

Solar Energy Project in Saudi Arabia

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Abstract— Solar energy can offer a very smart way of handling the energy-related and economic challenges that Saudi Arabia is facing. Encouraged by the necessity to expand the country's economy, this paper aims to provide a complete understanding of the chances that solar energy offers to the Saudi Arabia, specifically about solar manufacturing and research accomplishments. This paper may lay the base for making the country a prominent place for solar manufacturing in addition to a leading solar research location worldwide. This paper discusses the assurance towards a most significant way to a green economy for sustainable development.

Index Terms—Energy, Green, Power, Saudi, Solar, Generation.

1 INTRODUCTION

SOLAR energy is believed as an important source for the future, not only for Saudi Arabia however also in the world. Saudi Arabia has the rich potential for developing solar energy, which is renewable, unpolluted, and freely accessible. The average annual solar energy falling on the Arabian Peninsula is about 2200 kWh/m². Uses of solar energy in Saudi Arabia have been rising ever since 1960. (KICP, 2009) Solar hydrogen manufacture plant located at the Solar Village, Riyadh, Saudi Arabia, could have been reflected as the world's first 350 kW solar-powered hydrogen manufacture plant at the period of its beginning. (KICP, 2009) The increase of solar energy, still, has been rather small due to some problems while consumption of solar energy in its many aspects is very attractive for Saudi Arabia. The main purposes of this proposal are to report current uses and future aspects of solar energy with researches conducted in this field and to consider them in the light of existing sustainable energy technologies to establish energy policies. The solar power related studied include various types of solar radiation associations, solar collectors, energetic solar radiation, solar photovoltaic systems, solar stills, solar-powered irrigation, solar hydrogen, solar energy-related greenhouses, solar water distillation and solar energy concept. Since the mid-seventies, Saudi Arabia has been at the lead of research and development for solar energy. Such as, two main international joint research and development (R&D) programs were supported, in cooperation with the United States of America and the Federal Republic of Germany, expected at rising solar energy technology and beginning its users by planning and installing several solar power projects. After over 20 years of research and development it currently becomes necessary to assess these R&D activities to conclude their welfares. This proposal, hence, discusses an assessment of some research projects about their technical and economic feasibility and performance. The proposal also considered the various lessons that have been learned through the procedure and preservation of these projects and studies the several causes are essential for either their success or failure.

2 BACKGROUND OF ENERGY CONSUMPTION IN SAUDI ARABIA

Saudi Arabia is the world's largest oil reserves with more than

20% of total reserves. Simultaneously, the biggest oil manufacturer is pumping out more than 9.9 million barrels a day that is adequate to produce 16.262 TW of electricity. (Bukhary, 2012) However, Saudi Arabia has an additional part of an energy consuming country. As shown in the table below, Saudi Arabia is placed sixth in the world concerning oil consumption; 2.643 million barrels of oil are used every day for Saudi local consumption, which is greater than the consumption in some developed countries and top developing countries, for example, South Korea, and Germany. As the Saudi petrochemical industry develops and local demand for power production will rise, the domestic need for natural gas consumption will rise. As a result, Saudi Arabia upraised its gas manufacture to 10.7 billion cubic feet per day in 2011 and calculated to increase its production volume of gas to 16 billion cubic feet per day by 2020 to decrease the consumption of oil in the Saudi local market (Alarabiya 2012) However, it is stated that an amount of LNG global manufacturers believe Saudi Arabia to become a gas importer in the following few years; the gas amount gap in Saudi Arabia is projected to be 2 billion cubic feet per day by the end of the years, possibly as early as 2017 (Bukhary, 2012).

Rank	Country	(bbl/day)
1	United States	19,150,000
2	China	9,057,000
3	Japan	4,452,000
4	India	3,182,000
5	Brazil	2,654,000
6	Saudi Arabia	2,643,000
7	Germany	2,495,000
8	Korea, South	2,251,000
9	Canada	2,209,000
10	Russia	2,199,000

As presented in the figure, the total energy use in Saudi Arabia raised from 7358.1-kilo tons of oil equivalent in 1971 to 157854.7-kilo tons of oil equivalent in 2009. Furthermore, according to King Abdullah City for Atomic and Renewable Energy (KACARE), it is expected that the electricity consumption

in Saudi Arabia will rise from 43 GW / Y in 2010 to 120 GW / Y in 2030. As presented in above figure, the local consumption of fossil fuel will increase from 3.4 MBOE/D (Million Barrels of Oil Equivalent per Day) to 83 MBOE/D if the Saudi government preserves its present policy of distributing domestic market needs for energy by depending on fossil fuels (Bukhary, 2012).

3 SOLAR ENERGY

Solar energy is said to be a renewable source of energy that can be transformed into operational energy through solar panels. There are two main forms of solar energy. Solar photovoltaic (PV) systems directly transform solar energy into a usable system of energy by means of a PV cell comprising a semiconductor material. CSP (concentrating solar power) in contrast, concentrate energy from sunlight to a heat receiver that converts energy from heat into mechanical energy, and produces, solar thermal electricity. Solar energy is resulting from the sun's radiation. The sun is an influential energy source. The energy that it delivers to the Earth for one hour might meet the global energy needed for one year. We can harness only 0.001 percent of that energy. Solar power is source energy from the sun and deprived of its existence, all life cycle on earth would end. Solar energy has been considered upon as a serious source of energy for many years as of the huge volumes of energy that is made freely accessible if harnessed by modern technology. The figure below shows some of the advantages and disadvantages of solar energy.

3.1 Advantages of Solar Energy

3.1.1 Solar Energy is Infinite

Solar energy is an actual renewable energy source. It may be harnessed in all regions of the world and is accessible daily. We cannot run out of solar energy, contrasting some of the other sources of energy. Solar energy will be operational providing we have the sun. Thus, sunlight will be accessible to us for however 5 billion years when according to scientists the sun is going to die.

3.1.2 Reduces Electricity Bills

Since meeting some of our energy needs with the electricity the solar system has generated, and energy bills will drop. How much we save on our electricity bill will be dependent on the size of the solar system and our electricity or heat convention. Also, not only will save the electricity bill, but if we produce more electricity than we use, the excess will be transferred back to the grid, and we will get bonus payments for that amount (considering that our solar panel system is linked to the grid).

Savings can promote raise if we sell additional electricity at high charges in the day and then purchase electricity from the grid in the evening when the charges are lesser. Indeed, even much sooner than nation's remarkably presence is damaged

by global warming, inside of the coming decades, global warming is anticipated to cost society trillions of dollars if left unchanged. In this way, although ignoring the significant risk of societal suicide, battling global warming with solar power will probably save society billions or even trillions of dollars. Further than solar PV panels, it is worth noting that solar energy can save money in about a dozen other ways as well – with proper planning and household design choices.

3.1.3 Solar Energy can Produce Power

Solar energy can be used for several purposes. It can generate electricity (PV) or solar thermal or heat. Solar energy power can be used to produce electricity in zones deprived of access to the energy grid, to distil water in zones with inadequate clean water supplies and to power satellites in space. Solar energy can also be incorporated into the materials used for constructions.

3.1.4 Solar Energy is Free

Solar energy systems do not need much preservation. It only needs to keep them comparatively unpolluted, so cleaning them a couple of periods per year will do the work. Most same solar system manufacturers provide 20-25 years warranty. Moreover, as there are no moving parts, there is no deterioration. The inverter is regularly the only part that needs to change after 5-10 years as it is constantly working to transform solar energy into electricity and solar thermal or heat. Thus, after covering the initial cost of the solar system, it can anticipate little expenditure on repair and maintenance work.

3.1.5 Technology Development

Technology in the solar power manufacturing is continuously progressing, and developments will increase in the future. Improvements in nanotechnology and quantum physics can increase the efficiency of solar systems and the electrical input to the solar power systems

3.1.6 Solar Power Advantages to moderate or Stop Global Warming

Global warming challenges the survival of human culture and, also, the survival of countless species. Fortunately, many years of analysis have prompted efficient solar panel systems that make power without creating global warming pollution. Solar energy is currently clearly a standout amongst perfect answers for the global warming emergency.

3.1.7 Solar Energy Gives Energy Self-sufficiency

Like the energy security help, solar energy gives the immense advantage of energy self-sufficiency. Once more, the "fuel" for solar panels cannot be purchased or consumed. It is free for all to utilize. When you have solar boards on your rooftop, you have a free source of electricity that is all yours. This is essen-

tial for people, additionally for urban areas, regions, states, nations, and even organizations.

3.2 Disadvantages of Solar Energy

3.2.1 Solar Energy is Expensive to Implement

The beginning expense of purchasing a solar system is just as high. Despite the fact that the UK government has introduced a few systems for boosting the execution of renewable vitality sources, for instance, the Feed-in Tariff, regardless you need to take care of the direct expenses. This incorporates paying for solar boards, inverter, batteries, and wiring and the establishment. All things considered, solar innovations are always growing, so it is protected to expect that costs will go down later on.

3.2.2 Solar Energy can be harnessed During The Daytime

Although solar energy can even now gather amid shady and stormy days, the effectiveness of the solar system drops. Solar boards are reliant on daylight to accumulate solar energy successfully. Consequently, a couple of shady, stormy days can noticeably affect the energy system. You ought to likewise consider that solar energy cannot be gathered amid the night. Solar energy disadvantages are not all that boundless. Truth be told, there's one and an only major impediment to solar power that can consider. That weakness is that the sun does not sparkle 24 hours a day. At the point when the sun goes down or is intensely shaded, solar PV panels quit creating electricity. If we require electricity around then, we need to get it from some other source. At the end of the day, we could not be 100% controlled by solar panels. At any rate, we require batteries to store electricity created by solar panels for use at some point later. Alternatively, there are a few key things to note on this solar power detriment. Firstly, the sun shines when we require electricity most. As people (not vampires), our days pretty much take after the development of the sun. Society almost awakens when the sun rises. At the season of the sun's most unusual tallness and permeability, people have a tendency to be dynamic. Right now, we are obviously utilizing substantially more electricity than as a part of the center of the night, so electricity is in more significant interest. (This additionally makes electricity more costly amidst the day, making electricity delivered from solar panels more expensive.)

3.2.3 Solar Energy Storage is Expensive

Solar power must be utilized immediately, or it can be put away in heavy batteries. These batteries, used as a part of off-the-grid solar systems, can be charged amid the day so that the energy is utilized during the evening. This is a decent

answer for utilizing solar energy throughout the day. However, it is likewise entirely expensive. Much of the time it is more brilliant just to utilize solar energy amid the day and take energy from the grid amid the night (you can just do this if your system is joined to the grid). Fortunately, our energy interest is normally higher amid the day so we can meet the vast majority of it with solar energy.

3.2.4 Large areas are required to capture the energy

The more electricity you need to deliver, the more solar boards you will require because you need to gather however much sunlight as could reasonably be expected. Solar boards require much space, and a few rooftops are not sufficiently enormous to fit the quantity of solar boards that you might want to have. An option is to introduce a portion of the boards in your yard, yet they need access to sunlight. At any rate, on the off chance that you do not have space for every one of the boards that you needed, you can simply get a less and they will even now fulfilling some of your energy needs.

3.2.5 Associated with pollution

Despite the fact that contamination identified with solar power systems is far less contrasted with different wellsprings of energy, solar energy can be connected with contamination. Transportation and establishment of solar systems have been connected to the outflow of greenhouse gasses. There are likewise some dangerous materials and unsafe items utilized amid the assembling procedure of solar photovoltaic, which can in a roundabout way influence the environment. By the by, solar energy dirties far not exactly the other option energy sources.

4 CONCLUSION AND RECOMMENDATIONS

Saudi Arabia has an extraordinary measure of potential solar energy. Immense zones get serious daylight consistently, least burdened by fogs or rain. Thus, the Kingdom is anticipating spending over \$7 million to build up this solar energy source. In any case, the Kingdom likewise has a couple of components that conflict with the gathering of solar energy, dust being one of the greatest. As it is a desert nation and has been for an enormous number of years, the sands of its deserts have been ground down, making extraordinary measures of dust that is gotten by the smallest breeze. There's no part of Saudi Arabia, except, perhaps, in the uneven Asir that is not subject to mammoth dust storms. The utilization of solar energy could cover a big part of the energy request in Saudi Arabia. If advancement is accomplished in the field of solar energy trans-

formation, Saudi Arabia can be a main maker and exporter of solar energy as power. The geographic area of Saudi Arabia, its far-reaching empty desert arrive, all make it a magnificent area for this. Heat, as well, shows issues, especially with regards to effectiveness and energy stockpiling. The adequacy of solar authorities can be diminished as much as 20% because of warmth variables alone. Moreover, after that, there's the matter of energy stockpiling. Energy changed over from daylight should be put away until it is required. That suggests batteries or some likeness thereof and batteries simply don't do well when they are kept hot. Battery innovation is one of the 'following horizon' open doors for organizations, with new advancements tagging along, however at a much slower rate than other advance.

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