Τεχνολογίες Περιβάλλοντος
Verde.tec

ΣΥΝΔΕΣΜΟΣ ΕΤΑΙΡΙΩΝ ΦΩΤΟΒΟΛΤΑΪΚΩΝ
HELLENIC ASSOCIATION OF PHOTOVOLTAIC COMPANIES

EUROSOL
ENERGY SOLUTIONS

SOLUTIONS FOR A SUSTAINABLE ENERGY FUTURE

Cutting Edge Design, German Engineering, World Quality

Power Generation

Energy Saving

E-Mobility

Power Management

Ιστορικό

Η EUROSOL είναι διεθνής εταιρεία με ειδίκευση στον σχεδιασμό (engineering) συστημάτων ανανεώσιμων πηγών ενέργειας με έδρα το Ludwigshafen στην Germany και παρουσία στην ευρύτερη περιοχή της Μεσογείου και της Μέσης Ανατολής.

Δραστηριότητες

EUROSOL
ENERGY SOLUTIONS

Power Generation

- RES POWER STATIONS
- HYBRID ENERGY SOLUTIONS
- ENERGY STORAGE SYSTEMS

Energy Management

- ENERGY EFFICIENCY APPLICATIONS
- COMMERCIAL & RESIDENTIAL
- SMART METERING

E-Mobility

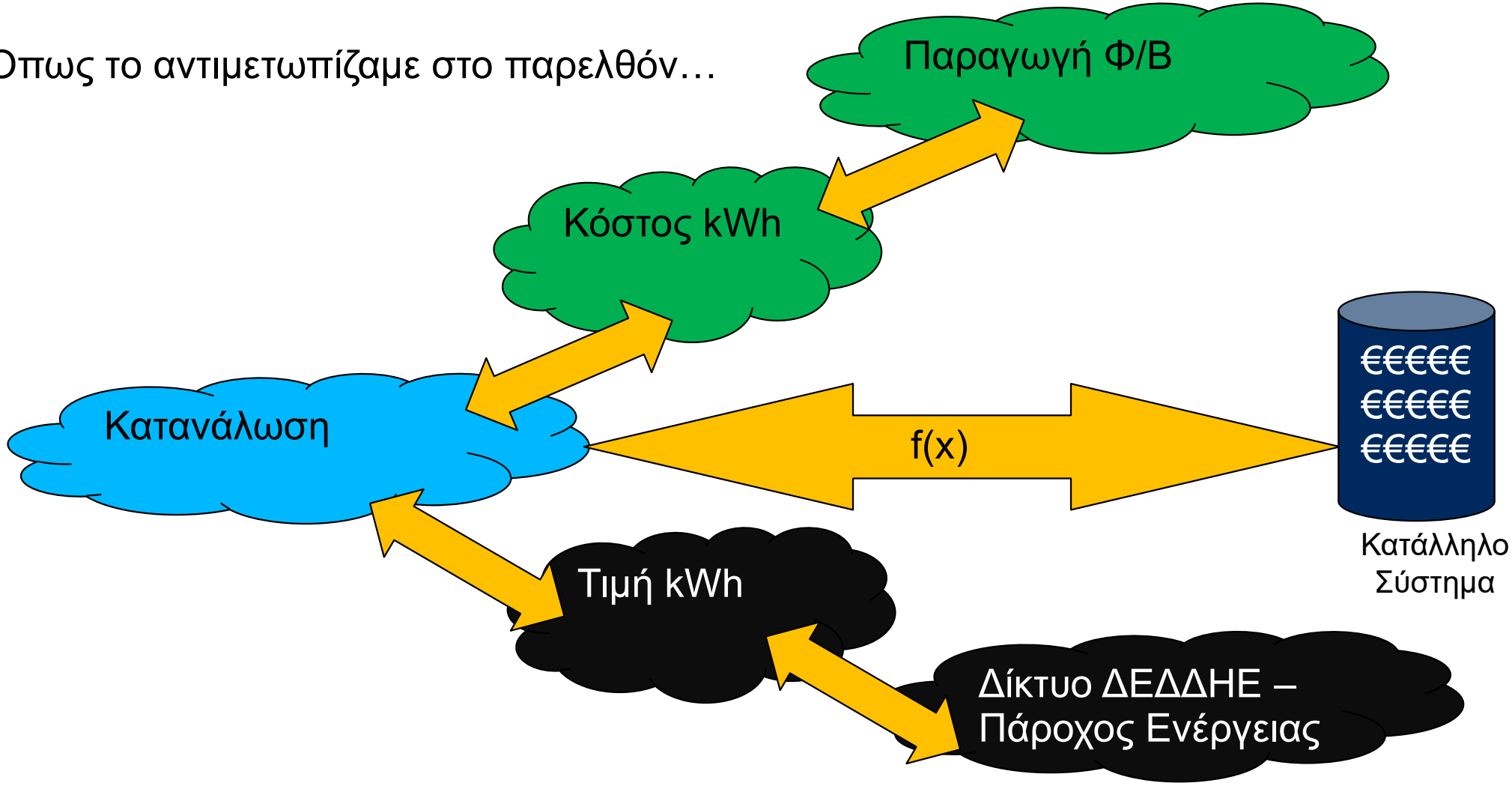
- RES TO ELECTRIC MOBILITY
- CHARGING INFRASTRUCTURE
- E-VEHICLES

Power Management

- MICRO-GRID SOLUTIONS
- INDUSTRIAL & COMMERCIAL
- POWER QUALITY OPTIMIZATION

Το πραγματικό πρόβλημα …

Όπως το αντιμετωπίζαμε στο παρελθόν…

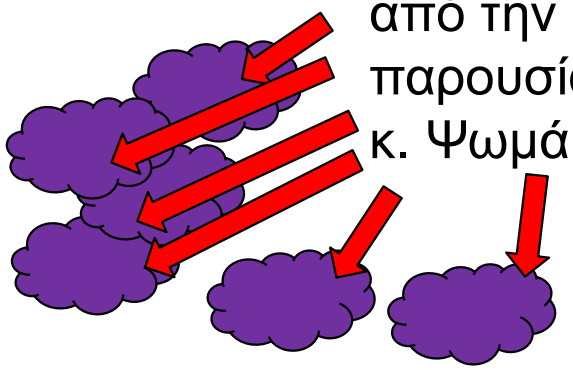


Το «πρόβλημα» του 2023…

Οικιακό Net Metering με Ισχύ Φ/Β <= Εγγυημένης

Οικιακό Net Metering με Ισχύ Φ/Β <= Εγγυημένης αλλά και <= 10.8 kWp

Νέα «συννεφάκια» από την σημερινή παρουσίαση του κ. Ψωμά



Αυτοκατανάλωση με Μηδενική Έγχυση στο Δίκτυο με Ισχύ <= Εγγυημένης

Επαγγελματικό Net Metering με Ισχύ Φ/Β <= Εγγυημένης

Επαγγελματικό Net Metering με Ισχύ Φ/Β <= Εγγυημένης αλλά και <= 100 kWp

Επαγγελματικό Net Billing με Ισχύ Φ/Β Χωρίς Περιορισμό αλλά….

Το δίλημα του 2023…

EUROSOL ENERGY SOLUTIONS

ΟΙΚΙΑΚΑ ΣΥΣΤΗΜΑΤΑ

- Οικιακό Net Metering (<10kW) ή Οικιακή Αυτοκατανάλωση με Μηδενική Έγχυση Ενέργειας στο Δίκτυο?
- Οικιακό Net Metering (<10kW) ή Οικιακό Net Metering με Αποθήκευση Ενέργειας (<<10kW) ?

ΕΠΑΓΓΕΛΜΑΤΙΚΑ ΣΥΣΤΗΜΑΤΑ

- Net Metering, Net Billing ή Αυτοκατανάλωση?

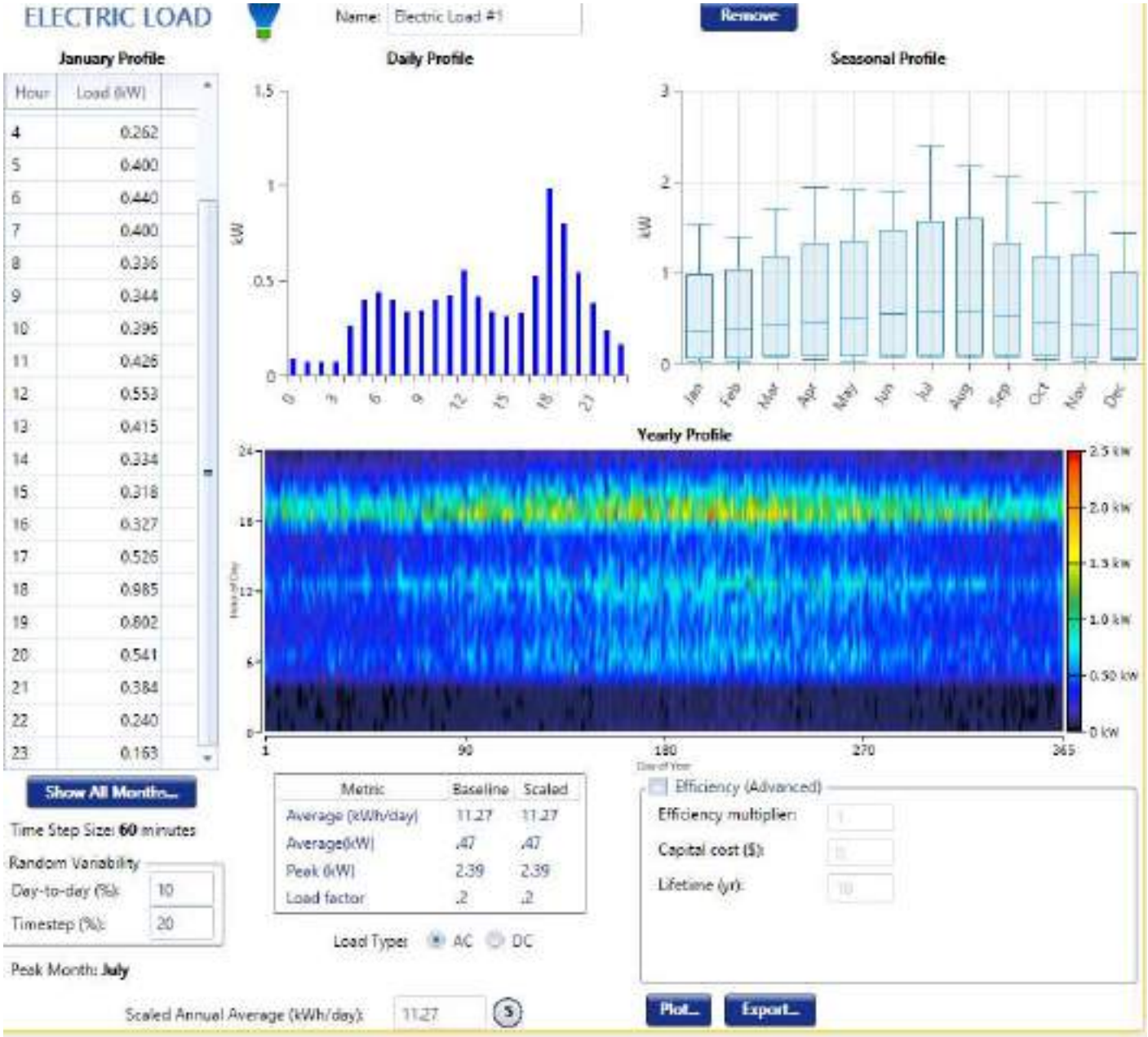
Δεδομένα και Υποθέσεις….

EUROSOL ENERGY SOLUTIONS

- *Καμπύλη Κατανάλωσης*
- *Κόστος Ενέργειας**
- Ισχύς Φ/Β συστήματος
- Μέγεθος Αντιστροφέα Μπαταριών
- Χωρητικότητα Μπαταριών
- Κόστος Φ/Β και Μπαταριών *
- *Τιμή Εγχυόμενης Ενέργειας **
- *Υποθέσεις για μελλοντική εξέλιξη κόστους χρήματος, επιτοκίων, πληθωρισμού,…**

- ** = Άγνωστες Μεταβλητές - Υποθέσεις*
- *Τεχνολογικές Μεταβλητές*
- *Οικονομικές Μεταβλητές*

Καμπύλη Κατανάλωσης 1 - Οικιακή



Electric Load #1 Scaled Average (kWh/d)
11.27
23
34
45
100

- Τυπική καμπύλη κατανάλωσης Οικίας
- 5 διαφορετικά επίπεδα <u>ετήσιας</u> κατανάλωσης
  - 4.000 kWh
  - 8.400 kWh
  - 12.400 kWh
  - 16.400 kWh
  - 36.400 kWh

Καμπύλη Κατανάλωσης 2

EUROSOL ENERGY SOLUTIONS

Weekdays | Weekends

Hour	January	February	March	April	May	June	July	August	September	October	November	December
0	0.087	0.090	0.098	0.109	0.120	0.128	0.131	0.128	0.120	0.109	0.098	0.090
1	0.076	0.079	0.085	0.095	0.105	0.111	0.114	0.111	0.105	0.095	0.085	0.079
2	0.076	0.079	0.085	0.095	0.105	0.111	0.114	0.111	0.105	0.095	0.085	0.079
3	0.076	0.079	0.085	0.095	0.105	0.111	0.114	0.111	0.105	0.095	0.085	0.079
4	0.262	0.271	0.294	0.327	0.360	0.383	0.392	0.383	0.360	0.327	0.294	0.271
5	0.400	0.415	0.450	0.500	0.550	0.585	0.600	0.585	0.550	0.500	0.450	0.415
6	0.440	0.457	0.495	0.550	0.605	0.644	0.660	0.644	0.605	0.550	0.495	0.457
7	0.400	0.415	0.450	0.500	0.550	0.585	0.600	0.585	0.550	0.500	0.450	0.415
8	0.370	0.383	0.416	0.462	0.508	0.541	0.554	0.541	0.508	0.462	0.416	0.383
9	0.378	0.393	0.426	0.473	0.520	0.553	0.568	0.553	0.520	0.473	0.426	0.393
10	0.436	0.452	0.490	0.545	0.599	0.637	0.653	0.637	0.599	0.545	0.490	0.452
11	0.469	0.487	0.528	0.586	0.645	0.686	0.704	0.686	0.645	0.586	0.528	0.487
12	0.608	0.631	0.684	0.760	0.836	0.889	0.912	0.889	0.836	0.760	0.684	0.631
13	0.457	0.474	0.514	0.571	0.628	0.668	0.685	0.668	0.628	0.571	0.514	0.474
14	0.368	0.382	0.414	0.460	0.506	0.538	0.552	0.538	0.506	0.460	0.414	0.382
15	0.349	0.362	0.393	0.437	0.480	0.511	0.524	0.511	0.480	0.437	0.393	0.362
16	0.360	0.373	0.405	0.450	0.495	0.526	0.540	0.526	0.495	0.450	0.405	0.373
17	0.526	0.546	0.592	0.658	0.724	0.770	0.790	0.770	0.724	0.658	0.592	0.546
18	0.985	1.022	1.108	1.231	1.354	1.440	1.477	1.440	1.354	1.231	1.108	1.022
19	0.802	0.832	0.903	1.003	1.103	1.174	1.204	1.174	1.103	1.003	0.903	0.832
20	0.541	0.561	0.608	0.676	0.744	0.791	0.811	0.791	0.744	0.676	0.608	0.561
21	0.384	0.398	0.432	0.480	0.528	0.562	0.576	0.562	0.528	0.480	0.432	0.398
22	0.240	0.249	0.270	0.300	0.330	0.351	0.360	0.351	0.330	0.300	0.270	0.249
23	0.163	0.169	0.184	0.204	0.224	0.239	0.245	0.239	0.224	0.204	0.184	0.169

Χρήση ωριαίων φορτίων για όλο τον χρόνο, εργάσιμες και αργίες…

Φωτοβολταϊκό Σύστημα 1

EUROSOL ENERGY SOLUTIONS

Cost

Capacity (kW)	Capital ($)	Replacement ($)	O&M ($/year)
1	1,000.00	1,000.00	5.00

Lifetime

time (years): 25.00

More...

Sizing

HOMER Optimizer™

Search Space

kW
0
4
6
8
10.8

Site Specific Input

Derating Factor (%): 80.00

Electrical Bus

AC DC

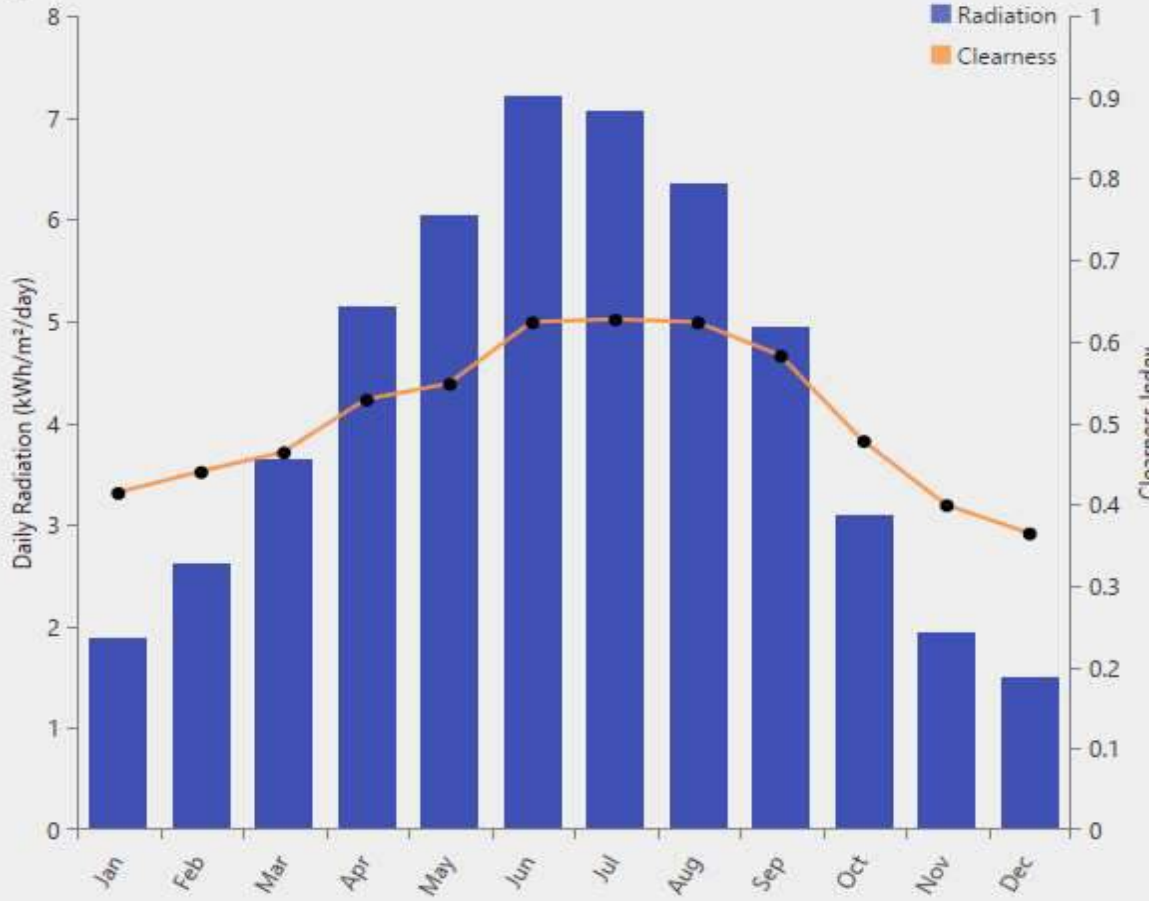
Με αναζήτηση μόνον μέσα στα επιτρεπτά πλέον όρια του Οικιακού Net Metering…

Φωτοβολταϊκό Σύστημα 2

EUROSOL ENERGY SOLUTIONS

Monthly Average Solar Global Horizontal Irradiance (GHI) Data

Month	Clearness Index	Daily Radiation (kWh/m²/day)
Jan	0.413	1.890
Feb	0.439	2.610
Mar	0.463	3.640
Apr	0.528	5.150
May	0.547	6.050
Jun	0.623	7.210
Jul	0.626	7.070
Aug	0.622	6.360
Sep	0.582	4.940
Oct	0.477	3.100
Nov	0.398	1.940
Dec	0.363	1.510

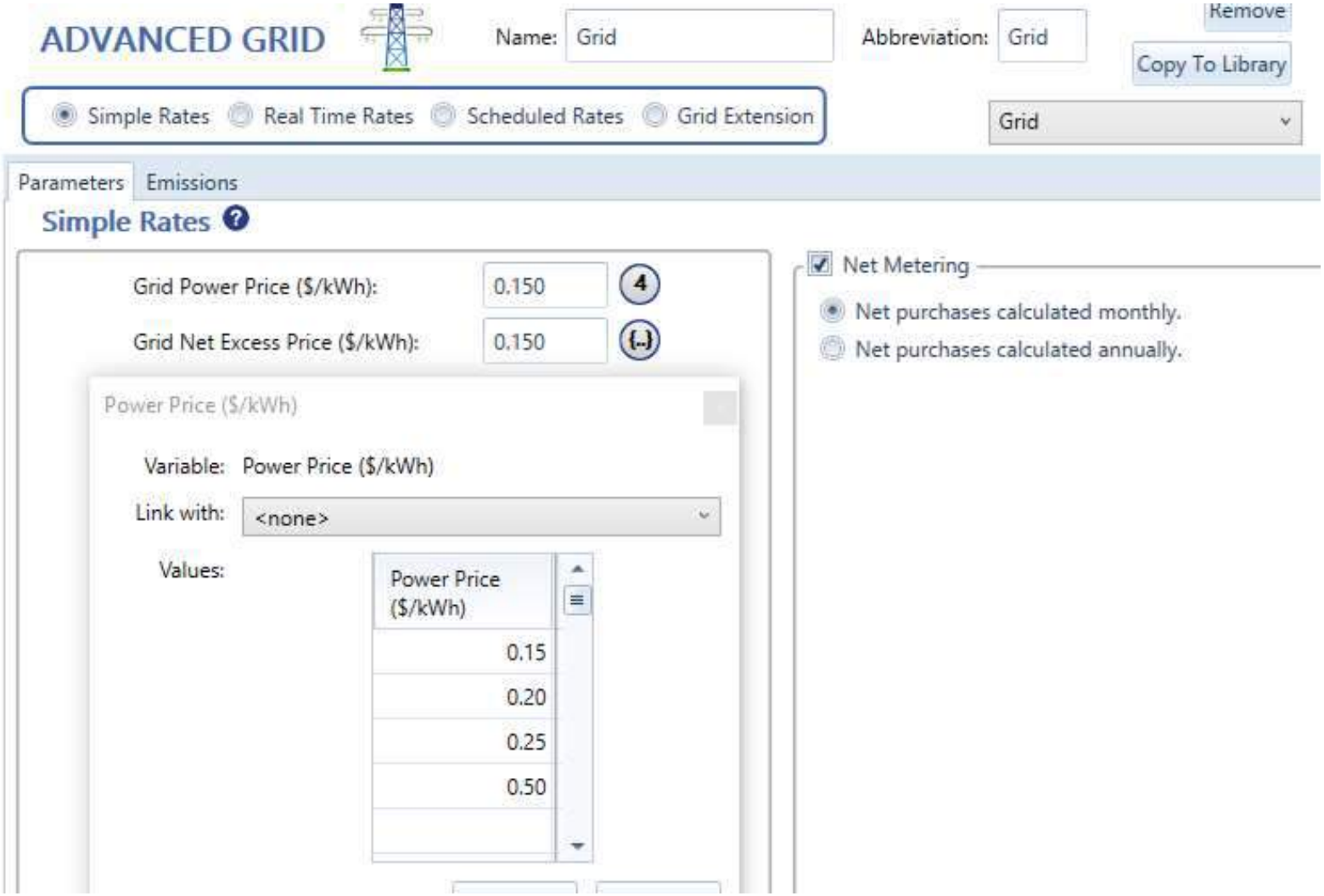


Downloaded at 3/18/2023 12:51:21 PM from:
NASA Prediction of Worldwide Energy Resource (POWER) database.
Monthly averages for global horizontal radiation over 22-year period (Jul 1983 - Jun 2005)
cellMidpointLatitude: 38.25
cellMidpointLongitude: 23.75

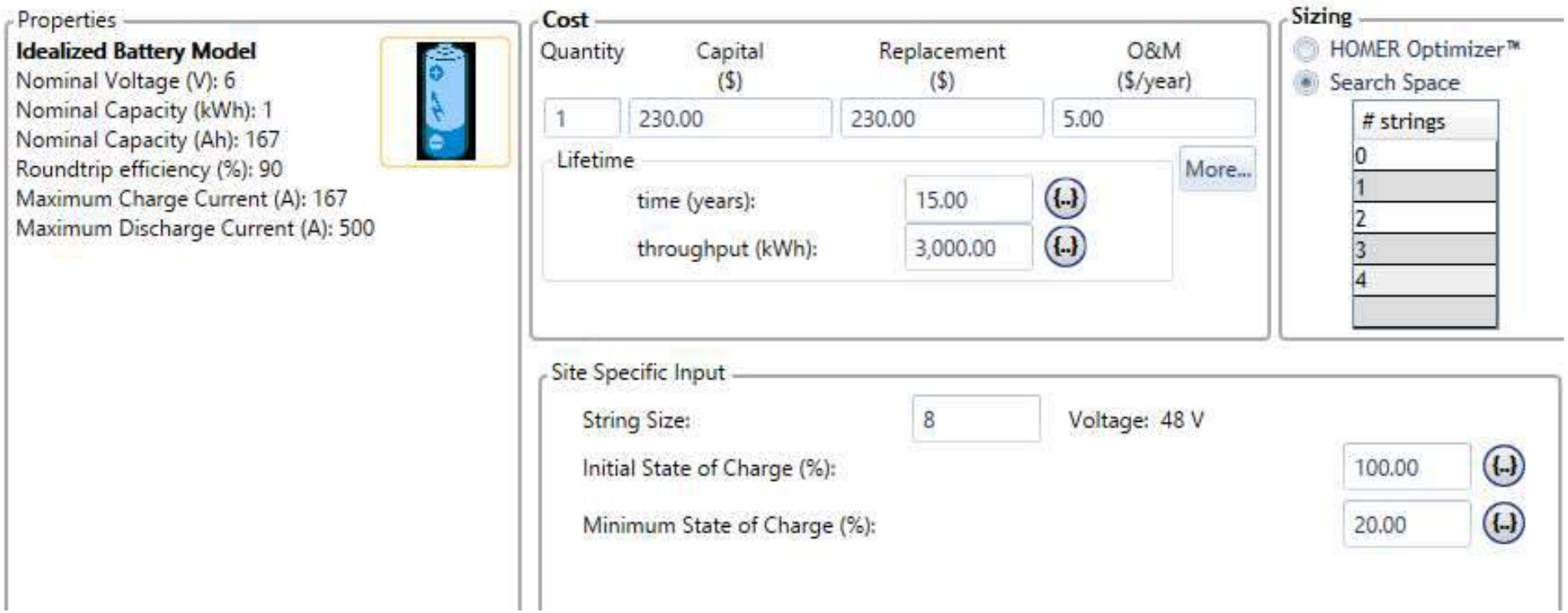
Annual Average (kWh/m²/day): 4.29

Με τα δεδομένα της Αττικής…

Δίκτυο


ADVANCED GRID
Name: Grid
Abbreviation: Grid
Remove
Copy To Library
Simple Rates
Real Time Rates
Scheduled Rates
Grid Extension
Grid
Parameters
Emissions
Simple Rates
Grid Power Price ($/kWh): 0.150
Grid Net Excess Price ($/kWh): 0.150
Net Metering
Net purchases calculated monthly.
Net purchases calculated annually.
Power Price ($/kWh)
Variable: Power Price ($/kWh)
Link with: <none>
Values:
Power Price ($/kWh)
0.15
0.20
0.25
0.50

Αποθήκευση



Και με διερεύνηση αποθήκευσης ενέργειας…

Και μετά από μεγάλη αναμονή….

EUROSOL ENERGY SOLUTIONS

HOMER is optimizing for lowest net present cost...

Αποτελέσματα Net Metering 1α

EUROSOL ENERGY SOLUTIONS

Power Price ($/kWh)	Electric Load #1 Scaled Average (kWh/d)	PV (kW)	1kWh LI (#)	Grid (kW)	XTM 4000-48 (kW)	Dispatch	NPC ($)	LCOE ($/kWh)	Operating cost ($/yr)	CAPEX ($)	Ren Frac (%)	Total Fuel (L/yr)	CAPEX	Energy Production (kWh/yr)
0.150	11.3	10.8		999,999		CC	-$8,955	-$0.0414	-$1,528	$10,800	87.7	0	10,800	14,661
0.200	11.3	10.8		999,999		CC	-$8,955	-$0.0414	-$1,528	$10,800	87.7	0	10,800	14,661
0.250	11.3	10.8		999,999		CC	-$8,955	-$0.0414	-$1,528	$10,800	87.7	0	10,800	14,661
0.500	11.3	10.8		999,999		CC	-$8,955	-$0.0414	-$1,528	$10,800	87.7	0	10,800	14,661
0.150	23.0	10.8		999,999		CC	-$652.83	-$0.00263	-$885.93	$10,800	76.4	0	10,800	14,661
0.200	23.0	10.8		999,999		CC	-$652.83	-$0.00263	-$885.93	$10,800	76.4	0	10,800	14,661
0.250	23.0	10.8		999,999		CC	-$652.83	-$0.00263	-$885.93	$10,800	76.4	0	10,800	14,661
0.500	23.0	10.8		999,999		CC	-$652.83	-$0.00263	-$885.93	$10,800	76.4	0	10,800	14,661
0.150	34.0	10.8		999,999		CC	$7,133	$0.0254	-$283.68	$10,800	67.5	0	10,800	14,661
0.200	34.0	10.8		999,999		CC	$7,391	$0.0263	-$263.72	$10,800	67.5	0	10,800	14,661
0.250	34.0	10.8		999,999		CC	$7,649	$0.0272	-$243.77	$10,800	67.5	0	10,800	14,661
0.500	34.0	10.8		999,999		CC	$8,939	$0.0318	-$143.99	$10,800	67.5	0	10,800	14,661
0.150	45.0	10.8		999,999		CC	$14,918	$0.0473	$318.57	$10,800	60.0	0	10,800	14,661
0.200	45.0	10.8		999,999		CC	$16,104	$0.0510	$410.27	$10,800	60.0	0	10,800	14,661
0.250	45.0	10.8		999,999		CC	$17,289	$0.0548	$501.97	$10,800	60.0	0	10,800	14,661
0.500	45.0	10.8		999,999		CC	$23,216	$0.0735	$960.46	$10,800	60.0	0	10,800	14,661
0.150	100	10.8		999,999		CC	$53,846	$0.105	$3,330	$10,800	37.1	0	10,800	14,661
0.200	100	10.8		999,999		CC	$67,962	$0.133	$4,422	$10,800	37.1	0	10,800	14,661
0.250	100	10.8		999,999		CC	$82,079	$0.161	$5,514	$10,800	37.1	0	10,800	14,661
0.500	100	10.8		999,999		CC	$152,659	$0.299	$10,973	$10,800	37.1	0	10,800	14,661

Σε κανέναν συνδυασμό δεν προτείνεται αποθήκευση ενέργειας μια και εδώ έχουμε την «δωρεάν μπαταρία» του δικτύου!

Αποτελέσματα Net Metering 1b

EUROSOL ENERGY SOLUTIONS

System Architecture:	HOMER Cycle Charging
Generic flat plate PV (10.8 kW)	
Grid (999,999 kW)	

Power Price (0.25 $/kWh)	
Scaled Average (45.00 kWh/d)	

Total NPC:	$35,750.86
Levelized COE:	$0.1133
Operating Cost:	$2,013.60

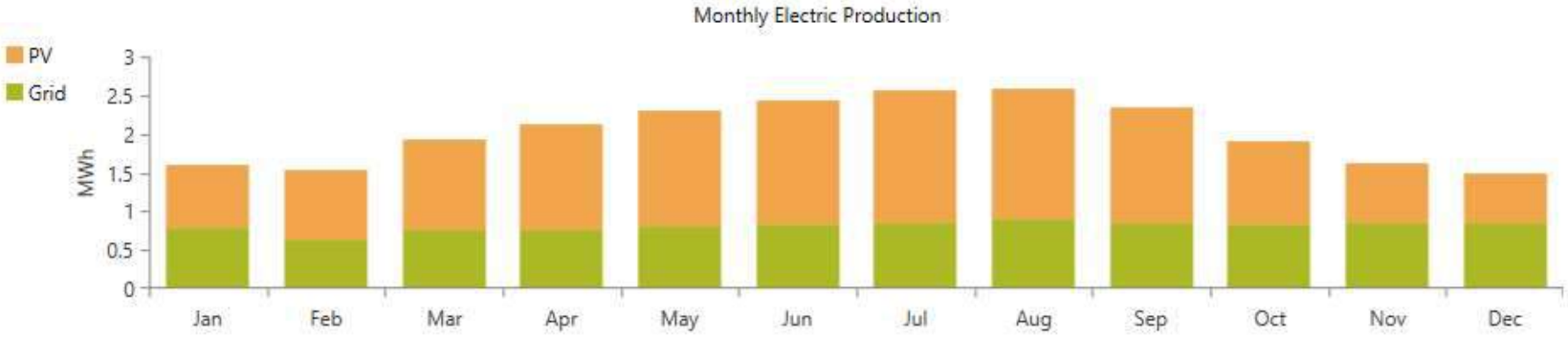
Cost Summary | Cash Flow | Compare Economics | Electrical | Renewable Penetration | Generic flat plate PV | Grid | Emissions

Production	kWh/yr	%
Generic flat plate PV	14,661	60.0
Grid Purchases	9,757	40.0
Total	24,418	100

Consumption	kWh/yr	%
AC Primary Load	16,425	67.3
DC Primary Load	0	0
Deferrable Load	0	0
Grid Sales	7,993	32.7
Total	24,418	100

Quantity	kWh/yr	%
Excess Electricity	0	0
Unmet Electric Load	0	0
Capacity Shortage	0	0

Quantity	Value	Units
Renewable Fraction	60.0	%
Max. Renew. Penetration	100	%



- Ταυτοχρονισμένη Κατανάλωση: 16.425 kWh
- Εισαγωγή από Δίκτυο ΔΕΔΔΗΕ: 9.757 kWh
- Έγχυση στο Δίκτυο ΔΕΔΔΗΕ: 7.993 kWh

Αποτελέσματα Net Metering 1c

EUROSOL ENERGY SOLUTIONS

PV (kW)	1kWh LI (#)	Grid (kW)	XTM 4000-48 (kW)	Dispatch	NPC ($)	LCOE ($/kWh)	Operating cost ($/yr)	CAPEX ($)	Ren Frac (%)	Total Fuel (L/yr)	CAPEX	Energy Production (kWh/yr)	Autonomy (hr)	Annual Throughput (kWh/yr)
10.8		999,999		CC	$14,918	$0.0473	$318.57	$10,800	60.0	0	10,800	14,661		
10.8	8	999,999	0.0500	CC	$17,933	$0.0568	$407.88	$12,660	60.0	0	10,800	14,661	3.41	6.40
		999,999		CC	$31,850	$0.150	$2,464	$0.00	0	0				
	8	999,999	0.0500	LF	$34,850	$0.164	$2,552	$1,860	0.0355	0			3.41	6.40

- **Όπου υπάρχει δυνατότητα Net metering, δεν συμφέρει η αποθήκευση**
- **Μόνον σε περιοχές με ασταθές δίκτυο - όχι με οικονομικά κριτήρια**
- **Ή αν ο πελάτης το απαιτεί!**

Αποτελέσματα Αυτοκατανάλωσης 1α

EUROSOL ENERGY SOLUTIONS

- **Τι κάνουμε σε περίπτωση Οικιακού συστήματος Αυτοκατανάλωσης με μηδενική έγχυση στο Δίκτυο?**
- **Το προηγούμενο ακριβώς σενάριο με την αφαίρεση της δυνατότητας έγχυσης**

Sensitivity		Architecture							Cost				System		PV				
Power Price ($/kWh)	Electric Load #1 Scaled Average (kWh/d)	PV (kW)	1kWh LI (#)	Grid (kW)	XTM 4000-48 (kW)	Dispatch	NPC ($)	LCOE ($/kWh)	Operating cost ($/yr)	CAPEX ($)	Ren Frac (%)	Total Fuel (L/yr)	CAPEX	Energy Production (kWh/yr)	Autonomy (hr)	Annual Throughput (kWh/yr)	1kWh LI
0.150	100	10.1		999,999		CC	$59,726	$0.119	$3,848	$18,089	35.2	0	10,089	13,696			
0.150	11.3	1.14		999,999		CC	$6,731	$0.119	$432.57	$1,139	35.2	0	1,139	1,546			
0.150	23.0	2.33		999,999		LF	$13,737	$0.119	$882.64	$2,327	35.2	0	2,327	3,159			
0.150	34.0	3.45		999,999		CC	$20,307	$0.118	$1,304	$3,447	35.3	0	3,447	4,680			
0.150	45.0	4.50		999,999		CC	$26,877	$0.119	$1,731	$4,499	34.9	0	4,499	6,108			
0.200	100	11.7		999,999		LF	$75,782	$0.145	$4,954	$11,738	39.4	0	11,738	15,934			
0.200	11.3	1.34		999,999		CC	$8,541	$0.145	$556.92	$1,341	39.8	0	1,341	1,821			
0.200	23.0	2.69		999,999		CC	$17,438	$0.145	$1,140	$2,688	39.3	0	2,688	3,649			
0.200	34.0	3.97		999,999		CC	$25,766	$0.145	$1,686	$3,971	39.3	0	3,971	5,390			
0.200	45.0	[illegible]		999,999		CC	$34,102	$0.145	$2,231	$5,260	39.3	0	5,260	7,141			
0.250	100	25.8	64	999,999	9.20	LF	$86,721	$0.158	$2,288	$44,208	77.0	0	25,807	35,003	12.3	12,786	64.0
0.250	11.3	3.01	8	999,999	1.14	LF	$9,892	$0.159	$347.61	$5,309	79.6	0	3,011	4,086	13.6	1,569	8.00
0.250	23.0	6.11	16	999,999	2.29	LF	$19,982	$0.158	$717.49	$10,707	79.1	0	6,112	8,297	13.4	3,154	16.0
0.250	34.0	9.24	24	999,999	3.45	LF	$29,561	$0.157	$1,038	$16,138	80.1	0	9,237	12,540	13.6	4,754	24.0
0.250	45.0	11.8	32	999,999	4.49	LF	$39,161	$0.161	$1,410	$20,019	78.9	0	11,775	15,985	13.7	6,196	32.0
0.500	100	36.3	88	999,999	13.4	LF	$108,842	$0.165	$3,627	$61,958	90.4	0	36,338	49,329	16.9	16,956	88.0
0.500	11.3	3.89	8	999,999	1.22	LF	$12,545	$0.170	$489.23	$6,220	87.0	0	3,893	5,285	13.6	1,721	8.00
0.500	23.0	8.28	24	999,999	3.17	LF	$25,608	$0.172	$814.84	$15,066	91.2	0	8,277	11,237	20.0	4,040	24.0

- **Δείχνει την «ανάγκη»» χρησιμοποίησης αποθήκευσης για βέλτιστα οικονομικά αποτελέσματα**

Αποτελέσματα Αυτοκατανάλωσης 1b

EUROSOL ENERGY SOLUTIONS

System Architecture:	Studer Xtender XTM 4000-48 (9.20 kW)
Generic flat plate PV (25.8 kW)	Grid (999,999 kW)
Generic 1kWh Li-Ion (8.00 strings)	HOMER Load Following

Power Price (0.25 $/kWh)	
Scaled Average (100.00 kWh/d)	

Total NPC:	$86,720.62
Levelized COE:	$0.1579
Operating Cost:	$3,288.55

Emissions

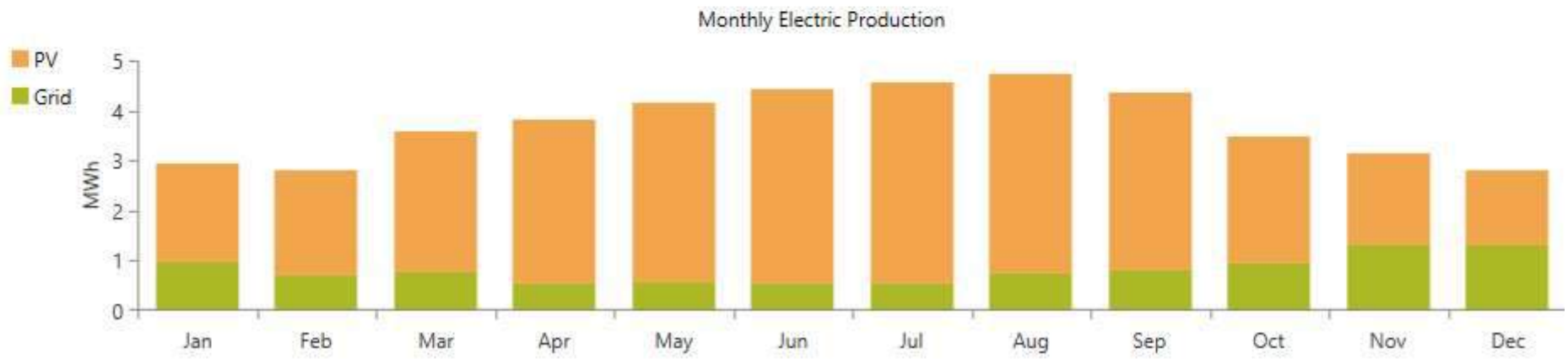
Cost Summary | Cash Flow | Compare Economics | Electrical | Renewable Penetration | Generic 1kWh Li-Ion | Generic flat plate PV | Grid | Studer Xtender XTM 4000-48

Production	kWh/yr	%
Generic flat plate PV	35,033	78.2
Grid Purchases	9,789	21.8
Total	44,822	100

Consumption	kWh/yr	%
AC Primary Load	36,500	85.9
DC Primary Load	0	0
Deferrable Load	0	0
Grid Sales	5,984	14.1
Total	42,484	100

Quantity	kWh/yr	%
Excess Electricity	0	0
Unmet Electric Load	0	0
Capacity Shortage	0	0

Quantity	Value	Units
Renewable Fraction	77.0	%
Max. Renew. Penetration	599	%



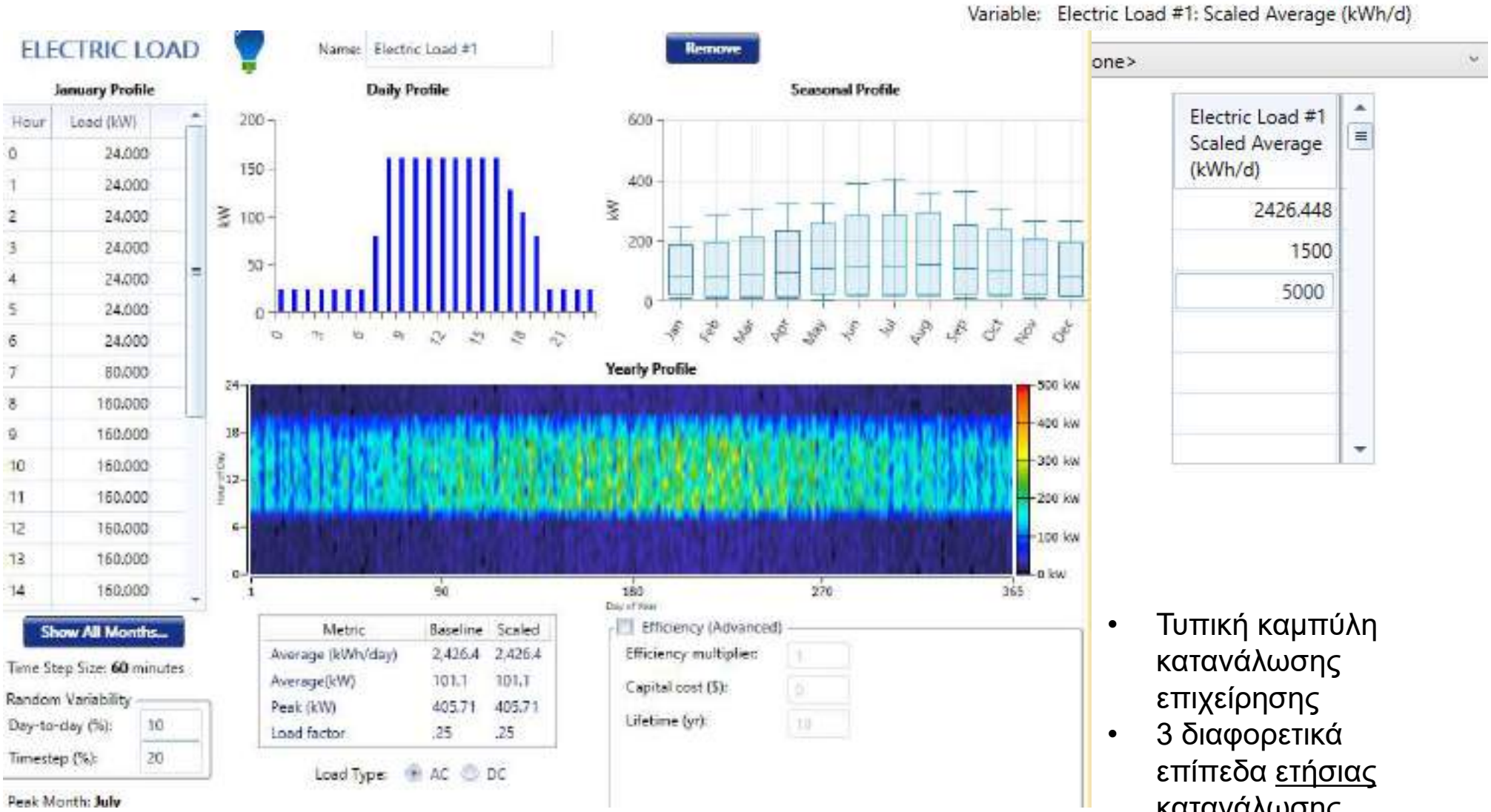
Αποτελέσματα Αυτοκατανάλωσης 1c

EUROSOL ENERGY SOLUTIONS

Architecture						Cost				System		PV			
PV (kW)	1kWh LI (#)	Grid (kW)	XTM 4000-48 (kW)	Dispatch	NPC ($)	LCOE ($/kWh)	Operating cost ($/yr)	CAPEX ($)	Ren Frac (%)	Total Fuel (L/yr)	CAPEX	Energy Production (kWh/yr)	Autonomy (hr)	Annual Throughput (kWh/yr)
25.8	64	999,999	9.20	LF	$86,721	$0.158	$3,289	$44,208	77.0	0	25,807	35,033	12.3	12,786
13.3		999,999		CC	$91,420	$0.169	$6,045	$13,271	43.0	0	13,271	18,015		
		999,999		CC	$117,964	$0.250	$9,125	$0.00	0	0				
	8	999,999	0.667	LF	$121,202	$0.257	$9,213	$2,107	0.0160	0			1.54	6.40

- **Για Αυτοκατανάλωση με Μηδενική Έγχυση, και με τις τρέχουσες τιμές της αγοράς, συμφέρει πάντα η εγκατάσταση συστήματος αποθήκευσης, ακόμη και για πολύ μικρές καταναλώσεις όταν έχουμε κόστος ενέργειας > 0.25€ / kWh.**

Καμπύλη Κατανάλωσης 2 - Επαγγελματική



- Τυπική καμπύλη κατανάλωσης επιχείρησης
- 3 διαφορετικά επίπεδα <u>ετήσιας</u> κατανάλωσης

Αποτελέσματα Αυτοκατανάλωσης 2α

EUROSOL ENERGY SOLUTIONS

Summary | Tables | Graphs | Calculation Report

Export... | Export All...

Sensitivity Cases

Left Click on a sensitivity case to see its Optimization Results.

Compare Economics | Column Choices...

Sensitivity		Architecture									Cost				System	
Power Price ($/kWh)	Electric Load #1 Scaled Average (kWh/d)					PV (kW)	1kWh LI (#)	Grid (kW)	XTM 4000-48 (kW)	Dispatch	NPC ($)	LCOE ($/kWh)	Operating cost ($/yr)	CAPEX ($)	Ren Frac (%)	Total Fu (L/yr)
0.150	500					83.4		999,999		CC	$265,281	$0.100	$14,067	$83,428	55.4	0
0.200	500					107	40	999,999	7.35	LF	$320,019	$0.114	$15,507	$119,547	66.5	0
0.250	500					138	160	999,999	29.3	LF	$353,673	$0.122	$12,927	$186,564	81.3	0
0.500	500					182	208	999,999	35.9	LF	$458,053	$0.133	$16,581	$243,702	89.9	0
0.150	1,000					171		999,999		CC	$530,505	$0.0997	$27,836	$170,648	56.3	0
0.200	1,000					211	80	999,999	14.9	LF	$640,033	$0.115	$31,287	$235,573	65.9	0
0.250	1,000					272	320	999,999	59.1	LF	$707,441	$0.124	$26,148	$369,416	80.8	0
0.500	1,000					366	416	999,999	76.3	LF	$916,273	$0.133	$32,841	$491,714	90.1	0
0.150	2,426					411		999,999		LF	$1.29M	$0.100	$67,784	$410,967	56.0	0
0.200	2,426					513	184	999,999	33.1	LF	$1.55M	$0.115	$76,161	$568,504	65.8	0
0.250	2,426					665	744	999,999	129	LF	$1.72M	$0.122	$64,114	$887,234	80.6	0
0.500	2,426					876	1,032	999,999	182	LF	$2.22M	$0.134	$80,153	$1.19M	90.0	0

Export... | Export Details...

Optimization Results

Left Double Click on a particular system to see its detailed Simulation Results.

Categorized | Overall

	Architecture									Cost				System		PV	
					PV (kW)	1kWh LI (#)	Grid (kW)	XTM 4000-48 (kW)	Dispatch	NPC ($)	LCOE ($/kWh)	Operating cost ($/yr)	CAPEX ($)	Ren Frac (%)	Total Fuel (L/yr)	CAPEX	Energy Pro (kWh
					107	40	999,999	7.35	LF	$320,019	$0.114	$15,507	$119,547	66.5	0	107,408	145,807
					101		999,999		CC	$320,742	$0.113	$16,988	$101,125	62.5	0	101,125	137,279
							999,999		CC	$471,854	$0.200	$36,500	$0.00	0	0		
						8	999,999	1.59	LF	$475,465	$0.202	$36,588	$2,474	0.00319	0		

Αποτελέσματα Αυτοκατανάλωσης 2b

EUROSOL ENERGY SOLUTIONS

System Architecture:	Studer Xtender XTM 4000-48 (7.35 kW)
Generic flat plate PV (107 kW)	Grid (999,999 kW)
Generic 1kWh Li-Ion (5.00 strings)	HOMER Load Following

Power Price (0.20 $/kWh)	
Scaled Average (500.00 kWh/d)	

Total NPC:	$320,018.80
Levelized COE:	$0.1141
Operating Cost:	$15,507.36

Emissions

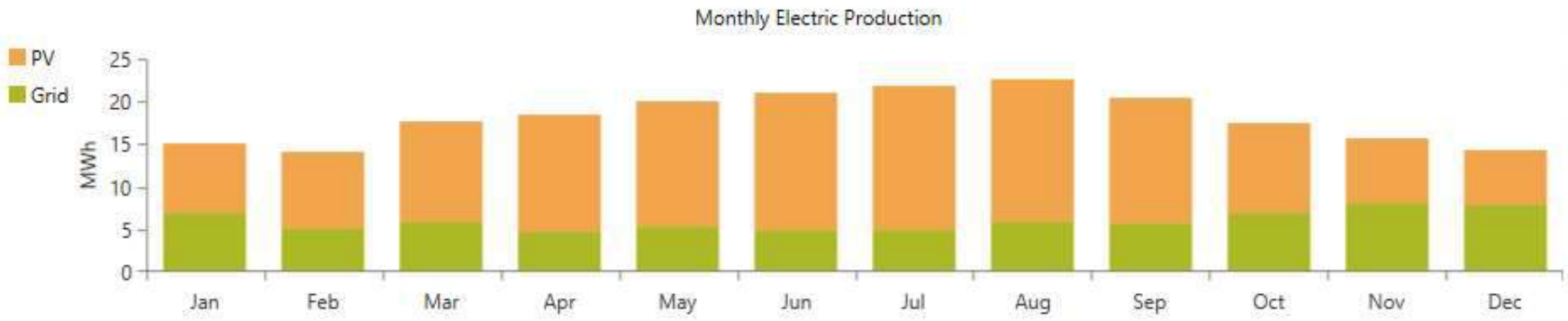
Cost Summary | Cash Flow | Compare Economics | Electrical | Renewable Penetration | Generic 1kWh Li-Ion | Generic flat plate PV | Grid | Studer Xtender XTM 4000-48

Production	kWh/yr	%
Generic flat plate PV	145,807	66.8
Grid Purchases	72,612	33.2
Total	218,419	100

Consumption	kWh/yr	%
AC Primary Load	182,500	84.1
DC Primary Load	0	0
Deferrable Load	0	0
Grid Sales	34,448	15.9
Total	216,948	100

Quantity	kWh/yr	%
Excess Electricity	0	0
Unmet Electric Load	0	0
Capacity Shortage	0	0

Quantity	Value	Units
Renewable Fraction	66.5	%
Max. Renew. Penetration	244	%



Αποτελέσματα Αυτοκατανάλωσης 2c

- Για Αυτοκατανάλωση με Μηδενική Έγχυση και σχετικά μεγάλες καταναλώσεις, και με τις τρέχουσες τιμές της αγοράς, συμφέρει πάντα η εγκατάσταση συστήματος αποθήκευσης όταν έχουμε κόστος ενέργειας > 0.20€ / kWh,

Αυτοκατανάλωση με Μηδενική Έγχυση

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Σε μονοφασικά συστήματα…κανένα πρόβλημα!

Η διάταξη περιορισμού παραγωγής για επίτευξη μηδενικής έγχυσης λειτουργεί απροβλημάτιστα.

Σε τριφασικά συστήματα έχουμε… 3 προβλήματα!

- L1
- L2
- L3

Γιατί?

Η παραγωγή ισχύος του Φ/Β είναι απολύτως συμμετρική στις 3 φάσεις.

Εάν η κατανάλωση δεν είναι ισοκατανεμημένη στις 3 φάσεις, υπάρχουν μόνον 2 δυνατά αποτελέσματα:

1. Περιορισμός της παραγωγής σε 3 x [Ισχύς φάσης με minimum A]
2. Έγχυση στις φάσεις με μικρή κατανάλωση, αγορά από το δίκτυο στην φάση με την μεγαλύτερη κατανάλωση

Όμιλος

EUROSOL

- EUROSOL Italia s.r.l. (Italy)
- EUROSOL Hellas SA (Greece)
- EUROSOL Energy Solutions Maroc s.à.r.l. (Morocco)
- EKINLER-EUROSOL A.Ş. (Turkey)
- EUROSOL LLC (Qatar)
- EUROSOL AM (Egypt)

EUROSOL – SHARP Partnership

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a. Grid-connected Solar Plants						kWp
1	Industrial Rooftop	Greece	Kifissia, Attica	Mercedes-Benz Hellas	2012	299
2	Industrial Rooftop	Greece	Avlonas	ELTON	2012	532
3	Open-space	Greece	Domokos	Modus Energeiaki S.A.	2012	711
4	Open-space	Greece	Pydna, Pieria	Olympiaka Fotovoltaika Parka Ltd.	2012	902
5	Open-space	Greece	Distomo	Aeiforos S.A.	2013	500
6	Industrial Rooftop	Turkey	Manisa	Ekinler Endfustri san. Tic. A.S.	2014	252
7	Industrial Rooftop	Turkey	Istanbul	Samson, Hadımköy	2015	172
8	Open-space	Turkey	Gönen, Isparta	Sybac Solar Güneş Enerjisi Üretim AŞ	2016	4.715
9	Open-space	Turkey	Elazig	Local Investor	2017	4.550
10	Open Space	Greece	Livadeia	Local Investor	2019	499
11	Open Space	Greece	Livadeia	Local investor	2020	499
12	Industrial Rooftop	Cyprus	Nicosia	IKEA Cyprus	2021	637
13	Open Space	Greece	Pelagia	Local investor	2022	499
14	Industrial Rooftop	Greece	Oinofyta	Alolfin	2022	97
15	Industrial Rooftop	Greece	Oinofyta	GR Sarantis ABEE	2022	1000
16	Industrial Rooftop	Qatar	Al Rayyan,	Woqod	2022	339
17	Industrial Rooftop	Qatar	Al Rayyan	Woqod	2022	347
18	Industrial Rooftop	Qatar	Sawdanatheel	Woqod	2022	375
19	Industrial Rooftop	Qatar	Doha	National Museum of Qatar	2022	120
b. Hybrid Energy Systems						
1	Power & Storage	Greece	Mount Athos	Xenofontos Community	2013	100
2	Hybrid System	Saudi Arabia	Rafha	Military	2013	22
4	E-vehicle Charging	Greece	Kifissia, Attica	Mercedes-Benz Hellas	2014	5
5	E-vehicle Charging	Greece	Piraeus	Technical Institute of Piraeus	2014	3
6	Hybrid System	Saudi Arabia	Rafha	Military	2014	68
7	Hybrid System	Saudi Arabia	Rafha	Military	2015	14 x 15
8	Hybrid System	Morocco		Military	2016	60
9	Solar Lighting Towers	Qatar	Doha	Qatar Foundation	2016	16

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EUROSOL PHOTOVOLTAIC SYSTEMS

PV POWER PLANT Sarantis **1** MWp

- Technical Specifications:
- Location: Oinofyta (Greece)
- Plant direction: South
- Construction year: 2022
- Performance: 1MWp
- Modules: 2.247 Sharp NU-JD445
- Inverter types: 8 X Sungrow SG110cx
- Mounting system: K2 MultiRail

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PV POWER PLANT IKEA (Cyprus) **637** kWp

- Technical Specifications:
- Location: Nicosia, Cyprus
- Plant direction: South
- Comissioning: 2021
- Performance: 637kWp
- Modules: 2.358 Sharp ND-RJ270 (270Wp)
- Inverter types: 6 X ABB PVS-100-TL
- Mounting system: Renolit AlkorSolar Alumil

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PV POWER PLANT JORDINA 1,5 MWp

- Technical specifications
- Location: Amman (Jordan)
- Plant direction: South
- Construction year: 2015
- Performance: 1,5 MWp
- Modules: BYD 260P6C (260 Wp)
- No. of modules: 5.770 pieces
- Inverter type: 49 x ABB TRIO 27.6-TL-OUTD-S2x

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PV POWER PLANT Alolfin **97** kWp

- Technical Specifications:
- Location: Oinofyta (Greece)
- Plant direction: East/West
- Construction year: 2022
- Performance: 97kWp
- Modules: 184 Sharp NU-JD540
- Inverter types: 1 X Sungrow SG110cx
- Mounting system: Alumil Solfie-H2300 Helios

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ENERGY SOLUTIONS

PV POWER PLANT Aeiforos **499** kWp

- **Technical Specifications:**
- Location: Livadeia (Greece)
- Plant direction: South
- Construction year: 2020
- Performance: 499kWp
- Modules: 1.515 Sharp ND-AF330C
- Inverter types: 13 X KOSTAL PIKO 36 EPC
- Mounting system: Emmanouil S.A.

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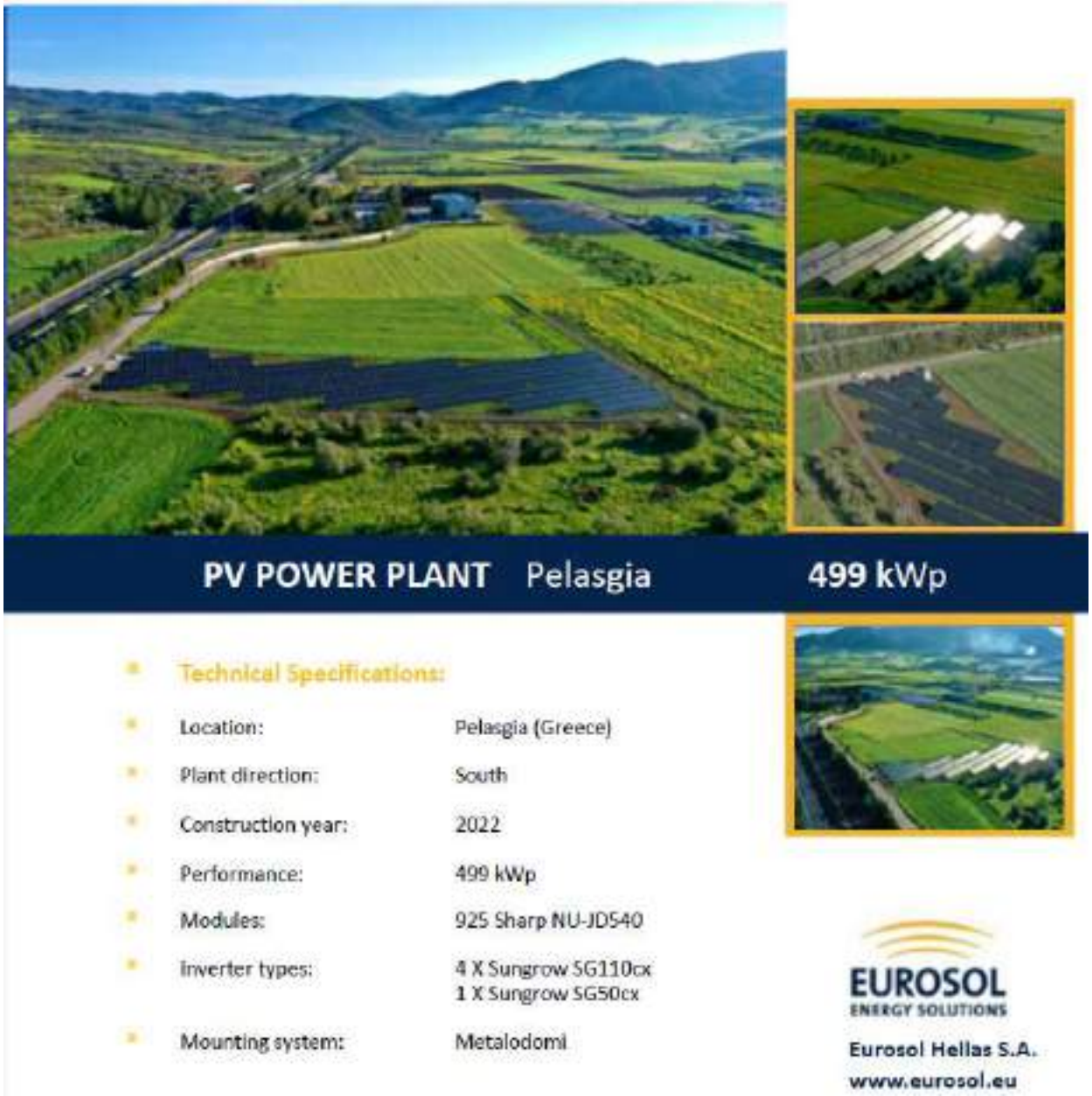

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PV POWER PLANT Woqod Golf Course Petrol Station **339 kWp**

- Technical Specifications:
- Location: Al Rayyan (Qatar)
- Plant direction: South
- Construction year: 2022
- Performance: 339 kWp
- Modules: 745 Q Cells XL G9.3 455
- Inverter types: 2 X SMA STP110-60
- 1 X SMA STP20000TL-30
- Mounting system: K2 Mini Rail

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PV POWER PLANT ELTON 532 kWp

- Technical specifications
- Location: Avlonas, Attica (Greece)
- Plant direction: East/West
- Construction year: 2012
- Performance: 532 kWp
- Modules: 2.173 x BYD 245P6-30 (245 Wp)
- Inverter type: 4 x Fronius CL 60.0
3 x Fronius CL 48.0
3 x Fronius CL 36.0
- Mounting system: Hilti MSP-AL

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PV POWER PLANT Woqod Rawdat Petrol Station **347 kWp**

- Technical Specifications:

Location:	Al Rayyan (Qatar)
Plant direction:	South
Construction year:	2022
Performance:	347 kWp
Modules:	762 Q Cells XL G9.3 455
Inverter types:	4 X SMA STP15000TL-30 2 X SMA STP20000TL-30 2 X SMA STP110-60

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PV POWER PLANT Woqod New Petrol Station **375 kWp**

- Technical Specifications:

Location:	Sawdanatheel (Qatar)
Plant direction:	South
Construction year:	2022
Performance:	375 kWp
Modules:	216 Sharp NU-JD540 91 Q Cells XL G9.3 455
Inverter types:	2 X Sungrow SG110cx 3 X Sungrow SG40cx 1 X Sungrow SG33cx

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PV POWER PLANT National Museum of Qatar **120 kWp**

- Technical Specifications:
- Location: Doha (Qatar)
- Plant direction: South
- Construction year: 2022
- Performance: 120 kWp
- Modules: 216 Sharp NU-JD540
- Inverter types: 1 X Sungrow SG110CX V115
- Mounting system: Alumil Solar

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Ευχαριστούμε για την… Υπομονή!