Heat Decarbonisation Plan

Collingtree
(C of E) Primary School

Issue	Description	Date	Engineer
ISSUE 1	Issued for Information	12/03/2022	

Contents

1 EXECUTIVE SUMMARY

Collingtree (C of E) Primary School instructed XX XXX to carry out an assessment of the existing main building and provide a heat decarbonisation plan. This plan will summarise any findings from a non-intrusive site survey, guidance on energy saving options and ways to reduce the carbon footprint of the trust/schools.

1.1 Purpose of the heat decarbonisation plan

The Academy Trust is aiming to reduce its carbon emissions, in particular its direct emissions, which arise predominantly as a result of heating. The starting point is to develop a heat decarbonisation plan, to demonstrate how the organisation will reduce its emissions.

The plan will outline what would need to be completed to achieve net zero, which links with the Government ambition by 2050.

The plan will act as a live document and will be updated to reflect the current status and to track progress.

Energy use in the schools plays a key part into greenhouse gas emissions and contributes towards changes in our climate. The UK has committed to net zero emissions by 2050. The target will require the UK to bring all greenhouse gas emissions to net zero by 2050, compared with the previous target of at least 80% reduction from 1990 levels.

Carbon Trust CTV019 – Schools document states that *'UK schools could reduce energy costs by around £44 million per year which would prevent 625,000 tonnes of CO_2 from entering the atmosphere.'* Understanding the impact energy usage in schools has on costs and greenhouse gas emissions could help facilitate reductions in energy usage. This will result in lower costs and less CO_2 emissions produced by schools which would be a vital contribution to achieving the UK net zero emission by 2050.

This report shall outline measures in achieving carbon reduction and in particular geared towards applying net zero.

The vision is to apply a fabric first approach, reducing the overall energy heating demand, implement low energy measures for heating (sized to the reduced energy demand), lighting and hot water, then provide appropriate renewables to offset the energy usage (Photovoltaics / Solar Thermal Panels).

It is appreciated and considered that the potential low energy heating measures shall be geared towards use of electricity over fossil fuels for carbon saving. The increased reliance of the electrical infrastructure will bring into question the existing capacity and the need for upgrades.

The establishment is in its infancy of decarbonisation journey, but the report will demonstrate options, and feasibility of options from a technical and cost perspective. It is not expected that these measures shall be completed in one phase, but over multiple years, with a view that each stage enhances the other.

Carbon Trust CTV019 – Schools document provides a breakdown of energy costs in a typical school. The energy consumption will vary on a case by case basis depending on factors such as:

- Age of building
- Fabric build-up
- Occupancy hours

- Amount and type of electrical equipment installed

Figure 1a **Schools – percentage of energy use**

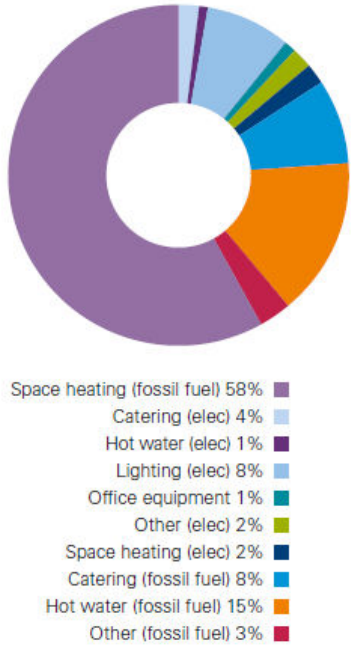


Figure 1b **Schools – percentage of energy cost**

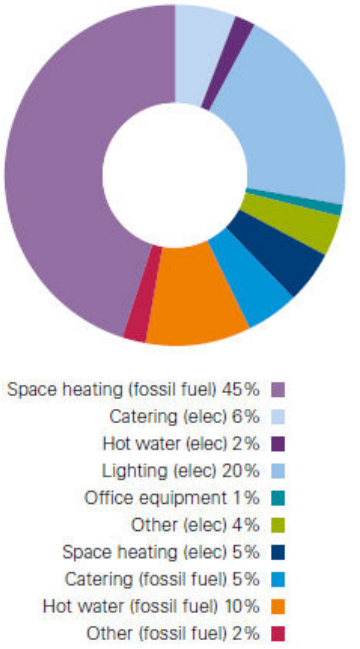


Figure 1 Carbon Trust CTV019 energy consumption in schools extract

The two figures above show that the highest energy use is due to space heating, therefore this would have a high energy cost. In most schools, heating is achieved using fossil fuel which cost less than electricity. However, it is important to note that the National Grid in the UK is decarbonizing rapidly allowing the electrification of heat and a move from fossil fuels as the man source of heating. Lighting only accounts for 8% of the energy usage but due to higher costs for the electrical supply, lighting accounts for 20% of the energy costs. This indicates that by reducing the two key areas where energy use or cost is high, there will be a significant impact on the overall building energy running costs and CO_2 emissions.

A five-step hierarchy was proposed by UKGBC in order to achieve a Net Zero Carbon Building but the hierarchy can be applied to existing buildings in order to address the issues related to energy efficiency before addressing carbon emission reduction. Since this report is investigating an existing school, the 'operational energy' route will be followed as shown in Figure 2, therefore addressing the following steps:

1. Reduce Operational Energy Use – reduction in energy demand and consumption should be prioritized over all other measures.
2. Increase Renewable Energy Supply – once the energy demand and consumption has been reduced to the minimum possible, the on-site renewable energy sources should be prioritised.
3. Offset Any Remaining Carbon – once the previous two steps have been achieved then any remaining carbon should be offset using a recognized offsetting framework.

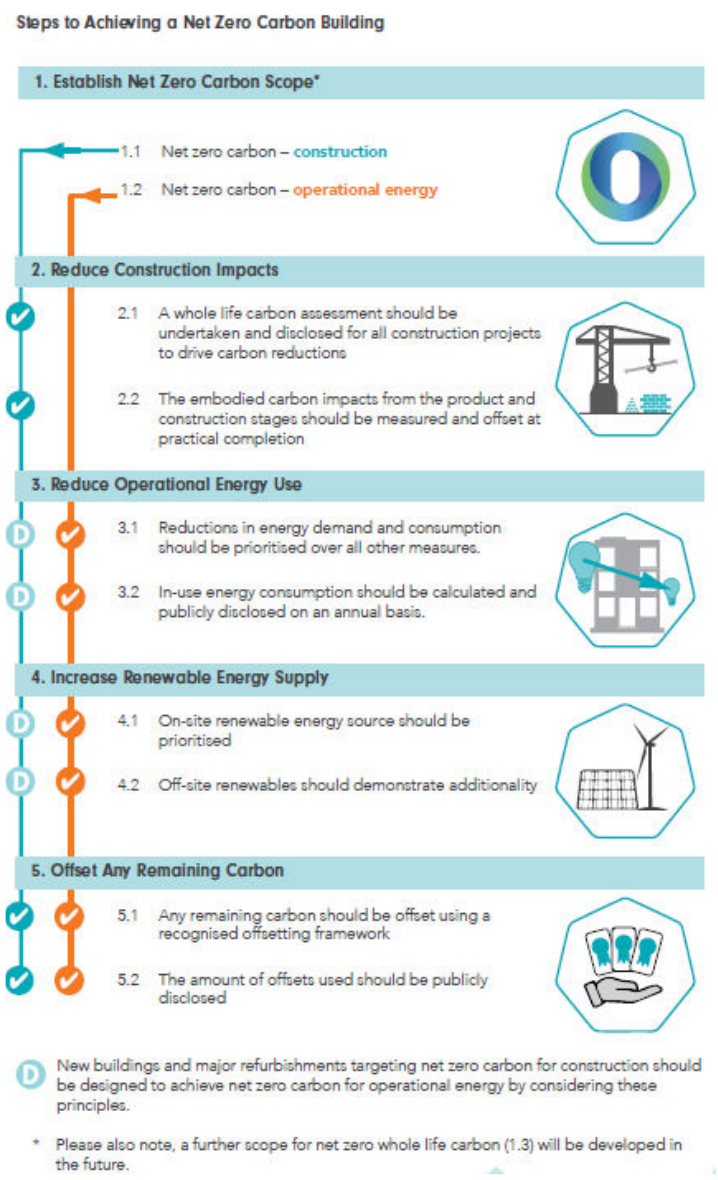


Figure 2 Steps to achieving a Net Zero Carbon building (Net Zero Carbon Buildings - A framework definition UKGBC)

The main point of focus for this report would be to address the 'Reduce Operational Energy Use' step. This will make the highest impact on reducing the energy usage of the building and this will consist of the following hierarchy:

1. Building fabric and passive design – Improved fabric to reduce heating and cooling demand
2. Systems efficiency – Improve the energy efficiency of the building systems
3. Energy management – Implement smart energy or building management systems

Figure 3 Operational Energy Route (Net Zero Carbon Buildings - A framework definition UKGBC)

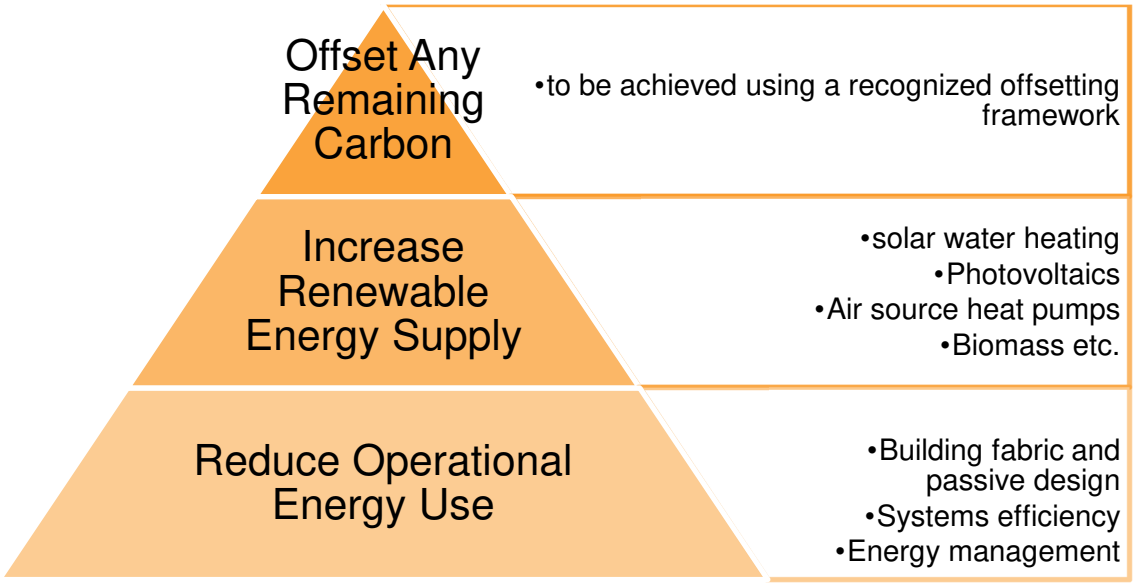


Figure 4 Impact hierarchy on reducing the energy usage of the building

1.2 Sign off

Authorising official	Signature	Date

1.3 Summary of technical solution

Main Building

Energy saving opportunity	Relevance	Total Cost	Energy Reduction %	Estimated Annual Energy Saving	Carbon Impact
Cavity wall insulation £35/m²	Relevant	£37,068.03	5%	£62.44	Low
Solid wall insulation £100/m²	N/A		10%		High
Suspended Ceiling pad insulation £18/m²	N/A		9%		Low
Flat roof insulation £180/m²	N/A		5%		Low
Flat roof replacement £250/m²	N/A		11%		Medium
Pitched roof replacement (including tiles and new insulation)	N/A		11%		Medium
Pitched roof, new insulation at joists	N/A		12%		Medium
Pitched roof, new insulation at rafters	N/A		11%		Medium
Double Glazed Windows & Doors	N/A		13%		Medium
Thermostatic Radiator Valves	N/A		11%		Medium
Heat emitter replacement £110/m²	Relevant	£124,552.49	5%	£65.04	Low
Lighting upgrade	Relevant	£56,048.62	10%	£405.17	Medium
Lighting controls upgrade £15/m²	Relevant	£15,285.99	5%	£202.59	Low
Improve air tightness (sealing, draught stripping etc) £15/m²	Relevant	£15,520.25	3%	£39.02	Low
Improve metering provisions in accordance with CIBSE TM39	Relevant	£20,108.48	10%	£130.07	Medium
Boiler to High Temperature ASHP	Relevant	£270,828.87	49%	£638.02	High
Boiler to Biomass	N/A		49%		High
Direct Electric to High Temperature ASHP	N/A		70%		High
Storage Heaters to High Temperature ASHP	N/A		70%		High
PV Panels	Relevant	£26,811.31	5%	£65.04	Low
Solar Thermal	N/A		5%		Low
	Relevant	**£566,224.04**		**£1,607.38**	

Early Years School

Energy saving opportunity	Relevance	Total Cost	Energy Reduction %	Estimated Annual Energy Saving	Carbon Impact
Cavity wall insulation £35/m²	N/A		9%		Low
Solid wall insulation £100/m²	Relevant	£28,822.16	18%	£234.13	Medium
Suspended Ceiling pad insulation £18/m²	N/A		9%		Low
Flat roof insulation £180/m²	N/A		10%		Medium
Flat roof replacement £250/m²	N/A		22%		High
Pitched roof replacement (including tiles and new insulation)	N/A		22%		High
Pitched roof, new insulation at joists	N/A		22%		High
Pitched roof, new insulation at rafters	Relevant	£19,022.63	22%	£286.16	High
Double Glazed Windows & Doors	N/A		26%		High
Thermostatic Radiator Valves	N/A		11%		Medium
Heat emitter replacement £110/m²	N/A		5%		Low
Lighting upgrade	Relevant	£14,266.97	10%	£117.07	Medium
Lighting controls upgrade £15/m²	Relevant	£3,890.99	5%	£58.53	Low
Improve air tightness (sealing, draught stripping etc) £15/m²	Relevant	£3,950.62	3%	£39.02	Low
Improve metering provisions in accordance with CIBSE TM39	Relevant	£20,108.48	10%	£130.07	Medium
Boiler to High Temperature ASHP	Relevant	£76,691.91	49%	£638.02	High
Boiler to Biomass	N/A		49%		High
Direct Electric to High Temperature ASHP	N/A		70%		High
Storage Heaters to High Temperature ASHP	N/A		70%		High
PV Panels	Relevant	£26,811.31	5%	£65.04	Low
Solar Thermal	N/A		5%		Low
	Relevant	**£193,565.08**		**£1,568.05**	

2 INTRODUCTION

2.1 Estate introduction

Collingtree (C of E) Primary School was first opened around the 1986 main building and 1800's for the Early Years building, it is a primary school in Collingtree.

Today, the school sees an increasing appetite from pupils and staff to address Sustainability as well as a need to invest in the fabric of the main building, whose outdated building fabric struggles to deliver good comfort.

The Academy Trust is aiming to reduce its carbon emissions, in particular its direct emissions, which arise predominantly as a result of heating. The starting point is to develop a heat decarbonisation plan, to demonstrate how the organisation will reduce its emissions.

The plan will act as a live document and will be updated to reflect the current status and to track progress.

The Trust has made a commitment to cut carbon emissions, this is part of their ethos and central policy, having carbon reduction part of the discussion, with governors and school leadership teams.

The Trust understands the business case for carbon reduction with significant financial savings to be comprehended by the schools and, by parents.

2.1.1 The estate

Buildings	Description	Use	Age	Location	Characteristics
 **Main building**	Two storey orignal building with minor fabric improvements	Admin + classrooms	late 1980's,	NN4 0NQ Urban Close to other blocks	• Cavity walls – partial fill insulation assumed • Pitched roof - insulated • Double glazed • 90% of building has old fluorescent lighting

2.1.2 Site specific restrictions or challenges to decarbonisation

- Poor thermal efficiency of the building – possibility for an intrusive survey to establish the current condition of the fabric
- Current electricity load – possibility of a new incomer
- Space available for heat pumps
- Additional noise created by heat pumps towards classrooms and neighbouring buildings
- Disruption to teaching – mitigated by having decarbonisation works undertaken in the 6 week summer break

2.1.3 Energy – existing systems

The existing systems have been detailed for each building and their life expectancy has been compared to CIBSE Guide M element design life. The main equipment is detailed in the table below, this is not an exhaustive list and CIBSE Guide M should be used for any further references.

Equipment	CIBSE Guide M Element Design Life	Equipment	CIBSE Guide M Element Design Life
Condensing boiler	15 years	**Radiators (cast iron)**	20 – 25 years
Storage cylinders (steel)	20 years	**Radiators (steel)**	15 years
Control Panel	15 years	**Fan Convectors**	15 years
Circulating pumps	20 years	**Distribution Pipework (heating and hot water)**	Copper 45 years Steel 25 - 35 years (open/closed systems)
Valves	25 years	**Underfloor heating**	25 years (steel) 30 years (plastic)
Local electric instantaneous water heater	12 years	**Thermostatic mixing valves**	15 years

Equipment	CIBSE Guide M Element Design Life	Equipment	CIBSE Guide M Element Design Life
Thermostatic radiator valves	15 – 20 years	**Central air supply & extract system**	20 years
General lighting	20 years (Lamp life depends on usage)	**Control panel lamps and alarms (electronic controls)**	10 years
Local extract fan (twin toilet and window or wall mounted)	10 – 20 years	**Local split system (cooling unit)**	15 years

2.1.3.1 *Main Building*

System	Description	System age	Exceeded Design Life by	System performance	Notes
Heating					
Heating	2no Valliant Eco TEC	5-10 years	-33.3%	90%	
	Two pipe	35+ years	End of life		Reasonable condition – but expect issues in near future
Heat Emitters	Panel radiators	25+ years	End of life	n/a	Reasonable condition – but expect issues in near future
Heating Pumps	Twin pump set with inverters	5-10 years	-33.3%	n/a	
Hot water					
Hot water	Point of use Zip Aquapoint water heaters	5-10 years	-50%		
HWS Circulation Pumps	n/a				
Distribution pipe	Good condition				

System	Description	System age	Exceeded Design Life by	System performance	Notes
Thermostatic mixing valve	Good condition				
Mechanical Ventilation					
Air Handling Units	n/a				
Heat Recovery Units	n/a				
Local fans	Good condition	10-15 years	Nearing or end of life		Plate wall fan – good condition
Kitchen AHU	n/a				
Air Conditioning					
Air conditioning	n/a				
Miscellaneous					
Control Panel	Main control panel in plantroom	5-10 years	-33.3%		
Valves	Good condition overall				
Passive ventilation stacks	n/a				
Lighting					
Fluorescent	Present in 90% of the building, replaced on a failure basis				
LED	Majority of LED is present in the new extension with gradual replacement of fittings in main building				
Other	n/a				

2.1.3.2 *Early Years*

System	Description	System age	Exceeded Design Life by	System performance	Notes
Heating					
Heating	Valliant ecoTec Plus	10-15 years	Nearing or end of life	90%	Reasonable condition – but expect issues in near future
	Two pipe	35+ years	End of life		Reasonable condition – but expect issues in near future
Heat Emitters	Panel radiators	25+ years	End of life	n/a	Reasonable condition – but expect issues in near future
Heating Pumps	Twin pump set with inverters	5-10 years	-33.3%	n/a	
Hot water					
Hot water	Point of use Zip Aquapoint water heaters	5-10 years	-50%		
HWS Circulation Pumps	n/a				
Distribution pipe	Good condition				
Thermostatic mixing valve	Good condition				
Mechanical Ventilation					
Air Handling Units	n/a				
Heat Recovery Units	n/a				
Local fans	Good condition	10-15 years	Nearing or end of life		Plate wall fan – good condition
Kitchen AHU	n/a				

System	Description	System age	Exceeded Design Life by	System performance	Notes
Air Conditioning					
Air conditioning	n/a				
Miscellaneous					
Control Panel	Main control panel in plantroom	5-10 years	-33.3%		
Valves	Good condition overall				
Passive ventilation stacks	n/a				
Lighting					
Fluorescent	Present in 90% of the building, replaced on a failure basis				
LED	Majority of LED is present in the new extension with gradual replacement of fittings in main building				
Other	n/a				

2.1.4 Proximity to other public sector buildings

The school is situated in a residential area with no further schools in close proximity of its blocks.

2.1.5 Review of the existing position on the decarbonisation journey

Although steps for decarbonisation, such as window replacement, have been implemented (within the main building) the school are at the infancy of journey towards carbon zero.

2.2 Priority areas and monitoring needs

It is worth considering that the decarbonisation of heat is one of the later steps in the journey and any plan must include reducing demand to a minimum first as well as any enabling works (for example changes to the existing heating system to support lower operating temperatures)

2.2.1 Main building

Element	Can improvement be made?	What improvement	Priority
Roof	No	Insulation	N/A
Walls	Yes	Insulation-full fill insulation, increase over the assumed partial fill	High
Windows	No	Already double glazed	N/A
Doors	No	Already double glazed	N/A
Heating plant	Yes	Boiler to ASHP	High
Heating Distribution	Yes	Twin pipe upgrade	High
Heating Emitter	Yes	Heat emitter upgrade with new TRV's	Low
Lighting	Yes	Fluorescent to LED	High

2.2.2 Early years

Element	Can improvement be made?	What improvement	Priority
Roof	Yes	Insulation	High
Walls	Yes	Insulation-solid wall insulation possible required internally due to neighbouring aesthetics	High
Windows	Yes	Single to double	High
Doors	Yes	Single to double	High
Heating plant	Yes	Boiler to ASHP	High
Heating Distribution	Yes	Twin pipe upgrade	High

Element	Can improvement be made?	What improvement	Priority
Heating Emitter	Yes	Heat emitter upgrade with new TRV's	Low
Lighting	Yes	Fluorescent to LED	High

School / Trust could not provide CDC report

3 BUILDINGS

The site is formed out of 2No blocks as detailed below:

1. Main building.
2. Early years

The site is located in a residential area of Collingtree. Since the site is a primary school the hours of use are as following:

Weekdays 8am–5pm

Weekends Closed

No building inventory is held at the moment. The only reference would be this HDP report, and the supporting reports within the appendix.

Carbon trust publication CTV014 – Building fabric advises on percentages of heat loss through different building fabric elements, as shown in Figure 3. The majority of the heat is lost through ventilation and air infiltration loss, then roof, then windows. Different fabric elements have different thermal (heat transfer) properties. Glazing, for instance, is usually the part of the fabric least able to retain heat. The ability of fabric to transfer heat is a measured factor expressed as its U-value. The lower the U-value the better the material is at preventing heat loss.

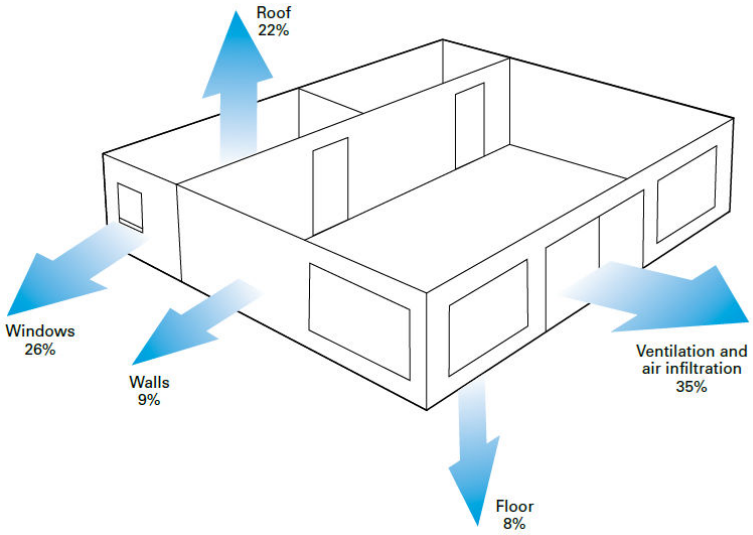


Figure 5 Carbon Trust CTV14 - Building Fabric - heat loss from a commercial building

The condition of the fabric will be graded for priority of works as per table below:

CONDITION	PRIORITY
GRADE A – Good Performing as intended and operating efficiently.	PRIORITY 1 – URGENT IMMEDIATE WORK REQUIRED THAT WILL: Prevent immediate closure of premises Address an immediate high risk to H&S of occupants remedy a serious breach of legislation
GRADE B – Satisfactory Performing as intended but minor repairs required.	PRIORITY 2 – ESSENTIAL WORK REQUIRED WITHIN 2 YEARS THAT WILL: prevent serious deterioration of the fabric or services address a medium risk to H&S of occupants remedy a less serious breach of legislation
GRADE C – Poor Poor, exhibits various defects, each of which might not be significant in itself but together need attention on a planned basis.	PRIORITY 3 – NECESSARY WORK REQUIRED WITHIN 3-5 YEARS THAT WILL: prevent deterioration of the fabric or the services address a low risk to the H&S of occupants remedy a minor breach of legislation
GRADE D – Bad/Urgent work required Life expired. Exhibits major deterioration. Serious risk of imminent breakdown or is a H&S hazard.	PRIORITY 4 – DESIRABLE WORK REQUIRED FROM 5 YEARS ONWARD THAT WILL: prevent possible deterioration of the fabric or services

3.1 Fabric Condition

3.1.1 Walls

Location	Wall Type	% Across Block	Overall Condition
Main Building	Cavity Wall - Partial Fill	100	Condition Category C3
Early Years	Solid Wall - No Insulation	100	Condition Category C3

3.1.2 Ceilings and Roofs

Location	Roof Type	% Across Block	Overall Condition
Main Building	Pitched - Insulated at Joists	100	Condition Category B3
Early Years	Pitched - Non Insulated	100	Condition Category B3

Location	Ceiling Type	% Across Block	Overall Condition
Main Building	Plasterboard Ceiling - Non Insulated	100	Condition Category A3
Early Years	Plasterboard Ceiling - Non Insulated	100	Condition Category A3

3.1.3 Glazing

Location	Glazing Type	% Across Block	Overall Condition
Main Building	Double Glazed	100	Condition Category B3
Early Years	Single Glazed	100	Condition Category D1

3.1.4 Doors

Location	Door Type	% Across Block	Overall Condition
Main Building	Double Glazed Door	100	Condition Category B3
Early Years	Solid	100	Condition Category C2

3.2 Building Heat loss

The Salix peak building heat loss calculation tool has been used to produce a heat loss calculation for the old part of the main building. The U-values used are based on assumptions and historical values for the time period the school was built, and measurements are based on Google maps sizing. We would propose an intrusive survey to determine if the cavity is fully filled.

A better insulated building will result in a lower heat loss which in turn will reduce the size of the air source heat pumps. It is recommended that the fabric is investigated and improved first before implementing any low carbon heating.

Main Building

Thermal Capacity Calculator		
	Average U-value (W/m^2K)	Area (m^2)
Roof	0.35	844.64
Pitched roof (ins @ ceiling) / Flat roof	0.35	0.00

Walls	0.60	1013.57
External / Internal Insulation	0.60	0.00
Windows/Doors	3.30	271.39
Floor	1.00	844.64

Building Thermal Capacity	2,644	W/K

Heat Loss Calculation		
	Value	Unit
Building Thermal Capacity ΣUA	2,644	W/K

Volume of Space to be Heated by Heat Pump	*2,533.92*	m^3
Air Changes per Hour	*1.00*	ACH

Ventilation Loss	845	W/K
Heat Loss Coefficient	3,489	W/K
U'	3	kW/K

Winter Internal Setpoint Temperature	*21.00*	°C
Winter Outdoor Design Temperature	*-5.00*	°C

Peak Building Heat Loss	**90.70**	kW

Early Years School

Thermal Capacity Calculator		
	Average U-value (W/m^2K)	Area (m^2)
Roof	2.00	215
Pitched roof (ins @ ceiling) / Flat roof	2.00	0
Walls	1.70	0
External / Internal Insulation	1.70	258
Windows/Doors	5.70	64.5
Floor	1.00	215

Building Thermal Capacity	1,451	W/K

Heat Loss Calculation		
	Value	Unit
Building Thermal Capacity ΣUA	1,451	W/K

Volume of Space to be Heated by Heat Pump	*645.00*	m^3
Air Changes per Hour	*1.00*	ACH

Ventilation Loss	215	W/K
Heat Loss Coefficient	1,666	W/K
U'	2	kW/K

Winter Internal Setpoint Temperature	*21.00*	°C

Winter Outdoor Design Temperature	*-5.00*	°C

Peak Building Heat Loss	**43.32**	kW

3.3 Lighting

Currently the school has a light fitting split as following:

Location	Lighting Type	% Across Block	Overall Condition
Main Building	Fluorescent*	90	Condition Category D1
Main Building	LED	10	Condition Category A4
Early Years	Fluorescent*	90	Condition Category D1
Early Years	LED	10	Condition Category A4

* Replaced on a failure basis

Fluorescent lights would require replacement with LED lighting in order to reduce energy usage and costs associated with a high electricity consumption. Other saving options would be to encourage staff and students to switch off lighting when not in use. With fluorescent lighting, there is a common misconception that these should be left on since starting them up repeatedly wastes energy. This is not true and thus lighting should be switched off when not used in order to save energy. Additionally, consideration must be given to lighting controls such as time switches with a manual override for teaching areas and occupancy sensors in intermittently occupied spaces.

Fluorescent fittings can also be replaced with more efficient fittings that use reflectors / louvres or efficient prismatic controllers which will improve the amount of light by 30-60% (compared to fluorescent fittings with opal diffusers which are permanently discoloured) and will achieve a 30-45% lighting quality improvement over fluorescent fittings.

LED lighting upgrades, where affordable, are clearly the better option and will provide the greatest payback of all the measures noted in this report.

3.4 Renewables

Location	Renewable Type	Overall Condition
	N/A	Condition Category N/A

The school does not currently have any renewables installed.

4 ENERGY CONSUMPTION AND CARBON EMISSIONS

4.1 Data collection

- the level of the quality of the data and method of collection
  - ✓ combination of utility bills and extrapolation of display energy certification – high quality data collection
  - ✓ no utilities bills provided and extrapolation of display energy certification – medium quality data collection
  - ✓ no utilities bills provided and no display energy certification available – low quality data collection, based on assumptions made and engineer calculations

  Note 1: utility bills should be reviewed on an annual basis by the school trust in line with decarbonisation measures and any changes in school capacity / use.

  Note 2: Display Energy Certificates should be reviewed on an annual basis by the school trust in line with decarbonisation measures and any changes in school capacity / use. Dependent on school size and capacity, the DEC will be updated annually, or every 10 years as required by law.

4.2 Energy Consumption

The following section outlines the school's energy consumption, energy costs and annual CO_2 emissions.

As shown in the tables below, we compare the buildings actual usage (via DEC's) the Good practice kWh/m^2/yr value for utilities.

Where photovoltaics arrays are installed and recorded on the DEC electrical usage is typically lower than Good practice.

4.2.1 Metering strategy

Table 1 Summary of estate's meters (reference number from this table corelates to the same number under photographic evidence)

Ref.	Utility type	Meter Number	Supplier	Building served	Payment by	Comments
1.	Electricity	MPAN 1100019132873038O1N13 MSN S80FV16125	Laser (Npower Electricity)	Main building	School / Trust	No submetering
2.	Electricity	MPAN 1100019774774048 11N12 MSN S80FV16125	Laser (Npower Electricity)	Early Years	School / Trust	No submetering
3.	Gas	MPRN 8816974910 MSN E016K0705216D6	Laser (Total Gas & Power)	Main building	School / Trust	No submetering
4.	Gas	MPRN 8878874807 MSN G4K00200641701	Laser (Total Gas & Power)	Main building	School / Trust	No Submetering

4.2.2 Heat Demand

Ref.	Building	Gross Internal Area m^2	Annual kWh	Annual Energy use kWh/m^2
1.	Main Building	844.64	100,881.69	119.44
2.	Early Years School	215.00	25,679.06	119.44

The following demonstrates the actual annual usage taken from DEC reports and compares to the CIBSE good practice benchmarks.

We extrapolate the annual usage kWh/m^2 and multiple this against area to provide annual total utility costs and annual CO2 emission.

The end of report cost savings versus capital cost is less than a typical benchmark building due to the energy efficiency measures already undertaken, therefore payback periods are higher than usual, but the recommended measures would be the next step towards carbon neutral or as close as practically possible.

4.2.2.1 *Site Wide*

Fossil Fuel Benchmarks Comparison						
	CIBSE Benchmarks		*DEC 2015*			
Building Type	Good practice fossil fuels	Typical practice fossil fuels	Annual Thermal Fuel Usage	Typical Thermal Fuel Usage	Renewables Fuel Thermal	Variance
Primary School	**121**	**151**	44	156	0	**-63.64%**

Electricity Benchmarks Comparison						
	CIBSE Benchmarks		*DEC 2015*			
Building Type	Good practice fossil fuels	Typical practice fossil fuels	Annual Thermal Fuel Usage	Typical Thermal Fuel Usage	Renewables Fuel Thermal	Variance
Primary School	**38**	**47**	41	40	0	**7.89%**

DEC 2015	*Annual Consumption*		*Annual Cost*		*Annual CO2 Emissions*	
Utility	kWh	%	£	%	kgCO2	%
Gas	46,624	52	£1,631.85	22	8,573	44
Electricity	43,445	48	£5,647.88	78	11,000	56
Total	90,069		£7,279.73		19,573	

4.2.3 Energy monitoring

No improvements planned. It is suggestable that an action plan in line with TM39 is reviewed and dates / requirements considered.

The school / trust have provided historical energy consumption via energy. We have reviewed the consumption DECs which form part of our baseline.

The school do not have any monitoring and verification plans in place for proposed measures. We suggest that an annual review of utility bills and changes to DEC reports are analysed.

4.3 Carbon Emissions

4.3.1 Current carbon emissions

See Section 4.2.2 for current carbon emissions

The school / trust has not previously considered calculation of carbon emissions; therefore, no patterns / trends have been found. In future the emissions are expected to have been reduced in line with the below calculated emissions, subject to funding streams being available to complete works.

4.3.2 Future carbon emissions

Main Building

844.64	**m^2**

Fabric Improvements					
	Current U-value	New U-value	%	% Building Loss	% Building Proposed Loss
Roof	0.35	0.18	**194**	**22**	**11.31**
Walls	0.60	0.28	**214**	**9**	**4.20**
Windows	3.30	1.60	**206**	**26**	**12.61**
Floor	1.00	1.00	**100**	**8**	**8.00**
Infiltration m3/hr @ 50 pa	10.00	7.00	**143**	**35**	**24.50**
Heat Loss Improvement from Fabric	**39.38**	%			
Current Annual kWh	**100,882**				

	Proposed Annual Consumption	Proposed Annual CO_2 Emissions
Utility	kWh	$kgCO_2$
Gas	61,155	11,245

ASHP Improvements

Technology	% Saved
N/A - Heat pump Already installed	0

	Proposed Annual Consumption	Proposed Annual CO_2 Emissions
Utility	kWh	$kgCO_2$
Electricity	100,882	25,542

Lighting Improvements - Fluorescent / Incandescent to LED

Technology	% Site
LED	10%
Fluorescent / Incandescent	90%

Technology	Current W/m²	Proposed W/m²	Total Load kW	Annual kWh
Estimate Lighting Load	12	6	9.63	15.41

	Proposed Annual Consumption	Proposed Annual CO_2 Emissions
Utility	kWh	$kgCO_2$
Electricity	5,068	1,283

Early Years School

215.00 **m^2**

Fabric Improvements					
	Current U-value	New U-value	%	% Building Loss	% Building Proposed Loss
Roof	2.00	0.18	**1111**	**22**	**1.98**
Walls	1.70	0.28	**607**	**9**	**1.48**
Windows	3.30	1.60	**206**	**26**	**12.61**
Floor	1.00	0.22	**455**	**8**	**1.76**
Infiltration m3/hr @ 50 pa	10.00	7.00	**143**	**35**	**24.50**
Heat Loss Improvement from Fabric	**57.67**	**%**			
Current Annual kWh	**25,679**				

	Proposed Annual Consumption	Proposed Annual CO_2 Emissions
Utility	kWh	$kgCO_2$
Gas	10,870	1,999

ASHP Improvements

Technology	% Saved
Boiler (Condensing) to High Temp ASHP	49.05

	Proposed Annual Consumption	Proposed Annual CO_2 Emissions
Utility	kWh	$kgCO_2$
Electricity	13,083	3,313

Lighting Improvements - Fluorescent / Incandescent to LED

Technology	% Site
LED	10%
Fluorescent / Incandescent	90%

Technology	Current W/m²	Proposed W/m²	Total Load kW	Annual kWh
Estimate Lighting Load	12	6	2.45	3.92

	Proposed Annual Consumption	Proposed Annual CO_2 Emissions
Utility	kWh	$kgCO_2$
Electricity	1,290	327

4.3.3 Energy source carbon emissions

Carbon emissions for each energy source are as below:

Energy Source	kg CO_2e/kWh
Electricity	0.25319
Gas	0.18387
Gas oil	0.25672
Fuel oil	0.26775
Burning oil	0.24666
Coal	0.34462
LPG	0.21448
Wood pellets	0.03744
Wood chips	0.00792
Biogas	0.02405

5 HEATING SYSTEMS

5.1 Current Heating Technologies

The current heating technologies for the school are detailed under section 2.1.3 Energy – existing systems. There are no heat network connections currently associated with the school.

5.1.1 Heating fuel breakdown

Ref.	Building served	Plantroom	Fuel type	Water temperature*
1.	Main Building	Main plantroom	Gas	LTHW
2.	Early Years	Main plantoom	Gas	LTHW

*Note: *LTHW – low temperature hot water 70-95°C*
MTHW – medium temperature hot water 100-120°C
HTHW – high temperature hot water over 120°C

5.1.2 Heating Condition

The heating systems will be graded for priority of works as per table below:

CONDITION	PRIORITY
GRADE A – Good Performing as intended and operating efficiently.	PRIORITY 1 – URGENT IMMEDIATE WORK REQUIRED THAT WILL: Prevent immediate closure of premises Address an immediate high risk to H&S of occupants remedy a serious breach of legislation
GRADE B – Satisfactory Performing as intended but minor repairs required.	PRIORITY 2 – ESSENTIAL WORK REQUIRED WITHIN 2 YEARS THAT WILL: prevent serious deterioration of the fabric or services address a medium risk to H&S of occupants remedy a less serious breach of legislation
GRADE C – Poor Poor, exhibits various defects, each of which might not be significant in itself but together need attention on a planned basis.	PRIORITY 3 – NECESSARY WORK REQUIRED WITHIN 3-5 YEARS THAT WILL: prevent deterioration of the fabric or the services address a low risk to the H&S of occupants remedy a minor breach of legislation
GRADE D – Bad/Urgent work required Life expired. Exhibits major deterioration. Serious risk of imminent breakdown or is a H&S hazard.	PRIORITY 4 – DESIRABLE WORK REQUIRED FROM 5 YEARS ONWARD THAT WILL: prevent possible deterioration of the fabric or services

5.1.2.1 *Main Building*

Element	Overall Condition
Heating Plant – Boilers (Gas-fired)	Condition Category *B3*
Heating Plant – Heat Pump (Gas-fired)	Condition Category N/A
Heating Plant - ASHP	Condition Category N/A
Heating Plant – Plantroom pipework distribution	Condition Category B3
Heating Plant – Heating Pumpsets	Condition Category B3
Heating Plant – Domestic water distribution	Condition Category B3
Heating Plant – Hot Water Return Pump	Condition Category N/A
Heating Plant – Heat emitters	Condition Category B2
Heating Plant – Heating distribution	Condition Category D2
Air Conditioning – Split & Multi Splits (Electric HP)	Condition Category N/A
Air Conditioning – VRV/VRF (Electric HP)	Condition Category N/A

*Note: overall condition is taken as an average across the site. The condition will vary between the blocks – see photographic evidence appended to this report for a specific representation

5.1.2.2 *Early Years*

Element	Overall Condition
Heating Plant – Boilers (Gas-fired)	Condition Category *B3*
Heating Plant – Heat Pump (Gas-fired)	Condition Category N/A
Heating Plant - ASHP	Condition Category N/A
Heating Plant – Plantroom pipework distribution	Condition Category B3
Heating Plant – Heating Pumpsets	Condition Category B3
Heating Plant – Domestic water distribution	Condition Category B3
Heating Plant – Hot Water Return Pump	Condition Category N/A
Heating Plant – Heat emitters	Condition Category B2
Heating Plant – Heating distribution	Condition Category D2
Air Conditioning – Split & Multi Splits (Electric HP)	Condition Category N/A
Air Conditioning – VRV/VRF (Electric HP)	Condition Category N/A

*Note: overall condition is taken as an average across the site. The condition will vary between the blocks – see photographic evidence appended to this report for a specific representation

5.2 Hot water generation

Description	Overall Condition
Hot water generation type	See section Energy – existing systems
Size	See section Energy – existing systems
Condition	Condition Category B2
*Note: overall condition is taken as an average across the site. The condition will vary between the blocks – see photographic evidence appended to this report for a specific representation	

The school's water use is metered. The hot water is provided by gas fired cylinders (serving approx. 90% of the site) and local direct electric water heaters (approx. 10% of the site). The school has a kitchen and the hot water for this is provided from the main boiler plantroom hot water cylinders.

5.3 Maintenance programme

Description	Frequency	Completed
Gas safety	Annual (Gas Safe)	Yes - report evidence
EIR Electrical Inspection Report	5 years (BS:7671)	TBC
PAT testing	Annual recommended	TBC
Emergency lighting check	Monthly (BS:5266)	TBC
Fire alarm check	Monthly and Annual (BS:5839)	TBC
Fire risk assessment	Annual	TBC
Disabled refuge check	Monthly	TBC
F-gas	Depending on HFCS	N/A
Asbestos Management Plan	5 years (HSE)	TBC
Boiler / Heating plant Servicing	Annual recommended	Yes - report evidence
Pressure relief valves	Annual	TBC
Legionella	Weekly, 3monthly, annual (L8/HSG)	TBC
LTHW system dosing	Annual	TBC
Kitchen hygiene (i.e. ductwork cleaning)	Depending on frequency and type of cooking	N/A
Ventilation filters cleaned / changed	Depending on external environment	N/A
Fan coil unit filter cleaned	Annual	N/A

Description	Completed
External maintenance company employed	Yes
Site manager / caretaker undertakes minor maintenance	No

5.4 End of life equipment

Refer to the condition grading table within each relevant section.

6 SOLUTION

Dependent upon the stage the school / trust is at, their plan may be more or less mature. We are at the initial stage, and we shall record the conceptual ideas.

6.1 Main building

Solution 1	Description	Comments
Proposals	Fabric improvements	Ease of install - High
Stage of plan	Conceptual	

Solution 2	Description	Comments
Proposals	Boilers to ASHP	Ease of install - High
Stage of plan	Conceptual	

Solution 3	Description	Comments
Proposals	LED lighting upgrade	Ease of install - High
Stage of plan	Conceptual	

Solution 4	Description	Comments
Proposals	PV panels	Ease of install - High
Stage of plan	Conceptual	

6.2 Early Years

Solution 1	Description	Comments
Proposals	Fabric improvements	Ease of install - High
Stage of plan	Conceptual	

Solution 2	Description	Comments
Proposals	Boilers to ASHP	Ease of install - High
Stage of plan	Conceptual	

Solution 3	Description	Comments
Proposals	LED lighting upgrade	Ease of install - High
Stage of plan	Conceptual	

Solution 4	Description	Comments
Proposals	PV panels	Ease of install - High
Stage of plan	Conceptual	

The proposed solutions are meant to complement each other and to provide the best option for the school / trust to decarbonise.

We recommend that the school to take a fabric first approach before implementing any low energy measures. It is noted that fabric improvements can be carried out at the same time as low energy measures.

We are suggesting an approach which moves away from a fossil fuel reliance based on the use of an electric infrastructure which may require upgrades to the existing incoming supply / network.

Planning permission may be required for external siting of ASHP plant and PV / solar thermal panels.

All measures shall be designed and installed by certified competent professionals. The low energy measures shall be designed so that operation is automated, limiting the manual intervention of operatives. In all instances, operation and maintenance (O&M) manuals must be provided.

7 ESTIMATED COST

7.1 Cost breakdown

Cost estimates for the proposed solutions have been based upon cost approximations from industry expertise. Risk items have contingent funds added.

Any risk items should be included as provisional sums, below line in any contractor's tender return. Such items include:

1. Temporary heating plant – recommended 6 week duration
2. Temporary power (generator plant) – recommended 6 week duration

The costs below include provisional sums for;

1. Prelims – 6%
2. Asbestos Removal – 10%
3. Abnormal Costs - £9,000.00 (Electrical infrastructure upgrade due to ASHP Load)
4. Client Contingency – 3%
5. Professional Fees – 10%
6. Inflation – 2%

Main Building 844.64 m²

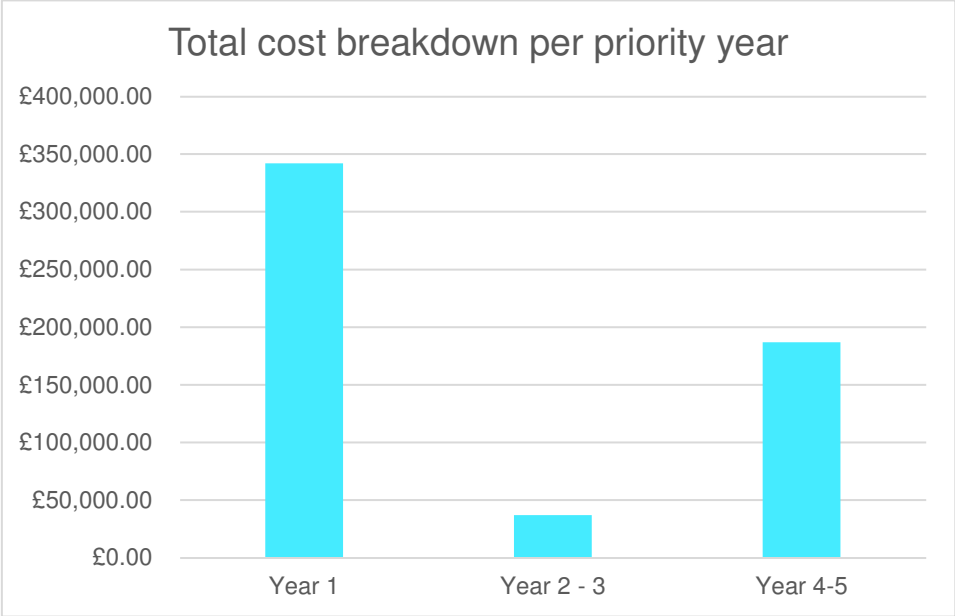
Ref	Energy saving opportunity	Relevance	Area affected	Unit	Cost Range	Cost m²	Total Cost	Year 1	Year 2 - 3	Year 4-5	Condition Priority
1	Cavity wall insulation £35/m²	Relevant	844.64	m²	£35.00	Per m²	£37,068.03		£37,068.03		Medium
2	Solid wall insulation £100/m²	N/A	0	m²	£100.00	Per m²					Low
3	Suspended Ceiling pad insulation £18/m²	N/A	844.64	m²	£18.00	Per m²					Low
4	Flat roof insulation £180/m²	N/A	844.64	m²	£180.00	Per m²					Low
5	Flat roof replacement £250/m²	N/A	844.64	m²	£250.00	Per m²					Low
6	Pitched roof replacement (including tiles and new insulation)	N/A	844.64	m²	£550.00	Per m²					Low
7	Pitched roof, new insulation at joists	N/A	844.64	m²	£15.00	Per m²					High
8	Pitched roof, new insulation at rafters	N/A	844.64	m²	£66.00	Per m²					Low
9	Double Glazed Windows & Doors	N/A	844.64	m²	£550.00	Replacement area					Low
10	Thermostatic Radiator Valves	N/A	844.64	m²	£20.00	Per Valve					Low
11	Heat emitter replacement £110/m²	Relevant	844.64	m²	£110.00	Per m²	£124,552.49			£124,552.49	Low
12	Lighting upgrade	Relevant	760.176	m²	£55.00	Per m²	£56,048.62	£56,048.62			High
13	Lighting controls upgrade £15/m²	Relevant	760.176	m²	£15.00	Per m²	£15,285.99	£15,285.99			High
14	Improve air tightness (sealing, draught stripping etc) £15/m²	Relevant	844.64	m²	£15.00	Per m²	£15,520.25			£15,520.25	Low
15	Improve metering provisions in accordance with CIBSE TM39	Relevant	844.64	m²	£15,000.00	Range £5,000-20,000	£20,108.48			£20,108.48	Low
16	Boiler to High Temperature ASHP	Relevant	844.64	m²	£230.00	Per m²	£270,828.87	£270,828.87			High
17	Boiler to Biomass	N/A	844.64	m²	£230.00	Per m²					Low
18	Direct Electric to High Temperature ASHP	N/A	844.64	m²	£230.00	Per m²					Low
19	Storage Heaters to High Temperature ASHP	N/A	844.64	m²	£230.00	Per m²					Low
20	PV Panels	Relevant	844.64	m²	£20,000.00	Per 30kWp	£26,811.31			£26,811.31	Low
21	Solar Thermal	N/A	844.64	m²	£20,000.00	Estimate					Low
							£566,224.04	**£342,163.47**	**£37,068.03**	**£186,992.54**	

Early Years School 215.00 m²

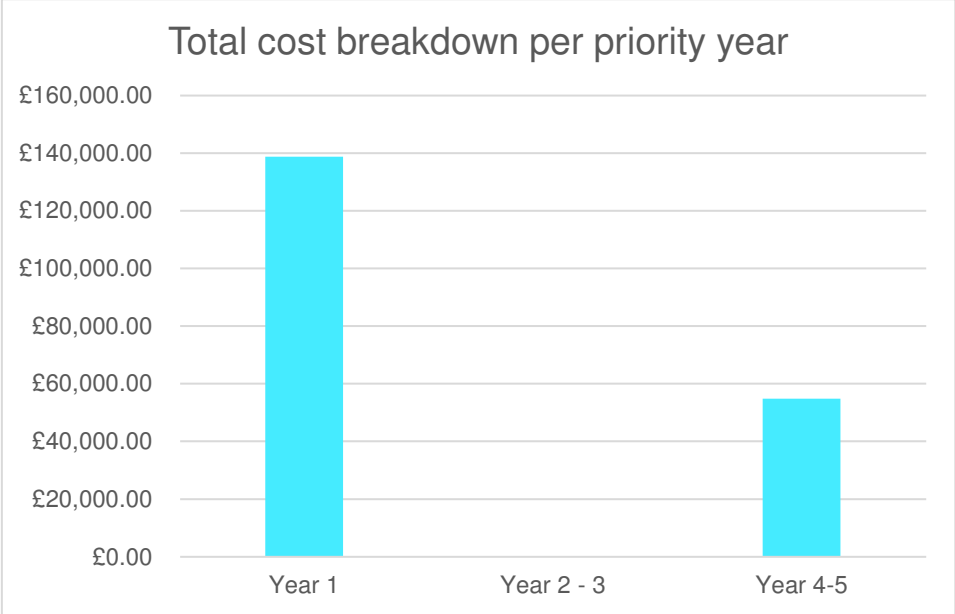
Ref	Energy saving opportunity	Relevance	Area affected	Unit	Cost Range	Cost m²	Total Cost	Year 1	Year 2 - 3	Year 4-5
1	Cavity wall insulation £35/m²	N/A	0	m²	£35.00	Per m²				
2	Solid wall insulation £100/m²	Relevant	215	m²	£100.00	Per m²	£28,822.16	£28,822.16		
3	Suspended Ceiling pad insulation £18/m²	N/A	215	m²	£18.00	Per m²				
4	Flat roof insulation £180/m²	N/A	215	m²	£180.00	Per m²				
5	Flat roof replacement £250/m²	N/A	215	m²	£250.00	Per m²				
6	Pitched roof replacement (including tiles and new insulation)	N/A	215	m²	£550.00	Per m²				
7	Pitched roof, new insulation at joists	N/A	215	m²	£15.00	Per m²				
8	Pitched roof, new insulation at rafters	Relevant	215	m²	£66.00	Per m²	£19,022.63	£19,022.63		
9	Double Glazed Windows & Doors	N/A	215	m²	£550.00	Replacement area				
10	Thermostatic Radiator Valves	N/A	215	m²	£20.00	Per Valve				
11	Heat emitter replacement £110/m²	N/A	215	m²	£110.00	Per m²				
12	Lighting upgrade	Relevant	193.5	m²	£55.00	Per m²	£14,266.97	£14,266.97		
13	Lighting controls upgrade £15/m²	Relevant	193.5	m²	£15.00	Per m²	£3,890.99			£3,890.99
14	Improve air tightness (sealing, draught stripping etc) £15/m²	Relevant	215	m²	£15.00	Per m²	£3,950.62			£3,950.62
15	Improve metering provisions in accordance with CIBSE TM39	Relevant	215	m²	£15,000.00	Range £5,000-20,000	£20,108.48			£20,108.48
16	Boiler to High Temperature ASHP	Relevant	215	m²	£230.00	Per m²	£76,691.91	£76,691.91		
17	Boiler to Biomass	N/A	215	m²	£230.00	Per m²				
18	Direct Electric to High Temperature ASHP	N/A	215	m²	£230.00	Per m²				
19	Storage Heaters to High Temperature ASHP	N/A	215	m²	£230.00	Per m²				
20	PV Panels	Relevant	215	m²	£20,000.00	Per 30kWp	£26,811.31			£26,811.31
21	Solar Thermal	N/A	215	m²	£20,000.00	Estimate				
							£193,565.08	**£138,803.66**	**£0.00**	**£54,761.41**

7.2 Total prioritised costings by blocks

7.2.1 Main building



7.2.2 Early Years



8 DELIVERY

8.1 Project Planning

The works shall be **prioritised** based upon **Condition Category D1 which denotes the urgency of need.**

- Fixed price tenders shall be obtained.
- Highest need areas in the worst condition have been prioritised across the School and will be addressed first.

- Works will fully comply with the Output Specification 2020 for schools
- Working with an existing competitively sourced supply chain enables accurate programme planning.
- Project readiness will be explained and project programme and Risk Register are provided identifying key tasks and timescales associated with the project. **Dates shall be based on contractors recommendations.**
- A contingency sum and time period shall be allowed for in case of any unforeseen items.
- Access and working areas shall be agreed prior to works, to provide defined and segregated access routes.
- Asbestos management report reviewed, and an R&D asbestos survey to be completed prior to works commencing

Programming of work & Impact on School

All key tasks and timescales associated with the project to be evaluated to ensure the project can be delivered within the contractors proposed timescales. Key dates to be highlighted on the contractor's proposal.

Readiness to deliver

- The scope of the project to be defined and quotations received.
- Tenders remain fixed for 1 year from receipt of tender.
- Proven experienced of contractors to be selected for tender.
- Health and Safety Packs to be compiled (principal designer appointment)
- An R&D asbestos survey to be undertaken within the specific area in preparation of pending works.

8.2 Internal Sign off

The appointed officer, such as the school business manager shall discuss the needs with the head teacher, governing body, and trust officials to gain statutory approvals (i.e., covenant discharge) and funding source approvals (such as Salix / CIF funding streams).

The projects shall be:

- Cost monitored, from concept to inception.
- Time reported – periodic programming liaison between contractor / professional team and school / client input.
- Periodically inspected during the project programme for quality assurance.

These metrics shall ensure project deliverables are fully assessed as suitable for the establishments needs.

8.3 Procurement Process

Project to be tendered under the JCT Minor Works Building Contract and based on a traditional procurement route. The preliminaries within the tender documentation shall set out all project and contractual particulars associated with the project, identifying retention periods, payment terms, liquidated and ascertained damages and terms of engagement. The scope of the project to be specified by a competent person / professional consultancy.

8.4 Project Program

Project works duration shall be based upon the type of works carried out, phasing requirements, and funder requirements.

The duration of works that do not affect the occupant's day to day activities shall be spread out over the year, being considerate to climate conditions of inclement weather which may cause delay. An example of this shall be hot rolled felting works.

Low energy measures such as heating, and LED lighting replacements will be restricted to the summer holiday period. Plant room heating replacements can be carried out during the summer period which may extend into the October period, considering that year's weather. If the heating plant serves hot water, this works will be limited to the summer holiday period. Temporary plant should be considered for these works and be included as a provisional sum.

All works shall be phased to suit the priority of need, as identified within section 7.2 costing plan.

8.5 Risks

RISK DESCRIPTION	LIKELIHOOD	IMPACT	MITIGATION
Health and Safety	Med	Med	S2e appointed as Principal Designer to oversee all aspects of health and safety during the project delivery phase. All works are programmed for completion during school holidays with float period before to enable works to isolated areas and after to address weather related risks. Construction Phase Plans approved by Principal Designer
Asbestos	Med	High	Asbestos management survey assessed. Refurbishment and demolition survey to be carried out prior to commencement.
Erection of scaffolding	Low	Low	Scaffolding required for high level pipework distribution
Access/Egress to site Works vehicle traffic	Low	Low	Principal Designer to agree site management plan prior to commencement of work.
Signing in	Low	Low	All contractors to sign in at compound and remain in working zone at all times. School Site Manager to be informed if further access is required.
Parking/Storage	Low	Low	Contractors compound and working space agreed with SLT as shown on Contractor set up

RISK DESCRIPTION	LIKELIHOOD	IMPACT	MITIGATION
Noise	High	Low	Summer holiday project.
Fire Routes	Low	Med	The existing fire routes can be maintained in use during the works. Alternative routes will not be required.
Insurances	Low	Low	School to contact insurances regarding work to ensure cover is in place.
Cost Certainty	Low	Low	Project tendered in advance of funding application.
Hot Work	Low	Low	Compression pipe jointing system, hot work not required.
Programme Slippage	Low	Low	Contingency included in programme.
Unforeseen work	Low	Low	Contingency included in budget.
Disruption to school	Low	Med	Summer Holiday Project. Sequence of replacement established
Project Management	Low	Med	Experienced CIF project managers appointed.
Site Security	Low	Med	Secure site setup provided. Premises staff on site during work.
Communication	Low	Med	Weekly meetings with leadership team.
Materials	Low	Med	Pipework and emitters readily available.

RISK DESCRIPTION	LIKELIHOOD	IMPACT	MITIGATION
DBS Enforcement	High	Low	**All contractor operatives approved DBS to work** within defined area. All contractors to follow Academy specific Safeguarding Procedures. **Summer Holiday Project.**
Personnel Identification	Med	Med	**All contractor operatives to wear PPE.** All Hi-Vis clothing to bear the name of the contractor employing the operative. All contractor operatives to carry photographic ID.
Noise Disruption	Med	Low	**Summer Holiday Project.**
Notifying Pupils and Staff of Working Areas	Med	Low	Heras fencing and signage to be used to separate working areas. Signage to be clear and at both high and low level. **Summer Holiday Project**.
Signing in	Low	Low	When internal access is required, contractor operatives must sign in at school reception prior to entering the main school buildings.

RISK DESCRIPTION	LIKELIHOOD	IMPACT	MITIGATION
Parking & Deliveries	Med	Low	**Additional material handling required due to distance from road. Extra planning of deliveries required.**
"Back to School" Meeting	Med	Low	As works are to commence in the summer holidays, a meeting will be held to review the site setup and working procedures prior to the return of pupils in the September Term.
Teacher/Staff Engagement	Med	Low	An all staff email is to be incorporated into project communication. "All staff" emails to be issued to the Academy for forwarding by the Business Manager.
Works are to be programmed to make best use of holiday periods and weekends. This avoids where possible term time working.			

9 RESOURCES

9.1 Planned Projects

Building	Project Type	Technology - Work Type	Start Date	End Date	Duration Weeks
n/a					

The School does not have any planned projects at the time of issue of this document.

9.2 Governance

Due to the size of the MAT the investment and delivery of projects shall be inline with the 'DFE Condition grants spend guidance'. The guidance requires demonstration of key point indicators ensuring:

1. Agreement with the MAT authority structure of strategy.
2. Clear documentation of performance, responsibilities, and cost (finance, procurement, and risk contingency) indicators.
3. HSE policies and management (i.e. incorporation of a principle designer within project responsibilities)
4. Prioritisation of works specific to the estate.
5. Demonstration of good value for money.

In addition, the MAT is reliant on further government funding streams such as the Salix LCSF scheme which has enabled this decarbonisation report to have been assigned, and the PSDS.

9.3 Management & Personal

The appointed officer, such as the school business manager and/or head teacher shall oversee the financial requirements and undertake a resource plan, acting as the senior sponsor for the project(s) supported by the site manager/caretaker, in monitoring the works.

Due to the complex nature of the projects it has been proven successful in past to appoint an external consultancy team to.

1. Formulate Decarbonisation Strategies – as demonstrated within the LCFS report.
2. Provide support in for funding applications (to enhance financial resources), producing condition reporting, project planning / programming, costing (i.e. tendering)
3. Provide support in appointment of contractors, such as forming contracts (i.e. JCT and where appropriate Minor Works with or without contractor design clauses).
4. Provide contract administration/project management to plan, coordinate, monitor and certify contractors works.

Decarbonisation projects require an understanding of the measures from a technical view to ensure the strategy and phasing of measure introduction maximises the gains of the potential projects. External consultants shall have the professional experience of such measures which is beneficial support tool for school/trust resources. Where schools/trust look to undertake this in house, team members must either come from a background where their understanding of measures is robust, or undertake specific training, but to have a sound holistic understanding is not an area which can be understood within a short time frame. Therefore, a good consultancy shall represent good value for money, which is in line with the aforementioned key point indicator of governance.

Projects shall include monitoring/recording of energy inline with TM39 requirements, and it is highly recommended that the site team familiarise themselves, through supported contractor training, in the recording of information. The energy information recording is dependent upon the future works integration, currently the energy usage information is simplistic at source via authority meters, with limited sub metering. The decarbonisation strategy shall included to enhance and where possible automate the collection of energy usage, more difficult within existing establishments.

10 PREVIOUS ENERGY EFFICIENCY PROJECTS AND EXISTING LOW CARBON HEATING TECHNOLOGY

Below are the details of previous low energy/carbon projects undertaken.

Building	Project Type	Technology - Work Type	Applicable (yes/no)	Estimated Energy Reduction %*
Main Building	Boilers	Change atmospheric to condensing boiler	Yes	22%
Early Years	Boilers	Change atmospheric to condensing boiler	Yes	22%

*Estimated energy reductions based upon calculated energy efficiencies

11 HEATING NETWORKS AND OPPORTUNITIES ON SITE

Existing or planned heat network developments located close to the establishment:

Technology - Work Type	Viability of Use
No technologies within the site vicinity	N/A

12 ELECTRICITY LOADING CAPACITY TO SUPPORT A SWITCH TO ELECTRIC HEATING SOLUTIONS

12.1 Estimated Peak Capacity Baseline

Main Building

Estimated Peak Load		
School Area	844.64	m²
Estimate load (W/m²)	122	W/m²
Calculated load	103,046	W
Diversity %	0.5	
Total Calculated load	51.52304	kW
Total Calculated load	74	Amp

Early Years School

Estimated Peak Load		
School Area	215.00	m²
Estimate load (W/m²)	122	W/m²
Calculated load	26,230	W
Diversity %	0.5	
Total Calculated load	13.115	kW
Total Calculated load	19	Amp

Notes:

1. This is and estimated load based upon BSRIA BG9/2011: Table 18 (Page53) & Table 20 (Page 55)

12.2 Onsite Capacity and voltage

Capacity	Running Current from Onsite Load Monitor*	Voltage
Running current	Not available – no load monitors	LV - supplied from roadside

* The states load is from a visual inspection of the meter at the time of visit, this is not representative of a peak load. We would recommend a load monitoring exercise be carried out prior to any electrical load increase being instated, for a minimum period of 7 days during peak school hours.

12.3 Anticipated electrical load increase due to low energy measures.

Building	Project Type	Technology - Work Type	Estimated Load Addition
Main Building	Heat Pump	Two stage high temperature heat pump, Stage 1 Air to water, Stage 2 Water to Water	Primary – up to 2,000m2 - Two stage high temperature heat pump, Stage 1 Air to water, Stage 2 Water to Water – 63amp
Early Years	Heat Pump	Two stage high temperature heat pump, Stage 1 Air to water, Stage 2 Water to Water	Primary – up to 2,000m2 - Two stage high temperature heat pump, Stage 1 Air to water, Stage 2 Water to Water – 63amp
Main Building	EVC	Electric vehicle charging based upon a 7.2kW shared load (diversified system)	Primary - up to 2,000m2 - 32amps

The school has not liaised with the DNO over potential capacity upgrades, this would form part of design works associated to the future projects.

12.4 Low energy measures currently installed to reduce electrical load

Building	Project Type	Technology - Work Type	Estimated Load Reduction
		No current plans	

12.5 Planned Low energy measures to reduce electrical load

Building	Project Type	Technology - Work Type	Estimated Load Reduction
		No current plans	

12.6 Potential Low energy measures to reduce electrical load

Building	Project Type	Technology - Work Type	Estimated Load Reduction
Main Building	PV	Photovoltaic array 30kWp	40amp
Main Building	Low Energy Lighting	LED replacement	10%
Main Building	Low Energy Lighting	Lighting Controls to include PIR detection and daylight dimming	5%
Early Years	PV	Photovoltaic array 30kWp	40amp
Early Years	Low Energy Lighting	LED replacement	10%
Early Years	Low Energy Lighting	Lighting Controls to include PIR detection and daylight dimming	5%

13 SUPPORTING INFORMATION

See attached supporting information package with information provided as per below checklist:

Supporting Information	Provided
Display Energy Certificates (DECs)	☒
Age of buildings	☐
U values of building elements	☐
Energy consumption data	☒
Maintenance costs	☒
Current contractual agreements (e.g. facilities management) and their targets	☐
Target emission savings for the decarbonisation plan	☐
Site surveys	☐
Floor plans	☒
Images of the systems and building fabric.	☒
Heating system condition reports.	☐
Building fabric condition reports.	☒
Heating and electrical schematics.	☐
Heat loss calculation for the buildings.	☐

14 PLANS FOR THE SITES

Supporting Information	Yes/No	Comments
Any known planning restrictions, or planning guidance	No	External ASHP and PV arrays before installation, shall be consulted with the relevant authorities.
Plans for demolition and rebuilding, major refurbishments or change of use	No	None known
Plans for change of occupancy or operation hours	No	None known
Plans that are in the public domain for expansion or rationalisation of sites or change of usage	No	None known
Plans for new builds and the planning standards for new builds in your area	No	None known
Building standards and building regulations	No	Minimum building regulations (enhancement recommended) along with specific industry guidance to be adopted for and potential projects

15 APPENDIX