

SOLUTION TO GLOBAL ENERGY CRISIS

Solar Energy on a Home-scale

INTRODUCTION

The global energy crisis has been thriving substantially, which puts the human in the position to solve the problem within 53 years before all fossil fuels are used up for energy production. Mega-scale solar energy project has been promoted by nations throughout the years but there will only be little improvement unless the majority of their population participate. So, one of the alternatives to the crisis will be..... solar panel installation on a household scale!

Do You Know?

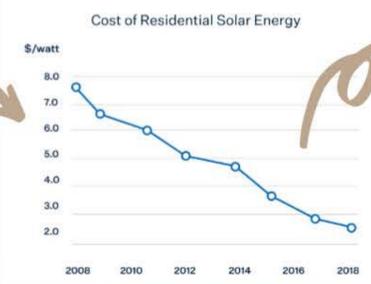
Solar Energy can produce power **WITHOUT** direct sunlight

Yes! You capture that right!

The sun is the most abundant source of energy for solar panels to absorb and convert to electricity, but there is no need for direct sunlight. Solar panels can capture different parts of the sun's light spectrum. So, if the sun isn't beaming directly on the panels - or it happens to be a cloudy day - it doesn't mean that the shades reflected from the sky are not captured and used by the solar panel.

EFFECTIVENESS

Cost of solar power, especially on a residential scale, has indeed **fallen substantially** over the past decade. Decrease from almost \$8 per watt to \$2.6 per watt, the price of residential solar energy has a significant 62% decrease in that period, which perhaps may be a joint result of both the **increasing number of funding sources and economies of scale**. Thriving trust towards the solar industry has **boost its credibility** in borrowing low interest bank loans, thus cheaper cost of production allows for a cheaper price. Increasing demand for solar cells have made **average cost lower** and hence allow producers to exploit economies of scale, making solar energy affordable to most people.



ENVIRONMENTAL IMPACTS

They are renewable energy and hence stock level will not be depleted due to economic exploitation, which is more sustainable and planet-saving. This correlates to the energy crisis as mentioned before. If more renewable energy occupies the energy production composition in the world, then the energy deficit will no longer be an urgent problem. Unlike large-scale solar facilities, residential solar panels are mostly installed on the rooftop or in the garden of a household. Thus, this does not raise any concerns regarding land degradation and habitat loss for animals, **protecting biodiversity on land**. At the same time, there will be a reduction in crude oil extraction in the sea if there is a larger reliance on solar power. Hence reducing the chance of possible oil spills occur during crude oil extraction and BTEX compounds produced in petroleum refineries, **protecting life below the water**.

INSTALLATION DETAILS

Traditional Solar Cell Working Principle:

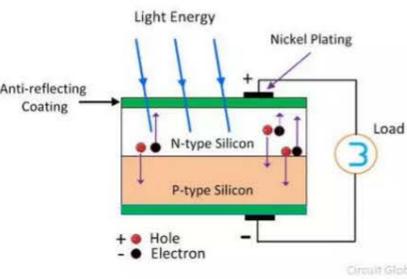
The key components used to convert sunlight into electricity is photovoltaic modules, which are constructed with silicon crystals.

Silicon crystals are divided into **n-type** and **p-type** layers, stacking on top of each other. By placing p-type and n-type semiconductors next to one another, a p-n junction is formed. The p-type, with one less electron, attracts the surplus electron from the n-type to stabilise itself. Hence, electricity is displaced and the flow of electrons are produced. The photovoltaic effect is created when sunlight hits the semiconductors and causing more negatives in the n-type semiconductors and more positives in the p-type, thus creating electron flow for electricity.

Scheme Details:

A **solar energy feed-in tariff (FiT)** can be hold! This means the electricity-producing centre will purchase the solar energy the households have generated or at surplus after self-consumption

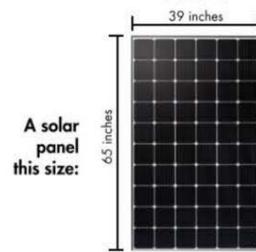
and provide them to the public at a cheap price. A standardised FiT rate can be used to calculate the profits that each house may receive while solar panels purchase meant, maintenance and installation will be paid by the household on a regular basis under the electricity-producing centre's guidance.



Circuit Globe

COST

In... **1954**



Was: 6% efficient
And could produce: 20 watts

Enough to power: 1/3 of a 60-watt bulb

Energy output is **gradually increasing** since the first solar panel created in 1954, which only takes 6% of the energy from the sun and convert it into electricity, when compare to 18.7% in 2020. This means more electricity will be generated to benefit the public or for self-consumption. Although solar energy may still be less efficient when compare to traditional fuels, its positive trend shows an **optimistic outlook**. Due to its low cost and slowly increasing output, solar energy has the competitive edge of becoming more and more efficient in the long run.

OUTPUT

2020



18.7% efficient

320 watts

5 and 1/3 60-watt bulbs

According to the UN, **sustainability** refers to meeting the needs of the present without compromising the ability of future generations to meet their own needs. Solar energy is a **renewable** resource, as opposed to non-renewable energy sources, they can be naturally replenished over a short period of time and hence will not be depleted through economic extractions, making it an important component to combat climate change. In addition, its **non-polluting abilities** make solar energy an ideal embodiment of sustainability itself. With no waste products and pollutants produced, they sit idly on rooftops and large solar arrays just to produce clean electrical energy for us!

Sustainability

Benefits

Even though solar energy itself is clean, other stages of the solar life-cycle such as manufacturing and transportation may still **emit greenhouse gases**, thus intensifying global warming. To purify the semiconductor surfaces, a number of **hazardous materials** such as the **1,1,1-trichloromethane** and **hydrogen fluoride** will be used. If amounts are not well controlled, they may pose health risks to both the owners and the neighbourhoods.

Concerns

Graphene Solar Cell

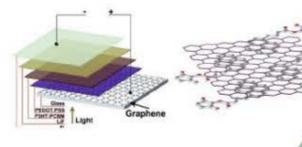
The product combines **low-cost organic materials with graphene electrodes** (a flexible, transparent material that is constructed from cheap and abundant sources of carbon). The novel method of depositing a **one-atom-thick layer** of graphene on the solar cell, without compromising nearby sensitive organic materials, enabled this advancement in solar technology.

Photovoltaic solar cells made of graphene would offer a variety of advantages over today's silicon solar cells. They will be easier and faster to make. Instead of being strong, stiff, and brittle, they would be **lightweight and elastic** and would thereby be easier to be transported, including to distant areas without a central power grid.



Lately, Professor Kian Ping Loh and his colleagues at the Department of Chemistry, National University of Singapore developed large-area, continuous, highly transparent, multilayer graphene films with sheet resistance of 200 μ /square chemical vapor deposition (CVD) system.

Using polydimethylsiloxane (PDMS) stamp approach the CVD grown graphene film can be easily transferred to glass and can be used as the anode for application in organic photovoltaic cells.



Texts:

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Pictures:

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- Rooftop solar power demonstration**
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