

# COMMENTARY ON “UK RENEWABLE ENERGY STRATEGY CONSULTATION” FROM THE DEPARTMENT OF BUSINESS, ENTERPRISE AND REGULATORY REFORM, JUNE 2008

## TREC-UK

September 2008

### 1 Introduction

These comments on the renewable energy strategy consultation from DBERR [DBERR2008] are from TREC-UK, a group of volunteers based mainly in the UK who are working to raise awareness of the DESERTEC concept developed by the “TREC” international network of scientists and engineers.<sup>1</sup>

As of September 2008, TREC-UK has over 140 members. In order to ensure that these comments represent the opinions of the whole group, they have been circulated to the group with a request for comments or suggestions. After a cycle of revisions and further comments, the document has been circulated to the whole group again to ensure that everyone is happy that the document represents the opinions of the group.

Since conservation of energy and renewable forms of energy will often be referred to together, we shall, for sake of brevity, use the word *conren* to stand for them both. For the same reason, the UK renewable energy strategy consultation document will be referred to as *stratcon*.

### 2 Concentrating solar power and the DESERTEC concept

In his speech to the inaugural meeting of the Union for the Mediterranean in Paris on the 13<sup>th</sup> of July 2008, Gordon Brown said:

*... in the Mediterranean region, concentrated solar power offers the prospect of an abundant low carbon energy source. Indeed, just as Britain's North Sea could be the Gulf of the future for offshore wind, so those sunnier countries represented here could become a vital source of future global energy by harnessing the power of the sun. So I am delighted that the EU is committing at this summit to work with its neighbours—including Egypt, Jordan, Morocco and the League of Arab States—to explore the*

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<sup>1</sup> The TREC website is at [www.desertec.org](http://www.desertec.org) and the TREC-UK website is at [www.trec-uk.org.uk](http://www.trec-uk.org.uk). The Coordinator of TREC-UK is Dr Gerry Wolff Phd CEng (+44 (0) 1248 712962, [gerrywolff65@gmail.com](mailto:gerrywolff65@gmail.com)). All correspondence should be sent to him.

*development of a new 'Mediterranean Solar Plan' for the development and deployment of this vital technology from the Sahara northwards.*

Despite this emphatic endorsement by the Prime Minister of concentrating solar power (CSP) and its potential, and despite the fact that it has now been endorsed by several other high-profile individuals and organizations,<sup>2</sup> *there is no mention of it in stratcon.*

CSP in desert regions, coupled with transmission of electricity throughout EUMENA<sup>3</sup> are key elements in the 'DESERTEC' concept developed by the 'TREC' group of scientists and engineers.<sup>4</sup> Here are some of the reasons why these ideas are relevant to the UK and should be part of the UK's energy strategy:

- *The DESERTEC concept is credible.* It requires only proven technologies that are available now. The concept is backed by detailed research at the German Aerospace Centre (DLR), the US Department of Energy, and elsewhere.
- *The quantities of clean energy that are available are colossal.* Using CSP, less than 1% of the world's deserts could generate as much electricity as the world is now using.<sup>5</sup>
- Concentrating solar power (CSP) is *already* feeding electricity into the European transmission grid.<sup>6</sup> CSP plants are quick to build and capacity may be ramped up fast.
- *The UK may start to benefit from CSP quite soon.* It is not necessary to wait until the proposed HVDC Supergrid has been completed. The UK may receive solar imports indirectly via a 'cascading' principle using the existing transmission grid.<sup>7</sup> As the quantities of electricity increase, the existing transmission grid may be upgraded by removing bottlenecks, by introducing "FACTS" technologies, by converting existing HVAC lines to HVDC, and by building new HVDC transmission lines.<sup>8</sup> The end result will be the creation of the Supergrid but the UK may start to benefit from CSP imports using the existing transmission network.
- CSP in desert regions can provide power that is clean, safe, plentiful, inexhaustible, globally distributed, technologically proven, quick to build, dispatchable (available on demand), not dependent on scarce materials or dwindling supplies of fuels, and with a good EROEI.<sup>9</sup> *Few other sources of power have so many positive features.* A particular point is that CSP plants with heat storage and hybridisation with gas firing can deliver any combination of base-load power, intermediate load, and peaking power, and this flexibility can be a particular benefit in ironing out variations in supply and demand.

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<sup>2</sup> See <http://www.trec-uk.org.uk/endorsements.html>.

<sup>3</sup> See Section 3.

<sup>4</sup> A relatively short summary of the DESERTEC concept may be seen on <http://www.trec-uk.org.uk/index.htm>. There is an even shorter summary on [http://www.trec-uk.org.uk/csp/in\\_brief.htm](http://www.trec-uk.org.uk/csp/in_brief.htm).

<sup>5</sup> This calculation has been made by researchers at the DLR and has been confirmed to Gerry Wolff in a personal communication from Dr Franz Trieb, project manager for the TRANS-CSP and MED-CSP reports [TCSP2006 and MCSP2005].

<sup>6</sup> "PS10 solar power tower", Wikipedia, [http://en.wikipedia.org/wiki/PS10\\_solar\\_power\\_tower](http://en.wikipedia.org/wiki/PS10_solar_power_tower).

<sup>7</sup> See [http://www.trec-uk.org.uk/elec\\_eng/cascade.html](http://www.trec-uk.org.uk/elec_eng/cascade.html).

<sup>8</sup> See [http://www.trec-uk.org.uk/elec\\_eng/kickstart.html](http://www.trec-uk.org.uk/elec_eng/kickstart.html).

<sup>9</sup> "Energy Return on Energy Invested". The energy payback time for CSP plants is about 6 months.

- Taking account of environmental and hidden costs, CSP is cheaper than nuclear power,<sup>10</sup> it is probably already cheaper than electricity from “clean” coal<sup>11</sup> and it is likely to become one of the cheapest sources of electricity throughout Europe.<sup>12</sup> CSP costs are falling while the cost of electricity from fossil fuels and from nuclear power are both rising.
- Because the energy potential of deserts is so large, the DESERTEC scenario can increase the energy security of all countries around the world by helping to head off the worst effects of “peak oil,”<sup>13</sup> “peak coal”<sup>14</sup> and the anticipated “global grab for energy.” In the scenario for Europe up to 2050 proposed in the TRANS-CSP report from the DLR [TCSP2006], there would be an overall *reduction* in imported sources of energy and an *increase* in the diversity of sources of energy, with CSP imports providing only a part of Europe’s electricity. In this scenario, *the entire renewable energy supply system would be significantly more secure than what we have now*. There is more about security of energy supplies under the DESERTEC scenario at [www.trec-uk.org.uk/csp/security.htm](http://www.trec-uk.org.uk/csp/security.htm).

More information about the DESERTEC concept may be found on [www.desertec.org](http://www.desertec.org) and [www.trec-uk.org.uk](http://www.trec-uk.org.uk).

## ***2.1 Imports of renewable energy into the EU and the UK***

Since the DESERTEC proposals involve imports of renewable energy into the EU, it is important to consider how this relates to the EU renewable energy target for each country in the EU. In that connection, stratcon says (para. 22):

*A particular issue under discussion is whether trading with other EU member states or investment in renewable projects outside the EU should be allowed to count towards the target. The measures set out in this document relate to increasing renewable deployment in the UK. But because the cost of renewables projects in some other countries (both within and outside of the EU) are lower than the cost in the UK, allowing a specified and limited proportion of our target to be delivered abroad would make the task significantly less expensive – we estimate that trading one percentage point of the target could save 15 to 20% of the costs of meeting the target domestically, with a correspondingly lower impact on energy prices. Supporting the deployment of renewables outside the EU could also provide investment in clean energy technology in poorer countries. We want to hear your views about the extent to which we should seek to use such opportunities.*

<sup>10</sup> 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/gh/no\\_nukes.htm](http://www.mng.org.uk/gh/no_nukes.htm)).

<sup>11</sup> Speaking about CSP at the Solar Power 2006 conference in California, US venture capitalist Vinod Khosla said “... we are poised for breakaway growth—for explosive growth—not because we are cleaner [than “clean” coal-fired electricity] but because we are cheaper. We happen to be cleaner incidentally.”

<sup>12</sup> The TRANS-CSP report from the German Aerospace Centre (DLR) [TCSP2006] calculates that CSP in desert regions is likely to become one of the cheapest sources of electricity throughout Europe, *including the cost of transmission*.

<sup>13</sup> “Steep decline in oil production brings risk of war and unrest, says new study”, The Guardian, 2007-10-22, <http://www.guardian.co.uk/business/2007/oct/22/oilandpetrol.news>. See also *The Last Oil Shock* by David Strahan, 2007, ISBN-13: 978-0719564239.

<sup>14</sup> “Coal: bleak outlook for the black stuff,” David Strahan, *New Scientist*, 2008-01-19, pp 38-41.

In relation to the issues raised in that paragraph, the TREC group is clear on two points:

- Renewable energy that is produced outside the EU and delivered to consumers that are *outside* the EU (eg wind energy in China) should *not* count towards any EU target for renewable energy.
- Renewable energy that is produced outside the EU and delivered to consumers *within* a given country within the EU *should* count towards the renewable energy target for that country.

We agree with both points. By extension, we believe that it makes sense for renewable energy that is produced within one country within the EU and delivered to consumers in another country within the EU *should* count towards the renewable energy target for the country in which the consumers reside. Of course the trading of renewable energy between countries throughout the EU is implicit in the idea of a single European market for energy, something that is being strongly promoted by the European Commission and the UK government and is taking shape now.

### 3 The Supergrid concept

As was mentioned in the previous section, a key part of the DESERTEC concept is the transmission of electricity throughout EUMENA. Although stratcon contains a brief reference to the idea of building grid connections between offshore wind farms in UK waters to those in the seas of other countries within Europe, and to increasing the amount of interconnection between the UK grid and the European grid (para. 3.6.25) there is no recognition of the substantial benefits that may accrue to the UK and other countries throughout the EU or EUMENA from building a large-scale HVDC Supergrid across the whole of the EU or EUMENA, as described in the TRANS-CSP report from the DLR [TCSP2006].<sup>15</sup> In that connection, EU energy commissioner Andris Piebalgs has endorsed Airtricity's proposal<sup>16</sup> for a Europe-wide Supergrid composed entirely of submarine HVDC cables.<sup>17,18</sup>

In general, the benefits of a transmission grid increase with the geographical spread of the grid. A relatively small grid such as the one that serves the UK can yield some useful benefits. But greater benefits may be obtained by the creation of a Supergrid across a larger region.

#### 3.1 Benefits

The main benefits are:

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<sup>15</sup> Other proposals for large-scale HVDC Supergrids are described on [http://www.trec-uk.org.uk/elec\\_eng/grid.htm#large\\_scale\\_grids](http://www.trec-uk.org.uk/elec_eng/grid.htm#large_scale_grids).

<sup>16</sup> See [http://www.airtricity.com/ireland/wind\\_farms/supergrid/offshore\\_supergrid\\_layout/](http://www.airtricity.com/ireland/wind_farms/supergrid/offshore_supergrid_layout/).

<sup>17</sup> See "EU's Piebalgs says grid infrastructure needed quickly for offshore wind energy", 2008-03-31, <http://www.forbes.com/markets/feeds/afx/2008/03/31/afx4833163.html>.

<sup>18</sup> Greenpeace Belgium and 3E have also proposed a "A north sea grid electricity grid [r]evolution", September 2008, [http://www.greenpeace.org/raw/content/eu-unit/press-centre/reports/A-North-Sea-electricity-grid-\(r\)evolution.pdf](http://www.greenpeace.org/raw/content/eu-unit/press-centre/reports/A-North-Sea-electricity-grid-(r)evolution.pdf).

- *Reduction of wastage.* If for example, the wind is blowing strongly in Scotland during the winter, producing more electricity than the local people can use, then in the absence of any economical system for bulk storage of electricity, that surplus energy is simply wasted unless it can be moved to places where it may be needed elsewhere in the UK, Europe or EUMENA.
- A large-scale transmission grid is needed to take advantage of the large amounts of energy that may be obtained from *large-scale but remote sources of renewable electricity* such as wave farms, offshore wind farms, tidal lagoons, tidal stream generators—and concentrating solar power!
- A related point is that a large-scale transmission grid can open up entirely new sources of energy that might not otherwise be considered. For example, there is potential to import geothermal energy from Iceland via a submarine HVDC transmission line.<sup>19</sup>
- A grid that covers a large area like Europe or EUMENA can have a substantial impact in reducing the variability of energy sources such as the wind. The wind may stop blowing in any one spot but it is very rare for it to stop blowing everywhere across a wide area like Europe or EUMENA. Without a large-scale grid, it may be necessary to maintain conventional power stations on ‘spinning reserve’ to supply electricity at short notice if the wind drops, and this spinning reserve is wasteful.
- A large-scale transmission grid helps to reduce the amount of ‘plant margin’—the difference between actual generating capacity in any area and the theoretical minimum generating capacity—that is required. This is because a large-scale grid smoothes out much of the variability in electricity supply and demand and because spare generating capacity that is needed to meet contingencies can be shared across a relatively wide area, thus reducing the amount that is allocated to any one area.
- A related point is that *large-scale transmission grids help to ensure the security of electricity supplies in any one area.* This is because any shortage of supply or local peak in demand in any one country or area can almost always be met from one or more other countries or areas where there is spare capacity.
- The UK government and the European Commission wish to create a single European market for electricity (as we have in the UK), unbundling power generation from power transmission and promoting competition between different suppliers and sources of electricity. *A large-scale HVDC Supergrid is essential for the proper working of that single market.*
- *Optimisation of costs.* Transmission grids that cross time zones may increase the value of electricity by moving it, at any one time, from areas where it is cheap to areas where it will fetch a good price. More generally, large-scale grids allow

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<sup>19</sup> See “Iceland’s hot rocks may be power source for UK” (Sunday Times, 2007-05-13, <http://www.timesonline.co.uk/tol/news/uk/article1782183.ece>).

customers to obtain electricity from wherever it is cheapest at any one time, and that may vary throughout each day.

- An HVDC Supergrid can help to stabilize frequencies and voltages in the HVAC grids to which it connects.
- *Export potential.* For a country like the UK, with its great potential for wind power, wave power, and power from tidal lagoons and tidal streams, an HVDC Supergrid would provide the means of exporting energy to the rest of Europe and EUMENA.

More information and discussion may be found on [www.trec-uk.org.uk/elec\\_eng/grid.htm](http://www.trec-uk.org.uk/elec_eng/grid.htm).

### 3.2 Costs

Some estimates for the cost of the DLR proposal for a EUMENA-wide HVDC Supergrid are given in Section 4.5, together with some figures for the costs of some other things that governments spend money on.<sup>20</sup> *Bearing in mind that the cost of the Supergrid would be shared amongst many countries and would be spread over a few years, its cost is small, it is certainly affordable, and it would be excellent value in terms of the benefits it would deliver.*

The substantial economic benefits of large-scale transmission grids are described in *Interstate transmission superhighways: paving the way to a low-carbon future* (RenewableEnergyWorld.com, 2008-07-30).<sup>21</sup>

### 3.3 Timescales

The entire UK rail network, which was originally much larger than it is now, was built in the 20 years between 1830 and 1850 using little more than picks and shovels.

The HVDC Supergrid throughout EUMENA is a large project but it requires substantially less engineering than the UK rail network as it was in the 19<sup>th</sup> century. And there are many modern aids to construction that were not available then. With the right political impetus, there is every reason to believe that the Supergrid could be put in place within 10 years.

Planning issues could cause delays but there are several options for minimising or eliminating the visual impact of new transmission lines and thus smoothing the path for those developments.<sup>22</sup>

### 3.4 Create a single market for electricity throughout EUMENA or Europe

An important adjunct to the creation of a Supergrid is the creation of a single market for electricity throughout EUMENA (best) or Europe (a good second-best). The single market

<sup>20</sup> See also [http://www.trec-uk.org.uk/csp/costs.htm#hvdc\\_costs](http://www.trec-uk.org.uk/csp/costs.htm#hvdc_costs).

<sup>21</sup> See <http://www.renewableenergyworld.com/rea/news/story?id=53193>.

<sup>22</sup> See [http://www.trec-uk.org.uk/elec\\_eng/hvdc\\_impact.html](http://www.trec-uk.org.uk/elec_eng/hvdc_impact.html).



provides the means of realising the full potential of the Supergrid, and the Supergrid is needed to allow the single market to function effectively.

The creation of a single market for electricity throughout EUMENA means unbundling power generation from power transmission. It should be possible for any customer in EUMENA to buy solar power from any supplier throughout the region in the same way that anyone in the UK can buy electricity from any UK supplier.

Both the British Government and the European Commission are in favour of this kind of development within the EU. But there is some resistance from commercial interests that currently enjoy monopolistic benefits from the vertical integration of power generation with power transmission.

## 4 Helping things forward

We believe that the DESERTEC proposals, including the Supergrid concept, are highly relevant to the UK's needs and should be supported. The following subsections summarise things that governments can or should be doing to help things forward. Where the UK government does not have complete control, it would need to work with its international partners to put the necessary systems in place.

### 4.1 *Remove overt or hidden subsidies for non-renewable sources of energy*

In a report published in 2004,<sup>23</sup> the New Economics Foundation made a conservative estimate that worldwide subsidies for fossil fuels amounted to about \$235bn a year—and there seems not to have been much change since then. In most countries where it operates, the nuclear power industry benefits from substantial hidden subsidies.<sup>24</sup>

These kinds of support for old-style sources of power have the effect of tilting the “playing field” against the renewable sources of energy, including solar power, that we now urgently need. *All overt and hidden subsidies for non-renewable sources of energy should be removed.*

### 4.2 *Ensure that a proper price is paid for emissions of CO<sub>2</sub>*

To a large extent, users of fossil fuels are still being allowed to use the atmosphere as a free dumping ground for CO<sub>2</sub>. *This must stop.*

The European Emissions Trading Scheme has not been satisfactory and it is, in any case, only a partial scheme. We believe that it should be replaced by a system that covers all emissions of CO<sub>2</sub>.

We believe that the Kyoto2 proposals [TICKELL2008] are very promising and could be adapted to operate in a circumscribed area such as the UK or the EU, as described in that book. Another promising option is to introduce a UK-wide or EU-wide system of

<sup>23</sup> See <http://news.bbc.co.uk/1/hi/sci/tech/3818995.stm>.

<sup>24</sup> One of the biggest hidden subsidies is limitations on liabilities for the effects of a Chernobyl-style accident or worse—see [http://www.mng.org.uk/gh/no\\_nukes.htm](http://www.mng.org.uk/gh/no_nukes.htm).

Personal Carbon Allowances (PCAs).<sup>25</sup> There may be a case for introducing both systems since they can operate together and they would reinforce each other.

### ***4.3 Provide the right framework of incentives***

Although CSP has quite a long history, its expansion has been held back because fossil fuels have been so cheap and because it has not received the kind of support that has been provided for wind power. As it expands, economies of scale and refinements in technologies will bring prices down—as has happened already with wind power.

If overt and hidden subsidies are removed from non-renewable sources of power and if a proper price is charged for emissions of CO<sub>2</sub>, this will make a big difference. But there may still be a need for some short-to-medium-term support for renewable sources of power, including CSP. The rapid growth of renewables in countries like Denmark, Germany, Spain and Portugal provides evidence in support of their system of *feed-in tariffs*. The current UK system of ROCs has proved to be less successful, apparently because it creates too much uncertainty for investors.

The DESERTEC concept is trans-national. To get things moving, *an international framework of incentives is needed* to provide investors with confidence about the long-term stability of prices, ensuring that sources of renewable energy are recognised amongst all participating countries, and ensuring preferential access to the grid for renewable energy projects. To realise the DESERTEC vision for EUMENA, the international framework of incentives should apply in all countries throughout the region.

### ***4.4 Create a single market for electricity throughout EUMENA or Europe***

The creation of a single market for electricity throughout EUMENA means unbundling power generation from power transmission. It should be possible for any customer in EUMENA to buy solar power from any supplier throughout the region in the same way that anyone in the UK can buy electricity from any UK supplier.

Both the British Government and the European Commission are in favour of this kind of development within the EU. But there is some resistance from commercial interests that currently enjoy monopolistic benefits from the vertical integration of power generation with power transmission. And although a single market for electricity within the EU would be a great help, it would be even better if it were extended to the whole of EUMENA.

### ***4.5 Build a EUMENA-wide or Europe-wide HVDC Supergrid***

As was mentioned in Section 2, the UK may begin to benefit from CSP imports via the existing transmission network.<sup>26</sup> As the quantities of electricity increase, the grid may be upgraded progressively until it becomes the HVDC Supergrid envisaged in the TRANS-CSP report [TCSP2006].

<sup>25</sup> See <http://www.mng.org.uk/gh/dtcrs.htm>.

<sup>26</sup> See [http://www.trec-uk.org.uk/elec\\_eng/kickstart.html](http://www.trec-uk.org.uk/elec_eng/kickstart.html).



At present, HVDC transmission lines are commissioned on a case-by-case basis without reference to any overarching plan. It would be better if the EU, in collaboration with countries in North Africa and the Middle East, would decide to build the proposed EUMENA-wide HVDC Supergrid. A good second-best would be the building of a Europe-wide Supergrid.

It would probably be best if this development were treated as essential infrastructure (like the roads network) and paid for centrally. No doubt, richer countries would pay more.

The estimated cost of a EUMENA-wide HVDC Supergrid comprising 20 transmission lines of 5 GW each is €45 billion. The estimated cost of two 5 GW transmission lines between North Africa and the UK is €5 billion.<sup>27</sup>

Bearing in mind that these costs would be shared amongst national governments and would be spread over a few years, they are small compared with other things that governments spend money on:

- The estimated cost of widening the M1 motorway is €7.6bn (£5.1bn).<sup>28</sup>
- The Metronet fiasco has cost UK taxpayers €2.68bn (£2bn).<sup>29</sup>
- Gordon Brown has said that the cost of cleaning up Britain's nuclear legacy is likely to be €133.4bn (£90bn).<sup>30</sup>
- €100.6bn (£76bn) is the estimated cost of renewing Britain's Trident nuclear missile system.<sup>31</sup>

As described in Section 3, it appears that large-scale transmission grids yield benefits that are substantially greater than their cost.

## 5 Conclusion

There is much to commend in the consultation document but the DESERTEC proposals and the Supergrid concept are substantial omissions. It would be good to see them incorporated in the UK renewable energy strategy, together with policies that will help to make them a reality.

## Bibliography

DBERR2008: "UK Renewable energy strategy consultation", Department of Business, Enterprise & Regulatory Reform, June 2008.

<sup>27</sup> These estimates come from the TRANS-CSP report (<http://www.trec-uk.org.uk/reports.htm>), Table 2-11, p. 77.

<sup>28</sup> "M1 widening to cost £21m per mile", The Observer, 2007-05-06, [http://observer.guardian.co.uk/uk\\_news/story/0,,2073611,00.html](http://observer.guardian.co.uk/uk_news/story/0,,2073611,00.html).

<sup>29</sup> "£2bn of public money goes down the Tube as Gordon Brown counts cost of failed deal," Times Online, 2008-02-07, <http://www.timesonline.co.uk/tol/news/politics/article3321667.ece>.

<sup>30</sup> "Nuclear costs to hit £90bn, warns Brown", The Observer, 2006-06-04, <http://observer.guardian.co.uk/business/story/0,,1789671,00.html>.

<sup>31</sup> See "New Trident system may cost £76bn, figures show," <http://www.guardian.co.uk/uk/2006/sep/21/military.armstrade>.

MCSP2005: “Concentrating solar power for the Mediterranean region”, report for the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, April 2005, <http://www.dlr.de/tt/med-csp>, <http://www.trec-uk.org.uk/reports.htm> .

TICKELL2008: “Kyoto2”, Oliver Tickell, London: Zed Books, 2008.

TCSP2006: “Trans-Mediterranean interconnection for concentrating solar power”, report for the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, June 2006, <http://www.dlr.de/tt/trans-csp>, <http://www.trec-uk.org.uk/reports.htm> .