

DESERTEC and the UK¹

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There are several reasons why Desertec² developments can be beneficial for the UK. The following sections summarise the potential benefits from a UK perspective, provide answers to some of the questions that people raise about the Desertec concept, and suggest things that it would be useful for the government to do.

1 Benefits for the UK

1.1 Indirect benefits

With or without imports of 'desert' power into the UK:

- The worldwide potential of the Desertec concept is colossal: *it is probably the single most effective means of cutting worldwide emissions of CO₂*.³ Since we are all at risk from climate change, this in itself provides a good reason to promote the concept.
- The Desertec project will create many business opportunities for "UK plc", with corresponding potential for the creation of new jobs in the UK.⁴
- Since electricity from concentrating solar power (CSP) is expected to become one of the cheapest sources of power in Europe (including the cost of transmission),⁵ imports of solar power from the Middle East and North Africa (MENA) can help to hold down the cost of electricity throughout Europe.⁶
- Flooding the world market with relatively cheap supplies of clean energy means fewer worries about the security of energy supplies or about the risks of conflict over "a global grab for energy".
- Increased diversity of renewable energy supplies means increased energy security for everyone.
- There are several potential benefits for the UK from the proposed HVDC supergrid spanning the whole of Europe, the Middle East and North Africa (EUMENA). These

¹ An electronic copy of this document, with live links, may be downloaded from <http://www.trec-uk.org.uk/resources.htm#PDFdocs>.

² The DESERTEC concept is described at <http://www.trec-uk.org.uk/> and <http://www.desertec.org/>.

³ Using the proven technology of concentrating solar power (CSP), less than 1% of the world's deserts could generate as much electricity as the world is now using. Using low-loss HVDC transmission lines, it is feasible and economic to transmit electricity for 3000 km or more. It has been calculated that 90% of the world's people live within 2700 km of a desert.

⁴ There are already several companies with a presence in the UK that have DESERTEC-related knowledge and skills. They are marked 'UK' the list of companies that can be seen on <http://www.trec-uk.org.uk/links/commercial.htm>.

⁵ See the 'TRANS-CSP' report from the German Aerospace Centre (DLR) which may be downloaded from <http://www.trec-uk.org.uk/reports.htm>.

⁶ The EC is working to create a single market for electricity throughout Europe. With that in place, imports of inexpensive power into Europe will help to hold down the price of power in all parts of Europe, including the UK.

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include reduced wastage of power, increased security of supplies, and the smoothing out of peaks and troughs in supply and demand.⁷

- By helping to raise living standards in developing countries,⁸ Desertec can reduce tensions arising from poverty and immigration. Of particular interest is the potential to use waste heat from power generation for the desalination of sea water.
- The Desertec concept can help improve relations between different groups of people. It is the basis of the ‘Mediterranean Solar Plan’, one of the projects of the Union for the Mediterranean that have been established as win-win collaborations that can help improve relations between people—in much the same way that the European Coal and Steel Community helped to develop cooperation within Europe.

1.2 Direct benefits

Apart from the indirect benefits just described, the UK may benefit more directly from Desertec developments by importing power from MENA or southern Europe or both. In principle, any customer in the UK should be able to buy ‘desert’ electricity directly from any supplier in MENA or southern Europe. It appears that, within Europe, that kind of single market for electricity is now largely complete.

Physical imports would of course help the UK meet its energy needs, they would help to diversify our sources of energy (reducing our dependence on more polluting and possibly less secure sources of energy such as imported gas), and they would help to hold down the price of power in the UK.⁹

Physical or virtual imports should count towards the UK’s agreed target of meeting 15% of its energy supplies from renewable sources by 2020, and they should also count towards agreed targets for cutting CO₂ emissions.

2 Questions

Here, in the following subsections, are answers to some of the questions that are asked about the Desertec concept.¹⁰

2.1 Aren’t CSP developments something for the future?

No, things are happening *now*:

- The PS10 and PS20 CSP plants are already in operation near Seville in Spain and the Andasol 1 CSP plant near Granada has also recently come on stream. Other CSP plants are operating in California, Australia and elsewhere around the world. More CSP plants are under construction in Spain, Morocco, Algeria, Egypt, Israel, and elsewhere—and many more are being planned around the world.¹¹

⁷ See “Supergrid costs and benefits” (PDF, 49 KB, http://www.trec-uk.org.uk/resources/supergrid_costs1.pdf) and http://www.trec-uk.org.uk/elec_eng/grid.htm.

⁸ See <http://www.trec-uk.org.uk/csp/bonuses.htm>.

⁹ As previously noted, it is anticipated that CSP will become one of the cheapest sources of power in Europe, including the cost of transmission.

¹⁰ There is a much fuller set of FAQs, with links to answers, on <http://www.trec-uk.org.uk/faqs.html>.

¹¹ See, for example, “Morocco unveils \$9 bln solar power scheme” (Reuters, 2009-11-03, <http://af.reuters.com/article/investingNews/idAFJJOE5A202D20091103>) and “Morocco to take bids for first 500MW Saharan CSP plant” (Recharge News, 2010-01-07, <http://www.rechargenews.com/energy/solar/article202819.ece>). Details of CSP projects around the world may be seen on Google Earth via a link from http://www.trec-uk.org.uk/resources.htm#CSP_GE.

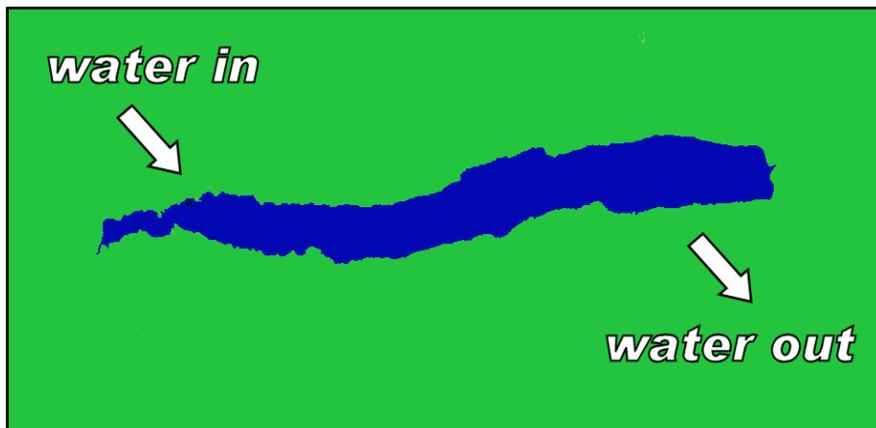
- A consortium of blue-chip companies, the Desertec Industrial Initiative, has been formed with the declared intention of implementing the Desertec concept, much as described in [1, 2].¹²
- The Union for the Mediterranean¹³ has initiated a “Mediterranean Solar Plan” that has been inspired by the Desertec concept.
- The World Bank is already providing funding for CSP plants that are under construction in Morocco, Egypt and Mexico, and it is likely that more projects will be funded by the bank in the future.¹⁴
- Five CSP companies feature in the “Global Cleantech 100”, a list of 100 clean technology companies that have been identified by a panel of experts as global leaders.¹⁵

CSP plants can be built in 2 or 3 years. Build times are likely to decrease as designs are rationalized to facilitate speedy construction.

It is true that priority should be given to the needs of people in the host countries but, with the right political and financial impetus, it should be possible to develop the local and export markets in parallel.

2.2 Aren't the deserts of the Middle East and North Africa too far away to be relevant to the UK?

2.2.1 The cascading principle



¹² See <http://www.desertec.org/en/actions/events/desertec-industrial-initiative-assembly/>. Some of the many news reports may be viewed via links from http://www.trec-uk.org.uk/highlights.html#munich_re. Founding members of the DESERTEC Industrial Initiative are ABB, ABENGOA Solar, Cevital, Deutsche Bank, E.ON, HSH Nordbank, MAN Solar Millennium, Munich Re, M+W Zander, RWE, SCHOTT Solar, and SIEMENS.

¹³ See http://en.wikipedia.org/wiki/Union_for_the_Mediterranean.

¹⁴ See “WORLD BANK GROUP: Over \$5.5 billion in new investment for clean energy technology in the Middle East and North Africa region” (TradingMarkets.com, 209-12-10, <http://www.tradingmarkets.com/.site/news/Stock%20News/2714216/>).

¹⁵ See <http://www.guardian.co.uk/globalcleantech100/cream-low-carbon-ideas>. The five CSP companies are [Bright Source Energy](#), [Concentrix Solar](#), [GreenVolts](#), [Infinia Corporation](#), and [Solel Solar Systems](#).

It is not necessary for electrons to travel all the way from the Middle East or North Africa to the UK. In some ways, a transmission grid is like a lake, as shown in the figure: it is possible to tip water into one end of a lake and take the same amount of water out from the other end so that, in effect, the water has been ‘transferred’ along the length of the lake. In a similar way, solar electricity imported into southern Europe can produce an immediate benefit for countries throughout Europe.¹⁶

2.2.2 Low-loss ‘HVDC’ transmission

The cascading principle, just described, reduces the need for long-distance transmission but does not eliminate it. Where long-distance transmission is required, this can be done efficiently using high-voltage direct-current (HVDC) transmission lines. With transmission losses at about 3% per 1000 km, plus AC/DC conversion losses up to 2% (taking both ends together), HVDC transmission losses over the 2000 km between North Africa and the UK would be less than 10%.

2.3 Won’t the UK have to wait until the HVDC supergrid has been built?

Imports may begin quite soon using the existing transmission grid. As the quantities of electricity increase, the grid may be upgraded by removing bottlenecks, and by installing smart electronics and high-voltage direct-current (HVDC) transmission technologies.¹⁷

2.4 What about the security of energy supplies?

There are several reasons why the Desertec scenario would provide *greater* energy security for the UK and the rest of Europe than what we have now. These are summarised in a short document “Desertec: security of energy supplies”¹⁸ and in a web page with the same name.¹⁹

2.5 Isn’t this all going to be very expensive?

In the ‘TRANS-CSP’ scenario up to 2050, it is estimated that it would cost about €350 billion to build 100 GW of CSP capacity and about €45 billion to build the EUMENA-wide HVDC transmission grid [1, p 77].

Of course, these are large sums of money but we have to remember that power plants of all kinds wear out after about 30 or 40 years and need to be replaced. Over the 40-year period between now and 2050, it is likely that similar sums of money would need to be spent in replacing old power plants with new ones and in maintaining and upgrading transmission grids. The total cost of the TRANS-CSP scenario is unlikely to be any more than “business as usual” and may well be cheaper (see below). And, of course, it would mean big cuts in emissions of CO₂ and other pollutants.

¹⁶ See “The cascading principle”, http://www.trec-uk.org.uk/elec_eng/cascade.html.

¹⁷ See “Kick-start and upgrade” (PDF, 128 KB), http://www.trec-uk.org.uk/resources/kick_start1.pdf.
See also http://www.trec-uk.org.uk/elec_eng/kickstart.html.

¹⁸ See http://www.trec-uk.org.uk/resources/desertec_security2.pdf (PDF, 45 KB).

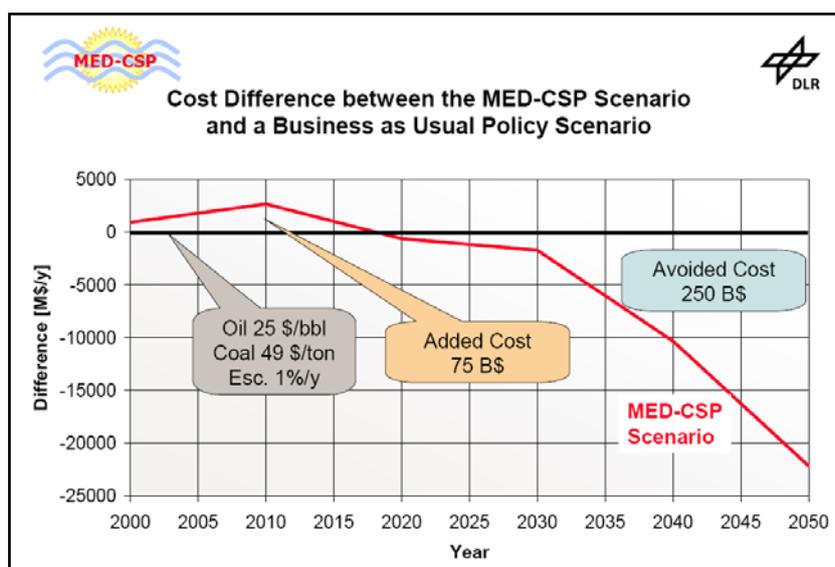
¹⁹ See <http://www.trec-uk.org.uk/csp/security.htm>.

2.5.1 CSP costs

Taking account of environmental and hidden costs, CSP is cheaper than nuclear power,²⁰ it is probably already cheaper than electricity from “clean” coal,²¹ and it is likely to become one of the cheapest sources of electricity throughout Europe.^{22,23}

As volumes increase, CSP costs will fall via economies of scale and via refinements in CSP technologies and in processes for their manufacture and installation. Meanwhile, the cost of electricity from fossil fuels and from nuclear power is on a rising trend.

The following chart²⁴ shows how, after an initial period where public support will be required, CSP will become cheaper than electricity from fossil fuels and its relative advantage will increase over time.



It is pertinent to note that the ‘TRANS-CSP’ estimate from 2006 which was quoted above (€350 billion to build 100 GW of CSP capacity) may already be out of date. A lower cost per watt is now quoted for some CSP projects.²⁵

2.5.2 Supergrid costs

As previously mentioned, the estimated cost of a EUMENA-wide HVDC Supergrid is €45 billion. If these costs are shared amongst 30 or more countries and spread over about 10 years, then *the average annual expenditure by any one government would be €150 million or less*. Much of the cost may be met by private investors.²⁶

²⁰ When all the hidden costs are added in, nuclear power is one of the most expensive sources of electricity (see <http://www.mng.org.uk/nsubsidies.pdf>).

²¹ US venture capitalist Vinod Khosla says that CSP is *already* cheaper than electricity from “clean” coal and it is likely that it will soon be cheaper than electricity from “dirty” coal.

²² In [1], it is calculated that CSP in desert regions is likely to become one of the cheapest sources of electricity throughout Europe, *including the cost of transmission*. Google Inc has identified CSP as a key technology in its project to develop “Renewable Energy Cheaper than Coal” (“RE<C”).

²³ More information about the cost of CSP may be seen on <http://www.trec-uk.org.uk/csp/costs.htm>.

²⁴ From [2].

²⁵ See <http://www.trec-uk.org.uk/csp/costs.htm#watt>.

²⁶ For example, the investment company Imera has announced a €4.4 billion plan to start building a pan-European electricity grid composed of submarine cables (see http://sev.prnewswire.com/utilities/20090202/3828897en_iCrossing02022009-1.html).

Quite apart from the transmission of ‘desert’ electricity, there are several other benefits from large-scale transmission grids, including reductions in wastage of electricity, smoothing out variations in supply and demand over a large area, and strengthening the security of energy supplies.²⁷ In general, supergrids appear to be good value for money.²⁸

3 What the UK government can do

Things that national governments and the EC can do to promote Desertec developments in EUMENA are described in a short document “Clean power from deserts: what governments can do”.²⁹ In brief:

- Remove overt or hidden subsidies for established sources of energy.
- Ensure that a proper price is paid for emissions of CO₂.
- Provide a good framework of incentives to bring forward renewable sources of energy.
- Ensure that there is a well-functioning single market for electricity throughout Europe or, better, EUMENA.
- Support the creation of a EUMENA-wide HVDC Supergrid.

A Desertec team in the Department of Energy and Climate Change would be a useful focus for the development of Desertec-related policies and for Desertec-related collaboration with the UK’s international partners.

4 Bibliography

[1] “Trans-Mediterranean interconnection for concentrating solar power”, the “TRANS-CSP” report, German Aerospace Centre (DLR), 2006. A copy may be downloaded via links from <http://www.trec-uk.org.uk/reports.htm>.

[2] “Concentrating solar power for the Mediterranean region”, the “MED-CSP” report, 2005. A copy may be downloaded via links from <http://www.trec-uk.org.uk/reports.htm>.

²⁷ See http://www.trec-uk.org.uk/elec_eng/grid.htm.

²⁸ See “Supergrid costs and benefits” and “Interstate transmission superhighways: paving the way to a low-carbon future” which may be downloaded from <http://www.trec-uk.org.uk/resources.htm#PDFdocs>.

²⁹ This may be downloaded from <http://www.trec-uk.org.uk/resources.htm#PDFdocs>.