Energy and Geopolitics in China

Mixing Oil and Politics

A Report of the CSIS Energy and National Security Program

AUTHOR
Robert E. Ebel

November 2009

CSIS | CENTER FOR STRATEGIC & INTERNATIONAL STUDIES

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CONTENTS

About the Geopolitics of Energy Series v

1. Mixing Oil and Politics 1
   - The 2008 Summer Olympic Games 7
   - The World Financial Crisis 8

2. Limits to Growth 12
   - Unstoppable, Yet Unsustainable 12
   - Measurable Obstacles to Growth 14

3. The Chinese Approach to Global Warming 22
   - From Kyoto to Copenhagen 22
   - The Good Gone Bad 26

4. Security of Supply 28
   - Natural Gas 31
   - A Strategic Petroleum Reserve 33

5. Fueling Growth 35
   - The Situation in 2006 35
   - The Situation in 2007 35
   - The Situation in 2008 36
   - The Situation in 2009 43

6. Looking to the Future 45
   - Looking Ahead to 2010: A Limited Crude Oil Future 47
   - Beyond 2010 49
   - Threats to Oil Supply Lines 52
   - China: Both a “Taker” and a “Giver” 53

7. More than Oil 54
   - Coal 54
   - Natural Gas 57

Nuclear Energy 59
Alternative Forms of Energy 61

8. How China Plans to Secure Its Energy Future 63

About the Author 65

List of Figures

1.1. China's Growth in Gross Domestic Product, by Quarter, 2008-2009 3
1.2. China versus the World, through 2030 7
1.3. China's Growth in Internet Users, 2000-2008 10
2.1. Shifts in China's Rural and Urban Populations, Selected Years, 1978-2006 18
2.2. An Aging China, Losing Out to the United States, 1970-2050 19
3.1. China's Carbon Emissions, by Fuel, 1980-2015 24
6.1. China's Apparent Demand for Petroleum Products, 2007-2009 47
8.1. China's Energy Production and Consumption, 1980-2015 63

List of Tables

4.1. China's Natural Gas Balance, 2005, 2010, and 2020 32
5.1. China's Oil Supply and Demand, 2006 36
5.2. Crude Oil Imports by China, 2007 37
5.3. China's Oil History in the First Half of 2008 41
5.4. Leading Suppliers of Crude Oil to China, by Country of Origin, 2008 42
5.5. China's Apparent Oil Supply-Demand Balance, 2008 42
6.1. Energy Consumption in China, by Type of Fuel, 2010 and 2005 48
6.2. Crude Oil Production in China, Selected Years, 1990-2010 49
7.1. Percentage of Installed Electricity Capacity in China, by Type of Fuel, 2008 55
7.2. Coal Production in China, Selected Years, 1990-2015 56
7.3. Natural Gas Production in China, Selected Years, 1990-2015 58
7.4. China's Nuclear Generating Capacity, Selected Years, 1997-2020 60

ABOUT THE GEOPOLITICS OF ENERGY SERIES

In November of 2000, CSIS published *The Geopolitics of Energy into the 21st Century.* The report was the culmination of a two-year effort conducted under the auspices of the Strategic Energy Initiative (SEI), designed to identify and examine significant geopolitical shifts that could impact future global energy security, supply, and demand. The effort, which was cochaired by Senator Sam Nunn and Dr. James Schlesinger, was undertaken on the premise that the relatively "benign" global energy situation that had persisted for the previous 15 years was masking emerging changes in both markets and international realignments and consequently allowing policymakers and the public at large to become complacent about making hard choices with respect to energy, foreign and security policy, the economy, and the environment.

The time horizon for the SEI report was the first two decades of the twenty-first century. Many of its conclusions, in hindsight, look remarkably prophetic and remain critically relevant almost a decade later, though events of the past several years also point to some clear omissions. Central to our (and a variety of other) forecasts at the time, the SEI report projected that energy demand over the time period would be met in essentially the same ways as it was at the turn of the century, but in increasingly larger quantities.

For example, the report concluded that fossil fuels would continue to provide the overwhelming majority (in excess of 85 percent) of global energy needs for the next several years; that the Persian Gulf would remain the key marginal supplier of oil to the world (cautioning, however, that massive investment would be needed to realize increases in future production output); that the anticipated growth in energy, especially natural gas, use would both tax the delivery system and raise a new series of geopolitical issues that could lead to new political alignments; that production from the Caspian would be important at the margin, but not (in this time frame) a pivotal source of global supply; that Asian demand would increasingly look to the Persian Gulf for energy; that Europe's overreliance on Russian natural gas would become a "worrisome" dependency; and that U.S. oil imports would continue to grow.

Three broad conclusions were drawn from the SEI analysis—namely, that as the world's only superpower, the United States must accept its special responsibilities for preserving worldwide energy supply; that ensuring adequate and reliable energy supplies would require enormous investments that needed to be made "immediately"; and that decisionmakers in this century would face the special challenge of balancing the objectives of sustained economic growth with concerns about the environment. The 2000 report even identified Osama bin Laden by name in a discussion of terrorism and the rise of dangerous nonstate actors.

Missing from the analysis, however, was the recognition of how quickly China's energy demand would grow, how dramatically prices would change over a relatively short time period, or how precipitously climate change, carbon constraints, and renewable fuels initiatives would move to center stage.

Nonetheless, the SEI report emphasized the concerns surrounding the political fragility in key energy-producing countries and regions, predicted an increase in resource competition, and articulated how weakened U.S. alliance relationships with Europe, the Persian Gulf, and Asia, coupled with a resurgence of conflict and power politics, could adversely affect global energy security and promote geopolitical realignment.

At the time of its publication, portions of the SEI assessment were characterized as unduly pessimistic. Events of the last eight years suggest that they were anything but.

In this iteration of the Geopolitics of Energy series, the intent is not to assess the accuracy or shortcomings of the previous report or to develop a new bottom-up projection of supply/demand forecasts from now to 2030. Rather, the current work is designed to focus on relevant drivers that will dictate future trends in energy consumption, supply sources, geopolitical relations, foreign policy, and environmental choices.

CSIS GEOPOLITICS OF ENERGY SERIES 2009

The Geopolitics of Russian Energy: Looking Back, Looking Forward by Robert E. Ebel (July 2009)

Energy and Geopolitics in China: Mixing Oil and Politics by Robert E. Ebel (November 2009)

The Geopolitics of Energy: Emerging Trends and Changing Landscapes by Frank A. Verrastro (Forthcoming)

1 MIXING OIL AND POLITICS

China burst on the world oil market scene in 2004, catching oil exporters and importers alike by surprise,[1] as oil consumption rose by 900,000 barrels per day (b/d) to 6.43 million b/d, accounting for roughly one-third of that year's growth in world oil consumption. China's demand turned out to be far in excess of what most observers had anticipated. This surprise, by pressuring available supplies, was among the key factors pushing world oil prices that year to $55 per barrel, and beyond.

What were the factors that had led to restricted supplies? First, over the years, oil-exporting countries, but particularly those in the Gulf region, had allowed their oil-producing capacity to be run down to a point where it basically matched demand. The remaining spare capacity was largely in the hands of Saudi Arabia, but the Saudi crude oil itself was heavy, of a quality that was not especially desirable.

Second, oil-refining capacity worldwide had not kept up with growth in world oil demand. No new refinery had been built in the United States, for example, in the past quarter century. In the absence of adequate refining capacity, exporters asked why they should expand oil production. Indeed, some asked for guarantees of demand before making investments in new oil-producing capacity, implying that oil prices would be under upward pressure until their producing capacity caught up with the growth in demand. These factors together helped raise crude oil prices to new heights, but higher prices did not translate into immediately noticeable consumption declines.

Should the jump in demand have been a surprise?[2] Probably not. Indeed, over the 10-year period 1994–2004, China had accounted for 28 percent of the growth in world oil consumption, although lower rates were present during the early years of that period and higher rates during the closing years.

China still surprises; for instance, its demand growth averaged 400,000 b/d during the whole of 2008. Conversely, global demand fell by 270,000 b/d,[3] as lower demand in countries belonging to the Organization for Economic Cooperation and Development (OECD) more than offset demand growth in non-OECD countries.

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1. China is full of surprises, not all to its detriment. For example, in December 2005 the National Bureau of Statistics announced that it would soon release new data, based on the results of a national economic census, showing that the economy is significantly larger than the government's official measure. An official statement released on December 20, 2005, placed the economy larger by 16.7 percent.

2. Another surprise awaited, but this one should be of concern. The Asian Development Bank released official survey results indicating China's economy is smaller and poorer than thought—that it will turn out to be 40 percent smaller, based on purchasing power parity data, than previously stated. See Albert Keidel, "The Limits of a Smaller, Poorer China," *Financial Times*, November 14, 2007.

3. Robert Perkins and Richard Swann, "IEA Slashes Estimates for World Oil Demand," *Oilgram News*, January 19, 2009.

Saudi Arabia continued as the leading exporter of crude oil to China; during 2008, it supplied on average 730,182 b/d, or one-fifth of all China's crude oil imports.[4] Saudi Arabia has been the top supplier of crude oil to China since 2002, and it is unlikely to give up this leading position.

What was behind the oil demand growth in China? Though the United States probably would look to transportation fuels, especially motor gasoline, this was not so for China. The average new car in China now gets almost 36 miles per gallon and will be required to average a bit more than 42 miles per gallon by 2015.[5] Subsequent research has shown that the reason for this oil demand growth instead it was—and continues to be—the ravenous appetite for energy by the nation's heavy industry sector. Has this sector given any indication of a slowdown in response to guidance from Beijing? Indeed, heavy industry now accounts for 54 percent of China's energy use, up from 39 percent just a short five years ago.[6] Steel, cement, and aluminum are the sector's leaders, and not only in energy use but also in total world output.

Heavy industry grew by a reported 19.6 percent during the first quarter of 2007, up from 17.6 percent during the first quarter 2006. But because this sector, along with construction, could not escape the grasp of the world financial crisis, output fell and unemployment rose almost immediately.

In mid-March 2009, the World Bank projected economic growth in China at 6.5 percent, considerably below the necessary 8 percent put forward by Chinese officials and reflecting the corrosive impact of the financial crisis. But then the Bank offered hope for the future, as it expressed the opinion in early April that an economic recovery in China was likely to begin in 2009 and take hold in 2010.[7] Spending was up, as were car sales, lending support to the Bank's comparative optimism.

Analysts have learned, sometimes the hard way, that publicly released data on China's performance can be subject to misinterpretation. The 2008–2009 financial crisis emphasized the need for fully transparent and hopefully correct measurements of what is taking place in the economy. No one welcomes bad economic news, but policymakers everywhere benefit when accuracy in reporting is allowed to prevail.

Crude oil and petroleum product imports were down during the first three months of 2009 as compared with the first three months of 2008, indicating perhaps that all was not well. Most important of all, exports of goods were down, and that carried implications for practically all sectors of the economy.

The reported first quarter 2009 growth of the gross domestic product of 6.1 percent was the worst quarterly economic growth in two decades,[8] adding to doubts about an early turnaround. There was one bright spot, however. Government subsidies and tax incentives, designed to support smaller and more efficient cars, pushed automotive sales to a record 1.1 million units in March, a

4. Winnie Lee, "Saudi Arabia Is China's Top Crude Supplier in 2008," *Oilgram News*, January 26, 2009.

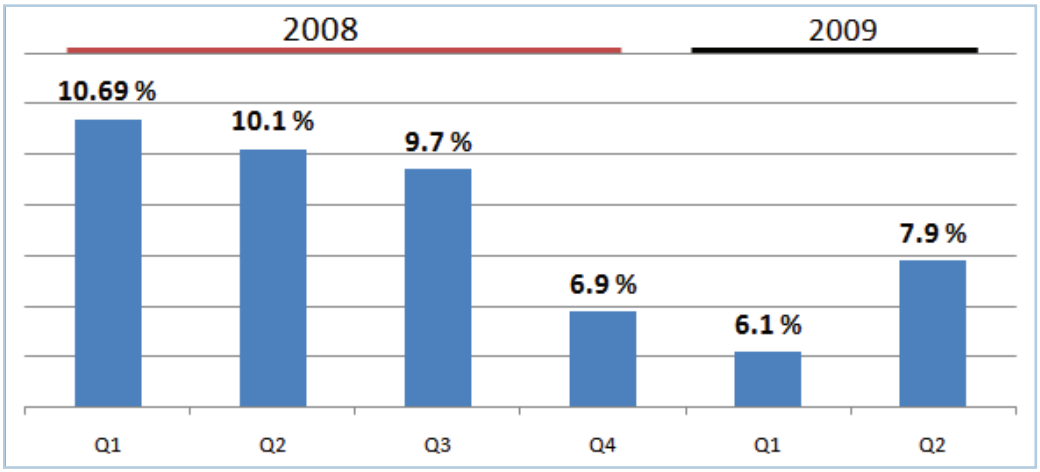
5. See http://www.eenews.net/climatewire/print/2009/08/18/1.

6. Daniel H. Rosen and Trevor Houser, "China Energy: A Guide for the Perplexed," paper prepared for the China Balance Sheet project, sponsored by the Peterson Institute for International Economics and the Center for Strategic and International Studies, Washington, April 2007.

7. Margaret McQuaile, "China Recovery Likely to Start in 2009: World Bank," *Oilgram News*, April 8, 2009.

8. Terence Poon and Andrew Batson, "China's Growth at Slowest in Almost Two Decades," *Wall Street Journal*, April 16, 2009.

Figure 1.1. China's Growth in Gross Domestic Product, by Quarter, 2008–2009 (in percent)



Sources: *Inspiring Economic Figures*, advertising supplement to *Washington Post*, July 24, 2009; various.

gain of 5 percent over March 2008.[9] By the end of the second quarter of 2009, China's GDP growth had essentially returned to levels offering confidence to the authorities that the corner to recovery had been turned (figure 1.1).

How does the United States' performance compare to that of China? Not very well, unfortunately. The U.S. GDP shrank during the April–June 2009 period by 1 percent, although that was a considerable improvement over the preceding two quarters, when GDP fell by at least 6 percent.[10]

Nevertheless, it cannot be said with certainty that the future of China is well assured. To date, exports and government investments have carried the day. Banks have embarked on a lending spree that has resulted in new loans totaling $1.1 trillion.[11] That cannot last; consumer consumption must increase, and soon—but for this to happen will be seen as a long-term project.

China reportedly became the world's number one vehicle manufacturer in 2009, surpassing Japan.[12] China sold 9.1 million vehicles during 2008, considerably lagging U.S. sales of 13.5 million vehicles. In terms of production, China outperformed the United States in 2008, if only slightly, by 100,000 units, but it fell short of Japan by 800,000 units. The difference between U.S. production and sales relates to idle manufacturing capacities and imports.

Further, the fuel efficiency of Chinese family automobiles already exceeds that of the United States, largely because cars in China are smaller.[13] Importantly, though, China lacks the technological know-how, systems integration, and design capabilities to be able to compete internationally.[14]

9. Winnie Lee, "China's March Crude Runs Rise 0.7% on 2008," *Oilgram News*, April 22, 2009.
10. Neil Irwin and Ylan Q. Mui, "Economy Turning Out of Steep Dive," *Washington Post*, August 1, 2009.
11. Andrew Peaple, "China's Perilous Exit Decision," *Wall Street Journal*, August 3, 2009.
12. John D. Stoll, "GM Pushes the Throttle in China," *Wall Street Journal*, April 22, 2009.
13. Keith Bradsher, "Miles to Go in China," *New York Times*, May 28, 2009.
14. Kendra Marr, "As Detroit Crumbles, China Emerges as Auto Epicenter," *Washington Post*, May 18, 2009.

If that is China's desire, then a joint venture or an acquisition of a foreign auto manufacturer would seem to be in order. China took the first step in that regard with the purchase in June 2009 of the Hummer automobile brand from bankrupt General Motors. The Chinese buyer has had no experience in building automobiles and needs permission from the government to complete the deal. United States–based production operations will continue. There are concerns about the proposed acquisition, which center on the buyer's inexperience and of course the Hummer's reputation as a gas guzzler.

At present, imports make up only 1.9 percent of China's market because of heavy import taxes.[15] Perhaps more telling is the share of car ownership in China, standing at just 2 to 3 percent.[16]

China's performance as an automotive manufacturer places a heavy burden on the oil sector, including the expansion of crude oil import levels and refining capacity to match growing gasoline demand.

In China, the dominance of heavy industry as a consumer supports the volatility and unpredictability of energy prices, and in 2007 placed China as likely the leading emitter of carbon dioxide. Of course, this situation also precludes any meaningful reduction in the nation's energy use per unit of GDP. Although its energy use per unit of GDP fell 1.33 percent in 2006, revised from an earlier reported 1.23 percent, its annual target had called for a reduction of 4 percent.[17] It is unlikely that its Eleventh Five-Year Plan goal of a cut of 20 percent can be achieved.

China has overtaken Japan and now stands as the second leading oil consumer in the world, trailing only the United States. But with position comes responsibility to provide the market with transparency and with current and reliable information. China has difficulty in responding to this requirement, much to the dissatisfaction of the oil market.

Equally important, China must be reminded that it does not live in isolation, that every energy-related decision made carries implications for the rest of the world. The world oil market was again caught off guard by China's very aggressive moves in early 2009 to line up long-term oil imports, in addition to other efforts following the "go out" philosophy. With almost $2 trillion in hard currency then available and with bargains everywhere, against the knowledge that China's reliance on foreign oil can only increase, those actions to be taken were undeniable.

When the Ministry of Land and Resources states that oil imports are expected to rise to 60 percent of supply by 2020, everyone takes note,[18] although the State Information Agency has raised the ante to 66 percent. Nevertheless, forecasts place crude oil imports at 7.25 million b/d by 2020,[19] if other estimates of domestic oil production and demand are reasonably correct. Opportunities were quickly grasped to expand oil and gas imports and, at the same time, diversify sources of supply and how that supply is to be delivered to China.

The onset of the world financial crisis has given China unequaled opportunities to tie up long-term agreements for deliveries of crude oil, or access to crude oil, using the foreign exchange

15. Irwin and Mui, "Economy Turning Out."

16. Geoff Dyer, "Little Leaps Forward?" *Financial Times*, May 28, 2009.

17. Premier Wen Jiabao had set a target of reducing energy consumption by 20 percent per unit of GDP during the period of the Eleventh Five-Year Plan, 2006–2010. See Winnie Lee, "China's Energy Use on GDP Basis Declined 1.23 Percent in 2006," *Oilgram News*, March 5, 2007.

18. Winnie Lee, "China Sees Oil Import Dependency Rising," *Oilgram News*, January 9, 2009.

19. Winnie Lee, "China Aims to Secure Its Energy Needs for Next Decade," *Oilgram News*, May 26, 2009.

accumulated as a result of sharp growth in international trade. The country is making the most of the opportunity to secure energy needs for at least the next decade. Slower growth in energy consumption will help, as will improvements in energy efficiency.

But China will always need to import more crude oil to meet its growing domestic demand. Drawing upon lessons learned during its early efforts, when wandering about the world and bidding for established companies did not prove especially successful, it changed its tactics. For example, to overcome political obstacles, it now seeks partnerships or joint ventures with established Western companies, although its own companies may go it alone when seeking to acquire smaller targets.

Recognizing that bargains could be had and putting its foreign exchange reserve to good use, it has concluded a number of loans-for-oil deals involving Russia, Venezuela, Brazil, and Kazakhstan.[20] The arrangement struck with Russia is by far the largest, committing Russia to provide 300,000 b/d of crude oil for a period of 20 years, in return for a loan placed at $25 billion. A total of $15 billion will be directed to Rosneft for oil field development, and Transneft will receive the remaining $10 billion for pipeline construction.

It should be explained that these are all not loans for oil in the strictest sense. For example, China will not be buying $90 billion worth of oil for $25 billion. The oil will be paid for at prices prevailing at the time of purchase, and Russia will pay back the loans separately.[21]

Kuwait, another Middle Eastern oil supplier, has struck a deal with China involving the construction of refinery in Guangdong Province with a capacity of 300,000 b/d. Kuwait, in turn, will provide all the crude oil to be processed by the refinery, raising the volume to be imported from that country to 500,000 b/d.[22]

Venezuela also has hopes of supplying 1 million b/d of oil to China. That particular goal, a level that seems quite unreasonable in light of current developments in the Venezuelan oil sector, may lie in the distant future. But such efforts are useful in securing China's diversity of supply.

China's arrangement with Brazil is a bit unusual in that the loan of $10 billion is not tied to an oil supply agreement but rather will be repaid over a period of 10 years.[23] This is not to say that oil deliveries are not involved, for they are, via a separate 11-year agreement calling for Petrobras to deliver 150,000 b/d during 2009 and 200,000 b/d in each of the following 10 years.[24] These volumes will represent a considerable increase over 2008 imports from Brazil, which averaged just under 61,000 b/d.

Other commodities, such as iron ore and aluminum, are being purchased by China from other countries and stockpiled for future use. For example, as a pragmatic nation China needs access to natural resources, North Korea has them, and trade flourishes between them. Such actions are in part responsible for commodity prices holding at high levels. But what happens when the world fully emerges from the 2008–2009 financial crisis? China is turning to its stockpiles and minimizing purchases on the open market, thus possibly slowing down the rebound under way.

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20. Winnie Lee, "China's CNPC Signs Loan-for-Oil Deal with Kazakhstan," *Oilgram News*, April 20, 2009.
21. See http://www.atimes.com/atimes/printN.
22. Miriam Amie and Winnie Lee, "Kuwait Says Deal Signed on Big China Project," *Oilgram News*, May 12, 2009.
23. See www.ogj.com/articles/article_display.cfm?article_id=3627498p=7.
24. Winnie Lee, "Petrobras to Supply Simnopec 200,000 b/d," *Oilgram News*, May 21, 2009.

China's energy use has grown because of the transformation of virtually every aspect of its industry and general economy. Interestingly, in 2006, it used 15 percent of the energy consumed in the world to produce 5.5 percent of global GDP.[25] That particular relationship clearly is unsustainable. The nation's planners recognize this imbalance and have warned that the growth model must be changed and moved away from a high consumption of energy and resources.

The economic growth in China has underscored the availability of opportunities there, and foreign investors have been quick off the mark, attracted by the size of a market defined by 1.3 billion potential consumers. But most investors have been ill-schooled in the ways of doing business in a country just emerging from the shadows. These investors have sometimes discovered rather quickly that Western business models do not always work; nor is there an "average Chinese customer."[26] Many investors have come to China and most have left, but some have stayed and over time learned what it takes to be successful.

Although foreign direct investment has thus far been a major force in China's economic expansion, a change may be coming, and this change will see overseas direct investment by China overtaking foreign investment. Why? It has been postulated that the drive for overseas investment will reflect China's spending for access to natural resources and other assets needed to support its continued growth.[27]

Unfortunately, China's venture into overseas investment has not always been successful. The recent demise of a planned $19.5 billion investment in the Anglo-Australian mining firm Rio Tinto is a case in point. The failure of this project—which was part of a larger effort to secure a stable, cost-effective supply of natural resources to support continued economic growth—underlined the fact that China still has much to learn when it comes to foreign acquisitions and strategic partnerships.[28]

China, as the world's largest importer of iron ore, thinks it should have a greater role in how iron ore is priced.[29] Talks regarding iron ore prices between China's steel industry and producers, including Rio Tinto, broke down on July 1, 2009. Three days later, four Rio Tinto employees were taken into custody by the Chinese authorities, accused of stealing state secrets. This action smacks of retaliation, whether true or not, but it does tell foreign companies that there is little that cannot be subjected to the state secrets law.

In sum, the U.S.-Chinese economic relationship is probably the most important in the world, at least in the judgment of Brent Scowcroft, who can look back on close working relationships with seven U.S. presidents.[30] Yet, as Scowcroft has noted, the 2008–2009 financial crisis can either bring the two countries closer together or move them apart.

In May 2009, the U.S. Energy Information Administration released its *International Energy Outlook 2009 with Projections to 2030.* One of the charts therein compared China's net increase in industrial energy use for the period up through 2030 with that for a group of non-OECD countries as well as the OECD as a whole (figure 1.2).

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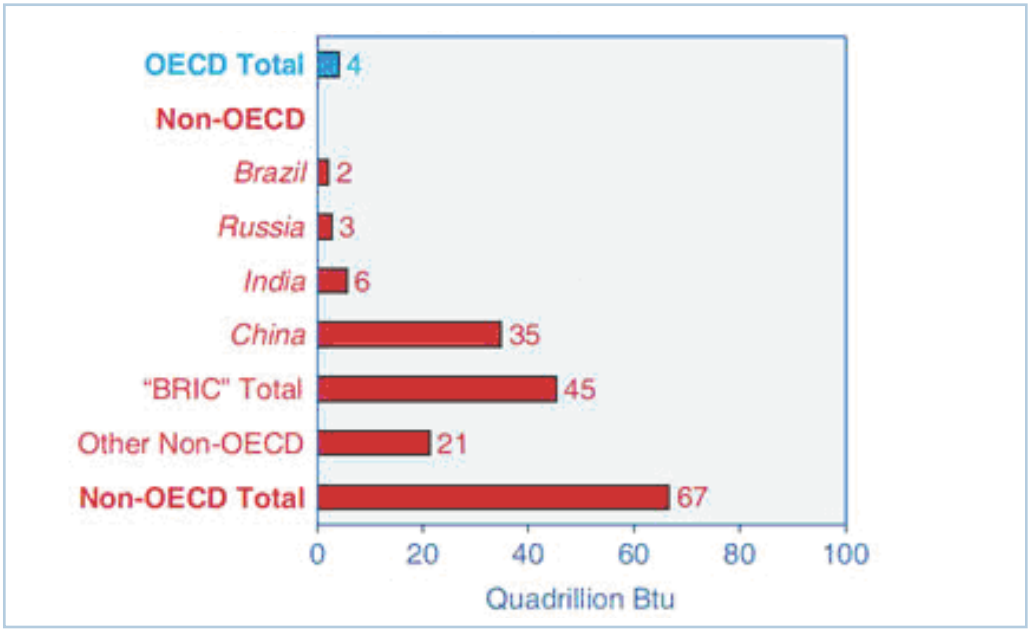
25. See http://en.ce.cn/business/macro-economic/200703/19/t20070319_10740776.
26. "How to Get China and India Right," *Wall Street Journal*, April 28–29, 2007.
27. Lawrence Brainard and Jonathan Fenby, "Chinese Takeout," *Wall Street Journal*, February 20, 2007.
28. Shujie Yao, "China Will Learn from failed Chinalco-Rio Deal," *Financial Times*, June 7, 2009.
29. Patti Waldmeir, "Rio Case Shakes Groups into Assessing China Methods," *Financial Times*, July 18, 2009.
30. Gerald Seib, "Scowcroft Likes Prospects for Better Ties to Russia, China," *Wall Street Journal*, May 1, 2009.

Figure 1.2. China versus the World, through 2030 (quadrillion British thermal units)



Note: OECD = Organization for Economic Cooperation and Development. BRIC = Brazil, Russia, China, and India.

Source: Energy Information Administration, *International Energy Outlook 2009* (Washington, D.C.: U.S. Government Printing Office, 2009), figure 8.

China clearly leads the way, with its net industrial energy use during these years projected to be almost 9 times that of the OECD as a whole. Can this leadership be transferred to world political leadership as well? Figure 1.2 also underscores that the net increase in industrial energy use by non-OECD countries will be a high multiple—almost 13 times—that of the OECD. Should this give rise to concern and, if so, what can or should be done to minimize this apparent coming shift in leadership, assuming of course that levels of energy use translate into political power?

The 2008 Summer Olympic Games

China opened up itself to the outside world in the most dramatic fashion possible—hosting the 2008 Summer Olympics—and impressing upon television viewers around the world that the China of today is a country to be reckoned with. An estimated $40 billion was spent to ensure that the athletic events would take place under the very best conditions possible.

The international media were unanimous in awarding a "gold medal" to China for the spectacular and often mind-boggling opening ceremonies on August 8, 2008. One small segment of the opening ceremonies, which was deemed newsworthy enough to make the front page of the *New York Times*, involved a change made "in the national interest."[31] What could have been so important

31. Jim Yardley, "In Grand Olympic Show, Some Sleight of Voice," *New York Times*, August 13, 2008.

as to involve the highest levels of the Communist Party, where this order for change originated? It was nothing more than replacing a young lady who was very pretty but not a very good singer with a less pretty one who was a better singer. So what did they do? Let the pretty girl have the spotlight and lip-sync the words recorded by the better singer. The unknowing TV audience was captivated by what they heard and saw.

Was this substitution a deceitful act of monumental proportions? Of course not. But to explain that it was taken in the national interest will give pause for thought to China watchers. For who knows how else the national interest may be employed for China to put its best face forward.

What happened when the Olympic Games came to a close, as they did in memorable fashion, the athletes and tourists have left for home, and TV watchers around the world have returned to their regular programs? What memories will be retained? Might it be the ability of the Chinese government to focus on an event, to ensure its success, and to display to the world that which is possibly its greatest strength—the sheer number of its people?

Might it be that 100,000 soldiers and more than 1 million volunteers helped keep security during the games?[32] Three protest zones had been set up around Beijing, and 77 applications were received, but none were approved. Web sites were shut down, and eight Americans were arrested and jailed as they tried to protest China's policies toward Tibet. Nonetheless, considering what could have happened, the games were won by China, and that is not just counting the number of gold medals awarded.

The World Financial Crisis

As one Chinese official is said to have remarked, our strength is our numbers and, with our people, we can do anything. Give the population access to the latest technology, in the broad aspects of an expanding economy, and the world will indeed take heed.

Still, perhaps one of the more formidable post-Olympics challenges facing China are the continuing internal political disturbances and the prospect that these disturbances could broaden to encompass larger portions of the country. This is a fear that catches every party official—the fear of uncontrolled social upheaval—and 2009 was just the beginning.

The worrisome rate of inflation is of course always present. How to contain inflation in a country where a progrowth policy dominates? Containment appears to have been found in the decline in economic activity, in particular by the drop in exports. As 2009 opened, consumer price inflation registered just 1 percent in January, falling for the ninth month in a row.[33] Exports had dropped in January by 17.5 percent, the largest decline in more than a decade. For comparison, imports declined that month by an astounding 43.1 percent, yet that decline allowed China to record a substantial trade surplus for the month.[34]

Although the drop in exports cannot be considered a surprise, the impact of China's 2008 stimulus program has provided the needed growth in the domestic market. But can domestic

32. Edward Cody, "A Victory for China," *Washington Post*, August 25, 2008.
33. Geoff Dyer, "China Faces Consumer Price Deflation," *Financial Times*, February 11, 2009.
34. Geoff Dyer, "China Exports at Lowest Level in a Decade," *Financial Times*, February 11, 2009.

growth be sustained in the absence of substantial exports?[35] The Chinese government has taken steps to ensure continued growth of the domestic market by issuing an explicit "buy Chinese" policy.[36] This step will not go unnoticed around the world, other countries will be pressured to follow China's example, and as a result political tensions will surely rise.

Inflation had been the central question—or rather was the central question, until the effects of the world financial crisis began to envelop China. The problem now facing the Chinese government is how best to protect the economy. Continued economic growth is essential not only to protect jobs but equally to prevent workers from taking to the streets to protest declining living standards. Given that more than 500 million Chinese get by on less than $2 a day,[37] prospects appeared rather dim.

Millions of migrant workers, cut loose as jobs disappeared, returned home to a vanished future—that is, reportedly 25 million out of a total 130 million rural migrants.[38] Statistics covering joblessness as a whole in China are not available. Chinese exports to the United States, essential to the desired economic growth, fell drastically as that country entered a financial downturn. Thousands of small Chinese companies had collapsed and protestors were taking to the streets in huge numbers. The crisis had become a political one; social stability was threatened. Maintaining a high growth rate remained the key priority.

China ultimately acted as other nations had done, announcing a $586 billion economic stimulus package in early November 2008, to be used through 2010. The sum may not be that large in actuality, as a portion had been announced previously. The larger portion will be directed to rural infrastructure and social services.[39] An annual growth rate of at least 8 percent is essential to build jobs and keep the populace reasonably happy. The growth rate for 2008, at 9 percent, had met these requirements, but just barely, considering that the growth rate in 2007 was 13 percent.

A good portion of the stimulus fund is being targeted for the construction of infrastructure projects such as railroads and highways.[40] Nor are the funds being directed solely to favorite cities and regions; instead, they are programmed to also reach outlying parts of the country. On the home front, the Chinese, always good savers, are becoming even more cautious with their spending, in considerable part because of the fear of job loss.

Details of the stimulus package for the oil and petrochemical sector were released in mid-May 2009. A key element in this package is that the country's crude oil-processing goal will reach 8.3 million b/d by 2011, a jump of 18 percent over the 2008 volume.[41] Given the anticipated growth in oil demand, this level of increase is not particularly surprising. A remaking of the oil-refining sector will be undertaken. Small, obsolete refineries will be closed, and three to four integrated refining bases, each with a capacity of 400,000 b/d, will be built.[42]

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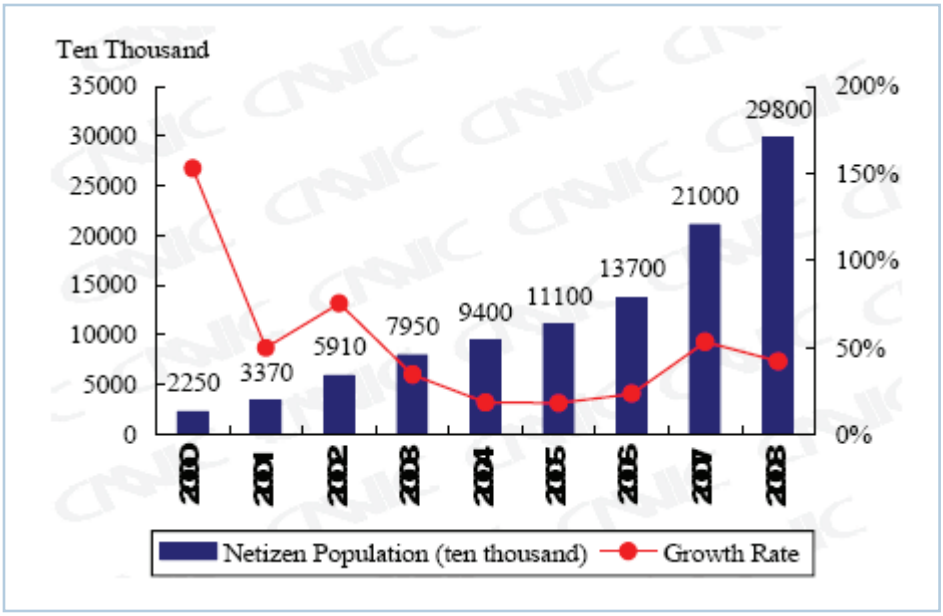
35. Keith Bradsher, "Data Shows China Relies More on Growth at Home," *New York Times*, June 11, 2009.
36. Jamil Anderlini, "'Buy China' Policy Set to Raise Tensions," *Financial Times*, June 16, 2009.
37. Jim Yardley and Keith Bradsher, "China, an Engine of Growth, Faces a Global Slump," *New York Times*, October 23, 2008.
38. Ian Johnson and Andrew Batson, "China's Migrants See Jobless Ranks Soar," *Wall Street Journal*, February 3, 2009.
39. Andrew Batson, "Beijing Reveals Small Parts of Big Stimulus," *Wall Street Journal*, November 15–16, 2008.
40. Keith Bradsher, "China's Route Forward," *New York Times*, January 23, 2009.
41. Winnie Lee, "Stimulus Plan Details Transformation of Refining," *Oilgram News*, May 19, 2009.
42. Ibid.

Figure 1.3. China's Growth in Internet Users, 2000–2008 (ten thousands and percent)



Source: http://www.cnnic.cn/uploadfiles/pdf/2009/3/23/159540.pdf.

One detail that has not attracted much attention is the role of local authorities, which have been charged with coming up with three-quarters of the stimulus investment program.[43] The remaining one-quarter is the responsibility of the Chinese government. But do these local authorities have ready access to funds? No, they do not; they must borrow them, and these debts are ultimately borne by the central government. China, in a way, is thus mortgaging its future.

Although a number of issues continue to stress the United States–China relationship, none have perhaps caused as much concern as the strict new Internet censorship rules imposed by China.[44] The impact has been felt both domestically and internationally, as Chinese users fear the loss of their Internet freedoms. This loss would be sizable, as there are about 298 million Internet users—or "netizens," in Chinese terminology—up from just 22.5 million in 2000 (figure 1.3).

The seriousness of U.S. concerns is reflected by the action taken—the delivery of a démarche, a sharp expression of displeasure. The U.S. reaction did not develop overnight, because censorship has been steadily making inroads in Internet use for some time. Is the United States really concerned about what is taking place? Yes it is, but its strong interest more likely relates to the broader implications of Internet control, including the blocking of information having a political content. In this regard, in Iran the role of the Internet in bringing together those outraged by the 2009 presidential election results likely was followed by nations worldwide.

For a number of months, China had been imposing export quotas on raw materials such as coking coals, zinc, and bauxite. Negotiations between China and the United States proved fruitless,

43. Andrew Batson, "Concerns about Cost of China's Stimulus Grow," *Wall Street Journal*, June 10, 2009.

44. Richard Waters et al., "US Makes Official Complaint to China over Internet Censorship," *Financial Times*, June 22, 2009.

and finally the EU and the United States together complained to the World Trade Organization (WTO). China responded by rejecting these claims, saying the curbs were put in place to protect the environment and natural resources.[45]

It should have been expected that trading nations would do what they could to protect their economies during the 2008–2009 financial crisis. In fact, the United States had taken the first step by putting forward "buy American" legislation; and China, in an act that should have surprise no one, countered with its own "buy Chinese" law.

Actions and counteractions will likely continue as long as nations are threatened by the aftermath of the financial crisis and as long as national interests prevail—which of course they will. To illustrate, China joined the WTO in November 2001, but since then it has failed to sign a separate WTO agreement covering government procurement and has used that freedom to favor domestic suppliers over foreign suppliers in government contracting.[46]

As the financial crisis continued, economists concluded that China needed to export less and consume more. That would involve raising household income while reforming health care, education, and pension systems so that people would spend more and save less.[47] Will that advice be followed? Vice Premier Li Keying has been quoted as saying that China will unleash the potential of consumption to drive economic growth. Will the consumer respond?

Although recovery statistics were somewhat impressive as the summer 2009 was winding down, the Chinese government still faced weak export demand, and domestic consumption was not increasing to the extent desired. In the words of Premier Wen Jibao, "The pickup in China's economy remains unstable, unconsolidated, and imbalanced."[48]

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45. Tom Braithwaite et al., "China Rejects US and EU Trade Charges," *Financial Times*, June 24, 2009.

46. Keith Bradsher, "As China Stirs Economy, Some See Protectionism," *New York Times*, June 24, 2009.

47. Sarah O'Connor and Francis Williams, "Beijing Can Launch New Stimulus, Says IMF," *Financial Times*, July 23, 2009.

48. Andrew Batson and Terence Poon, "China Stimulus Fuels Bank Lending, Industrial Output," *Wall Street Journal*, September 13, 2009.

2 LIMITS TO GROWTH

There is reason to believe that by 2025 China's gross domestic product will be second only to that of the United States. One key measure: In excess of 5 million passenger vehicles were sold in China in 2007, and sales during 2008 had been expected to exceed 6 million,[1] but instead they totaled 9.1 million. China has become the world's second-largest automobile market after the United States, with private cars now numbering in excess of 38.85 million, representing almost 64 percent of the total number of vehicles.[2] On a per capita basis however, comparison with the United States is quite severe: fewer than 3 cars per 1,000 Chinese.

Or consider another measure: There are more than 470 million mobile telephone subscribers in China, with that total growing by 5.5 million every month.[3] Plus, fixed-line users total an estimated 377 million. Yet that leaves a full third of the population, mostly in western rural areas, with no access to phone service. The point is this: Though it is relatively easy to demonstrate that China has scored remarkable gains in a relatively short time, these gains risk being overwhelmed by what remains to be done, and especially by those barriers to growth discussed in this chapter.

A presentation on China given at the Center for Strategic and International Studies in Washington in May 2007 raised a disturbing question: Are the Chinese in denial?[4] The question had to do with the projected consumption of coal in 2025 by electric power generating plants and also allowing for industry needs. Even under the more conservative rates of growth (7.5 percent a year), the consumption of coal would reach 6 billion tons annually, or triple the 2005 demand. For purposes of comparison, world consumption of coal reached just 5.5 billion tons in 2004.

The question remains: Should China be expected to consume 6 billion tons of coal by 2025? No, it should not—not in terms of its already-overburdened rail transport capacities, not in terms of its carbon emission levels, not in terms of its coal reserves, and not in terms of its energy efficiencies. Current long-range plans call for China to produce 3.3 billion tons of coal by 2015.[5] Even that level appears questionable when viewed against the background of current reduced economic growth. Yet analysts will hedge against being taken by surprise once again.

Unstoppable, Yet Unsustainable

China's economic growth is viewed as both unstoppable yet unsustainable. But more important, what does China think? Do its policymakers understand that current growth rates cannot be con-

1. Keith Bradsher, "With First Car, a New Life in China," *New York Times*, April 24, 2008.
2. Winnie Lee, "Chinese Car Owners Curb Driving as Fuel Costs Rise," *Oilgram News*, July 14, 2008.
3. Tariq Osborne, "China Index," *ChinaTrade*, March 2007.
4. Malcolm Shealy and James P. Dorian, "Chinese Energy and Economic Challenges: Is the World in Denial?" Center for Strategic and International Studies, May 11, 2007, http://csis.org/files/media/csis/events/051107_presentation.pdf.
5. See http://news.yahoo.com/s/afp/20090108/bs_afp/chinacoalwarming_newsmlmmd/print.

tinued forever, and that change—read: slowdown—must come, and relatively soon? Some do, and they have spoken out to warn the public. To illustrate, Premier Wen Jiabao warned in 2007 that the Chinese economy was becoming increasingly "unstable, unbalanced, uncoordinated and ultimately unsustainable."[6] But there is little evidence that these warnings are being closely heeded.

As China emerged from the second quarter of 2007, it could boast of an annual growth rate of 11.9 percent, the fastest in more than a decade. The country could point to a trade surplus of $112 billion attained in just six months, but also an inflation rate in June 2007 that was the highest in years.

Unstoppable but unsustainable—Chinese officials wrestle with this conundrum, but they have not found the answers as to how to slow down the economic expansion without causing public dissatisfaction and political disruption. In the end, it may be that the answers will be found for them, and the results may well be unpalatable. Already, unpalatable results arrived with the full impact of the world financial crisis upon the Chinese economy.

In early March 2007, Prime Minister Wen Jiabao conceded that China was failing on important energy and pollution goals and declared that the country must become more energy efficient and quickly improve environmental protection to safeguard the long-term health of its economy.[7] He stressed plans to shut down backward steel plants and inefficient and polluting power plants, conserve energy, and decrease energy consumption. Yet he acknowledged that "the most important task for us is to promote sound and fast economic growth."[8] Clearly, he was paying tribute to the need to continue the country's expansion if the Communist Party is to hold onto its position.

It is one thing for Beijing to set national goals, but it is quite a different matter for the country to fall in line behind these goals. There is the conventional wisdom that China's one-party system—that is, the Communist Party—gives Beijing total power and control over all levels of government.

Not so, we are now told.[9] The regime lacks the capacity to bring about absolute obedience to edicts issued by Beijing. In sum, the leadership must calculate what would be acceptable to local authorities, and what would not. Far too much leeway is taken by local and regional leaders when it comes to activities that offer opportunities for growth and employment.

The construction of two dams on the Yangtze River offers a good example of endeavors going ahead without proper coordination with Beijing. Construction was under way when the Ministry of Environmental Protection found out that these two projects lacked the mandated environmental approval.[10] As a consequence, construction was stopped. These were two giant projects, and upon completion they would produce as much electricity as the Three Gorges Dam. Given that level of contribution, it would come as no surprise that, after a certain passage of time, construction would resume.

Is China being thrown back into its old cycle of decentralization and, ultimately, competing centers of power?[11] Can it successfully meet the challenges of corruption, pollution, adequate

6. Stephen Roach, "Insight: China's Consumers Key to Revival," *Financial Times*, July 28, 2009.
7. Jim Yardley, "Chinese Premier Emphasizes Energy, Pollution and the Poor," *New York Times*, March 5, 2007.
8. Ibid.
9. "China Balance Sheet Update," Center for Strategic and International Studies and Peterson Institute for International Economics, no date.
10. See http://www.eenmews.net/Greenwire/2009/06/12/24.
11. See http://www.stratfor.com/weekly/china_olympics_and_visa_mystery, July 30, 2008.

food supplies, and huge movements of population to its cities? What would happen if the growth bubble burst, or if all the migrant workers returned home, out of a job? Much is at stake, if the government wishes to continue to hold onto power, and it can be safely assumed that it does.

Will politics come into play? The last Communist Party Congress was convened in October 2007. Speculation had held that a younger team would be introduced to succeed President Hu Jintao when he steps down in 2012. Will this younger team simply pay fealty to the politics of Hu or, when the opportunity arises, will they set the country on a new and decidedly different path?

The expected answer was provided by a post-Congress newspaper headline, which read "Heirs Apparent Confidently Sing from Party Hymn Sheet."[12] Xi Jinping is slated to become president and head of the Communist Party in 2012. Li Keqiang will assume the position of premier.

There were no surprises, just affirmation of current policies balancing economic growth with environmental protection—policies to ensure that past rapid economic growth will be supported to continue. China is thus set for the next five years. But its prospects for the future will rest upon the degree to which local authorities not only sign on but also actually pay attention to those policies that Beijing lays out.

Although it is true that regional and city governments for some time now have had the freedom to do as they like, that freedom also has allowed officials to ignore safety violations and labor and environmental standards.[13] These officials are easy targets, and often rightly so, given all the ills that have risen to the surface during China's current period of rapid economic growth. What is the answer? Is it a stronger central government, taking away the freedom of action that has come to local governments not by decree but by default? Or should more power and responsibility be granted to local authorities? How these questions are dealt with in the future will determine to a considerable degree the face of China that greets the West.

Measurable Obstacles to Growth

There are other, equally important, obstacles to growth:

- food security,
- shortages of water,
- limited arable land,
- pollution as a constraint,
- migration from rural areas to the city,
- the burden of changing demographics,
- overcapacity and underutilization, and
- an immeasurable limit to growth.

12. Mure Dickie and Richard McGregor, "Heirs Apparent Confidently Sing from Party Hymn Sheet," *Financial Times*, October 17, 2007.

13. Andrew Batson, "China Tightens Local Oversight," *Wall Street Journal*, August 10, 2007.

Food Security

China faces the task of feeding 22 percent of the world's population with only 7 percent of its arable land and about 6 percent of its water resources.[14] Cultivated areas declined by 6.5 percent between 1996 and 2004. Moreover, increasing amounts of arable land are being designated for other purposes, including construction. The average amount of land per Chinese farmer is reported to be 1.5 acres,[15] whereas there is an average of 247 acres available to every U.S. farmer.[16]

Premier Wen Jiabao warned in March 2007 that if arable land were to fall under 1,206,000 square kilometers, China would not be able to feed itself.[17] Current arable land stands at 1,226,000 square kilometers. Thus, a loss of just 20,000 square kilometers, or roughly 1.6 percent, would push the country over the negative threshold. Some experts are inclined to believe that this threshold has already been crossed.

Probably because of this situation, Beijing is considering a plan under which Chinese companies would be encouraged to buy farmland abroad, particularly in Africa and South America, as a way of helping guarantee the security of the domestic food supply,[18] mirroring in a way the search for equity crude oil. The government has a long-standing policy of self-sufficiency in food production. But this policy clashes with the construction program under way. Moreover, a drought, described as the worst in Northern China in at last 50 years, has threatened wheat crops and available supplies of freshwater. More than 18,000 square miles of farmland remained critically endangered.[19]

It has been reported that construction requirements will take nearly three times as much arable land in 2009 and 2010 as can be brought into cultivation elsewhere.[20] That is the required arrangement, but it likely will not be met unless other approaches can be devised.

It must be pointed out that for the past several decades, there have been continual warnings that China's increasing demand for food would lead to shortages worldwide.[21] Those warnings missed the mark in the past, but now the constraints appear more real and more threatening, because global warming has been added to the list of constraints.

China is not alone in its approach to food security. Countries in the Middle East and North Africa that are also food poor are thinking about growing food supplies abroad on purchased land. Would land purchases be secured anonymously, knowing that such efforts would likely be opposed

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14. All the rural land is still owned by the state, with farmers allowed to lease plots for 30 years at a stretch. The land is effectively owned by village-level leaders and party secretaries. See Edward Cody, "Farmers Rise in Challenge to Chinese Land Policy," *Washington Post*, January 14, 2008.

15. This is for a total of 200 million farms, at the most recent count, almost all of them inefficient. Because farmers cannot buy or sell the land they are working, the amalgamation of a number of plots into one larger farm capable of supporting modern machinery is difficult to bring about. Land seizures for industrial purposes or housing continue on a large scale and are a source of resentment, often spilling out into large-scale public protests.

16. *ChinaTrade*, April 2007.

17. See http://asianews.it/view4print.php?1=en&art=9015.

18. Jamil Anderlini, "Beijing Looks at Foreign Fields in Plan to Guarantee Food Supplies," *Financial Times*, May 9, 2008.

19. Michael Wintes, "Worst Drought in Half Century Shrivels the Wheat Belt of China," *New York Times*, February 25, 2009.

20. Kendra Marr, "As Detroit Crumbles, China Emerges as Auto Epicenter," *Washington Post*, May 18, 2009.

21. Javier Blas and Geoff Dyer, "China Sows Seeds of Food Self-Sufficiency," *Financial Times*, April 16, 2009.

in other nations? Perhaps they would, but identities cannot be hidden forever. Or would the host countries instead offer to grow the food and then sell it to those who are short of supply? The tactics of the Organization of the Petroleum Exporting Countries with regard to oil supply have not been overlooked.

As the world's population increases, as living standards rise, as renewable fuel resources become more popular, and as the impact of global warming becomes more apparent, pressures on the adequacy of food supplies will become constant. Under these conditions, might the search for food supplies and the attendant geopolitical issues ever match the current search for adequate oil supplies?

Shortages of Water

Oil can be replaced but not the water needed to grow acceptable food supplies and meet consumer needs and industrial requirements. Water shortages were particularly evident in the early months of 2009, as China faced one of its worst droughts in years—and in some parts of the country, the worst since 1951.[22] These droughts have had multiple effects: shortages of drinking water for the affected population, potential shortages of food, and a loss of livestock.

Part of the problem is that the consuming public has become accustomed to low water rates, leading to the absence of any incentive to use water more efficiently. Yet the amount of water available per capita in China is no more than one-quarter of the world average.[23] Shortages reduce the country's economic output by about 1.3 percent, and pollution brings about a further loss of 1 percent.[24]

For certain countries of the world, especially where politics and secure water supplies clash, the answer would be "yes," the availability of water has become a grave concern. For China, 30 percent of the average family's income is spent on food, compared with just 10 percent in the United States.[25] But that stress pales alongside Kenya and Bangladesh, where 50 and 65 percent, respectively, of the family income must be spent on food. Clearly, the developing countries of the world suffer the most as the fuel and now the food crises take their toll. It is these kinds of crises, in this category of countries, that bring people into the streets.

Limited Arable Land

As a further complication for China, all rural land is owned by the government and leased to the individual farmer. When that land is taken away for other purposes, what recourse is available to farmers? They have none, except for public protests, and these are growing in number and in participants. Unfortunately, such protests are rarely successful.

A considerable portion of the farmland being lost is the direct result of seizures or confiscation (plus pollution and corruption) for industrial or housing construction. The affected farmers have little or no recourse except to take to the streets. The Public Security Ministry reported

22. Shai Oster, "China Battles Worsening Drought," *Wall Street Journal*, February 6, 2009.
23. Andrew Batson, "China Cities Raise Water Price in Bid to Conserve," *Wall Street Journal*, July 31, 2009.
24. Ibid.
25. Carola Hoyos and Javier Blas, "West Rethinks Strategic Threats," *Financial Times*, June 21, 2008.

87,000 public protests in 2006, up from 10,000 in 1994, accompanied by increasing violence.[26] Clearly, public protests have become commonplace on the local scene.

Pollution as a Constraint

Then there is the less-publicized but equally serious problem of China's farmland becoming increasingly polluted. More than 10 million hectares (24.7 million acres), or 10 percent of the nation's land that is cultivated, has been ruined.[27] Pollution has also had an impact on China's water supply. More than 70 percent of its waterways and 90 percent of its underground water sources are contaminated.

Pollution should be recognized as a very real constraint on growth. A report by the OECD, released in July 2007, found that by 2020 pollution in China would annually cause 600,000 premature deaths in urban areas and 20 million cases of respiratory illness, along with other medical problems, all possibly leading to the loss of 13 percent of the country's gross domestic product.[28]

The State Environmental Agency (SEPA) does not have an easy task as it seeks nationwide support to control pollution while information regarding its impact on public health remains quite sensitive. Local governments reportedly protect polluters, and industries may deny entrance to SEPA inspectors, while Beijing will seek to censure reports that carry the wrong message regarding the real impact of pollution.

To illustrate, SEPA demanded that the World Bank exclude statistics on premature deaths caused by pollution from a joint study because they would cause misunderstandings.[29] This report, *The Cost of Pollution in China*, and prepared by the Bank in cooperation with China's government agencies, found that 750,000 people die prematurely there each year, mainly from air pollution in the large cities.[30] Taken together, all this leaves little hope that China will be able to successfully mount any broad program to combat the negative results of filthy air and dirty water.

Migration from Rural Areas to the City

In China, rural-to-urban migration has been massive, responding to a government program to shift farmers into more productive occupations. This program reflects government thinking that for farming to become more productive and profitable through the introduction of equipment and technology, farms will need to become larger and the number of farmers smaller. But what can be done with the surplus farm labor? The answer: Off to the city. Now, however, because of job losses, that direction of migration is being reversed. But the fears of authorities that the return of jobless workers to their places of birth could eventually lead to public disturbances and possibly riots were never realized. These workers soon realized that it would be best to return to the cities where they once had jobs, in the hopes that, through government stimulation spending, opportunities for employment would once again appear.

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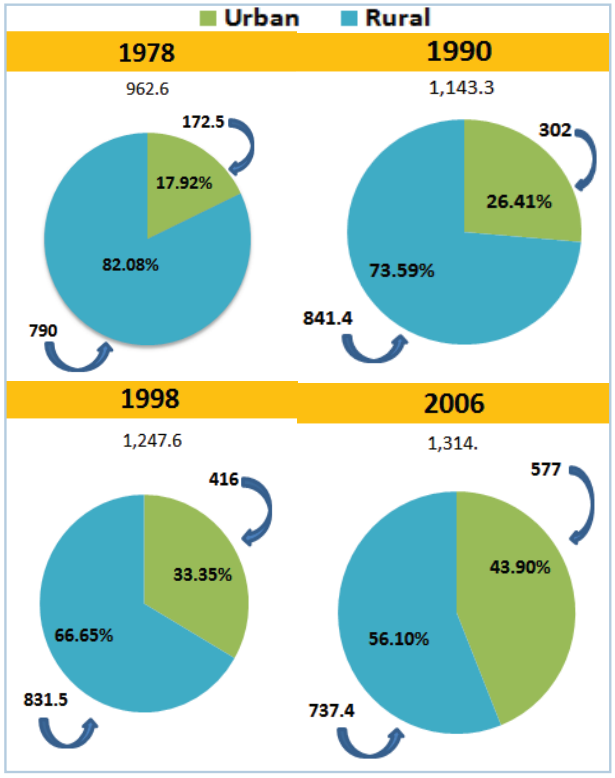
26. Howard W. French, "Citizens' Groups Take Root across China," *New York Times*, February 15, 2007.
27. See http://www.sundaytimes.co.za/news/article.aspx?id=432789.
28. Jamil Anderlini, "OECD Highlights Chinese Pollution," *Financial Times*, July 17, 2007.
29. Mure Dickie and Richard McGregor, "Lack of Clout Hits Chinese Pollution Watchdog," *Financial Times*, July 6, 2007.
30. Richard McGregorin, "Beijing Censored Pollution Report," *Financial Times*, July 3, 2007.

Figure 2.1. Shifts in China's Rural and Urban Populations, Selected Years, 1978–2006 (millions of people and percent)



Note: Because of rounding, totals may not always equal the sum of the parts.

Source: Li Xing, "Nation Stems Population Tide," *Reports on China,* advertising supplement to the *Washington Post*, June 12, 2009, in turn citing the National Bureau of Statistics.

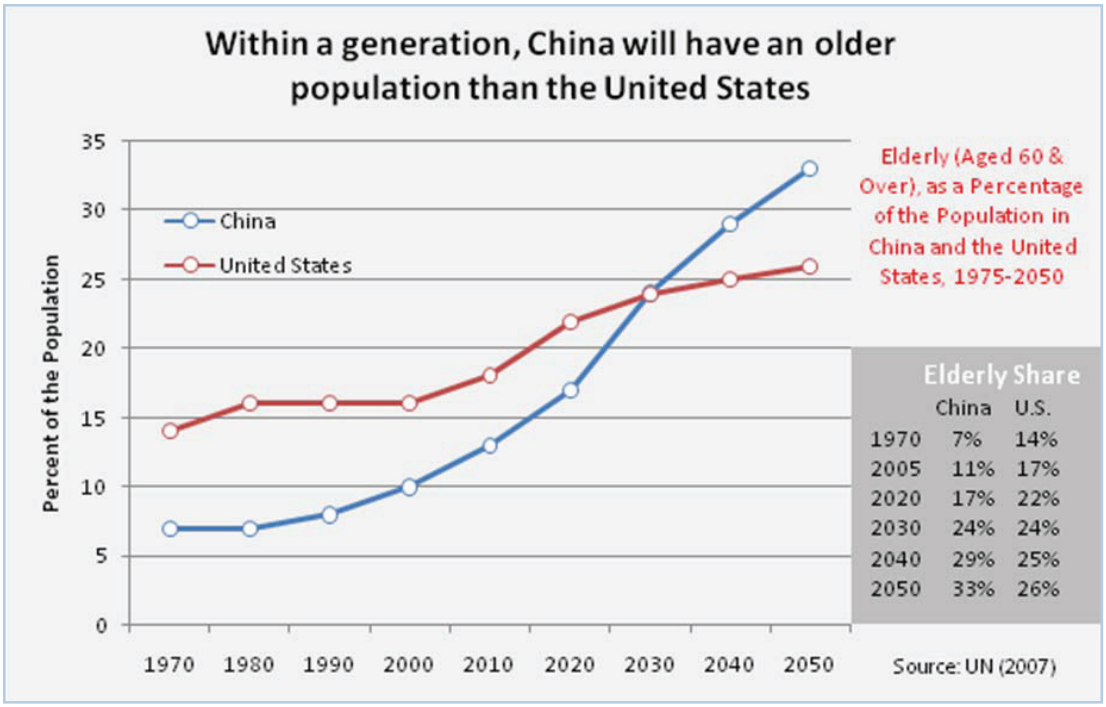
The Burden of Changing Demographics

China is burdened by its rural population of some 740 million, representing 56 percent of total Chinese, although down from 74 percent just 18 years ago. Rural residents average $690 in annual income, or just 30 percent of what urban dwellers can expect to earn.[31] How to keep both rural and urban dwellers reasonably happy is a continuous challenge for the authorities—it is easy to promote but more difficult to do.

There has been a steady shift in the rural/urban population breakdown during the past several years. As the nation's population has increased, so have the share and numbers of urban dwellers. The population growth rate has slowed, and the concept of the traditional large family has changed, reflecting in large part the "one child per family" approach, along with the pattern of young people migrating from rural areas to the big city. Figure 2.1 shows that the rural population peaked in total numbers in 1990 and then began a steady decline, losing almost 100 million during the eight-year period 1998–2006. A reasonable portion of the loss in the rural population was the result of people migrating to the cities who were looking for work.

31. Calum MacLeod, "Return of Jobless Migrants Strains China," *USA Today*, February 17, 2009.

Figure 2.2. An Aging China, Losing Out to the United States, 1970–2050



Source: United Nations data, as organized by Richard Jackson et al., *China's Long March to Retirement Reform* (Washington, D.C.: Center for Strategic and International Studies and Prudential Financial, 2009).

There were an estimated 120,000 strikes, protests, or riots in 2008 over corruption, the confiscation of land, or nonpayment of wages.[32] The issue at hand is how to keep these disruptive events, which so far have been generally localized, from spreading to affect larger geographic areas.

In 2009, China will also be burdened by the number of new college graduates who in previous years had little difficulty finding employment. Those days are gone. A reported 6.1 million graduates entered the job market in 2008, and a full one-third are still looking. Another 6.1 million will be looking for employment in 2009.[33] Many are poorly qualified, having attended little more than diploma mills. Their training is minimal. Are students ready to take to the streets, as they are apt to do in other countries? No, pessimism is just that, and nothing more.

But an aging population will surely confront the country in the coming years. By 2050, roughly 430 million people, equal to about a third of the current population, will be retired. Moreover, by 2030, China's total population is expected to start to decline. What will be the impact on the labor force, and in turn on this country that has benefited from the availability of hundreds of millions of cheap laborers? The loss of cheap labor will undeniably have a negative impact on the manufacture of those goods that form the basis of the country's export income. More important, how can the government reasonably address and resolve the attendant issues of pensions, health care, housing, and social security?

32. Andrew Jacobs, "Dragons, Dancing Ones, Set Off a Riot in China," *New York Times*, February 10, 2009.
33. Ian Johnson, "China Faces a Grad Glut after Boom at Colleges," *Wall Street Journal*, April 26, 2009.

A report recently released by the Center for Strategic and International Studies and Prudential Financial notes that the aging of China's population could usher in a new era of slower economic growth and mounting social stress.[34] What does this future hold for China, other than losing out to the United States? (See figure 2.2.) Will China be able to compete, given a future of an aging population accompanied by capital shortages and more of workers' incomes transferred to nonworking elders?[35] This future will surely test the will of the government and of the people of China. The tens of millions of Chinese arriving at old age will do so without pensions and without adequate family support. Some may believe that, given the current financial crisis, now is not the time to be concerned with such problems. In answering, the report argues that China's age wave is approaching so fast—and its potential economic and social costs are so large—that delay is not an option.

China's one-child policy has been enforced for nearly three decades, although farmers have been allowed to have two children. Uncertainty as to the usefulness of this policy has been growing recently, but any hope for change has been dashed. In the words of the senior population official who made the announcement in March 2008 that the policy would not change for at least another decade, "it has to be kept unchanged at this time to ensure stable and balanced population growth."[36]

All this is not to ignore HIV/AIDS and the threat it poses to China. But with a largely rural and unsophisticated population—including a "floating population" of 130 million or more from the countryside that is young and has no official residence or work cards—the danger is clear. Yet prevention is still a low priority.

Overcapacity and Underutilization

Emerging overcapacity has been present now for some time in certain of the more important sectors of China's economy, foretelling a coming slowdown in investment and new construction. For instance:

- Current steelmaking capacity exceeds demand.
- One-quarter of electrolytic aluminum capacity stands idle.
- Only about 40 percent of the ferroalloy industry is operational.
- Fully half the production capacity in the calcium carbide industry stands idle.
- Excess capacities exist in the cement, coal, and textile industries.

What if the growth rate of the economy continues to slow? The burden of overcapacity will become even more threatening, more factories will close, and workers will lose their jobs while those still employed will save as much as they can because of an uncertain future. The government recognizes this pattern, and it is doing what it can to shore up consumption.

34. Richard Jackson et al., *China's Long March to Retirement Reform* (Washington and Newark: Center for Strategic and International Studies and Prudential Financial, 2009).

35. Ibid.

36. Jim Yardley, "China Says One-Child Policy Will Stay for at Least Another Decade, *New York Times*, March 11, 2008.

Finally, what does one do with the foreign exchange reserves,[37] with these reserves increasing at a rate of $1 million every minute—a growth rate achieved during the first quarter 2007?[38] By mid-2009, foreign currency reserves approximated $2.1 trillion. Some of these dollars are being carefully invested in areas where the anticipated return will be higher than that now being secured.

There is good evidence, however, that China—like Brazil, Thailand, and India—will endeavor to keep its exports competitive in Western markets by curbing the yuan's appreciation against the dollar.[39] Then, dollars will be bought from the exporters, who will receive yuan in return.

In sum, the multiple obstacles to growth carry broad implications for both China and the world as a whole. Is a slowdown inevitable? As with so many issues regarding China, the answer is not readily apparent. The nation will attempt to bring about a soft landing, but how does its government convince its 1.3 billion people that though some may suffer, on the whole the country will be better off?

An Immeasurable Limit to Growth

There is one limit to Chinese growth that cannot be measured with any certainty, and that is the underlying tension with Taiwan. The United States is obligated under the Taiwan Relations Act to defend that country in the event of military action by China. Taiwan is aware of this commitment, and so is China. China recognizes that one of the first steps the United States might take as it comes to the aid of Taiwan would be to establish a naval blockade of the Strait of Malacca, through which move much of China's oil imports. To offset that possibility, China is taking steps to expand its naval military capabilities quickly and decisively; for example, its production and acquisition of submarines is now five times more than America's.[40]

China is also moving to improve its relations with Japan, slowly but surely. Undoubtedly, its purpose is to hopefully neutralize Japan in the event that Chinese-Taiwanese relations deteriorate. Finally, there will be two pipelines across Myanmar—one carrying oil, one carrying natural gas—to help minimize its dependence on the Strait of Malacca.

Recent events, however, have clouded efforts to improve relations between China and the United States. The more visible disturbance was the interdiction of the USNS *Impeccable*, a surveillance ship prowling the waters off Hainan Island, a province off southern China, by five Chinese vessels.[41] Was that action designed to send a message from China, and if so, what was it? Simply: You (the United States) are violating international law by carrying out surveillance in our exclusive economic zone. However, U.S. military officials drew another message: China is moving to acquire the means to challenge the United States on a global scale. Are these American anxieties fully warranted?

Although dire predictions perhaps are to be expected, Chinese officials take the low road, and that too was to be expected. Calm and reasonable acts from both sides are in order.

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37. Letter from Qu Hongbin, chief economist for China, HSBC, June 10, 2008.
38. See http://www.ft.com/cms/s/d87c7f7c-ec80-11db-al12e-000b5dfl0621,dwp_uuid=4e612cca-6...4/17/2007.
39. Keith Bradsher, "Dollars to Spare in China's Trove," *New York Times*, March 6, 2007.
40. Robert D. Kaplan, "Lost at Sea," *New York Times*, September 12, 2007.
41. Andrew Browne and Gordon Fairclough, "China, Friend or Foe?" *Wall Street Journal*, April 18–19, 2009.

3 THE CHINESE APPROACH TO GLOBAL WARMING

By August 2009, the Chinese authorities were expressing at least indirectly the view that global warming was a constraint, as part of a conscious effort to convince the world that China wished to be part of the solution and not viewed as obstructionist. Of course this approach centered on no carbon caps to confront developing countries.

From Kyoto to Copenhagen

On the basis of China's position that there should be no carbon caps to confront developing countries, the prospects for a successful meeting in Copenhagen—where talks are to begin in December 2009 to find a replacement for the Kyoto Protocol—have improved, if only marginally. Although China's climate change negotiator said in early August that the world cannot afford a failure at the Copenhagen talks,[1] he did add that China could not set a firm date for when its greenhouse gas (GHG) emissions would peak, citing several reasons to back up that statement, including uncertainty over economic growth and natural resource availability.

China continues to refuse any limits on GHG emissions, but is the shift noted here the first step toward a more accommodating position? The world will know by December 2009.

It is clear that the approach China has taken in preparations for the Copenhagen meeting has two aspects:

- There will be little or no acceptance of GHG emissions constraints that would, in China's perception, unfairly limit economic growth.
- China will press for recognition of the progress it is making toward becoming a world leader in the availability of renewable forms of energy.

Unfortunately, in these difficult economic times, China is becoming very protective of its domestic market, particularly with regard to renewable energy, and this protectionism has caused concern among its U.S. and European suppliers. Shielding its renewable fuels sector is not by accident. Such action is by design, to allow the industry to grow to the point where it becomes the world leader.[2] Indeed, Chinese manufacturers of solar panels are planning to build plants in the United States as a way of bypassing protectionist legislation.[3]

The negotiators in Copenhagen should not be surprised if the Chinese side attempts to link these two aspects and to swap advances in clean and renewable energy supply in exchange for

1. See http://www.eenews.net/Greenwire/print/2009/08/05/20.
2. Keith Bradsher, "China Builds High Wall to Guard Energy Industry," *New York Times*, July 14, 2009.
3. Keith Bradsher, "China Racing Ahead of U.S. in the drive to Go Solar," *New York Times*, August 25, 2009.

reduced pressure on global warming efforts. Moreover, China will continue to hold out for funding and technological advances on the part of the world's wealthy countries, to be made available to the developing world.

What will China build upon? Two of the more eye-catching projects include

- developing 500 megawatts (MW) of solar capacity in the next three years; and
- ramping up 120 gigawatts of wind power during the coming five years.[4]

Both approaches will be heavily subsidized by the government, and there will be a target that at least 15 percent of electric power come from solar, wind, and other renewable sources by 2020.[5]

China's first comprehensive strategy for addressing climate change was released in early June 2007. Though the plan called for controlling GHG emissions and for improving energy efficiencies, two goals largely supported by all countries, it also clearly indicated that China would not commit to any quantified targets for emissions reduction. China holds that mandatory emissions caps are unfair to developing countries because these caps would slow down their efforts to modernize and to improve living standards.

How important is it for China to buy into a bilateral agreement on climate change with the United States? To quote the U.S. special envoy for climate change, Todd Stern, "No deal will be possible if we don't find a way forward with China."[6] The reasoning is very simple. The developed world will not accept its competitors being given a free ride when it comes to carbon dioxide emissions. Yet a meeting between senior U.S. and Chinese officials in June 2009 did not lead to any common understanding, and very probably none was expected.

China has been very clear in what it would like to see on the part of the developed countries:[7]

- There would be sizable reductions in GHGs on the part of the developed countries, amounting to 40 percent by 2020, compared with 1990.
- There would be access to the latest clean technologies.
- The developed countries would give up to 1 percent of their gross domestic product in assistance to the developing world.

These demands put forward by China foretell that the road to Copenhagen in December 2009 will not be an easy one and that the bargaining that lies ahead can offer little assurance that all participants will come away happy. To illustrate, the cost of reducing China's GHG emissions (see figure 3.1) will likely reach $438 billion a year within 20 years, according to Chinese economists, and the developed countries will have to bear much of that cost.[8]

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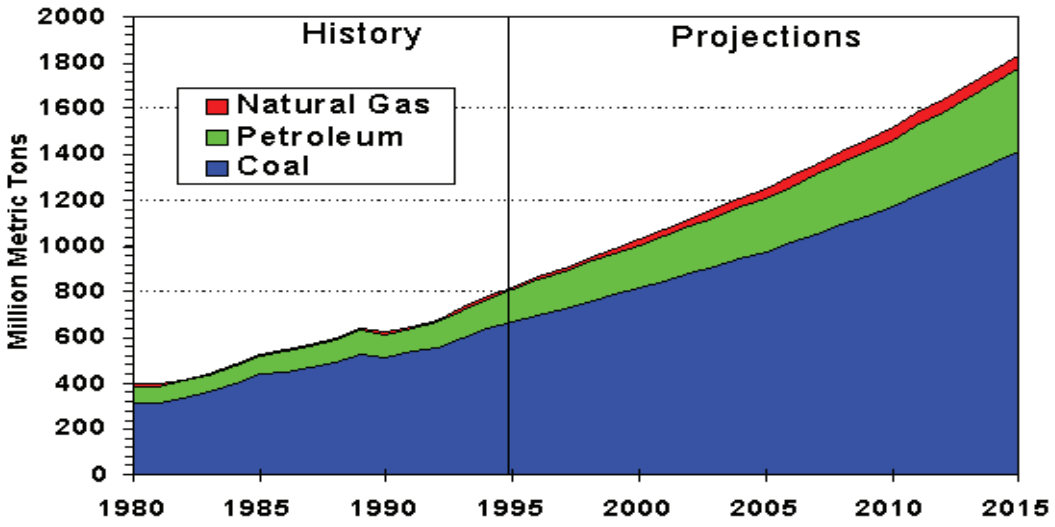
4. See http://www.eenews.net/climatewire/print/2009/07/27/3.
5. "China Promises Solar Power Subsidies in Effort to Develop Clean Energy Industry," *Los Angeles Times*, July 22, 2009.
6. See http://www.grist.org/article/2009-06-03-stern-china-climate-talks/.
7. Fiona Harvey, "Climate Change Talks Move at Slow Pace as Nations Hold on to Bargaining Chips," *Financial Times*, June 13, 2009.
8. Kathrin Hille and Fiona Harvey, "China's High Cost for Emission Cuts," *Financial Times*, September 1, 2009.

Figure 3.1. China's Carbon Emissions, by Fuel, 1980–2015 (millions of metric tons)



Source: U.S. Department of Energy, http://www.eia.doe.gov/emeu/cabs/china/part2.

The U.S. climate change negotiator, Todd Stern, has taken a more general approach to China and climate change. According to Stern, the United States wants China to slow the rate of its GHG emissions growth, peak at some undefined year, and then start to actually slash production of GHGs.[9]

In China's opinion, the developed countries of the world have been responsible for almost all the GHG emissions to date. Because of that, the developed world should make the latest technology available to countries like China and also provide financial assistance to support the struggle to contain GHGs. Chinese premier Wen Jiabao, speaking at a UN-sponsored conference on climate change, stated that "developed countries should shoulder . . . responsibility to tackle climate change and should alter their unsustainable lifestyle."[10]

A significant portion of China's air pollution can be traced directly to the production of goods that are exported.[11] The prices of these exported goods are artificially low because factories are not paying for the costs associated with pollution. Not only that, Chinese officials argue that if it were not for countries like the United States—a major importer of Chinese goods—then their need for imported oil to fuel factories to make these goods would not be so high. In this way of thinking, blame is attached to the United States, while China is absolved of any guilt.

China's rapid economic expansion cannot be fully blamed for today's global warming problems. That remains largely the responsibility of the developed world, at least in China's opinion. But what about now, and tomorrow? The answer is found in data showing that China's GHG

9. Lisa Friedman, "U.S. Officials Expect Sharp CO_2 Reductions from China," *ClimateWire*, June 15, 2009.
10. Geoff Dyer, "China Tells West to Boost Climate Effort," *Financial Times*, November 9, 2008.
11. Jane Spencer, "China Shifts Pollution Fight," *Wall Street Journal*, November 1, 2007.

emissions have been growing by a total amount much greater than that of all industrial countries taken together.[12] China's emissions were only 42 percent of the United States' level in 2001 but had soared to an estimated 97 percent of America's level by 2006 and likely passed it in 2007.

China indeed led the world in terms of carbon dioxide discharges as 2007 came to an end. Is China aware of the devastating impact global warming could have on its land and its people, particularly on agriculture? Yes, it is, but the government continues to rebuff arguments for setting mandatory targets. Officials argue that China must be given the chance to attain the West's standard of prosperity before it will cut GHG emissions.[13] And further, officials like to express energy use and GHG emissions on a per capita basis, which of course sharply dilutes their importance.[14] That does not bode well at all in terms of China agreeing to a successor to the Kyoto Protocol when it expires in 2012.

Unless China—and India, which faces many of the same issues—can be convinced to build efficient, low-carbon-emitting electricity generating plants, powered by natural gas rather than coal, over the next one to two decades, little can be done to stem the tide of global climate change.[15] Plans may set out suitable goals, such as reducing the share of coal-fired electricity generating plants from today's 75 percent to 64 percent by 2020. But nothing is said about how many coal-fired plants will still be operating by 2020. The share of gas-fired plants, for example, is to reach 6 percent by 2020. But how will the remaining 30 percent be fired? And if tariffs remain low, encouraging electricity demand, GHG emissions will grow as well.

By 2020, China wants to increase the share of renewable energy in its total energy consumption from the present 10 percent to 20 percent. But a lack of the required funding and lagging technologies work against that goal being achieved. Moreover, in the rush to overcome the debilitating effects of the financial crisis, environmental considerations are being conveniently overlooked as approvals of industrial projects are speeded up.[16]

China's position was perhaps best expressed in a recent national global warming assessment: "Before general accomplishment of modernization by the middle of the 21st century, China should not undertake absolute and compulsory [GHG] emission reduction obligations."[17] Yet recent media reporting noted that "almost everywhere one turns in China today, the environmental consequences of the country's economic juggernaut are evident."[18]

There is little reason to believe that the Chinese positions outlined in the preceding paragraphs will change much in the determinations leading up to the selection of a substitute for the Kyoto Protocol. The hard line taken by China in late May 2009, while clearly just the opening salvo, sets out severe requirements for the developed countries of the world to help poorer countries, including China, cut GHG emissions and cope with global warming.[19] This approach has not found much acceptance among industrial countries.

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12. See http://sfgate.com/cgi-bin/article.cgi?file=/c/a/2007/03/05/MNG180FHF21.DTL&type=print, March 5, 2007.
13. Ibid.
14. Almost anything would suffer when divided by 1.3 billion.
15. Fiona Harvey, "Billions Lost in Kyoto Carbon Trade Loophole, *Financial Times*, February 8, 2007, quoting Michael Ware, author of a study published in the February 2007 issue of the journal *Nature.*
16. Jonathan Ansfield, "Slump Tilts Priorities of Industry in China," *New York Times*, April 19, 2009.
17. "China Rejects Caps, Aims to Cut Carbon Intensity," Reuters (Beijing), April 16, 2007.
18. "Clearing the Air With China," *Washington Post*, April 15, 2007.
19. Jamil Anderlini and Fiona Harvey, "Tough Pose Held for Climate Talks," *Financial Times*, May 22, 2009.

How much "give" can be anticipated on the part of China, and how much understanding should the developed countries offer? There is some evidence of the latter taking place, with the European Union planning to spend €60 million on a carbon capture and storage project in China. Why the decision for clean coal technology transfer? It is largely because of the country's heavy reliance on coal—China reportedly built the equivalent of one 500-MW coal-fired power plant every two and a half days during 2007.[20]

The stage is set, and negotiations will continue up to the December 2009 meeting in Copenhagen, when all players should finally understand the prospects of mitigating global climate change.

The Good Gone Bad

The Three Gorges Dam, built and completed at a cost of $25 billion and capable of generating 18,200 MW of electricity, was at first praised as an enduring accomplishment for China. But it was not long before the bad news began to pour in. If the government did not act quickly, warned senior Chinese officials, the dam threatened to become an environmental catastrophe.[21]

Part of China's vulnerability, at least in terms of transportation fuels, may come from its rising dependence on imported oil, the source of much of the gasoline and diesel fuel burned by its vehicles. Yet, whereas China is home to 16 of the 30 cities with the worst air pollution in the world,[22] it is industry that must carry the blame, not cars.

A good portion of current pollution levels in China can be blamed on the heavily subsidized prices for fuel and for electricity. These prices do not encourage the population to make better, more efficient use of the fuel it consumes. Rather, the prices do just the opposite—encourage consumption. Thus, it would seem appropriate to raise prices, and thereby hopefully reduce both demand and pollution. But inflation in August 2007 turned out to be the highest in 11 years, turning aside any popular support for substantial price increases.

In a surprise move, China did raise prices for gasoline, diesel, and aviation kerosene by 10 percent, as of November 1, 2007.[23] These increases were designed to help alleviate persistent shortages and also ease the losses suffered by refineries, as well as put an end to hoarding by those looking to gain from price hikes. The 10 percent jump in these product prices will help, but it will not accomplish all that is hoped for. China paid out $2.8 billion in subsidies during 2006, and payment should have more than doubled in 2007, to be funded by the windfall tax on domestic crude oil, which takes effect when the price hits $40 per barrel. The windfall tax begins at 20 percent and gradually rises to a maximum 40 percent when the price hits $60 per barrel.[24]

Perhaps the government had hoarding and shortages in mind when the China National Petroleum Company (CNPC) and China Petrochemical Corporation (Sinopec) were told in March 2008 that they would have to ensure that independent wholesalers and retailers were provided with adequate supplies of petroleum products.[25] Moreover, these wholesalers and retailers would

20. "EU to Help China Bury CO_2 Emissions," *EurActiv*, June 25, 2009.
21. Jamil Anderlini, "Chinese Admit Three Gorges Is Ecological Risk," *Financial Times*, September 27, 2007.
22. Ibid.
23. Beth Evans, "China Sets 10% Price Hike for Gasoline, Diesel, Aviation Kerosene," *Oilgram News*, November 1, 2007.
24. "CNPC to Slash Investments by $3 Billion," *Oilgram News*, June 6, 2008.
25. Winnie Lee, "China Steps In to Protect Retail Independents," *Oilgram News*, March 7, 2008.

have to be guaranteed a profit of 5.5 to 7 percent for the wholesalers and a minimum of 4.5 percent for independent gasoline station operators, of which there are some 45,000. There are probably fewer than 1,000 independent wholesalers.

Complicating matters, the output from independent refiners is also sold by CNPC and Sinopec. Given this control that CNPC and Sinopec have over national oil product supply, it is not certain that the requirements of the government will be met to the fullest and with the required transparency.

In the minds of the Chinese authorities, economic growth has priority, and though they plan to halve the amount of GHGs the country emits per $1 of its economy by 2020, strict emission caps will be rejected for decades—that is, as long as current thinking prevails. Stated simply, the Chinese do not like other nations telling them what to do. However, despite its opposition to GHG caps, China has taken advantage of the Kyoto Protocol's Clean Development Mechanism, and it is currently the source of about one-third of the carbon credits traded on the global market through this mechanism,[26] earning it billions of dollars.

China opened up itself to the world on August 8, 2008, with the start of the 2008 Summer Olympics. What did the world see? Blue skies, or gray? Athletes performing at their best levels, or penalized by pollution? Happily, none of the bad scenarios that many had forecast came true. Studies have shown that during the summer months, pollution levels could spike to at least two to three times the level considered safe in the United States.[27] One thing was certain: China would do whatever it took to keep the air clean, and it acted accordingly. Traffic was banned,[28] factories were closed, and clean water supplies were diverted to Beijing. Parts of China were literally shut down. These actions were sufficient for the two weeks of the Olympics, but they came at a very high cost.

26. Winnie Lee, "China to Launch Carbon Trading Exchange," *Oilgram News*, February 8, 2007.

27. Shai Oster, "Will Beijing's Air Cast Pall Over Olympics?" *Wall Street Journal*, February 15, 2007.

28. The Chinese authorities experimented with automobile control in mid-August 2007 to see what impact, if any, these controls would have on air quality. Alternate dates on which cars with odd- and even-numbered plates could be driven were set over a period of four days. Pollution dropped by up to 20 percent, and the number of cars removed from the streets of Beijing was as high as 1.3 million. See Richard McGregorin and Fiona Harvey, "Beijing Hails Success of Anti-Smog Trial," *Financial Times*, August 22, 2007.

4 SECURITY OF SUPPLY

Oil-importing countries pay homage to diversity of supply as the best protection against disruption from a single source or grouping of sources. They may also seek diversity among the types of fuels consumed and as to how fuels make their way from exporter to importer. Finally, some importers may seek to develop "equity oil" abroad—that is, oil that they actually own—reasoning that this oil is a secure source of supply and will always be available. However, equity oil does not protect the owner against domestic violence in the host country, disruption of supply routes, or high prices.

China's growing dependence on imported oil to meet the fuel requirements of its expanding transportation system—especially privately owned automobiles[1]—has forced it to seek security of supply through diversity of supply. In other words, it is acting no differently than any other oil-importing country by taking the actions it deems necessary to support and protect its anticipated growth rates.

Indeed, China has embraced all three options—equity oil, diversity of supply, and diversity among fuels consumed—with varying success. But its failures, such as not understanding U.S. domestic politics, were factors in the denial of its bid to buy Unocal; and its effort to acquire a share in Kashagan, a giant oil field under development in the Kazakh sector of the Caspian Sea, did not succeed.

The scale of these losses has not been matched by successes, the most notable of which were the purchase of PetroKazakhstan and the acquisition, via a joint venture with India, from PetroCanada of the nonoperational mature oil and natural gas properties in Syria. Equally important, this was the first China-India upstream joint venture.

Then came China's $7.8 billion acquisition in late June 2009 of Addax Petroleum Corporation, a Swiss-based exploration company with interests in Africa and the Middle East, including the Kurdistan portion of Iraq.[2] This acquisition has been labeled the largest foreign takeover for a Chinese company—in this instance, China Petrochemical Company, also known as Sinopec.

Addax Petroleum operates the Taq Taq oil field in Kurdistan. Of particular importance, Taq Taq received permission from Baghdad to start exporting its crude oil on June 1, 2009. It is not a coincidence that the acquisition of Addax and initiation of exports occurred so close together.

China continues to score surprises in its search for oil worldwide. BP and the China National Petroleum Corporation (CNPC) were the only successful bidders, in a joint venture, to win the right to develop Rumaila in the Iraqi licensing round at the end of June 2009. Rumaila, discovered

1. Reportedly, there were 27.4 million motor vehicles on the road in 2004. That number is seen growing to 56.7 million in 2020 and 130.1 million 1n 2020.

2. See http://eenews.net/Greenwire/print/2009/06/24/7.

by BP in 1953, is the largest oil field in Iraq, and its current output stands at 956,000 barrels per day (b/d) out of a national total of 2.4 million b/d.[3] The current oil-producing capacity of Rumaila is placed at 1.1 million b/d.

Only technical service contracts were offered, not the production-sharing contracts oil companies prefer, and the government of Iraq insisted on paying no more than $2 per barrel produced above a preset level. The winning BP-CNPC joint venture proposal carried a commitment to raise production at Rumaila to 2.85 million b/d within six years.

What does China gain from all this? At first glance, it does not gain very much—some cash income; but, most important, the crude oil belongs to Iraq, and it is Iraq that would gain from any price increases. China, like any importer, would be in a position to acquire Rumaila crude, but would that be enough? Or will the presence of CNPC in Iraq carry long-term advantages? China, following its pragmatic nature, would answer "yes." Its presence in a country of rich undeveloped oil resources is viewed as invaluable to an importer whose reliance on foreign oil supplies will only continue to grow.

Backed with seemingly endless funds, and learning as they go, Chinese companies can look forward to more successes during the coming months. Chinese oil companies continue to prowl the world, often overpaying for whatever access they have secured and setting precedents that international oil companies cannot or will not meet. And the attention of not only the international oil companies been caught by such actions. Overseas investment by Chinese companies in countries such as Sudan has damaged and in some instances hijacked Beijing's foreign policy, according to diplomatic scholars in the capital. Investments in such diverse places as Zambia, Peru, and the Philippines have provoked a political backlash, causing Chinese diplomats to become involved in an effort to contain any fallout.[4]

Where have they been looking? They have primarily been active in Iran, Iraq, Sudan, and Syria—essentially countries that are of limited availability (except for Iraq) to the West because of U.S. opposition.[5] To reduce the appearance of overpayments, brought about in part because of China's competition with India, these two countries have traded competition for cooperation, and the early results of this China-India cooperation have, to a degree, paid off—as noted above. China's foreign oil field equity oil totaled 700,000 b/d in 2006, up 29 percent over the previous year's contribution, a multiple of what India achieved.

China's National Development and Reform Commission identified nine countries as suitable for investment by the country's oil companies: Kuwait, Qatar, Oman, Morocco, Libya, Niger, Norway, Ecuador, and Bolivia.[6] Iran, Iraq, Sudan, Venezuela, and Nigeria were conspicuous by their absence, although poor relations with the United States, sanctions, and civil wars were probably reasons enough. Nonetheless, China is present in all these nations, to one degree or another. Indeed, China signed an oil service contract on August 28, 2008, to develop the al-Ahdab Iraqi oil field, investing $3 billion and receiving from $3 to $6 per barrel produced.[7] But this would appear

3. Anthony DiPaola and Maher Chmaytelli, "BP, CNPC Beat Exxon to Win First Iraqi Oil Contract," Bloomberg News, June 30, 2009.

4. Richard McGregor, "Chinese Diplomacy 'Hijacked' by Companies," *Financial Times*, March 17, 2008.

5. Very small volumes also arrive by rail from Kazakhstan.

6. "China Names 9 Countries 'Suitable' for Oil Investment," *ShangaiDaily.com*, March 1, 2007.

7. Kate Dourian, "Iraqi Oil Minister Says Contract with China's CNPC Sign of Fairness," *Oilgram News*, September 30, 2008.

to be not much of a return, particularly when equity oil is not involved. So there must be other reasons.

In their search for equity oil, Chinese companies stamp themselves as quite different from the competition—that is, they studiously avoid interference in other nations' domestic affairs. Generally, that stand does work, but not all the time. In April 2007, an attack by ethnic Somali rebels killed nine Chinese oil workers in Ethiopia, and seven more were taken captive. Similar incidents occurred in 2007 in Nigeria and Kenya. China is not apt to change its position. After all, some 4 million Chinese are now working abroad, and the value of the multiple oil investments is growing almost daily.[8] Change is unlikely.

China's position of noninterference plays well in Chad and Somalia, where oil-related deals have been struck.[9] In Chad, for example, China has plans to build the country's first oil refinery and new roads for the economy. China follows its own way of doing business in Chad and in other countries, particularly those in Africa, although the jury is still out as to whether it will be successful. Will its no-strings approach work, or will it fail and surrender to the corruption that so defines Chad?

Do the United States and China find themselves in competition for access to oil? In the oil market per se, competition probably arises from time to time, but not yet for access to oil field development. But then U.S. international oil companies are quite capable of handling whatever competition does arise, as long as the playing field remains level. At the same time, China promises that its worldwide search for oil and natural gas will be carried out in a spirit of fair play and international cooperation so as not to disrupt sensitive international markets.[10]

China's quest for a diversity of supply routes has seen some success, with the completion of a crude oil pipeline from western Kazakhstan to the Chinese border, a distance of 1,000 kilometers. It can be presumed that both Kazakh and Russian oil will flow through this pipeline, which has an initial carrying capacity of 200,000 b/d, rising to 400,000 b/d, but only after 2010.

It has been agreed by both China and Kazakhstan to link the Atasu-Alashankou oil pipeline with two oil fields in Kazakhstan—Kenkiyak and Kumkol—that are owned and operated by the China National Petroleum Company.[11] To accomplish this will require installing a final pipeline segment, which will have an ultimate carrying capacity of 400,000 b/d. When completed, in the words of Nursultan Nazarbayev, the president of Kazakhstan, "the Caspian will be linked to western China."[12]

Deliveries of Russian oil by rail continue and will be competitive up to about 600,000 b/d, at which point pipeline delivery will have the advantage. And that will bring into play the much-discussed crude oil pipeline from Taishet, west of Angarsk, to Kozmino, which is an export terminal under construction near Nakhodka on the Pacific Ocean. Current plans call for construction from Taishet to a halfway point at Skovorodina and then laying a branch line to the nearby Chinese bor-

8. "China's Expansion Puts Workers in Harm's Way," *Washington Post*, April 26, 2007.

9. Edward W. French and Lydia Polgreen, "China, Filling a Void, Drills for Riches in Chad," *New York Times*, August 13, 2007.

10. Edward Cody, "China Vows Fair Play in Its Global Search for Oil and Gas," *Washington Post*, December 12, 2007.

11. See http://eng.zgjrw.com/News/2007820/English/525146412800, 8/22/2007.

12. Isabel Gorst, "Kazakhstan and China Sign Oil and Gas Pipelines Agreement," *Financial Times*, August 20, 2007.

der. China will then extend the branch line inside its border to the line's ultimate destination. Yet the general question remains: Where will the oil come from to fill both a branch line into China and as well onward to Kozmino, the port of export? Work on the 300,000-b/d offshoot to China began in late April 2009, following Chinese and Russian government approvals.[13]

The country of Myanmar (formerly Burma) has become aware of China's interest in diversification and has responded by proposing to become an energy corridor for China. It would do that by constructing a crude oil pipeline (to be paralleled by a natural gas pipeline) running from the west coast of Myanmar to the eastern border with China.[14] The advantage to China would be that the pipeline would offer oil tankers the opportunity to bypass the crowded and sometimes dangerous Malacca Strait and would save hundreds of kilometers. Construction is to begin in September 2009.[15]

Yet China has not forgotten the advantages of strengthening its ties with major oil exporters in the Persian Gulf. In December 2007, China announced an agreement with Saudi Arabia to increase imports from that country by about 200,000 b/d, raising the total to roughly 720,000 b/d.[16] Just before that announcement, China had also reached an agreement with Iran to raise oil import levels by one-third. These arrangements meet the national interests of both parties.

Natural Gas

For natural gas, diversity of supply can be secured either by pipeline or by imports of liquefied natural gas (LNG). China wishes to take advantage of both options, and in fact it is already importing small volumes of LNG from Australia's North West Shelf project, delivered to China's first LNG-receiving terminal at Guangdong. A second LNG terminal, at Fujian, was commissioned during 2008, and the first delivery apparently arrived in May 2009. A third terminal, at Shanghai, was due to be ready later in 2009.

A number of potential suppliers have eyed China as a market for natural gas delivered by pipeline, including Kazakhstan, Turkmenistan, Russia, ExxonMobil, and Myanmar. If China is to close the gap between domestic supply and demand, then access to all sources may be necessary (table 4.1).

China recently has indicated a more rapid scale of natural gas field development, with domestic output now scheduled to almost triple, to 150 billion cubic meters (bcm) by 2020.[17] If this output goal is reachable, but there is no change in forward demand, the country's dependence on imports could be cut substantially. Unfortunately, China is unlikely to be able to hold the line on demand.

Where will those volumes of natural gas needed to fill the gap between domestic demand and domestic production come from? If China wishes to continue its policy of diversification, the gas will originate with Kazakhstan, Turkmenistan, Russia, and of course in the form of LNG.

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13. Nadia Rodova, "Russia Starts Construction of China Crude Pipeline," *Oilgram News*, April 28, 2009.
14. Mriganka Jaipuriyar, "Myanmar Offers China New Energy Corridor," *Oilgram News*, August 22, 2007.
15. "China to Build Oil and Gas Pipeline to Myanmar," *Times of India*, June 16, 2009.
16. See http://www.reuters.com/articleprint?articleId=inpek13499320071217.
17. Winnie Lee, "China's Gas Output to Triple to 150 Bcm by 2020," *Oilgram News*, October 31, 2007.

Table 4.1. China's Natural Gas Balance, 2005, 2010, and 2020 (billions of cubic meters)

	Domestic Gas		Imports	
Year	Supply	Demand	Difference	Dependency
2005	50	50	—	—
2010	80	100	–20	20%
2020	120	200	–80	40%

Source: Gabriel Collins, "China's Growing LNG Demand Will Shape Markets, Strategies," *Oil & Gas Journal*, October 15, 2007.

Diversification is more than just a word. Russia and China debate the question of prices, including delivered prices of LNG, with the supplying countries. Moscow and Beijing had signed a memorandum on natural gas deliveries from Siberia to China in March 2006—the Altai project—with deliveries to start in 2011. But that is not going to happen, because an agreement on price has not been reached,[18] and the project has been delayed indefinitely.

For a number of months, higher prices for LNG turned China away as a potential buyer. But finally, concluding that prices were not going to come down, China agreed with Qatar to buy 3 million tons of LNG a year for a period of 25 years starting in 2011.[19] A second deal, calling for 2 million tons per year but beginning in 2009, has not yet been signed.

PetroChina plans to build a natural gas line parallel to the Myanmar oil line, tapping gas in fields off Myanmar's west coast. It was thought that construction would begin in September 2009 and that the pipelines would become available in 2012. The gas line will handle 12 bcm annually, whereas the oil line will carry 400,000 b/d.[20] PetroChina has also agreed to purchase LNG worth 50 billion Australian dollars from Gorgon (Australia) LNG, which has been hailed as Australia's largest trade deal.[21]

ExxonMobil has held discussions regarding the prospective export of natural gas from Sakhalin-1 to markets in China, but Gazprom intervened and advised ExxonMobil to drop such plans and instead export the gas to markets in the Russian Far East. Gazprom, with the Kovykta gas field near at hand, can begin to think about exports from this giant field to China, but not before 2015–2017 at the earliest.

Central Asia has not been overlooked by China. If current plans work out, Kazakhstan and Turkmenistan will deliver pipeline natural gas to China well in advance of Russia. Moreover, the pipeline carrying the gas will steer clear of Russian territory and will also bypass Afghanistan,

18. See http://www.mosnews.com/money/2009/06/17/pricedisagreement/.
19. Carla Hoyos and Richard McGregor, "China Signs Big Qatar LNG Deal," *Financial Times*, April 11, 2008.
20. See http://www.pipewire.net/print.cfm?storyid=2281.
21. Carola Hoyos and Peter Smith, "Chevron Backs Huge Gas Project," *Financial Times*, September 10, 2009.

Tajikistan, and Kyrgystan.[22] To help seal relations, China will loan Turkmenistan $4 billion, and in turn the pipeline's capacity will be raised from 30 to 40 bcm.

Although this line will considerably improve natural gas supplies in the country, it will still not be sufficient to bring gas supply and demand into balance. Yet this concern is balanced by the apparent closer relations between Turkmenistan and China and the thought that the gas will be flowing to China, and not to Russia.

The prospect of a new supplier emerged on the scene when Iran signed a $4.7 billion contract to develop Phase 11 of the South Pars natural gas field.[23] No mention was made of the future delivery of gas by pipeline to China, although the implication was there.

A Strategic Petroleum Reserve

A strategic petroleum reserve (SPR) would help China offset disruptions in supply and reduce the impact of price fluctuations, indicating a broader use of the SPR than is the case for OECD countries. Strategic reserves of coal, copper, rare earth metals, tungsten, and manganese have also been mentioned, again in the name of national security.[24]

A number of questions related to an SPR had to be answered—including how acquisitions will be financed, who will own and manage the stockpiles, whether they will also be used to leverage prices, and if the system will include petroleum products as well as crude oil. The SPR apparently will combine government and commercial stocks, and the government wants to build a reserve equal to 30 days' worth of consumption by 2010. But to do so at current prices would cost about $10 billion, and that makes for an expensive safety valve.

Yet the growth in China's dependence on imported oil would seem to mandate the establishment of an SPR, and both the International Energy Agency and the United States have strongly encouraged China to follow the example of other oil-importing countries and prepare for the time when supply disruptions, for whatever reason, could be offset with SPR drawdowns. At the same time, the fall in the crude oil price, plus the fall in oil demand, has provided Beijing with an opportunity to build and fill the needed storage tanks at considerable financial savings.

Chinese officials finally have put together a plan to guide the building of an SPR. The planned system will have three levels to ensure oil supply security:[25]

- the central government,
- local governments and state-owned oil giants, and
- small and medium-sized oil companies.

A state-owned entity—the National Oil Reserve Center—will have responsibility for managing the SPR bases.[26] The first phase of the program called for the construction of four terminals,

22. Winnie Lee, "Chinese Car Owners Curb Driving as Fuel Costs Rise," *Oilgram News*, July 14, 2008.
23. Bruce Pannier, "Iran Signs Major Gas Deal with China; Is Europe Next?" http://www.rferl.org/articleprintview/1747803.
24. Winnie Lee, "China Sees Oil Import Dependency Rising," *Oilgram News*, January 9, 2009.
25. See http://www.interfax.cn/displayarticle.asp?aid=26118&slug=china-energy-oil.
26. "China Should Build 120 Day SPR: Report," *Oilgram News*, July 23, 2007.

and the last of these four was ready for filling by the end of 2008.[27] The completion of construction marks the end of the first phase, and the total capacity of the four sites amounts to about 103 million barrels. Commercial storage facilities have also been filled. But having full storage tanks does not indicate just how and when the oil stored would be put to work. Volumes at these four sites equal 14 days' worth of domestic oil consumption.

In early 2008, the Chinese government announced that at least four more SPR bases would be included in the second phase of the program,[28] but without revealing any details. Not until November 2008 was planning completed for the second phase, which will have a storage capacity of about 169 million barrels.[29] This second phase is to involve eight strategic oil reserve bases, with construction to begin in 2009 and completion by the end of 2011.[30] Plans call for a phase three, but details are not yet available.

A proposal for the construction of an oil products reserve appeared in a draft of the stimulus package. The draft laid out a number of recommendations, beginning with a product reserve of 3 million tons in 2009, which would increase to 6 million tons in 2010 and 10 million tons by 2011.[31] The protection offered initially would be only marginal, and the volumes stored would have to be increased in the coming years.

27. Vandana Hari, "China's First 4 Crude Storage Sites on Target," *Oilgram News*, August 20, 2008.
28. Winnie Lee, "China Plans at Least 4 Bases in SPR Phase 2," *Oilgram News*, March 12, 2008.
29. See http://www.platts.com/oil/news/8172185.xml?s=printer&src=oilrssheadlines1.
30. See http://www.rogzone.com/news/article_pf.asp?a_id=72570.
31. Winnie Lee, "China Draft Stimulus Plan Includes Products Stockpile," *Oilgram News*, February 16, 2009.

5 FUELING GROWTH

China's growth has been fueled by various factors. These factors ranged from imports, in 2006, to fiscal stimulation, which provided the needed push when the nation was confronted by a decline in exports in 2009.

The Situation in 2006

Chinese media coverage in late 2005 variously informed its readers that oil imports were going to be less in 2006 than in previous years, or that imports would remain at the 2005 level, or that China's crude oil demand would rise 6 percent in 2006. What actually happened? Crude imports alone rose that year by 14 percent, to 2.9 million barrels per day (b/d). The apparent failure to reasonably judge the coming level of growth in the oil-consuming segments of the economy illustrates that China may have no better understanding of what the near term holds than do Western analysts. Working with Chinese oil-related data is frustrating, in part because the available data are lacking the transparency and accuracy demanded in the West.

Crude oil production in 2006 is placed at 184 million tons (3.68 million b/d), a gain of 60,000 b/d over 2005 production of 181 million tons (3.62 million b/d) (table 5.1). The 2006 crude oil import level of 144 million tons (2.88 million b/d) was reduced by exports of 110,000 b/d. Net product imports averaged 480,000 b/d. In both cases, crude and product exports must be deducted to help correctly define domestic demand.

The Situation in 2007

Gross crude oil import requirements were projected to exceed 3.2 million b/d in 2007, a jump of 320,000 b/d, or 11.1 percent.[1] It was thought that about half of the world's increment in oil consumption during 2007 would be provided by China and the United States. Crude oil imports during the whole of 2007 actually totaled 163.17 million tons, or 3.26 million b/d, up by 12.4 percent over 2006.[2] Crude oil exports fell to 3.89 million tons, or 77,800 b/d. China also imported 33.8 million tons (676,000 b/d) of oil products and exported 310,000 b/d.[3] On a net basis, then, Chinese oil imports during 2007 averaged 3.62 million b/d.

In sum, net petroleum imports (crude and products) totaled 3.26 million b/d, thus raising Chinese dependence on foreign oil to 47 percent. Though the output of domestic crude oil had

1. See http://www.forbes.com/afxnewslimited/feeds/afx2007/03/07/afx3496385.
2. Winnie Lee, "China Crude Production to Rise 1.6% in 2008: CPCIA," *Oilgram News*, December 21, 2007; and "China's Oil Imports Rose 12 Pct in 2007," Neftegaz.RU, January 14, 2008.
3. "China Imports Record 163 Mln Tons of Crude Oil in 2007," *China.com*, January 12, 2008.

Table 5.1. China's Oil Supply and Demand, 2006

Aspect	Amount (millions of barrels per day)
Crude oil production	3.68
Crude oil imports	2.88
Crude oil exports	0.11
Losses, direct burning, added to stocks (estimate)	0.32
Charge to refining	6.13
Product yield (estimate)	5.64
Product imports	0.73
Product exports	0.25
Apparent domestic product demand	6.12

Source: Derived from the data presented.

risen by just 1.7 percent, net oil imports were up 19.6 percent, with net product imports alone jumping by 37.9 percent.

It should be no surprise that the Middle East provided the larger share of crude oil imports during 2007. Though crude oil imports from all sources approached 3.3 million b/d during these 12 months, Middle East exporters shipped roughly 1.47 million b/d to China or about 45 percent of the total, with Saudi Arabia leading all suppliers with almost 527,000 b/d.[4] Indeed, Saudi Arabia was the leading supplier of crude oil to China for the entire period 2002–2007.

Angola held second place in 2007, with deliveries averaging 500,000 b/d, and led all West African exporters, which totaled approximately 667,000 b/d. Russia shipped in an estimated 291,000 b/d, putting that country in fourth place after Iran. The key suppliers of crude oil during 2007 are set out in table 5.2.

Interestingly, enhanced product exports, plus the closure of refineries for maintenance in times of high crude oil prices and oil dealers withholding stocks in the hopes of higher prices, have come together to produce shortages in major cities that caught the attention of the highest levels of government.

China can take some comfort in the diversity of sources it has secured among oil-exporting countries. Yet China, too, like other importers, cannot escape the dominating role held by the Middle East—for, as has become quite evident, production follows reserves, and where are the reserves? Of course they are in the Middle East. But it is Africa that continues to attract China's "going out" strategy in its search for equity oil, just as Africa is important as a supplier of oil to the United States.

The Situation in 2008

The year 2008 began on a bad note for China. As January was coming to a close, the country found itself virtually shut down by the worst snowfalls in 50 years and by electric power cuts because of

4. Winnie Lee, "Saudis Top Crude Supplier to China for Sixth Year in 2007," *Oilgram News*, January 28, 2008.

Table 5.2. Crude Oil Imports by China, 2007

	Volume	
Supplier	**millions of barrels per day**	**percent of total**
Saudi Arabia	0.527	16
Angola	0.500	15
Iran	0.411	13
Russia	0.291	9
Oman	0.274	8
Sudan[a]	0.206	6
Kazakhstan	0.120	4
Congo	0.096	3
Venezuela	0.082	3
United Arab Emirates	0.073	2
Total imports	3.26[a]	100

[a]Includes imports from a variety of other suppliers. It should be noted that although China acquires oil from Sudan, that oil is actually sold in the international market and does not enter China.

Source: Winnie Lee, "Saudis Top Crude Supplier to China for Sixth Year in 2007," *Oilgram News,* January 28, 2008.

coal shortages. The timing could not have been worse, what with the official start of the Chinese New Year just a handful of days away, marking the high point of the travel season. Many of the travelers were migrant workers, hoping to return to their families for the holidays. The full impact on the country was not clear,[5] but early predictions talked of severe damage to the economy, as it was noted that about 77 million people had been affected by the crisis.

Against the background of thousands of small mines having been closed for safety violations and inefficient operations, electricity supplies had fallen sharply short of demand as operating coal-fired plants ran out of fuel because the heavy snowfall impeded deliveries from the mines. An early return to normalcy proved doubtful because electricity rates had been capped while coal prices had been rising. Demand exceeded supply and shortages remained, as electric power plants were reluctant to expand output, and just-in-time stocks had been largely depleted, in part because of the high cost of coal.

Electricity demand has demonstrated remarkable growth, beginning in at least 2004, rising from 2,176 terawatt hours that year to 3,428 in 2008. Thermal power has continued to provide for

5. Richard McGregor, "Holiday Transport Crisis Hits China," *Financial Times*, January 29, 2008.

this basic growth, with hydropower showing some strength. The industrial sector, not surprisingly, dominates as a customer, taking three-quarters of annual supply. China remains both a minor importer and exporter of electricity, with exports dominating.

The explanation for the electricity imbalance may be simpler. Total demand for electricity rose by 20.2 percent annually from 2001 to 2007, but installed generating capacity grew by 18.5 percent during the same period.[6] Recognizing that price can be the best incentive, wholesale electricity rates were raised by an average of roughly 5 percent as a way of encouraging more supply, but retail rates were kept unchanged, largely to help keep inflation under control.[7] These conflicting rates do not instill confidence in the near term.

For whatever reason, the early prediction of economic growth slowdowns failed to materialize, as China's economy grew by 10.6 percent during the first quarter of 2008 compared with the first quarter of 2007.[8] The thirst for oil continued unabated, with crude oil imports averaging almost 3.7 million b/d, up 15 percent over 2007. Angola led the way, surpassing Saudi Arabia, with exports of 678,719 b/d, although Saudi Arabia has declared its intention to remain the leading exporter by supplying 1 million b/d until 2010.[9] These crude oil imports, combined with domestic production, implied a crude oil demand of 7.39 million b/d, up slightly more than 8 percent compared with the first quarter of 2007.[10]

Oil refiners for some time had been complaining about negative returns, brought about by the high cost of imported crude but with caps on domestic product prices. The difference between the high price for a barrel of crude oil and the capped price for petroleum products meant that the government had to step in to keep the refiners financially whole. The break-even point for PetroChina, for example, has been given as $66–67 per barrel, and for every $1 increase in the price of a barrel of crude oil, the company loses approximately $420 million.[11] The difficulties faced in the early days of 2008 led China to grant a crude oil tax rebate to refiners—in other words, a form of subsidy. The funding for these subsidies came from a windfall tax imposed when producers sell oil for more than $40 per barrel.

The other alternative would have been to raise domestic prices, but that approach was deemed unacceptable because of the already-high inflation rate. There may be other reasons as well. It may be that because the government emphasizes social stability over scarcity of resources or environmental cost, energy prices are set very low.[12]

The tax rebate, although helpful, worked out to be about $16 per barrel, short of what it would take to put the refiners in the black. In the absence of indications from the central government, the China Petrochemical Corporation (Sinopec) and PetroChina assumed that the 17 percent oil import tax would be reimposed on July 1, 2008.

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6. Gordon Fairclough and Loretta Chao, "Storms Highlight China's Limits," *Wall Street Journal*, February 5, 2008.
7. Andrew Batson, "China Bolsters Wholesale Electricity Prices," *Wall Street Journal*, August 20, 2008.
8. Richard McGregor, "China Economy Races on after Storm Chaos," *Financial Times*, April 17, 2008.
9. Winnie Lee, "Angola Is China's Top Crude Supplier in the First Quarter of 2008," *Oilgram News*, April 28, 2008.
10. Winnie Lee, "China's Q1 Crude Throughput Rises 7.6%," *Oilgram News*, April 21, 2008.
11. Jonty Rushforth, "PetroChina Pursues Growth in Gas Business," *Oilgram News*, May 27, 2008.
12. Jennifer Sills, ed., "China's Energy Policy Comes at a Price," *Science*, August 29, 2008.

Crude oil imports during the first four months of 2008 were up 9.8 percent over the first four months of 2007, but hiding the fact that April imports fell by 600,000 b/d from March 2008. The drop in crude imports was offset by a rise in product imports of some 15 percent over March 2008. All this took place before the devastating earthquake that struck in May. Privately held refineries were buffeted by the gap between international crude oil costs and capped domestic prices for petroleum products. These refineries took the only action possible. Crude oil imports were delayed, and that action led to product shortages during the first quarter.

Then disaster struck again, this time in the form of an earthquake in mid-May 2008, killing some 70,000 and leaving tens of millions homeless. Dams were weakened, threatening countless Chinese downstream. Because of the widespread damage, coal-based electricity generation was affected, and imports of diesel fuel jumped during the summer. As they have in the past, electricity shortages appeared.

The swift response of the Chinese government to the earthquake was generally applauded by the foreign press. But with the passage of time, that applause gave way to growing criticism—especially of the poor-quality construction of the school buildings that had collapsed on students, killing up to 10,000, while nearby government buildings withstood the quake.

These numbers were subsequently refuted in part by the Chinese government. In a report delivered one year after the earthquake, the number of student deaths was placed at 5,335 either dead or missing, whereas 68,712 people were reported killed and another 17,921 were listed as missing and presumed dead.[13] The question of why school buildings were demolished by the earthquake while other buildings remained intact has never been answered to the satisfaction of the parents of those children lost to the quake.

The full impact of this catastrophe has yet to be known. It took some four months for Beijing just to recognize publicly that shoddy construction may have contributed to the collapse of more than 1,000 school buildings.[14] Monetary compensation has been offered to survivors in exchange for keeping quiet, and the media was ordered to carry only positive quake-related stories. Although the government said that it would investigate the school collapses, no results have been released.[15] If nothing else, once again the fragile nature of China's infrastructure has been highlighted, a fragility that will haunt the country for years to come.

In an attempt to ease the burden on the oil-refining sector and to make more petroleum products available to the domestic market, prices for gasoline were raised by 16 percent and diesel fuel by 18 percent in the latter part of June 2008. To offset these price increases, subsidies were granted to the agriculture, fishing, and forestry sectors.[16] The government also indicated that subsidies would be given to taxi drivers to offset any additional costs because of the price increases. It was expected that oil imports would rise, as refiners tried to take advantage of the higher prices for gasoline and diesel. Product prices were expected to hold until after the Olympics were over.

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13. Andrew Jacobs and Edward Wong, "China Releases Its Toll of Students in '08 Quake, *New York Times*, May 8, 2009.

14. Loretta Chao and Jason Dean, "China Admits Shoddy School Construction," *Wall Street Journal*, September 5, 2008.

15. Edward Wong, "A Year after China's Quake, New Lives Can't Heal Old Wounds," *New York Times*, May 6, 2009.

16. "China Gives Fuel Subsidies to Agriculture, Fishing, Forestry," *Oilgram News*, June 24, 2008.

At the same time, caps were placed on the amount of coal burned in the generation of electricity, whereas the consumer will be paying a slightly higher price for electricity consumed. This cap could only mean financial strains on power plants, and indeed it was been reported that 80 percent of the power plants were losing money.[17]

Although this price move by the Chinese government was certainly aggressive, at least by their standards, reaction was generally skeptical. Analysts doubted that the impact on demand would be particularly noticeable while oil imports would continue to increase. For example, the market price for gasoline in Seoul was $.1.85 per liter, whereas, even after the price increase, gasoline could be had in Beijing for $0.84 per liter.

The burden of price caps on petroleum products continued, and Sinopec, the largest refiner in Asia, saw its profits during the first half of 2008 fall by 73 percent.[18] Companies were faced with having to take drastic measures. The China National Petroleum Company, for one, began what it called a redundancy program, under which 80,000 employees will lose their jobs over a three-year period. But that action is not as severe as it would appear, inasmuch as there are 1.7 million people working for the firm.[19]

As the first half of 2008 came to a close, it was evident that China's role as an oil importer and exporter had not waned but rather had steadily expanded, as illustrated in table 5.3. Imports surged for the simple reason that demand was surging, in considerable part because of preparations for the forthcoming Olympics through the building of stockpiles. Oil demand in June 2008 was placed by one energy analyst at 8.43 million b/d, for a growth rate of 7.1 percent. More important, perhaps, the measure of the year-on-year growth was placed at 557,000 b/d,[20] accounting for a substantial portion—40 to 50 percent—of total world growth in demand. Apparent demand growth continued through August, as crude oil imports rose during the first eight months of the year by 8.7 percent over the first eight months of 2007,[21] and product imports were 18 percent higher.

The next several months should have reflected a post-Olympics cooling off, but they did not. Crude oil imports during the first nine months of the year were up by 8.8 percent over the same period in 2007, while product imports rose by 16.5 percent. Crude oil exports were down 14.75 percent; product exports rose by 3.75 percent.[22] Chinese imports of crude oil from January to September 2008 averaged 3.62 million b/d, up by 8.8 percent, while exports reached 74,700 b/d. Exports of petroleum products during the same time period totaled 12.3 million tons, up by 3.7 percent.[23]

Looking just at September 2008, it would have been logical to expect a decline in oil imports as the economy began to feel the first effects of the global financial crisis and as stocks, built up in advance of the Olympic games, were drawn down. That was not the case. Nonetheless, the economy grew by 9.9 percent during the first nine months of 2008, down from the 11.9 percent registered for all of 2007.

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17. Wang Ying and Grant Smith, "China to Raise Gasoline, Diesel, Jet Fuel Prices, CCTV Reports," Bloomberg News, June 19, 2008.
18. Vandana Hari, "Sinopec's First Half Profit Plunges by 73%," *Oilgram News*, August 26, 2008.
19. "CNPC to make 80,000 Staff Redundant," *RTHK English News*, September 10, 2008.
20. John Kingston, "China's Oil Demand Passes 8 Million B/d in June: Ting," *Oilgram News*, July 23, 2008.
21. Vandana Hari, "China's August Crude Imports Climb 11.5%," *Oilgram News*, September 11, 2008.
22. Winnie Lee, "China Import Demand Slows in September," *Oilgram News*, October 15, 2008.
23. Ibid.

Table 5.3. China's Oil History in the First Half of 2008

Aspect	Amount (millions of barrels per day)	Change (percent)
Crude oil imports	3.66	Up 11
Crude oil exports	0.095	Up 30.6
Product imports	0.86	Up 16.4
Product exports	0.32	Stable
Domestic crude production	3.79	Up 1.1
Apparent domestic demand	7.3	Up 6.9

Sources: Winnie Lee, "China's First-Half Crude Imports Surge 11%," *Oilgram News,* July 11, 2008; Winnie Lee, "China's Oil Demand in June Increases 7.1%," *Oilgram News,* July 30, 2008; Winnie Lee, "China Posts Record Crude Throughput, Diesel Production in June," *Oilgram News,* July 31, 2008.

During 2008 as a whole, crude oil imports rose substantially, with Saudi Arabia continuing to hold onto its position as supplying more crude oil to China than any other country. Crude oil imports totaled 179 million tons, or 3.6 million b/d, registering growth of 9.6 percent over 2007.[24] Imports of petroleum products grew even faster, at 15 percent. Overall, net imports of crude oil and petroleum products averaged more than 3.9 million b/d (see table 5.4). With respect to the first half of 2009, the authorities were quite cautious and pointed to a continuing decline in demand, reflecting the financial crisis, and saw little or no prospect for recovery. It is perhaps not surprising that the Middle Eastern suppliers, led by Saudi Arabia, provided half of all Chinese crude oil imports in 2008—1.8 million b/d—and it would be a dramatic shift indeed if that position were to be lost. The year 2008 can perhaps be summed up by assembling an apparent supply-demand balance, presented in table 5.5.

Although the calculations shown in table 5.5 yield only an approximation of oil demand, lacking official Chinese data, the approach taken does offer an insight into the year. Growth in apparent oil demand during 2008 was 4.5 percent, slightly above the 4 percent recorded in 2007. But it hides significant developments during the latter half of that year. The charge to oil refining in December, for example, was down 7.4 percent from December 2007, reflecting the impact of the financial crisis that had enveloped the country, and was the lowest in 17 months.[25] Factory closings and sharp drops in exports were quickly reflected in oil product usage declines.

As China assumes an increasingly more important—and more visible—role in the world oil market, its lack of transparency becomes more worrisome. A good example can be found in Chinese

24. Winnie Lee, "China Hits Record 2008 Crude Imports as Growth Stalls," *Oilgram News*, January 14, 2009.,

25. Winnie Lee, "December Crude Throughput at Chinese Refineries Hits 15-Month Low on Economy," *Oilgram News*, February 5, 2009.

Table 5.4. Leading Suppliers of Crude Oil to China, by Country of Origin, 2008

Country	Barrels per Day Supplied
Saudi Arabia	730,182
Angola	594,533
Iran	420,879
Oman	308,730
Russia	232,418
Venezuela	129,400

Source: Winnie Lee, "Saudi Arabia Is China's top Crude Oil Supplier in 2008," *Oilgram News,* January 26, 2009.

press releases covering oil product consumption levels. To illustrate, the headline in a press release published by *People's Daily Online* stated that oil product use in 2008 rose by 12 percent.[26] The casual researcher would then employ that growth rate wherever applicable. The oil product consumption volume was presented as 215 million tons, or roughly 4.3 million b/d. But table 5.5 clearly states that apparent oil demand in 2008 was 7.29 million b/d. What is missing here? The oil product consumption volume, as defined by the Chinese, includes only gasoline, diesel, and kerosene. All other products derived from the refining of crude oil are excluded, and thus the 4.3 million b/d figure sharply understates the country's demand for oil products. Without the full complement of oil products, it becomes an exercise in frustration trying to pinpoint just what is happening in the Chinese economy.

Table 5.5. China's Apparent Oil Supply–Demand Balance, 2008

Aspect	Millions of Barrels per Day	Millions of Metric Tons
Domestic oil production	3.79	189.73
Net crude imports	3.51	174.72
Total supply	7.30	364.45
Charge to refining	6.85	342.06
Net product imports	0.44	21.82
Apparent oil demand	7.29	363.88

Note: Missing from this calculation are refinery yields, additions to stocks, and oil in transit.

Source: Estimates based on data presented in *Oilgram News,* February 5, 2009. See Winnie Lee, "China's 2008 Oil Demand Seen Rising 4.5%," *Oilgram News,* February 5, 2009.

26. See http://english.people.com.cn/90001/90778/90857/90860/6581523.

The Situation in 2009

The results for the first three months of 2009 underscored that China had not been able to escape the global financial crisis, that it faced in many ways the same problems as other nations, and that it has a population of 1.3 billion to look after. In terms of oil imports, there were few surprises. Demand for oil dropped 4.8 percent, as refiners drew down stocks, and refineries reduced operating levels. Crude oil imports from January through March fell by 10.3 percent compared with the first three months of 2008.[27]

The report for the month of April 2009 could be construed as misleading. Media headlines noted that oil demand during April rose by 4 percent, leading the casual reader to conclude that perhaps China was coming out of the financial crisis. But upon reading further, the reader would find that apparent oil demand during the first four months of 2009 was actually 2.8 percent lower than demand during the same period of 2008.[28]

The International Energy Agency (IEA), in its *Oil Market Report* of March 2009, estimated that oil product demand in China would average 7.911 million b/d during 2009, gaining a bare 48,000 b/d over demand in 2008, essentially marking time. However, the *Oil Market Report* is issued monthly, and that gives the IEA nine more opportunities to alter its forecast for the year. These opportunities are not overlooked.

The early drop in fuel demand largely reflected the collapse of the export market. In a country where the strategy has very much depended on sales abroad, the question becomes, What should China now be doing? Stepping up sales to the domestic market is not an immediate option. The Chinese consumer is different from his or her American counterpart, for he or she does not have a pension, does not have health care, and does not have social security. These absences must be covered with personal savings.

China oil watchers took particular note of the amount of crude oil refined in the month of May—7.4 million b/d, a record rate.[29] Car sales were up 47 percent, industrial output had climbed 8.9 percent, consumer spending was growing, and oil product stockpiles were shrinking. Had China turned the corner? It was perhaps too early to tell, because the prospective future of any country cannot be based on just one month's economic performance. Indeed, oil demand in the first half of 2009 was below that in the first half of 2008, albeit by a scant 0.23 percent.[30]

How would China take advantage of its cash surplus? The answer soon became clear, as the country went on a buying spree, aiming to lock up not just crude oil and natural gas supplies but also a full range of other commodities and businesses judged essential to its future. Prices are low, the commodities are desirable, and China has the cash to buy for the future. This position was finally confirmed officially by Premier Wen Jiabao in late July 2009, when he said that foreign exchange reserves would be used to support overseas expansion and acquisitions by Chinese companies.[31]

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27. Winnie Lee, "Saudi Crude Supplies to China Slip 22% in March," *Oilgram News*, April 28, 2009.
28. Winnie Lee, "China's April Demand Rises 4% on 2008," *Oilgram News*, May 22, 2009.
29. Yang Ying, "China Refines Record Oil on Factory Output, Car Sales," Bloomberg News, June 12, 2009.
30. See http://www.theenergydaily.com/pressreleases/coal/200907221103PR_news_uspr.
31. Jamil Anderlini, "China to Deploy Foreign Reserves," *Financial Times*, July 21, 2009.

This approach was confirmed in September 2009, when the China National Petroleum Corporation secured a $30 billion loan from the China Development Bank for the purpose making overseas acquisitions.[32] Just days previously, PetroChina had acquired a majority stake (60 percent) in two oil sands projects in Canada for $1.7 billion.[33] In 2009, China has also been successful in securing positions in two other oil sands projects. Indeed, by responding to these opportunities, China is becoming more assertive and probably envisions itself as an even stronger economic competitor than what it had been before the 2008–2009 financial crisis.[34]

In July 2009, one of China's worst fears was realized: vicious confrontations between Muslim Uighurs and Han Chinese. The Uighurs, a minority group that feels a close link with Central Asia as well as Turkey, and that has long complained of political, cultural, and religious persecution, thus presented a particular challenge to Beijing. The violence, described as one of the country's bloodiest outbreaks in recent history,[35] took place in Urumqi, the capital of Xinjiang, China's westernmost region. What started it all? Apparently the trigger was a violent standoff between Han Chinese and Uighur workers in Guangdong that left two Uighurs dead.[36] But anger on the part of the Uighurs has been present for decades and will not disappear easily. Most of the dead—the toll approached 200—were Han Chinese. Hundreds more were injured, and comparable numbers were arrested and jailed.

What did the Chinese government do? It pointed its finger at foreign instigators; cut Internet access, texting, and cellphone use; managed the news adroitly; and sent in security forces, numbering 20,000, to prevent any further outbreaks.

Why did the government act so swiftly? Setting aside the long-held Uighur resentment and Han reaction, the government is always nervous that local protests can explode geographically, and nothing would be allowed to interfere with the celebrations of the 60th anniversary of the Communist Party's Rule on October 1, 2009.

China is made up of 56 nationalities—that is, 1 majority nationality, the Han, and 55 minority groups.[37] The minority population accounts for 9 percent of the country's total, with the Han comprising the remaining 91 percent. Linguistic divisions also come into play. There is always the prospect then that these differences will come together to divide the country and that, of course, is what Beijing fears the most.

China's net crude oil imports rose during August 2009 to the second highest on record, 4.6 million b/d, giving the IEA reason to raise its estimate of global oil demand in 2010.[38] That volume allowed the refining of crude oil to rise year-on-year, cutting into imports and enabling refiners to benefit financially. Domestic demand had risen by an estimated 5.8 percent in July, year-on-year,[39] indicating that perhaps the stimulus was indeed working.

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32. Justine Lau and Geoff Dyer, "CNPC Boosts War Chest with $30 Billion Loan," *Financial Times*, September 9, 2009.
33. Bernard Simon, "PetroChina in $1.7bn Canadian Project Stake," *Financial Times*, August 31, 2009.
34. Keith Bradsher, "In Downturn, China Exploits Path to Growth," *New York Times*, March 17, 2009.
35. Ariana Eunjung Cha, "Scores Killed in Ethnic Riots in China," *Washington Post*, July 7, 2009.
36. Kathrin Hille, "China Says 140 Dead in Xinjiang Unrest," *Financial Times*, July 6, 2009.
37. Dru C. Gladney, "China's Ethnic Fault Lines," *Wall Street Journal*, July 11–12, 2009.
38. "China's Net Crude Oil Imports Rise, Supporting Prices," Bloomberg News, September 11, 2009.
39. *Oil Market Report* (International Energy Agency), September 2009.

6 LOOKING TO THE FUTURE

The Chinese authorities understand that domestic oil production will always fall far short of meeting demand. The growth planned for 2009—1.48 percent, raising output to 3.83 million barrels per day (b/d)—would be less than the growth of 2.3 percent achieved in 2008.[1] Plans for future years offer little hope, with output planned to rise 2.08 percent in 2010, and further by 1.02 percent in 2011. The continuing shortfalls between domestic supply and demand will rapidly translate into an ever-rising dependence on foreign oil imports. But that also means that there will be the need to expand the nation's refining capacity for crude oil, and plans are in place to do exactly that, through the construction of new capacities. China continues to look to the future, having signed about 10 contracts in the oil and gas sectors of Iran, most notably to develop the Yadavaran oil field, where production could reach 300,000 to 400,000 b/d.[2] In Iraq, China has reached an agreement to develop the al-Ahdab oil field at a cost of $3 billion, reportedly the first major upstream contract to be awarded to a foreign company (China National Petroleum Company, or CNPC) since the war of 2003.[3]

Then there is the ever-warming relationship between China and Venezuela. Current Venezuelan oil exports to China averaging about 300,000 b/d are to expand to 500,000 by 2010 and 1 million by 2012.[4] The question arises: Will these export levels impinge upon deliveries to other countries? A spokesperson for China said "no."

However, a larger question should be posed: Will Venezuela have the oil to respond to this commitment? It is doubtful. China's loan agreement with Venezuela has a reported value exceeding $8 billion, whereas its comparable deal with Brazil is valued at $10 billion and involves the delivery of 60,000 to 100,000 b/d of crude oil. And there is an equally important question for the world oil market: Are these deals partly responsible for the recent gains in the price of crude oil?

What China is doing is certainly not new; it has been searching out oil deals for some time now. What makes these deals newsworthy is their size, China's access to seemingly inexhaustible hard currency funds, low oil prices, and the general belief that crude oil will be more expensive in the years ahead. In other words, "them that has, gets."

The reverse seems to be true for the electric power sector—there is no lack of generating capacity, but rather shortages of coal and higher prices for those tonnages that are available. The shortages of electric power, in turn, will make for a long, hot summer for many of China's factories and businesses.

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1. Winnie Lee, "China Eyes 1.5% Oil Output Growth in 2009," *Oilgram News*, February 17, 2009.
2. Arescu Eqbali, "Iran's NIOC, Chinese Companies Talk Cooperation," *Oilgram News*, August 22, 2008.
3. Sabah Jerges and Kate Dourian, "China's CMNPC Signs $3 Billion Iraq Contract," *Oilgram News*, August 29, 2008.
4. See http//www.monstersandcritics.com/news/asiapacific/news/printer_1432838.php.

Smaller power plants shut down, simply because the more they generate, the larger the financial losses. The same situation confronts small-scale coal mines, many of which have been closed by the government because of unsafe conditions.

As July 2008 came to a close, the authorities approved the establishment of a National Energy Administration (NEA), located within the National Development and Reform Commission (NDRC).[5] Though the rationale sounds acceptable, the NEA will have a staff of just 112 people—hardly adequate, it would appear, for the tasks at hand. Criticism was immediate, noting that the NEA was merely a bureau under the NDRC, and who would give it the needed attention?

A new energy law has been held up by the NEA. This law was drafted in 2006 but was not expected to become effective until 2009.[6] It would cover all forms of primary energy, plus secondary sources such as petroleum products and electricity. And when approved, it could hold important implications for both producers and consumers.

Fuel consumption tax increases were imposed, to become effective January 15, 2009, but the pump prices for gasoline and diesel fuel would not increase, based upon the elimination of infrastructure maintenance fees. The general purpose of the increase was given as providing a profit margin increase for refiners.[7] Refiners posted a $22 billion loss in the first 11 months of 2008, caused by high crude oil prices and government-regulated product prices.[8]

Trying to forecast domestic prices for oil products can be an exercise in futility. Although guidelines have been set out, the government will continue to control final prices because of insufficient market competition and imperfect market conditions, according to the NDRC, which explains that the guidelines need not be followed "word for word."[9]

Apparent petroleum product consumption during 2007 and 2008 plus the first five months of 2009 is shown in figure 6.1. The impact of the Olympic Games on oil use in 2008 is clearly evident. At the same time, the 2009 consumption pattern is well above 2007 levels and should stay there.

Domestic crude oil producers have their own concerns that relate to an incremental upstream profits tax on this sector. The incremental tax ranges from 20 percent of the sales price when that price falls within $40 to $45 per barrel, with a higher take for each increment, up to 40 percent for prices above $60 per barrel.[10] Consideration is being given to raising the threshold rate, from $40 to $60 per barrel, as a means of giving support to the oil-producing sector.

Prices are also important to the consumer. China, in a surprise move, raised gasoline and diesel prices at the end of June 2009 for the third time since late March and to their highest levels ever, up abut 9 percent for gasoline and 10 percent for diesel.[11] Gasoline now retails for $3.53 per

5. Winnie Lee, "China Sets Up New Body within NDRC to Develop Energy Strategy," *Oilgram News*, July 30, 2008.

6. "China's Energy Law, Drafted in 2006, Stalled by Government Reshuffle: NDRC Source," *Oilgram News*, September 5, 2008.

7. Calvin Lee, "China Sets January 1 for Fuel Tax Implementation," *Oilgram News*, December 10, 2008.

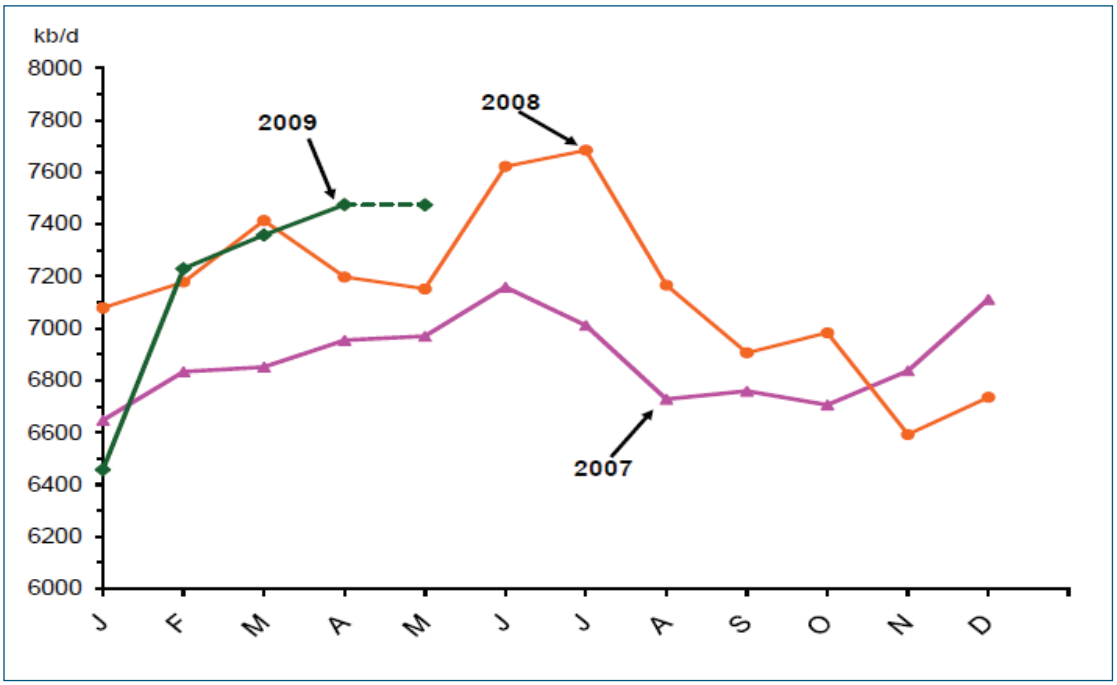
8. Winnie Lee, "China Refiners Face Massive Losses for 2008," *Oilgram News*, February 4, 2009.

9. See http://english.people.com.cn /90001/90776/90884/6654190.

10. Winnie Lee, "Higher Threshold for China Upstream Levy Considered: Report," *Oilgram News,* February 11, 2009.

11. "China Lifts Fuel Prices to Record Levels," *Financial Times*, July 1, 2009.

Figure 6.1. China's Apparent Demand for Petroleum Products, 2007–2009 (thousands of barrels per day)



Source of data: Energy Market Consultants, *EMC Weekly Fundamentals Update*, June 11, 2009.

gallon,[12] roughly $1 per gallon more than the U.S. driver had been paying. Gasoline and diesel prices were raised again at the end of August (or the beginning of September, depending on the source), by 4 to 8 percent.

What was the rationale behind these price increases? Was it to slow the growth in oil consumption? Was it to try to reduce waste—that is, cut back on driving? Is the rationale connected to improving refinery margins? The answer is yes, on all three counts.

Meanwhile, coal and electric power shortages continued to plague China, the result of growth in demand simply outstripping growth in supply. What can be done, and what should be done? Unfortunately, as long as the nation's economic expansion continues relatively unabated, it can expect to face these kinds of shortages. Turnabout will not come easily.

Looking Ahead to 2010: A Limited Crude Oil Future

What form, in the eyes of Chinese planners, should the energy consumption balance take by 2010? Clearly, no dramatic change should be expected during such a short period; nor is one planned (table 6.1). It appears that even these modest shifts may not be realized. The level of oil imports during 2010 could well average 55 percent, up from 46 percent in 2007.

12. Kang Wu and Lijuan Wang, "Latest Hike of Petroleum Product Prices in China: Implications for the Refining Sector," *China Energy Series, Oil Edition* (FACTS Global Energy), July 2009.

Table 6.1. Energy Consumption in China, by Type of Fuel, 2010 and 2005

	Percentage of Total	
Type of Fuel	**2010**	**2005**
Coal	66.1	69.1
Oil	20.5	21.0
Natural gas	5.3	2.8
Nuclear power	0.9	2.0
Hydropower	6.8	5.1
Other renewables	0.4	
Total	100.0	100.0

Source: http://www.iht.com/articles/2007/04/16/business/sxgas.php.

China cannot take pride in the near-term future of its crude oil industry, as producers struggle to accomplish little more than offset oil field declines and perhaps achieve a domestic growth rate of 1 or 2 percentage points.[13] But whatever growth is achieved, it will never be enough, and the country will become more and more dependent on foreign oil to feed its industrial and transportation sectors.

China had turned from a net exporter of oil to a net importer, beginning in 1993. Underscoring its import needs, Daqing, the country's largest oil field, declined for the fifth year in a row in 2007, as output dropped by 3.9 percent, to 835,000 b/d.[14]

This is not to say that geologists have given up looking for new deposits, for they have not. In fact, more time and money have been spent looking for oil at home than abroad.[15] Yet discoveries have been relatively few, and this must be disappointing for a country the size of China. It is because of this size, however, that the search continues, and if demand growth continues as well, upward pressures on worldwide oil prices will also continue.

The International Energy Agency (IEA) in Paris has projected that China's oil demand will hit 10 million b/d by 2012. Calculating from an estimated demand in 2006 of 6.1 million b/d, that works out as 650,000 b/d growth in each of the intervening six years, representing almost 25 percent of the anticipated annual increase in world oil demand.[16]

Against slow growth in domestic crude oil production (see table 6.2), the estimated demand for crude oil imports will expand from 3.26 million b/d in 2007 to 4.5 million in 2012. Will this anticipated growth be limited because of constraints on the world oil supply? It may be, for the IEA has also projected an oil supply crunch by 2012. It is perhaps unreasonable to conclude that China's appetite for oil will continue unrestrained during the coming five-year period, or that the government will be completely unsuccessful as it seeks moderation in demand growth. To the contrary, China's efforts to line up long-term oil supplies could provide the supply assurance the government seeks.

Although China can and does take great pride in its growth rates of years past, its planners have come to understand that the path taken by the developed countries simply must be avoided, for an extrapolation of oil demand bumps up against availability limitations. What course of action

13. Crude oil production in 2008 was expected to average 3.79 million b/d, up by 1.6 percent over 2007.
14. Winnie Lee, "Daqing Sees Oil Output Dip 3.9% in 2007," *Oilgram News*, January 4, 2008.
15. Shai Oster, "China's Big Oil Shows Reserve," *Wall Street Journal*, July 23, 2007.
16. See http://www.forbes.com/afxnewslimited/feeds/afx/2007/07/09/afx3893219, 7/13/2007.

Table 6.2. Crude Oil Production in China, Selected Years, 1990–2010

Year	Millions of Barrels per Day
1990	2.77
1995	2.99
2000	3.25
2004	3.49
2005	3.66
2006	3.68
2007	3.70
2008	3.79
2010	3.90

Sources: Various issues of *Platts Oilgram News*; http://www.resourceinvestor.com/pebble.asp?relid=30362.

should be followed that would differ from the one currently being followed? Officials will be reluctant to undertake any drastic policy shifts. Those chosen will reflect gradual, not overnight, change.

Has China been successful in at least replacing those volumes of crude oil produced, one of the key measures of the oil sector's performance? China categorizes its proven crude oil reserves using two different measures: proven reserves that can be extracted using existing technology; and proven reserves that are economically extractable.[17] Following this definition, China had 14.9 billion barrels of proven crude oil reserves at the close of 2006. A total of 172 million tons were added to reserves during 2006, but 184 million tons were produced. This performance, though a bit on the negative side, was not too different from that recorded by many of the international oil companies.

China holds promising oil- and gas-bearing territories in Bohai Bay, the South China Sea, the Pearl River estuary, and the southern Yellow Sea. Yet it does not fully possess the technology and expertise needed to go hunting for oil and gas offshore in deep waters. There will be announced discoveries, such as the recent oil find—the Jidong Nanpu oil field in the northern portion of Bohai Bay, reportedly the largest discovery in China in four decades.[18] A proven reserve of 3.3 billion barrels has been calculated. But because little supporting information was provided, full acceptance of the scale of the discovery should be withheld.

For a country of China's geographic size, yet alone its political and economic ambitions, not being able to count on much more than 4 million b/d of domestic crude oil through 2015 must be disappointing at best. Discoveries during the coming years will do little more than offset declines at existing fields. Indeed, as long as demand growth exceeds domestic production expansion, reliance on imported oil will increase, both volumetrically and in relative terms, and will become even more worrisome to policymakers.

Beyond 2010

Current Chinese thinking holds that oil production during the five-year period 2010–2015 may exceed 4 million b/d, but only marginally, if that.[19] The IEA, for one, implies a decline in the later

17. "China Details Exploitable Oil, Gas Reserves," *Oilgram News*, April 3, 2007.
18. "China's Big Crude Find Could Hold Over 7 Billion Barrels," *Oilgram News*, May 7, 2007.
19. A senior official of China National Petroleum Corporation has observed that China's oil output will peak in the years 2010–2020.

years, for it forecasts a demand of 12.8 million b/d by 2025, with net imports of 9.4 million, for a dependency of 73 percent, considerably exceeding the United States' proportional dependency today.

Increasing import dependency is behind China's search for equity oil abroad, a search that has not yet yielded the sought-after volumes. Nonetheless, there is no reason to believe these search efforts will be reduced. Where is that search taking place? First of all, it is being pursued in Africa, in the familiar oil-exporting countries of Angola and Nigeria, but most successfully in the Sudan, out of bounds to U.S. firms, all in an effort to secure diversification of supply. What is pleasing to these host nations, however, is the stated Chinese position of noninterference in internal matters.

It is not that China is a newcomer to Africa; it was attracted to that continent by the scent of oil when it became a net importer of oil in 1993. Years before, it had been active in Africa as a seller of goods and services, including military equipment. In Sudan, for example, it has sold the government military equipment ranging from tanks to fighter aircraft, and its companies are building bridges, roads, government offices, a hydroelectric dam, and an oil refinery.[20]

The value of acquisitions outside China's borders has grown from a paltry $19 million spent in 1990 to $13.8 billion invested in 2006,[21] although a considerable portion of these funds has necessarily been directed to secure access to oil and natural gas. And the nation has not limited its interests to just foreign oil and other commodities. It also wants to extend its political influence and create markets for what it has to sell.

Where else are the Chinese looking? They are active in the Middle East, Kazakhstan, Canada, Venezuela—and even the United States, although unsuccessfully there. A takeover attempt to acquire Unocal was rather quickly turned aside. This interest in a U.S. firm raised the question, yet unanswered, as to whether China was a competitor with the United States when it came to accessing to oil supplies.

Because acquisitions of equity oil will not carry the day, oil imports will need to be called upon to fill the growing gap between oil supply and demand. Take the China Petrochemical Corporation (Sinopec), for example. Saudi Aramco believes that deepening cooperation between the two countries can be facilitated by expanding oil sales to Sinopec. Sinopec imported about 460,000 b/d of crude oil from Saudi Arabia in 2007, rising to 650,000 during 2008.[22] Exports to Sinopec are expected to continue to grow, according to a memorandum of understanding signed by the two participants, reaching 1 million b/d by 2010 and 1.5 million by 2015.

If these goals are obtained, how much then of Saudi Arabian capacity will remain to cover the import requirements of other countries? A growth in sales to just one company during the period 2008–2015 of more than 1 million b/d, averaging 125,000 every year, is doable, of course. But that is not the question. Much will depend on the oil-producing capacity of Saudi Arabia by 2015. If 13 million b/d will be available, then yes, the goals are reasonable. But if measurably less will be available, then the question persists.

As China imports increasingly larger volumes of crude oil—the IEA thinks that China will be a net importer of 12.5 million b/d by 2020, exceeding U.S. net imports of 11.9 million[23]—the question

20. See http://www.ft.com/cms/s/c6517cea-e20c-lldb-af9e-000b5df10621,dwp_uuid=9c33700c-4c.
21. Craig S. Smith, "A British Classic in the Chinese Stable," *New York Times*, March 13, 2007.
22. "China's Sinopec to Import 1.5 Million b/d from Saudi Aramco by 2015," *Oilgram News*, July 3, 2008.
23. Organization for Economic Cooperation and Development and International Energy Agency, *World Energy Outlook 2008* (Paris: Organization for Economic Cooperation and Development / International Energy Agency, 2008).

arises as to the adequacy of its oil-refining capacity, especially to provide petroleum products answerable to the requirements of a modern economy. It held an estimated 6.3 million b/d of refining capacity in 2007, sufficient to process those volumes that were available. The concern is whether new refinery construction will keep pace with growth in demand.

The combined capacity of small, independent refineries is placed in excess of 1.4 million b/d, or roughly 22 percent of the current national total. Unfortunately, many are relatively unsophisticated and do not produce the high-quality products needed. CNPC and Sinopec together are to add roughly 1.6 million b/d in oil-refining capacity by 2010, although some slowdown is anticipated. These capacities presumably will incorporate the latest technologies. Other Chinese corporations have their own refinery projects under way, but they have uncertain sizes and timetables.

PetroChina plans to raise its oil-refining capacity so that it will account for 45 percent of the national total by 2020, up from 40 percent today. In volumetric terms, this means growth from 2.8 million b/d in 2007 to 3.3 million by 2010 and 6 million by 2020.[24] Moreover, if successful, that would imply a national oil-refining capability in excess of 13 million b/d. It can be assumed then that China's apparent crude oil demand in 2020 will be on the same order of magnitude.

If China's oil-refining capacity fails to keep pace with the growth in its oil demand, then the gap will have to be filled by importing more petroleum products. Should that happen, the country's vulnerability will rise, for petroleum products of the needed specifications and variety are not always available from foreign suppliers.

China's experts anticipate continued high growth rates, which will translate into higher rates of oil consumption. The Chinese Academy of Social Sciences, a government think tank, has estimated that the country will use 8.14 million b/d in 2010 and 11.26 million in 2020, up 4.5 percent a year through 2010 and 3.3 percent through 2020.[25] The NDRC concluded that China's economic boom should last until at least 2020,[26] but that was before the 2008–2009 financial crisis. A senior NDRC official noted that China, the world's fastest-growing major economy, has grown 9.88 percent annually over the past 30 years. Few details have been available, but if the Chinese boom continues as anticipated, then the strains on world oil and gas supplies should also expect to continue. And if predictions of very modest gains in domestic crude oil production work out, then China's relative dependence on oil imports could soon surpass that of the United States.

Yet China will not easily give up on domestic crude oil and natural gas. The country has established targets of discovering 10 new oil fields, each with reserves of 100 million tons, equal to 7.33 billion barrels total, by 2010.[27] Plus, more than 100 billion cubic meters of natural gas are to be found—not an impossible task. However, actual additions during 2007 were far less than the annual averages that will be needed during the period 2008–2010 to meet these goals.

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24. Winnie Lee, "PetroChina to Boost Refining Share to 45%," *Oilgram News*, May 8, 2008.

25. Winnie Lee, "China Oil Demand to Hit 563 Million Mt in 2020: Report," *Oilgram News*, April 10, 2008.

26. Mriganka Jaipuriyar, "China's Boom Set to Last until at Least 2020: Report," *Oilgram News*, May 5, 2008.

27. Vandana Hart, "China Targets 7.33 Billion Barrels of New Oil by 2020," *Oilgram News*, April 4, 2008.

Threats to Oil Supply Lines

More than 90 percent of the oil imported by China is transported by oceangoing tanker, and there is little reason to believe that any substantial shift away from tankers can be expected any time soon. It has been reported that some 80 percent of the oil imported by China passes through the Strait of Malacca, which is just 1.5 miles across at its narrowest point, creating the potential for collisions, piracy, and terrorist attacks.[28] Closure of the strait, for whatever the reason, would immediately lead to a spike in oil prices. China recognizes this potential threat to its oil supplies and has developed a "string of pearls" strategy, involving military bases and diplomatic ties, to protect its oil and strategic interests.

There is a second possible choke point: the Lombok/Makkasar straits that allow passage through the Indonesian Islands. Other than developing a blue water naval force to protect those tankers transiting the strait, China looks to pipelines to provide it with an additional sense of security, through diversification among forms of transport. Part of this strategy is an oil pipeline from Myanmar to China that will bypass the Strait of Malacca, and construction was to begin at some point during 2007, with completion scheduled in three years.[29]

But pipelines do not, however, provide the full answer, and China has taken the step that would be logical for any country growing increasingly dependent on foreign oil and soon on natural gas: building a blue water navy. Though this navy may protect oil flows, it also stands as a reminder to others that China has the means to deny access to waters it considers to be within its sphere of influence. Chinese spokespersons may downplay the motives behind this military resurgence, but the message is clear to all those who take the time to understand it.

China is also protective of its strategic sphere of influence, that is, the area off its coast. There was a series of confrontations in early 2009 between the naval vessels of China and the United States. U.S. and Chinese officials did meet to work out an acceptable solution, but the Chinese stand was less forgiving: Phase out your [U.S.] surveillance activities that run close to our coast.[30]

China is becoming more and more aggressive in protecting its national interests, whether at sea or on land. Western countries should understand and accept that an action taken against China will almost certainly be followed by a comparable action, possibly of even more severe consequences, taken against them. Henry Kissinger has called for a Pacific institutional structure based on close cooperation between America and China that is also broad enough to enable other countries bordering the Pacific to fulfill their ambitions.[31]

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28. There are problems at home as well, although the scale has diminished. During the past five years, the Chinese police have arrested a total of 14,000 suspects for stealing oil, damaging pipelines, and illegally drilling for oil or gas. A total 550,000 barrels of oil was seized by the police. See http://news.xinhuanet.com/English/2007-04/10/content_5959784.

29. See http://english.peopledaily.com.cn/200704/22/text20070422_368642. China's three oil producers are actively involved in oil exploration in Myanmar. Plans also call for a 1,500-mile gas pipeline from Myanmar to southwest China, scheduled to handle natural gas from the Middle East.

30. Kathrin Hille, "Beijing Urges US to End Coastal Watch," *Financial Times*, August 28, 2009.

31. Henry A. Kissinger, "Rebalancing Relations with China," *Washington Post*, August 19, 2009.

China: Both a "Taker" and a "Giver"

The Western media continue to focus on Chinese oil imports but overlook China as a supplier of both crude oil and petroleum products to the world oil market. China's crude oil imports, as noted, during 2007 averaged 3.26 million b/d; its petroleum product imports averaged about 676,000. China is thus a major "taker"; but what about its exports?

In 2007, China exported 387,800 b/d of both crude oil and petroleum products. Is it not unusual for an oil-thirsty country such as China to be a substantial oil exporter? Crude oil has been exported under long-standing trade agreements. Petroleum product exports are driven by the higher prices available outside the country. Exports have led to regional shortages, and these shortages will likely continue as long as domestic prices do not reflect the higher world crude oil prices.

In the dark world of the smuggler, China is also both a taker and a giver; that is, oil products are smuggled out of China just as oil products illegally find their way across the border into China. Comparatively low domestic prices, which are largely the result of price controls, support the illegal exports, while local shortages entice illegal imports.

7 MORE THAN OIL

In China, it will be difficult to achieve meaningful diversity among the fuels consumed. Coal will be the dominant fuel well into the foreseeable future. Mining, and consuming almost 3 billion tons of coal annually, allow China to boast that the country is 96 percent self-sufficient in its domestic energy supply. Nuclear power, renewable forms of energy (other than hydropower), and natural gas each contribute only a few percentage points, if that. Neither ethanol from corn nor oil from coal has yet produced acceptable results, and both approaches were to be discarded in the coming near term, although the biodiesel plant in Fuqing City reportedly had been restarted.[1] Though coal still holds promise as a raw material, as the basis for coal liquefaction or gasification projects, the first project was to come on line in 2007 to provide 20,000 b/d of liquids annually, but the economics did not work out.

Then, China recently announced plans to build the world's largest refinery to produce biodiesel. With a capacity of 40,000 barrels per day (b/d), the facility would be four times the size of the next largest plant.[2] The first unit, with a capacity of just 2,000 b/d, was scheduled to become operational in the first quarter of 2009. The supply of biodiesel in China in 2007 was less than 20,000 b/d, far below the 248,000 b/d needed in 2008. Crude jatropha oil will be the plant's raw material. Can the facility produce the profit per ton it has promised? It can, if tax incentives and subsidies of sufficient proportion are made available.

China apparently set aside these concerns when it announced in mid-July 2008 that approval had been given for the construction of three jatropha-based biodiesel plants having a combined capacity of 170,000 tons (3,400 b/d) per year.[3] Plans call for China to be consuming 200,000 b/d of ethanol and 40,000 b/d of biodiesel by 2020. Given that current oil consumption exceeds 7 million b/d, these goals seem rather insignificant indeed, yet these plans will be pushed as part of China's desire to diversify among the kinds of fuels consumed.

Unfortunately, China's continued economic growth and expanding political influence very much depend on adequate, timely, and diversified imports of oil. It is the measure of future imports, where they originate, and how these fuels make their way to the Chinese market that in large part will define what kind of future the rest of the world faces, at least in energy-related terms.

Coal

China today uses more coal than the United States, Europe, and Japan combined, which makes it the largest emitter of carbon dioxide.[4] Despite all the media coverage that growing imports of oil

1. Dave Ernsberger, "China Clean Energy Restarts Biodiesel Plant," *Oilgram News*, November 13, 2008.
2. Dave Ernsberger, "China Agro-Technology Plans Big Biodiesel Plant," *Oilgram News*, March 13, 2008.
3. Winnie Lee, "Chinese Policy Planner OKs 3 Biodiesel Plants," *Oilgram News*, July 15, 2008.
4. Keith Bradsher, "China Outpaces U.S. in Cleaner Coal-Fired Plants," *New York Times*, May 11, 2009.

Table 7.1. Percentage of Installed Electricity Capacity in China, by Type of Fuel, 2008

Type of Fuel	Percentage of Total
Thermal (coal, natural gas)	75.9
Hydropower	21.6
Nuclear	1.2
Other	1.3

Source: "Status of and Future Developments of China's Nuclear Power," *Energy Briefs* (FACTS Global Energy), April 2009.

may attract, it is coal that supports the industrial base and fuels the country's electric power stations. In 2006 alone, China added 102,000 megawatts (MW) of electric power capacity, almost all of which was coal-fired. It is likely that the net addition in 2007 was about 80,000 MW,[5] after making allowances for the closure of several hundred small coal-fired plants. It is thought that during 2007, China built on average two electric power plants every week. Again, the bulk of the new capacity will burn coal. These efforts led to a more than doubling of installed generating capacity since 2000, to 713 gigawatts (GW).[6]

The dominant role of thermal power plants in supplying electricity to China was a feature of 2008 (table 7.1), and this should continue for years to come. Any immediate shift in the percentages given in table 7.1 is considered unlikely.

It has been reported that installed generating capacity for all types of plants will total 792. GW at the close of 2009, up 10.3 percent over 2008.[7] Electricity generation in China seems to be either exceeding demand or falling short of demand, as the addition of new capacities continues unabated. Though the last power shortages came about in 2004, current shortages are just as worrisome, and could act as a brake on economic growth.[8] These shortages happen because of economic growth in the country, subsidized electricity rates, the closure of many small mines, and the unwillingness of power plants to buy more coal to produce more electricity when every sale meant a financial loss.

Is there a place for electric power plants using clean coal in China? Apparently so, and indeed China has emerged in the past two years as the world's leading builder of more-efficient, less-polluting coal plants.[9] Construction has been averaging one such plant a month. Moreover, the Chinese government has required that for each new power plant built, an older, more polluting plant is to be closed.

The coal sector has its serious detractions. First, although China leads the world in coal mining and consumption (see table 7.2), it also leads the world in deaths caused by mining accidents. For example, the death rate in Chinese mines is 100 times that of deaths in U.S. mines. There can be no more damaging indictment of the coal industry than this loss of life, which in large part is attributable to ignoring acceptable safety practices, compounded by corruption and mismanagement.

5. Richard McGregor, "Demand for Energy Rises Faster in China," *Financial Times*, December 11, 2007.
6. Shai Oster, "China Acts to Address Power Shortage," *Wall Street Journal*, August 19, 2008.
7. Lijuan Wang and Kang Wu, *China Energy Series, Oil Edition* (FACTS Global Energy), March 2009.
8. Andrew Batson and Shai Oster, "China's Power Woes Threaten Growth," *Wall Street Journal*, August 12, 2008.
9. Bradsher, "China Outpaces U.S."

Table 7.2. Coal Production in China, Selected Years, 1990–2015

Year	Billions of Metric Tons
1990	1.08
1994	1.27
2000	1.19
2004	1.90
2005	2.19
2006	2.38
2007	2.54
2010	2.90
2015 (planned)	3.30

Sources of data: For 1990–2006, see Robert E. Ebel, *China's Energy Future* (Washington, D.C.: CSIS, 2006). For 2007–2015 (planned), see http://news.yahoo.com.s/afp/20090108/bs_afpchinacoalwarming_newsmlmmd/print. Also see David Teague, "Blizzards and Coal Shortages Strain China's Rail Network, *New York Times*, February 1, 2008; Eadie Chen, "China Sees Imports at 60 Percent of Oil Use by 2020," *World Oil Market (a.m.)*, January 8, 2009.

Nationally, mining deaths exceeded 6,000 in 2004. The loss of life in 2006 fell to 4,746,[10] and further to 3,786 in 2007.[11] The leading causes of the continuing high death toll can probably be traced in part to the current high price of coal and to the thousands of small mines, many of which are illegal, that value production levels over safety measures.[12]

More than 100 million tons of coal are consumed annually by accidental mine fires, but whether these fires result in the loss of life is not known. China has set a goal of reducing the death rate to 2.1 for every 1 million tons mined in 2010, down from 2.81 in 2005.[13] In other words, an annual loss of life on the order of 5,000 can still be expected at the end of this decade.

Also, in an attempt to reduce the number of deaths from mine accidents and to regain some degree of control, the government by the end of 2005 was to begin shutting down those coal mines that could not meet safety standards even after improvements. The program called for the closure of 4,000 small mines annually for a period of three years.[14] Would this effort be reflected in lower coal mining levels for those years? Apparently not; in many instances, particularly for the smaller mines, the inspector leaves and the mine reopens.

China's coal industry underwent a historic change in 2007, as it became a net importer of coal during the first quarter of the year. High demand plus high local prices and the closure of many small mines encouraged the import of cheap coals from Indonesia and Australia.

Other than trying to match coal supply and demand in volume terms, the sector faces infrastructure shortcomings that interfere with timely coal deliveries to consumers. Currently, China's

10. Another Chinese source stated that more than 7,000 workers were killed during 2006 in mine blasts, floods, and collapses. See "Coal Mine Operators Ignore Closure Orders," *China Economic Net*, http://en.ce.cn/National/Local/200702/15/t120070215_10436181.

11. Edward Cody, "Safety Subverted in China's Mines," *Washington Post*, February 18, 2008.

12. China now has 24,000 small coal mines, each producing between 10,000 and 30,000 tons annually. These mines account for 70 percent of the country's coal mining ventures. See *China Daily*, March 20, 2007, http://www.chinadaily.com.en/english/doc2006-03/18/content_544025.

13. See http://en.ce.cn/National/Local/200704/18/t20070418_11073241.

14. A total of 2,411 coal mines had been shut down by mid-December 2005.

coal transport capacity by railroad can meet only 35 percent of the market demand. That translates into electric power shortages during the summer months, when high demand overwhelms supply.

Chinese coal mines hold tremendous volumes of methane gas, with a potential placed at 22.5 trillion cubic meters. Unfortunately, this potential is not easily exploitable, and the "take" from wells drilled may be no more than 10 billion cubic meters (bcm) by the end of 2015, compared with 4.3 bcm in 2007.

The economics of converting coal into liquids has not yet worked out, and the Chinese may be confused by their own media reporting. One recent article stated that China would have the capacity to produce 50 million tons (1 million b/d) of oil from coal (coal to liquids, or CTL) every year by 2020,[15] whereas an earlier item had discouraged the use of coal as a raw material for producing oil. The coal liquefaction projects, it noted, consumed a lot of energy, the technologies used were not sophisticated, and the process was costly and consumed too much water.[16] Yet so often local enterprises go off on their own, despite the waiting political and economic barriers.

Recent reports indicate that China is building a large CTL complex in Erdos, Inner Mongolia. The plant will be the largest such facility outside South Africa and will convert 3.5 million tons of coal per year into 20,000 b/d of petroleum products.[17] This plant is viewed as a start in fulfilling Beijing's plan to have CTL capacity of 50 million tons by 2020. Direct CTL technology is being employed at the plant under construction; that is, coal is converted directly into liquid fuel. Undoubtedly, the shift in thinking may be attributed partly to the then-continued increases in the price of a barrel of crude oil and partly to regional and local officials taking action on their own.

Yet it took the *National Development and Reform Commission* (NDRC) to effectively bring coal liquefaction projects to an end, except for two involving the Shenhua Group. The NDRC explained its actions by noting that the move aims to control the business risk of the coal-to-oil industry, which is still in an experimental stage.[18] But one coal-to-liquids facility, to be built by Shinhua, has been postponed indefinitely, presumably because of high costs and reduced demand.

Coal bed methane (CBM) is viewed as a clean energy source, and China has the world's third-largest reserves of CBM—73.5 bcm.[19] CBM is extracted from the seams of coal beds by drilling drainage wells. Extraction in 2008 totaled 5.8 bcm, and the plan for 2010 calls for 10 bcm. Yet every year, about 20 bcm have not been captured and are released into the atmosphere.

Coal can also be turned into natural gas, and the China National Offshore Oil Company (CNOOC) has indicated its intent to do just that, having lined up one of the country's largest mines as a source for the needed coal. Planned investment has been put at $4.4 billion, with an annual output of 4 bcm.[20]

Natural Gas

Natural gas plays a very minimal role in China's energy supply and demand, accounting for just 2.6 percent. All the gas consumed in the country came from domestic sources; there were no

15. See http://chinanews.cn/technology/2007-09-19/39640.html.
16. See http://chinanews.cn//business/2007-06-11/36657.html.
17. See http://www.enn.com/pollution/article/37304/print.
18. Vandana Hari, "China Pulls the plug on Most Coal-to-Fuel Projects," *Oilgram News*, September 9, 2009.
19. See http://en.ce.cn/Industries/Energy/&Mining/200908/24/t20090824_19851135.
20. Dow Jones Newswires, April 30, 2009.

Table 7.3. Natural Gas Production in China, Selected Years, 1990–2015

Year	Billions of Cubic Meters
1990	14.4
1995	17.0
2000	27.2
2003	34.3
2004	40.8
2005	50.1
2006	58.6
2007	69.3
2008	78.0
2010	110.0
2015	160.0

Sources of data: The data for 1990 through 2005 are from Robert E. Ebel, *China's Energy Future* (Washington, D.C.: CSIS, 2006). The data for 2006 and 2007 are from Kim Feng Wong, "China's 2007 Natural Gas Output Rises 23%," *Oilgram News*, February 13, 2008. The data for 2008, 2010, and 2015 are from Eadie Chen, "China Sees Imports at 60 Percent of Oil Use by 2020," *World Oil Market (a.m.)*, January 8, 2009.

imports until the Guangdong Dapeng liquefied natural gas (LNG) terminal went operational in September 2006. But, with the arrival of larger-scale imports hopefully later this decade, Chinese officials had wanted the contribution of natural gas to rise to 8 percent, a doable goal if everything had worked out perfectly, but it did not. The natural gas target will be missed because prices for imported LNG had been too high or because they could not find a supplier. One internal natural gas pipeline was completed in 2005—the West-East Pipeline, tapping gas from the Tarim Basin and moving it to consumers in the East.

Despite the anticipated growth (table 7.3), domestic natural gas extraction will fall short of demand of 120 bcm in 2010 and 200 bcm by 2020, thus setting the stage for a natural gas import program charged with filling the resultant gap. The natural gas production plan calls for an increment of 82 bcm between 2009 and 2015, or slightly more than doubling during these years. This plan is doable; the demand is there.

China, as with any other country, can import gas by pipeline and/or in liquefied form—LNG. There is one pipeline currently under construction that will deliver natural gas to China from Turkmenistan via Kazakhstan and Uzbekistan. The president of Turkmenistan recently proposed that China raise its purchases of gas from this pipeline to 40 bcm, up from an original 30 bcm. Discussions continue on possible deliveries from Kovykta, a huge gas field in East Siberia, but it still remains in the background.

Chinese companies have proposed building a total of 16 LNG receiving terminals, of which as many as 10 would be operational by 2010. However, just two terminals are presently in operation, and the CNOOC is at present the only Chinese importer of LNG.[21] Dapeng is fed by LNG from Australia's Northwest Shelf. A terminal at Fujian is supplied from Indonesia's Tangguh LNG. But Asian LNG is in short supply, prices are high, and China has not accepted these high prices. An agreement to buy 100 million tons of LNG from the Chevron-led Gorgon project in Australia has fallen through because of pricing and timing issues.[22] A subsequent agreement calls for PetroChina to buy 45 million tons of LNG from Gorgon over 20 years in a deal worth $41 billion. China has canceled a $10 billion 25-year LNG import deal with Iran because of the high price required by the supplier.

21. Christene Forster, "CNOOC to Buy LNG from Queensland Plant," *Oilgram News*, May 14, 2009.
22. The calculation here is that 1 million tons of LNG converts to 1.38 bcm of natural gas.

Nuclear Energy

Nuclear electric power in China first became available in 1991, when the Daya Bay plant came on line. By July 2004, a total of 9 reactors were supplying nuclear power to consumers. But in 2006, these reactors accounted for just 1.6 percent of the country's total electricity generating capacity and about 2.3 percent of domestic electricity supply. By 2007, China's nuclear reactors were producing 62.9 GW of electricity, which provided 2 percent of its total electricity supply, with two reactors having been added that year.

The Chinese government in early 2006 had issued a Mid- and Long-Term Development Program for Nuclear Power, covering the years through 2020. Under this program, China will embark on one of the most ambitious nuclear energy programs the world has ever seen. This program calls for the construction of 30 nuclear plants, for the purposes of both satisfying the hunger for electricity and replacing coal-burning plants in an attempt to reduce air pollution. To meet China's goal, an average of two 1,000-MW nuclear power plants will have to be built every year during the period 2006–2020.

It was not until 2008 that the nuclear energy sector began its rapid growth. As 2008 got under way, there was a total of 11 nuclear reactors in operation, representing a combined 9.1 GW of generating capacity, and this capacity provided 2 percent of China's gross electricity generation but only 0.8 percent its commercial energy consumption.[23] Gross nuclear generated electricity that year totaled 68 terawatt hours (Twh), a sharp improvement over 1998—14 Twh—and minor growth over 2007—62 Twh.

The implementation of this plan began in 2008, and since then 24 nuclear reactors, from 10 nuclear projects, have been under construction, with construction scheduled for completion between 2010 and 2015. When that happens, China's nuclear generating capacity should reach 34.8 GW.

If successful, China will increase its nuclear generating capacity to a planned 40 GW by 2020, and these nuclear plants will then be providing about 4 percent of total electricity generation capacity. These goals were subsequently revised upwards in mid-2008, to at least 60 GW by 2020, contributing 5 percent of electrical output by that year,[24] with costs budgeted at $65 billion—in other words, important but yet more on the margin and less in terms of its contribution to significant reductions in carbon dioxides emitted by coal-fired power plants. For comparison, the United States currently receives 20 percent of its annual electricity generation from nuclear plants.

China, looking to lock in long-term, secure supplies of uranium for its nuclear plants, has turned to a neighboring country, Kazakhstan. Kazakhstan in turn aspires to be the world's leading supplier of uranium by 2010, looking to provide 15,000 tons that year. In 2006, Kazakhstan stood in third place, after Canada and Australia.

Until the latter part of 2007, the private sector (domestic and foreign) had not been involved in China's nuclear power industry. State-owned companies had been responsible for the investments. Then that changed, when the giant French firm Areva signed with China what has been

23. Lijuan and Kang, *China Energy Series*.

24. Yang Ying and Winnie Zhu, "China Plans More Nuclear Reactors, Uranium Imports," *Bloomberg.com*, June 11, 2008.

Table 7.4. China's Nuclear Generating Capacity, Selected Years, 1997–2020

Year	Capacity (megawatts)
1997	2,200
2004	7,010
2008	9,124
2010	11,000
2015	35,000
2020	45,000

Source: "Status of and Future Developments of China's Nuclear Power," *Energy Briefs* (FACTS Global Energy), April 2009.

called the largest deal in the industry's history.[25] The deal calls for Areva to supply China with two advanced nuclear reactors, to build these reactors, and to help run and maintain them. And also important, the $12 billion deal calls for Areva to cooperate in the reprocessing of spent nuclear fuel and to provide African uranium for at least 14 years. Finally, the agreement calls on Areva to transfer technology and to work on other reactors in China.[26]

The scope of the construction program (table 7.4) has caught the attention of vendors worldwide—American, French, and Russian. Westinghouse Electric was selected to build four new AP1000 reactors. But it can be expected that China will be "going to school" during the early years of new reactor construction, so that international participation can be minimized and replaced by Chinese labor, equipment, and supplies.

What could constrain China's nuclear future? Nuclear power will continue to be regarded as a supplemental form of energy. Even though the ambitious nuclear power plan might be successfully filled, the resultant small percentage of total power generating capacity to be added in its own way points to the real problem: finding and maintaining balance between electricity supply and demand. Secure and sufficient electricity is absolutely essential to everyday life. Yet consumers in China are challenged by power shortages one year and with oversupplies the next. The industrial sector, small businesses, and the everyday consumer require a better performance from electricity generating plants in general. Whether they can respond is still uncertain.[27]

The State Electric Grid Corporation expects electricity generating capacity to grow by 10.5 percent a year out to 2010, then by 6.7 percent for the years 2011–2015 and by 4.17 percent during the period 2016–2020. Electricity demand is expected to reach 3.81 trillion kilowatt-hours by 2010, then grow annually by 5.8 percent during the period 2011–2015 and 3.9 percent in the period 2016–2020.[28]

The State Electric Grid Corporation foresees the growth rate in electricity consumption exceeding that growth rate attributable to the consumption of all types of energy. How can that be supported in China? By focusing on the construction of hydroelectric and nuclear power plants and by developing new energy sources, the planners would advise.

25. John Tagliabue, "China Deal Gives Lift to Revival of Fission," *New York Times*, November 27, 2007.
26. Jamil Anderline, "China Seals $12 billion Deal for Areva Uranium," *Financial Times*, November 26, 2007.
27. For a report on those reforms proposed for that sector, see Organization for Economic Cooperation and Development and International Energy Agency, *China's Power Sector Reforms, Where to Next?* (Paris: Organization for Economic Cooperation and Development / International Energy Agency, 2006). The proposals were based on a review of successful steps taken by other countries.
28. "China's Installed Capacity to Grow 10.5 Percent Annually," *China Economic Net*, March 22, 2007.

Alternative Forms of Energy

Alternative forms of energy include hydropower, wind, solar, and biomass (ethanol and biodiesel, for example). These forms of energy presently provide 7 percent of China's total national energy consumption,[29] to be raised to 15 percent by 2020. A Law on Renewables, passed in February 2005, had called for the share of these fuels to reach 10 percent by 2020, a more realistic goal.[30] China has indicated that it had set a target for renewable energy consumption of 40 percent of the market by 2050, while the director of the National Energy Administration's renewable energy department was quoted as saying that renewable energy will become the mainstream power supply in 2050.[31]

Under any goal, the bulk of alternate or renewable forms of energy will continue to be provided by hydropower. Little should be expected from other alternate or renewable energy forms. Yet in 2007, China added 3.4 GW of wind energy to the country's electrical grid, making it the fastest-growing market for wind power in the world.[32] More recently, China noted that it will invest the equivalent of $14.6 billion to more than double its wind power capacity by 2010 from 2008.[33] If successful, wind power capacity will expand to 30,000 MW from 12,000, although another senior Chinese official spoke of at least 20,000 by 2010.

When China decides to take action, it often does so on a very large scale. Plans were announced in late June 2009 to build several gigantic wind farms, each of which will generate as much electricity as the Three Gorges Dam—18.2 GW.[34]

To put matters in perspective, however, if the purchase of air conditioners in 2008 approximated prevailing thinking, these units will draw more electricity than that provided by the Three Gorges Dam,[35] and that does not bode well for consumers.

For China, wind power is the cheapest form of renewable energy. It should be no surprise, then, that wind power capacity is to be increased to 100,000 MW by 2020. That does not mean, however, that wind is cheaper than coal—for it is not. The "on-grid" price for wind power considerably exceeds that of coal.

But there is a weakness in Chinese wind power. Although the country has been doubling its wind power capacity every year since 2006, about 30 percent of its wind power assets stand idle. Much of the capacity is located in the north, unfortunately making it uneconomic to build lengthy power lines to deliver electricity to waiting customers.[36]

The development of solar power is to be no less grandiose. China and First Solar, a U.S. company, have signed an agreement for a 2,000-MW photovoltaic farm to be built in the Mongolian

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29. Coal currently supplies 67.7 percent, oil accounts for 22.7 percent, and natural gas provides 2.6 percent.

30. That goal of 10 percent subsequently (in November 2006) was revised upward to 15 percent.

31. Li Xiang and Sun Xiaohua, "Future Brighter for Renewable Energy Sector," in *Reports from China*, advertising supplement to *Washington Post*, June 12, 2009.

32. Bill Powell, "Smoke and Mirrors," *Time*, February 14, 2008. Others might well disagree. The United States, for example, installed 5.244 MW of wind power in 2007. See Sam Fletcher, "Texas Resources: Oil, Wind," *Oil & Gas Journal*, February 11, 2008.

33. See http://www.bloomberg.com/apps/news?pid=20670001&sid=aX7usNmOCAIE.

34. See http://www.eenews.net/Greenwire/print/2009/06/25/13.

35. Ibid.

36. See http://www.forbes.com/2009/07/20/china-wind-power-business-energy-china_print.

desert.[37] But that is not all. Not only is this the world's largest photovoltaic project to date, but it is also scheduled to be part of a planned 11,950-MW renewable energy park in Inner Mongolia.[38] Unfortunately, construction costs and timetables were not provided for the transmission lines needed to move the generated electricity to where it is needed.

Price caps on energy fuels lead to loss taking, to shortages, to hoarding, to exports. And renewable fuels are not excused. For example, the production of biodiesel in China faces the almost impossible task of trying to compete in a market where the cost of feedstocks has been rising dramatically while diesel prices have been set well under international prices, leading to negative margins.[39]

37. Todd Woody, "China and U.S. Company Plan a Bib Solar Project," *New York Times*, September 9, 2009.

38. Ibid.

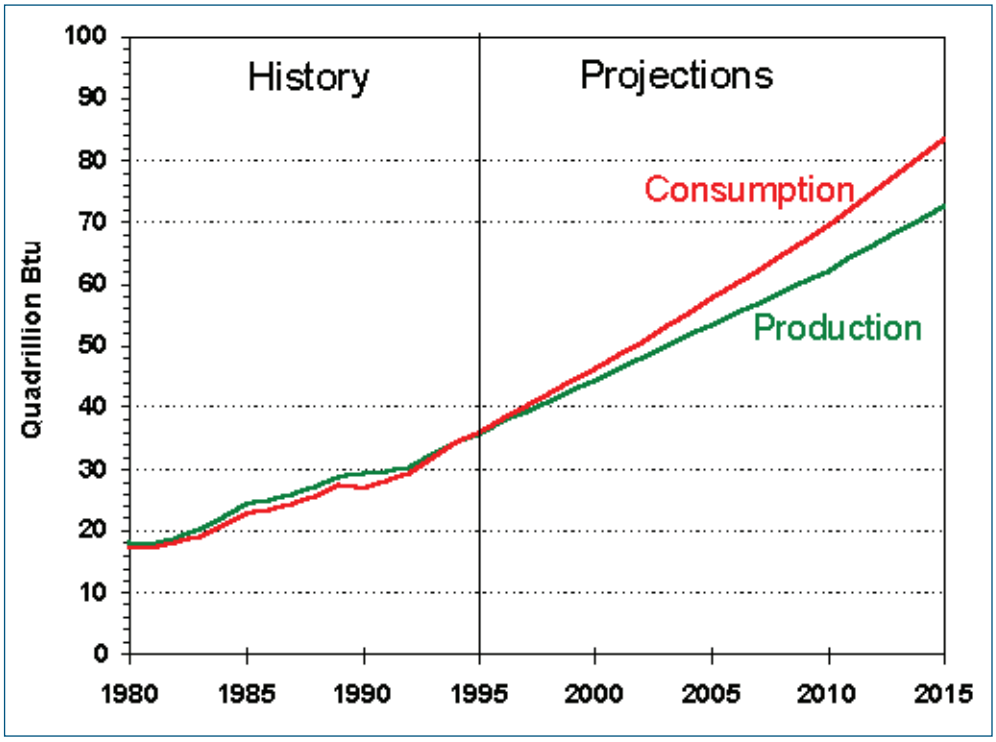
39. "Producers of Biodiesel in China Fight to Survive," *Oilgram News*, April 9, 2008.

8 HOW CHINA PLANS TO SECURE ITS ENERGY FUTURE

China became a net energy importer in 1995, and it will gradually enlarge its reliance on imports through 2015 (see figure 8.1). The key energy challenge for the Chinese government is likely to be how to manage these imports while protecting the security of its supply.

China has laid out a number of actions which, if successful, will give it an energy future that provides the fuels it requires at acceptable prices while minimizing its dependence on imports and maximizing protection of the environment—all while advancing national interests. What are the essentials of this program?

Figure 8.1. China's Energy Production and Consumption, 1980–2015 (quadrillions of British thermal units)



Source: U.S. Department of Energy, www.eia.doe.gov/emeu/cabs/china/part2.

- Ensure diversity among sources of imported fuel and diversity among types of fuels consumed.
- Place a particular emphasis on raising the contribution of renewable forms of energy.
- Avoid wasteful energy consumption while improving the efficiency of energy use.
- Eliminate the consumption of oil in electric power generation.
- Improve miles driven per gallon of gasoline consumed.
- Introduce hybrid automobiles.
- Contain and reduce the reliance on imported oil while supporting the importing of natural gas.
- Expand hydroelectric and nuclear power station construction.
- Expand domestic exploration for oil, natural gas, and uranium while accelerating the production of clean coal.

How much of this grand wish list can be implemented will not be the decision of China alone. Rather, the shape of the world energy market and the geopolitics that influence this market will help define China's energy future. Nevertheless, there are no surprises in this program, other than the reduction in reliance on imported oil, which is not considered likely under current circumstances. These are guidelines to which any energy-consuming country could subscribe. Not surprisingly perhaps, most already do.

Unfortunately, these goals were set out before the financial crisis began to envelop the world. Attempts to limit the effects of this crisis on China led to the establishment of a stimulus fund (see chapter 1), but the impact of this fund has been delayed by local governments that have not been able to raise their share of financing.[1] The reporting on this matter has been particularly skimpy, but it is clear that funds have been misused.

1. Jamil Anderlini, "Beijing's Stimulus Measures Questioned," *Financial Times*, May 19, 2009.

ABOUT THE AUTHOR

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Previously, Ebel served with the Central Intelligence Agency for 11 years and spent more than 7 years with the staff of the Office of Oil and Gas in the Department of the Interior. For the Federal Energy Office, he worked in the international energy area. In March 1974 he jointed ENSERCH Corporation as vice president, international affairs, and for some l4 years advised the corporation and its subsidiaries on international issues relevant to day-to-day operations.

Ebel, who has traveled widely in the former Soviet Union, was a member of the first U.S. oil delegation to visit that country in 1960 and in 1970 was in the first group of Americans to inspect the new oil fields of Western Siberia. In November 1997 he led an International Energy Agency team examining the oil and gas sector of Turkmenistan and Uzbekistan.

In August 2002, Ebel participated in the Sudanese peace talks, held in Machakos, Kenya, and from December 2002 through April 2003, worked with a group of former Iraqi oil officials, under the Department of State "Future of Iraq" project, to produce an assessment of the Iraqi oil sector. Again at the request of the Department of State, he traveled throughout Canada in September 2003 to speak to interested groups on U.S.-Canada energy relations.

Ebel is a past chairman of the Washington Export Council and past member of the board, American Near East Refugee Aid. He received the Department of State's Distinguished Public Service Award in April 2002. He is the author of a number of books, including *Energy Choices in Russia* (CSIS, 1994), *Energy in the Near Abroad* (CSIS, 1997), and *China's Energy Future* (2006). He was coeditor, with Prof. Rajan Menon, of *Energy and Conflict in Central Asia and the Caucasus* (2000) and edited *Caspian Oil Windfalls: Who Will Benefit?* (2003). His earlier books include *The Petroleum Industry of the Soviet Union* (1961) and *Communist Trade in Oil and Gas* (1970).

Ebel holds an M.A. in international relations from the Maxwell School at Syracuse University and a B.S. in petroleum geology from Texas Tech. A graduate of the United States Air Force Russian language program, he served in Air Force intelligence during the Korean War. A widely acclaimed speaker, Ebel is a frequent commentator on national and international radio and television, and his views on energy issues appear regularly in U.S. newspapers and abroad.