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2012

M-RCBG Faculty Working Paper No. 2012-16
Mossavar-Rahmani Center for Business & Government
Weil Hall | Harvard Kennedy School | www.hks.harvard.edu/mrcbg

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Prepared for the November 19, 2012 U.S.-Japan Symposium

Introduction

Japan achieved remarkable success in its energy policy over a long period of great turmoil. Limited domestic energy production presented Japan with an energy security challenge when disruptions following the Arab Oil Embargo of 1973 changed the nature of world's political economy of energy. This shock to the system drove up Japan's energy costs and required coordinated policy to mitigate the problems of energy import dependence. In the intervening decades Japan weathered the energy security storm. Japan took a leadership role in the push for international efforts to address the risks of climate change. Japanese energy policy and private investment began a transition to develop and deploy new renewable energy technologies. The tragedy at Fukushima in 2011 and eventual shutdown of nuclear energy production was a major setback that raised fundamental questions about Japan's basic energy policy and future directions. The high cost and disruption that ensued from this nuclear accident should not be minimized, but it should also be seen in context of the relative success of Japan's energy policy over a longer horizon. As Japan considers its future, the challenge is to meet the energy needs of the moment while considering dramatic changes in the world energy economy that will shape the future. The challenges before Japan today are different and will require major adjustments in policy and institutions.

Energy Security and Peak Oil

Japan depends on imports of energy for most of its consumption. According to the U. S. Energy Information Administration, today Japan is only 16% energy self-sufficient, and this has been its chronic condition for decades (EIA, 2012). When control of resources in oil exporting countries shifted from the hands of international oil companies to the host governments, there was a fundamental reorganization of the world energy market. The precipitating event was the Arab Oil Embargo of 1973 and the subsequent shocks of that decade. Oil prices rose suddenly to unprecedented heights, surprising everyone from producers to consumers. The oil exporters learned that wealth untold was theirs if they managed production. Consumers suddenly worried about the security of supply.

As an element of a global transformation, Japan's real energy prices rose dramatically, reaching a peak in 1982. With a policy framed as addressing the problems of energy security, Japan enthusiastically supported the creation of the International Energy Agency and promoted policies to diversify its sources of energy imports and participate in agreements for emergency sharing among oil importers during times of disruption. As part of its diversification strategy, Japan pursued a major expansion of nuclear generating capacity for electricity production, reaching 13% of total energy and 27% of electricity production in 2010. As a large importer of liquefied natural gas, Japan still was able to diversity its LNG sources, with the largest supplier being Malaysia with just under 20% of total LNG imports (EIA, 2012).

By contrast, the bulk of Japan's oil imports came from a small handful of countries in the Persian Gulf. In the nature of the distribution oil resources, it is very difficult for a major importer to diversify its oil imports away from the Persian Gulf. This is true for two reasons. First, the Persian Gulf dominates the total world export market. More importantly, the very nature of the oil market and the ease of moving oil tankers dictate that supply is highly fungible. If something significant occurs anywhere in the world oil market—especially changes in supply, demand and prices—the effects are felt everywhere. As emphasized by the U. S. National Petroleum Council, a hard truth is that interdependence is a fundamental characteristic of the oil market (NPC, 2007).

This interdependence has important policy implications. For example, starting with President Nixon, every U. S. administration since has made a public call to achieve energy independence, usually meaning that U. S. oil imports should be eliminated. Over the decades this policy was rhetorical only, and there were no practical steps taken that would or could achieve the stated goal, a goal which receded even further with the growth in oil imports. Furthermore, even if the goal could be achieved, the result would not be independence in any meaningful sense. The U. S. would still be a participant in the world oil market, and the volatile movements in oil prices would still buffet the economy.

From one perspective, Japan was more fortunate than the U. S. due to the pressure of necessity arising from its greater dependence on oil imports. In the U.S. the abundance of domestic supplies created policies that were often counterproductive—such as domestic price controls on oil and natural gas—and took many years to undo at great expense. By comparison, Japan had no such distractions, and was forced to face its import dependence and make many adjustments in domestic prices and markets to accommodate the higher costs and greater volatility of prices. Compared to the U. S., where real energy prices peaked at about the same time, Japan's relative performance over the following years was better (IEA, 2012).

Higher energy prices and upheaval in the world oil market reinforced a growing concern with the finite nature of energy resources and the specter of long term scarcity. From the days of the first publication of the "Limits to Growth" report of the Club of Rome (Meadows, Meadows, Randers, & Behrens, 1972), predictions abounded that economic growth and associated increases in the rate of consumption of energy could not be sustained. The implication was that the impacts of these limits were imminent. This perspective reinforced concerns with energy security and a policy emphasis on physical access to energy supply. Japan's pursuit of energy security included substantial efforts and investment in oil exploration and production in other countries. In the U. S., the most egregious example of a focus on limits and shortages was the Power Plant and Industrial Fuel Use Act of 1978, repealed in 1987, that prohibited the construction of new electricity generating plants that would utilize natural gas. The concern with limits and running out became popularly known under the heading of peak oil theory, perhaps most famously represented by an analysis that purported to show that even Saudi Arabia had reached the limits of its ability to expand or even sustain its ambitious production objectives (Simmons, 2005).

The appeal of the logic of limits often seems irresistible. Surely the ultimate deposits of non-renewable fuels are finite, so increasing use cannot go on forever. There must be a limit. While this is true at the most general level, the logic does not tell us anything about when the limits will constrain us in a material way. By now we know that the original forecast of the Club of Rome was overly pessimistic. We have seen that if anything the real cost of non-renewable commodities has declined rather than risen (Nordhaus, 1992).

A missing piece in the analysis of physical shortage and limits has always been the role of technology improvements. In a static world, with finite resources and growing demand, the resources may soon be exhausted. But in the dynamic world where technological innovation makes available new resources and improves the productivity of the resources that we have, the difference in outcomes can be dramatic. The focus on limits leads to the wrong conclusions. While everyone agrees that the world will eventually turn away from oil and other non-renewable resources, it is not likely to be soon. A reasonable view extends the current horizon for peak oil to at least many decades into the future (Yergin, 2011). This has important policy implications. A primary implication is that the emphasis should be on research and development to identify and perfect alternative energy technologies for the long run. But it would be premature to stop investing in even the long-lived infrastructure that supports and depends upon the use of familiar fuels like oil, gas and coal.

Three examples illustrate the point in areas that have been and will be important for Japan. First, the shortage theory and limits analysis almost always assumes that energy consumption is tied in fixed proportions to the level of economic activity. If the economy is to grow, then energy consumption must also grow at the same rate over any extended period of time. However, it is clear that with innovation and investment, this iron link can be broken to allow economic growth with improved energy efficiency. The change from year to year may be just a few percent, but the power of compound interest prevails. Over the long run, improved energy efficiency makes a great difference. Japan has been and can continue to be an international leader in this type of innovation: "[a]mong the large developed world economies, Japan has one of the lowest energy intensities, as high levels of investment in R&D of energy technology since the 1970s has substantially increased energy efficiency." (EIA, 2012)

Second, the expansion of world oil supplies has been enormous, with new areas opening up to exploration. Coupled with the vast improvements in the technology for drilling and seismic analysis, production outside the Persian Gulf has risen steadily and beyond all predictions. The change has not been so great as to eliminate the power of the oil export cartel to maintain high prices. But the expansion of competing production has put limits on the ability to raise oil prices with impunity and without apparent limits. A recent survey and meta-assessment of oil field data and analysis reinforces this conclusion (Maugeri, 2012). The interconnected world oil market will continue to be dominated by the Persian Gulf producers for a long time. But new and different oil supplies abound. This means that there will be a lot of oil available, but at high prices. The world is not running out of oil, at least not soon.

Finally, the most dramatic change in the shortage mentality that arose from the analysis of limits comes from the almost miraculous revolution in production of natural gas and oil from shale resources. The early days have been dominated by the experience in the U. S., but there is reason to believe that the same experience is about to be repeated in many other parts of the world where similar shale deposits reside. The existence of massive quantities of hydrocarbons locked in shale deposits has been known for a long time. But the means of accessing these deposits were not available or not competitive. Gradual and cumulative innovations in horizontal drilling, deep well operation, seismic analysis and fracturing to create and maintain small passageways in the shale eventually broke through the barrier of cost and competitiveness (Maugeri, 2012). In 2007 the level of production in the United States was less than 1%. By 2010 the EIA reports that natural gas production from shale had risen to 16% of gross domestic production (EIA, 2011). The impact has been profound. There is a gold rush atmosphere in many parts of the U. S. as workers and investors race to drill in new areas, return to old fields that can benefit from the same technology, and reconfigure the pipeline system to deliver the new supplies. The many development plans for U. S. gasification facilities to import LNG have been dropped or converted to exporting LNG to the world market. There is even quiet talk that the oil and gas coming from shale deposits could in the future make the U.S. a net energy exporter. Certainly, as a major importer of LNG, this dramatic turn of events is a welcome development for Japan.

The policy implications for Japan are important. It should now be clear that a focus on shortages, limits and physical energy security was always misplaced, and certainly is not relevant now. Japan is well integrated in the world economy and can continue to earn its way to pay for its energy imports. There is no need to impose high costs on Japanese consumers to switch to domestic renewable resources designed to create energy independence. Any need to make a major transition to an alternative energy mix is a long-term issue rather than an emergency. And the increased availability of oil and natural gas will help Japan in making that transition.

Green Agenda

A principal energy policy concern is to address the environmental impacts of energy production and utilization. Emissions from power plants and mobile sources contribute to air and water pollution. The risks of nuclear power operations and waste disposal are apparent and always a matter of concern. The standard interpretation is that when left with the opportunity to "free ride" on everyone's environment, individual firms would not recognize and account for these costs. Government must impose policies to internalize these costs and protect the public. Hence, Japan has strict environmental laws and continues to work for and achieve a cleaner environment.

For most pollutants, this effect of local emissions is reasonably well understood and the impacts fall on a country's own citizens. This makes environmental regulation easier to justify and local in its application. The story is quite different in the case of the threat to climate as a result of greenhouse gas (GHG) emissions, particularly CO_2, that can change the very climate of the world. In the worst cases, the climate impacts could be devastating, particularly for the most vulnerable populations and areas of the world. Addressing this threat is now a prominent part of the green agenda.

Although overall policy to address climate impacts is controversial and in flux, there are some matters that are reasonably settled. The rise of the industrial age and the accelerated burning of fossil fuels increased the rate of GHG emissions. The concentration of GHGs in the atmosphere has been increasing and is now well above pre-industrial levels. The slow accumulation and transformation in the atmosphere combine with very long-lived residence of the gases, meaning that current emissions can affect climate for centuries to come. Because the atmospheric concentration is not in equilibrium with current emissions, even if emissions could be stabilized immediately the concentrations in the atmosphere would continue to rise for the foreseeable future. Since the climate impacts are roughly driven by concentrations and not emissions, the impacts will similarly increase. The only policy to stabilize or reverse the concentration of GHGs in the atmosphere would be one that involved substantial reductions in net emissions.

By contrast the determination of the impact of GHGs on climate, and what to do about it, is far from resolved. The scientific consensus is that the impacts will be, and probably already are, serious and the recommendation is for the world to get on a path to reduce GHG concentrations (IPCC, 2007). The economic analyses that evaluate policies are less settled, but there is agreement that beginning to do something now is justified by the best estimates of the costs and benefits (Nordhaus, 2008). A common feature of the economic analyses is that the optimal trajectory for GHG emissions is first to slow the rate of growth, and then to reverse that growth, perhaps all the way to zero net emissions, eventually (Stavins, 2008). Another commonplace in the analysis is that unlike other air pollutants which are primarily local in their effects, the climate problem entails the entire planet, both in terms of the varied impacts and in the need for a comprehensive policy if there is to be successful intervention to reduce global atmospheric concentrations.

Japan has been a leader in addressing the challenges of climate change. The Kyoto Protocol was an important milestone in the effort to craft an international agreement. The absence of key nations such as the U.S., with the largest emissions in the developed world, and emerging economies like China that dominate the growth in emissions, is a major flaw in the present arrangements. Japan has been forthright in taking actions to reduce its own emissions, all the while calling for and emphasizing the necessity of broader participation by at least all the large emitters of GHGs.

In crafting an energy policy that respects the imperatives of the green agenda, there are some aspects that reinforce and others that conflict with the issues of energy security and the limits on non-renewable resources. First, responding to the climate problem requires a very-long term perspective. While it is true that CO_2 emissions today will linger in the atmosphere for a very long time, the primary determinant of climate impacts fifty or one hundred years hence will be the cumulative emissions and not the trajectory. Second, the climate problem points to reducing GHG emissions, not necessarily to the use of renewable energy sources. Although renewable energy resources do not emit CO_2, neither would non-renewable coal burning if it were connected to carbon capture and sequestration (CCS). Virtually all the currently available technologies for low carbon emissions are expensive and not competitive with continued use of conventional and abundant non-renewable fossil fuels.

The energy policy implications of these simple observations are important. For example, neither the climate problem nor the depletion of non-renewable resources is a type of emergency that requires crash programs or that would justify large expenditures to roll out expensive renewable alternatives. A focus on research and development to create better technologies for the future is clearly warranted. The goal should be to achieve long-term availability of inexpensive, carbon-free energy sources. The goal should not be immediate substitution of expensive renewable energy. The best argument for subsidizing renewable deployments otherwise not competitive in the market would be to learn how to improve the technology, and capture the indirect benefits of learning by doing. With typical estimates of conventional learning rates, this implies that the scale of such subsidies would be quite small and the principal product should be information, not renewable energy (van Benthem, Gillingham, & Sweeney, 2008). In the long-run, the most important policies would be those which improved and incorporated the estimates of the costs of climate impacts and stimulated the innovation needed to address the green agenda.

Electricity Market Reform

A major focus of energy policy to address the green agenda centers on the electricity sector. Electricity generation is the largest source of GHG emissions. In addition, many of the policies designed to address related energy problems involve greater electrification of the economy. The most obvious example is the possible large increase in reliance on electric cars (Moselle, Padilla, & Schmalensee, 2010). The importance of the electricity sector in Japan is only reinforced by the compelling and immediate need to rethink and reorient Japan's policy towards reliance on nuclear energy.

The choice that Japan makes in the wake of the Fukushima catastrophe is unlikely to expand or even sustain the prior commitment to nuclear power generation. The more likely outcome would be some balance that substantially reduces nuclear output from existing plants in the near term and defers for many years or decades revisiting any decisions to develop new or replacement nuclear facilities. Perhaps Japan will go the way of the German choice to phase out existing nuclear plants altogether. This is Japan's decision to make. But whatever the choice, the larger implications are evident.

The reduction or complete loss of the contribution of nuclear power eliminates a source of carbon free power generation and materially adds to the near term difficulty of meeting the challenges of the green agenda. The most likely response will be to increased reliance on power generation derived from gas plants using imported LNG. This option enjoys the advantages of being relatively low in carbon emissions, compared to imported coal, and likely to benefit from the near term burgeoning of the availability of gas supplies in the world market.

Subsidizing larger scale renewable technologies, such as wind and solar, is within Japan's grasp but is not likely to be a good long-run solution. With the present state of electricity storage technologies, the intermittent nature of these resources imposes real additional costs on the rest of the system when renewables grow to a significant scale. Furthermore, the likely possibility is that the existing renewable technologies will be surpassed by invention and innovation in this rapidly changing field. Subsidizing a little to learn how to improve and adapt to renewables would be recommended. Subsidizing large scale investment, particularly through the blunt instrument of electricity feed-in tariffs such as Japan has already adopted, is likely to burden Japan with future regrets for money wasted and other unintended consequences.

The real challenge is to reform the electricity sector to stimulate innovation, internalize the costs of environmental impacts and allow decentralized experimentation through greater use of markets. The simple summary is that the current transition in the structure of the energy system is not amenable to the solutions of central planning by a monopoly. If we knew what to do, then it would be easy to turn the problem over to the central planners and ask them to implement the grand design by mandating the use of the right technologies. But if we don't know exactly what to do, and we have to invent the future, the better path is to work now on the institutional design and create the incentives for surprising innovation that works toward the long run goals. To meet the challenges of reinventing the electricity sector and addressing the green agenda, we need innovation not expedited implementation of off-the-shelf solutions. As Bill Gates summarized, "we need energy miracles."(Gates, 2010)

Electricity markets around the world have begun to show that it is possible to structure the institutions to respond in new and sometimes surprising ways to change energy investment, integrating demand participation and energy efficiency, and make the electricity system smarter with technology (smart grids) and incentives (smart prices). The U.S. has experimented with many different institutional models and, after much trial and much error, settled on a workable system that now stands at the center of electricity market design in the seven organized markets that cover two-thirds of the country. The key organizing principle is to separate out control of the critical transmission grid under an independent system operator coordinating an open spot market that can allow for easy entry and smart prices to stimulate competition and efficiency (Hogan, 2010). Coupled with tax policies or similar regimes to put a price on carbon and other pollutants, electricity market reform would be a powerful tool for Japan in meeting its many challenges ahead. If the current turmoil in Japanese electricity and energy policy leads in this virtuous direction, it would be some compensation for the costs that have been incurred by the nuclear catastrophe.

Conclusion

Japan can deal with its energy problems. The chronic dependence on energy imports is not likely to change soon, and the intermediate term response to the nuclear power review is likely to be met largely by increased imports of LNG. The world is not running out of energy, and Japan should be able to continue its de facto policy of earning through exports more than enough to pay for its energy imports. Energy policy of the past, framed as one of dealing with shortage and energy security, will not be a good guide for the future. The long term challenge is to invest in research and reform Japan's energy markets to stimulate innovation, inventing a different and more cost effective energy system that comports with the green agenda. This is not an emergency that requires crash programs. It is a grand challenge that will occupy generations of Japanese leadership.

References

EIA. (2011). *Annual Energy Review: 2010*. Energy Information Administration, U.S. Department of Energy. Retrieved from http://www.eia.gov/totalenergy/data/annual/pdf/aer.pdf

EIA. (2012). Japan: Country Analysis. U.S. Energy Information Administration, U.S. Department of Energy. Retrieved from http://www.eia.gov/EMEU/cabs/Japan/pdf.pdf

Gates, W. H. (2010). TED Speech 2010: Bill Gates on energy: Innovating to zero! Retrieved from http://www.ted.com/talks/lang/en/bill_gates.html

Hogan, W. W. (2010). Electricity Wholesale Market Design in a Low-Carbon Future. In B. Moselle, J. Padilla, & R. Schmalensee (Eds.), *Harnessing Renewable Energy in Electric Power* (pp. 113–136). Washington, DC: RFF Press. Retrieved from http://books.google.com/books?hl=en&lr=&id=KHJIC6JdZXIC&oi=fnd&a

mp;pg=PA113&dq=Electricity+Wholesale+Market+Design+in+a+Low+Carbon+Future&ots=INnkMfF9-Z&sig=G1l6p1H0_dKtmdFXzDjbNoOVjpQ

IEA. (2012). End-use prices: Indices of energy prices by sector. *IEA Energy Prices and Taxes Statistics (database).* Paris: International Energy Agency. doi:10.1787/data-00444-en

IPCC. (2007). Climate Change 2007, Synthesis Report: An Assessment of the Intergovernmental Panel on Climate Change. World Meteorological Organization and the United Nations Environment Programme. Retrieved from http://www.ipcc.ch/publications_and_data/publications_ipcc_fourth_assessment_report_synthesis_report.htm

Maugeri, L. (2012). Oil□: The Next Revolution. Belfer Center for Science and International Affairs, Harvard University. Retrieved from http://belfercenter.ksg.harvard.edu/files/Oil-The Next Revolution.pdf

Meadows, D. H., Meadows, D. L., Randers, J., & Behrens, W. W. I. (1972). *The Limits to Grwoth*. New York: New American Library. Retrieved from http://www.clubofrome.org/?p=1161

Moselle, B., Padilla, J., & Schmalensee, R. (2010). *Harnessing Renewable Energy in Electric Power Systems: Theory, Practice, Policy*. Washington, DC: RFF Press. Retrieved from http://books.google.com/books?hl=en&lr=&id=KHJIC6JdZXIC&oi=fnd&pg=PR5&dq=Harnessing+Renewable+Energy+in+Electric+Power+Systems:+Theory,+Practice,+Policy&ots=INnkMfEd-Z&sig=xR1PLjnFR9tM1KKUWgInbDlMb-o

NPC. (2007). Facing The Hard Truths About Energy: A Comprehensive View To 2030 Of Global Oil And Natural Gas. Retrieved from http://downloadcenter.connectlive.com/events/npc071807/pdf-downloads/NPC_Facing_Hard_Truths.pdf

Nordhaus, W. (1992). Lethal model 2: The limits to growth revisited. *Brookings Papers on Economic …*, *1992*(2), 1–59. Retrieved from http://www.jstor.org/stable/10.2307/2534581

Nordhaus, W. (2008). *A question of balance: Weighing the options on global warming policies*. *Science Communication*. Retrieved from http://scx.sagepub.com/content/30/1/77.short

Simmons, M. (2005). *Twilight in the desert: The coming Saudi oil shock and the world economy*. Wiley. Retrieved from http://www.amazon.com/Twilight-Desert-Coming-Saudi-Economy/dp/047173876X

Stavins, R. (2008). Meaningful US Cap-and-Trade System to Address Climate Change, A. *Harv. Envtl. L. Rev.* Retrieved from http://heinonlinebackup.com/hol-cgi-bin/get_pdf.cgi?handle=hein.journals/helr32&section=13

Yergin, D. (2011). *The Quest: Energy, Security, and the Remaking of the Modern World*. Penguin Group US. Retrieved from http://books.google.com/books?id=nmXCgIcFK-gC

van Benthem, A., Gillingham, K., & Sweeney, J. (2008). Learning-by-Doing and the Optimal Solar Policy in California. *The Energy Journal*, *29*(3), 131–152. doi:10.5547/ISSN0195-6574-EJ-Vol29-No3-7

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