

## Worldwide PV support experience - a snapshot

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- 1. Introduction to IEA PVPS
- 2. Trends report 2012
- 3. PV support now and into the future





# **IEA Activities**

- International Energy Agency
- Energy security and environment
- Governing Board & CERT
- Working Parties (4) & Implementing Agreements (41)
- Renewable Energy Working Party 10 IAs including PVPS
- More than 6,000 participants, more than 1,000 research projects, 500 participating institutions, annually mobilize 120-150 million USD
- Flexible, time-proven mechanism for technology collaboration
- Work is shared equitably by the signatories to each IA
- Each IA is self-financed by the participants.



## The aims of the IEA include:

Promote sustainable energy policies that spur economic growth and environmental protection in a global context – particularly in terms of reducing greenhouse-gas emissions that contribute to climate change. Support global collaboration on energy technology to secure future energy supplies and mitigate their environmental impact, including through improved energy efficiency and development and deployment of low-carbon technologies.



# **The IEA PVPS Programme**

**23 participating countries:** Australia, Austria, Belgium, Canada, China, Denmark, France, Germany, Israel, Italy, Japan, Korea, Malaysia, Mexico, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, the United Kingdom and the United States of America



The European Commission (EC), the European Photovoltaic Industry Association (EPIA), the US Solar Electric Power Association (SEPA) and the US Solar Energy Industries Association (SEIA) are also members



# **IEA PVPS features**

- Regarded as "one of the most active, successful programmes"
- Global network of expertise
- Broad variety of stakeholders
- Independent, objective, neutral
- Analyses & recommendations carry weight because of the IEA connection
- Guided by all members through ExCo, work carried out on a task-shared basis





### Current PVPS activities (tasks) www.iea-pvps.org

- Task 1: Information exchange & dissemination
- Task 8: Very large scale systems
- Task 9: Deploying PV services for regional development
- Task 10: Urban scale PV applications ended
- Task 11: Hybrid systems recently ended
- Task 12: Environmental Safety & Health
- Task 13: Photovoltaic Performance and Reliability (followup of Task 2), NEW!
- Task 14: High penetration of PV systems in electricity grids (building on work of Tasks 5 & 10), NEW!



# International PV information exchange and dissemination (Task 1)

- PV information from 23 participating countries on national markets, public budgets, industry, prices, economic benefits, policy initiatives, electricity utility activities, standards and codes, and R&D activities
- Range of information tools including workshops, newsletters, reports, website and fact sheets



# Survey approach





PHOTOVOLTAIC POWER SYSTEMS PROGRAMME

Implementation of PV systems

The PV industry

Policy, regulatory and business framework for deployment



Summary of trends



#### PHOTOVOLTAIC POWER SYSTEMS PROGRAMME



#### Cumulative installed grid-connected and off-grid PV power in the reporting countries





# **Annual PV markets in 2011**

- Almost 28 GW of PV were installed in the IEA PVPS countries during 2011 about double the amount as in the previous year. Cumulative installed capacity 63,6 GW.
- 60% were installed in Italy and Germany alone. If China, the US, Japan and France are also included, then over 86% of PV installations in 2011 occurred in six countries.
- Nine countries have annual markets exceeding or close to 1 GW.
- About 2,5 GW of PV were installed in China, a fivefold increase on 2010 levels
- The grid-connected PV power installed in France amounted to 1,6 GW up from 817 MW in 2010
- In Germany there were 7,5 GW of new grid-connected PV capacity for the year, much the same as 2010
- United States increased by about 1,9 GW in 2011 double the growth of 2010
- 2011 market leader, Italy, installed 9,3 GW, a fourfold increase
- Newly installed electricity power generation capacity in 2011, PV's share: Australia 36%, France 57%, Italy over 60%, Korea almost 6%, the US approaching 10% and so on.



# Real patterns of growth are very interesting.....







# ...driven by how the various support measures are implemented

- Enhanced feed-in tariffs
- Direct capital subsidies
- Tax credits
- Green electricity schemes
- Renewable portfolio standards
- Sustainable building requirements

#### PHOTOVOLTAIC POWER SYSTEMS PROGRAMME



Evolution of price of PV modules and small-scale systems in selected reporting countries accounting for inflation effects - Years 2001-2011 (2011 USD)



**PVPS** 

#### PHOTOVOLTAIC POWER SYSTEMS PROGRAMME



#### Evolution of the PV industry in selected countries -PV cell production in 2008, 2009, 2010 and 2011







## Feed-in tariffs...the present day

- Nearly all countries now offer or are about to implement feed-in tariffs of some description for PV electricity
- The journey can be quite exciting. In Malaysia, within three hours of the 2011 launch of the national FiT the allocated quota for the commercial sector projects was completely filled.
- FiT approaches have successfully driven grid-connected PV investments in large-scale (multi-MW) plants, smaller-scale building-integrated applications and combinations of both.





# **Feed-in tariffs**

- The FiT can be national-scale, state-based or even operate at the local community or utility level. Sweden's Sala-Heby electricity utility provides a good example of a local feed-in tariff programme.
- While FiTs are clearly seen as the prime mechanism for promoting strong growth in grid-connected PV applications, they are by no means the only method of PV promotion that can deliver positive results (for example, the US with tax credits and RPS operating successfully across market segments and Japan's positive experience with its capital subsidies for the residential PV market).





## **Feed-in tariffs**

- FiTs also may be associated with explosive markets, profiteering, political interference, over-reliance on imports, market collapses, business closures and so on.
- The various design features of feed-in tariff schemes are now well known differentiating tariffs according to various PV applications, the boundary effects of introducing caps, the impact of whether the scheme is gross or net...
- In today's environment a well-functioning FiT scheme usually implies the ability to adjust incrementally for changes in PV system prices and other factors (to avoid overheated markets and windfall-seeking investors)



## **Feed-in tariffs**

- In Germany, with parity already being reported with retail electricity prices, the FiT depends on the system size and type, is adjusted in response to real market conditions, encourages the self-consumption of the PV electricity and rates are guaranteed for an operational period of 20 years.
- In France, the decrease of the feed-in tariffs every three months depends on the number of grid-connection requests made during the previous quarter. Switzerland's 18% drop in the FiT price allows the cap on installations to be lifted, creating a larger market. Austria simply removed systems of less than 5 kW capacity from the scheme.
- There are many permutations and combinations of policy responses but, more often than not, in response to an explosive market, the political course of action is quite reactionary Australian schemes' closures, for example.



### **Towards sustainable markets**

- PV technology can now be regarded as mainstream in many of the countries with expanding PV markets, and the main policy challenge is to decide how best to move towards true market transformation
- Within the coming years the sustainable market will eventuate as parity with retail electricity prices occurs in different markets and market segments. For governments the issue now is how to best manage the transition period leading to sustainable markets for PV
- This may involve moving support policies away from handouts of public money to focus more on enabling strategies, appropriate regulation and development of innovative business models.





# Regulation

- The regulatory approach commonly referred to as the 'renewable portfolio standard' (RPS) is a powerful policy tool to increase renewable energy deployment particularly in more competitive electricity markets.
- RPS can be further developed to provide direct support for PV deployment. The most obvious example is the US where a number of PV-specific state-based regulatory approaches, such as PV set-asides, have been implemented.
- Other countries allow PV electricity to earn multiple certificates compared to other renewable technologies, with the multiplier able to be varied over time to reflect the increasing cost-competitiveness of PV electricity.
- Most interestingly, to manage the transition to grid parity, the Korean Government is replacing their feed-in tariff scheme from 2012 with RPS, sending a strong message to electricity utilities about their role in the PV market of the future.



## Regulation

- Sustainable building regulations are an emerging force.
- Requirements on new building developments (residential and commercial); also properties for sale. PV reducing the building's energy footprint or mandated as an inclusion.
- The commercial sector building PV market has been underrepresented in many national markets.
- In Korea, the Public Building Obligation Programme sees new public buildings larger than 3 000 square meters spending 5% of their total construction budget installing renewable energy facilities, leading to 14,6 MW of PV installed during 2011
- In Denmark the EU directive on energy consumption in buildings, minted into a revised national building code, allocates PV electricity a factor of 2,5 in the calculation of the energy footprint of a building





# **Municipalities**

- Municipalities and regions in Denmark have demonstrated a rapidly growing interest in PV technology. Main drivers are climate change action plans and targets. Municipalities follow-up with demonstration of PV and information campaigns targeting both the citizens using the municipal buildings and the community in general.
- Many local governments around Australia have active greenhouse gas reduction and renewable energy support programmes for example, the Fraser Coast Regional Council has established a Community Solar Farm that will generate approximately 630 MWh.
- Local authorities can also exert a positive impact on the market through their role as the permitting body. In the US, Vermont has implemented a pre-defined permitting process for PV installations, the City of Los Angeles has moved towards decreasing permitting barriers, the City of Santa Cruz has eliminated building permits altogether for PV systems that meet certain criteria.



# **Municipalities**

- Public concerns about nuclear power generation saw an upsurge in activity in Japan with 875 local governments and municipalities implementing their own subsidy schemes during 2011, to promote residential PV systems.
- The same concerns in Switzerland have also seen an increase in interest amongst local governments and municipalities, with PV increasingly installed on public buildings.
- In the Netherlands, the province of Noord-Brabant stimulated the development of solar energy with a substantial investment, aimed at positioning this region at the top of solar energy technology and innovation in Europe.





# Financing

- Third-party financing schemes (including leases and power purchase agreements) that address high up-front capital requirements are becoming more common.
- In 2011 approximately 47% of residential PV systems installed through the California Solar Initiative used third-party financing arrangements.
- A number of Australian PV installation companies offer finance or leasing options, especially for commercial systems.
- In the Netherlands several banks provide Green Mortgages (ASN, Triodos, ING, Rabobank, Fortis), offering 1% to 2% discounts on market interest rates.
- PV in Germany receives support from the state owned bank KfW-Bankengruppe through loans for application of renewable energy and measures to reduce energy consumption.
- Canadian non-profit organizations such as the Ontario Sustainable Energy Association and the Community Energy Partnership Programme are facilitating community co-operative investments in PV with toolkits, workshops and usergroup forums, plus investment assistance.

PVPS



- Australian electricity utilities are involved in the Solar Cities and Smart Grids programmes. All electricity retailers must obtain renewable MWh's under the Renewable Energy Target and some have installed their own PV systems. Some utilities have also established solar businesses and sell PV systems to their customers. The Electricity Networks Association is preparing guidelines and protocols for high PV penetration.
- In Canada, Calgary's ENMAX electricity utility offers installed PV systems with no upfront investment cost and a 15-year lease-toown programme, including parts and labour warranties and ongoing service agreements.





- The Danish transmission system operator, Energinet.dk sees PV both as a potential contributor to electricity supply and as support for the electricity grid. The distribution utilities have included PV technology in their portfolio of products; some offer finance packages and payment via the electricity bill. EnergiMidt is now marketing PV technology without any special support.
- In Germany, where the regulations of the EEG are so successful in eliminating barriers to private sector investment and the electricity utilities have played a subordinate role, the first initiatives by the electricity utilities are now being seen in the PV market.





- In Japan, electricity utilities constructed MW-scale PV power plants ahead of schedule during 2011. Several utilities now operate large-scale PV power plants. Electricity utilities have started installing PV systems on the rooftops of customer properties and have also started installing PV at their own facilities.
- Korean electricity utilities signed a Renewable Portfolio Agreement with the government. Electricity companies have constructed their own PV plants or have purchased PV electricity from private operators under the RPS Demonstration Programme.





- In the Netherlands some electricity utilities offer customers turnkey PV systems in a package deal with the energy contract, or systems under a leasing arrangement to self-generate electricity for a fixed price. Some utilities offer additional net metering beyond the mandatory limit of 5 000 kWh annually.
- The interest in PV from the electricity utility businesses in Sweden has increased. From one company buying surplus electricity previously, 2011 saw a number of electricity utilities launching compensation schemes and some network businesses introduced net metering.
- In Switzerland, local and regional utilities especially have begun to design new 100% renewable energy products incorporating an increasing share of PV. In addition they have implemented changes to procurement strategies in order to significantly increase the availability of renewable electricity.





- Interest continues to increase in the United States, with the key drivers being the 30% federal tax credit at the national level and Renewable Portfolio Standards at the state level. Four broad categories of utility PV business models can be seen.
- Ownership of assets allows the utility to take advantage of the tax credit benefits, earn a rate of return on the asset (investor-owned utilities) and provides control over planning, siting, operation and maintenance.
- *Financing of Solar Assets* is a PV business option for utilities that choose not to own solar assets for tax, cost, regulatory, or competitive considerations.
- Customer Programmes are designed to increase access to PV electricity by lowering costs, for all parties. These may involve a community PV system and participating customers to whom a proportional share of the output can be allocated offsetting their electricity bill directly, or by offering a fixed-rate tariff that is attractive compared with current (and future) retail electricity prices.
- PVPS
- *Utility Purchase of Solar Output* is a business model often applied by publically owned utilities to create value for their communities by supporting local PV development (for example by offering a feed-in tariff to purchase PV electricity).



- Worldwide, electricity utilities are now investing in very large-scale PV plants or asking how they can benefit from meeting their customers' interest in PV plants or PV electricity. It is highly likely that the electricity utilities will have an even more significant role to play in PV deployment in coming years, particularly the 'new' electricity network businesses.
- These issues provide benefits, opportunities and challenges for electricity utilities and their industry regulators.
- On the business side, what will be the approach to widespread deployment of PV taken by these utilities and their industry regulators, who is going to pay for some of the network-related issues and how might PV be financed into the future?
- These are key issues for the coming years.



## Thank you for your attention!

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