

Helical Fusion Power Plant Economics Studies

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The Physics-Engineering-Cost (PEC) Code has been updated to include data from specific blanket-shield designs, a new costing structure, more recent unit costs, and improved algorithms for physics and engineering parameters. For benchmarking the Code has been used to model the ARIES-AT tokamak and the ARIES Stellarator Power Plant Study (SPPS). The Cost of Electricity (COE) variations with various parameters are studied.

The COE is related strongly to the neutron wall load, which can be enhanced by increasing the magnetic field, the output power, or the value of beta. At a given output power level, increasing the value of beta reduces the reactor size, which reduces the energy confinement time, making ignition more difficult. Therefore, the useful value of beta is limited by the ignition condition and the desired output power, in addition to the beta limits from plasma equilibrium and stability.

There is a strong economy of scale, showing that Heliotron power plants can be economically competitive at high power levels, so the siting issues of large power plants are important.