

Status of the KSTAR Project and Fusion Research in Korea

Gyung-Su Lee



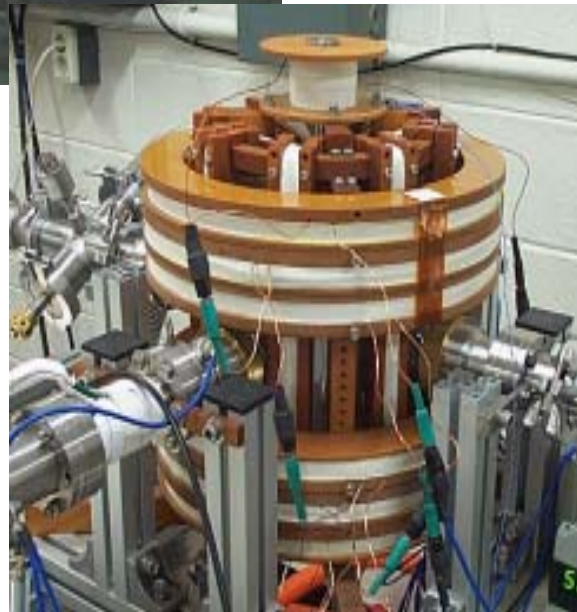
**National Fusion R & D Center
Korea Basic Science Institute**

Fusion Research Activities and Plan in Korea

- 📍 **Basic Plasma and Fusion Research at University : 1970's**
- 📍 **Construction of Small-scale Fusion Research Device : 1980-1990's**
 - SNUT- 79 Tokamak (SNU)
 - KT- 1 Tokamak (KAERI)
 - KAIST Tokamak (KAIST)
 - HANBIT Mirror Device (KBSI)
- 📍 **Korean National Fusion Program : 1995 ~**
 - KSTAR Tokamak Project :
**Universities, Research Institutes and Major Industries
with Emphasis on International Collaboration**
- 📍 **Collaboration with Major International Fusion Program : 2005 ~**
 - Operate KSTAR as International Fusion Collaboratory
 - Participate Major International Fusion Research Program

Fusion Research at SNU

SNUT-79 Tokamak Experiment



Small AC Spherical Torus Experiment

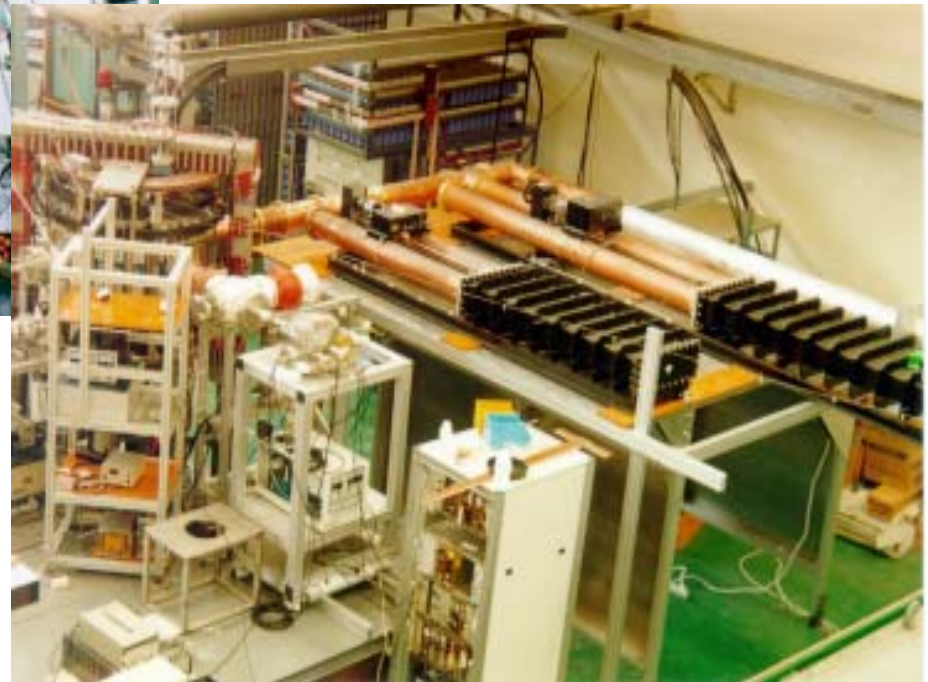
Superconducting CS Model Coil



KT-I Tokamak (KAERI)

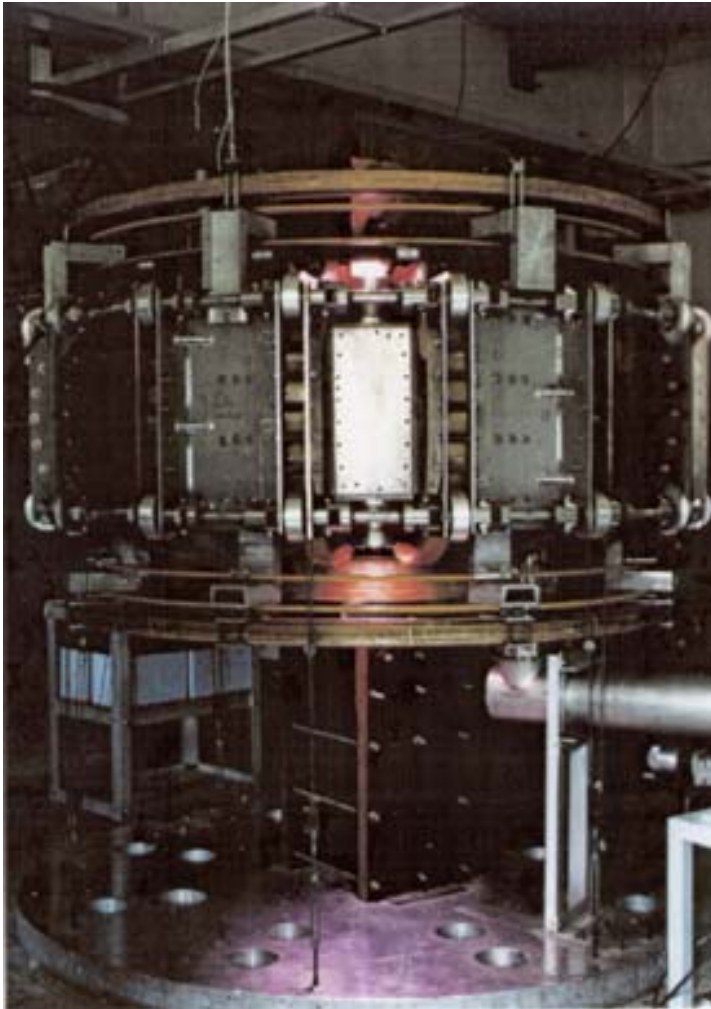


RF Heating Physics



KAIST Tokamak

Diagnostics and Heating

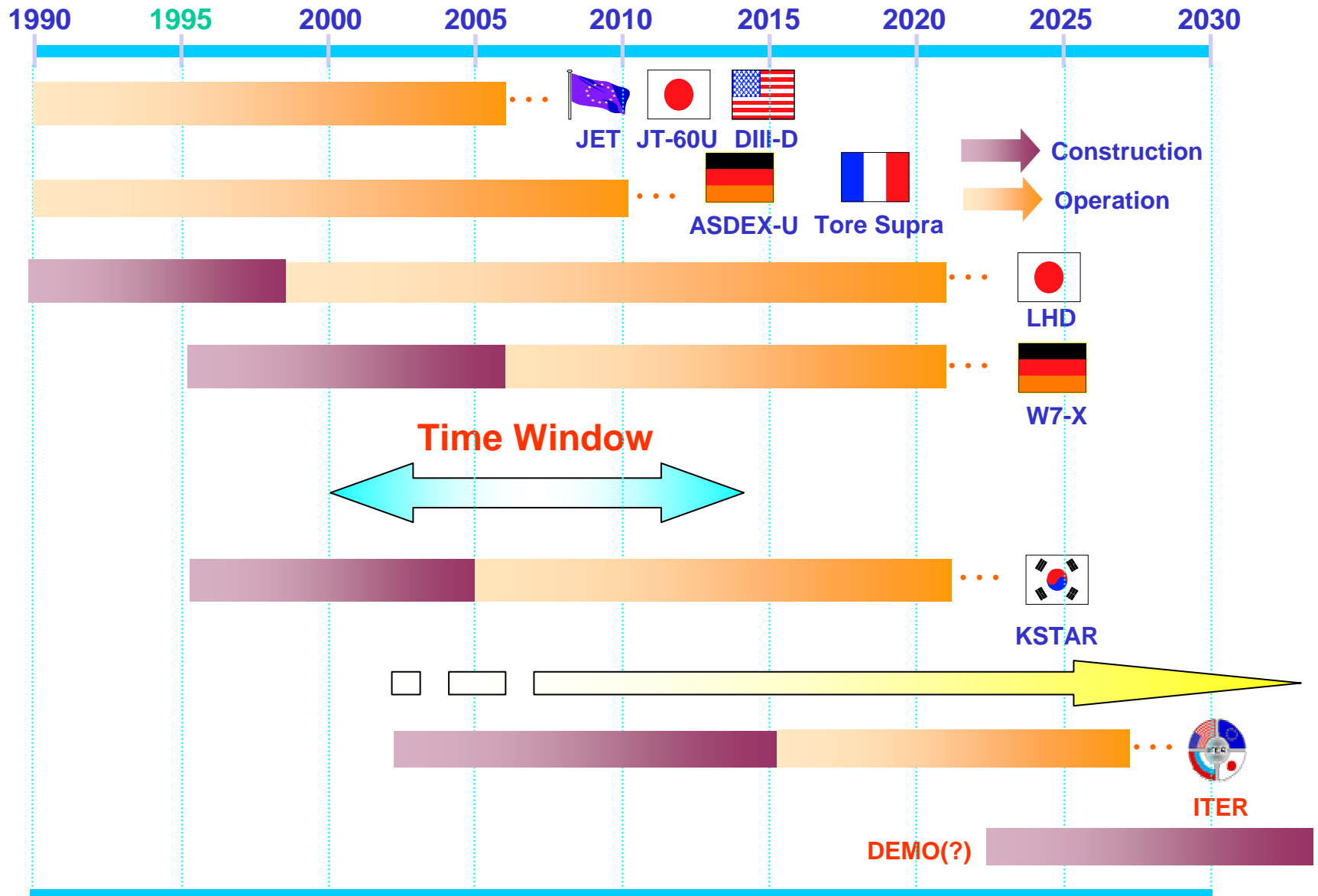


HANBIT Plasma Research Facility (KBSI)

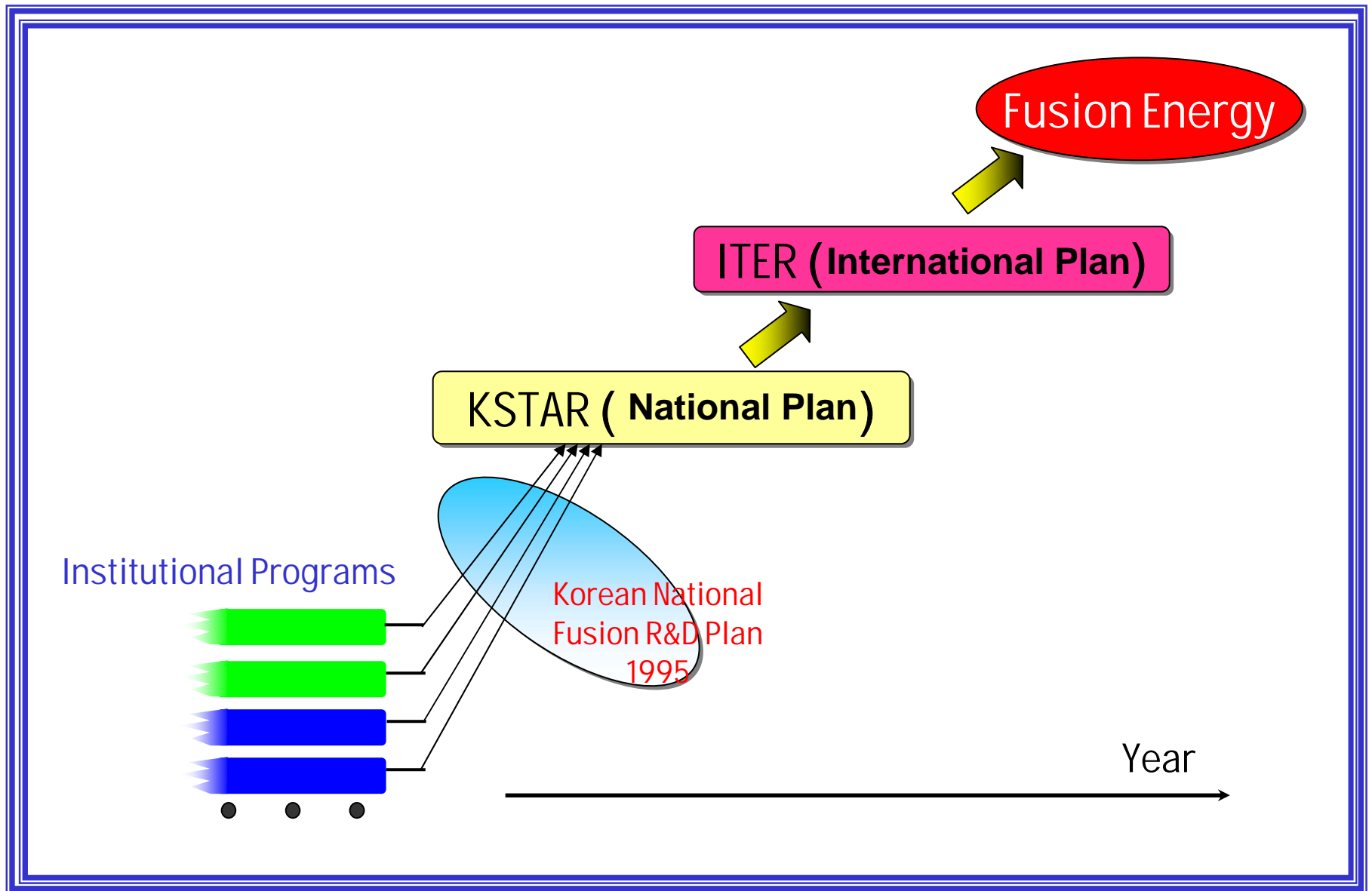


Basic Plasma Research, Diagnostic and Heating

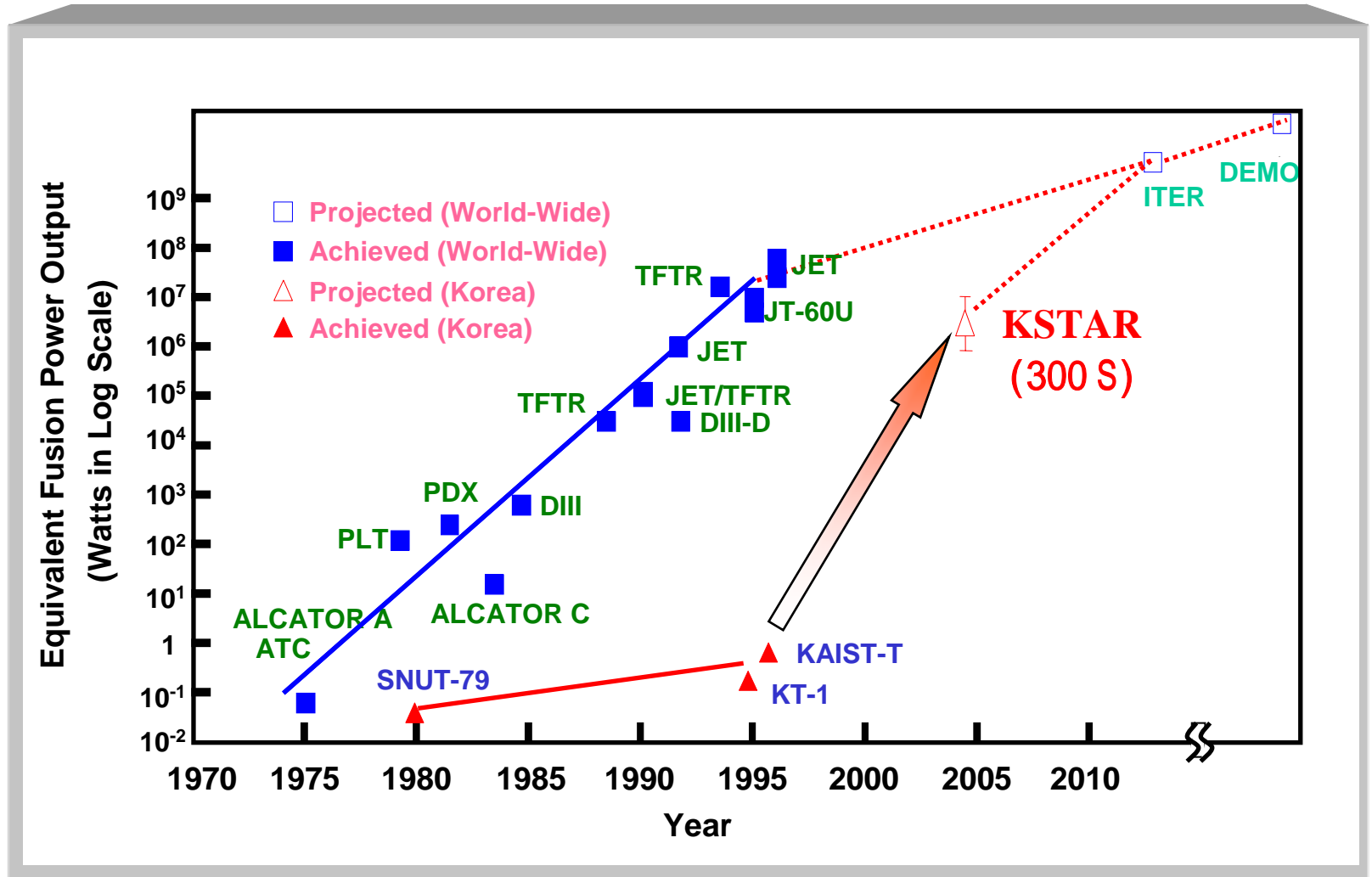
Korean National Fusion Program Time Window



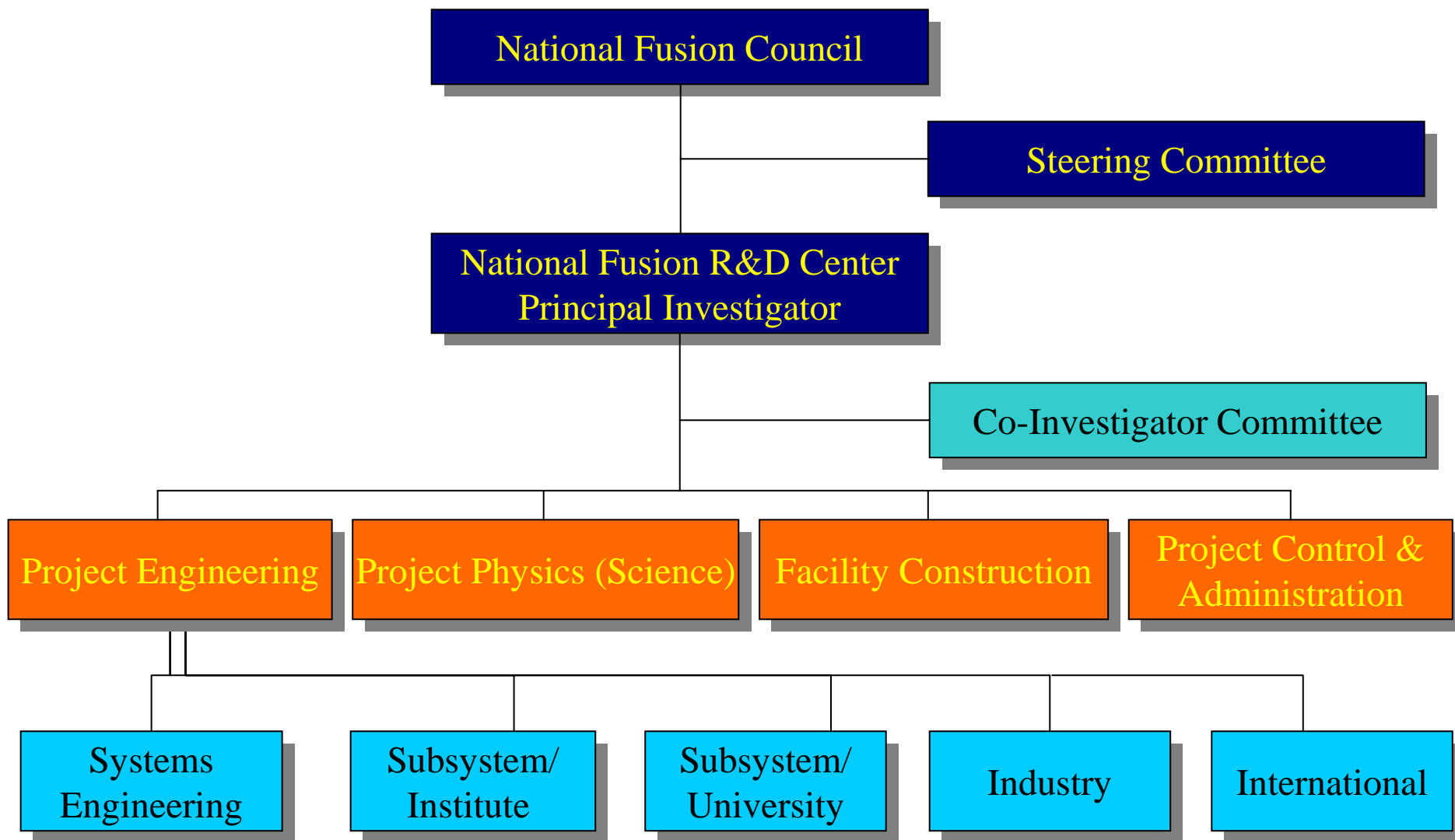
Fusion Research and Development Strategy



World-wide Tokamak Performance and KSTAR Target



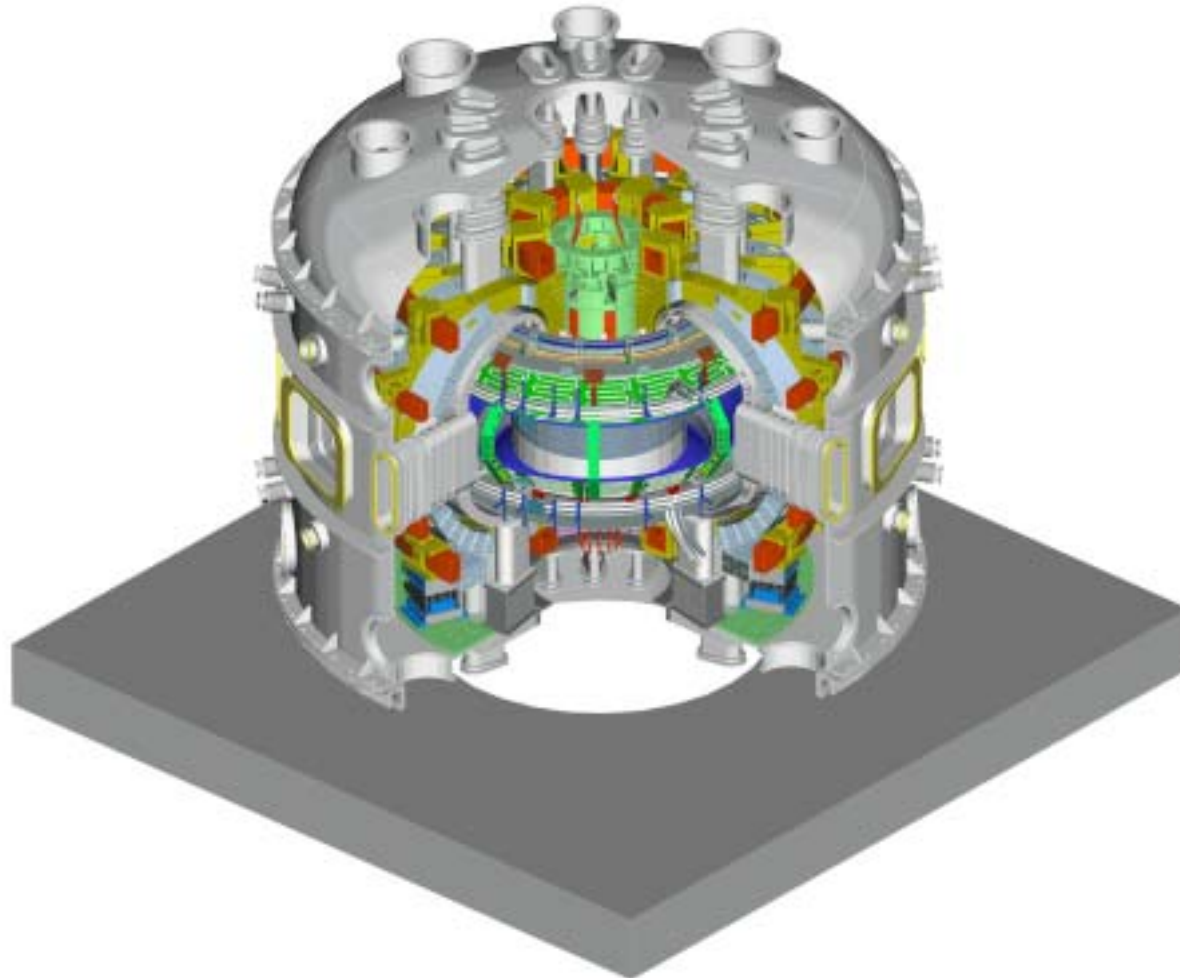
Program and Project Management Structure



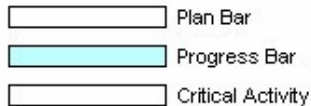
KSTAR Machine Parameters

	Parameters	Remarks
Major Radius, R_0 Minor Radius, a Toroidal Field, B_{T0} Plasma Current, I_P Elongation, κ Triangularity, δ	1.8 meter 0.5 meter 3.5 Tesla 2.0 MA 2.0 0.8	<ul style="list-style-type: none"> • Nb₃Sn, NbTi • Double-null
Pulse Length Heating & Current Drive Plasma Species	20 sec < t_{pulse} < 300 sec NBI, ICRH / FWCD LHCD, ECH / ECCD H/D	<ul style="list-style-type: none"> • Current Drive

KSTAR Tokamak

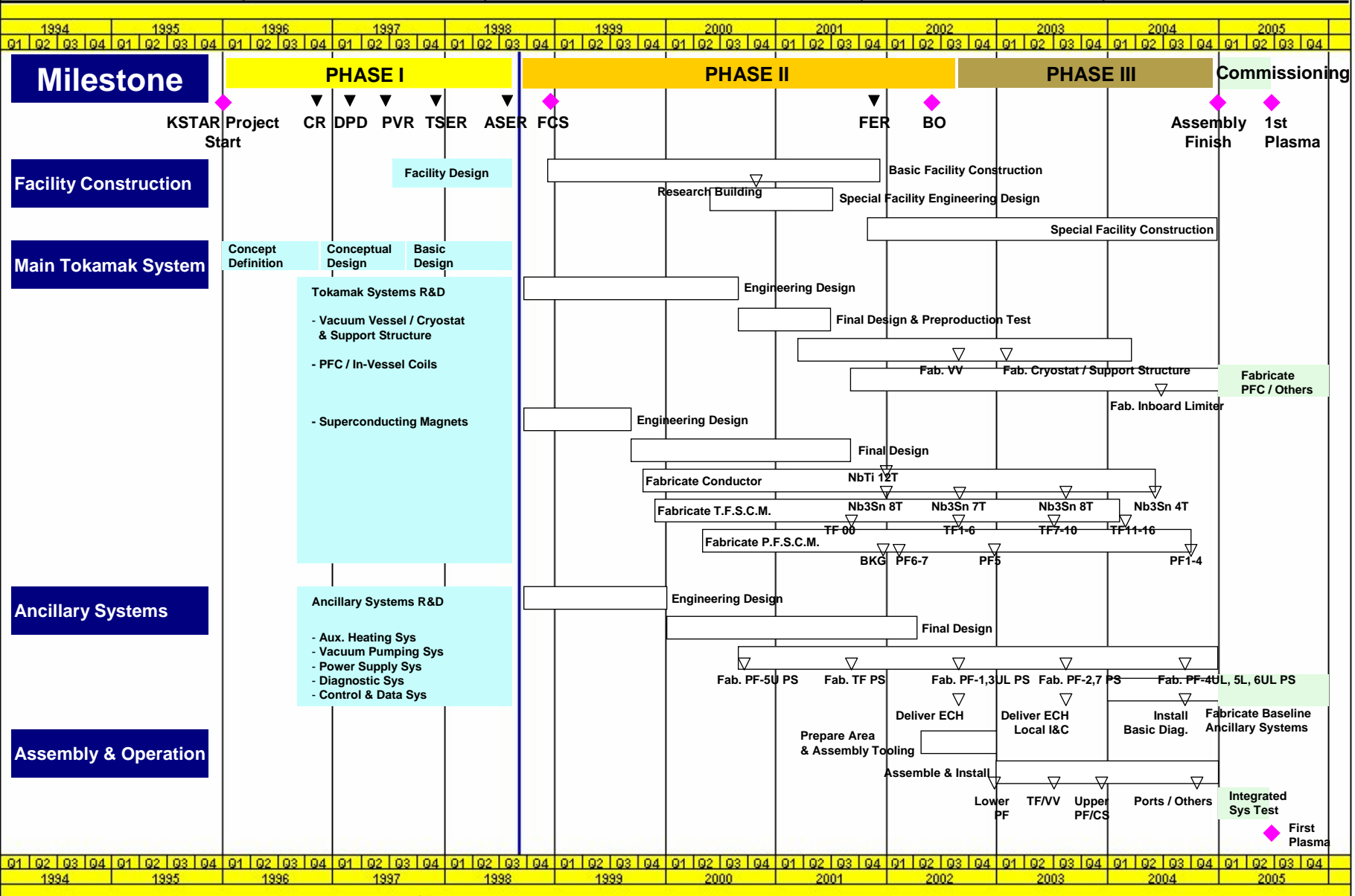


Start Date 951228
Data Date 010531

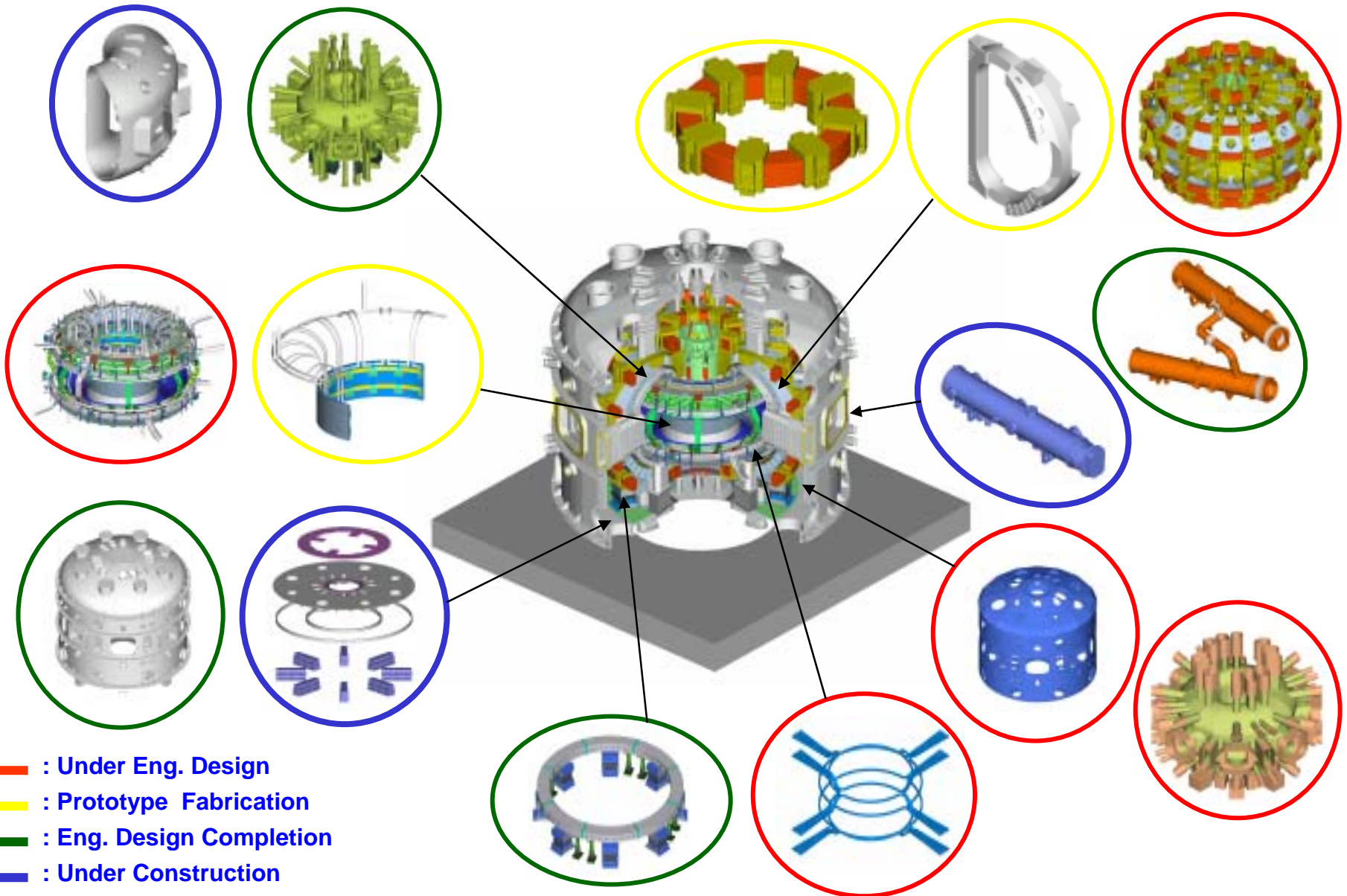


KSTAR SUMMARY SCHEDULE

[Update 3D]

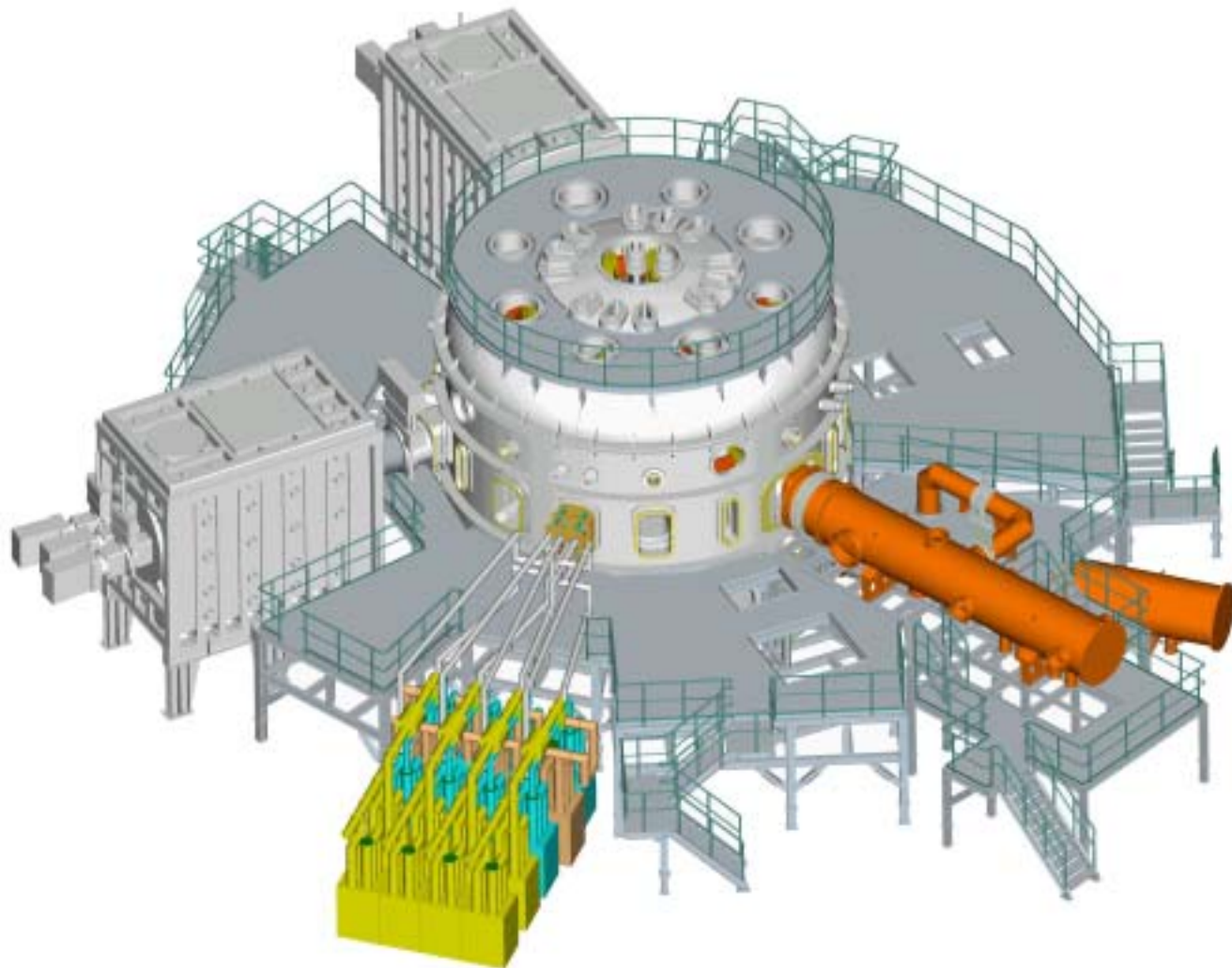


KSTAR Tokamak System Engineering

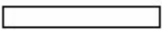

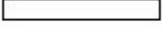


- Orange** : Under Eng. Design
- Yellow** : Prototype Fabrication
- Green** : Eng. Design Completion
- Blue** : Under Construction

KSTAR Tokamak Layout

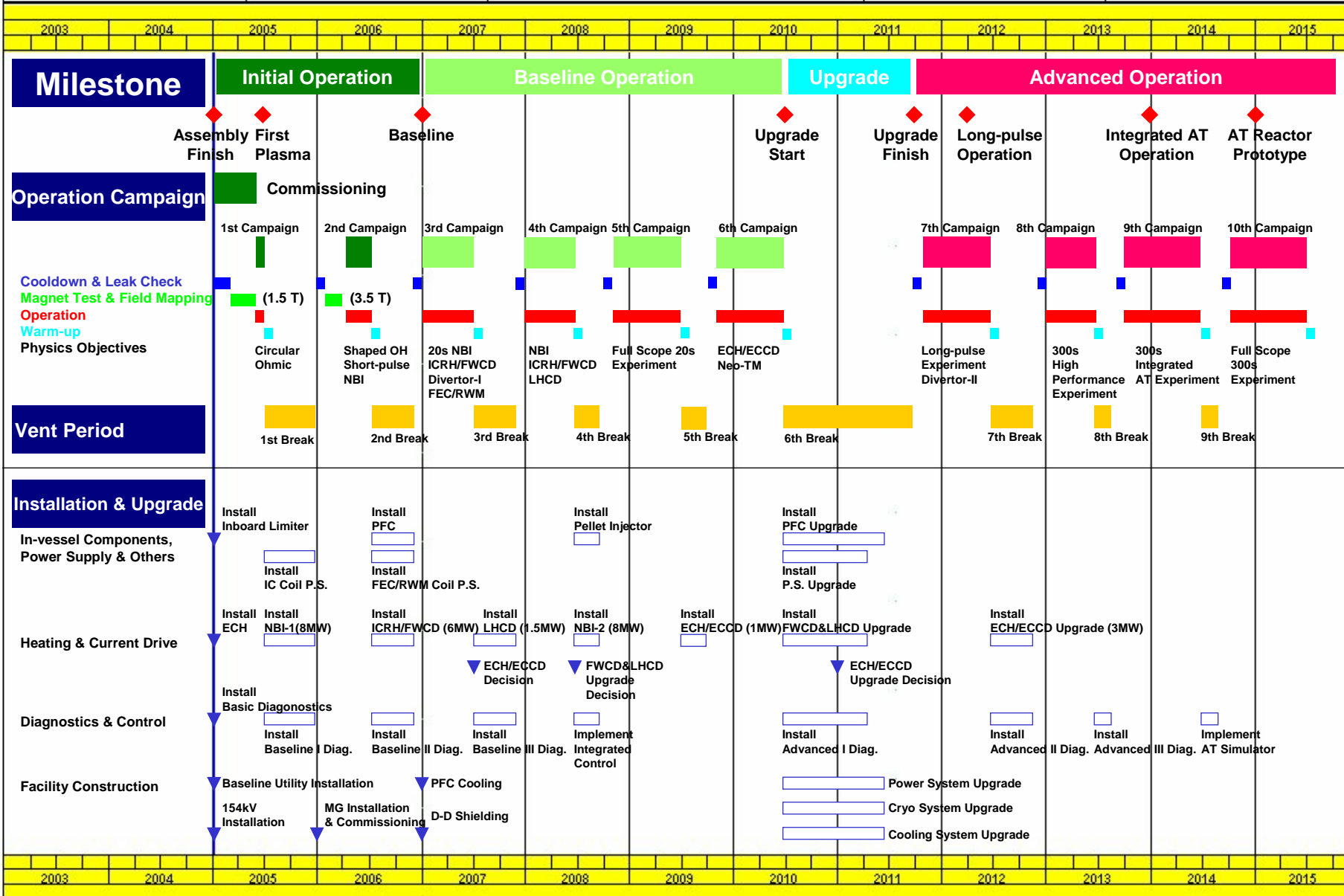


Start Date 050101
 Finish Date 151231

 Plan Bar
 Progress Bar
 Critical Activity

KSTAR OPERATION SCHEDULE

[Update 2]



KSTAR Experimental Building

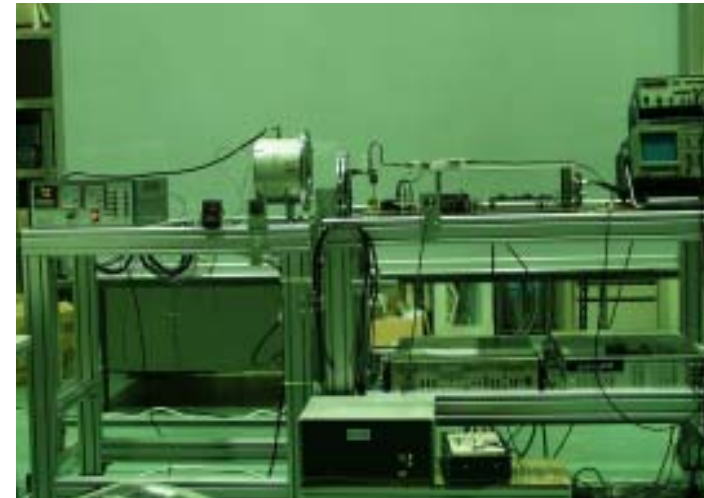


KSTAR Facility Construction Status

November 2001



Diagnosics Development (KBSI, KAERI, KAIST, Univ.)



 서울대학교
SEOUL NATIONAL UNIVERSITY

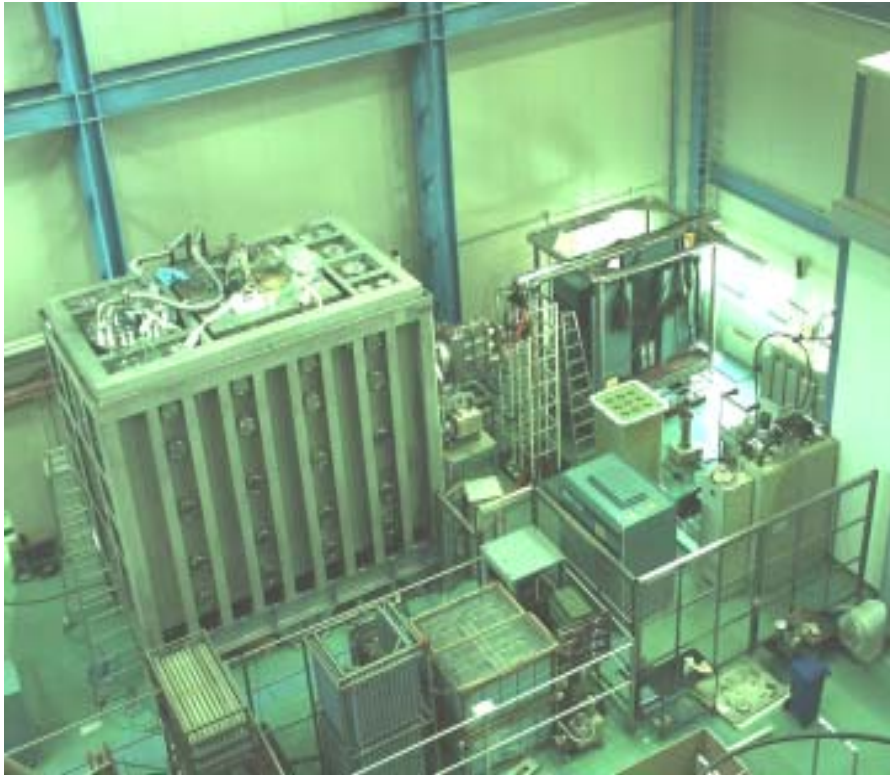


KAIST



Heating System Development (KAERI, POSTech)

RF Heating System



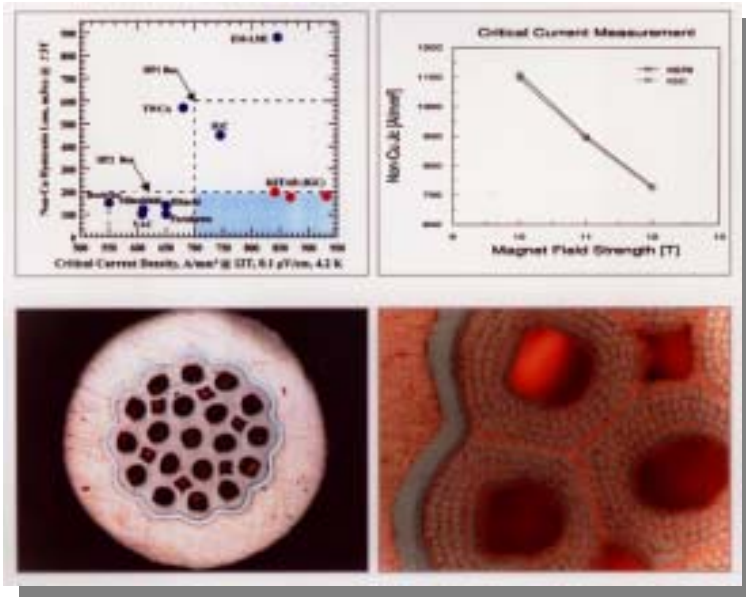
MW System



NBI Heating System



KSTAR SC Magnet Facility (Samsung)



KSTAR SC Magnet Fabrication



KSTAR Vacuum Vessel Fabrication (HYUNDAI)



KSTAR Vacuum Vessel Test



KSTAR Power Supply Fabrication (POSCON)



POSCON




PAL 포항가속기연구소
POHANG ACCELERATOR LABORATORY



KSTAR Project Role in World-wide Fusion Research

The KSTAR project will make critical contributions to the world fusion research and development program.

It will:

-  **Extend advanced tokamak research to high performance and steady state operation regimes.**
-  **Contribute techniques for successful steady state physics operation.**
-  **Compare advanced tokamak physics results with those from superconducting stellarators and spherical tokamaks.**



Utilize KSTAR as “International Fusion Collaboratory” !!

International Collaboration

Governments :

- **U.S. - Korea Cooperation Agreement in the Area of Fusion Energy Research & Related Fields, June, 1996.**

Institutions :

- **Princeton Plasma Physics Laboratory, U.S.A.**
- **Plasma Science & Fusion Center, M.I.T., U.S.A.**
- **National Institute for Fusion Science, Japan**
- **Max-Planck Institute for Plasma Physics, Germany**
- **UKAEA Fusion Culham, U.K.**
- **CEA Cadarache, France**
- **Kurchatov Institute, Russia**
- **Efremov Institute, Russia**
- **Institute of Plasma Physics, Academy of Sciences, China**
- **South West Institute of Physics, China**

International Energy Agency: Implementing Agreement