



◀ Countries

Bolivia



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Background

The energy sector is of political and economic significance to Bolivia, which is a meaningful contributor to regional natural gas supplies.

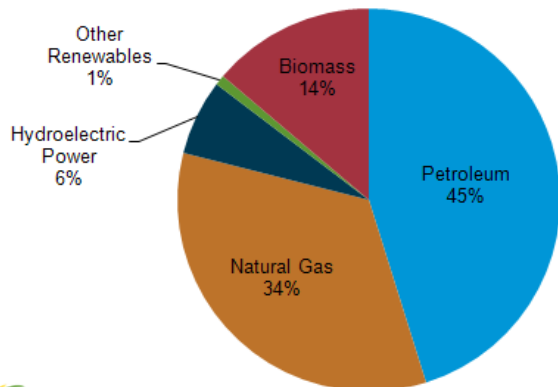
Hydrocarbons are an important element of Bolivia's economy, one of the poorest and least developed in Latin America. Though Bolivia exports natural gas to Brazil and Argentina, continued questions about the actual size of its proved natural gas reserves have contributed to skepticism about the country's potential to be a significant fossil fuel producer and regional energy hub. Bolivia's known fossil fuel endowment is largely concentrated in southern and eastern departments, which have been controlled by opposition parties that demand greater autonomy from the federal government — partly in order to increase investment in and revenues from the hydrocarbon sector.

Despite stirring Western turmoil from his May 2006 nationalization decree, President Evo Morales and his Movimiento al Socialismo (MAS) party's nationalization of the energy sector was atypical. Morales sent the military to oil and gas sites but seized no foreign assets, unfurled Bolivia's national flag but replaced no foreign companies. The decree did increase taxes and royalties by 32% on the two largest producers (Petrobras and Repsol YPF), grant formal ownership of oil and gas reserves to state-owned Yacimientos Petroliferos Fiscales Bolivianos (YPFB), and offer companies 180 days to renegotiate contracts; however, companies' operations and autonomy went largely unhindered. Since the decree, Morales has renegotiated contracts with foreign firms, but with less demanding terms than expected and nationalized Bolivia's own partially privatized companies: Andina, Chaco, and Transredes. Additionally, Morales has offered tax and compensation incentives to foreign companies to increase exploration and production. In 2010, YPFB and foreign firms invested \$1.05 billion, a substantial increase from \$247 million in 2005. YPFB estimates that investment is expected to total over \$2 billion in 2012.

Hydrocarbons, primarily natural gas, account for just over 6 percent of Bolivia's gross domestic product, 30 percent of government revenues, and 45 percent of total exports. Petroleum is responsible for over half of Bolivia's primary energy consumption, with most of the remainder attributable to natural gas. According to the International Energy Agency, combustible renewables and waste meet nearly 15 percent of the country's energy needs. Traditional biomass is an important fuel for heating and cooking, especially for the 2.2 million Bolivians who lack access to electricity. The electrification rate of 77.5 percent masks enormous disparities for urban and rural populations: more than 98 percent of city dwellers have access to electricity, compared to just 38 percent of those in rural areas.



Total energy consumption in Bolivia, by type (2011)



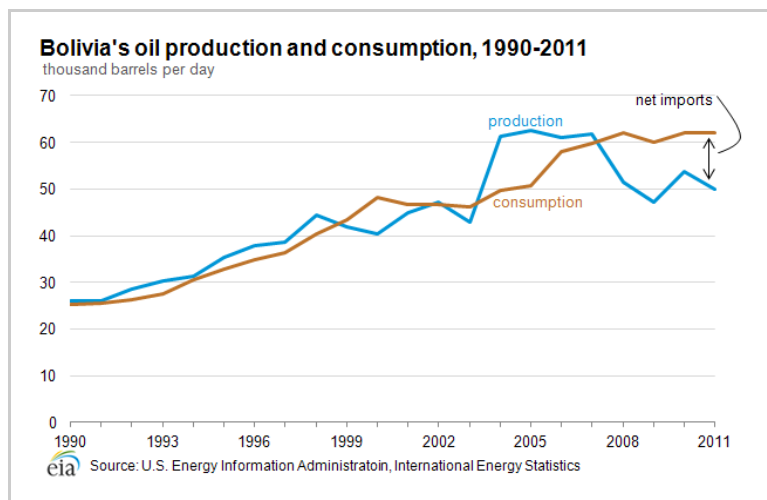
Source: U.S. Energy Information Administration, International Energy Statistics

Oil

Bolivia has been a net oil importer in recent years, as production has failed to keep pace with consumption.

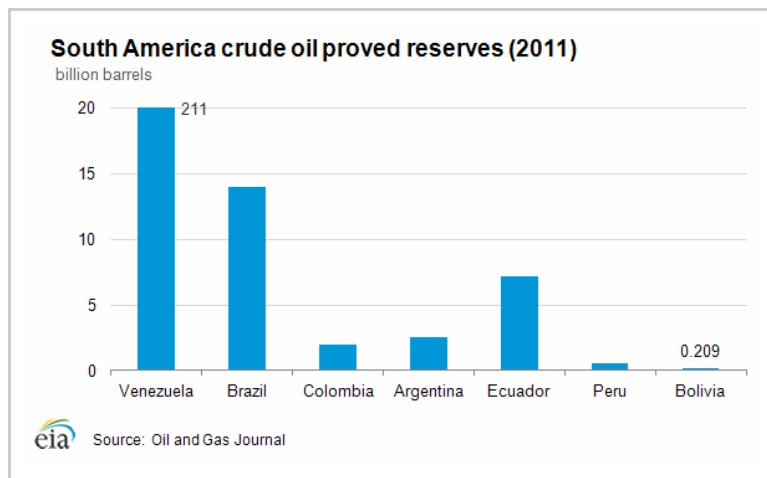
Historically, Bolivian oil consumption and production were steadily increasing. Domestic production satisfied most of the country's demand, with a small surplus devoted to exports. Following the sector's reorganization, oil production declined by nearly one-quarter between 2007 and 2009 and Bolivia transitioned from the status of a net exporter to a net importer of petroleum. While oil production rebounded appreciably in 2010, Bolivia sustained a decrease in production. Statistics from the state-owned oil company suggest that increased production of natural gas liquids more than offset declines in crude oil production.

Bolivian officials have stated that fuel subsidies, which have frozen the prices of gasoline and diesel at around \$2 per gallon, cost the government \$1.5 billion over the last five years. An attempt to reform subsidies in December 2010 was quickly aborted after large-scale protests erupted in response to a roughly 75-percent rise in the prices of some transportation fuels.



Reserves

Bolivia has proven oil reserves of 209 million barrels, according to Oil & Gas Journal (OGJ). Estimates of Bolivia's proven reserves have been relatively consistent since the early 2000s, when they increased three-fold due to heightened exploration activity. Bolivia has only the sixth-largest oil reserves in South America and ranks among the smallest reserve-holders in the world. The country claims another 391 million barrels of probable reserves and 255 million barrels of possible reserves.



Exploration and production

Bolivia's total oil production, including natural gas plant liquids, condensates and other liquids, was nearly 50,000 bbl/d in 2011, which was an increase of about 1,500 bbl/d from 2010. The production of crude oil, including lease condensate, was about 35,500 barrels per day (bbl/d) in 2011, up about 1,000 bbl/d from 2010.

According to official Bolivian statistics, more than half of the country's oil production is driven by two fields — Sabalo (37 percent) and San Alberto (21 percent). They are primarily natural

gas fields that produce associated lease condensate. Tarija, which claims those two fields, dominates liquids production (70 percent), followed by the departments of Cochabamba (15 percent), Santa Cruz (12 percent), and Chuquisaca (3 percent). As operator of the Sabalo and San Alberto fields, Petrobras's Bolivian subsidiary was responsible for 58 percent of the country's 2011 liquids production. Other significant operators include Repsol YPF (17 percent of 2011 liquids production) and two subsidiaries of the national oil company — YPFB Chaco (12 percent) and YPFB Andina (6 percent).

Though specifics have not been finalized, the government reportedly plans to unveil policies to encourage new investment and stimulate hydrocarbon exploration and production. There have been proposals to reimburse fully private producers for their exploration costs if they find new reserves of oil or gas, or increase the price paid to private firms for each barrel of oil produced.

Pipelines

The state-owned YPFB Transporte controls the majority of Bolivia's petroleum transportation network. It operates nearly 1,553 miles (2,500 kilometers) of pipelines — capable of carrying crude oil, condensate, natural gas liquids, and intermediate products — that connect centers of production with the departments of Cochabamba, Oruro, and La Paz.

CLHB S.A. Nacionalizada, another component of the national oil company, operates a separate network of petroleum product pipelines that total about 932 miles (1,500 km).

An international oil pipeline connects the northwestern terminus of the domestic pipeline network with Arica, Chile. In the south, the YPFB Transporte network terminates at the border between Yacuiba, Bolivia and Pocitos, Argentina.

Major Bolivian oil pipelines



Exports

Though it is a net oil importer, Bolivia produces reconstituted crude for occasional export through the pipeline to Arica, Chile. It exported an average of under 900 bbl/d throughout 2011 to Chile, its only export destination for oil.

Refining

Bolivia's refining capacity is roughly equivalent to its current crude output. YPFB Refinación S.A. is the state-owned subsidiary that operates the country's two largest refineries. Roughly 56 percent of Bolivia's 2011 refinery output came from the Gualberto Villarroel refinery in Cochabamba, which has 25,000 bbl/d of crude oil refining capacity according to OGJ. The second largest refinery is the Guillermo Elder Bell refinery in Santa Cruz, which processed over 37 percent of the country's refinery output. Two much smaller refineries in Santa Cruz, Oro Negro and Parapeti produced the remainder. The combined output from YPFB Refinación's two refineries satisfied all internal demand for gasoline, jet fuel, and kerosene, 43 percent of domestic diesel consumption; and 21 percent of liquefied petroleum gas consumption in 2011. YPFB has announced plans to boost capacity from 43,600 bbl/d to 57,000 bbl/d over the next few years.

Sector organization

The state-owned oil company, Yacimientos Petrolíferos Fiscales Bolivianos (YPFB) formally controls, oversees, or executes all activities in the country's oil and gas sector. YPFB has obtained ownership stakes of at least 51 percent in Bolivia's formerly privatized firms, such as YPFB Andina, YPFB Chaco, and YPFB Transporte (formerly Transredes), which now act as subsidiaries of the national oil company. YPFB Petroandina was created as a 60-40 joint venture between YPFB and PDVSA (the Venezuelan national oil company).

While YPFB leads the oil and gas sector, private companies often act as operators and lend important expertise, services, and capital. For those firms that were not nationalized, the government imposed significantly higher royalties and eliminated the "risk-sharing" contracts that conferred ownership rights over resources to private companies. Instead, private companies surrender production to YPFB in exchange for a fee.

The Ministerio de Hidrocarburos y Energía (MHE, Ministry of Hydrocarbons and Energy) is the planning and policymaking body that has overseen the industry's restructuring, augmented state control over the energy sector, and attempted to revitalize hydrocarbon exploration, production, and processing. The Agencia Nacional de Hidrocarburos (National Hydrocarbons Agency) has regulatory oversight over the supply and disposition of oil and gas.

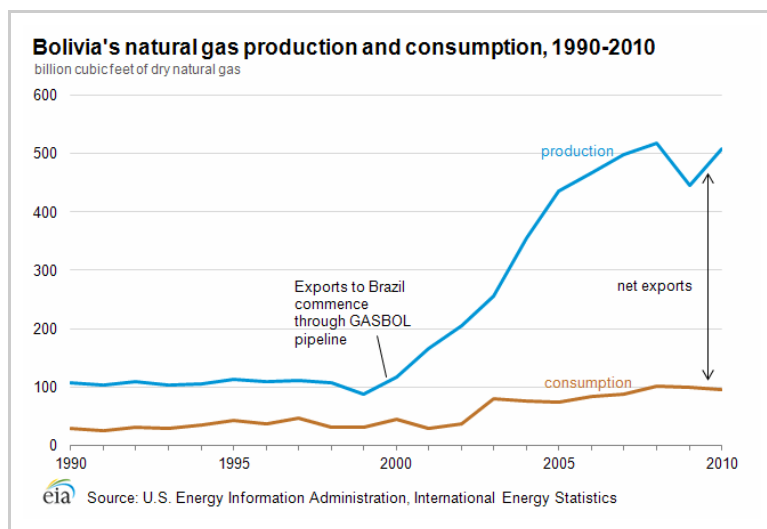
Natural gas

Bolivia possesses significant proved reserves of natural gas and exports most of its production to Brazil and Argentina.

Among mainland South American countries, Bolivia trails only Argentina and Venezuela in terms of natural gas production. Its production volumes have risen dramatically since 1999, when natural gas exports to Brazil began. However, Brazil and Argentina, which already import a majority of Bolivia's natural gas, are demanding further volumes. Along with a growing domestic demand in the industrial sector, Bolivia is having a difficult time meeting its contractual obligations.

The development and disposition of Bolivia's natural gas has been a source of considerable controversy. Violent unrest and government crackdowns in late 2003 became known as the "Gas Wars" because they were precipitated by opposition to a plan to export liquefied natural gas (LNG) via Chile, with which Bolivia has had troubled relations since it lost its sovereign access to the sea during the nineteenth-century War of the Pacific.

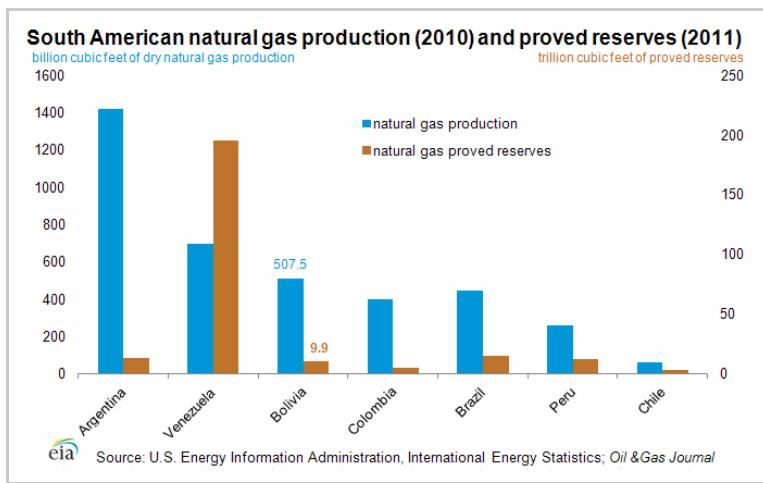
Roughly one-fifth of Bolivian natural gas production is slated for the domestic market, which is dominated by electricity demand (over one-half of Bolivian natural gas consumption), industry (roughly one-quarter), and transportation (just below one-fifth). Domestic natural gas prices are fixed at levels that range from \$0.90 per thousand cubic feet (Mcf) to \$1.98 per Mcf, depending upon its end-use.



Reserves

Bolivia has proved natural gas reserves of over 9.9 trillion cubic feet (Tcf), according to *Oil & Gas Journal*, which would rank as the fifth largest reserves in South America. Tarija contains over 85 percent of the country's proved natural gas reserves (led by the San Alberto, Margarita, Sábalo, and Itaú fields), followed by Santa Cruz (10.6 percent) and Cochabamba (2.5 percent). Recent test wells by Repsol YPF and YPFB have each discovered large volumes of natural gas in Santa Cruz's Rio Grande field.

According to recent [analysis](#) by EIA and Advanced Resources International, Bolivia has 48 Tcf of technically recoverable shale gas resources.



Exploration and production

Bolivia produced an estimated 507 billion cubic feet (Bcf) of dry natural gas in 2010, a decline from a peak of 518 Bcf in 2008. According to the EIA, natural gas production reached a new peak of more than 590 Bcf in 2011.

Approximately three-fifths of Bolivian natural gas production comes from the Sabalo (34 percent) and San Alberto (26 percent) fields. They both lie in Tarija, which accounts for over 70 percent of Bolivian natural gas production. Santa Cruz ranks second at just below 20 percent. MHE has announced that La Paz, Beni, and Pando could soon join Chuquisaca, Cochabamba, Santa Cruz, and Tarija as natural gas producing departments.

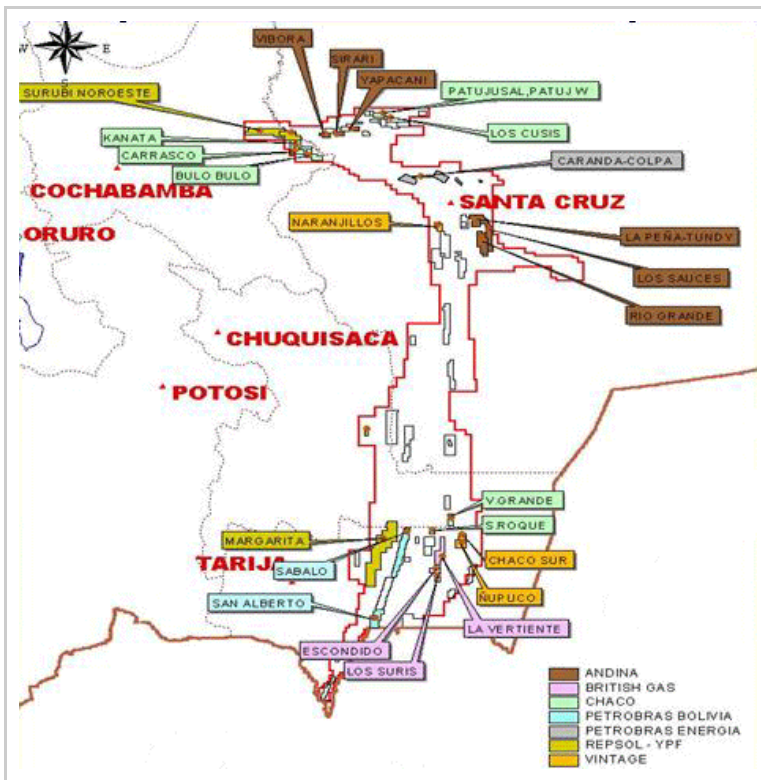
Officially, the largest natural gas producer in the country is YPFB. However, as with the oil sector, Petrobras Bolivia is the operator of the Sabalo and San Alberto fields and is thus responsible for 58 percent of the country's output. State-owned YPFB Chaco and YPFB Andina collectively produce 22 percent of Bolivia's natural gas, with a number of privately held firms responsible for smaller stakes.

In February 2011, a consortium that includes Total, Petrobras, and YPFB Chaco announced the start of commercial production in the Itaú field (near San Alberto field), which will produce over 50 million cubic feet (MMcf) of natural gas per day. According to some plans, future phases of development could more than triple those volumes.

YPFB has announced that it and foreign partners plan to invest over \$4 billion in the natural gas sector by 2015. President Morales's goals include a near-doubling of natural gas production by 2015.

Selected oil and gas fields in Bolivia

Source: YPFB



Pipelines

YPFB Transporte controls the most extensive natural gas pipeline network in the country, while a number of smaller, regional pipelines are operated by various public and private entities. The U.S. Central Intelligence Agency estimates that Bolivia's total natural gas pipeline infrastructure spans 3,226 miles (5,192 kilometers).

Bolivia-Brazil

The Bolivia-Brazil natural gas pipeline (commonly referred to as GASBOL) — which connects Santa Cruz, Bolivia with Porto Alegre, Brazil via São Paulo — is described by Petrobras as Latin America's biggest and most important energy infrastructure project. The 1,907-mile (3,069-kilometer) pipeline, of which 346 miles (557 kilometers) transit Bolivia, required over \$2 billion of financing by Petrobras. Construction commenced in November 1997 and was completed one year later. The Bolivian portion of GASBOL is owned and operated by Gas TransBoliviano, of which YPFB Transporte has a majority stake. The GASBOL system has a maximum capacity of 1.1 Bcf/d.

Completed in 2001, the Cuiabá pipeline connects Ipias, Bolivia to a thermoelectric power plant in Cuiabá, in the Mato Grosso state of Brazil and has an installed capacity to transport 141 MMcf/d of natural gas.

Bolivia-Argentina

The YABOG pipeline, which runs from Río Grande, Bolivia to Salta, Argentina, was completed in 1972 with a capacity of 210 MMcf/d. Argentina and Bolivia operate another small cross-border pipeline, known as Juana Azurduy, from the Margarita field in Bolivia to the border town, Madrejones, to an Argentinian plant at the Duran field. With a capacity of 953 MMcf/d of natural gas, the pipeline began operations in June 2011. The Argentine government has proposed a Gasoducto del Noreste Argentino to serve its remote northeastern provinces with the larger volumes of gas that Bolivia has promised for future

years.

Major natural gas pipelines in Bolivia



Source: YPFB Transporte, Ministerio de Hidrocarburos y Energía

Exports

Brazil

Brazil is the primary destination for Bolivian natural gas. In 2010, roughly 68 percent of Bolivian natural gas output — or roughly 80 percent of exports — was directed to Brazil.

Natural gas exports to Brazil commenced in 1999. The bilateral natural gas trade is governed by a 20-year contract between YPFB and Petrobras, under which Bolivia commits to supplying 1.1 Bcf/d (30.08 million cubic meters per day, or MMcm/d) and minimum average flows of .85 Bcf/d (24.06 MMcm/d) are guaranteed through a take-or-pay provision. The price of natural gas sold to Brazil is computed quarterly according to the terms of the contract, and averaged \$6.03 per million Btu in 2010.

In October 2010, Bolivia agreed to supply Brazil with another 78 MMcf/d (2.2 MMcm/d) of gas for a power plant in Cuiabá, which had been shuttered since Bolivian supplies were interrupted in 2007 due to unexpectedly low output and high domestic demand.

Argentina

Bolivia began exporting natural gas to Argentina in 1972, which is now the destination for about 20 percent of Bolivian natural gas exports. A contract addendum between YPFB and Energía Argentina Sociedad Anónima (ENARSA) extends through 2026 and stipulates a trade volume of 272 MMcf/d (7.7 MMcm/d) by 2007 and to grow to nearly 1 Bcf/d (27.7 MMcm/d) by 2010. In 2010, Bolivia exported only 177 MMcf/d (5 MMcm/d). Unable to meet

export commitments, in March 2010, Bolivia signed an amended contract that stipulated 177 MMcf/d (5 MMcm/d) by 2010 and 1 Bcf/d (27.7 MMcm/d) by 2017. With the opening of the Juana Azurduy pipeline, Bolivia's exports to Argentina increased an estimated 263 MMcf/d (7.45 MMcm/d) in 2011, but Bolivia it must increase its production volumes, if Bolivia is to fulfill its contractual agreement.

Sector organization

Similar to the oil sector, YPFB exercises control over natural gas as a state-owned company. Likewise, the Ministry of Hydrocarbons and Energy (MHE) and the National Hydrocarbons Agency establish and enforce industrial strategy, policy, and regulation. The Empresa Boliviana de Industrialización de Hidrocarburos (the Bolivian Company for the Industrialization of Hydrocarbons) was established in 2009 to develop a more robust petrochemicals industry, based largely upon the country's natural gas resources.

Following the nationalization decree in May 2006, oil and gas companies were required to negotiate new contracts with the state as a condition of continued operation in the country. The contracts agreed to in October 2006 entitled the state to a majority of the take from natural gas fields: 18 percent in royalties, 32 percent from the special hydrocarbon tax (IDH), and up to a 32 percent share for YPFB.

Though the country adopts a unified approach to many facets of the oil and gas industry and its attempts to stimulate exploration and production, natural gas is the country's more significant resource. As such, the government is attempting to promote the domestic use of natural gas as a substitute for oil products, integrate more households into the natural gas grid, and convert most of the motor vehicle fleet to compressed natural gas.

Electricity

Natural gas-fired plants and hydropower are the dominant sources of Bolivia's electricity supply.

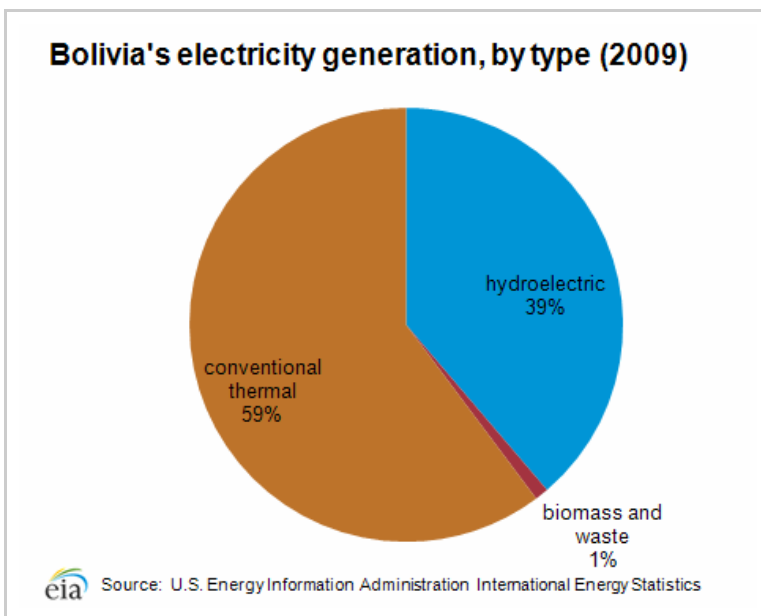
Bolivia generated 5.8 billion kilowatthours (kWh) of electricity from nearly 1.5 gigawatts (GW) of installed capacity in 2010. Thermoelectric power plants, which are the largest source of generation, primarily burn natural gas and a small amount of oil.

The Bolivian government plans to invest in nearly 1 GW of capacity additions, mostly hydroelectric, by 2015. The government has expressed a desire to increase its reserve margin, or the cushion between available capacity and peak load, from around 10 percent in order to enhance system reliability and minimize disruptions.

Major electricity infrastructure in Bolivia



Sources: Comité Nacional de Despacho de Carga



Sector organization

Electricity has been broadly governed by the Ley de Electricidad (Electricity Law) of 1994 and associated rulemaking, which privatized and unbundled the electricity sector. However, the

sector has changed dramatically in recent years through a new constitution, new institutions, and President Morales's renationalization campaign.

Bolivia's principal electricity system is the Sistema Interconectado Nacional (SIN), a network of generation, transmission, and distribution infrastructure that connects major population centers. The SIN serves about 90 percent of the country's electricity demand. Electricity on the SIN network is bought, sold, and traded on the Mercado Eléctrico Mayorista (MEM, wholesale electric market). The Sistemas Aislados (SA, or "isolated" systems) consist of the electricity infrastructure in remote areas not served by the broader SIN grid.

In 2009, the Autoridad de Fiscalización y Control Social de Electricidad (AE) replaced the Superintendencia de Electricidad as the regulatory and planning body with oversight of the electricity sector. AE's stated objectives are to promote universal access to electricity; equitable and affordable rates; and efficient, sustainable, and secure system operations.

The Comité Nacional de Despacho de Carga (CNDC, roughly translates as National Committee for Load Dispatch) is Bolivia's approximate equivalent to a Regional Transmission Organization or Independent System Operator. CNDC is responsible for the operation of the SIN and the administration of and planning for the MEM.

The national electricity company, Empresa Nacional de Electricidad (ENDE), was essentially re-founded in 2008 after its assets had been privatized in the 1990s. In May 2010, four electricity firms, which accounted for more than half of the electricity market, were expropriated by the government after failed contract renegotiations: Corani (had been 50 percent owned by France's GDF Suez), Guaracachi (had been 50 percent owned by the United Kingdom's Rurelec), Valle Hermoso, and the Empresa de Luz y Fuerza Eléctrica Cochabamba (ELFEC). The nationalizations returned the firms' assets to the recently reconstituted ENDE. Following the announcement, the government claimed control over 80 percent of Bolivia's electricity generation and expressed a desire to achieve complete government control over the sector.

Sources

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