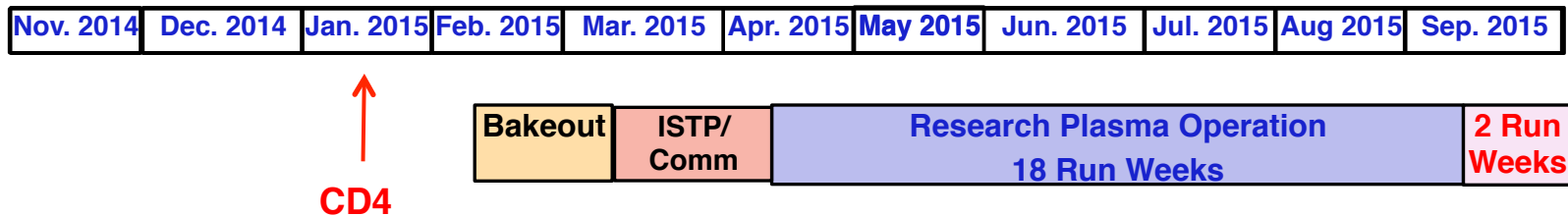


# PAC Report Discussion - NSTX Upgrade Project Status, Facility/Diagnostic Progress and Plans

- While the schedule is tight, there is good probability that CD-4 will be achieved by Jan 2015, and that a full 18 weeks of operation could be completed in FY 2015. **CD-4 date may slip but we need to be ready for research operation by March 2015!**

## Run Plan for FY 2015



- Particle control remains a critical issue in achieving low-collisionality, long-pulse discharges in NSTX-U. **Boronization system should be available by March 2015. LITERs should be available also. Upward flash Li evaporator and Li granular injector will be available in FY 2015. Cryo-system design will start in FY 2015 pending adequate funding.**

Black – from PAC report, Red – MO Response

# PAC Report Discussion - NSTX Upgrade Project Status, Facility/Diagnostic Progress and Plans II

- The PAC is, however, concerned at the early stage of development of (ECH/EBW) 28 GHz gyrotron coupled with its importance for the entire current ramp scenario. We urge that this development be expedited as much as possible, as it appears to set the critical path for a full current ramp demonstration. The NI start-up is critical for the NSTX-U program so identification of a gyrotron to purchase or borrow is paramount. The PAC suggests that borrowing a short pulse,  $\sim 0.5$  s, gyrotron would allow NSTX-U to proceed with the NI start-up and may be possible through collaboration. **We will certainly attempt to implement the gyrotron as soon as possible. Will explore various possibilities – short-pulse vs. long-pulse.  $\sim 0.5$  is not a short pulse option. No significant saving for 0.5 s tube compared to 5 s tube. Also a gyrotron itself is a relatively minor part of the expense.**

Black – from PAC report, Red – MO Response

# PAC Report Discussion - NSTX Upgrade Project Status, Facility/Diagnostic Progress and Plans III

- The present plan should provide useful data on the mechanical stability of the new tiles but limited and perhaps confusing information on plasma-material interactions owing to the small surface area available. The initial coverage (presently only one row in outboard lower divertor in FY16) should be reconsidered before installation in FY16. The detailed shaping of W-lamellae should also be considered. Different options to consider include: 1) expand the poloidal coverage to more than one toroidal row in FY16 and 2) add toroidally separated high-Z tiles at various wall locations to better validate the lamellae design in a variety of loading condition (i.e., smallscale melting has tended to be the most limiting factor in W PFC deployment). **Should we increase the scope of the initial high-Z tile installation from one row? This is certainly a near-term issue since we have to finalize the design this calendar year – M. Jaworski...**

Black – from PAC report, Red – MO Response

# PAC Report Discussion - NSTX Upgrade Project Status, Facility/Diagnostic Progress and Plans IV

- The proposed diagnostic set is appropriate to both support the NSTXU overall mission and advance the edge physics in the first few years of operation. The team is also contemplating more aggressive diagnostic deployment in the long term. The development and installation of divertor Thomson scattering would be a great addition to the diagnostic battery, and one that seems possible with the rather open divertor geometry of NSTX-U. The set of PMI diagnostic tools has been improved, particularly with MAPPS. Continued deployment and improvement to PMI diagnosis should be considered. **This is certainly the area we have been putting high priority. The MAPP system should be available . We certainly need to look for further improvements in divertor plasma/radiation characterization diagnostics including x-rays, bolometer, Thomson, etc.**

Black – from PAC report, Red – MO Response

# PAC Report Discussion - NSTX Upgrade Project Status, Facility/Diagnostic Progress and Plans V

- The PAC would welcome more extensive use of high- $k$  scattering (for turbulence) and CHERS (for  $Er$ ,  $Ti$ ) in the pedestal if possible, or development of plans to improve their applicability. **We will consider the possibility of covering the pedestal region for high- $k$  and CHERS.** The installation of a laser blow-off system in FY16 will provide a key tool to help understand transport of high- $Z$  ions through the edge region. **We are proceeding to accept the laser blow-off system in FY 16.**
- The NCC would be a valuable tool for NSTX-U for EFC, rotation tailoring, pedestal/ELM control amongst others. The PAC agrees with the prioritization with respect to other enhancement projects (i.e., that the cryopump and the ECH are higher priority). The PAC supports the NSTX-U team in requesting incremental funding to realize the NCC as soon as possible, noting the risk that beginning work in 2017 for installation and realization after that may reduce the international impact. **We certainly welcome the incremental funding to implement the partial NCC in 2017.**

Black – from PAC report, Red – MO Response

# PAC Report Discussion - NSTX Upgrade Project Status, Facility/Diagnostic Progress and Plans VI

- While it is valuable to do more detailed comparisons of measured and theoretical Alfvén Eigenmode (AE) damping rates, the PAC suggests that higher priority should be placed on demonstrating and evaluating AE control tools over characterization of AE modes. **The 4 element AE antennas were installed. We will use it passively before going to an active system.**
- The present antenna performance appears to limit HHFW utilization significantly, e.g., the maximum voltage of 25 kV in vacuum is too low for reliable operation. **The HHFW antenna was tested with the new feeds to 45 kV at the test stand. It is possible the multiple antenna configuration may limit the voltage stand off. We will be also careful on excessive lithium applications to avoid lithium induced arcing... An improved grounding scheme was implemented to reduce the arcing.**

Black – from PAC report, Red – MO Response