

Toward Practical Use of Fusion Energy

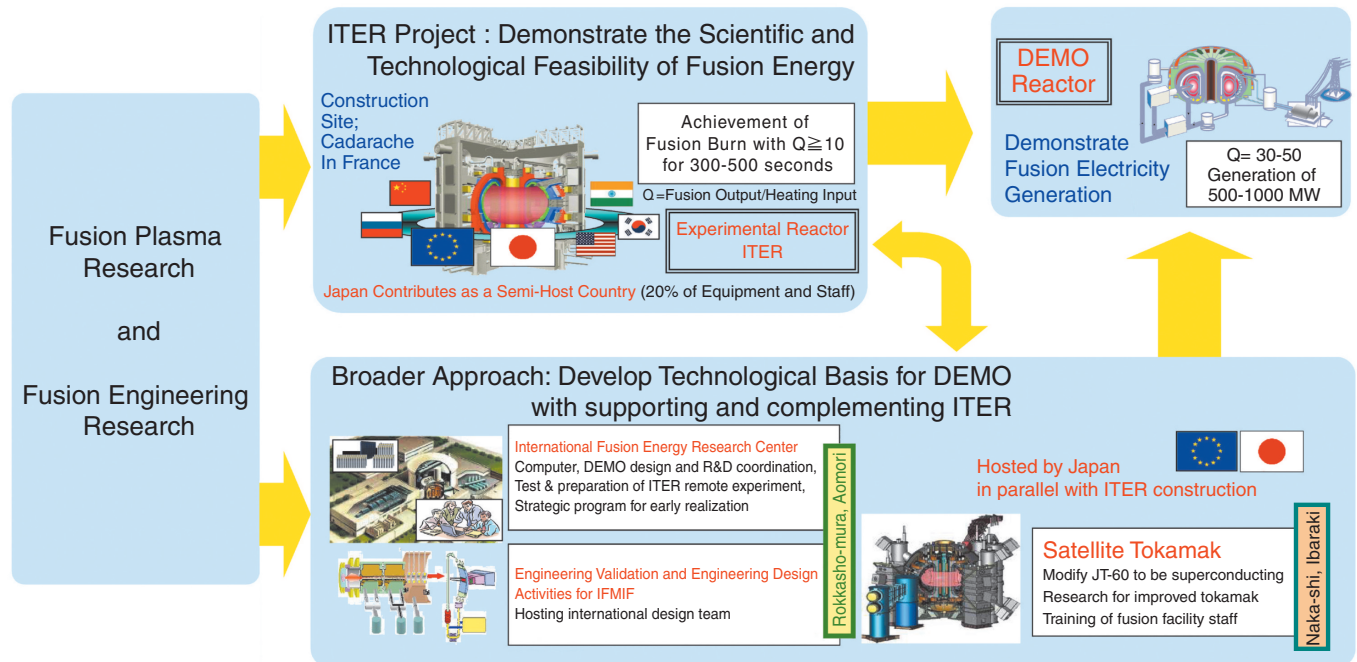


Fig.3-1 Development Steps toward the Fusion DEMO Reactor

In Fusion Research and Development Directorate, crucial R&D toward practical use of fusion energy (fusion plasma and fusion engineering R&D) has been pursued through intensive international cooperation such as International Thermonuclear Experimental Reactor (ITER) project and Broader Approach (BA) activity etc., aiming at realization of the fusion DEMO reactor (Fig.3-1).

ITER Project

The ITER project is an international cooperative project to demonstrate the scientific and technological feasibility of fusion energy through construction and operation of an experimental reactor. The ITER agreement entered into force in October 2007, and JAEA was designated as the domestic agency of the ITER project in Japan. JAEA has proceeded with the preparation of the equipment that Japan was allotted to provide, achieved technological development which leads the world, concluded a procurement agreement with ITER Organization before any other country, and has started the production of the superconducting coil conductor.

BA Activity

The BA activity is a joint project by Japan and EU, which executes the support research for ITER and the research and development for a DEMO reactor, the next step of ITER, aiming at the early realization of fusion energy. The BA agreement entered into force in June 2007, and JAEA was designated as the implementing agency of BA activity in Japan. JAEA is steadily advancing the production of the equipment that Japan was allotted to provide.

Fusion Plasma Research

JT-60 greatly contributed to fusion R&D for many years as the core device in fusion plasma research, and 23 years and 4 months of experimentation was completed on August, 2008. JT-60 achieved a lot of world records, and recently R&D to enhance the plasma pressure, aiming at improvement of the economy of the fusion reactor, was pursued aggressively with it. A world record in the time high-pressured plasma was maintained was achieved in the final fiscal year of experiments. The results of JT-60 obtained over the past years are considered highly valuable throughout the world, as was seen at the 22nd IAEA Fusion Energy Conference held in Geneva in October, 2008, where all participants stood up and respectfully applauded the completion of experiments after the overview presentation of JT-60 on the first day of the conference. The upgrade of JT-60 to JT-60SA is now in progress in a combined program of the Satellite Tokamak Project in the BA and the National Centralized Tokamak Project.

Fusion Engineering Research

The kinetic energy of the neutron generated with the reaction is converted into heat with a blanket which is situated to enclose plasma, and the heat is extracted in the fusion reactor. The R&D to develop the technological foundation necessary for the fusion reactor, such as effective method for extraction of the heat and materials that can endure irradiation with neutrons etc., is being performed.