

ENERGY AND RESOURCES

Energy saving and new energy sources within the context of global environmental concerns



A petrochemical complex
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Japan's Current Energy Profile

Japan's limited domestic energy resources combined with its huge energy demand mean that it must depend on foreign sources for approximately 80% of its energy supply. Imports of crude oil account for the largest portion.

Except for the periods after the oil crises of 1973 and 1979, energy consumption in Japan has steadily increased. In the decades since the oil crises, consumption of energy by industry has remained fairly steady while consumption for residential and commercial

use and passenger and freight transportation has tended to increase, regardless of economic trends.

Since the end of the 1980s, as oil imports from such Asian countries as Indonesia and China have decreased, Japan has been relying to an ever greater degree on oil from the Middle East, which now provides around 90% of Japan's oil imports. Global energy demand, especially that in Asia, is expected to continue to increase, and oil is likely to remain the world's principal source of energy. With oil reserves declining in some producing regions, the world is likely to become even more dependent on the huge oil production capacity

that still exists in the Middle East.

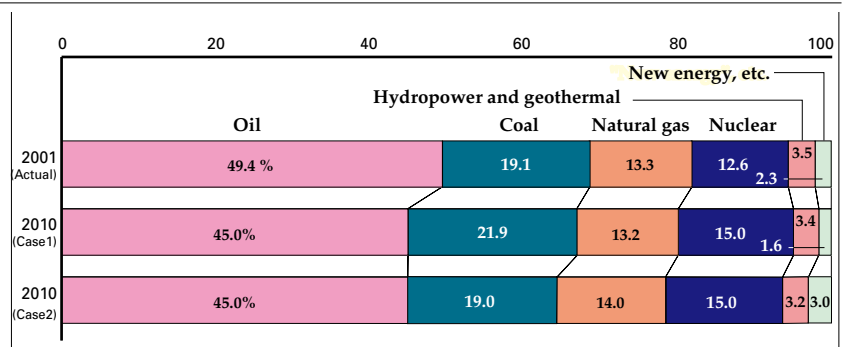
Given that Japan already relies on the Middle East for around 90% of its oil and also depends on imports for most of its non-oil energy resources, it is clear that the country's energy supply structure is even more fragile than that of other industrial nations. Under these conditions, reducing energy risk by securing stable supplies will continue to be a critical issue for Japan's energy policy. To reduce energy risks and to prepare for emergency situations, Japan is pursuing measures for stockpiling oil, encouraging independent development of resources, and promoting cooperation with oil producing countries.

In 2002 the government passed the Basic Law on Energy Policy in order to promote comprehensive and integrated energy policies. This law sets forth the basic energy policy principles of "ensuring a stable energy supply," "harmonization with the environment," and "utilization of market mechanisms," and it also mandates the preparation of a "Basic Energy Plan" that promotes a systematic, long-term, comprehensive approach to policies concerning energy supply and demand.

The Prevention of Global Warming and New Energy

The greenhouse effect, which is mainly the result of carbon dioxide emissions created when fossil fuels such as petroleum and coal are burned, has become a matter of serious global concern. At the end of 1997, the Third Session of the Conference of the Parties to the United Nations Framework Convention on Climate Change (COP3) was held in Kyoto. The Kyoto Protocol adopted at the conference was ratified by Japan in 2002, but as of the end of 2003 it had not yet taken effect because it had still not been ratified by the minimum number of countries required.

In the quest for technologies and facilities that lessen greenhouse gas emissions, attention is naturally given to the potential of both nuclear power and natural energy sources. While nuclear power generation does not produce carbon dioxide, the nuclear



power industry is encountering increasing difficulty in securing sites for the construction of new power plants and facilities for the storage of spent nuclear fuel. Thus, the active development of natural energy sources is highly desirable, even though the diffusion and popularization of these new energy technologies still pose many problems.

Already in 1974, the Ministry of International Trade and Industry (now the Ministry of Economy, Trade and Industry) announced its Sunshine Project for developing new energy technologies aimed at coping with the energy crisis and building a society free of environmental pollution. In 1993, this project underwent fundamental revisions that gave birth to the New Sunshine Program, the objective of which is to develop innovative technology to create sustainable growth while solving energy and environmental issues. Two research areas that the program is currently focusing on are the development of technology to reduce carbon dioxide emissions—thereby helping Japan to meet its COP3 emission-reduction target—and the development of technology that will foster new industries in environment-related fields such as recycling.

A key factor inhibiting the development of new energy sources has been the costs involved. According to the Ministry of Economy, Trade and Industry, the cost of generating electricity from solar energy for household use is three or four times more expensive than an ordinary household electric bill, while the cost of electricity generated through wind power is two to three times that of electricity produced by petroleum-fueled power plants. New energy reliability with respect to the production of a continuous and uninterrupted energy supply is also considered a problem. In the field of solar power generation, much progress has been achieved in private enterprise research and development in recent years, with the result that solar-energy equipment is going down in price. Measures such as subsidies to help home-owners install the necessary

Japan's Supply of Primary Energy (as of 2001)

Note: Case 1 indicates the figures to be reached if the current level of energy-saving measures are maintained; Case 2 indicates those figures which are expected when maximum measures are taken for both demand and supply.
Source: Energy Research Society, *Outlook for Long-Term Energy Supplies*

equipment are spurring the spread of new solar technologies to private dwellings. Notable, too, has been the introduction by local governments of public facilities for the generation of electricity from solar energy and wind power and from the heat produced by waste incinerators.

Another strategic technology in the development of new energy sources is hydrogen fuel cells. These fuel cells have a wide range of applications, the most conspicuous being use as an automobile power source. Several Japanese companies are already producing fuel-cell-powered automobiles although they are not yet being mass marketed. As part of its comprehensive strategy in this field, the government is promoting both fuel cell technology development and the development of the technology and infrastructure needed to produce, store, and supply the hydrogen needed to make nonpolluting fuel cell vehicles a practical reality.

The Current State of Nuclear Energy

Given the present-day difficulties involved in ensuring the reliability and large-scale supply of new energy, nuclear energy cannot help but have an important role as a substitute for oil and as a type of energy that does not produce carbon dioxide. Based on the premise that operational safety can be ensured, the government is promoting nuclear power as a key source of electricity for the country.

As of July 2003, the 52 commercial nuclear reactors in operation had a total electric power generation capacity of 45.74 million kilowatts and supplied about one-third of the country's electricity. An additional four reactors were under construction and eight were in a preliminary stage of planning prior to the start of construction. Private electric power companies own and operate all the nuclear reactors. Efforts to build new nuclear power plants have been greatly complicated by the fact that the public's confidence in the safety of nuclear energy has been greatly shaken by a series of nuclear-power-related accidents in



Japan since the mid-1990s.

It is estimated that the operating nuclear power plants of the type known as "light water reactors" (which burn uranium fuel) will, within about 60 years, exhaust the world's currently known deposits of natural uranium. With this in mind, Japan has proceeded with a plutonium thermal use plan in which spent nuclear fuel is reprocessed to create a plutonium-uranium mixed oxide (MOX) fuel for use in light water reactors. The Nuclear Waste Management Organization (NUMO) of Japan was established in 2000 to promote the disposal of high-level radioactive waste originating from nuclear power generation. NUMO's responsibilities include: the carrying out of nuclear waste disposal research activities; selection and investigation of potential disposal sites; construction, operation, and maintenance of repositories; and implementation of final waste disposal.

Deregulation in the Energy Industry

In recent years, there has been a steady easing of regulations in Japan's energy industry. In the case of oil-related businesses, the importation of crude oil to be refined into gasoline, light oil, and fuel oil had earlier been almost wholly monopolized by the oil refineries. Since April 1996, however, such imports have been possible by any enterprise so long as it meets certain standards of safe storage and quality control. In April 1998 the prohibition of self-service pumps at gasoline stations was lifted. As part of a series of deregulation measures, in January 2002 regulations controlling the supply-demand balance were eliminated and a new system was implemented for ongoing collection of information to be used in the event of an emergency. Such deregulation measures are helping to spur the reorganization of Japan's domestic oil industry through corporate mergers and alliances.

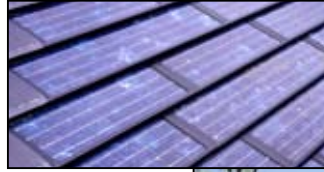
Deregulation is also taking place in the electricity sector. In accordance with a revision to the Electricity Utilities Industry Law,



Alternative fuel

A refueling station for vehicles powered by natural gas.

© Toyota Motor Corporation



since December 1995 competition has been introduced into the market for the generation and supply of electricity. The introduction of a wholesale electric power bidding system in 1996 made it possible for companies other than electric power companies to sell the electricity that they generate to the electric power companies. In March 2000 the retail sales of electricity was also partially deregulated, and it became possible for companies other than electric power

companies to sell electricity directly to large-volume purchasers.

Solar energy in use
This house has solar power generation panels installed on its roof.
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