

Energie Solar Heating and the RHI

Cernunnos Homes

Version 3.2

last updated June 2011

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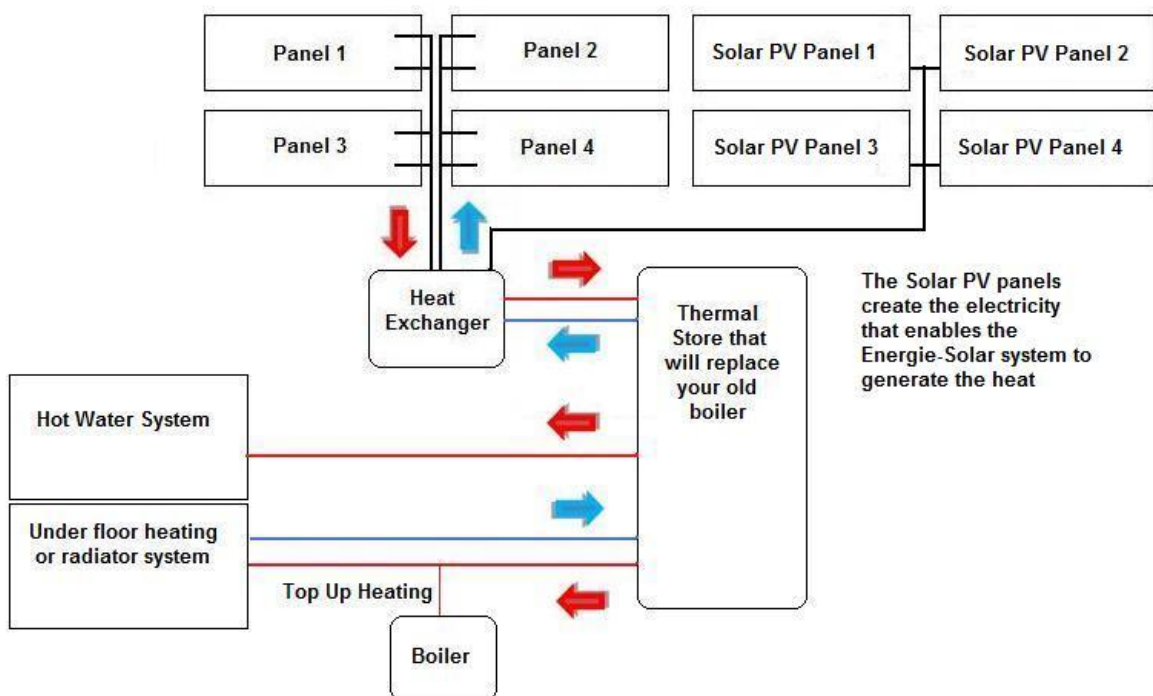
Energie Solar – The only Solar Heating system that works all year round – even at night time!

What is the Energie Solar System?

- The Energie Solar system combines Solar Thermal technology with that of Air Source Heat Pumps, using Thermodynamics to generate heat all year round - even at night. In fact, **the system even works in temperatures down to -10 degrees Celsius.**
- The system has been developed in Europe over the last 16 years and has seen over 16,000 installations in the last 3 years alone, with over 200 in the UK and Ireland.
- The Technology is suitable for Central Heating, Domestic Hot Water and for Heating Swimming Pools.
- It combines a Solar Thermal panel system, which is located on the roof, with an Air Source Heat Pump, located within the property or on the external wall of the property.
- The Energie-Solar system is the first “next-generation” solar thermal system that uses a refrigerant gas in the panels, rather than the more common use of water (or antifreeze). The refrigerant fluid (which boils at a temperature of -26 C) is transformed to a gaseous state in the solar panel as it encounters the outside climate/temperature change (the fluid is heated), this gas is then transferred to a heat exchanger that increases the pressure of the gas, thereby creating even more heat (based on the laws of thermodynamics). This heat is then transferred to the water circuit. As the pressure is increased, the gas turns back into a liquid and is sent back to the solar panel to restart the continuous process.
- The components of the Energie-Solar system:
 - Solar Panels
 - Heat Exchanger
 - Liquid distributing piping



- The solar panels are arranged just like other panels, with more panels in the system the greater the requirement for heat. Thus a small 4 block system will produce enough heat for a households water heating requirement, whilst a large 16 or 24 block system will produce enough heat for a large houses water heating and space heating requirements all year round.
- The system requires electricity in order to pump the gas around the pipes and for the heat exchanger to work. However, the system has a Co-efficient of Performance (CoP) of around 4 to 1. That is, for every unit of electricity it uses, it produces 4 units of heating!
- To counteract the need for electricity, some systems are installed with Solar PV alongside to produce the required energy to run the system:



How much energy does it produce?

- There are numerous systems you can chose from the Energie Solar range:

Model	Capacity (L)	No Panels	Height (mm)	Diameter (mm)	Input Power (W)	Output Power (W)	CoP
ECO 500	500	2	1,830	650	595	2,800	4.7
ECO 750	750	4	2,135	750	960	7,290	7.6
ECO 1000	1000	4	2,185	850	960	7,290	7.6
ECO 1500	1500	6	2,460	950	1,230	9,680	7.9
ECO 2000	2000	8	2,520	1,100	1,440	11,240	7.8

ECO 3000	3000	12	2,900	1,250	2,010	16,580	8.2
ECO 3000 E	3000	16	2,900	1,250	3,210	24,210	7.5
ECO 4000	4000	24	2,960	1,450	4,140	31,430	7.5
ECO 5000	5000	32	3,030	1,600	5,690	42,600	7.5
ECO 6000	6000	40	2 x 2,900	2 x 1,250	7,630	52,790	6.9

- Let us assume we are looking at the ECO 4000 system of 24 panels. This has a power input requirement of 4,140kW, i.e. the kWh of electricity that is needed to power the system, and an Output power of 31,430kWh of heat. Thus, the coefficient of performance (CoP) is 7.6. That is, for every unit of electricity you put into the system, you get 7.6 times that amount of energy out of the system in the form of heat. Obviously this is a maximum CoP, and in practice the average working CoP is around 3.5/4. This is significantly higher than traditional Solar Thermal systems that tend to have a CoP of around 2 to 1. More traditional methods of heating, such as immersion heaters, have a CoP of 1 or even less than this (meaning more energy input is required than the outputted heat). For example, Gas and Oil boilers have efficiency ratios of 85%, equivalent to a CoP of 0.85.
- In essence, the Energie Solar system can be designed to provide enough hot water for a small house or enough heating for the largest of swimming pools or buildings – we can ensure that the system you chose will work to suit your requirements.

How much does it cost?

System	Cost (inc VAT)
2 Panel System	£4,000
4 Panel System	£8,250
6 Panel System	£9,100
8 Panel System	£10,050
12 Panel System	£11,800
16 Panel System	£14,250
24 Panel System	£18,500
32 Panel System	£23,000
40 Panel System	£27,150

- These costs do not include Installation costs.
- A 2 panel system is enough to cover the Domestic How Water needs for an average sized UK house, whilst a 4 panel system would cover Domestic Hot Water AND all heating needs. A 40 panel system is large enough for a large swimming pool!

Am I Suitable for Energie Solar?

- The panels can be facing any direction, and can even be placed on external horizontal walls!
- The one caveat of the system is that it will only heat your hot water to 55/60 degrees, whereas traditional gas boilers will heat the water to 75/80 degrees (in fact, for hot water systems you need to heat the water to this temperature to combat legionnaires disease).
- It is for this reason that the system works best with under floor heating systems or low surface temperature radiator systems, rather than more modern radiator systems.
- It is also for this reason that the system generally requires a Thermal Store to replace your existing Hot Water Tank. A Thermal Store is very similar to traditional hot water tanks, although they allow multiple heating sources to be connected. Thus you can have your existing boiler connected alongside the Energie Solar system, where the traditional boiler will provide the top-up heat when required.

The Renewable Heat Incentive:

- The Renewable Heat Incentive (RHI) is very similar to the Feed In Tariff (FIT) scheme for renewable electricity, but applies to technologies that generate heating from a renewable technology.
- The RHI is being put in place to encourage the take-up of renewable heat technologies that remain more expensive to install and run than traditional fossil-fuel heating systems. It is for this reason that the Government is setting up a cash incentive scheme whereby under the RHI you will be paid quarterly on the total amount of renewable heat generated, expressed in kWh. The scheme aims to generate a return on investment of 12% for all technologies and 6% for Solar thermal.
- The scheme is being brought in over two Phases:
 - Phase One starts in June 2011 and sees the Renewable Heat Incentive introduced for the non-Domestic sector. This includes Corporate, Public Authorities, Schools and Hospitals.
 - Phase Two: this will see the inclusion of the domestic sector in October 2012 when the Green Deal is introduced.
- Eligible Technologies include: Ground Source Heat Pumps, Solar Thermal, Biomass Boilers, Biogas, Biomethane and Combined Heat and Power (CHP).
- Only technologies that are MCS accredited, and installed by MCS accredited installers, will be eligible for the RHI payment.
- Tariff Rates are set as:

Technology	Eligibility	Size		p/kWh	Duration	
Biomass	Solid Biomass; Municipal Solid Waste (incl. CHP)	< 200kWth	Tier 1	7.6	20.0	Tier 1 to installed capacity x 1,314
			Tier 2	1.9	20.0	
		200-1,000 kWth	Tier 1	4.7	20.0	
			Tier 2	1.9	20.0	
> 1,000kWth	No Tier	2.6	20.0	Metering		
Ground Source Heat Pump	GSHP's, Water Source Heat Pumps and deep Geothermal	< 100kWth		4.3	20.0	Metering
		> 100kWth		3.0	20.0	Metering
Solar Thermal		< 200kWth		8.5	20.0	Metering
Biomethane	Biomethane injection and Biogas combustion	All		6.5	20.0	Metering

Energie Solar and the RHI:

- Heating systems are very complicated to design. For the purpose of this example, we have assumed a system has been designed without giving details, other than the system output, system cost and the CoP. All have been based on real life systems. Please contact us for a free, no-obligation consultation to see what heating system you would be suited to.
- Firstly, let us assume that our business currently uses Heating Oil to heat the building, and we have the following inputs:
 - The current Boiler efficiency is 85%
 - The Heating Oil price is currently 6.3p/kWh
 - The Energy Consumption required is 125,000kWh per annum
- Therefore it currently costs $£6.3p \times (125,000kWh / 85\%) = £9,264.71$ annually to heat the business premises.
- Our heating engineers calculate that the business premises needs a 40 panel Energie Solar system to provide this amount of heat annually, and this system costs £43,575 fully installed including all taxes.
- We also assume that this system has a CoP of 4 (a conservative assumption). We then know that the amount of heat generated by the system will be 200,000kWh, which equates to:
 - $125,000kWh \times 8.5p = £10,625$ annual RHI payment

- However, the system also needs electricity to run, and with the CoP of 4 this costs:
 - $(200,000\text{kWh} / 4) \times \text{£}0.13 = \text{£}4,062.5$ annual electricity bill
- This gives a Net payment of:
 - $\text{£}10,625 - \text{£}4,062.5 = \text{£}6,562.5$
- However, you are also saving $\text{£}9,264.71$ by not paying for heating oil.
- In summary, we have the following cash flow's:

Total Return Over 20 years	£397,794.12
Total Cost Over 20 years	-£124,825.00
Net Profit over 20 years	£272,969.12
Payback Period (years)	2.4
% Return Over 20 years	319%
Annual Percentage Return (APR)	5.97%
Return On Investment (ROI) Over 20 years	219%
Annual Return On Investment	22.30%
IRR	57%

Enegie Solar in Practice:

- The Enegie Solar system is particularly suited towards:
 - New build and retro fit large premises
 - Community projects
 - Swimming pools
- Indeed, in a recent study, the Enegie Solar system was found to be price competitive with other forms of heating, even without any subsidies!

	Price per unit (£)	kWh per unit	Price per kWh (£)
Natural Gas	0.04	1	0.039
Heating Oil	0.63	10	0.063

LPG	0.52	7	0.079
Electricity	0.13	1	0.13
Energie Solar	0.05	1	0.046

- The Energie Solar system is price comparative to all forms of heating except Gas, even without Government incentive payments!

Energie Solar Installations:

- **36 McDonald Restaurants Equipped with Energie in Spain**

Solar System: Eco300is
 Application: Domestic Hot Water
 Number of collectors: 2
 Surface: 3.2 m²
 Number of Litres: 500 l/day



After having 3 trial units for a year period the world famous restaurant chain McDonalds installed 36 Energie solar systems at their restaurants in Spain.

- **12 Apartments Building at Aveiro, Portugal – IRHU prize winner**

Solar System: Eco300i
 Application: Domestic Hot Water
 Number of collectors: 1
 Surface: 1.6 m²
 Number of Litres: 300 l/day



The IHRU award is an annual award for Portuguese architecture since 1989. It has been awarded to developers, architects and builders by the Portuguese Institute of Housing and Urban Renewal. The prize IHRU is one of the most prestigious architectural awards in Portugal and values technologies and materials environmentally friendly that are able reduce energy consumption of the building.

- **Nursing and Retirement Home Lar de Santa Teresa**

Solar System: 2 x Solar Block 40
 Application: Domestic Hot Water & Central Heating
 Number of collectors: 80



Surface: 128 m²
 Number of Apartments: 10

Saint Teresa it's a Nursing Home and a Retirement Home at Viana do Castelo – Portugal. The use of two solar blocks 40 making possible the DHW and the central heating of the building.

- **International Marian Centre at Fatima Sanctuary- Portugal**

Solar System: 3 x Solar Block 40 + 2 x Solar Block 32
 Application: Central Heating
 Number of collectors: 184
 Collectors Area: 294 m²
 Surface to Warm: 4,800 m²
 Number of Litres: 27.5 m³



The Marian centre gives a better response in the pilgrims hosting travelling to Fatima sanctuary. The building also includes an area of convent. The 184 thermodynamic solar panels enable a central heating of the building as well as DHW without recourse to any other type of backup system.

- **Hotel Sol Meliá Avenida America in Madrid, Spain.**

Solar System: Eco 6000
 Application: Domestic Hot Water
 Number of collectors: 40
 Surface: 19.2 m²
 Number of Rooms: 64

Sol Meliá Hotels & Resorts is the largest holiday hotel company in the world with more than 300 hotels in 30 countries. They choose Energie solar systems to supply the hot water, and the performance of the system completed their expectations. Another projects are being study to use Energie systems.

