

Review of *Sustainable Energy without the Hot Air*, by David MacKay, UIT Cambridge; 384 pages; 2009

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David MacKay's book can be bought or downloaded free from www.withouthotair.com. Irritated by the waffle that often surrounds discussions of energy and climate change, Mr. MacKay, a physicist at Cambridge University, has chosen to illustrate the challenge of breaking our fossil-fuel addiction armed only with the laws of physics, reams of publicly available information and the back of an envelope.

Mr MacKay favours no particular technology. He is concerned only that proposals to decarbonise the economy should add up. But his refreshingly hard-headed approach (confined to Britain, but easily adapted to other countries) comes to some sobering conclusions. Meeting Britain's energy needs from onshore wind power would require covering literally the entire country in turbines, even assuming that the wind was guaranteed to blow. If only 10% of Britain were covered then wind could provide roughly a tenth of total demand. Switching every piece of agricultural land to biofuel production would provide just 12% of the requisite juice.

It is a similar story for offshore wind, tidal and wave energy, all of which make the claims of green advocates that Britain has a "huge" renewable resource look somewhat hollow, especially since the book ignores questions of costs and focuses purely on physical limits. To make a dent in fossil-fuel consumption without using nuclear power, renewable-energy facilities will have to be "country-sized", with offshore wind farms bigger than Wales and huge solar-power arrays in sunny deserts piping power to cloudier nations.

Although Mr MacKay's conclusions are fascinating, much of his book's appeal lies in its methods. Ballpark calculations are a powerful way of getting to grips with a problem. The book is a tour de force, showing, for example, how the potential contribution of biofuels can be approximated from just three numbers: the intensity of sunlight, the efficiency with which plants turn that sunlight into stored energy and the available land area in Britain. As a work of popular science it is exemplary: the focus may be the numbers, but most of the mathematical legwork is confined to the appendices and the accompanying commentary is amusing and witty, as well as informed.

With global climate-change and energy policy consisting mostly of feel-good rhetoric rather than action, Mr MacKay's reminder that the natural world

does not care for political expediency—summed up in Richard Feynman’s famous observation that “nature cannot be fooled”—should be engraved on environment-ministry doors the world over. For anyone seeking a deeper understanding of the real problems involved, “Sustainable Energy—Without the Hot Air” is the place to start