



Analysis of Technological Innovation Systems for BIPV in Different IEA Countries

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Main Authors:

M. van Noord¹, N. Martín Chivelet², N. Weerasinghe³, J. Halme⁴, F. Tilli⁵, A. Baggini⁶, M. Tabakovic⁷,
O. Bernsen⁸, R. Yang³, E. Daun¹

¹ RISE Research Institutes of Sweden, Sweden

² CIEMAT, Spain

³ RMIT, Australia

⁴ Aalto University, Finland

⁵ GSE Gestore dei Servizi Energetici, Italy

⁶ Università di Bergamo, Italy

⁷ FH Technikum Wien, Austria

⁸ RVO, the Netherlands

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EXECUTIVE SUMMARY

This report compiles and compares the results of seven national technological innovation systems (TIS) analyses for building integrated photovoltaics (BIPV), in Spain, Finland, Sweden, Italy, Australia, Austria and the Netherlands. All these analyses were performed within Subtask A of the IEA PVPS Task 15 and built upon the guidelines published earlier by the same task. The data for the national analyses were gathered from (national or international) databases on projects, publications, patents and regulations; interviews, workshops and/or surveys with representatives along the BIPV value chain; and websites, press and literature review.

Analysing the structures of the national innovation systems has identified research and education actors to be a driving force in most of the countries, together with BIPV manufacturers. For Austria, the Netherlands, Spain, and Sweden, policymakers have also been found to have a relevant impact on the innovation systems' development. Industry associations are typically less active in BIPV, giving them low importance for the TISes in all countries except Austria and Australia.

The formal institutional framework (i.e. regulations, standards, etc.) for BIPV is still underdeveloped or unspecific. BIPV is typically not considered as a building product and guidance on how to comply with building code regulations is limited, which complicates implementation of BIPV. Incentives are generally directed towards PV in buildings or towards renewable energy in general, which puts BIPV in a competing situation, primarily with BAPV. In this competition BIPV is typically a less mature option, with higher complexity and costs. In the informal institutional framework (i.e. culture, habits, etc.) there is support for PV and BIPV



at a higher level, while at a more practical level, BIPV is hindered by a cultural gap between the solar energy and the construction industries.

Within the current structures of actors and formal or informal frameworks, niche markets for BIPV have evolved in all countries. For all countries except Spain, a main sub-market exists for roof systems with regular sized modules. In Spain, façade solutions with PV glazing are the most developed sub-market, while Austria has a combination of the two.

Analyses of applied and granted patents show that Italy and the Netherlands are the two most active countries in BIPV intellectual properties, followed by Spain. The application types that are targeted in the patents generally correspond to the main sub-markets for each country.

In order to advance from a niche market to a commercial market, a TIS must function properly. This is assessed using eight TIS-functions. Out of these eight, all countries have at least three (and up to eight) functions with insufficient fulfilment for a commercial market growth. All suffer from insufficient knowledge dissemination (to the construction industry, the market, public administration and/or supporting actors) and insufficient market formation (through market push, market pull or market incentives). Furthermore, the creation of social capital is low in six of seven countries, which hampers many other aspects such as legitimisation, resource mobilisation and entrepreneurial experimentation.

The underlying problems for insufficient functional fulfilment are listed and discussed. The main issues are a limited engagement of certain actor groups, such as actors originating from the construction industry and product manufacturers; the industry's difficulties in reducing prices sufficiently or convincing customers of the benefits of BIPV; and the lack of BIPV-specific policy incentives to mitigate differences in maturity between BIPV and competing technologies. Also, limited social interaction between actors in the BIPV and adjacent value chains, and the lack of educational resources, are important barriers in many countries.

Recommendations to facilitate BIPV market development are mostly similar from country to country and the main recommendations can be grouped into:

- Engaging new actors in the TIS to fill gaps and increase diversity, for example through assessing and communicating market potential.
- Increasing interactions between actors in the value chain, through collaborative actions on roadmaps, market creation, knowledge dissemination, etc.
- Bridging gaps between the solar and construction sectors (cultural and interactional), e.g. by requiring such cooperations in tenders or funding calls.
- Stimulating further innovation and development, in areas like rationalisation of production and scalable solutions for retrofitting.
- Improving regulations, standardisation, and increasing technical guidance for BIPV, for instance through acknowledgement of BIPV-products as construction products.
- Stimulating BIPV market(s), which could be done through regulatory incentives or requirements.
- Increasing education, training, and knowledge transfer.

Since many of the overarching problems and recommendations are similar for the studied countries, there is a clear potential for multi-lateral cooperation by industry actors and for international policy initiatives. In topics like knowledge dissemination or technical guidance, IEA PVPS Task 15 has the potential to make a difference.