

COUNTRY ANALYSIS BRIEFS

Chile

Last Updated: September 2006

Background

Chile has limited domestic energy resources and relies on imports to meet its rapidly growing energy demand.

Chile has one of South America's most robust and open economies. The country is an associate member of the Common Market of the Southern Cone (MERCOSUR) and full member of the Asia-Pacific Economic Cooperation (APEC) organization. Chile is a member of a number of free trade agreements (FTAs) with various countries, such as Canada, Mexico, South Korea, the United States, and the European Union. The FTA with the United States entered into force in January 2004 and plans to lead to full trade liberalization within 12 years.



In 2005, Chile's real gross domestic product (GDP) grew by 6.3 percent, continuing the strong growth experienced in 2004 (6.2 percent). Booming prices for Chile's mineral exports, especially copper, are the principle drivers of the high growth rate. State-owned copper mining firm Corporacion Nacional del Cobre de Chile (Codelco) is the world's largest copper-producing company. While copper and other minerals remain the mainstays of Chile's exports, trade of other non-traditional products, such as forestry products, fresh fruit and seafood, have grown considerably over the past two decades.

Chile has limited domestic energy resources. As a result, the country must import the bulk of its energy needs. Chile's growing reliance on energy imports, particularly on natural gas, has not been without consequences. In April 2004, Argentina began restricting natural gas exports to Chile, with cuts reaching nearly 50 percent of contracted volumes on some days. Chile, in turn, began to reconsider its energy policy, which, prior to the import restrictions, had assumed an increased use of natural gas and power imports from Argentina. Most importantly, Chile has

begun to pursue other sources of natural gas, such as liquefied natural gas (LNG) or piped gas from other countries.

Oil

Chile has limited oil reserves and production.

According to the *Oil and Gas Journal (OGJ)*, Chile had 150 million barrels of proven crude oil reserves in January 2006. As a result, the country's oil production is limited, reaching 15,100 barrels per day (bbl/d) during the first eight months of 2006. In contrast, Chile consumed an estimated 238,000 bbl/d of oil during that period. The country's main source of oil imports is Argentina, followed by Brazil, Angola, and Nigeria.

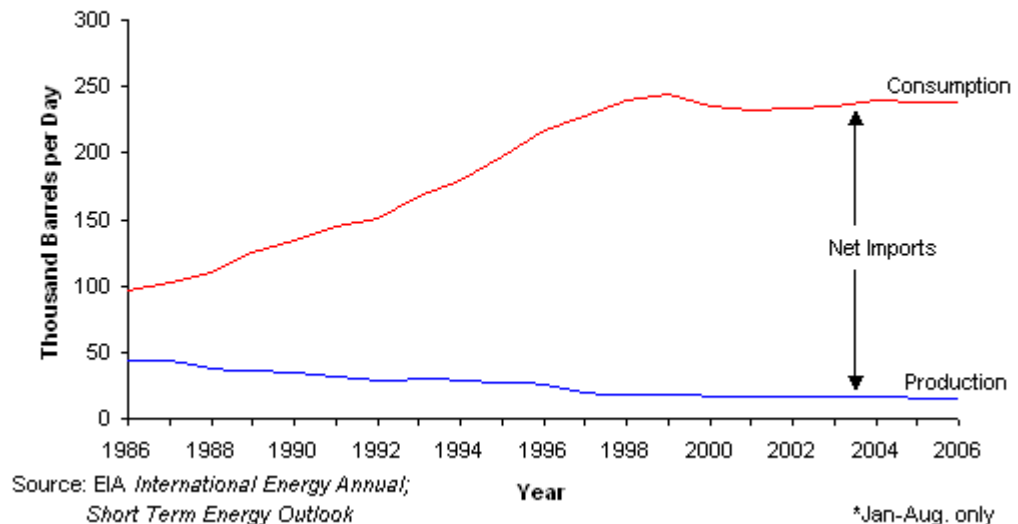
Sector Organization

State-owned Empresa Nacional del Petroleo (ENAP) controls Chile's oil sector. The company is the sole producer and refiner in the country. In 1990, ENAP formed an international subsidiary, Sipetrol, to seek foreign production that could offset declining domestic fields. Sipetrol has pursued investments in places such as Argentina, Colombia, Ecuador, and Egypt. The Comision Nacional de Energia (CNE) has principle regulatory oversight of the oil sector.

Exploration and Production

Chile's Magallanes basin is the sole oil-producing region in the country. ENAP has developed 23 fields in the basin, the largest being the Costa Auera. Overall, oil production in Chile is in decline, as existing wells have matured and exploration efforts elsewhere have proven unsuccessful.

Chile's Oil Production and Consumption, 1986-2006*



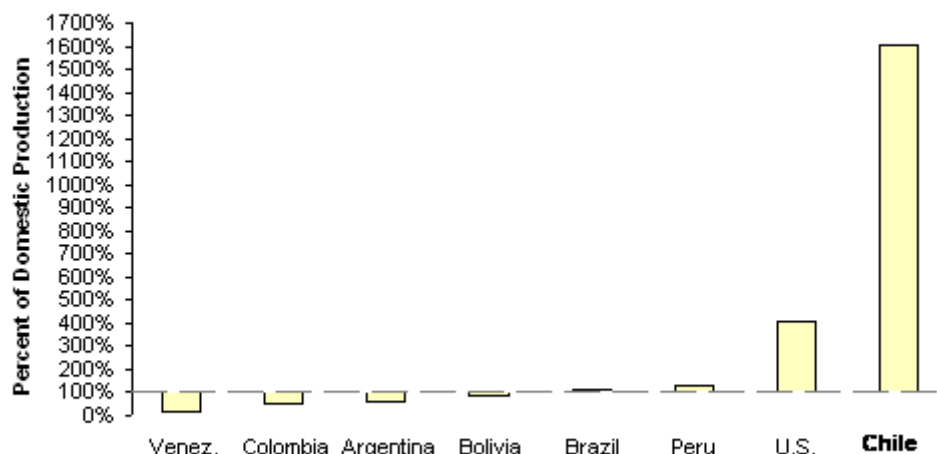
Pipelines

Sonacol operates Chile's domestic oil transport network. The company operates 290 miles of crude oil and product pipelines, which link Chile's oil fields to its refineries and population centers. Sonacol also operates a fleet of oil tankers. Chile has two crude oil import pipelines. The 270-mile, 115,000-bbl/d Trasadino, linking Chile with Argentina, and the Arica-Sica, linking Chile with Bolivia.

Downstream

According to *OGJ*, Chile has 226,800 bbl/d of crude oil refining capacity. The country has three facilities, all operated by ENAP. The largest is the 113,400-bbl/d BioBio refinery, located north of Santiago.

Oil Consumption as Percent of Domestic Oil Production, 2006*



Source: EIA *Short Term Energy Outlook*

*Jan-Aug only

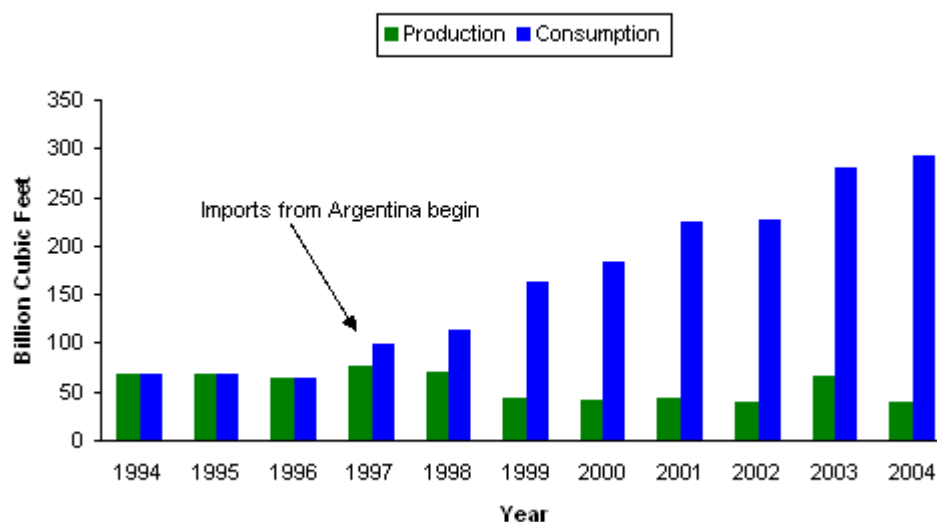
ENAP has been investing in expanding the capacity of its refineries. In June 2004, it signed a deal with partners Tecnicas Reunidas (Spain) and Germany's Ferrostaal Group to build a \$110 million mild hydrocracker at its BioBio refinery to produce low-sulfur diesel fuel; ENAP announced in November 2005 that it would add facilities at the BioBio plant to produce low-sulfur gasoline as well. In June 2005, ENAP announced that it would build a \$430 million delayed coker plant at its Aconcagua refinery, with planned start-up in 2008.

Natural Gas

Chile depends upon imports for almost all of its natural gas needs.

OGJ reported that Chile had 3.5 trillion cubic feet (Tcf) of proven natural gas reserves in January 2006. The country has little domestic production, totaling 38.5 billion cubic feet (Bcf) in 2004. ENAP controls all natural gas production in Chile, which occurs mostly in the Magallanes basin. Chile has vigorously explored the country for natural gas reserves, but has so far not met with any significant success.

Chile's Natural Gas Production and Consumption, 1994-2004



Source: EIA *International Energy Annual*

Despite its lack of domestic reserves, Chile's natural gas consumption has ballooned in recent

years. Historically, low domestic production constrained consumption, with natural gas only constituting 8 percent of total energy consumption (TEC) in 1996. A combination of increasing energy demand, environmental concerns, and the unreliability of hydropower prompted the Chilean government to re-consider its energy policy and encourage the use of natural gas. To that end, Chile began large-scale imports of natural gas for the first time in 1997; since then, the country's natural gas consumption has increased by an average of 21.7 percent a year, reaching 292.8 Bcf and 26 percent of TEC in 2004.

Pipelines

Domestic System

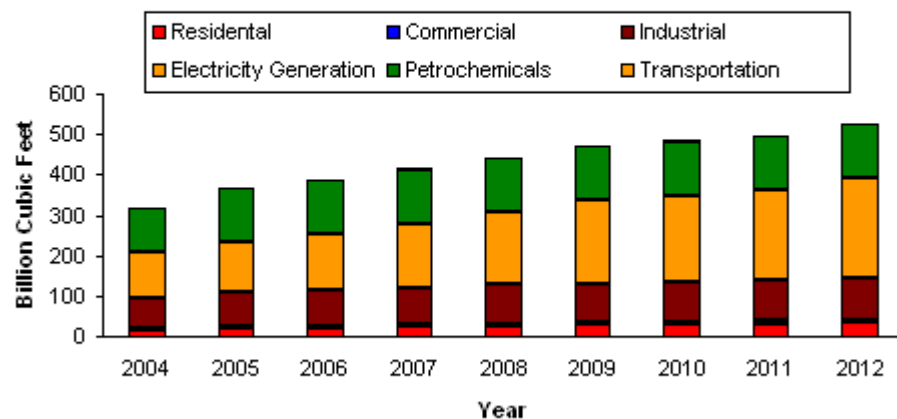
ENAP operates a network of natural gas pipelines that connect production fields in the Magallanes basin to major consumption center.

Import Pipelines

Seven pipelines, all built in the late 1990s, link Argentina with Chile. Three in the south; Tierra del Fuego, El Condor-Posesion, and Patagonia supply methanol plants operated by Methanex, the world's largest methanol producer. Methanex exports most of the methanol produced here to North America and Asia. The Methanex plants have been impacted by the disruption of natural gas imports from Argentina (see below), forcing some plants to shutdown or reduce runs.

In the north, the GasAtacama pipeline runs from Cornejo, Argentina to Mejillones, Chile. Owned by Endesa and U.S.-based CMS, the 580-mile GasAtacama supplies 300 million cubic feet per day (Mmcf/d) to the companies' Nopel power plant. Also in the north, the 250-Mmcf/d NorAndino, operated by Belgium's Tractebel, runs parallel to GasAtacama. In the central region, the 290-mile, 310-Mmcf/d GasAndes pipeline, majority owned by Total, connects the Neuquen basin in Argentina to Santiago, Chile. Also in the central region, the 330-mile, 340-Mmcf/d Gasoducto del Pacifico connects Neuquen to central Chile. Majority owned by TransCanada, El Paso, and Gasco, Gasoducto del Pacifico supplies municipal distributors and gas-fired power plants. In April 2006, the Gasoducto del Pacifico consortium submitted an environmental impact study for a proposed extension of the system to connect the main trunk line with the Campanario power plant in Cabrero.

Chile's Projected Natural Gas Consumption, by Sector, 2004-2012



Source: CNE

Disruptions in Argentine Supplies

In recent years, repeated disruptions in the flow of natural gas from Argentina to Chile have strained relations between the two countries. In 2004, Argentina suffered an energy crisis, forcing it to cut natural gas exports to Chile. Since then, exports to Chile have fluctuated between 20-50 percent below contracted volumes, with natural gas flows ceasing completely on some occasions. For example, Argentina completely cut exports to Chile for two weeks in August 2006. The import cuts have caused shutdowns at power plants and methanol facilities, as well as forcing consumers to switch to costlier fuels. Along with the cuts in volumes, Argentina has also increased natural gas prices: in July 2006, Argentina increased its natural gas export tax to 45

percent, from 20 percent. Continuing structural difficulties in Argentina's natural gas sector could lead to continuing supply problems in the future (also see the [Argentina Country Analysis Brief](#)).

Proposed Pipelines

In light of the disruption of supplies from Argentina, Chile has pursued alternative sources of natural gas imports. Along with liquefied natural gas (see below), additional natural gas import pipelines are possible. In June 2005, Suez Energy International, a subsidiary of Belgium's Tractebel, began a formal feasibility study for a pipeline linking Peru's Camisea natural gas project with northern Chile. The project would feature a 930-mile pipeline system between Pisco, Peru and Tocopilla, Chile, with installed capacity of 810 Mmcf/d. In addition, the pipeline would have connects to the GasAtacama and NorAndio, allowing potential exports to Argentina, if future conditions permitted.

This pipeline is part of the natural gas "ring" proposed by Peru, Chile, Argentina, Uruguay, and Brazil. The ring would utilize new and existing pipelines to link natural gas reserves in those countries, facilitating greater energy integration in the Southern Cone. The ring would also reduce the dependence of some countries, notably Brazil, upon Bolivian natural gas production.

Liquefied Natural Gas (LNG)

As mentioned above, Chile has begun to pursue LNG as a means to diversify its natural gas supply away from Argentina. In February 2006, ENAP awarded a \$400 million tender to BG Group for the construction of an LNG regasification terminal near Quinteros, in central Chile. BG plans to begin construction by the end of 2006 and hopes to bring the plant onstream by 2009. The facility will have an estimated sendout capacity of 330 Mmcf/d. ENAP has already signed supply contracts with large distributors.

There has also been talk of a potential second LNG import terminal. In August 2006, the Chilean government announced that Codelco would lead an effort to develop a terminal in the northern part of the country, which would supply power plants and major industrial consumers. Suez has also floated the idea of building a northern LNG terminal.

Coal

Most of Chile's coal consumption is for electricity generation.

Chile has recoverable coal reserves of 1,300 million short tons (Mmst). In 2004, the country consumed 5.7 Mmst while producing 0.4 Mmst. Domestic coal production is located in the Lota/Coronel area and in the extreme south on Tierra del Fuego. The country has two mines, operated by Empresa Nacional del Carbón (Enacar) and La Compañía Carbonífera San Pedro de Catamutún (CCSPC), respectively.

The level of coal consumption has tended to fluctuate, as the power sector, the country's largest coal consumer, uses the fuel largely as a back up to hydropower. In this role, it is possible that coal consumption will rise rapidly in coming years, especially if the unreliability of natural gas imports from Argentina continue. In 2004, most imports came from Australia, followed by Indonesia and Colombia.

Electricity

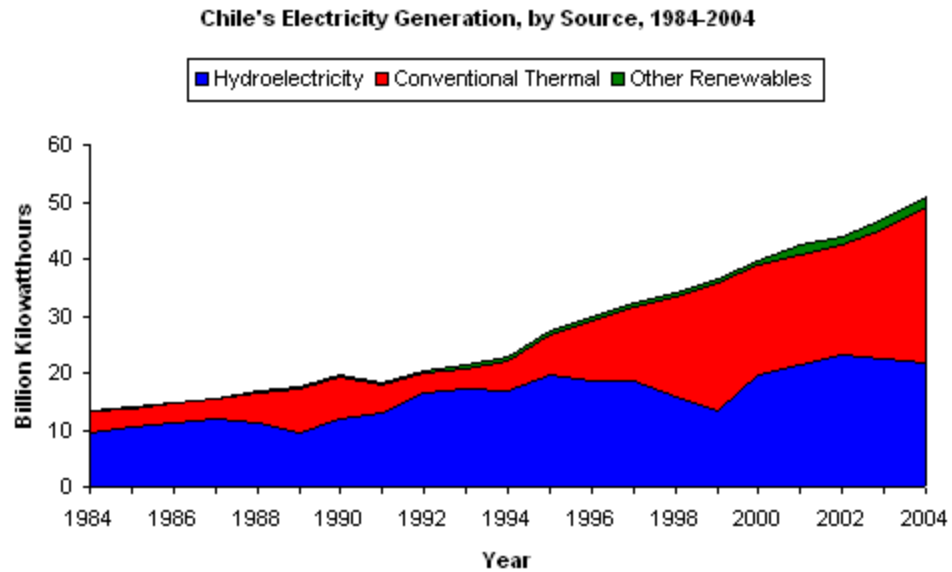
The majority of Chile's electricity supply comes from hydroelectricity, though the importance of conventional thermal sources is increasing.

In 2004, Chile had total installed electricity generating capacity of 10.7 gigawatts. The country produced 50.9 billion kilowatthours (Bkwh) of electricity in 2004, while consuming 49.1 Bkwh. Hydroelectricity supplies the largest share of Chile's electricity supply, contributing 43 percent in 2004. However, the contribution of conventional thermal sources has grown rapidly since the start of natural gas imports from Argentina in the late 1990s.

Sector Organization

Chile privatized its electricity sector in the 1980s, and all generation, transmission, and distribution activities are now in private hands. CNE is mostly responsible for government regulation of Chile's electricity sector, along with the Ministry of Economy and Energy (MEE).

Chile has four separate electric systems: the Sistema Interconectado Central (SIC), which serves the central part of the county; the Sistema Interconectado del Norte Grande (SING), which serves the desert mining regions in the north; and the Aysen and Magallanes systems, which serve small areas of the extreme southern part of the country. The systems are mostly autonomous, as long distances between the four make integration difficult. Transelec controls almost the entire national transmission grid that serves the four systems. In August 2006, Hydro-Quebec sold its majority stake in Transelec to a consortium of private investors.



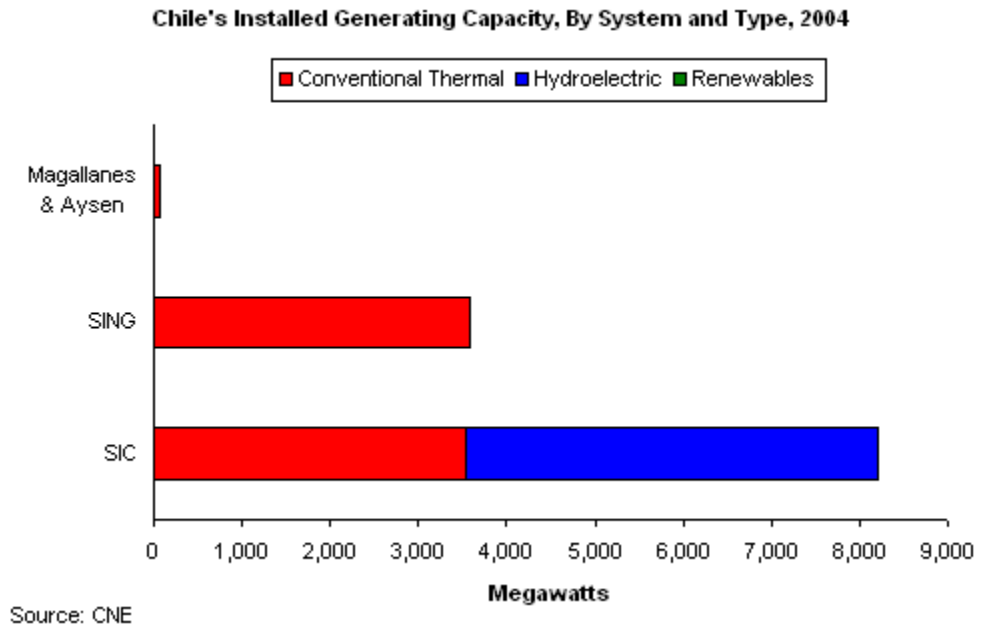
Of the four electricity systems, the largest is the SIC, which covers the major population centers surrounding Santiago and serves over 90 percent of all electricity customers. In the SIC, the most important player is Enersis, majority owned by Spain's Endesa. Enersis holds controlling stakes of both the largest generating company, Endesa, and the largest distribution company, Chilectra, which serves about half of Chile's population.

Unlike the large number of household consumers in the SIC, the SING serves mostly large industrial customers, principally mining interests, in Chile's northern regions. Also unlike the SIC, the large majority of the electricity supply of the SING comes from thermal sources, chiefly imported natural gas from Argentina. The largest generating company in the SING is Electroandina, owned by Tractebel and Codelco.

Hydroelectricity

Hydropower has historically been Chile's single largest power source. Droughts, however, have periodically curtailed hydropower production, causing supply shortfalls and blackouts. In response, the Chilean government began in the 1990s to diversify its energy mix to become less reliant on hydropower, mainly by building natural gas-fired power plants.

After being delayed for several years by opposition from local residents and environmental activists, Endesa's Ralco hydropower plant on the Biobio River began operations in September 2004. Ralco is the largest power plant in Chile, with generating capacity of 570 megawatts (MW). In December 2004, Chile's environmental agency approved plans by Endesa to expand Ralco's capacity to 690-MW.



The Argentine gas crisis has revitalized other Chilean hydropower projects. Chilean power generator Colbun announced in November 2004 that it would proceed with construction of the 70-MW Quilleco hydroelectric plant on the Rio Laja; Colbun originally received regulatory approval for the \$80 million project in 1999, and construction is now slated to be completed by 2007. Colbun is also developing the Chiburgo (19 MW) and Hornitos (55 MW) hydroelectric projects. Endesa plans to complete the 32-MW Palmucho plant, which will work in conjunction with the company's Ralco facility, in the second half of 2007. Australia's Pacific Hydro and Norway's SN Power Invest are developing the 155-MW La Higuera hydroelectric plant on the Tinguiririca River, scheduled for completion in 2008.

Conventional Thermal

Conventional thermal sources, especially natural gas-fired, have become increasingly important to Chile's electricity supply as a way to reduce susceptibility to hydroelectricity's seasonal fluctuations. In the SIC, conventional thermal sources constitute about half of the total electricity supply, while in the SING they constitute almost all of the supply.

There are numerous large-scale power projects in the development pipeline for Chile. Colbun is currently building the 250-MW Candelaria combined-cycle, gas-fired turbine (CCGFT). Endesa plans to complete a 370-MW CCGFT at its existing San Isidro plant, near Santiago, by the end of 2007. Southern Cross, a private equity fund, began construction in April 2006 on the 120-MW Campanario project, a gas-fired power plant in central Chile that will also have the ability to run on diesel. Southern Cross purchased the project from Innergy Holdings, a local gas distributor that had decided not to pursue the project. Some planned projects, though, have been delayed. AES Gener, a subsidiary of US-based AES Corp, sought regulatory approval in early 2005 for its 740-MW Totihue CCGFT south of Santiago; however, a combination of local opposition to the plant and uncertainty about future natural gas supplies have caused the company to delay the project for the foreseeable future. Many of the proposed gas-fired power projects will also have the ability to run on fuel oil or diesel.

Due to the Argentine natural gas crisis, coal-fired power plants have begun to receive renewed attention. Chile has two existing coal-fired facilities, the 340-MW Ventanas and the Guacolda plant. In early 2006, Guacolda (majority-owned by AES) received environmental approval for a 200-MW addition at the facility. AES also received environmental approval in August 2006 for a 250-MW expansion at the Ventanas facility. Other companies that have stated interest in building new coal-fired capacity include BHP Billiton (300 MW), Endesa (350 MW), and Suez (400 MW).

In the longer term, LNG could provide another potential fuel source for electricity generation. ENAP plans to develop a gas-fired power plant alongside its Aconcagua refinery. Endesa has

also stated that it would supply its San Isidro project from a potential LNG import terminal.

Other Renewables

Other renewables contribute a small portion of Chile's total electricity supply. There has been heightened interest recently in Chile's geothermal potential. Geotermica del Norte, a consortium of ENAP and Enel, began surveying the country in 2001; in 2006, the company requested a concession to develop geothermal resources in the El Tatio region of northern Chile. Chile Wireless Energy Chile announced plans to develop three, 5-MW wind power stations in the country, while Endesa plans to develop a 10 MW wind plant.

Environment

Both the energy and carbon dioxide intensities of the Chilean economy are near the regional average.

Chile's dependence upon hydroelectricity and natural gas as energy sources has tended to keep carbon dioxide emissions low, with the carbon dioxide intensity of the country's economy near the regional average. The primary environmental threats to Chile are air pollution from vehicle and industrial emissions, water pollution from untreated industrial sewage, deforestation and soil erosion. Air pollution in Santiago is the most obvious and severe environmental problem in Chile. Mitigating threats to the environment, however, is the increasing use of alternative fuels in Chile's industrial and energy sectors.

Click [here](#) to view the full environmental report.

Profile

Country Overview

Chief of State	President Michelle Bachelet Jeria (since March 2006)
Location	Southern South America, bordering the South Pacific Ocean, between Argentina and Peru
Independence	18 September 1810 (from Spain)
Population (2005E)	15,980,912

Economic Overview

Currency/Exchange Rate (9/13/2006)	1 Chile Peso = 0.0019 USD
Inflation Rate (2005E)	3.1%
Gross Domestic Product (GDP, 2005E)	\$115 billion
Real GDP Growth Rate (2005E)	6.3
Unemployment Rate (2005E)	8.1%
External Debt (2005E)	\$47.5 billion
Exports (2005E)	\$40.6 billion
Exports - Commodities	copper, fruit, fish products, paper and pulp, chemicals, wine
Exports - Partners (2004E)	US 14%, Japan 11.4%, China 9.9%, South Korea 5.5%, Netherlands 5.1%, Brazil 4.3%, Italy 4.1%, Mexico 4%
Imports (2005E)	\$30.4 billion
Imports - Commodities	petroleum and petroleum products, chemicals, electrical and telecommunications equipment, industrial machinery, vehicles, natural gas
Imports - Partners (2004E)	Argentina 17%, US 14.1%, Brazil 11.1%, China 7.1%
Current Account Balance (2005E)	\$703 million

Energy Overview

Proven Oil Reserves (January 1, 2006E)	150 million barrels
Oil Production (2006E)	15.1 thousand barrels per day, of which 22% was crude oil.
Oil Consumption (2005E)	238 thousand barrels per day

Crude Oil Distillation Capacity (2006E)	226.8 thousand barrels per day
Proven Natural Gas Reserves (January 1, 2006E)	3.5 trillion cubic feet
Natural Gas Production (2004E)	38.5 billion cubic feet
Natural Gas Consumption (2004E)	292.8 billion cubic feet
Recoverable Coal Reserves (2003E)	1,301.8 million short tons
Coal Production (2004E)	0.4 million short tons
Coal Consumption (2004E)	5.7 million short tons
Electricity Installed Capacity (2004E)	10.7 gigawatts
Electricity Production (2004E)	50.9 billion kilowatt hours
Electricity Consumption (2004E)	49.1 billion kilowatt hours
Total Energy Consumption (2004E)	1.2 quadrillion Btus*, of which Oil (41%), Natural Gas (26%), Hydroelectricity (18%), Coal (12%), Other Renewables (1%), Nuclear (0%)
Total Per Capita Energy Consumption (2003E)	69.8 million Btus
Energy Intensity (2004E)	5,982.7 Btu per \$2000-PPP**

Environmental Overview

Energy-Related Carbon Dioxide Emissions (2003E)	53.8 million metric tons, of which Oil (51%), Natural Gas (26%), Coal (22%)
Per-Capita, Energy-Related Carbon Dioxide Emissions (2003E)	3.4 metric tons
Carbon Dioxide Intensity (2004E)	0.3 Metric tons per thousand \$2000-PPP**
Environmental Issues	widespread deforestation and mining threaten natural resources; air pollution from industrial and vehicle emissions; water pollution from raw sewage
Major Environmental Agreements	party to: Antarctic-Environmental Protocol, Antarctic-Marine Living Resources, Antarctic Seals, Antarctic Treaty, Biodiversity, Climate Change, Climate Change-Kyoto Protocol, Desertification, Endangered Species, Environmental Modification, Hazardous Wastes, Law of the Sea, Marine Dumping, Ozone Layer Protection, Ship Pollution, Wetlands, Whaling signed, but not ratified: none of the selected agreements

Oil and Gas Industry

Organization	Empresa Nacional de Petroleo (ENAP), state-owned oil and gas company; Comision Energia Nacional (CNE) principal energy regulation and planning
Major Oil and Gas Fields	Costa Auera, Posesion, Daniel Este-Dungeness, Skau, Spiteful
Major Refineries (capacity, bbl/d)	BioBio (113,400), Aconcagua (97,650), Gregorio (15,750)

* The total energy consumption statistic includes petroleum, dry natural gas, coal, net hydro, nuclear, geothermal, solar, wind, wood and waste electric power. The renewable energy consumption statistic is based on International Energy Agency (IEA) data and includes hydropower, solar, wind, tide, geothermal, solid biomass and animal products, biomass gas and liquids, industrial and municipal wastes. Sectoral shares of energy consumption and carbon emissions are also based on IEA data.

**GDP figures from OECD estimates based on purchasing power parity (PPP) exchange rates.

Links

EIA Links

[EIA - Energy Data on Chile](#)

U.S. Government[CIA World Factbook - Chile](#)[U.S. State Department's Consular Information Sheet - Chile](#)**Foreign Government Agencies**[Comisión Chilena de Energía Nuclear](#)[Comisión Nacional de Energía](#)[Instituto Nacional de Estadísticas](#)[Ministerio de Economía y Energía](#)[Superintendencia de Electricidad y Combustibles](#)**Oil and Natural Gas**[ENAP](#)[Energas](#)**Electricity**[AESGener](#)[Arauco Generación](#)[CELTA \(sub. of Endesa\)](#)[Cenelca](#)[CGE Transmisión](#)[Colbún](#)[Edelaysen](#)[Edelmag](#)[Edelnor](#)[Electroandina](#)[Emel](#)[Endesa](#)[Energis](#)[Energía de Casablanca](#)[GasAtacama Generación](#)[Guacolda](#)[Ibener](#)[Luz Linares](#)[Luz Parral](#)[Norgener](#)[Pacific Hydro](#)[Pehuenche](#)[PSEG](#)[San Isidro](#)[SES](#)[Sociedad Austral de Electricidad S.A. \(SAESA\)](#)**Sources**

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Chile National Energy Commission

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Global Power Report

Economist Intelligence Unit ViewsWire

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Noticias Financieras

Oil and Gas Journal

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Petroleum Economist
Platts Oilgram News
U.S. Energy Information Administration
Washington Times
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