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P2.222 Analysis and possible reduction of fusion plant construction costs

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In fusion plants the overnight cost (capital cost minus financing) is expected to be the main contribution to the cost of electricity. The overnight costs (euro/kWe) for ITER and DEMO are several times higher than the ones of present commercial sources (wind, photovoltaic, fission, coal, gas, ...). It is shown that cost reduction from high learning rates in future commercial plants should not be taken for granted, because of the size and complexity of fusion plants. Therefore, assuming the remaining engineering issues are solved, the economic aspect is highly relevant already at the level of a DEMO plant. In order to identify the main sources of cost in fusion plants, two type of analysis have been considered: in the first approach the costs are subdivided between plant core and auxiliary equipment. In the second one the focus is on the specific material input for the components (quantified in tons of steel per kWe) and the associated specific cost (in euro/ton), which can vary greatly depending not only on type of material but also on the specifications, regulations and quantities (for example competition among suppliers). Comparisons are made with commercial power plants and in particular with fission and coal plants, which share with fusion plants some common features (large capital costs, large components, extensive on-site construction). From both analysis (core/auxiliary equipment and specific material input/specific costs) fusion plants looks clearly more expensive than fission and other commercial plants, mainly because of the low power density and complexity. Nevertheless, the analysis helps to identify some possible paths leading to a reduction in the construction costs, bringing fusion power plant on the way to compete with traditional electricity sources.

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