

Faculty of Geosciences Copernicus Institute of Sustainable Development Energy & Resources

Energy performance of a 1.2 MWp photovoltaic system distributed over eight buildings at Utrecht University campus

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Introduction

Utrecht University aims to be CO_2 -neutral by 2030.

Intermediate aim to generate half of its energy consumption in 2020 in a sustainable way, including thermal storage, the purchase of wind power and the use of solar energy.

This has motivated the design and realization of 4,600 PV modules on several buildings in the Utrecht Science Park De Uithof in the periode May-September 2016.

The grid-connected system is designed such that it is predicted to generate one million kWh of electricity annually, which constitutes $\sim 2\%$ of the annual electricity demand.

The installation of the PV systems contributes to a reduction of the CO_2 footprint. Moreover, it offers the potential to enhance research and education component of faculties involved.

System location

Impressions





Performance





1: Caroline Bleeker building, 2: Victor J. Koningsberger building, 3: Library, 4: David de Wied building, 5: Jeannette Donker-Voet building, 6: Willem C. Schimmel building, 7: Martinus G. de Bruin building, 8: Waterberging Diergeneeskunde/Jongveestal. The Utrecht Photovoltaic Outdoor Test facility (UPOT, red dot) is used for measured irradiation.

System description

The layout of the system is optimized using separate inverters per orientation.

•4,600 modules of 270 Wp are installed at 10 degree tilt (some at 30 degree tilt).

•37 inverters of AC capacity 12, 20, 23, and 30 kW.



Building JDV* and CB* suffer from data transmission issues. Data of production meters shows that systems actually are running well.

Conclusion

•Average ratio of PV DC size to AC inverter capacity is 0.825

Monitoring

Calibrated production meters (for SDE+ subsidy)
Inverter readings of power (5 min time resolution)
Irradiation from UPOT

•In future: 15 pyranometers per system per orientation, and temperature sensors on back of $\,{\sim}50$ modules

•Period: September 2016 – August 2017

System installation video



Summary of results

PV system delivers energy as designed.

Building	Size (kWp)	Orientation	Ratio PV size inverter capacity	Total energy (MWh)	Yield (kWh/kWp)	Performance ratio
1 (CB)	132.3	W-E	0.81	81	613	0.592*
2 (VJK)	33.4	S	0.90	29	865	0.835
3 (Lib)	232.2	S-N	0.85	202	871	0.841
4 (DdW)	121.1	W-E-S	0.80	111	899	0.868
5 (JDV)	46.4	W-E	0.73	25	529	0.511*
6 (WCS)	233.3	W-E	0.85	186	798	0.771
7 (MdB)	285.7	W-E	0.81	245	856	0.827
8 (JV)	131.2	S	0.81	129	986	0.857