Energy Review Summary

Residential Units

PMC Construction and Development Services Ltd &

Hyde New Build Limited

Kingston Wharf
Brighton Road
Shoreham-by-Sea

SRE

Version	Revision	Date	Author	Reviewer	Project Manager
2	A	20221207	Malcolm Maclean	Aniruth Raghunathan	Aniruth Raghunathan

The figures within this report may be based on indicative modelling and an assumed specification outlined within the relevant sections. Therefore, this modelling may not represent the as built emission or energy use of the Proposed Development and further modelling may need to be undertaken at practical completion to confirm precise performance figures. Please contact SRE should you have any questions, or should you wish further modelling to be undertaken post planning.

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SRE Registered Office | Greenforde Farm

Stoner Hill Road | Froxfield

Petersfield | Hampshire | GU32 1DY

01730 710044

info@sre.co.uk

www.sre.co.uk

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Executive Summary

Executive Summary

This Energy Review Summary has sought to provide both a 'high level' overview of the predicted energy use and associated carbon emissions as well as 'detailed' predicted annual running costs between two energy strategies for a number of sample residential units at Kingston Wharf, Shoreham-by-Sea.

The planning stage energy strategy (community heating with centralised PV) is being replaced with the proposed energy strategy (individual electric heating with individual PV, PV diverter and WWHR) which delivers significant reductions in the predicted average energy use intensity (>20%) and annual average carbon emissions (>50%) of the scheme in line with the wider environmental and social aspects of Hyde New Build Ltd and PMC Construction & Development Services Ltd.

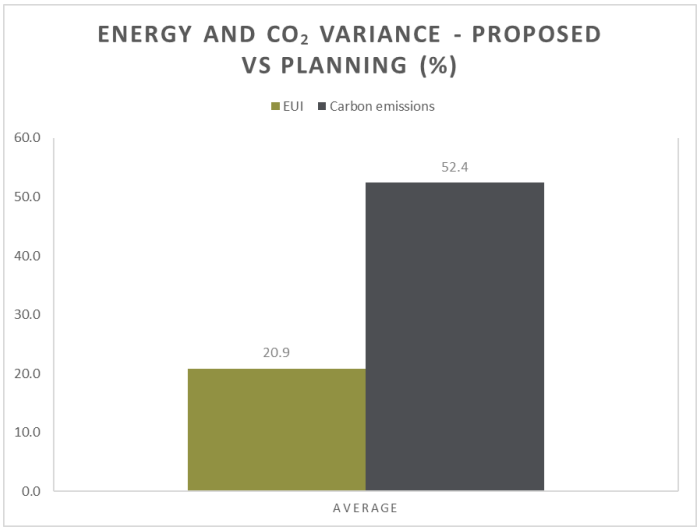


Figure 1 – Energy & Carbon Percentage Variance Summary (Planning v Proposed)

The energy review has also assessed the predicted annual running costs of the two strategies due to the energy market volatility and increased energy prices being experienced across the UK over the past 12 months. Three pricing periods have been assessed because of this in order to provide a predicted cost 'bandwidth'. The proposed strategy (being electrically focused) results in a range of predicted average annual running costs from -6.7% to -1.9% reduction in cost over the three pricing periods.

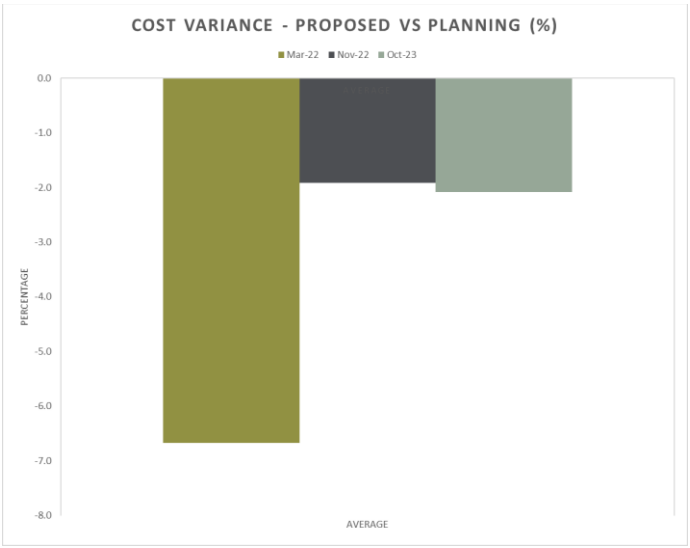


Figure 2 – Percentage Variance in Annual Running Cost between Proposed Energy Strategy and Planning Energy Strategy (March 2022, November 2022 & October 2023)

Further analysis of the proposed strategy applied to a single top floor unit has been undertaken using dynamic energy modelling (TM54) to review the impact of a number of scenarios relating to how the unit might be used and lived in by the residents compared to a typical energy profile.

The additional scenarios include working from home, high water use and increasing the set point of the living room from 21°C to 24°C. The results provide a 'bandwidth' of predicted running costs depending on the type and level of occupancy within the space.

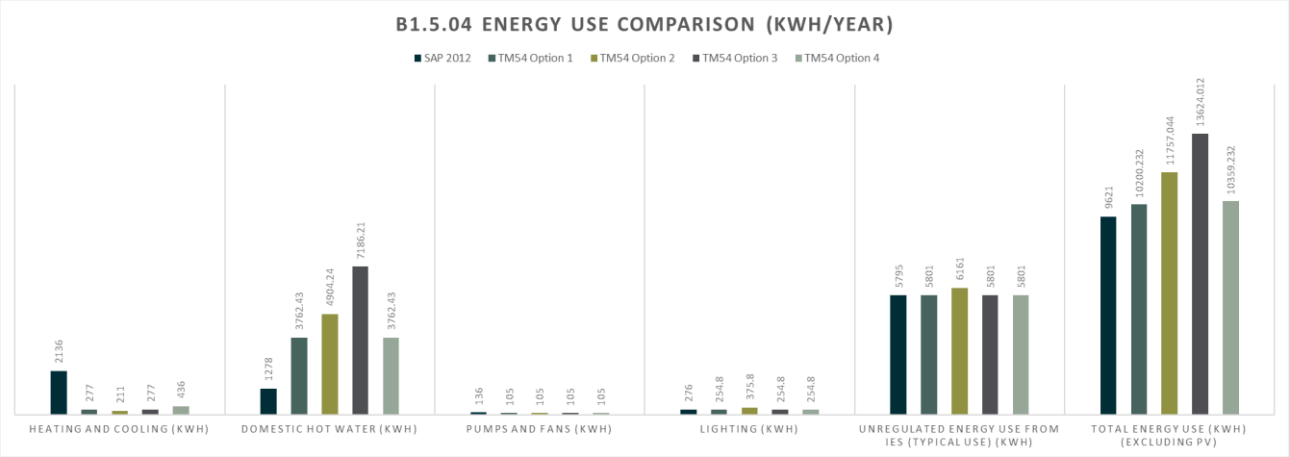


Figure 3 – TM54 Modelling of annual energy use for 4 no. scenarios in a sample unit

Overall the significant reduction in energy use intensity and carbon emissions deliver a long term, robust solution that will result in lower predicted average energy costs compared to the communal heating approach proposed at planning. Of those costs ~45-50% relate to unregulated energy use which is predominantly outside of the influence (other than smart metering) of the Proposed Development's building performance and Hyde and PMC.

Introduction

1.0 Introduction

This Energy Review Summary has been written by SRE Ltd for PMC Construction and Development Services Ltd (PMC) and Hyde New Build Limited (Hyde) to demonstrate the changes between the planning application energy strategy and the present energy strategy for the residential elements of Kingston Wharf, Shoreham-by-Sea (Proposed Development).

The development of an alternative energy option has come about as clarification on the deliverability of the Adur District Heating system has been made available to the team and the changes associated with new Building Regulations Part L have been analysed in relation to the building performance.

The energy review will not only compare the energy and CO_2 impact of the two energy strategies on a range of sample units, but also the predicted cost implications to the end users. Especially in light of the recent energy crisis affecting the UK.

1.1 Background & Methodologies

Both PMC and Hyde are committed to developing energy efficient and low carbon developments, and in doing so seek to address the social impact of the decisions being made as part of their wider ESG work – and the Proposed Development at Kingston Wharf is no different.

1.1.1 Energy Hierarchy

The Energy Hierarchy has long since been adopted as best practice when designing energy efficient low carbon buildings and is now commonly used across the UK.

Fundamental to the ongoing development of the energy strategy has been a focus on the practical delivery of the energy hierarchy in order to minimise energy use and associated CO_2 emissions.



Lean

minimise the overall environmental impact and energy use through energy efficiency measures

Clean

ensure that energy systems on-site (heat & power) are efficient & produce minimal CO_2 emissions

Green

Implement suitable technologies to provide renewable and emission free energy sources

Seen

incorporate monitoring through SMART metering and accessible displays

1.1.2 Planning Policy & Conditions

The Planning Conditions and associated key Local Policies informed the energy strategy and are listed below:

Planning Policy / Condition	Requirement & Interpretation
Planning Condition 34 (Sustainability & Energy)	34. The development hereby approved shall incorporate the following sustainable energy and heat management measures, in accordance with the details in Energy and Sustainability Statement by SRE Consultants, dated 8th January 2020, submitted with the current application: • Energy efficient building fabric, • LED internal & external lighting, • Provision of Solar panels, • Balanced mechanical ventilation with heat recovery system (MVHR),

	• Building Energy Management Systems, • Efficient water goods and fixtures to achieve <110L/Person/day. The development shall be implemented and maintained in accordance with the details thereby approved, unless the Local Planning Authority give prior written approval for any variation. *Reason: In accordance with the submitted application, to ensure that the development is sustainable and makes efficient use of energy, water and materials having regard to the National Planning Policy Framework and policies 18 & 19 of the Adur Local Plan and SH1 of the Shoreham Harbour Joint Area Action Plan and paras 150-154 of the NPPF, 2019.*
Adur Local Plan	Policy 18 Residential Internal water use to be < 110 litres/person/day. Commercial water use to meet BREEAM 'Very Good' Standards as a minimum. Policy 19 An assessment of the opportunities to use low carbon energy, renewable energy and residual heat/ cooling for both domestic and non-domestic developments must be provided. Adur Local Plan Text states that: *"in order to help reduce carbon emissions all major development should incorporate renewable and low carbon energy production equipment to meet at least 10% of predicted energy requirements"* Policy 28 The incorporation of electric vehicle charging points is encouraged where possible and feasible.
Shoreham Harbour Joint Area Action Plan	Policy SH1 • Maximise opportunities to support local sustainability objectives and commitments • Zero-Carbon development is encouraged • Passive design measures incorporated • Low and zero carbon energy generation on site is encouraged and supported • Heating and cooling is to be selected based on the heating and cooling hierarchy • Water use is required to be reduced to <110 litres/person/day in excess of Building Regulations Part G requirements. Connection to the Shoreham Harbour District Energy Scheme is mandatory for all developments along its route, with future connection required where it is not yet in place. Guidance on plant size requirements is given within the Policy document. Two points of note: *"Where no heat network is in place, development proposals must be designed to be connection ready, and will be expected to demonstrate that all specifications below have been met:* *All Buildings must use a centralised communal wet heating system rather than individual gas boilers or electric heating.* *All buildings must allow adequate plant room space to allow for connection at a later date.* *Plant rooms must be situated to consider potential future pipe routes. The developer must identify and safeguard a pipe route to allow connection between the building and the highway or identified network route where available.* *The developer must not in any other way compromise or prevent the potential connection."* ***Policy SH1, 7.*** *"Development within the proposed Shoreham Heat Network area will be required to connect to district heating networks where they exist, or incorporate the necessary infrastructure for connection to future networks"* ***Policy SH1, 8.***

Table 1 - Summary of local planning policy & conditions

Energy Review

2.0 Energy Review

The following section aims to highlight the key differences between the two energy strategy options and summarise their environmental and social impacts.

2.1 Energy Strategies

The two energy strategy options that are being reviewed are the 'Planning Strategy': gas based communal heating & hot water system proposed at planning (8th January 2020 Energy Statement – and listed in Planning Condition 34) and the 'Proposed Strategy' individual electrically based heating & hot water system.

The key elements of the two energy options are summarised in the following table:

Item	Planning Strategy	Proposed Strategy
Heating	Gas Communal Heating - HIU	Electric Panel Heaters
Hot Water	Gas Communal DHW - HIU	Individual DHW – 125-150l cylinder
Ventilation	MVHR	MVHR
PV	147.9kWp – landlords supply	147.9kWp – individual units
WWHR	-	WWHR – System A
iBoost Diverter	-	iboost Diverter
Glazing	1.4 $W/m^2 k$	1.2 $W/m^2 k$
Air Permeability	$4m^3/hr/m^2$	$3m^3/hr/m^2$

Table 2 – Summary of the key elements of the two energy options

All other building performance aspects of the Proposed Development remain as previously modelled in SAP and summarised in the Energy Statement.

2.1.1 Sample Units

In order to complete the energy review of the two options a total of 12 no. sample units (4 no. from each block) of different sizes, storey level and orientations have been used to provide an average figure for the scheme.

Block & Unit Number	Unit Type	Area (m^2)	No. of Beds	Level	Exposed Orientation
A1.0.02	Type 1	39	1B1P	Ground	South
A2.1.08	Type 28	71	2B4P	Mid - Lvl 1	North and East
A1.3.03	Type 7	50.3	1B2P	Mid- Lvl 3	East
A1.6.03	Type 30	74	3B4P	Top	South
B1.0.05	Type 12	61	2B3P	Ground	West and South
B2.3.06	Type 9	56	1B2P	Mid - Lvl 3	East

B2.3.03	Type 8	50	1B1P	Mid - Lvl 3	West
B1.5.04	Type 16	61	2B3P	Top	West
C2.0.01	Type 23	81	2B4P	Ground	North and South
C2.1.04	Type 31	77	3B4P	Mid- Lvl 1	South and West
C1.5.05	Type 29	70	2B4P	Mid -Lvl 5	North and East
C1.6.02	Type 14	61	2B3P	Top	South and East

Table 3 – Sample Unit Summary Data

2.1.2 Measurables

The Proposed Development has sought to minimise energy demand and associated CO_2 emissions throughout the design process. Therefore, to enable a robust comparison the following measurables have been calculated for each sample unit:

- energy use intensity (EUI) – kWh/m^2/year
- carbon emissions – kg/year
- predicted operating costs - £/year

The average annual running costs have been compared between the Planning Energy Strategy and the Proposed Energy Strategy and for three price scenarios to reflect the recent significant changes in wholesale and retail energy prices – as well as future predictions:

a) March 2022 – OFGEM Cap Price
b) November 2022 – Energy Price Guarantee (EPG)
c) October 2023 – OFGEM Cap Price once the EPG is lifted

In addition Unit B1.5.04 has had IES dynamic energy modelling undertaken to compare the unit's performance in more detail under CIBSE TM54 standards.

As part of this analysis the energy costs for 4 no. scenarios has been calculated within the TM54 dynamic energy modelling, and the scenarios are:

a) Option 1 – Typical Occupancy
b) Option 2 – 'Working from Home'
c) Option 3 – High Water Use
d) Option 4 – High Set Point (internal temperature)

2.2 Assumptions

A number of key assumptions have had to be made – informed by best practice and industry standards – in order to deliver robust result and these are summarised for the SAP modelling, IES dynamic energy modelling (TM54) and cost analysis:

2.2.1 SAP 2012

- The energy calculations are based on Building Regulations 2013 Part L1A (SAP 2012)
- CO_2 emissions are based on SAP10.2 figures for all systems
- Heating set point assumed to be at 21 degree Celsius for living and kitchen area and 18 degree C for bedrooms.
- Proposed Option: All PV generated wired back to the flat for consumption by all appliances and solar iboost DHW divertor.

- Carbon Emissions includes the offset from PV for the both the options.

2.2.2 TM54 (dynamic modelling)

- Heating set point assumed to be at 21 degree Celsius for living and kitchen area and 18 degree C for bedrooms with a setback of 16 C. 24 C assumed within living room for option 4.
- Domestic Hot Water Use assumed to 65 l/person/day which is based on threshold Part G value of 125 l/s/person, and 50% of this will be heated for usage. Hot water consumption was doubled for Option 3 and only 1/3rd added to Option 2.
- All PV generated wired back to the flat for consumption by all appliances and solar iboost DHW divertor.
- Savings form waste water heat recovery (WWHR) has been input based on 10% percentage offset from total water use (based on 110l/p/d occupancy)
- Heat loss from natural ventilation/Purposed Provided Openings (PPO) are not taken into account within the dynamic simulation.
- EUI figures include Unregulated Energy.

2.2.3 Annual Running Costs

- Communal Heating: No Gas Standing Charge applied
- Communal Heating: Maintenance & Replacement Charge based on 2011 historical data from Centenary Quay, Southampton with inflation of 30% applied. equates to £400/year/unit to cover landlord costs
- Energy prices (all) and standing charges sourced from British Gas[1] and Cornwall Insight[2]
- Price Cap (all) sourced from Forbes[3]

2.3 Energy Use Intensity and Results

Total average energy use is >20% higher for the Planning Energy Strategy compared to the Proposed Energy Strategy.

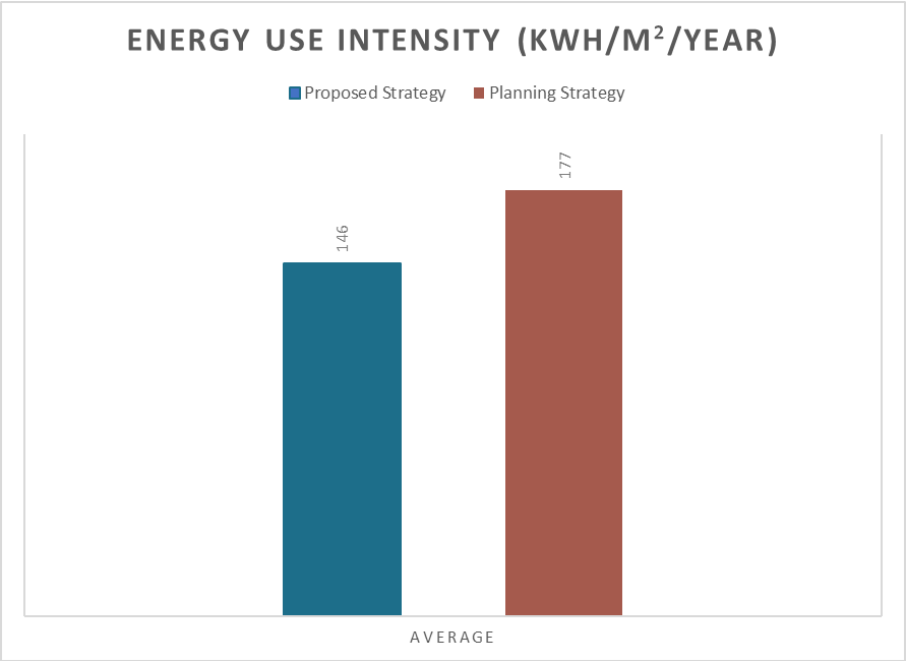


Figure 4 – Energy Use Intensity kWh/m²/year (Planning v Proposed)

[1] https://www.britishgas.co.uk/energy/price-cap.html
[2] https://www.cornwall-insight.com
[3] https://www.forbes.com/uk/advisor/energy/energy-price-caps/

2.4 Carbon Emissions Results

Total average carbon emissions is >50% higher for the Planning Energy Strategy compared to the Proposed Energy Strategy.

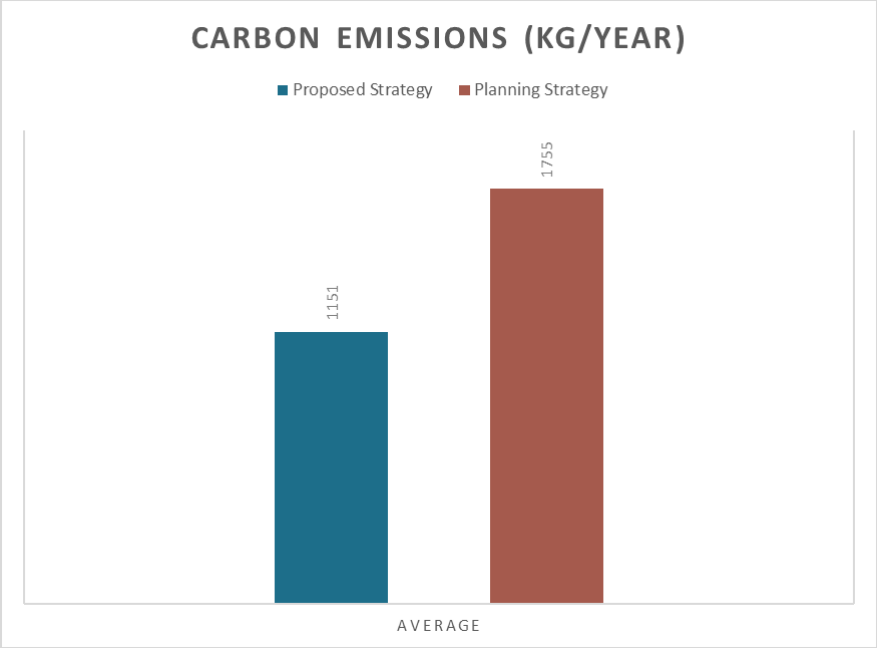


Figure 5 – Annual Carbon Emission per year (Planning v Proposed)

When Figure 4 and Figure 5 are summarised in a single graph as below the environmental improvement of the Proposed Energy Strategy becomes evidently clear.

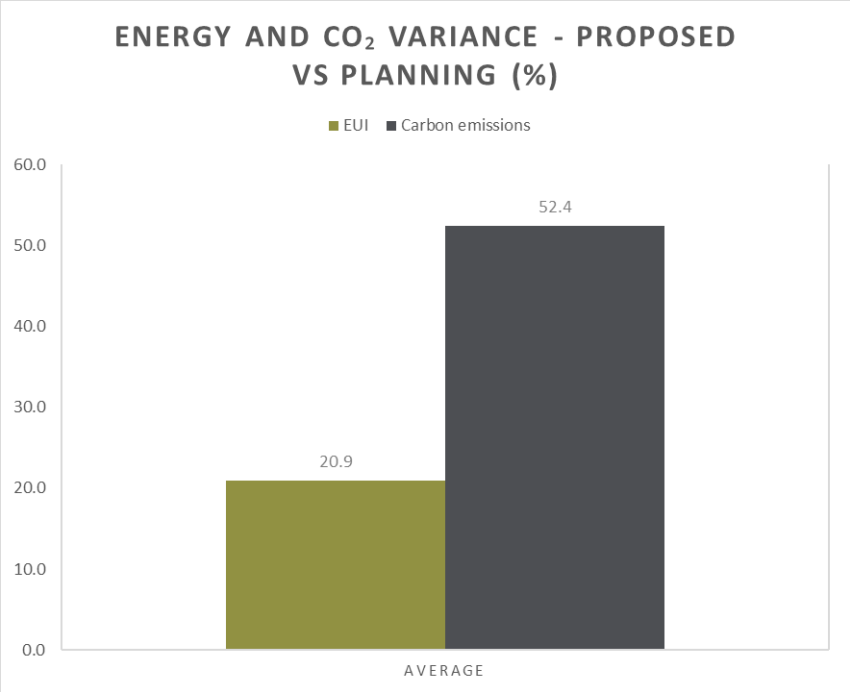


Figure 6 – Energy & Carbon Percentage Variance Summary (Planning v Proposed)

2.5 Annual Running Costs Results

Predicted Annual Running Costs are summarised in Figure 7 below.

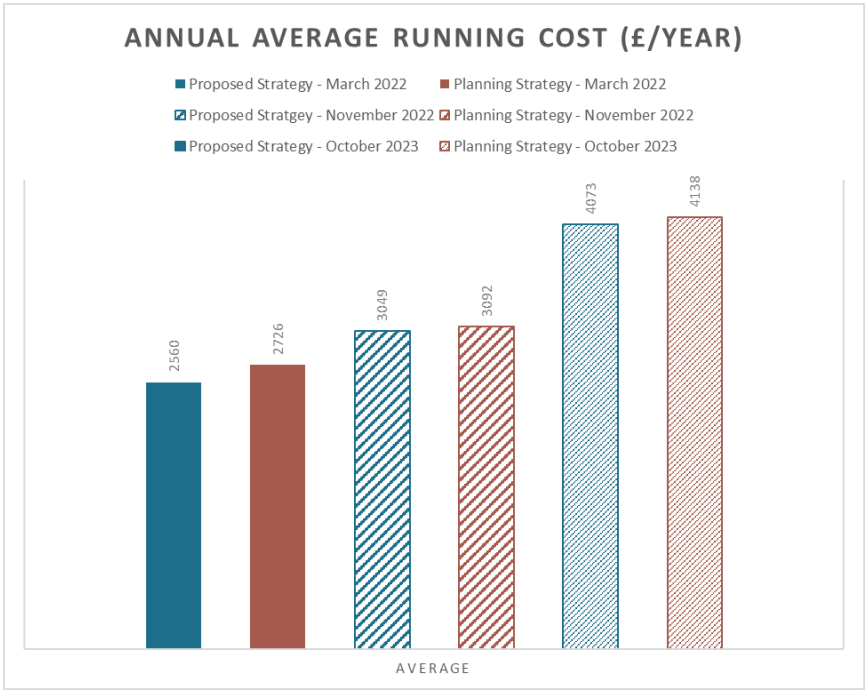


Figure 7 – Annual Average Running Cost Comparison between Proposed Energy Strategy and Planning Energy Strategy (March 22, November 2022 & October 2023)

Costs are compared between the two energy strategies and for the three different pricing periods (March 22, November 22 and October 23).

The results show that the Proposed Energy Strategy delivers a range of average costs that are from -1.9% to -6.7% lower compared to the Planning Energy Strategy. This can be seen more clearly within Figure 8 below.

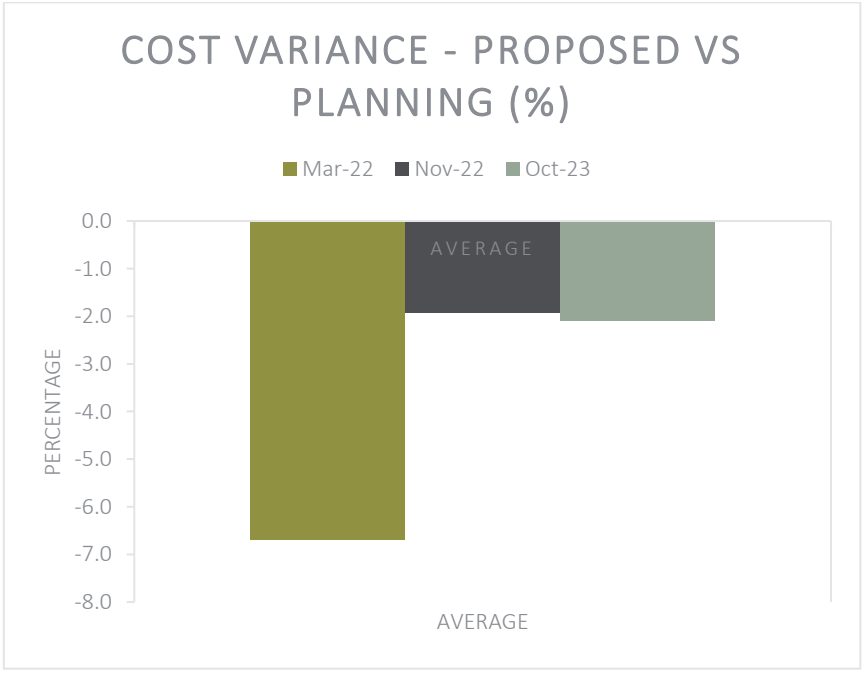


Figure 8 – Percentage Variance in Annual Average Running Cost between Proposed Energy Strategy and Planning Energy Strategy (March 2022, November 2022 & October 2023)

2.6 Dynamic Energy Modelling (TM54) Results

The modelling of the 4 no. scenarios within a top floor unit (B1.5.04) has provided a range of detailed energy figures and how they are impacted by the different uses.

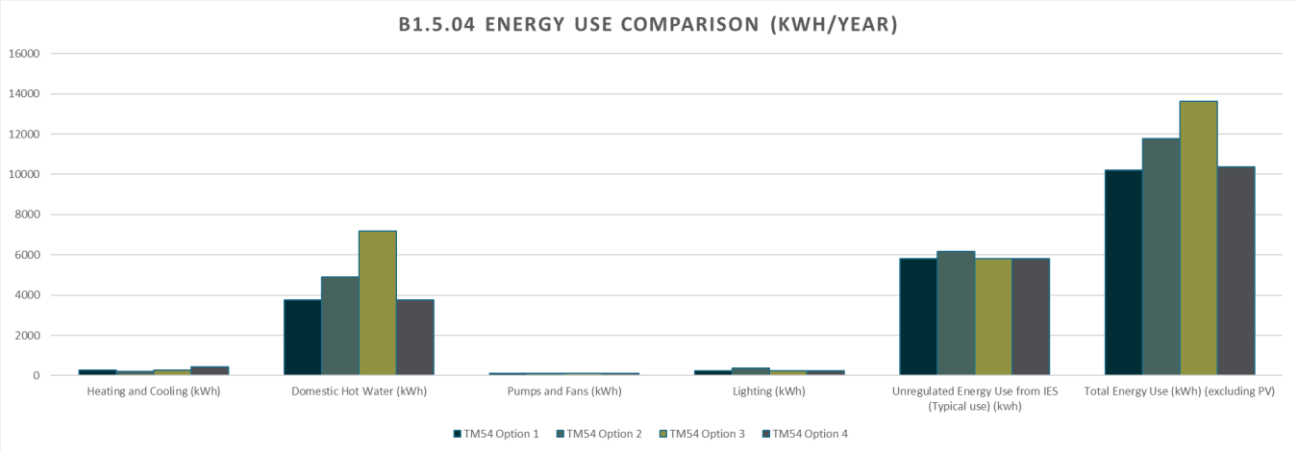


Figure 9 – TM54 Modelling of annual energy use for 4 no. scenarios in a sample unit

The savings from the WWHR have not been modelled within any of the scenarios due to limitations within the modelling, and this would obviously reduce the hot water load associated with the unit.

What is also of interest is that heating is not a significant load for any of the scenarios – reflecting the high quality building envelope performance limiting heating demand from the outset.

When the costs associated with the 4 scenarios are compared one can see the direct correlation between increased hot water use and running costs – even with the use of the PV Diverter (but noting the WWHR is not being modelled.)

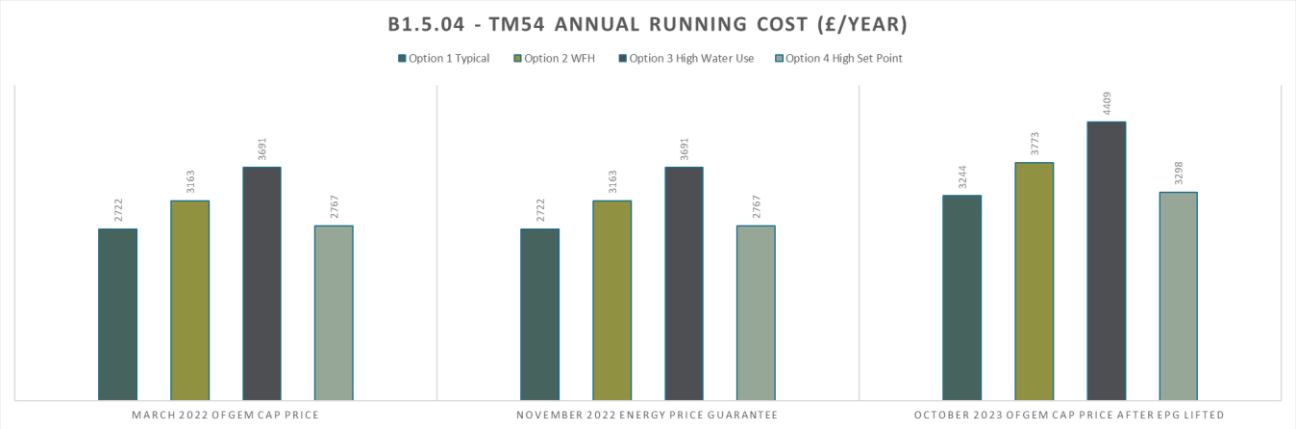


Figure 10 – Predicted Annual Running Costs for 4 no. scenarios compared to SAP 2012 Proposed Energy Strategy (Sample Unit)

Please note that ~45-50% of the energy use and cost is associated with unregulated uses (ie cooking, TV, appliances etc) – and would be similar across all units, and therefore predominantly outside of the control and performance of the Proposed Development, PMC and Hyde.

3.0 Conclusion

The Energy Review Summary had shown how a range of typical units across the Proposed Development are predicted to perform based on the proposed energy strategy (electric heating & DHW) compared to the planning energy strategy (communal heating & DHW).

Significant savings in energy use and carbon emissions are achieved across all units resulting a reduced environmental footprint for the Proposed Development.

A number of assumptions have been listed but it should be noted that the results contain both regulated and unregulated energy figures. Unregulated energy use accounts for ~45-50% total energy consumption.

The annual average running costs for the proposed energy strategy do vary based on the different price points that have been assessed, with a range of -6.7% to -1.9% reduction compared to the planning energy strategy.

The dynamic modelling has highlighted that the heating load is not the most significant issue to address, namely DHW and unregulated energy need the most focus.

Overall the significant energy and carbon savings, along with the ability for individual tenants to manage their DHW consumption and heating strategy (when needed), could further reduce the running costs for the tenants.

Appendices

Appendix A Supporting Calculations

									Regulated Energy Use (kwh)					Unregulated Energy Use (kwh)										
SAP 2012	Design Final - Electric Panel Heaters, Immersion Heaters, PV, WWHRS	Block	Units	Unit Type	Area	No of Beds	Level	Exposed Orientation	Heating and Cooling (kWh)	Domestic Hot Water (kWh)		Pumps and Fans (kWh)	Lighting (kWh)	Unregulated Energy Use from IES (Typical use) (kwh/m2)	Unregulated Energy Use from IES (Typical use) (kwh)	PV Energy Generated (-kWh)	PV Energy Consumed (-kWh)	Total Energy Use (kWh) (excluding PV)	EUI (kWh/m2/yr) (excluding PV)	CO2 emissions (kgCO2/yr)	Additional Charges	March 2022 Ofgem Cap Price	November 2022 Energy Price Guarantee	October 2023 Ofgem Cap Price lifted
	Average	All	12	various	63		Various	Various	1492	1276		151	281	95	5948	686	686	9147	146	1151	0	2560	3049	4073
									Regulated Energy Use (kwh)															
	Planning Strategy - (Fabric - Windows 1.4, Air Permeability 4), Communal Gas, PV to landlord	Block	Units	Unit Type	Area	No of Beds	Level	Exposed Orientation	Heating and Cooling (kWh)	Domestic Hot Water (kWh)	Electrical Energy for Distribution (kWh)	Pumps and Fans (kWh)	Lighting (kWh)	Unregulated Energy Use from IES (Typical use) (kwh/m2)	Unregulated Energy Use from IES (Typical use) (kwh)	PV Generated (-kWh)	PV Energy Consumed (-kWh)	Total Energy Use (kWh) (excluding PV)	EUI (kWh/m2/yr) (excluding PV)	CO2 emissions (kgCO2/yr)	Additional charges - Gas & electric Standing Charge Maintenance and Replacement	March 2022 Ofgem Cap Price	November 2022 Energy Price Guarantee	October 2023 Ofgem Cap Price lifted
	Average	All	12	various	63		Various	Various	2497	2145	43	151	281	95	5948	686	0	11064	177	1755	400	2726	3092	4138
TM54		Block	Unit	Unit Type	Area	No of Beds	Level	Exposed Orientation	Heating and Cooling (kWh)	Domestic Hot Water (kWh)		Pumps and Fans (kWh)	Lighting (kWh)		Unregulated Energy Use from IES (Typical use) (kwh)	PV Generated (-kWh)	PV Energy Consumed (-kWh)	Total Energy Use (kWh) (excluding PV)	EUI (kWh/m2/yr) (excluding PV)	CO2 emissions (kgCO2/yr)	Additional charges - Maintenance and Replacement	March 2022 Ofgem Cap Price	November 2022 Energy Price Guarantee	April 2023 Ofgem Cap Price after EPG lifted
	Dyanamic Modelling Results - Proposed Scheme Flat Type 16 B1.5.04	B	Option 1 Typical	Type 16	61	2B3P	Top	West	277	3762.432		105	254.8		5801	1166	1166	10200.232	167	1229	100	2822	3344	4956
			Option 2 WFH						211	4904.244		105	375.8		6161	1166	1166	11757.044	193	1440	100	3263	3873	5764
			Option 3 High Water Use						277	7186.212		105	254.8		5801	1166	1166	13624.012	223	1694	100	3791	4509	6732
			Option 4 High Set Point						436	3762.432		105	254.8		5801	1166	1166	10359.232	170	1250	100	2867	3398	5039



SRE Main Office | Greenforde Farm
Stoner Hill Road | Froxfield
Petersfield | Hampshire | GU32 1DY
01730 710044
info@sre.co.uk
www.sre.co.uk