The rise of building-integrated photovoltaics: policy construction begins

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ABSTRACT

Building-integrated photovoltaics, or BIPV, is one form of solar electricity that looks set to dominate the solar market in the coming years. The increase in BIPV installations is already evident in some European countries as governments begin to tweak their policies in order to provide a platform for this technology. The past few months have seen countries such as France and Italy make efforts to up the installation rate of this integrated form of solar, increasing the feed-in tariff (FiT) rate quite substantially for BIPV and lowering it for the more common installations such as roof and ground-mounted systems in order to increase the uptake. This BIPV-dedicated section will focus on the new policies implemented in France and Italy, concentrating on France's policies as a blueprint for others. It will provide a focus on why governments are so keen to increase incentives in favour of BIPV and what the future implications of this market shift will be.

France: BIPV foundations are laid

France was one of the first European countries to place a new focus on BIPV, setting the pace for other nations to implement changes and learn from the practices implemented there. Due to its highly favourable BIPV FiT, the French PV market is dominated today by BIPV applications for residential and commercial applications. The country's incentive for this form of PV is set higher than any in the world at €0.60/kWh, leading to a significant increase in BIPV installations.

The French government chose to place an emphasis on BIPV for several reasons. Firstly, France has a rich architectural heritage that it is keen to preserve, and, at many levels of government, it is considered necessary to conserve the architectural integrity of France's urban, village and country landscapes. Unlike some forms of building-applied photovoltaics (BAPV), which can often be viewed as unsightly additions simply placed on top of an existing structure, BIPV is seen as an acceptable compromise as it replaces certain elements of a building's structure; the PV elements become its 'skin', whilst also providing renewable energy. Secondly, when the FiT was last revised in early 2006, France had a small domestic PV industry that worked largely for export markets (namely northern Africa and Germany). An emphasis on BIPV products, of which few existed on the world market, was considered to be a convenient way of increasing the possibilities for the French PV industry to dominate in at least one market segment, and the high BIPV tariffs were to help finance product development and expansion in the local industry. Thus, the French BIPV market was born.

Source: Solarcentury

Figure 1. Energy roof from Solarcentury, Rotignon, France.

Although the French government is keen to significantly increase the amount of BIPV installations in the country, it cannot be said that the process is a straightforward one. In order to keep in line with its architecturally aesthetic impetus, the government has implemented some restrictions on what type of BIPV application is acceptable. One of the ways the government has come up with to enhance the quality of implementation is to oblige the installer to submit a certificate attesting that the works were designed and constructed in compliance with regulations and rules of art. If the installation complies with the guidelines it will receive the full BIPV FiT bonus.

Source: Solarcentury

Figure 2. C21e solar electric roof slates in Languedoc-Roussulon, France.

The French market is therefore segmented into those products eligible for the current FiT bonus and those that are not. These eligible systems must be either PV roofs, tiles or slates that have been industrially designed with or without support; sun shades (brise-soleils), windows, balcony and terrace balustrades, railings and vertical protection, PV glass roofs without back protection, façades or curtain walls. Any of these eligible forms of technology applied for in 2009 will receive the full €0.60/kWh tariff.

However, a draft text that is expected to be applied by January 1st 2010 is anticipated to be far more restrictive. The new policy will state that in order to be eligible for the full BIPV bonus, the system must not only fulfil one of the above criteria, but, in the case of PV roofs, the module itself must provide the waterproofing for the roof. Integration systems that rely on a plastic or metal waterproofing under-sheet will no longer be eligible for the bonus. To compensate for this tightening of eligibility criteria, an intermediate tariff will be created that will allow systems installed parallel to the roof to be eligible for a smaller bonus. This will call for a total tariff of €0.45/kWh.

The BIPV tariff in France is therefore attractive, yet not altogether simple. However, the return on investment (ROI) is also fairly positive, as if the BIPV tariff is

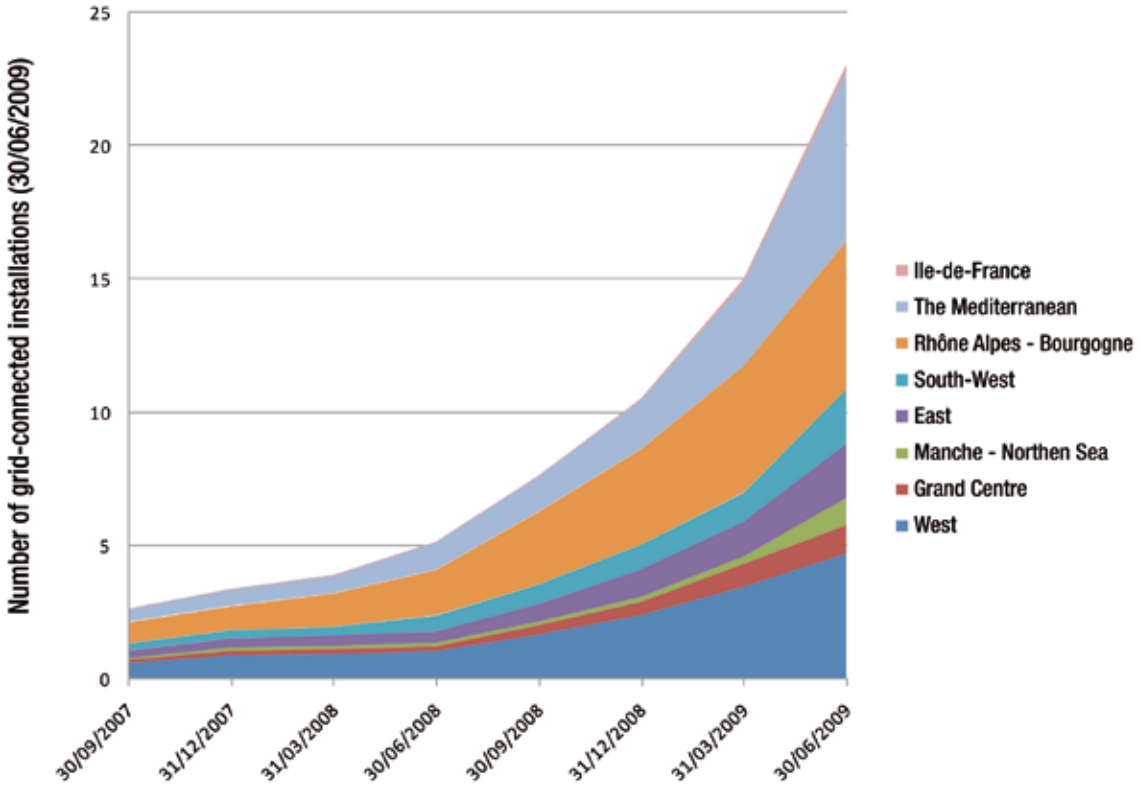

Figure 3. Number of grid-connected installations (by region) [1].

combined with tax breaks and incentives for private homeowners installing systems on their own houses, the economic payback could be achieved in five years (this figure is based on the insolation levels in southern France). It can be considered reasonable to expect that with the new, more complex BIPV regulations coming into force by early 2010, the amount of installations by the end of 2009 should significantly increase.

That is not to say that France has seen a limited interest in this form of PV. Figures as of June 2009 show that approximately 23,000 systems have already been connected to the mainland grid since the introduction of the tariff in 2006, only a handful of which were not BIPV. The tightening of the eligibility

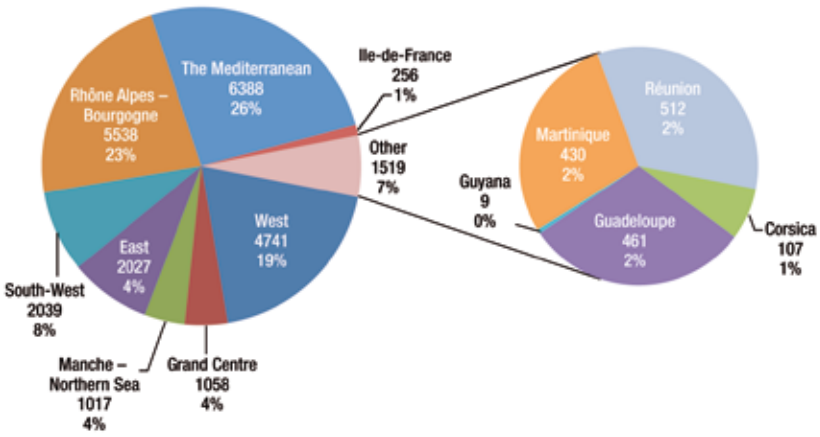

Figure 4. Number of grid-connected installations (as of June 30th 2009) [1].

Country	Roof/ground tariff (□/kWh)	BIPV tariff	BAPV tariff	Term (Years)
France	0.32-0.43	0.60		20
Germany	0.32	0.33-0.43		20
Italy	0.35-0.39	0.43-0.48	0.39-0.43	20
Switzerland	0.30-0.40	0.38-0.56	0.37-0.46	25
Austria		0.30-0.46	0.30-0.46	10+1+1
Czech Republic	0.48-0.49			20
Greece	0.40-0.60			20
Luxembourg	0.36-0.39			15
Netherlands	0.29-0.38			15
Portugal	0.62			5+10
Slovenia	0.33-0.37			5+5+10
Spain	0.32-0.34			25

Table 1. BIPV tariff comparisons in Europe (correct as of October 13th, 2009).

Data courtesy of EPIA.

Source: Solarcentury

Figure 5. Europe's largest solar façade, the CIS Tower, Manchester, UK.

criteria for the BIPV bonus in France is also expected to encourage more sophisticated BIPV products such as roof tiles and waterproofing joints for standard modules. Without this advancement, there is limited room for growth progression in this technology, as the new regulations will restrict the amount of conventional solutions eligible.

Italy: forging ahead with its own BIPV policies

Paving the way for other countries to enter the BIPV fray, France's work in promoting the use of solar energy and a new FiT rate have encouraged the adoption of similar strategies in Italy. The tariff that ranges from €0.43-0.48/kWh for BIPV installations has promoted a total installed PV capacity of approximately 600MWp to date. This tariff weighed against the non-integrated rate, set at €0.39/kWh for systems of 1-3kWh, is less appealing in comparison. Of the 600MWp installed so far in the country, 462MWp is either BAPV or BIPV. At 77% of the installed capacity, this figure alone shows the strong drive for the integrated form of PV technology in the country.

Although the Italian incentive is not as high for BIPV as in France, the rules surrounding this type of installation are equally as strict. The Italian electricity services operator GSE [2] has recently updated and published its Guideline for BIPV applications. This list of guidelines has been developed to help PV manufacturers, designers and installers develop BIPV systems in Italy. The GSE guide outlines the specifics of BIPV acceptability, listing many forms of restrictions on this type of installation. The guide also defines minimum requirements of both a functional and architectural nature that each installation will have to fulfil in order to obtain the full incentives for partial or total building integration. Some examples of eligible BIPV solutions include:

- PV modules that substitute the covering material of the roof and have the same architectural functionality of the surface;
- Mounting structures with fully operating shelters, canopies, arbors or sheds;
- Modules partly substituting the transparent or semi-transparent covering material, thus allowing the natural lighting of the rooms below, such as PV glass/c-Si glass.

This is just a handful of the 10 eligible examples listed on the GSE website. Again, we can expect these regulations to complicate things from a PV perspective unless significant advancements are made in terms of the inventiveness of integrated PV solutions. The technology surrounding this is therefore expected to advance quite significantly in the next few years if BIPV is to become successful while complying with the regulations in place.

The future of BIPV

As BIPV installations become more creative and inventive with the advancements in technology from leading BIPV companies, so the need for architectural input grows in the industry. Products and technologies such as Suntech Power's BIPV solutions, Dow Chemical's latest 'Solar Shingle' technology and Solarcentury's applications have been demonstrated throughout Europe. In order to achieve a better standardization of PV materials and components, a strong technical collaboration between the building and the photovoltaic sectors is needed. We can therefore expect to see a strong relationship develop between those in the photovoltaics industry and those in the architectural industry as the BIPV sector grows. Many architects are already getting involved by collaborating with those in the PV manufacturing and installation industry.

All the technical aspects aside, the BIPV industry is also likely to grow quite significantly for another more obvious reason. As the technology advances in the ways described in this focus, the more these new-build, aesthetic constructions will become a popular focus for the average citizen. One of the issues with PV's growth so far has been the question of who to approach if one requires an installation, who are the manufacturers, who are the installers and how much will it cost; will it be complicated to complete, and so on. However, if the technology is already integrated into a building, then all of these issues are erased, increasing the amount of interest on the part of the potential customer.

The integrated form of PV is certainly set for expansion as we move into 2010. Achieving this goal will require fine-tuning of incentive policies, reliance on aesthetic preference and strengthening of the relationship between the PV and construction industries. The PV sector can expect to be placed quite prominently in the spotlight as new-build BIPV technology begins to crop up across the globe and residential and commercial PV installation becomes commonplace in the construction industry.

Acknowledgements

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