

# **APEC: Energy Issues and Trends**

**May 2000**

**Energy Information Administration**  
Office of Energy Markets and End Use  
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# Preface

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Asia-Pacific Economic Cooperation (APEC) member economies are beginning to prepare their energy sectors to meet the internal and external challenges of the 21st century. In response to this effort, the U.S. Department of Energy, in conjunction with the city of San Diego, is hosting the APEC Energy Ministers' Conference in May 2000. The theme for the APEC Energy Ministers' Conference, "Turning Vision Into Reality," refers to the implementation of policies to foster the creation of the energy infrastructure to meet the economic and environmental needs of the 21st century. APEC member economies will focus on strategies to implement existing policy commitments and to enhance investment in clean and sustainable energy development, on opportunities for regional energy market integration, and on continued transition to a market-oriented business climate. The regions' energy ministers and representatives of the private sector, multilateral institutions, and nongovernment organizations will work together to create a vision for the 21st century that will support clean and sustainable energy and economic development.

The following report by the Energy Information Administration (EIA), provides a quick, "executive summary"-style snapshot of the current energy situation in APEC Member Economies, as well as historical perspectives and future possibilities. For much more extensive detail on many of the APEC economies, please see the EIA Country Analysis Briefs (<http://www.eia.doe.gov/emeu/cabs>), *International Energy Outlook* (<http://www.eia.doe.gov/oiaf/ieo/index.html>), and international energy statistics (<http://www.eia.doe.gov/emeu/international/contents.html>).

To view this report electronically, please go to  
<http://www.eia.doe.gov/emeu/cabs/apec/apecbook.html>

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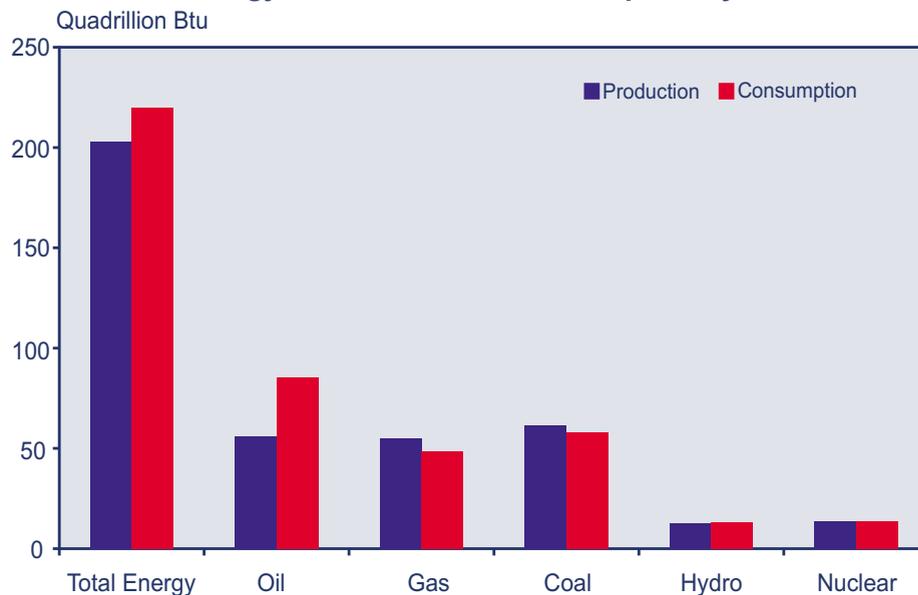




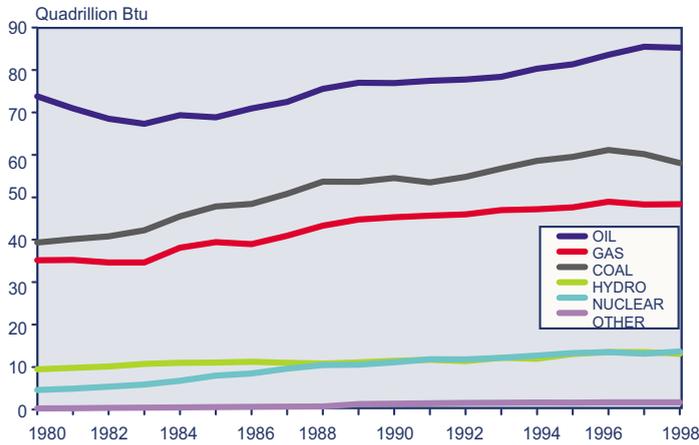
# APEC

- ◆ As a group, the Asia-Pacific Economic Cooperation (APEC) economies account for over half of world energy production and consumption. In 1998, APEC consumed 220 quadrillion Btu (quads) of energy and produced 203 quads, making it a net energy importer of 17 quads.
- ◆ In 1998, APEC accounted for 65%-70% of world natural gas, coal, and “other” production and consumption. APEC also accounted for around 56% of nuclear power production and consumption, and 48% of hydroelectric. APEC accounted for around 35% of world oil output and consumed 36%.
- ◆ In 1998, APEC was a significant (around 30 quads, or 14 million barrels per day — bbl/d) net oil importer. The United States was by far the largest net oil importer in APEC, followed by Japan, South Korea, Chinese Taipei, China, Singapore, and Thailand. All other APEC members were very small net importers or exporters, with the exceptions of Russia, Mexico, Canada, and Indonesia, all significant net oil exporters.
- ◆ APEC was a significant net natural gas exporter in 1998, largely as a result of Russian gas exports to Europe. Canada exported large volumes of gas, almost exclusively within APEC (to the United States). Japan imported large volumes of natural gas in 1998, all in the form of liquefied natural gas (LNG), mainly from Southeast Asia.
- ◆ APEC also was a significant net coal exporter in 1998, mainly coming from Australia, the United States, Indonesia, and China (Japan and South Korea were large net coal importers).

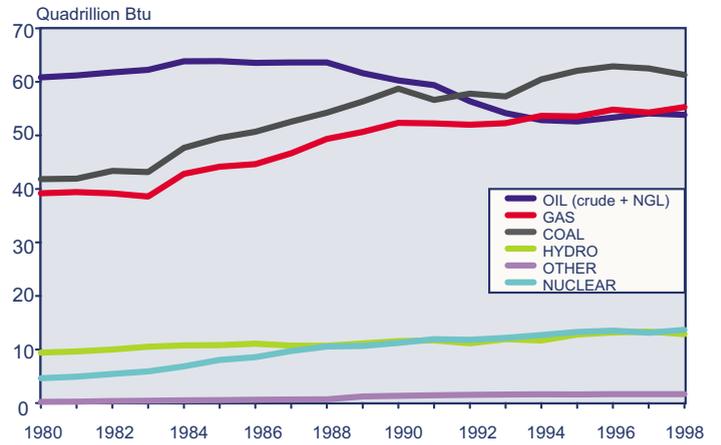
**APEC: Energy Production and Consumption by Fuel, 1998**



**APEC: Energy Consumption by Fuel Type, 1980-1998**



**APEC: Energy Production by Fuel Type, 1980-1998**



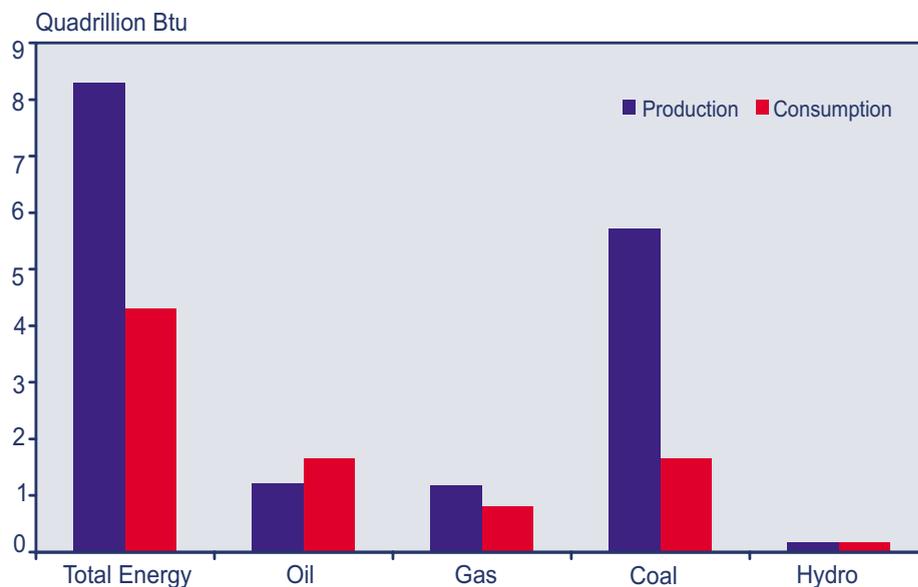
- ◆ Between 1980 and 1998, oil was consistently the leading fuel consumed within APEC, followed by coal, natural gas, hydroelectricity, nuclear power, and “other”.
- ◆ As far as APEC energy production is concerned, since 1980 coal has surpassed natural gas and oil in first place, while natural gas has surpassed oil for second place. Nuclear and hydroelectricity for years have been approximately tied for fourth place, while “other” consistently has ranked last over the time period.
- ◆ From 1980 through 1998, APEC energy consumption increased 35%. Oil consumption increased by 16% over that period, natural gas by 37%, hydroelectricity by 38%, coal by 48%, nuclear by 198%, and “other” (wind, geothermal, etc.) by 577% (from an extremely low base).
- ◆ From 1980 through 1998, APEC energy production increased 78%. Oil production increased by 40% over that period and natural gas by 113%. Hydroelectric output rose 64%, coal 75%, nuclear 233%, and “other” 574% (from an extremely low base).



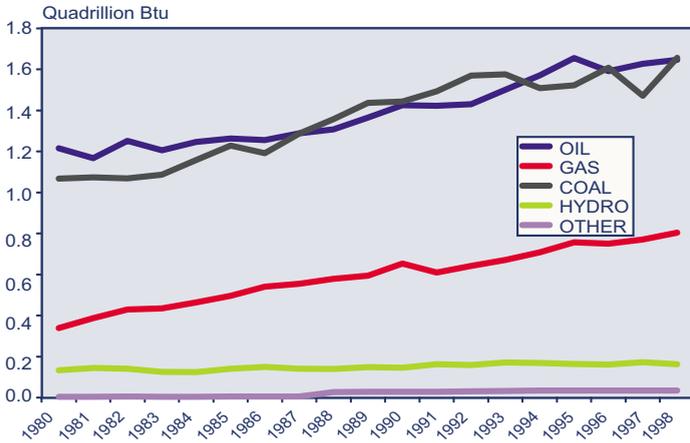
# Australia

- ◆ Australia is by far the world's largest coal exporter. For 1998, Australia's coal exports stood at 184 million short tons, largely to Japan. In late 1999 and early 2000, the Australian coal industry was hit by falling prices and demand. For environmental reasons, China represents a prospective new market for Australian low-sulphur coal exports.
- ◆ The Australian coal industry is undergoing a period of consolidation and cost-cutting, including Shell Coal's announcement that it intends to sell off its Australian operations.
- ◆ Due to the development of new finds, Australia's oil production is rising sharply. This reverses a slide in oil production in the late 1990s. One of the major new developments is the Laminaria-Corallina fields in the Timor Sea, currently producing around 140,000 bbl/d.
- ◆ Prospects for increased Australian sales of liquefied natural gas (LNG) have improved with the economic recovery in East Asia. In late 1999, China held high-level talks with Australia on the subject of possible LNG imports. Chinese Taipei also has expressed an interest in importing Australian LNG. Increased LNG demand may make it possible to move forward with a planned expansion of Australia's North West Shelf LNG facility, and possibly the stalled Gorgon Project in the longer term.
- ◆ Australia may embark on a project to build a pipeline to transport natural gas from Papua New Guinea to customers in Australia.
- ◆ The Australian government recently announced an increase in the requirement for utilities to buy electricity generated from renewable sources by an additional 2% by 2010. The new requirement is expected to generate \$2 billion in investment in renewable energy.

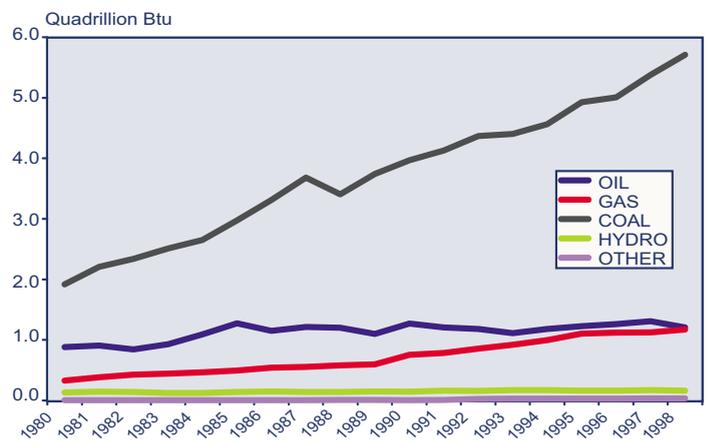
**Australia: Energy Production and Consumption by Fuel**



**Australia: Energy Consumption by Fuel Type, 1980-1998**



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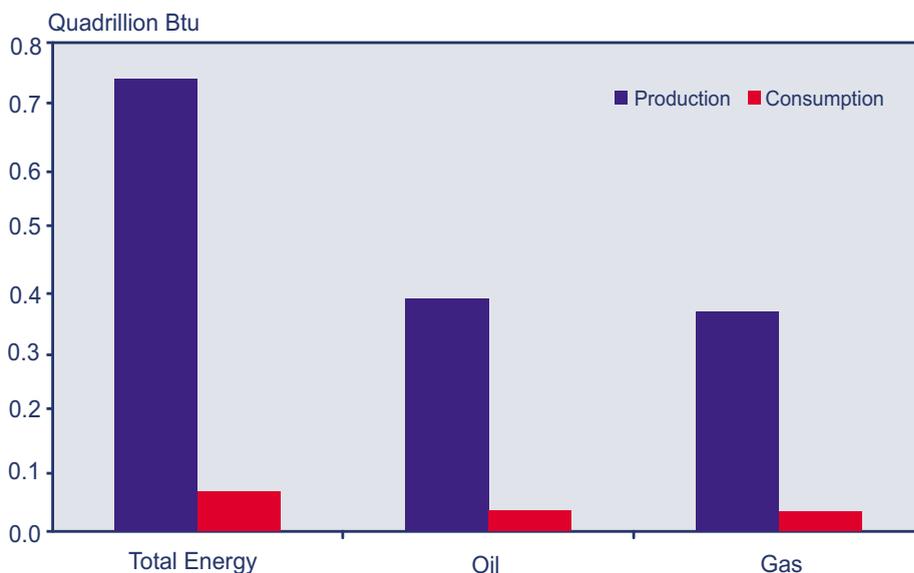
- ◆ From 1980 through 1998, Australia's energy consumption increased 56%. Oil consumption grew 35% over that period, coal 55%, natural gas 137%, hydropower 22%, and "other" (wind, geothermal, etc.) 816% (from an extremely low base).
- ◆ From 1980 through 1998, Australian energy production increased 154%. Coal production increased 198% over that period, oil production 37%, and natural gas output 256%. Hydropower output rose 22%, coal 198%, and "other" 816% (from an extremely low base).
- ◆ Since 1980, oil and coal have remained consistently as the top Australian energy consumption sources, with natural gas next (and growing), with hydropower and "other" far behind.
- ◆ As far as Australia's energy production is concerned, since 1980 coal has consistently widened its lead over oil and natural gas, with hydropower and "other" significantly behind.



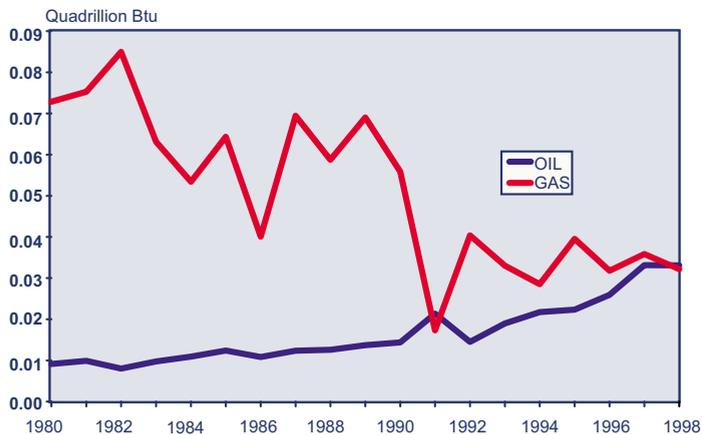
# Brunei

- ◆ Oil and gas exports account for around 90% of Brunei's hard currency export earnings.
- ◆ Brunei encourages foreign investment in its energy sector. The largest oil and gas firm in Brunei is Brunei Shell Petroleum. Shell is undertaking a program to introduce enhanced-recovery techniques to prolong the life of Brunei's existing oilfields, and is concentrating further exploration on deepwater areas offshore.
- ◆ Brunei Liquefied Natural Gas, a joint venture between Brunei's government and Royal Dutch Shell, produces LNG for sale to Japan and South Korea. Brunei is the fifth largest exporter of LNG in the world.
- ◆ OGP Technical Service recently has been awarded a contract valued at \$100 million for the development of a new natural gas compression plant in Brunei. The company is a joint venture in which Petronas of Malaysia is the largest shareholder.
- ◆ Petronas also recently concluded an agreement with the Brunei firm SKBB Holdings for the marketing of Petronas-branded petroleum products in Brunei.

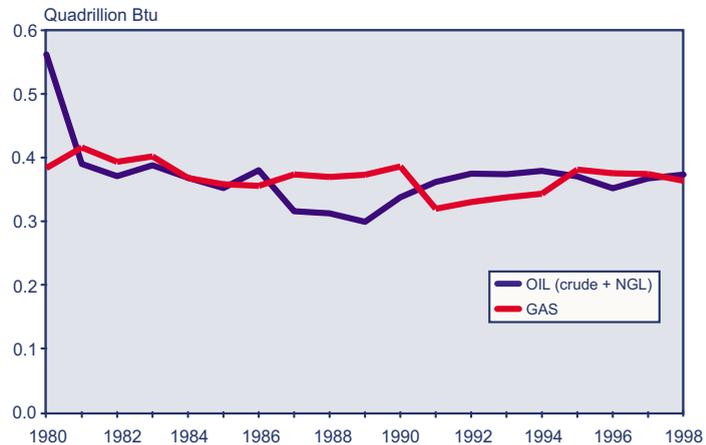
**Brunei: Energy Production and Consumption by Fuel, 1998**



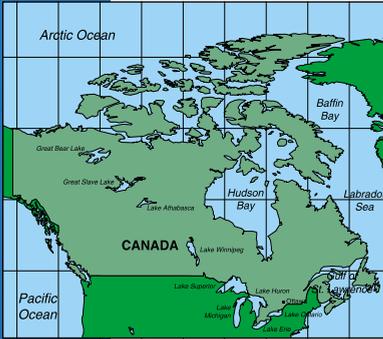
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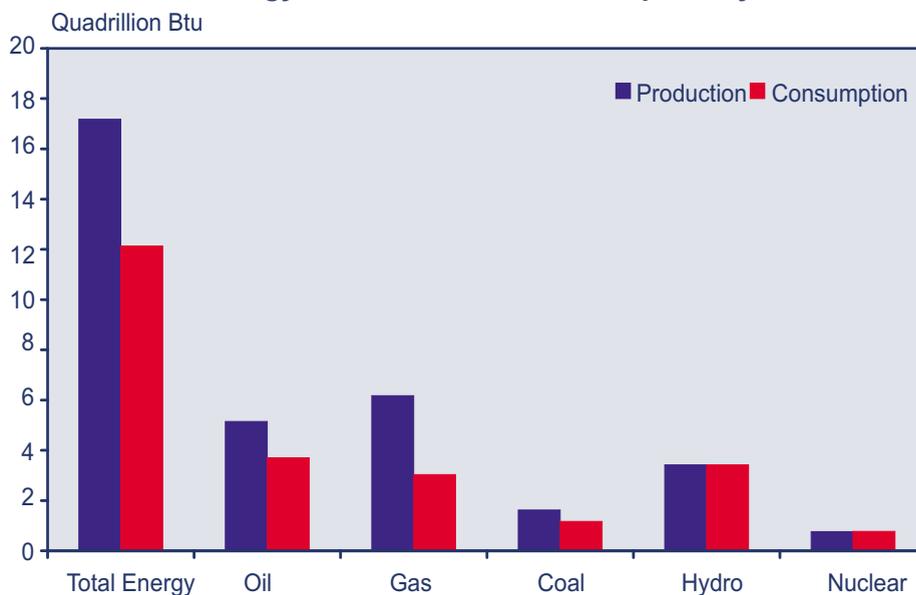
- ◆ From 1980 through 1998, Brunei's energy consumption fell 20%. Natural gas consumption fell 56% over that period, while oil increased 263% (from a very low base).
- ◆ From 1980 through 1998, Brunei's energy production fell 22%. Oil production fell 34% over that period and natural gas output fell 5%.
- ◆ Since 1980, Brunei has consumed and produced relatively small quantities of energy — exclusively oil and natural gas.



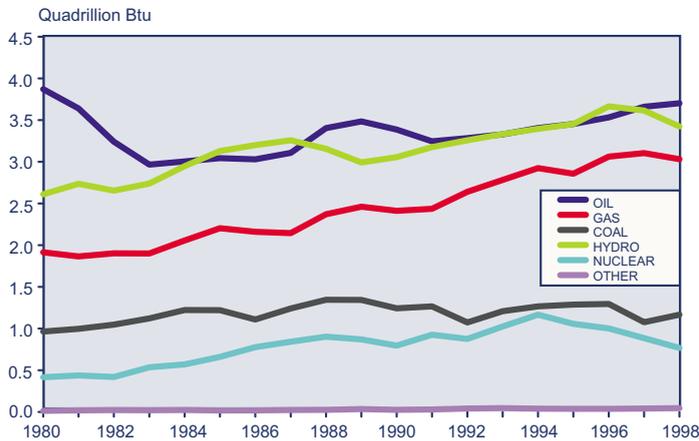
# Canada

- ◆ Canada is the world's fifth largest energy producer (after the United States, Russia, China, and Saudi Arabia). Canada is the world's third largest natural gas producer (behind Russia and the United States) and second largest gas exporter (behind Russia).
- ◆ There has been a trend toward consolidation in the Canadian energy industry over the past year. In 1999, Talisman Energy (Canada's largest independent oil and gas producer) took over Rigel Energy, U.S.-based Burlington Resources took over POCO Petroleum, U.S.-based Apache purchased most of Shell Canada's oil producing properties, and Canadian Natural Resources and Penn West acquired much of BP Amoco's reserves.
- ◆ Canada has among the world's largest reserves of oil sands. Synthetic crude oil production from oil sands is expected to increase over the next 25 years. In December 1999, a consortium of Shell Canada (operator), Chevron Canada, and Western Oil Sands announced plans to start construction on a C\$3.5-billion oil sands project in Alberta.
- ◆ Two new projects offshore of Newfoundland (the 1-billion-barrel Hibernia oil project, which could come onstream as early as 2000) and Nova Scotia (the 3.5-trillion cubic foot -- Tcf -- Sable Island gas project, which came onstream in December 1999) will significantly increase eastern Canada's oil and gas production.
- ◆ Between 1998 and the end of 2000, five new pipeline projects and an upgrade on a sixth will increase greatly Canada's natural gas exports to the United States, bringing the Canadian share of the U.S. gas market to 18%. Canada's gas exports to the United States have been growing steadily for a decade.

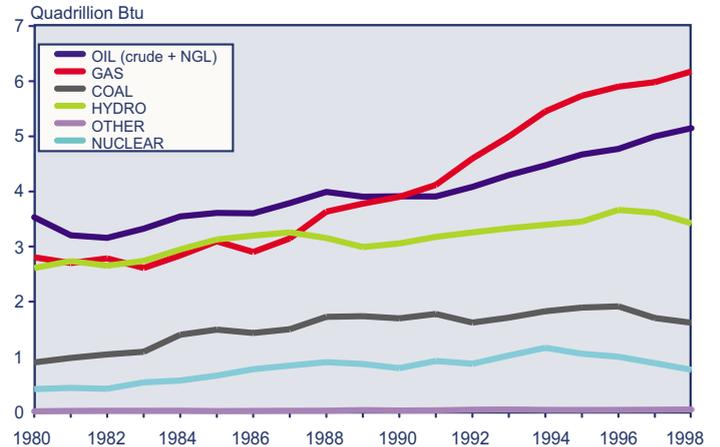
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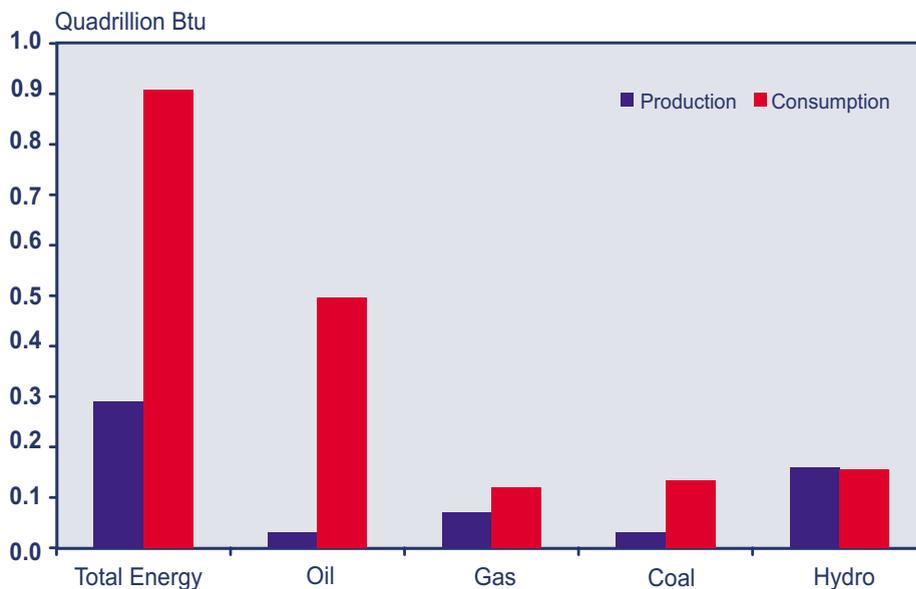
- ◆ The most populous Canadian provinces, Ontario, Quebec, British Columbia, and Alberta, are in the process of deregulating their power industries. Alberta was the first province to deregulate, and Ontario plans to have a competitive market in place by late 2000.
- ◆ From 1980 through 1998, Canada's energy consumption increased 24%. Hydropower consumption increased 31% over that period, natural gas 58%, coal 21%, nuclear 84%, and "other" (wind, geothermal, etc.) 256% (from an extremely low base). Oil consumption fell 4% from 1980 through 1998, largely due to demand response from the oil price shocks of the 1970s, but has risen since the oil price collapse of the mid-1980s.
- ◆ From 1980 through 1998, Canada's energy production increased 67%. Natural gas production increased 120% over that period, oil 46%, hydropower output 31%, coal 80%, nuclear 84%, and "other" 256% (from an extremely low base).
- ◆ Since 1980, oil and hydropower have remained consistently as the top Canadian energy consumption sources. Natural gas has been next (and rapidly growing), followed by coal and nuclear, with "other" far behind.
- ◆ As far as Canada's energy production is concerned, since 1990 natural gas has taken the lead over oil and hydropower, with coal and nuclear power next, and "other" significantly behind.



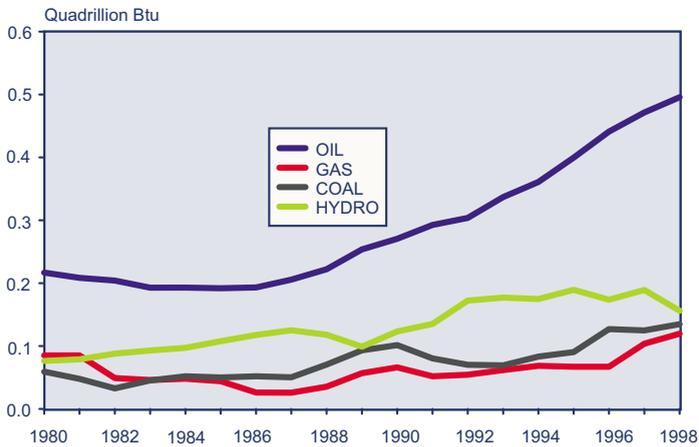
# Chile

- ◆ Chile is a net energy importer, with oil accounting for the largest share.
- ◆ Domestic oil production meets only about 10% of Chilean oil demand. Oil demand has doubled during the past decade, while production has declined by two-thirds.
- ◆ Chilean oil exploration, development, and refining are carried out by state-owned Empresa Nacional de Petróleo (ENAP), while private companies are involved in distribution. ENAP is seeking joint venture partners to help reactivate mature oil and gas fields in the Magallanes/Austral basin and Tierra del Fuego.
- ◆ Increasing Chilean natural gas demand and limited domestic supply have prompted a surge in gas pipeline construction between Chile and neighboring Argentina. The GasAtacama pipeline went into service in mid-June 1999, and the NorAndino and Gasoducto del Pacifico pipeline projects came onstream in November 1999. The GasAtacama and NorAndino pipelines run parallel to each other, and both serve a market that is gauged to be large enough to support volume from only one pipeline.
- ◆ The Chilean electricity sector has been privatized completely over the past 10 years. Companies competing to control Chile's utilities helped the economy register more than an 80% increase in foreign investment from January-September 1999 over those months in 1998.
- ◆ A severe drought from late 1997 to mid-1999 increased interest in diversifying Chilean power sources, now very dependent on hydropower. Natural gas is expected to play an increasing role as the share of hydropower declines.
- ◆ In November 1999, Chile and Argentina agreed to expand and link their electricity grids.

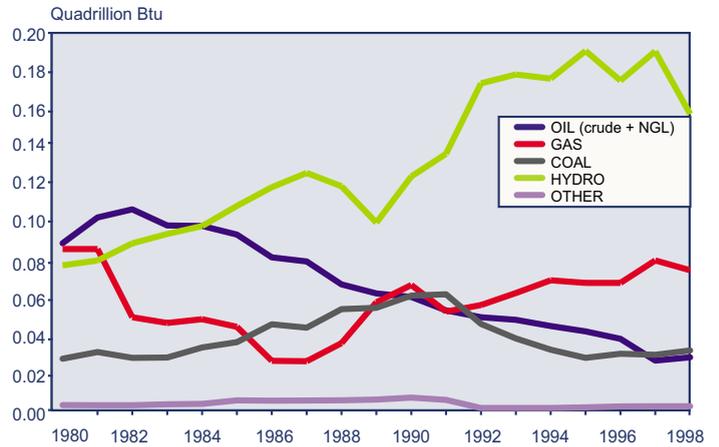
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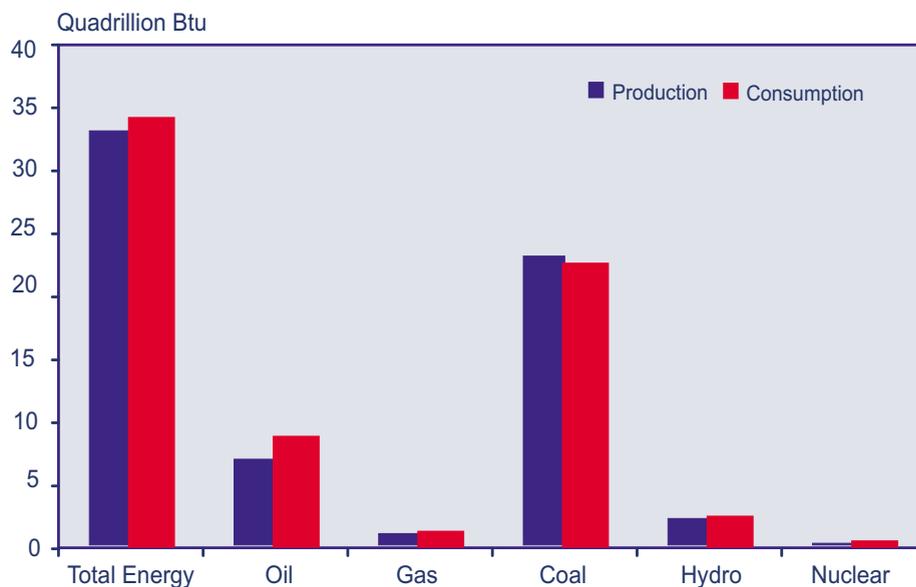
- ◆ From 1980 through 1998, Chile's energy consumption increased 106%. Oil consumption increased 129% over that period, hydropower 105%, coal 127%, and natural gas 41%.
- ◆ From 1980 through 1998, Chile's energy production increased 4.5%. Hydropower, which accounts for more than half of Chile's total energy production, increased 105%. Coal, which makes up a far smaller share, grew 16%. Natural gas and oil production both fell over that period, 13% and 68%, respectively.
- ◆ Since 1980, oil has remained consistently as the top Chilean energy consumption source, with hydropower, natural gas, and coal far behind.
- ◆ Since 1980, Chile has produced a varying mix of hydropower, natural gas, oil, and coal, with small amounts of "other."



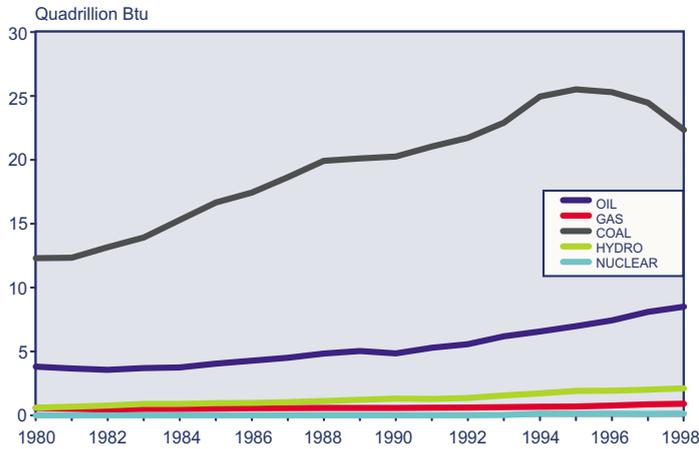
# China (PRC)

- ◆ China is the world's largest producer and consumer of coal, China's primary fuel. In 1998-1999, China saw an oversupply of coal to which the Chinese government responded by closing small-scale coal mines. China's coal consumption is projected to grow 3.9% annually through 2020, which is a slower rate of growth than projected for other fossil fuels.
- ◆ China's oil industry is in the midst of a major restructuring. In 1998, the bulk of state-owned oil industry assets were grouped into two vertically integrated firms, China National Petroleum Corporation (CNPC) and China Petrochemical Corporation (Sinopec). CNPC has formed a holding company, PetroChina, in which it offered shares on the New York Stock Exchange in early April 2000.
- ◆ New offshore oilfields discovered recently in the Bohai Bay area will help China expand its domestic crude oil production.
- ◆ Growth in China's petroleum consumption is projected at an average of 3.8% through 2020. China became a net oil importer in 1993, and its oil imports continue to increase rapidly.
- ◆ While natural gas has not constituted a large share of China's energy mix in the past, demand has begun to grow more rapidly in recent years. Gas-fired power could provide a cleaner alternative to coal for power plants located along the heavily populated Pacific coast. Gas pipelines are under consideration from both the Tarim Basin deposits in Xinjiang and from Russia. Imports of LNG also have been under consideration.
- ◆ Economic growth has led to huge increases in demand for electric power in China. While coal is expected to remain the primary fuel for electric power generation, hydropower and natural gas-fired plants will supply an increasing share of China's electricity. China plans to increase hydroelectric generating capacity by more than 75% between 2001 and 2010.

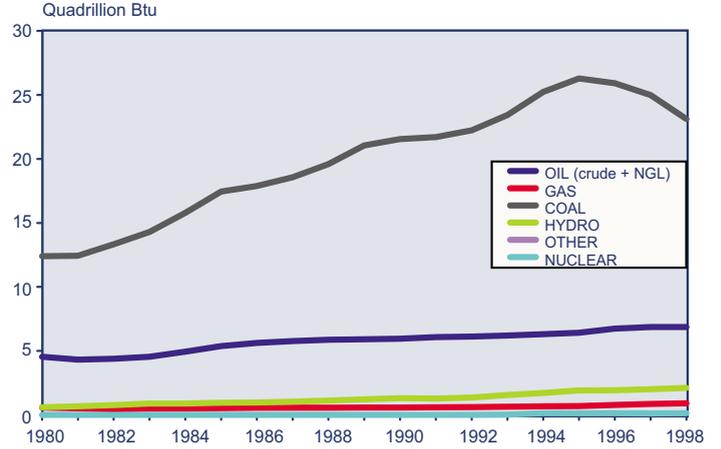
**China: Energy Production and Consumption by Fuel, 1998**



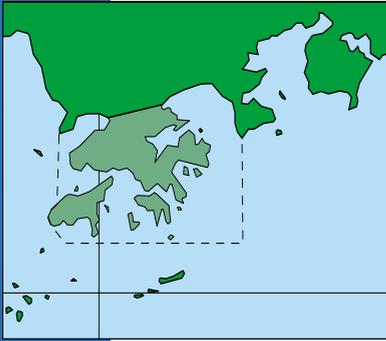
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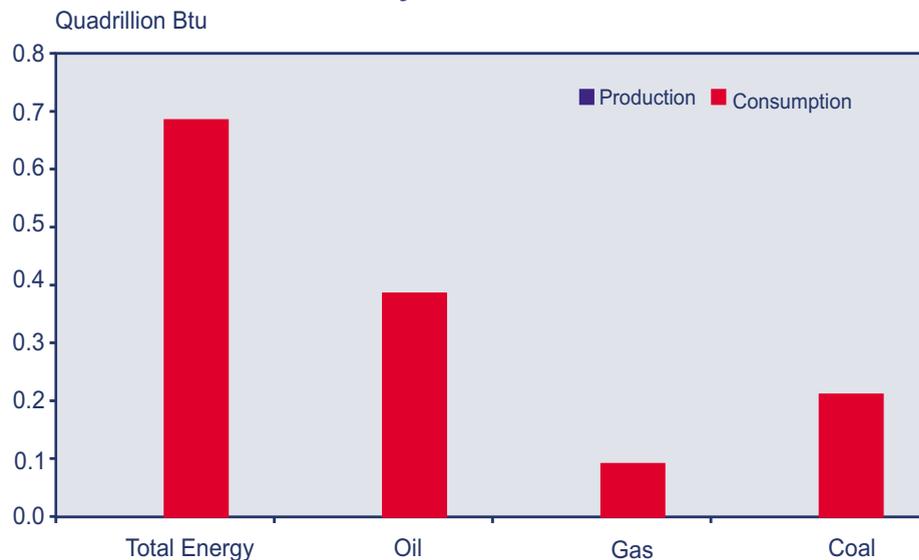
- ◆ From 1980 through 1998, China's energy consumption increased 97%. Coal consumption increased 82%, oil 123%, hydropower 252%, and natural gas 52%. Nuclear power went from zero in 1980 to 0.14 quads in 1998.
- ◆ From 1980 through 1998, China's energy production increased 83%. Coal production increased 87%, oil 51%, hydropower 252%, and natural gas 56%.
- ◆ Since 1980, coal has remained consistently as the top Chinese energy consumption source, with oil next, and hydropower, natural gas, and nuclear far behind.
- ◆ As far as China's energy production is concerned, since the early 1990s coal has widened its lead over oil, with hydropower, natural gas, and nuclear significantly behind.



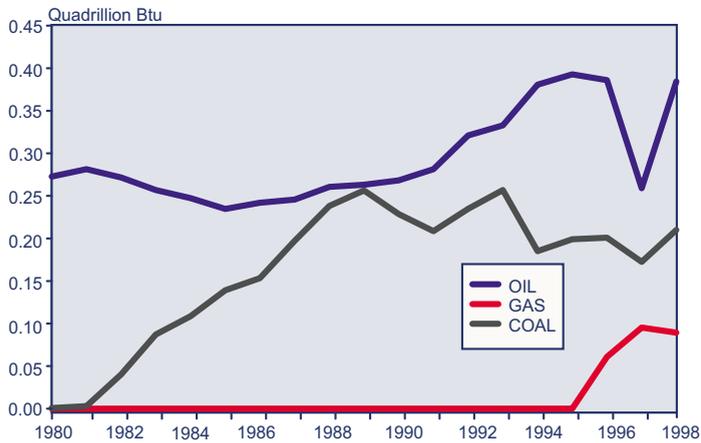
# Hong Kong, China

- ◆ Hong Kong, China is a large per capita energy consumer, due to its highly developed industrial economy. Virtually all of Hong Kong, China's energy needs are satisfied with imports.
- ◆ Hong Kong, China recently began receiving natural gas from a pipeline from China's offshore Yacheng gas field. Aside from industrial uses, Hong Kong, China also will see increasing gas use for electric power generation. The Black Point Power Station, which came into operation in 1996, is Hong Kong, China's first gas-fired power plant.
- ◆ Hong Kong, China, in the short term at least, has excess power generation capacity, which may allow it to export power to neighboring Guangdong province.
- ◆ Government plans to increase competition in the petroleum sector are expected to help lower Hong Kong, China's relatively high petroleum product prices. One barrier to competition has been the scarcity of real estate for construction of new petroleum product storage and distribution facilities.
- ◆ While the energy sector in Hong Kong, China was hit hard by the Asian financial crisis in 1997-1998, demand now has recovered to pre-crisis levels.

**Hong Kong, China: Energy Production and Consumption by Fuel, 1998**



**Hong Kong: Energy Consumption by Fuel Type, 1980-1998**



## Hong Kong Produces No Primary Energy

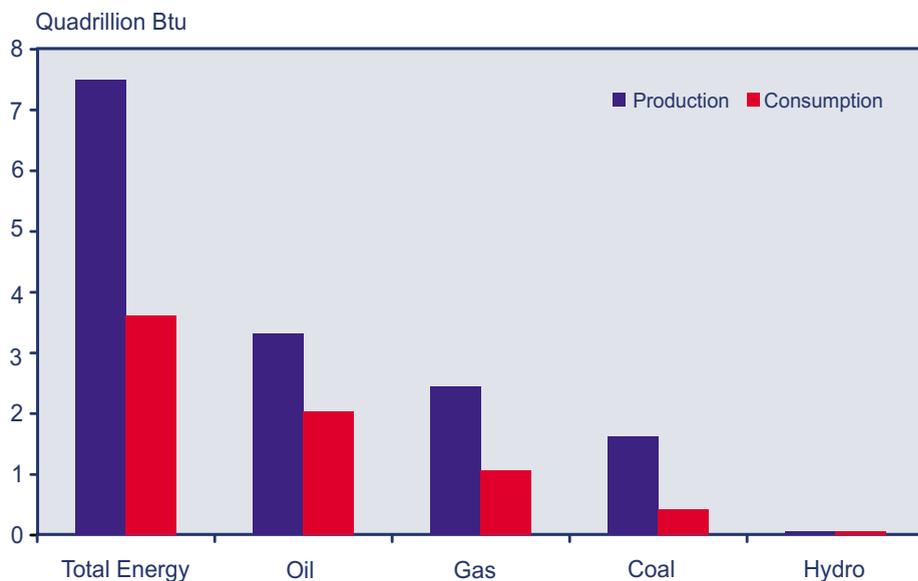
- ◆ From 1980 through 1998, Hong Kong, China's energy consumption increased 150%. Oil consumption increased 41% over that period, and coal 29,786% (from an extremely low base). Hong Kong, China began to consume natural gas in 1996.
- ◆ From 1980 through 1998, Hong Kong, China produced no energy.
- ◆ Since 1980, oil has remained consistently as the top Hong Kong, China energy consumption source, followed by coal, with natural gas only recently introduced, in 1996.



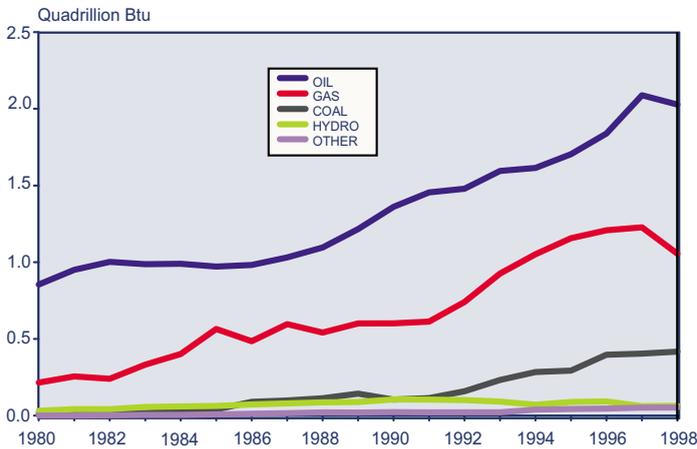
# Indonesia

- ◆ Indonesia currently is making a modest recovery from the effects of the Asian financial crisis on its energy sector.
- ◆ Indonesia is a significant oil exporter and a member of the Organization of Petroleum Exporting Countries (OPEC).
- ◆ Indonesia's oil production has remained stable over the past decade. Production from newer, relatively small-scale fields has replaced production declines at more mature fields. While most Indonesian oil production is concentrated in the western part of the country, new exploration is concentrated in more remote, eastern areas.
- ◆ Indonesia's state-owned oil firm, Pertamina, is in the midst of a major restructuring. Indonesia has been considering allowing foreign investment in its oil and gas sectors without required participation of an Indonesian partner. Indonesia also has considered ending subsidies for domestic petroleum product consumption.
- ◆ Indonesia is the world's largest LNG exporter. The country plans to develop another LNG facility in Irian Jaya, and has expanded the Bontang LNG facility on Borneo.
- ◆ Indonesia's power sector, in the short term at least, suffers from major overcapacity. Demand has not kept up with the construction of new Independent Power Projects (IPP's), and the state utility PLN, has experienced serious financial problems.

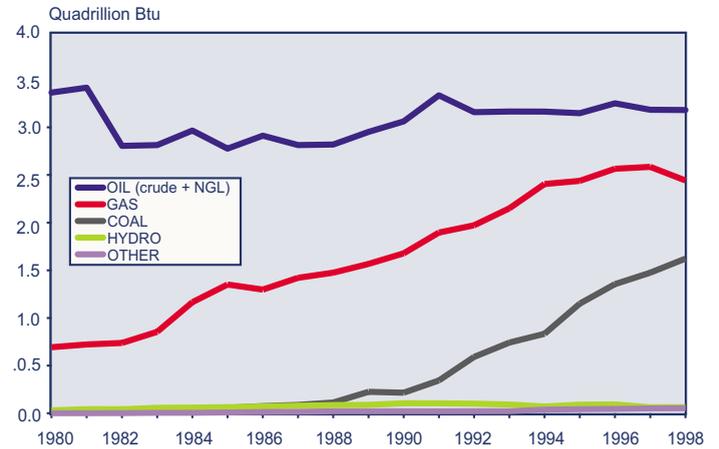
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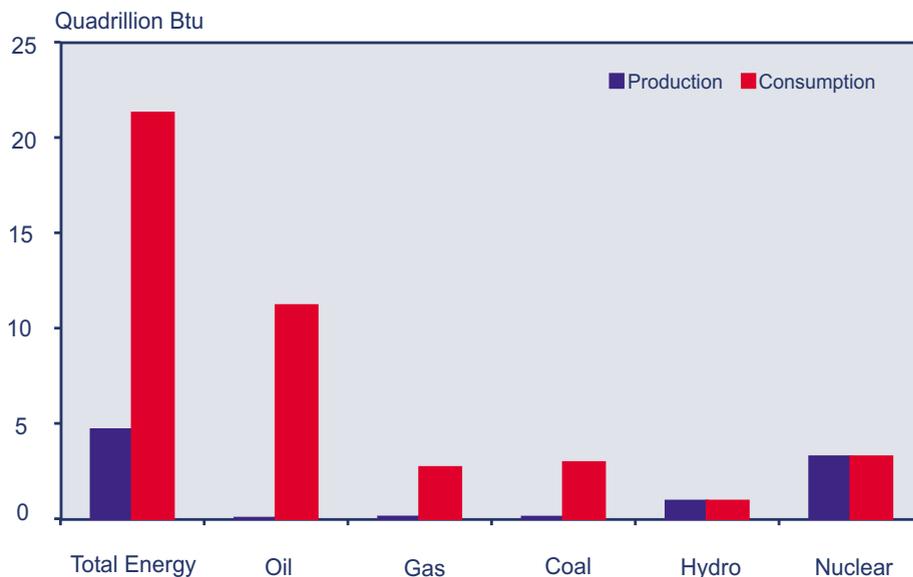
- ◆ From 1980 through 1998, Indonesia's energy consumption increased 224%. Oil consumption increased 138% over that period, natural gas 392%, coal 2,570% (from an extremely low base), and hydropower 106%. "Other" consumption has increased from zero in 1980 to 0.05 quads in 1998.
- ◆ From 1980 through 1998, Indonesia's energy production increased 79%. Oil production decreased 6%, while natural gas increased 253%, coal 10,503% (from an extremely low base), and hydropower 106%. "Other" production has increased from zero in 1980 to 0.05 quads in 1998.
- ◆ Since 1980, oil has remained consistently as the top Indonesian energy consumption source, followed by natural gas, with coal, hydropower, and "other" far behind.
- ◆ As far as Indonesia's energy production is concerned, since 1980 oil has maintained its lead over natural gas and coal, both of which have increased their shares rapidly, however. Hydropower and "other" production have lagged far behind.



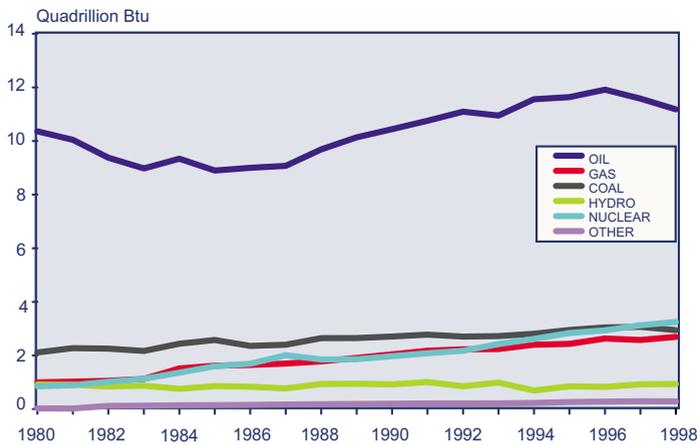
# Japan

- ◆ The growth of Japan's energy sector slowed during the 1990s due to the overall stagnation in Japan's economic growth. Still, Japan remains the fourth largest energy consumer in the world (after the United States, Russia, and China).
- ◆ Japan is the world's second largest importer of crude oil and petroleum products (after the United States). Japan's oil industry has been undergoing a major consolidation in recent years. Several downstream oil companies have either merged or entered into strategic alliances with each other to help cut costs in the face of declining refining margins. Japan's Arabian Oil Company (AOC) has been hard-hit by the expiration of its concessions in the Saudi Arabian portion of the Neutral Zone, but the company still has production operations in Kuwait.
- ◆ Japan is by far the world's largest LNG importer. Its largest supplier is Indonesia. Imports of LNG continued to grow during the 1990s as more gas-fired power generation capacity came online.
- ◆ Nuclear power grew rapidly in Japan in the 1990s, adding more than 50% to installed generating capacity. Japan is the third largest producer of nuclear power in the world.
- ◆ Japan is undertaking a limited liberalization of its market for electric power to promote competition and lower prices to consumers. The impact of the program will be primarily on large industrial electric power buyers.
- ◆ Most of Japan's imported oil comes from the Persian Gulf.
- ◆ Of Japan's 219 GW of installed generating capacity in 1998, 45 GW was from nuclear power plants.

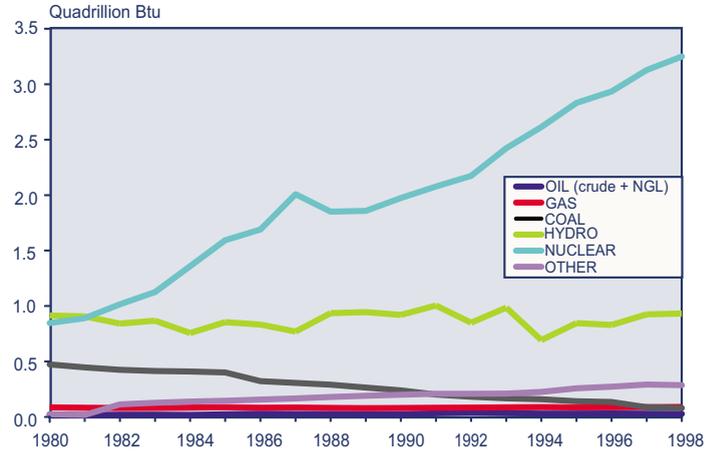
**Japan: Energy Production and Consumption by Fuel, 1998**



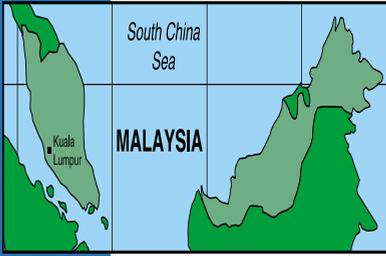
**Japan: Energy Consumption by Fuel Type, 1980-1998**



**Japan: Energy Production by Fuel Type, 1980-1998**



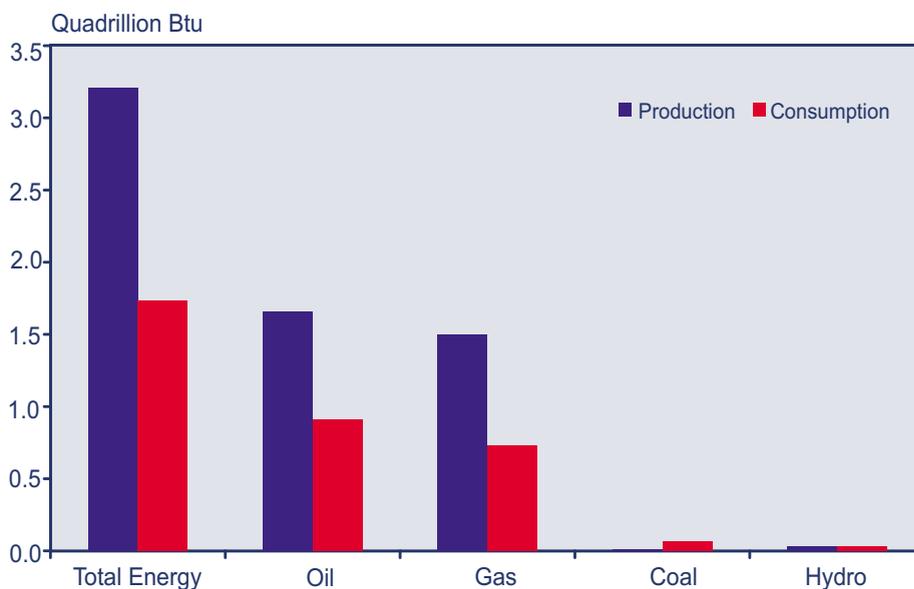
- ◆ From 1980 through 1998, Japan's energy consumption increased 40%. Oil consumption increased 8% over that period, nuclear 284%, coal 39%, natural gas 171%, hydropower 2%, and "other" 1,112% (from an extremely low base).
- ◆ From 1980 through 1998, Japan's energy production increased 97%. Nuclear power production increased 284%, hydropower 2%, "other" 1,112% (from an extremely low base), natural gas 5%, and oil 20%. Coal production fell 83% (from an already low base) during the time period.
- ◆ Since 1980, oil consistently has remained the top Japanese energy consumption source, with nuclear, coal, and natural gas next, and hydropower and "other" far behind.
- ◆ As far as Japan's energy production is concerned, since 1980 nuclear power has maintained (and widened) its lead over all other energy sources. Hydropower production has been next, with "other", coal, natural gas and oil lagging far behind.



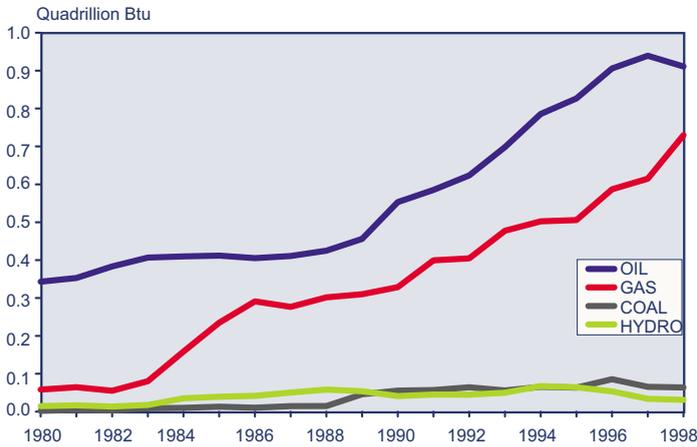
# Malaysia

- ◆ Malaysia is a significant net exporter of energy, particularly of oil and gas.
- ◆ Malaysia recently concluded an agreement for construction of a pipeline for imports of natural gas from the offshore Thailand-Malaysia Joint Development Area (JDA).
- ◆ In January 2000, Malaysia awarded a contract to Kellogg Brown and Root for the construction of two additional LNG trains at its LNG complex at Bintulu, Sarawak. The project is valued at approximately \$1.5 billion. The first of the two additional LNG trains is to be completed by the end of 2002. A preliminary letter of understanding has been signed for the sale of much of the two new LNG trains' output to customers in India.
- ◆ The country has begun reforms in its electric utility sector. Tenaga Nasional Bhd has put several of its power generation plants up for sale. Since the market was opened to IPP's in 1994, 15 such facilities have been licensed.
- ◆ Malaysia's government also is considering legislation which would provide for a regulatory framework for a fully competitive power market.
- ◆ The Malaysian government is implementing a project backed by the United Nations Global Environmental Facility (GEF) designed to reduce carbon emissions. The Industrial Energy Efficiency Improvement Project will focus on increasing efficiency in energy-intensive industries.
- ◆ Malaysia consumed 700 billion cubic feet (Bcf) of natural gas in 1998, roughly half of its production. Most of the rest was exported as LNG.

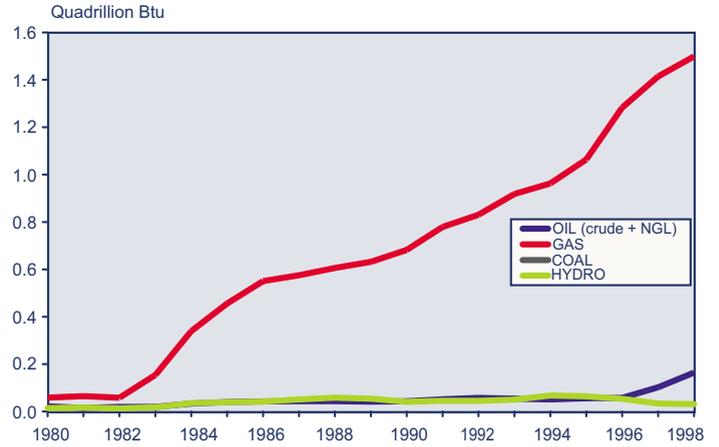
**Malaysia: Energy Production and Consumption by Fuel, 1998**



**Malaysia: Energy Consumption by Fuel Type, 1980-1998**



**Malaysia: Energy Production by Fuel Type, 1980-1998**



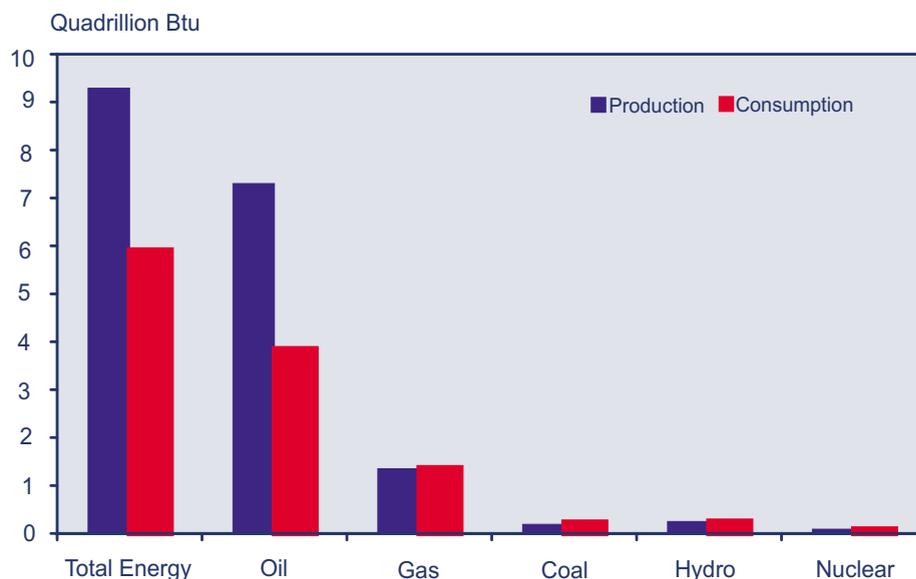
- ◆ From 1980 through 1998, Malaysia's energy consumption increased 315%. Oil consumption increased 166% over that period, natural gas 1,149% (from a very low base), coal 3,013% and hydropower 115% (also from extremely low bases).
- ◆ From 1980 through 1998, Malaysia's energy production increased 1,700% (from an extremely low base). Gas production increased 2,467%, oil 661%, and hydropower 115% (all from extremely low base levels).
- ◆ Since 1980, oil has remained consistently as the top Malaysian energy consumption source, followed by natural gas, with coal and hydropower far behind.
- ◆ As far as Malaysia's energy production is concerned, since 1980 natural gas has maintained (and widened) its lead over oil, hydropower, and coal, which now lag far behind.



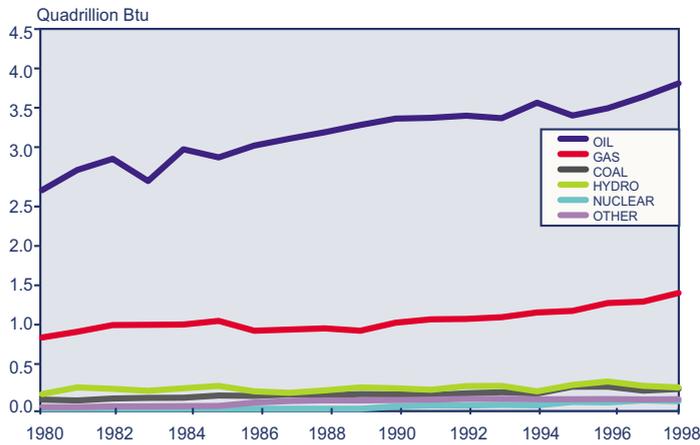
# Mexico

- ◆ Mexico is an important non-OPEC oil exporter, with net exports of about 1.5 million bbl/d in 1999. Mexico's oil reserves, at 28.4 billion barrels, are the second largest in the Western Hemisphere, behind Venezuela.
- ◆ Pemex, Mexico's state oil company, has a monopoly in both upstream and downstream sectors of the Mexican oil industry. Pemex's major oil project is development of the giant offshore \$5.3-billion Cantarell heavy oil field in the southern Bay of Campeche. Cantarell already produces about 1.4 million bbl/d of crude, almost half of Mexico's total crude production, and Pemex plans to spend almost \$5 billion between 1998 and 2011 to boost output.
- ◆ Other Mexican oil development projects include the Ku-Maloob-Zaap heavy-crude complex offshore in the Campeche basin and the Grijalva Delta light oil project.
- ◆ Natural gas development historically has not been a major focus in Mexico, but natural gas demand is expected to double over the next decade, much of which will be used to fuel electricity. Pemex plans to increase output from Mexico's largest non-associated gas field, Burgos.
- ◆ Natural gas is the most liberalized of Mexico's energy sectors. A 1995 law opened transportation, storage, distribution, and trade to private and foreign investors.
- ◆ Mexico's electricity generation capacity has increased substantially but still is having problems keeping pace with quickly increasing demand. In 1999, Mexico licensed nine new generation facilities, eleven transmission lines, and four new connections with the U.S. grid.
- ◆ Although most electricity generation, transmission, and distribution is handled by state-run companies, IPPs are allowed.

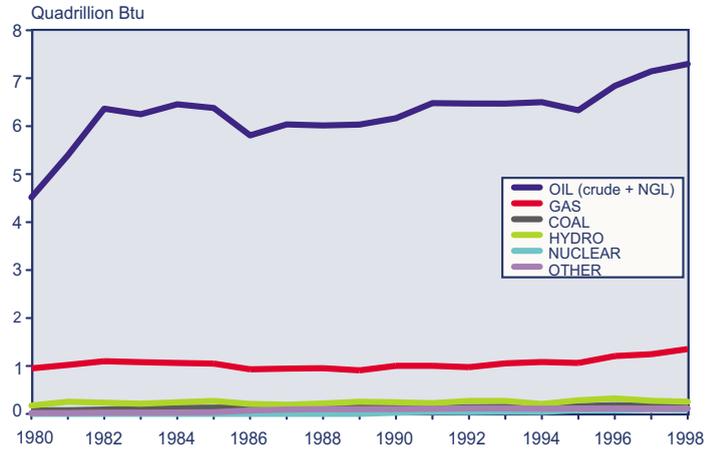
**Mexico: Energy Production and Consumption by Fuel, 1998**



**Mexico: Energy Consumption by Fuel Type, 1980-1998**



**Mexico: Energy Production by Fuel Type, 1980-1998**



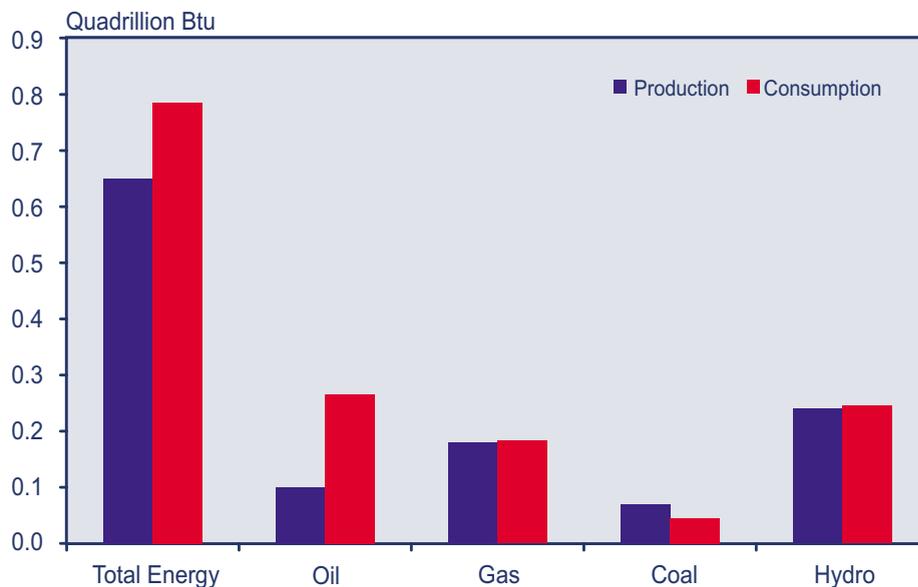
- ◆ From 1980 through 1998, Mexico's energy consumption increased 58%. Oil consumption increased 49% over that period and natural gas 63%. Hydropower grew 45%, coal 116%, and "other" 503% (all from very small base levels). Mexico also went from no nuclear power consumption in 1980 to 0.09 quads in 1998.
- ◆ From 1980 through 1998, Mexico's energy production increased 62%. Oil production decreased 62% and natural gas 42%. Hydropower grew 45%, coal 145%, and "other" 503% (all from very low base levels). Mexico also went from no nuclear output to 0.09 quads in 1998.
- ◆ Since 1980, oil has remained consistently as the top Mexican energy consumption source, followed by natural gas, with all remaining energy sources lagging far behind.
- ◆ As far as Mexico's energy production is concerned, since 1980 oil has maintained its lead (by far) over natural gas. Other fuel sources have lagged far behind.



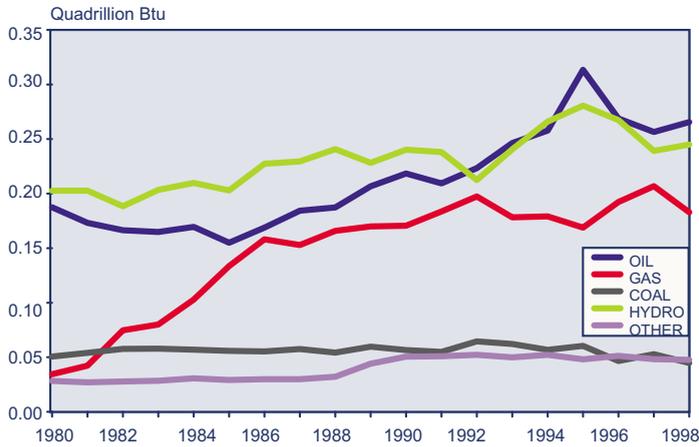
# New Zealand

- ◆ New Zealand is a net oil importer, producing about half of the oil it consumes. In the last two years, falling production at mature fields has raised concerns over a possible increase in import dependency.
- ◆ The results of recent drilling offshore from Taranaki (Hochstetter -1) have been disappointing. A modest-sized new field (the offshore Rimu-A1) was discovered by Swift Energy in late 1999.
- ◆ Apart from exploration for new fields, New Zealand is attempting to extend the life of the existing mature fields and increase recovery rates.
- ◆ New Zealand also is making efforts to improve its energy efficiency as a means of limiting consumption growth.
- ◆ More than half of New Zealand's electric power comes from hydroelectric facilities.

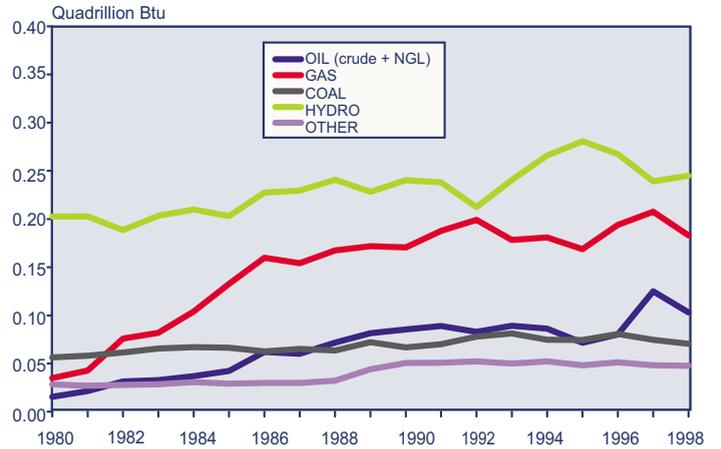
**New Zealand: Energy Production and Consumption by Fuel, 1998**



**New Zealand: Energy Consumption by Fuel Type, 1980-1998**



**New Zealand: Energy Production by Fuel Type, 1980-1998**



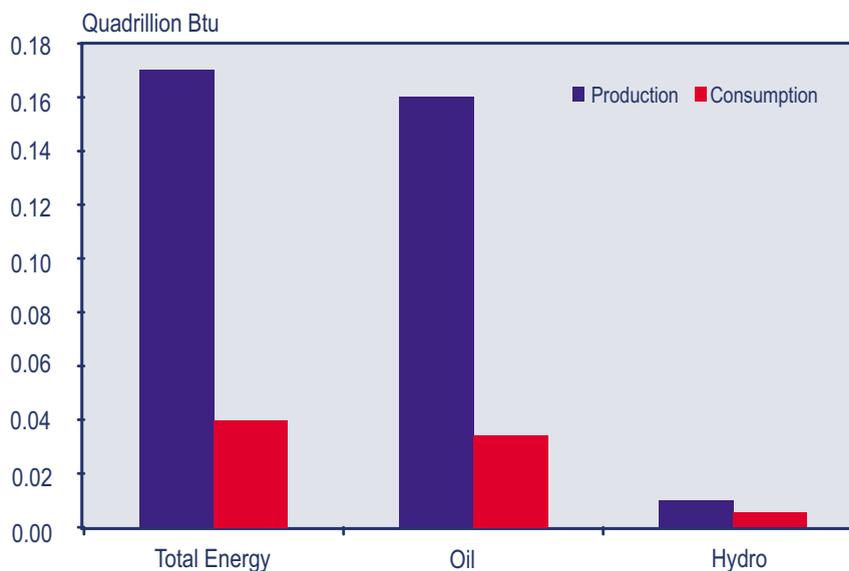
- ◆ From 1980 through 1998, New Zealand's energy consumption increased 56%. Oil consumption increased 42% over that period, hydropower 21%, natural gas 431% (from a very low base), and "other" 68%. Coal consumption declined 12% between 1980 and 1998.
- ◆ From 1980 through 1998, New Zealand's energy production increased 92%. Hydropower production increased 21% over the period, natural gas 423% (from a very low base), oil production 567% (from an even lower base), coal 25%, and "other" 68%.
- ◆ Since 1980, oil and hydropower have remained consistently as the top of New Zealand's energy consumption mix, followed by natural gas, with coal and "other" lagging behind.
- ◆ As far as New Zealand's energy production is concerned, since 1980 hydropower has maintained its lead over natural gas, followed by oil, coal, and "other."



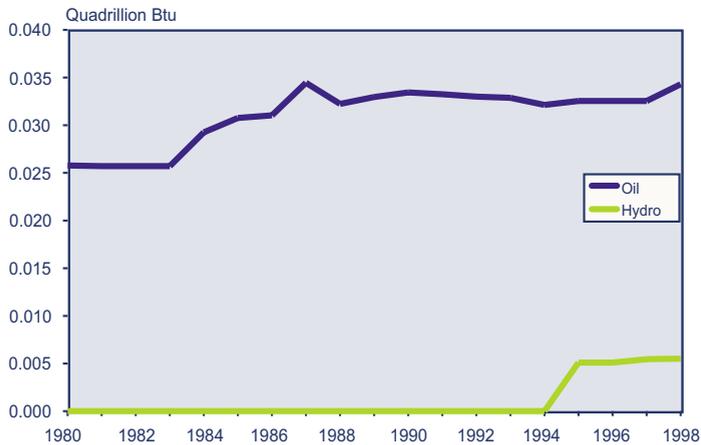
# Papua New Guinea

- ◆ Papua New Guinea is a net oil exporter, mainly to Australia. Chevron is the main foreign oil company operating in New Guinea.
- ◆ The Australian oil and mining firm BHP recently sold its assets in Papua New Guinea to Orogen Minerals for \$130 million. Orogen Minerals is controlled by the Papua New Guinea government.
- ◆ Papua New Guinea's government recently approved a project for the construction of two new small-scale refineries. One 10,000-bbl/d unit, to be built by a Singaporean firm, would be located at Lae, with the other to be built by the Canadian firm InterOil near the capital, Port Moresby.
- ◆ Papua New Guinea may begin exporting natural gas via pipeline to Australia. The feasibility of a pipeline to Queensland is currently under evaluation.
- ◆ Papua New Guinea's power generating capacity is about two-thirds oil-fired power plants and one-third hydroelectric facilities.

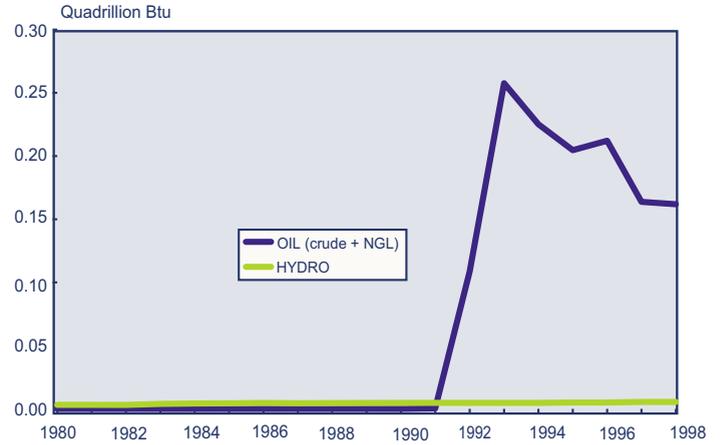
Papua New Guinea: Energy Production and Consumption by Fuel, 1998



**Papua New Guinea: Energy Consumption by Fuel Type, 1980-1998**



**Papua New Guinea: Energy Production by Fuel Type, 1980-1998**



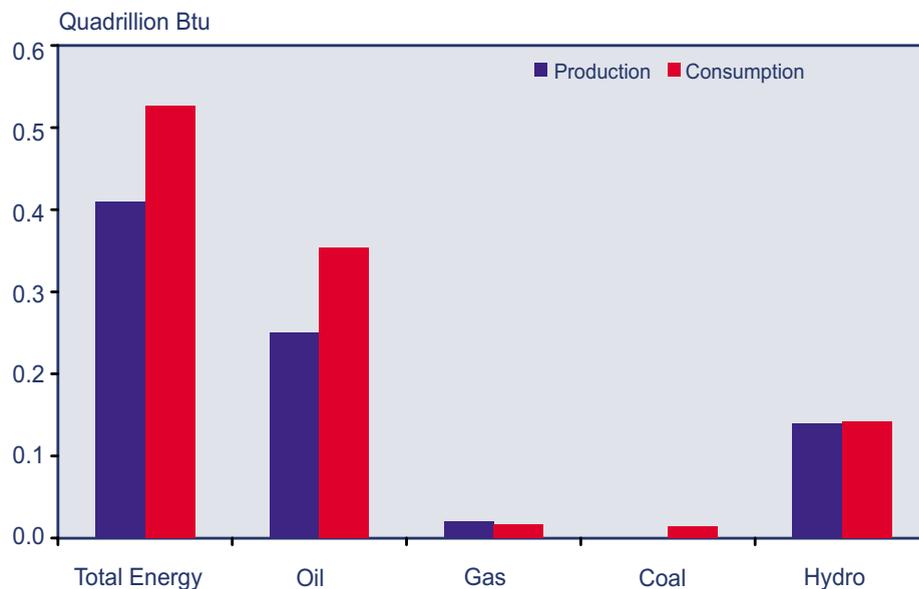
- ◆ From 1980 through 1998, Papua New Guinea's energy consumption increased 54%. Nearly all of this was oil, which increased 33%. The remainder was hydropower.
- ◆ From 1980 through 1998, Papua New Guinea's energy production increased 5,201%, but from an extremely low base. Nearly all of this increase was in oil, and a small amount of hydropower.
- ◆ Since 1980, oil has remained consistently as the top energy consumption source in Papua New Guinea, followed in recent years by small amounts of hydropower.
- ◆ As far as Papua New Guinea's energy production is concerned, oil production increased sharply beginning in 1992, surpassing hydropower (by far).



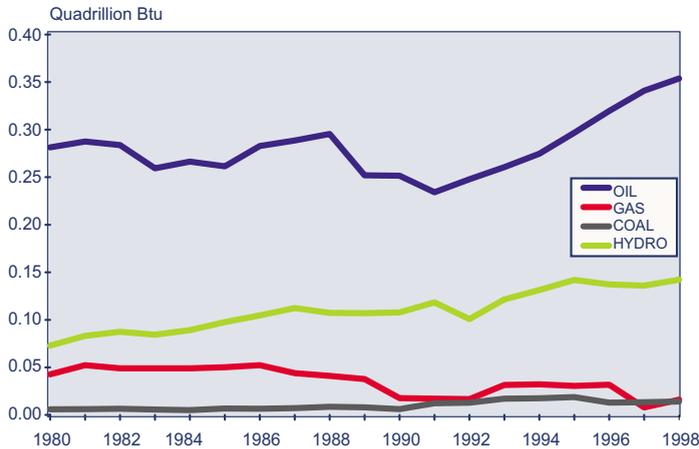
# Peru

- ◆ Peru consumes more energy than it produces, and natural gas is the only commercial energy resource in which Peru has the potential to become a significant net exporter.
- ◆ Privatization of energy industries is proceeding slowly in Peru. The government has put off the sale of its remaining oil assets, but is selling its shares in many hydroelectric plants.
- ◆ Argentina's Pluspetrol will take over one of U.S.-based Occidental Petroleum's blocks in Peru's northern jungle, which will make Pluspetrol Peru's largest oil producer.
- ◆ Peru's Camisea natural gas field contains an estimated 13 Tcf of gas and over 600 million barrels of condensate. The Peruvian government estimates that investment in Camisea could reach about \$2.6 billion. A consortium of Argentine Pluspetrol, American Hunt Oil, and Korean SK Group in February 2000 won a concession to develop the upstream production of Camisea, and the consortium expects to invest \$1.6 billion over the 40-year concession. The auction for the transportation and distribution concession for Camisea, involving an estimated \$1 billion in investment, is not expected until after Peru's upcoming presidential runoff election.
- ◆ Hydropower generation accounted for 80% of total electric power in 1998 (13.7 bkwh out of a total 17.0 bkwh). Peruvian power generator Edegel expanded its generation capacity by bringing into service its new 42-MW Yanango hydroelectric plant in late February 2000. This was the first step in the larger Chimay-Yanango-Pachachaca electricity project. The government has stalled construction on the state-owned 130-MW Yuncan hydroelectric project.

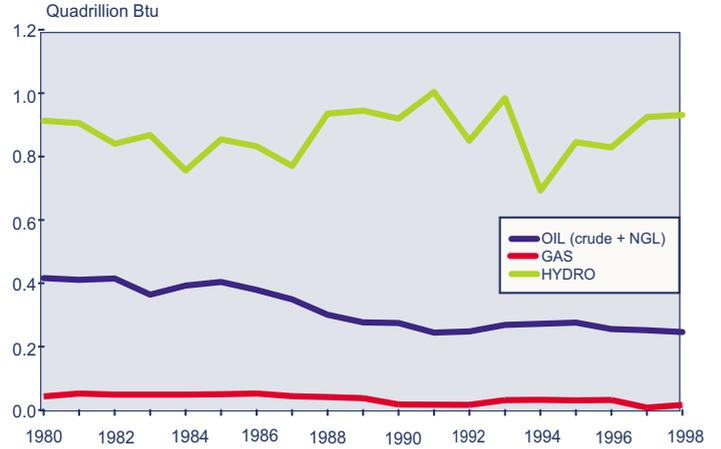
**Peru: Energy Production and Consumption by Fuel, 1998**



**Peru: Energy Consumption by Fuel Type, 1980-1998**



**Peru: Energy Production by Fuel Type, 1980-1998**



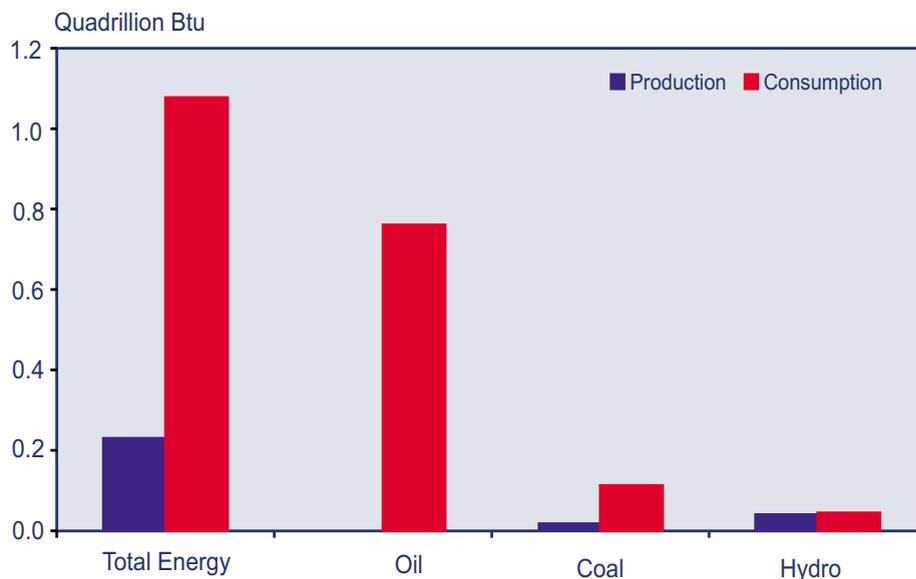
- ◆ From 1980 through 1998, Peru's energy consumption increased 31%. Oil consumption increased 26% over that period, hydropower 95%, and coal 236% (from an extremely low base). Natural gas consumption fell 62% during that period (also from an extremely low base).
- ◆ From 1980 through 1998, Peru's energy production fell 24%. Oil production fell 41%, gas 63%, and coal 34% (the latter two from extremely low bases). Hydropower production grew 95% over that period.
- ◆ Since 1980, oil has remained consistently as the top Peruvian energy consumption source, followed by hydropower, with gas and coal lagging behind.
- ◆ As far as Peru's energy production is concerned, since 1980 oil has maintained its lead over hydropower and gas.



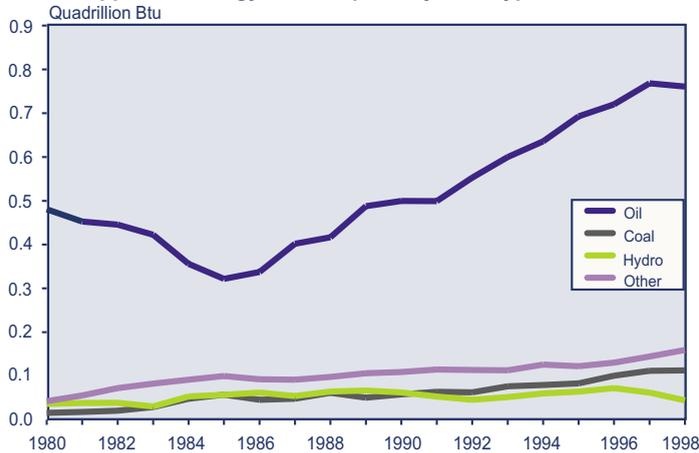
# Philippines

- ◆ With the development of the offshore Malampaya gas field, the Philippines is set to become a significant natural gas producer. Malampaya gas will be used primarily to fuel electric power generation.
- ◆ Gas exploration in the Philippines also is to begin on Fuga Island.
- ◆ The Philippines is a leading world producer of geothermal electric power, which makes up nearly one-quarter of the country's electricity production.
- ◆ Deregulation of the Philippines' electric power sector currently is under consideration. Relatively high prices for electricity have held down consumption, and there is much potential for demand growth if a competitive power market lowers rates.
- ◆ In 1999, the Philippines government deregulated the country's petroleum refining and distribution industry and removed price controls on petroleum products. Pressure to keep retail prices low has tended to discourage foreign firms from investing in the country's petroleum sector.
- ◆ The Philippines produced only a small amount of natural gas in 1998, but the Malampaya gas field development likely will make the country a significant gas producer in the future.
- ◆ Renewable energy, mainly hydroelectric dams and geothermal plants, accounts for nearly half of the Philippines' electric generating capacity.

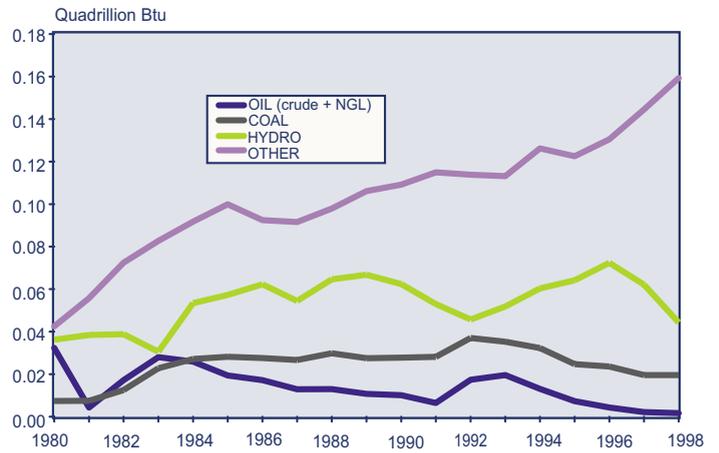
**Philippines: Energy Production and Consumption by Fuel, 1998**



**Philippines: Energy Consumption by Fuel Type, 1980-1998**



**Philippines: Energy Production by Fuel Type, 1980-1998**



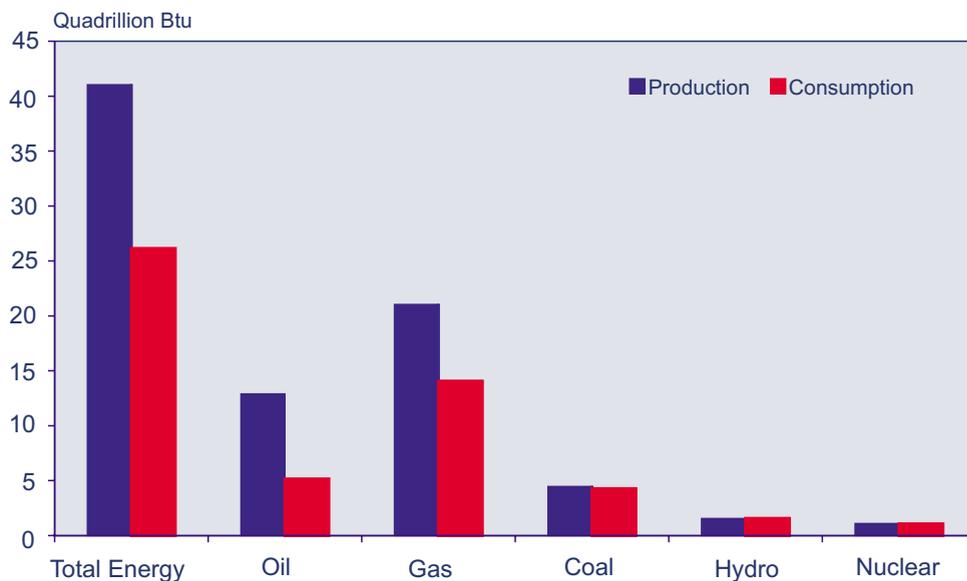
- ◆ From 1980 through 1998, the Philippines' energy consumption increased 87%. Oil consumption increased 58% over that period, "other" (mainly geothermal) 275%, coal 606% (from a very low base), and hydropower 22% (also from a very low base).
- ◆ From 1980 through 1998, the Philippines' energy production increased 90%. "Other" production increased 275%, and hydropower 22%. Coal increased 164% (from an extremely low base), and oil production fell 95%, to nearly zero, during that time period.
- ◆ Since 1980, oil has remained consistently as the top Philippines energy consumption source (by far), followed by "other," coal, and hydropower.
- ◆ As far as the Philippines' energy production is concerned, since 1980 "other" has maintained and increased its lead over hydropower, coal, and oil.



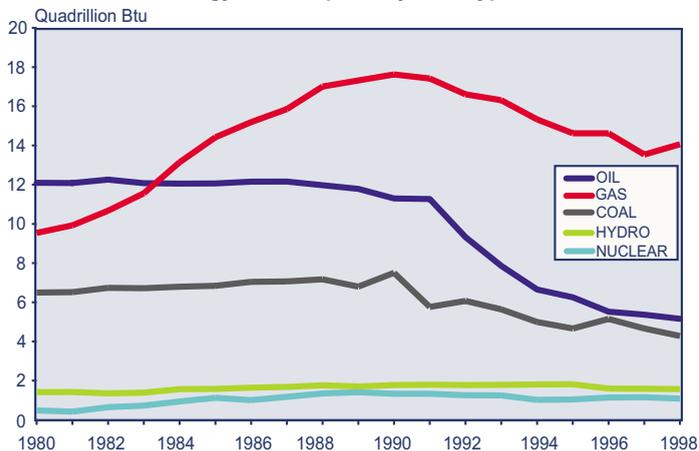
# Russia

- ◆ Russia's total energy production in 1998 far outstripped its total energy consumption. In addition to the world's largest natural gas reserves, Russia also is home to the world's second largest coal reserves and 8th largest oil reserves.
- ◆ Gazprom, the world's largest natural gas company, is stepping up efforts to diversify its export strategy to bring in more hard currency. Gazprom's long-term aim is to reduce gas transit through debtor countries such as Ukraine and Moldova.
- ◆ Since the breakup of the Soviet Union in 1991, Russian oil production has fallen nearly 23%. Despite the year-long rally in oil prices, cash-strapped Russian oil firms are still recovering from the twin blows of the August 1998 financial crisis and the oil price collapse of December 1998.
- ◆ Russia has plans to build a number of new export terminals and pipelines to expand its ability to export oil. The Baltic Pipeline System, a series of ports and pipelines on the Russian Baltic coast, is the largest pipeline export scheme outside of the Caspian region.
- ◆ The Russian coal industry continues to undergo a period of restructuring. Efforts to revamp the industry, often by closing inefficient mines, have met with resistance by coal miners.
- ◆ By 2007, as many as 10 of the Russia's 29 nuclear reactors will reach the maximum prescribed service life of a reactor (30 years); however, most are scheduled to remain online, despite a lack of funding for renovation and modernization.

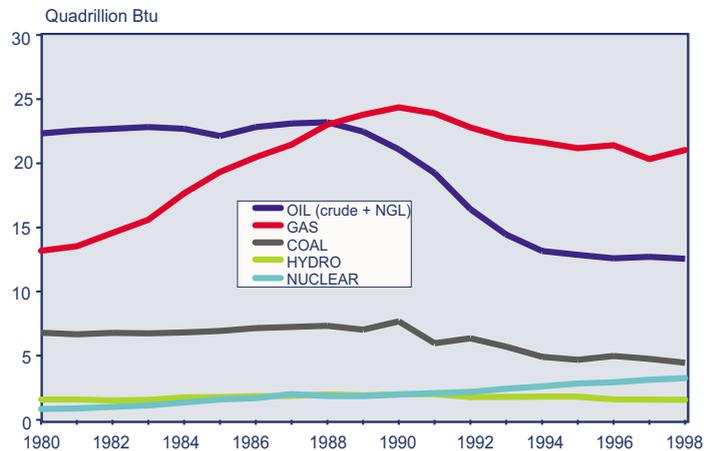
**Russia: Energy Production and Consumption by Fuel, 1998**



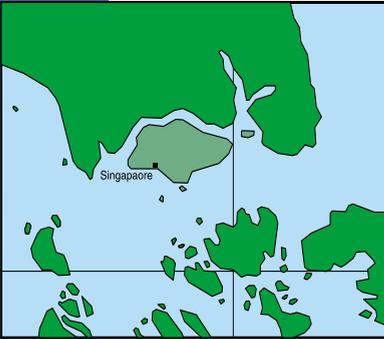
**Russia: Energy Consumption by Fuel Type, 1980-1998**



**Russia: Energy Production by Fuel Type, 1980-1998**



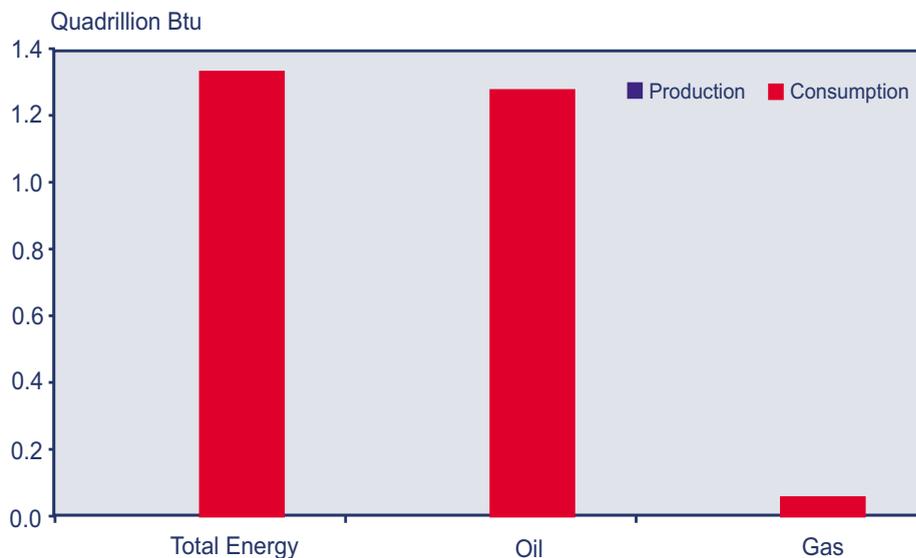
- ◆ From 1980 through 1998, Russia's energy consumption fell 13% as the country's economy experienced a sharp downturn following the collapse of the former Soviet Union. Oil consumption fell 57% over that period, and coal output declined 34%. Natural gas consumption, on the other hand, increased 47%, hydropower grew 10%, and nuclear power 125%, although these gains all occurred prior to the Soviet Union's collapse.
- ◆ From 1980 through 1998, Russia's energy production fell 7.5%. Oil production fell 43%, and coal output declined 34%. Natural gas output increased 60% over that time period, hydropower 10%, and nuclear power 125%. As with Russian energy consumption, production generally increased during the 1980s and fell sharply during the 1990s.
- ◆ Since 1980, natural gas has taken a significant lead as the top Russian energy consumption source, followed by oil and coal (both declining), hydropower and nuclear (both roughly flat).
- ◆ As far as Russia's energy production is concerned, since 1980 natural gas has increased and taken the lead relative to other fuel sources, especially oil, which has fallen sharply. Coal consistently has been third, with nuclear taking over fourth place from hydropower.
- ◆ Russian natural gas production in 1998 totaled 20.9 Tcf, with net gas exports in 1998 amounting to 7.0 Tcf, largely to Western Europe via pipeline.
- ◆ Russia exported around 3.6 million bbl/d of oil in 1998, including 3.1 million bbl/d outside the former Soviet Union, largely to Western European customers.
- ◆ Hydropower and nuclear power account for approximately 20% and 13%, respectively, of Russia's electricity generating capacity.



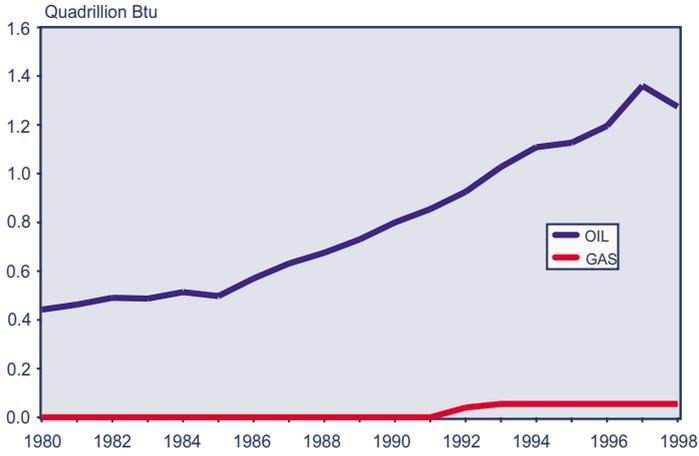
# Singapore

- ◆ Singapore is a major refining center for Asia, with processing capacity for more than double the volume of petroleum products consumed locally. The Asian financial crisis had a strong negative effect on Singapore's refining sector, depressing margins, for instance. Meanwhile, construction of new refining capacity throughout Asia has provided competition for petroleum products from Singapore.
- ◆ Singapore also is a major center for petrochemical industries.
- ◆ Singapore currently imports all of its natural gas from Malaysia, but is attempting to diversify its sources of supply by constructing a gas pipeline from Indonesia's West Natuna field. Construction of an LNG import terminal also is under consideration.
- ◆ Singapore is in the process of deregulating its electric power sector. The state-owned power generating companies are to be privatized by 2001, and SembCorp, Singapore's main gas importer, plans to enter the electric power generation market.
- ◆ Plans exist for 2.3 GW of gas-fired power generating capacity to be added to Singapore's current 5.6 GW. Oil-fired plants are currently under conversion to use natural gas.

**Singapore: Energy Production and Consumption by Fuel, 1998**



**Singapore: Energy Consumption by Fuel Type, 1980-1998**



**Singapore Produces No Primary Energy**

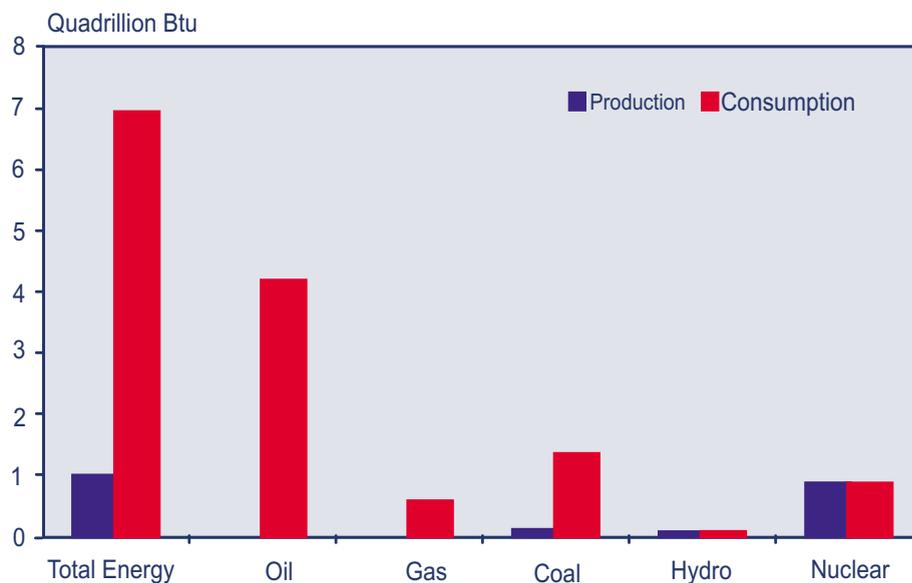
- ◆ From 1980 through 1998, Singapore's energy consumption increased 201%. Nearly all of this was oil, with small amounts of natural gas.
- ◆ From 1980 through 1998, Singapore produced no primary energy.



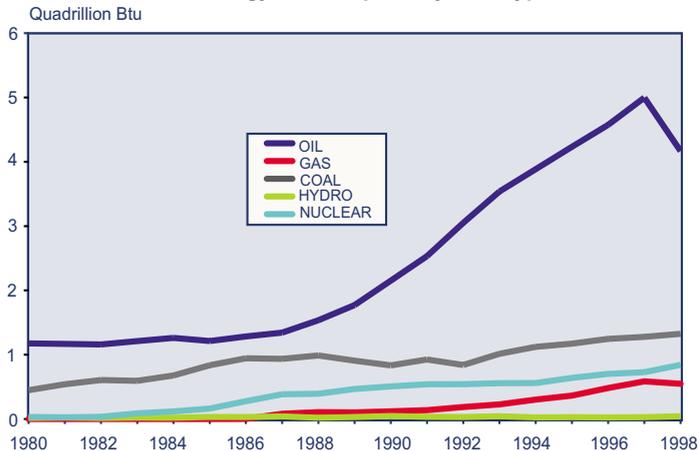
# South Korea

- ◆ Although its overall share has been declining, petroleum continues to make up about half of South Korea's energy mix. With no domestic reserves, South Korea is totally reliant on imports.
- ◆ South Korea's refining industry was hit hard by the effects of the Asian financial crisis, and is undergoing a period of consolidation following the government's deregulation of the industry in October 1998. Several South Korean industrial conglomerates have sold off refining assets which were not seen as part of their core businesses.
- ◆ South Korea is the world's second largest importer of LNG, upon which it relies for all of its natural gas needs.
- ◆ South Korea is in the process of privatizing some state-owned energy firms, most notably Kogas, the country's LNG importer. An initial public offering of stock in Kogas was made in late 1999.
- ◆ The South Korean government has plans to privatize the state electric utility, KEPCO. Eventually, KEPCO is to be split into separate units for generation and transmission and distribution. As many as six separate competing generating companies may result.
- ◆ Nuclear power accounts for nearly one-fourth of South Korea's installed electric generating capacity.

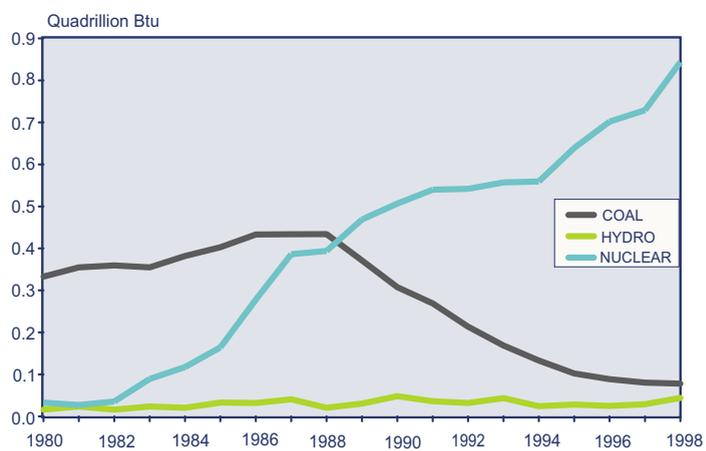
**South Korea: Energy Production and Consumption by Fuel, 1998**



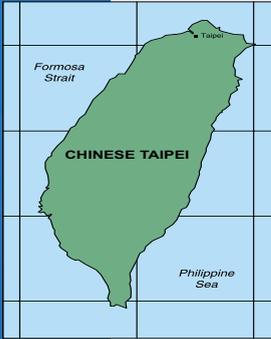
**South Korea: Energy Consumption by Fuel Type, 1980-1998**



**South Korea: Energy Production by Fuel Type, 1980-1998**



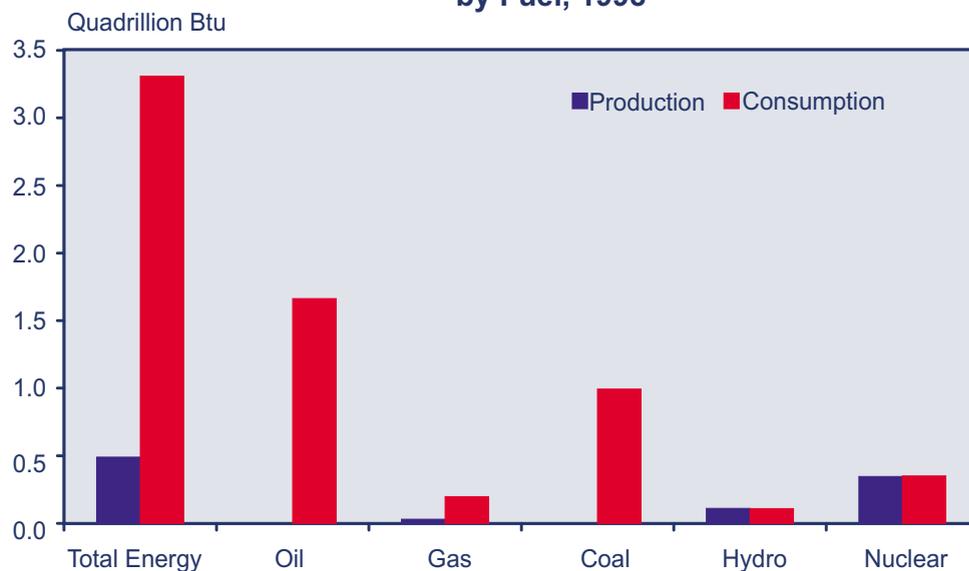
- ◆ From 1980 through 1998, South Korea's energy consumption increased 314%. Oil consumption increased 254% over that period, coal 195%, and nuclear 2,395% (from an extremely low base). Natural gas consumption increased from zero in 1980 to 0.55 quads in 1998.
- ◆ From 1980 through 1998, South Korea's energy production increased 153%. Nuclear power production increased 2,495% (from an extremely low base) and hydropower 175%. Coal production fell 77% over the period.
- ◆ Since 1980, oil has remained consistently as the top South Korean energy consumption source, followed by coal, nuclear, natural gas, and hydropower far behind.
- ◆ As far as South Korea's energy production is concerned, since 1980 nuclear power has grown rapidly and taken the lead over coal (which has fallen sharply), and hydropower.



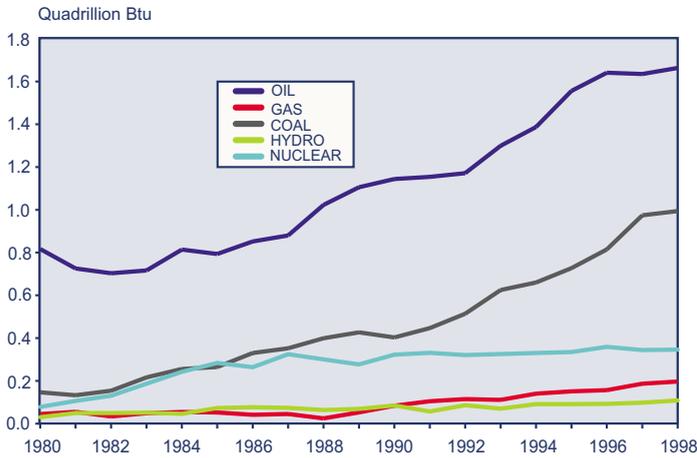
# Chinese Taipei

- ◆ Oil makes up over half of Chinese Taipei's total energy mix. While the publicly owned refiner, Chinese Petroleum Corporation (CPC), is still the dominant force in the industry, competitors have begun to emerge. A private refinery owned by Formosa Petrochemical Group, for instance, opened in 1999. Once fully operational, the 450,000-bbl/d private refinery will virtually eliminate Chinese Taipei's demand for imports of refined petroleum products.
- ◆ CPC and the mainland-based China National Offshore Oil Corporation (CNOOC) agreed in 1996 to jointly explore a 5,939-square-mile area in the Tainan Basin of the Formosa Strait. The first round of seismic surveys was completed in October 1999.
- ◆ Chinese Taipei is a major consumer of LNG, and CPC is currently expanding the capacity of its import terminal at Yungan. Under Chinese Taipei's program to liberalize its energy sector, privately-owned LNG terminals would be allowed, and at least one private firm, Tuntex, is reported to be interested in building a second facility.
- ◆ Chinese Taipei's power sector is dominated by a state firm, Taipower, but is in the process of liberalization. The first IPP, Formosa Plastics' Malilao plant, became operational in 1999.
- ◆ Of Chinese Taipei's 26 GW of installed generating capacity in 1998, around one-fifth was nuclear.

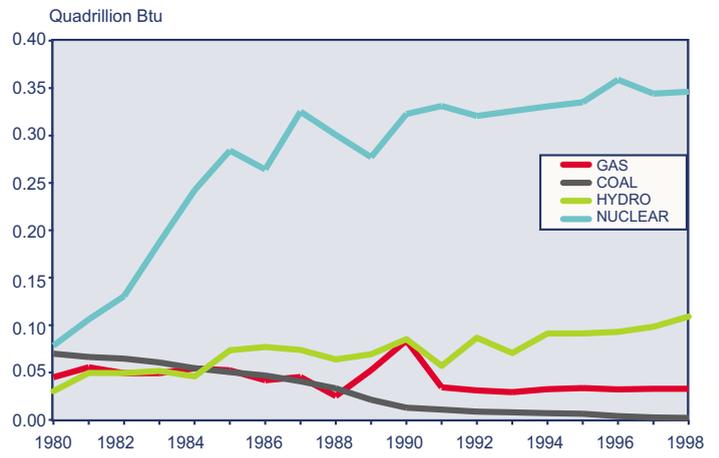
**Chinese Taipei: Energy Production and Consumption by Fuel, 1998**



**Chinese Taipei: Energy Consumption by Fuel Type, 1980-1998**



**Chinese Taipei: Energy Production by Fuel Type, 1980-1998**



- ◆ From 1980 through 1998, Chinese Taipei's energy consumption increased 196%. Oil consumption increased 104% over that period, coal 577%, nuclear 342%, natural gas 338%, and hydropower 261%.
- ◆ From 1980 through 1998, Chinese Taipei's energy production increased 119%. Nuclear production increased 342% and hydropower 261%. Coal production fell 97% and natural gas 27%.
- ◆ Since 1980, oil has remained consistently as the top Chinese Taipei energy consumption source, followed by coal and nuclear, with hydropower and natural gas lagging behind.
- ◆ As far as Chinese Taipei's energy production is concerned, since 1980 nuclear power has increased its lead over hydropower, natural gas and coal.

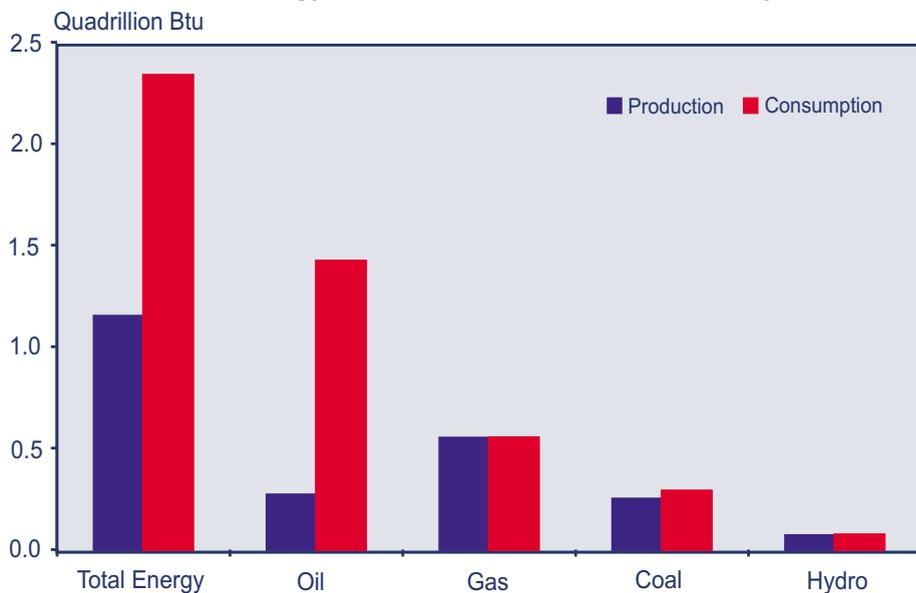


# Thailand

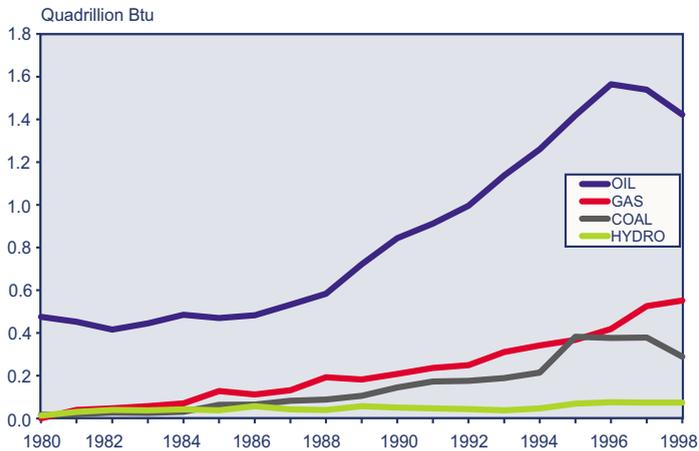
- ◆ Thailand produces a modest amount of crude oil and a significant amount of natural gas. Several new offshore gas finds have been reported in the last year.
- ◆ Thailand and Malaysia recently concluded an agreement for the development of natural gas in the offshore Thailand-Malaysia Joint Development Area (JDA). A pipeline will be built to carry gas from JDA fields to peninsular Malaysia.

- ◆ While Thailand's oil and gas sector is dominated by the Petroleum Authority of Thailand (PTT), the government is planning to break up and privatize PTT's holdings. The privatization is scheduled to take place in 2001.
- ◆ Plans to import LNG from Indonesia and Oman have been delayed, due both to a reduction in gas demand growth stemming from the Asian financial crisis, as well as to new domestic gas finds.
- ◆ Thailand has proceeded with natural gas imports from Burma to supply the Ratchaburi Power Plant, which began operations in January 2000. The Thai government has plans to privatize the Ratchaburi complex.

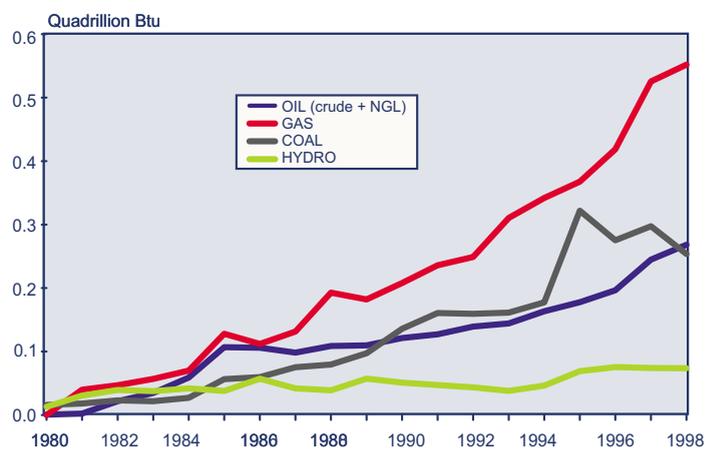
**Thailand: Energy Production and Consumption by Fuel, 1998**



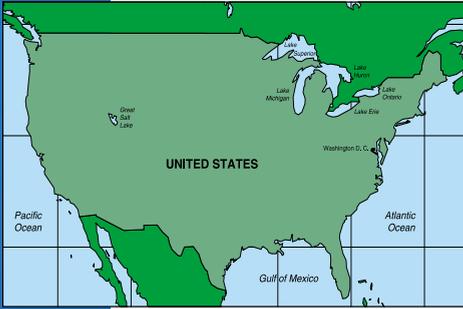
**Thailand: Energy Consumption by Fuel Type, 1980-1998**



**Thailand: Energy Production by Fuel Type, 1980-1998**



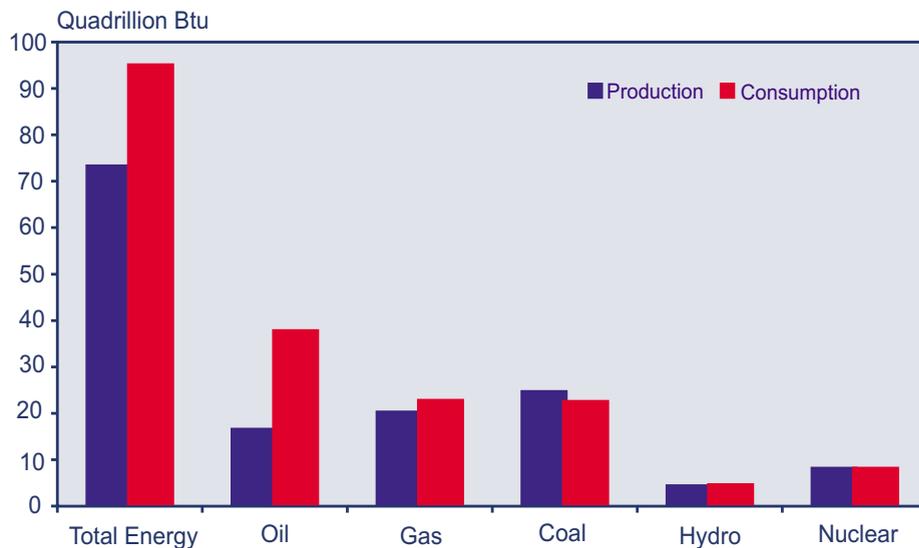
- ◆ From 1980 through 1998, Thailand's energy consumption increased 363%. Oil consumption increased 199% over that period, coal 1,618%, hydropower 463% (all from extremely low base levels). Natural gas consumption grew from zero in 1980 to 0.55 quads in 1998.
- ◆ From 1980 through 1998, Thailand's energy production increased 3,748% (from an extremely low base). Oil production increased 39,344% (all from extremely low base levels), coal 1,481% and hydropower 463%. Natural gas production grew from zero in 1980 to 0.55 quads in 1998.
- ◆ Since 1980, oil has remained consistently as the top Thailand energy consumption source, followed by natural gas and coal, with hydropower lagging behind.
- ◆ As far as Thailand's energy production is concerned, since 1980 natural gas has maintained its lead over oil and coal, with hydropower lagging behind.



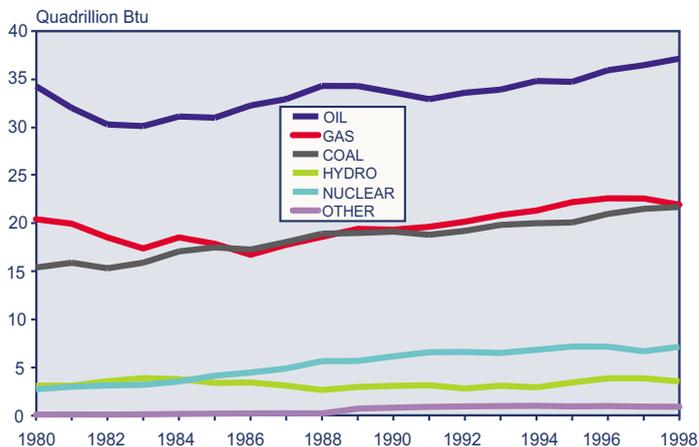
# United States

- ◆ The United States is by far the world's largest energy producer, consumer, and importer. In 1998, U.S. energy consumption accounted for around 25% of the world total, and 43% of the APEC total. U.S. energy production in 1998 accounted for 19% of the world total, and 36% of APEC output.
- ◆ Over the past few years, the United States has seen an enormous surge in corporate combinations (mergers, acquisitions, joint ventures, etc.) across the energy sector.
- ◆ At the same time, there has been widescale divestiture of oil refining assets and closure of refineries, due in large measure to a long period of low profitability in the refining/marketing line of the oil business.
- ◆ The U.S. natural gas industry is undergoing large-scale changes, in large measure a result of FERC (Federal Energy Regulatory Commission) Orders 436 (1985) and 636 (1992), which "unbundled" the purchase of gas from its transport.
- ◆ The U.S. power sector is undergoing major changes as well, particularly deregulation, increased retail competition, and direct access by consumers to service providers.
- ◆ During the 1990s, a pared-back, more efficient, competitive U.S. coal industry emerged, dominated by large operations and corporations, and starting to involve consolidated energy suppliers. Also in the 1990s, productive capacity shifted increasingly from the eastern to the western United States. These changes were prompted by several forces, including electricity and railroad deregulation, plus Federal acid rain regulations.
- ◆ The United States is becoming increasingly integrated with Mexico and Canada in terms of energy. The three countries, for instance, are moving towards a unified North American market for natural gas, while power integration also is moving ahead.

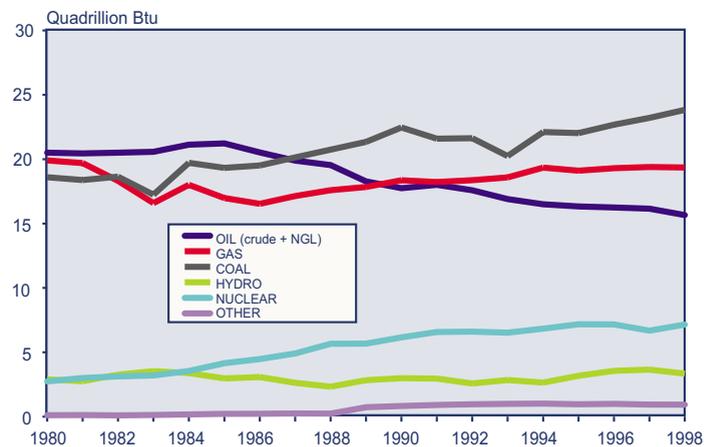
**United States: Energy Production and Consumption by Fuel, 1998**



**United States: Energy Consumption by Fuel Type, 1980-1998**



**United States: Energy Production by Fuel Type, 1980-1998**



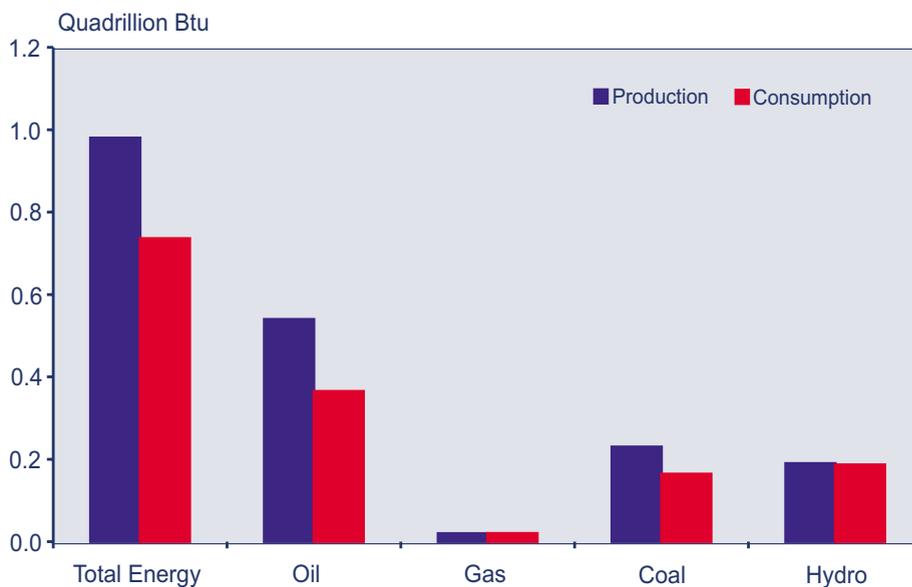
- ◆ From 1980 through 1998, U.S. energy consumption increased 22%. Oil consumption increased 8% over that period, natural gas 7%, coal 41%, nuclear 161%, hydropower 14%, and “other” (wind, geothermal, etc.) 712% (from an extremely low base).
- ◆ From 1980 through 1998, U.S. energy production increased 8%. Natural gas output fell 3% over that period and oil production fell 24%. Coal output rose 28%, nuclear 161%, hydropower 15%, and “other” 712%.
- ◆ Since 1980, oil has remained consistently as the top U.S. energy source, with natural gas and coal next (and roughly the same), and with hydropower, nuclear, and “other” far behind.
- ◆ As far as U.S. energy production is concerned, since 1980 coal has overtaken natural gas and oil for first place, while natural gas has overtaken oil for second place. Nuclear is in fourth place, hydropower in fifth, and “other” consistently has ranked sixth.
- ◆ The United States consumed around 19.5 million bbl/d of petroleum in 1999, and imported around 9.8 million bbl/d. Production of crude oil, natural gas liquids, processing gain, and other hydrocarbons/alcohol inputs in that year was 9.1 million bbl/d.
- ◆ Domestic crude oil production has leveled off following a 500,000-bbl/d decline since 1997, caused in large part by an extremely low oil price environment during that time period.
- ◆ The United States imports over 3 Tcf of gas, nearly all from Canada.
- ◆ The United States is the world’s third largest coal exporter, behind Australia and South Africa.
- ◆ Coal-fired plants account for around 40% of total U.S. power production, natural gas for 21%, hydropower and other renewables for 16%, nuclear for 13%, and petroleum for 9%.



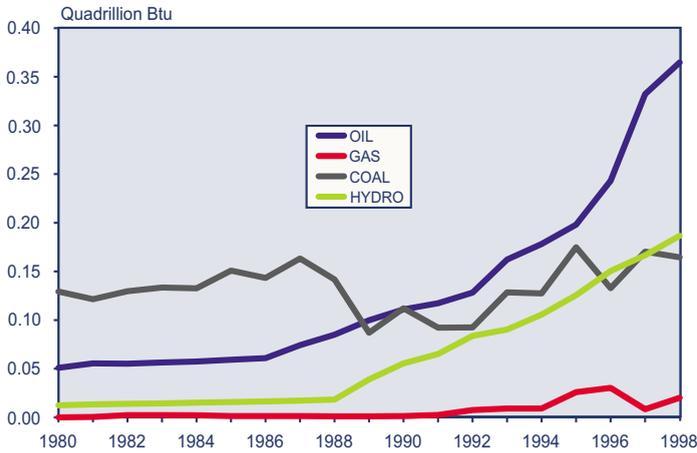
# Vietnam

- ◆ Vietnam produces a modest volume of crude oil, all of which is exported due to the fact that the country does not have any domestic refining capacity. The most active foreign oil company in Vietnam is Zarubezneft of Russia. In all, 37 investment licenses for oil and gas exploration have been awarded since the market was opened to foreign firms in 1998.
- ◆ Vietnam is planning to build its first refinery in Quang Ngai province.
- ◆ Vietnam became a coal exporter in the mid-1990s, with sales primarily to Japan.
- ◆ Growth in electric power demand has strained Vietnam's power generating capacity in recent years. While Vietnam has relied heavily on hydroelectric facilities for electricity, more thermal power plants will be built in the future to meet growing demand. Vietnam also has plans to eventually unify its national electric power grid, which currently is a patchwork of local systems.
- ◆ Most of Vietnam's electricity comes from hydroelectric facilities.

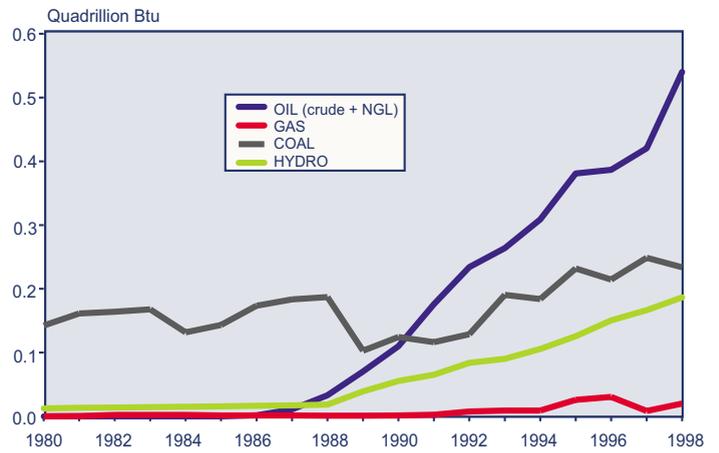
**Vietnam: Energy Production and Consumption by Fuel, 1998**



**Vietnam: Energy Consumption by Fuel Type, 1980-1998**



**Vietnam: Energy Production by Fuel Type, 1980-1998**



- ◆ From 1980 through 1998, Vietnam's energy consumption increased 282%. Oil consumption increased 616% over that period, hydropower 1,410% (from an extremely low base), and coal 27%.
- ◆ From 1980 through 1998, Vietnam's energy production increased 533%. Almost all of this was due to increased oil production, from zero in 1980 to 0.54 quads in 1998. Coal production increased 64%, and hydropower 1,410% (from an extremely low base).
- ◆ Since the late 1980s, oil has taken the lead as the top Vietnamese energy consumption source. Hydropower has grown rapidly and overtaken coal, with natural gas lagging far behind.
- ◆ As far as Vietnam's energy production is concerned, since the mid-1980s oil has increased rapidly to surpass coal and become the leading Vietnamese energy source. Hydropower remains in third place, but is increasing rapidly, and natural gas lags far behind.

# **Data Tables for APEC Member Economies**

## APEC Economic and Demographic Indicators

	Gross Domestic Product* (GDP)			Per Capita GDP, 1999E (U.S. Dollars)	Population, 1998E (Millions)
	1999E (Billions of U.S. Dollars)	Real GDP Growth Rate			
		1999 Estimate	2000 Projection		
Australia	\$393.9	3.9%	3.5%	\$20,734	18.8
Brunei	NA	NA	NA	NA	0.3
Canada	\$631.9	3.5%	2.6%	\$20,695	30.3
Chile	\$69.8	-0.5%	6.2%	\$4,643	14.8
China (PRC)	\$1,026.9	7.3%	6.9%	\$809	1,255.7
Hong Kong, China	\$161.5	1.2%	3.0%	\$23,538	6.7
Indonesia	\$148.3	-1.1%	3.2%	\$715	204.4
Japan	\$4,366.3	1.3%	2.0%	\$34,482	126.4
Malaysia	\$79.3	4.9%	5.8%	\$3,503	21.4
Mexico	\$469.8	3.5%	4.8%	\$4,905	100.2
New Zealand	\$53.0	3.0%	4.2%	\$13,850	3.8
Papua New Guinea	\$4.1	1.4%	1.4%	\$890	4.3
Peru	\$57.1	3.0%	6.5%	\$2,269	24.8
Philippines	\$79.0	3.2%	4.7%	\$1,031	75.2
Russia	\$149.7	1.5%	2.0%	\$1,024	146.5
Singapore	\$87.8	4.9%	5.9%	\$27,293	3.9
South Korea	\$424.6	9.0%	5.9%	\$9,062	46.4
Chinese Taipei	\$292.8	5.3%	6.7%	\$13,296	21.8
Thailand	\$129.6	3.7%	4.2%	\$2,083	61.2
United States	\$9,233.3	3.9%	3.1%	\$33,918	270.3
Vietnam	\$34.2	4.0%	4.5%	\$417	77.6
<b>Total*</b>	<b>\$17,893</b>	<b>3.5%</b>	<b>3.3%</b>	<b>\$7,051</b>	<b>2,514.8</b>

\*GDP total excludes Brunei. All GDP figures use market exchange rates.

E=Estimate

Source: WEFA Outlooks 1Q2000

## APEC Energy Consumption and Carbon Dioxide Emissions, 1998

	Energy Consumption							Carbon Dioxide Emissions <sup>2</sup> (Million metric tons of carbon)
	Total (Quadrillion Btu)	Petroleum	Natural Gas	Coal	Nuclear	Hydroelectric	Other <sup>1</sup>	
Australia	4.3	38%	19%	38%	0%	4%	1%	83
Brunei	0.1	51%	49%	0%	0%	0%	0%	1
Canada	11.8	31%	26%	10%	6%	29%	-2%	138
Chile	0.9	55%	13%	15%	0%	17%	0.2%	14
China (PRC)	33.9	25%	3%	66%	0.4%	6%	-0.2%	740
Hong Kong, China	0.8	57%	12%	31%	0%	0%	11%	13
Indonesia	3.6	56%	29%	12%	0%	2%	1%	68
Japan	21.3	53%	13%	14%	15%	4%	1%	288
Malaysia	1.7	52%	42%	4%	0%	2%	(s)	28
Mexico	5.9	65%	23%	4%	1%	4%	2%	95
New Zealand	0.8	34%	23%	6%	0%	31%	6%	9
Papua New Guinea	0.04	78%	9%	0.1%	0%	13%	0%	1
Peru	0.5	67%	3%	3%	0%	27%	0.3%	7
Philippines	1.1	71%	(s)	10%	0%	4%	15%	18
Russia	26.0	20%	54%	16%	4%	6%	-1%	405
Singapore	1.3	96%	4%	(s)	0%	0%	0%	26
South Korea	6.9	60%	8%	19%	12%	1%	(s)	108
Chinese Taipei	3.3	50%	6%	30%	10%	3%	0%	59
Thailand	2.3	61%	24%	12%	0%	3%	0.2%	43
United States	94.8	39%	23%	23%	8%	4%	4%	1,495
Vietnam	0.7	50%	3%	22%	0%	25%	0%	12
<b>Total</b>	<b>222.2</b>	<b>38%</b>	<b>22%</b>	<b>26%</b>	<b>6%</b>	<b>6%</b>	<b>2%</b>	<b>3,652</b>

<sup>1</sup> For all countries, "other" includes biomass, geothermal, solar, and wind electric power. For the United States, "other" also includes biomass, geothermal, and solar energy not used for electric power generation, imports of geothermal electric power from Mexico, and net imports of electric power derived from nonrenewable sources. For all other countries, "other" includes net imports of electricity. A negative value for "other" indicates that the country was a net exporter of electricity.

<sup>2</sup> Includes carbon dioxide emissions from the consumption of petroleum, natural gas, and coal, and from the flaring of natural gas. Tons of carbon can be converted to tons of carbon dioxide gas by multiplying by 3.667.

(S)=Value less than 0.05%

Note: Percentages may not add to 100% because of independent rounding.

Source: Energy Information Administration, International Energy Database, April 14, 2000.

## APEC Energy Supply Indicators

	Fossil Fuel Proved Reserves			Fossil Fuel Production, 1998			Electric Generating Capacity, 1/1/98 (Million kilowatts)	Crude Oil Refining Capacity, 1/1/00 (Thousand barrels per day)
	Crude Oil, 1/1/00 (Million barrels)	Natural Gas, 1/1/00 (Trillion cubic feet)	Coal, 12/31/97 (Billion short tons)	Petroleum <sup>1</sup> (Million barrels per day)	Dry Natural Gas (Trillion cubic feet)	Coal (Million short tons)		
<b>Australia</b>	2,895	44.6	99.6	0.6	1.1	314	39	812
<b>Brunei</b>	1,350	13.8	0	0.2	0.3	0	0.4	9
<b>Canada</b>	4,931	63.9	9.5	2.7	6.0	83	112	1,912
<b>Chile</b>	150	3.5	1.3	0.02	0.1	1	8	205
<b>China (PRC)</b>	24,000	48.3	126.2	3.2	0.8	1,351	254	4,347
<b>Hong Kong, China</b>	0	0	0	0	0	0	11	0
<b>Indonesia</b>	4,980	72.3	5.8	1.6	2.2	66	20	993
<b>Japan</b>	59	1.4	0.9	0.1	0.1	4	219	4,998
<b>Malaysia</b>	3,900	81.7	0	0.8	1.4	0.2	14	524
<b>Mexico</b>	28,399	30.1	1.3	3.5	1.3	11	38	1,525
<b>New Zealand</b>	127	2.5	0.6	0.1	0.2	4	8	98
<b>Papua New Guinea</b>	333	5.4	0	0.1	0	0	0.5	0
<b>Peru</b>	355	9.0	1.2	0.1	0.0	0.0	5	182
<b>Philippines</b>	289	2.8	0.3	0	0	1	12	401
<b>Russia</b>	48,573	1,700.0	173.1	6.1	20.9	272	206	6,673
<b>Singapore</b>	0	0	0	0	0	0	6	1,255
<b>South Korea</b>	0	0	0.1	0.1	0	5	44	2,540
<b>Chinese Taipei</b>	4	2.7	0	0	0	0.1	26	770
<b>Thailand</b>	296	12.5	2.2	0.1	0.6	22	17	713
<b>United States</b>	21,034	164.0	275.1	9.3	18.9	1,119	779	16,541
<b>Vietnam</b>	600	6.8	0.2	0.2	0	12	5	0.8
<b>Total</b>	142,274	2,265	697.4	28.8	53.9	3,266	1,822	44,498

<sup>1</sup> Includes crude oil, natural gas plant liquids, other liquids, and refinery processing gain.

Sources: Crude Oil and Natural Gas Reserves: PennWell Publishing Co., Oil Gas Journal, 12/20/99. Crude Oil Refining Capacity: PennWell Publishing Co., Oil Gas Journal, 12/20/99. All Other Data: Energy Information Administration, International Energy Database, April 2000.

# **Special Interest Topics**



# Environmental Issues

## Climate Change and Carbon Emissions



- APEC includes six of the world's ten largest carbon emitters (using 1998 data): the **United States** at 1,495 million metric tons; **China** at 740 million metric tons; **Russia** at 405 million metric tons; **Japan** at 288 million metric tons; **Canada** at 139 million metric tons; and **South Korea** at 108 million metric tons.
- The **United States** has signed (but not ratified) the Kyoto Protocol, under which it has pledged to reduce its carbon emissions 7% below 1990 levels by 2008-2012. U.S. carbon emissions have continued to rise steadily since 1990 and are predicted to reach almost 2,000 million metric tons per year by 2020.
- **China**, the world's most populous nation, is heavily reliant on highly carbon-intensive coal. As a non-Annex I developing country, China has no Kyoto Protocol obligation to reduce emissions and is expected to surpass the United States to become the world's largest carbon emitter by 2020. The amounts of energy and carbon consumed per dollar of GDP have decreased dramatically in China over the past two decades, while GDP growth rates have averaged around 10%.
  - **Russia's** carbon emissions have dropped from 583 million metric tons of carbon in 1992 to 405 million metric tons in 1998. This situation is explained more by Russia's deteriorating economic situation during the 1990s than by more energy-efficient consumption.
- Under the Kyoto Protocol, **Japan** committed to reduce its carbon emissions 6% below 1990 levels by 2008-2012. While its carbon emissions began to decline in 1997, they remain above 1990 levels. Japan's Ministry of Trade and Industry is revising its long-term energy plan to reduce energy consumption and carbon emissions. Japan is one of the least energy- and carbon-intensive economies in the world.
- **Canada** made a Kyoto Protocol commitment to reduce its carbon emissions 6% below 1990 levels by 2008-2012. While Canada has not yet ratified the treaty, the government has approved (in principle) an expenditure of \$1.63 billion over five years for a package of greenhouse gas emissions control and mitigation measures, including: improving mass transit, establishing tax incentives for the purchase of energy efficient technologies, bolstering an international emissions trading program, and improving Canada's domestic climate research.
- **South Korea's** energy use and carbon emissions increased dramatically throughout the 1980s and 1990s (until the 1997 Asian financial crisis), catapulting South Korea into the top ten world carbon emitters.
- APEC members **Singapore** and **Papua New Guinea** are members of the Alliance of Small Island States, representing countries that are most at risk of suffering adverse effects (including loss of territory to rising sea levels) due to climate change.

## Non-thermal Energy

- The volcanically active "Ring of Fire" in the Pacific Ocean affords many APEC members significant geothermal energy potential. Only about 17 countries in the world produced geothermal energy in 1998, and six of the world's top ten producers are APEC members: the **United States** at 13.9 bkwh, the **Philippines** at 7.6 bkwh, **Mexico** at 5.4 bkwh, **Japan** at 3.5 bkwh, **Indonesia** at 2.5 bkwh, and **New Zealand** at 2.0 bkwh.
- Half of the world's top ten hydroelectricity producers in 1998 were APEC members: **Canada** at 329.3 bkwh, the **United States** at 324.1 bkwh, **China** at 202.9 bkwh, **Russia** at 150.5 bkwh, and **Japan** at 89.5 bkwh.
- While hydropower does not produce greenhouse gases, it is not without environmental costs. Some major hydroelectric dam construction projects in APEC have been controversial: the 18.2-GW Three Gorges dam in **China**, slated for completion in 2009, could have serious environmental repercussions; construction of the 570-MW Ralco dam on the Bio-bio River in **Chile** was suspended in February 2000, in part due to environmental concerns and in part to concerns over the displacement of indigenous peoples (construction likely will resume in the spring of 2000).
- Five of the world's ten largest nuclear electricity producers are APEC members: in 1998, the **United States** produced 674 bkwh of nuclear electricity, **Japan** 318 bkwh, **Russia** 98 bkwh, **South Korea** 82 bkwh, and **Canada** 68 bkwh.
- Although nuclear power does not emit greenhouse gases, nuclear waste disposal and the possibility of nuclear accidents pose potential environmental threats. All of the major APEC nuclear power producers face the controversial issue of how best to store radioactive nuclear waste. While some countries' nuclear reactors are more prone to accidents than others, all must deal with the possibility of accidents resulting in radioactive contamination and negative public opinion associated with smaller accidents.



## Air Pollution

- A report released in 1998 by the World Health Organization (WHO) noted that seven of the ten most polluted cities in the world are in **China**. Sulfur dioxide and soot caused by coal combustion are two major air pollutants, resulting in the formation of acid rain, which now falls on about 30% of China's total land area.
- Mexico City, **Mexico**, is among the world's most polluted cities. Exhaust fumes from Mexico City's 2.5 million cars are the main source of air pollutants, and the city's location in a basin exacerbates the problem, as pollutants are trapped above the city.



- **Chile's** capital city, Santiago, suffers extreme air pollution, although its air quality has improved in the 1990s. Santiago's location in an Andes Mountain valley traps emissions from the city's large and quickly growing fleet of privately owned vehicles. Santiago's air usually is considered to be the most polluted of any South American city and is among the most polluted in the world, especially in terms of suspended particulates.



- There are over three million motor vehicles in Jakarta, **Indonesia**. Jakarta's Land Transport Organization estimates that 70% of Jakarta's air has been contaminated by chemical compounds from vehicle emissions, which are associated with a variety of health concerns. The government began to take steps to phase out the use of leaded gasoline in 1999, but complete elimination of leaded gasoline is not expected until 2004.
- The **United States** Environmental Protection Agency in March 2000 released a legislative framework to replace MTBE, an additive in gasoline that reduces gasoline's contribution to ground level ozone, with renewable additives such as ethanol. The Clean Air Act of 1990 required areas with severe ozone smog problems to use reformulated gasoline; 87% of reformulated gasoline uses MTBE, which is associated with ground water pollution.



# Electricity

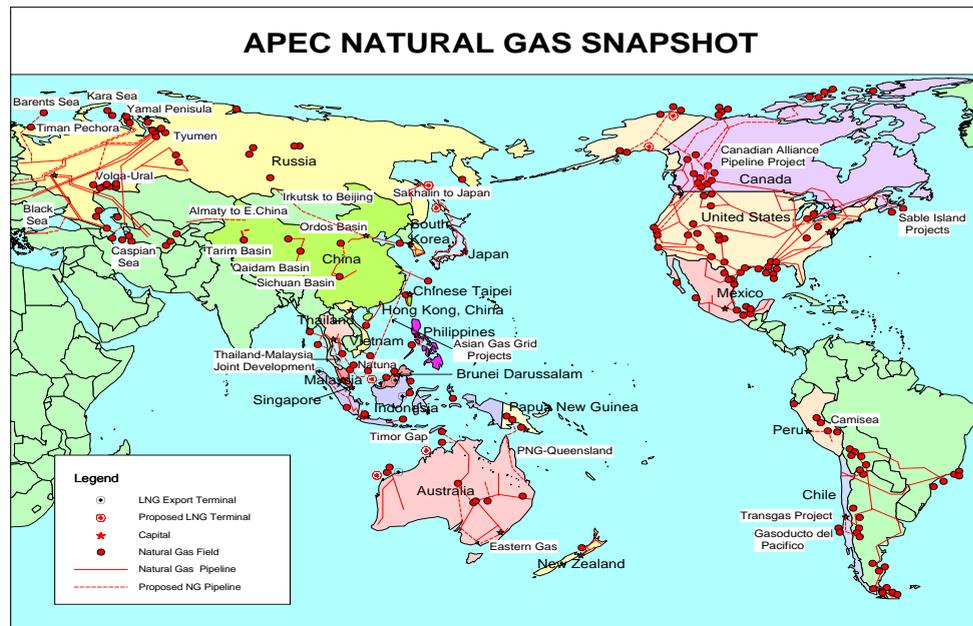


- ◆ Electricity demand grew rapidly in the APEC economies during most of the 1990s, as a result of overall economic growth. With many APEC economies currently recovering from the effects of the financial crisis of 1997-1998, a short-term pause in this power growth is being reversed. The developing economies of Asia are projected to have the strongest growth in the world in electricity demand over the next 20 years.
- ◆ **China** is emerging from a short-term oversupply problem in its electricity sector. While residential demand continued to grow from 1997 to 1998, industrial demand was flat. The Chinese authorities responded to the oversupply by closing some older small thermal plants and announcing a temporary moratorium on new power project approvals. Even so, there was 70 MW worth of new capacity under construction at the beginning of 1999. The largest project is the Three Gorges Dam, which when completed (possibly in 2009) will have 26 separate 700 MW generators, for a total of 18.2 GW.
- ◆ **China** plans eventually to create a unified national power grid, in place of today's patchwork of regional grids, and to develop a modern competitive market for electric power.
- ◆ **China's** electric power demand is projected to grow by 5.7% annually through 2020, which will necessitate a massive flow of investment in new generating capacity, if it is to keep up with demand.
- ◆ **Japan's** electric power sector is expected to show modest growth rates over the next two decades. While thermal power plants generated 57% of Japan's electricity in 1998, Japan is expected to shift toward more nuclear power, which currently makes up about one-third of Japan's electricity supply.
- ◆ **Japan** undertook a partial deregulation of its electric power sector in March 2000. Under the new scheme, large industrial power consumers, which account for about 30% of total power consumption, will be able to purchase their power in a competitive market.
- ◆ **Indonesia** is in the process of dealing with the financial problems in its electric power sector caused by lower-than-expected demand, which stemmed partially from the effects of the Asian financial crisis. One positive sign is the March 2000 interim agreement between PLN, the state-owned utility, and the Paiton IPP project, which will allow Paiton to start selling power to the grid. Indonesia's power sector is beginning to recover, with preliminary Indonesian figures showing strong demand growth in 1999.
- ◆ **Australia's** power sector is moving in the direction of integrated grids and a competitive power market. For geographic reasons, Australia still has isolated power grids in some areas, such as Western Australia and the Northern Territories. A project to connect the grids of Queensland and New South Wales was recently completed.
- ◆ **Singapore** is in the early stages of restructuring its electric power sector, which is intended to lead to a privatized, fully competitive market. Divestment of major state-owned power generation assets is expected in late 2001 or early 2002.

- ◆ **South Korea's** government has plans to split up and sell off the assets of the Korea Electric Power Corporation (KEPCO). KEPCO eventually is to be divided into six competing companies, with nuclear power plants kept together in one company.
- ◆ While about half of **Mexico's** electric power currently is generated from oil, plans call for most power plants built in the future to run on natural gas. Demand is growing rapidly, and there is some concern about the ability of the power sector to keep up with demand growth in the industrial sector. Estimates of the capital investment needed to keep pace with demand growth run around \$50 billion over the next decade.
- ◆ The **United States** is in the middle of a transition toward an unbundled and competitive electric power market, separating generation from transmission and distribution. One major effect of this transition is the steep rise in generating capacity held by non-utility generators, and the decline in generating capacity held by traditional investor-owned utilities.
- ◆ **Canada** also is restructuring its electricity sector to facilitate competition. While more than half of Canada's current electricity supply is from hydroelectric dams, natural gas-fired power plants are expected to make up an increasing portion of Canada's electric power sector. The Canadian Energy Research Group has estimated that Canada's use of natural gas for electric power generation will triple over the next decade.
- ◆ **Canada** and the **United States** have highly interconnected power grids, and competition in the industry is expected to increase volumes of electricity trade between the two.
- ◆ **Chile** is attempting to diversify its electric generating capacity, which is heavily dependent on hydropower, after experiencing supply problems due to a year-long drought in 1999. Natural gas is expected to grow rapidly as a fuel for electricity generation in Chile.
- ◆ **Russia's** electric power generation has dropped nearly 20% since 1992, as the Russian economy has contracted. Russia would like to increase electricity exports to countries outside the Commonwealth of Independent States (CIS) in order to strengthen the finances of Unified Energy Systems (UES), Russia's dominant electric utility company.

# Natural Gas Integration

## Asian Regional Gas Grid Interconnection



- ◆ While natural gas trade in Asia historically has centered on LNG, pipelines may provide an alternative in the future. As a share of overall primary energy, East Asian countries consume far less gas than Europe or North America, in part due to the lack of an integrated international gas grid, but there has been discussion in recent years of building pipelines linking the region. Another idea would include a link to supply southern **China** and **Chinese Taipei** with gas from Southeast Asia.
- ◆ International pipelines currently under construction include one from the offshore **Thailand Malaysia** Joint Development Area (JDA), and another to bring gas from **Indonesia's** Natuna gas field to Singapore.
- ◆ The proposed Asian Gas Grid (AGG) project, with an estimated cost of around \$8 billion, would link the Natuna gas field to Shanghai, **China** and tie in existing gas networks in **Malaysia, Indonesia, and Thailand**, and possibly **Vietnam**. With its projected rapid increase in gas demand, China could be expected to absorb the bulk of gas exported through the new system.
- ◆ LNG trade also has begun to expand once again following a downturn caused by the Asian financial crisis. India is to become a major consumer of Southeast Asian LNG once regasification terminals are completed. **China** also has held talks with potential suppliers of LNG for use in southern China.
- ◆ In Northeast Asia, discussions have taken place on the possibility of using **Russia's** natural gas reserves, the largest in the world. One scheme would deliver gas from Sakhalin Island to **Japan** through a subsea pipeline. Another would pipe Siberian gas to consumers in northern **China**. Internally, China is planning to develop a pipeline from the western Xinjiang province to Shanghai.

## North American Gas Integration

- ◆ As natural gas demand in the **United States** has grown, U.S. imports from **Canada** have grown rapidly, and the gas pipeline networks of the two countries have become increasingly interconnected. This is especially true of the Northeast United States and the Pacific Coast, where Canadian gas makes up a significant portion of gas supplies. The United States received 3.3 Tcf of natural gas from Canada in 1999, more than half of Canada's total natural gas production.
- ◆ The Alliance pipeline, scheduled for completion in late 2000, will carry 1.3 Bcf per day of gas from Western **Canada** to the Chicago area. The TransCanada pipeline also will bring 900 Mmcf/d of new capacity to Chicago, which is set to become a major supply hub for imports of Canadian gas into the **United States**.
- ◆ The Maritimes and Northeast (M&N) pipeline, with a capacity of 530 Mmcf/d, will bring gas from the Sable Island field off Nova Scotia to customers in the northeastern **United States**.
- ◆ Increased natural gas trade between the **United States** and **Canada** has been, in part, a result of the deregulation of the two countries' natural gas industries.
- ◆ There are also gas pipeline interconnections between the **United States** and **Mexico**, which support a smaller volume of natural gas trade, in both directions. The United States exported 64 Bcf of natural gas to Mexico in 1999, while importing 55 Bcf.



Grande Prairie Area, AB - CAN - February 2000. Photo courtesy of [http://www.alliance-pipeline.com/construction/PhotoStory/Lowering/lowering\\_lrg8.htm](http://www.alliance-pipeline.com/construction/PhotoStory/Lowering/lowering_lrg8.htm).

# Energy Industry Privatization and Restructuring

- ◆ **China's** petroleum industry is going through a major restructuring. As part of that process, China reorganized most state-owned oil and gas assets in 1998 into two vertically integrated firms, the China National Petroleum Corporation (CNPC) and the China Petrochemical Corporation (Sinopec). Originally, CNPC had been involved mainly in upstream production and exploration activities, while Sinopec was involved mainly in downstream refining and distribution. The reorganization carried out in 1998 provided for a transfer of assets between the two, transforming them into vertically integrated regional entities, with CNPC in the north and west and Sinopec in the south. Sinopec transferred four northern refineries to CNPC, and CNPC transferred eight southern oil fields to Sinopec. CNPC still has a disproportionate share of oil production capacity, with 2.20 million bbl/d, compared to Sinopec's 0.75 million bbl/d. Refining capacity remains tilted toward Sinopec, with CNPC at 2.05 million bbl/d and Sinopec at 2.45 million bbl/d.
- ◆ CNPC in 1999 formed a holding company, PetroChina, including most of its assets for the purpose of offering shares on the international market. In April 2000, the company made an initial public offering (IPO) on the New York and Hong Kong stock exchanges.
- ◆ **South Korea** has seen significant changes in its downstream oil industry since the beginning of the Asian financial crisis. The South Korean government deregulated the petroleum industry in October 1998, and large conglomerates have sold off petroleum refining and distribution assets which were not considered part of their core businesses.
- ◆ **Japan's** downstream petroleum industry is undergoing a period of consolidation in the face of stagnant petroleum products demand and low refining margins. Several Japanese oil companies and subsidiaries of multinationals have announced strategic alliances or mergers in an attempt to cut operating costs.
- ◆ In **Indonesia**, the state oil and gas firm Pertamina is undergoing reforms under the new administration of President Wahid. In February 2000, a new president was appointed for the firm, and many senior managers were replaced. The Indonesian government has reportedly been considering reforms which would eventually end Pertamina's monopoly, under which it is a required partner for foreign oil and gas firms operating in Indonesia.
- ◆ **Indonesia's** state power company, PLN, is continuing its efforts to strengthen its finances and settle disputes with IPP's. The company's finances have been hurt by a glut of surplus generating capacity.
- ◆ **Thailand's** government currently is planning to split up and privatize the holdings of the Petroleum Authority of Thailand (PTT), as part of the package of economic reforms agreed with the International Monetary Fund (IMF) in 1998. The privatization is scheduled to take place in 2001. Thai Oil also recently concluded a major restructuring of its debt to keep it in operation, after the decline in petroleum products demand severely reduced the firm's cash flow.
- ◆ The **Thai** government also is planning to privatize the gas-fired Ratchaburi power complex. Under the plan, the plant's employees would receive an ownership stake, and the state power grid company would retain a 45% equity interest.

- ◆ The **Philippines** undertook a deregulation of its downstream petroleum industry in 1998, ending most government price controls for petroleum products, and removing barriers to new entrants to the market. While some new firms have begun importing petroleum products and establishing retail networks in the Philippines, the market remains dominated by three refiners.
- ◆ **Canada** is in the process of deregulating its electric utility sector. Alberta was the first province to create a competitive market in generation, with location-based rates and a power pool for spot trading in electricity. Ontario's electricity deregulation plan represents part of an ambitious effort to integrate the Canadian and U.S. power grids into one competitive market, and to spur competition and exports of electric power to the United States. Ontario plans to have a \$7 billion, competitive power market in place by November 2000.
- ◆ The oil industry in the **United States** is undergoing a period of consolidation, part of a global trend. The ExxonMobil merger in 1999 was the largest oil industry merger in United States history.
- ◆ The electric utility sector in the **United States** is undergoing a process of unbundling and deregulation. From a primarily vertically-integrated industry, it is moving toward a competitive system in which power generation, transmission, and distribution are separated.
- ◆ The natural gas industry in the United States also is undergoing a process of unbundling and deregulation in several areas. Consumers in some states already have a choice of gas suppliers, even while the local distribution company controls the local pipeline infrastructure.



The ExxonMobil merger in 1999 was the largest oil industry merger in United States history.

# International Trade

The APEC economies in 1998 made up about 42% of the total volume of world trade.

Trade within the APEC region grew rapidly during most of the 1990s, averaging an annual growth rate of 11.3% during the period from 1992 through 1997.

The five largest intra-APEC importers in 1997 were the **United States, Japan, Canada, China, and Hong Kong, China.**

Member Economy	Value of 1997 Imports from other APEC Economies in \$1997	Average Annual Growth in Intra-APEC Imports Between 1992-1997
United States	\$588 billion	10.0%
Japan	\$229 billion	10.0%
Canada	\$170 billion	9.5%
China (PRC)	\$138 billion	14.9%
Hong Kong, China	\$130 billion	9.0%

The five APEC economies with the fastest growing imports from other APEC economies during the period 1992-1997 were **Vietnam, the Philippines, Malaysia, Peru, and Chile.**

Member Economy	Value of 1997 Imports from other APEC Economies in \$1997	Average Annual Growth in Intra-APEC Imports Between 1992-1997
Vietnam	\$9 billion	26.3%
Philippines	\$31 billion	22.8%
Malaysia	\$66 billion	20.7%
Peru	\$4 billion	16.6%
Chile	\$10 billion	15.0%

The five APEC economies with the largest intra-APEC exports in 1997 were the **United States, Japan, China, Canada, and Chinese Taipei.**

Member Economy	Value of 1997 Exports to other APEC Economies in \$1997	Average Annual Growth in Intra-APEC Exports Between 1992-1997
United States	\$495 billion	11.3%
Japan	\$328 billion	6.9%
China (PRC)	\$240 billion	16.8%
Canada	\$197 billion	10.9%
Chinese Taipei	\$106 billion	9.4%

The five APEC economies with the fastest growing exports to other APEC economies during the period from 1992-1997 were **Vietnam, the Philippines, Mexico, Russia, China, and Malaysia** (tied with China for fifth place).

Member Economy	Value of 1997 Exports to other APEC Economies in \$1997	Average Annual Growth in Intra-APEC Exports Between 1992-1997
Vietnam	\$7 billion	28.6%
Philippines	\$26 billion	21.3%
Mexico	\$99 billion	20.1%
Russia	\$17 billion	18.6%
China (PRC)	\$240 billion	16.8%
Malaysia	\$77 billion	16.8%

Most members of APEC also are members of the World Trade Organization (WTO). **China** currently is a candidate for membership in the WTO. The United States and China reached a landmark agreement in November 1999. Before entering the WTO, China still must conclude bilateral negotiations with a number of other WTO members, including the European Union. Multilateral negotiations on China's accession protocol also must be completed.

Several other regional trade groupings overlap with APEC. The **United States, Mexico, and Canada** are members of the North American Free Trade Agreement (NAFTA). The Association of Southeast Asian Nations (ASEAN) includes APEC member economies **Brunei, Indonesia, Malaysia, the Philippines, Singapore, Thailand, and Vietnam**. **Peru** is a member of the Andean Community. **Chile** is an Associate Member of Mercosur (Southern Market).

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