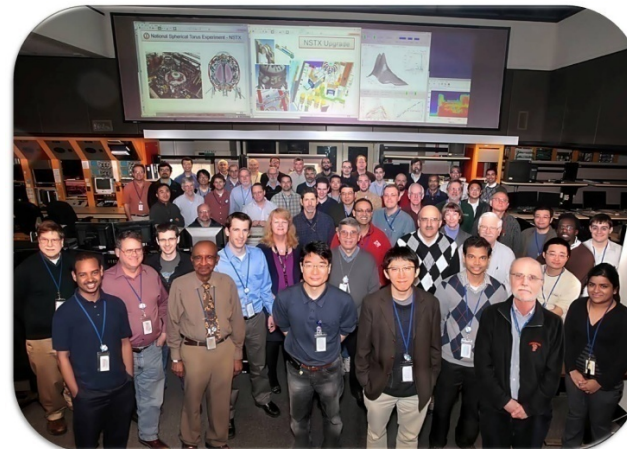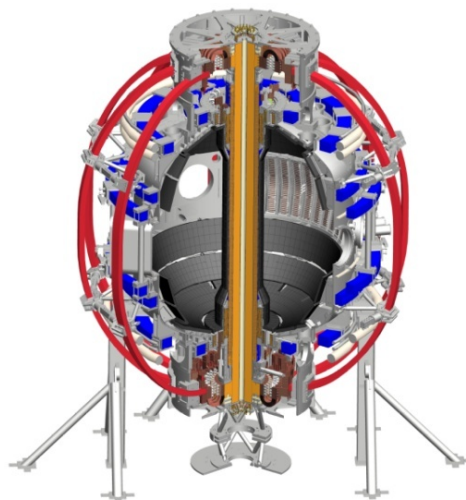# Sustainment and Control Chapter Status

Stefan Gerhardt

12/5/12

Coll of Wm & Mary
Columbia U
CompX
General Atomics
FIU
INL
Johns Hopkins U
LANL
LLNL
Lodestar
MIT
Lehigh U
Nova Photonics
ORNL
PPPL
Princeton U
Purdue U
SNL
Think Tank, Inc.
UC Davis
UC Irvine
UCLA
UCSD
U Colorado
U Illinois
U Maryland
U Rochester
U Tennessee
U Tulsa
U Washington
U Wisconsin
X Science LLC

Culham Sci Ctr
York U
Chubu U
Fukui U
Hiroshima U
Hyogo U
Kyoto U
Kyushu U
Kyushu Tokai U
NIFS
Niigata U
U Tokyo
JAEA
Inst for Nucl Res, Kiev
Ioffe Inst
TRINITI
Chonbuk Natl U
NFRI
KAIST
POSTECH
Seoul Natl U
ASIPP
CIEMAT
FOM Inst DIFFER
ENEA, Frascati
CEA, Cadarache
IPP, Jülich
IPP, Garching
ASCR, Czech Rep

Overview

- Chapter is divided into 4 thrusts + introduction
  - Introduction is finished…is it the same scope as other chapters?
- Time-lines for individual research activities presently distributed throughout the chapter, and in *paragraph form*
  - Should these be replaced by bulleted lists?
  - Describe 5 years individual years, or "early", "middle", "late"?
- No sections for diagnostics or codes at the moment.
  - Is everybody else writing these?
  - Or are the large graphical timelines good enough?
- Have not yet made any reference to Molybdenum PFCs, but do mention the cryo-pump.
  - What is the metal PFC plan?

9.2.1: Scenario Development

- ## 9.2.1.1: 100% non-inductive
  - Done

- ## 9.2.1.2: Long pulse partial inductive at high-current
  - Done
  - Needs to be checked carefully against BP and PMI plans.

- ## 9.2.1.3: RF Heating in Advanced Scenarios
  - Mostly just points to HHFW chapter.
  - Done, w/ corrections from Gary.

- ## 9.2.1.4: Coupling to 100% non-inductive ramp-up
  - Mostly just points at SFSU chapter
  - Done.

9.2.2: Axisymmetric Control
Needs the Most Work

- 9.2.2.1: Boundary, Shape, & Position control
  - 9.2.2.2.1: Boundary control
    - Not started, wait for E. Kolemen. SPG could do it himself if necessary.
  - 9.2.2.2: Vertical position control
    - Basic part in nearly done, would like Egemen to add additional material.
- 9.2.2.2: Divertor control
  - 9.2.2.2.1: Snowflake divertor control
    - Nearly done, but could use an improvement in the dual X-point tracking description (Kolemen).
  - 9.2.2.2.2: Radiative divertor control
    - Done, but needs checking for consistency with BP
- 9.2.2.3: Profile control
  - Needs descriptions of Lehigh and PU collaborations (Kolemen, Gates)
  - 9.2.2.3.1: q-profile control
    - Done, except for paragraph on model-based controller (Kolemen)
  - 9.2.2.3.2: Rotation profile control
    - Done, except for paragraph on model-based controller (Kolemen)
    - Need some agreement on the n=2 & n=3 braking profiles (Sabbagh, Park, Kim)
    - Needs checking for consistency with MS Thrust 2 (Gerhardt, Park, Sabbagh)
- 9.2.2.4: Deuterium Inventory Control
  - Done, but should be check for overlap w/BP chapter (Gerhardt, Soukhanovskii)

9.2.3: Automated Rampdown

- ## 9.2.3.1: Realtime disruption detection
  - Done
  - One section needs a proof-reading and correction by S. Sabbagh

- ## 9.2.3.2: Rampdown automation
  - Done

  - Interesting aside:
    - As written, this focuses solely on inductive rampdown
    - We have a non-inductive start-up program, should we have a non-inductive rampdown program.
      - Disruptions, deliberate or otherwise, don't count.

9.2.4: Scenario Physics for Next Step STs

- ## 9.2.4.1: Optimal profiles for high-β_N steady state
  - Done.
  - Need to check against MS and T&T plans
- ## 9.2.4.2: Range of validity for classical NBCD calculations
  - Done
  - Need to check against EP plans
- ## 9.2.4.3: Optimization of Pedestal Control
  - Not sure what to say here, beyond that already included in the long-pulse non-inductive sub-section.
  - Would like to delete this section
- ## 9.2.4.4: Exploration and Validation of Integrated Models for FNSF…
  - Done
  - Need to check against T&T plans.