Optimising Fusion's Contribution to Economically Efficient Climate Change Mitigation

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The ambience within which fusion development planning is undertaken is changing. Recent publications by the Intergovernmental Panel on Climate Change and by the Stern Review (by the former Vice-President and Chief Economist of the World Bank) have removed most of the residual uncertainties about the reality, causation, pace and cost of climate change. European and Governmental decisions, and demonstrations of public support, have displayed increasing commitment to mitigating climate-changing emissions. It is becoming more widely appreciated that during the second two-thirds of this century continued world economic development, and continued growth in energy consumption, must co-exist with the reduction of carbon emissions to very low levels, and that this will give rise to large political and economic forces. The concluding of the ITER Treaty and the Broader Approach Agreement has removed much uncertainty relating to the near-term steps of fusion development. Concerns over energy security and diversity of supply have also markedly increased.

Thus, it has become reasonable to plan on the assumption that in twenty years time ITER and IFMIF will have been successful and the world will be eager for clean, secure energy supplies. Previously published 'fast track' scenario studies all assumed a sequential model of fusion development, severely constrained by funding. The present paper explores the economic justification for relaxing these assumptions, drawing on the lessons to be learnt from self-consistent energy/environment/economics modelling, and the resulting potential for more rapid, but cost-effective, fusion deployment. This includes the consideration of the acceptability of reduced targets for the economic performance of the first generation of power plants (as might be evinced, for example, by pulsed operation or ITER design-basis plasma physics, lower fluence-limited lifetime for some components, and lower power density), and overlapping of development stages with risks controlled and options held open by broadening of the development stages, for example by several IFMIF and DEMO devices.