

Toward Practical Use of Fusion Energy

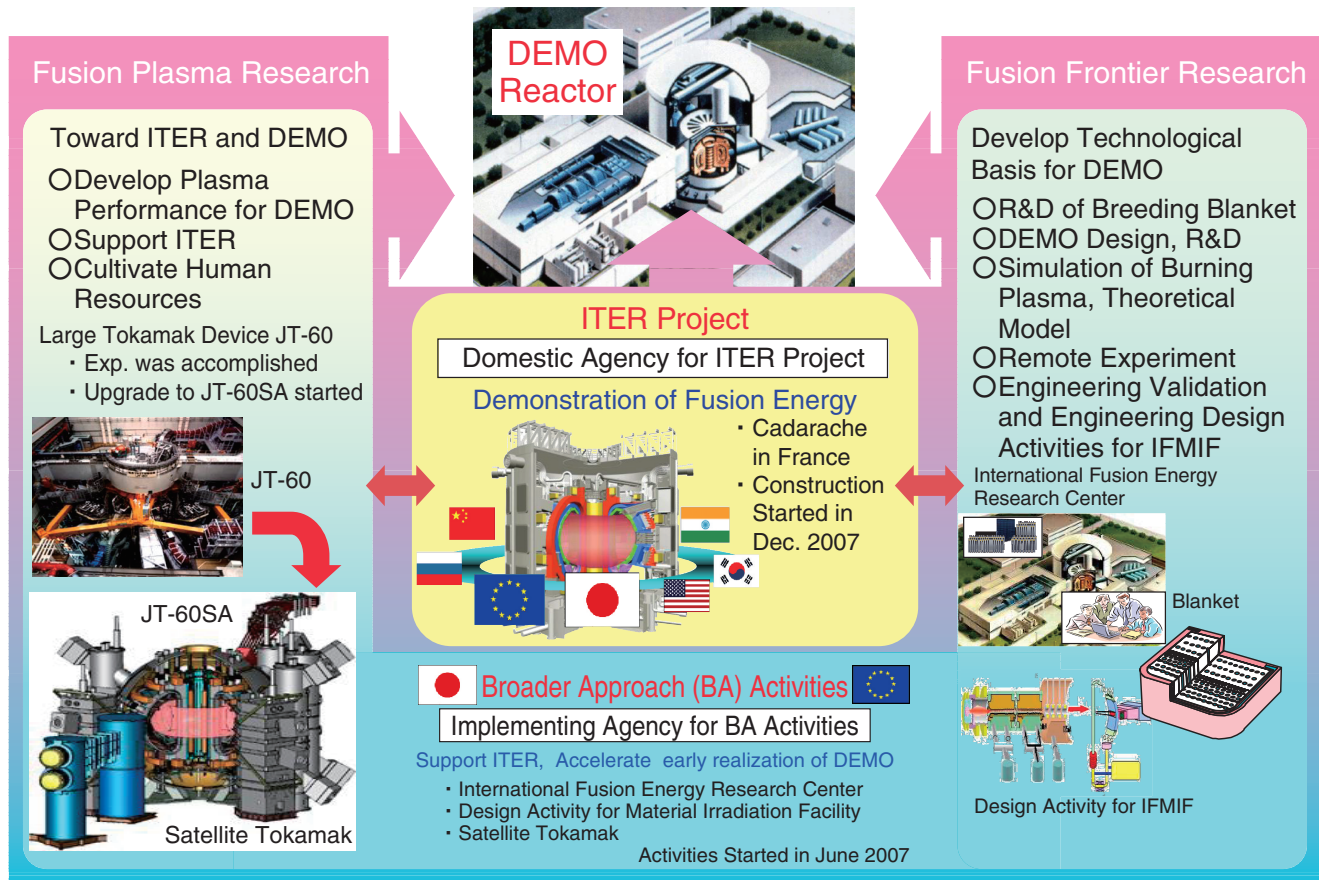


Fig.4-1 Development steps toward the Fusion DEMO Reactor

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

Crucial research and development on fusion plasma research and fusion frontier research toward the practical use of fusion energy are being pursued through intensive international cooperation such as the International Thermonuclear Experimental Reactor (ITER) project, Broader Approach (BA) activities, and other collaborations (Fig.4-1), aiming for the 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 JAEA was designated as the domestic agency of the ITER project in Japan. JAEA has proceeded with preparing the equipment that Japan was committed to provide. In particular, JAEA has continued mass production of a superconducting coil conductor (Topic 4-1) ahead of any other country participating in ITER, and has made various technological developments (Topics 4-2, 4-3).

BA activities

The BA activities are joint projects by Japan and EU for executing support research for ITER and the research and development for a DEMO reactor, which is the next step of ITER, aiming for the early realization of fusion energy. The BA agreement came into force in June 2007, and JAEA was designated as the implementing agency of BA activities in

Japan.

BA activities consist of three projects: (a) projects on the International Fusion Energy Research Center (IFERC), (b) Engineering Validation and Engineering Design Activities of the International Fusion Material Irradiation Facility (IFMIF/EVEDA), and (c) the Satellite Tokamak Program (STP). Topic 4-4 reports the progress made on the IFERC project. Topic 4-5 describes the results achieved along with the researches related to IFMIF/EVEDA. In STP, the construction activities of JT-60SA have progressed well, including the design and manufacture of components (Topics 4-6, 4-7, 4-8).

Fusion plasma research

Analysis of JT-60 experimental data has been performed and inter-machine experiments have been conducted for the purpose of achieving high economical efficiency of fusion reactor by attaining high plasma pressure. Topic 4-9 is the result to contribute to overcoming the instability that is the dominant factor to hinder the achievement of high plasma pressure.

Fusion frontier research

In the fusion reactor, tritium is produced (breeding) from lithium by using the neutron produced by the fusion reaction. Topic 4-10 is intended to efficiently acquire the lithium necessary for fuel breeding. Topic 4-11 is intended to obtain results that will form the basis for controlling the plasma in a DEMO reactor.