

## TASK 10 – URBAN SCALE PV APPLICATIONS



Fig. 1 - EPIA provides a presentation at the Task 10 French stakeholders' workshop, "Solar Cities Around the World."

### INTRODUCTION

The workplan for this Task is designed for flexibility towards the fast growing and emerging market. The grid connected PV market requires new financial relationships beyond the network industry and their customers, as well as integration into traditional operations and planning of the broader stakeholder group involved in the market. Task 10 work initiated in January 2004, with a 5 year planned period of work. There has been delay of resource commitment to the Task, but as the second year of the Task is completed, several resolutions have occurred.

- **Japan** has joined the Task with great interest in both the Subtask 1 and Subtask 3 (market values and network benefits)
- **Norway** has joined the Task with focus on Subtask 2 (Urban Planning)
- **Switzerland** has made resource commitments to the Subtasks 2 and 3
- **The European Commission - Intelligent Energy Europe Programme-** awarded a multi country proposal titled PV in Urban Policies: a Strategic and Comprehensive Approach for Long-term Expansion, PV-UP-SCALE which was basically intended to give direct and indirect input to Task 10 from countries not formally participating in Task 10 and enhance some current contributions. Furthermore, dissemination of the results of Task 10 and further outcomes of the PV Upscale project is a major goal. The **Netherlands** leads this project, with coordinated contributions from **Austria, France, Spain, Germany and UK.**

These additional resources and particularly the PV-UP-SCALE project which is a 3 year project beginning in January 2006, will put Task 10 back on schedule.

### OVERALL OBJECTIVE

The objective of Task 10 is to enhance the opportunities for wide-scale, solution-oriented applications of PV in the urban environment as part of an integrated approach that maximizes building energy efficiency and solar thermal and photovoltaics usage. Value analysis, policy incentives, analysis tools as well as system design and integration that have proven successful in the participating countries will be developed to the extent possible into a uniform international set of tools for the global market. This will be accomplished through:

- making connections between the building design and development industry;
- deriving recommendations for stakeholders to remove barriers to mass market uptake of photovoltaics;
- developing system components, design and applications with the largest global market penetration potential, including aesthetic values as well as the mechanical and energy related values;
- expanding successful tools (models, roadmaps, guides, system integration, etc.) and analysis relevant to the needs of the emerging global markets;
- identifying gaps in currently available information and developing products to fill those gaps;
- developing materials and holding events targeted at meeting the needs of specific groups of stakeholders; and
- providing continuous communication, promotion and education throughout the period of the task.

In line with the objectives, the short term goal (5 years post) of the Task is to have a clear definition of the global market and all associated values, resulting in stakeholders considering urban scale PV in their respective spheres of activities. The Task's long term goal

(10 years post) is for urban-scale PV to be a desirable and commonplace feature of the urban environment in IEA PVPS member countries.

### APPROACH

There will be four subtasks in Task 10, with 17 activities. The total range of deliverables has been designed comprehensively to include and meet the various needs of the stakeholders who have been identified as having value systems which contribute to urban-scale PV. The deliverables are designed to optimise usefulness to the stakeholders and have multiple communication and promotion scenarios. Although each of the deliverables is a separate product which can be developed independently from all the other deliverables, the relationship between deliverables will be cross-referenced or data based as appropriate. Through developing and producing these deliverables, Task 10 will contribute to achieving the vision of mainstreaming urban-scale PV. The comprehensive list of targeted stakeholders is:

- Building Sector: builders and developers, urban planners, architects, engineers, permit and code authorities;
- End-Users: residential and commercial building owners;
- Government: supporting, regulatory and housing agencies;
- Finance and Insurance Sector: Banks, insurance companies, loan for houses
- PV Industry: system manufacturers, PV system supply chain, retail sector;
- Electricity Sector: network and retail utilities; and
- Education Sector.

### SUBTASKS AND ACTIVITIES

#### SUBTASK 1: Economics and Institutional Factors

This subtask seeks to provide opportunities for stakeholders to look beyond a single-ownership scenario to the larger multiple stakeholder value. In this way, utility tariffs, community policy, and industry deployment strategy can be used to create scenarios which combine all stakeholder values to the PV system investor through sustained policy-related market drivers. Austria is the subtask leader and is also the corresponding work package leader for the PV-UP-Scale project. Activities will include:

##### Activity 1.1: Value Analysis

This activity will develop a value matrix of stakeholders by the extended value stream beyond the economic market drivers (the market drivers will be included), allowing individual stakeholders to realise a full set of values. Austria leads this activity.

Progress includes a stakeholder value survey developed and implemented with the participating technical experts as well as other interested countries. The results of the survey were presented in a paper at the 20th EU PVSEC conference in Barcelona, Spain in June 2005. The US has developed analysis on government stakeholder

economic values such as emissions, health care cost and water consumption reductions, jobs, gross regional product, and household incomes.

##### Activity 1.2: Barriers Resolution

Recommendations to stakeholders will be developed for removing barriers to mass market uptake of PV. Austria leads this activity.

Progress includes the development of a barriers survey.

##### Activity 1.3: Market Drivers

Building upon existing lessons learned with financing, policy, environmental and rate structure issues this activity will analyse the economic contribution of these market drivers and developing best practice scenarios. Austria leads this activity.

Progress includes the collection of individual country's analysis. The surveys in activities 1.1 and 1.2 will be used to determine priorities for the global analysis.

##### Activity 1.4: Market Roadmaps

Using participating country industry roadmaps, either a global market roadmap or a roadmap of global markets will be developed. Either product will serve as a guide for roadmap development.

Progress on this activity includes analysis of the European Industries Association Roadmap, the US Industry Roadmap and the Australian Industry Roadmap.

### SUBTASK 2: Urban Planning, Design and Development

This subtask focuses on infrastructure planning and design issues needed to achieve the vision of a significantly increased uptake of PV in the urban environment. The subtask will integrate PV with standard community building practices.

##### Activity 2.1: Integrating PV Development and Design Practices

This activity will develop guidance for integrating PV into standard whole building design models, rating tools, and building development practices. Emphasis will be placed on the building integration properties of PV for efficiency gains.

##### Activity 2.2: Urban Planning

A guide will be developed for integrating PV and the whole community energy infrastructure element into urban planning practices through a guide providing processes and approach for setting quantifiable urban-PV goals and objectives in the planning process. Architectural considerations such as building aesthetics, land use, shading, and urban renewal opportunities for BIPV will be included as planning elements. Additionally, community energy use forecast and planning impacts related to the whole building approach and coordinated utility or community system load control to increase demand reduction and increase PV capacity value. The US leads this activity.

Progress on this activity includes a workshop in France on Solar Cities prior to the Lyon Task meeting. Using results from the workshop a compendium of solar cities has been developed and is under review. Additionally, Norway is developing a tool for urban planning integration of solar technologies. The UK, through PV-UP-SCALE will make specific contributions to this activity and the Swiss contribution is largely towards this activity.

### SUBTASK 3: Technical Factors

This subtask concentrates on technical development factors for mainstream urban-scale PV. Large-scaled urban integration of BIPV systems faces technical challenges related to synergetic use as building material and for energy supply purposes. Other challenges involve the potentially negative impact on the grid and obstacles posed by the regulatory framework. The aim of this subtask is to demonstrate best practices and to advocate overcoming those barriers associated with extensive penetration of BIPV systems on urban scale. The deliverables focus on the broad set of stakeholders required to achieve the vision such as the building product industry, builders, utilities and PV industry.

#### Activity 3.1: Building Industry/BIPV Products and Projects

By identifying the building material and energy use synergies of PV and of BOS as well as updating the existing Task 7 database of products and projects for BIPV, guidance will be developed for mainstreaming these products in the building industry. A major aspect of the building integration will be building energy management integration and coordinating energy use with lighting and HVAC systems to assure demand reduction and capacity value. Canada is the lead for this activity.

Progress includes the development of a detailed workplan entitled "Residential Urban BIPV in the Mainstream Building Industry" a first step to this is to get the PV industry to participate in updating the database. Malaysia's MBIPV development program plan, may potentially serve as a guide for other countries as well as communities program development.

#### Activity 3.2: Codes and Standards

Existing codes and standards applicable to urban scale PV and the needs for developing new codes and standards will be evaluated. Both electrical and structural codes will be evaluated as related to buildings. Network codes and standards will be evaluated in a separate activity. This work will build upon work initiated in Tasks 5 & 7. Denmark is the lead for this activity.

Progress on this activity includes an information matrix for investors or installers of PV systems which points to legal demands, guidelines and good advice for PV system components, issues and systems as part of buildings

TABLE 1 - LIST OF PARTICIPANTS AND THEIR ORGANISATIONS

COUNTRY	PARTICIPANT	ORGANISATION
Australia	Mr. Mark Snow	University of New South Wales
Austria	Mr. Reinhard Haas Mrs. Assun Lopez-Polo Mrs. Demet Suna	Institute of Power Systems and Energy Economics Energy Economics Group Vienna University of Technology
Canada	Mr. David Elzinga Mr. Masa Noguchi	Arise Technologies Corporation NRCAN/CANMET Energy Technology Centre - Varennes
Denmark	Mr. Kenn Frederiksen	Energimidt Erhverv A/S
European Union	Mr. Henk Kaan	Energy Research Centre of the Netherlands Through EU, PV-UP-SCALE
France	Mr. Marc Jedliczka Mr. Bruno Gaidon	HESPUL
Italy	Arch. Niccolò Aste Mr. Michele Pellegrino Mr. Carlo Zuccaro	Politecnico di Milano CER ENEA CEPI SpA
Japan	Mr. Keiichi Komoto Mr. Tomoki Ehara	Environment, Natural Resources and Energy Mizuho Information & Research Institute Inc.
Korea	Mr. Kyung Shick Yoom	Korea Photovoltaics Development Organization Korea University
Malaysia	Mr. Ahmad Hadri Harris	Malaysia Energy Center, PTM
Norway	Mrs Inger Andresen Mrs. K�the Hermstad Mrs. Anne Grete Hestnes	SINTEF Civil and Environmental Engineering
Portugal	Mrs. Maria Jo�o Rodrigues	Center for Innovation Technology and Policy Research Instituto Superior T�cnico (Technical University of Lisbon)
Spain	Mrs. Estefania Caama�o Martin	INSTITUTO DE ENERG�A SOLAR E.T.S.I. Telecomunicaci�n, Ciudad Universitaria s/n
Sweden	Mr. Mats Andersson	Energibanken AB
Switzerland	Mr. Pierre Renaud	Planair SA
USA	Ms. Christy Herig	Segue Energy Consulting/Subcontractor to National Renewable Energy Laboratory

### Activity 3.3: Electricity Networks

This activity will analyse electricity network effects, benefits, impacts, and issues. Interconnection, operational effects, and market issues will be included.

Progress includes the collection of analysis of PV's contribution to peak load reduction in both Australia and the US. Japan has developed a proposal for the activity and Germany is the PV-UP-Scale lead for the corresponding work package.

### Activity 3.4: Market Driven Approach

The US developed systems driven approach to research and development will be expanded to the global market by i) establishing a benchmark of current system component cost and market penetration relationships; ii) testing benchmark relationships with existing and potential future system designs, applications, building integration and operational economics; and iii) documenting relationship between research investment in system component development and market penetration.

Progress is the initiation of work on a Canadian contribution focusing on the Mass Customising Photovoltaic Solar Homes in Subdivision Development.

### Activity 3.5: Certification Practices

Certification practices will be reviewed and standard test procedures harmonized and transferred to the relevant stakeholders and standard committees. The US leads this activity.

Progress includes a set of documents developed by the US installer certification program in accordance with ISO/IEC 17024 Working Draft, "General Requirements for Bodies Operating Certification Systems of Persons". These documents, will be reviewed by Task 10 participants to be made into templates for countries to use.

### SUBTASK 4: Targeted Information Development and Dissemination

This subtask will carry out the information dissemination of all deliverables produced in Task 10. As activities develop in other subtasks, subtask 4 will review to assure the results are useful to the targeted stakeholders. Participating countries will be encouraged to translate documents and workshop materials. This task will also organise countries to host technical development and education workshops. The subtask will also prepare mass/multi-market promotional material about urban-scale PV and will update existing PV education tools. An innovative deliverable will involve holding a competition for urban-scale PV with the winner of the competition announced at a forum on PV for the venture capital sector. Market research for the purpose of understanding and targeting stakeholder perceptions will also be part of this subtask. Finally, this task will be responsible for continuous outreach to stakeholders for input and participation in the task.

France is the Subtask leader, and is also the Work Package leader for the corresponding Work Package in the PV- Upscale project, thus guaranteeing a broad dissemination.

### Activity 4.1: Educational Tools

This activity will include a best practices web site which will include templates for tender documents, sales contracts, consumer guides, as well as best practices, detailed real project development information. Sweden leads this activity.

### Activity 4.2: Competition

Progress is that Portugal launched the Lisbon Ideas Challenge - Designing with Photovoltaics: New Energy Concepts for the Built Environment.

### Activity 4.5: Continuous Communication

France leads this activity.

Progress includes three 2005 workshop in Chambéry, France on Solar Cities, a task 10 brochure, a Task 10 presentation which was used at the Shanghai PVPS workshop and a fully active website. At the 26th ExCo meeting it was decided to move the website to the PVPS website.

## INDUSTRY INVOLVEMENT

At the 20th EU-PVSEC, Task 10 was invited to participate in an industry meeting looking at values, several points emerged as important to industry from this meeting. The network peak match

TABLE 2 - MEETING SCHEDULE  
(2004, 2005 AND 2006 PLANNED)

TASK 10 MEETING	DATE	PLACE
1st Task 10 Technical Experts	Feb. 4-5, 2004	Vienna, Austria
2nd Task 10 Technical Experts	Oct. 4-5, 2004	Florence, Italy
3rd Task 10 Technical Experts	March 17-18, 2005	Lisbon Portugal
Combined 26th Task 1 and 4th Task 10	June 1-3, 2005	Lyon, France
5th Task 10 Technical Experts	October 6-7, 2005	Washington, DC, USA
6th Task 10, combined with Tasks 1,2&9	March 27-28, 2006	Vancouver, BC, Canada
7th Task 10 Technical Experts	Sept 11-13, 2006	Malmö, Sweden



Fig. 2 - Task 10 Technical Experts, Washington, DC, October 2005.

value of PV, which has been started in Task 10 and is a work product to be completed by the end of 2006 in PV-UP-SCALE Standardising value analysis so that different countries are not presenting differing answers to non-country specific values, which Task 10 is starting to address by participating in the analysis publication database, expected to lead to analysis guidelines following the values-by-stakeholder matrix developed in Task 10. Additionally, as Task 10 moves forward, the two main reasons for commitment delays which are market oriented will be considered as deliverables are developed. These reasons:

1. As the PV market grows at phenomenal rates, countries question their analysis/resource investment in deployment type work such as Task 10 and consider R&D expenditures to be more important. Task 10 will participate in the development of a publication database, which should help with both analysis and R&D coordination.
2. Three countries, Japan, Germany, and USA (mainly California) installed 94 % of the 2004 market. The market sectors that have emerged, though both grid connected, are mainly customer sited for the purpose of offsetting customer energy use (Japan and California) and large free field systems for the purpose of selling into the grid (Germany and most of EU). The later market sector of free field systems puts to question the need for urban-scale deployment type work such as Task 10. Both markets are policy driven and Task 10 will work towards understanding the market transformation related to the policies.

#### KEY DELIVERABLES

##### (2004)

- 2nd International Symposium, Photovoltaic-Electricity From the Sun, February 11, 2004, Vienna - Austria
- Oral Paper Mainstreaming PV in the Urban Landscape - Activities of the New Task 10 IEA PVPS Implementing Agreement, 19th PVSEC, Paris, France, June 2004.
- Architects and Builders workshop for French stakeholders during the 19th PVSEC, Paris, France, June 2004
- Brochure/flyer for outreach to stakeholders.
- Task 10 website with front end for stakeholder outreach and Task 10 participants' password accessible working platform.
- Italian Stakeholders Workshop, PV integration in urban areas, October 6, 2004, Florence, Italy

##### (2005)

- Workshop targeted at all building sectors, Photovoltaics in Buildings: Opportunities for Building Product Differentiation, Lisbon, Portugal March 16th, 2005
- Workshop on Solar Cities in Chambéry France, June 1st, 2005
- Paper Value Analysis: International Comparison Of PV Values For Multiple Stakeholders, at 20th PVSEC, Barcelona Spain, June 2005
- Task 10 Presentation at ISES/ASES World Conference in Orlando, August 2005
- Task 10 presentation at PVPS Workshop Shanghai Oct, 2005
- Best practises website

##### (PLANNED 2006)

- Swedish stakeholder meeting, September 11, Malmo, Sweden
- Environmental Benefits of PV Systems in OECD Cities
- The Value of Policies in OECD Countries (proposed)