

Historic Estates – retrofitting to protect our history and preserve our future

Presented by Laura Mansel-Thomas

architecture
building surveying
building services
planning
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sustainability
civil and structural
quantity surveying
project management
CDM and H&S services
Transport and infrastructure

Introduction – Balancing Heritage Conservation with Sustainable Development



- Introduction
- Balancing conservation and modernisation
- Net Zero
- Typical Approach
- Solutions
- Strategic ten year plans
- Examples
- Conclusion

Introduction



IET The Institution of
Engineering and Technology

Who we are.....

Formed in the 1930s, Ingleton Wood is a growing practice which now has over 270 staff and has grown into a multi-disciplinary practice with a wide geographical reach.

The Practice consists of 7 offices; Oxford, Cambridge, London, Billericay, Colchester, Norwich, and Nottingham.

Ingleton Wood has a range of project experience in all building sectors and take pride in our cross discipline value led sustainable approach to low energy and environmental design.



Until recently, I was also CIBSE Vice President and now sit on the Technology Committee and the Accreditation Panel.



BREEAM[®]



Introduction



The Challenge – Balancing Conservation and Modernisation



Typical constraints.....

Retrofitting historic buildings comes with a unique set of challenges and constraints that must be carefully managed to preserve their historical and architectural value while improving their energy efficiency and sustainability.

- Regulatory and compliance issues
- Conservation requirements
- Architectural constraints
- Technological limitations
- Financial constraints
- Thermal performance
- Access and logistics
- Cultural and aesthetic issues
- Environmental considerations

Net Zero Strategy – Why does it matter for historic buildings?

MISSION ZERO

Independent Review
of Net Zero

Rt Hon Chris Skidmore MP



Why is this important.....

The UK public sector is committed to achieving net zero greenhouse gas emissions by 2050, with an interim target of reducing emissions by 78% by 2035 compared to 1990 levels.

In January 2023, Chris Skidmore's independent review Mission Zero: Independent Review of Net Zero stated that

“The UK should continue to show leadership through ambitious public sector decarbonisation by conducting its own trials to ensure alignment with the targets in the Heat and Buildings and Net Zero Strategies”

Net Zero Strategy – Why does it matter for historic buildings?



UK Net Zero Carbon Buildings Standard

Technical Principles

- Informed by climate science (**science-based**)
- Including both **operational and embodied** carbon
- Prioritising **energy efficiency** and **eliminating the performance gap** by using measured performance data
- Prioritising the reuse of **existing** buildings and assets
- Adopting a **whole life carbon** approach
- Enhancing **renewable energy** generation
- Ensuring that buildings are responsive to electricity grid fluctuations

Typical Approach – What are we aiming for?

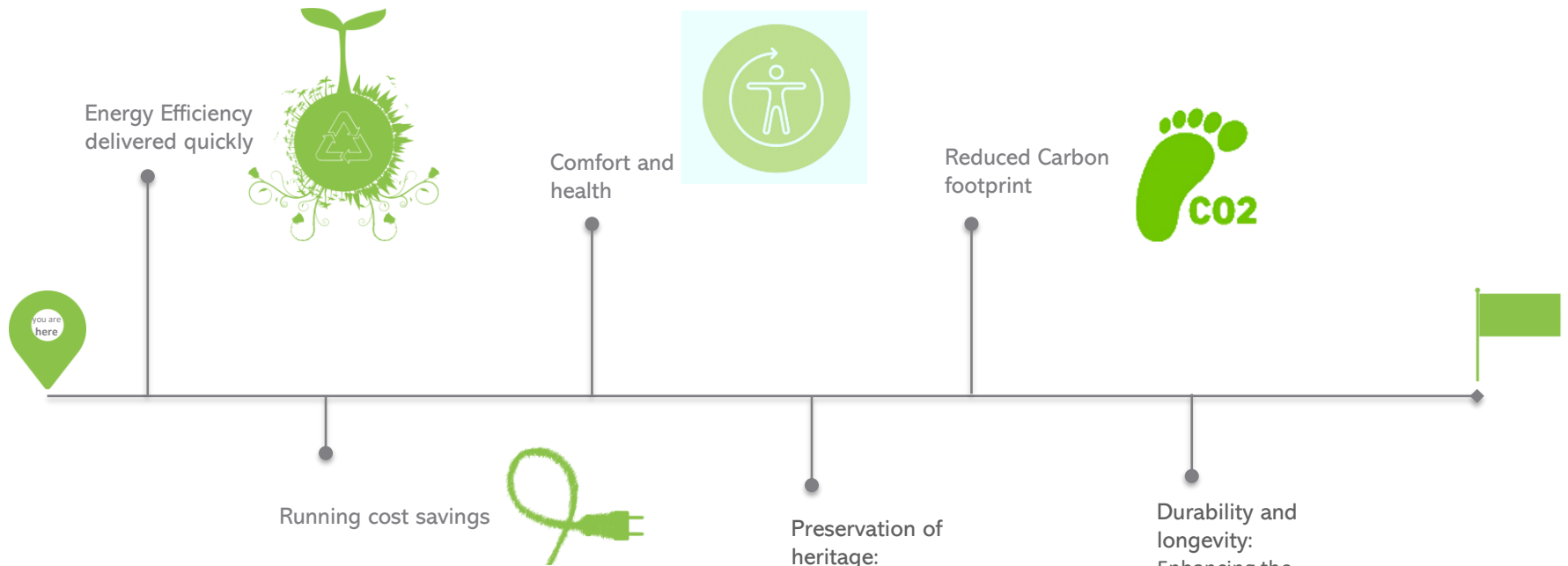
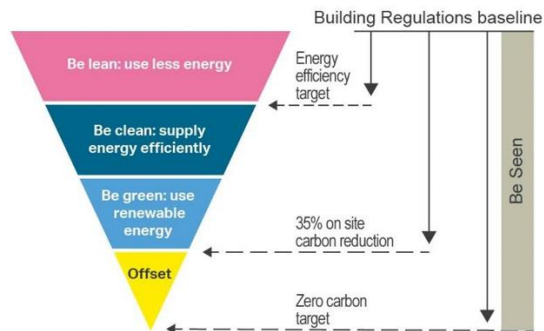


Figure 1: The London Plan energy hierarchy

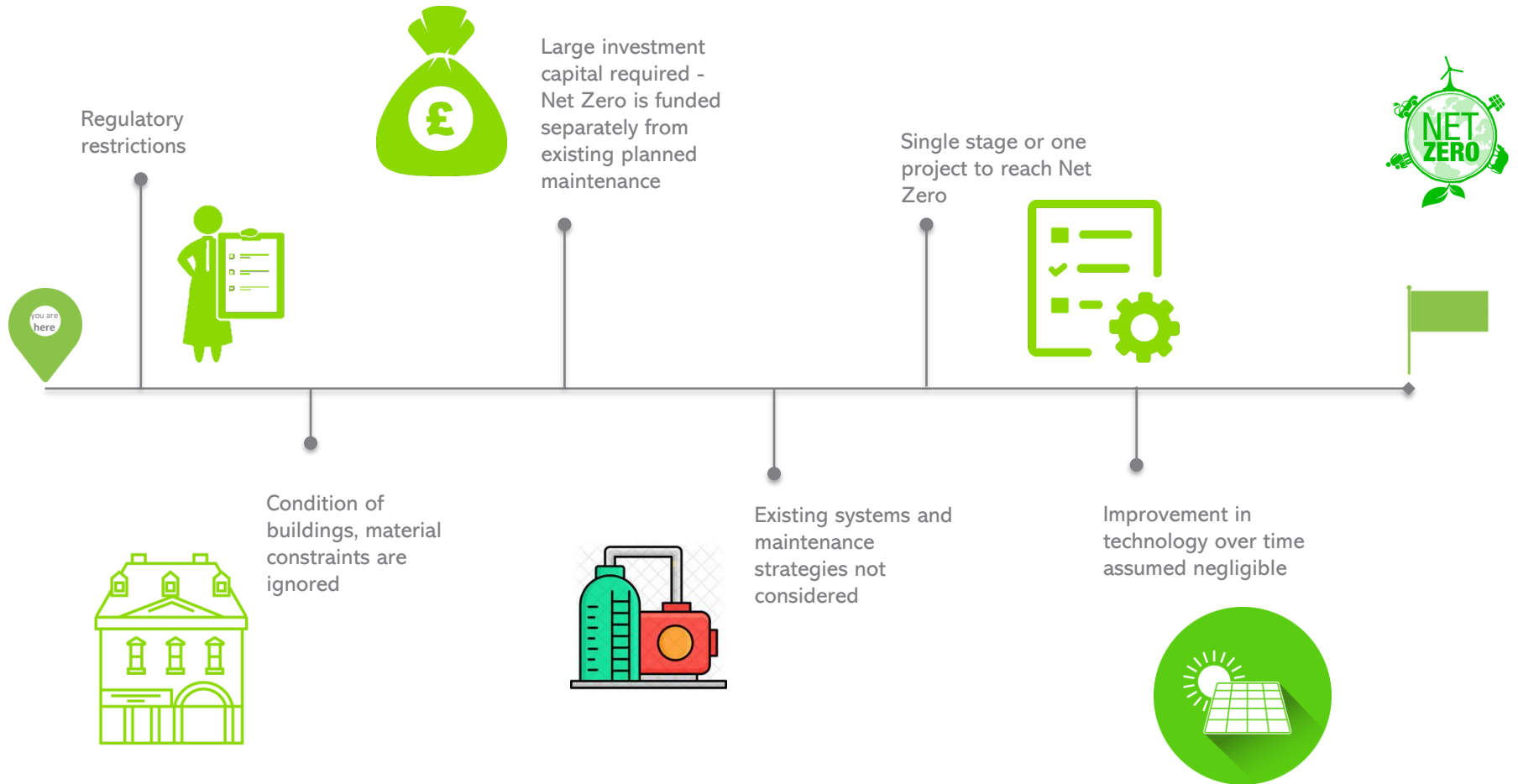


Preservation of heritage:
Careful enhancement of the building fabric can be achieved without altering its historic appearance, maintaining the cultural and architectural integrity.

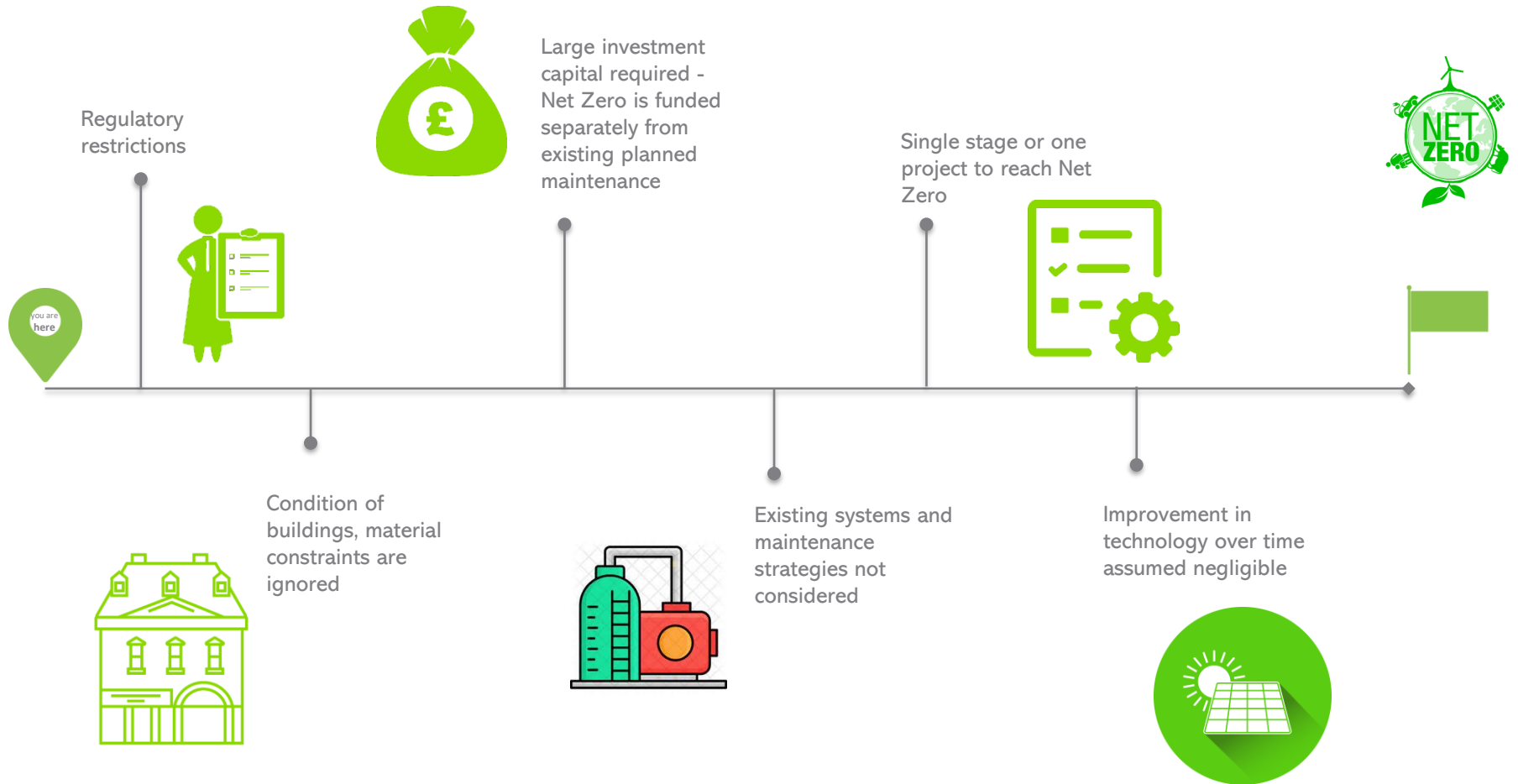
Durability and longevity:
Enhancing the building fabric can protect the structure from weather and environmental damage, extending the lifespan of historic buildings



Typical Approach – Challenges



Typical Approach – Challenges

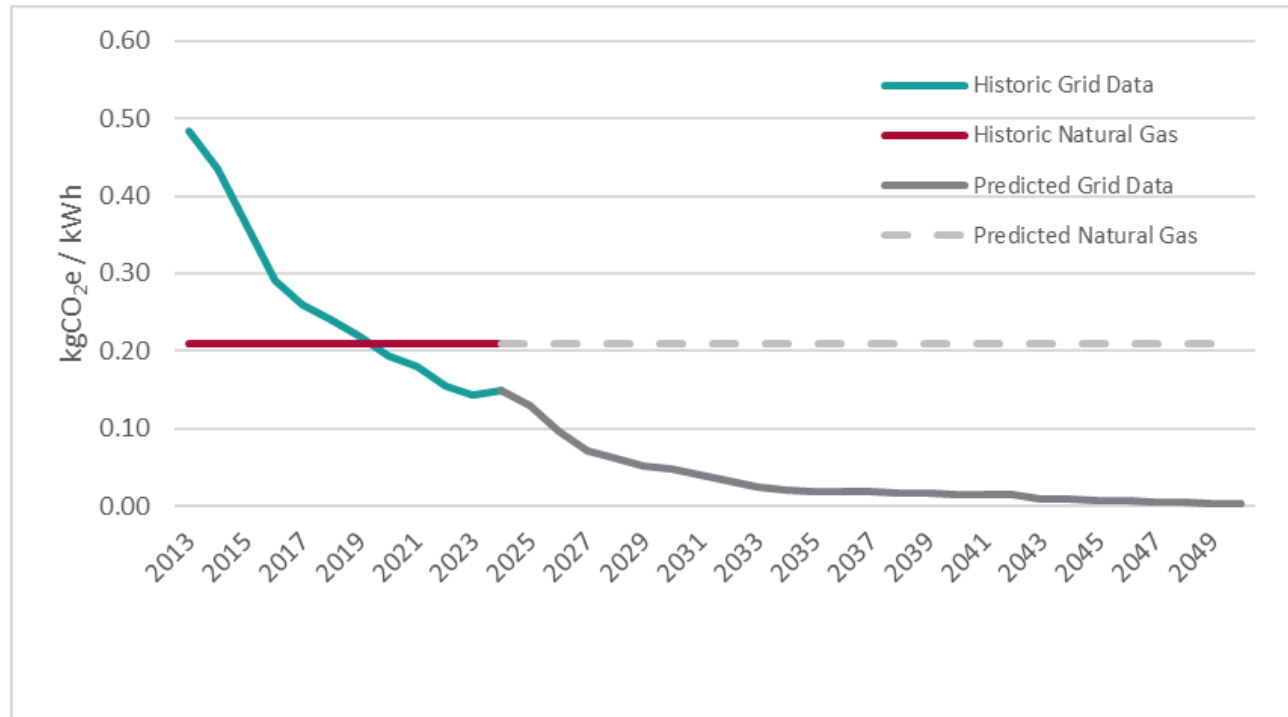


The solution – decarbonisation of the grid



Improvement over time is inevitable.....

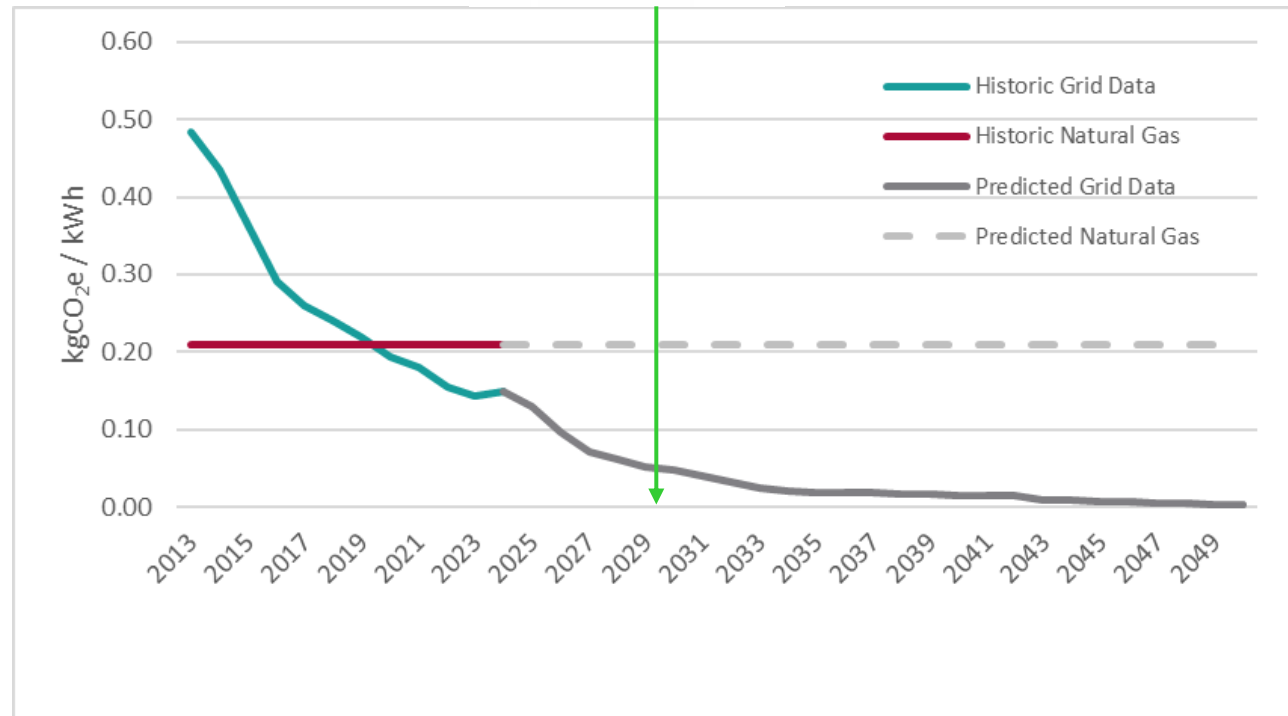
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The solution – decarbonisation of the grid



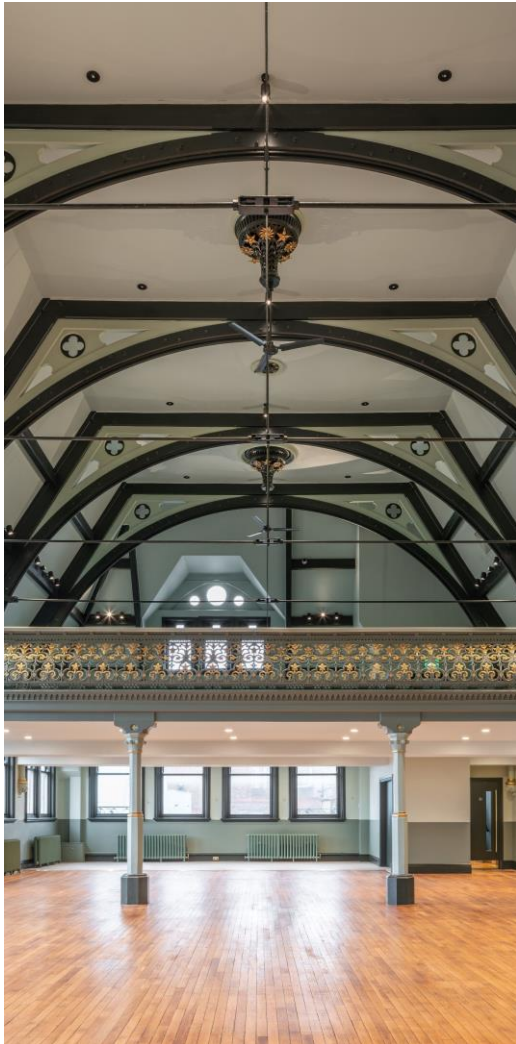
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Improvement over time is inevitable.....

- Lighting
 - Phase out started in 2009 with 100W incandescent lightbulbs
 - Most recently continued with T5 and T8 fluorescent tubes in September 2023
- Refrigerants
 - Phase out of high Global Warming Potential gases
 - Next challenge is R410a, R404... now moving to R32 and others.
 - System changes & higher temperature options become available
 - NZCBS proposes limits on the GWP of refrigerants and a requirement for lead detection.



Ten-year plan.....

- Building Assessment
 - Historical Significance
 - Current Condition
 - Previous Maintenance Records
- Maintenance Strategy
 - Preventative Maintenance
 - Predictive Maintenance: (Using technology such as sensors to predict and address issues before they become serious)
 - Corrective Maintenance
- Energy Efficiency Improvements
 - Insulation Upgrades
 - Window and Door Improvements
 - Upgrades to Heating and Cooling Systems (and Controls)
 - Lighting



The solution – A strategic ten-year plan



Ten-year plan.....

- Material Conservation
 - Compatible materials
 - Traditional repair techniques
- Moisture Management
 - Ventilation systems
 - Moisture damage
 - Moisture acceptance
- Review and Revision
 - Annual reviews
 - Continuous improvement



Ten year Sustainable Maintenance Plan.....

- M&E Maintenance Strategy
- Building Maintenance Strategy
- Site Development and Refurbishment Plans
- Comprehensive Energy Assessments

Reviewed and combined to give...

- Net Zero Carbon Feasibility Study

Remembering to consider...

- Moisture and ventilation management
- Material compatibility
- Stakeholder engagement



Integration with a 10 year maintenance plan.....

- Lifecycle cost analysis
- Establishing upgrade criteria
 - Performance metrics
 - Regulatory compliance
- Holistic phased replacement plan
 - Prioritise upgrades
 - Complementary measures
 - Careful phased approach
- Futureproof design
 - Emerging technologies
 - Anticipate future regs
- Continuous improvement
 - System testing
 - FM training
 - Performance monitoring
 - Occupant feedback

Building Component	Economic Lifespan in years
Decoration	10
Heating Controls	10-15
Plate Heat Exchangers	15
Air Conditioning	15-20
Heating Ancillaries	10-15
Hot Water Tanks	25
Boilers	20-25
Roofs	30-50
Copper Pipework	45
Windows & Doors	25-50

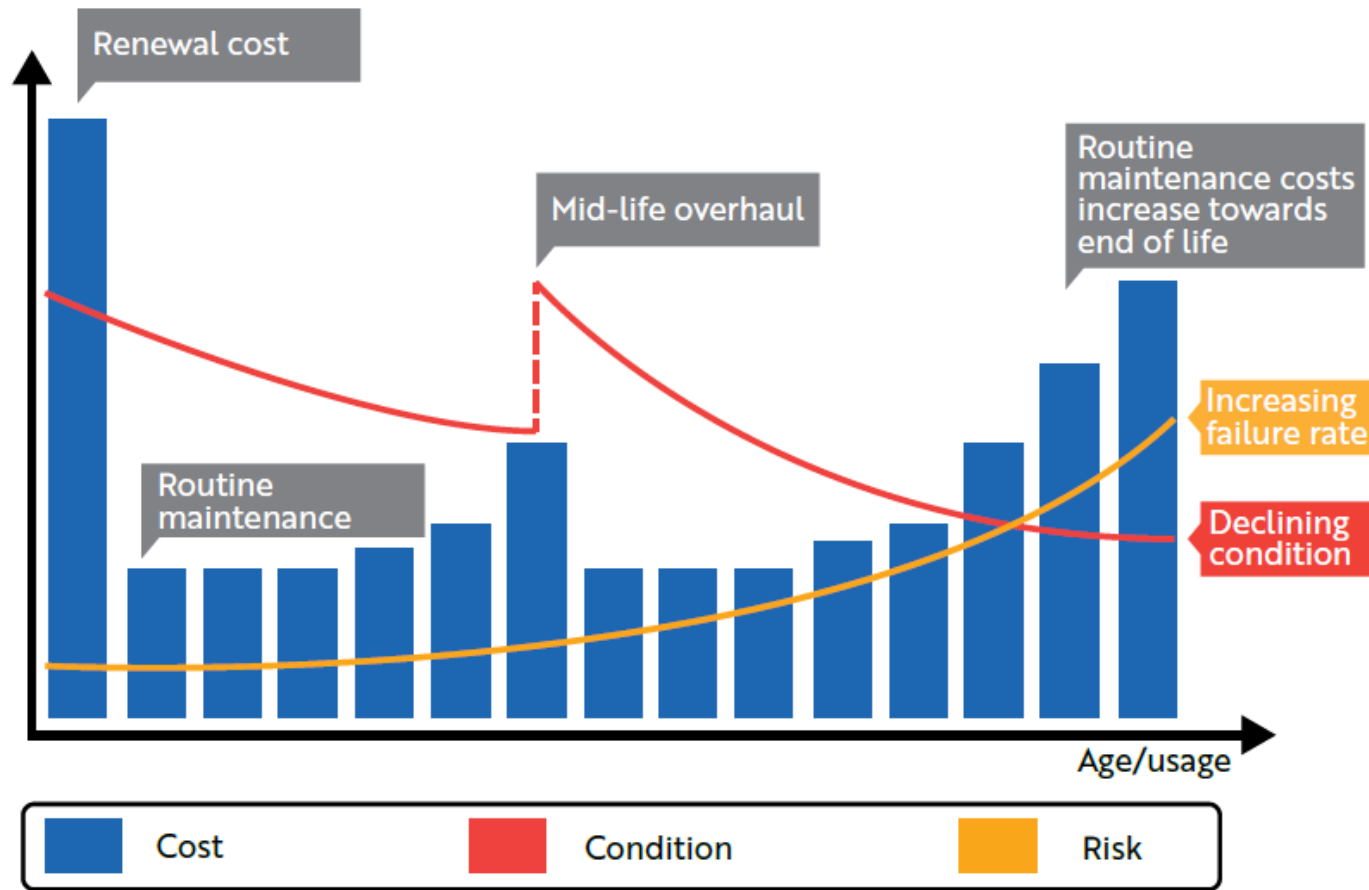
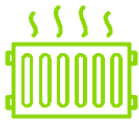


Figure 11.4 Example degradation curve indicating how costs and condition risks inform action triggers (source: Institution of Asset Management)



Ten year Sustainable Maintenance Plan.....

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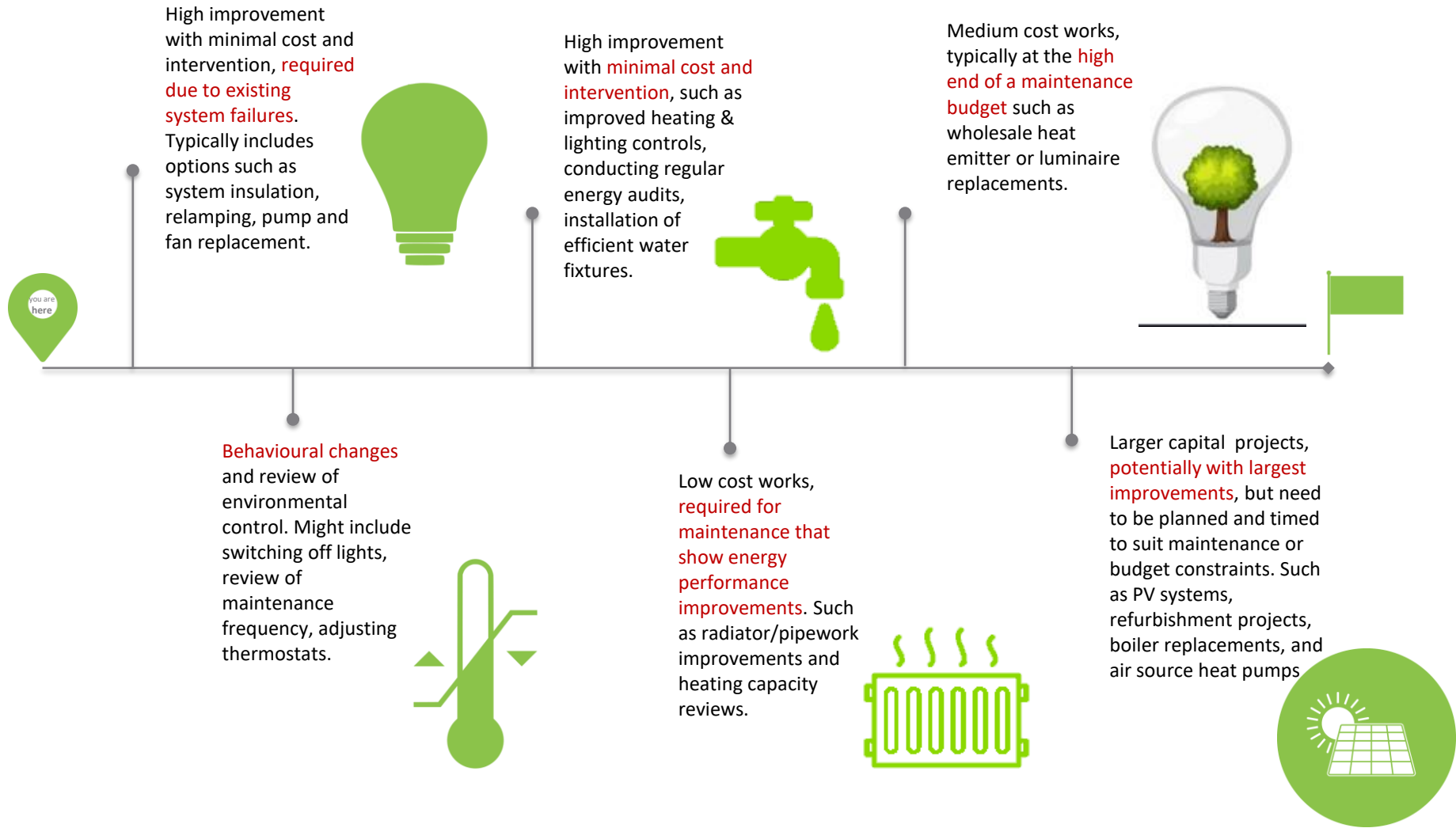
Reinvestment of energy savings – Some technologies are easier to fund raise for, and offer an early impact on energy consumption and carbon emissions

Compounding carbon reduction by starting early – greater gains are available in early years... but will move you towards your 2035 goals, but bring a need to keep control of energy/running costs





The solution – A sustainable refurbishment strategy



The solution – Sustainable Refurbishment



Consider an ongoing M&E maintenance strategy....

Condition (or lack of) pipework insulation is surveyed and documented

Project needs to include:

- Replacement of insulation

Could the project also include:

- Improvement of insulation thickness
- Addition of insulation on valves
- Access improvements



The solution – Sustainable Refurbishment

Consider a building that needs major roof repairs...

Reroofing works are planned in advance and 'seen coming' as far as possible.

Project needs to include:

- Roofing work
- Lightning protection work

Could the project also include:

- Addition of insulation
- Renewable technologies such as solar thermal and PV systems
- Access improvements

Could the scaffold also be used for:

- Glazing repairs or upgrades



Example – Blenheim Palace Orangery



Example – Blenheim Palace Orangery



Solving global challenges one building at a time

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Solving global challenges one building at a time

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The solution – Sustainable Refurbishment

Consider a boiler that is failing and is due for replacement...

Boiler failure is predicted, and replacement works are planned in advance.

Project needs to include:

- Boiler replacement

Could the project also include:

- Update to a lower carbon heat source
- Additional control or zones
- Renewable technologies such as ASHPs
- Heating system upgrades



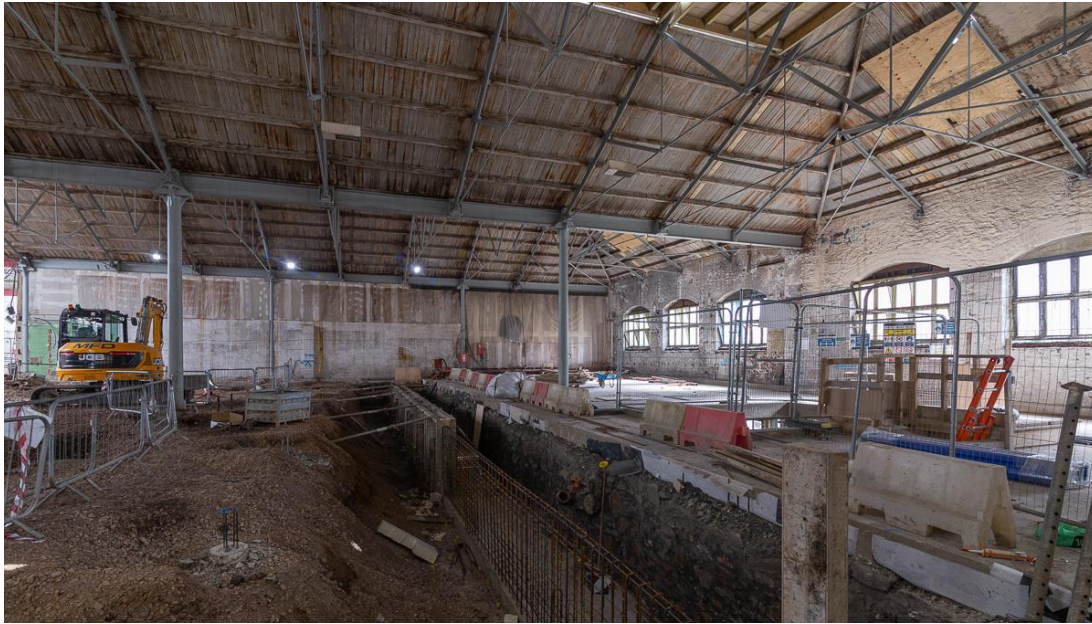
Example – Malvern Council House



Solving global challenges one building at a time

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Example – Swindon Carriage Works



Conclusion



Conclusion

- Develop a targeted 10-year plan
- Take the time to **understand** your estates
- Work with your estates team and selected professionals to **prioritise and optimise** maintenance plans
- Talking through **opportunities** and ‘master planning’ potential
- Asking questions and **challenging presumption**