

# Exploitation Of Renewable Sources In Japan

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For many years, Japan has been a leading consumer and importer of electrical energy. Japan is also recognized by the world because of its large economy and energy exploitation technology. Japan's energy production efforts were motivated by the fallout that resulted from the 2011 earthquake and the Fukushima nuclear disaster. The two incidents led to a series of events that made the government of Japan revise its energy policy. To start with, the accidents led to the closure of all power plants, resulting in a drop of about 40% in overall electrical production and supply. The shortage in nuclear energy production resulted in an increase in the use of fossil fuels and carbon dioxide emissions. The government was also forced to import energy from neighbouring countries, and this brought electricity prices to unsustainable levels.

According to Zografakis 1080, Japan reconstructed a new energy policy with the aim of providing safe, cheap and reliable electrical energy to the Japanese. The Japanese government came up with several strategies that relied on diversifying the sources of energy exploited so that it could achieve a steady power supply. Ambitious goals were outlined, such as using less fuel energy, which would also curb the emission of carbon dioxide. Secondly, the Japanese government chose to rely more on renewable energy from sources like wind, solar and water. The challenges facing Japan were so severe that the International Energy Agency (IEA) had to intervene. IEA encouraged Japan to increase the production of renewable energy and restart nuclear power production as soon as the nuclear power plants were proven safe to operate. Over the years, the generation of electrical energy has decreased in Japan. This was attributed to the fact that Japan depended on nuclear and thermal sources to supply electricity to the country. The article by Aghaei further claims that the production of electricity from renewable sources had dropped from 25% to about 10%. The report also claims that in the year 2012, the Japanese government and other energy stakeholders came up with aggressive plans to ensure that the goals of exploiting renewable sources were achieved. Hydropower was the first strategy to be implemented. The primary challenge facing the exploitation of hydropower is that Japan experiences severe winter, and the availability of water dramatically decreases during this season. The article states that hydro-power production drops to 5% during winter and rises to about 12% – 15% during winter (Zografakis 1090). Another challenge facing renewable source exploitation in Japan is that some of the resources required are scarce in supply. For example, wind exploitation is affected by the occurrence of the tsunami in Japan. However, Japan was able to overcome these challenges and reduce the use of coal. In line with claims from Zografakis' book, Japan has significantly reduced the number of nuclear reactors in the country.

One of the most cost-effective and efficient ways used by Japan to produce safe energy from renewable sources was the installation of hydropower plants. A considerable number of hydroelectricity-generating plants were installed across the country. Two installation methods, the flow-type installation and pump-power installations, were applied. The flow-type hydropower stations

were installed in strategic locations like waterfalls. The force of the water flowing due to gravity was used to turn turbines that produced electricity. Pump-power hydropower plants, on the other hand, are situated in elevated areas and are installed together with a vast water reservoir, such as a dam. Reversible generators are then fixed to generate electricity and pump the required water to the repository. Pump-power plants were developed with the purpose of completing a network of centralized energy production that involved hydro-power production and nuclear and thermal production. The article further states that by the year 2012, Japan had the capacity to produce over 69.2 TWh of hydroelectricity. The Japanese locals also developed numerous small-scale hydropower enterprises to fulfil the government's vision of delivering safe and reliable energy. According to Zografaki, the Japanese installed over 1198 small-scale hydropower plants that produced over 3225 MW of electricity. The mini hydropower plants account for about 6.6 per cent of the total hydroelectric energy produced in Japan annually. The advantages of hydroelectric power are currently evident in Japan. First, the cost of energy has drastically reduced to sustainable levels. Secondly, the emission of carbon dioxide from industries has diminished, enhancing the call to preserve the environment and reduce global warming (Zografakis 1093). Also, the general public has trust in hydroelectricity since the generation of hydropower is cost-effective and safe in the sense that it cannot cause severe damage compared to nuclear energy. Despite the crucial steps taken by the Japanese community to successfully produce hydroelectricity, there is still significant capacity remaining to be executed. This mainly applies to small-scale mini-hydropower plants.

Of all the renewable sources exploited in Japan, geothermal is among the least utilized. Japan is located in the region referred to as "ring of fire" making it possess numerous volcanoes. A large number of volcanoes results in Japan having a high potential for geothermal production. The book by Saber states geothermal reserves are the third largest in the world. Following the Fukushima nuclear disaster, Japan started to focus heavily on geothermal energy. The article continues to state that by the year 2011, Japan had installed six geothermal power generating stations. The Japanese Ministry of Industry and Trade continually conducted further exploration of over forty locations that showed signs of potential power production (Saber 1231). Photovoltaic (solar) energy is another renewable source of energy exploited in Japan. Similar to all the other renewable sources, solar energy in Japan was produced for commercial purposes after the Fukushima nuclear plant disaster. The production of solar energy in Japan started in the early 1990's. Before the year 2000, Japan was the leading producer of solar energy (producing an overall of 36%) but was overtaken by Germany (yielding 39%). Until 2012, the Japanese had failed to exploit their full potential in solar energy production. Full exploitation of solar energy was set forth after the government adopted the Strategic Energy Plan (SEP). The adoption of SEP made the Japanese come up with strategies to improve the growth of solar energy production. After 2012, Japan was able to produce over 3.5 per cent of the solar energy that is consumed globally. Solar technology in the country is mainly used for two purposes. One, solar energy is mainly used for electricity (photovoltaic), and second, it is used for heating systems, especially during severe temperatures experienced in winter. The 7.4-gigawatt figure describes an earlier stage of Japan's solar development. Japan's Agency for Natural Resources and Energy now publishes updated 2024 energy and electricity statistics, so this older figure should not be used as a

current capacity total. Most of the solar power is utilized in government institutes such as hospitals and schools (Saber 1231).

Carrasco's book states that adds to the number of renewable resources exploited in Japan. Wind energy and biomass energy are some of the renewable sources, he said. Japan's large number of industries and vast population produce millions of tons of electrical, plastic and other waste materials daily. Waste control was becoming an issue in Japan until the invention of converting these waste materials into energy. Japan installed several biomass processing plants to produce this type of power. The claim of more than 200 biomass plants describes the source period and should not be presented as a current nationwide total without updated official data. The process converts about 320 million tons of waste daily with the efficiency of generating 76% of energy from the trash. Another article in his book states that wind energy generation is the least exploited in Japan among all the other renewable sources of energy (Carrasco 1012). This is attributed to the fact that the winds blowing over Japan are consistently affected by tsunamis. Wind energy exploitation was almost neglected as the most focus was placed on other forms of energy production. However, Japan still exploits wind energy, and the Shin Izumo power plant is a perfect example. The Shin Izumo plant, owned by Eurus Energy, is the most significant power plant in Japan. The firm produces over 76 megawatts of electrical energy from the twenty-six turbines it operates. The 2,440-megawatt wind figure is an older capacity estimate and should not be presented as Japan's current wind total. Research is still being done to evaluate potential areas that can improve the exploitation of wind energy (Carrasco 1012).

The Japanese are not yet done with renewable energy exploitation, and various research teams are still coming up with strategies for fully exploiting renewable resources. A good example is a statement by the Japanese government in 2012 proposing to install power-producing plants along the country's coastline to generate energy from the tides and waves. The government has also noted that the vast number of automobiles in the country release a significant amount of carbon dioxide into the atmosphere. The government is currently implementing strategies that will produce engine vehicles that will use hydrogen fuel. The 40,000-car figure was a pre-2020 forecast. Japan's Ministry of Economy, Trade and Industry reported 8,408 fuel-cell vehicles in service as of May 2024, showing that the earlier target was not achieved on that timetable. Another crucial project proposed in Japan is the Energy From The Desert project. The heat and the sunny conditions provide the requirements for efficient solar energy production.

## Works Cited

Aghaei, Jamshid, and Mohammad-Iman Alizadeh. "Demand response in smart electricity grids equipped with renewable energy sources: A review." *Renewable and Sustainable Energy Reviews* 18 (2013): 64-72.

Ammar, Yasmine, et al. "Low-grade thermal energy sources and uses from the process industry in

the UK." *Applied Energy* 89.1 (2012): 3-20.

Carrasco, Juan Manuel, et al. "Power-electronic systems for the grid integration of renewable energy sources: A survey." *IEEE Transactions on Industrial Electronics* 53.4 (2006): 1002-1016.

Mwasilu, Francis, et al. "Electric vehicles and smart grid interaction: A review of the vehicle to grid and renewable energy sources integration." *Renewable and Sustainable Energy Reviews* 34 (2014): 501-516.

Saber, Ahmed Yousuf, and Ganesh Kumar Venayagamoorthy. "Plug-in vehicles and renewable energy sources for cost and emission reductions." *IEEE Transactions on Industrial Electronics* 58.4 (2011): 1229-1238.

Zografakis, Nikolaos, et al. "Assessment of public acceptance and willingness to pay for renewable energy sources in Crete." *Renewable and Sustainable Energy Reviews* 14.3 (2010): 1088-1095.