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Public Sector Decarbonisation Scheme

Investment Grade Proposal

Trinity St Marys C of E Primary School

SOUTHWARK DIOCESAN BOARD OF EDUCATION
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Investment Grade Proposal

Version Control

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File Name	Release Date	Summary of Changes	Location of Change	Change Impact
PSDS RE:FIT IGP – 37. Trinity St Mary's v2	23 June 2021	Addition of solar PV	Throughout	Additional savings
PSDS RE:FIT IGP – 37. Trinity St Mary's – final	29 August 2021	Final specification following surveys	n/a	Revised savings figures
PSDS RE:FIT IGP – 37. Trinity St Mary's – 2022 update	9 May 2022	Additional information on savings	Section 7.1	Clarify savings in light of 2022 fuel price increases

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1. Executive Summary

1.1 Background and Scope

The rising impact and cost of carbon emissions mean that public sector organisations are under increasing pressure to reduce their emissions. In addition, with energy prices predicted to continue to rise, there is an increasing need for all organisations to achieve savings. As such, reducing carbon emissions leads to direct financial, risk management and reputational benefit to public sector, third sector and commercial organisations alike.

The Southwark Diocesan Board of Education recognises that the environment has a huge impact on the quality of the lives of local residents and if the most is made of existing and emerging technologies, the challenges of climate change can be reframed to build a cleaner, greener portfolio which reaps the economic rewards of a clean growth revolution, while eliminating health and social inequalities and their associated costs.

The RE:FIT framework is co-owned by Local Partnerships and the Greater London Authority. It has been developed in partnership with the former Department of Energy and Climate Change (now department for Business, Energy and Industrial Strategy ("BEIS")) and the Crown Commercial Service.

The RE:FIT for Schools (London) Programme assists London's schools to retrofit their existing buildings with energy saving measures, thereby reducing carbon emissions and achieving substantial annual cost savings.

Following a competitive tendering process through the RE:FIT Framework, Asset+ were appointed as the Energy Services Company (ESCo) to deliver this programme. Asset+ are a UK independent energy performance contracting specialist.

1.2 Public Sector Decarbonisation Scheme

In October 2020 The Department for Business, Energy and Industrial Strategy (BEIS) launched the Public Sector Decarbonisation Scheme (PSDS), which offered £1bn of grant funding for capital energy efficiency and heat decarbonisation projects within public sector non-domestic buildings, including schools.

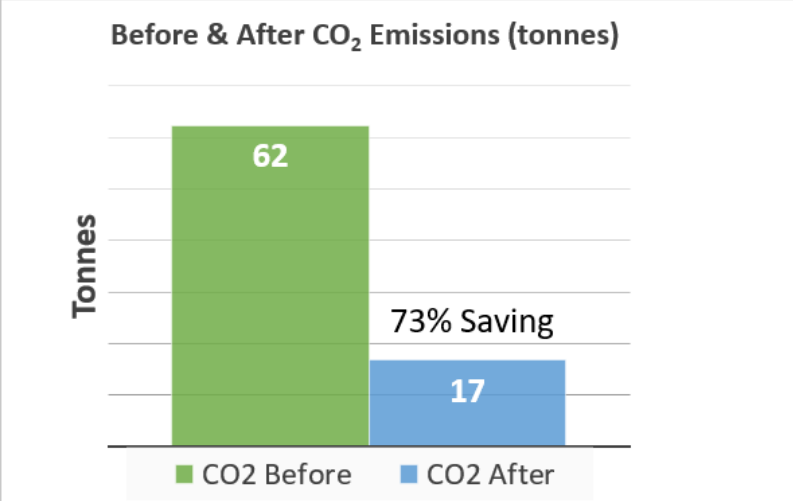
Asset Plus, SDBE's existing RE:FIT Schools delivery partner, was nominated to bid for funding on behalf of schools across the SDBE portfolio. This covers a range of decarbonisation measures, such as air source heat pumps (ASHPs), photovoltaic panels (PV), LED lighting projects, boiler optimisers, fridge optimisers and valve/pipe insulation.

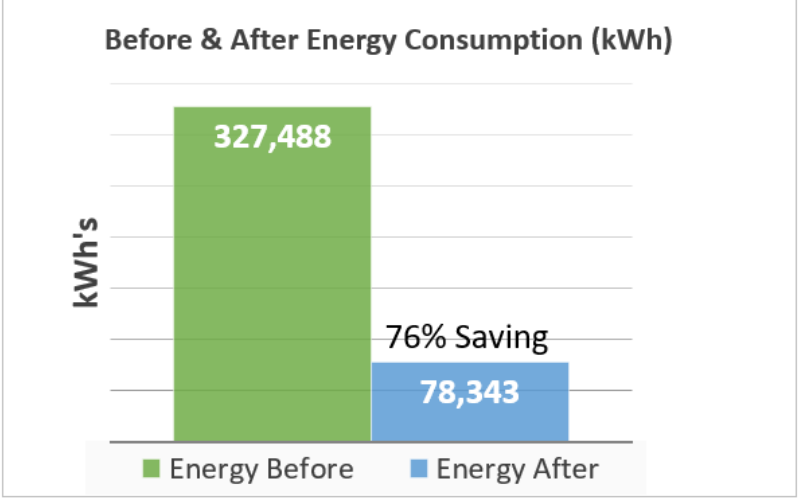
SDBE's bid was successfully awarded, and your school is set to benefit. We are now actively moving forward with the project, and this Investment Grade Proposal sets out the measures proposed for your school, as well as their associated energy and carbon savings.

2. Annual Savings

Headline Annual Savings for your school

- Carbon Saving:
  - 45 tonnes
  - 73%
- Energy Saving:
  - 249,145 kWh
  - 76%





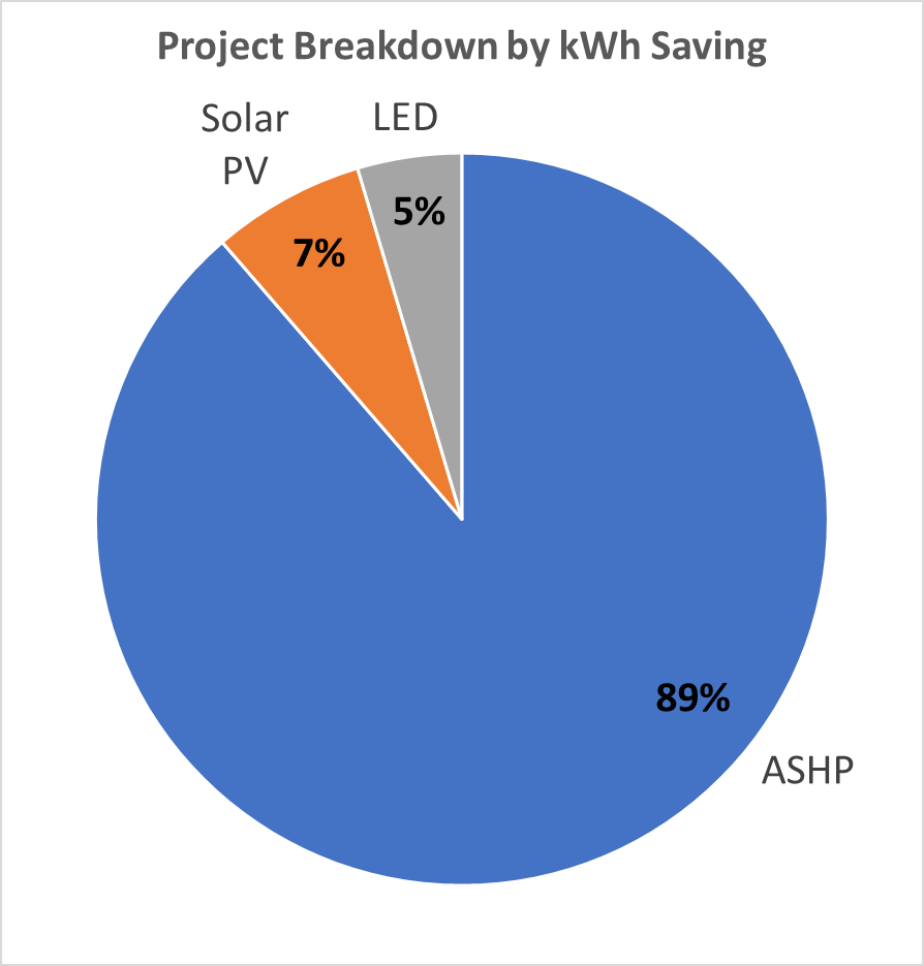
3. Overview of Decarbonisation Measures

This report outlines the detailed results of our recent surveys following the award of the PSDS application.

The following measures are being put forward:

- 1 x 105 kW Air Source Heat Pump
- New boiler
- LED lighting upgrade
- Solar PV panels

The savings performance of the selected measures is shown below – note that the savings impact of the new boiler has been included in the ASHP section as these technologies work together.



4. Frequently Asked Questions

Is there anything for schools to pay?

No, these installations are 100% funded with nothing for schools to pay. Please note that where installations take place outside core hours, schools will be responsible for providing access to site, e.g. overtime pay for a site operative or caretaker.

What technology will you be installing in our school?

Most schools will be receiving an Air Source Heat Pump, with some also receiving other measures. Your school specific plan is set out in section 5 of this document.

What is the timescale?

Your project timescale is set out in section 6 of this document.

Do we have to manage the installations ourselves?

No, whilst you are welcome to have greater involvement if you wish, Asset Plus will project manage these installations on your behalf. You will be consulted for any key decisions and you will be required to provide access to site. See page 2 above for key contact personnel.

Will the work be disruptive?

We recognise that minimising disruption for schools is of paramount importance and will endeavour to keep any impacts to the minimum. Much of the installation work will take place outside of core school areas – for example, within boiler rooms – and where we need to carry out more disruptive work such as lighting installations, these will take place out of hours or during holidays.

5. Proposed decarbonisation measures for your school

5.1 Air Source Heat Pump (ASHP)

An Air Source Heat Pump absorbs heat from outside air and uses this to heat water for your existing radiator and hot water systems. Electricity is used during this process, but typically at least three units of heat are produced for every one unit of electricity consumed.

Following recent survey work, we have confirmed your school is ideally placed to benefit from this technology.

The proposed system consists of 1no 105kW Carrier Air Source Heat Pump, coupled with an enhanced controls package.

Alongside this, the school's boiler will also be replaced.

The upgraded system would consume approximately 36,000 kWh of electricity per year, and would supply over 257,000 kWh of clean heat.

The system operates by use of an external temperature sensor (TS). This is set at to an external temperature above which the heating load is satisfied by the heat pump alone. If the external ambient temperature drops below this set point, then the heat pump will switch off, and the secondary boiler will switch on to supply heat into the heating distribution system.

The heat pump will deliver most of the heating needed during a large part of the year. They are modulating and have weather compensation functionality. This allows the heat pumps to only produce the heat required and to vary the temperature of the water in the radiators themselves if required.

The heat pumps will be used to pre-heat the building in the morning prior to occupation.

Existing Installation

The current installation consists of 1no Potterton Derwent Premier 11 gas boiler (180kW) and 1no Andrew's gas fired DHW cylinder.

The boiler is supplying 2no heating circuits.

The DHW cylinder has a secondary return supplying portable hot water to the school.

The mains incomer to the school is located in the hall way just through the main entrance to the school alongside the reception office.

This is a 100A three phase mains incomer.

There are a number of circuits fed from here via switched isolators which are feeding distribution boards elsewhere around the school.

Proposed Design Philosophy

The introduction of air source heat pumps is used to combine the high efficiency, low running cost and low carbon footprint of a heat pump with an existing boiler (Oil, LPG or Gas) to feed into an existing system. This system is known as a bivalent system or sometimes hybrid system.

This system is most advantageous for older / larger properties with a higher heat loss, and where an air source heat pump alone would not be capable of emitting enough heat during cold weather, or where a multiple air source heat pump installation is not possible due to overloading of the power supply.

Description of Operation`

Bivalent systems utilise a secondary boiler, which is designed to provide heat into the distribution system when the heat pump is not sized for 100% of the peak load. They are generally found in retrofit applications where insulation levels of the building are not sufficient, and a heat pump cannot meet all of the heating load effectively.

Bivalent systems must be carefully designed to avoid the return temperature of the heating circuit being too high. If this return temperature is above the in-built temperature set point at which the heat pump turns off, the heat pump will never actually turn on and the whole of the load will be taken by the secondary boiler, resulting in higher-than-expected energy bills and carbon emissions.

The simplest and most effective way of providing the maximum efficiency of a bivalent heating system, is to weather compensate the heating system operating temperatures. When ambient temperatures are above the heat pump operating set point the heat pump leads with the boilers as secondary heat sources and when the ambient temperature is below the heat pump operating set point, the boilers lead.

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Carbon

A heat pump is on average 300% efficient compared to a new condensing gas boiler (95%) or an older gas boiler (75%). The carbon content of electricity is now considered to be lower than gas (136kgCO2/kWh for electricity to 210kgCO2/kWh for gas*) so, taking into account the relative efficiencies of the two technologies, any heat delivered by the heat pump is of a significantly lower carbon content than that heat delivered by a boiler. **SAP10.1*

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Proposed System

The proposed system is to install a ASHP on to the hydraulic system to contributing towards the hot water and heating requirements of the school (a new boiler plantroom refurbishment has been quoted separately, part of this proposed solution will require that work to have been carried out by ourselves or others).

The proposed location for the heat pump is to be in the car park in a currently unused space alongside the gate to the car park. This will include installing a new platform, gates to prevent unauthorised access and suitable barrier to prevent damage from accidental vehicle collisions.

There will be a requirement to install services in a trench across the car park, this will include hot water flow and return pre insulated pipe, power and communication cables. A spare duct will also be included to allow for and additional services that may be required in the future.

The heat pump will be connected into the return on the weather compensated circuits.

The electrical installation will require the installation of a new cable from the mains incomer. This will be installed in suitable trunking suitable for each area the cable passes through.

The image below shows the approximate heat pump location in red, with the plantroom location in yellow and an approximate route for the services between the plantroom and the heat pump.

Control Philosophy

The intention of this section is to describe herein, the operation of the following equipment:

- ASHP (cascade controller)
- LTHW System Controls

To incorporate the ASHPs into the BMS control strategy equipment will be added to the existing control panel.

Local user interrogation of the system will be as existing using a panel fascia HMI screen.

Heat Pump to operate in sequence to provide the “first stage” of LTHW when external conditions allow this.

The ASHPs operates to a compensated slope thus providing a variable temperature LTHW output on the primary or secondary circuits (dependent on the hydraulic positioning of the ASHP).

The BMS control system will control / monitor the following elements:

- ASHP Enable
- ASHP Run Status
- ASHP Fault Status
- ASHP Circulation Pump Enable
- ASHP Circulation Pump Run Status
- ASHP Circulation Pump Fault Status
- ASHP Common LTHW Flow Temperature Sens or
- ASHP Common LTHW Return Temperature Sensor

ASHP Start Sequence:

On receipt of a “go” signal the BMS will command the ASHPs to operate, following this sequence:

- ASHP Circulation Pump Enable
- ASHP Circulation Pump Run Status is confirmed
- ASHP Flow DPS will make releasing the ASHP for operation.
- ASHP will operate in sequence to provide initial stage of LTHW

The ASHPs are operated via a PID loop to provide the output as required from the primary compensated slope. Typically, the compensated slope is as detailed in section “LTHW Temperature Control”

Site Works
All site works will be carried out in accordance with CDM regulations.

Suitable heras fencing, welfare facilities and access equipment shall be provided by the contractor.

Works will be carried out during normal operating hours (Monday – Friday 08:00 – 17:00).

Manuals
On completion and acceptance by Asset+, the school caretaker will be provided with a hard copy of the Operation and Maintenance manual which will include an 'As-Fitted 'schematic pipework drawing, a descriptive controls philosophy, a F-Gas refrigerant statement, a simple guide to everyday operation, care and maintenance and a caretaker's guide to basic fault rectification.

Assumptions / Information Provided
The design and operation of the heat Pump system has been based on the existing annual consumption data for each school provided to us.

External temperature references are based on London Half Hour heating data sets.

Warranties

The new installation, including all new plant, equipment, pipework and controls will be subject to a 5 Year warranty including a 12-month parts and labour warranty from the date of practical completion. This warranty is conditional upon the maintenance of the equipment being carried out at all times as per the manufacturer's recommendations provided in the Manuals.

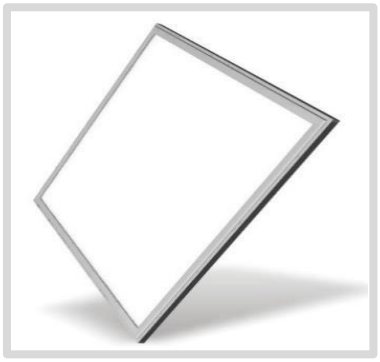
Liabilities

Works to this site are to decarbonise the main heating plant. This does not include the fixing of any existing temperature issues within the buildings or upgrading of wider infrastructure. As such any existing issues may still exist after our works and will not be covered by our warranty.

ASHP Maintenance

The first years of annual maintenance is included within this proposal at zero cost to the school. If the school wish Asset+ to carry out annual servicing of the heat pumps following the first year, this can be carried out for an annual charge of £985 + VAT.

5.2 LED lighting



Lighting consumes a significant proportion of the school's total electricity demand and is therefore an essential target for efficiency improvement. We will replace or modify an estimated 163 light fittings across all feasible areas of the school, giving savings of over 11,000 kWh per year.

As well as being more energy efficient, the new LED lamps will provide a more pleasant environment for staff and children, and will also reduce maintenance costs due to longer lamp life.

During installation access to most/all school areas will be required.

During holidays access to school buildings must be provided via a Caretaker or other personnel; please note that the school will be responsible for paying any associated wage/overtime costs.

Alternatively, the installation team can become keyholders for the project duration – please note a preliminary meeting to understand access/security issues will be required.

Warranties

The lighting comes with a five-year warranty.

5.3 Solar PV panels

Solar PV (photovoltaic) panels produce electricity from sun light. The school has been assessed for suitability and is ideally placed to benefit from this technology, with suitable roof area available to accommodate a 19 kWp system. This would consist of 52 panels.

The system will provide significant energy and cost savings, and will on average generate over 16,000 kWh of clean electricity per year.

During installation access is required to roof area(s) and switch rooms. Storage of materials on site may be required (this can be internally or externally, fencing can be provided). A suitable access route is needed and scaffold may be erected.

Depending on roof type, some drilling may be required in order to fix panels, although this is not always needed.

During holidays access to school buildings must be provided via a Caretaker or other personnel; please note that the school will be responsible for paying any associated wage/overtime costs.

Alternatively, the installation team can become keyholders for the project duration – please note a preliminary meeting to understand access/security issues will be required.

Proposed location

Warranties

The solar PV system comes with a ten-year warranty.

Solar PV Maintenance

The first year of annual heat pump maintenance is included within this proposal at zero cost to the school.

Subsequent annual routine maintenance would be £350 + VAT.

Measurement and Verification

To ensure the successful performance of the assets and services deployed Asset Plus will validate savings and effectiveness of the ECMs via Measurement & Verification one year post install in line with the industry standard IPMVP framework.

ASHPs

M&V Approach

IPMVP Option B - site gas consumption before change. Option B after change will require direct measurement of heat pump efficiency

Data Source

Access required to the schools HH Gas data source, where applicable. Regular updates required via LBH/School of non-HH, monthly Gas data.

LED lighting

M&V Approach

IPMVP Option B. The current on a selection of lighting circuits will be measured before any changes are made and the same circuit measured after the lamps are upgraded to LED. A calibrated True Amps RMS meter will be used. The selection of circuits to be measured will be agreed by all stakeholders. Allowance will be made for any faulty lamps in the present state. The tests will be witnessed and signed-off by stakeholder's representatives. The output from this process will provide confirmation of the energy performance of this measure.

Data Source

Local, direct measure by accurate, calibrated ammeter

Solar PV panels

M&V Approach

This system will already be provided with a panel to indicate instantaneous and cumulative generation at any time. The system will also be provided with a fiscal meter to record and display the generated total kWh. M&V will therefore not be necessary for this measure.

6. Installation Programme

Installation of the Air Source Heat Pump is estimated to be approximately 15 days.

Installation of the new boiler is estimated to be approximately 10 days.

Installation of the LED lighting is estimated to be approximately 7 days.

Installation of the Solar PV is estimated to be approximately 10 days.

The proposed installation programme is to be confirmed and will be communicated to you by the Project Manager (Richard Hall).

7. Baseline Data

We have based this proposal on the baseline energy data we received from schools and SDBE during the grant application process, as set out below:

Fuel	Usage (kWh per year)
Gas	286,208
Electricity	41,280

Emissions factors

The following BEIS Greenhouse Gas Conversion Factors (June 2020) have been used to calculate carbon emissions savings.

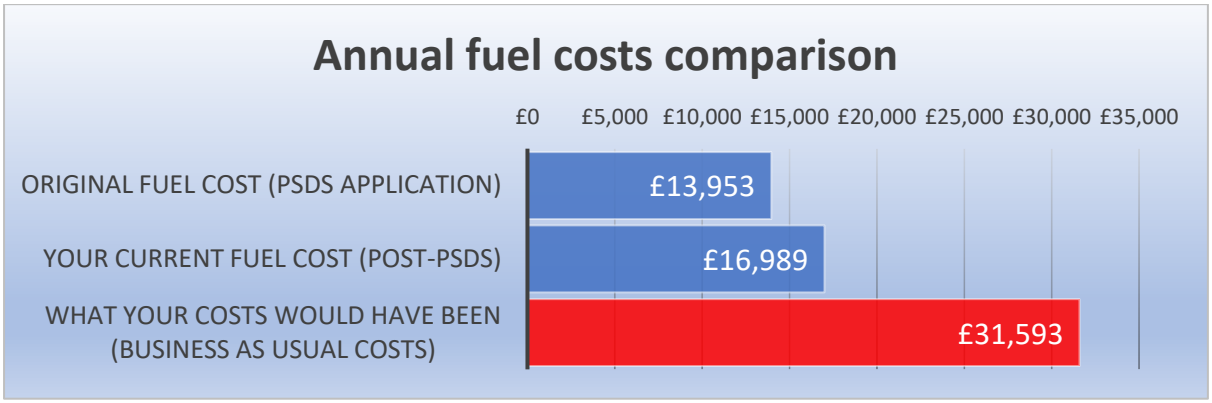
Fuel	Factor	Units
Gas	0.18387	kgCO2e/kWh
Electricity	0.23314	kgCO2e/kWh

Fuel Rates

We have used the following unit rates for fuel costs

Fuel	£ per unit
Gas	0.03
Electricity	0.15

7.1 2022 Fuel costs update



As shown above, when originally applying for the PSDS scheme, your school's bills were approximately £13,953 per year.

This is an estimate based on the baseline data provided to us, and typical fuel costs as shown in section 7 of this report. It excludes any additional charges e.g. standing charges.

Due to the recent major price increases in both gas and electricity, had the school simply continued with business as usual your annual bills would have risen to £31,593 per year, an increase of £17,640.

However, because the school has taken part in the PSDS scheme, the impact of the fuel cost hikes will be significantly reduced. Based on April 2022 fuel costs, your annual bills are estimated to be £16,989, an increase of £3,037.

Whilst your bills are higher in real terms, they are £14,604 per year lower than they would have been, had the school continued with business as usual.

2022 Fuel Rates

We have used the following unit rates to estimate 2022 fuel costs.

Fuel	£ per unit
Gas	0.07
Electricity	0.28