



IAEA FEC 2014

Contribution ID: 639

Type: Poster

Physics Design and Economic Assessment of a Long-Pulsed Fusion Power Plant

Thursday, October 16, 2014 8:30 AM (4 hours)

A fusion power plant based on long-pulsed operated tokamak fusion reactor was proposed to avoid the issues of steady-state operation of non-inductive current driven methods. The plasma current, excepting the bootstrap current, is only driven inductively to sustain several hours. The burning stage can be sustained by α heating and started by ohmic and radio frequency wave heating methods. Thus, the axillary heating methods was cut in order to save about 1/3 of gross electric power supply to them. With 0.8 of plant capability assumed, the capital cost and cost of electricity (COE) were assessed and minimized to search feasible physics designs with stable power balance and under feasible engineering conditions. The plasma equilibrium and charge evolution were analyzed with TSC (Tokamak Simulation Code) to verify the magnetic flux requirement and stability of self-sustained heating and inductive current driven. The COE was also compared with the case of steady-state operation with sensitivity analysis of duty ratio and efficiency of non-inductive current driven methods. The results indicated that the feasibility of the periodic operated fusion reactor depends on its duty ratio and can be an alternative scenario for future demonstration reactor and fusion power plant.

Paper Number

SEE/P5-15

Country or International Organisation

China

Primary author: Mr CHEN, Dehong (Institute of Nuclear Energy Safety Technology (INEST), Chinese Academy of Sciences)

Co-authors: Dr JIANG, Jieqiong (Institute of Nuclear Energy Safety Technology (INEST), Chinese Academy of Sciences); Dr DUAN, Wenxue (Institute of Nuclear Energy Safety Technology (INEST), Chinese Academy of Sciences); Dr HOU, Yawei (Institute of Nuclear Energy Safety Technology (INEST), Chinese Academy of Sciences); Prof. WU, Yican (Institute of Nuclear Energy Safety Technology (INEST), Chinese Academy of Sciences)

Presenter: Mr CHEN, Dehong (Institute of Nuclear Energy Safety Technology (INEST), Chinese Academy of Sciences)

Session Classification: Poster 5