

The Little Build

Sustainability Proposals

There is an expectation from DCSF (although it is not a condition of grant) that all new schools should achieve a 60% reduction in carbon emissions, when compared to 2002 Building Regulation standards.

The Technical Design team have been addressing methods of achieving this, whilst also considering how to minimise long-term running costs.

A standard building would be constructed from steel frame and blockwork. This requires a suitably-sized heating source - the usual installation being gas-fired boilers. This approach will not achieve the 60% Carbon reduction target.

To achieve a reduction in carbon emissions with a standard building construction method the heating source is often now chosen to be a biomass boiler, fuelled by wood pellets or chips. The Government's assumption is that because wood fuel is being regrown, any carbon emitted during burning is re-absorbed by newly-planted trees and thus wood is a "carbon-neutral" fuel (ie a sustainable source of fuel).

However, CO₂ is still being produced during the burning of the wood pellets (even though these are deemed carbon-neutral) and the NO_x emissions are higher than with gas fuel. The trees absorbing this CO₂ are not available for absorbing CO₂ from other fossil-fuel burning. There are also concerns that as more and more biomass boilers are installed, the demand for wood fuel will soon exceed the UK production capacity, causing fuel shortages and corresponding price rises. There are also adverse maintenance and replacement issues related to a biomass boiler over the lifetime of the building/facility.

A different approach is therefore being adopted, reducing the operational energy demands where possible by creating a 'lean' design. Only then are renewable energy technologies integrated into the design to achieve the required carbon reduction target. This ensures a low cost, low maintenance future with minimised initial capital costs for renewable technologies. The overarching approach is based on a significant increase in the thermal performance of the building envelope, achieved by a combination of insulated timber framing plus insulated external render/cladding. In addition, significant increased performance in building air-tightness is achieved through the use of the timber frame as opposed to a steel frame. An automatically-controlled natural ventilation system also reduces energy loads and provides the best teaching and learning internal environment.

The resulting much-reduced heating demand will be met by a relatively small array of solar hot water heating, supplemented by small and efficient gas boilers. In this way, fuel demand and thus overall CO₂ emissions during operation of the building will be significantly reduced. This will meet the DCSF-expected 60 % reduction in CO₂, whilst reducing NO_x levels, reducing overall fuel costs and ensuring an intuitive scheme that is robust/low maintenance.

There are some small increases in capital cost to achieve these aspirations. Additional costs of timber frame, insulation and air-tightness can essentially be met from the assumed cost of the biomass boiler. To achieve the full 60% carbon reduction would then only require around £30k additional capital for the solar hot water heating system.

Incorporating the recently introduced heat feed-in tariff programme, it is currently estimated that

the £30k capital investment for the solar hot water array will have a short payback period (9 years). Thereafter, there is an opportunity for the project to generate money through the feed-in tariff programme during periods when the school has low energy demands (ie during summer breaks).

This is also a very visual “green” statement, giving real rather than notional benefits in both emissions and running costs that can be directly integrated into the school curriculum (in accordance with the “Evidence of Impact of Sustainable Schools” publication by the DCSF).

Very few schools in the UK currently can provide evidence of this holistically sustainable approach to design, with the majority delivering carbon reduction targets through the use of costly ‘bolt on’ renewable energy sources (often to the detriment of core brief items such as fundamental teaching and learning areas). An example of this is a landmark new build project which incorporates the use of high capital investment renewable technologies such as a £120k ground source heat pump but achieves only a 20% carbon reduction.

The Oakham CofE scheme considers all aspects of sustainability and directly targets carbon reduction without displacing carbon -offsetting somewhere else further up or down the supply chain, whilst still maintaining all aspects of the Brief within consideration of the budget. The result of this truly sustainable approach is a low maintenance, low running-cost school that meets all carbon-reduction targets.

“Sustainable development will not just be a subject in the classroom: it will be in its bricks and mortar and the way the school uses, and even generates, its own power. Our students won’t just be told about sustainable development, they will see and work within it: a living, learning place in which to explore what a sustainable lifestyle means.”

Prime Minister Tony Blair (2004) quoted on Teachernet