DESSERTINEE: AN ENERGY TRANSFER REFERENCE CASE

BACKGROUND
National demand for electricity follows a regular and predictable daily pattern. This pattern is set to change due to efficiency improvements, de-industrialisation and electrification of heat and transport, but these changes are not well understood.

Scenarios and roadmaps for energy in 2050 are too coarse to think about the electricity sector, considering only annual averages or a few time slices per year. Other studies simply assume that electricity load curves will retain their current shape, scaling up or down equally in all hours.

European countries are adding a lot of wind and solar generators with variable outputs, further changing the shape of the load to be met by thermal (fossil and nuclear) and hydro plants.

These changes will profoundly affect the electricity industry: increasing the requirements for flexible and peaking capacity, and reducing asset utilisation and profitability. Additional cross-border transmission may be a way to mitigate these effects.

AIMS AND OBJECTIVES
- Develop a model of Europe and North Africa’s energy system in 2050 which can simulate hourly electricity demand profiles and the operation of the intercontinental electricity system.
- Produce a set of scenarios for the electricity transfers between countries in 2050 to help inform planning for an ‘electricity internet’.

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ACHIEVEMENTS

DESSTinEE (Demand for Energy Services, Supply and Transmission in EuropE) is a model of the European energy sector in 2050, going from demand for energy services through to the hourly profiles of demand and generation / transmission of electricity. It is built in Microsoft Excel and is free to download from http://tinyurl.com/desstinee.

The model is populated with typical decarbonisation scenarios from the IEA, European Commission, and others. These have been used to show that a future with large energy efficiency improvements and switching to electric heating and transport will have significant impacts on the shape of the load curve. In Britain, peak demand is modelled to grow at twice the rate of annual energy demand, rising to 92 GW by 2050. This is very sensitive to the rate of electrification: a million extra heat pumps or electric vehicles add up to 1.5 GW to peak demand.

The market impacts of a new transmission line between Norway and the UK have been studied, revealing the impact on prices and the economically feasible capacity that could be installed.

IMPACT


Collaboration with Bamise Olanrewaju (Cardiff) and Danny Pudjianto (Imperial).