Energy Makeover Report

for

Ysgol San Sior

Llandudno

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March 2014

British Gas

Generation Green

What is Generation Green?

British Gas is the UK's leading energy supplier and we take energy efficiency and sustainability very seriously. Generation Green is just one of the ways we have helped teachers, pupils, parents, schools and communities reduce energy costs and carbon emissions.

Generation Green is an exciting programme that engages the UK's next generation into having a positive impact on carbon reduction and the environment. Through the installation of real time data displays the tangible benefits can be identified inspiring them into becoming future energy innovators.

In 2012/3 British Gas held a competition for schools to enter a competition where they could win a Generation Green "Energy Makeover". Through this national competition, British Gas invested £1.6Mn of energy saving projects into the 15 winning schools.

Ysgol San Sior was one such school that benefitted from this investment and this report outlines the financial and other benefits enjoyed by the school to date.

Ysgol San Sior Energy Makeover

Following the announcement that the school had been successful in winning the competition in early 2013 a British Gas Energy Specialist visited the school and, working alongside the school staff, identified areas where energy savings measures would benefit the site. The list of measures was discussed with site staff and the agreed measures were implemented in the second half of 2013:

- a new 6.4kW solar PV array,
- new LED lighting,
- new outside floodlights,
- new boiler burner controls and
- hot water pipe work insulation.

Monthly Energy Consumption

The school provided the British Gas energy experts with historical billing data. This data was analysed and profiled to determine the school's monthly consumption. Subsequent to the Energy Makeover the school has been providing monthly readings that can now be compared to the historical energy data.

Gas Consumption

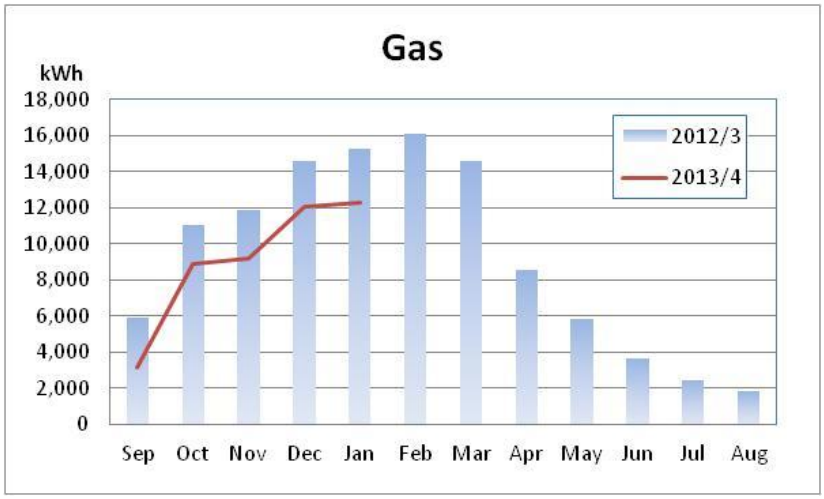

Fig 1

Fig 1 shows the gas consumption since September 2012. The gas is used predominantly for space heating, domestic hot water generation and catering purposes.

The chart has been created from the monthly readings provided by the school. It shows that the new pipe work insulation and burner management units have helped lower consumption and this is now lower than the previous year's. In fact the overall consumption from September to January is 22% lower. It should be noted that the latest winter has not been as cold as the previous year but using Degree Day correction of the energy data, the consumption is still 19% lower.

Electricity Consumption

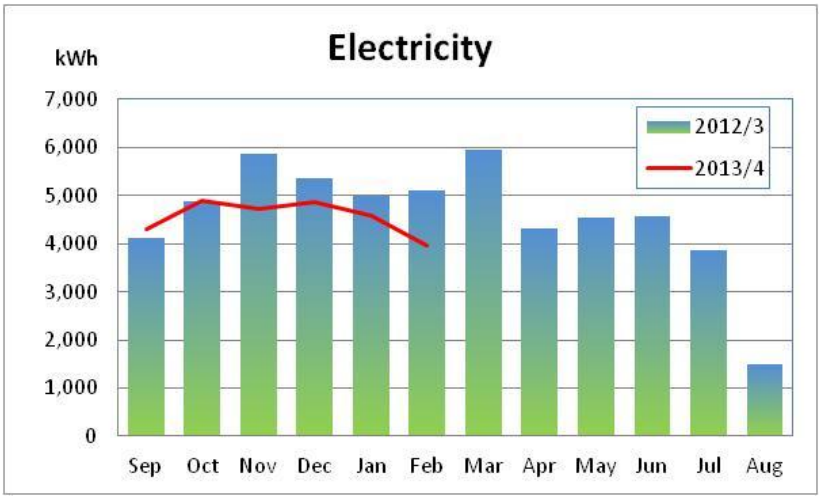

Fig 2

Fig 2 shows the electricity consumption since September 2012. Electricity is used in a variety of ways including lighting, computers, catering purposes and heating circulation pumps. It is less weather related than the gas consumption. The new lighting and solar PV installed by British Gas has helped reduce the site energy usage. The overall consumption from September to February is 10% lower than in 2013/4 than in 2012/3. It is expected that this will further increase as the electricity generated from the solar PV will have a greater effect as summer approaches.

Half Hour Electricity data from newly installed data loggers

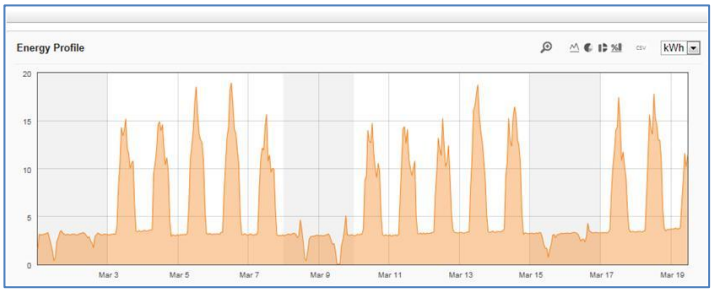

Fig 3

Fig 3 shows the electricity data measured by the electricity logger; it shows the electricity demand (in kW) throughout the day. The “peaks” on the graph represents a school day and the variation between day/night and weekday/weekend usage can clearly be seen. It should also be noted that

- The night and out of hours usage is approximately 3kW and is likely to be consumed by security lighting, IT equipment and heating circulating pumps. Addressing out of hours load is important as it can comprise a large proportion of the annual electricity bill; since the school is closed for approximately 75% of the year.
- The “dips” at the weekend clearly show the effect of the solar generation when the school is unoccupied (see Fig 5).

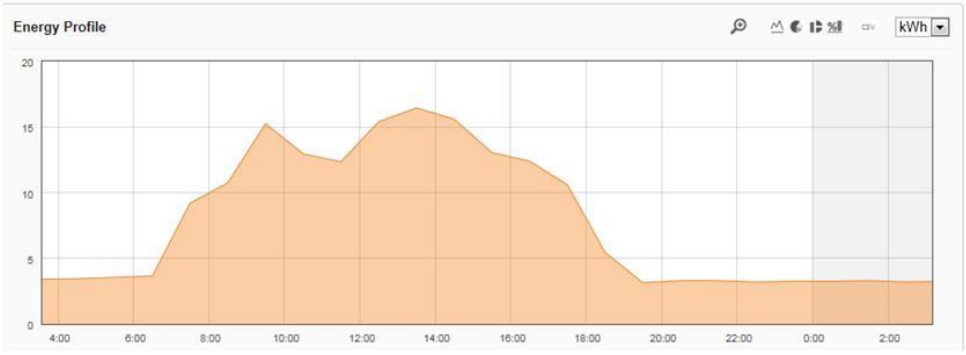

Fig 4

Fig 4 shows Friday 14th March's consumption in more detail

- The school's consumption increases from approximately 06:30 and is believed to be due to lights, heating pumps and catering loads being switched on.
- The peak occurs just after 13:00-13:30 and falls as kitchen staff finish their duties. It then continues to fall until 19:30 where it plateaus.

Solar PV

The solar PV panels have generated over 320kWh of daytime electricity since they were first installed. Not only has this reduced the electricity demand (as can be seen in Fig 5 below) but once the application is finalised it will also provide the school with a financial income from the Government's Feed in Tariff scheme.

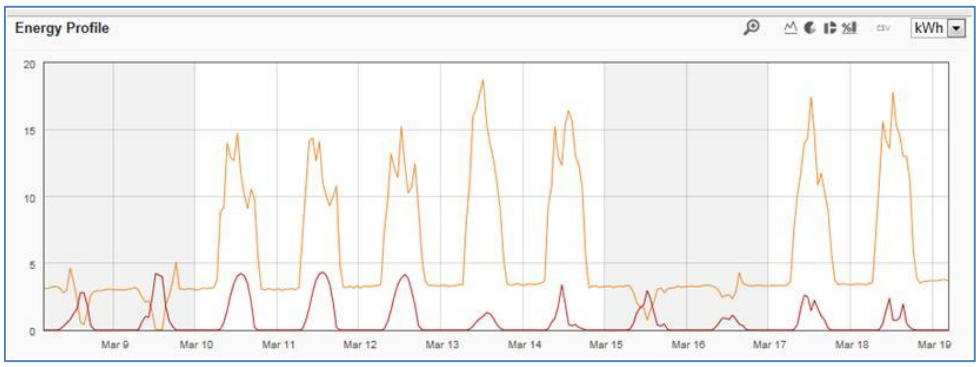

Fig 5

Fig 5 shows both the electricity demand profile (orange) and solar PV generation (red) for the last 10 days.

It is noticeable how much the solar is generated when the out of hours usage is studied. It can be seen that the "troughs" on the electricity usage match the peaks of the solar generation".

Continuing your school's carbon reduction journey

This report has shown how the school has benefitted from the Generation Green Energy Makeover and will continue to benefit financially from implementing energy conservation measures. Furthermore the active engagement of the children will help them appreciate the need to adopt good energy savings practices and measures.

As your school continues to find ways to build upon the Energy Makeover savings there may be areas where British Gas can assist you. I would like to draw your attention to the range of competitive services that are available to help your schools further reduce your energy bill:

- Electricity and gas tariffs.
- Lighting installations – including efficient LED and lighting controls.
- Boiler replacement – high efficient conventional units or biomass that benefits from the Renewable Heat Incentive (RHI).
- Heat pump technologies – efficient heating systems with a greater than 100% efficiency - air source, ground source and gas absorption heat pumps.
- Solar PV and solar thermal arrays – generating heat and/or electricity from the sun and benefitting from FiT and RHI incentives.
- Cavity and loft insulation, external wall cladding – keeping the heat within the school.
- Boiler controls and BEMS (Building Energy Management Systems) – optimising and reducing the amount of energy your school consumes.
- Self funded projects – financing projects in a manner that the future savings pay for the new technologies. Designed so there is no capital outlay or increase in revenue.

For more information on the above technologies or any questions regarding this report please contact Steve Hinsley on 07789 579125 (stephen.hinsley@britishgas.co.uk).

Glossary of Terms

kW and kWh - Power is measured in Watts (W) or for larger values kilowatt (kW). A kilowatt is 1,000W. If a 2kW electric heater is switched on for 1 hour then it uses 2kWh. (2kW x 1 hour = 2kWh), a 100W light left on for 8 hours uses 800Wh or 0.8kWh (100W/1000 x 8hours). Energy on both the school's gas and electricity bills will be shown in kWh.

Degree Day - A degree day is a measure of the heating or cooling load on a facility caused by outdoor temperature. If the mean daily outdoor temperature is one degree below a stated reference temperature (for schools, 15.5^{o}C) then this is defined as one heating degree day. Alternatively, an ambient temperature of 13.5^{o}C (2^{o}C below 15.5^{o}C) for 12 hours would also be calculated as a degree day. When the ambient temperature is below the reference temperature, heating degree days are recorded; above the reference, cooling degree days are recorded. Degree day data is published by the Met Office.

Degree Day Correction – When a warmer winter follows a colder one,it is not surprising that the building's gas consumption falls; conversely if colder then consumption increases. It is therefore not always possible to see the true effect of energy savings measures and hence we have applied Degree Day Correction. The two winters' monthly gas consumption are compared and also the number of degree days compared on a monthly basis. The historical data would be adjusted by the ratio of the degree days to produce a value that can then be compared with the latest consumption.

Feed in Tariff - When renewable electricity generating equipment is installed such as solar PV, hydro and wind technology, the UK Government's Feed-In Tariffs scheme (FITs) mean that money can be claimed from the energy you generate. The equipment owner/user is paid for each kWh of electricity generated at the relevant FiT rate. Where consumption is greater than the electricity generated the energy will be used on site. Where the site is using less, the surplus will be "exported" to the electricity distribution system in your area.

Renewable Heat Incentive – When renewable heat generating equipment is installed such as biomass, solar thermal and ground source heat pumps the UK Government's Renewable Heat Incentive means the equipment owner/user can claim money from the heat you generate. Payment is made for each kWh of heat that you produce at the relevant RHI rate.