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Office of Science

NSTX

NSTX Program Update:

Collaboration status
5 year plan writing schedule
Topical Science Groups & Research Forum
5yr plan prioritization discussion

College W&M
Colorado Sch Mines
Columbia U
Comp-X
General Atomics
INEL
Johns Hopkins U
LANL
LLNL
Lodestar
MIT
Nova Photonics
New York U
Old Dominion U
ORNL
PPPL
PSI
Princeton U
SNL
Think Tank, Inc.
UC Davis
UC Irvine
UCLA
UCSD
U Colorado
U Maryland
U Rochester
U Washington
U Wisconsin

J. Menard, PPPL

November 2, 2007
NSTX Team Meeting
Princeton Plasma Physics Laboratory

Culham Sci Ctr
U St. Andrews
York U
Chubu U
Fukui U
Hiroshima U
Hyogo U
Kyoto U
Kyushu U
Kyushu Tokai U
NIFS
Niigata U
U Tokyo
JAERI
Hebrew U
Ioffe Inst
RRC Kurchatov Inst
TRINITI
KBSI
KAIST
ENEA, Frascati
CEA, Cadarache
IPP, Jülich
IPP, Garching
ASCR, Czech Rep
U Quebec

NSTX Collaboration Opportunities for 2008-2010

- Program/project reviewed and approved 24 records of discussion
- 22 NSTX collaboration proposals received by DOE
  - DOE expects 1/3-1/2 of these to be funded
- DOE expects initial review comments back in December
- Expect to know who most awardees are by time of NSTX PAC

Meeting and 5 year plan completion schedule

We are here

• **September 17-19**	**Tokamak Planning Workshop at MIT**
• **Oct. – Dec. 2007**	**Improve the draft plan** **Prioritize upgrades, finalize the draft text**
• **November 12-16**	**APS DPP meeting**
• **November 27-29**	**NSTX Research Forum**
• **January 22-24, 2008**	**NSTX PAC – Review of draft plan**
• **February 2008**	**Final draft plan ready for review by the team**
• **April 1, 2008**	**Final plan (document) ready**
• **3 wks before review**	**Draft presentation material ready**
• **2 wks before review**	**Dry run of the presentation**
• **1 wk before review**	**Final presentation material ready**
• **~ May 2008 (TBD)**	**New 5 Year Plan Review meeting**

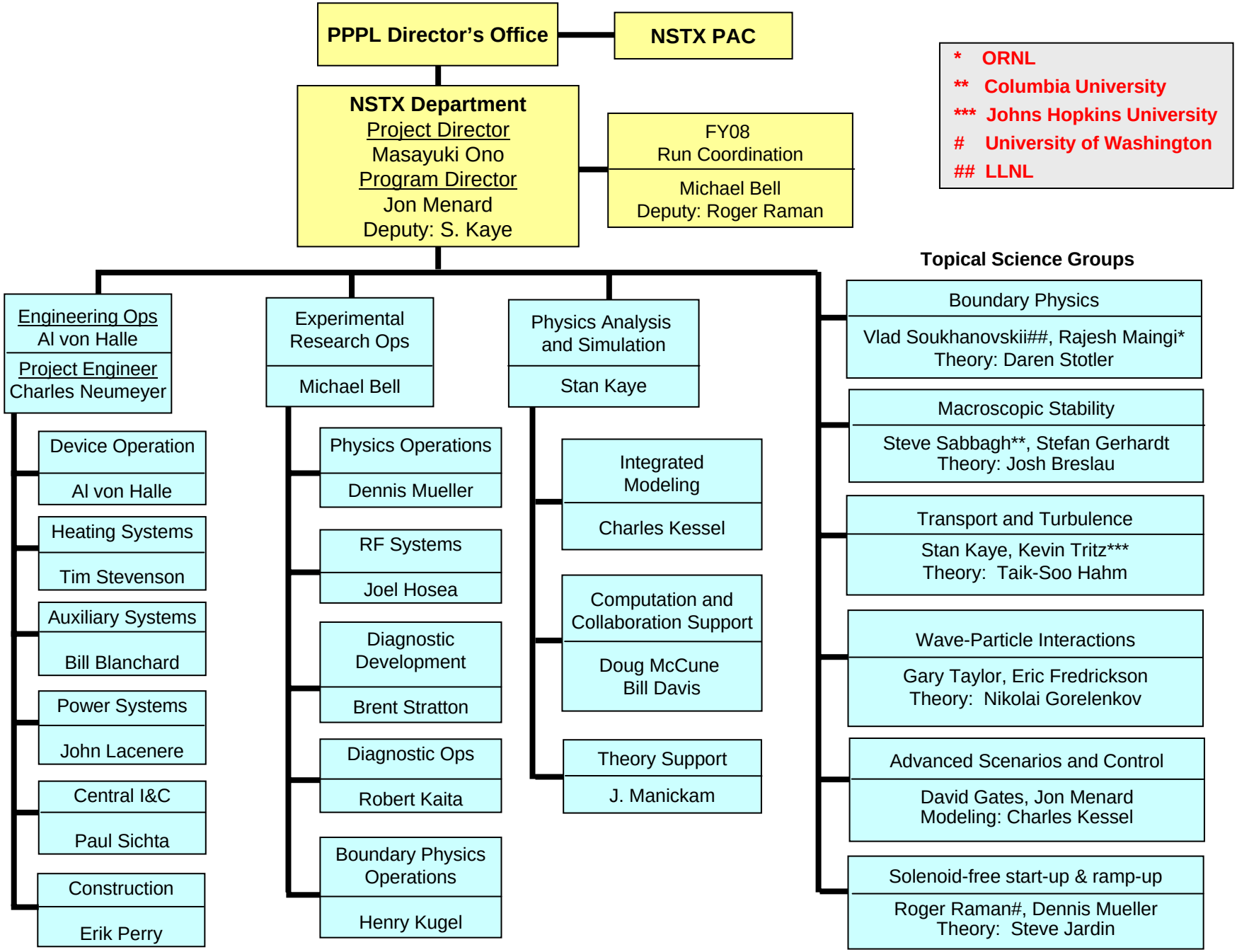
Five Year Plan Write-up Structure and Status

- Modification: "Fusion development" text moved to beginning of document
  - Useful to motivate ST, NSTX, subsequent chapters up-front
  - Martin unavailable to lead writing of this chapter

		Lead	Status
Chapter 1	NSTX overview and role in fusion development	M. Ono J. Menard	Outline
Chapter 2	MHD	S. Sabbagh	Text
Chapter 3	T&T	S. Kaye	Text
Chapter 4	Waves & Particles	G. Taylor	Text
Chapter 5	Boundary	R. Maingi	Outline
Chapter 6	Integration	J. Menard	Outline + SFSU text
Chapter 7	Facility/Diagnostics/Control	M. Bell	Outline + intro text
Appendix	NSTX Collaboration Plan	M. Peng	Gathering collaborator info

5 year plan write-up schedule

- Interim DRAFT TEXT DUE November 2, 2007
  - Program/Project then edit for content/schedule consistency
- FINAL DRAFT TEXT DUE December 7, 2007
  - Correct chapter numbers, figures, references, etc.
  - Program/Project then edit for format consistency – finish by December 21
- PAC preparation, dry runs to be held in early January
- APS, Research Forum, PAC are all coming soon!
  - Please keep writing
- Fold in prioritization guidance, increment assumptions during Oct.
- For those who have contributed text – thanks
- For those who haven't written text…
  - Intro material can should be written NOW
  - Plan text can be based on workshop presentations + prioritization


PPPL Director's Office
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NSTX Department
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Program Director
Jon Menard
Deputy: S. Kaye
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Deputy: Roger Raman
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** Columbia University
*** Johns Hopkins University
# University of Washington
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Project Engineer
Charles Neumeyer
Device Operation
Al von Halle
Heating Systems
Tim Stevenson
Auxiliary Systems
Bill Blanchard
Power Systems
John Lacenere
Central I&C
Paul Sichta
Construction
Erik Perry
Experimental Research Ops
Michael Bell
Physics Operations
Dennis Mueller
RF Systems
Joel Hosea
Diagnostic Development
Brent Stratton
Diagnostic Ops
Robert Kaita
Boundary Physics Operations
Henry Kugel
Physics Analysis and Simulation
Stan Kaye
Integrated Modeling
Charles Kessel
Computation and Collaboration Support
Doug McCune
Bill Davis
Theory Support
J. Manickam
Boundary Physics
Vlad Soukhanovskii##, Rajesh Maingi*
Theory: Daren Stotler
Macroscopic Stability
Steve Sabbagh**, Stefan Gerhardt
Theory: Josh Breslau
Transport and Turbulence
Stan Kaye, Kevin Tritz***
Theory: Taik-Soo Hahm
Wave-Particle Interactions
Gary Taylor, Eric Fredrickson
Theory: Nikolai Gorelenkov
Advanced Scenarios and Control
David Gates, Jon Menard
Modeling: Charles Kessel
Solenoid-free start-up & ramp-up
Roger Raman#, Dennis Mueller
Theory: Steve Jardin

Guidelines for NSTX Topical Science Groups (TSG)

- TSG Goal: Sustain scientific program focus beyond annual milestones
  - Extend tenure for leadership team to 2 years (flexible, renewable)
  - Share responsibilities, achieve consensus on priorities from all involved
- One TSG leader + 1 deputy, typically 2 experimentalists + theory/modeling
  - Make theory/experimental coupling a high priority for research

TSG leader responsibilities - through group discussion/consensus:

- Be inclusive – invite NSTX team to topical group meetings
- Determine & address highest priority scientific issues within topical area
  - Organize Research Forum guided by (but not limited to) these priorities
- Define draft scientific/performance milestones - utilize expertise of TSGs
  - Organize, propose, and execute experiments to achieve milestones
- Define facility/theory resources required to achieve research goals
- Aid dissemination of results (help Physics Analysis & Simulation Division):
  - Journal publications, seminars, colloquia, invited talks, conferences, ITPA, BPO
- Provide 1 page (maximum) bulletized ppt summary of group scientific progress at NSTX monthly team meeting to promote discussion
- Report to Program/Project directors

NSTX Macroscopic Stability TSG – Update 11/2/07

- 5 Year Plan
  - Research plans for RWM stabilization/control, field-induced viscosity, code development, NCC physics design (leading up to NCC installation) more clearly defined and detailed (SAS)
  - MHD research represented in 2 talks at Oct. ITPA-MHD meeting in Garching
- 2008 Run preparation
  - NSTX Forum
    - Macroscopic Stability TSG run logistics (physics topics, milestones, priorities etc.) defined and posted on web; final updates still being made
    - Discussion with researchers at several facilities (DIII-D, MAST, JET) to start preparations for joint experiments (SAS)
  - Diagnostics
    - Halo Current Detectors installed in Lower Outboard Divertor (SG)
    - Prototype "Thin-Film" Mirnov coil installed (EF/RK)
    - In-vessel magnetic sensors operational; one Mirnov coil fixed
- Physics
  - Continued analysis of TM data; island model that allows prediction of both Mirnov and USXR signals (SG)

Solenoid-free plasma startup

- Ideas from all aspects of solenoid-free startup and sustainment to be discussed during Research Forum
  - Revised NSTX ET structure allows proposed ideas that did not receive run time to be tracked for the following year
  - Related E-Mail to be sent to NSTX Team (week of Nov 5)

- Demonstrate ohmic flux savings using CHI
- Increase plasma pulse-lengths using CHI startup
- Relaxation current drive
- Plans for outer PF startup
- Plans for Plasma Gun startup
- Synergism between different startup methods
- Theoretical support

Research Forum and Run Preparation

- Dates: November 27-29 – Tuesday morning through mid-day Thursday
- Michael Bell will organize, with help from Stan
- **We have new Research Forum web page – thanks Stan!**
  - Identified 2 high priority goals for each TSG to help guide submissions
  - All ideas welcome

2008 NSTX Research Forum

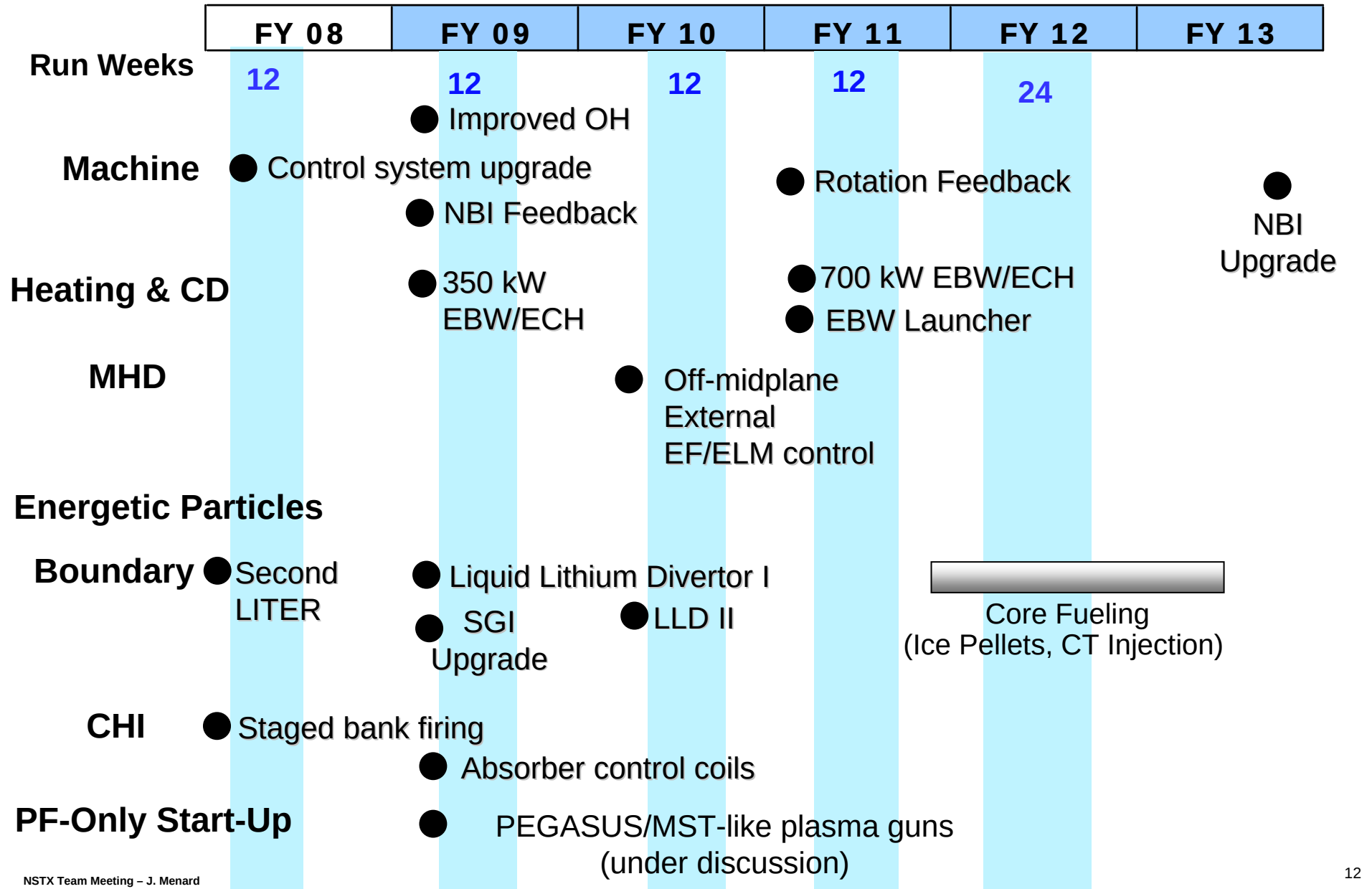
5 year plan prioritization proposal and issues

- Guidance from DOE is to consider base plan, and 10-15% increment case
  - Expect flat budgets (COLA) for base program during ITER spending ramp

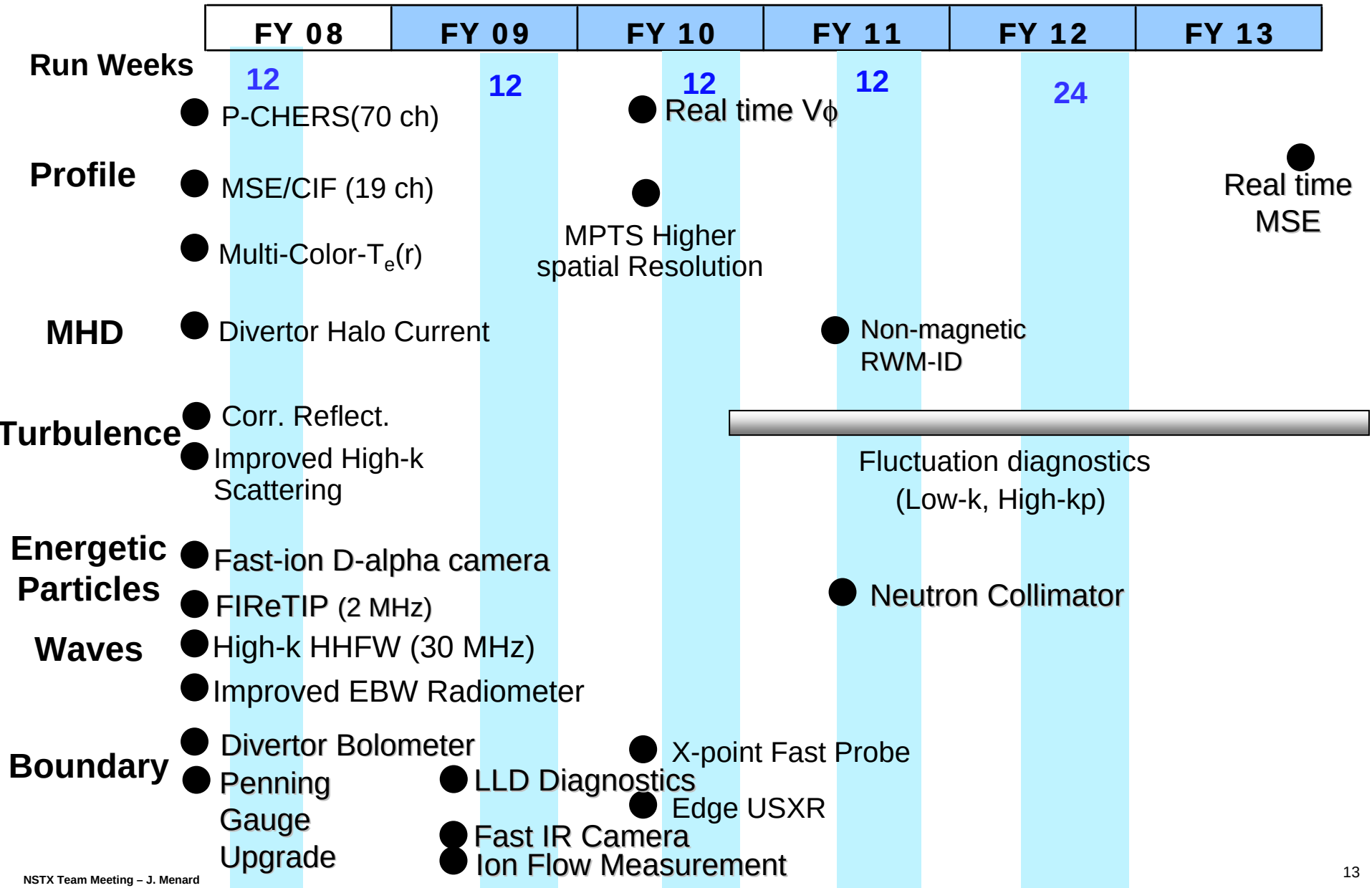
- Base case impact:
  - Most major facility and diagnostic upgrades planned in FY12 and 13 for 25% increment case presented at 3 tokamak workshop **are eliminated**
  - 2nd NBI would come late, if at all
  - Internal NCC coils not affordable
    - Consider external coils – complements DIII-D/MAST/ASDEX internal coils
  - No TF/OH sub-cooling
  - No HHFW upgrade
  - No divertor MPTS or 2D divertor spectroscopy

- 10% increment case
  - 2nd NBI probably possible – **requires estimated 1-1.25 year outage period**
    - Would occur FY10-FY11
  - TF/OH Sub-cooling, NCC coils, HHFW upgrade, long-pulse divertor possible
    - Most would occur in out-years FY12-13

NSTX 5 Year Facility Upgrade Plan – Base Case



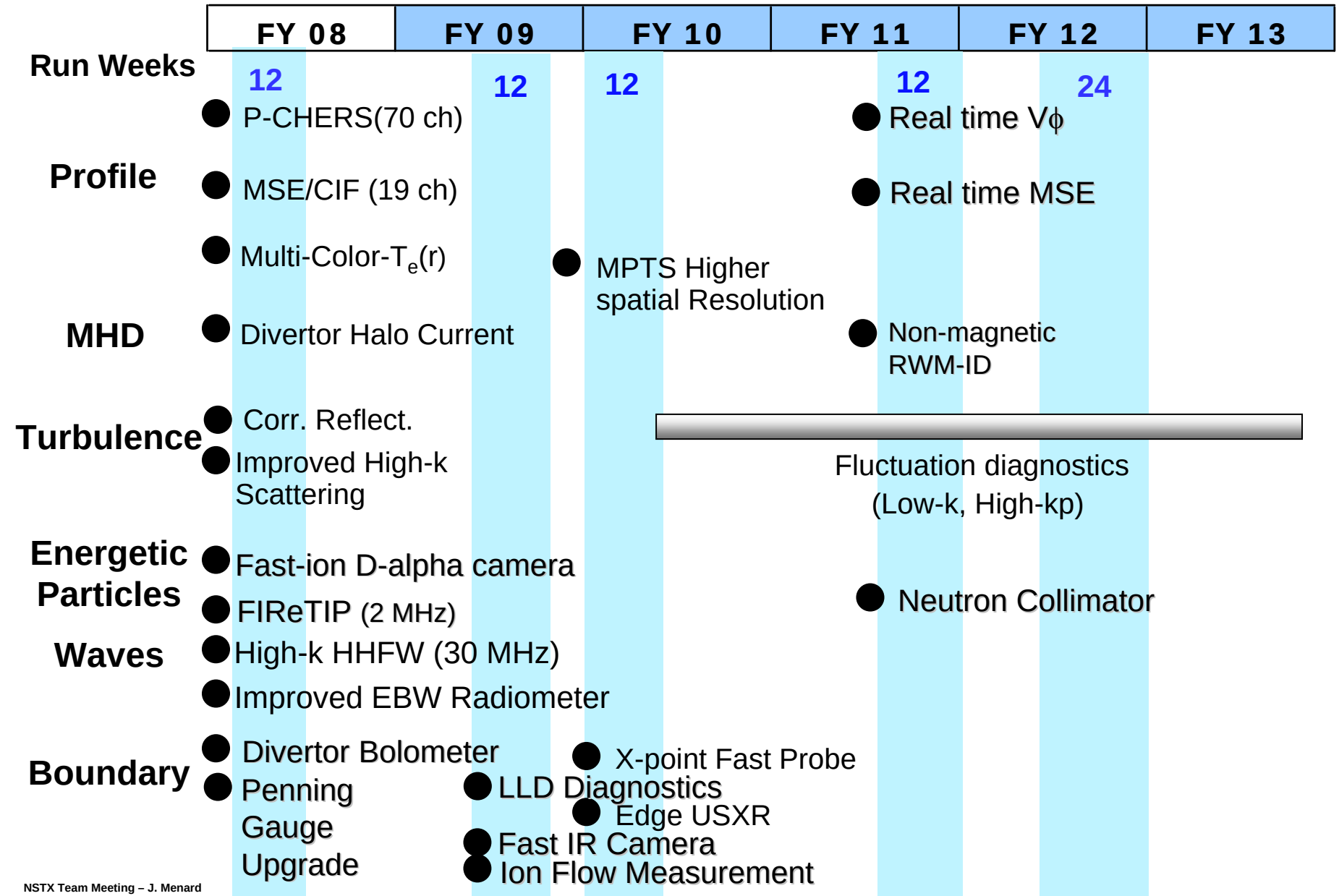
NSTX 5 Year Diagnostic Upgrade Plan – Base Case



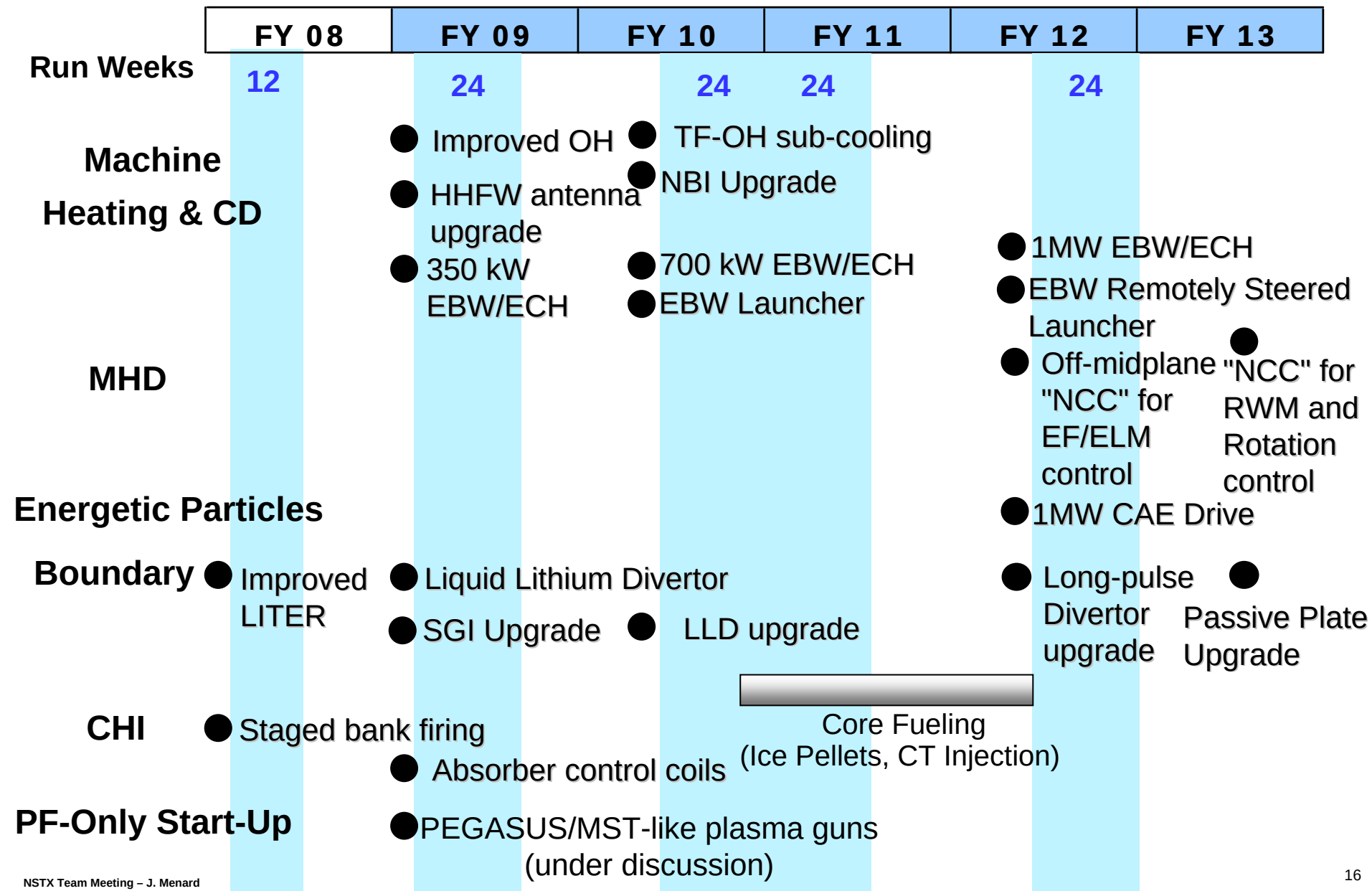
NSTX 5 Year Facility Upgrade Plan – 10% increment

	FY 08	FY 09	FY 10	FY 11	FY 12	FY 13
Run Weeks	12	12	12	12	24	
Machine		Improved OH			TF-OH sub-cooling	
Heating & CD				NBI Upgrade		
				HHFW Upgrade		
		350 kW EBW/ECH		700 kW EBW/ECH		
				EBW Launcher		
MHD						Off-midplane "NCC" for EF/ELM control
Energetic Particles						
Boundary	Improved LITER	Liquid Lithium Divertor (tile?)				Long-pulse Divertor
		SGI Upgrade		LLD Upgrade (mesh?)		
					Core Fueling (Ice Pellets, CT Injection)	
CHI	Staged bank firing					
		Absorber control coils				
PF-Only Start-Up		PEGASUS/MST-like plasma guns (under discussion)				

NSTX 5 Year Diagnostic Upgrade Plan – 10% Increment



NSTX 5 Year Facility Upgrade Plan – 25% increment



NSTX 5 Year Diagnostic Upgrade Plan – 25% increment