# Task 10 - Urban-Scale PV Applications

**Seminario**
**APLICACIÓN DE LA ENERGIA SOLAR FOTOVOLTAICA DESDE LA PLANIFICACION URBANISTICA**

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Madrid Spain

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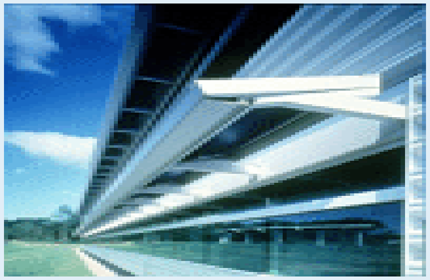
PVPS

# IEA Work Leading to Task 10
# BIPV in IEA Perspective

- IEA SHC Task 16
  What is BIPV ?

- IEA PVPS Task 7
  How can we do BIPV ?



- IEA PVPS Task 10
  Let‘s do BIPV !

## PV-UP-SCALE

Spain (ES)
Germany (DE)
The United Kingdom (GB)
The Netherlands (NL)

## IEA-PVPS-TASK 10

Australia (AU)
Canada (CN)
Switzerland (CH)
Denmark (DK)
Italy (IT)
Japan (JP)
Korea (KR)
Malaysia (MY)
Norway (NO)
Portugal (PT)
Sweden (SE)
The United States (US)

Austria (AT)
France (FR)

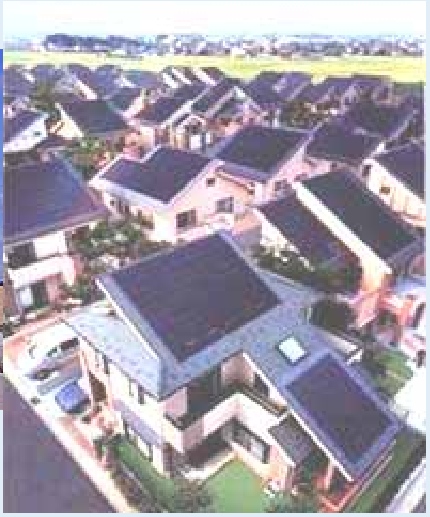
# Task 10 - Urban Scale PV Applications

## Overall objective

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

# Definition-Urban Scale PV

Urban-scale applications of photovoltaic power systems include small, medium and large installations on both existing and new buildings, homes, sites, and developments as well as point-of-use, targeted load solutions on a distributed basis throughout the high density urban environment.



# Analysis and Research Results will have Multiple Products Targeted at Stakeholders

- **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.**

# Task 10-Workplan

**SUBTASK 1: ECONOMICS AND INSTITUTIONAL FACTORS**

1.1 Value analysis

1.2 Barriers Resolution

1.3 Market Drivers/Roadmap

**SUBTASK 2: PLANNING, DESIGN AND DEVELOPMENT**

2.1 Integrating PV development and design practices

2.2 Urban Planning

**SUBTASK 3: TECHNICAL FACTORS**

3.1 Building Industry/BIPV Products and Projects

3.2 Codes and Standards

3.3 Electricity Networks

3.4 Market Driven Approach

3.5 Certification Practices

**SUBTASK 4: TARGETED INFORMATION DEVELOPMENT INTERESTED PARTICIPANTS**

4.1 Educational tools

4.2 Marketing Competition

4.3 Marketing approaches and consumer aides

4.4 Stakeholder Perceptions

4.5 Continuous communication/results

# SUBTASK 1: ECONOMICS AND INSTITUTIONAL FACTORS

## Activities

1.1 Value analysis

1.2 Barriers Resolution

1.3 Market Drivers/Roadmap

## Sample Deliverables

Report "Analysis of PV Systems Values Beyond Energy"

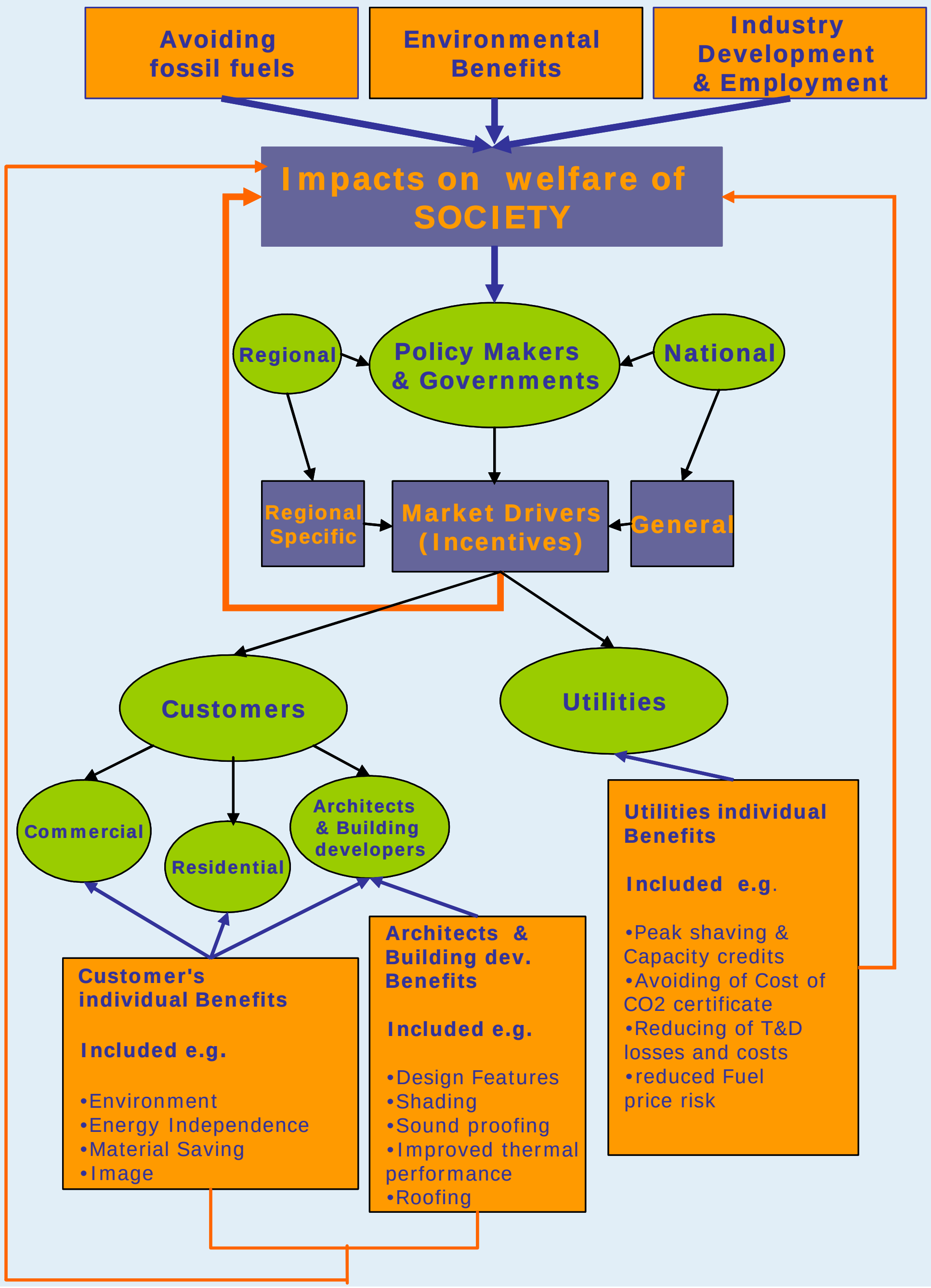
Published for PV-UP-Scale, expanded for Task 10, possible joint publication

Report "Economical Drivers and Market Impacts of Urban PV"

Published for PV UP Scale

Report on Barriers

# Relationship between Values, Stakeholder and Market Drivers

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# SUBTASK 2: PLANNING, DESIGN AND DEVELOPMENT

## Activities

2.1 Integrating PV development and design practices

2.2 Urban Planning

## Sample Deliverables

Tools and process for integrating PV in planning, buildings, developments, and communities

# Urban Planning Tool

**environmental programming**
↓
**urbanPVtool phase A**
↓
**evaluate and elaborate goals**
↓
**urbanPVtool phase B**
↓
**follow up and detail design**

- Determination of goals and priorities

- Overall performance requirements
- Support in site acquisition
- Support for determining extent of PV
- Design aid for initial sketches

- Evaluation/elaboration of initial performance requirements vs phase A results

- Development of solutions
- Illustration of environmental profiles

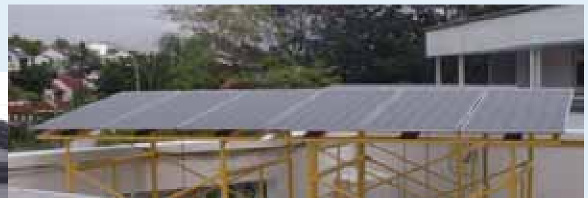
- Elaboration of final solution

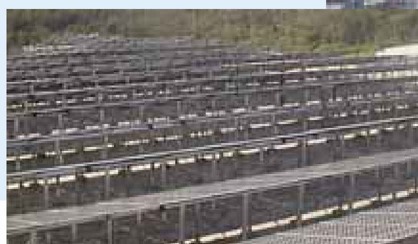
*The model should not be used mechanically to reach "the right answer" but as a tool to facilitate discussion, contribute to learning and to make evaluations and decisions more transparent"*

# Malaysia BIPV

## GCPV in Malaysia: Pilot stage (buildings)


Private School 1kW, 2001





TPM **362kW**, 2001

BP Station 20kW, 2002

UTM 1kW, 2002

# SUBTASK 3: TECHNICAL FACTORS

**Activities**

3.1 Building Industry/BIPV Products and Projects

3.2 Codes and Standards

3.3 Electricity Networks

3.5 Certification Practices

**Sample Deliverables**

Database BIPV Products/Projects/communities Communities Report

Global understanding of utility benefits

- 1 Impacts & effects of PV connection
- 2 Guidelines & Network Operation Policies
- 3 Countermeasures & Technologies

Guide on Certification Program Development

# SUBTASK 3: Technical Factors
# Activity 3.1 Building Industry/BIPV Products and Projects

Japan report - "Examples of community-scale PV installation in urban area: PV community database" example brief

### JAPAN: COSMO-TOWN KIYOMINO (tentative)

**BIODATA**

| | |
|---|---|
| PV community name: | COSMO-TOWN KIYOMINO |
| Kind of community: | Residential - urban district |
| Main building type in community: | Single house |
| New/Retrofit/Added: | New district/community |
| Type of project: | Commercial project |
| Start of operation: | Year 2001 |
| Location/City: | Yoshikawa, Saitama |
| Country: | Japan |
| Latitude: | N35 53' 54" |
| Longitude: | E139 51' 22" |

**PV SYSTEM CHATACTERISTICS**

| | |
|---|---|
| PV power total community: | 239 kW |
| Number of houses/buildings: | 79 |
| PV power per unit: | 3 kW/house |
| Energy yield per year: | 3 106 kWh/year (calculated) |
| Main PV system type: | Grid-connected - demand side |
| Main PV application type: | Inclined roof - PV roof tiles |
| Main PV module type: | PV roof tile |
| Main PV cell type: | Amorphous Si |
| PV module manufacturer/brand: | KUBOTA corporation |
| Inverter manufacturer/brand: | KUBOTA corporation |
| Investment for PV systems/modules: | 2 300 000 JPY/3kW-system |

**OWNERSHIP**

| | |
|---|---|
| Building owner: | Inhabitant |
| PV owner: | Inhabitant |
| PV energy user: | Inhabitant |

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**PV COMMUNITY DESCRIPTION**

**PV Community Brief**

Kiyomino is located in the northeast of Yoshikawa-city, Saitama, and is approximately 20km from center of Tokyo. The area has been developed toward comfortable living environment of 21st century and its concept is "human-friendly town development".

The development of Kiyomino area was planned and promoted by the Urban Renaissance Agency of Japan (the UR). Hakushin corporation was allowed to develop and sale 79 houses in the area. Then, they decided to develop a PV community, e.g. all houses equipped with PV system.

The community was one of advanced and practical cases of "PV community' and was given 'New Energy Award in FY2002" in Japan.

**Grid issue**

To avoid negative influences against a grid network caused by a high-density PV systems installation into a limited area, a precise negotiation with a utility company (Tokyo Electric Power corporation) was implemented and the design of grid-connection was decided below;

- each PV system (each house) has each point for grid-connection (LV line)
- one transformer for four PV systems
- enhancement of a capacity of transformer

The negotiation with the utility company was in charge of PV system provider for the community.

**Urban planning and architectural issues**

To create a well-designed appearance of the houses and a harmonized streetscape as a community, well-integrated PV modules into the roof were required, as well as satisfying fundamental facilities of "roof" is indispensable. From the viewpoints, design of PV modules, technological reliability on developing and installing roof materials and the cost were comprehensively evaluated for selecting PV module manufacturer.

Originally, roofing geometry of houses was designed as gable roof. However, the design was changed to be a shed roof for obtaining a maximum electricity generation from PV systems as well as creating well-designed roofs.

**Economic / financial issues** (including information on tariff, net-metering etc.)

The development plan of Kiyomino area given by the UR was defining averaged sale price of the houses in the area. To realize the price level, the costs of house itself and various kinds of equipment including PV system had to be reduced. Drawing up a cost-effective construction schedule was a one of promising measures and installing lots of PV systems in a limited area worked for reducing installation cost.

As for PV system itself, a governmental subsidized program for residential PV systems was available. After starting operation, a net-metering has been applied and surplus electricity from the house is being traded between the inhabitant and the utility company, at the same price of electricity tariff for residentials.

**Other remarks**

The community project has been contributing not only to deploying areal PV system installation in residential area but also to increasing publicity of the project companies.

The concept of the community development and equipping PV systems was well accepted and handed down to the inhabitants. Some of houses in the community were also equipped with a high-efficiency electric water heater, called "Eco-Cute".

According to the recent interview, the inhabitants' concern about environmental problems and motivation of energy saving have been growing.

**COMMUNITY INFORMATION**

| | |
|---|---|
| Project leader company: | Hakushin Co., Ltd. and Urban Renaissance Agency |
| Other project company: | Kubota corporation, Fuji-design Co., Ltd. |
| Project's www: | |
| Contact address: | MSK corporation<br>Shinjuku, Tokyo, 160-0023, Japan<br>Tel: +81-3-3342-3838 FAX: +81-3-3342-6534<br>Website: http://www.msk.ne.jp/ |



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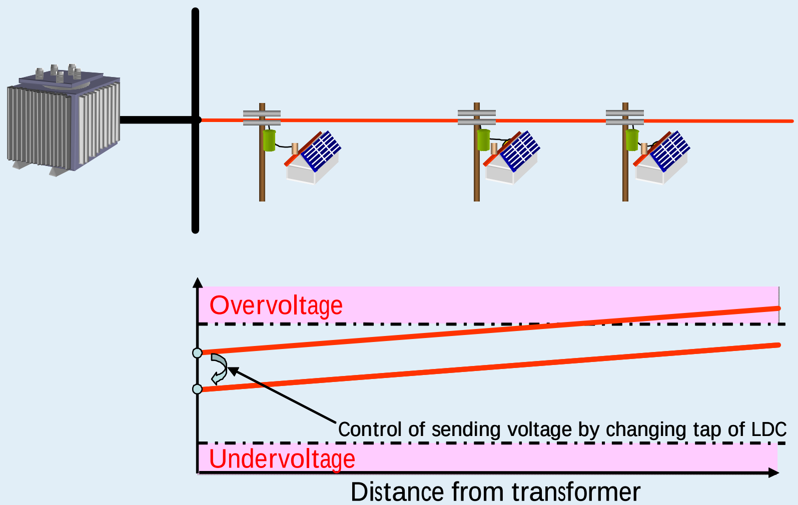
PV DATABASE
Urban Scale Photovoltaic Systems
Home | Introduction | BIPV Projects | BIPV Products | Urban scale PV | Links | Contact | Legal
PV database
Building integrated photovoltaic (BIPV) solar energy projects and products.
BIPV PROJECTS
BIPV PRODUCTS
URBAN SCALE PV
NEWEST ENTRIES
PV UPSCALE
Intelligent Energy Europe
partner area | statistics
February 2004 - October 2007
IEA PVPS TASK 10

# SUBTASK 3: Technical Factors Activity 3.3 Network Issues-Counter measures and technologies

<table>
<tr><td>Name</td><td>LDC (Line voltage drop compensator)</td></tr>
<tr><td>Development Stage</td><td>Practical use</td></tr>
<tr><td>Place to Install</td><td>Grid-side (Transformer)</td></tr>
<tr><td>General Description</td><td>Line voltage drop compensator (LDC) is a device to control secondary voltage (sending voltage) of the transformer. It is designed to compensate line voltage drop by looking at changes in line current. The device is normally installed next to transformer and can control line voltage flexibly according to daily changes in current/load. The voltage is controlled mechanically by switching the tap in the devices<br>

</td></tr>
<tr><td>Relevant impact/effect</td><td>Overvoltage suppression</td></tr>
<tr><td>Problems</td><td>
<ul>
<li>Response time is one of the disadvantages of LDC. LDC cannot respond to instantaneous voltage change since the switching tap is a mechanical process.</li>
<li>LDC can control only sending voltage from the transformer and it cannot control each line voltage independently. Therefore, as more distributed power generators are installed, it becomes more difficult to control the voltage by LDC only.</li>
</ul>
</td></tr>
</table>

# SUBTASK 4: TARGETED INFORMATION DEVELOPMENT INTERESTED PARTICIPANTS

## Activities

- 4.1 Educational tools merge w/4,3
- 4.2 Marketing Competition
- 4.3 Marketing approaches and consumer aides
- 4.4 Stakeholder Perceptions
- 4.5 Continuous communication/results

## Accomplishments

Educational tool design

Lisbon Ideas Challenge I

Lisbon Ideas Challenge II

Energy Payback Time report

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# IEA PVPS Task 2 and Task 10 Educational Tool

## Building integrated PV - from idea to operation

**Navigational tool**

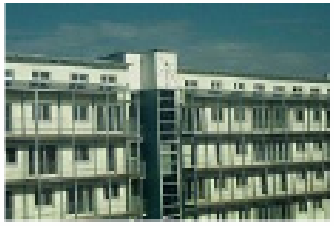
**Case studies for:**
Austria

Idea → Decision phase → Decision → Design phase → Tendering → Contract → Installation → Commissioning → Operation and evaluation

| Decision phase | | Design phase | Tendering | Installation | Operation and evaluation | |
|---|---|---|---|---|---|---|
| Added values | Architectural | Modules | Tendering | Grid connection and installation issues | Monitoring | Lessons learned |
| | | Mounting | | | | |
| Economic issues | Energy calculations | Electric design | | | Maintenance | |

Standards, regulations, recommendations, grid connection, links & references

| | |
|---|---|
| **Name of the project:** | Aspern at the Sun |
| **Location:** | Vienna |
| **Project type:** | Roof / shading device |
| **Peak power installed:** | 11,0 kWp |
| **Start of operation:** | August 1999 |



# Energy Payback Time Report – The product

## One overall presentation (2 A4 pages)


IEA INTERNATIONAL ENERGY AGENCY

### Energy Payback time of Urban Scale photovoltaic systems

Forword

Introduction

Not an LCA analysis

Indicators

EPBT and ERF

Methodology

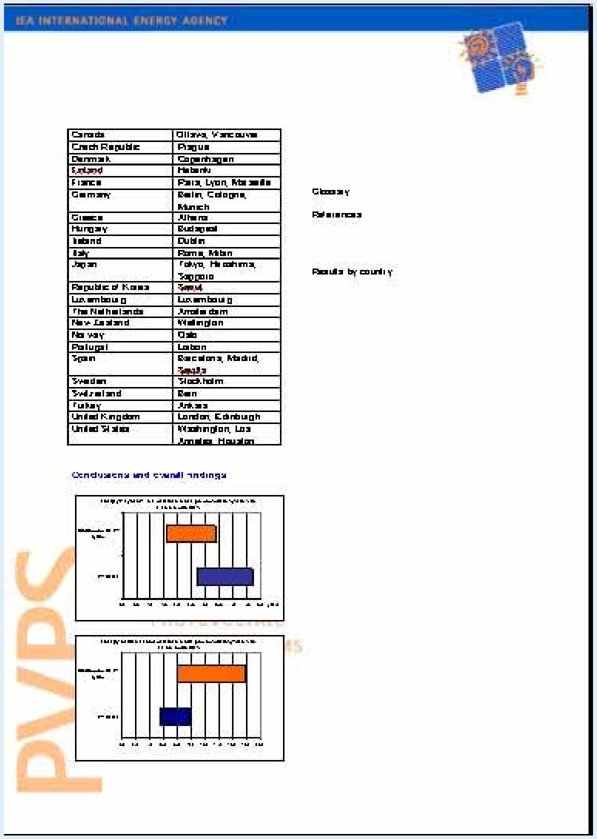
Determination of the EPBT and ERF

2 List of selected cities in each OECD country

Assumptions and source of data

- Primary energy input

| Country | Selected cities |
|---|---|
| Australia | Sydney, Perth, Brisbane |
| Austria | Vienna |
| Belgium | Brussels |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| | |
|---|---|
| Canada | Ottawa, Vancouver |
| Czech Republic | Prague |
| Denmark | Copenhagen |
| Finland | Helsinki |
| France | Paris, Lyon, Marseille |
| Germany | Berlin, Cologne, Munich |
| Greece | Athens |
| Hungary | Budapest |
| Ireland | Dublin |
| Italy | Rome, Milan |
| Japan | Tokyo, Hiroshima, Sapporo |
| Republic of Korea | Seoul |
| Luxembourg | Luxembourg |
| The Netherlands | Amsterdam |
| New Zealand | Wellington |
| Norway | Oslo |
| Portugal | Lisbon |
| Spain | Barcelona, Madrid, Sevilla |
| Sweden | Stockholm |
| Switzerland | Bern |
| Turkey | Ankara |
| United Kingdom | London, Edinburgh |
| United States | Washington, Los Angeles, Houston |

Glossary

References

Results by country

Conclusions and overall findings

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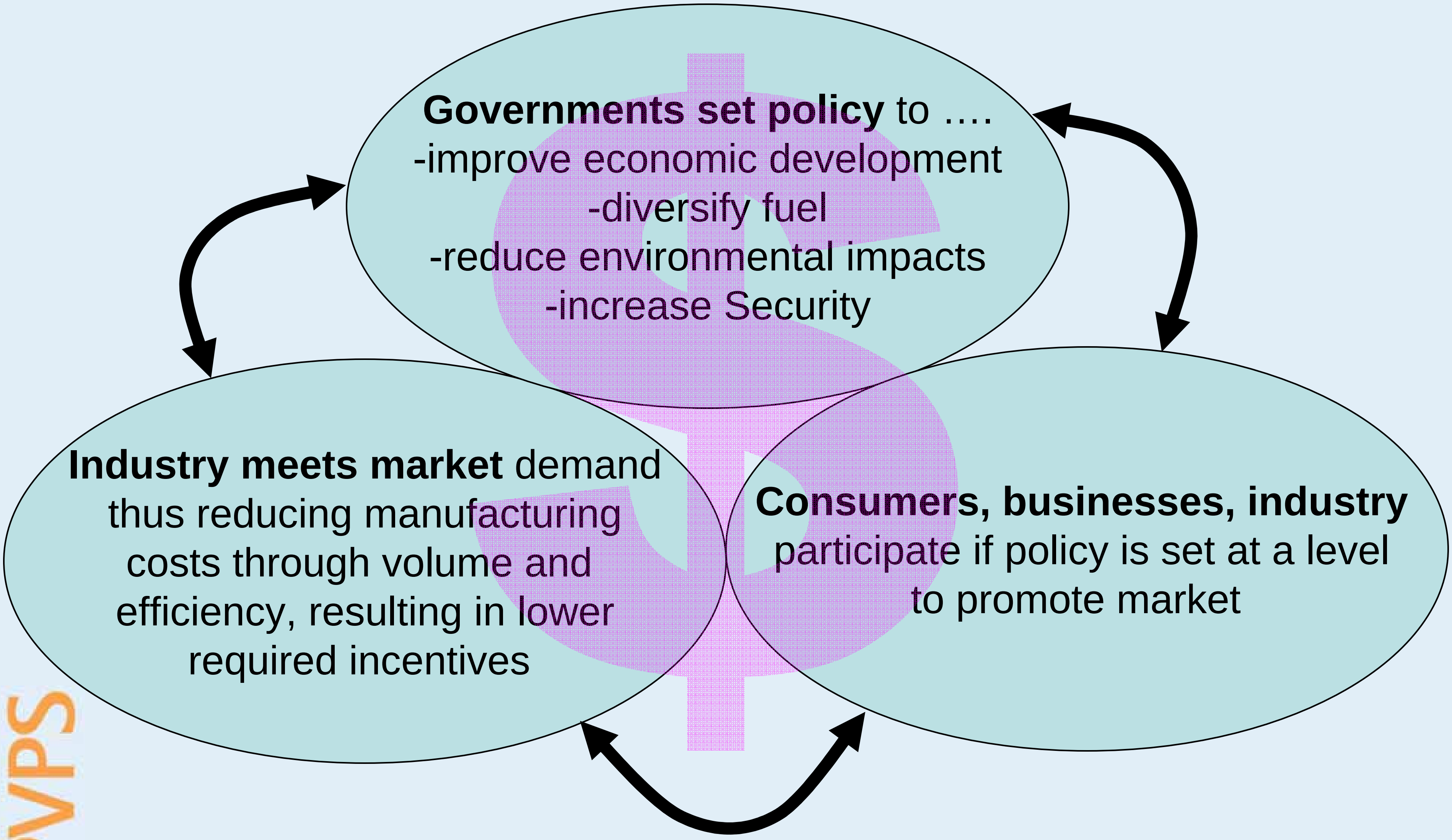
# Technology Market Transition with…….

## …..BIPV

## …..Solar Communities

## …..Solar Developments

# Sustained Global "**Solar**" Market

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# Task 10 - Urban Scale PV Applications

http://www.iea-pvps-task10.org