§10. Summary of Key Element Technology Verification and Preparation for Engineering Validation of Intense Neutron Source

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The world fusion program is now entering a new phase to construct, operate and exploit the ITER with a programmatic objective to demonstrate the scientific and technological feasibility of fusion energy for peaceful purposes. In anticipation that the ITER will be made operational in a decade and the programmatic objective can be met in the succeeding seven or eight years, the roadmap toward the DEMO can be revisited and R&D elements indispensable for fusion energy utilization can be aligned in the horizon of the ITER schedule. A minimum set of R&D elements essential for fusion energy utilization can be categorized in the following:

1) demonstration of technologies essential to a reactor in an integrated system under fusion environments through ITER construction and operation;

2) integrated testing of the high-heat-flux and nuclear components required to utilize fusion energy through ITER exploitation; and

3) development of structural materials with high irradiation resistance and low neutron-induced activations.

Development of radiation-resistant and low-activation materials is a central R&D issue to realize fusion energy utilization. The world fusion community can now identify candidate materials for the DEMO and extensive R&D efforts have been devoted worldwide to data accumulation and evaluation of the candidates by means of irradiation testing as well as modeling and simulation. In addition, the world fusion community stresses the necessity of an appropriate irradiation test facility, which can adequately simulate the fusion environment and provide qualified data under fusion-relevant neutron irradiation.

To this end, the IFMIF Project has been implemented under the framework of IEA Implementing Agreement of Fusion Materials, and conceptual design and key elements R&Ds have been successfully completed during the period of so-called 'Key Element Technology Phase (KEP)'. Discussions are in progress on a possible framework and content of technical activities for the succeeding phase, Engineering Validation and Engineering Design Phase (EVEDA), on the basis of the Joint Paper attached to the Joint Declaration by the Negotiators of the six ITER Parties, 28 June 2005. The EVEDA is planned to focus on the detailed engineering design and the associated prototypical component tests with an objective to providing engineering database necessary for making a decision of IFMIF construction.

EVEDA is then nominated as one of the major activities in the framework of Broader Approach agreed by Japan and EU, with potential participation by other ITER parties.

In the present collaboration, preliminary discussion on the participation of Japanese Universities to EVEDA activities was made, taking into account the infrastructure established during the KEP phase. Efforts were focused on planning the subjects in which Japanese Universities are expected to play leading roles, such as Li Target technology, Test Cell design and optimization and Small Specimen Test Technology.

Also discussed was the consistency of the EVEDA activity with overall road-map for materials/blanket development as shown in Fig. 1.

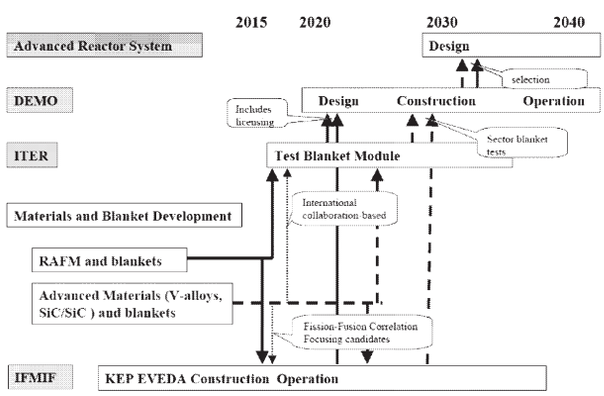

Fig. 1 Roadmap for materials and blanket development discussed in the collaboration