Media Partner

The Herald

#SXLExpo

# Hugh Carr

## Director of Strategic Procurement

# Morag Angus

MA Hons, Dip LS, FRICS

**Scottish Government**

Chief Surveyor

and

Head of Property and Construction

Scottish Government
Riaghaltas na h-Alba
gov.scot

# Challenge and Opportunity

- Public Funding and budgets
- Workforce
- Cost of living
- Technological and digital transformation
- Climate change
- International instability
- Hybrid working
- Ageing estate

# The Requirement

Deliver:

- Quality outputs which contribute to quality outcomes
- Value for Money

# Quality

- Quality has two elements to it.
  - Firstly, it is about defining a specification which meets the functional and operational requirements of the use and users of the built asset and,
  - secondly, it is about delivery in all respects of that specification through its design, procurement and construction.

*(Paragraph 3.1, Chapter 3 Construction Phase Handbook, Client Guide to Construction Projects.)*

# Value for Money

Possible Definitions:

- Value for money is defined as the optimum combination of whole-life cost and quality (or fitness for purpose) to meet the user's requirement.
- '…a judgement about the optimal use of public resources to achieve stated objectives embodied in the SMART objectives of a proposal…'.

# Key activity

- Skills and capability
- Construction industry transformation
- Collaboration
- Public procurement
- Efficient processes
- Quality assurance

# Framework Benefits

- A co-ordinated collaborative approach across the Scottish public sector;
- Saves time in the procurement process and adds value;
- A standardised approach to terms & conditions which were considered by the industry ahead of the framework being implemented;
- Pre-qualified contractors who were selected after a comprehensive tender exercise;
- Shared learning and best practice across public sector bodies and framework contractors;
- A commitment to community benefits (such as mentoring and school/college/university engagement), and
- A commitment to fair work first measures such as paying the real living wage.

# Key activity

- Skills and capability
- Construction industry transformation
- Collaboration
- Public procurement
- Efficient processes
- Quality assurance

# Summary

- Quality
- Value for Money
- People

# Constructive Collaboration

Mary Mitchell
Chief Procurement Officer

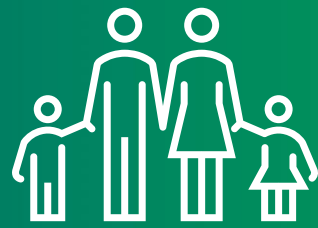
SCOTLAND EXCEL

Always evolving

Commercial

Carbon

Community



# Portfolio Overview


SCOTLAND EXCEL

Always evolving

# ACHIEVING ZERO CARBON ESTATES

September 2024

ARCHITYPE/PERFORM+

# Welcome

Christina Gaiger
Associate Director

ARCHITYPE/PERFORM+

## CREATIVE

We pioneer imaginative, sustainable solutions, creating beautiful architecture that performs well. We strive for clarity, not complexity.

## ECOLOGICAL

We design holistically. Our buildings are healthy, inspiring, empowering environments for people and communities. We take action to minimise our impact on the planet.

## PROGRESSIVE

We are always driven to do more, using rigour and technical know-how to deliver the highest quality sustainable design we can.

## COMMUNITY

We work collectively to create a common vision. Integrity, respect and honest communication are the hallmarks of our co-design process.

ACTIONS NOT WORDS

# The Challenges

# The Challenges – The Climate Emergency

"The climate emergency is a race we are losing, but it is a race we can win.
The climate crisis is caused by us and the solutions must come from us.
We have the tools: technology is on our side."

UN Secretary-General Antonio Guterres


University of Reading

Ed Hawkins

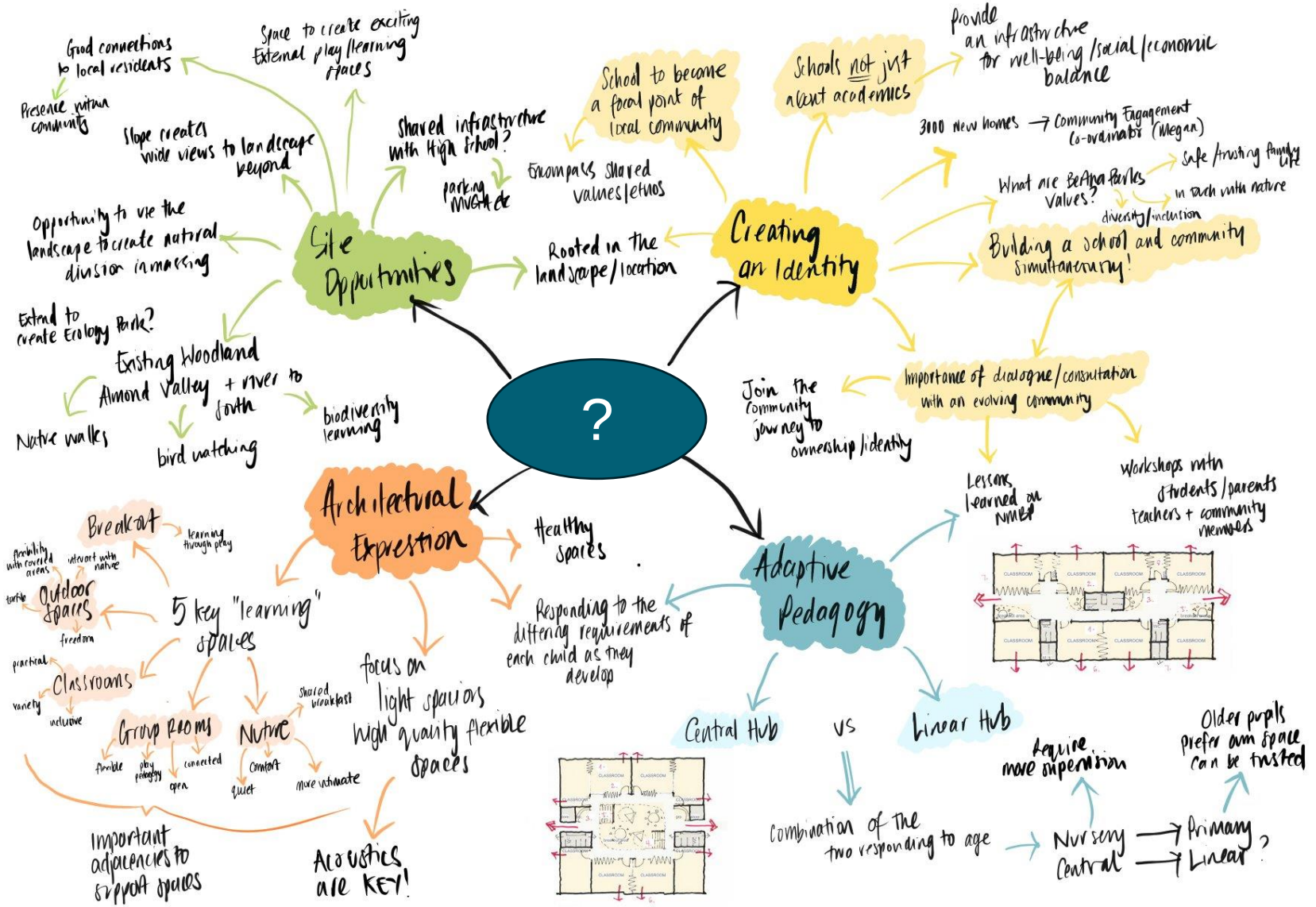
ARCHITYPE/PERFORM+

# The Challenges – The Complexities

- 80% of buildings that will exist in 2050 have already been built
- UK construction industry contributes to 40% of greenhouse gas
- UK buildings perform up to 10 times worse than design predictions
- Unclear targets
- Constrained budgets

# The Challenges – The Complexities

- Briefing / balancing priorities is difficult
- How can capital costs be met alongside the performance targets
- Listening & understanding
- Design is problem solving
- AND we have a very big problem to solve!



# The Challenges - Retrofit

“The greenest building is the one that already exists”

Carl Elefante, former president of the American Institute of Architects

- Entopia – world class retrofit for University of Cambridge Institute for Sustainability Leadership


Before

# The Challenges - Retrofit

“The greenest building is the one that already exists”

Carl Elefante, former president of the American Institute of Architects

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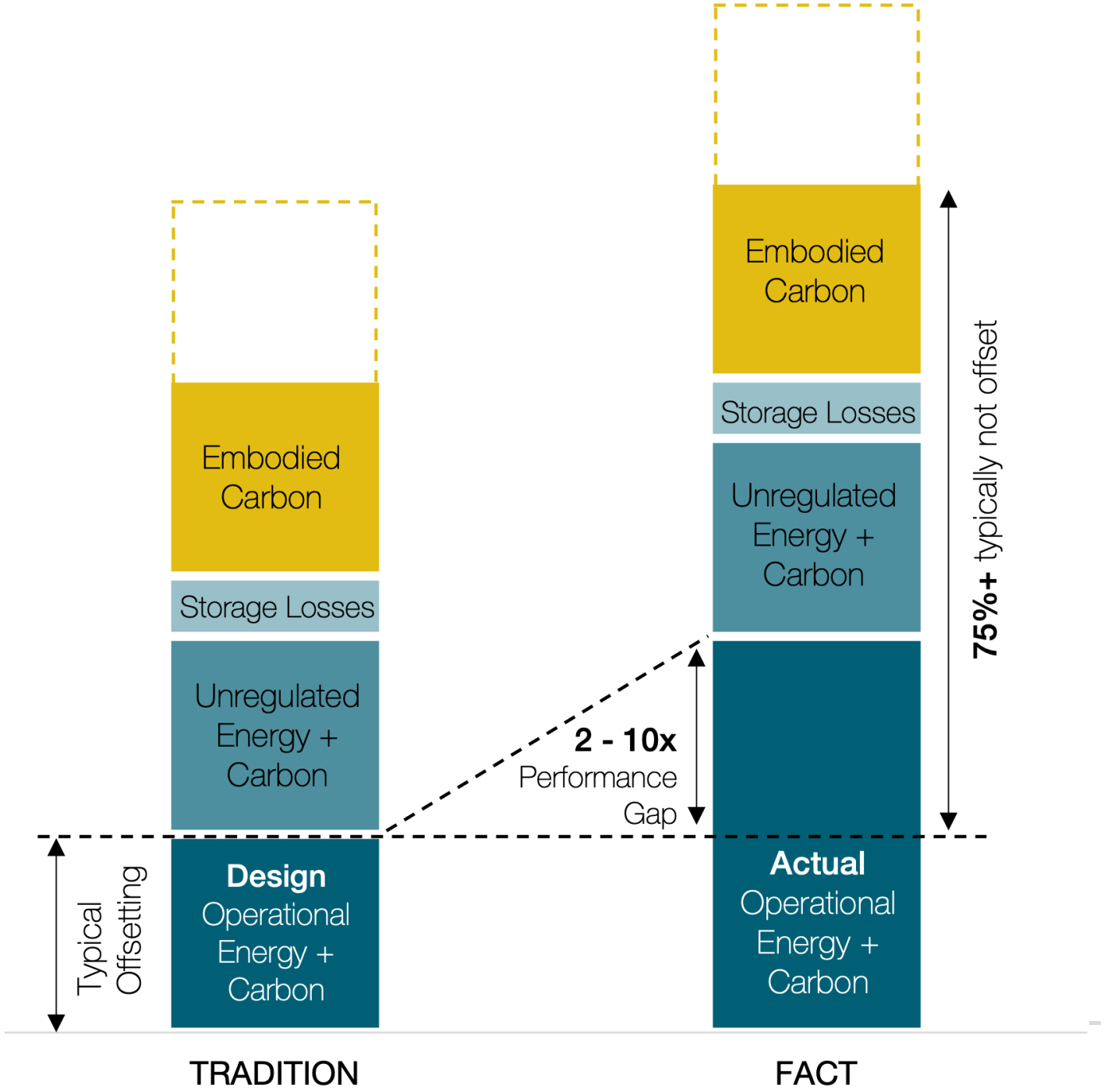
# The Challenges – What is Zero Carbon?

- Over 30 different zero carbon definitions
- Wide range of assumptions
- The misconception of carbon offsetting and the performance gap



# The Solutions

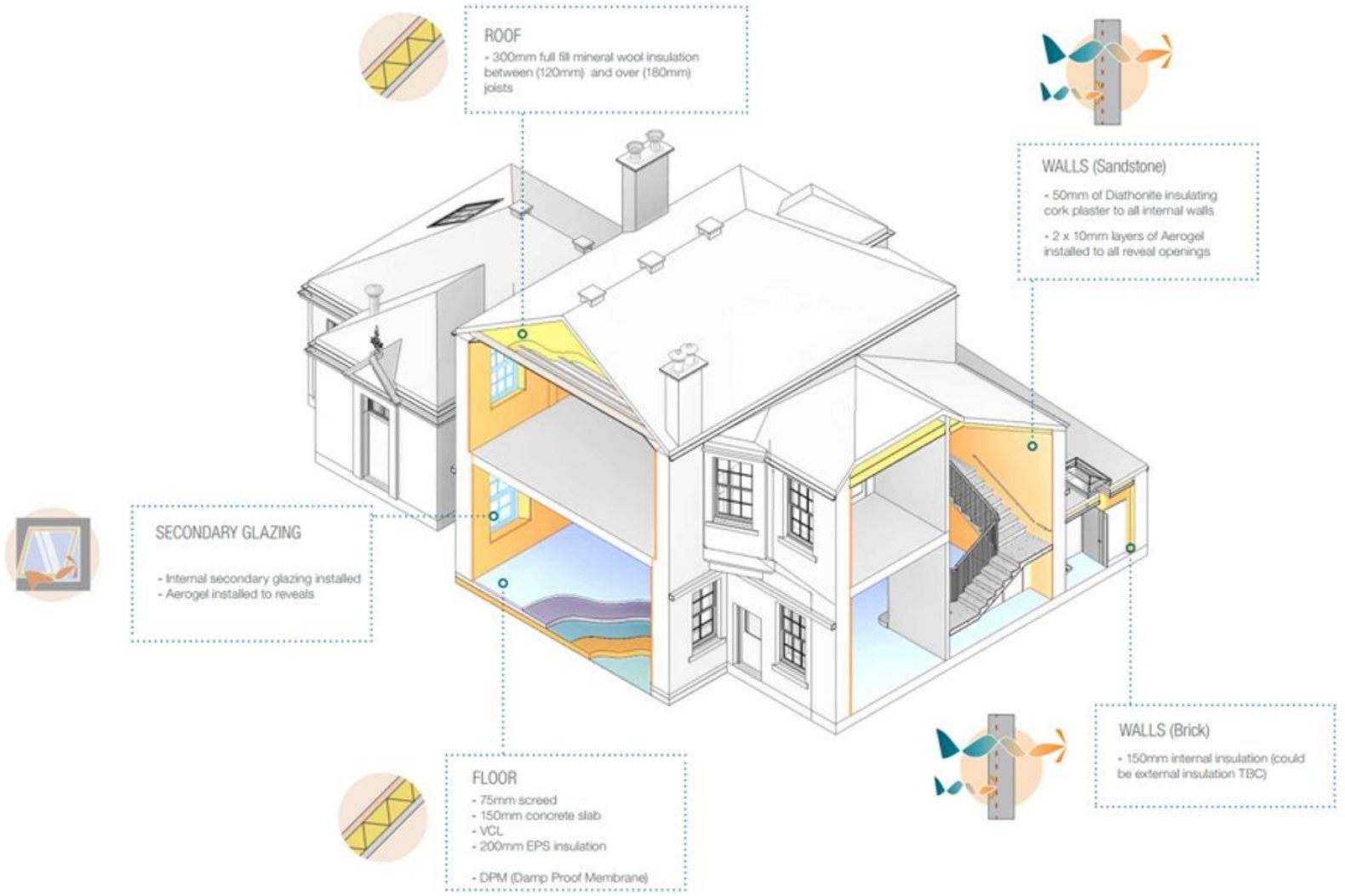
ARCHITYPE/PERFORM+

# First Steps to Zero Carbon Buildings

1. Use less energy
2. Understand how YOUR buildings can use less energy
3. Account for carbon emissions (operational + embodied)
4. Consider renewables
5. Invest to save

# What does that mean … First Steps to Zero Carbon Buildings

1. Understand building performance  and building use across the estate
2. Rigorous methodology to assess carbon and cost impacts
3. Quantitative benchmarks like Passivhaus or EnerPHit standard



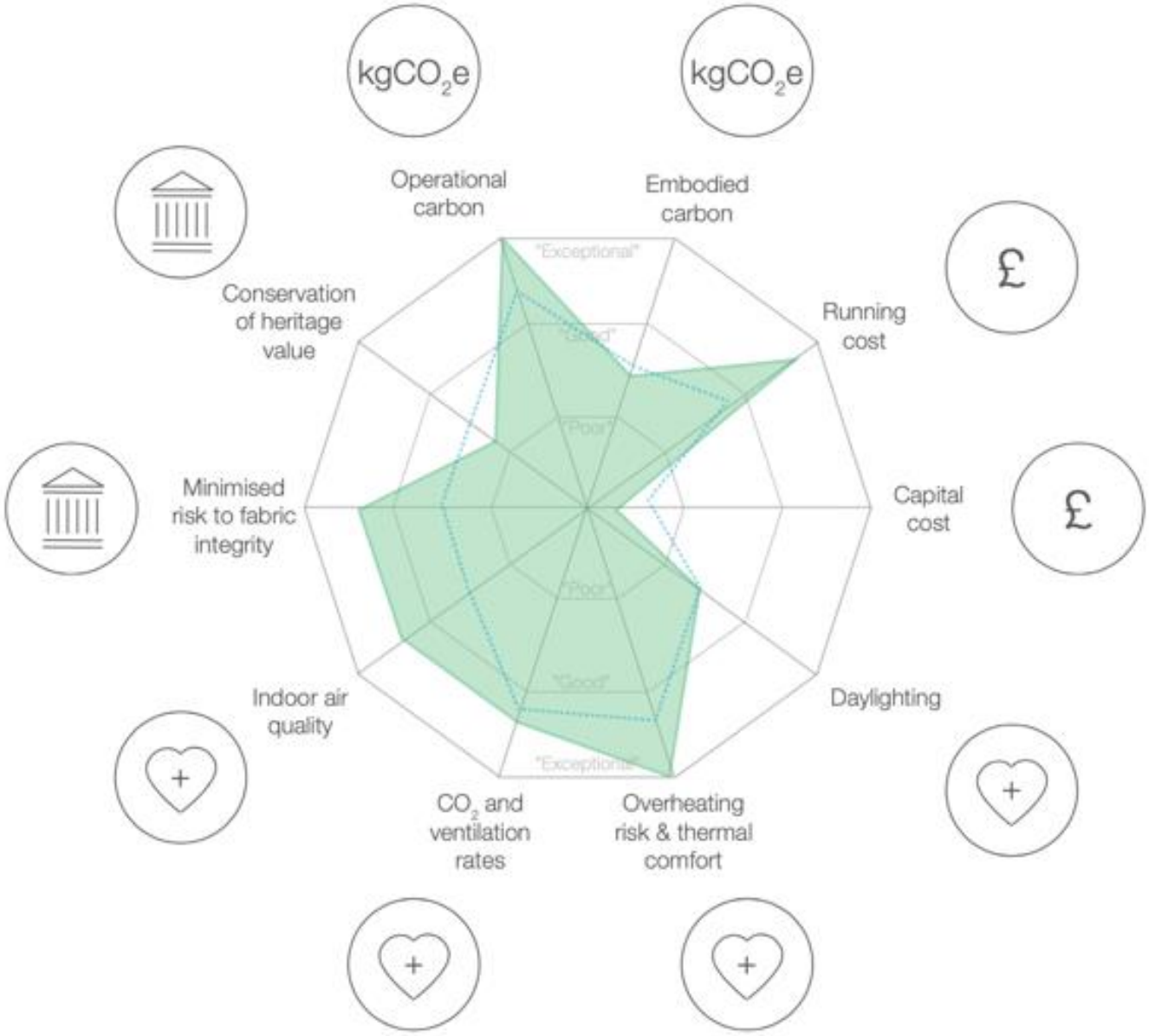
# First Steps to Zero Carbon Buildings

4. Identification of new estate investment (where is it appropriate to build new)

5. Forensic analysis on key typologies of existing assets

# First Steps to Zero Carbon Buildings

6. Options developed and modelled across the estate
7. Pilot projects for deeper cost insight
8. Clear path to net zero



# Case Studies

# 1. New Buildings

## Riverside Primary School

- Funding metric targets
- Certified quality criteria

# 1. New Buildings

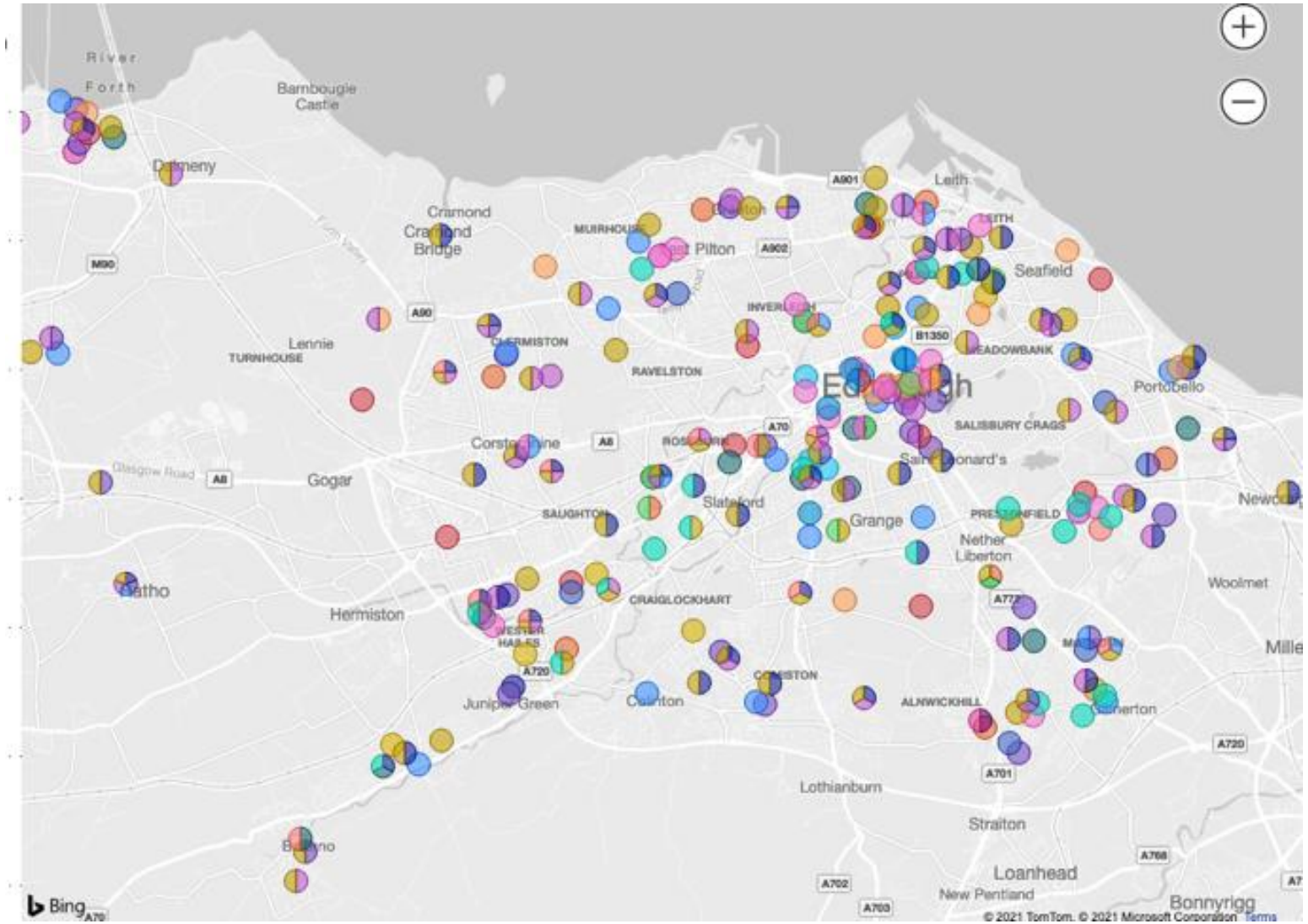
## Riverside Primary School

- Minimisation of the performance gap
- Comfortable & healthy quality of space

# 2. Estate Wide

## City of Edinburgh Council

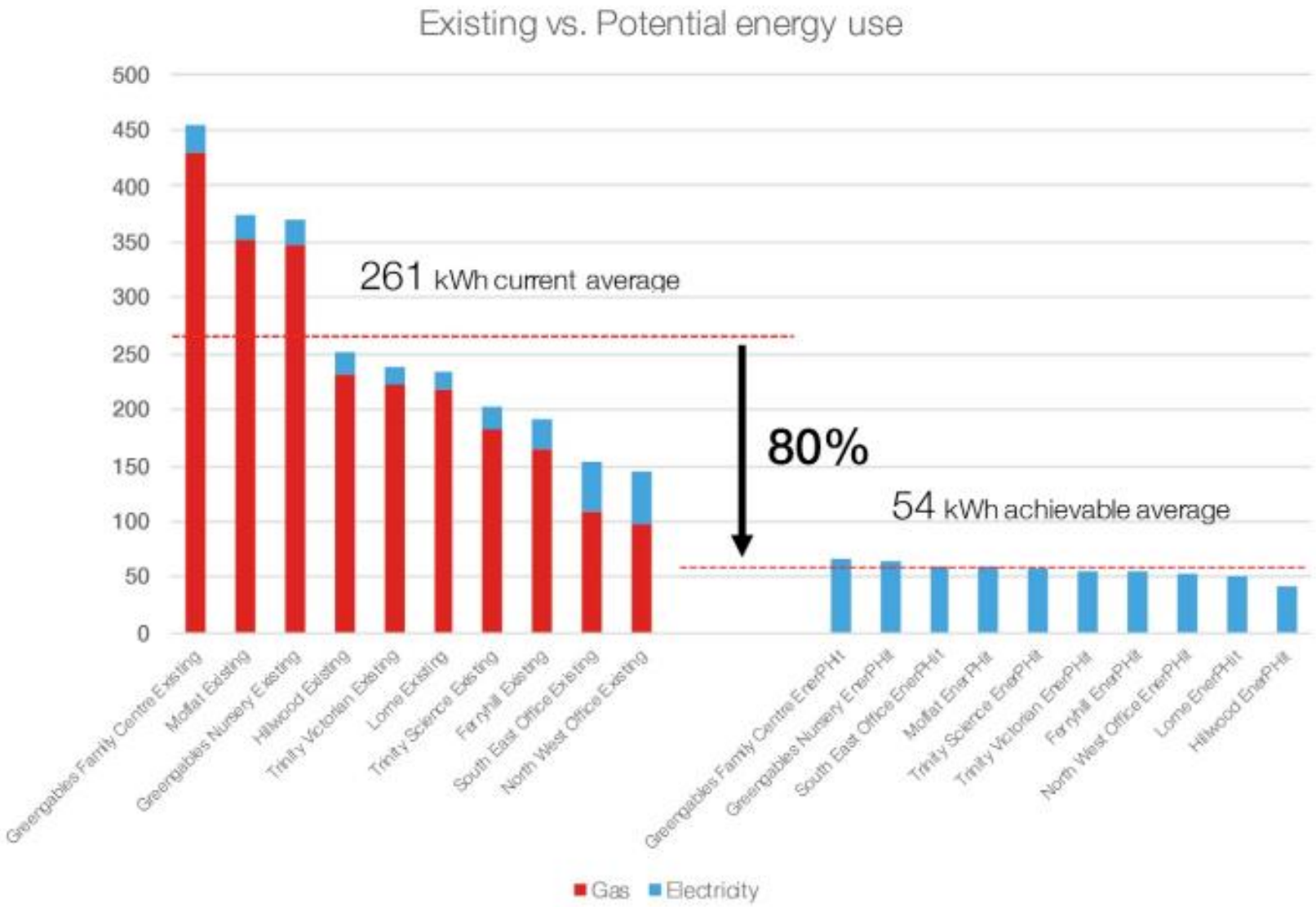
- New buildings may be easier to identify
- Where do we start with everything else?



# 2. Estate Wide

## City of Edinburgh Council

- EnerPHit informed retrofit plan for 300 buildings across the estate



# 2. Estate Wide

## City of Edinburgh Council

- Gaining a deep understanding

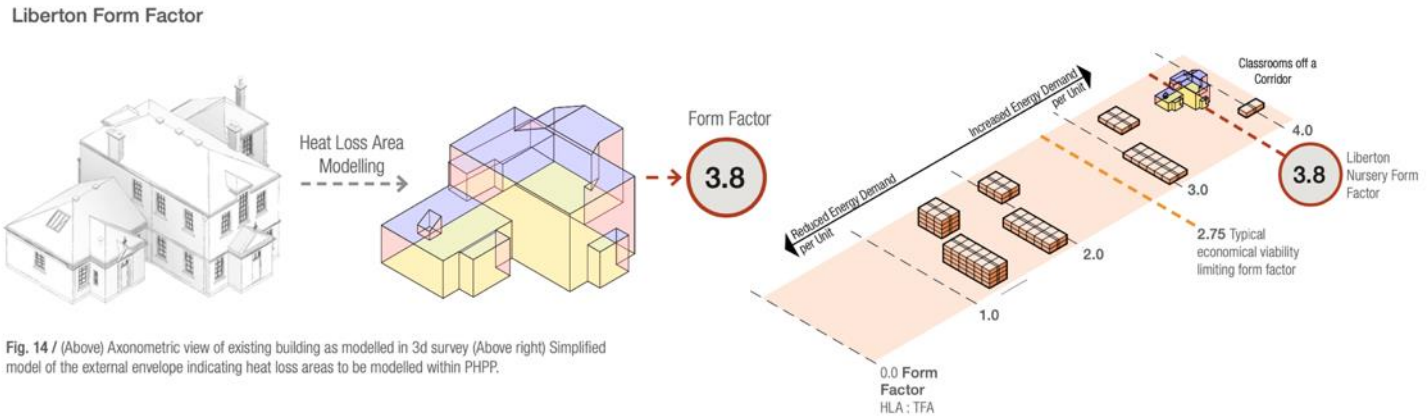
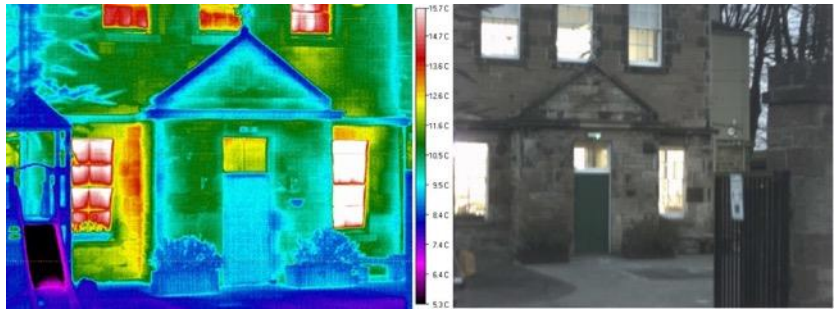
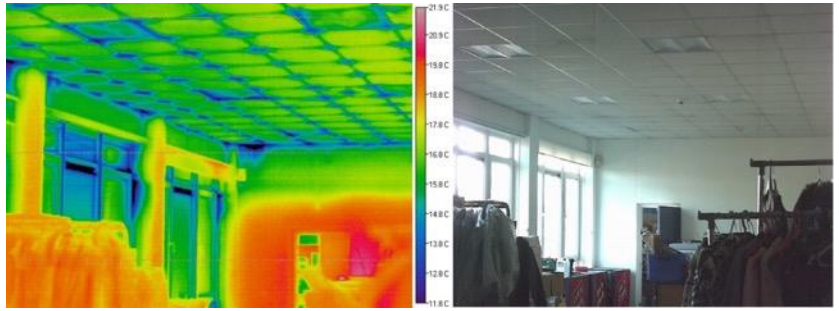



Fig. 14 / (Above) Axonometric view of existing building as modelled in 3d survey (Above right) Simplified model of the external envelope indicating heat loss areas to be modelled within PHPP.

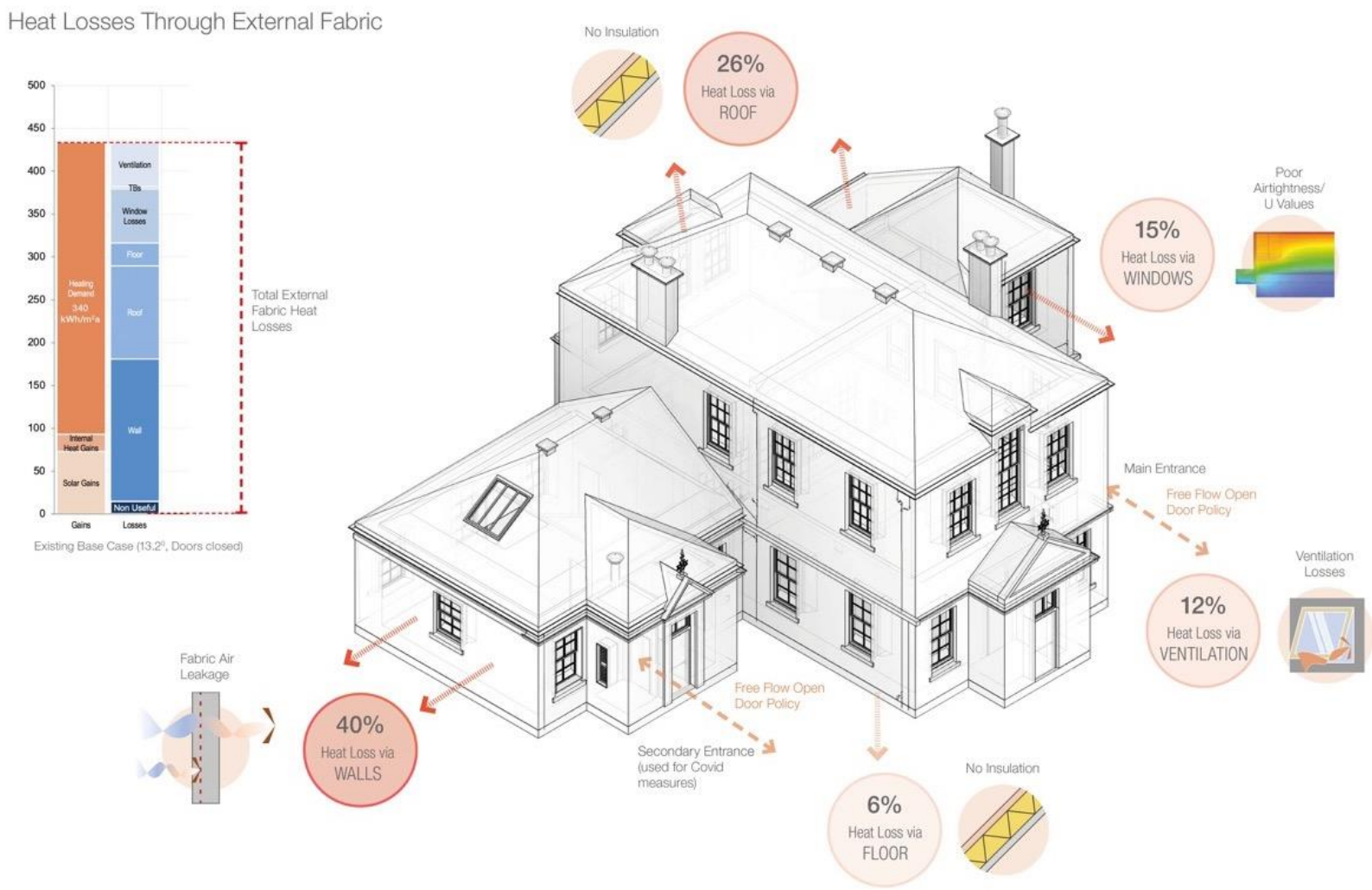


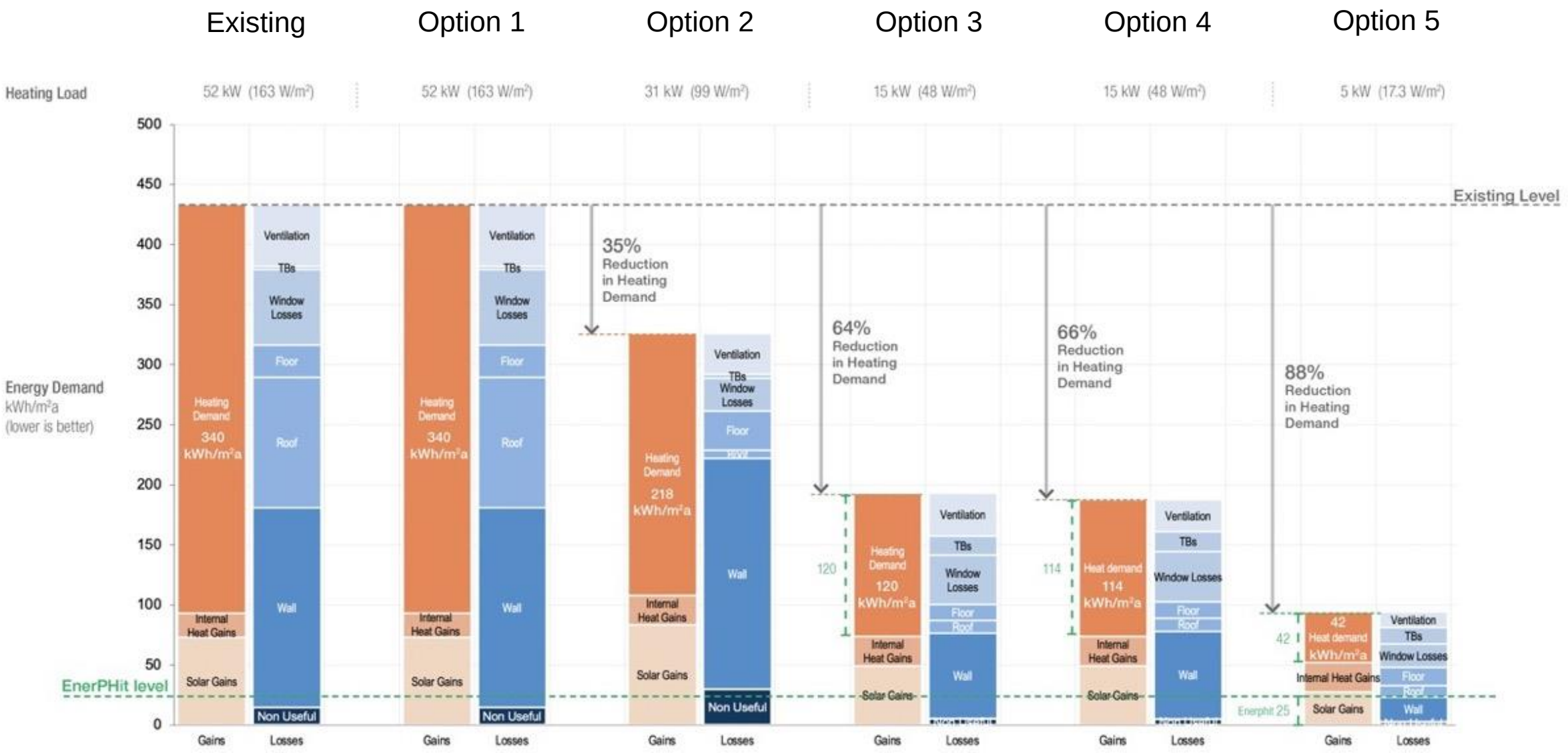


# 2. Estate Wide

City of Edinburgh Council

- Establishing our baseline





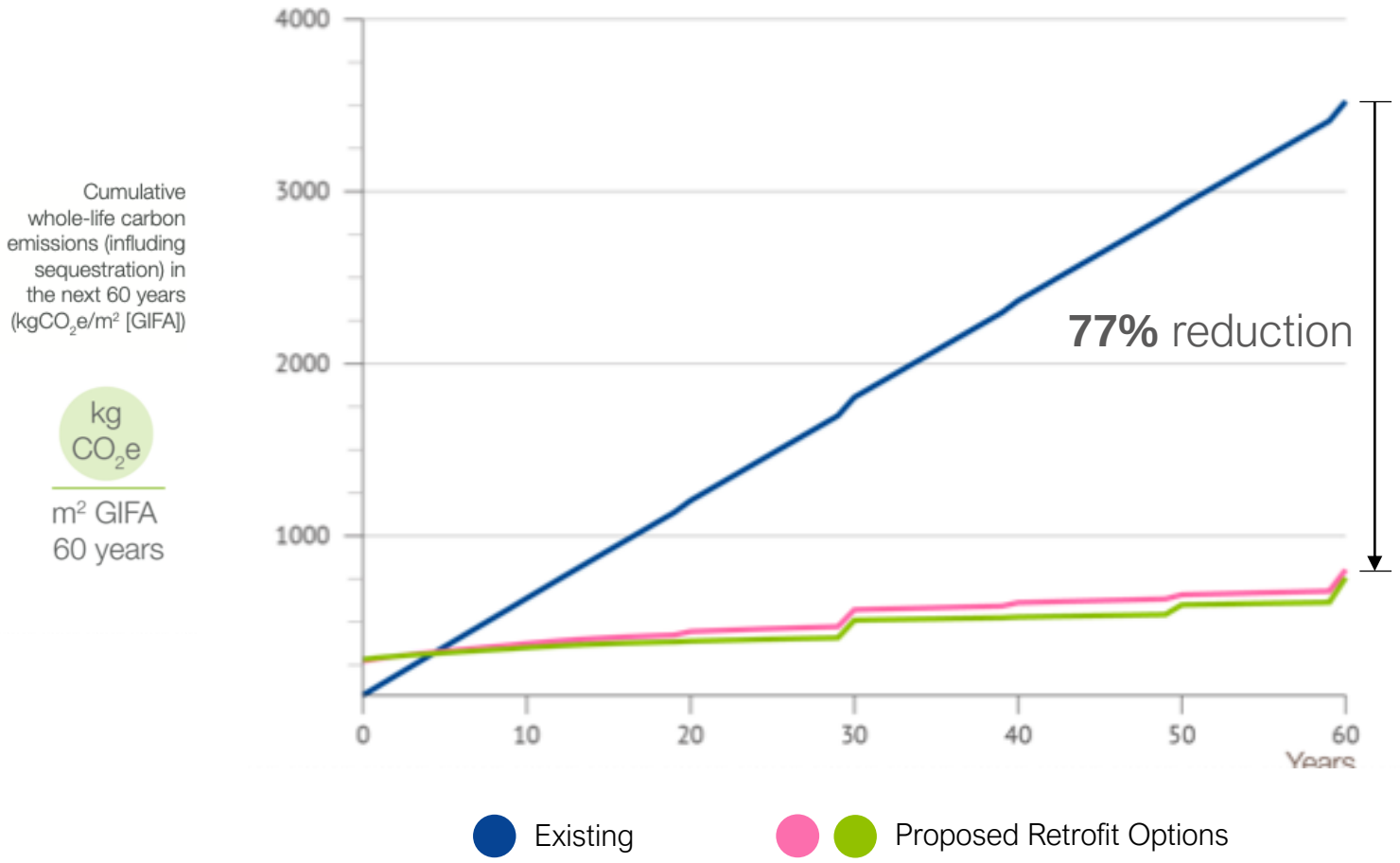

- Exploring what is possible

# 2. Estate Wide

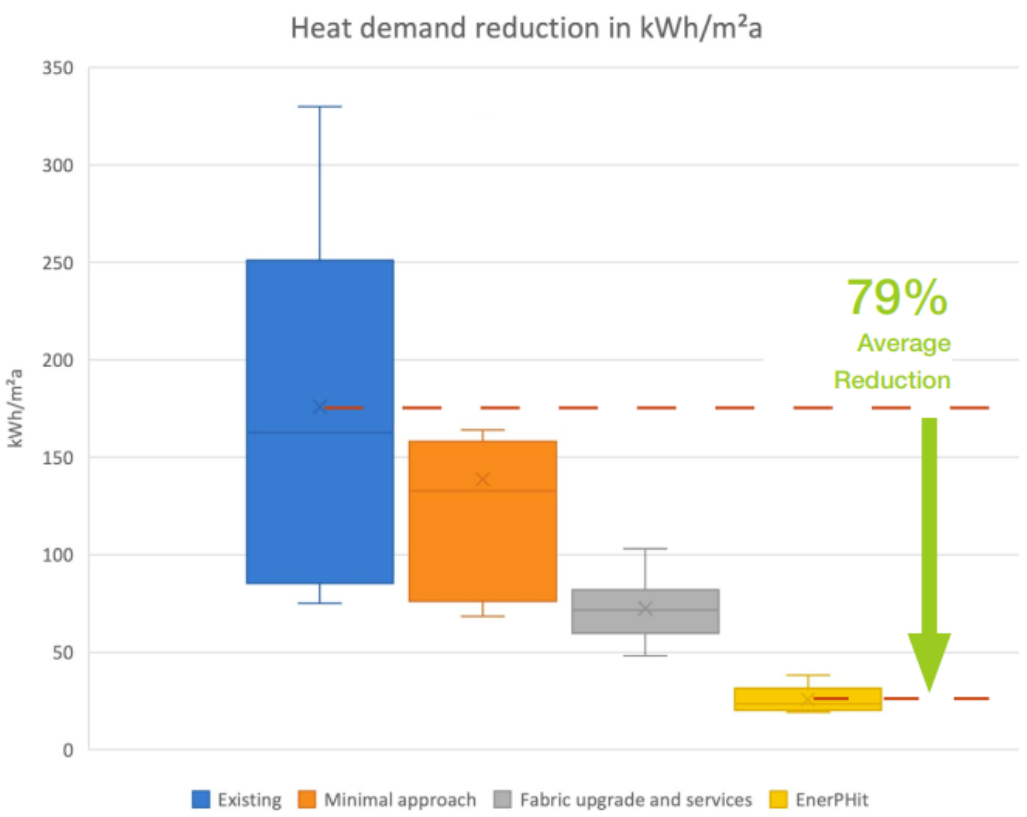
## City of Edinburgh Council

- Establishing a clear path to net zero

Whole Life Carbon



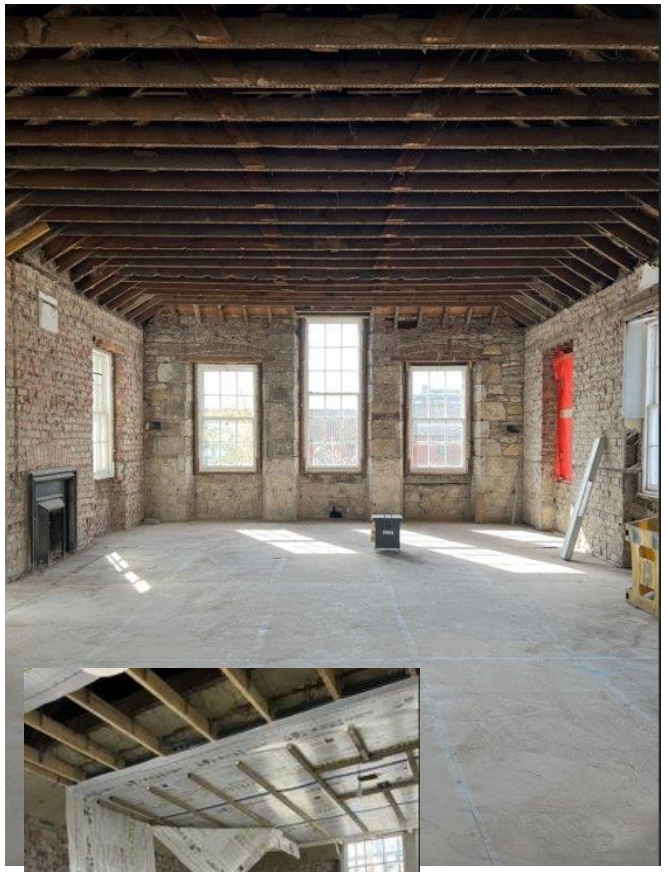
# 2. Estate Wide

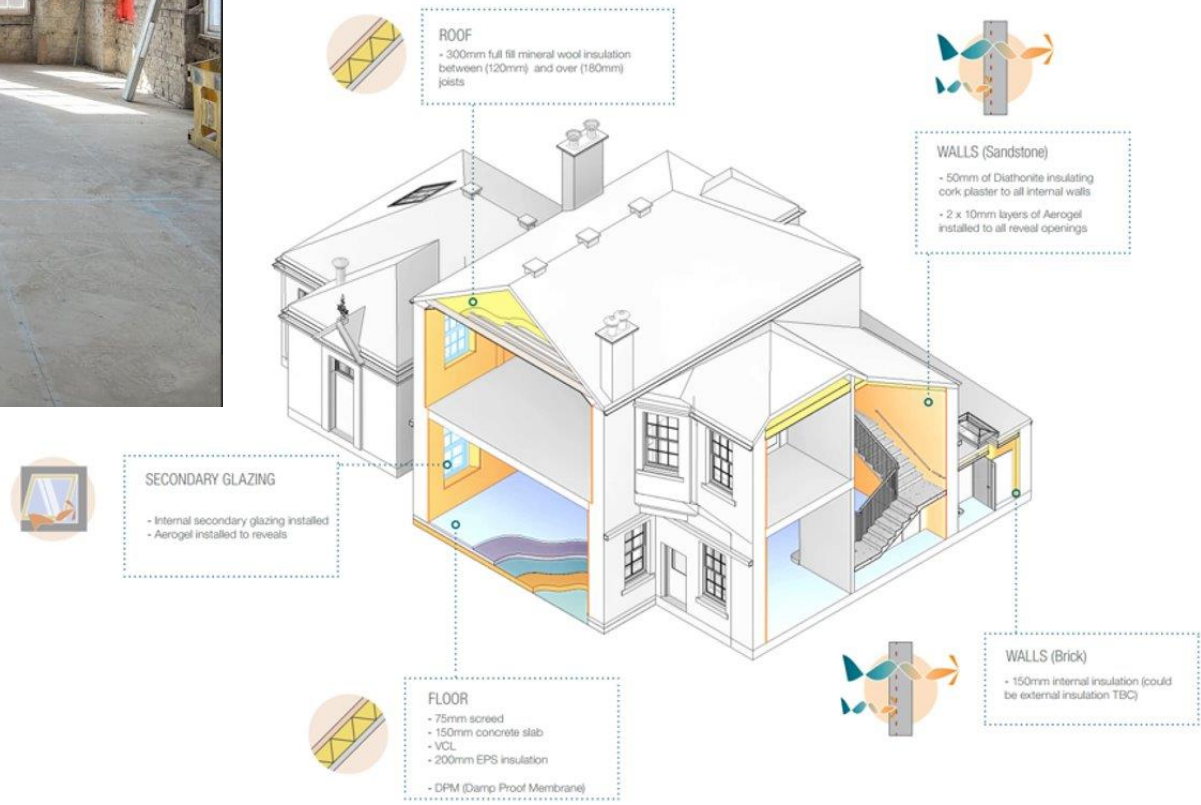



# 2. Estate Wide

## City of Edinburgh Council

- Pilot typology projects
- Liberton Nursery – Sandstone Victorian Building





# 3. Existing Buildings

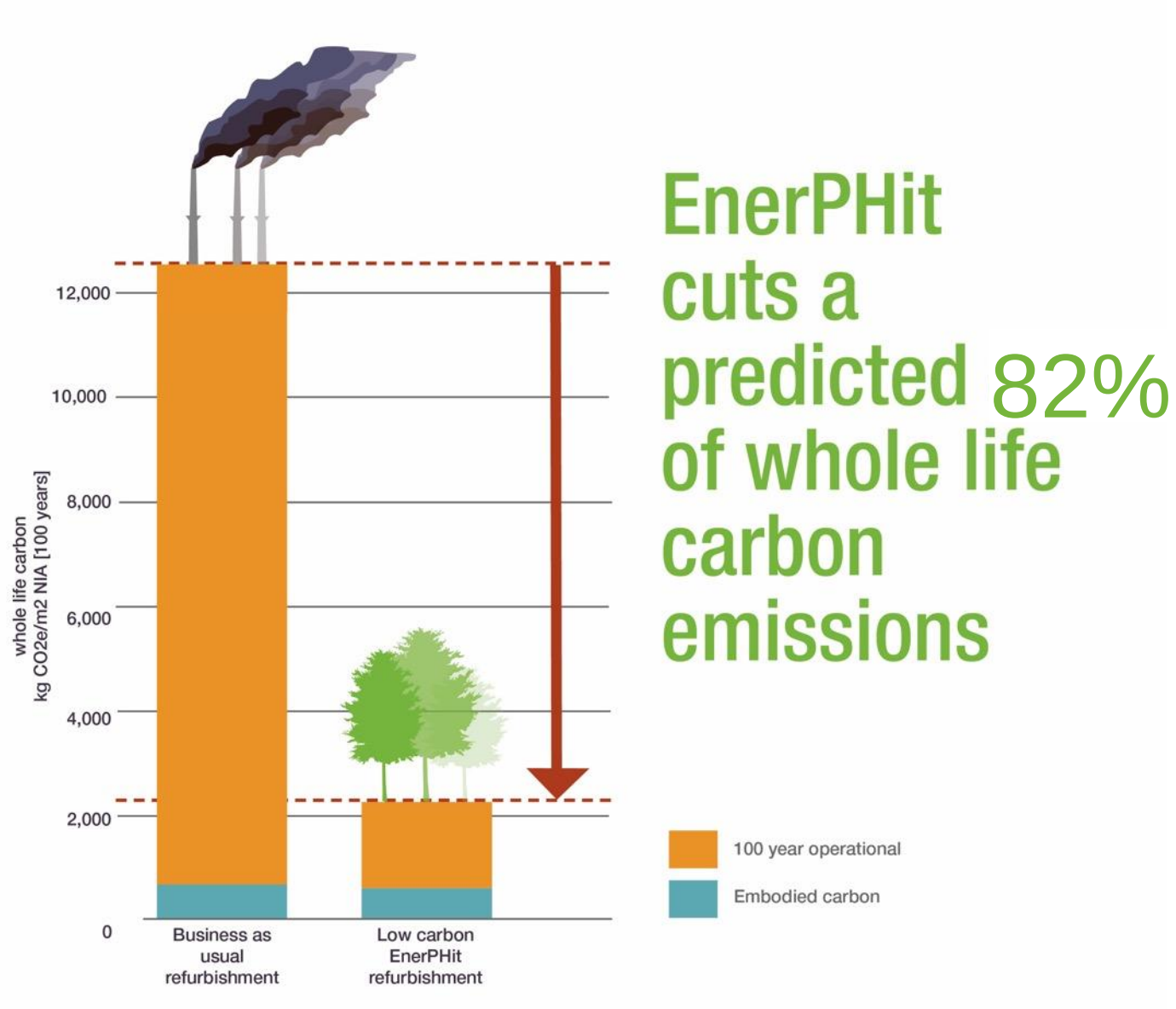
## Entopia / Univ. of Cambridge Institute for Sustainability Leadership

- World class retrofit: EnerPHit, WELL Gold + BREEAM Outstanding
- 82% reduction in whole life carbon
- Predominantly from operational savings

# 3. Existing Buildings

## Entopia / Univ. of Cambridge Institute for Sustainability Leadership

- Whole life carbon modelling
- 82% reduction in whole life carbon
- Most of this in operational carbon due to EnerPHit approach



# 3. Existing Buildings

## Entopia / Univ. of Cambridge Institute for Sustainability Leadership

- Certified EnerPHit in a Conservation area
- Bio-based material focus

# How Can We Help You?

ARCHITYPE/PERFORM+

# Initial Triage Analysis

- Preliminary allocation of retrofit intervention level
- Informed by initial site visits
- Enables indicative holistic reduction outcome
- Degree of risk due to assumptions and base info

## Overview of built estate opportunities

### 4.3 / Site-wide retrofit opportunities

To viably achieve Net Zero Carbon at [redacted] it will be necessary to retrofit the campus extensively. This presents an ideal opportunity to also improve buildings for user comfort, spatial optimisation, and future-proofing for the changing climate we are already experiencing. By considering the architectural merit, age, form, structural type and general construction of each building it is possible to divide the campus into 6 approaches of retrofit:

1/ As Is - 13% of Floor Area
Some buildings on the estate are of such significant architectural merit that proposing alterations is unrealistic. Performance of these buildings can be improved through reconsideration of their seasonal use patterns, and existing heating and cooling solutions / controls.

2/ Re-cladding - 1% of Floor Area
One identified building is structurally sound and of a form and format that is conducive to ongoing use, but the building fabric is poor. It is understood this building will receive additional insulation in forthcoming works, acknowledging that the building may be replaced in due course.

3/ Over-clad (EnerPHit) - 48% of Floor Area
The majority of buildings are of structure, form and building fabric than can be clad over the top of the existing to achieve a very high-performing fabric that could target the EnerPHit standard.

4/ Internal Insulation (towards Enerphit) - 7% of Floor Area
Many buildings carry sufficient architectural merit and site positioning that it is desirable to retain the external appearance, however, internally are suitable for progressive levels of retrofit, and could target the EnerPHit targets for dramatic improvements.

5/ Internal Insulation - 31% of Floor Area
Some buildings are of sufficient architectural merit that it is not desirable to impact the external appearance of them. In these cases thermal efficiency can be improved by providing additional insulation and often secondary glazing to the interior face of the building envelope.

6/ Demolishing
Some buildings on campus are at the end of their useful life, or are not appropriate to retrofit and need demolishing.

| BUILT FABRIC | CAPITAL COST | OPERATIONAL COST | SYSTEM + SERVICES |
|---|---|---|---|
| As is | - | £££ | Controls |
| Re-clad | ££ | ££ | Electrify/Heat network |
| Over-clad | £££ | £ | MVHR |
| Internal Enerphit | £££ | £ | ASHP/MVHR |
| Internal Insulation | £ | ££ | Controls |
| Demolition | ££ | - | - |

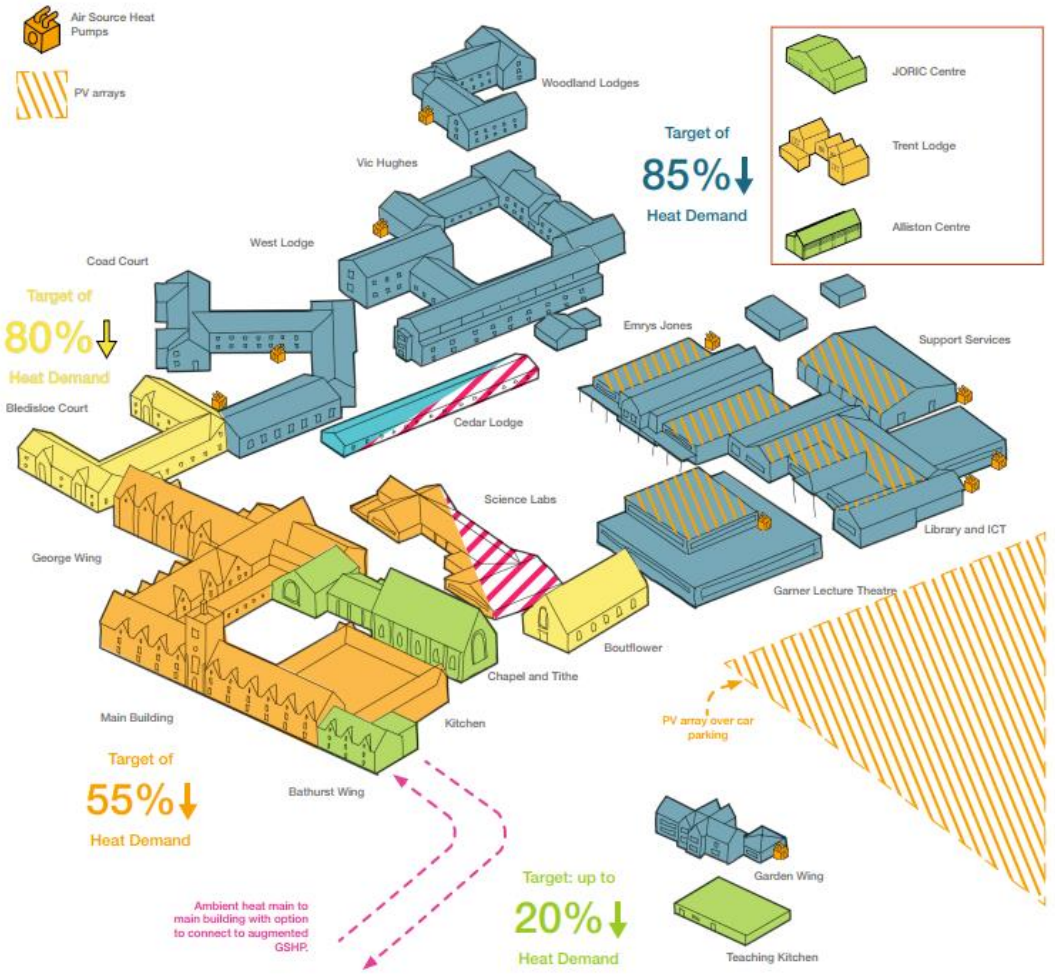
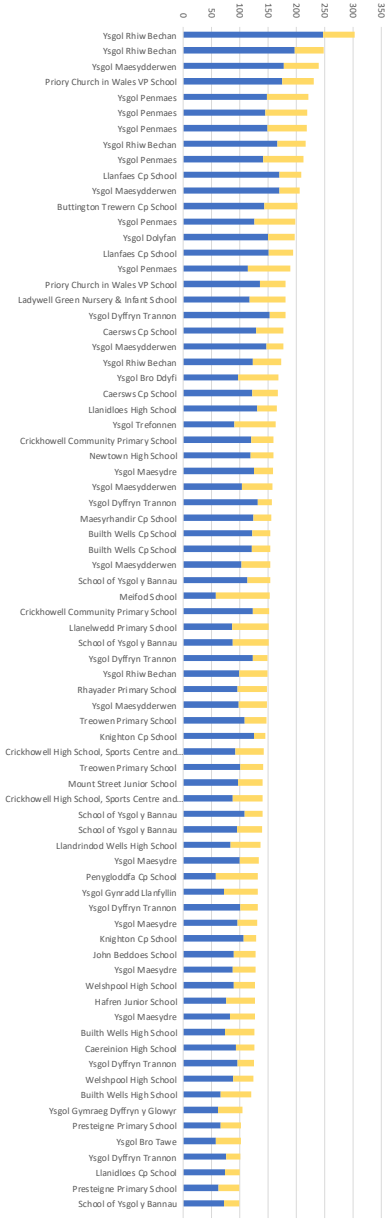
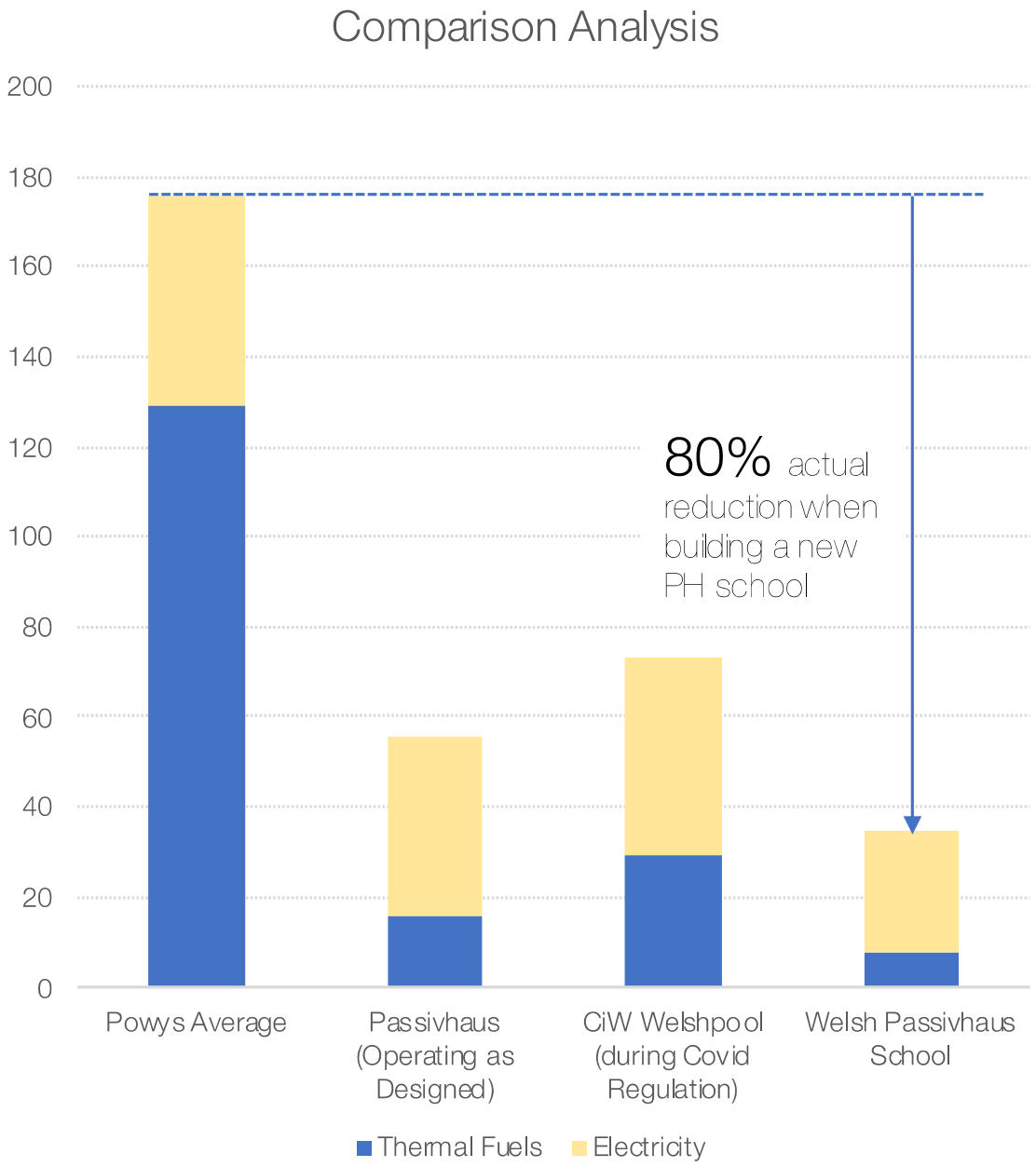



Fig.26 [redacted] Estate Retrofit Opportunities map.

# DEC Comparison of Powys County Council Schools

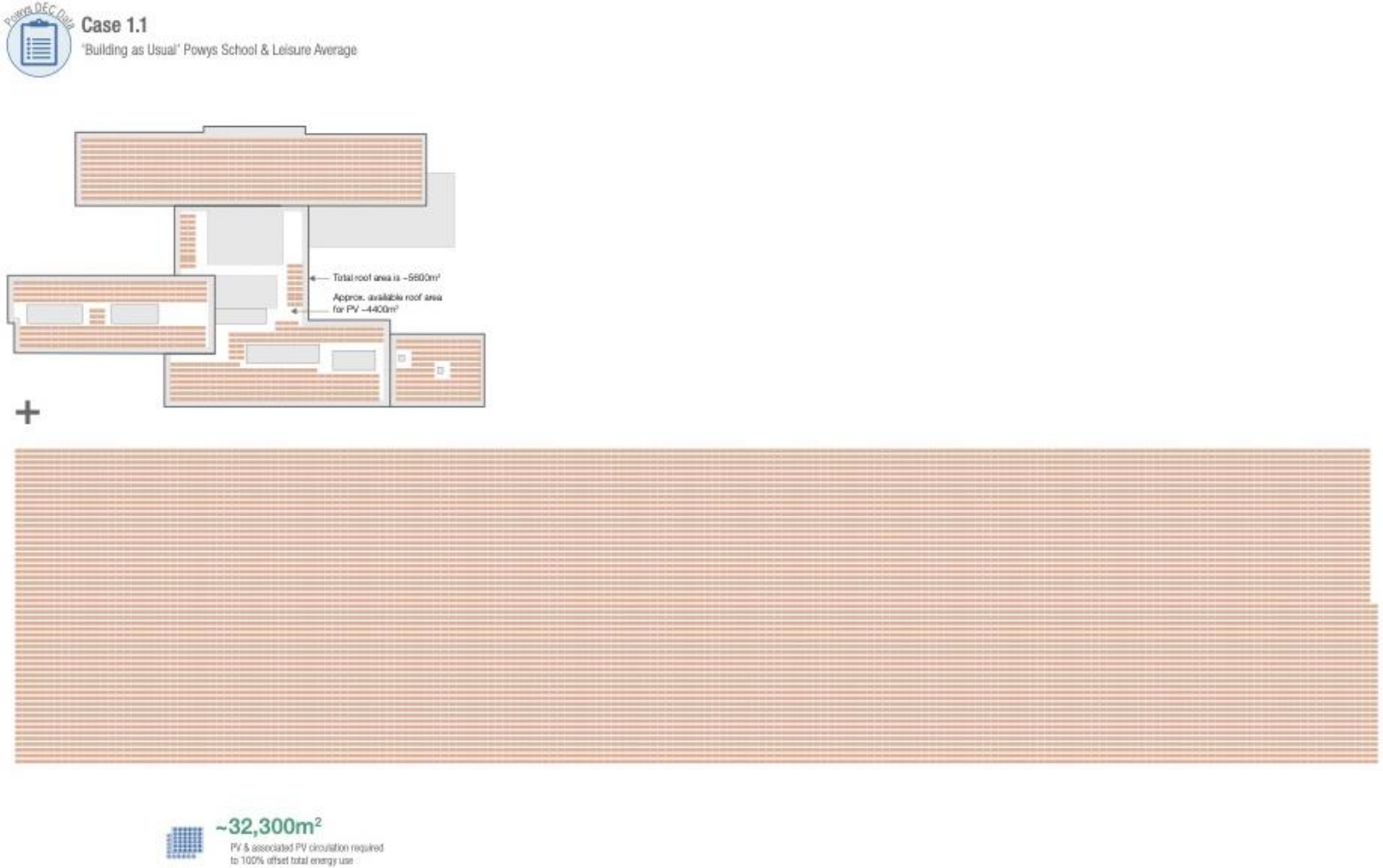
- Passivhaus is the tried + tested route to avoiding performance gaps
- Operational savings apply year-on-year!



# The Dangerous Reliance on Offsetting

- Efficiency must come first before offsetting with PVs
- PVs cost the earth a great deal!




**3.5 million kg** of Carbon Emissions saved by adopting Passivhaus for Ysgol Bro Hyddgen

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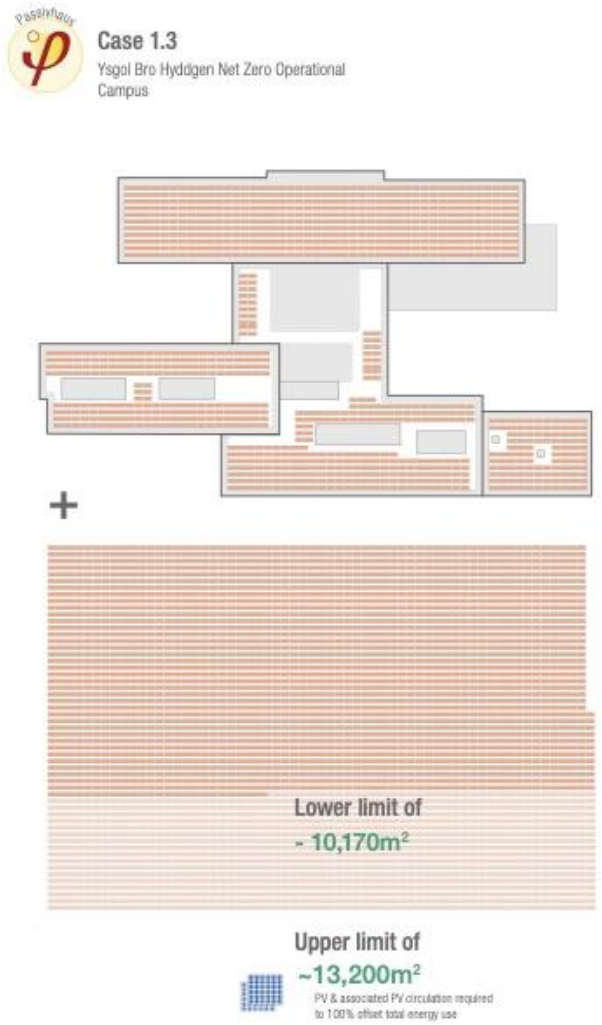



**3.5 million kg** of Carbon Emissions saved by adopting Passivhaus for Ysgol Bro Hyddgen

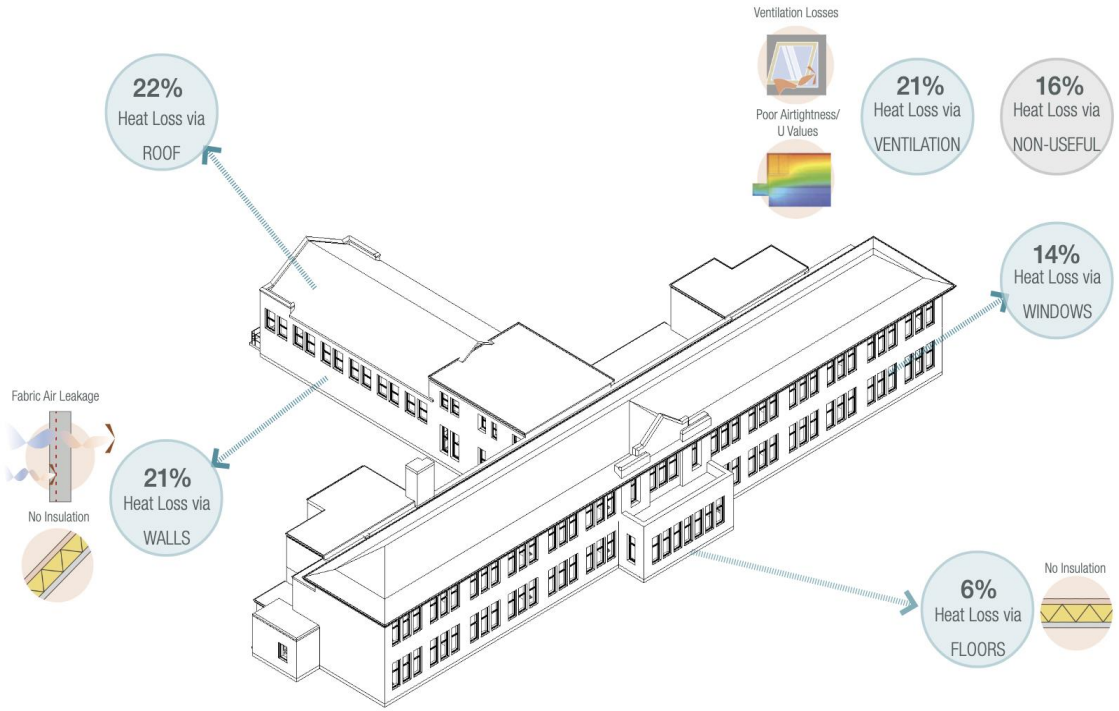
# Estate-wide Strategy

- Retrofit approaches and scenarios appropriate for estate building typologies
- Carbon emissions savings from retrofit of estate building typologies
- Prioritisation of building typologies
- Establish the weighting and performance criteria making for a client's whole estate


# Scope

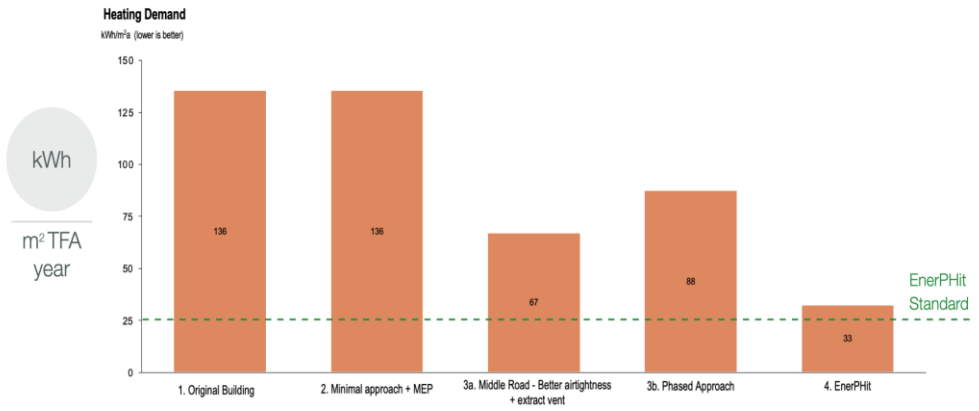
- Analyse existing building condition / performance, including airtightness testing and thermal imaging
- Investigate the potential upgrade of building fabric and services to reduce energy demand and CO2e emissions
- Outline potential levels of retrofit as Options 1-4 of increasing levels of intervention
- Analyse the potential energy demand and CO2e emission reductions as a result of these options
- Analyse lifecycle carbon emissions for each retrofit option based on embodied carbon analysis

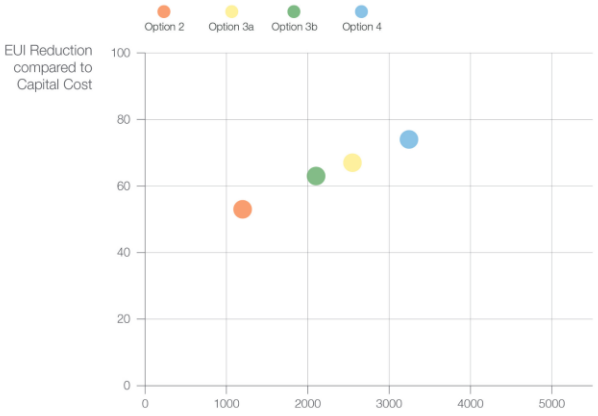
**Example from Hillhead Primary School - Analysis of existing building condition**




Damp damage to existing wall to stairwell

Broken / cracked windows

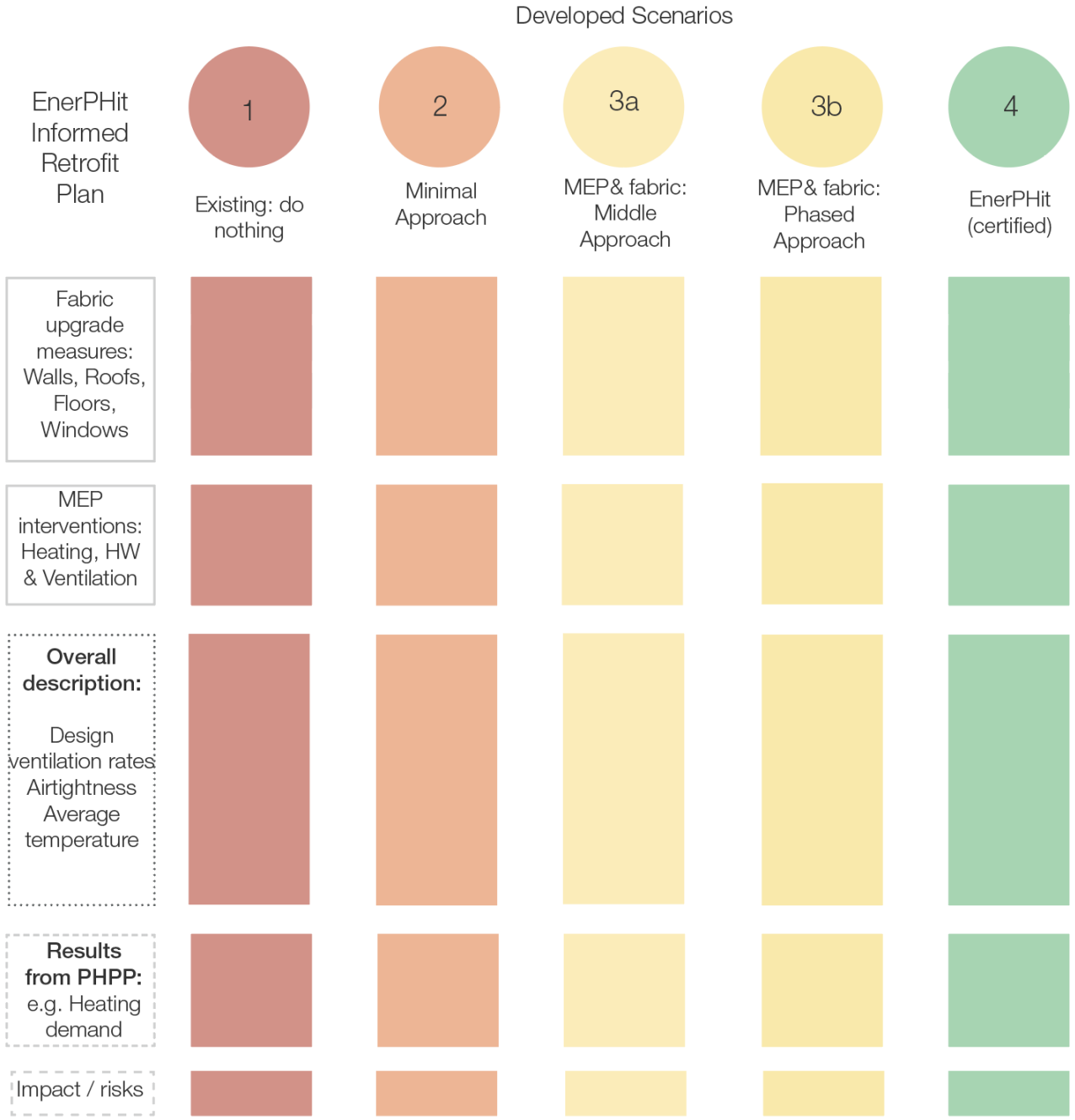


# Output

## EnerPHit Informed Retrofit Plan

- Designed to be phased over 10+ years for optimum efficiencies i.e. sequencing of interventions
- This plan and its proposed upgrades can be overlaid with impending and ongoing maintenance – identifying quick hits, combining and optimising available budgets



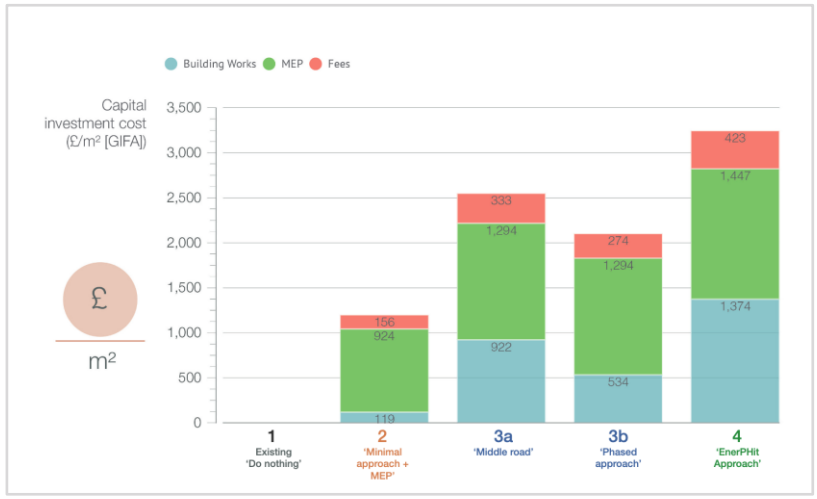
# Output

## Quantitive Analysis

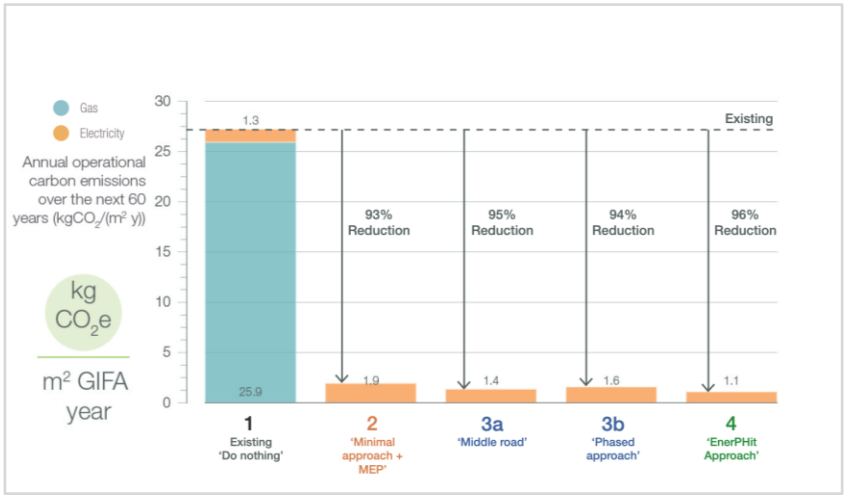
Output for each building:

- Capital cost estimates
- Operational cost reductions
- Carbon emissions reduction
- Heating demand reductions

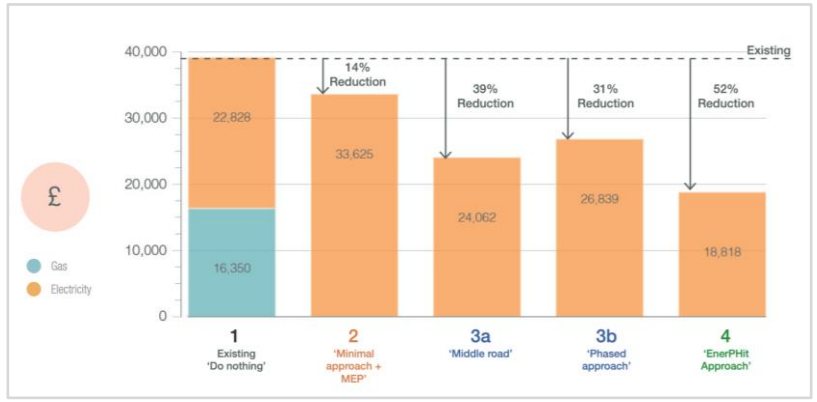
**Examples from Hillhead Primary School Report :**



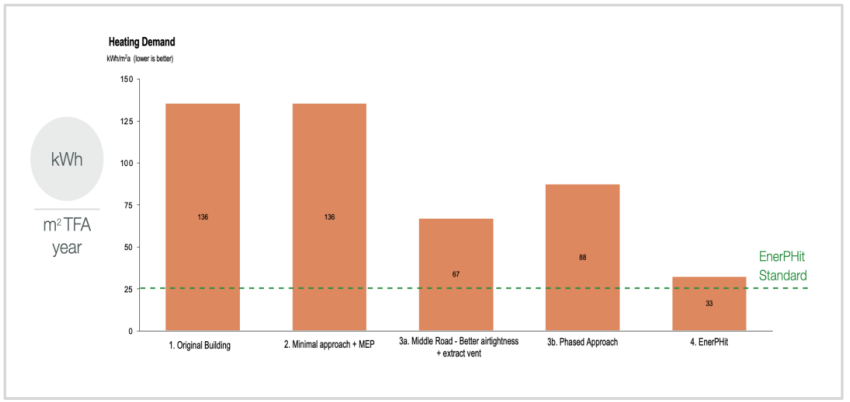

Capital Cost




Carbon emissions




**Operational Cost**




Heat demand

# Lifecycle Carbon

- Level of intervention has impacts on 60-100 year building life for whole life carbon
- Highlights importance of intervention to significantly reduce operational carbon
- Similar trends noticeable across all buildings

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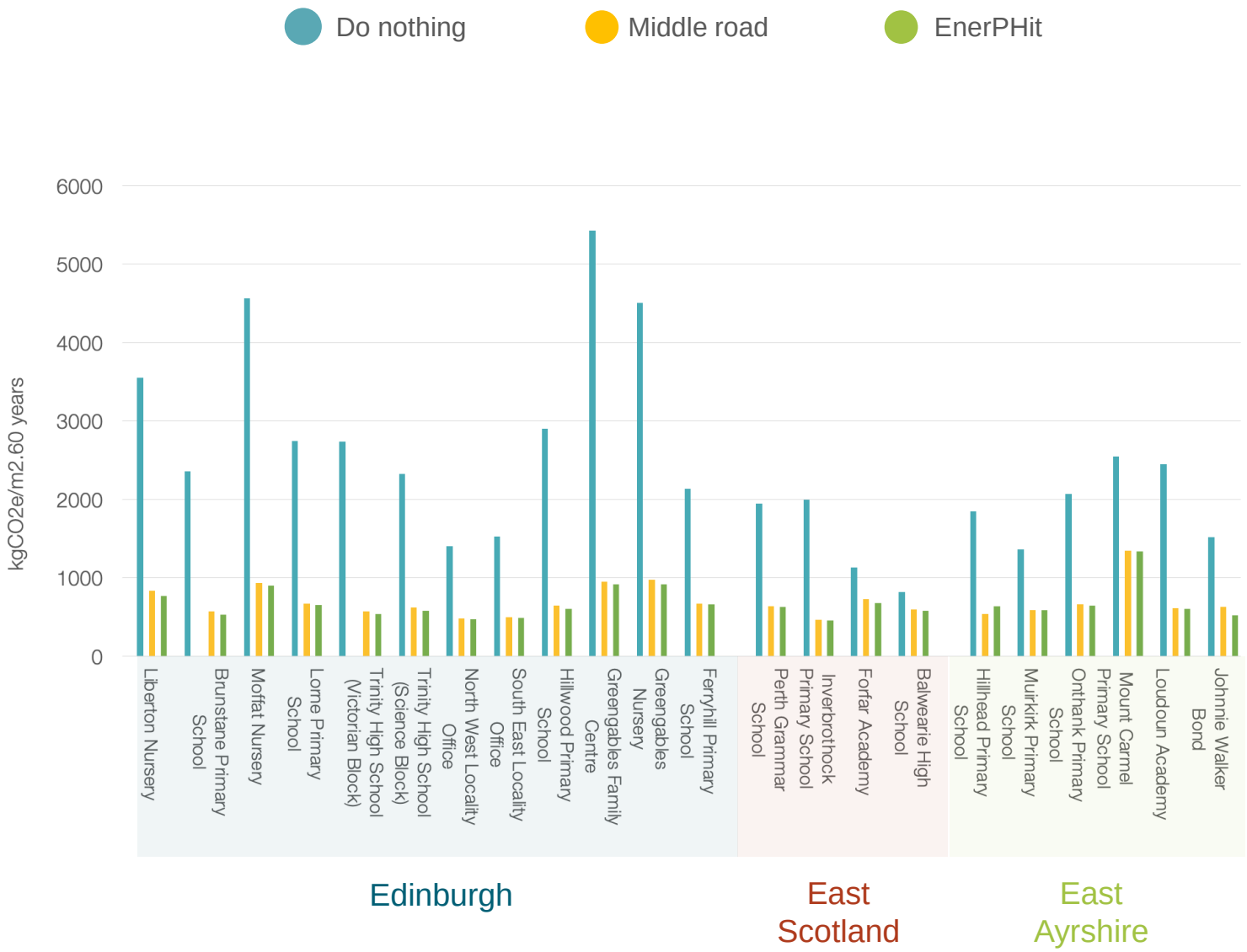
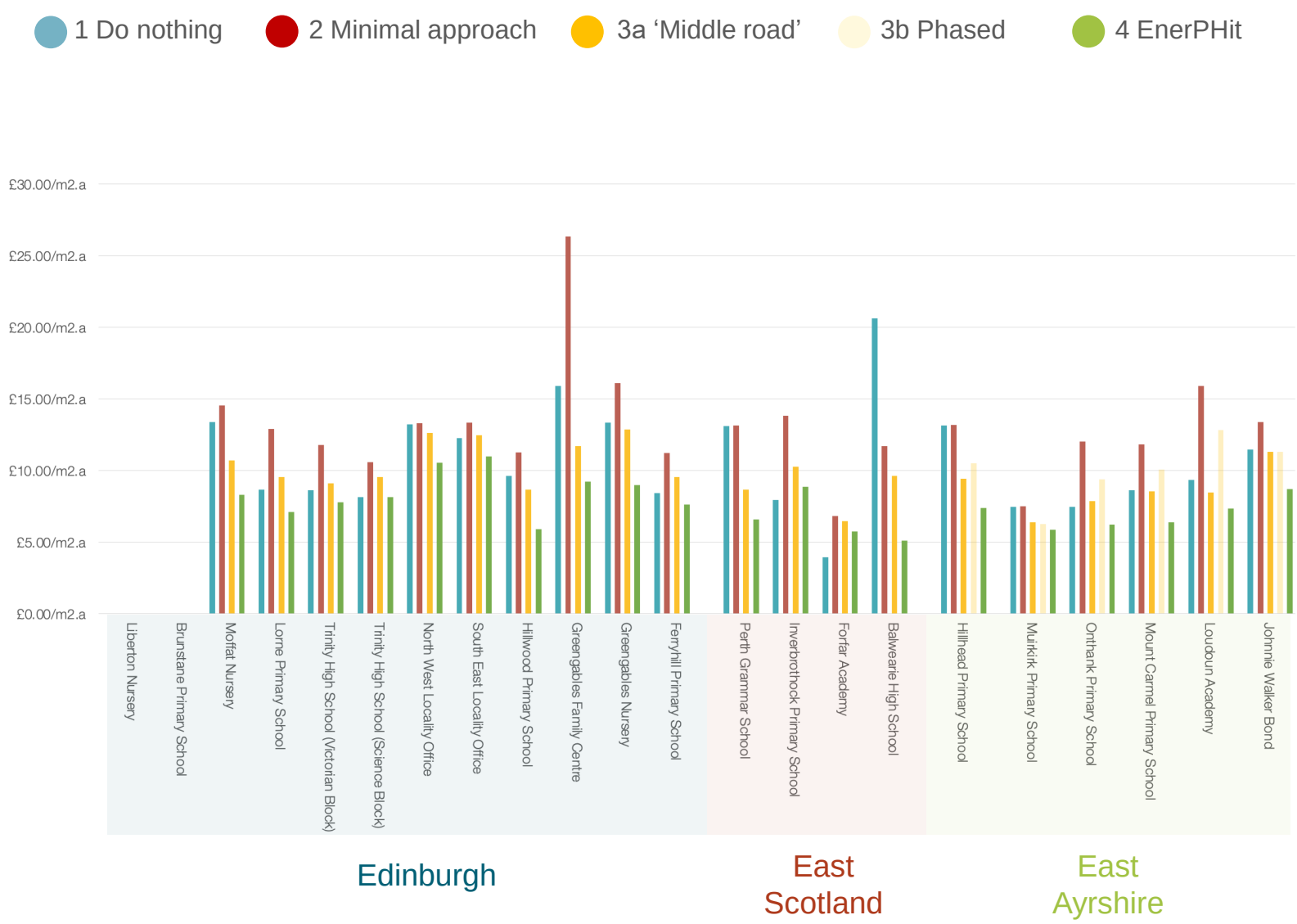


# Operational Cost

- Introducing ASHPs can lead to significant cost increase in some cases
- Highlights need for fabric-first intervention proposed in Options 3-4
- EnerPHit retrofits can reduce annual operational costs by 20-40% in most cases



# Our Approach

*“Making the simple complicated is commonplace.*

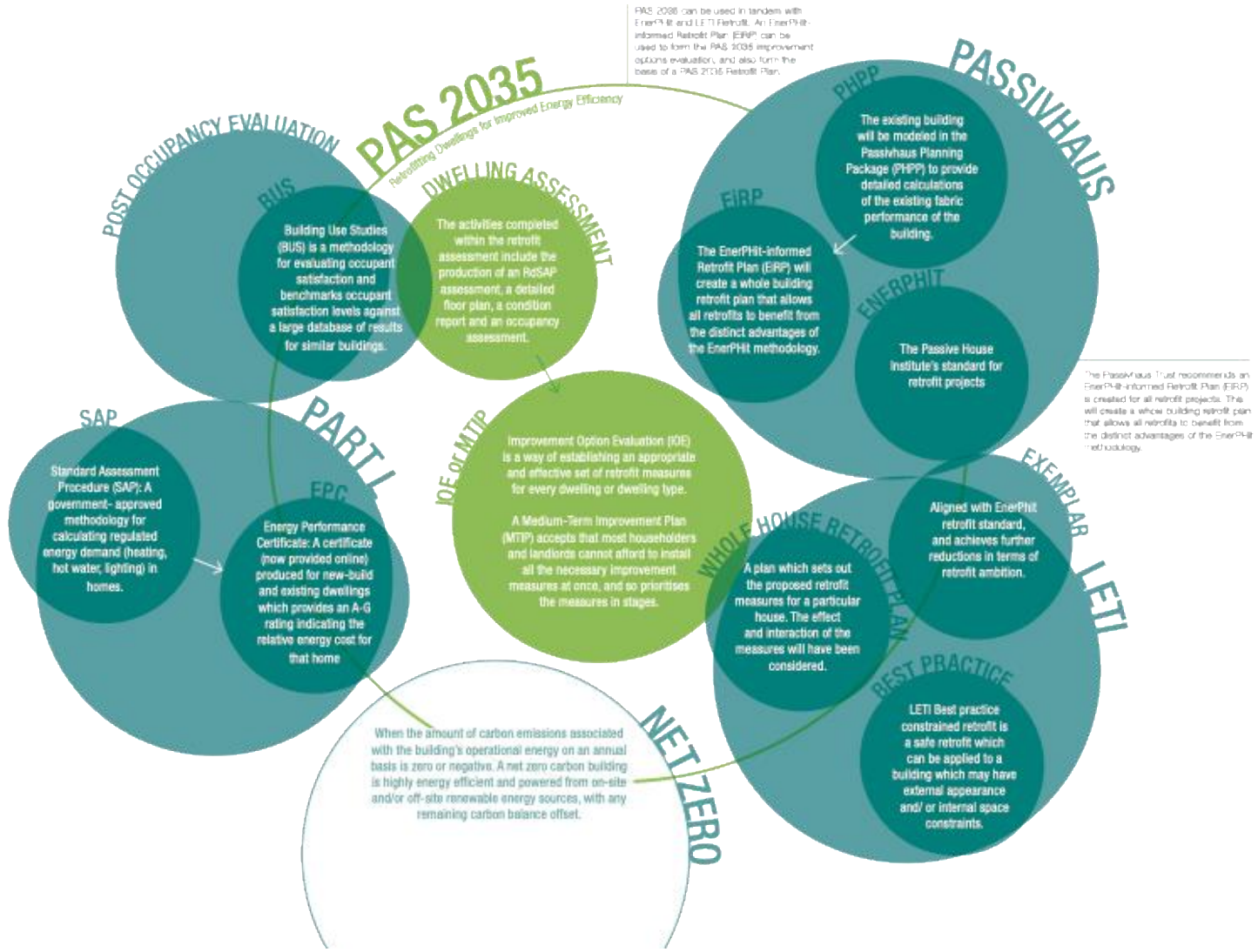
*Making the complicated simple, that's creativity”*

*Charlie Mingus*

Duxford Paper Store
Imperial War Museum

# Recap: Challenges

- Market volatility / cost risk
- Decant costs and disruption
- Difficulty in retrofitting services and insulation
- Perceived lack of return on investment
- Difficulty in holistically assess assets
- ‘Non fabric solutions’ more attractive / easy
- ‘Race to the bottom approach’ on quality
- Hard to anticipate building use & longevity




**Navigating Net Zero Map**

# Solutions


- Invest in early-stage analysis for better cost certainty and understanding
- Focus on longer term view on cost transition to de-carbonization
- Invest in intelligent asset management
- Use outcome-based funding targets
- Focus on fabric-first approach
- Service upgrades still have associated costs, and don’t address demand reduction
- Focus on holistic suitability assessment to feed into a whole estate view

**Estate wide study for The Royal Agricultural University**

# Key Lessons

- There is great opportunity to improve performance, reduce emissions and cut down operational costs
- Early-stage analysis and forensic investigations can achieve best results for both performance and prices
- The cost for fabric-first retrofits is not prohibitive but requires an experienced design team and contractor
- It is possible

**The Enterprise Centre**
**“UK’s Greenest Building”**

# Your next steps?

ARCHITYPE/PERFORM+

# ACHIEVING ZERO CARBON ESTATES

September 2024

ARCHITYPE/PERFORM+

Media Partner

The Herald

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# Refreshments & Exhibition