Education Estates: Sustainability Conference 2026

Project Showcase : Strategy & Practice

Birmingham Metropolitan College

February 2025

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What we do

We are a specialist education-led team of Client Advisors, Project Managers, Cost Consultants, Designers, Bid Writers, Space Planners and Fit Out Specialists.

We delivered over £1bn of new buildings and refurbishments in the education, municipal and commercial sectors.

Our core service is strategic advice and project management, and our team has multi-disciplinary sector experience including senior leadership in education institutions, corporate director experience in Local Authorities, architecture, cost consultancy, surveying, and project management.

We exist to make a difference – creating spaces & shaping futures

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Our reach and understanding of the further and higher education sector

No.	Name	Space Planning	Rationalisation	Master Planning
A	George Green School	X	X	
B	Thames Christian College	X		
C	Langley School	X	X	X
D	Hampshire County Council	X		X
E	Berkhamsted School	X		X
F	Charterhouse School	X		
G	Dixie Grammer School	X		
H	Lord Wilson School	X		
1	Birmingham Metropolitan College	X	X	
2	Buckinghamshire College Group	X	X 2*	X *1
3	Capital City College Group	X	X 2*	X *3
4	City College & Solent University	X	X 2*	X *3
5	West London College	X	X	X
6	Eastleigh College & City College	X		X *1
7	Fareham College	X		X
8	Hadlow College	X	X	X *3
9	Havant and South Downs College	X	X	X *1
10	Lambeth College (LSBU Group)	X	X	X
11	Lincoln College	X	X	
12	London South East Colleges	X	X	
13	Moulton College	X	X	
14	South Staffordshire College	X	X	X *1
15	Solent University	X	X *2	X *3
16	St.Vincent College	X	X *2	X
17	States of Guernsey Institute	X	X	X *3
18	The Henley College	X	X *2	X
19	The Loddon School	X		X *3
20	The RNN Group	X	X	
21	University of Chichester	X	X	X *3
22	South Thames College Group	X		X
23	Runshaw College	X	X	X
24	Shrewsbury College	X	X	X
25	Midkent College	X		X
26	University of Central Lancashire	X	X	
27	Hartpury College	X		
28	Bath College	X		X
29	Weymouth College	X		
30	Telford College	X		
31	Heart Of Worcestershire	X		

*1 – Work included the development of new build briefs and the management of a Design Approach Competition to appoint an architect-led design team

*2 – Work included the appointment of an architect team to take forward alternative use site disposals

*3 – Work included PMc in-house development of an estate wide master plan

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Strategic Context - Area Analysis of the Existing Estate

Campus	Total Area (m^2)
Matthew Boulton	14,799
Sutton Coldfield	20,899
James Watt	15,250
Erdington	3,880
TOTAL	**54,828**

PMc has now completed 2 estate strategies for BMet, the first being in 2020/21, and then an update in 2025. BMet has delivered one of the most substantial sets of changes to its estate in the FE sector in the last 5 years:

- college estate consolidated by 30% from 78,781 to 54,828 m^2;
- Closure of Stourbridge, Kidderminster, Sports Academy, Botanical Gardens & Millenium Point.
- Improvement in use of Matthew Boulton as a result of closure of Millennium Point;
- PMP plan developed – and evidence used to back up a successful FECTF bid for estate investment;
- T Level works including GF Watts construction & robotics spaces;
- Replacement of boilers and all hot water pipe work in James Watts;
- Substantial window replacement at both James Watts and Sutton Coldfield.

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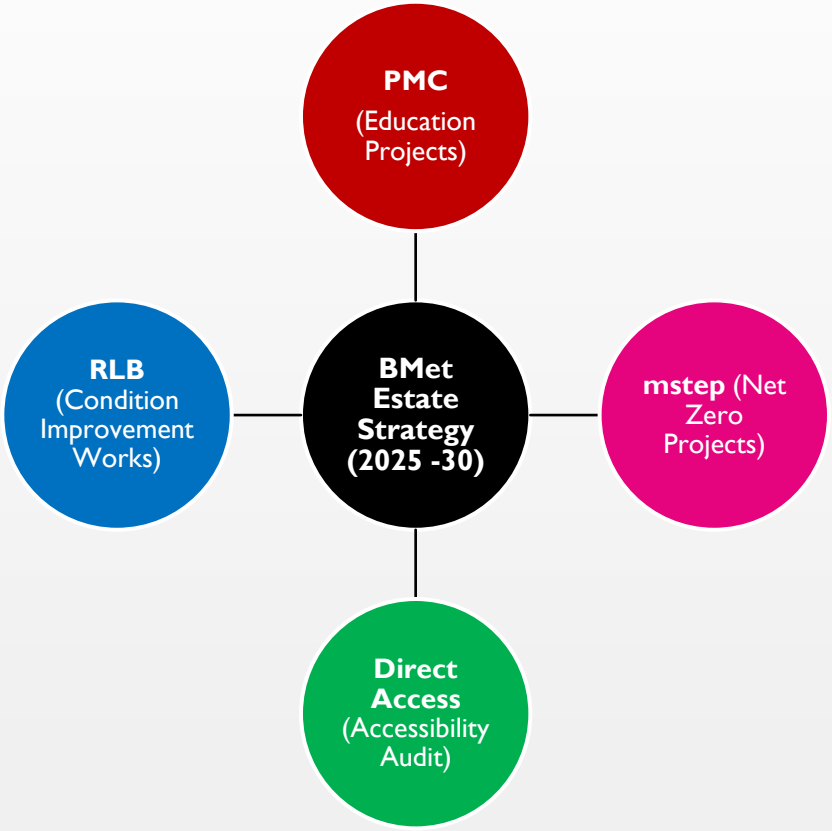
BMet – integrated approach to the creation of a long-term Estates Strategy



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RLB

Direct Access

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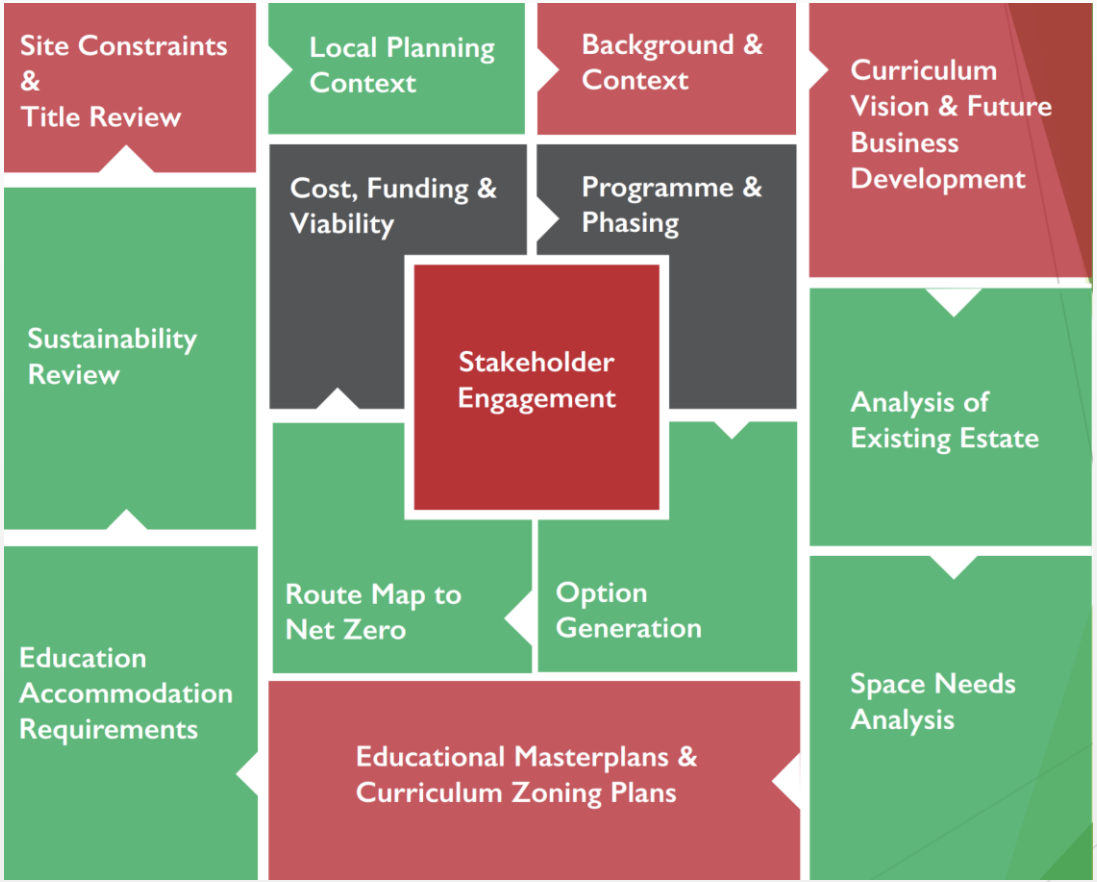
PMc Estates Strategy Approach Including consideration of Sustainability

- Heating & Ventilation Systems, Sources of Energy Generation
- Subject specific area analysis including student's no's and student guided learning hours



- Utilisation Analysis
- Condition & Functionality Assessments
- Estate-wide analysis on space needs based upon current & future curriculum plans.

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BMet's Outline Sustainability Route

2020 – 2024

Rationalise the Estate
Increase Space Efficiency
Address Estate Condition

- ✓ Explore land disposals (where feasible)

2025 – 2030

Optimise Energy Efficiency
Reduction of Heat Loss

- ✓ Improve fabric performance Maximise natural light
- ✓ Control and monitoring - BMS

Reduce Energy Demand & Revenue Cost

- ✓ Upgrades to buildings' envelope (roofs, facades, windows)
- ✓ Lighting Upgrade

Increase Ventilation Effectiveness
Reduce Overheating

- ✓ Maximise natural and cross-ventilation
- ✓ Introduce Mechanical Ventilation/AC

Deliver Fossil Fuel-Free Heat

- ✓ Upgrade to heating equipment and pipework
- ✓ Incorporate sustainable heating solutions (heat pumps, solar thermal)

Generate On-Site Renewable Energy

- ✓ Explore on-site electricity generation (Solar PV Panels, GSHPs, ASHPs)

Enhance Green Infrastructure & Diversity

- ✓ Explore greening options at the city centre campus
- ✓ Possibilities for biodiversity enhancements within land-based zone and overall masterplan.
- ✓ Install EV Charging

2030+

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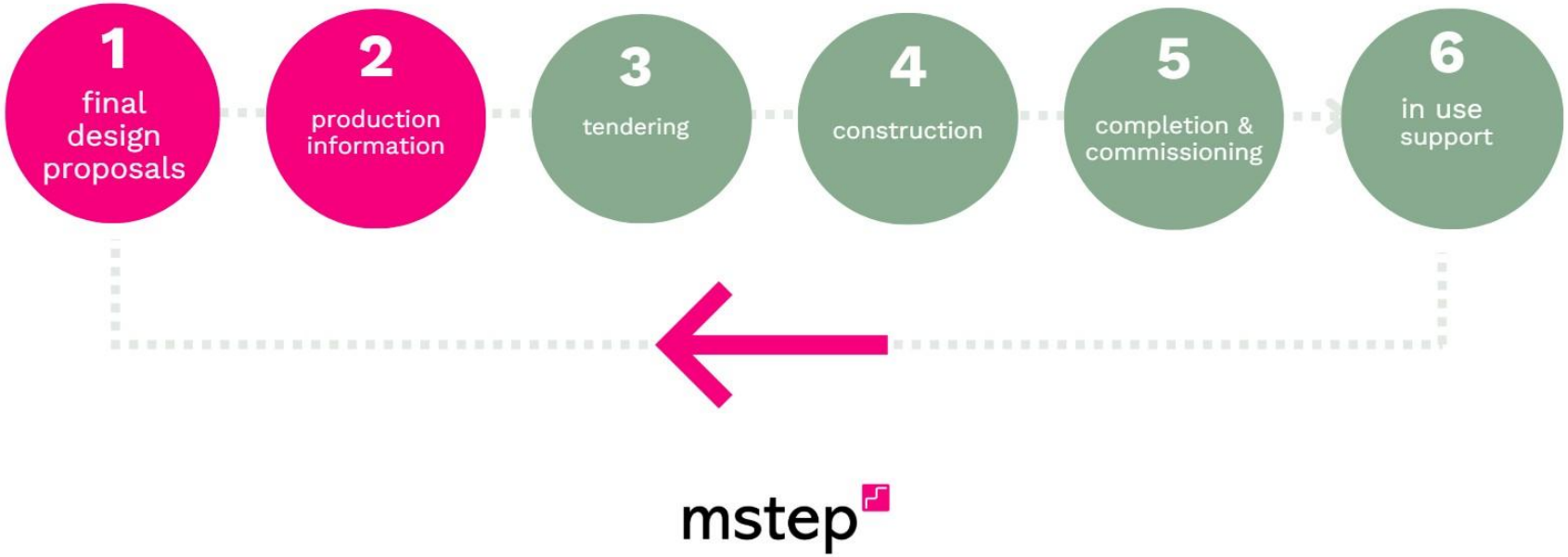

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some of our projects:

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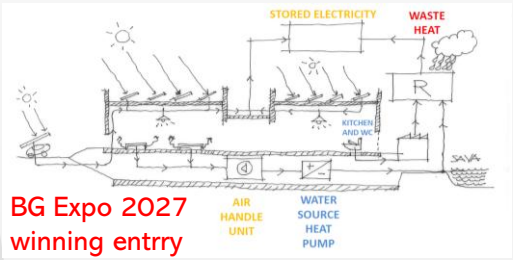
United Nations Office in Geneva
Technical Advisor to the UN


Slovenska Plaza, Budva
Energy/MEP Masterplanning

HVAC Design and Monitoring



BG Expo 2027
winning entrry


Tooting Bec Lido
MEP Design


Osborne Carke
1 London Wall
MEP Fitout Design


Ridgway Mews
MEP Design


Budimpeshta Street, Sofia
Ventilation Design


Olimpia Square Kiyv
Sustainability and
Energy/MEP Masterplanning


Science Park, Budapest
Goldman Sachs, Decarbonisation Study


Private home,
Chelsea, MEP Design


Private home,
Wandsworth, MEP Design


minds skills tools environment planning
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united nations office Geneva (UNOG)
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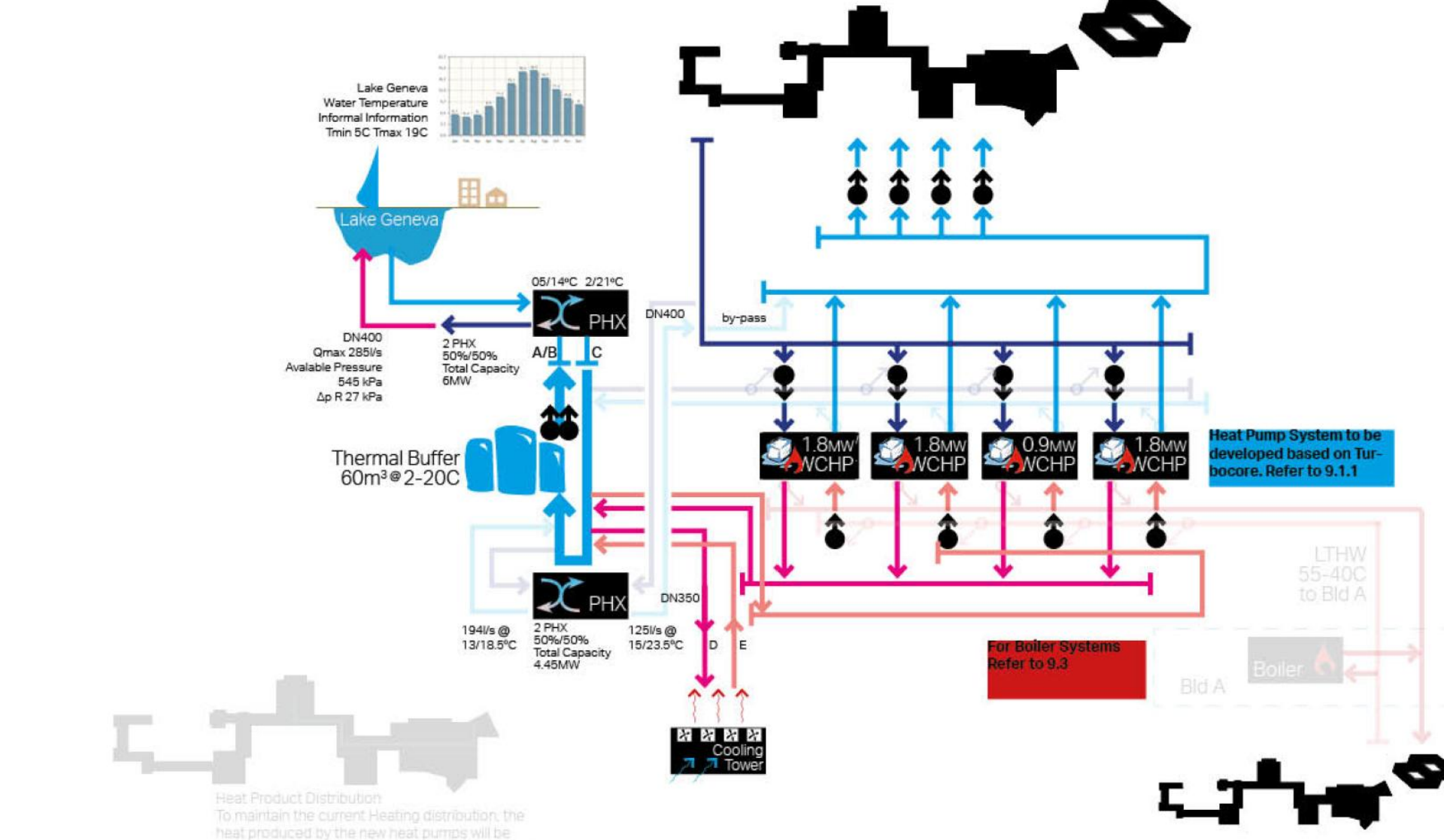
Lake Geneva
Water Temperature
Informal Information
Tmin 5C Tmax 19C
Lake Geneva
05/14ºC 2/21ºC
PHX
DN400
Qmax 285l/s
Avalable Pressure
545 kPa
Δp R 27 kPa
2 PHX
50%/50%
Total Capacity
6MW
A/B
C
DN400
by-pass
Thermal Buffer
60m³@2-20C
1.8MW WCHP
1.8MW WCHP
0.9MW WCHP
1.8MW WCHP
Heat Pump System to be developed based on Turbocore. Refer to 9.1.1
PHX
DN350
194l/s @
13/18.5ºC
2 PHX
50%/50%
Total Capacity
4.45MW
125l/s @
15/23.5ºC
D
E
LTHW
55-40C
to Bld A
For Boiler Systems
Refer to 9.3
Boiler
Bld A
Cooling Tower
Heat Product Distribution
To maintain the current Heating distribution, the heat produced by the new heat pumps will be piped to the existing plant room into the distribution network from the existing boiler plant room.


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4 campuses | multiple typologies | one decision framework

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BIRMINGHAM METROPOLITAN COLLEGE
30
30


R25
Munrow Sports Centre
Running Track
North Car Park
R22
Main Library
R21
R18
R17
R19
R26
R27
R23
R16
West Gate
R28
University square
R24
R14
R15
UNIVERSITY ROAD EAST
East Gate
R2
R1
R3
CHANCELLOR'S COURT
R13
R4
R8
R9
R5
R7
R12
R10
R6
Y16
Y9
Y8
Y2
Y10
Y1
Y12
Y11
Y13
Y3
Y4
D1


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JAMES WATT COLLEGE
JAMES WATT COLLEGE
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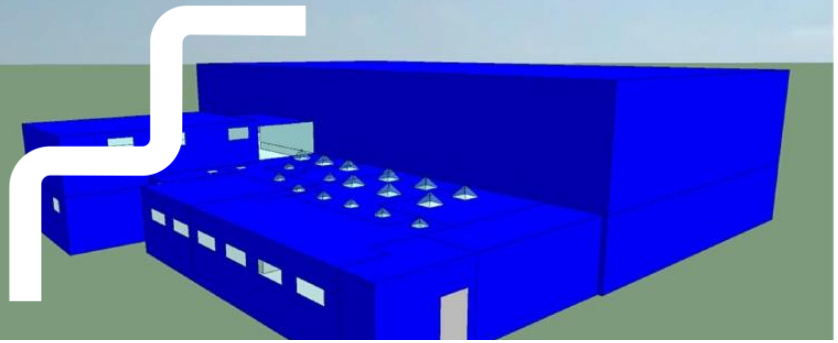
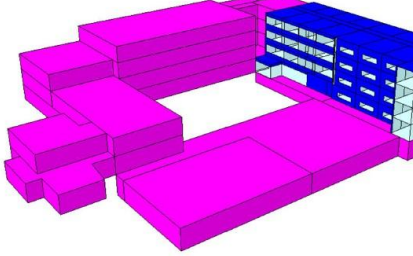
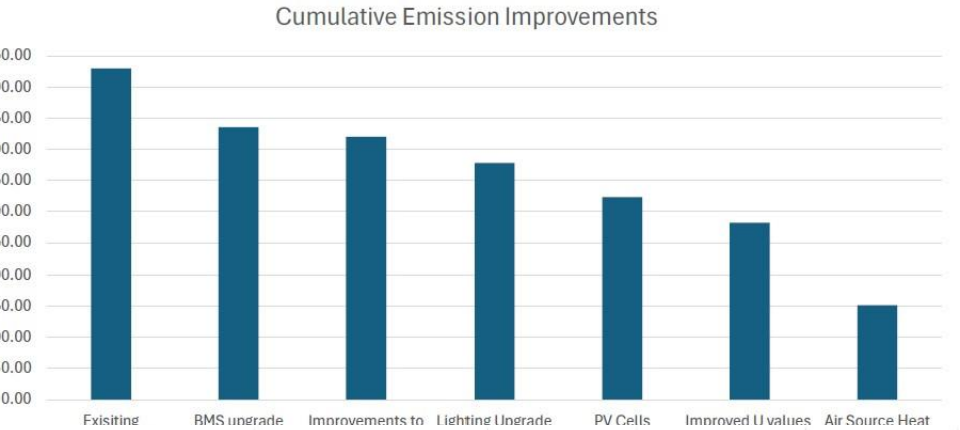
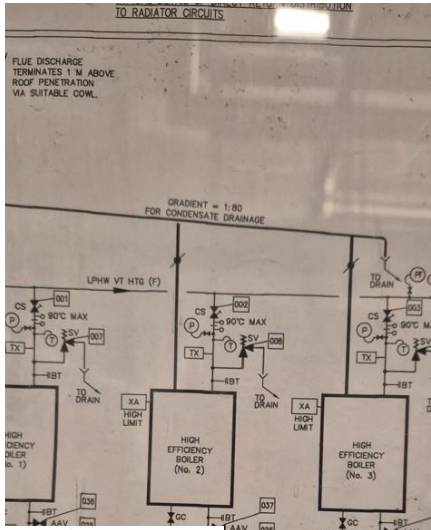


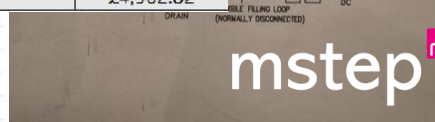
Description	Room	Purchase Date
Extract Fan	Ground Floor - Staff Room	01/01/2004
Fan Coil Unit	Ground Floor - Reception	01/01/2004
Fan Coil Unit	Ground Floor - Reception	01/01/2004
Fan Coil Unit	Ground Floor - Reception	01/01/2004
Fan Coil Unit	Ground Floor - Reception	01/01/2004
Fan Coil Unit	Ground Floor - Reception	01/01/2004
Fan Coil Unit	Ground Floor - Reception	01/01/2004
Gas Fired Boiler	1st Floor - Plant Room	01/01/2004
Gas Fired Boiler	1st Floor - Plant Room	01/01/2004
Gas Fired Boiler	1st Floor - Plant Room	01/01/2004
Gas Fired Burner	1st Floor - Plant Room	01/01/2004
rner	1st Floor - Plant Room	01/01/2004
rner	1st Floor - Plant Room	01/01/2004
ter Heater	1st Floor - Plant Room	01/01/2004
ter Heater	1st Floor - Plant Room	01/01/2004
linder	1st Floor - Plant Room	01/01/2004
mp	1st Floor - Plant Room	01/01/2004
mp	1st Floor - Plant Room	01/01/2004
mp	1st Floor - Plant Room	01/01/2004
p	1st Floor - Plant Room	01/01/2004
p	1st Floor - Plant Room	01/01/2004
changer	2nd Floor - Plant Room	01/01/2004
mp Twin Set	2nd Floor - Plant Room	01/01/2004
mp	2nd Floor - Plant Room	01/01/2004
mp	2nd Floor - Plant Room	01/01/2004
mp Twin Set	2nd Floor - Plant Room	01/01/2004
mp Twin Set	2nd Floor - Plant Room	01/01/2004
mp Twin Set	2nd Floor - Plant Room	01/01/2004
mp	Roof - Roof Plant	01/01/2004
p	Roof - Roof Plant	01/01/2004
VRV Condensing Unit	Roof - Plant Room	01/01/2011
VRV Condensing Unit	Roof - Plant Room	01/01/2011
VRV Condensing Unit	Roof - Plant Room	01/01/2011
Condensing Unit	Roof - Plant Room	01/01/2014
Condensing Unit	Roof - Plant Room	01/01/2014

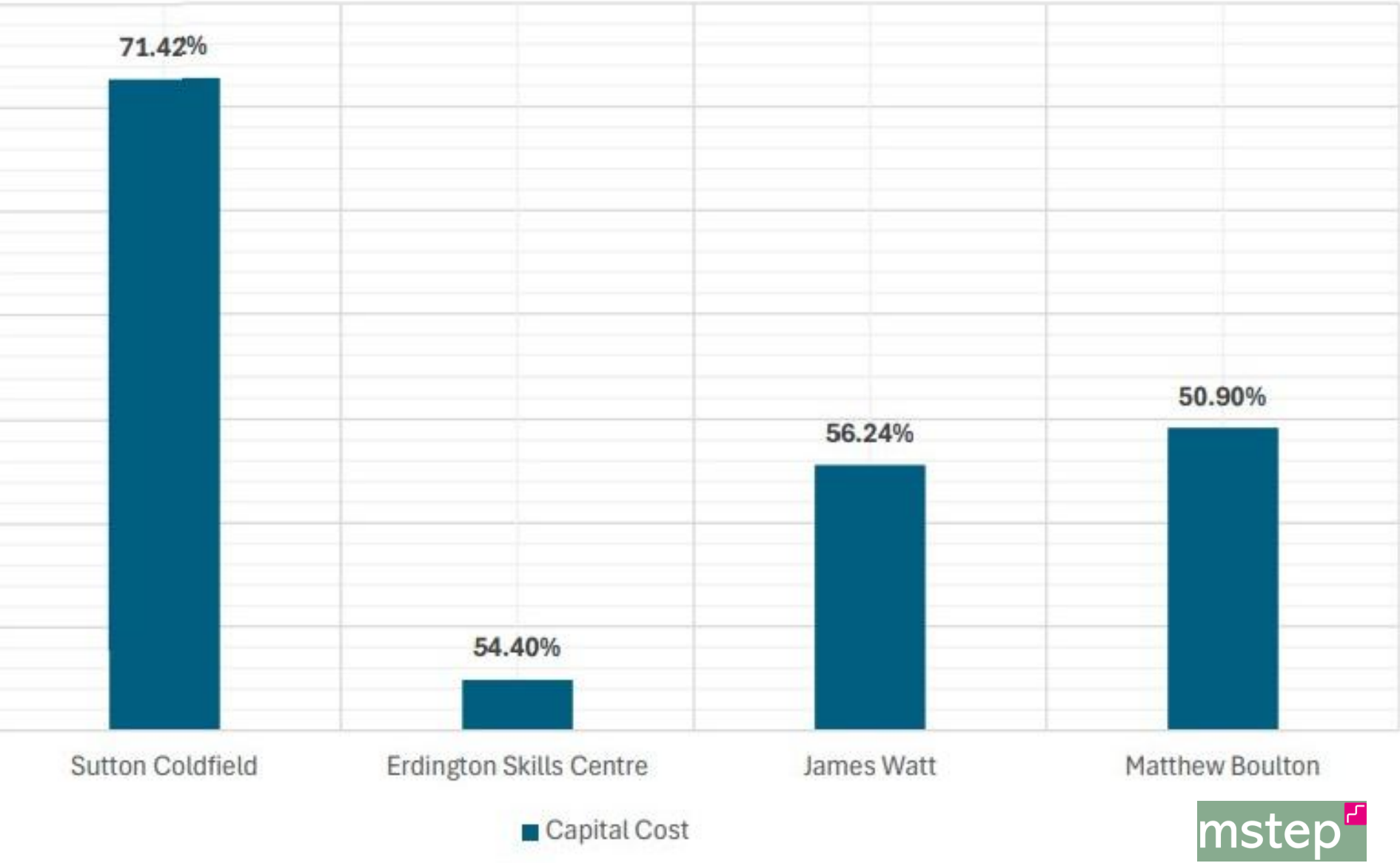


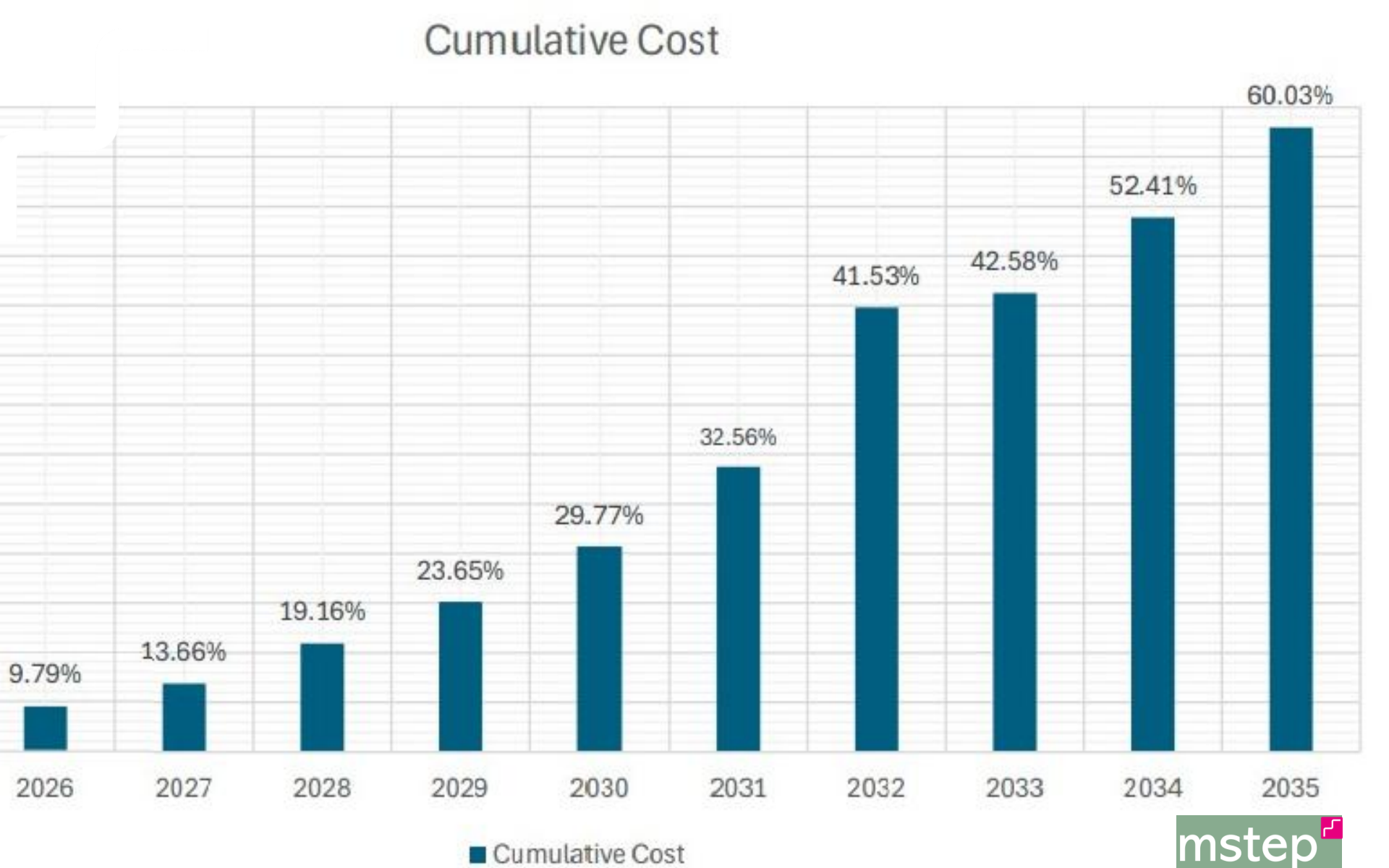




tton Colfield Summary ASHP	Capital Cost	Annual kWh Saving Electricity	Annual kWh Saving Gas	Annual Cost Saving (£)	Simple Payback (Years)	Annual CO2 Saving (TCO2)	Annual CO2 Saving %	Measure Lifetime	Lifetime £/TCO2 saved
S Upgrades	£546,966.00	186,030.11	300,939.18	51,186.16	10.69	94.21	17.79%	12.00	483.82
provements to Mechanical ipment	£354,515.00	127,120.57	120,375.67	29,434.92	12.04	48.86	9.23%	15.00	483.74
hting Upgrades	£101,290.00	39,979.42	-	6,796.50	14.90	8.48	1.60%	10.00	1,195.07
tallation of PV Cells	£517,312.00	258,656.00	-	43,971.52	11.76	54.84	10.36%	25.00	377.36
bric Upgrades	£1,604,800.00	-	224,399.76	14,585.98	110.02	40.84	7.71%	50.00	785.88
tallation of ASHP & erventions to MEP installation	£3,214,960.00	- 292,053.63	1,059,607.39	19,225.36	167.22	130.93	24.73%	15.00	1,636.95
SUBTOTAL	£6,339,843.00			£165,200.45	38.38	378.15	71.42%		£4,962.82




71.42%
54.40%
56.24%
50.90%
Sutton Coldfield
Erdington Skills Centre
James Watt
Matthew Boulton
Capital Cost


Cumulative Cost
9.79%
13.66%
19.16%
23.65%
29.77%
32.56%
41.53%
42.58%
52.41%
60.03%
2026
2027
2028
2029
2030
2031
2032
2033
2034
2035
Cumulative Cost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from feasibility to stewardship
thank you

Summary of Investment Strategy over a ten-year period

We developed an investment strategy for the college over the next 10 years using:

- Benchmark rates for each of the estate strategy projects;
- Mstep budget figures for building improvement works;
- Key decision points for adoption of green technologies;
- Costings for Condition Improvement works, undertaken by RLB;
- Dependencies of projects i.e decant works;
- Equitable expenditure of funds over all college sites year on year; and
- Total expenditure each academic year.

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Summary of Scoring Criteria

			Matthew Boulton College										Erdington Skills Centre				James Watt College						Sutton Coldfield College									
			Option 1 - Refurbishment of the West 3rd Floor		Option 2 - Enhanced Zoning of Curriculum Zoning and Colocation of Curriculum across floors		Option 3 - External Amenity Space on 3rd floor		Option 4 - Alteration to Floorplate and GP Classroom Sizes		Option 5 - Move student services and/or LRC to ground floor		Option 6 - Dispose of the Carpentry Building		Option 7 - Disposal of Erdington Skills Centre entirely		Option 8 - Plot Adjacent to Aldridge Road Sold		Option 9 - Access Arrangements - for pedestrians and to promote a more inclusive approach to DDA access.		Option 10 - Refurbishment of the 3rd and 4th floor of the main building.		Option 11 - Disposal of Former Nursary Building		Option 12 - Refurbish the Second Sports Hall with external funding or remove/demolish the building.		Option 13 - Façade Replacement Works		Option 14 - LRC Re-imagination		Option 15 - Improved entrance/ drop off area	
ID	Criteria	Weighting : 1-5	Performance: 1-5	Weighted Score (Importance x Performance)	Performance: 1-5	Weighted Score (Importance x Performance)	Performance: 1-5	Weighted Score (Importance x Performance)	Performance: 1-5	Weighted Score (Importance x Performance)	Performance: 1-5	Weighted Score (Importance x Performance)	Performance: 1-5	Weighted Score (Importance x Performance)	Performance: 1-5	Weighted Score (Importance x Performance)	Performance: 1-5	Weighted Score (Importance x Performance)	Performance: 1-5	Weighted Score (Importance x Performance)	Performance: 1-5	Weighted Score (Importance x Performance)	Performance: 1-5	Weighted Score (Importance x Performance)	Performance: 1-5	Weighted Score (Importance x Performance)	Performance: 1-5	Weighted Score (Importance x Performance)	Performance: 1-5	Weighted Score (Importance x Performance)	Performance: 1-5	Weighted Score (Importance x Performance)	Performance: 1-5	Weighted Score (Importance x Performance)
A	Size of Estate – right-sizing to reduce operational costs	1	1	1	1	1	1	1	1	1	1	1	4	4	5	5	2	2	1	1	1	1	4	4	3	3	1	1	1	1	1	1
B	Generation of Funds to Support Investment	2	1	2	1	2	1	2	1	2	1	2	3	6	5	10	4	8	1	2	1	2	4	8	2	4	2	4	1	2	1	2
C	Travel to Study Impact – protecting market share	5	5	25	5	25	5	25	5	25	5	25	3	15	1	5	5	25	5	25	5	25	5	25	5	25	5	25	5	25	5	25
D	Ability to Deliver Whilst Maintaining Operations (learner experience)	4	3	12	3	12	5	20	4	16	3	12	3	12	1	4	5	20	4	16	3	12	5	20	5	20	3	12	3	12	3	12
E	Future Capacity to Grow – ensuring sufficient assets/land for growth	4	5	20	5	20	5	20	5	20	5	20	4	16	3	12	5	20	5	20	5	20	4	16	4	16	5	20	5	20	5	20
F	Programme – speed of delivery (protecting delivery and student experience)	3	4	12	2	6	5	15	5	15	4	12	2	6	1	3	3	9	5	15	2	6	2	6	2	6	3	9	4	12	3	9
G	Capital Cost of Funding – affordability (limited capex for major estates projects)	4	4	16	3	12	4	16	4	16	3	12	4	16	3	12	5	20	5	20	2	8	5	20	3	12	2	8	3	12	4	16
H	Strategic fit to agreed curriculum vision – maximising benefit to learners	5	4	20	5	25	1	5	3	15	5	25	2	10	1	5	1	5	5	25	5	25	1	5	3	15	1	5	5	25	3	15
I	Degree of risk – securing planning consent and realising benefits	3	5	15	5	15	5	15	5	15	5	15	2	6	1	3	1	3	5	15	5	15	1	3	2	6	3	9	5	15	3	9
J	Sustainability Impact – energy efficiency and environmental benefits	4	3	12	1	4	3	12	1	4	1	4	4	16	5	20	2	8	1	4	3	12	3	12	4	16	5	20	3	12	1	4
K	Student and Staff Satisfaction – improving learning and working environments	4	5	20	5	20	3	12	3	12	5	20	4	16	3	12	1	4	5	20	5	20	1	4	3	12	2	8	5	20	4	16
L	Community and Stakeholder Engagement – support and alignment with local needs	4	3	12	3	12	1	4	1	4	1	4	2	8	1	4	3	12	4	16	1	4	4	16	4	16	1	4	5	20	4	16
	TOTALS		43	167	39	154	39	147	38	145	39	152	37	131	30	95	37	136	46	179	38	150	39	139	40	151	33	125	45	176	37	145
	RANK		3		4		8		9		5		13		15		12		1		7		11		6		14		2		9	

Critically, the selection of projects were evaluated using a scoring criteria agreed with the Senior Leadership Team and then tested and verified in workshops with the governing body.

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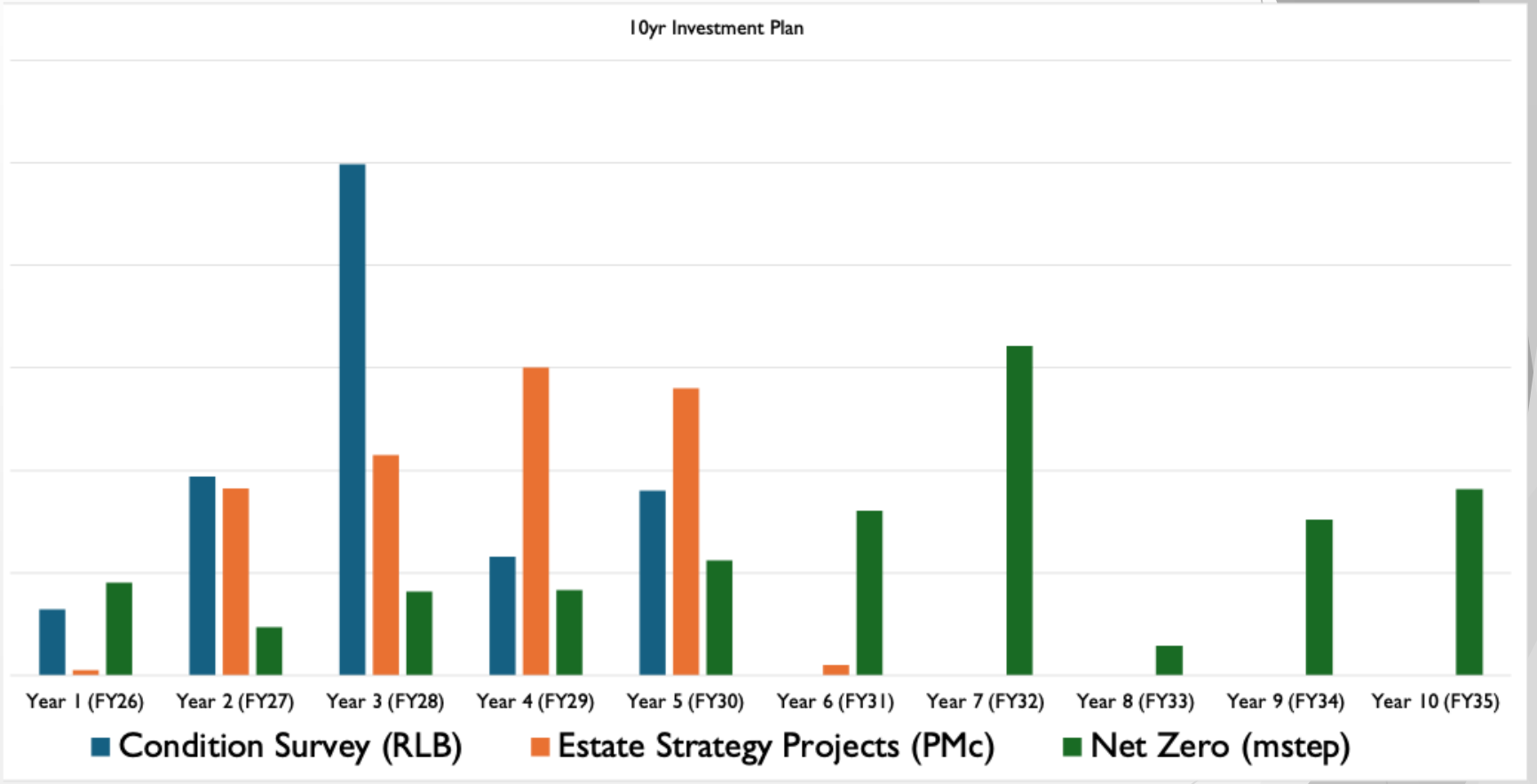
Summary of Investment over a ten-year period



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Key Outcomes of the Estate Strategy

The focus of BMet's new estate strategy is a strategic shift from 'right-sizing' of estate in 2020 to the consolidation and continued investment of the existing estate to enhance building fabric and protect market share from 2025-30.

c.17,000m^2 of refurbishment work outlined within the estate's projects, targeting areas of poor condition and/or functionality.

Tackling the shortfalls highlighted during site visits on accessibility and inclusion.

A full implementation of mstep's net zero work would see a further 60% carbon reduction (from 2023 base year) on the college's existing carbon emissions.

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Holy Trinity Secondary School:

NZCiO Refurbishment pathfinder

CUNDALL

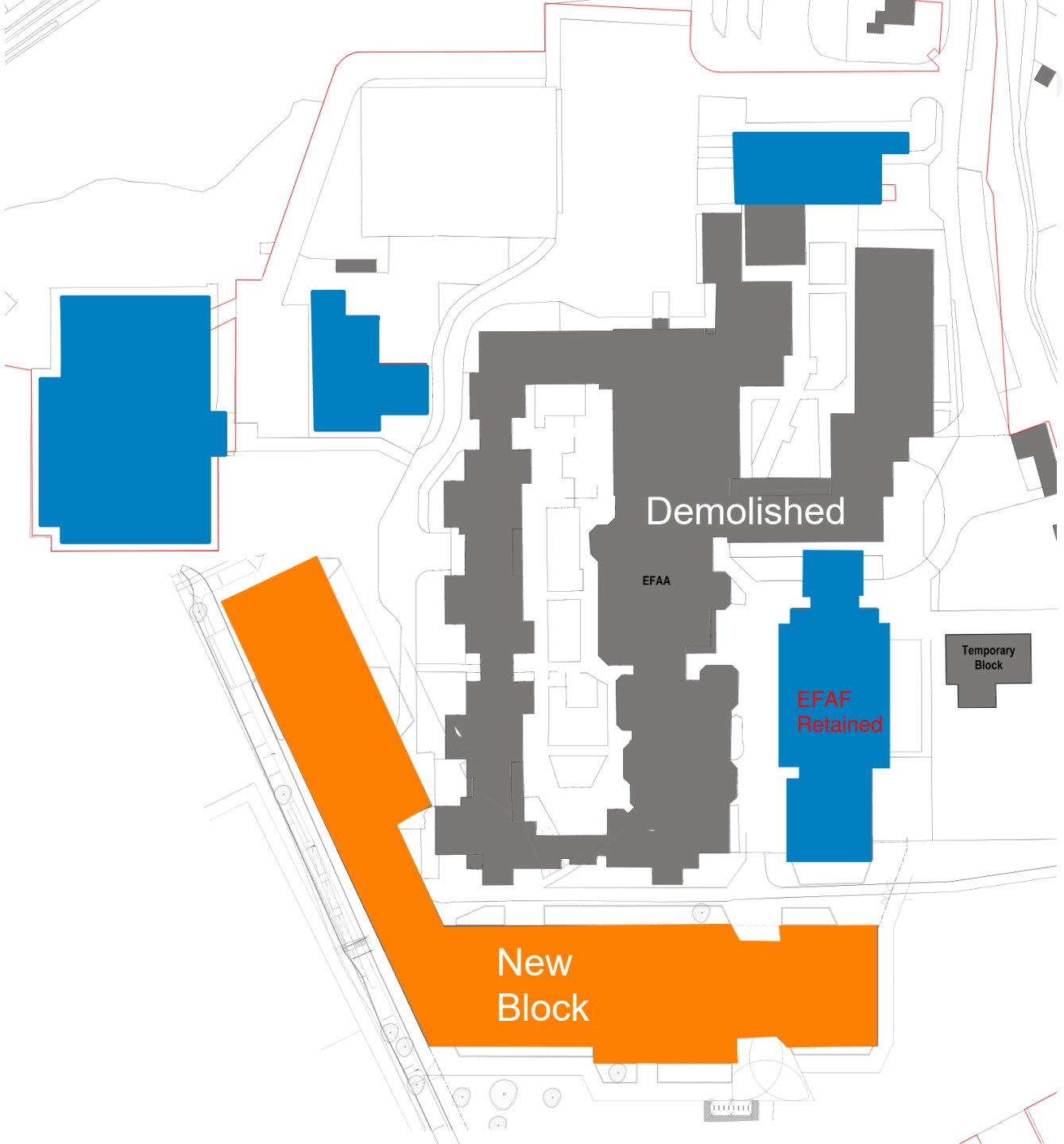
Holy Trinity Secondary School

The Holy Trinity school rebuild, part of the DfE's SRP (School Rebuilding Programme)

- Located West Sussex
- Majority of existing Buildings demolished
- New Teaching Block to consolidate and replace aged buildings.
- One existing building to be retained was proposed to be refurbished and upgraded to be NZCiO (net zero carbon in operation) to DfE standards.

<u>The design team:</u>
Architect: Jestico + Whiles
Contractor: Bouygues
Structures & Civils: Cundall
Services: Cundall
Sustainability: Cundall

Currently closing out RIBA stage 4.



Retained Block - EFAF

- Circa 1,360 m^2 Specialist teaching block
- Early 2000's construction
- Natural ventilation by openable windows (on 100mm restrictors) and H/L turrets
- Radiator heating
- Fluorescent lighting within 600sq. lay-in-grid

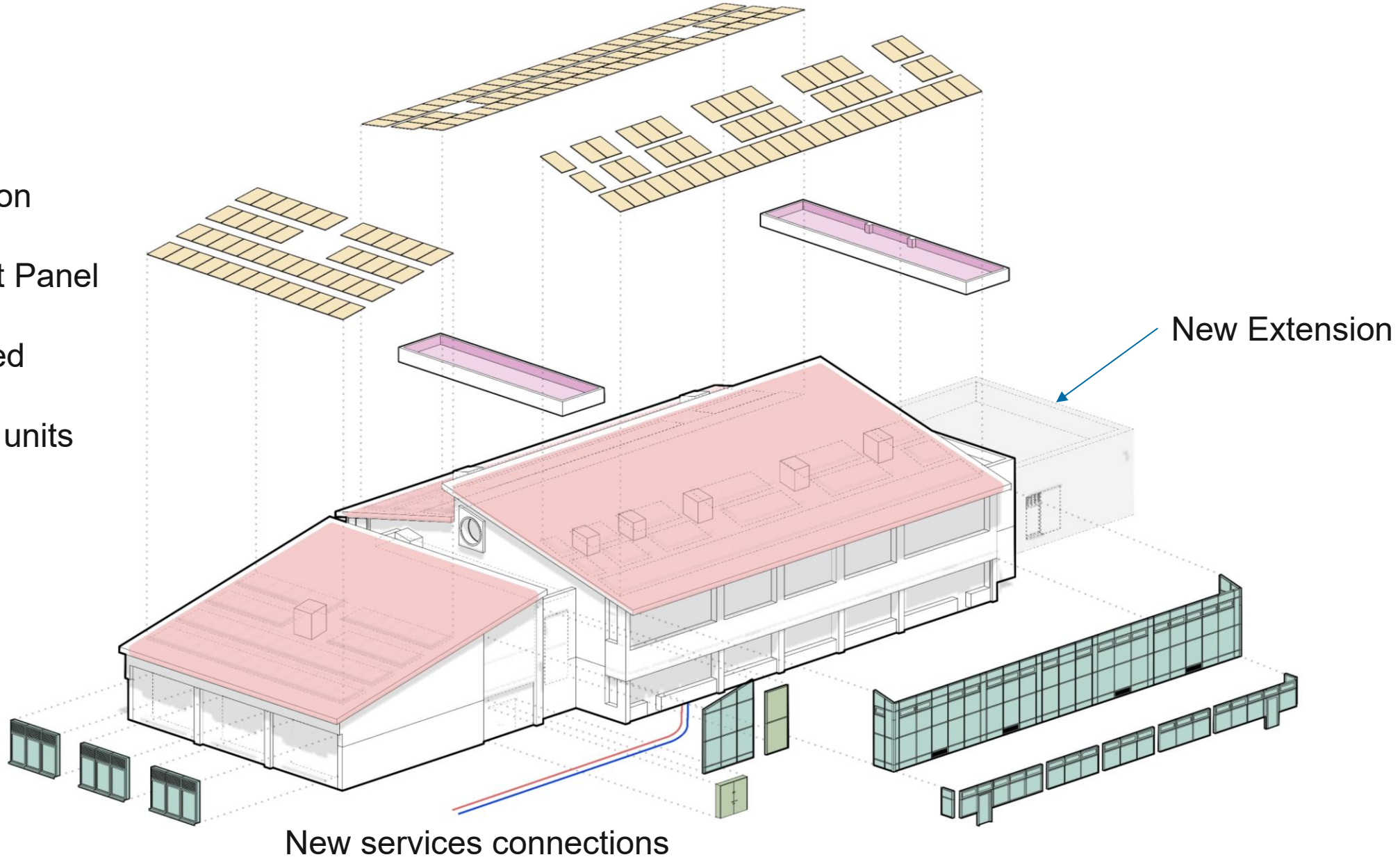
Why upgrade?

- A need to re-feed disconnected heating systems
- Lacklustre in-use feedback:
  - Poor internal learning environment
  - Poor ventilation/thermal comfort in summer
  - Poor/no controls
- Lessons learned from previous schemes: how to apply and adapt various aspects of CF21 OS to a refurbishment project
- Curtain walling near end of life – replacement alongside wider school development programme.
  - Immediately offers up a joined-up improvement to incorporate local HVRs (with automation and heat recovery)

CUNDALL

Refurbishment Elements

- PV Panels
- Soffit Insulation
- Insulated Flat Panel
- Double Glazed
- Triple glazed units



Embodied Carbon Overview

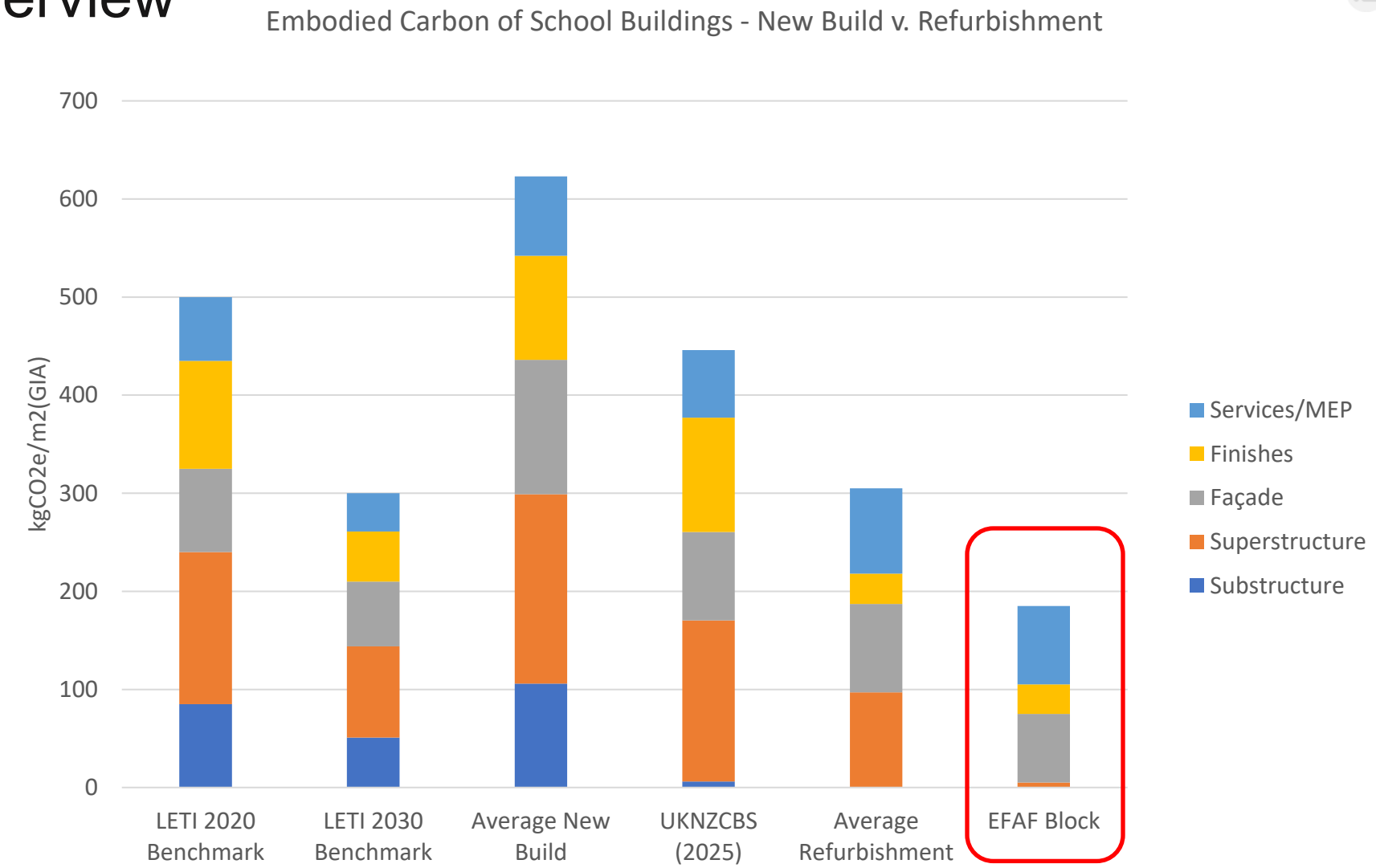
Refurbishment is estimated to achieve **~66%** reduction in embodied carbon compared to an average new build

Equivalent to:

82 flights from London to Hong Kong

4,019,577 mugs of tea

22 Average UK Carbon Footprint



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Energy Performance – EFAF Block

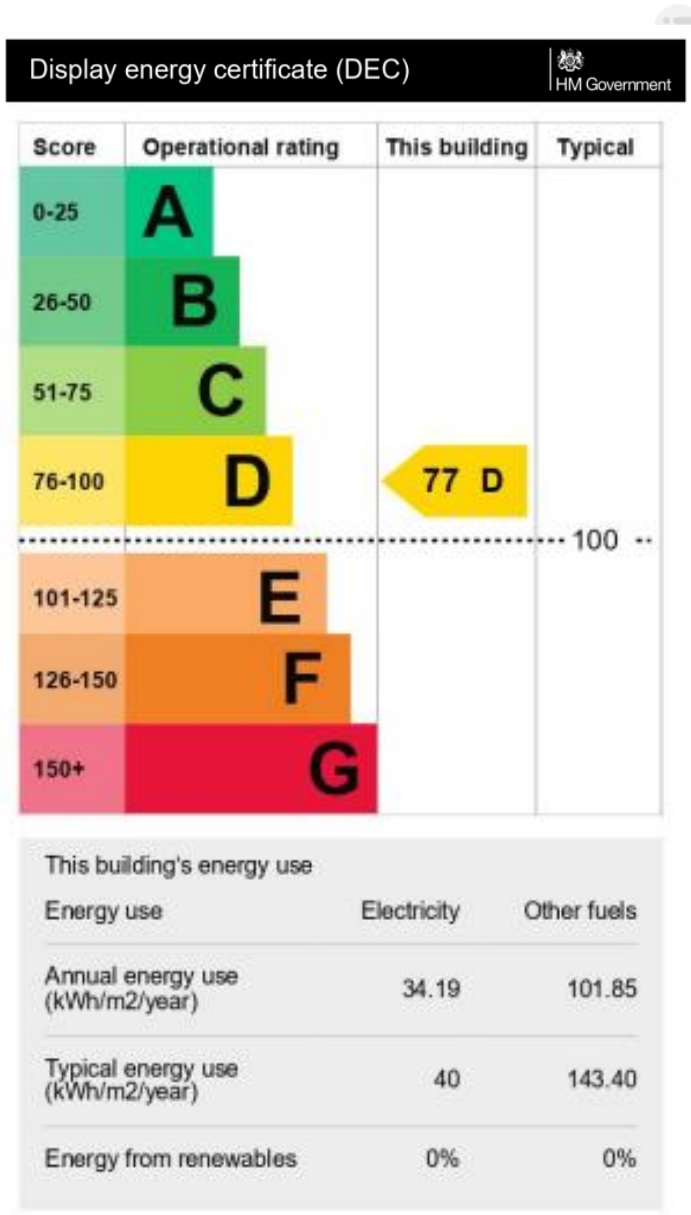
Existing Building has a D rated DEC.

- Electrical energy is good; primarily small power & lighting energy
- Heating energy is poor; old gas fired LTHW fed from main building boilers

Refurbishment Scope of work (RSoW) included for new LED lighting, a new decarbonised heat source, and proposed façade replacement.

Cundall challenged the fabric improvements:
We realised that we would need to look at the breakdown of predicted heating energy to determine the priority for fabric interventions.

Element	DfE Annex 2H 2023 (Secondary)	Targeted Energy Use (kWh/m²·yr)
Heating	8	17.0
Domestic Hot Water	5	3.8
Internal Lighting	8	6.5
Fans and Pumps	5	3.8
Cooling	0	0
Lifts	1	0.3
Building Related Services	2	2.0
External Lighting	6	N/A
Small Power	25	25
Server	0 (included in small power)	Included in small power
Catering	7	N/A
Total	**67**	**58.4**



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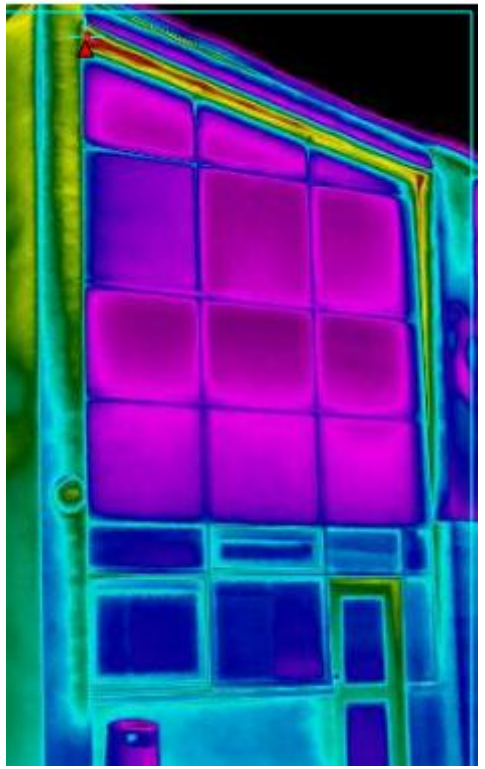
Energy Performance – Fabric First!

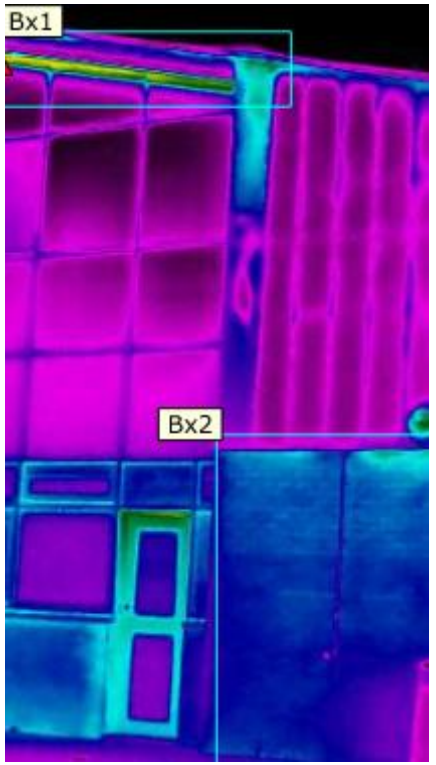
Challenging the assumptions and brief:

- Original brief looked at full fabric improvement
- Insulation levels set out in 2000 Building regulations
- Any improvements to fabric would likely be expensive and carbon intensive
- Air-tightness improvements offer biggest win
  - we are targeting 8.0, almost halving current tested value
- Curtain wall surveyed and thermal imaging used to review refurb option
  - Openable window portion is very small compared to modern standards
  - Feedback is of poor thermal comfort
  - Existing curtain walling wouldn't align with required louvres for new HVR systems

In order to find the optimum solutions we realised we needed to look beyond financial paybacks; we tested various façade improvements against

- Cost benefit
- Operational Carbon
- Embodied Carbon





Tested Air Permeability

Retrofit Options Tested

Element		Energy savings ($kWh/m^2/yr$)	Embodied Carbon ($kgCO_2/m^2$)	Lifecycle Carbon Payback (years)
External Walls Overcladding	Sandwich Panel (U-value = 0.15 $W/m^2.K$)	2.8	73	137
	Rainscreen (U-value = 0.15 $W/m^2.K$)	2.8	65	122
	Insulated Render (U-value = 0.15 $W/m^2.K$)	2.8	12	23
External Walls Full fill cavity	Blown EPS Beads (U-value = 0.38 $W/m^2.K$)	0.7	6	45
	Blown Mineral Fibre (U-value = 0.38 $W/m^2.K$)	0.7	1	12
	Expanding Foam (U-value = 0.38 $W/m^2.K$)	0.7	16	127
External Walls Full fill cavity & interior	Blown EPS Beads and Interior Panels	0.7	16	122
Roof Insulation between rafters	Rockwool Insulation Board	10.6	34	18
	Recycled insulation	10.6	16	8
Glazing Replace	Triple-glazed; Timber/ Aluminium frame (U-value = 0.62 $W/m^2.K$)	23.7	19	5*
	Triple-glazed; Aluminium frame (U-value = 0.79 $W/m^2.K$)	23.7	22	5*
	Double-glazed; Timber frame (U-value = 1.20 $W/m^2.K$)	22.3	22	6*
	Double-glazed; Aluminium frame (U-value = 1.20 $W/m^2.K$)	22.3	15	4*
	Double-glazed; Aluminium frame (U-value = 1.50 $W/m^2.K$)	21.5	22	6*

***NOTE: window carbon payback significantly reduced by air tightness & thermal bridge improvements. Otherwise, payback estimated at 10-15 years.**

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Retrofit Options Tested

Element		Energy savings ($kWh/m^2/yr$)	Embodied Carbon ($kgCO_2/m^2$)	Lifecycle Carbon Payback (years)
Mechanical	Air Source Heat Pump	33	43	8
	Ground Source Heat Pump	41	54	7
	Mechanical Ventilation with Heat Recovery	15	43	5
Electrical	LED lighting	8	4	3
	Rooftop solar PV panels (PV area of 461 m^2)	17	60	19

Notes:

- Energy savings from fabric upgrades account for a 22 $kWh/m^2/yr$ reduction in operational energy linked to infiltration improvements
- Calculations assume a carbon factor of 0.19 $kgCO_2/kWh$.
- Air tightness makes up significant proportion of estimated improvement from building fabric enhancement
- Cavity-fill insulation option has minimal impact on improving air tightness. Potential negative side effects of cavity insulation.
- Likely thermal bridging issues for glazed façades and roof should be considered.

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Curtain Wall: Embodied Carbon Options

Glazing

- Typical (4mm): 11 $kgCO_2e/m^2$
- Low Carbon, 64% recycled glass: 6.6 $kgCO_2e/m^2$

Design options

- Alternative materials in spandrel panels.
- Deeper facade depth to maximise efficient profiles and minimise aluminium content.
- Explore timber composite systems for punch windows.

Aluminium

Billet options:

- 85% Post consumer recycling: 1.2 $kgCO_2e/m^2$
- 65% Post consumer recycling: 2.9 $kgCO_2e/m^2$
- EU Average: 6.7 $kgCO_2e/m^2$

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The design so far

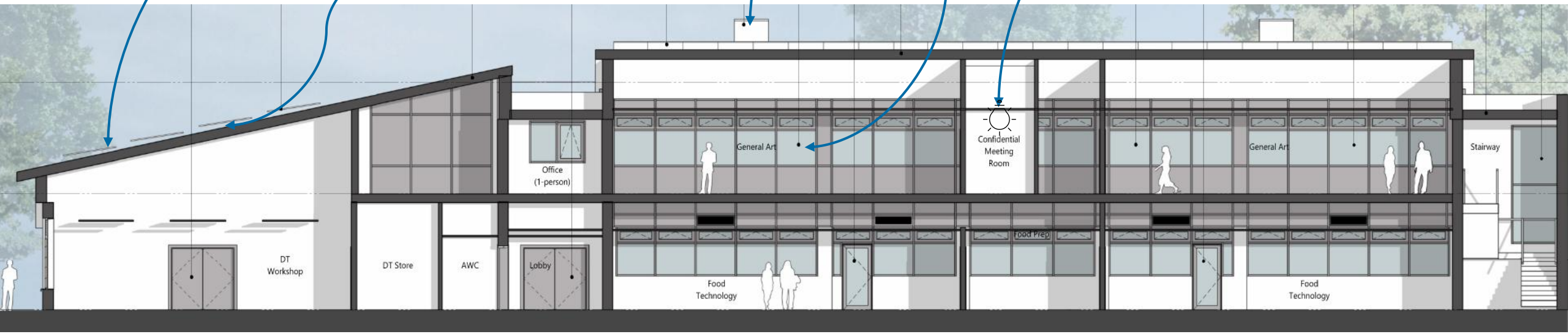
Re-use vent turrets, increase faced openable areas

Curtain Walling and majority of windows replaced

All LED + Automatic controls

Additional insulation added under existing roof

Retro fit of PV panels



Energy Use Intensity Target: 50.4 kWh/m^2/annum

Embodied carbon ~210 kgCO_2e/m^2

Heating: Wet heating fed from new GSHP

Improved HVAC controls and metering

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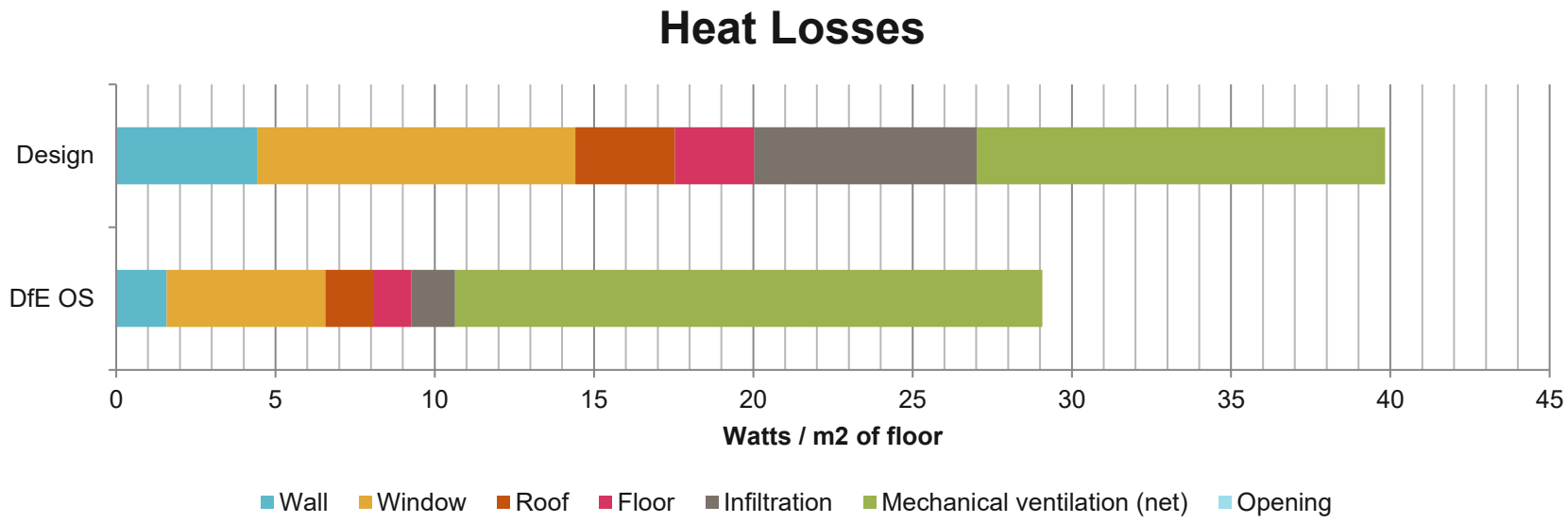
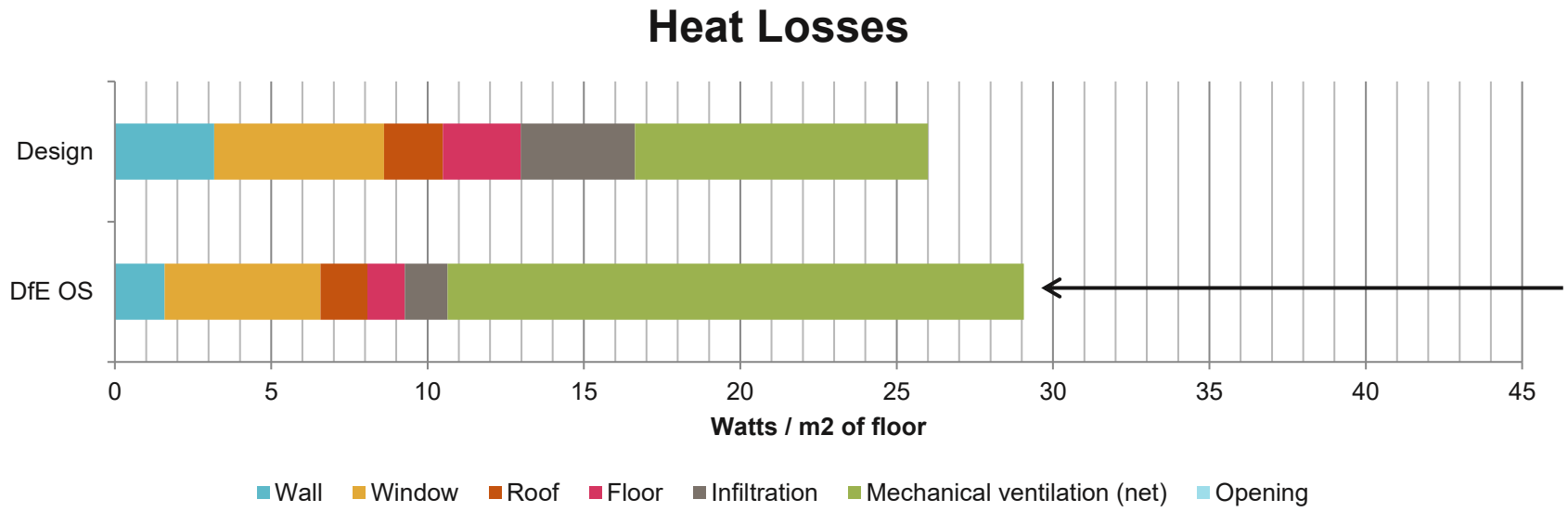
The design so far – Fabric performance

Before



After



Note: DfE OS assumes 100% nat.vent with no heat recovery

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Summary

- Energy use intensity (EUI) target: 58.4 kWhr/m^2/annum – better than new build OS
- New Photovoltaic panels on roof to offset 100% of EUI
- Simple fabric improvements directed by lowest embodied carbon payback period
  - target heat losses of circa 26 W/m^2 is below overall OS benchmark
- Embodied carbon of proposed interventions is circa 210 kgCO_2e/m^2 – better than LETI 2030 benchmark
- Improved window design + HVR units provides improved window free area, better background ventilation, and improved summer thermal comfort.
- Key lessons:
  - evaluate the existing performance - understand the building,
  - optioneering: test and model various options – look at ‘low hanging fruit’ first
  - Apply sensible solutions - target the best performing improvements with the lowest EC