Grid-Connected System: Simulation parameters

Project : **Carport , UK**

Geographical Site	**ASDA Express Diner, UK**		Country	**United Kingdom**
Situation	Latitude	53.48° N	Longitude	-2.19° W
Time defined as	Legal Time	Time zone UT	Altitude	58 m
	Albedo	0.20		
Meteo data:	**ASDA Express Diner, UK**	Meteonorm 7.2 (2004-2013), Sat=100% - Synthetic		

Simulation variant : **Carport with 3Dshading**

Simulation date 30/04/22 13h04

Simulation parameters	System type	**Rows as domes east-west**		
2 orientations	tilts/azimuths	10°/55° and 10°/-125°		
Sheds configuration	Nb. of sheds	18	Identical arrays	
	Sheds spacing	16.0 m	Collector width	4.75 m
Shading limit angle	Limit profile angle	4.2°	Ground cov. Ratio (GCR)	29.7 %
Models used	Transposition	Perez	Diffuse	Perez, Meteonorm
Horizon	Free Horizon			
Near Shadings	Linear shadings			
User's needs :	Unlimited load (grid)			

PV Arrays Characteristics (2 kinds of array defined)

PV module	Si-poly	Model	**REC 350TP2S 72**	
Original PVsyst database		Manufacturer	REC	
Sub-array "West array #1"		Orientation	#1	Tilt/Azimuth 10°/55°
Number of PV modules		In series	19 modules	In parallel 48 strings
Total number of PV modules		Nb. modules	912	Unit Nom. Power 350 Wp
Array global power		Nominal (STC)	**319 kWp**	At operating cond. 291 kWp (50°C)
Array operating characteristics (50°C)		U mpp	656 V	I mpp 443 A
Sub-array "East array #2"		Orientation	#2	Tilt/Azimuth 10°/-125°
Number of PV modules		In series	19 modules	In parallel 48 strings
Total number of PV modules		Nb. modules	912	Unit Nom. Power 350 Wp
Array global power		Nominal (STC)	**319 kWp**	At operating cond. 291 kWp (50°C)
Array operating characteristics (50°C)		U mpp	656 V	I mpp 443 A
Total Arrays global power		Nominal (STC)	**638 kWp**	Total 1824 modules
		Module area	**3661 m²**	Cell area 3228 m²

Inverter		Model	**ECO 25.0-3-S**	
Original PVsyst database		Manufacturer	Fronius International	
Characteristics		Operating Voltage	580-850 V	Unit Nom. Power 25.0 kWac
Sub-array "West array #1"		Nb. of inverters	12 units	Total Power 300 kWac
				Pnom ratio 1.06
Sub-array "East array #2"		Nb. of inverters	12 units	Total Power 300 kWac
				Pnom ratio 1.06
Total		Nb. of inverters	24	Total Power 600 kWac

PV Array loss factors

Array Soiling Losses			Loss Fraction	1.5 %
Thermal Loss factor	Uc (const)	29.0 W/m²K	Uv (wind)	0.0 W/m²K / m/s

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Wiring Ohmic Loss	Array#1	25 mOhm	Loss Fraction	1.5 % at STC
	Array#2	25 mOhm	Loss Fraction	1.5 % at STC
	Global		Loss Fraction	1.5 % at STC
LID - Light Induced Degradation			Loss Fraction	2.0 %
Module Quality Loss			Loss Fraction	-0.4 %
Module Mismatch Losses			Loss Fraction	1.0 % at MPP
Strings Mismatch loss			Loss Fraction	0.10 %

Incidence effect (IAM): User defined profile

0°	30°	45°	60°	70°	75°	80°	85°	90°
1.000	1.000	1.000	0.974	0.907	0.832	0.688	0.445	0.000

System loss factors

	Wires: 3x700.0 mm²	191 m	Loss Fraction	2.0 % at STC
Unavailability of the system	3.6 days, 3 periods		Time fraction	1.0 %

Grid-Connected System: Near shading definition

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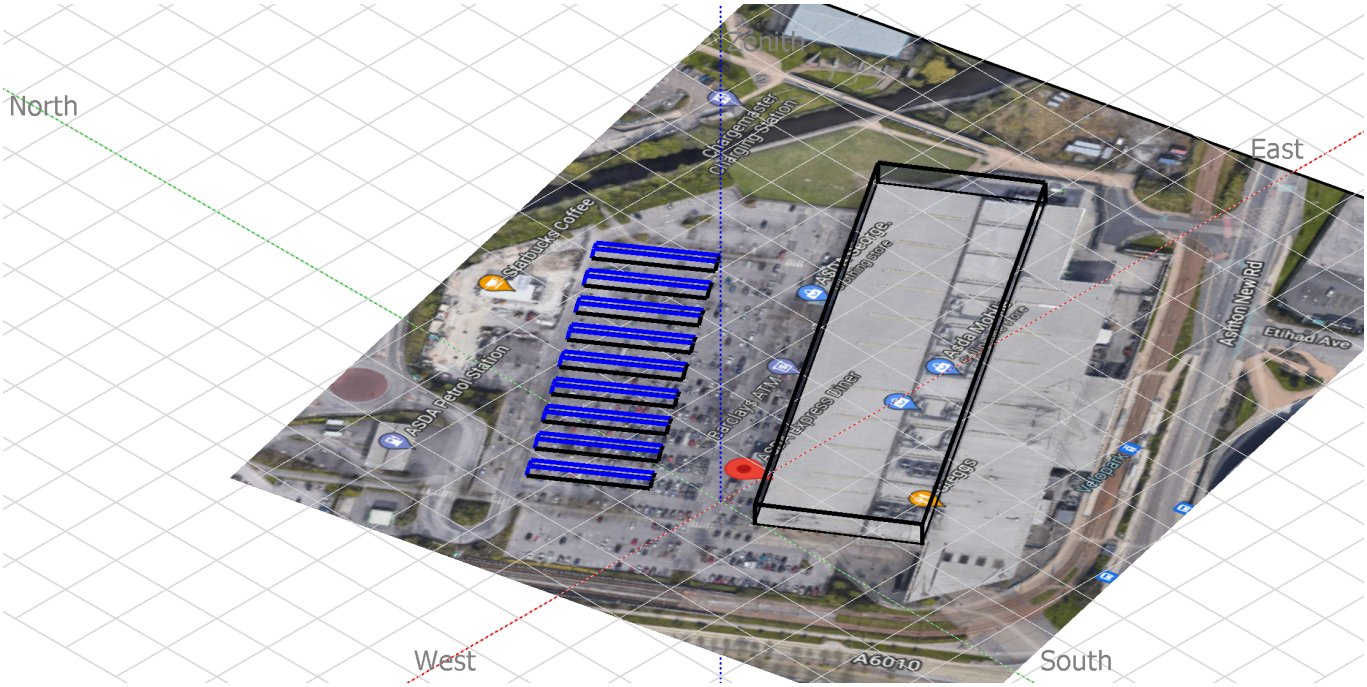
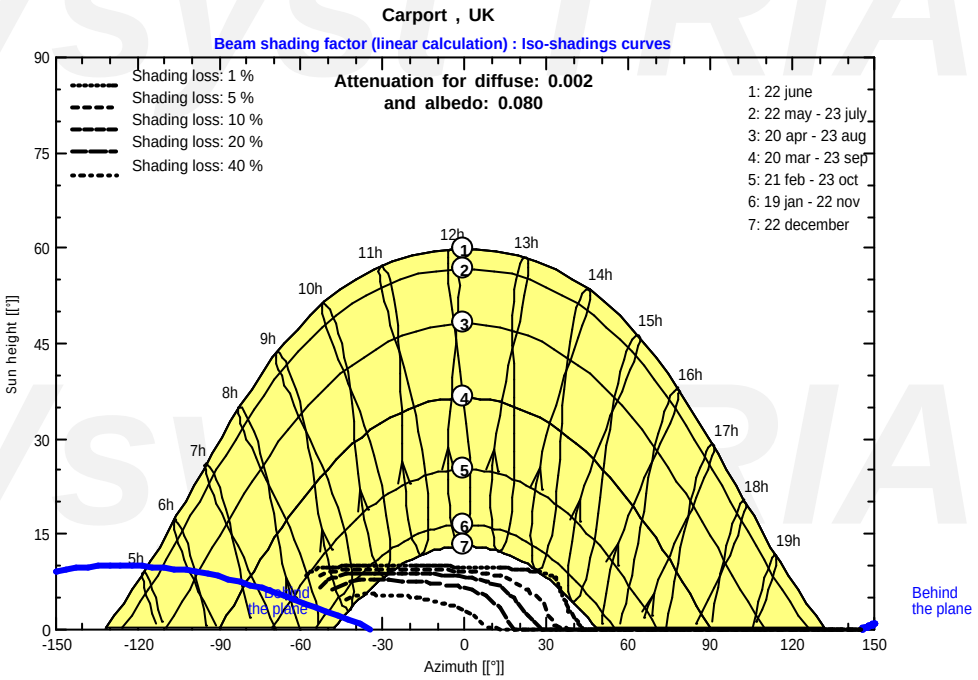
Near Shadings	Linear shadings			
PV Field Orientation	2 orientations	Tilt/Azimuth = 10°/55° and 10°/-125°		
PV modules	Model	REC 350TP2S 72	Pnom	350 Wp
PV Array	Nb. of modules	1824	Pnom total	**638 kWp**
Inverter	Model	ECO 25.0-3-S	Pnom	25.00 kW ac
Inverter pack	Nb. of units	24.0	Pnom total	**600 kW ac**
User's needs	Unlimited load (grid)			

Perspective of the PV-field and surrounding shading scene



Iso-shadings diagram



Grid-Connected System: Main results

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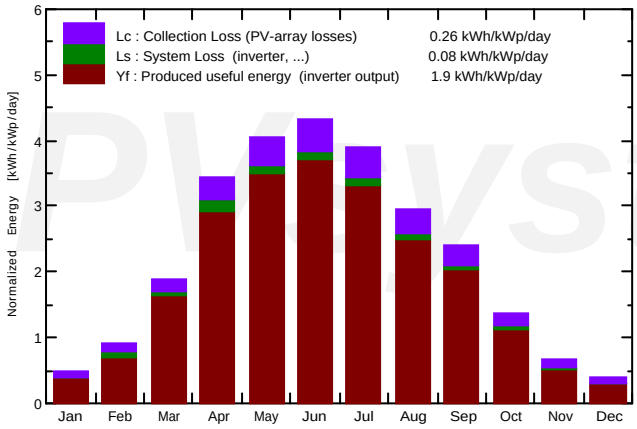
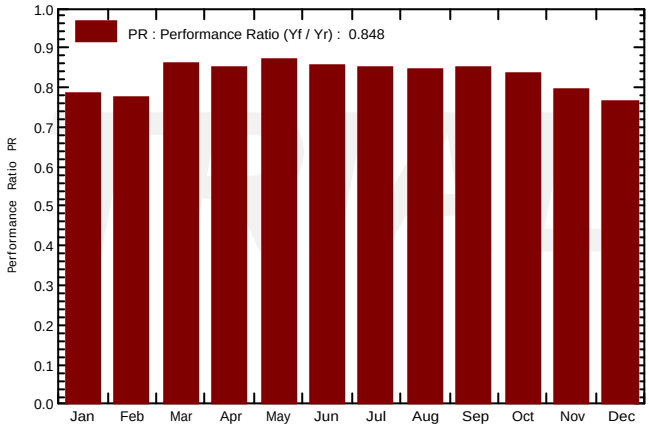
Main simulation results

System Production	**Produced Energy**	**443.3 MWh/year**	Specific prod.	694 kWh/kWp/year
	Performance Ratio PR	84.82 %		

Normalized productions (per installed kWp): Nominal power 638 kWp



Performance Ratio PR



Carport with 3Dshading

Balances and main results

	GlobHor kWh/m²	DiffHor kWh/m²	T_Amb °C	GlobInc kWh/m²	GlobEff kWh/m²	EArray MWh	E_Grid MWh	PR
January	15.7	11.17	5.31	15.6	14.1	8.23	7.82	0.784
February	26.2	16.35	4.95	26.0	24.0	14.43	12.92	0.778
March	59.5	37.32	6.76	58.9	55.5	33.81	32.47	0.863
April	103.8	60.69	8.89	102.9	97.7	59.63	55.92	0.851
May	126.5	81.01	12.26	125.3	119.2	71.89	69.51	0.869
June	131.1	75.71	14.69	129.9	123.7	73.50	71.05	0.857
July	121.9	80.73	16.49	120.6	114.7	67.82	65.59	0.852
August	92.7	61.29	16.39	91.7	87.2	51.40	49.66	0.848
September	72.8	41.93	14.00	72.2	68.1	40.50	39.13	0.849
October	43.0	25.53	10.98	42.6	39.5	23.58	22.72	0.836
November	20.7	13.89	7.32	20.5	18.6	10.91	10.43	0.795
December	12.6	9.55	4.95	12.4	11.2	6.43	6.08	0.766
Year	826.4	515.17	10.28	818.7	773.7	462.13	443.29	0.848

Legends:

GlobHor	Horizontal global irradiation	GlobEff	Effective Global, corr. for IAM and shadings
DiffHor	Horizontal diffuse irradiation	EArray	Effective energy at the output of the array
T_Amb	T amb.	E_Grid	Energy injected into grid
GlobInc	Global incident in coll. plane	PR	Performance Ratio

Grid-Connected System: Special graphs

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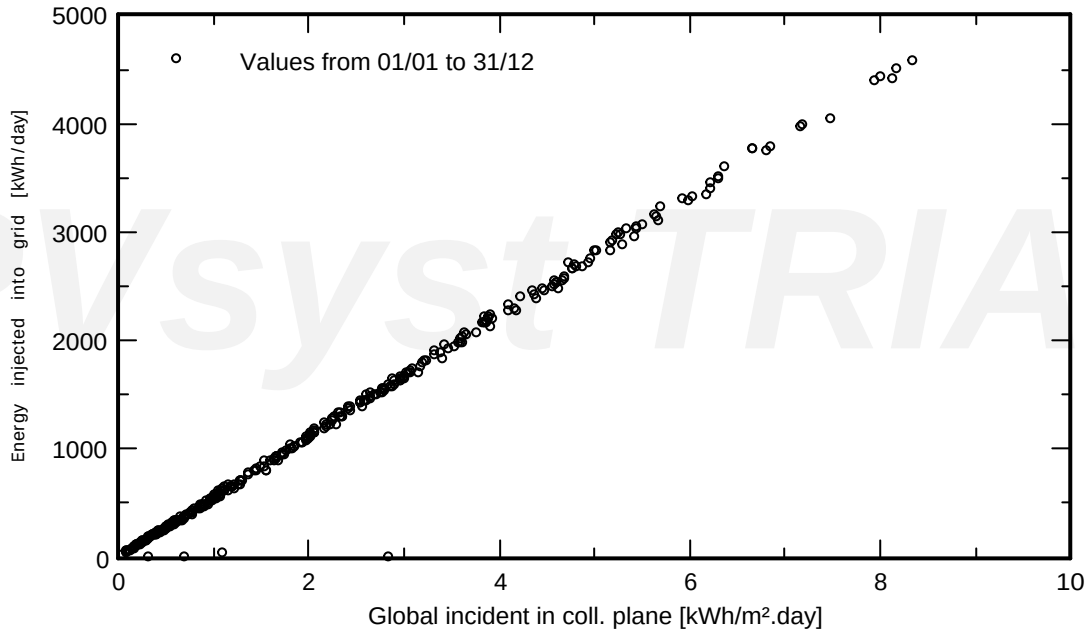
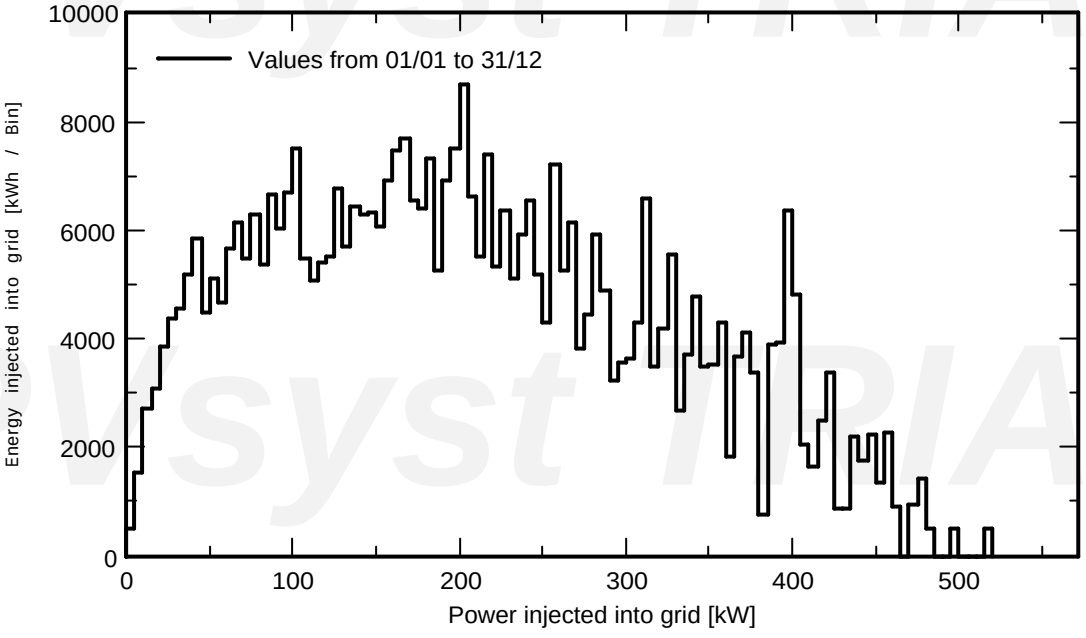
Daily Input/Output diagram



System Output Power Distribution



Grid-Connected System: Loss diagram

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Loss diagram over the whole year