

# CLEAN POWER FROM DESERTS: what governments can do<sup>1</sup>

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The DESERTEC concept, developed by the TREC international network of scientists and engineers, has *huge* potential to supply the world with clean energy and cut emissions of CO<sub>2</sub>.<sup>2</sup> There are other substantial potential benefits as well.

Concentrating solar power plants are being built now and low-loss HVDC transmission lines are being installed but changes in policies are needed at national and international levels to remove unnecessary obstacles and smooth the path for these developments. These notes apply mainly to Europe, the Middle East and North Africa (EUMENA) but similar principles apply elsewhere.

Here, first, are some reasons why national governments and the EU should do all that they can to facilitate these developments and, second, a summary of what actions are needed to move things forward.

## MOTIVATIONS

- *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, the US Department of Energy, and elsewhere.
- 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>3</sup> *Few other sources of power have so many positive features.*
- CSP is *already* delivering electricity into the European electricity grid and new plants are under construction *now*. New plants can be built in 3 years or less. *With the right political impetus, electricity supplies from CSP may be ramped up quickly.*
- Using the existing transmission grid, *countries throughout EUMENA may start to benefit quite soon from CSP electricity.*<sup>4</sup> As the quantities of electricity increase, the grid may be upgraded with HVDC technologies and smart electronics. Several HVDC lines are already in place.
- CSP can help countries throughout Europe, including the UK, to meet their international commitments for the development of renewable sources of energy and cutting emissions of CO<sub>2</sub>.
- Taking account of environmental and hidden costs, CSP is cheaper than nuclear power,<sup>5</sup> probably already cheaper than electricity from “clean” coal<sup>6</sup> and it is likely to become one of the cheapest sources of electricity throughout Europe.<sup>7</sup> CSP costs are falling while the cost of electricity from fossil fuels and from nuclear power is rising.
- *The worldwide potential is enormous.* Using CSP, less than 1% of the world’s deserts could generate as much electricity as the world is now using. Using highly-efficient HVDC transmission lines, it is feasible and cost-effective to transmit electricity for 3000 km or more. It has been calculated that 90% of the world’s population lives within 2700 km of a desert and could be supplied with solar electricity from there.

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

<sup>2</sup> See [www.desertec.org](http://www.desertec.org) and [www.trec-uk.org.uk](http://www.trec-uk.org.uk) and the leaflet “The DESERTEC concept in brief” (<http://www.trec-uk.org.uk/resources.htm>).

<sup>3</sup> “Energy Return on Energy Invested”. The energy payback time for CSP plants is about 6 months.

<sup>4</sup> See [http://www.trec-uk.org.uk/elec\\_eng/kickstart.html](http://www.trec-uk.org.uk/elec_eng/kickstart.html).

<sup>5</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>6</sup> 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.

<sup>7</sup> The TRANS-CSP report from the German Aerospace Centre (DLR) calculates that CSP in desert regions is likely to become one of the cheapest sources of electricity throughout Europe, *including the cost of transmission*.

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- By flooding the world market with cheap energy, DESERTEC can increase the energy security of all countries around the world, helping to head off the worst effects of “peak oil,”<sup>8</sup> “peak coal”<sup>9</sup> and the anticipated “global grab for energy.”<sup>10</sup>
- *Support for this bold plan would be popular with voters.* Many people want to see vigorous and imaginative action to curb rises in energy costs, to cut emissions of CO<sub>2</sub> and other greenhouse gases, and to bring forward new clean sources of energy. UK businesses and householders would welcome the opportunity to buy inexpensive clean power from deserts.
- *The urgent need to decarbonise the world’s economy:*
  - Amongst other things, the Stern Report concluded that *the economic benefits of strong, early action to combat climate change considerably outweigh the costs.*<sup>11</sup>
  - In a public lecture, Dr Kevin Anderson<sup>12</sup> has warned that each year that the world delays cutting CO<sub>2</sub> emissions means that bigger annual cuts in emissions will be needed to avoid increases in global temperatures that are considered dangerous.<sup>13</sup>
  - In a speech in 2007, Ban Ki-Moon, Secretary General of the UN, said “... the danger posed by war to all of humanity—and to our planet—is at least matched by the climate crisis and global warming.”<sup>14</sup> That implies that all governments should be treating the problem of cutting emissions of CO<sub>2</sub> and other greenhouse gases with the same urgency as if we were going to war.
- By breaking the link between fossil fuels and wealth, *DESERTEC can help to break deadlocks in international negotiations over cutting CO<sub>2</sub> emissions.* Countries like China and India can leapfrog the ‘dirty’ phase of development, making cuts in CO<sub>2</sub> emissions whilst maintaining or increasing their energy supplies. Countries like Saudi Arabia can move directly from being oil-rich to being solar-rich. The USA could potentially meet all its energy needs from the sunshine states of the south west.
- *Additional benefits*, especially for host countries, include jobs and earnings in a large new industry; the creation of fresh water by the desalination of sea water using the waste heat from CSP plants—a welcome bonus in arid regions; the partially-shaded areas under the solar mirrors have many potential uses including horticulture (using desalinated sea water)—a source of food and other products; a win-win solar collaboration can help to improve relations amongst different groups of people.
- *Benefits of the proposed HVDC Supergrid* include: increased security of energy supplies because temporary shortfalls in any area may be covered from elsewhere; reductions in wastage by allowing electricity to be transmitted from areas of surplus to areas of need; reducing the effects of intermittency in energy supplies by matching variable demands with variable supplies across a wide area; and providing access to large-scale but remote sources of renewable energy such as offshore wind farms, wave farms, tidal stream generators—and CSP.<sup>15</sup> An HVDC Supergrid is needed for the proper working of the proposed single European market for electricity. Several studies have shown that Supergrids represent very good value for money.<sup>16</sup>

<sup>8</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>9</sup> “Coal: bleak outlook for the black stuff,” David Strahan, *New Scientist*, 2008-01-19, pp 38-41.

<sup>10</sup> See also <http://www.trec-uk.org.uk/csp/security.htm>.

<sup>11</sup> See <http://politics.guardian.co.uk/economics/story/0,,1935208,00.html>.

<sup>12</sup> Research Director, Tyndall Centre for Climate Change in the University of Manchester.

<sup>13</sup> “Drinking in the last chance saloon: what hope for 2° C?” Dr Anderson has given this lecture in numerous places, see for example <http://talks.cam.ac.uk/talk/index/9095>.

<sup>14</sup> See “Climate change is our top priority, says UN chief,” The Guardian, 2007-03-02, <http://www.guardian.co.uk/environment/2007/mar/02/climatechange.climatechangeenvironment>.

<sup>15</sup> The benefits of a large-scale HVDC grid are described more fully at [http://www.trec-uk.org.uk/elec\\_eng/grid.htm](http://www.trec-uk.org.uk/elec_eng/grid.htm).

<sup>16</sup> See “Interstate transmission superhighways: paving the way to a low-carbon future”, RenewableEnergyWorld.com, 2008-07-30, <http://www.renewableenergyworld.com/rea/news/story?id=53193>.

## **ACTIONS: what governments can do**

National governments can have a major influence on what happens at both national and international levels. The following subsections summarise things that governments and the EU can or should be doing to help things forward.

### **Remove overt or hidden subsidies for established sources of energy**

In a report published in 2004,<sup>17</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>18</sup>

These kinds of support for long-established sources of power have the effect of tilting the “playing field” against the new cleaner sources of energy, including solar power, that we now urgently need. *All overt and hidden subsidies for long-established energy technologies should be removed.*<sup>19</sup>

### **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. It should be replaced, throughout the EU and beyond, by a more comprehensive system for the rationing of carbon, either an “upstream” system like Kyoto2<sup>20</sup> or a “downstream” system of Tradable Personal Carbon Allowances.<sup>21</sup>

### **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.

With regard to the “20-20-20” targets set by the EU,<sup>22</sup> it is right that these targets should exclude projects outside the EU that have no direct impact on the use of energy within the EU, but it is entirely acceptable that solar electricity that is imported into any country within the EU and paid for by customers in that country should count towards that country’s targets for renewables and for reductions in emissions of CO<sub>2</sub>.

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<sup>17</sup> See <http://news.bbc.co.uk/1/hi/sci/tech/3818995.stm>.

<sup>18</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).

<sup>19</sup> Although it is not a renewable source of power, “clean” coal-fired generation of electricity with carbon capture and storage (CCS) may have a role to play in cutting CO<sub>2</sub> emissions. For that reason, there may be a case for providing public support for CCS until it is commercially viable.

<sup>20</sup> “Kyoto2”, Oliver Tickell, London: Zed Books, 2008. See also <http://www.kyoto2.org/>.

<sup>21</sup> See <http://www.mng.org.uk/gh/dtcrs.htm>.

<sup>22</sup> The EU is aiming to cut CO<sub>2</sub> emissions by 20%, and to obtain 20% of its energy from renewable sources by 2020 (see <http://news.bbc.co.uk/1/hi/world/europe/6432829.stm>).

## 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.

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

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.

Because the benefits of a Supergrid would be spread widely, it would probably be best if this development were treated as essential infrastructure (like the roads network) and paid for by national governments and the EU. No doubt, richer countries would pay more. However, with the right framework of incentives, it is possible that this infrastructure could be financed by private investors.<sup>23</sup>

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>24</sup>

If these costs were shared amongst 30 or more countries, and bearing in mind that the costs would also be spread over about 10 years, then *the average annual expenditure by any one government would be €150 million or less*. In general, the cost of the proposed HVDC Supergrid is quite modest compared with other things that governments spend money on:

- The estimated cost of widening the M1 motorway is €7.6bn (£5.1bn).<sup>25</sup>
- The Metronet fiasco has cost UK taxpayers €2.68bn (£2bn).<sup>26</sup>
- Gordon Brown has said that the cost of cleaning up Britain's nuclear legacy is likely to be €33.4bn (£90bn).<sup>27</sup>
- €100.6bn (£76bn) is the estimated cost of renewing Britain's Trident nuclear missile system.<sup>28</sup>

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<sup>23</sup> See "Imera announces EUR4.4 billion pan European electricity grid project", PRNewswire, 2009-02-02, [http://sev.prnewswire.com/utilities/20090202/3828897en\\_iCrossing02022009-1.html](http://sev.prnewswire.com/utilities/20090202/3828897en_iCrossing02022009-1.html).

<sup>24</sup> These estimates come from the TRANS-CSP report (<http://www.trec-uk.org.uk/reports.htm>), Table 2-11, p. 77.

<sup>25</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>26</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>27</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>28</sup> See "New Trident system may cost £76bn, figures show," <http://www.guardian.co.uk/uk/2006/sep/21/military.armstrade>.