

Energy Demand and Possible Strategy of Fusion Research in China

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It is predicted by the rapid economic development with 6~10 % annual increase rate and the population growth that at 2050 the population in China will be 1.5 billion; the total GDP will be 6000-12000 billion US\$ and the energy demand will be 5 billion tons of CE and the installed electric capacity will be 1200-1500 GW. So China will face to serious shortage and pollution of energy in near future. The strategy on the development of energy should be at least:

1.The main energy resources in near term will still be the fiscal fuel (coal, gas and oils). The high efficiency and low pollution technologies for using fiscal fuel and the clean and renewable energy resources such as hydrodynamic, solar and wind energy should be strongly supported;

2.The fission power should be developed as more as possible to control the CO₂ and other pollutions on atmosphere. In present the nuclear power is only about 1% of total capacity. So the nuclear power demand in China will be extremely huge in next 20 to 40 years. With the rapid and huge development of fission power China will face to new serious problems: 1) strong limitations on the natural uranium ore. So breeding the fission fuel will be very important; 2) how to transmute the huge amount of long-lived radioactive wastes.

3. So China must support fusion energy development as strong as possible from now. The government has given fusion research strong support via EAST, HL-2A and participant of ITER project. The possible strategy for fusion research in China is:

1) The all missions, especially the steady state operation with higher performance plasma on EAST should be achieved under strong support both by CAS and Chinese government within next 10 years;

2) As one of ITER members China should make great effort on the jointed design, construction and assembly of ITER and then on the burning plasma experiments to make the necessary contribution for the future fusion reactor;

3) Basing on the progresses of EAST, ITER and other international fusion project China should as early as possible begin the conceptual and engineering design of a test reactor which must satisfy three goals at least: **a)** can breed fission fuel, **b)** can transmute large amount of long-lived wastes, **c)** can produce tritium for fusion fuel cycling. The important R&D for some key technologies such as blanket, materials should also begin as early as possible. The test reactor should be constructed around 2020~2030. It may be an advanced tokamak or spherical tokamak and it will be determined by future progress of tokamak and compact torus projects. The test reactor must have multi-functions. The key design will be the changeable blanket for the different functions. Several conceptual designs of the test reactor with different blanket have been done and will be given in this paper.

4) It is hoped that the first fusion power plan based on the progresses of above projects can be constructed and the fusion energy can finally be commercially used in China around 2040~2050.