

Choose NO MORE THAN TWO WORDS from the passage for each answer.

Concentrating Solar Power (CSP)

Unlike solar panels, CSP concentrates the sun's rays on boilers by using 10 The resulting heat produces high-temperature 11 , which in turn moves the turbines which generate electricity. CSP plants will be situated in 12 to allow sea water to run in. This, when purified, can be used to wash the equipment. The resulting dirty water will be used for 13 around the power plant, and in this way oases will be formed.

Out of Africa: solar energy from the Sahara

Vivienne Walt reports on how the Sahara Desert could offer a truly green solution to Europe's energy problems

- A For years, the Sahara has been regarded by many Europeans as a *terra incognita** of little economic value or importance. But this idea may soon change completely. Politicians and scientists on both sides of the **Mediterranean** are beginning to focus on the Sahara's **potential** to provide power for Europe in the future. They believe the desert's true value comes from the fact that it is dry and empty. Some areas of the Sahara reach 45 degrees centigrade on many afternoons. It is, in other words, a **gigantic** natural storehouse of **solar energy**.
- B A few years ago, scientists began to **calculate** just how much energy the Sahara holds. They **were** astonished at the answer. In theory, a 90,600 square kilometre chunk of the Sahara – smaller than Portugal and a little over 1% of its total area – could **yield** the same amount of electricity as all the world's **power plants combined**. A smaller square of 15,500 square kilometres – about the size of Connecticut – could provide electricity for Europe's 500 million people. 'I admit I was **sceptical** until I did the calculations myself,' says Michael Pawlyn, director of Exploration Architecture, one of three British environmental companies comprising the Sahara Forest Project, which is testing solar plants in Oman and the United Arab Emirates. Pawlyn calls the Sahara's potential 'staggering'.
- C At the moment, no one is proposing the creation of a solar power station the size of a small country. But a relatively well-developed technology exists, which proponents say could turn the Sahara's heat and sunlight into a major source of electricity – Concentrating Solar Power (CSP). Unlike solar panels, which **convert** sunlight directly into electricity, CSP **utilises** mirrors which **focus** light on water pipes or boilers to produce very hot steam to **operate** the turbines of **generators**. Small CSP plants have produced power in California's Mojave Desert since the 1980s. The Sahara Forest Project proposes building CSP plants in areas below sea level (the Sahara has several such depressions) so that sea water can flow into them. This water would then be **purified** and used for powering turbines and washing dust off the mirrors. Waste water would then supply **irrigation** to areas around the stations, creating lush oases – hence the 'forest' in the group's name.

D But producing significant quantities of electricity means building huge **arrays of mirrors and pipes** across hundreds of miles of remote desert, which is expensive. Gerry Wolff, an engineer who heads DESERTEC, an international consortium of solar-power scientists, says they have **estimated** it will cost about \$59 billion to begin transmitting power from the Sahara by 2020.

E Building plants is just part of the challenge. One of the drawbacks to CSP technology is that it works at maximum **efficiency** only in sunny, hot climates – and deserts tend to be distant from population centres. To supply Europe with 20% of its electricity needs, more than 19,300 kilometres of **cables** would need to be laid under the Mediterranean, says Gunnar Asplund, head of HVDC research at ABB Power Technologies in Ludvika, Sweden. Indeed, to use renewable sources of power, including solar, wind and tidal, Europe will need to build completely new **electrical grids**. That's because **existing infrastructures**, built largely for the coal-fired plants that supply 80% of Europe's power, would not be suitable for carrying the amount of electricity generated by the Sahara. Germany's government-run Aerospace Centre, which researches energy, estimates that replacing those lines could raise the cost of building solar plants in the Sahara and sending significant amounts of power to Europe to about \$465 billion over the next 40 years. **Generous government subsidies** will be needed. 'Of course it costs a lot of money,' says Asplund. 'It's a lot cheaper to burn coal than to make solar power in the Sahara.'

F Meanwhile, some companies are getting started. Seville engineering company Abengoa is building one **solar-thermal plant** in Algeria and another in Morocco, while a third is being built in Egypt by a Spanish–Japanese **joint venture**. The next step will be to get cables in place. Although the European **Parliament** has passed a law that **aids investors** who help the continent reach its goal of getting 20% of its power from renewable energy by 2020, it could take years to create the necessary infrastructure.

G Nicholas Dunlop, secretary-general of the London-based NGO e-Parliament, thinks companies should begin transmitting small amounts of solar power as soon as the

North African plants begin operating, by linking a few cable lines under the Med. 'I call it the Lego method,' he says. 'Build it piece by piece.' If it can be shown that power from the Sahara can be produced **profitably**, he says, companies and governments will soon jump in. If they do, perhaps airplane passengers flying across the Sahara will one day count the mirrors and patches of green instead of staring at sand.