



The photovoltaic effect was discovered as early as 1839. Edmond Becquerel generated voltage and current, when he illuminated silver chloride in an acidic solution connected to platinum electrodes. In 1921, the Nobel Prize in Physics was awarded to Albert Einstein for the discovery of the law of the photoelectric effect. He explained the effect already in 1907, basing on his theory of quantum physics from 1905.

#### What is Solar Power?

- Solar photovoltaic (PV) power is the conversion of sunlight into electricity via solar cells within a solar panel or module.
- The PV cell consists of one or two layers of a semi-conducting material. When light shines on the cell it creates an electric field across the layers, causing electricity to flow.
- A PV system does not necessarily need bright sunlight. It can also generate electricity on cloudy days with diffuse light conditions.
- Solar PV systems are scalable to provide a wide range of power requirements from watts (W) and kilowatts (kW) to megawatt (MW) size.
- The Bell Laboratories in New Jersey presented the crystalline silicone PV technology in 1954. Shortly after that, the first technical application of these cells of modern design was to power remote telephone repeater stations. But being able to charge the batteries onboard of Vanguard I (America's second earth-orbiting satellite from 1958), made the use of PV cells popular.
- The 550 MW Topaz Solar Farm in California is the world's largest operating photovoltaic plant (as of Dec. 2014). Later in 2015, the Desert Sunlight Solar Farm will have the same installed capacity. The even bigger Solar Star Project in Kern County (California) is supposed to have an installed capacity of 579 MW and is going to start operation by the end of 2015.



*Increased use of solar power builds energy security, reduces greenhouse gas emissions, and moves Canada toward a sustainable energy future.*

#### WHY SOLAR?

- The earth's upper atmosphere receives in average 1,380 W/m<sup>2</sup> of the full spectrum of solar radiance. At ground level, after the radiation has traversed the atmosphere, the available energy is still around 1,000 W/ m<sup>2</sup> on a clear day.
- The areas in southern Canada, where 90% of the population lives, receive more solar radiation than Germany, which is the world leading nation in the use of PV per capita.
- Increased use of solar power builds energy security, reduces greenhouse gas emissions, and moves Canada toward a sustainable energy future.
- Solar PV energy compliments existing hydro dams, allowing water to be stored for times of high electricity demand. That is why it helps to reduce peak loads and postpones or prevents the need for additional baseload energy generation as well as distribution infrastructure (e.g. hydroelectric dams, coal-fired power generation stations, and underwater electrical cables).
- Solar power generation requires no fuel or moving parts. It makes no noise and produces no emissions with minimal maintenance.
- So far, energy has been very cheap in Canada, but with oil & gas prices bound to rise, more people are recognizing that clean energy such as solar power has an important role to play.



354-409 Granville Street  
Vancouver, BC V6C 1T2, Canada  
Office 604.568.4778  
Fax 604.568.4724

[www.cleanenergybc.org](http://www.cleanenergybc.org)



Our mandate is to develop a viable independent power industry in BC that serves the public interest by providing cost-effective electricity through the efficient & environmentally responsible development of the province's energy resources.



## THE TECHNOLOGY

- Approximately 90% of today's PV cells on the market use the crystalline silicon technology with over 14 different cell types.
- The performance of a solar cell is measured in terms of its efficiency at turning sunlight into electricity. A typical commercial crystalline PV module has an efficiency ranging between 11 and 19 percent.
- The PV industry has dramatically lowered the cost for the production of solar cells and improved their efficiency at the same time.
- The prices for complete Solar PV systems of the MW size in Canada can be less than two Canadian Dollar per watt (installed capacity). These costs include development, installation and auxiliaries (e.g. inverters, wiring, controllers, mounting hardware).
- While the highest cost for large PV projects are the grid connection and labour during the installation, the price of electricity from PV systems at suitable sites can easily compete with conventional power generation.

## BRITISH COLUMBIA'S POTENTIAL

- B.C.'s best solar energy resources are located in the northeast and southern interior of the province, with additional potential in areas along the southeast coast of Vancouver Island and the Lower Mainland. The annual solar radiation in the Kootenay Region is among the highest in the country (see *Key Links* for map).
- The Sunmine Solar Power Project in Kimberly is the first MW scale project in British Columbia as well as the first Canadian project of its size outside of Ontario. It will start operation in 2015.
- The T'Souke First Nation community located just west of Victoria, hosts three photovoltaic systems, with a total capacity of 75 kW, comprising the largest solar PV project in British Columbia owned by First Nations.
- Currently, in BC PV modules are mainly used to power radio repeater stations, monitoring stations and off-grid communities in remote areas. For these applications the costs of PV technology compete aggressively with the costs of electricity derived from fossil fuel. Areas requiring extensive power line construction may find solar PV to be more cost effective as well.



## KEY LINKS

EcoSmart Sun

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