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Teaching "The Physics of Energy" at MIT

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New physics courses on energy are popping up at colleges and universities across the country. Many require little or no previous physics background, aiming to introduce a broad audience to this complex and critical problem, often augmenting the scientific message with economic and policy discussions. Others are advanced courses, focussing on highly specialized subjects like solar voltaics, nuclear physics, or thermal fluids, for example. About two years ago Washington Taylor and I undertook to develop a course on the "Physics of Energy" open to *all* MIT students who had taken MIT's common core of university level calculus, physics, and chemistry. By avoiding higher level prerequisites, we aimed to attract and make the subject relevant to students in the life sciences, economics, *etc.* — as well as physical scientists and engineers — who want to approach energy issues in a sophisticated and analytical fashion, exploiting their background in calculus, mechanics, and E & M, but without having to take advanced courses in thermodynamics, quantum mechanics, or nuclear physics beforehand. Our object was to interweave teaching the fundamental physics principles at the foundations of energy science with the applications of those principles to energy systems. We envisioned a course that would present the basics of statistical, quantum, and fluid mechanics at a fairly sophisticated level and apply those concepts to the study of energy sources, conversion, transport, losses, storage, conservation, and end use. In the end we developed almost all of the material for the course from scratch. The course debuted this past fall. I will describe what we learned and what general lessons our experience might have for others who contemplate teaching energy physics broadly to a technically sophisticated audience.