

## **CARBON EMISSION REDUCTION INITIATIVE**

### **Review of Post Project Evaluations: 2011-2013**



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## **1.0 SUMMARY**

The Carbon Emission Reduction Initiative (CERI) capital stream was established in 2011/12. This initiative was undertaken as part of the Departmental response to both the Cross Departmental Working Group on Climate Change requirement to help meet the Executives Priorities for Government (PfG) of reducing Greenhouse Gas emissions in line with the UK Governments requirements for carbon emission reduction under the Climate Change Act (2008) and the introduction of the Carbon Reduction Commitment in April 2010 which placed mandatory requirements on government departments and large energy consuming organisations to pay for their carbon emissions through purchase of carbon allowances.

The aim of this initiative was to aid the improvement of the energy efficiency of the Health, Social Care and Public Safety estates through a carbon emission reduction approach to improving energy performance.

Analysis of the Post Project Evaluations (PPE) received from the HSC organisations who received funding from the initiative for the first two years of the scheme (2011-2013) indicates that recurring annual energy savings of 12.5million kWh's (approximately 1.6% of annual total energy consumption) equating to carbon savings of 5481.5 Tonnes (approximately 2.4% of emissions generated in 2010/11) are being achieved. The annual recurring revenue savings are £1.3m (approximately 3% of annual energy spend) achieved with a capital investment of £5.72million.

This review of the CERI PPE's indicates that significant savings in revenue can be achieved from appropriate investment in energy and carbon efficiency projects.

## 2.0 BACKGROUND

In April 2010, the Carbon Reduction Commitment (CRC) Energy Efficiency Scheme came into operation, aimed at improving energy efficiency and delivering carbon emission reductions from large energy consuming organisations and government departments to assist the UK in meeting its mandatory carbon reduction targets defined in the Climate Change Act 2008.

Under the rules of the CRC Scheme, HSC Trusts are mandated to participate and pay for their carbon emissions, in the form of carbon allowances, based on their energy consumption.

Further, the Northern Ireland Executive in its Programme for Government (PfG) in 2011 confirmed a commitment to achieving a 35% reduction in Greenhouse gas emissions for Northern Ireland by 2025, based on 1990 levels. The DHSSPS in the setting of policy and strategic direction for its ALB's in the provision of health and social care is required to have due regard to this commitment.

With HSC Trusts collectively set to incur an annual cost of around £2m from participating in the CRC scheme and the need for the Department to set policy and direction to deliver on Executives PfG commitments, Health Estates Investment Group established the Carbon Emission Reduction Initiative (CERI). The aim of CERI was to refocus Health, Social care and Public Safety (HSCPS) organisations to improve the energy efficiency and performance of their estate through a carbon emission reduction approach with the objective of realising cost savings that could be directed to frontline patient care.

The CERI capital stream was established in 2011, as part of the regional HSCPS Capital Investment Programme and together with other potential sources of funding such as Invest-to-Save initiatives and Maintaining Existing Services programmes, was directed at the improvement of the performance of the existing estate.

In support of this initiative, HEIG issued guidance '*Carbon Emission Reduction & Energy Efficiency: Healthy budgets through further energy efficiency in Health, Social Care and Public Safety*'. This guidance focussed on improving energy

performance and highlights many of the cost effective energy efficiency opportunities available to HSCPS organisations.

This report is an analysis of the outcome of the CERl initiative based on PPE information provided by the HSC organisations who received funding under the initiative for the years 2011-2013. Over this period, £7m was originally identified and allocated to HSC Trusts and other bodies for CERl projects however not all projects proceeded and the capital expenditure recorded by Trusts under the CERl capital stream in 2011- 2013 amounts to £5.8m.

### **3.0 METHODOLOGY.**

HSC organisations were invited by HEIG on an annual basis to submit bids for funding of CERI projects. The bids were required to meet the following requirements:-

- Individual project costs below delegated capital expenditure limit of £500k.
- Projects and expenditure to be completed in the financial year of allocation.
- HSC Trust approved business cases to be in place before expenditure incurred.

The assessment of the bids was based on energy efficiency, carbon reduction and additional non-monetary benefits to the HSC estate.

#### 4.0 PROJECT REVIEW AND ANALYSIS.

An overview of the range type and nature of projects undertaken by HSC bodies in the first two years of the initiative indicates that a total of 46 separate projects were undertaken. These individual projects can be grouped under 17 different project types. The proportion of capital allocation to each project type is shown in figure 1.

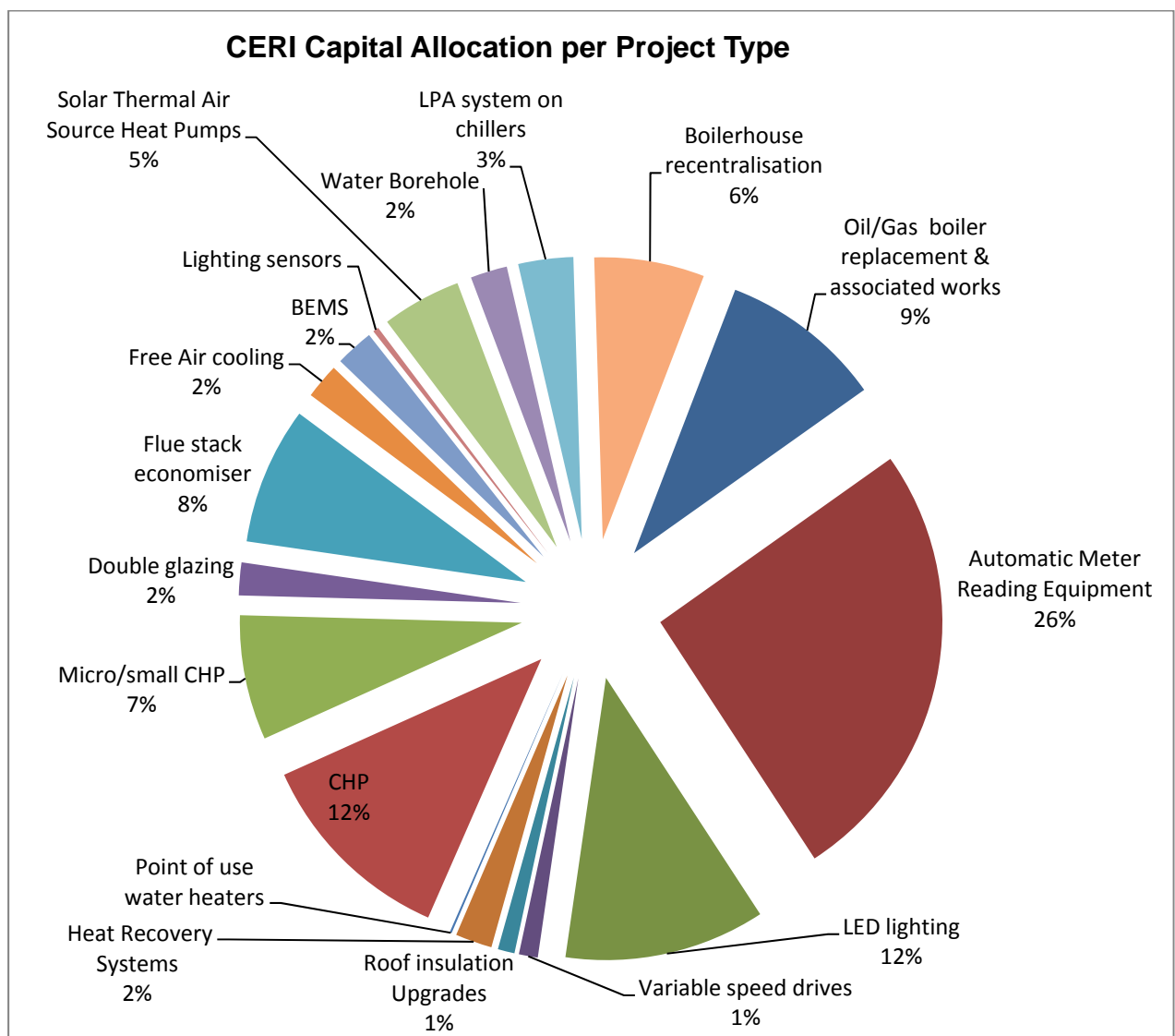


Figure 1 – Proportion of capital allocation per Project Type

The greatest capital expenditure was allocated to Automatic Meter Reading Equipment, accounting for approximately 26% of the total expenditure on reported

CERI projects. This was closely followed by LED lighting installations (12%), Combined Heat and Power (12%) and Oil to Gas Conversions (9 %).

As would be expected given their proportion of capital expenditure these projects have provided the greatest proportion of the monetary and non monetary benefits i.e. revenue savings and CO2 emissions reduction achieved by the initiative. This is indicated in figures 2 and 3.

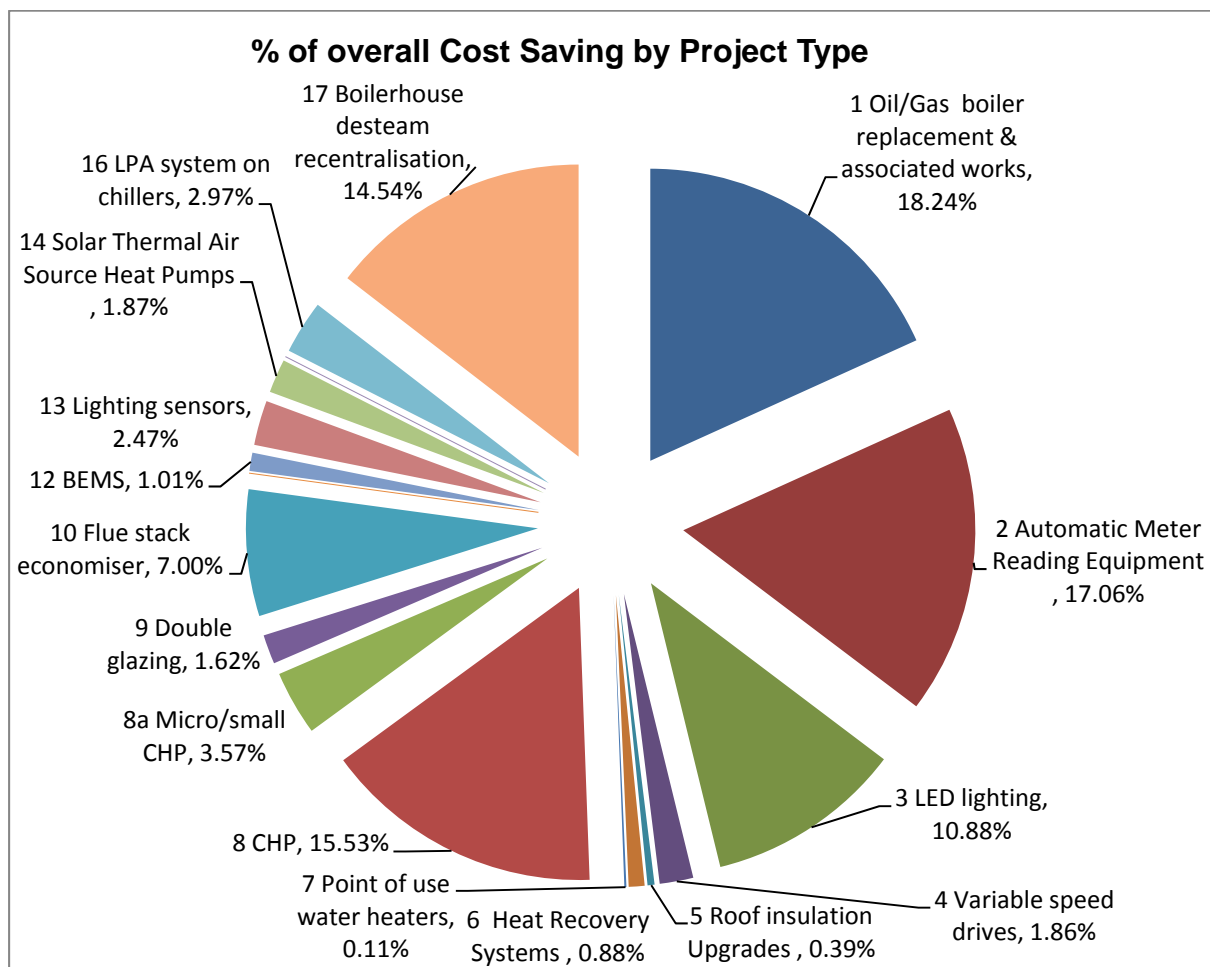


Figure 2 – Proportion of savings by Project type.

N. B. Water borehole and free air cooling not indicated due to insufficient data on level of saving achieved.



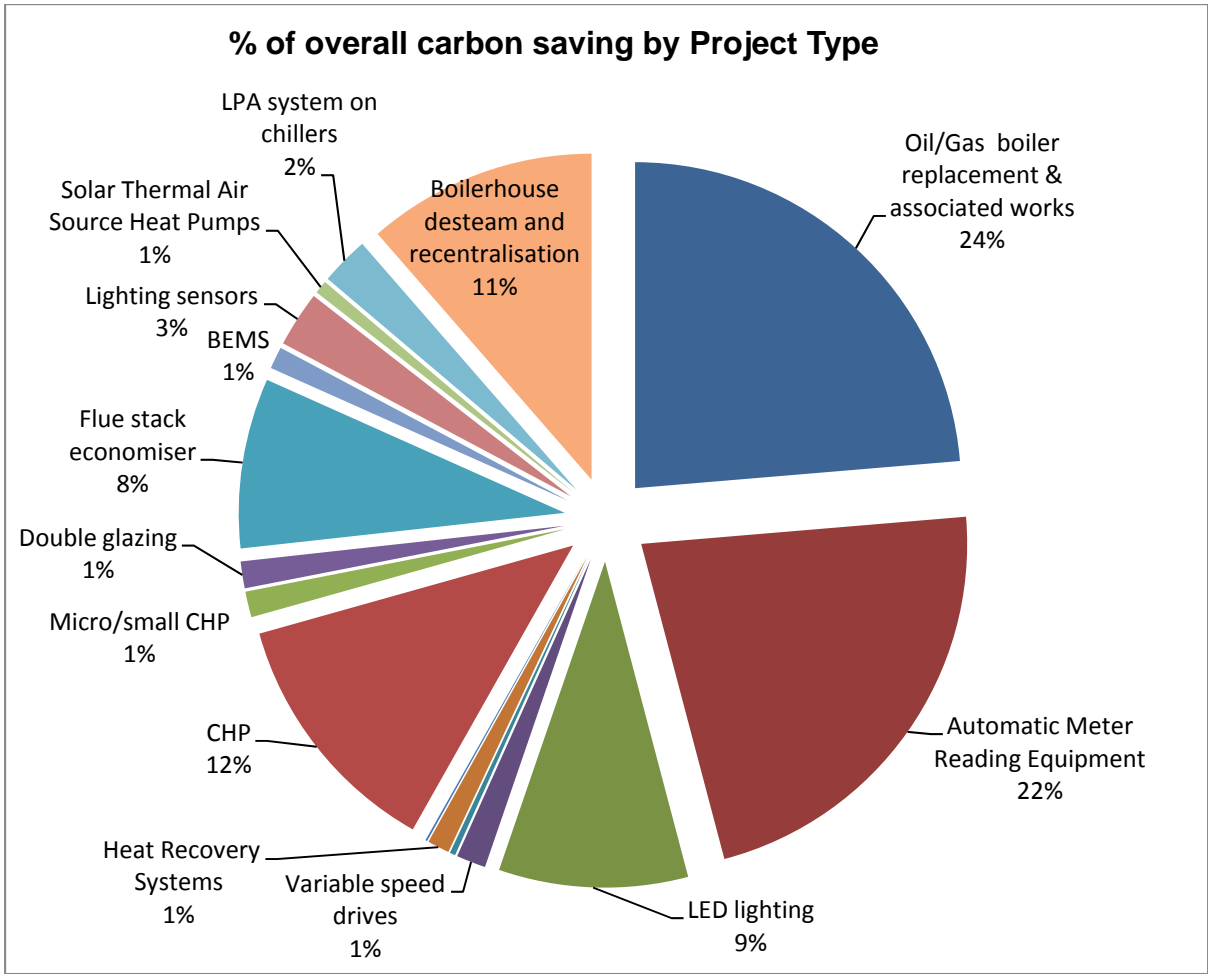


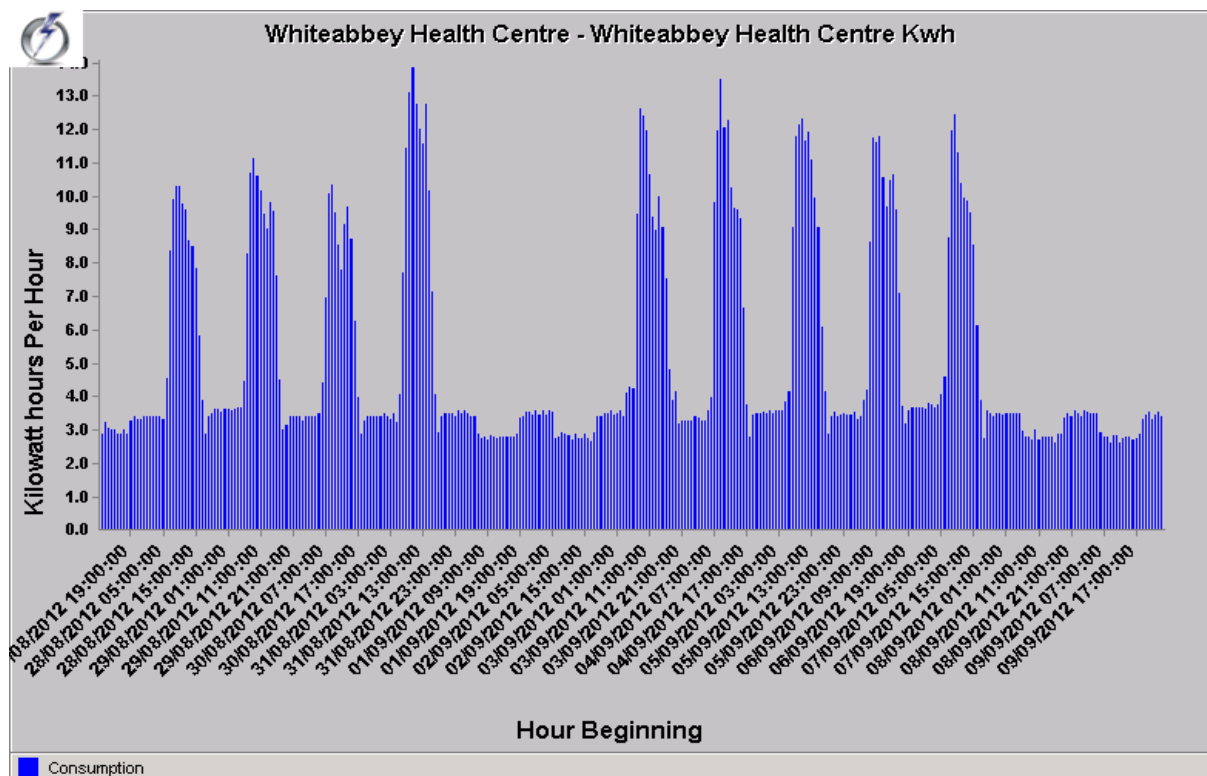
Figure 3 – Proportion of CO2 Saving per project type

N. B. Water borehole and free air cooling not indicated due to insufficient data on level of savings achieved.

## 5.0 SPECIFIC PROJECT INFORMATION

### Automatic Meter Reading.

The recent NHS Energy Efficiency Fund Final report commissioned by the DoH (England) highlighted the benefit of detailed data collection, analysis and recommended that NHS Trusts being enabled to collect and analyse this data is required and prior to the start of CERI initiative, HEIG had previously advised HSC Organisations of the benefit of this technology.



As a result, Automatic Meter Reading Projects were instigated and completed across all of the five HSC Trusts as part of a regional identification of the need to accurately measure, monitor and target energy consumption in the health estate. While the installation of the automatic metering does not automatically generate savings, the systems installed across the Trusts now provide the Estates Energy Managers with the necessary data, information and trends that is enabling them to identify savings and eradicate wasteful practices. The Trusts have subsequently reported savings of 4 million kWhs from good energy management practice with the use of this system, generating revenue savings of £220k with an environmental benefit of 1,200 Tonnes

of CO2. Further non-monetary benefits have also been achieved through the ability to generate accurate cost information on actual energy use removing estimated billing and delivering tight budget management control for HSC Trust Directorates.

## LED Lighting

LED Lighting technology has improved greatly in recent years and the Trusts have



utilised the CERI initiative to adopt this highly efficient technology into their estates to deliver immediate savings on both energy and carbon emissions. Trust are also reporting that the installations are proving very successful with staff and service users through

enhanced lighting conditions within the work and service user environment and that there are reduced maintenance charges being realised due to the long life lamps.

LED lighting projects are currently providing savings of 954000kWh and 514 tonnes of CO2 with recurring revenue savings of £140k.



Above- Daisy Hill  
Reception -SHSCT

Left -Pennybridge  
Area Stores- NHSCT

## **Combined Heat and Power (CHP)**

CHP is a proven technology however with a high initial capital cost for the plant. The expenditure under this heading is mainly attributable to one project carried out at Musgrave Park Hospital. This scheme alone is providing approximately 700,000 kWh on energy saving whilst also contributing on carbon savings of 625 tonnes. The project will pay back in 2.6 years from completion.

## **Boilerhouse Desteaming and Recentralisation**

In order to realise the benefits of CHP at Musgrave Park Hospital, the Belfast Health and Social Care Trust identified the requirement for a sufficient load requirement for



the heat produced by the CHP plant.

Innovative thinking identified a solution that took into account desteaming of plant, an already proven energy and cost saving approach and also for recentralisation of some boilerhouses to provide sufficient load and maximise the CHP benefits. This one-off project highlights the benefits of innovative thinking and assessing all options to realise greater savings in the long term. The BHSCT Trust is reporting that desteaming aspect of the project is providing equivalent savings being achieved by the CHP plant and the combined project providing a 2.5 year

payback.

## **Oil to Gas Conversions**

All HSC Trusts completed projects involving oil to gas conversions that have proven to be very successful in terms of providing carbon and cost savings. The CERF funding coupled with expansion of the natural gas network provided opportunities for HSC Trusts to continue to upgrade their estate to utilise cleaner, cheaper and more

environmentally friendly fuel source. The use of natural gas provides a saving of over 25% in CO2 emissions per kWh compared to oil.

The figures below indicate the relative spend and carbon savings. From a number of the PPE reports submitted by HSC organisations, it was clear that these projects enabled boiler plant to be modernised through the installation of modern high-efficiency boilers to gain maximum benefit from the expenditure.

	CERI Fund	%CERI Spend	Overall Spend	kWh energy saved	Tonnes of Carbon	Cost Saving	£/Tonne Of CO2	£/kWh	VFM Over 5 Years
Oil to Gas boiler replacement	554773	9.34%	578433	1233705	1297.5	234611	445.81	0.47	2.03

Of the remaining projects, the following innovative projects incorporating new technology have been implemented.

- Installation of Liquid Pressure Amplification system on chillers at Altnagelvin Hospital designed to reduce energy consumption of the main system compressors and improve system efficiency accordingly has been reported by the Western HSC Trust the project objectives were met successfully and the associated reduction in energy consumption of 26.5% achieved with a return on investment being achieved within 3 years from project completion.
- Digital Lighting Sensors – Movement and dimming sensors were installed throughout the New Downe Hospital. The Trust has reported that they were quick to install with immediate savings being realised. The project is saving approximately 151 Tonnes of CO2 with revenue savings in the region of £32K per annum.



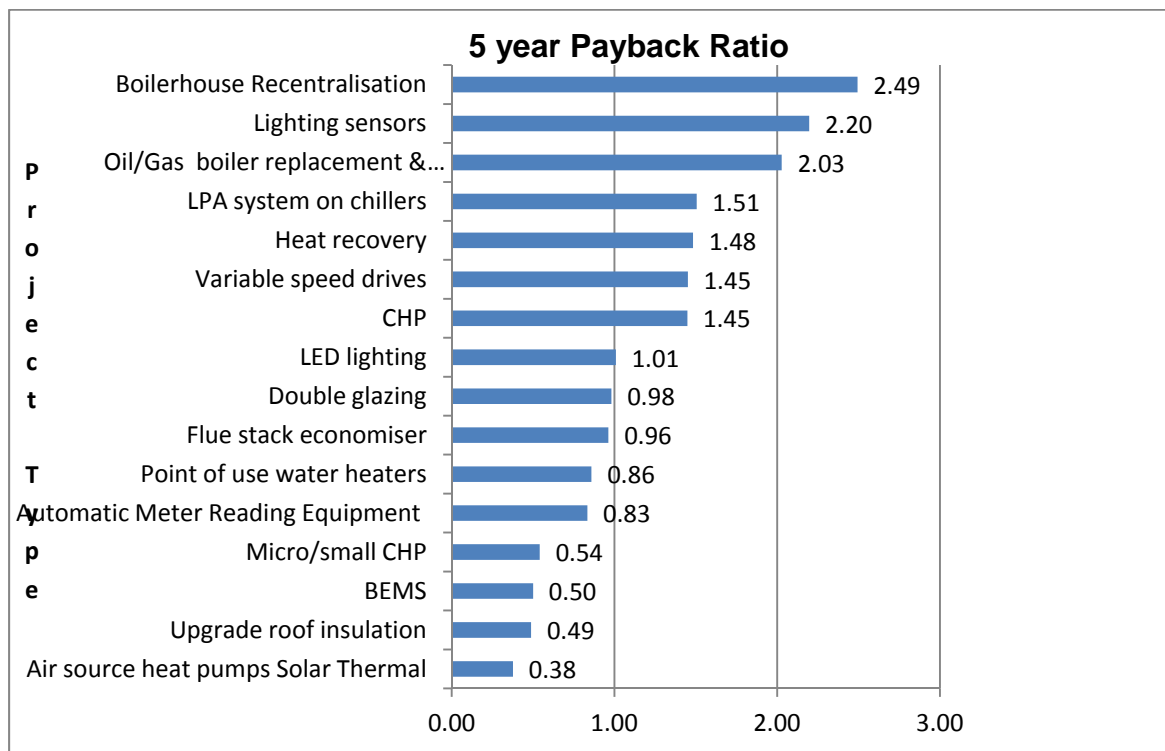
- A Flue stack economiser, enabling all the heat that would have normally been expelled to atmosphere via the flues being reclaimed and utilised was installed at AAH hospital at a cost of £467241. At project concept stage this project was estimated to provide over £4million kWh of gas energy however due to operational problems on other linked systems and a reduction in hot water demand at the AAH the scheme did not fully achieve estimated savings in the first year of operation. Currently however the Northern Trust is reporting that

energy savings of 2.6million kWh and 462 Tonnes of CO2 are being achieved providing a project payback in 5.5 years. These savings also have offset the heating energy consumption of the recent A&E extension to the hospital.

## 6.0 BENEFITS

Figures 4 and 5 indicate the value for money of each of the project types undertaken in terms of meeting a five year payback and the average cost for each of the project types in terms of saving a tonne of CO<sub>2</sub>.

It should be noted that the PPE reports mention that some projected savings on projects may not have been fully quantified and this is due to the absence of individual metering at some locations and other on-site development works that were ongoing that have affected the overall energy requirements of the site.

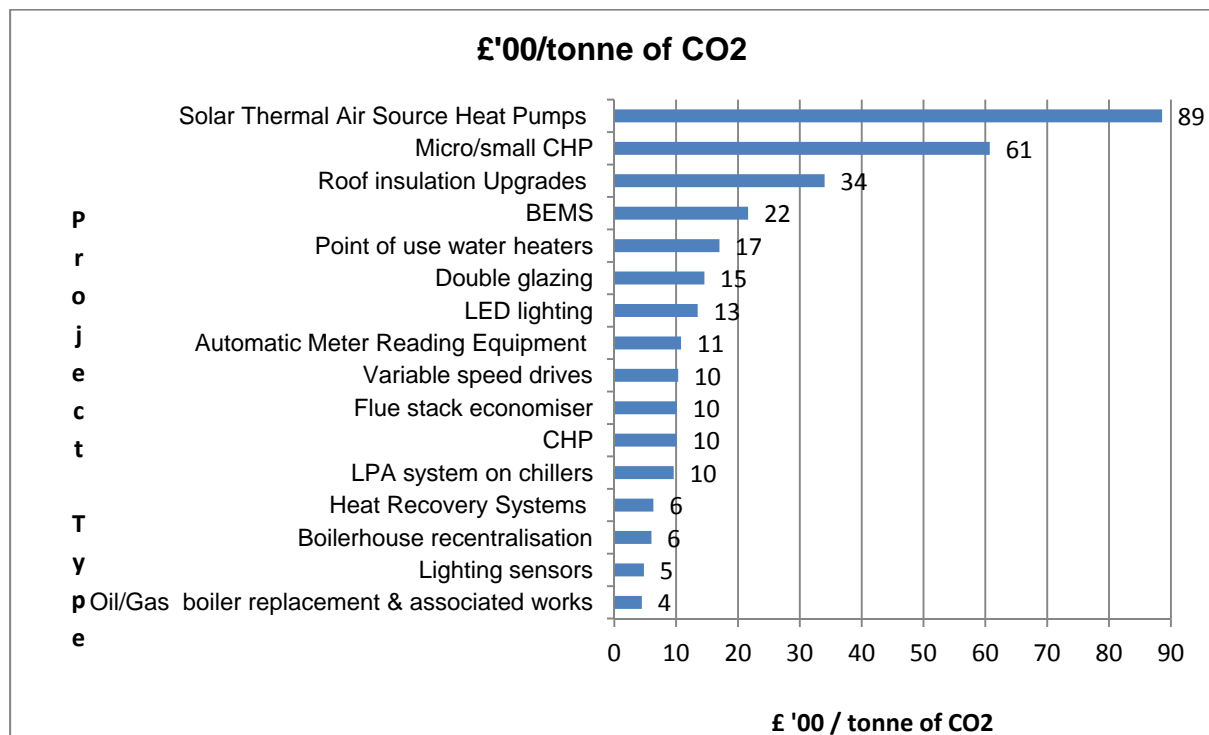


**Figure 4 – 5 year Payback Ratio**

In considering this data, the larger the value indicates the quicker the payback against a base of five years. It has generally been the accepted criteria for public sector organisations that “invest to save” projects should provide at least a five year return on investment. However while not all the individual projects achieved this target it is recognised that this criteria was not always achievable particularly if the project involved the replacement/upgrade of end-of-life equipment. In these cases it

is recognised that additional non-monetary benefits through reduction of risk associated with aging plant is being achieved along with the other benefits of CO2 emission reductions

PPE reports indicate that for the solar thermal project (the only renewable energy project undertaken in the initial two years of the scheme) and micro CHP installations have only recorded partial savings are being achieved due to other on-site operational issues. Other projects, including the Building Energy Management Systems (BEMS) and insulation upgrades, are providing additional non-monetary benefits due to the age of the plant. However on an overall basis, the average payback for all projects funded through CERl between 2011-2013 is five years.



**Figure 5 – cost per tonne of CO2 reduction.**

As with those projects providing the most value for money, the same projects have also been identified as providing the best value for saving one tonne of CO2. The figures received indicate that for the project types completed, the average cost of investment required to save one tonne of Carbon is approximately £1000. The lowest cost for saving a tonne of CO2 being £445 applicable to the oil to gas conversion projects. This would not be unexpected given that depending on the grade of fuel oil, automatic savings on emissions of between 22-28% kg CO2 can be



achieved for an energy unit of gas against an energy unit of oil. The expansion of the gas network into the west of the province will provide opportunities for further projects of this nature.

Overall, the PPE reports indicate energy savings of 12.5m kWh's equating to carbon savings of 5481.5 Tonnes and cost savings of £1.3m. This equates to a 1.6% reduction of energy consumption, 2.4 % reduction of CO2 emissions based on 2010/11 data and approximately 3% savings on annual revenue spend on energy.

With these CO2 savings, the Health, Social Care and Public Safety Estate is indicating a 36.7% reduction in CO2 levels from energy use based on 1990 levels. This will continue to contribute meeting the NI Executive target set in the Programme for Government (PfG) to reduce GHG emissions by 35% below 1990 levels by 2025, as set out in Public Sector Agreement (PSA) 22.

## 6.0 CONCLUSIONS AND RECOMMENDATIONS

With the main driver for the initiative being the mitigation of carbon dioxide emissions and realising revenue savings through energy performance improvement, the post project evaluations have indicated that the first two years of the initiative has been successful with completed projects providing a 2.4% reduction in CO<sub>2</sub> emissions when compared to 2010/11 levels. A reported £1.3 million ongoing revenue saving releases additional funding for frontline service delivery.

Whilst this financial saving is identified, the external forces affecting energy consumption and energy costs means that continual ongoing close management and control of energy is required to maintain this position and ensure that resources are utilised effectively. This can now be carried out more successfully with the assistance of the automatic metering that is providing up to date and current data, leading to elimination of wasteful practices.

The funding, realisation of savings and other non-monetary benefits has also provided the driver for HSC Estates Operations and Energy Managers to critically look at energy consumption and management strategies within their estate and has pump primed the further identification of revenue saving projects based on carbon reduction and energy efficiency.

However, the data from PPE's indicates that saving on carbon dioxide emissions through reduction in energy consumption by energy efficiency projects will cost on average £1000/ tonne of CO<sub>2</sub>. Further lower cost carbon savings may be achievable with the expansion of the gas network into the west of the province and HSC organisations in this area should consider planning for oil to gas conversion projects to ensure that any necessary business cases are in place.

The projects completed in the first two years have been a mixture of innovative and proven energy efficient technologies. The nature and complexity of the engineering infrastructure required for a health estate has provided opportunities for the installation of technologies such as CHP, flue stack economisers and Liquid Pressure Amplification – there are a limited number of facilities where these projects can be implemented.

Going forward, it is likely that relatively straightforward technologies such as lighting upgrades and fabric improvements will continue through ongoing estate refurbishment projects as these are recognised and proven practice. Energy managers should communicate to their project managers and design teams successful technologies for inclusion in schemes. However the opportunity for large scale innovative projects is only likely to be available for schemes that would require integration within the strategic planning for the HSC and Public Safety Estate through major capital development projects.

The feedback received from HSC Trust Energy Managers would indicate that the availability of ring-fenced capital monies for implementing proven technologies in energy efficiency and carbon reduction projects has enabled the successful realisation of the projects and that it is unlikely that the projects would have been successful in any competition for general capital funding.

Due to the challenging budgetary position for 2015/16, further funding for CERI was not identified and this situation is likely to continue for the foreseeable future. In light of this situation the CERI capital stream has been removed from capital priorities planning.

This review of the PPE's however indicates that significant savings in revenue can be achieved from appropriate investment in energy and carbon efficiency projects.

The option for financing projects by borrowing from financial institutions exists and, if selected, means that the project would be financed from revenue rather than capital. In line with the NI guide to Economic Appraisal, the recommended procurement route for any project in terms of financing would be the route that delivers best value for money and this assessment would need to be undertaken at the project business case stage.

It is noted however that in practice it is usually difficult to satisfy best value for money via borrowing unless efficiency gains arise in the delivery of a project because of the introduction of externally raised debt.

This report covers the first two year if the scheme and further investment was undertaken in 2013-14 and 2014- 15. PPE evaluations will be requested for these years in 2016 allowing for sufficient time for monitoring and recording of the savings from the schemes.