Appendix 2: MBC Operational Net Zero Estimated Costs

This document outlines and estimated costs (in today's prices) to decarbonise:

(i) MBC key properties (those with the highest emissions);

(ii) To decarbonise all the energy MBC is purchasing (excluding Maidstone House/The Leisure Centre/Lockmeadow Entertainment Complex which are currently under different energy provider contracts);

(iii) To decarbonise MBC's current temporary accommodation housing stock;

(iv) To electrify MBCs petrol/diesel fleet (based on today's technology);

(v) To offset MBC's remaining operational emissions through third party carbon offsetting schemes (based on projected carbon cost scenarios); and

(vi) To alternatively offset MBC's remaining operational emissions through potential direct land purchases for carbon sequestration schemes and renewable energy generation schemes.

Please note, this document does not include factors outside of MBC operation control and does not include offsetting for MBC's Scope 3 emissions. Please also note, the calculation used are based on MBC current assets, and current available prices – estimates should be used as an indication only as costs will vary depending on many aspects of the market and need further investigation.

Cost to Decarbonise MBC Key Properties

The following costs to decarbonising key MBC assets have been identified by APSE Energy, who were consulted to take a whole building approach to increase the energy efficiency of each key MBC building and recommend the best low carbon or electrical heating alternative technology to effectively unplug the buildings from the gas mains and decarbonise in line with the councils Net Zero 2030 commitment. The total capital costs are the combined costs of all APSE Energy's recommendations to upgrade heating, insulation, glazing, LEDs and other efficiency controls which vary in each building. Details of recommended interventions can be found in standalone APSE reports for each building.

The annual savings have been calculated based on the kWp reduction that a new heating technology would have. For some buildings however, the cost of converting to an electrical heating option increases the cost to the Council in the short term to achieve decarbonisation (these are highlighted in red). The associated costs of 'electrifying' the heating systems of each building will reduce in the medium to long term, as the national grid supply is increased with renewable energy sources.

Building/Asset	Capital Costs of Upgrades/Retrofits	Annual savings to council	Carbon reduction	Priority (in terms of heating system replacement and funding eligibility)	Issues
1. Maidstone House and Link	£3,481,600	£51,875	361.8	High Priority	
2. Maidstone Leisure Centre	£3,070,470	£79,083	354.1	Medium Priority	Linked to overall investment plans for

					leisure centre
3. Maidstone Museum	£1,158,650	+£2,607	42.8	High Priority	
4. Maidstone Archbishops Palace	£1,712,670	+£12,525	30	Medium Priority	Linked to future decisions about use of Archbishops Palace
5. Maidstone Town Hall	£433,030	+£12,058	19	Medium Priority	
6. Lockmeadow Leisure Complex	£97,350	£37,974	1.7	Low Priority	
7. Lockmeadow Market	£772,710	+£14,117	13	Low Priority	
8. Cobtree Manor 9. Park Golf Course Clubhouse	£154,630	£9,305	9.1	Low Priority	Linked to procurement of new operator
10. Cobtree Visitor Centre	£141,840	£428	12.4	Low Priority	
11. Vinters Park Crematorium Chapel	£175,360	£5,568	22.2	Low Priority	
12. Vinters Park Crematorium Offices	£182,610	£9,137	8.6	Low Priority	
13. Parkwood Depot	£394,532	£696	13.9	Low Priority	
Total	**£11,775,452**	**£152,759**	**888.6 tCO2e**		
Added costs for design/study fees 5%	+ £588,772		39% of total		

**tCO2e are averages per building and may differ from the totals that can be found on the MBC Carbon Footprint Dashboard.*

The total costs to decarbonise the 13 key MBC assets is **£12,364,224.00**. This includes additional approximate costs associated with detailed design, architectural, and structural engineering fees. If all of these interventions were taken MBC's total **carbon footprint would be reduced by approximately 40%** and the council would make annual **cost savings across all of these buildings by approximately £152,000 per year**. The remaining emissions are the hard to reduce emissions that will need to be offset in order to be Net Zero – please see 'cost estimated to offset remaining carbon' section of this report.

The costs of some decarbonisation interventions are propositionally very high, compared to the reduction in carbon emissions. For instance, the Lockmeadow Leisure Complex is already a relatively efficient building, and decarbonising it would have little reduction in the Council's annual carbon

emissions, however £37,974 would be saved per annum if a Heat Recovery system is installed and electric ovens replace the existing gas ovens. In other cases, for example with Maidstone House and the Museum, improving energy efficiency, insulation and decarbonising the heating and cooling of the buildings would have a large carbon reduction and cost savings for the council, however capital expenditure is high. It is advised that these costs be used to priorities the largest cost savings and carbon reductions to the council, as these buildings will be eligible for external funding such as from the Public Sector Decarbonisation Scheme.

Cost to Purchase 100% Renewable Energy for MBC Buildings

MBC are currently procuring conventional electricity and gas. Action 7.3 of the council's Biodiversity and Climate Change Action plan is to 'Purchase 100% renewable energy for our buildings and operations where we control the supply'. There are various options to ensure MBC's procured energy is renewable, the most common being a Renewable Energy Guarantees of Origin (REGO) scheme. Please note, that both REGO purchases and carbon offsetting can contribute to reducing environmental impact, they differ in their focus. REGOs specifically promote the use of renewable energy, while carbon offsetting aims to offset emissions by investing in various projects. REGO prices have been rising since the UK began to export to the EU market in 2018 with some reductions post-Brexit and after the demand reduced caused by Covid related lockdowns in 2020. Since April 2021 the increasing demand for net zero, non-domestic energy users taking more steps to improve their green credentials, and GHG reporting grew and consequently the REGO demand grew much further with many users requiring 100% renewable energy tariffs as standard. REGO prices have increased by 50% in comparison to 2020, with a rate of about £1.45/MWh for the 2021-22 pricing period and increased to £6.16/MWh for 2022-23 pricing period, with estimate of £11/MWh for the April'23 onto Mar'24 period.

For MBC full asset portfolio that sits with Laser Energy (excluding Maidstone House/The Leisure Centre/Lockmeadow Entertainment Complex which are currently under different energy provider contracts), MBC would be looking at **approximately £55,320 for REGOs** for the Oct'23-Sep'24 to decarbonise the total energy used by MBC and procured via Laser Energy. Please note that Maidstone House, The Leisure Centre, and Lockmeadow Entertainment Complex are high energy users, and this figure would be significantly higher should REGOs also be purchased for these buildings.

Meter Types	Meters	EAC (kWhs)	Energy Type	Potential REGO/RGGO based on Apr'23-Mar'24 prices (£14/MWh for gas and £11.11/MWh for elec)	www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2022	Estimated Budget Projections Apr'23-Mar'24	REGO/RGGO % of Total Period Cost (Green Tariffs)	Estimated Cost and Size of Solar PV £1.2 - £1.3/ kWh (2022 average)
Gas	22	2,346,816	Conventional	£32,855	478	£272,931		
HH Metered	13	1,408,832	Conventional	£15,652	268	£445,450		
NHH Metered	52	459,980	Conventional	£5,110	88	£134,740		
UMS	13	153,187	Conventional	£1,702	31	£48,965		
Gas totals	**22**	**2,346,816**		**£32,855**	**865 tonnes of CO2e**	**£272,931**	12%	**£2,527,498**
Electricity totals	**78**	**2,021,998**		**£22,464**		**£629,154**	4%	
Potential cost of REGO/RGGO (Green Tariffs)				**£55,320**	Totals	**£902,085**	**6%**	**1.95 MWp**

Cost to Bring MBC's housing stock to Minimum Target EPC-C rating

Energy performance certificates (EPCs) are a rating scheme to summarise the energy efficiency of buildings. The building is given a rating between A (Very efficient) -G (Inefficient), the EPC will also include recommendations the most cost-effective ways to improve your homes energy rating. On average, existing houses in England and in Wales that had an EPC undertaken in financial year ending 2019 were rated within band D. The UK Governments current target is to have as many homes as possible in EPC band C by 2035.

MBC has 58 houses, 28 of which are EPC rated E or D. Recommendations on upgrading insulation, heating, and efficiency will depend on the multiple aspects including the materials, current insulation, fuel type, size, and age of the property. It is estimated that £3,653 is needed to upgrade a one-bedroom flat from EPC D to C, while a small mid-terrace house is likely to cost up to £6,400, and larger detached homes are expected to cost around £12,540 in energy-saving improvements.

Using these estimates, it is estimated to cost approximately **£219,693** to bring the Council's temporary accommodation housing stock EPC rated E and D up to a C rating. Please note that this would not necessarily mean decarbonising the housing stock, as high efficiency condensing boilers or other technologies may be more suitable depending on the dwelling and therefore it is not possible to calculate an accurate carbon reduction for conducting these upgrades.

Address	EPC Rating
1 BED	
7 The Cottages, ME15 0HE	D
2 BEDS	
16 Plumpton walk, ME15 8UQ	D
525 Loose Road, Maidstone, ME15 9UQ	D
485 Loose Road, Maidstone, ME15 9UQ	D
6 Beasconsfield Road, ME15 6RU	D
42 Peel Street, ME14 2SB	D
48 Forrest Hill, ME15 6TH	D
50 Forrest Hill, ME15 6TH	D
7 Randal Street, maidstone, ME14 2TB	D
26 Foxglove Rise, ME14 2AF	D
143 Merton Road , ME15 8LT	D
68 Peel Street , ME14 2SB	E
3 BEDS	
63 Graveney Road, Maidstone, ME15 8QL	D
66 Felderland Close,, ME15 9YD	D
55 Dickens Road, Maidstone, ME14 2QR	E
12 Bell Road, Parkwoord, ME15 9EH	D
45 Beaumont Road, Maidstone, ME16 8NG	D
23 Mangravet Avenue, ME15 9BG	E
9 Church Road, Tovil, Maidstone	D
43 Lushington Road	D
55 Lushington Road	D
61 Hampshire Drive, Maidstone , ME15 7EX	D

67 Beamount Road, Maidstone, ME16 8NG	D
4 Beds	
20 Egerton Road, ME14 2QY	E
144 Westmoralnd Road , ME15 8JQ	D
Shared houses	
Marsham Street	D
2 Square Hill	D
58 Melville Road,	D

Cost to Decarbonise MBC's Fleet

Maidstone Borough Council currently operates 68 vehicles of which 9 are already fully electric. These range from heavy goods vehicles including 26 tonne refuse compaction vehicles and specialist sweepers to 3.5 tonne vans, pick-up trucks and cars. Most of these vehicles are operated by the Council's depot services. The entire fleet produce 264 tCO2e in 2020/21 and travel over 430,000 miles per year, with the 10 heavy commercial vehicles responsible for the highest proportion of emissions.

Calculations to fully replace the remaining MBC fleet with Electric Vehicle (EV) alternatives that are able to ensure the same operational standard, based on today's technology and costs are calculated in this section. These calculations do not include emerging or alternative technologies (such as hydrogen), and figures should be used as an indication only as the EV market varies considerably in supply. Please note that there are not electric vehicle alternatives for every type of vehicle in MBCs current fleet. Some information, for example, for the Scarab (Sweepers) have been provided by manufactures however these electric vehicles are not yet on the market, as testing is ongoing, and prices may vary. Similarly, the DAF 7.5T Tippers and Dennis Dustcarts also have no EV alternate to MBC's current fleet.

MBC Current Vehicle	Electric Version of Vehicle	Price
Street Scrubber		
Ford Courier Trend	Nothing available until 2024	
Ford Courier Trend	Nothing available until 2024	
Ford Courier Trend	Nothing available until 2024	
Toyota Hilux Icon D/C	Maxus e-T90EV Electric Pick Up 88.5kW, White	£53,983.53
Toyota Hilux IconD/C	Maxus e-T90EV Electric Pick Up 88.5kW, White	£53,983.53
DAF LF180 Caged Tipper 7.5Tonne	nothing available as of yet - Iveco 7.2T	
DAF LF180 Caged Tipper 7.5Tonne	nothing available as of yet - Iveco 7.2T	
DAF LF230 Maven 65 sweeper 16Tonne		£400,000.00
DAF LF180 Merlin XP sweeper 12Tonne		£400,000.00
Fiat Doblo Workup Tipper	Maxus e-Deliver 3 Electric Dropside	£41,056.37
Fiat Doblo Workup Tipper	Maxus e-Deliver 3 Electric Dropside	£41,056.37
Peugeot Expert	Peugeot e-Expert Professional Premium + Panel Standard 75kWh, Ply, Navigation, Bluetooth, Mats and Seat Covers	£43,065.13
Fiat Doblo Workup Tipper	Maxus e-Deliver 3 Electric Dropside	£41,056.37
Transit 350MWB S/C Tipper	Maxus e-Deliver 9 LH Electric Chassis 88.5kW Battery Fiat e-Ducato 35 MH1 Chassis 79kW	£83,599.84
Transit 350MWB S/C Tipper	Maxus e-Deliver 9 LH Electric Chassis 88.5kW Battery Fiat e-Ducato 35 MH1 Chassis 79kW	£83,599.84

Transit 350MWB Dropside Tipper	Maxus e-Deliver 9 LH Electric Dropside	£71,029.21
Fiat Ducato 35 Multijet II Tipper 3500kg	Fiat e-Ducato 35 MH1 Chassis 79kW	£83,599.84
Fiat Ducato 35 Multijet II Tipper 3500kg	Fiat e-Ducato 35 MH1 Chassis 79kW	£83,599.84
Fiat Ducato 35 Multijet II Dropside 3500kg	Maxus e-Deliver 3 Electric Dropside	£41,056.37
Fiat Ducato 35 Multijet II Dropside 3500kg	Maxus e-Deliver 3 Electric Dropside	£41,056.37
Ford Connect 210LWB	Vauxhall Combo Prime Panel Van L2 2300 100kW 136PS Auto 50kWh Battery, Manual Air Con, Sat Nav, Full Plyling	£36,628.03
Fiat Doblo Workup	Maxus e-Deliver 3 Electric Dropside	£41,056.37
Fiat Doblo Workup	Maxus e-Deliver 3 Electric Dropside	£41,056.37
Fiat Doblo Workup	Maxus e-Deliver 3 Electric Dropside	£41,056.37
Mitsubish Outlander	Peugeot e-2008 Allure Premium + Pearl White	£31,053.54
Esagono Gastone	nothing available as of yet	
Dennis Eagle Elite 6 Dustcart	No EV alternate - only 26T or 18T available	
Toyota Hilux Active S/C	Maxus e-T90EV Electric Pick Up 88.5kW, White	£53,983.53
Toyota Hilux D/C	Maxus e-T90EV Electric Pick Up 88.5kW, White	£53,983.53
Fiat Doblo	Fiat e-Doblo Van L1 electric 50kW Auto	£36,044.73
Scarab M25H Sweeper	Scarab MC210 - release estimated 3rd quarter 2024	£250,000.00
Scarab M25H Sweeper	Scarab MC210 - release estimated 3rd quarter 2024	£250,000.00
Scarab M25H Sweeper	Scarab MC210 - release estimated 3rd quarter 2024	£250,000.00
Ford Transit 350 LWB	Ford e-Transit H2L3 350 198kW 269PS Trend, Frozen White, Mats, Manual Air con, Ply	£46,337.00
Fiat Doblo 16 Multijet	Fiat e-Doblo Van L1 electric 50kW Auto	£36,044.73
Fiat Doblo 16 Multijet	Fiat e-Doblo Van L1 electric 50kW Auto	£36,044.73
Fiat Full Back Pickup	Maxus e-T90EV Electric Pick Up 88.5kW, White	£53,983.53
Ford Transit 350 MWB Tipper	Maxus e-Deliver 9 LH Electric Chassis 88.5kW Battery Fiat e-Ducato 35 MH1 Chassis 79kW	£83,599.84
Ford Transit 350 MWB TIPPER	Maxus e-Deliver 9 LH Electric Chassis 88.5kW Battery Fiat e-Ducato 35 MH1 Chassis 79kW	£83,599.84
Ford Transit Custom 290L	Vauxhall e Vivaro 100kW 136PS Kaolin White, Plylining, Sat Nav, Mats	£48,017.51
Ford Transit 350	Ford e-Transit H2L2 350 198kW 269PS Trend, Frozen White, Mats, Manual Air Con, Ply	£46,337.00
Fiat Doblo Multijet 2	Fiat e-Doblo Van L1 electric 50kW Auto	£36,044.73
Ford Transit 350 Tail lift	Ford e-Transit H2L2 350 198kW 269PS Trend, Frozen White, Mats, Manual Air Con, Ply, Tail lift conversion	£46,337.00
Ford transit 350 tail lift	Ford e-Transit H2L2 350 198kW 269PS Trend, Frozen White, Mats, Manual Air Con, Ply, Tail lift conversion	£46,337.00
Iveco EUROCARGO 75E 16K TIPPER	Nothing available as of yet	
Iveco EUROCARGO 150 / 220 Sweeper		
Ford Transit Courier Base TDCI	Nothing available until 2024	
Fiat Doblo 16v M/Jet		
Vauxhall Mavano F3500 l3H1 CDTI Beavertail		
Mitsubishi PICK UP L200 Life		
Fiat Doblo 16v M/Jet	Fiat e-Doblo Van L1 electric 50kW Auto	£36,044.73
Fiat Doblo 16v M/Jet	Fiat e-Doblo Van L1 electric 50kW Auto	£36,044.73
Fiat Doblo 1.3 16v M/Jet Pickup	Maxus e-Delive 3 Electric Dropside	£41,056.37
Vauxhall Mavano F3500 L3H1 CDTI Beavertail		
Ford Ranger XK 4x4 TDCI Pickup		

Mathieu Sweeper/scrubber MC210		
Iveco EuroCargo		
Johnston C201 Sweeoer		
Ford Courier TDCI	Nothing available until 2024	
Ford Ranger Pickup	Maxus e-T90EV Electric Pick Up 88.5kW, White	£53,983.53
Ford Transit 350	Ford e-Transit H2L2 350 198kW 269PS Trend, Frozen White, Mats, Manual Air Con, Ply	£46,337.00
Ford Transit Tipper		
Ford Transit Connect 210 Ecotec		
Ford Transit 125 T350 RWD	Ford e-Transit H2L3 350 198kW 269PS Trend, Frozen White, Mats, Manual Air con, Ply	£46,337.00
DAF Merlin XP sweeper		
Dennis Elite 6 Dustcart	No EV alternate - only 26T or 18T available	
	Total	**£3,469,091.35**

Converting the remaining petrol/diesel vehicles in MBC fleet to fully electric would cost approximately **£3,469,091.35** and reduce MBC emissions by approximately 160 tCO2e per year, based on 2020-21 mileage and emissions data. However, these calculations exclude the replacement of the heavy-duty vehicles that do not yet have EV equivalents on the market, which proportionally emit higher emissions and are likely to cost substantially more.

Please not that further investigation is needed to compare maintenance costs and replacement cycle of conventional vehicles to EV equivalent, as maintenance is likely to be reduced in the medium term with a fully electric fleet. However, ensuring all vehicles are charged and able to operate at peak times will need more management at the depot which may incure additoan satf or training needs at the depot.

Costs to Upgrade the Capacity of The Depot to Meet the Electric Demand

Costs to upgrade the capacity of the depot to meet the electric demand of a full EV fleet have also been included in this section. Including recommendations from Clarke EV and SWARCO who conducted a fleet electrification feasibility study in 2022 on behalf of the Council and recommended measures to ensure the operations of the depot would not be jeopardised by switching to EVs. The results of the feasibility study showed that if all the vehicles used today were replaced with electric vehicles and were used in a similar way, a supply capacity of 600KVA would be required, or a timed connection of 200 KVA between 6 am and 11 pm and 1200KVA between 11pm and 6am. The supply capacities can be reduced if fast chargers are used for the light commercial vehicles, which would increase the cost of the required infrastructure, but may reduce the associated District Network Operator costs.

Indicative costs for instillation and connection for a secondary substation (by 2027) to ensure the electric capacity of the depot meets all the EVs charging needs, provision of sufficient 22kW or 43kW chargers, including two rapid 50kW to 100kW chargers are likely to be required for the large commercial vehicles, Battery storage to utilise solar power charging of vehicles overnight, and contingency should the national grid have supply issues and the depot operations need to continue.

EV Infrastructure Required	Number required	Cost
Indicative price for a 800KVA sub-station	1	£140,000
22kW AC Post Charge Point	10	£23,000
50kW DC Charge Point (Rapid charger)	2	£50,000
Battery Energy Storage Systems (BESS) 250kWh sized system (excluding instillation/housing fees)	1	£45,000

Total	**£253,000**

It is estimated to cost **£253,000** to ensure the Depot has sufficient capacity to charge a fully electric fleet. MBC has a Green Fleet Strategy, adopted on the 15th of November 2022 by the Communities, Housing and Environment Policy Advisory Committee, that sets out the decision-making process for selecting new or replacement fleet vehicles and how the Council will seek to deliver its commitment to reducing emissions, miles, and fuel usage. So gradually over the next 7 years when purchasing new vehicles up to Net Zero 2030, attention is given to whether the vehicle is necessary and if so, whether there is a commercially viable electric or hybrid alternatives, including the whole life costs of the vehicle and its operational requirements. This strategy also means that heavy duty vehicles or those that do not have EV versions on the market yet will not be prioritised for replacement until viable alternatives are available.

Please note, that if energy storage is installed at the Depot, there may be a business case to increase the capacity of solar PV (solar panels) installed on the roof of the depot. In this case, all the energy generated by the solar panels could be stored in the battery and used by the vehicles, and therefore the value of the energy generated by a solar panel array would be tied to the cost of electricity for Maidstone Depot.

Cost Estimates to Offset Carbon

To achieve Net Zero carbon, the ethos is to reduce emissions as much as possible and generate energy onsite from renewables. The remaining emissions are the hard to reduce emissions that will need to be offset. The Climate Change Committee recommend on offsetting a maximum of 10% of an organisation's emissions and to prioritise removal of emissions before offsetting. The effectiveness and impact of carbon offsetting can vary depending on the quality and credibility of the offset projects chosen.

Currently offsetting costs between £8 and £25 per tonne of CO2e, which some argue make offsetting too affordable and incentivise organisation to offset rather than reduce their emissions. However, this has been forecast to change as greater demand and higher regulation are projected to lead to a significant carbon price increase. The Woodland Trust states that it costs £25 (based on rates of 2022) to offset 1 tonne of CO2 in British woodlands. Experts at UCL predict prices will rise to around £45 per tonne in the next two years and Bloomberg has developed three possible price scenarios based on regulatory differences, ranging from £45 with light regulation of markets to £200 with tighter regulation. The following cost scenarios are based on MBC's 2021-22 carbon footprint and show the costs under each scenario based on offsetting 100% of MBC emissions and 10%.

Carbon Cost Scenarios

Carbon Cost Scenario per tonne	Cost Per Annum to MBC based on total 2021/22 scope 1 and 2 carbon footprint (1,722.15tCO2e)	Cost Per Annum to MBC based on 10% 2021/22 carbon footprint (172.21tCO2e)
Present Scenario low £8	£13,777.20	£1,377.72
Present Scenario High £24	£41,331.60	£4,133.16
Predicted Scenario Low £45	£77,496.75	£7,749.68
Predicted Scenario High £200	£344,430.00	£34,443.00

Under the tighter regulation scenario, prices could rise very rapidly, causing problems for the Council seeking offsets around 2030. If MBC decarbonise all buildings and fleet, there would potentially still be a **£34,443 cost per year** to offset the remaining emissions under a high-cost scenario. If MBC are

unable to meet the net zero 2030 commitment and need to offset proportionality more, this could be at a high cost by 2030.

MBC could gain advantages from signing long-term agreements sooner rather than later. Longer-term arrangements rather than add-hoc purchases of carbon offsets could also help improve the stability of carbon markets and reduce risks to long-term activities including forestation and habitat restoration. Where offsetting is relevant, projects must be real, verified, permanent and additional in nature. Recently there has been some bad press about international carbon offsetting schemes, and so selecting or investing must be carefully considered.

Alternatively, there are ways to offset MBC's emissions directly, by investing in renewable energy generation to a level beyond MBC's total carbon footprint or developing direct carbon sequestering projects, through for example tree planting and rewilding.

Cost to Directly Offset MBC's Remaining Carbon

Offsetting through renewable energy generation:

Offsetting with renewable energy generation such as investing in solar or wind farms, as well as maximising solar energy generation on MBC's estate for 'point of use' for council operated buildings could greatly reduce MBC direct emissions, reduce utility costs to the council, and if larger longer-term investments are made, can offset MBC emissions to reach net zero.

Public Energy Partnership Power Purchase Agreement (PEPPPA) or electricity power agreement, are a long-term contract between an electricity generator and a customer, usually a utility, Government or company. PEPPPAs can last between 5 and 20 years, during which time the power purchaser buys energy at a pre-negotiated price. Such agreements play a key role in the financing of independently owned renewable energy generators like solar farms or wind farms. Such an investment would potentially save MBC costs in the long term and reduce MBC's exposure to a fluctuating energy market.

Additionally, maximising the renewable energy generation on MBC estate is also shown to be cost effective in the medium term. Solar panels require low maintenance and are a one-time investment with long-term returns that are a quiet, simple, and safe way to generate energy in operation. However, solar has a seasonal output and is sun dependant often requiring extensive space to be most cost effective. To offset MBC total emissions (based on 2021-22 carbon footprint) an estimate **1,677 panels would be required, occupying a space of 2.3 hectares**. A lot of the costs associated with large scale solar instillations are the trenching and cabling require to take the electricity produced to grid or place of use. Therefore, there are advantages to seeking rooftop space where solar can be installed that minimises connections needed, so that electricity can be used where it is generated and avoid additional costs.

The following solar projects have been scoped on MBC property to maximise the renewable energy generated on these buildings for direct use by the council. These projects are pending property decisions outlined in the Cost of Decarbonise MBC Key Properties section of this report.

New Solar Projects Identified

Building / Location	Size/capacity of Solar Array	Capital Costs of Solar Project	Annual savings to council	Pay back in Years	Carbon reduction (CO2te)
	16 kWp (solar PV	£20,850	£3,360	6.2	3.2

1. Maidstone House and Link	used on site) Link Building BioSolar Roof				
	185.57 kWp (solar PV carpark used on site 50% split for Mall and MBC)	£112,450	£8,909 *(TBD with +50% going to the Mall)*		43 *(TBD with +50% going to the Mall)*
2. Maidstone Leisure Centre	122kWp Mote Park Car Park Solar Canopy used at Leisure centre (grade listed status)	£213,600	£20,724	9.9	20
3. Lockmeadow Leisure Complex	995KWp (on 4 roof locations)	£845,750	£70,852	8	28.5
4. Cobtree Manor 5. Park Golf Course Clubhouse	32 kWp (solar PV used on site)	£26,300	£6,927	3.7	6.7
6. Cobtree Visitor Centre	9 kWp (solar PV used on site)	£10,400	£1,709	6.1	1.7
7. Vinters Park Crematorium Chapel	13 kWp (solar PV used on site) apportioned	£13,700	£2,273	5.8	2.2
Total	**1372.57 kWp**	**£1,243,050**	**£ 114,754 saved**	**6.6 years**	**105.3CO2te reduced**

Investment in these small-scale solar projects would **save the council £114,754 per year** and pay back in approximately 7 years, while reducing MBC emissions by approximately 8% (based on MBC's 2021-22 carbon footprint).

Offsetting through land purchase for carbon sequestration:

Carbon sequestration (or carbon storage) is the process of storing carbon, meaning it removes a greenhouse gas from the atmosphere. The largest carbon sequestration rates amongst seminatural habitats are in woodlands. Native broadleaved woodlands are reliable carbon sinks that continue to take up carbon over centuries with benefits for biodiversity and other ecosystem services, although the rate varies greatly with tree species and age and is strongly influenced by soils and climate. Sequestration rates decline over time, but old woodlands are substantial and important carbon stores.[1]

[1] Natural England (2021), Carbon storage and sequestration by habitat: a review of the evidence (second edition)

Natural England analysis found that a representative carbon sequestration rate for mixed broadleaved woodland (trees and soil) over 30 years the rate of uptake of approximately 14.5tCO2e per hectare per year because of the high sequestration rates seen in the early decades of tree growth. **To offset 10% of MBC carbon emissions per year based on the 2021-22 carbon footprint, it would mean planting approximately 9.6 hectares (or 10,666 trees)** mixed broadleaved native woodland on mineral soil (to 1m depth with spacings of 3m suggested by Woodland Trust).

Different environments sequester carbon more or less carbon, and these environments would need to be managed, but could be combined with nature-based solutions for duel local benefits. This would mean considering the purchase of land on the open market, buying direct from the Woodland Trust, or offsetting on third party land with agreements in place to not double count carbon sequestered. Land prices and grading, tree species suitable for that land, and costs of planting and maintenance cannot be calculated without further investigation.

Total Estimated Costs for MBC to Achieve Operational Net Zero

The following table totals all the estimated cost presented in this report. The calculation used are based on MBC current assets, current available prices, and data available – estimates should be used as an indication only as costs will vary depending on many aspects of the market and need further investigation.

MBC Net Zero Operational Areas	Total Estimated Costs	Carbon Reductions (tons and %)
1. Estimated cost to decarbonise 13 MBC key/largest properties	**£12,364,224.00**	**888.6 tCO2e (60%)**
2. Estimated cost to purchase Green Tariffs to decarbonise procured energy across MBC estate (excluding Maidstone House/The Leisure Centre/Lockmeadow Entertainment Complex)	**£55,320.00 (Per Annum)**	Not Applicable
3. Estimated cost to improve MBC's current temporary accommodation housing stock to EPC-C minimum	**£219,693.00**	Unable to calculate carbon reductions of housing stock at this time
4. a. Estimated cost to electrify MBCs petrol/diesel fleet (based on today's technology, excluding heavy duty vehicles where replacements EVs are not yet on the market)	**£3,469,091.35**	**160 tCO2e (11%)**
b. Costs to upgrade the capacity of the depot to meet the electric demand	**£253,000.00**	Not Applicable
5. Estimated cost to offset MBC's remaining 10% operational emissions through third party carbon offsetting schemes (based on projected high carbon cost scenario)	**£34,443.00 (Per Annum)**	**140 tCO2e (10% based on 2021-22 MBC carbon footprint)**

6. a. Alternative estimated cost to offset MBC's remaining operational emissions through renewable energy generation schemes	Unable to calculate without further investigation and expert advise	Not Applicable
b. Cost to maximise solar energy generation on MBC estate (scoped projects)	**£1,243,050.00**	**105.3 CO2te (7.5%)**
7. 7. Alternative estimated cost to offset MBC's remaining operational emissions through potential direct land purchases for carbon sequestration schemes.	Unable to calculate without further investigation and expert advise	Not Applicable
Estimated Total to achieve net zero carbon on MBC Scope 1 and 2 emissions	**£17,638,821.35**	**1293.9 CO2te (92% reception based on 2021-22 carbon footprint)**

The table shows that a priority area is the decarbonisation of MBC properties, and of those an 85% reduction (of the 13 buildings in the table) in emission can be achieved by upgrading/retrofitting just three building, namely Maidstone House and Link, Maidstone Leisure Centre, and Maidstone Museum which have the highest proportion of carbon emissions, but account for 44% of the total estimated cost to achieve Net Zero.

The proportion of tCO2e removed per annum by converting the entire fleet to electric, plus the costs to upgrade the infrastructure at the depot, suggests that the cost benefit ratio is poor, and that the current green fleet strategy to gradually transition vehicles to EV based on the market and operation is the better medium-term pathway. Particularly as the heavy-duty vehicles proportionately account for more emissions and equivalent EV versions are not yet on the market. Waiting for other emerging technologies for the heavy vehicles and upgrading lighter vehicles will likely save the council costs in the medium term.

Investment in maximising the solar energy generation on Council property is a good medium-term investment in terms of both savings to the council and carbon reductions. Further investigation into larger renewable energy generation schemes is needed, as is longer term procurement of renewable energy (Green Tariffs) for the Council.

Options for indirectly or directly offsetting 10% of MBC emissions also need further investigation. However, it is likely that larger costs would be incurred for directly offsetting emissions through local renewable projects or tree planting, but these costs must be evaluated in regard to other local social, biodiversity benefits and ecosystem services.