



## The Swedish PV programme – Market support and RTD

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## Global Outlook

- 5 GW installed PV capacity
- Annual PV production of >1 GW
- Annual market growth of 40 %
- The *21st European Photovoltaic Solar Energy Conference and Exhibition* in Dresden had 2700 delegates and 400 exhibitors
- Japan and Germany are the largest module manufacturers
- Germany, Japan and California are the largest PV markets
- While off-grid PV is cost-competitive in numerous applications, grid-connected PV still needs financial support
- National support programmes are the market drivers for PV
- Feed-in tariffs causes a transition from stand-alone systems to grid-connected systems



## Swedish energy policy

- The Swedish Energy Agency is the responsible governmental agency for energy issues (except nuclear)
- Goals for the Swedish energy policy
  - Security of energy supply
  - An energy system with low environmental impact
  - Energy at reasonable prices for industry and households
- 17 TWh new renewable electricity during 2003–2016
- Economic incentives (taxes, RECs, investment subsidies, etc) and RTD to fulfill these goals



## Swedish PV policy

- Government support for PV has been devoted to research
- PV has been regarded as a business opportunity rather than a contributor to electricity production in Sweden
- No specific goal for the deployment of photovoltaics in Sweden
- No specific market support for PV (until May 2005)
- REC prices and fuel taxes are too low to have an impact on PV

### Research

- PV RTD is part of the long-term energy research programme
- Total budget of 90 million Euro per year for energy RTD
- Approximately 2 million Euro for PV RTD (not fixed)



## PV in Sweden today

### Applications

- Installed PV capacity is 4–5 MW
- <0.1 % of national electricity production (nuclear power and hydropower dominate)
- PV is mainly used in off-grid applications (lighthouses, telecom, recreational applications, etc)
- Building-integrated PV is gaining market shares due to the new investment subsidy for PV on public buildings



Photos: Energibanken

## PV in Sweden today

### Industry

- Four module manufactures (silicon modules)
- A new spin-off company (Solibro AB) is developing a production process for thin film CIGS modules
- No BOS manufacturers
- Increasing number of PV consultants
- A lot of new actors are entering the Swedish PV market due to the investment subsidy
- Scandinavian Photovoltaic Industry Association ([www.solcell.nu](http://www.solcell.nu))



Photo: Energibanken

## Market stimulation programme

- Investment subsidy for PV on public buildings
- Part of a broader support scheme for energy-efficiency and conversion to renewable energy in public buildings
- 70% of the total cost for the PV installation (investment+labour)
- 15 May 2005 – 31 Dec 2008
- 150 MSEK (approx. 16 MEUR) for PV installations
- Also support (30%) for an energy assessment of the building
- Expectations:
  - Double PV capacity in Sweden, from 4 MW<sub>p</sub> to 8 MW<sub>p</sub>
  - Create jobs in the building and PV sectors
  - Increase electricity production from renewables
  - Reduce CO<sub>2</sub> emissions and dependency on fossil fuel

## Results so far

- The programme has run for 15 months
- According to plan
- Half of the budget (77 MSEK) has been used (August 2006)
- The responsible authorities (the counties) have received 75 applications, of which 58 have been approved
- Rather good spread across the country
- Stockholm and Malmö hold the top positions with 26 and 12 approved projects, respectively
- Malmö has fewer but larger projects
- Stockholm has several rather small projects (PV on schools)

## Results so far – Approved amount per county

Län:	Antal inkomna ansökningar	Beviljade ansökningar	Beviljat belopp	Utbetalade ansökningar	Utbetalat belopp
Blekinge	3	1	586 250		
Dalarnas län	2	1	2 961 000		
Gävleborgs län	3	2	336 000		
Hallands län	3	2	7 495 044	1	2 495 044
Jämtlands län	1	1	97 230		
Kalmar län	1				
Kronobergs län	2				
Norrbottnens län	2				
Skåne län	14	12	26 891 600		
Stockholms län	26	26	20 675 900	1	722 400
Uppsala län	1				
Värmlands län	2	1	875 000		
Västmanlands län	2	1	1 067 231	1	1 067 231
Västra Götalands län	8	6	9 023 000		
Örebro län	3	3	4 436 817	1	2 556 617
Östergötlands län	2	2	2 650 312		
<b>Totalt</b>	<b>75</b>	<b>58</b>	<b>77 095 384</b>	<b>4</b>	<b>6 841 292</b>



## Alléskolan, Hallsberg

- High school renovation project
- South, east and west façades
- 289 glass/poly-Si/glass modules with aluminium frames from Schüco
- >400 m<sup>2</sup>, 45 kW<sub>p</sub>
- Cost: 3,5 MSEK
- Architect: Staffan Nordlund, White
- Installer: Flex Fasader (their first PV system)



Photo: Energibanken



## Fjärås care centre

- Roof-mounted
- 65 kW<sub>p</sub> – largest in Sweden when installed
- Annual production of about 45 000 kWh, which equals annual electricity consumption
- Net-metering (agreement with the utility company Fortum)
- Owner: Eksta Bostads AB
- Inaugurated by energy minister Mona Sahlin



Photo: Energibanken



## Schools in Stockholm

- Pre-study by Energibanken AB for PV on 13 kindergartens and schools in Älvsjö, Stockholm
- Roof-mounted small standard systems of 2.5 kW modules, inverter, etc.
- 10 applications was approved
- Owner: Skolfastigheter i Stockholm AB (owned by the municipality of Stockholm)



Photo: Energibanken



## Ullevi soccer stadium, Göteborg

- Planned PV system on the VIP stand for high visibility
- 84 kW, about 630 m<sup>2</sup>
- Pre-study by Switchpower, financed by the SolEI programme, Got Event, Higab and Göteborg & Co



## Results so far – Impact on the PV innovation system

Linus Palmblad (M.Sc. thesis, Chalmers) has found that:

- The investment subsidy has led to a number of new PV projects
- It has influenced the dynamics in the Swedish innovation system for PV in a number of positive ways
- New actors have entered the Swedish PV market
- Important changes are the creation of an industry association and that the regulatory framework (e.g. for grid-connection and metering) is questioned
- Too early to make statements about the occurrence of self-reinforcing mechanisms
- PV in Sweden needs continued market support

The report is available on [www.elforsk.se/solei](http://www.elforsk.se/solei)



## The programme

An applied PV RTD programme

SolEI aims at reducing the cost of PV systems in Sweden by

- Increasing the knowledge in Sweden about PV
- Develop, evaluate and demonstrate new PV applications
- Increase the PV competence within academia and industry



## Focus areas for SolEI

Annual call for proposal

- Building-integrated PV
- Demonstration of new and interesting PV applications
- Grid-connection issues and standardisation
- System aspects
- Information and education
- Technology and market assessments, conference reports
- Evaluation and monitoring of PV systems

Scholarships

- Attending EUPVSEC(2 scholars per year)
- MSc thesis (2 scholars per year)



## Financing institutions

Swedish Energy Agency

Sharp

NCC/Byggsektorns utvecklingsfond

Stiftelsen för Arkitekturforskning

Brostaden

EkoSol AB

Malmö Stad Stadsfastigheter

Statens Fastighetsverk

Utility companies: Vattenfall AB, E.ON AB, Göteborg Energi AB, Mälarenergi AB, Jämtkraft AB, Borlänge Energi AB, Falkenberg Energi



## Exemples of SoIEI BIPV projects

- Web based BIPV tool, [www.solcell.nu](http://www.solcell.nu)
- Pre-studies for PV systems in Malmö
- PV-thermal hybrid systems for building-integration
- SoIEI Roadshow
- Assessment of the potential for PV on roofs in Sweden (10 TWh)



## More information about SoIEI

- [www.elforsk.se/solei](http://www.elforsk.se/solei)
- Newsletter twice per year
- Programme manager Monika Adsten ([monika.adsten@elforsk.se](mailto:monika.adsten@elforsk.se))
- Annual seminars



Breda, Holland. Foto: Carl Michael Johannesson

## More information about Swedish PV RTD and market

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Breda, Holland. Foto: Carl Michael Johannesson



## Potential for photovoltaics in Sweden

