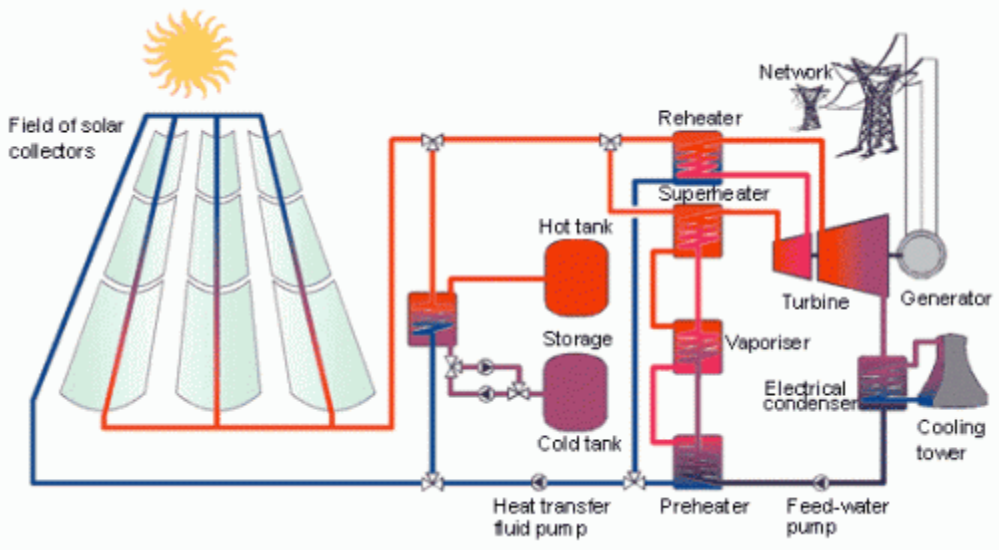
DESERT SOLAR POWER

A recent renewed interest in alternative energy technologies has revitalized interest in solar thermal technology, a type of solar power that uses the sun's heat rather than its light to produce electricity. Although the technology for solar thermal has existed for more than two decades, projects have languished while fossil fuels remained cheap. But solar thermal's time may now have come — and mirrored arrays of solar thermal power plants, hopefully, will soon bloom in many of the world's deserts.

Large desert-based power plants concentrate the sun's energy to produce high-temperature heat for industrial processes or to convert the solar energy into electricity. It is quite interesting to note that, as per the recent reports on Solar Power, the resource calculations show that just seven states in the U.S. Southwest can provide more than 7 million MW of solar generating capacity, i.e., roughly 10 times that of total electricity generating capacity of U.S. today from all sources.

In US, as per report, four more concentrating solar technologies are being developed. Till now, parabolic trough technology (i.e., tracking the sun with rows of mirrors that heat a fluid, which then produces steam to drive a turbine) used to provide the best performance at a minimum cost. With this technology, as per the report, since the mid-1980s nine plants, totaling about 354 MW, were operating reliably in California's Mojave Desert. Natural gas and other fuels provide supplementary heating when the sun is inadequate, allowing solar power plants to generate electricity whenever it is needed. In

addition, in order to extend the operating times of solar power plants new heat-storing technologies are being developed as well.



Realizing the advantages of solar energy and seeing the success of desert solar power installed, several solar power plants are now being planned in the U.S. Southwest. Renewed Governmental supports and rising fossil fuel prices including natural gas, lead to new interest in concentrating solar power among many entrepreneurs. Efficiency of concentrating solar technologies has also been improved substantially, since then. While earlier trough plants needed a 25 percent natural gas-fired backup, the new improved plants will require only about 2 percent backup. As per recent news in US, utilities in states with large solar resources such as Arizona, California, Nevada, and New Mexico etc., are considering installation of solar dish systems on a larger scale. As per the latest estimation, within the next decade more than 4,000 MW of central solar plants will be installed. It's quite encouraging!!

Concentrating Solar Technologies -

(i) Parabolic trough technologies track the sun with rows of mirrors that heat a fluid. The fluid then produces steam to drive a turbine.

(ii) Central receiver (tower) systems use large mirrors to direct the sun to a central tower, where fluid is heated to produce steam that drives a turbine. Parabolic trough and tower systems can provide large-scale, bulk power with heat storage (in the form of molten salt, or in hybrid systems that derive a small share of their power from natural gas).

(iii) Dish systems consist of a reflecting parabolic dish mirror system that concentrates sunlight onto a small area, where a receiver is heated and drives a small thermal engine.

(iv) Concentrating photovoltaic systems (CPV) use moving lenses or mirrors to track the sun and focus its light on high-efficiency silicon or multi-junction solar cells; they are potentially a lower-cost approach to utility-scale PV power. Dish and CPV systems are well suited for decentralized generation that is located close to the site of demand, or can be installed in large groups for central station power.

7. Development of new technology making solar power economically competitive -

We all know that solar power is excellently exhilarating. Just put a sheet or a panel exposing sun and everyday, for total life span of the device, we get power at free of cost. No fuel, no maintenance botheration and no cost incurred. It is a renewable resource – no raw material requirement. Sun may disappear behind a few clouds for a few minutes, disappear completely at night, or for hours during the winter, we can always expect it to come back in full force. Apart, solar power is completely non-polluting, green sustainable energy – throughout its life – free. Unlike oil, solar power does not emit any greenhouse gases into the atmosphere. It is silent powered – no noise pollution.

There are so many advantages of solar power. Unfortunately, the size of the initial investment keeps the cost of solar generated power higher than the cost of coal. It may be worth noting here that, if environmental costs of burning coal taken into account, the solar power is already slightly more economical. But we are not taxing carbon (yet) so we have to make solar power cheaper. At present,

solar cells are not cheap. However, technology is improving, and it will continue to improve as the cost of other forms of power increase. There are few of the finest examples that are working to bring solar power to at par with grid. Below some of these technologies are briefed:

a. Most expensive part of a traditional photovoltaic array is the silicon wafers. To solve this cost problem (and also the problem of the environmentally wasteful process of creating the silicon crystals) several people are concentrating the sunlight thousands of times onto an extremely small solar panel. They decrease the amount of solar material needed by thousands of times, and produce just as much power.

Technologies collectively known as concentrating photovoltaic are starting to enjoy their day in the sun, thanks to advances in solar cells, which absorb light and convert it into electricity, and the mirror- or lens-based concentrator systems that focus light on them. The technology could soon make solar power as cheap as electricity from the grid. The idea of concentrating sunlight to reduce the size of solar cells – and therefore to cut costs -has been around for decades. The result is solar power that is nearly as cheap (if not as cheap) as coal.

The thinking behind concentrated solar power is simple. Because energy from the sun, although abundant, is diffuse, generating one gigawatt of power (the size of a typical utility-scale plant) using traditional photovoltaic requires a four-square-mile area of silicon. A concentrator system would replace most of the silicon with plastic or glass lenses or metal reflectors, requiring only as much semiconductor material as it would take to cover an area of much smaller in size. Moreover, because of decrease in the amount of semiconductor needed makes it affordable to use much more efficient types of solar cells. The total footprint of such plant, including the reflectors or lenses, would be only two to two-and-a-half square miles.

The big problem of this technology is very hot piece of silicon. You have to keep the silicon cool, even with sunlight magnified 2000 times on it. Otherwise the silicon will melt, and it’s all over. Scientists are working prototypes already and are hoping to go commercial in the coming years.

b. Another solution to the problem of limited and expensive crystalline silicon is to just not use it. This is why there are so many solar startups right now working on solar technology using non-crystalline silicon or other thin-film solutions. Many have already broken out of the lab and into manufacturing. One of the leading technologies, not using expensive crystalline silicon is ‘Nano-solar’ prints. Nano-solar prints it’s mixture of several elements in precise proportions onto a metal film. The production is fast, simple and cheap, at least for now. Some fear that shortages in indium will bring a halt to nano-solar’s cheap

printing days. Though scientists make some efficiency sacrifices when compared to crystalline silicon, they are so much cheaper to produce that they might soon even beat coal in cost per watt.

The advantages of 'Nano-solar' prints are, they are super cheap, ultra-adaptable solar panels that can be printed on the side of pretty much anything, promising solar power anywhere you want it. At the present condition, they still slide under coal's $2.1-a-watt energy cost, though they're not mass produced at the scale needed to bring it to the 30-cents-a-watt level.

c. While the first two options provide the most efficient path to solar electricity, but converting photons directly into electrons, a less efficient, though simpler, option might turn out to be the real cost-effective. Simply by focusing hundreds or even thousands of mirrors onto a single point, scientists are hoping to create the kind of heat necessary to run a coal fired power plant, but without use of coal. The heat would boil water which would then be used to turn turbines. In other words, it is nothing but, concentrated thermal solar power, which concentrates the heat from the sun to power turbines or sterling engines.

The advantage of such a system is converting the existing steam turbines being produced for traditional power plants, and the rest of the technology just involves shiny objects and concrete. The problems however, are these things too hot to handle. The material holding the boiler has to be able to withstand the extreme heat that these installations can produce. That kind of material, that won't melt or degrade under such extreme heat, can be quite expensive.

d. Researchers reveal solar power breakthrough – To rival electricity grid in five years:

The cost of electricity generated by solar power cells is falling so fast, it is likely to provide a serious alternative to the national grid within five years.

Scientists demonstrated that solar cells are now capable of converting 43 percent of the sunlight hitting them into electricity.

However, the demonstration did not use regular silicon-based solar cells, which are much cheaper and more likely to be in popular use.

Rather, the demonstration cells require sunlight to be split into five different frequencies, or ‘colours’, with each colour sent to a different cell.

In contrast, the efficiency record with regular silicon-based solar cells stands at just 25 percent.

Significance of the new system is that, as the intensity of light is increased, the efficiency of the demonstration cells improves.

8. Conclusion – Solar power technology is improving consistently over time, as people begin to understand the benefits offered by this incredible technology. As our oil reserves decline, it is important for us to turn to alternative sources for energy. Therefore, it would be better that converting some of the world’s energy requirements to solar power are in the best interest of the worldwide economy and the environment. Since we all are aware of the power of the sun and the benefits we could get from it.

Now, the cost of solar power is quite high. In fact, for solar energy to achieve its potential, desert solar power plant construction costs will have to be further reduced via technology improvements, economies of scale, and streamlined assembly techniques. Development of economic storage technologies can also lower costs significantly. According to renewable energy department, a desert solar power plant covering 10 square miles of desert has potential to produce as much power as the Hoover Dam of US produces. Thus, desert-based power plants can provide a large share of the nation’s commercial energy needs.

Source : http://saferenvironment.wordpress.com/2009/02/02/solar-power-%E2%80%93-sustainable-green-energy-to-protect-our-economy-and-environment/