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China's Fusion Energy program

Xie, Jikang for Institute of Plasma Physics, CAS & South West Physics Institute

Future Energy Demands in China is coming into the national energy strategy. As well known, the estimated 1.6 billion populations in 2050 and meanwhile the fast growth up of economy, the energy demand will increase from near 1B TCE to over 4B TCE in China. Fossil fuel could not meet the huge demands and rapid increment. Fusion is an inevitable option as well as other renewable-energy and hydrogen energy.

One big step towards the fusion energy is to join ITER. China has planed the commitment to ITER. To be a contributive member with other partners to the successful exploitation of fusion energy, we have successively set a domestic MCF program in parallel to ITER mission. That program includes main topics such as R&D for ITER & DEMO technology, solid bases for theory and simulation, foster young scientists and engineers, organizing industry support and a strong steady support from government and public. CN-ITER home team (Hefei & Chengdu branches) has been established. Preliminary CN-Package for ITER includes Feeders, Correction coils, Magnetic supports, CC conductor(7%, 54%), Blanket(20%), Cryostat, Transfer cask, AC-DC converter(35%), Diagnostics(4%), GDC and fueling and TBM.

Recently domestic MCF research program in China are going smoothly. Main devices include HL2A tokamak and HT-7 tokamak. The main parameter of HL-2A Tokamak are $R=1.64\text{m}$, $a=0.4\text{m}$, $B_t=2.8\text{T}$, $I_p=480\text{kA}$. It has started operation with SN divertor configuration with Lower Single Null (LSN) divertor, feedback controlled Plasma current and displacement and CF code Identified plasma boundary.

HT-7 tokamak with $R=1.22\text{m}$, $a=0.27\text{m}$, $I_p=100\text{-}250\text{kA}$, $B_t=1\text{-}2.5\text{Tesla}$ mainly concentrated on steady state high performance research. It has equipped by RF=18-30MHz 350KW CW with IBW & FW antenna, LHCD $f=2.45\text{GHz}$, 1.2MW CW with Multi-junction waveguide grill, 30 diagnostics, SS real time PF control. 4 min discharges ($T_e > 1.0\text{keV}$) has been achieved. Synergy between IBW and LHCD experiment has got Stationary ITB and sustained for $> 20t_{CR}$ during LHCD and IBW.

EAST Superconducting tokamak is under assembly. Its main parameters are $B_T=3.5\text{T}(4.0)$, $I_p=1\text{MA}(1.5\text{MA})$, with intensive LHCD(3.7GHz, 4MW, 2.45GHz, 2MW & 4.6GHz, 4MW), ICRF(20-55MHz, 5MW & 25-110MHz, 5MW) and NBI(80keV, 10MW) heating power. The first test of the cryogenic system and superconductive coils are planed at the end of this year.

The domestic MCF program has been planed for next five year, which shall Speed up the research activity. It includes the following items: operation and continuous improvement EAST, HL-2B research facilities, starting R&D and construction of ITER -CN packages, strengthening the basic plasma science research and education (theory and simulation, new concept and innovative approaches, education for ITER-generation(~ 1000 students in 5 years), starting key technologies for ITER, starting Demo material program.