Response to "Fusion Power: Will It Come?" By W. E. Parkins

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In the March 10 edition of Science, William Parkins argues that the practical application of fusion is dubious on engineering grounds. His arguments are derived from a study he performed in 1970s and ignores achievements since that time. The latest US study, ARIES-AT[1], arrives at a cost of electricity of ~5 ¢/kWh, comparable to that of coal-fired plants.

Mr. Parkins overestimates the cost of blanket/shield in a fusion device by a factor of ten or more. He uses a heat flux of 0.3 MW/m^2 to estimate the first wall area, citing a pressurized water reactor (which is actually limited by the thermal conductivity of uranium oxide fuel and its maximum temperature and not applicable to fusion). Higher heat fluxes are handled routinely in many industries and in currently operating fusion experiments. Most importantly, in arriving at the cost of the blanket/shield, he ignores the fact that these components include a coolant. In a fusion plant such as ARIES-AT, coolant accounts for over 80% of the blanket volume.

Mr. Parkins' comments regarding the need for periodic replacement of the vacuum vessel are also incorrect. The vacuum vessel of ITER, projected to generate 500 MW of fusion power, is a lifetime component. The innermost ~20cm of the blanket (not the vacuum vessel) need to be replaced on a ~4 year basis, but this is included in the projected cost of electricity.

We do not argue here that all fusion engineering issues are resolved, rather that the challenges are well known, and possible solutions can be found in an extensive body of literature[1]. These challenges should be judged in the context of the immense payoff of developing commercial fusion power with attractive economics, safety, and environmental features.

1) See http://aries.ucsd.edu/ARIES for US studies and links to studies in EU and Japan.

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