

Sustainable Energy Futures, and what we can do about it

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ABSTRACT

Energy underpins every society's ability to meet most of its primary needs. Its demand has been traditionally governed by supply, technology and economics. The new constraint posed by energy's environmental impact is radically changing the playing field, making energy a global issue and one of the key challenges of this century. The scale of this challenge is daunting, and several approaches may be taken.

We will briefly discuss the need for and benefits of taking a very broad view of energy, with emphasis on whole systems and sustainability, in addressing the wide ranging and cross-cutting energy problems that we face. It will be shown how a systems approach, applied to meeting the primary societal needs, gives key, sometimes surprising insights and indicates key directions for technology and policy development.

A series of examples, at various scales of complexity and potential impact, will then be used to highlight the key role of Systems Engineering methodology and tools in improving the efficiency of energy utilisation and in devising new energy supply, conversion, distribution and demand management solutions.

Some of the initiatives undertaken at Imperial College to address the above challenges will be discussed. At the research level, these include a series of large scale, multidisciplinary projects within the Energy Futures Lab. At the teaching level, a new Masters Course in Sustainable Energy Futures has been launched, aimed at meeting the need for skilled people able to take a quantitative, strategic view of energy. The course is highly multidisciplinary, involving academic staff from 11 departments in three faculties. The rationale for the course and its structure will be discussed, together with some key challenges arising from its broad nature and the need to straddle organisational boundaries.

Final comments will address the need for the traditional process systems community to collaborate with researchers in other key disciplines such as biosciences, materials, energy economics and policy, and behavioural sciences.