Electric grid japan

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The electric power industry in Japan covers the generation, transmission, distribution, and sale of electric energy in Japan. Japan consumed approximately 918 terawatt-hours (TWh) of electricity in 2014.[1]Before the 2011 Fukushima Daiichi nuclear disaster, about a quarter of electricity in the country was generated by nuclear power the following years, most nuclear power plants have been on hold, being replaced mostly by coal and natural gas.Solar power is a growing source of electricity, and Japan has the third largest solar installed capacity with about 50 GW as of 2017. Japan"s electricity production is characterized by a diverse energy mix, including nuclear, fossil fuels, renewable energy, and hydroelectric power.

Japan has the second largest pumped-hydro storage installed capacity in the world after China.[citation needed]

The electrical grid in Japan is isolated, with no international connections, and consists of four wide area synchronous grids. Unusually the Eastern and Western grids run at different frequencies (50 and 60 Hz respectively) and are connected by HVDC connections. This considerably limits the amount of electricity that can be transmitted between the north and south of the country.

In 2008, Japan consumed an average of 8507 kWh/person of electricity. That was 115% of the EU15 average of 7409 kWh/person and 95% of the OECD average of 8991 kWh/person.[2]

Compared with other nations, electricity in Japan is relatively expensive.[3]

Since the Fukushima Daiichi nuclear disaster, and the subsequent large scale shutdown on the nuclear power industry, Japan"s ten regional electricity operators have been making very large financial losses, larger than US$15 billion in both 2012 and 2013.[4]

In 2020 transmission and distribution infrastructure access will be made more open, which will help competitive suppliers cut costs.[8]

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Electricity transmission in Japan is unusual because the country is divided for historical reasons into two regions each running at a different mains frequency.[10] Eastern Japan has 50 Hz networks while western Japan has 60 Hz networks.[10][11] Limitations of conversion capacity causes a bottleneck to transfer electricity and shift imbalances between the networks.[10][11]

Eastern Japan (consisting of Hokkaido, Tohoku, Kanto, and eastern parts of Chubu) runs at 50 Hz;

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Western Japan (including most of Chubu, Kansai, Chugoku, Shikoku, and Kyushu) runs at 60 Hz.[10][12] That originates from the first purchases of generators from AEG for Tokyo in 1895 and from General Electric for Osaka in 1896.[13][14]

The frequency difference partitions Japan"s national grid and so power can be moved only between the two parts of the grid using frequency converters, or HVDC transmission lines. The boundary between the two regions has four back-to-back HVDC substations, which convert the frequency: Shin Shinano, Sakuma Dam, Minami-Fukumitsu, and the Higashi-Shimizu Frequency Converter.[citation needed] The total transmission capacity between the two grids is 1.2 GW.[15]

The limitations of these links have been a major problem in providing power to the areas of Japan affected by the Fukushima Daiichi nuclear disaster.[13] During the 2011 T?hoku earthquake and tsunami, there were blackouts in some areas of the country because of the insufficient ability of the three HVDC converter stations to transfer energy between both networks.[12]

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