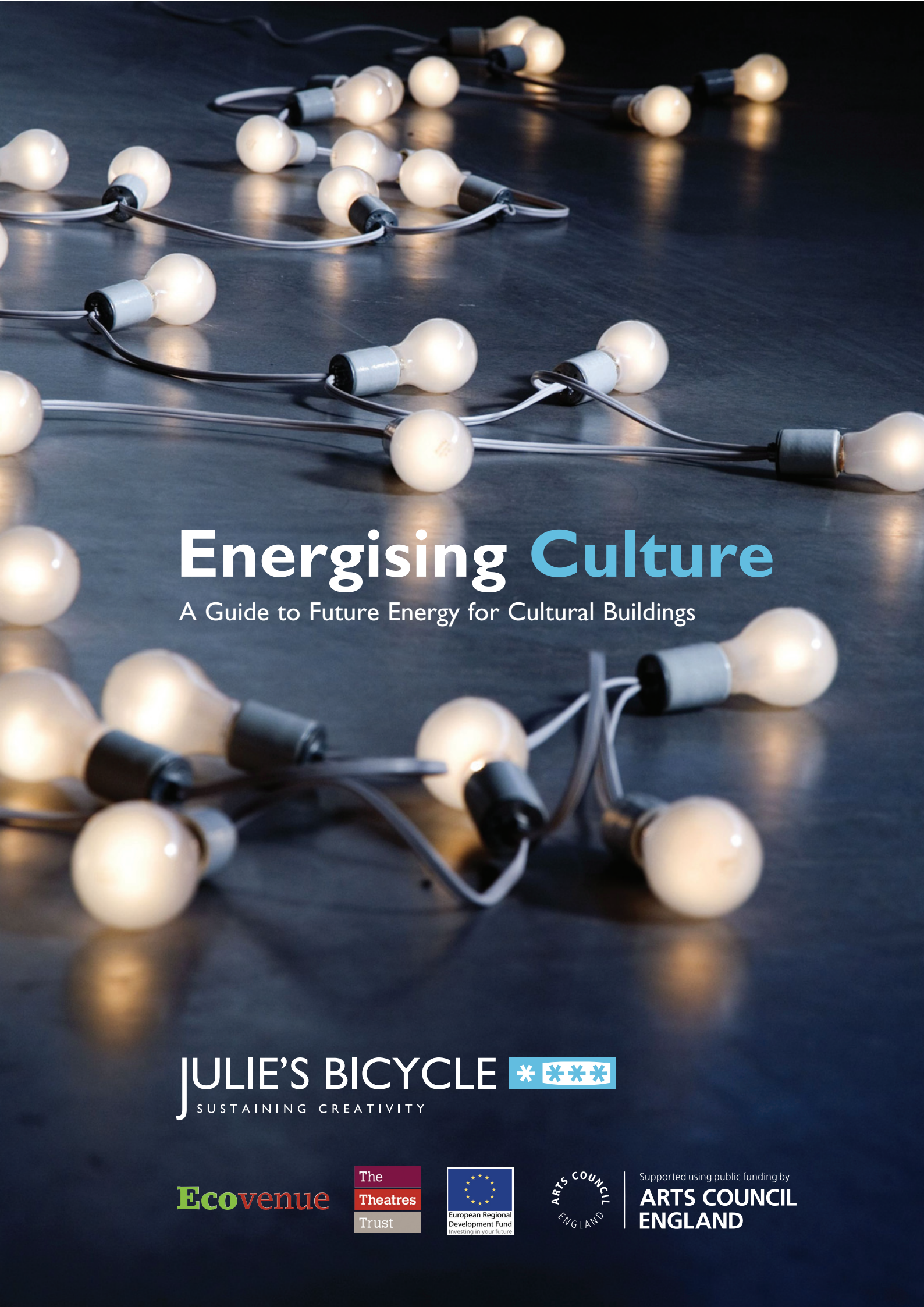

Energising Culture

A Guide to Future Energy for Cultural Buildings

JULIE'S BICYCLE

SUSTAINING CREATIVITY

Ecovenue

The Theatres Trust

European Regional Development Fund
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Contents

Forewords

Despite the entrenched nature of our current energy infrastructure, still vastly reliant on fossil fuels, systemic change to sourcing, supply and distribution of energy is inevitable. While energy is still cheap and easily accessible to the arts and cultural sector the energy system is poised on the edge of profound change. Already energy costs are volatile, carbon pricing is a reality, and the building of environmental externalities into the costs of materials and services is underway.

Over the coming years we can confidently predict that our current economic framework will be remodelled to account for a broader spectrum of value for any given resource – including environmental impacts. The consequent profound changes will impact on all aspects of arts and culture: and it is these business realities that are already stimulating change much more effectively than campaigns, science or personal ethics. The aim of this guide is to support these changes.

In the UK the current coalition government, under the guise of austerity, has decelerated low carbon incentives that would have stimulated bigger shifts (such as feed-in tariffs, mandatory reporting and CRC returns) even though investment in the 'green economy' is at record levels.

Such investment is transforming what is possible in sectors including digital, transport, communications, utilities, and materials and design, all directly relevant to the arts and culture. These transformational technologies combined with new business concepts and partnerships that strike through existing silos will, in large part, determine the future of arts and culture.

In the short term efficiencies and low cost retrofits will be the quickest wins and Arts Council England has already sent out helpful signals by including environmental sustainability as criteria in capital applications; encouraging the development of environmental policies; and measuring, tracking and benchmarking performance across the portfolio.

This guide, the first of a two-part publication, aims to set out the issues around energy demand, energy supply and the related implications for business models; and to make informed decisions about a long-term energy strategy for arts buildings.

The second part will take a more comprehensive long-term vision of environmental sustainability and how the cultural sector intersects, ranging across activities, business models, new technologies and emerging cultural values.

Protecting energy and resource supply, understanding demand, and the capital interventions that will buffer the arts and culture from price and supply volatility is of critical and immediate importance.

We hope this guide will provide cultural organisations with the information and guidance to help them plan for a resilient energy outlook over the coming years.

Alison Tickell
Chief Executive, Julie's Bicycle

2012 is the UN International Year of Sustainable Energy for All, designed to promote action and address global energy issues. As the advisory body for theatres in the UK I'm delighted that we've been able to play our part and come together with Julie's Bicycle to publish this valuable guide designed to help theatres and other cultural organisations improve their energy efficiency, adapt to climate change and rethink their approach to energy. The 48 venues in our Ecovenue project assisted by the European Regional Development Fund, which has part funded this guide, have contributed to developing our understanding of how theatres and small venues can manage their energy better and have been front runners in achieving Display Energy Certificates. This guide draws on the lessons we've learnt and covers many of the areas we've engaged with. I hope that Energising Culture will inspire you to understand the challenges ahead, take action, and see where we can work together to achieve a lower carbon future for our theatres and cultural buildings.

Mhora Samuel – Director, The Theatres Trust

Executive summary

Key points:

• Pressure to reduce energy consumption and related emissions and impacts is increasing. Fossil fuel prices are rising inexorably but unpredictably. Our global future energy needs, sources, supplies, distribution, and infrastructural interventions are subject to larger forces at play, such as economic constraints and political priorities.

• Drivers for change in the arts and cultural sector are no different from other sectors – ethics, cost and efficiencies, compliancy and regulations and future-proofing. However, the arts and culture are particularly vulnerable to reputational risk and it is critical therefore to address the concerns of your stakeholders, from patrons and artists, to audiences and local communities, so you are in a position to be proactive and share your energy story and successes.

• In the short-term the evolving policy and regulatory environment, increasing energy prices, uncertainty over future energy supply and climate change adaptation, present many challenges. In the long-term they can provide opportunities to rethink how your organisation uses energy in ways which can save you money and reduce environmental impacts; improve the fabric of your building and guarantee a secure supply of clean energy.

• Regardless of the size of your building, its function and whether you own, lease or share it, it's important to plan your energy future and to understand the relationship between your energy requirements and your carbon emissions.

• Increase energy efficiency through

- awareness-raising and behavioural change
- energy monitoring and evaluation
- energy efficient appliances
- smarter controls

• Rethink systems and services by

- managing heat, ventilation and cooling
- seasonal performance planning
- making buildings more multi-functional

• Rethink our energy supply by

- generating energy onsite
- community energy generation

• Medium to longer-term planning and investment in energy efficiency and low or zero carbon energy sources and technology will present challenges for many cultural buildings, in particular given:

- budget cuts and uncertainty over future funding;

- a lack of incentive if energy-related costs savings result only in reduced budgets and the organisation implementing the measures doesn't benefit;

- the need to ensure that energy-related measures do not compromise the organisation's ability to meet the needs and expectations of their artists and audiences and;

- lower levels of control or influence over how buildings are used by audiences and artists.

• Shifting to a culture in which energy, carbon and climate change become core considerations for building upgrade, capital investment and renewal programmes and opening up to new and collaborative investment models will strengthen the cultural sector's ability to provide stewardship of its physical infrastructure. Creative collaboration within the sector, among owners and occupiers and between owners, occupiers and local communities will make it easier to develop innovative and smart solutions and overcome barriers to investment.

In short, an informed and longer-term approach to energy strategy and management has the potential to save money, drive innovation, and catalyse the business relationships and ideas that are necessary conditions for sustainable and resilient businesses.

This guide is intended to help address the challenges outlined above, by raising key questions, outlining options for future energy strategy and management of buildings, and stimulate debate, with case studies and further resources to inform your decisions.

Summary of Chapters:

• Chapter 1. **Drivers for change**
outlines how energy and climate policy and regulation and the changing energy system are likely to impact on cultural buildings in the long term, voluntary schemes and standards which can help drive improvements, and what you should be thinking about in terms of reputational risk.

• Chapter 2. **Getting your house in order**
focuses on understanding energy use, costs and emissions, operational efficiency and energy procurement – an essential precursor to any longer term planning or investment.

• Chapter 3. **Future proofing**
outlines medium to longer-term options for reducing energy use, costs and emissions and sourcing low and zero carbon energy, looking at buildings, offsite productions and digital services.

• Chapter 4. **Funding opportunities and investment models**
provides information on financial incentives, funding programmes and investment models you may be able to use to support your initiatives.

• Chapter 5. **A framework approach to your energy future**
provides a framework for developing your energy strategy and implementing an on-going process to improving energy performance and moving towards a lower or even zero carbon future.

• **Appendix A)**
provides more detailed technical guidance on the options outlined in Chapters 3 and 4.

• **Appendix B)**
highlights tools and databases, guidance and support, certifications and standards available to the arts and cultural sector.

1.0 Drivers for change

1.1 Energy and climate policy, regulation and standards

The Context:

Nationally UK Governments have, to some extent, recognised that climate change is one of the more significant threats to our security and prosperity. In 2008 the Labour Government introduced the world's first legally binding long-term framework for tackling climate change: the Climate Change Act. The Act set ambitious targets to reduce the UK's carbon emissions by 34% below the 1990 baseline by 2020 and 80% by 2050. The Coalition Government's approach thus far has lacked urgency, and policy signals, such as non-mandatory reporting, Feed-In Tariffs and the Carbon Reduction Commitment Energy Efficiency Scheme have been unclear, generating uncertainty for businesses. However, the overall direction of travel is clear and a range of voluntary standards and local initiatives have been emerging.

At a local level, councils are expected to contribute to achieving national priorities, including renewable energy deployment, reducing the carbon emissions from their estate and encouraging those living and working in their area to reduce their emissions. Over 90% are already working towards locally adopted CO_2e reduction targets and over 380 councils have signed the Nottingham Declaration, soon to be replaced by Climate Local, which pledges councils to systematically address the causes of climate change and to prepare their community for its impacts. Some arts organisations will already be engaged in this agenda, for example co-operating on community energy projects (see Chapter 3.3).

There are a range of policies and regulations in place to help us meet our 80% carbon reduction target by 2050, many of which already affect how we use energy in cultural buildings. This chapter highlights the key issues and developments to be aware of for future building projects and the underpinning knowledge and reporting requirements on your how your building uses energy and how much energy it uses. Financial incentives and funding programmes developed within the current policy context are dealt with in Chapter 4.

	What?	Who?	Details
	Climate Change Act 2008	Everyone	To reduce the UK's carbon emissions by 80% by 2050 using a carbon budgeting system that caps emissions over five-year periods, presided over by the Climate Change Committee.
POLICY AND REGULATION	Carbon Reduction Commitment (CRC) Energy Efficiency Scheme	Public and private sector organisations (consuming more than 6,000 MWh electricity per year)	Mandatory cap and trade scheme that uses a range of reputational, behavioural and financial drivers
	Building regulations Part L	All building work	The 'conservation of fuel and power' section of building regulations to be updated in 2013 to reflect tighter carbon emission standards
	Energy Performance Certificates (EPCs)	Required for the construction, sale or rent of all buildings	EPCs show an A–G rating of the energy efficiency and carbon emissions of your building fabric.
	Display Energy Certificates (DEC)	Buildings with floor area over 1,000m^2 that are occupied/part occupied by public authorities or institutions providing public services to a large number of people	A DEC shows the energy performance of a building based on actual energy consumption along with a rating from A to G. The DEC should be displayed where it is clearly visible to the public.
	Climate Change Levy (CCL)	Public and private sector organisations	A tax on the use of energy in industry, commerce and public sector.
	Smart metering	Energy suppliers will be required to roll out smart meters to households and smaller businesses 2014-19. Installation of smart meters is voluntary in the commercial sector.	Smart or advanced energy metering is hardware used to collect energy use data and provide real time information about energy consumption. Standards for smart metering are still being devised.

Building energy performance

The most common forms of legislative measurement of energy performance for buildings are the Display Energy Certificate (DEC) and the Energy Performance Certificate (EPC). DECs rate a building from A (good) to G (not good) based on records of energy use. DECs are currently only legally required for public buildings with a floor area greater than 1000m^2. In practice this usually means civic theatres and concert halls, museums, galleries and university buildings. The certificate must be renewed annually and displayed prominently at the building's main entrance. Any organisation can opt to have a voluntary DEC.

Energy Performance Certificates (EPCs), issued whenever a building is sold or leased, look similar to DECs but are based on assumptions about the building's fabric and services, not on actual energy consumption. EPCs include a guide to energy saving measures and potential improved energy performance.

The Government has consulted on proposals to widen the scope of the DEC scheme, reducing the threshold from a 1000m^2 to a 500m^2 floor area, although this is unlikely to happen. The Government has also indicated, through the Energy Act 2011, that commercial buildings scoring in the two lowest EPC letter bands (F and G) would have to undertake improvement measures before

they could be re-let or sold. This could have a significant impact on leased venues. If landlords are unprepared to take on timely building upgrades, occupiers may have to look elsewhere.

The benchmarks used to rank a building within the 'Entertainment Halls' category for both DECs and EPCs, issued by CIBSE (Chartered Institution of Building Surveyors and Engineers) are inaccurate, and have not been revised since 2008. Using data obtained by Julies Bicycle's IG Tools[1] and Pilio's sMeasure[2] new benchmarks have been developed by Julie's Bicycle and approved by CIBSE which reflect the real performance of these venues. The new recommended benchmarks are shown in the table below:

	Benchmark relative to floor area kWh/m2/yr		Benchmark relative to capacity kWh/seat/yr	
	New	Old	New	Old
Electricity	110	180	320	520
Gas	140	420	370	1220

Specifically for theatres, the Theatres DEC Pool, led by The Theatres Trust, will provide a national picture of the DECs held by theatres. Information submitted by venues through an online survey on DEC results, building type, age, listing status, capacity, hours of operation, construction will enable venues to compare their performance with others that share similar characteristics. Results will be published annually from 2012.

New build and refurbishment

The new National Planning Policy Framework was adopted by Government in April 2012, and includes a caveat – that 'there will be a presumption in favour of sustainable development' meaning 'economically, socially and environmentally sustainable'.

All new buildings still must conform to the current version of Part L (Conservation of Fuel and Power) of the Building Regulations which sets out minimum energy performance standards for new builds in terms of overall carbon footprint, as well as circumstances in which refurbishment must trigger 'consequential improvements' – additional changes to the fabric to improve energy performance where practical and cost-effective.

The government has set out the requirement that all new non-domestic buildings be zero carbon by 2019. The zero carbon definition, currently being reviewed, is defined as a building's emissions from providing heating, cooling, ventilation, hot water and fixed lighting being net zero over each year. To achieve this it is expected that buildings meet high standards of energy efficiency; have low and zero carbon sources of energy onsite; and contribute to offsite solutions, as appropriate for the building type and location.

The Building Research Establishment's Environmental Assessment Method (BREEAM) is an indicator of building performance which operates for new builds and can be implemented at any period from design through to occupancy. It covers a broad range of topics from energy to ecology, water use to social well-being. While being voluntary, BREEAM is increasingly used, especially on large buildings, as a statement of intent to the planning system, construction team, occupiers and ultimately, end users.

Voluntary and mandatory emissions reporting

[1] IG Tools are a unique suite of tools for festivals, venues, offices, tours and production managers to measure greenhouse gas emissions on an annual or per-activity basis.

[2] sMeasure is an online energy analysis tool used by over 100 music and theatre venues of all sizes to understand where and when their buildings are using the most energy.

Reporting on carbon and other greenhouse gases (GHGs)[3] is not yet mandatory for UK businesses with the exception of those which consume over 6,000 MWh of electricity under the CRC. The Climate Change Act 2008 requires the UK government to introduce regulations for mandatory GHG reporting by businesses by April 2012. However in March 2012, and despite widespread support from the business community, DEFRA announced that it was delaying its decision on mandatory reporting. Many businesses have already realised the value of emissions reporting as a means of driving cost-savings and emissions reductions and addressing stakeholder concerns, and most larger businesses report using voluntary standards, guidance or tools, such as the GHG Protocol's series of accounting and reporting standards, DEFRA guidance and, in the arts and cultural sectors, the Julie's Bicycle Industry Green (IG) reporting tools.

Voluntary standards and other requirements

There are a number of voluntary schemes and standards which may provide a useful framework for cultural organisations managing environmental and energy performance, in particular for organisations seeking external recognition for their efforts. These include Industry Green (IG), the environmental certification scheme for festivals, venues, offices and CD packaging, ISO 14001 on environmental management systems, ISO 5001 on energy management systems, and BS8901 soon to be replaced by IS0 20121 on event sustainable management systems. The formal management system approach may however not be suitable, nor sensible, for every organisation.

There may also be other non-regulatory requirements with which organisations must comply. Of particular note for the cultural sector are the requirements introduced in 2012 by the Arts Council England for its National Portfolio Organisations and Major Partner Museums to measure and improve their energy and water and energy use, and develop an environmental policy and plan.

What does this mean for cultural buildings?

Current energy and climate policy may not yet require your organisation to monitor and reduce its carbon emissions. However, regulations may apply to smaller organisations over time to ensure that every sector of society contributes towards meeting the 80% target. It is therefore crucial to understand how the current policy and regulatory framework impacts on your buildings and their energy use, and to anticipate and plan for how this will impact on your building's performance in the future.

It will also be important to be aware of how your building is performing in relation to other buildings in your sector. The new performing arts venues benchmarks in particular will allow your organisation to compare its energy performance with a sector-specific average, which can be helpful in identifying a standardised energy and carbon reduction target, adjusted to take account of regional weather variations. Whether you are developing new buildings or refurbishing old, make sure you consider the regulations, standards and voluntary schemes that drive improvement, emissions reductions and cost-savings in the long term, and contribute to understanding energy for the cultural sector.

Key questions

1. Which policies and regulation most directly affect your organisation?
2. What can you do to anticipate changes and be ahead of the game on policy and regulation?
3. Do you have a long term energy strategy? And if so, will it enable you to reduce your emissions by at least 80% by 2050?
4. Do you know how your building performs relative to others in the sector?
5. Does your building conform to current regulatory and other requirements?

[3] Carbon dioxide (CO_2) is a Greenhouse Gas along with methane (CH_4), nitrous oxide (N_20), hydrofluorocarbons (HFCs), perfluoro-carbons (PFCs) and sulphur hexafluoride (SF_6), dealt with by the Kyoto Protocol, the UN-brokered global agreement on reducing GHGs.

1.2 Energy security and supply

Creating resilient energy supplies and building in flexible energy demand will be critical in coming years for managing the risks and uncertainties of international energy markets. Developing a comprehensive energy strategy for your organisation will help buffer against changing circumstances.

Change and uncertainty

The energy system in the UK is changing: around a fifth of electricity generation capacity is due to close in the next 10 years. In 2005 the UK returned to net importing fossil fuel after quarter of a century of using North Sea gas and oil reserves. The Government's Energy Bill, announced in May 2012, highlighted electricity market reform, and the role of renewables, nuclear and carbon capture and storage to meet future demand. Five key uncertainties are:

- The financial case for nuclear investment, particularly following the withdrawal of all but one bidder from the Government's process to build new nuclear power stations;
- Fracking[4] as a solution to the UK's energy needs: the amount of fossil fuel reserves available, environmental and health impacts, and financial competitiveness are not fully known;
- Fossil fuel sources from other countries are unreliable due to geo-political instability;
- Carbon capture and storage at power stations has yet to be proven on an industrial scale;
- Increasing renewable supply requires improvements to the National Grid and energy storage mechanisms to allow for times when supply and demand do not match.

Future demand

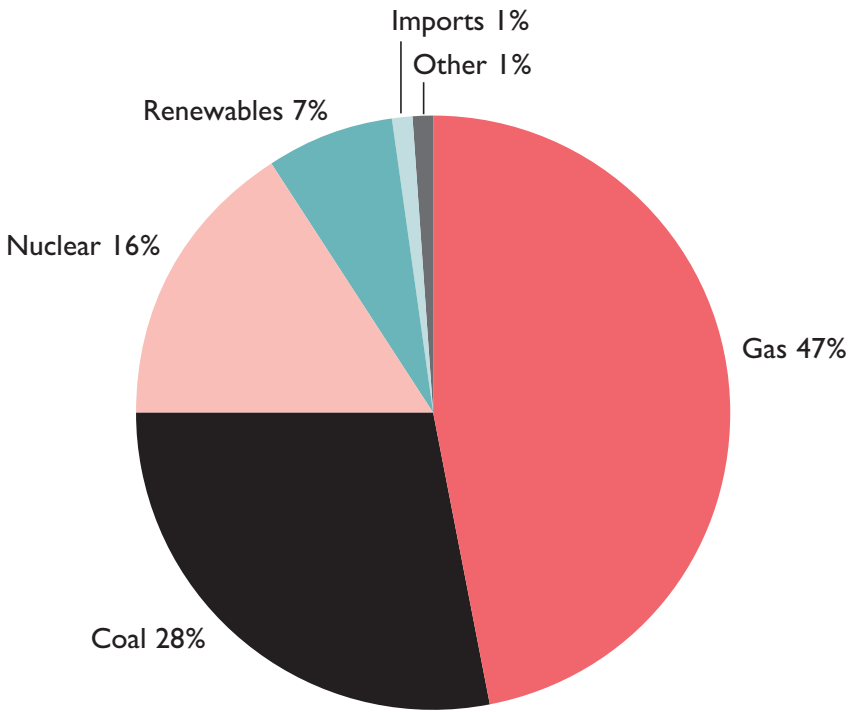
UK electricity demand has increased by 18% since 1990 and is predicted to double by 2050 due to increased electricity use for transport, heating and cooling. If the growth in demand continues unchecked it is unclear how sufficient new capacity can be built to meet it. This is why energy efficiency plays such an important role in ensuring energy security.

The time of day that we use electricity may also change to help manage peak-demand and balance variability in the grid. It is likely that smart metering and smart grid technology which can control and adjust energy use will be developed.

[4] Fracking, or hydraulic fracturing, is the injection of a highly-pressurized fluid to create fractures in the rock to increase the extraction rates of fossil fuels that were previously inaccessible.

Current energy mix

The UK is reliant on fossil fuels to heat buildings, to power transport, and to generate electricity. Almost half of the energy consumed in 2010 was petroleum, used mostly in transport, and a third of energy consumed was natural gas, used to heat our buildings and power industry. Electricity, illustrated in the pie chart, was generated mostly from gas, followed by coal and then nuclear power. Just 7% was generated from renewable sources.[5]



This illustrates the challenge in shifting our current energy mix to one commensurate with our carbon reduction target of 80% by 2050 and reducing our reliance on energy imports.

What does this mean for cultural buildings?

Uncertainties around the reliability and affordability of future energy supply make investment decisions difficult. However, it is clear that reducing your building's reliance on fossil fuels and demand on the energy system will decrease risk of potential price shocks and shortages in supply. This means increasing the energy efficiency of buildings and investigating options for generating energy onsite or in your local community.

Key questions

1. In what ways do you rely on fossil fuels?
2. How can you best decrease your demand for fossil fuel energy?
3. Can you generate your own energy onsite?

[5] DECC (2011) Digest of UK Energy Statistics 2011.

1.3 Climate adaptation for buildings

The UK is already managing impacts from climate change and anticipating some further climate change due to the greenhouse gas emissions we have been emitting since the industrial revolution – some greenhouse gases remain in the atmosphere for many years after they are emitted and so the changes we are experiencing today are as a consequence of past activities. Therefore, we need to adapt our buildings and infrastructure in anticipation of on-going climate change. The physical risks your organisation should plan for include, at least, flooding, overheating and water stress. As you consider investment in your building fabric and operations to reduce energy use also consider measures to safeguard the building from local climate variability and events.

Adaptation to climate change needs to be considered as part of all key decisions about your building design, financing, operations and behaviour. While it is impossible to predict the specific changes that will occur, the balance of risk is strongly in favour of adapting to climate change, rather than ignoring it.

How is our climate changing?

The UK is expected to be wetter in the winter and drier in the summer although there will be regional variation in this pattern. There has been an increase in heavy precipitation events in winter and a decrease in rainfall in the summer months, causing both flooding and droughts. The changes in climate patterns means heating demand might go down and cooling demand might go up. Cities and towns along the coast are vulnerable to sea level rise and buildings located close to waterways will be vulnerable to surges in the water levels.

Climate projections, based on the most robust climate science to date, suggest that we will experience significant changes in our weather patterns in the next 70 years. The UK Climate Projections 2009 (UKCP09)[6] and the UK Met Office predict that:

- Average UK summer temperature is likely to rise by 3-4°C by the 2080s;
- Average summer rainfall across the UK is expected to decrease 11-27% by the 2080s, and winters are likely to become wetter;
- Sea levels will continue to rise. The central estimate (taking into account land movement) is a rise of 36cm in London by the 2080s;
- Extreme weather events are likely to become more common. For example, the Met Office suggests the summer heat wave we experienced in 2003 could become a normal event by the 2040s and by the 2060s would be considered cool.

These projections are based on the assumption that we will be able to secure an ambitious global commitment to limit emissions over the long term. If this does not happen, it is anticipated that we will experience more extreme changes in our climate.

[6] Defra (2009) Adapting to Climate Change: UK Climate Projections.

What does this mean for cultural buildings?

Adapting to climate change as part of your organisation's business planning procedures will help ensure decisions are taken to manage operational running costs and minimise disruption. Local authorities (with planning and use regulations) and utility companies will make more requirements of organisations to reduce water and energy demand.

- Flooding risks inundating basements and ground floor areas as well as water collection on facades and roofs. 33,000 tourist and leisure facilities in England alone are within areas that could be affected by river or tidal flood and many cultural businesses are completely dependent on the local and national infrastructure to cope with climatic changes.
- Overheating poses risks to human health and damage to electrical equipment; demand for energy will significantly increase if energy intensive cooling systems are required; and local blackouts may be experienced due to the energy demand for cooling.
- As a result of overall stress on water supply restrictions in water use may have to be introduced; damage could be caused to mains and on-site water pipes resulting in leakage; and water charges are likely to go up to reduce demand and to pay for infrastructure maintenance.

Adaptation to climate change strategies include:

- improving the insulation of the building fabric;
- installing mixed mode systems for air ventilation and cooling;
- installing glaze shading;
- installing daylight controls;
- vegetating the building area by planting green walls, roofs and trees;
- installing grey water systems;
- and installing good drainage systems around the building (including any car park areas)[7].

Case study: Southbank Centre

Since the reopening of the Royal Festival Hall in 2007, the Southbank Greywater Partnership has been providing greywater for the Southbank Centre's cooling systems, the Queen Elizabeth Hall toilets, and for watering site gardens, including their newly opened roof garden and allotment on the Queen Elizabeth Hall viewing gallery which was planted in 2011 in partnership with the Eden Project.

The greywater is sourced from two boreholes on site and is crucial to running the building's two York chillers. Most of the discharge volume goes towards the Royal Festival Hall cooling system, but also services the retail outlets of levels 1 and 2, the Southbank Centre office and function rooms. The Greywater Partnership has meant that on average over the last 5 years Southbank Centre has improved energy efficiency by up to 20%, despite animating new spaces both internally and externally that have increased demand. To cope with rising demand, Southbank Centre are planning to introduce a further 2MW cooling into further site development projects and create both a chilled circuit and heat load circuit by reclaiming heat from the cooling system greywater via the existing domestic hot water system, which would reduce gas consumption from their boilers and further improving energy efficiency. Through these new updates, the Partnership will also offer the opportunity to other organisations based along the South Bank to use the recycled greywater after it's passed through the Southbank Centre's cooling systems.

[7] London Climate Partnership (2009) London's Commercial Building Stock and Climate Change Adaptation

Case study: **National Theatre**

Much of the National Theatre's infrastructure had been in place since the building opened in 1976. Starting in 2007, a programme of investment in smarter use of systems and low carbon technology has brought the National significant carbon and financial savings.

This first tranche of work included switching the facade lighting and teletex screen to LED, producing a 70% energy saving per year in these areas. Internal lighting has been changed where possible to low energy, long life lamps, and occupational sensors have been fitted in all Front of House and refurbished Rear of House toilets to ensure lighting only comes on when required. The underground car park has also been fitted with zoned occupational sensors and dimmable lights, which stay at 10% when unoccupied and raise to 90% when occupied. These works have contributed to a 20% reduction in carbon emissions in recent years.

As part of NT Future – a major redevelopment project which includes replacement of much of the original building infrastructure, the building's main boilers and chilled water systems are being renewed. The three original 1795kW boilers have been being replaced with two high efficiency 1650kW boilers and a 513kW HEAT and 400kW POWER Combined Heat and Power (CHP) plant, which will cover the building's base power load between the peak tariff time of 7am to midnight. The remaining electrical demand is supplied by Smartest Energy from renewable sources, and so is exempt from the Climate Levy charge. By making use of the CHP heat output during periods of low heat demand, it can supply both heating and domestic hot water. An absorption chiller and a 'thermal store' facility are currently being installed, and the subsequent stored 'coolth' can be used to supplement the main chiller.

The controls to the Air Handling Units serving the theatres are due to be upgraded, as well as the replacement of the old pneumatic valves and dampers. Supply and extract fans are being fitted with Variable Speed Drives, and Carbon Dioxide monitoring introduced into the control strategy to help maintain the optimum level of fresh air in the space, while at the same time allowing the fans to run at reduced speed and/or make best use of reclaimed/recirculated air.

On completion, the NT Future works are expected to deliver a further reduction of 22% in the NT's carbon emissions.

Case study: **Greenwich Theatre**

Greenwich Theatre makes a special effort to stage as many of its summer productions outdoors as possible, to reduce bills for cooling the auditorium during the hottest months. This along with other efficiency measures has resulted in the theatre having the lowest energy use per seat compared with eleven other small to mid-scale producing theatres in London.

Key questions

1. How will your building be impacted by local climate change?

2. How do future plans for the building and your use of it affect, expose or mitigate for flooding, overheating and/or water stress?

3. What are your options for responding to changes in your local climate?

1.4 Reputational risk

It can take some time to establish a credible reputation for environmental integrity but it can take a matter of days for reputations to fall if claims are found to be false or exaggerated.

Types and source of risk

Given the public nature of cultural organisations, it is essential to have an understanding of the type and level of reputational risk to which your organisation may be exposed in relation to environmental performance, what you can do to address these risks, and potentially even turn them into opportunities. The type of risk will vary depending on organisational size, type and profile. For example a higher energy-using business participating in the CRC may run the risk of being poorly ranked in the CRC's annual public performance league table, whereas a smaller business may run the risk of losing a bid if it cannot demonstrate its environmental credentials to potential donors, customers or artists.

In general there are a number of key areas to consider:

- Who are your key stakeholder groups, e.g. funding organisations, audiences, local community groups, staff? What are their energy and environmental concerns and are these concerns being addressed?
- Are you complying with relevant regulatory and other requirements?
- Do you know the environmental requirements of the funding organisations, artists, clients you are targeting and can you demonstrate that you meet them?
- Are you being compared to other organisations or buildings in your sector, e.g. via sector benchmarks or Display Energy Certificates (DEC), or is this likely to happen in the future?
- Are you aware of your suppliers' and contractors' energy and environmental performance and how this reflects on and relates to your own environmental and energy performance and reputation?
- If you are already communicating on your environmental and energy performance, are you doing this in a transparent and consistent way?

What does this mean for cultural buildings?

By understanding and working to improve your environmental and energy performance, ensuring compliance and communicating what you are doing in a transparent and consistent way, your organisation can go beyond a reactive risk management approach to protect and enhance its reputation. Cultural organisations have many opportunities to turn potential risks into benefits by engaging with their stakeholders, donors, audiences, artists, local community, peers on environmental and energy issues. Think about communicating your building's energy performance even if you are not obliged to; think about the ways you are already engaging with stakeholders and how you can bring in environmental and energy issues and; make sure you know what your peers and competitors are doing in this field.

Key questions

1. Who is interested in your energy performance, costs and carbon impacts?

2. What are their concerns and are they being addressed?

3. What are the risks to your reputation if you fail to understand and improve your energy performance and carbon impact

2.0 Getting your house in order

The first step for developing a long-term energy strategy is to understand building energy use and trends. This requires implementing a good energy management system with close involvement of staff.

It will enable you to identify the best options for saving energy and moving to lower or zero carbon energy sources. Most organisations will be able to achieve significant energy, carbon and cost-savings by focusing first on no and low-cost measures.

Energy auditing

It is important to have a clear view of how your building currently uses energy in order to make the best decisions on energy saving interventions so an energy audit is a good place to start.

Make sure all key staff members contribute to the energy audit and the findings are discussed so energy planning can begin.

The following questions should be considered when auditing energy use and costs:

- What systems are using energy? e.g. ventilation, heating, lighting;
- Where is it being used? e.g. in performance/exhibition areas, foyers, loading bays, archives, offices, bars;
- What are the occupants' perceptions? e.g. of comfort and light;
- When is energy being used? e.g. day versus night, winter versus summer;
- What systems and equipment are most in need of upgrade? e.g. older or more inefficient equipment;
- What are the fuel types and costs?

More detailed guidance on collecting and analysing energy data is provided in Appendix A.1).

If you are leasing or renting a building or a space within a building it will be essential to work with the landlord, or the building management company, to obtain reliable and accurate data on actual energy use. In multi-occupancy buildings it may also be worth looking at options for setting up an energy or environmental group to work together on energy monitoring and reductions.

Operating efficiently

You don't need to wait for a major refurbishment programme, or the installation of on-site renewable energy sources, to be able to stimulate significant reductions and improvements. Before committing to investment in new energy saving interventions it is usually possible to achieve substantial reductions by adjusting the way existing building fabric and systems are maintained and operated. Use regular maintenance budgets and programmes to affect no and low cost changes and also use business case analysis to demonstrate the revenue savings from capital investments with short payback periods e.g. 2 to 3 years. In addition, if significant capital investments are planned, undertaking improvements can reduce the demands upon new equipment and therefore costs. Chapter 4 includes an overview of financial incentives and funding programmes which could be of use to your organisation.

Julie's Bicycle has seen buildings achieve annual energy savings of 10% every year for 3-5 years just on no-low cost efficiencies alone. Develop an action plan that takes capital costs and lifetime savings into account. Measure and report your successes, especially to staff and audiences, and keep on looking for efficiencies.

Detailed information on the kind of no-low cost interventions that can significantly reduce energy use is provided in Appendix B.2).

For leased spaces and buildings, the UK's Green Buildings Council's Better Building Partnership provides a Green Lease Toolkit to enable owners and occupiers to work together to reduce the environmental impact of their commercial properties including best practice principles, a sample agreement and a schedule of energy saving measures.

Case study: Sage Gateshead

In September 2009 the Sage Gateshead, an international music venue and music education centre, was one of the first organisations to sign up to the 10:10 climate campaign, pledging to reduce its greenhouse gas emissions by 10% over the following year. Since then it has made great strides in reducing energy consumption and greenhouse gas emissions. Some of the biggest savings have come from switching lighting to low-energy LED bulbs, installing highly efficient new air-conditioning filters and decreasing the amount of gas used for heating. The Green Team has engaged with staff across the organisation with initiatives such as a 'Switch It Off' campaign for electrical appliances.

As a result of their efforts The Sage Gateshead has made consistent reductions in energy consumption, with a drop of 44% in electricity and 28% in gas use per concert between 2007/8 – 2008/9. This trend was continued the following year, which marked another 9% fall in overall energy use per show. As a result they have been awarded not only Industry Green status, but also the Gold Standard National Clean Air Award.

Case study: Circus Space

Circus Space is a circus skills training centre, offering a degree programme in circus skills, housed in a former power station in Hoxton which used to use waste from the local community to generate energy. The Theatres Trust has been working with Circus Space as part of its Ecovenue project which is improving the environmental sustainability of 48 small to medium-sized performing arts venues in London. Having put together an Environment and Sustainability Team (EaST), Circus Space has embarked on a mission to improve operating efficiency.

Ecovenue provided Circus Space with an energy monitor, which was positioned on the main reception desk. The monitor's display provided a live readout of building energy use to all staff, students and visitors. The monitor also logged detailed energy usage that building staff could use to identify areas needing improvement. As a result, they were able to reduce their overnight baseload by about 2kW, saving about £800 per year. Using the Cost/Benefit Calculator supplied by Ecovenue, Circus Space was able to investigate the efficiencies to be gained by retrofitting LED lamps into its foyer and reception area, lit with tungsten-halogen downlighters. The calculator provided reassurance that despite a large initial outlay, energy and carbon savings were immediate, with a payback period of approximately a year and a half.

Energy procurement

There are a number of more sustainable options for energy procurement:

- Buy 'green tariff' electricity from your current provider. Green tariffs are sometimes more expensive than standard tariffs, but if your organisation can afford to do this, you will be contributing to increasing the market demand for greener energy and pushing the big six companies to meet their legal obligation to source an increasing proportion of electricity from renewable sources each year;
- Switch to a 100% renewable energy provider such as Good Energy, Ecotricity or Green Energy. While the big six energy companies provide a mix of 'brown' and 'green' electricity, there are a number of companies that provide 100% renewable energy. They tend to be contributing in a more ethical and innovative way to renewable energy generation;
- If your landlord has control over electricity supply, ask them to switch to one of the above;
- Another option, of particular interest for cultural organisations, is that of joining together with other organisations to negotiate joint energy procurement. While the main advantages of this approach are more cost and risk related, by securing a better price over a longer-time period, your organisation can free up resources for investing in energy savings measures or onsite energy generation.

For organisations which own their buildings, options for installing efficient and renewable energy supplies onsite are covered in Chapter 4.2.

Case study: Joint energy procurement

The National Theatre, Royal Opera House and the Royal Albert Hall have been collaborating to form an 'Arts Basket' for the purchase of electricity, and subsequently gas, working with the energy broker Power Efficiency. A contract for what is known as 'joint flexed purchase' of electricity has been signed for three years starting October 2012. Under the contract, Power Efficiency will monitor the wholesale markets and, when indicated by the risk strategy, will purchase electricity. Power Efficiency will buy if prices rise or fall by an agreed percentage to ensure certainty of price. In a market where prices are falling, Power Efficiency may advise to unlock (sell purchased electricity back to the market) and relock (buy) at a lower price. The Arts Basket is open to other organisations to join , provided they have half-hourly meter readings, and some of The Theatre Trusts' Ecovenues are already joining the 'Arts Basket'.

The National Theatre has identified the following benefits from its participation in the Arts Basket:

- Increased certainty of energy prices;
- Some benefit of bulk buying over a longer period may be realised and the attractiveness of the makeup of the basket for suppliers may also provide benefits;
- The utilities companies will levy a penalty if consumption is higher or lower than 10% to 15% of purchased quantity, depending on the supplier. Being part of a basket means the penalty will kick in at a higher absolute value which may be beneficial to the National Theatre because it is involved in a number of energy reduction projects;
- The contract provides for invoice validation.

Key questions

Strategy

1. Does your organisation understand how it uses energy, how much it uses, what type it uses and the related costs and emissions?

2. Who currently on staff is responsible for energy management, procurement and future building planning? Is there join-up?

3. How might you invest in energy improvements in the shorter to medium term e.g. measures with short payback periods, using existing revenue maintenance budgets?

4. How will you communicate on energy performance and carbon impacts to staff and audiences?

Monitoring

1. Whose role is it to analyse energy use data and to inform interventions?

2. What existing energy use data is available and what additional data should be collected?

3. What systems and equipment should have detailed monitoring for energy efficiency?

Options

1. What opportunities do you have for low and no cost and/or procurement-related measures to increase energy efficiency, and reduce or stabilise costs?

2. Is equipment well maintained and is correct operation clear?

3. What equipment is inefficient and when and how will it be replaced?

3.0 Future proofing

While the energy landscape is fraught with short-term uncertainty, in the long-term the infrastructural and pricing challenges provide unprecedented opportunities to rethink how your organisation works so that overall business resilience is strengthened.

3.1 Major refurbishment

When considering major refurbishments seek opportunities to reduce energy use and proof the building for local climate change impacts.

Major refurbishment involves substantial replacement of equipment and changes to the building fabric. Typical refurbishments which will improve energy performance include installing more energy efficient boilers or lighting, improving building insulation, zoning buildings' heating, cooling, lighting according to use, occupancy times and levels, and changing buildings controls e.g. setting up a Building Energy Management System. Consider improving the following elements of your building: fabric, shading, heating, ventilation, cooling, other equipment, controls and monitoring.

More detailed information is provided in Appendix A.3).

Refurbishment provides excellent opportunities for improving energy efficiency, although it can increase energy consumption where services are enhanced, for example, introducing air conditioning. Careful attention should be paid to the design brief, design checks and handover process.[8]

See Chapter 5. for an overview of financial incentives, funding programmes and investment models for major refurbishment projects.

Case study: The National Theatre

In 2008 the National Theatre set itself a target. Over three years, it would reduce its consumption of gas and electricity by 20%. Like other institutions, the National made quick progress with 'low-hanging fruit'. The next steps are going to require substantial investment. Everything has been considered, from introducing CHP (Combined Heat and Power) to a proposal to insulate parts of the roof with plants. The theatre would, quite literally, be going green.

Case study: Manchester Art Gallery

The gallery has implemented a number of environmental actions, informed by its sustainability strategy, including installing low energy gallery lighting (Xicato Artist Series LEDs), funded by Manchester City Council's 'Invest to Save' scheme. The gallery has borrowed £96,000 on a five-year payback scheme but estimates that this will be paid back within 13 months due to energy savings and lower maintenance costs.

[8] BSRIA's 'Soft Landings' provides a useful framework to ensure these are addressed.

Key questions

Strategy

1. Do you have a long-term vision and plan for your building, which includes major refurbishment?

2. Are you aware of the funding mechanisms you may be able to draw on for major refurbishments?

Options

1. What opportunities does the building have for equipment and fabric upgrade?

2. How could the fabric be changed to reduce heating, cooling and lighting demands?

3. How could equipment be changed to make it more efficient?

4. Have unintended consequences of refurbishment been identified? (e.g. on comfort, usability and condensation).

3.2 Onsite energy generation

Provision of energy onsite will help buffer you against uncertainty and risks in the international energy markets, but also makes energy use visible to your staff, suppliers and patrons. A variety of onsite energy generation technologies are emerging as well as the financing models to fund installment. Explore what is best suited to your organisation's locality and circumstances.

Generating renewable energy onsite, also known as micro-generation, can have many benefits. These include:

- Reduced energy bills;
- Protection against future rises in energy prices;
- Reduced carbon emissions;
- Being an exemplar in your community, with the potential to showcase new technologies;
- Minimal transmission losses associated with centralised electricity generation;
- Can attract financial incentives designed to offer a return on investment of 6-8% (e.g. feed-in tariffs for renewable electricity or the Renewable Heat Incentive).

Options

The following technology options are available for onsite energy generation:

For electricity generation

- Solar photo-voltaic panels;
- Micro-hydro;
- Micro-medium scale CHP (Combined Heat and Power plants);
- Wind turbines (contingent on sufficient space).

For heat generation

- Heat pumps (air, water and ground source);
- Solar thermal;
- Biomass.

For more detailed information on the various technologies, their benefits and limitations see Appendix A.4).

Case study: Glyndebourne

In December 2011, after nine years of planning, design and consultation, Glyndebourne's wind turbine started operating. It is expected to generate 800,000 kWh of electricity each year, meeting 90% of Glyndebourne's annual electricity requirements. Electricity which is generated but not used by Glyndebourne is fed back into the grid, supplying renewable energy elsewhere and generating income for Glyndebourne.

Case study: Theatr Brycheiniog

Theatr Brycheiniog became Wales' first theatre to generate its own onsite solar power in 2008. The solar photovoltaic panels now provide part of the venue's power, and have allowed the venue to reduce its carbon output by just over 5 tonnes per year. To lower the general demand for power, and ensure that a larger proportion of their total energy use can come from the solar panels, the theatre also recently purchased a large quantity of LED stage lighting equipment to complement their conventional tungsten rig, meaning that it now has a 50% low-energy lighting rig. An energy monitor in the foyer of the building shows exactly how much is being generated and the panels have also been used to help educate visiting children about the opportunities for solar power. Solar photovoltaic panels are not necessarily inexpensive to fit – in this case the cost was in the region of £60,000 – but assistance is available through various local and national schemes, such as the feed-in-tariff (FiT) system. FiTs provide a payback not only on the energy you generate, but also through reduced electricity bills. Although installed before the FiT scheme's introduction, Theatr Brycheiniog has been incorporated into the programme.

Case study: Theatre Royal Newcastle

As part of its major refurbishment completed in autumn 2011, Newcastle Theatre Royal installed thirty-six 230W photovoltaic modules on their roof. A display at the box office shows the current output and running total of energy and carbon savings. The predicted annual output will be 6045kWh, with the theatre using the electricity or benefitting from the Feed-in Tariff when it exports to the grid.

Key questions

Strategy

1. What would be the strategic benefits of onsite low carbon or renewable energy generation for your organisation?

2. How might your energy use patterns be aligned to maximise the usefulness of onsite renewable energy?

Options

1. What opportunities does the building have for onsite installation of energy generating technology?

2. What proportion of your energy use might be met through micro-generation?

3. How might energy generating technology be funded?

4. What partnerships and new business models do you need to make this approach viable?

3.3 Community energy generation

Many venues will find onsite renewables are not feasible for their building or budget. When this is the case, it may be possible to take advantage of an existing or planned community generating scheme, or to initiate the development of a new community scheme.

Community energy projects range in scale, technology, ownership and funding models. Projects can be individual installations or community wide networks which generate either heat and/or power to meet the energy needs of a community. They can be directly owned by the community, for instance through co-operatives, or they can be led and funded by local authorities to supply energy to community facilities. Alternatively, it may be more appropriate to set up purchase agreements with suppliers to provide cost-effective installation of technologies for community networks.

Options

There are three main options for community energy generation at present:

1. Join an existing or planned project, such as a heating and cooling network. There is potential for renewable heat schemes, such as biomass, which have become more financially viable since the introduction of the Renewable Heat Incentive.

2. Initiate a new project. This could involve:

- Encouraging your local authority to generate energy from renewable sources for your building and other community facilities;
- Identifying other big energy users or landowners in the local area to partner with, and then explore the technical and financial options available;
- Setting up a purchasing agreement with an energy supplier to provide a community network.

3. Invest in renewable energy offsite, such as sponsoring a turbine, investing in Ecotricity bonds or a local renewable energy cooperative, such as Brixton Energy. This option does not necessarily supply clean energy to your building but it can provide a return on investment which can be used to invest in your own scheme onsite or to further improve the energy efficiency of your building.

Case Study: Birmingham District Energy Scheme

The Birmingham District Energy Scheme is owned and operated by COFELY District Energy working in partnership with Birmingham City Council – under the name of Birmingham District Energy Company Ltd (BDEC). One of BDEC's three core schemes is the Combined Heat and Power (CHP) Plant scheme which runs across the Broad Street City Centre Energy Network. This provides hot water for heating and electricity and cold water for air conditioning to many of Birmingham most prominent buildings, including the Town Hall, the Council House, Birmingham Rep Theatre and NEC's International Conference Centre and National Indoor Arena. By utilising energy from the CHP plant over 10,500 tonnes of carbon have been saved since 2007 for both NEC venues.

Case study: Capital FM Arena, Nottingham

Capital FM Arena is located as part of the National Ice Centre (NIC) in Nottingham and features two Olympic ice rinks. It sources 100% of its heat and power from a local Combined Heat and Power (CHP) plant powered by waste. Nottingham has the largest district heating system in the UK, serving close to 5,000 homes and more than 100 businesses with 65km of pipes. The heat is produced by energy from a waste plant owned by Nottingham City Council.

Key questions

Strategy

1. What strategic opportunities could a community approach to energy generation afford your organisation?

2. Are there any existing energy generation schemes in your local community in which you could get involved? If not, who in your local community might be interested in starting a new scheme?

Options

1. Could any of the existing renewable energy funding or financing schemes be appropriate?

2. What partnerships and finance models do you need?

3.4 Digital energy

Growth in digital activity is fast. CISCO predicts that there will be 4 billion mobile internet users worldwide by 2015, with internet traffic quadrupled from 2010. Digital activity is often assumed to be environmentally beneficial as it reduces the amount of 'stuff' – for example switching from print media to an online presence reduces the use of paper, water, ink, energy and transport. However the energy used by data centres, internet service providers (ISP) and individuals both running their devices and accessing the internet is very significant.

A comparison between streaming and shipping a DVD carried out by the University of Massachusetts in 2010 found that if the film was streamed in an energy-inefficient manner, the emissions were double that of shipping. However if the latest advances in digital efficiencies were applied to streaming, emissions could be 65% less than shipping. These savings are eroded if the film file size grows by switching to 3D or high definition.

Awareness of these issues has been highlighted by the successful campaign to shift the location of Google's infrastructure to countries with cooler climates and lower carbon electricity, and Apple's investment in solar photovoltaic panels. In 2008 Gartners estimated that the ICT sector was creating 2% of global carbon emissions, a figure equivalent to aviation. Experts raised concerns with Ofcom in 2009 about the environmental impact of 3G (Plextek and Eftec).

However, the impact of digital media is still poorly understood. A lack of publicly available information about data centres, ISPs, device manufacturers and consumer behaviour makes estimating impacts for new digital services difficult.

Options

Venues are increasing the functionality of their online presence, for example by making interview and trailer videos and programmes available to download. Some are also delivering their art form digitally, making performances available to stream, download or hosted on cinema screens. Digital provision increases your venue's direct energy use if you have servers on site, and indirectly through increased use of staff computers and devices. The more data stored on site, even on individual computers, the more energy will be used. Costs will also be increased through the procurement of digital services: effectively paying for the energy use of the server farms, data centres and distribution. Finally your indirect emissions will include the energy used by your audiences as they use their devices and access the internet for your content.

The cost and carbon impacts of digital provision are extremely complicated for venues to analyse. Impacts will be contingent on content development, distribution methods, and on user behaviour. A methodology for measuring digital impacts with a clear scope and which accounts for these variables is not yet available and remains elusive as business models and demand is rapidly evolving. Venues face the added complexity of accounting for audience travel. Digital delivery offers the potential to reduce audience travel or grow the audience without increasing travel: probably having a beneficial impact though no quantitative study has yet been undertaken.

Despite the current limitations around measuring digital impacts, there are some actions you can take to reduce your energy costs and carbon impact of data storage and distribution, and the way in which it is used by your audiences:

- Rationalise your data storage – on servers and individual computers;
- Ask your storage and distribution providers how much energy is being used at your venue and offsite and what they are doing about this;
- If switching storage and distribution providers, ask for and compare energy use and emissions per GB;

- If you're providing downloads or streaming consider solutions that use a Content Management System, caching or pre-loading;
- Provide a 'data-light' version of content.

Key questions

Strategy

1. What are your organisation's longer-term plans for digital services?
2. What is the cost and carbon impact of your current and future digital service?

Options

1. How can you reduce the energy use of your digital services?
2. How can you best design and develop new digital services to be energy efficient?

3.5 Energy for offsite productions

Energy use for outdoor and temporary locations is usually provided by diesel generators. Generators rarely run efficiently, are noisy and cost money to hire and fill with diesel. Costs and carbon impacts can be improved by reducing the amount of energy required, ensuring generators are run efficiently, replacing diesel with waste vegetable oil and shifting to renewable sources of power such as batteries charged from solar, wind or pedal power. As diesel costs increase, outdoor events are seeing alternative solutions become cost-effective.

Options

Power requirements include lighting, sound, AV, production offices and practical lighting. Energy efficiency should be part of the production manager's role, for example encouraging equipment switch-off and updating lighting and sound technologies. Once energy use is being managed and well-understood, renewable sources of power can be considered. The main options currently available on the market are:

- Solar power;
- Wind power;
- Biofuel (waste vegetable oil).

For more detailed information on the various technology options, their benefits and limitations see Appendix B.2)

The Green Festival Alliance (GFA) and Julie's Bicycle's Powerful Thinking Campaign brings festival promoters, production managers and power suppliers together to better understand power use at festivals, increase efficiencies and explore new technologies, looking at i.e.:

- Better planning and rationalising of generators;
- Using more energy efficient kit for PA and lighting;

- Increasing the supply of WVO biodiesel;
- Obtaining better information from energy suppliers about the power and entertainment output provided by diesel, biodiesel and renewable installations to increase confidence and promote forward-planning.

Information on this and other resources such as the Powerful Thinking Campaign Toolkit and the ISAN Environmental Sustainability Toolkit for the Outdoor Arts Sector is provided in Appendix B.2).

Case study: Frieze Art Fair

Carbon audits of Frieze Art Fair since 2007 identified diesel use as the single largest source of direct emissions. Following a successful pilot in 2009 where 10% of energy was powered by waste vegetable oil, the fair was 100% powered by waste vegetable oil in 2010 and 2011: this reduced the fair's carbon footprint dramatically. The carbon footprint per visitor in 2010 was 0.25 kg CO_2e, down by over 90%.

Case study: Green Festivals Alliance

Julie's Bicycle and the University of Sussex conducted research into the uptake of biodiesel and renewable power across the UK music festival sector. The research findings show that UK music festivals consume about 12 million litres of diesel per year, generating an estimated 48,000MWh of electricity and 31,600t CO_2e emissions. Waste vegetable oil is currently meeting 3-6% of this festival power supply demand, and on-site renewable energy – solar powered battery, temporary wind or pedal power – is meeting just ~0.026%. The Green Festival Alliance, convened by Julie's Bicycle, is now working with festivals and power providers, testing better pre-production techniques, metering generators and encouraging WVO and renewables to radically reduce carbon emissions

Key questions:

Strategy

1. How can the energy costs and emissions from your offsite productions be reduced?

Options

1. What opportunities does you organisation have for reducing energy use for offsite productions and/or using low or zero carbon energy sources?

2. How might investments in energy efficient technology and/or low or zero carbon energy sources be funded?

3. What partnerships and new business models do you need to make this approach viable?

4.0 Funding opportunities and investment models

The obvious barriers to implementing energy measures are finance and potential risks. However, a range of financial incentives, funding programmes and organisational models are available that can address these issues and make possible interventions that would otherwise be unattractive or too expensive.

Shifting to a culture in which energy, carbon and environmental impacts become core considerations for building upgrade, capital investment and renewal programmes and opening up to new and collaborative investment models will enhance the cultural sector's ability to provide stewardship of its physical infrastructure.

Longer term strategic planning and investment to upgrade buildings and building fabric and improve energy and environmental performance will cover a number of elements:

- Developing a strategy for building upgrades over a longer timeframe incorporating regular revenue investment supplemented by the periodic need for more step-change intervention e.g. major refurbishments;
- Justifying capital investment based on payback calculations;
- Using revenue budgets (regular maintenance and renewal budgets) to invest in environmental improvements that are low cost or have short payback periods or can capitalise on available financial incentives;
- Considering medium term investment strategies for capital renewal programmes;
- Creative collaboration to overcome barriers to investment e.g. between building owners and occupiers or owners and local communities;
- Seeking incentives, external funding or new business models to enable periodic major refurbishment projects, support local low or zero carbon energy schemes which your organisation can avail of, or finance low or zero carbon energy sources or technologies for on-site use or offsite productions.

Financial incentives

A number of financial incentives and funding programmes have been established as a result of energy and climate change policy and priorities on the national, local and sectoral level.

Non-domestic Green Deal	Private sector organisations	The Green Deal eliminates the upfront cost of energy efficiency measures which are paid back through savings in energy bills.
Renewable Heat Incentive (RHI)	Public and private sector organisations	Long term financial support scheme for renewable heat, such as ground source heat pumps and wood chip boilers.
Feed-in Tariff (FIT)	Public and private sector organisations	Long term tariff support for small-scale generation of renewable electricity, for example from solar photo-voltaic (PV panels), wind and hydro.
Arts Council England capital investment programme	Arts sector organisations with large capital investment projects of > £500,00	A £214.6 million programme with National Lottery funds, for improving buildings' environmental and energy performance, including installing or retrofitting technologies. £114.6 million has already been established. A further £50 million will be available in 2012/13 and in 2013/14.
Creative Scotland's Cultural Economy Programme – Sustainable Development	Projects to enable cultural and creative sector organisations in Scotland to improve long-term organisational resilience and financial sustainability	Support for development of new business initiatives, strategic projects and collaborations - organisational, financial, digital, and environmental. Awards of £15,000 - £100,000.
Enhanced Capital Allowances (ECAs)	Businesses investing in: • Energy-saving plant and machinery • Low carbon dioxide emission cars and natural gas and hydrogen refuelling infrastructure • Water conservation plant and machinery	ECAs enable a business to claim 100% first-year capital allowances on their spending on qualifying plant and machinery. It can write off the whole of the capital cost of the investment in these technologies against the taxable profits of the period during which it makes the investment.
The Carbon Trust and Siemens Financial Services' Energy Efficiency Financing scheme	All types of organisations, who have been trading for more than 36 months and are seeking to reduce their own energy use	Financing is provided for investment in energy efficient equipment. It can be arranged either directly by the customer or through the scheme's recognised suppliers. A carbon saving assessment is undertaken by the Carbon Trust's Implementation Services while the financing is provided by Siemens Financial Services.
Salix	Public sector organisations	Provide interest free loans for proven energy efficiency measures, such as insulation, heating and lighting upgrades.
Local Energy Assessment Fund (LEAF)	Communities	Funding for community groups to understand their potential for improvements in energy efficiency and local deployment of renewable energy, alongside demonstrations of solid wall insulation.
Scottish Partnership for Regeneration in Urban Centres (SPRUCE) Fund	Public and private sector organisations located within the 13 local authority areas in the Lowlands and the Uplands of Scotland as determined by the Scottish Index of Multiple Deprivation	The fund provides affordable, flexible, repayable loans for regeneration and energy efficiency projects in Scotland.

Investment models

Considerations for choosing a model which best fits your aims and objectives include:

- Scale – how big is the project and hence what are capital requirements likely to be?
- Smaller initiatives are less likely to require a special structure: using reserves or borrowing money will be quicker, providing a sound financial argument for increased income or savings as a result of the proposed improvements;
- Organisational capacity – what are the skills available within your organisation?
- Use the expertise already in the organisation wherever possible, for example in energy and facilities management, and contracts and procurement which mean that you are well placed to handle things yourself. Where these are not present, there is likely to be a greater degree of reliance on external partners, and greater spend as a result;
- Risk and reward – what if something goes wrong and how big are the potential financial and organisational benefits?

  This can be at the stages of design, implementation or operation. It may be that direct guarantees on work are sufficient, but an organisation may prefer to transfer the risk through a contract or ownership model. The potential for financial returns will generally decrease as the risk is transferred elsewhere, but this may be an acceptable trade off, particularly if stability is a significant motivation.

It is not possible to generalise and say that there is a 'right' model for cultural organisations. There are, however two principal models: you can buy expertise in, or set up a new structure. These are set out below, along with scenarios of what they might look like in practice.

1) Buy expertise in

It is possible to align environmental and cost saving outcomes with financial incentives for external organisations. The cultural organisation can act as the client and many of the responsibilities are passed over to the contractor.

- **External financing and operation**

  There are organisations that will finance and retain ownership of new equipment resulting in them taking a greater share of the risk but also the potential reward. Such approaches typically take advantage of Government incentives such as the Feed-In Tariff and Renewable Heat Incentive. These Government schemes provide a degree of confidence in the potential income stream to the financer, leaving the energy generated with the host organisation. This removes an up-front cost and contracts should cover repairs in the event of any breakdown.

- **Energy performance contracting**

  This is when an external organisation offers predictable costs and/or guaranteed savings (financial or in carbon) as part of a long term contract to meet energy requirements. This approach brings in external expertise and can mean that an organisation is free to focus on its core activities. Usually contracts are structured so that there is an incentive for the contracting company to use its experience and funding to bring down costs (sometimes via a profit share) by improving the building fabric and installing appropriate technology and management systems. This approach reduces capital and operational costs and risks but not to the same extent as external financing and ownership.

2) Set up a new structure

The main reasons to do this are to encourage investment and enable the new organisation to focus on energy generation or energy efficiency. The arts organisation can still have a stake in this business to allow for influence of the new entity and provide a mechanism for financial return. Two possible scenarios follow:

- **Establish a limited company or partnership**

  Aside from the possible benefits of risk transfer, this can also allow for ownership by partners, such as the local authority or a private sector provider. This has for instance been used where organisations located near each other want to jointly invest in a Combined Heat and Power plant. Partners can own different proportions of a company, appoint the board and share in the profit. It is likely to be appropriate for larger projects. An organisation could also offer land/space in which to house a scheme, generating a financial return from this as well as cheaper energy. Although varied, these kinds of schemes are often described as an Energy Supply Company (ESCO).

- **Community share offers**

  This is a mechanism which allows private individuals or organisations to invest in and own a share of an Industrial and Provident Society. This model is becoming increasingly common for community energy projects but has also been used for pubs and shops where a local community has a stake in the success of the venture. They can be set up in different ways which affect if and how any surplus is distributed. An institution could use this mechanism for fundraising in general, not just for energy related improvements.

It is worth noting that 'social finance', where investors (including charitable foundations and venture capitalists) are interested in investing money for a social and/or environmental return, not just a financial one, is becoming more common. Cultural organisations with clear benefits for the community and environment could potentially attract social finance, and it may well prove cheaper than mainstream bank funding.

Case study: Solar4Schools – Finance, Operation and Ownership

Solarcentury offers financing, installation and ownership of photovoltaic systems for schools to reduce capital cost requirements. Options include:

1. **Buy Outright**: Schools can buy the system and benefit from the FiT and electricity savings.
2. **Hosted Solar**: Schools pay a small up-front cost and save money on their electricity bills.
3. **Leased Solar**: Schools pay a small deposit and lease the system, which is paid off by the FiT.

Case Study: London Energy Efficiency Fund - Finance

The London Energy Efficiency Fund (LEEF) is a £100m fund which provides competitively priced finance for energy efficiency retrofit projects in existing public sector buildings in London.

LEEF's investment criteria is for projects which deliver energy savings of 20%, and which save a tonne of Carbon Dioxide for every £1500 of LEEF investment. A significant proportion of capital refurbishment works, repairs and other building improvements will include eligible energy efficiency measures which can be funded by LEEF.

Case study: Brixton Energy – Community Share Offer

Brixton Energy Solar is a new co-operative set up to enable local people to invest in renewable energy generation in Brixton and raise funds for energy efficiency initiatives. The project has already installed several hundred square metres of solar panels on the roof of Elmore House in the Loughborough Estate in Brixton. The solar panels started generating power in March 2012.

Key questions

Strategy

1. How might you invest existing revenue maintenance budgets strategically to reduce energy use and improve efficiency?

2. How can you integrate energy and climate change into longer-term capital investment and renewal programmes?

Options

1. What options do you have to invest in environmental improvements with relatively short payback periods?

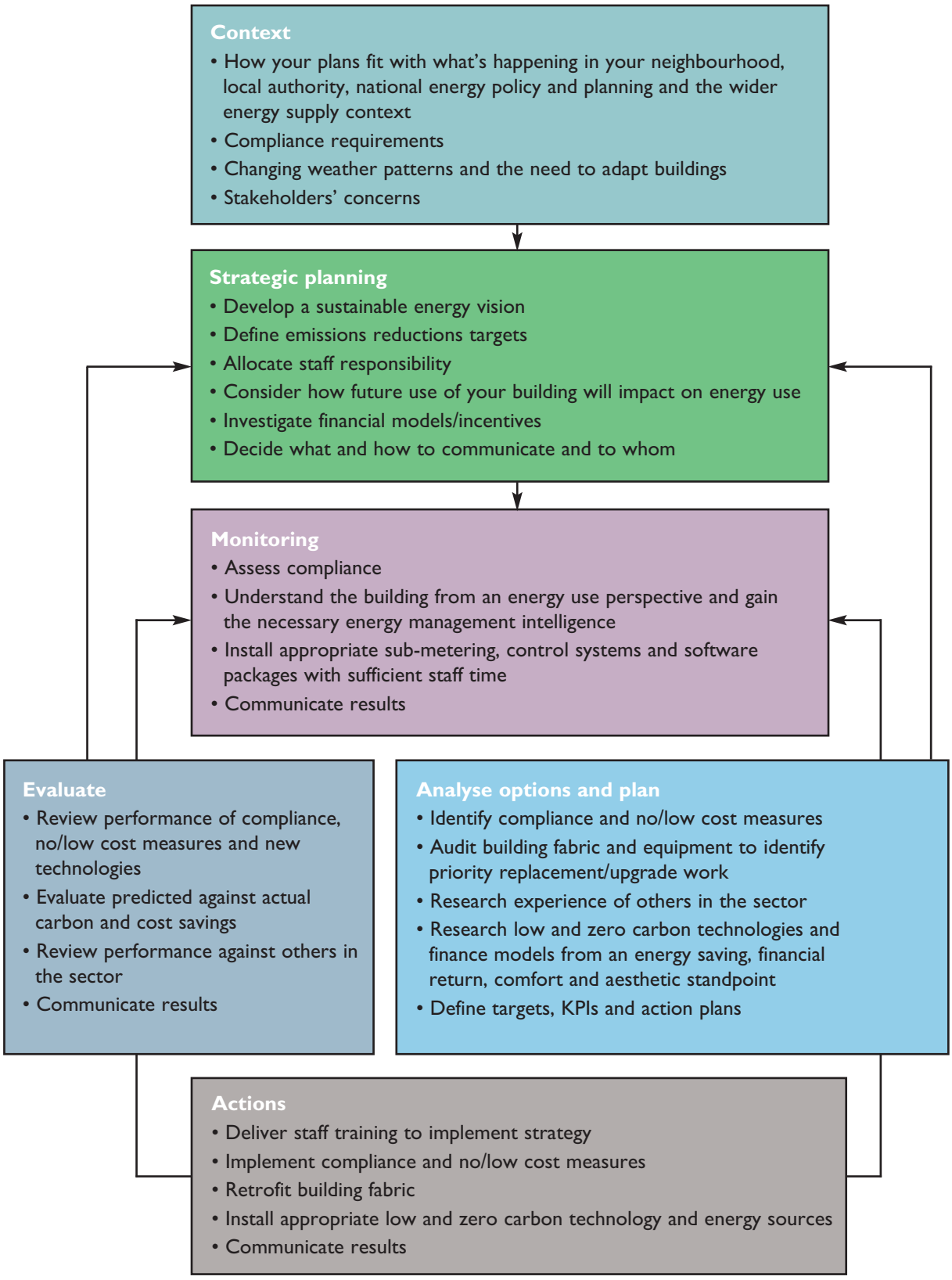
2. Who could you work with on securing investment? Are there other local projects underway or forthcoming on which you could collaborate?

3. What level of risk are you comfortable with? What does this suggest about contracts and/or ownership structures?

4. What kind of investment (if any) are you seeking to attract? Is it equity or loan finance? Is the investor likely to prefer a particular model?

5.0 A framework approach to your energy future

The following flowchart illustrates what energy strategy, planning and management could look like over the short to long-term.



Many cultural organisations have already started reducing their energy and carbon. For those which are in the early stages of addressing energy and carbon, there are a number of key steps to take and issues to consider when getting started.

Make sure staff roles and responsibilities are clear:

- Provide leadership from the top;
- Designate clear responsibilities for energy management;
- Make sure there is join-up among staff responsible for energy management, future building planning and procurement;
- Ensure key staff members get training or have access to external support on energy management;
- Give staff responsibility for considering energy use in all aspects of work, including procurement decisions.

Make sure you have a clear understanding of which regulatory and other requirements (e.g. ACE environmental requirements for National Portfolio Organisations and Major Partner Museums) you need to be complying with. Consider also if there are any voluntary schemes, certifications or standards which may be useful in framing and providing external recognition for your work.

Think about communication right from the start.

- How can you communicate with and engage your patrons and other key stakeholders – both internal and external – in formulating and supporting your energy vision and plans?
- How can you get involved in formulating the energy vision and plans of your local community?
- What do you want to communicate, to whom and at what stage?

Focus first on getting a good understanding of energy use, costs and impacts, and operational efficiencies, in particular low-cost high-saving opportunities. An organisation's first energy plan will most likely be a mix of actions on energy monitoring, no and low cost energy saving measures, including staff engagement, and possibly some compliance measures. Many organisations have already achieved this initial stage and will be ready to consider longer-term more profound changes in their approach to energy.

Appendix A) Technical Guidance

1. Energy data collection and analysis

When collecting data on your building's energy performance, the following considerations should be included:

What systems are using energy?	- Heating - Cooling - Hot water - Lighting - IT - Lifts - Specialist equipment
Where is it being used?	- Performance/gallery/library space - Rehearsal/archive/storage - Front of house - Offices - Restaurant/café - Exterior versus interior
What are the occupants' perceptions?	- of comfort - of light - of equipment reliability and effectiveness
When is energy being used?	- Day versus night - Weekday versus weekend - Month to month - Season to season - Year to year
What systems and equipment are most in need of upgrade?	- What is the age of systems and equipment? - What systems and equipment are inefficient and should be prioritised for an upgrade? - What are the fuel types and costs?
What are the fuel types and costs?	- Electricity versus gas (versus other fuel) - Baseload versus peak demand

Sources of data include:

- Invoice data - invoices are an essential source of information on energy use and costs;
- Meter readings – meters and sub-meters can be read directly at more frequent intervals than required by utility companies to provide greater detail;
- Building Energy Management Systems (BEMS or BMS) – more complex buildings usually have BEMS or BMS which, in addition to controlling building equipment, usually record detailed energy use information;
- Occupant surveys - to understand the perceptions of building occupants there are established surveys that can be used, such as that developed by Building Use Studies.

Once data has been collected it can be analysed to highlight any immediate corrective action, as well as inform strategic decisions on appropriate energy interventions. A range of approaches can be undertaken, such as:

- Calculating overall building performance indicators, for example, total energy consumption, energy per square meter or number of occupants;
- Comparison with benchmarks, such as those set out in DECs and EPCs or the new environmental performance benchmarks for performing arts venues and major festivals developed by Julie's Bicycle and approved by CIBSE (Chartered Institution of Buildings Services Engineers);
- Statistical analysis;
- Use of software, such as sMeasure.

2. No and low-cost measures

The following measures illustrate the kind of no-low cost interventions that can significantly reduce energy use:[9]

Good housekeeping and maintenance A 'switch it off' policy requires no capital expenditure but requires the co-operation of all staff, particularly maintenance staff who are responsible for a large part of good housekeeping.	- Adjust controls to match heating, cooling and lighting use to occupancy periods - Concentrate out-of-hours occupancy in as few areas, or buildings, as possible - Engage and inform staff and audiences
Building fabric Maintenance of the building fabric is essential to avoid excessive air infiltration and to minimise heat losses.	- Re-hang misaligned doors and windows - Replace insulation that is damaged or missing - Replace worn draught exclusion / sealant - Seal air gaps between walls, windows, doors etc. and around pipes and cables. - Insulate blacked-out windows - Check for and remedy moisture/damp within the structure
Controls Regular checking/maintenance of controls to ensure correct setting and operation is fundamental to energy efficiency.	- Check controls are correctly commissioned and are set at the appropriate levels - Check zone controls zone meet the needs of the occupants - Check occupants understand the use of local controls - Keep access to controls to a minimum number of personnel
Ventilation Good maintenance of ventilation and air conditioning plant can have a significant effect on the overall success of the ventilation strategy, energy efficiency, comfort and indoor air quality.	- Check insulation of ductwork - Check for leaks in ducts - Clean heat transfer surfaces and filters
Cooling Cooling systems are often used intermittently to meet short periods of excessive heat gains. This places additional stress on them.	- Check insulation - Check equipment is well maintained - Use window shading devices during summer to minimise cooling loads
Lighting Regular maintenance of lighting installations will sustain lighting levels and ensure continued efficiency.	- Clean lamps and luminaires, windows and internal walls - Use efficient lamps and ballasts when replacement is carried out - Check the operation of controls is effective and they are suitable for space occupancy and use
Heating and hot water systems Heating and hot water systems require regular maintenance in order to ensure efficient operation.	- Check insulation - Check equipment is well maintained - Check settings are optimised for efficiency
Plug-in electrical equipment Review the efficiency and use of electrical equipment.	- Update and rationalise fridges and freezers - Ensure electrical equipment is switched off / unplugged when not in use - Purchase energy efficient equipment, such as hand-dryers

[9] Drawn from CIBSE Guide F – Energy Efficiency in Buildings

3. Major refurbishment

The following elements of your building should be considered when planning and carrying out a refurbishment.

Fabric Upgrade the fabric of the building to reduce energy requirements for heating and cooling. (Thermal photography, showing where heat is lost, can help identify suitable improvements).	- Improve insulation (walls, floors, roofs, windows, doors, roof lights) - Improve air tightness (joints between walls, floors, windows, gaps around pipes and cables, dock doors which can be very drafty, etc.) - Install parallel sets of doors main entrances to reduce heat loss/gain from draughts - Use materials that absorb heat (providing cooling) such as masonry, concrete and brick.
Shading Introduce measures to reduce external heat gains in the summer and therefore reduce/remove cooling requirements while maximising daylight.	- Replace windows and roof lights with glazing that minimises heat gains with little effect on sun light - Fit external shading.
Ventilation Change to the ventilation strategy to minimise the use of mechanical ventilation.	- Openable windows - Stack and cross flow ventilation (that establishes air flow using little/no equipment).
Equipment Install more energy efficient plant.	- Boilers - Cooling equipment - Combined heat and power - Fully insulated pipes and hot water storage - Lighting - Fans - Pumps - IT
Controls Install more efficient and easy to understand controls.	- Lighting - Heating - Cooling - Ventilation - Zoning - Building Energy Management Systems.
Monitoring Improve the provision of monitoring to enable a better understanding of energy use.	- Sub meters - Building Energy Management Systems

4. Onsite energy generation

Technology	Benefits	Limitations
ELECTRICITY GENERATION		
Solar Photo-voltaic panels	- Zero carbon - Financial support from feed-in tariffs - Ideal for new builds or when upgrading roof - Low maintenance costs	- Potential difficulties obtaining planning permission if in a listed building - Need strong roof structure - Roof must be south-facing and unshaded
Wind turbines	- Zero carbon - Financial support from feed-in tariffs - Provides a powerful statement to your audience	- Require an area suitable for installation - Requires good wind conditions
Micro- hydro	- Zero carbon - Financial support from feed-in tariffs - Schemes have long operating lives	- Requires a body of water that is both flowing and has a drop in level - May require a water extraction license from Environment Agency and planning permission
Micro-CHP	- Low carbon (even more so if biomass powered) - Financial support from feed-in tariffs - Generates both heat and electricity - Payback periods improve dramatically when the current boiler is due for replacement	- If using biomass, see below - If using gas, the emissions will be higher
HEAT GENERATION		
Heat pumps (air, water and ground source)	- Low carbon - Financial support from renewable heat incentive - Can provide heating or cooling - Payback periods improve dramatically when the current boiler is due for replacement - Provide 'low grade heat' – suitable for energy efficient buildings	- Ground source heat pumps require a large amount of civil engineering works, such as sinking bore holes - Performance varies dramatically according to air/water/ground temperature
Solar thermal	- Zero carbon - Financial support from renewable heat incentive - Financially viable if use high quantities of hot water	- Potential difficulties obtaining planning permission if in listed building - Need strong roof structure - Roof must be south facing and unshaded - Panels need to be located close to hot water collectors
Biomass	- Low carbon - Financial support from renewable heat incentive - Attractive if have access to cheap source of fuel	- Ideally need to be close to source of fuel to reduce transportation - Adequate space is necessary to accommodate fuel storage and delivery - Must comply with legislation such as the Clean Air Act and building regulations

5. Energy for off-site productions

The following energy options are available for off-site productions: solar power, wind power and biofuel (waste vegetable oil). Kinetic energy and fuel cells are less commonly available on the market at present.

Solar generator systems can supply the needs of most small-scale productions, particularly when using efficient sound and light equipment. Your supplier will plan for the demand from equipment you have, advise you how to reduce demand, or supply a whole solution, i.e. power, sound and lighting.

Advantages	Disadvantages
• Solar generators are silent and do not emit exhaust fumes, allowing them to be located close to stages, performers or audiences without causing disruption. • Zero carbon • They are often small and portable allowing for delivery into difficult locations. • Quick set-up time	• Some larger requirements may not be possible, for example large lighting rigs using older tungsten bulbs. • In some instances solar may cost marginally more than diesel, but this is not always the case. • Over longer periods weather may affect the capacity of the system

WVO Biofuel (reprocessed waste vegetable oils) power is almost carbon neutral, and can provide a like-for-like solution compared to traditional diesel generators, usually at similar costs.

Advantages	Disadvantages
• Significant carbon reduction compared to traditional diesel generators • Large amounts of power can be supplied • Quick set-up time • Not reliant on weather • Less requirement for detailed planning of power requirements	• Can be noisier than solar or wind • Exhaust fumes – however they are less 'noxious' than diesel fumes • Larger generators may require access for larger vehicles for delivery

Wind power, like solar is carbon neutral. There are fewer providers for wind power.

Advantages	Disadvantages
• Zero carbon • Gives a powerful statement to your audience	• Requires an area suitable for installation – usually a large flat area without public access. • Set-up times can be longer than solar or biodiesel • Can be vulnerable to weather conditions

It is important to note that the majority of renewable systems use batteries as storage and come delivered to site fully charged. This means there is 'back-up' in the system for short term low-yield weather conditions.

Tips for using outdoor temporary renewable energy

- Establish your needs before choosing what kind of power to use;
- Work with your staff and other suppliers to plan carefully which equipment you need to power to avoid surprises;
- Ask your supplier for advice – they know how it works!
- Communicate to your audience about what you are doing to boost your image;
- For large productions consider making the transition to new technologies gradually – try an element of your production to learn about how it works best and develop new relationships;
- Try to use suppliers local to you to reduce carbon from delivery.

The Powerful Thinking Campaign Toolkit and the ISAN Environmental Sustainability Toolkit for the Outdoor Arts Sector, included in Appendix B.2) provide further guidance on this topic.

Appendix B) Further resources

This section identifies some of the resources available to help cultural buildings to improve their energy performance. These resources fall broadly into three categories:

Tools and databases – usually online calculators and databases that offer automated but targeted information, e.g. energy auditing/carbon footprint results;

Guidance and advice – organisations, publications and websites that bring together best practice, advice, worksheets, templates and case studies to inspire improved performance;

Certifications and standards – that support environmental ambitions by offering assurances that an organisation, activity, product or service has met predetermined environmental criteria or is complying with environmental standards including emissions reductions;

The options below should be seen as a starting point. Local municipalities, central government environment departments, NGOs, charities or universities develop generic resources that can also be beneficial to arts organisations.

1. Tools and databases

Julie's Bicycle Green Venues, Festivals & Events Database

The database, to be launched in summer 2012, will enable users to search for venues, festivals and events which are taking their environmental impacts seriously.

www.juliesbicycle.com/resources/jb-green-database

For information on how to apply to be included in the database contact info@juliesbicycle.com

The Theatres Trust DEC Pool

To be published annually from 2012, The Theatres DEC Pool will provide a national picture of the Display Energy Certificates held by theatres. Initiated as part of the Trust's Ecovenue project, information submitted by venues through an online survey on DEC results, building type, age, listing status, capacity, hours of operation, construction will be entered in the Trust's Theatres Database which includes over 3,000 theatres. It will enable the Trust to analyse a theatre building's energy performance, and help venues compare their performance with others that share similar architectural and building characteristics.

To contribute to the Theatres DEC Pool please contact the Trust.

www.theatrestrust.org.uk

Performing arts venues benchmarks

These new benchmarks are based on data obtained by the Julie's Bicycle Industry Green (IG) Tools and Pilio's sMeasure and approved by CIBSE to reflect the real performance of performing arts venues.

For an overview of the benchmarks see tinyurl.com/7htpq33

For more detailed information see 'Benchmarking energy use in performing arts buildings' Julie's Bicycle, CIBSE (proceedings of the 2012 Technical Symposium), April 2012 www.cibse.org/content/cibsesymposium2012/Paper039.pdf

Julie's Bicycle IG (Industry Green) Tools

Developed specifically for the creative industries, the IG Tools are free-to-use online carbon calculators suitable for use across the world. The IG Tools measure the greenhouse gas (GHG) emissions produced by Touring, Production, Venues, Festivals and Outdoor Events, and Offices. The IG Tools provide results on GHGs generated by energy, water, waste, audience and business travel. The IG Touring and Production Tools can also be used as a planning tool before the tour or production takes place, to calculate expected emissions, and then revisit when the event is complete to identify the actual emissions. Alongside the IG Tools are tips, guidance, resources and publications on the Julie's Bicycle website.

www.juliesbicycle.com/resources/ig-tools
www.juliesbicycle.com/resources

sMeasure

sMeasure is an online energy analysis tool specifically designed for small and medium business from research by the Environmental Change Institute at Oxford University. Using weekly meter readings for electricity and gas, sMeasure's weather analysis assesses the energy performance of buildings against weather conditions. In addition, the performance is assessed against national standard energy efficiency benchmarks thereby facilitating a good estimation of energy over- and under-spend. sMeasure now also includes water. The energy data captured in sMeasure contributes to Julie's Bicycle and The Theatres Trust performance benchmarking work.

sMeasure is a commercial tool but discounts for using the tool are provided via Julie's Bicycle

smeasure.com/
www.juliesbicycle.com/resources/smeasure

The Environment Tools Directory

Environment Tools is an online database which lists over 500 environmental accounting software tools, and techniques for measuring and monitoring. www.environmenttools.co.uk/

2. Guidance and advice

Julie's Bicycle

Julie's Bicycle is a non-profit company working across the arts and creative industries, providing expertise in environmental sustainability to over 350 organisations in the UK and internationally. Julie's Bicycle offers practical advice, tools, resources and Industry Green environmental certification, informed by world-leading research into the environmental impacts of the creative industries.

Julie's Bicycle facilitates the **Green Theatre Network**, which exists as an online platform and also as a series of networking events and focus groups on sustainability within the theatre sector.

For further information on Julie's Bicycle see www.juliesbicycle.com

For further information on the Green Theatre Network juliesbicycle.ning.com

Key Julie's Bicycle resources

Green Suppliers Database
www.juliesbicycle.com/resources/jb-greendatabase

Environmental policy and plan guidelines
www.juliesbicycle.com/resources/environmental-policy-guidelines

Factsheets www.juliesbicycle.com/resources/fact-sheets

currently available on Freight; Biofuels; Food; Governance; the Science behind Climate Change; Travel; Merchandise; Offsetting and Stage Set Construction and Disposal

The Theatres Trust

The Theatres Trust is the national advisory body for theatres in the United Kingdom, and is a statutory consultee in the planning system. The Trust's Members Service provides priority access to advice and resources on the sustainable development, conservation, refurbishment and retrofitting of theatre buildings, as well as reductions on specialist support including its Advisory Review peer service on theatre building developments, workshops, annual Conference and hire of the Trust's Resource Centre.

Green Festivals Alliance

The Green Festival Alliance (GFA) brings together promoters and suppliers committed to acting on climate change to identify and speed up the adoption of sustainable practices at festivals through innovation and collective action.

www.juliesbicycle.com/about-jb/green-festival-alliance

Powerful Thinking Campaign Toolkit

Designed to help festival promoters, production managers, and power suppliers better understand energy usage on site, in order to improve efficiencies and increase the use of renewable power at festivals, part of the Green Festivals Alliance and Julie's Bicycle Powerful Thinking Campaign.

www.juliesbicycle.com/resources/practical-guides/powerful-thinking

ISAN Environmental Sustainability Toolkit for the Outdoor Arts Sector

ISAN is an independent group of producers, presenters, promoters and artists working in outdoor arts from the UK and Ireland. The Toolkit, commissioned by ISAN and authored by Julie's Bicycle with support from Arts Council England, is a practical online resource to help outdoor arts organisations assess and reduce their environmental impacts. It covers all areas of production and planning, with case studies, top tips, and links to tools, resources and support for organisations to embed environmental sustainability into the heart of their work.

www.isanuk.org/publications-downloads/downloads

www.juliesbicycle.com/resources/green-guides

Carbon Trust

Provides advice to businesses, government and the public sector on their opportunities to reduce carbon emissions, as well as measuring and certifying the environmental footprint of organisations, products and services.

www.carbontrust.com/

Energy Saving Trust

Another source of advice, including on microgeneration. Although primarily with a domestic focus, advice is easily applied to the other buildings.

www.energysavingtrust.org.uk/

UK Green Buildings Council - Better Building Partnership

The BBP provides guidance and advice on improving buildings' environmental and energy performance through partnerships between buildings owners and occupiers. The Green Lease Toolkit to enable owners and occupiers to work together to reduce the environmental impact of their commercial properties, which includes best practice recommendations and a model memorandum of understanding.

www.betterbuildingspartnership.co.uk

www.betterbuildingspartnership.co.uk/download/bbp-green-lease-toolkit-1.pdf

Global Reporting Initiative (GRI)

GRI has developed a widely used sustainability-reporting framework which sets out the principles and indicators that organisations can use to measure and report their economic, environmental, and social performance. Tailored versions of the GRI Guidelines are available for different sectors in Sector Supplements. For the event organising world the relevant supplement is the GRI Event Organisers Sector Supplement (EOSS), which provides reporting guidance that is suitable for all types and sizes of events, including cultural events.

www.globalreporting.org

www.globalreporting.org/reporting/sectorguidance/event-organizers/Pages/default.aspx

Greenhouse Gas (GHG) Protocol

The GHG Protocol is the most widely used international accounting tool for government and business leaders to understand, quantify, and manage greenhouse gas emissions, developed by the World Resources Institute and the World Business Council for Sustainable Development. they provide a series of standards from a general corporate reporting standard to sector specific supplements

www.ghgprotocol.org

DEFRA guidance on GHG emissions reporting

DEFRA, in partnership with DECC provides guidance for all sizes of business as well as public and third sector organisations on how to measure and report their greenhouse gas (GHG) emissions, including a small business user guide. DEFRA also publishes annual greenhouse gas conversion factors to help convert existing data sources such as utility bills into CO_2 equivalents. Julie's Bicycle's IG Tools have been developed in keeping with DEFRA guidance.

www.defra.gov.uk/environment/economy/business-efficiency/reporting/

Chartered Institution of Building Services Engineers (2012) - Guide F Energy efficiency in buildings

The guide covers both the energy requirements committed by the design and the energy costs in use and includes information and checklists on i.a. design and energy audits and surveys.

http://tiny.cc/i6acew

Defra (2009) - Adapting to Climate Change: UK Climate Projections

www.defra.gov.uk/publications/files/pb13274-uk-climate-projections-090617.pdf

London Climate Partnership (2009) - London's Commercial Building Stock and Climate Change Adaptation

www.ukcip.org.uk/wordpress/wp-content/PDFs/londons-commercial-building-stock-09.pdf

Building Services Research and Information Association (2009) Soft Landings

This report provides a framework for better briefing, design, handover and buildings performance in use, and covers a range of issues to be considered for major refurbishment projects.

http://tiny.cc/k4acew

3. Certifications and standards

For Buildings

BREEAM Assessments

BREEAM provides a rating related to a range of categories including: management, health and well-being, energy, transport, water, materials, waste, land use and ecology, pollution and innovation. BREEAM is an assessment method for sustainable buildings enabling designers, developers and building managers to demonstrate environmental credentials.

www.breeam.org/

Display Energy Certificates (DECs)

A Display Energy Certificate shows the energy performance of a building based on actual energy consumption as recorded annually over previous years. A DEC is valid for one year and must be updated annually. It is required for buildings that are occupied in whole or part by public authorities and by institutions providing services to the public, such as concert halls, theatres, libraries and museums. The DEC uses an average kWh/m^2 for gas and electricity to work out where a venue is on the A-G scale. The average was developed by CIBSE (Chartered Institute of Building Services Engineers). Julie's Bicycle has found that average to be unreliable for many performing arts venues, so has calculated a new average based on data from over 100 venues. Julie's Bicycle is now developing a document to go on the wall next to a venue's DEC, which explains the building's performance against the new average. This 'co-display' document will support venues by providing more industry specific data than the current DEC can provide.

www.communities.gov.uk/publications/planningandbuilding/displayenergycertificates

Industry Green for Venues and Offices (IG)

Industry Green is a simple voluntary certification programme that is based on four principles of environmental good practice: commitment, understanding, improvement and communication. With carbon dioxide (CO_2) reduction at its heart, the certification covers impacts associated with energy, water, waste and travel alongside organisational commitment, improvement and communication. It is externally verified by the Environmental Change Institute, Oxford University and an independent Expert Advisory Group.

www.juliesbicycle.com/industry-green

IS0 14001 for environmental management systems

A voluntary, internationally recognised standard for implementing an environmental management system with guidance in your building. ISO 14001 provides assurance that the organisation is in control of the processes and activities that have an impact on the environment.

www.iso.org

EMAS for environmental management systems

EMAS is the European Eco-Management and Audit Scheme. The management system element is based on ISO 14001, but EMAS has additional and stricter requirements on stakeholder engagement, public reporting, and the demonstration of real performance improvements. There is a central database of all organisations which have achieve EMAS certification. The EMAS Helpdesk provides i.a. advice and guidance on implementing EMAS, case studies, tools and the register of all EMAS organisations

http://ec.europa.eu/environment/emas/index_en.htm

ISO 50001 for energy management systems

A voluntary, internationally recognised standard for energy management that gives organisations the requirements for energy management systems (EnMS). It is compatible with the IG Tools and the Industry Green certification.

www.iso.org

BS 8901 for sustainable event management systems

A voluntary British Standard specifying a sustainability management system for events. The guidance documentation promotes continual improvement of organisational sustainability performance by identifying what a company should consider/address.

www.bsigroup.co.uk/en/Assessment-andCertification-services/Managementsystems/Standards-and-Schemes/BS8901/

ISO 20121 for sustainable event management systems

A voluntary, internationally recognised standard for event sustainability management systems based on BS 8901, currently in development and expected to be complete in mid 2012.

www.iso.org

Industry Green for Festivals and Outdoor Events (IG)

Industry Green is a simple voluntary certification programme that is based on four principles of environmental good practice: commitment, understanding, improvement and communication. With carbon dioxide (CO_2) reduction at its heart the certification covers impacts associated with energy, water, waste and travel alongside organisational commitment, improvement and communication. The certification is externally verified by the Environmental Change Institute, Oxford University and an independent Expert Advisory Group.

www.juliesbicycle.com/industry-green

Green 'N' Clean

Originally launched by Yourope, the European Festival Association in 2006/07 as a printed booklet with environmental guidelines for music festivals, Green 'N' Clean is now supplemented by an online tool providing festival organisers with customised environmental advice plus an award for festivals who achieve a defined number of criteria in terms of environmental measures.

www.yourope.org/green_clean.aspx

Green Key

Eco-label primarily for hospitality facilities that aims to contribute to prevention of climate change and sustainable tourism by awarding and promoting good initiatives.

www.green-key.org

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