Technology Collaboration Programme
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International Energy Agency
Photovoltaic Power Systems Programme

Task 1 Strategic PV Analysis and Outreach

PVPS

National Survey Report of PV Power Applications in Spain 2020

UNEF
Unión Española Fotovoltaica

What is IEA PVPS TCP?

The International Energy Agency (IEA), founded in 1974, is an autonomous body within the framework of the Organization for Economic Cooperation and Development (OECD). The Technology Collaboration Programme (TCP) was created with a belief that the future of energy security and sustainability starts with global collaboration. The programme is made up of 6.000 experts across government, academia, and industry dedicated to advancing common research and the application of specific energy technologies.

The IEA Photovoltaic Power Systems Programme (IEA PVPS) is one of the TCP's within the IEA and was established in 1993. The mission of the programme is to "enhance the international collaborative efforts which facilitate the role of photovoltaic solar energy as a cornerstone in the transition to sustainable energy systems." In order to achieve this, the Programme's participants have undertaken a variety of joint research projects in PV power systems applications. The overall programme is headed by an Executive Committee, comprised of one delegate from each country or organisation member, which designates distinct 'Tasks,' that may be research projects or activity areas.

The IEA PVPS participating countries are Australia, Austria, Belgium, Canada, Chile, China, Denmark, Finland, France, Germany, Israel, Italy, Japan, Korea, Malaysia, Mexico, Morocco, the Netherlands, Norway, Portugal, South Africa, Spain, Sweden, Switzerland, Thailand, Turkey, and the United States of America. The European Commission, Solar Power Europe, the Smart Electric Power Alliance (SEPA), the Solar Energy Industries Association and the Cop- per Alliance are also members.

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What is IEA PVPS Task 1?

The objective of Task 1 of the IEA Photovoltaic Power Systems Programme is to promote and facilitate the exchange and dissemination of information on the technical, economic, environmental and social aspects of PV power systems. Task 1 activities support the broader PVPS objectives: to contribute to cost reduction of PV power applications, to increase awareness of the potential and value of PV power systems, to foster the removal of both technical and non-technical barriers and to enhance technology co-operation. An important deliverable of Task 1 is the annual "Trends in photovoltaic applications" report. In parallel, National Survey Reports are produced annually by each Task 1 participant. This document is the country National Survey Report for the year 2020. Information from this document will be used as input to the annual Trends in photovoltaic applications report.

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COVER PICTURE

Statkraft, Talayuela Solar Plant, Cáceres

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1 INSTALLATION DATA

The PV power systems market is defined as the market of all nationally installed (terrestrial) PV applications with a PV capacity of 40 W or more. A PV system consists of modules, inverters, batteries and all installation and control components for modules, inverters and batteries. Other applications such as small mobile devices are not considered in this report.

For the purposes of this report, PV installations are included in the 2020 statistics if the PV modules were installed and connected to the grid between 1 January and 31 December 2020, although commissioning may have taken place at a later date.

1.1 Applications for Photovoltaics

Solar PV develops in Spain mainly in ground mounted utility-scale plants. The available land, the good solar resource and the competitiveness of the technology made PV the most installed technology at the utility scale segment in 2020.

In addition, almost all the newly installed PV capacity (2,812 MW DC) did not receive any public support program. That is, it was financed thanks to PPAs, making Spain the leading European market in this type of contracts.

Besides from utility-scale PV, there is a growing self-consumption market (above 700 MW DC in 2020) supported mainly by industrial and commercial segments. The current framework was completed in 2020 and eliminated old barriers, that made some installations go off grid in the past, so now almost all installations are on-grid.

Floating PV is starting to deploy with the first MW size plant commissioned in 2020. Agri PV is a step behind but is catching up fast, impulsed by the intense agriculture activity in Spain.

1.2 Total photovoltaic power installed

Table 1: Annual PV power installed during calendar year 2020

		Installed PV capacity in 2020 [MW]	AC or DC
	Decentralized	701	DC
	Centralized	2,813	DC
	Off-grid	14	DC
	Total	**3,528**	**DC**

Centralized data is published by the Spanish TSO (REE). Decentralized and off grid data are UNEF's estimations. The estimates are result of a request of information to installers and components distributors present in those segments and is validated by experts in the Spanish solar PV sector.

Table 2: PV power installed during calendar year 2020

			Installed PV capacity [MW]	Installed PV capacity [MW]	AC or DC
Grid-connected	BAPV	Residential	701	136	DC
		Commercial		164	DC
		Industrial		401	DC
	BIPV	Residential	0		
		Commercial			
		Industrial			
	Utility-scale	Ground-mounted	2,813	2,812	DC
		Floating		1	DC
		Agricultural			
Off-grid		Residential	14	14	DC
		Other			
		Hybrid systems			
Total			**3,528**		DC

Table 3: Data collection process

If data are reported in AC, please mention a conversion coefficient to estimate DC installations.	Data are in DC
Is the collection process done by an official body or a private company/Association?	For utility-scale, official data are published by Spanish TSO already in DC. For decentralized and off-grid data, it is an estimation done by UNEF in AC and then transformed to DC using a conversion factor of 1.2.
Link to official statistics (if this exists)	https://www.ree.es/es/datos/generacion (utility-scale)

Table 4: The cumulative installed PV power in 4 sub-markets

Year	Off-grid [MW]	Grid-connected distributed [MW]	Grid-connected centralized [MW]	Total [MW]
2010			3.829	3.829
2011			4.233	4.233
2012			4.532	4.532
2013			4.638	4.638
2014	5	10	4.646	4.661
2015	10	19	4.678	4.707
2016	26	53	4.683	4.762
2017	71	141	4.685	4.897
2018	149	298	4.712	5.159
2019	163	999	8.913	10.075
2020	177	1.700	11.725	13.602

Table 5: Other PV market information

	2020
Number of PV systems in operation in your country	62,225
Decommissioned PV systems during the year [MW]	0
Repowered PV systems during the year [MW]	0

Table 6: PV power and the broader national energy market

	Data	Year
Total power generation capacities [GW]	110,756	2020
Total renewable power generation capacities (including hydropower) [GW]	63,050	2020
Total electricity demand [TWh]	250	2020
New power generation capacities installed [GW]	4,331	2020

	Data	Year
New renewable power generation capacities (including hydropower) [GW]	4,331	2020
Estimated total PV electricity production (including self-consumed PV electricity) in [TWh]	23	2020
Total PV electricity production as a % of total electricity consumption	9,2%	2020
Average yield of PV installations (in kWh/kWp)	1,646	2018

1.3 Key enablers of PV development

During 2020 the government elaborated the storage and the green hydrogen strategies with the aim of increasing the development of these two technologies in the upcoming years. However, regarding storage, there is not public information (nor any possible way to estimate it) of installed capacities. Regarding green H2, several projects have requested aids from the government within the national recovery plan. There are 88,538 electric vehicles of which 41,513 were new sales in 2020. The Spanish government has estimated that there are 8.5 million residential heat pumps.

2 COMPETITIVENESS OF PV ELECTRICITY

2.1 Module prices

Table 7: Typical module prices

Year	Lowest price of a standard module crystalline silicon	Highest price of a standard module crystalline silicon	Typical price of a standard module crystalline silicon
2020	-	-	0.23 €/Wp

Average price for a 10-50 MW facility.

2.2 System prices

Table 8: Turnkey PV system prices of different typical PV systems

Category/Size	Typical applications and brief details	Current prices [€/W]
Residential BAPV 5-10 kW	Grid-connected, roof-mounted, distributed PV systems installed to produce electricity to grid-connected households. Typically roof-mounted systems on villas and single-family homes.	1.3-1.7
Small commercial BAPV 10-100 kW	Grid-connected, roof-mounted, distributed PV systems installed to produce electricity to grid-connected commercial buildings, such as public buildings, multi-family houses, agriculture barns, grocery stores etc.	0.7-0.9
Large commercial BAPV 100-250 kW	Grid-connected, roof-mounted, distributed PV systems installed to produce electricity to grid-connected large commercial buildings, such as public buildings, multi-family houses, agriculture barns, grocery stores etc.	0.65-0.85
Industrial BAPV >250 kW	Grid-connected, roof-mounted, distributed PV systems installed to produce electricity to grid-connected industrial buildings, warehouses, etc.	0.6-0.8
Small centralized PV 1-20 MW	Grid-connected, ground-mounted, centralized PV systems that work as central power station. The electricity generated in this type of facility is not tied to a specific customer and the purpose is to produce electricity for sale.	0.55-0.75
Large centralized PV >20 MW	Grid-connected, ground-mounted, centralized PV systems that work as central power station. The electricity generated in this type of facility is not tied to a specific customer and the purpose is to produce electricity for sale.	0.5-0.55

Table 9: National trends in system prices for different applications

Year	Residential BAPV Grid-connected, roof-mounted, distributed PV system 5-10 kW **[€/W]**	Small commercial BAPV Grid-connected, roof-mounted, distributed PV systems 10-100 kW **[€/W]**	Large commercial BAPV Grid-connected, roof-mounted, distributed PV systems 100-250 kW **[€/W]**	Centralized PV Grid-connected, ground-mounted, centralized PV systems 10-50 MW **[€/W]**
2020	1.50	0.80	0.75	0.65

2.3 Financial Parameters and specific financing programs

Table 10: PV financing information in 2020

Different market segments	Loan rate [%]
Average rate of loans – residential installations	6%
Average rate of loans – commercial installations	3.5%
Average cost of capital – industrial and ground-mounted installations	2.5%

2.4 Specific investments programs

Utilities, independent retailers and big self-consumption installers have acquisition or leasing programs easing the installation of PV rooftop. The company bears the investment, builds the facility (or contracts it to a third party) that is then repaid through a monthly fee paid by the consumer/ client. Once the facility is repaid, the consumer/ client becomes the owner of the facility but before that, the owner is the installer.

2.5 Additional Country information

Table 11: Country information

Retail electricity prices for a household [c€/Wh]	19.2
Retail electricity prices for a commercial company [c€/Wh]	13.8
Retail electricity prices for an industrial company [c€/Wh]	8.2
Liberalization of the electricity sector	The electricity sector is liberalized since 1997 and retail was separated from distribution network ownership in 2009. There are more than 440 retailers.

3 POLICY FRAMEWORK

This chapter describes the support policies aiming directly or indirectly to drive the development of PV. Direct support policies have a direct influence on PV development by incentivizing or simplifying or defining adequate policies. Indirect support policies change the regulatory environment in a way that can push PV development.

Table 12: Summary of PV support measures

Category	Residential		Commercial + Industrial		Centralized	
Measures in 2020	**On-going**	**New**	**On-going**	**New**	**On-going**	**New**
Feed-in tariffs	-	-	-	-	-	-
Feed-in premium (above market price)	-	-	-	-	-	-
Capital subsidies	-	Yes	-	Yes	-	Yes
Green certificates	-	-	-	-	-	-
Renewable portfolio standards with/without PV requirements	-	-	-	-	-	-
Income tax credits	-	-	-	-	-	-
Self-consumption	Yes	-	Yes	-	-	-
Net-metering	-	-	-	-	-	-
Net-billing	Yes	-	Yes	-	-	-
Collective self-consumption and delocalized net-metering	Yes	-	Yes	-	-	-
Sustainable building requirements	-	Yes	Yes	-	-	-
BIPV incentives	-	-	-	-	-	-
Local tax exemptions	Yes	-	Yes	-	-	-

3.1 National targets for PV

There is not a mandatory target but the National Climate and Energy Plan 2021-2030 foresees 39,181 MW of solar PV in 2030.

3.2 Direct support policies for PV installations

3.2.1 Specific remuneration regime

The support scheme for renewables called “specific remuneration regime” approved by Royal Decree 413/2014 is still in place for existing plants (built before 2019). In this scheme, this

specific remuneration is defined as a complementary retribution to the wholesale market in order to allow renewable technologies to achieve a "reasonable profitability".

This "reasonable profitability" is defined as the retribution on the electricity generation activity that a well-managed renewable plant would have. In order to determine the regulated incomes to be given, a set of theoretical standard installations with standard costs was developed. Current reasonable profitability values are:

- 7.09% for 2020-25 for plants built after retroactive reform of 2013.
- 7.4% for 2020-31 for plants built before retroactive reform of 2013 if they renounce to international arbitration processes.

3.2.2 Investment grants for ground mounted PV in Canary and Balearic Islands

To foster development of renewables in the islands, investment grants were given through auctions celebrated in 2020 both to Balearic and Canary Islands projects. In the Canary Islands 65 PV projects with a total power of 255 MW were awarded grants and in the Balearic Islands there were awarded 44 PV projects with a total power of 168 MW.

3.2.3 BIPV development measures

There are no specific policies for BIPV promotion.

3.3 Self-consumption measures

Table 13: Summary of self-consumption regulations for small private PV systems in 2020

PV self-consumption	1	Right to self-consume	Yes
	2	Revenues from self-consumed PV	Savings on the electricity bill
	3	Charges to finance Transmission, Distribution grids & Renewable Levies	No
Excess PV electricity	4	Revenues from excess PV electricity injected into the grid	Yes. The wholesale market price at that hour
	5	Maximum timeframe for compensation of fluxes	Month
	6	Geographical compensation (virtual self-consumption or metering)	Only nearby PV facilities (not virtual)
Other characteristics	7	Regulatory scheme duration	Not limited by regulation
	8	Third party ownership accepted	Yes
	9	Grid codes and/or additional taxes/ fees impacting the revenues of the prosumer	No
	10	Regulations on enablers of self-consumption (storage, DSM…)	Yes
	11	PV system size limitations	No

	12	Electricity system limitations	Network access permits are required for PV rooftop facilities above 15 kW if they inject excess electricity to the grid
	13	Additional features	

3.3.1 Investment grants for PV rooftop

During 2020 most autonomous communities held PV rooftop promotion programs that awarded a fraction of the investment to PV rooftop facilities.

3.3.2 Local taxes exemptions

Most municipalities have local taxes exemptions to promote PV self-consumption. These include property tax, construction tax and economic activities tax.

3.3.3 Simplified permitting

Eleven (out of 17) autonomous communities passed legislation to exempt PV rooftop facilities from obtaining construction work license.

3.4 Collective self-consumption, community solar and similar measures

Collective self-consumption is legal in Spain but there are no specific measures to promote it.

3.5 Tenders, auctions & similar schemes

3.5.1 Renewable auctions

During 2020 the Spanish Government developed a new regulatory framework for celebrating renewable auctions and approved a calendar establishing minimum capacities to be auctioned up to 2025. The first auction was held in January 2021.

The scheme grants a fixed price (pay-as-bid) for the energy generated during 12 years for a certain capacity. In the first auction the Government followed a mixed design between technology specific and neutral. It pre assigned 1,000 MW to PV, 1,000 MW to wind and left 1,000 MW to be auctioned in neutrality, that were won by PV.

The scheme modifies the purchasing price of the agents in the market, so after the wholesale market clearance the selling units that won the auction receive their awarded price and there is no need to finance it outside through charges or taxes.

It is not compulsory. The Ministry for the Ecologic Transition announces how much capacity is auctioning and the counterpart is the electricity system in general, as it affects the purchasing price of the wholesale market players.

It is similar to extract the energy generated by the plants of the auction out of the marginal price formation of the wholesale market. Thus, as the auction had lower prices than the market, the electricity price seen by consumers is reduced thanks to renewables.

3.5.2 PPA risk hedge

In addition, the Government approved in 2020 new legislation to reduce the electricity costs of big consumers obliging these agents to sign renewable PPAs. The scheme introduces exemptions for big consumers on the payment of certain electricity charges conditioned to the signature of a renewable PPA for 10% of their consumption. To ease the signature of these PPAs, a public insurance company will cover the risks of the PPA.

3.6 Other utility-scale measures including floating and agricultural PV

There are no specific measures to promote or develop floating and agricultural PV.

3.7 Social Policies

There are no social policies related to PV.

3.8 Retroactive measures applied to PV

There were no retroactive measures applied to PV in 2020.

3.9 Indirect policy issues

3.9.1 Rural electrification measures

Rural and remote areas are connected to the grid.

3.9.2 Support for electricity storage and demand response measures

Some autonomous communities included behind the meter storage in their self-consumption capital grant program in 2020.

3.9.3 Other support measures

Some autonomous communities introduced self-consumption working groups in 2020 to ease the implementation of PV rooftop in their regions.

3.10 Financing and cost of support measures

Specific remuneration regime is financed through charges in the electricity tariff. Grant subsidies are partially financed thanks to the European Regional Development Fund of the EU. Local taxes exemptions are financed by the municipalities.

4 INDUSTRY

4.1 Production of feedstocks, ingots and wafers (crystalline silicon industry)

Table 14: Silicon feedstock, ingot and wafer producer's production information for 2020

Manufacturers (or total national production)	Process & technology	Total Production	Product destination	Price
-	Silicon feedstock [Tonnes]	0		
-	sc-Si ingots. [Tonnes]	0		
-	mc-Si ingots [Tonnes]	0		
-	sc-Si wafers [MW]	0		
-	mc-Si wafers [MW]	0		

4.2 Production of photovoltaic cells and modules (including TF and CPV)

Module manufacturing is defined as the industry where the process of the production of PV modules (the encapsulation) is done. A company may also be involved in the production of ingots, wafers or the processing of cells, in addition to fabricating the modules with frames, junction boxes etc. The manufacturing of modules may only be counted to a country if the encapsulation takes place in that country.

Total PV cell and module manufacture together with production capacity information is summarised in Table below.

Table 15: PV cell and module production and production capacity information for 2020

Cell/Module manufacturer (or total national production)	Technology (sc-Si, mc-Si, a-Si, CdTe, CIGS)	Total Production [MW]		Maximum production capacity [MW/yr]	
		Cell	Module	Cell	Module
Wafer-based PV manufactures					
Escelco		0	1,5	0	35
Thin film manufacturers					
-		0	0	0	0
Cells for concentration					
BSQ Solar		0	0,11148	0	2,5
Totals		**0**	**1,61148**	**0**	**37,5**

4.3 Manufacturers and suppliers of other components

Spain has a strong position in the photovoltaic manufacturing chain with companies with their own technology in the elements with the highest added value of the value chain (power electronics, trackers, structures, design, EPC, promoters) and with leading companies worldwide, especially in the manufacture of solar trackers and inverters.

However, it remains in Spain a belief of PV as a foreign technology is maintained, by identifying the sector exclusively with the panels, although these represent only 35% of the cost of the project. Although it is true that the vast majority of the panels are produced abroad (in Asia), the other equipment, 65% of the cost of the project, can be covered by Spanish companies.

Pannels	Trackers	Structure	Inverters	Switching	Transformer	Batteries
Atersa Aurinka BSQ Solar Escelco Ferrosolar (Silicio) Mondragón Asse. Onyx Solar	Braux BSQ Solar Trina (Nclave) Praxia PVH Soltec Stansol STI Norland	Alusín solar Braux Csolar Gonvarri solar Imedexsa INSO Aluminios Isigenere Magon Nclave Praxia PVH Solarstem Soltec Stansol STI Norland Sunfer Energy	GP Tech Ingeteam JEMA Energy Pwr. Electronics Zigor	Gave Ormazábal	DF Electric Eremu Faramax IESA IMEFY Ormazábal Suesa	Ampere Energy Cegasa Exide Tech. Hydra Redox Zigor

By components, Spain has two of the ten largest inverter manufacturers in the world and four of the ten largest manufacturers of solar trackers (previously there were five, but Nclave was bought by Trina, the Chinese manufacturer of modules). It should be noted that these companies have gained this current position when in Spain there was no domestic market that would provide demand for their equipment, that is, competing internationally and focusing exclusively on exports. All structures are manufactured in Spain and part of the production is exported.

Regarding the manufacture of modules, there are initiatives that can be consolidated, such as the Escelco factory in León that came into operation in 2020 and new projects such as the announced PERC module factory to be built in Seville with the capacity to manufacture 5 GW per year. In this sense, the SolarPower Initiative should also be mentioned, an alliance of companies and associations that promotes the growth of the manufacturing capacity of Made in Europe modules to reach 20 GW in 2025.

Likewise, Spain is a leader in promoters, engineering companies and EPC (Prodiel, a Sevillian company is the third largest solar EPC worldwide), companies that carry out projects by hand, to order, related to engineering, acquisitions or construction. In services, Spanish advisers and consultants, with the know-how acquired in Spain, provide added value throughout the world by helping to exploit the knowledge economy. These companies also serve as a spearhead for the rest of the Spanish industry when it comes to exporting.

5 PV IN THE ECONOMY

This chapter aims to provide information on the benefits of PV for the economy.

5.1 Labour places

Table 16: Estimated PV-related full-time labour places in 2020

Market category	Number of full-time labour places
Research and development (not including companies)	ND
Manufacturing of products throughout the PV value chain from feedstock to systems, including company R&D	5,483
Distributors of PV products and installations	1,125
Other	10,158
Total	**16,766**

5.2 Business value

Table 17: Rough estimation of the value of the PV business in 2020 (VAT is excluded)

Sub-market	Capacity installed [MW]	Average price [€/W]	Value [M€]	Sub-market [M€]
Off-grid	14	0.7	10	10
Grid-connected distributed	701	0.7	491	491
Grid-connected centralized	2,813	0.55	1,547	1,547
Value of PV business in 2020				**2,048**

6 INTEREST FROM ELECTRICITY STAKEHOLDERS

6.1 Structure of the electricity system

There are four vertically integrated utilities with generation, distribution and retailing. There is a single Transmission network owner not vertically integrated (not present in generation or retail), that is the System Operator (Ownership Unbundling model). There are many independent power producers.

Retailers and network businesses are separated but the four mentioned utilities are present at the same time in retailing and in the distribution activity. There are many independent retailers but their market share is still small in comparison with traditional utilities.

There are almost no public owned companies.

There are two electricity regulators: the Ministry for the Ecologic Transition dictates electricity policy and the National Commission for Markets and Competition dictates electricity regulation.

6.2 Interest from electricity utility businesses

Electric utilities are both present in the development of ground mounted plants (through their generation branch) and in PV rooftop (through their retailers).

- Ground mounted plants are driven by the competitiveness of PV in auctions, in the wholesale market and the PPA segment (Spain is the European leader in PPAs).
- PV rooftop is a growing market due to the enabling regulatory framework introduced in 2019 that allows through-the-network facilities, collective self-consumption, third party ownership and excess electricity remuneration.

Regarding PV business models, a standard development/ ownership scheme is present in which the economic exploitation of plants relies on auctions, PPAs and the wholesale market (merchant projects). Additionally, most of the big companies in the sector are exploring the green H2 production with industry and transportation companies, etc.

6.3 Interest from municipalities and local governments

As mentioned, most municipalities have local taxes exemptions to promote PV self-consumption. These include property tax, construction tax and economic activities tax.

In addition, some have plans to install self-consumption in public buildings. In this regard, Madrid city council has a target of reaching an installed power of 75 MWp and coverage of 61% of the electricity demand expected in 2030 with PV rooftop.

Barcelona has a Program for the promotion of solar energy generation including a series of tax credits to facilitate the installation of renewable energy systems in private buildings. On the other hand, the city hall is also working on various facilitating measures, such as creating a single window for the processing of energy generation facilities, simplifying the management and legalization procedures and creating energy advice points.

It is also to be mentioned the project of Zaragoza's city hall that implemented a solar neighbourhood in collaboration with an electricity utility.

7 HIGHLIGHTS AND PROSPECTS

7.1 Highlights

In 2020 solar PV new capacity was around 3.5 GW, putting Spain close to world top ten and in the second place in Europe, only after Germany, confirming the strength of the growth of previous year. In national terms, 2019 and 2020 have been the best and the second-best year in history for solar PV in Spain.

In ground-mounted plants, the economic competitiveness of solar PV, the terrain availability, the good resource and the know-how of Spanish developers are attiring the interest of many. The liquidity of the capital markets and the limited investment options explain why so many actors see the solar energy in Spain as an optimal opportunity.

According to IHS Markit, Spain is the fifth most interesting market in the world to invest in renewables, and ground-mounted solar has big part of the blame. In fact, ground-mounted solar was the most installed technology in 2020 thanks to 2.8 GWp of new capacity. It has to remarked that all these solar plants were installed without any type of public aid or regulatory scheme, making Spain the leading PPA market in Europe, according to RE-Source.

In PV rooftop, the situation is a bit different. The existing regulatory framework (that eliminated the Sun's tax, allowed automatic surplus remuneration and collective and through-the-network facilities) was completed as early as 2020, so self-consumption in Spain is still far below the level of our neighboring countries and the potential of our resource. In spite of that, installed power increased by 715 MW in 2020, +30% compared to the previous year, showing the resilience of this sector to covid.

With regard to legislation, the year 2020 has probably been one of the busiest in terms of regulatory activity. RD-law 23/2020 was approved, which introduced administrative milestones to network access permit holders, and RD 960/2020, which introduced the new renewable auctions based on the allocation of a fixed price for the energy generated, and RD 1183/2020, which modified the access and connection framework, to name the most relevant.

7.2 Prospects

The GW-size figures of installed solar PV capacity are consistent with the target scenario set out in the Spanish National Climate and Energy Plan (NCEP) that foresees solar PV capacity as high as 39.2 GW in 2030- a significant rise from around 12.5 GW now.

This forecast to 2030 is what the Government considers necessary to meet RES targets, recently established in the Spanish climate change act, approved in May 2021. The law fixed a dual target for renewables in 2030: 42% share in final energy consumption and 74% share in electricity generation. It also includes a clause to review (only upwards) the targets in 2023.

In terms of outlook, and beginning with 2021, expectations are of continuity. In the ground mounted segment up to June 2021, the installed capacity is already 1,214 MW, figure that will reach around 3 GW at the end of the year, according to our estimates. Further on, the January 2021 renewable auctions awarded 2 GW to solar (to be commissioned before Feb-23) and new auctions will be held every year with at least 1.8 GW to solar every year. On top of the auction-driven capacity the PPA segment that has performed particularly well for 2020 and will also in 2021, is to be considered as well.

In PV rooftop, a positive evolution is also expected, even exceeding in 2021 last year record figures. For the following years, growth will be accelerated by the incentive program for self-consumption included in the national recovery plan that could be able to deploy 3 GW of new facilities.

In the following years, and also driven by the national recovery plan, the start of the deployment of the first green hydrogen projects is to be expected. In 2020 the Government approved the Hydrogen Roadmap with a target of 4 GW of electrolyzers to 2030 and a 25% penetration of green hydrogen in hydrogen consumption in Spain (currently about 500,000 tons / year). As an intermediate point, by 2024 it is estimated that there will be an installed capacity of electrolyzers of between 300 and 600 MW.