

Toward Practical Use of Fusion Energy

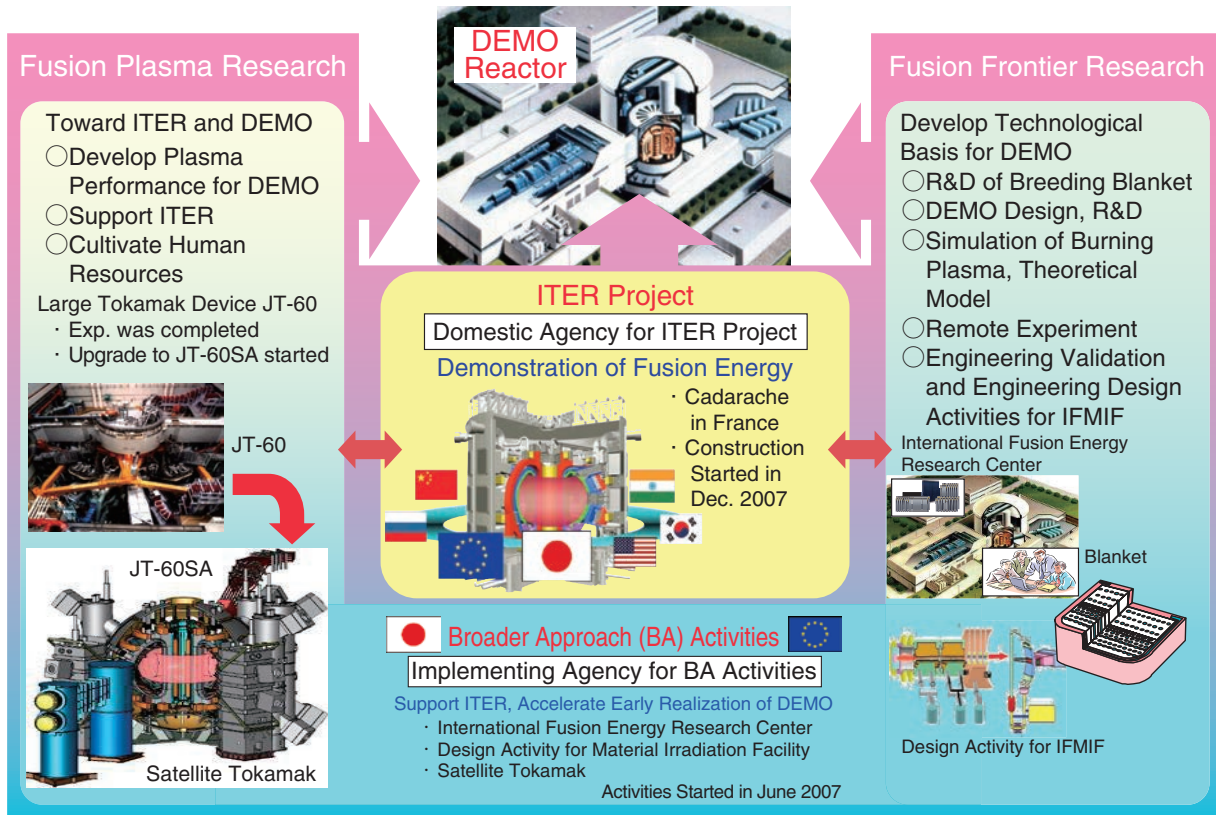


Fig.4-1 Steps involved in the development of fusion DEMO reactor

Fusion plasma research and fusion frontier research are being pursued to develop a DEMO reactor, aiming for early realization of fusion energy.

Crucial Research and Development on Fusion Plasma Research and Fusion Frontier Research toward the practical use of fusion energy is being pursued through intensive international cooperation, for example, the International Thermonuclear Experimental Reactor (ITER) project, Broader Approach (BA) activities, and other collaborations (Fig.4-1), aiming for early realization of a fusion DEMO reactor.

ITER Project

The ITER project is an international cooperative project to demonstrate the scientific and technological feasibility of fusion energy through the construction and operation of an experimental reactor. The ITER agreement came into force in October 2007, and the Japan Atomic Energy Agency (JAEA) was designated as the domestic agency for the ITER project in Japan. The JAEA proceeded with preparing the equipment that Japan has agreed to provide and achieved various results in terms of technological development (Topics 4-1, 4-2). In particular, the JAEA began the production of a superconducting coil for the actual machine ahead of any other country participating in ITER.

BA Activities

The BA activities are joint projects by Japan and the EU for conducting supporting research for ITER and research and development (R&D) for a DEMO reactor, which is the next step of ITER, aiming for early realization of fusion energy. The BA agreement came into force in June 2007, and the JAEA was

designated as the implementing agency of the BA activities in Japan.

The BA activities consist of three projects: projects in the International Fusion Energy Research Center (IFERC), the engineering validation and engineering design activities of the International Fusion Materials Irradiation Facility/Engineering Validation and Engineering Design Activities (IFMIF/EVEDA), and the Satellite Tokamak Program (STP). Topics 4-3 and 4-4 describe the results achieved in the R&D activities toward a DEMO reactor in the IFERC. Topics 4-5 and 4-6 describe the results obtained by IFMIF/EVEDA. In the STP, the construction of JT-60SA has progressed well (Topic 4-7). Topics 4-8 and 4-9 are also results contributing to JT-60SA.

Fusion Plasma Research

The analysis of the JT-60 experimental data was promoted, and inter-machine experiments were conducted for the purpose of achieving high economic efficiency of the fusion reactor by attaining a high plasma pressure. Topic 4-10 is a result that clarifies the mechanism of the formation of high plasma pressure.

Fusion Frontier Research

Various R&D activities are executed at the BA site in Rokkasho, aiming at the construction of a technological basis for a DEMO reactor. Topic 4-11 describes theoretical simulation research that uses the high-performance computer at IFERC; the result can provide a basis for controlling the plasma in a DEMO reactor.