PV Financing Best Practice: Domus Energethica Multi Family Home (Italy)

General project Description

The “Domus Energethica” project is a 6-floor multi-family house in the residential sector but also including 4 commercial activities, with several sub-shops, in the ground floor of the same building. The number of flats per floor ranges between 6 and 8 depending on the apartment sizes.

The building is located in corso Bernacchi 35, quite in the urban centre of the small city of Tradate (almost 18,000 inhabitants), close to the larger city of Varese, in the Lombardia region. In summer 2015 about 1/3 of the flats have been sold and the building will be officially inaugurated in January 2016.

It is a low energy consumption building, belonging to the “A” energy ranking, with the following main featured technologies:

- High width thermal insulation of the outer walls;
- Double-glazed windows with low emission factor;

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

- High-efficiency induction cooking;
- Home automation devices controlled by smartphones;
- 80 kWp PV plant for covering heating needs (electricity-based), as well as cooling demand and sanitary hot water preparation of the flats;
- Centralised domestic hot water production through heat pumps;
- Geothermal plant with ground as heat source (direct heat exchange between pipes and ground);
- Radiant floor heating with temperature control;
- Air ventilation system with heat recovery;
- High-efficiency lift with energy recovery;
- Rain water recovery and separate water grid for WCs;
- Led lighting for common areas.

The company developing the project, F.lli Bertani S.p.A., is very clear in stating that „high quality construction, also from the point of view of environment and energy efficiency is a must. Quality always pays off“. The idea and the main driver of the project was to develop a high-technology and low-consumption building where the owners of the flats can be sure that their energy bill will be so low for the next 20 years that they should not be worried of any increase in fuel prices because they rely mainly on renewable energy sources.

Business case description / economic parameters

The estimated electricity demand is distributed during the year as follows:

- Winter (180 days):
  - domestic hot water + space heating: 34.7 MWh
- Intermediate seasons (90 days):
  - domestic hot water: 4.2 MWh
- Summer (90 days):
  - cooling: 33.5 MWh
  - domestic hot water: no further consumption because the hot water is heated through the heat recovery from the chiller
- Yearly consumption for pumps and fans: 35.7 MWh

Therefore the total yearly electricity need is 108.1 MWh. The PV production should reach at least 95 MWh/year.

The cost for the PV plant is about 100,000 €, which means 1,250 €/kWp, price which is in line with the national average cost for such system size.

No public support or other form of incentives have been used for the project. In the phase of project development, an application was made to a regional tender for technological innovation but it was not accepted. The only revenue for the development company will come from the sale of the flats.

Regarding the PV plant, it will remain property of the building company which will sell electricity (both for direct use and heating) to the flat owners and to the commercial activities through an internal agreement or through an ESCO contract. This is at the moment the most critical point which still has be to analysed in depth.

From this point of view, the role of commercial activities will be crucial because, in order to maximise the benefits from PV production, self-consumption should be as high as possible, while residential applications are usually able to cover only 30÷35% of the PV electricity by self-consuming it. The difference in profit between self-consumed PV electricity and surplus sold to the grid is roughly 4 to 1, based on an assumed average end-consumer electricity

price of 0,23 €/kWh. Self-consuming all the PV electricity would mean a revenue between 16,000 and 20,000 €/year.

The innovative approach of this project is the guarantee given by the constructor of a maximum annual operation cost for each flat, which does not exceed 750 € including all the building costs (energy consumption for all uses including lighting and lift, cleaning, insurance, maintenance, administration costs). Therefore the project developer takes all the risks for possible higher costs, especially regarding the energy supply.

There is even a contract provision where Domus Energeticha, for a period of 20 years from the starting of plant operation, directly pays for the gas consumption needed in case of a not sufficient production from renewable energy plants. This clause has of course some limitations such as, for instance, to not exceed a room temperature of 20 °C and a hot water monthly consumption of 1,000 litres per person.

Technical project parameters

From a technical point of view, the project is interesting because it combines geothermal and PV technologies to obtain a 100% renewable multi-family house.

Self-consumption of PV electricity, which could range between 30% and 35% in case only the flats use the PV production, can be increased to much higher values by using the excess output to supply energy to the commercial activities. There are no electric storage systems in

place, due to the still too high investment cost needed, and therefore this option cannot be used to increase self-consumption rate.

The only storage used is a thermal one, the ground, which is heated up during the summer and cooled down in winter.

Regarding smart systems, the building is equipped with home automation devices, which can be controlled through smartphones, and energy consumption can be monitored separately for each user thanks to individual meters.

Stakeholders / companies / PPA

The main stakeholder involved in the project is the building company which basically is in charge of energy supply and which also takes the corresponding risks as explained above.

The PV plant which, as reported above, needed an investment of about 100,000 €, was financed as part of the overall building investment.

As reported in the previous sections, PV electricity should be sold via a PPA to both the flats and the commercial activities but the exact conditions have not been defined yet. The main goal will be to increase self-consumption as much as possible.

There is a standard O&M plan and an additional automatic alert system which can detect failures of the different energy supply devices before a serious damage can occur. The estimated O&M cost for all the plants is around 6,000 € per year.

Replicability / Outlook

The main project feature which can assure its replicability is the guarantee offered by the constructor on the users' bills since this increases the project appeal.

Such a project, however, would be more feasible in case of new buildings, which are not quite common in the current situation of the construction market.

The "hot spot" is for sure how the building company will deal with the details of to sell the PV electricity to multiple users, most probably through the constitution of an ESCO to sell energy

services. The applicability of the chosen solution will be key to further replications of this model.

At the moment, the same company is looking for an investor willing to finance a similar project including 6 towers with 50 flats each, which should foresee a turnkey price for potential buyers, including the whole energy supply with the O&M service.

More examples come from Valle d'Aosta regions, where two small existing multi-family buildings (with 7 and 8 flats), using both PV and heat pumps, have been deeply renovated by a building cooperative company which is now able to guarantee 10 years of zero bill and zero O&M costs (more information in Italian is available at www.qualenergia.it/articoli/20150706-se-la-casa-viene-venduta-a-bolletta-zero-garantita).

Source of photos and information:

www.domusenergethica.it