



Task 1 Strategic PV Analysis and Outreach

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National Survey Report of PV Power Applications in Italy 2020





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

Source: *Catalogue of Photovoltaic Plants Integrated with Innovative Characteristics*, Gestore dei Servizi Energetici, GSE



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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

Italy in 2020 installed new PV capacity for 749 MW (see note 5 of table 1 and table 2), almost the same amount of 2019. The pandemic crisis of Covid-19 has changed the timing of commissioning of the plants; in the central months of the year, following the reopening of economic activities, the installation trend improved significantly (more than 120 MW installed in June). Around 57% of the plants installed in 2020 are under the net-billing scheme (so-called Scambio Sul Posto, hereafter SSP) managed by GSE. The cumulative capacity at the end of the year is 21.650 MW (for 935.838 PV plants installed), mostly due to the effect of the past FiT Law (so-called Conto Energia, 2005–2013).

The total PV production in 2020 was 24.942 GWh, with an increase compared to 2019 (+5,3%), mainly thanks to better solar radiation conditions. Out of the 24.942 GWh, 13.411 GWh were generated by the industrial sector, 4.929 GWh by the tertiary sector, 3.732 by the domestic sector and 2.870 by the agricultural sector.

In 2020 around 55.500 PV plants were installed, most of them with a capacity between 3 and 20 kW. The average capacity of the PV plant installed in 2020 is 13,5 kW, lower than the one installed at the end of 2020, which is 23,1 kW.

97,6% of PV plants installed in Italy are connected to the low voltage distribution grid; a share of 2,4%, consisting of 22.634 plants, are connected to the medium voltage grid, representing the 55% of total existing capacity. Only a small number of PV installations are connected to the high voltage grid, with a capacity of around 1.618 MW, the 7,5% of the total one.

At the end of 2020, 44,5% of the total capacity installed is located in the North and 37,4% in the South. Apulia, in the South, has the national record in term of regional installed capacity with 13,4% of the cumulative power.

The capacity installed at the end of 2020 results in a national data of 72 kW per km² (+3 kW/km² compared to 2019) and in a national power per capita of 359 W per inhabitant, (+13 W compared to 2019). Ground plants are 41% of the total capacity installed.

Electricity produced and self-consumed amounted to 4.735 GWh in 2020, a value of 19% of total PV systems production and of 46% of self-consumption plants production. Almost all the PV plant owners in the domestic sector self-consume (it is a real-time self-consumption). The



highest percentage shares of self-consumption are in the tertiary and industrial sectors (taking into account the quota of plants that self-consume).

Polycrystalline silicon PV modules are installed on 71,5% of the existing capacity, monocrystalline silicon modules on 22,8% and thin film modules or different materials (which include a-Si, CIS, CdTe) on 5,7%. Thin-film technology is used mostly in the South of Italy, especially in Sicily, where it represents the 11% of the total power installed. Valle d'Aosta and Bolzano Province are the two Regions with the highest percentage of monocrystalline modules.

1.2 Total photovoltaic power installed

Table 1: Annual PV power installed during calendar year 2020 ⁽¹⁾ ⁽²⁾

		Installed PV capacity in 2020 [MW]	AC or DC
	Decentralized ⁽³⁾	646	DC
	Centralized ⁽⁴⁾	139	DC
	Off-grid		
	Total	785 ⁽⁵⁾	DC

¹Source: GSE

²Blank box stands for not available data

³Any PV installation which is embedded into a customer's premises (self-consumption)

⁴Any PV installation which only injects electricity and is not associated with a consumer (no self-consumption)

⁵ The value indicated in the table results from the difference between the value at the end of 2020 less the value of 2019. It is important to point out that actual installed capacity in 2020 is equal to 749 MW, due to decommissioning and statistic power update

Table 2: PV power installed during calendar year 2020 ^{(1) (2)}

			Installed PV capacity [MW]	Installed PV capacity [MW]	AC or DC
Grid-connected	BAPV ⁽³⁾	Residential	615	213,8	DC
		Commercial		164,5	DC
		Industrial		236,7	DC
	BIPV ⁽⁴⁾	Residential			
		Commercial			
		Industrial			
	Utility-scale	Ground-mounted	170	170	DC
		Floating			
		Agricultural			
Off-grid	Residential				
	Other				
	Hybrid systems				
Total			785 ⁽⁵⁾		DC

¹Source: GSE

²Blank box stands for not available data

³Building Applied Photovoltaic

⁴Building Integrated Photovoltaic

⁵ The value indicated in the table results from the difference between the value at the end of 2020 less the value of 2019. It is important to point out that actual installed capacity in 2020 is equal to 749 MW, due to decommissioning and statistic power update

Table 3: Data collection process

If data are reported in AC, please mention a conversion coefficient to estimate DC installations	Data refer to the sum of PV nominal power
Is the collection process done by an official body or a private company/Association?	Public body for statistical data: GSE
Link to official statistics	www.gse.it www.terna.it www.arera.it

**Table 4: The cumulative installed PV power in 4 sub-markets** ^{(1) (2)}

Year	Off-grid [MW] (including large hybrids)	Grid-connected distributed [MW] (BAPV, BIPV)	Grid-connected centralized [MW] (Ground, floating, agricultural, etc.)	Total [MW]
2019		12.204	8.661	20.865
2020		12.819	8.831	21.650

¹Source: GSE, TERNA

²Blank box stands for not available data

Table 5: Other PV market information ^{(1) (2)}

	2020		
Number of PV systems in operation in your country	Residential	756.799	935.838
	Commercial	100.965	
	Industrial	78.074	
Decommissioned PV systems during the year [MW]	5,7		
Repowered PV systems during the year [MW]			

¹Source: GSE

²Blank box stands for not available data

**Table 6: PV power and the broader national energy market**

	Data	Year
Total power generation capacities [GW]	119,109	2020
Total renewable power generation capacities (including hydropower) [GW]	56,586	
Total electricity demand [TWh]	283,8	
New power generation capacities installed [GW]	- 0,19	
New renewable power generation capacities (including hydropower) [GW]	1,09	
Total PV electricity production (including self-consumed PV electricity) in [TWh]	24,94	
Total PV electricity production as a % of total electricity consumption	8,79%	
Average yield of PV installations (in kWh/kWp)	1.176	

1.3 Key enablers of PV development

Table 7: Information on key enablers ⁽¹⁾

	Annual Volume	Total Volume	Source
Storage systems	13.181	39.689	GSE
Residential Heat Pumps		6.500.000	GSE ⁽²⁾
Electric cars	31.144	53.079	www.aci.it
Electric buses and trucks	1.015	5.950	www.aci.it

¹ Blank box stands for not available data

² Estimate



2 COMPETITIVENESS OF PV ELECTRICITY

2.1 Module prices

Table 8: Typical module prices for a number of years [€/W] ⁽¹⁾ ⁽²⁾

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
2009	2,30		2,50
2010	1,50		1,70
2011	1,20		1,50
2012	0,70		0,80
2013	0,50		0,60
2014	0,50	0,80	0,55
2015	0,50	0,75	0,55
2016	0,40	0,65	0,48
2017	0,32	0,56	0,40
2018	0,20	0,48	0,35
2019	0,18	0,45	0,29
2020	0,16	0,44	0,30

¹ Blank box stands for not available data

² GSE specific survey

2.2 System prices

Table 9: Turnkey PV system prices of different typical PV systems ⁽¹⁾

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.	1,20 – 1,60
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.	1,15 - 1,25



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.	0,95 - 1,15
Industrial BAPV >250 kW	Grid-connected, roof-mounted, distributed PV systems installed to produce electricity to grid-connected industrial buildings, warehouses, etc.	0,80 - 1,00
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.	0,70 - 0,80
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.	0,50 - 0,70

¹GSE specific survey

Table 10: National trends in system prices for different applications ^{(1) (2)}

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]
2011	3,60		2,70	2,80
2012	2,60		1,80	1,70
2013	2,20		1,40	1,20
2014	1,67		1,40	1,03
2015	1,60		1,32	0,96
2016	1,55		1,22	0,88
2017	1,44		1,10	0,80
2018	1,41	1,20	1,08	0,69
2019	1,34	1,15	1,00	0,63
2020	1,33	1,15	1,00	0,62

¹ Blank box stands for not available data

² GSE specific survey



2.3 Cost breakdown of PV installations

Table 11: Cost breakdown for a grid-connected roof-mounted, distributed residential PV system of 5-10 kW ⁽¹⁾

Cost category	Average [€/W]	Low [€/W]	High [€/W]
Hardware			
Module	0,38	0,32	0,44
Inverter	0,14	0,13	0,16
Mounting material	0,27	0,22	0,32
Other electronics			
Subtotal Hardware	0,79	0,67	0,92
Soft costs			
Planning ⁽²⁾			
Installation work	0,09	0,07	0,10
Shipping and travel expenses to customer	0,03	0,02	0,03
Permits and commissioning ⁽³⁾	0,10	0,08	0,11
Project margin	0,32	0,26	0,37
Subtotal Soft costs	0,54	0,43	0,61
Total (excluding VAT)	1,33	1,10	1,53
Average VAT	10%	10%	10%
Total (including VAT)	1,46	1,21	1,68

¹ GSE specific survey

² Planning cost are included in the other soft costs

³ Including financing



Table 12: Cost breakdown for a grid-connected, ground-mounted, centralized PV systems of >10 MW ⁽¹⁾

Cost category	Average [€/W]	Low [€/W]	High [€/W]
Hardware			
Module	0,19	0,16	0,23
Inverter	0,06	0,05	0,07
Mounting material	0,12	0,11	0,13
Other electronics			
Subtotal Hardware	0,37	0,32	0,43
Soft costs			
Planning ⁽²⁾			
Installation work	0,04	0,03	0,05
Shipping and travel expenses to customer	0,02	0,01	0,02
Permits and commissioning ⁽³⁾	0,03	0,02	0,04
Project margin	0,16	0,14	0,17
Subtotal Soft costs	0,25	0,20	0,28
Total (excluding VAT)	0,62	0,52	0,71
Average VAT	10%	10%	10%
Total (including VAT)	0,68	0,57	0,78

¹ GSE specific survey

² Planning cost are included in the other soft costs

³ Including financing



2.4 Financial Parameters

Table 13: PV financing information in 2020 ⁽¹⁾

Different market segments	Loan rate [%]
Average rate of loans – residential installations	3,1 – 5,2
Average rate of loans – commercial installations	2,1 – 3,2
Average cost of capital – industrial and ground-mounted installations	1, 4 – 2,0

¹ GSE specific survey

2.5 Additional Country information

Table 14: Country information

Retail electricity prices for a household [€cent/kWh]	21,90 ⁽¹⁾ - 24,69
Retail electricity prices for a commercial company [€cent/kWh] ⁽²⁾	20,25 - 33,63
Retail electricity prices for an industrial company [€cent/kWh]	8,10 - 17,46
Liberalization of the electricity sector	Italian electricity sector went through a deep reform that changed it from a vertically integrated monopolistic structure to a liberalized market. The process started in 1999 but the complete liberalization is expected to be fully completed in 2023. There is a debate about the possibility to postpone again after 2023 the full liberalization of the domestic sector due to the sharp rise of tariffs during 2021.

¹ Consumption up to 5.000 kWh per year

² Nomisma Energia estimate



3 POLICY FRAMEWORK

Table 15: Summary of PV support measures

Category	Residential		Commercial + Industrial		Centralized	
	On-going	New	On-going	New	On-going	New
Measures in 2020						
Feed-in tariffs	-	-	Yes	-	Yes	-
Feed-in premium (above market price)	-	-	-	-	-	-
Capital subsidies ⁽¹⁾	Yes	-	Yes	-	-	-
Green certificates	-	-	-	-	-	-
Renewable portfolio standards with/without PV requirements ⁽²⁾	-	-	-	-	-	-
Income tax credits	Yes	-	Yes ⁽⁴⁾	-	-	-
Self-consumption	Yes	-	Yes	-	Yes	-
Net-metering	-	-	-	-	-	-
Net-billing ⁽³⁾	Yes	-	Yes	-	Yes	-
Collective self-consumption and delocalized net-metering ⁽⁵⁾	Yes	Yes	Yes	Yes	-	-
Sustainable building requirements	Yes	-	Yes	-	-	-
BIPV incentives	-	-	-	-	-	-

¹At a regional level (most of tenders are for buildings of public administration and small and medium-sized enterprises (SME))

²No obligations for utilities to obtain a minimum percentage of their power from renewable energy sources

³Up to 500 kW

⁴Specific national tax relief

⁵Virtual net metering under some condition (paragraph 3.4)

3.1 National targets for PV

The Italian Ministry of Economic Development has issued the Integrated National Energy and Climate Plan, which foresees a strong increase of RES electricity share in consumption, rising from 34% in 2017 to about 55% by 2030. The main contribution will be from photovoltaic, with a set target of cumulative PV capacity of 50 GW by 2030 and a corresponding 70 TWh/year of electricity production.



3.2 Direct support policies for PV installations

The 2019 decree (MD of July 4th, 2019) aims at supporting, in the period 2019-2021, energy from new, refurbished and upgraded plants from “mature” RES: PV (>20 kW), onshore wind, hydro and sewage gas for a total capacity of about 8 GW (of which 7,4 GW new). Competitive auctions (for capacities over 1 MW) for groups of technologies and registries for smaller plants (with a capacity up to 1 MW), with some competitive elements are foreseen. The support for the plants with a capacity up to 250 kW is a Feed-In Tariff, and over 250 kW a sliding Feed-in Premium, so-called called “two-ways mechanism”: the producer receives an incentive equal to the difference between a reference tariff and the hourly zonal price of energy. There are also additional remunerations: for plants installed on buildings ($P \leq 100$ kW), on self-consumed energy (if self-consumption exceeds 40% of yearly net production), and for PV plants replacing asbestos.

Tax credit (available for small size plants up to 20 kW and for storage devices), together with a net-billing scheme (Scambio Sul Posto, SSP), and a specific national tax relief for medium commercial/industrial installations, are further measures to support PV market.

Italy switched from the net-metering mechanism to a net-billing scheme for systems below 500 kW in 2009, in which electricity fed into the grid is remunerated through an “energy quota” based on electricity market prices and a “service quota” depending on grid services costs (transport, distribution, metering and other extra charges). The net-billing scheme is valid for one year and automatically renewed once granted. Market prices are applied for the electricity injected into the grid as an alternative to SSP. Self-consumption is allowed for all PV system sizes.

Concerning fiscal measures, in 2020 a tax credit measure has been introduced (so-called Superbonus 110%) for interventions in the field of energy efficiency, installation of photovoltaic systems or infrastructures for charging electric vehicles in buildings. PV have to be coupled with building energy efficiency intervention.

An important contribution came from regional policies, such as tenders for capital subsidies for PV plants (and other RES or building energy efficiency interventions), mostly dedicated to plants to be installed on public administration buildings and for medium-sized enterprises (SME). Several Regions called for tenders in 2020.

3.2.1 BIPV development measures

None.



3.3 Self-consumption measures

Table 16: 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	Net-billing based on energy and services; indirect sale through a dedicated withdrawal ⁽¹⁾
	5	Maximum timeframe for compensation of fluxes	Self-consumption, real time; net-billing, advance payment twice per year
	6	Geographical compensation (virtual self-consumption or metering)	On site. Meter aggregation and virtual net-billing are allowed for some specific cases, i.e., Municipalities of up to 20.000 inhabitants and the Ministry of Defence. In 2019/2020 a new measure, concerning energy communities, has been introduced for renewable plants with capacity < 200 kW
Other characteristics	7	Regulatory scheme duration	Self-consumption, unlimited; net-billing is yearly renewed
	8	Third party ownership accepted	Yes, with condition
	9	Grid codes and/or additional taxes/fees impacting the revenues of the prosumer	None
	10	Regulations on enablers of self-consumption (storage, DSM...)	Yes (tax credit for storage coupled with PV)
	11	PV system size limitations	Self-consumption, none; net-billing, up to 500 kW
	12	Electricity system limitations	None
	13	Additional features	None

¹ Managed by GSE



3.4 Collective self-consumption, community solar and similar measures

Meter aggregation and virtual net-billing are allowed for some specific cases, i.e., Municipalities of up to 20.000 inhabitants and the Ministry of Defence.

The Italian Parliament approved in 2019/2020 a new measure about self-consumption, allowing final consumers/RES producers to group together in order to share electricity locally produced by new RES plants with a capacity ≤ 200 kW. Plants must be commissioned after February 2020 and up to 60 days after the entry into force of decree transposing Directive (EU) 2018/2001. The Decree of 16 September 2020 completed the regulatory framework on energy communities and self-consumers; on December 2020, GSE made available the website to send the preliminary request to access to incentives (alternative to net-billing scheme) foreseen for two categories of prosumers:

- RES consumers acting collectively in a group located in the same building
- RES energy communities

A group of RES self-consumers acting collectively consists of at least two RES self-consumers. The PV plant may be owned and/or managed by a third party.

In the energy community, members may be private persons, small and medium-sized enterprises, local or regional public administration authorities. The main features of the RES energy communities are listed below:

- the withdrawal points of consumers participating in the community, as well as the entry points of the related plants, must be located on the LV electricity grids underlying the same MV/LV transformer substation;
- the consumption users included in the community remain connected to the existing public distribution network and they are not physically connected but virtually;
- relations between consumers are regulated through a private contract by identifying a delegated person responsible for the allocation of shared energy and any other tasks;
- it is possible to exit the configuration at any time, possibly by paying contractual fees.

Two different contributions are granted for 20 years:

- a premium tariff for the shared electricity (100 €/MWh for the group of prosumers, 110 €/MWh for energy communities). The share electricity is the lowest value, calculated on an hourly basis, between the electricity fed into the grid and the electricity withdrawn from the points of connection;
- a contribution which is the sum of transmission fee and the highest value of the variable distribution component for consumers/loads in low voltage. Moreover, for a group of self-consumers acting collectively, an additional contribution, due for avoided network losses is granted.

It is also possible to request the withdrawal for the electricity injected to the grid managed by GSE (40-50 €/MWh). Moreover, the access to 50% of tax deduction is allowed. For PV plants under 20 kW, in addition, the access to the 110% tax deduction is possible under the condition of not receiving the premium tariff and of delivering the electricity injected to the grid to GSE.



3.5 Tenders, auctions & similar schemes

In Italy RES producers can stipulate private PPA but there are not specific regulation/or measures in favour that could boost this development.

For FiT tenders, see paragraph 3.2. Regional tenders support RES, (building) energy efficiency, energy communities and electric vehicles.

3.6 Other utility-scale measures including floating and agricultural PV

The Law Decree 76/2020 allowed the admission to support mechanisms for photovoltaic systems built on abandoned/degraded areas even if classified as agricultural. For PV plants in rural areas public incentives cannot be requested.

3.7 Social Policies

The municipality of Porto Torres (Sardinia Region), with the collaboration of GSE, introduced in 2007 the so called "reddito energetico" (energy income) project: the municipality allocated public resources to purchase PV systems, sold on loan to families in energy poverty conditions, to benefit them from PV self-consumption, reducing their energy bills. The revenues of the net-billing (Scambio, Sul Posto, SSP) feed a public fund, in order to support the purchase of PV plants for other families and the maintenance of the systems.

After this pilot project, other municipalities and Regions carried out similar initiatives.

3.8 Retroactive measures applied to PV

Law 116/2014, implementing Law June 2014, n.91, defines new procedures related to incentives granted to electricity produced by PV plants under all Feed-in schemes (I, II, III, IV and V Conto Energia), among which the so-called "spalma incentivi". From January 1, 2015, tariffs (bonuses included, if any) for plants with a capacity over 200 kW are adjusted according to one of the following options (the Responsible Party of the plant can select the option):

- Incentives are granted for 24 years (instead of 20) with a tariff reduction on the remaining period.
- Incentives are granted for 20 years but with a tariff adjustment (a reduction for the first period and an increase for the second one).
- Incentives are granted for 20 years but with a tariff reduction.



3.9 Indirect policy issues

3.9.1 Rural electrification measures

The decree of February 14, 2017 grants subsidies to electric RES and thermal plants in small Italian geographical islands, not connected to the mainland electricity grid, with an area greater than 1 km², located more than 1 km from the continent and with a resident population of at least 50 people.

The mechanism is a feed-in tariff for the electricity fed into the grid that GSE withdraws and sells on the market while paying to the producers a subsidy for 20 years. For self-consumed electricity a feed-in premium is applied.

3.9.2 Support for electricity storage and demand response measures

Tax deduction for storage coupled with PV plants is foreseen. At the end of 2020, almost 40.000 storage systems were installed in Italy for a total nominal capacity of 189 MW. The capacity of PV plants with storage is equal to 231 MW. Some regional tenders support storage.

3.9.3 Support for electric vehicles (and VIPV)

Law 145/2018 introduced subsidies for purchasing electric and hybrid vehicles for the years 2019-2021 and tax deduction for purchasing and installation of recharging infrastructures for vehicles powered by electricity. Some regional tenders support electric vehicles.

3.10 Financing and cost of support measures

The Feed-in Tariff law set the financial cap for PV of 6,7 BEUR in terms of yearly payments. The cost of the incentives for the Feed-in Tariff / Feed-in Premium for the years 2005-2013 is covered by a component of the electricity tariff paid by all final electricity consumers. The economic resources for the new RES decree is covered in the same way.



4 INDUSTRY

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

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

Table 17: PV cell and module production and production capacity information for 2020

Cell/Module manufacturer	Technology	Total Production [MW]		Maximum production capacity [MW/yr]	
		Cell	Module	Cell	Module
Wafer-based PV manufactures					
Eclipse Italia	sc-Si, mc-Si	0	70,00	0	150,00
EXE s.r.l.	mc-Si				60,00
Enel Green Power SpA – 3SUN	Si-HJT			200,00	200,00
Gruppo STG	sc-Si, mc-Si	0	2,30	0	23,00
Micron - Cappello Group SpA	sc-Si, mc-Si				
Solbian	sc-Si PERC c-Si HJT mc-Si				
SPS ISTEM	mc-Si				75,00
Sunerg Solar	sc-Si, mc-Si				100,00
Trienergia srl	sc-Si, mc-Si	0	2,90	0	23,00
Totals			75,20	200,00	632,00

¹ Blank box stands for not available data

² RSE specific survey

In 2020 the total annual production reached from the interviewed companies is 75,20 MW, having a total production capacity of 632,00 MW/yr.

Italian PV manufacturers focus both on niche markets, such as architectural building integration (BIPV or BAPV) or PV integration in the e-mobility (VIPV), and on the development of innovative technologies of PV modules for utility-scale, such as high-efficiency bifacial technologies.



SOLBIAN targets the production of PV flex-modules particularly suited to sailing yachts or electric mobility applications; the company is also able to provide custom PV modules where the number of cells, colours and electrical characteristics can be adapted to suit the customer's needs.

STG Group proposes Building-Applied Photovoltaics (BAPV) and Building-Integrated Photovoltaics (BIPV) solutions; the brand Energy Glass - Gruppo STG, designs and manufacture BIPV products with transparent or opaque glass that is used as a building element. The products can be customized in terms of sizes, power, transparency and colours.

Trienergia proposes design triangular photovoltaic panels (21 cells) and rectangular panels (42 or 60 cells), designed for triangular roofs.

Enel Green Power (EGP) - 3SUN 2.0 is the major PV manufacturer in Italy based in Catania (city in the south of Italy), focusing its market on large-scale photovoltaic systems and exporting its product all over the world. The PV technology developed is the Bifacial heterojunction, and important results have been achieved in 2020: the previous record of 24.63% has been improved with a new efficiency of 25.0% for a heterojunction solar cell with an active surface of 213 cm², based on the M2 silicon wafer format. EGP is currently investing to increase its annual production capacity to 3 GW in the second half of 2023. In addition, the company is collaborating with national research centers to study innovative agrivoltaic applications.

In the field of CPV (concentrated solar power) Italian operators such as Solergy, Beghelli Bechar, and Sungen, have experienced the development of prototypes and systems both, mirror and lens-based, passively or actively cooled.

4.2 Manufacturers and suppliers of other components

The national RES targets for 2030, as well as the new national Recovery and Resilience Plan, leads the Italian manufacturers to introduce in the market components with innovative features to the benefit of end-users and the electrical network.

Relevant national PV inverter manufacturers both for small-scale and utility-scale applications, are Elettronica Santerno S.p.A, Elpower s.r.l, Borri S.p.A, Fimer S.p.A, Friem S.p.A., Reverberi Enetec s.r.l, Nidec ASI S.p.A., Riello Solar Tech - RPS S.p.A., and Siel S.p.A. In the framework of energy storage systems, also for residential applications, relevant national companies are Aton, Fiamm, Reverberi Enetec, SIEL.

Other Italian companies (such as Bitron Electronic, Loccioni Group and also ABB Italia SpA), offer technology solutions that, combined with photovoltaic systems, are able to maximize the energy self-consumption and interact with local energy management systems.

In the field of supporting structures for PV modules, a relevant Italian company specialized in the development of single-axis trackers for the PV utility-scale applications is Convert Italia SpA which exports its technological solutions mainly in Chile, Brazil and India.



5 PV IN THE ECONOMY

5.1 Labour places

Table 18: Estimated PV-related full-time labour places in 2020 ⁽¹⁾

Market category	Number of full-time labour places
Research and development (not including companies)	
Manufacturing of products throughout the PV value chain from feedstock to systems, including company R&D	
Distributors of PV products and installations	
Other	
Total	6.160 ⁽²⁾

¹ Blank box stands for not available data

² GSE data concerning permanent jobs, in terms of FTE (Full Time Equivalent), directly and indirectly related to O&M activities on existing PV plants. Figures updated according to availability on new O&M data

5.2 Business value

Table 19: Rough estimation of the value of the PV business in 2020 (VAT is excluded) ⁽¹⁾

Sub-market	Capacity installed [MW]	Average price [€/W]	Value of PV business in 2020 [€]
Off-grid			
Grid-connected	749 ⁽²⁾	1,078	807.422.000

¹ Blank box stands for not available data

² 749 MW is the actual installed capacity in 2020 (see note 5 of Table 1 and Table 2)



6 INTEREST FROM ELECTRICITY STAKEHOLDERS

6.1 Structure of the electricity system

Italian electricity sector went through a deep reform over the last 20 years that changed it from a vertically integrated monopolistic structure to a liberalized market. The process started in 1999 but the complete liberalization was decided only in August 2017 and it is expected to be fully completed in 2023, when the tariff system will be eliminated also in the domestic sector. However there is a debate about the possibility to postpone again after 2023 the full liberalization of the domestic sector due to the sharp rise of tariffs during 2021. The former monopolist Enel still holds relevant market shares in all segments, especially in the domestic sector and in distribution. Enel is a private stock company where the state holds a 24% stake.

Generation, transmission and distribution are separated. Generation is a free activity where the first six groups industrial companies (Enel, Eni, Edison, A2A, EP Produzione and Iren) hold 48.6% of the national gross production while the rest is scattered among several players (Table 15).

Transmission is a regulated activity held by the transmission system operator (TSO) Terna, a stock company with the state holding a 30% stake; distribution is a regulated activity where e-distribuzione (Enel group) is the first operator with 86% market share, followed by the other three major operators (Unareti, Areti, Ireti) that hold another 8,9%.

Retail activity is free, but with regulated tariffs for the domestic sector (for customers who decided not to switch to the liberalized market) until 2023. The 10 major retail operators hold 64% of the market, with Enel holding an overall 32%. Some companies with activities in production, distribution and retail are former municipalities owned by local authorities.

The Energy Authority (Italian Regulatory Authority for Energy, Networks and Environment - ARERA) was created in 1995 and regulates the electricity sector following directives from the Italian Government and the Parliament.

6.2 Interest from electricity utility businesses

Italian electricity utilities are involved in the PV sector and also in the secondary market.

6.3 Interest from municipalities and local governments

Public Administration, at the end of 2020, owns 18.727 PV plants, for a capacity of 789 MW (3,6% of the total capacity installed in Italy).



7 HIGHLIGHTS AND PROSPECTS

7.1 Highlights

After subsidies period, that allowed almost 18 GW out of 21,6 GW capacity installed in Italy, marked evolved, on one side, to small residential systems based on self-consumption and net-billing scheme, and on the other side, to a secondary market of managing and acquisition of large plants.

Since 2017, Italy is experiencing also private PPA agreement for PV plants. PV revolving fund is raising a lot of interest in managing projects to address energy poverty, together with energy community projects (see paragraph 3.4 and 3.7).

7.2 Prospects

In the ambitious target of 55% of electricity from RES set in the Integrated National Energy and Climate Plan presented to the European Commission, PV expected to contribute the most with a capacity of around 50 GW by 2030.

Major development of energy communities is expected. At the same time, it will also be important to build large plants, promoted by instruments such as contracts for difference and PPAs. The construction of large plants will be favoured by administrative measures, such as the identification of areas of the territory (established by Regions) where the authorization procedure can be further simplified.

