



Benefits of a European-North African renewable energy supergrid

Connecting Europe and North Africa with a single, long-distance electricity 'supergrid' is technically possible and the cheapest option available to meet Europe's renewable energy targets, according to new research. However, significant political challenges, such as minimising the perception of risk and attracting sufficient investment, need to be overcome.

Although investment in renewable energy (e.g. wind, solar and biomass) varies widely across Europe, the average annual growth in renewable energy development in the EU between 1990-2007 was just 3.2% - far below what is needed to meet the binding target of generating 20% of energy from renewable sources by 2020¹.

In this study, researchers analysed model simulations of electricity costs and supply from previous studies and carried out extensive interviews with stakeholders to investigate how combining renewable energy output in a supergrid across the EU, Middle East and Northern Africa could overcome several major issues cost-effectively. Europe's potential for renewable energy could be increased by a factor of 100 with the introduction of the supergrid, according to the research. This could be achieved by selecting the most productive sites for solar and wind energy production, thereby lowering costs and increasing cost-efficiency. For example, model simulations suggest that with all other factors being equal the cost of photovoltaic (PV) solar energy production in North Africa would be approximately one third of that in Germany, the current world leader in installed PV capacity.

Currently, the electricity demand from users in any single country fluctuates daily between peak and off-peak times and also seasonally, depending on the geographical region. Equally, wind and solar energy generation is variable in nature, making it difficult to ensure supply meets demand at all times. Model simulations suggest that a trans-Mediterranean supergrid could level the variability in demand by encompassing several time zones and by balancing higher electricity demand in the north in winter with higher demand in the south in summer.

The variability of renewable energy supply could also be greatly reduced by inter-connecting power plants across different regions. Northern Europe is windiest in winter, whereas in North Africa is windiest in summer, which, when combined, increases the minimum available wind capacity all year round. A sensible combination of solar (PV and Concentrated Solar Power, where concentrated heat from the sun is used to drive a steam turbine connected to an electric power generator) and wind power will also help keep the overall supply relatively constant. For example, northern Europe and Spain generate 40% as much wind power in July as in January, but this is compensated by solar production in Spain and North Africa, which is two and a half times higher in July than January. The potential to store heat produced by CSP plants over short timescales (a day or so) also reduces the need for expensive electricity storage options or alternative energy supplies.

Model simulations indicate that to produce 100% renewable power, Germany could save approximately €0.045 per unit of energy (kWh) under a supergrid system. This is mainly achieved by topping up during periods of peak demand with relatively cheap renewable energy produced elsewhere, rather than relying on relatively more expensive biomass or biogas sources.

Various issues need to be overcome before a supergrid system could be implemented. Firstly, more research is needed into how supportive North African governments, companies and citizens would be of a supergrid system. Secondly, bureaucratic complexities and the perceived risk of corruption are disincentives for investment in North African renewable energy, which the researchers say could be resolved without increasing government spending. Finally, any potential risk to Europe associated with terrorism and intentional supply cuts needs to be considered.

1. See: http://ec.europa.eu/clima/policies/package/index_en.htm

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