

## Toward Practical Use of Fusion Energy

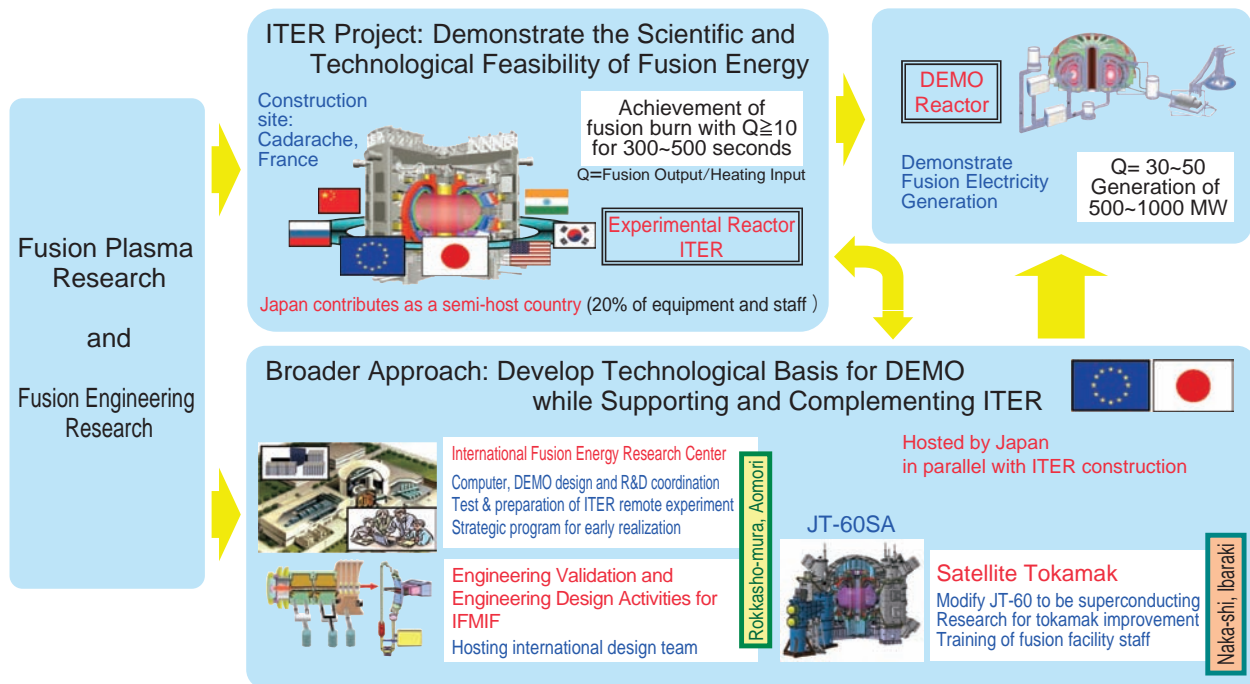


Fig.3-1 Development Steps Toward the Fusion DEMO Reactor

In the Fusion Research and Development Directorate, crucial R&D toward the practical use of fusion energy (fusion plasma and fusion engineering R&D) is being pursued through intensive international cooperation such as the International Thermonuclear Experimental Reactor (ITER) project, Broader Approach (BA) activity, and so on, aiming to make the fusion DEMO reactor a reality (Fig.3-1).

### 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 allotted to provide, has achieved various results in terms of technological development (Topics 3-2, 3-3, and 3-4), has completed an advanced conductor manufacturing factory in cooperation with the world of industry, and has started mass production of a superconducting coil conductor (Topic 3-1) ahead of any other country participating in ITER.

### BA Activity

The BA activity is a joint project by Japan and the EU for executing support research for ITER and research and development 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 JAEA was

designated as the implementing agency of BA activity in Japan. BA activity consists of three projects: the activities of the International Fusion Energy Research Center, the engineering validation and engineering design activities of the international fusion material irradiation facility (IFMIF/EVEDA), and the Satellite Tokamak Program. The International Fusion Energy Research Center buildings were completed in March, 2010, and its real activity began. Topic 3-11 describes the results achieved in research related to IFMIF/EVEDA. In the Satellite Tokamak Program, Japan and the EU began joint construction of the advanced superconducting tokamak JT-60SA (Topic 3-5). Moreover, Topic 3-6 describes a result that also contributes to the JT-60SA.

### Fusion Plasma Research

The critical requirement for a future fusion reactor is attaining a high level of economic efficiency: namely, to sustain high fusion power in a reactor core of compact size. It is necessary to improve the plasma pressure to accomplish this. Topics 3-7 and 3-8 describe results that can indicate guiding principles for achieving high plasma pressure.

### Fusion Engineering Research

In a fusion reactor, it is necessary to maintain an ultra high temperature plasma of 100 million degrees or more in the vacuum vessel. Topics 3-9 and 3-10 relate results achieved regarding development of equipment for this.