PV Financing Best Practice: NOVOMUSICA Office Building (Spain)

General project description

Novomusica is a music company focused on the sale of audio and video systems based in Zaragoza (Spain). At the time of its 40th anniversary, in 2014, the company decided to change its headquarters to a new 2-floor shopset in a building that combines residential apartments in the upper and commercial establishments in the lower part.

During the development of this new shop, Novomusica sought to incorporate the latest innovative technologies to reduce electricity consumption. The most significant novelty was the installation of PV panels on the façade of the building, which lower the electricity costs and reduce the company's environmental impact.

The modern shop window incorporates six innovative thin-film laminated PV glass modules, which sum up to a total installed capacity of 576 Wp. These panels were the first thin-film laminated PV glass modules to be installed in the region of Aragon (Spain) and were integrated discreetly into the façade of this new establishment.

Novomusica's Shop window

Novomusica decided to install PV panels in order to promote new innovative technologies and renewable energies and to obtain energy savings through lowered electricity consumption from the electricity grid.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 646554

Business case description / economic parameters

In Spain, any electricity consumer is legally permitted to generate PV electricity for self-consumption, albeit without receiving any compensation for the excess generation. There is neither a feed-in tariff scheme nor a net-metering mechanism (nor comparable) in place. Certain requirements for legalizing the installation exist. Two types of self-consumption are permitted legally:

- Instantaneous self-consumption, under the complimentary technical instruction ITC[1] BT[2] 40 for Low Voltage Generating Installations, included in the Spanish Low Voltage Electric Technical Regulation REBT[3].
- Grid connected self-consumption, under the Royal Decree 1699/2011, of 18 November 2011, on the grid connection for electricity production for small scale renewable energy installations.

Novomusica's installation was built in order to comply with the instantaneous self-consumption regulation, under ITC BT 40 for Low Voltage Generating Installations, included in the REBT.

After the moratorium on FIT (refer to the annex for more information), in July 2013, the Spanish government presented a draft proposal for the PV market. The measures designed in this proposal include the following elements:

- No compensation for any excess PV generation fed into the grid
- A fee charged for every kWh of PV self-consumption (in case grid connection exists)

Because of this draft regulation the PV system installed in Novomusica includes a control system that prevents the injection of any excess power into the grid. According to the installer company, this design permitted Novomusica to invest in PV installations without having to worry about the mentioned regulation proposal. The system's setup guarantees that there will be no grid injection and therefore possible problems with the future regulation are avoided in case the current proposal of paying a fee for the PV electricity is accepted. Although until the final version of the regulation has not been published, it will not be possible to make a definite evaluation of the installation's compliance.

[1] Instrucción Técnica Complementaria, ITC - Complimentary technical instruction
[2] Baja tensión, BT - Low voltage
[3] Reglamento Electrotécnico para Baja Tensión, REBT - Low Voltage Electric Technical Regulation

The company has invested a total of 200.000 EUR in its new location, implementing several environmentally friendly measures, in order to become a smart and sustainable store[4]. The PV system integrated in the shop windows, which was installed by the Aragonese company EndeF, represented an investment of 7.000 EUR and will enable financial savings through the self-consumed energy (the annual generation of the installation amounts to 591,71 kWh). 10% of this investment corresponds to the inverter system that assures zero grid injection.

During the project's development, EndeF carried out a feasibility study for the PV system and a payback period of 10 years was calculated. According to the installer the period is relatively long because of the high investment cost (EUR/ kW), the reduced installed capacity and shading issues and they believe the period to be even longer since the start of operation of the system. They have not been able to provide a new estimate due to shading's volatility throughout the year. The shading does not only come from the buildings and trees nearby, but is also influenced by the people who stand in front of the shop windows.

Technical project parameters

Novomusica has installed a modern shop window with six integrated thin-film PV glass modules. The capturing surface has a black hue and an extension of 9,3 m^2. Each laminate is composed of two tempered glasses which hold a thin-film laminate manufactured by deposition of amorphous silicon. The installer of the Novomusica system considers this technology to represent a major step for the integration of PV generation into building envelopes.

As stated before, a control system for the inverter was integrated in the PV installation, in order to guarantee that there will be no grid injection. The mechanism used is a dynamic power controller which reduces the inverter's efficiency to adjust the supply of the generated energy to the consumption curve. When the controller detects no consumption signal it reduces the inverter's efficiency to zero to stop the electricity supply.

This installation, apart from the zero injection system, does not use any other additional systems of interest such as batteries for storage or any smart metering device, since it was designed to self-consume instantaneously 100% of the electricity it generates.

[4] The company received subsidies from the Aragonese government after the investment had been cmpleted. The subisidies were granted for being a renewable and energy efficient system

Stakeholders / companies / PPA

As pointed out before, Novomusica approaching its 40th anniversary contacted EndeF and expressed its idea of a smart and sustainable store. EndeF then researched along with Novomusica how to integrate PV panels in the new and innovative establishment.

Key stakeholders for the development of this innovative system of PV panels were EndeF's engineers and installers, and also Novomusica's owners, as they were the ones covering the initial investment. As mentioned, once the project was developed, Novomusica received a subsidy from the Aragonese government for the shop's energy efficiency and sustainability.

Another factor worth highlighting is the low maintenance required by this installation because to being a relatively simple system. EndeF provides maintenance services for a 10-year period which involves an annual revision of the system in order to detect possible faults or problems. At the time of research the installation had not required any changes/ adjustments.

Replicability / Outlook

It can be stated that Novomusica's PV installation serves as an exemplary case for Spain, mainly because of being one of the few installations that have been completed in Spain in the last years (because of the country's unfavorable and to a certain extent uncertain regulatory situation regarding renewable energy installations).The system was designed to include a zero-injection mechanism. Further, it is interesting as it provides an example of how to use PV in the commercial segment without having access to roof-top spaces.

Novomusica can serve as an example for other companies, residential buildings, offices, etc. which want to install solar PV to lower their energy costs. In Spain, depending on the final version of the self-consumption regulation which is currently being discussed, the need as well as the acceptance of the regulation of a zero injection mechanism to avoid additional fees will have to be evaluated.

The case is replicable in other segments and other countries. If a project with these characteristics should be developed in another country, the installation could be carried out without difficulty due to the simplicity of the system. However, the control mechanism would only be necessary in those countries that penalizes the injection of self-produced electricity to the grid. If there is no such regulation it would not be necessary to install the control system and these costs could be avoided.

In terms of scalability, this type of PV installation seems like a feasible option for all application segments, as it is integrated in the façade of a building. In the case at hand the capacity was limited to the surface they had, but if there is a lager surface available the installed capacity could be higher and more consumption could be covered by self-generated energy or sold to other consumers[5]. It should be noted that as in any PV installation, profitability rates vary depending on building conditions and its surroundings.

As mentioned, the payback period in the Novomusica case is very long. The payback period can be expected to be more attractive for systems that are installed with less shading problems and with larger capacities and of course for those that do not require the zero-injection mechanism. Further, as with other PV technologies, price reduction can be expected in the future for these integrated modules.

Annex

Self-consumption in Spain

In Spain, several regulatory changes have been implemented in recent years. The moratorium on the FiT mechanism for new renewable energy installations, presented in January 2012, strongly affected the PV sector, which had already seen the entry into force of different retroactive measures since 2010, such as:

- The Royal Decree 1565/2010, which modified the government support for electricity produced from PV plants. Existing FiTs were cut down by:
  - 5% for small-size roof installations (< 20 kW)
  - 25% for medium-size roof installation (>20 kW)
  - 45% for ground installations
- The Royal Decree-Law 14/2010, which requires electricity generators to pay a fee of 0,50 EUR/MWh for the electricity fed into the grid, in order to reduce the electricity sector's tariff deficit.

[5] Although it has to be kept in mind that the Spanish regulation does not allow several supply contracts for one consumer, meaning that the owner of the PV system would have to supply all electricity consumed by the client

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