MAINSTREAMING PV IN THE URBAN LANDSCAPE - ACTIVITIES OF THE NEW TASK 10 IEA PVPS IMPLEMENTING AGREEMENT

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ABSTRACT: The International Energy Agency PV Power Systems (PVPS) Task 10, *Urban-Scale PV Applications*, is an international collaborative task bringing together architects, builders, financial experts, utility personnel, municipal planners, the solar industry and the educational sector to address the economic, institutional, planning and technical issues necessary to mainstream the use of PV in the urban environment. As the global market finds definition PV is poised to provide urban energy solutions. Whether a newly planned community targeting an enviro/socio conscious market or an existing high density, built-out urban area, PV can meet the needs. The purpose of this 5-year project 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 operations including energy efficiency, and solar thermal and photovoltaic technology usage. Task 10 will combine and expand on the successes in participating countries, through international collaboration to make Photovoltaic Solar Electricity commonplace in the urban environment. The paper describes the work plan and approach for the PVPS Task 10, which started in January of 2004.
Keywords: PV Market, Grid-Connected, Buildings

1 OVERVIEW AND BACKGROUND

As the global market finds definition PV is poised to provide urban energy solutions. Whether a newly planned community targeting an enviro/socio conscious market or an existing high density, built-out urban area, PV can meet the needs. The newest IEA-PVPS task, Task 10, Urban Scale PV Applications will build on existing market development success stories to establish a sustainable and global urban solar market. The theme of Task 10 is business opportunities through urban energy solutions.

Task 10 will build on earlier work carried out in the completed Solar Heating and Cooling (SHC) Task 16-Photovoltaics in Buildings [1], PVPS Task 5-Grid Interconnection of Building Integrated [2] and Other Dispersed Photovoltaic Power Systems and PVPS Task 7 [3] Photovoltaic Power Systems in the Built Environment.

The first IEA task to address Photovoltaics in Buildings (BIPV) was the SHC Task 16. Described as the "What" of BIPV, Task 16 defined the subject, addressed emerging issues, interacted with architects and created an international network.

The work of PVPS Task 5 developed and verified a range of technical requirements relating to PV in buildings and other applications that could serve as the technical guidelines for grid interconnection. This included matters of safety and reliable connection to the electricity grid at the lowest possible cost.

The second body of work, specifically targeted at BIPV was PVPS Task 7. The primary focus of Task 7 was on the integration of PV into the built environment and on market factors, both technical and non-technical, that needed to be addressed and resolved before wide-spread adoption of PV in the built environment could occur.

Task 10 – Urban Scale PV Applications will develop building energy business solutions and creating global marketing opportunities for all participants.

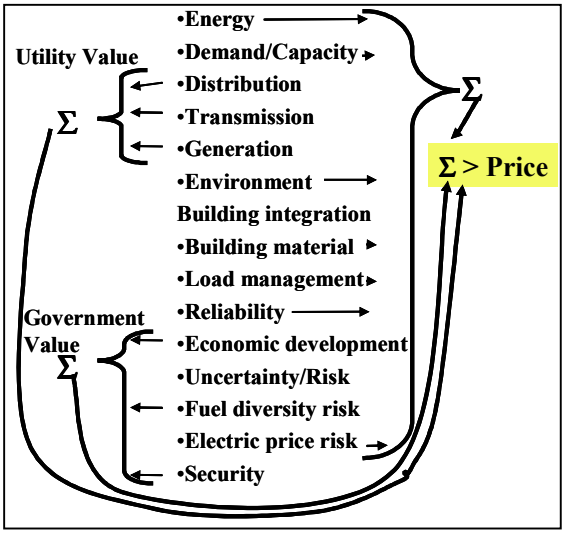
The total range of deliverables has been designed comprehensively to include and meet the various needs of the stakeholders who have been identified as having value systems which contribute to urban-scale PV. The deliverables are designed to optimise usefulness to the stakeholders and have multiple communication and promotion scenarios. Task 10 will be flexible enough to target the current stakeholder needs throughout its 5 year work plan.

An integrated multidisciplinary approach involving all stakeholders will be used in carrying out the work in Task 10. The PVPS Programme will be the managing Implementing Agreement for the Task, but to assure the results contribute effectively to wider whole-of-building integrated urban-scale efforts, the Task will actively coordinate with several IEA Implementing Agreements. The approach recognizes that optimising good design and solar thermal and PV potential and maximizing their synergies will require cooperation of a number of the Implementing Agreements (particularly the Photovoltaic Power Systems Programme, the Solar Heating and Cooling Programme, and the Energy Conservation in Buildings and Community Systems Programme). The Solar Heating and Cooling Implementing Agreement has decided to participate in Task 10 with technical experts.

Task 10 will combine and expand on the successes in participating countries, through international collaboration to make Photovoltaic Solar Electricity commonplace in the urban environment. The solar building market has grown substantially

[4] in recent years, mainly due to policy. However, the policy is often unstable. The value metrics planned for development and dissemination in Task 10 will provide justification for sustained solar policies similar to other energy resources. Additionally, Task 10 will define market revenue streams to different ownership scenarios to assure the owner or investor of the solar system realises full monetary value. As shown in Figure 1, the market will be sustained when the sum of the values exceed the price of the PV investment.

Figure 1: Combining Values



A sustained global market for solar energy solutions to urban building through value analysis and barrier resolution is the goal for Task 10. The Task officially started in January of 2004.

2 OBJECTIVE

The objective of Task 10 is to enhance the opportunities for wide-scale, solution-oriented application of PV in the urban environment as part of an integrated approach that maximizes building energy efficiency, 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.

The Task's long term goal is for urban-scale photovoltaic to be a desirable and commonplace feature of the urban environment in IEA PVPS member countries

3 STAKEHOLDERS

Mainstream solar electricity will result when multiple stakeholder values define a new, integrated, solution based energy market for buildings. Task 10 is a business opportunity for the full spectrum of stakeholders involved in the urban building and energy market. Solution values will be analysed and developed for multiple stakeholder perspectives. Barriers caused by the traditional energy market will be resolved.

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: educators, media

In addition to coordination and inclusion of other multidisciplinary implementing agreements, the Task seeks technical experts from all stakeholder groups for participation. Extended participating country stakeholder input will occur at every Task meeting, which will include a host country stakeholder workshop. The Task 10 work is targeted at a sustained solar electricity global market enterprise for all stakeholders.

4 SUBTASKS

Task 10 is segmented into four subtasks with 17 activities. Stakeholder targets have been identified in the work plan and multiple products per Subtask or activity are planned for the purpose of targeting the specific stakeholder.

4.1 Subtask 1: Economics and Institutional Factors

Subtask seeks to define the global solar market through economic and other market drivers. The subtask includes the following four activities :

1.1 Value analysis
1.3 Barriers Resolution
1.3 Market Drivers
1.4 Market Roadmap

This subtask will develop products 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. A matrix of stakeholder by values will be developed to justify sustained market drivers.

Subtask 1 products will include:

- developing 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;
- deriving recommendations to stakeholders for removing barriers to mass market uptake of PV;
- building upon existing lessons learned with financing, policy, environmental and rate structure issues by analysing the economic contribution of these market drivers and developing best practice scenarios;
- promoting transboundary transfer of lessons learned; and
- identify participating country industry roadmaps and produce guide for roadmap development.

4.2 Subtask 2: Urban Planning, Design and Development

Subtask 2 will develop the guidance to integrate photovoltaics into standard building design models, tools, practises, and community energy infrastructure planning. The activities for this subtask include:

2.1 Integrating PV development and design practices
2.2 Urban Planning

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 by:

- developing 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.
- 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.

4.3 Subtask 3: Technical Factors

Subtask 3 concentrates on technical and infrastructure challenges related to BIPV. The activities for this subtask include:

3.1 Building Industry/BIPV Products and Projects
3.2 Codes and Standards
3.3 Electricity Networks
3.4 Market Driven Approach

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, with the following approach:

- identifying the building material and energy use synergies of PV and of balance of system as well as updating the existing Task 7 database of products and projects for BIPV. 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;
- identifying existing codes and standards applicable to urban scale PV and the needs for developing new codes and standards. 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;
- analysing electricity network effects, benefits, impacts, and issues. Interconnection, operational effects, and market issues will be included;
- expanding the market-driven approach to research and development 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; and
- reviewing certification practices and defining harmonized standard test procedures transferred to the relevant stakeholders and standard committees.

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.

4.4 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 prepare mass/multi-market promotional material about urban-scale PV and will update existing PV education

tools. An innovative deliverable will involve holding a marketing competition for urban-scale PV. 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. The activities for ths subtask include

4.1 Educational tools
4.2 Marketing Competition
4.3 Marketing approaches and consumer aides
4.4 Stakeholder Perceptions
4.5 Continuous communication/results
4.6 Demonstration Projects

5 KEY GOALS, ACCOMPLISHMENTS AND NEXT STEPS

Subtask 10 has just started. The IEA PVPS website [2] has a complete work plan with more detailed information on opportunities for participation for Task 10. Participants are developing a resource base for each subtask and activity. Task 10 is also seeking to fill out representation of the full spectrum of targeted stakeholder expertise with additional participation. Currently the financing stakeholder sector is not a direct participant.

The first technical expert's meeting was held in Vienna, Austria in February 2004. This meeting included an Austrian stakeholder workshop targeted at the Architectural and Educational sectors. The Task 10 portion of the meeting was targeted at process and schedule for each subtask and activity. For more detailed information, contact the country participant or the Task Operating Agent.

Additionally, Subtask four has completed the Task 10 Brochure, and an achitects and bilders workshop for French stakeholders during this conference, June 10, 2004 will be held.

Task 10 website with front end for stakeholder outreach and Task 10 participants password accessible working platform is located at www.iea-pvpstask10.org.

The primary expected outputs of this task are as follows:

- Report on value analysis, barriers resolution, and market drivers
- Roadmap for the Global urban-scale PV market
- Manual on developing a long-term urban energy infrastructure plan•Report on how PV systems and components can best meet the needs of the market
- Workshops for participating country research agencies
- Communication tools - multi- media educational tools and other consumer aides;
- Forum on urban-scale PV for the venture capitalists
- Outreach materials (Task related) like web-site, presentations and flyers

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7 REFERENCES

[1] http://www.iea-shc.org/, select navigation bar - Publications, then select Task 16 in drop down box
[2] http://www.iea-pvps.org/, select navigation bar - Tasks, then select Task 5 in drop down box
[3] http://www.iea-pvps.org/, select navigation bar - Tasks, then select Task 7 in drop down box