

Decarbonising with Purpose: How do we prioritise campus-wide choices?

**(From strategy to delivery at the
University of Leeds)●**

30 January 2025



Running order.



Introduction/Chair - Sarah Williams (RIBA)
Principal S Williams Architects



Campus wide decarbonisation
Shaun Scholey (CEng MCIBSE)
Associate Director Buro Happold



Net Carbon reduction project Examples
Jon Roylance (RIBA)
Higher Education Director ADP

- **Q&A**



THE UNIVERSITY OF LEEDS BACKGROUND

The University of Leeds.



The University of Leeds.

- The Main Campus includes more than 365 buildings on a 90-acre campus
- The main campus is largely in a conservation area
- Over a third of the buildings on campus are listed
- A varied number of architectural styles on campus, including: *Gothic Revival, Art Deco, modern contemporary and Concrete Brutalist*



Parkinson building
Grade 2 listed (art Deco)



Nexus
(modern contemporary)



EC Stoner building
Grade 2 listed (concrete brutalist)

The University of Leeds.

- High value public realm space around campus, which is hugely valued for the student experience
- Strong ties to the Leeds innovation arc
- There are 7 faculties within the University
- With have more than 38,000 students
- We are a Russel Group University



Roger Stevens Building
Grade 2 listed (concrete brutalist)



Great Hall
Grade 2 listed (Gothic revival)



View down the precinct

THE UNIVERSITY OF LEEDS DECARBONISATION

University of Leeds Decarbonisation.

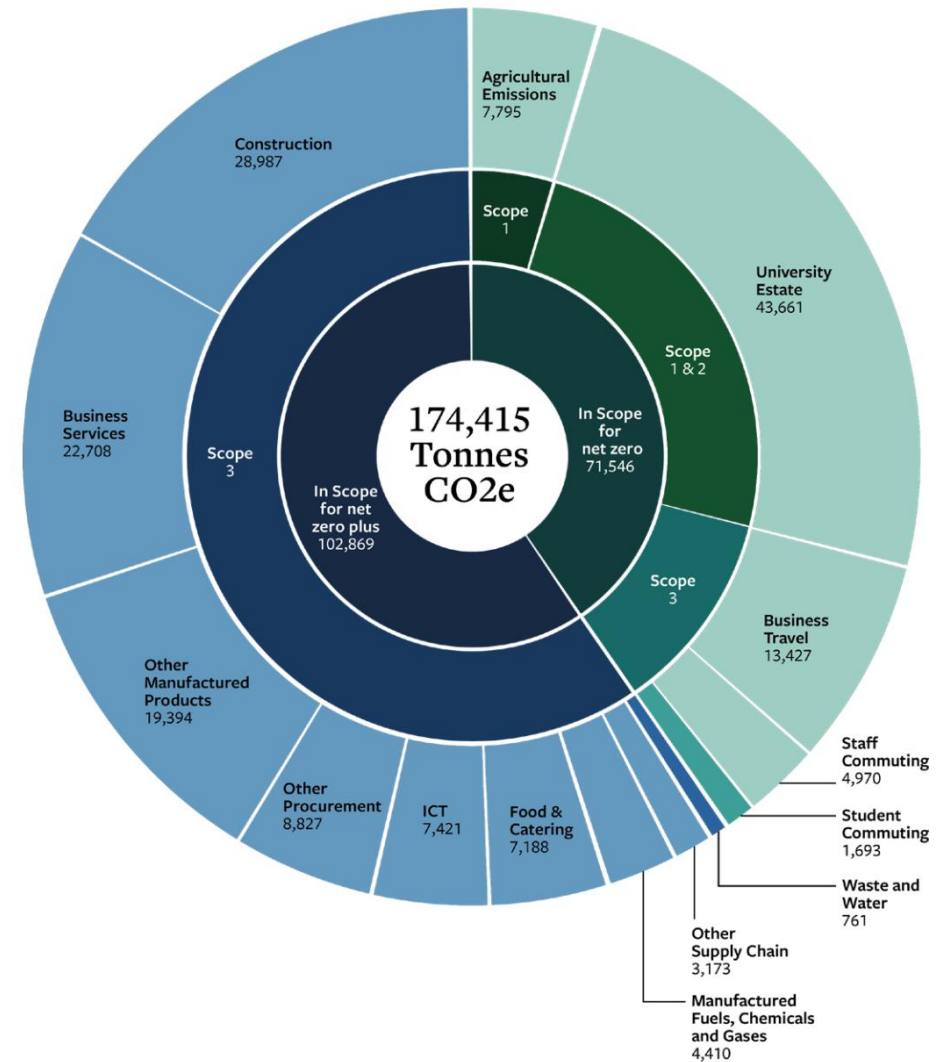
- The University is currently supplied with heat via an existing steam network within the campus.
- The heat source is fossil fuel boiler and CHP plant.
- The goal of the University is to migrate the heating source to a low carbon heat source, in the form of electrical heat pump technology.
- The heating source will be gradually migrated to a low carbon LTHW heat network.



BASELINING AND ANALYSIS OF THE CAMPUS

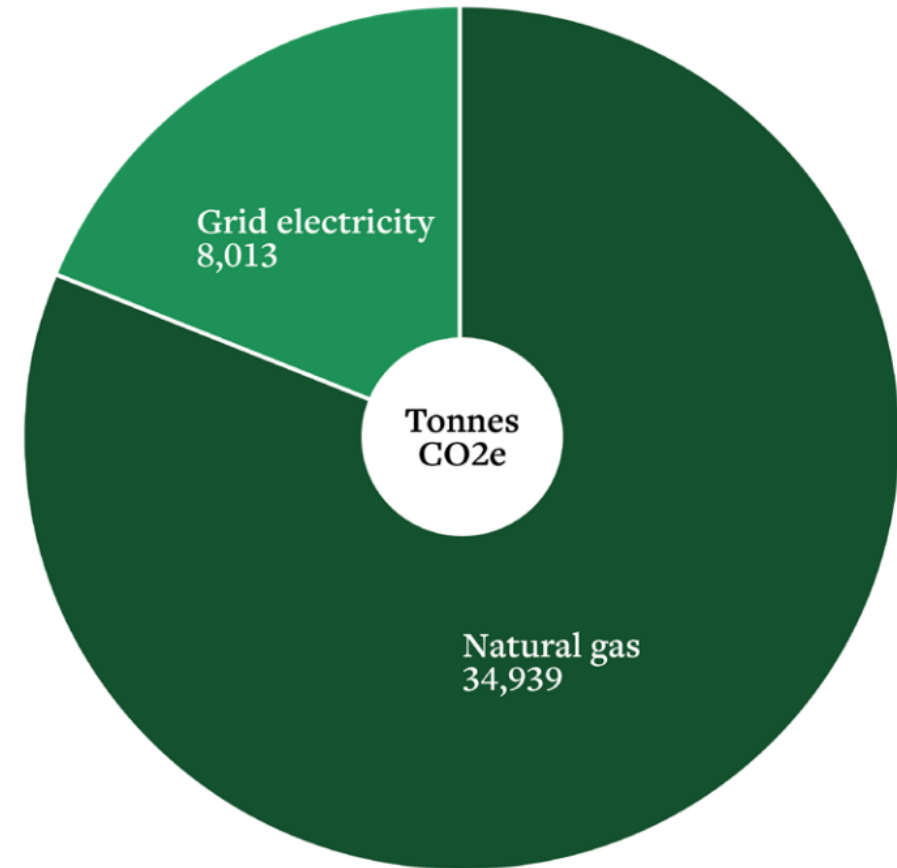
University of Leeds baseline Carbon Emissions.

- 2021 evaluation of carbon footprint to act as a baseline
- The total baseline carbon emissions have been calculated as 174,415 Tonnes for the University
- 71,546 tonnes are targeted to achieve net zero carbon for scope 1,2 and some scope 3 emissions
- This presentation will focus on the Scope 1&2 emissions within the University Estate, so the 43,661 Tonnes of carbon
- Net Zero plus will be developed once the supply chain has sufficient data to measure



Baseline campus emissions by energy source.

- The University is a major energy user and our scope 1&2 emissions come largely from heating and powering our buildings
- Approximately 80% of these emissions are linked to natural gas consumption
- A move away from natural gas for heating is critical to any net zero carbon pathway

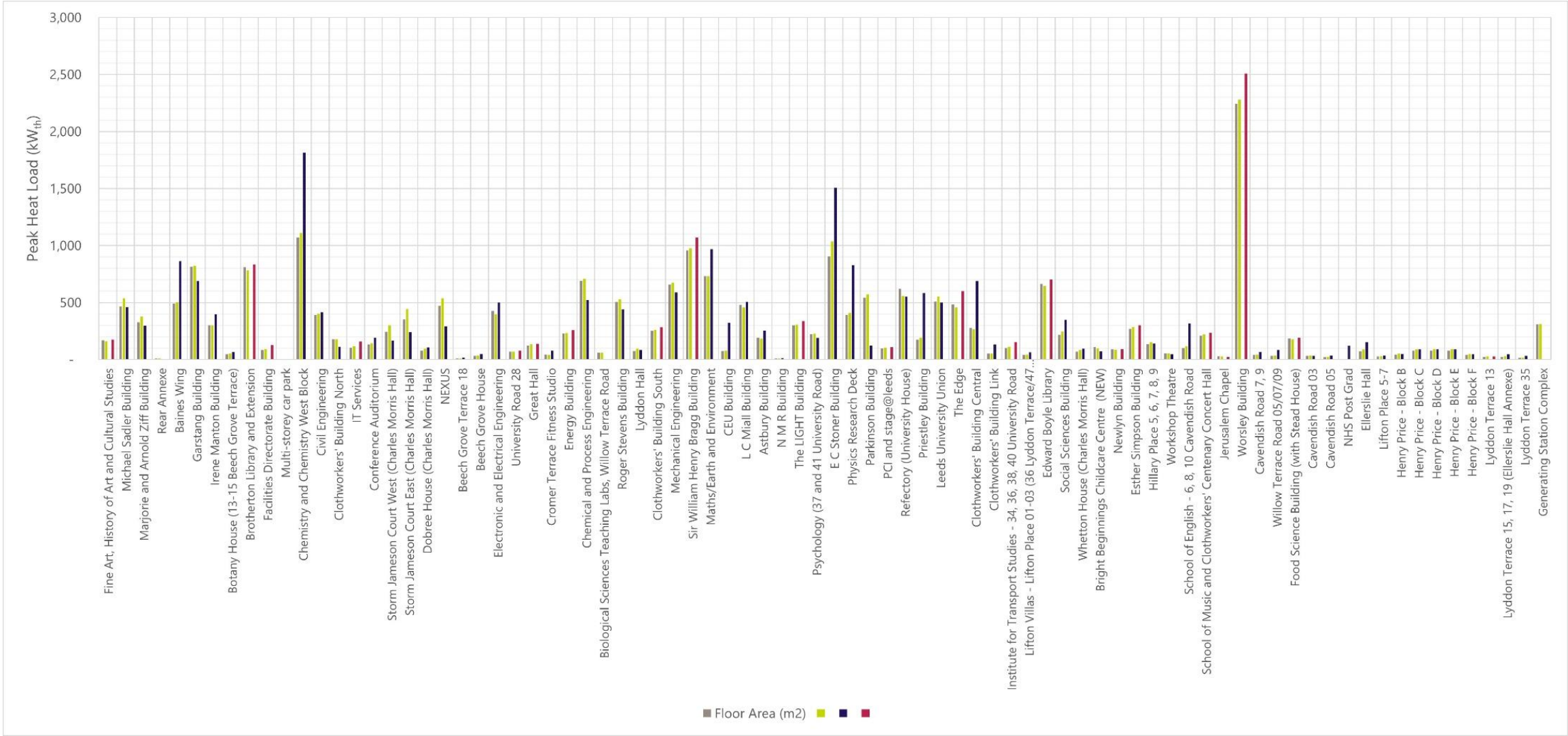


Condition surveys and Baselineing at building level.

- Condition surveys of buildings and assets
- Thermal analysis of building fabric
- Analysis of energy usage data
- Benchmarking of energy data
- The benchmarking exercise showed which buildings were performing well and poorly.



Benchmarking data.



INTERVENTION SCENARIO TESTING

Modelling and Scenario testing.

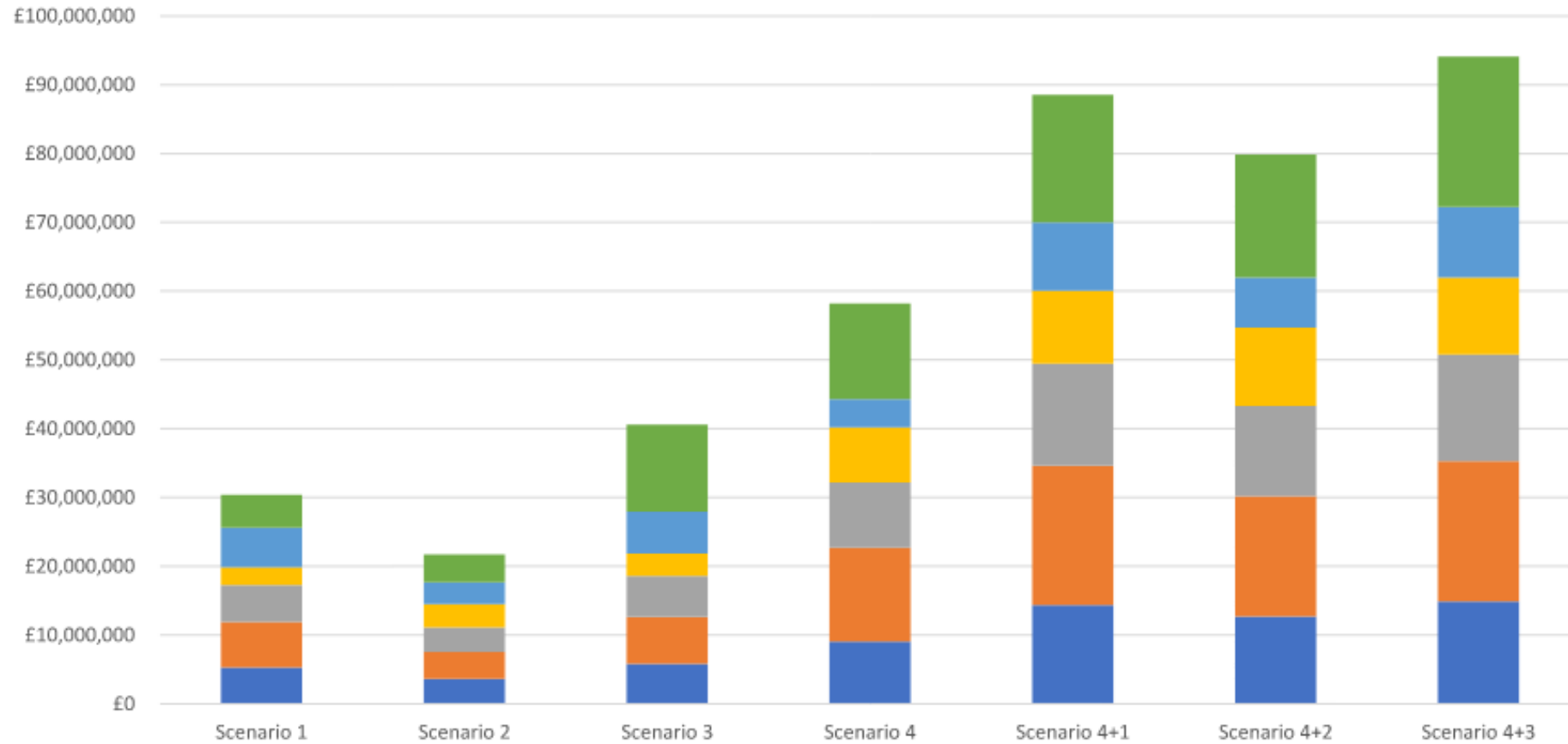
- A selection of buildings typologies were selected
- The selected buildings were modelled in a digital environment (IES)
- A number of scenarios with differing levels of intervention were modelled and tested
- Deep retrofit scenarios were modelled with services and building fabric interventions.
- Lighter interventions were modelled.



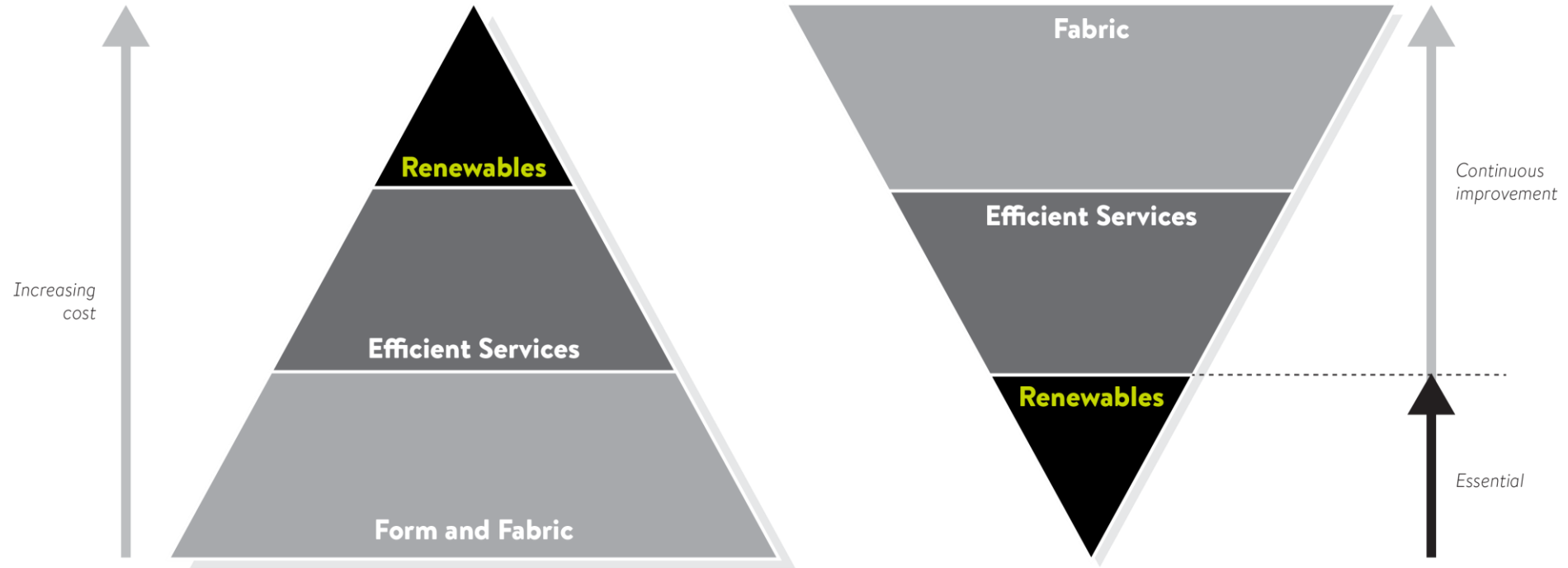
Intervention Scenario testing.

Scenario	Building intervention level	Heating provision	Capital cost	% CO2 decrease to 2050 (from baseline)	Level of Disruption to building	Tonnes of carbon saved annually at 2030
1	No building interventions	Air source heat pumps at building level with high temperature output	£1.7X	77%	Low	334
2	No building interventions	Air source heat pumps provided centrally with high temperature output	£Xm	77%	Low	334
3	Low level services upgrades, no building fabric upgrades	Air source heat pumps at building level with low temperature output	£1.8X	78%	Medium	343
4	Deep retrofit, services upgrades, building fabric upgrades	Existing steam heating retained	£3.5X	29%	High	138
4+1	Deep retrofit, services upgrades, building fabric upgrades	Air source heat pumps at building level with low temperature output	£5.2X	81%	High	367
4+2	Deep retrofit, services upgrades, building fabric upgrades	Air source/Ground source heat pumps provided centrally with high temperature output	£4.6X	82%	High	368 (34 tonne additional saving)
4+3	Deep retrofit, services upgrades, building fabric upgrades	Air source/Ground source heat pumps provided centrally with low temperature output	£5.3X	82%	High	372

Intervention and Scenario testing.



Technology Lead Approach.



Traditional approach to sustainable building design
Fabric first

Net Zero Carbon building hierarchy
Renewables first

NET CARBON REDUCTION PROJECT EXAMPLES



EDUCATION ESTATES CONFERENCE

University of Leeds

Net Carbon reduction project examples

Sir William Henry Bragg Building

Central Teaching Laboratories

BACKGROUND



Sir William Henry Bragg University of Leeds



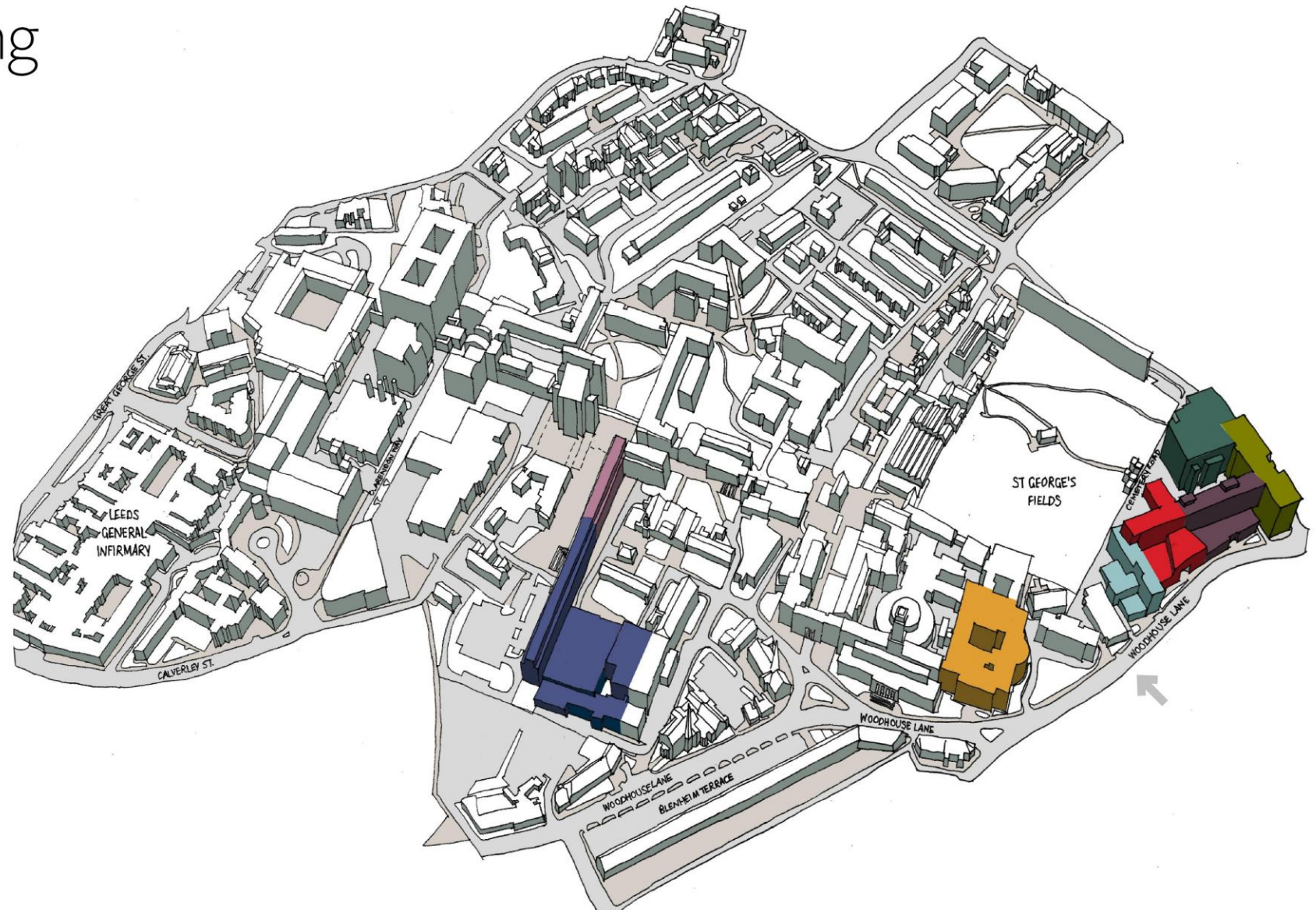
THE CAMPUS



MaPS + Engineering

KEY

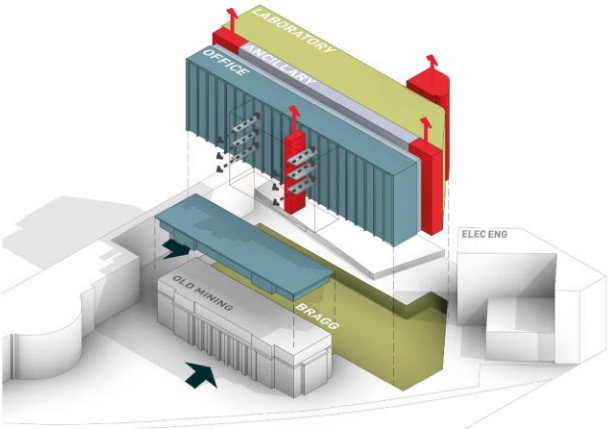
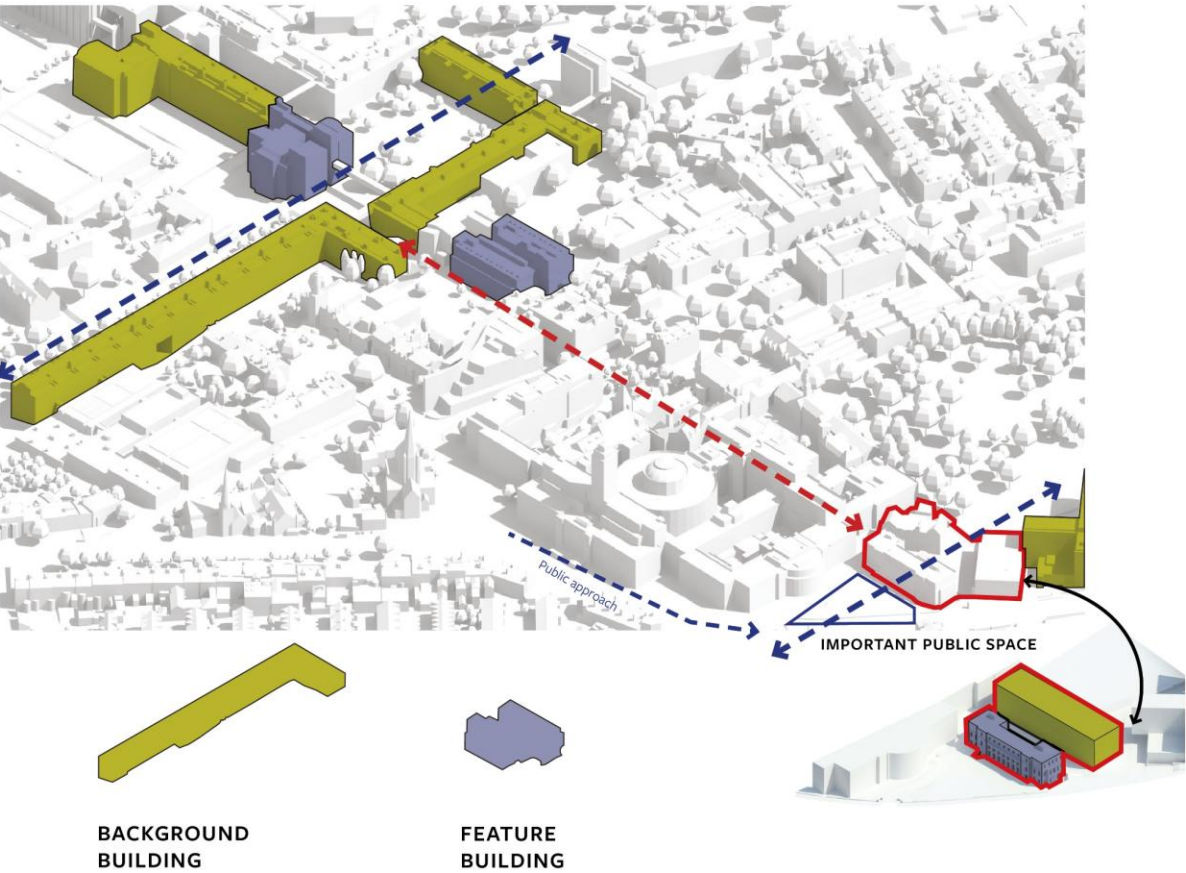
- PHYSICS
- ENERGY
- MATHS
- BIOLOGICAL SCIENCES
- CHEMISTRY
- PROCESS AND CHEMICAL ENGINEERING
- CIVIL ENGINEERING
- MECHANICAL ENGINEERING
- ELECTRICAL ENGINEERING
- COMPUTING



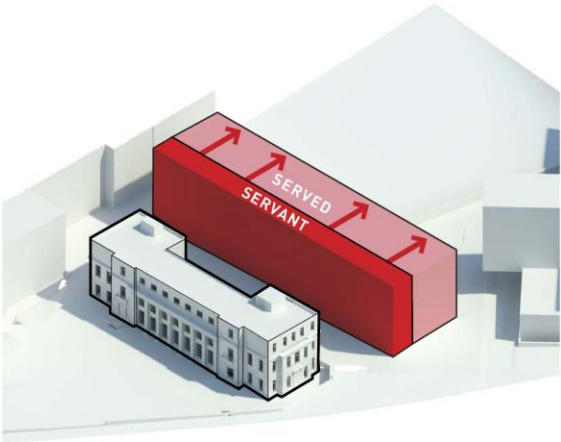
THE SITE



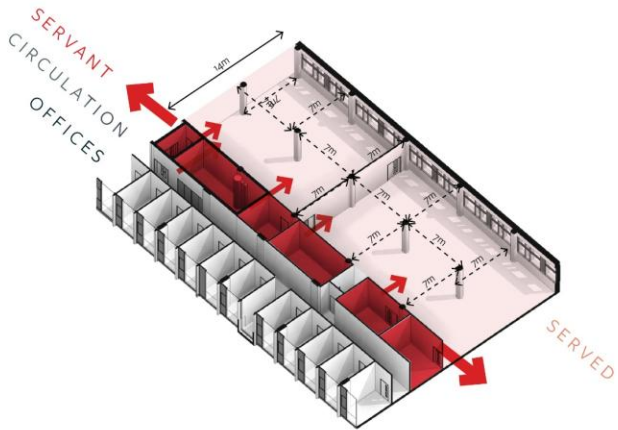
THE CONCEPT



FINAL MASSING

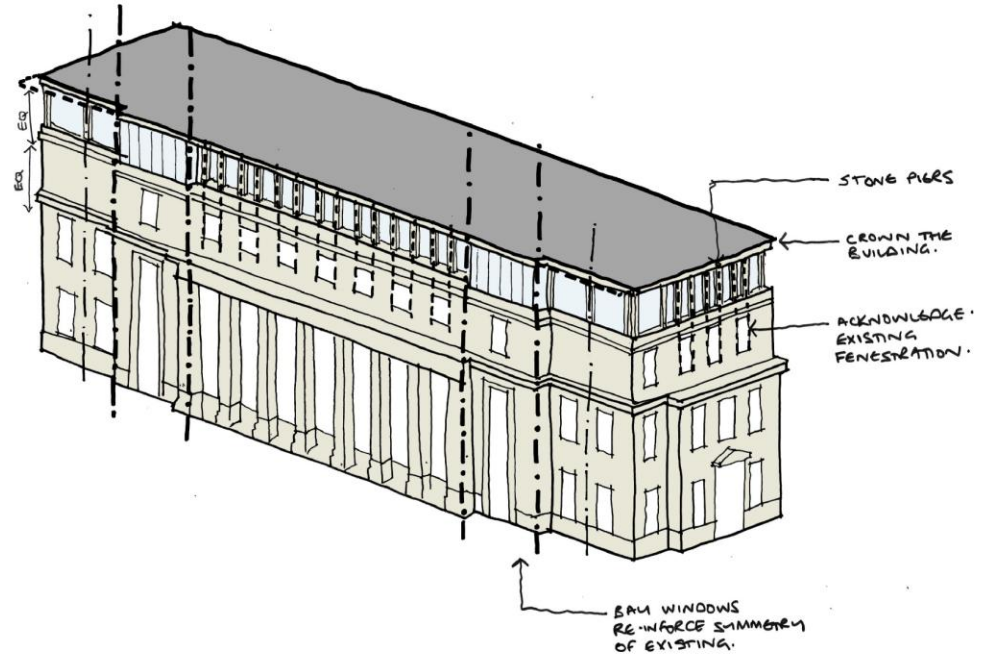


SERVED AND SERVANT SPACES



FLEXIBILITY OF PROGRAMME

CANOPY FLOOR



SERVICING / ENERGY CONSERVATION

Roof
0.14 W/m²K

Roof
0.14 W/m²K

External walls
0.15 W/m²K

External windows
0.3 W/m²K

External walls
0.47 W/m²K

Replacement
Double-glazed
Steel Frame
Windows
1.38 W/m²K

Ground Floor Slab
0.14 W/m²K

Ground Bearing Floor Slab
0.22 W/m²K

SUBSTATION

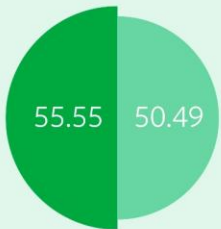
- THERMAL LINE
- AIR TIGHTNESS LINE
- INNER ROOM ENHANCED EMC / TEMP / VIBRATION

- CLEAN ROOMS
- SPECIALIST GASES

- VIBRATION
- DELIVERIES
- TEMP CONTROL
- PLENUM
- EMC

Energy Use

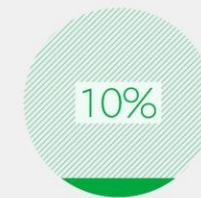
UNREGULATED REGULATED



kWh/m²/year

A new **11,000sqm** home for the faculty of engineering and physical sciences

BREEAM®
EXCELLENT



Low Carbon Energy Sources

20%

CO₂ Emissions Improvement Against Target Emissions Rate



Recycled Materials



NZC/Sustainability features
The Sir William Henry Bragg Building

Increased public access

Green Specification Guide

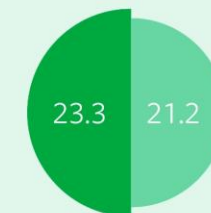
Adaptive re-use

Retained materials and features

Improved accessibility

CO₂ Emissions

REFURBISHMENT NEW BUILD



kgCO₂eq/m²

60%

Biodiversity net gain



62%

Energy efficient adjoined new build constructed on a brownfield site



Reclaiming a former car parking and delivery yard to landscaped gardens.

- Increased public access
- Green Specification Guide
- Adaptive re-use
- Retained materials and features
- Improved accessibility
- Off-site fabrication
- Exposed thermal mass
- Retained and additional trees

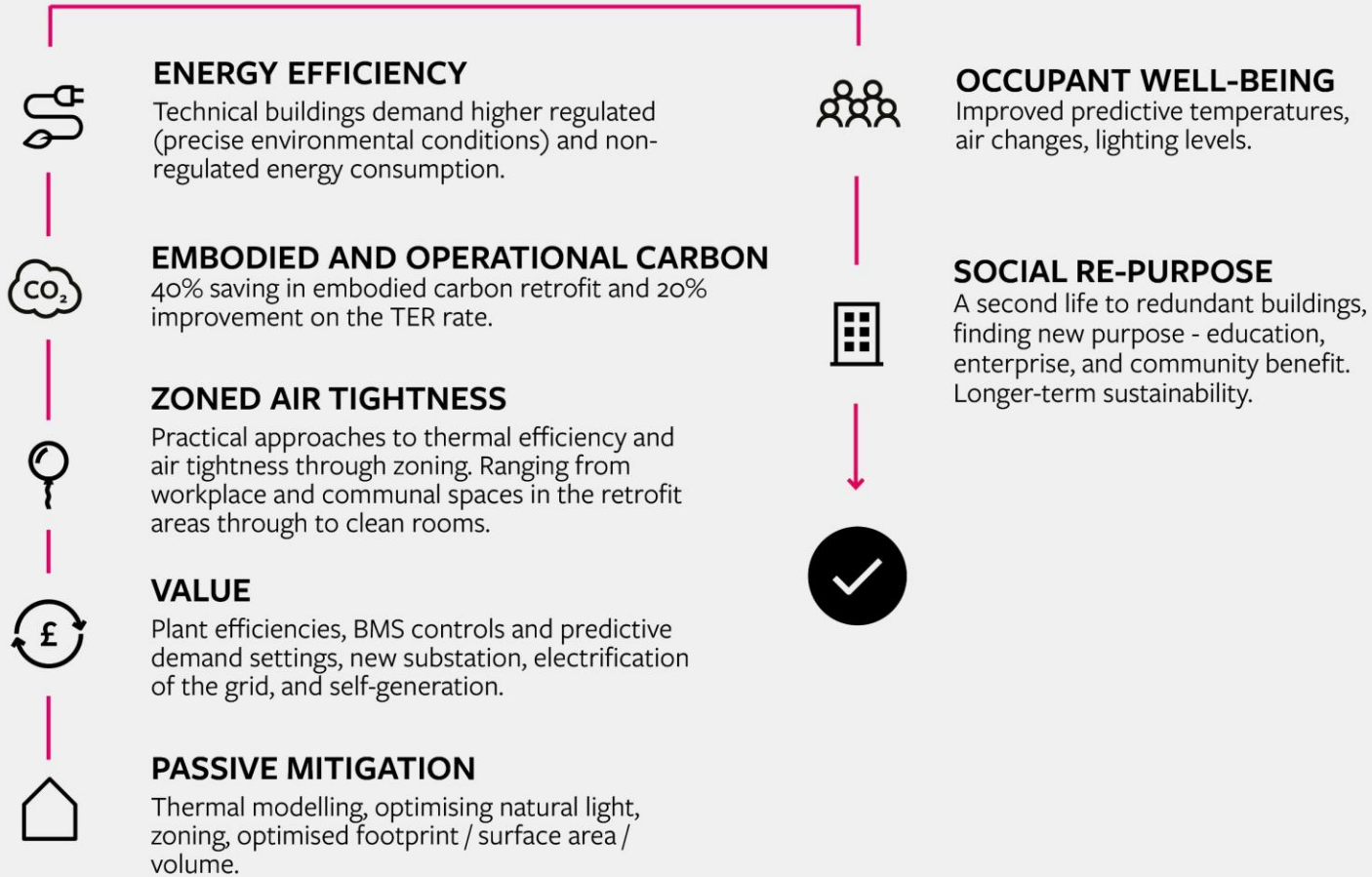
38%

Re-purposing of an existing building asset



SUMMARY

Value judgements on NCZ/sustainability



BACKGROUND

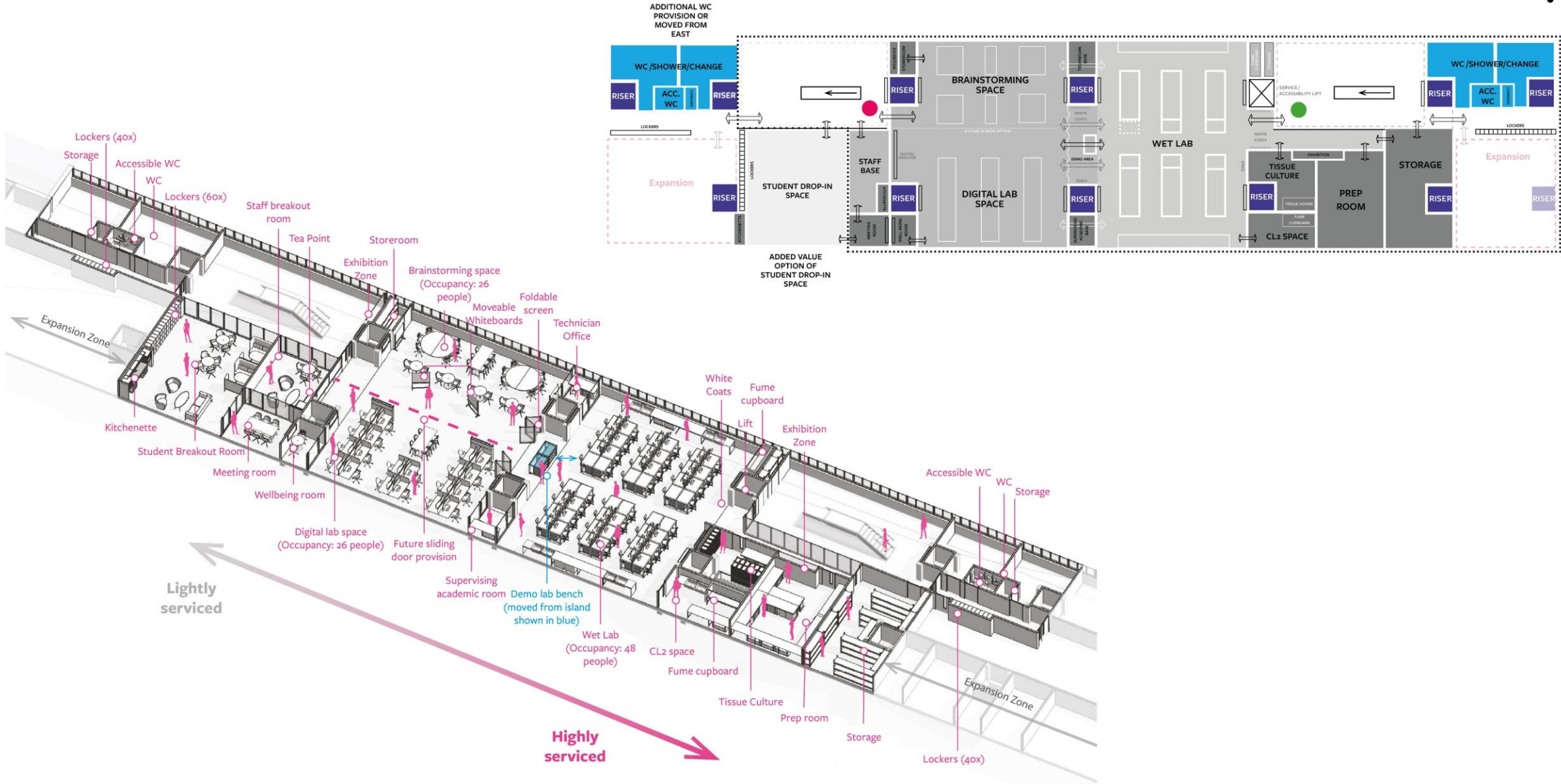


Central Teaching Laboratories

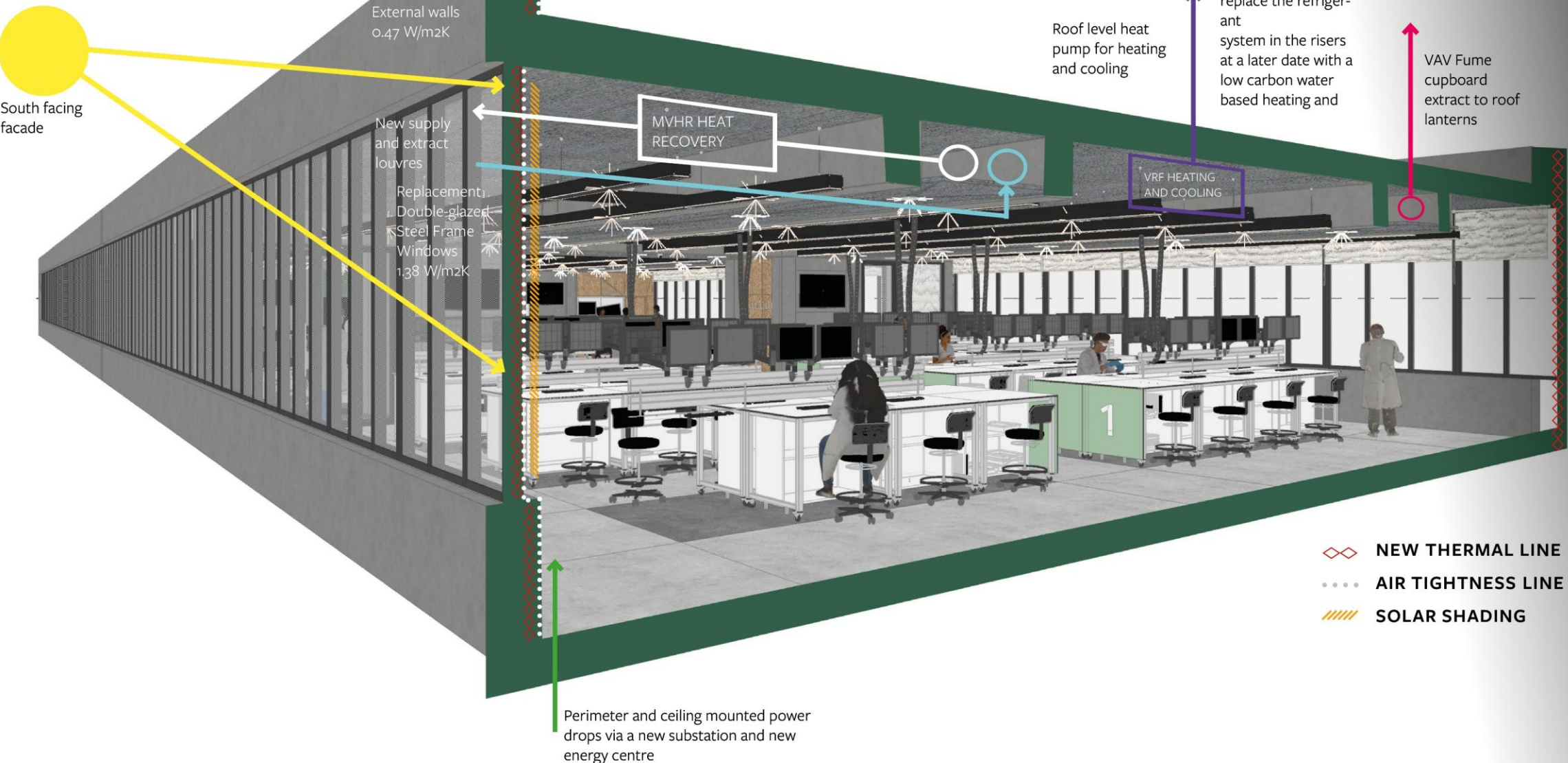




THE CONCEPT

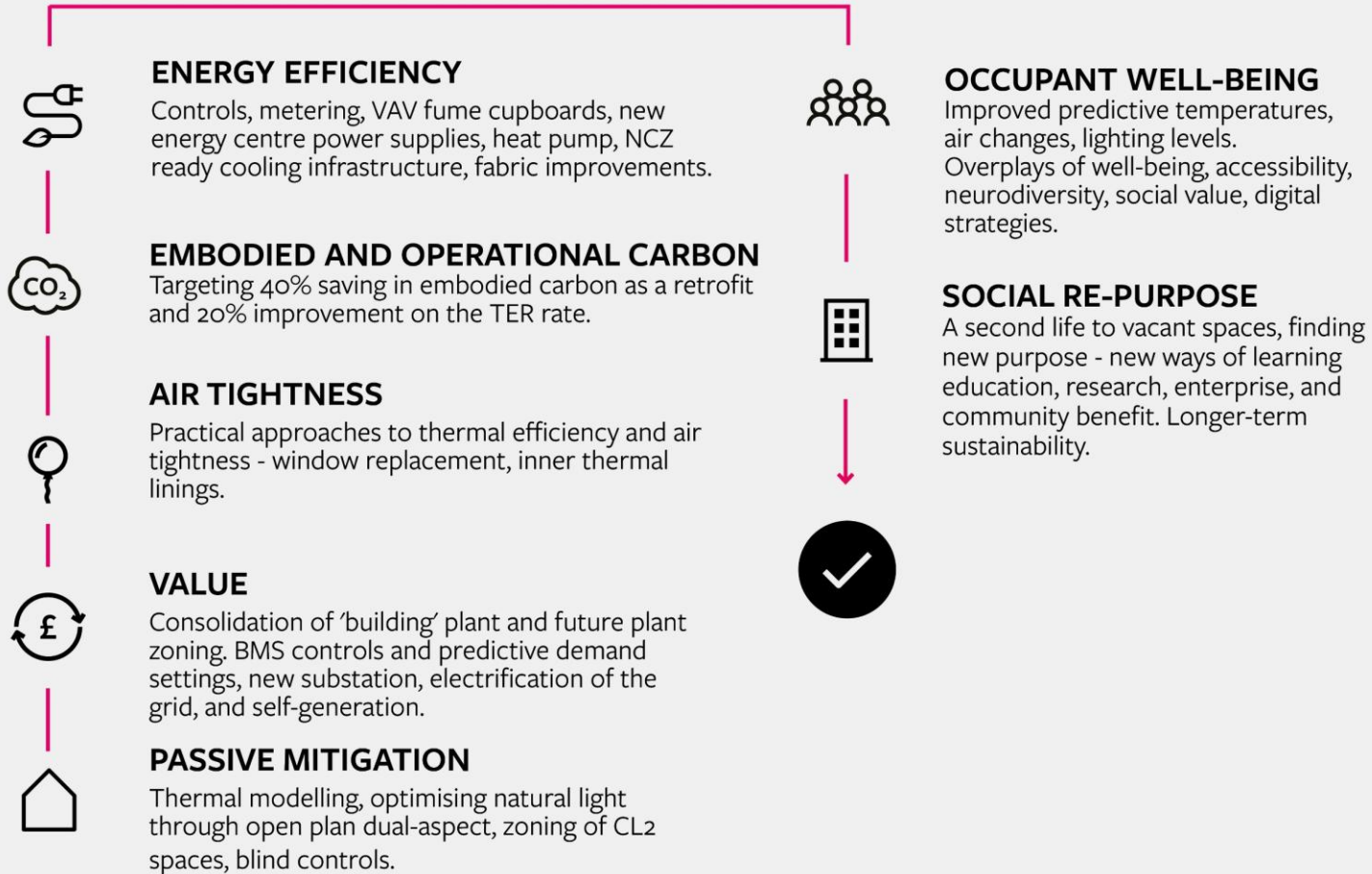


SERVICING / ENERGY
CONSERVATION



SUMMARY

Value judgements on NCZ/sustainability





Thank you

