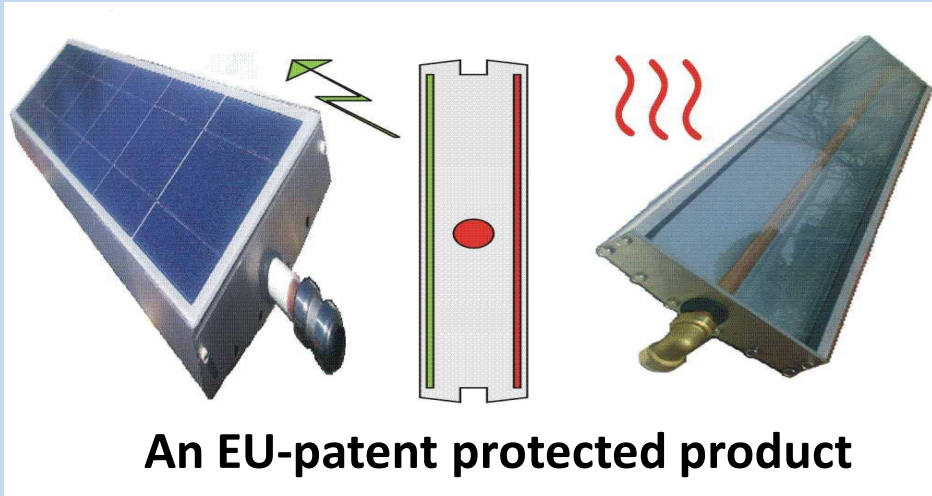


TP4-enersol

A new ThermicSol product

Double-Faced Thermo-Electric Solar-Panel TD/PV & Solar Tracker & Rotation Device



An EU-patent protected product

TP4-referens.pdf

Introduction Show and Video in *.PPS

TP4-pricelist.xls

Do you have your own property?
Do you want to convert it into 'Green-Tech'?
Are you choosing the method of solar collectors?
Is the available roof space area is very limited?
What kind of solar collectors will you give priority?

Thermodynamics	Photovoltaics	Fifty - Fifty

What will be the 'outcome' of each alternative?
Good in winter, but useless in summer, or vice versa
Good all year around, but useless in winter time only with half the output
Here comes the solution to the space problem!
Now you can 'functionally double' the available space area!
Rotatable solar collectors - double faced - double functioning!
Thermodynamic on the one and Photovoltaic on the other side!
Total yearly energy output >200% compared to other makes!

Rotatable depending on season and according to your own energy requirements.

Thermodynamics in winter time for space heating.

Photovoltaics in summertime for electrical supply of air condition.

WINTER season: Functioning 90% thermodynamically with an additional +10% photovoltaic energy (back side)

SUMMER season: Functioning 100% photovoltaically +25% increase due to hybrid pipes for domestic hot water +15% increase for water

At last a fantastic revolution in Green Tech applications
Info: +30 6932 231 959 E: tkmhellia@yahoo.gr www.tp4-enersol.com

TP4-leaflet.pdf

Changes in weather: alteration of the collectors

Thermodynamics on the one and photovoltaics on the other

A double installation in one and the same area

Solar panels TP4

Solar pergola

Solar heating system

Heat-Pump air to water

Solar swim-pool heating

Technical leaflet TP4
Example of ordering
Mounting instructions

TKM Hellas
Project developing company

TP4-broschvyr.pdf

Changes in weather: alteration of the collectors

Thermodynamics on the one and photovoltaics on the other

A double installation in one and the same area

Solar collectors TP4

Solar pergola

A house on 100% renewable energy

A) Floor heating

B) Electrical current

C) Domestic hot water

d) Swimming pool heating

TKM/TP4

Technical leaflet TP4
Example of ordering
Mounting instructions

TKM Hellas
Project developing company

TP4-technical.pdf

Changes in weather: alteration of the collectors

Thermodynamics on the one and photovoltaics on the other

A double installation in one and the same area

Solar collectors TP4

Solar pergola

A house on 100% renewable energy

A) Floor heating

B) Electrical current

C) Domestic hot water

D) Swimming pool heating

TKM/TP4

Technical characteristics of photovoltaic modules and additive material for energy collection & usage

TKM Hellas
Project developing company

TP4-photovoltaics.pdf

TP4-enersol



**A New Solar System developed by ThermicSol Greece
To stop video press HOME button**

TP4-enersol

A New Art of Solar Technology
is born!

Thermodynamic **P**hotovoltaic **4**sensor

Thermo-Electric Double-Faced Solar-Collector
Rotatable complete with
Autocalibrating Universe Solar Tracking Unit

Woaow!!!

TP4-enersol



Video - Construction & function



Photos Structural parts



Photos Functional advantages



Photos Installation references



Drawings East / West Philosophy



Photos Functional positions East-West



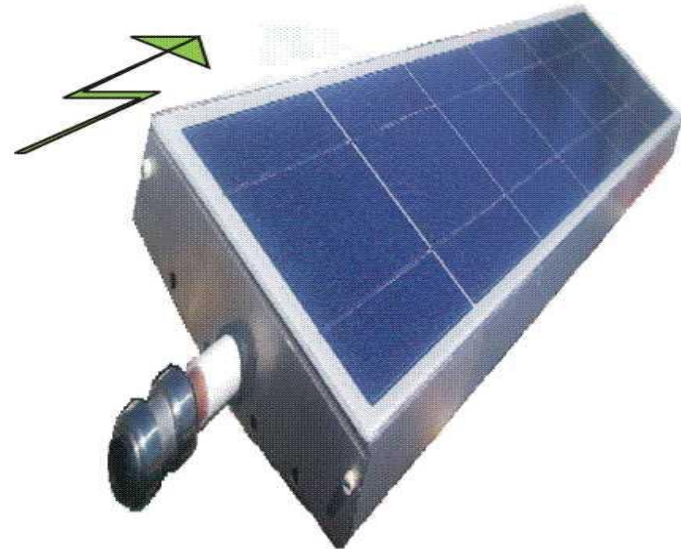
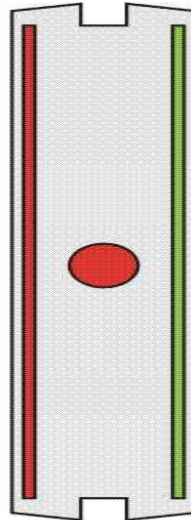
Diagrams TD & PV output efficiency



TP4-enersol

Pool-Heating and
Hot Water in
Winter season

Cooling A/C and
Electricity in
Summer season



Change of functional side = Change of energy mode

TP4-enersol

Highest possible energy flexibility



By the worm Gear rotation device

TP4-enersol

Highest possible energy efficiency



By the quadruple solar sensor unit

TP4-eners01

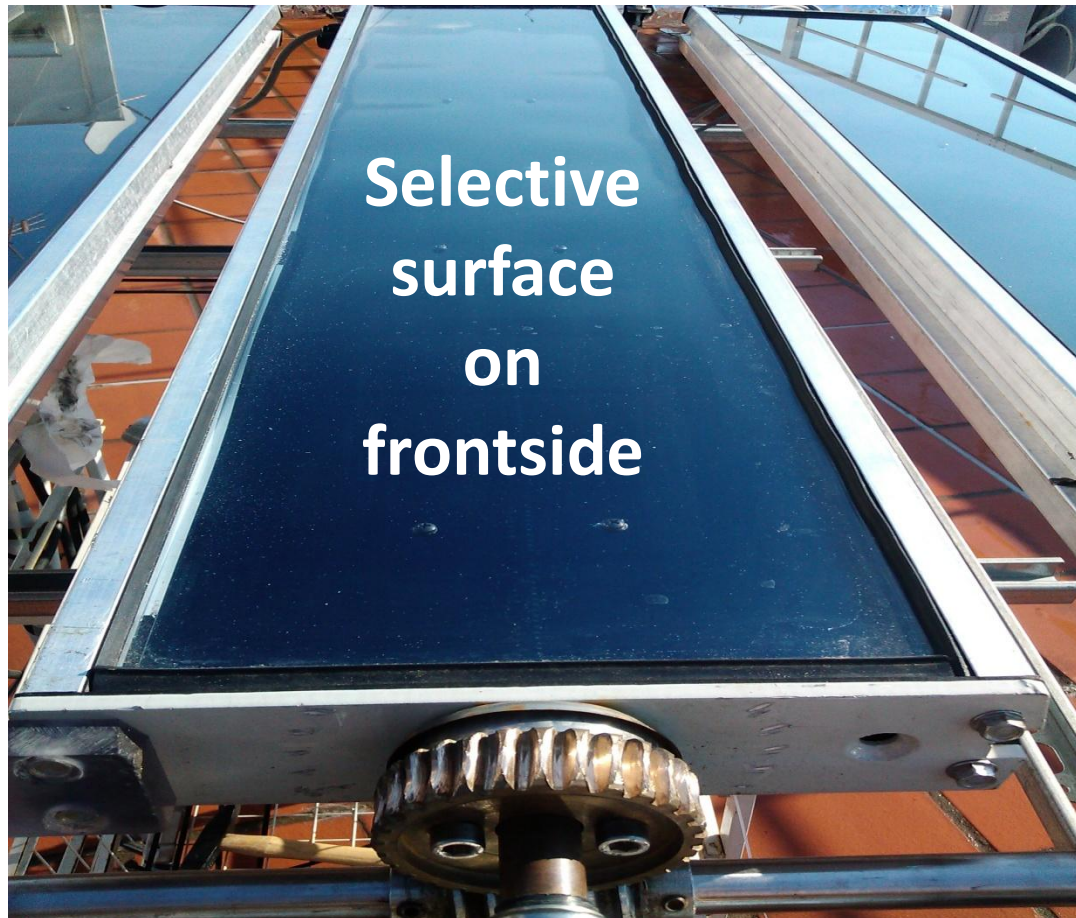
Highest possible daily output



By Autocalibrating Solar Tracking Unit

TP4-enersol

Normal working position for hot water



Basic function is the thermodynamic TD-mode

TP4-enersol

No Overheating Problems when not used

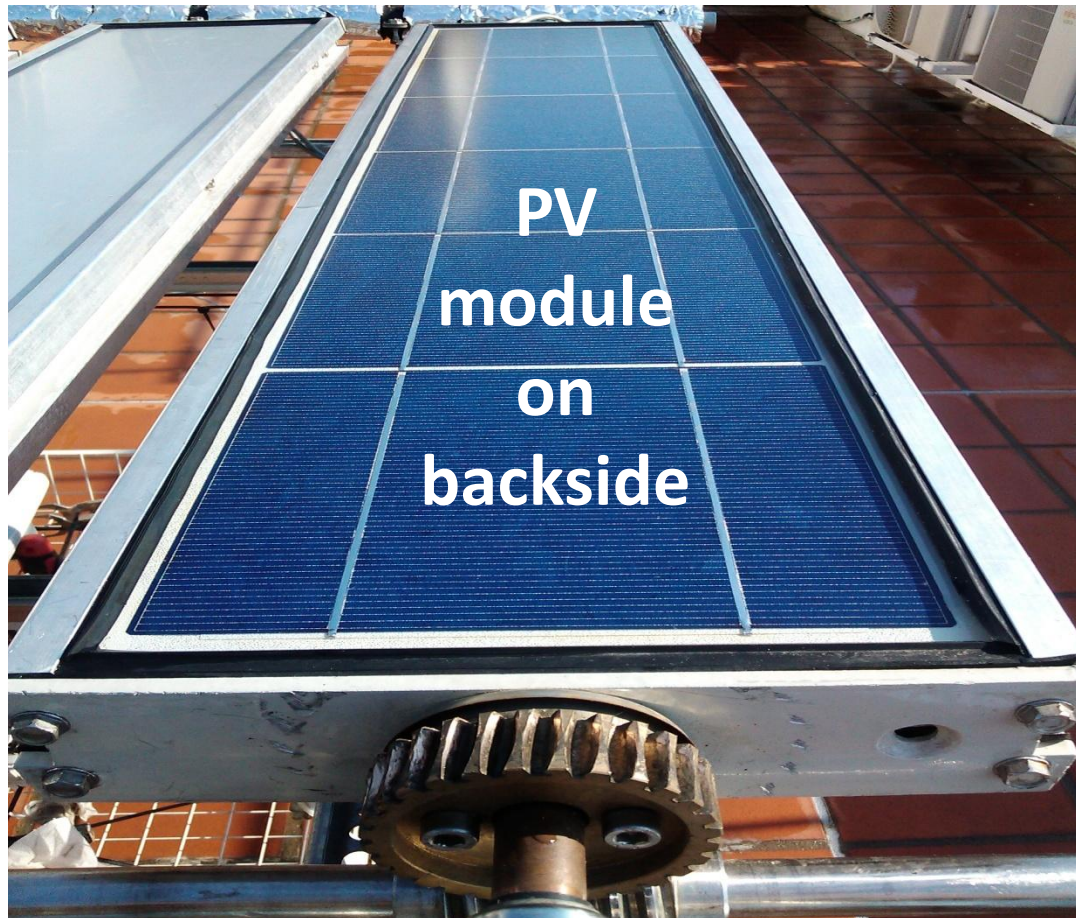


Because panels can turn into shadowed mode



TP4-enersol

When heating is satisfied, use alternative energy



By turning the panels into their PV electric mode

TP4-enersol



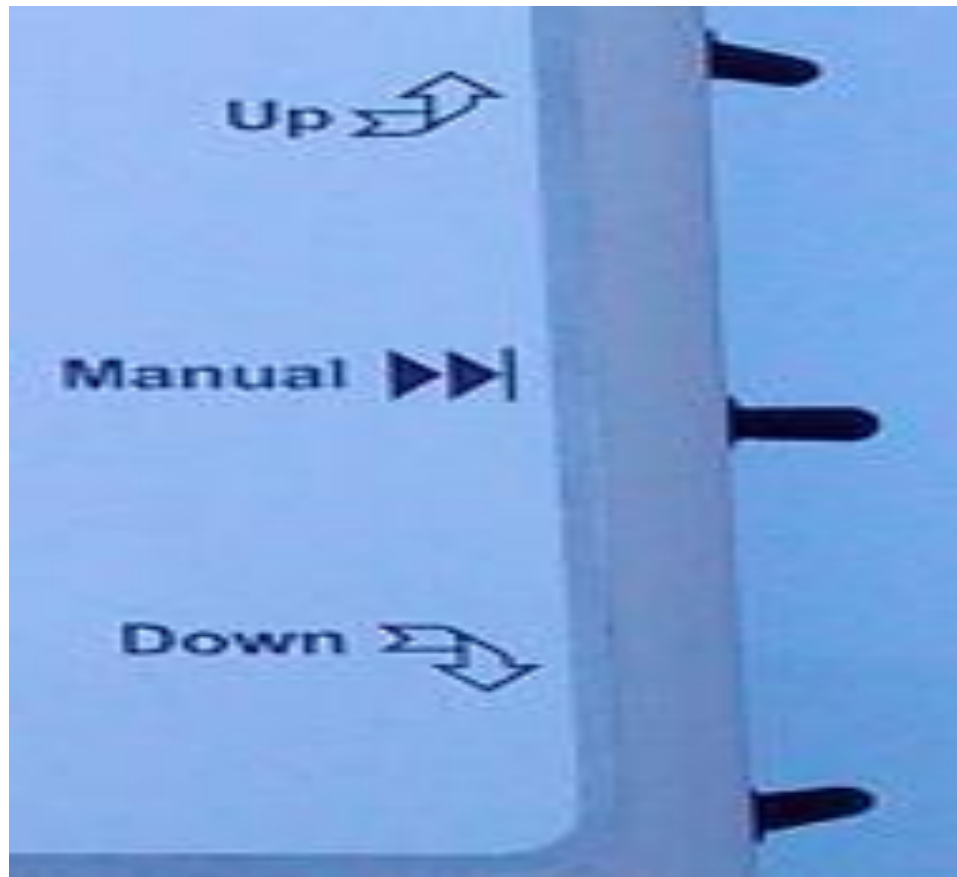
No Snow, Hail or Sand storm problems



Because panels turns into vertical safe position

TP4-enersol

Easy cleaning of collecting surfaces on both sides



By moving the panels manually up & down

TP4-enersol

Full overview control within your home



With functional interior remote control panel

TP4-enersol

No architectural disturbance



Due to low height of profile – only 200 mm



TP4-enersol

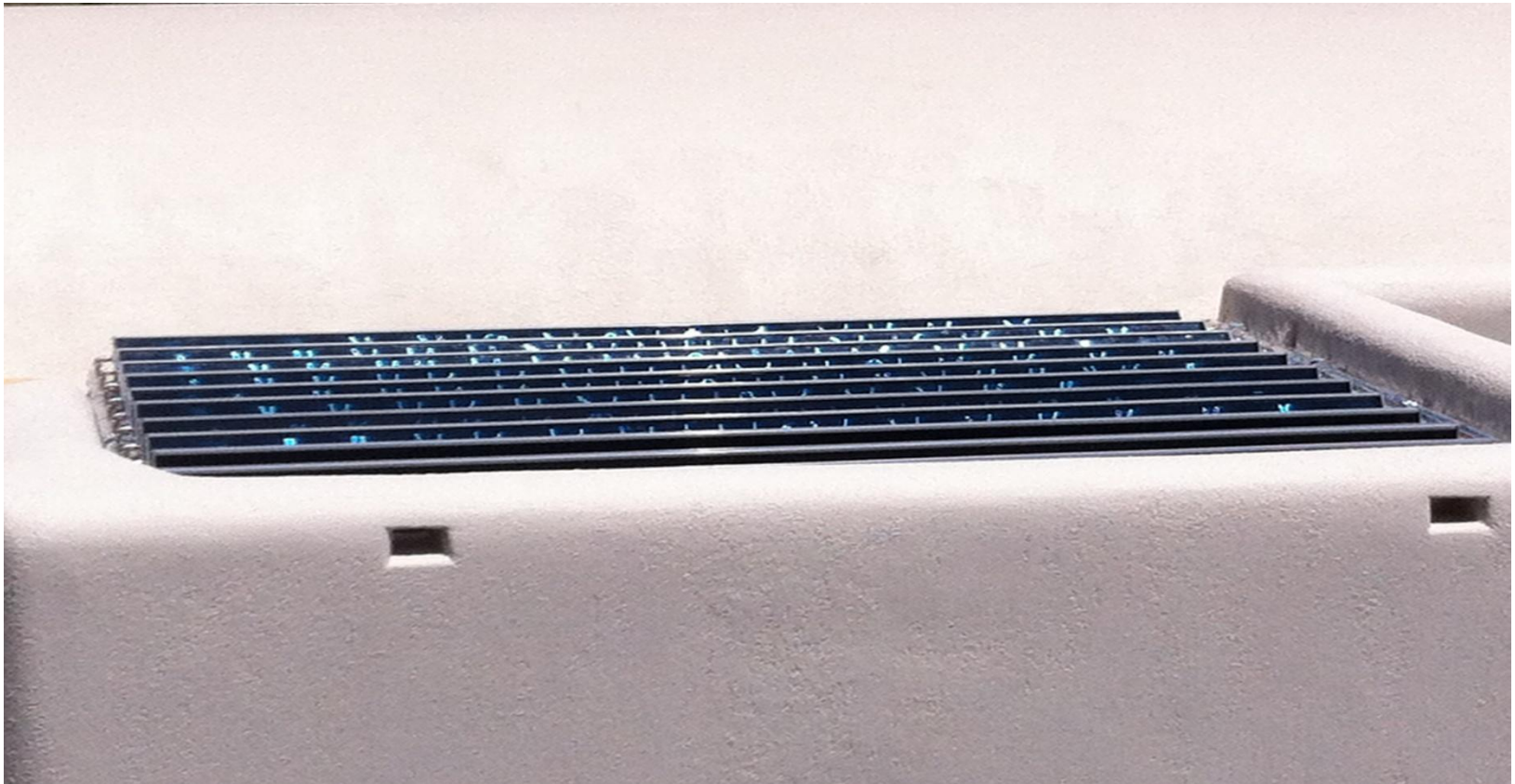
Solar panels are not visible from street level



Due to very low height profile – only 200 mm

TP4-enersol

Easy building incorporation



With panel lengths from 1 to 3 meter

TP4-enersol

Easy access for maintenance work



By walking in between the solar panels

TP4-enersol

Nice shadowing pergola applications



For your swim-pool, garden, veranda, terrace, etc

TP4-enersol

4-store family house in Voula Athens



85 panels for heating, hot water and pool

TP4-enersol

4-store family house in Marousi Athens



40 panels for heating, hot water and pool

TP4-enersol

Resort eco-house A in Santorini island



12 panels for heating, hot water and Jacuzzi

TP4-enersol

Resort eco-house B in Santorini island



16 panels for heating, hot water and Jacuzzi

TP4-enersol

Resort eco-house C in Santorini island



16 panels for heating, hot water and Jacuzzi

TP4-enersol

Resort eco-house D in Santorini island



36 panels for radiator heating & hot water

TP4-enersol

Eco-house X in Antiparos island



40 panels for floor heating & hot water

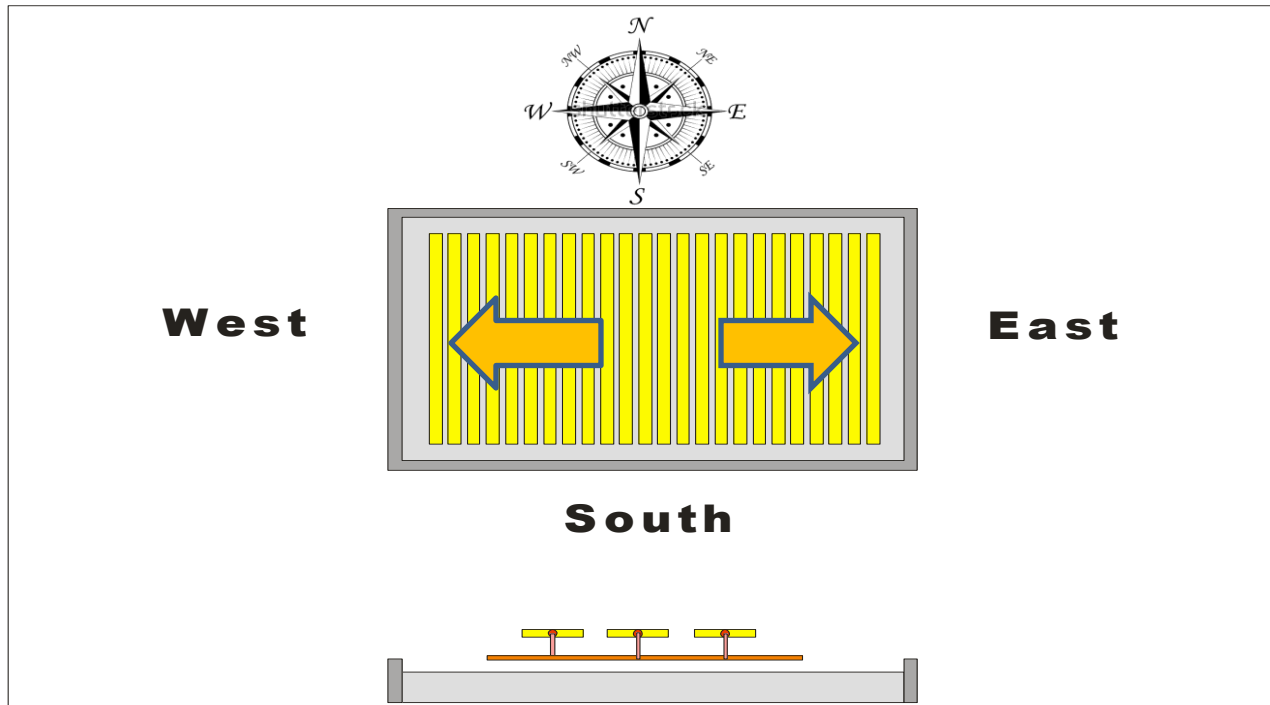
TP4-enersol

Eco-house Y in Antiparos island



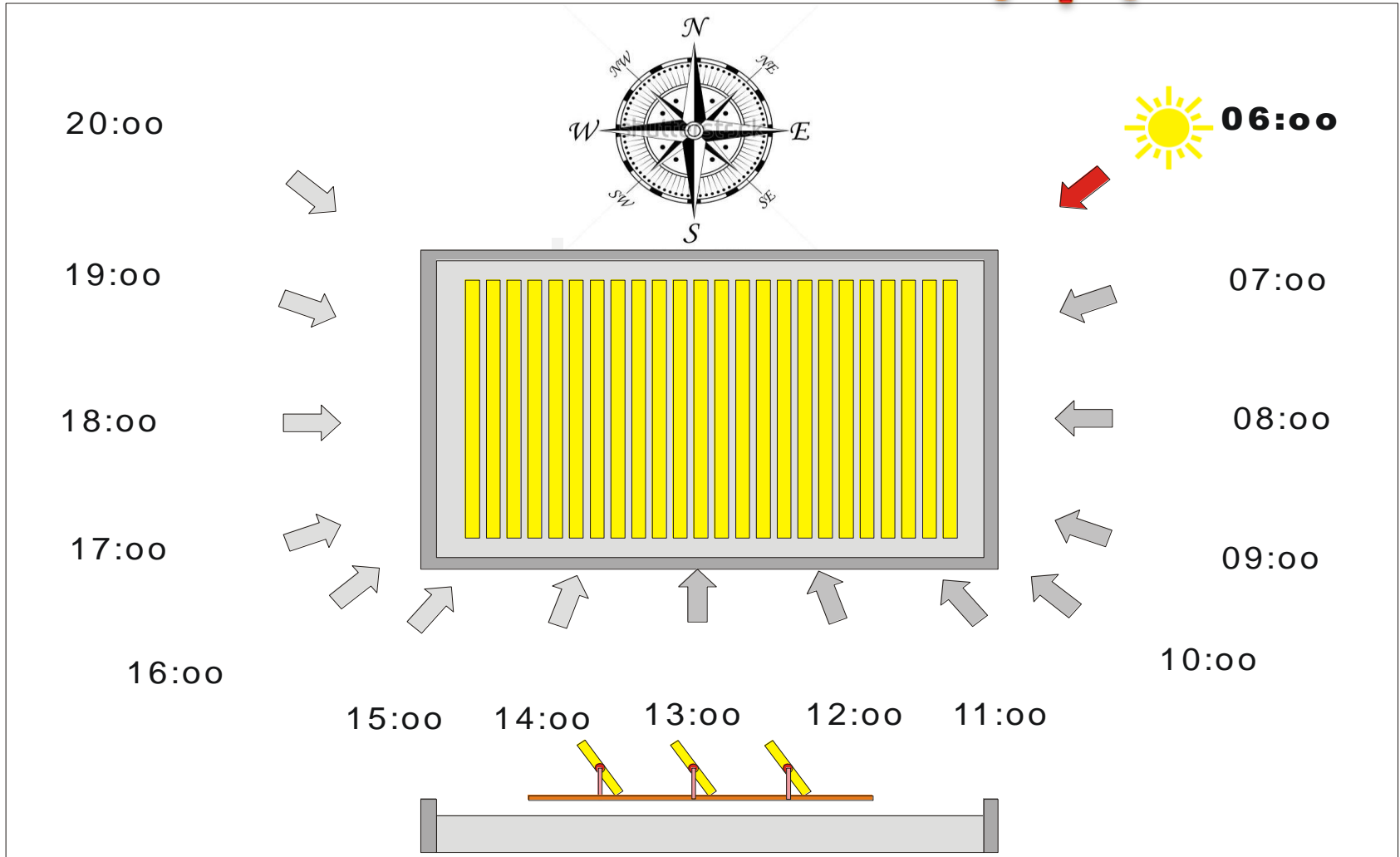
40 panels for floor heating & hot water

TP4-enersol



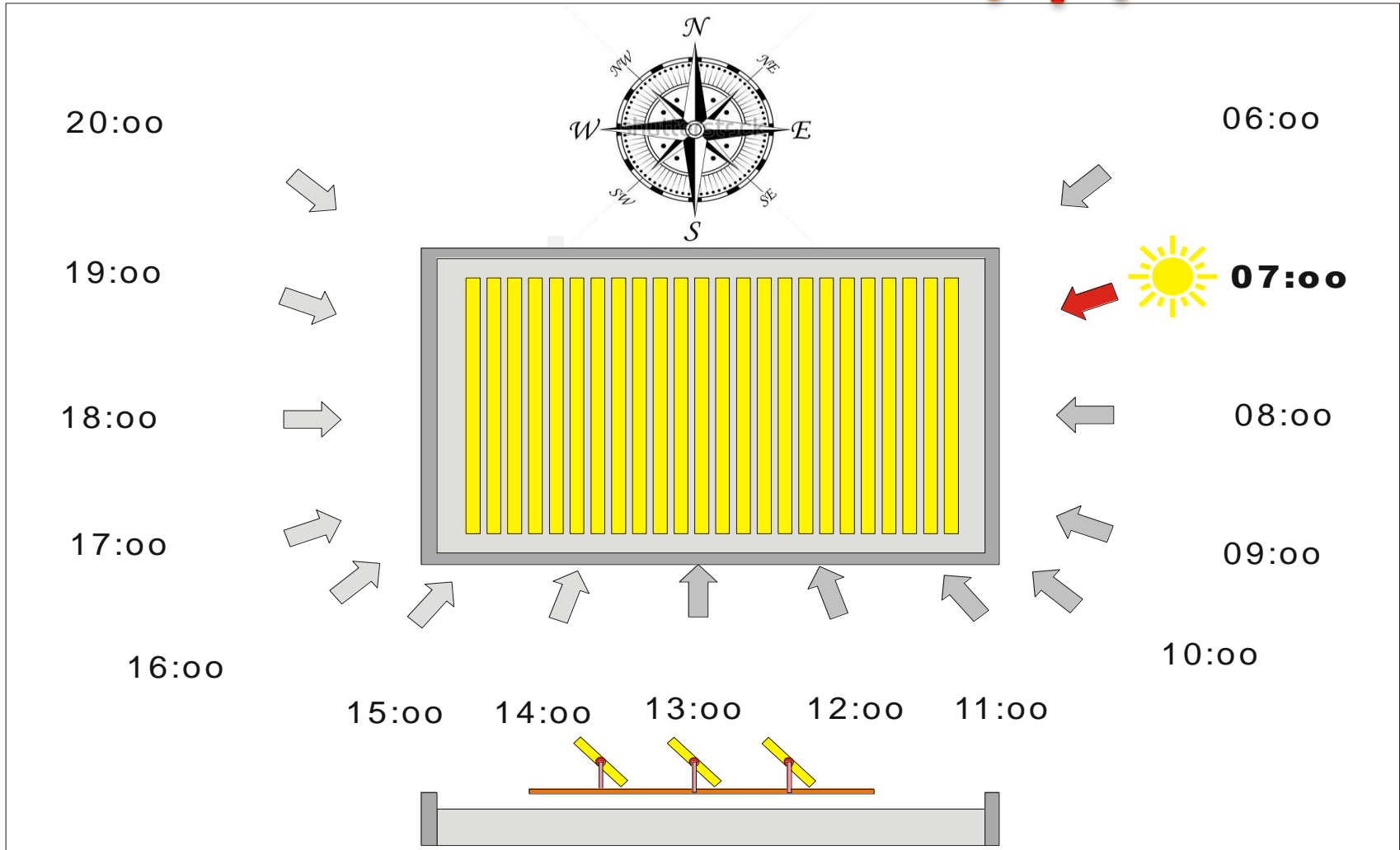
The TP4-panels can move from East to West

TP4-enerso1



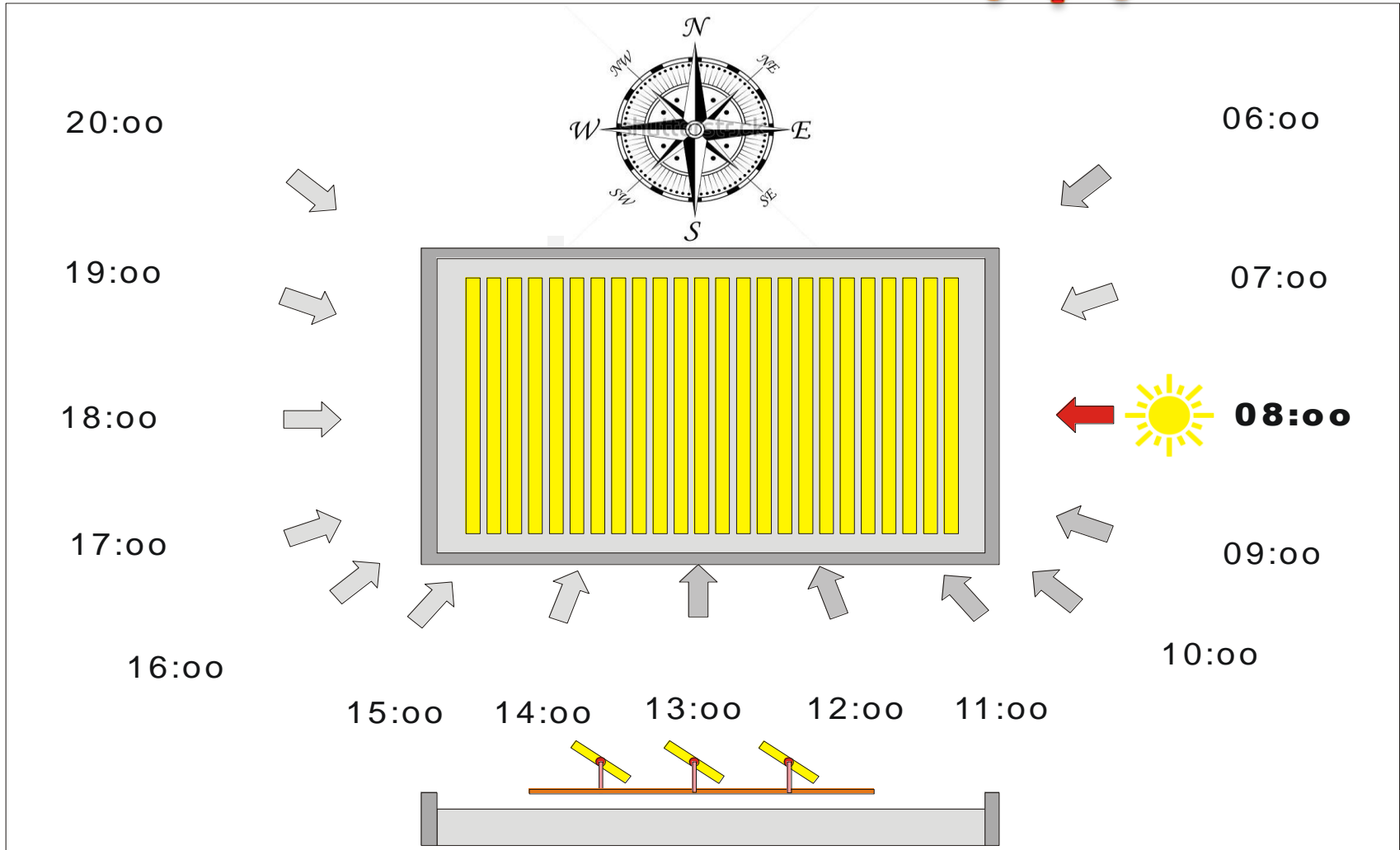
The sun rises in the North-East

TP4-enerso1



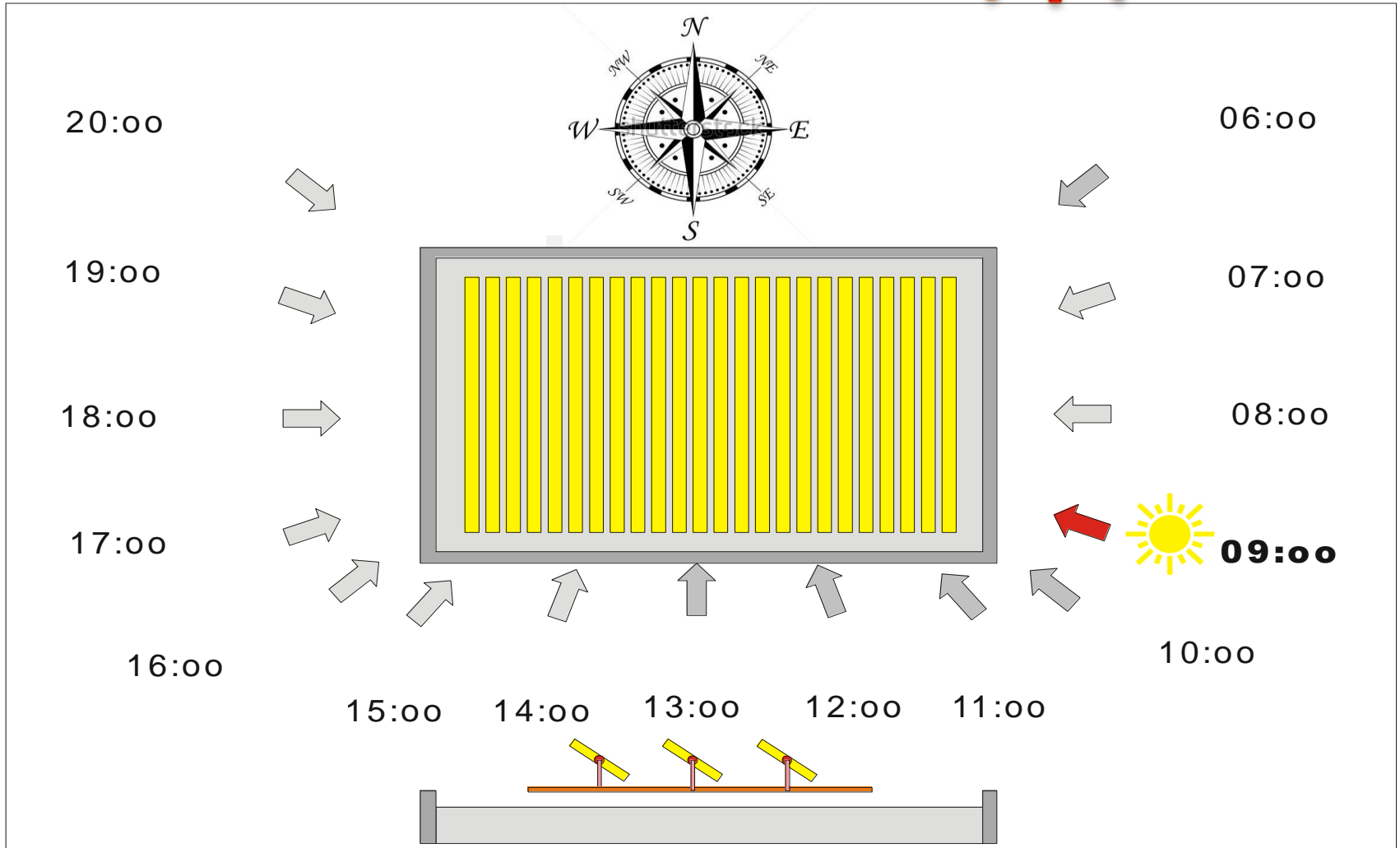
The solar sensors measure the radiation

TP4-enersol

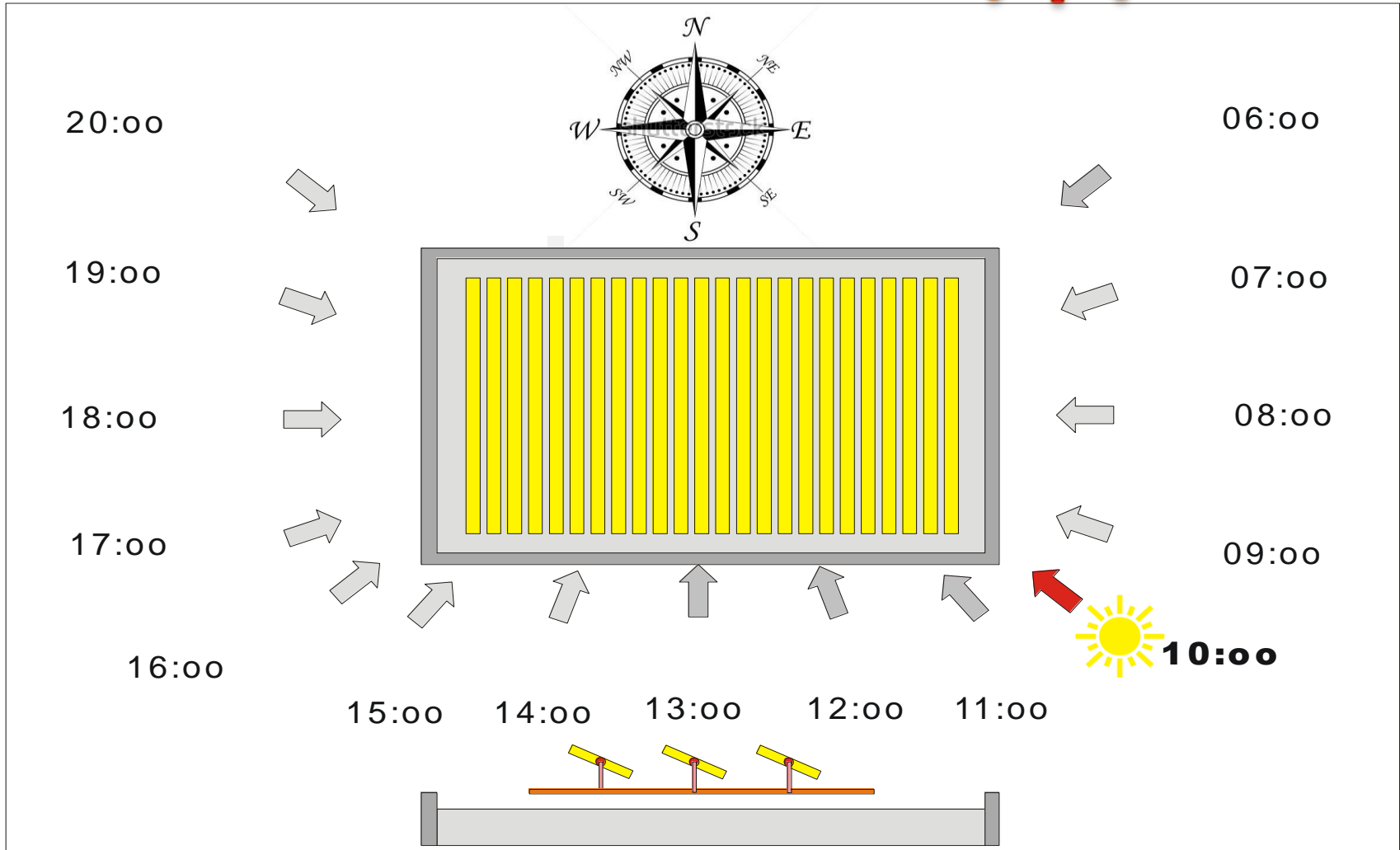


Solar tracker calculates the angle

TP4-enersol

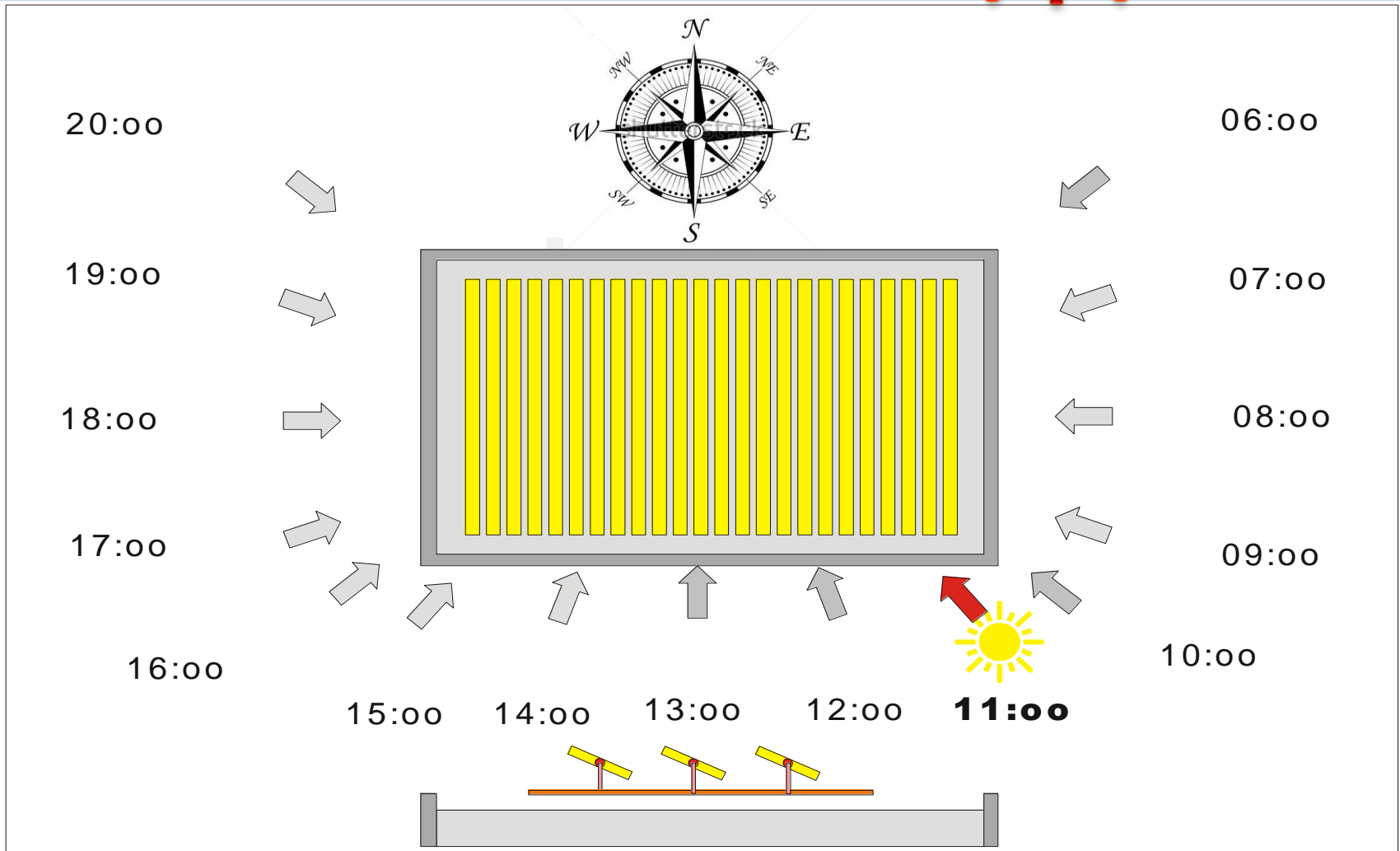


TP4-enersol



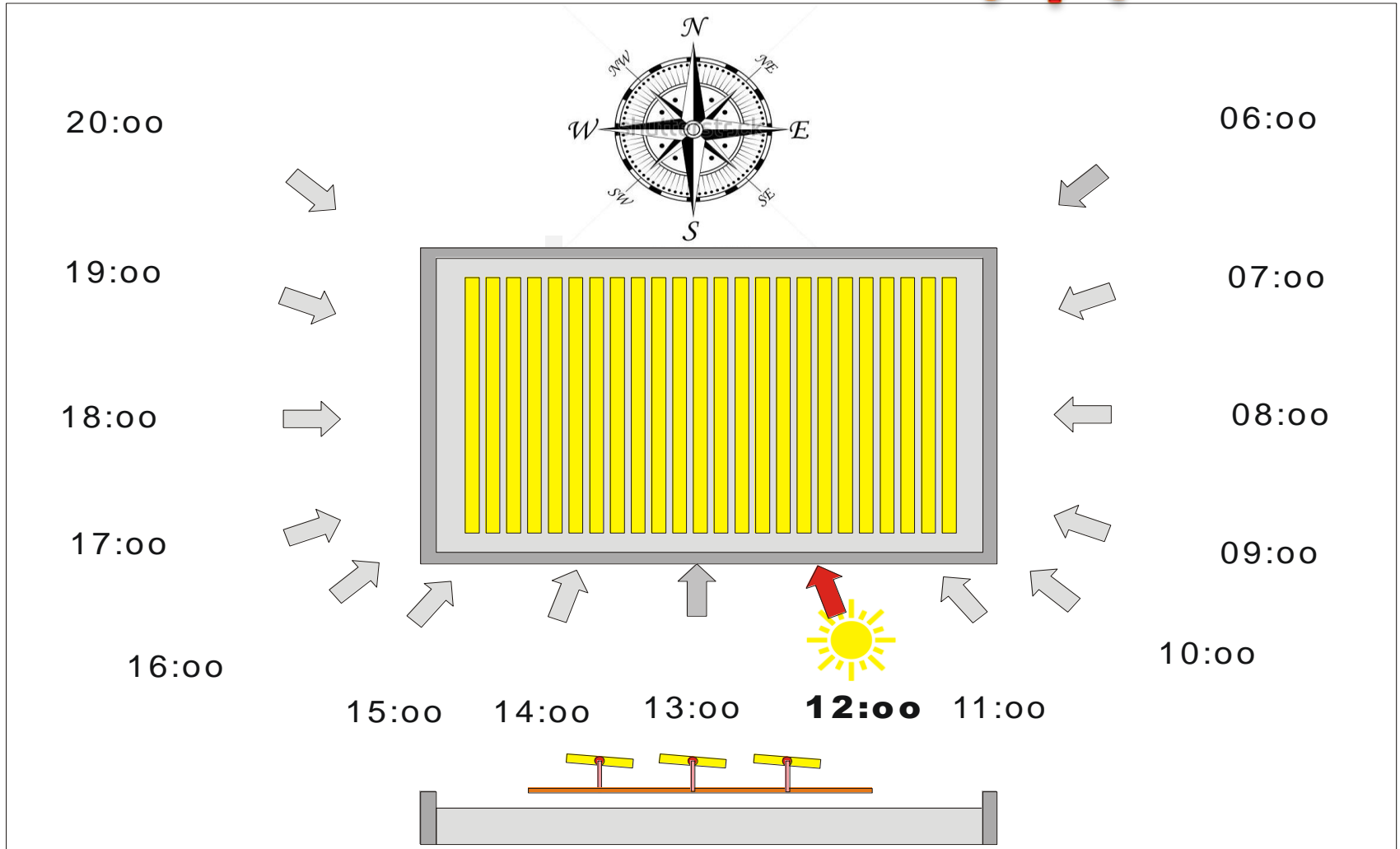
Ordinary panels start functioning NOW !

TP4-enersol



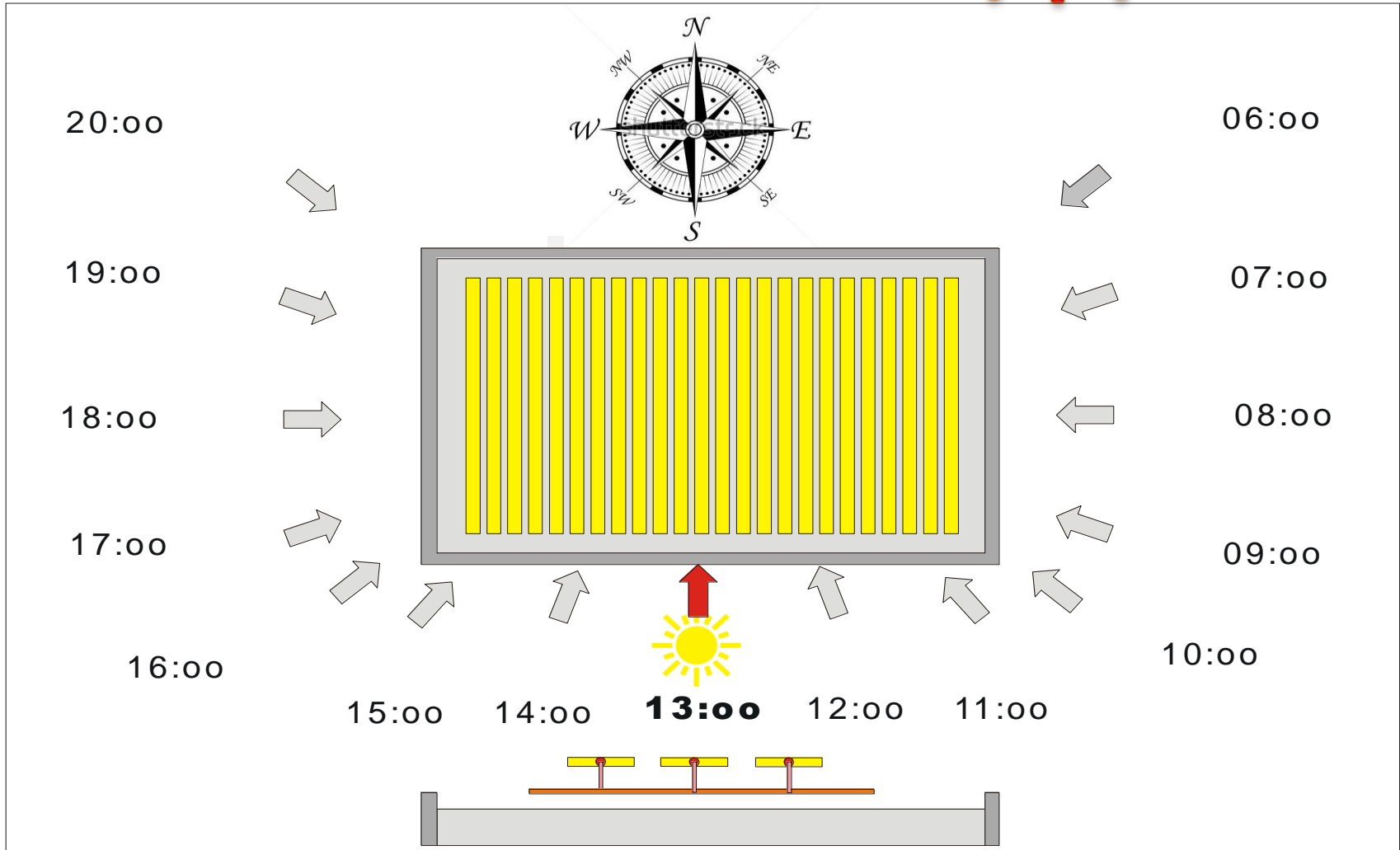
Panels are always directed towards the sun

TP4-enersol



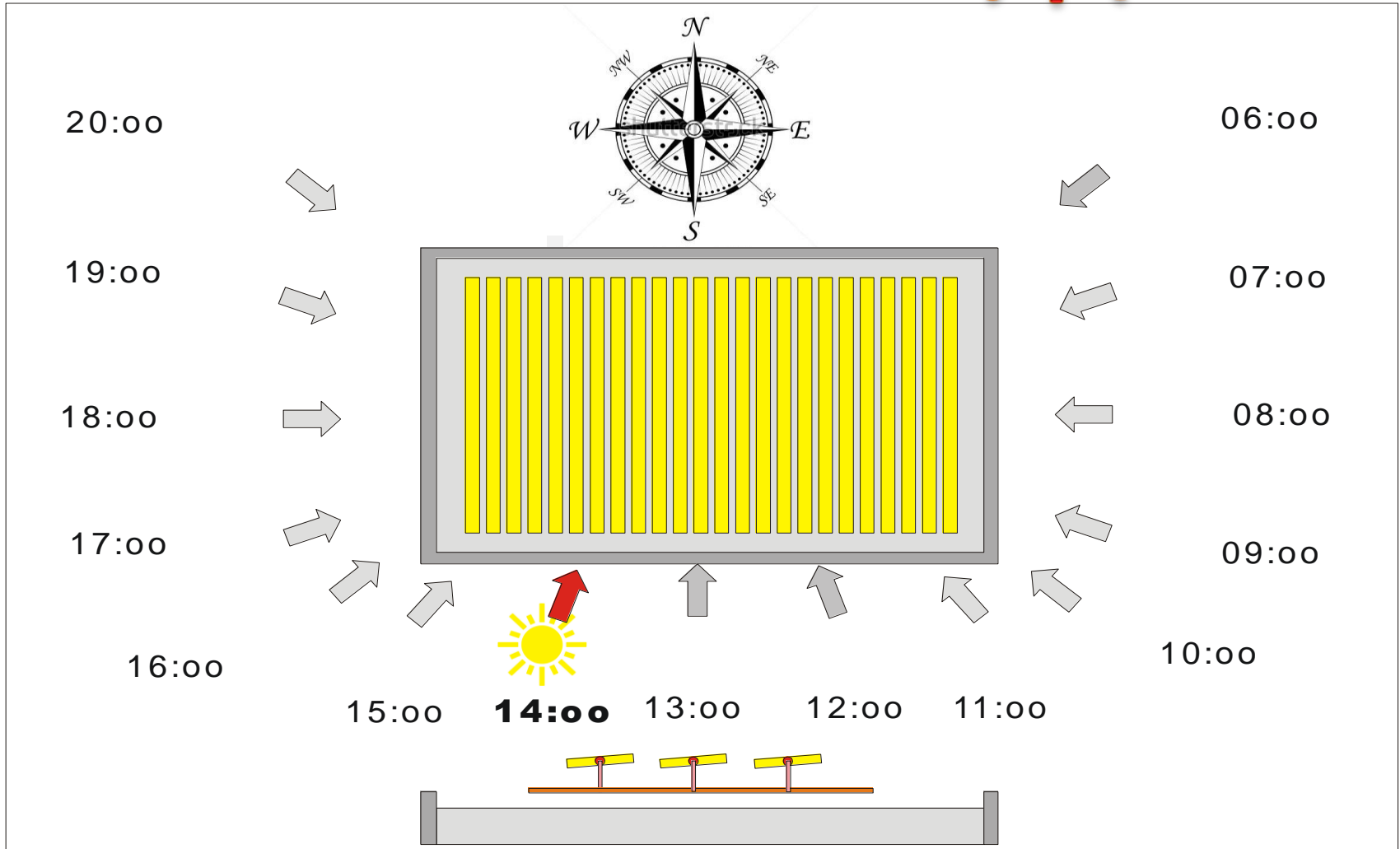
Getting the maximum energy output

TP4-enersol



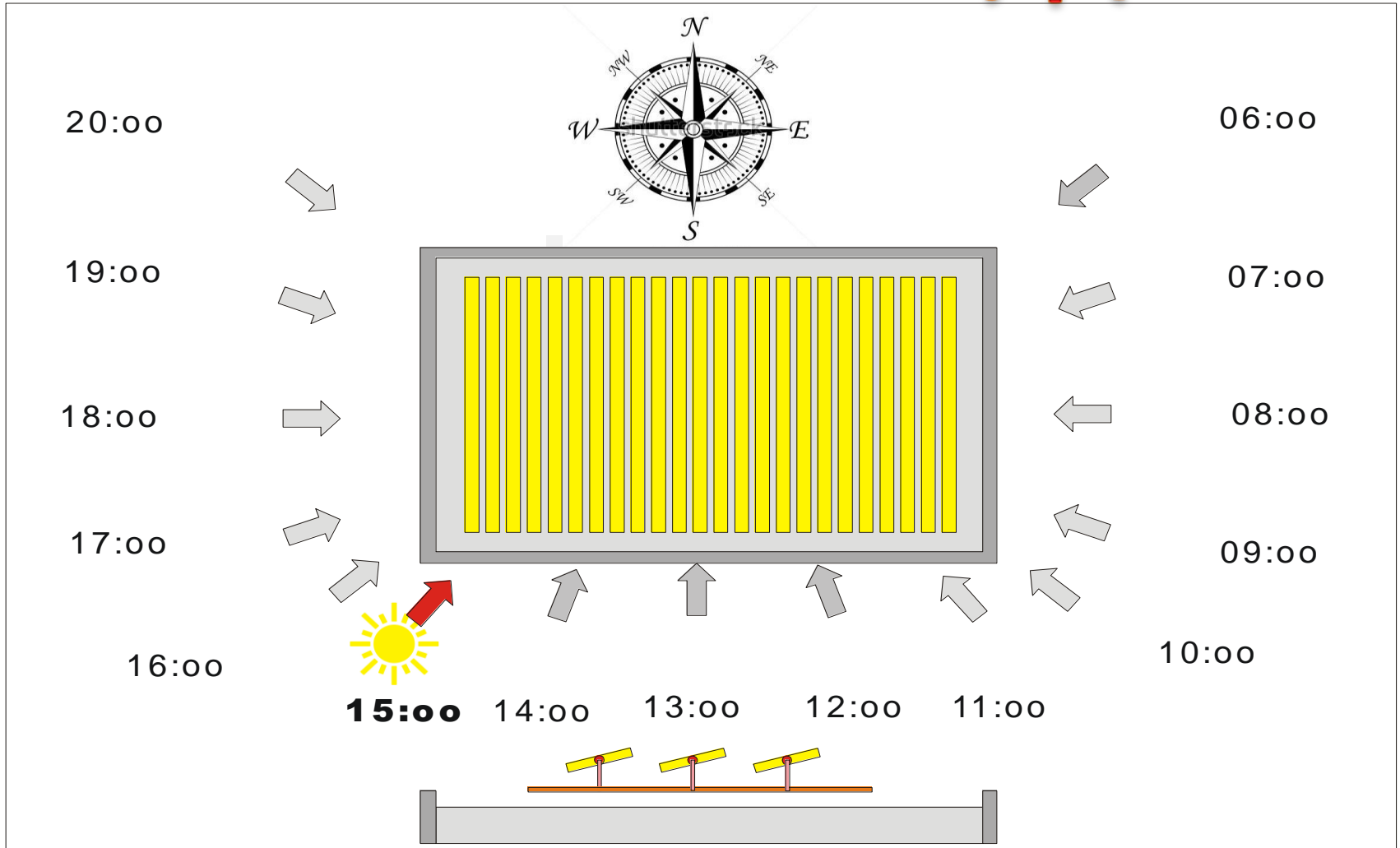
At mid-day panels are horizontal

TP4-enersol



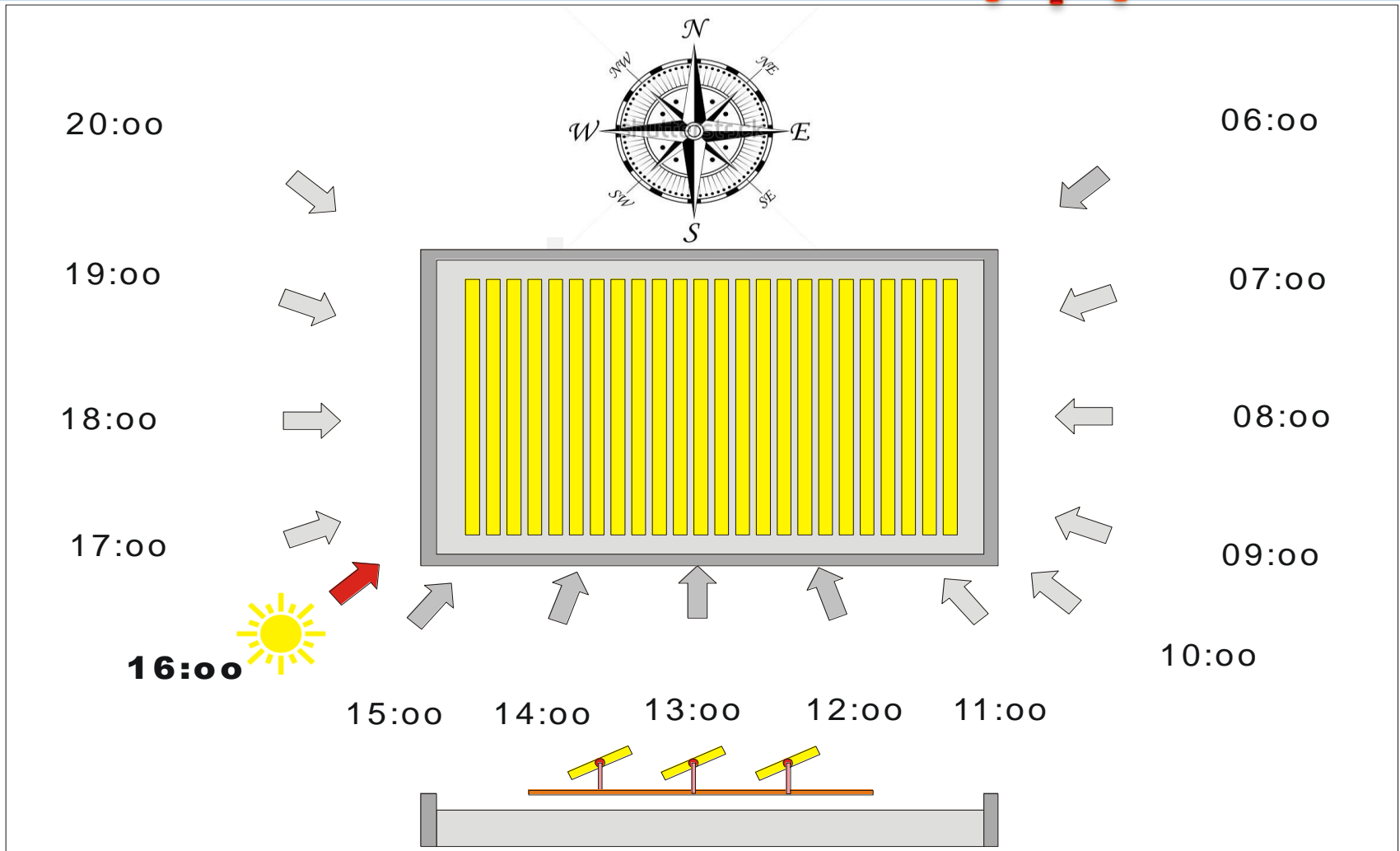
Reverse function in the afternoon

TP4-enersol



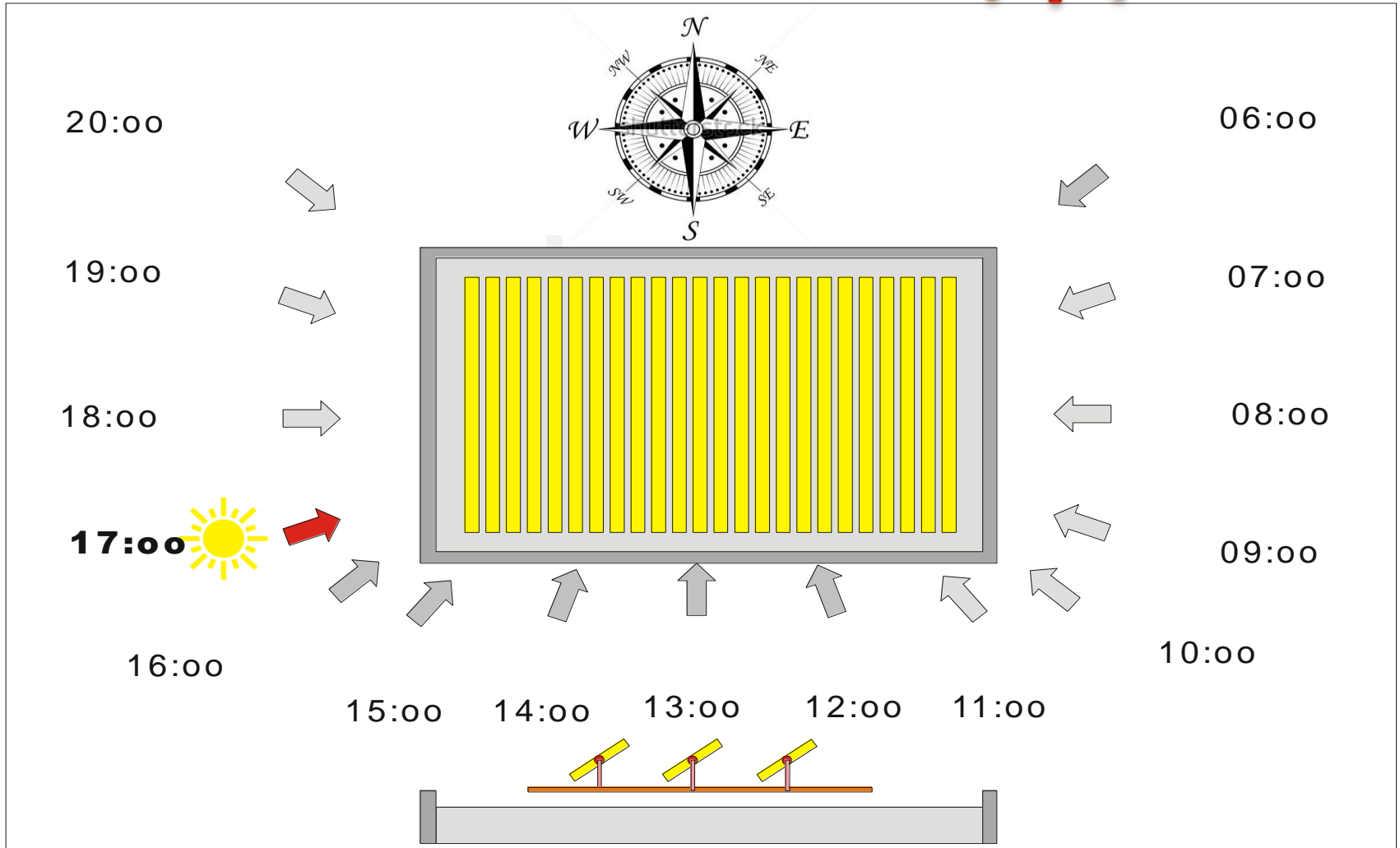
Moves panels towards the West

TP4-enersol



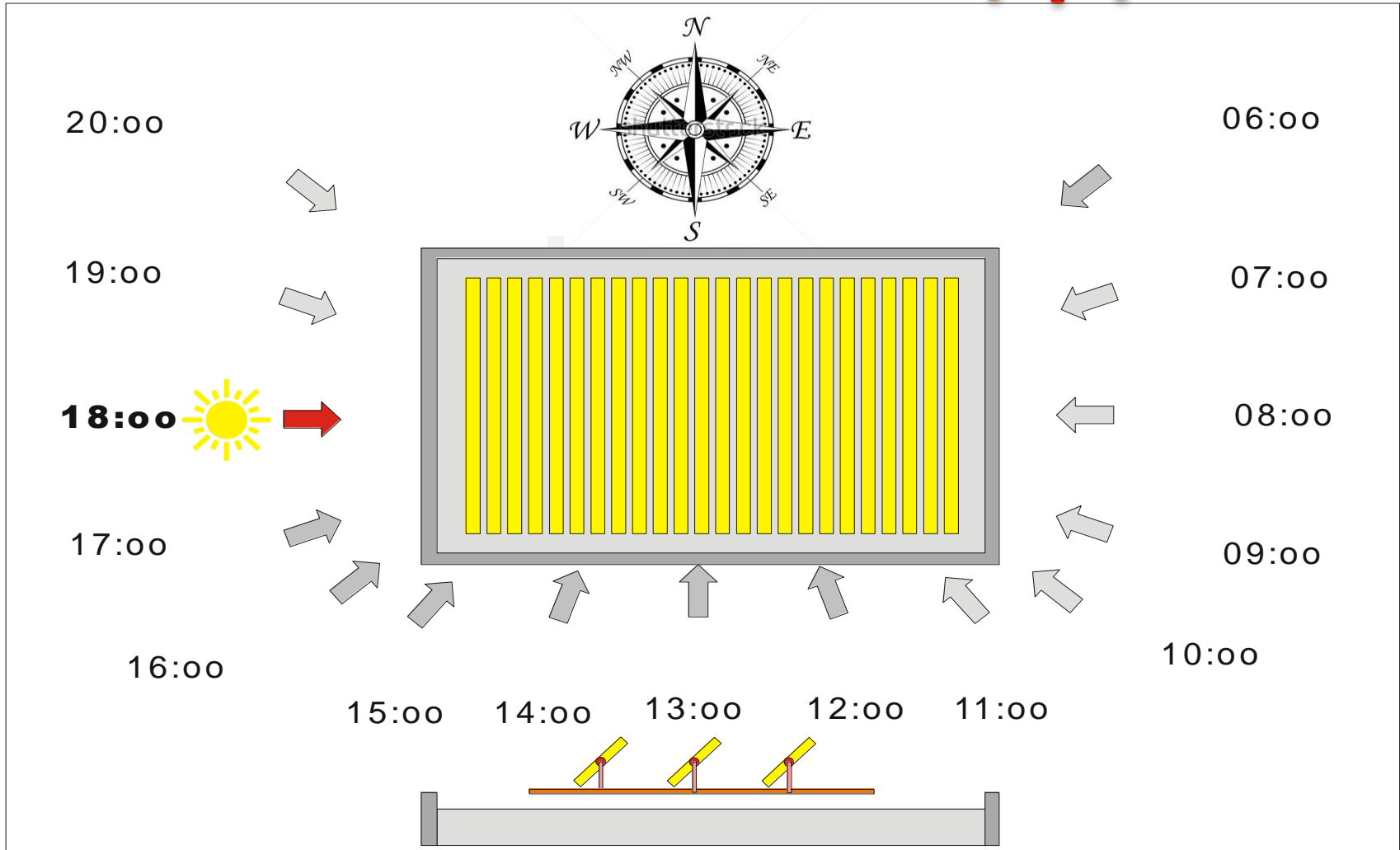
Ordinary panels stops working NOW !

TP4-enersol



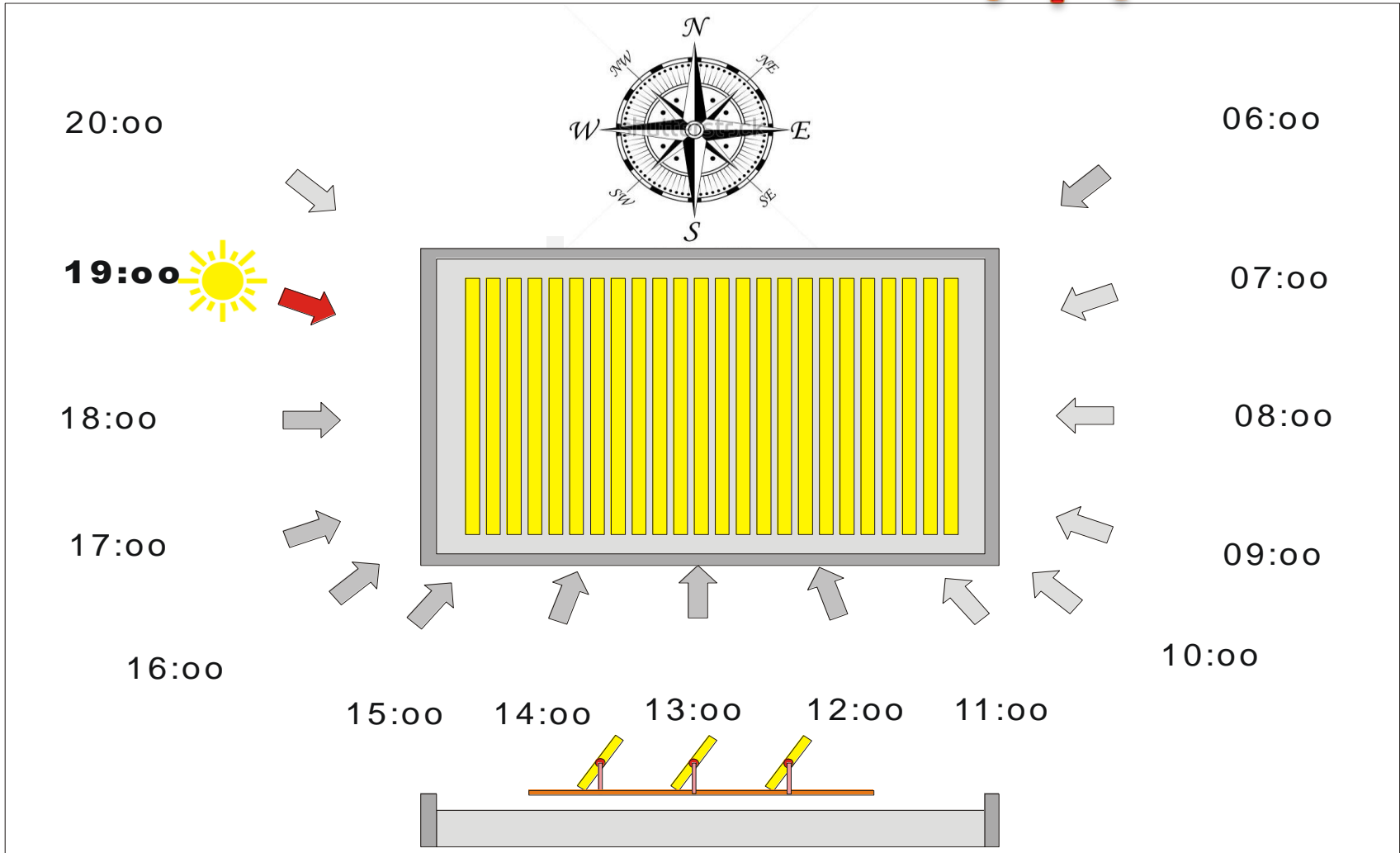
TP4-panels continue to work !

TP4-enersol



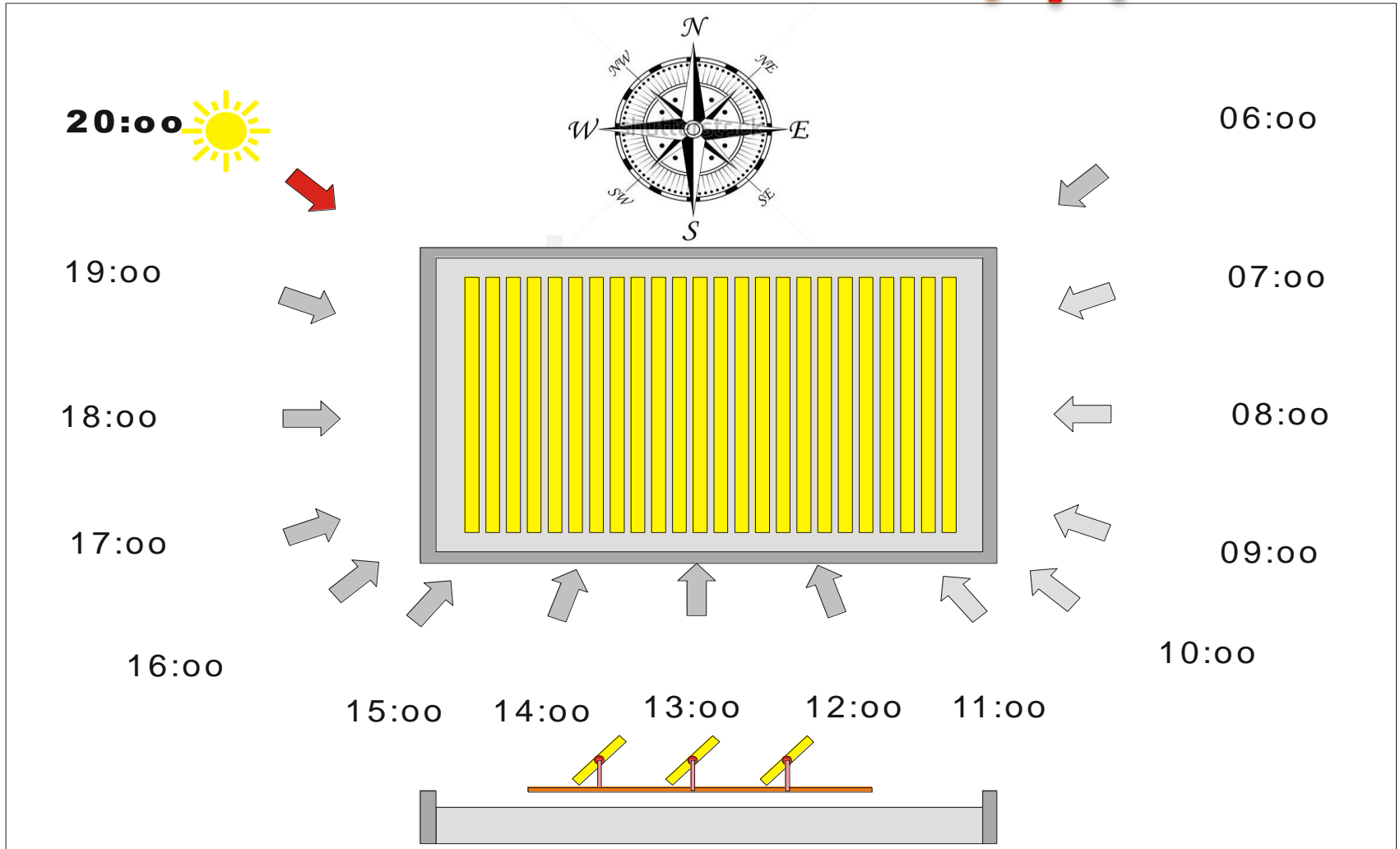
Total hours depends on season !

TP4-enersol



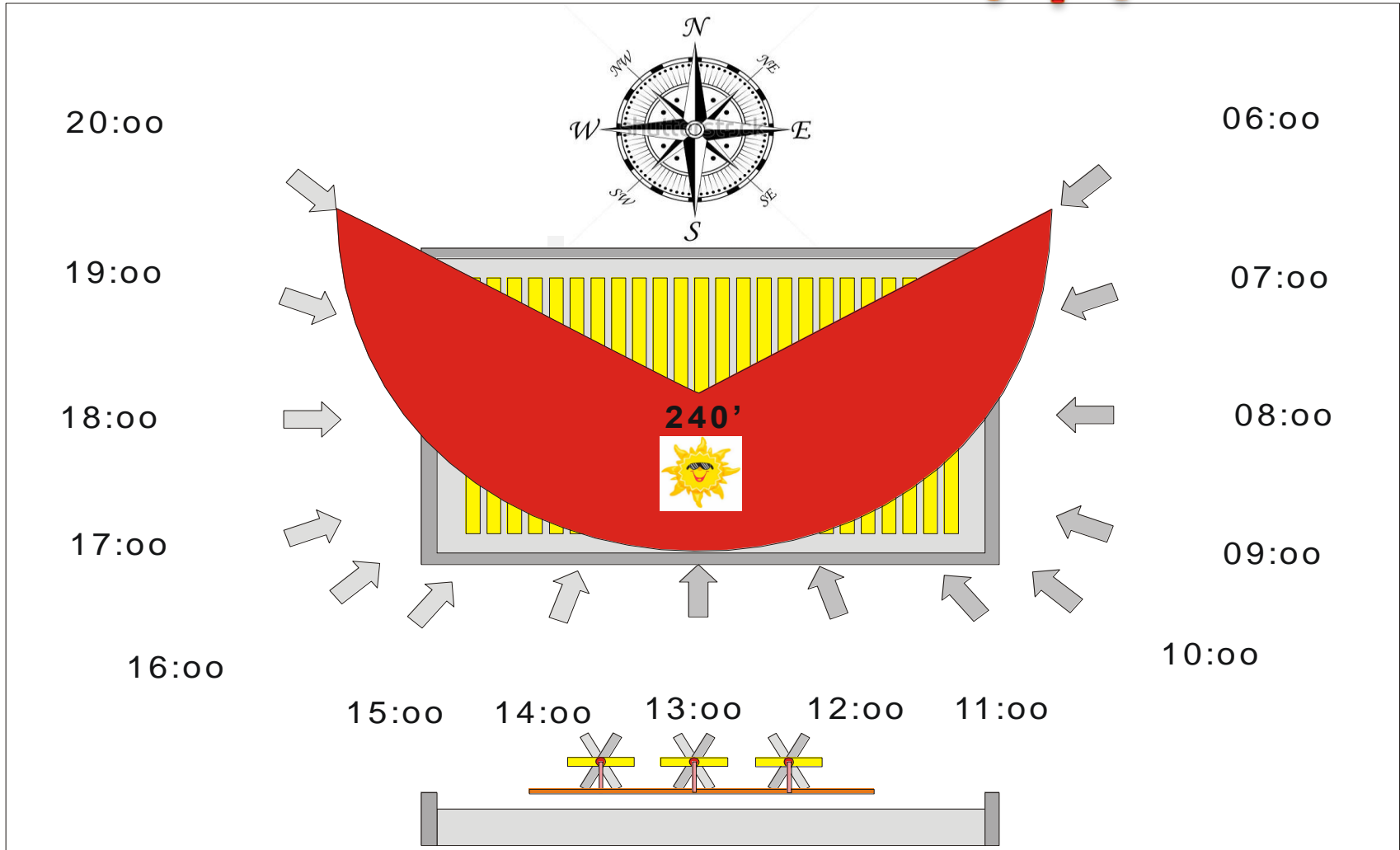
Total hours also depend on Latitude

TP4-enersol



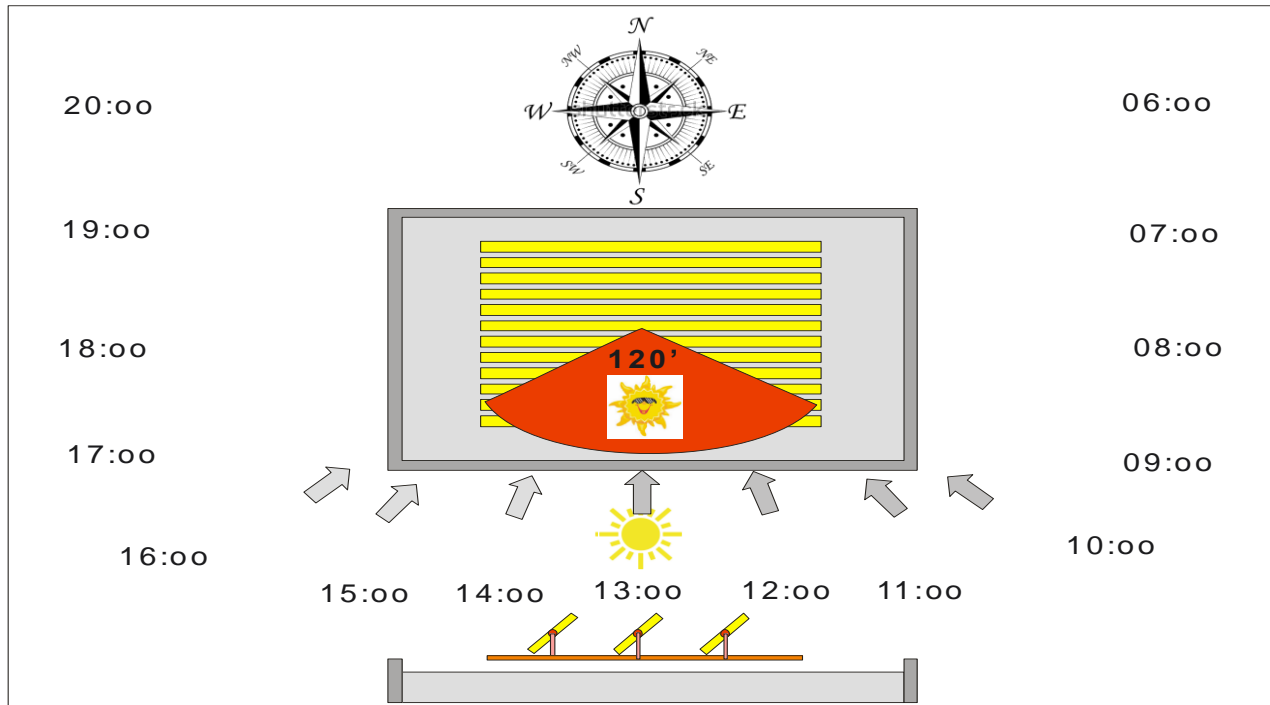
Gain up to 200 % daily solar energy

TP4-enersol



TP4-panels work 240' and up to 16 hours

TP4-enersol



Ordinary panels work 120' and only 6 hours

TP4-enersol

Benefits from East to West positioning

- A) Solar collection starts at 6 am in the morning
- B) Solar collection stops at 8 pm in the evening
- C) Which means a total of 14 hours sun per day
Instead of 7 hours from a South orientation
- D) Panels 90' towards the sun by Solar Tracker.



TP4-enersol



Benefits from East to West solar tracker

>30% higher energy output

Due to increased solar input hours

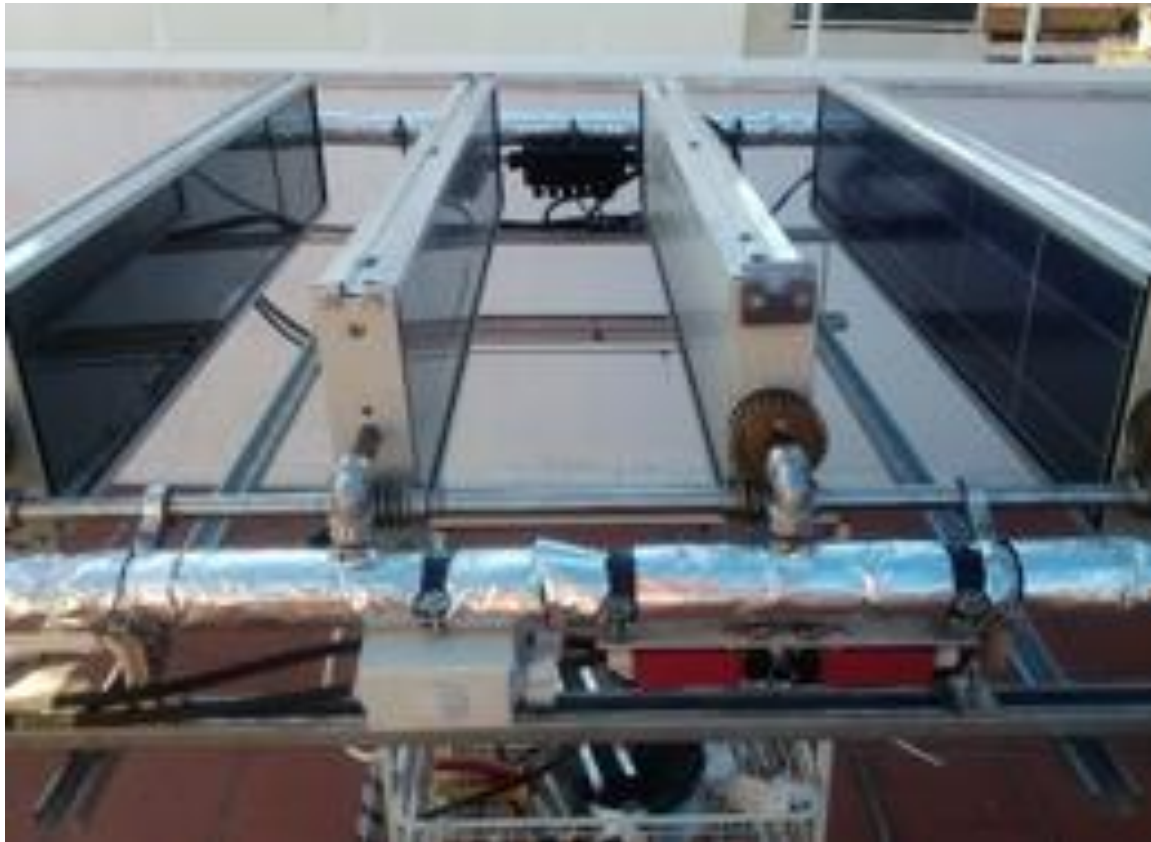
>20% higher energy output

Due to 90' angle solar tracking

**>50% higher energy output if combined
with PV-modules on the back-side**



TP4-enersol



Vertical Safe Position - during night time



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Morning thermodynamic position

TP4-enersol



Pre-noon thermodynamic position

TP4-enersol



Noon thermodynamic position



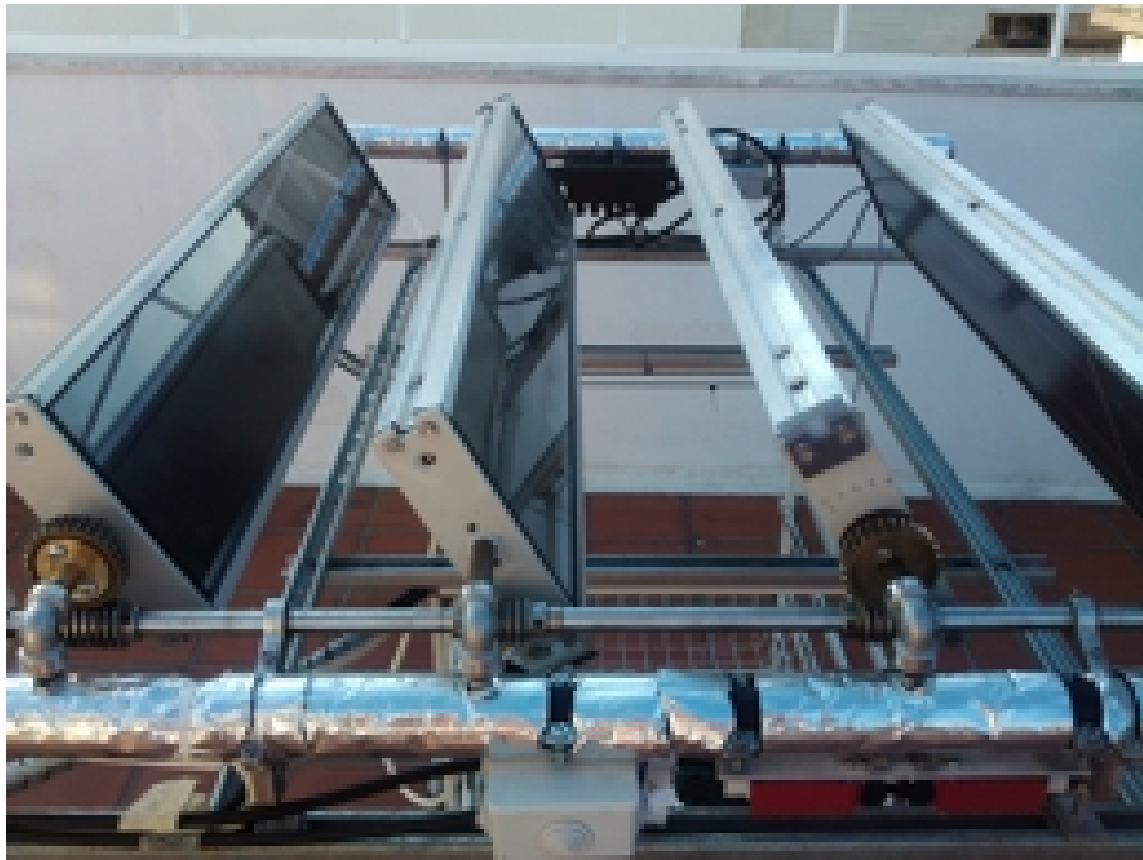
TP4-enersol



After-noon thermodynamic position

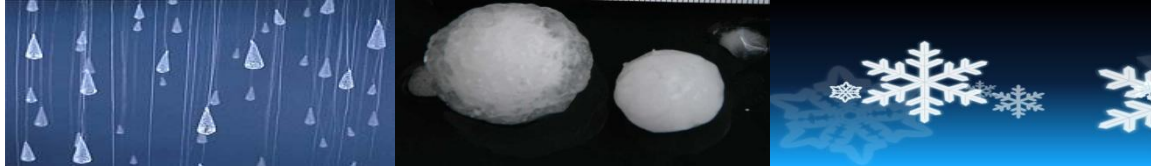


TP4-enersol



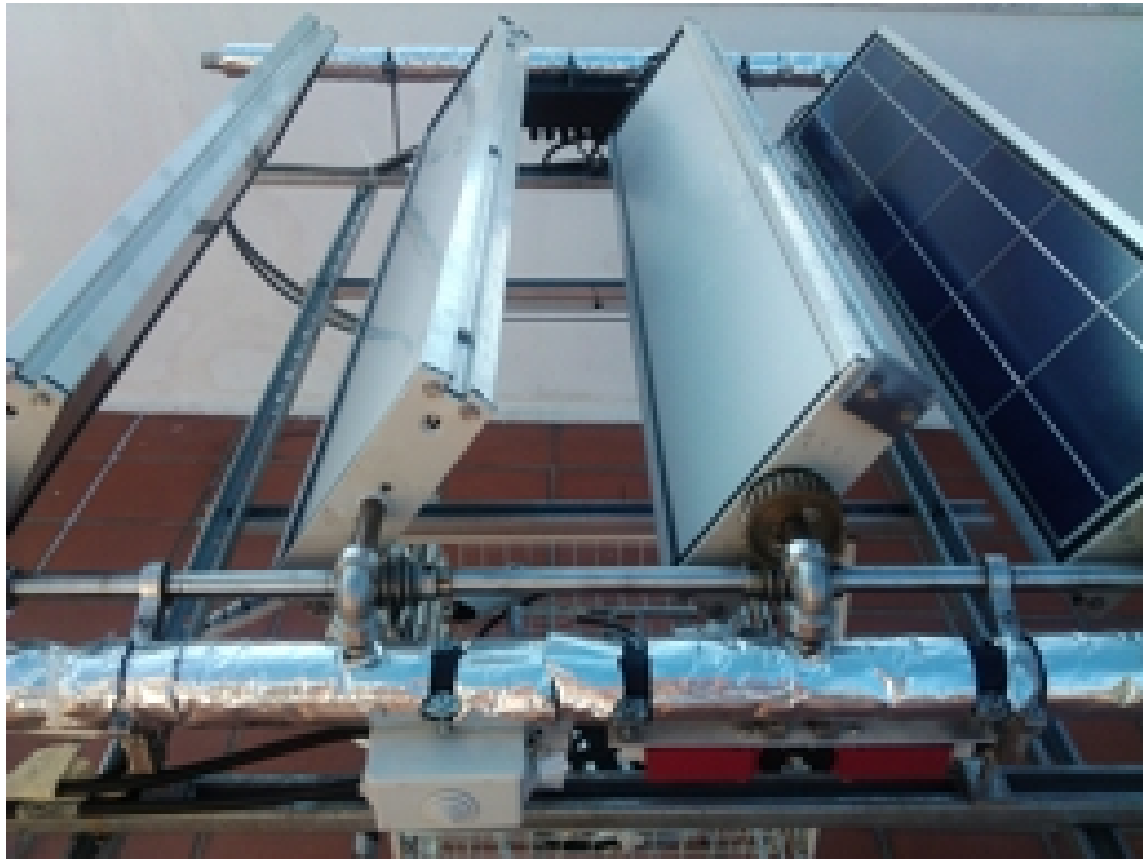
Evening thermodynamic position

TP4-enersol



Rain, Hail & Snow safe position

TP4-enersol



Morning photovoltaic position



TP4-enersol



Noon photovoltaic position



TP4-enersol



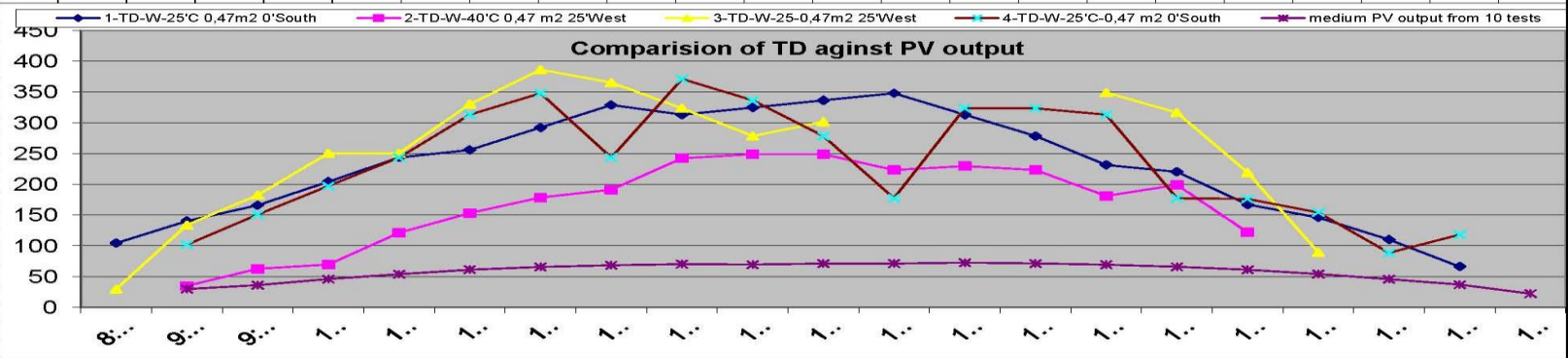
Evening photovoltaic position

TP4-enersol



4 thermo-tests against 1 PV-test output

1	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
1	object	terrace Areos 22/ Αλκυονίδας P.Faliron				Date posit. Direct.				Enersol TP4-II-TD				3.0 meter stripe =0,47 m2		1-module=nom. 3,1V and 8,1A							
2	date	06/9 water in 25°C				07/9 water in 40°C				15/9 water in 25°C				17/9 water in 25°C				MEDIUM PV-output					
3	time	No1 Dt	I/h	W-TD	No2 Dt	I/h	W-TD	No3 Dt	I/h	W-TD	No4 Dt	I/h	W-TD	3 modules 18 cells			mixed conditions						
4	8:30	TD-II-0° S No track				TD-II-0° S No track				TD-II-25° W+tracker				TD-II-25° W+tracker									
5	9:00	0,9	100	104	0,5	60	35	0,7	110	30	0,8	110	102	9,9	3	29,8							
6	9:30	1,1	110	140	0,9	60	63	1,1	105	134	1,3	100	151	12,0	3	36,1							
7	10:00	1,3	110	166	1	60	70	1,5	105	183	1,7	100	197	15,3	3	46,0							
8	10:30	1,6	110	204	1,9	55	121	2,4	90	251	2,1	100	244	17,9	3	53,8							
9	11:00	2	105	244	2,4	55	153	2,4	90	251	2,7	100	313	20,4	3	61,3	4 measurements of the (TD)						
10	11:30	2,1	105	256	2,8	55	179	3	95	331	3,0	100	348	21,9	3	65,8	thermodynamic function at various						
11	12:00	2,4	105	292	3	55	191	3,7	90	386	2,1	100	244	22,8	3	68,5	water inlet temperatures 25/40°C						
12	12:30	2,7	105	329	3,8	55	242	3,5	90	365	3,2	100	371	23,4	3	70,2	at dir. 0° South and 25° West with						
13	13:00	2,7	100	313	3,9	55	249	3,1	90	324	2,9	100	336	23,2	3	69,5	and without tracking The graph						
14	13:30	2,8	100	325	3,9	55	249	2,4	100	278	2,4	100	278	23,7	3	71,2	shows TD efficiency in relation to						
15	14:00	2,9	100	336	3,5	55	223	2,6	100	302	1,7	90	177	23,7	3	71,2	medium PV-output of max. 75 W						
16	14:30	3	100	348	3,6	55	230				3,1	90	324	24,2	3	72,6	per 3 modules						
17	15:00	2,7	100	313	3,5	55	223				3,1	90	324	23,8	3	71,3							
18	15:30	2,4	100	278	3	52	181				3	90	313	23,1	3	69,4							
19	16:00	2,1	95	231	3,3	52	199	4,3	70	349	1,7	90	177	22,0	3	65,9							
20	16:30	2	95	220	2,1	50	122	3,9	70	317	1,6	95	176	20,4	3	61,2							
21	17:00	1,6	90	167				2,7	70	219	1,4	95	154	18,1	3	54,2							
22	17:30	1,4	90	146				1,1	70	89	0,9	85	89	15,3	3	45,9							
23	18:00	1	95	110							1,2	85	118	12,3	3	36,9							
24	18:30	0,6	95	66										7,4	3	22,2							
25	mediu	2,0	100,5	230	2,7	55,3	171	2,6	89,7	253,9	2,1	95,8	233,6	18,1	54,4	0,0	0,0	0	0,0	0,0	0,0	201,1	

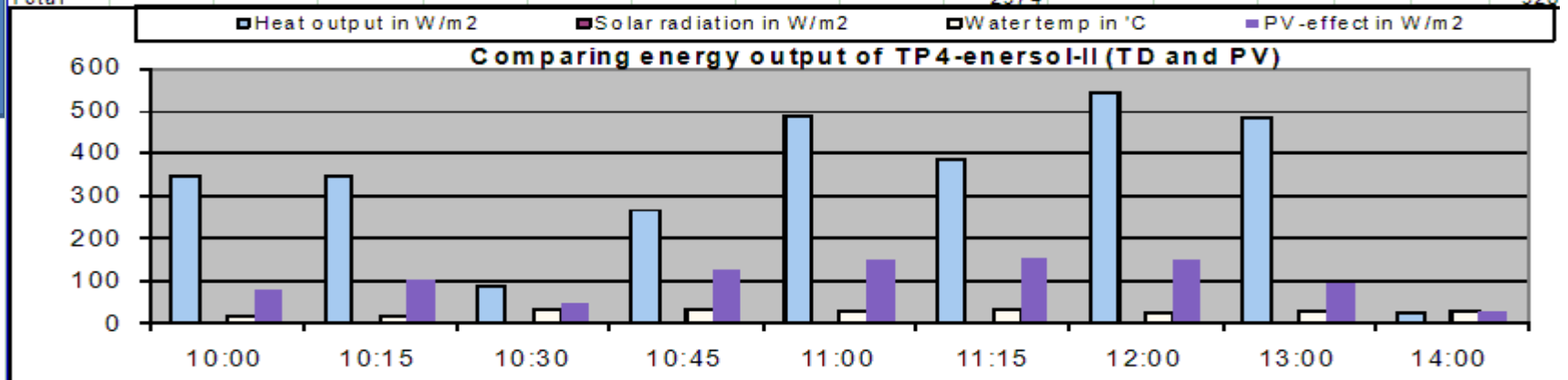


Proofs that TD-mode gives 4 x energy than PV-mode

TP4-enersol

Comparing test of TD and PV energy output

ΔΟΚΙΜΗ	26dec-12	Αρσος 22	Π.Φαλιρα	Ταρατσά	3*1 μετρο	paralila	Area =	0,46	m 2	Solar in-	%	PV	1 mod	0,153	E ffect
Test	Volume	Seconds	L/h	Tin	Tout	Dt	Tout	Time	W att/m 2	solation	effect	Amp	Volt	W att	W /m 2
1	1,7	115	53	18,4	21,2	2,8	18	10:00	347			3,6	3,4	12	80
2	1,7	115	53	18,4	21,2	2,8	19	10:15	347			4,7	3,3	16	101
3	1,7	115	53	31,2	31,9	0,7	20	10:30	87			2,1	3,6	8	49
4	1,7	112	55	31,4	33,5	2,1	20	10:45	267			5,6	3,5	20	128
5	1,7	105	58	29,0	32,6	3,6	21	11:00	488			6,5	3,5	23	149
6	1,7	110	56	30,8	33,8	3	22	11:15	388			6,6	3,5	23	151
7	1,7	115	53	25,0	29,4	4,4	21	12:00	545			6,4	3,5	22	147
8	1,7	115	53	29,4	33,3	3,9	21	13:00	483			4,2	3,5	15	96
9	1,7	120	51	28,8	29,0	0,2	20	14:00	24			1,2	3,3	4	26
Total									2974						928



Συμπέρασμα των δοκιμών 3x1 μετρο με κατεύθυνση 0° South και κλίση 50° είναι ότι το θερμικό στοιχείο αποδίδει 3 ως 4 φορές περισσότερη ενέργεια από το φωτοβολταϊκό στοιχείο
 Conclusion of this test of 3x1 meter at 0° South orientation and 50° inclination are that
 The thermal module TD collects 3 to 4 times more solar energy in W than the photovoltaic module PV

Total	32-35	νερο	δίνει	2974 W	με ηλιοφάνεια	0	και για P V μονον	928 W att
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The insolation rates are for horizontal surface and m 2

Proofs that TD-mode gives 4 x energy than PV-mode

TP4-enersol

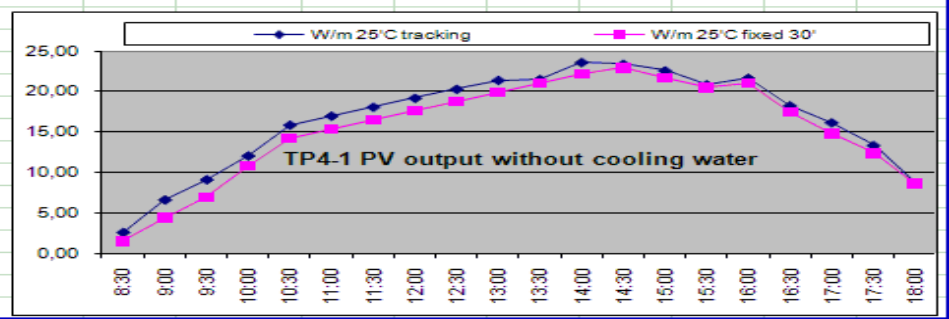


Comparing PV-output with and without tracking

object	terace	Areos 22/ Αλλκουνης			P.Faliron			Direction			25' West		Enersol		TP4-II		PV only		No 1
date	time	center	panel	Amp	VDC	PV W	Amp	VDC	PV W	solar	air	water	water	TP4	flow	water	Watt		
19 sep-12		25'west	tilt	tracker	tracker	output	30°C	30°C	output	radiat.	temp	in	out	temp	L/h	Dt	TD		
	8:00		shadow							actual									
	8:30		-35	0,78	3,25	2,54	0,48	3,16	1,52	300	23,1			23,9					
	9:00		-15	1,97	3,33	6,56	1,32	3,29	4,34	380	26			27,8					
	9:30		-5	2,71	3,35	9,08	2,08	3,33	6,93	500	26,4			30					
	10:00		5	3,59	3,35	12,03	3,24	3,34	10,82	680	27,1			31,8					
	10:30		15	4,85	3,27	15,86	4,35	3,27	14,22	750	29,3			39,3					
	11:00					16,97			15,36										
	11:30					18,08			16,50										
	12:00					19,19			17,63										
	12:30					20,30			18,77										
	13:00					21,41			19,90										
	13:30					21,52			21,04										
	14:00		40	7,5	3,15	23,63	7,04	3,15	22,18	750	31			48,1					
	14:30		45	7,43	3,15	23,40	7,3	3,14	22,92	750	30,7			49,4					
	15:00		45	7,13	3,17	22,60	6,93	3,13	21,69	680	30,4			47,2					
	15:30		45	6,6	3,16	20,86	6,51	3,15	20,51	660	30,4			45,2					
	16:00		50	6,9	3,14	21,67	6,72	3,13	21,03	720	30,8			46,1					
	16:30		45	5,72	3,19	18,25	5,5	3,17	17,44	580	28,3			42,8					
	17:00		50	4,92	3,28	16,14	4,54	3,26	14,80	530	27,1			35,9					
	17:30		45	4,1	3,25	13,33	3,81	3,24	12,34	500	28,1			36,4					
	18:00		35	2,63	3,28	8,63	2,63	3,27	8,60	430	26,7			30,7					
	18:30																		
	19:00		shadow																
	19:30		shadow																
						total W			total W										
			medium values	8,3	0,7	329	4,5	3,2	307	565	26,6	0	0	36,5	0				

due to late autumn 19 september measurement and due to direction of panels towards 25 West the gain of morning and evening insolation is low in comparison to summer time tests and mid-day Watt interpolation gives lower figures

Notices			
	Above results are measured from a TP4-II PV panel		
	Panel is positioned with PV-side towards the insolation		
	TRACKER & FIXED POSITION		
	Medium exterior outside temperature =		26,6
	Medium back space PV-module temperature =		36,5
	Medium water flow through panel pipe =		0
	Medium water temperature inlet =		0,0
	Medium water temperature outlet =		0,0
	Medium temperature increase / 3 m panel length =		0,0
	Converted to medium panel length 2.5 m =		0,0
	low gain of morning and evening insolation'	watth	kwh/m2
	a) the total energy gain tracked PV-function is	329	2,16
	b) the total energy gain No tracker PV function is	307	2,01
	max. TP4 backspace temperature	49,4	

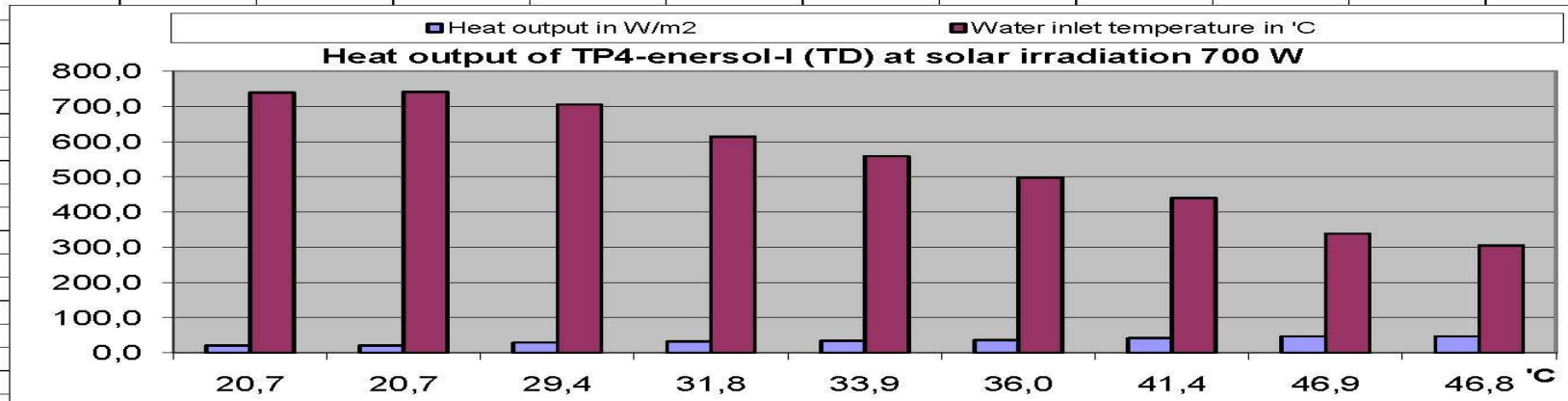


+ 10% output when at 25' Southwest orientation

TP4-enersol

tests TD-mode output at various inlet temperatures

ΔΟΚΙΜΗ	8 okt-12	Αρσος 22	Π.Φαλιρα	Ταρατσα	3*1 μετρο paralila			Area =	0,46	m2	Solar in-	%
Test	Volume	Seconds	L/h	Tin	Tout	Dt	Tout	Time	Watt/m2	solation	effect	
1	1,7	42	146	20,7	22,7	2	30	12:20	739	680	1,09	
2	1,7	44	139	20,7	22,8	2,1	30	12:25	741	680	1,09	
3	1,7	44	139	29,4	31,4	2	30	12:30	705	700	1,01	
4	1,7	48	128	31,8	33,7	1,9	30	13:25	614	700	0,88	
5	1,7	50	122	33,9	35,7	1,8	30	13:40	559	690	0,81	
6	1,7	50	122	36,0	37,6	1,6	30	13:45	497	690	0,72	
7	1,7	53	115	41,4	42,9	1,5	30	13:45	439	690	0,64	
8	1,7	55	111	46,9	48,1	1,2	30	14:00	339	700	0,48	
9	1,7	56	109	46,8	47,9	1,1	30	13:30	305	680	0,45	



Test to definate the percentage of heat output depending on the temperature of incoming water
 Conclusion of test with 3 x 1 m parallell at position 0' south and inclination 45'

1.	20°C	νερο	δινει	700 W	με ηλιοφανεια	680	ισον	103 %
2.	30°C	νερο	δινει	660 W	με ηλιοφανεια	700	ισον	94 %
3.	36°C	νερο	δινει	590 W	με ηλιοφανεια	690	ισον	86 %
4.	40°C	νερο	δινει	440 W	με ηλιοφανεια	690	ισον	64 %
5.	47°C	νερο	δινει	320 W	με ηλιοφανεια	690	ισον	46 %

At 47°C water input the TD-mode output is 46 %