

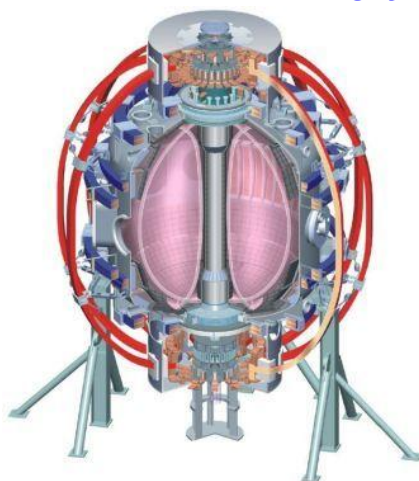
Introduction and Motivation of the Meeting

Masa Ono

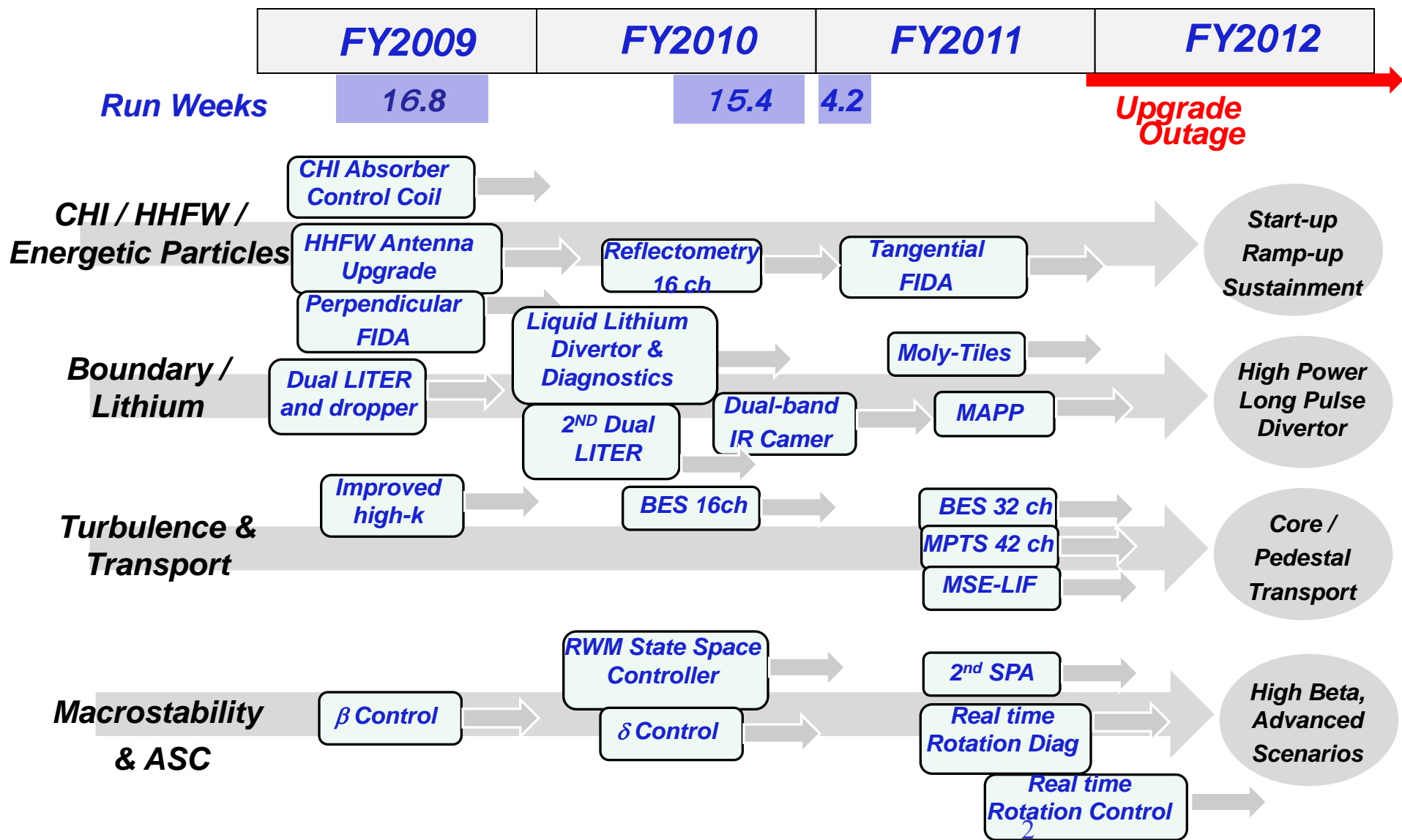
**NSTX-U Facility Enhancement
Brainstorm Meeting
February 7 - 8, 2012**

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

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
JAEA
Hebrew U
Ioffe Inst
RRC Kurchatov Inst
TRINITI
KBSI
KAIST
POSTECH
ASIPP
ENEA, Frascati
CEA, Cadarache
IPP, Jülich
IPP, Garching
ASCR, Czech Rep
U Quebec



Significant Facility Enhancements Implemented To Support NSTX Mission Elements and Upgrades

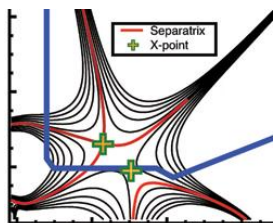


NSTX Upgrade + follow-on upgrades will enable access to broad range of new ST regimes

2009 2010 2011 2012 2013 2014 2015 2016 2017 2018

1 MA Plasma

- HHFW Upgrade
- LLD
- Moly-tile
- CHI Control Coils



“Snowflake”

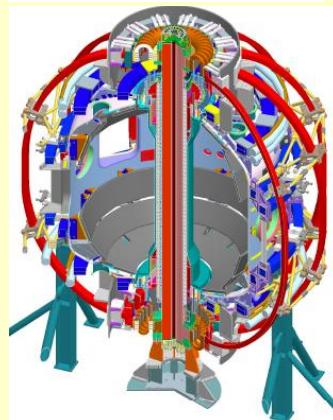


Lithium

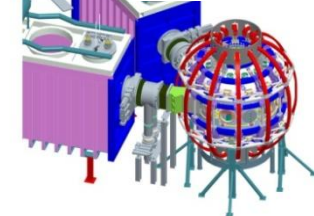
Upgrade Outage

2nd NBI

New Center-stack



2nd NBI



1.5 → 2 MA Plasma

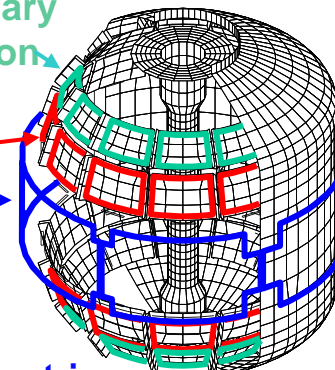
- 1 - 2 MW ECH/EBW
- Long-pulse Divertor
- 0.5 MA CHI
- 0.5 MA Plasma Gun
- 1 MA CHI / Plasma Gun
- NCC Upgrade

Secondary PP option

Primary PP option

Existing coils

Non-axisymmetric Control Coils (NCC)

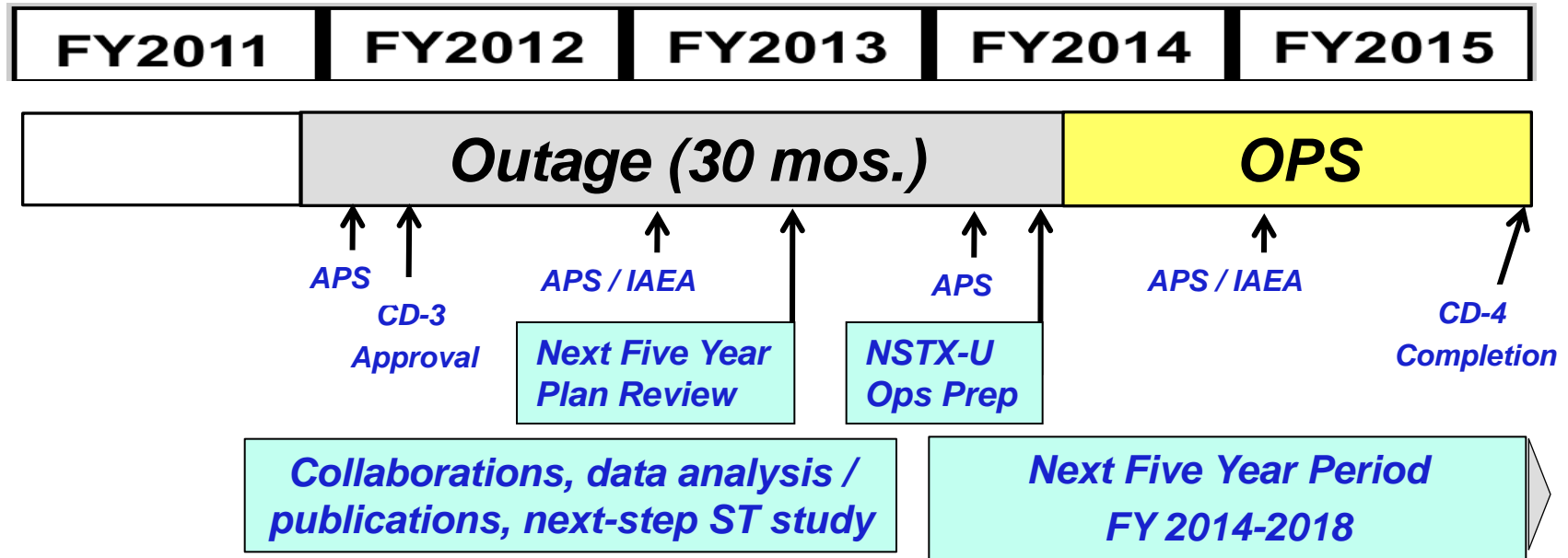


NSTX Upgrade Research Goals

- Low collisionality plasma regimes
- 100% non-inductive operation
- Long-pulse, high power divertor
- Advanced high- β scenarios

NSTX-U Outage Near Term Schedule

A rare opportunity to think broadly and innovatively!



NSTX resources are highly constrained in the near term but the need for innovation is greater than ever!

- NSTX Upgrade Project has the highest priority
- Other enhancements needed for NSTX-U Operation is next priority
 - e.g., motor generator repair, rectifier fault detector, firing generator
- Implement high priority enhancements as resources become available after completion of NSTX Upgrade Project

Facility Enhancements Brainstorming Meeting

Let us explore all innovative possibilities!

Brainstorm Facility Enhancement Possibilities:

- **Support NSTX-U operation (FY 2012 - 2014)**
- **Enhance NSTX-U operation (FY 2014 – 2016)**
- **Help achieve NSTX-U mission / goals (FY 2014 – 2018)**

Looking for new ideas to achieve NSTX-U mission elements:

- **Save \$ to make best use of limited resources**
- **Significant improvement to present approach**
- **Enable new capability**
- **Enhance possibility of fusion break-through!**
- **Enhance external support for NSTX-U (community, DOE..)**

We have a full program so please adhere to allotted time!

Agenda for NSTX-U Facility Enhancement Brainstorming Meeting Tuesday, February 7 & Wednesday, February 8, 2012

Tuesday, February 7, 2012 – B318, PPPI		
Time	Topic	Speaker
1:00 PM	Introduction and Motivation of the Meeting	M. Ono
1:20	Programmatic Vision for NSTX-U	J. Menard
1:40	NSTX Upgrade Project Overview	R. Strykowski
	Non-Upgrade Scopes	
2:00	Power Supply Upgrades	R. Ramakrishnan
2:10	Basic Magnetics for NSTX-U Operations	S. Gerhardt
2:20	Improved Power Handling at CHI Gap	S. Gerhardt
2:30	Hardware Upgrades Related to PCS	S. Gerhardt
2:40	HHFW Antenna Enhancement	J. Hosea
2:50	Energetic Particle	
3:00	*AE antenna	E. Fredrickson
	Particle Control / Divertor	
3:10	Upper Divertor Molybdenum Tiles	H. Kugel
3:20	Active Cooling	M. Jaworski
3:30	Upward facing LiTER	R. Maingi
3:40	Divertor Cryopump and Baffle	R. Maingi
3:50	PCS feedback on divertor temperature and associated diagnostics	R. Maingi
4:00	Glow Discharge Cleaning system upgrade	V.Soukhanovskii
4:10	Divertor gas injector upgrade	V.Soukhanovskii
4:20	Supersonic Gas injector Upgrade	V.Soukhanovskii
4:30	Molecular cluster injector	R. Majeski
4:40	CT fueling	R. Raman
4:50	Replaceable divertor module	S. Zweben
5:00	Fast liquid metal loop based on RDM	H. Ji
5:10	HFS gas injection shut-off valve	C. Skinner
	Mini Li evaporator concept	C. Skinner
	3-D Fields	
5:20	Off-midplane coils for improved poloidal spectrum of magnetic perturbations	R. Maingi

Wednesday, February 8 – B318, PPPL		
Time	Topic	Speaker
	Lithium /Boundary Related Enhancements	
1:00 PM	Near Term Lithium Options	H. Kugel
1:10	LTX-style crucible evaporators	R. Majeski
1:20	FLiLi	L. Zakharov
1:30	Li injectors for real-time Li fueling	L. Roquemore
1:40	Masking of LITER evaporators to preferentially deposit Li in specified areas	L. Roquemore
1:50	Dual band thermography in NSTX-U	J-W. Ahn
2:00	Pellet injector for ELM pacing and fueling	T.K. Gray
2:10	The fast liquid lithium shower	G. Wurden
2:20	Li CPS PFCs	R. Goldston
2:30	Monitor SOLC for machine protection	H. Takahashi
2:35	Compensate for SOLC-generated error field in machine control and equilibrium reconstruction	H. Takahashi
2:40	Drive SOLC externally for machine performance extension	H. Takahashi
2:50	Surface studies to support particle control	C. Skinner
3:00	Improved tile-to-tile alignment of divertor plasma facing components	F. Scotti
3:10	Long pulse divertor biasing	D. Battaglia
	3-D Fields	
3:20	Driving EHOs	R. Goldston
3:30	Distant 3-D field Coils	S. Gerhardt
3:40	Non-axisymmetric Control Coil Upgrade and other ideas by the Columbia U. Group	S. Sabbagh
3:50	Diagnostics supporting advanced global mode stabilization studies	S. Sabbagh
	Start-Up / Current Drive	
4:00	CHI Cap. bank upgrade to higher voltage and bank energy	R. Raman
4:10	Improvements to CHI	R. Raman
4:20	NB Upgrade For Increased Pulse Length at High Power	S. Gerhardt
4:30	Plasma gun startup	D. Battaglia
4:40	Point-Source Helicity Injection Startup in NSTX-U	R. Fonck
4:50	ECH/EBW Svstem	J. Hosea
	Other Diagnostic Ideas	
5:00	MPTS long term plans	B.P. LeBlanc
5:05	Facility modifications for Divertor Thomson Scattering diagnostic	V.Soukhanovskii
5:10	Monitor NB ions species mix	M. Podesta
5:15	Improved Magnetics IN NSTX-U	R. Raman