EPIA's Photovoltaic Observatory: an in-depth analysis of feed-in tariff schemes

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ABSTRACT

The vital importance of the regulation framework to trigger the development of a PV market has been recognized these last few years in many European countries. For policymakers today, one of the key challenges is making the best choice to initiate and stimulate PV markets. In the aftermath of the financial crisis, EPIA has launched the PV Observatory initiative. This paper describes this new initiative, which aims at analyzing the current state of regulatory frameworks in a set of countries, starting with the main European PV markets.

The PV Observatory Policy Report becomes available in February 2010, and concentrates on identifying the best practices among various policies implemented across Europe in recent years. Three major areas of policies impacting the development of PV markets are assessed: the financial support schemes (with a clear focus on the most effective system: the feed-in-tariffs, or FiTs), the administrative processes and the grid connection.

The 'sustainable PV market development' recipe results from an appropriate combination of these three policy areas. The best support scheme will not trigger any substantial development if the administrative barriers discourage investors or if the grid codes do not favour electricity from renewable sources. The other way round, the best administrative framework will never trigger any development without an appropriate financial support.

In summary, EPIA's Photovoltaic Observatory Policy Report analyses all the elements of this global recipe to present the best practices extracted from the most relevant European PV markets.

Feed-in-Tariffs pave the road to market development

First of all, it is of utmost importance to remember that feed-in-tariffs should be used only during a temporary pre-competitive period, i.e. the period before grid parity is reached. Approaching grid parity, and beyond, other support mechanisms should be put in place. Tariffs allow the market to develop and the industry to decrease PV costs, as was clearly demonstrated in the past years. In a few years' time, investment costs will be low enough to be paid off without the need for the support of any feed-in tariffs.

Assuming the temporary measure status of feed-in-tariffs begs the question: what parameters do authorities have to consider when setting up such a financial incentive?

The first thing to consider is what type of market authorities wish to develop: large-scale ground mounted PV systems, distributed rooftops or building-integrated solutions, or a mixture of each. The structure of the tariff segments and the level of the feed-in tariffs will depend largely on this primary decision. The choice will depend on policy choices as well as the market structure: small households' rooftops and large ground-mounted power plants do not require the same investment and installation capacity. In times of uncertainty regarding the financing of investments, diversification remains the key word for PV segmentation. Nevertheless, the specifics of each country (geography, grid topography, other policy choices...) will finally prevail in shaping the segments.

> "The feed-in tariff is often not the only support measure available for PV and is often combined with other financial instruments."

What is the best tariff level?

Proper support design is a crucial task for policymakers as it shall guarantee a sustainable PV market development, thus permitting consistent market growth, national value chain development, but also preventing possible speculation when financial returns are excessively high.

As a matter of fact, the feed-in tariff is often not the only support measure available for PV and is often combined with other financial instruments such as soft loans, fiscal incentives and beneficial credit terms, made available either at national or regional level. The combination of these instruments determines the overall financial attractiveness of the PV investment.

Using the Internal Rate of Return (IRR) is a rigorous analytical way of comparing the level of PV support across countries. It allows the synthesis of the financial support provided by different mechanisms in one single figure and the assessment of its appropriateness. Regarding the private investors' perspective, the IRR is considered as 'sustainable' when within it falls between 6% and 10%. Below this range, IRR is considered too low to ensure an adequate market expansion; above this range, IRR is considered too high, as it creates a risk of market overheat. For business investors, the recommended IRR values should be slightly higher as shown in the Table 1.

Therefore, a very important criterion to define the level of the tariff is to make sure it is sustainable in the long run. Using the IRR analysis is the best way to help qualify best practices and assessing the quality of a support scheme.

Potential issues with FiTs?

Behind the feed-in-tariff lies the idea that the market will develop if private and institutional investors consider PV as a competitive investment. Meanwhile, money is not the single aspect of the decision and investors may decide to overreact for psychological reasons. The financial crisis that forced governments all over the world to support the banking world could have triggered an appetite for PV in some countries (as a stable and

Evaluation logic	Insufficient support	Sustainable support	Unsustainable support
Private investor	<6%	6-10%	>10%
Business investor	<8%	8-12%	>12%

Table 1. Recommendations for financial support levels provided by IRR.

Source: PV Observatory Policy Report, EPIA.

predictable investment) and destroyed the market in others. Moreover, the fast price decline that was experienced in 2009 challenged some markets as well by doping the demand.

As we have seen before, the support scheme is not intended to last forever. Its goal consists in supporting market deployment during PV pre-competitive phase, progressively being phased out once grid parity is reached. In this way, control methods can be used to keep the market within reasonable boundaries.

Unsustainable market growth

What kind of growth can a country's market sustain? We define sustainable growth as the development process that will allow industry, including local market players, to grow continuously, creating long-term employment and added value in the country itself. The installed capacity must remain in line with the capabilities of the installers and producers, as well as the investors. The graph in Fig. 1 represents three different growth scenarios. In the first scenario ('insufficient'), IRR is too low to generate market demand and leads to market stagnation. The second scenario ('sustainable') shows that market growth rate progressively increases as IRR increases; the third scenario ('unsustainable') shows an overly generous IRR resulting in an explosive growth followed by a market collapse.

This situation, without recovery of the market after the bubble's explosion, reflects that the confidence of all stakeholders could be destroyed for a long period of time due to an inadequate management of the growth. We assume that overly generous IRRs can provoke an explosive growth in a short period of time (a few months) when all other conditions of development are met.

The very principle of feed-in tariffs is that they do not cost money to the government budgets. The feed-in tariff concept bases itself on a repartition of the added PV costs across all electricity consumers. Therefore, the taxpayers' money is not impacted while a redistribution mechanism is built inside the electricity market itself. The global cost of this mechanism can be limited using a predefined market CAP. This solution brings a theoretical maximum extra cost to the electricity bill, but it also constraints the market; today in Europe no example of a market, truly constrained by a fixed CAP, has led to a successful sustainable PV deployment.

> "The feed-in tariff concept bases itself on a repartition of the added PV costs across all electricity consumers."

The self-regulated method relies on defining upper and lower boundaries in terms of market volumes. A predictable increase or decrease in the attractiveness of the financial support (for instance in reducing or increasing FiT digression rate) will allow stimulation, or on the contrary, moderation of the market growth if boundaries are crossed downwards or upwards. This method, when used with caution and reasonable assessment periods, can be considered as the best practice.

Stability and predictability

Stability in time and predictability of future tariffs is an essential component to ensure the investor's confidence. In 2009, the rapid price evolution rendered obsolete almost all of the calculations made at the beginning of the year. A good regulation implies forecasting such changes and being able to adapt the feed-in tariff accordingly. Otherwise, given the average time to decision, the level of uncertainty felt by investors can threaten the market growth. Therefore, we strongly recommend avoiding a *stop & go* policy, which works to the detriment of the sector.

Two points must be taken into consideration:

- The uncertainty about the tariff evolution can lead investors to anticipate or delay their investment, causing a market overheating or a market collapse. Authorities should clearly anticipate the price variations and communicate in due time their intentions.
- Rapid price evolution can transform an adequate tariff into an unsustainable one. Regular assessment and adaptation of the support level should be foreseen to ensure IRRs of support schemes actually reflect system prices' evolution and remain at all time within the predefined sustainability range.

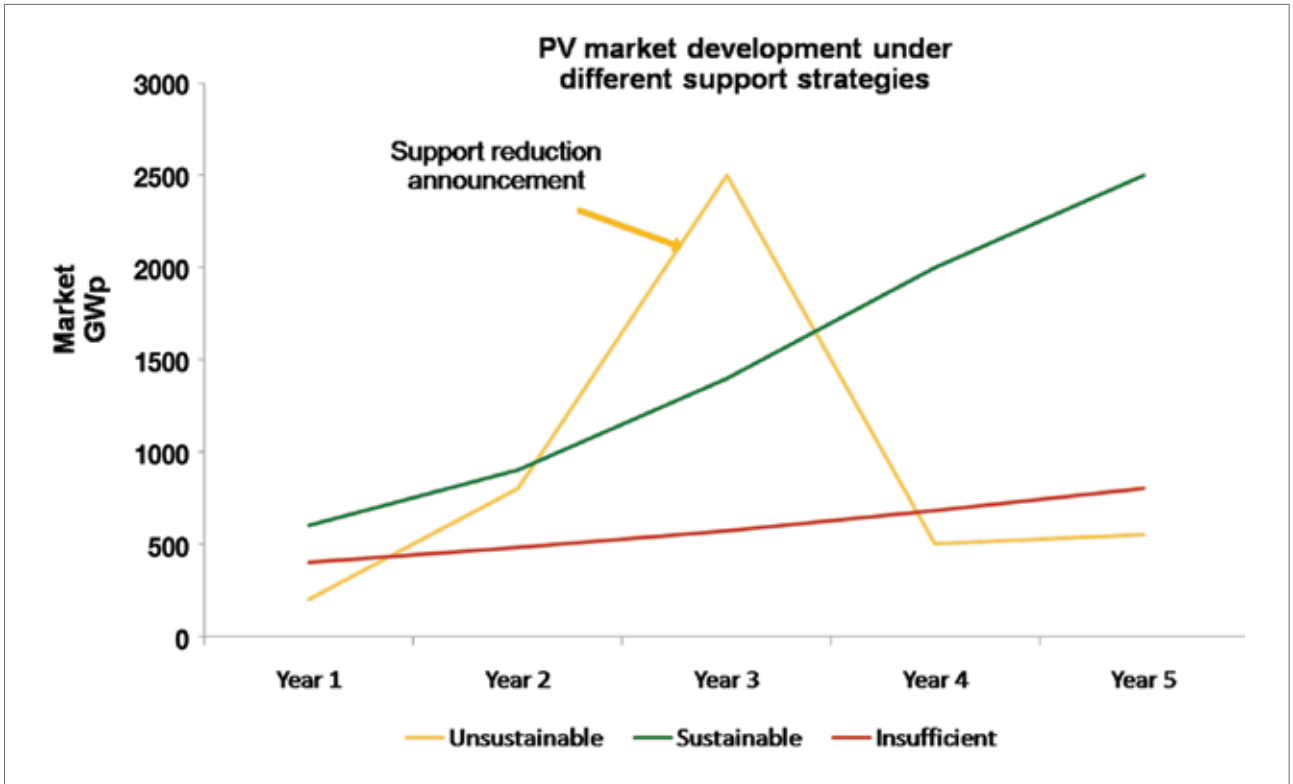

Figure 1. CAP or self-regulated method?

The future of feed-in tariffs

In the mid-term, support schemes have to evolve as PV is transitioning into a competitive technology. This process is gradual and needs to reflect differences by customer segment and region.

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The pre-competitive phase, which reflects the current status in most markets, is ideally governed by FiTs with digressive levels of support. These can be supplemented by support from various instruments (tax credits, subsidies, loans, etc.) but overall should not exceed sustainable support levels. Efficient administrative procedures (e.g. for licensing and building permits) as well as short grid-connection times are key conditions that still need to be realised in several markets. Significant R&D support and cooperation for basic and applied research is equally important in this phase.

During the transition phase, as we have seen before, support for PV should move towards a gradual adaptation of FiTs to ensure sustainable growth; FiPs (Feed-in Premium for direct electricity auto-consumption) to increase incentives for self-consumption, and the inclusion of PV in regulations such as, for example, zero-energy or energy-positive building standards that are supplemental policies/measures to ensure continued deployment.

Some policy support for PV will also be needed during the competitive phase, as investment competitiveness alone does not automatically provide sufficient incentives to overcome switching costs and resistance. The most important long-term policy target should be the full implementation of time-of-use electricity billing and net metering in Europe, as this will ensure compensation for PV's favourable attributes as a peak power generation technology. Furthermore, the maintenance of low FiPs might be necessary in some markets or for certain segments, as long as the investment threshold warranting sustainable IRRs is not reached.

> "Support for PV should move towards a gradual adaptation of FiTs to ensure sustainable growth."

EU-wide introduction of time-of-use electricity billing and net metering

A mid-term objective of the EU should be the EU-wide introduction of time-of-use electricity billing and net metering. Time-of-use electricity billing allows an adjustment of pricing to load conditions, thereby providing consumers with the right incentives to optimize system costs. It will require the installation of smart meters able to measure when electricity is consumed.

Net metering allows the sale of excess electricity to the grid. It will require the installation of smart meters capable of measuring how much of the produced electricity is fed into the grid. For instance, a Southern California utility uses a bi-directional smart meter to measure and/or track the 'net' difference between the amount of electricity produced and the amount of electricity consumed during each billing period.

Summary of feed-in-tariff core elements

In summary, the core elements of a well-designed feed-in tariff are as follows:

- **A temporary mechanism**. The feed-in tariff should be introduced in order to stimulate the market and should be reduced progressively as parity is reached, then replaced by another compensation scheme (e.g. net-metering).
- A **self-regulated feed-in tariff with predictable changes** is the key to stability and sustainability of market development.
- **Consideration for taxpayers**, as the money financing the incentive comes from a limited extra amount taken from the monthly electricity bill.
- **The driver for further cost reductions and economies of scale**: by creating volume, and driving price reduction through well-designed digression rates.
- **Ensures high quality PV systems** and good performance as the return on investment depends on the performance of the system.
- It should be provided **for a long time** (typically 20 years or more) to create secure conditions for potential investors.
- It should be accompanied by **an ambitious national industrial policy** in order to develop a national industry and thus maximize the effect of developing a local industry and creating local wealth.

About the Author

Gaëtan Masson joined the EPIA team in November 2009 as Senior Economist. After working as an electromechanical engineer, he graduated in political sciences and recently completed a Master's degree in environmental sciences at the Université Libre de Bruxelles. His career path has been mainly dedicated to the finance industry.

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