IEA International Energy Agency

IMPLEMENTING AGREEMENT ON PHOTOVOLTAIC POWER SYSTEMS

TASK 15 ENABLING FRAMEWORK FOR THE ACCELERATION OF BIPV

Executive summary

BIPV Design and Performance Modelling: Tools and Methods

IEA PVPS Task 15, Report IEA-PVPS T15-09: 2019

June 2019

Authors:

Nebojsa Jakica, Mikkel Kragh (University of Southern Denmark, Denmark), Rebecca J. Yang W.M.Pabasara, U. Wijeratne, Eric Too, Ron Wakefield (RMIT University, Australia), Johannes Eisenlohr (Fraunhofer ISE, Germany), Simon Boddaert (Centre Scientifique et Technique du Bâtiment, France), Pierluigi Bonomo, Erika Saretta, Francesco Frontini (SUPSI, Switzerland), Alessandra Zanelli (Politecnico di Milano, Italy), Sara Freitas (Lisboa E-Nova and Faculdade de Ciências, Universidade de Lisboa, Portugal), Philippe ALAMY (EnerBIM, France), Jonathan Leloux (LuciSun, Belgium)

Editors:

Nebojsa Jakica (University of Southern Denmark, Denmark), Rebecca J. Yang (RMIT University, Australia), Johannes Eisenlohr (Fraunhofer ISE, Germany)

The given state-of-the-art review of BIPV design and management tools presents recent developments in BIPV modelling concerning design and management processes with different levels of detail, targeting various stakeholders and their requirements in the BIPV value chain in relation to geophysical, technical, economic and environmental aspects. It goes beyond focusing only on PV modelling and gives an overview of the BIPV tools from the perspective of BIPV integration in design and multi-performance modelling and planning. The report examines features and functions, as well as potential development and limitations of currently available tools used in BIPV planning process, including tools specifically designed for BIPV and PV tools with capacity to simulate certain BIPV cases. Moreover, report provides information on limitation and reliability of these tools in different settings and for different BIPV categories, indicating pathways and tools' selection that would provide the highest confidence and fidelity of results as well as positive user experience throughout the process.

The report streamlines workflows according to the type and complexity of BIPV integration and offers pathways and tools suitable for required case. The report included 15 domains of BIPV planning such as geophysical, technical, economic and environment which affect successful BIPV integration. 27 software, 9 online tools and 4 apps were compared against the aforementioned domains.

The findings of this review showed none of the examined software and apps can cater to all the factors pertaining to PV project design and management. Results have shown that majority of tools used in BIPV modelling come from PV domain and consequently still lack important features regarding BIPV integration, especially for vertical or externally mounted BIPV.

Therefore, this study propose a decision support system which will address stakeholders' practical difficulties by providing the main features: (1) a localized data repository which will include weather information, building regulations, energy consumptions in different building sectors, utility prices, construction and maintenance costs, contract types, financial modes, carbon prices and government incentive schemes; (2) efficient 3D model creation of the physical environment; (3) Hourly comparison of energy input and output; (4) PV layout design optimization; (5) Simulated installation process and impact analysis; (6) Monitoring and inspection modules with auto diagnosing function; (7) PV system performance recording; and (8) sensitivity analysis and scenario-based decision making support.