How much power is needed to start the reactor and to keep it working?

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Q: How much power is needed to start the reactor and to keep it working?

A: JET consumes large amounts of power – for fusion to occur we need to create and maintain plasma at extremely high temperatures. Additionally we need to contain the plasma by energising large magnetic coils. In total, when JET runs, it consumes 700 – 800 MW of electrical power (the equivalent of 1-2% of the UK's total electricity usage!).

Future reactors will use superconducting magnetic coils, which are much more efficient, so they will not expect to use so much power – maybe 200-300 MW of electrical power. They will produce 1-2GW (1000 – 2000 MW) of electricity, whereas JET does not have the set up to harvest any energy produced, as it is not a power reactor, but an experiment.

Read more: Producing pulses (https://www.euro-fusion.org/wpcms/fusion/focus-on/how-to-start-a-fire/thirdly-produce-pulses/)

The power required to keep a reactor working is an interesting question. Energy input is required to keep the plasma hot, because most of the energy produced by fusion is carried away by the neutrons. However 20% is carried by the helium nuclei, which remain within the plasma, so it is possible to reach a point called ignition, at which the production of hot helium is enough to sustain the plasma and the external energy sources can be turned off. It is not clear yet however whether that will be the optimum operating regime in a power plant – being slightly below ignition may give better control of the reactor (while still producing plenty of hot neutrons).

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