9. Activities of Rokkasho Research Centre

At Rokkasho village in Aomori prefecture, the facilities of 1) International Fusion Materials Irradiation Facility/Engineering Validation and Engineering Design Activities (IFMIF/EVEDA) project and 2) International Fusion Energy Research Centre (IFERC) project have been constructed under the Broader Approach (BA) agreement between EU and Japan. The roles of the Rokkasho Research Centre of NIFS are to assist NIFS and universities to cooperate with those activities, and to prepare the environment for promoting various collaborative researches including technology between activities at Rokkasho and universities. As cooperation activities, the head of the Rokkasho Research Centre of NIFS is undertaking jobs as the IFERC project leader, and the Rokkasho Research Center of NIFS has been set inside of the JAEA Aomori Research and Development Center, where IFERC and IFMIF/EVEDA projects are located.

The mission of IFERC project is to complement ITER and to contribute to an early realization of the DEMO reactor, and so IFERC project implements the 3 sub-projects; DEMO Design and R&D Coordination Centre, Computational Simulation Centre (CSC), and ITER Remote Experimentation Centre (REC). The mission of DEMO Design and R&D Coordination Centre is to coordinate scientific and technological DEMO activities necessary for performing activities on DEMO pre-conceptual Design and on R&D of DEMO technology. The mission of CSC is to provide a state-of-the-art supercomputer and to exploit high performance and large-scale fusion simulations, in order to analyse experimental results, to prepare ITER operational scenario, to predict ITER performance, and to contribute to DEMO design physics and to BA activities. In the case of REC, the mission is to prepare ITER remote experiments and to verify the functions by using JT-60SA and an EU tokamak. The IFERC project is implemented almost on schedule according to the Work Programme 2014 and the Project Plan approved at BA Steering Committee meetings.

In the DEMO Design Activity (DDA), a more in-depth and focused engineering/design analysis was carried out. Scoping calculations led to possible design points that would be explored in greater detail to consolidate the associated machine parameters and operating space base. These activities have been reflected in the DDA intermediate report, which summarizes a study starting in 2010 with the goal of (i) providing a technical perspective of a DEMO with the capability of generating a few hundred MW of net electricity and operating with a closed fuel-cycle tokamak consistent with credible operating scenarios and feasible engineering solutions to critical design issues, (ii) preliminarily identifying a representative range of machine parameters. The emphasis in this report has been placed on identifying and analyzing key design issues and R&D needs in the following areas: systems code and analysis of DEMO design points; physics basis and scenario modelling; divertor and power exhaust; vessel and in-vessel components; remote maintenance; superconducting magnets; structural material design and R&D, and safety. The DEMO R&D activities in the five task areas (T1: SiC_f/SiC composites, T2: Tritium technology, T3: Material engineering, T4: Advanced Neutron multiplier, T5: Advanced Tritium breeders) have been carried out successfully in accordance with the Work Programme 2014 and Procurement Arrangements (PAs). EU/JA collaboration on (i) compatibility of SiC and SiC_f/SiC composites with liquid Pb–Li alloy for T1, and (ii) analysis of JET ILW (ITER Like Wall) for T2 are progressing as planned. Progress has also been made on the fabrication and examination of RAFM steel for T3, neutron multipliers (e.g. Rotating Electrode Method) for T4 and advanced tritium breeders, such as Li_2TiO_3 with excess Li ($Li_{2+x}TiO_{3+y}$) for T5.

The CSC activity has progressed in full accordance with the project plan and with the schedule of the various PAs. The activity was performed by the IAs in coordination with the SWG-1 regarding, in particular, the monitoring and the early operation phase of the Intel Xeon Phi (MIC) extension with 427 TF to Helios, and in coordination with the Standing Committee (StC) regarding the selection of simulation projects, allocation of computer resources and evaluation of user reports. The Integrated Project Team (IPT) of CSC including HPC team continuously and dedicatedly supports users and operation of Helios, leading to stable operation with a high availability ratio, high utilization rate and many papers accepted or published in scientific journals. The 3rd cycle of the regular simulation projects has been completed, and the 4th cycle is ongoing.

Based on the overall plan of REC approved at the 11th BA SC, development of the software for REC successfully started in collaboration with the Satellite Tokamak Programme (STP), which is other project in the BA activities carried out at JAEA Naka site, in order to test functionality of the remote experiment. The software under development addresses fundamental applications for remote experiments: remote experiment system, remote experimental data analysis software, remote data access and documentation management system.

In addition, the Rokkasho Research Centre performs communication works with the organization related to ITER-BA, Aomori prefectural office, and Rokkosho village office, and publicity works to have villagers understand the research of the nuclear fusion.

(Nakajima, N.)