

Environmental and economical assessment of various fusion reactors by the calculation of CO₂ emission amount

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To estimate environmental and economical burdens of fusion reactors, we calculated life-time CO₂ emission amount and cost of electricity. We assessed several typical fusion reactors which have different confinement systems by PEC system code [1]. The confinement systems we evaluated here are three types of magnet confinement systems (Tokamak Reactor, Helical Reactor and Spherical Tokamak reactor) and some design examples of inertial confinement reactor systems which have different driver systems (KOYO-F, SIRIUS-P and Prometheus-H).

Calculation results of CO₂ emission amount from various fusion reactors are shown in Fig.1. HR needs large superconducting magnet and blanket, therefore CO₂ is emitted during its construction stage. However, HR does not require large re-circulating power so CO₂ emission is small related to its Balance Of Plant (BOP) construction. The Fusion Island (FI) of inertial confinement fusion reactor is so compact that CO₂ emission related to its blanket modules is small. But inertial confinement fusion reactor emits much CO₂ than magnetic confinement fusion reactors from fuel cycle including pellet purification process.

We analysed economical and environmental effects when carbon tax imposed on the CO₂ emission is introduced. Cost of electricity including some carbon tax is shown in Fig.2. This figure shows that carbon tax for fusion reactor is less influential than that for thermal power plant which emits much CO₂.

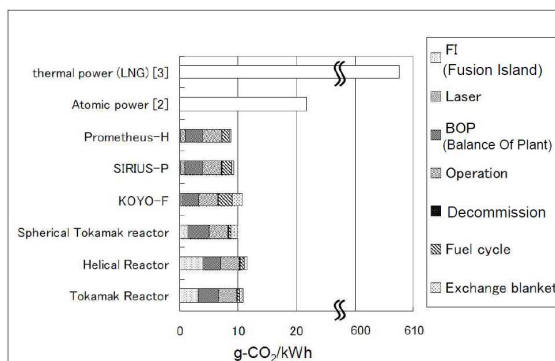


Fig.1 CO₂ emission amount of fusion reactors.

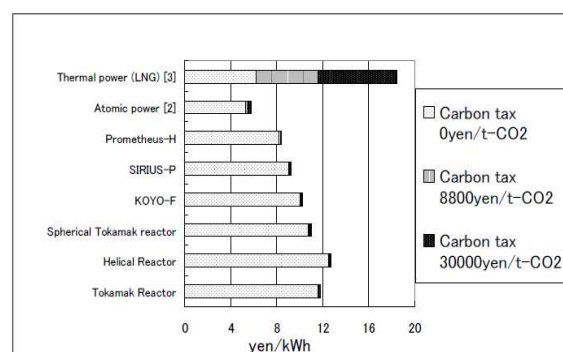


Fig.2 Cost of electricity including carbon tax

[1] K. Yamazaki, T. J. Dolan, Fusion Engineering Design. **81** (2006) 1145.

[2] H. Hondo, Socio-economic Research Center. (2001) Y01006.

[3] H. Hondo, Y. Uchiyama, Y. Moriizumi, Socio-economic Research Center. (2000) Y99009.