

AMERICAN REINVESTMENT AND RECOVERY ACT (ARRA)

\$12,335,000 of funding was obligated on September 28, 2009 for tasks to be accomplished through June 2011. These funds will be used for additional DIII-D operations, staff retention and facility upgrades to diagnostic and auxiliary heating systems. In the quarter, January to March 2010, Enhanced Operations expenditures totaled \$103,377 and supported 1.07 FTEs; Upgrade expenditures totaled \$1,018,051 and supported 10.49 FTEs. Cumulative expenditures through March 2010 are \$2,740,199 for Enhanced Operations and \$2,292,689 for Upgrades.

Enhanced Operations

Three weeks of additional DIII-D operations were completed as scheduled in the FY10 1st quarter and focused on detailed experimental studies of the effect of non-axisymmetric error fields introduced by a set of coils installed on DIII-D to mimic the effects of Test Blanket Modules (TBMs) planned for ITER.

During the second quarter, the physics staff continued analysis of the experimental data.

Upgrades

ECH Socket and Transmission Line

Design of the ECH socket and transmission line was completed this quarter. An option raised during the final design review to use a different size waveguide with potentially lower power losses was reviewed. It was decided to retain the current size due to the cost differences. The design for the transmission line was finalized, including the design for the transmission line within the machine hall. It was determined that planned modifications to equipment within the machine hall would provide clear access to the assigned port for the launcher. A final design review was also held on the gyrotron instrumentation and control for the socket. Procurement of components and material and fabrication have begun for the gyrotron socket and transmission line.

High Voltage Power Supply

Design of the high voltage power supply was completed this quarter. Purchase of two long-lead-time items (line reactor and filter capacitors) was initiated. Statements of work were prepared and are in review for the mod/reg enclosures, the concrete pads and conduit duct banks. The specification and statement of work were prepared for the capacitor bank shelter and quotations were solicited.

Gyrotron

The purchase order for the gyrotron was issued to the vendor, CPI. The preliminary design review for the gyrotron was completed with CPI. Delivery is currently scheduled for July 2011.

ECH Launcher

The ECH launcher specification was completed and agreed to with PPPL during 1st Quarter FY10. PPPL is responsible for fabrication of the launcher.

Edge Diagnostics

Edge diagnostic design and initial procurements were begun in September 2009.

The upgrade of the Lithium Beam diagnostic is nearly complete. New control modules have been ordered and control circuitry upgraded. The system is fully assembled and has undergone final testing. The beam has been injected into plasma and fluorescence data has been obtained.

New DACQ equipment and related electronics (fiber optic receivers/transmitters) were procured for the fixed Langmuir probes (SNL). The electronics have been installed and the DACQ configured, installed and undergone initial testing.

The expansion of the Thomson scattering system was begun in August 2009 and new lab space made available for the planned addition of the Edge Thomson system. The mechanical layout of the viewing port has been fully modeled in Solid Works and the complete existing optical design has been migrated to Zemax. Detailed optical design of the expanded system has begun and options have been detailed for mounting the new holder at the existing port.

Initial measurements were made in July 2009 for the design of a system for measuring flows in the edge and scrape-off layers, using coherence imaging techniques. Additional measurements were made in December, this time looking at the lower divertor. Much data has been obtained during the last quarter in the lower divertor showing detailed profile of the flows, including in reverse field conditions.

A new fast framing camera (UCSD) was procured and put into service in the 2nd quarter.

Core Diagnostics

The Test Blanket module assembly was completed and installed into the DIII-D port and made ready for electrical testing the first week of October. The completed system included two racetrack coils for producing toroidal field, a central solenoid for vertical field, water cooling, graphite protection tiles, thermocouples on all key systems, a vacuum enclosure, a movable insertion system, and an array of magnetic probes and instrumentation.

The power system, control, monitoring and interlock system for the Test Blanket Module (TBM) was installed and tested and was made ready for experiments in mid October. This work included: installation of two current monitors for the TBM cables, modifications to the PCS for current control in the solenoid and the coil, modifications to the OPS computer procedures to monitor and check the TBM temperatures and water flow, creation of graphical displays for the TBM temperatures and water flow, modifications to the patch program for

the SPAs, and changes to the operations startup checklist and the baking checklist, and the writing of a startup traveler for the initial TBM testing.

The TBM assessment package was used in November for many experiments on DIII-D, with the participation of more than 15 International participants and the DIII-D team. The experiments were successful and the TBM package was removed on November 23rd after the completion of the experiments.

Two Yag lasers for the Thomson scattering systems have been ordered and received in August 2009.

The visible camera intensifier was ordered in July 2009 and the delivery was scheduled in early 2010. Following a failure at the vendor, the unit's delivery has been delayed and is now expected for late April 2010.

The prototype Fast Ion Loss detector system was installed and taking data in FY10 Q1. The prototype will serve as the basis for the design of the second detector. The conceptual design of the second detector has begun, taking advantage of the operational experience. Its expected location has been identified.

Scientific Staff

Scientific staff were funded and retained to support diagnostic and experimental analysis under this task.

Milestone Status (Scheduled/Completed)

Upgrades

- Complete design of Electron Cyclotron Heating Socket and Transmission Line (Scheduled Nov 2009/Completed Feb 2010). Delay due to review of possible design modification to reduce power losses.
- Begin Electron Cyclotron Heating and Transmission Line procurement (Scheduled Dec 2009/Completed Jan 2010). Delay due to review of possible design modification to reduce power losses.
- Begin fabrication of Electron Cyclotron Heating Socket and Transmission Line (Scheduled Jan 2010/Completed Jan 2010).
- Complete High Voltage Power Supply design (Scheduled Feb 2010/Completed Mar 2010).
- Complete first phase of gyrotron manufacturing (Scheduled Mar 2010/Completed Mar 2010).

Upcoming Events (April – June 2010)

Upgrades

- Complete Core Diagnostic Upgrades/New Diagnostics (May 2010)
- Begin High Voltage Power Supply fabrication (June 2010)
- Edge Diagnostic Systems Design completed (June 2010)