

Sustainable energy update – part 2

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Last week I [blogged](#) on a sustainable energy update on the

book "Sustainable Energy — without the hot air" by the late Professor David JC MacKay. The blog post became too long so I've split it in two. Here continues another look at the book in the light of events... **Aircraft.** Who would have thought it that short haul electric aircraft are under development. Professor MacKay does talk about electric aircraft and describes the energy use of one which is exactly the same as a normal aircraft. He not unreasonably asks if we do have such aircraft are under development then where is the energy going to come from? The only change as I have mentioned before is in battery technology. **Cars.** There has been surprisingly little change here on the face of it. Professor MacKay suggests ranges that are not exceeded today and there are not that many electric cars on the road (although its reached the stage that its not that uncommon to see one). The main changes are in the political and manufacturing drive towards them becoming commonplace. Also the battery technology is undergoing regular incremental improvement and the costs have plummeted and continue to do so. When the book was written with the ranges suggested by Professor MacKay there would have been little room for any passengers or luggage! As we looked at in the last post the multiplier effect of so many items is important and even small improvements in battery technology will make the overall energy use lower. There is one more point that Professor MacKay talks about. That is the use of car batteries to store energy as grid backup. This was in vogue at one point then went out of vogue with the government and now seems to back in. The main problem as we wrote in our book is getting people to sacrifice their car use. What has changed is the cost of batteries has made home storage for people with renewable energy systems a practical possibility. Huge battery systems are also being built as grid storage. **Wind Turbines.** Two things have changed since book was written in the UK. Onshore wind has pretty much been banned to appease nimbys. The second is that offshore wind prices have plunged and electricity is now cheaper than nuclear (one thing he definitely did not foresee although neither did many other people). The reason for this is the size of turbines has increased dramatically. When the book was written most turbines being installed out at sea were probably 2-3MWh peak output. Now we are approaching 15MWh per turbine with 20 being talked about. The question is do these large turbines offer any advantages in terms of space? Turbines upwind interfere with those downwind and put stress on them and lower their power output. In the E-version of the book Professor MacKay does not show his calculations. He comes up with huge areas required. This question has been impossible for me to determine definitively. If people have the figures they are not letting on. An anti-wind site in the US says the answer is that the larger the turbine they need to be spaced relatively further apart. However the academic links given don't reveal this. I think it must be true- its logical. Therefore bigger size does not mean more capacity for a given area, just much lower costs. Predicting a given number of turbines per unit area is a mugs game anyway. This site gave two offshore wind farms which used the same turbine (I looked this up) and the areas were very different, presumably due to the sea bed? There are things that Professor MacKay did not see. One of which is surprising that he did not is that wind turbines are being put in deeper and deeper water. This makes his area availability calculations wrong. As does the use of floating turbines which are also coming along fast. The last thing to say is the load factor (fraction of time turbines operate at full output) for UK offshore wind is almost 40%. No book is perfect and making predictions is never easy (we know). Professor MacKay future proofed some of his predictions but not others. Overall today we can produce more power from less for less money and increasingly store it. The overall conclusion that we cannot switch wholesale to renewables and maintain our current lifestyles is still correct though. We can however get closer than Professor MacKay thought for less money. Neil

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