

Chile

Power Report

Includes 10-year forecasts to 2027



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Key View

Key View: Chile's power sector offers an attractive investment profile and the market is expected to prove one of the regional out-performers in the fast growing Latin America region. Strongest growth will be seen in the renewables segment which has drawn the attention of a wide range of international energy firms and boasts the most extensive project pipeline. The thermal sector, particularly natural gas, will also achieve growth as Chile continues to move towards cleaner sources of energy, reducing the role of coal-fired power in the market. Although our forecasts for growth in the power sector are positive, we do note downside risk from a potential decline in consumption demand which could hinder future investment plans.

HEADLINE POWER FORECASTS (CHILE 2017-2023)							
Indicator	2017e	2018f	2019f	2020f	2021f	2022f	2023f
Generation, Total, TWh	74.647	78.420	80.569	82.548	85.045	87.474	90.079
Consumption, Net Consumption, TWh	73.1	75.5	77.8	79.7	82.1	84.5	87.0
Capacity, Net, MW	25,355.0	26,611.5	27,184.7	29,400.7	30,270.3	30,483.3	31,129.3

e/f = Fitch Solutions estimate/forecast. Source: EIA, Fitch Solutions

Latest Updates And Structural Trends

- While previous power auctions have attracted major investor interest, there is a risk that a number of contracts awarded will be suspended in light of lower regulated consumption forecasts from the National Energy Commission. Demand from regulated customers is now expected to total 37,393GWh in 2025, down from a previous estimate of 41,247GWh.
- Solar power already accounts for 5% of total electricity generated in Chile. Numerous projects are underway in the sector, such as the 210MW Carro Dominador combined concentrated solar power (CSP) and photovoltaic (PV) project in Maria Elena. A consortium of Spanish groups **Abengoa** and **ACCIONA** signed a contract in July 2018 to complete construction of the 110MW CSP section. The 100MW PV portion has been in commercial operation since February, and the overall scheme is expected to become operational in 2020.
- Chile's openness to foreign investment means opportunities abound for overseas energy companies. US-based energy and infrastructure developer **Glenfarne Group** recently announced plans to develop five backup power stations in Chile.
- In the wind power sector, **AR Coihue**, a subsidiary of **Mainstream Renewable Power**, plans to build a 310.5MW wind park, dubbed Entre Ríos Wind Farm, in the Bío Bío region. The subsidiary submitted an environmental impact study for the project to the Chilean environment regulator Servicio de Evaluación Ambiental. The USD497mn scheme includes the installation of 69 wind turbines, each of 4.5MW, in the communes of Mulchén, Negrete and Los Angeles.
- **Enel Green Power** continues to expand its presence in Chile. The company is embarking on a USD700mn investment plan which includes wind, solar and geothermal projects, such as the expansion of 48MW Cerro Pabellon geothermal power plant. Enel plans to bring almost 600MW of new renewables capacity online in 2021, ahead of the 2024 deadline set under power auctions.
- We continue to forecast steady growth in terms of generation and capacity in the Chilean power sector over the course of the forecast period. Strong gains in the renewables sector, and growth in hydropower and natural gas will help to offset the ongoing decline in coal-fired output.

SWOT

SWOT Analysis

Strengths

- Chile privatised its electricity sector in the 1980s and all generation, transmission and distribution activities are now in private hands.
- The growing economy will keep demand for electricity rising at a robust pace in the years ahead.
- Favourable natural conditions, coupled with supportive regulations, make Chile one of the world's most attractive renewables markets.
- A stable political environment and an attractive business climate will facilitate investment in Chile's power sector.

Weaknesses

- Chile's economy is vulnerable to volatility in mining commodities' prices and GDP growth has been hit by the slowdown in Chinese demand.
- Chile is a net importer of hydrocarbon fuels, exposing electricity prices to fluctuations in the cost of natural gas, oil and coal.
- Regulations underpinning the hydropower sector remain opaque, with large-scale projects frequently being postponed or blocked.
- Investment in transmission lines is needed to allow the full implementation of planned renewables capacity and in order to eliminate grid congestion.

Opportunities

- The government is promoting the adoption of LNG in the energy matrix, supporting growth in natural gas-fired power generation.
- The connection of the SIC and SING grid is expected to reduce power prices and facilitate the integration of growing renewables capacity.
- Government targets and incentives for renewables underpin a large project pipeline and strong investor interest in the sector.
- Future power auctions will offer long-term power purchase agreements - and new transmission lines are being tendered.

Threats

- Volatile commodities' prices and Chinese demand are a sizeable risk to Chilean mining, which is a major driver of electricity consumption.
- The implementation of large-scale hydropower projects faces a risk of delays, due to the long environmental permitting process and vocal popular opposition.
- Some parts of the power grid are congested, which at times pushes spot prices close to zero and damages investment returns for renewables.
- Strong price competition at auctions between renewables and conventional power generators means that new thermal plants struggle to win contracts.

Industry Forecast

Chile Snapshot

COUNTRY SNAPSHOT: ECONOMIC AND DEMOGRAPHIC DATA (CHILE 2016-2021)

Indicator	2016e	2017e	2018f	2019f	2020f	2021f
Nominal GDP, USDbn	250.2	277.1	302.8	326.4	351.8	380.0
Real GDP growth, % y-o-y	1.3	1.5	3.5	3.2	3.2	3.3
GDP per capita, USD	13,969	15,348	16,642	17,797	19,041	20,425
Population, mn	17.91	18.05	18.20	18.34	18.47	18.60

e/f = Fitch Solutions estimate/forecast. Source: BCC, Fitch Solutions

COUNTRY SNAPSHOT: ECONOMIC AND DEMOGRAPHIC DATA (CHILE 2022-2027)

Indicator	2022f	2023f	2024f	2025f	2026f	2027f
Nominal GDP, USDbn	414.4	441.9	469.5	499.3	531.3	566.1
GDP per capita, USD	22,120	23,432	24,736	26,143	27,652	29,292
Real GDP growth, % y-o-y	3.1	3.4	3.3	3.2	3.3	3.5
Population, mn	18.73	18.86	18.98	19.10	19.21	19.33

f = Fitch Solutions forecast. Source: National sources, Fitch Solutions

COUNTRY SNAPSHOT: POWER SECTOR

Access to electricity, % of population	99.6
Quality of electricity supply (Value)	6.1/7
Quality of electricity supply (Rank)	32/137

Source: World Economic Forum - Global Competitiveness Report 2017-2018, World Bank

Chile Power Forecast Scenario

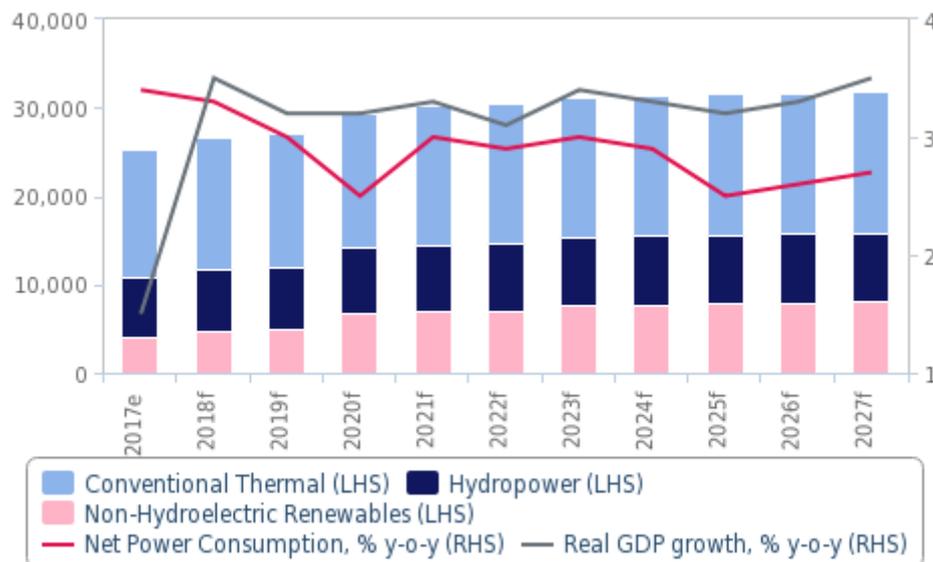
Key View: Chile's power sector continues to offer substantial growth potential. The country is set to make strong gains in terms of installed capacity and generation over the current forecast period (from 2018 to 2027), supported by a stable regulatory environment, high government targets and an increasingly welcoming investment environment. The expansive project pipeline is led primarily by renewables, alongside a smaller number of thermal power projects, and while the majority of projects are still at early stages of development, a significant number are expected to be completed over the next decade.

Our outlook for the Chilean power sector remains broadly consistent this quarter. Energy policy is set to remain stable, despite the change of government in Chile in early 2018 (see 'New Government To Focus On Renewables, Infrastructure And Gas', March 14 2018) and the project pipeline is substantial with around 48.3GW of new capacity at various stages of development. Taking into account sector-specific growth factors and consumption trends, we are forecasting average growth in generation of . In the short-term, we are forecasting growth in generation of just under 3% annually, on average, between 2018 and 2027, with growth in natural-gas fired thermal power, hydropower and non-hydropower renewables compensating for the ongoing decline in coal and oil fired output.

Our forecasts for the sector are subject to both upside and downside risks. In particular we note the potential impact of a large-scale shift of regulated consumers to the free market, which would affect investment in the power market over the coming years. Consumers in some sectors can choose to purchase energy direct from generators on the free market where prices are currently at historically low levels. As a result there is scope for a significant fall in demand on the regulated market where a large number of projects are under development (it is estimated as much as 25% of new projects could be surplus to demand). Should regulated demand fall sharply, new power plants currently being planned may be suspended or cancelled which could cause supply issues further down the road.

We also note that there is a significant bottleneck in terms of project development, with a large section of the pipeline still stuck in the planning phase, including a major share of the renewables projects rewarded under recent energy auctions. The completion of new transmission infrastructure should start to ease the pressure, particularly in the renewables segment, and as more projects enter the construction phase we would look to revise our forecasts accordingly. Chile is certainly proving an attractive market for investors and upside risk to our current forecasts stems from the latest successful power auction, which saw 600MW of installed capacity awarded to renewables projects. These are due to come online in 2024 (therefore boosting generation in full from 2025), but could be completed earlier, which would boost our forecasts for the segment.

Solid Long-Term Fundamentals Will Drive Power Growth
Chile - Power Capacity By Source, MW And Selected Indicators



Source: National sources, Fitch Solutions

Coal Generation And Capacity Forecast

Key View: Coal-fired thermal power has long played a key role in the domestic energy mix in Chile and in 2018 will account for almost 40% of electricity generated in the country. The ongoing shift towards cleaner energy (from a combination of natural gas, hydropower and renewables) does however mean that coal-fired generation will decrease throughout much of the forecast period (2018-2027).

Latest Developments

- The outlook for coal-fired power remains subdued and overall we anticipate a decrease in coal-fired generation from 31.00TWh in 2018 to 25.93TWh in 2027 when coal-fired power will make up around a quarter of domestic energy generation.

Structural Trends

Coal-fired power generation has accounted for the majority of Chilean power generation since 2013. However, its role in the country's power sector will gradually diminish over the coming decade. Some capacity will be added this year with the completion of **Engie's** 375MW IEM plant which was reportedly ready for commissioning in August 2018. However, for the remainder of the forecast period, coal will be outpaced by other sectors. We estimate that Chile's coal-fired power generation totalled 29.11TWh in 2017, which represents 39% of the country's total electricity output for that year. After an increase in 2018, we expect to see further declines in output, meaning that the share of coal in the Chilean power mix will decrease to 28.5% in 2022 (24.96TWh) and fall further to 25.9% in 2027 (25.93TWh).

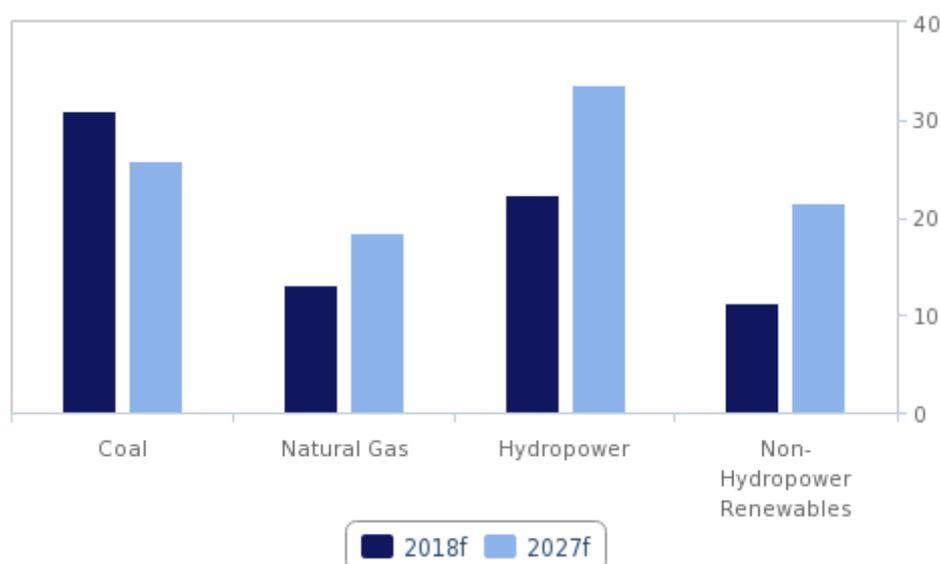
Supporting our bearish outlook on coal-fired power generation in Chile over the long run, three of Chile's major power generators - Engie, **Enel** and **AES Gener** - have indicated that they intend to focus on natural gas-fired plant development and leave coal power behind. Indeed these companies have agreed with government plans to entirely phase out coal-fired power by 2050.

We highlight that coal power facilities will be hit by Chile's carbon tax that entered into force in 2017 (and became payable from April 2018), because they emit more carbon dioxide (CO2) than gas plants. Though initially small (USD5 per tonne of CO2), the tax could

grow over the coming years, in line with the Chilean government's goal of boosting the role of natural gas in the country's thermal power mix. Coal-power projects also face long environmental evaluation processes and have a track record of being cancelled and suspended, which will further dissuade generators from committing to new coal-fired power plants.

In addition, we note that stronger growth in alternative sources of power will reduce the role of coal in Chile's powergeneration mix through to 2027. Although we forecast Chile's power consumption to grow through 2027 (albeit at a slower pace than previously forecast), we expect growth in cheaper and cleaner power sources to push generators to rely less on existing coal-fired power plants when new hydropower and gas-fired plants become available. This is also reliant upon the completion of works to modernise and expand the national transmission grid in order to facilitate the integration of new (fluctuating) hydropower and renewables output.

Coal Power To Fall While Other Technologies Grow
Chile - Power Generation By Technology, TWh



f = Fitch Solutions forecast. Source: EIA, CNE, SysteP, Fitch Solutions

In terms of risks to our outlook, we acknowledge that our forecast for coal-fired power generation in Chile is based on the assumption that the other types of power plants that are expected to come online through 2027 will not be delayed. To some extent, this has already played out, due to the delay in the El Camesino natural-gas power plant, which is now expected to come online in 2021. This is two years later than planned, resulting in changes to our forecasts for coal-fired power in 2020 and 2021. If any other large-scale hydropower or gas-fired power projects that are under construction were to miss their completion schedules, Chile would have to rely more on existing coal-fired power plants - thus prompting us to revise up our coal power forecast. We also note that unpredictable weather events, such as an extended drought that would curtail hydropower output, could result in greater generation from coal-fired power plants than we currently forecast.

Gas Generation And Capacity Forecast

Key View: With new capacity coming online over the next two years, the short-term outlook for natural-gas fired thermal power has improved and we expect the sector to make a greater contribution to the country's domestic energy mix moving forward. Ongoing plans to shift away from coal-fired power in Chile means that natural-gas fired power will play an increasingly important role as a stable baseload against variable renewables output.

Latest Updates

- We have updated our forecasts for natural-gas to reflect new capacity coming online. Generation is now expected to increase by 3.4% in 2018 followed by more robust growth of 15.8% in 2019.
- Investor interest in the market is high. **EDF** and **Andes Mining Energy** recently announced the acquisition of the 379MW Nueva Renca natural-gas combined-cycle power plant and three peak-demand plants: the 132MW Los Vientos facility, the 139MW Santa Lidia plant and the 100MW Renca project from **AES Gener** for USD300mn. EDF already has an extensive presence in Chile.

Structural Trends

We maintain that natural gas will play an increasingly important role in Chile over the coming decade, both in the power sector and in other industries. This view is underpinned by a number of factors:

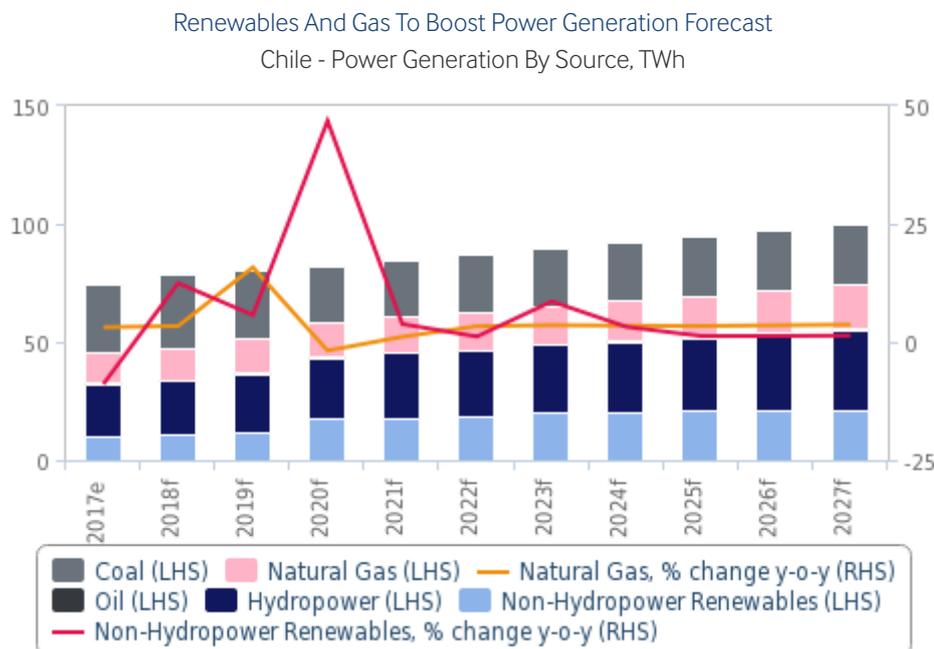
- Chile's new President Sebastian Piñera is broadly maintaining the energy policy of the previous government. The new Energy Minister Susana Jiménez has highlighted that, in order to support the effective integration of renewables in the power mix, Chile will need to add flexible thermal power plants, which are most likely to take the form of natural gas-fired power plants.
- We expect the carbon tax that Chile introduced in January 2017 to provide additional upside to gas-fired power generation in the country. Natural gas has a lower CO₂ content than oil and coal, and this will make it relatively cheaper than other hydrocarbon feedstock for thermal generation.
- Investment by international players in the Chilean gas distribution sector is growing. In particular, Spain's **Gas Natural Fenosa** earmarked an investment of EUR5.1bn in gas networks in its strategic plan for 2016-2020, and the company has plans to build at least one gas-fired power plant in the country, the 600MW Tierra Noble.

These positive factors and a strong project pipeline means that we forecast average annual growth of 3.9% in natural-gas fired generation between 2018 and the end of the forecast period in 2027. As such, we expect the share of gas in Chile's total power mix to rise from 16.7% in 2018 to 18.5% in 2027.

While we are positive in our outlook for the gas-fired power segment, we highlight that the increasingly low cost of supplying electricity through wind and solar power plants in Chile has created headwinds to the development of new gas-fired power plants - as illustrated by the results of the country's 2016 energy auction. Several existing and aspiring new players in the Chilean power market participated in the tender, with projects for gas power plants to be supplied by LNG, including the country's national oil company **ENAP** - which has made entering the power generation business one of the pillars of its industrial strategy. Nevertheless, these projects were outbid by renewables, which secured all power purchase agreements (PPAs) and led to an average price per bid of USD47.59 per megawatt hour (MWh). A similar outcome resulted from the October 2017 power auction, with all 600MW awarded to renewables with a low average price of USD32.5 per MWh for solar and wind power. We do expect to see new gas plants contracted at future auctions. While competition with renewables for PPAs at auctions in 2018 will remain fierce, it is likely that the government will incentivise the awarding of contracts to utilities bidding gas power plants in order to favour supply reliability and is in line with the Bachelet administration's long-term goal of boosting the role of natural gas in the country.

As a risk to our present forecast, we highlight the problems currently facing the development of the 640MW El Campesino plant, as noted above. In late January, Chile's Supreme Court revoked the environmental permit for the Penco-Lirquén LNG import terminal, because of irregularities in the project's consultation process with indigenous communities. The USD165mn import terminal is planned for the Bio Bio region and will supply gas to a planned new gas-fired power plant, owned by French utility EDF. In December 2016, EDF reiterated that El Campesino would come online in the second half of 2019, despite the problems it had faced in the past - even before the hurdles with its LNG feedstock source. Some progress was made in July 2018 when the Supreme Court rejected an appeal against a ruling from the Environmental Tribunal of Valdivia. Given these legal delays as well as delays in the completion of the Penco Lirquén LNG terminal, we now forecast the power plant to come online in 2021, rather than its scheduled completion date of 2019. If EDF continues having problems in securing feedstock for the plant, it would further delay the plant's completion -

thus leading to a downwards revision of our natural gas-fired power generation forecast.



e/f = Fitch Solutions estimate/forecast. Source: EIA, Fitch Solutions

Hydropower Generation And Capacity Forecast

Key View: Hydropower is already a key source of power in Chile, accounting for over a quarter of installed capacity and total electricity generated in 2018. While flagship projects such as the Alto Maipo complex have faced significant development delays, overall we do expect to see new capacity brought online, boosting output and expanding hydropower's role in the market.

Latest Updates

- **AES Gener** has completed a restructuring deal with **Strabag** for 531MW Alto Maipo hydropower complex. Strabag will provide a lump sum of financing to AES in exchange for USD392mn that will be repaid in 20 years subject to start of commercial operation of the entire Project. Alto Maipo is 64% complete and the complex is expected to start operations near end 2020.
- We are broadly maintaining our forecasts for the hydropower sector this quarter, though we have shifted the inclusion of the Alto Maipo project to 2020 in light of recent progress, and overall expect hydropower generation to increase from 22.40TWh in 2018 to 33.62TWh in 2027.

Structural Trends

Chile has a notable pipeline of hydropower plants under construction and expected to come online over the coming years, both small- and large-scale. We believe that Chile's small-scale hydropower projects - those with less than 50MW of power generating capacity - will not have to overcome the same social and regulatory obstacles that affect the development of large-scale hydropower projects in the country. As such, they will be a more attractive option for companies looking to invest in the Chilean hydropower sector. A number of factors support this view:

- **Regulatory Support For Small-Scale Hydropower:** Faced with strong popular opposition to projects with a disruptive impact on the environment, the government will support the development of small-scale hydropower projects. Chile considers small-

scale hydropower as a renewable energy source, and the government has a goal of installing 100 such plants during its mandate.

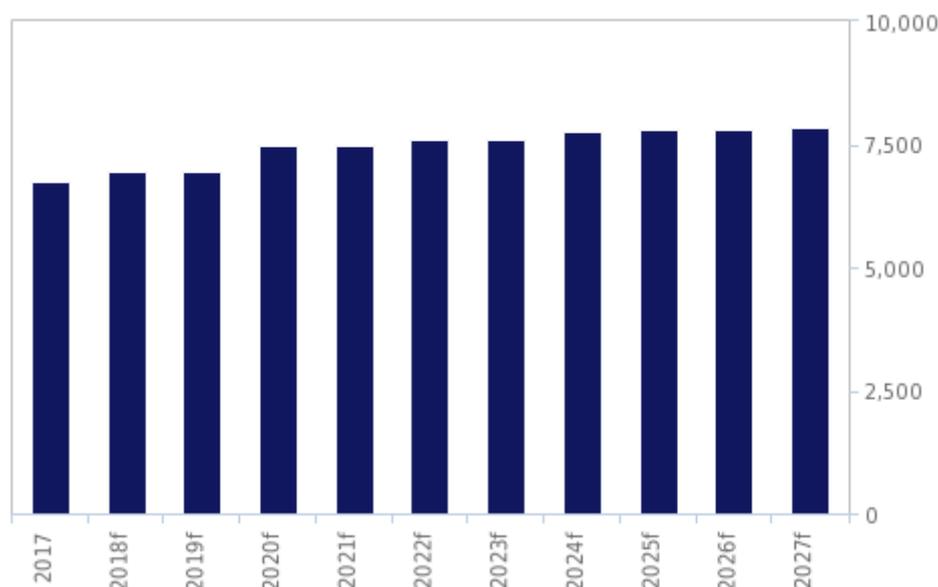
- **Continued Hurdles To The Development Of Large Projects:** We have long highlighted that uncertainty about the environmental permitting process and local opposition to the construction of infrastructure with a potentially disruptive impact on natural and social environments are serious barriers to the development of hydropower projects in Chile. This view is very much in play, and will continue to affect the scale and pace of development of the Chilean hydropower sector.

Opposition to large-scale developments has been significant. The Alto Maipo hydropower complex noted above has been subject to significant delays **including** the suspension of works due to safety concerns, though AES Gener has reached an agreement with contractor **Strabag** to restart construction on the project. The project's original cost was USD2bn, but delays increased the estimated cost to USD2.5bn. The Alto Maipo complex includes the 267MW Las Lajas and 264MW Alfafal 2. The new contract agreed with Strabag establishes the basis to modify and restructure the tunnel construction contract and defines new terms and conditions so that work can resume. Strabag will assume the geological risk of the project's construction, carry out works under the modality of lump sum with a fixed price and include guaranteed construction completion dates. The contractor will also finance part of the new contract cost and increase its shareholding in Alto Maipo. In May 2018 AES Gener announced a comprehensive restructuring of the project aimed at moving the development forward - under the new structure Strabag's contract value has risen by EUR800mn over the lifetime of the plant. Based on recent progress, we have adjusted our forecasts to show inclusion of capacity from this project from 2020.

Other smaller-scale projects planned include that of **Shenyang Yuanda Commercial & Investment of China**, which reported in early 2017 that it had signed an MOU with **Schwager Energy** to develop a 5.4MW small hydropower project in Chile. The two companies are also developing the 3MW Los Pinos hydropower project in the country.

Even amid these obstacles, a significant pipeline of projects planned and under construction supports our positive growth outlook for the hydropower sector in Chile over the coming decade. We forecast that installed hydropower capacity in the country will expand from 6,936MW in 2018 to 7,467MW in 2020; this is when the last of the hydropower projects currently under construction - namely, the 150MW San Pedro plant, owned by Chilean generator Colbun - is scheduled to come online. Looking past 2020, we expect hydropower capacity to continue to grow, albeit at a slower rate, and total around 7,829.00MW by the end of our forecast period in 2027.

Positive Outlook For Chile's Hydropower Sector
Chile - Hydropower Capacity, MW

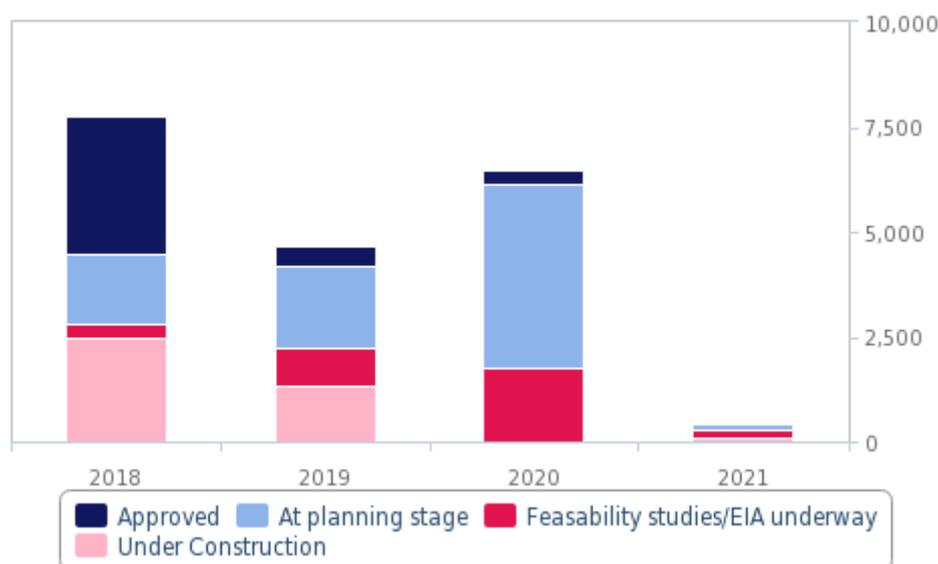


e/f = Fitch Solutions estimate/forecast. Source: EIA, CNE, Fitch Solutions

Our forecast for Chile's hydropower sector is informed by data from our Key Project Database, which shows that Chile has a robust portfolio of projects at different stages of development. We highlight, however, that we have adopted a cautious approach for our 2021-2027 hydropower capacity forecast, by assuming lower growth than what would result if all projects currently planned come online over the next 10 years. We will wait to see a greater number of projects entering the construction phase before revising up our long-term forecast for Chile's hydropower capacity.

As for hydropower generation, we expect it to grow from 22.40TWh in 2018 to 33.62TWh in 2027. Accordingly, we forecast the share of hydropower in Chile's total electricity mix to grow from 25.9% to 32.5% over the next 10 years. As a risk to our generation forecast, we highlight that periods of drought could change the hydropower output we expect for a certain year through to 2027 - although they will not alter the long-term trend we expect for the industry, because of growing installed capacity.

Projects Progressing Through Pipeline
Chile - Hydropower Projects By Stage Of Development And Year Of Expected Completion, MW



Source: Fitch Solutions Key Projects Database

Renewables Generation And Capacity Forecast

Key View: The renewable energy sector in Chile is set to outperform the rest of the power market over the course of the forecast period. The project pipeline in the renewables sector has been boosted by strong uptake at power auctions and there are a large number of plants at various stages of development, spanning primarily across solar, wind and geothermal energy, creating a wide range of opportunities for investors. However, we note challenges stemming from transmission bottlenecks.

Latest Updates

- The geothermal segment has received a potential boost from recent news that the government plans to make legislative changes in order to encourage investment following a report that found exploitable geothermal potential of up to 3,800MW.
- In the wind power segment, **Mainstream Renewable Power** has erected the first turbine at the 170MW Sarco wind farm. The facility will feature a total of 50 Senvion turbines, each with a capacity of 3.4MW. The plant is owned by **Aela Energía**, which is a 60/40 joint venture between **Actis** and Mainstream.
- We continue to forecast robust growth in the renewables sector, with generation expected to increase from 11.31TWh in 2018 to 21.45TWh in 2027.

Structural Trends

Chile's stable business environment, ideal natural conditions and favourable regulatory framework have made the country's non-hydropower renewables sector one of the hottest in Latin America over the past few years. Installed non-hydro renewables capacity totalled 4,135.00MW by the end of 2017, up from 3,443MW in 2016. Looking ahead, we forecast total non-hydro renewables installed capacity will reach 4,736.50MW in 2018, while generation will be 11.31TWh - equal to 14.4% of Chile's total electricity generation.

There are currently a large number of wind and solar power projects under construction in the country, with more planned as a result of the country's power auctions in August 2016 and October 2017 - where companies bidding with new wind and solar power plants obtained the majority of the power on offer. In the latest auction, CNE reported that 600MW of clean, renewable projects were awarded, which are expected to entail investment totalling around USD1bn. This builds upon previous auctions, which resulted in the awarding of major contracts such as the USD608mn solar power complex by the **CEME 1** joint venture, as well as the USD535mn Elena and the USD101mn Almeyda solar farms planned by **Ibereolica** and **Acciona Energia Chile**.

The latest auction does provide some upside risk to our current forecasts, should new projects be completed before the 2024 deadline. At present, however, we forecast non-hydro renewables capacity to total around 8,069.93MW in 2027, an increase from our previous forecasts, while generation will reach 23.95TWh.

There are several key downside risk factors to consider in relation to the renewables segment:

- First, the country has seen **delays in the implementation of renewables projects** scheduled to come online in 2016 and 2017. In particular, four out of the five companies that won PPAs at an auction in 2015 will not be ready to start supplying power as they had initially committed to.
- Second, there is growing **concern about the economic feasibility of planned projects**. Investors have started to question whether the price at which developers have won their PPAs will provide a sufficient return, and could become less inclined to provide capital for project development. As a case in point, the inability to find financing was reported as the reason the biggest winner in the 2015 auction was delayed. The average winning price at the 2015 auction was USD79.30 per MWh, significantly higher than the average USD47.50 at the 2016 auction. It is important to note that the projects contracted in 2016 are scheduled to start providing power in 2021 and 2022, while the October 2017 projects are contracted to start providing power in 2024, which means it is likely that developers are modelling the economic feasibility of their projects on the expectation that the technology costs for wind and solar will fall further over the coming years.
- Third, Chile's power **transmission infrastructure faces a bottleneck** and may be too crowded to accommodate the renewables plants that are planned to be developed in the northern part of the country's central grid (SIC). Particularly in Chile's northern grid (SING), the large influx of electricity generated by solar plants often pushes spot prices close to zero at times of maximum irradiation, hitting generators' revenues. We do note, however, that this will be eased with the completion of the 753km Cardones-Polpaico transmission line.

Through a reform of the power transmission sector approved by Congress in 2015, the government is working to address these issues (see *Transmission And Distribution section*). The connection of the SING and SIC power grids, as well as the development of a key 753km transmission line between the Cardones substation (outside Copiapó) and the Polpaico substation (outside Santiago) are expected to assuage the abovementioned problems within the Chilean transmission infrastructure. If these improvements did not materialise, or if more developers struggled to find financing for their projects, we would revise down our forecasts for Chile's renewables industry.

Electricity Generation And Power Generating Capacity

TOTAL ELECTRICITY GENERATION DATA AND FORECASTS (CHILE 2016-2021)						
Indicator	2016e	2017e	2018f	2019f	2020f	2021f
Generation, Total, TWh	73.877	74.647	78.420	80.569	82.548	85.045
Generation, Thermal, % of total generation	63.591	57.000	57.017	54.943	47.770	46.415
Generation, Coal, TWh	32.456	29.112	30.995	28.480	23.923	23.794
Generation, Coal, % y-o-y	19.499	-10.302	6.469	-8.116	-16.000	-0.538
Generation, Coal, % total electricity generation	43.932	39.000	39.525	35.348	28.981	27.979
Generation, Natural Gas, TWh	12.307	12.690	13.120	15.193	14.916	15.079
Generation, Natural Gas, % y-o-y	15.019	3.112	3.389	15.800	-1.826	1.097
Generation, Natural Gas, % of total electricity generation	16.659	17.000	16.730	18.857	18.069	17.731
Generation, Oil, TWh	2.216	0.746	0.597	0.594	0.594	0.600
Generation, Oil, % change y-o-y	5.539	-66.319	-20.000	-0.500	0.000	1.000
Generation, Oil, % of total electricity generation	3.000	1.000	0.762	0.737	0.720	0.706
Generation, Nuclear, TWh	0.000	0.000	0.000	0.000	0.000	0.000
Generation, Nuclear, % of total electricity generation	0.000	0.000	0.000	0.000	0.000	0.000
Generation, Hydropower, TWh	19.445	22.390	22.400	24.350	25.568	27.357
Generation, Hydropower, % change y-o-y	-16.912	15.145	0.045	8.705	5.000	7.000
Generation, Hydropower, % total electricity generation	26.321	29.995	28.564	30.223	30.973	32.168
Hydro-Electric Pumped Storage, TWh	0.000	0.000	0.000	0.000	0.000	0.000
Hydro-Electric Pumped Storage, % total electricity generation	0.000	0.000	0.000	0.000	0.000	0.000
Generation, Non-Hydropower Renewables, TWh	11.037	10.054	11.307	11.952	17.547	18.214
Generation, Non-Hydropower Renewables, % change y-o-y	23.117	-8.909	12.464	5.701	46.815	3.800
Generation, Non-Hydropower Renewables, % of total electricity	14.940	13.469	14.419	14.834	21.257	21.417

e/f = Fitch Solutions estimate/forecast. Source: EIA, National Sources, Fitch Solutions

TOTAL ELECTRICITY GENERATION DATA AND FORECASTS (CHILE 2022-2027)						
Indicator	2022f	2023f	2024f	2025f	2026f	2027f
Generation, Total, TWh	87.474	90.079	92.758	95.027	97.599	100.176
Generation, Thermal, % of total generation	47.039	45.888	45.832	45.605	45.504	45.022
Generation, Coal, TWh	24.958	24.584	25.198	25.450	25.908	25.934
Generation, Coal, % y-o-y	4.891	-1.500	2.500	1.000	1.800	0.100
Generation, Coal, % total electricity generation	28.532	27.291	27.166	26.782	26.546	25.889
Generation, Natural Gas, TWh	15.583	16.139	16.696	17.263	17.872	18.529
Generation, Natural Gas, % y-o-y	3.340	3.570	3.453	3.392	3.531	3.678
Generation, Natural Gas, % of total electricity generation	17.814	17.917	18.000	18.166	18.312	18.497
Generation, Oil, TWh	0.606	0.612	0.618	0.624	0.631	0.637
Generation, Oil, % change y-o-y	1.000	1.000	1.000	1.000	1.000	1.000
Generation, Oil, % of total electricity generation	0.693	0.680	0.667	0.657	0.646	0.636
Generation, Nuclear, TWh	0.000	0.000	0.000	0.000	0.000	0.000

Indicator	2022f	2023f	2024f	2025f	2026f	2027f
Generation, Nuclear, % of total electricity generation	0.000	0.000	0.000	0.000	0.000	0.000
Generation, Hydropower, TWh	27.904	28.742	29.604	30.788	32.019	33.620
Generation, Hydropower, % change y-o-y	2.000	3.000	3.000	4.000	4.000	5.000
Generation, Hydropower, % total electricity generation	31.900	31.907	31.915	32.399	32.807	33.561
Hydro-Electric Pumped Storage, TWh	0.000	0.000	0.000	0.000	0.000	0.000
Hydro-Electric Pumped Storage, % total electricity generation	0.000	0.000	0.000	0.000	0.000	0.000
Generation, Non-Hydropower Renewables, TWh	18.423	20.002	20.641	20.902	21.168	21.455
Generation, Non-Hydropower Renewables, % change y-o-y	1.145	8.575	3.195	1.263	1.274	1.354
Generation, Non-Hydropower Renewables, % of total electricity	21.061	22.205	22.253	21.996	21.689	21.417

f = Fitch Solutions forecast. Source: National sources, Fitch Solutions

ELECTRICITY GENERATING CAPACITY DATA AND FORECASTS (CHILE 2016-2021)

Indicator	2016e	2017e	2018f	2019f	2020f	2021f
Capacity, Net, MW	23,761.0	25,355.0	26,611.5	27,184.7	29,400.7	30,270.3
Capacity, Net, % y-o-y	9.8	6.7	5.0	2.2	8.2	3.0
Capacity, Conventional Thermal, MW	13,622.0	14,487.0	14,939.0	15,179.0	15,179.0	15,819.0
Capacity, Conventional Thermal, % y-o-y	3.6	6.4	3.1	1.6	0.0	4.2
Capacity, Conventional Thermal, % of total capacity	57.3	57.1	56.1	55.8	51.6	52.3
Capacity, Nuclear, MW	0.0	0.0	0.0	0.0	0.0	0.0
Capacity, Nuclear, % of total capacity	0.0	0.0	0.0	0.0	0.0	0.0
Capacity, Hydropower, MW	6,696.0	6,733.0	6,936.0	6,936.0	7,467.0	7,467.0
Capacity, Hydropower, % y-o-y	3.0	0.6	3.0	0.0	7.7	0.0
Capacity, Hydropower, % of total capacity	28.2	26.6	26.1	25.5	25.4	24.7
Capacity, Non-Hydroelectric Renewables, MW	3,443.0	4,135.0	4,736.5	5,069.6	6,754.7	6,984.3
Capacity, Non-Hydroelectric Renewables, % y-o-y	72.9	20.1	14.5	7.0	33.2	3.4
Capacity, Non-Hydroelectric Renewables, % of total capacity	14.5	16.3	17.8	18.6	23.0	23.1

e/f = Fitch Solutions estimate/forecast. Source: National sources, Fitch Solutions

ELECTRICITY GENERATING CAPACITY DATA AND FORECASTS (CHILE 2022-2027)

Indicator	2022f	2023f	2024f	2025f	2026f	2027f
Capacity, Net, MW	30,483.3	31,129.3	31,382.5	31,529.1	31,645.9	31,813.0
Capacity, Net, % y-o-y	0.7	2.1	0.8	0.5	0.4	0.5
Capacity, Conventional Thermal, MW	15,819.0	15,850.6	15,850.6	15,882.3	15,882.3	15,914.1
Capacity, Conventional Thermal, % y-o-y	0.0	0.2	0.0	0.2	0.0	0.2
Capacity, Conventional Thermal, % of total capacity	51.9	50.9	50.5	50.4	50.2	50.0
Capacity, Nuclear, MW	0.0	0.0	0.0	0.0	0.0	0.0
Capacity, Nuclear, % of total capacity	0.0	0.0	0.0	0.0	0.0	0.0
Capacity, Hydropower, MW	7,603.6	7,603.6	7,774.7	7,790.3	7,805.9	7,829.0
Capacity, Hydropower, % y-o-y	1.8	0.0	2.3	0.2	0.2	0.3
Capacity, Hydropower, % of total capacity	24.9	24.4	24.8	24.7	24.7	24.6
Capacity, Non-Hydroelectric Renewables, MW	7,060.6	7,675.1	7,757.1	7,856.4	7,957.7	8,069.9

Indicator	2022f	2023f	2024f	2025f	2026f	2027f
Capacity, Non-Hydroelectric Renewables, % y-o-y	1.1	8.7	1.1	1.3	1.3	1.4
Capacity, Non-Hydroelectric Renewables, % of total capacity	23.2	24.7	24.7	24.9	25.1	25.4

f = Fitch Solutions forecast. Source: National sources, Fitch Solutions

Electricity Consumption

We are broadly maintaining our forecasts for power consumption in Chile this quarter. We expect to see consumption rise by an average annual rate of 2.8% between 2018 and 2027. The economic outlook in Chile has slowed somewhat, as copper weaknesses (the country's key export) weigh on economic growth prospects, resulting in a disappointing performance over the first half of the year. That being said, a gradual strengthening of the manufacturing sector, solid private consumption growth and the copper sector's growing power needs amid declining ore grades will all support power consumption growth over the coming years. This will lead to a general uptick in demand and a more-positive outlook for consumption.

We do note some downside risk due to slowing investment and declining revenues from copper exports, which are subdued by historical standards. A deteriorating labour market and falling revenues amid structurally lower copper prices will limit the support that private consumption and government expenditure can provide to growth. As a result, should investment fall short of our expectations, we will be forced to reassess our real GDP growth forecasts, which in turn would affect our forecasts for electricity consumption in the market. Our Country Risk analysts currently forecast Chile's real GDP to grow by 3.5% y-o-y in 2018, up from 1.5% in 2017. However, downwards revisions to economic growth forecasts would have a similar impact on our power sector forecasts. Additional downside risk stems from a higher than expected switching rate among regulated large-scale consumers to the free market which could result in a downwards revision of our consumption forecasts in the coming quarters.

TOTAL ELECTRICITY CONSUMPTION DATA AND FORECASTS (CHILE 2016-2021)

Indicator	2016e	2017e	2018f	2019f	2020f	2021f
Consumption, Net Consumption, TWh	70.7	73.1	75.5	77.8	79.7	82.1
Consumption, Net Consumption, % y-o-y	3.0	3.4	3.3	3.0	2.5	3.0
Consumption, Net Consumption, KWh per capita	3,946.7	4,048.1	4,148.9	4,240.9	4,314.9	4,412.8

e/f = Fitch Solutions estimate/forecast. Source: EIA, Fitch Solutions

TOTAL ELECTRICITY CONSUMPTION DATA AND FORECASTS (CHILE 2022-2027)

Indicator	2022f	2023f	2024f	2025f	2026f	2027f
Consumption, Net Consumption, TWh	84.5	87.0	89.5	91.8	94.2	96.8
Consumption, Net Consumption, % y-o-y	2.9	3.0	2.9	2.5	2.6	2.7
Consumption, Net Consumption, KWh per capita	4,509.5	4,614.0	4,717.3	4,804.8	4,900.9	5,006.4

f = Fitch Solutions forecast. Source: EIA, Fitch Solutions

Transmission And Distribution, Imports And Exports

Key View: Chile's transmission and distribution network is the subject of ongoing investment as the government works towards reducing losses, increasing connectivity and facilitating the integration of new capacity, including fluctuating output from a much larger renewables segment. The forthcoming connection of the northern and central power grids is a major step towards easing the bottleneck currently hindering the development of the power sector.

Latest Updates

- **Antofagasta**, a Chilean copper producer, has sold its electricity transmission business (**Centinela Transmisión**) to **Red Eléctrica Chile SpA**, a subsidiary of **Red Eléctrica Internacional** for USD117mn.

- Investment in new, modern infrastructure means that losses from the national grid are expected to decrease slightly over the course of the forecast period, to around 3.6% of output in 2027.

Structural Trends

Chile's stretched geography, multiple power grids and growing share of renewables in its power mix make an efficient and widely developed T&D network crucial for the country's energy security. Moreover, expanding and upgrading the transmission grid will be fundamental to the government's goal of tackling the problem of spot prices falling to near zero during periods of peak supply from solar power plants in the north and no connection to the main power demand centres. The country's national grid currently stretches some 9,483km in the Interconnected System of the Norte Grande (which runs between the regions of Arica-Parinacota, Tarapacá and Antofagasta) and a further 22,070km in the Central Interconnected System (which runs from the ridge of Paposo in the north (Second Region) to the island of Chiloé in the south (Tenth Region)). The smaller Los Lagos, Aysén and Magallanes grids serve small areas of the extreme southern part of the country.

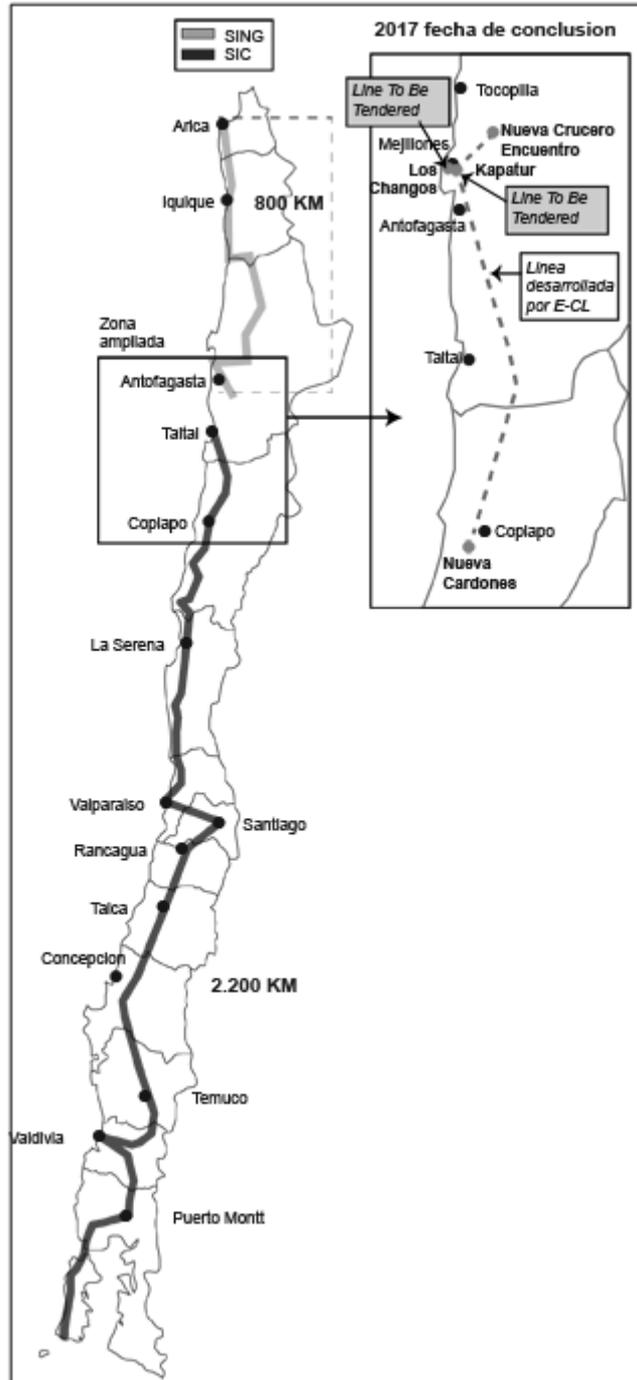
We expect to see abundant business opportunities for companies operating in the T&D sector in Chile over the next few years. On one hand, these will come from the need to connect to the power grid new installed power capacity; on the other, the government will foster investment in T&D to address the following challenges:

- Oversupply in certain parts of the grid, which has at times pushed spot prices close to zero and damaged investment returns of power generators
- A growing pipeline of solar and wind projects expected to come online over the coming quarters, but with limited access to a potentially congested grid
- Strengthening connections to remote regions. This is necessary to improve the energy security of isolated communities and to reduce costs for the mining sector, a critical component of Chile's economy and a major driver of power demand
- Reducing the cost of electricity by eliminating bottlenecks in the T&D network. The government aims to reduce the marginal electricity cost for consumers served by the SIC system (more than 90% of the total population) by 30% by 2018

In order to tackle these challenges, the government has promoted the connection between the Central Interconnected System and the Interconnected System of the Norte Grande via a new transmission line, which is expected to be completed in 2018. The line is being developed and will be operated by Engie in a joint venture with Spain's Red Eléctrica. Engie appointed local company **Sigdo Koppers** to build the 600km line and French firm **Alstom** to supply the substations.

The Comisión Nacional de Energía has issued an extensive list of T&D projects currently under development, with completion dates ranging from early 2017 to July 2021. A number of companies are involved, including **Transelec**, **Pacific Hydro**, Colbun, **Elecnor** and Engie. New projects were also added over the first half of 2017. In June, Interconexión Eléctrica, Enel Distribución Chile, the Red Eléctrica Chile-Cobra Instalaciones Servicios consortium and the Saesa-Chilquinta consortium won various power transmission contracts. Interconexión Eléctrica has won a contract to build and operate 500/220kV transformers at the Nueva Cardones, Nueva Maitencillo and Nueva Pan de Azúcar substations in the Atacama and Coquimbo regions. Work is scheduled to be completed in August 2021. Enel Distribución Chile secured a contract for the 220kV Seccionadora Nueva Lampa substation, expected to start operating in February 2020. The Red Eléctrica Chile-Cobra Instalaciones Servicios consortium won contracts for three 2x220kV transmission lines. The lines are Nueva Pozo Almonte-Pozo Almonte, Pozo Almonte-Cóndores and Pozo Almonte and Parinacota. The consortium also secured a contract to build the 220kV Seccionadora substation. The first phase of the scheme is slated to start operating in August 2019, which will be followed by the second phase in August 2021. The consortium between Saesa and Chilquinta secured the contract to build and operate the Maitencillo-Punta Colorada-Nueva Pan de Azúcar 2x220kV transmission line and an associated 2x500MVA substation. The project is due to open in August 2021. The projects will involve an overall investment of USD288mn.

Chile's Crucial Grid Interconnection
Chile - SING & SIC Grids, & Support Interconnection Lines



Source: Ministerio de Energia, Fitch Solutions

As part of its efforts to strengthen Chile's electricity network, the Chilean government submitted to parliament a bill to reorganise the country's power transmission system, in a bid to improve its efficiency and to support its expansion by attracting additional investment in the sector. Among the major changes introduced by the bill, we highlight the creation of an independent body that will coordinate the operations of the SIC and SING grids once their unification is completed. The bill was approved by both branches of the Chilean parliament and promulgated by President Bachelet in July 2016.

The creation of a larger, unified grid that pools the power generating plants of the two main transmission grids - as well as coordination by a single system operator - will significantly improve the efficiency of Chile's power supply. In addition, the

transmission bill contains a number of regulatory changes that are intended to facilitate investment in Chile's power transmission industry and expedite project development. These include the division of the transmission system into sub-sectors (national, international and dedicated to infrastructure - among others) and the introduction of a system of long-term planning for the industry.

ELECTRIC POWER T&D LOSSES DATA AND FORECASTS (CHILE 2016-2021)

Indicator	2016e	2017e	2018f	2019f	2020f	2021f
Electric power distribution losses, TWh	3.2	1.6	2.9	3.0	3.0	3.1
Electric power distribution losses, % of output	4.3	2.1	3.7	3.7	3.7	3.6

e/f = Fitch Solutions estimate/forecast. Source: EIA, Fitch Solutions

ELECTRIC POWER T&D LOSSES DATA AND FORECASTS (CHILE 2022-2027)

Indicator	2022f	2023f	2024f	2025f	2026f	2027f
Electric power distribution losses, TWh	3.2	3.2	3.3	3.4	3.5	3.6
Electric power distribution losses, % of output	3.6	3.6	3.6	3.6	3.6	3.6

f = Fitch Solutions forecast. Source: EIA, Fitch Solutions

Industry Risk/Reward Index

Latin America Power RRI: Mexico And Argentina In Focus

Key View

- Power sector investors and project developers will be able to capitalise on Latin America's significant need for power generation and transmission infrastructure, as well as growing electricity consumption.
- Business opportunities will be available across the region, although these will be accompanied by a varying level of Country and Industry Risks depending on the market in question.
- While Chile continues to lead the regional ranking, this quarter we highlight opportunities and risks in the power markets of Mexico, Argentina, Venezuela and Honduras.

Attractive Business Environment Supports Chile's Outperformance
 LatAm Power - Risk/Reward Index Heat Map



Source: Fitch Solutions Power Risk/Reward Index. Scores out of 100, Higher Score = More Attractive Market

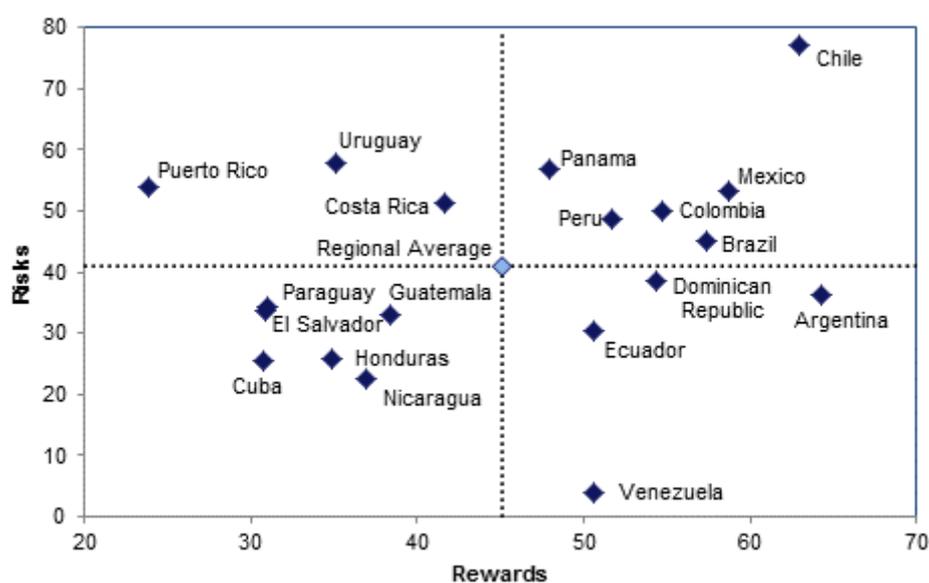
Main Regional Features And Latest Updates

- The average score for the Latin American region in our Power Risk Reward Index (RRI) remained substantially unchanged this quarter. **Chile** continues to lead the regional ranking due to its very low level of risk coupled with a growing power sector and a strengthening economy. Conversely, **Cuba** ranks last in the region as a result of its unattractive mix of limited business opportunities and elevated risk.
- In terms of its overall RRI profile, Latin America scores below the global average. The region's RRI score is dragged down by the low scores of most Central American and Caribbean countries, which are characterised by a small power market and an unattractive business environment. **Venezuela** also weighs down the regional average score as it offers almost no opportunities amid a prolonged economic crisis and lack of public investment in its state-dominated power sector.
- On the other hand, Latin America's regional score is supported by a number of countries with medium or large power markets that we expect will offer significant opportunities in terms of tenders and industry growth over our forecast period, such

as **Mexico, Argentina** and **Brazil**. The attractiveness of these countries' power sectors, however, has to be weighed against the current context of heightened political and economic uncertainty, which drags down their scores.

- Overall, power sector investors and project developers will be able to capitalise on the region's large need for power generation and transmission infrastructure over the coming years, as well as growing electricity consumption. We believe that opportunities will be available across the region - particularly in the non-hydro renewables and power transmission sectors – although, these will be accompanied by a varying level of Country and Industry Risks depending on the market in question.
- This quarter we focus on two outperforming markets in our Latin America RRI, Mexico and Argentina, and two underperforming markets, namely Venezuela and **Honduras**.

Region Offers Diverse Range Of Opportunities And Risks
LatAm - Power Risk/Reward Index

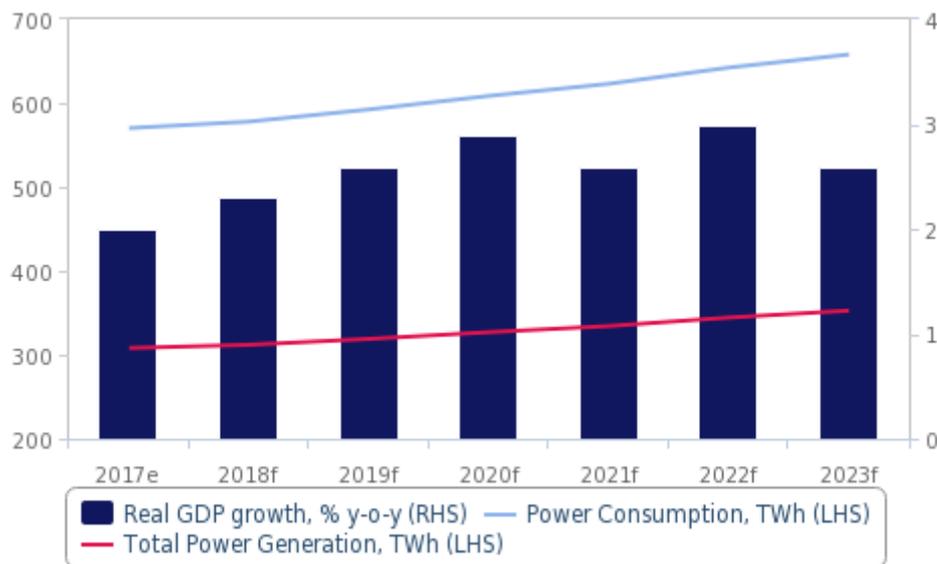


Source: Fitch Solutions Power Risk/Reward Index. Scores out of 100, Higher Score = More Attractive Market

Top Of The Chart: Mexico and Argentina

We hold a positive long-term outlook for investment opportunities in **Mexico's** power sector, as the country will experience substantial growth in power consumption over our 10-year forecast period and has adopted a regulatory environment that will support investment in the development of new power capacity, particularly in the non-hydropower renewables sector. That said, the Mexican economy has been growing below its full potential due to a number of issues, most acutely corruption and security risks. These factors are reflected in Mexico's profile in our RRI, with the market ranking second in Latin America. The country has one of the highest Industry Rewards scores in the region - which takes into account future installed power capacity and electricity generation - but a relatively unexceptional score for Country Rewards, which include our outlook for Mexico's real GDP growth over the next five years.

Solid Market Fundamentals Support Positive Long-Term Outlook
Mexico - Power Generation and Consumption, And Real GDP Growth



e/f = Fitch Solutions estimate/forecast. Source: EIA, SENER, Fitch Solutions

Mexico is currently facing policy and economic uncertainty in the wake of the election victory of leftist populist Andrés Manuel López Obrador (AMLO) in the July 1 presidential election and the strong result of his party Movimiento Regeneracion Nacional (Morena). This will potentially result in a major policy shift from the more orthodox economic agenda of the previous Peña Nieto administration, given that AMLO campaigned against free trade agreements and the liberalisation of the energy sector (see 'AMLO Victory A Watershed Moment For Mexico', July 2). These factors weigh down Mexico's Country Risks profile, especially the Long-Term Political Risk Index sub-indicator. However, we believe that the negative impact of AMLO's presidency on business opportunities in the Mexican power sector will be contained and mostly limited to the thermal power sector (see 'AMLO Will Not Reverse Core Power Sector Reforms' June 14).

Our still optimistic outlook for the market under AMLO is underpinned by our view that the new administration will not remove public schemes that support growth in renewables - such as power auctions and the liberalisation of the electricity market. The expansion in Mexico's renewables sector will require the development of new power transmission lines, which suggest that tenders for new transmission infrastructure will also be maintained. Moreover, we do not expect AMLO will be able to substantially reduce the role of natural gas in Mexico's power generation mix or reduce the country's dependency on natural gas imports - although opportunities in the development of new gas-fired power plants owned by state-controlled utility **Comisión Federal de Electricidad** are likely to take a hit.

Argentina Presents Higher Rewards And Risks Than Chile
 Select Countries - Power Risk/Reward Index

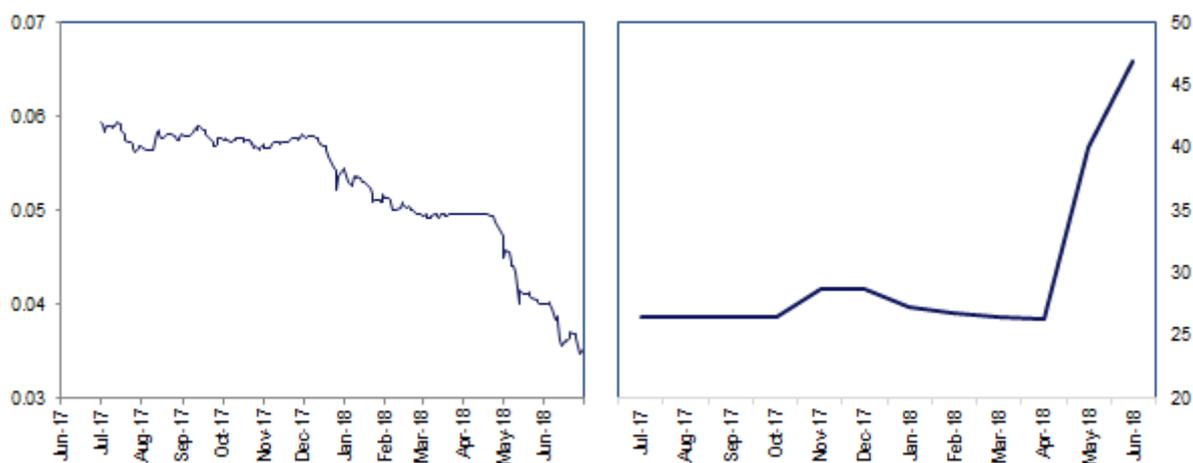


Source: Fitch Solutions Power Risk/Reward Index. Scores out of 100, Higher Score = More Attractive Market

Argentina offers higher rewards than Mexico, although it also presents a more elevated level of risks. The country ranks third in our Latin America table this quarter, boosted by having the region’s highest Industry Rewards score. This reflects our forecast for strong growth in Argentina's installed capacity over the coming five years, primarily as a result of the development of the renewables and thermal power projects contracted in capacity auctions over the past two years, as well as the planned commissioning of two large hydropower plants. The Argentine government is committed to ensuring Argentina achieves the legally-mandated goal of meeting 20% of its power needs with non-hydro renewables by 2025, which will require holding new capacity auctions over the coming years.

This target, plus a sizeable economic expansion and years of under-investment in the country's power infrastructure, create notable long-term investment opportunities in Argentina's electricity market. However, this has to be weighed against limited access to financing for project development and increased macroeconomic and political volatility in the wake of a significant depreciation of the Argentinean peso in May (see 'Currency Crisis Increases Risks For Growing Power Sector' May 24). Argentine President Mauricio Macri's decision to seek an IMF credit facility will raise public and legislative opposition to his agenda. Moreover, the replacement of former Energy Minister Juan José Aranguren - a strong supporter of business-friendly energy market reforms - will contribute to perceptions of increased risk in the market.

Cheaper Currency And Higher Interests Increase Financing Costs
ARS-USD Exchange Rate (LHS) And Lebac* 35-Day Yield, % (RHS)



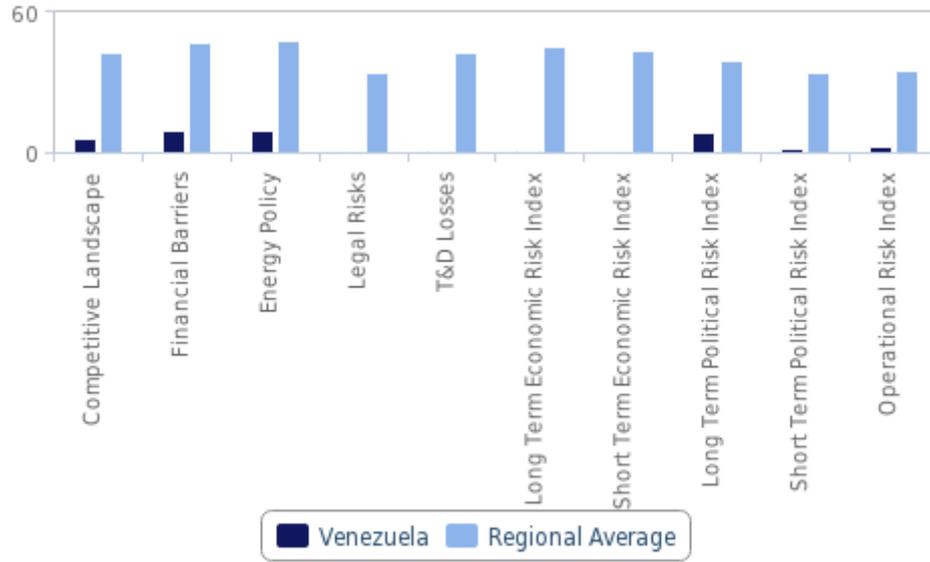
*= Argentine Government Short-Term Debt. Source: Bloomberg, BCRA, Fitch Solutions

Bottom Of The Chart: Venezuela And Honduras

Countries in the bottom half of our Latin America RRI generally present high risks and limited opportunities for power sector investment. These markets are characterised by elevated legal risks, limited access to financing, economic weakness and, in some cases, political instability and security concerns. In addition, as mentioned above, the countries in this group have a small power sector, limiting the range of opportunities on offer even for more risk-tolerant investors.

With a population of over 30mn, **Venezuela** stands out from the rest of the group of small markets trailing in our RRI. However, the country's ongoing economic crisis and tense political situation, coupled with the dilapidated state of its power infrastructure, account for Venezuela's poor performance in our RRI - ranking 16th out of 19th countries this quarter. Globally, Venezuela has the lowest Risks score on our index overall, which reflects the power sector's dependency on government spending given the absence of private investment in the market, as well as an economic collapse and political instability. These factors significantly drag down Venezuela's score in our Political, Economic and Operational Risk Indices.

Venezuela Severely Underperforms For Industry And Country Risks
Selected Power RRI Sub-Indicators



Source: Fitch Solutions Power Risk/Reward Index. Note: Scores out of 100; higher score = more attractive market.

Honduras ranks 17th in our Latin America RRI this quarter. Our outlook for a robust expansion in the economy over the next five years and a growing population support Honduras' score for Country Rewards, but the market's small-scale and elevated risks drag down its score for Industry Rewards and both Risks indicators in our index. That said, the market will experience some growth over the next two years as a result of the development of three solar power plants currently under construction and accounting for a cumulative capacity of 82 megawatts (MW), as well as the completion of a 104MW hydropower plant.

Latin America Power Risk/Reward Index
Rewards & Risks Scores

RRI	Industry Rewards	Country Rewards	REWARDS	Industry Risks	Country Risks	RISKS	RRI	Regional Rank	Global Rank
Chile	65.9	58.4	62.9	79.1	75.1	77.1	68.6	1	10
Mexico	65.5	48.5	58.7	58.2	48.1	53.2	56.5	2	39
Argentina	72.0	52.8	64.3	32.4	40.4	36.4	53.1	3	45
Colombia	58.6	48.7	54.7	54.9	45.3	50.1	52.8	4	46
Brazil	67.7	41.8	57.3	48.7	41.3	45.0	52.4	5	52
Panama	47.0	49.4	47.9	56.9	57.1	57.0	51.6	6	54
Peru	46.1	60.1	51.7	48.8	48.9	48.8	50.6	7	57
Dominican Republic	55.0	53.4	54.4	36.6	40.4	38.5	48.0	8	64
Costa Rica	40.1	44.0	41.6	53.8	48.9	51.3	45.5	9	74
Uruguay	41.8	25.2	35.2	56.3	59.2	57.7	44.2	10	80
Ecuador	49.6	52.0	50.6	27.2	33.3	30.3	42.5	11	86
Guatemala	34.1	44.8	38.4	40.2	25.5	32.8	36.2	12	99
Puerto Rico	25.6	21.1	23.8	60.3	47.5	53.9	35.9	13	100
Paraguay	26.9	37.1	31.0	38.8	30.0	34.4	32.3	14	104
El Salvador	25.4	39.0	30.9	40.9	26.6	33.7	32.0	15	105
Venezuela	60.6	35.8	50.6	5.1	2.7	3.9	32.0	16	106
Honduras	28.4	44.4	34.8	29.8	21.8	25.8	31.2	17	108
Nicaragua	25.6	53.9	36.9	24.1	20.8	22.5	31.2	18	109
Cuba	30.8	30.7	30.8	22.4	28.9	25.6	28.7	19	113
Global Average	50.0	50.0	50.0	50.0	50.0	50.0	50.0	~	~
Regional Average	45.6	44.3	45.1	42.9	39.0	41.0	43.4	~	~

Source: Fitch Solutions Power Risk/Reward Index. Scores out of 100, Higher Score = More Attractive Market

Latin America Power Rewards
Industry Rewards & Country Rewards Scores

Rewards	Electricity Capacity (MW)	Electricity Capacity (%)	Electricity Generation (TWh)	Electricity Generation (%)	Industry Rewards	Real GDP Growth (%)	Labour Market Risk	Electricity Import Dependence	Population Growth (%)	Country Rewards	REWARDS	RRI	Regional Rank	Global Rank
Chile	69.8	69.8	68.1	56.0	65.9	56.0	78.4	59.5	39.7	58.4	62.9	68.6	1	10
Mexico	86.2	42.2	89.7	44.0	65.5	31.0	71.6	30.2	61.2	48.5	58.7	56.5	2	39
Argentina	78.4	75.0	76.7	57.8	72.0	54.3	44.0	64.7	48.3	52.8	64.3	53.1	3	45
Colombia	58.6	54.3	62.9	58.6	58.6	56.9	56.9	40.5	40.5	48.7	54.7	52.8	4	46
Brazil	94.8	43.1	94.0	38.8	67.7	23.3	28.4	78.4	37.1	41.8	57.3	52.4	5	52
Panama	25.0	74.1	19.8	69.0	47.0	81.9	29.3	11.2	75.0	49.4	47.9	51.6	6	54
Peru	54.3	29.3	56.0	44.8	46.1	69.0	75.0	36.2	60.3	60.1	51.7	50.6	7	57
Dominican Republic	25.9	82.8	33.6	77.6	55.0	75.0	25.9	58.6	54.3	53.4	54.4	48.0	8	64
Costa Rica	22.4	60.3	18.1	59.5	40.1	57.8	37.9	32.8	47.4	44.0	41.6	45.5	9	74
Uruguay	32.8	52.6	31.0	50.9	41.8	29.3	33.6	7.8	30.2	25.2	35.2	44.2	10	80
Ecuador	44.8	62.1	38.8	52.6	49.6	17.2	55.6	65.5	69.8	52.0	50.6	42.5	11	86
Guatemala	23.3	27.6	17.2	68.1	34.1	58.6	12.1	25.9	82.8	44.8	38.4	36.2	12	99
Puerto Rico	33.6	13.8	20.7	34.5	25.6	1.7	64.7	2.6	15.5	21.1	23.8	35.9	13	100
Paraguay	39.7	4.3	56.9	6.9	26.9	72.4	11.2	0.9	63.8	37.1	31.0	32.3	14	104
El Salvador	5.2	23.3	8.6	64.7	25.4	21.6	12.9	87.1	34.5	39.0	30.9	32.0	15	105
Venezuela	72.4	37.9	69.8	62.1	60.6	0.0	19.0	61.2	62.9	35.8	50.6	32.0	16	106
Honduras	16.4	50.0	10.3	37.1	28.4	64.7	6.9	28.4	77.6	44.4	34.8	31.2	17	108
Nicaragua	4.3	44.0	2.6	51.7	25.6	71.6	10.3	77.6	56.0	53.9	36.9	31.2	18	109
Cuba	36.2	26.7	30.2	30.2	30.8	3.4	55.6	43.1	20.7	30.7	30.8	28.7	19	113
Global Average	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	~	~
Regional Average	43.4	46.0	42.4	50.8	45.6	44.5	38.4	42.7	51.5	44.3	45.1	43.4	~	~

Source: Source: Fitch Solutions Power Risk/Reward Index. Scores out of 100, Higher Score = More Attractive Market

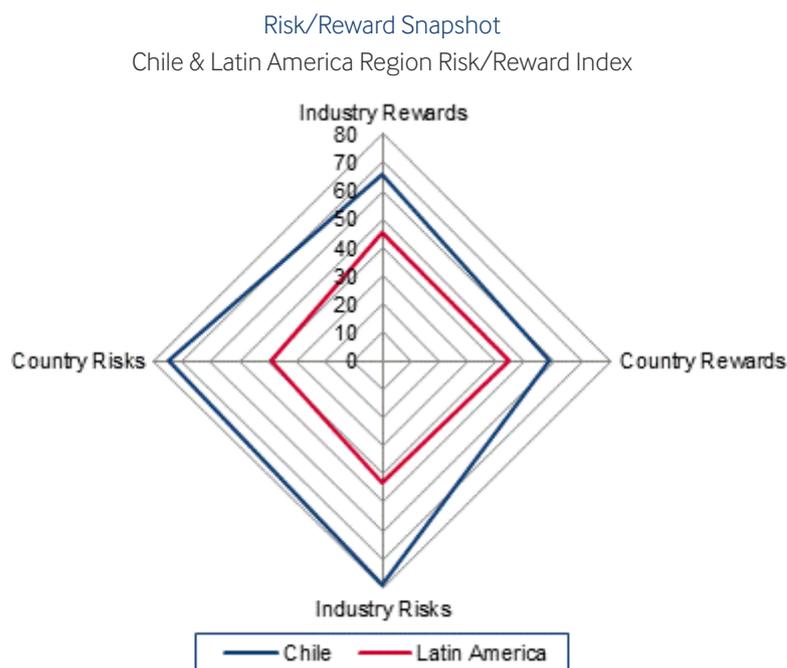
Latin America Power Risks
 Industry Risks & Country Risks Scores

Risks	Competitive Landscape	Financial Barriers	Energy Policy	Legal Risks	T&D Losses	Industry Risks	Long Term Economic Risk Index	Short Term Economic Risk Index	Long Term Political Risk Index	Short Term Political Risk Index	Operational Risk Index	Country Risks	RISKS	RRI	Regional Rank	Global Rank
Chile	74.6	78.4	77.6	76.7	87.9	79.1	70.7	75.9	84.5	77.6	71.1	75.1	77.1	68.6	1	10
Mexico	64.2	62.9	77.6	46.6	39.7	58.2	63.8	72.4	44.8	19.8	44.0	48.1	53.2	56.5	2	39
Argentina	47.4	19.0	45.7	23.3	26.7	32.4	44.8	40.5	42.2	42.2	36.2	40.4	36.4	53.1	3	45
Colombia	64.2	95.7	20.7	42.2	51.7	54.9	60.3	60.3	37.9	34.1	39.7	45.3	50.1	52.8	4	46
Brazil	64.2	47.4	77.6	32.8	21.6	48.7	56.9	47.8	56.9	15.5	35.3	41.3	45.0	52.4	5	52
Panama	47.4	75.9	77.6	49.1	34.5	56.9	64.7	54.7	59.1	59.1	52.6	57.1	57.0	51.6	6	54
Peru	47.4	61.2	45.7	43.1	46.6	48.8	67.7	73.3	44.0	22.0	43.1	48.9	48.8	50.6	7	57
Dominican Republic	47.4	25.0	45.7	34.5	30.2	36.6	39.7	31.9	45.7	62.9	31.0	40.4	38.5	48.0	8	64
Costa Rica	47.4	53.4	62.1	51.7	54.3	53.8	47.4	42.2	68.1	40.5	47.4	48.9	51.3	45.5	9	74
Uruguay	64.2	36.2	77.6	55.2	48.3	56.3	62.1	53.0	74.1	65.9	50.0	59.2	57.7	44.2	10	80
Ecuador	26.7	29.3	20.7	21.6	37.9	27.2	50.9	46.6	13.8	14.7	37.1	33.3	30.3	42.5	11	86
Guatemala	26.7	64.7	62.1	15.5	31.9	40.2	48.3	53.0	12.9	4.3	17.2	25.5	32.8	36.2	12	99
Puerto Rico	47.4	74.1	20.7	59.5	100.0	60.3	50.0	51.7	33.6	27.2	61.2	47.5	53.9	35.9	13	100
Paraguay	47.4	23.3	31.9	31.0	60.3	38.8	34.5	40.5	40.5	24.6	19.8	30.0	34.4	32.3	14	104
El Salvador	26.7	28.4	45.7	25.9	77.6	40.9	37.9	19.0	38.8	10.3	26.7	26.6	33.7	32.0	15	105
Venezuela	5.6	9.5	9.5	0.0	0.9	5.1	0.9	0.0	8.6	1.7	2.6	2.7	3.9	32.0	16	106
Honduras	26.7	55.2	45.7	16.4	5.2	29.8	31.9	50.0	12.1	5.6	15.5	21.8	25.8	31.2	17	108
Nicaragua	26.7	11.2	45.7	13.8	23.3	24.1	15.1	13.4	9.5	44.0	21.6	20.8	22.5	31.2	18	109
Cuba	13.8	46.6	20.7	12.1	19.0	22.4	19.0	8.6	19.8	79.3	23.3	28.9	25.6	28.7	19	113
Global Average	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	~	~
Regional Average	43.0	47.2	47.9	34.3	42.0	42.9	45.6	43.9	39.3	34.3	35.5	39.0	41.0	43.4	~	~

Source: Fitch Solutions Power Risk/Reward Index. Scores out of 100, Higher Score = More Attractive Market

Chile Power Risk/Reward Index

Key View: Chile continues to rank first in the Latin American region on our Power Risk/Reward Index and a competitive 10th globally. Although a sizeable pipeline of projects under development, particularly in the renewables segment, and an attractive regulatory environment support the country's outperformance, it is the low operational and political risks relative to most emerging markets that really set Chile apart from other regional markets.



Note: Scores out of 100; higher score = more attractive market. Source: Fitch Solutions Power Risk/Reward Index

Global And Regional Ranks

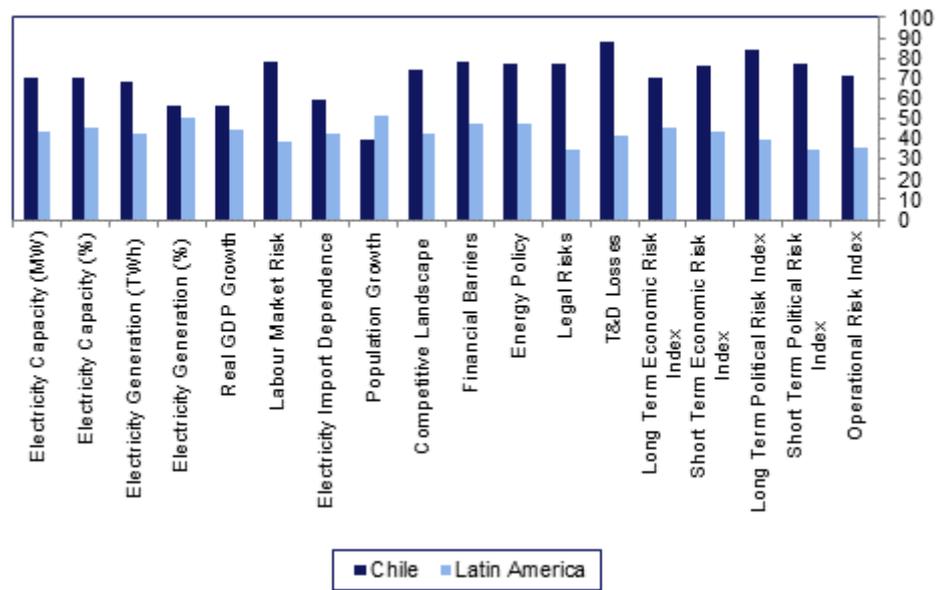
- Regional rank (out of 19): 1st
- Global rank (out of 117): 10th

Key Features And Latest Updates

- Chile continues to record a strong performance on the power RRI, at both the regional and global levels, attributable to the considerable rewards on offer from an expansive project pipeline, as well as low operational and political risks (relative to countries with an economy and power industry with similar characteristics).
- Good legal institutions and elevated political stability are positives for the markets, as is a track record of prudent fiscal and monetary policy execution. These features, coupled with a diversified competitive landscape and favourable power sector regulations, make the country an attractive destination for foreign investors. As a result, Chile's score for both Country Risks and Industry Risks in our index is significantly higher than the Latin American and global average.
- A sizeable pipeline of conventional and renewables power projects at various stages of planning and construction boosts Chile's Rewards score. We do note, however, that delays in the execution of large-scale hydropower and thermal power projects remain a relevant risk in Chile, as is the case in most Latin American countries. Power grid bottlenecks are also an obstacle to power sector investment, although the completion of new key transmission lines over the coming quarters will facilitate the integration of new capacity.
- Although Chile's Rewards score is one of the highest in Latin America, it is weighed down by slowing economic growth relative to the years of larger commodities export volumes to China. We also highlight that over the coming years, Chile will likely have

growing competition for investment from Latin American countries that have a much larger power sector or a rebounding economic cycle, such as Mexico, Argentina and Brazil.

RRI Matrix Breakdown
Chile & Latin America Region Risk/Reward Index By Component



Note: Scores out of 100; higher score = more attractive market. Source: Fitch Solutions Power Risk/Reward Index

Market Overview

Key Policies And Market Structure

Regulation And Competition

Chile privatised its electricity sector in the 1980s, and all generation, transmission and distribution activity is now in private hands. The National Energy Commission (Comisión Nacional de Energía, CNE) is largely responsible for the state regulation of the power sector, along with the Ministry of Energy.

The government agencies in charge of governing and regulating Chile's electricity sector include:

The National Energy Commission (CNE), which is in charge of devising the long-term development strategy for the power sector and determining the tariffs for the market's regulated clients. As per a law implemented at the end of January 2015, power purchase agreements (PPAs) to supply electricity to Chilean distributors (the regulated market) are auctioned by the CNE rather than by the distributors themselves. This means that the government is now responsible for the results of the long-term energy auctions, while distributors have only an administrative role.

The Superintendence for Electricity and Fuels (SEC), which is responsible for the enforcement of laws, regulations and technical standards affecting the generation, production, storage, transport and distribution of electricity and other fuels.

The government's long-term strategy for the power and energy sector in Chile is outlined by a planning document named 'Energía 2050' and published in January 2016. As part of this strategy, Chile is expected to produce 70% of its electricity from renewable energy sources by 2050. Chile has an interim goal of generating 20% of its electricity from non-hydro renewables by 2025.

A number of other long-term goals for the Chilean energy sector were announced by the government in May 2014, including a USD650mn investment plan aimed at reducing electricity costs and fostering investment in unconventional energy sources. A number of other provisions of the energy plan have been shaping the development of Chile's power sector since then. These include:

- A focus on investment in renewable energy in order to cut the power sector's dependence on fuel imports
- Greater reliance on LNG imports in the short term, with the government planning to import cheaper volumes from the US when export capacity comes online
- The promotion of greater private sector investment
- The involvement of Chile's national oil company (NOC) **ENAP** in the power generation business - particularly through the construction of new natural gas-fired power plants

To this end, in January 2016, a bill allowing ENAP to access the power generation sector - by holding a stake of up to 66% in power generation projects, under joint ventures (JVs) with private companies - received definitive approval from the Chilean parliament. The bill had met strong opposition by Chilean power generators and some political forces, because of concerns that ENAP's public nature could hinder competition in the power market.

The new government is expected to maintain Chile's current energy development trajectory. Sebastián Piñera of the centre-right Chile Vamos (CV) coalition was elected president of Chile in December 2017, following a run-off against Alejandro Guillier of the incumbent centre-left Fuerza de la Mayoría (FM). Piñera will focus on expanding renewable energy, developing flexible thermal power generation and upgrading the transmission and distribution system. Although Piñera will place greater emphasis on market forces over state planning than the former administration, we anticipate broad policy continuity with regards to Chile's energy agenda and maintain our existing views on the power sector.

Power Auctions Encourage Investment In Renewable Energy

In 2015, the government introduced new regulations for the auctions through which the CNE secures energy for regulated clients in Chile. These regulations allow renewable energy projects to bid for specific time slots or 24-hour slots, instead of just for the daytime consumption shifts. The introduction of these specific time slots is credited for wind and solar energy projects being able to offer the cheapest power supply at the October 2015 auction, outbidding all conventional plants in the competition.

Following the successful tender of 12,430GWh a year at the auction finalised in August 2016, the government has announced that it will hold new auctions over the coming years. In 2017, the government aims to tender 4.2TWh annually for 20 years, with projects contracted starting to deliver electricity in 2023. An auction held in October 2017 reportedly attracted 24 bids. In addition, previous reports suggested that in 2018, the government plans to contract 8.9TWh annually, with supply starting in 2025.

The government introduced some new elements to the power tender process in 2017, in a bid to attract even greater investment in renewable energy projects. In particular, the government has doubled the economic guarantees required from developers to secure PPAs, to USD32,000 per GWh - in order to discourage speculative bidding. Moreover, it has introduced three-monthly time slots for PPAs in certain periods of the year. This should favour contracting solar power projects during the months in which they are most productive in terms of capacity factors, and could encourage developers to offer hybrid projects (combining multiple power generating technologies).

By increasing supply flexibility, the three-monthly blocks are expected to help enhance the stability of the power system by allowing a better match of supply with power demand. Developers should be able to offer electricity from renewables projects (including hydropower) according to the seasonality of the power resource in question.

Reorganisation Of Power Transmission Regulations Underway

In August 2015, the Chilean government submitted to the parliament a bill to reorganise the country's power transmission system, in a bid to improve its efficiency and support its expansion. The final objective of the regulatory changes introduced by the bill is to foster the development of a more competitive power market and reduce electricity prices in the country. In particular, the new regulatory framework is expected to accelerate the development process of new power transmission lines. This will be crucial for avoiding congestion and bottlenecks in Chile's stretched transmission infrastructure and increasing connection points for the country's large pipeline of solar and wind power plants.

Some of the specific provisions put forward by the bill include:

- Laying the legal framework for the interconnection of the SIC and SING power grids
- The creation of a national coordinator for Chile's currently fragmented electricity grid, in order to improve the competitiveness and foster the development of the country's electricity market. The new body will take on the functions of the system operators of the SIC and the SING, ensuring better coordination of the power grids once they are unified
- Improving Chile's energy planning through a five-year forecasting process carried out by the Ministry of Energy, with a 30-year scope
- A number of regulatory changes are likely to attract further investment in Chile's power transmission industry, including the division of the transmission system into sub-sectors (national, international and dedicated to infrastructure - among others)

The bill was approved by the lower chamber of the Chilean Parliament in late January 2016 and by the Senate in July 2016. The implementation of the law is regarded as the necessary condition for the power projects contracted at the latest power auction in August 2016 to be connected to the grid, and for Chile's electricity prices to fall. Increased efficiency in the operation of the power transmission infrastructure and the creation of a regulatory environment facilitating investment in the sector are expected to reduce congestion and bottlenecks through the electricity grid.

Sustainable Energy Policies

As part of its 2014 energy strategy, the Chilean government established a target of 20% of electricity sourced from non-hydropower renewables by 2025 and 70% by 2050. In January 2016, then President Michelle Bachelet introduced a new energy strategy - called 'Energia 2050' - that aims at having renewable sources (including small hydropower) account for 70% of Chile's total power mix by 2050. President Bachelet restated her commitment to this goal in November 2016, at the UN COP22 meeting in Morocco. Chile also ratified the Paris Agreement on climate change. Following the election of Sebastián Piñera in 2017, Chile has again reiterated its commitment to the development of renewable energy. In April 2018 the Minister of Energy Susana Jiménez confirmed that Chile would be updating the Energy Efficiency Plan 2020 under which the government will seek to improve energy efficiency for industrial, public and residential consumers.

The government has introduced a set of indirect support mechanisms for renewables. These include the introduction of a carbon tax in 2017. By placing a tax of USD5.0 per tonne of greenhouse gas on emitters with an installed capacity equal to or bigger than 50MW (excluding those burning biomass), the so-called 'impuesto verde' will increase renewables cost competitiveness by making thermal power generation relatively more expensive.

Pricing

Among the pillars of the long-term energy plan introduced by the government of President Bachelet in 2014, there is the goal of driving down the price that consumers and businesses pay for electricity. For this reason, the low average bid price at Chile's latest power auction in August 2016 was hailed by the government as a milestone in its plan to reduce electricity prices for households and businesses.

The average price per bid at the auction was USD47.59/MWh - significantly lower than the USD79.34/MWh registered at the previous auction in October 2015. The government expects this to translate into lower electricity bills for regulated clients in Chile starting from 2021. Prices fell further in the 2017 auction, with the lowest price coming in at USD21.48/MWh and an average price of USD32.5/MWh. In turn, this development supports our Country Risk team's view that the country will try to boost the role of manufacturing in its economic growth model over the coming years.

Chile Power Projects Database

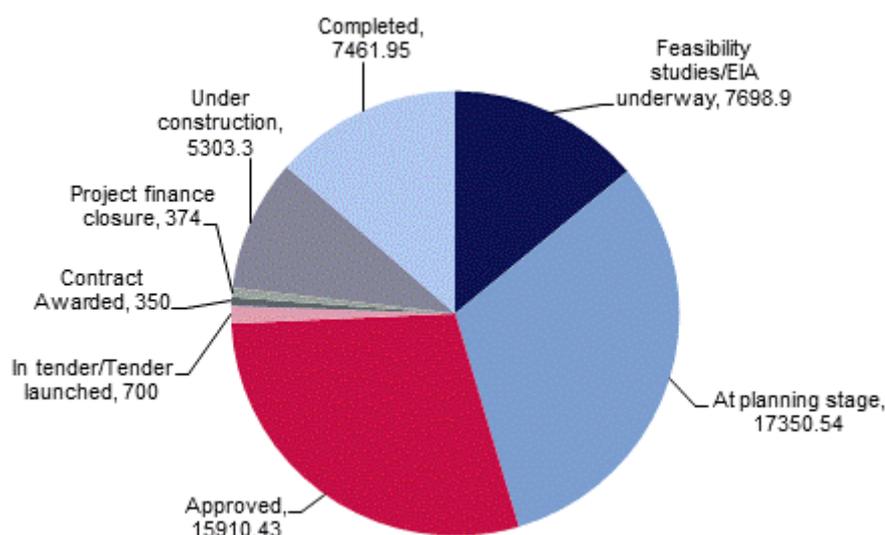
Chile boasts an extensive project pipeline in the energy sector that comprises primarily non-hydropower renewable energy projects, alongside several large-scale thermal (primarily natural gas-fired) power plants. This supports our view that the market will be a regional hot spot of investment in solar and wind power in future, though we do maintain a degree of caution relating to the successful implementation of the full project pipeline.

There is almost 48.3GW of new capacity at various active stages of development in Chile's power sector. Non-hydropower renewables account for 34.4GW of the current pipeline. Natural gas-fired power projects currently account for the second-biggest share of plants planned and at different stages of development in Chile, at around 7.3GW. This reflects our view that natural gas will play an increasingly important role in the Chilean power mix over the next 10 years, owing to the greater availability of imported liquefied natural gas (LNG) and the government support for greater use of gas for electricity generation.

Our database also includes several coal-fired projects planned and one under construction, although we expect that only the plant currently under construction will come online over our forecast period. This view is based on the growing momentum behind the development of gas-fired power generation and the implementation of a carbon tax in 2017.

Hydropower projects also represent a significant share of the database, at almost 4.2GW. We have excluded the HydroAysen hydropower complex, which was cancelled in 2014, from the database. The vicissitudes regarding this project reflect a major risk of delays in the development of large-scale hydropower projects in Chile, due to a long environmental permitting process and vocal opposition from local communities affected by the construction.

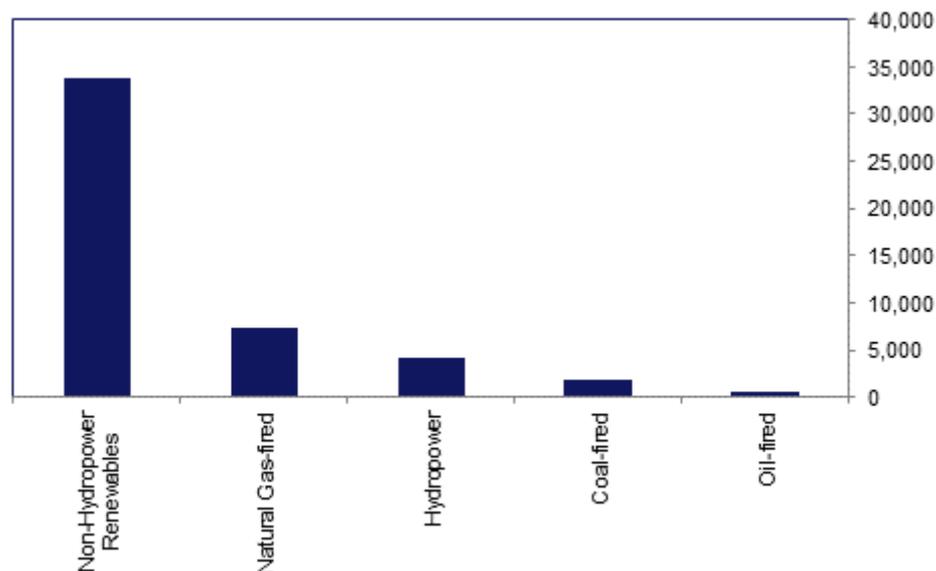
Renewables Sector Set To Expand
Chile - Power Projects By Fuel Type



Source: Fitch Solutions Key Projects Database

The risk of delays and cancellations for hydropower and coal-fired power plants in Chile is evident when looking at the chart that follows, which shows the stage of development of the projects included in our database. The chart also highlights the wide range of opportunities on offer for developers of conventional and renewable energy projects in the Chilean market - with 5.3GW of new projects currently marked as under construction and 17.4GW at the planning stage.

Many Projects Still At Planning Stage
Chile - Power Projects At Various Stages Of The Project Pipeline (MW)



Source: Fitch Solutions Key Projects Database

In addition to the large volume of new capacity that will be constructed over the coming years, we also note the extensive range of projects planned or underway to extend and improve the national transmission and distribution grid. According to our Key Projects Database, there are more than 100 grid infrastructure projects planned or underway in Chile, which will support the integration of new capacity as it comes online. Any delay to these projects could affect the construction of new capacity as some of the renewables projects that obtained a permit to be developed are reliant on sufficient power transmission infrastructure being constructed over the coming years.

CHILE - TOP 10 POWER PROJECTS BY CAPACITY

Project Name	Value (USDmn)	Capacity (MW)	Companies	Timeframe End	Status	Fuel Type
Central Termoelectrica Ttanti, Mejillones, Antofagasta	1,300	1,290	GasAtacama S.A.[Operator]{Chile}	2020	Feasibility studies/EIA underway	Natural gas-fired
El Campesino Power Plant, Bio Bio		1,200	EDF[Sponsor]{France}, Bio Bio Genera S.A.[Operator]{Chile}, Andes Mining & Energy Corporate S.A.[Sponsor]{Chile}	2020	At planning stage	Natural gas-fired
Andes Tamarugal Solar Plant, Pozo Almonte, Tarapaca	4,500	1,100	Andes Green Energy[Operator]{South Korea}		At planning stage	Non-Hydropower renewables
El Loa Solar Plant, Calama, Antofagasta	6,500	1,000	Andes Green Energy[Operator]{South Korea}		At planning stage	Non-Hydropower renewables

Project Name	Value (USDmn)	Capacity (MW)	Companies	Timeframe End	Status	Fuel Type
Central Electrica Luz Minera, Mejillones, Antofagasta	758	760	Larrain y Asociados[Consultant/Project Management]{Chile}, Asset Chile[Consultant/Project Management]{Chile}, Codelco[Sponsor]{Chile}, Empresa Nacional del Petroleo (ENAP)[Sponsor]{Chile}, Mitsui & Co.[Sponsor]{Japan}		At planning stage	Natural gas-fired
Infraestructura Energetica Mejillones (IEM) Thermoelectric Plant, Antofagasta	1,800	750	Belfi[Construction]{Chile}, Salfacorp[Construction]{Chile}, Amec Foster Wheeler[Consultant/Project Management]{United Kingdom}, Siemens[Equipment]{Germany}, Doosan Skoda Power[Equipment]{Czech Republic}, SK Engineering & Construction Co. Ltd[Construction]	2018	Under construction	Coal-fired
South Campos Sol Project, Copiapo, Atacama	1,600	698	Empresa de Desarrollo de Energias Renovables Alen Walung[Operator]{Chile}	2020	At planning stage	Non-Hydropower renewables
Cuervo Hydroelectric Plant Project, Aisen	800	640	Origin Energy[Operator](51){Australia}, Glencore[Operator](49){Switzerland}		At planning stage	Hydropower
Colbun Taltal Wind Farm Project, Antofagasta	971	607	Chile Government[Sponsor]{Chile}, Colbun SA[Operator]{Chile}		Contract Awarded	Non-Hydropower renewables
Cielos De Tarapaca Solar Park, Pozo Almonte, Tarapaca	1,000	600	Valhalla Energy[Operator]{Chile}	2020	At planning stage	Non-Hydropower renewables

Where blank = not available. Source: Fitch Solutions Key Projects Database

Competitive Landscape

Chile's electricity sector has been fully privatised since the 1980s and all generation, transmission and distribution activity is now in private hands. **Transelec** (controlled by a Canadian consortium led by **Brookfield Asset Management**) controls almost the entire national transmission grid. A range of power generators are active in the country, including leading electricity company **AES Gener** (the local subsidiary of the US-based **AES**). Room for new entrants remains, primarily in the renewables sector.

The biggest electricity generator in Chile is AES Gener. The second-most important player in the market is **Enel Chile** (formerly **Endesa**). In 2016, AES Gener and Enel accounted for 31.4% and 26.5% respectively of Chile's total gross electricity generation. They were followed by local **Colbun** (14.5%) and France's **Engie** (11.8%). The remaining players in the market together accounted for 15.8% of total gross power generation.

Norway's **Statkraft** is another relevant international player operating in Chile. The company has been active in the country since 2004 via **SN Power**, a subsidiary created in partnership with the Norwegian Investment Fund for Developing Countries. In February 2015, Statkraft stepped up its Chilean presence by buying a majority stake in the listed Chilean hydropower company **Empresa Eléctrica Pilmaiquén** (EEP). Statkraft aims to ramp up its involvement in Chile by developing EEP's greenfield hydropower project portfolio.

Another notable player in the Chilean market is **Electricité de France** (EDF), which won a contract to supply 4TWh to the country's central power grid (the SIC) through the 1,200MW El Campesino gas-fired combined cycle plant (to be built in the Bio Bio region) at the December 2014 energy auction. Another relevant thermal power generator is a South Korean consortium - made up of **Samsung C&T** and **Korea Southern Power** - which won a contract from **BHP Billiton** in November 2013 to develop a gas-fired power plant in Mejillones. The 517MW Kelar power plant was completed in late December 2016 and it is now operating.

Transelec

Transelec owns and operates most of the electricity transmission lines and sub-stations of Chile's trunk transmission system in the SIC, as well as a portion of the high-tension lines in the SING. Transelec is 100% owned by the **BAM Consortium**, which includes **Canadian Pension Plan Investment Board** (CPP, 27.7%), **British Columbia Investment Management Corporation** (26.0%); and other investors (18.5%). In April 2018 China's **Southern Power Grid** received regulatory approval to acquire **Brookfield Asset Management's** 27.8% share in Transelec in a deal reportedly worth USD1.3bn.

Transelec's assets are the backbone of the Chilean electricity sector, with the company owning 8,239km of transmission lines and 51 power sub-stations. Its assets deliver electricity to around 99% of the Chilean population through various local distribution companies. In 2016, Transelec reportedly connected 1,022MW of renewable energy plants comprising 66% solar power, 23% from wind power and the remainder from hydroelectric plants.

Enel Chile

Enel Chile (previously known as Enersis) is one of Chile's principal private power utilities, involved in the generation and distribution of electricity in the country. The Italian power group **Enel** paid EUR8.25bn for the 60.6% of Enersis owned by Spain's Endesa in October 2014 and the company has seen two significant restructurings since 2016.

Enel Chile has around 6,351MW of installed power generating capacity in Chile, equal to 29% of the Chilean generation market. This consists primarily of hydro, which represents 54% of the total, while thermal power capacity and renewable energy account for 44% and 2% of the total, respectively. Enel Chile supplies electricity to the major regulated distributors, the large non-regulated industrial

companies (primarily in the mining, cellulose and steel sectors) and to the spot market. In the Chilean distribution segment, Enel Chile operates through its subsidiary **Enel Distribución Chile** (formally Chilectra - 99.1% stake). In May 2016, the chief financial officer of Enel Chile announced that the company plans to invest an average of USD400mn in the Chilean power market over the next four years - with a main focus on the power generation segment.

ENAP

The entrance of Chile's national oil company (NOC) **ENAP** into the power generation business is one of the objectives included in the energy strategy for 2025 (Agenda de Energía), which was presented by the administration of President Michelle Bachelet in May 2014 - together with ENAP's expansion in the liquefied natural gas (LNG) sector. ENAP's entry into the domestic power generation segment will benefit the company, enabling it to diversify away from the country's less-promising hydrocarbon upstream sector. In addition to its involvement in the construction of the country's first geothermal power plant, ENAP is set to take a direct role as the owner of natural gas-fired power generation assets, and a wind farm.

In December 2015, ENAP signed an agreement with Japan's **Mitsui** for the development of two combined-cycle gas-fired thermal power plants, the 760MW Luz Minera and the 510MW Nueva Era plants. The projects - which reportedly have a cumulative investment value of almost USD1.5bn - are planned to be built in northern and central Chile, respectively, receiving feedstock from the Quintero and Mejillones LNG import terminals.

We highlight that the access to internal sources of feedstock (from domestic production and its Quintero LNG import terminal) will give ENAP a price advantage over other companies expected to bid in upcoming power auctions with gas-fired projects. The abovementioned developments create the conditions for making ENAP an important player in the Chilean power generation sector.

No new thermal power plant managed to win a contract in the 2016 energy auction, as wind and solar power projects outbid all competitors and won power purchase agreements (PPAs) at record low prices. While these developments highlight headwinds for ENAP's planned operations in the thermal power sector, we believe that the company will have a chance to win PPAs in future auctions, when pushing down contract prices will not be the main goal of the tender, and reliability will also play a role.

In August 2016, ENAP announced that it is evaluating constructing a 9MW wind power plant in the Magallanes region. The company estimates that the project would cost USD18mn. Part of the power generated by the plant would reportedly be used to supply ENAP's operations in the region, while the rest would be sold to local utility **Edelmag**. The project was approved by the regional council in April 2017 and has reportedly been expanded to 10MW at a cost of USD24mn.

Engie

The French power and gas group (previously known as GDF Suez) has been active in Chile via its subsidiaries since 1996. In the generation sector, Engie operates via **E-CL**, which is currently developing the Mejillones 375MW coal-fired power plant, expected to be completed in mid-2018. In January 2016, the European Commission authorised E-CL to sell 50% of **Transmisora Eléctrica del Norte** - the company involved in the construction of the transmission line that will connect the SIC and SING power grids - to Spain's **Red Eléctrica Internacional**.

Moreover, via its subsidiary **Tractebel**, Engie owns stakes in several Chilean power companies. **Edelnor** is the second-largest power generator in the SING system, operating nine units with a total installed capacity of 681MW. It is the owner and operator of 861km of high-voltage transmission lines. **Electroandina** is the largest power generator in the SING system that covers northern Chile. Its generating park of 10 units, located in Tocopilla, totals an installed capacity of 939MW, and it is also the owner and operator of 921km of high-voltage transmission lines. Tractebel is a participant in Colbún.

AES Gener

AES Gener is among the largest power generators of electricity in Chile. The company has put into operation the 125MW Los Vientos diesel-fired plant. This took AES' total generating capacity in Chile to 2.56GW, which is about 20% of the country's total generating capacity. It serves the SIC through four hydropower plants, three thermal carbon plants and a gas turbine. It also serves the SIC through a combined natural gas cycle unit belonging to its subsidiary **Electrica Santiago**, two coal-based thermal units belonging to its related company **Empresa Electrica Guacolda** and two co-generation plants of its subsidiary **Energia Verde**. It also supplies energy for the SING, through its two subsidiaries, **Norgener** and **TermoAndes**. The former has two coal-fired units in the city of Tocopilla and the latter has a gas generating plant in Salta, Argentina, connected to the SING through a transmission line owned by subsidiary InterAndes.

AES Gener's main project currently under development in Chile is the 531MW Alto Maipo hydropower complex, which is running significantly above budget, with latest reports suggesting costs are 20% higher than the original USD2bn budget. As of July 2017, AES Gener had reportedly invested USD536mn in the project, noting that construction was 50% complete. The group announced the restructuring of finance for the project in May 2018 with Austria's **Straba** coming on board. The project has faced environmental criticism relating to the water flow of the Maipo river and the impact on local communities. Accordingly, AES Gener's representatives said in February 2017 that in future, the company will focus on the development of smaller-scale projects in Chile.

Colbún

Colbún is the second-largest SIC power generator, with capacity comprising 17 hydropower plants and seven thermal plants, with a total installed capacity of 2.96GW. It is owner and operator of 429km of high-voltage transmission lines. In March 2018 Colbún announced it was acquiring solar assets from **First Solar** including the 150MW Sol de Tarapacá PV project.

Pacific Hydro

Pacific Hydro is a key player in the Latin American renewable energy market, particularly in Chile. It has a hydropower plant in Chile with a capacity of 76.3MW and a further seven projects under development, which will have a total capacity of 824MW. In July 2017, the company started installing the first turbines at the 82MW Punta Sierra Wind Farm.

Others

In its strategic plan for 2016-2020, presented on May 11 2016, Spain's **Gas Natural Fenosa** earmarked an investment of EUR5.1bn in gas networks and EUR2.1bn in electricity networks, and indicated Chile as a major destination for this funding. In December 2015, the company announced that it would invest EUR635mn in Chile over the next five years, through its subsidiaries **Metrogas** and **GasSur**. The company's growing focus on the country is in line with our expectation that natural gas will play an increasingly important role in Chile, for domestic consumption and for export to Argentina. Gas Natural was also awarded a power supply contract at the August 2016 power auction, which the company will fulfil by developing a 120MW solar power plant and a 204MW wind power plant.

In April 2016, it was reported that Spain's Red Eléctrica is interested in acquiring assets owned in Chile by Spanish EPC firm Abengoa, which is currently financially distressed and undergoing restructuring. **Abengoa** holds 3,000km of power transmission lines in Chile and recently won four transmission contracts with a total value of USD180mn. Beyond this possible acquisition, Red Eléctrica has made Chile a clear target of its international expansion. In December 2015, the firm spent USD218mn in the acquisition of 50% of

Transmisora Eléctrica del Norte, the Chilean company that will build and operate the electricity transmission line linking the country's northern and central power grids.

Company Profile

Enel Chile

SWOT Analysis

Strengths

- It has diversified supply to the regulated, spot and unregulated markets.
- Enel Chile is the biggest Chilean power generation company (for capacity installed) and power distribution company.
- Its corporate structure is nimbler after the shift of its international activities to Enel Americas.
- The company has a stock exchange listing.

Weaknesses

- Substantial investment is required.
- Exposure to hydrocarbon import price volatility is affecting thermal power costs.
- Opposition by environmental groups halted the progress of major hydropower projects in the past.
- Significant hydropower capacity creates negative exposure to rainfall fluctuations.

Opportunities

- There is potential for organic capacity growth in Chile and abroad.
- The growth outlook for Chilean power consumption is positive.
- The company could focus on small-scale hydro, natural gas-fired plants and renewables for its future power generation assets.
- Enel's financial and operational backing offers significant opportunities.

Threats

- There is strong competition in the domestic power market.
- Coal-fired power plants will be hit by Chile's carbon tax from 2017-2018.
- There is growing competition with wind and solar power plants for PPAs at power auctions for the regulated market.
- Corporate restructuring and rebranding will be costly and will have a potentially negative impact on brand recognition in Chile.

Company Overview

Enel Chile (previously known as Enersis) is an integrated power company with a significant share of Chile's generation and distribution markets.

The company is controlled by Italian energy group Enel which holds a 60.6% share. Enel announced the restructuring plan of Enersis in relation to Chilean subsidiaries Chilectra and Endesa Chile and their international operations in 2015. Enel transferred Enersis' international operations to Enel Americas through an extensive corporate restructuring plan, concluded in Q416. In November 2016, Enersis Chile announced that it had formally changed its name to Enel Chile. This was followed by a further restructuring programme in early 2018 when Enel Chile increased its holding in Enel Generación Chile and merged with Enel Green Power Latin America.

Enel Chile has 6,351MW of installed power generating capacity, making up around 29% of Chile's total installed capacity. Enel Chile's capacity is comprised of hydropower (54%), thermal power (44%) and wind power (2%). Enel Chile supplies electricity to the major regulated distributors, the large non-regulated industrial companies (primarily in the mining, cellulose and steel sectors) and to the spot market.

In the Chilean distribution segment, Enel Chile operates through its unit Enel Distribucion (previously a subsidiary known as Chilectra, 99% stake) and accounts for 44% of the market. The company supplies about 7.8TWh to 1.9mn clients in Chile.

Strategy

Enel Chile's strategy was set out in May 2016, when its chief financial officer announced the company's plans to invest an average of USD400mn per year in the Chilean power market over the next four years - with a main focus on the power generation segment. In 2015, the company identified a potential organic growth of up to 3GW of capacity in Chile.

Enel Chile Generacion indicates that the challenge for its future development is to diversify its mix and increase efficiency. We believe this strategy fits the growing competition that the company faces from independent power producers who generate from renewables, which contributed to lower electricity prices in 2016. With Chile's power procurement system based on auctions, efficiency and cost-competition will be key factors for power generators.

Enel Chile's share price underperformed the national stock market in 2016 because of the low electricity prices at which PPAs were awarded at the country's energy auction in 2016. Enel Chile obtained almost 50% of the contracts for continued power supply, but the high penetration of renewables brought down power prices at a historic low. However, the company's performance improved in 2017 as a wetter climate supported hydropower generation and led to higher earnings for the year.

Financial Data

Enel Chile's financial results for 2017 include:

- Revenues of USD3,897mn
- EBITDA of USD1,139mn
- Total assets of USD9,264mn
- Net debt of USD590mn

Regional Overview

Latin America Power & Renewables Key Themes In 2018 - Mid-Year Update

Key View: The key themes for Latin America's power and renewables industries that we identified at the start of 2018 have largely been playing out, with investor interest - particularly in the renewables sector - remaining resilient in many key markets despite political uncertainty. Here we include a number of developments illustrating these themes and assess their outlook over the remainder of 2018.

LATIN AMERICA'S 2018 POWER & RENEWABLES KEY THEMES			
Theme	Description	Playing Out?	Metrics
Industry Attractiveness Will Trump Political Uncertainty	Most large Latin American countries will attract power & renewables sector investment despite a volatile political environment in 2018	Yes	Company announcements, industry growth, investment statistics
Renewables Capacity Growth Will Outperform	Non-hydropower renewables will see the biggest growth of any power-generating technology in Latin America in 2018	Yes	Fitch Solutions' Industry Forecast
Demand For T&D And Smart-Grid Assets Will Be Strong	Developers and operators of power transmission and distribution infrastructure will find business opportunities in Latin America in 2018.	Yes	Project tenders, company announcements

Source: Fitch Solutions

Industry Attractiveness Will Trump Political Uncertainty

Key View: Supportive industry regulations and appealing long-term fundamentals will make Latin America an attractive market for power sector investment in 2018 despite a busy electoral cycle, which will create political uncertainty.

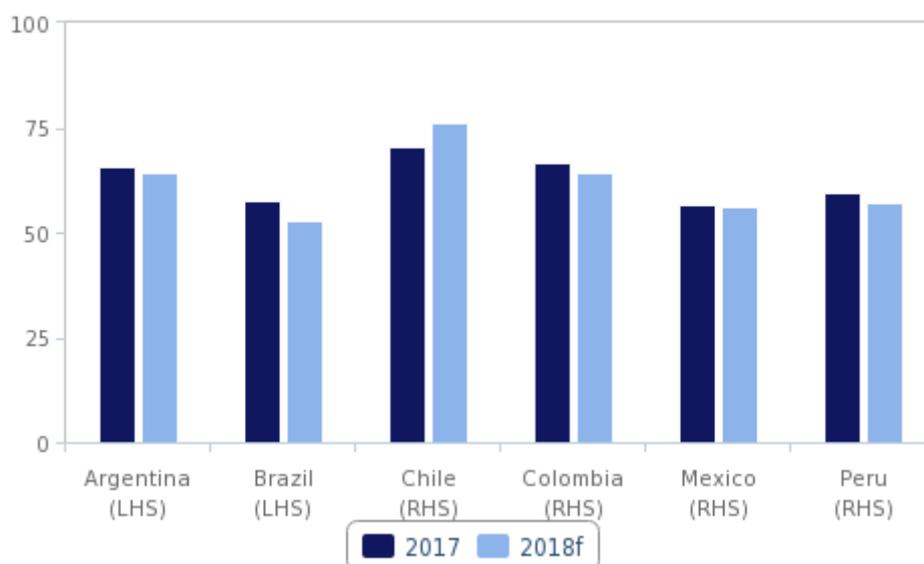
H1 2018 Developments:

- Brazil will hold a general election in October and business-friendly candidates are trailing in the polls, while right-wing populist Jair Bolsonaro has become the front-runner. Nevertheless, the Brazilian power sector has continued to attract investors' interest. In April, Brazilian authorities finalised an energy auction for new power projects expected to come online in 2022. Companies' participation in the tender was strong, with the government awarding power purchase agreements (PPAs) to projects with a cumulative capacity of 1,024.5 megawatts (MW). Another auction is scheduled to take place on August 31, and the total power capacity of the 1,090 projects that registered to compete in the tender stood at 59,116MW in early June.
- In addition, foreign investors continue to show eagerness to enter Brazil's power distribution sector. In June, Italian power group Enel acquired 73% of the shares of Brazilian distributor **Eletropaulo** for a price of BRL5.55bn, outbidding Spain's **Iberdrola** and Brazil's **Energisa**.
- Colombia held a presidential election in May-June that saw business-friendly candidate Ivan Duque square off against Gustavo Petro, who ran on a platform that would have negatively impacted investment in the country's heavy industries (see 'Duque

Remains Our Strong Favourite In Presidential Run-Off', June 13 and 'Duque Win Will Support Heavy Industry', May 18). Political uncertainty ahead of the election did not discourage power investors from betting on the market. For example, in May, Enel - through its local subsidiary **Enel Green Power Colombia** - started construction of the 86.2MW El Paso solar power plant in the Cesar department in the north of Colombia.

Outlook: With a general election taking place on July 1, Mexico will be a litmus test for our view that Latin America's main power markets will continue to attract investment even in a context of higher political risk. Our Country Risk team expects the presidential election to be a landslide victory for leftist populist candidate Andrés Manuel López Obrador (AMLO). However, we don't expect AMLO to cancel electricity auctions nor to roll-back core electricity market reforms, meaning that the Mexican power sector will continue to offer business opportunities, particularly in renewable energy (see '*AMLO Will Not Reverse Core Power Sector Reforms*', June 14). As for Brazil, the developments listed above indicate that investor interest in the market remains strong. However, we note that the end of the country's interest rate cutting cycle and currency weakness due to election uncertainty might hurt growth in the Brazilian power sector (see '*External Shock Ends Rate Cutting Cycle*', May 22 and '*Election Risk Points To Further BRL Weakness*', June 12).

Risk Profiles Deteriorating In Most Countries
 Select Latin American Countries - Short-Term Political Risk Index, Out Of 100



f = Fitch Solutions forecast. Source: Fitch Solutions

Renewables Capacity Growth Will Outperform

Key View: Non-hydropower renewables will see the biggest growth of any power-generating technology in Latin America in 2018, due to lower costs and speed of development compared to hydropower and thermal plants. This will be further supported by the governments' commitment to attracting investment in the industry via auctions and other supportive policies.

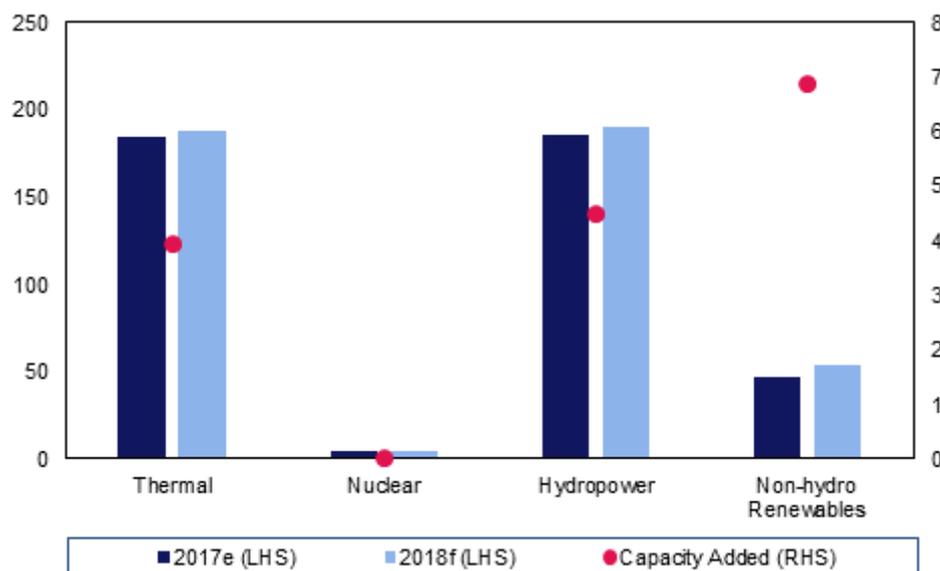
H1 2018 Developments:

- Over the first half of 2018, power supply auctions have attracted investment pledges and supported future growth in non-hydropower renewables in key Latin American markets. In addition to Brazil's successful A-4 auction in April, we have also seen progress in Argentina. In June, the country's wholesale electricity market administrator, CAMMESA, signed six PPAs with the winners of round two of the RenovAr renewable energy auction. The contracts reportedly correspond to 178.8MW of capacity and comprise two wind, two biogas and two biomass projects.

- While Brazil, Mexico and Argentina will account for the biggest share of renewables capacity added in Latin America in 2018, Chile has also progressed in the development of its renewables project pipeline. For example, it was reported in June that **Mainstream Renewable Power** has installed the first turbine at the 170MW Sarco wind farm in Chile’s Freirina commune. As of June, the country's national energy commission expected approximately 604MW of wind power and 201MW of solar power capacity to come online in 2018.

Outlook: We currently forecast that 6.7GW of renewable capacity will be installed across Latin America in 2018, compared to 4.5GW for hydropower and 3.9GW of thermal power capacity. Brazil, Mexico and Argentina will drive renewables' outperformance, each adding around 2.6GW, 1.5GW and 1.0GW, respectively. The completion of the projects contracted at past power auctions will drive growth, although delays in the development of projects in Mexico led us to revise down our regional forecast compared to the beginning of 2018. However, we are accounting for some project development delays in markets where the industry has only recently started to develop, such as Argentina.

Renewables Will See Biggest Expansion In 2018
Latin America - Installed Power Capacity By Technology, GW



e/f = Fitch Solutions estimate/forecast. Source: EIA, National Sources, Fitch Solutions

Demand For T&D And Smart-Grid Assets Will Be Strong

Key View: Developers and operators of power transmission infrastructure will find considerable business opportunities in Latin America in 2018, particularly in the form of project tenders. At the same time, Latin American utilities will aim to improve their power distribution networks and invest in smart grids.

H1 2018 Developments:

- In February, Mexico's electric utility **Comisión Federal de Electricidad** launched the tender terms for a high-voltage direct current transmission line project. The line, called "303 LT en Corriente Directa Ixtepec Potencia-Yautepec Potencia", will transport power generated from the wind and cogeneration plants in the Isthmus of Tehuantepec towards central Mexico. The project will be a public-private partnership scheme and will reportedly require an investment of about USD1.7bn, with the winning bidder also operating the project for 25 years.
- In May, the board of Brazilian regulator Agência Nacional de Energia Elétrica (ANEEL) has approved a call for tenders for about 2,600km of transmission lines, also covering substations with a transformation capacity of 12,200MVA. The auction will be held

on June 28 in Sao Paulo. The lines will be divided into 20 lots, with successful bidders building, operating and maintaining the lines. ANEEL expects that the auction will generate a total investment of BRL6bn.

- In June, following a successful bid to acquire Brazilian distributor **Eletropaulo**, Enel stated that it plans to invest USD900mn in the company over the 2019-2021 period, and that part of the resources will go into digitalising the power network.

Outlook: Investment in power transmission and distribution infrastructure will be necessary in Latin America over the remainder of 2018 and the following years, which will create business opportunities for local and international players in the sector. New transmission lines will have to be developed to connect the large amount of power capacity that will be installed across the region - especially given the fact that much of it will consist of intermittent renewables. This will push governments to continue to hold tenders for power transmission projects. Moreover, Latin American utilities will invest in gradually modernising their distribution network to reduce power losses and improve efficiency, thus creating opportunities for suppliers of smart-grid equipment.

Power Glossary

	Definition		Definition
bn	billion	IPO	initial public offering
capex	capital expenditure	IPP	independent power producer
CEE	Central and Eastern Europe	km	kilometres
CHP	combined heat and power plants	kW	kilowatt (10 ³ watts)
DoE	US Department of Energy	kWh	kilowatt hour
e/f	estimate/forecast	LNG	liquefied natural gas
EBRD	European Bank for Reconstruction and Development	MEA	Middle East and Africa
EIA	US Energy Information Administration	mn	million
EM	emerging markets	MoU	memorandum of understanding
EU ETS	European Union Emissions Trading System	MW	megawatt (electric) (10 ⁶ watts)
EU	European Union	MWh	megawatt hour
EWEA	European Wind Energy Association		not available/applicable
FDI	foreign direct investment	NGL	natural gas liquids
FIT	feed-in tariff	OECD	Organisation for Economic Co-operation and Development
FTA	free trade agreement	OPEC	Organization of the Petroleum Exporting Countries
GDP	gross domestic product	PV	solar photovoltaics
GHG	greenhouse gas	RES	renewable energy sources
GW	gigawatt (10 ⁹ watts)	R&D	research and development
GWh	Gigawatt hour (1 GWh = 3.6 TJ)	t	metric ton = tonne (1 t = 1,000 kg)
GWEC	Global Wind Energy Council	TPES	total primary energy supply
IAEA	International Atomic Energy Agency	trn	trillion
IEA	International Energy Agency	TW	terawatt (10 ¹² watts)
IMF	International Monetary Fund	TWh	terawatt hour (1 TWh = 3.6 PJ)

Power Methodology

Industry Forecast Methodology

Fitch Solutions' industry forecasts are generated using the best-practice techniques of time-series modelling and causal/econometric modelling. The precise form of model we use varies from industry to industry, in each case determined, as per standard practice, by the prevailing features of the industry data being examined.

Common to our analysis of every industry is the use of vector autoregressions. They allow us to forecast a variable using more than the variable's own history as explanatory information. For example, when forecasting oil prices, we can include information about oil consumption, supply and capacity.

When forecasting for some of our industry sub-component variables, however, using a variable's own history is often the most desirable method of analysis. Such single-variable analysis is called univariate modelling. We use the most common and versatile form of univariate models: the autoregressive moving average model (ARMA).

In some cases, ARMA techniques are inappropriate because there is insufficient historic data or data quality is poor. In such cases, we use either traditional decomposition methods or smoothing methods as a basis for analysis and forecasting.

We mainly use OLS estimators and in order to avoid relying on subjective views and encourage the use of objective views, we use a 'general-to-specific' method. We mainly use a linear model, but simple non-linear models, such as the log-linear model, are used when necessary. During periods of 'industry shock', for example poor weather conditions impeding agricultural output, dummy variables are used to determine the level of impact.

Effective forecasting depends on appropriately selected regression models. **Fitch Solutions** selects the best model according to various different criteria and tests, including but not exclusive to:

- R2 tests explanatory power; adjusted R2 takes degree of freedom into account;
- Testing the directional movement and magnitude of coefficients;
- Hypothesis testing to ensure coefficients are significant (normally t-test and/or P-value);
- All results are assessed to alleviate issues related to auto-correlation and multi-collinearity.

Fitch Solutions' uses the selected best model to perform forecasting.

Human intervention plays a necessary and desirable role in all of our industry forecasting. Experience, expertise and knowledge of industry data and trends ensure analysts spot structural breaks, anomalous data, turning points and seasonal features where a purely mechanical forecasting process would not.

Sector-Specific Methodology

- **Generation And Consumption Data**

A number of principal criteria drive our forecasts for each generation and consumption variable, with the following identity forming the basis of our forecast model:

"Total consumption = total generation + total net imports - transmission and distribution losses"

- **Total Generation**

Total generation is defined as the process of producing electric energy or the amount of electric energy produced by transforming other forms of energy, commonly expressed in kilowatthours (kWh) or related units.

While gross electricity production is measured at the terminals of all alternator sets in a station, and thus includes the energy taken by station auxiliaries and losses in transformers that are considered integral parts of the station, net electricity production is defined as gross production less own use of power plants.

According to the International Energy Agency (IEA), the difference between gross and net production is generally observed to be

about 7% for conventional thermal stations, 1% for hydro stations and 6% for nuclear.

Historical figures for electricity generation are based on data published by the US Energy Information Administration (EIA) and the World Bank, and consider net electricity production. Whenever possible, we compare these data with accounts published by government/ministry sources and official data of the companies operating in each country.

Fitch Solutions' electricity generation forecasts examine the sector with a bottom-up approach, forecasting electricity production for each resource in order to calculate the value of total generation. The regression model used to calculate generation considers real GDP, industrial production, fixed capital formation, population and fiscal expenditure.

- **Total Consumption**

Total consumption is commonly expressed in kilowatt hours (kWh) or related units.

Historical figures for electricity consumption are based on data published by the EIA. Whenever possible, we compare these data with accounts published by government/ministry sources and official data of the companies operating in each country. Our electricity consumption forecasts are based on a regression similar to the model illustrated above for electricity generation.

- **Total Net Imports**

Historical figures for net imports are computed as total imports, minus total exports, based on data from the EIA. Our total net imports forecasts are calculated as total consumptions, minus total generation, plus transmission and distribution losses.

- **Transmission And Distribution Losses**

Transmission and distribution losses include electric energy lost due to the transmission and distribution of electricity. Much of the loss is thermal in nature.

Our historical figures for electricity transmission and distribution losses are computed as generation, plus net imports, minus consumptions. However, transmission and distribution losses are calculated using a regression model in the forecasts.

- **Electricity Generating Capacity Data**

Electricity generation capacity is defined as the maximum output, commonly expressed in megawatts (MW) or related units, that generating equipment can supply to system load, adjusted for ambient conditions.

Historical figures for electricity generation capacity are based on data published in UN statistical databases, as well as data from the EIA and IRENA. Whenever possible, we compare these data with accounts published by government/ministry sources and official data of the companies in each country.

Our electricity generation capacity forecasts examine the sector with a bottom-up approach, forecasting capacity for each resource to calculate the total value of capacity in each country. Our electricity generation capacity forecasts are based on a regression similar to the model illustrated above for electricity generation.

Sources

Fitch Solutions uses publicly available information to compile the country reports and collate historical data. Sources used in power industry reports include those from international bodies mentioned above, such as the EIA, the World Bank and the UN as

well as local energy ministries, officially released company figures, national and international bodies and associations and news agencies.



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