Case Study 5: Replacing storage heaters

Trinity First School replaced storage heaters with air conditioning in its Early Years classroom block, saving about £1,500 per year in electricity costs

'Working with Energy Sparks has been brilliant. It is always lovely to find ways of saving money but to do so whilst not just maintaining but improving standards is a double bonus. Plus, we have been able to do meaningful work with the children on environmental issues alongside making changes which have a positive impact on the environment.'

Amanda Seager, Headteacher, Trinity First School, Frome

Summary

Trinity C of E First School in Frome saved £1,500 per year in electricity costs when they spent £10,000 on replacing storage heaters with air conditioning and upgrading to LED lighting in their Early Years classroom.

Storage Radiators

Storage radiators work differently from other forms of heating in that they consume electricity overnight, store the energy, and then release the stored heat to classrooms during the day. In contrast most gas and air conditioning heating systems consume gas to produce heat immediately, so only consume energy during the school day.

Storage heaters can be very inefficient as they don't know how cold it is likely to be during the following day, and therefore how much heat to download and store from the electricity grid overnight. They therefore try to store as much heat as possible whether the following day is likely to be hot or cold.

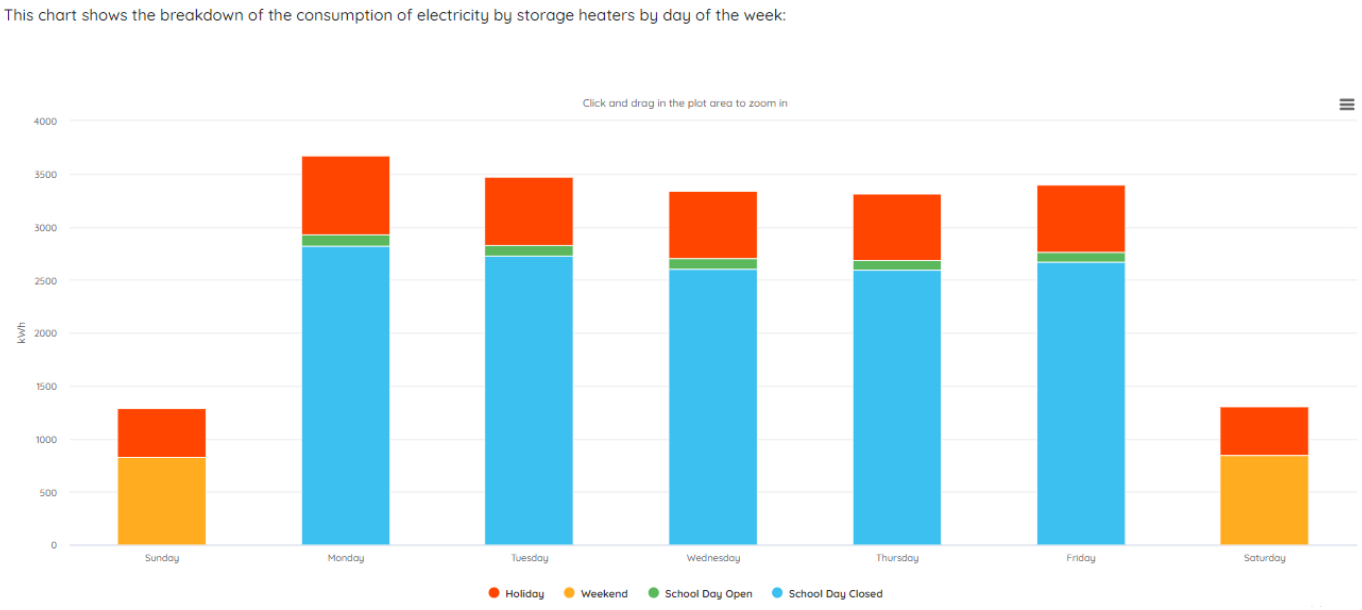
Storage heaters try to save money by making use of cheaper overnight electricity (economy 7 or differential tariff) which costs about 7p/kWh compared with 12p/kWh for daytime electricity. Overnight electricity is cheaper to produce because there is less demand. However, many schools don't have access to differential tariffs, or they can work out more expensive as the daytime rate (typically 13p/kWh) is higher.

Storage radiators are often installed in rural off-grid locations where mains gas is not available or in isolated or temporary classroom blocks where the cost of laying a gas main is prohibitive.

Make storage heaters more energy efficient or switch to a different source of heat

If you are looking to save money on the running of your school's storage heaters, you have several choices:

1. Energy Sparks provides specific data presentation tools for analysing the energy used by your school's storage radiators e.g.



   Use Energy Sparks to make sure the timing of your storage heaters is controlled well: see Energy Sparks Case Study 3 where Stanton Drew School saved £800 per year using Energy Sparks and got a return on their investment within 16 weeks

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2. Evaluate whether your school would benefit from switching to a differential tariff (economy 7) – Energy Sparks provides tools for accurately determining this
3. Consider replacing the storage heaters either with gas (a fossil fuel – so may not be good from a carbon perspective!), air conditioning or air source heat pumps

Air conditioning

Trinity School took a decision to replace its storage heaters in an isolated classroom block 2 years ago and decided to upgrade the heating system to air conditioning, reducing their electricity consumption, costs and carbon emissions.

Air conditioning (air to air heat pump for heating) has several advantages over storage heaters:

- It provides a more comfortable environment with better thermostatic control than storage heaters
- Air conditioning doesn't rely on stored heat so can be turned on on-demand
- Air conditioning can heat up a room very quickly, so less heat is wasted before the school is open in the morning
- It's about 3 to 4 times more energy efficient than storage heaters because it extracts free latent heat from the outside environment and converts it to more concentrated heat to warm the inside of a building (explanation here)

For Trinity First School the options were:

	Annual Heat Requirement Demand kWh	Efficiency	Energy requirement kWh (Demand)	Fuel cost p/kWh	Annual cost	Capital cost	Payback (years)	CO2 emissions (kg/year)
Existing storage heaters	12,500	100%	12,500	12	£1,500			2,875
Existing storage heaters (economy 7)	12,500	100%	12,500	12	£1,500			2,875
Air conditioning	12,500	350%	3,571	12	£429	£8,000	7	821
Gas heating	12,500	85%	14,706	3	£441	£12,000	11	3,088

Economy 7 wasn't an option because it would have increased the daytime rate for the rest of the school making the overall electricity bill more expensive. Switching to gas heating was more expensive because of the capital cost of installation and the cost of laying a gas pipe across the school playground. Carbon emissions are also significantly lower for air conditioning systems, in this example a 70% reduction over storage heaters and 73% reduction over gas.

Air-source heat pumps, which use a similar underlying technology to air conditioning systems – producing hot water rather than hot air, will have similar economic benefits, and may be eligible for a subsidy under the UK Government's Non-domestic Renewable Heat Incentive Scheme (RHI).

Lessons Learned

- Energy Sparks provides specific tools for analysing your school's storage radiators
- Air conditioning systems or air source heat pumps can provide a cost effective and more thermostatically comfortable replacement for storage radiators. They also offer the best way of significantly reducing your school's carbon consumption.

If you have any questions about Energy Sparks, please contact us: hello@energysparks.uk

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