

ARCHIMEDES Ltd

ΑΡΧΙΜΗΔΗΣ ΕΠΕ



ΑΡΧΙΜΗΔΗΣ ΕΠΕ

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Description of the project

- •••, or Archimedes Ltd.
- Renewable energy Power Company
- Limited liability
- The purpose of the company is to generate 20MW_p electric power for the island of Crete in Greece.
- The technology profiled for this project is High Concentration Photovoltaics (HCPV).

Market Analysis



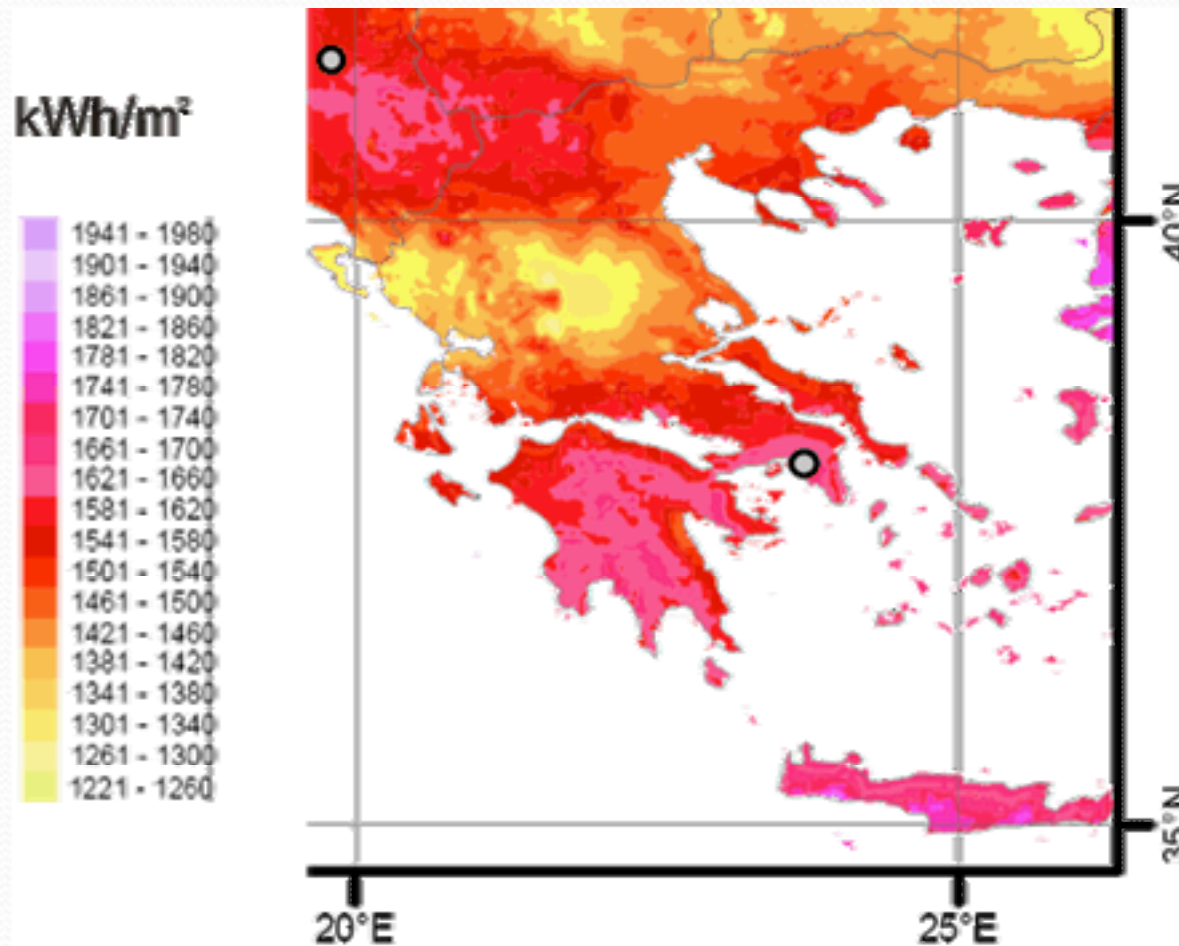
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Overview

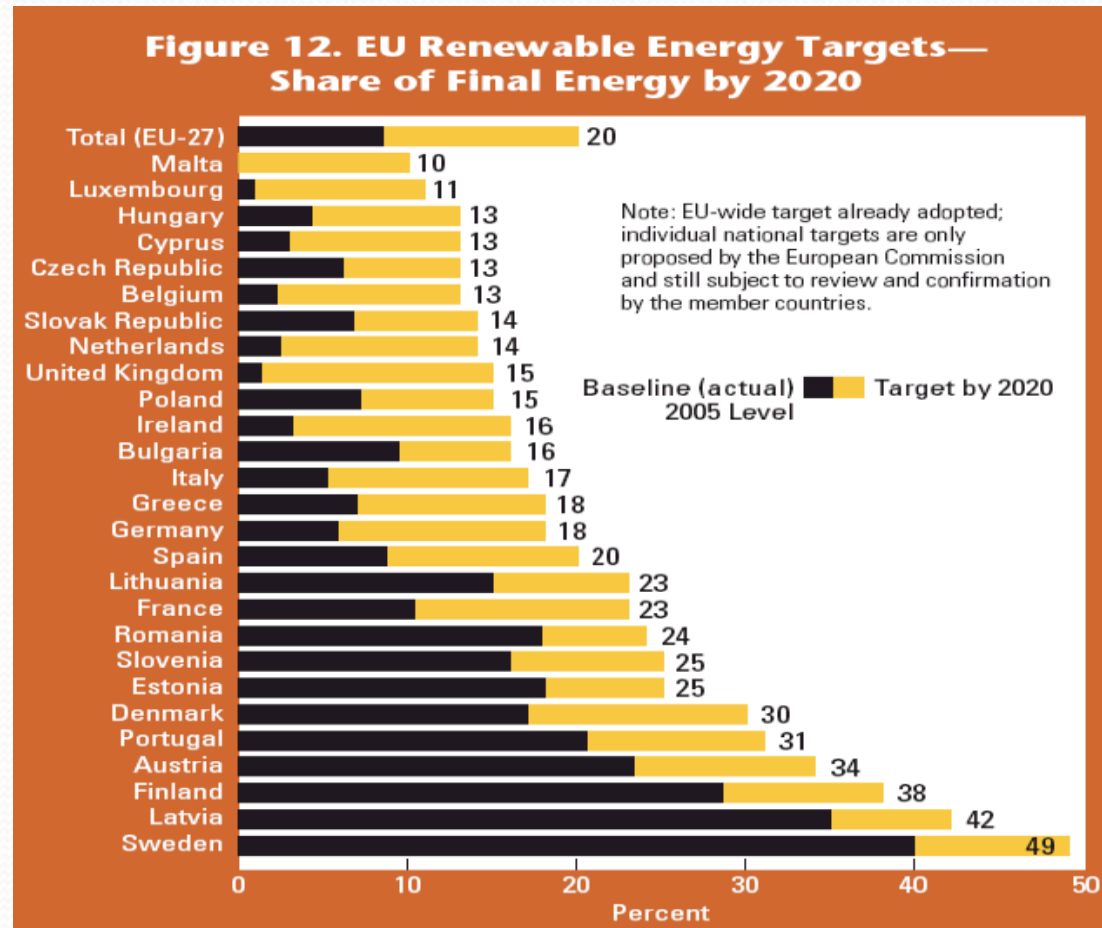
- Greece is a warm sunny country.
- High irradiation flux during the year (1600 kWh/m²)
- Over that last few years the country has been experiencing power shortages.
- Following EU's directives, Greece has adopted a policy for renewable power production that attracted a lot of interest, domestic and foreign.

Annual Solar Irradiation in Greece



EU Renewable Energy Targets

- The target set by Greece for 2020 is 18% and recently increased to 29%,
- In 2005 Greece had achieved 8%.
- There is still a lot of potential to go.



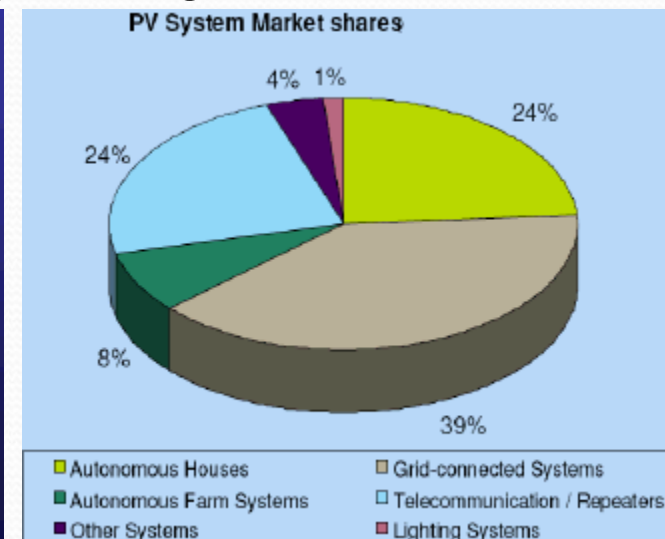
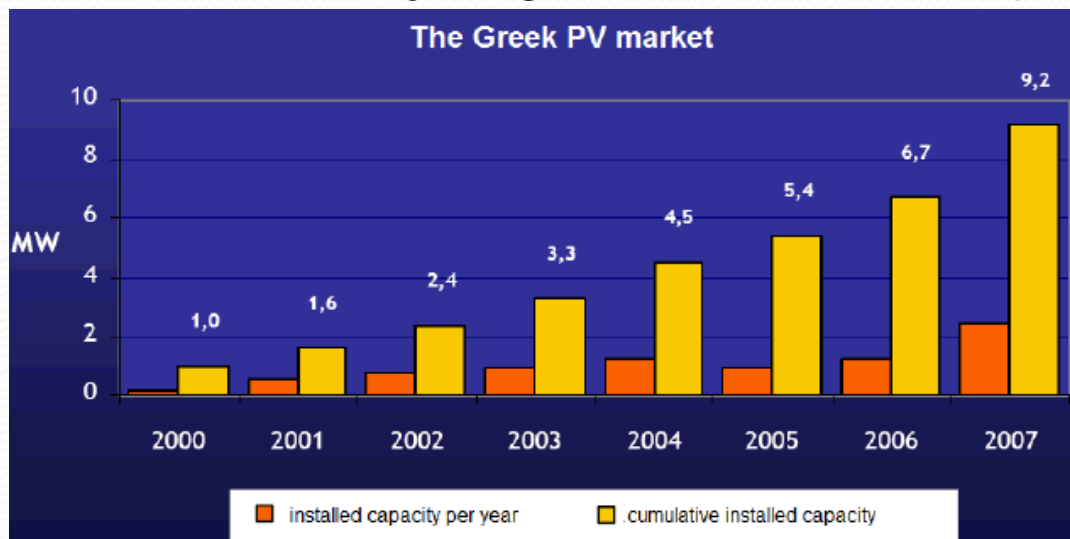
Guaranteed Price & Market

- The state is obligated to buy the power produced by law.
- The feed-in tariffs set by the Greek government in 2006 are guaranteed for 20 years.
- The price is adjusted to inflation and the market.

Rated Power	Mainland Grid	Off-grid Islands
<150 kW	0.45 €/kWh	0.50 €/kWh
>150 kW	0.40 €/kWh	0.45 €/kWh

PV Market Growth

- Greek PV market has grown the past decade considerably fast.
- Every year more PV systems are being installed in Greece, and with the commitment shown by the government, the PV industry is guaranteed to keep growing.



Choice of Location -Crete-

- The island of Crete is considered an off-grid island, and for a proposed plant size of 20MW_p prices of 0.45 €/kWh are set by the government and guaranteed for 20 years.
- There is a great power demand during the touristic season.
- The planned site for investment is located at the south-east part of Crete, near the town of Ierapetra, on a land area where agriculture is not suitable.

Location

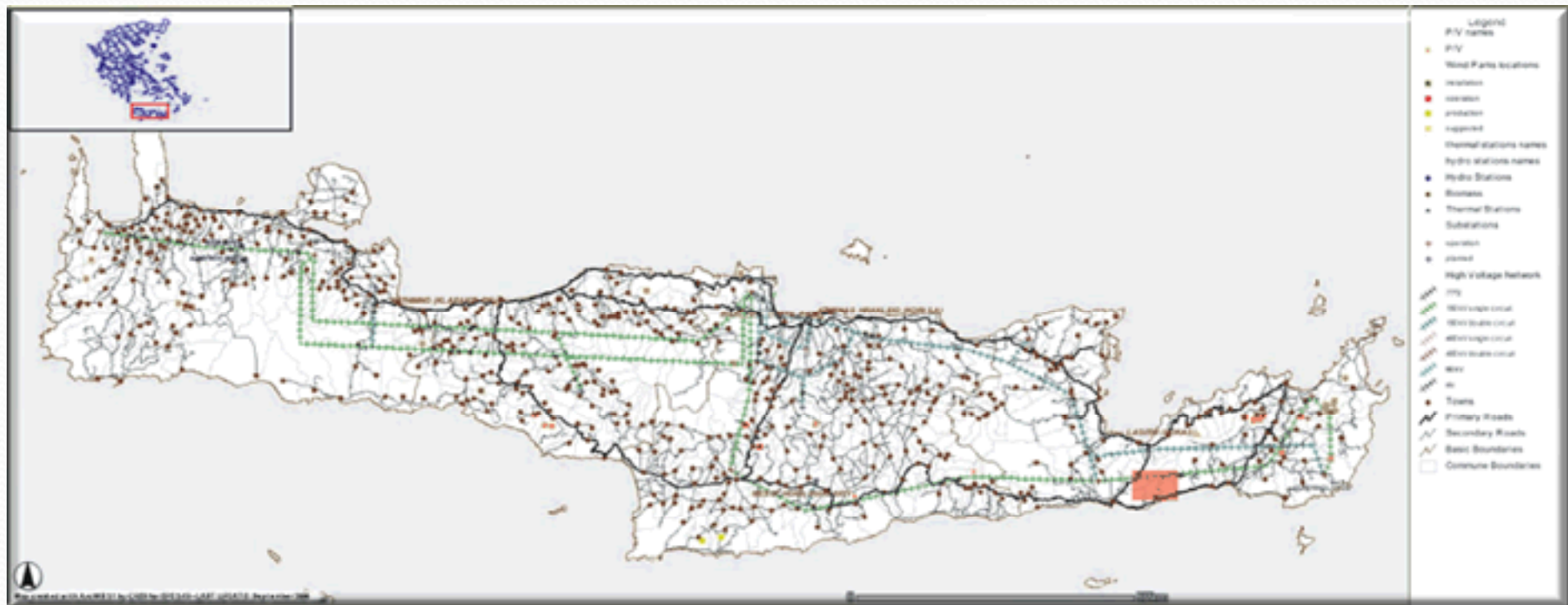


Choice of Location -Crete-

- Target area sits on a mountain slope very close to high voltage transmission lines and away from residential and touristic areas.
- The choice of a south facing slope is made to avoid shadowing while keeping the arrays relatively close together.
- Furthermore, mountainous land areas are usually inexpensive due to the fact that they are inconvenient for farming or building.



Power Grid



Competitors

- The rapid growth of the grid connected PV market in Greece has created a backlog in approval for new PV powerplants. Until 2010, which is the end of the first phase of the Greek legislation, 790MW of licenses are set for approval. At the moment applications for 3700 MW have been submitted, but after many reviews by the Greek government, additional allowances have been made to incorporate as many investments as possible. This is part of the recent update of the Greek government's goal from 18% renewables by 2020 to 29%, which gives room for Archimedes, Ltd. to enter the market.

The Company



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The Company

	Eteria Periorismenis Efthinis E • E/EPE - Limited Liability Company
Company law	Law 2190/20
Founders	at least 1 founder
Capital requirements	€18,000
Liability	limited to contributions
Incorporation	articles of association + registrations and notary public
Company name	the company name must either be incorporated by the name of one or more of its shareholders or by the business object and in all cases must include the company form.
Accounting obligation	yes
Management	at least one director

Partners

- Kurt Bastian
- David Castaño
- Paris Chatzitakis



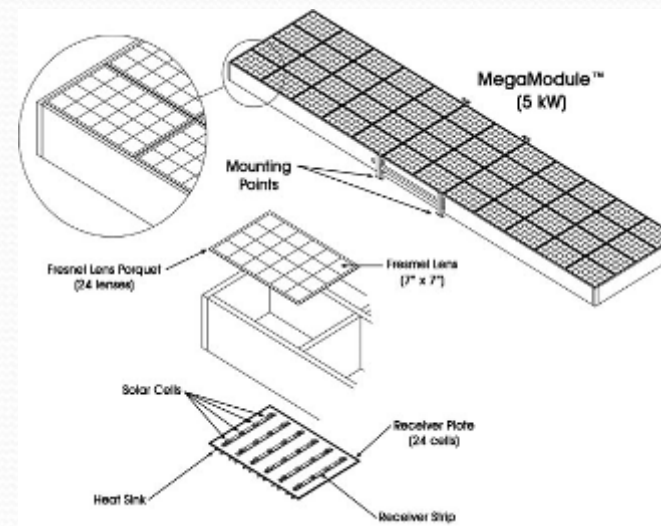
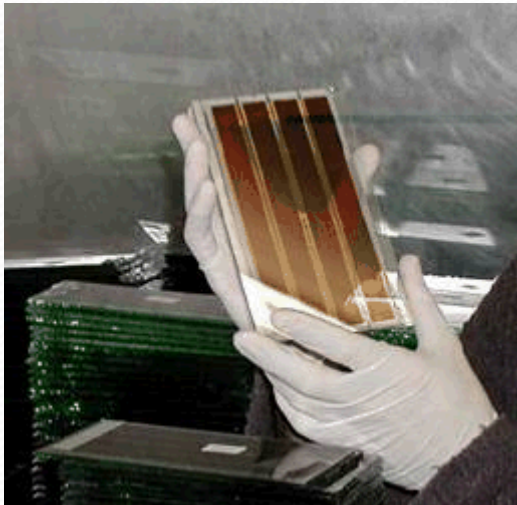
Licenses Needed

- Installation License.
- Operational License.
- The production License.
- Environmental License.
- Zoning Inspection.
- Grid Connection Contract.
- Grid Management Contract



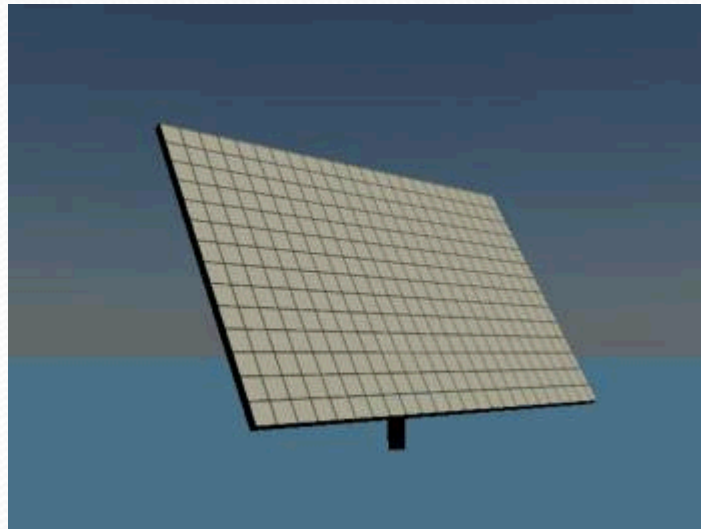
Technology

- Our production method is through high concentration photovoltaic technology. Specially designed Fresnel lens will concentrate sunlight 500 times, with an efficiency of 85%, on high efficiency III-V photovoltaic cells, with an efficiency of 38%. Conventional PV solar cells have a maximum efficiency between 15-17%.



Technology

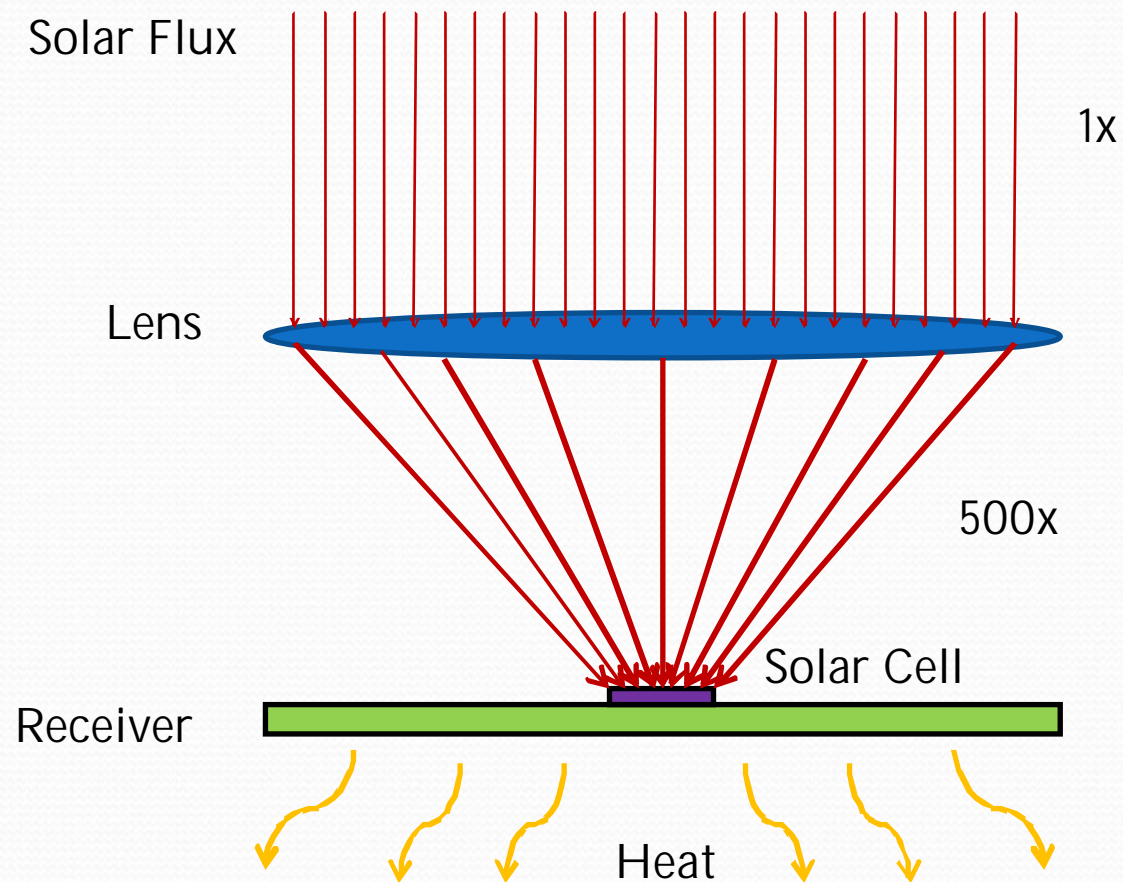
- The modules are packed and mounted on pedestal tracking systems which follow the sun's movement with an accuracy of 0.1%. Each module is equipped with a heat sink so passive cooling can take place and dissipate the excess heat. Mounted on the base of the tracking system is the inverter and the power electronic systems. System administrators will be able to remotely monitor and control the performance of all subsystems on real time.



Why HCPV??

- Less PV cell area needed to produce a given amount of power
- An opportunity to use higher performance cells, that otherwise would be prohibitively expensive
- Significantly less land area needed relative to other PV solutions
- Favourable energy payback time
- **Bottom-line:** Significant reduction of electricity cost by replacing expensive PV converter area by less expensive optical material

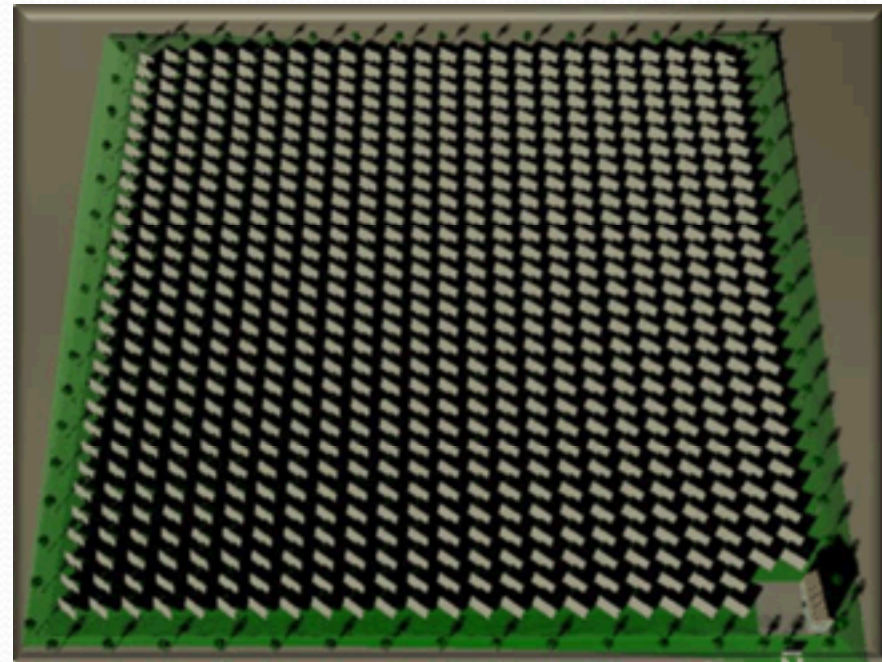
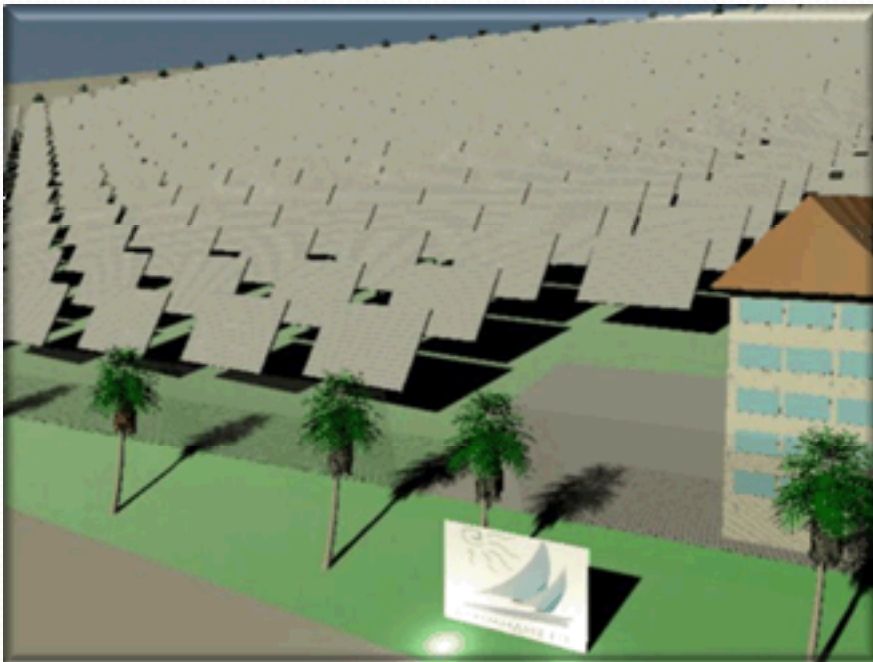
How does it work?



The Farm



- The 20MWp power plant will be a farm of 35kWp tracking arrays, each of which will have an effective area of 125m². In total 572 tracking arrays will be installed resulting in a total effective area of 502,000m².



Financial Instruments and Economic incentives for Energy Investments



Incentives



	Zone A	Zone B	Zone C
Subsidy on Equipment	20%	30%	40%
Tax Exemption	60%	100%	100%
Labor Costs Subsidy	20%	30%	40%

Sales

- Projected average production 43,730 MWh/a
- Guaranteed sale for fixed price 0,45 €/kWh
- Steady production throughout 10 years



Schedule Before Operation

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
Grid connection fee													
Production License													
Environmental License													
Installation license													
Zoning inspection													
Operational License													
Surveying and Land Preparation													
Foundations & Building													
Fence													
Lighting & Drains													
Module Mounting													
Testing													
Connection & 100% Operation													

Financing

- Bank Loan for 75% of the total investment
- Interest rate: 5.65% fixed
- Venture capital for the rest of the investment



Cost Calculations



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Investment & Depreciation Costs

Description	Investment €	Depr. [years]	Depr. in € p.a.
Land			
Property [m2]	6,134,440.00 €	-	- €
Prop. Purch. Fee 10%	613,444.00 €	-	- €
Realtor's Fee 2%	122,688.80 €	-	- €
Legal Fees 1.5%	92,016.60 €	-	- €
Total Purchase of Land	6,962,589.40 €		
Installation for a 20MWe Plant			
Buildings	120000	20	6,000.00 €
Surveing	45000	20	2,250.00 €
Landscaping	15000	20	750.00 €
Foundations	45000	20	2,250.00 €
Roads	6000	20	300.00 €
Lighting	9000	20	450.00 €
Drains	9000	20	450.00 €
Cables	30000	20	1,500.00 €
Fence	21000	20	1,050.00 €
Total Instalation	300,000.00 €		15,000.00 €

Investment & Depreciation Costs

Establishment of the company			
pre-approval. Cor. name	30.00 €		
Lawyer's fees	180.00 €		
Notary Public	300.00 €		
Lawyer's Fund appr.	100.00 €		
Lawyer's Providence Fund	180.00 €		
capital accumulation tax	180.00 €		
pre registration	96.69 €		
Court of First Instance	8.79 €		
publ. Articles of Incorporation	250.00 €		
Limited company Capital	18,000.00 €		
Total Est. Costs	19,325.48 €		

Investment & Depreciation Costs

Licensing			
Grid connection fee	20,000.00 €	20.00	1,000.00 €
Production Licence	5,000.00 €	20.00	250.00 €
environmental license	3,000.00 €	20.00	150.00 €
Installation license	3,000.00 €	20.00	150.00 €
Zoning inspection	3,000.00 €	20.00	150.00 €
Operational License	1,000.00 €	20.00	50.00 €
Total Licensing	35,000.00 €		1,750.00 €
Vehicles			
Snake 2112 Smart, Oil & Steel Mounted Lift	80,000.00 €	5	16,000.00 €
Honda Motorcycles	9,000.00 €	5	1,800.00 €
Fire Truck	200,000.00 €	5	40,000.00 €
Car company	75,000.00 €	5	15,000.00 €
Total Vehicles	364,000.00 €		72,800.00 €

Investment & Depreciation Costs

Other			
Contingencies	4,600,000.00 €	10	460,000.00 €
Engineering and Const. Management	1,400,000.00 €	10	140,000.00 €
Installation Crew (units)	200,000.00 €	10	20,000.00 €
Furniture	20,000.00 €	10	2,000.00 €
Total Other	6,220,000.00 €		622,000.00 €
Electronics			
Office computers (with Licenses)	7,500.00 €	4	1,875.00 €
Printer & Scanner	700.00 €	4	175.00 €
Security System (Fire, Accident Alarms, etc.)	15,000.00 €	4	3,750.00 €
Total Electronics	23,200.00 €		5,800.00 €

Investment & Depreciation Costs

Power Equipment				
Control Electronics	1	75,000.00 €	4	18,750.00 €
Modules 35kWp	572	54,340,000.00 €	10	5,434,000.00 €
Total Power Equipment		54,415,000.00 €		5,452,750.00 €
	Total Investment	68,339,114.88 €	Total Dep. Costs	6,170,100.00 €

Annual Fees

Annual Fees	Units/%	Costs
Labor Costs		
Technicians	2	60,000.00 €
Cleaning	1	10,000.00 €
Secretary	1	27,000.00 €
Security	4	40,000.00 €
Administrative Costs		
Insurance (Plant)	1	160,000.00 €
Utilities	1	20,000.00 €
Land Tax (0.8%)	0.8%	49,076 €
Production Costs		
Operation & Maintenance	1	200,000.00 €
	Total	566,076 €



Financing

Total Investment	68,339,114.88 €
30% Subsidy for Technology	16,324,500.00 €
75% finance (bank)	51,254,336.16 €
25% venture capital	17,084,778.72 €

Financing

Bank Loan Repayment				
Year	Balance debt	Interest Rate %	Interest costs paid	Repaying
1	51,254,336.16 €	5.65%	2,895,869.99 €	5,125,433.62 €
2	46,128,902.54 €	5.65%	2,606,282.99 €	5,125,433.62 €
3	41,003,468.93 €	5.65%	2,316,695.99 €	5,125,433.62 €
4	35,878,035.31 €	5.65%	2,027,109.00 €	5,125,433.62 €
5	30,752,601.70 €	5.65%	1,737,522.00 €	5,125,433.62 €
6	25,627,168.08 €	5.65%	1,447,935.00 €	5,125,433.62 €
7	20,501,734.46 €	5.65%	1,158,348.00 €	5,125,433.62 €
8	15,376,300.85 €	5.65%	868,761.00 €	5,125,433.62 €
9	10,250,867.23 €	5.65%	579,174.00 €	5,125,433.62 €
10	5,125,433.62 €	5.65%	289,587.00 €	5,125,433.62 €
		Total Interest Paid	15,927,284.96 €	
			Total Repayment	51,254,336.16 €

Venture Capital Repayment				
Year	Balance debt	Interest Rate %	Interest paid	Repaying
1	17,084,778.72 €	7%	1,195,934.51 €	- €
2	17,084,778.72 €	7%	1,195,934.51 €	16,324,500.00 €
3	760,278.72 €	7%	53,219.51 €	3,205,367.25 €
		Total	2,445,088.53 €	19,529,867.25 €

Self Costs, Revenue, Cash Flow, and Equity

Year	1	2	3	4	5	6	7	8	9	10
Utilization Capacity	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Quantity Produced MWh/year	-	43.730	43.730	43.730	43.730	43.730	43.730	43.730	43.730	43.730
Price per kWh	0,45	0,45	0,45	0,45	0,45	0,45	0,45	0,45	0,45	0,45
Turnover/Revenue	- €	19.678.500,00 €	19.678.500,00 €	19.678.500,00 €	19.678.500,00 €	19.678.500,00 €	19.678.500,00 €	19.678.500,00 €	19.678.500,00 €	19.678.500,00 €

Costs										
Depreciation Costs	6.170.100,00 €	6.170.100,00 €	6.170.100,00 €	6.170.100,00 €	6.170.100,00 €	6.170.100,00 €	6.170.100,00 €	6.170.100,00 €	6.170.100,00 €	6.170.100,00 €
Financing Costs	2.895.869,99 €	2.606.282,99 €	2.316.695,99 €	2.027.109,00 €	1.737.522,00 €	1.447.935,00 €	1.158.348,00 €	868.761,00 €	579.174,00 €	289.587,00 €
Annual Fees	566.075,52 €	566.075,52 €	566.075,52 €	566.075,52 €	566.075,52 €	566.075,52 €	566.075,52 €	566.075,52 €	566.075,52 €	566.075,52 €
Total of Costs	9.632.045,51 €	9.342.458,51 €	9.052.871,51 €	8.763.284,52 €	8.473.697,52 €	8.184.110,52 €	7.894.523,52 €	7.604.936,52 €	7.315.349,52 €	7.025.762,52 €

Loss carried Forward	0	9.632.045,51 €	- €	- €	- €	- €	- €	- €	- €	- €
Profit Before Taxes	- 9.632.045,51 €	703.995,97 €	10.625.628,49 €	10.915.215,48 €	11.204.802,48 €	11.494.389,48 €	11.783.976,48 €	12.073.563,48 €	12.363.150,48 €	12.652.737,48 €
Tax Free (25%)	- €	- €	- €	- €	- €	- €	- €	- €	- €	- €
Profit After Taxes	- 9.632.045,51 €	703.995,97 €	10.625.628,49 €	10.915.215,48 €	11.204.802,48 €	11.494.389,48 €	11.783.976,48 €	12.073.563,48 €	12.363.150,48 €	12.652.737,48 €
Cash-Flow (net profit+depreciation)	- 3.461.945,51 €	6.874.095,97 €	16.795.728,49 €	17.085.315,48 €	17.374.902,48 €	17.664.489,48 €	17.954.076,48 €	18.243.663,48 €	18.533.250,48 €	18.822.837,48 €
Repayment Credit	5.125.433,62 €	5.125.433,62 €	5.125.433,62 €	5.125.433,62 €	5.125.433,62 €	5.125.433,62 €	5.125.433,62 €	5.125.433,62 €	5.125.433,62 €	5.125.433,62 €
Subsidy	- €	16.324.500,00 €	- €	- €	- €	- €	- €	- €	- €	- €
Repayment to Ventures	- €	16.324.500,00 €	3.205.367,25 €	- €	- €	- €	- €	- €	- €	- €
Dividend	- 8.587.379,13 €	1.748.662,36 €	8.464.927,62 €	11.959.881,87 €	12.249.468,87 €	12.539.055,87 €	12.828.642,87 €	13.118.229,87 €	13.407.816,87 €	13.697.403,86 €

Equity Profitability										Total Dividend
Equity	17.084.778,72 €	17.084.778,72 €	17.084.778,72 €	17.084.778,72 €	17.084.778,72 €	17.084.778,72 €	17.084.778,72 €	17.084.778,72 €	17.084.778,72 €	17.084.778,72 €
Interest on Equity	-50,26%	10,24%	49,55%	70,00%	71,70%	73,39%	75,09%	76,78%	78,48%	80,17%

Conclusions



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Conclusions

- Guaranteed prices and market for the next twenty years
- High insolation value in Crete
- High efficiency and low cost technology applied
- High demand for power during the summer months
- Significant competition for licenses
- Very competitive plan in regards to the proposed plant's size and technology.
- Payback period of the total investment is calculated as 5.2 years
- The plant should be able to run for a total of twenty years bringing in far more profit.

Conclusions

- Even in the case that the Greek government decided to eliminate the subsidies and lower the price per kWh, the company could still operate profitably with conventional market prices.



**Thank you for your
attention**