

Toward the Practical Use of Fusion Energy

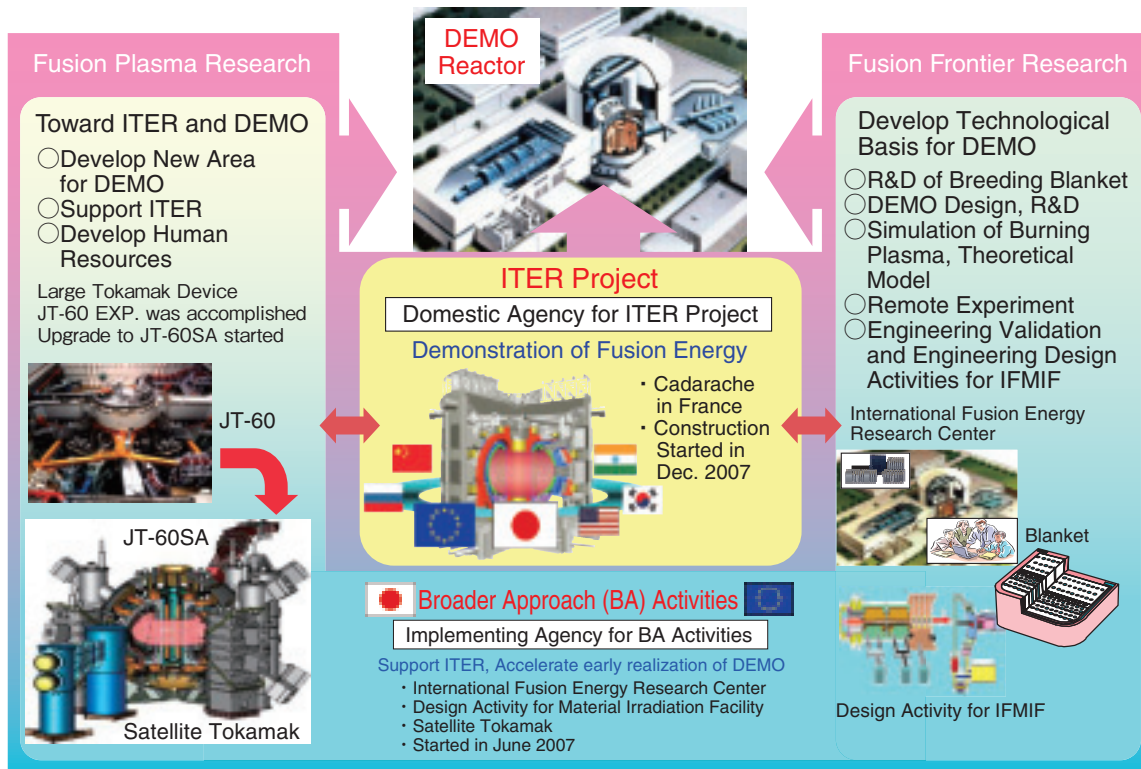


Fig.3-1 Steps involved in the development of fusion DEMO reactor

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

Crucial research and development on fusion plasma and fusion frontier is being pursued through intensive international cooperation, i.e., through the International Thermonuclear Experimental Reactor (ITER) project, Broader Approach (BA) activities, and other collaborations (Fig.3-1), aiming at the practical use of fusion energy.

ITER project

The ITER project is an international cooperative project that aims at demonstrating 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 for the ITER project in Japan. JAEA has proceeded with preparing the equipment that Japan was allotted to provide, has been successful in terms of technological development (Topics 3-2, 3-3, and 3-4), and has started the mass production of a superconducting coil conductor (Topics 3-1) ahead of any other country participating in the ITER project.

BA activities

BA activities is a joint project by Japan and EU that aims at executing support research for the ITER and pursuing research and development activities for the development of a DEMO reactor, which is the next step of ITER, with the goal of early realization of fusion energy. The BA agreement came into force in June 2007, and JAEA was designated as the

implementing agency for BA activities in Japan.

BA activities includes three projects: projects at the International Fusion Energy Research Center (IFERC), Engineering Validation and Engineering Design Activities for the International Fusion Material Irradiation Facility (IFMIF/EVEDA), and the Satellite Tokamak Program (STP). Topic 3-9 shows an outline of the IFERC project and the related schedule. Topic 3-12 describes the results of the research related to IFMIF/EVEDA. In STP, the construction activities of JT-60SA progressed well, including the design and manufacture of the components (Topic 3-5).

Fusion plasma research

The critical requirement for development of the future fusion reactor is achieving high economical efficiency, namely, sustaining high fusion power in a compact reactor core. It is necessary to improve the plasma pressure, for example, to accomplish this. Topics 3-6, 3-7 and 3-8 are the results that can contribute to achieve high plasma pressure.

Fusion frontier research

In the fusion reactor, it is necessary to utilize the neutrons from the fusion reaction effectively for fuel production. Topic 3-11 includes the results that can contribute to the efficient conduction of experiments in this regard. Moreover, Topic 3-10 discusses the result that can form the basis for the control of the DEMO reactor.