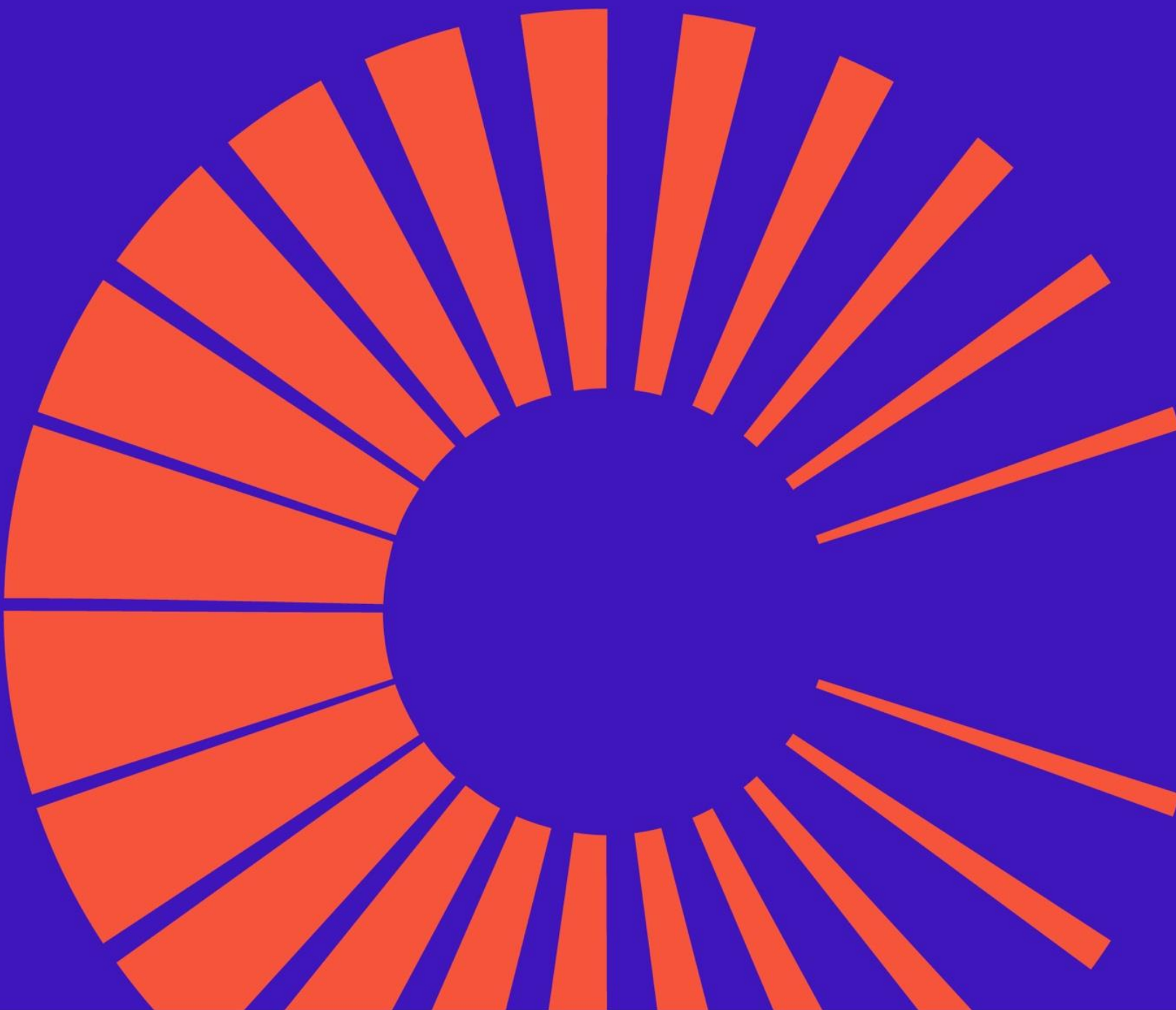


University Academy Long Sutton

DEIR079 - Energy Strategy Report
SRP1155-CHD-XX-XX-T-M-0003

Revision	Date	Description	BY / QA
P01	22/01/24	Draft CP Issue	SD / JD
P02	16/02/24	Clarification Update	JD / SB



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1.0 Introduction

This section of the submission details the Energy Consumption and Water Efficiency Plan for the proposed new University Academy Long Sutton development in Long Sutton . The project includes the development of a new teaching block.

The energy strategy follows a good practise ‘Be Lean’, ‘Be Clean’, ‘Be Green’, ‘Be Seen’ hierarchy as described herewith. This strategy of adopting passive design techniques to reduce energy use and carbon emissions results in a design whereby the construction budget is invested in the building fabric as a priority which enhances the building performance.

The school has been designed to meet the designs standards for educational buildings based upon the Department for Education (DfE) briefing documents, including the Output Specification (OS) and associated technical annexes.

2.0 Planning & Building Regulations

This section of the submission details the requirements and initial compliance checks for both planning and building regulations compliance.

2.1 Planning Policy Compliance

The local planning policies relevant to energy consumption have been identified as follows: -

The South East Lincolnshire Local Plan

- Policy 31: Climate Change and Renewable Low Carbon Energy
 - Associated infrastructure and the integration of decentralised technologies on existing proposed structures will be permitted
- Reasoned Justification Climate Change
 - 7.5.2 The consequences of current and future climate change require careful consideration. Accordingly, proposed development should be designed with a view to minimising and mitigating the effects of climate change. It is expected that climate change will produce warmer wetter winters and warmer drier summers
 - 7.5.7 South East Lincolnshire’s progress in relation to the Government target for 30% of electricity used from renewable sources, 15% of all energy used from renewable sources and the 34% cut in greenhouse gases by 2020 and 80% by 2050 is contained within the ‘South East Lincolnshire’s Carbon Challenge’.

The projects NZCiO target will ensure that on-site renewables shall satisfy the requirement for low and zero carbon technologies required under the local planning policies. The requirement to undertake a BREEEAM assessment shall be further discussed with the Planner once a face-to-face dialogue can be commenced.

2.2 Building Regulation Compliance

A provisional SBEM calculation has been carried out using Level 5 IES software which shows the building as currently designed complies with Part L2A:2021. As the design evolves the Part L model shall be updated to reflect the design development. It should be noted that the initial Part L software is likely to have hotfix updates to the software which may adjust the SBEM calculation as the design progresses. The results are shown below: -

BRUKL Output Document

 HM Government

Compliance with England Building Regulations Part L 2021

Project name

University Academy Long Sutton with PV

As designed

Date: Thu Jan 18 10:44:58 2024

Administrative information

Building Details

Address: Address 1, City, Postcode

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.24

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.24

BRUKL compliance module version: v6.1.e.1

Certifier details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

Foundation area [m²]: 1935.75

The CO₂ emission and primary energy rates of the building must not exceed the targets

Target CO ₂ emission rate (TER), kgCO ₂ /m²·annum	2.78
Building CO ₂ emission rate (BER), kgCO ₂ /m²·annum	-3.82
Target primary energy rate (TPER), kWh _m /m²·annum	29.72
Building primary energy rate (BPER), kWh _m /m²·annum	-46.97
Do the building's emission and primary energy rates exceed the targets?	BER <= TER BPER <= TPER

The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Fabric element	U _{o-Limit}	U _{o-Calc}	U _{i-Calc}	First surface with maximum value
Walls*	0.26	0.16	0.26	0000005C:Surf[0]
Floors	0.18	0.14	0.22	0000005C:Surf[2]
Pitched roofs	0.16	-	-	No pitched roofs in building
Flat roofs	0.18	0.13	0.18	0000005C:Surf[38]
Windows** and roof windows	1.6	1.16	1.35	00000000:Surf[3]
Rooflights***	2.2	1.4	1.4	0000005C:Surf[36]
Personnel doors^	1.6	-	-	No personnel doors in building
Vehicle access & similar large doors	1.3	-	-	No vehicle access doors in building
High usage entrance doors	3	-	-	No high usage entrance doors in building

U_{o-Limit} = Limiting area-weighted average U-values [W/m²K]

U_{o-Calc} = Calculated area-weighted average U-values [W/m²K]

U_{i-Calc} = Calculated maximum individual element U-values [W/m²K]

* Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.

** Display windows and similar glazing are excluded from the U-value check. *** Values for rooflights refer to the horizontal position.

^ For the doors, limiting U-value is 1.8 W/m²K.

NB: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air permeability	Limiting standard	This building
m³/(h.m²) at 50 Pa	8	3

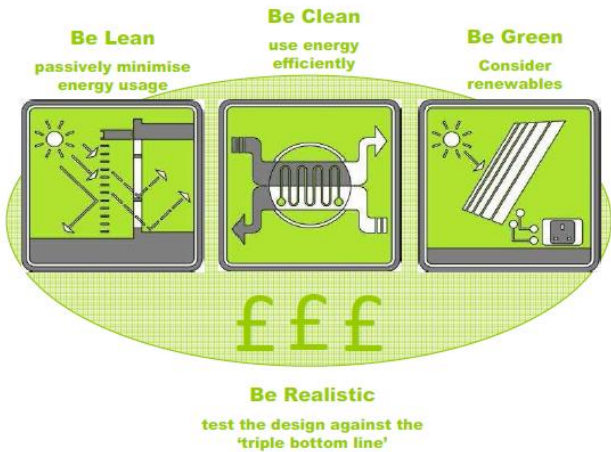
As can be seen from the results, the building as designed is currently exceeding the mandatory requirements of Part L2A:2021.

The BRUKL will include for an allowance of photovoltaic panels for onsite renewable electricity generation, for further details please refer to the PV layout drawing. The allowance made for PV array yields at this stage are assumed in with the NZCiO calculations undertaken. In the next stage of the design, the external canopy designs for additional PV arrays shall be coordinated and the achievable amount of PV shall be decided.

As the design develops, it is the duty of the Mechanical and Electrical Sub-contractor to model the building to reflect the detailed design, ensure Building Regulations compliance, amend the design as required (and liaising with other members of the design team where changes are necessary to the architectural or electrical design etc) and to submit the “As Designed” and “As Built” compliance certificates and energy performance certificates.

3.0 Approach to Optimising Energy Use

The design philosophy for reducing energy consumption is demonstrated below in the image below and is aligned with the OS and CIBSE guidelines: -



The project energy strategy is to maximise a fabric first energy strategy whereby the construction budget is focussed on reducing energy consumption and using it efficiency.

3.1 Be Lean ‘Passive’ Design Measures

The table below shows some of the ‘Be Lean’ passive design measures incorporated within the design to demonstrate our approach.

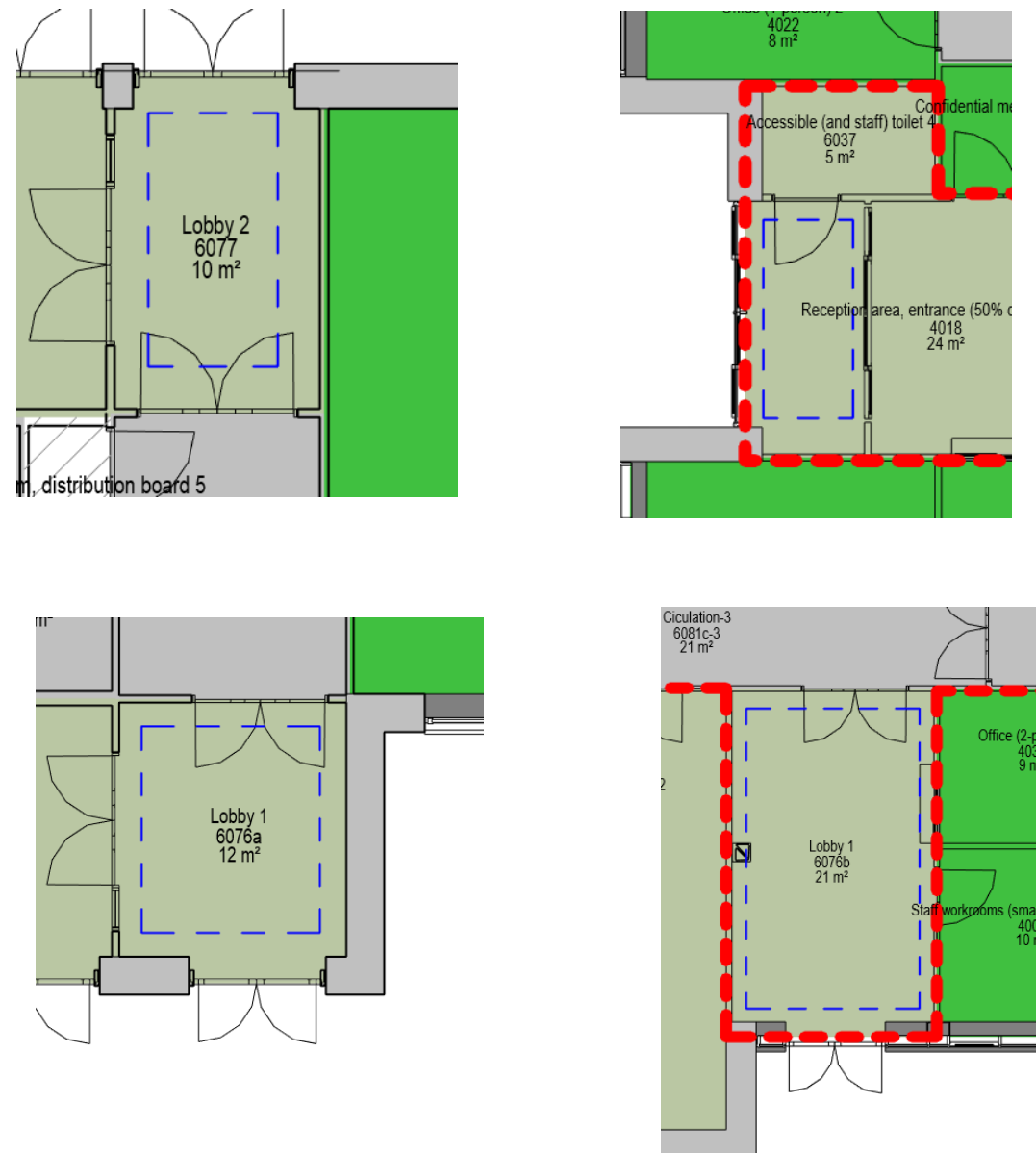
‘Be Lean’ Passive Design Measures

Design Measure	Description & Benefits
Fabric First Energy Strategy	High levels of building fabric efficiency reduce heat loss at the source which in turn reduces heat generation plant capacity and the associated costs.
Building Geometry	Multi-story building reduces exposed surface area to internal volume, reducing heat loss and improving efficiency.
Draught Lobbies	All main entrances incorporate a draught lobby to prevent excessive heat loss.
Optimise Useful Daylight	Climate Based Daylight Modelling has been utilised to ensure the building has optimum ‘useful’ daylight levels that in combination with

	daylight-dimming lighting controls, help eliminate the need for artificial lighting energy consumption.
Control Solar Gain / Optimise the use of shading	Balance the extent of windows and implement solar control glass where necessary to control solar gain
Thermal Bridging	Thermal bridges will be designed out through robust construction details.
Air Tightness	Achieve a minimum airtightness of 3m³/hr/sq.m @ 50 Pa
Avoid Air Conditioning – Façade Design	Façade specific solar performance glazing reduces heat gains into the space to help avoid the need for air conditioning.
Avoid Air Conditioning – Optimise the use of Thermal Mass	Where provided, a concrete soffit will help to eliminate the need for air conditioning by providing exposed thermal mass that can be used for maintaining comfortable conditions using passive measures.
Utilise light coloured materials where possible	The majority of the façade to be light where possible subject to planning requirements and School preference. This will reduce the absorption of heat by the building.
Maximise the potential for natural ventilation	Openable windows are provided in Offices, Halls and the Activity Studio where possible including the use of roof lights and high level glazing / turrets
Reduce cold and hot water consumption	By utilising water-efficient fittings, the amount of energy consumed for water consumption is much reduced.

3.1.1 Draught Lobbies to Main Entrances

During the operation of the school as pupils arrive, it’s likely that the main entrance doors will be left open for an extended period. During this period, large amounts of heat can be lost from the building. In line with the OS and to alleviate this heat loss, the main visitor and pupil entrances of the building incorporated a draught lobby to reduce heat loss as shown in the below images: -



Winter draught lobbies – main building

3.1.2 Fabric First Energy Strategy – Thermal Envelope

Aligned with our Energy Strategy we promote a thermally efficient building fabric specification in order to inherently reduce the energy consumption of the building. This strategy reduces the need for Renewables (LZC) solutions that are disproportionately expensive and ensures the construction budget is put into the building. The table below shows the targeted building fabric thermal performance:

Thermal Envelope Strategy

Building Element	Part L 2013 Maximum Allowance	Target
External Wall	0.35 W/m²k	0.15 W/m²k
Roof	0.25 W/m²k	0.12 W/m²k

Floor	0.25 W/m²k	0.12 W/m²k
Windows	2.2 W/m²k	1.10 W/m²k
Air-tightness	10 m³/m²/hr @ 50 Pa	3 m³/m²/hr @ 50 Pa

3.1.3 Solar Shading Strategy

The scheme benefits from the usage of solar performance glazing. The glazing specification is carefully selected to ensure the internal environment is pleasant on all orientations but varying the g-value. In addition, a number of locations contain internal blinds to limit daylight, reducing the effective g-value further still – please refer to DEIR 078 Daylight Report for further details. The table below shows the proposed solar performance glazing specification by orientation and space:

Solar Shading Strategy

Orientation / Location	Proposed Glazing g-value (BS EN 410)	Light Transmittance (%)
North	0.59	71
East	0.38	69
West	0.38	69
South	0.38	69
Rooflights - Clear	0.37	65-70

3.2 Be Lean ‘Active’ Design Measures

The table below shows some of the ‘Be Lean’ active design measures incorporated within the design to demonstrate our approach.

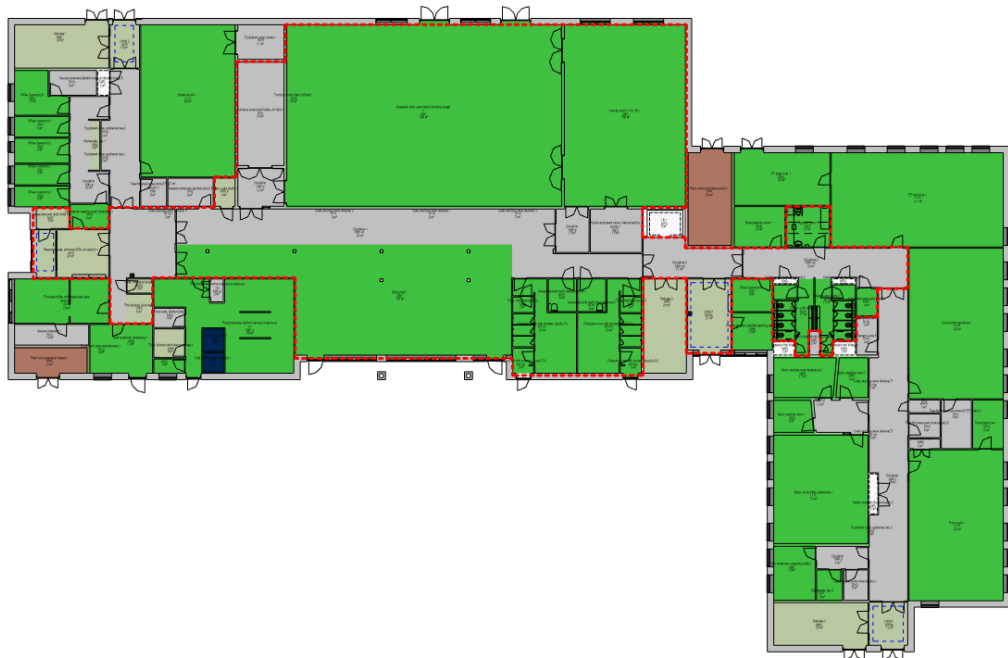
‘Be Lean’ Active Design Measures

Design Measure	Description & Benefits
Include Low Emission and Carbon Dioxide Efficient Heating Systems	High-efficiency combination of ground and air source heat pump technologies is utilised for Heating and some Hot Water whilst ensuring no fossil fuels are directly utilised for the building operation. An all-electric building is proposed (except Science Bunsen Burners).
Heat recovery ventilation	Within occupied spaces, the ventilation system utilises heat recovery that is deployed to maximise energy efficiency.
Maximise the use of passive cooling technology	Openable windows to be provided, night cooling utilising hybrid ventilation systems. Thermal modelling is to be carried out at the next stage.
Select efficient ventilation systems	High-efficiency ventilation with low SFPs to maximise energy efficiency
Lighting Efficiency	LED’s have been appraised for their suitability as part of the design development and have been found to be a cost-effective measure to

	reduce lighting electrical energy use – please see DEIR 084 Lighting Strategy Report for details.
Lighting Controls	Incorporate movement sensors and daylighting dimming controls – please see DEIR 084 Lighting Strategy Report for details
On-demand control to teaching spaces	The room by room ventilation, heating and lighting controls ensure that energy efficiency is maximised in every space where the amount of air delivered is variable to suit the space.
Variable speed pumping	Variable speed pumping on all secondary circuits reduces energy consumption associated with distribution significantly.
Zoned building services	The building contains separate zoning as agreed with the school and indicated on the heating and ventilation strategy drawing to ensure energy is not wasted elsewhere in the facility.
Automatic monitoring of all energy sub-metering	Out of range alarms will be triggered when the energy consumption of the building exceeds the typical consumption levels to highlight to the facilities staff that excessive energy use has occurred.

3.2.1 Community Use (Out of Hours) Zoning

Out of hours zoning of the building services systems is provided to ensure the whole building does not need heating when in partial use, such as community use. The out-of-hours areas of the will be agreed during the next stage of the CEM process but are indicated on the heating philosophy drawings.



3.3 Be Clean Design Measures

The table below shows some of the design features where energy is used efficiently within the design, i.e. ‘Be Clean’.

‘Be Clean’ Design Measures

Design Measure	Description & Benefits
Offsite District Heating	There is no available district heating to connect to within the locality of the site.
New Teaching Heating System	To support the net-zero carbon in operation aspirations at handover, the new Teaching will be a fossil fuel-free all-electric building with heating and hot water generated by air source heat pumps.

3.4 ASHP Proposal

A new low-temperature hot water heating (LTHW) installation shall be provided comprising an Air Source Heat Pump (ASHP) solution which shall be located in an external preconstructed plantroom outside of the building envelope to feed a CT circuit running through the main building to serve all heat emitters and localised plant rooms where domestic hot water shall be generated locally to serve zones.

3.5 Be Green Design Measures

‘Be Green’ Design Measures

Design Measure	Description & Benefits
Project Specific Planning Requirements	Refer to Planning Policy compliance section for details
Project Specific Electric Vehicle Charging Points	Refer to Planning Policy compliance section for details
Technical Annex 2J: Sustainability	All New Buildings shall achieve Net Zero Carbon in Operation (NZCiO), as defined by the standards within the Net Zero Carbon Buildings: A Framework Definition UK Green Building Council (UK GBC) Using EN15978. Recognising a development of targets over a timeline.
Renewable Energy Solutions	The following renewable energy solutions are currently proposed as part of the NZCiO design: Heating to serve the development is anticipated to be generated by ground source heat pumps units with a buffer vessel located within the ground floor heating plantroom within the yard area of the landscape. Hot water to serve the Sports Block will be generated by a roof mounted air source heat pump unit with a storage vessel (with immersion backup) located within the ground floor heating plantroom. A photovoltaic panel array will be installed on the roof. Refer to TM54 analysis & Response to SS6 document for details.

3.6 Photovoltaic (PV) Proposal

As part of the NZCiO strategy, a significant PV array is required to offset the operational energy use of the building. In response to the requirements of OS Annex 2G, the PV system shall be installed and certified through the microgeneration certification scheme (MCS) and monitored and metered as per the ‘Be Seen’ section of this report.

Our proposals will ensure that the PV array layout will be designed to maximise the amount of active PV whilst being coordinated with other roof plant to ensure the PV’s are not within the shade cast by plant and natural ventilation turrets. The PV array layout will also consider where rainwater outlets and access routes for maintenance are located to ensure that any pooling of rainwater does not occur where PV maintenance is to occur.

Please refer to the PV layout drawing and SS6 document for details of the PV proposal.

4.0 Be Seen Design Measures

4.1 Monitoring & Targeting & Outline Metering Strategy

The building will contain a Building Energy Management System (BEMS) to control the major items of plant. The BEMS system will also monitor all major items of plant highlighting any faults in operation.

The BEMS will be web-enabled to allow remote access to all data for remote monitoring purposes via the platform.

The proposed design will include automatic monitoring and reporting (AMR) of data from all the buildings energy meters to ensure any excessive consumption is quickly identified and dealt with. The automatic metering will utilise the iSERV methodology for uploading the consumption data to the Carbon Buzz benchmarking website for comparison to enable the school to quickly appraise their in-use energy consumption against other similar facilities and identify any cases of unusual consumption.

The proposed M&E systems have been kept as simple as possible allowing a relatively simple metering strategy, as encouraged by the OS. However, the metering strategy is sufficiently robust to be able to support the Building Performance Assessments (BPE) post-handover – please see the BPE section for further details.

To ensure the requirements set out in Annex 2I of the Output Specification and the BPE requirements can be met and NZCiO can be proven, a B+K specific standard known as ‘Validate’ has been developed to standardise the approach to metering (and sensors) including, some of items controlled by the standard are: -

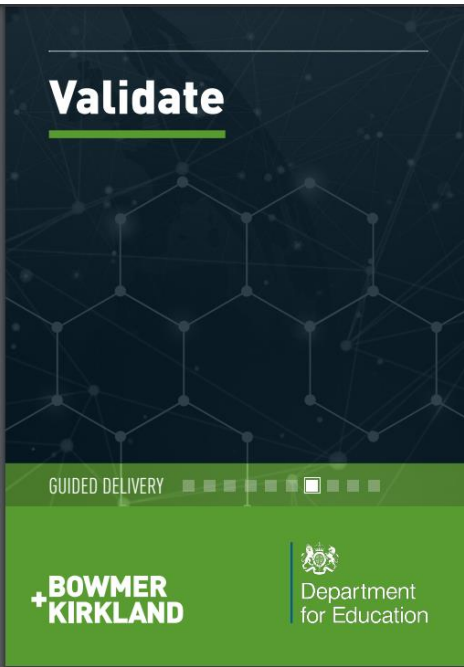
- What end use systems and services need metering
- Type of meter and data output
- How meters (and sensors) are named and tagged
- The process for commissioning of the systems including documentation
- Soak test delivery
- Post handover requirements including Measurement and Verification plans

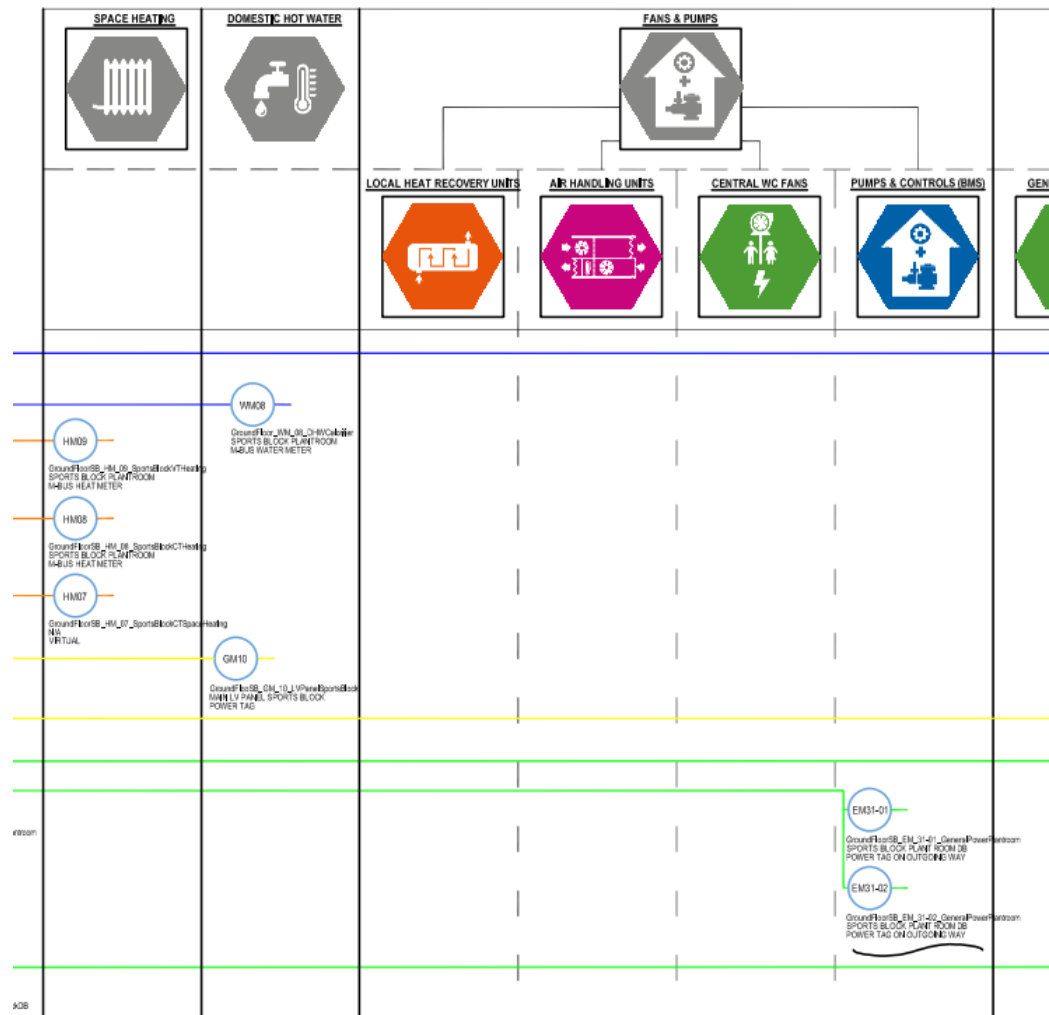
The Validate standard also set out the requirements of B+K and their supply chain to ensure important steps in the process are not overlooked. The table below is taken from the validate document and set out the documentation to be produced and by whom where ‘DCO’ is the MEP Design Consultant, ‘MEC/ELC’ are the Mechanical / Electrical Contractor, ‘BMS’ is the BMS specialist, ‘MCO’ is the Main Contractor, ‘IES’ is IES-VE who will monitor the data produced and ‘ICOM’ is an Independent Commissioning Engineer.

RIBA Stage	Metering Schematic	Metering Spreadsheet	Commissioning Report	Soak Test Report	BPE Report	Measurement & Verification Report	Third Party Validation
Stage 1 – PITT	-	-	-	-	-	-	-
Stage 2 - ITT	-	-	-	-	-	-	-
Stage 3a – Draft CP's	DCO	-	-	-	-	-	MEC / ELC
Stage 3b - Contractors Proposals	MEC	MEC	-	-	-	-	DCO/ ICOM
Stage 4 – Detailed Design	MEC	MEC	-	-	-	-	DCO/ ICOM
Stage 5 – Construction	MEC	MEC	-	-	-	-	-
Stage 6 – Commissioning	MEC	MEC	MEC / ELC	BMS	MCO	MEC / ELC	ICOM / DCO
Stage 7 – Post Handover	MEC	MEC	-	-	MCO	IES	ICOM

By setting this information out, we are able to ensure that all Configure School projects adhere to the same naming conventions and the like to allow meaningful comparisons of data between schools. Templates for all the necessary documents are provided to the supply chain to ensure continuity from project to project.

A major benefit of the Validate process has been to reverse engineer the metering strategy around the DfE End-Use Energy Targets. A snippet of an example Metering strategy is shown below where each meter is placed within the Energy End-Use category, this removes any ambiguity such as if Kitchen Lighting energy consumption comes under ‘Kitchen’ or Artificial Lighting.





The mechanical services that shall be metered under the Validate process is listed below: -

System	Sub-System	End-Use Category	Units	Type
LTHW	CT (Secondary) System	N/A	kWhTh	M-BUS Heat Meter
	Space Heating	Space Heating	kWhTh	Virtual
	Heat Pump(s) Output (Primary Circuit)	Heat Pump Heat Generation	kWhTh	M-BUS Heat Meter
	Catering Kitchen Supply AHU	Catering Kitchen – Canopy Ventilation	kWhTh	M-BUS Heat Meter
	DHW Heat Pumps	Domestic Hot Water	kWhTh	M-BUS or Modbus Heat Meter
Water	Utility Meter at Boundary	N/A	m3	M-BUS Water Meter
	Building Incoming (by building)	N/A	m3	M-BUS Water Meter

	Building Potable Water (by building)	Water – Potable Water Consumption	m3	Virtual
	DHW Heat Pumps	Catering Kitchen – Domestic Hot Water	m3	M-BUS Water Meter
	CAT5 System	Water – CAT5 & Bin Store	m3	M-BUS Water Meter
	Catering Kitchen BCWS	Water – Catering Water Consumption	m3	M-BUS Water Meter
	Excluded Loads*	Water - Excluded Loads	m3	M-BUS Water Meter
	Plantrooms	Water – CAT5 & Bin Store	m3	M-BUS Water Meter
Gas	Utility Meter at Boundary	N/A	kWh	Diaphragm Meter with M-BUS
	Teaching Spaces (Virtual)	Gas – Science / Food Tech	kWh	Virtual

The list of electrical meters to be included under Validate process is shown in the table below: -

System	Sub-System	End-Use Category	Units	Type
Electrical	Utility Meter at Boundary	N/A	kWh	SMETS2
	Building Incomer (by building)	N/A	kWh	PM5000 64BIT
	Heat Pump Input	Air Source Heat Pump – Heat Pumps (Electrical Input)	kWh	Modbus or Powertag
	Electric Emitters	Space Heating	kWh	Modbus or Powertag
	Point of Use Water Heaters (per floor)	Domestic Hot Water	kWh	Modbus or Powertag
	Electric Showers	Domestic Hot Water	kWh	Modbus or Powertag
	Hot Water Immersion Heater(s)	Domestic Hot Water	kWh	Modbus or Powertag
	Mechanical Ventilation	Fans & Pumps – Central WC Fans	kWh	Modbus or Powertag
	General Lighting – By Circuit	Internal Lighting – General Lighting	kWh	Modbus or Powertag
	Stage Lighting (if required)	Internal Lighting – Stage Lighting	kWh	Modbus or Powertag
	External Lighting	External Lighting	kWh	Modbus or Powertag
	General Power (by floor)	Teaching Small Power – General Teaching & Learning	kWh	Modbus or Powertag
	Resistant Materials General Power	Teaching Small Power – Resistant Materials	kWh	Modbus or Powertag
	Food Technology General Power	Teaching Small Power – Food Technology	kWh	Modbus or Powertag

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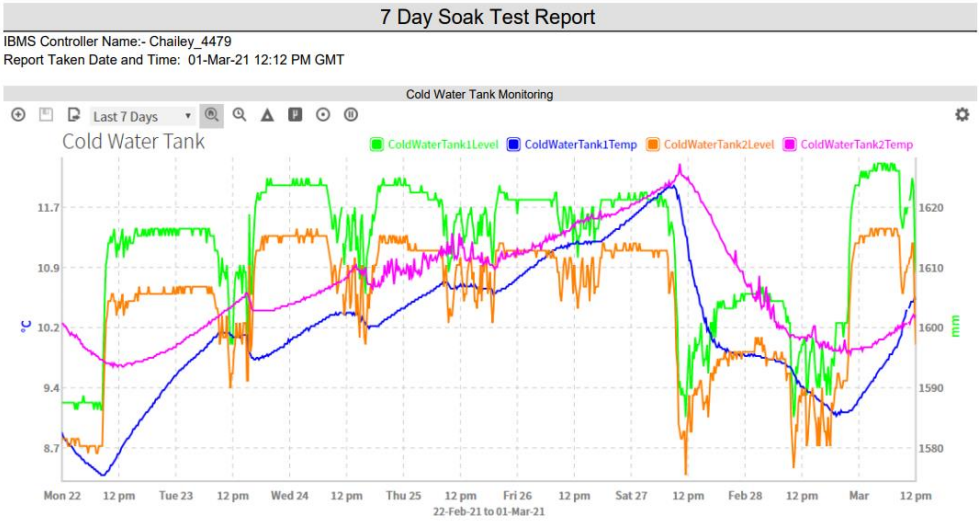
	Science Laboratories General Power	Teaching Small Power – Science Labs & Prep	kWh	Modbus Powertag	or
	Excluded General Power	Teaching Small Power – Excluded	kWh	Modbus Powertag	or
	ICT Classrooms General Power	ICT Rich Classroom	kWh	Modbus Powertag	or
	Server / Hub Room Active Equipment	Server Room – IT Equipment	kWh	Modbus Powertag	or
	Catering Kitchen General Power	Catering Kitchen – General Power & Equipment	kWh	Modbus Powertag	or
	Catering Kitchen Hot Water Generation	Catering Kitchen – Domestic Hot Water	kWh	Modbus Powertag	or
	Main Building Lift	Lift	PM5000 64BIT	MODBUS Meter	
	Electric Vehicle Charging	Electric Vehicle Charging	kWh	Gateway Receiver	
	PV Generation	PV Generation	kWh	Modbus Powertag	or
BMS	Main AHU Supplies	Fans & Pumps – Air Handling Units	kWh	Modbus Powertag	or
	Plantrooms – Pumps & Controls	Fans & Pumps – Pumps & Controls (BMS)	kWh	Modbus Powertag	or
	Server/Hub Room DX Cooling	Server Room - Cooling	kWh	Modbus Powertag	or

Part L2 of the Building regulations has had a recent update.

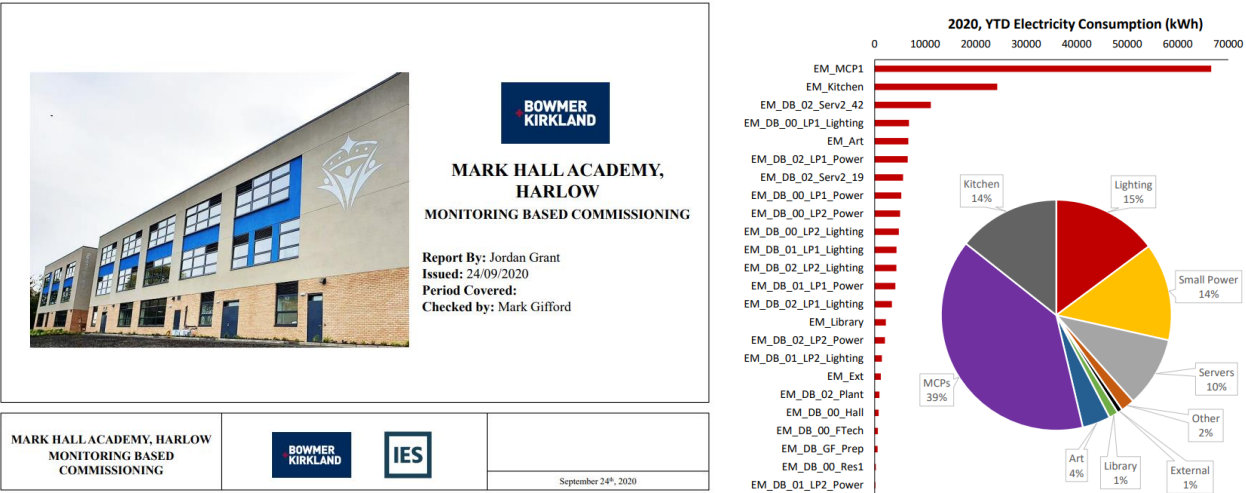
This approved document takes effect on 15 June 2022 for use in England. It does not apply to work subject to a building notice, full plans application or initial notice submitted before that date, provided the work for each building is started before 15 June 2023. The following is to be incorporated: -

- General lighting and display lighting should be metered for each circuit,
- Various methods are considered in the BS and it should be referred too,
- This is not an exhaustive list.

In accordance with DfE OS Annex 2I, a 7 day soak test period shall be undertaken on all project and has been built into the Validate process. The soak test report shall monitor the performance of the installed system and shall include details of any ‘alarms’ raised by the BMS system during the soak test period to ensure that systems operating as intended. An example image of a Soak Test Report is shown below.



A Measurement & Verification report is used to report on the buildings performance in-use and report against the NZCiO requirement by end-use system type. The images below are taken from a completed M&V report on a completed B+K Configure DfE school.



In addition to the metering consumption data, further monitoring data will be provided to help assist the school estates team in operating the HVAC systems effectively as possible, the items shown in bold text are over and above the requirement of the DfE OS: -

- Space temperature of each heating zone
- CO₂ levels of each (heating) zone
- Outside air temperature
- Filter status indication as identified within the OS/TA2F and the new BB101
- Space temperature of areas as identified within Technical Annex 2F

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- CO₂ levels of areas as identified within Technical Annex 2F
- **Supply air temperature of each classroom**
- **Exhaust air temperature of each classroom**

Consumption data will be gathered using 15-minute step intervals to provide the school with monthly monitoring and targeting reports using the DfE/K2n (or IES Scan) spreadsheet template. In addition to monthly reports, the school will also be able to review their live performance data through IES Scan platform – please see the below section for further information.

5.0 Building Performance Evaluation (BPE) Methodology

We are committed to ensuring that University Academy Long Sutton performs as per our design intent. There are many factors that can affect the operational performance of the building; however, we will ensure that design and construction aid a transparent assessment of the building performance drawing from experience from previous projects.

Using the B+K Configure system whereby many aspects of the design have been standardised, has enabled to already learn some key lessons, incorporate the remedies and ensure that there is a process of continuous improvement not only on individual projects, but across the DfE Framework.

This section sets out our proposed methodology for each stage of the project to ensure BPE can be performed affectively and with meaningful outcomes and results.

5.1 Proposed BPE Methodology during Design Stage

5.1.1 Data Collection Methodology

We have already learnt from previous projects that to be able to identify factors affecting the Building Performance, we need to be able to identify meaningful trends within the collected data. Bowmer + Kirkland have developed a platform to navigate live data in a meaningful and swift way, the online platform is known as IES Scan and can be accessed at any time by the School and Bowmer + Kirkland's team. One of the benefits of remote login to live data is that any issues can be investigated and resolved far quicker than the time delay of physically getting to site.

IES Scan takes the data from the Automatic Meter Reading (AMR) as well as the room data (see previous section for list of collected data) and allows comparisons to be made of performance vs. the relevant targets in a clear and readily understandable format. This enables any issues affecting the buildings performance can be more swiftly identified and addressed as opposed to waiting for a monthly data dump and time taken for the subsequent analysis.

IES Scan has been monitoring Bowmer + Kirkland DfE Framework projects since 2016, where the first 3 projects to be monitored were (all part of the Hillingdon and Hounslow batch): -

- Abbotsfield School for Boys (now known as Oak Wood)
- Swakeleys School for Girls
- Kingsley Academy

5.1.2 Integration of BPE into the Design

The project has been assessed to identify key aspects of the school building to ensure that an effective BPE can be conducted during commissioning and beyond. The Out-of-Hours usage of the building has been confirmed during the CEM process where zoning of the building services has been implemented to ensure excessive energy consumption does not occur during these times.

We have also ensured there is sufficient metering to be able to account for energy consumption which is key when identifying issues through monitoring and targeting, please see previous section for further details.

The naming of the meters can have a surprisingly large impact on the successful implementation of energy accounting allowing swifter analysis and trend identification to be performed. We will work with the school and facilities management staff to ensure that the naming of the meters relates to the physical area they serve wherever possible.

5.1.3 Proposed BPE Methodology for Commissioning/Handover Stage

The correct commissioning of the building services can heavily affect the performance of any building. For the energy savings to be realised from such systems as daylight linking lighting controls, the commissioning stage must be conducted correctly. A major cause in poor commissioning is not having sufficient time to allow the commissioning engineers to fully commission the system. Therefore, we propose to implement a 7-day soak test period post commissioning to ensure the building is operating as intended.

The soak test period will be used to ensure the IES Scan platform is performing correctly and that staff are familiar with how to use the system. Staff training will occur at handover to ensure the facilities management team understand the design intent for each system and how to optimise its performance.

During the soak test period, the building and associated plant will operate continuously for 7 days to ensure all functions and monitoring is operating as intended. The purpose of the soak test period is to identify any immediate issues with the building performance prior to occupation. All the data from the soak test period will be available to the school.

5.1.4 BPE Initial Performance Review

The initial performance review of the building will be conducted 3-6 months after occupancy of the building. It is proposed that the initial performance review consists of a site visit and walkaround the school to investigate and document any issues raised in the initial BPE. The initial performance review will be conducted by Bowmer + Kirkland and their specialist designers, the relevant school staff (including the person with financial responsibility for the school) and the facilities management team.

Prior to the site visit, a desktop analysis will be performed of the data collected on the building performance including comparisons against the predicted design stage targets, typical industry benchmarks (such as CIBSE TM46) and DfE benchmark data (iSERV). In addition, benefitting from the IES Scan platform, all the live data can be compared against the other DfE schools delivered by Bowmer + Kirkland, this enables a much greater depth of comparison and will aid the identification of particular issues that maybe causing the building to not perform as intended.

Questionnaires will be provided to the relevant teaching staff as well as the facilities management staff with the intention of identifying broader trends within the feedback relating to the building's performance and operation.

Seasonal commissioning will be conducted throughout the first year of occupation to ensure that each system is operating as intended at all times of the year. During this period, the re-calibration of any meters or equipment will be addressed to ensure the data gathered is meaningful and representative.

All the analysis will then be developed into an agreed action plan with priority ranking to address any issues raised with the view to resolving them ahead of the final performance review.

5.1.5 BPE Final Performance Review

The final performance review of the building will be conducted 9-12 months after occupancy of the building with the intention of allowing time to resolve any issues prior to the end of the defect liability period. The final performance review will reanalyse the issues and actions identified at the initial

Energy Strategy Report

performance reviews to ensure the factors that caused the initial issue has been addressed and the building is now performing as intended. Further interview with the Facilities Management team will be conducted to revisit any issues raised during the initial performance review as well as giving opportunity for the FM team to raise any new issues that may have occurred including any issues with the ease of maintaining and cleaning the building. If required depending upon the report findings, a further site visit will be conducted to address any unresolved issues from the Initial BPE Review action plan.

A Final Performance Review report will be produced where the building performance (both meter readings and other data collected CO₂ levels / temperatures in classrooms) will be reanalysed and benchmarked against both the design targets, the DfE benchmarks (iSERV) and other B+K DfE projects benefitting from the IES Scan software. Monthly summaries of data will be provided to allow the variation in performance relating to the seasons can be easily understood enabling them to better identify unusual trends in the future. In addition, a selection of the most relevant daily graphs will be provided which identify performance data at a much more detailed level.

Any unusual consumption/performance data will be identified, analysed and a commentary provided on the findings including identifying synergies between the data and the activities that are taking place in the school.

A report of the findings will be produced for the school including any further actions that are required to address any remaining issues.

5.2 Supporting the Sustainable Estates Strategy through GEMS

Supporting Good Estate Management in Schools or (GEMS), is a key aspect of achieving NZCiO and engaging the FM staff in the process. To support the School-Specific Sustainable Estate Strategy, we shall promote planned maintenance and all the benefits that come with it rather than traditional reactive maintenance. Our Revit model shall be used to provide Computer Aided Facility Management (CAFM) providing maintenance schedules in accordance with SFG20 list of schedules to ensure that the FM teams can achieve GEM's as part of the post-handover process.

SFG20

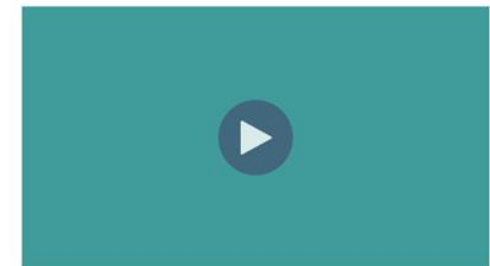
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SFG20: Industry Leading Providers of Maintenance Software

SFG20 is a unique, mobile-enabled, maintenance system that's essential for anyone who owns or manages facilities. Created for the industry and used by the industry, this web-based software solution can be used throughout the asset lifecycle and can be fully integrated with CAFM systems.

Built around the maintenance industry's standard, SFG20's solution provides asset maintenance requirements in a simple and easily-digestible format, with a host of specialist tools available to support the application to assets as well as projective cost modelling.

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5.3 Water Efficiency Plan

The design proposals seek to reduce water consumption for the project by specifying water-efficient sanitary fittings and outlets. These include: -

- Dual-flush low volume WC's
- Major leak detection system on incoming water main to main building
- Adaptable landscaping that does not need irrigation
- Low consumption showers
- Low flow taps

As required by Annex 2K of the OS, water consumption shall be monitored and reported – Please refer to the Metering section of this report for details on physical and virtual water meters.

5.4 Water Quality Plan

A water quality policy document plan shall be produced by the Contractor setting out the procedures in place to protect the building occupants against the risk of legionella infection and the necessary management procedures needed to ensure the water quality is maintained. As part of the water quality plan, a Legionella risk assessment shall be produced by the Contractor in conjunction with the school in accordance with the HSE approved code of practice L8: Legionnaires disease.

6.0 Energy Use Intensity (EUI) Targets

The following EUI values define the minimum standards for New Building and will be achieved before the application of renewable technology ('Be Green' Stage) as per Technical Annex 2H: Energy.

To meet the EUI Targets, the energy model will have energy end-use for school per m² of GIFA (kWh/m²) excluding unheated (transition spaces).

Energy Use Intensity (EUI) Targets

School Type	Maximum EUI	Units
Primary	52	kWh/m ² /yr
Secondary	67	kWh/m ² /yr
SEN_D	52	kWh/m ² /yr

The University Academy Long Sutton is a secondary school and will therefore target a maximum EUI of 67 kWh/m²/yr.

The following breakdown below provides an indication of how to achieve the overall EUI targets, by the end-use system.

Energy Use Intensity (EUI) Targets – System Benchmarks

School Type	Maximum EUI	Units
Heating	8	kWh/m ² /yr
Hot Water	5	kWh/m ² /yr
Internal Lighting	8	kWh/m ² /yr
Fans and Pumps	5	kWh/m ² /yr
Cooling	0	kWh/m ² /yr
Lifts	1	kWh/m ² /yr
Building Related Services	2	kWh/m ² /yr
External Lighting	6	kWh/m ² /yr
Small Power (Primary)	10	kWh/m ² /yr
Small Power (Secondary)	25	kWh/m ² /yr
Small Power (SEN_D)	10	kWh/m ² /yr
Server Room	0	kWh/m ² /yr
Catering	7	kWh/m ² /yr
ICT Equipment	Included within Small Power	Included within Small Power

As per the Q&A relating to CFMC 4 - Consultation on NZCiO amendments in S21 and the implementation of a Ban on Combustible Insulation in External Walls (FRM2021-DFE-XX-XX-T-X-0001-Q&AforCFMC4-S2-P02) reference items 33 and 34.

The Contractor should focus on operational energy, and not carbon. The carbon element is a requirement and uses the carbon factor relevant to the date of handover of the project, any fluctuations of this in the future are only anticipated to get better.

Items such as electrical vehicle charging, and community use fall outside of the scope of the NZCiO calculation and therefore this will not impact the outcome.

Projects shall demonstrate NZCiO at handover using the occupancy profiles associated with education and as detailed in Technical Annex 2H. Community use is not included within this calculation, however, community use should be considered as part of the metering strategy to ensure energy consumption relating to community use can be assessed independently of school use.

As per Technical Annex 2H: Energy;

- All consumption associated with Community Use will be reported as a separate data set.
- All consumption associated with EV charging will be reported as a separate data set.

7.0 CIBSE TM54: Evaluating Operational Energy Use at the Design Stage

The TM54 methodology covers all types of modelling.

‘Modelling’ is used in this document to encompass calculations of energy performance in a wide sense, including spreadsheet and steady-state tools as well as dynamic simulation modelling (DSM).

‘Simulation’ is used to specifically refer to DSM.

The methodology provides an approach to evaluating operational energy use at the design stage. The aim is that the models should then evolve through to occupancy and enable a process of continuous data-driven commissioning that keeps the building operating as efficiently as possible and helps identify when/where performance issues arise.

The methodology is based on:

- The use of modelling of the appropriate level of detail to reliably estimate energy use for heating, cooling, fans and pumps; this is complemented by energy use calculations for specific end uses (i.e. lighting, lifts, escalators and domestic hot water).
- Dialogue between the designers and future occupants where they are known (or a representative) and the building owner or developer about the likely prospective occupants and who will have responsibility for the operation of the building, including factors such as operating hours and energy management regimes.
- The inclusion of all the anticipated energy uses in the building, rather than just the central plant and equipment.
- The principles and approach published in CIBSE TM22: Energy assessment and reporting methodology (2006a), whereby energy use is provided as a breakdown by end-use, which can then be compared against benchmarks and sub-metered energy uses. There should be consistency between the model and the metering strategy to allow evaluation in use against modelling results.
- Scenario testing and sensitivity analysis to understand the factors likely to have the greatest impact on the end energy consumption of the building, presenting the results as a range with a high and low energy use scenario. Scenario and sensitivity analysis helps to understand the drivers for building energy performance and potential risk factors. It is not intended as an excessive margin, but instead to reflect a range of outcomes associated with a range of plausible inputs, and to highlight the importance of design, operational and occupancy factors for performance outcomes.
- A comparison against project targets to ensure that the results are within a range of likely outcomes, and on track to meet desired outcomes.

7.1 Initial TM54 Estimate

Refer to DEIR 594 Estimated Energy Consumption Data for details (SRP1115-CHD-XX-XX-T-M-0006 TM54 Implementation Matrix).

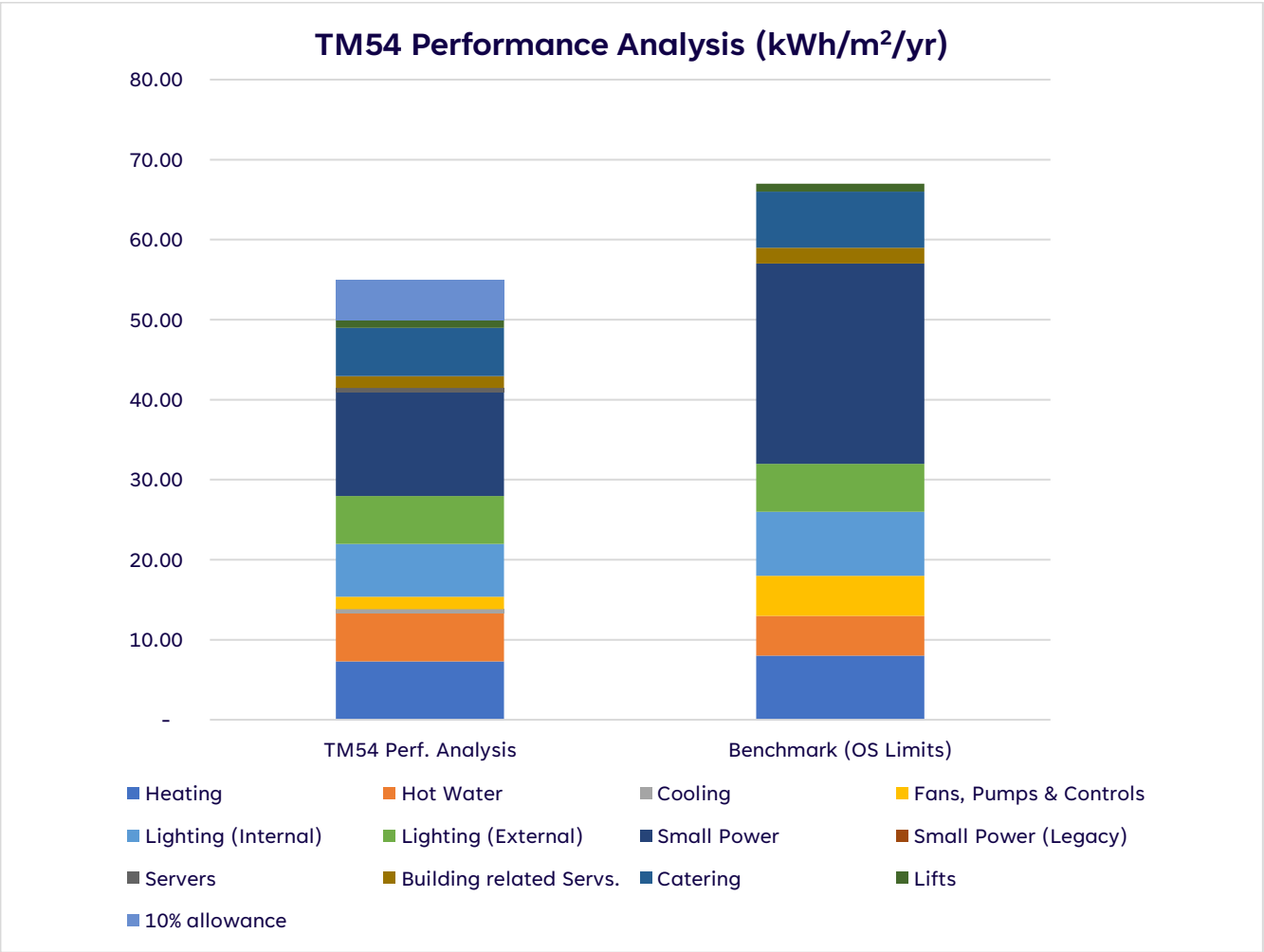
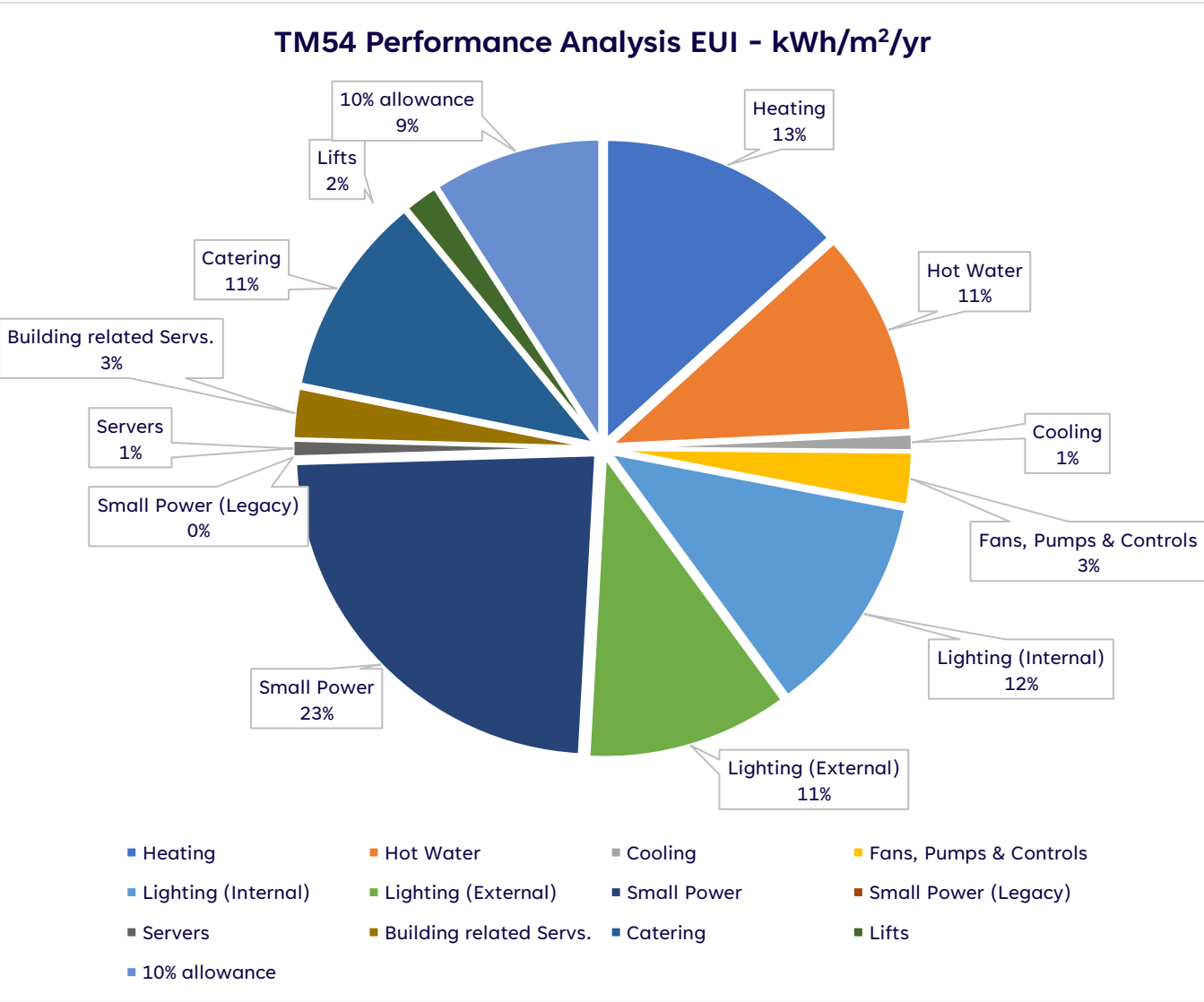
The figures provided are estimated to the best of our knowledge at the time of carrying out calculations. The calculations presented in this document should not be taken as an exact prediction. It is intended as a detailed estimate of the factors that affect operational energy use.

Figures below show initial Draft CP stage TM54 estimates for the University Academy Long Sutton against Technical Annex 2H End-Use Energy Benchmarks. The current estimate is based predominantly on general ‘Modelling’. Therefore, to allow for tolerance in the accuracy at this early stage, a 10% spare has been included within the estimate.

The table below presents a comparison of the design proposal compared with the OS Energy Targets.

Step		TM54 Perf. Analysis	Benchmark (OS Limits)	Actual (TBC)
11.a	Heating	7.29	8	0
9	Hot Water	6.03	5	0
11.c	Cooling	0.50	0	0
11.b	Fans, Pumps & Controls	1.57	5	0
3	Lighting (Internal)	6.57	8	0
3	Lighting (External)	6.00	6	0
5.a	Small Power	13.00	13	0
5.b	Small Power (Legacy)	-	0	0
7	Servers	0.50	0	0
8	Building related Servs.	1.50	2	0
6	Catering	6.00	7	0
4	Lifts	1.00	1	0
Spare	10% allowance	5.00	0	0

Total	54.96	55
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The estimated EUI is **54.96 kWh/m²/yr** which falls below the maximum Technical Annex 2H benchmark of 55 kWh/m²/yr based on a treated floor area of 5,920m². The untreated floor area is deemed to be 208m².

‘Simulation’ / Dynamic Simulation Modelling (DSM) will be carried out at the next stage to provide more detailed figures as part of a Concept Energy Model.

The figures adjacent present a comparison of the design proposal compared with the OS Energy Targets and identification of energy demands across the proposed development by service type.