BUILDING-INTEGRATED PHOTOVOLTAIC TECHNOLOGIES AND SYSTEMS FOR LARGE SCALE MARKET DEPLOYMENT

Overview of PVSITES products

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Products – whole value chain

Modules

BOS

Other products

Products trying to answer market challenges

Enhanced flexibility of design, outstanding aesthetical value, multi-functionality and cost-effectiveness

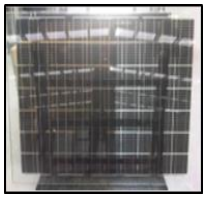
Assistance to design phase through the joint simulation of BIPV products and building energy performance

More predictable, manageable, grid-friendly profitable BIPV generation

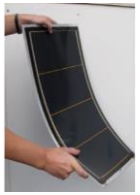
Demonstration of performance and reliability of BIPV solutions through effective incorporation onto real buildings

Key technologies - modules

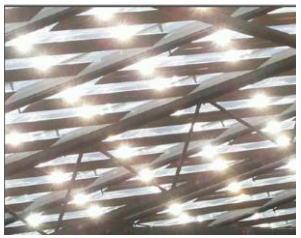
- **Glass – glass c-Si solutions (Onyx) and curved CIGS (collab.with Flisom)**
  - Hidden bus-bar and L-interconnections
  - Back-contact solar cells as see-thru glass-glass
  - Large formats
  - Glazing treatments



- **Flexible CIGS on metal substrates (Flisom)**
  - Roofing shingles, CIGS on steel
  - Solar roof tiles on different metal sheets
  - Large area flexible membranes, roof and façade



- **Semitransparent low concentration – passive solar control BIPV solutions (Tecnalia – Onyx)**
  - Skylight
  - Ventilated façade
  - Shading elements



Key technologies - modules

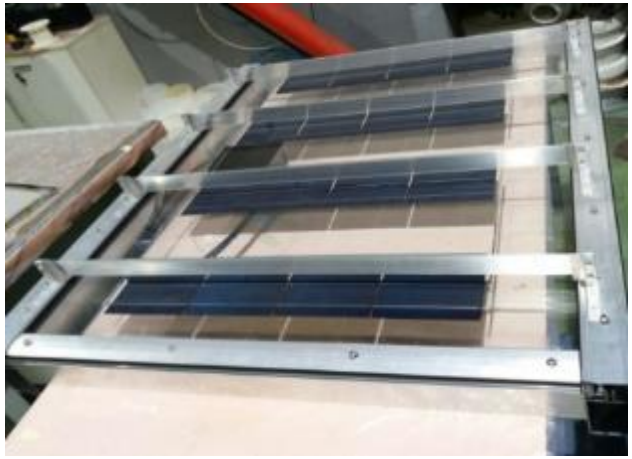
Glass–glass crystalline silicon based solutions (ONYXSolar)

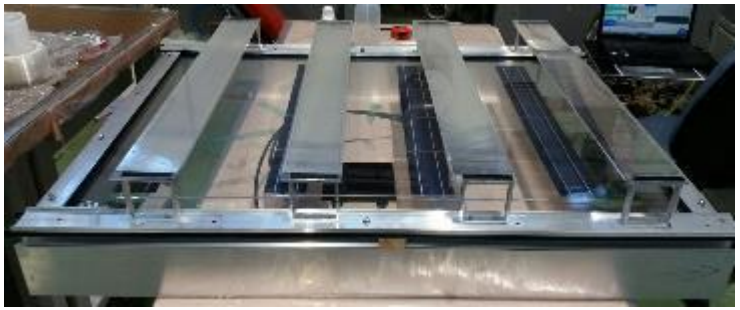
Key technologies - modules

Glass–glass based solutions (ONYXSolar + ONYX)

Key technologies - modules

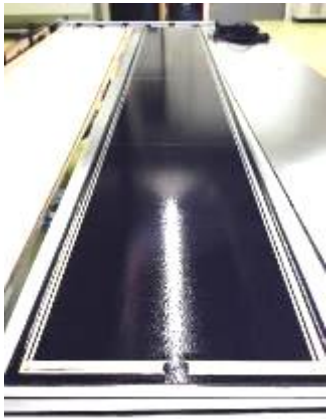
Semitransparent low concentration – passive solar control BIPV solutions (Tecnalia – Onyx)

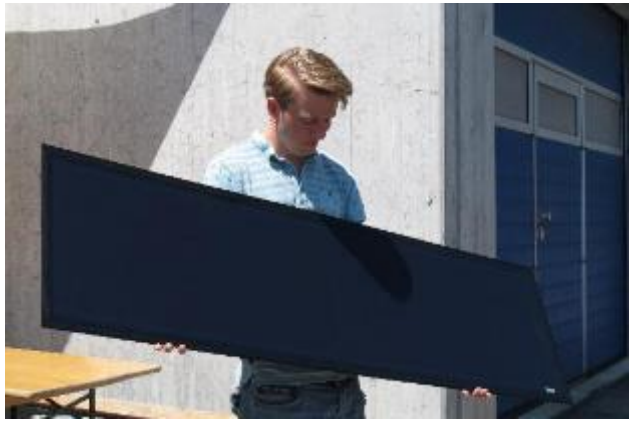




Key technologies - modules

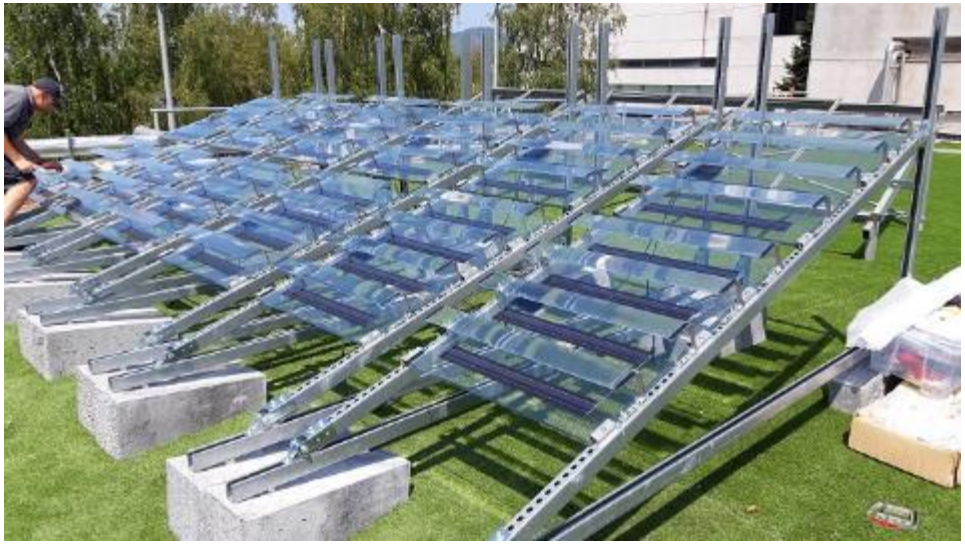
CIGS on metal BIPV modules (FLISOM)





Key technologies – modules in test-benches

Modules in outdoor testing @ Acciona, Tecnalia, CEA

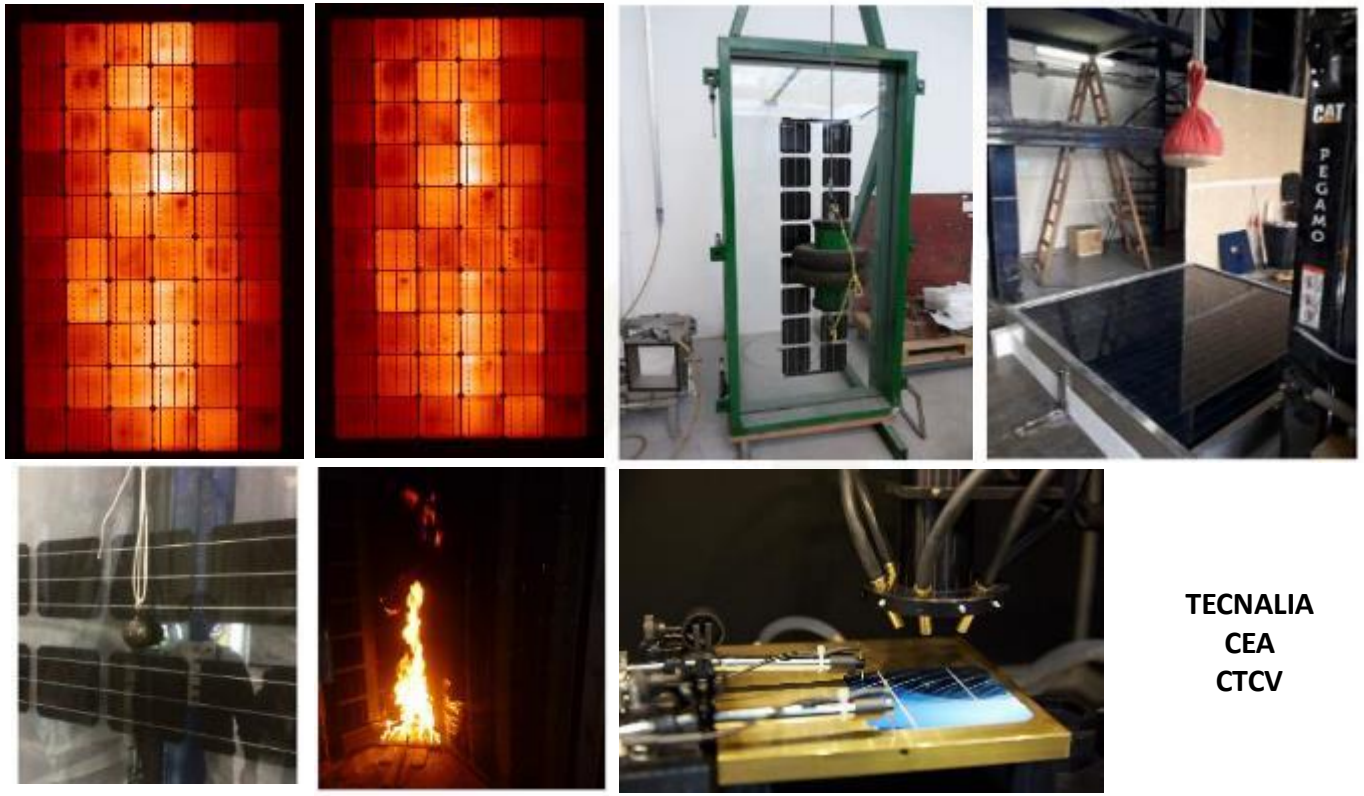


Key technologies – modules in test benches

ACCIONA, CEA, TECNALIA

Key technologies – modules and standards

Application of the new BIPV standard, EN 50583 (2016)

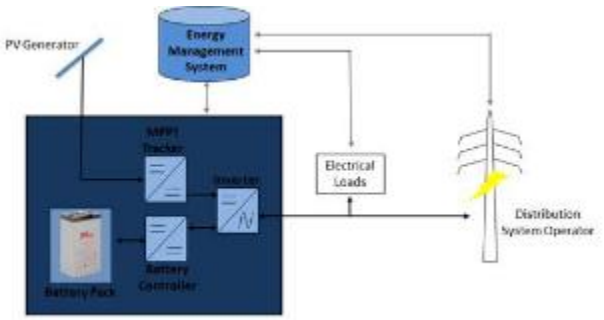


TECNALIA
CEA
CTCV

Key technologies – energy conversion & management

- **PV storage inverter with high DC coupling (Tecnalia) and single-stage SiC based PV inverter (CEA)**

  - High efficiency
  - High reliability
  - Cost reduction
  - Flexibility in system design
  - Scalability

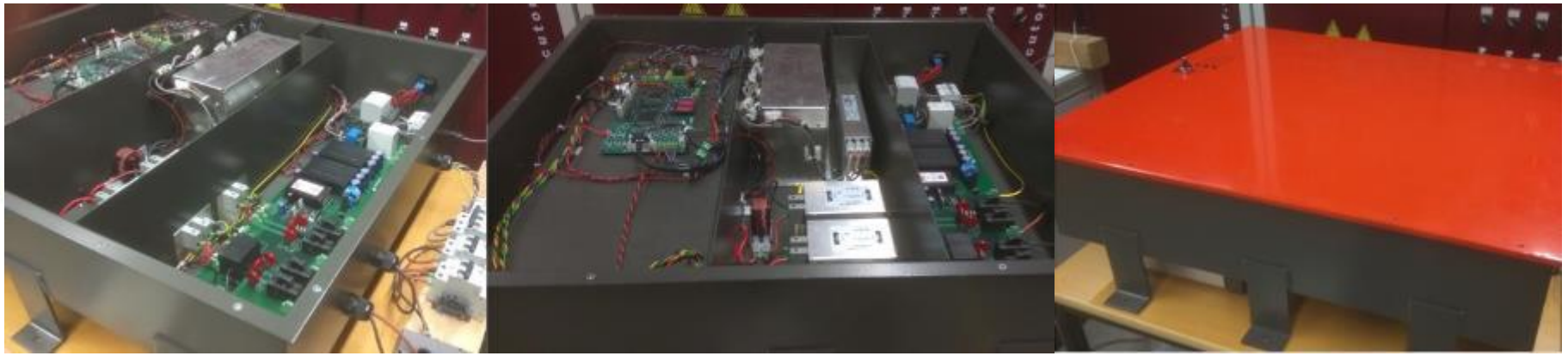


- **Building Energy Management Systems (BEMS) (Tecnalia, Acciona, R2M)**

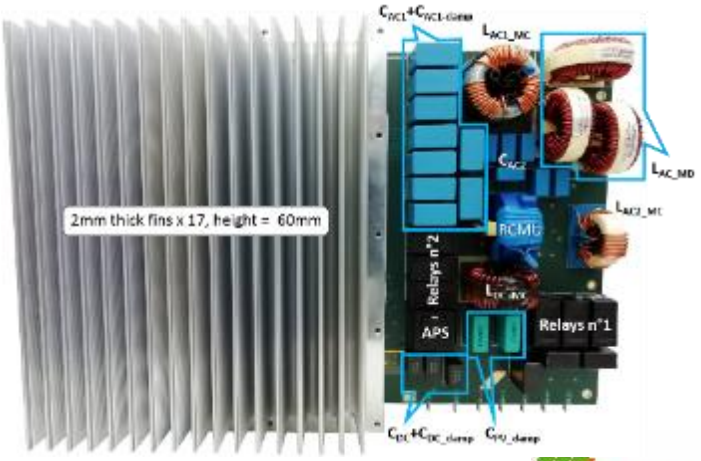
  - Planner tool for CAPEX optimization
  - Low-cost and reliable BIPV generation and building electrical consumption forecasting tools
  - Optimal use of BIPV excess
  - Active load management capability

Key technologies – energy conversion & management

- Best **storage solutions for BIPV** defined
- Grid interface using storage system with DC coupling (TECNALIA)

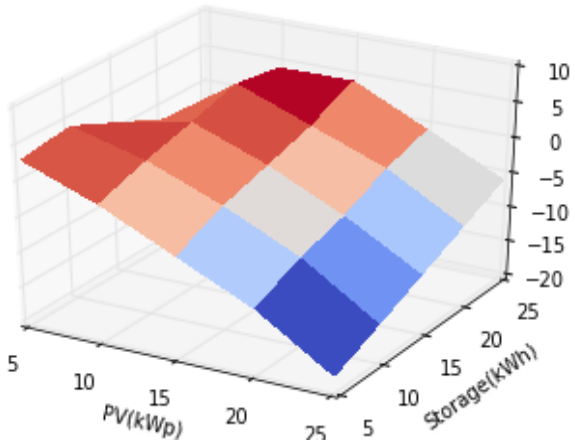


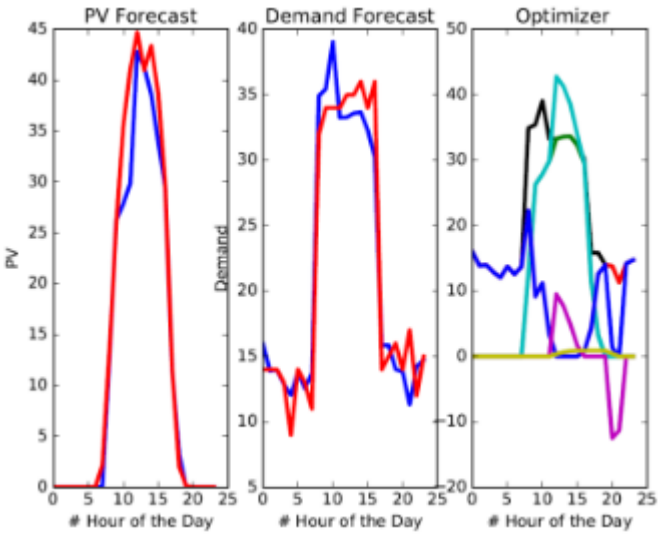
- SiC based inverter – current source inverter topology (CEA)



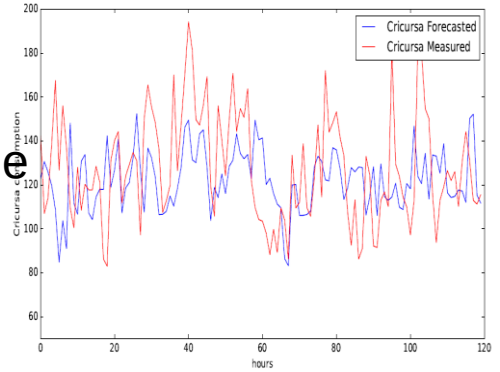
Key technologies – energy conversion & management

- Planner tool PV storage systems





- Refinement of **BIPV** generation and building electrical consumption **forecasting tools**

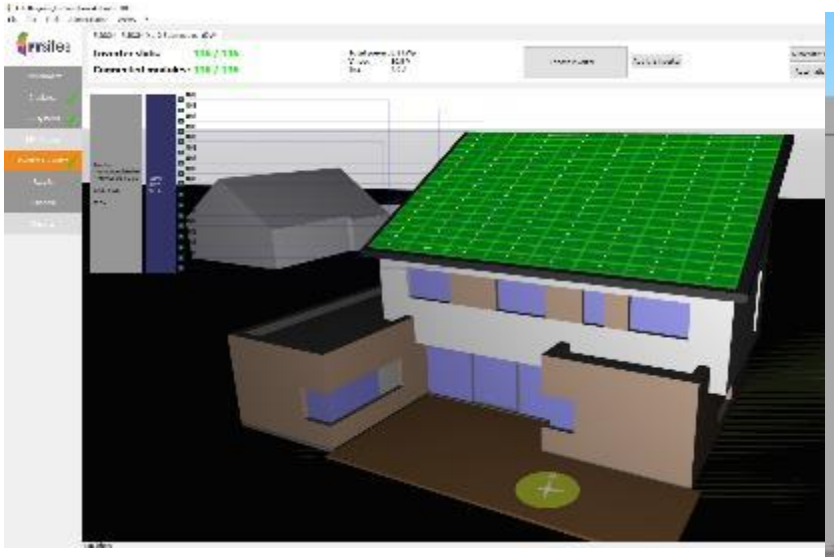


- **Building Energy Management System** for each use case

Key technologies –software development

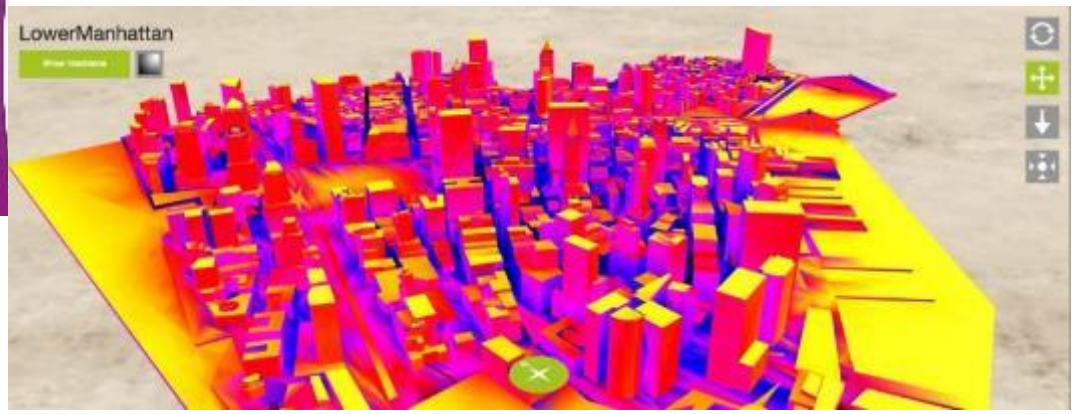
Integrated tool for BIPV and building energy performance simulation (CADCAMation, Tecnalia, Bear, Nobatek)

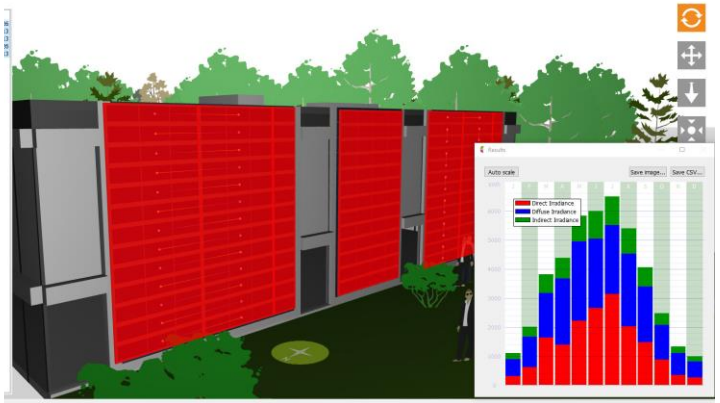
SOA holistic platform – BIM objects - Validation

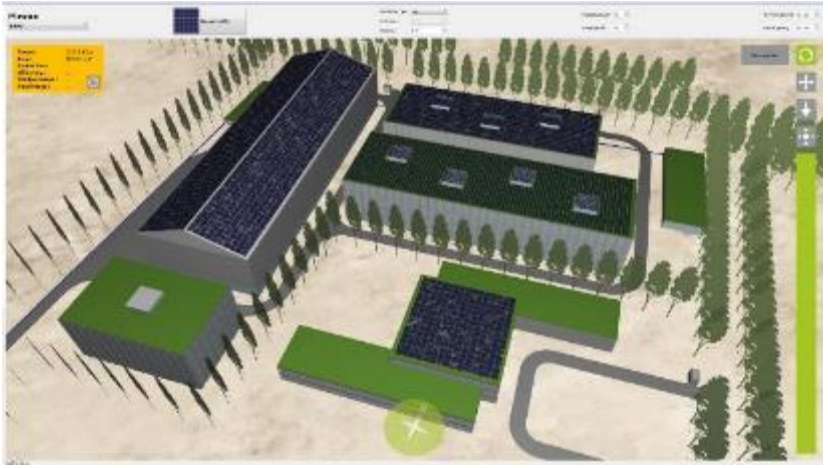


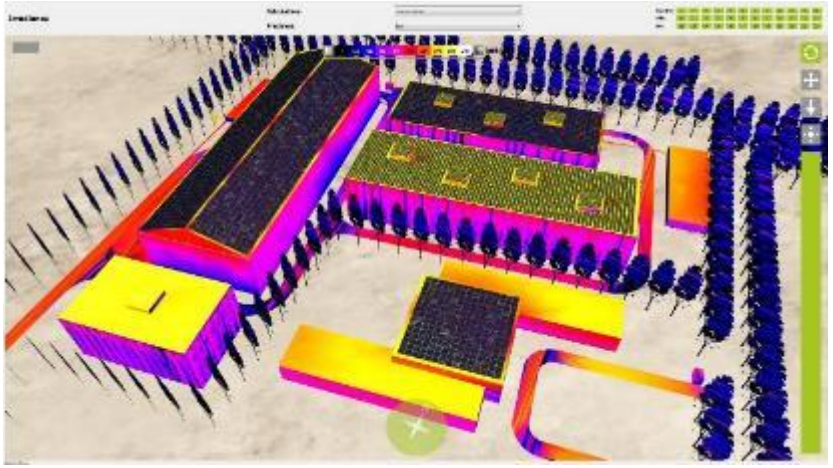
Key technologies –software development

BIM-based SW tool (available at http://pvsites.enerbim.com/)









PVSITES products in the market

PVSITES in the market – exploitation success

- Planner tool adapted and license sold by TECNALIA for use in radio-frequency stations to an ESCO.
- Demonstration of forecasting tools and BMS, licensing to a large Energy company in Spain in progress (TECNALIA).
- Exploitation agreement for TECNALIA storage inverter in progress with ELSON Electronics.
- BIMSOLAR platform already on-line (free version)
- The collaboration between **R2M Solution** and **Onyx Solar** in the PVSITES project has led to a new commercial development, with R2M Solution now being the official Onyx Solar distributor in Italy and France.
- ONYX SOLAR and FLISOM products already in the market

PVSITES products in the market

PVSITES in the market – CIGS products

180 kW BAPV retrofitting of bitumen roofs in the Netherlands
With e Flex CIGS product (FLISOM)

PVSITES products in the market

PVSITES in the market – CIGS products

250 kW installation of e Flex CIGS product (FLISOM)
in a flowers market in Johannesburg (SA)

PVSITES products in the market

PVSITES in the market – c-Si products

Black frit PVSITES modules in Atic in Castle Lane Street, close to Buckingham Palace, London (Onyx Solar)

PVSITES products in the market

PVSITES in the market – c-Si products

16 kW BIPV glass-glass blue tinted curtain wall (ONYX Solar) at Balenciaga storefront (Miami, USA)

PVSITES products in the market

PVSITES in the market – c-Si products

Awarded Most Innovative Curtain Wall project ” in the US

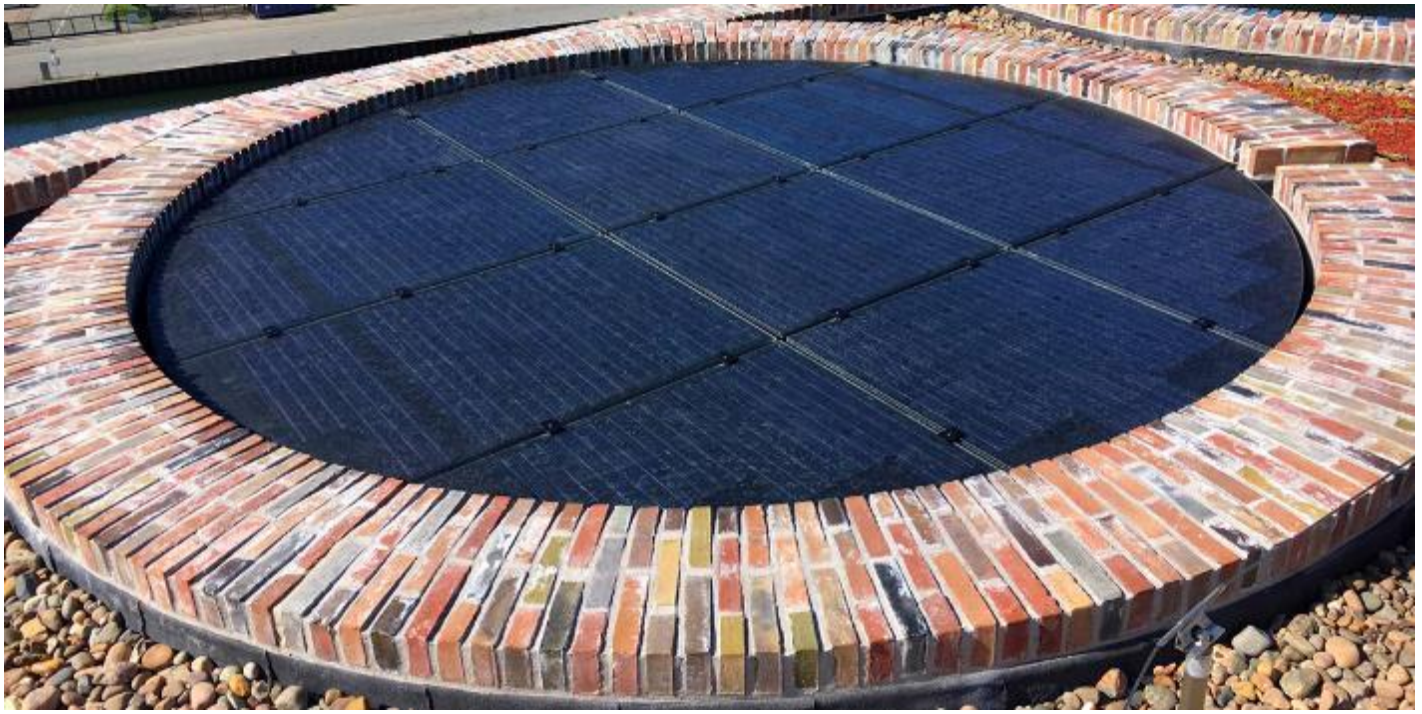
PVSITES products in the market

PVSITES in the market – c-Si products

Canopy in Czech Republic, blue tinted glass (ONYX SOLAR)

PVSITES products in the market

PVSITES in the market – c-Si products



Kirk Kapital HQ, Denmark (Lego) PV skylight by Onyx Solar, 450 m2, 51 kWp, 11 circles. Opaque glass, where the front of the glass is acid etch and the rear layer includes a black frit

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