In the development of the design of The Grange Primary School, careful consideration has been given to sustainable performance mindful of North Lincolnshire's drive to encourage and support exemplar development and the guidance within Core Strategy and Policy documents.

Whilst the policies outline requirements for levels of renewable energy sources on industrial and commercial premises, a proactive approach has been taken in the design of the new school by improving the energy performance of the building such that it is better than the requirements of the current Building Regulations.

The key principal is that we have demonstrated that through a combination of efficient systems and a 'fabric first' approach we can achieve a significant betterment on carbon emissions when compared against the notional building in Part L2A 2013. The proposal demonstrates an approach to sustainability and energy reduction that is holistic and is driven by our brief from the EFA and ultimately by affordability in both capital cost and future maintenance.

There are also significant improvements in the energy performance on the existing building which is to be replaced, including;

- Improved building fabric
- Greater plant control and efficiencies
- Enhanced lighting control
- Energy monitoring

The betterment over Part L2A 2013 is achieved by taking a prioritised approach to designing the school, adopting the "sustainability hierarchy".

The "sustainability hierarchy" takes the approach of first incorporating measures in the design of the building form to minimise the need for active environmental control systems. Where such systems cannot be designed out completely, measures are then considered to make these systems as energy efficient as possible. Finally consideration is given to on-site renewable energy generation and other low and zero carbon (LZC) systems.

This is often paraphrased as:

**Be Lean** – make the building work passively
**Be Clean** – specify energy efficient systems & controls
**Be Green** – apply renewable technology

Following this hierarchy, the following measures are incorporated within the scheme;

**Be Lean**

- ✓ Building orientation maximises use of natural daylight within teaching spaces - maximisation of daylighting has been achieved through early stage modelling which has informed the façade design.
- ✓ High performance envelope, exceeding minimum Part L 2013 requirements and notional building performance.
- ✓ Air permeability of 3.0$m^3$/hour/$m^2$ @ 50Pa targeted.
- ✓ Location of teaching spaces adjacent to external facades maximises use of natural ventilation.
- ✓ Solar control glazing specified where required to mitigate the requirement for cooling during warmer periods due to solar gains whilst maximising daylight.

- ✓ Use of Natural Ventilation Heat Recovery (NVHR) Units to facilitate secure night purge.

**Be Clean**

- ✓ Local Ventilation Units to incorporate heat recovery (minimum 80% efficiency).
- ✓ Heating systems zoned to allow operation to be closely matched to occupancy/load pattern at any one time (including community use).
- ✓ Lighting controls will monitor the daylight contribution and will automatically dim the artificial lighting.
- ✓ High efficiency, low NOx, gas fired condensing boiler modules specified – 2No. units rated at 66% allows boiler to modularise efficiently to meet intermittent demand.
- ✓ Variable speed drives
- ✓ Inverters
- ✓ Metering - Energy will be sub-metered at each distribution board (lighting and power), and supplies to major plant (e.g. gas supply to boiler) will be metered to allow monitoring of end energy use.

**Be Green**

- ✓ The proposal has focused on providing a highly efficient fabric and services design that betters the energy performance requirements of Part L, reducing the amount of energy required to operate the building. This could be further supplemented with renewable technology installations, if required, and subject to capital and ongoing maintenance funding.
- ✓ An assessment of low and zero carbon technologies has been undertaken (see summary of feasibility analysis below) and the most appropriate technologies for this development would be a Photovoltaic Array to meet some of the electrical demand (if required).
- ✓ A photovoltaic array is not required in order to meet the Part L2A 2013 regulations due to the ‘fabric first’ approach adopted and is therefore not incorporated within the current design.
- ✓ The current design/strategy is compliant with the EFAs Facilities Output Specification and tender documentation. The solution is both sustainable and easily operated by the user.

| Feature | Comments | Status |
|---|---|---|
| Combined heat and power | Likely to be cost prohibitive. | Discounted. |
| Biomass / biofuel heating | Boilers using wood pellets or wood chips could give reasonable payback. But vehicle access for fuel deliveries, storage facilities and pollution issues would need to be considered. | Discounted. Pursuing alternative LZC technologies instead. |
| Solar thermal | Roof-mounted solar panels for hot water heating. Likely to give reasonable pay-back.<br>The maximum size of solar hot water installation would depend on the hot water load. | Discounted as school hot water usage is limited. |
| River / lake / water feature cooling / heating | Cost prohibitive - would rely on a connection to the estuary | Discounted |
| Micro-hydro-electric | No suitable body of water nearby. | Discounted |

| Feature | Comments | Status |
|---|---|---|
| Air Source Heat Pumps | Can be incorporated within the AHUs to provide 'peak lop' cooling. AHUs do not generally serve teaching spaces or areas with significant heat gain (excluding the server room) | Not beneficial based on current ventilation strategy. |
| Photovoltaics | Roof-mounted solar panels for electricity generation. Likely to give attractive pay-back period and have a good impact on the building's energy/CO2 profile. | To be incorporated (only if design strategy changes and this is required to achieve Part L requirements). |
| Ground source energy systems | Heat pump linked to vertical closed loop boreholes or horizontal buried pipework. Likely to give reasonable pay-back but high initial cost. | Less favourable than other technologies on both cost and potential contribution grounds. Pursuing alternative LZC technologies instead. Discounted. |
| Fuel cells | State of technology not yet such as to make financially or technically viable on a project of this type. | Discounted |