Cut the Carbon Fund

City College Plymouth case study

Title of project	**Assessing the effective use of car parks and large flat roof areas, in a general F.E. College, with alternate energy generating technologies.**	
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1. Aims of the project	The aims of the project were:
	• To investigate the effectiveness of using car parks and large flat roof areas, commonly found in older General FE Colleges, to generate energy through the use of ground source heat pumps and large solar arrays.
	• To assess the impact of such installations relation to:
	  • Overall carbon reduction
	  • The environment
	  • Sustainability
	  • Financial viability
	  • Short term disruption	

2. Situation: Identify the situation or issue that faced you	The situation we faced was a need to gain an insight into the levels of energy consumption and carbon emissions relating to the Construction Building at City College Plymouth, Kings Road Site. We also wanted to assess the feasibility of using renewable energy technologies to achieve an overall 15% reduction in carbon emissions.	

3. Task: Define the outcomes you needed to achieve	The outcomes we sought to achieve were: • To investigate the installation of ground source heat pumps using buried coils under cark park areas. • Calculating the maximum and typical levels of energy generation. • To calculate the overall reduction in carbon emissions. • Undertaking a financial analysis to determine overall viability • To assess environmental impact and the impact on present and future student population. • Investigating the installation of large Photovoltaic (PV) solar arrays on the flat roof areas of the Engineering and Construction workshop buildings. • To calculate the maximum and typical levels of energy generation. • Calculating the overall reduction in carbon emissions. • To undertake a financial analysis to determine overall viability • The production of a feasibility/case study report that can be used by other institutions and stakeholders to assess the suitability of applying this type of carbon reduction solution and can also be used as a teaching resource.
4. Actions that you took in order to achieve your plan, and your approach	• To obtain data relating to energy consumption of the Construction building by liaising with the Estates Manager and staff. • Researching background theory and application of Heat Pump Technology and PV Technology • To understand the design requirements for Heat Pumps and PV Technology and the use of associated calculations and to develop associated teaching resources. • Developing teaching resources from above. • To gain an understanding of the thermal modelling of building and the calculation of “U” values for the Construction Building with teaching resources to be developed • Calculating the levels of energy to be produced by renewable

	energy sources • To calculate carbon reduction levels • Calculating possible cost /energy savings • To develop designs for PV installations and to achieve required results • Developing designs for Heat Pump Installations to achieve desired results. • To develop spreadsheets to aid the design process • Creating spreadsheets for financial analysis • The Production of a complete feasibility report, an end of project report and a case study
5. Results that you obtained including: • **practical achievements (what's in place)** • **quantitative change (statistics etc)** • **qualitative change (behaviour, culture, thinking, attitudes etc)** • **what the organisation(s) have learned from this** • **what it means for learners**	• Practical achievements (what's in place) A feasibility report which can be used to assess the viability of the installation of renewable energy technologies together with teaching materials which can be used for staff training; and for teaching resources and spreadsheets for design and financial calculations and scenario analysis. • Quantitative change (statistics etc) The levels of building energy consumption and carbon emissions (CO_2) are now known: Predicted electricity use: 257499 kWh/year Predicted fossil fuel use: 161568 kWh/year Predicted total energy: 419067 kWh/year **The actual CO_2 values are:** Electricity: 108665 kgCO2/kWh Gas: 31344 kgCO2/kWh The total CO_2 value is 140009kgCO2/kWh For a 15% reduction in carbon emissions for both gas and electricity, the following energy levels would need to be

generated from renewable sources:

Electricity 38625 kWh

Gas 24235 kWh

These energy levels can be supported by the use of a 400 square metre PV array mounted on the roof of the Construction Building and a Ground Source heat pump with a matrix of boreholes situated in the car park area adjacent to the Construction building.

- Qualitative change (behaviour, culture, thinking, attitudes)

  1. We gained a better understanding of renewable technologies, their use, application and limitation.
  2. We also now understand the cost implications and the effect on payback periods when energy costs rise.
  3. We affected a cultural change whereby staff and students have a better understanding of the need to reduce carbon emissions and the impact if this is not done.

- What the organisation have learned from the project

  1. A more detailed knowledge of our own environment and the amount of energy consumed.
  2. A better understanding of renewable technologies and how this can theoretically be used to reduce the carbon footprint of a large Construction Building within a Further Education College.

- What it means for learners

  1. We created a plan to protect their future environment by addressing the need to reduce carbon emissions.
  2. Staff are now better informed and they can be trained in the theory and application of renewable technologies.
  3. There is now an improved understanding to support the development of an exemplar Energy Centre within the Construction Building.

6. What made the project a success? What were the key ingredients?	Having clearly defined outcomes and goals to achieve contributed significantly to the success of the project. This enabled staff to focus on the job in hand and for them to research and resource appropriate information more effectively.		
7. Any resources or tools produced by the project	The resources we produced for the project were: • A detailed 90-page feasibility study with appendices that can be used as teaching resources covering the theory, design and application of renewable technologies. • Spreadsheets with in-built formulae for calculating design parameters, energy levels, financial data and scenario analysis.		
8. Total costs of the project	LSIS funding	Match funding	Total funding
	£8000	£4333 additional staff time £3500 stake holder sponsorship mainly monitoring and control equipment.	£15833

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