The development and the prospects of BIPV systems in Italy

Federico Brucciani, Gruppo Imprese Fotovoltaiche Italiane (GIFI), Milan, Italy

This paper first appeared in the seventh print edition of *Photovoltaics International* journal.

ABSTRACT

The current feed-in tariff (FiT) scheme in Italy has so far resulted in a total installed PV capacity just above 760MWp (925MWp considering also the first FiT). The majority of those installations (71%) are building-adapted (BAPV) or building-integrated (BIPV) thanks to the higher incentives provided compared to non-integrated ground-mounted plants. Moreover, there are special premiums on top of the basic FiT, such as when asbestos roofings are replaced with PV modules. On the one hand, this makes the Italian PV market very attractive for those players specialized in roof applications, while on the other, it represents an opportunity and a strong motivation for both the installers and the manufacturers to explore innovative and standardized BIPV solutions and materials. Will this trend continue in the years to come?

From January 1st 2011, a new FiT scheme will replace the current system. ANIE (Associazione Nazionale Imprese Elettrotecniche ed Elettroniche) and GIFI have already elaborated and disclosed a solid proposal that, if fully envisaged by the Italian policy decision-makers, will secure a sustainable growth of all the market segments until the goal of grid parity is reached.

The feed-in tariff currently in force: structure, tariffs and premiums

The Ministerial Decree dated February 19th 2007 defines the rules of the incentive scheme for the electrical energy produced by photovoltaic plants in Italy. It grants a 20-year fixed tariff, which differs according to the size, in kWp, and to the level of building integration of the plant itself. Table 1 shows the FiT scheme valid in 2010.

Moreover, the legislation establishes several rules aimed at adding value to the electrical energy produced by a PV plant, for example the net-metering for installations up to 200kWp of nominal power and the sale (direct and indirect) of electricity in the liberalized market.

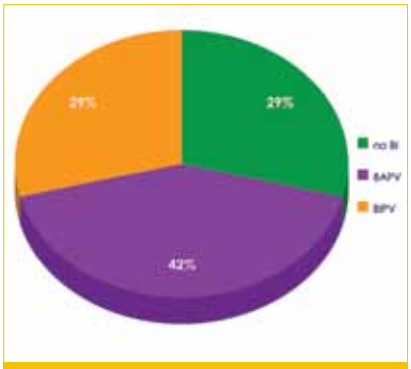
On top of the basic tariff, the Ministerial Decree sets a premium of +5% to be awarded to those PV plants fulfilling certain criteria. These criteria mainly favour public institutions such as schools, health institutions and municipalities:

- for non-integrated plants with power over 3kWp, if the owner self-consumes at least 70% of the energy produced by the plant;
- for plants where the owner is a public or parity school or a public health care institution;
- for BIPV plants in buildings and constructions for agricultural use that substitute covers in cement asbestos or containing asbestos;
- for plants where the owner is a local administration authority covering a population of less than 5,000 inhabitants.

The incentives may also be increased if the PV installation is coupled with energy efficiency interventions to the building. The premium, a maximum of 30% of the basic tariff, applies to PV plants that benefit from the net-metering installed in new and existing buildings where the energy performance index is improved by specific interventions.

Results of feed-in tariff in terms of building integration

The Gestore dei Servizi Elettrici (GSE - the Italian electricity services operator) is in charge of granting the FiT and keeps track of all PV installations grid connections nationwide. According to the data made available by the GSE, as of the 31st January 2010, the building integration level of all PV installations can be represented as in Fig. 1.



Source: GSE

Figure 1. Level of building integration in PV plants.

What are the requirements for a PV system to be admitted to the incentives as BAPV or BIPV installations? The GSE has recently updated and published a Guideline for the building integration of PV plants [1]. It represents a unique handbook for those manufacturers, designers and installers willing to develop building integrated photovoltaic

Power (kWp)	Non-integrated	BAPV	BIPV
1 ≤ P ≤ 3	0.384 €/kWh	0.422 €/kWh	0.470 €/kWh
3 < P ≤ 20	0.364 €/kWh	0.404 €/kWh	0.442 €/kWh
P > 20	0.346 €/kWh	0.384 €/kWh	0.422 €/kWh

Table 1. The FiT scheme valid in Italy in 2010.

Owner	Type of installation
Self producer*	Non-integrated with nominal power > 3kWp
Public school	All
Public health institution	All
All	BIPV plants substituting asbestos
Municipalities with up to 5000 inhabitants	All

*Note: a self-producer is a natural or legal person that produces electrical energy and uses over 70% of this output. The label self-producer is not applicable to a subject that benefits from net-metering.

Table 2. Criteria for the +5% bonus as contained in the Ministerial Decree.

systems. This document presents 13 types of interventions, defining minimum requirements, both functional and architectural, that each plant have to fulfil in order to obtain incentives for partial or total building integration.

Types of BAPV installations benefiting from FiTs

BAPV installations in Italy embrace all PV modules mounted on buildings or street structures – such as kiosks, bus shelters and acoustic barriers – without substituting the underlying building materials.

The GSE handbook provides three specific types of BAPV installations:

- PV modules installed on flat roofs and terraces. Those surfaces may have ring elements of different heights. If the height of the ring element (Hr) is below or equal to 50 cm the PV installation has no height restrictions. In case the height of the ring element (Hr) is over 50 cm then the median axis of the PV module shall be always below Hr.
- PV modules installed on top of tilted surfaces (roofs, façades, parapets and balusters) without substituting the underlying material. This is the most common roof installation whereby PV modules have the same inclination of the surface and do not stretch out from the covering lap.
- PV modules installed on top of street structures without substituting the underlying material.

Types of BIPV installations benefiting from FiTs

BIPV installations have similar features to those that fall under the BAPV title. However, in this case, all PV modules completely substitute the covering elements, such as tiles, foil and tin roofings. Generally speaking, in BIPV installations, solar modules must have a dual function, for example waterproofing, protection and thermal regulation or noise reduction.

As for BIPV, the GSE handbook addresses 10 specific types of installations:

- PV modules with the same inclination as that of the tilted surface (roof, façade or sheeting) substituting the covering material and having the same architectural functionality of the surface itself. PV modules should partly or fully cover the tilted surface. From the energy efficiency point of view, the PV installation should not jeopardize the energy performance index of the whole building during either winter or summer.
- PV modules and their mounting structures fully operating as shelters, canopies, arbors or sheds. The design of the installation, especially in regard to the mounting structure and the cable channelling, should not jeopardize the shading function of the whole covering.

Figure 2. Example of BAPV roof installation.

- PV modules partly substituting the transparent or semi-transparent covering material thus allowing the natural lightning of the rooms below. This solution involves the use of both glass/c-Si glass and adequately textured thin-film modules. This solution is particularly suited to 'photovoltaic green houses,' quickly becoming more and more popular in Italy. In order to be certified a BIPV installation, the green house should be permanently ground-fixed and the height of the covering lap should be at least two metres.
- PV modules partly substituting the noise protection modules of an acoustic barrier. In this case the PV modules should be mounted in the upper part of the structure, thus avoiding shading, degradation or breaking effects.
- PV modules powering street lightning devices. As well as general streetlights, this category includes parking meters and advertising plates. Priority is given to lighting devices based on LED technology. However, as the minimum nominal power benefiting from the FiT is set to 1kWp, the application will need to involve an array of street lightning devices in order to satisfy this requirement.
- PV modules and their mounting structures fully operating as shading devices. The PV installation must be mounted in the façade of the building as a shield for the glass surfaces.
- PV modules substituting the covering material of balusters and parapets. These modules should be completely integrated in the supporting structure.
- PV modules partly or fully substituting the glass of windows. This involves the use of glass/glass PV modules, preferably movable, within windows and glass walls.
- PV modules fully substituting the shading elements of blinds/shutters.
- Any of the above mentioned surfaces where PV modules represent the covering formfitting the surface itself. This category is particularly suited to flexible thin-film PV modules installed in any part of the building's covering surface.

When does an installation does not qualify as BIPV?

With these points in mind, perhaps it would be interesting to explain the most frequent design mistakes that can prevent an installation from gaining BIPV status. We will take a look at the first of the 10 installation types just listed (PV modules

Figure 3. Example of BIPV roof installation.

Figure 4. Example of a PV roof installation where the modules exceed the upper line of the roof tiles.

Power classes kWp	Ground-mounted €/kWh (reduction % vs. 2010)	Roof-mounted €/kWh (reduction % vs. 2010)
1-6	0.365 (5%)	0.401 (5%)
6-50	0.339 (7%)	0.375 (7%)
50-200	0.298 (14%)	0.330 (14%)
200-1.000	0.291 (16%)	0.323 (16%)
>1.000	0.277 (20%)	0.307 (20%)

Table 3. ANIE/GIFI proposal for the feed-in tariff after 2010.

with the same inclination as that of the tilted surface (roof, façade or sheeting) substituting the covering material and having the same architectural functionality of the surface itself), which represents the most common roof application.

There are five main errors to be avoided:

- Omitting junction elements such as claddings and flashings for covering both horizontal and vertical discontinuity between the PV module and building elements. This may cause the roof to loose its water resistance and/or thermal properties;
- the positioning of PV modules should fully adapt to the geometric properties of the roof;
- the PV modules should not 'lean out' from the roof;
- the PV module should be positioned no further than its own thickness past the upper line of the tiles.

However, if these 'errors' are unavoidable, the installation can still be qualified as BAPV, thus receiving a minor incentive.

Feed-in-Tariffs after 2010: what to expect?

The current legislation will cease to be valid as of the end of 2010. Will the focus on BIPV remain? The Italian PV Industry Association (Confindustria ANIE/GIFI) has already elaborated and disclosed a solid proposal that, if fully envisaged by the Italian policy decision-makers, will secure a sustainable growth of all the market segments until grid-parity is reached. The basic tariff proposed does not differ from the current one, according to the level of building integration of the PV installation. It refers to only two types of installations: ground-mounted and roof-mounted.

However, the focus on small/medium-sized BIPV installations is preserved. In fact, the association proposes a minor reduction (compared to ground-mounted plants) of a +25% premium for full BIPV systems and a +10% premium for PV modules substituting asbestos roofing. The basic tariff proposed also differs according to the nominal power of the PV system but there are now five power classes instead of three. Table 3 shows the proposed FiT scheme.

Conclusion

BIPV installations are regarded by many experts as the long-term development of the photovoltaic market worldwide. However, in order the keep the adequate balance between all market segments and to secure the production of a large amount of 'green' electricity, utility-scale PV plants should be planned accordingly.

Italy, unlike Spain and the U.S., has a limited availability of land, which is mainly concentrated in the southern territories. At the same time the availability of industrial, commercial and residential roofs is rather large. According to the CNES (National Committee on Solar Energy) report on the potential for PV in Italy, there are, theoretically, 13,000km^2 of roofing surfaces with different levels of solar radiation and sunlight exposition.

In terms of policies, it is evident that the focus of the decision-makers is on roof photovoltaic systems, both BAPV and BIPV. However, in order to achieve a better standardization of PV materials and components, a strong technical collaboration between the building and the photovoltaic sectors is required.

Reference

[1] GSE 2009, "Guida agli interventi validi ai fini del riconoscimento dell'integrazione architettonica del fotovoltaico" [available online at http://www.gse.it/Pagine/default.aspx].

About the Author

Federico Brucciani is the Communication Officer for GIFI, the Italian PV Industry Association based in Milan, Italy. Before joining the association in July 2007, he worked for two years for the Italian Ministry for the Environment as a consultant for European energy policies. He has also served the European Parliament in Luxembourg as an intern. He is the co-founder and the president of the Italian NGO Prorinnovabili and collaborates with Solarplaza, the consultancy firm based in Rotterdam (The Netherlands). He holds a Bachelor's degree in electronic engineering from the University of Pisa (Italy) and from the Technical University of Gent (Belgium).

Enquiries

Gruppo Imprese Fotovoltaiche Italiane
Viale Lancetti, 43
20158 Milano
Italy

Tel: +39 02 3264 228
Fax: +39 02 3264 217