



Decarbonisation of Buildings

Susan Jones, Capital Project Delivery Manager

Ben Burfoot, Head of Sustainability and Climate Strategy

Hexagon Theatre Background

Existing Theatre

- 1,000 seats, regional home of Royal Philharmonic Orchestra
- Built in 1977 - 'brutalist' architecture:
 - High concrete massing
 - Concrete walls
 - Lots of (single) glazing
 - Aging gas boilers with air handling units



New Studio Theatre

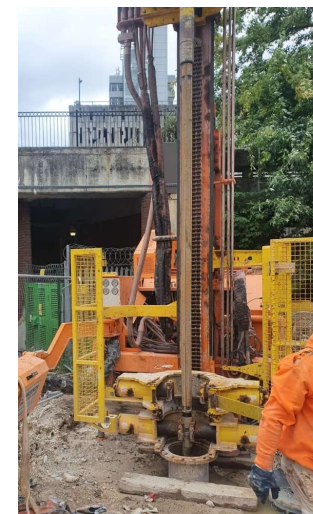
- Successful Levelling Up Fund bid Jan '23
- New build extension for 200 seat / 300 standing theatre with direct level access off Queens Walk
- Council to decarbonise existing theatre as match funding



Hexagon Decarbonisation Programme

Options appraisal suggested:

- Open-loop ground source heat pump
- Roof insulation
- PV array
- LED lighting



LUF approval	LED lighting installed	EA consent to investigate ground water source	PSDS application	PSDS approval	Bore holes drilled & tested	EA test pump data submitted	EA consent to abstract for GSHP	GSHP trench dug / pipes laid	SSE upgrade substation	Anciliary works carried out	Heat pumps / system installed
Jan-23	Apr-24	Oct-23	Jan-24	Apr-24	Oct-24	Jan-25	Apr-25	Oct-25	Jan-26	Apr-26	Oct-26

Grant
Licenses
Works

Challenges & Lessons Learnt

Grant Funding

- PSDS application and change request process is challenging
- Grant timelines drive programme
- Apportioning savings and costs – new build LUF / existing PSDS

Licenses

- Hydrologist to manage Environment Agency process due to complexity
- Lengthy statutory timings for approvals
- Thames Water Trade Effluent Waste license limited test volumes

Works

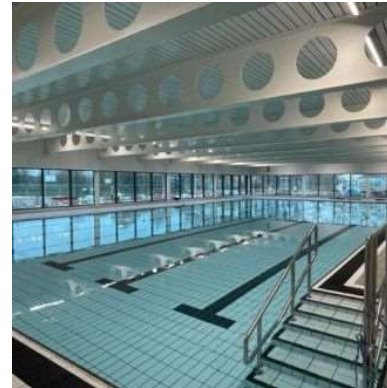
- Flexible contractors – ‘pillow tank’ during GSHP pump tests; new open loop experts
- Council funded cost for bore holes at risk
- Insulation & PV no longer feasible
- Revised heat pump with heat recovery to maximise savings (to maintain PSDS)
- Work taking place within a live theatre

End result will be a renewably heated, sustainable theatre for residents

Leisure Centres



**2 Leisure Centres
installed heat Pumps
and solar panels
Funded from PWLB**



Civic Offices



Refurbished 1980's office
2014 – 650 solar panels – 7
arrays – Save ~75% CO₂
Installed heat Pumps 2024/5
– Net Zero ready
Funded from SALIX & LEP
Grant

New Integrated Library – Close previous Library – further CO₂ saving.

New Central Library and Civic
Reception Redesign approved



Funded by
UK Government

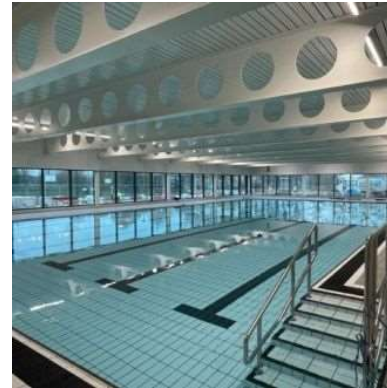
POWERED BY
LEVELLING
UP

Reading
Borough Council
Working better with you

Leisure Centres



**2 Leisure Centres
installed heat Pumps
and solar panels
Funded from PWLB**



Reading Town Hall – The Last Large Building

Element	Colour Code
Existing walls (Uninsulated)	Green
Existing walls (Proposed Internal wall insulation)	Blue
Existing roof (uninsulated)	Cyan
Existing roof (proposed roof upgrades)	Magenta

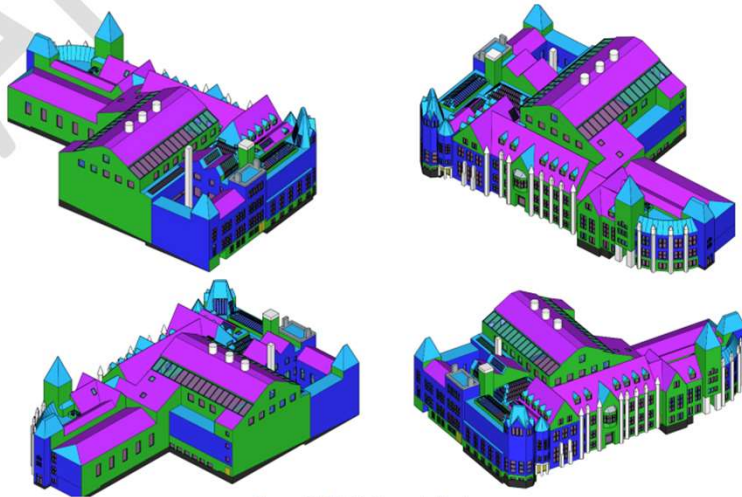
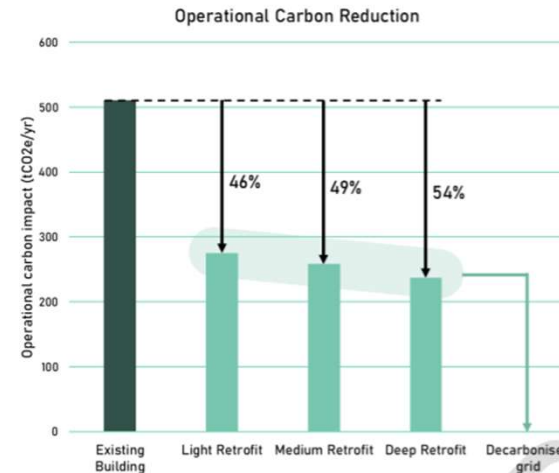


Figure 21 Fabric Upgrade Mark-ups

Funded from ?



Using Green Book to Business Plan

Table 1: Electricity emissions factors to 2100, kgCO₂e/kWh
Consumption and generation-based emissions factors.

Analysts should use **consumption-based emissions factors** for measuring GHG emissions per unit of final energy demand. These emissions factors include transmission and distribution losses, including significant losses due to power system efficiency. **Generation-based emissions factors** measure GHG emissions per unit of electricity generated.

Long-run marginal emissions factors should be used for measuring small changes in consumption. Average emissions factors are used for footprinting.

Year	Long-run marginal			Table 3: Carbon values and			
	Consumption-based			Low	Carbon Values		High
Domestic	Commercial/ Public sector	Industrial	Central		High		
2010	0.389	0.382	0.375	120	241	361	
2011	0.384	0.377	0.370	122	245	373	
2012	0.377	0.370	0.363	124	248	378	
2013	0.367	0.361	0.354	126	252	384	
2014	0.360	0.354	0.347	128	256	390	
2015	0.350	0.344	0.337	130	260	396	
2016	0.340	0.333	0.327	132	264	402	
2017	0.330	0.324	0.318	134	268	408	
2018	0.319	0.313	0.308	136	272	414	
2019	0.308	0.302	0.296	138	276	420	
2020	0.296	0.290	0.285	140	280	427	
2021	0.283	0.278	0.272	142	285	433	
2022	0.269	0.264	0.259	144	289	440	
2023	0.255	0.250	0.246	147	293	447	
2024	0.240	0.236	0.231	149	298	453	
2025	0.224	0.220	0.216	151	302	459	
2026	0.207	0.203	0.200	153	307	465	
2027	0.189	0.186	0.182	155	312	471	
2028	0.171	0.167	0.164	157	317	477	
2029	0.151	0.148	0.145	159	322	483	
2030	0.130	0.127	0.125	161	327	489	

