Building Energy Assessment Results

To Support PSDS Salix Finance Applications

Zero Carbon Places .org

Supplementary Information To Our Main Proposal

asset utilities
Delivering Solutions

Introduction

This supplementary document to our main proposal demonstrates the results our services achieve, which can then support the completion of the PSDS application form.

Our proposals are completed as a **COVID secure desktop study** with no requirement to visit each building. We do require each building to have an EPC in order for our software to complete the assessment.

This document focuses on the results from these two areas :

01 Building Energy Audit

Using the criterion within the PSDS, each building is assessed to identify the suitable Category 1, 2, 3 and 4 acceptable technologies and the impact on heat decarbonisation, energy and CO2 reductions.

02 Renewable Energy Assessment

An assessment of the viability for a range of renewable energy technologies is completed, which also includes identify if there are any grid connection issues.

Our Proposals Apply To All Your Buildings.

CORPORATE OFFICES

Town Halls, civic buildings and offices.

EDUCATIONAL BUILDINGS SCHOOLS AND COLLEGES

OPERATIONAL BUILDINGS

Including depots and other operational assets such as crematoria

LEISURE CENTRES

Includes all leisure and activity centres.

ARTS, CULTURAL AND COMMUNITY VENUES

Including libraries, galleries and museums and community venues.

The Focus Of Our Service.

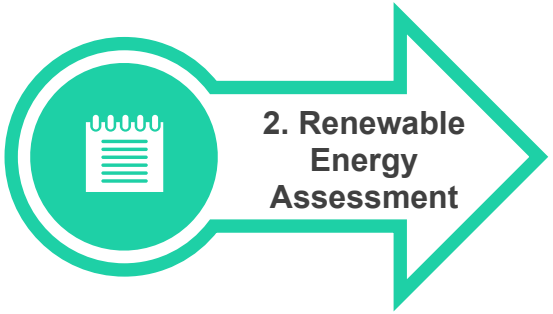
Our proposals provide a **cost-effective desk top** assessment (COVID-19 secure) of the potential for carbon reduction and energy efficiency measures for a range of local authority buildings.

They identify opportunities for further investment, cost savings and renewable energy using the following methodology :

This detailed desktop report assesses the carbon reductions, energy savings, installation costs and therefore financial viability for technologies in Categories 1, 2 , 3 and 4 of the Public Sector Decarbonisation Scheme.

The data file for the **EPC is required** to complete the assessment for each building.

Decarbonisation of Heat	Reducing Overall Energy Demand	Enabling Technologies
Pumps - Air Source - Ground Source - Water Source District Heating Electric Heating	BEMS Cooling Systems Hot Water Systems Building Fabric LED Lighting Ventilation Boilers	Small Hydropower Solar PV Solar Thermal Batterage Storage Combined Heat and Plant



Each building will be fully assessed for a complete range of technologies with financial modelling provided over 20 years to demonstrate the financial viability.

This will also include testing the grid to determine if any connection constraints exist and associated connection grids.

1. Building Energy Assessment.

Building software is used to complete a desktop analysis of each building **from its EPC**. This commences with an analysis of the suitability and viability where appropriate, of Category 1 technologies.

Category List

Project Type	Work Type	Persistence Factor	Status/Comments
Category 1			
Heating	Air Source Heat Pump (air to water)	**12.54**	Use a separate line for each fuel type
	Ground Source Heat Pump	**16.72**	Use a separate line for each fuel type
	Water Source Heat Pump	**16.72**	Use a separate line for each fuel type
	Connect to existing district heating	**28.50**	
	Heating - Electric Heating	**9.50**	

The modelling software then assesses each building for a range of potential improvement opportunities, many of which are listed in the Category 2 measures of the Public Sector Decarbonisation Scheme.

The full list of applicable measures assessed include :

- Cooling – Replace existing chiller plant
- Hot Water – Install point of use system
- Insulation – Cavity wall insulation
- Insulation - Double glazing with metal or plastic frame
- Insulation – Replace or retrofit insulated roof
- Insulation – draught proofing
- LED lighting – new fitting
- LED lighting – same fitting
- Ventilation – Replace air handling unit

1. Building Energy Assessment.

STAGE 1 : Assessment of Decarbonisation of Heat Technologies (PSDS Category 1).

Each building will be assessed for the financial viability of an air source heat pump and the following table demonstrates how the findings (energy and carbon savings, installation costs and payback period) are presented.

These results can be imported into the PSDS main funding application.

Row Labels	Sum of Affected Area	Sum of Upper cost	Sum of Lower cost	Sum of Savings	Sum of Discounted Payback Period	Sum of kgCO2
Apt. 102, 102 Legros Gateway, LONDON, CQ1 0TB	30.18	£ 1,805	£ 1,388	£ 15	0	52881.7868
Apt. 140, 140 Britteny Springs, LONDON, QL1 4VH	55.01	£ 3,290	£ 2,530	£ 692	4.6	9591.39507
Apt. 305, 30551 Pearly Trail, LONDON, VV3 0BX	44.53	£ 2,663	£ 2,048	£ 561	4.6	8608.63349
Apt. 326, 32607 Wilderman Trace, London, WQ3 2LH	33.81	£ 2,022	£ 1,555	£ 22	0	3484794.98
Apt. 355, 35558 Jacobson Falls, LONDON, VF3 5YY	40.08	£ 2,397	£ 1,844	£ 199	13.6	4837.1636
Apt. 670, 67074 Eusebia Tunnel, LONDON, AH6 7ED	141.57	£ 8,466	£ 6,512	£ 89	0	1385030.51
Apt. 767, 76709 Fermin Bypass, LONDON, XQ7 6ZN	174.98	£ 10,464	£ 8,049	£ 345	81.4	34589.9346
Apt. 883, 88316 Vanna Canyon, London, TO8 8RG	850.21	£ 50,843	£ 39,110	£ 5,621	9.6	3312503.17
Apt. 960, 96066 Ruth Motorway, LONDON, AP9 6GW	929.29	£ 55,572	£ 42,747	£ 1,801	90.4	131926.417
Suite 378, 3781 Kaleigh Plains, LONDON, KR37 8ZL	84.48	£ 5,052	£ 3,886	£ 459	12.1	9911.23494
Suite 574, 5744 Hyatt Mills, LONDON, EI57 4KC	80.71	£ 4,826	£ 3,713	£ 93	0	16595.8006
Suite 616, 6160 Nell Coves, LONDON, AL61 6DK	147.46	£ 8,818	£ 6,783	£ 142	0	12144.2896
Suite 737, 7372 Matthew Shoal, LONDON, OS73 7XW	132.97	£ 7,952	£ 6,117	£ 28	0	16700.2968
Suite 783, 7835 Marchelle Station, LONDON, VD78 3EB	49.47	£ 2,958	£ 2,276	£ 864	3.3	8238.75854
Suite 813, 8130 Giovanni Shoal, LONDON, QP81 3UW	252.58	£ 15,104	£ 11,619	£ 1,696	9.4	34292.1198
Grand Total	3047.33	£ 182,230	£ 140,177	£ 12,627	229	8522646.49

Demonstrating financial viability

A desktop study and comment on the suitability of ground and water source heat pumps is also provided, but without a financial viability.

1. Building Energy Assessment.

STAGE 2 : Assessment of All Measures (PSDS Category 2, 3 and 4).

An assessment is then completed for each ‘measure’ that can be implemented within that building from its EPC.

This information includes the energy saving and CO2 reduction, cost of installation and payback period, which can then form the basis for the PSDS application.

This is an example of the measures assessed for a sample building.

Each measure can then be expanded to be fully assessed individually **- see next slide.**

Individual Simulations

In the table below you can find the results summary for each of the individual recommendations available for this building.

Category	Recommendation	Affected area2	Cost	Savings	Discounted Payback period (yrs)	Saved $kgCO_2/m^2$	Rating	MEES Exempt?
Lighting	Replace tungsten lamps with LEDs (lamp)	318m²	£1,051 to £1,369	£3,490	0.3 to 0.4	0.25	F 131	✖
Lighting	Replace T8 fluorescent tubes with high frequency fluorescent fittings or LED equivalent	6,612m²	£38,085 to £49,511	£16,502	2.4 to 3.2	1.21	F 129	✖
Lighting	Replace high pressure mercury/sodium lamps with LEDs (lamp and luminaire)	1,513m²	£9,836 to £12,802	£526	30.9 to 55.5	0.04	F 131	✔
Lighting	Replace tungsten lamps with LEDs (lamp and luminaire)	318m²	£21,010 to £27,314	£4,050	5.8 to 7.8	0.29	F 131	✖
Lighting	Replace T8 fluorescent tubes with LEDs (lamp and luminaire)	6,612m²	£137,527 to £178,721	£24,896	6.2 to 8.4	1.83	F 128	✖
Lighting	Replace high pressure mercury/sodium lamps with T5 fluorescent tubes (lamp and luminaire)	1,513m²	£6,598 to £8,595	£1,434	5.1 to 6.8	0.11	F 131	✖
Lighting	Install lighting controls	23,632m²	£70,895 to £92,163	£20,344	3.8 to 5.0	1.49	F 128	✖
Solar control	Apply solar control film to existing glazing	7,901m²	£395,061 to £513,579	£2,723	N.A.	0.20	F 131	✔
HVAC	Replace existing local electric heating and/or air source heat pump with a new air source heat pump system	850m²	£39,110 to £50,843	£5,621	8.1 to 11.1	0.42	F 131	✔
Misc	Replace local electric heating system(s) with gas fired, wet radiator system	956m²	£58,634 to £76,223	£5,044	15.2 to 21.9	0.29	F 131	✔
Misc	**Replace existing air handling units**	**40,900m²**	**£309,406 to £402,228**	**£218,406**	**1.5 to 1.9**	**16.9**	D 98	✖

* Showing 11 recommendations with positive results from the total 11 recommendations processed.

1. Building Energy Assessment.

Example : Replace Air Handling Units

This is how the results for this measure are represented to provide the necessary information for PSDS application.

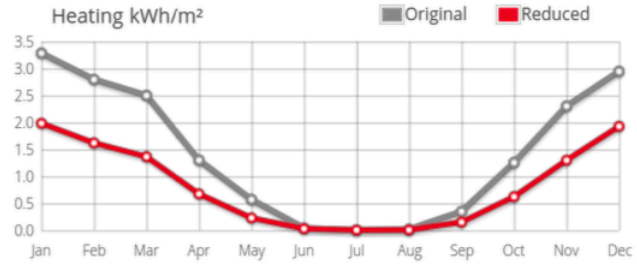
Annual Consumption	kWh/m²	kgCO₂/m²	£/m²	kWh	kgCO₂	£
Original F 131	139	66.5	21.3	5,688,251	2,719,455	870,842
Altered D 98	102	49.6	16.0	4,176,818	2,027,342	652,436
Annual Saving	37.0 26.6%	16.9 25.5%	5.34 25.1%	1,511,433 26.6%	692,113 25.5%	218,406 25.1%

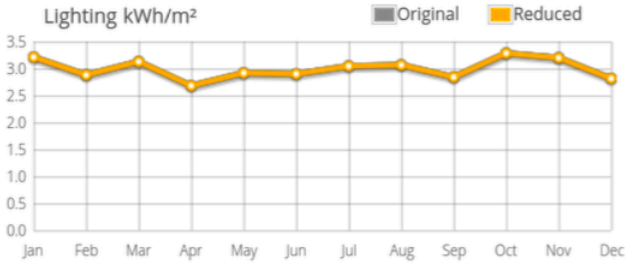
Affected area3	Cost	Annual cost saving	Discounted Payback period
40,900 m²	£ 307,575 to £ 399,848	£ 218,406	1.7 yrs

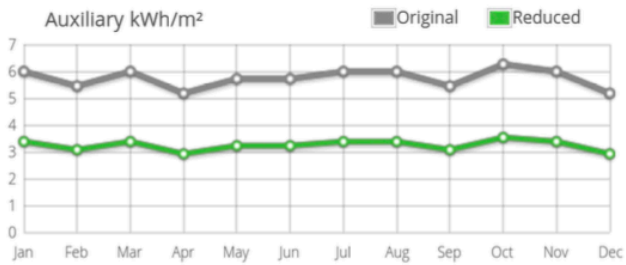
1. Building Energy Assessment.

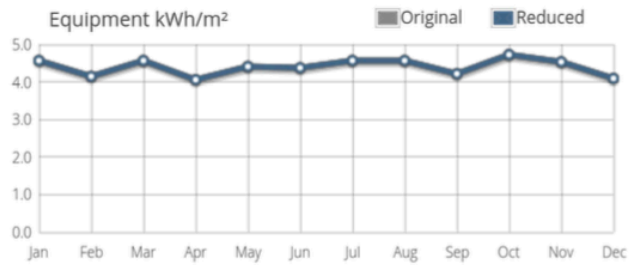
Further Results : Visual Reductions

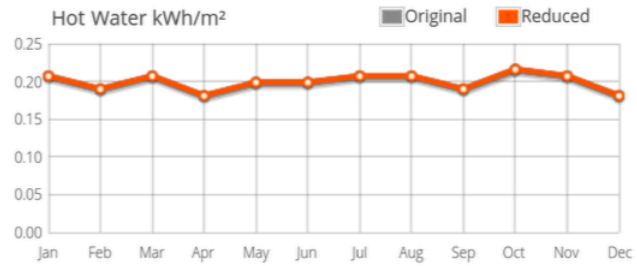
Each measure can then also be presented in graphical form to visually demonstrate reductions and benefits.

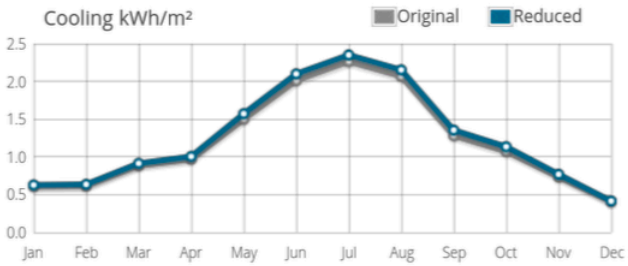


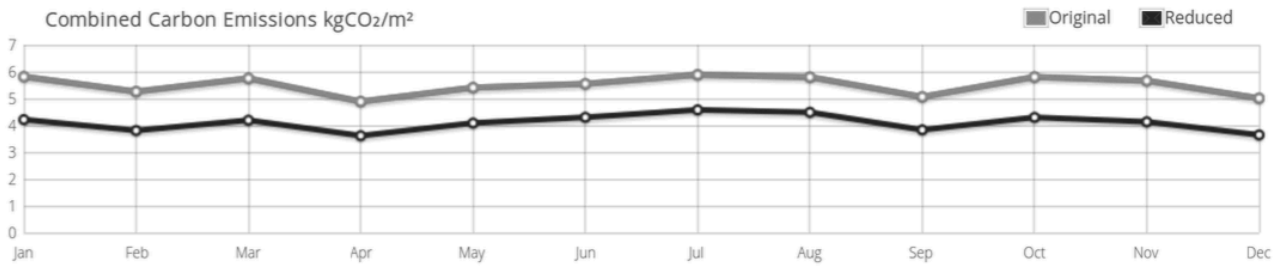












2. Renewable Energy Assessment.

This stage commences by assessing all the possible renewable energy technologies that could be deployed on or near the building.

Nearly every renewable technology will require a grid connection whether be input or export, even if the all the generated electricity was to be consumed by the building. We therefore test the grid to determine if there is sufficient capacity and also obtain a budget connection cost. The connection cost is important as it plays a key role determining the financial viability of the project.

To determine if the renewable technology is financially viable, detailed modelling typically over 20 years is completed.

Different scenarios for the size of the technology are included to determine the most financially viable option and will include a battery where appropriate.

In order to optimise the returns, each building will be assessed using the following five options.

Chosen Configuration	Maximise Internal Rate of Return	Maximise NPV	Simple Payback	Maximise CO_2 Reduction

2. Renewable Energy Assessment.

This is an example of the financial viability that will be produced for each of the five options.

This example is based on utilising solar PV with a battery. Please note different sizes of batteries are assessed to find the optimum solution.

As well as the profit and loss assessment using five different scenarios, a full 20 year cashflow will also be produced.

From this assessment, the local authority will have sufficient information to commence the technical specifications within their procurement document.

Summary of Optimised Installation options

Description	Chosen Configuration	Maximise Internal Rate of Return	Maximise NPV	Simple Payback	Maximise CO_2 Reduction
Area that can be used for PV	1,271m^2	1,271m^2	1,271m^2	1,271m^2	1,271m^2
Roof orientation	South	South	South	South	South
Roof Inclination	15°	15°	15°	15°	15°
Panel type	Monocrystalline silicon PV	Monocrystalline silicon PV	Monocrystalline silicon PV	Monocrystalline silicon PV	Monocrystalline silicon PV
Shading type	None | 0%	None | 0%	None | 0%	None | 0%	None | 0%
Power output	916.42 kWh/kWp	916.42 kWh/kWp	916.42 kWh/kWp	916.42 kWh/kWp	916.42 kWh/kWp
Battery Type	ST-SES 300kWh	No Battery	ST-SES 300kWh	No Battery	No Battery
Usable battery capacity	300.0 kWh	0.0 kWh	300.0 kWh	0.0 kWh	0.0 kWh
Generation Potential					
All figures here are estimates. Detailed analysis is needed for the technology to be developed.					
Estimated power generation (kWh/yr)	137,021.40	56,195.05	137,021.40	56,195.05	137,023.56
Installed capacity (kWp)	150	61	150	61	150
Electricity demand met (%)	89.2	36.6	89.2	36.6	89.2
Energy generated by solar panels used on-site (%)	43.19	56.66	43.19	56.66	43.19
Usable electricity generated (kWh/yr)	59,186	31,843	59,186	31,843	59,187
Commercial Summary Costs					
Engineering, procurement and construction (EPC) (£/kWP)	750	750	750	750	750
Total Capital investment (£) (assumes installation costs and development costs)	£166,000	£46,000	£166,000	£46,000	£112,000
Annual Operation and maintenance (£)	£3,747	£429	£3,747	£429	£1,047
Revenue First year £					
Generation FiT revenue	0	0	0	0	0
Export revenue (FiT/spill)	1,891	1,789	1,891	1,789	5,397
Value of electricity saved	15,395	3,551	15,395	3,551	5,835
Net operating revenue	13,540	4,910	13,540	4,910	10,185
Investment Return					
Capital IRR	13.9%	15.7%	13.9%	15.7%	12.6%
Simple payback	9 years	8 years	9 years	8 years	9 years
NPV	£197,976	£66,116	£197,976	£66,116	£97,975
Annual CO_2 Benefit (tonnes)	42.09	17.26	42.09	17.26	42.09
£/tonne CO_2	89.18	36.57	89.18	36.57	89.18
NB: A Full Cash Flow Model provided as an appendix for each option					

Additional Benefits Of Our Service

SUSTAINABLE DEVELOPMENT GOALS

One of the potential benefits of our approach is the ability to align carbon reduction and energy efficiency measures to wider sustainable development goals.

Some of the goals and targets are more applicable to some Councils than others.

Demonstrating some of the co-benefits which can be achieved through decarbonising public buildings is an important component of the approach.

WE PROVIDE A MENU OF SERVICES THAT YOU CAN PICK FROM

The Local Authority will receive a final robust report that summarises all the measures that have been analysed from Building Energy Assessment and Renewable Energy Assessment.

An initial report is produced within 10 days containing the assessments shown in this document, but will exclude comment on grid constraints and grid connection costs. Due to statutory DNO timescales, these will be included in the final report to be delivered within 4 weeks from project commencement.

Local Authority Options	Cost for a Smaller Building (up to 4,000m2)	Cost for a Larger Building (over 4,000m2)
1. Building Energy Assessment **2. Renewable Energy Assessment**	£2,200 plus vat	£2,600 plus vat

Our fee is dependent on the size of the building and **an EPC being available.**

If an EPC is unavailable, an energy audit can still be completed using a different method and a revised quotation can be provided on request.

Meet Our Team

The building assessment is completed by two leading experts in this field.

Asset Utilities Ltd

Grid specialist providing strategic delivery of net zero carbon solutions, with 28 local authority clients.

Marc Wynn

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Municipia

Local government consultant specialising in municipal energy and Climate Change

Mark Bramah

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Our key clients include :

To discuss how our proposal can support your carbon reduction aspirations and meet your SDG commitments, please contact either

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Thank You