



## **Les Hauts de Feuilly, Saint-Priest, France**

Saint-Priest is a municipality of 40 000 inhabitants located in the Grand-Lyon conurbation, the second largest in France, with a mix of large commercial areas and industry. *Les Hauts de Feuilly* is a new housing district of 27 700 m<sup>2</sup> of useful floor area created by the Grand-Lyon Community in 1998 in order to develop a new form of housing based on high quality architecture and urban living. This project includes the construction of 117 individual homes and 81 dwellings in 6 multi-apartment buildings.

*Les Hauts de Feuilly* is now considered in France as a very innovative and successful development focused on sustainable development. Almost all the developers selected to design buildings used energy efficient building techniques and renewable energy sources in order to reduce the use of conventional energy. For example :

- *Les nouveaux Constructeurs* optimised the location and orientation of buildings in order to maximise solar gains, reinforced the insulation and used heat recovery ventilation and solar hot water systems,
- *SIER* optimised natural lighting, used natural material such as bricks, reinforced the insulation and used solar systems for heating and hot water production,
- *France-Terre* equipped each building with a roof integrated photovoltaic system,
- *Groupe MCP* will build passive houses equipped with solar thermal and photovoltaic systems.

As part of the PV UP-SCALE project, interviews were held with many people who have been involved in the development of this new area. These included members of *SERL*, the company in charge of the project, *France-Terre*, the developer that included PV in each building constructed and the Local Energy Agency.

Discussions focused on the *France-Terre* project which was completed in 2006 and which included the installation of a roof-integrated photovoltaic system on each building. Topics such as the complexity of the financial scheme and the connection to the grid were of particular interest to the stakeholders involved.

### **Description of the PV programme/project reviewed**

Within the *Les Hauts de Feuilly* area, PV was installed as standard equipment on 19 detached houses and 3 multi-story apartment buildings constructed by one developer, *France Terre*. In addition, *Groupe MCP*, another developer of this project, equipped its passive houses with PV in order to improve their energy balance.

At the beginning of the project, environmental issues were not part of the development scheme. This was first discussed when *SERL*, the company in charge of the city planning, raised the idea of using an environmental management method for the construction of this project. Each developer was given the choice to propose innovative building solutions in order to fulfil an environmental guideline proposed by the Grand-Lyon community.

*France-Terre*, one of the developers selected for the construction of this project, chose to pay special attention to the integration of photovoltaic systems, which was an innovative alternative to solar hot water systems in urban and collective housing projects.



Site plan of *Les Hauts de Feuilly*

The initial architectural choice of *France-Terre* was to equip detached houses with red tiles and multi-story apartment buildings with black tiles, both supplied by *IMERYYS TC*, the French largest fired clay tiles manufacturer that was also, by that time, involved in a European project to develop and install roof integrated PV systems. So when *France-Terre* decided to include PV in its commercial offer, it just asked its roof material supplier for a new offer that included PV. Finally, the developer decided to use only dark flat tiles for both types of buildings in order to improve the technical and aesthetical integration of the chosen PV tile.

For this project, site design was completed prior to the decision to equip the site with PV. This explains why the architectural choices, especially building orientation on streets and the roof type and orientation, are not fully optimised for PV. Also, as *France-Terre* wanted to offer the same quality to each house owner, each house was equipped with the same 1 kWp PV system, despite the fact that in reality some of the PV systems have better operating conditions than others.



France-Terre detached houses  
1 kWp integrated PV system each

The price of each PV system was approx. 10 000 euros including VAT, which represents less than 5% of the total price paid by private owners for each house, approx. 250 000 €. In order to help the developer sell the houses and help the private owners buy them, each PV system was funded by :

- the European Commission thanks to the use of an innovative PV product, the *IMERYS TC* PV tile
- the French National Agency for Environment and Energy Savings, ADEME
- and the Rhone-Alps Regional Council

The final additional cost for private owners of each PV system was less than 1% of the total price of the delivered house. At the completion of the project in 2006, the applicable feed-in tariff for PV was 0.14 €/kWh. But fortunately for the house owners, due to a delay in the official connection of each PV system to the grid, none of the PV systems were commissioned before summer 2006, when the new feed-in tariff was announced by the government. Finally, as the PV systems are integrated into the roof, the applicable feed-in tariff for this project will be 0,55 €/kWh for a guaranteed period of 20 years.

All the experience gained during this project was used by the Grand-Lyon Community in order to improve a local energy guidelines applicable to all buildings constructed on the land owned by the community and to increase energy efficiency in buildings and use of renewable energy systems above levels required by national regulations.



The **PV-STARLET** project was a European Commission funded project involving the development of a PV-tile and the installation of over 600 kWp of this product in Europe. This project was coordinated by *IMERYS TC*, the French largest fired clay tiles manufacturer.

Within PV-Starlet, 25 kWp were installed in *Les Hauts de Feuilly* by *IMERYS TC* on *France-Terre* buildings in 2006 :

- 19 kWp on 19 detached houses (1 kWp each)
- 6 kWp on 3 multi-story apartment buildings (2 kWp each)

Although the total installed power in this area is relatively small, this project is important as it was the first time in France a developer decided to include PV as a standard equipment of its' homes.

### Summary of problems, barriers, solutions and recommendations

#### **Problem : when designing building shape and layout, developers should know if buildings will be equipped with PV in order to take appropriate measures**

In this new development, site design was completed prior to the decision to equip the houses with PV. *France-Terre*, the developer of this project, chose to offer the same quality to each house owner by installing a 1 kWp on the roof of each house, despite the fact that architectural choices, especially the orientation on building on streets and the type and orientation of roofs, were not fully optimised for PV. Consequently, some of the PV systems are installed on roofs that do not face south.

#### **Recommendation**

In addition to regular urban planning and architectural requirements, developers should take into account basic requirements in terms of roof shape and orientation and reduce mutual shadings of buildings. This will make possible the installation of a PV system on each home and also ensure that each installed PV system operates under acceptable conditions.



France-Terre detached houses  
PV systems with different orientations



**Problem : Connecting PV systems on the distribution grid may generate additional costs if not well anticipated with the Distribution Network Operator**

In France, in order to benefit from the feed-in tariff for the totality of the energy produced by a PV system, the utility has to create an additional connection point to the grid dedicated to the PV system. For this new development, the Distribution Network Operator simply created the connection point to the grid to supply each house with electricity as done for regular development but was not formally informed that each home would be equipped with PV. Therefore the fact that an additional connection point to the grid was necessary for each PV system had not been anticipated. This was done at a later stage of the project, once the inhabitants had moved into their homes and delayed the commissioning of all PV systems but fortunately did not generate over-costs as the power of each PV system is below a certain level.

**Recommendation**

The company in charge of urban planning and developers should inform the Distribution Network Operator as soon as possible that new buildings will be equipped with PV systems. This will allow the Distribution Network Operator to modify its usual network planning works in order to include all necessary features for an optimal grid operation. This will also avoid additional infrastructure work after the completion of buildings if the Distribution Network Operator requires a direct connection to the transformer as may be the case for large scale PV systems.

**Problem : selling new homes with PV as standard equipment generates new requirements for developers**

A developer who chooses to install PV systems on its' buildings will not only have to deal with technical aspects but also with non-technical aspects such as the administrative procedures for the connection of PV systems to the grid or the contract for the purchase of the electricity produced at a specific feed-in tariff. Such procedures should normally be carried out by future home owners but as they are complicated and time consuming, developers generally choose to initiate them on behalf of future home owners as a commercial service in order to better sell the homes.

**Recommendation**

Developers should assist future home owners until the commissioning of the PV system. In particular, developers should make sure that future home owners have signed the contract for the connection of the PV system to the grid with the Distribution Network Operator and the contract for the purchase of the electricity produced at a specific feed-in tariff. Not assisting them could generate dissatisfaction of home owners and damage the developer's image.

**Sources of further information**

Semi-public company in charge of city planning : [www.serl.fr](http://www.serl.fr)  
European project that funded PV systems: [www.pv-starlet.com](http://www.pv-starlet.com)

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