

Japan: The Power of Efficiency

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Energy security concerns are nothing new in Japan. The oil embargo during World War II and the 1970s oil shocks shaped much of Japan's recent history. The island of Japan is unique among industrialized nations in that it is virtually devoid of natural resources. Foreign suppliers must be found for all components of its energy portfolio except hydro and renewables: oil (47% of total energy supply), coal (21%), liquefied natural gas (13%), and nuclear (15%).¹ Long the technology leader in Asia, Japan finds itself preparing for a future in which its energy policy must weigh increased global energy demand, emerging resource nationalism, and stagnating upstream development. Japanese energy policy is built upon an understanding that resources are finite and that it has maxed out its domestic resources. This is the main factor behind Japan's relentless drive for efficiency and diversification. By putting efficiency at the center of its policies, since 1973 Japan's energy intensity has improved by 37 percent, and its oil dependency has dropped by 30 points, making it one of the largest, most energy-efficient economies in the world.

A History of Energy Insecurity

Japan's current energy approach, emphasizing efficiency, diversification, and international cooperation, evolved out of its wartime experience. Oil supply security played an important role in the imperial policies leading to World War II and in the period that followed, when energy policy was directed at reconstruction of the country.

Soon after the eruption of hostilities with China, many Western powers curtailed oil shipments to Japan out of fear that British and Dutch colonial possessions in South Asia could be threatened. While the United States used its position as Tokyo's main oil supplier to restrain the Japanese, President Franklin D. Roosevelt resisted sanctions proposed by members of his cabinet. Roosevelt

velt suspected that cutting the Japanese off from their only reliable supply of oil was likely to drive their military south toward the East Indies. He sustained the flow of petroleum products to Japan even as its war against China continued. FDR overruled Petroleum Coordinator Harold Ickes's proposed halt to petroleum exports out of east coast ports, which was intended to maximize availability of petroleum to support Britain in its war against Germany. Nevertheless, a restriction in 1940 on the types of petroleum products available for export to Japan was implemented to ensure enough fuel was available for U.S. aircraft.² Embargoes on Japan grew tighter, and by August of 1941, oil exports to Japan had effectively dried up, causing great anxiety in Tokyo.³ Just as Roosevelt predicted, Admiral Yamamoto's fleet steamed for the East Indies, simultaneously attacking Hong Kong, Singapore, the Philippines, and Borneo. The attack on Pearl Harbor was aimed at securing the advancing Imperial navy's rear flank, ensuring that that the United States could not interfere in Japan's efforts to gain the oil it needed.⁴

After the war, with the collapse of the Japanese industrial base, a general decimation of its infrastructure, and policymaking decisions in the hands of the Supreme Commander of the Allied Powers, General Douglas MacArthur (SCAP), the development of a coherent energy policy receded as a priority.⁵ Instead, growing industries such as iron and steel took precedence, boosting demand for the only energy source available domestically—coal. Power demand began to rise, and by the early 1950s electricity shortages and outages became a reality of daily life.⁶ In response, the Japanese government put together its first energy policy, the Matsunaga Plan. Despite objections from inside and outside the government, the Matsunaga Plan was forced through the Diet on General MacArthur's instructions.⁷ By May 1951, the national electricity monopoly had been dismantled and nine vertically integrated private utilities were formed.⁸ Just over a year later, with rates up 30 percent and public opinion turning against the reorganization, the government created the Electric Power Development Corporation (EPDC), which was tasked with using government resources to develop hydropower plants to supply the nine regional monopolies.⁹

Because of oil's key role in the Japanese war machine and the dearth of domestic sources, SCAP's initial stance was to dismantle the petroleum industry in Japan. By the early 1950s, however, oil was seen as an increasingly attractive alternative to dirty, though abundant, coal. Worsening pollution combined with union unrest among coal miners and escalating costs to reduce Japanese international competitiveness.¹⁰ The shift to oil gathered momentum with the outbreak of the Korean War, as U.S. forces began to require ever greater amounts of petroleum products, and the oil infrastructure began to improve.¹¹ This pattern of development set the tone for the next 20 years, particularly as labor unrest and cartelism persisted in the coal sector. The introduction of the First Coal Program in 1962, nationalizing the mining industry and capping prices, was not enough to preserve coal's role in the economy, and by 1964 its share of the total primary energy supply (TPES) dropped below oil's.¹²

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The absence of a Japanese company from the roster of the oil majors did not go unnoticed by the government, which established the Japan Petroleum Development Corporation in 1967. Modeled on the French and Italian oil firms (ELF and ENI, respectively), JPDC (later the Japan National Oil Company, or JNOC) was initially tasked with providing capital for projects using revenues collected from oil consumption taxes.¹³ This arrangement was meant to ensure a stable flow of energy through the development of oil and gas resources by Japex and Inpex, two major oil companies established through government initiatives. The nascent nuclear power industry, a source of pride for some, remained a marginal player in Japan's energy mix during this period. The public's ambivalence toward nuclear technology, along with the need to import much of the hardware, restricted initial investment to the government-sponsored Japan Atomic Power Company (JAPC).¹⁴ Established in 1957, JAPC took nine years to put into service its first nuclear reactor, the 166 MW gas-cooled Tokai Power Station, and it was another four years before the first Boiling Water Reactor produced electricity commercially at Tsuruga.¹⁵ Both power plants were based on imported designs, the first from Britain and the second from America's General Electric.¹⁶

This energy-intensive stage of Japanese development, with heavy industry and manufacturing serving as engines for the reconstruction of the country, required coordination of industrial and energy policy. By focusing investment on exporting industries, Japan sought to generate foreign exchange with which to satisfy its energy needs.¹⁷ Few countries were as affected as Japan was by the Arab oil embargo of 1973. The resulting changes in the industrial landscape, the economic slowdown that followed, and dramatic increases in energy prices helped to mobilize the Japanese population in support of energy efficient policies. By the second oil shock six years later, Japan was in a position not only to weather the storm better than most developed countries, but also to capitalize on the world's newfound desire for energy conservation by exporting fuel-efficient cars and other technology.¹⁸

The Path to Diversification and Efficiency

The mid-1970s saw a wave of energy-related legislation in Japan. Enacted in December 1973, the Emergency Law for the Stabilization of National Life gave the government the ability to set prices for everyday products during times of severe inflation. The Petroleum Supply and Demand Optimization Law of the same year set oil supply targets and restricted oil use.¹⁹ To insulate the economy from turbulent market effects, the Petroleum Stockpiling Law of 1975 provided financial assistance to private companies for the maintenance of a 70-day supply of petroleum products.²⁰ The Law Concerning the Rational Use of Energy, enacted in June of 1979, encouraged efficiency on the part of Japanese consumers.²¹ Setting out specific efficiency goals for factories, buildings, and machinery, this law demonstrated recognition that while some industries had responded early to the call for efficiencies, government-mandated goals had to be tailored to specific sec-

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tors. Japan succeeded in reducing its dependence on oil through a rapid improvement in energy intensity, while maintaining healthy rates of economic growth. The beginnings of antinuclear sentiment in Japan may have been established in World War II, but it had been truly ignited by the exposure of Japanese fishermen to radioactive ash from an American nuclear test in 1954, and the public failure of the *Mutsu* nuclear-fueled cargo ship. While general pacifism remains, this opposition became easier to overcome in the aftermath of the first oil shock, and three laws passed in June of 1974 gave the nuclear industry the support it needed to dramatically accelerate development.²²

In 1970, Kansai Electric Power Company put into service its first reactor. Along with the JAPC's two commercial nuclear reactors, this accounted for just 0.5 percent of all electricity in the country.²³ By 1974 the number of reactors increased to eight and to 46 by 1993.²⁴ Nuclear energy's share in electricity production climbed up from 2 percent in 1975, to 17 percent by 1980, to 30 percent today.²⁵ Domestically, however, nuclear power has not been received without trepidation. A spate of problems after 1991, averaging one incident per reactor per year, undermined public confidence in the technology.²⁶ Starting with the 1991 accident at the Mihama nuclear plant and gradually escalating in severity to a level-3 fire and explosion at a fuel-reprocessing plant, the Japanese nuclear industry and bureaucracy have faced growing skepticism from the public. An October 1999 Japan Public Opinion Company survey found 52 percent of people were "uneasy" about nuclear power. A March 2000 Asahi Shinbun poll found that 75 percent of Japanese did not trust the bureaucracy.²⁷ These polls took place before the 2002–2003 shutdown of TEPCO's 17 reactors in reaction to public outcry following falsified safety reports. The Kashiwazaki-kariwa plant, which suffered a major earthquake in mid-2007, revealed some weaknesses in the reporting procedures that eclipsed the otherwise excellent performance of the emergency shut-off system and a follow-up clean bill of health by the International Atomic Energy Agency (IAEA). Thus, despite Japan's need for nuclear power and increasing public understanding, it is no surprise that a not in my back yard mentality still persists.

While Japan is undecided about the future of its nuclear industry, coal is enjoying resurgence. Because of its relatively low cost and long-term viability, it now accounts for approximately 20 percent of the energy mix.²⁸ Coal is also attractive because of its wide geographic distribution in stable countries, with over half of Japan's coal imports coming from Australia, and the remainder from China, Indonesia, the United States, Canada, and other countries. Like many other nations, Japan has increased its use of natural gas since the oil shocks. Imported liquefied natural gas (LNG) currently provides 14 percent of total energy supply, primarily for electricity generation.²⁹ Though Japan was a pioneer in the LNG trade, it now finds itself in an increasingly competitive international market, accounting for only half of global demand.³⁰ Hydro-generation accounted for 9.5 percent of electricity production in 2004.³¹ By the 1960s virtually all hydroelectric potential in Japan had been exhausted (all major Japanese rivers have been dammed—many

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more than once) leaving this sector with little additional capacity.³² Finally, alternative sources make up only 2 percent of Japan's total primary energy supply. Given the country's relatively high energy use for electricity, however, this sector has great potential for growth. The country has embraced solar power as a growing part of its energy mix and has continued to build large-scale wind farms in many areas.³³ Alternatives and renewables have expanded by 50 percent per year for the past decade.³⁴

The Ministry of International Trade and Industry (MITI) also created a subsidiary agency tasked with developing alternative energies not related to nuclear power. The New Energy Development Organization (NEDO) was created to support projects focused on reducing Japan's oil dependency through technology development.³⁵ NEDO concentrates its efforts on three core technologies—coal-to-liquids, geothermal, and solar—while also providing domestic support to the promotion and dissemination of these technologies, and participating in overseas mining and geological surveys.³⁶ The government encouraged a switch in electricity generation away from oil through the imposition of tariffs on petroleum imports, with the revenue directed toward implementing the Stockpiling Law and non-oil energy-related research and development. One of the effects of this policy shift was an increased use of LNG. Prior to the oil shocks, LNG comprised 2 percent TPES.³⁷ Though the Tokyo Electric Power Company (TEPCO) had begun the development of transportation, regasification, and distribution networks for Alaskan LNG in 1969, it was not until 1979 that a significant increase in the use of LNG for power generation occurred.³⁸ This policy environment made TEPCO an early adopter of gas combined-cycle (GCC) technology, the most thermally efficient form of electricity generation from fossil fuels. Motivated by a wider distribution of natural gas throughout the world, and its low emissions, the Japanese government exempted LNG from taxes on energy imports imposed in 1980.³⁹ Gas's share of Japan's TPES rose to 7 percent in 1982, and 11 percent in 1990—a six-fold increase in less than 20 years.⁴⁰

Economic Adjustments

Instability in world energy markets led the Japanese government to a conscious decision not to shield domestic consumers from rising global energy prices.⁴¹ The result was a rapid market-driven increase in the price of petroleum products, and consequently of electricity for Japanese consumers and industry. With energy becoming a significant drag on their budgets, and the general impression of scarcity in the oil market, Japanese industry began an adjustment that allowed for the decoupling of economic growth and energy consumption.⁴² The government worked to ensure energy supplies as the private sector responded by improving energy efficiency and conservation. Concurrent with the shift toward more efficient equipment and manufacturing processes was the development of the high technology and microelectronics industries, which by their nature were much less energy intensive and became the cornerstones of the new Japanese economy.⁴³ By

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the 1980s, Japan also became an importer of processed materials and commodities requiring great amounts of energy input in the refining process, effectively exporting some of its energy consumption to less developed countries.⁴⁴ Japan came out of the 1980s with a high degree of energy security for a country so poorly endowed with domestic resources.

The economic slowdown of the 1990s in Japan had far-reaching consequences. During this period unemployment rose and homeless appeared in major cities, with some labeling this the nation's lost decade. For the outside world, this period marked the end of the Japan, Inc. economic juggernaut. For the Japanese, it was a time when *shoganai*, the sense that little can be done, replaced a steely national confidence. During this period energy consumption in Japan's industrial sector remained flat and conservation efforts plateaued as Japanese manufacturers reached the upper limit of efficiency gains through the turnover of capital stock to more efficient machinery. An economic downturn and historically-low energy prices weakened the pressure to conserve, refocusing government efforts on other concerns. The internationalists at MITI (now METI—Ministry of Economy, Trade, and Industry) felt partly vindicated, having advocated reliance on the global market and an end to large-scale oil-substitution research and development. Some blamed spending on grandiose schemes of the 1980s for the economic malaise of the 1990s.⁴⁵ After a decade of economic drift, Japan began to rebound in 2002. Unlike previous periods, during which economic growth and low energy prices coincided, growth accelerated from 0.13 percent in 2002 to 2.63 percent in 2005, even as oil prices in the wake of the Iraq War rose from \$24.96 per barrel in 2002, to \$51.57 in 2005. Unlike other OECD economies, Japan did not experience inflationary pressures brought on by rising energy prices. At the time, however, Tokyo viewed this as a disappointment because the economy had suffered a decade of deflation, which acted as a drag on consumption.

This most recent period has coincided with an inverse energy-income relationship: tightening conservation measures may indeed have little impact on growth.⁴⁶ Toyota's surpassing GM as the world's largest car company on the strength of its sales of hybrids and fuel-efficient compacts, and the expansion of production capacity by Honda to satisfy higher-than-expected demand for its most fuel efficient models provide further proof that energy conservation and high fuel prices do not always translate into job losses and industrial decline.⁴⁷ The growth in Japan's automobile industry has received much attention, but growth in sales of energy-efficient technology is also visible across a range of other industries. The solar sector received support from NEDO from 1994 until 2002 and has reduced prices of photovoltaics by 60 percent, making them a good buy for many households.⁴⁸ Japan provides nearly 40 percent of the world market and leadership in thin-film technology.⁴⁹ Steelmaking, shipbuilding, glassmaking, transportation, and home heating are just a few other fields in which Japanese companies have taken a leadership position through gains in efficiency and pollution reduction. The 1980s era investment in technologies meant to prepare Japan for the next oil

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shock, such as hybrid-engine automobiles or waste-heat recovery, have begun to pay off.⁵⁰

Current Energy Security Challenges

While oil remains the primary source of energy in Japan, its share in the total energy mix has fallen dramatically from a high of 77 percent in the 1970s to below 50 percent today. Prior to the oil shocks, more than half of all electricity in Japan came from oil-fired thermal power plants. Currently, oil accounts for only 8 percent of electricity production.⁵¹ Despite that, Japan still remains the world's third largest oil importer, with its transportation sector 98 percent reliant on petroleum.⁵² Unlike most OECD member states, it depends on the Middle East for most of its oil, particularly Saudi Arabia, the UAE, and Iran.⁵³ An additional vulnerability is the near-total dependence on the Malacca Strait as the transit route for this oil.

An important tenet of Japan's energy security is its relations with Russia. Capitalizing on Japanese weakness at the end of World War II, Russia claimed sovereignty over part of Japanese-controlled Sakhalin Island, as well as some of the Kuril Islands. These islands, known as the Northern Territories, had previously been part of the Japanese archipelago. Japan's refusal to accept these acquisitions continues to complicate energy relations with Russia.⁵⁴ The East Siberia Pacific Ocean (ESPO) pipeline, first proposed by YUKOS in 1998, has generated both cooperation and contention among Russia, Japan, and China.⁵⁵ The pipeline is to carry oil pumped from fields in East Siberia to Asia, with the terminus located at either Nakhodka, a short ferry trip from the tip of Japan, or Skovorodino, in Eastern Siberia.⁵⁶ Though the project initially suffered delays due to funding and environmental concerns, record-high oil prices have rekindled progress. Beijing's growing interest in the project may persuade Transneft, the Russian pipeline monopoly, to designate Skovorodino, near the Chinese border, as the terminus for not only the first stage of construction, but for the entire project. Beijing already has plans to build a trunk line to Daqing, while the remainder of the oil would be shipped by rail to Nakhodka or Vladivostok.

Second to Russia, China has long exerted influence on Japanese energy security. Energy has been an important part of the economic relationship between Asia's two biggest trading powers.⁵⁷ Disagreements over claims to East China Sea gas resources persist, with periods of heightened tension, but overall the two countries have maintained a dialogue on the issue and produced a steady stream of positive pronouncements.⁵⁸ Six working groups relating to energy have been established between China and Japan: oil and natural gas, electricity, power generation (including nuclear), coal, renewables, and perhaps most importantly, conservation. With eight times the energy intensity of Japan's economy, improving efficiency is an important part of Chinese attempts to meet growing energy demands.⁵⁹ Helping China would have strategic, economic, and environmental benefits for Japan. Japanese consumers ultimately pay for inferior Chinese envi-



ronmental standards through pollution that wafts across the East China Sea and high levels of toxins captured in fisheries common to the two nations. While the Chinese are eager to access superior Japanese technology and know-how, the pitfalls associated with an aggressive approach to energy security are plainly obvious in the Japanese historical example. By helping China manage the environmental effects of its rapid growth, Japan strengthens its claim to regional and international leadership.

Iran poses a specific challenge for Japan, one that demonstrates the delicate balance that Japan must pursue between fulfilling its energy needs and living up to its responsibilities as a member of the international community. After years of negotiations over a contract to explore and develop the vast Azadegan oil field in southwest Iran, Inpex was forced to reduce its stake in the project to 10 percent from an original 75 percent after negotiations faltered, purportedly over responsibility for cleaning up landmines.⁶⁰ The field was to produce 260,000 bpd and form a central component of Japan's strategy to pursue independent upstream development of overseas oilfields. The debate over Azadegan reflected the struggle within the Japanese bureaucracy between METI and the Foreign Affairs Office, and within METI between internationalists and autonomists.⁶¹ Whereas the internationalists look to downplay the severity of Japan's supposed vulnerability to the disruptions from Persian Gulf countries, seeing the market as the great equalizer, the more hawkish faction is reluctant to do business with the regime in Tehran at a time when the Bush administration is looking for ways to isolate it internationally. But by supporting the United States and Europe in their efforts to prevent Iran from developing nuclear weapons, Japan proved that its global responsibilities trump narrower interests of energy security and economic growth. In the case of Iran, Japan's choice to side with the United States was almost natural—after all, Japan's military dependence on the United States is no less important for its energy security than Iran's oilfields. Despite the fact that the Japanese Maritime Self-Defense Force (MSDF) is the most capable blue-water navy in East Asia, Japan still relies on the U.S. Navy for trade route security. But there are increasing pressures within Japan to assume more responsibility for its military needs and amend Article IX of the constitution, which commits Japan to a pacifist foreign policy. This issue has been at the center of a wider debate that has gone on for years over attempts to project an image more befitting a "normal country." As part of Japan's assistance to the United States in the war on terrorism, Tokyo assumed responsibility for refueling in the Arabian Sea operations against the Taliban. This requires, among other things, MSDF to traverse the route over which 90 percent of Japanese oil travels. This oil-carrying umbilical cord, traditionally prone to piracy, has experienced a significant reduction in attacks since the MSDF began its operations in 2001.⁶² The MSDF's participation in the annual Cobra Gold military exercises as well as the recent Malabar Exercise, involving American, Australian, Singaporean, and Indian naval forces, suggest the possibility that aspects of Japanese energy security have in fact already been partially militarized.

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Policies for the Future: International Leadership, Regional Cooperation

When world leaders gathered in Kyoto in 1997 to discuss global warming, they came to an agreement that required a collective reduction in greenhouse gas emissions to at least 5 percent below 1990 levels by 2008–2012.⁶³ For Japan, this translated into a 6 percent cut in its emissions.⁶⁴ In the years that followed, the Kyoto Protocol experienced complications. Citing economic burdens not borne by developing nations such as China and India, the United States withdrew its signature. Other countries have failed to meet their commitments. Aside from excluding developing countries, the agreement failed to account for energy intensity. Given that Japan had the most energy efficient baseline in the world for 1990, it was said that achieving a 6 percent reduction would be like wringing water out of a dry towel.

The development of Asian economies over the past quarter century has complicated energy security for Japan. By harnessing its experience in technology and efficiency efforts, Japan aspires to regional leadership in energy, security, and environmental efforts. The increased commitment to helping other Asian nations in their energy concerns was expressed explicitly in the New National Energy Strategy of 2006.⁶⁵ Through regional organizations such as the Asia Energy Conservation Collaboration Center, Japan has promoted the adoption of “widely conceived emergency response options” aimed at encouraging stockpiling strategies that will forestall panic purchasing in the event of supply disruptions.

Nobuo Tanaka, Executive Director of the International Energy Agency, is a cosmopolitan thinker who has emerged as one of Japan’s voices for a fairer approach to energy, admonishing rich countries for not following a sustainable energy path.⁶⁶ Unlike his predecessors at the IEA, the former METI official has become a global advocate for more responsible energy policies. Tanaka’s leadership at the IEA is a source of pride for Japanese bureaucrats and symbolizes Japan’s conception of its role in regional and international energy security. Japan hopes its leadership role will ensure stable resource markets for developed and developing countries and facilitate the establishment of a post-Kyoto framework to control the effects of greenhouse gases.

Technology Development

As one Japanese official remarked, energy security is seen as sacrosanct in Japan—it is not questioned. In the short term, the Japanese focus is on highly feasible, immediately effective projects that promote energy conservation. These include power storage, superconductors, and other products that improve conservation at the commercial and residential levels.⁶⁷ NEDO also works to develop more forward looking, long-term technology projects that include solar and highly efficient coal technology.⁶⁸ In keeping with its commitment to international cooperation in the development and dissemination of energy-related technologies,

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Tokyo has taken the lead in the effort to advance the study of coal liquefaction. This technology allows countries to use an abundant resource for development purposes while mitigating its harmful environmental impact.⁶⁹ After sponsoring a pilot project in Australia, Japan donated equipment to a coal plant in Indonesia that will use Japanese liquefaction technology when it comes online in 2013.⁷⁰

In line with Japan's diversification-centered policy, LNG continues to play an important role as a non-oil fuel alternative. But what was once a duopoly of LNG consumers, with France in the Atlantic basin and Japan in the Pacific, is now a varied and vibrant market. As this market continues to grow, Japanese power companies have begun to question the viability of take-or-pay contracts.⁷¹ Though the Japanese government continues to promote take-or-pay, there may only be so much support for this policy before buyers move to a market-based system, something that has already taken place in Europe and North America.⁷²

The Japanese auto industry has played an important supporting role in the country's energy security strategy. After nearly 30 years of conservation measures in industry, the doubling of energy consumed by Japan's fleet of cars, trucks, and trains has made the transportation sector a prime target for efficiency efforts.⁷³ Transportation accounts for nearly half of oil consumption, making it an important arena for diversification away from petroleum.⁷⁴ Japanese companies were the first to commercialize hybrid automobiles and the government expected diesel-powered automobiles to displace gasoline-powered ones, lowering fuel consumption in the transportation sector while helping to diversify fuel sources. Diesel can be obtained through traditional refining processes as well as through gas-to-liquids (GTL), coal-to-liquids (CTL), and biomass conversion. Despite efforts on the part of the public and private sector, however, METI expects the transportation sector's dependence on oil to decline only 20 percent by 2030.

Finally, Japan has long recognized the need to enlist ordinary Japanese in conservation efforts.⁷⁵ One Japanese official explained that the Shinto tradition embraces conservation since it posits spirits in all things. This tradition manifests itself in the Japanese mindset of "*mottainai*" or "don't waste."⁷⁶ The wartime effort to encourage civilians to collect pine roots for processing into synthetic fuel has evolved into measures that affect the way Japanese people dress, drive, and consume.⁷⁷ Japan aims to achieve a 30 percent improvement in conservation and a 40 percent reduction in oil dependence by 2030. Shifting policies may nevertheless prove challenging. As IEA's Tanaka said in an interview, it is difficult to change policies when previous ones were successful.

The ability to tailor energy policy to fit each stage of development and to acknowledge the transition from one stage to another may depend on values inherent in the Japanese experience, but the government's willingness to frame consumption choices in terms of energy security can serve as a model to many nations. As one Japanese official put it, increasing energy efficiency is like finding new energy resources.

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Overall, Japanese officials interviewed for this chapter mentioned several approaches suitable for duplication: the mixture of global market prices and domestic regulation; emphasis on energy efficiency; use of cross-sector consultations to set standards; and promotion of new technologies. But if they had to put Japan's strategy in one word, it was efficiency. Indeed, at the 2008 World Economic Forum, it was suggested that Japan's energy efficiency achievements could be of "great aid" to the world as it attempts to deal with energy and environmental problems.⁷⁸

Resource demands have long been among the strongest forces shaping a country's foreign policy. From the development of trade relationships to the acquisition of colonies, countries have looked for ways to gain materials from beyond their borders to fuel their development. In a globalized economy, in which the demands of development and the environment constrain many actors, nations must take every measure within their power to ensure that their people and economies remain competitive and well supplied.

Increased interdependence has given states more leverage over one another, creating superpowers in various fields. If Japan can continue to lead in its use of technology to overcome the restraints of an ever-changing energy environment, it may stake a claim as an "efficiency superpower" in the 21st century's struggle for energy security.

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57. See Kent Calder, "Sino-Japanese Energy Relations: Prospects for Deepening Strategic Competition," presented at the Conference on Japan's Contemporary Challenges, Yale University, New Haven, Connecticut, March 9–10, 2007.

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77. But to argue that conservation is unique to Japan may be an overstatement. According to TEPCO's Aug. 2007 report "Recent Challenges and Solutions of the Energy and Electric Utility Industry in Japan" (85); studies show that Japanese are as inclined to pay for green energy as others.

78. World Economic Forum Web site, http://www.weforum.org/en/knowledge/KN_SESS_SUMM_23969?url=/en/knowledge/KN_SESS_SUMM_23969.

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