

# ENERGY REPORT

What is the energy situation in Chile?

What investment opportunities does the country offer?

And what do we really need to know about the renewable energy sector  
within our borders?

**We answer you here!**



# INTRODUCTION



Chile, popular for having played a global leadership role in the field of clean energy, has seen significant developments in its energy production over the past decade. Indeed, in order to respond to the fight against climate change, the country's energy policy has evolved dynamically in recent years through major institutional and political reforms. Chile's long-term energy policy includes its commitment to achieve carbon neutrality by 2050 by establishing a path of decarbonisation that covers all sectors of the national economy and is supported by a just transition strategy.

Today, and in recent years, Chile has become a world-class destination for developers of solar and wind energy, thanks to its excellent territorial opportunities and renewable energy resources. Its legislation also encourages investment in generation capacity across the electricity sector. The increased role of the State in energy planning has helped to stimulate the development of projects, especially in electricity transmission.

We will try through this document to summarize the Chilean energy context by presenting the key points of the country, such as national energy consumption, the challenges launched by the Chileans in terms of renewable energy production, recent developments in clean energy installations, as well as factors favoring the country to make a major shift towards this energy transition. Based on official and academic sources, this report hopes to shed light on current national needs and investment opportunities but also inspire them through the presentation of Belgian companies that have already taken the plunge and are now helping Chile achieve its carbon neutrality targets.

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# ACRONYMS

<b>CO2</b>	Carbon dioxide
<b>CSP</b>	Concentration of Solar Power
<b>ECLAC</b>	Economic Commission for Latin America and the Caribbean
<b>GHG</b>	Greenhouse gases
<b>IDB</b>	Inter-american Development Bank
<b>ILO</b>	International Labour Organization
<b>IEA</b>	International Energy Agency
<b>IRENA</b>	International Renewable Energy Agency
<b>LNG</b>	Liquefied Natural Gas
<b>MW</b>	Megawatts
<b>MoU</b>	Memorandum of Understanding
<b>OECD</b>	Organisation for Economic Cooperation and Development
<b>NEC</b>	National Energy Commission
<b>PV</b>	Photovoltaic
<b>RE</b>	Renewable Energy
<b>WEC</b>	Women Energy Council

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## 2. ENERGY SITUATION IN CHILE

Through this section, the energy context will be provided through the history of consumption and its peculiarities. Next, renewable energy will be addressed as well as the long-term energy policy established by the government in 2015. Recent advances in the green energy sector will be presented as well as the factors that have favoured this energy transition.

### A) ENERGY CONSUMPTION

Due to the growth of national economic activity since the 1980s, Chile has experienced a drastic increase in carbon dioxide (CO<sub>2</sub>) emissions in the energy sector. The nation was able to meet the needs of the economy through the opening of coal-fired and natural gas-fired power plants providing sufficient energy. Moreover, unlike Belgium or Luxembourg, Chile does not have nuclear energy, due among other things to the exposure of the territory to the risk of earthquakes, an energy that could have constituted a cheap access to energy as is the case in Europe. Nevertheless, this forced the country to turn to other sources of energy and finally in 2015 following, in part, strong pressures from civil society and research centres, energy policy has begun a major shift towards cleaner energy by setting the goal of carbon neutrality by 2050.

The country, known for its rich mineral resources, has rare and abundant metals essential for the development of renewable energies (RE) providing considerable opportunities for their development. But this asset will also remain a challenge for the country, because between 2011 and 2020, mining is one of the country's largest energy consumers with the industrial sector (figure 1).



The transport sector accounts for 33% of final energy consumption in 2020 and the commercial, public and residential sector for 23%. (Bersalli, 2019; CNE, 2021)

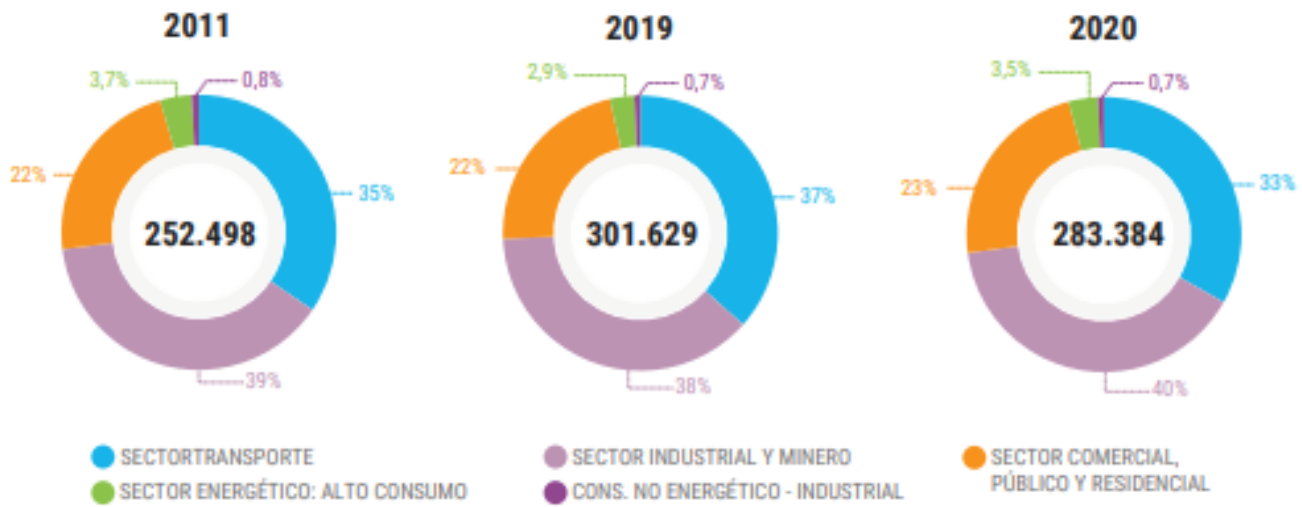


FIGURE 1 : COMPOSITION OF FINAL ENERGY CONSUMPTION BY SECTOR IN TCAL, CHILE 2011-2020 (CNE, 2021)

Despite the energy policy of 2015, until 2020 renewable energies were not yet a major part of the energy production flow with a pervasive predominance of fossil fuels (figure 2). It is when we look deeper into the generation of electricity that we notice a significant amount of hydro generation, followed by solar, wind, and very little biofuels.

In 2018, conventional and unconventional RE generated 45% of the electricity consumed in Chile and 18% excluding large hydropower plants over 20 megawatts (MW) (figure 3) (ACERA, 2019; Bersalli, 2019; IEA, 2022; Proaño, 2018).

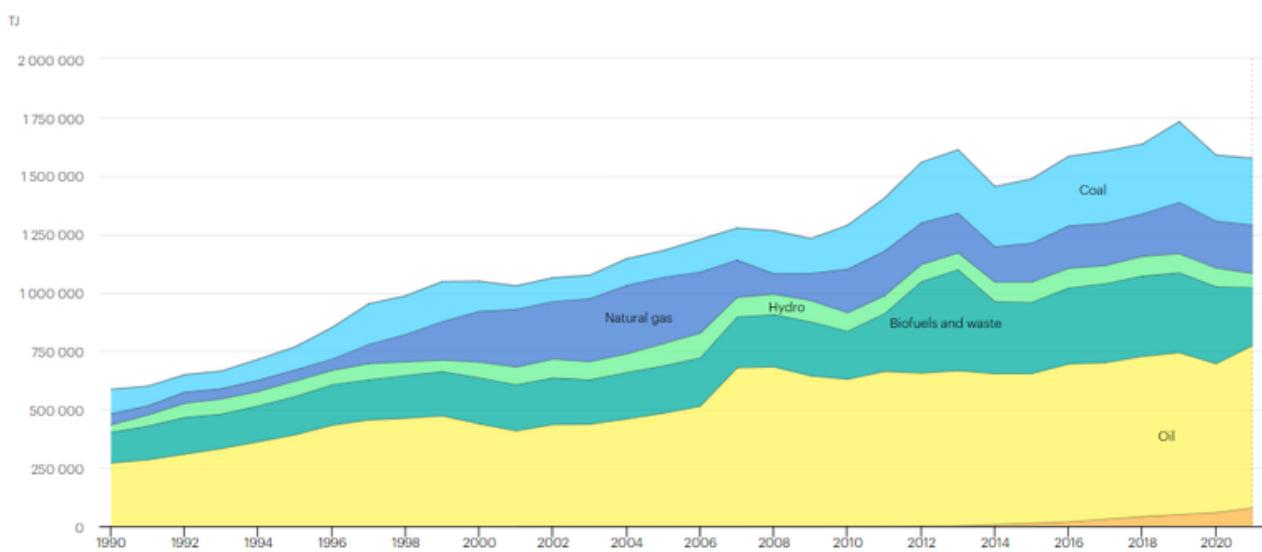


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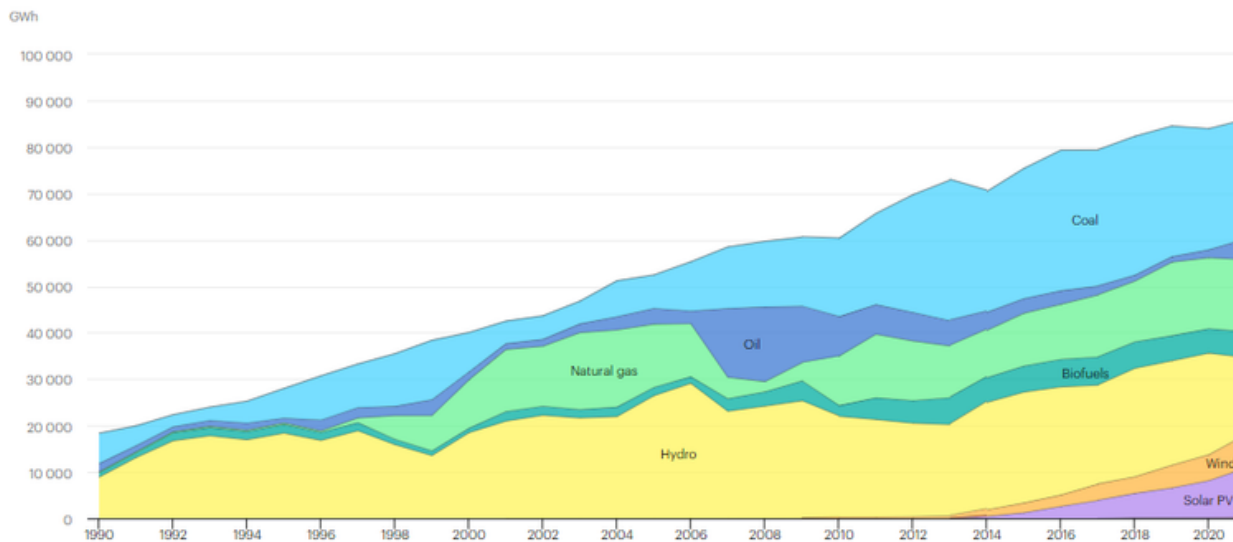


FIGURE 3: ELECTRICITY GENERATION BY SOURCE, CHILE 1990-2021 (IEA, 2022)

Chile's per capita primary energy consumption is well above the average of the Latin American countries, the OECD countries (Organisation for Economic Cooperation and Development) and the countries of the world in general (figure 4). On the other hand, the country stands out positively from the rest of the world with its index of evolution of consumption of renewable energy source which knows since 2015 a good growth that happens to be higher than the global average (figure 5).

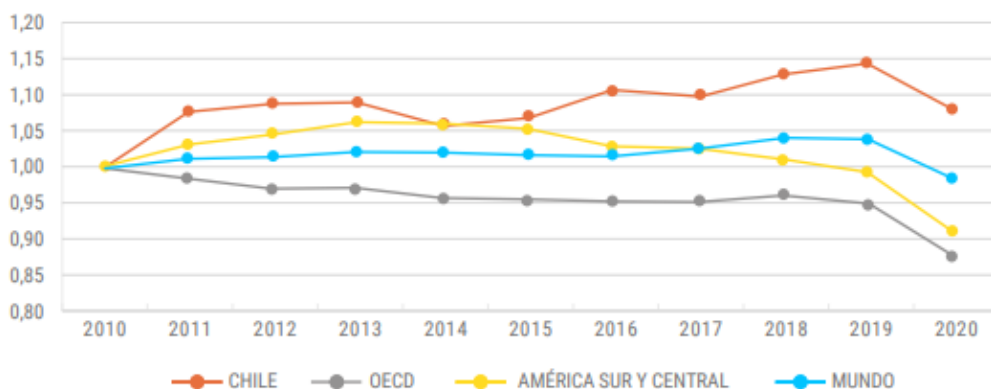


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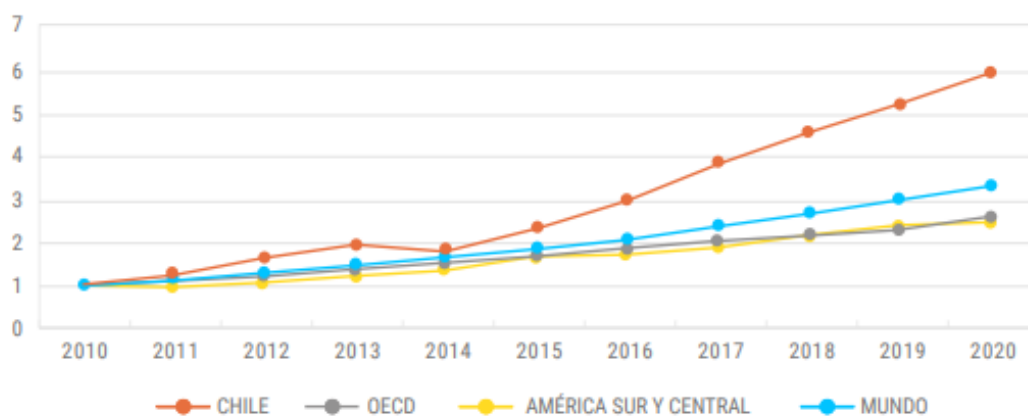


FIGURE 5: EVOLUTION OF THE CONSUMPTION INDEX FOR RENEWABLE SOURCES [BASE 100 = 2010] (CNE, 2021)

## B) THE PRESENCE OF RENEWABLE ENERGIES

### 1. ENERGY POLICY

Despite its links with fossil fuels and copper extraction, Chile has accelerated its energy transition in recent years through broad political support, public-private partnerships and innovative green technologies. In 2015, the Chilean government published the country's first energy transition strategy. The government has committed to becoming carbon neutral by 2050 and has set an ambitious goal of converting 70% of its total energy consumption into renewable energy by 2030, including accelerating the development of wind energy projects, solar and geothermal across the country. The country's energy transition has been largely supported by parties from all political backgrounds and supported by the public with 91% of Chileans who believe that climate change should be treated as a government priority. (World Economic Forum, 2023)

Chilean energy policy proposes a vision of the energy sector by 2050 that corresponds to a reliable, sustainable, inclusive and competitive sector, in order to move towards sustainable energy in all its dimensions. (Ministerio de Energía, 2015).

To achieve this vision by 2050, energy policy is based on four pillars that support the long-term vision and enable the definition of goals and action plans for the State, the private sector and citizens :

1. **Security and quality of supply ;**
2. **Energy as a driving force of development ;**
3. **Energy compatible with the environment ;**
4. **Energy efficiency and education.**



In addition, this policy includes the closure of two-thirds of coal-fired plants by 2025 and also, for the first time, focuses on green hydrogen and electric mobility (IEA, 2022).



## 2. RENEWABLE ENERGY DEVELOPMENT AND GROWTH

For the first time in 2022, it was established by the National Energy Commission (NEC), that RE production surpassed coal, with coal accounting for 27% of national electricity production and 29% from solar and wind energy. In 2022, the country's electricity production was 62 429,8 GWh and 20 014 GWh came from renewable sources. Following this news, the Secretary of State stressed the importance of continuity of state policies, which contribute in the long term to decarbonise the energy matrix. In addition, the Minister of Energy, Diego Pardow, stressed that this is a key step : *« because it shows precisely the success that these policies aimed at promoting investments in renewable energy have had. It's a multi-year type of investment, so the decisions made five or ten years ago are now paying off.»*

Indeed, monthly data on the injection of different technologies between October 2012 and October 2021 showing the generation of electricity from renewable sources show a peak of growth in recent years. Solar energy has continued to grow impressively since 2016, with peak production starting in 2021. In addition, wind has also made its way as a major national energy generation since 2021. As for hydraulics, despite its historic presence, this energy source seems to be stagnating and biomass has been less and less successful in recent years despite its advantage of not experiencing intermittent production (figure 6). (Gobierno de Chile, 2022)

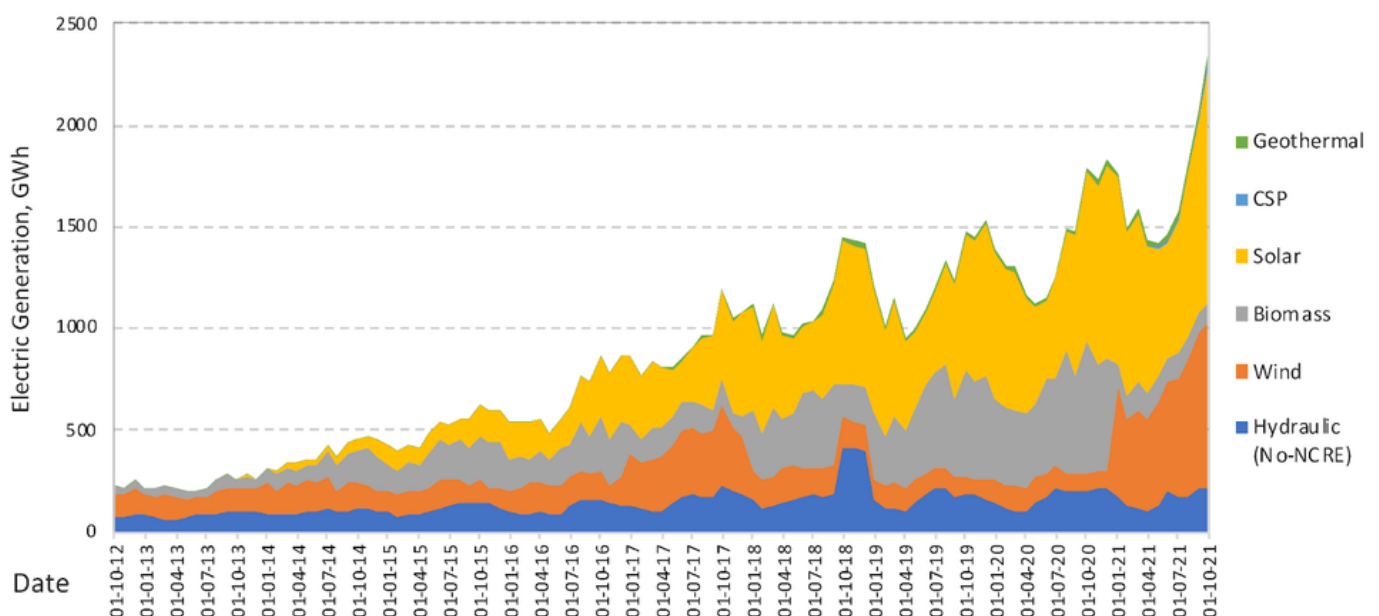


FIGURE 6 : RENEWABLE ELECTRIC GENERATION IN GWH, CHILE 2012-2021  
(MORAÑA-CONTRERAS ET AL., 2022)

When investments in RE began in 2011, it was hydro that produced half of the electricity with 53% of the total flow of renewable with biomass and wind that followed almost a quarter each of production. Despite its great success in the early 2000s, hydraulics no longer experienced major growth after 2010. Over the years, other energies have developed on the national territory with photovoltaic solar energy, which created a big place by producing in 2021 49% of the total national electricity, followed by wind with 33%. In 2020, we note the presence of geothermal despite its very small part. In 2021 the Concentration of Solar Power (CSP) appeared in the country.

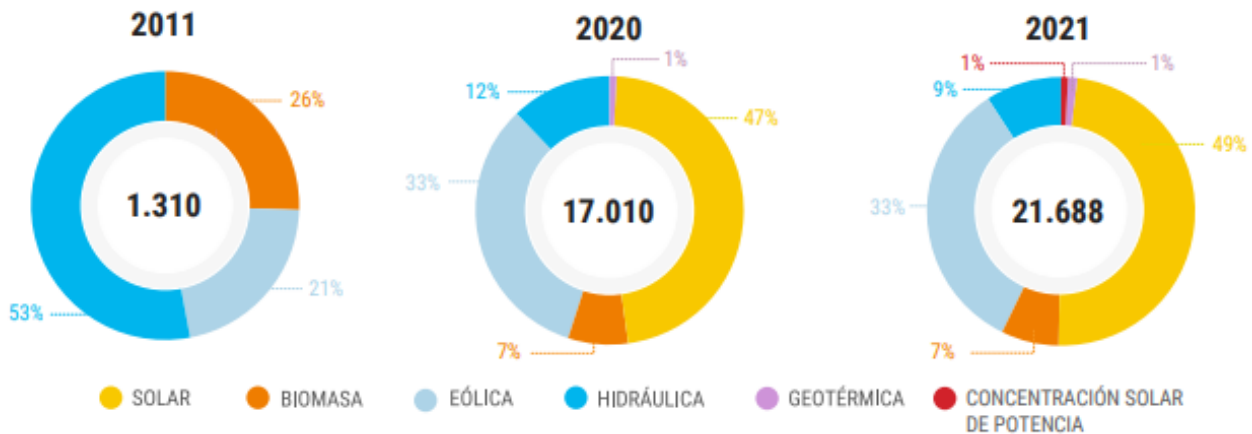


FIGURE 7: EVOLUTION OF ELECTRICITY GENERATION COMPOSITION BY TECHNOLOGY IN GWH (CNE, 2021)

### 3. GREEN ENERGY PROJECT DEVELOPMENT SECRETS

Prior to 2014, the Chilean energy context was complex: it was strongly affected by the disruption of gas supply from Argentina, as well as by severe and long periods of drought. In addition, there was public opposition to large plant projects, as well as little change in production and scarce infrastructure investment in both electricity generation and transmission. (Proaño, 2018) However, in recent years, Chile is taking an important turn with the development of many RE projects where recently, photovoltaic (PV), Concentration of Solar Power (CSP) and wind energy has grown significantly beyond other sources of RE such as hydro, biomass and geothermal. (Moraga-Contreras et al., 2022)

The fall in plant prices, the typology of the Chilean territory and public policy have been major factors in promoting the growth of the Chilean renewable energy market.

- **FALLING PRICES**

Indeed, between 2010 and 2017, the installation costs of RE projects fell considerably: large-scale photovoltaic solar projects saw a 68% drop in costs; the total costs of newly commissioned CSP projects fell by 27%; installation costs for newly commissioned



onshore wind projects decreased by 20%; finally, for offshore wind, total installed costs decreased by 2%. (International Renewable Energy Agency [IRENA], 2018; Proaño, 2018)

- **THE TERRITORIAL POTENTIAL**

Between the desert sun, the powerful winds of the Pampa, the four thousand kilometres of coastline and the presence of hundreds of volcanoes, Chile has enormous potential for developing clean energy. A potential that has already proven its worth with the exploitation of wind, solar, hydraulic and geothermal sources exceeding national targets meeting its 2025 target of 20% unconventional RE in advance (excluding hydroelectricity of more than 20 MW) in its electric package. In addition, Chile expects RE to account for 45% of all new capacity installed between 2014 and 2025. (Proaño, 2018; World Energy Council, 2022)

- **EFFECTIVE PUBLIC POLICY AND AUCTIONS**

In addition to its long-term public energy policy established in 2015, which includes a new role for the public sector and an extensive legislative agenda, Chile stands out among its neighbours in 2017 as the first country in South America to introduce a carbon tax on the energy production sector. Its policy is also remarkable, as RE projects have developed strongly through the implementation of quotas, auctions and net invoicing and not with public subsidies. In fact, the Chilean auction system has been described as wonderful creativity. Some technologies, such as solar, hydro and wind, have been promoted by allowing them to maximise their potential without having to integrate an expensive storage component. (Bersalli, 2019; Proaño, 2018)

According to the Corporación de Bienes de Capital, Chile has more than \$11 billion in RE investment for the period 2017-2021. Their development is advantageous for the country as it has led in recent years to a significant decrease in the price of electricity for Chileans. Moreover, the rapid deployment of green energy certainly has several positive effects, including the fight against climate change and the increase of energy security. (Proaño, 2018)

# 3. THE COUNTRY'S OPPORTUNITIES

Although the growing importance of RE in the country's electricity balance sheet is real, this should not mask the fact that Chile still relies heavily on carbon energy and that opportunities for developing clean energy remain numerous. In fact, in 2015, Chile's per capita energy consumption growth rate was already well above the OECD countries, as well as Latin America and the Caribbean. The reasons are linked to the importance of the transport sector, the widespread use of high-consumption electrical appliances among its population, as well as the growth in the energy-intensive needs of its mining industry, which is by far the most important sector in terms of electricity consumption, representing more than 37% of the total in 2015. (Bersalli, 2019; IEA, 2018; World Bank, 2015)

Chile is not yet the Eldorado of renewable energy, although it is ahead of the OECD average (Bersalli, 2019). In fact, in 2018, Chile ranked first among the most attractive countries for RE investment, thanks to solid government policies, a strong track record of investing in clean energy and a commitment to decarbonisation (Bloomberg NEF, 2018).



# A) THE POTENTIAL FOR CLEAN ENERGY DEVELOPMENT WITHIN THE CHILEAN BORDERS

In order to achieve net-zero emissions, drastic reductions in fossil fuel investment are needed. As mentioned above, Chile has a diverse territory that provides remarkable potential for the installation of clean energy projects. Thanks to its extensive peaceful coasts, the installation of wind turbines offshores and tidal power has significant energy potential. In addition, the country



includes 10% of the most active volcanoes in the world, which allow exploiting this energy by doing geothermal. Biomass is also a clean energy that Chile uses. Thanks to its desert areas in the north of the country, especially in the Atacama region, the solar photovoltaic (PV) potential is major in the country with the use also of thermodynamic solar (CSP). (BloombergNEF, 2022; Ministerio de Energía, 2015; Simsek et al., 2019)

## 1. MARINE ENERGY

Experts agree that Chile is one of the countries with the greatest potential for producing marine energy in the world. Its gross wave generation potential is about 164 GW, not counting the tides and natural energy of the Chacao Canal. (Simsek et al., 2019)

Still little known, this type of energy production directly benefits from marine currents by putting turbines similar to a wind farm, but under water and being much smaller, because the water is much denser than air. When the sea level rises and falls, there is an inlet and outlet of water to and from the bays, a large amount of water must cross in a short time. The current that is created is then very strong and that is where that energy drives a turbine and produces electricity. (Universidad de Concepción, 2022)

Tidal power has great potential to become a solution, especially for remote communities where resources are available due to geography and location, and where there is no connection to an established electricity grid. An example of them is the region of Magallanes or Chilean Patagonia, there are fjords and canals with



attractive currents. It would be an initiative to meet electricity needs, for example, in places that rely on diesel, because there are communities that have to buy and transport that fuel to get electricity. But just as they have generators, they could put a wind turbine, a small wind turbine in a garden or a tidal turbine in a nearby river or canal. In Chile, there is already an effort by people to materialise it as tidal energy is seen as an alternative or as a complement to other RE. (Universidad de Concepción, 2022) In addition to providing high energy security, tidal energy has a low environmental impact and low implementation costs. Furthermore, wave energy is also a way of producing energy using the energy contained in the wave movement. In Chile, the Chacao Canal and the Strait of Magellan in southern Chile are among the most promising sites for developing these projects. (Simsek et al., 2019)

## 2. GREEN HYDROGEN

Green hydrogen is an important element already part of the energy transition in Chile. This clean energy source that divides water into hydrogen and oxygen using renewable electricity is an energy carrier that acts as a battery to store excess energy created by renewable energy. It represents one of the future levers to accelerate the transition to carbon neutrality: development of green mobility, decarbonation of massive industrial uses of hydrogen (fertilisers, refinery, chemistry, etc.), better integration of intermittent renewable energy into the energy system or massive storage of surplus electricity produced. This technology can be integrated into the country's mining and raw materials sectors as well as other local carbon-dependent supply chains. In Chile, the green hydrogen market has been accelerated through public-private partnerships.

Thanks to its favourable environment for renewable energy, Chile could be among the most affordable green hydrogen countries in the world. Worldwide, hydrogen production will reach 500 million metric tonnes per year by 2050, five times higher than today. The Chilean government has already pledged \$50 million for six projects to advance the country's green hydrogen industry.

In addition, the Chilean government estimates that 13% of the world's green hydrogen will be produced within its borders thanks to forecasts of wind and solar energy supplies. Some predictions not insignificant and with great impacts, because hydrogen represents a significant global contributor to the achievement of net zero expected by 2050 as it represents about 6% of the reductions. (BloombergNEF, 2022; World Economic Forum, 2023)

In addition, Diego Luna Quevedo, Director of Energy Scenarios 2030, says that the estimated availability of generation capacity is significant relative to current demand. In this way, the country will have a lot of energy that could be exported. Of course, this requires overcoming a series of challenges in the areas of negotiations, agreements and market concepts that make this export viable. (ACERA, 2019)

Green hydrogen, which is a priority for Chile, has benefited from foreign investments that have played a major role in the development of the sector. This promising sector, which is expected to continue to attract around US\$1 billion, expects production capacity to reach 25 GW by 2030. As mentioned above, the country intends to become a major exporter by 2030. (AWEX, 2022; World Energy Council, 2022)

In addition, despite the efforts made and the growing presence of renewable energy projects in Europe, the most energy-intensive countries, such as Germany, Belgium and the Netherlands, do not have much space to implement enough projects than to meet their energy demand. They are already forced to import their energy from other countries and will be even more so in the coming years, whether by suppliers such as Portugal or Chile. Regarding the commercialisation of green hydrogen, Europe can benefit from an existing system: gas pipelines. Indeed, hydrogen can be transported in these tubes, representing a huge advantage for Europe, which already has a wide network and whose Chilean trade will benefit from it in the coming years.





The FLUXYS group, also present in Chile with its production plant GNL Quintero, is aware of the importance of hydrogen for the success of the global energy transition. The group is determined to help the country develop this energy through its production and distribution.

ENGIE positions itself as a major player in renewable hydrogen, by being present throughout the hydrogen value chain, from the production of renewable energies to end uses: strategy, design, engineering, energy efficient asset construction, digital platforms, operations, financing and results engagement. Among its main hydrogen projects worldwide, the company's unique projects in Latin America are in Chile, with the HyEx and Hydra projects. On the other hand, we know that renewable hydrogen can significantly reduce the carbon footprint of the mining industry. It can be the fuel for heavy-duty vehicles, the energy source to produce « hydrogen electricity » that powers production processes, or the raw material in the manufacture of explosives. It is for all these reasons that ENGIE has decided to position itself strategically to advise and support the mining industry.



### 3. LIQUID NATURAL GAS (LNG)

Liquid natural gas (LNG) accounts for a large part of Chile's energy consumption. Through the construction of the GNL Quintero Terminal, a new LNG supply route was opened from the Atlantic Ocean to the Pacific, using the Strait of Magellan and the Panama Canal, so LNG



terminals have allowed the country to be energy independent. Quintero's LNG is primarily used for power generation, for industries, refineries and for residential, commercial and transportation consumption.

- **LOW-EMISSION**

LNG consists primarily of methane (98%) and very low proportions of ethane, propane, butane, nitrogen and carbon dioxide. In this way, natural gas is the cleanest fossil fuel that exists, with combustion that generates almost no emissions of particulate matter or other local pollutants. LNG has an important role to play as a complement to and support for renewable generation based on its high availability, reliability, efficiency and environmental benefits relative to other energies. The use of natural gas to replace other fossil fuels implies a significant reduction in emissions levels. It is therefore important to encourage the incorporation of natural gas in buses, taxis and commercial fleets in large cities.

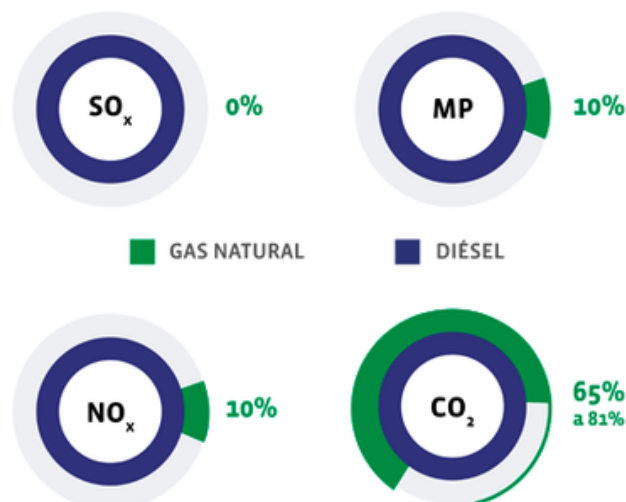


FIGURE 8 : COMPARISON OF GAS AND DIESEL AIR EMISSIONS (GNL QUINTERO, 2023)

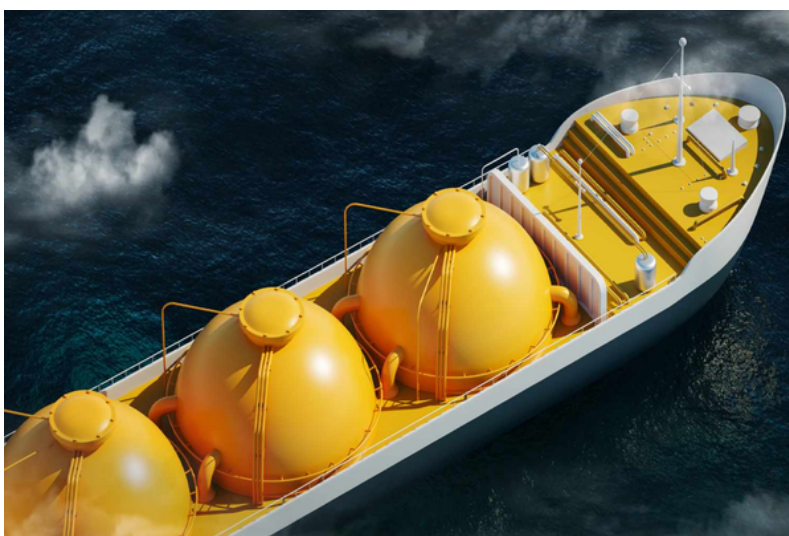


- **ZOOM ON FLUXYS AND ITS TERMINAL GNL QUINTERO**

Thanks to a visit to the GNL Quintero Terminal organized by FLUXYS, the BELGOLUX Chamber realised the importance of the Terminal as a key and indispensable player in the country's natural gas import, the gas being the first source of energy for the electricity production in the central zone of Chile. The company now supplies most of the national energy demand and the Santiago metropolitan area with gas. The GNL Quintero production plant was built at lightning speed in 2008, allowing the country to be energy independent since its inception.

Aware of the environmental challenges of the market, the company has been integrating a culture of sustainability since 2014, where the 17 sustainable development goals are part of its activities. It has also been recognised by several ISO standards that certify its environmental management system, the safety of its employees, as well as the quality of its services and products.

The company now represents 0.1% of the total CO<sub>2</sub> emissions of the Bay of Quintero and seeks to interact and collaborate significantly with local communities to support them in particular with its Urban Development Plan «*Quintero Vive*» and its Sustainability Plan for the Bay of Quintero.



- **OPERATION**

Once natural gas is extracted from the depths of the earth, it is processed into a liquid form by lowering its temperature to minus 160 degrees. This process reduces its volume 600 times and facilitates its transport. GNL Quintero Terminal manages the arrival of large ships that transport liquefied gas and receive it for storage in large storage tanks. On request, gas regasification begins in the vapouriser zone, where the temperature increases, so that the gas is injected into the pipeline system to supply residential, commercial, transportation customers, industrial, petrochemical and electricity generation in the central area of Chile.

- **TERMINAL STRUCTURE**

### DOCK

It is the structure that accommodates LNG boats, built with the highest standards for safe operation. The dock is the infrastructure that allows the terminal to receive the boats that bring LNG.

### STORAGE TANKS

The reservoirs store LNG and ensure the continuity of natural gas supply.

### VAPOURISERS

Vapourisers involve the process of returning LNG to its original gaseous state for injection into the pipeline system.

### TRUCK LOADING STATION

Infrastructure where LNG is loaded on special vehicles to supply markets that do not have natural gas pipelines.

### CONTROL ROOM

This is the brain of Operation GNL Quintero. In the control room, all the terminal processes are monitored, with state-of-the-art systems.





## 4. ENERGY EFFICIENCY

The role of energy efficiency is also part of the solution to achieve the country's carbon neutrality targets. It also offers answers regarding the fall in energy prices, the climate crisis and energy security. Working towards the goals of neutrality with energy efficiency is more critical than ever. However, Chile has fallen behind in achieving its specific energy efficiency target by failing to present legislative initiatives to address this issue in the context of the 2050 Energy Agenda, without any relevant achievement in this area. (Proaño, 2018) It is only in 2021 that Chile establishes its first energy efficiency law, which aims to make an efficient and rational use of resources covering almost all of the country's energy consumption in terms of transport, to mining and industry, but also to the residential, public and commercial sectors. (ChileAtiende, 2022)

Integrating energy efficiency into businesses does not necessarily mean investing in capital equipment, as some objectives can be achieved and some bills reduced only by changing process management. Since the Chilean campaign for energy efficiency has been enshrined in law (2021), many business opportunities have been created for specialised consultants to help companies reduce and optimise energy consumption. At the Chilean national level, energy efficiency would reduce greenhouse gas (GHG) emissions by 35% and thus achieve carbon neutrality by 2050. This is an opportunity both for traders and those concerned, because compliance with the law now reduces costs in this case. In addition, this subject is extended and concerns all projects supporting electrification as well as public transport, the modification of the structure of factories and buildings, and others. A central objective of the law is an overall reduction in energy intensity of at least 10% by 2030 compared to 2019, which leaves many opportunities for action for people and companies concerned by the subject. (ChileAtiende, 2022)

## 5. ENERGY CHALLENGE: TRANSPORTATION AND STORAGE

The biggest challenge of the global energy transition is energy transportation and storage. In Chile, this is particularly true because the energy production areas are very far from the consumption areas. Indeed, although the country has the best sun in the northern region, and a very good wind in the south, which both allow to produce energy in large quantities, the majority of consumption is in the centre of the country. At the same time, the government relies heavily on private sector innovation and has no financial incentive to help the energy sector. It is therefore necessary to find innovative solutions to transport energy across the country to reach the places of consumption.

Pipelines, a major force in the European energy market, are unfortunately not part of the Chilean solution. The latter would have to connect too great distances for it to be economically affordable. In addition, it is also difficult to implement this system because of the many territorial permits to be acquired. Europe benefits from this system thanks to the short distances between each point of interest. Northern Chile is connected by pipeline to Santiago and this network is already stretched to the maximum for the transport of energy. A project of a second connection line is in progress but this will not be enough to meet the demand of the projects present and under development.

Today, innovative ideas are being developed to find appropriate solutions for the country. One such solution would be to produce green hydrogen when the energy transmission network is saturated. For example, when solar energy reaches peak production and the transmission system cannot transport more energy, a water electrolysis system would produce green hydrogen from that energy and thus avoid its loss. It comes down to using one energy to create another that is more easily stored.



## B) AN ENERGY TRANSITION FOR POLLUTING SECTORS

### 1. MINING INDUSTRY

The Atacama Desert, located in the northern region of Chile, has the largest non-metallic mineral and copper reserve in the world that has maintained the mining industry for over a century. Atacama also has one of the largest lithium reserves, which is essential for the production of batteries and various components.



Producing 37% of Chile's GHGs, the mining industry is both a considerable CO<sub>2</sub> producer, but also a huge opportunity for the country to develop its green energies. In addition, the decarbonisation of the mining industry can make a significant contribution to reduce GHGs at the national level. Given its emissions, the decarbonisation of this industry would allow the country to significantly reduce its GHGs and achieve its carbon neutrality targets. In recent years, mining activities have begun to benefit from the excellent solar resources of the country's desert region by using PV for its energy use. It is essential that the mining industry continue in this direction and respond to the challenges in terms of access to sustainable economic energy. (Bersalli, 2019; IEA, 2018; Paillard, 2019; Proaño, 2018)



Moreover, this industry with strong environmental and social impacts must also respond to the challenges of water supply. There are specific water management solutions for the mining industry today. For example, a common approach is to adopt a water use strategy that is fit for use, that is, replace fresh water with lower quality water (saline groundwater, seawater, wastewater, etc.). Customised and specific solutions can be adopted. This requires creative thinking, an association of technical innovation, but also social collaboration.

The International Council of Mines and Metals (ICMM), published in 2017, functions on the water governance strategy. This paper defines water governance as social, environmentally sustainable and economically beneficial use. There is a need for mining companies to work with government, civil society, businesses and local communities to promote effective governance.

## 2. FOREIGN COMPANIES ACCOMPANYING THE TRANSITION

In order to achieve the Net-Zero Scenario targets on a global scale, almost \$5 must be invested in low-carbon supply for every \$1 invested in fossil energy supply until 2050. (BloombergNEF, 2022) Chile's energy market is already seizing this opportunity to diversify and expand its clean energy sector. Some Belgian companies have already taken the plunge and have come to develop their energy projects within Chilean borders. This includes the following companies :



**ENGIE** is an electricity supplier and has already developed a wind farm in Calama, solar farms in Tamaya and Pampa Camarones and a hydroelectric plant in Chapiquiña, among others.



**FLUXYS** is active in the transportation and storage of gas and the transportation of liquefied natural gas operating in Europe and also develops activities in South America, notably in Chile. It also owns 80% of the GNL Quintero Terminal.



An expert in various types of lighting, **SCHRÉDER** develops solutions by combining global expertise from a local perspective to build a legacy for future generations. It improves Chile's lighting levels by offering excellent visual comfort and impressive energy savings.



Developing, building and operating the third marine LNG storage, unloading and regasification terminal in Chile is the mission of **GNL TALCAHUANO**. This company returns natural gas to the south of Chile, in harmony with the needs of the community, in absolute respect for the environment.



**Sociedad Química y Minera de Chile (SQM)** supports energy companies very closely thanks to its mineral products such as lithium and its derivatives that enable the production of electric batteries.





Active in the renewable energy sector, the **MACHIELS** group develops solar farms, wind farms, biogas plants and produces electricity from recycling. She brings her expertise to Chile by developing some of her projects in Concepción, Quillagua and Chiza.



Present in Chile since the late 1960s, the company **TRACTEBEL** participates in major projects of thermoelectric power plants, gas pipelines, hydroelectric or green hydrogen projects. She's part of the ENGIE group.



The **JOHN COCKERILL** group develops large-scale technological solutions to meet the needs of its time, bringing added value in areas such as sustainable production, green mobility or facilitating access to renewable energy. The Group participates in projects such as the creation of electrolysis plants, air treatment or renewable energy projects in Chile with its subsidiary **INGEQUIP**, with which they have supplied the engine of the Cerro Dominator facility.



## C) ADDITIONAL AND EQUAL EMPLOYMENT

In addition to reducing CO2 emissions and being competitive in the marketplace, renewable energy sources avoid importing fossil fuels, generate jobs and democratise access to energy. (ACERA, 2019)

12,7 million jobs is what the renewable energy sector represents around the world. Despite the multiple crises, the growth of jobs in the clean energy sector has been confirmed by the International Labour Organization (ILO) as well as by IRENA. In 2021, the solar energy sector is the largest employer with 4,3 million jobs, accounting for more than a third of the current global renewable energy workforce. (ILO, 2022)

An energy model has been announced by the ILO and the Economic Commission for Latin America and the Caribbean (ECLAC) which plans to generate more than 1 million jobs in Latin America by 2030. The Solar Strategic Plan has already planned 45 thousand green jobs for 2025. In addition, the Cerro Dominador solar project had planned to generate 1 000 jobs in the years following its construction. (Solis, 2018)



Chile is also taking advantage of its progress in renewable energy to fight gender inequality. Indeed, in 2018 the government launched *Energía + Mujer* (Energy + Women) which provides companies with resources to reduce gender gaps in the workplace, thereby enhancing diversity and inclusion in the country's male-dominated energy sector.

The logo features the word 'energía' in a clean, sans-serif font, followed by '+ mujer' in a large, white, cursive script. The entire logo is set against a solid purple rectangular background.

The country also receives support from the Inter-American Development Bank (IDB) to promote equal pay, gender parity in its renewable energy sector and accelerate the use of clean energy sources. (World Economic Forum, 2023)

In addition, as Rosaline Corinthien, CEO of ENGIE Chile, commented : « [...] *the energy transition must be accompanied by a cultural transformation, which must aim at a fair balance between all those who make up this society. In this just society, gender equality is a duty. Today, more than a goal or a desire, it is a moral imperative that must be written by each of us in the sense of history.* » This is why ENGIE Chile has decided, among other things, to participate in the public-private initiative *Energía + Mujer*, led by the Ministry of Energy. Other initiatives have also been implemented by the company to achieve its gender equality goals, including the Fifty-Fifty Program, which aims to achieve a 50% share of women in executive and executive positions by 2030. They are also part of the Women Energy Council (WEC) program, which brings together women in industry to develop their leadership skills and integrate them into an active network of connections.

SQM stresses that inclusion, diversity and gender equity are essential to generate sustainable value. This is why society encourages and values the participation of women who, at the end of 2022, reached 20% following various strategies and aims to strengthen this work to reach 25% by 2025. Regarding the promotion of gender equality, the executive highlighted the holding of conferences and events in Iquique and Antofagasta, including seminars «*Vamos por +Mujeres en Minería*». SQM has also participated in public-private partnerships that promote the entry and development of women in the world of work and has recently obtained 3262 certification on gender equality and reconciliation of work, family and personal life. (Minería Chilena, 2023; SQM, 2023)

## 4. EXPERT'S VISION OF CHILE

*« CHILE IS ONE OF THE WORLD LEADERS IN THE ENERGY TRANSITION. [...] THE ENERGY TRANSITION CAN BE AN EXCELLENT VEHICLE FOR A NEW INCLUSIVE, PROSPEROUS AND RESILIENT ECONOMY »*

**Francesco La Camera, Director of the International Renewable Agency (IRENA)**

*« THE CHILEAN MARKET OFFERS MANY OPPORTUNITIES FOR RENEWABLE ENERGY COMPANIES LIKE OURS, BOTH FOR ITS TREMENDOUS NATURAL POTENTIAL AND FOR ITS NEED TO DEVELOP ITS CLEAN ENERGY MATRIX »*

**José Antonia Valdés, Executive President of SPIC (Pacific Hydro)**

*« CHILE HAS ENORMOUS RENEWABLE ENERGY RESOURCES AND IS THEREFORE WELL POSITIONED TO LEAD. THEY HAVE BUILT A LOT AND THERE IS A GROWING INDUSTRY, WHICH IS WHY RENEWABLE ENERGY HAS SUSTAINABLE POLITICAL SUPPORT. REAL COMPANIES HAVE EMERGED AND HAVE AN INTEREST IN THE SUCCESS OF THE INDUSTRY »*

**David Victor, Professor of Innovation and Public Policy at the University of California**

## 5. DID YOU KNOW THAT ... ?

### THE ATACAMA DESERT HAS ONE OF THE HIGHEST LEVELS OF SOLAR RADIATION IN THE WORLD?

It is therefore not surprising to learn that it has been hosting the Cerro Dominador solar complex since 2021. This CSP facility has 392 000 solar panels capable of producing 100 MW and avoids the emission of some 870 000 tonnes of CO<sub>2</sub> per year! In addition, the Belgian company JOHN COCKERILL, represented in Chile by INGEQUIP, contributed by supplying the engine in the tower of the installation, a Chilean project with a Belgian heart! (Ferrer, 2021; Ministerio de Energía, 2021)



### CHILE AND BELGIUM ARE WORKING TOGETHER TO COMMERCIALISE GREEN HYDROGEN?

In late 2021, Chile signed a MoU (Memorandum of Understanding) with the Port of Antwerp on the transport and import of green hydrogen. It aims at cooperation to establish a corridor between Chile and Belgium in order to ship green hydrogen or derivatives, produced in Chile and received in the Belgian port. Chile will therefore be able to meet the demand for European hydrogen through further distribution via Belgium. (AWEX, 2022)



## CHILE AIMS TO BAN THE OPERATION OF COAL-FIRED POWER PLANTS FROM 2040?

Chile has launched a public-private partnership to phase out coal-fired electricity generation by 2040, with a first phase by 2024, during which eight plants must be closed. This would mean shutting down all coal-fired power plants in Puchuncaví and 80% in Mejillones by 2025. The country would therefore continue to operate with 18 coal-fired plants, which would represent 65% of Chile's coal-fired plants. (Gobierno de Chile, 2021)



## CHILE IS STILL LACKING COOPERATIVE SCALE ENERGY PROJECTS?

A cooperative is an autonomous association of people who have voluntarily united to meet their common economic, social and cultural aspirations and needs through a jointly owned and democratically controlled enterprise. As yet undeveloped, energy production cooperatives play an important role in the energy transition. They position themselves as a fairer, more democratic alternative and promote the development of local energy to address environmental problems and climate change. They make citizens independent by enabling them to produce their own electricity at a fair price, democratic control and access to information. (Gobierno de Chile, 2020)



FIGURE 9: BENEFITS OF THE ENERGY COOPERATIVE (GOBIERNO DE CHILE, 2020)

## 6. CONCLUSION

Through the history and progress of the Chilean energy sector, it has been possible to observe a particular and growing interest on the part of the government and companies to engage and develop renewable energy projects thus enabling the achievement of the 2050 carbon neutrality targets. Thanks to its policies and investments, Chile ranked first among the most attractive countries for renewable energy investments in 2018 and already attracted many foreign companies to its territory.

Known for its geographical diversity, the country has countless opportunities to develop clean energy projects: from onshore wind to offshore, from photovoltaic solar to thermodynamic solar power plants, from marines to wave energy, and hydro, geothermal, and biomass. All these energies have already been installed in the territory and the majority of them continue to experience strong growth. Let us also remember that the construction of terminals of liquid natural gas has allowed the country's energy independence and that the growth of the market for green hydrogen already causes Chile to think about its future export and marketing especially with Belgium.

Despite the country's growth in green energy, we must not forget that Chile's energy consumption remains one of the largest in the world and that the country still relies heavily on carbon energy.

Among the country's energy-intensive sectors, the mining industry is a double-edged sword for Chile: representing both a source of raw material for developing renewable energies, this sector is also the country's most polluting and energy-intensive source. Aware of the current challenges, the industry is trying to align itself in recent years with national objectives and companies such as ENGIE are present and ready to support them in their transition.

Despite the country's efforts in the development of clean energy, energy efficiency, which can significantly reduce greenhouse gases, must be included in the energy transition in order to reach national targets for 2050. Chile must invest in this sector in the coming years if it hopes to continue to align its objectives.

With its large surface area, Chile faces some challenges in carrying out its energy transition, notably due to energy transport and storage. The private sector continues to invest in research and innovation to find solutions that meet the concentrated



energy needs of central Chile. The country also faced the needs and values of the population, becoming aware of public opinion and its priorities: a just and egalitarian energy transition for all.

Finally, the energy transition not only achieves government objectives, it also ensures energy security for Chileans, to benefit businesses by reducing their costs and offering them a place in the future economy, but also to create jobs and seize this opportunity to include more gender equality.

We will remember that the Chilean energy sector has undergone a good evolution over the last decade, by setting ambitious targets for carbon neutrality and developing many renewable energy projects. The country has begun a shift and is determined to meet its targets. Despite the many opportunities for developing clean energy on its territory, the country's geography and land mass are causing companies to think about how to meet the challenges of electricity transmission and storage. Energy efficiency must also be part of the solution in order to meet the targets, and polluting sectors must also be part of the change for Chile to meet its targets. Foreign companies have already stepped up and established themselves in Chile, helping the development of the renewable energy sector across the country.

We would particularly like to congratulate the Belgian investments made so far in the sector, as well as **ENGIE**, **SQM**, **MACHIELS**, **FLUXYS** and **JOHN COCKERILL (INGEQUIP)**, which are helping Chile's energy transition.

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We recall that the purpose of this report is only to provide, for information purposes, data on the state of the Chilean energy situation.

This situation may change over time and we will let you know in due course.

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