



www.coolpower.ie

*Focus your energy
Intelligently.*

EMMA by Coolpower Products.

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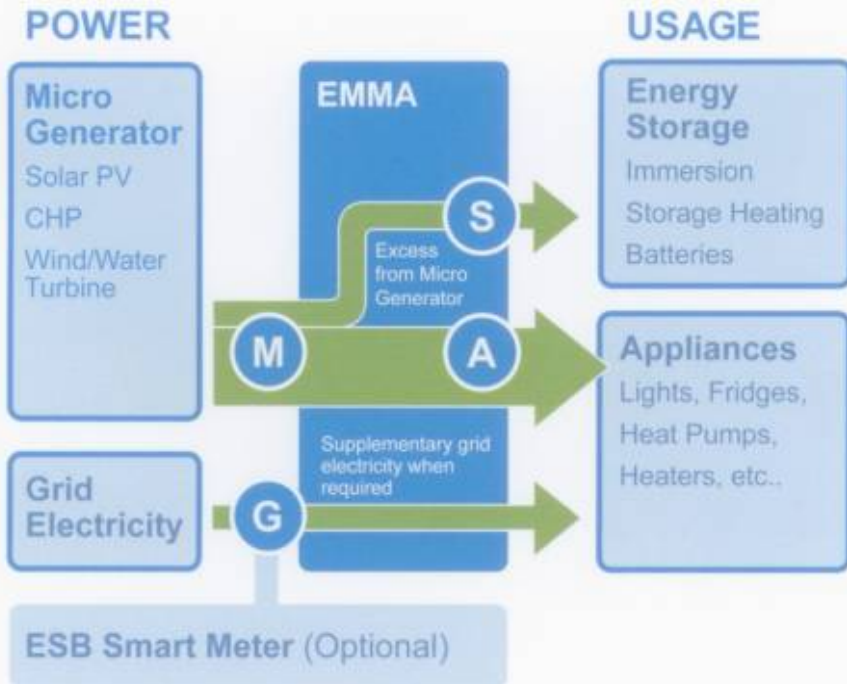
Cool Power Products Ltd., 89 Booterstown Avenue, Blackrock, Co. Dublin, Ireland. 01 2108344
Registered in Ireland no. 450079 Directors T. Cooper, E. Cooper

The EMMA controller developed exclusively by Cool Power can transfer excess electricity generated by your PV system or wind turbine into the electric immersion or storage heater.

This means that 100% of your renewable electricity is used in your home instead of being dumped onto the grid. When the ESB extends its REFIT scheme EMMA also will be able to export electricity to the grid when it is at its highest value and import electricity when at its lowest cost.



EMMA Functionality



Electricity from micro-generator **M** used first

If **M** is greater than **A**, the excess electricity is diverted to **S**

If **A** is greater than **M**, grid electricity **G** is used to supplement **M**

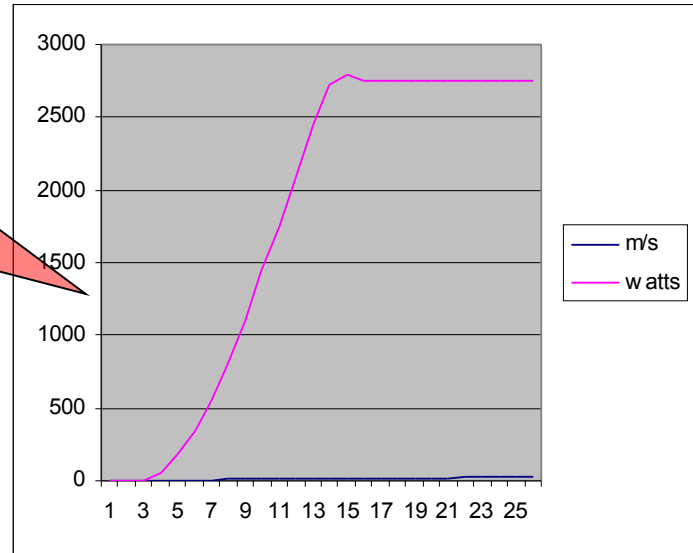
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smart sustainable energy

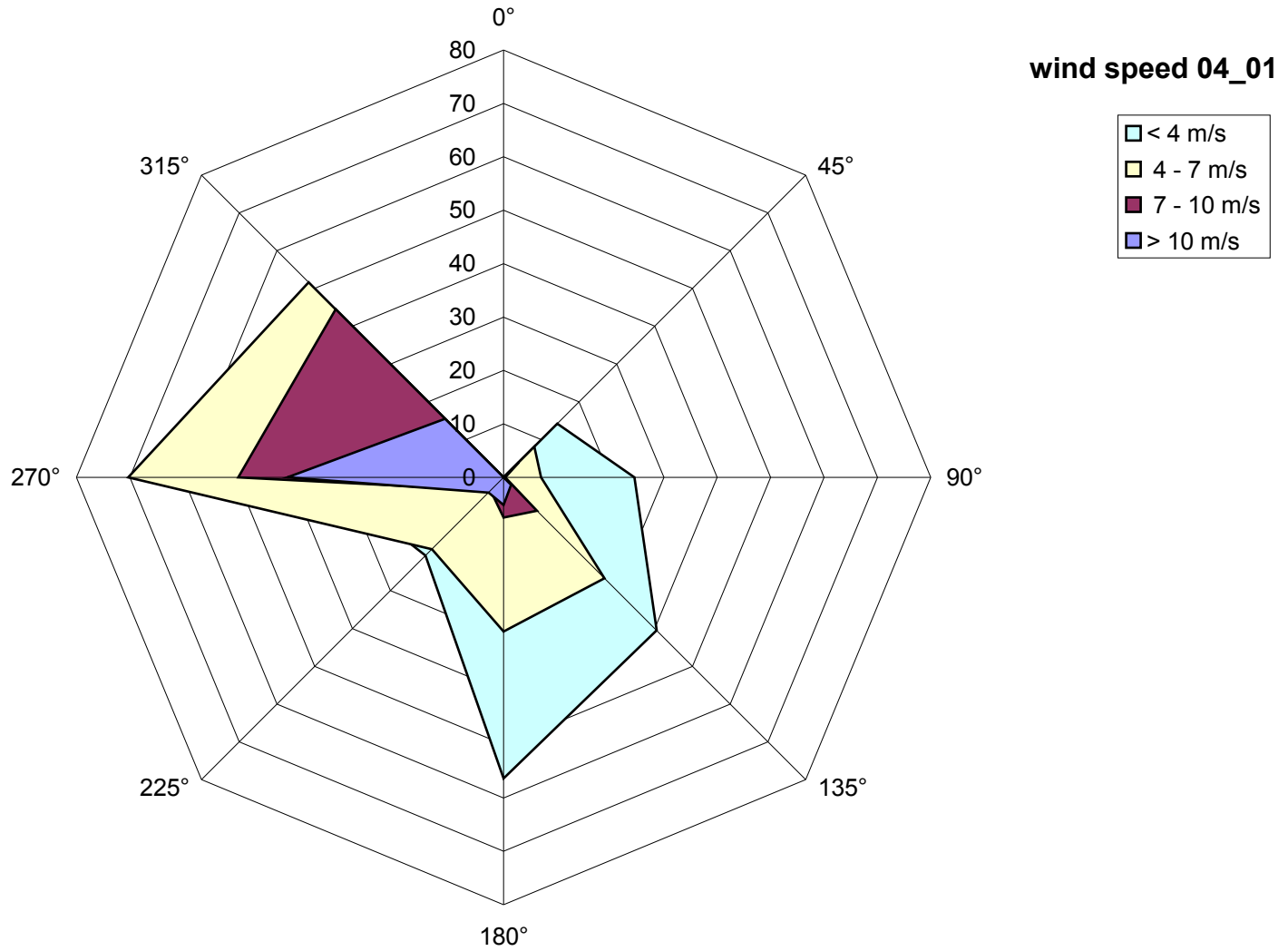
- In its simplest form, EMMA continuously monitors the amount of electricity being generated by the micro-generator (e.g. a solar PV array or wind turbine) and the amount of electricity being consumed in the household using reliable and accurate clamp-on sensors.
- This information is used to enable the system to adjust the amount of electricity being supplied to resistive heating loads (e.g. hot water immersion heater) using a highly-efficient solid-state phase-angle firing thyristor in a way that ensures that all the output from the micro-generator is used in the household.



From left to right Proven 2.5kW on 6.5m tower; Proven 6kW on 9m tower; 6ft tall man and Proven 15kW on 15m tower

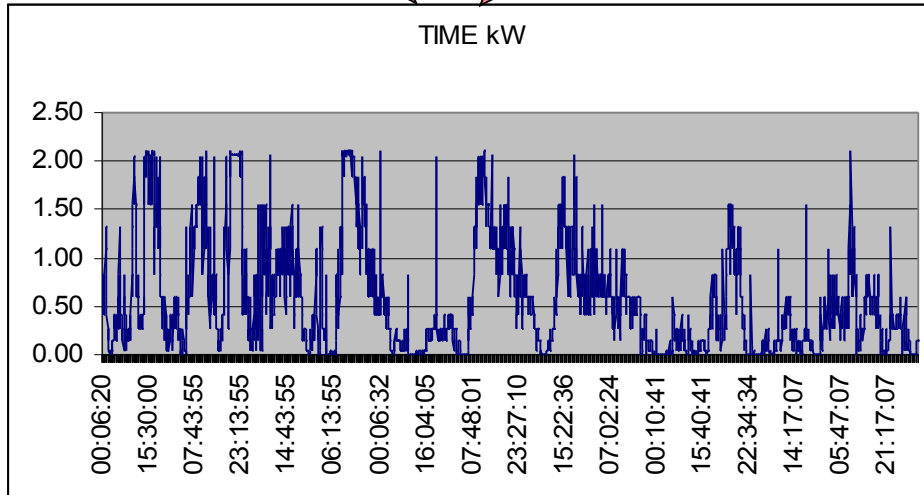
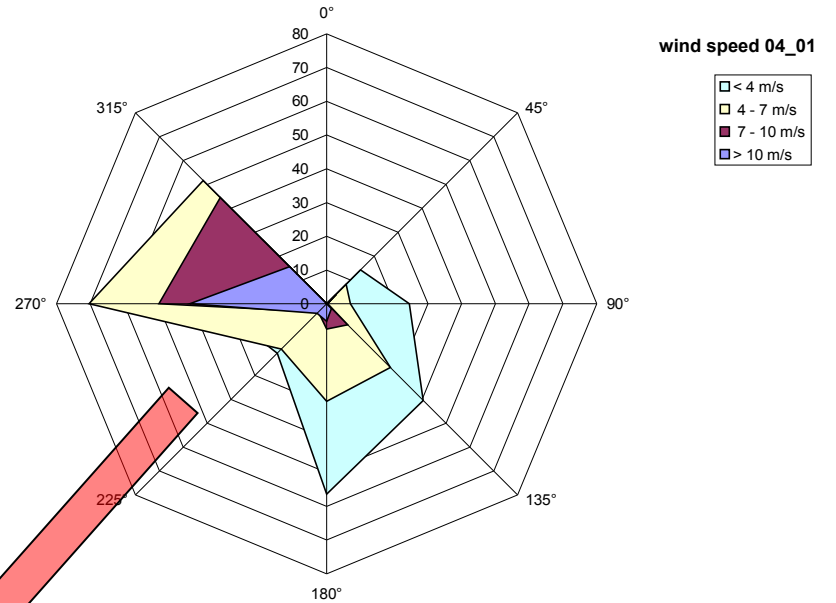
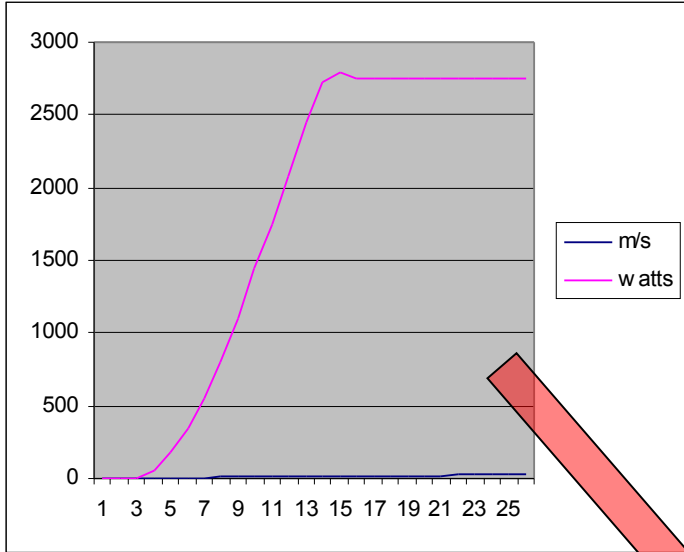


Dun Laoire Harbour Wind Data – March 2001



Dun Laoire Harbour Wind Data – March 2001

DATE	TIME	GUST	RAINFALL	SPEED	DIRECTION	AIRTEMP	HUMIDITY	PRESSURE	DEWPOINT	2MINDIRECTION	10MINDIRECTION	2MINSPEED	10MINSPEED
DD/MM/YY	HH:MM:SS	LogUni	mm	m/s	Degrees	-C	%RH	hPa	-C	degrees	degrees	m/s	m/s
01/04/2001	00:06:20	100	0	6.4	74	10	82.4	1012.6	7.2	212.4	215.6	6	6
01/04/2001	00:16:20	100	0	6.5	222	10.4	78	1012.6	6.8	219.2	223.9	7.2	6.6
01/04/2001	00:26:20	100	0	7.2	215	10.5	77	1012.6	6.6	206.6	211.3	8	7.1
01/04/2001	00:36:20	100	0	6.8	237	10.3	79	1012.8	6.8	218.1	214.3	7.1	7.3
01/04/2001	00:46:20	100	0	6.9	253	10.3	77.8	1013	6.6	233.5	229	6.9	7.9
01/04/2001	00:56:20	100	0	5.8	249	10.3	77.3	1012.9	6.5	246.3	236.8	7.2	6.3
01/04/2001	01:06:20	100	0	4.1	256	10.1	79.8	1013	6.8	255.4	249.3	5.1	5.4
01/04/2001	01:16:20	100	0	5.9	247	10	76.1	1013	6	248.4	252.5	5.7	5.9
01/04/2001	01:26:20	100	0	7.8	260	10.1	74	1013.3	5.7	251.1	247.5	6	5.7
01/04/2001	01:36:20	100	0	5.6	262	10	75.4	1013.4	5.9	260.4	254.1	6.9	7.4
01/04/2001	01:46:20	100	0	7.1	260	9.8	76.1	1013.4	5.8	262.3	263.1	7.4	7.4
01/04/2001	01:56:20	100	0	7.2	270	9.7	75.2	1013.6	5.5	256.8	258.9	6.9	6.2
01/04/2001	01:00:00	100	0	7.5	261	9.6	75.4	1013.7	5.5	262.6	259.5	6	6
01/04/2001	01:10:00	100	0	6.3	266	9.6	76.6	1013.5	5.7	262.9	262.5	7.4	7.4
01/04/2001	01:20:00	100	0	7.8	260	9.4	77.2	1013.6	5.6	267.1	264	8.1	7.6
01/04/2001	01:30:00	100	0	8.3	280	9.2	77.8	1013.8	5.5	270.3	267.5	8.5	8.7
01/04/2001	01:40:00	100	0	10.6	284	8.9	79.9	1013.9	5.6	277.6	275.6	9.8	10
01/04/2001	01:50:00	100	0	9.7	283	8.5	81.3	1013.9	5.5	288.5	282.9	9.4	9.8
01/04/2001	03:00:00	100	0	8.6	280	8.3	82.3	1013.7	5.5	282	286.4	9	9.5
01/04/2001	03:10:00	100	0	7.5	277	8.4	81.5	1013.6	5.4	277.9	279	8.1	8.2
01/04/2001	03:20:00	100	0	7.3	268	8.4	82.1	1013.8	5.5	275.2	276.7	8.4	9
01/04/2001	03:30:00	100	0	7.6	288	8.4	81.2	1013.9	5.3	279.4	276.5	8.4	8.9
01/04/2001	03:40:00	100	0	7.4	275	8.3	82.2	1014.1	5.4	277.8	280.2	6.8	8.1
01/04/2001	03:50:00	100	0	7.5	282	8.4	80.7	1014.1	5.3	274.9	273.9	8.1	8
01/04/2001	04:00:00	100	0	6.8	272	8.4	80.5	1014.4	5.2	268.3	271.5	6.6	7
01/04/2001	04:10:00	100	0	4.2	273	8.3	81.9	1014.4	5.4	265.5	262.8	4.6	5.2
01/04/2001	04:20:00	100	0	3.3	240	8.3	80.5	1014.5	5.2	240.4	253.6	3.7	4.6
01/04/2001	04:30:00	100	0	3.5	240	8.3	80.5	1014.7	5.1	257.8	249.8	4.8	4.1
01/04/2001	04:40:00	100	0	3.1	271	8.3	81.6	1014.6	5.3	253.9	253.8	3.4	3.4
01/04/2001	04:50:00	100	0	3.1	271	8.3	81.8	1014.7	5.4	252.6	257.9	3.3	4.1
01/04/2001	05:00:00	100	0	2.8	241	8.2	81.3	1014.8	5.2	241.1	253.6	2.8	3.6
01/04/2001	05:10:00	100	0	3	240	8.2	80.5	1014.9	5.1	233.9	232.7	2.7	2.8
01/04/2001	05:20:00	100	0	2.6	231	8.3	80.6	1015.2	5.1	239	240.3	2.3	2.8
01/04/2001	05:30:00	100	0	3.6	237	8.3	80.1	1015.4	5.1	227.2	232.4	2.9	2.6
01/04/2001	05:40:00	100	0	1.9	66	8.4	80	1015.3	5.1	241	232.2	2.2	2.6
01/04/2001	05:50:00	100	0	0.7	181	8.4	76.6	1015.1	4.6	234.8	242.4	1.4	2.1

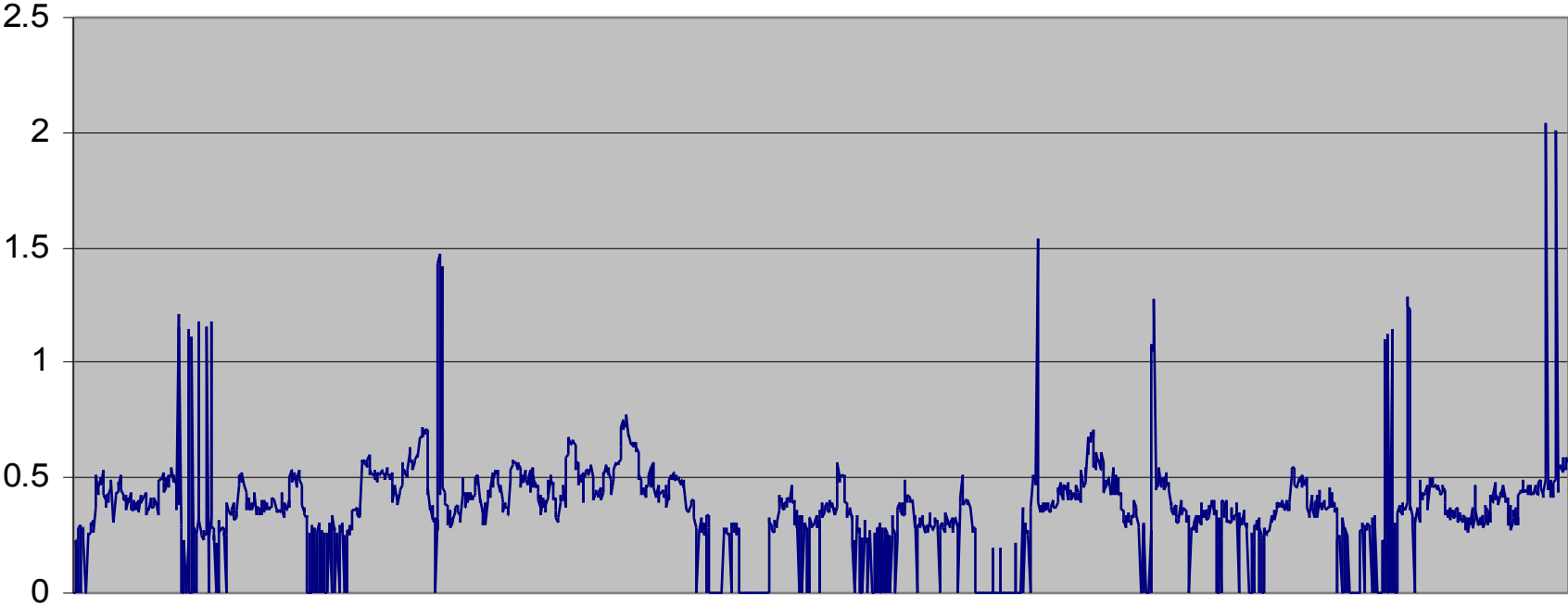


2.5 kW Turbine Output – March 2001



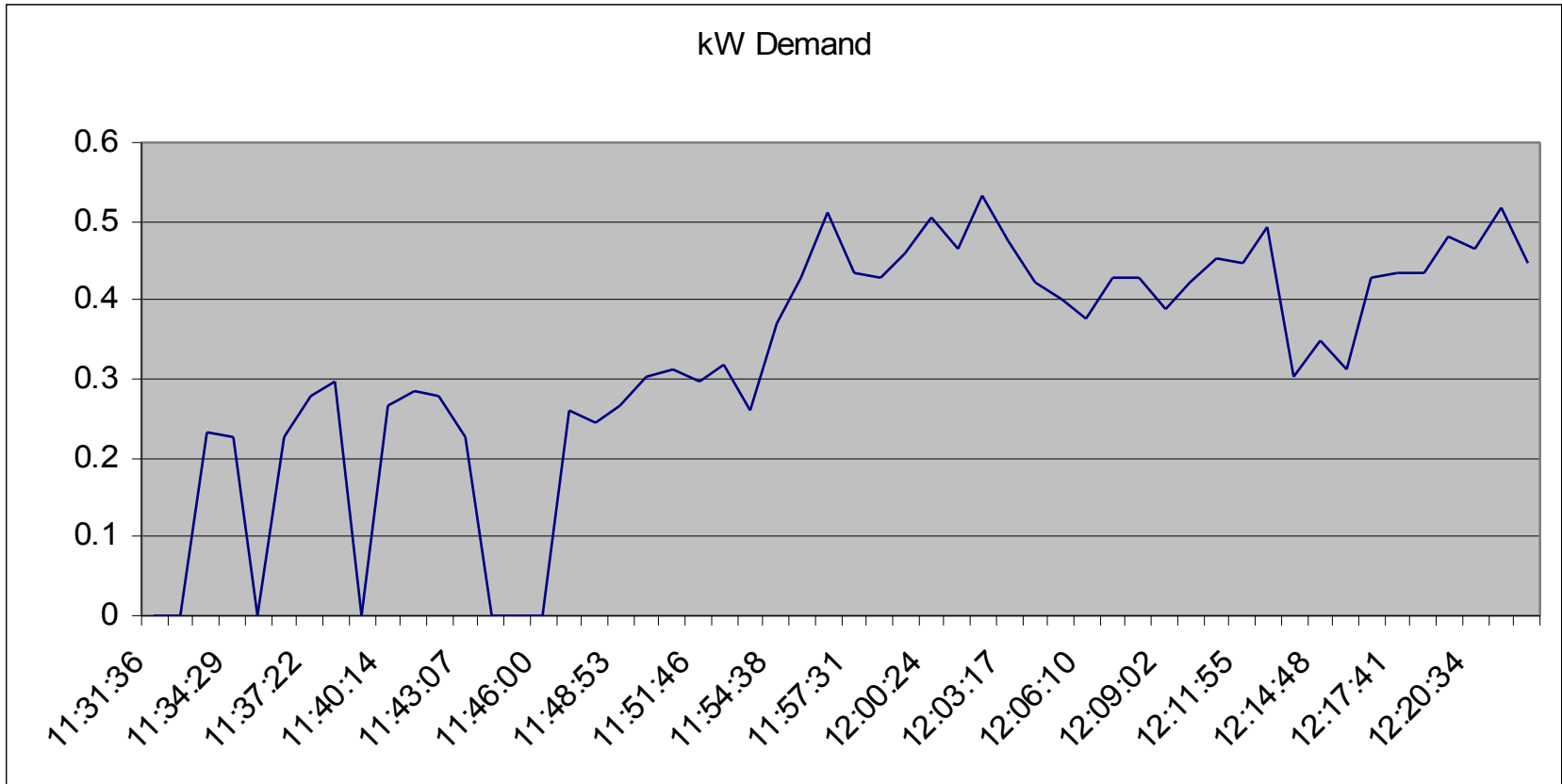
Date	Time	kW Demand
11/04/2008	11:31:36	0
11/04/2008	11:32:34	0
11/04/2008	11:33:31	0.23328
11/04/2008	11:34:29	0.2268
11/04/2008	11:35:26	0
11/04/2008	11:36:24	0.2268
11/04/2008	11:37:22	0.27864
11/04/2008	11:38:19	0.29808
11/04/2008	11:39:17	0
11/04/2008	11:40:14	0.26568
11/04/2008	11:41:12	0.28512
11/04/2008	11:42:10	0.27864
11/04/2008	11:43:07	0.2268
11/04/2008	11:44:05	0
11/04/2008	11:45:02	0
11/04/2008	11:46:00	0
11/04/2008	11:46:58	0.2592
11/04/2008	11:47:55	0.24624
11/04/2008	11:48:53	0.26568
11/04/2008	11:49:50	0.30456
11/04/2008	11:50:48	0.31104
11/04/2008	11:51:46	0.29808
11/04/2008	11:52:43	0.31752

kW Demand - 5th March to 11th March 2008
1 minute intervals



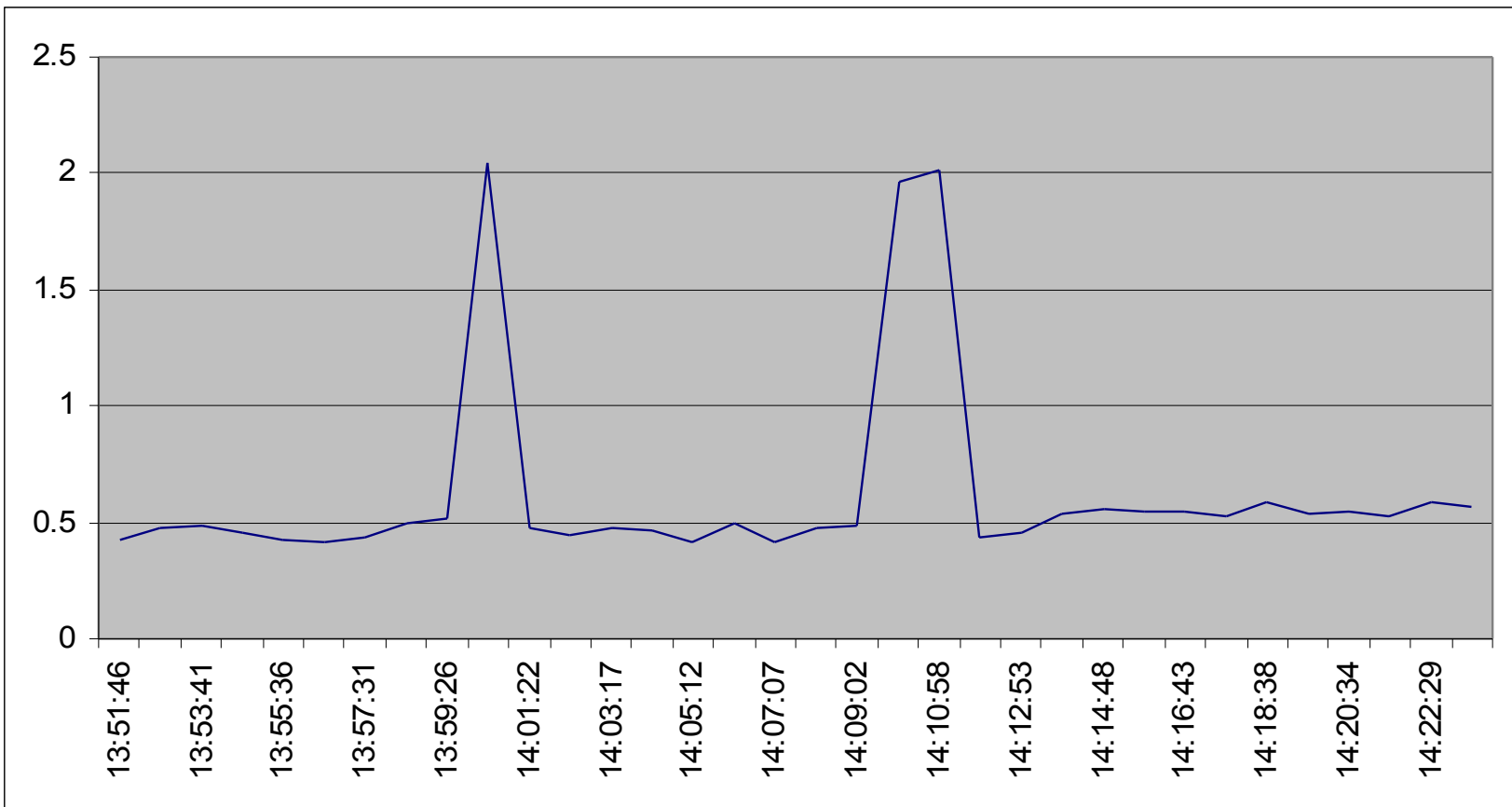
Two hour snap-shot

Base load of 300-500W

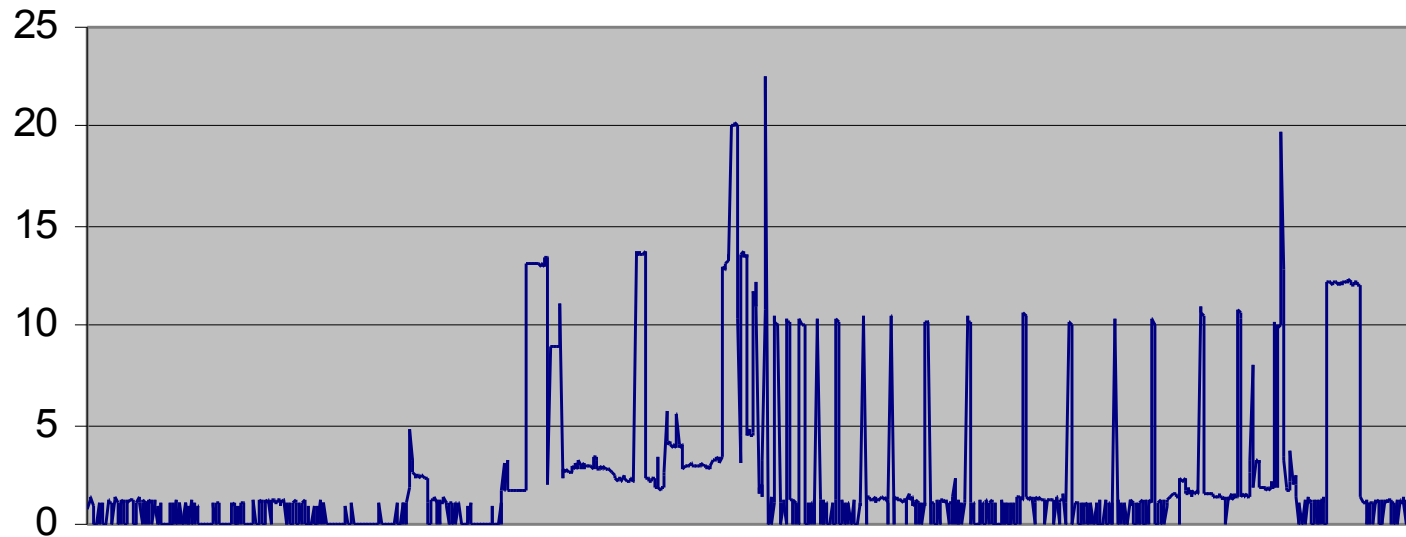


Another two hour snap-shot

Base load of 500W with 2,000W pulses

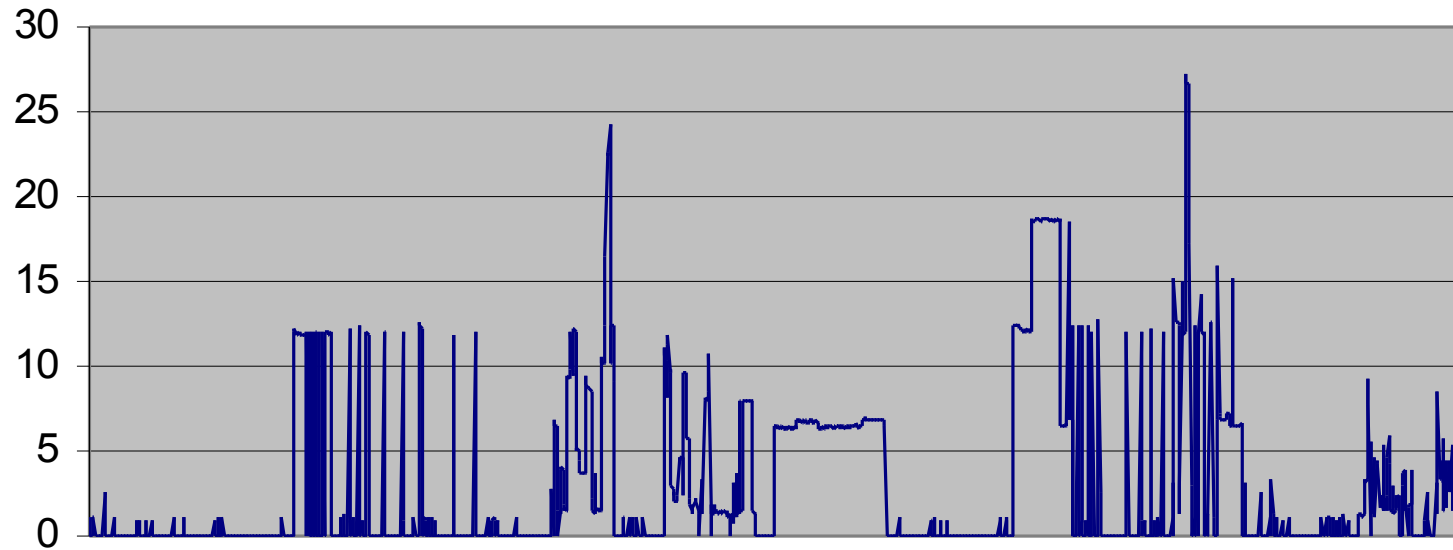


All-electric penthouse apartment



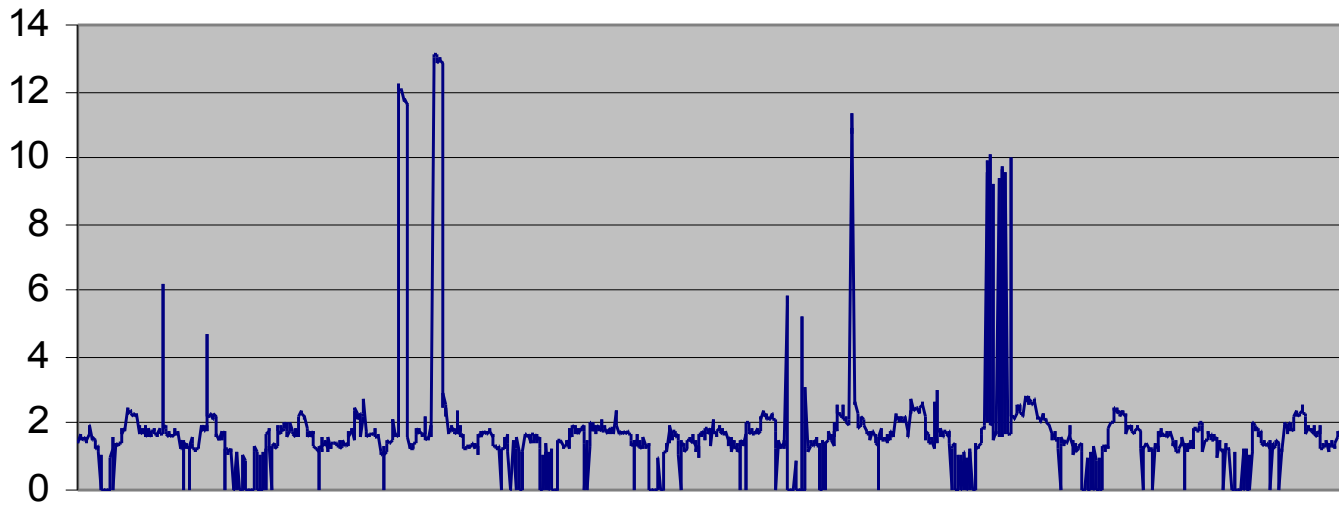
Load in amps

All-Electric apartment



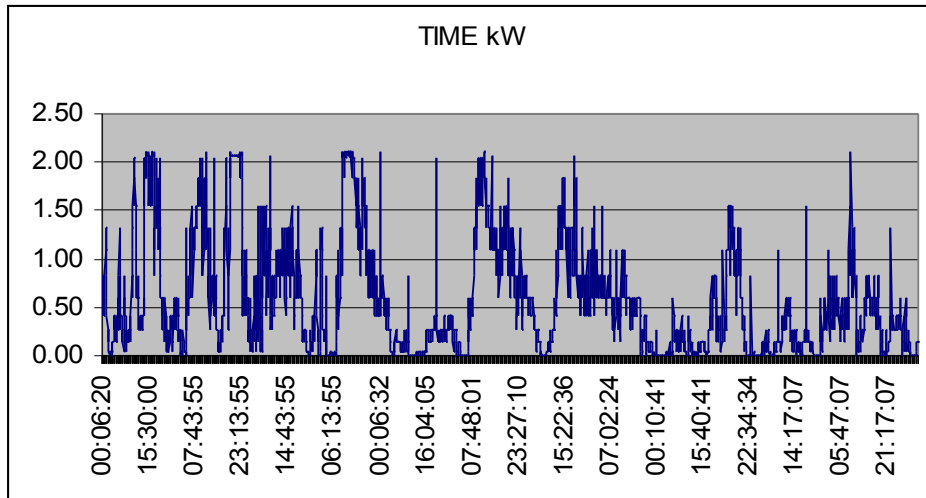
Load in amps

230m² house

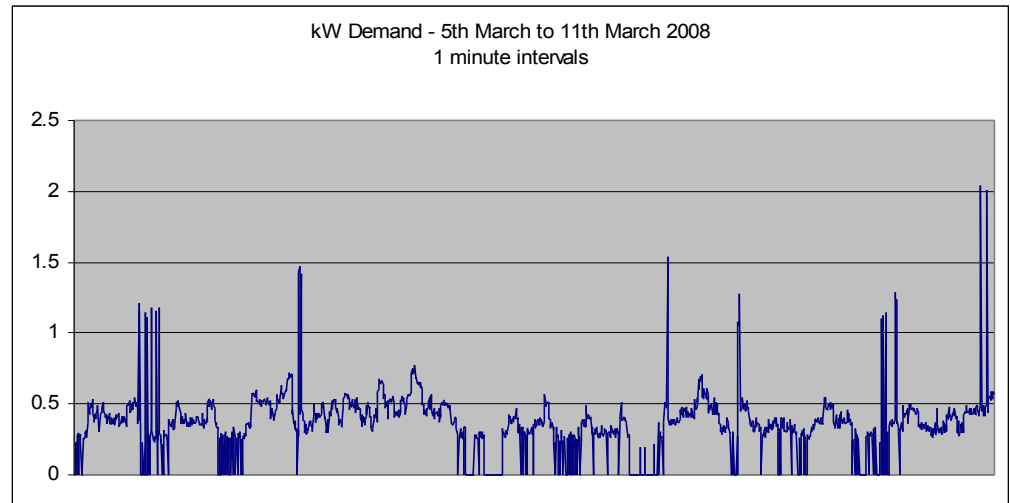


Load in amps

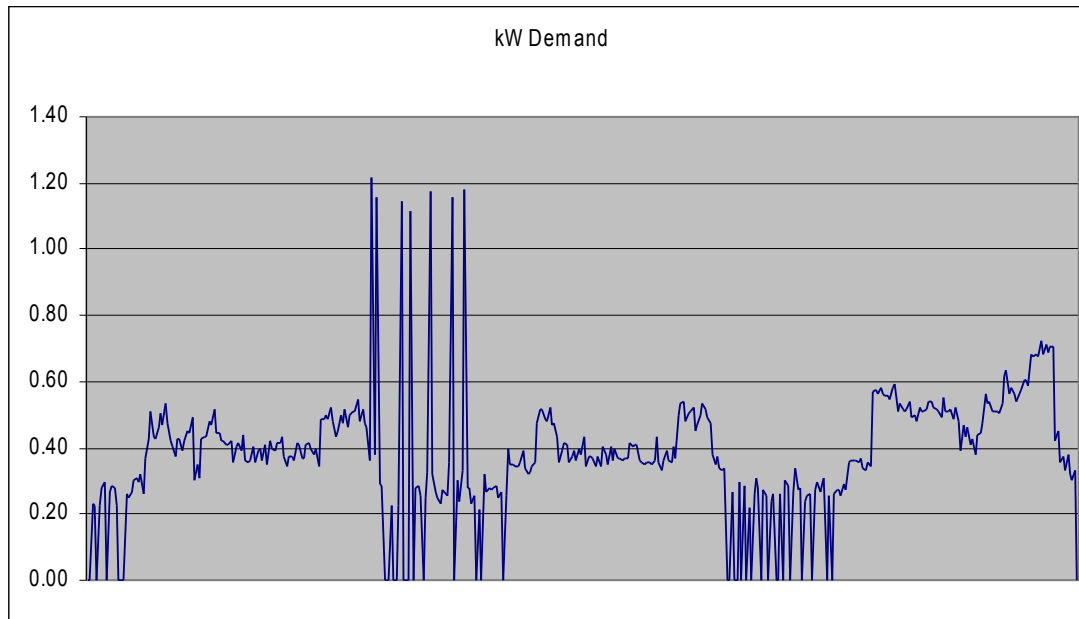
Turbine Output



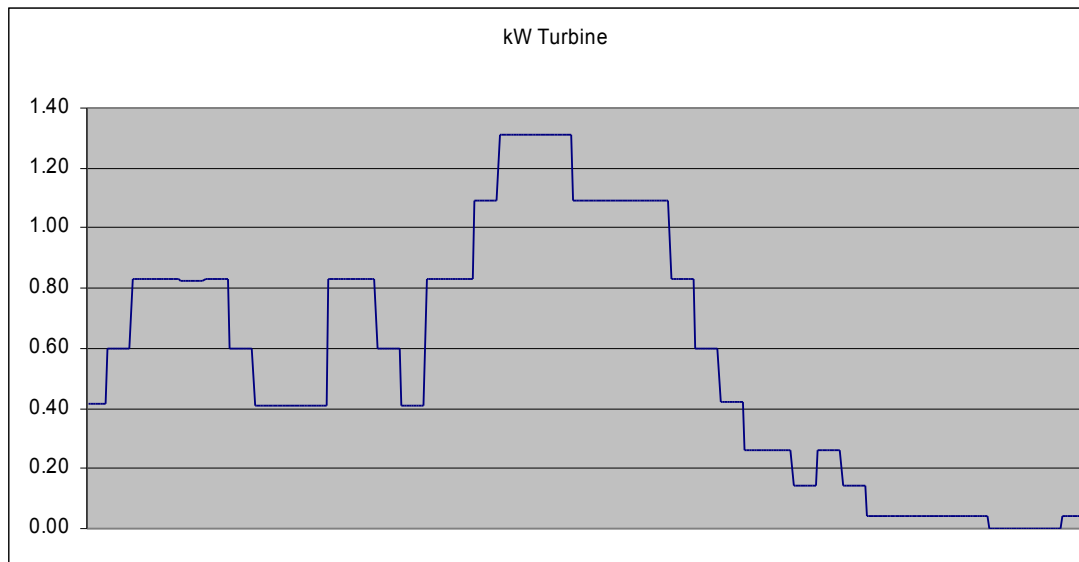
Household Demand



1 minute data

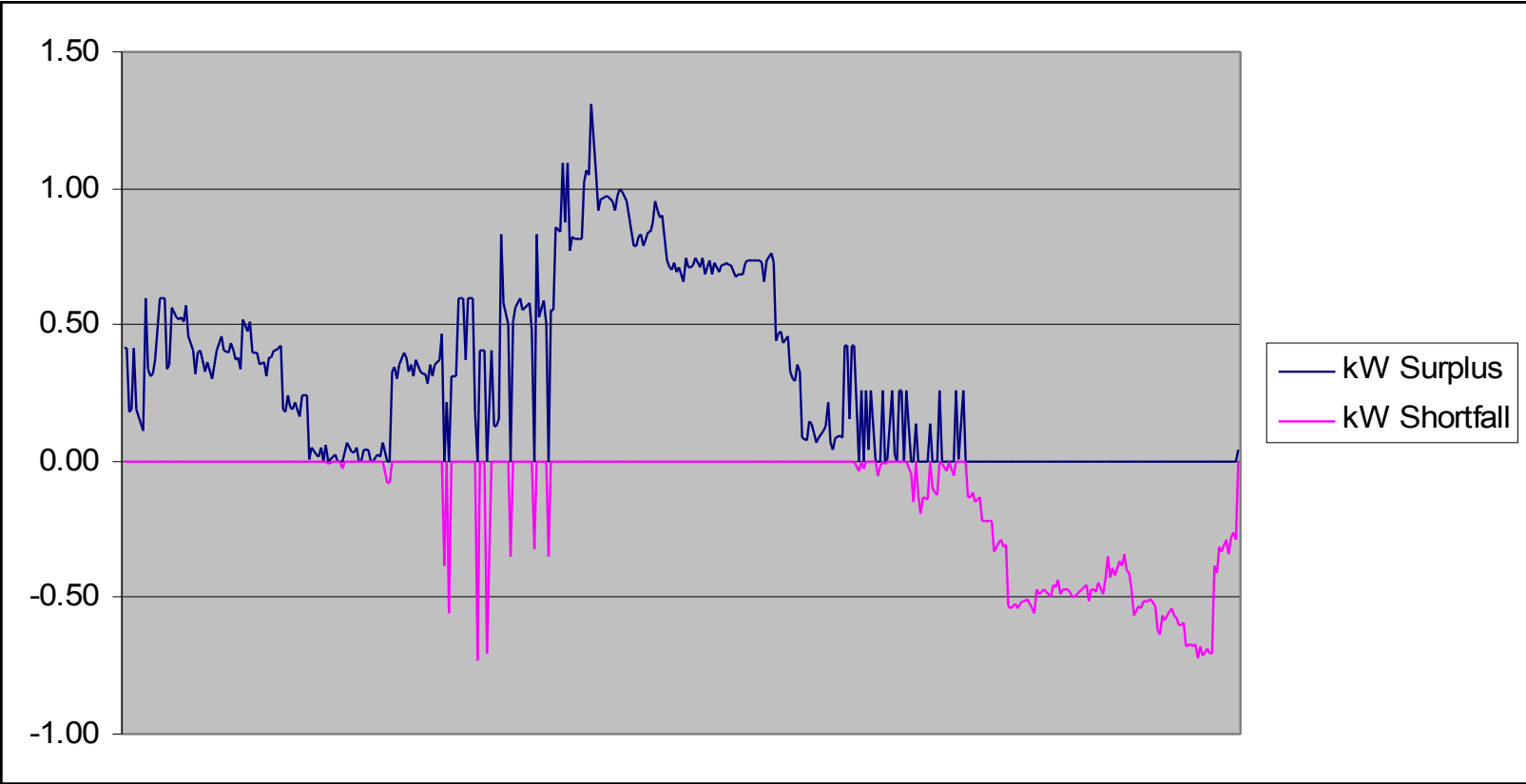


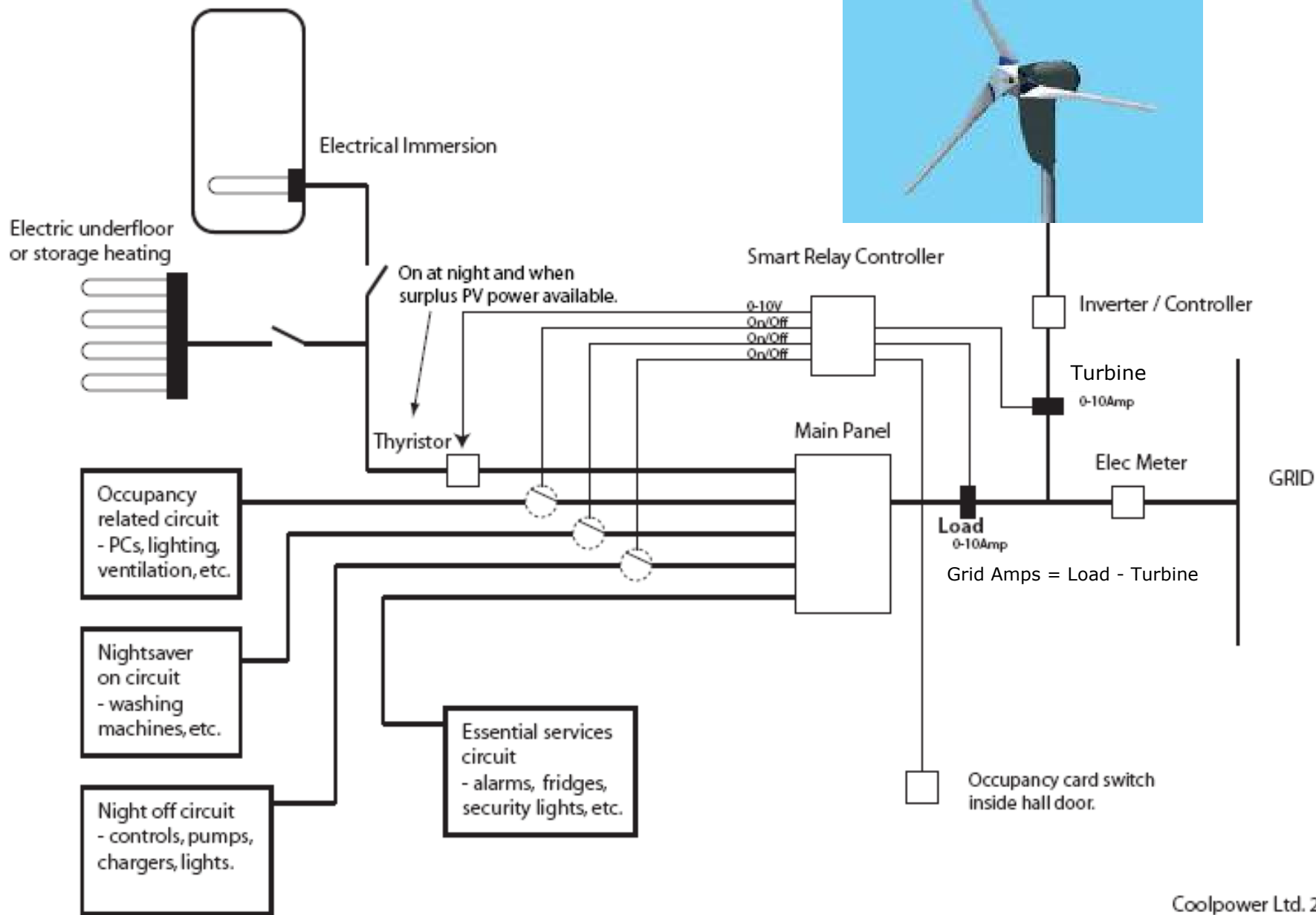
10 minute data

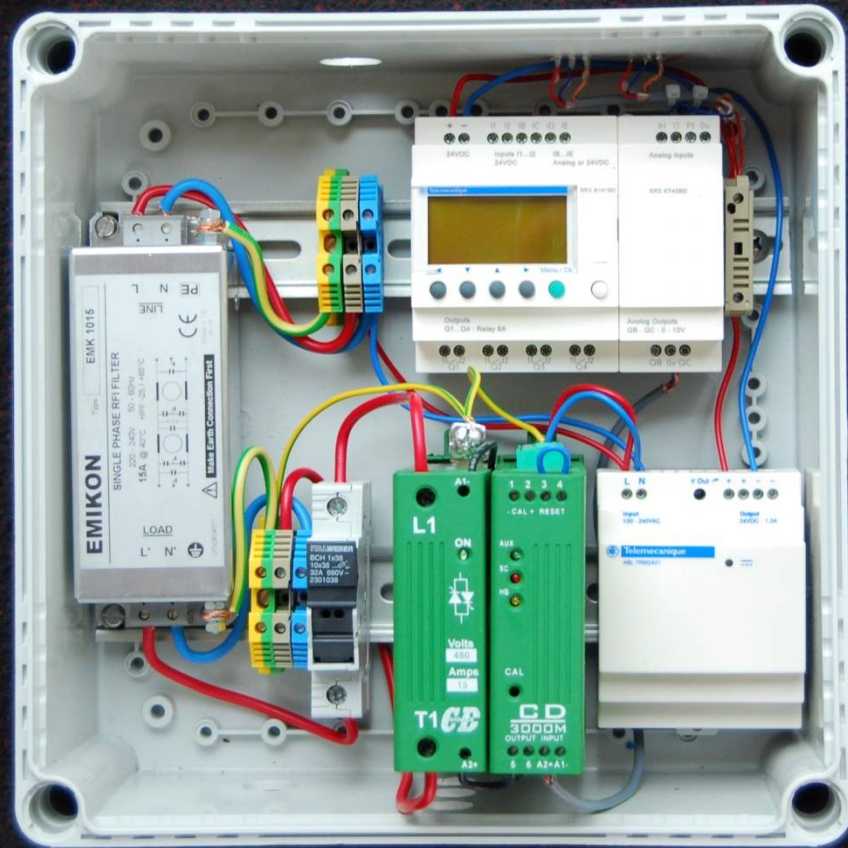


Typical snap-shot

54.42% of Turbine Output lost to grid

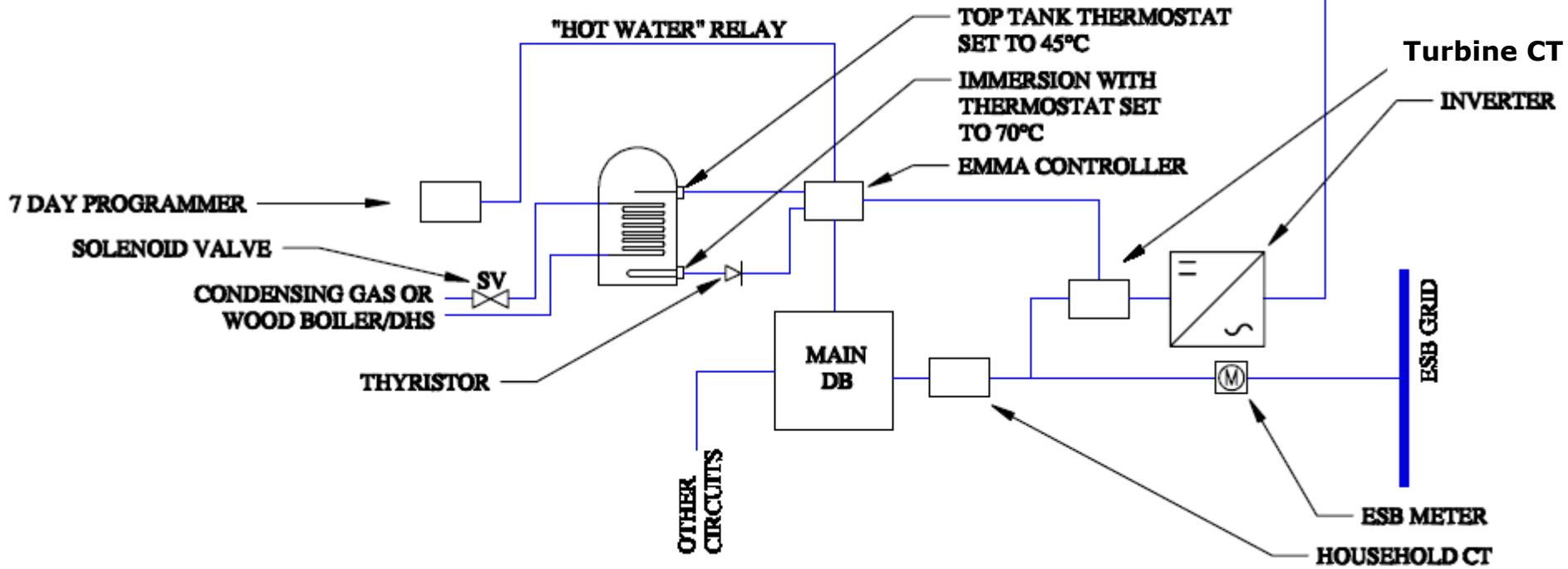


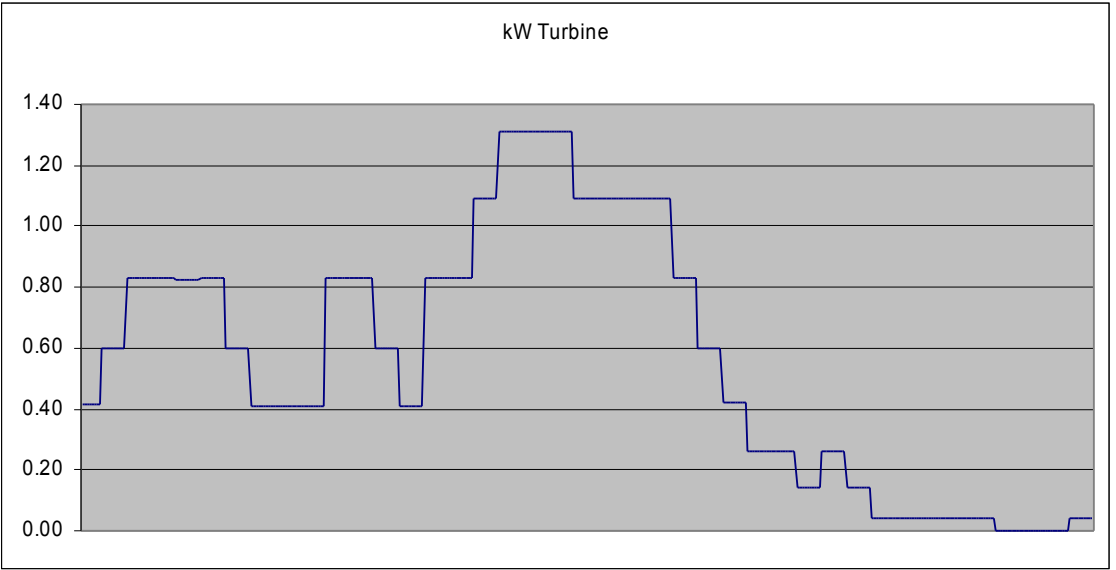
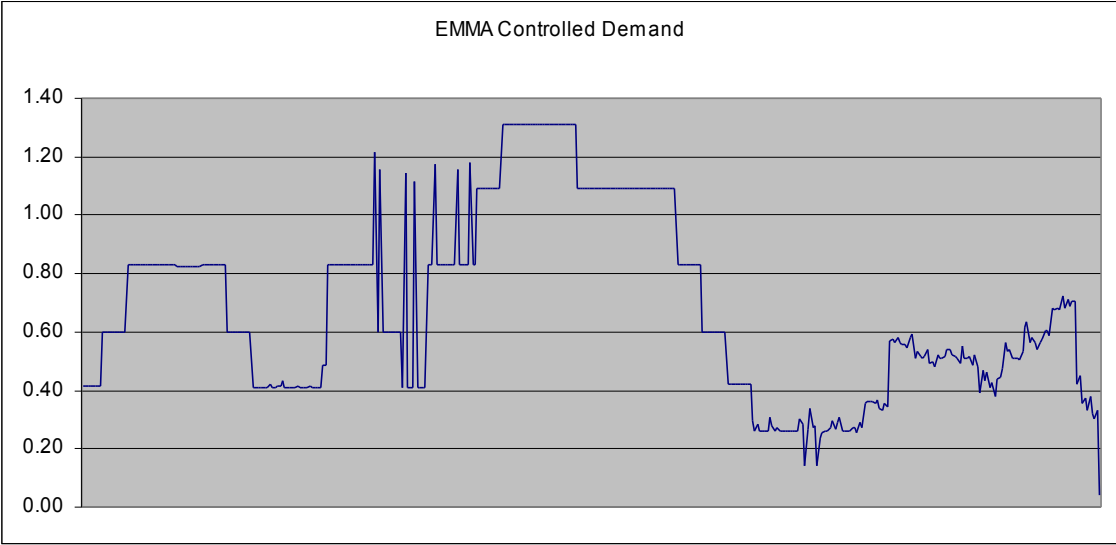


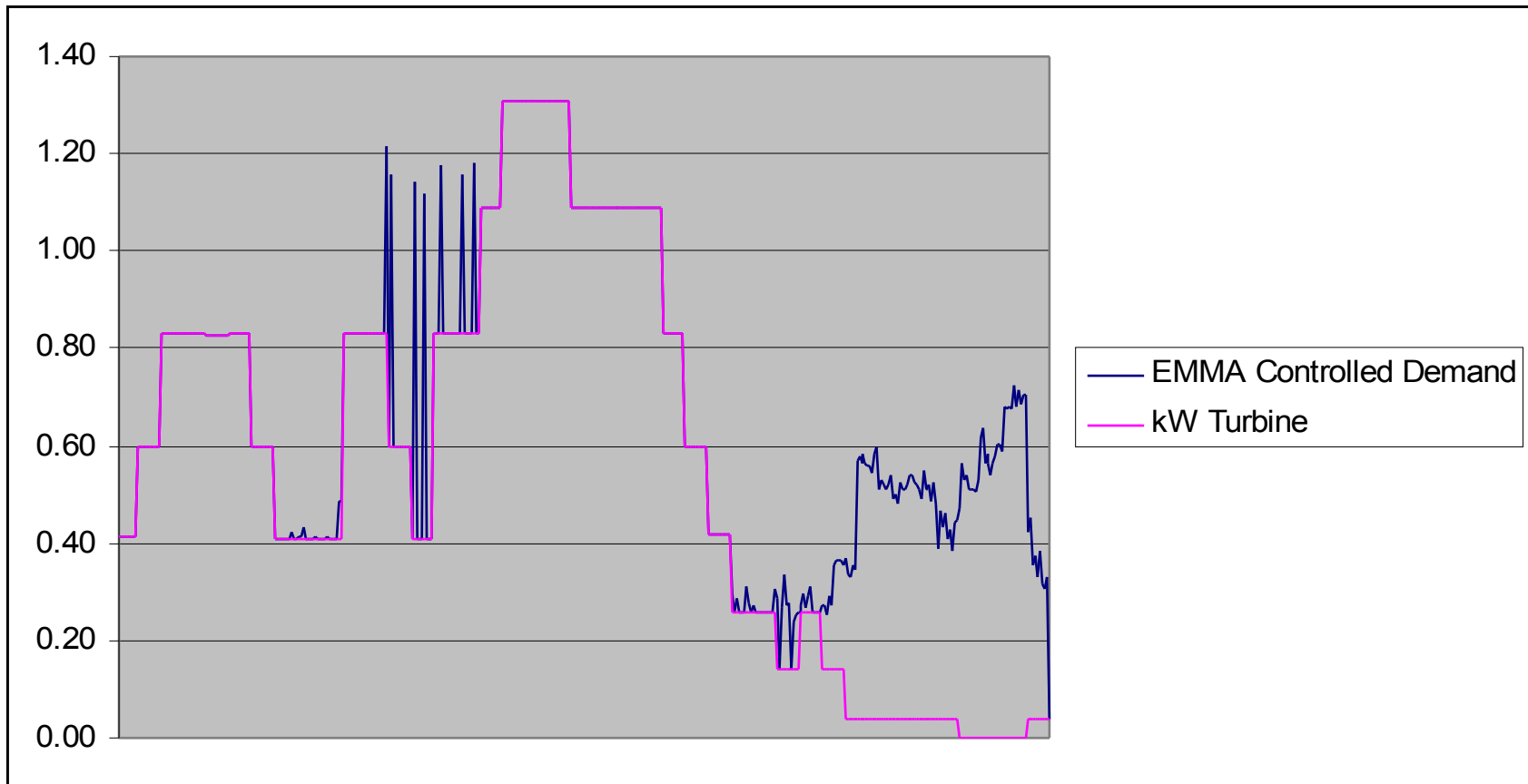




Turbine →









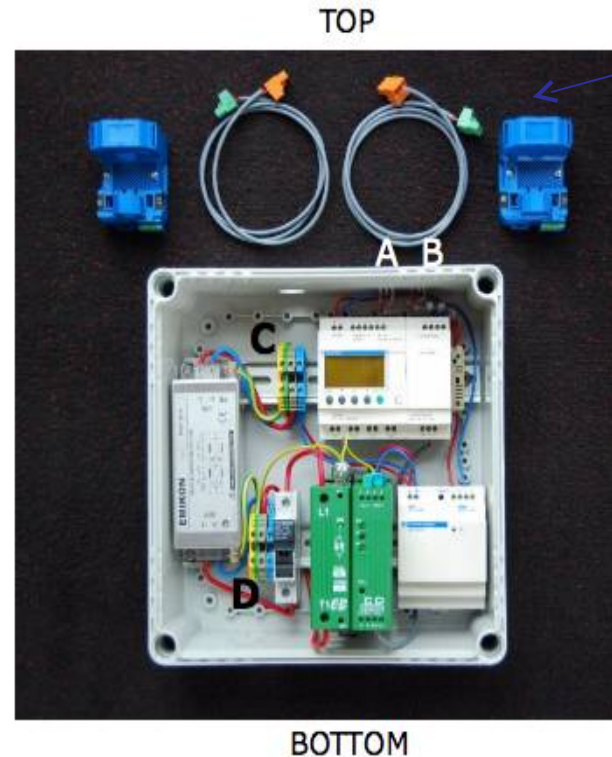
First EMMA controlled wind turbine

• **Smarter load management control**

• EMMA is an innovative smart load management controller from Coolpower Products.

• EMMA is built on over a decade of experience of developing and field testing advanced methods for monitoring and controlling electricity consumption in Irish homes and businesses.

• EMMA is designed to prevent inefficient and wasteful double handling of electricity generated by household micro-generators.



Controller, Leads and CTs

A = Micro Generator circuit

B = Household load

C = 240V AC input terminals

D = AC Power output terminals