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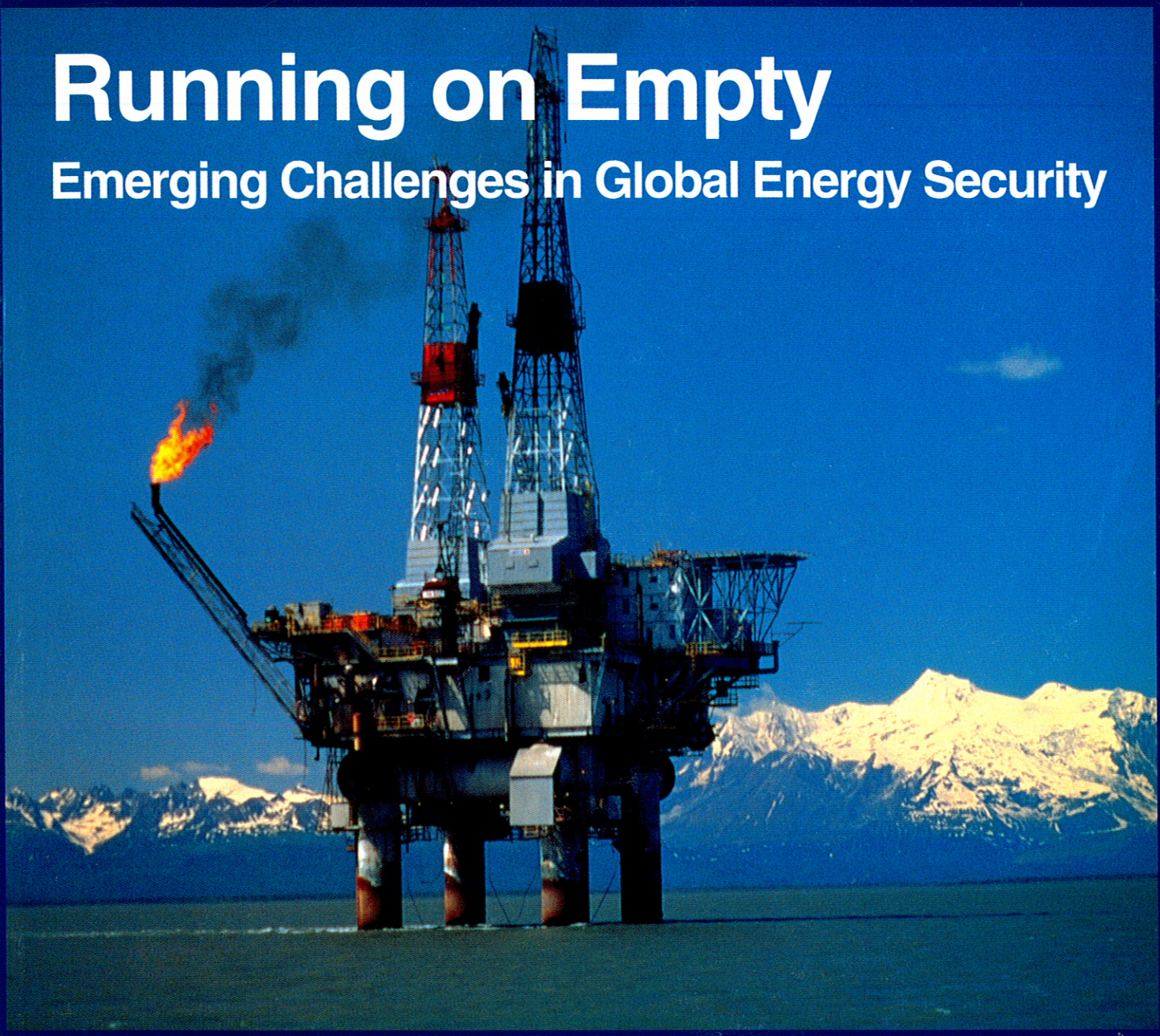
Running on Empty

Emerging Challenges in Global Energy Security



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Twin Challenges

Energy and the Environment in Asia

BY WILLIAM F. MARTIN

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Over the next 15 years, Asia's demand for energy is expected to more than double—accounting for approximately 40 percent of world energy demand. The rapid economic expansion of the industrializing nations of Asia is dramatically redefining energy security in the region for, while this economic growth is raising living standards in many of these nations, it is resulting in a dramatic increase in the demand for energy. The World Bank estimates that, over the next ten years, more than half of all infrastructure expansion in Asia will be devoted to energy-related projects. As Asian energy demand increases, principally for fossil fuels such as oil and coal, the energy insecurity and environmental quality challenges associated with these energy resources become glaringly apparent.

Energy demand has risen in Asia largely as a result of the increasing industrialization of Asian economies. The removal of barriers to free trade and greater liberalization of markets has facilitated a shift in manufacturing away from industrialized economies, such as those in the Organization for Economic Cooperation and Development (OECD), to rapidly industrializing economies, such as those in East Asia. Basic steel production, for example, shifted from the United States and Europe to Japan, then to Korea, and is now concentrated in Thailand and other East Asian economies.

These manufacturing industries, such as steel, use a greater amount of energy per unit of gross domestic product (GDP) than the more service-oriented economies in OECD countries. Energy demand is also expanding because increasing percentages of Asian populations are living in cities. Urbanization leads to a greater demand for refrigerators, televisions, electric fans, and other appliances, and is also directly related to the rise in demand for motorized transportation.

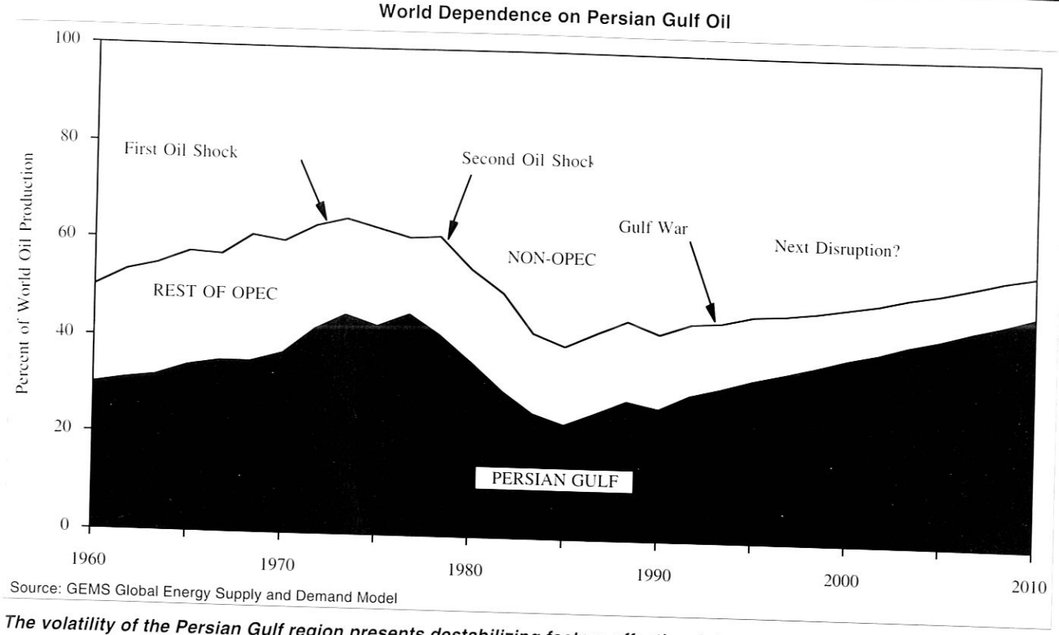
Energy and Environmental Insecurity

At present, approximately half of Asia's demand for oil is supplied through imports from outside the region. With a growing transportation sector, this dependence on imports will only worsen over time. While there are several regions in Asia, such as China's Tarim Basin, which could have potentially huge oil reserves, technical and financial obstacles make it unlikely that these areas will be sufficiently exploited to impact oil supply levels in the near future.

Given the soaring demand, this lack of indigenous oil production, is pushing Asian nations toward a greater reliance on oil from the volatile Persian Gulf region. In fact, this huge increase in Asian demand for oil and Asia's subsequent dependence on Middle Eastern oil producers is driving global reliance on the Persian Gulf back toward mid-1970s levels.

Ironically, this increasing Asian dependence is occurring at a time when North America and Europe are lessening their overall dependence on the Middle East. Greater than expected production in the North Sea, Canada, and the Gulf of Mexico is diversifying the base of supply for North America and Europe.

Unfortunately for Asia, there arefewer options. It is inevitable that Asia will become the principal consumer of Middle Eastern oil, engendering entirely new dynamics in the economic, political, and military relations between Asia and the Middle East. Some of these dynamics have already manifested themselves in the new relationship between China and Iran. China's expanding appetite for oil corresponds to Iran's desire to acquire and develop advanced military technology, thus leading to an increased risk of nuclear proliferation.



The volatility of the Persian Gulf region presents destabilizing factors affecting Asian energy security interests.

In addition to the geopolitical risks of Asia's dependence on oil, the environmental impacts of fossil fuel use pose a further challenge. Asia's expanded fossil fuel use will intensify environmental problems such as global climate change and acid rain. Asian nations are expected to double their greenhouse gas emissions over the next 15 years, raising gas emissions from Asian nations from 28 to 45 percent of the world total. China, which now produces less than one-third the emissions of OECD countries, will probably account for a larger increase in annual emissions from 1990 to 2010 than all OECD countries combined. If greenhouse emissions are to be stabilized at 1990 levels, a fundamental change in the international energy structure must occur.

In addition, transboundary acid deposition, which first became a major concern in the highly industrialized regions of North America and Europe during the 1970s and 1980s, is beginning to become evident in many parts of Asia. Although there is not yet a cross-national scientific or public constituency to address this problem, available data shows that the acidity of rainfall has been rising dramatically along the southern coast of China, the Korean peninsula, and Japan.

As Asia continues to rely on fossil fuels for over 80 percent of its growing primary energy needs, these acidity levels will continue to increase. The total projected sulfur dioxide emissions for Asian countries in 2000 and 2010 far exceed those for North America and Europe combined.

Toward A More Sustainable Energy System

These energy security and environmental quality issues regarding Asia's medium-term energy supply and demand patterns necessitate changes in energy policies. Looking to the middle of the next century, it is clear that in order to achieve a sustainable future, the current energy structure must shift away from its dependence on fossil fuels.

This shift will require greater reliance on nuclear energy, natural gas, and renewable energy sources as well as implementation of clean coal technologies, increased energy efficiency, and advances in oil and gas production from regions not dominated by the Organization of Petroleum Exporting Countries (OPEC), such as Central Asia and Russia. In addition, extending the benefits of international cooperation to rapidly industrializing countries through such organizations as the International Energy Agency (IEA) will vastly improve the global economy's ability to handle future energy supply disruptions. This cooperation should include an emphasis on encouraging rapidly industrializing nations, such as China, to begin accumulating strategic oil stocks. Such oil reserves will buy time in the event that an emergency supply disruption occurs.

For many Asian nations intent on diversifying energy supplies, natural gas, with its relatively clean-burning attributes and abundance, is an important alternative. There is much potential for gas to become a major fuel in both the electricity generation sector, and, over the medium-term, in the transportation sector. Within the electricity supply sector, natural gas is often the fuel of choice when increasing generation capacity, especially for independent power producers (IPPs), while advances in combined cycle gas turbine technology (CCGT) have also made gas

an extremely competitive option. Increasing air pollution in many of Asia's largest cities is also leading those cities to consider promoting the use of alternatively fueled vehicles, including those using compressed natural gas (CNG). If fully implemented, the utilization of natural gas in the transportation sector would improve the economics of building long-distance gas pipelines from Central Asia and Siberia to burgeoning markets in Asia.

However, if this potential of natural gas is to be fully realized, both in the electricity generation sector and the transportation sector, there are a number of challenges which must be overcome, especially those involving the construction of long distance pipelines and liquefied natural gas (LNG) port facilities.

Geology and geography will force some pipelines to cross several countries to carry the natural gas from source to market. Asian consumers, along with suppliers from the Middle East and, in the long-term, Central Asia, need to work together to ensure the integrity of international gas pipelines to guarantee that their energy needs are met.

In the next decade, over half of all Asian infrastructure expansion will be energy-related.

In addition to natural gas as an alternative, the abundance and cost-effectiveness of coal will make it the fuel of choice for many Asian countries, especially India and China. At present, coal serves as China's principal energy source, representing over 75 percent of China's total primary energy supply. Its economic attractiveness will ensure that coal remains China's main source of energy into the next century. Despite its economic benefits, the burning of coal is at the core of many of the most formidable environmental problems in Asia, including problems such as urban pollution, regional acid rain, and, on a global level, climate change. Given the environmental consequences of expanded coal use, it is important for Asian nations to facilitate the implementation of clean coal technologies as much as possible. Even if "second-best" technologies are used, they will be far more efficient and cleaner than the technology used in industrialized nations 30 years ago.

Aside from coal and natural gas, wider use of renewable energy resources would dramatically improve Asia's energy dependence and ameliorate many of the impending environmental problems. It will, however, be several decades before renewables will make a significant impact on energy supply. Excluding hydropower, renewables generate less than one percent of the world's electricity. While there are certain renewable energy technologies, including photovoltaic cells and wind energy, which are competitive in some rural areas that are not connected to

main electricity grids, the use of renewable energy resources is certainly not widespread.

The Nuclear Option

Faced with looming geopolitical and environmental insecurities, many Asian nations view nuclear power as a vital long-term energy solution. Not only does nuclear energy serve as a means of limiting dependence on the unstable Middle East, nuclear energy exempts Asian nations from an environmental headache—it emits no greenhouse gases. Over the past several decades, Japan, a country well aware of the consequences of overreliance on oil from the volatile Persian Gulf, has made the expansion of nuclear energy the principal element of its strategy to reduce energy imports and address environmental degradation concerns. While regulatory and political problems have halted the nuclear program in the United States, Japan plans to double its use of nuclear power over the next two decades to meet growing energy needs.The importance of nuclear energy is further underlined by the long-term planning that the Japanese government and electric utilities are undertaking to develop a fully closed nuclear fuel cycle.

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To maximize national energy resources, Japan is not satisfied with merely replacing oil with nuclear energy. Instead, it is Japan's goal to become as self-sufficient as possible through the reprocessing of spent fuel to recover uranium and plutonium that can be reused in existing commercial light-water reactors in the form of mixed-oxide (MOX) fuel. Japan plans to begin using MOX fuel in several commercial light-water reactors by the end of the decade.

Understandably, Japan is not the only Asian nation attaching importance to nuclear energy. Other countries, such as South Korea, Taiwan, and China, also view nuclear power as a key component of a long-term energy strategy. China, for example, has ambitious plans to expand its commercial nuclear power program, a program which currently consist of three reactors, to a target of over 350 gigawatts of generating capacity. While this goal of expanding China's nuclear power capacity to nine times Japan's current capacity may prove unattainable, it does reveal the importance China attaches to the nuclear energy option.

If nuclear power is to play a key role in alleviating Asia's energy insecurity and improving the quality of its environment, there are a number of issues which need to be addressed. With the region's most advanced program and extensive experience in the design, construction, operation, and maintenance of plants, Japan needs to impress upon its Asian neighbors the importance of developing a culture of safety and accountability. Disposal of spent fuel, the largest hurdle facing the US nuclear industry, is an issue Asian nations need to consider as well. In addressing this challenge, Asian countries should consider the concept of an international monitored retrievable storage site (IMRSS), which would enable nations to share expertise and expenses.

As nuclear power programs expand, there will be increasing concerns over non-proliferation. These concerns can be best alleviated through broadened monitoring by the International Atomic Energy Agency (IAEA). One proposal is for the countries of the region to establish cooperative arrangements that could lead to the creation of an Asian Atomic Energy Commission (ASIATOM). ASIATOM would promote transparency, safe operation of nuclear facilities, and safe disposal of nuclear waste material.

A Common Approach

As free trade and deregulation of markets continue to shift manufacturing and heavy industry toward the rapidly industrializing nations of East Asia, the twin challenges of energy security and environmental quality will remain of paramount importance. Energy and its effects on the surrounding environment will be key issues for Asia.

The recent expansion of the Asia-Pacific Economic Cooperation (APEC) forum's responsibilities to include a working group on energy and the environment is a step in the right direction, for there needs to be a common approach to improving Asia's energy security and environmental quality. This can be done by securing the integrity of natural gas pipelines, facilitating the implementation of clean coal technologies, guaranteeing the safe proliferation and development of nuclear power, and convincing large oil-consuming nations such as China to begin building strategic oil stocks.

Under the status quo, a sudden oil supply disruption as a result of instability in the Persian Gulf region would wreak havoc on Asia's fast growing economies, just as the oil crises of the 1970s became the debt crisis of the 1980s. Meeting the challenges of improving Asia's energy security and improving environmental quality can only be achieved through joint undertakings, and these challenges should be regarded as an opportunity for cooperation, not an excuse for conflict.•