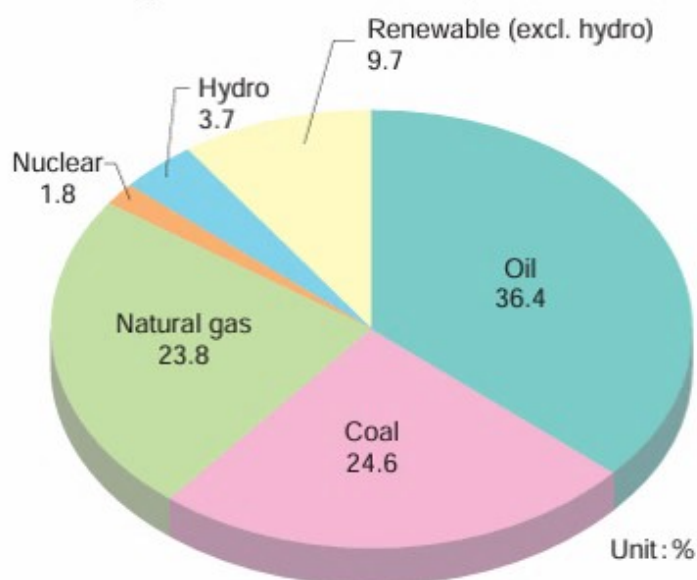


Nuclear energy

Various energy sources

Among energy sources necessary for daily life and economic activities, the ratio that can be secured within a country is called energy self-sufficiency. Japan's energy self-sufficiency rate peaked at 58.1% in FY1960 and has declined significantly since then, due to the shift of fuel from domestically produced coal to oil. Today, almost all oil, natural gas, and coal are imported. Uranium, necessary for nuclear power generation, is also imported from abroad. Although the diversification of energy sources has progressed, the dependence on fossil energy in 2020 was significant at 84.8%. In particular, oil accounts for just under 40% of the total, most of which is imported from the Middle East.

Energy sources used in Japan (FY2020)



(Note 1) In "Comprehensive Energy Statistics", the calculation method for the figures has been changed since FY1990.

(Note 2) "Renewable (excl. hydro)" refers to solar, wind, biomass, geothermal, etc.

Source: Ibaraki Prefecture Nuclear Power and Energy Book for High School Students, 2022 Edition (excerpts)

Difference between nuclear power generation and atomic bombs

Nuclear power generation and atomic bombs both use energy from the nuclear fission of uranium. Atomic bombs must generate a vast amount of energy in an instant, thus highly enriched uranium, with close to 100% concentration of uranium 235, which easily undergoes nuclear fission, is used. In contrast, nuclear power generation aims to boil water continuously, thus low-enriched uranium, with 3-5% uranium 235 concentration, is used. Moreover, many control rods, consisting of material that absorbs neutrons, are placed like sleeves around the fuel rods in the reactor, to control the radiation emitted by the nuclear fission reaction.

| | Ratio of Uranium-235 to Uranium-238 & Chain Nuclear Reaction | Method of Controlling Fission Rate |
|--------------------------|---|--|
| In a Nuclear Power Plant | <p>Uranium 235 (3~5%) Uranium 238 (95~97%)</p> <p>The ratio of Uranium-235 is low, so fission is sustained at a constant scale, for reasons such as absorption of neutrons by Uranium-238.</p> <p>1st time 2nd time 3rd time</p> | Many control rods are installed and the reactions are self-limiting, so the rate of fission cannot increase rapidly. |
| In a Nuclear Bomb | <p>Gunpowder</p> <p>Uranium 235 (Almost 100%)</p> <p>The ratio of Uranium-235 is nearly 100% and at this high level neutrons cannot be absorbed by anything else, so one atom after another undergoes fission and the energy is released instantly as an explosion.</p> <p>1st time 2nd time 3rd time</p> | No control rods are installed and the reactions are not self-limiting, so the rapid increase in fission cannot be stopped. |

Sources: Graphical Flip-chart of Nuclear & Energy Related Topics