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‘Should I invest in Solar PV on my Home’

Is it worth it?

Philip Angus – NEP

John Beardmore – T4 Sustainability

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Agenda

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- Costs - what factors determine cost?
- Generation - size, orientation, shading
- Benefits - load profile, how to maximise, CO_2 savings
- Cost / Benefit - investment and avoided grid electricity
- Storage

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Costs

- Size of system
  - Panels typically measure 2m x 1m
  - Typically, 360W - 415W per panel,
  - 6 x 400W panels = 2.4kWp
  - 10 x 400W panels = 4kWp
- Cost of PV, inverter, meters, labour, storage

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Costs

- Type of roof covering
- Access – bungalow, 1, 2 or 3 storey
- Above roof or integrated






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Some Typical Costs

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PV 3.2kW : £5,000 (tiled roof) = £1,500 per kW

PV 3.8kW : £7,750 (slate roof) = £2,000 per kW

PV 3.8kW and 2.4kWh battery (tiled roof) : £10,130

PV 3.8kW and 2.4kWh battery (slate roof): £10,790

PV 9.02kW only (steel trapezoidal roof, single storey): £10,590

PV 14.76 kW only (steel trapezoidal roof, single storey): £14,740

Stand alone AC coupled Tesla Powerwall 2: c. £13,000 (other batteries cheaper)

All system on rails on roof i.e. not integrated.

PV is VAT free, storage is VAT free if purchased together.

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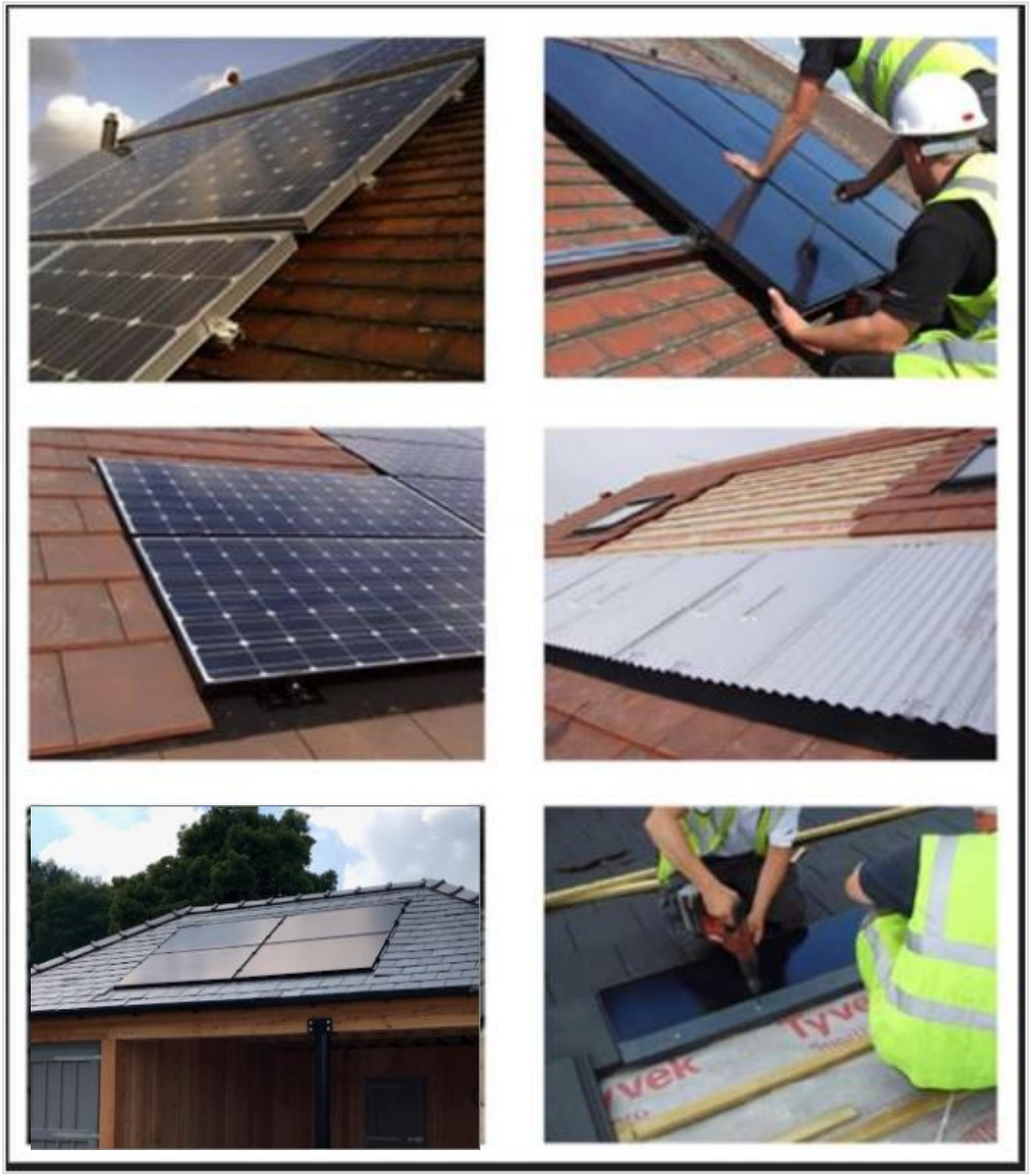
Installation Types

- On Roof Mount
- In Roof Mount
- Build integrated solar PV
- Flat roof mounted
- Ground mounted solar



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Installation Types – In Roof

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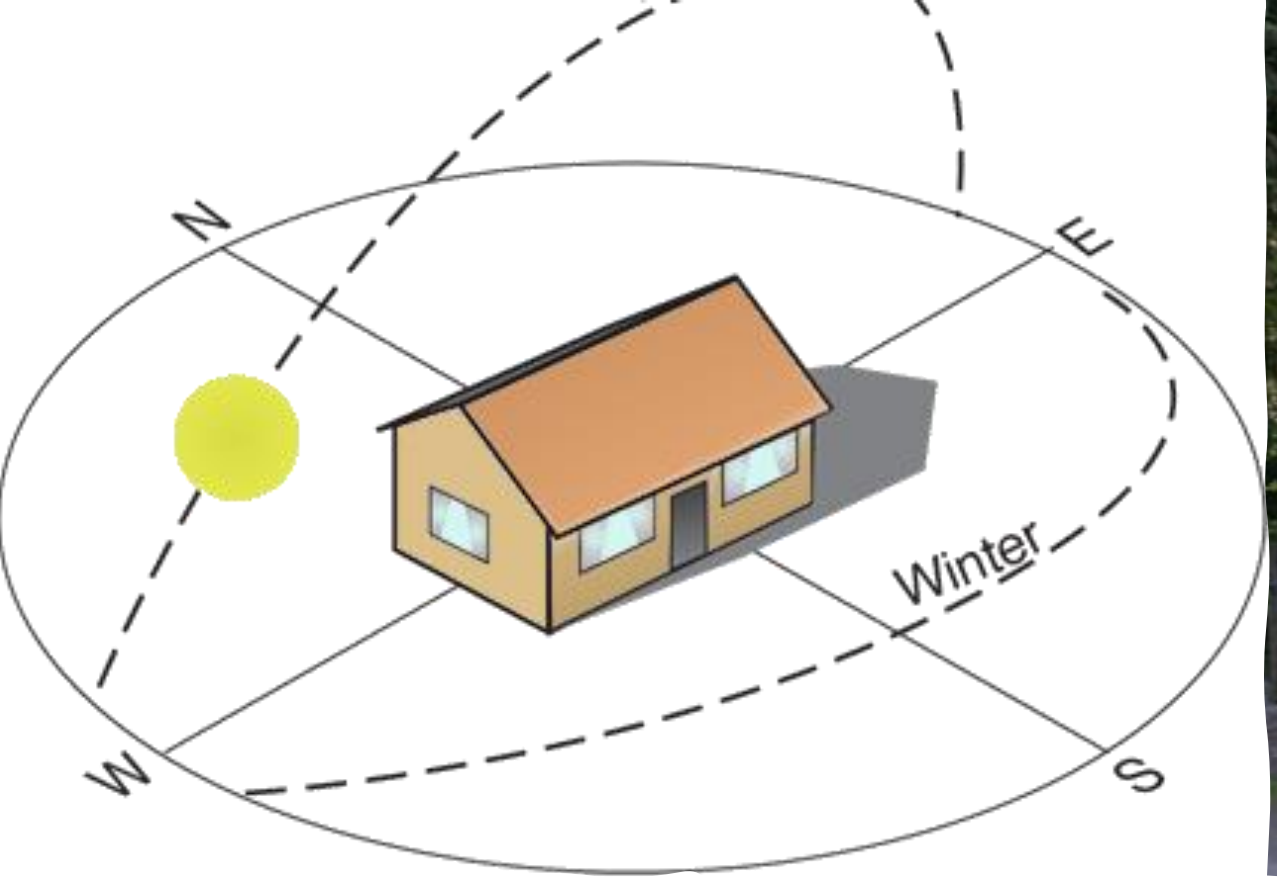

Orientation (and pitch)

Shading

Generation – size, orientation, shading

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Generation

HURRAY – JOB DONE

Standard Assessment Procedure (SAP) Calculation

Expected Output kWh/yr = Irradiance x Shading Factor x kWp x 0.8

Tilt of Collector	S	SSE	SSW	SE	SW	ESE	WSW	E	W	NE	NW	N
Horizontal	961	961	961	961	961	961	961	961	961	961	961	961
5	980	976	976	972	972	963	963	953	953	932	932	923
10	998	991	991	983	983	964	964	945	945	902	902	884
15	1017	1006	1006	994	994	966	966	937	937	873	873	846
20	1036	1020	1020	1005	1005	967	967	929	929	844	844	807
25	1054	1035	1035	1016	1016	969	969	921	921	814	814	769
30	1073	1050	1050	1027	1027	970	970	913	913	785	785	730
35	1067	1042	1042	1017	1017	955	955	893	893	752	752	700
40	1060	1034	1034	1007	1007	940	940	874	874	719	719	670
45	1054	1026	1026	997	997	926	926	854	854	686	686	640
50	1032	1003	1003	974	974	901	901	828	828	656	656	593
55	1011	981	981	950	950	876	876	802	802	627	627	547
60	989	958	958	927	927	852	852	776	776	597	597	500
70	908	881	881	853	853	782	782	711	711	545	545	457
80	827	803	803	779	779	713	713	647	647	492	492	414
Vertical	746	726	726	705	705	644	644	582	582	440	440	371

Typical generation in UK:

950kWh per 1kW of solar array.

3.2kW system x 950kWh

= 3,040 kWh / annum

Typical household usage:

3000 kWh / annum

Hurray – job done! You've saved 3,040 kWh at 32.8p/kWh

That's a saving of £997.00

Therefore Payback in 5 -6 years

And then bank £20,000 over the next 2 decades

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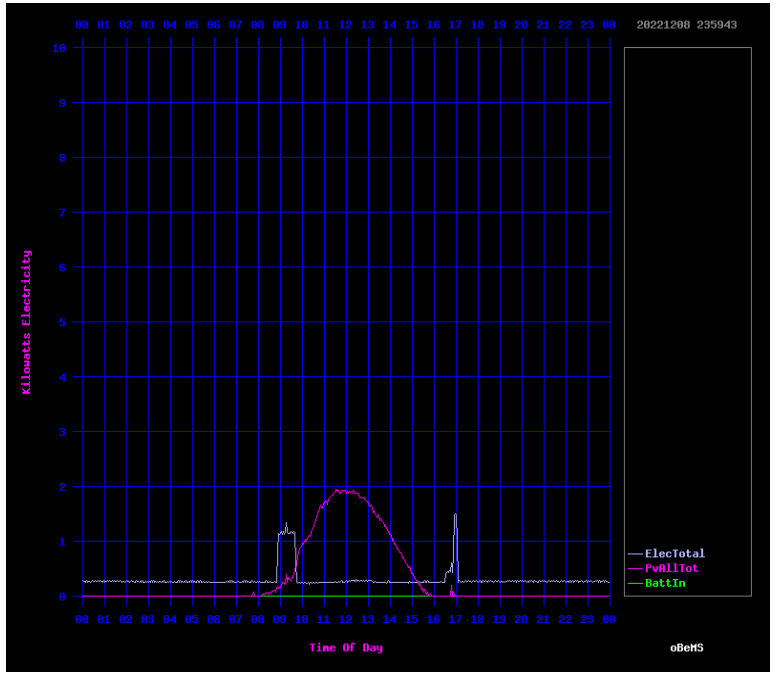
NOT SO FAST!

Solar PV Electricity Output Winter vs Summer

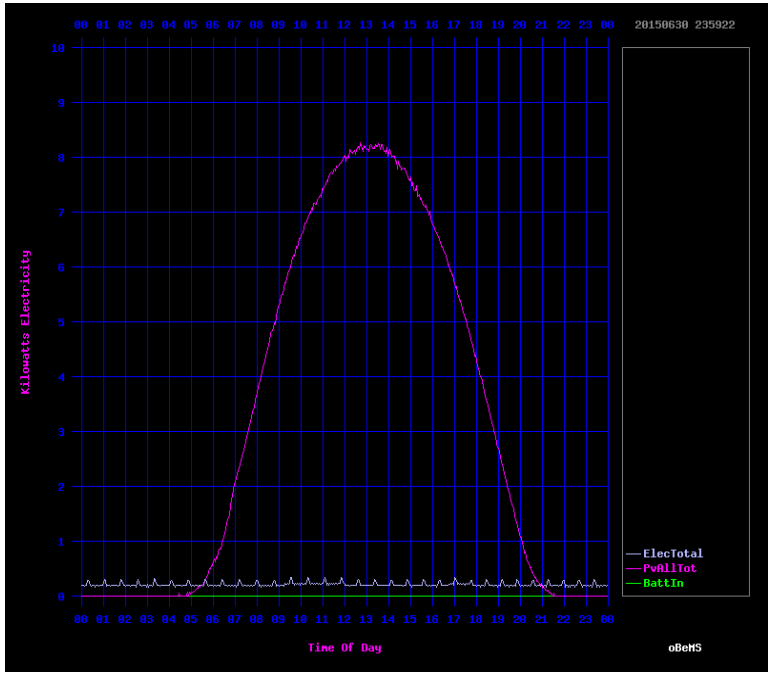
Nice day in Winter Output (kW)



In Winter less output due to:

- shorter days
- sun is lower in the sky
- lower sun angles
- More cloud cover

Nice day in Summer Output (kW)



In Summer higher output due to:

- longer days and more daylight hours
- higher more direct sun angles
- Panels receive more sunlight

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Useful Generation Depends on

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- How much energy you use, AND WHEN YOU USE IT
- Typically you only use 36% of the energy you generate
- That gives you £358 direct saving through avoided grid electricity
- There is also the Smart Export Guarantee (SEG) payment
- Plus SEG at 6p = 64% of 3040kWh x 0.06p = £116

Total saving is £358 + £116 = £474

That doubles the payback to just over 10 years. Can you do better?

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Assessing the Opportunity and Assessment Tools

- There are no right answers
- There is no right time to buy
- The MCS method
- Simulations
- One good use for a smart meter: the Loop app
- Heat pumps / air conditioning
- Storage, AC coupled and DC coupled
- PV aware electric car chargers

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Things to understand

- Summer vs Winter
- Good days and bad days
- Reliability of PV, inverters and batteries
- Scheduling electricity use
- Ways to use storage
- Pros and cons of DC coupled and AC coupled storage
- Export income
- Energy trading schemes, pros and cons, Tesla Energy Plan
- Other ways to store energy, e.g. heat pumps and [PCM] heat stores

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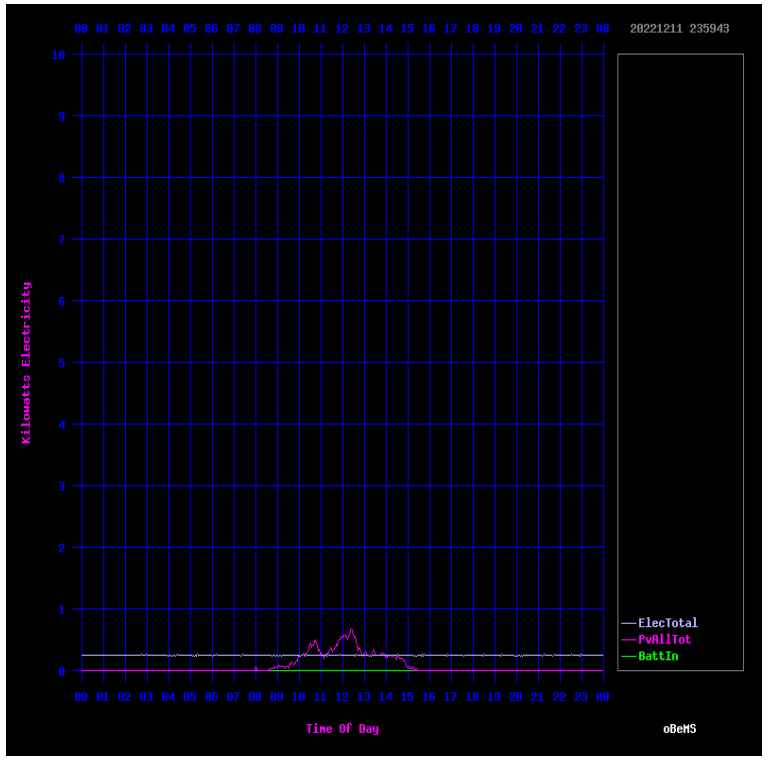
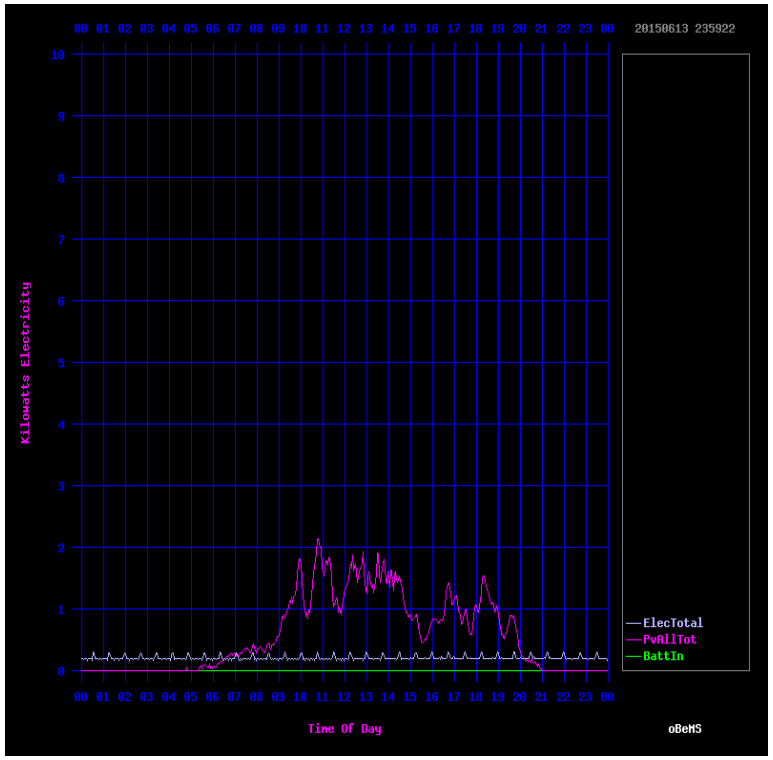
Comparison of Outputs on a Bad Winter and Summer's Day

Bad day in Winter Output (kW)



Bad day in Summer Output (kW)



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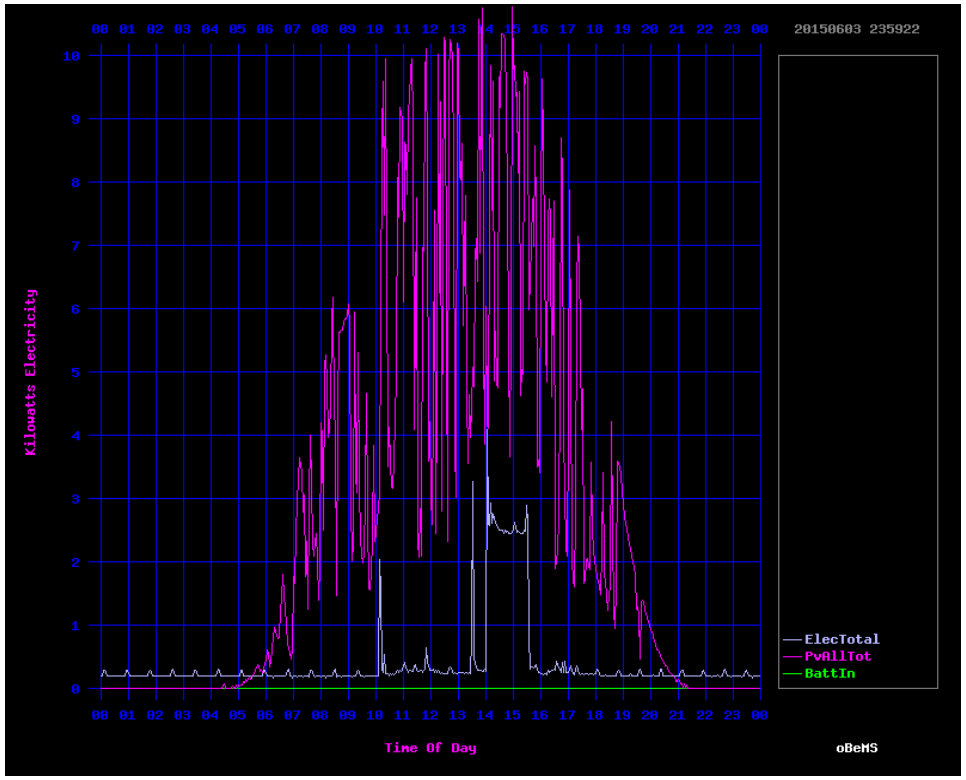
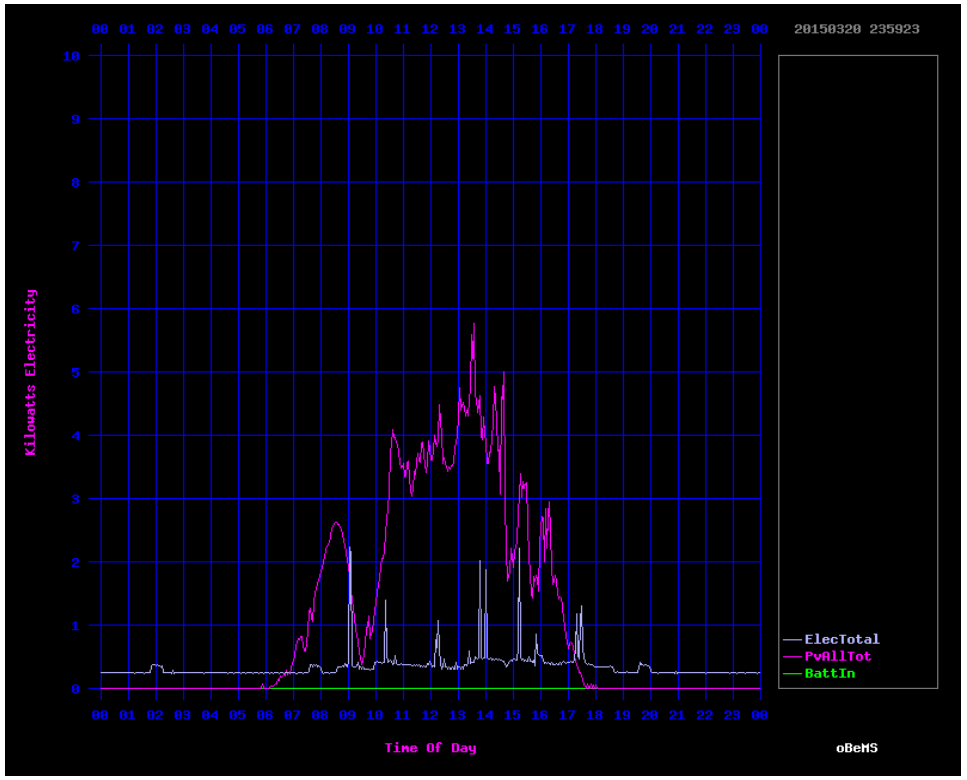
1. Typical Summer Day

Brightly lit but intermittent cloud



2. Spring with Solar Eclipse

09:28 20th March 2015



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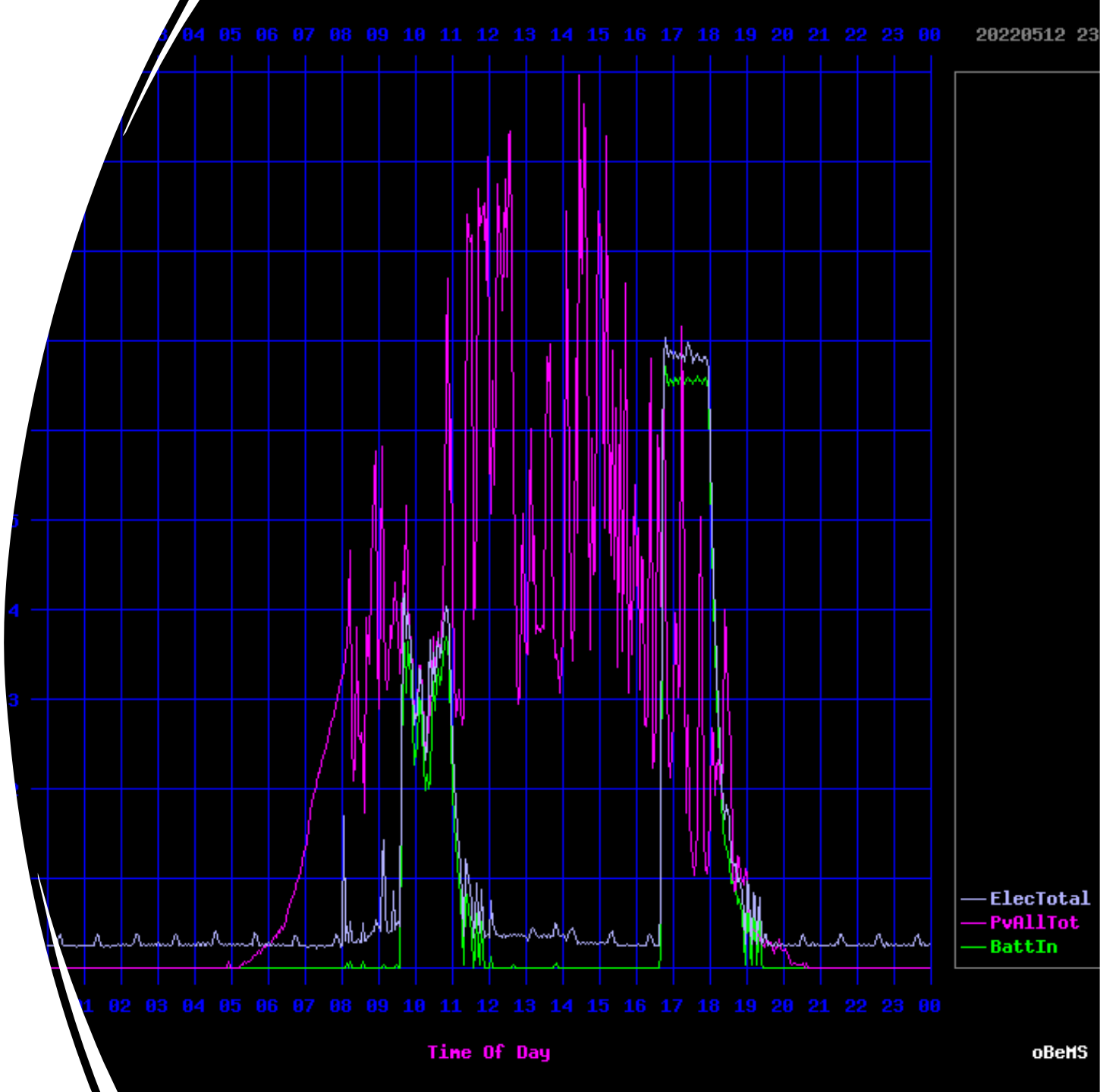
Solar Generation and EV Usage

In the morning the rate of charge is tied to free PV energy.

In the afternoon / evening charging is switched to full power despite the lack of available solar.

- Vehicle charging - green line
- PV generation - purple line



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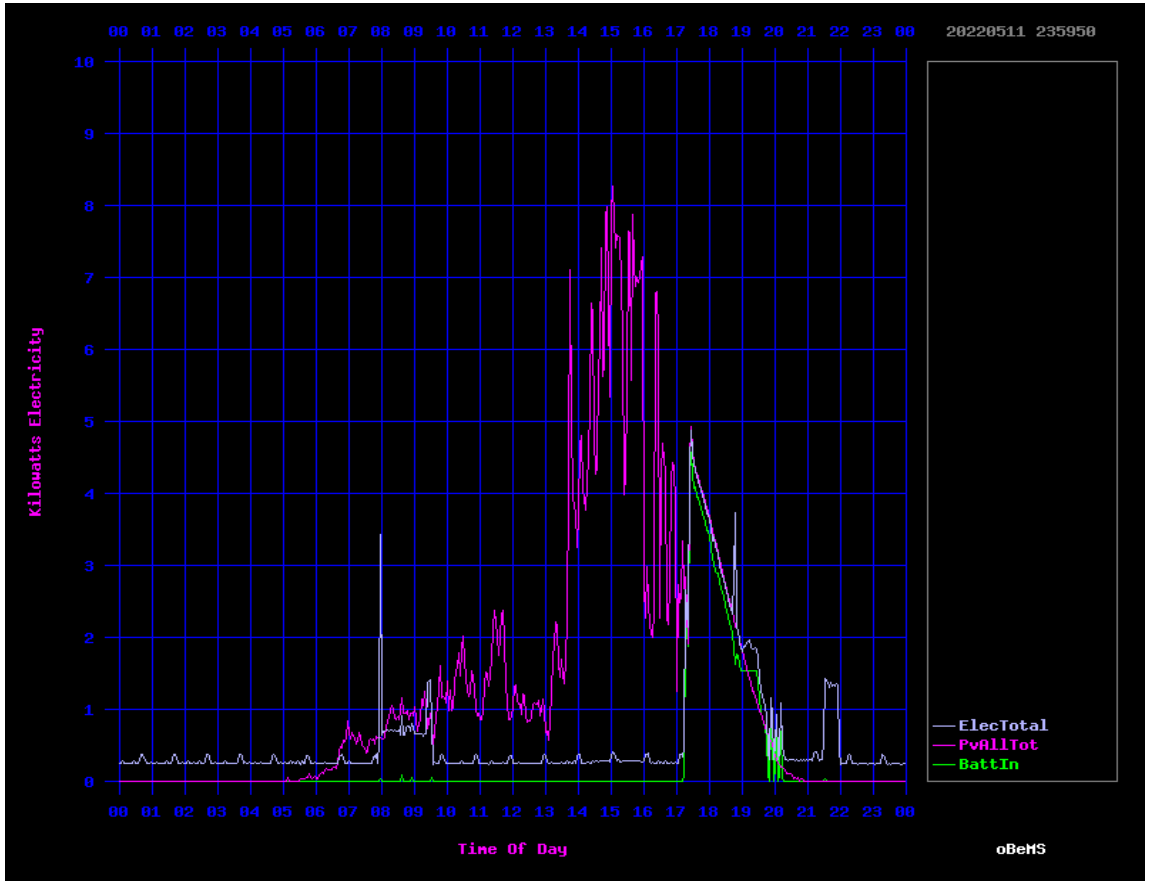

Where the rate of charge is limited to the available free PV energy.

- Vehicle charging - green line
- In solar mode – PV- purple line

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