# PV Policy Group

## Designing Photovoltaic Policies in Europe

**Joint Position Paper and Action Plan**
**of the PV Policy Group on Photovoltaic Policies in Europe**

Supported by

Intelligent Energy Europe

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# IMPRINT

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## Note to the reader

This Joint Position Paper and Action Plan on Photovoltaic Policies in Europe is one of several publications by the PV Policy Group.

In addition to this paper the following major project publications are also available (Download: www.pvpolicy.org):

European Best Practice Report – Assessment of 12 national policy frameworks for photovoltaics:

- Country analyses
- Benchmarks
- Conclusions

National Position Papers and Action Plans of the eight partner countries of the PV Policy Group:

- Austria
- France
- Germany
- Greece
- The Netherlands
- Portugal
- Slovenia
- Spain

Summary and conclusions of the PV Policy Group project:

- Summary of the European Best Practice Report
- Summaries of all National Position Papers and Action Plans
- Summary of the Joint European Position Paper and Action Plan
- Conclusions on the PV Policy Group project

# EXECUTIVE SUMMARY

The Photovoltaic (PV) sector is currently one of the fastest growing industries in the world. On the surface, Europe – with an installed capacity of 1.79 GW in 2005 [1] – seems to be contributing to this development. Closer examination, however, reveals that substantial market deployment takes place merely in a few EU Member States: Germany accounted for 85 % of total European PV capacity in 2005 followed by only eight countries in which installed capacitiy exceeded 10 MW [1]. In some of the latter, initially promising developments almost grinded to a halt due to worsened conditions. However, thanks to political action in some countries, especially Spain, Italy and Greece, considerable growth can already be observed and is expected for the near future.

The PV Policy Group – a consortium of energy agencies and PV experts from eight European countries (AT, FR, DE, EL, NL, PT, SI, ES) – was created with the objective of stimulating political action throughout Europe towards the development of political-legal framework conditions for PV. Following a detailed assessment of existing policy frameworks the PV Policy Group presents this Joint European Position Paper and Action Plan. It addresses politicians on national and EU level as well as other stakeholders who are invovled in the political decision making process for solar PV. The document comprises two main sections:

1. **Joint European Position Paper:** Following the analysis of existing policies concrete recommendations for PV policy design were elaborated.
2. **Joint European Action Plan:** The members of the PV Policy Group propose own actions to actively contribute to the solution of the most important tasks in PV policies that derive from the recommendations of the Position Paper.

**Joint European Position Paper**

The primary section of the Position Paper addresses policy issues on a national level and presents recommendations for the following four fields:

1. PV strategies and their implementation
2. Regulatory frameworks
3. Financial support measures
4. Monitoring systems

Proposals for EU political decision-makers on how introduction of PV ought to be supported on the European level are presented in the second part.

The key findings and recommendations can be summarised as follows:

*1. PV strategies and their implementation*

In most EU countries PV promotion is undertaken by a patchwork of political initiatives rather than a coherent long-term strategic approach. The basis for the design of national policy frameworks, however, should be a clear vision for PV development in the long run manifested by ambitous but realistic targets and transferred into coherent policies adapted to local circumstances. Whilst policy frameworks should evolve over time in line with market development and national targets, they must be simultaneously stable enough to convey reliabity to market actors.

*2. Regulatory frameworks*

Throughout Europe complex administrative procedures, insufficient grid access and missing or restrictive building sector regulations frequently deter potential PV operators from investing in proprietary systems. Administrative procedures must be clear-cut and avoid unnecessary administrative burden. As required by RES-E Directive 2001/77/EC [2] free, non-discriminatory grid access has to be guaranteed in national legislation. Technical requirements for safe and grid-compatible plant commissioning and operation should be differentiated according to power categories and not impose any inappropriate demands on operators. Cumbersome restrictions discouraging the installation of PV systems on roofs or in building integrated application must also be removed. Even more, when transposing EU Building Directive 2002/91/EC [3] into national law, PV should be highlighted as an option for fulfilling the Directive. Finally, in order to ease the use of PV components as integral parts of buildings, efforts in the production of standardization and official certification must be intensified.

*3. Financial support measures*

Beyond the augmentation of research and development funds, increased industrial output is essential for cost reduction of PV systems and per extension of the cost reduction of PV electricity (economies of scale). Financial support in the form of market development mechanisms triggers consumer demand which in turn leads to increased capital investment from industry to construct adequate production capacity to meet increased demand, that in the end also leads to lower costs. As current cost levels render the technology uncompetitive with conventional power pricing structures such financial support for this type of renewable energy technology is fundamental. Although many EU Member States have implemented financial incentives for PV, their effect remains negligible mainly due to insufficient levels of economic incentive for potential plant operators.

Feed-in-tariff schemes have proven to be the most effective and efficient incentive, if designed appropriately: the tariffs must allow for rates of return that are at least equal

to alternative investments with similar risk and duration and be differentiated for different plant types, sizes and – on a larger geographical scale – solar irradiation (e. g. distinction between free-standing and building integrated systems). Decrease of tariffs for new plants over time (policy sun-set) has the effect of stimulating production efficiency and cost reduction efforts within industry. However, it is conceivable to start decreasing the tariffs in a newly implemented scheme only after a defined period of time in order to allow a substantial market to develop. Long-term stability, reliability, coherence and avoidance of "stop-and-go" disruptions are other important aspects in the design of feed-in-tariffs.

In addition to feed-in-tariff schemes a large variety of financial support measures exists across Europe (direct subsidies, soft loans or tax reductions etc.). In isolated application such mechanisms have demonstrated limited and marginal effect. In combination with a strong feed-in-tariff scheme, however, an initial or intermediate temporary acceleration of a fledgling PV market can be achieved.

*4. Monitoring systems*
The implementation of effective political support schemes has triggered considerable market growth of PV applications in some EU countries. The growing policy spill-over effect and economic impact of the PV sector on industry and society at large increases the relevance of political decision-making in this area. Although good monitoring practices exists for certain market areas, a comprehensive approach is missing in most countries. As a result, a scientific-technically sound and regularly updated information data base is becoming an increasingly urgent necessity for the facilitation of political decision making. Besides mere market data collection the monitoring system should comprise routines for evaluating the efficiency of the policy framework for PV. Monitoring systems should furthermore be designed to enable collected data to be shared in a pan-European database.

*EU level political support for PV*
Throughout Europe good practice in all PV political fields exists. Although transfer and exchange of know-how can be observed between Member States, implemented support legislation for PV remains largely heterogeneous and frequently ineffective. In order to leverage a coordinated and efficient introduction of PV support policies throughout Europe all EU political instruments ranging from actual legislative acts to flanking measures (e. g. campaigning or joint projects) ought to be exploited.
Four concrete recommendations should be stressed here:

- Missing sector targets in European legislation carry the serious risk that PV market introduction remains – as it is the case today – restricted to a few Member States. Thus the consideration of PV should explicitly be demanded of the Member States when European legislation is implemented.
- In terms of regulatory frameworks the EU Commission should demand from Member States that especially in the context of transposing RES-E Directive 2001/77/EC [2] into national legislation that any unnecessary barriers for PV be removed and that PV is sufficiently promoted. Also, it should be observed that, with regards to Building Directive 2002/91/EC [3], PV is mentioned explicitly in national regulation as a means to fulfil and comply with the Directive.
- To financially support PV, feed-in-tariff schemes can be considered best choice and should therefore be promoted accordingly. However, harmonisation of financial incentives should not be a primary short-term aim: the starting point for any national support policy should be overall framework conditions and the development stage of the PV market in each country. At the same time alibi schemes without effect should not be accepted by the European Government.
- Finally, to provide entirely reliable information for political decision-making an EU-wide market and industry monitoring system should be installed on the basis of a jointly defined data collection procedure in the single Member States.

**Joint European Action Plan**
Derived from the recommendations of the Position Paper and further observations the PV Policy Group proposes the implementation of an action plan that is designed to contribute to the optimisation of PV political support throughout Europe. It proposes the following five cross-national joint actions:

*Action 1. Continuation of the PV Policy Group project to support the introduction of PV strategies and their implementation on national level*

*Action 2. PV in the built environment*

*Action 3. Grid access regulations for small, decentralised PV and renewable energy systems*

*Action 4. Financial support for PV – Establishing innovative financial instruments for small-scale PV projects*

*Action 5. Concept for a pan-European monitoring system*

# I. INTRODUCTION

## 1. PV Sector Status

**Present situation: great achievements, but also imbalanced development**

Since 2003 we are witnessing an industry sector with one of the highest growth rates worldwide: Photovoltaics (PV). PV technology has passed from niche markets to wider applications and consequently to the creation of an important market with a growing number of players and increasing competition. Political commitment and support policies in some of the EU Member States contribute strongly to this development. It has also led to the creation of an industry with increased added value for Europe, highly qualified jobs and an important turnover for the market actors involved. Also in the global context, the European PV industry has achieved a strong position within a short period of time. The target defined in the European White Paper for Renewable Energies [4] of 3 GW installed PV capacity until 2010 is thus likely to be met (Fig.1).

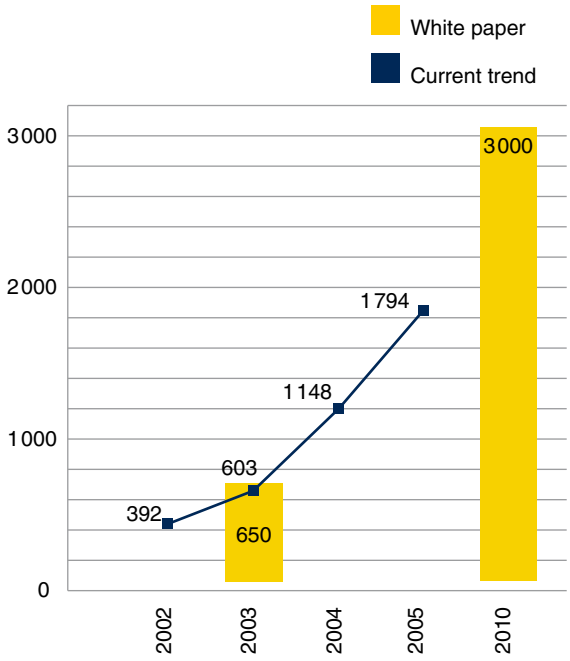



***Fig. 1: Comparison of the present trend with the White Paper objectives (in MW); Source: EurObserv'ER 2006 [1]***

However, it must also be noted that a strong imbalance continues to exist in the European market, with merely one country (Germany) showing strong domestic market development and only a few other markets (Spain, Italy, Greece, France) that have recently entered the growth path by implementing sufficiently attractive policy frameworks. In all other EU Member States national PV markets and industries are still in an early stage of development or have come to a halt due to worsened conditions. (Table 1)

| Countries | Cumulated power at the end of 2005 | | |
|---|---|---|---|
| | on grid | off grid | Total |
| Germany | 1508,000 | 29,000 | 1537,000 |
| Spain | 42,500 | 15,200 | 57,700 |
| Netherlands | 46,300 | 4,900 | 51,200 |
| Italy | 23,000 | 13,000 | 36,000 |
| France | 13,800 | 18,867 | 32,667 |
| Luxembourg | 23,266 | 0,000 | 23,266 |
| Austria | 18,223 | 3,207 | 21,430 |
| United Kingdom | 9,786 | 0,878 | 10,664 |
| Greece | 1,412 | 4,032 | 5,444 |
| Sweden | 0,254 | 3,922 | 4,176 |
| Finland | 0,223 | 3,779 | 4,002 |
| Portugal | 0,600 | 2,700 | 3,300 |
| Denmark | 2,335 | 0,305 | 2,640 |
| Belgium | 1,712 | 0,053 | 1,765 |
| Cyprus | 0,490 | 0,135 | 0,625 |
| Czech Rep. | 0,380 | 0,150 | 0,530 |
| Poland | 0,085 | 0,232 | 0,317 |
| Ireland | 0,000 | 0,300 | 0,300 |
| Slovenia | 0,118 | 0,098 | 0,216 |
| Hungary | 0,085 | 0,091 | 0,176 |
| Slovakia | 0,000 | 0,060 | 0,060 |
| Lithuania | 0,000 | 0,017 | 0,017 |
| Malta | 0,015 | 0,000 | 0,015 |
| Latvia | 0,000 | 0,005 | 0,005 |
| Estonia | 0,000 | 0,003 | 0,003 |
| **Total U.E.** | **1692,584** | **100,934** | **1793,518** |

***Table 1: PV installed capacity in European Union in 2005 (in MW); Source: EurObserv'ER 2006 [1]***

**Future outlook: enormous potential, yet barriers to overcome**

With regard to the future, both the European Commission and energy experts expect a considerable contribution to electricity supply from PV in the long term. This expectation is supported by several scenarios from organisations as diverse as Shell International [5], the PV industry (EPIA) [6], Greenpeace [7], the European Renewable Energy Council (EREC) [8] and others. The scenarios imply that new policy measures for the deployment of renewable energies including PV are introduced internationally. Scenarios are based on the assumption of advanced political action for renewable energy sources, high natural potential and clear advantages of the technology: suitable for local decentralised applica-

tion in the built environment, silent and without moving parts, no emissions during operation, easy and low cost maintenance. In terms of electricity production costs it is assumed that PV has the potential to reach step by step competitiveness with cost structures of conventional electricity generation, for instance parity with end-consumer prices or added value through contribution to peak-shaving as medium-term objectives.
In order to achieve large-scale implementation in the future, PV markets must be developed today. First steps have been accomplished: the technology is developing quickly and PV applications are readily available in almost all European countries. Over the past 30 years the PV market has witnessed a steadily increasing learning curve – a price reduction of 20% as and when production output doubled. For the past 10 years alone this has meant the halving of system prices. Nevertheless, further cost reduction by approximately factor 5 is required for PV to play a mainstream role in the future. This will only be achieved through a joint European effort in both public and industrial research, as well as market development.
On the research level, major challenges for the industry are increasing the efficiency of materials and energy use as well as achieving economies of scale through widespread deployment.
On the market level, political frameworks constitute current barriers to entry that must be overcome to meet the needs of market actors. Experience in successful PV markets has shown that investment in PV is triggered when political support ensures the following general principles:

- Sufficient attractiveness and economically justifiable risk of investments in PV technologies / applications.
- Transparency and reliability of legal framework conditions, and therefore long-term security of investments.
- High efficiency in the way overall legal conditions are implemented in practice by public authorities to limit administrative inconvenience and lead times for projects and minimize promotion related macro-economic costs.

## 2. Challenge for PV policy-makers

From the point of view of the EU and national governments, development of sustainable growth of PV markets serves three major short- to long-term objectives:

1. Contribution to security of energy supply, economic growth and employment in Europe.
2. Contribution to the European position as a knowledge-based economy.
3. Contribution to the reduction of $CO_2$ emission and mitigation of climate change.

*In her "Communication […] to the Council, the European Parliament, the Economic and Social Committee and the Committee of the Regions", the European Commission states that: "The competitiveness of manufacturing industry is a cornerstone of Europe's sustainable development strategy. Sustainability has three pillars: economic, social, and environmental. Competitiveness is a necessary ingredient in the success of the sustainability strategy."*

***"Communication from the Commission to the Council, the European Parliament, the Economic and Social Committee and the Committee of the Regions", COM (2002) 714 final, Brussels, 11.12.2002***

Whilst fast growth and continuous globalization of the PV market form new opportunities for the European PV sector on the one hand, it simultaneously creates an increasingly competitive environment on the other. In order to maintain a leading position and high level of competitiveness EU and national policies should support PV with a coherent, effective and intelligent policy for research, industry and market development.

To achieve the above-mentioned objectives PV policy should focus on the following priority areas:

- To establish effective and efficient public R&D policies including an appropriate budget which reflects the potential for photovoltaic technology. Continuity in programming and coordination of R&D actions between public and industry based research is essential. R&D activities range from fundamental to applied research. Investment on R&D balanced with market implementation support will generate knowledge and contribute to continuous improvement of products to reach cost reduction, high performance and innovation.
- To create sustainable market development in Europe driven by effective and well tuned support mechanisms with clearly defined regulations. This support should be oriented at the overall objective to step-by-step lead PV into self-supporting markets with competitive electricity prices especially in a global context.

- To promote new financial mechanisms adapted to the specific needs of photovoltaic investors (usually small-scale investments, relatively long payback times, limited access of investors to conventional sources of finance other than public subsidies). Innovative financial tools should involve both public and private sources alike.
- To raise awareness and understanding of PV technology amongst all stakeholders to ease implementation. Basic knowledge about the potential and benefits of PV in society, education at schools and universities or special training for craftsmen is crucial for accelerated PV application.
- To enhance the use of solar electricity in developing countries by supporting the implementation of United Nation's (UN) Millennium development goals, by contributing to the European Union Energy Initiative for Poverty Eradication and Sustainable Development (EUEI).

If Europe wants to strengthen its role in this global market an EU-wide long term political commitment and support, but also better coordination between the different countries is needed. Whereas the coordination of research and development is stimulated and enhanced by initiatives like the Photovoltaic European Research Area Network (PV ERA NET), the knowledge exchange and collaboration in terms of market-oriented PV policies across the EU is still deficient.

The PV Policy Group was convened to address this task.

# II. THE PV POLICY GROUP

## 1. Project background

### Project issues and objectives

The European PV Policy Group aims at stimulating political action for the improvement and alignment of policy frameworks for photovoltaic technology on national and EU Community level. Such action is required to overcome political-legal barriers that are currently preventing investments in the majority of European PV markets and to achieve political targets until 2010 and beyond. Against the background of an overall PV strategy the group deals with three major policy areas:

- Regulatory frameworks for PV
- Financial support schemes for PV
- Monitoring systems for PV

In all these policy fields, there is high potential for improvement, which was explored by joint efforts of the PV Policy Group, in terms of assessment, exchange, policy proposals and, last but not least, own activities.

### Project partners and structure

The European PV Policy Group was formed by energy agencies from 8 European nations (Austria, France, Germany, Greece, the Netherlands, Portugal, Slovenia and Spain), the European Photovoltaic Industry Association (EPIA) and WIP (Munich). With Italy and Sweden, two further countries informally joined this core group later on. In addition, a number of experts and representatives of European key actors (e.g. EC, EU-networks, industry associations, special interest groups) were invited to join the core group's advisory board and three thematic working groups.
On the country level, each participating energy agency established a national PV Policy Group that again involved a variety of PV stakeholders via roundtable discussions and working groups.

### Project methodology and results

In line with the aforementioned objectives, figure 2 shows the project's work programme that followed four overall steps:

1. Comparative assessment of national policy frameworks in 12 countries published in the European Best Practice Report [9]
2. Mutual exchange and knowledge transfer between project participants on lessons learned and ways of improvement
   - On the cross-national level, by means of the European Core Group and three Thematic Working Groups
   - On the country level, via eight National Core Groups in roundtable discussions with key actors
3. Development of policy proposals for improvement to politicians (key results: position papers, both on national and European level)
4. Definition of own activities to contribute to the implementation of proposals (key results: action plans, both on national and European level)

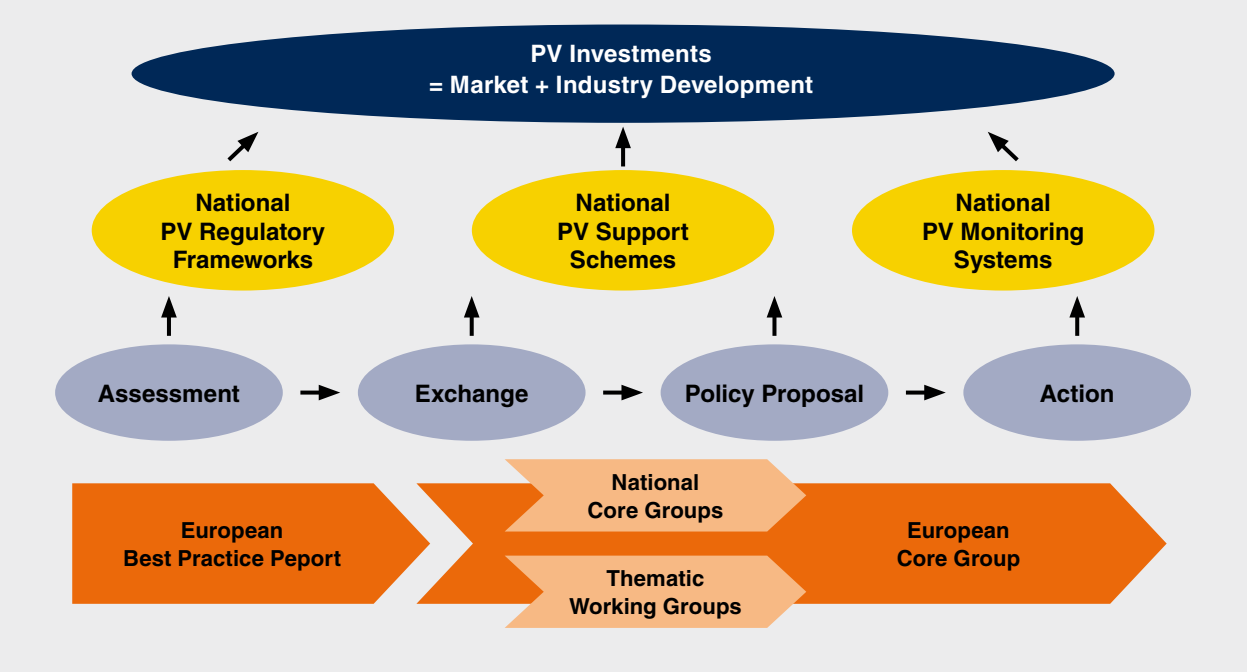



*Fig. 2: PV Policy Group – set-up and work programme*

## 2. This Joint European Position Paper and Action Plan

**Purpose and objectives of this position paper and action plan**

The key objectives of this paper may be summarised as follows:

- Summarise key findings and conclusions from all previous project activities that are viable across country-specific boundaries, concretely:
  - European Best Practice Report
  - European PV Policy Group meetings, including advisory board and thematic working groups
  - National core groups meetings, including roundtables and working groups
- Formulate recommendations to policy makers on national and European level, with regard to the improvement and alignment of policy frameworks for PV
- Define own activities of the policy group members to be implemented on national and European level, with regard to the improvement and better coordination of policy frameworks for PV

**Target groups and dissemination of this position paper and action plan**

The following main target groups of this paper shall be reached:

- European Commission and Parliament
- National governments and political key actors
- European PV industry and other EU projects and networks (e. g. EU PV Technology Platform)

**Other documents related to this position paper and action plan**

This Joint European Position Paper & Action Plan is closely linked to the following other major publications of the PV Policy Group:

- European Best Practice Report [9]
- Eight national position papers and action plans (Austria, France, Germany, Greece, the Netherlands, Portugal, Slovenia and Spain)
- Summary and conclusions of the PV Policy Group project

All documents are available for free download from the project website www.pvpolicy.org.

# III. RECOMMENDATIONS TO NATIONAL GOVERNMENTS: SHORT-TERM IMPROVEMENT OF NATIONAL PV POLICY FRAMEWORKS

## 1. Development of an integrated PV policy approach

Especially in the early stage of PV market development, as is currently still the case in most EU Member States, the key to successful PV implementation is the creation of consistent PV policy frameworks. Ideally, these may be set by pursuing the following three steps:

1. Set ambitious but realistic long-term PV targets in a defined timeframe in line with EU policies, national political goals and priorities on the national level.
2. Establish a target-oriented coherent PV strategy.
3. Implement the PV strategy by transferring it into a balanced mix of actual PV support measures, consisting of
   - regulatory measures (administrative procedures, grid-access codes, building regulations, quality standards etc.)
   - financial support measures (feed-in-tariff, green certificates, subsidies, soft loans, fiscal incentives etc.)
   - promotional and educational measures (awareness/information campaigns, qualification etc.)
   - evaluation and monitoring measures (market/industry monitoring, policy performance measurement)

Fig. 3 shows a possible approach to an integrated PV policy framework. The highlighted elements show the policy fields the PV Policy Group dealt with in detail and which are presented in greater detail in this position paper.

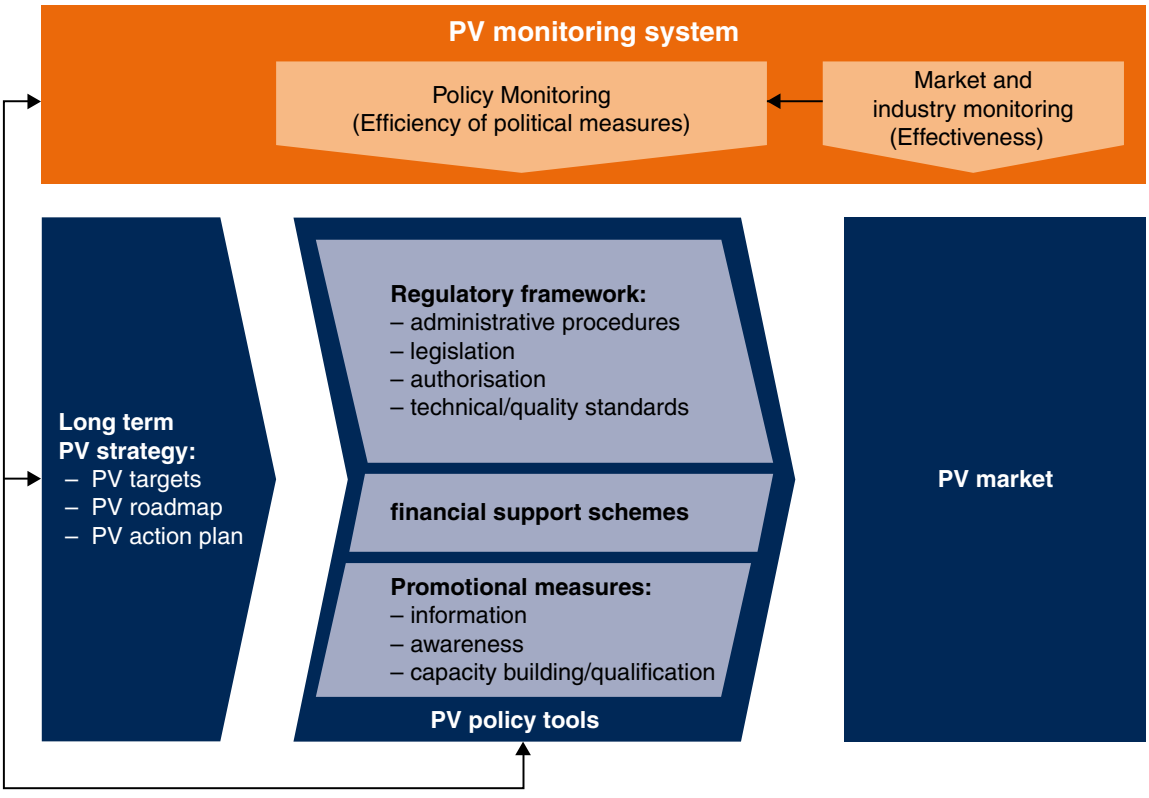



*Fig. 3: Integrated PV policy approach*

## 2. Improvement of PV strategies and their implementation

**Overview of key issues**

The following issues were identified as key by the PV Policy Group in the area of PV strategies and their implementation:

- Official PV targets (medium and long term)
- Implementation of PV strategies to align political action to targets
- Market caps (total/annual) as means to limit and control development
- Coherence of the policy framework to balance single political instruments to the overall strategy

Key findings of the PV Policy Group:

- Official quantitative and/or qualitative targets for PV are an indicator of the political commitment of the respective government. Some EU Member States have defined official targets until 2010–2012. Although they are not binding, a strong effect on the market can be observed as they convey reliability to industry and investors.
- Some countries combine a long-term indicative target with shorter-term capacity caps to limit and control PV market development. These caps apply either for the total market volume or to annual installations. In contrast to minimum targets these maximum caps always represent a hard barrier with the potential of a sudden market breakdown if the target is reached too quickly.
- In most EU countries PV promotion is undertaken by a patchwork of political initiatives, rather than a coherent, long-term strategic approach. Also, the landscape of national approaches to PV promotion remains heterogeneous across Europe. A large number of support measures and combinations of them exist in parallel.
- A typical shortcoming in many countries with PV strategy is that it is not implemented effectively in practice by the responsible institutions.
- PV policy frameworks are often exposed to sudden changes in time, typically after governments change. This frequently leads to detrimental market effects.
- In many countries single authorities (e.g. authorities in different regions) apply common national regulations in practice in very different ways. Often these authorities are over-challenged in dealing with PV as a new technology. Sometimes single authorities are not properly integrated in overall authorisation procedures.

Recommendations by the PV Policy Group:

- The basis for the design of national policy frameworks should be a clear vision of PV development in the long run. This vision should be manifested by ambitious but realistic targets and transferred into a consistent strategy to give orientation to market actors. Targets should be flexible and adapted in order to react on unforeseen developments.
- Country-specific conditions (e.g. economic restrictions of potential plant operators or low awareness of the technology) have to be taken into consideration when formulating a national PV strategy and policy. However, successful concepts from other countries should be taken into account and adapted to local conditions.
- The national strategy should be sustained over at least five years. However, regular reviews should enable flexible adaptations in line with actual market development, but without introducing fundamental changes or a turnaround of the overall political direction.
- National policy frameworks should evolve over time, in line with market development and according to national targets. For instance, the right mix of measures to stimulate an embryonic market would be different from the framework for a high-growth market close to maturity. The overall design of the national PV framework, including all single policy measures, should be coherent in itself in order to achieve a transparent and efficient support system.
- As important as the political concept is the effective involvement of key actors and communication to target groups in order to create awareness and acceptance.
- The application of total market caps is generally not recommended. However, if a government opts for caps they should at least be high enough to enable a constant market development, but also flexible in order to be able to react on undesired effects.
- The definition of annual market caps is not recommended either. However, they can be a tool to control the dynamics of the market and avoid uncontrollable market explosion. These caps should be progressive from year to year to reflect a healthy growth rate required to achieve the overall targets. By no means, should they be too restrictive to avoid the aforementioned undesired effects of market caps.
- A national PV strategy should stipulate a monitoring system to ensure ongoing impact assessment.

▶ *see also* ***Action 1. Continuation of the PV Policy Group project to support the introduction of PV strategies and their implementation on national level (p. 36)***

**Good practice:**
**Spain's Renewable Energy Plan 2005–2010 (PER)**

A clear official indicative target for the PV sector was already stated in the first Spanish Renewable Energy Plan from 1999 (PFER 2000–2010) [10]. Given the dynamic development of the market the first target of 150 MW of cumulated capacity until 2010 was increased to 400 MW in the revised plan from 2005 (PER 2005–2010) [11]. The plan, built upon detailed national resources and scenario analyses, provides a reliable basis for actual PV legislation or possible legal amendments. It identifies barriers and proposes measures how the set targets can be achieved. The parliamentarian approval of the plan plays an important role as it is a strong signal to the PV industry and investors that the parliament is willing to support the development of renewable energies. If the PER and its political implementation provide sufficient stability, being at the same time flexible enough to react on undesired effects (e.g. when maximum installed PV capacities are reached sooner than expected) this approach will maintain its role model character. It is expected that the Spanish Energy Agency IDEA will initiate the preparation of a new Plan in 2008, covering the period from 2010 to 2020, with new analyses, targets and proposals on measures for renewable energy and therefore the PV sector.

## 3. Improvement of national regulatory frameworks for PV

### Overview of key issues

The following issues were identified as key by the PV Policy Group in this area:

- Administrative procedures (e.g. building permissions, grid access, procedures within authorities etc.)
- Grid connection and use (grid-access codes)
- Building sector regulations (incl. building integration)

(Note: The legal issue of financial support schemes is discussed later in chapter III.4., p. 21)

### Administrative procedures for planning and constructing PV plants

Key findings of the PV Policy Group:

- In most countries the administrative procedures for planning, construction and/or operating grid-connected PV systems represent a significant barrier for market development.
- In many countries, even small-scale PV installations are still treated as conventional electricity production facilities, so that the requirements are often inappropriate for this type of technology (e.g. extensive requirements to obtain building permissions or to perform environmental impact analyses). Only in some countries have sector regulators introduced PV specific technical or administrative rules or guidelines for PV investors.
- In most countries, administrative procedures are longer and more complex than necessary. Investors are often confronted with great difficulties and long lead times in application processes.
- In addition, the handling of regulations in practice, typically by regional or local authorities, is often suboptimal. Authorities in different regions or with other responsibilities sometimes apply common regulations in a different way. Often too many different institutions are involved in the authorisation process. Apart from this authorities are often unfamiliar with PV technology and thus overcharged with applications. This also leads to uncertainties for investors and time-consuming authorization processes.
- The evaluation process of national administrative procedures required by RES-E Directive 2001/77/EC [2] has not led to improvements in most countries.
- The formal status of a small independent power producer (IPP) as economic entity is often unclear. Especially for private PV operators the status imposes high requirements (e.g. in terms of administrative or fiscal obligations) that have to be considered a barrier to the development of a market for small systems.

Recommendations by the PV Policy Group:

- Introduce sound and straightforward procedures for PV promoters and investors. Wherever possible, integrate requirements and permits in one specific and transparent procedure for small, distributed electricity producers. The provision of model contracts, templates and forms increases efficiency. Qualification and training measures for staff involved in the procedures should be offered where necessary.
- Specific regulation for PV should exclude unnecessary conditions and requirements. It should clarify or replace the overall electricity sector regulations applicable for larger-scale applications.
- The number of required permissions and authorities involved should be minimised, especially for small projects. Ideally, one easily accessible authority on national or regional level should be established as contact point for applicants.
- PV plants should generally be exempt from any specific environmental impact assessment (EIA). An EIA should only be required for large, freestanding installations under certain preconditions, for instance in protected areas. Environmental standards must not exceed existing environmental regulation and be made transparent to reduce the inconvenience for promoters to a reasonable level.
- The formal status of independent power producers as economic entity should be defined in order to avoid uncertainties (in terms of taxation, insurance, grid access etc.). If all these issues are clear for potential PV power producers and relevant regulations are simple to apply, more investors will be willing to install a PV system.

**Grid access, connection and use of PV plants**

Key findings of the PV Policy Group:

- In addition to general administrative processes, the lack of legislation for grid access and connection in nearly all European countries represents another major barrier to PV market development.
- In many countries the requirement of the European RES-E Directive 2001/77/EC [2] to ensure free, non-discriminatory grid access for any renewable electricity producer is not fully met by actual application of regulations on the regional or local level.
- Due to a lack of experience utilities or grid operators are often concerned about grid stability and safety when PV plants are to be connected to the grid. At the same time in countries where PV is already widely applied it has been shown that connecting PV systems to the grid is technically unproblematic and safe due to clear technical codes.
- Technically highly demanding codes for grid access and use, which are mainly designed for large, centralised production units, are applied for small PV systems alike.

Recommendations by the PV Policy Group:

- National legislation should guarantee distributed power producers priority rights in terms of grid access and use. It should also provide long-term legal security for operators via guarantees for grid-connection and feed-in-permission.
- Any country should implement simple standardized norms for grid connection and safety in operation. They could be achieved either by amendment of the overall electrical code or definition of a special sub-regulation for PV. Until European standards (e.g. prEN/CENElec) are defined, existing norms proven to be effective from other countries may be adopted.
- Technical requirements for grid-connection should be differentiated according to system size and voltage range respectively. Requirements for small-scale PV installations connected to the low voltage grid should be clearly lower than for large Megawatt parks. Ideally, grid-connection for small household applications should be accepted without any preconditions except electrical safety standards, so that the effort is not higher than for other domestic appliances.
- Especially safety aspects should be stressed in regulation for PV (e.g. obligation that grid-connection may only be executed by authorised, trained personnel).
- Standard or model contracts between operator and local utilities (grid connection, grid use, feed-in of electricity, payment) should be provided in a reasonable and easy-to-understand pattern. Ideally, they should not be heavier than those used for electricity sales to end-users.
- Utilities must be informed and qualified on PV connection by means of special training.

▶ *see also* ***Action 1. Continuation of the PV Policy Group project to support the introduction of PV strategies and their implementation on national level (p. 36)***

▶ *see also* ***Action 3. Grid access regulations for small, decentralised PV and renewable energy systems (p. 38)***

**Good practice:**
**Administrative procedures, grid access and technical codes – no barrier for PV in Germany**

If a private individual wishes to install a PV plant on her private house in Germany, only a few simple administrative tasks have to be completed. Relevant forms and applications are standardised, grid access and use are guaranteed by law. Usually the project lead time is less than three months. The following aspects characterize the preparatory administrative work:

- A building permission is not required, except in special cases, for instance when the plant is to be installed on a historical building.
- The renewable energy sources act (EEG) determines the legal obligation for the grid operator to connect the plant to the grid, to buy all fed-in electricity and to remunerate it according to the tariffs specified in the law. Therefore, theoretically even a contract wouldn't be required. In practice, however, contracts between plant and grid operator are concluded to clarify technical and commercial terms of the relationship. To set-up these contracts usually is an easy task as templates exist.
- To apply formally for grid connection is easily done by means of a simple standard form. Thanks to ongoing practice over the years installers provide comprehensive assistance with these formalities or even take them over completely.
- Grid connection can be executed by a representative of the grid operator but also by a certified installer. A final technical approval between plant and grid operator concludes the grid connection procedure (e.g. for reading the meter).
- Electrical codes – to some extent especially formulated for PV – guarantee the safe and grid compatible operation of the plant. Applying these common technical rules is no problem for professional installers.
- In terms of taxes, every PV power producer by fiscal regulation automatically becomes an entrepreneur with all fiscal rights (e.g. tax deduction or V.A.T. refund) and duties (e.g. payment of income tax). A formal registration of a business is possible but not required.

**Building sector regulation for PV**

Key findings of the PV Policy Group:

- In the densely populated area of Europe, building integration appears to be one of the preferred applications for PV. However, building codes and restrictions in many EU countries still obstruct a wide implementation of PV. Formal building permits are compulsory, administrative requirements are high and in many cases inappropriate especially for small roof-top systems.
- The European Directive on Energy Performance of Buildings 2002/91/EC (EPBD) [3], favouring renewable energy systems especially in new buildings with a useful area larger than 1.000 m², is being transposed in all countries. However, in most national building directives PV is not explicitly promoted, since policy-makers are not always aware of PV as a potential technology to use.
- Specific solutions for building integration of PV installations (both roof- or façade-integration) are not as well developed as for example in Japan. Although there is specific financial support for building integrated PV available in some countries other barriers are still too pre-dominant (e.g. missing standards facilitating the use of PV as building component, so that architects and constructors cannot provide sufficient warrantees).
- In Europe (esp. in Spain) there are various examples for solar obligations, mainly on a municipal basis. These regulations go beyond the requirements of the EPBD and make PV obligatory in specific types of buildings (new and to be renovated).
- The level of awareness and knowledge on building-integrated PV applications among key actors (e.g. architects, construction companies, municipalities) is still low.

Recommendations by the PV Policy Group:

- Remove or minimise restrictions to installing PV on roofs or integrated in buildings, apart from specific overruling regulation (e.g. protection of historical sites or environment).
- Raise awareness on the national level, so that PV is explicitly mentioned as an option in national legislation (EU Building Directive). Create awareness of the potential of PV amongst public authorities, responsible for the compliance with the Building Directive who at the same time act as important multipliers on the local level.
- Introduce a country-wide PV obligation for new buildings and renovations is less effective for national market development than an effective incentive mechanism such as a feed-in-tariff (FIT) system. Such a national obligation may not be helpful for PV market implementation because obligations may create unnecessary resistance or carry the risk of low-quality plants being installed merely to meet the obligation. However, an obligation may be considered for certain buildings such as public buildings (lighthouse effect).

- Ensure proper transposition of the requirements of the EPBD in the national legislation. Create awareness of the potential of PV amongst the authorities, responsible for the compliance with the Building Directive.
- Support – ideally European-wide – efforts for the standardisation of PV as building component and introduce PV in official lists for building components. This could for instance be achieved by a further intensification of the co-operation between the European Photovoltaic and Construction Technology Platforms.
- Land-use plans should be developed in a way that requirements of solar applications and low-energy houses are met (e. g. south-orientation of roofs free of shadowing objects).
- Support courses on the integration of renewable energy options in buildings as part of professional education for all curricula and all levels, from urban planners and architects to individual roofers.

▶ *see also* ***Action 2. PV in the built environment (p. 37)***

**Good practice:**
**The Technical Building Code in Spain**

In Spain, the Royal Decree 314/2006 incorporates the Building Directive 2002/91/EC. By Decree the use of PV is obligatory for specified types of large buildings. PV must be installed if the floor space of the building is larger than either 3.000 $m^2$ and 10.000 $m^2$, depending on type of use of the building (e. g. shopping centers, exhibition centers or administrative buildings) or if there are more than 100 beds in the case of hotels and hospitals. The requirements are clearly defined in the national technical building code "Código Técnico de la Edificación" (CTE).

Besides market stimulation the benefit of this approach is awareness creation for renewable energy solutions in the building sector. In addition, the fact that the chosen buildings are likely to be highly frequented will contribute to increase awareness amongst the public. Nonetheless, critics state that the bureaucratic requirements of this norm lead to implementation problems and that the obligation might partially provoke opposition against solar energy. All in all however, the Technical Building Code in Spain can be considered a valuable element in addition to the existing major market stimulation instruments (feed-in-tariff).

## 4. Improvement of national financial support schemes for PV

If PV is supposed to play an important role in future global power systems, further cost reduction is vital to the step-by-step creation of a market that is self-sufficient and free from incentive programmes. The recent development in the PV sector has shown that one of the most important factor for cost reduction is economies of scale in production of components [12] that result from a high volume, mainstream PV market. As it is not yet competitive with conventional electricity price structures, a financial support scheme becomes necessary that facilitates the development of strong PV market which in turn leads to a decrease in costs. Initiation of a support scheme requires clear vision for a long-term large scale PV market in each country. This may differ from country to country, depending on the geographic, economic and political situation. The final selection, detailing and balancing of instruments will depend on this vision.

The following section presents lessons learnt in the EU from existing support schemes as well as recommendations for their effective design.

### Overview of key issues

The following issues were identified as key by the PV Policy Group:

- General requirements for the formulation of financial support schemes
- Design of feed-in-tariffs (FIT) (level, decrease, differentiation, regular adaptation, combination with other instruments etc.)
- Other investment support mechanisms (direct subsidies, fiscal measures etc.)
- Combination of feed-in-tariffs with other financial support schemes (e. g. FIT scheme and other subsidies)

### General requirements for the design of financial support schemes

Key findings of the PV Policy Group:

It was observed that only little, unstable or no PV market development occurred in countries with the following conditions:

- Uncertainty amongst stakeholders due to lack of coordination of different support instruments.
- "Stop-and-go" effect especially during subsidy programmes financed by public budgets: budgets are often either too low or runtime of programme too short.
- Little transparency, high complexity and bureaucracy.
- Insufficient flow of information to target groups about existing programmes.

Recommendations by the PV Policy Group:

- Design transparent support schemes on the basis of a clear, long-term strategy that reflects set targets and integrates all chosen instruments. If possible, one single dedicated support scheme ought to be implemented on a national basis.
- Provide long-term stable, reliable, attractive and effective financial conditions.
- Make the support scheme easily accessible for target groups. Information about the programmes is essential.
- A critical success factor for any financial support scheme is a professional management incl. sufficient structures and approach for ongoing impact assessment. Personnel in charge must be informed and trained before starting programmes.

**Design of feed-in-tariff schemes**

The main conclusion of the PV Policy Group is that feed-in-tariff (FIT) schemes can be very effective and efficient instruments to stimulate market deployment of PV. However, examples in Europe have shown that their effectiveness and efficiency heavily depend on an elaborate design.

Key findings of the PV Policy Group:

- The calculation of a well-balanced feed-in-tariff is a key challenge for policy-makers. Although good examples exist and calculation models are available some countries have set tariffs that did not meet the basic requirements (see below). Modifications (e.g. increase, decrease or differentiation of tariffs) directed at actual market development after a certain period of time could be observed.
- Some countries have chosen to combine feed-in-tariffs with other financial incentives. In this case the calculation of tariffs and additional subsidies became more complex.
- The combination of FIT schemes and low market caps caused stop-and-go effects or lead to the deflation of entire markets.
- The promotion of specific PV applications (e. g. building integrated PV applications) is mostly done by providing specific tariffs.
- A scheme that includes an annual decrease of the FIT for new plants following the expected price reduction stimulates the industry to produce at lower costs and initiates and supports the trend of lower end-user prices for PV systems.
- The administrative implementation of a feed-in-tariff system is relatively easy.
- A FIT system provides intrinsic quality control for PV installations as payment depends on produced energy (kWh) and not capacity (kW). It automatically supports the economic objective to produce a high amount of PV electricity at minimum costs.
- Although legal and administrative implementation of a FIT system has proven to be relatively easy, some countries faced problems to do so. Reasons vary from lack of political will or technical understanding to unsatisfactory coordination between involved authorities.
- Net metering (electricity meter spinning slower or backwards because of own (PV) electricity production and use) is rarely applied in Europe. Reasons are low revenues per kWh electricity which equals the normal consumer's electricity price and regulatory barriers.

Recommendations by the PV Policy Group:

- The tariff should be calculated carefully and enable an internal rate of return (IRR) for PV plant operators that is equal to investments with similar risk and duration. If the tariff is too low, it will not create a critical demand. Unrealistically high tariffs could create inefficient market conditions which might lead to the loss of political acceptance.
- As the definition of feed-in-tariff schemes requires careful planning, a periodical timeframe should be defined during which the initial feed-in-tariff shall not be modified. After that period a review should take place that includes negotiations and involvement of all relevant stakeholders especially when the market fails to perform as expected.
- Introduce a system that sets tariffs for different types of PV applications (differentiate between small or large PV plants, roof-top installations or building integration, free-standing systems etc.), allowing approximately equal internal rate of return for the applications most suitable now or in the future for the respective country.
- Ensure sufficient investor confidence by setting FIT and priority grid access via long-term contracts.
- Stipulate a decrease of tariffs for new contracts, thus stimulating cost reduction efforts within the PV industry and rewarding first movers and early adopters. It is conceivable to start decreasing the tariffs in a newly implemented scheme only after a defined period of time in order to allow a substantial market to develop.
- Avoid linking feed-in-tariffs to an absolute maximum PV capacity (market cap). However, an annual cap in correspondence with a predefined market volume or a feed-in-tariff with a cap per tariff level may be reasonable to control the market. Caps should be flexible enough to be adapted if necessary.
- The cost of the feed-in-tariff scheme (the sum of the feed-in-tariff paid by the utilities to the PV electricity producers) should be distributed equally to every kWh of electricity sold in a country in a transparent manner. Varying the proportional share between certain consumer groups may be economically justifiable but should not overburden any one of these groups.
- Avoid the definition of an upper limit in terms of system size admitted to the feed-in-tariff system.
- Net Metering is an effective variation of feed-in-tariff system, as it does not require any additional metering or administrative procedures. Especially in countries with high solar radiation and high end consumer electricity prices options to facilitate net metering should be verified.

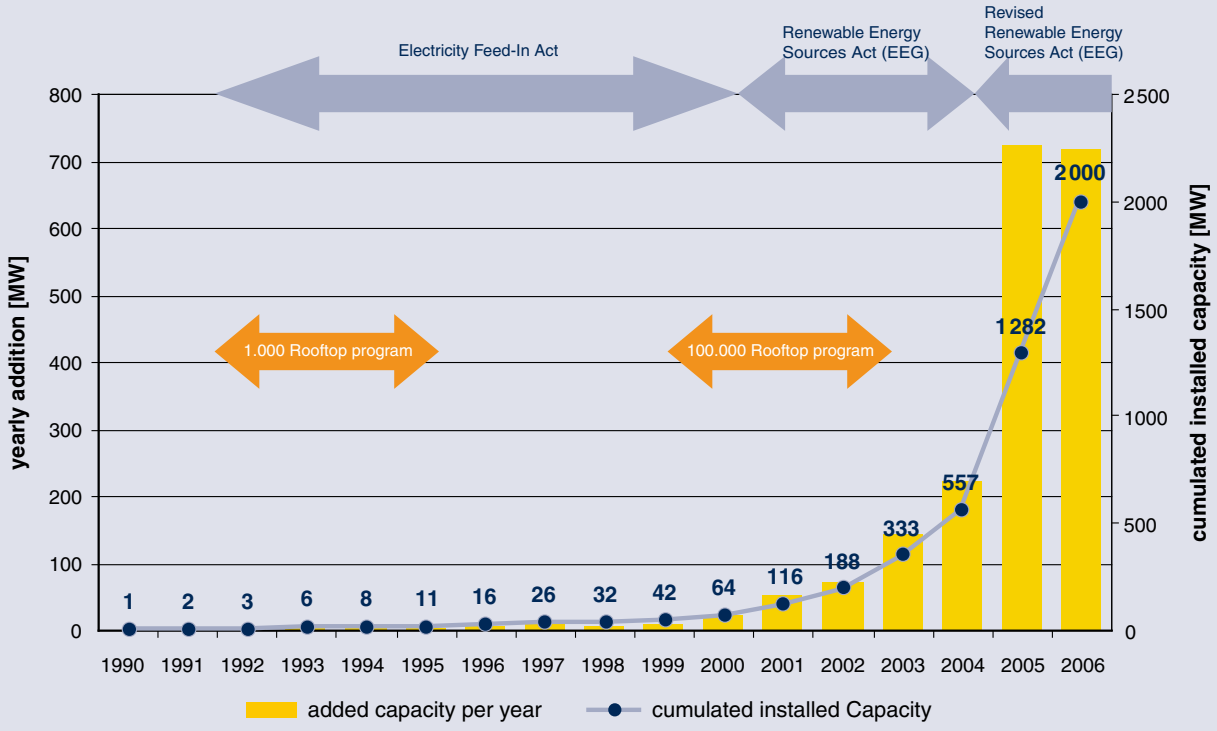
Based on these conclusions and observations the PV Policy Group recommends a well balanced feed-in-tariff scheme for stimulating the market implementation of PV.

**Good practice:**
**The German Feed-in-Tariff Scheme**

The introduction of the German Renewable Energies Sources Act (EEG) in 2000 and its amendment in 2004 (English text of the law: [13]) is the main driver of the very successful German PV market introduction. One of the law's core elements is a fixed tariff paid per kWh of electricity fed into the grid over a defined period of time. This feed-in-tariff allows operators to run a PV system with a sufficiently attractive return on investment. The positive market development in Germany is based upon the following important design aspects of the EEG:

- Fixed feed-in-tariffs and guaranteed duration of payment of 20 years.
- Guaranteed and preferential grid access for all PV systems.
- Independence from public budgets as cost burden of the EEG is collectively carried by all electricity consumers (avoids "stop-and-go"-effects).
- No market caps.
- The annual decrease ("sunset") of the FIT for new contracts motivating the industry to reduce costs through research and technological development.
- Different feed-in-tariffs for different PV plant types and sizes (e.g. distinction between building integrated, rooftop and free-standing installations).

With the EEG PV investors and market actors can rely on long-term legal planning and investment security. The law enabled the development of a strong domestic market and by proxy the creation of a highly developed PV supply industry with substantial job creation, capital investments and rapid innovation rates. The following graph shows the impact of the EEG and its amendment on the German PV market. Note that subsidies from the 100.000 rooftop program could be combined which gave an additional boost to the market.




**Characteristics of the incentives shown above:**

- Rooftop program (1991–1995): Subsidy program for experimenting the feeding-in of PV electricity to the grid.
- Electricity Feed-In Act (1991–2000): Right of grid access and refund per kWh (approx. 8.7 €ct/kWh)
- 100.000 Rooftop program (1999–2003): Low-interest loans for 300 MW of installed capacity
- Renewable Energy Sources Act (EEG) (2000): Feed-in-tariff of 51 €ct/kWh
- Revised Renewable Energy Sources Act (EEG)(2004): Feed-in-tariff of 45.7–62.4 €ct/kWh

***Source (data and explanation of the incentives): German Solar Industry Association (BSW); 2006***

**Other investment support instruments**

Investment support schemes were sometimes found to be effective to initiate or boost a market, but most times turned out to be complicated due to high administrative requirements, and subjugation to political change processes. A substantial variety of investment support mechanisms exists across Europe. Each instrument has specific advantages and shortcomings. In most cases, however, chosen measures in isolated application have led to limited creation of markets in the short-term or no market at all. Both effectiveness and operational efficiency of subsidy schemes are often insufficient in practice.
In addition, country-wide uniformity of financial support and its handling is missing in many countries. Different programmes and procedures between regions, or different regional application of national procedures lead to a general lack of transparency and confusion among market actors.

Key findings of the PV Policy Group:

- **Direct subsidy schemes** (or investment subsidies), for instance system size dependent payment at the beginning of a project, often have limited effect due to:
  - low accessibility (access often only under very restrictive conditions or because of mismanaged programmes),
  - complex and time-consuming application procedures,
  - low financial contribution not allowing profitable PV plant operation,
  - continuous interruption of market development as fixed budget is spent and
  - time limited application periods (e.g. application only possible once a year during one month).

  In addition, scheme costs are high compared to other forms because of expensive administration, for instance through complicated application procedures or preliminary project examination. However, there are some good examples in Europe that showed that direct subsidies helped market development especially in early market stages.
- **Tender subsidy schemes** require a large organisation and a skilled team of experts evaluating proposed projects. Although it is expensive in execution, it has the advantage of being focused on the development of innovative solutions. PV tenders however are not suitable for the creation of a mainstream market. They are usually more effective for technologies in the pilot or early demonstration phase.
- **Soft loans** (loans with subsidised low interest rates) can be a helpful instrument. Their success depends on the actual revenue that can be achieved. Due to its relatively low contribution it is usually regarded a supplementary support instrument. The scheme requires the involvement of the financial sector.
- **Tax credits** refund system costs to the applicant independently of the level of the tax bill. Tax credits are very similar in nature to direct subsidy schemes, though disbursed through another mechanism, which is perhaps somewhat easier to implement. An often-cited problem is the fact that the tax credit is available only with delay following project start.
- **Tax reductions** were implemented in some European countries. Because of their relatively minor contribution to sustainable market development they are considered suitable as side measure to an overall approach only. Some examples are:
  - Reduction of the value added tax (VAT).
  - Income tax deduction.
  - Exemption of tax on investment profits.
  - Refund of real estate taxes.

Recommendations by the PV Policy Group:

- Direct subsidy schemes should only be applied in the very early stages of market development. To avoid the aforementioned negative effects they should be removed in favour of less bureaucratic instruments as soon as the market moves from the embryonic/early growth to the high growth stage. However, it makes sense for the subsidy programmes not to be discontinued completely, but focused on special target groups (e. g. schools) and on particular PV applications such as off-grid systems, building integrated or demonstration projects that do not capitalise in a sufficient way from the overall incentive schemes (e. g. a feed-in-tariff).
- Public tender schemes should only be applied for large-scale projects.
- Soft loan schemes as public private partnerships (PPP) – joint initiatives between public authorities and private banks – can be a highly effective financing mechanisms especially for small-scale PV investors. As with direct subsidy schemes such initiatives are particularly effective in the very early stages of market development and can increasingly be followed by private loan offerings from banks as soon as the PV market has reached commercial strength. However, it is recommended to apply a loan programme only as complementary mechanism to an overarching, comprehensive incentive scheme.
- Further alternatives to direct subsidy or soft loan schemes can take the form of fiscal incentives, though they are insufficient to trigger substantial market growth in the long term and especially if applied in isolation.

**Combination of feed-in-tariffs with other financial support schemes**

For initial or intermediate temporary acceleration of a PV market a feed-in-tariff combined with a generic investment support mechanism could be considered. (Possible complementing instruments are presented in the section above.)
In such a set-up the feed-in-tariff should be sufficiently high to create a stable and sustainable market. Additional investment support could for instance be used to financially support early adopters in their purchase decisions, to support special applications or, where necessary, to

control market growth by annually adapting the level of financial support.
However, it is important to bear in mind that such a combination of two disparate instruments may also reveal negative side-effects:

- Higher socio-economic cost, as two instruments have to be administered.
- Calculation of the height of feed-in-tariffs and additional investment support becomes more complex.
- Insufficient coordination between the two instruments is likely to create uncertainties in the market.

**Good practice:**
**The French income tax credit as a complementary market stimulation tool**

An individual owner in France who wishes to install a PV system on the roof of his dwelling can benefit from a 50 % subsidy on investment costs (labor costs excluded). The name “income tax credit” is derived from the fact that the subsidy is paid by deducting it from the income tax (if the subsidy exceeds the income tax to be paid the owner receives the difference in form of a refund). The maximum system cost is limited to 16.000 € per dwelling.

Example: A family buys a PV system that costs 19.000 €. The investment cost accounts for 85 % of the total cost (16.150 €). The income tax credit will be 50 % of 16.000 € (8.000 €). The owner pays 3.000 € of income tax that year. He therefore will pay no tax in the coming year and moreover receive 5.000 € from the treasury.

Although the slight disadvantage that the investor has to advance the money for one year, more than 1.000 dwellings had made use of the “income tax credit” by the end of 2006 to finance their PV systems. Combined with the new French feed-in-tariff, it typically allows an amortization period of 8 years for building integrated PV (feed-in-tariff: 0.55 €/kWh) and 20 years for slot roof PV systems (feed-in-tariff: 0.30 €/kWh).

The possibility to partly finance the initial costs in such an easy way via one‘s tax declaration motivates many investors to face this considerable investment. It thus contributes to the market breakthrough especially in this early stage of market development.

## 5. Improvement of national monitoring systems for PV

The implementation of effective political support schemes has triggered considerable PV market growth in some EU countries. The growing impact of PV on economy, industry and society increases the relevance of political decision-making in this area. As a consequence, a sound and frequently updated information base is required, that provides data for the preparation of political decision making.
In addition to mere PV market and industry data collection comprehensive monitoring systems also comprise routines for interpretation and reporting to facilitate the evaluation of a country's PV policy performance. Furthermore, each national monitoring system should be designed in a way that data can be used in a common European PV database and thus enabling assessment of EU-wide market development. The objective must be to measure and compare the performance (efficiency and effectiveness) of national PV policy frameworks (see fig. 5).

**Objective: to measure & compare the performance of national PV policy frameworks**

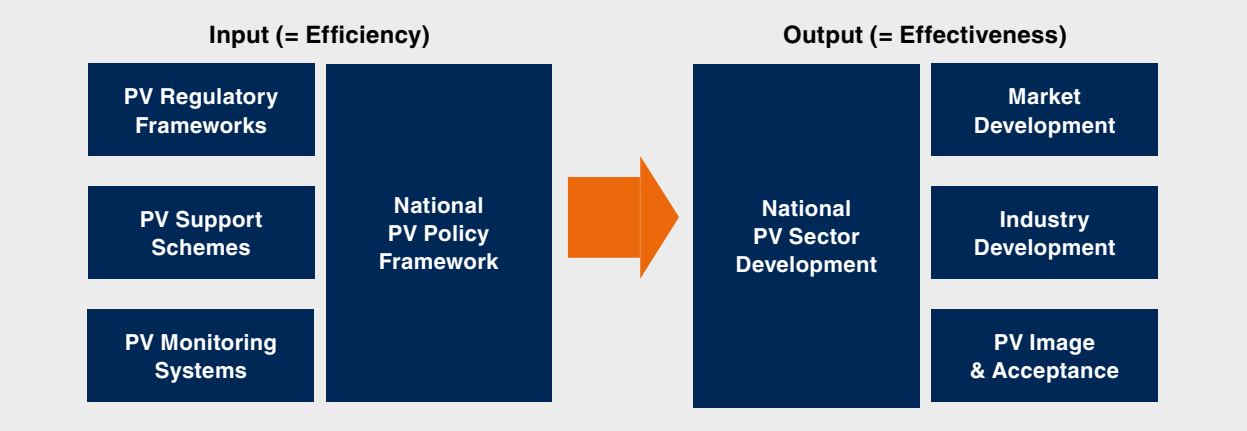



***Fig. 5: Relevant aspects of a national PV market monitoring***

**Overview of key issues**

The following issues were identified as key by the PV Policy Group:

- National PV market and industry monitoring
- National PV policy performance monitoring

**National PV market and industry monitoring**

Key findings of the PV Policy Group:

- Although good monitoring practices exist for certain market areas, a comprehensive approach to PV market and industry monitoring is lacking in most EU countries. It is thus difficult to find reliable and accurate market figures at all.
- The measures applied for data collection, evaluation and dissemination vary widely from country to country.
- There is a lack of appreciation and awareness for the relevance of monitoring.
- To establish a sufficiently valid market monitoring system is often considered to be a very difficult and complex task whose costs exceed the benefits.
- Monitoring is often based on one-off efforts (e.g. surveys) rather than long-term, self-sustainable systems.
- A crucial factor for monitoring systems is the motivation of all parties involved (e.g. collection and delivery of accurate data).
- Monitoring findings are often inaccurate. Verification, cross-checking reliability and validity of data is often neglected.

- A compulsory national register for PV installations delivers the most accurate and sound data basis for monitoring systems.

Recommendations by the PV Policy Group:

- Monitoring should be based on a consistent, balanced and long-term approach instead of single one-time measures. It should therefore
  - comprise constant market, industry, system and policy monitoring,
  - address all relevant groups involved in the political decision-making process alike,
  - balance expected costs and benefits,
  - make use of existing data sources to minimize cost and
  - provide additional market related information (e. g. employment numbers, macro-economic costs, impact on grid infrastructure, environmental impact etc.)
- Monitoring systems should be based on a research design that precisely defines
  - target groups,
  - key data,
  - data collection methods and sources,
  - incentives for data sources to deliver data,
  - data management and interpretation as well as
  - costs and benefits.
- Setting up a national monitoring system should be in accordance with the minimum requirements of a possible European-wide monitoring system. In addition, data harmonisation and possible synergies with the data collection activities such as IEA-PVPS, Task 1 (Exchange and dissemination of information on photovoltaic power systems) and the renewable energy barometer (EurOberv'ER) should be ensured.
- Feed-in-tariff systems should be complemented by a national plant register in which all grid-connected installations (installed capacity, electricity produced, tariffs received) are captured. Data should be directly fed into a central database. Both plant and grid operators should be obliged to deliver data for the register. Data communication should be simple, if possible by means of an online interface.
- PV market monitoring should be aligned and use synergies with monitoring measures imposed by the national application of the European Building Directive [3].

**Good practice:**
**PV industry monitoring in the Netherlands**

The Netherlands developed a very reliable market monitoring approach via industry surveys. Until 2004 several monitoring schemes were in place in the Netherlands, measuring indicators of the Dutch PV market. None of these schemes resulted in a reliable and overall insight in the performance of the PV market. Therefore, Holland Solar, IEA PVPS (SenterNovem) and CBS (Statistical Agency of the Dutch State) agreed on a joint approach. They committed themselves to the following monitoring requirements: reliability, independence, confidentiality, applicability to all stakeholders, coverage of all required data and rapid, up to date availability.
Together with industry representatives a two-page questionnaire was developed which surveys key statistics such as installed power, production capacities, turnover, import and export figures, domestic trade, employment and RTD budget. The questionnaire was sent to more than 95 % of the supply chain in Holland and about 80% of them (covering more than 90% of the Dutch market) responded. To guarantee anonymity, monitoring activities are conducted by CBS, which is a truly independent governmental organisation.

**National PV policy performance monitoring**

Key findings of the PV Policy Group:

- PV policy performance monitoring interprets data from PV market and industry monitoring in order to assess the chosen political measures. In order to review whether political targets are actually achieved, professional market monitoring is therefore an essential pre-requisite. Lack of transparent market information makes impartial political decision-making extremely difficult.
- Political decision makers are often afraid of losing control of developments if no budget limits or review dates are fixed in the underlying legislation. If there is no effective control mechanism in place, it is hard to convince them of a strong and/or long-term commitment. Policy monitoring therefore is compulsory for ambitious policies.
- Only a few countries have actually implemented a continuous and transparent approach to PV policy evaluation so far. Most measures applied in these countries are linked to the monitoring of a specific national support scheme (e. g. feed-in-system and/or subsidy scheme). As a result, policy monitoring often stops as soon as these programmes expire.
- In the majority of countries there is no consistent approach, neither for performance tracking of single policy measures nor for policy frameworks as a whole. The measures applied by policy makers in these countries are generally not guided by a transparent overall methodology, and the data base used is generally insufficient in terms of depth and quality.

Recommendations by the PV Policy Group:

- Implementation of a robust monitoring system is recommended to ensure both effective control of policy frameworks and their acceptance by all relevant target actors as well as to secure long-term commitment by policy-makers (beyond likely changes of governments).
- As with market monitoring, an advanced approach for policy performance measurement, application of a consistent methodology and professional tools for the collection, evaluation and dissemination of data to key decision-makers, is necessary.
- Obviously this approach should be aligned with other national monitoring activities, in other policy areas. Complementing market monitoring with regular data interpretation and reporting to decision-makers ensures a regular "feedback loop" with political decision processes (e.g. regular review cycles of national legislation).
- One key aspect of policy monitoring systems ought to be financial control, i. e. ongoing control and justification of costs incurred by the policy measures applied – either for public budgets or electricity consumers.
- At any rate, data should be collected where they emerge anyway, for instance within existing support schemes.

*For more detailed information on the design of a monitoring system see Annex 1.*

**Good practice:**
**Monitoring of the Austrian Green Electricity Act**

The regulator E-Control is in charge of monitoring the effects of the Austrian Green Electricity Act and has to deliver an annual monitoring report to the Federal Ministry of the Economy.
E-Control has three channels of data collection:

1. PV systems have to be accredited as "green power plant" by provincial governments. The data of the accreditation, containing capacity of the plant and the energy source, are processed into the database of E-Control (plant register). This allows calculating the total on-line capacity per energy source.
2. The so-called Green Electricity Management Agency is obliged to buy RES-E from the plant operators and to pay the feed-in-tariffs. It is therefore the heart of the Austrian RES-E promotion scheme. This agency operates a database containing detailed information for every single plant about installed capacity, fed-in electricity and paid tariffs for the different energy sources covered by the Green Electricity Act. All this information is reported to E-Control.
3. If further information is needed, the monitoring is completed by own investigations by E-Control.

From this data, E-Control prepares statistics which are published regularly on its website (www.e-control.at). The monitoring report of E-Control – published annually in June – contains detailed information on:

- statistics: Supported volumes, expenses and capacities of accredited plants;
- anticipated trends; and
- compliance with targets.

Also, recommendations about the further political market deployment are integral part of the report.

The Austrian monitoring system delivers interesting and reliable figures. But one has to bear in mind that gaps can emerge if accredited plants are not on-line or if grid-connected plants do not receive feed-in-tariffs which might be the case especially for PV plants due to the very low market cap applied in Austria.

▶ *see also* ***Action 5. Concept for a pan-European monitoring system (p. 40)***

# IV. RECOMMENDATIONS FOR EU LEVEL POLITICAL SUPPORT FOR PV

**Overview of key issues on the European policy level**

1. The European Renewable Energy Road Map: its role for PV;
2. PV strategies and policies in the Member States: EU-wide policy push and improved exchange between EU countries;
3. Improved national financial support schemes: EU-wide diversity vs. harmonisation;
4. Improved regulatory frameworks: Promotion of administrative and technical standards; and
5. A pan-European PV market and policy monitoring system.

## 1. The Renewable Energy Road Map and its role for PV

In its Communication "Towards a European Strategic Energy Technology Plan (SET-Plan)" (COM(2006)847) [14] accompanied by the Renewable Energy Roadmap from January 2007 (COM(2006)848) [15] the European Commission (EC) proposes the legally binding target of 20 % share of renewable energy consumption in the EU by 2020. With the intention to increase flexibility in target setting on national level the proposal sets no specific sector targets for electricity, heat and transport (except a 10 % obligation for the share of biofuels) and therefore neither for PV. The European Council backed these proposals of the Commission at its summit on the 8th and 9th of March 2007.

In principle, the PV Policy Group agrees with the demand for flexibility and that country specific potential and priorities should be taken into account in the various National Action Plans in order to increase the share of renewable energies. However, experience has shown that major achievements especially in the PV sector have only been reached with specific political commitment on national level. RES-E Directive 2001/77/EC [2] as the hitherto most important legislative measure for the promotion of renewable energy sources in Europe certainly had a considerable impact on the implementation of favourable political conditions for PV market deployment. However, as binding targets for PV are not set in the Directive, substantial PV market growth could only be observed in a few Member States. The proposed approach of the SET-Plan therefore also carries the serious risk that PV market introduction remains – as it is the case today – restricted to a few Member States.

If the proposal of the European Commission is accepted, the consideration of PV under the National Action Plans should be demanded explicitly of the Member States when legislation is implemented. In sum the individual national targets should allow for sustainable PV market growth in Europe and include a significant number of Member States in order to achieve geographically dispersed and balanced development throughout Europe. The PV Policy Group also strongly recommends follow up of the European Parliament's position on binding sector specific targets for RES.

The PV Policy Group fully supports the actions announced by the European Commission in the Renewable Energy Roadmap in terms of promotional policies and other flanking measures such as the EU research and technology development programmes. In this context, key issues and recommendations by the PV Policy Group with a focus on PV are presented hereafter.

## 2. Strengthening the introduction of PV strategies and policies in the Member States

**EU-wide policy push and improved exchange between EU countries**

Key findings of the PV Policy Group:

- The overall impressive development of the European PV market and industry in fact originates from a small group of countries (and in particular Germany). In most other countries substantial commitment and more consistent, long-term PV strategy is absent.
- PV policies – if at all existent – often have little or no effect. The landscape of chosen measures is still rather heterogeneous across Europe. Although certain approaches in all PV policy fields have proven to be effective and efficient there is – with some exceptions – only little exchange amongst EU Member States in the field of PV.
- The existence of official quantitative and qualitative targets on national level frequently has a positive effect on PV markets as they convey reliability to industry and investors. Most EU countries, however, have failed to establish such targets.

Key recommendations by PV Policy Group:

- As already outlined above, the EC should demand that all Member States explicitly consider PV in their national renewable energy policies in order to achieve more balanced and geographically dispersed market development throughout Europe.
- The EC should actively promote best practice in terms of national PV strategies and policies via recommendations, reporting, campaigning or joint projects (e.g. via the Intelligent Energy Europe programme EIE).

## 3. National financial support schemes

**EU-wide diversity vs. harmonisation of national financial support schemes and innovative financial instruments**

Key findings of the PV Policy Group:

- So far across Europe various financial support instruments and measures are being applied to promote PV at country level with a diverse range of success.
- Some national approaches have proven to be effective and efficient, particularly in Germany and Spain. The chosen policy approaches differ between these two countries, but the common principle is that they are based on a feed-in-tariff system. France, Italy and Greece have recently also introduced improved feed-in-tariffs for PV as the main instrument for market deployment. Also very promising is the development in Slovenia where the doubling of the market could be observed every year since 2005, mainly thanks to the implemented feed-in-tariff scheme.
- The diversity of national approaches is not necessarily controversial as they take into account specific national and local framework conditions.
- Characteristics of PV investments, in the majority of cases (small installations for private households), include the considerable level and up-front nature, effective run-time over the entire life-cycle of the plant (> 20 years) as well as comparatively long payback times. On the other hand, for conventional financial institutions such as banks, the investment volume of such domestic applications is considered small-scale and usually not attractive enough to finance. Many (private) investors thus have no access to financial resources other than their own money or public subsidies.

Key recommendations by PV Policy Group:

- It should not be a primary short-term aim to harmonise financial support schemes and instruments for PV across Europe.
- Approaches from successful European countries should serve as benchmarks that are actively promoted by the EC. At present, feed-in-tariff systems can be considered the most effective and efficient support mechanism for PV market introduction and are therefore recommended by the PV Policy Group. However, the starting point for any national support policy must always be the specific circumstances in the respective country (e.g. natural, economic, technological, political, socio-demographic conditions), as well as the particular development stage of the national PV market. The actual choice and design of a financial support scheme should therefore be left to the countries but alibi schemes without effect should not be tolerated.
- In addition to traditional subsidy schemes, more innovative types of financing should be developed, particularly in order to leverage PV markets that have

passed from embryonic to early expansion and growth stages. Such financing mechanisms should combine public and private sources. Various types of innovative measures for PV have been developed and applied across Europe in the past, others could be transferred from more advanced sectors (e. g. conventional energy, building & financial industries).

▶ *see also* ***Action 4. Financial support for PV – Establishing innovative financial instruments for small-scale PV projects (p. 39)***

## 4. Regulatory frameworks

**Promotion of administrative and technical standards**

Key findings of the PV Policy Group:

- Free, non-discriminatory grid access for electricity producers as required by the EU RES-E Directive 2001/77/EC [2] is currently not a reality in most countries. Procedures are often too complex and/or not sufficiently transparent; in addition, local grid operators are partly not dealing with connection requests in an appropriate manner. Also, in many countries even small-scale PV installations (< 50 kW) are treated as conventional power production facilities, so that authorisation and monitoring requirements are often inappropriately cumbersome and costly.
- When implementing the EU Building Directive 2002/91/EC [3] into national legislation most EU Member States do not explicitly consider PV a technical option.
- Currently there is no EU-wide approach regarding standardisation of PV and solar thermal components for the purpose of building elements and climate shells. This acts as an entry barrier for the technology in terms of a building-integrated solution.
- Clear electrical norms for safe and grid compatible PV system installation and operation are often missing.

Recommendations by the PV Policy Group:

- The Commission should verify the actual implementation of the EU Directives most relevant to the PV sector, especially RES-E Directive 2001/77/EC [2] and Building Directive 2002/91/EC [3].
- The Commission should strengthen activities to raise awareness for PV amongst authorities as a means to fulfil the Building Directive 2002/91/EC.
- In order to remove any unnecessary barriers to PV market deployment certain minimum requirements or guidelines should be formulated upon the basis of best practices, especially for grid connection, extension and access as well as building codes.
- Whilst in preparation, the establishment of European electrical standards (prEN/CENElec) for distributed independent power production should be accelerated.
- As a critical prerequisite for the future use in the built environment (lower costs through double function of energy production and building climate shell as well as cost saving from installation labour force) standardisation efforts for PV as a building integrated component and construction element should be enforced.

▶ *see also* ***Action 1. Continuation of the PV Policy Group project to support the introduction of PV strategies and their implementation on national level (p. 36)***

## 5. Pan-European PV Market and Policy Monitoring System

Key findings of the PV Policy Group:

- Whilst Europe-wide data collection and evaluation of PV market statistics by the European Commission (EurObserv'ER) and other actors (e.g. IEA PVPS)exists to a certain degree, scientifically sound and holistic market and policy performance monitoring that is based upon reliable and verifiable data is missing today. This is mainly due to non-existent monitoring schemes in individual Member States.
- The measures applied for data collection – if any – are highly disparate from country to country.
- On national levels, monitoring is frequently based on one-off efforts rather than a longer-term, reoccurring evaluation system.

Recommendations by the PV Policy Group:

- An EU-wide market and industry monitoring system and database ought to be initiated. Such a system should define minimum requirements for data collection on national levels so that the data can be correctly evaluated and utilized for Europe as a whole. Existing know-how, instruments and initiatives should be integrated in this process.
- Before a pan-European monitoring system can be installed, some participating Member States will have established their own monitoring systems. The EU should therefore promote existing best practice and encourage all Member States to introduce national monitoring systems.
- For more detailed information on PV market and policy monitoring please refer to Annex 1 of this paper.

▶ *see also* ***Action 5. Concept for a pan-European monitoring system (p. 40)***

# V. JOINT EUROPEAN ACTION PLAN

The objective of the PV Policy Group is not only to analyse and discuss policy issues and to formulate proposals for target groups on national and European level, but also to propose own activities. These common activities should be designed to continue the work of the PV Policy Group members beyond the duration of this first project and leverage the implementation of recommendations made.
In addition, rather than proposing a long list of minor tasks, the members of the PV Policy Group decided to focus their Joint European Action Plan on the following five core activities that are directly related to the most important findings and the most urgent policy proposals reflected in the recommendations given above:

**Action 1. Continuation of the PV Policy Group project to support the introduction of PV strategies and their implementation on national level**

**Action 2. PV in the built environment**

**Action 3. Grid access regulations for small, decentralised PV and renewable energy systems**

**Action 4. Financial support for PV – Establishing innovative financial instruments for small-scale PV projects**

**Action 5. Concept for a pan-European monitoring system**

All activities focus on actions to be implemented on the cross-national, i.e. EU level.

Note: On the national level each of the eight project partner countries have defined their own national action plans (Download: www.pvpolicy.org).

## Action 1.

### Continuation of the PV Policy Group project to support the introduction of PV strategies and their implementation on national level

By disseminating this Joint European and eight National Position Papers and Action Plans an important first step towards improved political framework conditions for PV will have been achieved. The continuation of the project would nevertheless be reasonable in order to push the implementation of the proposals. There are two major tasks: First, to facilitate and monitor the implementation of proposed actions on national and EU level; and secondly, to include additional EU countries who should develop own recommendations and actions.

Key findings and objectives:

A consistent PV policy framework aiming at an effective market introduction of PV is still missing in most European countries. On a national level this action shall raise awareness, build capacities and transfer know-how to national political decision makers and public authorities. It aims at:

- establishing target-oriented coherent PV strategies,
- implementing improved regulatory and administrative framework conditions,
- introducing effective and efficient financial support measures, and
- promoting PV through awareness and educational campaigns.

The European Commission should simultaneously implement appropriate measures and endorse activities on a national level. These measures could be supported by the PV Policy Group.

Contents and tasks of the action:

- Extension of the existing PV Policy Group by new partner countries and transfer of knowledge accumulated in this first project to the new partners, for instance through workshops.
- Development of an operational guideline for monitoring the advancement of projects on national and EU level. Elaboration of national development strategies for the complete PV sector with the target of the implementation of existing action plans from this first project.
- Support of the European Commission by contributing to recommendations, guidelines, campaigns, legislative proposals etc.
- Establishment of official bilateral or multilateral partnerships between different EU countries on strategy and policy issues.
- Preparation of awareness and educational campaigns in countries or regions where PV still is a widely neglected issue.
- Old partner countries: Contribution to national policy processes for the implementation of the proposed actions and recommendations. First, options of the national contact points (energy agencies and national partners) for exercising influence on political processes should be identified. Then, appropriate detailed project proposals should be elaborated and submitted to the relevant organisations.
- New partner countries: Assessment of the national situation and elaboration of own National Position Papers and Action Plans. This should be followed by the preparation of the implementation of the proposed actions in a later project phase.
- All partner countries: Update of existing country profiles or elaboration of such that do not yet exist. Evaluation and reporting of new developments to all partners. Update of the European Best Practice Report published under this first PV Policy Group project if appropriate. The aim of this task is to perform regular monitoring of the PV political advancement in Europe.

Target groups and contributors:

- Key target groups: political decision-makers (e. g. ministries or parliamentary task forces), public authorities, regulators, utilities and other PV stakeholders from all partner countries and the European Commission.
- Main contributors: old and new members of the European PV Policy Group (national energy agencies as contact points on national level, EPIA and other consulting institutions).
- Other key actors to be involved: PV industry associations from countries not yet participating in the PV Policy Group and additional PV-related institutions, experts and stakeholders.

Project environment and financing:

Intelligent Energy Europe (co-financing by the European Commission and other national or European co-financing sources)

Estimation of the timeframe:

- 6 months for preparation, aiming at proposal submission by the end of 2007
- Run time of the project: 36 months

Contact:

- European Photovoltaic industry Association (EPIA)
- French Environment and Energy Management Agency – Agence de l'Environnement et de la Maîtrise de l'Energie (ADEME)
- German Energy Agency – Deutsche Energie-Agentur GmbH (dena)

*Contact details can be found in Annex 2.*

## Action 2.

### PV in the built environment

Especially in densely populated areas the application of PV in the built environment is highly relevant. There are two ways to use PV in buildings: building integrated PV (BIPV), providing a double function as electricity producer and building envelope, and non-integrated PV (e. g. roof-top installations). Both ways of utilization often face considerable obstacles caused by very diverse reasons. This action pursues two major aims: First, to raise awareness and support technical standardization or certification efforts for BIPV and second, to remove restrictive regulations for both BIPV and non-integrated applications. By this action the implementation of the European Building Directive 2002/91/EC [3] with consideration of PV shall also be enhanced.

Key findings and objectives:

- In most countries there are no or only few official technical standards or certificates for PV components (modules) also functioning as building envelope. Architects or constructors therefore hesitate to plan with BIPV as they cannot provide sufficient warrantees. This action shall facilitate the use of PV components as building envelope by stimulating activities for the definition of adequate technical standards and certificates.
- Throughout the EU knowledge and awareness about BIPV amongst professionals of the construction and solar sector is rather low. This action aims at further opening the dialogue between the construction and the PV industry and introducing PV in academic education. Also vocational training for handicraft is to be improved.
- When transposing the European Building Directive 2002/91/EC [3] into national law, PV is mostly not explicitly promoted. The objectives are awareness raising amongst policy-makers and the explicit inclusion of PV in national legislation or respective other regulation (e. g. norms) in as many EU countries as possible.
- Building codes and restrictions in many EU countries still obstruct a wide implementation of PV even if not building integrated. This action shall help removing all unnecessary restrictions and simplify the respective procedures.

Contents and tasks of the action:

- Identification of already existing initiatives and projects in this area and establishment of contacts. Set-up of a cross-national European Working Group and thematic task forces.
- Technical standardization and certification for BIPV:
  – Report on the status of standardization and certification activities in Europe.
  – Workshops and/or conferences to exchange experience between architects, constructors, standardization experts and the PV industry and to initiate relevant projects.
- Establishment of three thematic task forces covering the following topics:
  – Technical standardization and certification for BIPV.
  – Academic and vocational training and improvement of the dialogue between PV industry and architects/constructors.
  – PV and the European Building Directive.
- Accomplishment of architectural competitions (national or Europe-wide) taking into consideration the above-mentioned thematic focuses as criteria for the competition contributions. Through this highly relevant practical information from the point of view of architects can be obtained.

Target groups and contributors:

- Key target groups: architects and constructors with practicing and academic background; PV industry; standardization institutes; public authorities and political decision-makers
- Main contributors: national energy agencies; architects, constructors and representatives of the PV industry with experience in BIPV; experts in standardization; members of other BIPV projects
- Other key actors to be involved: industry associations, research institutes and interest groups in building and solar energy as well as representatives of relevant ministries.

Project environment and financing:

- Intelligent Energy Europe (co-financing by the European Commission and other national or European co-financing sources)
- For architectural competitions: sponsoring by the solar energy industry, innovation funds, ministries or financial institutions.

Estimation of the timeframe:

- 6 months for preparation, aiming at proposal submission by the end of 2007
- Run time of the project: 36 months

Contact:

- Energy Restructuring Agency (ApE) – Slovenia
- German Energy Agency – Deutsche Energie-Agentur GmbH (dena)
- Portuguese Energy Agency – Agência para a Energia (ADENE)
- WIP Munich (Germany)

*Contact details can be found in Annex 2.*

◀ *see also* ***section III.3. Improvement of national regulatory frameworks for PV (p. 17)***

## Action 3.

### Grid access regulations for small, decentralised PV and renewable energy systems

A frequently encountered problem for the implementation of PV is the regulation concerning access to the low voltage grid. Whereas RES-E Directive 2001/77/EC [2] requires objective, transparent and non-discriminatory criteria for grid access for renewable energy sources (RES), the connection of small decentralised RES still is frequently blocked by local authorities or utilities. Reasons for that are lacking knowledge of the European and national regulatory frameworks and missing understanding of renewable energy technologies. In several cases PV market deployment is blocked by complex licensing procedures, poor integration of electricity from RES in regional and local planning and opaque grid-connection procedures. As this is a problem in most European countries, the PV Policy Group proposes a joint European approach to assess the bottlenecks and compare good practices in grid connection for RES. Especially, it is important to communicate the added value of RES to municipal utilities and grid operators. With this activity the consortium aims at formulating a joint approach to resolve these bottlenecks and barriers and to implement appropriate measures. As this issue also concerns other small decentralised renewable energy system and to ensure wide acceptance, the action shall be carried out together with stakeholders of all affected technologies.

Key findings and objectives:

- It appears that RES-E Directive 2001/77/EC [2] has not been uniformly implemented in the regulatory frameworks of the EU Member States. This action will include the drawing up of an inventory of the incorporation of the Directive's requirements in the national legislation, and, where needed, the formulation of recommendations to the national governments on how to (further) incorporate these requirements.
- Campaigning against the lack of knowledge about the value and technology of RES is an important aspect of the action. It aims at raising awareness for the fact that RES can not only provide sustainable and ecological electricity but that they also have an economical and technical added value, for instance by reducing transmission costs or grid losses.
- In several countries local authorities and utilities are not fully aware of the position of RES in the regulatory framework on grid connection and energy production. Within this task an inventory will be made of the extent and content of this problem. To solve it, an awareness campaign will be formulated and carried out.
- Even in countries where the requirements of the Directive are fully implemented, other regulations or practices sometimes obstruct the grid connection for RES. This action will provide an inventory of these regulatory obstructions and a joint approach to tackle them.

Contents and tasks of the action:

- Formation of a project group consisting of governmental agencies, utilities, grid-operators, regulators (national) and industry associations for the different decentralised RES technologies (PV, small wind and small combined heat and power (CHP; including fuel cells)
- Formulation of a project proposal for the Intelligent Energy Europe-Programme including:
  - Assessment of barriers and bottlenecks on utility issues and connected to legal and administrative aspects
  - Development of added value for RES into the low-voltage grid argumentation
  - Communication via round table discussions and workshops
  - Development of a strategy for overcoming barriers
  - Dissemination and promotion activities

Target groups and contributors:

- Target groups: Governments, local authorities, utilities, grid-operators, regulators, renewable energy industry and end-users
- Contributors: national agencies, utilities, renewable energy industry (through industry associations)

Project environment and financing:

- Intelligent Energy Europe (co-financing by the European Commission and other national or European co-financing sources)

Estimation of the timeframe:

- 6 months for preparation, aiming at proposal submission by the end of 2007
- Run time of the project: 36 months

Contact:

- Energy Restructuring Agency (ApE) – Slovenia
- SenterNOVEM (The Netherlands)
- European Photovoltaic industry Association (EPIA)
- WIP Munich (Germany)

*Contact details can be found in Annex 2.*

◀ *see also* ***section III.3. Improvement of national regulatory frameworks for PV (p. 17)***

## Action 4.

### Financial support for PV – Establishing innovative financial instruments for small-scale PV projects

Financing is a critical issue for PV investors. The characteristics of PV investments are in the majority of cases (small installations for private households) that for the investor on the one hand they are considerable, effective over the entire lifetime of the plant (> 20 years) and have comparatively long payback times. On the other hand, for conventional financial institutions like banks the investment volume is very small-scale and usually not very attractive to finance. The result is that many investors have no access to financial resources other than their own money or public subsidies.
This activity aims at establishing innovative financial instruments for small-scale PV projects that complement existing "classic" public financial support such as feed-in-tariff schemes or direct subsidies.

Key findings and objectives:

- Typical public support schemes for financing PV projects, other than feed-in-tariff schemes, can be helpful in certain market development stages. Direct subsidy schemes, for instance, are an effective tool to trigger PV markets at a very early development stage, especially when combined with feed-in-tariffs. However, they should be discontinued as soon as the market gains a critical size and momentum. Other public schemes like fiscal incentives are useful, but normally not sufficient to close the financing gaps for many investors.
  It can be concluded, that in advanced markets these and other forms of public support are either not sufficient or can no more be financed publicly. (Please also refer to chapter III.4.; p.32.)
- As a result, in addition to classical subsidy schemes, more innovative types of financing should be developed, especially to leverage PV markets having passed from embryonic to early high growth stages. Such financing mechanisms should combine public and private sources. Various types of innovative measures for PV have been developed and applied across Europe in the past, others could be transferred from other, more advanced sectors (e.g. conventional energy, building & financial industries). As examples could be mentioned soft loans, the creation of energy service companies (ESCOs) or investment funds for renewable energies, as well as incentive schemes concerned with demand-side management measures (third party financing, energy performance contracting).
- The objective of the proposed action is to investigate and assess such innovative financing mechanisms especially for small-scale PV investments, as well as to build capacities and transfer knowledge to relevant target groups on national and European level. In addition new practice-oriented approaches should be developed.

Contents and tasks of the action:

- Analysis of innovative financing mechanisms across Europe (best practice study).
- Exchange of experience and capacity building on financing mechanisms and development of new approaches in a cross-national working group.
- Dissemination to target groups via various communication measures (esp. seminars and guidelines).

Target groups and contributors:

- Key target groups: political decision-makers (e.g. ministries) and public authorities; financial institutions; utilities; PV market actors
- Main contributors: national energy agencies; industry associations; financial institutions
- Other key actors to be involved: selected European experts from institutions for financing issues (private and public)

Project environment and financing:

- Intelligent Energy Europe (co-financing by European Commission and other national or European co-financing sources)

Estimation of the timeframe:

- 6 months for preparation, aiming at proposal submission by the end of 2007
- Run time of the project: 30 months

Contact:

- European Photovoltaic industry Association (EPIA)
- WIP Munich (Germany)
- eclareon GmbH (Germany)

*Contact details can be found in Annex 2.*

◀ *see also* ***section III.4. Improvement of national financial support schemes for PV (p. 20)***

## Action 5.

## Concept for a pan-European monitoring system

The growing impact of PV on economy, industry and society increases the relevance of political decision-making in this area. As a consequence, a reliable information basis is required for the preparation of political decisions. This action aims at the conceptual design and establishment of an EU-wide PV monitoring system fed by reliable and comparable national data. This includes the establishment of routines for regular data interpretation and reporting.

*A detailed approach to a possible monitoring concept can be found in Annex 1.*

Key findings and objectives:

- Although good monitoring practice exists for single market segments in different countries, a comprehensive approach to PV market and industry monitoring is missing in most EU Member States. The objective is to find a cross-national common approach to national monitoring and to initiate corresponding actions on national level.
- There is no common approach to data collection between the single European countries complicating an EU-wide monitoring. This action is to elaborate a technical and administrative approach to EU-wide monitoring under consideration of existing monitoring systems. Options for the introduction of such a system shall also be examined in preparation of an actual implementation.
- There is a need of data for monitoring the fulfilment of the targets of RES-E Directive 2001/77/EC [2] and the implementation of Building Directive 2002/91/EC [3].

Contents and tasks of the action:

- Phase 1: In-depth analysis of PV monitoring systems on national level by describing key data, data collection methods and data sources, costs, responsible institutions for data management and ways of data communication. Establishment of contacts to other initiatives and projects dealing with monitoring on national and European level.
- Phase 2: Definition of minimum requirements for national monitoring systems (key data and general rules) in European workshops with the participation of PV Policy Group partners (energy agencies) and national PV data managers.
- Phase 3: Workshops on national level with PV Policy Group project partners and responsible national data managers and stakeholders: Discussions on the results and definition of action plans in the respective countries to overcome shortcomings in monitoring and to prepare the implementation of improved or new monitoring systems based on the agreed minimum standards in phase 2. In that phase all participating partners should take the opportunity to receive advice from other project partners (countries) that have already implemented monitoring systems successfully.
- Phase 4: Investigation of options and motivation for building up a standardised European PV database based on national monitoring results.

In this process a co-operation with the activities of IEA renewable statistics (especially IEA PVPS Task 1) and EurObserv'ER will be useful and necessary.

Target groups and contributors:

- Target groups: at EU level: EU Directorates General Transport and Energy; European energy industry associations like EPIA, EREC, EURELECTIC, etc.; national ministries and relevant administrative bodies; national energy industry associations and other PV market stakeholders.
- Main contributors: national energy agencies; national and international PV industry associations; other external consultants.

Project environment and financing:

- Intelligent Energy Europe (co-financing by the European Commission and other national or European co-financing sources)
- Financing of the activities on national level by the respective national administration should be verified.

Estimation of the timeframe:

- 2 months for preparation, aiming at proposal submission by the end of 2007
- Run time of the project: 30 months

Contact:

- Austrian Energy Agency – Österreichische Energieagentur (A.E.A.)
- Portuguese Energy Agency – Agência para a Energia (ADENE)

*Contact details can be found in Annex 2.*

◀ *see also* ***section III.5. Improvement of national monitoring systems for PV (p. 25)***

# ANNEX

## Annex 1

## Recommendations for designing PV monitoring systems

The growing impact of PV on economy, industry and society increases the relevance of political decision-making in this area. In order to be able to properly discuss the further development of PV, reliable information about the PV market will be essential in the forthcoming years.

However, as described in the European Best Practice Report [9] it is very difficult to find reliable and accurate market figures at present. In the following recommendations are presented about how efficient and effective monitoring could be designed on the European and national level.

The main problem for building up a consistent monitoring system working on an ongoing basis is the heterogeneity of the national PV market stakeholders. To successfully implement the suggested approach later on, this Position Paper is addressed to all relevant stakeholders needed for implementation, namely

- at international and European level: EU Directorate Generals TREN, RTD and Enterprise, members of the EU parliament, IEA, European energy industry associations like EPIA, EREC, EURELECTIC, etc.
- at national level: ministries and their administrative bodies, members of national parliaments, national energy industry associations and market actors themselves.

**Key questions to design a PV monitoring system**

A comprehensive approach to designing a PV monitoring system must give answers to the following questions:

1. Target groups and key data: Who are the relevant users of a Europe-wide PV monitoring system and therefore which are the relevant key data to be covered?
2. Data collection method and sources: What are the best data collection methods? What institutions will be in charge of providing data? How can the institutions be motivated to provide data on a regular basis? How can data quality be ensured?
3. Data management: Who is suitable for managing the entire monitoring system on a national basis and on a European basis?
4. Data interpretation and communication: How will the data communicated to relevant stakeholders European wide most effectively?

In the following this paper tries to give first answers to these questions.

**1. Target groups and key data**

Target groups, relevant key information and their relevance for target groups can be structured as follows:

| **Key information** | **Relevance of data for target groups** (low, medium, high) |
|---|---|
| PV Policy Monitoring: Information about the development of the PV market related to a particular PV support scheme and national regulatory framework | Policy makers: high<br>Administrative bodies: high<br>Industry: high<br>Public: high |
| PV Market Monitoring: Data about the development of National PV market segments and installed types of systems | Policy makers: high<br>Administrative bodies: high<br>Industry: high<br>Public: low |
| PV Industry Sector Monitoring: Data about the National PV industry sector developments like production capacities, turnovers, employment etc. | Policy makers: high<br>Administrative bodies: high<br>Industry: medium<br>Public: low |
| PV System Monitoring: Data about the development of system performance, technical evolutions and quality aspects | Policy makers: medium<br>Administrative bodies: law<br>Industry: high<br>Public: medium |

When collecting these data coordination and possible synergies with the data collection activities under IEA Photovoltaic Power Systems Programme (IEA PVPS, www.iea-pvps.org) – Task 1, and EurObserv'ER should be used.

Definition of key data for PV Policy Monitoring

PV Policy monitoring means performance measurement of national PV legal frameworks and support schemes. If the national regulatory framework and support schemes are considered as "input factors", the "output factors" can be covered by means of the following data for each support scheme in place:

| Key data | Measurement by |
|---|---|
| Applications for public support per year and average installed capacity per application | Number per year / kW |
| Yearly newly installed capacity and total installed capacity reached by the end of the year | MW per year / MW total |
| Yearly newly installed plants and total number of plants by the end of the year | Quantity per year / Total quantity |
| Yearly new PV electricity produced by all new installed systems and total electricity production by all systems in the respective year* | MWh new per year / MWh total per year |
| Yearly amount of national budget (if so) spent for PV support schemes | Euro per year |
| Yearly amount of national budget (if so) spent on monitoring | Euro per year |
| Electricity (kWh) price increase (if so) due to PV support schemes by the end of the year | Euro per year |

**** Another possibility would be to collect the potential yields of new installed systems because of the strong dynamics of the market (many installations commissioned each year)***

By means of the key data different illustrative indicators can be derived such as cumulative data, growth rates or density rates. To make data from different sources comparable it is recommended to establish a common standard for physical values, as currently different measurement units are in use such as peak power or rated power.

Definition of key data for PV Market Monitoring

Some key data presented in the table above (PV Policy Monitoring) are relevant for market monitoring as well but should cover the whole market. Additional key data for market monitoring are:

| Key data | Measurement in |
|---|---|
| Regional market penetration/growth | MW per region per year |
| Market segmentation/capacity installed (on grid / off grid) | Percentage on grid / off grid per year |
| Market segmentation / type of application | Percentage open-land installation / roof-top / roof-integrated / façade per year |
| On-grid / off-grid PV system price development | Euro per kW and Euro per kWh |

**** Another possibility would be to collect the potential yields of new installed systems because of the strong dynamics of the market (many installations commissioned each year)***

Definition of key data for PV Industry Sector Monitoring

For PV industry sector monitoring key figures are production capacities and yearly production, employment, turnover and import/export ratio. PV industry sectors to be covered are producers of ingots, wafers, cells, modules and inverter. Also figures on employment and turnover of service providers (planners, system integrators, wholesalers and installers) should be considered.

Definition of key data for PV System Monitoring

PV System monitoring should provide data about the system performance, technical evolutions and quality aspects of on-grid and off-grid systems. Because it is impossible to get detailed measurement data for all installed systems, it is recommended to monitor a representative sample of PV plants. Synergies with the activities of Task 2 of the IEA PVPS should be used. In this task, a performance database was created which contains operating data of over 400 PV plants (about 250 thereof in the EU) and is updated regularly (see www.iea-pvps-task2.org). To do so, standard data collection formats and definitions were developed. Key data for system monitoring are the following:

| Key data | Measurement in |
|---|---|
| Annual irradiation | kWh/m² per year |
| Annual energy yield | kWh/kW per year |
| Daily system losses | kWh/kW per day |
| Annual performance ratio | Number (less than 1) |
| Array efficiency | Percentage |
| Inverter efficiency | Percentage |
| Plant efficiency | Percentage |

### 2. Data collection method and data sources

An important data source are national administrative bodies running the PV support schemes since these institutions usually dispose of the data and can be obliged to deliver it. Other sources are the industry (industry associations) and the PV plant investors and operators. The data collection method is strongly determined by the motivation of the data sources to provide the information.

The following scheme can help to identify the data sources, data collection methods and to estimate motivation, options for legal obligation and respective costs.

| Key data | Source | Data collection method | Motivation of data source to provide data? | Possibility to oblige data source to provide data? | Costs for best source implementation? |
|---|---|---|---|---|---|
| **Data to be surveyed** | • Industry<br>• PV plant operators<br>• Investors<br>• Public bodies<br>• etc. | • Register<br>• Metering<br>• Accounting<br>• Survey<br>• etc. | • Low<br>• Medium<br>• High | • Yes<br>• No | • High<br>• Medium<br>• Low |
| *Example:*<br>***Yearly new installed capacity*** | Public body that administers the support scheme | Register | High, because of legal obligation | Yes | Low |

### 3. Data management

After having specified key data and discussed practical questions about data collection, there are further questions to be addressed about data management:

- Who will be the body on national level running the monitoring system?
- Who will run an aggregate system on a European level?

### 4. Data communication

Due to the fact that all relevant target groups using a European PV monitoring system have different professional backgrounds (political, industrial, social, academic etc.), they will have very different needs with regard to researching and visualising the data. As a result, the most cost-effective and user-friendly way of communicating the existing data is to publish all data in a centralised Internet database. To enable a user-friendly interactive interface for data research and evaluation for each user this tool should also provide a query system in which the user chooses for instance the key data, the target region and the period of the query, and the way to visualise the respective query results. Finally the researcher should be able to download the results easily for further processing.
In addition to the mere data collection a report should be compiled in regular intervals by a defined institution.

### Conclusion

Answering all the aforementioned questions is an important step towards reliable information about national and EU-level for political decision-making. The development of this common database should be realised in an evolutionary manner. The PV Policy Group suggests a project to elaborate a concept for a European PV monitoring system aiming at its implementation. For further details about this action proposal please refer to the Action Plan of this paper (Action 5. Concept for a pan-European monitoring system; from p. 40.) For this activity an intensive exchange with the activities of IEA renewable statistics (IEA PVPS, Task 1) and EurObserv'ER is important.

## Annex 2

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## Abbreviations

| | |
|---|---|
| AT | Austria |
| BPR | Best Practice Report |
| CBS | Statistical Agency by the Dutch State |
| CENElec | European Committee for Electrotechnical Standardization |
| CHP | combined heat and power |
| CTE | Código Técnico de la Edificación (Spanish Technical Building Code) |
| DE | Germany |
| DG RTD | Research Directorate General |
| DG TREN | Directorate General Transport and Energy |
| EC | European Commission |
| EIA | Environmental impact assessment |
| EIE | Intelligent Energy Europe |
| EL | Greece |
| EPBD | European Directive on Energy Performance of Buildings 2002/91/EC |
| EPIA | European Photovoltaic Industry Association |
| EREC | European Renewable Energy Council |
| ES | Spain |
| EUEI | European Union Energy Initiative for Poverty Eradication and Sustainable Development |
| FIT | feed-in-tariff |
| FR | France |
| IEA | International Energy Agency |
| IPP | Independent Power Producer |
| IRR | internal rate of return |
| NL | The Netherlands |
| PER / PFER | Renewable Energies Plan (Spain) |
| prEN | preliminary European Norm |
| PT | Portugal |
| PV | Photovoltaic(s) |
| PV ERA NET | Photovoltaic European Research Area Network |
| R&D | Research and Development |
| RD | Royal Decree |
| RES | renewable enery sources |
| RES-E | Renewable Energy Sources (electricity) |
| SET-Plan | Strategic Energy Technology Plan |
| SI | Slovenia |
| UN | United Nations |
| VAT | value added tax |

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