Carbon Management Plans and CRC in Higher and Further Education

Higher Education Institutions are required to produce and submit Carbon Management Plans (CMPs) to secure funding from HEFCE and this is likely to be extended to Further Education in the near future.

Many HE and FE Institutions also fall within the Carbon Reduction Commitment Energy Efficiency Scheme (CRC) from April 2010, providing further financial and reputational stimulus to improve energy efficiency.

There is cross party agreement on UK energy/carbon reduction targets which are established in law. Whatever the immediate to medium term financial future looks like for the UK, pressure on HE/FE to reduce CO_2 emissions is going to increase. In addition, energy prices are set to increase substantially over this decade making the case for improved energy efficiency compelling.

HEFCE's January 2010 publication *Carbon Reduction Target and Strategy for Higher Education in England* states that the higher education sector in England has agreed to commit to meet government targets for carbon reductions of 34% by 2020 and 80% by 2050 against a 1990 baseline. Against a 2005 baseline, this is equivalent to a reduction of 48% by 2020 and 84% by 2050.

The good news is that a much greater proportion of these very demanding targets can be met by improving energy efficiency than is generally realised ***and*** in a cost effective manner. However achieving savings at this level requires a much more rigorous technical and financial analysis to be undertaken than is usually the case.

It is possible for CMPs to be produced that satisfy HEFCE that are technically and financially unrealistic and unachievable. This would expose Institutions to potential future difficulty in securing HEFCE funding, a poor CRC performance and unnecessarily high energy bills.

It is essential that those organisations involved in CRC have a robust and comprehensive CMP in place before Phase 2 of the Scheme starts in April 2013 because the number of Allowances will be capped and the price of Allowances will rise from £12 to perhaps £50-£100 per tonne of CO_2.

Without a CMP that is fit for purpose it will be impossible to know how many carbon allowances to bid for at any particular price, leading to expensive errors in bidding for allowances and investing in carbon reduction measures.

Many current CMPs are:

1. based on 'walkround' energy surveys that have missed major carbon reduction opportunities and have failed to adequately quantify others so that the correct business case cannot be made for their implementation.

2. project driven and tend to incorporate a wish list of bolt on solutions that have not been adequately assessed in terms of suitability for the site taking into account the underlying inefficiencies of the existing plant and buildings. Not only can this lead to inappropriate technologies being adopted, it can also lead to the oversizing of plant. A recent Green Consultancy college survey revealed grant funded replacement boiler plant oversized by 300% and incapable of running efficiently even on the coldest days.

Two of greatest causes of energy wastage, and avoidable carbon emissions, are oversized and poorly controlled plant. Any CMP that doesn't address these issues is seriously flawed.

A CMP should identify the organisation's current carbon emissions, together with a logical series of technical and managerial steps to be taken in order to arrive at the required reduction target.

The production of a CMP that is fit for purpose – ie robust and comprehensive – requires the following to be carried out:

- ***Investment Grade Energy Efficiency Audit (see pages 3-6)***
- ***Condition Survey Of Buildings and Plant***
- ***Feasibility Study of Renewable Energy Sources***

The Green Consultancy provides CMPs for clients that can be trusted to deliver the carbon reductions required as cost-effectively as possible. We also review existing plans – annually, if required.

We have been providing energy/carbon/environmental consultancy to hundreds of colleges, including 52% of all UK universities, since 1992.

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Investment Grade Energy Efficiency Audits

1 Introduction

Green Consultancy "Investment Grade" Energy Efficiency Audits are more sophisticated and detailed than traditional "Walkthrough" energy surveys which rely largely on the visual identification of opportunities and do not measure the energy efficiency of systems.

The energy consumption or efficiency of a piece of equipment or a process cannot be measured by simply looking at it. Major opportunities with short payback periods are usually missed completely by Walkthrough surveys because they do not establish the inputs and outputs from the system or piece of equipment in order to reveal the extent of inefficiencies.

Thus, even after implementing a valuable energy saving opportunity identified in a Walkthrough survey, a process or plant could still be less than 10% efficient.

The Green Consultancy's Energy Efficiency Audits differs from Walkthrough Surveys as follows.

- Extensive use of energy analysers and other measuring and metering equipment – for example temperature probes and flue gas analysers.
- More detailed analysis of all energy consumption data relating to the systems and processes that use the most significant amounts of energy.
- Measurement of the true efficiency with which energy is being used in those systems and processes.
- Identifies, quantifies and prioritises remedial measures to improve efficiency. The aim being to raise the efficiency of a process to as close as possible to the theoretical maximum.
- Provides sufficient information for either site staff or competent contractors to be able to complete the necessary remedial works. (In some cases, additional investigative or design work may be required for solution development.)
- More time spent on site, analysing data and report writing.

2 Benefits

- Provides a sound business case for implementation by accurately quantifying savings and identifying remedial measures that are significantly more cost-effective than those identifiable through a Walkthrough Survey.

- Better opportunity identification and improved savings and payback potential leads to a more compelling case for management attention and capital investment - essential for confident bidding in the Carbon Reduction Commitment (CRC) when allowances are capped and their price rises from £12 to perhaps £50-£100 per tonne of CO_2.
- Energy consumption within specific processes can be reduced by up to 90%, sometimes without major capital investment.
- Identification of major energy saving opportunities that could not otherwise have been found, in systems such as: space and water heating, ventilation and air conditioning, compressed air, refrigeration, steam systems and boiler plant, industrial processes. *Examples of these are given on pages 3-4.*
- Provides the only sound basis for Carbon Management Plans which otherwise usually fall into the twin traps of being based on Walkthrough Surveys and/or a shopping list of projects that disregard the true priorities of the site and so cannot possibly be cost-effective or deliver the projected carbon savings.

The output from an investment grade Energy Efficiency Audit will often allow a building operator to completely revise both investment plant and carbon/energy targets, which are often unrealistically conservative compared with the available potential. Savings of 30% within two years are not unknown provided that some investment is available, but absolute savings of the order of 5% per annum are often achievable without significant investment. This often allows the development of a "virtuous circle" in energy efficiency, with reductions in building demands allowing the replacement of plant with smaller and more modern equipment that results in additional savings.

3 Scope & Methodology

1. Investigate all areas of energy and water use.
2. Identify systems (processes and/or buildings) with sufficient consumption to make significant savings possible.
3. Use all available information – such as half-hourly data, gas/fossil fuel use profile, degree-day data (heating and cooling), water consumption, building structure, occupancy, location, ventilation and internal dissipation, natural light, and production data – to determine the theoretical energy requirement and actual energy consumptions of those systems.
4. Determine the energy efficiency of each system dividing the theoretical energy requirement by the actual energy consumption.
5. Identify all significant viable energy/carbon reduction opportunities within the inefficient systems by more detailed investigations which may require the use of energy analysers, data-loggers and other measuring equipment. This may involve investigation such as:
   a) checking combustion efficiency of all significant combustion plant;
   b) assessing standing and other losses;
   c) investigating the operation and capabilities of any Building Energy Management Systems (BMS) *(Full BMS Audits are an optional extra.)*
   d) considering the scope for building fabric improvements and the

resulting opportunities for the specification of smaller and thus more cost-effective plant;
e) identifying where beneficial additional management effort should be directed, the measures necessary for improving staff performance, and additional sub-metering and other related matters.

6. Analyse the potential of renewable energy opportunities and technologies such as CHP and heat-pumps.
7. Report on all of the above, providing an accurate assessment of the potential energy/carbon reductions along with details of the specific measures required for implementation, illustrative costs and payback periods. *(Actual quotations or tendering support are optional extras – as is full project management.)*

If other services are required such as: those mentioned above; condition surveys; or others, it is possible that they can be carried out more cost-effectively by delivering them simultaneously with an investment grade Energy Efficiency Audit.

4 Energy Saving Examples

Green Consultancy Energy Efficiency Audits result in energy consumption reductions of up to 80% within specific processes and such savings may be achievable without major capital investment. Here are some typical examples.

Chilled Water Plant - Aquarium
Use of an energy analyser to profile the electricity consumption of a packaged water chiller at an aquarium identified the opportunity to modify the operating regime at no cost, reducing consumption by over 1,000kWh per day, and saving over £30,000pa.

Compressed Air – Print & Manufacturing
Detailed analysis of an air compressor at a print works identified the opportunity to reduce electricity consumption through a relatively small adjustment of pressure settings, saving over £4,000/year at no cost. At a manufacturing site, savings of over £8,000/year were identified though a no-cost modification to the compressor operating regime. This was nearly 8% of the site's electricity costs.

Refrigeration - Retail
At a retail outlet, an adjustment of display case temperatures reduced refrigeration electricity consumption by approximately 50%, and also resulted in an improvement in the quality of the product.

Space and Water Heating – FE College and University
Decentralisation of space and water heating at a College of Further Education allowed modification to the operating regime for the heating system that reduced fossil fuel consumption by 50%. At a university, similar measures produced savings of over 40%.

Steam Systems and Boiler Plant - Industrial
Detailed analysis of the operation of boiler plant on a textile manufacturing site revealed the unnecessary operation of steam heating during the weekends, at a cost of over £1,000 per day.

On another industrial site, adjustment of the boiler controls resulted in a 29% reduction in operation at no cost.

On a third industrial site analysis revealed the opportunity for cost-effective replacement of the existing boilers with two new ones with one third of the capacity. This resulted in a 40% reduction in gas consumption and also freed up valuable space in the plant room.

Ventilation and Air Conditioning - Hospital
A new hospital was suffering from excessive energy consumption. A detailed investigation of the BMS and ventilation plant identified that the LPHW valve to a frost battery was being held open continuously. Remedial works cost nothing, and saved over £12,000/year in reduced LPHW and chilled water demands.

Water Heating - General
Water is commonly heated with incredibly low efficiencies; figures of less than 5% have been established through detailed analysis. This often provides the opportunity for spectacular savings.

At an educational establishment, the decentralisation of water heating reduced fossil fuel costs from £3,000 to £300 during the summer months, with additional but smaller savings accruing during the heating season.

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