



E-ASIA

university of oregon libraries

<http://e-asia.uoregon.edu>

China: An Energy Sector Overview

Table of Contents

Introduction

[China at a Glance](#)

[Energy at a Glance](#)

1. Economics, Demographics, and Environment

[China in a World Context: 1995](#)

[The People of China](#)

[The Economy of China](#)

[China in the International Market](#)

[U.S.-China Business and Trade](#)

[Energy in China's Economy ...](#)

[China and the Environment ...](#)

2. Energy Situation

[China's Energy Balance: 1980-2015](#)

[Energy Production by Major Fuels, 1980-2015](#)

[China's Energy Consumption](#)

[China's Carbon Emissions, 1980-2015](#)

[Energy in China's Ninth 5-Year Plan \(1996-2000\)](#)

[U.S. - China Energy Comparisons](#)

3. Energy Structure

[Organization of China's Energy Industry](#)

[The Key Players in China's Energy Sector ...](#)

[A Quick Snapshot of China's Coal Industry ...](#)

[Key Details About Coal in China ...](#)

[A Quick Snapshot of China's Oil and Gas Industry ...](#)

[Key Details About Oil and Gas in China ...](#)

[A Quick Snapshot of China's Electric Power Industry ...](#)

[Key Details About Electric Power in China ...](#)

[Key Details About Renewable Power in China ...](#)

4. Relevant Links

Other U.S. Energy Information Administration Information

[Latest EIA Detailed Annual Data](#)

[Country Energy Data -- China](#)

[Country Analysis Brief - China](#)

[EIA Privatization Report - China](#)

[EIA Privatization Report - China \(power\)](#)

[EIA Privatization Report - China \(coal\)](#)

Other U.S. Department of Energy Information

[U.S. Department of Energy's Office of Fossil Energy's International section - China](#)

Other U.S. Government Information

[CIA World Factbook - China](#)

[Background Notes on China from the U.S. Department of State](#)

[U.S. International Trade Administration, Country Commercial Guide - China](#)

[Department of Commerce, Big Emerging Markets - Chinese Economic Area](#)

The following links are provided solely as a service to our customers, and therefore should not be construed as advocating or reflecting any position of the Energy Information Administration (EIA) or the United States Government. In addition, EIA does not guarantee the content or accuracy of any information presented in linked sites.

[Information about China from China's Consulate General in New York, NY](#)

[China Today](#)

[Information about China from Chinascape](#)

[Tradeport Trade Directory, China](#)

[A picture of the Great Wall](#)

[A picture of the Imperial Palace](#)

If you liked this report on China or any of our many other Country Analysis Briefs, you can be automatically notified via e-mail of updates. Simply click [here](#), put in your e-mail address, and check the box labeled "Country Analysis Briefs" on the list of products. You will then be notified within an hour of any updates to our Country Analysis Briefs.

File last modified: October 28, 1997

Contact:

Erik Kreil

Erik.Kreil@eia.doe.gov

Phone: (202)586-6573

Fax: (202)586-9753

URL: <http://www.eia.doe.gov/emeu/cabs/china/china97.html>

If you are having technical problems with this site, please contact the EIA Webmaster at wmaster@eia.doe.gov.



China at a Glance



President and General Secretary of the Communist Party: Jiang Zemin

Premier: Li Peng

Government: Unitary state with a central government, 22 provinces, 5 autonomous regions, and 4 municipalities (Beijing, Chongqing, Shanghai, and Tianjin). Hong Kong, a former British Colony, became a Special Administrative Region on July 1, 1997.

Unless otherwise noted, data in this report excludes Hong Kong, reflecting China's policy of "one country, two systems."

Main Political Organization: Chinese Communist Party (CCP)

Most Recent Presidential Election: March 1993 (next scheduled 1998)

Capital: Beijing

Major Economic Centers: Shanghai, Tianjin, Shenyang, Wuhan, Guangzhou, Chengdu, Hong Kong

Special Economic Zones: Shenzhen, Xiamen, Zhuhai, Shanto, Hainan Province (coastal belt and selected cities also open to foreign investment)

Area: 3.7 million square miles (slightly larger than the United States)

Climate: Extremely diverse, ranging from tropical to subarctic

Currency: Renminbi (domestic); Yuan (foreign exchange)

Exchange Rate (October 1997): US\$1 = 8.28 Renminbi

Note: Foreign currency is exchanged for Yuan, which is equivalent to the domestic Renminbi.

Major Exports: Light industrial & textile products, mineral fuels, heavy manufactures, agricultural goods

Major Imports: Machinery, steel, chemicals, miscellaneous manufactures, industrial materials, grain

Major Trading Partners: Japan, United States, European Union, South Korea, Taiwan

Language: Mandarin (official), Shanghainese, others

Religion: Officially atheist; Buddhism, Taoism, Confucianism are traditional

Literacy Rate (1995): 82%

Labor Force: Agriculture & forestry (60%), industry & commerce (25%), construction & mining (5%), services (5%), other (5%)

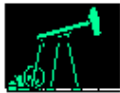
Key Economic Indicators

	1995	1996 Estimate	1997 Forecast
Population	1.22 billion	1.23 billion	1.25 billion
Real GDP Growth Rate	10.2%	8.1%	8.1%
GDP Per Capita (1987 \$)	\$436	\$457	\$499
Inflation Rate	17.1%	8.4%	5.1%
External Debt	\$110 billion	\$127 billion	\$139 billion
Exports	\$128.1 billion	\$130.0 billion	\$149.7 billion
Imports	\$110.1 billion	\$115.7 billion	\$125.4 billion
Overall Trade Balance	\$18.1 billion	\$14.4 billion	\$24.3 billion
– with U.S. only	\$33.8 billion	\$39.5 billion	\$44.0 billion

Sources: U.S. Department of Commerce, WEF Group, and Energy Information

Outlook

- Population growing about 1% annually and slowing; should peak at 1.45 billion around the year 2030.
- Booming economy: projected to expand by over 35% in real terms between 1996 and 2000.
- Higher-than-average energy/GDP ratio is falling rapidly; energy intensity in 2015 projected to be less than half the 1990 level.
- Economic reform, privatization should continue.
- Key problems: Economic inefficiencies, especially in state enterprises and agriculture; income gaps; unemployment; foreign debt; corruption; environmental degradation; carbon emissions.



Energy at a Glance

China's Total Energy Consumption (1995) = 36 Quadrillion Btu



Electric Power in China--An Overview

1995 Total Net Electricity Generation: 887 billion kilowatt-hours
(79% Fossil-generated, 20% Hydroelectric, 1% Nuclear)

- 1995 electric generating capacity estimated at 190 gigawatts (GW), fourth highest in the world. About 70 percent is coal-fired.
- Government plans to add 16 GW capacity annually through 2000 to ease chronic shortages caused by booming economy and urbanization.
- High coal use has serious environmental repercussions. China plans to diversify by doubling its 1990 level of hydropower production by 2000 and increasing nuclear capacity. Three Gorges hydro project is largest in the world.
- Foreign investment in independent power projects encouraged.

Petroleum in China--An Overview

1996 Crude Oil Production: 3.1 million barrels per day (b/d)
1996 Domestic Oil Consumption: 3.6 million b/d
Oil Refining Capacity (1/1/97): 2.9 million b/d
1997 Proven Oil Reserves: 24 billion barrels

- Largest fields: Daqing, Shengli, Liaohe, and Xinjiang.
- Oil demand has grown 80 percent over last 10 years. Country became a net oil importer during 1993 for the first time since early 1960s.
- Most production is from onshore. Offshore areas and some onshore areas (including parts of the Tarim Basin) now open to foreign investment.
- At current growth rates, China's oil imports could exceed 1 million b/d by 2000.

Natural Gas in China--An Overview

1996 Production: 0.7 trillion cubic feet
Reserves (1/1/97): 41 trillion cubic feet

- Natural gas makes up only about 2 percent of domestic energy production.
- Natural gas is underutilized relative to China's total resource base of this energy source. Current development efforts are targeting the development of large gas fields--both offshore and in the northwest.
- China's largest offshore gas field, Yancheng-13 (proven reserves of 3 trillion cubic feet), began producing in 1996. The joint venture in the South China Sea (between China National Offshore Oil Corp., Arco Co., and Kuwait Foreign Petroleum Exploration Corp.) supplies natural gas to Hainan Island and a 2400-megawatt power plant in Hong Kong.

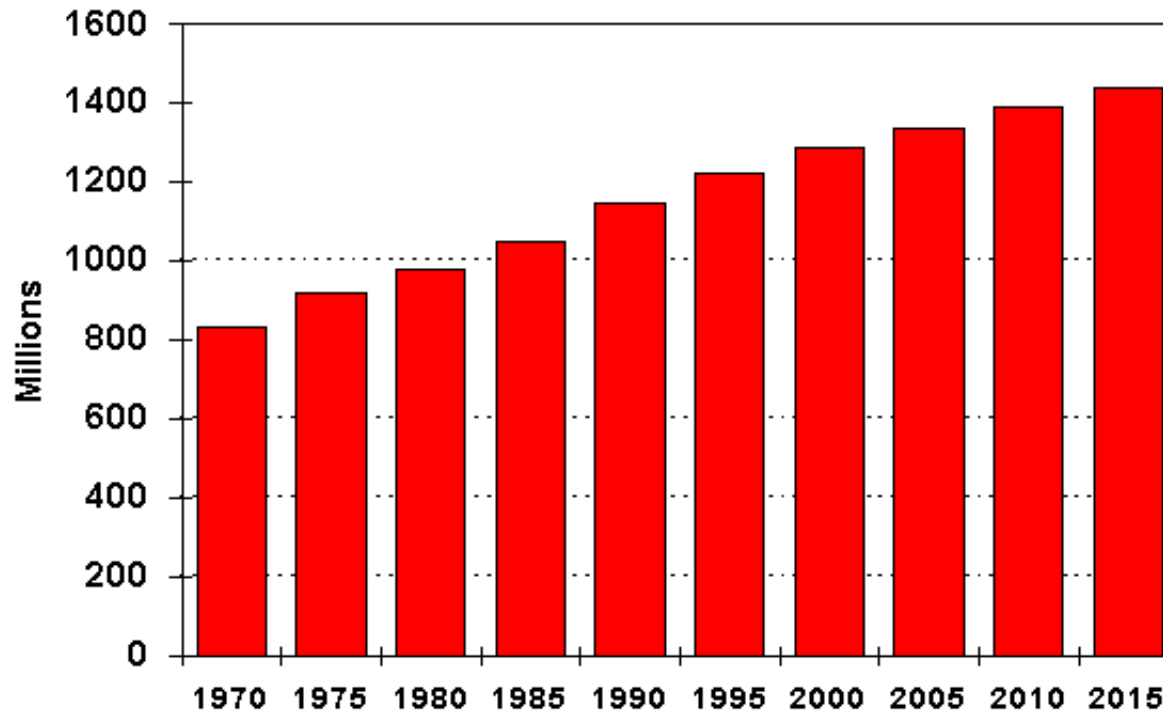
Coal in China--An Overview

1996 Production: 1.5 billion short tons
1996 Proven Reserves: 126 billion short tons

- Coal is by far the most important energy source in China, providing more than 70 percent of the country's total needs. China is the world's largest coal producer.
- Vast majority of China's coal reserves are bituminous (hard coal), located far from population centers in remote northern and northwestern China.
- China's current 5-Year Plan (1996-2000) aims to stabilize output in the east and develop mines in Shanxi, Shaanxi, and Inner Mongolia.
- Amendments to China's Mineral Resources Law, effective January 1997, provide a comprehensive legal framework for exploration and exploitation and could encourage foreign investment.

The People of China

China's Population, 1970-2015



Source: U.S. Census Bureau

- **China is the most populous country in the world, home to 1.2 billion people (20% of the world's total).**

- Population growth, however, is slowing. It currently averages about 1% annually, but should drop below 1% after 2000. Total population is expected to peak at about 1.45 billion around 2030. About 70% of the population lives in rural areas.

- Population density is highly uneven. Vast desert areas of western China are nearly uninhabited, while areas of eastern China are among the most densely populated in the world. Average population density is about 325 per square mile.

- **Industry and commerce constitute the basis of the Chinese economy, but agriculture employs the majority of the labor force.**

- About 60% of the labor force is engaged in agriculture and forestry.

- About 25% work in industry and commerce, 5% in construction and mining, 5% in social services, and 5% other areas. Important Chinese industries include textiles, garments, machinery, cement, iron and steel,

coal, and oil.

- Women comprise over 40% of the labor force, but this excludes the large number of women engaged in agricultural and household work.

- **China has one dominant ethnic group -- Han, with over 90% of the population -- and dozens of others.**

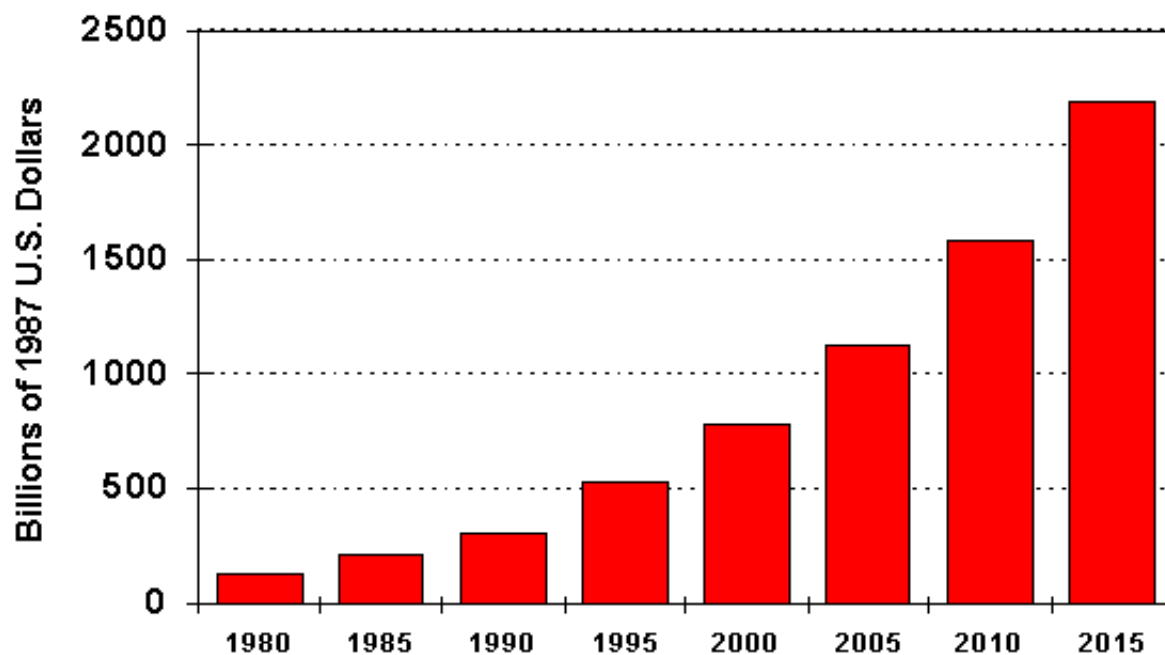
- Minority ethnic groups include Zhuang, Manchu, Hui, Miao, Uygur, Yi, Tujia, Mongolian, and Tibetan.

- China is officially atheist, but traditional religions and philosophies of life--including Confucianism, Buddhism, and Taoism-- remain important. About 2-3% of the population is Muslim, 1% Christian.

- Mandarin (northern Chinese) is the principal and official language of China. Local dialects are spoken in the south and southeast. English is not widely spoken.

The Economy of China ...

China's Gross Domestic Product (Exchange Rate Valuation)



Source: Energy Information Administration

- China's gross domestic product (GDP) is growing about 8 times as fast as the population. With inflation currently under control (projected to be about 5% in 1997), real income per capita is increasing rapidly.

- In 1996, China's real GDP grew about 8.1% and its GDP per capita (1987 US\$) reached \$467, up from \$436 in 1995. GDP is forecast to grow by about 8% per year through 2005, and 7% annually thereafter through 2015. Note that GDP measured on a purchasing power parity basis may be many times higher, largely due to the inclusion of nonmarket transactions.

- Economic development is proceeding much more rapidly in coastal and urban areas than in the rural hinterland, widening regional economic disparities. In August 1997, the rural unemployment rate approached 35%, compared with less than 8% in urban areas.

- **State-owned enterprises dominate China's economy.** Reform of inefficient companies is a high priority, but could boost unemployment.

- Industry accounts for nearly half of national output,

and service sectors (including commerce, construction, and transport) about one-third.

- Agriculture contributes about 20% of GDP. China is self-sufficient in food, but the loss of arable land (due to erosion and economic development) is a serious concern.

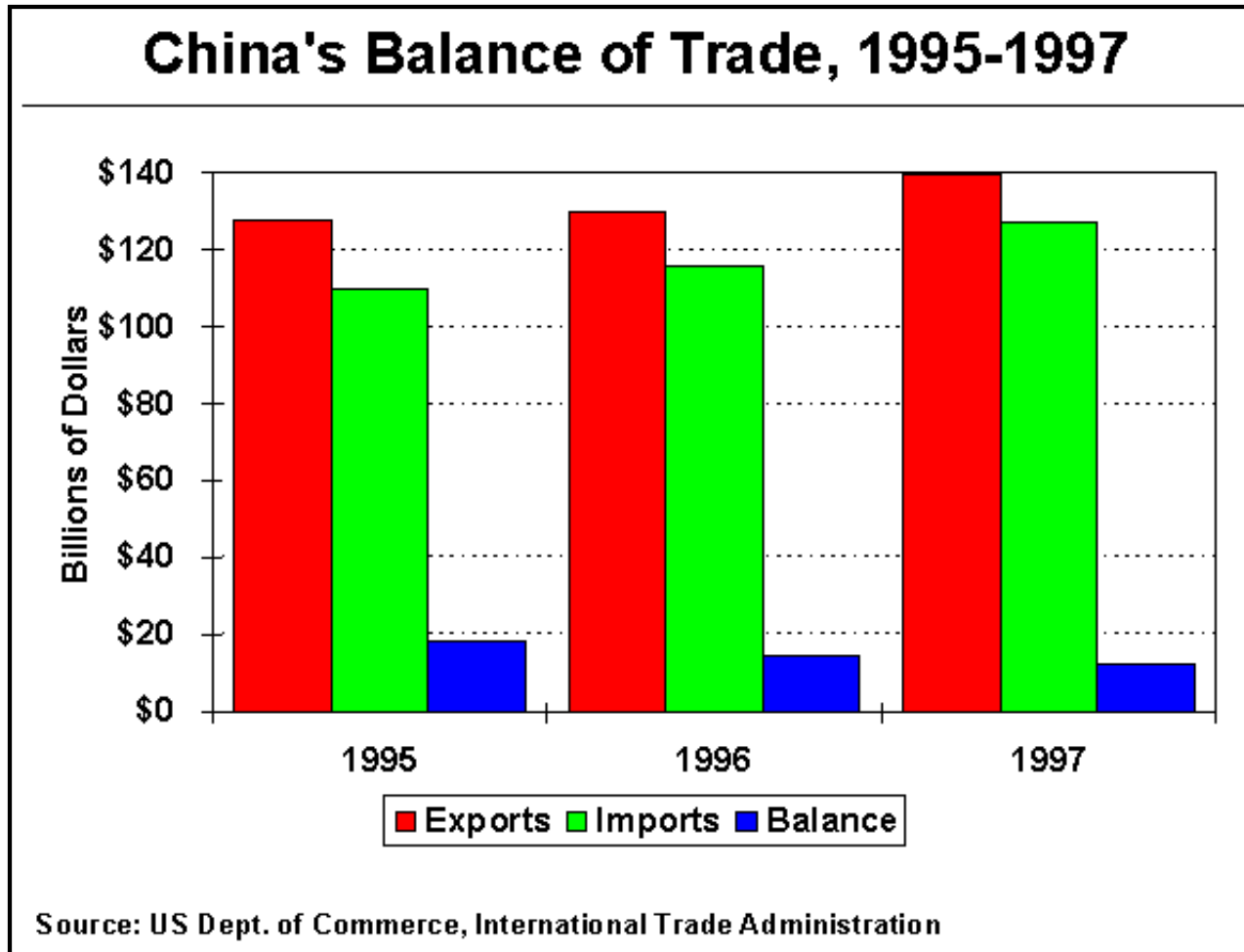
- **Economic development is proceeding under China's Ninth 5-Year Plan (1996-2000).** Basic principle: "Seize the opportunity, deepen reform, open up wider, promote development, and maintain stability."

- Priorities: Sustain economic growth. Improve living standards and economy's overall quality and efficiency. Establish a socialist market economy. Improve

industrial structure and increase its capacity. Promote scientific and technological advances.

- Special emphasis on agriculture and 5 pillar industries: Machinery, electronics, petrochemicals, auto-making, and building.
- At its 15th Party Congress in September 1997, China announced plans to speed up privatization of state-owned enterprises.

China in the International Market ...



- China plays a major role in world trade. In 1996, trade totaled \$246 billion (\$130 billion exports plus \$116 billion imports), an increase of 3% over 1995. China has had a trade surplus since 1994. The surplus peaked at \$18.1 billion in 1995.

- China's major exports are light industrial and textile products, mineral fuels, heavy manufactures, and agricultural goods. Major imports are machinery, steel, chemicals, miscellaneous manufactures, industrial materials, and grain.

- China's chief trading partners are Japan, the United States, the European Union, South Korea, and Taiwan.

- **Both imports and exports are increasing.** China is seeking membership in the World Trade Organization. To promote trade, China has established duty-free "special economic zones" offering tax, investment, and other incentives to foreign businesses. However, China's currency is not yet completely convertible, and the country retains controls on access to foreign exchange.

- **China's international reserves are increasing, but so is its foreign debt.** In mid-1997, international reserves (excluding gold) exceeded \$120 billion.

Foreign debt totaled \$127.3 billion in 1996.

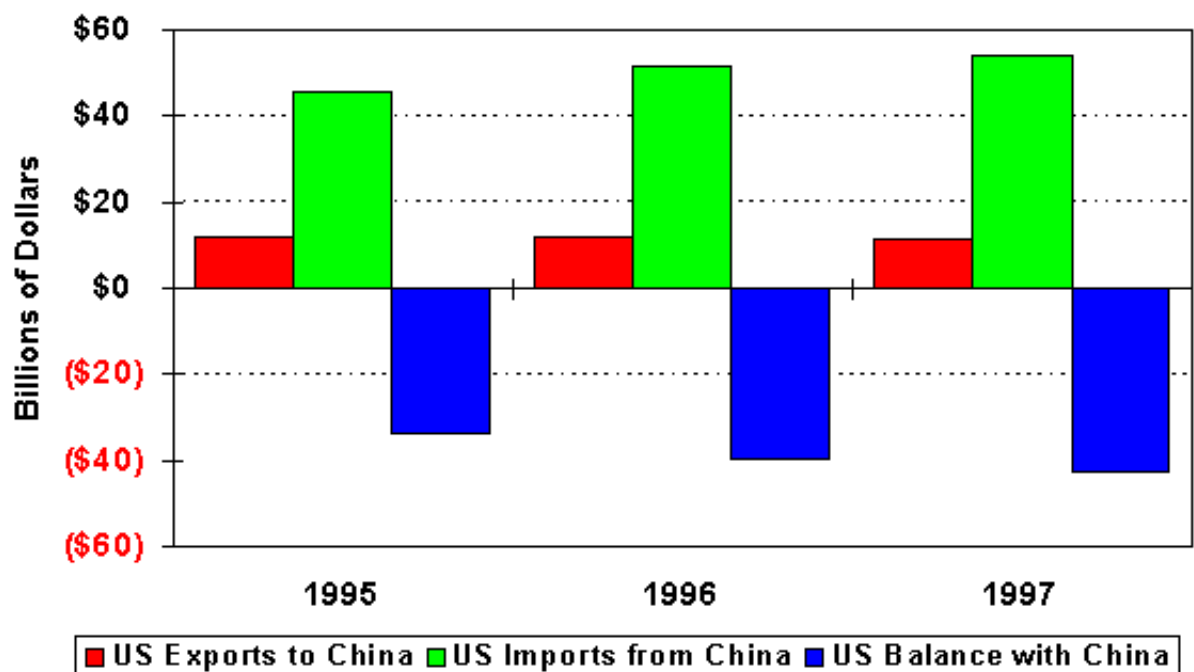
- China has attracted \$177 billion in foreign investment since the late 1970s, and hopes to attract about \$250 billion more over the 1996-2000 period. China's State Statistical Bureau reported \$42.35 billion in direct foreign investment in 1996, up 12.2% over 1995 investment. Major investors include Japan, the

United States, Singapore, and Taiwan.

- China is a major recipient of aid from international organizations such as the World Bank and Asian Development Bank.

U.S.-China Business and Trade ...

U.S. Trade with China, 1995-1997



Source: US Dept. of Commerce, International Trade Administration

- The United States ran an estimated \$40 billion trade deficit with China in 1996.

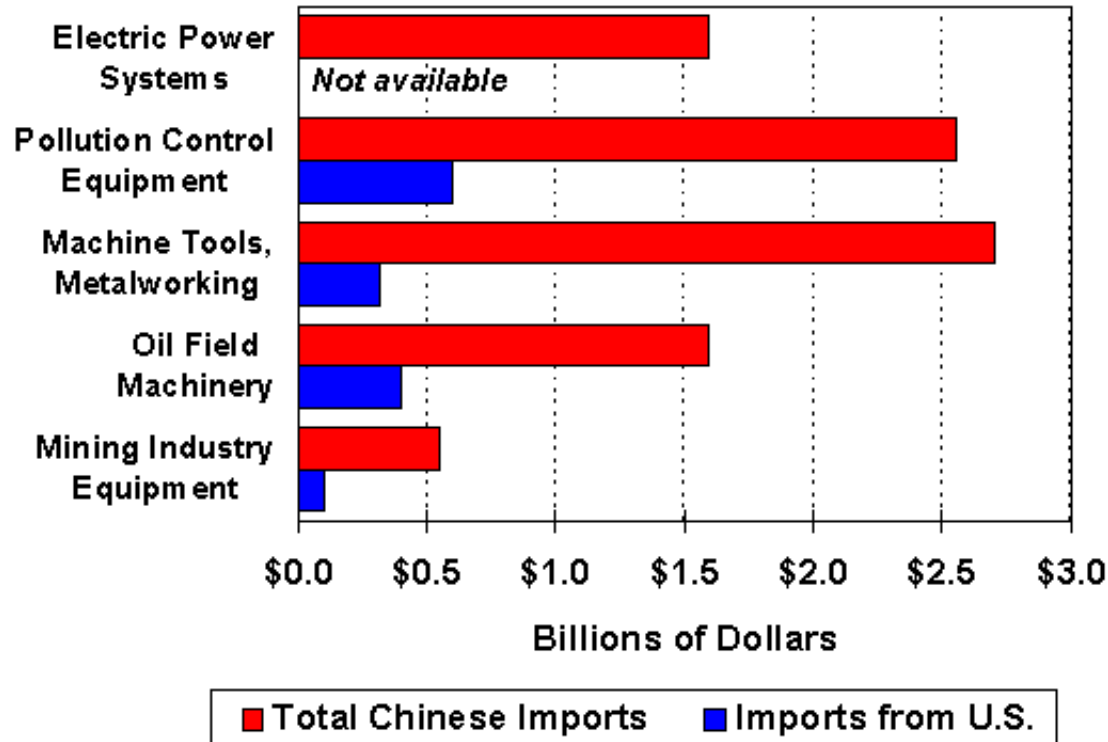
• This deficit widened in the first 7 months of 1997 (to \$25.9 billion, compared with \$19.5 billion in the first 7 months of 1996). Several monthly deficits have exceeded those with Japan, which is traditionally the largest deficit market for the United States.

- U.S. investment in China totaled \$10.7 billion as of the end of 1995 and accounted for about 5% of foreign investment in 1995.

• According to the U.S. Department of Commerce, top commercial prospects for U.S. energy businesses in 1997 include electric power systems, oil field machinery service, mining industry equipment, and pollution control equipment.

- The U.S. Export-Import Bank has agreed to provide \$50 million in business loans for energy efficiency and renewable energy. Trade Development Administration and Overseas Private Investment Corporation funding has been suspended since 1989.

Energy-Related Trade Prospects in China, 1997

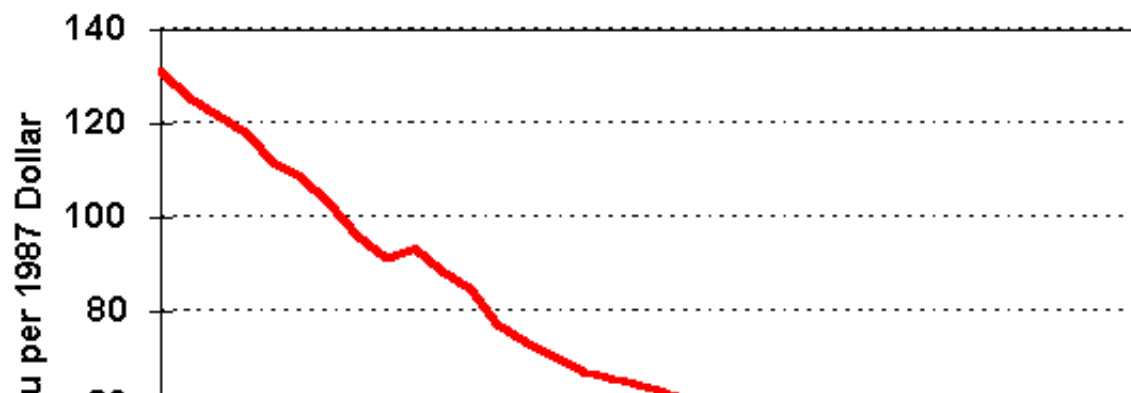


Source: US Dept. of Commerce, International Trade Administration

- China enjoys Most Favored Nation (MFN) trading status with the United States, renewable annually.
- U.S. exports of products with potential military (especially nuclear) applications remain tightly controlled. Concerns over human rights and other issues complicate the annual debate over renewal of China's MFN status.

Energy in China's Economy...

Energy Consumption per Dollar of GDP

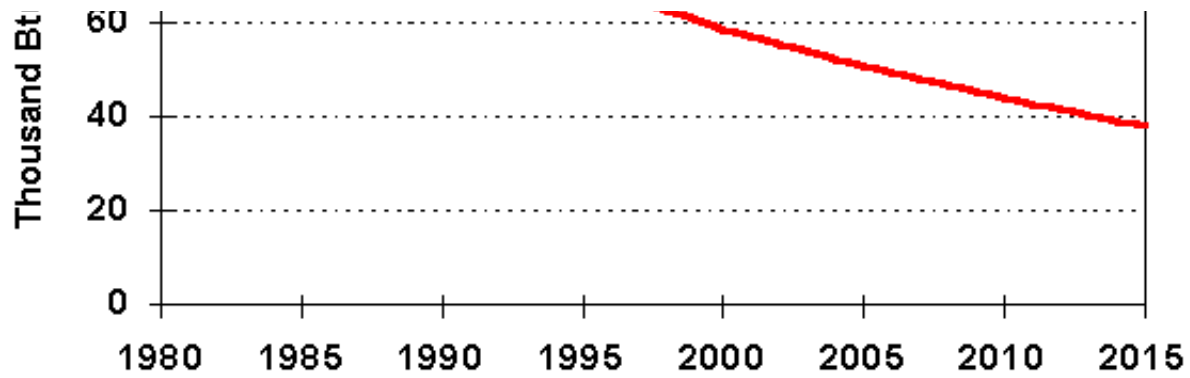


- China's energy consumption per unit of output is high, but falling.

- China consumes three times as much energy per dollar of gross domestic product (GDP) as the world average, and twice the average for all developing countries.

- China's energy/GDP ratio declined by about 50% since 1980, as economic growth outpaced increases in energy consumption. China's energy consumption should continue to grow less rapidly than GDP through 2015.

- China's per capita energy consumption is low,

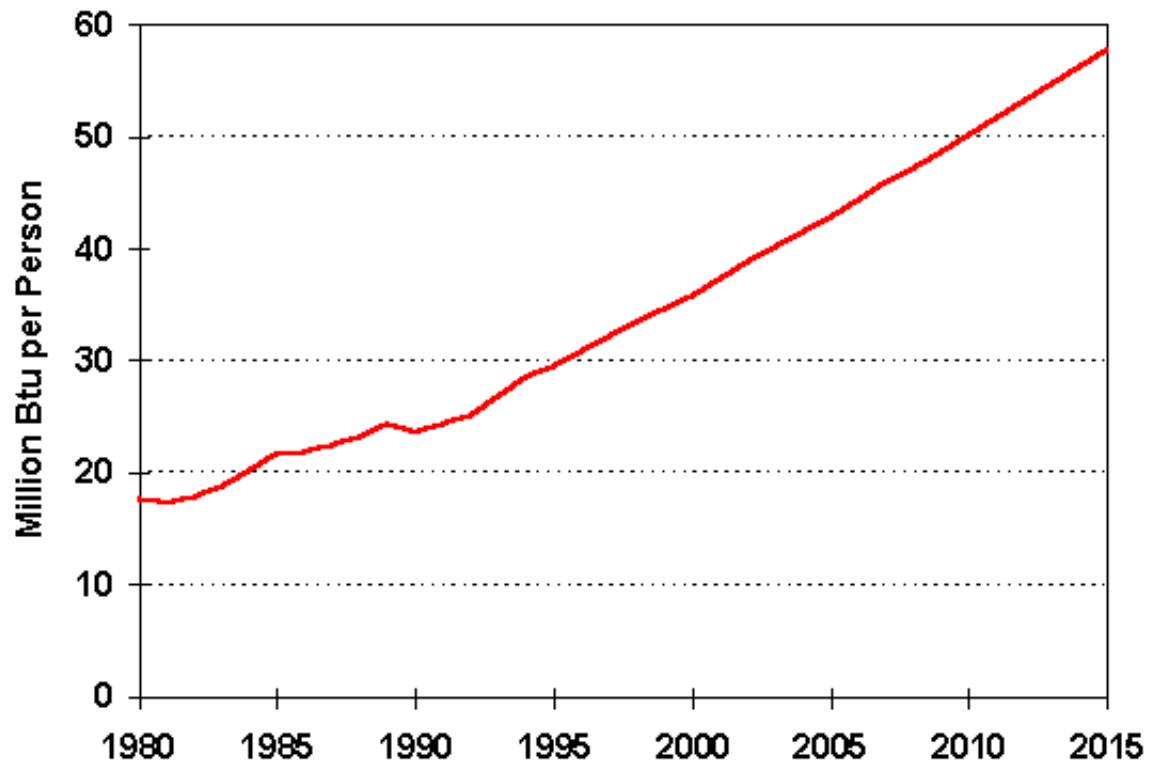


but rising.

- China consumes only about one-eighth the energy per person as the developed economies of the Organization for Economic Cooperation and Development (OECD), and only about one-fourth as much as Taiwan or South Korea.

- China's per capita energy consumption has grown from less than 18 million Btu in 1980 to about 31 million Btu in 1996. It is projected to reach 58 million Btu by 2015.

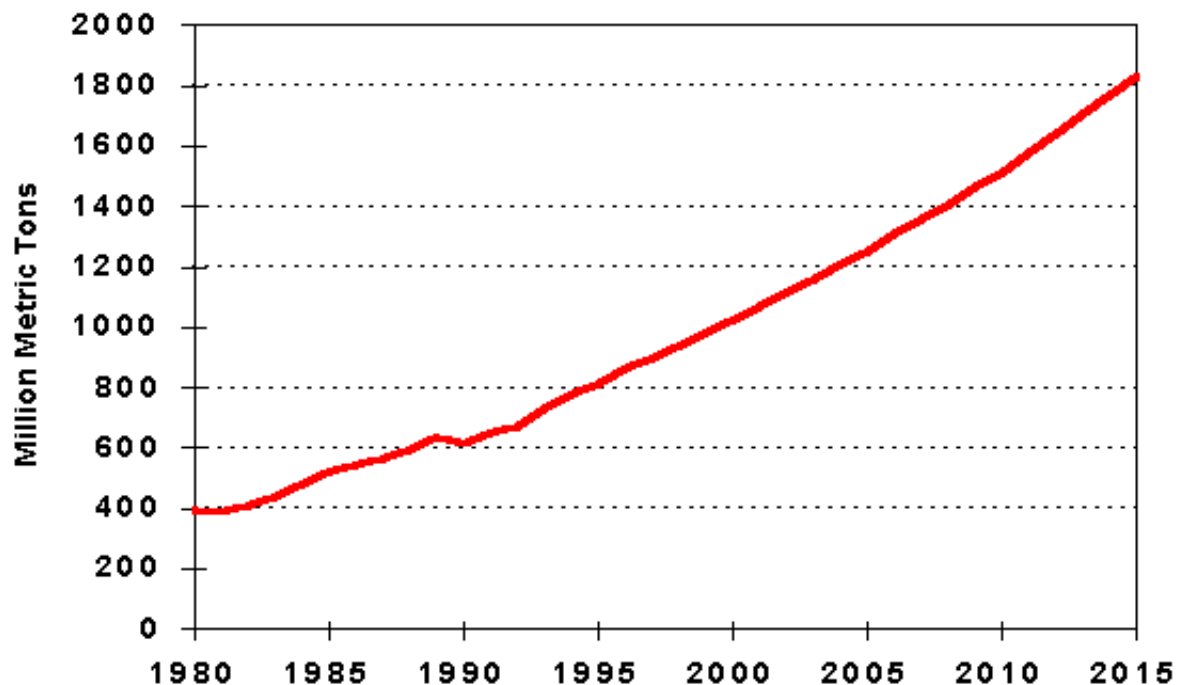
Energy Consumption per Capita



- China's inability to keep up with rapidly increasing demand for electricity has dampened industrial and economic growth.

China and the Environment...

Carbon Emissions, 1980-2015



• A consequence of China's rapid economic growth has been severe environmental pollution, including acid rain, thick smog, toxic waste, water pollution, and carbon emissions.

• China accounts for about 13% of world carbon emissions, ranking second behind the United States. Per capita emissions, however, are significantly lower than in the United States (0.7 metric tons/person compared with 5.42 metric tons/person in the United States). China's rapidly growing carbon emissions are expected to account for 19% of the world total by 2015.

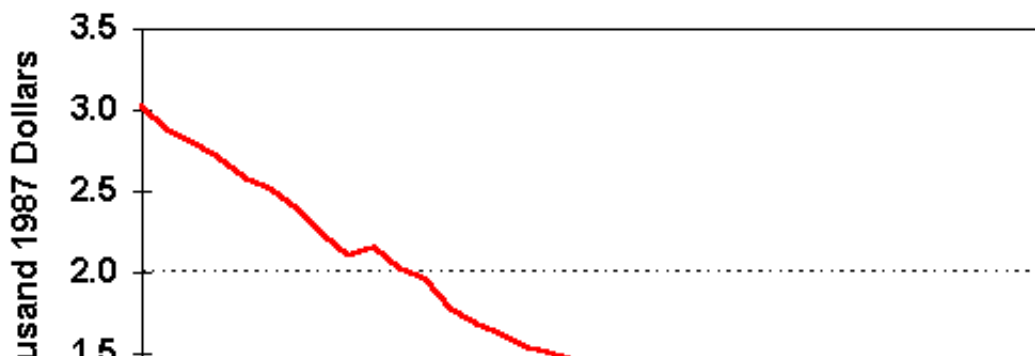
• Sulfur dioxide levels in nearly all Chinese cities greatly exceed international standards. Three of China's cities (Shenyang, Beijing, and Xian) are among the world's ten most polluted. This is mostly attributed to the economy's heavy reliance on coal.

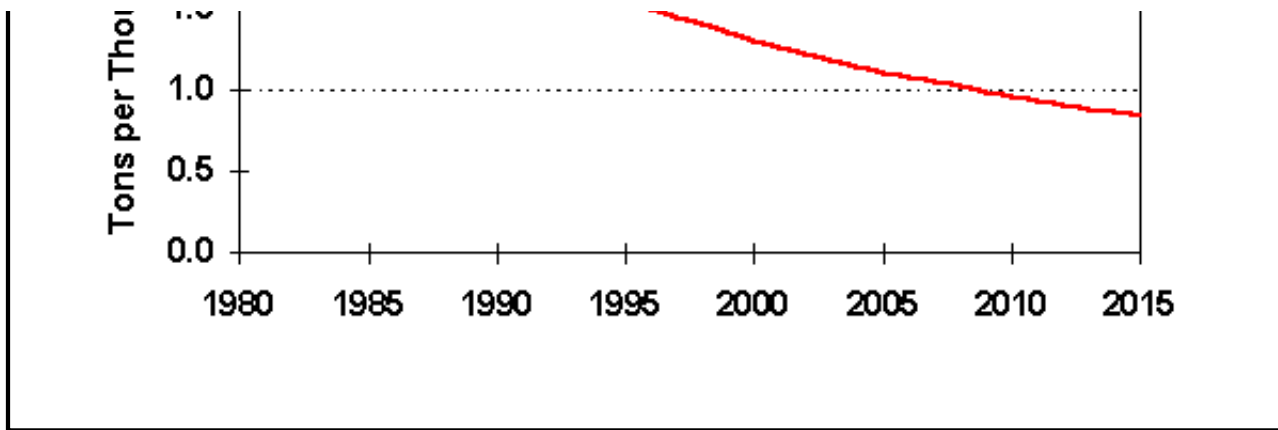
• China's Agenda 21 program, developed following the United Nations Conference on Environment and Development held in Rio de Janeiro in June 1992, presents an ambitious plan for dealing with these environmental problems.

• Energy-related features of the plan include increased emphasis on efficiency, renewable power sources (including hydroelectricity), clean coal technology, combined cycle power plants, and nuclear power.

• China is seeking financial and technological assistance from other countries and foreign investors to achieve its sustainable development goals.

Carbon Emissions Per Unit of GDP, 1980-2015





China in a World Context: 1995

Country	Gross Domestic Product (Billion 1987 Dollars)	Population (Millions)	GDP per Capita (1987 Dollars)	Energy Consumption (Quadrillion Btu)	Carbon Emissions (Million Metric Tons)	Energy/GDP Ratio (Thousand Btu/\$1987)	Number of People per Car	Percent of Households with Electricity (1994)
Argentina	129.1	34.8	3709	2.5	34.5	19.4	7	90%*
Brazil	332.6	155.8	2135	6.8	67.0	20.4	14	91%*
China	532.9	1211.7	439	35.7	807.5	67.0	290	80%
Russia	246.9	148.1	1677	26.8	428.7	108.5	21**	N.A.
India	378.6	935.7	405	10.5	213.2	27.7	272	88%
Indonesia	129.4	193.8	668	3.1	52.2	24.0	109	39%
Mexico	155.3	94.9	1636	5.6	92.6	36.1	11	95%
Poland	66.0	38.6	1710	3.8	84.0	57.8	11	N.A.
South Africa	90.2	41.2	2189	5.5	135.1	61.0	11	44%
South Korea	252.1	44.9	5615	6.3	102.0	25.0	8	100%
Turkey	116.5	61.6	1891	2.5	43.0	21.4	20	N.A.
United States	5452.5	263.4	20700	88.3	1415.1	16.2	2	100%
World Total	21282.3	5724.4	3718	362.2	6063.1	17.0	12	N.A.

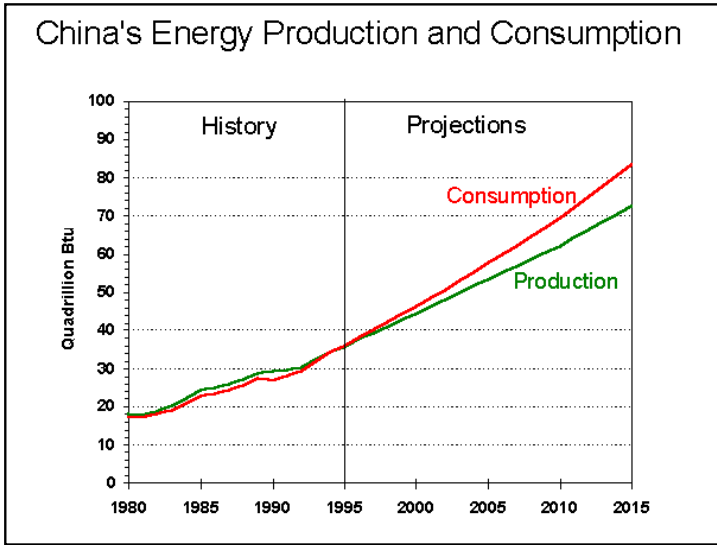
NOTES

* Urban population only

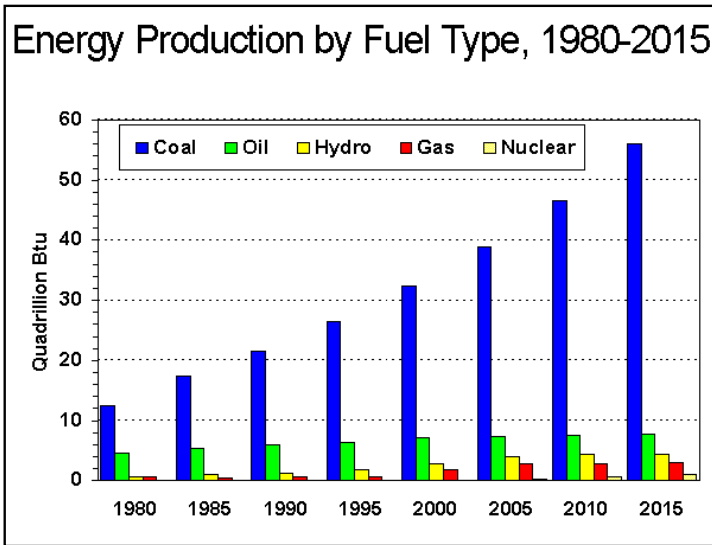
** For all of the Former Soviet Union

China's Energy Demand Now Exceeds Domestic Supply

- China is currently the second largest energy consumer in the world, following the United States (about 36 quadrillion Btu in 1995 versus 88 quadrillion Btu in the United States).
- China's rapidly growing economy will drive energy demand growth of about 4-5 percent annually through 2015 (compared with growth of about 1 percent in the industrialized countries). China currently consumes about 10 percent of the world's energy, and also accounts for about 10 percent of world energy production.
- China became a net importer of energy in 1995, and is expected to become increasingly dependent on imports; however, it is expected to remain a net exporter of coal through the forecast period. China has been a net importer of oil since 1993.
- Production and distribution of energy will be one of China's greatest challenges in coming years. For instance, only about 80 percent of the population is hooked up to China's electrical grid; energy reserves are far from consumption centers; and bottlenecks exist in transportation and electricity distribution (for example, 60 percent of rail transport is tied up in transporting coal).



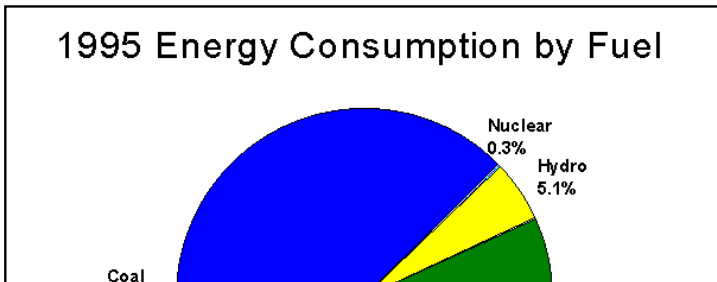
China's Energy Production is Dominated by Coal...

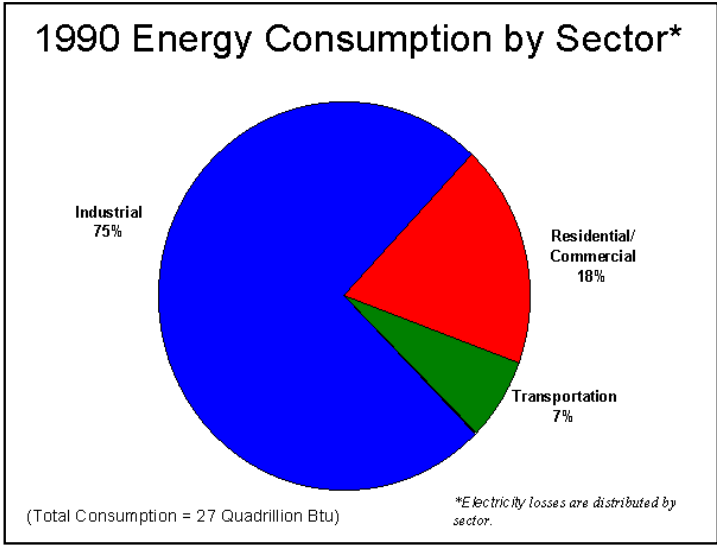
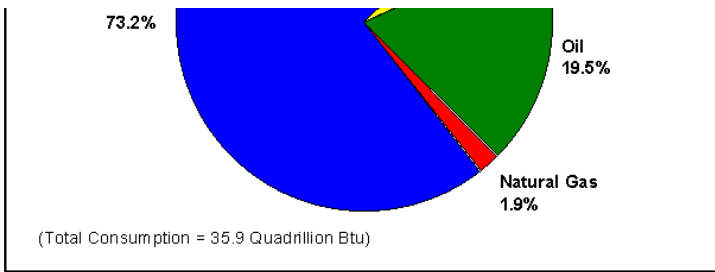


- In 1995, coal accounted for 74.5 percent of China's primary energy production. In the same year, petroleum accounted for 18.1 percent, hydroelectricity 5.1 percent, natural gas 1.9 percent, and nuclear power 0.4 percent.
- China's electricity is generated overwhelmingly by coal (about 75 percent). Hydroelectricity ranks a distant second (about 20 percent), followed by oil, gas, and nuclear power, which account for the remaining 5 percent.
- Coal is expected to retain its importance in China's fuel production mix, increasing its share to 77.4 percent of the total by 2015 (from 74.5 percent in 1995). Hydroelectricity, natural gas, and nuclear energy will also become increasingly important, while the petroleum share declines.
- The natural gas share of total energy production is expected to grow to about 4.1 percent by 2015, as China begins to take greater advantage of its large domestic reserves. The hydroelectric share is expected to reach 6.2 percent, and the nuclear share 1.6 percent, as the petroleum share falls to 10.7 percent.
- Overall, China's energy production is expected to reach about 44.3 quadrillion Btu (quads) in 2000, about 2.5 times 1980's production of 18.1 quads, largely due to a doubling of coal output. By 2015, overall energy production is expected to reach 72.5 quads, of which 56.1 quads is projected to be coal. (For comparison purposes, the United States produced about 69 quads in 1995).

Coal Made Up Three-Quarters of China's 1995 Energy Consumption...

- China consumed 35.9 quadrillion Btu (quads) of energy in 1995, representing about 9.8 percent of world energy consumption. Of this amount, coal accounted for 26.3 quads (73.2 percent) and petroleum another 7.0 quads (19.5 percent).

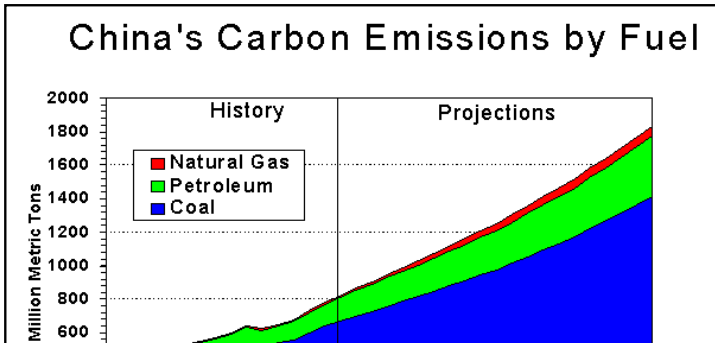




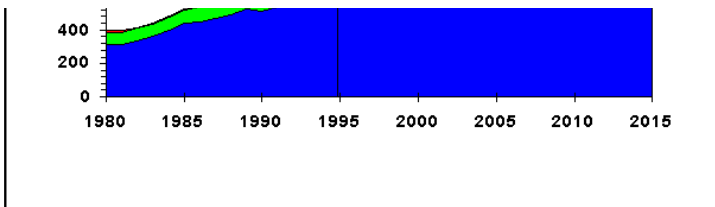
- The industrial sector historically has accounted for about 75 percent of China's energy consumption. Continuing increases in industrial energy efficiency are expected from such measures as installation of more efficient boilers. At the same time, however, industry is likely to become more electricity-intensive as it phases out direct fuel burning.
- The transportation sector, in contrast, accounts for only about 7 percent of China's energy consumption; however, transportation demand is projected to increase rapidly.
- China's electricity demand more than doubled between 1986 and 1995, and is expected to triple between 1995 and 2015. The residential/commercial sector should experience the most rapid growth in electricity demand, driven largely by enormous increases in appliance ownership and continued electrification of rural areas.

China's Energy-Related Carbon Emissions Are Heavily Concentrated in the Industrial Sector and are a Result of China's Reliance on Coal...

- China's industrial sector *alone* emitted 485 million metric tons of carbon in 1990, or about 75 percent of the country's total carbon emissions in that year. For perspective, China's industrial carbon emissions are greater than total emissions from any country in the world, except for the United States and Russia.
- China's carbon emissions increased about 5 percent per year in all economic sectors between 1980 and 1990. In absolute terms, industrial carbon emissions grew the most (about 180 million metric tons), while transportation sector emissions grew the least (about 15 million metric tons) during the 1980s.



- China's carbon emissions are expected to increase about 4 percent annually through 2015, driven by rapid economic growth and a rapid increase in coal use. The country's total carbon emissions should exceed 1.8 billion metric tons in 2015, over three times the 1986 emissions of 543 million metric tons and more than double the 1995 emissions of 808 million metric tons.



Energy in China's Ninth 5-Year Plan (1996-2000)

"The ability of (the) energy industry in propping up national economic growth will be further strengthened."

Total Energy

Increase total energy output by about 9% by 2000.
Improve energy efficiency by 5% annually.

- Coal and electric power industries among 15 industries targeted for technological upgrading.
- Iron and steel, nonferrous metals, chemicals, building materials, and transportation industries targeted for efficiency improvements.
- Top priority to conservation, but promoting both conservation and development.
- Emphasis: Power development based on coal, oil and gas exploration, and development of new energy.

Electric Power

Increase capacity and generation by 7% annually.
Reach 290 gigawatts in generating capacity and generate 1.4 trillion kilowatthours annually by 2000.

- Simultaneous promotion of hydro and thermal sources; "appropriate" development of nuclear.
- Development of power stations near coal mines.
- Requirements for new thermal capacity: high-parametric, high-efficiency, minimum 300 megawatts.
- Emphasis on flue gas desulfurization and extra-high voltage transmission technologies.
- New generation to include wind power, marine energy, and geothermal power.

Coal

Increase total output to 1.4 billion tons by 2000.

- Emphasis on stabilizing output in the east and developing mines in Shanxi, Shaanxi, and Inner Mongolia.
- Accelerated development of technology for cleaning coal.
- Use of high-quality anthracite from Shanxi's Jicheng as base for chemical fertilizers.

Oil and Natural Gas

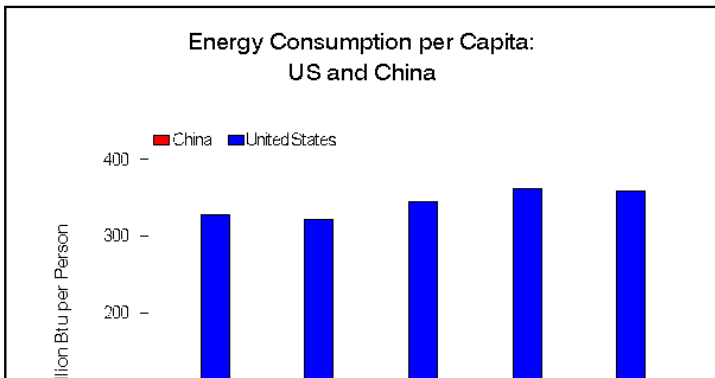
Boost proven reserves: Add 33 billion barrels of crude oil and 17.7 trillion cubic feet of natural gas by 2000.
Increase crude oil output to 3.1 million b/d and refinery output to 4.5 million b/d by 2000.
Increase natural gas production to 833 billion cubic feet by 2000.
70% of urban households to use gas fuel by 2000.

- Onshore principle: Stabilize production in the east, increase production in the west, exploit both oil and gas at the same time, expand the scope of opening up to development.
- Offshore principle: Continue to open up, expand the scope of independent operation, exploit both gas and oil at the same time, steadily increase production.
- Increase efforts to prospect resources and increase proven reserves.
- Some output should come from overseas resources.
- Full use of natural gas from Hainan and associated natural gas from Xinjiang oil fields for large-scale nitrogenous fertilizer plants.
- Upgrading/expansion of refineries in Zhenhai, Maoming, and Fujian.; no more production of leaded gasoline.
- Add/improve pipelines and storage facilities.

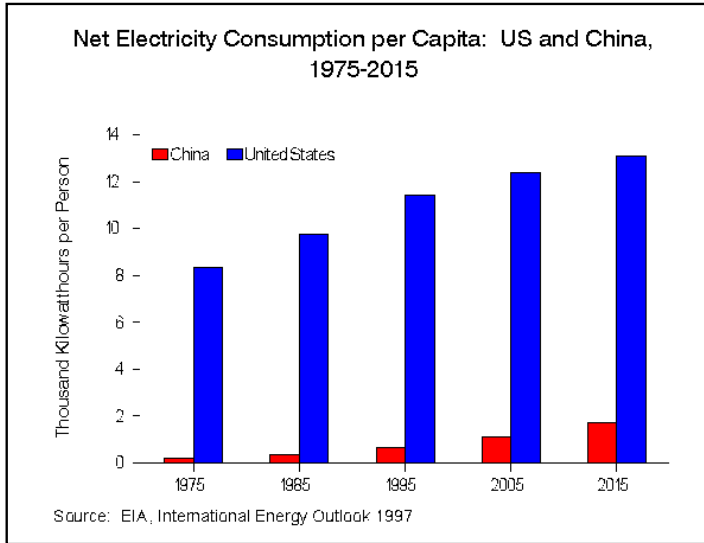
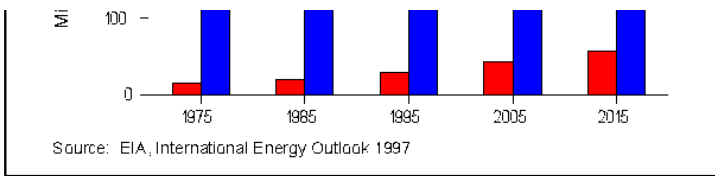
United States - China Energy Comparisons

The following charts depict comparisons between the United States and China for the following energy statistics:

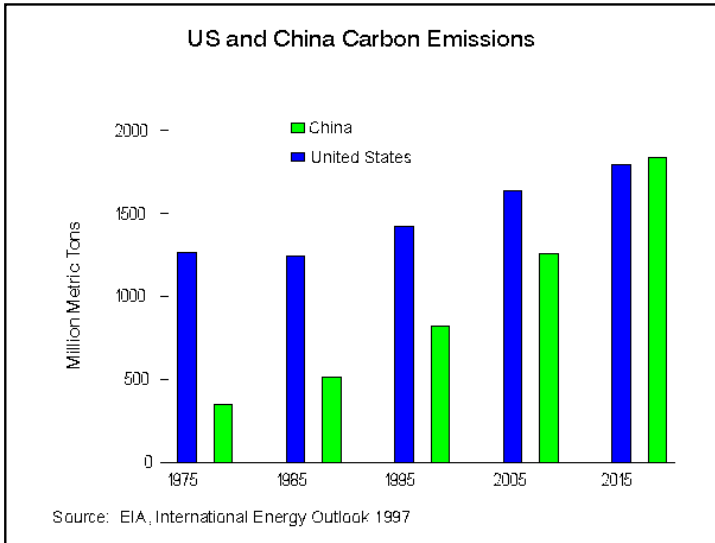
- [Energy Consumption Per Capita, 1975-2015](#)
- [Electricity Consumption Per Capita, 1975-2015](#)
- [Carbon Emissions from Energy Sources, 1975-2015](#)
- [Number of Vehicles Per 1000 People, 1985-2015](#)
- [Energy Intensity, 1970-2015](#)



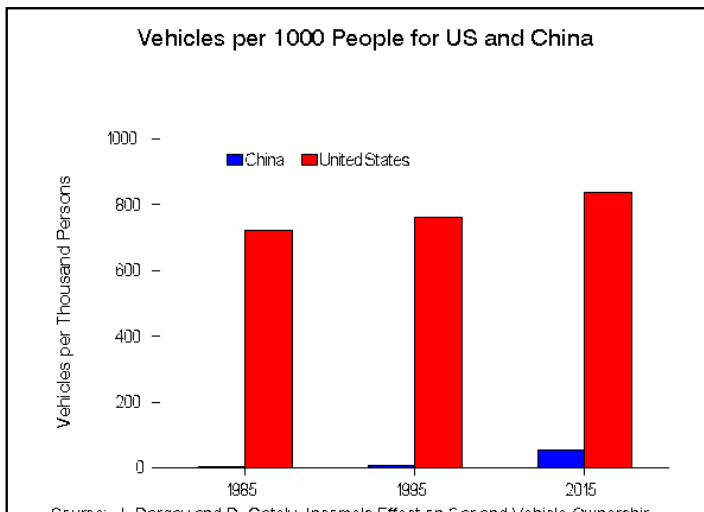
Although China's energy consumption is growing rapidly (estimated 4.3% annual growth between 1995 and 2015), the average person in the United States in 2015 is expected to consume over 6 times as much energy as the average person in China.



Although China's electricity consumption is growing rapidly (estimated 5.7% annual growth between 1995 and 2015), the average person in the United States in 2015 is expected to consume over 7.5 times as much electricity as the average person in China.



Currently, the United States is the world's largest emitter of carbon emissions from energy. However, China is expected to overtake the United States as the number one emitter in the world by 2015.



Although the number of vehicles per 1000 people in China is expected to increase by more than 6 fold between 1995 and 2015 (8.5 per 1000 in 1995 and 55 per 1000 in 2015), it is still much less than the estimated 840 vehicles per 1000 people in the United States in 2015.

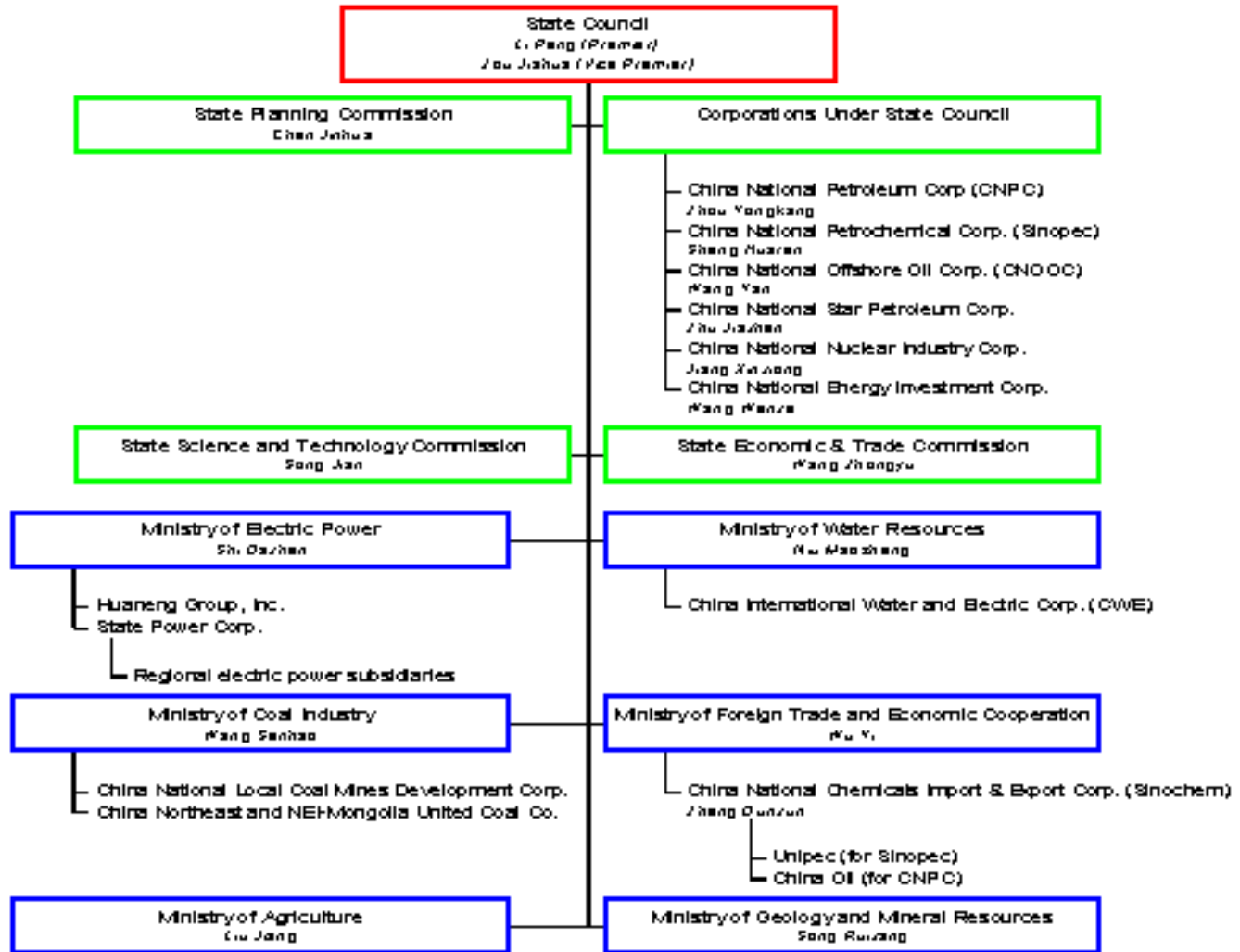
China's energy intensity (the amount of energy consumed per unit of economic output) is expected to decline at a rapid rate through 2015, due

Source: J. Dargay and D. Gately, INCOME'S EFFECT ON CAR AND VEHICLE OWNERSHIP, Worldwide

largely to adoption of more efficient factories and power plants.

At present, China has one of the highest energy intensities in the world, although this has dropped rapidly since the late 1970s as the country has introduced more market-oriented incentives into its economy.

Organization of China's Energy Industry



The Key Decision-Makers Affecting China's Energy Sector ...

- **Three types of organizations** govern China's energy sector: **Ministry-level corporations** run the highly centralized petroleum and nuclear industries (reporting to the State Council, headed by Premier Li Peng with Zou Jiahua the vice premier for energy issues), while **energy ministries** and **affiliated national corporations** run the less-centralized electric power and coal industries.
- The **State Planning Commission (SPC)** has ultimate authority for energy project approval, budget allocations, and financing arrangements. The **State Science and Technology Commission (SSTC)** and the **State Economic and Trade Commission (SETC)** are also involved with energy industry development. The **China National Energy Investment Corporation** oversees major investment loans for the energy sector. Current president: **Wang Wenze**.
- The **China National Petroleum Corporation (CNPC)** is responsible for all onshore upstream oil and gas operations, including shallow water areas. In the past few years, CNPC has begun the transformation into a multinational integrated oil company, establishing subsidiaries and acquiring overseas acreage and refineries in pursuit of export markets. The **China National Offshore Oil Corporation (CNOOC)** was established in 1982 to explore China's offshore petroleum resources. CNOOC has four regional subsidiaries (Bohai, East China Sea, Nanhai East, and Nanhai West) and several specialized subsidiaries. Current president: **Wang Yan**. China established a third state oil company, **China National Star Petroleum Corporation**, in January 1997. The company is awaiting central government approval of four proposed exploration ventures with foreign companies. The **China National Petrochemical Corporation (Sinopec)** is responsible for petroleum processing and product distribution, controlling production facilities for 90 percent of China's refined oil products and over three-quarters of its petrochemicals. Current president: **Sheng Huaren**. The **China National Chemicals Import and Export Corporation (Sinochem)** is primarily involved in imports and exports of crude oil, petroleum products, and natural gas. Current president: **Zheng Dunxun**.
- The **Ministry of Coal Industry** allocates national coal production and coordinates production activities by central-government-controlled mines (about 45 percent of nationwide production) and "local" mines (collective or private-ownership mines as well as state-owned mines operated at the provincial, prefectural, or county level). Current minister: **Wang Senhao**. The **Ministry of Power Industry** (current minister: **Shi Dazhen**), which regulates power production, is being transformed into a new national power company. **State Power Corp.** was established in 1997 to handle business aspects of the industry, with generation and transmission the responsibility of regional subsidiaries. The **Ministry of Water Resources** is concerned with China's hydropower production. Current minister: **Niu Maosheng**. The **China National Nuclear Corporation** is a conglomerate of more than 200 enterprises and institutions concerned with China's nuclear power production and waste disposal facilities. Current president: **Jiang Xingxiang**.

Key Details About Coal in China ...

- **China is the largest producer of coal in the world.** Production totaled about 1.5 billion short tons in 1995 (compared with about 1 billion short tons in the United States). **China's estimated total coal resources are second only to the former Soviet Union**, although proved reserves rank behind both the United States and the former Soviet Union--due mainly to a lack of exploration.
- More than half of China's **recoverable reserves (estimated at more than 126 billion short tons)** consist of anthracite and bituminous coal. China has concentrated its resource development efforts on these higher grade coals, so that **bituminous accounts for about 75 percent of annual production** and anthracite most of the rest.
- **Less than half of China's coal production is now centrally administered**, with the majority produced by either **local state-owned mines** or **rural collectives**. In the early 1980s, the central government began to encourage the development of small coal mines in rural areas. Some of these mines are individually owned. Amendments to China's Mineral Resources Law, effective January 1997, provide a comprehensive legal framework for exploration and exploitation and could encourage foreign investment.
- **Northern China, especially Shanxi Province, contains most of China's easily accessible coal** and virtually all of the large state-owned mines. Coal from southern mines tends to be higher in sulfur and ash, and therefore unsuitable for many applications.
- **The biggest coal-consuming sectors are industry and electric power generation.** Regional imbalances between coal supply and demand necessitate the transporting of large quantities of coal--generally from northern areas to the south and east.
- **Transportation bottlenecks are a problem in the coal industry**, with the high content of dirt and rocks included in shipments (only 20-25 percent of coal is now washed) taxing the system even further. Coal accounts for a larger percentage of freight than any other commodity in China. More than 50 percent of the coal is shipped by rail. The major north-south lines are Zhengzhou-Wuhan and Xuzhou-Nanjing, and the primary east-west line is Datong-Qinhuangdao. Solutions include rail expansion projects and alternatives such as coal pipelines, liquefaction, and coal-by-wire (i.e., siting power plants at minemouths).
- **China is a net exporter of coal.** China tripled its coal exports between 1980 and 1990, as newly built coal washing, rail, and port facilities made more of its high quality coal available for export. Japan, China's biggest customer, has provided loans for the improvement of railroads and ports for the overseas transport of Shanxi coal. Both North and South Korea are important destinations for Chinese coal.

Key Details About Oil and Gas in China ...

- China's oil and gas industry is **almost exclusively government-owned**, with the exception of a limited number of joint ventures, and focussed on oil development (although the current 5-Year Plan seeks to take greater advantage of natural gas resources).
- **Most oil is produced onshore by the China National Petroleum Corporation (CNPC)**. The central government maintains active control over China's most productive fields, including the **Daqing field** in the Songliao Basin of northeastern China and the Shengli and Liaohe fields in the Bohai Basin of northeastern China. The **China National Oil Development Corporation (CNODC)**, a CNPC subsidiary, is the contracting agent for cooperation with foreign companies in the onshore oil industry. **China National Star Petroleum Corporation** (established in 1997) is pursuing exploration ventures with foreign companies. By late 1996, almost 1 million square miles (including the southern provinces, the southeast sector of the Tarim Basin, and areas in northern and eastern China) were open to foreign companies, and 30 petroleum contracts worth \$770 million had been signed with 35 companies. The **China National Offshore Oil Corporation (CNOOC) has traditionally sought foreign investment** for offshore oil, which represents a relatively small share of China's oil industry. As of late 1996, foreign commitments totaled nearly \$3 billion (almost 60% of total offshore exploration and development).
- **The China National Petrochemical Corporation (Sinopec) produces most of China's refined petroleum products**. China's first joint venture refinery, West Pacific Petrochemical Company (20% owned by Total SA of France) opened in late 1996. Through 2000, however, China's investment plans emphasize upgrading and expanding existing refineries, in some cases to handle imported crude oil from the Middle East.
- The **China National Chemicals Import and Export Corporation (Sinochem) dominates oil and gas trade**, with import and export quantities determined by State planners. However, Sinochem also has partnerships with CNPC (China National United Oil Corporation, also referred to as **China Oil**) and Sinopec (the China International United Petroleum and Chemical Corporation, also referred to as **Unipec**). Some CNOOC production-sharing agreements also allow direct exports from offshore fields. Future import routes include planned oil and natural gas pipelines from Russia and Central Asia.
- **"Stabilize the East. Develop the West"** is the current slogan in China's petroleum industry, which is applying enhanced oil recovery techniques to older fields and investing in promising areas of the West--in particular the remote **Tarim Basin** in the harsh environment of the Taklamakan Desert. A less remote, but smaller, target for development is the **Turpan-Hami, or Tuha, Basin**. A new 300-mile pipeline serving both of these areas was completed in 1997. Territorial disputes in the South China Sea and Spratly Islands complicate offshore activities. The **South China Sea** is the most active offshore development area.

Key Details About Electric Power in China ...

- **China has the world's fastest growing electric power industry.** Yet, the Ministry of Electric Power estimates that about 15-20 percent of the country's electricity demand is not being satisfied. Up to 100 million people still lack access to electricity.
- **China's 1995 electric generating capacity has been estimated at about 190 gigawatts.** Most of this (about 75 percent) is thermal capacity--primarily coal. Natural gas is not used extensively.
- **Hydroelectric** generating capacity in China is also significant, and represents a particularly important source of electric power in the central and western regions. China has the greatest hydropower potential in the world; however, the location of this potential relative to markets and the environmental concerns associated with large projects could limit hydropower's contribution to China's electric generation needs. The **Three Gorges** project on the Yangtze River involves construction of the world's largest dam, with its 26 hydropower generating units (700 megawatts each) slated to provide a total of 18 gigawatts generating capacity by 2009.
- **Nuclear power** represents a relatively minor, but growing, share of China's electric generating capacity, with two plants currently in operation: **Qinshan** at Hangzhou Bay in Zhejiang province (288 megawatts) and a plant at Daya Bay in **Guangdong** province (1812 megawatts). China has plans for 9 additional units, totaling 8 gigawatts. By 2015, output from nuclear plants is projected to increase 9-fold over 1996 levels, accounting for about 4.5 percent of China's electric power generation. Under construction are two 600-megawatt units at the Qinshan plant and two 1,000-megawatt units at a new plant, **Lingao**, near Hong Kong.
- **Under the current 5-Year Plan (1996-2000), China plans to add about 16 gigawatts of generating capacity annually (including about 3.5 gigawatts per year of hydropower).** The goal is to achieve 290-300 gigawatts of installed capacity by 2000. China also plans to expand its electric power transmission system, link existing grids, and implement a unified national power grid by 2020.
- **About 20% of the funding for the electric power sector is expected to come from foreign investment**, a role recognized in China's first law governing electric power generation (enacted in 1996). In its first project open to international bidding, China has awarded a **build-operate-transfer** project (the 720-megawatt Laibin coal-fired plant) to a consortium headed by France's EDF. Bidding on a second project (a 600-megawatt plant in Hunan province) is underway.
- In addition, **industrial cogenerators** produce significant amounts of electricity for which only limited statistics are available. In energy-intensive process industries such as chemical, steel, refineries, and mining/minerals, it is typical for plants to generate their entire internal electric requirements and to export excess electricity to the local community.

Key Details About Renewable Energy in China...

- **China's renewable energy resources include biomass, geothermal, solar, and wind.** Further development of these resources could reduce China's growing dependence on imported oil, reduce the need for additional coal-fired power plants, and provide sources of energy for populations in remote areas not currently served by existing energy distribution systems.
- China has begun to invest in development of its **wind energy** resources. As of 1995, the country had 44 megawatts of wind power generating capacity, of which 14 megawatts were installed in 1995 alone.
 - Xinjiang province, in northwestern china, has announced plans to add 66 wind power generators to an existing wind power plant to create what would be the largest wind power base in Asia.
 - China's total wind generating capacity is projected to reach 350-600 megawatts by 2000, and should exceed 1 gigawatt by 2010.
 - The potential market for wind energy is estimated to be 1,336 megawatts, but the total energy resource base is significantly larger (an estimated 253,000 megawatts).
- China is also investing in development of its **geothermal energy** resources, with nearly 29 megawatts of generating capacity installed as of 1995 (up about 50 percent from 1990).
 - Geothermal capacity will nearly triple by 2000 (to 81 megawatts).
 - As with wind energy, the market potential and resource base are significantly greater: an estimated 1800 megawatts of geothermal resources, with market potential of 600 megawatts.
- China's **solar energy** resources are assessed at 4 megawatts per square meter.
 - Market potential for solar energy is estimated to be 135 peak megawatts.
 - In 1995, nearly 6 percent of U.S. photovoltaic exports went to Hong Kong (1125 peak kilowatts of capacity).
- **Biomass** resources are assessed at 260 million tons of oil equivalent.
- International assistance for development of China's renewable energy resources includes support from the **World Bank**. In fiscal year 1998, the Bank's Global Environmental Fund is funding appraisal projects for photovoltaics, wind, and biomass as well as hydroelectricity.



A Quick Snapshot of China's Coal Industry ...



Region	Description	Major Mines (> 5.5 Million Short Tons Per Year)	Production, 1993		Consumption, 1990		
			Total (Million Short Tons)	Share (%)	Total (Million Short Tons)	Share (%)	
Northeast	<u>Provinces:</u> Liaoning, Jilin, Heilongjiang	Jixi Hegang Fuxin Shuangyashan Qitaihe	Fushun Tiefu Pingzhuang Shenyang Tonghua	169	13	207	18
North	<u>Provinces:</u> Hebei, Shanxi <u>Municipalities:</u> Beijing, Tianjin <u>Autonomous Region:</u> Inner Mongolia	Datong Kailuan Xishan Yangquan Fengfeng	Lu'an Jincheng Fenxi Beijing Antai	474	37	261	22
East	<u>Provinces:</u> Jiangsu, Zhejiang, Anhui, Shandong, Fujian, Jiangxi <u>Municipality:</u> Shanghai	Huaibei Xuzhou Xinwen Yanzhou	Huainan Zaozhuang Feicheng Zibo	179	14	283	24
South-Central	<u>Provinces:</u> Hubei, Hunan, Henan, Guangdong, Hainan <u>Autonomous Region:</u> Guangxi	Pdingshan Yima	Zhengzhou Hebi	184	15	198	17
Northwest	<u>Provinces:</u> Shaanxi, Gansu, Qinghai <u>Autonomous Regions:</u> Ningxia, Xinjiang	Shitanjing	Tongchan	100	8	86	7
Southwest	<u>Provinces:</u> Sichuan, Yunnan, Guizhou <u>Autonomous Region:</u> Xizang	<i>All mines less than 5.5 million short tons per year.</i>		163	13	128	11
Total China				1268	100	1173	100

Source: China Energy Databook, Energy Policy 1994 (vol. 22, no. 7).

Note: Totals may not add due to rounding and conversion from metric to short tons.



A Quick Snapshot of China's Oil and Gas Industry ...



Proved Reserves (1/1/97)	Oil: 24 billion barrels Natural Gas: 41 trillion cubic feet		
Production (1996)	Oil: 3.1 million barrels per day Natural Gas: 0.7 trillion cubic feet		
		<u>Million Barrels Per Day</u>	<u>Percent of Total</u>
Major Oil Companies (1995 Production)	China National Petroleum Corporation (CNPC)	2.8	94.3
	China National Offshore Oil Corp. (CNOOC)	0.2	5.7
Major Producing Fields (1995 Production)	Daqing (CNPC)	1.1	37.6
	Shengli (CNPC)	0.6	20.2
	Liaohe (CNPC)	0.3	10.4
	Xinjiang (CNPC)	0.2	5.3
	TOTAL FOR 4 LARGEST FIELDS	2.2	73.5
Refining Capacity (1/1/97)	Total China (34 plants)	2.9	
		<u>Barrels Per Day</u>	
Major Refineries	Capacity as of 1/1/97:	Fushun	174,000
		Maoming	170,000
		Qilu	160,000
		Zhenhai (7/97 capacity)	160,000
		Gaoqiao	146,000
		Dalian	142,000
		Yanshan	140,000
Geographical Zones	Eastern Zone.....	Most developed producing region (includes Daqing, Shengli, and Liaohe fields)	
	Western Zone.....	Highly prospective (includes Tarim Basin); parts opened to foreign investment	
	Central Zone.....	Natural gas discoveries (Shan Gan Ning basin)	
	Southern Zone.....	Open to foreign investment since 1985	
	Offshore.....	Open to foreign investment since 1979	

Source: *Oil and Gas Journal*

Totals may not add due to rounding.



A Quick Snapshot of China's Electric Power Industry ...



Region	Description	Capacity, 1990		Gross Generation, 1993		Sales By Sector, 1990 (%) ^a
		Total (MW)	Hydro (%)	Total (GWh)	Hydro (%)	
North-east	Provinces: Liaoning, Jilin, Heilongjiang	19,472	18.3	112,240	7.4	Residential: 8.4 Transport: 0.6 Commercial: 1.0 Agricultural: 5.2 Industrial: 80.4 Other: 4.6
North	Provinces: Hebei, Shanxi Municipalities: Beijing, Tianjin Autonomous Region: Inner Mongolia	20,935	4.6	142,900	1.3	Residential: 5.7 Transport: 2.1 Commercial: 1.2 Agricultural: 10.5 Industrial: 74.7 Other: 5.7
East	Provinces: Jiangsu, Zhejiang, Anhui, Shandong, Fujian Municipality: Shanghai	38,381	13.4	244,310	8.4	Residential: 8.1 Transport: 0.6 Commercial: 1.3 Agricultural: 16.2 Industrial: 69.5 Other: 4.4
South-Central	Provinces: Hubei, Hunan, Jiangxi, Henan, Guangdong, Hainan Autonomous Region: Guangxi	34,141	41.5	188,580	32.1	Residential: 8.1 Transport: 1.1 Commercial: 1.8 Agricultural: 13.2 Industrial: 70.9 Other: 4.9
North-west	Provinces: Shaanxi, Gansu, Qinghai Autonomous Regions: Ningxia, Xinjiang	11,176	44.5	69,560	32.7	Residential: 4.6 Transport: 2.6 Commercial: 1.0 Agricultural: 12.3 Industrial: 3.8 Other: 4.4
South-west	Provinces: Sichuan, Yunnan, Guizhou Autonomous Region: Xizang	13,834	52.5	81,860	46.3	Residential: 9.1 Transport: 1.9 Commercial: 0.6 Agricultural: 6.8 Industrial: 77.6 Other: 3.9
Total China		137,929	26.1	839,440	18.1	Residential: 7.5 Transport: 1.2 Commercial: 1.3 Agricultural: 11.7 Industrial: 73.6 Others: 4.7

^aIndustrial sector includes auxiliary consumption of powerplant and system losses. Nationwide system losses are 12.9 percent of gross generation.

MW = Megawatt (1,000 kilowatts)

GW = Gigawatt (1 million kilowatts)

GWh = Gigawatthour

Sources: Asian Development Bank, *Electric Utilities Data Book for the Asian and Pacific Region*, 1993.
Lawrence Berkeley Laboratories, *China Energy Databook*, 1996.



