SPAIN

ENERGY

Spain's upswing in renewables defeats years of headwinds

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Spain's upswing in renewables defeats years of headwinds

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Spain has very favourable geographical conditions for the deployment of variable renewable energy sources, but was slow to take advantage of these assets owing to a certain market sluggishness tied with a weak national political will during most of the 2010-2020 decade. Within this context, the decentralised political framework and the existence of major energy players in Spain are assets as well as hindrances for investment in the production of electricity from renewable sources. While the phase-out of coal becomes increasingly urgent, Spain has just renewed its body of legislation and regulations to boost its climate and just transition strategy. What role have non-state actors played in Spain's energy transformation in recent years?

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Key takeaways

Greenhouse gas emissions in Spain dropped sharply after the economic crisis of 2008 (by 30.6%). In spite of natural resources that were exceptionally favourable for the use of solar and wind energy, the development of renewable energy received little public or private support between 2010 and 2018. The lifting of the "solar tax" in that year permitted the development of photovoltaics while floating wind energy opened up new avenues for investment in marine energies.

European law has served as the normative motor behind the Spanish energy transition while coal lost financial profitability in favour of gas (combined cycle power plants) at first, and renewables more recently. Half of all coal power plants closed in 2020, without the Spanish government ever having formulated the objectives behind the closure of the plants.

The oligopolistic nature of the electricity market has long held back the development of renewables. Today, the convergence of electricity companies towards the target of carbon neutrality confirms the strategy pursued by the traditional market players such as Iberdrola, the Catalan SomEnergia cooperative, or newcomers such as the Repsol oil company.

At the regional level, the unprecedented adoption in three years of energy transition laws in the Balearic Islands, Catalonia, and in Andalusia, takes on a political dimension in the quest for autonomy of the regions vis-à-vis central power. Despite a body of legislation at the national level, a certain vagueness surrounds the devolution of competences linked to climate, which can provoke its share of conflict – as demonstrated by the censorship of the Catalan energy transition law by the Constitutional Tribunal.

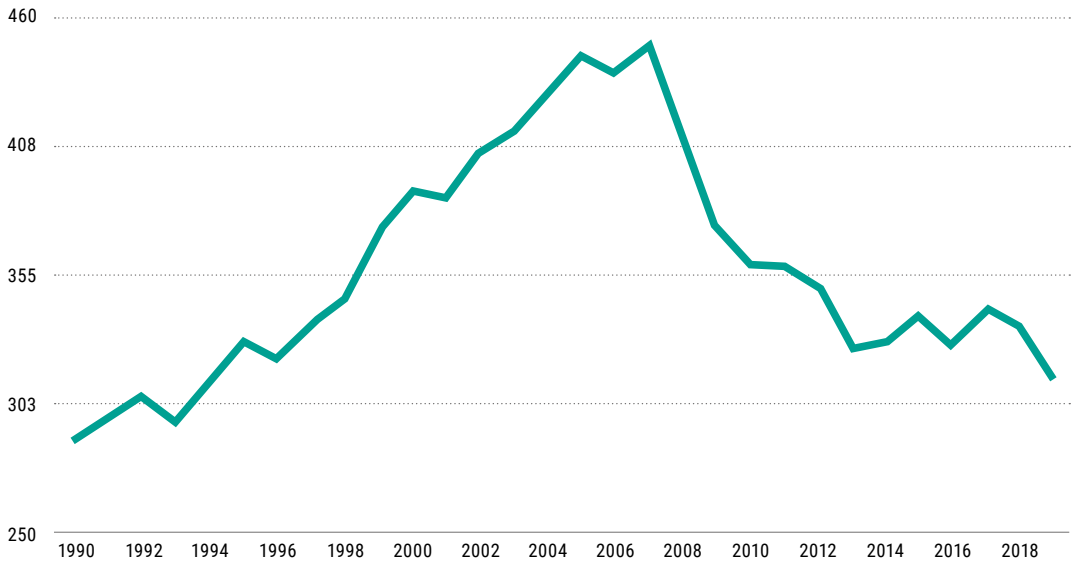
In Spain, climatic urgency is generating a revival of environmental mobilisation, which has traditionally been kept away from national representation by the bipartisan parliamentary system. The phase-out of coal has brought unions into the energy debate to negotiate just transition agreements, while the proliferation of energy cooperatives diversifies the market players.

1. Spain begins its shift towards a more renewable electricity mix

• THE STRUCTURAL TRANSFORMATION OF THE SPANISH ECONOMY SINCE 2008 HAS LED TO A DROP IN GREENHOUSE GAS EMISSIONS • Greenhouse gas emissions in Spain have dropped sharply over the past decade (**fig. 1**): between 2007, the peak year, and 2019, national emissions fell by 30.6%. Three main factors maintain this trend (García A. y del Val D., 2020; REE, 2020).

FIGURE 1

EVOLUTION OF SPAIN'S TOTAL EMISSIONS FROM 1990 TO 2019 ($MTCO_2$), EXCLUDING LAND USE, LAND-USE CHANGE AND FORESTRY (LULUCF) - *Source: Inventario Nacional de Gases de Efecto Invernadero, Ministerio para la Transición Ecológica y Reto Demográfico*



Above all, the economic crisis of 2008 has had a considerable impact on Spain's economic activity. The 8.8% GDP recession between 2008 and 2013 considerably reduced national energy demand: over the period, final energy consumption decreased by 23.3% (Secretaría de Estado de Energía).

A long and slow recovery period followed, starting in 2014. During this period, energy demand increased again, but more modestly as a result of change in the sector structure of the GDP, combined with energy efficiency gains within the economy, which led to a decline in energy intensity in Spain. Indeed, the construction industry – one of the main drivers, including speculative ones, of the previous economic cycle – has shrunk sharply in favour of service activities with less energy consumption. This tertiarisation of the economy explains the nearly 50% reduction in energy intensity in Spain, twice as much as in the euro zone. The pure gains in energy efficiency therefore have had a smaller effect in Spain than in neighbouring economies (REE, 2019).

Finally, a third factor, since 2017: the combination of public policies intended to develop renewable energies and the decline of coal with the shutdown of most thermal power plants – although largely replaced by gas –has led to a substantial drop in emissions from the electricity sector.

The energy sector remains by far the main contributor to greenhouse gases in Spain (75%), in particular via transportation (29%), industry (20.6%), and electricity production (13.5%). This is followed, according to the latest national inventory of emissions which uses the sectoral categories used by the IPCC[1], by agriculture and livestock (12.5%), industrial processes (excluding combustion, 8%), and waste (4.3%) (Ministerio para la Transición Ecológica y Reto Demográfico, 2020)..

1 2006 IPCC Guidelines for National Greenhouse Gas Inventories

A. An oversized power sector, unevenly distributed over the country, and controlled by an oligopoly.

Electricity production in Spain has gone from a mix based on coal, gas, and hydro energy (75% in the 1990s) to a mix dominated by combined cycle power stations[2] and wind and solar farms. The last few years in particular show the sharp decline of coal in favour of gas as well as wind and photovoltaic energy (**fig. 2**).

FIGURE 2

NATIONAL BALANCE SHEET OF THE SPANISH POWER SECTOR.

Source: Database from Red Eléctrica de España

	2014	2015	2016	2017	2018	2019	10M 2020
Hydropower	15 %	11 %	14 %	7 %	13 %	9 %	12 %
Wind energy	20 %	18 %	18 %	18 %	18 %	20 %	21 %
Photovoltaic solar	3 %	3 %	3 %	3 %	3 %	3 %	7 %
Thermal solar	2 %	2 %	2 %	2 %	2 %	2 %	2 %
Other renewables	1 %	1 %	1 %	1 %	1 %	1 %	2 %
Total production of renewable energy	**42 %**	**36 %**	**38 %**	**32 %**	**37 %**	**37 %**	**44 %**
Turbine pumping	1 %	1 %	1 %	1 %	1 %	1 %	1 %
Nuclear	21 %	21 %	21 %	21 %	20 %	21 %	22 %
Combined cycle	10 %	11 %	11 %	14 %	11 %	21 %	18 %
Coal	17 %	20 %	14 %	17 %	14 %	5 %	2 %
Fuel + gas	2 %	2 %	3 %	3 %	2 %	2 %	2 %
Cogeneration	9 %	10 %	10 %	11 %	11 %	11 %	11 %
Non-renewable production	**62 %**	**66 %**	**61 %**	**66 %**	**60 %**	**62 %**	**57 %**

Currently, Spanish production of electricity is characterised by a low rate of utilisation of the available generation capacity. Various reasons explain this. First, a historical disconnect between the production of electricity and the growth of installed capacity, which became particularly evident during the rise of combined cycle power plants during the 2000s. To meet the increasing demand for energy during the economic cycle prior to the crisis of 2008, the combined cycle power plants experienced considerable growth thanks to significant investments from the five main Spanish electricity companies, supported by financing facilities, lower production costs than for the other types of power plant, and a better environmental reputation (Palazuelos, 2019). This happened to such a degree that these combined cycle power plants are running at overcapacity today; currently, the combined cycle power plants can operate down to 10% of their capacity during dips in economic activity. On the other hand, the relatively low load factor[3] of renewable photovoltaic and wind installations resulting from their sensitivity to meteorological variations, also leads to the installation of production capacities greater than the actual production.

Another particular characteristic of the Spanish electricity sector can be found in the regional inequalities in access to the grid, in particularly between the peninsula and the islands. The Canaries, the enclaves of Ceuta and Melilla as well as a large part of the Balearic Islands remain unconnected

2 Combined cycle power stations use gas as the main source of energy. According to the definition of Red Eléctrica de España, the combined cycle is the "*technology of producing electrical energy whereby two thermodynamic cycles coexist in a system: one of which whose working fluid is water vapour, the other whose working fluid is a gas. In a power station, the gas cycle produces electrical energy by means of a gas turbine, and the water vapour cycle does so by means of one or more steam turbines. The heat generated by combustion in a gas turbine is fed to a traditional boiler or heat recovery element and is used to run one or more steam turbines, thereby increasing the efficiency of the process. The electrical power generators are coupled to gas or steam turbines.*"

3 "*The load factor of a unit of electrical production is the ratio between the energy it produces over a given period and the energy it would have produced in that period if it had constantly operated at nominal power*" (Connaissance des Énergies, in French). In other words, the lower the load factor, the greater the need to anticipate nominal excess production capacity in order to meet the actual demand.

to the electricity transmission grids. Only the Balearic Islands have a maritime connection to the peninsular network. In addition, more than 80% of the power available in all non-peninsular territories comes from thermal (48%) and combined cycle (33%) power plants. These conventional technologies give rise to 93% of the effective electricity generation. However, developments in renewable energy sources took place in some localities, such as on the island of El Hierro (Balearic Islands), where more than 50% of the energy produced in 2019 came from renewable sources[4]. This regional inequality is also found in different regions of the peninsula where at the end of 2019 the large majority of coal-based thermal power plants were concentrated in the main industrial areas and where four regions combine almost 60% of the thermal production capacity (Castilla y Leon 20%, Galicia 13.9%, Andalusia 12.9% and Castilla-La Mancha 12.1%; REE, 2019).

Still, the Spanish energy-electricity market is characterised by an oligopolistic method of operation within which five large internationalised enterprises operate. Endesa (owned by the Italian Enel energy company since 2009), Iberdrola, Naturgy, EDP España and Viesgo (owned by the Spanish Repsol oil company), are responsible for 70% of energy production as well as sales, in spite of the market liberalisation implemented in 2003. This oligopolistic structure permitted the historical exercise of a significant influence, not only over European competition within the Spanish market, but also over public authorities (Morales de Labra, 2014; Fabra, 2014; Observatorio de la Sostenibilidad, 2017; Palazuelos, 2019; **Box1**).

TO BETTER UNDERSTAND

THE MARGINAL COST PRICING SYSTEM, A BRAKE ON OPENING UP THE MARKET TO COMPETITION.

After the liberalisation of the electricity market required by European Commission law in 1997, the legislation put in place in Spain is complex and – paradoxically – opposes strong barriers to the entry of newcomers into the market.

The main barrier is the **marginalist system of price setting in the wholesale electricity market.** There is an hourly auction system[5], the workings of which resemble that of the stock market, which determines the price of the remuneration that all power plants connected to the grid will receive each hour according to the price of electricity offered by the last plant that satisfies the last requested unit of electricity. It is a unique hourly price, independent of the technology and primary source of energy used. Under conditions of perfect competition, the marginal cost system is expected to stabilise the price around the variable cost of the last unit which enters the system. However, perfect competition is far from being achieved given that a significant percentage of the system's electricity is generated in plants using technologies that are not accessible to new entrants (such as hydro or nuclear sources of power with very low variable costs). Furthermore, this mechanism allows companies in an oligopolistic market to develop strategies to push the price upwards, for example by bidding on expensive technologies such as coal-based technologies before the hourly auction closes. This is a practice that has led to sanctions by the Spanish competition regulator, sometimes deeming these very elevated prices to be unjustified (El País, 30/11/2015; El Confidencial, 19/12/2017; CNMC, 27/06/2018).

BOX 1

The technologies with the lowest production costs are thus remunerated at the highest prices. In the case of power plants with high fixed costs that risk being unable to cover their production costs

4 The island of El Hierro met its demand for electric power with 100% renewable sources for 24 consecutive days in 2019. The Gorona del Viento hydro-wind power plant (capacity 11.5 W) was the main source of generation (REE, 2020b).

5 https://www.omie.es/es/mercado-de-electricidad

under this marginal cost price system, such as the renewables (in particular the first generations), the system makes provision for bonuses / remunerative supplements regulated by the administration in different forms and whose justifications are sometimes difficult to ascertain (bonuses for the development of renewable energies, payments by capacity for coal and combined cycle, or nuclear and hydro power plants until 2009, etc.).

This system, which some authors qualify as "socialisation of losses, privatisation of profits", explains why the average price of electricity in Spain has doubled over the last two decades, to the point of becoming one of the highest prices in Europe, while the demand for electricity has not surpassed the levels attained before the 2008 crisis, and while wage levels have stagnated – according to the Spanish National Statistics Institute (Morales de Labra, 2014; Fabra, 2014; Urkidi et al., 2015; Palazuelos, 2019). Today, between 3.5 and 8.1 million users – depending on the indicators used – are in energy poverty (Ministry for the Ecological Transition, 2019a). These high electricity prices are also an explanatory factor for the deindustrialisation of the Spanish economy.

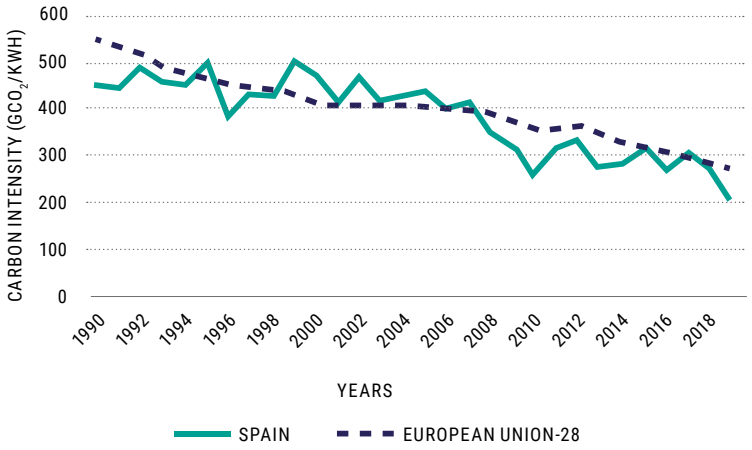
B. The decline of coal and thermal power plants under the influence of the market and European standards.

In the 1960s, in line with Spain's late economic expansion and industrialisation, coal deposits were widely exploited and coal became a major energy resource. Its decline started in 1980 as a result of the combination of several factors: competition in technology and production from other electricity sources, such as gas, used in combined cycle power plants, or wind energy; the rise of environmental awareness in civil society and in the international community; loss of profitability caused by a rise in the operating costs of coal deposits, which made the import of coal more economically viable (Palazuelos, 2019).

FIGURE 3

EVOLUTION OF CARBON INTENSITY IN ELECTRICITY PRODUCTION IN SPAIN AND THE EUROPEAN UNION-28 BETWEEN 1990 AND 2019 (GCO_2/KWH).

Source: European Environmental Agency, 2020



The thermal coal-based power plants established in the country underwent an evolution similar to that of the coal deposits, although it was a later decline occurring during the last decade as a result of low energy demand following the 2008 economic crisis, but especially as a result of increasing pressure caused by EU environmental regulations.

Directive 2009/28/EC on renewable energy set 30th June, 2020 as the deadline by which plants had to adapt and comply with the established emission limits[6]. Faced with this situation, seven of the fifteen thermal power plants that were still operational in 2020 decided not to invest and to cease their activities in 2020, and four others requested authorisation to shut down (El País, 29/06/2020). As a result, the contribution from coal in the production of electricity went from 20% in 2015 to less than 3% in the first half-year of 2020 (Red Eléctrica de España). All of this without the Spanish government having had to formulate a coal phase-out plan. In this context, the Ministry for Ecological Transition created an Institute for Just Transition (IJT) in April 2020, starting from a modification of the goals and status of a structure that existed since 1997 for the transition in the mining sector, in order to support the retraining of workers made unemployed by the closure of these plants (Institute for Just Transition).

C. 2019, a turning point for renewables after a decade of stagnation.

Hydropower constituted up to 80% of the installed capacity of the electricity sector in mid-20th century, and was the main source of electricity production until the 1960s. Its development began at the end of the 19th century, prior to a first boom in the 1930s with large-scale works exploiting the Duero river, then from the 1950s, during the economic reconstruction following the Spanish civil war. Today, hydropower is solely a complementary source and its contribution fluctuates depending on water conditions. There are physico-geographical possibilities to add to hydroelectric capacity, but financial evaluations suggest a limited financial profitability in the vast majority of cases (Palazuelos, 2019).

Starting from the second half of the 20th century in Spain, another source of energy was developed through reconstruction and industrialisation: nuclear (El Independiente, 31/03/2018). Seven reactors went into operation between 1983 and 1988 (out of ten in total), the only ones still active today. Other power plants in the construction phase never saw the light of day (31 reactors were planned), with the interruption of the program in 1984, made definitive in 1994, due to high investment costs and the rise in anti-nuclear movements (Palazuelos, 2019). While nuclear energy today generates 20% of Spanish electricity production, the government signed a plan in early 2019, with the companies Iberdrola, Endesa and Naturgy for the gradual closure of reactors by 2035 (CincoDías, 02/11/2019).

The development of renewable energy always depended on the support of public policies. Save for hydropower, the first large increase in renewables took place in the first decade of the 21st century, driven by changes in norms and standards, and accompanied by high rewards to companies (fixed rates and variable bonuses in line with the wholesale market price) which led to the consolidation of wind energy in the electricity mix and to the first developments in solar energy. The development of renewables was abruptly halted during the change of government in 2011 until the elections in 2016. The objectives set for the 2011-2020 Renewable Energy Plan (REP), which also reproduces the European objectives set in directive 2009/28/EC, led the public authorities to organise calls for projects to develop these energy sources after years of status quo.

Since then, the installation of new generating capacity from variable renewable energy sources has become the main driver of growth in power generation capacity on the peninsula. Thus, after five years of decline, the capacity of renewables increased by 13.9% between 2018 and 2019, while the non-renewables decreased by 0.8%, mainly as a result of the closure of thermal power stations, resulting in an increase in total production capacity of 6.4% over the year. In 2020, the aggregate of renewable energy sources accounted for 43.6% of Spanish power generation, compared to 37.5% in 2019. CO_2 emissions associated with the generation of electricity dropped by 27.3% in the same year (REE, 2020c).

6 Companies that had not adapted their facilities had to close after this date (they would have had only a limited number of operating hours per year, insufficient to cover their fixed costs).

Onshore wind energy is by far the most developed renewable energy technology: in this field, Spain ranks second in Europe, just behind Germany (Wind Europe, 2019). On the other hand, offshore wind power remains very limited, due in particular to the physical conditions of the continental platform: the quality of the seabed makes the placement of the foundations for the turbines very expensive (López, 2018). But today Spain is undergoing a revival of the sector thanks to investments in floating wind farms, which bypass this geological limitation in the development of offshore wind power (World Energy Trade, 25/09/2020). Today Spain is the fifth country in the world that invests the most in wind energy – behind China, United States, Great Britain, and India – and the second country in Europe in terms of installed wind power capacity (REN21, 2020). The potential capacity of floating wind turbines over the entire Iberian peninsula is estimated at 3 gigawatts GW in 2030[7] (Energy News, 02/12/2020).

When it comes to solar energy, Spain has a more mixed record. On the one hand, Spain now has the largest installed capacity of concentrated thermodynamic solar power plants in the world (REN21, 2020). On the other hand, Spain suffers from a long delay in terms of photovoltaic capacities compared with its European neighbours who have a much lower solar potential. In fact, Spain benefits from highest solar radiation flux in Europe, particularly in the south of the peninsula (AEMet, 2012). The delay in the deployment of photovoltaics can be attributed to several factors: the initial reluctance of the dominant energy players to invest in the market, the burden of collective housing in property holdings which do not favour the individual installation of solar panels, and especially the abolition in 2012 of the *feed-in-tariff* mechanism, followed by the introduction, in 2015, of a "sun tax" (**Box 2**).

EXPERIENCE FEEDBACK

THE END OF THE "SUN TAX", THE LIFTING OF A BRAKE ON SELF-CONSUMPTION

One of the most controversial energy transition measures in recent years was the legislation on self-consumption, more commonly known as the "sun tax". In effect from 2015 to 2019, this fiscal measure required self-consumers (owners of electric power capacity destined for their own consumption) of renewable energy, to pay a tax to contribute to the electricity system. After years of contestation, notably on the part of the National Association of Producers and Investors of Renewable Energy, which took the matter to the Supreme Court, the law ended up being modified as a result of the change of government in 2018 (El Periodico, 17/10/2018). The new royal decree (Real Decreto 244/2019), eliminates this "tax", thereby recognising the right of shared self-consumption within a community of owners – which is significant progress given that 65% of Spaniards live in shared buildings – a district or an industrial zone. This "sun tax" is one of the factors which explains why Spain today has only 10,000 solar panels, compared to the 1.4 million in Germany and the 800,000 in the United Kingdom (REE, n.d.).

BOX 2

7 By way of comparison, installed nuclear power in Spain, which provides 22% of the electricity generated, now stands at 7.4 gigawatts, with a load factor of close to 90%.

In all respects, 2019 marked a turning point in the development of renewable energy, a year in which Spain was the European country that invested the most in them: €8.4 billion were invested in renewables (all technologies combined), an increase of 25% with respect to 2018 and an absolute record for the country. €6 billion, in particular, were dedicated to solar energy, an increase of 75% (McCrone et al., 2020). Among the projects developed is the largest photovoltaic project in Europe: a 500 MW power plant, capable of meeting the demand of 250,000 people, built by Iberdrola in Badajoz (La Vanguardia, 12/30/2019).

Also a major first in 2019, the renewables now exceed half of the installed electric power capacity in Spain. The installed power in the peninsula that comes from renewable energy technologies increased by 13.9% in 2019 (+6,528 MW) and accounted for 52% of the total capacity. Wind energy (46%) climbs to first position, overtaking the combined cycle technology for the first time; solar photovoltaic energy underwent a significant growth (+93.2% in 2019) and today accounts for 16% of the peninsula's renewable energy capacities. The figures are similar at the national level (islands included): 50% of the installed capacity comes from renewable energy. Combined cycle is on top (23.8% of the installed power capacity), but is closely followed by wind (23.3%) and hydro (15.5%) (REE, 12/03/2020).

The Spanish Ministry for Ecological Transition announced new calls for projects starting December 2020 within the framework of the National Integrated Energy Plan (NIEP) 2021-2031 which provides for the installation of 60,000 MW renewable, the modalities of which will make it possible to further open the energy market to competition (no stakeholder will be able to obtain more than 50% of the capacity in each auction).

The Ministry has published an orientation schedule with the objective of installing a minimum of 19,440 MW of renewable energy capacity (half of which will come from photovoltaic technologies), between 2020 and 2025.

FIGURE 4

AGGREGATE INSTALLED CAPACITIES PROJECTED TO 2025

Source: Ministerio para la Transición Ecológica, 2020

Aggregate installed capacity	2020	2021	2022	2023	2024	2025
Wind	1,000	2,500	4,000	5,500	7,000	8,500
Photovoltaic	1,000	2,800	4,600	6,400	8,200	10,000
Solar thermoelectric		100	200	300	400	500
Biomass	80	150	200	260	320	380
Other technologies		20	20	40	40	60
Total	3,100	5,560	9,020	12,500	15,960	19,440

• EUROPEAN LAW, THE NORMATIVE DRIVER OF THE SPANISH ENERGY TRANSITION •

In Spain, legislation for a low-carbon transition is based on nine laws relating to climate, and 29 climate policies (plans, strategies, programmes, etc.) including the renewable energy plans (REP formulated in 2005, then in 2011) as well as the National Climate Change Adaptation Plan (NCCAP, 2006), with three work plans (2006, 2011, 2014). While Spain is the fifth largest emitter of greenhouse gases in the European Union, and one of the countries most affected by climate change, its national legislative framework has to transpose the standards enacted by European Community law into its own national legislation (Averchenkova, Lázaro-Touza, 2020).

In this way, the objectives set by REP 2011-2020 directly reflect those provided for in European Directive 2009/28/EC: 20% reduction in greenhouse gas emissions, 20% energy efficiency gains and 20% energy consumption from renewable sources compared to 1990 levels. The first two targets are far from being achieved (in 2019 emissions were 8.3% higher than in 1990, **fig. 1**). However, 18.4% of final consumption came from renewable sources in 2019, putting Spain on a credible trajectory to achieve this target of the European package. A positive result also in view of the ambitions of SDG 7 on access to clean and affordable energy (Instituto Nacional de Estadística).

If the gaps separating their 2019 targets are variable, all renewable technologies, except for solar photovoltaics, were far from being aligned with objectives set by the REP 2011-2020 (**fig. 5**).

FIGURE 5

GAP BETWEEN RENEWABLE PRODUCTION TARGETS AND RESULTS IN 2019

Source: APPA, 2020

	REP TARGETS FOR 2019		SITUATION IN 2019		GAP	
	GWh generation	MW installed	GWh generation	MW installed	% GWh	% MW
Onshore Wind	68,252	33,569	54,328	25,799	-20.4%	-23.1%
Solar Photovoltaic	11,532	6,810	9,240	8,914	-19.9%	30.9%
Solar thermoelectric	12,817	4,351	5,166	2,304	-59.7%	-47.0%
Biomass, MSW, biogas	10,586	1,695	4,507	1,236	-57.4%	-27.1%
Offshore Wind	1,065	480	0	5	-100.0%	-99.0%
Geothermal	180	30	0	0		
Tidal turbine, tidal	165	75	0,3	4,8	-99.8%	-93.6%
TOTAL	104,597	47,010	73,241	38,263	-29%	-19%

Created in 2018, the new Ministry for Ecological Transition made pass the Law on Climate Change, Energy Transition (LCCET) in May 2021, which aims for carbon neutrality in 2050 and sets new targets for 2030, in line with those of the European Union and the Paris Agreement.

The law provides for a reduction in emissions of at least 23% compared to 1990[8], the generation of 74% of electricity from renewable sources, 42% of the final energy consumption coming from renewable sources, and gains in energy efficiency of at least 39.5% compared to the *business-as-usual* scenario. To achieve carbon neutrality by 2050, the legislation is pursuing an emission reduction target of 90% compared to 1990 and a 100% renewable electricity system by 2050 (El País, 08/04/2021).

This bill provides for the establishment of an action framework for energy and climate through the draft of the first National Integrated Energy and Climate Plan (NIECP) 2021-2030 and the implementation of a Just Transition Strategy for the social categories and geographical areas that will be most affected.

The NIECP also provides for the mobilisation of €200 billion in investment over the next ten years, at the same time allowing the creation of between 250,000 and 350,000 net jobs per year. Among the measures, there is the support for the development of new renewable facilities from project tenders, a new remuneration system based on a long-term fixed price for energy[9], funds for the energy rehabilitation of buildings, support for sustainable mobility, or even the divestment of fossil energy products.

8 As a reminder: on December 11, 2020, the European Union set itself the target of reducing emissions by 55% by 2030 as part of the European Green Deal.

9 The concrete characteristics of the new remunerative frameworks have not been specified by the NIECP but could entail substantial changes in the functioning of the electricity market described in Frame 1.

To achieve the emission targets, the reduction trend observed between 2018 and 2019 (-5.7%) will have to be increased until 2030 (an annual reduction of 7%). A considerable effort, such that the drop in emissions observed in 2019 was encouraged, as we have seen, by the almost total phase-out of coal from the energy mix.

2. The renewables market opens up Spanish electricity to competition

• THE OLIGOPOLY ESTABLISHES ITS DOMINATION OVER LARGE RENEWABLES PROJECTS • The Spanish energy-electricity market is made up of five historic companies, and nearly 300 suppliers with less than 100,000 customers, who operate in areas where they are historically established. The five dominant companies (Endesa, Iberdrola, Naturgy, EDP España and Viesgo) are responsible for 70% of production and sales of electricity, each with a dominant position in the country. Some were built upon the legacy of public energy companies that were privatised in the 1990s in response to the new EU directive – for instance, Endesa, which took over the Catalan company ENHER in 1999, a year after privatisation of the latter. These major financial players have also internationalised over the past two decades, in part thanks to the support of the public authorities[10]: initially in Latin America, where they have developed a very strong presence, but also more recently in the United States, in Europe, China and Africa (Gonzalez and Ramiro, 2014; Palazuelos, 2019).

The major Spanish energy companies have now fully invested in the renewable energy market despite an initial reluctance characterised by statements made against the high costs of these energy sources, that were still being made at the start of the 2010s (El País, 03/11/2013; El Periodico, 11/09/2013; Greenpeace, 14/06/2013). This new strategy allows energy companies to adapt to the various laws aimed at energy transition, and to respond to a growing ecological awareness among citizens (Sanchez-Herrero, 2014; Palazuelos, 2019). Faced with large groups active in renewable production and with oil companies wishing to diversify, small emerging players struggle to exist.

Within this landscape, Iberdrola, which is today one of the global leaders in renewable energy, is a pioneer. In 2019, 54% of its international investments went to renewable production (Iberdrola, n.d.). Between 2019 and 2020, the group increased its global production of energy derived from renewable sources by 14.9% (68 GW), and by 16.8% in Spain (25 GW). In spite of it all, Iberdrola still remains far from its climate objectives: committed to reducing its carbon footprint to 50 gCO_2/kWh in 2030, this was still 110 gCO_2/kWh in 2019, a decrease of 1.8% compared to the previous year (185 gCO_2/kWh and 2015) (Enerdata, 18/02/2020). Iberdrola is particularly transparent about its results, publishing an annual inventory of greenhouse gas emissions calculated on a Scope 3 since 2017, based on the recognized methodology of the *GHG Protocol*, as well an assessment of its activities with regard to the United Nations Sustainable Development Goals (SDGs), in particular SDGs 7 (Affordable and clean energy) and 13 (Climate action) in its (non-financial) annual report (Iberdrola, 2020).

In January 2021, Iberdrola announced the signing of a *power purchase agreement* (PPA), with Danone, regarding the future Francisco Pizarro photovoltaic plant, built by Iberdrola in Extremadura. With a capacity of 590 MW and an investment of €300 million, this photovoltaic power plant will be one of the largest in Europe. One the one hand the agreement guarantees the supply of renewable energy to Danone's Spanish sites, which aim to achieve carbon neutrality by 2050, and on the other hand it provides long-term financing to Iberdrola for its power station (PV-Magazine, 01/22/2021). Resorting to PPAs to ensure outlets for producers and the supply of renewable energy to customers has been a major global trend in recent years (Climate Chance, 2020).

10 Public support from the Spanish State based on fiscal measures, financial support, bilateral and/or multilateral trade agreements, and investment protection agreements with third countries.

• NEWCOMERS TO THE MARKET CHANGE THE RULES OF THE GAME • The large oil groups present in Spain have also recently expressed their "adherence" to the ecological transition and have embarked on renewable energy projects. At the end of 2019 the Spanish association of Petroleum Product Operators (APPO) presented a plan to replace oil with biomass, waste, and hydrogen in order to produce less polluting eco-fuels in its refineries (AOP, 2019). This plan proposes the transformation of eight Spanish refineries – five from Repsol, two from Cepsa and one from BP – into centres to produce fuels made from ecological materials, requiring the State to provide investment incentives and favourable taxation on the consumption of these "eco-fuels".

Repsol, a company that traditionally operates in the oil and gas sector, has also started investing in renewable energy. As of December 2019, Repsol was the first of a long list of major European oil companies to commit to achieving carbon neutrality by 2050 (Repsol, 12/03/2019). An objective that responds to the need to diversify the company's activities in the field of renewable energy production. Repsol has made numerous investments to develop new renewable capacities in Spain. The *Delta* wind farm, located in Aragon and with a power capacity of 300 MW, started injecting electricity into the grid at the end of October 2020. In addition to this first farm, Repsol has begun to deploy *Delta 2*, a megaproject of nearly 900 MW[11] divided into 25 wind farms spread across the provinces of Huesca, Zaragoza and Teruel. During 2020, Repsol also launched construction of the *Kappa* (125 MW) photovoltaic complex in the province of Ciudad Real, and its largest photovoltaic project, *Valdesolar*, in the province of Badajoz (264 MW). (El Periódico de la Energía, 28/10/2020). Like other Spanish energy companies, but also using the same procedures as European oil companies, Repsol is expanding its portfolio of renewable assets abroad by investing in projects that are currently in service, under construction, or in development. For example, Repsol acquired a stake in a joint venture created with Grupo Ibereólica Renovables, giving it access to a portfolio of 1,600 MW renewable projects in Chile by 2025 (Repsol, 23/07/2020).

This strategic turn of the major energy companies on the way to the "energy transition" was accompanied by the emergence of new independent suppliers in the market since 2010 and by legislative revisions on the marketing of energy. These new players are presenting more economical offers focused on renewable energies. Among these suppliers there are energy cooperatives with a high degree of social and environmental concern (Som Energia, Zender, GoiEner, etc.). Still in the early stages of their development, these cooperatives try to cover the energy consumption of their associates, but encounter difficulties in realising their own production projects because of normative barriers (**part 4. C.**). They therefore focus a large part of their work on the commercialisation of electricity, an activity whose low margins limit their expansion potential (Capellan-Perez et al., 2018).

In spite of this, in 2018 22% of consumers that left one of the large traditional companies for another operator, had chosen one of these newcomers (Expansión, 06/05/2019).

11 Power equivalent to that of a "stage 1" nuclear reactor.

3. Developing climate and energy skills – political leverage for local governments in search of regional autonomy

The division between regional and central expertise was always a bone of contention in Spain, which grants significant political financial autonomy to the 17 Autonomous Communities (ACs) which have made up the country since the Constitution of 1978. Among these, the Basque Country and Catalonia enjoy special tailor-made regimes that recognise their cultural identity. In this capacity, CAs each have a legislature and government. The CAs have exclusive legislative and executive powers in all matters relating to social services, agriculture and animal husbandry, inland fishing, industry, commerce, tourism, youth, and sports. On the other hand, they are empowered to enact the fundamental basic legislation of the central State, as well as to implement environmental legislation, economic policy, consumer protection, education, and health (administracion.gob.es).

National strategies on climate change[12] set various targets to establish regional and local emission reduction strategies, accompanied by annual reports in order to measure the impact. In terms of the fight against climate change, powers are therefore shared: the central state is responsible for establishing basic legislation and the CAs for applying them in their territories and for putting in place additional protection rules. This organisation of governance in practice leads at times to conflicts of interpretation regarding the scope of the powers at each level (Pérez Gabaldón, 2013).

At the regional level, the first Autonomous Communities to have developed climate strategies were Andalusia, the Balearic islands, Galicia, and Madrid, followed a year later by remaining regions between 2008 and 2009. Almost all regions now have a regional public policy advisory body for climate change mitigation and adaptation, although with varying degrees of responsibility. Among the most important, may be cited the Oficina Catalana de Cambio Climático (OCCC) in Catalonia, the Centro Vasco para el Cambio Climático (BC3-Klima Aldaketa Ikergai) in the Basque country, and Portal Andaluz de Cambio Climático in Andalusia. Led by multidisciplinary scientists and funded by the Ministry of Science, Innovation and Universities, the BC3 is undoubtedly the most comprehensive organization at the regional level, whose role of providing advice, information and public policy evaluation can be compared, at the national level, to the United Kingdom-wide Committee on Climate Change, or to the Haut Conseil pour le Climat in France.

Catalonia, Andalusia, and the Balearic Islands are the only Autonomous Communities to have passed a climate change law (in 2017, 2018, and 2019 respectively). Most recently, Law 10/2019 of February 22, 2019 on climate change and the energy transition of the Balearic Islands recognizes its territory as the most dependent on external energy and with the lowest renewable electricity production capacities. The law therefore provides, notably, for the gradual closure of thermal power plants[13], the obligation to install solar panels in large car parks and on new buildings, as well as public and private sector energy efficiency measures (public lighting, reduction of the carbon footprint of companies). Among its objectives, the law also endeavours to "promote the energy democratisation of citizens" with the aim of guaranteeing citizens, as well as consumers and producers, access to energy through the development of energy communities: this objective, enshrined in European Community law, is now included in the national-level Law on Climate Change and Energy Transition.

In Catalonia, the adoption of a law on climate change by the Generalitat de Catalunya also serves the purposes of energy autonomy of the region, in line with its desire for political independence. Law 16/2017 was amended and completed in November 2019 by Royal Decree 16/2019 on measures

12 Until 2020 this was the Estrategia española de cambio climático y energía limpia, horizonte 2007-2012-2020, now relayed by the Estrategia a Largo Plazo para una Economía Española Moderna, Competitiva y Climáticamente Neutra in 2050.

13 The Es Murterar power station as well as the Maó, Eivissa and Formentera power stations.

against the climate emergency and the promotion of renewable energies. The decree notably provided for a schedule for reducing the Autonomous Community's GHG emissions: - 40% in 2030, - 65% in 2040 and - 100% in 2050. On the energy front, Catalonia then decided to ban hydraulic fracturing and obtain an energy mix without fossil or nuclear energy in 2050, using 100% renewable energies (DECRET LLEI 16/2019, of 26 of November 2019). But in the summer of 2019, the Constitutional Court of Spain censured 15 articles of the law, considering that the Catalonian regional Government did not have the power to set emission reduction or energy transition targets (Rodríguez Beas, 2019). By contrast, it approved the establishment of a regional carbon tax on motor vehicles, the law of which shifts income equally towards a Climate Fund on the one hand and a Natural Heritage Fund on the other.

Finally, Law 8/2018 on measures against climate change and on the transition to a new energy model in Andalusia has largely enabled the development of the body of standards and the institutional fabric for climate change in the Community. An Interdepartmental Commission on Climate Change was created by decree in March 2020, responsible for driving, coordinating, and monitoring the implementation of climate policies, while an Andalusian Climate Council (*Consejo Andaluz del Clima*) will serve as a forum of participation for local administrations, businesses, environmental associations and trade unions. In accordance with the Law of 8/2018, an Andalusian Plan of Action for Climate (APAC) for the period 2021-2030 was adopted in October 2020. The APAC sets the strategic objectives on mitigation, adaptation and on communication/participation, and lists sectoral emission reduction targets (transport, industry, buildings, etc.), together with an overall emission reduction of 39% in 2030, as compared to 2005. For each sector, "strategic lines" are then defined describing the measures to be taken to achieve these objectives. In terms of energy, the town of Cádiz, the third largest municipality in the Community, sets the example (**cf. case study**). Finally, there is a system for calculating the carbon footprint of Andalusian municipalities on the Andalusian Parliament website, the latest data of which date back to 2016.

The Spanish City Network for the Climate Network (*Red Española de Ciudades por el Clima, RECC*) is a branch of the Spanish Federation of Cities and Provinces (*Federación Española de Municipios y Provincias*, FEMP) formed in 2005 by cities that integrate climate change mitigation and adaptation into regional policies. RECC wishes to be the coordinating instrument of towns committed to the climate, by helping to articulate and deploy local strategies (urbanism, waste management, water management, mobility and urban transport, among others) and by translating national policy objectives on climate change and energy management to the local level. It serves as a platform for sharing knowledge and good practices, for meeting stakeholders and offers technical assistance to participating municipalities. For example, it offered them a methodology for calculating and reporting the carbon footprint of cities (FEMP, RECC, 2016). The network comprises 315 "local entities" (all types combined) representing more than 29 million inhabitants, or nearly 60% of the Spanish population (the goal of the national strategy is to achieve 80%).

Cadiz - Spain

CASE STUDY

CITY PROFILE

Population: 120,000 inhabitants
Mitigation target: reducing emissions by 40% compared with baseline 2030 scenario
Emissions in 2016: 305,681 tCO_2/year (2016)

The case of Cádiz, at the forefront of the municipalisation of energy

A port city of 120,000 inhabitants located in the south of Andalusia, capital of the eponymous province (1,200,000 inhabitants), Cádiz is considered a model of municipal energy policy in Spain and in Europe. A signatory to the Covenant of Mayors for Energy and Climate in Europe since its launch in 2009, Cádiz then committed to reducing its emissions by 21% in 2020, as compared to 2007. Though no results were reported, the city announced the publication of an adaptation plan and an action plan in favour of sustainable energy and the climate (APSEC) and the update of its emissions inventory at the end of 2021, with a target of reducing emissions by 40% by 2030. In 2016, it was estimated hat the city's carbon footprint amounted to 305,681 tCO_2/year.

Participatory municipalisation of energy

The originality of Cádiz is based on the existence, since 2000, of the largest semi-public electricity distribution and supply company in the country, Eléctrica de Cádiz (EdC), the capital of which is 55% owned by the municipality (the rest by Endesa and Unicaja Bank).

Since 2015, EdC has encouraged the active participation in the public management of electricity through the organisation of round tables on energy transition (MTEC) and against energy poverty (MCPE). It was a decision by an MTEC that led EdC to supply certified 100% renewable electricity, thanks to guarantees of origin. This performance allows EdC to claim a reduction of 58,500 tCO_2/year.

Cádiz struggled for a long time to develop the production of electricity from renewable energy on its territory, even though the city benefited from one of the highest levels of sunshine in Europe – conducive to the development of photovoltaics. EdC does not produce its own energy and does not directly invest in renewable generation capacities. But it has encouraged self-consumption since 2018. In January 2020, a 50% exemption from the property tax was implemented by the municipality for all housing and premises which installed photovoltaic panels for their own consumption, in addition to a 95% reduction in the tax on constructions, installations and works (Cádiz + Cerca, 02/21/2021).

The fight against energy poverty

Since 2015, the fight against energy poverty has become a priority for the government "del cambio", an alliance of the two coalitions "Ganemos Cádiz" and "Cádiz sí se puede". Hard hit by the economic crisis of 2008, Cádiz then had one of the highest unemployment rates in Europe (30%). A diagnosis revealed the municipality's energy waste and citizens' lack of understanding of their energy bills. The new majority therefore launched a first "Shock plan against energy poverty". Three editions of this plan made it possible to provide personalised follow-up to 2,218 families, the organisation of 155 workshops on energy savings and the understanding of electricity bills (in which 1,670 people participated, including households suffering energy poverty) (ESEficiencia, 03/03/2020). In 2017, an MCPE led to the adoption of a social tariff (*Bono Social Gaditano*), funded in equal parts by the municipality and EdC to reduce the energy bills of the most impoverished families (El Periódico de la Energía, 07/01/2017).

In November 2020, EdC signed a new agreement with the municipality of Cádiz and the social services to establish the "Annual Energy Coverage" (*Cobertura Energética Anual* – CEA), a new aid intended to guarantee minimum access to energy to the neediest families who struggle to pay their bills. In return for this measure, which was trialled for a year in 30 families during a pilot phase, each beneficiary household must attend a training workshop on energy efficiency. The CEA also offers EdC a new pricing rationale for consumers. Indeed, there is a national social tariff to which each of the country's 500 electricity suppliers contributes, but only a handful of "Benchmark suppliers" are entitled to distribute, thus favouring large national suppliers at the expense of municipal companies.

Sources: *Eléctrica de Cádiz*

4. The Spanish political ecology is reinventing itself at the time of the climate emergency

• SPANISH POLITICAL ECOLOGY, A HISTORICALLY WEAK MOVEMENT • Spanish society has not seen any major environmental or climate protection movements. The main action and mobilisations for the environment were historically led by a small number of actors, each with a specialisation and a specific repertoire of action. Five NGOs dominate the landscape: Greenpeace, with its advocacy campaigns and institutional lobbying; WWF, rather focused on biodiversity; Save Your Life and Friends of the Earth, focused on citizen energy initiatives; and Ecologistas en Acción which, since 1998, has acted as a confederation of Spanish political ecology movements by bringing together more than 300 domestic activist groups. The last two have had a long history of legal action in various conflicts.

The militant approach of these actors is based on the notion of "social ecology" which sees in the models of production and globalised capitalist consumption the origin of environmental problems. Their actions are linked to the economic problems encountered in Spain, such as the fight against speculation in town planning, long one of the main vectors of economic growth. Historically, political ecology in Spain has suffered from a weak ability to mobilise citizens, and from scant parliamentary influence because of two factors: ecology ranks fairly low in public debate, and the bipartite parliamentary system hampers the access of small parties to national representation. As a result, there is no historical green party in Spain with national parliamentary representation, as is the case for most of its European neighbours. Only the young EQUO party, born in 2011 at the dawn of the 15M social movement, succeeded in entering the Spanish parliament as part of a coalition of left-wing parties in the general elections.

Spain has at any rate experienced two major historical periods of mobilisation on energy and the environment, for different reasons. At the end of the 1970s, while Spain's ambition was to expand its civilian base and gain access to nuclear weapons, local anti-militarist protests movements which were also hostile to the construction of second-generation power plants gathered under the banner of the *State Antinuclear Coordinator* (*Coordinadora Estatal Antinuclear* – CEAN). Founded in 1977, it would operate until the start of the 1990s, totalling up to 52 member associations in 1984, and playing an important role in the signing of the Nuclear Non-Proliferation Treaty by the Spanish Socialist Workers' Party (*Partido Socialista Obrero Español* – PSOE) in 1987. Created in the same year as the CEAN, the Ecological Movement Federation (*Federación del Movimiento Ecologista*), which brings together antinuclear militants, communists, anarchists, and even naturalist ornithologists, will prove to be too disjointed to function. Since 1998, it is Ecologistas en Acción which has played the role of a confederation of Spanish political ecology movements (Ecologistas en Acción, 01/09/2018). The second important period, which is more recent, can be identified with the "Greta effect" which, since 2019, has helped sprout a new ecological awareness focused on the climate crisis in Spanish society, particularly among the youth. Spain has not been free form the global civil disobedience movements led by Extinction Rebellion and the climate marches initiated by Fridays for Future, with Youth for climate (*Juventud por el* clima). In its breadth and wider reach throughout society, this second period surpasses the historical Spanish environmental movement (Sánchez, MJ, 2005; López Ruiz, JJ , 2013; Ecologistas en Acción, 05/15/2018; interview with Hector Tejero Franco, climate change activist and Spanish politician from the Mas Madrid party, 09/23/2020).

The mobilisations for climate bring a new dimension to this subject in ecological debates, and they diversify its collective action. Created in 2008 under the name Coalición Clima before being renamed in 2015, Alianza por el Clima (The Climate Alliance) was until then the main collaboration platform for citizen movements and civil society organisations on the subject of the climate in

Spain. Today it brings together more than 400 organisations coming from environmental activism, trade unionism, cooperation in development, research, and consumer protection. There are local branches of well-known international organisations (350Barcelona, Amigos de la Tierra, WWF, Oxfam, etc.) as well as organizations representing Spanish social and environmental movements. Its activities revolve around three main courses of action: to inform and to raise awareness on the effects of climate change, to encourage changing habits and consumption practices, and to mobilise pressure from citizens.

With regard to the energy transition in particular, the Fundación Renovables has set itself the task of "*making up for the enormous information gap that exists [in Spain] on energy in general and on renewable energies in particular.*" Created in 2010, it leads, for that purpose, a Renewable Energy Observatory (*Observatorio de las energías renovables*) which acts as a monitoring and information platform on the progress of these energies in Spain and around the world. Its Energía4all programme offers free courses and training on climate change and energy, urban air pollution, and even energy self-consumption..

• JUST TRANSITION BRINGS TRADE UNIONISM INTO THE ENERGY DEBATE. • Like the parties, Spanish trade unionism, though deeply rooted in the national political landscape, has hardly explored the issues of ecology. A structural unemployment rate above the European average and massive deindustrialisation have arguably, in this respect, focused attention on the economic challenges.

In the context of the energy transition, however, the unions have adopted the defence of a "just transition" over the past few years, as expressed by the guidelines defined in 2016 by the International Labour Organisation (ILO, 2016). Indeed, jobs in regions affected by the closure of coal-fired power stations and mining basins, as well as nuclear power stations, are particularly vulnerable. If the NIECP foresees a rise in employment of 1.6% in 2030, the issue of retraining workers in factories affected by the plans of closure and economic conversion in the affected regions remains no less urgent at the time of closure of many thermal power plants.

In 2020, trade unions and the government reached a just transition agreement which, with EDP joining this agreement in March 2021, now covers all thermal power plants in Spain. In particular, the government has undertaken to present a plan supporting the training and professional integration of plant and auxiliary workers, in order to align training plans with the needs of new applicants from the sector. Thanks to the degree of consensus reached between the stakeholders, the government has prided itself on a "pact that is unique in the world" (MITECO, 24/03/2021). In particular, the agreement provides for the design of "just transition conventions" which, at the cantonal level (*comarcas*), must propose plans for the transition of employment and the maintenance of economic activity. Twelve just transition conventions exist today and according to the last update in November 2020, 1,534 proposals and ideas have been submitted in the most affected regions: Aragón, Asturias, Castilla-León, Andalucía, and Castilla la Mancha (MITECO, 2020c).

The Coal Regions in Transition Initiative , born out of the European Commission launched in 2017, has selected Asturias among the regions to receive its technical assistance. Unlike the other regions, none of the companies operating coal power plants in Asturias had proposed an employment transition plan when they closed in June 2020 (La Voz de Asturias, 25/06/2020).

However, unions to the right of the political spectrum remain hostile to the announced plans for the energy transition. Thus, the "anticommunist" union Solidaridad, close to the Vox party, which is classified as extreme right, opposed the LCCET and called for the reindustrialisation of Spain by supporting the chemical and refining sectors, as reported by Vox press organ *La Gaceta de la Iberosfera* (La Gaceta de la Iberosfera, 14/05/2021).

• ENERGY COOPERATIVES – AN ALTERNATIVE TO THE LARGE ENERGY COMPANIES •

Like its European neighbours, and opposite to the oligopolistic situation of the electricity market, Spain has seen a boom in energy cooperatives in recent years. Joined within the Unión Renovables, the 19 Spanish cooperatives now claim more than 100,000 corporate members, with the right to participate in the capital of the organisation and the right to vote on their board of directors, independently of the size of their capital ownership. In addition to functioning democratically, the cooperatives offer a certified and 100% renewable electricity supply, and some even invest directly in local production capacity.

Founded in 2010 at Gerona in Catalonia, with the intention of targeting mainly the domestic market and small to medium-sized companies, Som Energia counts as one of the pioneers of the genre. With more than 70,000 cooperative members (*socios*) and 127,000 contracts, it now operates throughout Spain. In addition to its electricity commercialisation activities, in 2015 the cooperative launched the *Generation kWh* project which allows members of the cooperative to invest in "energy shares" in exchange for a remuneration in the form of a reduction in the energy bill during the entire lifetime of the facilities built thanks to this financing. Two renewable photovoltaic energy projects are already operational thanks to this device, which has collected the contributions of more than 4,500 people, to the amount of €4.3 M: the solar power plant of Alcolea del Río, in Seville, and that of Fontivsolar, in Fontiveros, produce a total of 5 GW/year. A third project, the La Serra solar power plant at Anglesola, is in preparation. In total, all of the projects in operation owned by Som Energia (solar, hydroelectric, and biogas) produce 18.5 GW/year, or the equivalent of the consumption of 7,400 households.

Throughout the country, other cooperatives operate at a regional level only, sometimes with just a few hundred members: GoiEner in the Basque country and in Navarra, Nosa Enerxia in Galicia, or La Solar in the Murcia region. One remarkable case is the autonomous community of Valencia, which has no less than nine distinct cooperatives.

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