REPORT ON PVP4GRID CONCEPTS AND BARRIERS

English Summary

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Introduction to PVProsumers4Grid

Europe´s electricity sector is in the midst of major transformation moving from public monopolies into competitive private companies in liberalized markets. The liberalization of the market is expected to deliver more competitive and therefore more efficient and cheaper energy. Due to its cost and growth perspective, photovoltaics (PV) will be a key driver of this development throughout Europe because PV has reached a level of competitiveness that allows moving to self-consumption schemes in many European countries and eventually to peer-to-peer selling of the self-produced energy.

Such a “prosumption” role empowers consumers to participate actively in the electricity market by producing energy themselves. Technical developments such as battery systems or smart meters, and advanced business models promoting self-consumption change the technical design of the electricity systems. The success of these developments depends, however, on the regulatory and administrative framework in terms of energy policy and regulation, grid financing, taxation and legal relationships amongst the involved entities and it requires innovative solutions coupled with suitable business and management models to achieve sustainable system integration.

PV-Prosumers4Grid (PVP4Grid) is an EU-funded project coordinated by BSW-Solar, involving 11 partners from various European countries[1] and running from October 2017 until March 2020. The main objectives of PVP4Grid are to increase the market share and market value of PV by enabling consumers to become PV prosumers in a system-friendly manner, as well as a better power system integration of PV with a focus on market integration. New management and business models to combine PV, storage, flexible demand and other technologies into a commercially viable product, will be assessed, improved, implemented and evaluated.

To achieve this, detailed guidelines for Prosumers and Distributed System Operators (DSO´s), as well as policy recommendations for national and European policy makers on how to achieve the suitable regulatory framework for prosumption, will be developed. Additionally, an online tool to help prosumers to get an economic assessment of PV prosumer projects will be created, among other relevant outcomes.

Please visit www.pvp4grid.eu to learn more about the PVP4Grid project, incl. the outcomes, tools & events.

[1] See project partners and project outcomes on the website: www.pvp4grid.eu.

1 Abstract

The present document provides a summary of the different prosumption concepts which have been identified within the 8 targeted countries of the PVP4Grid project. It is based on the Report on existing and future prosumer concepts.

It provides an overview of the concepts together with the potential economic and regulatory barriers which hamper their implementation. Where applicable, this report also provides good practice examples for each of the concepts identified.

Individual self-consumption is allowed and feasible in almost 100% of the countries analysed. However, collective self-consumption, independently of the scale (individual building – residential, commercial- and at larger scale in districts / group of buildings), is currently not feasible in most of the countries. Despite the fact that PV Prosumer (PVP) concepts that use the public grid to sell excess PV electricity to third parties are legally allowed, such schemes are hardly ever seen operational in real life, due to economic / administrative / regulative barriers. There are exceptions, such as collaborative generation plant for a single building (e.g. multi-apartment buildings) in Austria, collective scheme in France or “Mieterstrommodelle” - neighbour solar supply model -, in Germany. Other conclusions that can be extracted from the analysis are:

- Very frequently PVP concepts are applied to small-scale PV plants (max. hundreds of kW, limited by power capacity of the electricity consumer), meaning a clear opportunity for distributed generation.
- Battery storage is promoted in most of the countries through financial support, tax exemptions and other measures. It can be used to increase the self-consumption ratios and reduce the power capacity contracted by the consumers.
- Virtual models (metering, demand aggregation) are more developed outside Europe (e.g. AU, USA). These virtual schemes have been excluded from the PVP concepts definition, but they are likely to represent a great opportunity for the future electricity market in Europe.

2 National Summaries

2.1 Austria

2.1.1 PV Prosumer Concept 1

Individual self-consumption is allowed in Austria. Two financial instruments supporting PV installations are implemented: (1) investment grant and (2) fixed FiTs. There are different thresholds in terms of installed PV capacities (5 kWp, 30 kWp, 50 kWp, 100 kWp, 200 kWp, 500 kWp) where these two different support instruments are granted, either exclusively or in a combined support model of both instruments:

- Small PV systems up to 5 kWp, the typical installations in residential buildings, receive investment grant only. The latter amounts to €275/kWp for PV systems on a building ("rooftop") and also small "free-standing" PV systems (considering a ceiling to max. 35% of the PV system investment cost). For building integrated PV systems (BIPV) an amount of €375/kWp is foreseen (also ceiling to 35% of PV system investment cost).
- For "PV community facilities" the same investment subsidies are granted as shown above for PV systems up to 5 kWp, whereas the two following restrictions have to be considered: (i) max. 5 kWp per person (i.e. an individual shareholder of the community facility) can be applied and (ii) the maximal capacity of the PV community plants cannot exceed 30 kWp.
- For dedicated PV systems in the agricultural/forestry sector also the same investment subsidies are granted as shown above for PV systems up to 5 kWp, whereas the restriction exists that these PV systems need to be in a capacity range between 5 and 50 kWp.
- PV systems between 5 and 200 kWp installed on a building ("rooftop") or integrated into a building (ground mounted PV systems are explicitly excluded here) receive a FiT of €0.0791/kWh in 2018. An annual adjustment of this FiT is foreseen, resulting in €0.0767/kWh in 2019. In addition to the FiT tariff for PV systems with a capacity between 5 and 200 kWp installed on a building or building integrated, a 30% of the PV system investment cost is remunerated, however, a ceiling of the amount per kWp to €250/kWp (for capacities in the range of 5-100 kWp) and €200/kWp has to be considered.
- For larger PV plants between 200-500 kWp an investment subsidy of €200/kWp is granted but limited to max. 30% of the total PV system investment cost.

Barriers to implementation:

- Inefficient ex-ante competition/reward procedure of financial PV support (“ÖMAG Förderung”): In the past the implementation of the first come / first serve procedure at the beginning of the year resulted in a situation that in the end many potential PV projects have not been realized.
- Heterogeneous grid access policies
- Heterogeneous grid planning approaches and grid (interface) protection standards

Good practice examples:

- Waste Water Treatment Plant, Bad Hall: Since 2015, the wastewater treatment plant has been self-consuming electricity from its own 25 kWp plant. The plant is controlled by an energy management system so that its electricity self-consumption is 100%.
- Nursing Home, Weyer: a nursing home needs a lot of electricity during the day, because the residents usually get up early, are mostly at home during the day and go to bed early in the evening. For efficient rooftop use, the modules were installed in the southwest and southeast directions with a total rated output of 40 kWp. The own power consumption is 100%.

2.1.2 PV Prosumer Concept 2-3

Referring to collaborative generation plant for a single building in Austria, a new regulation of collective PV self-consumption from 2017 is in place for any kind of building, including multi-apartment buildings. The main aspects are as follows:

- At its core, the model involves an operator of the generation plant, and local users of the locally generated electricity. Other relevant parties involve the grid operator (DSO), individual suppliers (retailers) of residual energy imported from the grid by the users involved, and the market actor buying the surplus energy exported to the grid.
- Besides the requirement that an operator of the generation plant needs to be defined, the model reflecting the contractual relations (rights and obligations) between the owner of the plant, its operator, the users and other parties is generally subject to the contractual freedom of the contracting parties.
- Technically, the PV system is connected to the building’s main power supply line (which generally belongs to the domain of the building anyway).
- Smart metering is required for both generation and consumption in order to enable an exact billing of the energy quantities.

- The grid operator (DSO) is responsible for gathering, calculating and providing all relevant metering data (generated electricity, direct local consumption of the users involved, grid-imported residual consumption by each user, surplus energy fed into the grid). The allocation of local production on local users is done by the DSO according to a contractual agreement (see above).
- Surplus PV electricity is fed into the grid.
- No grid fees are charged.

Barriers to implementation:

- Denomination/Splitting of PV-Plants: in Austria it is tolerated to split bigger PV plants into multiple smaller plants with sizes marginal below the different thresholds to get the highest benefits in terms of financial support. Subsequently, each one of these smaller plants has an own, independent grid connection point.
- Missing obligation of distribution grid operators for accounting/billing in reasonable time resolution/period of time
- Sub-optimal usage of available space (rooftop, facade) of already sealed surface

2.2 Belgium

2.2.1 PV Prosumer Concept 1

The main support schemes in Belgium are net-metering for household installations and self-consumption for industrial and commercial installations. The installations eligible for net metering are the systems up to 10 kWp in Flanders and Wallonia and below 5 kWp in the Brussels region.

Industrial installations are allowed to self-consumption and the excess electricity is remunerated through a PPA with utility suppliers. Moreover, according to the period when the PV plant was installed, some PV plants are allowed to receiving additional green certificates based on the percentage of the self-consumed electricity.

Barriers to implementation:

- A tariff that the prosumer is obliged to pay to the DSO for the use of the grid under the net-metering scheme. In the Flemish region this prosumer tariff is already applied and in 2018 it ranges between €87.14 and €121.46/kW. Prosumers can avoid this payment by installing an additional bidirectional meter but they lose their eligibility for net metering and switch to self-consumption. The prosumer tariff will most probably be implemented as well in Wallonia from the January 2020.

- As it concerned industrial installations, the lack of regulatory framework for prosumers who want to sell the electricity in excess is a problem since according to the current legislation they need to find an energy purchaser autonomously.

Good practice example:

- 73% of the installed PV capacity in Belgium is located in Flanders with 221 Wp per inhabitant, which equals one PV panel per capita (ODE, 2018). Most of the PV installations in Wallonia belong to individuals (Huart and Neubourg, 2017). The use of net-metering to kick-start the market was a good choice.

2.2.2 PV Prosumer Concept 2-3

Collective self-consumption in Belgium is not yet exploited due to the lack of regulatory framework. In the last months, thanks to the introduction of the concept of collective self-consumption in the Energy Code in France (May 2017), things are slowly starting to change and the policy makers are begging to show their willingness on introducing future regulations, particularly in Flanders.

Nowadays, the shared use of PV in larger buildings and facilities such as multi-family houses is not allowed. For instance, in case of a block of flats with a single PV installation on top, the owner of the installation is single and he is the legal entity representing the buildings and the energy can be used by this legal entity only to cover the common expenses of the building.

In case the co-owners want to install a PV installation to cover their own consumption, they should ask for the agreement of the condominium to use part of the common roof and install a personal solar PV installation in order to produce their own energy that could be used to cover their own consumptions.

Despite the lack of regulation, several examples can be found in Belgium. In Wallonia, the regional regulator for Energy, CWaPE, allows district self-consumption in few industrial districts for research purpose. In Belgium it is currently active a project for the implementation of the microgrid realized by the University of Liège but only for research purpose.

Barriers to implementation:

- The absence of a regulatory framework makes collective and virtual self-consumption impossible to be implemented. The relatively low prices of electricity for industrial applications can also be an issue.

Good practice example:

- In Brussels, the first project with a PV installation shared by multiple inhabitants of an apartment complex was realised in 2009. In total 24 co-owners living in 12 apartments participated. They installed 23 solar panels with a total capacity of 4.945 kWp. 4.200 kWh is produced annually, which is 10% of the total energy usage. This project, however, is the exception to the rule and rather unique in Belgium, in the Country collective self-consumption is not allowed. (Energuide, n.d.)

2.3 France

2.3.1 PV Prosumer Concept 1

The most important parameters to be considered, arisen from current regulation, can be summarised in:

- Individual and collective self-consumption are allowed according to the French energy code following the adoption of a series of legal and regulatory texts in 2016 and 2017. However, up to date, PV systems on building and rooftops cannot compete with the retail price of electricity at the moment.
- Most of the new PV installations are now individual self-consumption ones, given the fall of the modules’ cost, the increase of the electricity prices and the gradual decrease of FiT.
- Collective self-consumption is a nascent concept. Few projects have been launched to date but there are many expressions of interest. Projects owners wait for precisions (micro grid tariff (“TURPE”) for instance, later explained) in order to refine their Business Plans.
- As a main French special feature, the collective self-consumption is designed as a virtual private network embedded in the public network. Thus, the role of the DSO (Enedis, operates 95% of the network) is key.
- The energy code provides the possibility to introduce PV storage systems under certain conditions. But for the moment, it remains difficult to find economic rationality (notably because of the TURPE rules).

When PV in buildings is considered, the previous statements are slighted adapted, in the following sense:

- Given that retail electricity price is lower than FiT for systems in buildings, such projects adopt a model based on FiT instead of self-consumption. Thus, public supporting is still necessary if economic viability is intended.

- France has a FiT program for small PV systems which pays for the excess electricity fed into the grid (nowadays €10ct/kWh). These compensations are significantly higher for BIPV than for BAPV, in order to extend and boost the BIPV implementation. Although grid-parity has been already achieved for BAPV systems in locations with good radiation values (e.g. Marseille), BIPV FiTs are still over the grid electricity price.
- The sustained rise in the price of grid electricity price might facilitate the path to change.

Barriers to implementation:

- Since the law was implemented only one year ago, the main barriers to the development of self-consumption in residential PV installations are related to obtaining administrative authorizations.
- Another obstacle for the implementation of the PVP concept is the unpredictability of the grid connection costs that are especially volatile for low capacity installations (9 kW - 36 kW). A direct consequence of this, is the small development in this capacity range. In order to avoid this financial insecurity, it is necessary to adjust the capacity of the installation to higher power ranges. The distribution system operator does not provide an estimate of the typical connection cost and it also cannot promise to put a maximum limit on this cost.
- The distribution system operator makes the first free feasibility study while the following ones must be paid. This aspect complicates the connection of small installations, as the potentially high costs may have a deterrent effect (HESPUL, 2018).

Good practice example:

- Langon, in Gironde, where an E.Leclerc retail outlet has built a photovoltaic parking shack. The installation is 410 kWp. The annual electricity consumption of the site is 4,500 MWh, and the electricity budget of the site of about €450 000, i.e. a price of €10ct/kWh. The installation of the shelter is a budget of €850 000, an average price of about €2,073/kW. It will allow the production of 470 MWh per year, directly consumed by the store, or about 12% of its total consumption.

2.3.2 PV Prosumer Concept 2-3

Some of the main features of collective self-consumption are summarised below:

- Consumers and producers have to be part of a same legal entity. The form of this entity has to be decided on a case by case basis: association, company, cooperative….
- The PV installation operated by one producer cannot exceed 100 kW.

Other key aspects are displayed:

- The grid operator has the obligation to install smart-meters.

- Storage is considered as a consumer (C) when electricity is stored and as a producer (P) when it is supplied.

Inputs are still missing to have a complete collective self-consumption regulation:

- The TURPE = the price that has to be paid by consumers for the services of the grid operator. A “micro-TURPE” will be published adapted to self-consumption projects. The financial viability of collective self-consumption projects will depend on this micro-TURPE.
- This micro-TURPE amount will be the key for the quantity of collective self-consumption projects that will be achieved. The technical documentation that describes the connection to the grid (deadlines, information needed…).
- A contract template between the legal entity and the grid operator is needed.
- The limitation of the scope to the same low voltage station will become a barrier in the medium-term.

Barriers to implementation:

- The unpredictability of future revenues. For an industrial site it is difficult to estimate whether it will remain at the same location with the same consumer profile for 10 or 12 years. In the context of a collective self-consumption operation, the producer it is not subject to all the obligations of the electricity suppliers and the sale of electricity that he will offer to consumers will be in part exempted from withdrawals (Photovoltaique.info, 2018).
- The impossibility of being able to make a third party investment. For a direct sale of electricity, it is compulsory to be registered as an electricity supplier and therefore paying all taxes on the electricity sold.

Good practice example:

- In Bordeaux, the residence "Les Souffleurs was the first collective self-consumption project in France. Inaugurated on December 1, 2017, this project based on collective self-consumption was made possible by the law of February 24, 2017. The law allows several consumers and producers to bond with each other within a legal person to collectively consume electricity by distributing renewable electricity production downstream from the same public electricity distribution station.

2.4 Germany

2.4.1 PV Prosumer Concept 1

Individual self-consumption is allowed in Germany. In 2014 the legislation introduced a surcharge for self-consumed electricity produced by PV plants above 10 kW. They are exposed to the payment of 40% of the current “EEG levy” (surcharge). The 40% surcharge currently corresponds to €0.027168/kWh (as of 2018), the kWh price for households being approximately €0.2942/kWh (as of 2018 incl. all taxes).

Barriers for implementation:

- The payment of 40% of the EEG levy for self-consumption from PV systems with an annual self-consumption > 10 MWh or an installed capacity > 10 kWp.
- In legal terms, surcharge-free self-consumption of electricity restrictively requires identity of plant operator and electricity consumer (referring to the natural person or the legal entity). Otherwise, the transfer of electricity is considered as the supply of a third party which is subject to the full EEG levy.
- Complex technical requirements to measure and prove the simultaneity in time for each ¼-h period of electricity produced and consumed, which requires appropriate meters, evaluation and reporting methods.

Good practice example:

- The company “Metakon” in Kleve, North Rhine-Westphalia, which achieved a self-consumption rate of 63%, saving €25,345 in annual electricity costs with a PV system of 213 kW.

2.4.2 PV Prosumer Concept 2-3

Currently the most profitable option is the so-called “Mieterstrommodell”, which is a scheme governing the use of the electricity produced by a PV system when the plant operator and the consumer(s) do not coincide, but are connected by a direct wire. The plant operator may just sell PV electricity or also other electricity to the consumer(s). The latter may have just one supply contract with the plant operator or two contracts, one with the PV plant operator and one with a company meeting the residual electricity demand.

The PV electricity framed by this model is subject to the payment of the full EEG levy. However, in summer 2017 the German legislator decided to incentivize these models. The scheme aims at supporting e.g. landlords willing to install solar panels on the roof of the building that they rent out (within the limit of 500 MW/year). Electricity from solar panels installed on apartment buildings and sold to tenants is eligible for support.

The support is paid out as a premium calculated as the difference between the reference value applicable when the installation enters into operation and 0.085ct/kWh (the "deduction value"). The specific premium is only granted on the electricity produced by the PV installation and consumed by the tenants. Excess electricity produced by the PV installation but not consumed by the tenants and consequently injected into the grid remains eligible for support for electricity injected into the grid (ordinary feed in tariff).

In order to receive the support, the plant operator can sell the electricity either to tenants or to owners of apartments in the building. Also, at least 40% of the building's area must serve residential purposes.

It is also possible to collectively use a PV system in one place without using "Mieterstrom" with a regular Power Purchase Agreement.

The district power model is allowed in Germany. However, due to the condition of "consumer identity" this model can hardly be found in Germany. Germany does not have an energy regulation on private district grids.

Barriers to implementation:

- The payment of the full EEG levy (see exceptions above) and the electricity tax for PV systems > 2 MW.
- Administrative challenges for real estate companies in the implementation of the "Mieterstrom model", since they have to create a subsidiary in order to avoid the payment of the trade tax of their total profit.
- Limited capacity: The Mieterstrom law supports only PV installations with an installed capacity of no more than 100 kW.

Good practice example:

- Residential projects powered by micro-grids with renewable energy: one example is a PV system of 80 kW and a 20 kW pellet CHP plant installed in a district of 30 residential units built in 2016 in Halle an der Saale, which supplies until 85% their tenants with energy.

2.5 Italy

2.5.1 PV Prosumer Concept 1

In Italy the so-called “ritiro dedicato” system is in place since 2008. Ritiro dedicato is a mechanism of simplified purchase and resale arrangement where PV producers (PV plant operators) sell the electricity to the Electricity Service Operator at a guaranteed price, instead of selling it through bilateral contracts with the national Energy Distributor (ENEL) or directly on the IPEX market (Italian Power Exchange).

Producers of renewable energy of small capacity can also decide to use the net metering scheme (scambio sul posto), if the plant’s capacity is in the range of 20 kW up to 500 kW. Since 2015 this system requires operators to pay an annual fee for the cost of management, verification and control.

In November 2015, Italy started a new procedure for the construction of small PV installations, named the "Simplified Procedure for the construction, connection and start-up of small PV systems on the roofs of buildings" (including houses, small businesses, small warehouses and apartment buildings). The process only requires the compilation and submission of a Single Application Form for both the construction and operation of generation plants using renewable energy sources. The capacity threshold for the application of the Single Authorization procedure for PV plants is 20 kW.

The last reform of the residential electricity bill, unfortunately, by flattening the energy costs, has made self-consumption less convenient than before. Small residential PV systems (up to 20 kWp) can benefit of a tax reduction of 50% of the investment to be recovered in a 10-years period. Furthermore, battery storages can also be included in the eligible costs for the tax reduction, as part of the PV plant and up to a maximum investment of €96 000. Moreover, building automation measures, which can also contribute to increase the self-consumption rate, can benefit of a 65% tax reduction over 10 years. These fiscal measures are valid until the end of 2018 even though they are usually renewed year after year. Finally, the purchase of a PV plant can access the reduced VAT at 10%, valid for enterprises, professionals and private persons.

Barriers to implementation:

- Increase of self-consumption for single users, especially in the residential sector, should be enhanced through supporting, for instance by direct incentives or tax reduction, the purchase of devices for load concentration (home automation) and storage (batteries).

2.5.2 PV Prosumer Concept 2-3

Barriers to implementation:

- The current legislation does not allow any collective use of self-consumption, neither in the residential sector nor for commercial or industrial application so there is a substantial barrier to the implementation of concepts 2 and 3.

Good practice example:

- The pilot project of the H-Farm, in the province of Treviso, in the north-east of Italy. This PV plant is composed by several PV sub-fields each of which is cabled to an internal mini-grid, then connected with the public grid. Though also in this case there is only a single user, since the connection with the public grid is through just one meter, there are several different consumption points and, therefore, it is a real-life simulation of what would happen in a collective self-consumption model.

2.6 The Netherlands

2.6.1 PV Prosumer Concept 1

The model being chosen by the Netherlands until now is the net-metering (or in Dutch “saldering"): the price for buying retail electricity (~€0.23/kWh) is the same as the received benefit from the utility when feeding electricity back to the grid. With present market prices of €1-1.5/Wp for a 3-5 kWp PV system, economic payback time is 5-7 years.

Net-metering is allowed for so-called small users, that is, for PV systems up to 15 kWp in size with a grid connection that is limited to 80 A in three phases and where the electricity has to be supplied and fed into the same point. In case the amount of generated PV electricity is higher than the annual consumption, the owner of the system receives a smaller fee from the utility of about 0.05-0.07 €/kWh.

With typical PV system size in the Netherlands of about 3-4 kWp, and typical household demand of 3500 kWh annually, self-consumption is estimated to be about 30% on annual basis. This varies and has been modelled by research institutions (e.g. UU).

The new minister of Economic Affairs stated in 2018 that he will replace the net-metering scheme by a form of feed-in tariff system in 2020. Yet, he clearly claimed the intention that the present business model for PV will not be negatively impacted.

Barriers to implementation:

- As details of the feed-in subsidy that will replace the net-metering in 2020 are now known yet, this may discourage new investments. Still, a 7-year economic payback time is guaranteed.

Good practice example:

- There are over 500,000 good practice examples of small residential systems with net-metering.

2.6.2 PV Prosumer Concept 2-3

In apartment buildings in which apartments are owned by individuals, four solutions for self-consumption are possible:

- First, PV energy can be used for collective services in the building such as elevators and lighting; in general, this solution is not considered collective self-consumption, as the consumer is only 1 entity.
- In the second solution, individual apartment owners actually own part of the full PV installation on the roof and are directly connected to the apartment. Strictly, this is not the shared self-consumption, since the extra energy produced by the PV portion of an owner cannot be used by other owners.
- Third, a combination of both options in which a distributor is needed.
- The fourth option is a special case of the so-called Postal Code Rose policy, in which anyone living in one postal code is able to invest in PV system in and directly around the postal code area he/she is living in. The benefit is a waiver for energy tax on the energy bill.

Barriers to implementation:

- Regulatory issues (paying energy tax on produced energy) prohibit sharing PV power in apartment buildings.

Good practice example:

- An innovative solution was developed and named after Hermann Scheer. A power distributor ‘Herman’, that connects the PV system on the apartment building roof to individual households sequentially in such a way that the apartments can profit from net-metering.

2.7 Portugal

2.7.1 Individual self-consumption (Group 1)

Self-consumption units in Portugal are called UPAC (Unidade de Produção em Auto Consumo). The grid connected capacity of a UPAC system is limited to the consumption capacity defined by a consumer contract. The capacity of the PV installation can be up to twice the capacity connected grid.

Electricity not self-consumed (excess of production) is injected into the grid. Prosumers in Portugal are remunerated for this electricity fed into the grid on the basis of a contract with the DSO according to the energy provided in kWh, for which the system owner receives 90% of the Iberian Market price (MIBEL). Systems up to 1.5 kW do not receive remuneration for the excess electricity injected into the grid. The injected electricity is sold to the Electricity Provider (CUR – Comercializador de Último Recurso).

Subsidies to investment in the systems can be obtained through a Portuguese structural fund called POSEUR if the system is integrated in the process of fundamental renovation of the building.

Barriers to implementation:

- The technical rules have not yet been published (these rules define some major connection issues, as well as grid protection rules).
- The delay in approving projects (due to severe lack of manpower in the entities in charge).
- Some costs are not yet clearly defined.

Good practice example:

- Direct self-consumption achieves its full potential in plants. These types of businesses operate during the day, that is, during the production cycle. The oldest and more often used as reference, is a cheese factory (Montiqueijo, Lisbon). It has been operating since 2015.

2.7.2 Collective self-consumption (Groups 2-3)

Collective self-consumption (local collective use of PV)

There is no legal framework to accommodate this business model in Portugal.

Collective self- consumption with a private grid

There is no legal framework to accommodate this business model in Portugal. Nevertheless, there is much interest in the Portuguese market, and consequently there are professionals working on projects on the necessary technical rules that will allow this model in a near future.

Barriers to implementation:

- Lack of legal framework.

2.8 Spain

2.8.1 Local use of self-consumption (Group 1)

The law establishes two types of self-consumption with different conditions:

- **Self-consumption 1** (just for self-consumption, no remuneration for injection): the owner of the PV system must be the same as the owner of the supply point, i.e. the consumer. Contracted power can be up to a maximum of 100 kW and the generation facility's capacity cannot exceed the supply point's contracted power. Two energy meters are required: one for net energy generation (mandatory) and another one independent from the first one, in the border point. A third meter for the consumption is optional. The consumer does not receive any remuneration for the excess electricity injected into the grid.
- **Self-consumption 2** (self-consuming and selling): a consumer and a producer (two different legal persons) may exist for the same installation. It is necessary to register the PV generation system as an electricity production facility in the electricity production facilities register. The generation facility's capacity shall not exceed the supply point's contracted power, but there is no limit for it as in self-consumption 1. The consumer may receive compensation for the excess electricity injected into the grid which will be the market price. It is mandatory to install 1 bidirectional meter to register net generation and 1 meter for total energy consumption and optionally a bidirectional meter at the border point. Consumers who decide to self-consume under the new Royal Decree of 2015 will have to continue paying the electricity access tariff of consumption like any other consumer. Additionally, they will have to bear the charges associated with the costs of the electrical system for the electricity they self-consume.

The charge for the self-consumed electricity has been denominated “Sun tax” and implies an extra cost for consumers with PV self-consumption. The larger the ratio of self-consumption the higher amount of money to be paid under the “Sun-tax” concept.

Barriers to implementation:

- Complex and time-consuming administrative procedures,
- Long pay-back periods,

- Impossibility to receive remuneration for excess electricity injected in the grid under the self-consumption Type 1.

Good practice example:

- The regional administration of Catalonia implemented a support scheme for the purchase of batteries for small self-consumption installations.

2.8.2 Collective self-consumption (Groups 2-3)

Collective self-consumption is not regulated in Spain. The decision to develop a regulation for collective self-consumption falls in the regional governments, but as of March 2018, none of these regions have developed the rules for governing the shared self-consumption.

Barriers to implementation:

- Collective self-consumption not regulated yet,
- DSOs putting barriers to develop full potential,
- Complex and many times expensive administrative procedures, including the sun tax

Good practice example:

The regional administrations are taking up the challenge and are designing support schemes (not always financial) to develop self-consumption at regional and local level. Most of the times it is addressed to improve the competitiveness of the companies.