Insight Science Photovoltaik & BIM
BIPV - Headquater PÜSPÖK
ad2 architekten

Who is PÜSPÖK GROUP

- Windparkmanagement company since 1997
- In meantime the biggest private electricity producer in Burgenland
- Püspök operates 91 wind energy plants (windmill)
- The company grows from 1 person up to 15 staff members in 10 years
- 2013 decision for the new headquater in Parndorf

Project timetable

- Architecture competition October 2013
- Decision for the project of ad2 architekten November 2013
- Urban administration process until March 2014
- Start of construction Mai 2014
- Delivery of the building April 2015

Requirements to the competition

- Office for 20 company members
- Sun on the work table for min. 2 hours on the 21. of December
- Courtyard (traditional burgenländisch)
- All office spaces in one level (flat command structure)
- Energy self-sustaining as far as possible
- PV on the roof
- E-service station

PV in conventional using – design problem for ad2 architekten

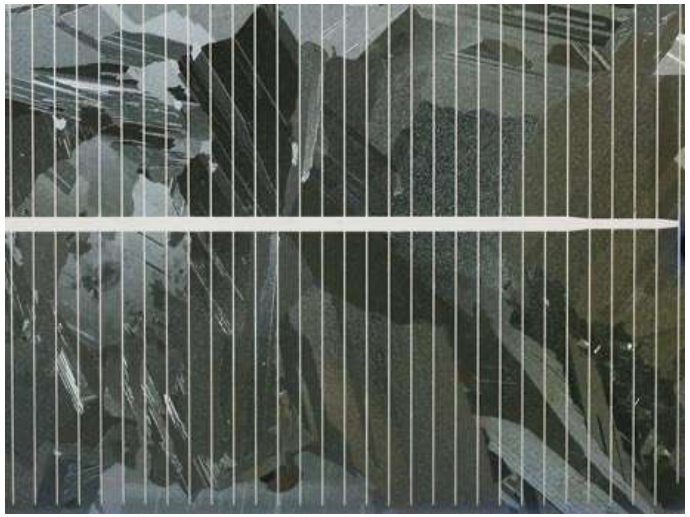
trouble analysis

- Fixed dimensions
- Definitive raster

PV in conventional using – design problem for ad2 architekten

trouble analysis

- Polycristallin cells - multicolored
- Monocristallin cells - bluecolored
- No transparence



Design dogma of ad2 for a holistic building

- Heating and cooling by activating the building chassis (compound) with heat pump
- Semiautomatic slats for sunprotection – perfect passiv energy earnings
- Operate the heat pump with PV energy
- Re-use rainwater
- High efficient insulation
- Green roofs

Design dogma of ad2 for a holistic building

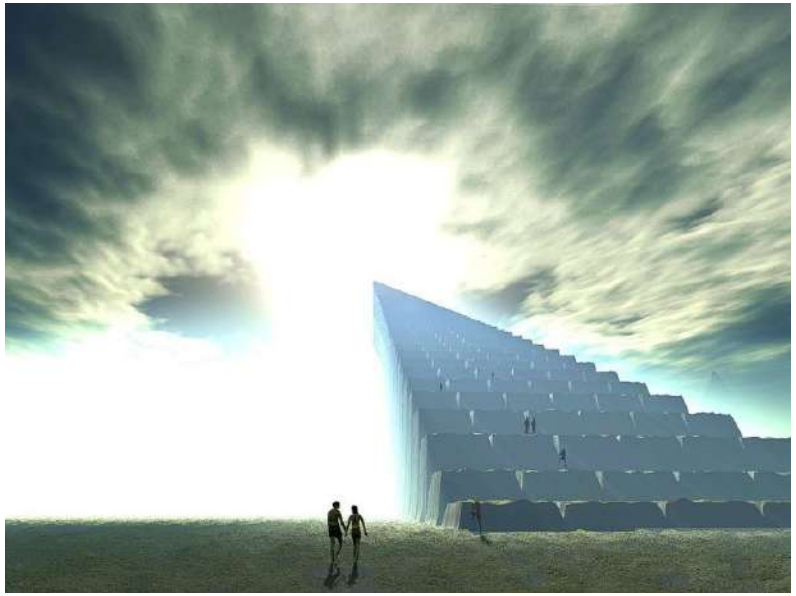
- Air collectorpipes under the ground and heat recovery systems
- PV solar panels as an essential element of the architecture (BIPV)

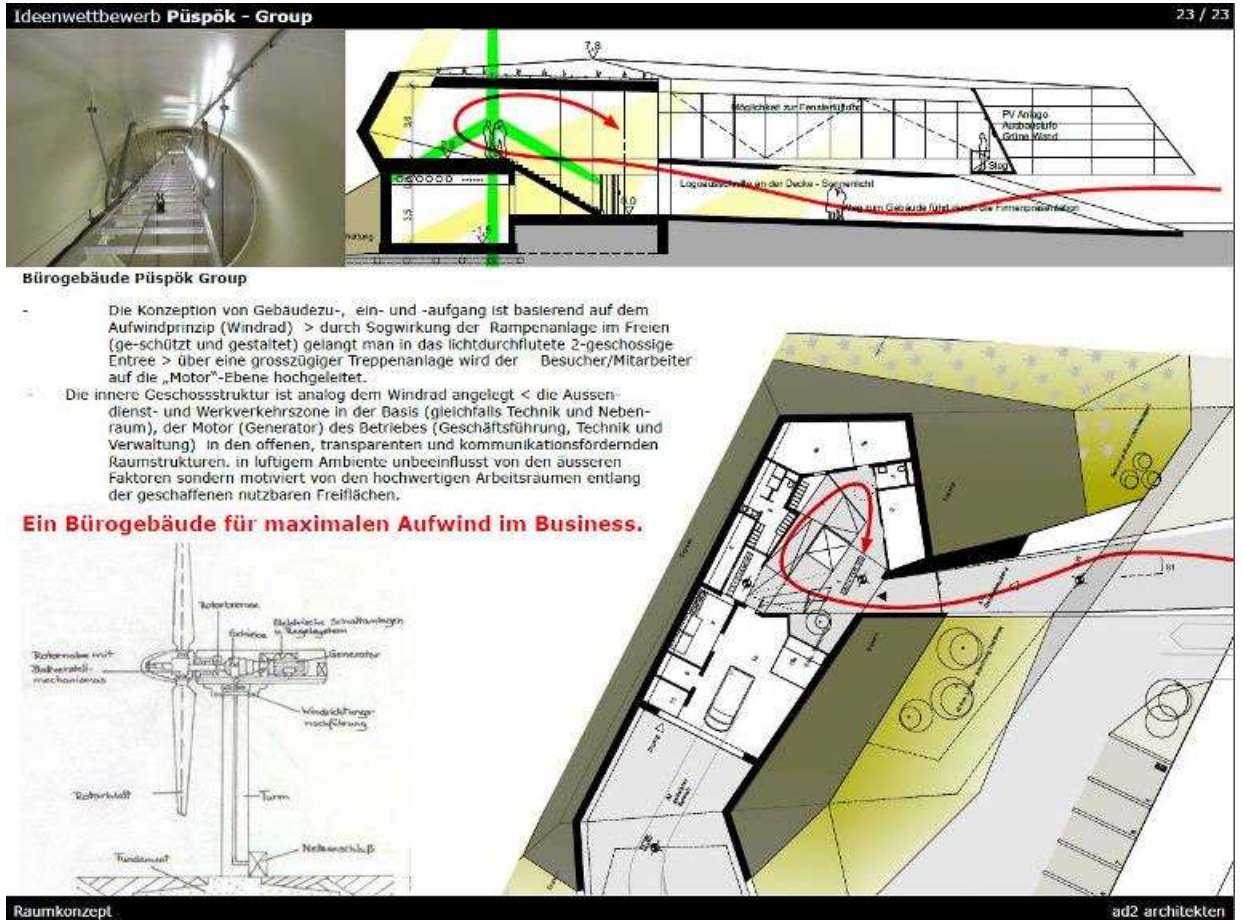
The Project

– One story building on a hill

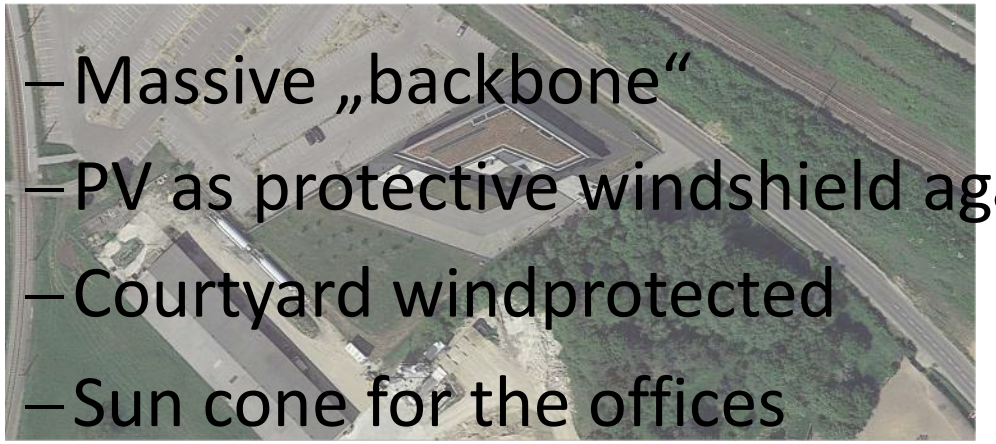
The Project

- Stairway to heaven
- Like an energy tubine





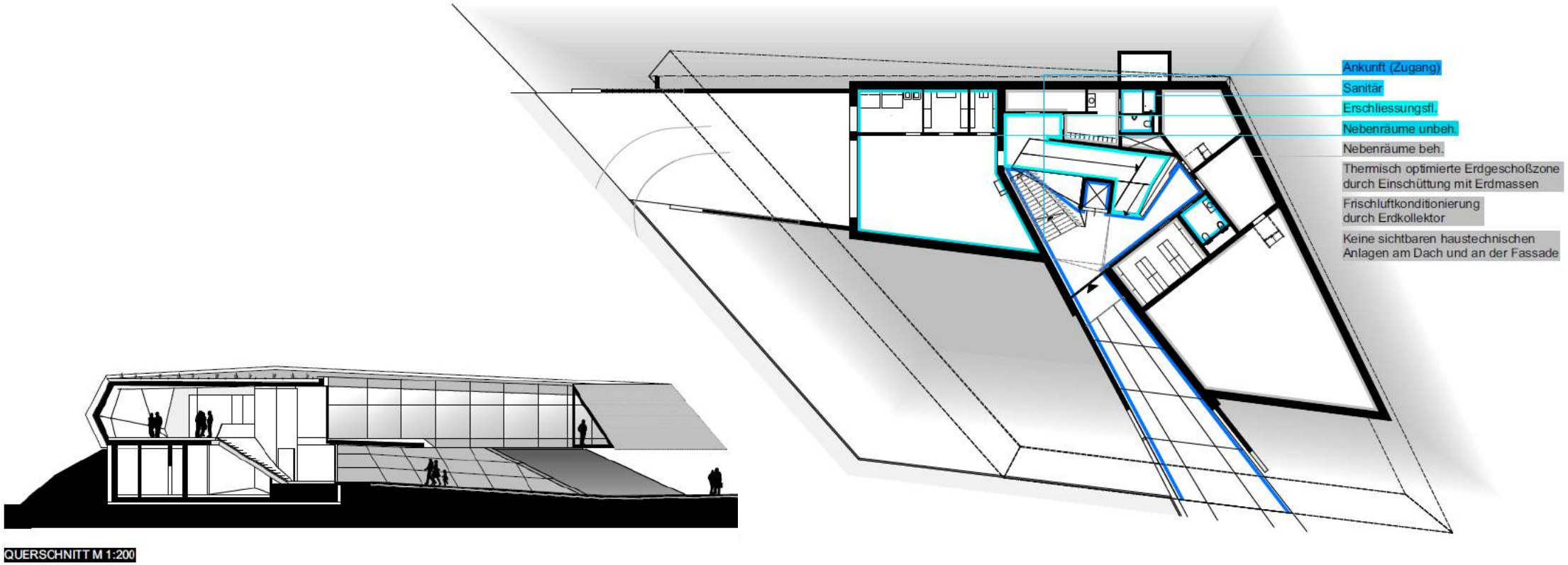
The Project



- Massive „backbone“
- PV as protective windshield against an the industrial neighbors
- Courtyard windprotected
- Sun cone for the offices

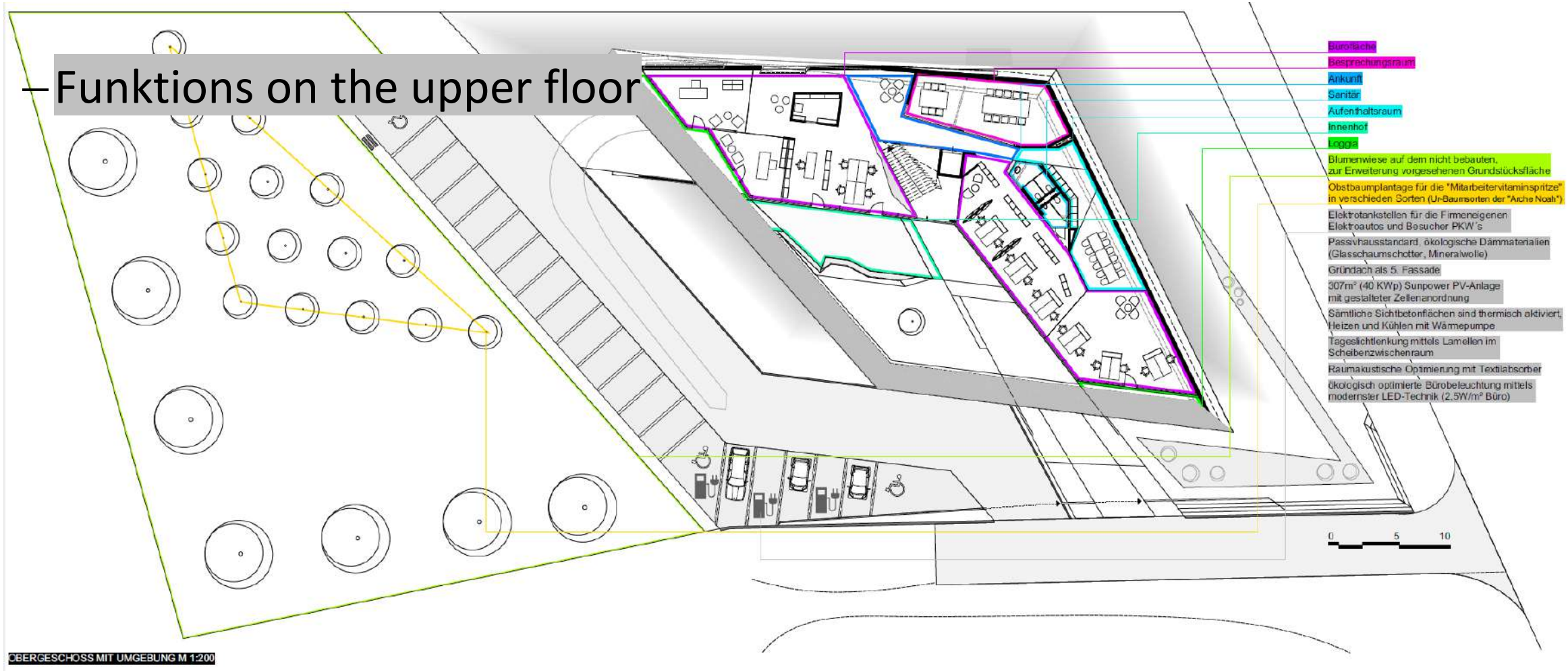
The Project

– Funktions on the ground floor



The Project

– Funktions on the upper floor



troubleshooting – comb through the industry

- Thin film PV wasn´t available, production company was insolvent
- We dont like perforated cells (double raster – less power)

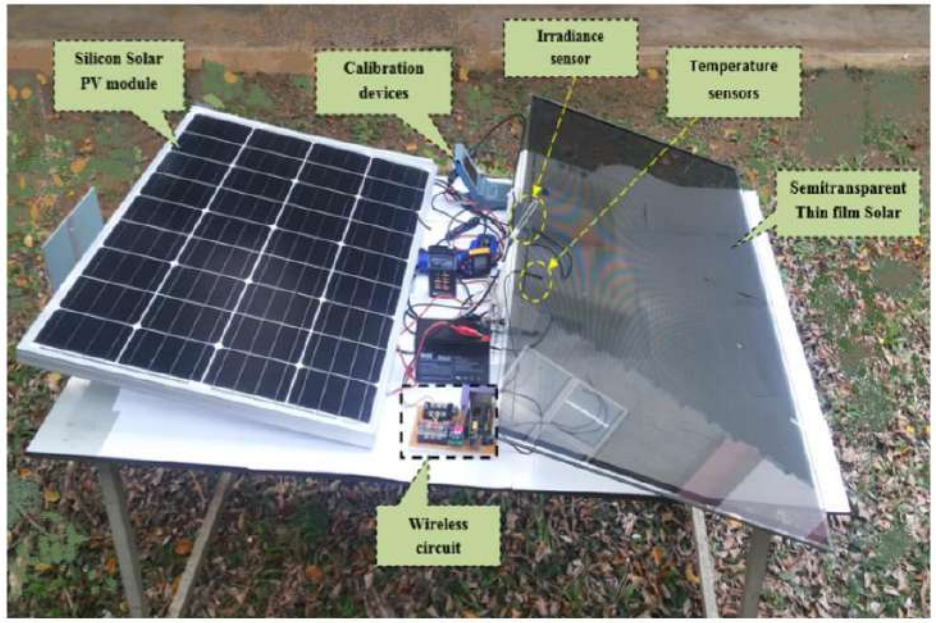
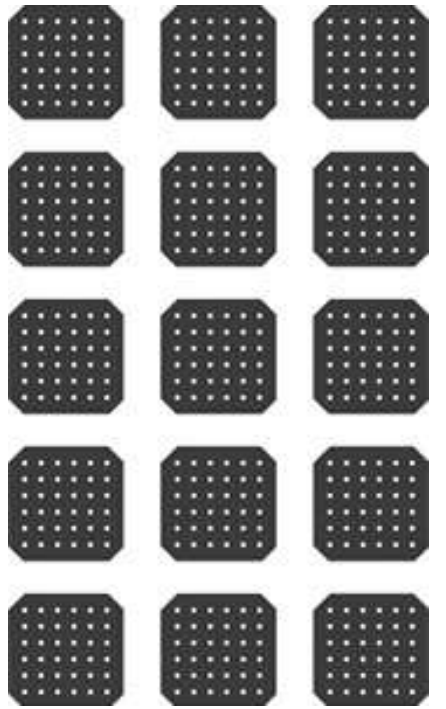
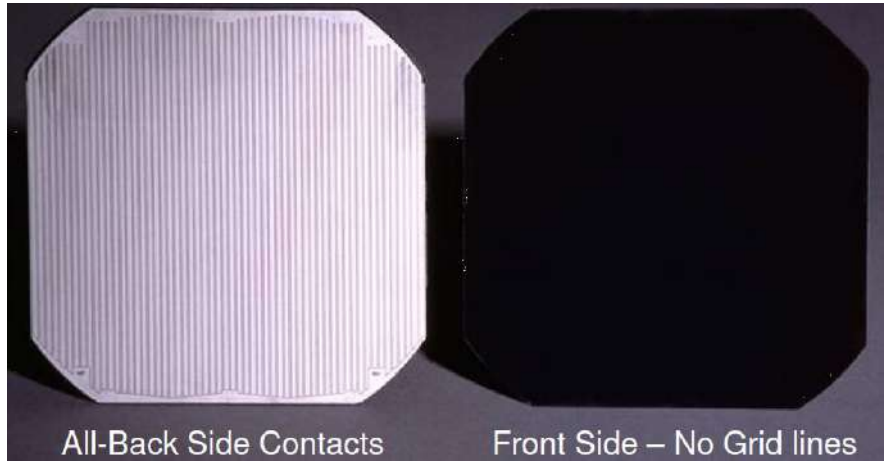


FIGURE 9. Field-based experimental measurements for one Thin-Film STPV and its equivalent silicon-based modules.



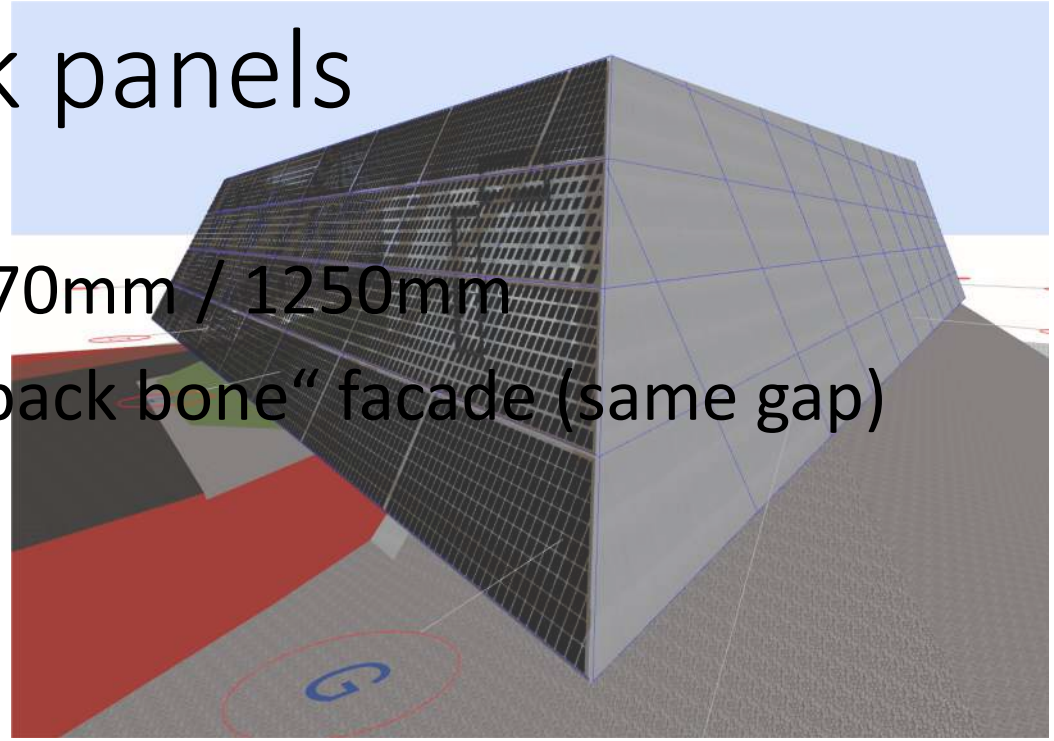
Solution – custom-made panels

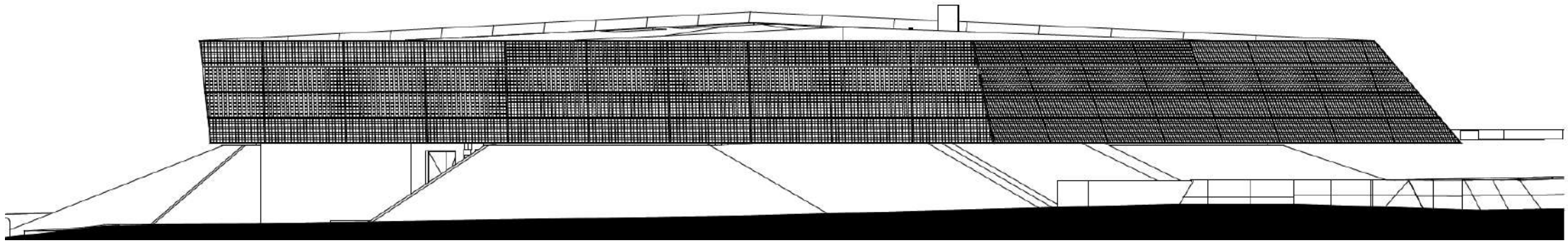
- Sunpower super cells 170Wp/m²
- Totaly black cells
- Custom-made panels are possible
- Play with the pattern



ad2 designed the Püspök panels

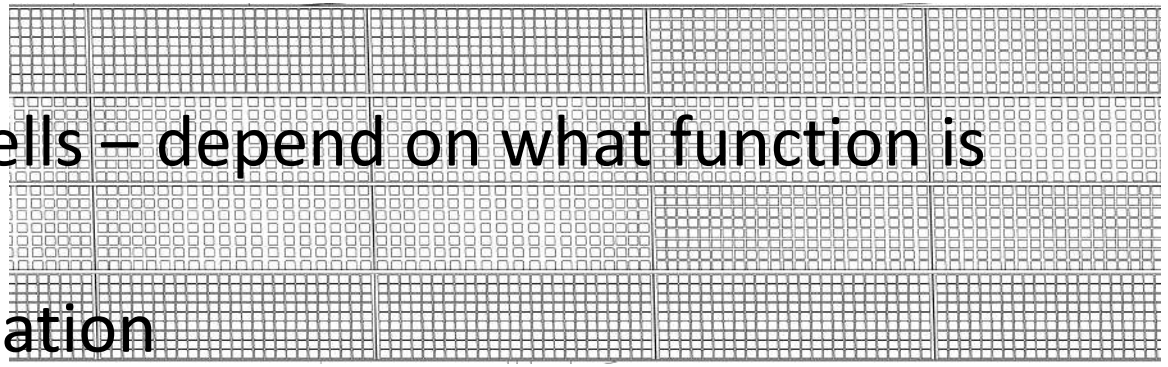
- Very big panels dimensions up to 4170mm / 1250mm
- Panels height correspond with the „back bone“ facade (same gap)
- Dummy cells in the corners

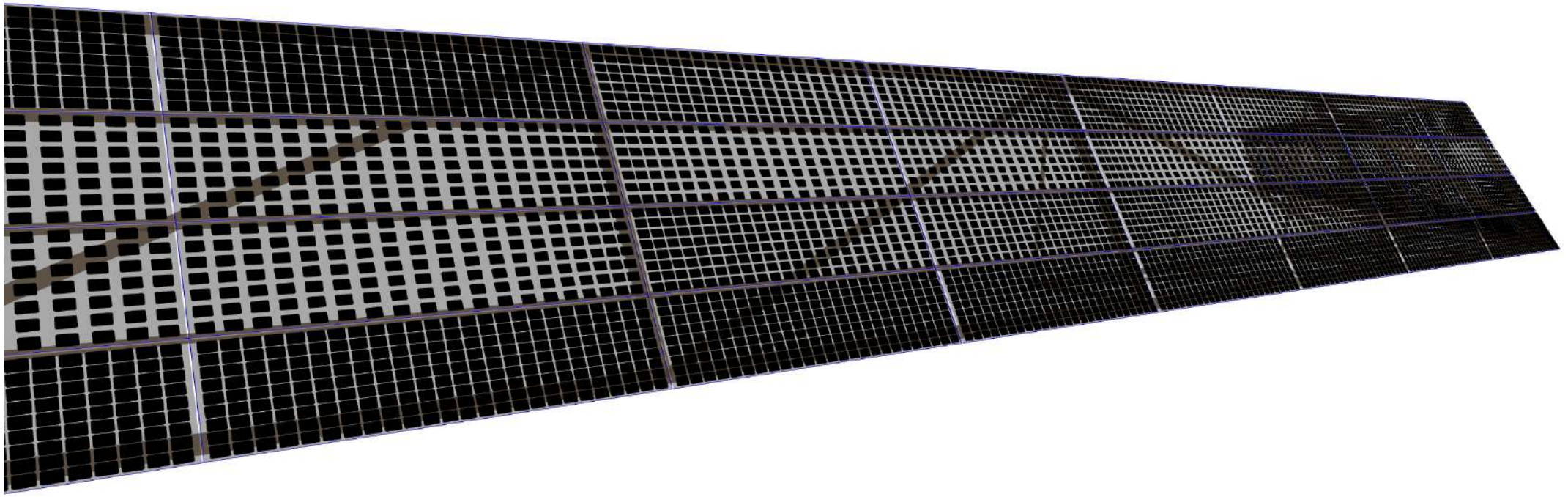




ad2 designd the Püspök panels

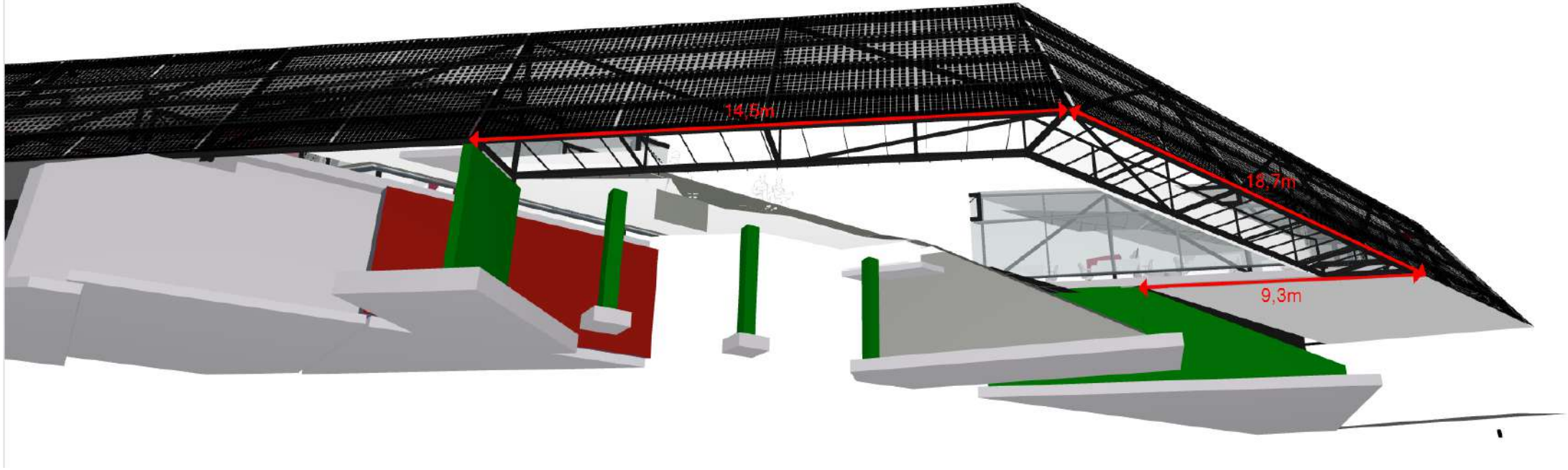
- Different spacing between the cells – depend on what function is behind
- Possibility with a grayglass lamination





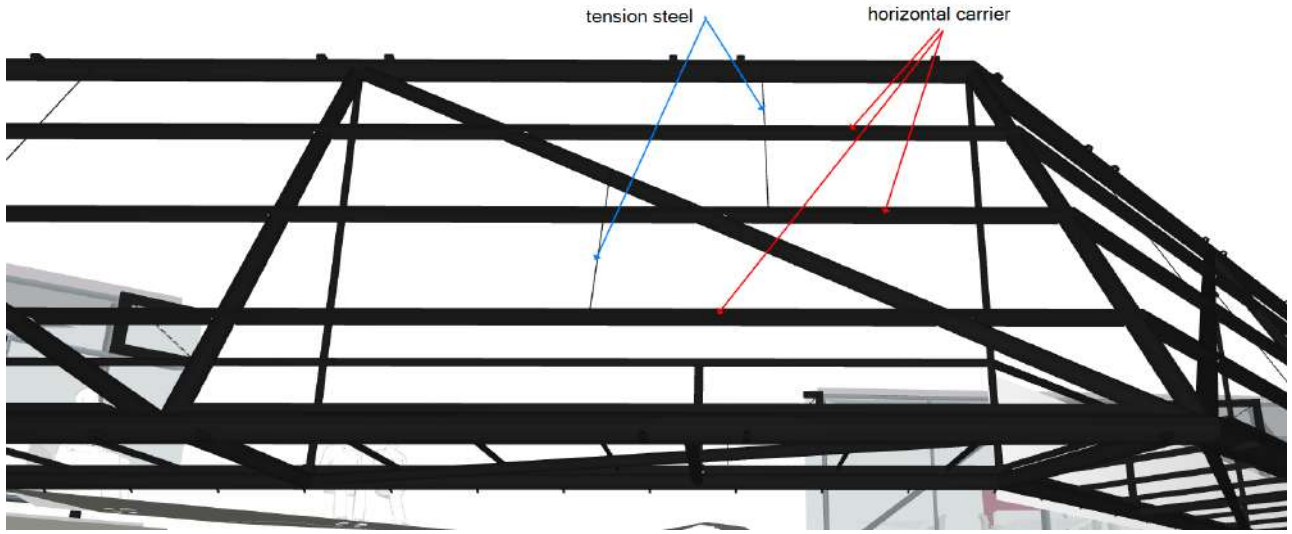
Substructure for the Panels

- Masterscetch of the competition was a light steel construction
- Exciting projections up to 18.5m
- First calculation of the deflection was up to 74cm



Substructure for the Panels

– Engineers have to optimize the construction
– Change direction of the diagonal rods
– Horizontal carrier for the PV-Panels and tension steel to keep it slim
– Better steelquality
– deflection only 4cm
– Perfect improvement



Substructure for the Panels

prefabrication

Substructure for the Panels

Steel knots without screws

Attachement steelpipe

40mm material thickness

Substructure for the Panels

The transport was only in the night posible

The buildingplot was prepared for assemble the construction

Substructure for the Panels

2 mobile crane lift the construction syncron

the construction fits

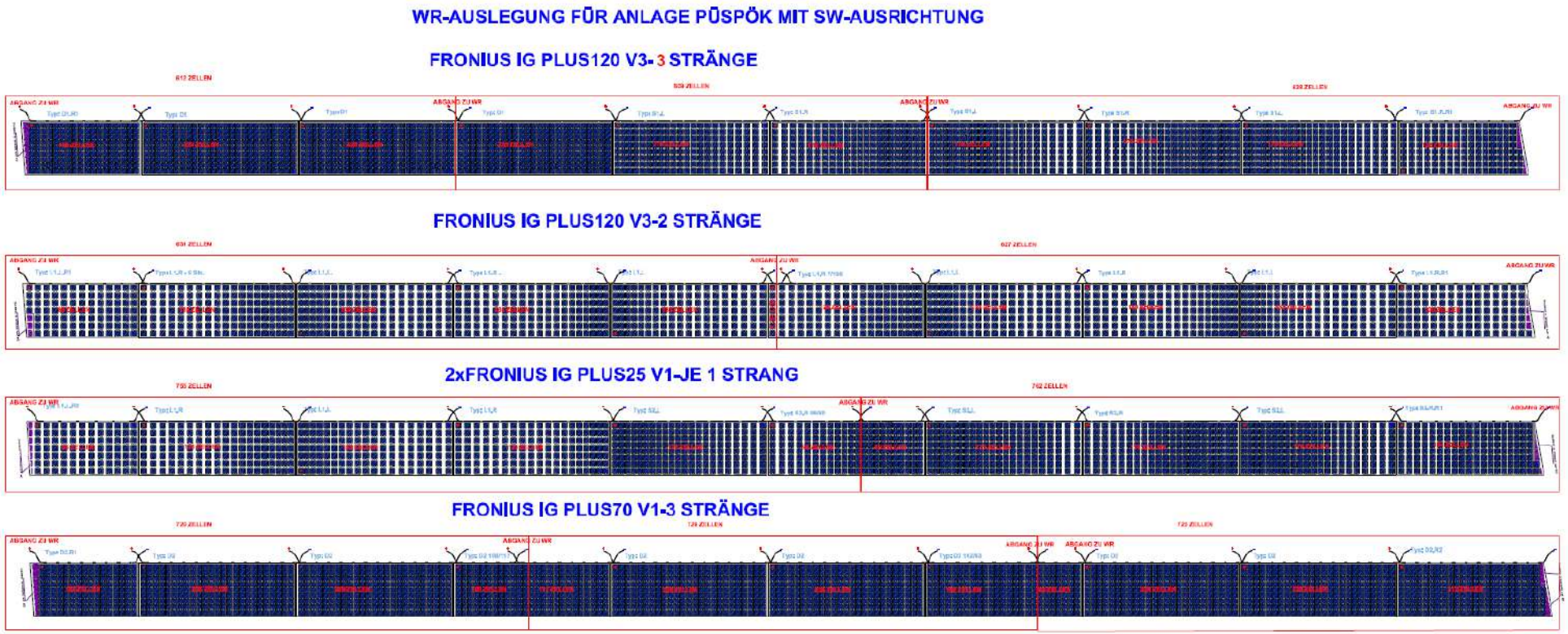
The dimesion of the diagonal was 66m. The tolerance between the concrete mainconstruction an the steelconstruction was 8mm.

Substructure for the Panels

the team was happy!

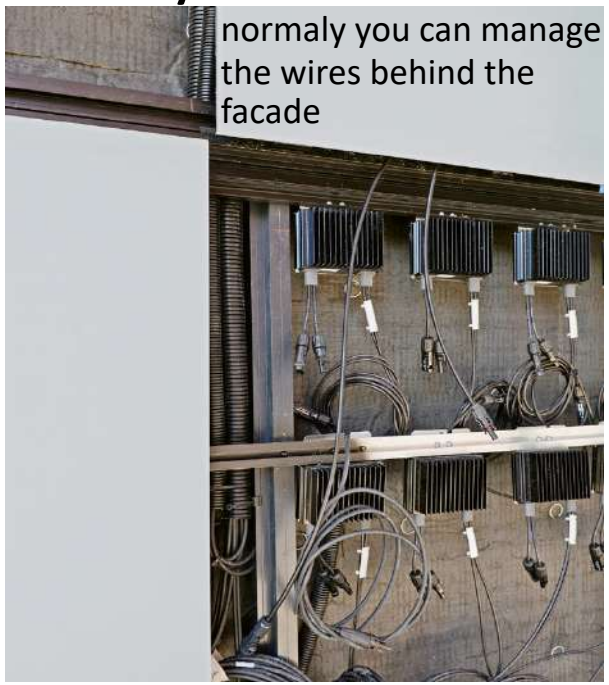
PV-panel design and layout

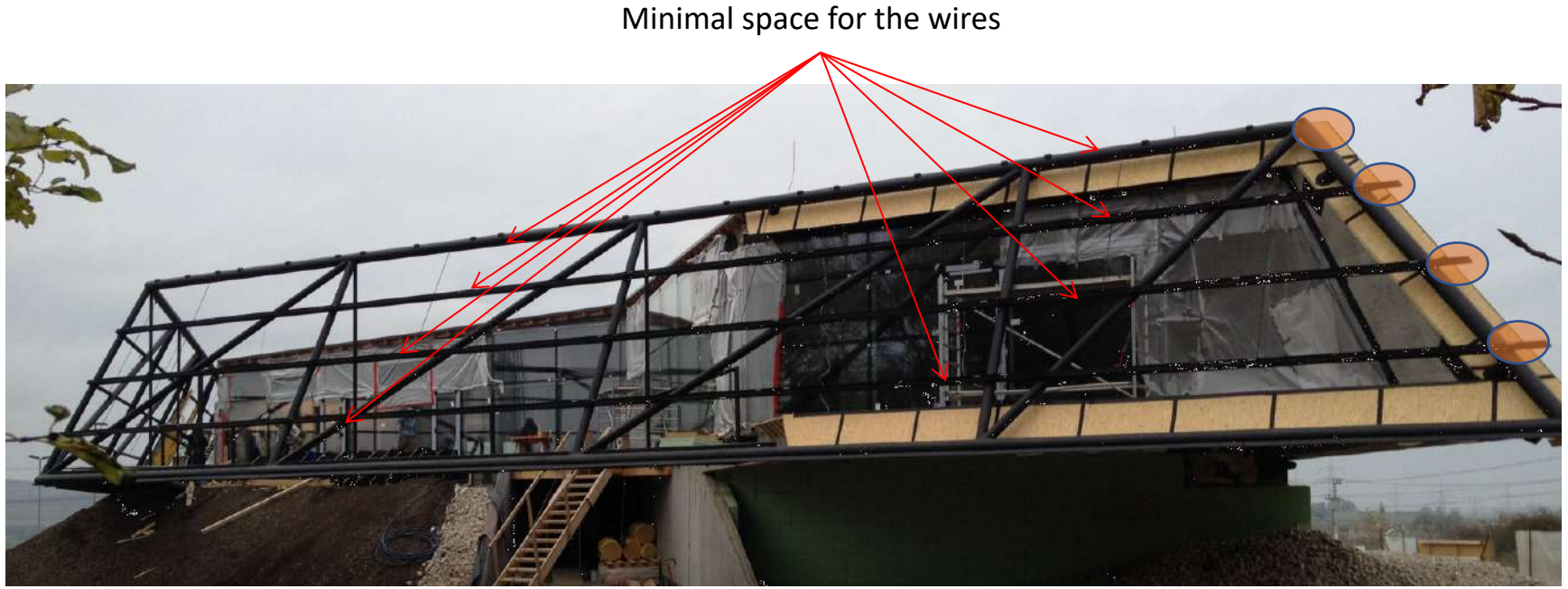
– Inverter planning was difficult – panels with different numbers of cells



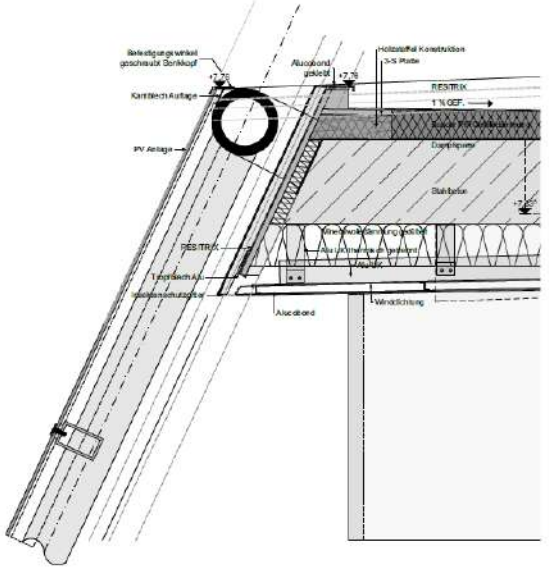
Wires managemet

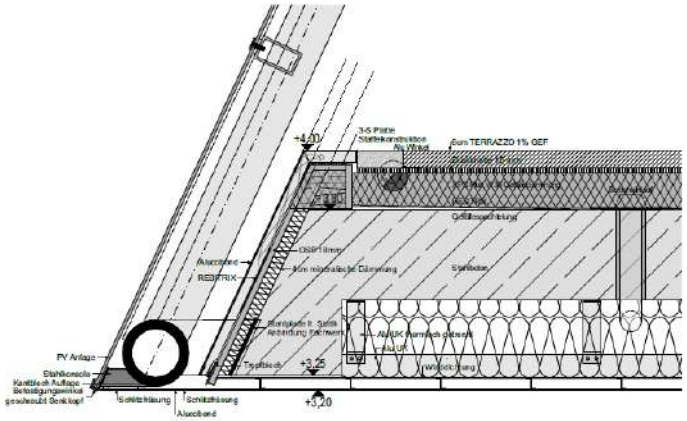
- Wires management is important – the visibility is also from inside out
- We have no ceeling and no bottom and no space behind for the wires – only the beam

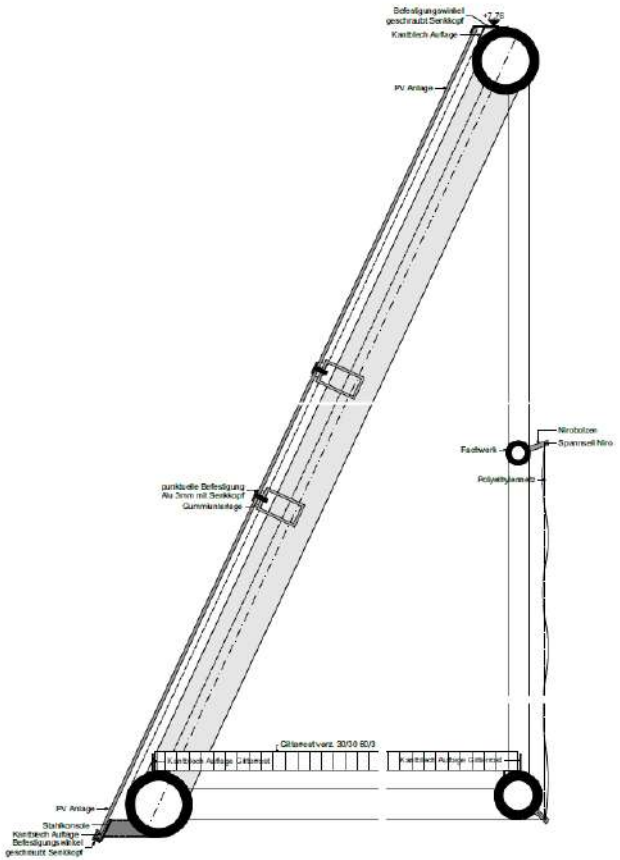




Interaction PV on steelconstruction

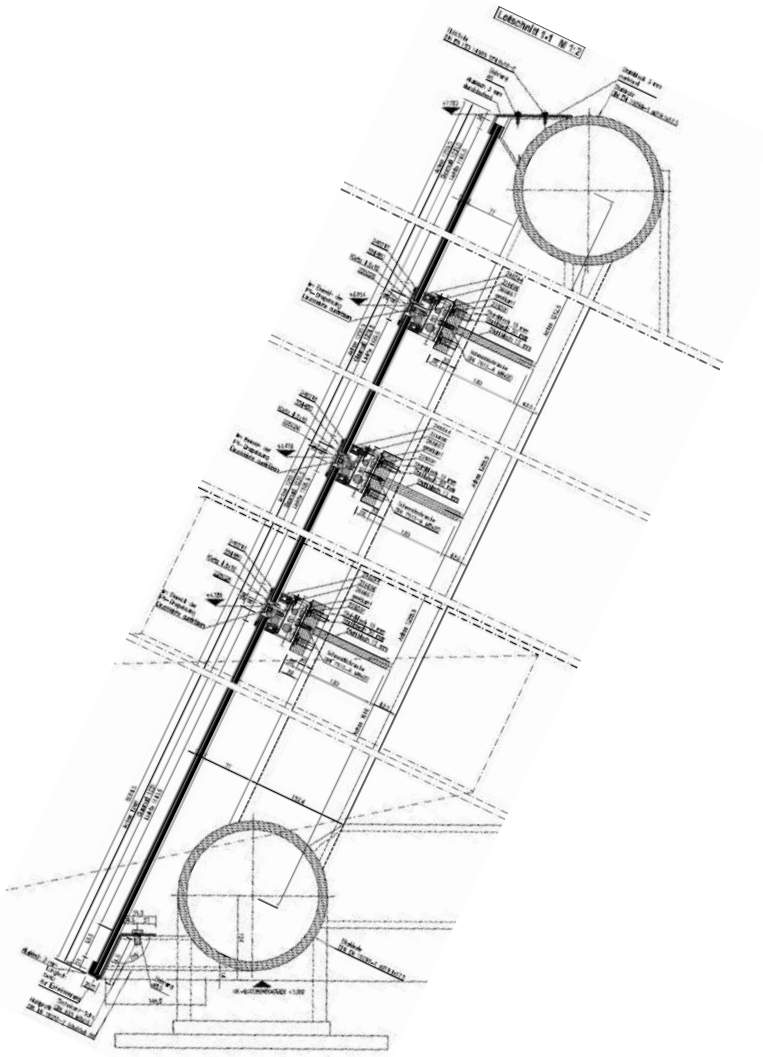


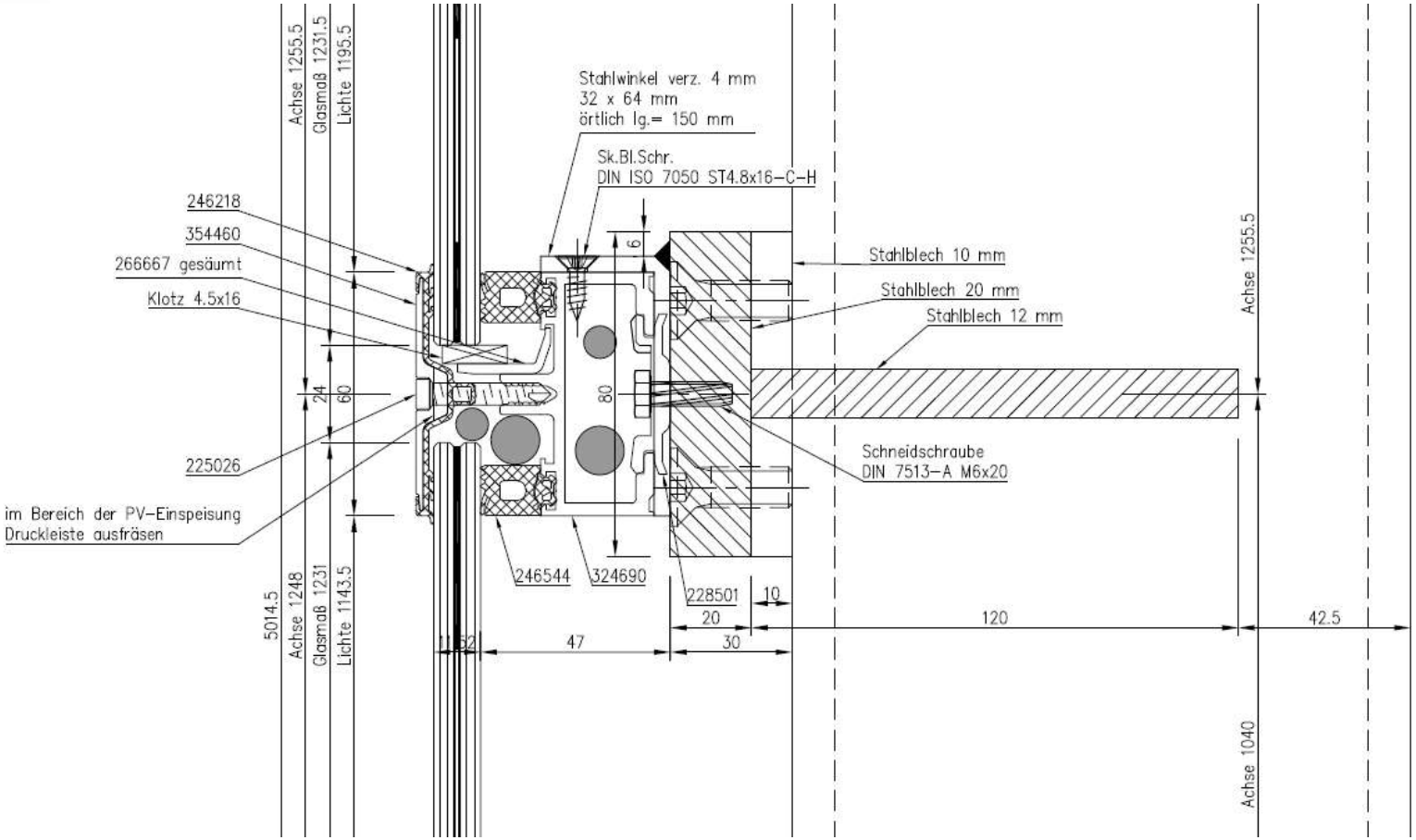




architectural requirements on the detail

Interaction PV on steelconstruction





Interaction PV on steelconstruction

Interaction PV on steelconstruction

Interaction PV on steelconstruction

Interaction PV on steelconstruction

Theoretically calculation - assessment

Projektname:	Püspök Anlage Südwest	12.11.2014
Variantenbezeichnung:	horizontale Verschaltung	
Bearbeiter/-in:	Ulrich	

Simulationsergebnisse für das Gesamtsystem

Einstrahlung auf Horizontale:	397.264 kWh	Eigenverbrauch:	57,9 kWh
PV-Gen. Einstrahlung:	423.955 kWh	PV-Gen. erzeugte Energie:	23.781 kWh
Einstrahlung abzl. Reflexion:	402.061 kWh	Systemnutzungsgrad:	5,3 %
Vom WR abgegebene Energie(AC):	22.435 kWh	Performance Ratio:	82,2 %
Verbrauch Bedarf:	0 kWh	Final Yield:	2,8 h/d
Netz Bezug:	58 kWh	Spez. Jahresertrag:	1.037 kWh/kWp

Ergebnisse für TG 1: Püspök SW Teil 1

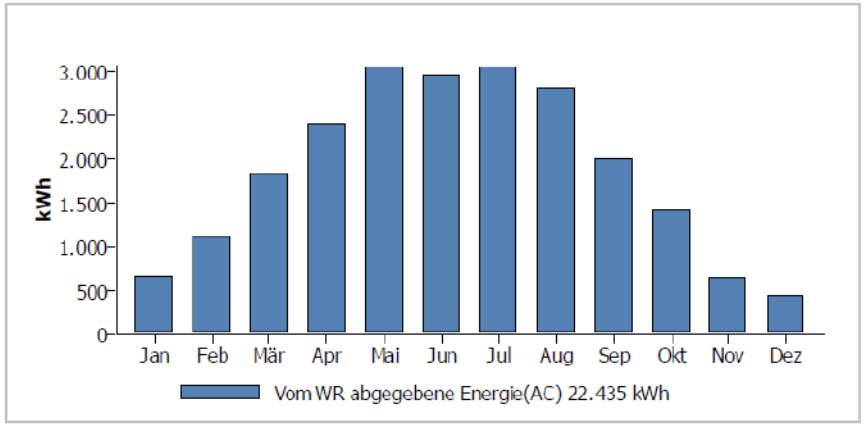
Einstrahlung auf Horizontale:	182.299 kWh	Systemnutzungsgrad:	5,3 %
Teilgenerator Einstrahlung:	194.546 kWh	Performance Ratio:	82,5 %
Erzeugte Energie (AC):	10.338 kWh	Spez. Jahresertrag:	1.041 kWh/kWp
Eigenverbrauch:	27 kWh	Generator Nutzungsgrad:	5,6 %
Erzeugte Energie (DC):	10.906 kWh	WR Nutzungsgrad:	94,5 %

Ergebnisse für TG 2: Püspök SW Teil 2

Einstrahlung auf Horizontale:	88.081 kWh	Systemnutzungsgrad:	5,2 %
Teilgenerator Einstrahlung:	94.005 kWh	Performance Ratio:	81,5 %
Erzeugte Energie (AC):	4.935 kWh	Spez. Jahresertrag:	1.028 kWh/kWp
Eigenverbrauch:	16 kWh	Generator Nutzungsgrad:	5,6 %
Erzeugte Energie (DC):	5.276 kWh	WR Nutzungsgrad:	93,2 %

Ergebnisse für TG 3: Püspök SW Teil 3

Einstrahlung auf Horizontale:	126.884 kWh	Systemnutzungsgrad:	5,3 %
Teilgenerator Einstrahlung:	135.404 kWh	Performance Ratio:	82,1 %
Erzeugte Energie (AC):	7.161 kWh	Spez. Jahresertrag:	1.036 kWh/kWp
Eigenverbrauch:	15 kWh	Generator Nutzungsgrad:	5,6 %
Erzeugte Energie (DC):	7.599 kWh	WR Nutzungsgrad:	94,0 %



Projektname:	Püspök Anlage Südost	12.11.2014
Variantenbezeichnung:	horizontale Verschaltung	
Bearbeiter/-in:	Ulrich	

Simulationsergebnisse für das Gesamtsystem

Einstrahlung auf Horizontale:	325.803 kWh	Eigenverbrauch:	67,0 kWh
PV-Gen. Einstrahlung:	348.103 kWh	PV-Gen. erzeugte Energie:	19.353 kWh
Einstrahlung abzl. Reflexion:	330.369 kWh	Systemnutzungsgrad:	5,2 %
Vom WR abgegebene Energie(AC):	18.202 kWh	Performance Ratio:	81,1 %
Verbrauch Bedarf:	0 kWh	Final Yield:	2,8 h/d
Netz Bezug:	62 kWh	Spez. Jahresertrag:	1.024 kWh/kWp

Ergebnisse für TG 1: Püspök SW Teil 1

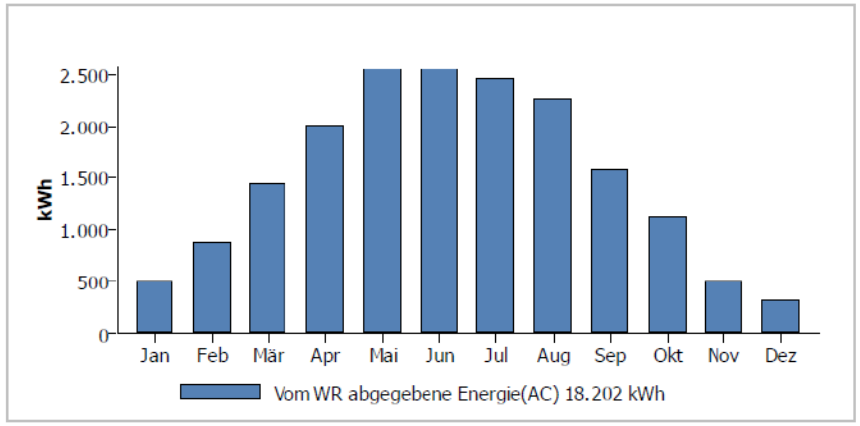
Einstrahlung auf Horizontale:	141.462 kWh	Systemnutzungsgrad:	5,2 %
Teilgenerator Einstrahlung:	151.146 kWh	Performance Ratio:	80,5 %
Erzeugte Energie (AC):	7.848 kWh	Spez. Jahresertrag:	1.016 kWh/kWp
Eigenverbrauch:	36 kWh	Generator Nutzungsgrad:	5,5 %
Erzeugte Energie (DC):	8.301 kWh	WR Nutzungsgrad:	94,1 %

Ergebnisse für TG 2: Püspök SW Teil 2

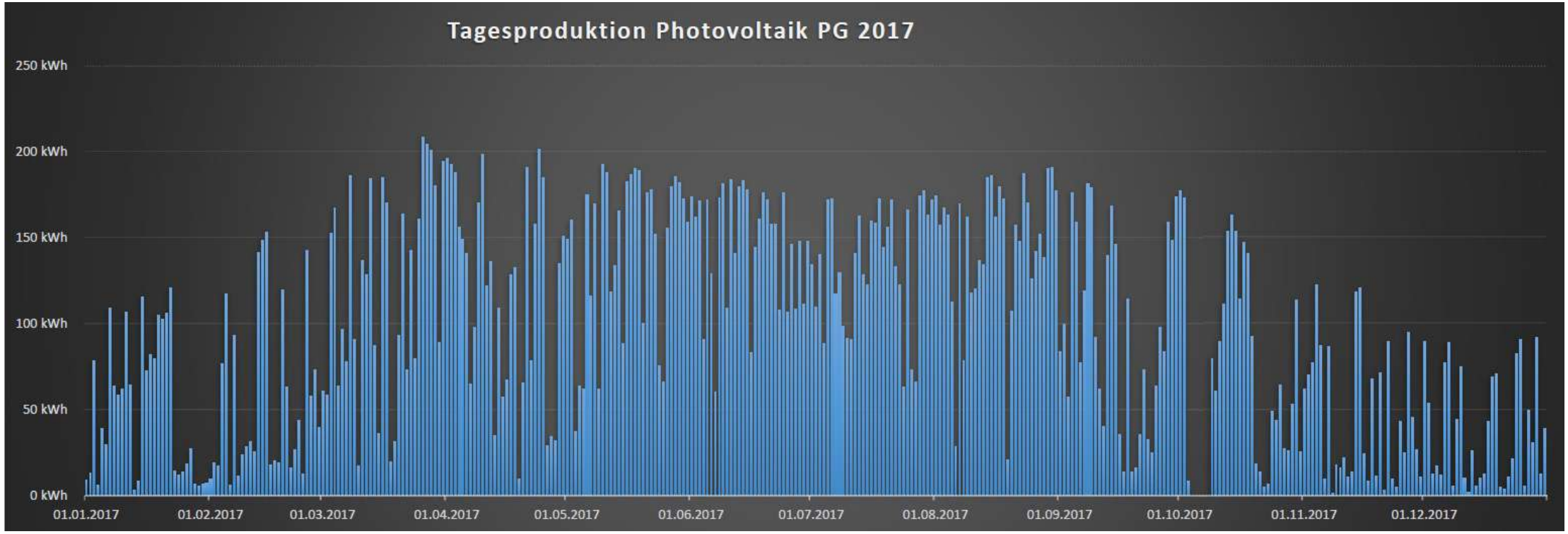
Einstrahlung auf Horizontale:	79.332 kWh	Systemnutzungsgrad:	5,2 %
Teilgenerator Einstrahlung:	84.766 kWh	Performance Ratio:	81,3 %
Erzeugte Energie (AC):	4.443 kWh	Spez. Jahresertrag:	1.027 kWh/kWp
Eigenverbrauch:	16 kWh	Generator Nutzungsgrad:	5,6 %
Erzeugte Energie (DC):	4.762 kWh	WR Nutzungsgrad:	93,0 %

Ergebnisse für TG 3: Püspök SW Teil 3

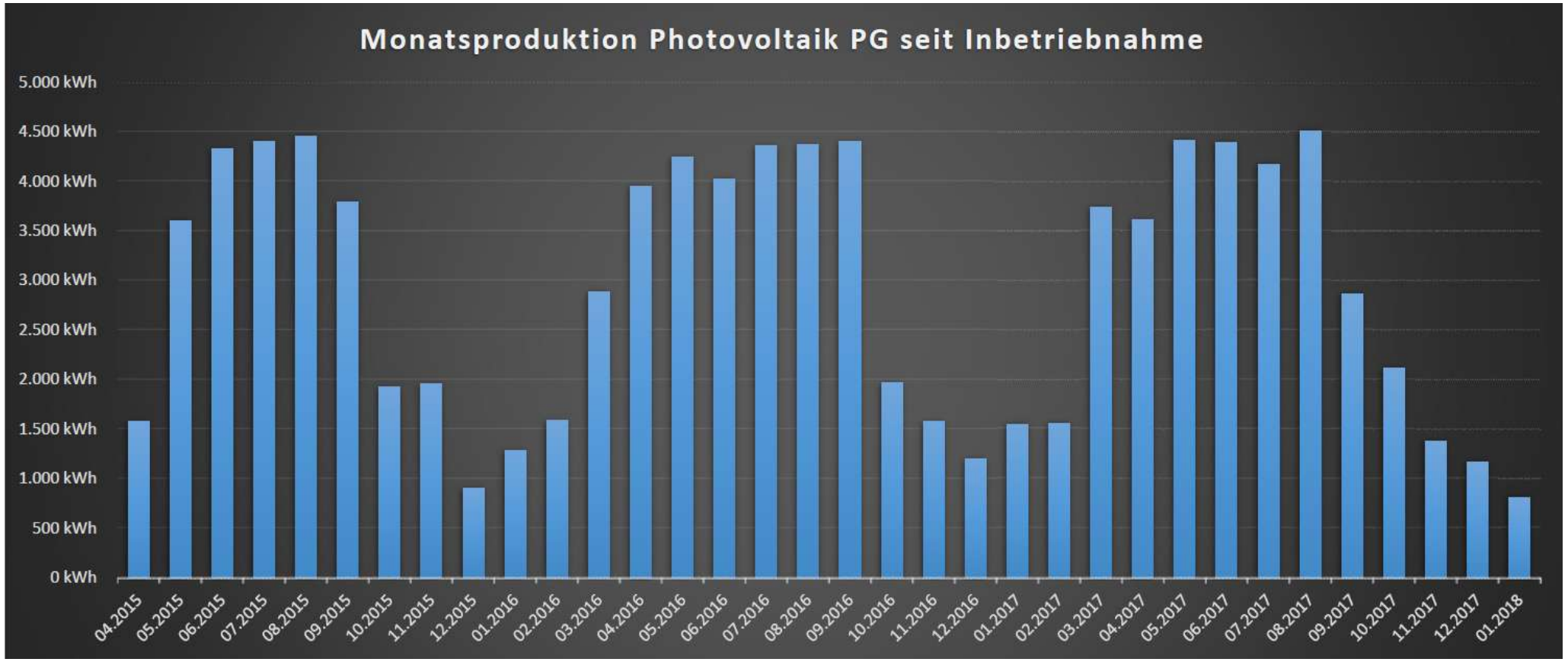
Einstrahlung auf Horizontale:	105.000 kWh	Systemnutzungsgrad:	5,3 %
Teilgenerator Einstrahlung:	112.191 kWh	Performance Ratio:	81,8 %
Erzeugte Energie (AC):	5.910 kWh	Spez. Jahresertrag:	1.033 kWh/kWp
Eigenverbrauch:	15 kWh	Generator Nutzungsgrad:	5,6 %
Erzeugte Energie (DC):	6.290 kWh	WR Nutzungsgrad:	93,7 %



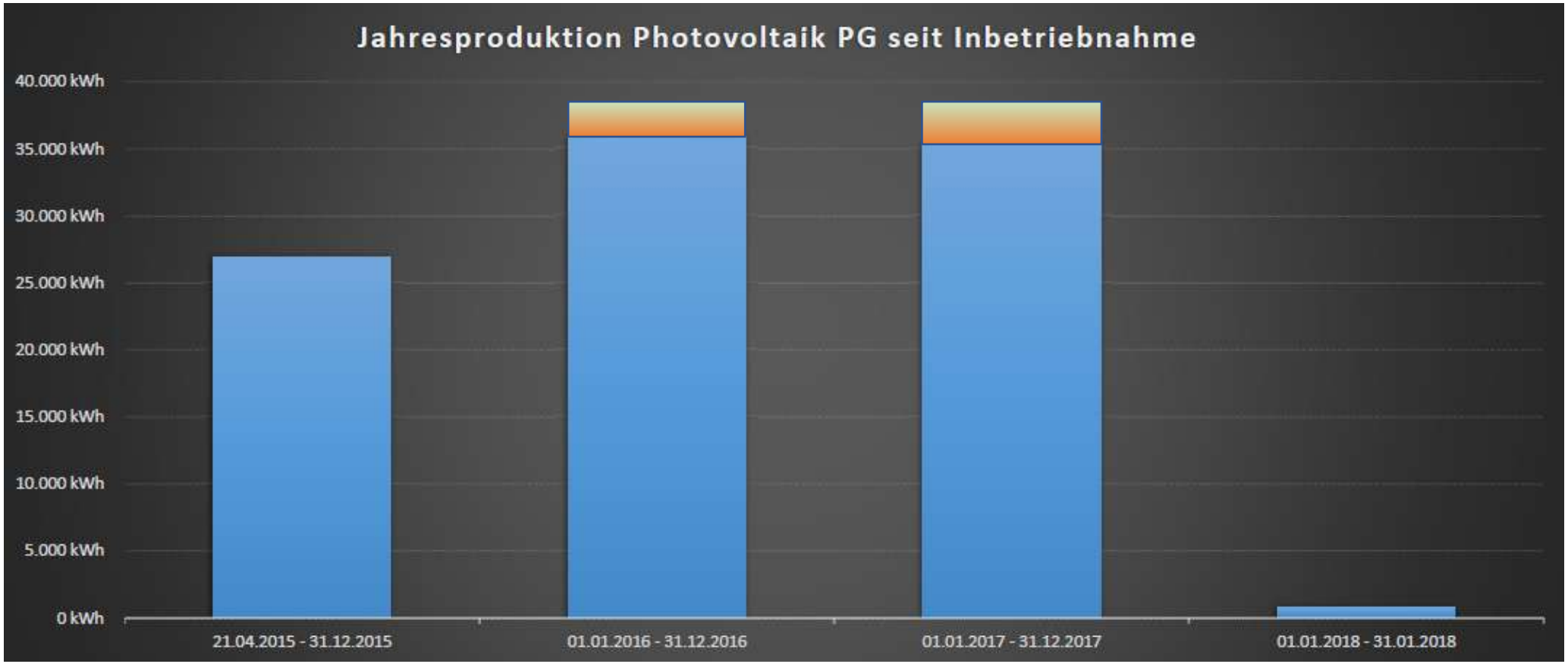
In fact values per day



In fact values per month



In fact values per year since handing over



Tour through the construction time

Tour through the construction time

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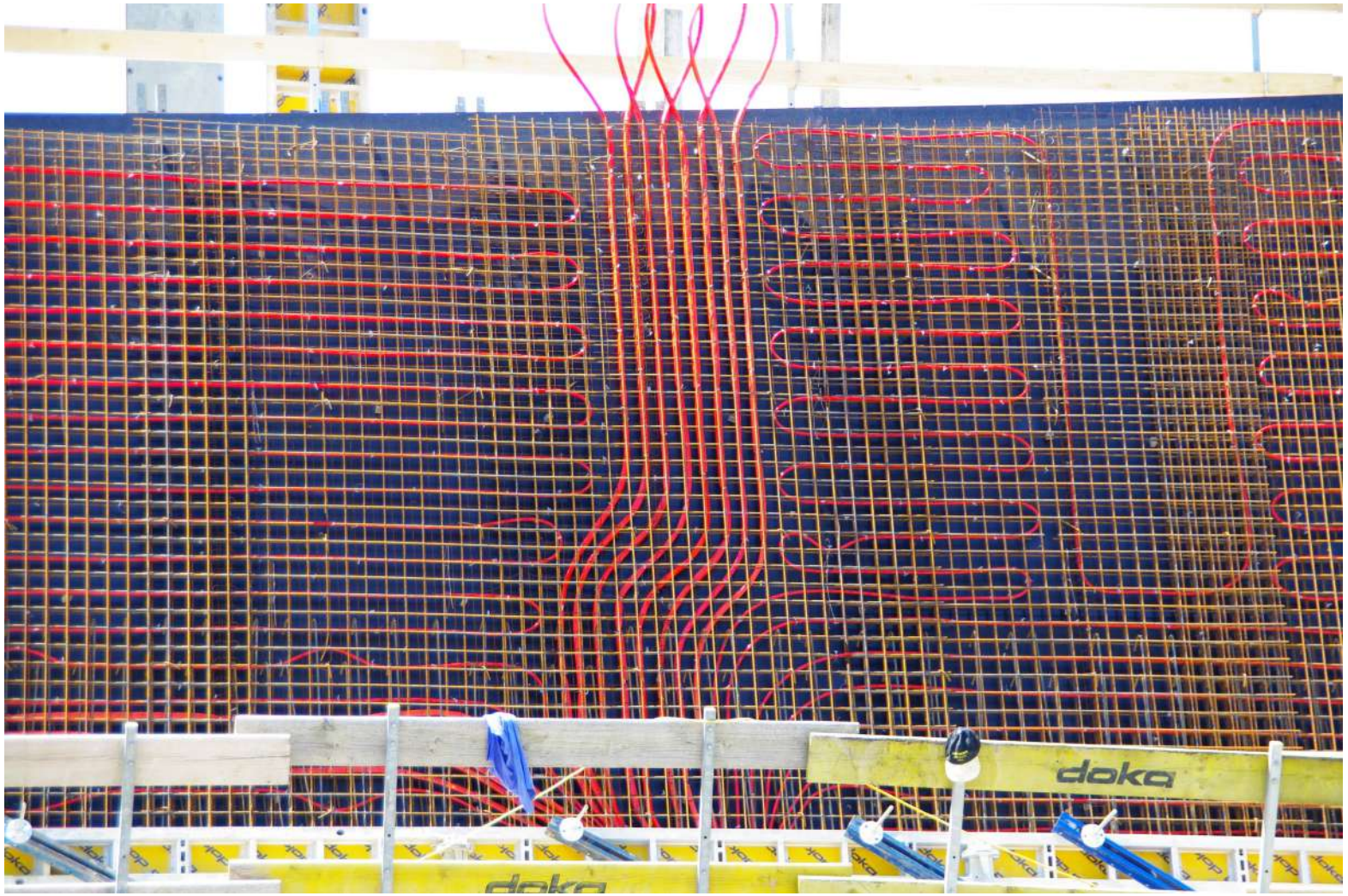

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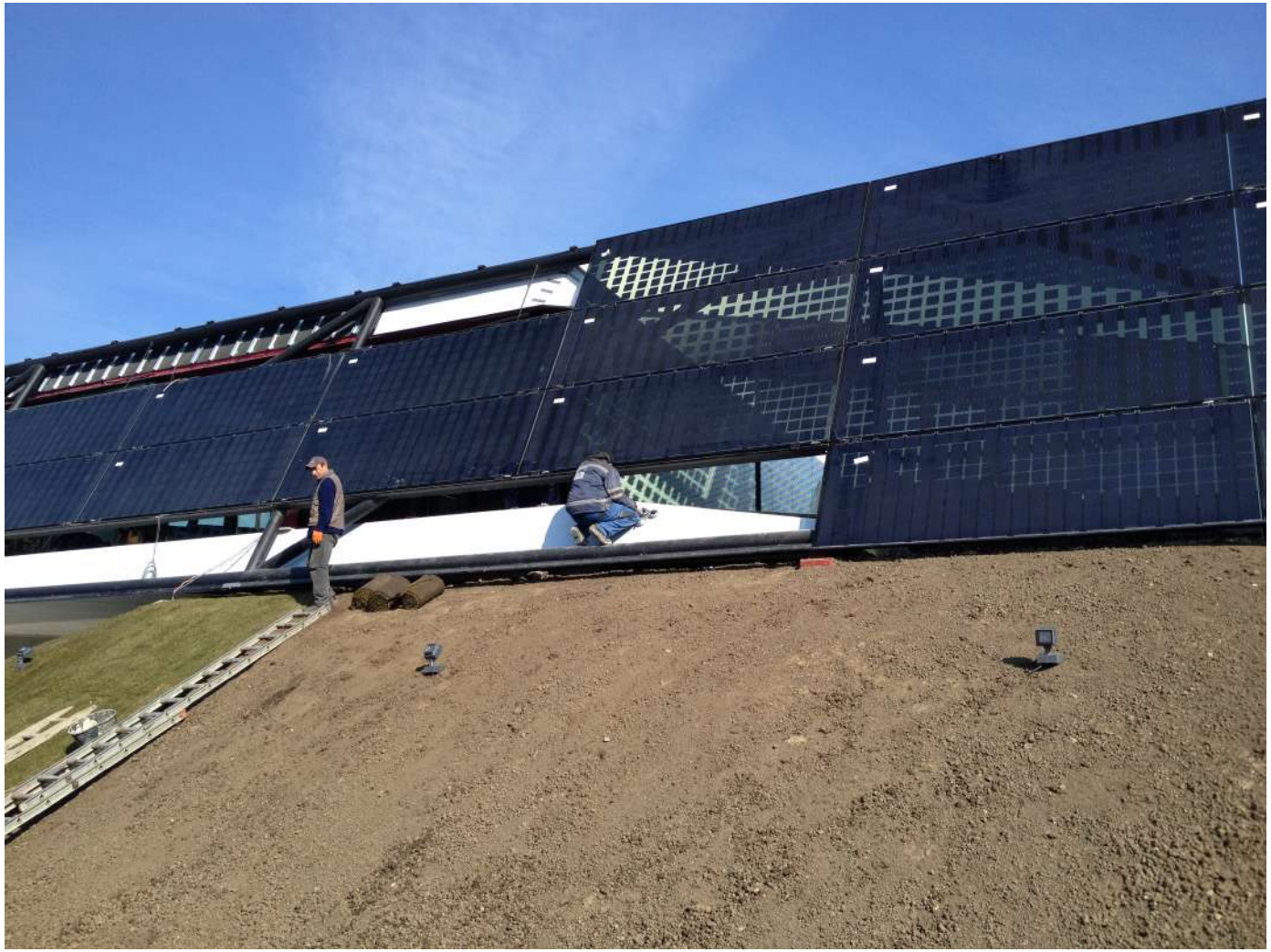

Tour through the construction time

Headquater Püspök Group

ad2 architekten ZT KG

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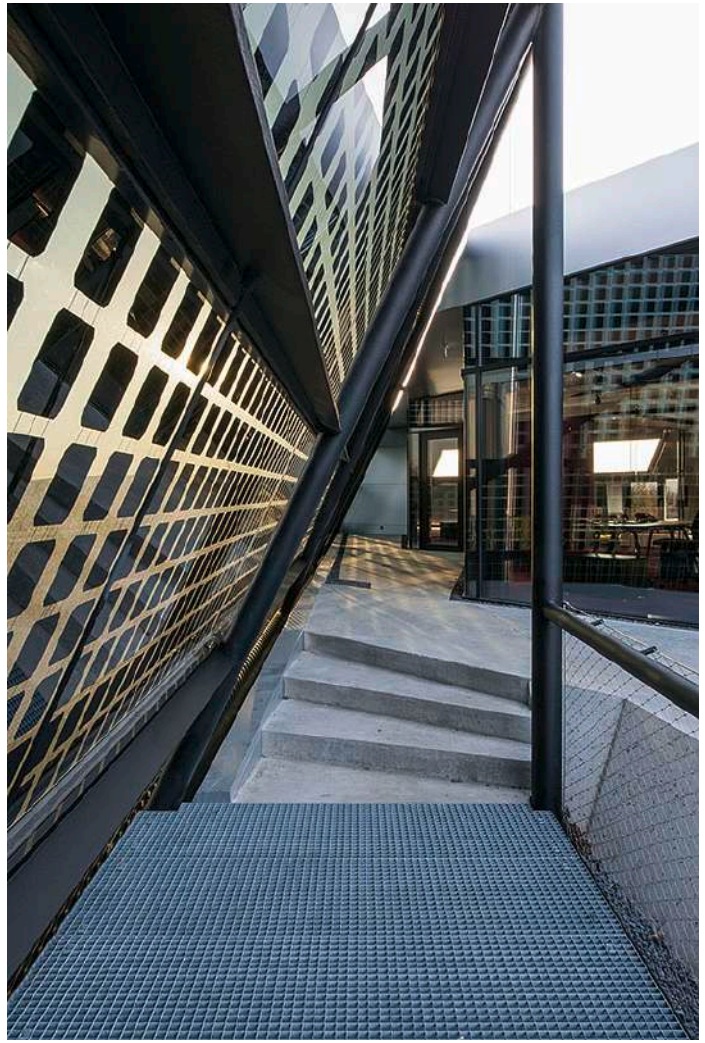

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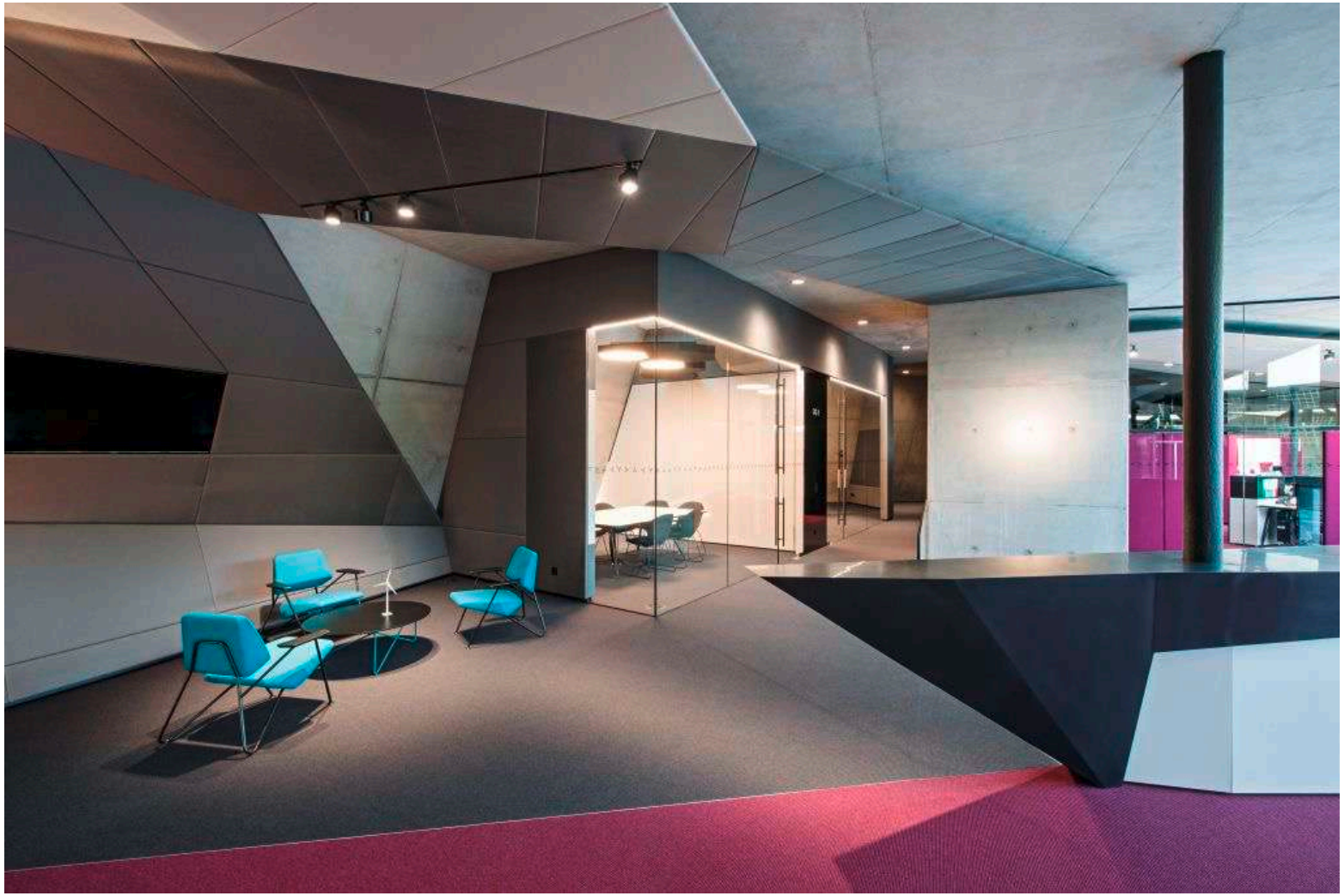

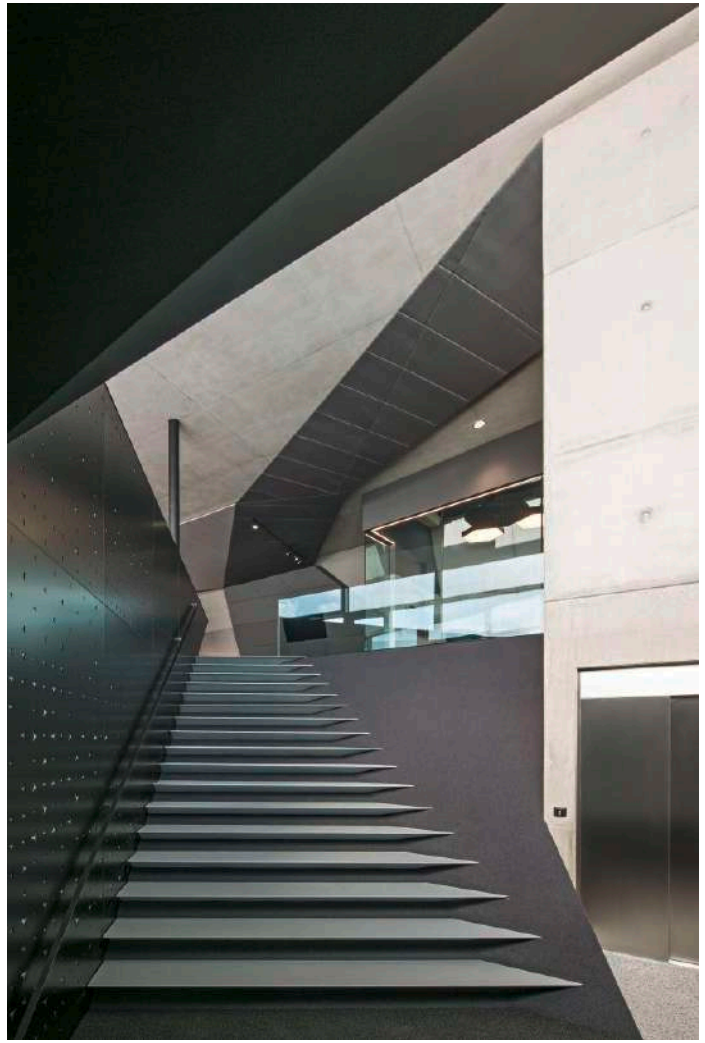

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