

# Company Presentation



# 1. Company Introduction



# 1. Company Introduction

## Diamond Aircraft premises



# 1. Company Introduction

## New production facility



- Successful implementation of "flagship" projects
- Delivery of modules to sales partners worldwide
- Reference system for all potential clients of turnkey module production lines
- Production of patented fiberglass acrylic for production partners
- Continue further development of PV modules

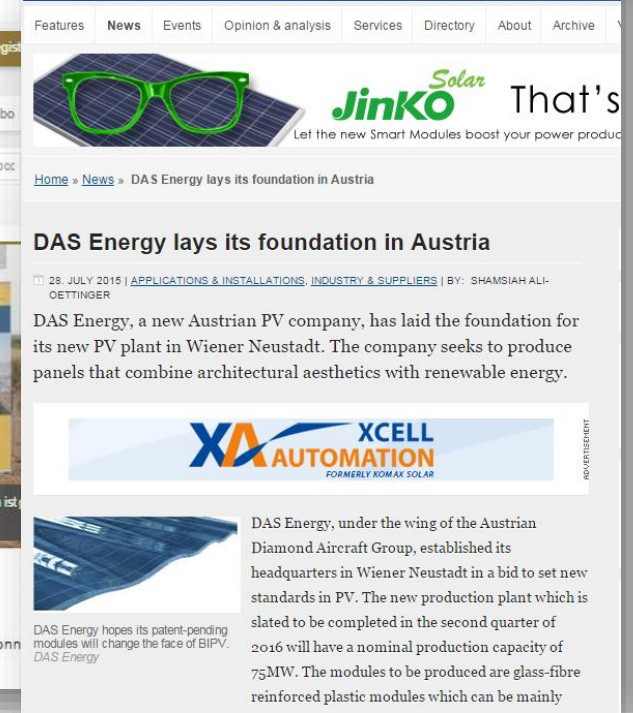


# 1. Company Introduction

## New production facility

### Laying of the foundation stone

- On July 23<sup>rd</sup> 2015 the laying of the foundation stone took place in Wiener Neustadt
- Planned completion: Q2 / 2016
- Nominal production capacity: 75 MWp / year



# 1. Company Introduction

## New production facility



Die Wirtschaftsagentur des Landes Niederösterreich

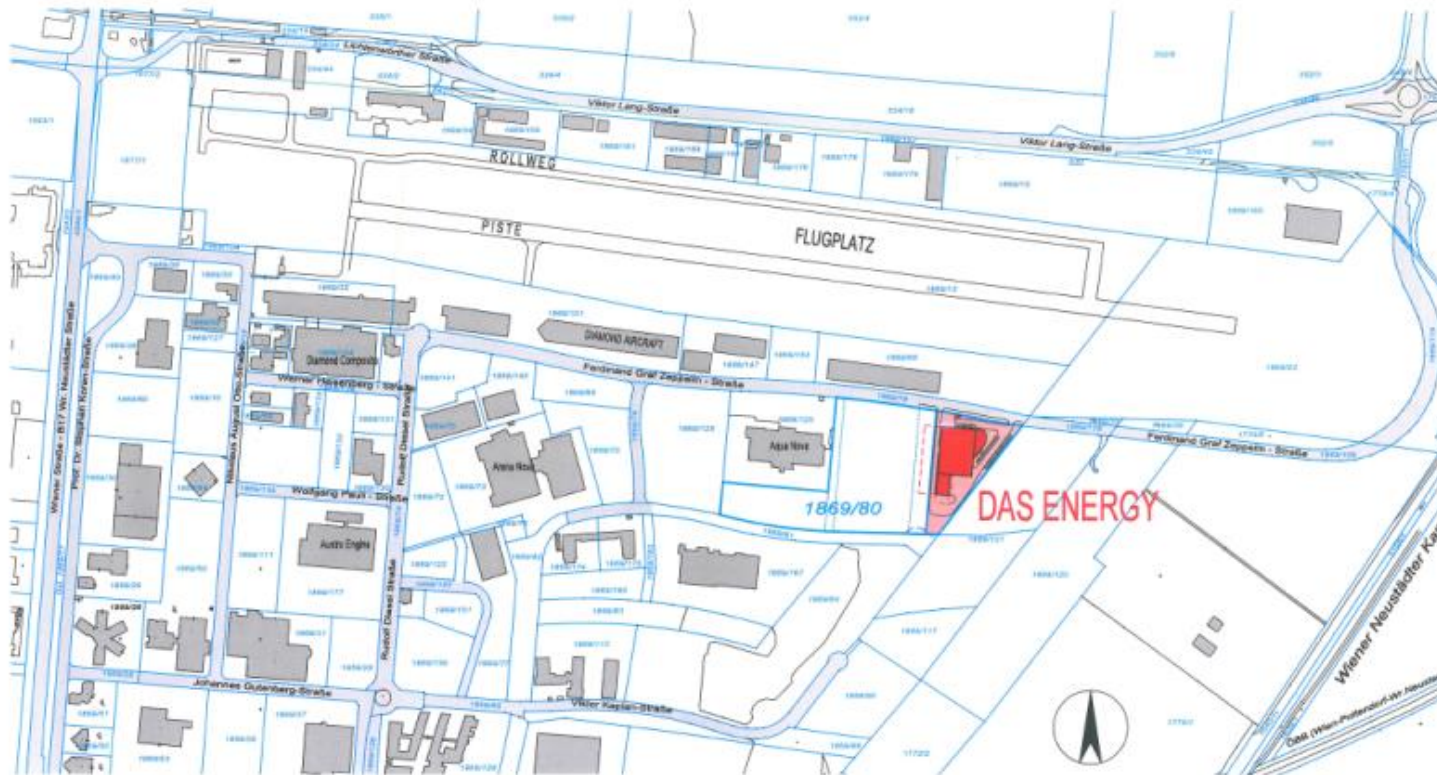


### Site plan



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# 1. Company Introduction

## New production facility



Die Wirtschaftsagentur des Landes Niederösterreich

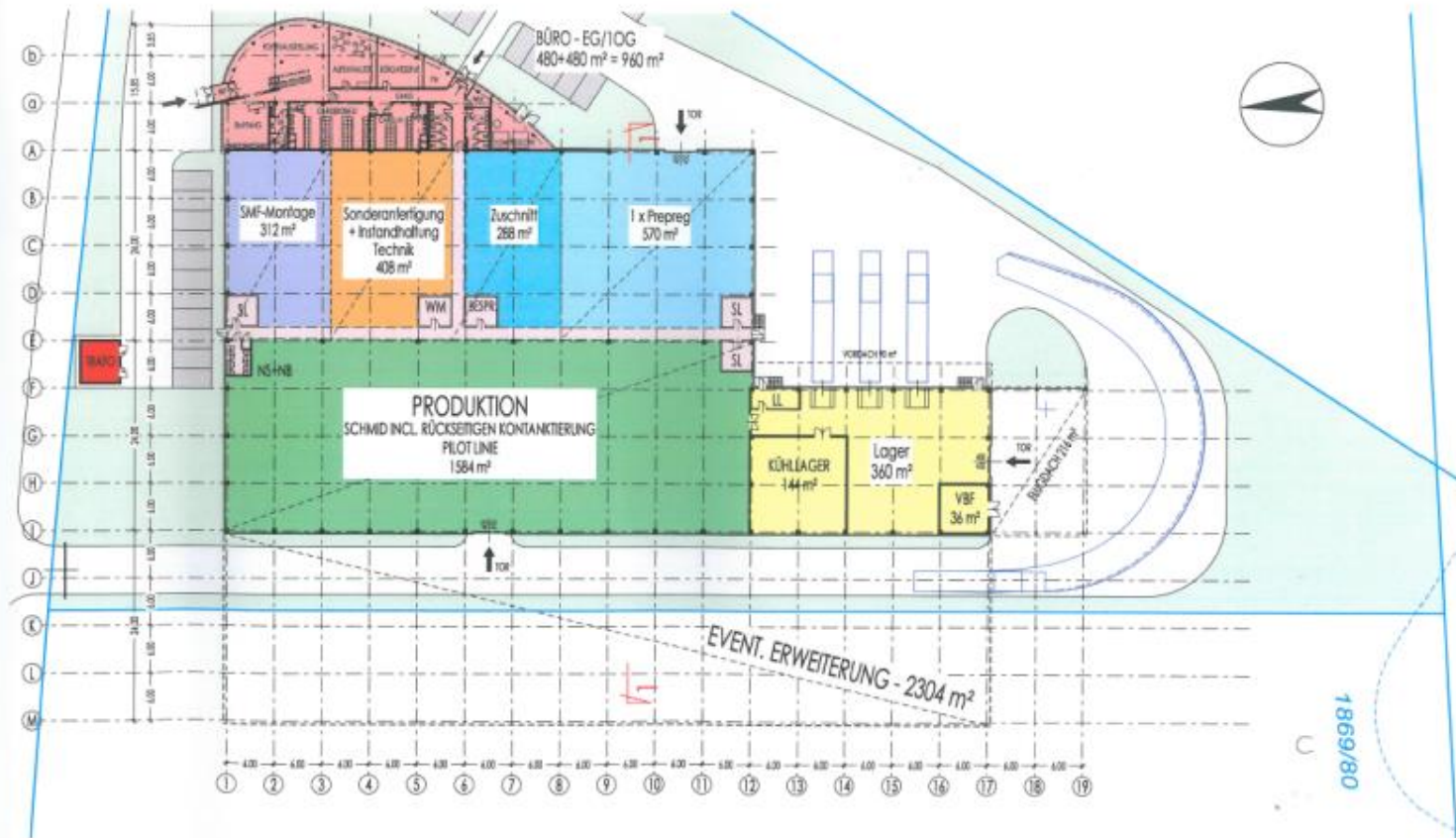


## Structural Design



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# 1. Company Introduction

## New production facility

### Showcase DAS Energy facility

- The roof will be fitted with 4 different waterproofing membrane technologies
- The building will be a reference project for DAS modules

*The surfaces marked in red will be fitted with PV modules*





# 1. Company Introduction

## Company Profile

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- **DAS Energy GmbH (DAS)** was founded in 2010. Headquarters are located in Wiener Neustadt, Austria on the premises of the Diamond Aircraft Group.
- **Management:** Christian Dries and Matthias Schoft
- **Core competence:** development of innovative ultra-lightweight, flexible PV modules. The patent was approved in February 2016, official certificate to be issued soon.
- **Key Technology & Market:** Combination of know-how of composite aircraft manufacturing with photovoltaics

## 2. Product

### Product characteristics

- Lightweight, flexible PV module with almost unlimited application possibilities
- Flexibility in geometry as well as size



60 cell module bending down to 50 cm diameter – possible up to 30 cm diameter depending on module type



## 2. Product

### USPs of the product <sup>1/3</sup>

#### 1. Ultra lightweight PV module

A standard size module (250Wp) weighs only 4,5 kg – instead of ~ 20 kg for a conventional module.

#### 2. Thickness of only 2 mm

#### 3. Flexible PV module

The PV module can be fixed extremely flexible – blends perfectly with the application surface.

#### 4. Higher efficiency in terms of energy production for example in vertical applications. The production process allows the use of an optical effect which focuses the light as well as microchip technology to optimize the energy production.



## 2. Product

### USPs of the product <sup>2/3</sup>

5. **Any silicon based cell can be used**  
mono, poly, backside-contact, smart wire...
6. **Coloured applications**
7. **Machinable for fixing**  
Drilling, sawing...
8. **Various mounting possibilities**  
glueing, screwing, riveting...
9. **Hardly visible under military radar**
10. **Minimized sunlight reflection**



Conventional glass module: glare

DAS Energy module:  
no glare

# 2. Product

## USPs of the product <sup>3/3</sup>



**11. Very high insulation resistance  $\geq 30 \text{ G}\Omega$**

IEC 61215 requires 24,1 M $\Omega$

**12. No PID (confirmed by TÜV)**

**13. Soil resisting surface**

**14. More resistant against damage Certified** compared to conventional glass modules

**15. Successfully passed the IEC 61701** salt mist corrosion test

**16. Classified according to EN 13501-5: BROOF (t1)**  
behaviour of roofs exposed to external fire;  
important for building integrated photovoltaic (BIPV)

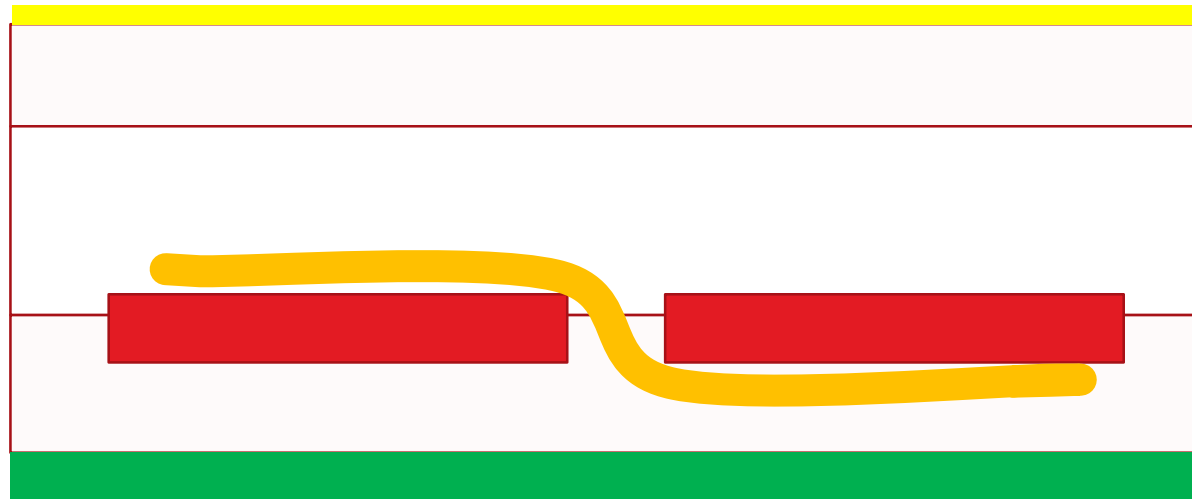
The collage contains three main documents:

- TÜV Rheinland Test Report:** A report for product DAS 240P, DAS 240S, and DAS 250P. It details test results for voltage durability qualification (IEC 61215) and potential induced degradation (PID) according to IEC 61215-2. The test results are positive, confirming the product's performance.
- OVE Statement of Conformity:** Issued by the Austrian Technical Institute for Electrotechnics (OVE). It certifies that the product conforms to the requirements of EN 13501-5:2010 for fire classification. The document includes technical details and a signature of the responsible official.
- Fire Classification Report (Klassifizierungsbericht zum Brandverhalten):** Issued by the Institute for Building Technology and Fire Research (IBT). It classifies the product as BROOF (t1) according to EN 13501-5:2010. The report includes details about the test method, the test specimen, and the classification result.

## 2. Product

### Product construction

Construction of our 2 mm thin PV module:



Dirt protection film

**Acryl/Glass fiber**

1 x EVA

Solarcells

Copper wires

**2 x Acryl/Glass fiber**

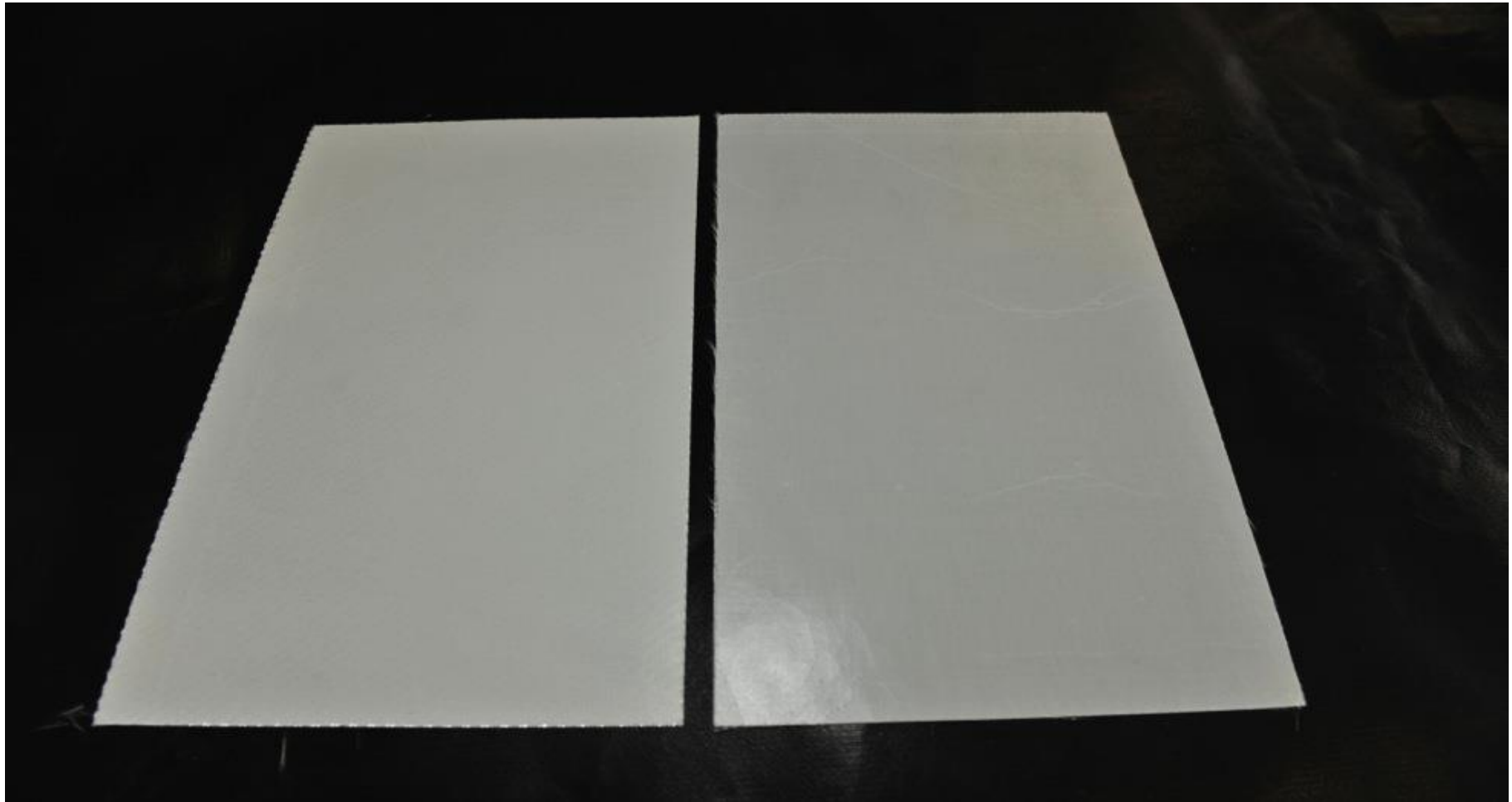
BS-Foil

## 2. Product

### Special core material

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Specially coated fiberglass reinforcement (Patent pending)



# 2. Product

## Product datasheet



The world's first fully-certified non-glass silicon solar cell based semi-flexible lightweight module



**DAS Series Module DAS 240 - 250P**  
**UNIQUE CHARACTERISTICS**

- No glass used - the proprietary fiber reinforced plastic core together with state-of-the-art front, back and EVA sheets, ensures rigidity, flexibility, quality and durability, all-in-one
- This base laminate can be delivered standalone, or attached to a stiff or semi-flexible lightweight substrate, and be integrated in a standard PV module frame for standard applications, or into a custom fixing system for BIPV or automotive applications
- Fully IEC certified (UL planned)
- Available in both mono- and multi-crystalline versions
- 156 mm x 156 mm cells, 2BB or 3BB
- Standard 60- and 72-cell versions
- Sizes, shapes and forms (2D and 3D) can be altered to customer needs



TECHNICAL DATA	
Solar Cells	60 polycrystalline silicon cells
Cell Characteristics	156mm x 156mm, with 3 bus bars
Front sheet	High transmission polymeric film
Core material	Proprietary fiber reinforced plastic
Encapsulant	EVA
Back Cover	Weather resistant back sheet (white, black, transparent)
Junction Box	TUV certified (IP 65) with 3 bypass diodes (12 A)
Output Cables	Two 4 mm <sup>2</sup> cables; 1 meter in length
Connector Type	Matching MC4 compatible connectors
Dimensions (L x W x H)	1657 mm x 991 mm x 2 mm
Weight	4.5 kg

ELECTRIC CHARACTERISTICS					
	Power [Wp]	Isc [A]	Voc [V]	Imp [A]	Vmp [V]
DAS 240P	240	8.40	37.53	7.87	30.61
DAS 245P	245	8.41	37.56	7.98	30.70
DAS 250P	250	8.41	37.57	8.00	31.17

THERMAL CHARACTERISTICS	
Operating Temperature Range	-40 to 85°C
Ambient Temperature Range	-45 to 45°C
Temperature Coefficient Pmp	-0.393 %/K
Temperature Coefficient Voc	-0.310 %/K
Temperature Coefficient Isc	0.051 %/K

CERTIFICATES	
IEC 61215	
Safety Class II	
IEC 61730	
9400 Pa according to IEC 61215	
IEC 61701	

HIGHLY RELIABLE	
25-year limited warranty on power output	
10-year product warranty	
Maximum system voltage 1000 V	
Maximum over current protection: 20 A	
All data given relative to STC (1000 W/m <sup>2</sup> , 25°C)	



A collaboration with the Company Diamond Aircraft has brought together Diamond's vast experience in the design of composite materials for the manufacturing of lightweight single- and twin-engine airplanes with DAS Energy's Photovoltaics industrial and technology expertise.



# 2. Product

## Product certifications IEC 61215 & 61730



	Ref. Certif. No.
	AT 3060

IEC SYSTEM FOR MUTUAL RECOGNITION OF TEST CERTIFICATES FOR ELECTRICAL EQUIPMENT (IECEE) CB SCHEME	SYSTEME CEI D'ACCEPTATION MUTUELLE DE CERTIFICATS D'ESSAIS DES EQUIPEMENTS ELECTRIQUES (IECEE) METHODE OC
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CB TEST CERTIFICATE	CERTIFICAT D'ESSAI OC
Product Produit	Photovoltaic (PV) modules
Name and address of the applicant Nom et adresse du demandeur	DAS Energy GmbH Werner Heisenberg-Straße 3-5, 2700 Wiener Neustadt, Austria
Name and address of the manufacturer Nom et adresse du fabricant	DAS Energy GmbH Werner Heisenberg-Straße 3-5, 2700 Wiener Neustadt, Austria
Name and address of the factory Nom et adresse de l'usine	DAS Energy GmbH Werner Heisenberg-Straße 3-5, 2700 Wiener Neustadt, Austria
<small>Note: When more than one factory, please report on page 2. Note: Lorsque il y a plus d'une usine, veuillez utiliser la 2<sup>ème</sup> page</small>	<input type="checkbox"/> Additional Information on page 2
Ratings and principal characteristics Valeurs nominales et caractéristiques principales	see test report page 3
Trademark (if any) Marque de fabrication (si elle existe)	
Type of Manufacturer's Testing Laboratories used Type de programme du laboratoire d'essais constructeur	—
Model / Type Ref. Ref. de type	DAS 240P, DAS 245P, DAS 250P
<small>Additional information (if necessary may also be reported on page 2) Les informations complémentaires (si nécessaire, peuvent être indiqués sur la 2<sup>ème</sup> page)</small>	<input type="checkbox"/> Additional Information on page 2
A sample of the product was tested and found to be in conformity with Un échantillon de ce produit a été essayé et a été considéré conforme à la	IEC 61215(ed.2)
As shown in the Test Report Ref. No. which forms part of this Certificate Comme indiqué dans le Rapport d'essais numéro de référence qui constitue partie de ce Certificat	2.00.80022.1.0a2
This CB Test Certificate is issued by the National Certification Body Ce Certificat d'essai OC est établi par l'Organisme National de Certification	

	<b>AUSTRIAN ELECTROTECHNICAL ASSOCIATION</b> Kahlenberger Str. 2A 1190 Wien, Austria Digitally signed by W. Martin Email=w.martin@ove.at Signature: Dipl.-Ing. W. Martin
	Date: 2014-05-23 ZVR: 327279890   DVR: 1055887

	Ref. Certif. No.
	AT 3109

IEC SYSTEM FOR MUTUAL RECOGNITION OF TEST CERTIFICATES FOR ELECTRICAL EQUIPMENT (IECEE) CB SCHEME	SYSTEME CEI D'ACCEPTATION MUTUELLE DE CERTIFICATS D'ESSAIS DES EQUIPEMENTS ELECTRIQUES (IECEE) METHODE OC
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	Date: 2014-08-18 ZVR: 327279890   DVR: 1055887

## 2. Product

### Product tests and certifications

DAS Energy works in collaboration with various test and certification institutes

#### Certified by:

- OVE
  - Austrian Electrotechnical Association
  - [www.ove.at](http://www.ove.at)



#### Tested by:

- AIT
  - Austrian Institute of Technology
  - [www.ait.ac.at](http://www.ait.ac.at)
- TÜV Rheinland
  - [www.tuv.com](http://www.tuv.com)
- IBS
  - Institut für Brandschutztechnik und Sicherheitsforschung  
(Fire classification - external fire exposure)
  - [www.tuv.com](http://www.tuv.com)
- OFI
  - OFI Technologie & Innovation GmbH
  - [www.ofi.at](http://www.ofi.at)

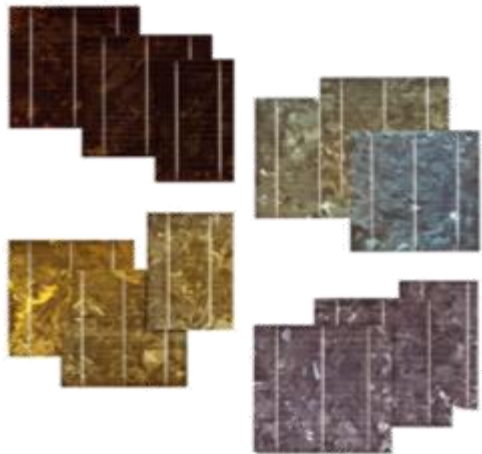


# 3. Range of applications

## Varieties for remarkable architecture

### Colored Design cells

- Energy production in attractive colors for perfect building integration
- Homogeneous coloring
- Reduction of energy costs
- Depending on cell colour between 10% and 14,5% efficiency currently
- Standard format: 6"
- 4" and 5" on customer demand



Source: Sunways



# 3. Range of applications

## Varieties for remarkable architecture

### Glass architecture



Waved glass module with DAS Energy module laminated between 2 waved glass plates – Cooperation with SFL technologies GmbH

also possible with curved and domed glass

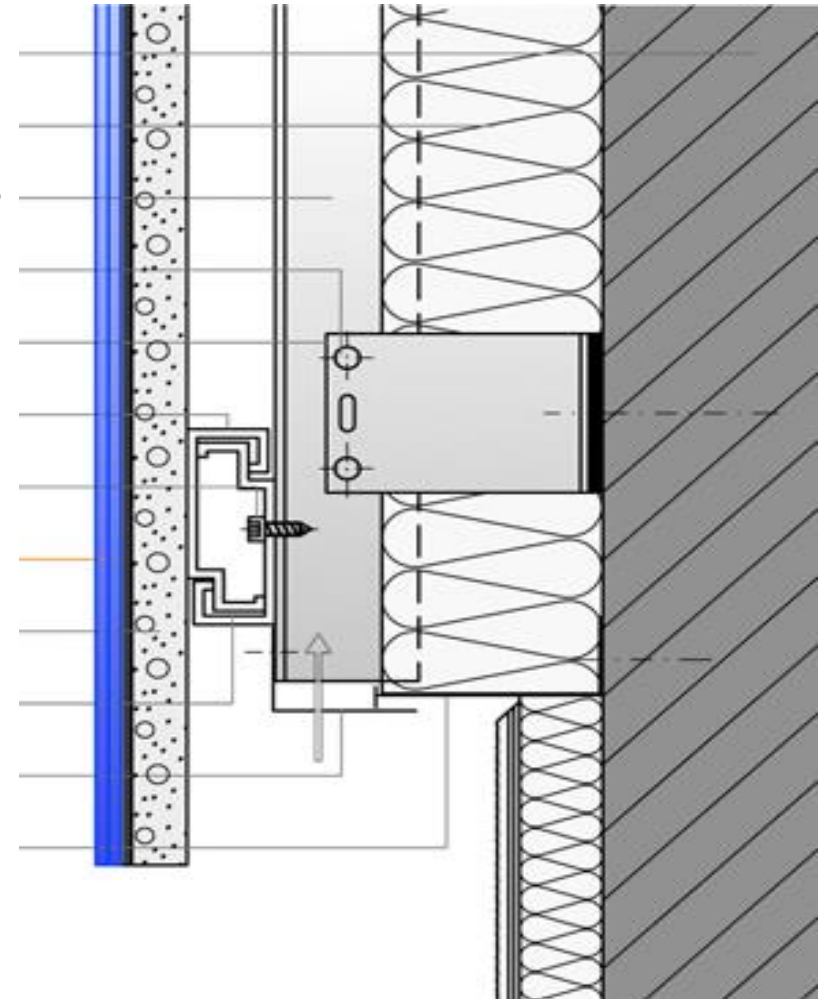


# 3. Range of applications

## Varieties for remarkable architecture

Facade application (without changing the current installation system):

- Outer wall -----
- Thermal insulation -----
- Aluminum T-profile -----
- Screw -----
- Wall Mount -----
- Plate profile -----
- Screw -----
- DAS PV-module 2kg/m<sup>2</sup>-----
- Carrier plate -----
- Profile -----
- Ventilation screen -----
- Joint Tape -----



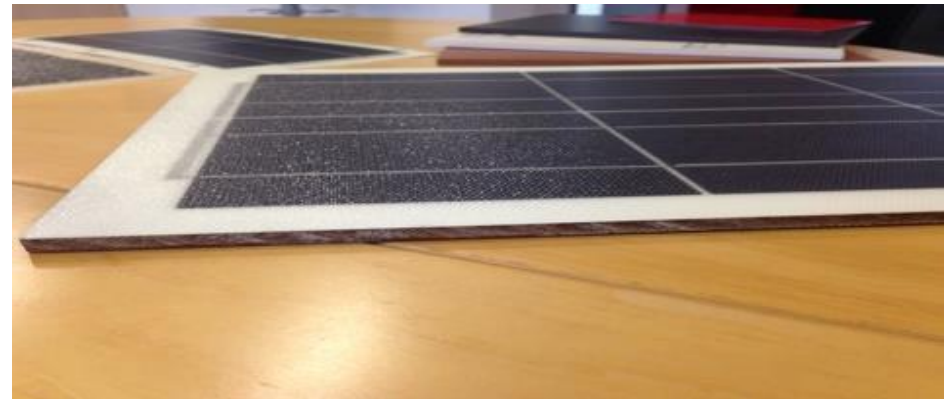
# 3. Range of applications

## Varieties for remarkable architecture

### Possible facade applications



sample



# 3. Range of applications

## Varieties for remarkable architecture

### Eternit Facade



Modules directly laminated on Eternit fiber cement plates – Cooperation with Eternit-Ludwig Hatschek AG



# 3. Range of applications

## Varieties for remarkable architecture

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### Rooftop applications



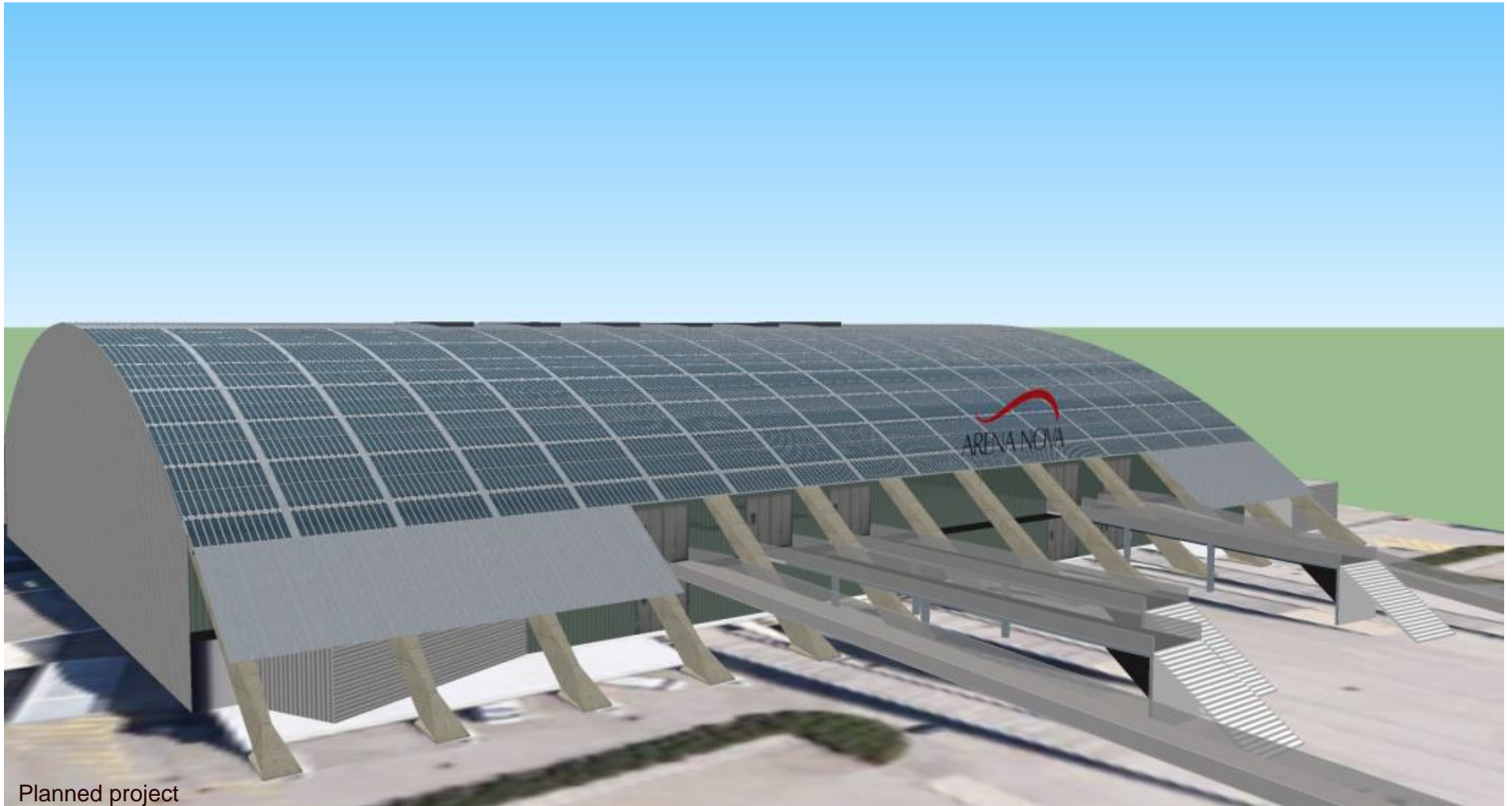
DAS Energy modules glued on aluminium standing seam roof - Cooperation with Kalzip GmbH (Tata Steel Group)



# 3. Range of applications

## Varieties for remarkable architecture

Arena Nova in Wiener Neustadt <sup>1/2</sup>



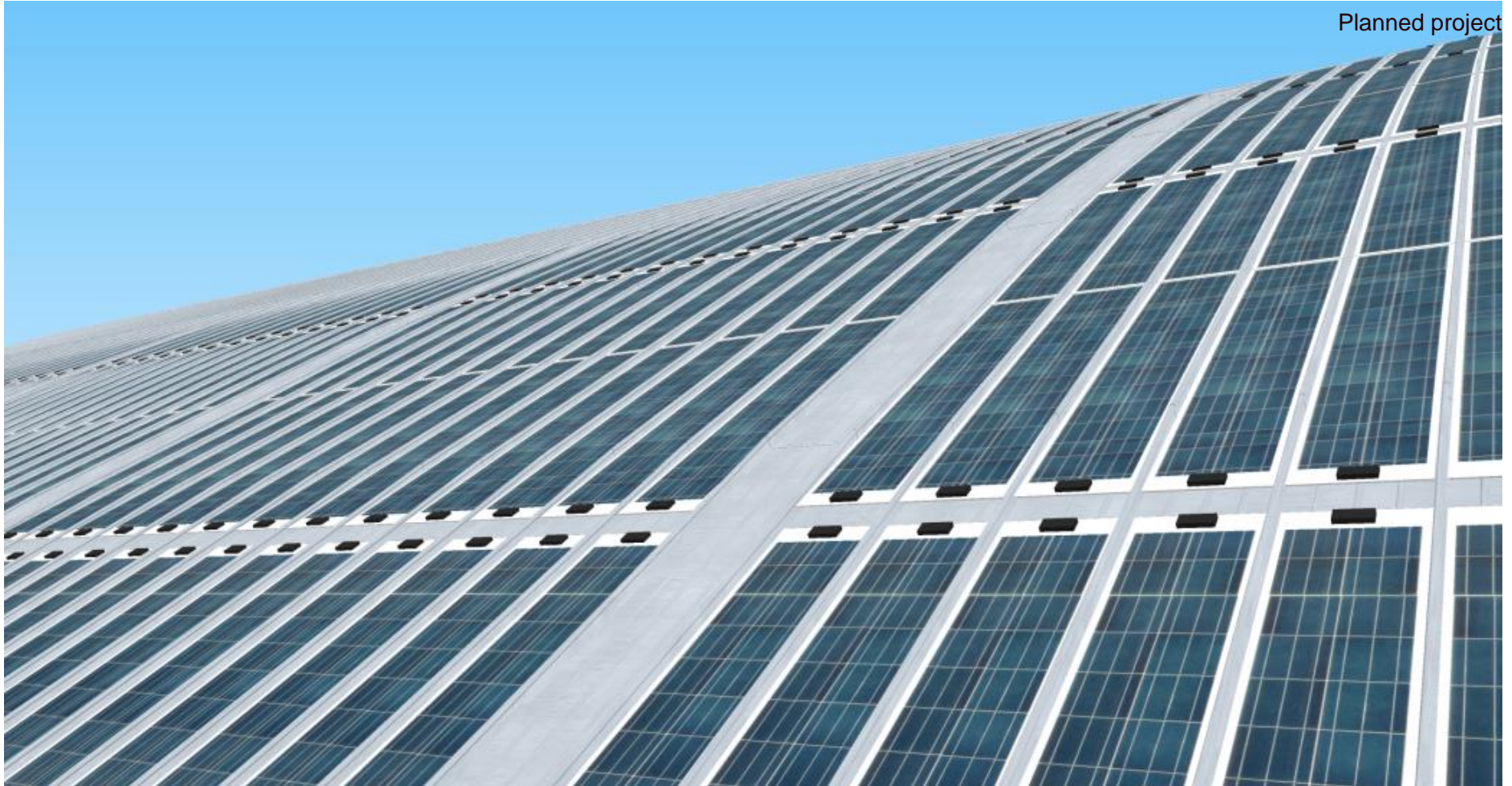
Planned project

# 3. Range of applications

## Varieties for remarkable architecture

Arena Nova in Wiener Neustadt 2/2

Planned project



# 3. Range of applications

## Varieties for mobile applications

### Modules for portable and mobile applications



Module for portable applications with eyelets and optional quick fastening (boat, tent, caravan...)

# 3. Range of applications Special PV Solutions

Smartflower REMULES with modules made by DAS Energy



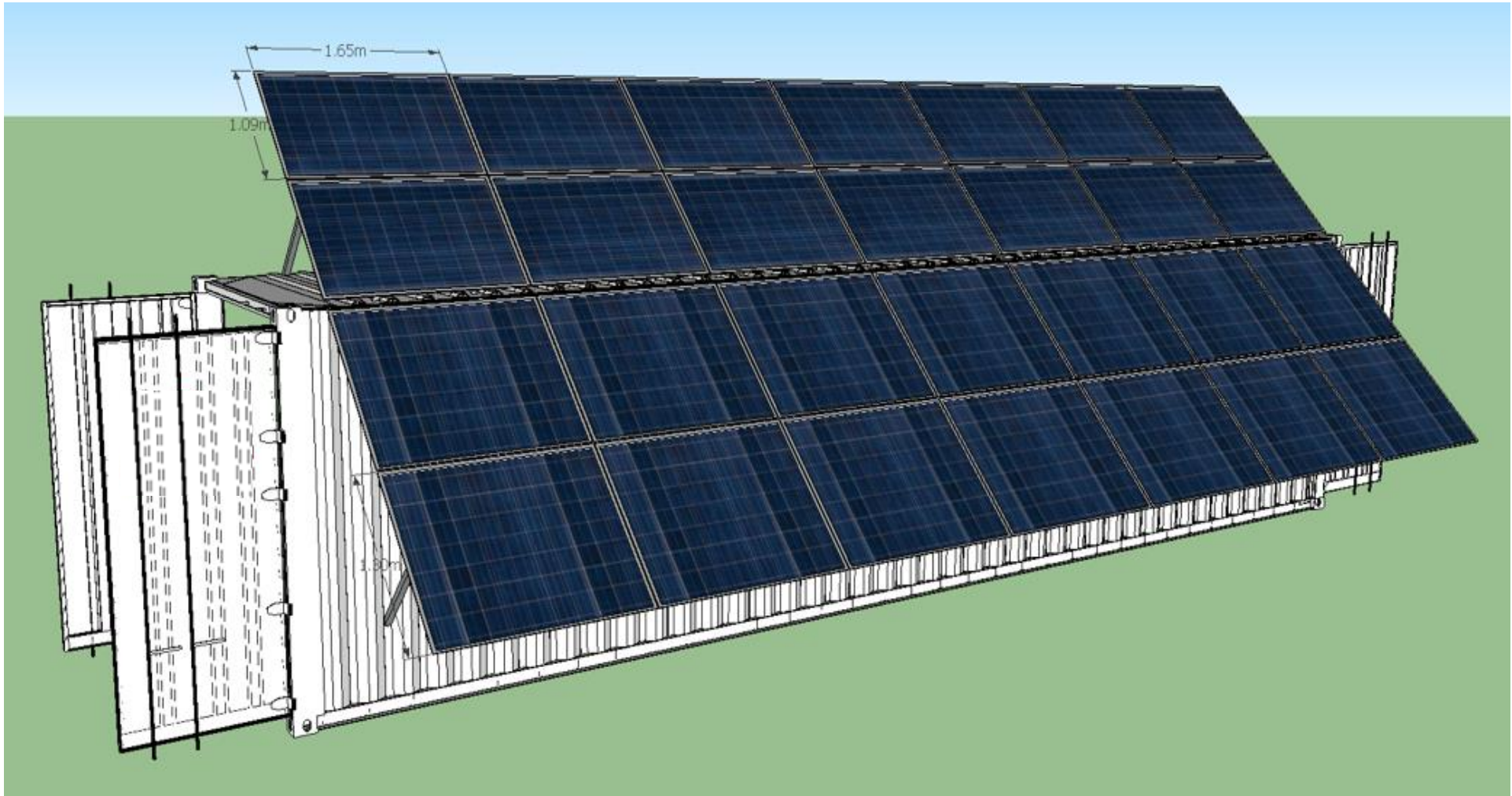
# 3. Range of applications Special PV Solutions

## Hybrid container solutions <sup>1/2</sup>



# 3. Range of applications Special PV Solutions

## Hybrid container solutions *2/2*



**Thank you!**

