



The Stanley Foundation

Policy Analysis Brief

September
2006

Innovative approaches to peace and security from the Stanley Foundation

China's Energy Security and Its Grand Strategy

Policy Recommendations

- Energy security has become an urgent global problem. Energy security and energy cooperation should become a major theme within the framework of multilateral dialogue and cooperation, such as the United Nations, G-8, and regional organizations.
- The International Energy Agency should be broadened by admitting all major energy-consuming countries such as China and India and seek to avoid energy supply disruptions and promote constructive cooperation among the member states by coordinating energy policies.
- China should not be made a scapegoat for rising fuel prices in the United States. Doing so is inaccurate and can unnecessarily raise tensions and divert attention from the root causes of American energy security challenges.
- China and the United States should not see each other as competitors but rather as partners in the international energy market. The two countries have many opportunities for cooperation in joint exploration, production and shipping safety, development of new and renewable energies, and environmental protection. Energy security and cooperation should be put on the agenda of the US-China Strategic Dialogue.

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Energy security has become the essential premise for China to achieve its strategic goal of quadrupling its gross domestic product (GDP) from 2000 to 2020. The Chinese government has worked hard to prevent energy from becoming a bottleneck undermining vibrant growth and social stability. China is committed to cultivating a new economic growth mode featuring low input, low energy consumption, low pollution, and high efficiency. China's short-term goal is to reduce the use of energy per unit of GDP by 20 percent by 2010, and achieve energy conservation and efficiency.

China currently meets more than 90 percent of its overall energy demand with domestic supply. China will adhere to the policy of meeting its energy needs mainly through domestic supply. On the other hand, China will take an active part in energy cooperation with other countries on the basis of mutual benefit. China is ready to strengthen dialogue and cooperation

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on energy with other countries to ensure global energy security and stability. China and the United States should not see each other as competitors but more as partners in the energy field. China stands ready to cooperate with the United States and other countries on the basis of equality and mutual benefit. By working together on energy issues, the two countries can minimize the risk of any potential conflict over energy supplies.

China's economic security depends on "Three Es," namely, economic growth, energy security, and environmental protection. The three variables are dynamically linked with one another. With rapid economic growth, China's energy security has become increasingly salient in ensuring sustainable development. Energy security means security of supply—sustainability of access to global energy resources—and security of demand—efficiency of energy consumption and environmental protection.

With the growth of energy consumption likely to approach the growth rate of the GDP in the coming decade while demand is likely to exceed domestic supply in the years to come, Chinese government efforts range from cooperative and market-oriented approaches to competitive and mercantilist ones. China's energy diplomacy is designed to develop strong ties with major energy exporting countries, secure overseas energy supplies, and establish a pipeline network of oil and natural gas flow in the Asian region.

This analytical piece attempts to address China's energy challenges, assess its responsive strategy, and interpret the implications for Sino-US interactions in mapping out an Asian energy security.

Energy Challenges With Rapid Growth

China is the world's most populous and fastest-developing country and its second largest oil importer. In 2005, China's GDP reached \$2.3 trillion, up 9.9 percent. With this growth, China has surpassed France and the United Kingdom to become the world's fourth largest economy. China's economy has been growing at an average annual rate of more than 9 percent since the 1980s and is expected to continue to increase rapidly in the coming decades. According to its Eleventh Five-Year Plan, China's GDP will maintain 8 percent annual growth between now and 2015 and then slightly slow to 6.5 percent from 2016 to 2020. Based on a newly completed 2006 forecasting report issued by the Center for Forecasting Science of the Chinese Academy of Sciences, China's GDP will total \$3.2 trillion by 2010 and per capita GDP will be \$2,400, at the current exchange rate.

Rapid economic growth poses energy demand challenges. Major energy resources located in turbulent and volatile regions (such as the Persian Gulf and Central Asia), vulnerable sea lanes with two chokepoints from the Persian Gulf to Northeast Asia (the Straits of Hormuz and the Straits of Malacca), and pipelines crossing several insecure borders have shaped China's growing sense of energy insecurity. Geographically, China's future oil and natural gas imports depend heavily on the Persian Gulf, Africa, and Latin America for maritime shipping and on Central Asia and Russia for its overland pipeline system. With more and more dependence on imported energy resources, China's fast growing economy is increasingly exposed to the potential risks of global and regional energy supply disruptions.

Energy Supply and Demand Gap

Rapid economic growth has boosted oil and natural gas consumption remarkably, while raising fears that energy shortages could hinder both short- and long-term economic

growth. For example, it is estimated that China's oil consumption grew about 6 percent and reached 177 million tons in 2005—increasing 9 million tons per year. At present, the oil refining facilities of the two Chinese oil giants, PetroChina and Sinopec, are running at full capacity. To maintain domestic oil supply, they would need to add 17 million tons of oil refining capacity in 2006, an increase of roughly 10 percent over current levels.

The past two years have experienced skyrocketing oil prices, rising to more than \$70 per barrel. But while rising prices have caused a very limited fall in demand, they have not choked off oil demand growth, and particularly have not dramatically reversed the momentum of economic growth. According to the International Energy Agency (IEA), world oil demand will continue to increase by 2.1 percent in 2006 to reach 85.5 million barrels per day (bpd). Developing consumer countries, whose economies proportionally rely much more on fossil energy than developed countries, will be the major victims of rising oil prices. Conversely for China, an oil price that is partially controlled by the Chinese government—and so lower than that of the international market—causes losses for the entire oil refining industry. China's oil refining industry suffered a net loss of \$3.6 billion in 2005, compared with considerable profits of \$2.6 billion in 2004. The current situation creates new tensions between price controls aimed at keeping energy affordable and the burgeoning private industries that rely increasingly on profits and the impacts of global commodity pressures.

China's oil demand doubled from 1.7 to 3.4 million bpd between 1985 and 1995. It doubled again, reaching 6.8 million bpd by 2005, with the result that in 2005 China imported 2.46 million bpd—or about 40 percent of its oil needs. Assuming this share will continue to grow as predicted, over the next ten years China will be able to meet between 62 and 71 percent of its domestic demand for oil, leaving it to depend on imports for between 30 and 40 percent of its oil needs. Analysts predict that China's share of world oil consumption could double to 14 percent over the next decade. The US Department of Energy expects that China's imported oil will climb to 9.4 million bpd by 2025, an estimate that some energy analysts believe is conservative. For comparison, the United States currently consumes 20.7 million bpd, roughly 25 percent of the world's oil production of 81.1 million bpd.

The enormous scale of prospective energy demands raises great concern about resource adequacy. As for China, while 94 percent of its overall energy supply came from domestic resources in 2005, this is projected to be near 80 percent in 2020. Compared with major developed countries, China's dependency on foreign energy markets is much lower at the moment. However, growing energy demands will result in potential supply disruptions and unacceptable environmental damages. Growing dependence on imports will cause increased insecurity and impose greater burdens on the economy. When a country the size of China imports more than 50 million tons of oil, fluctuations in the international oil market have considerable impacts on the national economic operations of that country. China's oil imports began to exceed 50 million tons as early as 2000. And since then, China has been exposed to potential risks of oil supply disruptions.

In order to mitigate environmental deterioration, the Chinese government has encouraged the use of natural gas instead of coal. Natural gas consumption now accounts for only 3 percent of total Chinese energy needs, but the government plans to more than double that proportion by 2010, to 8 percent of total energy demand. However, it is estimated that natural gas demand will surpass its domestic production beyond 2010. Only imports will be able to meet the growing gas demand, which will be estimated to account for 40 percent of China's total gas needs by 2025.

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Considering oil and natural gas supply constraints, China has again shifted its efforts to more dependence on coal. Traditionally, coal is dominant in China's energy consumption. Accordingly, by 2030, coal is expected to provide 62 percent, oil 18 percent, natural gas 8 percent, hydropower 9 percent, and nuclear power 3 percent of China's energy consumption.

Environmental Deterioration and Low Energy Efficiency

Many Chinese environmental problems are tied to energy consumption patterns. With its rapid development and low energy efficiency, China became the second largest emitter (2.8 billion tons) of sulfur dioxide (SO₂) in 1995. SO₂ from coal combustion causes acid rain. Petrocarbon fuel consumption causes global warming. Two-thirds of all Chinese cities already exceed residential area SO₂ air pollution standards. The global warming trend can also be seen in China. According to estimates of the effect of global warming on China, China's average temperature will increase rapidly over the next 35 years. Starting in 2013, China's average temperature will increase by 0.45 degrees Celsius over the next 20 years, and this trend will accelerate to increase another 0.75 degrees over the following ten years.

SO₂ emissions are the direct cause of increasing acid rain. The Chinese government has taken some measures to reduce acid rain by controlling SO₂, and establishing two acid rain control zones—accounting for 8.4 percent of China's land territory in the mid-1990s. SO₂ emissions are required to be controlled at the year 2000 level by 2010. Therefore, China has determined that it needs to limit SO₂ emissions to 12.23 million tons annually.

This goal can only be reached by increasing energy efficiency, using clean combustion technology to reduce emissions, and accelerating the switch to alternative low pollution energy sources. Coal consumption per unit of GDP in the acid rain control areas must be reduced from the current 3.35 tons to 2.49 tons per 10,000 RMB (Chinese yuan) of GDP by 2010. This goal can be achieved with a 2.8 percent annual increase in energy efficiency and thus coal consumption could be reduced by 250 million tons, accounting for reduction of SO₂ emissions by 5.54 million tons.

Since the early 1980s, the rate of US nitrogen dioxide (NO₂) emissions increase has been kept at 0.8 percent annually, compared with 5 percent for China. If the United States achieves its goal of reducing its NO₂ emissions by 20 percent to the 1990 level, China will exceed the US NO₂ emission level in 2020.

China's Strategy of Energy Security

Energy is a key strategic issue for China's economic development, social stability, and national security. As such, China sees energy shortages as one of the biggest potential threats. However, China faces challenges both from within and without, with rapid domestic economic growth combined with unstable and volatile international environments.

To meet these challenges, China has created the State Energy Leading Group, led by Premier Wen Jiabao. Its major tasks include research on China's energy strategy, key energy development and saving policies, energy security and external cooperation. The Chinese government has also established a team to draft the Energy Law, which will formulate long-term energy strategy, regulating all the aspects of China's energy exploration, production, consumption, and international cooperation. The Energy Law will be conducive to building a conservation-oriented and environment-friendly economy by optimizing energy structures and implementing clean production.

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China will promote both energy development and energy conservation, giving top priority to energy conservation. In recent years, a preliminary energy supply mix has begun to take shape, with coal as the principal fuel; electricity as the core; and utilizing the full development of oil, natural gas, and renewable energies. China's strategic goal is to reduce the use of energy per unit of GDP by 20 percent by 2010 and improve energy conservation and efficiency, while cultivating a new economic growth mode to achieve sustainable development.

China is both a major energy producer and a major energy consumer. Currently, it meets more than 90 percent of its overall energy demand with domestic supply and will adhere to a policy of meeting its energy needs mainly through domestic supply. On the other hand, China will take an active part in energy cooperation with other countries on the basis of mutual benefit. To meet the global energy challenge that is the common responsibility of all, China is ready to strengthen energy dialogue and cooperation with other countries to ensure global energy security and stability.

Intensify Domestic Energy Exploration and Production

To promote energy security, China will make full use of its domestic resources, diversify energy supplies, and further invest in exploration and energy infrastructure. According to China's Eleventh Five-Year Plan (2006-2010), China will try to meet its energy demand mainly with domestic supplies, as mentioned, utilizing coal as the main source of energy.

China's traditional domestic energy use is dominated by coal, accounting for two-thirds of its total energy consumption. Beyond China's proven coal reserves of more than 114.5 billion tons, energy resource exploitation and construction in its western regions has reached a new historical stage. Statistics demonstrate that Inner Mongolia and Shaanxi may contribute as much as 235.2 billion tons and 166.3 billion tons in coal reserves, respectively, ranking second and third in the country. Thirteen counties and districts at the borders of Shaanxi, Shanxi, and Inner Mongolia possess 60 percent of China's total proven coal reserves.

Water resources have also been regarded as a unique advantage of China's western regions. Yunnan, Guizhou, Guangxi, Sichuan, and Xizang in southwest China have enormous water resources, and among China's 12 major hydropower bases under construction, seven are located in southwest China.

China's main oil reserves are similarly in its western regions. Xinjiang preserves about 20.9 billion tons of oil and 10.85 trillion cubic meters of natural gas, respectively, accounting for 25.5 percent and 27.9 percent of China's total onshore oil and natural gas reserves.

Finally, western China has become the major region where renewable energy resources are developed. The Chinese government plans to increase the volume of solar energy utilization by a factor of 20 by 2010—from 20 megawatts (MW) to 400MW—and by an additional 25x—10 gigawatts (GW)—by 2020. For the moment, solar energy accounts for more than half of local power generation in Xinjiang, Qinghai, and Gansu.

China has tapped only a fraction of its natural resources, with vast energy reserves yet to be explored; it has decided, along with energy conservation, to make domestic exploration the top priority of its energy development strategy. China is confident that it will be able to overcome the energy bottleneck by tapping its own energy resources.

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Optimize Energy Consumption Structure

Coal accounts for two-thirds of China's overall energy consumption and nearly 80 percent of its electricity—twice the worldwide average. Optimization of its energy structure constitutes an important part of its energy development strategy.

China has set a goal to achieve a per capita oil consumption of 2-2.5 tons and a total national oil consumption of 3-3.75 billion tons by 2050. To achieve this goal, China will need to achieve an energy efficiency of 55-60 percent, higher than that of developed countries today. It is obvious that the above goal cannot be achieved with the current coal-based structure alone. It is roughly estimated that to achieve the above goal by 2050, coal consumption cannot exceed 35 percent of China's energy consumption, with oil and natural gas accounting for 40-50 percent and primary energy sources—such as nuclear, hydroelectric, solar, and wind power—accounting for 15-20 percent.

Over the past decade, China has sought to shift toward cleaner fuels in all sectors. As dependence on coal shows no sign of diminishing, China has increased investments in the development of clean coal technologies that may allow China to burn coal with less destruction of the environment. The global community should share a fundamental interest in helping China find new ways to consume coal cleanly.

China also attaches importance to transforming its energy consumption structure by cultivating the international oil and natural gas market. Historically, China's huge domestic supplies of coal have shaped the pattern of domestic energy consumption, but unconstrained growth of oil and natural gas consumption have boosted import dependence and caused energy supply concerns.

Improve Energy Utilization Efficiency

China has made great efforts to increase energy utilization efficiency and environmental sustainability. China's Eleventh Five-Year Plan proposes to reduce its per GDP unit energy consumption by 20 percent by 2010 from the 2005 year-end level, with the implication that between 2000 and 2020 China will quadruple its GDP while only doubling its energy consumption.

Statistics shows that about 80 percent of China's one-off energy is consumed by electricity generation, metallurgy, construction materials, chemicals, and transportation. The average energy consumption per product is 20 percent more than that in developed nations. In comparison, Japan has developed the highest energy consumption efficiency in the world. If the energy consumption of Japan for producing one unit of GDP is denoted as one, then that of the European Union is 1.6; the United States, 2.7; the Republic of Korea, 3.3; and China, 9. Clearly, there is still a lot of inefficiency in China's energy consumption compared with major developed countries, leaving much room for improvement.

Moving away from coal and toward lower carbon or no-carbon fuels such as oil, natural gas, nuclear power, and solar power will enable China to carry out commitments to reduce emissions to meet global warming agreements. As every developed country researches how to move toward high efficiency fuels, China should follow. China will do this through increased energy efficiency, conservation, and the reduction of the growth rate of NO₂ emissions. China's energy efficiency has been increasing steadily over the past two decades—energy consumption growth has been only half of overall economic growth. Even so, China's per capita energy consumption will reach 1.5 tons in 2020-2030 and a total energy consumption of 2.25 billion tons of oil.

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The efficient use of oil and the use of oil alternatives where possible are two key pillars of China's oil strategy. To that end, it has initiated new fuel economy standards for cars and trucks sold in China. The first phase of the standards went into effect in 2005 and range from 38 miles per gallon (mpg) for the lightest cars to 19 mpg for heavier trucks. In 2008 the standards will increase to 43 mpg and 21 mpg, respectively. China is also purchasing hybrids from abroad for immediate use and developing its own hybrid and fuel cell designs and manufacturing capabilities for the future. Already one of the largest markets for alternative fuel vehicles, it is the third largest ethanol producer in the world and is committed to expanding its fleet of natural gas and biofuel-powered vehicles.

China has pursued energy efficiency standards since 1989 and announced ten programs to improve energy efficiency in buildings and industries. It has identified three major ways to reduce the burning of coal for electricity: improve the efficiency of coal plants, put wasted heat to work in combined heat and power systems, and construct new buildings that cut energy consumption in half. Concerned about global warming and recognizing the potential of the clean energy market, China has recently committed to increasing its renewable energy use from the current level—less than 1 percent—to 10 percent by 2020 and has signed an agreement with the World Bank to reduce its greenhouse gas emissions over the next 20 years.

In the early 2000s, China began implementing a national Clean Air Program. This program contains two main components: the Clean Vehicle Action (CVA) for reducing and controlling emissions from vehicles and the Clean Energy Action (CEA) for reducing and controlling emissions for coal combustion. The CVA focuses on the use of liquefied petroleum gas (LPG) and compressed natural gas (CNG) in vehicles, the use of vehicle emission control systems, and the adoption of vehicles powered by electricity. The CEA focuses on improving the energy structure in each city and promoting the increased use of clean energy technologies, especially the use of washed or high-quality coal and renewable energy sources.

Establish Strategic Petroleum Reserve System

China has started to formulate plans for the strategic oil reserves and construction of some oil reserve facilities. This is one of the most important strategic measures for guarding against energy supply disruptions, ensuring sustainable energy supply, and stabilizing the oil market.

China's strategic oil reserve system will build from the experiences of developed countries. Accordingly, China has decided to establish a four-tier oil reserve system. The first tier is the national strategic oil reserve system, whose objective is to ensure energy security when oil supply is disrupted by unexpected events and political turbulences in oil-producing areas of the world. The other three tiers are commercial reserves of the three petroleum corporations, reserves of big oil consumers, and other reserves in the society.

China's current strategic oil reserve is far from satisfactory, with planned reserves of 15 million tons. However, according to a statistical report on China's oil consumption in 2002, 15 million tons of oil reserve is only sufficient for about 20 days of domestic oil consumption. In developed countries with established strategic oil reserves such as the United States, Japan, Germany, and France, their reserves will be able to last 158 days, 161 days, 117 days, and 96 days, respectively. As for the scale of China's oil reserve, opinions vary whether it should be equivalent to 90 days of oil consumption or perhaps as much as 120 days.

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To meet this challenge, China's national strategic oil reserve base construction is in full swing. The bases of such oil reserve will be located in China's east coastal areas, including Guangdong, Zhejiang, Shandong, and Liaoning provinces. Additionally, the Xinjiang, Shaanxi-Gansu-Ningxia, Sichuan-Chongqing, and Qinghai oil fields will become China's top four reserve oil fields.

Zhenhai base in Zhejiang's Ningbo City has built up 16 storage tanks in 2005, while the other three bases in Zhoushan, Dalian, and Huangdao have entered the stage of infrastructure construction. All are expected to be completed in 2007.

Develop New Alternative Energy Resources

High oil prices and environmental deterioration have become driving forces behind the development of alternative energies. They have promoted both investments in oil exploration and production and strengthened research and development of alternative and renewable energies.

Coal currently provides up to 70 percent of China's energy needs, mostly for the power and steel industries. High prices and growing import reliance have renewed interest in the process of turning China's abundant coal reserves into oil. China has strengthened research on specific technologies on coal gasification. With coal at about \$10 a ton, the price of coal-based oil would be about \$25 per barrel. In comparison, South Africa's Sasol refinery produces about 160,000 bpd of coal-based liquids at less than \$20 a barrel. It is estimated that China could make up to 1.2 million bpd of liquid fuel from coal in ten years, equivalent to more than a sixth of current demand.

In the long term, nuclear power will become one of China's main energy sources. China has quite rich uranium resources but lacks adequate uranium reactor spent fuel reprocessing capacity. China's nuclear development is also becoming more indigenous. Although the Daya Bay nuclear power plant was imported, with Chinese engineers taking part in the construction and management, the situation is changing. The 300,000-kilowatt Qin Shan Phase I nuclear power plant was designed by Chinese engineers and built from 95 percent homemade equipment. Similarly, the Qin Shan Phase II plant is a pressurized water reactor that would use some imported technology, but China now has the capability to design and build small- to medium-sized pressurized water reactors.

Brazil's experience with ethanol is attracting China's notice, with China increasingly interested in emulating Brazil's success. China has started and is already benefiting from an ethanol program. Brazil heavily uses ethanol in transportation and vehicles are required to operate on at least 20 percent ethanol, causing less pollution. Many cars are driven by flex-fuel engines, which are designed to run on combinations of gasoline and ethanol. Many Chinese companies and government officials are interested in the Brazilian experience, and from 2000 to 2005, China has developed ethanol production capacity of a million tons per year—which it plans to double by 2010. China's experimentation with ethanol spread to nine provinces by the end of 2005.

Biodiesel fuel can substitute for regular diesel in cars, trucks, buses, and farm equipment. In order to promote development of clean biofuels, the Chinese government plans to substitute biofuels for 2 million tons of petroleum by 2010 and 10 million tons by 2020. The Chinese government has encouraged domestic energy companies to develop renewable energies and encourage people to purchase vehicles powered by efficient hybrid or clean diesel. Combustion-electric hybrid vehicles travel about twice as far on a gallon of fuel as

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gasoline-only vehicles, meaning that when people are driving hybrids, they're conserving energy. Likewise, clean diesel vehicles use 30 percent less fuel than gasoline vehicles.

By 2010, nuclear power, hydropower, solar power, tidal power, geothermal power, and biomass will have risen from 5 percent in 1990 to 10 percent of China's power resources. The development of renewable energy would reduce dependence on traditional fuel and improve its ability to cope with energy shortages. Renewable energy—including solar, wind, and hydropower—will contribute to better energy security in China. It will also deliver substantial economic and environmental results. Over the next 15 years, China is set to spend about \$180 billion to increase its share of renewable energy to 15 percent, from the current 7 percent. In the coming 15 years, China will actively develop biomass energy and hope to replace ten million tons of petroleum with renewable energy annually. China also plans to expand the coverage of solar heaters to 300 million cubic meters by 2020, replacing the use of about 40 million tons of standard coal each year.

According to the National Development and Reform Commission (NDRC), China is working on a long-term plan to increase the use of alternative fuels to reduce the dependence on oil. China aims to raise the ratio of renewable energy in total consumption to 13 percent by 2020, up from the current 7 percent. Coal gas and renewable energy sources such as biomass and solar power are expected to become "major alternatives." The use of renewable energy has been growing at more than 25 percent in China—the highest in the world—and solar power consumption accounted for 40 percent of the global total at the end of 2004. The key to achieving this goal is to increase the use of nuclear, wind, and solar energy so that dependence on coal and oil could be cut.

Strengthen International Cooperation and Diversify Energy Supplies

Economic globalization is leading to the internationalization of energy sharing. Global economic development depends heavily on the international energy market. Global energy security, including supply as much as demand, is indivisible. Around the world, big oil and gas companies from the developed countries have dominated the global energy market. Given these realities, China realizes the importance of international cooperation in achieving energy security and is working to be part of the secure energy supply system. Peaceful energy development and international energy cooperation are the international dimensions of China's energy strategy.

Major Chinese oil companies started international operations in the 1990s and have made impressive progress. As acquisitions and mergers through purchasing oil and gas shares involve high costs, sharing products yielded by venture prospecting may bring better results. Tapping into energy resources in countries that do not have sound oil and gas infrastructure and helping them establish their own energy industries will bring about a win-win situation where both are able to share the benefits. China's energy cooperation includes both cooperation with energy producers and energy consumers.

China-Russia Energy Relations

Energy is a critical area for Sino-Russian cooperation and the two are highly complementary in the energy field. Strengthening energy cooperation between the two countries serves common interests and is very broad-ranged. It includes not only upstream exploitation but also downstream fields of oil and gas refinement. In addition, China is interested in strengthening cooperation with Russia in the areas of developing and using new, clean, and renewable energy.

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Russian oil exports to China currently are limited by the capacities of the two countries' rail systems and stood at about 7.7 million tons in 2005. Recently, Russia has also committed to extending a branch of its planned oil pipeline from eastern Siberia to the Pacific west to China. As well, a new gas pipeline, the Altai, could be built to deliver gas from western Siberia to China. A third possibility would deliver gas from eastern Siberia for a total of up to 80 billion cubic meters per year. Russia currently provides 8 percent of China's energy needs, and is expected to ship nearly 15 million tons of oil to China in 2006, nearly doubling last year's supply.

Russian President Putin's recent visit to Beijing was widely expected to finalize talks about oil and gas pipeline projects, building discussions for expanding energy cooperation on a number of fronts. As one example, Russian state energy firm Gazprom announced on March 13, 2006, that it would sign a memorandum with China National Petroleum Corporation (CNPC) on building gas pipelines to China's Xinjiang region.

President Putin's visit has also raised the profile of creating a cross-border oil pipeline from Siberia to Daqing, in northeastern China, as an offshoot of the East Siberia-Pacific Ocean pipeline, potentially delivering 30 million tons of crude to China.

Chinese oil companies have signed long-term contracts valued at \$200 billion, making China Iran's biggest oil and gas customer.

China-Central Asia Energy Relations

During the recent summit held in Beijing, Chinese President Hu Jintao and Turkmen President Saparmurat Niyazov signed a major agreement on the construction of a gas pipeline directly linking their countries and facilitating the flow of Turkmen gas to China. CNPC also inaugurated an oil pipeline running from Kazakhstan to northwest China. Initially, half the oil pumped through the new 200,000 bpd pipeline will come from Russia because of insufficient output from nearby Kazakh fields, meaning closer China-Kazakhstan-Russia energy cooperation.

In October 2005, China completed a \$4.18 billion takeover of PetroKazakhstan, Inc. China plans to connect several pieces of infrastructure and forge a new export corridor stretching from Kazakhstan's oil-rich Caspian basin, including Kashagan, through a series of western and central-Kazakh oil zones, and ultimately into China. Before opening the new pipeline, China imported 25,000 bpd from Kazakhstan. After the pipeline projects are complete, it could pump one million bpd, accounting for about 15 percent of China's oil needs.

China-Iran Energy Relations

With its unique geostrategic location linking two main energy hubs—the Caspian Sea and the Persian Gulf—and as OPEC's second largest oil exporter, Iran has become an energy partner of China. Chinese oil companies have signed long-term contracts valued at \$200 billion, making China Iran's biggest oil and gas customer. Iranian oil supplies account for about 14 percent of China's oil imports. Currently more than 100 Chinese companies are operating in Iran, developing ports, airports, and oil and natural gas. China is also in the process of importing Iranian natural gas. China hopes to become a comprehensive participant in exploration, drilling, petrochemicals, pipelines, and other upstream and downstream services related to Iran's oil and gas industries. More generally, bilateral trade between the two countries hit a new record of \$9.5 billion in 2005, up from \$7.5 billion in 2004.

China has signed a \$70 billion energy agreement with Tehran. China's Sinopec agreed to buy 250 million tons of liquefied natural gas (LNG) over 30 years from Iran, as well as to

develop the Yadavaran field and related petrochemical and gas industries, including pipelines. A second phase in the Iran-China strategic energy cooperation will involve constructing a pipeline in Iran to take oil some 386 kilometers to the Caspian Sea, there to link up with the pipeline from China into Kazakhstan.

China-Saudi Arabia Energy Relations

Saudi Arabia accounts for about 17 percent of China's imported oil, and total trade between the two countries grew by a substantial 59 percent in 2005 to \$14 billion. Saudi Arabia is China's largest trading partner in the region from West Asia to North Africa. Today, China is Saudi Arabia's fourth largest importer and fifth largest exporter, while Saudi Arabia is China's tenth largest importer and biggest oil supplier.

Since 2001, Saudi Arabia has determined to see its national security interests more independently of the United States. Saudi Arabia, as the world's largest oil exporter, wants to nurture China as a customer—as evidenced by the fact that Saudi Arabia currently supplies China with about 450,000 bpd—especially because Asian markets are closer to the Persian Gulf than Europe and the United States.

As one indication, during Saudi King Abdullah's recent trip to China, the two states signed a pact on energy cooperation that calls for increased cooperation and joint investment in oil, natural gas, and mineral deposits. Saudi Arabia's Aramco Overseas Co. has provided \$750 million of the total \$3 billion in investment to construct a petrochemical complex in Fujian province in southeastern China that will process 8 million tons of Saudi crude oil.

Sino-African Energy Relations

China currently imports a quarter of its total oil imports from Africa, largely from Nigeria, Angola, Chad, and Sudan. Nigeria is the world's eighth-biggest oil exporter. China and Nigeria signed deals to offer China four oil exploration licenses in Nigeria in return for a commitment to invest \$4 billion in Nigerian infrastructure. However, China might face problems with the militant rebel groups in the Niger Delta, as the violence surrounding the conflict has shut down nearly 20 percent of the country's oil output. China has invested heavily in Sudan, establishing oil exploration rights in 1995, and now over half of Sudan's oil exports go to China, accounting for 5 percent of China's total oil imports. During President Hu's recent visit to Africa, China and Kenya also signed an agreement for licenses allowing China's National Offshore Oil Corp. (CNOOC) to explore for oil off the coast of Kenya.

But in terms of African oil resources, China is not the only player. For example, Korea National Oil Corporation has obtained 65 percent oil and gas production rights in two Nigerian offshore blocks, and India's Oil and Natural Gas Corporation (ONGC) Videsh Limited has obtained a 25 percent stake. The big oil companies of developed countries are still playing a dominant role in the African oil market.

China and Canada

China and Canada signed their Statement on Energy Cooperation in the 21st Century in January 2005. Both sides have decided to promote cooperation to increase energy security and promote environmental sustainability and renewable energy. Such cooperation has the potential to cover a broad range of energy issues, including sources of supply, energy efficiency, and new technologies, whether Canada's oil sands or in the uranium resources field. Canada and China will therefore encourage mutually beneficial commercial partnerships in these sectors, including joint comprehensive research of oil sand technologies.

Saudi Arabia, as the world's largest oil exporter, wants to nurture China as a customer....

China-India Energy Cooperation

In discussing India and China, the talk is usually about their competition over energy and even about potential conflicts, ignoring their increasing cooperation in third countries, where the two Asian giants have already joined hands in their quest for energy resources. India wants to bid jointly with China for energy resources in other countries after losing out to China in a bid for Kazakhstan's third largest oil producer. The potential for India and China cooperation in Central Asia, Russia, and Africa is enormous.

Examples of India and China investing in the same hydrocarbon exploration fields are in Iran, Sudan, and Syria. In the development and exploration of the Yadavaran field in Iran, India's ONGC Videsh Limited has a 20 percent stake, while China holds a 50 percent stake. Along with this, both India and China are investing in natural gas imports from Iran. In Sudan's Greater Nile Oil Project, China's CNPC holds a 40 percent stake, while India has a share of 25 percent. CNPC and India's ONGC have teamed up to win the bid for oil assets worth up to \$1 billion in Syria.

The two countries have realized that unbridled rivalry between Indian and Chinese companies works only to the advantage of the sellers or their much stronger Western counterparts. They have agreed to strengthen the exchange of information when bidding for oil resources in a third country in order to realize mutual benefit.

China and India signed five memoranda on energy cooperation on January 12, 2006. The memoranda cover a comprehensive range of areas, including upstream exploration and refining in the oil sector, the laying of national and transnational oil and gas pipelines, research and development, as well as a joint energy efficiency program. The two countries will also assess the potential for working together on biofuels, such as vegetable oils blended with diesel and ethanol blended with gasoline.

The Implications for China-US Relations

China has emerged as the world's second largest oil market after the United States. I share Richard Giragosian's view from his recent *Asia Times* article "The Geography and Politics of Eurasian Energy" that most conventional assessments of China's energy strategy "miss a fundamental point and often start from a mistaken premise." That is, the "rise of China" with its growing energy demands in the world *could* pose a serious threat to US energy security, as China's energy pursuits with its mercantilist energy policies would come into conflict with US energy interests. However, from China's perspective, domestic energy strategy is rooted in the vulnerability of its access to external energy resources and defensiveness against the United States curtailing its energy supplies. Considering the vulnerability of the four-fifths of all Chinese oil imports that pass through the Strait of Malacca, China sees its maritime shipping security as a pressing priority. As such, the so-called "Chain of Pearls" is part of preventive strategic consideration.

Looking to the future, energy cooperation is vital to the sustainable development of the two countries in the 21st century. President George W. Bush called the United States "addicted to oil." In a recent speech at the Brookings Institution, Senator Richard Lugar, chairman of the Senate Foreign Relations Committee, warned that "energy is the albatross of US national security." In reality, China and the United States are both increasingly dependent on foreign energy.

The United States needs the cooperation of other major consumers, specifically China and India, to reduce, if not eliminate, the challenges posed by the global so-called

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addiction to oil. Much of the recent discussion in Washington about the growing oil demand of China—and to a lesser extent India—has focused on the threats posed to the US economy and foreign policy, but that often obscures the fact that the oil interests of China, India, and the United States are also broadly aligned.

China's Growing Oil Demand Not Really Driving Prices

The factors driving current oil prices up are manifold and worth further exploring and analyzing, as oil markets seem likely to remain volatile, with more pressures for price increases. Energy analysts have at various times listed several reasons for the rapid elevation in gas prices. First, until recently, oil-producing countries and big oil companies have invested insufficiently in their new capacities, causing overall tight global supply. For example, in the United States, shortages of refining capacity and associated infrastructure existed even before the devastating effects of hurricanes Katrina and Rita. Second, unstable politics in many oil-producing countries, such as Venezuela, Nigeria, Russia, Iran, Sudan, and Iraq, have brought psychological concerns about potential disruptions in supply. Third, the fast-growing energy demands in rising countries like China and India have put pressures on global supply. Fourth, there have been delays in the switchover to new alternative fuels in terms of research, production, and market supply. Additionally, there are possibilities of unexpected natural disasters and market price manipulation. Regardless of the exact reasons, soaring gas prices are affecting political, economic, and social behavior in the leading oil-consuming countries, as politicians and China-bashing analysts tend to blame China and its rapid-growing economic development and accompanying energy needs.

However, although oil prices are likely to climb higher through 2006, there has been strong global economic growth without significant economic downturns in major global economies such as the United States, Japan, and Europe, which are still growing at a satisfactory rate, largely due to lower energy use intensity—improved energy efficiency and the introduction of new alternative fuels. In light of tight oil supply and price hikes in the US gas market, there clearly exist problems in production and refining capacity, complicated by strained US relations with leading oil-producing powers.

It is reported that non-OPEC oil supplies, mainly in the Gulf of Mexico and the North Sea, are expected to fall 200,000 bpd in the coming years. Global refinery capacity utilization is reaching the ceiling. In the 1980s global refinery capacity utilization was around 75 percent, and it has risen to above 95 percent. With daily global demand roughly 85 million bpd, the world's oil producers have less than 2 million bpd of spare production capacity. For various reasons, there have not been any new refineries built in the United States since the 1980s, pushing the US refinery system beyond its sustainable bounds, with its refinery capacity utilization reaching over 98 percent.

Although oil prices are skyrocketing, major oil companies have continued to gain considerable profits, leading the Bush administration to threaten to investigate possible price gouging and market manipulation. It is reported that in 2005 ExxonMobil set a record for profits of \$36 billion among US companies as a result of hiking oil and gas prices and tax breaks and other subsidies.

Oil companies are nervous about local tensions, ranging from violence in Nigeria to the nuclear standoff with Iran, to the move toward nationalization of natural resources in Venezuela. Leading oil-producing countries are situated in unstable and turbulent regions such as the Middle East, Persian Gulf, and Central Asia. Particularly, US

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tensions with main oil-producing countries, such as Iran, Sudan, and even Saudi Arabia, have made the situation more unpredictable. Saudi Arabia, Iran, Iraq, and Venezuela possess enormous oil reserves in the world, with Iran holding the third largest proven oil reserves in the world, after Saudi Arabia and Canada, and the second largest proven natural gas reserves after Russia. Iraq remains locked in a never-ending war, and its oil industry has been a convenient target of the militants, with its oil output well below its potential. Iran's pursuit of nuclear power has put it on a collision course with the United States and Europe. Saudi Arabia's dissatisfaction with the United States is surfacing and growing. Nigerian oil exports are down because of violence there. US-Saudi tensions, US-Venezuelan strained ties, the US war in Iraq, and possible US-Iranian military confrontation have all contributed to uncertainty and unpredictability in the leading oil markets and enduring oil price hikes.

US sanctions forbid American companies and their foreign subsidiaries to conduct business with Iran, Sudan, and Myanmar, keeping the United States from importing oil or natural gas from these countries. But other major energy consumers, including China, have conducted normal energy business with these sovereign states. Any US military action against these countries could have an immediate effect on global oil prices. Thus it is not China's growing demand but global energy policies and strategies that are affecting the current energy market. China's growing oil demand has not been a significant factor for oil price skyrocketing if it is one at all.

China and the United States Not Necessarily Zero-Sum Game

While there is much concern over a possible China-United States collision over energy resources—as evidenced by Senator Joseph Lieberman's worries that an intense competition over energy resources could lead to military conflict between China and the United States, with global oil shortages and oil price hikes—China's strategy of tapping new oil reserves in countries that have strained relations with Washington could also put Beijing and Washington on a collision course. Some have even cautioned China that it needs to choose whether to work with the United States or be against it.

Recently, China's signing of many energy agreements on production rights, exploration rights, and pipeline construction with many countries has been taken, from a US perspective, as China's attempt to "lock up" energy resources. Some people have questioned China's quest for energy in oil-rich countries labeled by the United States as "problem states," such as Sudan, Uzbekistan, and Burma. These moves have alleged to pose "potential problems" to the United States from a strategic perspective. However, internally, China's energy policies are described as "economically neutral," with China pursuing the principle of noninterference in others' internal affairs. If US companies are either unwilling or unable to invest in particular countries for political reasons, it is not the problem of China's companies, but rather an indication of the competing forces influencing US policy.

Both the United States and China are oil importers. In the global energy market, they must first deal with the energy producers, who have manipulated the energy market and set oil and gas prices. China and the United States, as consumers, should work together to achieve reasonable pricing. Similarly, in developing new alternative energies, US advanced energy technology is complementary to China's huge energy demand. US energy policy could be a good example for China to learn from in developing more scientific and rational energy strategies. Therefore, the United States and China should be partners rather than competitors in ensuring their energy supply.

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Work Together to Cope With Common Challenges

The global economy is run on competition based on internationally accepted rules. However, this kind of competition over energy could be diminished substantially by shifting toward new alternative energies in these countries. The key to ensuring global energy supply in the future is to develop new alternative energies. In these areas the United States has advantages over China, yet the United States and China should see each other's energy needs as a real opportunity for business cooperation. With China and the United States as responsible stakeholders in the current international system, potential strategic competition unnecessarily disrupts a cooperative energy relationship. As the two largest energy-consuming countries in the world, China and the United States may also have the potential to coordinate and cooperate in meeting their respective energy needs; one example of this could be initiating joint research projects on developing new alternative energies.

China stands ready to cooperate with the United States and other countries on the basis of equality and mutual benefit. By working together on energy issues, the two countries can minimize the risk of any potential conflict over oil. China has the world's largest coal reserves and is increasing the share of energy use from coal. It also is investing in alternative sources and is expected to be the largest generator of nuclear energy in the world by 2050. For China and the United States, the major objective should be far less dependence on petroleum. It is imperative that the two countries establish a meaningful dialogue to manage these growing pressures.

Integrate China Into the IEA

The IEA, established in 1974 after the first oil crisis, seeks to coordinate energy policies among its 26 member states in order to avoid energy supply disruptions. The IEA member countries hold more than four billion barrels of public and industry oil stocks, with roughly 1.4 billion barrels of them government controlled. The IEA net oil-importing countries have a legal obligation to hold emergency oil reserves equivalent to at least 90 days of net oil imports of the previous year, with access to reserves restricted to emergencies such as natural catastrophes.

The United States and China should expand international coordination of energy issues to address the concerns about growing global competition for energy resources. Founded as a counter to OPEC in 1971, the IEA has the potential to become the effective advocate and coordinator for oil-importing countries that the founders foresaw at its outset. China should become a member of the IEA. Integrating China more fully into world oil and gas markets will help coordinate China's energy policies. ■

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