Enabling Framework for BIPV acceleration

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Solar is the energy source that can realize the paradigm shift in power generation.

Major barrier is less a technical one and more about awareness and political will.
Evolution of PV installations realized 2015
Key developments mass deployment PV

- Price decrease
- Efficiency improvement
- Electricity storage
- Building integration

Large market PV penetration

Potential of BIPV is there

**Rooftop PV and BIPV could generate 40 percent of EU’s electricity demand**

Rooftop and façade photovoltaics (PV) could generate up to 40 percent of Europe’s electricity demand by 2020, according to a leading industry body.

**Enormous growth potential**

*OT / 2015 APPLICATIONS & INSTALLATIONS* BY: IRA ROPKE

**BIPV:** The market for building-integrated photovoltaics is becoming increasingly important. The driving force behind this growth is France, though Germany and other markets around the world are also proving to be attractive.

<table>
<thead>
<tr>
<th>Work has started</th>
<th>Net Area in roofs (sq km)</th>
<th>Potential power (GWP)</th>
<th>Potential energy (TWh/year)</th>
<th>Percentage of PV electricity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Europe</td>
<td>3,723</td>
<td>618</td>
<td>494</td>
<td>14.64%</td>
</tr>
<tr>
<td>USA</td>
<td>4,563</td>
<td>757</td>
<td>904</td>
<td>19.54%</td>
</tr>
<tr>
<td>Japan</td>
<td>1,050</td>
<td>174</td>
<td>159</td>
<td>11.54%</td>
</tr>
<tr>
<td>Rest of OECD</td>
<td>1,273</td>
<td>211</td>
<td>230</td>
<td>20.10%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>10,609</strong></td>
<td><strong>1,760</strong></td>
<td><strong>10,519</strong></td>
<td><strong>16.98%</strong></td>
</tr>
</tbody>
</table>

Potential of BIPV systems: capacity for installation and electricity production. Source: EPA.

- There is an average of 18 m² roof area per capita potentially usable for photovoltaics in Central Western Europe. For the US/Australia, this figure is approximately 36 m², whereas in Japan only 8 m² are available per capita.

IEA PVPS Task 7, 2002

*Sustainable Business*
Friday, July 26, 2013 - 4:00am
2011 - forecast 430 MWp
2011 - realized 380 – 400 MWp (total PV market 75 GWp) → 0.6% BIPV

2015 – forecast 1900 – 2100 MWp
2015 – realized 1900 MWp (total PV market 230 GWp) → 0.8%
Risk of NoMyR (Not on My Roof) – opposition based on the believe that PV is necessary but should be realized further away (Ritzen, 2016).
IEA PVPS Task 15

Why come that the potential for BIPV is not exploited?

How can we overcome the main barriers?

Goal:
To enable the acceleration of BIPV overcoming the main non technical barriers by international collaboration.
Main barriers for BIPV acceleration

- **Databases** of exemplary projects and products do not fulfill market demands (mostly customized prototypes).
- The BIPV ecosystem is not yet mature, **businessmodels** have to be developed.
- Producers and installers do not have the insight in the **differing regulations** / certifications, requirements and needed specifications.
- **Environmental aspects** of BIPV products are not yet comparable to regular building components.
- BIPV testing and **demonstration** is internationally fragmented, adaptability of BIPV products in differing climatic circumstances unclear.
- **Dissemination** of BIPV expertise does not have a deep societal penetration.
IEA PVPS Task 15

- Started 2015
- 6 subtasks
- 15 countries
- 100 contributors

From a building process perspective
Strategy based on the building process

6 subtasks with clearly defined target audiences:

A. BIPV project and product database → designers
B. Transition towards sound BIPV business models → project managers
C. International framework of BIPV specifications → policymakers, BIPV product developers
D. Environmental aspects of BIPV → assessors, BIPV product developers
E. Demonstration → BIPV researchers, BIPV product developers
F. Dissemination → BIPV and general public
Subtask A - project database

Aim: not to get as many projects as possible; but to get from a selection of projects all relevant information.

Main target audience: designers (to be)

Results:
• Interactive database (+/- 40 projects)

Progress:
• Questionnaire to pinpoint reasoning behind BIPV selection
• Over 100 projects received
• Over 10 countries participating
• Interviewing phase
Subtask B – business models

Aim: develop specific business models for BIPV realization, including policy recommendations.

Main target audience: project managers

Results:
- Report with inventory on existing business models
- Report with business models and recommendations
Subtask B – business models

• Focus on innovation of business modeling

• Challenge status quo of BIPV as opposed to BAPV

• Foster and manage innovative approaches

• Focus on large scale BIPV deployment (as opposed to iconic demonstrations)

• Most existing projects are iconic / high end BIPV are not relevant to STB
Subtask B – business models

• Choice of representative BIPV [solutions/application] sets:
  – Residential house rooftop
  – Tertiary building cold façade (double skin)
  – Industrial/Commercial “light construction” roof

• Analysis of economic/non-economic barriers to BIPV implementation (financial, regulatory, social, behavioral …) as inputs to the design of innovative BM’s

• Use of Business Model Canvas to support the creative process (already used in IEA PVPS T9)
Subtask C – regulatory issues

Aim: improve the market potential of BIPV products by facilitating a internationally applicable regulatory framework.

Main target audience: policymakers, BIPV product developers

Results:

- Report on evaluation methodology and criteria
- Report on requirements, specifications and regulations and their barriers
- Guide of BIPV components that do have a general approval as building product in a certain country/region.
- Guidelines for harmonization
Subtask C – regulatory issues

- **Scope:**
  - International definition of »BIPV«
  - BIPV needs & functions analysis
  - BIPV requirements overview
  - Multifunctional BIPV evaluation
  - Suggest topics for exchange between different standardization activities on international level
Subtask C – regulatory issues

International definition of »BIPV«

BIPV = construction product with photovoltaic functionality.
Construction product = defined in the general CPR of the EU:

‘Construction product’ means any product or kit which is produced and placed on the market for incorporation in a permanent manner in construction works or parts thereof and the performance of which has an effect on the performance of the construction works with respect to the basic requirements for construction works.

EN50583 on “Photovoltaics in Buildings”
Subtask C – regulatory issues

Split the BIPV draft standard into two parts (similar to EN 50583). BUT:

- For part 1 (BIPV products), we only keep the categorization dependent on the material (glass / polymer / metal sheet / other).
  Part 1 includes rules how to quantify properties of the product (and may include general requirements as well).

- For part 2 (BIPV installations), we only keep the categorization dependent on the installation method.
  Part 2 includes requirements for BIPV products when used in the application.
Subtask C – regulatory issues

• We have to find a clear definition of the border line between part 1 and part 2 (what is a “product”, what a “BIPV system”?)

• It may be necessary to dig into the contents of the IEC61215 and IEC61646 and split them up in the BIPV draft standard (we should list the contents).

• We will then collect properties and requirements on product level and on system level.

• We will try to replace EN references by ISO references.
Subtask C – regulatory issues
Subtask D – environmental issues

Aim: provide the tools to compare the environmental aspects of BIPV with regular building components.

Main target audience: assessors, BIPV product developers

Results:

- Report with Product Category Rules (PCR) for BIPV products (T12)
- Report with BIPV environmental assessment comparison with regular building components, BIPV product datasheet
- BIPV environmental assessment plug-in for existing assessment tool
Subtask D – environmental issues

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>D.1</td>
<td>Identification of BIPV related environmental benefits worldwide</td>
</tr>
<tr>
<td>D.2</td>
<td>BIPV focused methodology for environmental assessment</td>
</tr>
<tr>
<td>D.3</td>
<td>BIPV environmental assessment test cases</td>
</tr>
<tr>
<td>D.4</td>
<td>BIPV environmental assessment plug-in for building assessment tools.</td>
</tr>
</tbody>
</table>
Participants: 29 persons / 12 countries
Contributors (supportive persons): 11 persons / 5 countries

- Korea
  - EAGON

- Sweden
  - SP Technical Research Institute of Sweden

- Denmark
  - Solar City

- Germany
  - Fraunhofer
  - Architektenburo Hagemann

- Belgium
  - IMEC

- Italy
  - Eurac
State of the art synthesis

- Finalizing the international list of PCR / EPD - Guidelines already developed in the field of BIPV, PV and buildings
- Establishing a comparison between PEF, PCR, IBU...

⇒ Work in progress in collaboration between Cycleco & Technikum Vienna

<table>
<thead>
<tr>
<th>Part of the work</th>
<th>Deadlines</th>
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<tbody>
<tr>
<td>Identifying of relevant documents</td>
<td>✓</td>
</tr>
<tr>
<td>Establishing a tab to compare documents (+ selection of pertinent criteria)</td>
<td>✓</td>
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<tr>
<td>Finalizing a report document (summary of the tab + report synthesis)</td>
<td>End of June 2016</td>
</tr>
<tr>
<td>Send the document to all Subtask D participants for feedback</td>
<td>September 2016</td>
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<tr>
<td>Send the document to all participants of Task 15</td>
<td>Oct-Nov 2016</td>
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## Screened document

<table>
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<tr>
<th>Guideline</th>
<th>Short name of the document</th>
<th>Sources</th>
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</thead>
<tbody>
<tr>
<td>Production of Photovoltaic modules used in photovoltaic power systems for electricity generation (NACE/CPA class 27.90 &quot;Manufacturing of other electrical equipment&quot;)</td>
<td>PEFCR - PV</td>
<td>European Commission, 2015</td>
</tr>
<tr>
<td>PCR Electricity, steam and hot/cold water generation and distribution</td>
<td>EPD PCR</td>
<td>PCR CPC 171 &amp; 173, 2013</td>
</tr>
<tr>
<td>BP X30-323-0: General principles for an environmental communication on mass market products</td>
<td>BP X30-323-0</td>
<td>ADEME, 2015</td>
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<tr>
<td>Methodological framework for assessing the Environmental Impacts of Photovoltaics systems using the Life Cycle Assessment method</td>
<td>REF PV</td>
<td>ADEME, 2013</td>
</tr>
<tr>
<td>EN 15804 - Sustainability of construction works - environmental product declaration - core rules for the product category of construction products</td>
<td>EN 15804</td>
<td>EN 15804, 2012</td>
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</table>

## Comparison criteria

<table>
<thead>
<tr>
<th>General information</th>
<th>Communication target audience</th>
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</thead>
<tbody>
<tr>
<td>Data alignment</td>
<td>Data quality requirements</td>
</tr>
<tr>
<td></td>
<td>Quality of primary data (rules on data collection) - Quantification</td>
</tr>
<tr>
<td></td>
<td>Quality of secondary data - Quantification</td>
</tr>
<tr>
<td></td>
<td>Specific databases</td>
</tr>
<tr>
<td>Rule alignment</td>
<td>Specification of the unit of analysis</td>
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<tr>
<td></td>
<td>Product category</td>
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<td>System boundaries (Scope of the study)</td>
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<tr>
<td></td>
<td>Relevant/irrelevant impact categories (Environmental footprint impact categories)</td>
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<tr>
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<td>Resource use and emissions profile</td>
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<td></td>
<td>Allocation rules</td>
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<td>Rules for additional information</td>
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<tr>
<td></td>
<td>Environmental footprint impact assessment (methodology)</td>
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<tr>
<td></td>
<td>Interpretation of results</td>
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<td>Cut-off</td>
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<td>Procedural alignment</td>
<td>Requirements for creation</td>
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<td>Requirements for review</td>
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<td></td>
<td>Validity period</td>
</tr>
</tbody>
</table>
Subtask E – BIPV field testing

Aim: to harmonize international BIPV demonstration activities and realize joint demonstration projects.

Main target audience: BIPV researchers, BIPV product developers

Results:

- Report on different existing test sites and in-depth comparison
- Guide for the installation and maintenance of BIPV demonstration facilities
- Cooperation agreement of the realization / exchange of BIPV product demonstrations based on specific needs (different climatic zones).
Subtask E – BIPV field testing

- **E1**: inventory of existing test sites.
  - First draft
- **E2**: Comparison Field and reliability tests
  - Work program validated.
    - First contribution provided (xls file)
- **E3**: Installation and maintenance Issues
  - Work in progress by CSTB
    - List of french contributors identified (with ADEME support)
    - First draft survey realised for French respondent (Google form)
    - Meeting scheduled
- **E4**: Diversity of products (Shape colours, technologies …)
  - Work program validated
- **E5**: Performance analyses (monitoring, evaluation and Feedback)
  - Work in progress
Concluding remarks

• BIPV potential is not fully exploited yet
• Barriers in this project or non-technical
• Main stakeholders in potential BIPV building projects are not aware of the possibilities
• By creating a framework, consisting of clearly developed elements for the different stakeholders, the main barriers can be breached.

Thank you for your attention.