SHARING OUR EXPERIENCE with PVSITES Catalogue of products and applications: BIPV Modules based on crystalline silicon, CIGS technology and advanced grid interface for BIPV system

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement Nº 691768

> PVSITES Software

by Philippe ALAMY

CADCAMation, PVSITES Project Partner, Switzerland

palamy@cadcamation.ch

> Why did we join this project?

What is the objective of our meeting today?

PVsites + CADCAMation

= BIM

BIPV eCatalog

> Background - Ambition

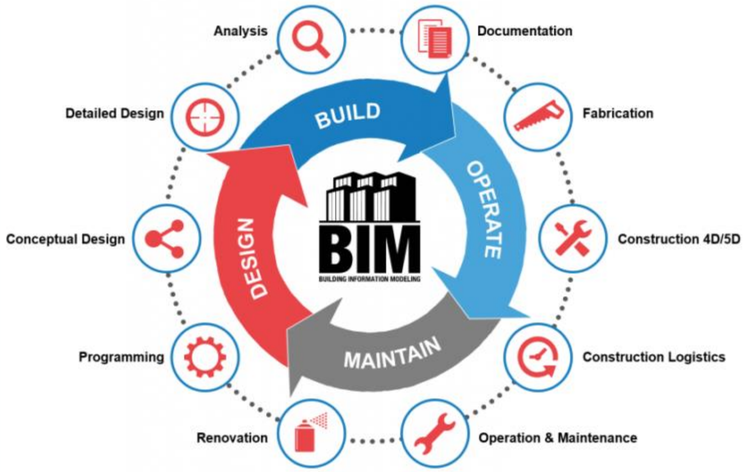
CADCAMation

CADCAMation SA

ARKANCE SYSTEMS

AUTODESK. Platinum Partner

- Located in Onex/Genève-Switzerland
- 1993 : **Fidia KMR SA** *CAD/CAM competence centre of FIDIA group (Torino)*
  Development of Hi-MILL software for on-line milling
- 1997 : **CADCAMation SA** - ***Autodesk VAR***
  Shaping your ideas (Digital and 3D technologies). BIM introduction in 2005
- 2010 : **CADCAMation SA** – ***EU R&D Partner (FP7, H2020)***
  - ***FOF-Industry 4.0 :*** *FoFdation with Airbus & Delcam-Autodesk, KAP with SAP…*
  - ***EeB-BIM:*** *PVsites, SUPERPV…*
- 2018 : ***Alliance*** **CADCAMation SA** – ***AriCAD*** ***Platinum partner***
  BIM & PLM integration, Solar bioclimatic simulation, PV Digital twin.
- 2019 : ARKANCE SYSTEMS *Accompagner les acteurs de la Construction dans leur transformation digitale*



NGUYEN Van Khai
dipl. EPFL
Consultant PLM & R&D
www.cadcamation.ch

CADCAMation

>Today's meeting purpose

1. Present our work
2. Open perspectives: next webinars
3. Foster BIM innovation for BIPV

OUR WORK

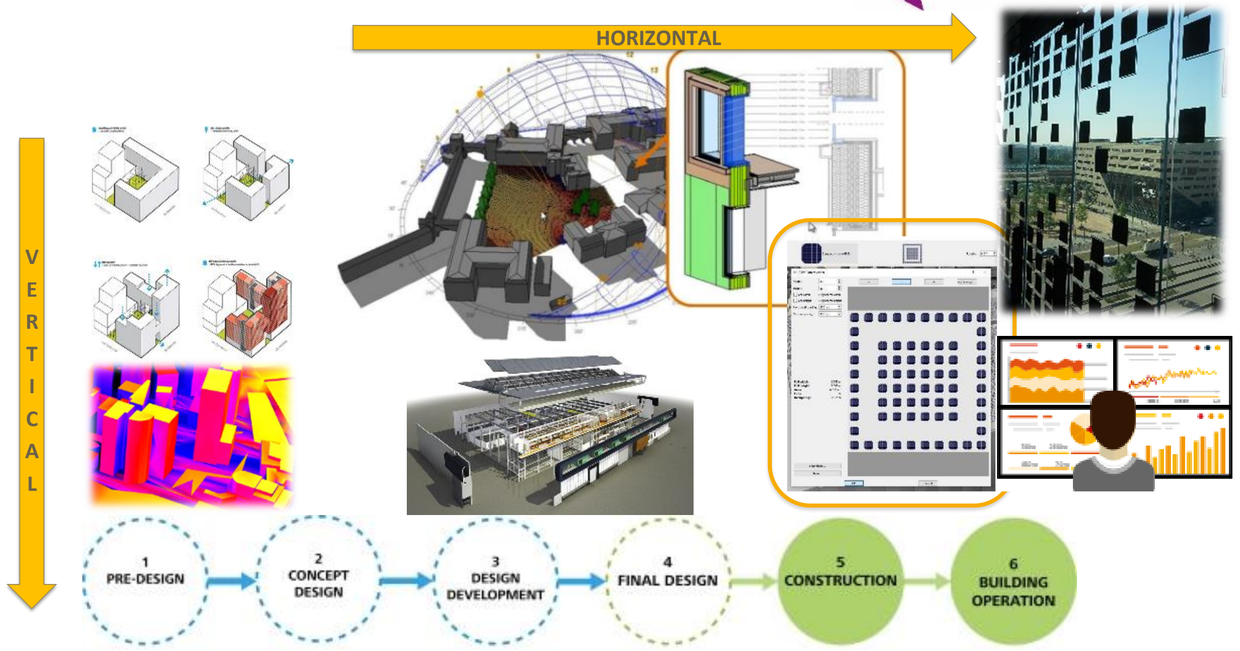
> Challenge

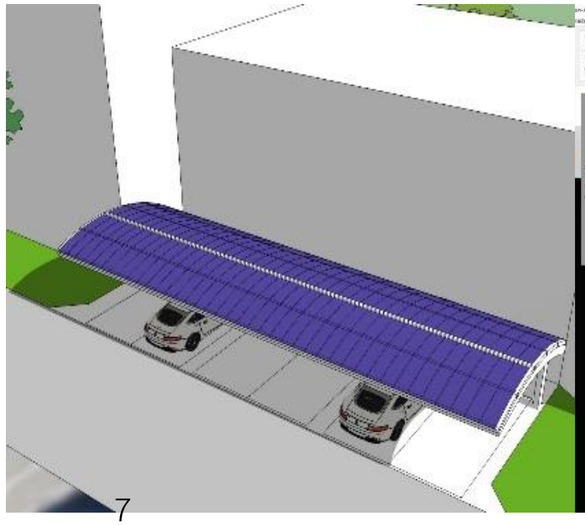
Software tool for the joint simulation of BIPV products and building energy performance

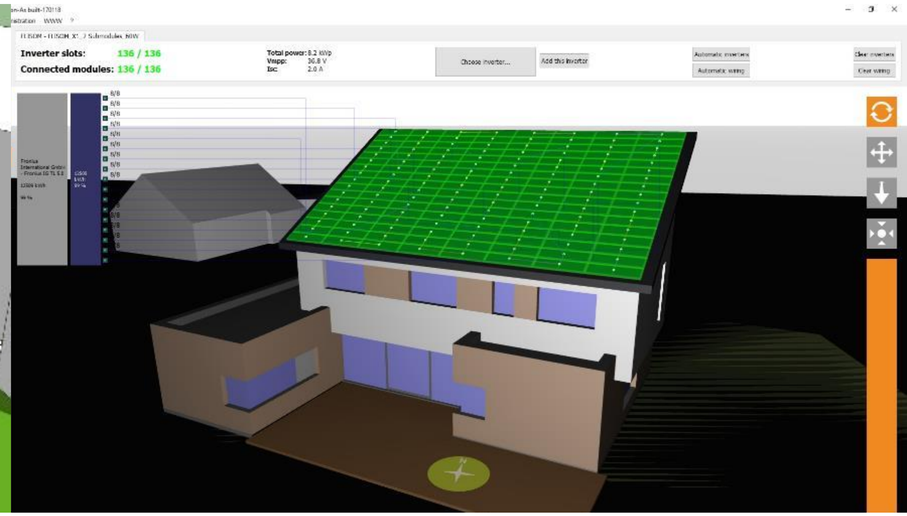
> Solution

An accurate, user-friendly, integrated SW tool for the simulation of BIPV products performance and their impact on building energy demands

BIM-based SW tool
(available on https://cadcamation.ch/solutions/bim-solar/)







> What is PVSITES eCatalog, linked to BIMsolar® and BIM-ready?

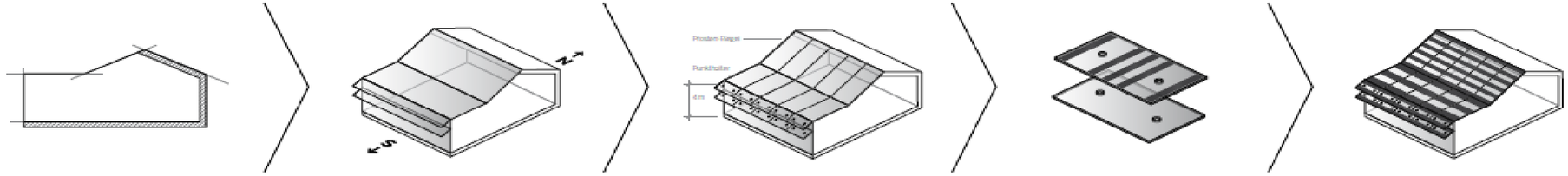
> What is the role of BIM for BIPV products?

BIM

PVSITES eCatalog: from BIPV design BIM elements

> Genesis: contextual design

The BIPV PROCESS: literature review



Successful building-integrated PV solutions are taken into account in even the preliminary planning and design stages of a project so that project-specific characteristics can be considered at an early stage.

PARTIES INVOLVED

- BiPV manufacturer
- Architect

In the case of complex installation situations, the BiPV manufacture provides advice regarding the possibilities for project-specific module designs. Support is also given to the electrical engineer with regard to the design of the electrical installations for the BiPV system.

PARTIES INVOLVED

- BiPV manufacturer
- Architect
- Project manager
- Structural engineer
- Electrical engineer
- Building shell design engineer

The product specifications are determined cooperatively and the interfaces are defined. A detailed calculation of the yield from the PV system can be made.

PARTIES INVOLVED

- BiPV manufacturer
- Architect
- Project manager
- Electrical engineer

Close cooperation between the BiPV manufacturer and the other service providers involved in the project ensures the development of a precisely tailored product that meets all the specific requirements.

PARTIES INVOLVED

- BiPV manufacturer
- Architect
- Façade contractor
- Electrical engineer
- Structural engineer

Partner companies install the customised solar modules on site. The quality of the individual solar modules is assured by means of guarantees.

PARTIES INVOLVED

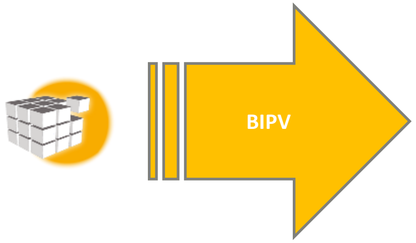
- BiPV manufacturer
- Architect
- Façade contractor

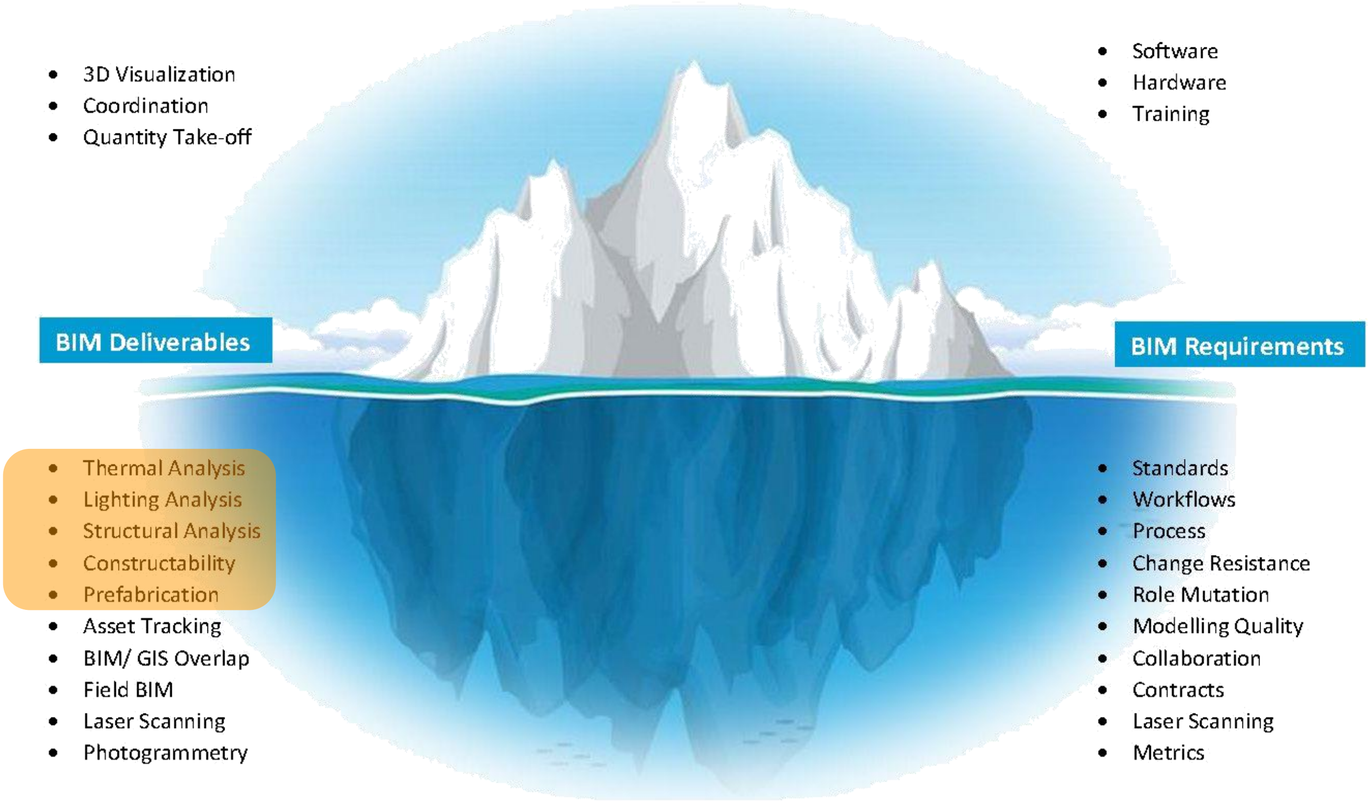
van der Zeeuw, H (2011): Manual for BIPV Projects

>Ambition: hidden data

BIM ICEBERG

BIPV addresses crucial hidden topics



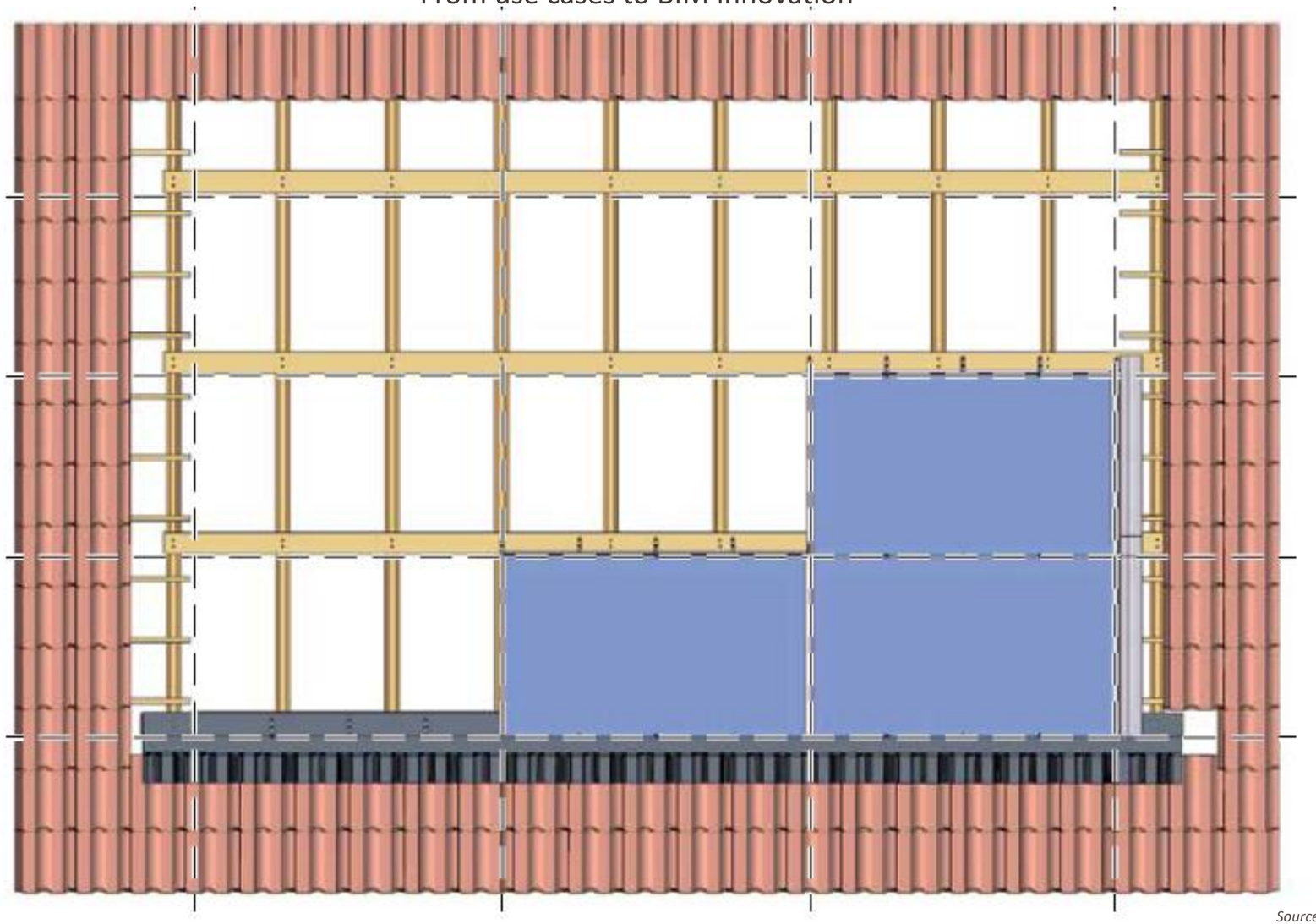


>Inspiration from reality!

From use cases to BIM innovation

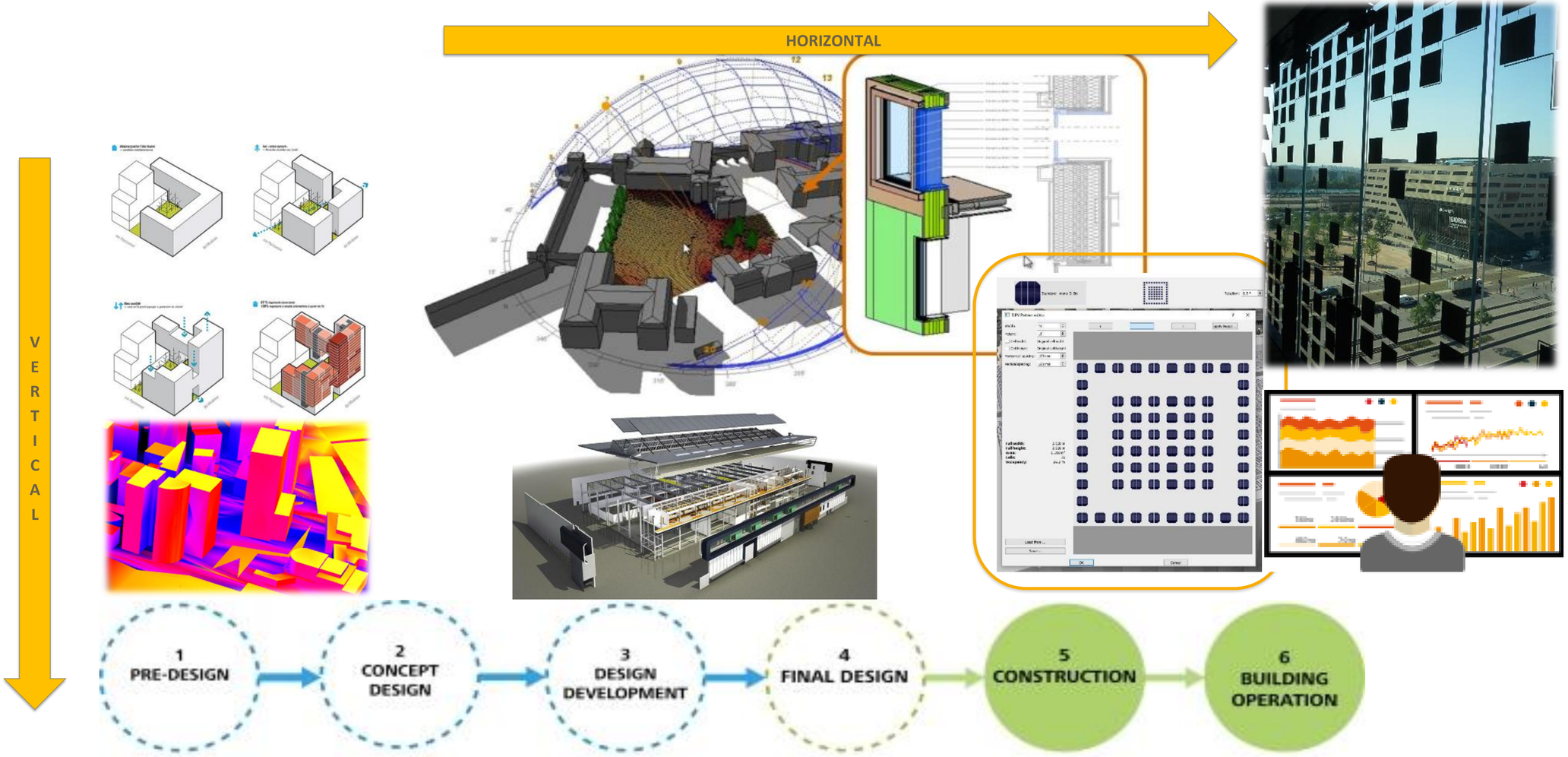
- BIPV roof
  - CIGS tiles
  - Wooden structure
  - Mounting devices

→how to generalize this solution and turn it into common industry?



Source:
BIPVBOOST demo#3 (SCHWEIZER©2019)

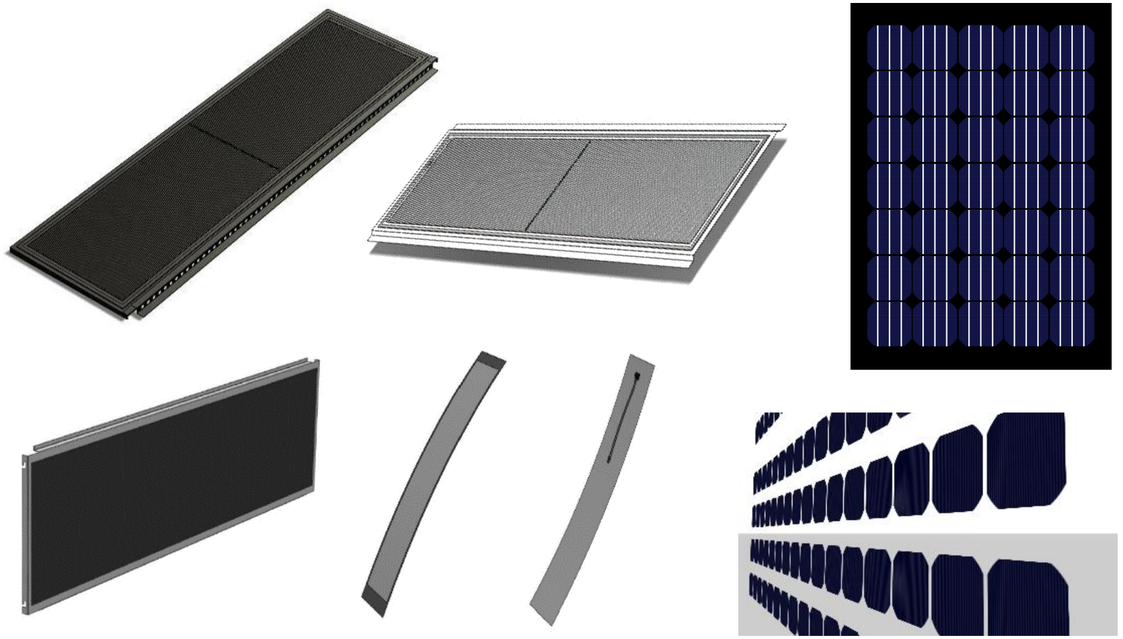
>Our workflow



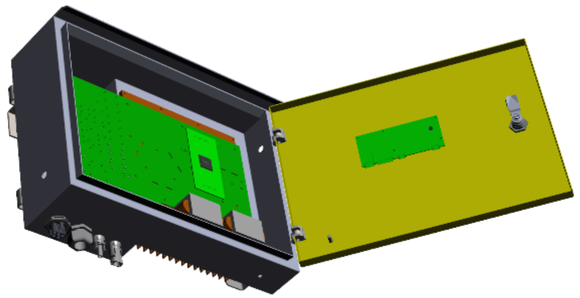
>PVSITES (e)Products

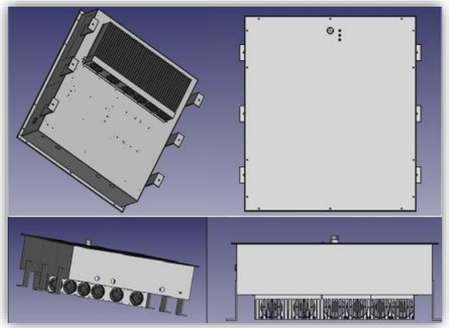
→Virtualization
→Parametrics

PVSITES Modules (6)



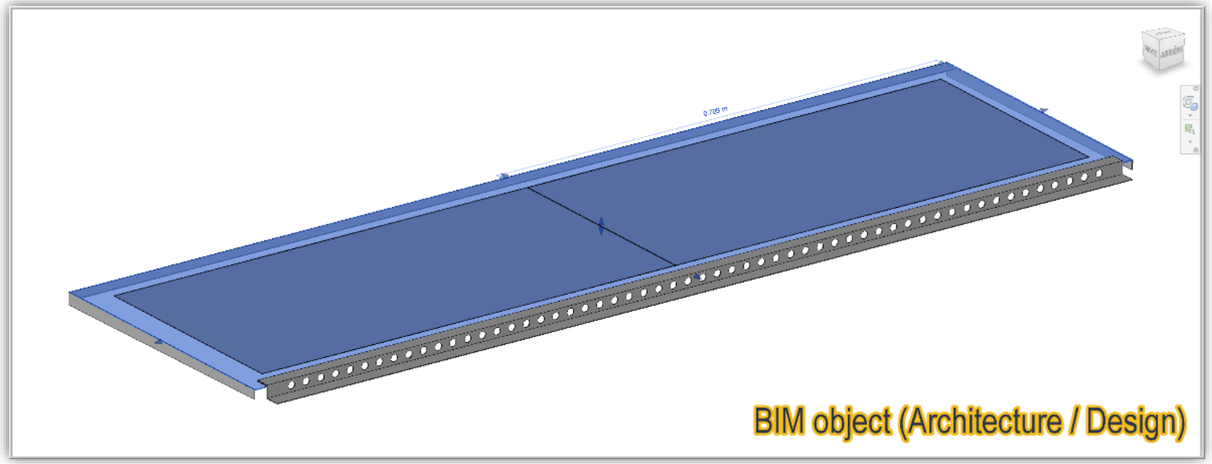
PVSITES Inverters (2)

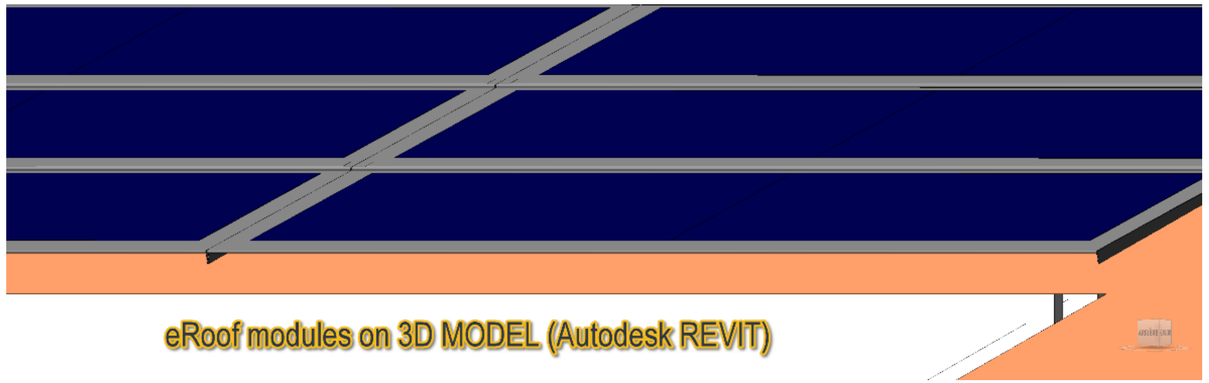




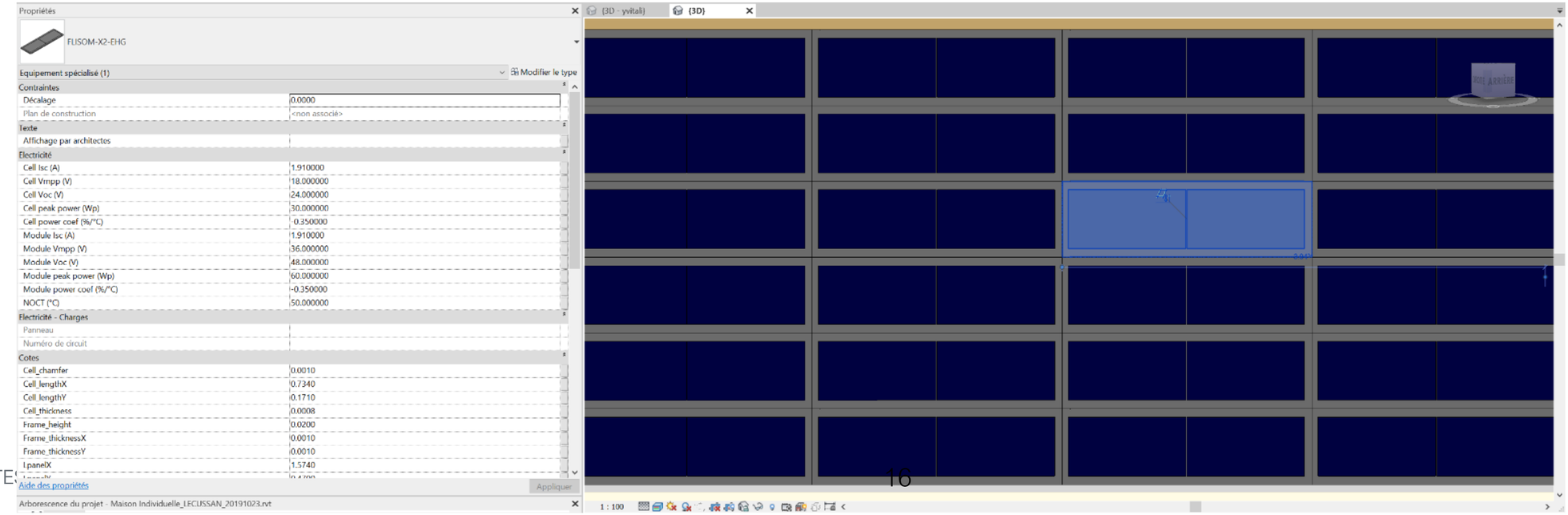
>(e)Product design process

1. Datasheet as main source
2. BIMsolar modelling
3. Fine tuning with manufacturers + architects
4. BIM-readiness (Autodesk REVIT families)

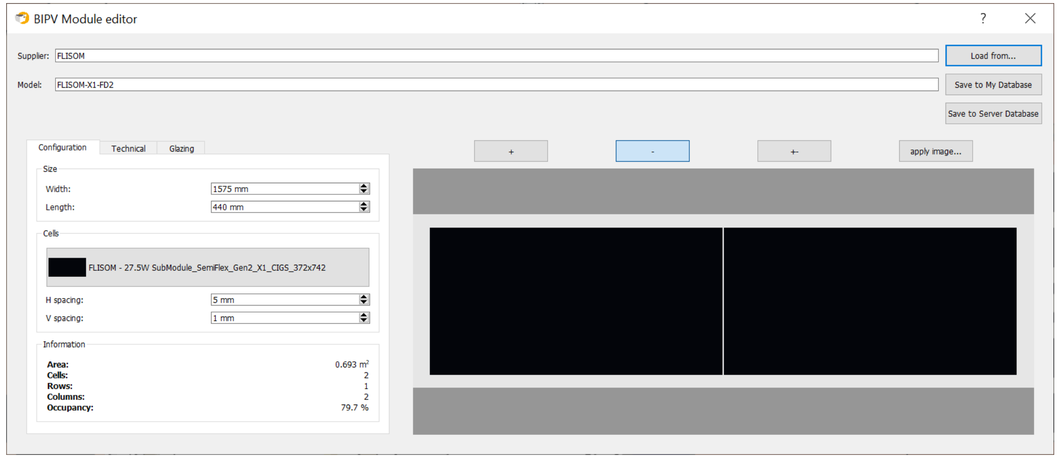


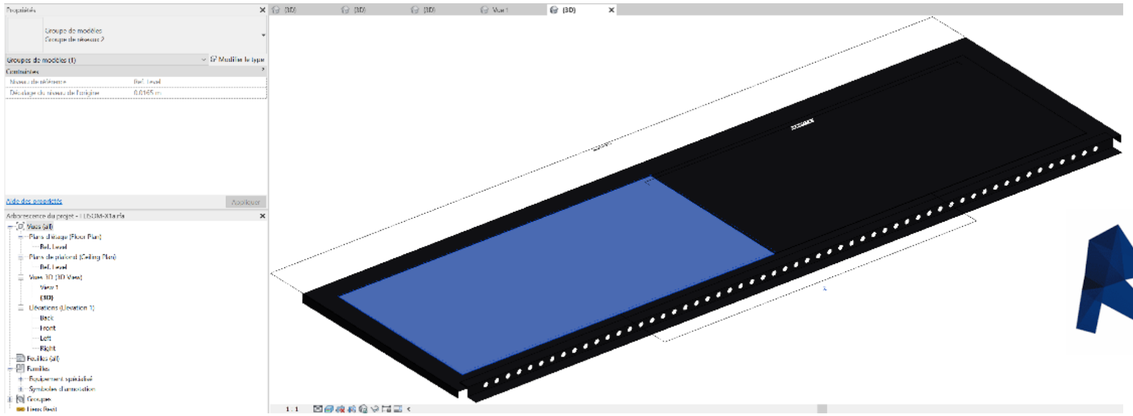


FLISOM - Thin Film CIGS modules



>eRoof - Tile

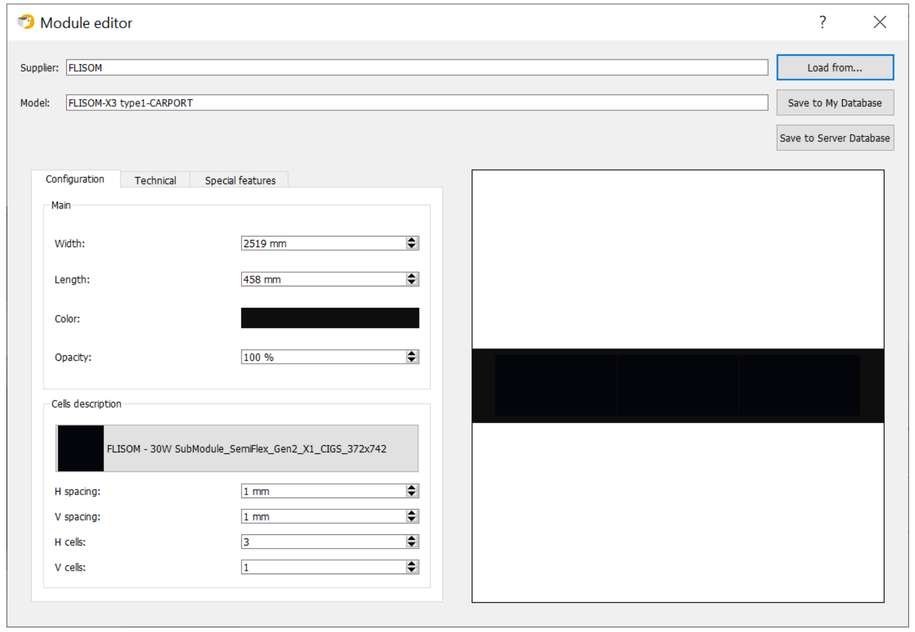


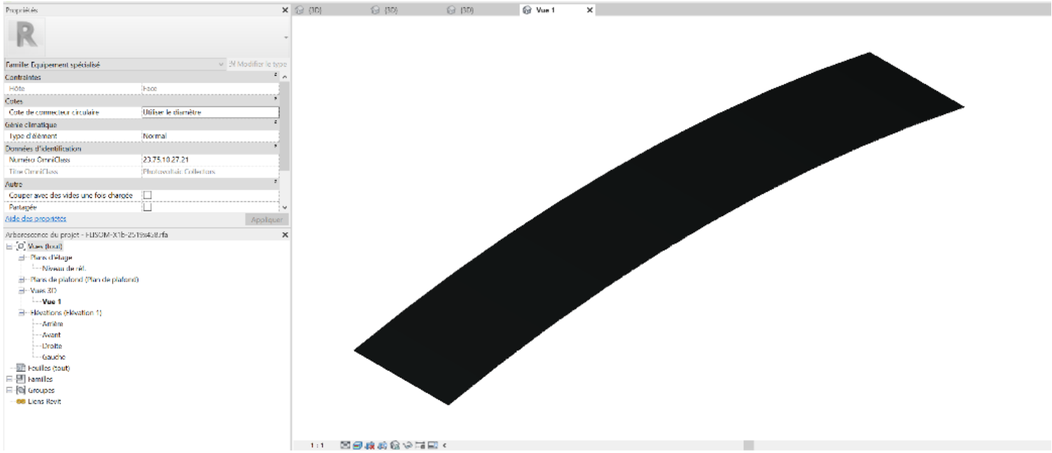


BIM READY

AUTODESK REVIT

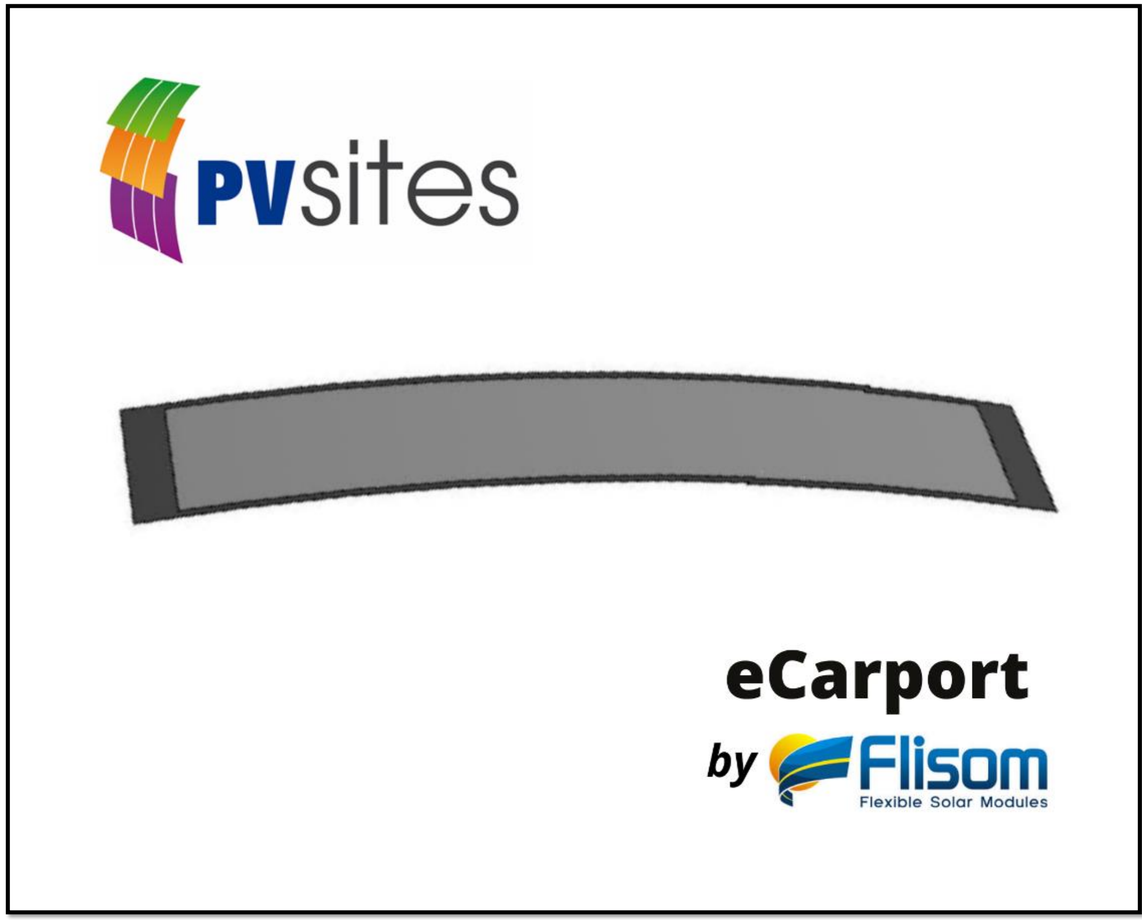
>eCarport



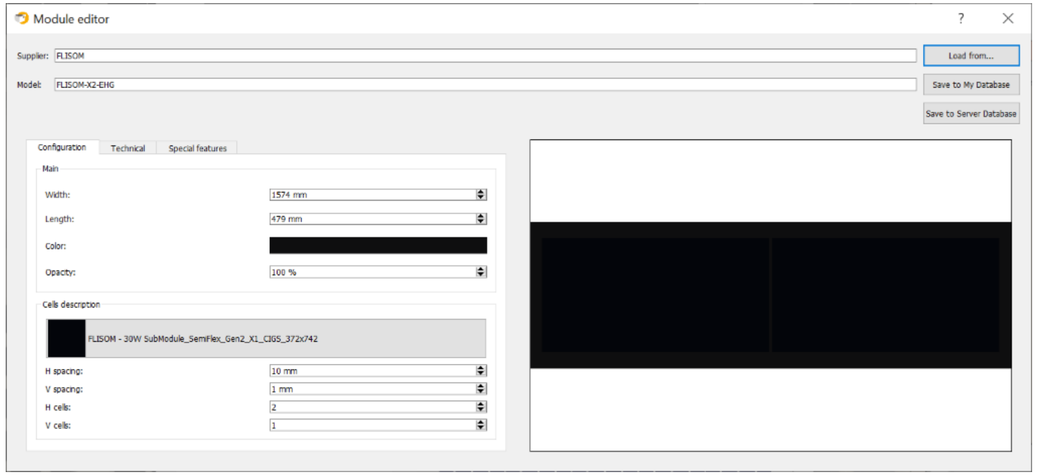


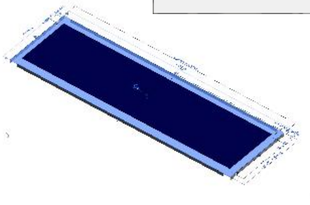
BIM READY

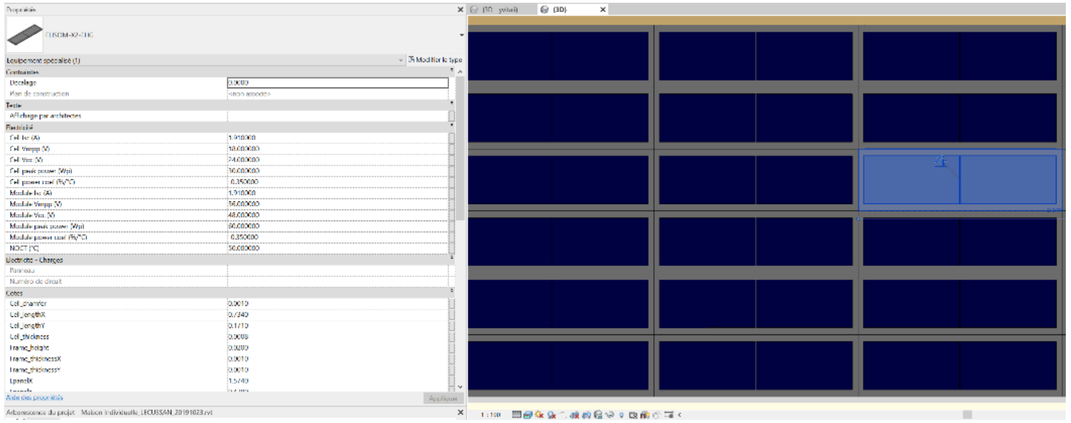
AUTODESK REVIT



>eFacade

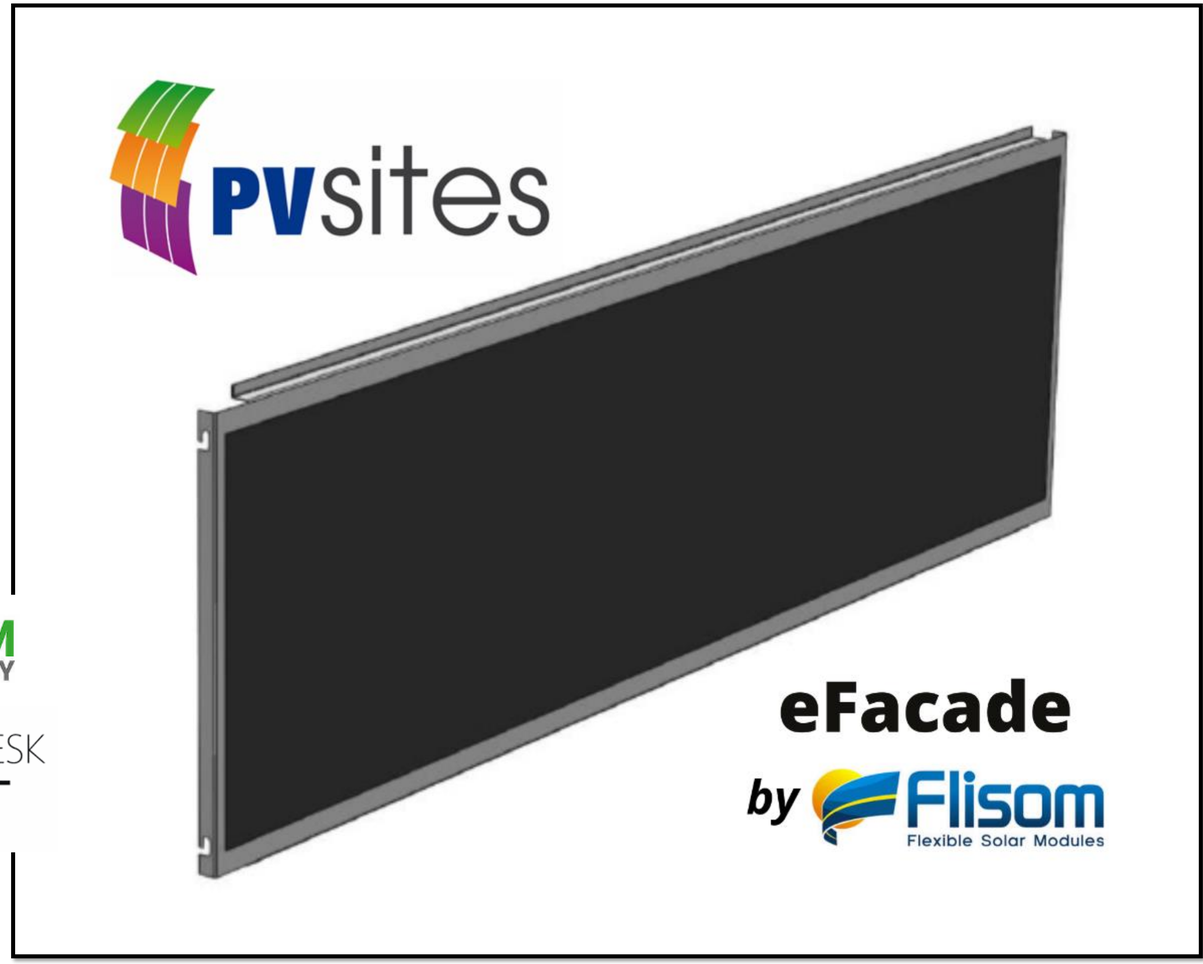




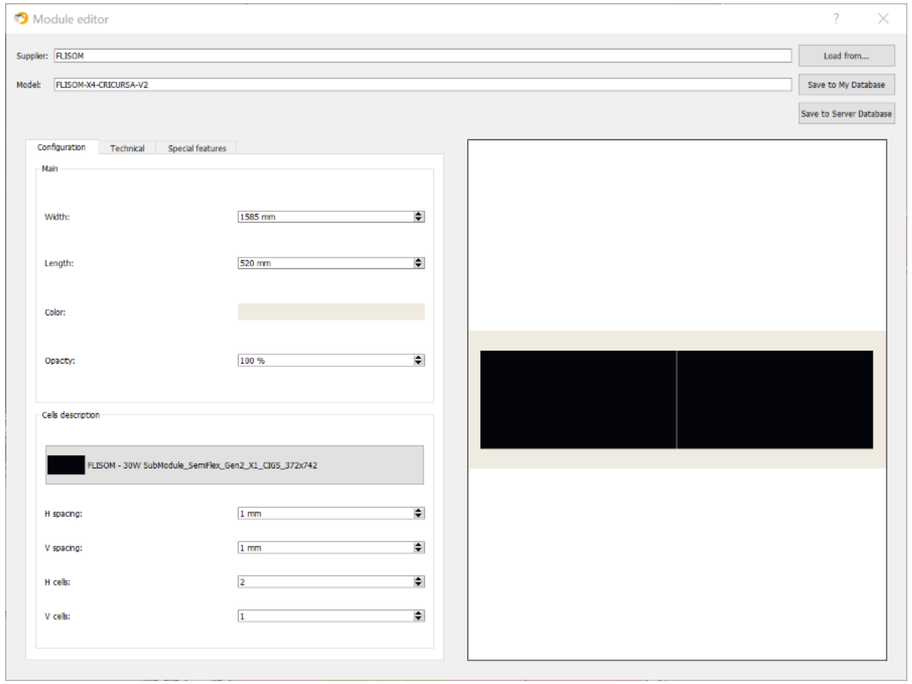


BIM READY

AUTODESK REVIT

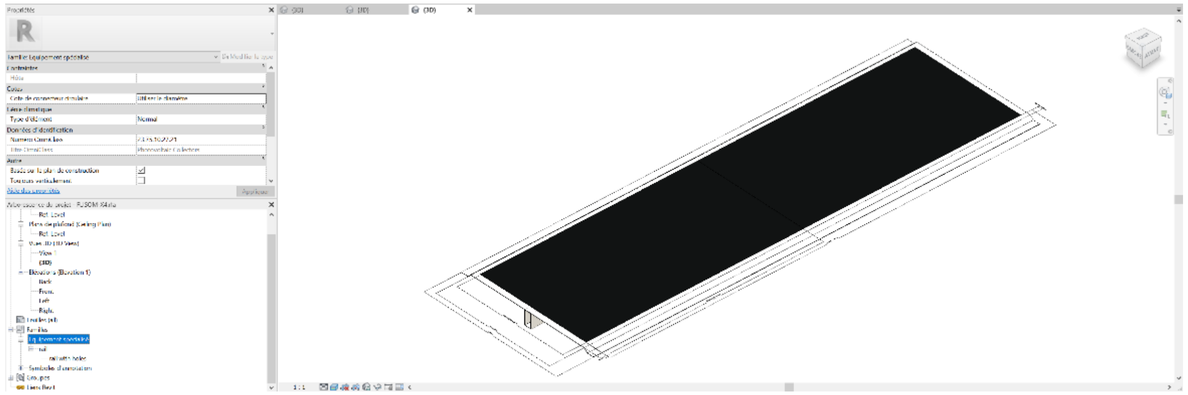


>eRoof - Industrial



BIM READY

AUTODESK REVIT



> PVSITES in the market Thin film CIGS products

FD2 HOUSE
PVSITES Project

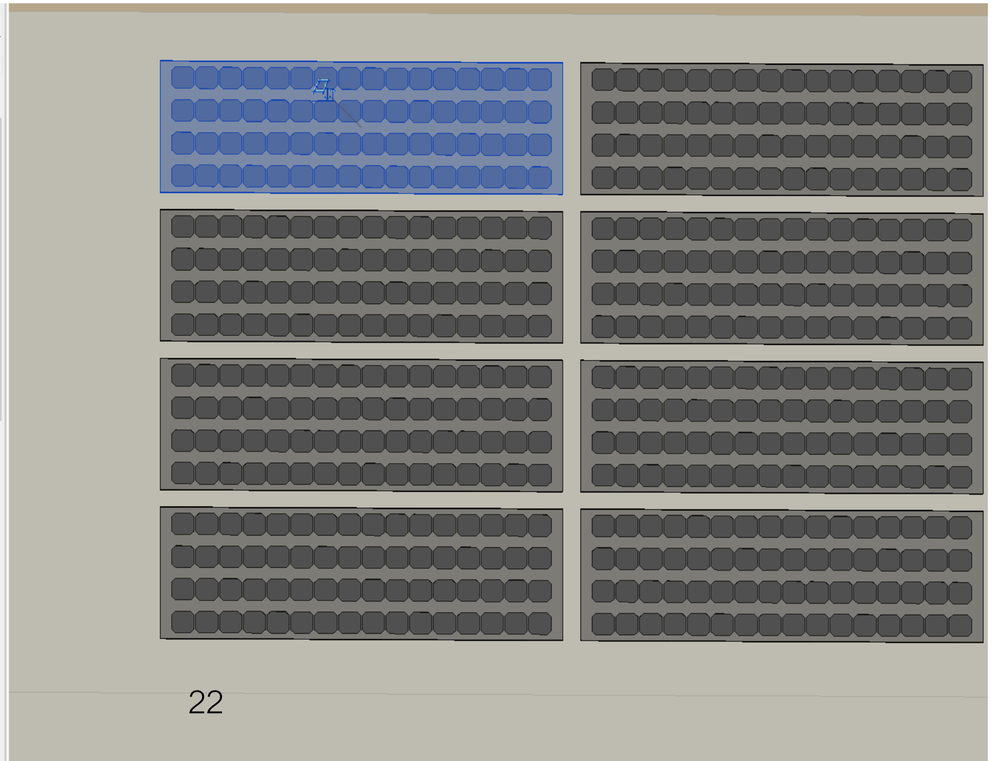
Flisom
Flexible Solar Modules
www.flisom.ch

ONYX Solar – cSi products

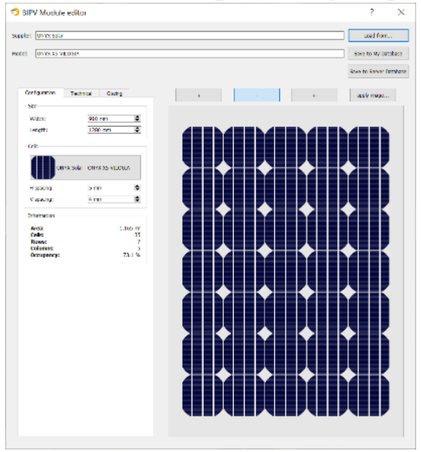
ONYX-X6-TECNALIA

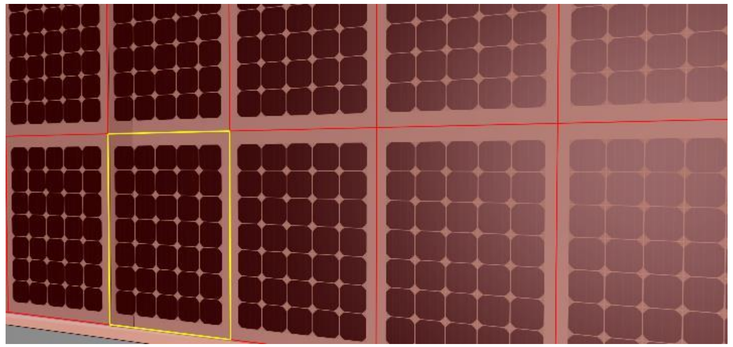
Equipement spécialisé (1) | Modifier le type

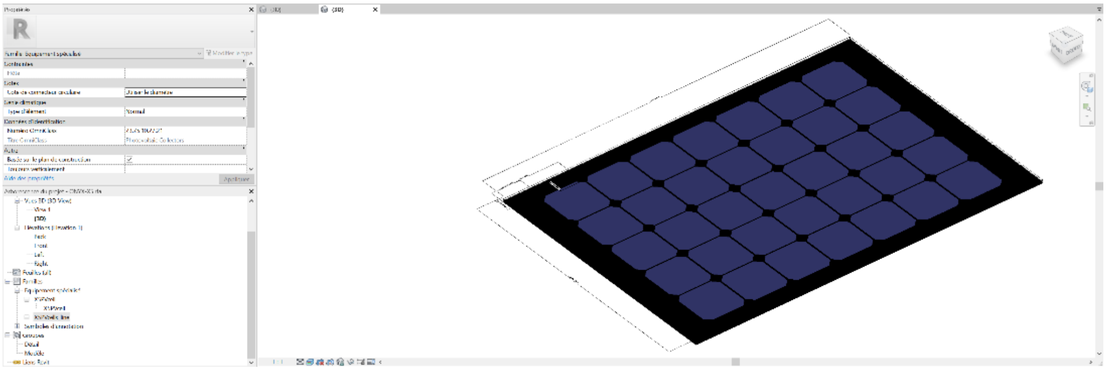
Contraintes	
Décalage	32.44
Plan de construction	<non associé>
Matériaux et finitions	
Glass_mat1	Verre, vitrage transparent
Glass_mat2	Verre, vitrage transparent
Electricité	
Module peak power (Wp)	192.000000
Module power coef (%/°C)	-0.300000
Module Voc (V)	41.599998
Module Vmpp (V)	34.880001
Module Isc (A)	5.700000
Cell peak power (Wp)	3.000000
Cell power coef (%/°C)	-0.300000
Cell Voc (V)	2.600000
Cell Vmpp (V)	2.180000
Cell Isc (A)	1.425000
NOCT (°C)	45.000000
Electricité - Charges	
Panneau	
Numéro de circuit	
Cotes	
Cell_chamfer	2.08
Cell_lengthX	12.50
Cell_lengthY	12.50
Cell_thickness	0.18
Frame_height	1.00
Frame_thicknessX	0.00
Frame_thicknessY	0.00
LpanelX	76.00
LpanelY	225.00



> X5 - C-Si glazed products with hidden bus bars and L interconnections

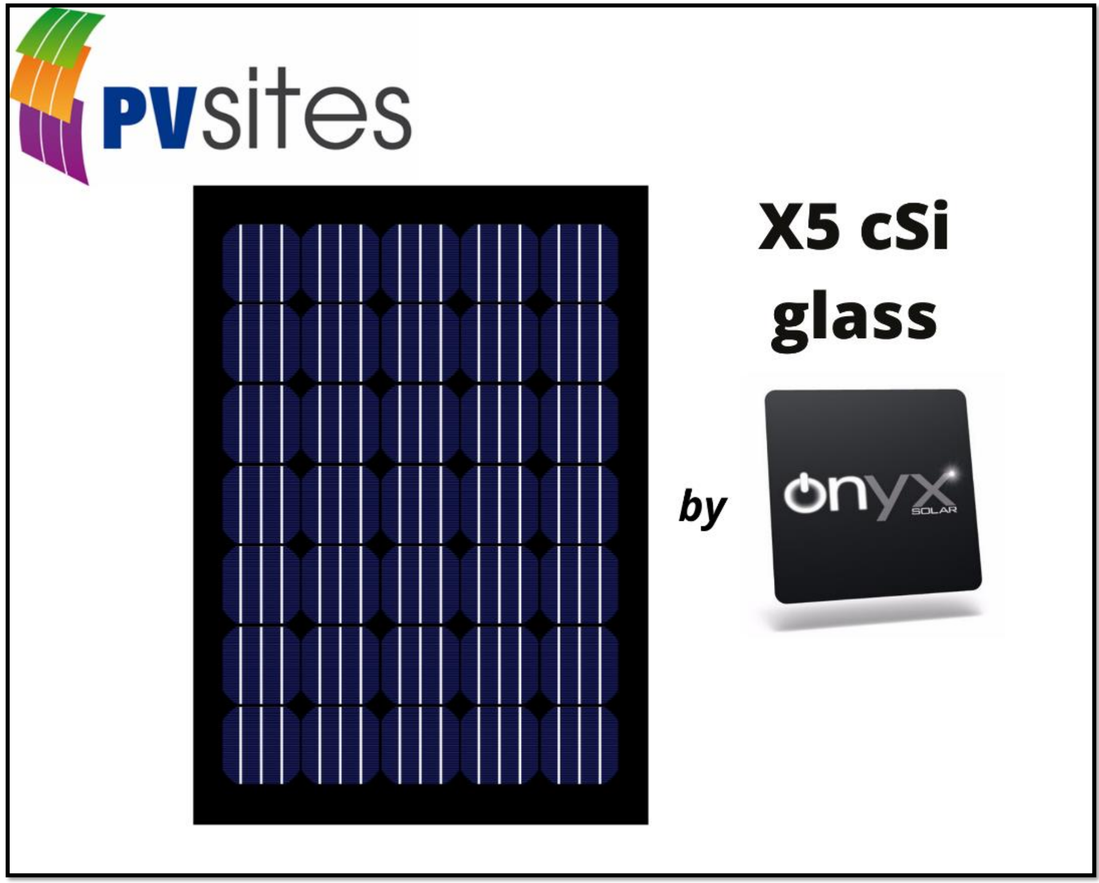




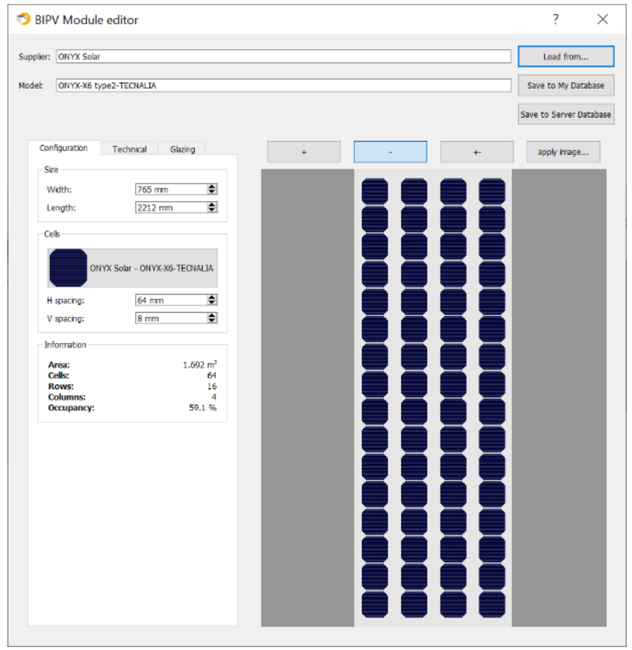


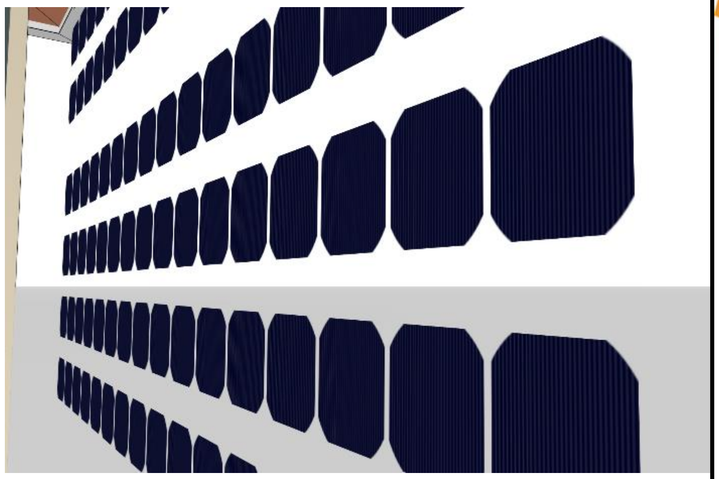
BIM READY

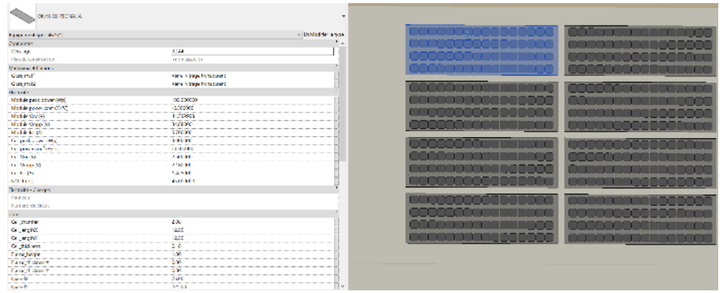
AUTODESK REVIT



> X6 - Glass-glass products with back contact c-Si cells



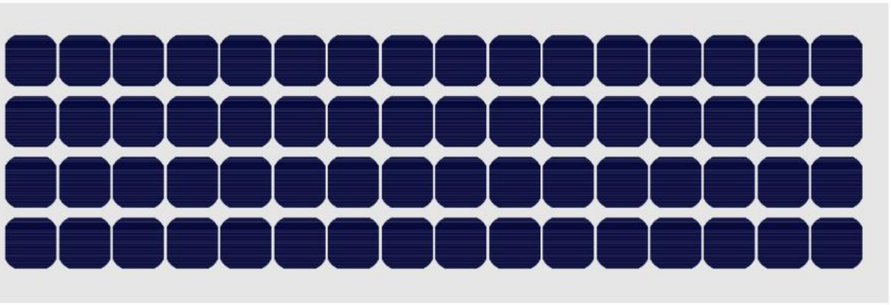




BIM READY

AUTODESK REVIT

PVsites

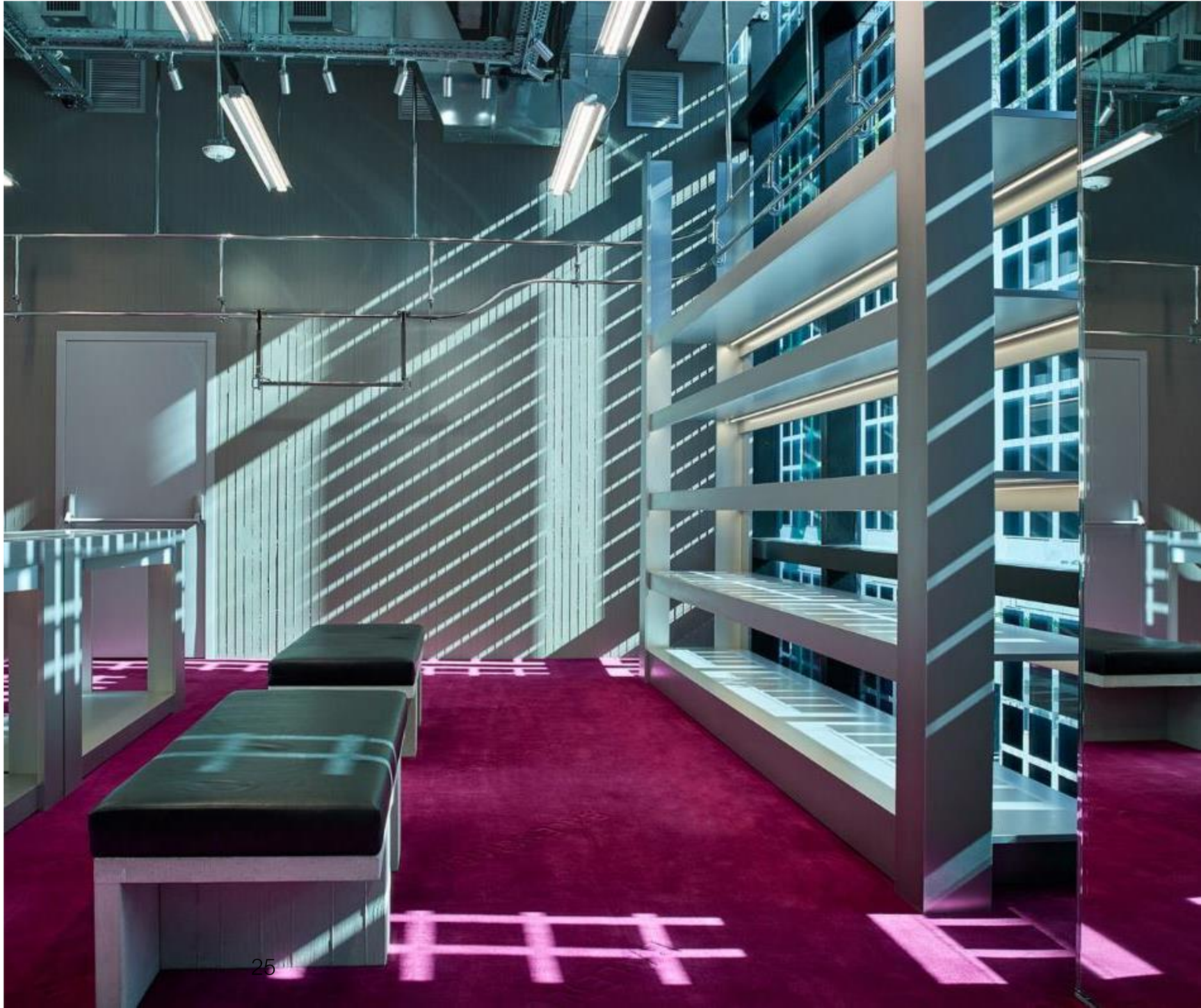


X6 cSi glass

by onyx SOLAR

> PVSITES in the market c-Si products

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



> PVSITES in the market c-Si products

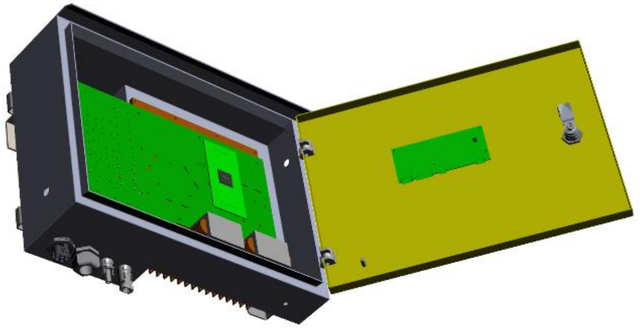
Awarded Most Innovative Curtain Wall project ” in the US

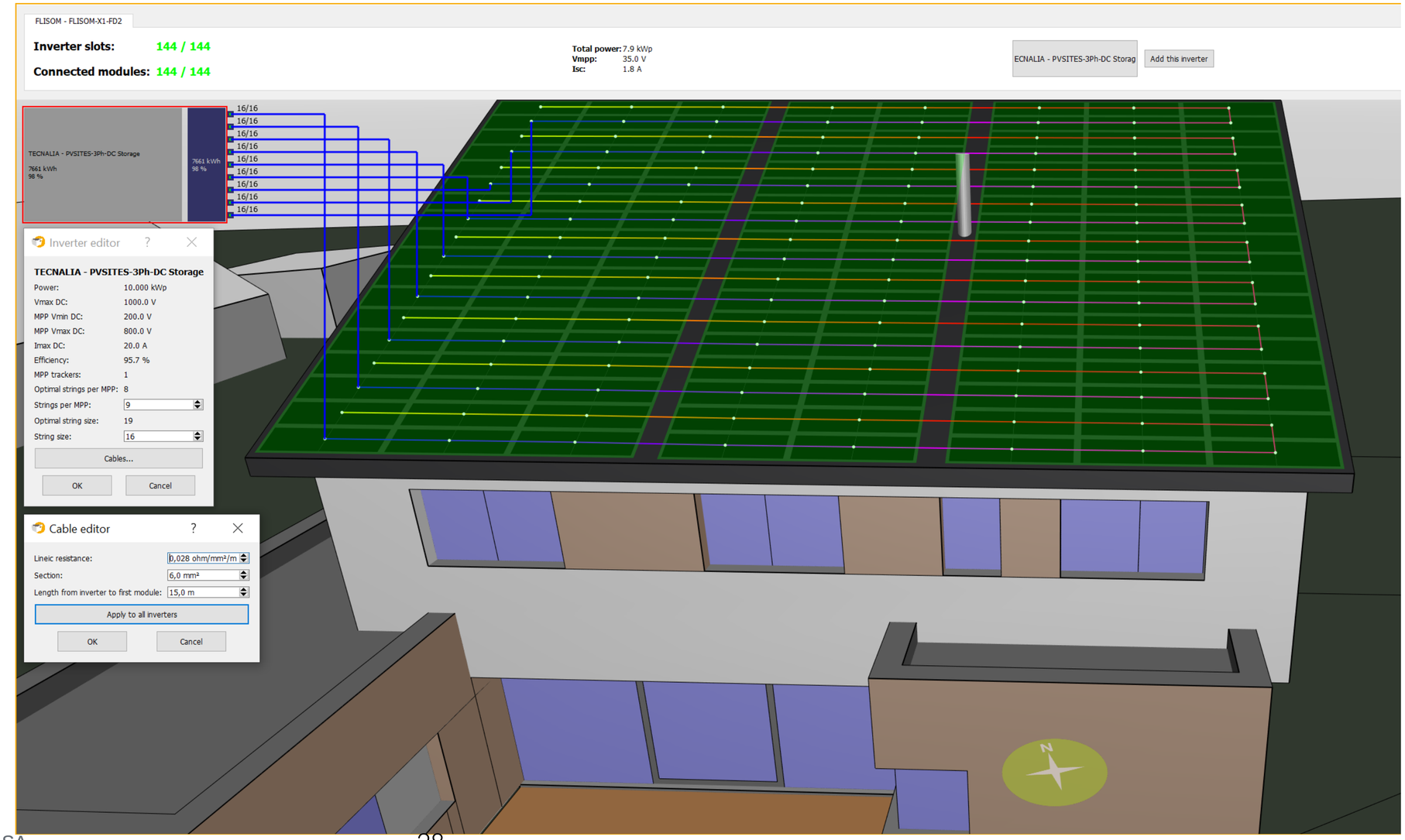
>

CEA | Si-C inverter

TECNALIA | DC coupled charge inverter

>Virtual inverters-MPPTs





Use of PVSITES (e)products

> PVSITES demonstrators

> 1. Single family house-Belgium

Location	Stambruges (Belgium)
Typology	Residential & office
Area	280 m² (219 m² heated floor)
Floors	3

Characteristics
New construction. Detached passive wooden house, located in a rural area, with residential and professional uses (architectural office).

Area available for BIPV
Single 30° sloped roof.
Area of 107 m² available for BIPV systems.
Small shadows caused by a chimney. Optimum orientation and inclination with maximum production guarantied.
Orientation: +14° (NNW).
Inclination: 30°.

> Single family house

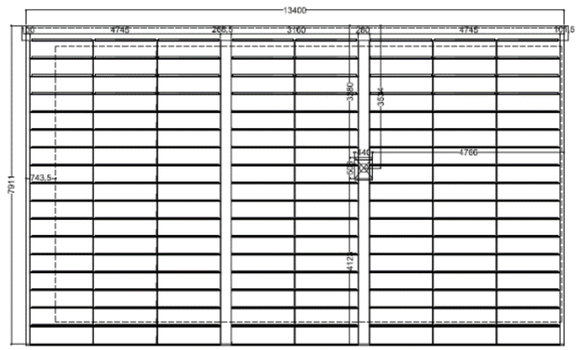
BIPV tile by FLISOM
Semi-flexible and lightweight CIGS PV element to be directly assembled to each other. Series connectivity enable to be carried out during the installation works, with hidden connection boxes and cables not disturbing fastening.

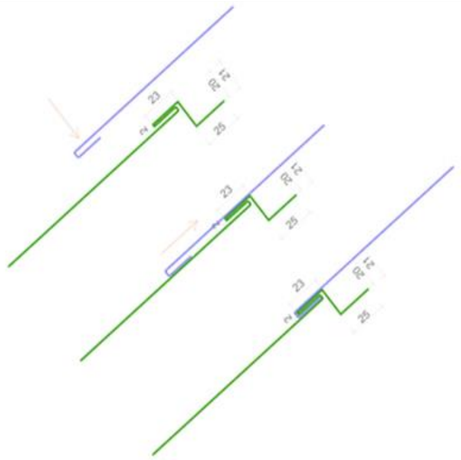
Solar inverter by TECNALIA
3-phase DC-coupled PV storage inverter 10 kW power, with advanced MPPT system, battery DC current/voltage regulation, and active and reactive current AC power regulation for grid-connected operation.

BIPV roof tile by FLISOM & Solar inverter by TECNALIA

> Single family house

BIPV solar roof

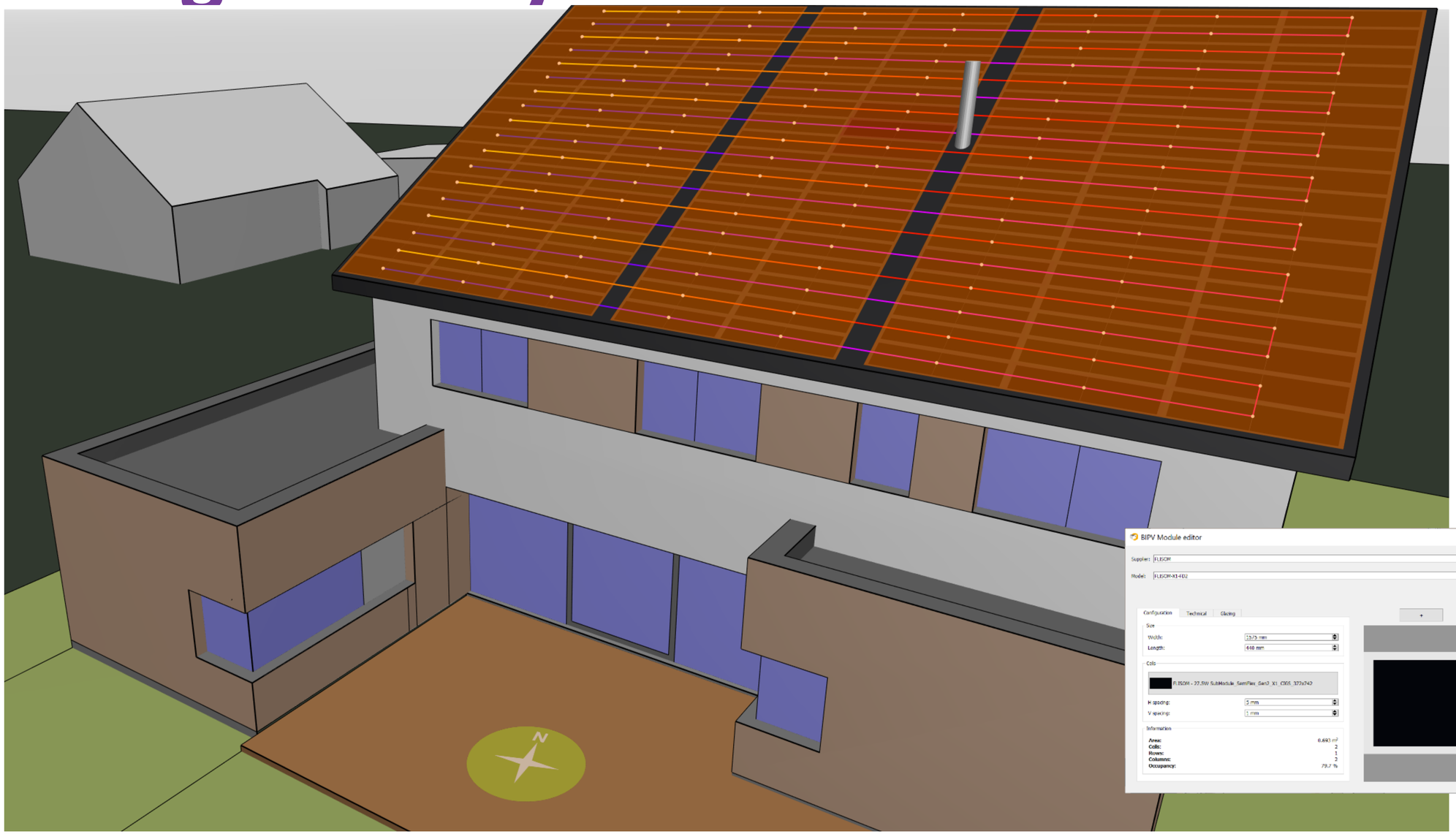


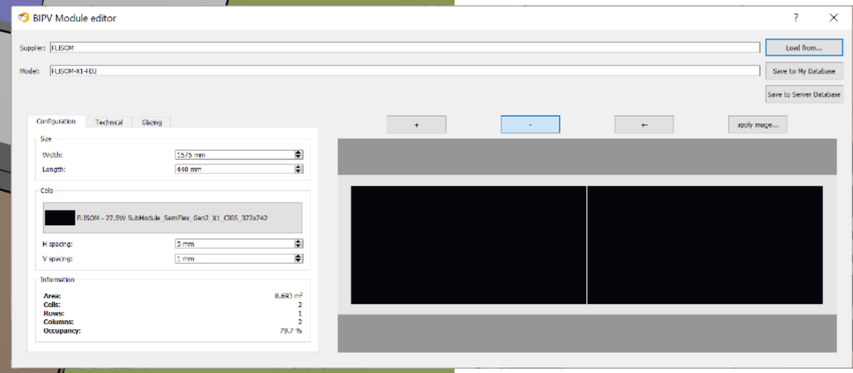


Building integration design

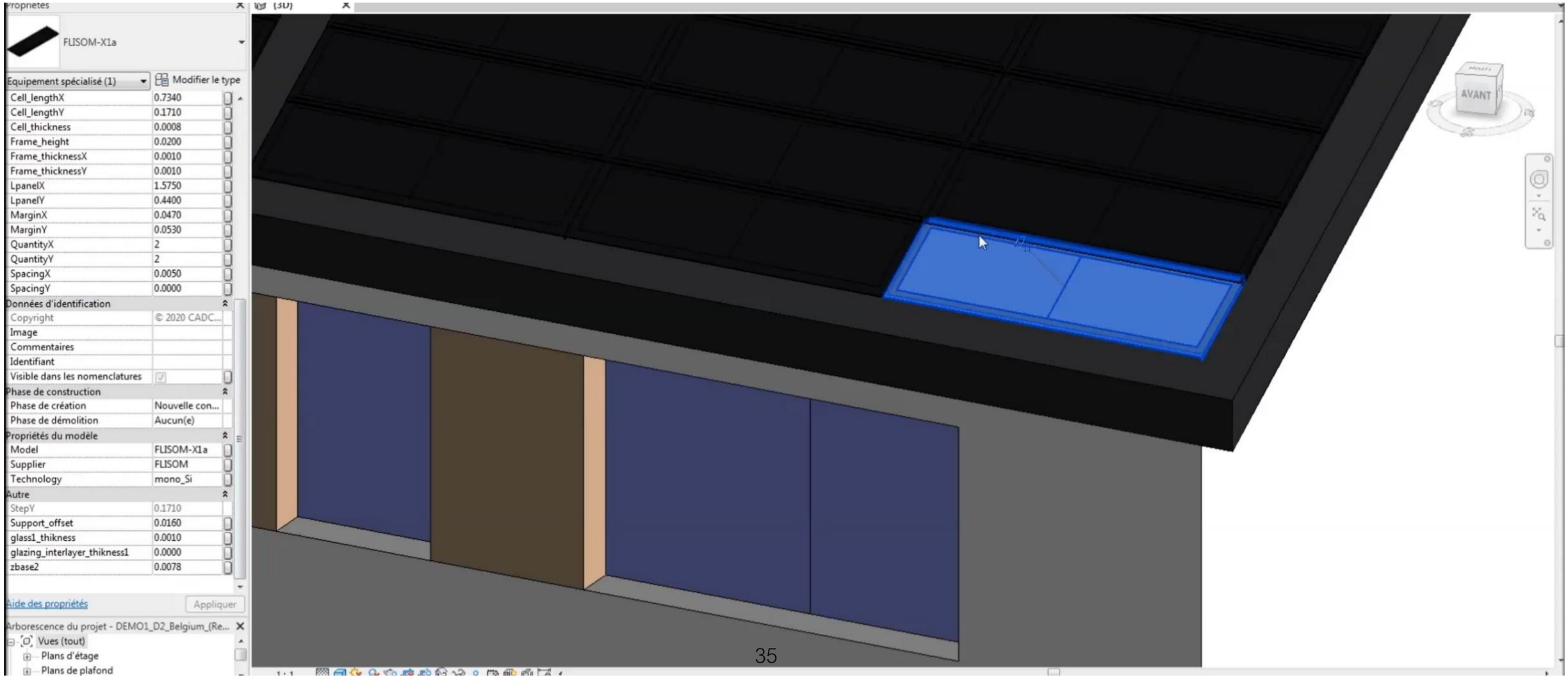
- Size and shape: module dimensions chosen to guaranty a high aesthetical quality and make easy installation. and connection works.
- Joints and fixings: minimizing of joints and non-visible fixings for a better aesthetical quality, by means of the interlocking system for the assembly of the tiles each other: the bottom of the upper module connects with the top of the lower module by sliding the module up.
- Visual appearance: colour and material are close or compatible to those used in the building.
- Roof edges and rims: specially cared finishing for functional and aesthetical reasons.

>Single family house: simulation





>Single family house: BIM



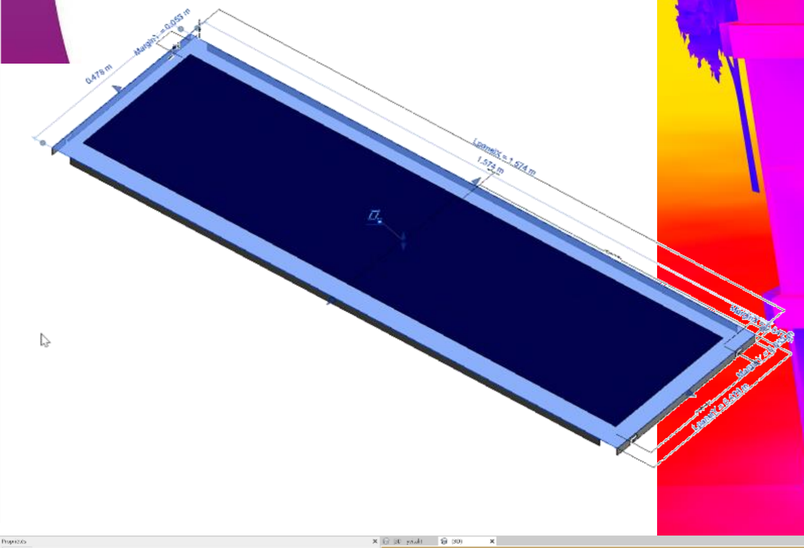
> Single family house: real

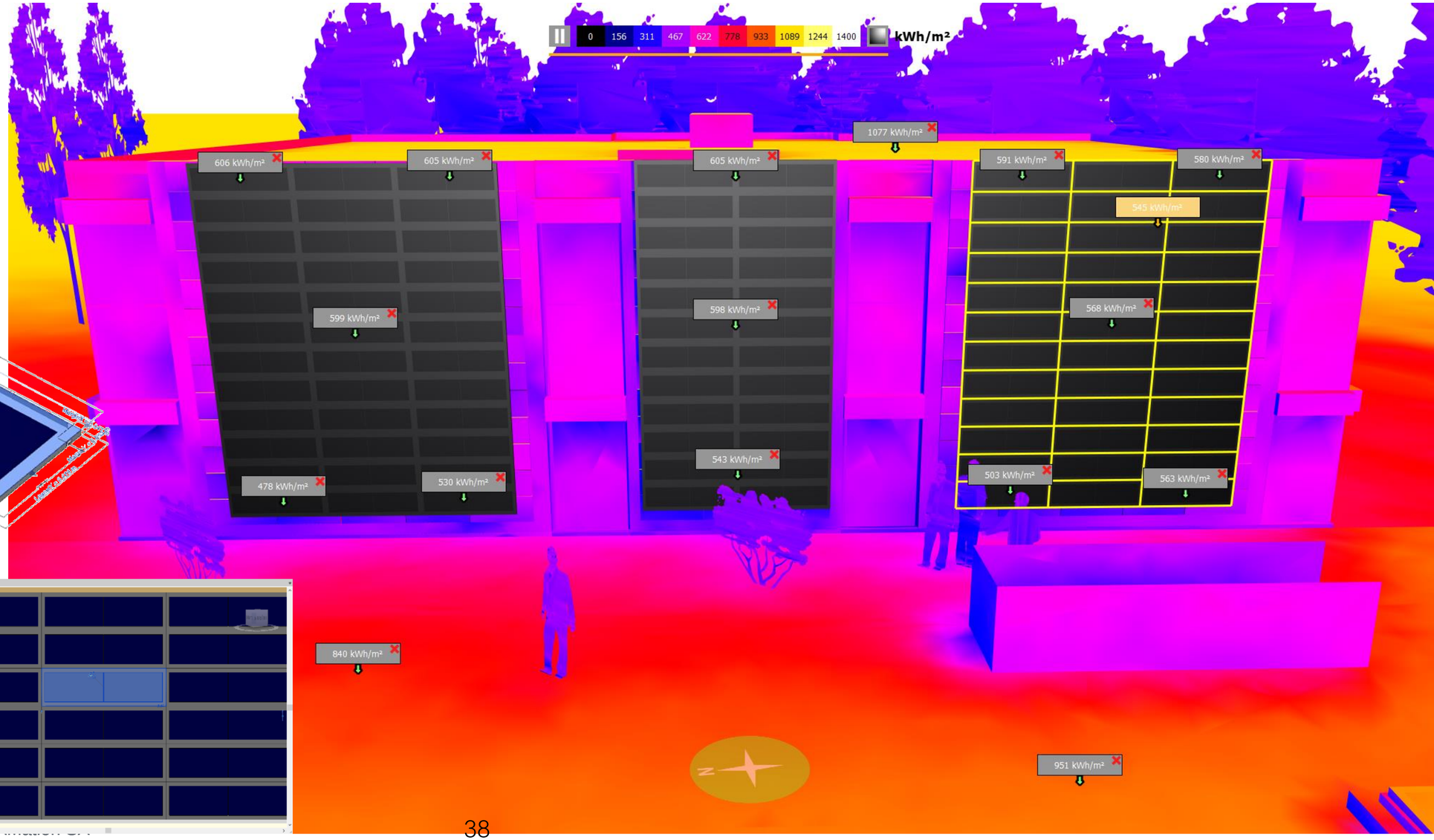
> **BIPV solar roof**

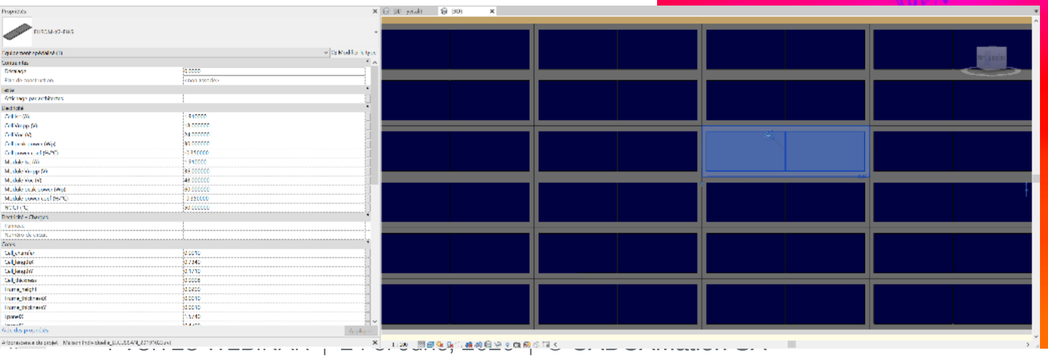
> Single family house: real

> **BIPV solar roof**

> 2.Educational Building: virtual



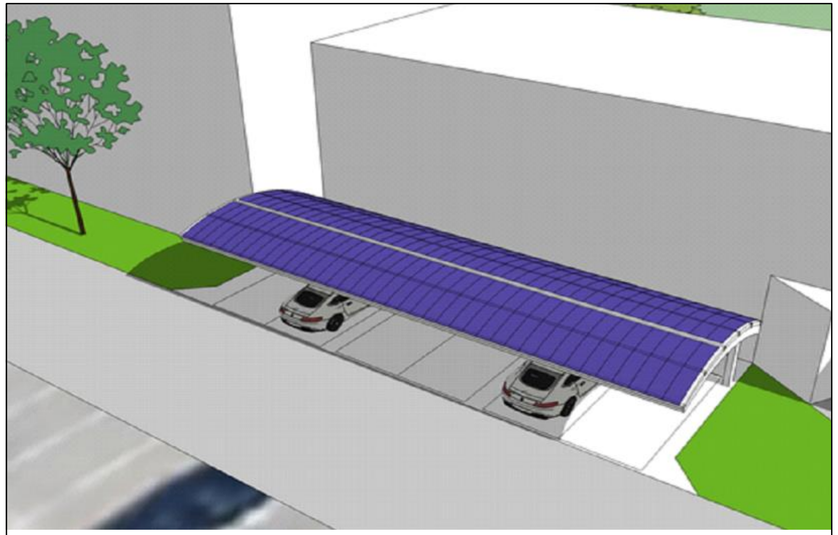




> 3.Carports - Zurich

Location	Dübendorf (Switzerland)
Typology	Parking carports
Area	93 m^2 / 103 m^2
Capacity	6 parking spots

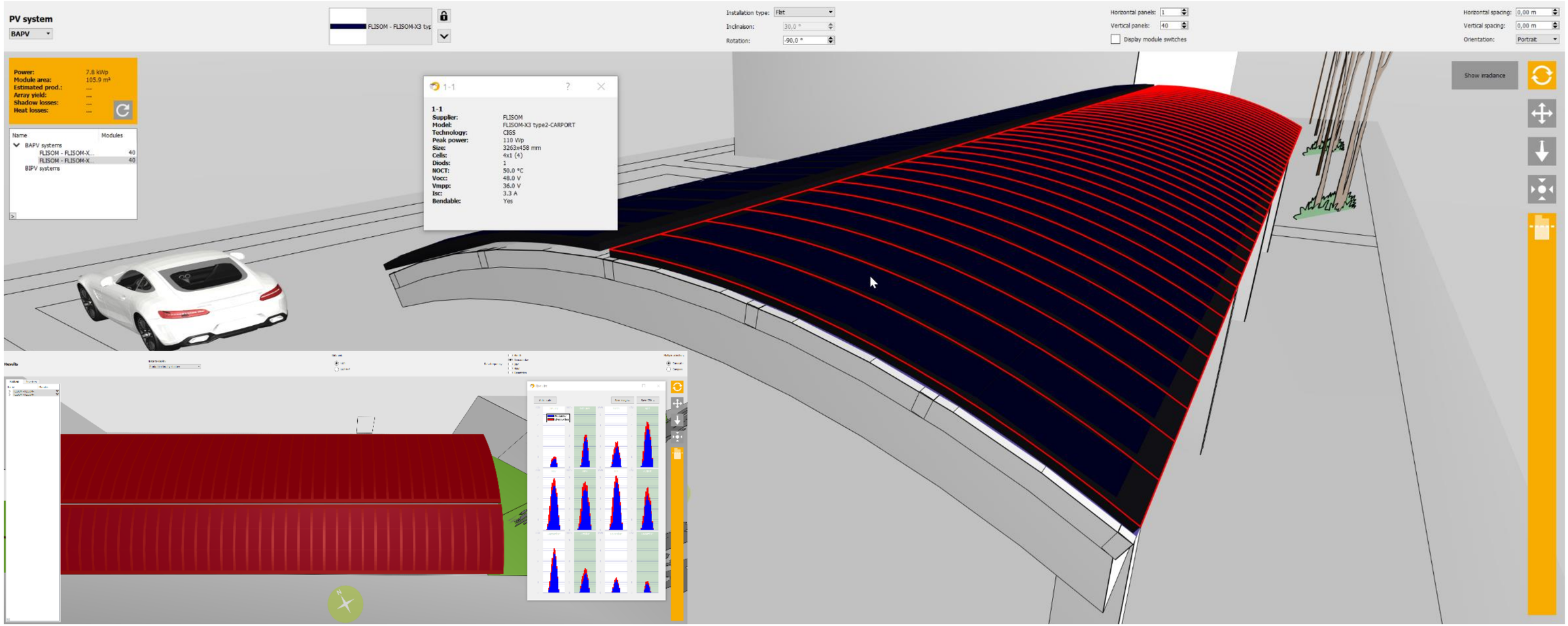
Characteristics
Carports located at EMPA and EKZ facilities, with 6 parking spots each, providing energy to charge cars or to contribute to the building power supply.



EMPA: Swiss Federal Laboratories for Materials Science.

EKZ: regional electrical provider.

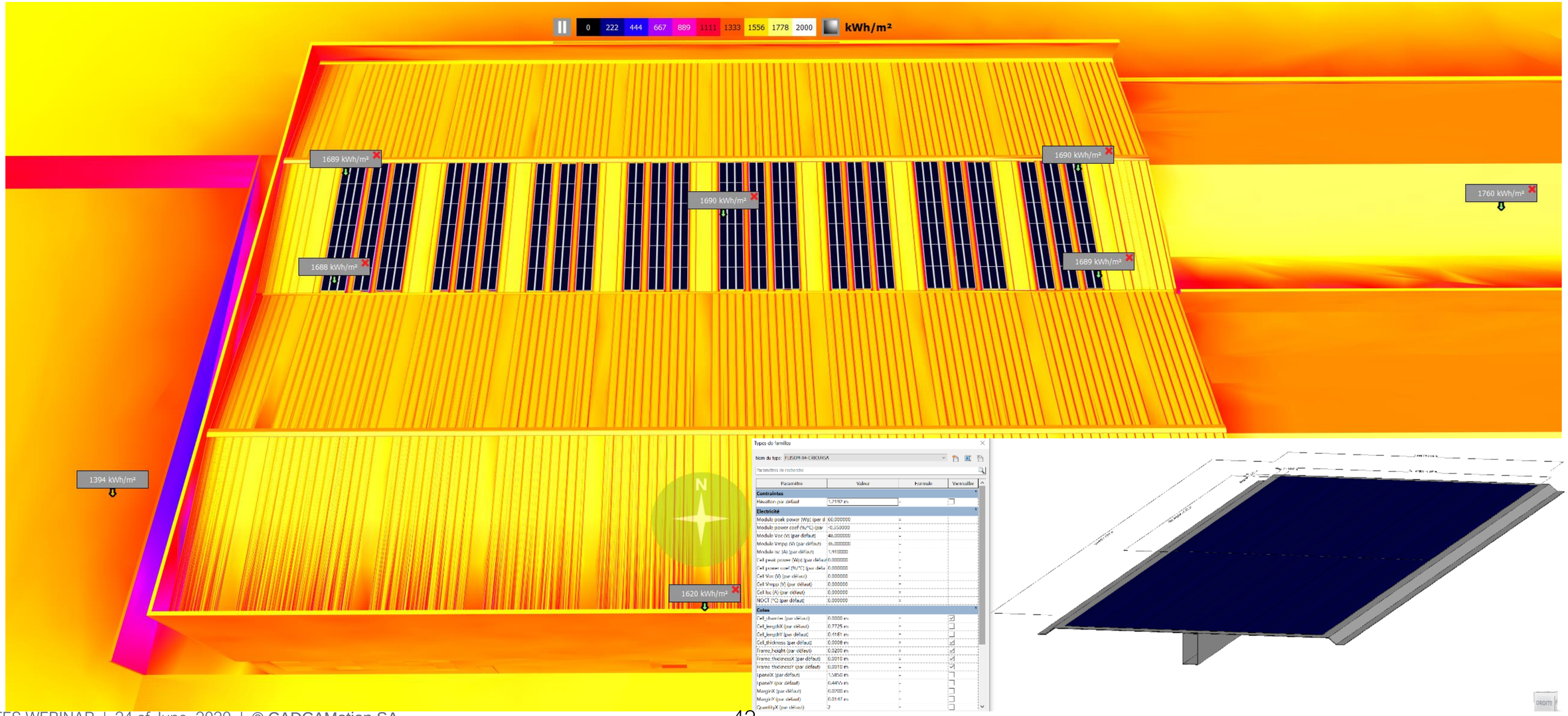
> 3.Carports – Zurich: virtual



> 3.Carports – Zurich: real

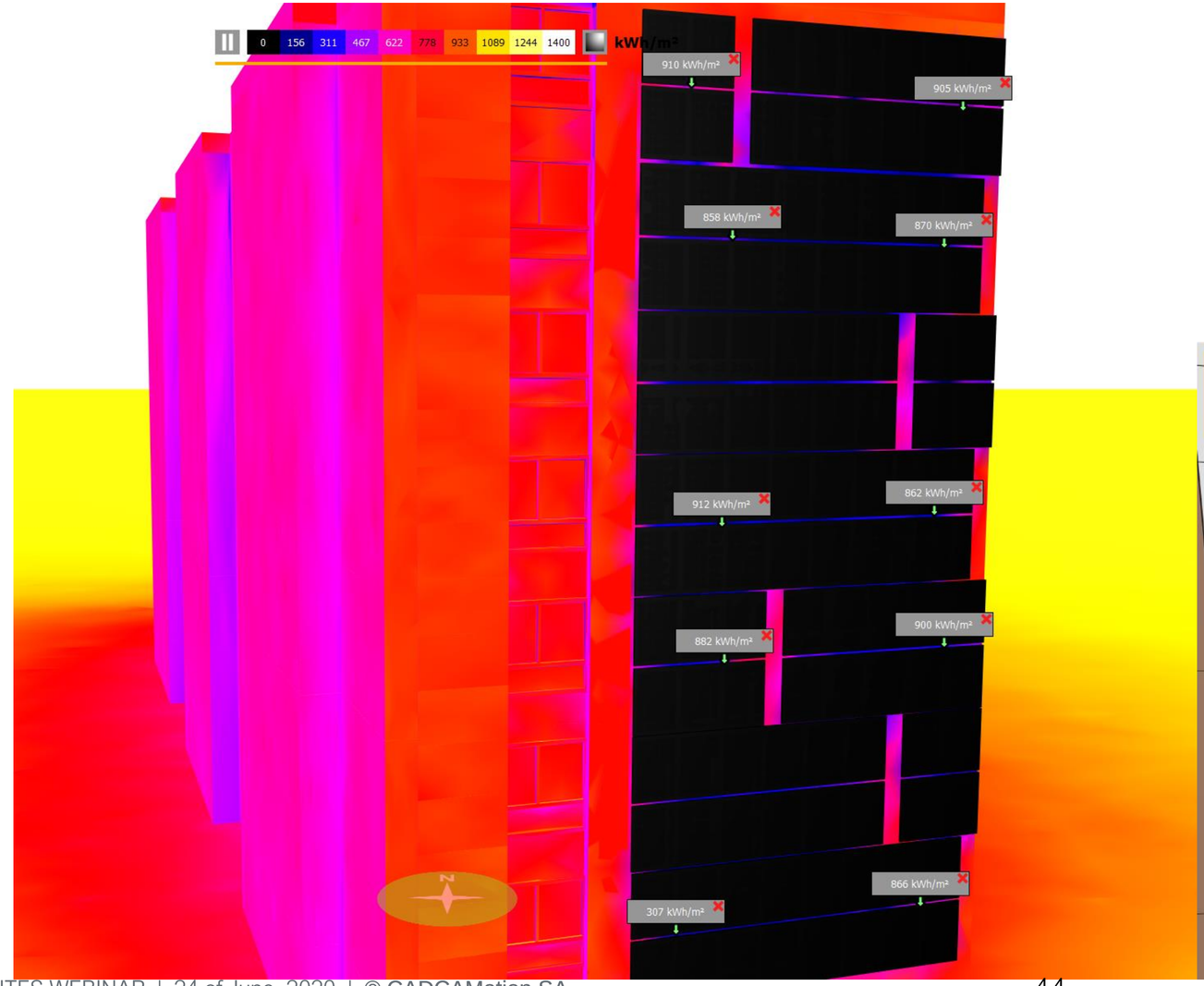
> **Carport Module “Model 3x1” & “Model 4x1” by FLISOM**

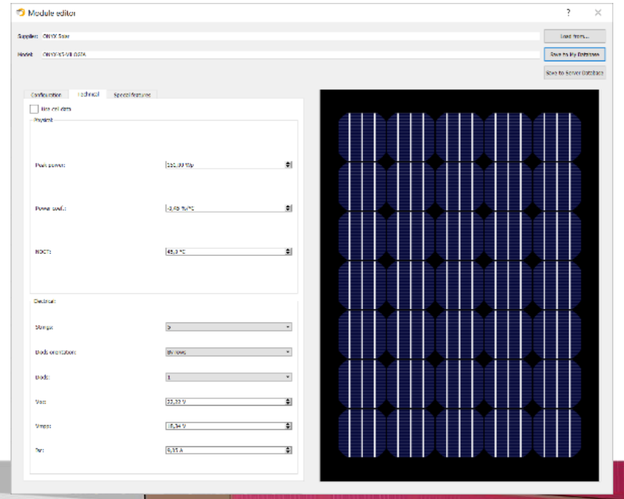
>4.Industrial Building: virtual

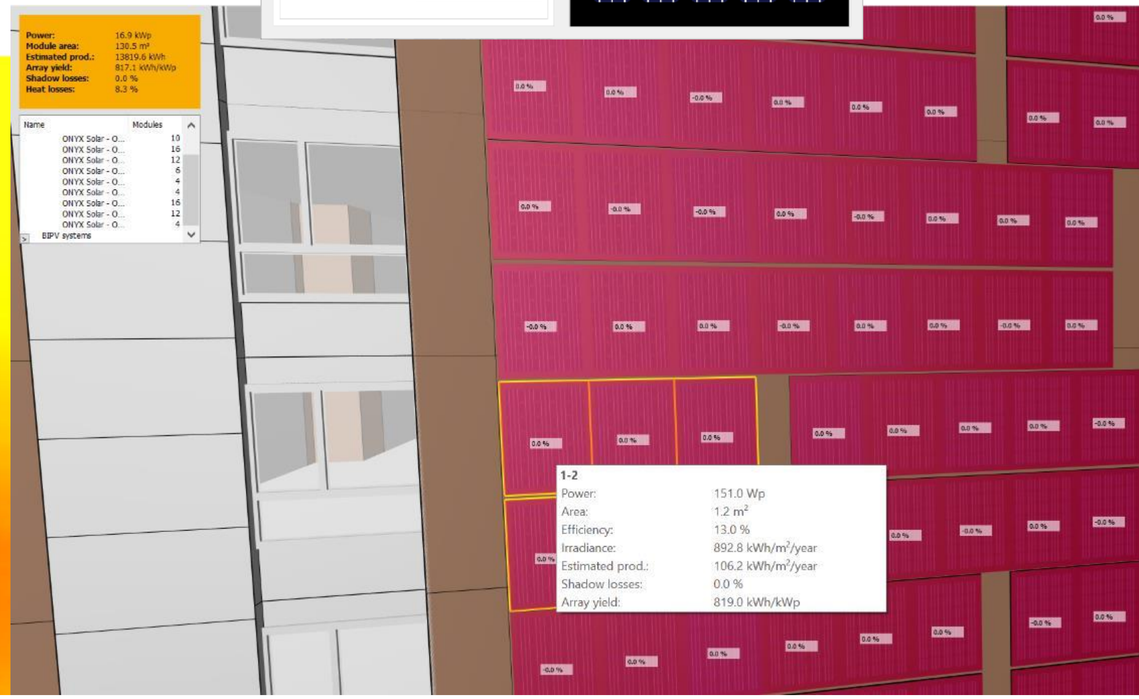


> 4.Industrial Building: real

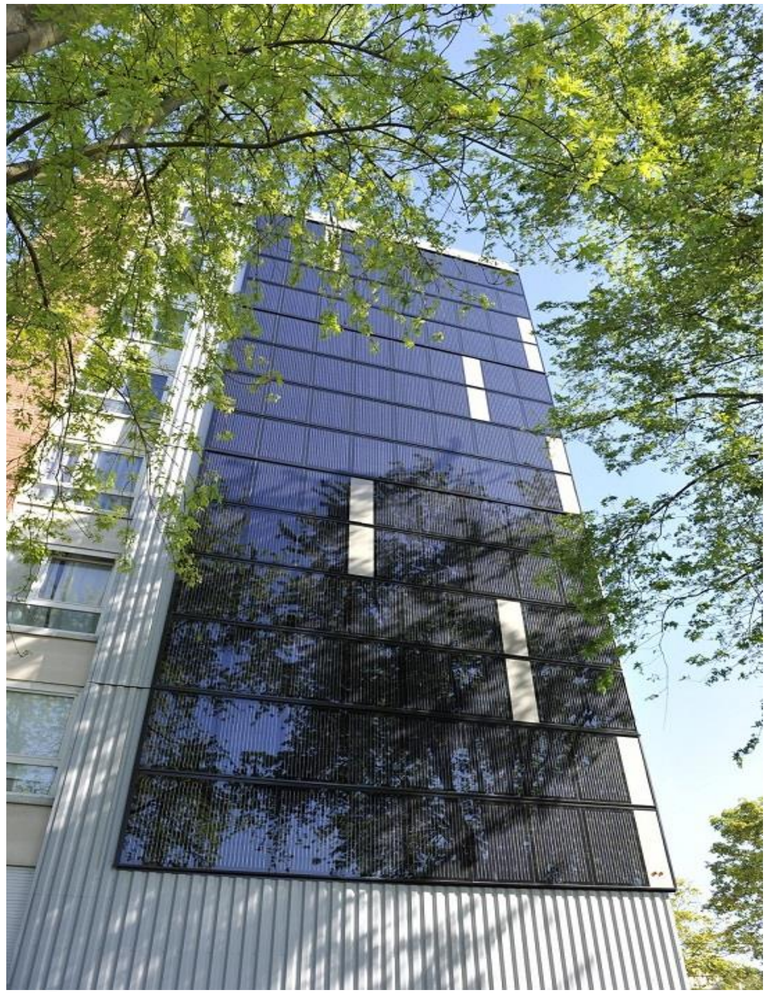
> 5. Apartments building: virtual



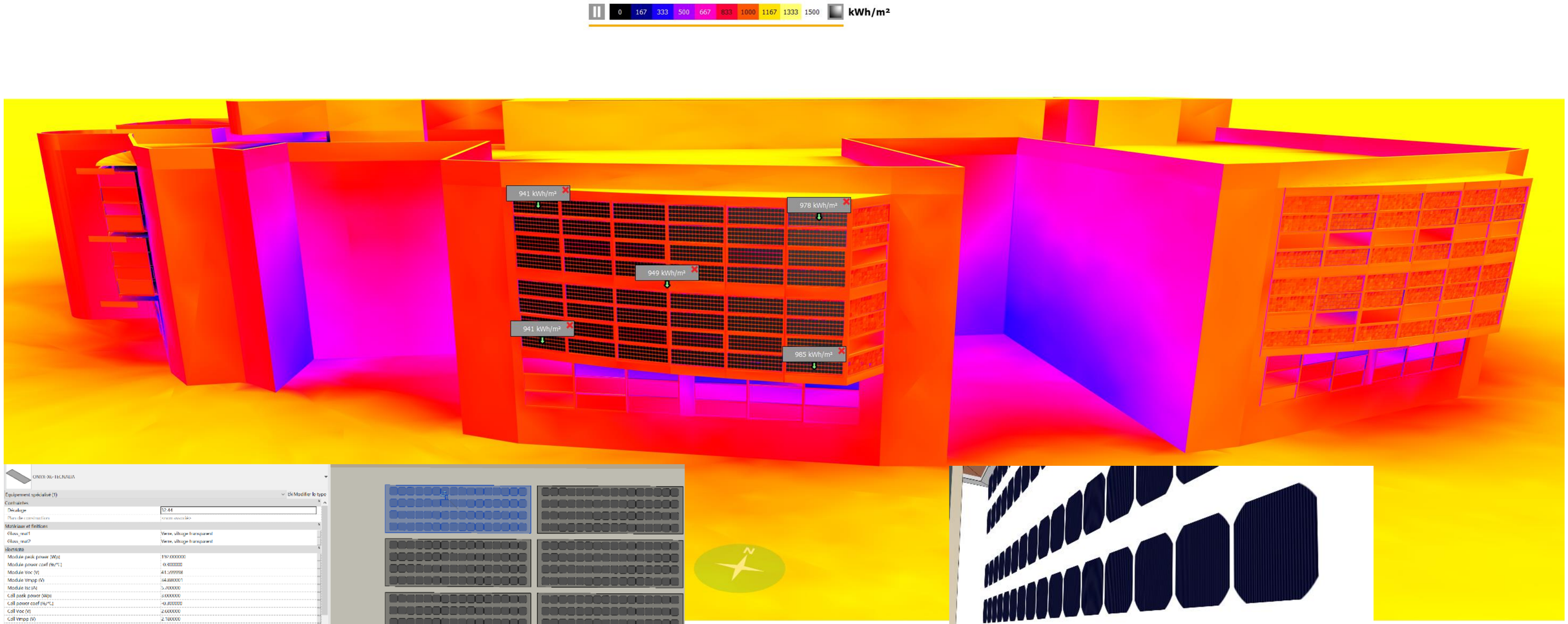


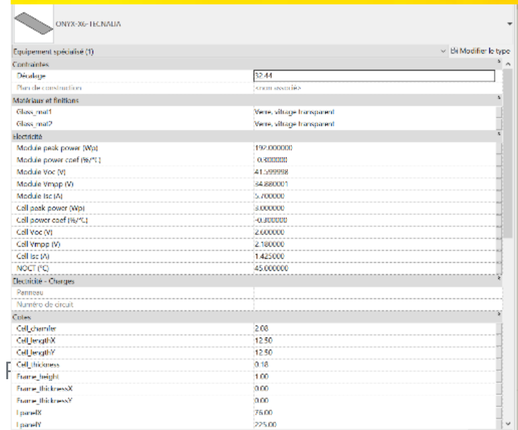


> 5. Apartments building: real



> 6.Office building: virtual





> 6.Office building: real

GET PVSITES (e)products

> PVSITES portfolio

www.bim-solar.com
www.pvsites.eu

PUBLIC RELEASE
1/7/2020

PVsites portfolio

PVSITES PROJECT

The PVsites portfolio of BIPV products has been developed within the PVsites project consortium to feature latest innovations for:

- Thin film CIGS modules from FLISOM
- cSiglass modules from ONYX Solar
- BIPVSiCinverter from CEA
- Inverter with storage system and DC coupling from TECNALIA

The PVsites eCatalog aims at providing virtual objects reflecting real products to be used within BIMsolar and the BIM ecosystem. You will now discover the PVsites portfolio through a user experience:

- Discover the BIPV products
- Visit the reference demo buildings
- Use a simple decision support tool to get the right product at the right location
- Step into BIMsolar to start working on your own BIPV projects and integrate PVsites object

Our ambition is to provide the key features and ideal use (building application) for every product.

You will find:

- 4 families of Thin Film CIGS modules from FLISOM and 4 applications: single house roofing, cladding on architectural façade, bended carports, industrial roofing
- 2 families of cSinext generation glass modules from ONYX Solar and 2 applications:opaque cladding for isolated façade, semi-transparent ventilated double-skin façade
- 2 families of next generation inverters for BIPV applications: BIPV SiC Inverter from CEA and Inverter with storage system and DC coupling from TECNALIA

> Plunge into our portfolio: best pictures and comprehensive information of PVsites products
> Access to our database of PVsites objects: when BIPV meets BIM

7 differents sites / 6 types of buildings have been chosen and are in service with PVSITES products. Training material is available to discover how was built every BIPV system

> eCatalog within BIMsolar® web platform

FLISOM – eRoof Tile

Accueil > FLISOM – eRoof Tile

FREE BIMsolar® object

FLISOM – eRoof Tile

The roofing shingle module is a semi-flexible and lightweight solar panel designed for BIPV roof tile installations. It is designed for longevity in demanding environments and is optimized for residential roofs. Each roof tile includes Flisom's CIGS monolithically interconnected cell technology.

Modules can be string connected via supplied standard connectors. Tile is mounted to the roof using conventional roofing technology.

FLISOM products

FLISOM contact

Add this BIMsolar® object for FREE into your personal database to be **BIM-ready!**

Add to CART

Catégories : BIPV, MODULE, PITCHED, RESIDENTIAL, ROOF, TILE Étiquettes : CADCAMation SA, EnerBIM, FLISOM

Description | Specific features | BIM features

BIM features

This product is published to the market as a « BIMready » component for Autodesk REVIT software and community

Table of operational material ready for download and BIM integration:

CODE	DESCRIPTION		DOWNLOAD link	Additional material
FLISOM-X1a.rfa		REVIT Family (V2018)		
FLISOM-X1a.rfa		REVIT Family (V2019)		
FLISOM-X1a.rfa		REVIT Family (V2020)		
FLISOM-X1a.rfa		REVIT Family (V2021)		
PVSITES_Plugins	BIPV innovation by CADCAMation			

Get more information on CADCAMation BIM pages

> CONCLUSIONS

- ✓ Mains efforts put on products virtualization
- ✓ Collaborative digital workspace: design, simulation, calculation
- ✓ BIM-readiness from element to building level
- ✓ Web platform to retrieve every digital asset

www.bim-solar.com

PUBLIC RELEASE 1/7/2020

> THANK YOU for your ATTENTION!

PVSITES Software

presented by Philippe ALAMY

CADCAMation, PVSITES Project Partner, Switzerland

palamy@cadcamation.ch

JOIN US: www.cadcamation.ch