

Inspiring pupils and supplying sustainable energy with wind and solar systems

Summary

Seaton Primary School, a 340-pupil state primary school in East Devon, is one of the few schools in the UK to have installed a range of renewable energy technologies. It has a 2.5 kW wind turbine and a 4.7 kW PV array which supply electricity to the school, and 48m² of solar water heating panels, which provide warm water for the school's outdoor swimming pool. An energy audit has identified efficiency measures that can reduce energy demand, and the school Energy Policy and Action Plan has set priorities for implementing these, some of which have already been addressed.

The renewable energy technologies provide outstanding learning opportunities for the pupils. They can see renewable energy in action within their own school, and learn to understand the operation and appreciate the benefits of different systems. This helps to stimulate interest in energy issues, and pupils are actively involved in energy saving activities around the school. Pupils in the Eco Club and class Energy Agents help to reduce energy wastage by ensuring that lights and equipment are switched off when not required and doors and windows are closed to prevent heat loss. Sustainable energy is emphasised through the curriculum and after-school activities.

The on-site renewables generated about 4.5MWh of electricity in 2006, which reduced the carbon emissions of the school by about 2 tonnes/year. Efficiency measures and behavioural change probably saved a similar amount of electricity.

Address: Alan Simpson, Head Teacher
Seaton Primary School
Valley View
Seaton
Devon
EX12 2HF

Telephone: +44 (0)1297 20922

Email: asimpson@seatonprimary.co.uk

Website: www.seatonprimary.co.uk

The school

Seaton Primary School has 343 pupils, 16 teachers and 36 non-teaching staff. The majority of the pupils live in Seaton, a small seaside resort in East Devon. The housing in the school's catchment area is mixed, with 5% of pupils from different ethnic backgrounds, and 10% receiving free school lunches.

The school's motto is 'Caring now for the Future'. This is illustrated by the various actions that have been taken to become a sustainably managed institution in which the pupils play a key role. The social, educational and environmental achievements at Seaton have enabled it to achieve UNESCO World Heritage status. It is also a member of the award-winning local Sustainable Axe Valley Enterprises (SAVE) Trail.

Behavioural activities to promote sustainable energy use

Apart from the reception class, each class at Seaton has two Energy Agents, selected on a rotating basis. The Energy Agents are responsible for making sure lights and appliances are switched off when not needed, and doors and windows are closed to avoid heat loss, and they also remind the school staff to do this. Members of the after-school Eco Club assist the Energy Agents and report their observations to the Student Council and at assemblies.

The Eco Club, together with teachers, governors and the caretaker form an Energy Task Force which monitors the use of energy in the school, reviews practice and suggests and implements improvements where possible. Meters are read monthly by the caretaker, occasionally assisted by Eco-Club members, and there are signs throughout the school encouraging energy efficiency. Collectively, these energy saving activities are a core function in the school and fit very well with the school's stated ethos of 'Caring now for the Future' in terms of environmental and social responsibility.

In addition to the energy efficiency activities, the school actively promotes cycling and walking to school and has an area reserved for composting. It has a substantial woodland (originally planted by the school children 25 years ago) and is also developing its own orchard to provide fruit for pupils and to offset some of its carbon emissions. Currently the school is installing a large grey water collection system to re-fill the school wildlife pond and to demonstrate small-scale water power.

Sustainable energy technology

At the entrance to the school is a Proven 2.5kW three blade wind turbine on a 11 metre mast. This was installed in 2004 and started generating in 2005. It is in a fairly sheltered site, but benefits from the prevailing south-westerly winds. The wind turbine feeds power into the mains electricity supply of the school. There was initially concern about the idea of a wind turbine from some members of the local community, but this has been turned around to enthusiastic support for the actual installation.

A 4.7 kWp photovoltaic (PV) array was installed on the south-facing roof of the school hall in 2004. It comprises a rectangular array of 56 PV modules, each rated at 84 Wp, manufactured by BP, which are set into the tiled roof on a weatherproof tray. It is highly visibly from the school entrance. The dc electrical output from the PV array is fed to a row of inverters, which convert it to ac at mains voltage and frequency, and then feeds the power into the school mains supply.

Within the school hall is an electronic display unit that shows real time generation (averaged over 5 minutes) and total generation figures from the wind and PV systems. When power is not needed in the school (for instance at weekends and during the summer holidays) any excess from the wind and PV systems is automatically exported through an export meter to the national grid.

The school has an outdoor swimming pool that was unheated before 2005 and rarely used. In 2005 a 48m² array of thirteen solar water heating panels was installed on a raised pergola. The pool is now open from May to October and the solar thermal system provides the heating, supplemented by a dedicated gas boiler that is used to bring the water up to the required temperature at the start of the season and to maintain the temperature in extended cloudy periods. A swimming pool cover is employed when the pool is not in use to minimise heat loss and prevent debris from falling into the water.

As well as these highly visible examples of renewable energy technology, Seaton school has recognised the importance of energy efficiency. In 2006 an energy audit was undertaken, and this highlighted areas for potential energy efficiency improvements. These included the installation of low energy lighting, sensors and timers and more efficient gas boilers. Although there is a building energy management system that regulates the use of heating in one of the school blocks, there are recommendations to install similar equipment in other buildings. The school now has a formal Energy Policy and is committed to carrying out this work when it is appropriate and funds are

available. The school has worked closely with the Devon Energy Efficiency Advice Centre and has held several energy assemblies and classroom energy awareness raising activities.

The school is also committed to ensuring that any new building or refurbishment work incorporates the highest specifications for sustainable construction. A new teaching block was built in 2003 with high insulation specifications, and with significant natural lighting. Preliminary investigations have taken place regarding the use of a ground source heat pump in a proposed new classroom block that will replace two mobile classrooms.

Sustainable energy in the curriculum

Energy is taught as a theme throughout the school, as part of the curriculum enrichment programme. The teachers take responsibility for determining the right level for the different ages of children. Regular reviews of the curriculum take place to identify further opportunities to incorporate sustainability and energy saving activities.

Sample activities include:

- Weather, climate change and global warming studies linked with encouraging personal actions at school and at home.
- Practical studies in energy efficiency and renewable energy by the Eco Club.
- Making models of sustainable buildings and energy generators and displays.
- Monitoring and assessment of the performance of the school's renewable energy systems by members of the Eco Club.
- Linking energy efficiency teaching with other studies such as literacy and art (poster and sign design).
- Regular swimming lessons from May through to October, in the part solar-heated swimming pool.

An innovative approach was the use of a team of apprentices from Rolls Royce to work with the school to develop educational materials based on the school's renewable energy sources. These are available on the school's web site (www.seatonprimary.co.uk/renewable_energy.htm) and can be readily used by other schools.

Benefits

The average annual output for the PV array was measured as 4,220 kWh, or about 900 kWh/year per installed kWp of PV – a very good figure for the UK. During the same year the wind turbine generated 290 kWh, or 120 kWh/year per installed kW of wind turbine: this is about half the typical amount expected from urban wind systems, as might be expected from the relatively sheltered site. For the solar thermal system a meter records how many hours of solar heating has occurred and the temperature at the pump outlet, and the pool temperature is checked manually when required.

The wind and solar systems were grant funded, and the school benefits from lower electricity bills. At the current electricity purchase price Seaton saves about £250 year from the on-site renewable electricity generation, avoiding the emission of about 1.9 tonnes/year of CO₂.

The most significant benefit of the solar thermal system is that it has considerably extended the swimming season, which is important for children and the community as a whole. Because the pool was un-heated (though often not used) before, the solar thermal does not actually save energy.

In terms of overall school electricity consumption this increased from 72.4 MWh in 2004 to 81.7 MWh in 2005, but then decreased to 71.3MWh in 2006. It is hard to make a clear interpretation of

these figures, because new energy-using equipment has been installed (for instance, additional IT equipment) over the same period that the renewable energy and energy efficiency measures have been introduced. However, the decrease of about 10.4 MWh from 2005 to 2006 suggests that behavioural and efficiency changes were enhancing the 4.5 MWh of renewable electricity generation, against a trend of increasing energy technology, and saving the school nearly 6 MWh/year of electricity and a further 2.5 tonnes/year of CO₂.

Potential for replication

Seaton Primary School demonstrates what can be achieved by working with the local authority and funding providers to introduce sustainable energy technology and practices. Its experiences are readily shared with other local networks and schools. The head teacher and chair of the school governors' premises committee are happy to offer free advice to other schools and provide presentations at local educational events and to Devon-based energy and sustainability groups. They welcome visitors to the school to see first-hand the renewable energy systems and information is provided on the school web site.

The success of the sustainable energy activities at Seaton provides a model for other schools to follow. There is a belief that the school's achievements can be replicated in other schools, provided certain conditions are in place, namely:

- A whole school commitment to a sustainable energy programme, with an attitude that knowledge is of little use on its own unless it is put to use.
- Someone in the school to take a leading role in driving the programme forward.
- The availability of grant funding.
- A willingness to work with the local community.

Management, finance and partnerships

The wind turbine, PV array and solar thermal system were 100% funded from grants. EDF Energy Green Fund committed up to £50,000 and provided about £35,000, with other funds coming from the DTI Clear Skies and the EST PV programme. The Co-operative Group donated £1,000 towards the electronic display unit in the hall. Devon County Council contributed £3,500 towards the feasibility study costs. The school has made provision for paying for maintenance of the wind and PV systems in its future budget, although this has not yet been needed.

The opportunities for energy efficiency that were identified in the Energy Audit will be gradually funded through the school's operating budget. It is disappointing that less grant funding is available to schools for efficiency improvements than for renewable energy supply, given that many efficiency improvements are more cost-effective.

The sustainable energy activities at Seaton school are managed by the governors' premises committee. The chair of this group has been the 'driver' for the renewable energy installations, with the full support of the head teacher and the other governors.

The school is also a member of the Sustainable Axe Valley Enterprises (SAVE) Trail, which won the Devon Environmental Business Initiative in 2005. The SAVE Trail gives local people the opportunity to visit a range of working examples of sustainability, so increasing the exposure of the school's work and strengthening community links.

The renewable energy equipment was formally opened in March 2005 on World Met Day by Hugo Swire MP, with close liaison with the Met Office.

This report is based on information provided to the Ashden Awards judges by Seaton Primary School, and findings from a visit by one of the judges to see their work.

Dr Anne Wheldon, Technical Director, Ashden Awards

Dr Mike Pepler, Technical Manager, Ashden Awards

May 2007

The Ashden Awards has taken all reasonable care to ensure that the information contained in this report is full and accurate. However, no warranty or representation is given by The Ashden Awards that the information contained in this report is free from errors or inaccuracies. To the extent permitted by applicable laws, The Ashden Awards accepts no liability for any direct, indirect or consequential damages however caused resulting from reliance on the information contained in this report.