



The PPPL Highlights for the week ending January 18, 2013, are as follows:

U.S. ITER FABRICATION (D. JOHNSON):

Neutronics analysis of equatorial port plug 3 including the diagnostics labyrinths for the motional stark effect diagnostic (US) and the charge exchange recombination spectroscopy system (RF) was presented, and indicated that significant changes to the conceptual designs for these systems are needed to meet the dose rate requirements in the interspace region, where hand's-on maintenance is expected.

A meeting to down-select concepts for the core imaging x-ray spectrometer considered design proposals by the US and the ITER Organization. Actions were assigned to both design teams, targeting a decision in mid-February.

The third in a series of three-way meetings (IO/RF-DA/US-DA) discussed an IO proposal for reconfiguring diagnostics in the port cell of equatorial port plug 11. Actions to resolve remaining clashes were assigned to the US and RF design teams.

A proposal to modify the design concept for the equatorial port diagnostic first wall panel attachment scheme was approved by the ITER Organization. The baseline design featured two bolted tabs and two keys. The new design eliminates the keys and features three bolted tabs per panel. One of the reasons driving this change was to mitigate the risk of arcing at the key locations.

Questions arising from last week's ITER HV Substation Transformer pre-proposal conference call were addressed and included in an RFP amendment.

A resource loading profile for PPPL Procurement Subcontract Administrator (SCA) support of ITER steady state electric network components was created and discussed with PPPL Head of Procurement Department.

NSTX (M. ONO):

M. Ono (PPPL) attended the First A3 Foresight Workshop in Spherical Torus at Seoul National University, Seoul, Korea, January 14-16. It is a workshop to coordinate the spherical tokamak research among three Asian nations, namely, China, Japan, and Korea. Ono gave an invited talk entitled "National Spherical Torus eXperiment -Upgrade Status and Plans". After the conference,

he collaborated with the CARFRE group at SNU on the VEST experiment and high harmonic fast wave heating and current drive feasibility study on the K-DEMO and KSTAR.

Tyler Abrams (Princeton University) made a successful presentation on January 15, of his doctoral thesis proposal entitled "The compositional and spatial evolution of thin mixed-material films in the NSTX-U divertor." Abrams intends to model the erosion and re-deposition of plasma-facing component (PFC) materials, and evaluate his results with measurements on the Magnum-PSI linear device. These studies will be relevant to PFCs planned for NSTX-U and future fusion devices.

NSTX Upgrade construction activities continued this week and are highlighted in the Engineering section below.

Preparations for plasma operations in the NSTX-U configuration also continued with the ongoing fabrication of the new field coil power conversion system firing generators. Additional technical resources have been added to this effort to be ready to have the first five firing generator chassis installed on FCPC rectifiers by the end of February.

ADVANCED PROJECTS (H. NEILSON):

Laboratory staff participated in the Wendelstein 7-X (W7-X) Commissioning Workshop including a remote presentation, "NSTX Operations Engineering," by A. von Halle. The workshop was organized by the Max Planck Institute for Plasma Physics (IPP) as a step in the transition from construction to operation for the W7-X project. The W7-X team presented preliminary plans for the commissioning phase, which is projected to start in May 2014 and conclude with First Plasma in October 2015. The PPPL team discussed the processes and procedures used in re-starting NSTX following a maintenance outage. Further information on PPPL's team organization and documentation used in commissioning were requested by the IPP team. Other presentations described commissioning experience and lessons learned on JET (UK), LHD (Japan), LHC (EU), Tore Supra (France), and KSTAR (Korea). The international sharing of facility operations information was unusual and valuable to IPP and all participants.

H. Neilson visited the Max Planck Institute for Plasma Physics in Greifswald, Germany, for discussions regarding the U.S.-IPP collaboration on W7-X. Topics discussed included plans for the commissioning of the U.S.-supplied trim coil system and key points of a planned U.S.-IPP research partnership for the operational phase. Neilson also attended the Commissioning Workshop on site.

THEORY (A. BHATTACHARJEE):

A. Bhattacharjee has been invited to serve on the Standing Committee on Solar and Space Physics (CSSP) of the National Academies for a term effective immediately and ending June 2014.

Recent PPPL kinetic studies of a collisionless plasma slab bounded by dielectric walls with strong secondary electron emission (SEE) predicted a strongly anisotropic, non-monotonic

electron velocity distribution function (EVDF), which is depleted in the loss cone. This EVDF reduces the electron wall losses compared to Maxwellian plasmas. Sheath oscillations occur due to coupling of the sheath potential and non-Maxwellian electron energy distribution function when there are intense electron beams emitted from the walls. In a bounded plasma where the electrons impacting the walls produce more than one secondary electron on average no classical Debye sheath or space-charge limited sheath exists. Ions are not drawn to the walls and electrons are not repelled. Hence, the plasma electrons travel unobstructed to the walls, producing extreme particle and energy fluxes. Strong dependence of the wall potential on SEE allows for active control of plasma properties by judicious choice of the wall material. These results are published by M. D. Campanell, A.V. Khrabrov and I. D. Kaganovich, in papers Phys. Rev. Lett. 108, 255001 (2012), Phys. Rev. Lett. 108, 235001 (2012), and Phys. Plasmas 19, 123513 (2012).

ENGINEERING AND INFRASTRUCTURE (M. WILLIAMS):

NSTX Upgrade (R. Strykowski, E. Perry, L. Dudek, T. Stevenson):

Construction: The welding on the outside of the JK cap for NB2 continues. The in-vessel fit-up of the neutral beam armor went well. The upgrades to the aluminum castings of the TF outer legs have been completed for all of the lower castings. The electricians are starting the re-installation of cable trays in the NSTX Test Cell.

Center Stack: The quadrant mold cover fabrication is proceeding nicely in the RESA building and CS winding area. The work has been taking longer than originally expected due to the extra work required to make it fit to the quad mold which has dimensional deviations in several areas. The first half is essentially complete and work has started on the second half. The edges of part 2 have been water jet cut and the side rails were also cut. Three (3) more TF bars were soldered this week, which completes the soldering operations for the upgrade. The Inconel centerstack casing was inspected in the CS winding area and can be accepted. A BPA release was signed for the CS casing stand.

Fabrication of the OH winding fixtures continues in the Tech Shop. Upgrades to the aluminum OTF castings continued throughout the week.

NBI Upgrade: Preparations for leak checking the Bay JK welds are underway. Bay JK VV corner reinforcement drawings are in progress. The 90 inch flange was moved into the NTC and lifted into place on the BL. Magnetic shielding installation work inside the BL continues. The Armor installation procedure has been approved. The armor backing plate in-vessel fit-up was completed. Minor changes to mounting studs will correct for as-built dimensions. These changes are in progress. A list of remaining items has been prepared to expedite final fabrication, assembly, and installation, and testing. Lifting fixtures for HVEs are being designed to raise lower HVE segments from TCB to TTC. Procurement packages for cable and tray and for water piping are in development. Water system drawings are in progress. A WCC package for installation of NTC platform 109 and 119 bridges is in progress. LHe cryogenics line installation on the TFTR Test Cell South wall continues. Fabrication in the Tech Shop continues on the central spool section for the NBI duct. Planning for fabrication and installation of the Bay JK RLM coil continues and conductor material has been acquired. Some TVPS vacuum equipment has been delivered. The large rectangular flanges for the duct have arrived.

Office of Project Management (T. Stevenson):

The monthly Project Status Review Board meeting was held. Active jobs reported notable progress through December close. Several types of staffing and coverage issues were discussed. Work continues on the Work Planning online system version 6.0. Validation of requirements is in progress prior to roll out which is imminent. The EVMS self assessment report draft is in review. System Engineer training with the online package is in progress. Development of the COG/RLM online supplemental training package has started.

Facilities and Site Services (M. Viola):

Fire Protection: A PPPL Fire Protection Review was held January 14-18. The primary emphasis of this fire protection review is to evaluate whether PPPL has the appropriate fire systems for its occupancies and activities and whether those systems are being properly controlled and maintained. There will be action items from the survey but the general impression of the site was good, especially the fact that all areas are sprinkled. This review was focused more on the Infrastructure and less on the programmatic aspects of the program.

Construction: There were peer reviews for two projects (Cooling Tower Pump House Backwash System Upgrade, NSTXu Bakeout System Power Supply Relocation).

Cafeteria: A Safety Meeting was held with the Brock Contractor employees to discuss safety issues.

Telecommunications: The Telecommunications Office and AC Power are installing a new electrical power transformer and new electrical power outlets in the Telephone Equipment Room, A117 to avoid stray electrical voltage that could damage the system circuit cards, which would ultimately knock-out phone service to Lab phones. The Telecommunications Office and Altura successfully installed the latest Avaya phone system software revision and will be installed on the remainder of the Gateways (2-6).

Property Management: Property Management is currently performing the capital equipment inventory. The high risk inventory was completed with a 100% Find Rate.

BUSINESS OPERATIONS (E. WINKLER):

A work for others proposal to support Princeton University on a grant received from the Department of State was approved by the DOE. The PPPL Principal Investigator for this effort is Rob Goldston; the funding to be provided by Princeton University is \$70,000 for the one-year period of performance.

The DOE Princeton Site Office provided its concurrence for five additional Laboratory Directed R&D (LDRD) projects for FYY2013; two projects are continuations of projects from prior fiscal years and three are new projects. The total budget allocated to these five projects is \$530K.

PPPL submitted the FY 2013 First Quarter Pricing Exception Report to DOE. This report identifies funding from non-DOE sponsors where the DOE Administrative Charge has been

waived. DOE currently waives this charge for funding provided by small businesses, institutes of higher education, nonprofit entities, state and local government, as well as the Department of Homeland Security.

PPPL maintenance cost data was provided to the DOE for inclusion in the Office of Science Quarterly Maintenance Report for the first quarter of FY2013.

Members of the accounting staff attended an introductory training session, hosted by the Princeton University Office of Finance and Treasury, which provides an overview of the new chart of accounts structure and fields.

Procurement and Human Resources have implemented two new review requirements for on-line requisitions. Both may be found on the "reviews" tab of the Online requisition system. The "Training Services and Educational Materials review" is applicable to requisitions for the purchase of training services or educational materials (books, software, online courses, etc.). The "Personal Services Review" is applicable to requisitions for the purchase of personal services, including consultant agreements. This requirement applies to any request for the services of a specific individual, regardless of whether they are named in the requisition or they will be identified later based on competitive selection.

N. Gnyp participated in the National Contract Management Association (NCMA) Mid-Year Leadership Conference in Las Vegas, Nevada. Gnyp is the vice president of NCMA's Pinelands Chapter. Attendance at the conference is part of her PPPL-sponsored participation in a one-year NCMA contract management leadership development program(CMLDP) for mid-career procurement professionals.

ENVIRONMENT, SAFETY, HEALTH & SECURITY (J. LEVINE):

A management safety walkthrough of the C-Site RF Building (floors 2-4) was held on January 16. Safety conditions in these areas were found to be very good.

Emergency Services Engine 66 responded to one mutual aid assignment in Princeton. Ambulance A166 responded to one mutual aid assignment in Plainsboro.

The PPPL Pandemic Response Plan was updated and submitted to PPPL senior management for review.

SPD submitted several articles for the next issue of the ESH&S Newsletter. PPPL Counterintelligence Officer P. Moskal visited the Laboratory January 15-17.

The Laboratory has prepared a list of "Essential Personnel" who have been designated due to the routine critical activities they may need to perform during or after an emergency condition. Each of these designated individuals has been provided a "Letter of Access - Essential Personnel" for their use should they need to report to the Laboratory for an emergency condition during a travel ban.

The PPPL Weekly featured an article on the recent DOE Safeguards and Security Peer Review Risk Assessment, and the high praise that PPPL received from the team.

An ESU Captains' Meeting was held this week; topics of discussion included the STOP Program and ISM, upcoming training, SPD policies and procedures, ESO selection process, platoon initiatives for 2013 and the Fire Protection Assessment that is underway.

PPPL Procedure GEN-008, Rev. 6, "Coordination of Visits, Assignments and Collaborations at PPPL" has been posted to the web (<http://bp.pppl.gov/procedures/gen008.pdf>). Please contact D. Stevenson if you have any questions on the updated procedure.

SPD staff and several PPPL senior managers viewed a Homeland Security Webinar on Active Shooters.

SPD staff met with an Interior Design Project Manager from Princeton University's Office of Design and Construction and with Captain D. Reichling, Princeton University Department of Public Safety to discuss set-up and lay-out of the Laboratory's planned tertiary Emergency Operations Center, to be based in the High Performance Computing Research Center (HPCRC) on B-Site.

SPD Emergency Planning & Training Coordinator J. Alkhateeb completed DHS/FEMA training for "Active Shooter: What You Can Do".

Emergency Services Officer Robert Walker completed his certification for International Code Council Fire Inspector.

OFFICE OF COMMUNICATIONS: (K. MACPHERSON):

C. Cane created a website for all National Lab exhibit submissions to Disney/Epcot. He posted the Commitment to Integrity document on the internal website and he issued several messages via social media.

J. Jackson DeVoe and G. Czechowicz edited, designed, and produced the PPPL Weekly containing stories such as: a profile on J. DeLooper; news of a highly positive DOE evaluation of PPPL's Security Booth operation and Site Protection services; an impending visit by outside experts on fire protection experts; and an upcoming Safety Survey.

J. Greenwald's article on the 30th anniversary of TFTR's first plasma was published in the Princeton Weekly Bulletin: <http://pwb.princeton.edu/recent-highlights/> and the DOE's Plugged In!, and his piece on PPPL's collaboration with South Korea was published on the Princeton University homepage, <https://www.princeton.edu/main/news/archive/S35/60/40I47/index.xml?section=topstories>, and led to a story in Science magazine. He distributed a press release and posted a story on the supercomputing awards from INCITE to the PPPL website, <http://www.pppl.gov/news/2013/01/pppl-physicists-win-supercomputing-time-simulate-key-energy-and-astrophysical-phenomena>.

K. MacPherson attended a meeting of the NLDC Chief Communications Officers Working Group at J-Lab in Newport News, Virginia, from January 10-11. Fifteen of the seventeen National Labs were represented. As chair of the education subcommittee, MacPherson is overseeing submissions by all NLs to Disney/Epcot on ideas for exhibits on science breakthroughs. She gave a presentation on efforts to develop a communications plan for the U.S. magnetic fusion program and on a proposed partnership on exhibits between the NLs and Disney. Other discussions centered on the possibility of a website featuring the NLs. Members heard presentations from: Dan Leistikow, head of public affairs at DOE headquarters; Steve Ashby, chair of the NLDC's Chief Research Officers Working Group; and Paul Doucette, director of Congressional affairs for science and technology at Battelle.

E. Starkman worked with the Princeton Writing Program where students are creating a website called Science Action, in coordination with A. Zwicker, that will enlist students to make short science videos on fusion physics and other topics. Starkman provided high-res photos of PPPL experiments and J. Greenwald wrote accompanying captions.

At the request of the Dean for Research, Starkman photographed a signing ceremony at Princeton University on an MOU between the University and the University of Science and Technology of China to promote science collaborations, including research in fusion energy and plasma science. She also printed up the images and distributed them to the visitors within hours. She worked with John DeLooper on the visuals in a PowerPoint presentation that will be part of the Lab's exhibit submission to Disney. She also shot photos at the request of the Princeton University School of Engineering.

J. J. DeVoe helped organize tours (some listed in the Director's section) including: On January 16, G. Ascione led a tour of seventeen high school students and two teachers from the Boy's Latin of Philadelphia Charter School. The group visited the NCSX site and the control room and control room annex.

BEST PRACTICES & EXTERNAL AFFAIRS (J. DELOOPER):

A. Zwicker met with Tony Rothman from the Physics Department at Princeton University to talk about a plan to create a new science center in Trenton, New Jersey.

A. Zwicker met with Alice White - Chief Scientist at Bell Labs Alcatel-Lucent; Susan Haig, Creative Director - NJ Arts News; Michael Bruno - Dean, School of Engineering and Science, Stevens Institute of Technology; Robert Prezant - Dean, College of Science and Mathematics, Montclair State University; and Don Sebastian - Senior Vice President, Research and Development, NJIT to plan an "Innovation Expo" as part of the events leading up to the 2014 Super Bowl in NJ.

A. Zwicker was interviewed by NJTV on the Princeton University Art of Science retrospective gallery that is currently on display at the Liberty Science Center in Jersey City, NJ.

A. Merali and A. Zwicker met with Steve DeAngelis, President and CEO of Enterra Solutions and Dana Harrison, Headmaster of the Newtown Friends School in Newtown, Pennsylvania to discuss a new partnership between private industry, educational institutions and PPPL.

A. Zwicker met with Teresa Riordan of the School of Engineering of Princeton University to plan for the 2013 Art of Science competition.

Joshua Goldston Peek, Hubble Fellow, of Columbia University, was the lecturer at the January 19 Science on Saturday event. 500 guests from the general public were present for this lecture.

DIRECTOR'S OFFICE (B. SOBEL):

On January 11, M. Zarnstorff was invited to speak at the Central New Jersey Mensa January meeting. His presentation entitled, "The Future of Magnetic Fusion" was well received.

On January 14, A. Cohen hosted the Chinese University of Hong Kong (CUHK). The visitors from CUHK were Joseph Jao Yiu Sung - Vice-Chancellor and President, Tai Fai Fok, Pro Vice-Chancellor and Vice-president, Eric Shu Pui Ng, Registrar and Secretary, Amy Yee Mei Tsui, Director of Communications and Public Relations, Shun Kei To - AV Producer, Fat Kei Cheung - Project Coordinator, Office of the Vice Chancellor and President.

On January 14-17, S. Prager attended the Max Planck Princeton Research Center on Plasma Physics Workshop. The purpose of the workshop was to discuss and formulate collaboration plans, and to present recent progress. Other participants from PPPL were A. Bhattacharjee, F. Ebrahimi, G. Fu, A. Hakim, G. Hammett, S. Jardin, J. Johnson, J. Menard, A. Reiman, and M. Yamada. The first meeting of this group was held in Princeton in March. The following talks were presented at the January meeting:

A. Bhattacharjee: "Fast Reconnection and Secondary Instabilities of Thin Current Sheets in High-Lundquist-number Plasmas"

F. Ebrahimi: "Global Simulations of Dynamo and Momentum Transport in Flowing Plasmas - Application to Plasma MRI Experiment"

G. Fu: "Energetic Particles in Fusion Plasmas: Progress and Plans for Interaction of Energetic Particles with Turbulence"

A. Hakim: "Initial Tests of a Discontinuous Galerkin Kinetic Code"

G. Hammett: "Plans in the Turbulence Area and Connection to the Other Three Research Areas of the Center"

S. Jardin: "Sawteeth in Tokamaks and Their Relationship to Other Two-fluid Reconnection Phenomena"

J. Johnson: "Gyrokinetic Studies of Nonlinear Saturation of the Mirror Instability"

J. Menard: "Effect of Rotation and Drift-kinetic Damping on NSTX Kink Stability with Future Application to Tearing Stability"

A. Reiman: "Theoretical Modeling of RMP Penetration and NTM Seeding"

M. Yamada: "Laboratory Studies of Magnetic Reconnection"

On January 16, Professor Rob Goldston, Princeton University, presented a colloquium entitled "Excitement at the Plasma Boundary".

On January 18, A. Cohen and K. Rule hosted visitors from New York Mayor Bloomberg's office.

This report is also available on the following web site:
<http://www.pppl.gov/polWeeklyHightsExternal.cfm>