Figurative BURO HAPPOLD Renew Culture The Theatre Green Book MGAC

Exploring Funding Options for Retrofitting Cultural Buildings

The Path to Net Zero

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Executive Summary

The theatres, galleries and other buildings owned or operated by the UK's cultural organisations are essential national assets. They are also widely energy inefficient, ageing and in need of capital investment. Research commissioned by the Department for Culture, Media and Sport (DCMS) estimates the total value of necessary repair, maintenance and renewal work for public and third-sector cultural infrastructure in England alone is £7 billion – a scale of need that cannot currently be met by public funding alone.

In addition to creating operational challenges, these inefficiencies hinder the sector's ability to meet its own climate goals and align with national, regional and local net zero priorities, including those envisaged in the UK Government's Creative Industries Sector Plan.

Retrofitting is the process of installing modern systems and equipment into existing buildings, primarily to improve their energy efficiency. Retrofitting cultural infrastructure offers significant carbon emission reductions and cost savings, and supports long-term organisational resilience. Retrofits could also help to address funding shortfalls for cultural infrastructure by attracting impact-motivated investment seeking positive social and environmental outcomes, alongside financial returns.

This report provides evidence on real-world energy and cost savings as well as the return on investment (ROI) from cultural retrofitting projects. It also identifies barriers and enablers of project success, to support understanding among cultural organisations, policymakers and funders involved in delivering these projects. Lastly, it explores whether the available returns could support a coordinated, strategic investment approach that could expedite projects and create scale in the level of funding available.

Context

Mixed-economy funding models for the cultural sector are under pressure from both declining public funds and rising costs. Capital funding is dominated by grants and donations, the availability of which is patchy and limited. Loan finance, particularly unsecured (not requiring collateral), is relatively new to the sector. As a result, it is often approached with caution and not widely understood, even though it could align well with retrofit projects that offer predictable cost savings.

Cultural organisations identify large maintenance backlogs, with almost half of arts centres struggling with basic upkeep.

Capital projects tend to be fragmented, bespoke and expensive, and organisational capacity to scope and manage such projects is limited.

The energy price volatility and supply bottlenecks resulting from international conflicts of recent years provide further reminders of the value of investing in demand-reducing technologies. Greater energy independence, reduced usage and transitions to renewables can reduce organisational exposure to such volatility and enable greater cost visibility.

Case Studies

The seven case studies collected for this report represent different building types, retrofit measures, project sizes, cultural subsectors and geographical contexts in England and Wales. The analysis combines real project costs with pre-and post-intervention metered energy costs, rebased to ensure comparability. ROI is calculated using annual cost savings divided by total project cost. Risks and challenges to data integrity can arise in retrofitting projects and are noted at both the broad and project levels.

Common challenges experienced by the case study organisations in cultural retrofit projects include planning uncertainty and the constraints of operating within heritage contexts. The specialist nature of many cultural buildings results in high consultant and construction costs and procurement hurdles. Skill and knowledge gaps within organisations can result in misalignment of projects with goals, while duplication of effort across the sector is significant. Poor funding visibility and high competition are obstacles to long-term strategic planning.

Common benefits identified include significant reductions in carbon emissions and consistent annual energy savings, ranging from moderate to transformative. Interviewees report improved comfort, audience experience and staff wellbeing, as well as enhanced reputations and increased organisational will for future works. Case study organisations have also improved their energy certifications, future-proofed their buildings and reduced the risk of major failures. The high visibility of projects and technologies within cultural organisations may also progress demonstration and acceptability of carbon reduction measures with audiences and other stakeholders.

Conclusions

All case studies achieved measurable energy and carbon reductions. A simple average ROI of approximately 10.7% implies around a 9- to 10-year payback period for interest-free capital, though we note significant variation across a small sample and the need for further investigation.

Among the case studies, solar panel and LED lighting-focused projects show the highest ROIs; complex heritage projects show lower ROIs but deliver essential risk mitigation benefits. Again, further investigation is needed to support these findings.

Insights for Cultural Organisations:

We conclude that energy efficiency retrofit projects provide clear environmental, financial and operational benefits. The case studies suggest even small, low-cost interventions deliver strong returns and build organisational momentum for larger works.

The barriers identified are, however, systemic – fragmented funding and a lack of coordination across the sector – and do not reflect a lack of will. With additional funding, streamlined frameworks and shared learning, the benefits demonstrated in the case study projects could multiply across the UK's cultural estate.

Insights for Policymakers and Funders:

We conclude that there is a clear economic case for retrofitting interventions, with all seven case study projects delivering cost savings, in some cases substantial.

Together, these case studies suggest there exists, at minimum, a subset of retrofit projects – those with payback periods of around 12 years or under, and typically focused on LED lighting, energy efficiency and other targeted interventions – for which repayable finance could be an appropriate funding mechanism. More complex and/or heritage-constrained projects may be suitable for a blended capital approach, combining grant and loan funding.

If designed and engineered to deliver implementation support alongside funding and delivered by an appropriate partnership, a collaborative blended capital financing vehicle could:

- Aggregate demand and diversify risk for investors.
- Provide sector-specific expertise, procurement frameworks and trusted supplier networks.
- Improve data consistency to strengthen future ROI modelling.
- Reduce effort wasted on unsuccessful bids and accelerate project delivery.

A strategic approach to engineering this funding would ensure investment capital could be leveraged alongside grants to narrow the funding gap, as well as expediting and streamlining the work. Such an approach would also provide funders motivated by social, cultural and environmental impact with a sound financial investment that delivers returns on each of these additional axes.

1

Introduction

1. Introduction

Culture is a UK success story, attracting visitors and exporting ideas across the world.[1]

Our extraordinary national infrastructure of cultural organisations, often publicly funded, is vital to maintaining the sector's powerful economic and social impact. However, the physical real estate of this crucial cultural asset base – our venue-based theatres, museums, arts centres, galleries, cinemas – is in urgent need of investment to ensure it is fit for purpose in the context of the climate emergency.

The Department for Culture, Media and Sport Creative Industries Sector Plan highlights the role the creative sector can play in achieving climate goals by aligning with net zero priorities at a local, regional and national level. The UK Government has committed to promoting this role and supporting green initiatives across the sector.[2] Climate commitment from the sector itself is widespread and growing,[3] while the Theatre Green Book conference in November 2025 evidenced significant will behind the movement to decarbonise the cultural built environment.

However, many UK cultural buildings, often high profile, sometimes listed or otherwise architecturally valuable, and essential to their communities,[4] are poor environmental performers.[5] The examples of other large-scale non-domestic buildings suggest our museums, galleries, theatres and other cultural buildings could significantly reduce their carbon footprints and their costs by incorporating retrofitting initiatives into capital projects.[6] The symbolic importance and public visibility of such buildings in communities mean such initiatives may also have the potential to drive wider change.[7]

Retrofitting is the process of installing modern systems and equipment into existing buildings, primarily to improve their energy efficiency or achieve other sustainability goals. It is almost always more environmentally sustainable than demolition and rebuild.[8] Examples of retrofitting initiatives include window upgrades and insulation to reduce energy needs, more efficient systems and controls to reduce energy use, and green installations such as solar PVs and heat pumps to generate energy locally.[9]

The UK Government's DCMS landmark announcement in January 2026 of a £1.5 billion package of capital investment in cultural venues is welcome, providing meaningful support.[10]

The overall cost of upgrading the UK's cultural buildings nonetheless goes well beyond the current reach of government funding or philanthropic donation, in a sector that has historically been unable to generate surpluses or hold reserves against long-term investment of this sort. An additional challenge reported by project partners is that, while the demand for retrofitting works is high, internal capacity to commission and implement them is low.

The challenge looks more manageable, though, when we consider the initial cost against the long-term benefits, particularly in consideration of the increasing proportion of capital that is ***motivated by positive social and environmental outcomes*** alongside financial returns, and seeking investment opportunities that reflect this motivation.[11] Among endowments and family offices, for example, growing momentum is shifting allocations away from commercial investments and towards impact.[12] Investment in sustainability for buildings generates an environmental return in the form of carbon emission reduction and, crucially, a financial return in the form of energy cost savings.

This long-term cashflow profile, particularly alongside the carbon emission reductions and long-term sustainability improvements, provides an investment case for retrofitting work of this sort.

Harnessing motivated capital and using the financial return from energy cost savings as a return on investment will enable public funding to attract significant additional leverage and deliver results more quickly and efficiently.

Through case studies of environmental retrofit projects undertaken by seven cultural organisations, this report aims to explore and evidence the potential cost savings, investigate the potential for those savings to be used to service loans, and serve as a first step towards understanding the optimal structure of any finance solution. We also seek to highlight the barriers to and benefits of coordinated action across the cultural sector.

We see this work as relevant to a broad audience, including, but not limited to:

- Cultural organisations and practitioners
- Public arts and cultural funders
- Policymakers
- Trusts and foundations
- High net worth individuals and institutional investors motivated by carbon reduction

We aim to illustrate the overlapping interests of these stakeholders, and the opportunities for collaboration and innovation.

It is worth noting that securing the case studies was a significantly more time-consuming process than the project partners expected. From this, we surmise that there is huge potential to drive additional value through more coordination, shared learning, collaboration and collective action on this topic within the cultural sector as a whole, including among the funding organisations, public and private, that so far support the vast majority of capital projects incorporating retrofit measures within the cultural sector.

Additional examples of retrofit projects within the broader cultural and creative sector, such as at Muncaster Castle and Glasgow Film Theatre, were brought to our attention as we completed the study, and we have no doubt that there is much activity of which we are not yet aware.

Further efforts to collect and document retrofitting activity in the sector are crucial, and the authors would be keen to connect and collaborate with anyone working in this area.

1.1 Research Partners and Case Study Organisations

This research project was conceived by Figurative, a new, independent charity dedicated to supporting impact, investment and innovation in the cultural and creative sector, in partnership with Renew Culture, the organisation behind Theatre Green Book and Arts Green Book; Buro Happold, engineering and sustainability consultants; and MGAC, building consultants and quantity surveyors.

Figurative conducted qualitative case study interviews and led report authorship. Theatre Green Book provided overall expertise, insight and guidance. Buro Happold worked with the case study organisations to understand the environmental and economic impact of the retrofitting interventions. MGAC validated and rebased the collected data to generate accurate and comparable ROI calculations.

This report was co-commissioned and jointly developed by Arts Council England and the Creative Industries Policy and Evidence Centre (Creative PEC).

Julie's Bicycle reviewed and concurred with the findings and provided additional insights based on experience and work with the sector on energy, decarbonisation and capital projects and investment. The report is also endorsed by Gallery Climate Coalition, the British Film Institute and The Linbury Trust.

The authors are deeply grateful to all the organisations who committed their time and resources to the report, particularly our seven case study organisations: Space Studios, Milton Keynes Theatre, The Lowry, Russell-Cotes Art Gallery and Museum, Oxford Playhouse, Wales Millennium Centre and Chichester Festival Theatre.

About Arts Council England

Arts Council England is the national development agency for creativity and culture. Between 2023 and 2026 we will have invested over £467 million of public money from Government, alongside an estimated £250 million each year from The National Lottery, to support individual practitioners, arts organisations, museums and libraries, and to help ensure that people in every part of the country have access to culture and creativity in the places where they live.
Visit our website to learn more about our work: **artscouncil.org.uk**

About Creative PEC

The Creative Industries Policy and Evidence Centre (Creative PEC) works to support the growth of the UK's creative industries through the production of independent and authoritative evidence and policy advice. Creative PEC is led by Newcastle University with the Royal Society of Arts and funded by the Arts and Humanities Research Council.
For more details visit: **www.pec.ac.uk.**

About Figurative

Figurative is an independent charity (Registered No.1214130) dedicated to impact, investment and innovation in the cultural and creative sector. As a global expert in impact investment for arts and culture, it specialises in raising and managing impact funds and attracting new philanthropy into the sector. It conducts and supports research to make the case for impact investment and continuing innovation in the sector to funders, policymakers and the public. It also provides advisory services to support organisations and funders with impact and funding models, and helps international peers to achieve their goals.
See more at: **figurative.org.uk**.

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2

Methodology

2. Methodology

This report explores the capital costs, resultant energy and carbon savings, and potential for return on investment of a variety of sustainable refurbishments and retrofits of buildings owned or operated by cultural organisations of varied types in England and Wales.

Though this report is co-commissioned by Arts Council England, the remit of Creative PEC is UK-wide. We looked for case studies across the UK but did not find suitable ones in either Scotland or Northern Ireland, although the example of Glasgow Film Theatre was brought to our attention as we completed the study.

We focus on energy as the most significant impact area for cultural organisations, accounting for 54% of total reported emissions in self-reported data from 591 of Arts Council England's National Portfolio Organisations, for example.[13]

Minimal studies exist on the financial benefits associated with energy-efficient retrofits and upgrades within the cultural sector. Those we were able to find are outdated,[14] or are for building types that are not broadly applicable to the sector.[15] Most studies focus primarily on projected carbon savings based on theoretical energy use and cost data. This study aims to reinforce that analysis with examples of retrofit works undertaken within the last five years, to assess the effectiveness of these measures in real-world scenarios.

It uses real-world project costs and energy data to help provide a practical assessment of the measures capable of saving both carbon emissions and costs in the long term.

The project consortium drew on existing networks of funders and cultural organisations to identify seven case study scenarios that represent a range of institution typologies as well as a variety of different common retrofit technologies implemented within the sector. The case studies were also selected to represent different scales of retrofit investment and geographical locations.

The selected cultural organisations were asked to volunteer information about recent retrofits they had undertaken in their buildings. Each also supplied data on their energy consumption both before and after various measures were implemented so an assessment could be made on the effectiveness of each sustainable intervention. This data was then mapped using industry best practice benchmarks to ascertain the breakdown of energy and cost savings and relative ROI for each measure.

The aim of the calculation was to provide an indication of when a retrofit project would pay for itself on a purely financial basis. The resulting metric is indicative, and clearly represents only one dimension of the benefits of retrofitting a building. Energy prices move, and organisations fix their energy costs to different extents, so the costs have been rebased to ensure fair comparison on this basis across the projects.

For each project, we took the annual energy cost savings as measured and divided these by the cost of the project. This provided a basic average annual ROI for the years measured.

Total project capital cost

For each of the case studies, the organisations concerned provided the capital cost of implementing their specific carbon reduction measures. This included any direct consequential costs such as professional fees and other relevant costs; for example, if an electrical connection had to be increased in size to enable an upgrade to an all-electric system.

Once verified, the costs were updated to a common base date. This was done using MGAC's tender price index, an index that shows how the costs of materials, labour and other construction-related expenses change over time. The costs were updated to December 2025.

The costs were then also adjusted to a Greater London location. This was done using MGAC's location index, which shows the regional discrepancies in the cost of construction work.

Running costs - annual cost savings

The methodology was to measure the building's energy usage (through the examination of its utility bills) before the implementation of any specific carbon reduction measures, to give a baseline measure of energy usage. Similarly, the building's energy usage was measured after the implementation of any specific carbon reduction measures (through the examination of its utility bills) so that a comparison could be made against the baseline position. A consistent rate/kw was applied, to moderate the impact of energy price volatility over the last few years.

Return on investment = annual cost savings / total project capital cost

Return on investment could be translated into a simple payback period by taking a reciprocal, to show how many years the savings would have to sustain in order to aggregate the total amount spent on the project. Again, this is indicative, as realised cash savings would be contingent on other variable costs.

Payback period = total project cost / annual cost savings = 1 / Return on investment

A brief description of the data source and time period used is provided in each case study, along with any other relevant information. Where not otherwise stated, data was sourced directly from building energy records supplied by the case study organisations.

2.1 Risks and Challenges to Data

Several risks and challenges to data management and integrity can arise in retrofitting projects. The complexity of integrating new systems such as building management systems (BMSs) with existing infrastructure can lead to data inconsistencies and integration issues. The accuracy of data collected from older buildings may also be compromised by outdated or incomplete records, making it difficult to establish a reliable baseline for energy performance. Finally, the process of upgrading building fabric and services often involves multiple stakeholders, which can result in fragmented data collection and communication gaps. Ensuring data governance and standardisation across all phases of projects is crucial to mitigating these risks.

Specific risks and challenges to the collected data are noted in each case study.

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3

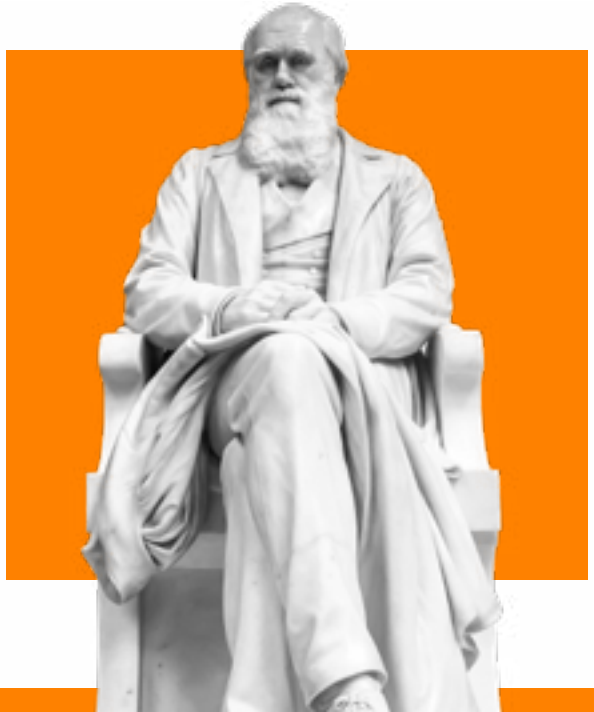
Context

3 Context

3.1 Organisational and Sector Context

Many cultural organisations in the UK carry an expensive backlog of overdue building works, from roof replacement to services upgrades.

DCMS research estimates the total value of necessary repair, maintenance and renewal work for public and third-sector cultural infrastructure in England alone is £7 billion, of which £3 billion is urgent (needs to be completed within the next five years).[16] A study of 90 UK arts centres published in May 2025 found over three quarters are unable to carry out planned work, while almost half reported difficulties with standard operational maintenance.[17] For many, these issues have the potential to be existential, particularly in financially straitened times: building failures close shows. Refurbishment is an essential prerequisite for business resilience.



At the same time, UK cultural organisations are embedding sustainability, seeking to tackle their carbon impacts and engaging audiences and stakeholders around climate change.[18] However, inefficient buildings are a challenge to these ambitions. In a museum sector case study analysis conducted by Arts Green Book, 40% of museum buildings had average or below average Display Energy Certificate (DEC) operational ratings, while annual emissions for the 251 surveyed venues in total equated to those generated by 21,500 UK households.[19] This inefficiency also means energy price volatility can have an outsize impact on organisational budgets.

A focus on energy-efficient and sustainable upgrades fulfils two vital needs simultaneously: addressing the maintenance backlog while supporting cultural organisations to achieve their sustainability goals, align with net zero targets and increase their energy independence. For example, many sustainability capital projects require an upgrade to roof insulation (simultaneously repairing failing roofs), and to heating and cooling systems (also replacing inefficient old boilers).

However, challenges around capacity within cultural organisations often mean capital works go ahead without being optimised for retrofit potential, sometimes even creating headwinds to decarbonisation goals, for example by replacing existing gas central heating.

More broadly, capital projects present numerous specific challenges for cultural organisations:

- Investment is split across many small (in construction terms) and bespoke capital projects.
- Availability of funding for capital projects is uncertain and unclear: funding streams can be uneven and specific, and difficult to align with long-term strategic planning. (See tables 1-3, page references.)
- More projects are developed than can be funded, with money wasted on the design and development of projects that don't progress.
- The funding process can be debilitating; cultural organisations wrestle with a confusion of overlapping requirements for different information.
- While funders aim to take a user-centred approach, organisations may prioritise projects that match funding criteria.
- Cultural organisations often lack both capital project experience and research and development funds, resulting in projects that do not always match organisational priorities.

The experience of Buro Happold and Julie's Bicycle suggests such projects, in common with many complex and bespoke projects for specialist buildings, have historically shown a profile of relatively high professional fees, construction preliminaries and other overheads. In addition, much research and development work has been duplicated across broadly similar small projects, while a lack of strategic coordination and alignment means money may not be productively allocated across projects at the sector level.

In the face of the climate crisis, the UK cultural sector's investment deficit requires us to eliminate as much waste as possible from these processes.

To maximise the return on overall investment, it is important to streamline projects and ensure that development costs are managed as efficiently as possible.

Investment in cultural infrastructure has knock-on benefits, supporting the sector's contributions to the government's Growth and Opportunity missions, in line with the UK Government's Creative Industries Sector Plan. The DCMS Culture and Heritage Programme recognises those benefits, aiming to enable the creative, culture and heritage sectors to more comprehensively value their impact on sustainable growth and long-term standards of living.[20]

Such effects are also illustrated in a study commissioned by the Theatres Trust in 2020 and compiled by Nordicity, which highlights:

- Additional revenue and employment for the theatre sector
- Direct economic impact through the construction sector
- Indirect economic benefit to town centres and the night-time economy
- Social and community benefits

When an environmental lens is applied to such infrastructure investments, additional benefits accrue. Audiences expect climate awareness, responsibility and action from cultural organisations.[21] They recognise the sustainability challenges organisations face in their own operations, for example related to the energy efficiency of specialist buildings, but look for progress and transparency in the journey.[22] Moreover, the high footfall and significant reach of cultural organisations mean the increased visibility of retrofit adaptations could have significant broader repercussions in terms of acclimatisation to and comfort with new environmental technologies in the broader UK population. "Beacon" decarbonised buildings not only serve as proof points for retrofit within the cultural sector,[23] but have the potential to lead to higher approval levels and increased, less frictional adoption of these and other new technologies within domestic and civic contexts.

3.2 Funding Environment Context

Most cultural organisations in the UK operate a mixed-economy model, deriving income from public funding, including the national Arts Councils and local authorities; earned income, usually from ticket sales or services such as venue hire; grants from trusts and foundations; and donations from private individuals.[24,25] Buildings are often renovated or developed as part of significant capital projects, which typically require bespoke fundraising campaigns, such as those currently underway at the National Gallery and Natural History Museum.[26,27] In most cases, projects are primarily funded through capital grants and donations.

These conditions, particularly in a time of shrinking overall funding and rising costs, have had the understandable effect of creating a scarcity mindset and short-term focus within organisations.

For institutions to prepare for net zero and survive in the longer term, longer-term funding tools are required.

Research by Society of London Theatre (SOLT) and UK Theatre suggests 20% of venues require at least £5 million each over the next two years just to maintain current operations. Without significant capital investment, close to 40% risk closure. With funding, however, 54% could provide more jobs, 62% would increase outreach, and 100% would increase environmental sustainability.[28]

Similar returns on capital investment can be expected by other cultural venues.

The significant new DCMS package for capital investment in cultural venues goes a long way to address precarity, both in its promise of sustained funding at scale and in its recognition of the importance of these institutions as a source of 'pride of place', opportunity and national identity.[29] The scale of need outlined nonetheless exceeds the current scope of public funding alone, meaning it is necessary to pull on all possible funding levers.[30] Public investment has a demonstrated ability to unlock other funding sources, such as philanthropy and corporate sponsorship, with the experience of SOLT and UK Theatre members suggesting a relationship of at least one to one;[31] indeed, emphasis is growing on match funding for grants as funders recognise the extent of the demand.

For a decade, Figurative's Arts & Culture Finance has worked to support organisations to invest in their revenue-generating assets using loan finance.[32]

This funding offer was designed and made available in an effort to encourage organisations to take an asset-led approach, and to support long-term strategic thinking about how broad the category of 'assets' can be. The income statements of arts organisations can reveal the opportunity to generate incremental free cash flow, which might support the servicing of loan finance, by growing income or reducing costs, acknowledging that, over that decade, many organisations have already pared back costs to address operating deficits.

The capital funding system for the cultural sector is broadly binary, with the vast majority of cash for purchase or development of assets coming either from grants/donations or mortgages. Sometimes secured or unsecured loans from impact investors or local authorities/other municipal sources are in the mix. Occasionally, an organisation gains additional capital or liquidity via a loan from a director or a board member/ trustee. Organisations may also receive 'in kind' capital/balance sheet support through donation or asset transfer of freeholds or leaseholds, or operate buildings as part of a Section 106 agreement or on a peppercorn lease from a municipal freeholder.

The majority of UK cultural organisations are structured as companies limited by guarantee and are registered charities, which means they cannot take equity investment.

It is well documented that the sector is in a challenging place financially[33,34,35] with rising costs, increasing scrutiny over corporate donations, and stretched trusts and foundations dealing with a significant increase in demand and/or competing priorities. Current funding opportunities – loans or grants – specifically for sustainability-focused capital upgrades are limited and often constrained to the charitable or public sectors, to listed buildings or to certain building uses.

The below tables are non-exhaustive lists of those opportunities; their piecemeal nature reflects both the funding picture itself and the challenges of sourcing the information in the absence, to date, of collective action to address retrofitting needs. Both the Creative Foundations Fund and the Museums Estate and Development Fund are identified as mechanisms for the delivery of the new UK government investment.

Table 1. Grants for Retrofitting Campaigns

Grant	Funding Body	Description	Grant Amount	Region
Creative Foundations Fund[36]	Funded by DCMS and Arts Council England. Grants administered, awarded and monitored by Arts Council England.	Grants support creative and cultural organisations in England in revitalising, restoring, retrofitting or renewing cultural assets, including urgent work to address issues that prevent organisations from effectively delivering work for the public.	£100,000 - £10M	England
Museums Estate and Development Fund[37]	Funded by DCMS and Arts Council England. Grants administered, awarded and monitored by Arts Council England.	Grants support non-national Arts Council England-accredited museums and local authorities based in England to apply for funding to undertake vital infrastructure and urgent maintenance backlogs beyond the scope of day-to-day maintenance budgets, including to increase the environmental performance of buildings and equipment to help reduce carbon emissions.	£50,000 - £5M	England
Historic Environment Grant[38]	Historic Environment Scotland	Grants support a wide range of projects that clearly relate to and will benefit Scotland's historic environment, including retrofitting of sympathetic energy efficiency measures as part of broader repair work. Open to all organisation types but primarily supports not-for-profit organisations.	£1,000 - £500,000	Scotland
HIE Green Grant Fund[39]	Highlands and Islands Enterprise	Grants support businesses and social enterprises across the Highlands and Islands to transition to net zero.	£20,000 - £250,000	Highlands and Islands of Scotland

Grant	Funding Body	Description	Grant Amount	Region
Library Improvement Fund	Funded by DCMS. Grants administered, awarded and monitored by Arts Council England	The Libraries Improvement Fund (LIF) is an open-access capital fund open to library services based in England to apply for funding to undertake capital infrastructure work, which will help address historic under-investment in technology and buildings. The fund aims to: • increase the sustainability and potential for transformation of libraries by developing more flexible, more commercial spaces • increase and improve digital access within communities • connect libraries to their communities and increase library use	£50,000 to £500,000	England
Listed Building Regeneration Grant Scheme[40]	Cadw	Grants support the repair, conservation, and sustainable reuse of listed buildings in Wales.	£10,000 - £250,000	Wales
Listed Places of Worship Grant Scheme[41]	Department for Culture Media and Sport	Grants cover the VAT on repairs to listed buildings used as places of worship.	£1,000 - £25,000	UK-wide
National Lottery Heritage Grants[42]	Heritage Fund	Grants fund projects that value, care for and sustain heritage for everyone across the UK, now and in the future. Will support heritage projects that reduce adverse environmental impacts and help heritage to adapt to our changing climate. If projects involve construction, the fund will encourage restoration, conservation and reuse, rather than new build.[43]	£10,000 - £10M	UK-wide

Grant	Funding Body	Description	Grant Amount	Region
Theatre Improvement Scheme[44]	Theatres Trust with the Wolfson Foundation	Grants support a range of projects that consider different ways theatre buildings can reduce their environmental impact.	Up to £20,000	UK-wide
The Linbury Trust	Philanthropic funding; two rounds so far, with 2026 round in partnership with the Wolfson Foundation, The Headley Trust, and Ashden Sustainable Communities.	Grants support a range of retrofit, mitigation and adaption. In addition to funding, Linbury runs a year-long learning network with grantees to help organisations embed longer-term thinking and action around environmental sustainability.	Up to £100,000	UK-wide

Table 2. Loans for Retrofitting Campaigns

Fund	Description	Loan Size	Loan Term	Opportunity	Region
Charities Aid Foundation Green Loans for Charities[45]	Open to charities and social enterprises to support retrofitting, waste reduction and sustainable energy systems.	£150,000 - £10M	Up to 25 years	Open	UK-wide
Mayor of London Green Finance Fund[46]	Projects must deliver energy efficiency, clean transportation or renewable energy within London; open to museums accredited under the Arts Council Museum Accreditation Scheme.	£1M - £500M	Up to 25 years	Currently closed	London
London Efficient and Decentralised Generation of Energy (EDGE) Fund[47]	Open to public and private sector organisations in London for energy projects relating to challenges around reliability, resilience, sustainability or cost.	£10M+	Up to 10 years	Open	London
Scottish Public Sector Energy Efficiency Loan Scheme (SEELS)[48]	Zero-interest loans to the public sector in Scotland to facilitate energy efficiency improvement projects that result in financial and carbon savings and contribute towards achieving net-zero aspirations.	£5,000+	Up to 10 years	Open	Scotland
Wales Funding Programme[49]	Open to public sector organisations in Wales, including local authorities, schools, universities, colleges and emergency services, to fund energy efficiency and decarbonisation projects.	£5,000+	Up to 10 years	Open	Wales
Local Climate Bonds[50]	Enable local authorities to raise citizen and institutional borrowing to fund environmental and social impact projects.	Various	Various	Various	Various local authorities

Table 3. Blended Finance for Retrofitting Campaigns

Fund	Description	Loan Size	Loan Term	Opportunity	Region
Energy Resilience Fund[51]	Provides a blended funding package of loan (60%) and grant (40%) to bolster the energy resilience of eligible charities and social enterprises in England.	£25k - £250k	2 - 10 years	Open	England

Loans, and particularly unsecured loans, are not yet widely deployed in the sector. On the demand side, this reflects a 'subsidy mindset' that makes sense from an economically rational cost of capital perspective: grant funding should always be pursued first. Both research and the subsequent experience of Figurative suggest organisations are also cautious about taking on loans, although Figurative's existing funds and the DCMS Culture Recovery Fund have contributed to growing experience and understanding.[53,54] At the system level, the subsidy mindset overlooks the likelihood that the pool of available grant capital shrinks in real terms. At the organisational level, it can also overlook the behavioural incentives and implications of raising grant funding, and fail to consider the most efficient allocation of different types of funding to different cost centres/purposes within the organisation.

In terms of the supply side of investment funding, providers of capital are not familiar with the sector: a self-perpetuating issue. There are blended and repayable finance vehicles supporting the broader charity and social enterprise sector, rather than the cultural sector specifically, to invest in energy efficiency and carbon reduction, including Energy Resilience Fund, led by Social Investment Business and delivery partners,[55] and CAF Bank Green Loans.[56] Salix Finance Ltd., which delivered government funding schemes across the UK to support councils, schools, housing associations, hospitals and universities to boost their energy efficiency, released numerous case studies on the environmental and economic savings associated with retrofit investments.[57,58,59] Such studies and resources associated with cultural buildings are not readily available. This report is intended to close the gap, investigating the potential for the cost savings from environmental retrofit projects to be used to service loans.

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4

Case Studies

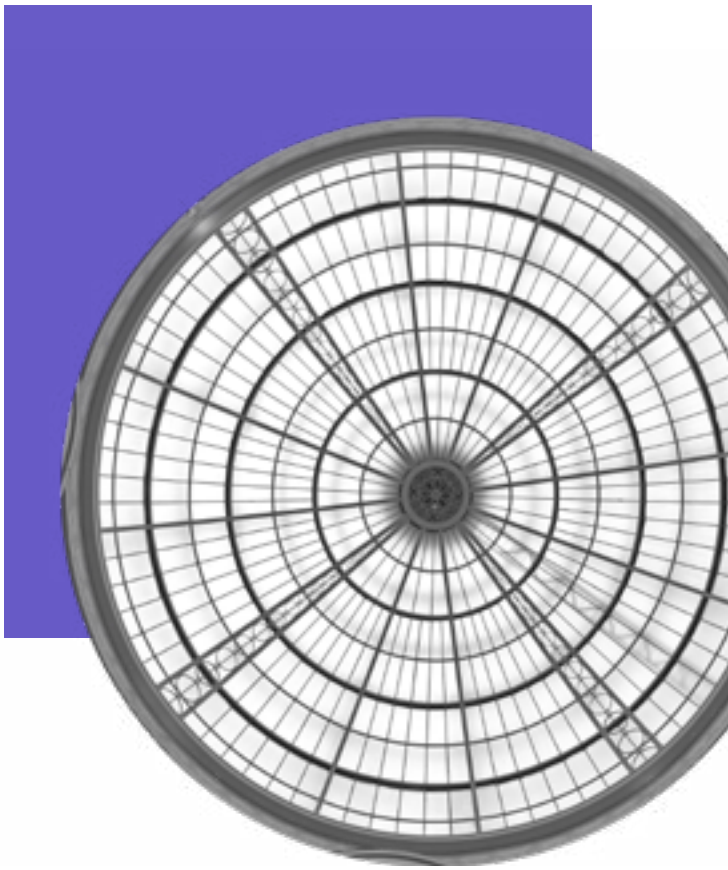
4 Case Studies

Our seven case studies were selected to represent a range of primary building uses, as well as a good geographic spread and types of retrofit measure deployed.

Buro Happold performed the analysis on energy pre- and post-intervention; MGAC checked the costs for completeness against what was submitted, adjusted for inflation to current prices. The Figurative team conducted qualitative interviews at each organisation to understand the organisational context, priorities, governance and decision-making process, and how the project was managed.

The interventions undertaken ranged from the very large and high budget, such as the installation of 720 solar panels at the Wales Millennium Centre, to the small and low-cost, such as the addition of an air curtain at the entrance of the Oxford Playhouse to prevent the introduction of cold exterior air. The inclusion of an early mover – Chichester Festival Theatre, which completed its ground source heat pump installation in 2014 – highlights the potentially enduring cost and reputational benefits of retrofitting projects. Project funding sources varied, with some organisations saving to implement stepwise changes and others raising significant sums through grants.

Case studies include identified next steps for each organisation, which have potentially useful read-across for other such projects. Several case studies refer to the 'Lean, Clean, Green' hierarchy – Theatre Green Book's recommended approach to identifying priorities for improving the sustainability of a building: first, make the building need less energy; then, make it use less energy through more efficient equipment; finally, switch to renewable sources.



4.1 Brickfields, Space Studios

4.1.1 Introduction

Brickfields is an artists' studio based in London, divided into 50 self-contained units charitably let at affordable rents to creative and visual arts practitioners.

Constructed in 1960 as a print factory, it was bought by Space Studios in 2014 and converted into artists' studios in 2015. This involved dividing the large volume space into smaller individual lettable units.

Space Studios, whose core business is managing buildings, is different from a venue, and may have energy specifications closer to a standard residential or commercial building. It also has sustainability as a priority. Across its portfolio of 21 buildings (four of which are owned, the remainder leased), it has different terms and tenures, as well as different types of buildings.

The studios at Brickfields were refurbished in 2023, with the project including retrofit measures driven by potential changes to minimum Energy Efficiency Standards, including an expanded solar power system and the installation of LEDs.

Funding from sources such as the London Legacy Development Corporation and Tower Hamlets Council has been crucial in Space Studios' sustainability efforts. Space Studios' success in securing funding is attributed to its small but experienced team, opportunistic approach and property expertise. The organisation also maintains strong relationships with local councils, who are proponents of funding projects supporting microbusinesses. However, challenges persist – notably, insufficient capital to retrofit the entire portfolio, barriers posed by considerable requirements around reporting to various stakeholders, and the lack of recognition for embodied carbon savings in retrofitting versus constructing new builds.

4.1.2 Building Characteristics

The building was refurbished in 2023 to achieve higher EPC energy ratings.

Building area:
2,880m²

Building age:
1960

Key user group:
Artists

Refurbishment date:
2023

Cost of capital project works:
£129,264

4.1.3 Retrofit Main Drivers

The key driver for the Space Studios retrofit was the risk to the organisation's business model due to potential stranded assets from changes to Minimum Energy Efficiency Standards (MEES). Currently, the minimum required EPC energy rating for a lettable commercial building is EPC E. However, the previous UK government proposed a stepped increase to EPC B by 2030.[60] Although these proposals were scrapped in 2023 and only a partial outcome to a consultation by the current government has so far been published, Space Studios aims to upgrade the buildings it owns to EPC B to protect its business model against future risks.[61] The changes also allowed heating/cooling to be controlled by individual tenants rather than by a centralised system, with usage metered and billed per studio.

Importantly, Space Studios could have achieved its environmental goals by demolishing and rebuilding the facility, but deemed the environmental cost in the form of embodied carbon released during demolition disqualifying.

4.1.4 Retrofit Measures Undertaken

The following measures were implemented as part of the project:

- ✓ Switch to all electric heating.
- ✓ Switch to LED lighting.

4.1.5 Energy Reduction, Carbon Reduction, Cost Savings

	Unit	Before	After	% reduction
Electricity	kWh/m²	20.2	19.7	2.5%
Gas	kWh/m²	21	0	100.0%
Carbon emissions	kg CO^2e/m^2	8.4	4.1	51.2%
Annual energy bills	£	£18,279	£14,104	22.8%

Electricity data is for November 2021-July 2022 (pre-retrofit) and November 2023-October 2024 (post-retrofit).
Gas data is for August 2022-July 2023 (pre-retrofit) and August 2023 onwards (post-retrofit).
Carbon emission and annual energy bill calculations based on 2024 UK government carbon conversion factors and non-domestic energy prices shown in Appendix 1.

4.1.6 Return on Investment and Payback Period

With a total applicable project cost of £138,000, rebased to December 2025 equivalent costs, the headline ROI for the project is 3.0%, implying a payback period of 33.1 years.

4.1.7 Key Takeaways

Following these changes, the organisation experienced a 51% reduction in carbon emissions and an annual saving of £4,175. The removal of gas boilers and switch to all-electric heating significantly reduced the building's carbon emissions. The reduction in energy costs was mitigated by the switch from gas to electric, which had become more expensive. However, the increase in electricity consumption was offset by the introduction of LED lighting, contributing to reduction in both overall bills and energy consumed. Allowing users to control their own energy consumption (and associated costs) also likely contributed to energy reduction. The implemented measures enabled the building to exceed the targeted EPC B rating, achieving an EPC A.

4.1.8 Specific Risks and Challenges to Data

Artists have 24-hour unmonitored access to the space, making it difficult to assess occupancy patterns before and after the retrofit. However, building managers reported increased winter occupancy and positive feedback on comfort after the retrofit works were completed. Artists' studios are often located in former industrial spaces with poor thermal comfort, and so the ability to control heating and cooling significantly improved comfort, particularly in winter. This increased the hours spent in the studios, raising operational costs, reducing the reported energy reductions, but supporting a higher occupancy and inferred productivity of the studios.

4.1.9 Additional Benefits of Works

- Individual heating controls allow occupants to run heating to meet personal comfort needs and cost/budget constraints.
- Upgrades to reflect potential changes to EPC requirements reduce risks to the organisation's future business plans.
- The organisation saves on annual energy bills.
- Complete elimination of gas improves future-proofing against fluctuating gas prices and takes steps towards net zero carbon.

4.1.10 Future Opportunities

The works covered by this case study are identified as being predominantly in the 'clean' section of the energy-saving hierarchy. Subsequent works undertaken by the studios but not assessed as part of this study due to insufficient data to date include the implementation of solar photovoltaic (PV) panels in the 'green' section.

Future proposed works would ideally focus on the 'lean' section in order to leverage the greatest benefits of passive energy reduction. Measures to explore could include:

- Air infiltration reduction measures
  - Filling holes from services that pass internal to external (plumbing, electricity)
  - Repairing seals on windows and doors
- Upgrading windows to double/triple glazing
- Upgrading doors/adding entrance lobbies
- Adding internal/external insulation
- Adding/increasing loft insulation where necessary

4.1.11 Conclusion

By implementing increasingly common retrofit measures in its Brickfields property, Space Studios has simultaneously reduced its carbon footprint by 51% and saved over £4,000 annually. By integrating electric heating and LED lighting, together with the subsequent solar PV panel installation, it has reduced its energy costs and subsequently achieved an EPC rating of A. While Space Studios has remaining upgrades to implement within its property portfolio, the achievement is significant for an industrial building of its size.

4.2 Milton Keynes Theatre, ATG Entertainment

4.2.1 Introduction

Milton Keynes Theatre is managed and operated by ATG Entertainment and is a large regional theatre in Buckinghamshire. The theatre opened in 1999 after a 25-year campaign in the local area. Its auditorium can accommodate a range of scales of show and the capacity can range between 900 and 1,400 seats.

The programme includes a variety of large and small West End productions, Christmas pantomime, touring opera and ballet. The theatre also offers preshow dining lounges and private hire for events, as well as a variety of creative learning activities.

The organisation has undergone significant retrofit work, including a chiller replacement, ad hoc LED replacement, energy monitoring and spot comfort cooling. These initiatives were selected in part due to their expected high financial payback. In addition to financial benefit and carbon emission reduction, the changes have resulted in a more pleasant experience for theatregoers and employees.

4.2.2 Building Characteristics

Building age:
1999

Refurbishment date:
2019

Building area:
10,131m²

Key user groups:
Theatregoers, arts practitioners, pre-theatre diners, educational groups

Cost of capital project works:
£549,000

4.2.3 Retrofit Main Drivers

At the end of 2019, the original chillers failed. Due to the age of the equipment and changes in technology, they could not be repaired. Temporary chillers were installed in September 2020 as the very hot summer caused overheating issues and limited the scope of environment controls, affecting long-running shows. With the likelihood and occurrence of heatwaves only increasing, new permanent chillers were installed in April 2022. In the same period, further minor upgrades were carried out, including additional focused spot cooling for comfort and ad hoc LED lighting upgrades. Energy monitoring systems were also added as part of the refurbishments, allowing the energy saving from efficiency upgrades to equipment to be supplemented by targeted behavioural and management changes. Finally, the works included voltage optimisation – a technology to reduce and stabilise incoming grid voltage to a lower, more efficient level.

Given significant theatre closures in 2020 and 2021, followed by a return to normal activity in April 2022, the comparison in this case study is not like-for-like. The saving would be greater on an activity usage-adjusted basis.

4.2.4 Retrofit Measures Undertaken

The following measures were implemented as part of the project:

- ✓ Chiller replacement
- ✓ Energy monitoring upgrade
- ✓ Ad hoc LED replacement
- ✓ Spot comfort cooling
- ✓ Voltage optimisation
- ✓ Switch to LED lighting.

4.2.5 Energy Reduction, Carbon Reduction, Cost Savings

	Unit	Before	After	% reduction
Electricity	kWh/m²	98.1	84.4	14%
Carbon emissions	kg CO^2e/m^2	20.3	17.3	14.8%
Annual energy bills	£	£247,173	£210,122	15%

Electricity data is for February 2019-January 2020 (pre-retrofit) and February 2022-January 2023 (post-retrofit). Carbon emission and annual energy bill calculations based on 2024 UK government carbon conversion factors and non-domestic energy prices shown in Appendix 1.

4.2.6 Return on Investment and Payback Period

With a total applicable project cost of £634,000, rebased to December 2025 equivalent costs, the headline ROI for the project is 5.8%, implying a payback period of 17.1 years.

4.2.7 Key Takeaways

The combined efficiency upgrades provided by a new chiller and select LED lighting upgrades, combined with energy management and monitoring approaches, have reduced the theatre's carbon emissions by 15% and resulted in an electricity bill saving of over £37,000. These upgrades also improved the comfort and wellbeing of staff and visitors. This highlights the value of replacing outdated or ageing equipment with newer, more energy-efficient models. The theatre's ad hoc LED lighting upgrades are also worth noting. These are relatively cheap and require minimal time and planning to execute, but result in financial gains and energy reductions. The specific benefits of voltage optimisation cannot be itemised, but are included in overall energy saving figures. Given the theatre's proximity to the substation, this intervention is considered particularly likely to have had beneficial impacts.

4.2.8 Specific Risks and Challenges to Data

Due to the high variability in the energy use, lighting requirements, seating capacity and uptake for different theatrical shows and productions, there is a high degree of variability month by month and year on year within the data. There are also expected discrepancies caused by the period of closure during the Covid-19 pandemic. These factors make it challenging to identify the exact impacts of specific measures.

To address these challenges, the pre- and post-retrofit energy data periods were selected to avoid anomalous years, such as those affected by closures in the pandemic, and to minimise the impact of atypical building usage patterns. The data reveals reductions in energy use that align with the expected operations of cooling equipment (during the summer months).

4.2.9 Additional Benefits of Works

- Upgraded chillers ensure the space is comfortable during shows, improving theatregoers' experience and enjoyment, and future-proofing the venue against increasingly frequent summer heatwaves.
- Monitoring systems allow for targeted identification of comfort and operational issues as well as ability to look at energy use trends and identify opportunities for future savings.
- Additional localised cooling solutions increase comfort levels in particular hot spots so that larger centralised systems can be used less frequently.
- Replacement of tungsten bulbs with longer-lasting, more efficient LEDs reduces energy consumption as well as the labour needed for routine maintenance, while future-proofing for the complete phase-out of tungsten bulbs.

4.2.10 Future Opportunities

Due to the relatively young age of the building (compared to many theatre buildings in the UK), the fabric specifications are reasonable. However, given the high proportion of glass on the building, the implementation of passive external shading measures could be a potential avenue for exploration.

Further proposed works would ideally focus on the 'lean' section in order to leverage the greatest benefits of passive energy reduction. Measures to explore could include:

- Passive external shading measures to reduce overheating
- Upgrading windows to double/triple glazing
- Upgrading doors/adding entrance lobbies and air curtains

Green measures should also be considered for the next point on the upgrade schedule and could include:

- Heat pumps to replace gas boilers
- Maximising roof top solar panels

4.2.11 Conclusion

By replacing its chiller and selectively upgrading its lighting with LEDs, Milton Keynes Theatre reduced its electricity carbon emissions by 15%, resulting in an annual electricity bill saving of £37,000. The combined efficiency upgrades, along with new energy management and monitoring systems, have helped the theatre to provide a more comfortable experience for staff and visitors, while also future-proofing against the increased incidence of heat waves.

4.3 The Lowry

4.3.1 Introduction

The Lowry, opened in 2000, is a theatre and gallery located in the Salford Quays, Greater Manchester. The complex hosts a 1,730-seat main theatre, a 466-seat secondary theatre and a 2,000m² gallery space devoted to both permanent and temporary art installations.

As a Millennium project, the Lowry is 25 years old and now at a critical juncture requiring substantial reinvestment. Despite a tight budget – the organisation's revenue model is 95% self-generated – the Lowry undertook a critical LED lighting and dimmer system replacement, driven by urgent operational need. The existing dimmer infrastructure had become obsolete: parts were no longer available, and the only specialist capable of repairing them had stopped servicing.

Replacing the system was non-negotiable, and although expensive, was funded through reserves due to the critical nature of the issue. While funding constraints limited implementable options, the LED and dimmer upgrade still showed clear operational and environmental payback. This success increased internal appetite for further investment in energy-saving measures, such as motion-sensor lighting on stairwells, which received full or match funding with short payback periods.

4.3.2 Building Characteristics

The building currently has a DEC operational rating of D.

Building age:
1999

Refurbishment date:
2023

Building area:
22,086m²

Key user groups:
Theatre and art gallery visitors, conference and function attendees

Cost of total capital project works:
£656,715

4.3.3 Retrofit Main Drivers

Across the Lowry's various theatres, galleries and conference spaces, the lighting was outdated and inefficient. This was due to the building's complex lighting strategies across its 22,086m² footprint, as well as to its age. Recognising the need for a transition to more energy-efficient and sustainable lighting solutions, updating the infrastructure to facilitate the replacement with LED alternatives became the main project driver. The retrofit aimed to modernise the lighting system, improve environmental performance and reduce financial costs in a venue with a notably small proportion of contributed revenue (5%).

4.3.4 Retrofit Measures Undertaken

The following measures were implemented as part of the project:

- ✓ LED lighting & dimmer replacement

4.3.5 Energy Reduction, Carbon Reduction, Cost Savings

	Unit	Before	After	% reduction
Lighting load	kWh/m²	35	4	88.6%
Lighting carbon emissions	kg CO²e/m²	4.1	0.4	90.2%
Annual lighting energy costs	£	£48,676	£4,911	89.9%

Data for lighting load was calculated using the quantity and wattage of each lamp type, combined with estimated daily and annual operating hours. This was used to determine the total power load (kW), annual energy consumption (kWh) and associated cost based on assumed electricity tariffs (split between day and night).

4.3.6 Return on Investment and Payback Period

With a total applicable project cost of £391,000, rebased to December 2025 equivalent costs, the headline ROI for the project is 11.2%, implying a payback period of 8.9 years.

4.3.7 Key Takeaways

The potential energy cost savings analysis for the overall project estimated savings of approximately 68% over a 15-year period, equating to predicted annual savings of around £55,438.

In practice, based on the data sourced to date, the lighting retrofit scheme has resulted in an 89% reduction in lighting load, saving the Lowry £43,765 per year. The upgrade to LED lighting also future-proofs the building for when alternate light bulbs, such as tungsten bulbs, become cost prohibitive and are ultimately phased out of use entirely.

4.3.8 Specific Risks and Challenges to Data

The nature of the Lowry's lighting usage varies significantly between event and non-event days and weeks. Any impact on showtimes and high-usage months will affect the quality and true impact of the electrical data – for example, the Covid-19 pandemic significantly reduced usage in 2020 and 2021.

To address this challenge, the data for this case study is calculated based on consistent estimated daily and annual operating hours. Comparing the predicted impact of the lighting upgrade to the measured impact shows that the data is on trend and reacting accordingly. This serves as a useful case study for other building typologies to predict the financial and environmental impact of an LED upgrade.

4.3.9 Additional Benefits of Works

- Enhanced lighting systems enable more complex lighting strategies, benefiting theatre performances, art displays and the variety of conferences hosted at the Lowry.
- A better understanding of lighting and electrical consumption is now achievable, as a result of data collected through the BMS.
- Seasonal adjustments to lighting are now possible, providing a more comfortable and occupiable space.
- The demonstrated energy and cost savings have been used successfully to petition for additional upgrades within the building and a greater focus on sustainability organisation-wide.

4.3.10 Future Opportunities

Due to the large size of the Lowry, improving the fabric performance of the building would have a significant impact on its overall performance. Additionally, large theatres require substantial air changes to ventilate the multiple open spaces during events. Upgrading the mechanical, electrical and plumbing (MEP) equipment serving the ventilation of the auditoriums and theatres to energy-efficient alternatives, which can also heat and cool the space, would result in considerable energy reductions.

The organisation has identified the pressing need to:

- Upgrade its boilers and chillers, which are 25 years old
- Introduce greater environmental controls
- Additional measures to explore further include:
- Upgrading doors/adding entrance lobbies and air curtains
- Introducing heat pump technology

4.3.11 Conclusion

The Lowry is at a significant juncture in its history. At 25 years old, the building needs significant capital investment. Despite financial limitations, the organisation successfully upgraded its lighting system to LEDs with dimmers. The resulting 90% reduction in lighting carbon emissions and annual electricity cost savings of over £43,000 have given the Lowry momentum to garner further support for additional upgrades and centred environmental sustainability within the theatre's operations.

4.4 Russell-Cotes Art Gallery and Museum

4.4.1 Introduction

The Russell-Cotes Art Gallery & Museum is a historic house and art gallery situated on Bournemouth's East Cliff, overlooking the sea. Originally built as a residence, the building was transformed into a public art gallery and museum in 1907 to showcase the original owner's extensive private collection.

Currently, Bournemouth, Christchurch and Poole (BCP) Council is the sole trustee. However, a structural transition is underway, with trusteeship in the process of being transferred to a newly formed independent charity.

The Grade II* listed building fell into disrepair due to constant coastal weather and a lack of preservation efforts. In 2000, through a major Heritage Lottery-funded project, the museum was restored to its original state as a historic house and home.

The organisation recently undertook a complex capital project with support from the Arts Council England Museum Estate and Development Fund (MEND), matched by funding from BCP Council and supplemented by public donations.[62] The project focused on replacing the air handling system and restoring the conservatory, a unique Victorian glasshouse damaged by sea winds and weather. This initiative reflects broader challenges faced by the sector, particularly concerning governance, funding structures and technical capacity.

4.4.2 Building Characteristics

The building currently holds a DEC operational rating of D.

Building area:
2,330m²

Building age:
1901

Key user groups:
Gallery and museum visitors

Refurbishment date:
2024

Cost of capital project works:
£902,972

4.4.3 Retrofit Main Drivers

The Russell-Cotes Museum had not seen significant maintenance investment for 20 years. As most funding sources tend to be focused on exhibitions and visitor experience, it had found it challenging to secure funding to address the structure and conditioning of the building.

The project funding was a real opportunity to fix aspects of the building and undertake essential maintenance works.

4.4.4 Retrofit Measures Undertaken

The following measures were implemented as part of the project:

- ✓ Air handling unit upgrade
- ✓ Improved drainage, potentially improving heating and air handling system efficiency

4.4.5 Energy Reduction, Carbon Reduction, Cost Savings

	Unit	Before	After	% reduction
Electricity	kWh/m²	91.9	65.6	28.6%
Gas	kWh/m²	4.8	4.3	10.4%
Carbon emissions	kg CO^2e/m^2	14.5	14.5	27.5%
Annual energy bills	£	£53,923	£38,627	28.4%

Electricity data is for April 2022-March 2023 (pre-retrofit) and January 2024-December 2024 (post-retrofit).
Gas data is for April 2022-March 2023 (pre-retrofit) and January 2024-December 2024 (post-retrofit).
Carbon emission and annual energy bill calculations based on 2024 UK government carbon conversion factors and non-domestic energy prices shown in Appendix 1.

4.4.6 Return on Investment and Payback Period

With a total applicable project cost of £1,091,000, rebased to December 2025 equivalent costs, the headline ROI for the project is 1.4%, implying a payback period of 71.3 years.

4.4.7 Key Takeaways

The Russell-Cotes Museum successfully implemented numerous sustainability upgrades despite funding complexities and timeline issues due to the Covid-19 pandemic, procurement and contractor difficulties and the complexity of the project – particularly the conservatory restoration. The project's success required perseverance and highly coordinated communication to ensure all stakeholders, including curators and engineers, were in agreement and informed.

With the upgrades, the museum has experienced a 28% decrease in annual carbon emissions and has saved £15,296 annually in energy bills.

4.4.8 Specific Risks and Challenges to Data

Insufficient time has elapsed between the retrofit project and the collection of measurable data. Surveying the true impact of the upgrade is not feasible until more data has been gathered and compared to the building's performance prior to the upgrade. Additionally, there may be differences in data collection methodology due to meter/BMS upgrades. This would make it challenging to compare the data unless some form of data handling was done beforehand to standardise the time, scale, and type of data.

4.4.9 Additional Benefits of Works

- Completing the project while the museum was open increased public visibility of museum capital and maintenance needs.
- Initial funding and project management challenges have allowed museum leadership to refine and strengthen its approach to fundraising for capital projects and procurement protocols.

4.4.10 Future Opportunities

As the organisation becomes independent from BCP Council, its project management and funding procurement strategies will shift and likely become more agile, enabling leadership to consider additional sustainability improvements. Learnings from this capital project may enable the organisation to secure more funding, more quickly in future campaigns.

4.4.11 Conclusion

Despite setbacks associated with fundraising, supply chain and project management, the Russell-Cotes Museum completed significant and much-needed upgrades to its 125-year-old building. With support from Arts Council England and the council, and individual donations from its community, the museum replaced its air handler and restored its Victorian glass conservatory, which reopened to the public in April 2025.

Reflecting on the project, the museum acknowledged a pressing need for a sector-wide reassessment of funding approaches – particularly in how capital versus maintenance work is defined and supported. The project underscored the value of having technically competent advisors who can bridge the knowledge gap between curators and engineers. As the museum moves toward greater independence, it is adopting a more forward-looking and reflective stance, aiming to future-proof its operations and embed sustainability into its long-term strategy.

4.5 Oxford Playhouse

4.5.1 Introduction

Oxford Playhouse is a Grade II* listed, leading regional theatre and the only not-for-profit mid-scale venue in Oxfordshire. It is governed by the University of Oxford and pays a peppercorn rent. The playhouse is central to the cultural life of the city and region, with a rich heritage of live performance, including drama, dance, music and comedy.

Oxford Playhouse also produces mid-scale and studio productions, including a popular pantomime that attracts audiences of over 40,000 annually.

Oxford Playhouse has undertaken a series of capital and maintenance projects, including the installation of air curtains, replacement of an ageing air chiller, the installation of LEDs and secondary window glazing and the replacement of an outdated digital screen. These interventions have varied in scale and cost and have been carried out within the constraints of the organisation's limited financial resources, as well as restrictions associated with the building's heritage designation. However, the upgrades have collectively enabled Oxford Playhouse to increase its energy efficiency, while improving the experience for visitors.

4.5.2 Building Characteristics

Building age:
1938

Refurbishment date:
2021

Building area:
3,000m²

Key user groups:
Theatre audiences, reading rooms and rehearsal space users, café visitors

Cost of capital project works:
£35,000

4.5.3 Retrofit Main Drivers

Retrofit measures were necessary at Oxford Playhouse due to its status as an old Grade II* listed building, constructed in 1938. These measures aimed to improve energy efficiency, reduce costs and enhance sustainability.

The restoration of Oxford Playhouse focused on including sympathetic secondary glazing for 80-year-old sash and tilting windows to reduce energy loss and improve comfort. Draught management for the main entrance doors included improved door seals and an air curtain to prevent heat loss. The building fabric was further upgraded with additional sealant and air curtains to better insulate and heat the space. Services were improved by updating the air conditioner chiller, integrating it with the BMS and replacing most lighting with energy-saving LEDs.

4.5.4 Retrofit Measures Undertaken

The following measures were implemented as part of the project:

- ✓ Secondary glazing
- ✓ Air curtains and door seals
- ✓ BMS management
- ✓ LED lighting

4.5.5 Energy Reduction, Carbon Reduction, Cost Savings

	Unit	Before	After	% reduction
Electricity	kWh/m²	78.4	67.8	13.5%
Gas	kWh/m²	149	118.5	20.5%
Carbon emissions	kg CO^2e/m^2	46.4	38.1	17.9%
Annual energy bills	£	£86,805	£73,095	15.8%

Electricity data is for August 2019-March 2020, then extrapolated data from April 2020-July 2020 (pre-retrofit) and August 2022-March 2023, then extrapolated data from April 2023-July 2023 (post-retrofit).

Gas data is for August 2019-March 2020, then extrapolated data from April 2020-July 2020 (pre-retrofit) and August 2022-March 2023, then extrapolated data from April 2023-July 2023 (post-retrofit).

Carbon emission and annual energy bill calculations based on 2024 UK government carbon conversion factors and non-domestic energy prices shown in Appendix 1.

4.5.6 Return on Investment and Payback Period

With a total applicable project cost of £44,000, rebased to December 2025 equivalent costs, the headline ROI for the project is 31.2%, implying a payback period of 3.2 years.

4.5.7 Key Takeaways

Following the retrofit measures, the Oxford Playhouse has achieved a DEC operational rating of B. The measures resulted in a 20% reduction in heating costs and a 14% reduction in electricity usage. This saved the Oxford Playhouse £13,710 per year on energy bills, while simultaneously respecting the building's historic nature and delivering a more enjoyable experience to visitors, performers and staff.

4.5.8 Specific Risks and Challenges to Data

When undertaking retrofit projects like the restoration of Oxford Playhouse, several risks and challenges to data management and integrity can arise. The complexity of integrating new systems such as BMSs with existing infrastructure can lead to data inconsistencies and integration issues. The accuracy of data collected from older buildings may also be compromised by outdated or incomplete records, making it difficult to establish a reliable baseline for energy performance. Finally, the process of upgrading building fabric and services often involves multiple stakeholders, which can result in fragmented data collection and communication gaps. Ensuring data governance and standardisation across all phases of the project is crucial to mitigate these risks.

4.5.9 Additional Benefits of Works

- Secondary glazing for the old windows reduces energy loss and enhances acoustic insulation.
- Better door seals and air curtains manage draughts, maintaining indoor temperature, reducing heating strain and increasing visitor comfort.
- Upgrading the building fabric and integrating the air conditioner with the BMS optimises energy use and lowers operational costs.
- Replacing most lighting with energy-saving LEDs cuts energy consumption and reduces maintenance efforts and costs.
- LED replacements have reduced the heat on the stage, making it more comfortable for performers and resulting in a reduction of actor makeup needs and related costs.

4.5.10 Future Opportunities

The Oxford Playhouse has been highly successful in making stepwise improvements to its sustainability while respecting the historic fabric of its building.

The organisation has identified an additional need to:

- Replace ageing heat pumps
- Install solar PVs using a membrane structure that does not affect the historic roof

Both interventions require significant funding as well as collaboration with governing heritage bodies.

4.5.11 Conclusion

By adopting a stepwise, 'small-wins' strategy, Oxford Playhouse has successfully implemented a range of sustainability upgrades. The retrofit measures, ranging from adding air curtains at the entrance to replacing the air chiller, have simultaneously increased the building's energy efficiency and improved the comfort and wellbeing of staff and visitors.

4.6 Wales Millennium Centre

4.6.1 Introduction

The Wales Millennium Centre is a landmark arts centre located in Cardiff Bay, Wales. Opened in 2004, it serves as a national stage for Wales, reflecting the spirit of the nation through its diverse range of performances, including opera, ballet, contemporary dance, musicals and comedy.

Architecturally, the building is renowned for its striking design, which incorporates materials and motifs inspired by the natural and industrial landscapes of Wales. The exterior features 2,000 tonnes of recycled Welsh slate and a copper-coloured roof.

As a cultural hub, the Wales Millennium Centre also offers educational and community programmes, fostering creative learning and engagement across diverse audiences. The centre's commitment to sustainability is evident in its use of local materials and energy-efficient design. While the centre is not directly bound by the Well-being of Future Generations (Wales) Act, its leadership has made a conscious effort to take forward strategic environmental projects, recognising its high-profile status within the country. The centre has spearheaded the use of LEDs and, in 2021, successfully installed over 720 solar panels on the south side of its roof.

4.6.2 Building Characteristics

Building age:
Phase 1 of the building was opened in 2004

Key user groups:
Theatre, ballet and opera audiences

Refurbishment date:
2021

Cost of total capital project works:
£128.2 million

Building area:
37,000m²

4.6.3 Retrofit Main Drivers

The Wales Millennium Centre sought to generate sufficient energy to power its 1,900-seat auditorium independently. Powering and conditioning such a large building requires a substantial amount of energy, which is costly. Therefore, any opportunity to reduce demand has significant financial and environmental benefits, including reduced carbon emissions. To address its energy demand problem, the Wales Millennium Centre installed 720 345W JA solar modules and four Solis inverters on six of its south-facing roof spaces.

4.6.4 Retrofit Measures Undertaken

The following measures were implemented as part of the project:

- ✓ Solar panel installation

4.6.5 Energy Reduction, Carbon Reduction, Cost Savings

	Unit	Before	After	% reduction
Electricity	kWh/m²	57.4	52.1	9.2%
Electricity only carbon emissions	kg CO²e/m²	11.9	10.8	9..2%
Annual energy bills	£	£527,565	£479,604	9.1%

Data for electricity was calculated based on the statement 'Solar power will produce around 10% of the electrical energy that the centre uses each year (based on pre-Covid figures of 2019)'.

4.6.6 Return on Investment and Payback Period

With a total applicable project cost of £240,000, rebased to December 2025 equivalent costs, the headline ROI for the project is 20.0%, implying a payback period of 5.0 years.

4.6.7 Key Takeaways

Following the retrofit measures, the Wales Millennium Centre has achieved a DEC operational rating of A. The centre has reduced its total energy consumption by 9%, resulting in annual savings of £47,961 from on-site renewable energy generation alone. The solar panels provide more than enough energy to power the Centre's stage activities, including heating and cooling the auditorium, for the next 25 years – a conservative estimate of the lifespan of the specific solar modules.

4.6.8 Specific Risks and Challenges to Data

PV panels require regular maintenance to ensure they operate at maximum efficiency. It is crucial to follow cleaning schedules to keep the panels free from debris and dust. The panels are also dependent on weather and seasonal conditions, leading to irregularities in power production throughout the year.

4.6.9 Additional Benefits of Works

- The centre's public commitment to sustainability has been good for marketing and has attracted a young, passionate workforce.
- The DEC A rating has been valuable in marketing and grant applications.

4.6.10 Future Opportunities

The Wales Millennium Centre has a public commitment to sustainability, in line with which it must continue to retrofit its building to maximise its energy efficiency.

The organisation has identified additional needs to:

- Expand its involvement in district heat networks
- Upgrade ageing chillers
- Enhance waste management practice with a stated 'zero to landfill' goal

The centre noted the Welsh government's demonstrated commitment to supporting these efforts, but is concerned about the effects of cost inflation and budget constraints on its ability to achieve its highly ambitious sustainability goals.

4.6.11 Conclusion

The Wales Millennium Centre has a very public, high-profile commitment to sustainability, particularly within Cardiff. It utilised the 2021 solar panel installation as an opportunity to further publicise this commitment. This campaign, combined with the energy saving effects of LED lights, resulted in significant cost savings, as well as the achievement of an energy rating of A.

The centre acknowledges that while retrofitting complex buildings poses challenges, the long-term gains make it worthwhile. The sustainability-focused retrofitting at Wales Millennium Centre has not only delivered financial benefits but has also given the organisation greater independence and control over long-term energy costs.

4.7 Chichester Festival Theatre

4.7.1 Introduction and Narrative

Funded by local subscription and conceived as a 1,300 seat 'pavilion in the park' by architects Powell and Moya, the innovative 1962 Chichester Festival Theatre was the UK's first 'thrust stage' performance space.

The inaugural Artistic Director was Sir Laurence Olivier, and it was at Chichester that the first National Theatre company was formed. Chichester's productions would transfer to the National Theatre's base at the Old Vic in London.

The Festival Season usually runs from April to October and includes productions from classics to contemporary writing and musicals, reaching an audience of 230,000. Productions originated at Chichester frequently transfer to London or tour nationally and internationally.

A range of additional events is designed to add to the experience of visiting the theatre, including performances, cabarets, family days, tours and talks. Through the winter months, the Theatre presents touring productions and a Christmas show mounted by Chichester Festival Youth Theatre. The Theatre runs a large and active learning, education and participation programme for all ages; its youth theatre is one of the largest in the country, with over 800 members.

In 2010, a serious feasibility study and fundraising campaign began, with the aim of delivering a full refurbishment of the main theatre building. This owed primarily to dilapidation concerns, as well as consideration of the upcoming 50-year anniversary in 2012, and followed the successful funding and delivery of a new rehearsal room. The plant was failing and the building was not fit for use. While sustainability wasn't initially a key driver, it became a core focus following an options analysis by Skelly & Couch.

4.7.2 Building Characteristics

Building age:
The building was opened as a 'concrete tent' in 1962, and developed over the intervening half-century

Refurbishment date:
Completed July 2014

Building area:
4,617m^2

Key user groups:
Theatre audiences

Cost of total capital project works:
£22m

4.7.3 Retrofit Main Drivers

The building needed significant refurbishment, and an options analysis showed that significant environmental improvements would be possible. The board, executive and project management teams were convinced that making the building more environmentally sustainable would be a worthwhile investment over time. Thanks to a good partnership with local funders, support from Arts Council England and the National Lottery Heritage Fund and a strong fundraising function, they were able to prioritise retrofit measures within the budget.

4.7.4 Retrofit Measures Undertaken

The following measures were implemented as part of the project:

- ✓ M&E system upgrade
- ✓ Ground source heat pumps (GSHP)
- ✓ Improved ventilation

4.7.5 Energy Reduction, Carbon Reduction, Cost Savings

	Unit	Before	After	% reduction
Electricity	kWh/m²	136.3	49.1	64%
Gas	kWh/m²	147.9	88.6	40%
Carbon emissions	kg CO^2e/m^2	284.2	137.7	52%
Annual energy bills	£	£162,753	£120,405	26%

Electricity data is for April 2011-March 2012 (pre-retrofit) and April 2024-March 2025 (post-retrofit).

Gas data is for April 2011-March 2012 (pre-retrofit) and April 2024-March 2025 (post-retrofit).

Since the building's Gross Internal Area (GIA) increased post-retrofit, a 76% adjustment factor was applied to all post-retrofit values to ensure comparability with pre-retrofit data.

Carbon emission and annual energy bill calculations based on 2024 UK government carbon conversion factors and non-domestic energy prices shown in Appendix 1.

4.7.6 Return on Investment and Payback Period

With a total applicable project cost of £1,742,000, rebased to December 2025 equivalent costs, the headline ROI for the project is 2.4%, implying a payback period of 41.1 years.

4.7.7 Key Takeaways

The project has been successful, and the ground source heat pumps have reduced carbon emissions, as well as cost. Their visibility within the facilities team and the broader organisation has enabled staff to become advocates for this technology.

There were some challenges around the type of heat pump possible. It was initially assumed from a very successful early bore hole that an open source GSHP would be possible; further boring revealed this to be an erroneous result, and so a hybrid system with 14 closed-loop vertical boreholes to supplement flow was selected. This was ultimately a successful system, but cost could have been saved by placing this discovery risk outside the core contract.

4.7.8 Specific Risks and Challenges to Data

This retrofit project took place over 10 years ago, and so the impact of the cost adjustments to 2024 prices is more significant than in the other case studies.

4.7.9 Additional Benefits of Works

Chichester Festival Theatre is now well known for its commitment to environmental sustainability, and reports advantages of being an early adopter. Executives and staff are motivated by and ambassadors for the transition to energy-efficient and environmentally friendly technologies.

4.7.10 Future Opportunities

Chichester Festival Theatre's Minerva Theatre is also due an upgrade, with similar issues to those presenting around failing plant and spalled concrete in the main building in 2010. Given the high level of engagement and enthusiasm around environmental sustainability, decarbonisation measures will be a strong priority within project plans.

4.7.11 Conclusion

Chichester Festival Theatre was a very early mover in the environmental sustainability sphere, and is reaping dividends in terms of cost savings, reputational benefits, recruitment, well-developed and trusting relationships with contractors, and a deep knowledge base within the organisation related to tendering for and delivering such projects.

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5

Conclusion and Insights

5 Conclusion and Insights

These case studies collectively demonstrate the breadth and depth of retrofitting interventions being undertaken across the cultural sector, often in highly constrained operational, financial and regulatory environments.

While the specific contexts vary – from Grade II listed museums and theatres to modern multi-use cultural venues – common themes emerge around the long-term value of investing in energy efficient upgrades.

A variety of interventions are represented within these case studies.

These include:

- **Mechanical upgrades:** Replacement of ageing and energy inefficient air handling units, chillers and plant equipment have proven highly effective in improving environmental control in listed or performance-critical buildings such as theatres. BMS upgrades and ground source heat pumps have also been appraised.
- **Building fabric improvements:** Secondary glazing and improved insulation measures such as air curtains can be inexpensive but increase heat retention, improve user comfort and reduce energy loss.
- **Lighting systems upgrades:** Widespread conversion to LEDs, often paired with dimmers or sensors, yields immediate energy savings, reduces maintenance needs and minimises waste.
- **Renewable energy systems:** Successful solar PV installations have delivered fast payback periods (as short as three years), reducing energy costs and providing visible evidence of sustainability commitments.

The table below shows the ROI for each of the projects.

Project	Gross internal area m²	Construction year	Refurbishment year	Original cost £	Cost at 4Q '25 £	Pre-works energy costs	Savings £	Reduction %	ROI %	Payback period years	Carbon emissions reduction %
Brickfields, Space Studios	2880	1960	2023								
Change to LED lights				£46,512	£50,000						
Remove gas boilers				£30,450	£33,000						
Solar PV				£52,302	£55,000						
Total				£129,264	£138,000	18,279	4,175	22.8%	3.0%	33.1	51.2%
Milton Keynes Theatre, ATG	10131	1999	2019								
Main chiller replacement				£238,000	£288,000						
Energy monitoring				£7,000	£8,000						
Ad hoc upgrade to LED lights				£212,500	£231,000						
Spot comfort cooling				£56,500	£68,000						
Voltage optimisation unit				£35,000	£39,000						
Total				£549,000	£634,000	247,173	37,051	15.0%	5.8%	17.1	14.8%
The Lowry*	22086	1999	2023								
Replacement of dimmers – not relevant				–	–						
Replacement of house and working lights				£375,000	£391,000						
Total				£375,000	£391,000	48,676	43,765	89.9%	11.2%	8.9	90.2%
Russell-Cotes Art Gallery and Museum	2330	1901	2024								
Upgrade of conservatory				£180,772	£218,000						
Replacement of AHU's				£722,200	£873,000						
Total				£902,972	£1,091,000	53,923	15,296	28.4%	1.4%	71.3	27.5%

Project	Gross internal area m²	Con-struction year	Refur-bishment year	Original cost £	Cost at 4Q '25 £	Pre-works energy costs	Savings £	Reduc-tion %	ROI %	Payback period years	Carbon emissions reduction %
The Oxford Playhouse	3000	1938	2021								
Selective secondary glazing & pipe lagging				£20,000	£27,000						
Air curtains & door seals				£5,000	£6,000						
LED light re-placement				£10,000	£11,000						
Total				£35,000	£44,000	86,805	13,710	15.8%	31.2%	3.2	17.9%
Wales Millennium Centre	**37000**	**2004**	**2021**								
PV on roof				£181,200	£240,000						
Total				£181,200	£240,000	527,565	47,961	9.1%	20.0%	5.0	9.2%
Chichester Festival Theatre**	**4617**	**1962**	**2014**								
Ground source heat pumps (closed loop)				£337,200	£580,000						
Upgrades to fabric (walls & roof)				£675,600	£1,162,000						
Total				**£1,012,800**	**£1,742,000**	**162,753**	**42,347**	**26.0%**	**2.4%**	**41.1**	**52.0%**
Average									**10.7%**	**9.3**	

6.1 Insights for Cultural Organisations

The case studies demonstrate the environmental and cost benefits of retrofitting projects for cultural organisations. Despite complexities including heritage settings, planning constraints, a limited fundraising landscape and the widespread effects of a global pandemic and period of high inflation, the case study organisations have successfully implemented changes with positive environmental impact. Strong partnerships with trusted contractors and advisors, support from local councils and communities and the strategic use of grant funding or framework agreements have been key to their success.

While project types and scopes are varied, several common findings and reflections emerged:

Wins

- The replacement of existing lightbulbs with LED alternatives was commonly cited as an easy upgrade with significant impacts in terms of both energy use and maintenance hours.
- In many examples, those impacts from small actions bolstered support for future sustainability efforts.
- The Theatre Green Book was cited on multiple occasions as an extremely helpful resource, both from a practical point of view and in supporting organisations and individuals to feel less isolated.

Needs

- The importance of a good contractor and clear communication was emphasised by all of the organisations. In some cases, appointment was dominated by external constraints, such as local authority procurement rules.
- Board-level buy-in and support was also a driver of success, echoing findings by Julie's Bicycle in Powering the Future.[63]
- Many organisations also highlighted how useful a framework or referral mechanism would be, to support their appraisal of need, assessment of quotes and ultimate appointment.
- It was reported that it is very hard for non-specialists to understand technical requirements and specifications for projects and that external consultants may be helpful in bridging these knowledge gaps.

Challenges

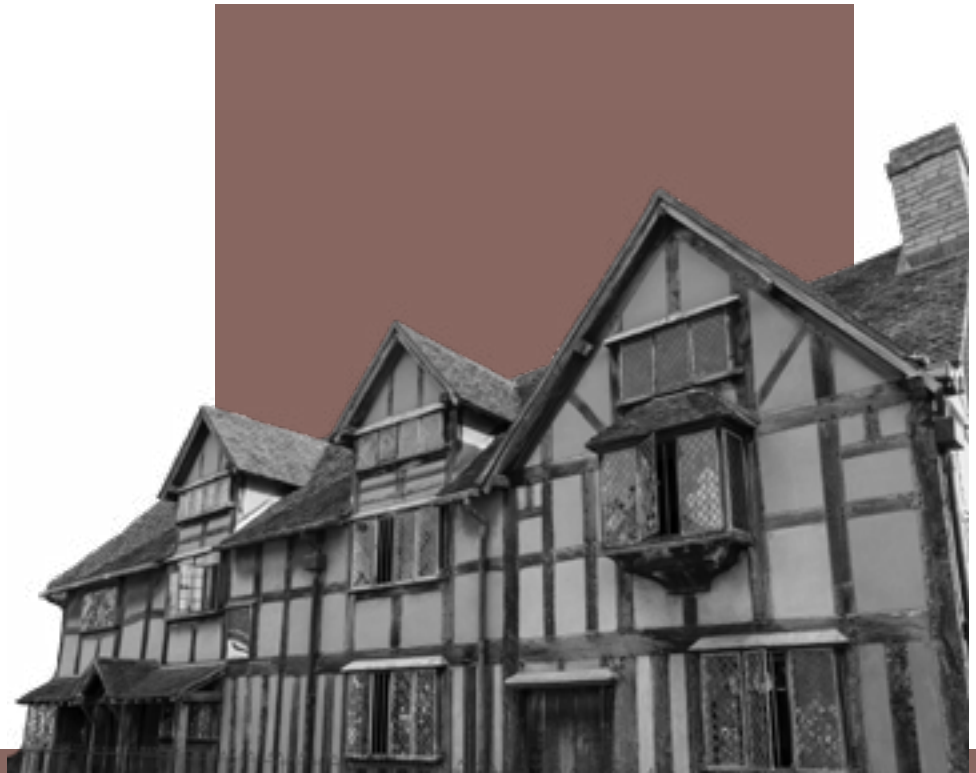
- Many organisations reported frustration around investing in the cost of a planning application when the outcome is uncertain, as well as the requirement for multiple quotes.

Although each organisation faced its own challenges, as well as difficulties in data analysis, all case study projects – no matter the scale of the retrofit – successfully reduced carbon emissions and produced associated cost savings.

Beyond the numerical savings, the retrofits described have also resulted in improved experiences for the organisations' staff and visitors and provided valuable visibility and momentum for additional projects and funding.

Organisations considering retrofitting projects may benefit from consulting Theatre Green Book's building survey tool, which triages the most effective measures and identifies those that will have immediate impact; it is currently beyond the scope of the tool to suggest a direct relation between impact and cost savings given the specifics of each building.

A further relevant resource is Julie's Bicycle's capacity-building model, developed through 20 years of experience in working with cultural buildings, clusters and networks to help cultural organisations plan and deliver energy, carbon and cost savings for their buildings, as part of Arts Council England's Environmental Programme.[64] This cohort model is based on providing access to sector-specific expertise, tailored training and resources and facilitated peer sharing.



6.2 Insights for Policymakers and Funders

There is a clear economic case for retrofitting interventions, with all seven case study projects delivering cost savings, in some cases substantial.

Together, these case studies suggest there exists, at minimum, a subset of retrofit projects – those with payback periods of around 12 years or under, and typically focused on LED lighting, energy efficiency and other targeted interventions – for which repayable finance could clearly be an appropriate funding mechanism, supplementing the recently announced grant funding for capital works in the sector. More complex and/or heritage-constrained projects, which deliver more limited business model development opportunities and smaller cost savings, may be suitable for a blended capital approach, combining grant and loan funding.

Across the seven case studies, a simple average return on investment of 10.7% implies a headline payback period for an interest-free loan of 9.3 years. This suggests a long-term funding initiative would need to give organisations 10 or more years (assuming some interest would be due) to pay back a loan based on realising the cash savings. Another approach might be to calculate a weighted average, which suggests a payback period of around 20 years, reflecting the lower headline ROI for the two largest projects. We provide these figures only as a basis for further investigation, noting the very wide range in the data and the variation in both project scales and types. Higher energy prices would increase the implied savings, and therefore the implied ROI; without the interventions, higher energy prices would result in unbudgeted, non-discretionary costs.

Together, the findings suggest ROI in cultural retrofit may best be understood at a portfolio level, where projects with short payback periods, which would be suitable for repayable finance on a standalone basis, could cross-subsidise longer-payback investments, which would require blended funding. Given the uneven and case-specific nature of the returns, early repayable or blended finance funds must be recognised as learning vehicles, requiring sufficiently patient capital, realistic return expectations, flexibility over payback periods and a true long-term focus.

More data would help to inform the sector on which projects may yield the most immediate benefits and/or be the best suited for repayable finance.

It is worth noting that economies of scale apply to lending (i.e. the proportional cost of making and managing a large loan is lower than for a small loan). There are also likely to be economies of scale around capacity and process as more organisations undertake

these kinds of projects and the learnings are shared. Along with the concomitant effects of shared undertakings, such as collective purchasing and procurement of services, these economies should reduce overall costs and increase project returns, all other things being equal.

Many organisations and the overall commentary suggest that higher returns on investment are possible. The dependencies on these calculations and the limitations of the methodology include (but are not limited to):

- Changing gas and electricity prices, both absolutely and comparatively – these affect projected savings, particularly of moves away from gas boilers to heat pumps, given the significantly higher rise in electricity prices over the reported period. If we were to assume that, in the longer term, electricity prices will reduce relative to gas prices, the economics of the interventions will become more favourable.
- The lack in some cases of sufficient data to reflect, for example, increased usage (and therefore full impact on, for example, audiences or profitability).
- The lifecycle of intervention technologies.

To mitigate the challenges of such analysis in the future, and to inform more robust calculations of likely ROI of decarbonisation initiatives, particularly when, as often, they occur as part of a larger capital project, we suggest the following requirements for any large-scale coordinated effort to support such initiatives in the cultural sector.

- To enable accurate data collection of the impact of energy efficiency measures, organisations should commission a DEC before works are undertaken and after the works are completed. Where this is not possible, annual metered electricity and gas readings should be required before and after. (NB: DECs are a requirement for public buildings over 250m^2.)
- A summary should be compiled highlighting operational changes that may affect energy consumption after the works are completed, for example:
  - Floor area increase
  - Increased number of visitors or shows
  - New food and beverage offers (café, canteen, bar)

Funding and support for such 'pipeline' activities will help to ensure organisational project readiness.[65]

The challenges the project team experienced with identifying, collecting and analysing data from our seven case study organisations only go to highlight the size of the opportunity for more coordination of retrofitting initiatives throughout the sector. Since the completion of the projects outlined in this report, income and cost pressures have compounded the strain on capacity, increasing both the difficulty of planning and executing such visions at an organisational level and the need for a more joined-up approach.

If designed and engineered to deliver support alongside funding and delivered by an appropriate partnership, a collaborative blended capital financing vehicle could:

01 Attract significant new investment capital to the sector by providing portfolio diversification benefits (i.e. mitigating exposure to any one organisation).

02 Utilise the widely recognised metric of carbon reduction to attract environmentally motivated capital.

03 Develop sector-specific lending skills and credit track record for the broader sector to support future capital raises.

04 Support the cultural sector to understand access to finance beyond grants and donations.

05 Accelerate execution of initiatives through structured support offers (e.g. lower interest rates/more flexible repayment terms in Y1).

06 Provide a mechanism to utilise e.g. carbon credit schemes within the sector.

07 Develop a vehicle for collective procurement of equipment and contracting.[66]

08 Understand the potential to develop a network of trusted approved providers, specifically for the sector, vouched for by peers and the funding intermediary.

09 Share knowledge around sequencing, planning and capital project management at different scales.

10 Minimise the economic and human resource waste around failed planning or funding bids by providing greater transparency and a scalable funding source.

Any such vehicle, intermediary or partnership would require a deep knowledge and understanding of the cultural sector to be successful. There already exist known and trusted sector experts such as Theatre Green Book, Julie's Bicycle, Buro Happold and Gallery Climate Coalition, as well as experienced funders including, but by no means limited to, Arts Council England, Historic England, National Lottery Heritage Fund, Architectural Heritage Fund and Social Investment Business. Figurative was established to develop investment practice specific to the cultural sector and has delivered multiple sector-specific financing vehicles. It is widely agreed by funders and practitioners alike that it is critically important to support organisations to develop the internal skills and resources they need to commission and execute these complex projects, and to deploy any funding capital most effectively.

Together, these case studies highlight a sector that is resourceful, committed, and increasingly strategic in embedding sustainability within its operations. With additional funding opportunities, the environmental, financial and strategic benefits outlined here can only be multiplied. A further study, and ongoing analysis of projects as they are commissioned, would provide greater confidence limits and predictability around the ROI for different types of intervention, for different types of organisation, and make it possible to ascertain any other correlations such as size of project, type of intervention or age/material of building.

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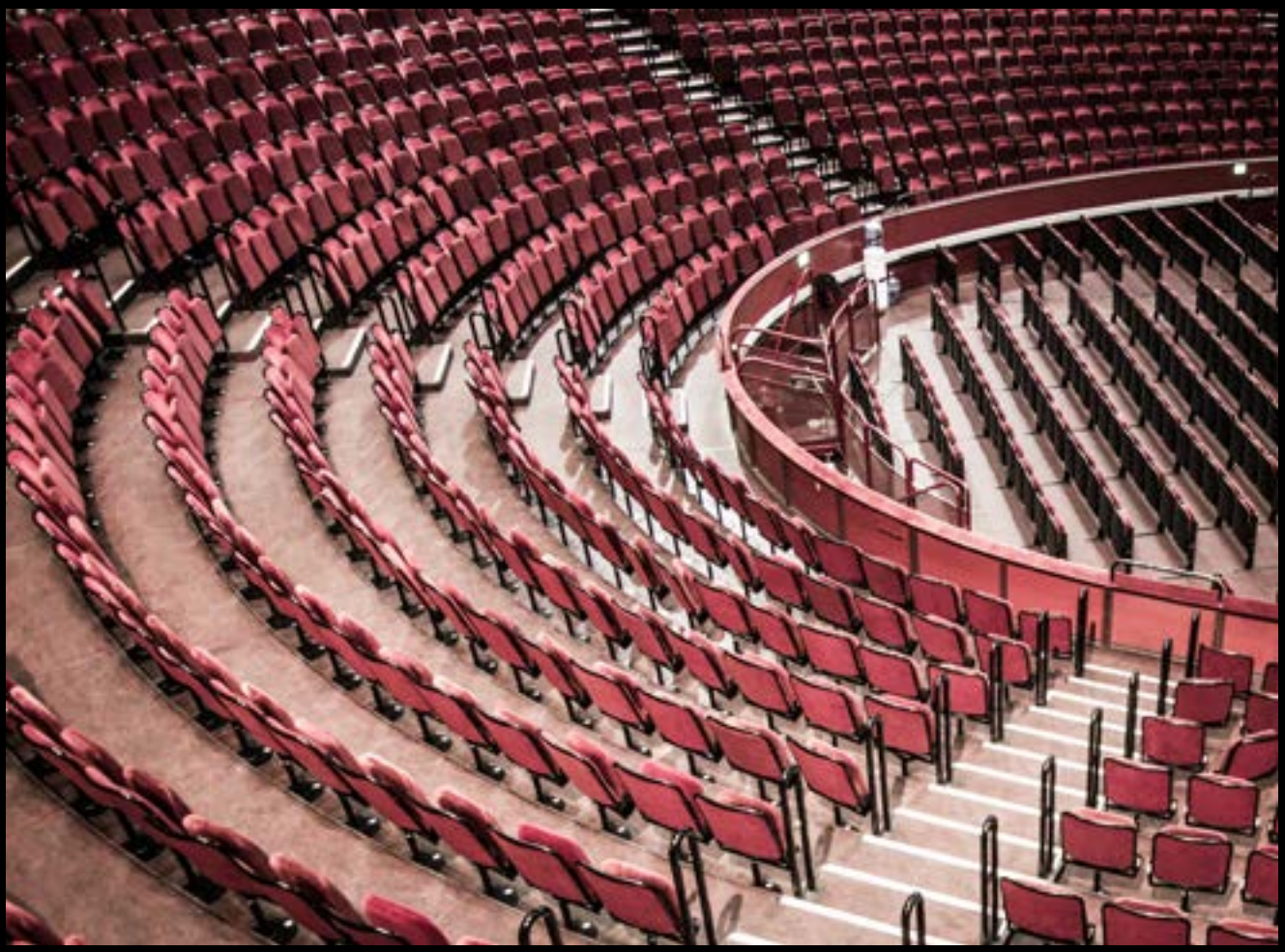
6

Appendix



7 Appendix 1. Carbon and Energy Price Constants

Electricity carbon conversion factors (UK, kWh)

Fuel	Unit	kg CO_2e	kg CO_2e of CO_2 per unit	kg CO_2e of CH_4 per unit	kg CO_2e of N_2O per unit
Natural gas	tonnes	2568.16441	2563.12000	3.85280	1.19161
Natural gas	cubic metres	2.04542	2.04140	0.00307	0.00095
Natural gas	kWh (Net CV)	0.20264	0.20223	0.00031	0.00010
Natural gas	kWh (Gross CV)	0.18290	0.18253	0.00028	0.00009

Electricity carbon conversion factors (UK, kWh)

Year	kg CO_2e	kg CO_2e of CO_2 per unit	kg CO_2e of CH_2 per unit	kg CO_2e of N_2O per unit
2025	0.17700	0.17489	0.00090	0.00122
2024	0.20705	0.20493	0.00090	0.00122
2023	0.207074	0.20496	0.000896	0.001218
2022	0.19338	0.19121	0.00080	0.00137
2021	0.21233	0.21016	0.00080	0.00137
2020	0.23314	0.23104	0.00072	0.00138
2019	0.25560	0.25358	0.00065	0.00137
2018	0.28307	0.28088	0.00066	0.00153
2017	0.35156	0.34885	0.00062	0.00209
2016	0.41205	0.40957	0.00039	0.00209
2015	0.46219	0.45850	0.00035	0.00334
2014	0.49426	0.49023	0.00033	0.00369
2013	0.44548	0.44238	0.00029	0.00281
2012	0.46002	0.45706	0.00028	0.00267
2011	0.45205	0.44917	0.00027	0.00261
2010	0.48531	0.48219	0.00026	0.00286
2009	0.49381	0.49054	0.00024	0.00303
2008	0.49608	0.49263	0.00022	0.00322
2007	0.46673	0.46359	0.00022	0.00291
2006	0.47337	0.47033	0.00021	0.00283
2005	0.47853	0.47537	0.00021	0.00294
2004	0.45670	0.45378	0.00020	0.00272
2003	0.47034	0.46725	0.00020	0.00289
2002	0.44914	0.44628	0.00019	0.00267

Gas prices:

Year	Gas: Average (Pence per kWh)
2004	1.254
2005	1.694125
2006	2.112152
2007	1.953755
2008	2.467677
2009	2.417332
2010	2.123727
2011	2.394274
2012	2.846743
2013	3.072701
2014	3.025158
2015	2.751572
2016	2.372979
2017	2.167969
2018	2.405551
2019	2.483604
2020	2.469798
2021	3.072868
2022	5.302067
2023	6.401888
2024	5.666955

Electricity prices:

Year	Electricity: Average (Pence per kWh)
2004	4.159
2005	5.149
2006	6.68664
2007	7.103556
2008	8.2018
2009	9.355758
2010	8.52846
2011	8.553878
2012	9.246741
2013	9.78459
2014	10.279063
2015	10.532267
2016	10.537531
2017	10.916615
2018	11.727001
2019	12.899436
2020	13.757556
2021	15.075087
2022	20.857358
2023	27.197454
2024	26.291283

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