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| **Department of Electrical Engineering**  **Assignment**  **Date: 25/06/2020**  **Course Details** | | | |
| **Course Title:** | Power Generation | **Module:** | 2nd |
| **Instructor:** | Eng. Sajid Nawaz sir | **Total Marks:** | 50 |
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**Student Details**

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**QUESTION 1: How Electric Generation is Possible from Run off river and ocean wave.**

**ANSWER:** Run-of-the-river plants have no water storage facilities but may use low-level dams to increase the difference between the water intake level and the turbine. In this case, the natural river flow generates electricity and the amount of power generated fluctuates depending on the cycle of the river. Although run-of-the-river technology can be used for large scale power generation, it is commonly applied to supply individual communities with electricity, with capacities of less than 30 MW. This form of power generation is popular in rural areas of China, but has potential application in many places, including in the United States. Run-of-the-river technology typically disrupts much less of the river flow as compared to large hydropower dams.

hydropower accounts for about [15 percent](https://www.worldenergy.org/publications/2013/world-energy-resources-2013-survey/) of electric generation. In 2014, U.S. hydropower plants had a capacity of about [101,000 megawatts](http://www.hydro.org/tech-and-policy/faq/#494)(MW) and produced [6 percent](http://www.eia.gov/tools/faqs/faq.cfm?id=427&t=3) of the total energy and [48 percent](http://instituteforenergyresearch.org/topics/encyclopedia/hydroelectric/#_edn1) of renewable electricity in the United States. Although most suitable sites for large scale dams have been developed in the United States and globally, there are many opportunities to install hydropower systems at existing dams currently without generation capability, and to use other water energy technologies in rivers, tidal zones and open ocean. According to two 2012 studies by the U.S. Department of Energy, existing dams that are not currently producing power could provide 12,000 MW of additional capacity, and if new installations (including those harnessing waves and tidal currents) are built, hydropower could potentially provide 15 percent of America's electricity by 2030 (vs. 6 percent today).

Hydropower facilities can be installed on rivers, oceans or lakes.

**QUESTION 2: How Solar thermal Electric generation is possible.**

## ANSWER: Solar thermal power/electric generation systems collect and concentrate sunlight to produce the high temperature heat needed to generate electricity. All solar thermal power systems have solar energy collectors with two main components: *reflectors* (mirrors) that capture and focus sunlight onto a *receiver*. In most types of systems, a heat-transfer fluid is heated and circulated in the receiver and used to produce steam. The steam is converted into mechanical energy in a turbine, which powers a generator to produce electricity. Solar thermal power systems have tracking systems that keep sunlight focused onto the receiver throughout the day as the sun changes position in the sky. Solar thermal power plants usually have a large field or array of collectors that supply heat to a turbine and generator. Several solar thermal power facilities in the United States have two or more solar power plants with separate arrays and generators

A solar thermal power plant in Spain. Solar thermal power plants are electricity generation plants that utilize energy from the Sun to heat a fluid to a high temperature. This fluid then transfers its heat to water, which then becomes superheated steam. ... Solar thermal power plants are considered active systems.

**QUESTION 3: Discuss the situation of our current power generation from wind.**

ANSWER: wind power generation means getting the electrical energy by converting wind energy into rotating energy of the blades and converting that rotating energy into electrical energy by the generator. Wind energy increases with the cube of the wind speed, therefore WTGs should be installed in the higher wind speed area.  
In May 2011, Toshiba involved in the business cooperation with a South Korea company UNISON, and since then we provide WTGs under the brand of Toshiba by using our business sales network and construct power plants using these WTGs. In October 2018 Toshiba had a mutually non-exclusive strategic cooperation agreement for the distribution of wind power generation systems with Senvion, German wind turbine equipment manufacturer to strengthen wind power business. We also keep developing electronic devices including controlling systems with our knowledge and technologies cultivated from thermal and hydraulic power plant designing and manufacturing technologies while are involved in the wind power generation business on our own. With a strength of standing on both sides, manufacturer and user, we offer solutions to meet customer needs in many different situations.

QUESTION 4: Briefly explain the Nuclear power plant and also write down the merits and demerits of Nuclear power plant.

ANSWER: A **nuclear power plant** is a [thermal power station](https://en.wikipedia.org/wiki/Thermal_power_station) in which the heat source is a [nuclear reactor](https://en.wikipedia.org/wiki/Nuclear_reactor). As is typical of thermal power stations, heat is used to generate steam that drives a [steam turbine](https://en.wikipedia.org/wiki/Steam_turbine) connected to a [generator](https://en.wikipedia.org/wiki/Electric_generator) that produces [electricity](https://en.wikipedia.org/wiki/Electricity). As of 2014, the [International Atomic Energy Agency](https://en.wikipedia.org/wiki/International_Atomic_Energy_Agency) reported there were 450 nuclear power reactors in operation in 31 countries.[[1]](https://en.wikipedia.org/wiki/Nuclear_power_plant#cite_note-iaea.org-1)[[2]](https://en.wikipedia.org/wiki/Nuclear_power_plant#cite_note-UIC-2)

Nuclear plants are usually considered to be [base load](https://en.wikipedia.org/wiki/Base_load) stations since fuel is a small part of the cost of production[[3]](https://en.wikipedia.org/wiki/Nuclear_power_plant#cite_note-3) and because they cannot be easily or quickly [dispatched](https://en.wikipedia.org/wiki/Dispatchable_generation). Their operations and maintenance and fuel costs are, along with hydropower stations, at the low end of the spectrum and make them suitable as base-load power suppliers. The cost of spent fuel management, however, is somewhat uncertain.

This water from around the nuclear core is sent to another section of the power plant. Here, in the heat exchanger, it heats another set of pipes filled with water to make steam. The steam in this second set of pipes turns a turbine to generate electricity. Below is a cross section of the inside of a typical nuclear power plant.

Another form of nuclear energy is called fusion. Fusion means joining smaller nuclei (the plural of nucleus) to make a larger nucleus. The sun uses nuclear fusion of hydrogen atoms into helium atoms. This gives off heat and light and other radiation.

In the picture to the right, two types of hydrogen atoms, deuterium and tritium, combine to make a helium atom and an extra particle called a neutron.

| **Advantages** | **Disadvantages** |
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| Produces no polluting gases. | Waste is radioactive and safe disposal is very difficult and expensive. |
| Does not contribute to global warming. | Local thermal pollution from wastewater affects marine life. |
| Very low fuel costs. | Large-scale accidents can be catastrophic. |
| Low fuel quantity reduces mining and transportation effects on environment. | Public perception of nuclear power is negative. |
| High technology research required benefits other industries. | Costs of building and safely decommissioning are very high. |
| Power station has very long lifetime. | Cannot react quickly to changes in electricity demand. |