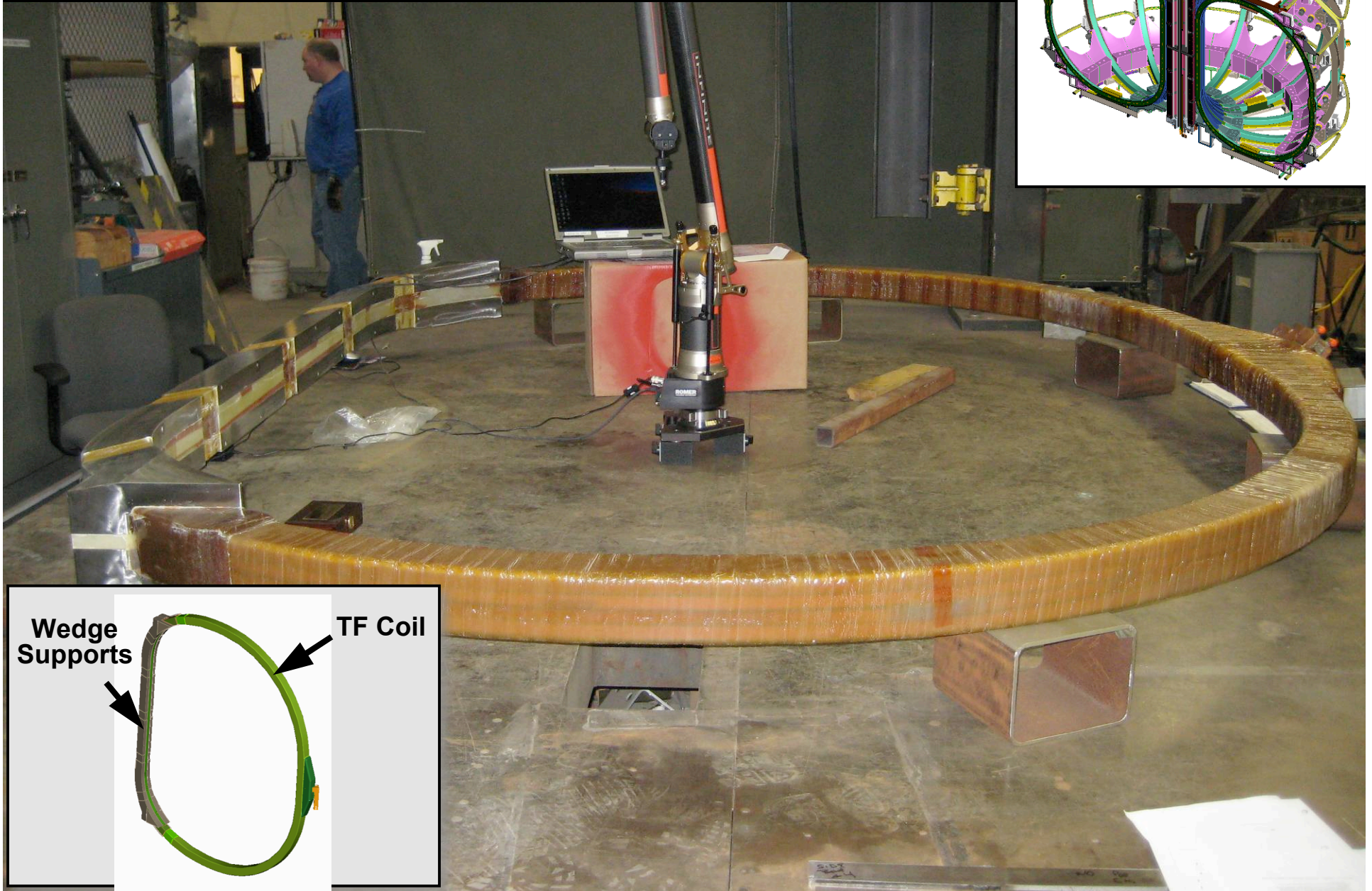
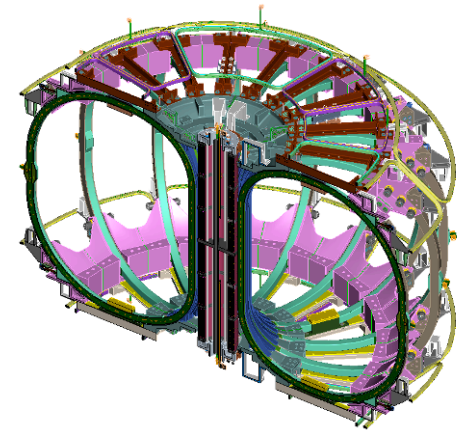


Bolted Interface



Toroidal Field (TF) Coil

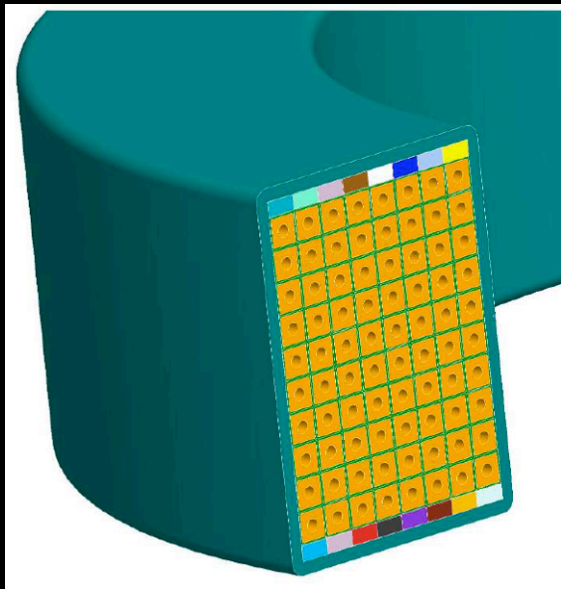
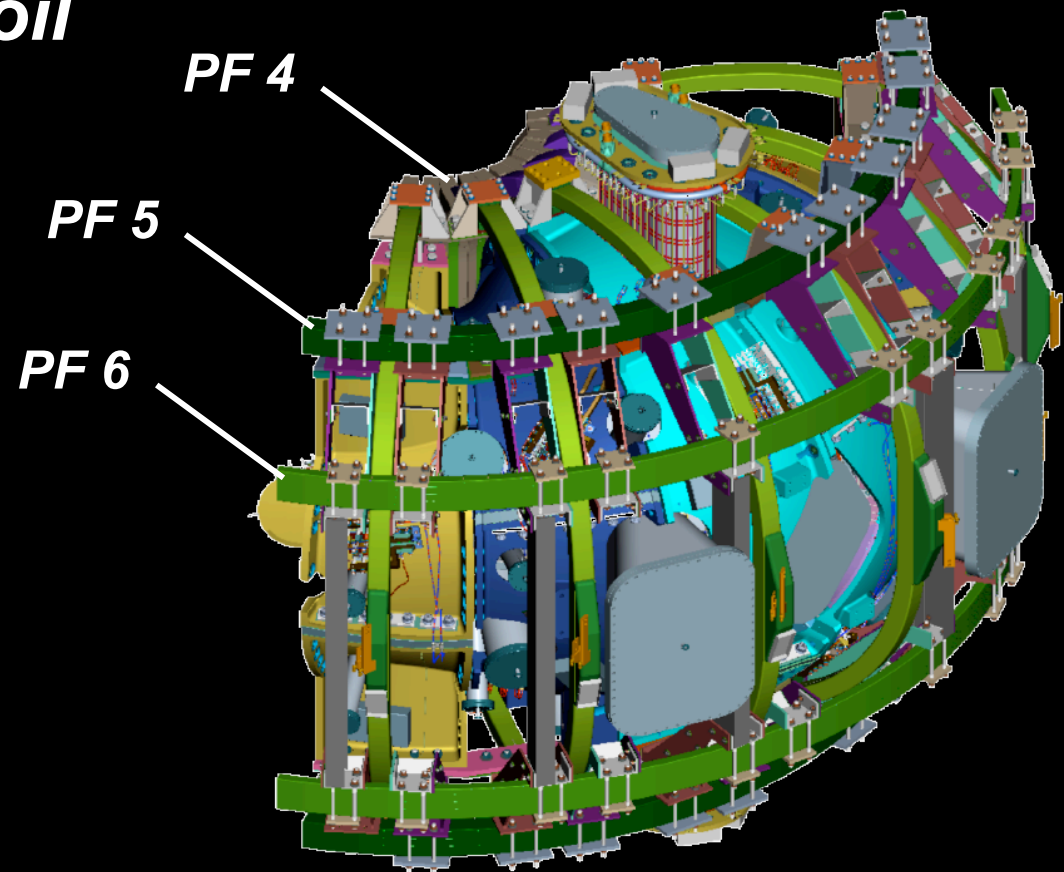
QTY = 18



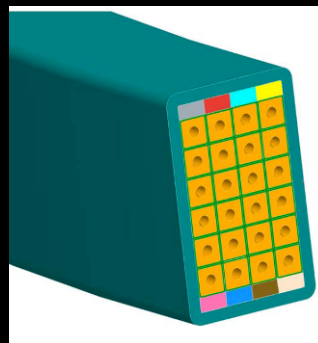
Poloidal Field (PF) Coil

QTY = 6

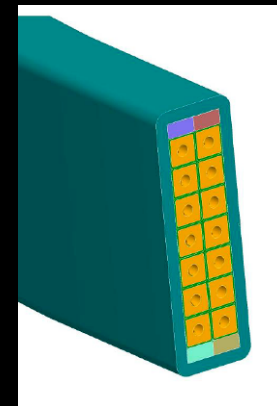
(2 each: upper & lower)



PF 4



PF 5



PF 6