

# Company Presentation 08-2015

---













# Product

**What is the story behind a world-leading EPC and an airplane producer developing an ultra light weight and flexible PV module?**

## **Key Technology & Market:**

- Combination of know-how of aircraft production technology with photovoltaic
- Product characteristics:  
Lightweight, flexible PV module with almost unlimited application possibilities
- Flexibility in geometry as well as size



- **DAS Energy GmbH (DAS)** was founded in 2010. Headquarter is located in Wiener Neustadt, Austria on the premises of Diamond Aircraft Group.
- **Core competence** lies in the innovative development of an ultra-lightweight, flexible PV module. The product has been patent pending since 2013.
- **Management:** Operational by Christian Dries and Matthias Schoft, strategically by Christian Dries and Dr. Johann Harter.



# USP of the product - I

## 1. Ultra lightweight PV module

Weight in the size of a standard module is only 3,5 kg – compared to ~ 20 kg for a standard module.

## 2. Thickness is only 2 mm

## 3. Flexible PV module

The PV module can be fixed extremely flexible – adjusts perfectly to the respective underground.

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



# USP of the product - II



- 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**  
gluing, screwing, riveting
- 9. **Hardly visible under military radar**
- 10. **Minimized sunlight reflection**



**Conventional glass module:**  
glare

**DAS Energy module:**  
reduced glare



# USP of the product - III

11. Very high insulation resistance  $\geq 30 \text{ G}\Omega$   
IEC 61215 requires 24,1 M $\Omega$

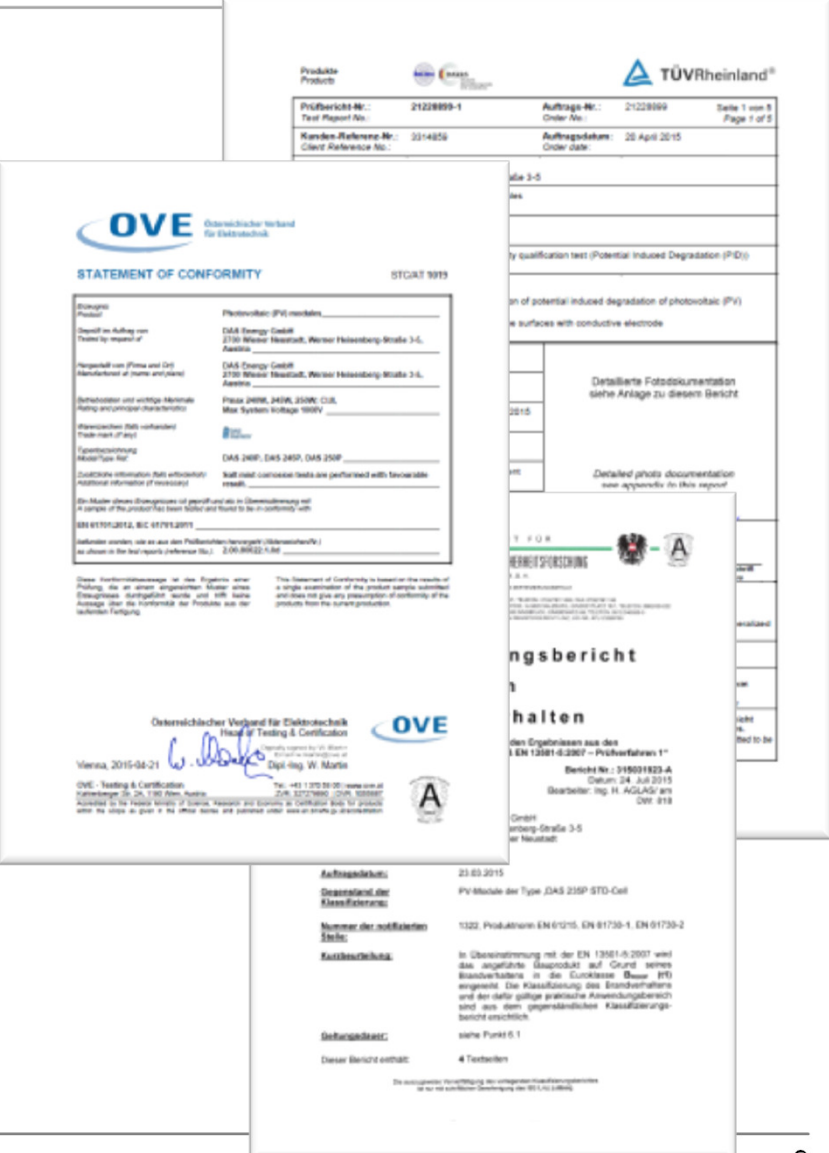
12. No PID (TÜV confirmed)

13. Soil resistant surface

14. More resistant to damage  
compared to conventional glass modules

15. Certified according IEC 61701  
passed salt mist corrosion testing

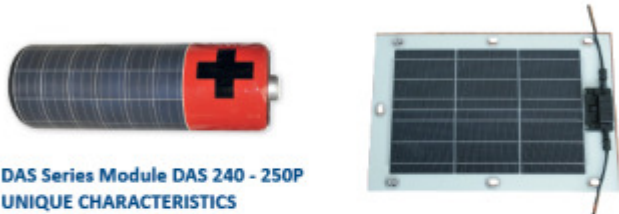
16. Classified according EN 13501-5: BROOF (t1)  
behaviour of roofs exposed to external fire;  
important for building integrated photovoltaic (BIPV)



The image displays a collage of technical documents related to the product's certification. At the top right is a TÜV Rheinland test report (Prüfbericht) for a PV module, with report number 2122899-1 and date 20 April 2015. Below it is an OVE (Österreichischer Verband für Elektrotechnik) Statement of Conformity (STATEMENT OF CONFORMITY) for a photovoltaic (PV) module, dated 23.03.2015. The OVE document includes details about the manufacturer (DAS Energy GmbH) and the product (DAS 240W, 240W, 250W; CIG; Max. System Voltage: 1000V). It also mentions that salt mist corrosion tests were performed with favorable results. To the right of the OVE document is a BROOF (Building Research Organisation of Fire) test report (Berichtsprotokoll) for a PV module, dated 24. Juli 2015. The BROOF report states that the product is classified according to EN 13501-5:2007 as BROOF (t1) and is suitable for building integrated photovoltaic (BIPV) applications. The BROOF report also mentions that the product is classified according to EN 13501-5:2007 as BROOF (t1) and is suitable for building integrated photovoltaic (BIPV) applications.



## 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	8.02	31.17

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

CERTIFICATES	
IEC 61215	
Safety Class II	
IEC 61730	
S400 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.



# Product certification IEC 61215



		<b>Ref. Certif. No.</b> <b>AT 3060</b>
<b>IEC SYSTEM FOR MUTUAL RECOGNITION OF TEST CERTIFICATES FOR ELECTRICAL EQUIPMENT (IECEE) CB SCHEME</b>		<b>SYSTEME CEI D'ACCEPTATION MUTUELLE DE CERTIFICATS D'ESSAIS DES EQUIPEMENTS ELECTRIQUES (IECEE) METHODE OC</b>
<b>CB TEST CERTIFICATE</b>		<b>CERTIFICAT D'ESSAI OC</b>
<b>Product</b> Produit	Photovoltaic (PV) modules	
<b>Name and address of the applicant</b> Nom et adresse du demandeur	DAS Energy GmbH Werner Heisenberg-Straße 3-5, 2700 Wiener Neustadt, Austria	
<b>Name and address of the manufacturer</b> Nom et adresse du fabricant	DAS Energy GmbH Werner Heisenberg-Straße 3-5, 2700 Wiener Neustadt, Austria	
<b>Name and address of the factory</b> Nom et adresse de l'usine <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>	DAS Energy GmbH Werner Heisenberg-Straße 3-5, 2700 Wiener Neustadt, Austria <input type="checkbox"/> Additional information on page 2	
<b>Ratings and principal characteristics</b> Valeurs nominales et caractéristiques principales	see test report page 3	
<b>Trademark (if any)</b> Marque de fabrique (si elle existe)		
<b>Type of Manufacturer's Testing Laboratories used</b> Type de programme du laboratoire d'essais constructeur	--	
<b>Model / Type Ref.</b> Ref. de type	DAS 240P, DAS 245P, DAS 250P	
<b>Additional information (if necessary may also be reported on page 2)</b> Les informations complémentaires (si nécessaire, peuvent être indiqués sur la 2 <sup>ème</sup> page)	-- <input type="checkbox"/> Additional information on page 2	
<b>A sample of the product was tested and found to be in conformity with</b> Un échantillon de ce produit a été essayé et a été considéré conforme à la	IEC 61215(ed.2)	
<b>As shown in the Test Report Ref. No. which forms part of this Certificate</b> 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 ZVR: 327276890   DVR: 1055687
Date: 2014-05-23		

# Product certification IEC 61730

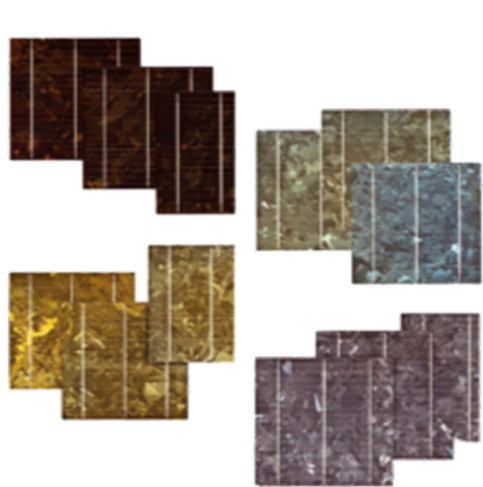


		Ref. Certif. No. <b>AT 3109</b>
IEC SYSTEM FOR MUTUAL RECOGNITION OF TEST CERTIFICATES FOR ELECTRICAL EQUIPMENT (IECEE) CB SCHEME		SYSTEME CEI D'ACCEPTATION MUTUELLE DE CERTIFICATS D'ESSAIS DES EQUIPEMENTS ELECTRIQUES (IECEE) METHODE OC
<b>CB TEST CERTIFICATE</b>		<b>CERTIFICAT D'ESSAI OC</b>
Product 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 reports page 3	
Trademark (if any) Marque de fabrique (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	
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)	<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 61730-1(ed.1);am1;am2 IEC 61730-2(ed.1);am1	
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	2.00.80022.1.0b1, 2.00.80022.1.0c1	
This CB Test Certificate is issued by the National Certification Body Ce Certificat d'essai OC est établi par l'Organisme National de Certification		
	AUSTRIAN ELECTROTECHNICAL ASSOCIATION Kahlenberger Str. 2A 1190 Wien, Austria	Digitally signed by W. Martin Email=w.martin@ove.at
Date: 2014-08-18	Signature: Dipl.-Ing. W. Martin	ZVR: 327279890   DVR: 1055687



## Coloured Design Cells

- Energy production in attractive colours
- Homogeneous colouring
- Reduction of energy costs
- Depending on cell colour, currently between 10% and 14,5% efficiency. Standard format: 6"
- 4" and 5" on customer demand



Source: Sunways



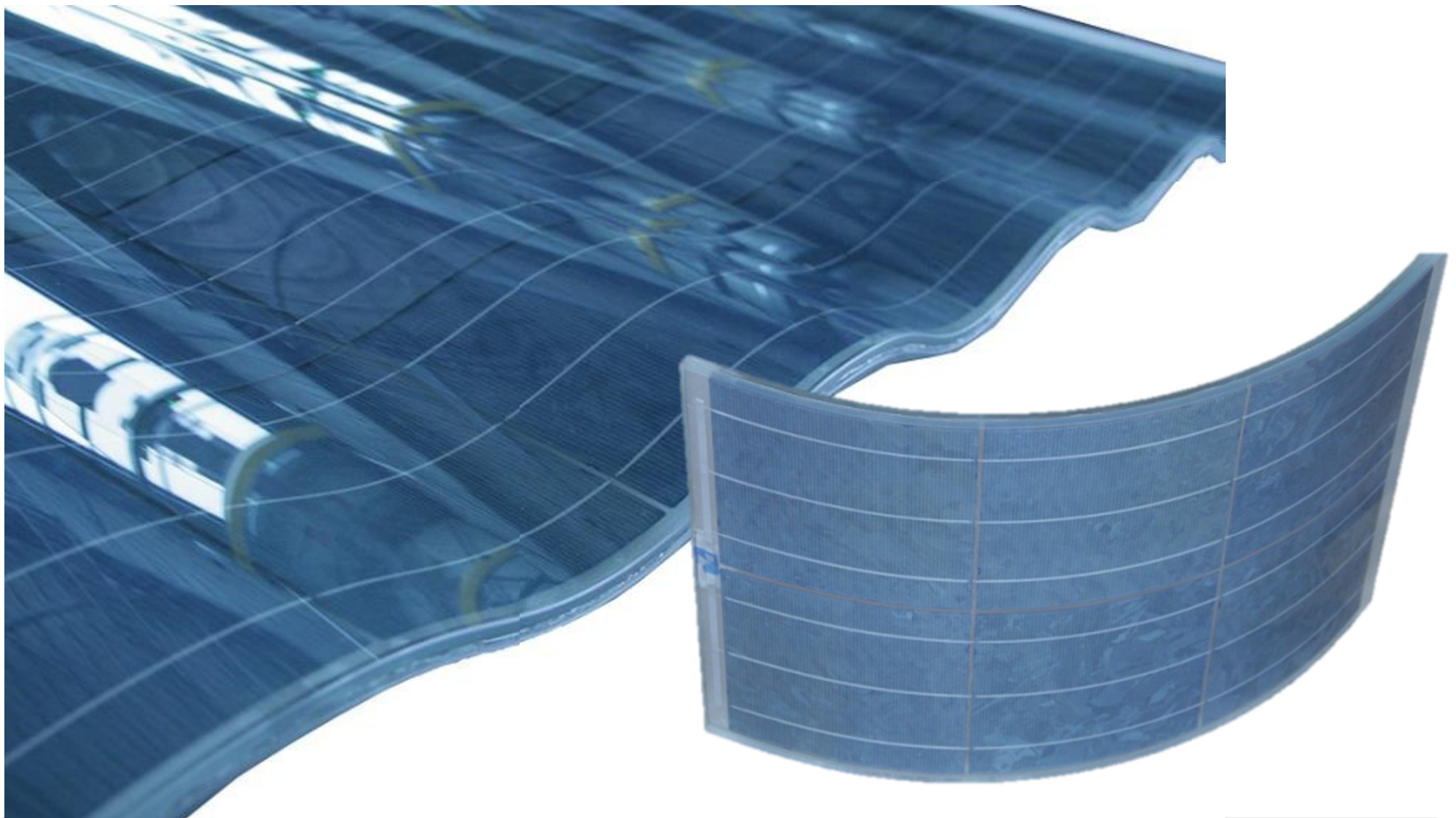
# SFL Glas - I

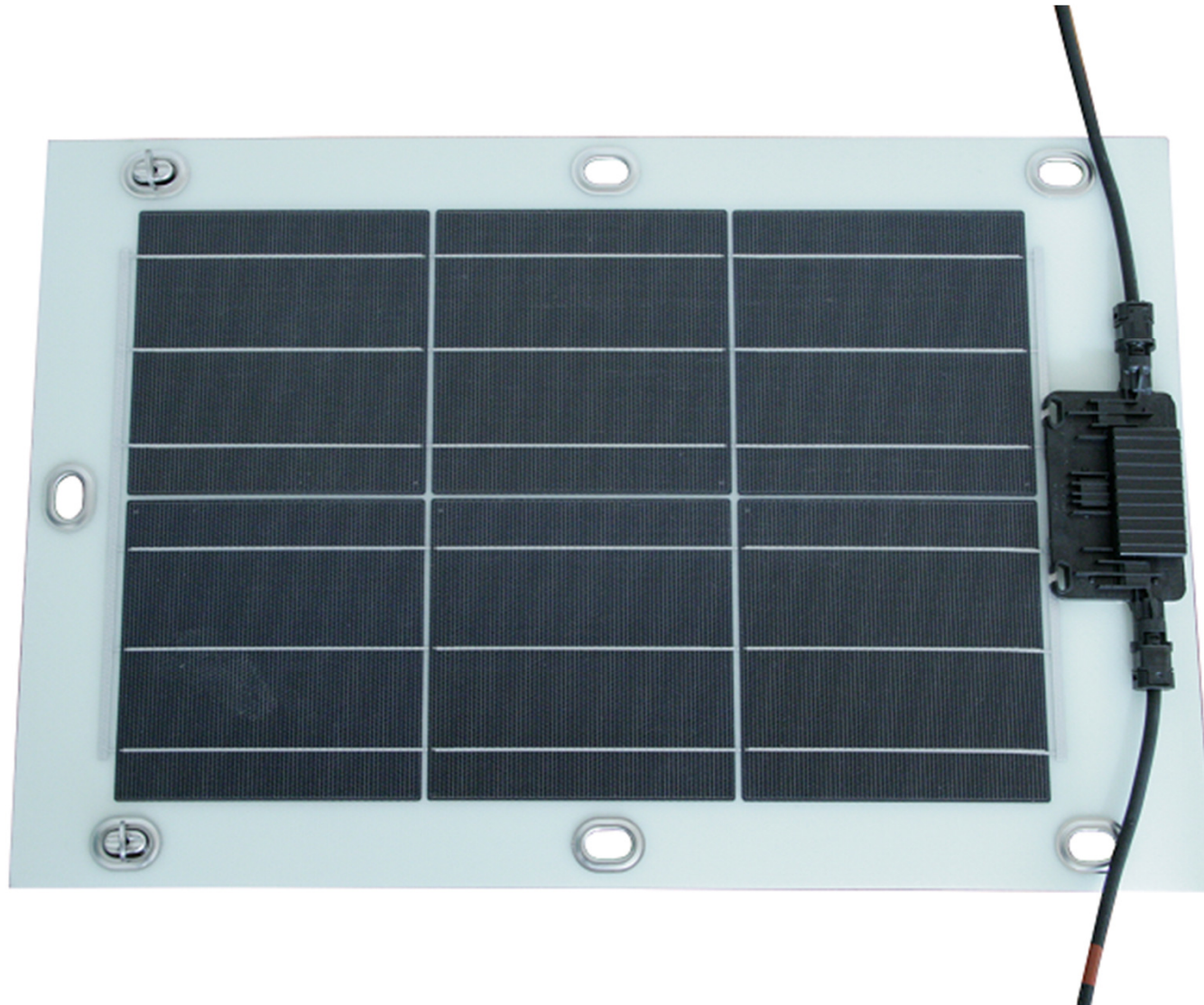
---





# SFL Glas - II







# Product

60 cell module bending down to 50 cm diameter





# Customer projects

## Smartflower REMULES with modules made by DAS Energy





# Potential "flag-ship" projects



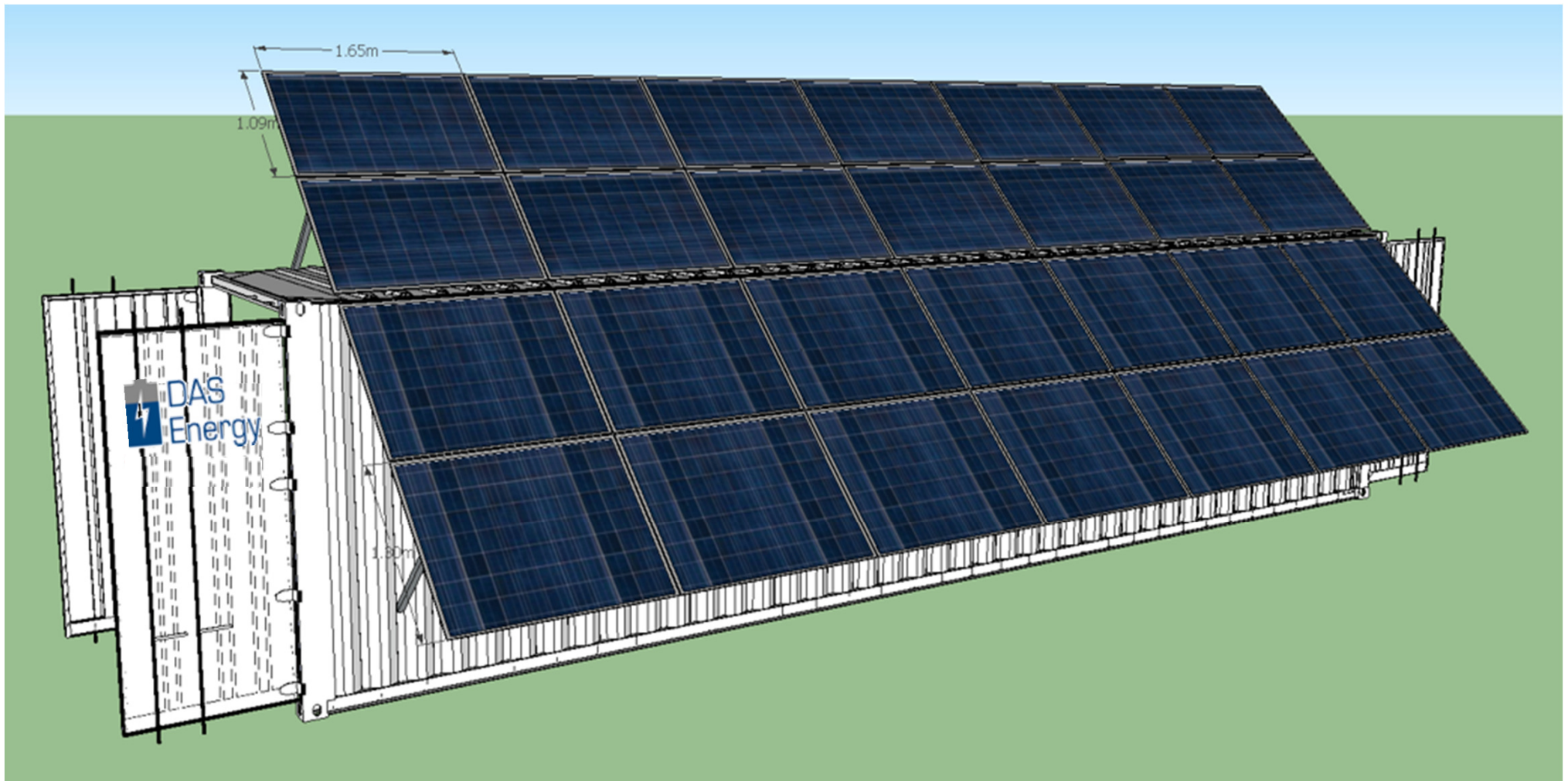
## Hybrid Container Solution





# Potential "flag-ship" projects

## Hybrid Container Solution

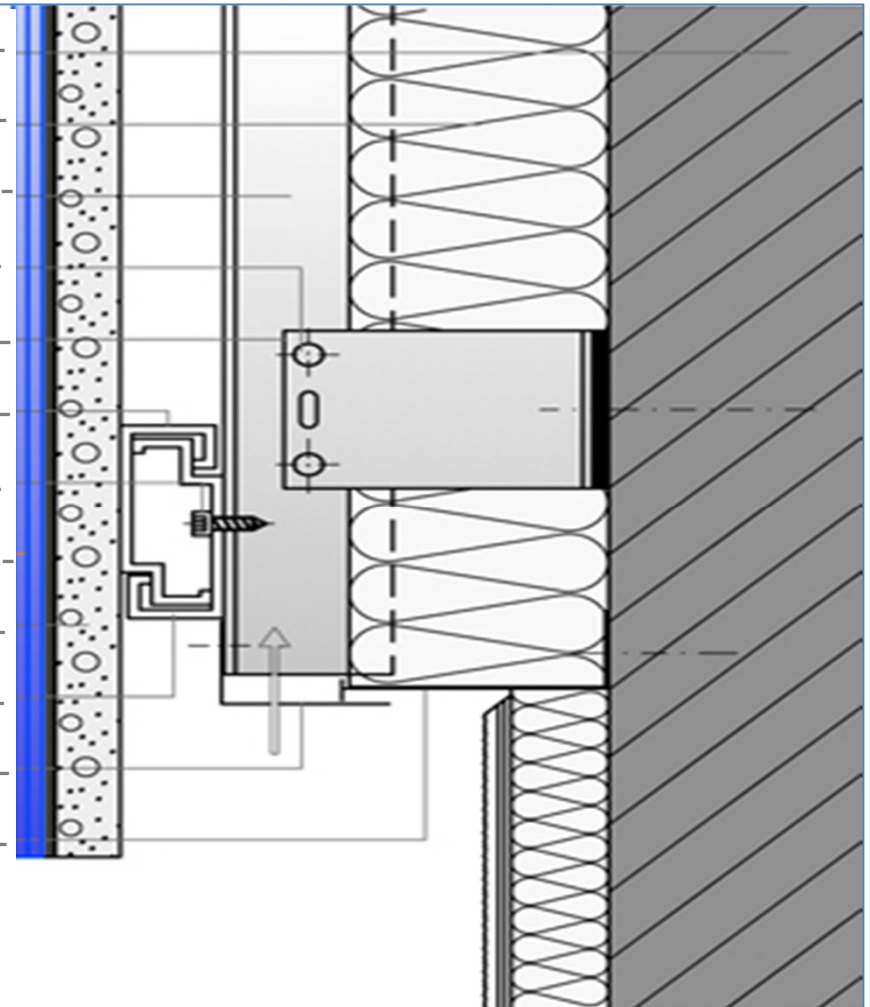




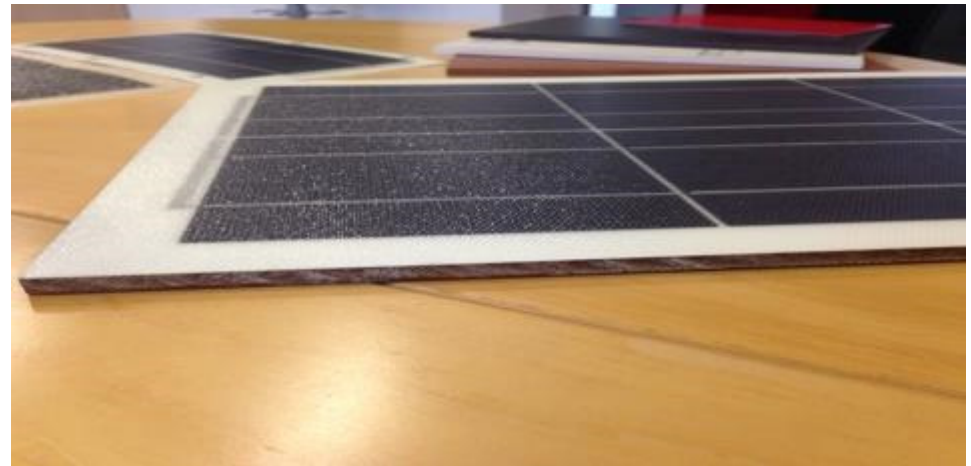
# Façade application

Façade application (without changing the 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 -----



# Possible façade application



# Eternit Façade

---





# Kalzip - aluminium standing seam roof **DAS Energy**

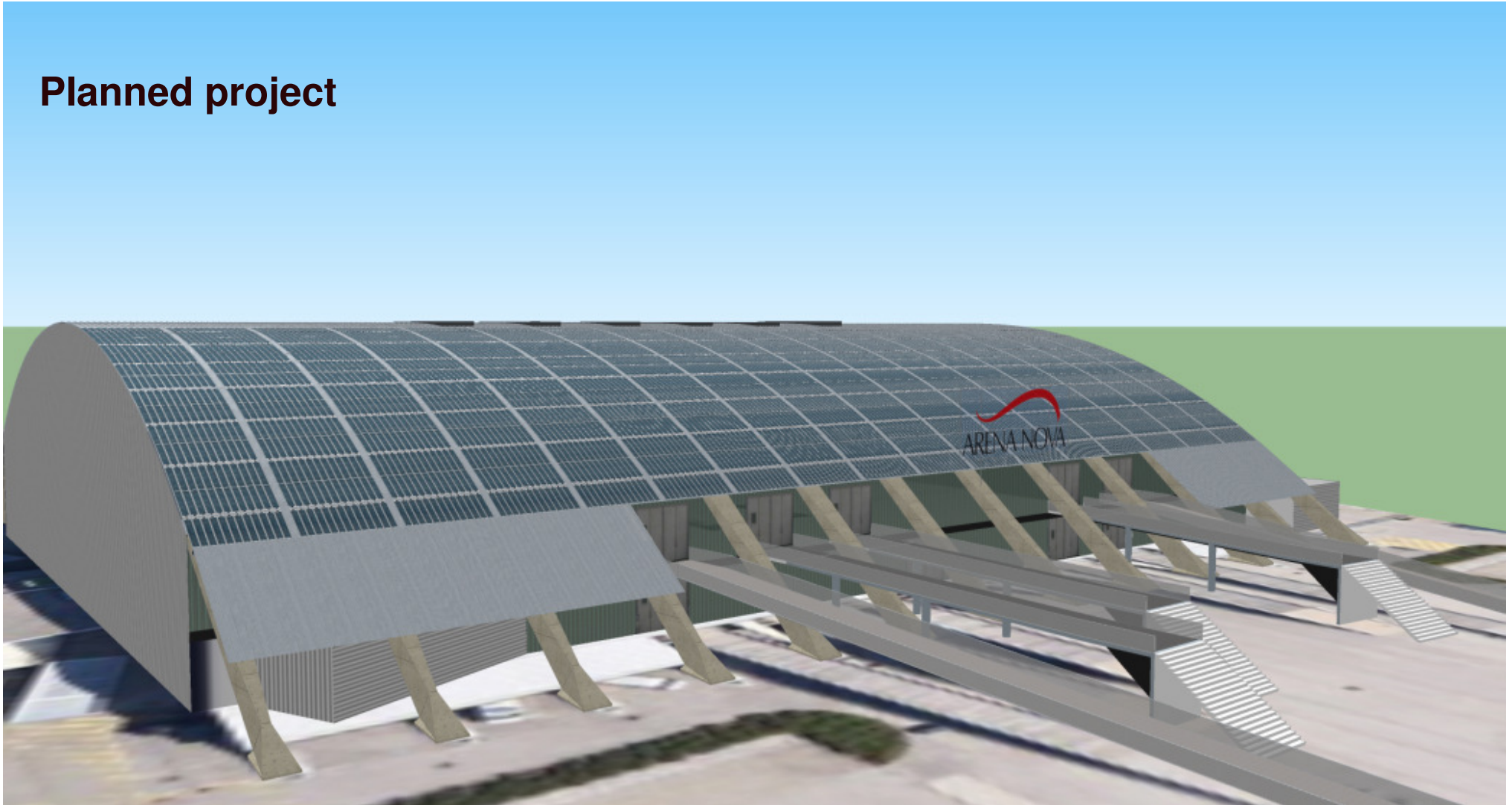
---



# ARENA NOVA Wiener Neustadt



Planned project

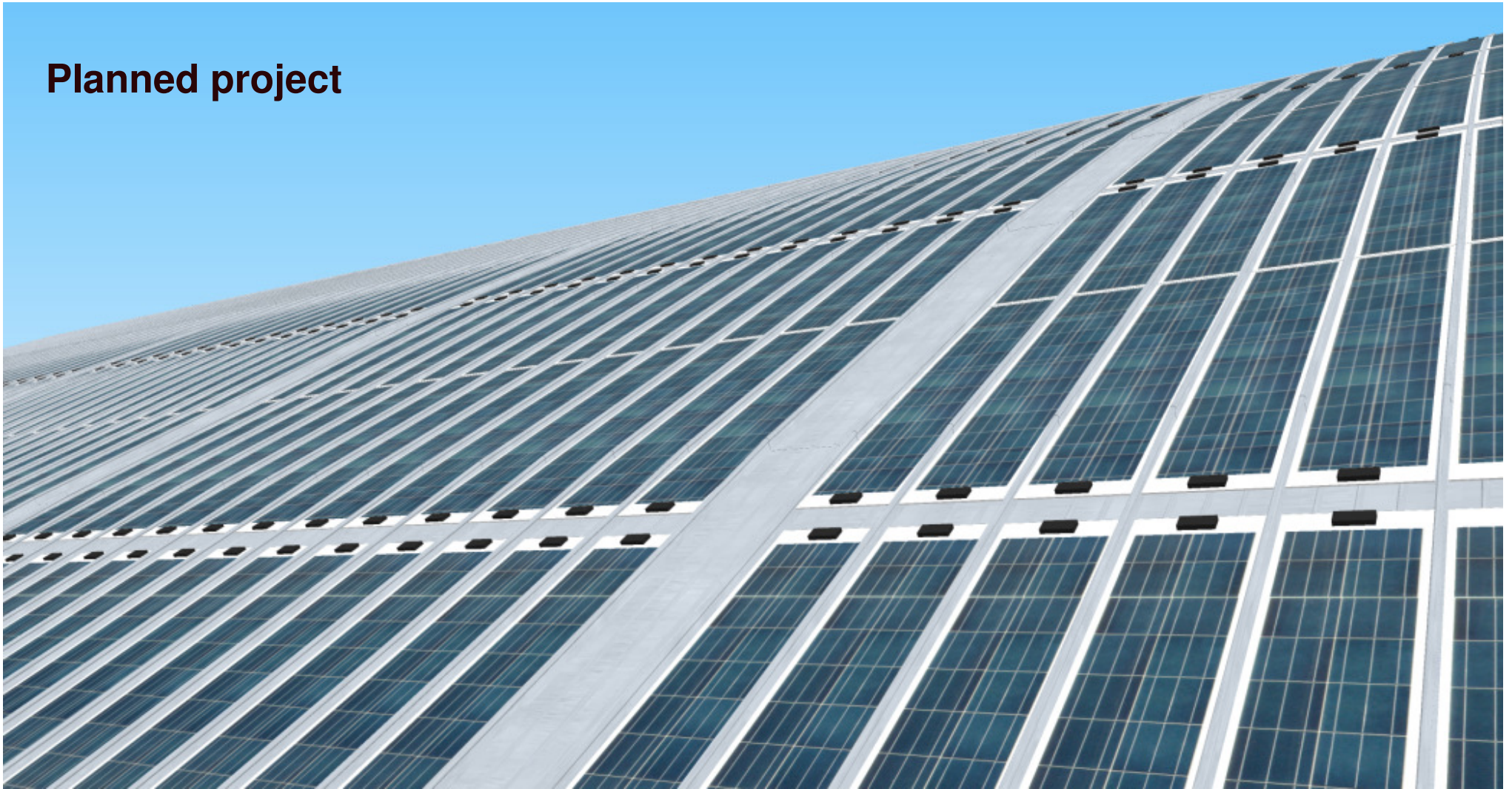




# ARENA NOVA Wiener Neustadt



**Planned project**





# Roof elements

## KALZIP module 100 Wp - applications



Working with strong industrial partners, using the advantage of flexibility and light weight.

*Source: Kalzip*

# Pilot line and Factory at Wiener Neustadt



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





# Ground breaking for new production facility

- On July 23<sup>rd</sup> 2015 the ground breaking took place in Wiener Neustadt
- Planned completion: Q2 / 2016
- Nominal production capacity: 75 MWp



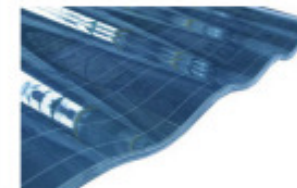
## Österreich bekommt neues Modulwerk

28. Juli 2015 | Märkte und Trends, Topnews

DAS Energy hat mit dem Bau einer neuen Produktionsstätte mit 75 Megawatt Jahreskapazität in der Nähe von Wien begonnen. Das Modulwerk soll voraussichtlich im zweiten Quartal 2016 seinen Betrieb aufnehmen.

## Photovoltaik-Produktion in Österreich: DAS Energy GmbH legt Grundstein für Modulfertigung mit 75 MWp

3+1 0 Tweet 3 Gefällt mir 1



Am 23. Juli 2015 fand in Wiener Neustadt die Grundsteinlegung für das neue Betriebsgebäude der DAS Energy GmbH statt.

Die neue Fertigungsstätte (geplante Fertigstellung Q2/2016) wird eine nominale Produktionskapazität von 75 Megawatt (MWp) haben.

Anwendungsbereiche für die in glasfaserverstärktem Kunststoff eingebetteten Module, sind schwerpunktmäßig gebäudeintegrierte Photovoltaik (BIPV, farbliche Anpassung an

DAS Energy plant, das zum Patent angemeldete Photovoltaik-Produkt mittelfristig mit Joint-Venture-Partnern in mehreren Produktionsstätten weltweit zu

Der Grundstein für das neue Modulwerk in Österreich ist gelegt.  
Foto: DAS Energy GmbH

Grundsteinlegung für eine 75-MW-Modulproduktion in Österreich (Foto: DAS Energy)



**Thank you!**

