

Ashton Hayes Community Energy CIC

Performance of PV Systems at the Primary School and Sports Pavilion.

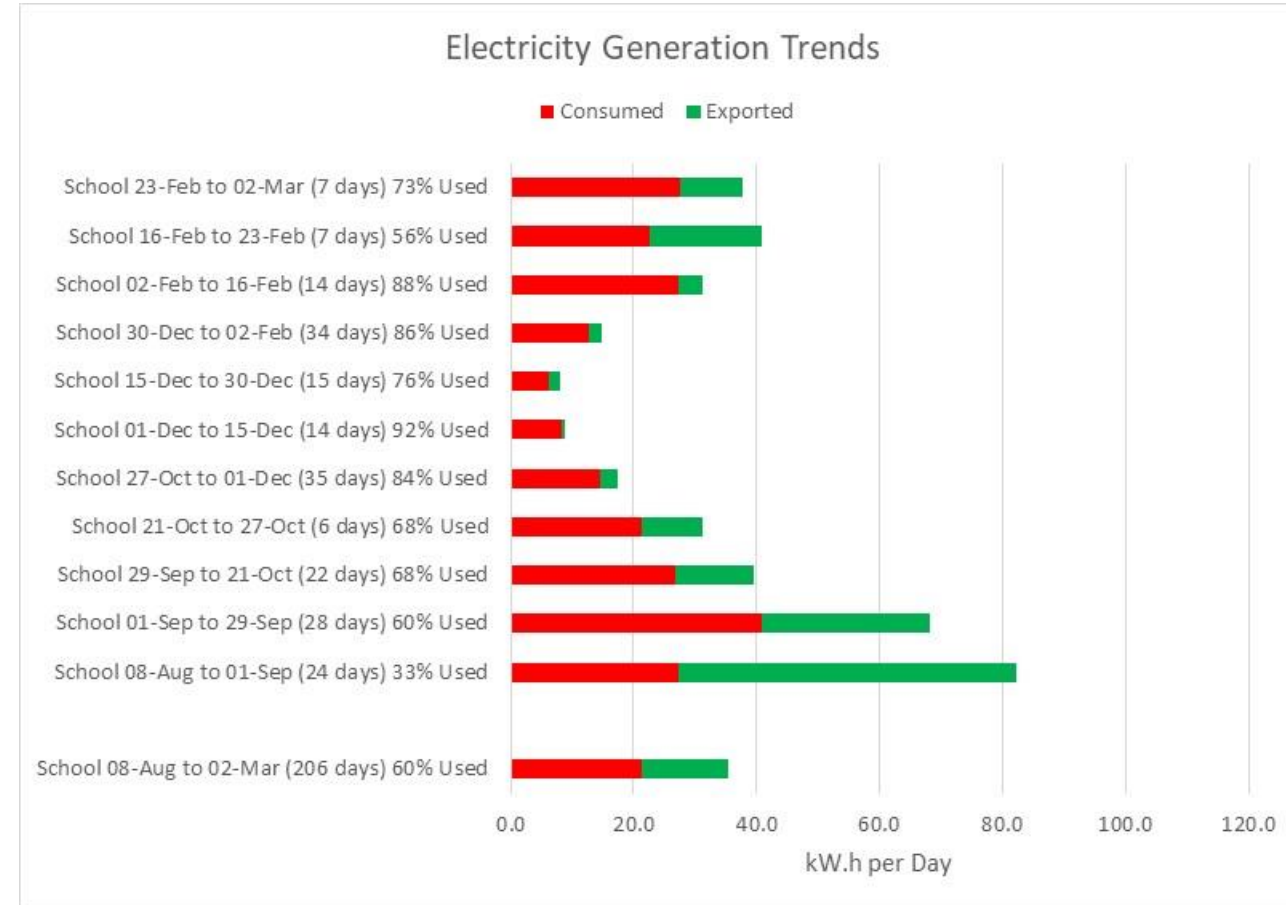
Typical Power Consumption from a Fridge and Freezer.

Data from August 2022 to February 2023

School Electricity Generation and Export

Electricity Generation Trends:

- Eleven periods **roughly** cover August holidays, Term time in September, Term time in October, October half-term (including one term day), Term time in November, Term time in December, Christmas holiday, Term time in January, Term time in February, February half-term (including one term day), Term time in Feb – March.
- Periods are of different length, so values expressed on a “per Day” basis.
- The Total (combined) bar length shows average Daily Generation, which clearly reduces through August, September, October etc. and reaches a minimum during the Christmas holidays. It then increases through January and February.
- The Red bar shows how much, on average, of the Daily Generation is being Consumed by the School.
 - This is low in August as there was little school activity during the day.
 - This increased in September as the school day activities were able to consume the power being generated.
 - This has dropped again in October as the reduced Generation has not been able to keep up with demand.
 - By November, almost all of the generation is being consumed as there is no sunlight outside of the school day.
 - From January, the trend starts to reverse.
- The Green bars show the remaining part of the PV generation, which is consequently Exported to the grid.
 - In August, when there is minimal school activity (only holiday club), a significant proportion of the generation is being exported.
 - During the first half of the Autumn term, there is still a reasonable amount of export, coming from the weekend (2 days a week ~30% of the time), sunshine hours outside of the school day and periods during the afternoon when generation exceeds demand.
 - By half-term, the export is being limited by the base-level consumption at the school. This is roughly 2kW (~20kW.h per day) and so even with the school closed, there is only a limited amount of energy being exported.
 - During December term-time, practically all of the generation is being consumed. Even during the weekend, the base-level consumption leaves nothing for export.
 - From January, the trend starts to reverse.



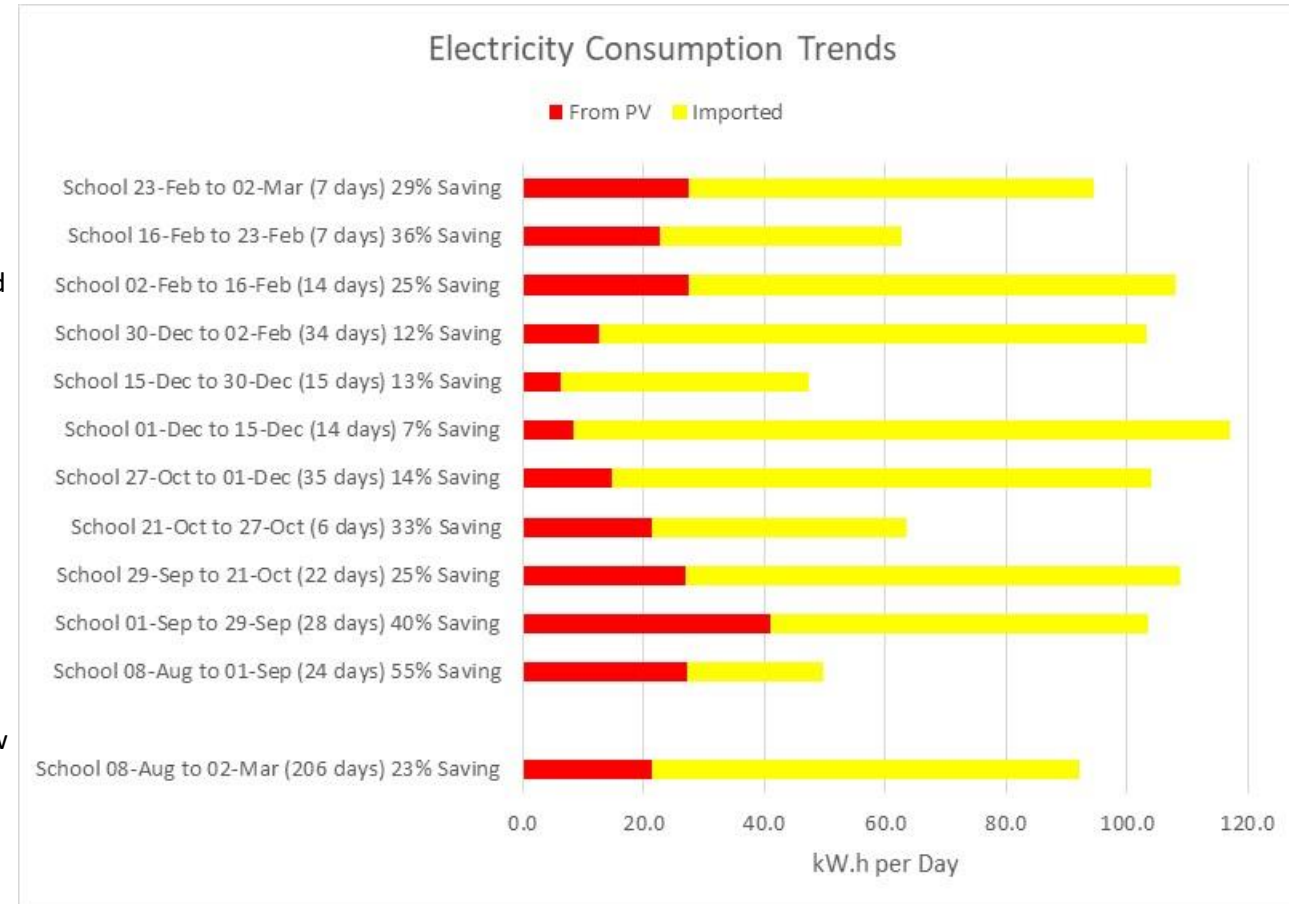
Summary of Generation over the Period as a whole (206 days):

- 7279 kW.h of electricity has been Generated (average 35.3 kW.h per day)
 - 4,401 kW.h was Consumed (60%)
 - 2,878 kW.h was Exported (40%)

School Electricity Consumption and Import

Electricity Consumption Trends:

- The same eleven periods are covered and values expressed on a “per Day” basis.
- The Total (combined) bar length shows average Daily Consumption.
 - This is low in August when the school is closed.
 - This more than doubles in September due to the school activities.
 - This shows a further small increase in October, as might be expected.
 - Consumption drops October over half-term, Christmas Holiday and February half-term.
 - The remaining term-time in November (some mild conditions), December (one very cold period), January (one cold period) and February are comparable with the October term-time consumption.
- The Red bars are the same as in the Generation graph, previous page, and show how much, on average, of the Daily Generation is being Consumed by the School.
- The Yellow bars show how much Electricity must be Imported to cover the daily consumption requirements.
- The % Savings (in the bar labels) represent the proportion of the daily consumption that is provided free by the PV generation.
 - This was 55% in the August holiday period but drops for the subsequent holidays:
 - 33% over October half-term.
 - 13% over Christmas holiday.
 - 36% over February half-term.
 - During the term-time it steadily drops as the days shorten, before rising again in the new year.
 - 40% in September.
 - 25% in October.
 - 14% in November.
 - 7% in December.
 - 12% in January.
 - 25% in February



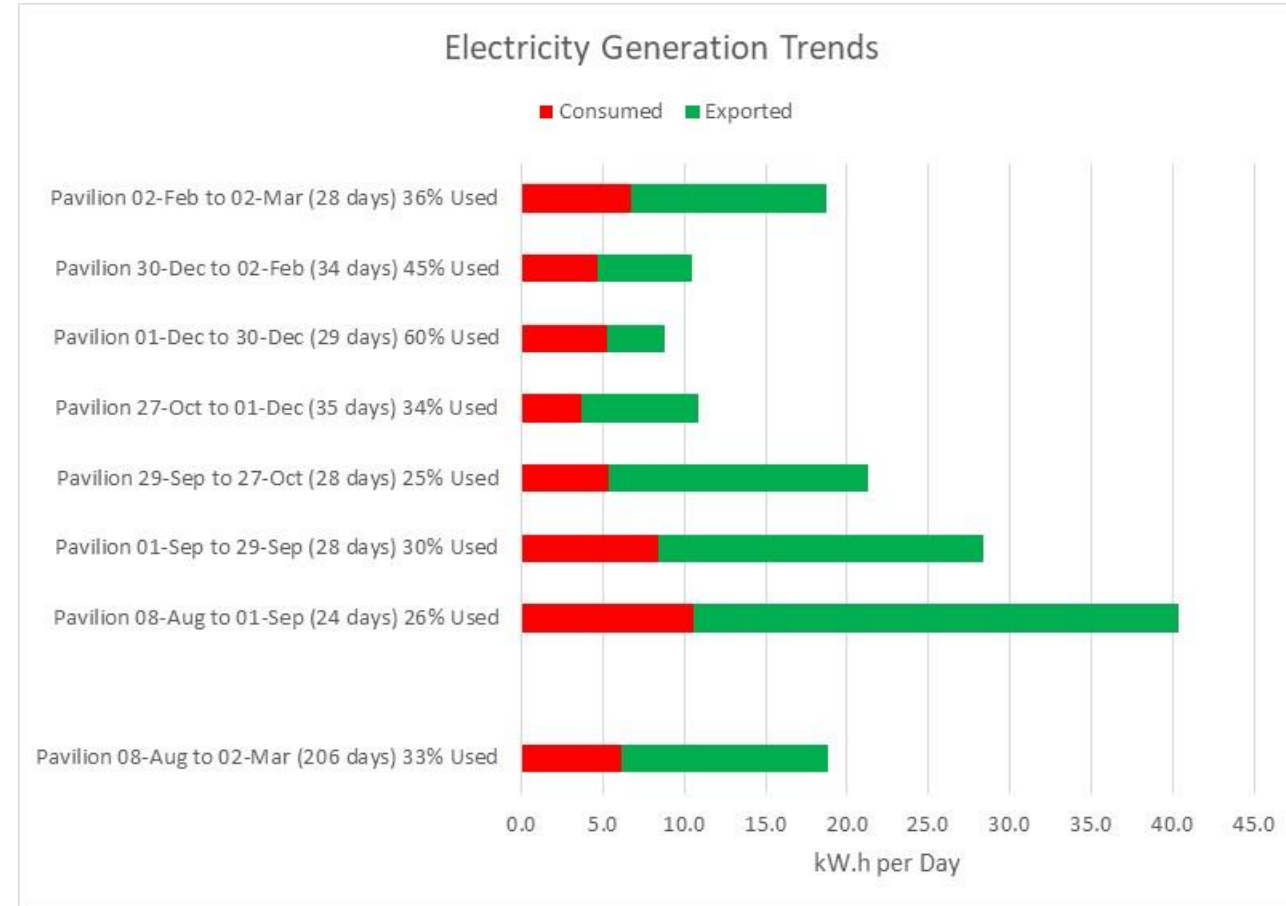
Summary of Consumption over the Period as a whole (206 days):

- 18,988 kW.h in total was Consumed by the School (average 92.1 kW.h per day)
 - 4,401 kW.h was provided by PV Generation (23%)
 - Requiring 14,587 kW.h to be Imported (77%)

Pavilion Electricity Generation and Export

Electricity Generation Trends:

- Seven periods **roughly** cover the seven months August 2022 to February 2023, inclusive.
- Periods are of slightly different length, so values expressed on a “per Day” basis.
- The Total (combined) bar length shows average Daily Generation, which clearly reduces through August, September, October etc. and reaches a minimum during December and then starts to rise again in January and February.
- The Red bar shows how much, on average, of the Daily Generation is being Consumed by the Pavilion.
 - This is somewhat confused by a switch in the hot-water and heating strategy in late September.
 - During the summer months (until late September), the Heat Pump is purely providing hot water and it timed to use the electricity generated during daytime.
 - When the heating is put back on in September, the first hot-water boost is timed for the low-rate night period so that the heating is given priority for the majority of the daytime period. (If the heating and hot-water are both in demand, the hot-water will take priority and the underfloor heating will not be supplied).
 - Thus from late September the amount consumed is partly related to the heating demand, which is most evident from the very cold period in December.
 - In the months with longer days, there is the opportunity to supply more of the daily background consumption (fridge, freezer and security systems). Thus there is some relationship between the amount consumed and the amount generated.
- The Green bars show the remaining part of the PV generation, which is consequently Exported to the grid.
 - During most months, more than 50% of the generation is being exported.
 - During December, the heating was in much greater demand during the daytime, hence there was less electricity available for Export.
 - Since the New Year there has been a moderate/high demand on the heating (more so than in November), so more of the generation has been consumed.



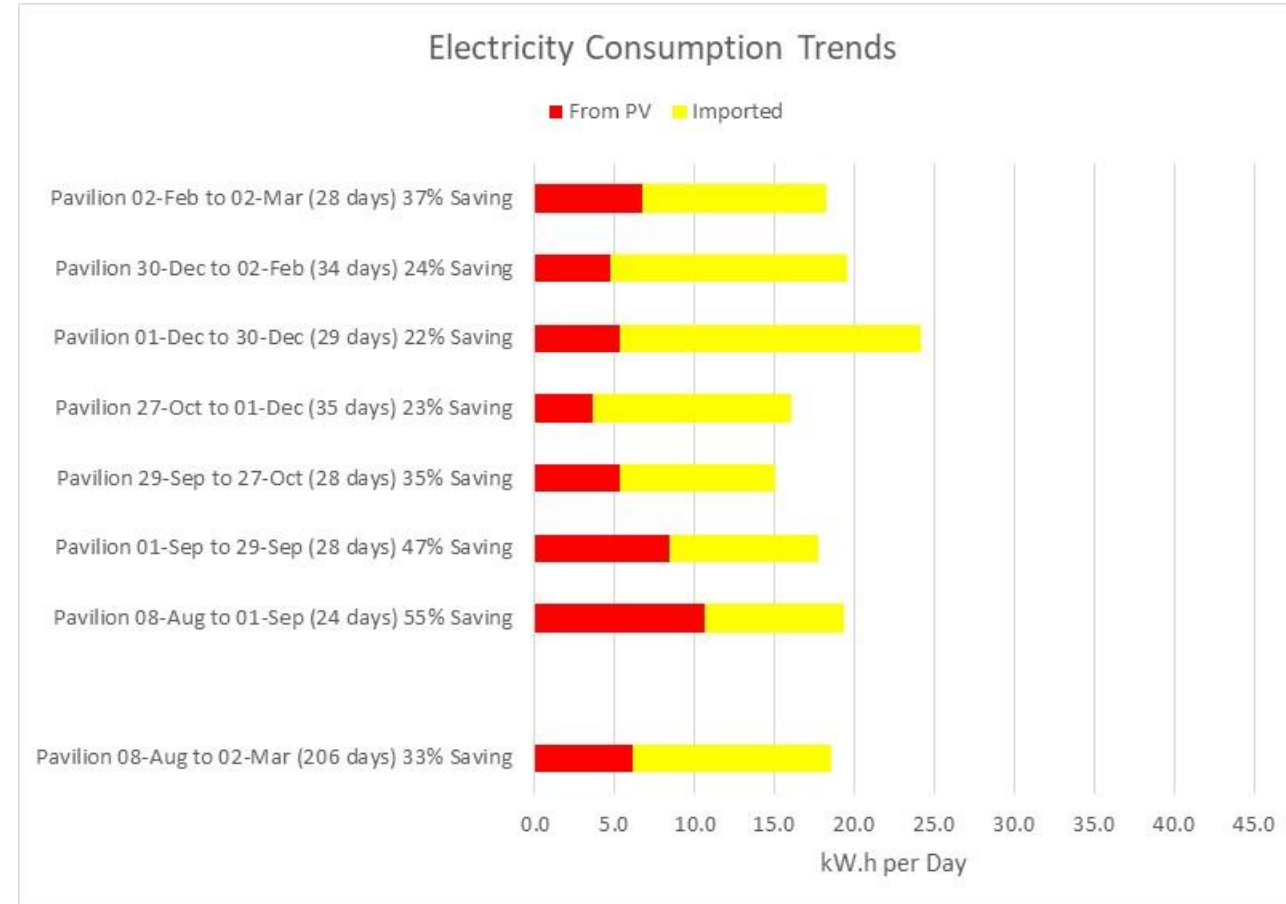
Summary of Generation over the Period as a whole (206 days):

- 3880 kW.h of electricity has been Generated (average 18.8 kW.h per day)
 - 1,270 kW.h was Consumed (33%)
 - 2,610 kW.h was Exported (67%)

Pavilion Electricity Consumption and Import

Electricity Consumption Trends:

- The same seven periods are covered and values expressed on a “per Day” basis.
- The Total (combined) bar length shows average Daily Consumption.
 - This has remained relatively constant over the six month period.
 - The one high month is December, due to the cold period.
 - The drop in October, may result from the hot-water and heating schedule change: Prior to this change, the hot-water was being allowed to be maintained during much of the daytime – between 8.30 to 10.00 and 14.00 to 16.30. Since the set temperature (60°C) is very close to the heat-pump maximum, the heat-pump can continue to run for extended periods trying to obtain this limit. In October, this was limited to two one-hour periods, one from 6.00 and one from 14.00 GMT.
 - Additionally, in October and November, the weather was relatively mild, so the additional demand for heating was low or zero, while December, January and February have been cold.
- The Red bars are the same as in the Generation graph, previous page, and show how much, on average, of the Daily Generation is being Consumed by the Pavilion.
- The Yellow bars show how much Electricity must be Imported to cover the daily consumption requirements.
- The % Savings (in the bar labels) represent the proportion of the daily consumption that is provided free by the PV generation.
 - This appears to change in relation to the length of day, and may reflect the ability of the generated electricity to cover the background electricity consumption (from the fridge, freezer and security system).



Summary of Consumption over the Period as a whole (206 days):

- 3,829 kW.h in total was Consumed by the Pavilion (average 18.6 kW.h per day)
 - 1,270 kW.h was provided by PV Generation (33%)
 - Requiring 2,557 kW.h to be Imported (67%)

Pavilion Freezer and Fridge Power Consumption

5 weeks of monitoring Freezer and Fridge in Café



Freezer:

- Operation is as expected
 - When running, it reads about 230 to 235 Watts.
 - When not running, it reads 0 Watts.
- Over each week of measurement, it was typically running for between 42% and 45% of the time.
- Hence, the average power consumption was 100 Watts, which equates to 2.4 kW.h per day.
- The highest value recorded was 273 Watts, which might occur briefly when the refrigerator starts up.
- The lowest value recorded was 42 Watts. There is no information to show when this occurs.

Fridge:

- Operation is not exactly as expected
 - It was never observed when running. The high reading suggests that the power consumed when running might be around 300 Watts.
 - When not “running” (i.e. no hum from the compressor) , it still showed a power consumption of about 20 Watts.
- Over each week of measurement, some power was being consumed for 100% of the time.
- The average power consumption was 60 Watts, which equates to 1.4 kW.h per day.
- The highest value recorded was 352 Watts, which might occur briefly when the refrigerator starts up.
- The lowest value recorded was 16 Watts. There is no information to show when this occurs, although it is not too different from the value observed when not “running”.
- This unexpected performance will be checked, either by repeating the measurements on this unit, or by comparison with results from similar equipment in the Community Shop.

