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Knowledge Innovation Community

Philippe ALAMY | EnerBIM | www.bim-solar.com

BIPV-Insight Consortium

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BIM solar

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We deliver FREE Software to

SUPPORT PV and ARCHITECTURE INTEGRATION

We develop PREMIUM SERVICES

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Who we are:

EnerBIM

→4 associated managers

→Experts in raytracing, energy calculation and simulation

→Experts in BIM innovation (Building Information Modeling)

The Origin:

Consortium BIPV-Insight

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2013 → 2017

tecnalia Inspiring Business	Leader, R&T
EnerBIM	BIM, AGILITY, business modelling
BEAR ID	BIPV and architecture
COMSA CORPORACIÓN / TFM	Construction, Installation and maintenance
I2M BORDEAUX	Research and Education

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BIPV-Insight Funding Partners

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"How to get crucial information about solar energy integrated into building skins?"

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The Market Needs: BIM+Solar

"Architects, engineers, merge 3D Modeling, BIM and PV production to design positive energy buildings"

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OUR ISSUES

- ✓ Architecture is BIMready. Traditional PV is not. BIPV is taking off
- ✓ Projects need to meet products and products to meet projects
- ✓ Our mission: bridge the gap and support BIPV with BIM innovation
- ✓ Product + services through BIMsolar community

BIMsolar community

BIM solar

PRODUCT + SERVICES business model

- ✓ We deliver high performance software for **free** to designers, to support their early decisions, building a worldwide **BIMsolar community**
- ✓ We build **premium** services for designers and manufacturers to get more **value** from BIM and stimulate **connections** between stakeholders
- ✓ We address **KEY PLAYERS** in energy and construction sectors

Experience – Design – Prescription

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WHAT BIMsolar® IS

BIM solar

- A BIM software with full 3D solar calculation
- A web platform and community. Focus = Solar Architecture
- Accelerator for early feasibility studies
- BAPV & BIPV systems configuration
- Design & decision support

Software INTERFACE: 3D, integrated, BIM

- ✓ Immediate importation of any 3D model, BIMready
- ✓ Easy interface – From project localization to report edition
- ✓ Progress bar (first steps=architectural issues)
- ✓ Economic / financial evaluation (to be improved)
- ✓ Reports: web configurator to be implemented (premium)

Clicking on the logo opens the file menu: open, save, save as.
The left icons are the main functionalities of the software:

- Environment
- Irradiation calculation
- Module Selection
- Inverter selection
- Wiring
- Financial analysis
- Results
- Reports

The top bar shows menu for the current functionality.
The 3D view shows the building and various elements depending on the functionality.
The tools on the right of the 3D view are used for navigation (orbit, pan, move, center, clipping plane).
A compass always shows the North direction

BIMsolar.com community

- Software download
- Discussion groups
- Projects featuring
- BIPV catalogs
- Premium services

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BIMsolar SOFTWARE

Description through the LUMINA project

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All you need: 3D model + weather data

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LUMINA apartments, DENVER, CO

3D

3D MODEL importation: 3D & BIM

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- From Trimble® SketchUp® file (.skp) to BIM files
- IFC, gbXML, IDF formats
- Autodesk® REVIT®: IFC generation

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ENVIRONMENT / SUNPATH

- ✓ 3D display for the sun path (1H time step)
- ✓ Calendar for the current day: visible sun + realistic shadows
- ✓ Upload weather data file: TM2, EPW or custom
- ✓ Check time zone + geo coordinates
- ✓ Generate albedo effects: more realistic reflected irradiance

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Show albedo
SUN COURSE
over the scene
120 °
135 °
150 °
165 °
S
195 °
210 °
225 °
240 °
255 °
W
N

Environment
Weather data: Denver Centennial Golden Nr
Time zone: UTC -8
Latitude: 39° 44' 24''' N
Longitude: - 105° 10' 48''' W
Ground height: 0,000 m
Current day: avr. 12
Current hour: 6
Display shadows
Show albedo
SUN COURSE CALENDAR
E
105 °
120 °
135 °
150 °

BIMsolar
Environment
Weather data: Denver Centennial Golden Nr
Time zone: UTC -7
Latitude: 39° 44' 24''' N
Longitude: - 105° 10' 48''' W
Ground height: 0,000 m
Current day: avr. 7
Current hour: 12
Display shadows
Show albedo
0 % 25 % 50 % 75 % 100 %
Set value:
Reflected radiations calculation
ALBEDO settings
20 %
N

Solar Calculation

Irradiance, shadowing, direct reception

IRRADIANCE CALCULATION + DISPLAY

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- ✓ 3D display in colours or shades of grey
- ✓ Calendar for calculation period
- ✓ Calculation modes: irradiance, shading, direct sun exposure
- ✓ Precision modes: adjust time and save computer resources

Irradiance

Calculation: Yearly irradiance

Precision: Fast

Months:	J	F	M	A	M	J	J	A	S	O	N	D
AM:	0	1	2	3	4	5	6	7	8	9	10	11
PM:	12	13	14	15	16	17	18	19	20	21	22	23

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Irradiance
Calculation:
Direct reception ratio
Precision:
Fast
Months: J F M A M J J A S O N D
AM: 0 1 2 3 4 5 6 7 8 9 10 11
PM: 12 13 14 15 16 17 18 19 20 21 22 23
0 11 22 33 44 56 67 78 89 100 %
62 %
DIRECT RECEPTION RATIO

Irradiance
Calculation:
Shadowing
Precision:
Balanced
Months: J F M A M J J A S O N D
AM: 0 1 2 3 4 5 6 7 8 9 10 11
PM: 12 13 14 15 16 17 18 19 20 21 22 23
0 11 22 33 44 56 67 78 89 100
ARCHITECTURAL SHADOWING
66 %

LAYOUT CONFIGURATION

- ✓ PV mode selector (BAPV, opaque BIPV, transparent BIPV)
- ✓ Cell configurator, including silk print from any picture
- ✓ Module configurator, including silk print from any picture
- ✓ Glass/glazing configurator

From specifications to configurations

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Solar Module
LSX 250 (Now 285 Watts)

Racking System
LSX Rail 1.0

Inverter – SMA
(3) Sunny Boy 6000TL-US-22 208V

Technical data	Sunny Boy 6000TL-US	
	208 V AC	240 V AC
Input (DC)		
Max. usable DC power (@ cos φ = 1)	6300 W	
Max. DC voltage	600 V	
Rated MPPT voltage range	210 – 480 V	
MPPT operating voltage range	125 V - 500 V	
Min. DC voltage / start voltage	125 V / 150 V	
Max. input current / per MPP tracker	30 A / 15 A	
Number of MPP trackers / strings per MPP tracker		
Output (AC)		
AC nominal power	5200 W	6000 W
Max. AC apparent power	5200 VA	6000 VA
Nominal AC voltage / adjustable	208 V / ●	240 V / ●
AC voltage range	183 – 229 V	211 – 264 V
AC grid frequency; range	60 Hz / 59.3 - 60.5 Hz	
Max. output current	25 A	
Power factor (cos φ)	1	
Output phases / line connections	1 / 2	
Harmonics	< 4%	
Efficiency		
Max. efficiency	96.8%*	97.1%*
CEC efficiency	96%*	96.5%*

Mounting & Wiring Spec

Equipment Specifications

MODULE CONFIGURATOR

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- ✓ Photon database: connected
- ★ eCatalogs connections: to be implemented as soon as contracted with manufacturers
- ★ Filters/selection/referencing: continuous improvement

MODULE CONFIGURATOR

✓ Customize your own BIPV cells/modules from any graphical source

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MIX LAYOUT DESIGN & IRRADIANCE display

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REAL TIME CALCULATION

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PV SHADOWING

MODULE MAPPING

REAL TIME CALCULATION

INVERTERS CONFIGURATOR

- ✓ Automatic or manual selection
- ✓ Photon database: integrated
- ★ Filters/selection/referencing: continuous improvement

INVERTERS / WIRING CONFIGURATOR

- ✓ Automatic or manual modes
- ★ Enhanced wiring/electrical functionalities to be developed (premium)

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RESULTS - REPORTS

- ✓ Technical results displayed in graph mode + csv exportation
- ✓ Monthly to hourly results: irradiance, production, losses
- ★ Customizable dashboard to be specified and integrated (premium)

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Results
Data to display:
DC production loss by mismatching
Data unit:
kWh
Data frequency:
Month
Average day
Day
Hour
Repartition
Multiple selection:
Cumulate
Compare
Modules
Inverters
Name
Modules
SMA Solar ... 28
SMA Solar ... 27
SMA Solar ... 28
Mismatching DC losses
Results
Auto scale
Save image...
Save CSV...
kWh
J F M A M J J A S O N D
DC Production
Mismatching loss
2800
2600
2400
2200
2000
1800
1600
1400
1200
1000
800
600
400
200
0

FINANCIAL ANALYSIS

- ✓ Comparative strategies: feed-in / self consumption / Mix
- ✓ Financial feasibility: based on BIM, custom and generic inputs
- ★ Customizable dashboard to be specified and integrated (premium)

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Main output: Feed in

Inverter	PV Cell	Production	Output
System		20436	Feed in
SMA So...	LUMOS - LUMO...	6232	Feed in
SMA So...	LUMOS - LUMO...	6875	Feed in
SMA So...	LUMOS - LUMO...	7329	Feed in

LUMINA use case:

Electricity tariff=12cts

Production credit=6cts

→ 18cts for analysis

→ CAPEX 14,546$ after depreciation

PV installation cost

PV system cost (CAPEX):	14546 $
Maintenance cost (OPEX):	1037 $

Energy network

Feed-in tariff:	0.1800 $/kWh
Electricity tariff:	0.1800 $/kWh

Energy consumption

Yearly consumption:	125000 kWh

Key figures

Total power:	21 kWp
Final yield:	984.9 kWh/kWp
Feed-in production:	20436 kWh
Self consumed production:	0 kWh
Lost production:	0 kWh
Feed-in income:	3678 $
Self consumption savings:	0 $
20 years benefit / investment ratio:	263.1 %
Payback period:	5 years

Monthly | Auto scale | Save image... | Save CSV...

Payback

SELF CONSUMPTION OPPORTUNITY

BIM solar

Main output: Self consumption

Inverter	PV Cell	Production	Output
System		20436	Self consumption
SMA So...	LUMOS - LUMO...	6232	Self consumption
SMA So...	LUMOS - LUMO...	6875	Self consumption
SMA So...	LUMOS - LUMO...	7329	Self consumption

PV installation cost

PV system cost (CAPEX):	14546 $
Maintenance cost (OPEX):	1037 $

Energy network

Feed-in tariff:	0.1800 $/kWh
Electricity tariff:	0.1800 $/kWh

Energy consumption

Yearly consumption:	125000 kWh

Key figures

Total power:	21 kWp
Final yield:	984.9 kWh/kWp
Feed-in production:	0 kWh
Self consumed production:	15619 kWh
Lost production:	4817 kWh
Feed-in income:	0 $
Self consumption savings:	2811 $
20 years benefit / investment ratio:	143.9 %
Payback period:	8 years

Monthly | Auto scale | Save image... | Save CSV...

ROUGH ENERGY CONSUMPTION

RESIDENTIAL / OFFICE profiles

Instant KPIs

FLEXIBILITY: What if Analysis comparition

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CITY SCALE

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3D

PlaceMaker

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TFM

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PROJECT UPLOAD + FEATURING

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- Upload from the software
- Connect to bimsolar.com web platform
- Share / Feature your project online
- Start discussion / find expertise

Coming soon

- Autodesk® REVIT® plugin
- EnergyPlus connection: thermal impact, thermal comfort
- Daylighting
- Report Builder
- eCatalogs of objects (BIMready) from manufacturers

CONCLUSION: enabling net-zero adoption

- LEED metrics
- Time savings (early stage feasibility studies)
- Free shading analysis tool for PV production
- Focus on architectural surfaces
- Validate incremental cost of architectural solar
- Quantifies multifunctional benefits

Software performance: BIPV+BIM commitment

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- Irradiance: fast calculation and 3D display
- Photovoltaic installation layout: 3D real-time designing
- Inverter database and selection: dynamic components in BIM mode
- PV system wiring: automatic and manual, 3D interface
- PV losses calculation: real-time, 3D visualization and reports
- Analysis, results: customizable, export to spread sheet
- Instant feedback to direct the design: dynamic 3D graphical interfaces + BIM connections (ifc, gbXML, IDF, REVIT plugin soon)

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L'équipe

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OUR VALUE PROPOSITION is UNIQUE

- ✓ **Smart 3D solar modelling**: integrate any **3D** model of your **building** into our virtual workspace and get instant **solar imagery**: share, comment, feature your designs
- ✓ **Save** time and money **up to 70%** for early decisional phases: get instant evaluation for your design parameters and your financial **KPIs**. Improve **green value, asset value** and energy savings
- ✓ **Online collaborative workspace**: simulation, **decision support**, design features are combined in a **real time** process to encourage collaboration within the **community. We feature your services online!**
- ✓ **Commercial prescription**: projects meet **products** and products meet **projects** through direct connections between manufacturers and designers.

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Just connect!

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