

**Various TESTS  
of  
TP4 SOLAR PERGOLAS**

**B) PVH against PV**

**C) PVH against TD**

**D) PV against TD**

**E) PV temperature Drop**

Concentrated test report B on TP4-enersol PV, TD and hybrid functions						Athens	May 10 2015	Detailed graphs shown in .ppt and .pdf			
B)	<u>TP4-PV + hybrid function - against - pure PV-function</u>										
	<u>Date</u>	<u>Time</u>	<u>distance</u>	<u>TP4 -PV</u>	<u>W/h/m2</u>	<u>TP4-H</u>	<u>W/h/m2</u>	<u>Hybrid +%</u>	This test compares the panels hybrid output in relation to its pure PV output		
1)	1/4/2015	9:00 - 11:30	c/c 333		102		283	277			
2)	3/4/2015	9:00 - 19:00	c/c 333		106		176	167			
3)	10/4/2015	9:00 - 12:15	c/c 333		134		76	57	The result depends on temperature,		
4)	11/4/2015	16:00 - 19:00	c/c 333		140		252	180	wind velocity, insolation, etc.		
5)	12/4/2015	9:00 - 18:45	c/c 333		109		190	174			
5 tests	medium + hybrid output was				118		195	171 % plus	Our medium value shows approx. +170%		
C)	<u>TP4-PV + hybrid function - against - pure thermic TD-function</u>										
	<u>Date</u>	<u>Time</u>	<u>distance</u>	<u>TP4 -PVH</u>	<u>W/h/m2</u>	<u>TP4-TD</u>	<u>W/h/m2</u>	<u>Thermic +%</u>	This test compares PV output together		
1)	18/4/2015	16:50 - 17:30	c/c 333		171		395	231	with its hybrid heat effect against our		
2)	28/4/2015	10:45 - 17:20	c/c 333		200		393	197	pure Thermodynamic panel function		
3)	1/5/2015	08:00 - 13:30	c/c 333		290		677	233			
3 tests	medium + hybrid output was				220		488	220 % plus	Our medium value shows approx. +220%		
D)	<u>TP4-PV - against - pure thermic TD-function</u>										
	<u>Date</u>	<u>Time</u>	<u>distance</u>	<u>TP4 -PV</u>	<u>W/h/m2</u>	<u>TP4-TD</u>	<u>W/h/m2</u>	<u>Thermic +%</u>	This test compares the pure PV output		
1)	18/4/2015	16:50 - 17:30	c/c 333		91		395	434	without any hybrid effect against our		
2)	28/4/2015	10:45 - 17:20	c/c 333		78		393	504	pure Thermodynamic panel function		
3)	1/5/2015	08:00 - 13:30	c/c 333		81		677	836			
3 tests	medium + hybrid output was				83		488	591 % plus	Our medium value shows approx. +590%		
E)	<u>TP4-PVH Temperature Drop of PV interior due to Hybrid function</u>										
	<u>Date</u>	<u>Time</u>	<u>distance</u>	<u>TP4 -PVH</u>	<u>t-PV nom</u>	<u>t-PV cool</u>	<u>Differens</u>	<u>Output +%</u>	PV output increase by temperat. drop		
1)	18/4/2015	17:30 - 18:15	c/c 333		50	42	8	4 % plus	Our medium value shows approx. + 4%		

## **Test B**

**was performed on basis of comparing values**

**of**

**TP4-Enersol TD-II-PV without Hybrid effect**

**against**

**TP4-Enersol TD-II-PV with Hybrid effect**

## **Hybrid effect means**

**a) cool down the PV-cells gaining more electricity  
Resulting in**

**b) Producing hot water from its hybrid heat effect  
The question is**

**Can you use this heat effect for any purpose**

**Yes**

**You can preheat domestic hot water tanks**

**And**

**You can even make hot water in summertime**

**So**

**How big is this Hybrid effect**

**TP4-Enersol  
rotatable solar panels solves problem**

**because**

**It has a built-in hybrid cool and heat function  
and**

**The following pages shows this effect in figures  
proofing**

**approximately 170 % paralell heat output**

**whilst**

**Producing PV electricity**

**NEXT PAGE**

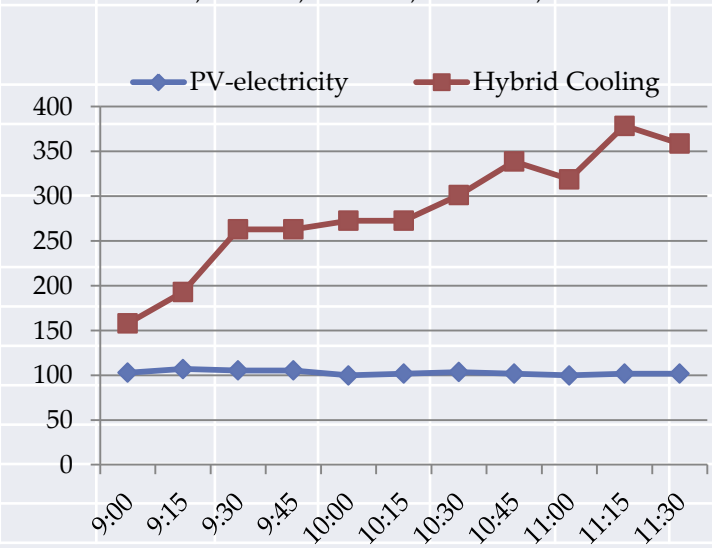
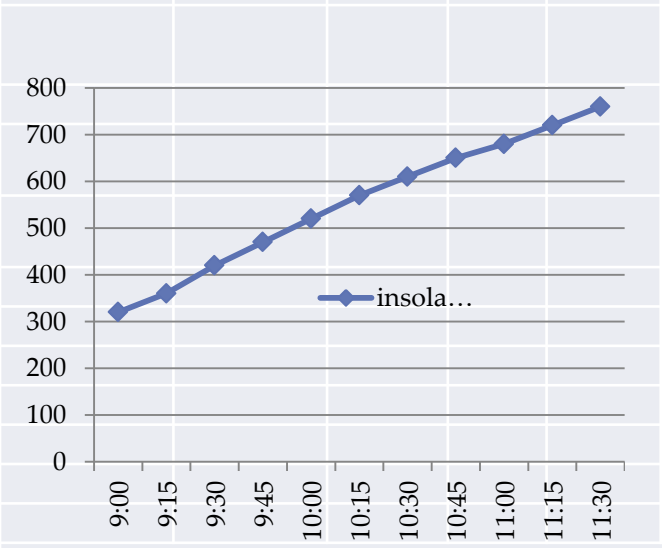
**TP4 test B1**

**c/c=333 mm**

**April 1 2015**

**Result was an increase of + 277%**

1 April 2015	direction East west		PV-TD panel		Manual tracker		Hybrid Cooling			Preheating water			
	Insolation		PV-elec		Water		Water	Diff.	Panel	Water	Heat output	Notice:	
time	W/h/m2	Amp.	VDC	Watt	W/m2	In 'C	Out 'C	Dt 'C	PVtemp.	flow l/h	Watt/m2	the PV-panel temperature	
9:00	320	5	3	15,0	103	18,6	19,5	0,9	23,1	22	158	reached max. 29,0 with the cooling function. Temperature reduction is estimated to about -3'C	
9:15	360	5,2	3	15,6	107	18,5	19,6	1,1	25,2	22	193		
9:30	420	5,3	2,9	15,4	105	18,5	20	1,5	27,5	22	263		
9:45	470	5,3	2,9	15,4	105	19	20,5	1,5	27,3	22	263		
10:00	520	5,2	2,8	14,6	100	19,4	21,3	1,9	26,9	18	272		
10:15	570	5,3	2,8	14,8	102	20,2	22,1	1,9	26,7	18	272	Insolation	553W/m2
10:30	610	5,4	2,8	15,1	104	21,4	23,5	2,1	28,9	18	301	PV-electr.	103W/m2
10:45	650	5,3	2,8	14,8	102	20,2	21,9	1,7	28,8	25	339	Hybrid heat	283W/m2
11:00	680	5,2	2,8	14,6	100	20,2	21,8	1,6	28,9	25	319		
11:15	720	5,3	2,8	14,8	102	20	21,9	1,9	29,7	25	378	Test shows that the	
11:30	760	5,3	2,8	14,8	102	19,8	21,6	1,8	28,7	25	358	Hybrid function absorps	
Medium	553			15	103	19,6	21,2	1,6	27,4	242	283	heat energy	276 %



compared to PV-module.

Med. Water in temp. = 19,6

Med. water out temp.= 21,2

Test shows that the Hybrid function absorbs at least twice the energy collected by the PV-module.

Test performed on a TD/PV-cooling panel constructed without any incorporation of any kind of thermo-isolation.

**NEXT PAGE**

**TP4 test B2**

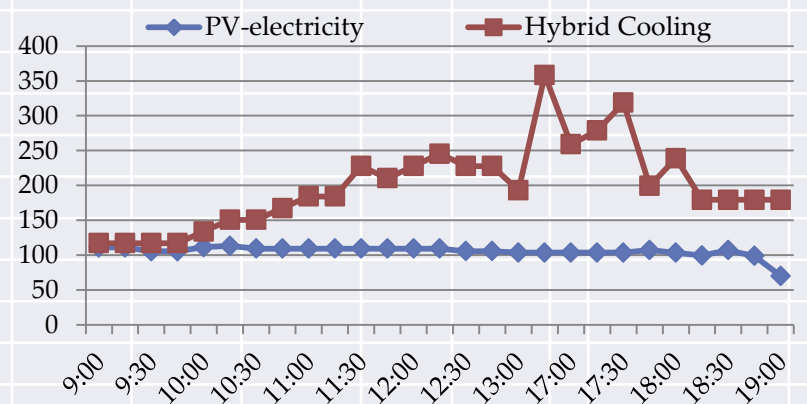
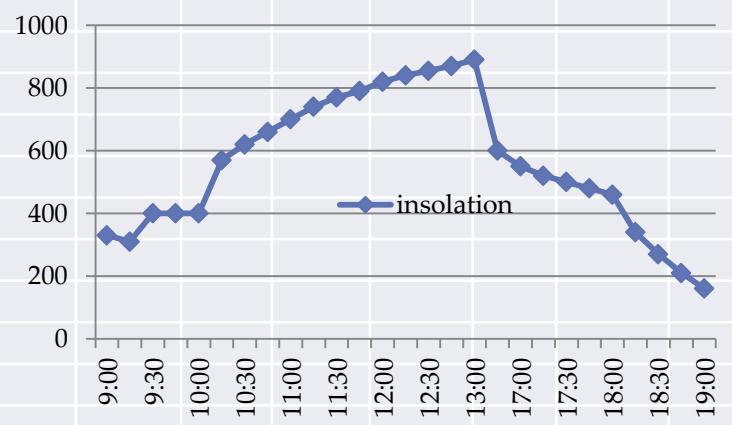
**c/c=333 mm**

**April 3 2015**

**Result was an increase of + 167%**



3 April 2015	direction East west			PV-TD panel			Manual tracker		Hybrid Cooling		Preheat water		Notice:		
	Insolation		VDC	PV-elec		Water	Water	Diff.	Panel		flow	Heat	the PV-panel temperature		
time	W/h/m2	Amp.		Watt	W/m2	In °C	Out °C	Dt °C	PV °C	ext °C	l/h	W/m2	reached max. 42,4 without		
9:00	330		5,4	3,0	16,2	111	18,5	19,2	0,7	23,9	16,2	21	117	the cooling function.	
9:15	310		5,4	3,0	16,2	111	19,0	19,7	0,7	29,5	17,0	21	117	PV-temperature reduction	
9:30	400		5,3	2,9	15,4	105	19,8	20,5	0,7	29,9	18,0	21	117	is estimated to about -10°C	
9:45	400		5,3	2,9	15,4	105	20,5	21,2	0,7	20,3	18,5	21	117		
10:00	400		5,8	2,8	16,2	111	21,8	22,6	0,8	30,7	19,0	21	134	Insolation	558W/m2
10:15	570		5,9	2,8	16,5	113	21,9	22,8	0,9	33,4	19,5	21	151	PV-electr.	105W/m2
10:30	620		5,7	2,8	16,0	109	22,4	23,3	0,9	34,3	20,7	21	151	Hybrid heat	199W/m2
10:45	660		5,7	2,8	16,0	109	22,9	23,9	1,0	34,0	21,2	21	167		
11:00	700		5,7	2,8	16,0	109	23,4	24,5	1,1	33,4	21,9	21	184	Test shows that the	
11:15	740		5,7	2,8	16,0	109	23,7	24,8	1,1	32,8	20,6	21	184	Hybrid function absorbs	
11:30	770		5,7	2,8	16,0	109	23,9	25,2	1,3	32,4	21,5	22	228	about 180% the energy	
11:45	790		5,7	2,8	16,0	109	24,4	25,6	1,2	33,2	21,8	22	210	collected by PV-module.	
12:00	820		5,7	2,8	16,0	109	24,6	25,9	1,3	33,2	21,9	22	228		
12:15	840		5,7	2,8	16,0	109	24,7	26,1	1,4	33,9	22,4	22	245	Test performed on a	
12:30	855		5,5	2,8	15,4	105	25,1	26,4	1,3	34,4	21,6	22	228	TD/PV-cooling panel	
12:45	870		5,5	2,8	15,4	105	25,2	26,5	1,3	33,8	21,7	22	228	constructed without any	
13:00	890		5,4	2,8	15,1	104	25,7	26,8	1,1	32,2	21,1	22	193	incorporation of any kind	
16:45	600		5,4	2,8	15,1	104	28,5	30,3	1,8	42,4	32,1	25	358	of thermo-isolation.	
17:00	550		5,4	2,8	15,1	104	26,2	27,5	1,3	41,5	28,8	25	259		
17:15	520		5,4	2,8	15,1	104	26,1	27,5	1,4	39,8	28,1	25	279	Med. Water in temp. =	23,3
17:30	500		5,4	2,8	15,1	104	25,4	27,0	1,6	39,8	28,0	25	319	Med. water out temp.=	24,4
17:45	480		5,4	2,9	15,7	107	22,8	23,8	1,0	32,4	24,1	25	199	Med. Exterior temp. =	22,4
18:00	460		5,2	2,9	15,1	103	23,8	25,0	1,2	32,1	25,9	25	239		
18:15	340		5,0	2,9	14,5	99	23,3	24,2	0,9	32,8	24,2	25	179		
18:30	270		5,2	3,0	15,6	107	22,7	23,6	0,9	31,3	24,0	25	179		
18:45	210		4,8	3,0	14,4	99	21,8	22,7	0,9	30,5	23,6	25	179		
19:00	160		3,4	3,0	10,2	70	21,1	22,0	0,9	30,1	21,8	25	179		
Medium	558		5,4	2,9	15	105	23,3	24,4	1,1	32,9	22,4	23	199		



**NEXT PAGE**

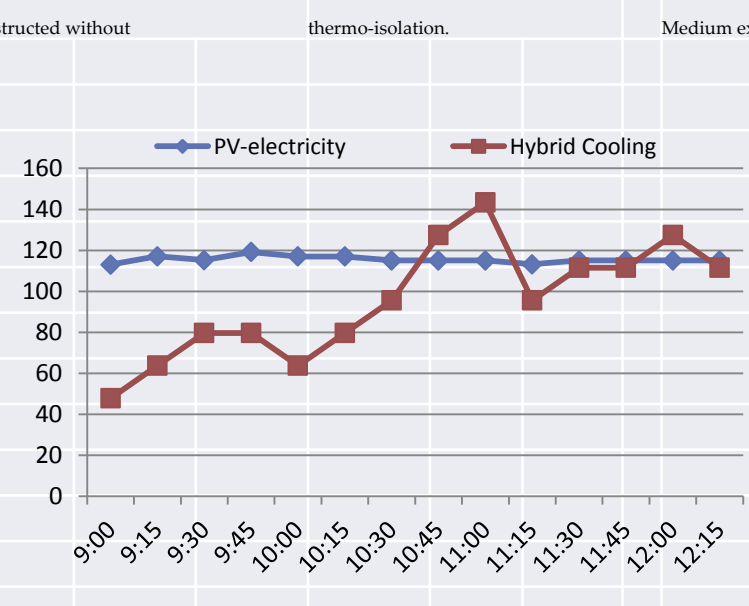
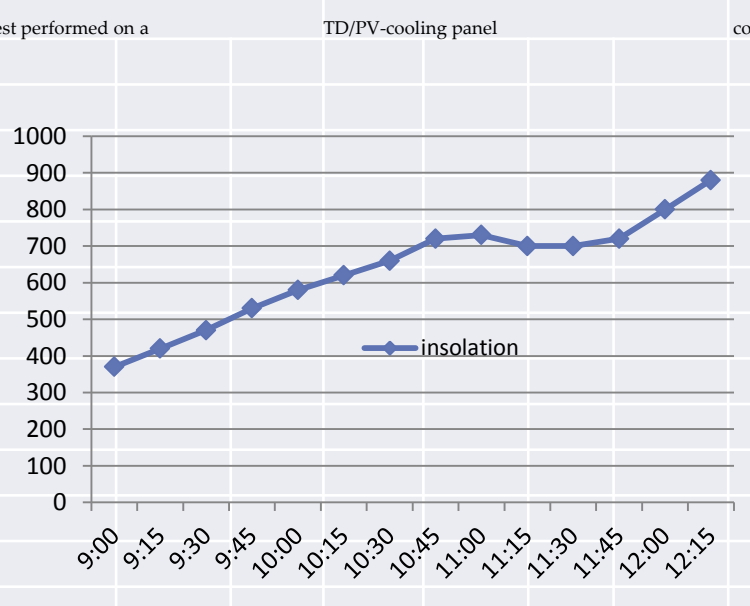
**TP4 test B3**

**c/c=333 mm**

**April 10 2015**

**Result was an increase of + 57%**

10 April 2015	direction East west			PV-TD panel			Manual tracker		Hybrid Cooling		Preheat water		Notice:			
	Insolation		VDC	PV-elec		Water		Water	Diff.	Panel		flow	Heat	the PV-panel temperature		
time	W/h/m2	Amp.		Watt	W/m2	In 'C	Out 'C	Dt 'C	PV 'C	ext 'C	l/h	W/m2	reached max.	34,0 'C with		
9:00	370	5,5		3	16,5	113	17,2	17,5	0,3	23,9	16,2	20	48	the cooling function.		
9:15	420	5,7		3	17,1	117	17,2	17,6	0,4	29,5	17,0	20	64	Temperature reduction is		
9:30	470	5,8		2,9	16,8	115	17,2	17,7	0,5	29,9	18,0	20	80	estimated to about -10'C		
9:45	530	6,0		2,9	17,4	119	17,8	18,3	0,5	20,3	18,5	20	80			
10:00	580	6,1		2,8	17,1	117	18,0	18,4	0,4	30,7	19,0	20	64	Insolation	636W/m2	
10:15	620	6,1		2,8	17,1	117	19,9	20,4	0,5	33,4	19,5	20	80	PV-electr.	116W/m2	
10:30	660	6,0		2,8	16,8	115	19,6	20,2	0,6	34,3	20,7	20	96	Hybrid heat	96W/m2	
10:45	720	6,0		2,8	16,8	115	19,7	20,5	0,8	34,0	21,2	20	127			
11:00	730	6,0		2,8	16,8	115	20,4	21,3	0,9	33,4	21,9	20	143	Test shows that the		
11:15	700	5,9		2,8	16,5	113	21,3	21,9	0,6	32,8	20,6	20	96	Hybrid function absorbs		
11:30	700	6,0		2,8	16,8	115	21,3	22,0	0,7	32,4	21,5	20	112	about 80% of energy		
11:45	720	6,0		2,8	16,8	115	21,7	22,4	0,7	33,2	21,8	20	112	collected by PV-module.		
12:00	800	6,0		2,8	16,8	115	21,7	22,5	0,8	33,2	21,9	20	127			
12:15	880	6,0		2,8	16,8	115	21,8	22,5	0,7	33,9	22,4	20	112			
Total	636				17	116	19,6	20,2	0,6	31,1	20,0	20	96	Medium water in	19,6	
														Medium water out	20,2	
Test performed on a	TD/PV-cooling panel						constructed without						thermo-isolation.		Medium exterior	20,0



**NEXT PAGE**

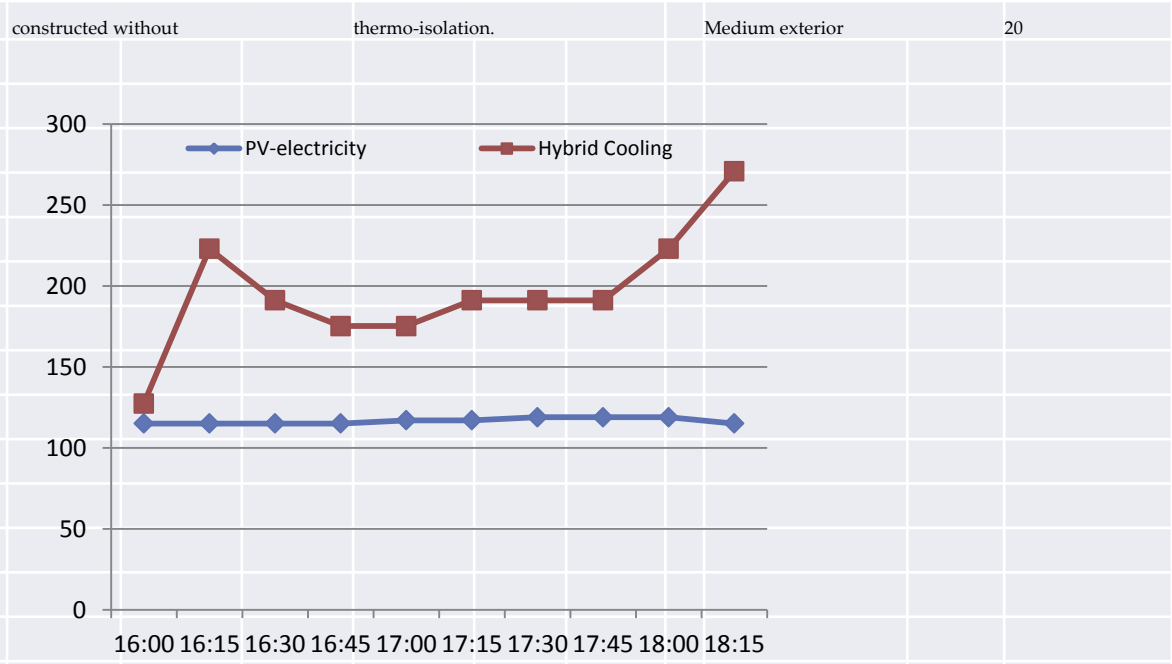
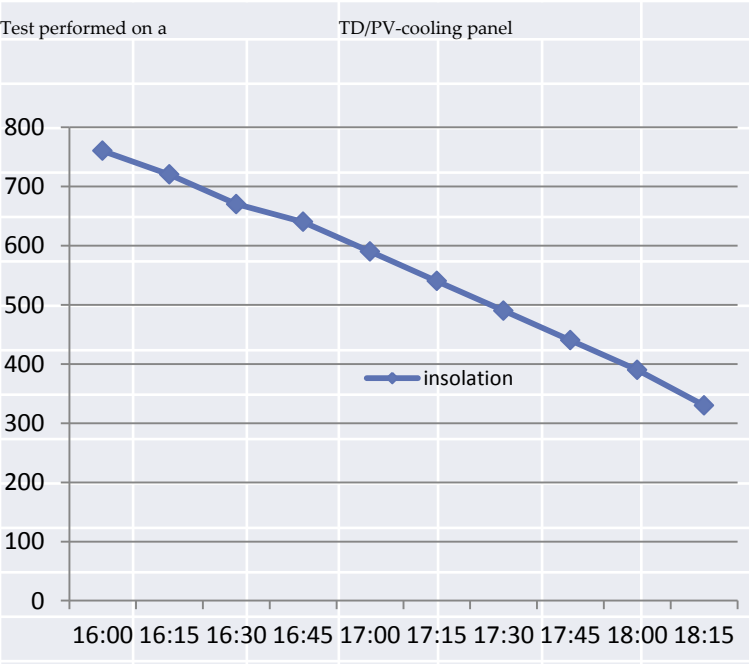
**TP4 test B4**

**c/c=333 mm**

**April 11 2015**

**Result was an increase of + 180%**

11 April 2015	direction East west			PV-TD panel			Manual tracker		Hybrid Cooling		Preheat water		Notice:		
	Insolation		VDC	PV-elec		Water		Water	Diff.	Panel		flow	Heat	the PV-panel temperature	
time	W/h/m2	Amp.		Watt	W/m2	In 'C	Out 'C	Dt 'C	PV 'C	ext 'C	l/h	W/m2	reached max.	34,9 'C with	
16:00	760	6,0		2,8	16,8	115	23	23,8	0,8	34,5	22,2	20	127	the cooling function.	
16:15	720	6,0		2,8	16,8	115	22,4	23,8	1,4	34,1	21,4	20	223	Temperature reduction is	
16:30	670	6,0		2,8	16,8	115	22,0	23,2	1,2	34,9	19,6	20	191	estimated to about -10'C	
16:45	640	6,0		2,8	16,8	115	21,9	23,0	1,1	33,7	19,2	20	175		
17:00	590	6,1		2,8	17,1	117	21,7	22,8	1,1	32,2	19,9	20	175	Insolation	482W/m2
17:15	540	6,1		2,8	17,1	117	20,7	21,9	1,2	31,7	26,0	20	191	PV-electr.	114W/m2
17:30	490	6,2		2,8	17,4	119	20,7	21,9	1,2	32,7	21,4	20	191	Hybrid heat	205W/m2
17:45	440	6,2		2,8	17,4	119	20,5	21,7	1,2	31,8	22,1	20	191		
18:00	390	6,2		2,8	17,4	119	20,1	21,5	1,4	33,2	22,8	20	223	Test shows that the	
18:15	330	6,0		2,8	16,8	115	19,7	21,4	1,7	34,5	23,0	20	271	Hybrid function absorbs	
18:30	280	5,8		2,8	16,2	111	19,0	20,4	1,4	34,7	21,4	20	223	about 180% of energy	
18:45	240	5,5		2,8	15,4	105	18,8	20,4	1,6	34,2	20,0	20	255	collected by PV-module.	
19:00	180	5,2		2,8	14,6	100	18,6	20,0	1,4	33,1	19,0	20	223		
Total	482				17	114	20,7	22,0	1,3	33,5	21,4	20	205	Medium water in	20,7
														Medium water out	22,0
Test performed on a														Medium exterior	20



**NEXT PAGE**

**TP4 test B5**

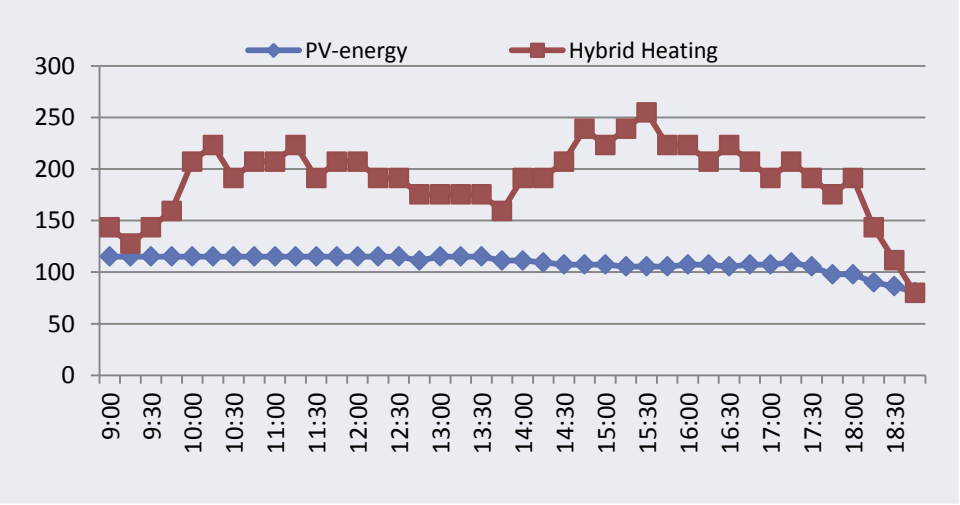
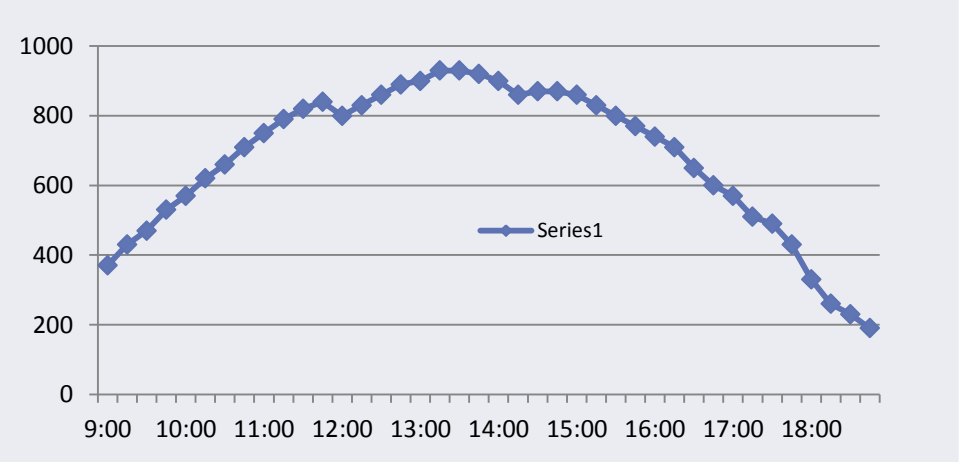
**c/c=333 mm**

**April 12 2015**

**Result was an increase of + 174%**

12 April 2015		direction East west				PV-TD panel			Manual tracker			Hybrid Cooling	
Insolation		PV-elec				Water		Diff.	Panel	flow		Heat	
time	W/m2	Amp.	VDC	Watt	W/m2	In °C	Out °C	Dt °C	PV °C	ext °C	l/h	W/m2	
9:00	370	6,0	2,8	16,8	115	18,9	19,8	0,9	27,6	17,6	20	143	
9:15	430	6,0	2,8	16,8	115	18,7	19,5	0,8	29,6	17,8	20	127	
9:30	470	6,0	2,8	16,8	115	18,5	19,4	0,9	30,0	17,9	20	143	
9:45	530	6,0	2,8	16,8	115	18,3	19,3	1,0	30,3	18,0	20	159	
10:00	570	6,0	2,8	16,8	115	18,7	20,0	1,3	28,8	16,6	20	207	
10:15	620	6,0	2,8	16,8	115	19,6	21	1,4	28,6	17,0	20	223	
10:30	660	6,0	2,8	16,8	115	20,3	21,5	1,2	30,9	17,5	20	191	
10:45	710	6,0	2,8	16,8	115	20,7	22,0	1,3	32,8	18,8	20	207	
11:00	750	6,0	2,8	16,8	115	20,9	22,2	1,3	31,5	18,2	20	207	
11:15	790	6,0	2,8	16,8	115	20,9	22,3	1,4	32,3	18,0	20	223	
11:30	820	6,0	2,8	16,8	115	21,1	22,3	1,2	30,6	18,3	20	191	
11:45	840	6,0	2,8	16,8	115	21,2	22,5	1,3	32,8	18,7	20	207	
12:00	800	6,0	2,8	16,8	115	21,2	22,5	1,3	30,1	18,8	20	207	
12:15	830	6,0	2,8	16,8	115	21,3	22,5	1,2	31,9	19,0	20	191	
12:30	860	6,0	2,8	16,8	115	21,0	22,2	1,2	31,7	18,5	20	191	
12:45	890	5,8	2,8	16,2	111	21,5	22,6	1,1	30,6	20,8	20	175	
13:00	900	6,0	2,8	16,8	115	21,4	22,5	1,1	32,7	21,3	20	175	
13:15	930	6,0	2,8	16,8	115	21,6	22,7	1,1	32,0	21,8	20	175	
13:30	930	6,0	2,8	16,8	115	21,7	22,8	1,1	32,3	22,3	20	175	
13:45	920	5,8	2,8	16,2	111	21,8	22,8	1,0	31,4	22,9	20	159	
14:00	900	5,8	2,8	16,2	111	21,5	22,7	1,2	34,0	23,1	20	191	
14:15	860	5,7	2,8	16,0	109	21,6	22,8	1,2	31,6	22,4	20	191	
14:30	870	5,6	2,8	15,7	107	21,7	23	1,3	34,7	23,2	20	207	
14:45	870	5,6	2,8	15,7	107	21,3	22,8	1,5	35,8	23,5	20	239	
15:00	860	5,6	2,8	15,7	107	20,9	22,3	1,4	39,6	25,3	20	223	
15:15	830	5,5	2,8	15,4	105	20,9	22,4	1,5	41,8	25,6	20	239	
15:30	800	5,5	2,8	15,4	105	21,0	22,6	1,6	38,7	23,0	20	255	
15:45	770	5,5	2,8	15,4	105	20,8	22,2	1,4	36,0	21,6	20	223	
16:00	740	5,6	2,8	15,7	107	20,6	22,0	1,4	34,5	20,8	20	223	
16:15	710	5,6	2,8	15,7	107	20,6	21,9	1,3	34,1	21,3	20	207	
16:30	650	5,5	2,8	15,4	105	20,4	21,8	1,4	34,9	21,1	20	223	
16:45	600	5,6	2,8	15,7	107	20,1	21,4	1,3	33,7	21,0	20	207	
17:00	570	5,6	2,8	15,7	107	20,0	21,2	1,2	32,2	21,2	20	191	
17:15	510	5,7	2,8	16,0	109	19,5	20,8	1,3	31,7	21,0	20	207	
17:30	490	5,5	2,8	15,4	105	19,3	20,5	1,2	32,7	20,3	20	191	
17:45	430	5,1	2,8	14,3	98	19,4	20,5	1,1	31,8	20,6	20	175	
18:00	330	5,1	2,8	14,3	98	19,4	20,6	1,2	33,2	21,8	20	191	
18:15	260	4,7	2,8	13,2	90	19,6	20,5	0,9	34,5	21,1	20	143	
18:30	230	4,5	2,8	12,6	86	19,2	19,9	0,7	34,7	21,2	20	112	
18:45	190	4,2	2,8	11,8	81	18,8	19,3	0,5	34,2	20,0	20	80	
Total	677			16	109	20,4	21,6	1,2	32,8	20,5	20	190	

Preheat water Notice: Insolation 677W/m2  
 PV-elect. 109W/m2  
 the PV-panel temperature Hybrid heat 190W/m2  
 reached max. 41,8 °C with  
 the cooling function. Test shows that the  
 Temperature reduction is Hybrid function absorbs  
 estimated to about -10°C about 170% of energy  
 collected by PV-module.  
 Test performed on a  
 TD/PV-cooling panel Medium water in 20,4 °C  
 constructed without Medium water out 21,6 °C  
 thermo-isolation. Medium exterior 20,0 °C



## **Test C**

**was performed on basis of comparing values**

**of**

**TP4-Enersol TD-II-TD thermodynamic effect**

**against**

**TP4-Enersol TD-II-PV including Hybrid effect**

**Medium effect increase was + 233%**



## **Hybrid effect means**

**a) cool down the PV-cells gaining more electricity  
Resulting in**

**b) Producing hot water from its hybrid heat effect  
The question is**

**Can you use this heat effect for any purpose**

**Yes**

**You can preheat domestic hot water tanks**

**And**

**You can even make hot water in summertime**

**So**

**How big is this Hybrid effect**

**TP4-Enersol  
rotatable solar panels solves problem**

**because**

**It has a built-in hybrid cool and heat function  
and**

**The following pages shows this effect in figures  
proofing**

**approximately 170 % paralell heat output**

**whilst**

**Producing PV electricity**

**NEXT PAGE**

**TP4 test C1**

**c/c=333 mm**

**April 18 2015**

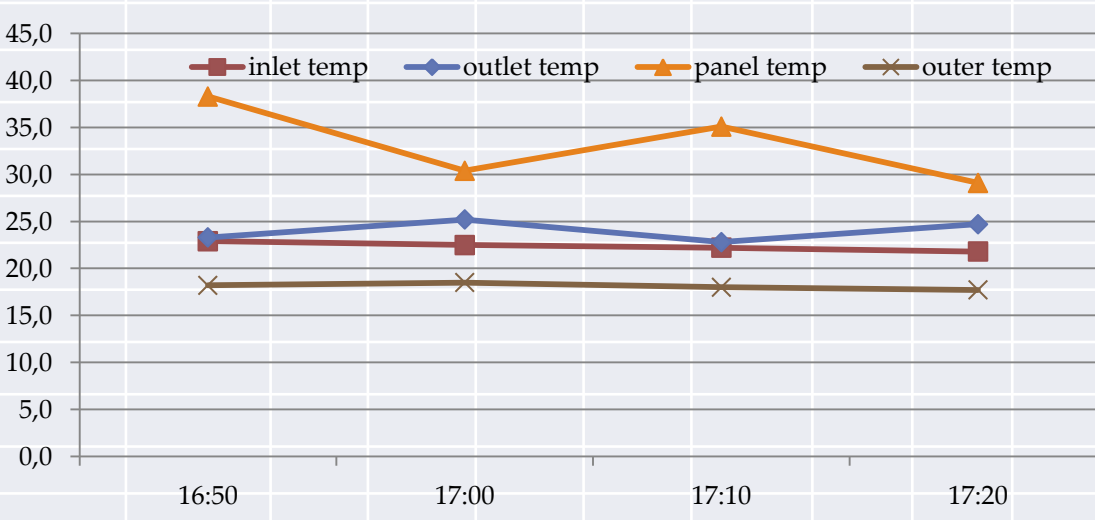
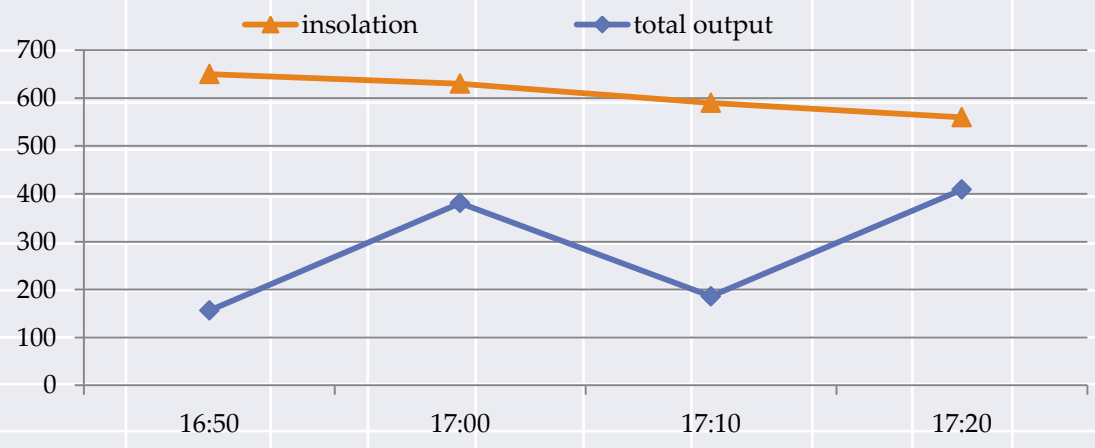
**TD against PVH**

**Result was an increase of + 187%**

18 April 2015

Test comparing PV + Hybrid Heat output of PV panel against its Thermodynamic function only

	Insolat.	T-in	T-out	Dt	flow	W/m2	T-PV	T-ext	Amp	Volt	W/m2	Wtot/m2	
16:50	650	22,9	23,3	0,4	20,0	64	38,3	18,2	4,5	3,0	14	92	156PV+Hybrid heat
17:00	630	22,5	25,2	2,7	20,0	381	30,4	18,5	0,0	0,0	0	0,0	381TD heating
17:10	590	22,2	22,8	0,6	20,0	96	35,1	18,0	4,4	3,0	13	90	186PV+Hybrid heat
17:20	560	21,8	24,7	2,9	20,0	409	29,1	17,7	0,0	0,0	0	0,0	409TD heating



/ 2  
 91PV Only  
 171PV+Hybrid heat  
 395TD heating

PV-panel was cooled continuously whilst exchanging function side every 15 minutes

Test shows that Hybrid heat gives approx. twice the energy made by pure PV-mode

Test shows that Pure TD heating gives 5 times more energy than Pure PV output

If also considering hybrid heat effect then TD makes 2 times more energy then PV+H

171	91	187%
395	171	231%
395	91	432%

**NEXT PAGE**

**TP4 test C2**

**c/c=333 mm**

**April 28 2015**

**TD against PVH**

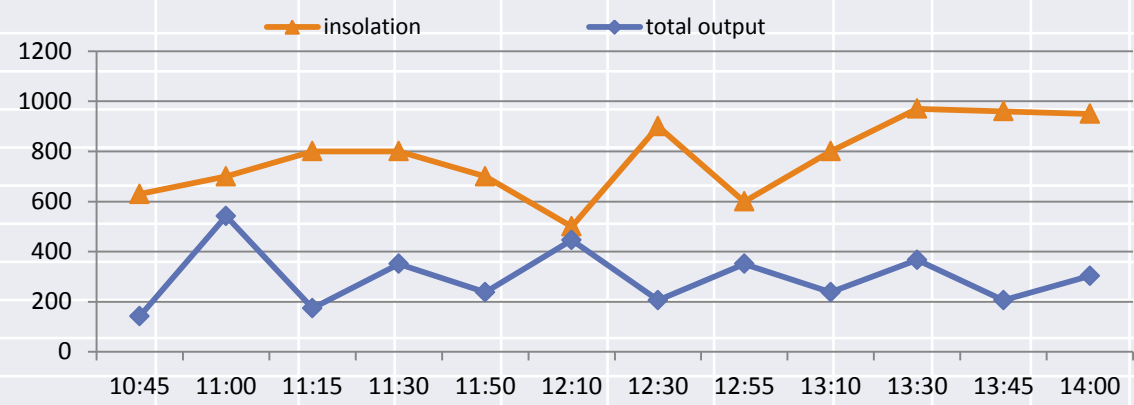
**Result was an increase of + 196%**

28 April 2015

Test comparing PV + Hybrid Heat output of PV panel against its Thermodynamic function only

	Insolat.	T-in	T-out	Dt	flow	W/m2	T-PV	T-ext	Amp	Volt	W/m2	Wtot/m2		
10:45	630	23,1	23,5	0,4	20	64	39,9	21,7	3,8	3	11	78	142	PV+Hybrid heat
11:00	700	23,3	26,7	3,4	20	542	33,9	22,3	0	0	0	0	542	TD heating
11:15	800	23,8	24,4	0,6	20	96	36,8	22,6	3,8	3	11	78	174	PV+Hybrid heat
11:30	800	22,9	25,1	2,2	20	350	35,4	24,1	0	0	0	0	350	TD heating
11:50	700	22,6	23,6	1,0	20	159	37,3	24,9	3,8	3	11	78	237	PV+Hybrid heat
12:10	500	22,5	25,3	2,8	20	446	34,7	26,7	0	0	0	0	446	TD heating
12:30	900	24,3	25,1	0,8	20	127	37,8	24,3	3,8	3	11	78	206	PV+Hybrid heat
12:55	600	24	26,2	2,2	20	350	35,2	27,5	0	0	0	0	350	TD heating
13:10	800	24,6	25,6	1,0	20	159	38,1	26,3	3,8	3	11	78	237	PV+Hybrid heat
13:30	970	25,3	27,6	2,3	20	366	34,4	27,6	0	0	0	0	366	TD heating
13:45	960	25,9	26,7	0,8	20	127	35,3	25,8	3,8	3	11	78	206	PV+Hybrid heat
14:00	950	26	27,9	1,9	20	303	36,4	29,1	0	0	0	0	303	TD heating

/ 6

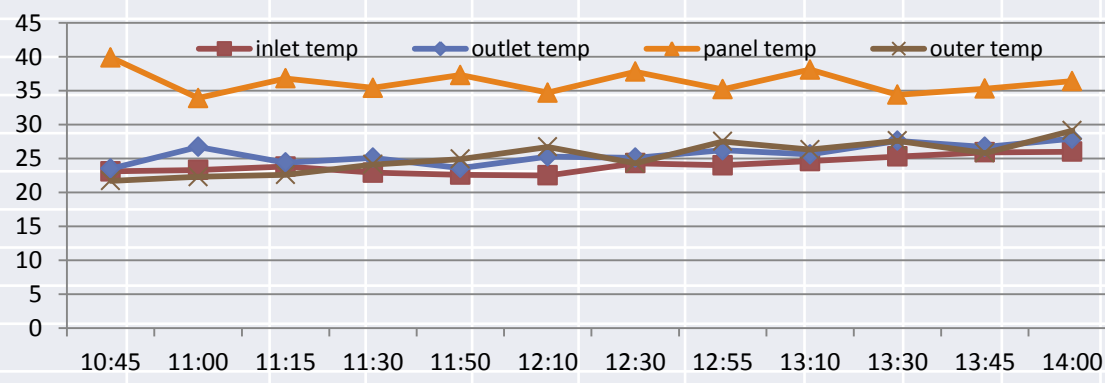


78PV Only  
200PV+Hybrid heat  
393TD heating

PV-panel was cooled continuously whilst exchanging function side every 15 minutes

Test shows that Hybrid heat gives approx. twice the energy made by pure PV-mode

Test shows that Pure TD heating gives 5 times more energy than Pure PV output



If also considering hybrid heat effect then TD makes 2 times more energy then PV+H

200	78	256%
393	200	196%
393	78	503%

**NEXT PAGE**

**TP4 test C3**

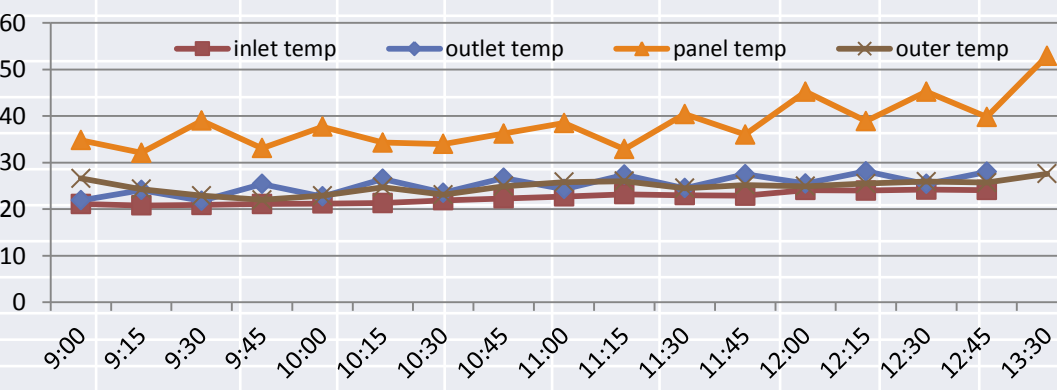
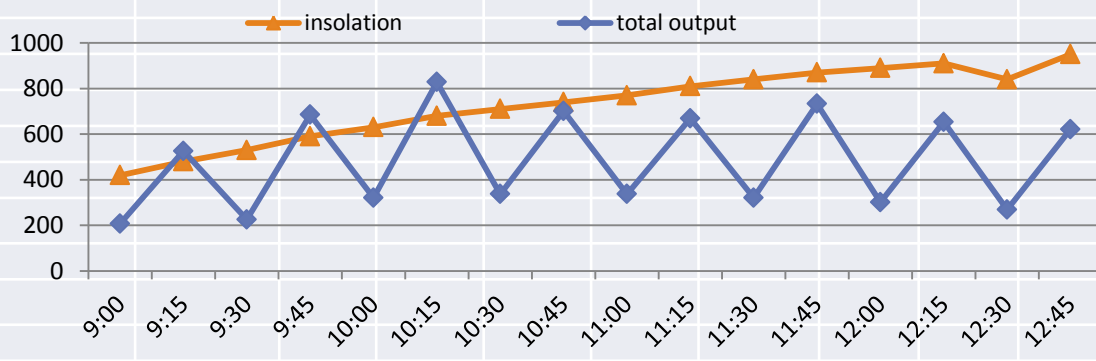
**c/c=333 mm**

**May 1 2015**

**Result was an increase of + 233%**

Test comparing PV + Hybrid Heat output of PV panel against its Thermodynamic function only

	Insolat.	T-in	T-out	Dt	flow	W/m2	T-PV	T-ext	Amp	Volt	W/m2	Wtot/m2	
9:00	420	21,1	21,9	0,8	20	127	34,8	26,6	3,9	3	12	80	208PV+Hybrid heat
9:15	480	20,8	24,1	3,3	20	526	32,1	24,3	0	0	0	0	526TD heating
9:30	530	20,9	21,8	0,9	20	143	39	22,9	4	3	12	82	226PV+Hybrid heat
9:45	590	21,1	25,4	4,3	20	685	33,1	22	0	0	0	0	685TD heating
10:00	630	21,2	22,7	1,5	20	239	37,7	22,9	4	3	12	82	321PV+Hybrid heat
10:15	680	21,3	26,5	5,2	20	828	34,3	24,7	0	0	0	0	828TD heating
10:30	710	21,9	23,5	1,6	20	255	34	23,1	4	3	12	82	337PV+Hybrid heat
10:45	740	22,3	26,7	4,4	20	701	36,2	24,9	0	0	0	0	701TD heating
11:00	770	22,7	24,3	1,6	20	255	38,5	25,8	4	3	12	82	337PV+Hybrid heat
11:15	810	23,2	27,4	4,2	20	669	32,9	26	0	0	0	0	669TD heating
11:30	840	23	24,5	1,5	20	239	40,4	24,5	4	3	12	82	321PV+Hybrid heat
11:45	870	22,9	27,5	4,6	20	733	36	25,2	0	0	0	0	733TD heating
12:00	890	24,1	25,5	1,4	20	223	45,2	24,9	3,8	3	11	78	301PV+Hybrid heat
12:15	910	24	28,1	4,1	20	653	38,9	25,5	0	0	0	0	653TD heating
12:30	840	24,2	25,4	1,2	20	191	45,2	25,9	3,8	3	11	78	269PV+Hybrid heat
12:45	950	24,1	28	3,9	20	621	39,8	25,7	0	0	0	0	621TD heating
13:30	0	0	0	0,0	0	0	52,9	27,6	0	0	0	0	0NO Flow



/ 8

81PV Only  
290PV+Hybrid heat  
677TD heating

PV-panel was cooled continuously whilst exchanging function side every 15 minutes

At the end of hybrid cooling test water flow was closed and temperature rized by 13°C

No flow stagnation temperature was 52,9 °C

290	81	358 %
677	290	233 %
677	81	837 %



**FINAL RESULT of**

**TP4 test C**

**TD against PVH**

**Shows an medium effect increase of**

**+ 231%**



**NEXT PAGE**

**TP4 test C1**

**c/c=333 mm**

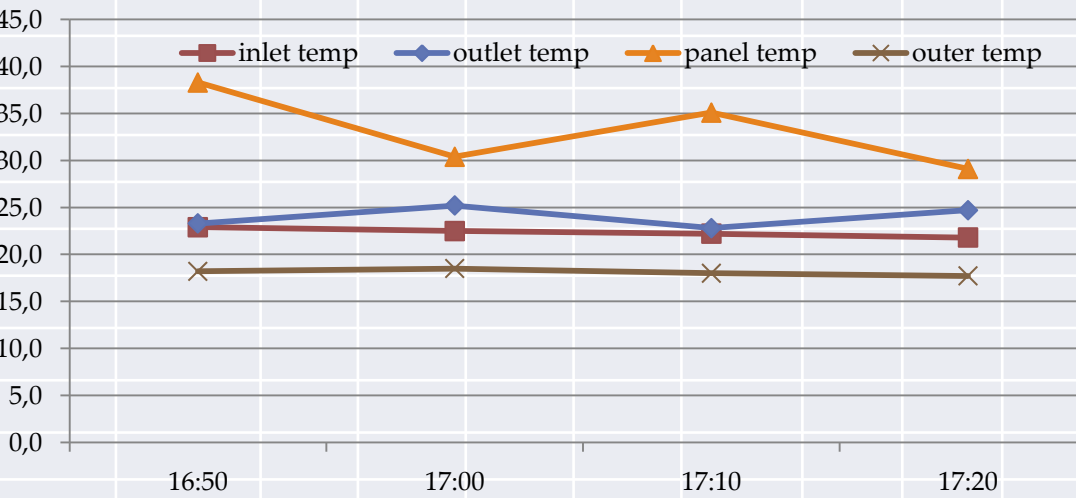
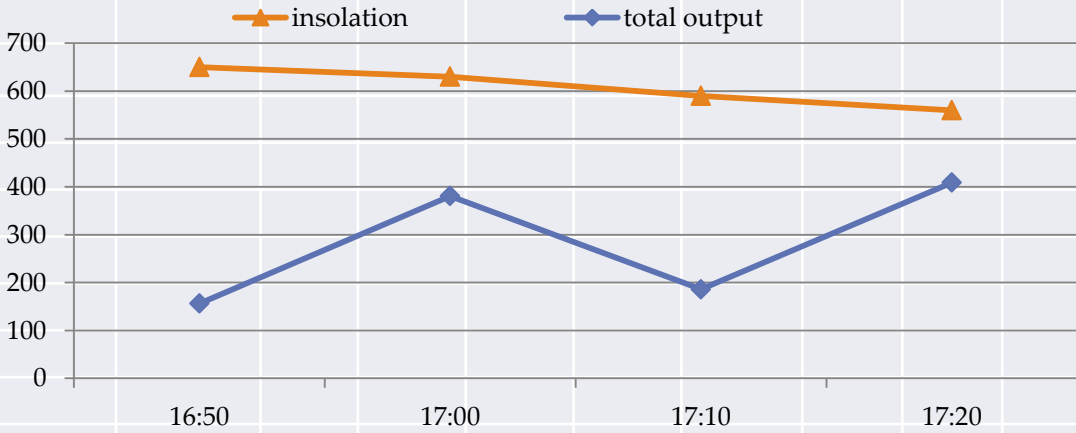
**April 18 2015**

**TD against PVH**

**Result was an increase of + 231%**

18 April 2015 Test comparing PV + Hybrid Heat output of PV panel against its Thermodynamic function only

	Insolat.	T-in	T-out	Dt	flow	W/m2	T-PV	T-ext	Amp	Volt	W/m2	Wtot/m2	
16:50	650	22,9	23,3	0,4	20,0	64	38,3	18,2	4,5	3,0	14	92	156PV+Hybrid heat
17:00	630	22,5	25,2	2,7	20,0	381	30,4	18,5	0,0	0,0	0	0,0	381TD heating
17:10	590	22,2	22,8	0,6	20,0	96	35,1	18,0	4,4	3,0	13	90	186PV+Hybrid heat
17:20	560	21,8	24,7	2,9	20,0	409	29,1	17,7	0,0	0,0	0	0,0	409TD heating



/ 2  
 91PV Only  
 171PV+Hybrid heat  
 395TD heating

PV-panel was cooled continuously whilst exchanging function side every 15 minutes

Test shows that Hybrid heat gives approx. twice the energy made by pure PV-mode

Test shows that Pure TD heating gives 5 times more energy than Pure PV output

If also considering hybrid heat effect then TD makes 2 times more energy then PV+H

171	91	187%
395	171	231%
395	91	432%

**NEXT PAGE**

**TP4 test C2**

**c/c=333 mm**

**April 28 2015**

**TD against PVH**

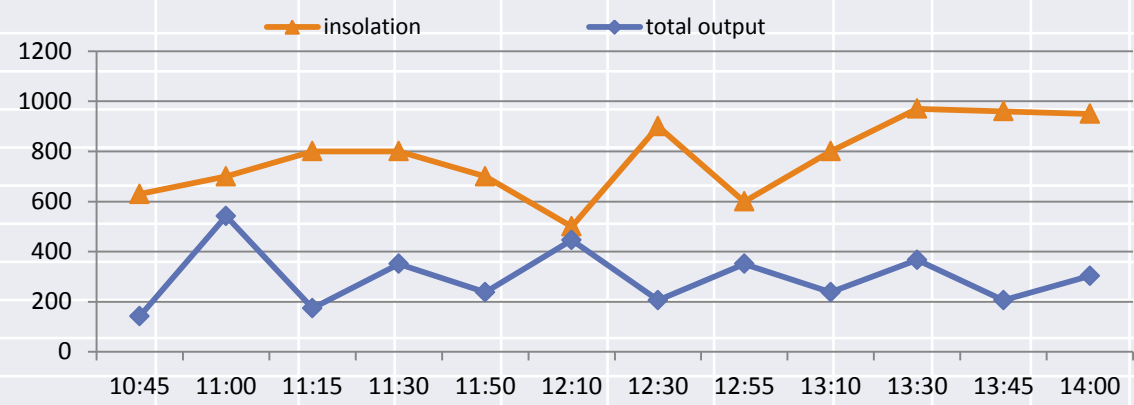
**Result was an increase of + 196%**

28 April 2015

Test comparing PV + Hybrid Heat output of PV panel against its Thermodynamic function only

	Insolat.	T-in	T-out	Dt	flow	W/m2	T-PV	T-ext	Amp	Volt	W/m2	Wtot/m2		
10:45	630	23,1	23,5	0,4	20	64	39,9	21,7	3,8	3	11	78	142	PV+Hybrid heat
11:00	700	23,3	26,7	3,4	20	542	33,9	22,3	0	0	0	0	542	TD heating
11:15	800	23,8	24,4	0,6	20	96	36,8	22,6	3,8	3	11	78	174	PV+Hybrid heat
11:30	800	22,9	25,1	2,2	20	350	35,4	24,1	0	0	0	0	350	TD heating
11:50	700	22,6	23,6	1,0	20	159	37,3	24,9	3,8	3	11	78	237	PV+Hybrid heat
12:10	500	22,5	25,3	2,8	20	446	34,7	26,7	0	0	0	0	446	TD heating
12:30	900	24,3	25,1	0,8	20	127	37,8	24,3	3,8	3	11	78	206	PV+Hybrid heat
12:55	600	24	26,2	2,2	20	350	35,2	27,5	0	0	0	0	350	TD heating
13:10	800	24,6	25,6	1,0	20	159	38,1	26,3	3,8	3	11	78	237	PV+Hybrid heat
13:30	970	25,3	27,6	2,3	20	366	34,4	27,6	0	0	0	0	366	TD heating
13:45	960	25,9	26,7	0,8	20	127	35,3	25,8	3,8	3	11	78	206	PV+Hybrid heat
14:00	950	26	27,9	1,9	20	303	36,4	29,1	0	0	0	0	303	TD heating

/ 6

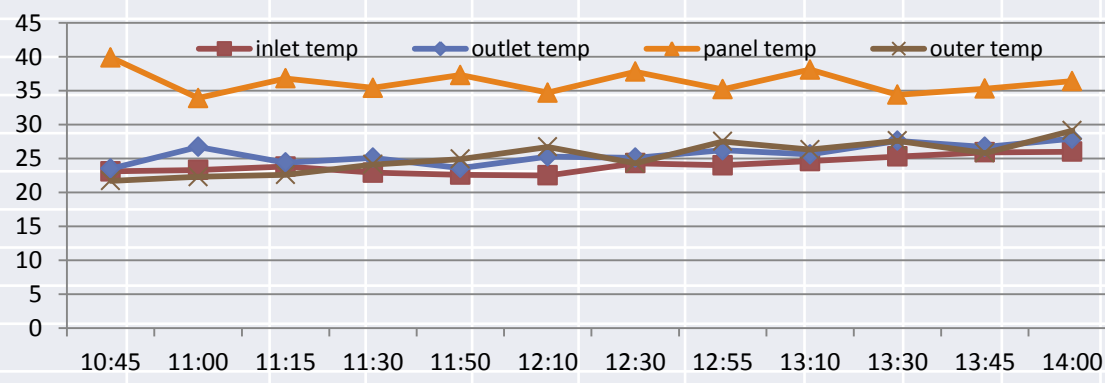


78PV Only  
200PV+Hybrid heat  
393TD heating

PV-panel was cooled continuously whilst exchanging function side every 15 minutes

Test shows that Hybrid heat gives approx. twice the energy made by pure PV-mode

Test shows that Pure TD heating gives 5 times more energy than Pure PV output



If also considering hybrid heat effect then TD makes 2 times more energy than PV+H

200	78	256%
393	200	196%
393	78	503%

**NEXT PAGE**

**TP4 test C3**

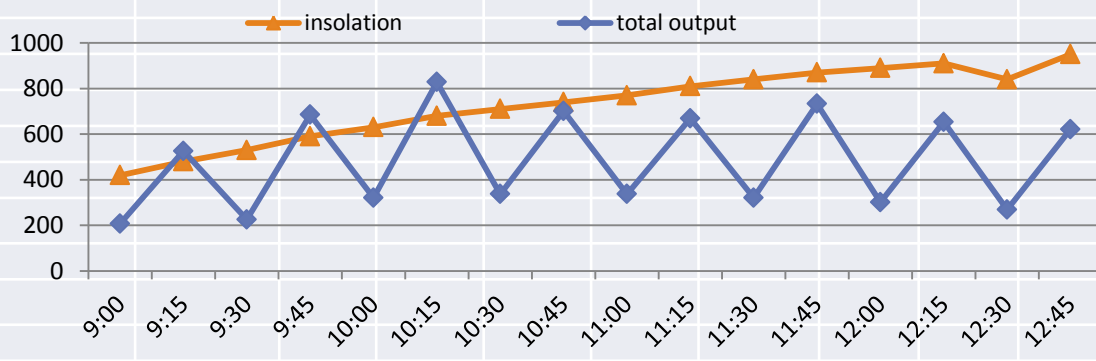
**c/c=333 mm**

**May 1 2015**

**Result was an increase of + 233%**

Test comparing PV + Hybrid Heat output of PV panel against its Thermodynamic function only

	Insolat.	T-in	T-out	Dt	flow	W/m2	T-PV	T-ext	Amp	Volt	W/m2	Wtot/m2			
9:00	420	21,1	21,9	0,8	20	127	34,8	26,6	3,9	3	12	80	208PV+Hybrid heat		
9:15	480	20,8	24,1	3,3	20	526	32,1	24,3	0	0	0	0	526TD heating		
9:30	530	20,9	21,8	0,9	20	143	39	22,9	4	3	12	82	226PV+Hybrid heat		
9:45	590	21,1	25,4	4,3	20	685	33,1	22	0	0	0	0	685TD heating		
10:00	630	21,2	22,7	1,5	20	239	37,7	22,9	4	3	12	82	321PV+Hybrid heat		
10:15	680	21,3	26,5	5,2	20	828	34,3	24,7	0	0	0	0	828TD heating		
10:30	710	21,9	23,5	1,6	20	255	34	23,1	4	3	12	82	337PV+Hybrid heat		
10:45	740	22,3	26,7	4,4	20	701	36,2	24,9	0	0	0	0	701TD heating		
11:00	770	22,7	24,3	1,6	20	255	38,5	25,8	4	3	12	82	337PV+Hybrid heat		
11:15	810	23,2	27,4	4,2	20	669	32,9	26	0	0	0	0	669TD heating		
11:30	840	23	24,5	1,5	20	239	40,4	24,5	4	3	12	82	321PV+Hybrid heat		
11:45	870	22,9	27,5	4,6	20	733	36	25,2	0	0	0	0	733TD heating		
12:00	890	24,1	25,5	1,4	20	223	45,2	24,9	3,8	3	11	78	301PV+Hybrid heat		
12:15	910	24	28,1	4,1	20	653	38,9	25,5	0	0	0	0	653TD heating		
12:30	840	24,2	25,4	1,2	20	191	45,2	25,9	3,8	3	11	78	269PV+Hybrid heat		
12:45	950	24,1	28	3,9	20	621	39,8	25,7	0	0	0	0	621TD heating		
13:30	0	0	0	0,0	0	0	52,9	27,6	0	0	0	0	0NO Flow		



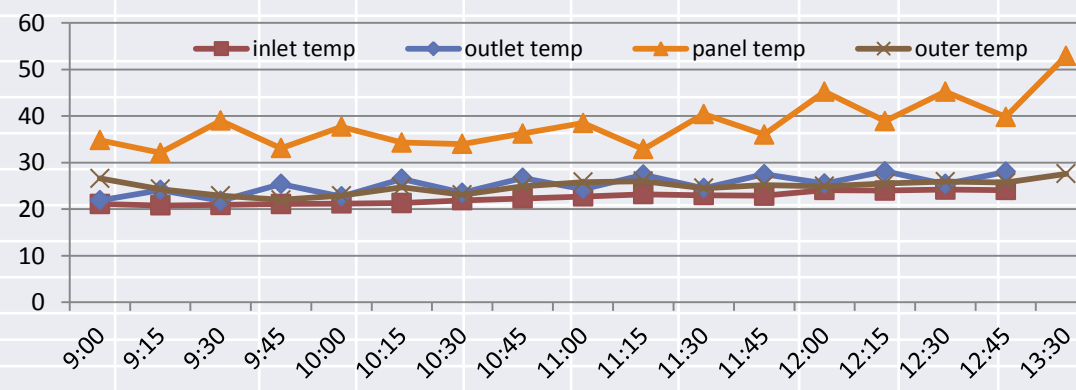
/ 8

81PV Only  
290PV+Hybrid heat  
677TD heating

PV-panel was cooled continuously whilst exchanging function side every 15 minutes

At the end of hybrid cooling test water flow was closed and temperature rized by 13°C

No flow stagnation temperature was 52,9 °C



290	81	358 %
677	290	233 %
677	81	837 %



**Special Cooling Test on Temperature drop  
Showing  
The temperature decrease from cooling water  
Until  
Stagnation of temperature occurs  
And  
The temperature increase  
When  
Cooling water is stopped  
Until  
Stagnation temperature is reached**

**NEXT PAGE**

**TP4 test E1**

**c/c=333 mm**

**Cooling Effect**

**April 18 2015**

**Result was an decrease of – 8°C**



**END**  
**of**  
**TEST**  
**REPORT**