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**DIRECTORATE OF INTELLIGENCE**

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**Japan: Energy Research Efforts**

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**Summary**

The Japanese Government, in a quest to reduce its dependence on imported crude oil, is funding a wide variety of research into alternative energy technologies. Among the areas being explored by Tokyo are fuel-cell technology, coal liquefaction and use of ceramics in power generation.

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Fuel-Cell Technology: Although Japan did not invest much time or money in fuel-cell technology until 1983, a broad-based and active research effort is now under way. The Japanese Government has spent about \$50 million over the past five years on this technology to reduce Japan's dependence on fossil fuels. Although Japan still lags the United States by several years in fuel-cell development, press reports indicate Japanese companies believe the technology will be commercialized by the early 1990s. Japanese utilities are likely to be the primary producers and consumers of fuel cells, which produce electricity through a chemical reaction involving hydrogen and oxygen. Japan's poor resource endowment and dense population make the high efficiency and low pollution levels of electric power plants using fuel cells very attractive. Tokyo

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[Redacted]

Electric Power--which supplies over 30 percent of Japan's electricity needs--plans to replace obsolete thermal power plants with fuel-cell plants, according to Embassy Tokyo. In addition to utility companies, many Japanese machinery firms plan to market fuel-cell power generators. [Redacted]

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Ceramics Research and Development: Although fine ceramics are currently used primarily for electric and electronic parts, Japanese firms are conducting extensive research on alternative applications. They hope eventually to market ceramic parts of use to industries such as biotechnology, steel and auto production, and energy generation. Although MITI plans to spend about \$60 million between 1980 and 1990 for ceramics research, private companies are underwriting most development costs because of the bright future predicted for the industry. [Redacted]

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[Redacted] the ceramics market in Japan, currently about \$2.5 billion per year, is expected to grow to well over \$4 billion by 1990 and to continue to experience rapid development throughout the next decade. [Redacted]

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[Redacted]

Coal Liquefaction: As part of its effort to reduce Japan's dependence on imported oil, MITI is sponsoring two programs to establish viable coal liquefaction technology, which produces a synthetic fuel that could be used instead of crude.

- MITI's New Energy Development Organization (NEDO) started a bituminous coal liquefaction project in 1984, designed to liquefy 250 tons of coal a day when the pilot plant is completed around 1990. The plant will cost an estimated 100 billion yen (about \$625 million at 160 yen/dollar), with NEDO providing 85 percent of the costs and participating companies supplying the remainder.
- The Nippon Brown Coal Liquefaction (NBCL) project is a joint venture with Australia, begun in 1980 and wholly funded by the Japanese Government. First-stage construction of the 50-ton-per-day pilot plant was completed in March 1985, and NEDO introduced coal into the plant in late 1985. Integrated operation will begin upon completion of the second-stage construction. [Redacted]

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[Redacted] the period of slack oil demand during mid-1985 had little effect on Japanese liquefaction efforts. [Redacted]

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[Redacted] However, the current low oil prices are reducing MITI's oil tax revenues, which finance alternative energy programs, and this may eventually force a cutback in the liquefaction projects. In addition, Japanese officials fear the low price will hinder corporate incentives to participate in these programs. Indeed, [Redacted] NEDO officials say the liquefaction process would not be economically viable unless the price of oil reached \$40 per barrel. [Redacted]

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Emissions-Control Technology for Fossil Fuels: We know little of Japanese emissions-control technology per se. However, Japan strictly enforces the world's most stringent emissions standards. Coal-fired power plants that started operations in 1983 and 1984, for example, devoted approximately 20 percent of the total construction cost for environmental protection. Local environmental regulations in the more densely populated areas of the country tend to be even stricter than national requirements. Standards in all sectors are set toward the top end of technically attainable ranges and are periodically adjusted as technical progress makes higher standards economically feasible. Tokyo provides funding for research and development in key areas of overlap between energy use and environmental concerns, including ash disposal, the handling of waste products from coal combustion, and processes for flue gas desulphurisation.

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