The PPPL Highlights for the week ending March 21, 2020, are as follows:

NSTX-U RECOVERY (J. GALAYDA) AND RESEARCH (S. KAYE)

Recovery (J. Galayda):

FY 2020 status: NSTX-U is in a maintenance and repair outage.

**NSTX-U Recovery Project Final Design Review** — The NSTX-U Recovery Project held the project’s final design review (FDR) March 17-19. The FDR was a 100% online review to accommodate travel constraints and difficulties associated with COVID-19. This was a fortuitous choice, as it became necessary for PPPL to curtail work onsite for the same reason. Committee members and project team members conducted the three-day FDR via remote teleconference. The review was thorough and productive, despite the fact that reviewers’ clocks spanned five time zones. Overall, the committee endorsed the design. This was a successful review.

**Coils** — Sigmaphi curtailed work on March 17 after safing the winding lines and laying up the equipment. They are currently planning to restart after April 1.

**Center Stack Casing (CSC)** — The CSC was shipped to the Camden Holtec machining facility, arriving satisfactorily on March 16. The CSC is currently in the queue to start machining within the next week. In parallel, the HTT/HTP components were successfully shipped from Hollis Line to the Holtec Turtle Creek facility and are in receipt inspection. Both Holtec facilities are still actively working.

**Machine Core Structure Fabrications** — Precision Boring continues working on the preload parts, PF1C capping flanges, and PF1B sling component parts. G. J. Oliver is actively working the PF1C supports. PPPL fabrications are curtailed until April 15.

**U.S. ITER FABRICATION (H. NEILSON)**

The Low Field Side Reflectometer (LFSR) design team submitted two more final design deliverable documents for the LFSR in-vessel antenna assembly. A decommissioning plan describes the equipment’s safe state at the end of operation and a feasible plan for decommissioning. The report states that in-vessel components are to be transferred, while still encapsulated in its shield module, to ITER’s hot cell complex for treatment using remote handling equipment. A Checklist for Radwaste Inventories identifies all of the LFSR components and classifies their activation state, either high or low, at the end
of life. All in-vessel components are expected to be high activation, precluding hands-on work. The reports were submitted by PPPL engineer W. Harris and were rapidly approved by U.S. ITER and submitted to the ITER Central Team for acceptance.

The ITER team continues its efforts toward re-start of suspended diagnostic projects. This week, PPPL engineer M. Smith rejoined the team to assume leadership of the Upper-Wide-Angle Viewing System, a visible and infrared imaging diagnostic that will monitor the surface temperature of the divertor targets. In a meeting with Central Team and Port Integration officers, progress in the design and interfaces was reviewed. PPPL is taking steps to reassume control of the design.

ITER & TOKAMAKS (R. NAZIKIAN)

DIII-D (B. Grierson):

Research:

A paper titled, “Machine learning control for disruption and tearing mode avoidance,” by graduate student Y. Fu, et al., with advisor E. Kolemen, was published in Physics of Plasmas. The paper was chosen as a featured article, or SciLight, by the editors.

A paper titled, “An ideal MHD δW stability analysis that bypasses the Newcomb equation,” by graduate students A. Glasser and R. Conlin, as well as E. Kolemen and others, was published in Physics of Plasmas.

M. Clement returned to PPPL during the week of March 9 and gave a talk at the NSTX-U/Magnetic Fusion science meeting titled, “Neoclassical toroidal viscosity torque prediction via deep learning,” based on GPEC simulations of NTV torque in DIII-D discharges. During his visit, Clement also discussed an intrinsic torque density with T. Stoltzfus-Dueck and worked with D. Boyer, et al. on developing GPU software for running disruption predictors.

THEORY (S. HUDSON)

From the website: “This report represents the output of an open and transparent process, in which input was received from town halls, webinars, hundreds of small group discussions among subject matter experts, dedicated workshops, and focus group discussions. This is the final report of this phase of the community planning process. A FESAC subcommittee will now take up the next phase of this process, using this report to fulfill the charge for long-range strategic planning issued by DOE.”

Y. Zhou, H. Zhu, and I. Dodin published an article titled, “Solitary zonal structures in subcritical drift waves: a minimum model,” in Plasma Physics and Controlled Fusion (https://doi.org/10.1088/1361-6587/ab78f3). This paper proposes a reduced mode for subcritical drift waves that can support solitary zonal structures. These structures are qualitatively similar to those recently identified in gyrokinetic simulations with background shear flows.

COMMUNICATIONS & PUBLIC OUTREACH (A. ZWICKER)

Communications (L. Bernard):

The Office of Communications posted two news stories to the PPPL website. The first focuses on a landmark report of the American Physical Society Division of Plasma Physics Community Planning Process. It proposes immediate steps for the United States to take to accelerate U.S. development of this long-sought power. N. Ferraro was a co-chair of this planning process. The second details research by graduate student Y. Fu that demonstrates the use of artificial intelligence, the same computing concept that will empower self-driving cars, to predict and avoid disruptions — the sudden release of energy stored in the plasma that fuels fusion reactions — that can halt the reactions and severely damage fusion facilities. These stories were also posted to the Newswise and EurekAlert press release distribution services.

DIRECTOR’S OFFICE (S. COWLEY)

Laboratory leadership has been communicating ongoing updates to staff regarding the COVID-19 virus and PPPL.

This report is also available on the following web site:

http://www.pppl.gov/publication-type/weekly-highlights