

REPORT

Energy

Projection & Opportunities

APRIL 2021

Energy

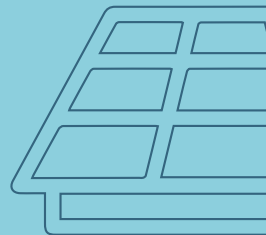
Projection and Opportunities in Chile

APRIL 2021

INDEX

01. Introduction	4
02. General Features of the Sector	5
03. Generation	6
04. Transmission	23
05. Distribution	25
06. Conclusion	27
07. Appendix	30

Data collection & analysis developed by BNAmericas for InvestChile



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01. Introduction

Chile's electric power sector is undergoing exciting transformations in almost all areas as the country transitions towards a cleaner and less centralized power grid.

Bloomberg's Climatescope 2020 report ranks Chile as the most attractive country in the world for renewable energy investment. In addition, the country remains one of the most stable in Latin America in terms of regulation, free market principles and a policy framework that remains consistent despite changes in government.

The country has undergone massive change in its electric power sector over the last ten years; in that time frame, renewables capacity has grown from an almost insignificant component of the matrix to over 28% of the total capacity.

This trend is expected to accelerate significantly in coming years. While only half a decade ago the most optimistic experts expected the country to achieve a 90% renewable matrix by 2050 given favorable conditions, today it is not uncommon for experts to predict the country will reach that goal within a decade – by the year 2030.

The report also provides a general description of Chile's power grid and main regulatory attributes, as well as an overview of the biggest players in the industry.

It aims to provide a general description of the Chilean power system, including the remarkable transformations it has been subject to in recent years. Within it, readers will find a breakdown of the main opportunities presented by the country's ambitious transformation of its energy sector.

02. General Features of the Sector

Chilean regulation splits the energy market into three discrete segments: generation, transmission and distribution. All of them are fully run by private companies, which invest in the necessary infrastructure according to each segment's regulatory scheme.

This market was privatized in the 1980s offering private investment opportunities in generation, transmission and distribution.

Well over 100 corporate entities have owned power generation assets over the years and the industry includes many international Independent Power Producers (IPP), either directly or via partnerships.

Transmission and distribution are also controlled by private sector players, albeit subject to stricter regulation.

Chile's power grid is mainly composed of a single interconnected grid known as the Sistema Eléctrico Nacional (SEN).

The country also has two very minor southern grids that cover isolated regions: the Sistema Eléctrico de Aysén (SEA) and the Sistema Eléctrico de Magallanes (SEM).

Chile's north is host to some of the strongest and most consistent sunshine on earth, and Concentrated Solar Power (CSP) capacity has surged in those regions in recent years through an open and technology-agnostic tender system to supply power distributors.

Another great contributor to Chile's attractiveness for international renewable energy investors is the country's track record when it comes to policy consistency and regulatory stability. Energy policy generally transcends changes in government, and the country has strong and independent regulatory bodies.

These stellar market conditions allowed non-conventional renewable installed capacity to grow from 2% of the national total in 2005 (provided

by a few biomass and mini hydro projects) to 26,4% in 2020, led mainly by solar and wind projects.

Inside each section of the report, corresponding each to one of the segments, a general overview of that section is presented, together with the main sources of information the reader can use to find out more.

The report also provides a general description of Chile's power grid and main regulatory attributes, as well as an overview of the biggest players in the industry.

Later chapters deal with future challenges – and opportunities that are expected to develop in the coming years.

Lastly, it closes with a glossary of relevant terms and institutions, as well as some additional relevant information.

03. Generation

Overview

Chile has an open and competitive generation market, where all main electric power assets are privately owned. The country offers ample opportunities for investment, especially in renewable generation, in the coming years.

The generation segment is based on free market rules. When a generator decides to connect to the national grid, it becomes subject to dispatch and wholesale market price regulations.

Grid operator *Coordinador Eléctrico Nacional* (CEN) regulates dispatch priority and sets prices according to its methodologies. It attempts to run the system by optimizing it to reach the lowest overall cost possible.

Whenever a generation facility is connected to the national grid, its owner or operator is subject to the instructions of the CEN. For any given demand, the CEN orders the injection of energy by the most cost-efficient power plants first (such as solar, hydro and wind) and, only if

necessary, by less efficient generators (thermal units powered by natural gas, coal and diesel).

Generation companies can sell their surplus energy (the difference between injections and withdrawals for contracted customers) in the spot market at a price equal to the marginal cost of the electricity system. This spot price is defined as the variable cost to produce energy by the least efficient generation facility per hour.

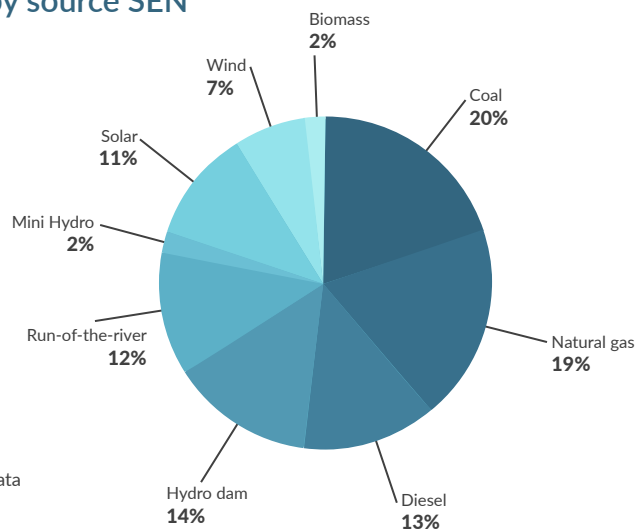
Besides their participation in the spot market, generators can also take part in the contract market. They can sell energy and/or capacity to private companies at a freely agreed price.

Finally, they can sell energy and capacity to power distributors through a public bidding process supervised by the Chile National Energy Commission (CNE), one of the main power sector regulators. This process awards 15-year supply contracts (PPAs) and is technology-agnostic, meaning all types of generation can compete fairly and transparently.

The CNE evaluates the need for new short-term and long-term supply tenders every year. (Information on new tenders can be accessed here.) <https://www.cne.cl/en/nuestros-servicios/licitaciones-y-suministros/>

According the CNE, Chile´s installed capacity by the end of 2020 reached 24,644MW on the SEN, which contains 99.3% of the country´s capacity. To that we must add 58MW in the southern SEA grid and 107MW in the far-south SEM grid.

Installed capacity by source SEN

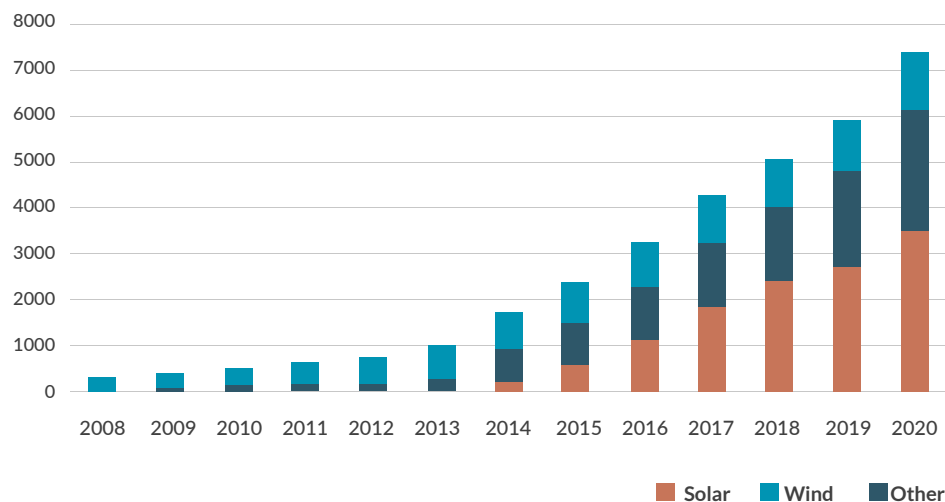


Source: BNamericas with CNE data

Recent changes in the makeup of the SEN have been dramatic. While in 2015 the country had 12% non-conventional renewable installed capacity, that number has grown to 26,4% (an exact up to date figure can be found here) <http://energiaabierta.cl/visualizaciones/capacidad-instalada/>

Nowhere has the change been starker than in photovoltaic generation. In 2013, Chile had 11MW of installed solar capacity. In 2020, that number has increased to 3GW. And the pace of growth is accelerating.

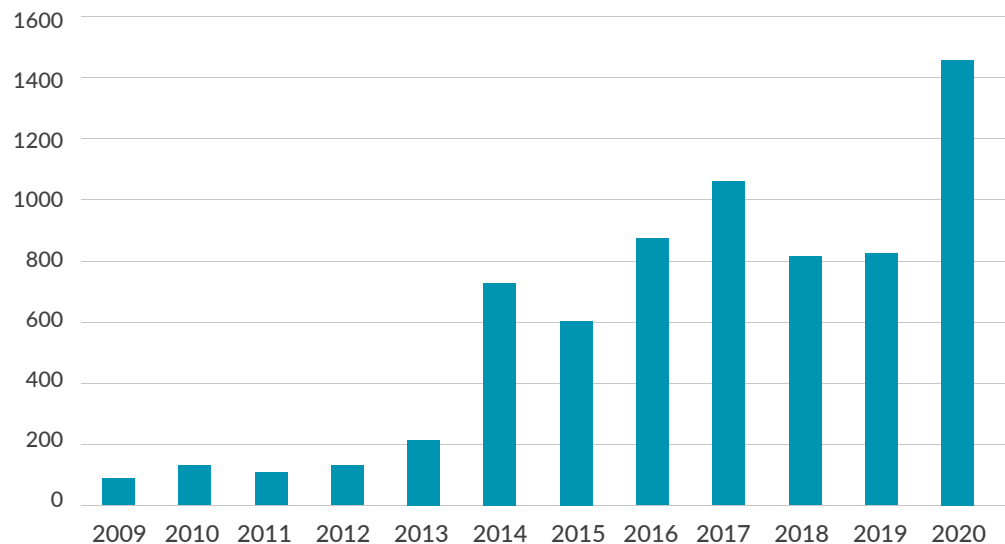
Renewable installed capacity [MW]



Source: BNamericas with data from renewables industry association Acera.

Starting in 2013, the country has added increasing amounts of renewable capacity every year, a trend that peaked in 2020, as seen in the graph below, and despite the difficulties associated with the COVID-19 pandemic.

Yearly renewable additions [MW]



Source: BNamericas with Acera data.

These changes have been made possible by a combination of factors, chief among them the quality of Chile's renewable resources, its technology-agnostic power auctions, allowing renewables to compete freely with other technologies, and the country's region-leading reputation of regulatory stability and judicial independence.

The country's trend-setting renewable transformation is expected to accelerate in the coming years. According to the CNE, by the end of 2020 Chile had an unprecedented 5.9GW of renewable projects under construction, expected to come online between 2021 and 2023.

According to a report on construction and investment projects in the energy sector by the Energy Ministry, as of December 2020 there were 99 power plants in the construction phase, representing an investment of US\$12.5 billion and a contribution of 6,683 MW net capacity.

95% of the plants under construction will generate energy from renewable sources, while 82% are from non-conventional renewable energy (NCRE) sources. Investments are led almost equally by hydroelectric technologies (37%; US\$4.6 billion) and solar (35%; US\$4.4 billion).

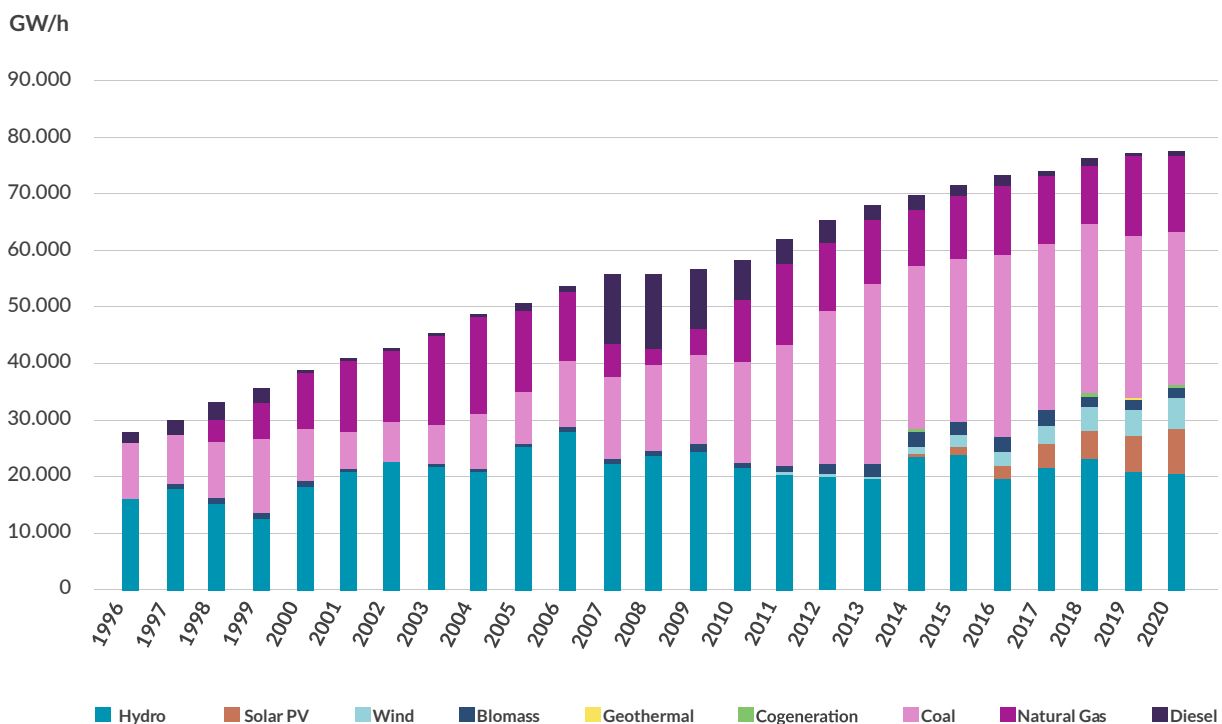
It is important to mention that at the same time, in the environmental assessment pipeline (prior to the construction phase) there were 212 power plant projects with an investment of US\$12.3 billion.

On the SEA, 55.3% of capacity is diesel-powered, 39.2% run-of-the-river hydroelectric and 5.4% of wind. On the SEM, 83% of capacity is natural gas-fired, 15% diesel and 2% wind.

In terms of power generation, according to grid coordinator CEN, during 2020 the SEN saw generation of 70.8 GWh,

In 2020, hydroelectric generation was the largest source of power production in Chile at 40.3% of the matrix, followed by coal at 30.3% and natural gas at 4,1%. Renewables had a significant participation, with wind and solar together generating 21.8% of the country's power.

Yearly power generation by technology



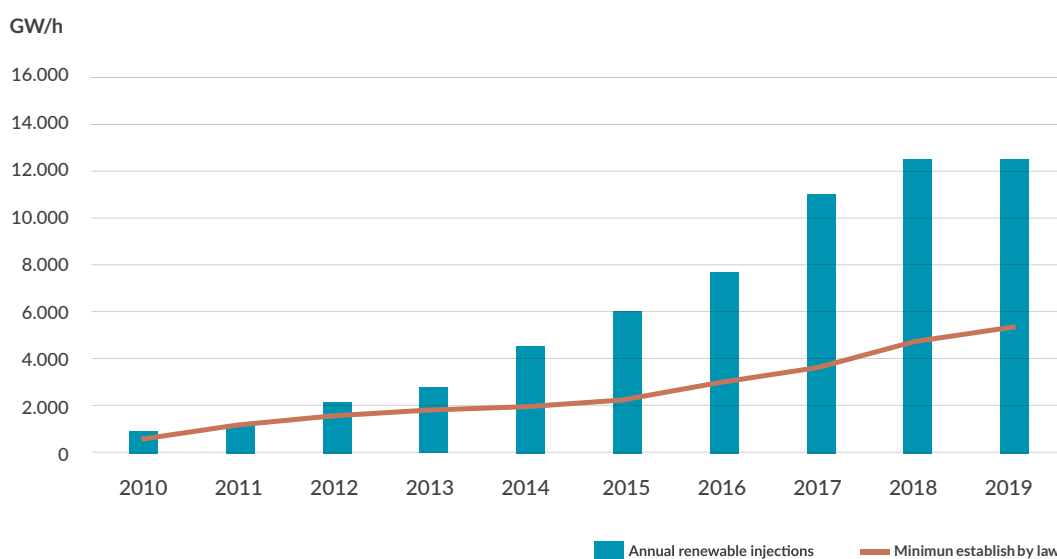
Source: BNamericas with data from Generadoras de Chile.

As can be seen in the chart above, as the participation of hydroelectric generation has dwindled, mainly due to prolonged droughts in the country's central regions, coal and non-conventional renewable generation have surged in recent years.

During the last months of 2019 and most of 2020, non-conventional renewable injections have made up more than 18% of Chile's power matrix, and more than 20% during some months. Meanwhile, coal generation made up 37% of generation in 2019, down from 39% in 2018.

In 2008, Chile established yearly goals for renewable generation as a percentage of the overall matrix through law 20,257, starting at 5% and working up to 10% in 2025. Law 20,698, a more ambitious overhaul, set a target of renewables to make up 20% of the generation matrix by 2025.

Renewable generation compared with national goals



Source: BNamericas with CNE data.

As shown in the graph above, Chile has consistently outpaced its goals over the past decade, with renewable generation growing by a yearly average rate of 35% between 2010 and 2019.

Moving forward, Chile's long-term commitments to combat climate change include 70% of its generation matrix comprising renewables by 2030. This last commitment was originally set for 2040, but the date was brought

forward in the context of the COP 25 summit of 2019.

Falling prices and Chile's world-class solar resources explain much of the boom. The price of solar panels has fallen consistently in recent years, dropping by 13.6% during 2019, according to a study conducted by the energy ministry.

The country's rock-solid regulatory reputation, its independent regulatory bodies and its commitment to free market and competitive principles have allowed it to take advantage of its world-class resources.

In 2019, coal still had a significant share of the generation park with 37% of total injections, being the cheapest form of thermoelectric generation locally and making up the backbone of Chile's matrix.

This role was previously taken up by hydroelectric power and natural gas, but years of drought in Chile's central regions and the Argentine natural gas crisis, which cut off competitive supply to Chile in the mid-2010s, dampened the growth of these technologies.

The participation of coal in the power matrix is expected to decrease dramatically in the coming years as part of a programmed coal-phase out plan agreed between the authorities and power companies. According to the agreed calendar, all coal-fired generators should be retired before 2040.

Small and Medium Size Power Generation (PMGD)

Chile has also seen great growth in small and medium distributed generation assets of up to 9MW, called PMGD due to the Spanish-language acronym.

According to consulting firm Sphera Energy, in July of 2020 PMGD installed capacity had reached 1,275MW, with 56% being solar, 20% hydroelectric, 15% diesel, 4% wind, 2% natural gas, 2% biogas and 1% biomass.

PMGDs can take advantage of several incentives, including easier protocols to connect to the grid and a separate price-setting mechanism known as the stabilized price regime.

The stabilized price is equal to the average value of PPAs on the market adjusted depending on projections of the spot market prices for the next four years. It allows project developers greater certainty about their expected returns, which in turn helps access financing for PMGD projects.



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Tenders and Contracts

Chilean renewable project developers have three main ways to secure contracts in order to seek financing for their projects: supply tenders, free contracts and the PMGD regime.

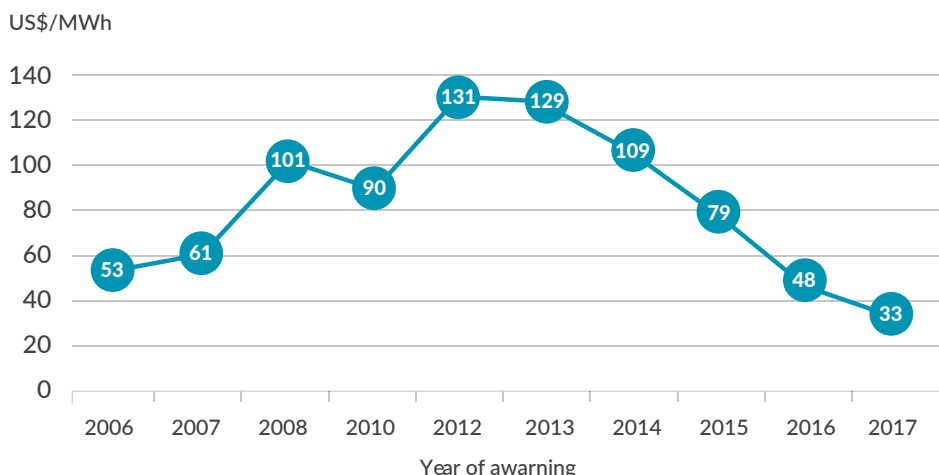
The most important way is through supply tenders offered by power distributors. Generation companies bid to offer the lowest prices and are awarded long-term PPAs starting five years after the awarding.

Companies can then use that PPA to seek financing for their projects and have them ready once their contracts take effect.

In recent years, due to the falling costs of building renewable generators, these supply tenders have been dominated by renewable plants (in two of the last three tenders, renewables have accounted for 100% of the projects awarded). As can be seen in the chart below, these tenders have involved consistently lower prices, in large part thanks to the contribution of renewable projects.

However, because of the country's auction process, most of these price drops will only start to be reflected in the system from 2021.

Average prices awarded in yearly supply tenders



Source: CNE.

As the above graph shows, awarded prices reached a peak between 2008 and 2014, in the aftermath of large-scale droughts that forced the system to rely on more expensive thermal units. At that time, most new generation projects were coal-fired.

However, as renewables became a viable option, awarded prices came down dramatically and to a record low average of US\$33/MWh in 2017. According to the CNE, these auctions are expected to lead to a 20% drop in end-customer prices over the next decade.

This decrease in prices was also made possible by changes to the tender process introduced in 2015, intended to increase its competitiveness. These include the introduction of different hourly blocks of energy supply and a longer supply period of 20 years.

Direct and Indirect Incentives

Chile offers both direct and indirect incentives for renewable development and energy investment in general.

Its free market principles in the generation segment, coupled with a robust and long-term PPA framework through competitive tenders, ensure participants can access financing and develop projects with a clear long-term outlook.

More broadly, the country has shown an ability to maintain a consistent policy and regulatory framework through governments of differing political affiliation.

The current presidential administration has expanded policies and increased the ambition of previously existing goals. Chile began a policy of renewable expansion in the mid-2010s, when it became apparent the cost of renewable development had decreased significantly.

In terms of specific incentives for certain technologies, the country requires companies with installed capacity of more than 200MW that withdraw energy from the electrical system to trade with distribution companies and consumers to certify that a percentage of their withdrawals come from renewable sources. This percentage increases every year and will reach 20% in 2025.

Chile’s government presented a coal-phase out plan in 2019 that aims to completely turn off its 5.5GW of coal-fired generation capacity by 2040, with 1.04GW set to retire by 2025. Chile will need to replace much of this capacity and is expected to do so mostly through renewable additions, storage technology and low-emission natural gas plants.

Since the implementation of Law 20,936, new plants don’t pay transmission tolls and the old ones will gradually stop paying it.

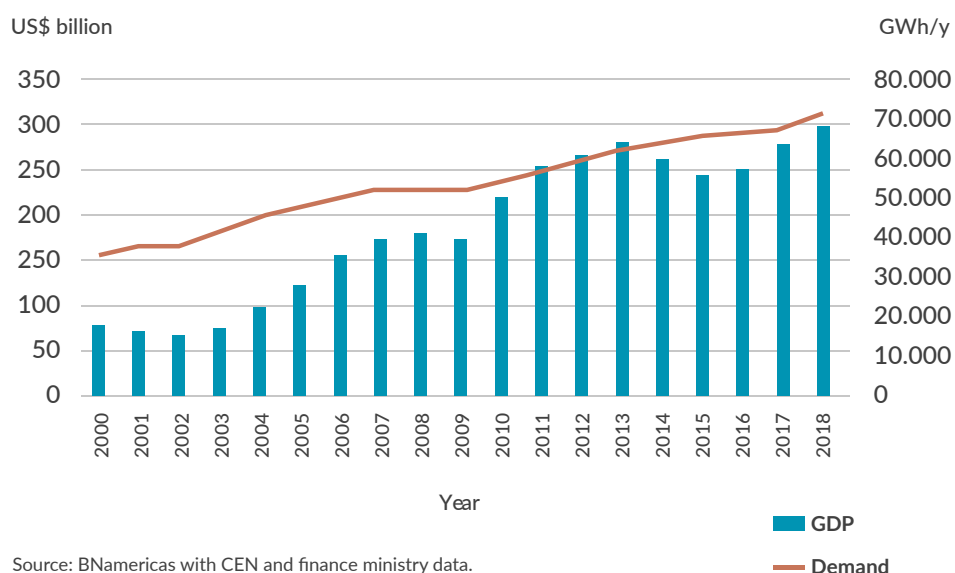
The country also has a flexible tax on local polluting emissions of particulate matter, NO (nitric oxide) and SO2 (sulfur dioxide), and a fixed tax for global CO2 emissions for generation plants with 50MW capacity and above. The country taxes US\$5,000 for every ton of CO2 emitted.

The government has also consistently awarded concessions for the use of fiscal property for the development of non-conventional renewable projects.

Between 2018 and 2021, the ministry of national assets plans to tender 136 plots of fiscal land for energy investment, all of them located in Chile’s northern regions.

Power Demand

Power demand vs. GDP



In Chile, as in most emerging countries, power demand has been historically strongly correlated with GDP growth.

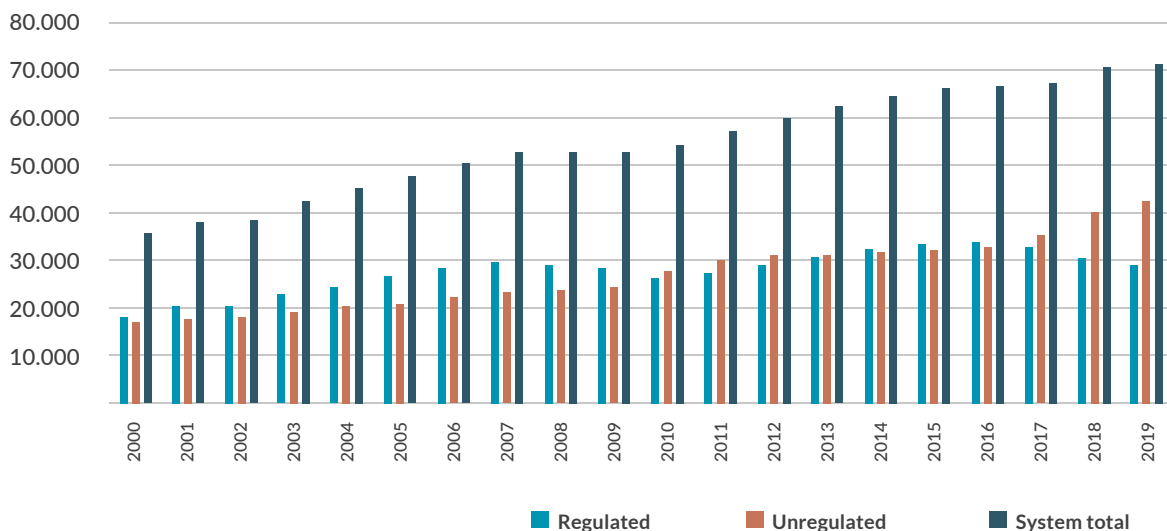
One of the most significant drivers of power demand are Chile’s large industrial consumers, mainly the country’s sprawling copper mining industry located in its northern regions.

One of the main characteristics of this consumption is its relatively constant demand for energy, which does not vary significantly with time of day or day of the week, requiring constant and steady supply.

In recent years, there has been a growing trend of large industrial and commercial customers switching over from the country’s regulated segment to the unregulated segment, where they can seek tailor-made solutions.

For example, large mining companies have been seeking certified renewable supply, which they can contract directly from generation companies in order to seek green label certification for their final product.

Historic Demand SEN [GWh]



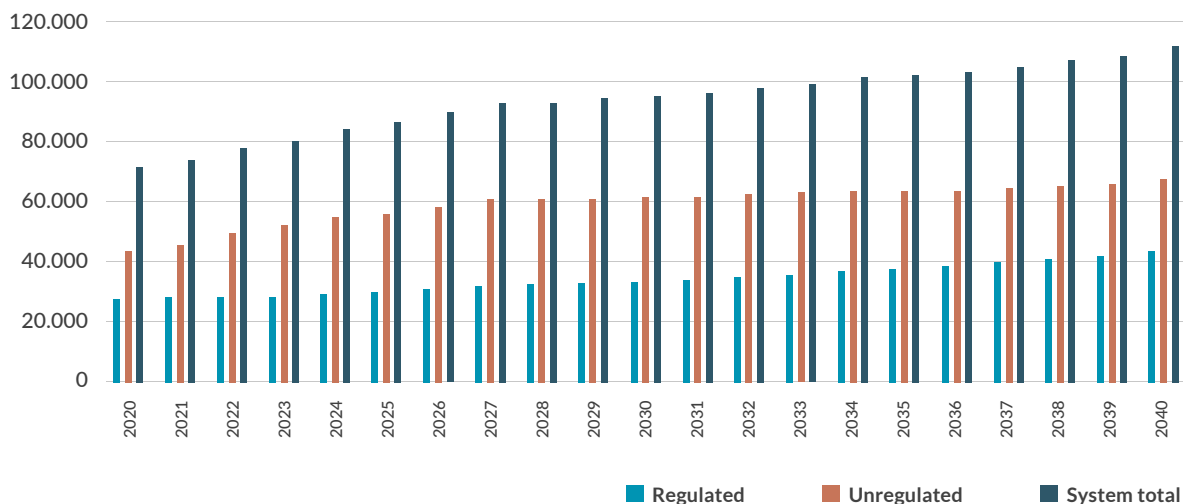
Source: BNamericas with CNE data.

The CNE revised CNE (national energy commission) revised its demand forecasts for the 2010-40 period in January of 2021. Demand was expected to reach 111.1 GWh in 2040, a 56% increase over 2020 demand of 71.2 GWh.

Demand is also expected to grow an average of 2.25% every year, with the regulated segment expanding 2.28% on average and the unregulated segment 2.23%.

It bears noting that, despite the effects of the COVID-19 pandemic, CNE’s updated demand forecasts (excluding 2020, when demand was 0.5% lower than originally forecast) are higher than those made in 2019, when demand was expected to rise 2.10% every through 2039. This is mainly due to an increase in the expected consumption of the unregulated segment.

Demand forecast 2021 [GWh]



Source: BNamericas with CNE data.

The CNE estimates demand for both the regulated and unregulated segments. Its estimations for the regulated segment then strongly inform its decision to conduct either short-term or long-term tenders for additional supply.

The energy commission has opened the 2021 tender process to supply power distributors, which will award power purchase agreements (PPAs)

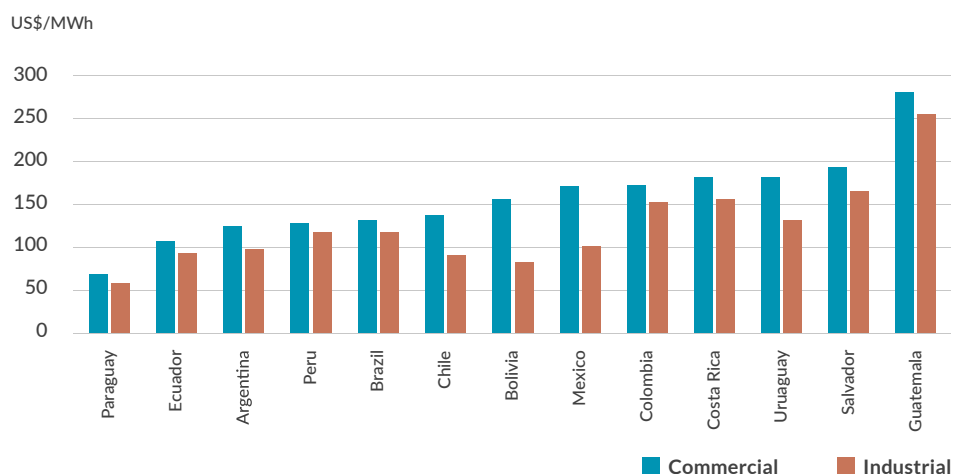
to supply 2,310GWh per year starting in 2026. The full details of the tender process can be accessed [here](#).

The CNE updates its demand forecasts every year and updates can be found on this link. <https://www.cne.cl/tarificacion/electrica/prevision-de-demanda-electrica/>

Power prices

According to the Regional Energy Integration Commission (CIER), which conducts a survey of Latin America’s power distributors every year, and the Latin American Energy Organization (OLADE), end-user power prices in January 2019 were the following:

Power prices in Latin America



Source: BNamericas with data by Olade and CIER.

However, as mentioned, regulated prices are expected to come down steadily over the next decade due to the effect of previously conducted supply tenders. Projects tied to awarded supply contracts will start to come online in 2021.



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Regulation

In terms of general regulatory structure, the general electricity law imposes restrictions on vertical integration, meaning that no national transmission company can participate in the generation or distribution business.

Accordingly, the participation of generation or distribution companies in the national transmission business cannot exceed 8% of the value of the country's transmission assets. If several companies own transmission assets collectively, their holdings cannot exceed 40% of the value of Chile's transmission assets.

Companies are also subject to Chile's more general antitrust provisions, contained in Decree Law 211/1973, also known as the Antitrust Law.

Chilean law also separates conventional from non-conventional renewable energy. In this last category, Law 20.257 includes energy generators that use wind, biomass, biogas, geothermal energy, solar energy and the sea to generate electric power, plus small hydroelectric generators (below 20MW). Big hydroelectric generators are thus excluded from the definition and classified only as producing renewable energy.

Main Players

Out of the three main segments comprising Chile's power sector, generation is the most diverse in terms of new investments.

While traditionally the segment was mostly controlled by the country's four biggest players, the country's renewable boom has brought in a large number of international players, and continues to do so every year.

AES Gener, a subsidiary of US-based AES Corporation, is one of Chile's four biggest generation companies.

The company is currently building three large-scale renewable plants: the Los Olmos wind farm (US\$298mn, 129MW), the Mesamávida wind farm (US\$255mn, 60MW), both in center-south Biobío region, and the Andes Solar II solar park (80MW) in northern Antofagasta region.

In addition, the company is finishing construction of its US\$3bn, 531MW Alto Maipo run-of-the-river hydroelectric complex, an embattled project

that has faced many engineering challenges and opposition from environmental groups.

Colbún, another of Chile's four biggest generators, is planning significant renewable expansion in the coming years.

While the company has large-scale projects under construction, it has a significant pipeline in early works, including the US\$788mn, 719MW Inti Pacha solar park, the US\$700mn, 607MW Horizonte wind farm and the US\$430mn, 610MW Jardín Solar solar park. The company also plans to build two solar parks in northern Chile, Diego de Almagro Sur I and II, for a total investment of US\$169mn and total capacity of 130MW.

The company is also planning a US\$442mn hydroelectric plant, San Pedro, that will have capacity of 170MW.

Engie Energía Chile, a subsidiary of France's Engie, is also one of the four largest generators in the Chilean market.

Engie has two large-scale projects under construction: the US\$200mn, 162MW Calama wind farm and the US\$130mn, 90MW Capricornio solar park, both in Antofagasta region. It also has several renewable projects in early works.

Enel Generación Chile and Enel Green Power Chile are subsidiaries of Italian power giant Enel, and together are also one of the four biggest generators in the country.

Enel Generación is building the US\$957mn, 150MW Los Cóndores hydroelectric plant in Biobío region.

Enel Green Power, meanwhile, has 9 renewable projects in early works, requiring US\$965mn in investment for total installed capacity of 842MW.

Ireland's Mainstream Renewable Power's Chilean subsidiary has an ambitious renewable expansion platform named Andes Renovables, which involves US\$1.7bn in investments in Chile in projects due to come online from 2022.

In 2019 the company closed financing for its first project package, a US\$580mn portfolio known as Cóndor. The company secured financing for its second set of projects, worth US\$600mn and named Huemul,

in 2020. All projects under Huemul are in construction and will reach commercial operation between 2021 and 2022.

Madrid-based Acciona's Chilean subsidiary invests in renewable generation assets.

The company is building two projects: the US\$43mn, 51MW Usya solar park and the US\$120mn, 87MW Tolpán wind farm.

Other significant players include Statkraft, Latin America Power, EDF, Cerro Dominador, Inkia Energy, First Solar, Ibereólica, Sonnedix, Grenergy, Canadian Solar, Austrian Solar, X-Elio, SolarReserve, Actis, GDF, Pacific Hydro, RP Global and Solarpack, among others.

04. Transmission

Transmission projects in Chile are planned yearly by energy commission CNE on the basis of its projections and suggestions by private players. Every year, a list of projects is selected and later tendered openly for construction.

Transmission is classified as a public service (national transmission and zonal transmission), and the remuneration is set by the offering company as part of the tender offer. This remuneration lasts for 20 years.

After that period, the assets remain private, but remuneration is determined every four years by the CNE as part of a study that values existing assets based on market values.

Both Chilean and foreign companies can participate in the tender process provided they operate existing transmission assets, either in Chile or abroad.

As of 2021, Chile's power grid included 35,919km of transmission lines across its territory, spanning 3,100km from the northern city of Arica to the southern island of Chiloé. The country's far-south regions are provided by two independent small networks, as explained previously.

Chile has tendered transmission works for investments amounting to US\$2.88bn between 2011 and 2019.

According to grid coordinator CEN, the country expects to tender 210 projects – involving either building new facilities or expanding existing ones – between 2020 and 2024 for total investment opportunities valued at US\$2.7bn.

New transmission projects 2020-2024

	2020	2021	2022	2023	2024	Total 2020-2024
New projects	10	10	12	10	7	49
Expansions	21	34	33	33	40	161
Total	31	44	45	43	47	210
Investment value (US\$mn)	246.8	234.5	632.9	1,398.20	185	2697.4

Source: Ministry of Energy.

The largest transmission project in Chile’s pipeline was moved forward by the Ministry of Energy. Instead of tendering in 2023, as previously planned, grid coordinator CEN moved forward with the tender process at the end of 2020. The project will be awarded in 2021.

The project involves investing US\$1.4bn to build the Kimal-Lo Aguirre HVDC powerline, connecting capital Santiago with the northern town of Mejillones in Antofagasta region.

The line is deemed essential to allow the system to transport the increasing amount of renewable energy being generated in the country’s northern regions to its biggest consumption points, namely capital Santiago.

It will also employ HVDC (high-voltage direct current) technology, which incurs fewer losses over long distances and has a series of technological benefits. It would be the first large-scale line in the country to employ this technology.

In 2022, the country expects to tender the construction of two new transmission lines, Entre Ríos – Ciruelos and Ciruelos-Pichirropulli in southern Los Ríos region.

Among Chile's most prominent transmission companies is Transelec. Owned by China Southern Power Grid International and two Canadian funds (Canadian Pension Plan Investment Board and British Columbia Investment Management), the company is Chile's largest operator of high-voltage transmission lines.

The company owns 10,000km of lines and 60 substations. It has a 57% share in the SEN.

A subsidiary of Colombia's ISA, Interchile owns the US\$1bn Cardones-Polpaico line that strengthened the interconnection of Chile's northern and center-south grids.

The rest of Chile's network is owned by Engie, Colbún, CGE and 33 other transmission system operators, many of them owners of generation assets or big consumers.

05. Distribution

Distribution companies operate in a concession area awarded by the state, which obligates companies to provide the service to every regulated customer who requests it. They are subject to service quality standards and must have available the energy they are forecast to require over the next five years.

Distribution fees are calculated by the CNE every four years and the regulated income considers the value of the assets, administration, operation and maintenance costs, consumer service and energy and capacity losses. A new regulation in the form of Law 21,194, published in December 2019, sets a variable rate of between 6% and 8% after tax. The rate will be calculated every four years, considering risk factors.

The three factors considered are systemic risk, which is an estimate of the variability in profits an efficient company would suffer when subjected to market fluctuations; a risk-free profitability rate, which is an average internal rate of return provided by the central bank; and market-risk compensation, calculated as the difference between the profitability of a diversified portfolio and the risk-free profitability rate.

Distributors purchase energy from generation companies in a competitive bidding process, generally known as the distributor power supply tender. Each block of energy is awarded to the company that offers the lowest price in 20-year PPA contracts.

Under the law, end-user prices must represent the real cost of generation, transmission and distribution of electricity in an efficient operation of the system as its base assumption. It seeks to establish correct price signals both for private companies and consumers to ensure an optimal development of the power grid.

The regulation establishes a system of free price-setting in those segments deemed to have adequate conditions for competition. Therefore, when supplying final users with connected capacity below 5,000kW, the regulation deems market conditions to favor natural monopolies and establishes price regulations. These clients are known as regulated clients.

When supplying final users with capacity above 5,000kW, the law establishes price freedom, as it assumes they have negotiating power and access to alternatives to supply their electricity, such as self-generation or contracting supply directly from power producers. These clients are known as free or unregulated clients. Clients with capacity between 500kW and 5,000kW can choose which segment (regulated or unregulated) to take part in for four years.

In any electric system above 1,500kW capacity, the law sets two regulated prices: the node price for generation-transmission (tied to a specific substation from which supply is carried out) and distribution prices, or end-user prices.

The final price power distributors can charge to their end-customers is determined on the basis of a simple formula: the node price, plus the added value of distribution (VAD) plus a charge for using the transmission system.

The Chilean distribution market is dominated by four players that represent some 98% of the energy distributed. These are Enel Distribución (owned by Italy's Enel), CGE (owned by Spain's Naturgy), Chilquinta (recently acquired from Sempra by China's State Grid International) and SAESA (owned by Ontario Teachers' Pension Plan/AIMCO).

The rest of the market is covered by 19 regional distributors.

Chile's main distributors as of 2019

Controlling Group	Company	Regions of distribution	Number of clients	Sales GWh
CGE	CGE	XV, I, II, III, IV, V, RM, VI, VII, VIII, IX	2,938,820	11,156
	Edelmag	XII	63,573	318
Chilquinta	Chilquinta Energía	V	611,889	2,542
	Litoral	V	63,223	106
	Energía de Casablanca	V, Metropolitan	6,401	52
	Luzlinares	VII	35,040	107
	Luzparral	VII, VIII	25,694	82
Enel	Enel Distribución	Metropolitan	1,941,950	16,999
	Colina	Metropolitan	27,880	98
	Luz Andes	Metropolitan	2,388	9
Saesa	Frontel	VIII, IX	365,747	1,001
	Saesa	IX, X, XIV	455,055	2,351
	Edelaysén	X, XI	48,528	159
	Luzosorno	X, XIV	23,985	158

Source: Ministry of Energy.

06. Conclusion

Chile is experiencing exciting changes in its power sector and especially in the generation segment, where the grid is seeing rapid transformation fueled by private investment.

While Chile has traditionally imported the lion's share of the hydrocarbons that traditionally made up an important part of its energy sector, the development of renewable energy has allowed the country to make use of its world-class local resources. This availability, coupled with the country's investment-grade status and economic openness, has allowed its renewable sector to grow at breakneck speed.

But there is still much to do. Chile expects its energy matrix to be comprised by 70% renewable generation by 2030 instead of 20% in 2020. This means it will need private players to develop many new projects to replace its outgoing thermoelectric power capacity, opening opportunities for foreign investors in the coming years.

The country will also need to develop technologies and practices that ensure grid reliability with a highly variable generation park at an efficient cost, including investment in battery storage, new flexibility regulation and a more competitive auction for ancillary services.

Longer-term opportunities can be found in Chile's newfound emphasis on green hydrogen and the widespread adoption of electric vehicles over the coming decades. The growing work being carried out to establish adequate frameworks for these sectors signals they could add great momentum to the country's energy transformation.

The Chilean energy sector has a robust regulatory stability and authorities that are always concerned with improving the existing framework to spur investment and increase the system's efficiency and technological makeup. Chile's strategy of renewable growth is also supported by both sides of the aisle politically, ensuring long-term stability.


Local private players, as well as authorities, are always looking for ways to innovate and follow international developments in renewable technology very closely. Regulators keep a close eye on new trends, such as the use of storage in both generation and transmission or the use of renewable assets to provide ancillary services to the grid.

The country is betting on a private-led wave of renewable investment to achieve its ambitious climate goals, with a strategy of setting fair rules and allowing players to freely compete.

These factors make Chile one of the most attractive countries in Latin America for renewable investment. Several observers, including the EY Renewable Energy Country Attractiveness Index, position Chile in the top 11 most attractive countries for renewable investment in the world, surrounded by economies like Spain, The Netherlands, Japan and France. Bloomberg's Climatescope ranks Chile as the most attractive country in the world for renewable investment.



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07. Appendix

Relevant authorities

Ministry of Energy

Chile's energy ministry is the lead government institution responsible for setting policy and overseeing the country's energy sector.

The overall objective of the ministry is to develop and coordinate plans, policies and standards for the proper functioning and development of the energy sector, ensuring compliance and advising the government on all matters related to energy.

The purview of the ministry includes matters dealing with the study, exploration, generation, transmission, transport, storage, distribution, consumption, efficient use, import and export, and any other activities that relate to electricity, coal, gas, petroleum and derivatives, nuclear energy, geothermal and solar and other energy sources.

It is headquartered in capital Santiago.

<https://www.energia.gob.cl/>

Comisión Nacional de Energía (CNE)

Chile's national energy commission is a public technical body in charge of supervising prices and drafting technical norms that govern the behavior of generation, transmission and distribution companies. Its objective is to ensure safe and high quality service that is compatible with economic operations.

The CNE also monitors the energy sector and makes forecasts, recommending potential regulation to the energy ministry, which it also counsels on matters related to the energy sector.

It is headquartered in Santiago.

<https://www.cne.cl/>

Superintendencia de Electricidad y Combustibles (SEC)

The superintendence of electricity and fuels (SEC) is a body that sets standards and enforces them through inspections and sanctions.

The entity charges and penalizes power companies or individual users for breaking safety or quality of service norms.

It is headquartered in Santiago.

<https://www.sec.cl/>

Coordinador Eléctrico Nacional (CEN)

The CEN is an independent body tasked with coordinating the operation of Chile's national power grid to ensure constant supply, safety, and the most economic operation possible, as well as free access to the country's transmission infrastructure.

The CEN follows guidelines issued by the CNE and Chile's general electricity law. It is also in charge of coordinating operation of medium-sized grids, defined as those in which more than a single generation company operates.

It is headquartered in Santiago.

<https://www.coordinador.cl/>

Servicio de Evaluación Ambiental (SEA)

The environmental evaluation service oversees the assessment of any private sector project, including in the energy sector, based on its compliance with applicable environmental regulation.

Companies need the service's approval to move forward with their projects, which means the agency plays a crucial role in the development of energy sector projects in distribution, transmission and generation.

<https://www.sea.gob.cl/>

Differences between regulated and unregulated clients

In Chile, the regulation establishes price freedom in those segments deemed to have adequate conditions for competition. Therefore, when supplying final users with connected capacity below 5,000kW, the regulation deems market conditions to favor natural monopolies and establishes price regulations. Clients subject to price regulations are known as regulated clients.

When supplying final users with capacity above 5,000kW, the law establishes price freedom, as it deems they have negotiating power and access to alternatives to supply their electricity needs, such as self-generation or contracting supply directly from power producers.

These clients are known as free or unregulated clients. Clients with capacity above 500kW can choose which segment (regulated or unregulated) to take part in for four years.

VAD

The energy ministry sets an indicator called added value of distribution (VAD for its Spanish initials) every four years. It establishes an average cost for distribution that considers the cost of investment and operation of a model company that is efficient in its investment policy.

The VAD is a key component of the final price a power distributor can charge to their regulated end-customers. This price is determined by the CNE by adding the node price, plus the VAD, plus a charge for using the transmission system.

PMGD (small and medium distributed generators)

In Chile, generation units of up to 9MW that connect to low- and mid-tension grids are categorized as small and medium distributed generators, or PMGD for their Spanish-language initials.

PMGDs can take advantage of several incentives, including easier protocols to connect to the grid and a separate price-setting mechanism known as the stabilized price regime.

The stabilized price is equal to the average value of PPAs on the market adjusted depending on projections of the spot market prices for the next four years. It allows project developers greater certainty about their expected returns, which in turn helps access financing for PMGD projects.

Land tenders for renewable generation

The ministry of national assets tenders public land for the construction of renewable energy projects. Detailed information about these ongoing tenders can be accessed [here](#).

Power supply tenders for regulated customers

According to Chilean law, distributors must have available enough power supply to cover the total demand of clients located within their concession areas. This is achieved through supply contracts awarded in public, open, non-discriminatory and transparent tenders designed, coordinated and directed by energy commission CNE.

Each tender starts with a preliminary report issued by CNE that examines the need for additional short-term and long-term supply. Information regarding ongoing and future supply tenders can be accessed [here](#).

Full demand forecast SEN (January of 2021)

Year	Demand forecast 2021		
	SEN		
Year	Regulated	Unregulated	System total
2020	27,558	43,695	71,253
2021	28,435	45,506	73,941
2022	28,346	49,441	77,787
2023	28,680	51,898	80,578
2024	29,411	54,923	84,334
2025	30,165	56,246	86,411
2026	31,047	58,498	89,545
2027	31,862	60,558	92,420
2028	32,494	60,583	93,077
2029	33,087	60,857	93,944
2030	33,527	61,245	94,772
2031	34,222	61,644	95,866
2032	35,048	62,527	97,575
2033	36,028	63,264	99,292
2034	37,055	64,003	101,058
2035	38,096	63,827	101,923
2036	39,080	64,098	103,178
2037	40,094	64,571	104,665
2038	41,084	65,366	106,450
2039	42,098	66,399	108,497
2040	43,271	67,903	111,174

Credit: CEN.

Average capex per MW between different technologies

The CNE's latest estimates, from March 2020, assign average investment figures for different generation technologies in Chile's national system.

Diesel plants emerge as the cheapest to build in the country with an investment cost of US\$448,000 per installed MW of capacity. They are followed by natural gas plants, at US\$675,000/MW for combined cycle plants and US\$898,000/MW for open cycle plants. In between those two sit photovoltaic parks, with an investment cost of US\$871,000/MW.

Technology	US\$/KW
Thermal - diesel	448
Thermal - natural gas (CC)	675
Solar PV	871
Thermal - natural gas (OC)	898
Biogas	1,144
Onshore wind	1,266
Solar w/storage	1,539
Wind w/storage	1,891
Biomass	3,170
Mini-hydro	3,263
Run-of-the-river	3,923
Geothermal	4,394
Hydro dam	4,439
Solar CSP	5,282

Credit: BNamericas with CNE data.

Solar and wind parks with storage capacity are seeing falling costs, as are renewable generators in general.

InvestChile

Foreign Investment Promotion Agency

InvestChile is the public organization that promotes Chile internationally as a destination for foreign direct investment, serving as a bridge between investor's interests and the business opportunities the country offers.

We provide tailor-made and individually-focused assistance, working closely with private organizations, public institutions and ministries to plan and offer attractive sectorial projects to promote investment.

Check out our services
and **let's make your next
project happen!**



Best Investment Promotion Agency in South America By Site Selection Magazine 2020



Best Investment Promotion Agency 2019, by International Business Magazine



Best Investment Promotion Agency in South America By Site Selection Magazine 2019



Government Standard of Excellence WEB AWARDS 2017

We Advise / We Connect / We Support

AT EVERY STAGE:



PROSPECTION



PRE- INVESTMENT



LANDING



ESTABLISHED COMPANY

SPECIALIZED SERVICES:

Knowledge & Info

- FDI statistics, business opportunity facts & figures
- Market insights & sectorial highlights
- Legal & tax information
- Detailed reports & studies on installation / sector-specific costs
- Portfolios of public projects & tenders

Promotion & Advice

- Meeting agenda/e-meetings with public & private players
- Investor delegations & B2B meetings
- Investment roadshows, conferences & workshops
- Detailed information on installation/sector-specific costs
- Investment incentives & special programs (i.e., R+D+i, visas, tax deductions/credits)

Guidance & Access

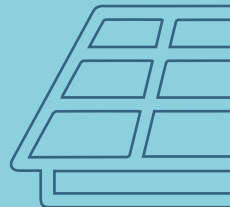
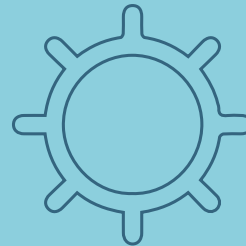
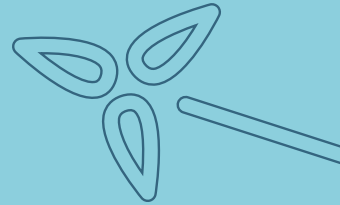
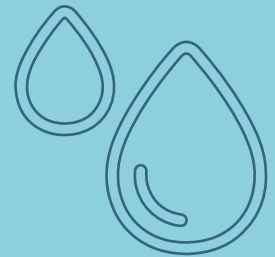
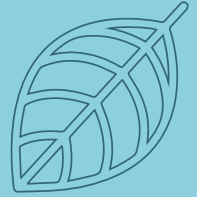
- Dedicated expert-sector managers speaking several languages (i.e.,spanish, chinese, english, german, french, afrikaans)
- Sector-specific and legal advice on starting up
- Contact with key players within the business ecosystem & site visits
- Assistance in applying for financial incentives & government programs
- Public-private portfolios & public tenders
- Incorporation into the Regional Support Network for projects outside the Santiago Metropolitan Region

Permanent Support

- Ongoing assistance for landing & expansion/re-investment
- Policy advocacy
- [#InvestChileE-Consulting](#) with immediate -free of charge- assistance to resolve your concerns
- [VisaTech Program](#) for fast-tracking work permits for technology sector human capital
- Management of contacts and difficulties with public sector institutions to speed up your investment (i.e., permits, R&D+i, human capital)
- Media management to highlight your company's contribution to the country
- Special advisory on value-added & sustainable development initiatives
- Contact with public and private partners to foster synergies and cooperation

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REPORT

Energy

Projection and Opportunities in Chile



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