North East College Scotland

Authority Data Pack Report
for
Scottish Funding Council

[redacted]
Assistant Project Manager

Turner & Townsend
Osborne House
1 Osborne Terrace
Edinburgh
Scotland
EH12 5HG
United Kingdom

t: +44(0) 7736 117837
e: [redacted]
w: turnerandtownsend.com

Colleges Energy Efficiency Pathfinder
Scottish Funding Council

24 March 2016

Contents

1	Executive Summary	1
2	Baseline Information	4
3	Authority's Minimum Requirements	6
4	Project Register	11
5	Energy Conservation Services Register	13
6	Summary of Buildings and their Services	15
Appendix 1 - Building Drawings and Site Plans		19
Appendix 2 - Condition Survey Reports		20
Appendix 3 - Carbon Management Plans		21
Appendix 4 - Asbestos Survey Reports		22
Appendix 5 - Building and Energy Data Sheet		23
Appendix 6 - Site Visit Report		24
Appendix 7 - Asset Register		25
Appendix 8 - Project Register		26

Rev	Originator	Approved	Date
1.0	[redacted]	[redacted]	30/03/2016

F:\EDI\INFRA\1. LIVE JOBS\INF12515 SFC COLLEGE CATALYST THE SCOTTISH GOVERNMENT\3.0 DATA GATHERING\AUTHORITY DATA REPORTS\NORTH EAST COLLEGE SCOTLAND\REPORT\AUTHORITY DATA PACK REPORT - NORTH EAST SCOTLAND COLLEGE V1.0.DOCX

1 Executive Summary

This report outlines the process undertaken by Turner & Townsend to establish a high level summary of key areas for investigation into the implementation of Energy Conservation Measures to save energy within the North East College Scotland estate utilising the Scottish Government's NDEE Framework.

The process undertaken followed the following steps:

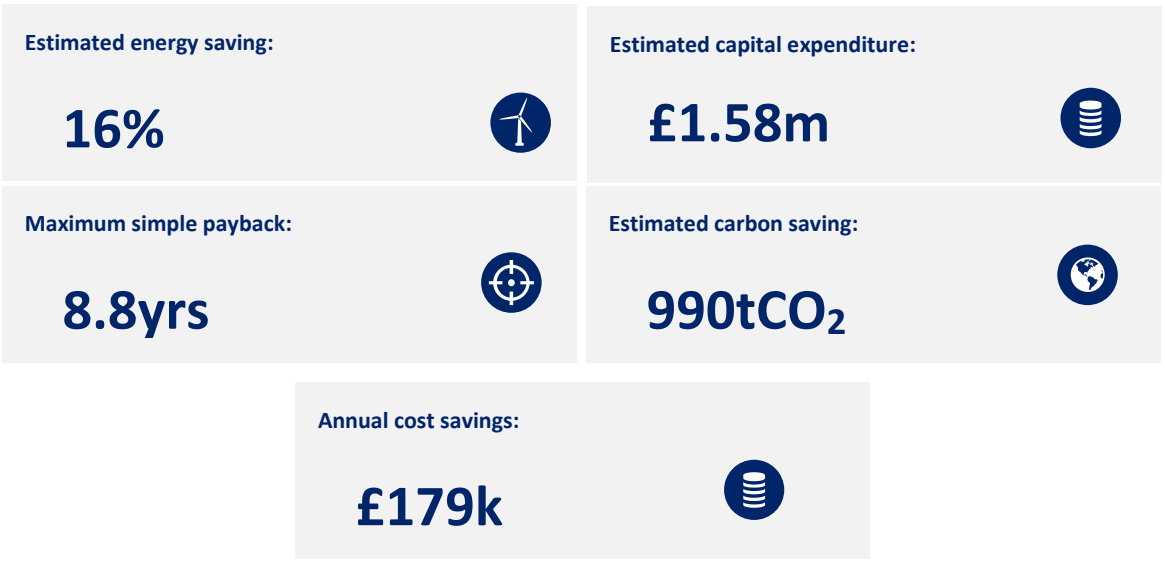
1. Data Gathering
2. Desktop Energy Assessment
3. Site Surveys
4. Project Register Development

The initial step was to gather appropriate data that could be used to investigate the energy performance of the North East College Scotland estate and the potential energy saving against the benchmark which in turn leads to the implementation of Energy Conservation Measures. Data required to be gathered included:

- Campus Name
- Building Name
- Building Usage including number of users, usage hours etc.
- Fuel Unit Costs
- Type of Tenure
- Heritage Status
- Floor Areas
- Year of Construction
- Refurbishment Details
- Energy Usage Data
- Energy Performance Certificate
- Metering Details

Following the data gathering exercise Turner & Townsend completed a desktop energy assessment of the College, at the building level, to identify estimated capital expenditure, return on investment and energy, carbon dioxide and financial savings. The output of this analysis can be seen in Figure 1 but in summary it is estimated that an energy saving of **16%** is possible at the College, equating to a saving of **990tCO_2**, using a variety of ECMs requiring an estimated capital expenditure of **£1.58m** with a maximum payback period of **8.8 years** with an annual saving of approximately **£179k**.

Figure 1 – Benchmarking Output – North East College Scotland estate



To ensure the robustness of the Desktop Energy Assessment site surveys were carried out at each of the sites within the North East College Scotland estate which have led to the identification of a number of Energy Conservation Measures that could be installed to meet the energy saving target identified. A selection of the projects specified in the CMP are: installation of roof insulation, double glazing and installation of wall insulation.

It should be noted that the list of ECMs identified in the Project Registers are only as a recommendation and in no way exhaustive. A final list of ECMs will need to be developed by the selected Framework Contractor in order to meet the performance standard identified in the desktop energy review.

The following categories shown in Table 1 of Energy Conservation Measure have been considered.

Table 1 – ECM Categories

ECM Cat. Ref.	ECM Cat Name	ECM Category Description
01	Automatic Meter Reading (aMR) systems	Energy consumption measurement, logging, communication & reporting systems.
02	Passive Measures (Passive)	Passive renewable energy technologies and measures, e.g. solar shading
03	Building Fabric (BF)	Building fabric thermal performance improvements, such as loft insulation.
04	Heating, Ventilation & Air Conditioning (HVAC)	Measures to improve energy efficiency of heating and cooling sources, distribution systems, heat emitters etc.
05	HVAC Controls	Building energy management systems and other HVAC controls.
06	Lighting and Lighting Controls (Light & Cntrl)	Artificial lighting systems and their control.
07	Electrical Equipment and Distribution (Electrical)	Efficient motors and other equipment; voltage management etc.
08	Low and Zero Carbon Technologies (LZC)	Biomass, solar thermal, heat pumps, photovoltaics, combined heat and power etc.
09	Specialist Systems (Specialist)	Swimming pools, lifts, catering, fume cupboards, process energy use etc.
10	Water Management (Water)	Management of water using devices, such as taps, WC cisterns, urinals etc.
11	Others (Others)	ECMs that do not fit into the above categories.

The Project Register for North East College Scotland can be identified within Appendix 8 of this report.

2 Baseline Information

North East Scotland College has a large number of buildings split over its 6 campuses: Gallowgate (Aberdeen City), Altens, Gordons, Clinterty, Fraserburgh and Peterhead.

- The Gallowgate campus has three buildings constructed in the 1960s and '70s. The tower block and east block benefitted from a refurbishment in 2014 including replacement glazing and overcladding. This has a GIFA of 9049m^2
- The Altens Campus has five buildings with the majority built in the 1970s other than Block F which was built in 1999. Block A received an internal upgrade in 2015 and Block B/C had a partial roof refurbishment. This has a GIFA of 2895m^2
- The Gordons Campus consists of a sports and leisure facility which was built in 2005. There are a number of buildings at the Gordons campus that are due to be demolished or are mothballed, these are: Block A, Guard House, Coffee Bar, Boiler House, Block C and Block D/E. This has a GIFA of 2580m^2
- The Clinterty campus was built in the 1970s with the Aset offices roof and lighting upgraded in 2015 and the two bungalows benefiting from internal refurbishment in the same year. The residential block and Portacabins at the campus are currently not in use. This has a GIFA of 15293m^2
- The Fraserburgh campus was built in 1974 and received a complete upgrade in 2012. The campus also has a nursery associated with it which is situated within a Portacabin on site. This has a GIFA of 627m^2
- The Peterhead campus, Scottish Maritime Academy, was built in 1995 and benefited from an internal refurbishment in 2012. This has a GIFA of 9049m^2

Below are a number of photographs to detail the current condition of the buildings.

Figure 2 - Gallowgate - Main Plantroom Pumps *Figure 3 - Altens Campus - Photovoltaics*

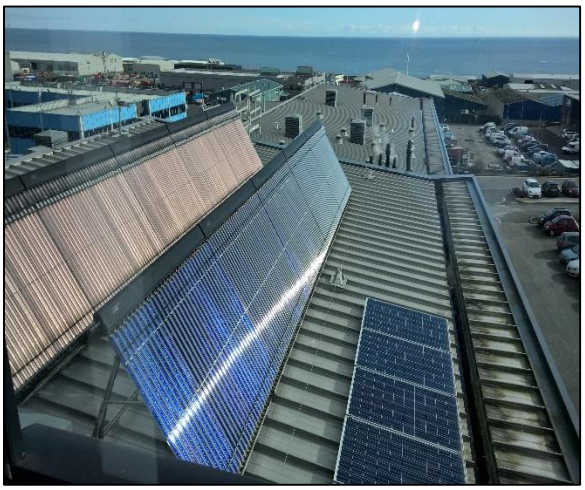


Figure 4 - Clinterty - Hot Water Cylinder

Figure 5 - Gordon Campus – Gas Fired Boilers

Site specific information presented within this authority data pack was gathered through site visits carried out the 1st and 2nd of March. The information is based on what was observed during site visits, discussions with Facilities Managers and through access to Operation and Maintenance (O&M) manuals, asset registers or building management systems (BMS).

The following information is available as appendices to this report:

Appendix 1 – Building Drawings and Site Plans

Appendix 2 – Condition Survey Reports

Appendix 3 – Carbon Management Plans

Appendix 4 – Asbestos Survey Reports

Appendix 5 – Building and Energy Data Sheet

Appendix 6 – Site Visits Report

Appendix 7 – Asset Register

Appendix 8 – Project Register

3 Authority's Minimum Requirements

Utilising the baseline data information gathered and in order to facilitate the process of identifying potential scope for energy savings across the College estate Turner & Townsend have completed a desktop energy assessment, at the building level, to identify estimated capital expenditure, return on investment and energy, carbon dioxide and financial savings.

3.1 Benchmarking approach

3.1.1 Energy and carbon savings

Turner & Townsend's benchmarking approach is a desktop based assessment which establishes current energy consumption per metre squared floor area (kWh/m2) and compares this against a blend of industry benchmarks including CIBSE's TM46, Carbon Trust Energy Benchmarks and Display Energy Certificates (DECs) as well as Turner & Townsend's own in-house data resources.

Where a building is performing above expected ranges, a proportion of the difference between actual and expected performance is calculated providing the estimated energy and carbon savings that are realistically achievable.

Where a building is performing below expected ranges, a proportion of expected energy savings is still calculated (albeit to a lesser extent) as it is recognised that energy benchmarks include old, inefficient buildings reflective of the overall building stock.

This does not involve detailed design work, which is considered at a later stage. However, if specific plant or systems are known to be inefficient/at end of life we are able to adjust the benchmarking calculations to recognise the increased availability of energy savings.

3.1.2 Capital expenditure

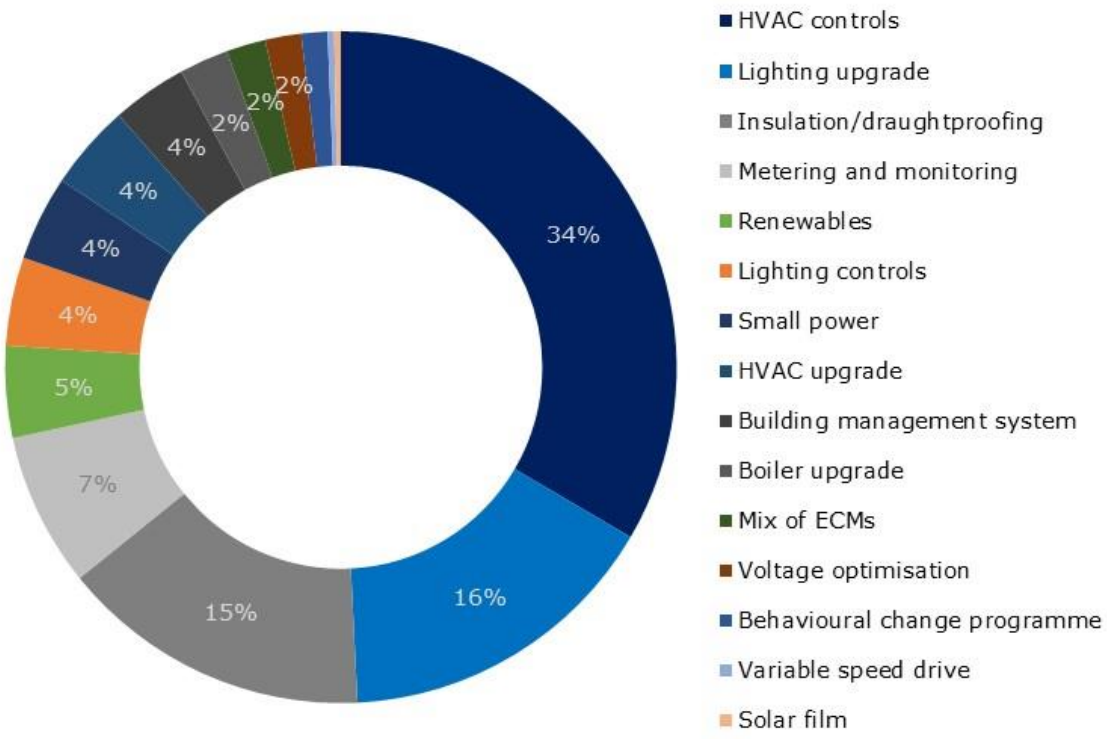
Through Turner & Townsend's experience of implementing energy conservation measures we have compiled an extensive database of project costs from the supply chain. With over 3,000 individual energy conservation measures, across a wide range of technology types, we are able to calculate the capital expenditure required to mitigate one tonne of carbon dioxide according to building type (e.g. school, office, leisure centre etc.).

Having established estimated carbon savings (Section 3.1.1); average capital expenditure costs can be applied to each building to establish the total indicative capital expenditure.

It is important to emphasise that estimated capital expenditure is based on a blend of energy efficiency measures (see Figure 6). This has the benefit of taking into account technologies with both short and long term payback periods providing flexibility during the later design stage.

Capital costs quoted in this report are at current day prices. This excludes preliminaries, VAT, client adviser fees and any specific client contingency/functional costs.

Figure 6 – Typical energy conservation measures implemented in EnPCs



3.1.3 Return on investment

Having calculated estimated energy savings and estimated capital expenditure, individual utility unit rates (£/kWh) for each building are used to calculate the maximum return on investment.

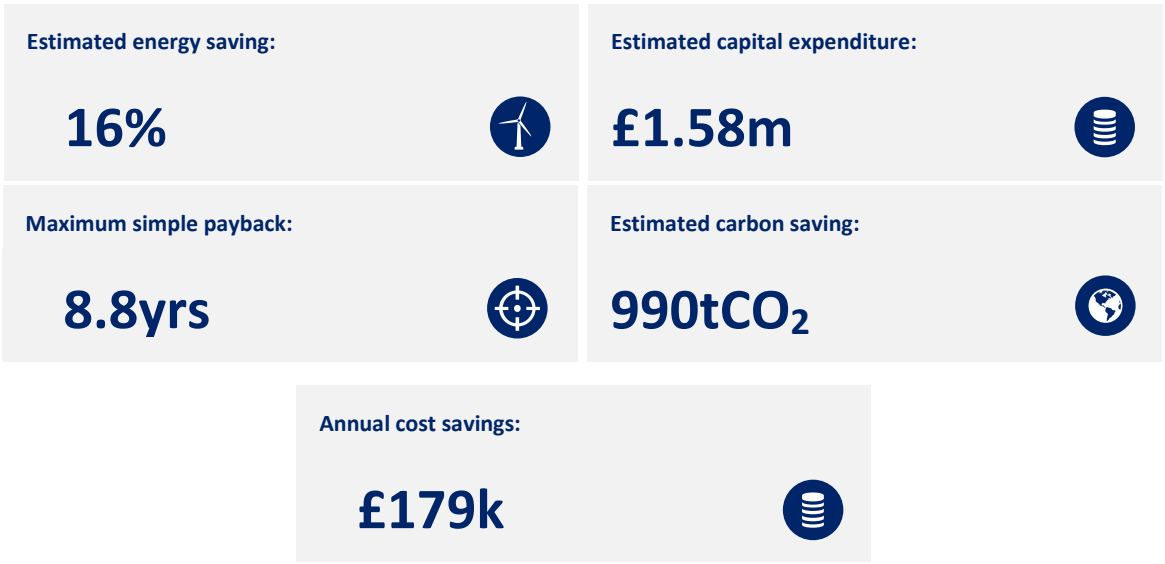
As the maximum return on investment is directly linked to utility unit rates, organisations with low energy unit rate costs tend to experience longer payback periods compared to those that pay relatively more for energy

3.2 Benchmark result

This analysis sets the business case criteria, guiding tendering framework contractors by providing minimum performance standards.

The results of this analysis are provided below.

Figure 7 - Benchmarking output – North East Scotland College



Minimum estimated energy savings are expected to be 16% when comparing current performance against 'typical' building performance benchmarks. In financial terms this equates to a minimum annual saving in the region of £179k against an estimated capital expenditure of £1.58m. This equates to a maximum payback period of 8.8 years.

Figure 8 and Figure 9 present building level benchmarking results separately by electricity and heating fuel energy consumption with actual energy consumption (kWh/m2) expressed as a percentage difference against benchmark energy rates (shown by the y-axis). Poorly performing buildings are above the 0% line and are found towards the left side of the graph. This highlights that there is greater scope to invest and make savings. Better performing buildings will be below the 0% line (i.e. they are performing under the benchmark rate) and are found towards the right-hand side of the x-axis.

The size of each bubble represents the energy spend for the given fuel type e.g. the larger the bubble, the more significant the energy spend.

Figure 8 – North East Scotland College – Electricity comparison to benchmark

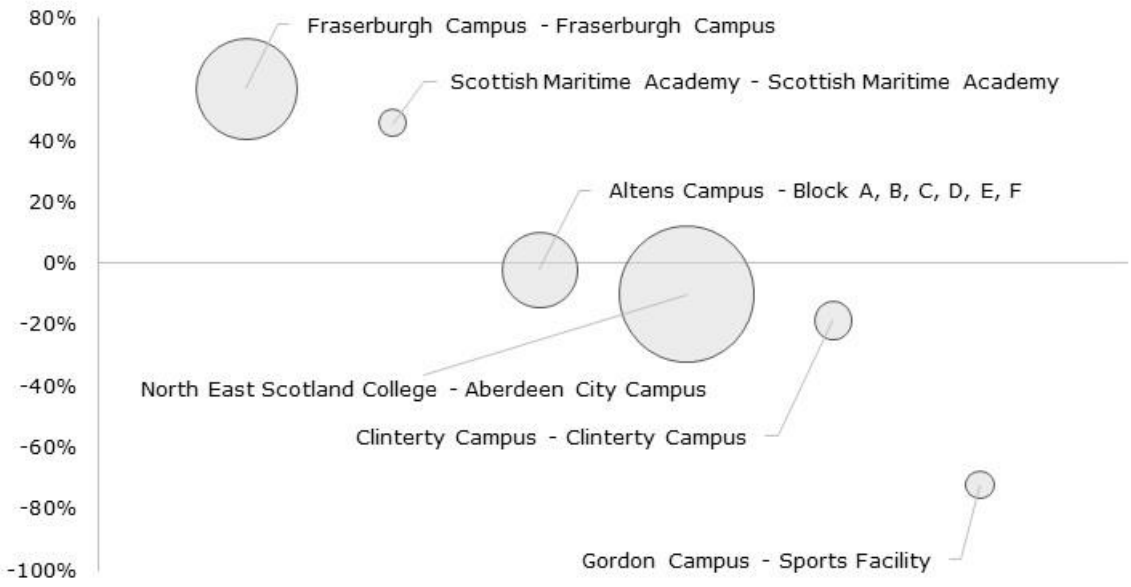
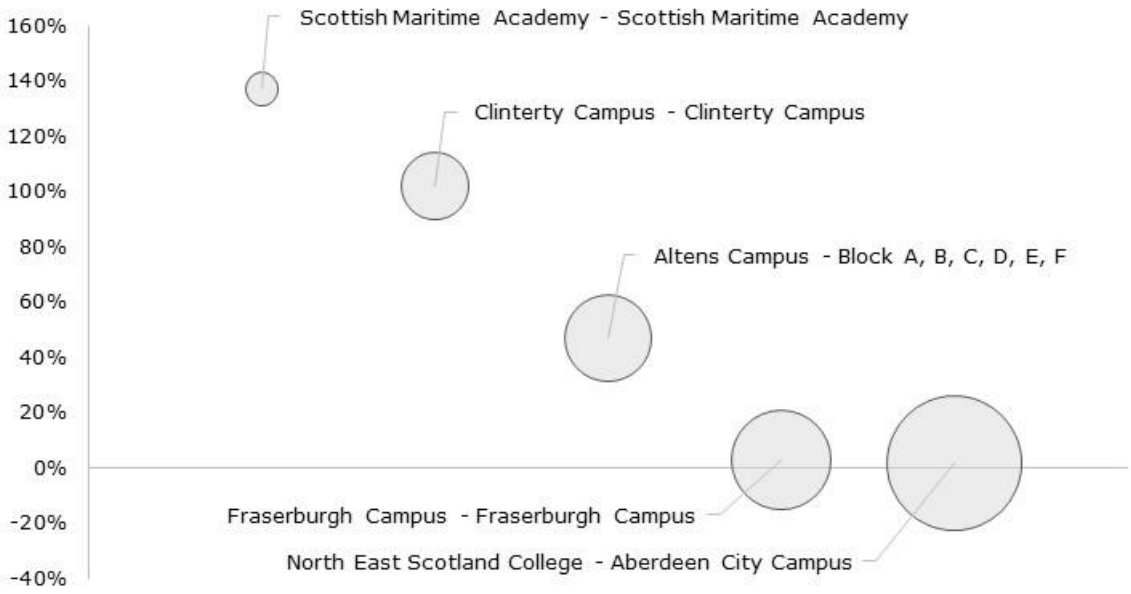


Figure 9 – North East Scotland College – Heating fuel comparison to benchmark



Gordon Campus, Sports Facility is electrically heated accounting for the 2kWh/m2 heating fuel which is used for heating water. For that reason it has been excluded from the heating fuel benchmarking analysis.

Table 2 shows current building energy consumption (kWh/m2) for both electricity and heating fuel and the percentage energy savings that can be expected to be achieved.

Table 2 - North East Scotland College – Current performance and estimated savings

Campus	Building	Current (kWh/m²) Electricity	Current (kWh/m²) Heating fuel	Estimated energy savings (%)	Comments
North East Scotland College	Aberdeen City Campus	[redacted]	[redacted]	12%	Includes Tower Block, East Block and South Block
Altens Campus	Block A, B, C, D, E, F			19%	
Gordon Campus	Sports Facility			10%	
Clinterty Campus	Clinterty Campus			25%	Includes Main Block, Engineering Block, Aset Offices, Kitchens, Bungalows
Fraserburgh Campus	Fraserburgh Campus			17%	Includes Nursery portacabin
Scottish Maritime Academy	Scottish Maritime Academy			29%	

Due to data availability a number of assumptions had to be made. The first assumption was the use of the national average figures published by the Department for Energy and Climate Change (DECC) for the energy usage costs for a number of the buildings at North East Scotland College. The costs utilised were published in December 2015 and were £0.1016/kWh for electricity and £0.2652/kWh for natural gas.

4 Project Register

The Project Register is defined for each of the properties within the North East Scotland College estate and is presented in Appendix 8.

Table 3 contains a description of the key heading within the Project Register.

Table 3: Description of key headings in the Project Register

Identifier		Description
ECM Category		Numerical code identifier of the energy conservation measure (ECM) group.
Description of ECM		Identification of the potential energy conservation measure (ECM) that, based on energy data from the College and site visits, could contribute to a reduction in energy demand.
Notes		Additional notes describing the ECM and relationship to other building maintenance factors that should be considered.
Utility		Identification of which utility is principally affected by the energy saving measure (gas, electricity, oil, water, telecoms)
Savings	Cost (£)*	Energy cost savings will include variable costs only[1].
	Energy (kWh)	The estimated energy saving per year will be presented resulting from the ECM.
	Carbon (tCO2e)	The resultant carbon saving should be presented based on 2015 carbon intensity figures.
Capital Cost (£)		The capital cost of the implementation of the ECM is presented.
Payback (Years)		The simple payback is calculated based on the capital cost and cost savings identified above.
Salix Persistence Factor		This should be presented based on the most recent set of performance factors published by Salix. The SPF takes into account the expected life of the installed product and the potential loss of savings due to poor maintenance and gradual degradation.
Year of Implementation		The Project Register will include a projection of the year that measures will be implemented. This can also be used retrospectively as a register of when ECMs were implemented.

[1] A breakdown of energy costs will be appended for each ECM, showing fuel unit costs, TUoS and DUoS charges, climate change levy, CRC, feed in tariff, renewable heat incentive and VAT where this is non-reclaimable by the Colleges.

The selection of individual ECMs will depend on the capital cost and the resulting economic savings which will come from reduced energy use resulting from the installation of ECMs. There will also be a resultant Carbon emissions saving that will offer a cost saving to the building owner. The economics and the payback for the investment is calculated based on the capital cost and cost savings identified above.

The Project Register identifies a list of potential ECM that were identified as a result of the site visits. These are presented as a register of potential ECMs that can be taken forward to deliver energy savings. The list is not limited and other measures can be added.

The Project Register in Appendix 8 has identified a series of measures including installation of on-site renewable energy, fabric energy efficiency measures and draught proofing, reduction in electricity demand through low carbon fittings and voltage management and building management upgrades and improved metering. The Project Register further identifies the potential for replacement boiler plant at the end of the lifetime of the existing system.

5 Energy Conservation Services Register

The energy conservation services (ECS) is a list of required interventions that require non-physical works to measure energy savings. Some of these services may result in direct or indirect energy savings.

The purpose of the ECSs are to ensure that energy conservation is prioritised. The list is not limited and other measures can be added.

5.1 Measurement and Verification

Measurement and verification will involve the production of reports by the contractor will quantify the effect of ECMs against the baseline. The real measurement will be compared to the forecast of energy usage including the effect of the deployment of ECMs and ECSs. The measurement and verification is required at a building or campus level and will include the following steps:

- Establishing and agreeing the baseline
- Defining a forecast of predicted performance
- Measurement and verification of the performance of the combination of ECMs at agreed frequencies

5.2 Bureau Service

The energy performance can be enhanced with better data collection, remote monitoring and control of the system. Installation of meters and sub-meters are recommended to allow enhanced quantification of energy demand and impacts on the performance of ECMs. The North East Scotland College Campuses will benefit from an automatic meter reading system and control of energy use through a building energy management system (BEMS).

5.3 O&M Manual and Training

The building O&M manuals will require updating with details of ECMs.

Training of the facilities management team is required from the Contractor in all building upgrades to achieve best practice application of ECMs.

5.4 Maintenance Requirements

The installation of ECMs will require commissioning to demonstrate the improved energy performance. Ongoing specialist maintenance support will be required in accordance with manufacturer's requirements and in agreement with North East Scotland College facilities management team. It is likely that photovoltaic installation and CHP, biomass or gas boiler replacements will require specialist operation and maintenance support.

5.5 Lifecycle

The lifecycle replacement of proposed ECMs should be documented in the O&M manual. This should highlight the service frequency in terms of fixed maintenance periods or preventative maintenance based on fixed run hours. It should also

document the anticipated lifecycle replacement period of ECMs or critical components with shorter lifetimes.

5.6 Behaviour Change

Significant energy efficiency is achievable through a positive attitude and behaviours. This may include training of the facilities management team to deliver high standards. It will also require energy efficiency is a priority to all building occupants, both students and staff.

Publicity and promotional materials directed at staff, students and visitors may form part of the ECSs to clearly explain how basic actions could offer benefits to the College.

6 Summary of Buildings and their Services

A summary of each of the building fabric and construction are shown below:

- Peterhead: Built in 1992 and was refurbished in 2012 consisting of steel frame with curtain walling along the front. Window seals in the curtain walling to be replaced

- Fraserburgh: Built in 1974 with a refurbishment and extension in 2012 which achieved BREEAM Very Good. The full façade was re-clad during this refurb. Additional extension and refurb currently underway with refurbishment of kitchens due to commence summer 2016. The separate nursery building was not surveyed during this visit.

- Altens Campus Block A: Built in 1970 with refurbishment during 2015 and consists of Harled brick and flat felt roof.

- Altens Campus Block B/C: Built in 1970 with refurbishment to roof and insulating material being added below the roof line.

- Altens Campus Block D/E: Built in 1971 consisting of steel portal frame construction with shallow pitched steel sheet and corrugated asbestos roofing.

- Altens Campus Block F: Built in 1999 and consists of steel frame construction.

- Clinterty Campus Main Block: Built in 1970 and is a mixture of concrete frame construction with cladding panels and traditional build under a felt roof excluding electrical workload which has a pitched steel roof. There is a part of the building there is an accommodation which is not being used currently

- Clinterty Campus Bungalows: Built in 1970 and refurbished in 2015 and is a traditional build, there are two of these

- Clinterty Campus Engineering Workshop: Built in 1973 and is a steel portal frame and corrugated asbestos wall cladding and roof.

- Clinterty Campus Aset Office: Built in 1970 and refurbished in 2015 (roof upgrade) is a traditional build.

- Gordon Campus: Built in 2005 consisting of plasterboard interior walls, blockwork walls, concrete flooring with various coverings, fibrous ceiling tiles on suspended metal grid.

Table 4 provides the general details of the buildings surveyed.

Table 4 - General Details of Buildings

Building	Floor Area	Orientation	EPC Rating
Clinterty Campus (Aset Offices)	213m^2	South West	NA
Clinterty Campus (Engineering Workshop)	847m^2	South West	G (107)
Clinterty Campus (Bungalows)	NA	South West	NA
Clinterty Campus (Main Block)	1520m^2	South West	G (107)
Gordon Campus	2895m^2	East	F (94)
Altens Campus (Block A)	924m^2	North East	E (94)
Altens Campus (Block B/C)	2456m^2	North East	E (73)
Altens Campus (Block D/E)	2697m^2	North East	E (80)
Altens Campus (Block F)	2972m^2	North East	E (64)
Fraserburgh (Main Campus)	15172m^2	South East	NA
Fraserburgh (Nursery)	121m^2	South East	NA
Peterhead	627m^2	North East	NA

A brief description of all buildings services equipment can be found below.

- Altens Campus - The campus is split into a number of buildings however not all of these have their own boiler plant. Buildings A is served from B and C and D and E served from one plant room. The boilers within Block B/C and serve Block A were replaced in 2011 and are Hoval Ultragas. The boilers are in good working order with modern controls. There is a separate gas fired heating system for the Powermatics room. In Block B/C there is one air handling unit which has heat recovery, heating coils are served from the gas boilers. There are two extract fans along with roof mounted de-strat fans. Split units are located in areas within the building linked to roof mounted outdoor units. Generally the equipment was working within normal parameters and is in good condition. Block D/E has a number of workshop spaces which do not have a central boiler plant, these spaces have cabinet heaters which are gas fired. Gas boilers are also provided to the building to serve other spaces, the boilers provide heating for the AHU. There is a ceiling mounted gas fired AHU proposed for the Motor Vehicle Workshop which is linked to manual control panel and timeclock settings. There is a large number of extract fans for the processes being undertaken in the building at roof level. These are on manual switches however, information on the age of these was not available from the Asset Register. Block F was built in 1999 and has a separate boiler plant located at ground floor level. There are two boilers in this space serving space heating and air handling unit heating coils linked to BMS. There is a separate gas fired water heater in the plant room for hot water. The boilers are around 15-20 years old in this building. Air handling units are supply only with separate extract fans and run around coils. There are some additional LEVs and plant room fan within the flue.

- Fraserburgh Campus - The Fraserburgh Campus is a mix of new and existing refurbishment. There are solar PVs and a ground source heat pump which provides pre-heat for fresh air to AHUs. All the heating is provided from central plant room which has 3 boilers, to relatively new boilers from 2003 and one existing boiler which is pre 1990 which is in good condition for its age however will be very inefficient. This boiler acts as the lead boiler. Heating coils in air handling plant are provided via the boilers. All the heating systems are linked to the BMS. There is a new extension currently underway which will rehouse some existing functions and move the workshops to new areas. These areas are proposed to be served from the gas boilers as there is enough capacity in the system. There are 4 AHUs which were installed at the time of the refurbishment in 2012 and a separate AHU for the Catering areas from 1984. There is to be a refurbishment of the Catering block which will occur in summer 2016. Heating is a mixture of radiators and underfloor heating to the Atrium. There is a centrally located daylight control system installed and a mixture of different light fittings. Moving forward there is a proposal to update to LEDs. There is a separate nursery block which is a portacabin which has separate electric heaters and instantaneous electric hot water.

- Peterhead (Scottish Maritime Academy) - The buildings main heat source is gas fired combi boilers which are approximately 2 years old. These boilers are in good working order. There is an additional electric water heater in the Female Toilet that provides hot water for this space. The building has no natural ventilation and air is provided by air handling unit located within the roof void. The AHU is a supply only with separate extract AHU with run around coil heat recovery. The BMS front end for Peterhead is located at Fraserburgh.

- Gordon Campus - The main heating source for this building is gas fired boilers located in the building plant room. This plant room is naturally ventilation and there is limited space available. There are a mixture of heat emitters in the space including underfloor heating, radiators, heating from split units and warm air heating. There is an existing AHU serving the building which is not accessible currently along with a number of local extract fans installed in 2005 and there is natural ventilation installed. The games hall itself has gas fired ambi-rads and a monodraught ventilation system. The water meter has been installed upside down. There are 3 calorifiers shown in the building which are working within normal parameters.

- Clinterty Campus - There are 4 buildings at Clinterty Campus, the Aset Offices and Engineering Workshop are served from the Main Building with the Bungalows with electric panel heaters. The wet heating is served from two oil fired boilers which are around 15-20 years old and serves the Aset Building and Engineering Workshop. There is an existing calorifier in this building providing hot water to the main building with electric calorifiers to the Aset Building, Bungalows and Engineering Workshop. All pumps are fixed speed. There are 2 air handling units located at roof level of the main building, these units are around 20 years old and have no heat recovery devices. The heat emitters are a mix of underfloor heating, radiators and wall mounted convectors. Cooling is provided to dedicated spaces in the main building using split air conditioning units. The Aset office has no AHUs and the Engineering Workshop has an existing unit at high level however details were unknown as no access is available. The heating coils for this are off the oil fired boilers. Local temperature controls are present in all areas.

Appendix 1 - Building Drawings and Site Plans

Appendix 2 - Condition Survey Reports

Appendix 3 - Carbon Management Plans

Appendix 4 - Asbestos Survey Reports

Appendix 5 - Building and Energy Data Sheet

Appendix 6 - Site Visit Report

Appendix 7 - Asset Register

Appendix 8 - Project Register