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Reducing energy costs in leisure centres

By Alan Barber

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Session Focus

Focus on Cost Resilience

Emphasis is on reducing consumption and tightening operational controls to protect budgets amid market volatility.

Clear Practical Priorities

Provides council officers with clear priorities to implement without waiting for new policies or large investments.

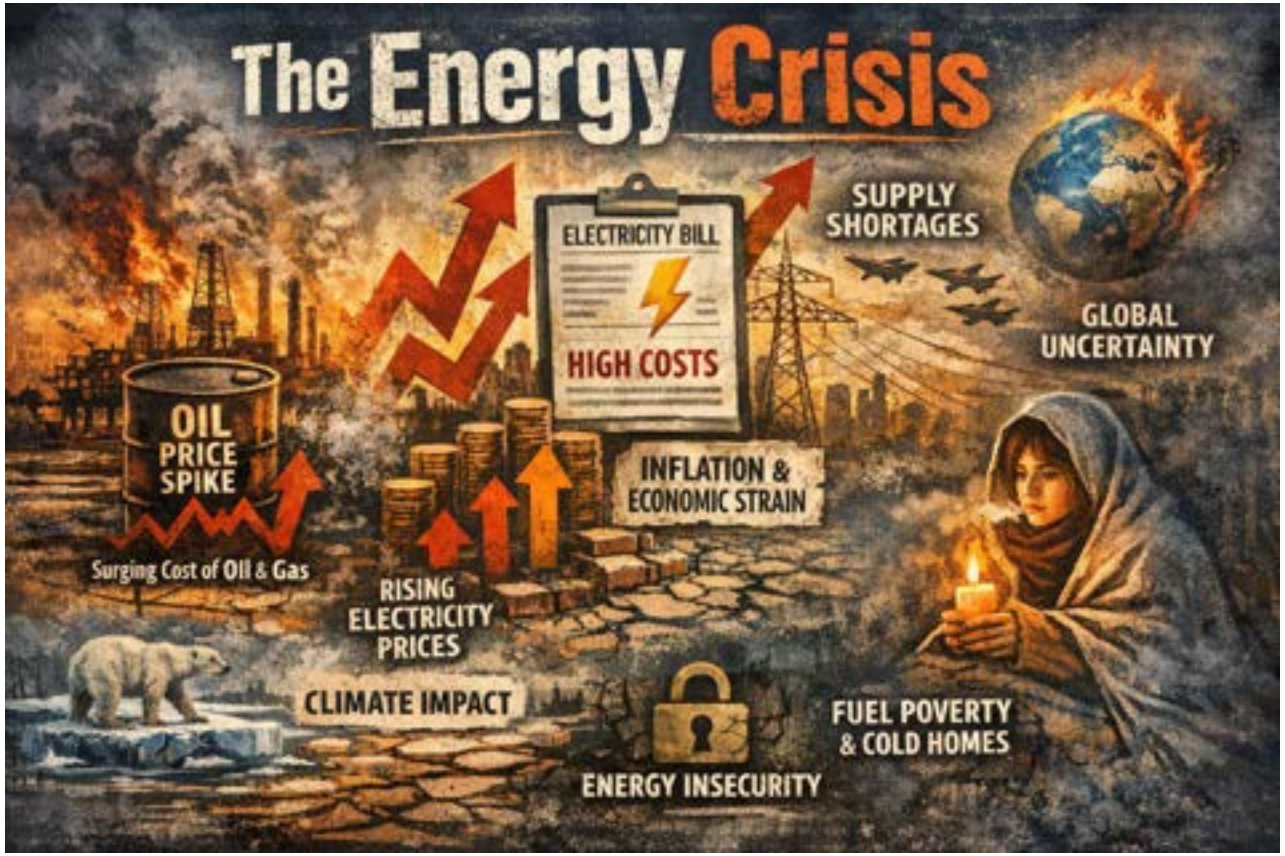
Stepwise Energy Reduction

Approach starts with identifying waste, then behavioral fixes, followed by targeted investments with predictable returns.

Why now: volatility = financial risk

- Energy markets are volatile; cost shocks feed through over time.
- Global geopolitical events make significant impact on local energy costs
- Current unrest will [hopefully] lead to more renewables and electrification

“The cheapest kWh of energy is the one we don’t buy — especially when prices are unpredictable.”

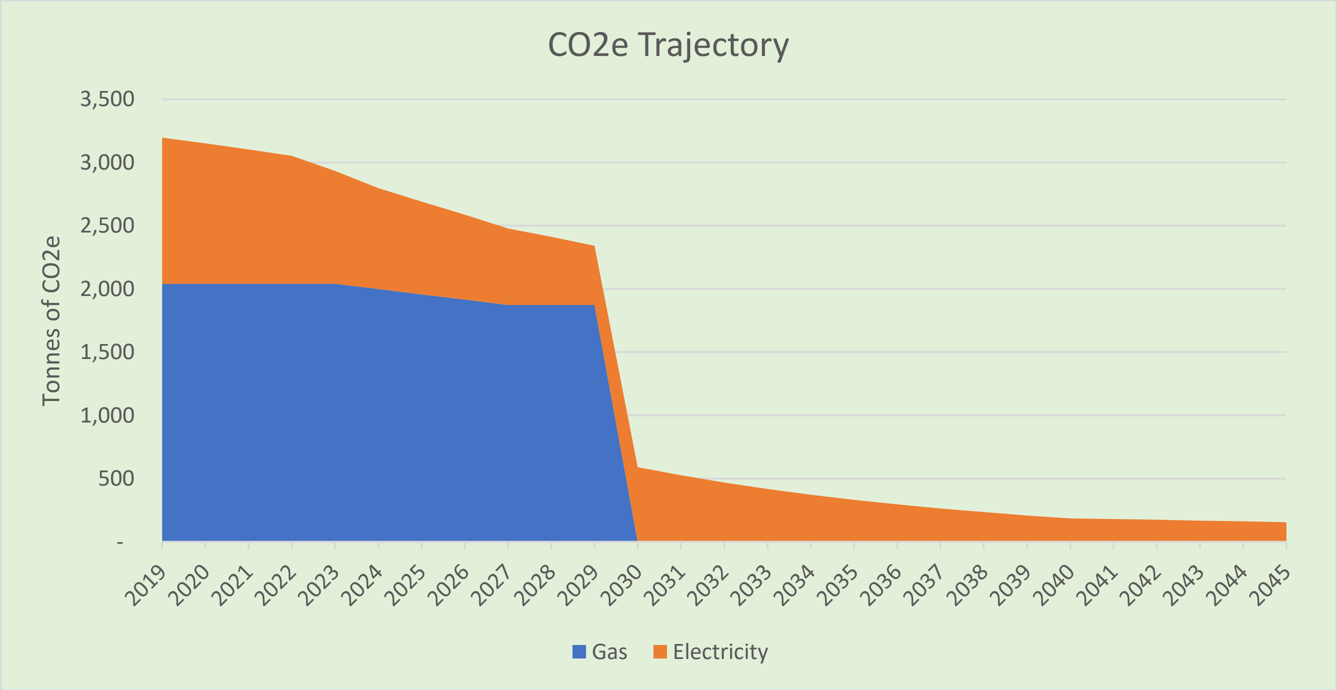


The cost and carbon challenge

- Energy costs in leisure centres are high
- High maintenance cost, particularly in ageing sites
- Gas is cheap and electricity expensive
- Net Zero Carbon challenge

Net Zero Vs. Operational Cost

- Reduce energy usage and optimise building performance (i.e. energy efficiency)
- Generate renewable local power
- Low carbon heating
- Offset



Net Zero Journey – Buildings

- Get your **Data** & estate in order
- Calculate **Baseline Emissions** & **Set Net Zero Targets**
- Do a **Net Zero Trajectory**
- Carry out **on-site Energy Audits / Feasibility Studies**
- **Engineering Design (Architectural Design)**
- Procurement
- Installation
- **Measure & Optimise** for *Continuous Improvement*

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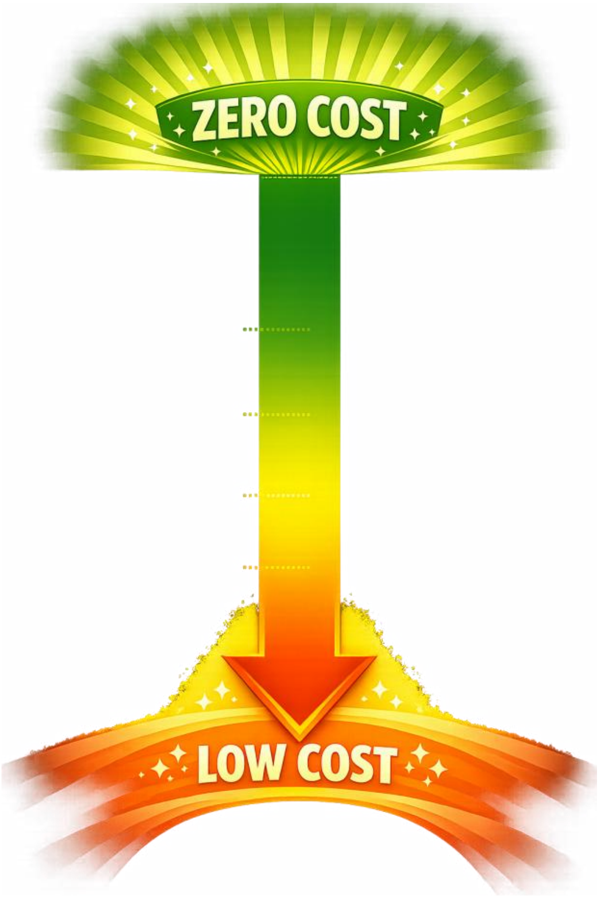
Getting Estate in Order

- Identify assets
  - kWh
  - Heat source
  - Energy expenditure
  - Floor area
  - Year of construction

Practical Measures

- Find waste (metering / BMS+ simple diagnostics
- Reduce avoidable out-of-hours energy and unnecessary energy
- Fix control & schedule issues
- Tune big hitters (pool hall AHU, pumps, lighting controls)
- Invest-to-save upgrades (heat recovery, PV, major plant renewal)



How to source energy data

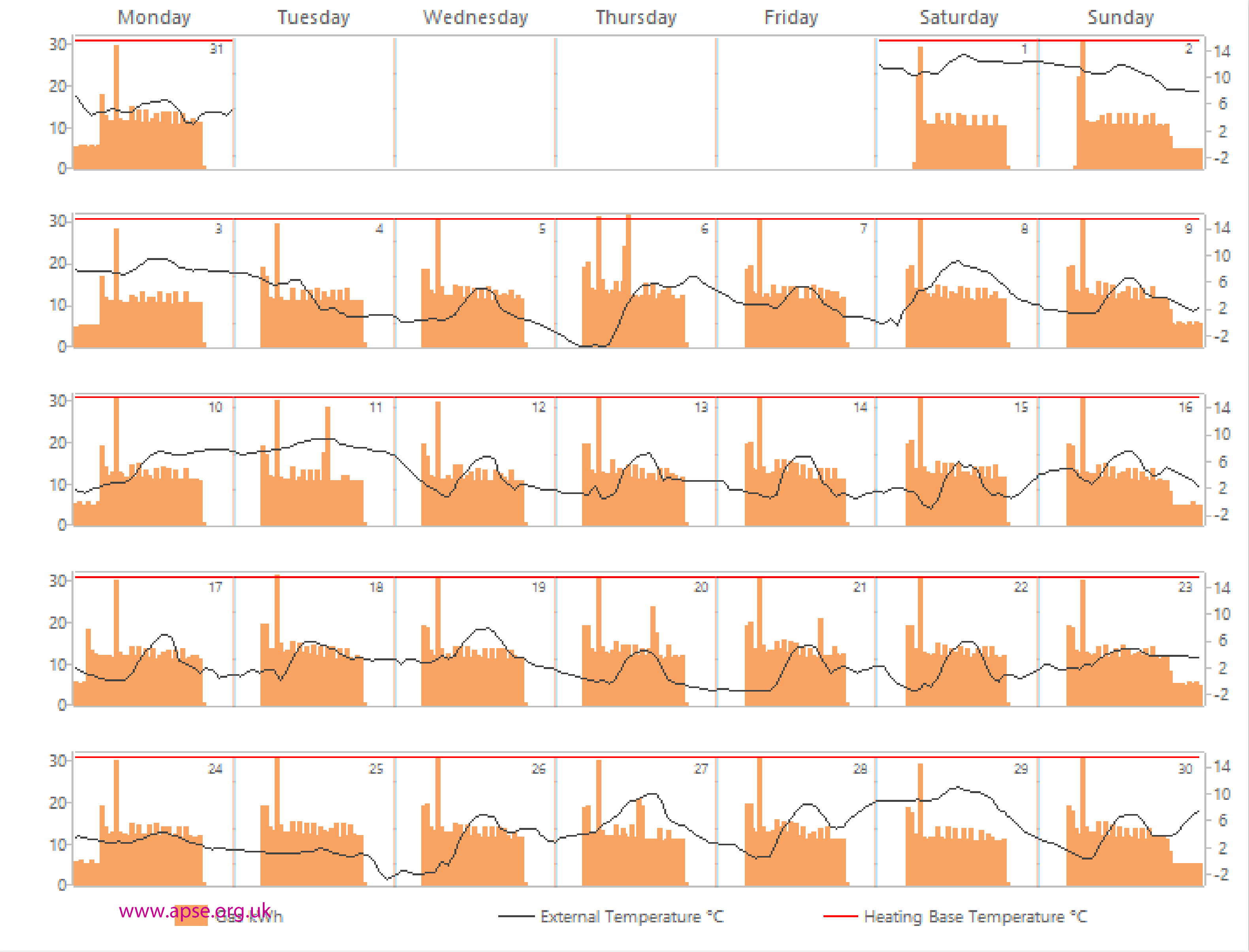
- HH and AMR
- Invoices
- Supplier portals (e.g. energy supplier / LASER)
- Meter readings
- Display Energy Certificates
- Modelling (IES)

How to Store and Use Data

- Energy Management Software Vs. Excel
- Automatic Meter Readers (AMR)
- Building Management Systems (BMS)

[Trend analysis, energy excess alarms, leak detection]

Automatic Meter Reader - Gas



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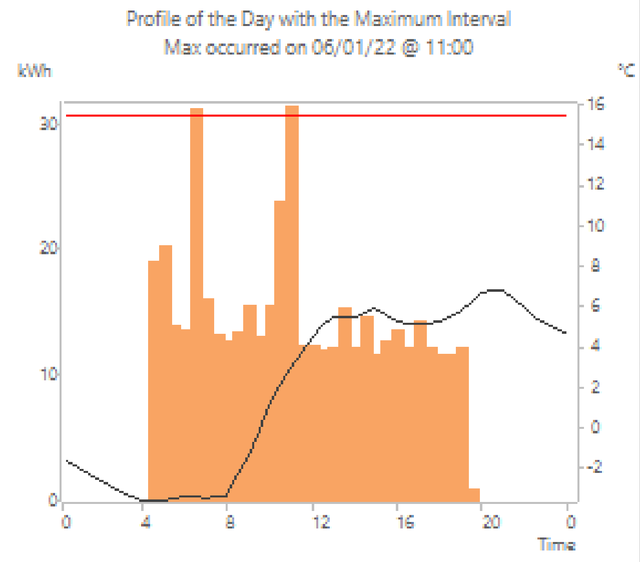
Consumption

Total (kWh)	13,048
Average Interval (kWh)	8.8
Maximum Interval (kWh)	31.4
Minimum Interval (kWh)	0.0

Temperature

Average (°C)	4.0
Maximum (°C)	13.6
Minimum (°C)	-3.6
Heating Degree Days @ HBT of 15.5°C	348.4



No/low cost: “stop paying for energy when nobody’s there”

Use the behavioural + operational savings

Pool covers are “obvious” and e**vaporation is the biggest heat loss mechanism** in pools; covers are the single most effective action when pools are not in use. But **behaviour and staffing** determine whether they get used

Controls must match operating hours and it can be better to spend a dedicated week observing how the building actually runs.

Practical examples

Align heating/plant schedules with real occupancy (and cleaning periods).

Flag windows/doors open while heating is on; entrances can be major heat-loss points. Consider draught lobbies.

Top practical measures

Use pool covers consistently when pool not in use (biggest saver)

Align plant schedules to real occupancy (including cleaning)

Fix out-of-hours baseload using half-hourly data and submetering

DHW pumped return timeclock

LED lighting no brainer

PIR sensors in intermittently used spaces (studios, stores, corridors)

Daylight controls + keep rooflights/glazing clean

Variable speed drives where fixed-speed fans/pumps remain

Upgrade pool AHUs to incorporate heat recovery (where end-of-life)

Ensure BMS governance (who controls it, who validates schedules)

PV as bill-reducer (after efficiency/control)

Use a "dedicated week" walk-through audit to observe real operation (don't rely on a

Capture and track savings so you can evidence ROI and build the investment case

Energy and water contracts to optimise utility rates

Leisure Centre Costed Examples

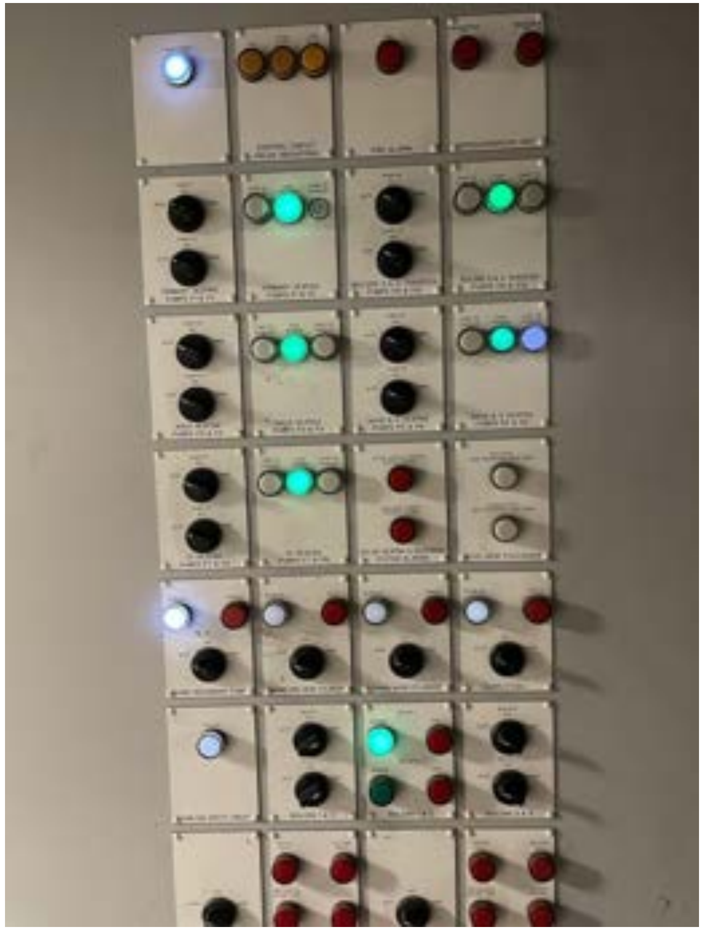
Timeclock on DHW pumped return: small cost, quick payback (annual saving ~£95.60; capex ~£200; payback ~2.1 years)

PIR/occupancy sensors (example: studio left lit when not in use): annual saving ~£5,687; capex ~£18,525; payback ~3.3 years

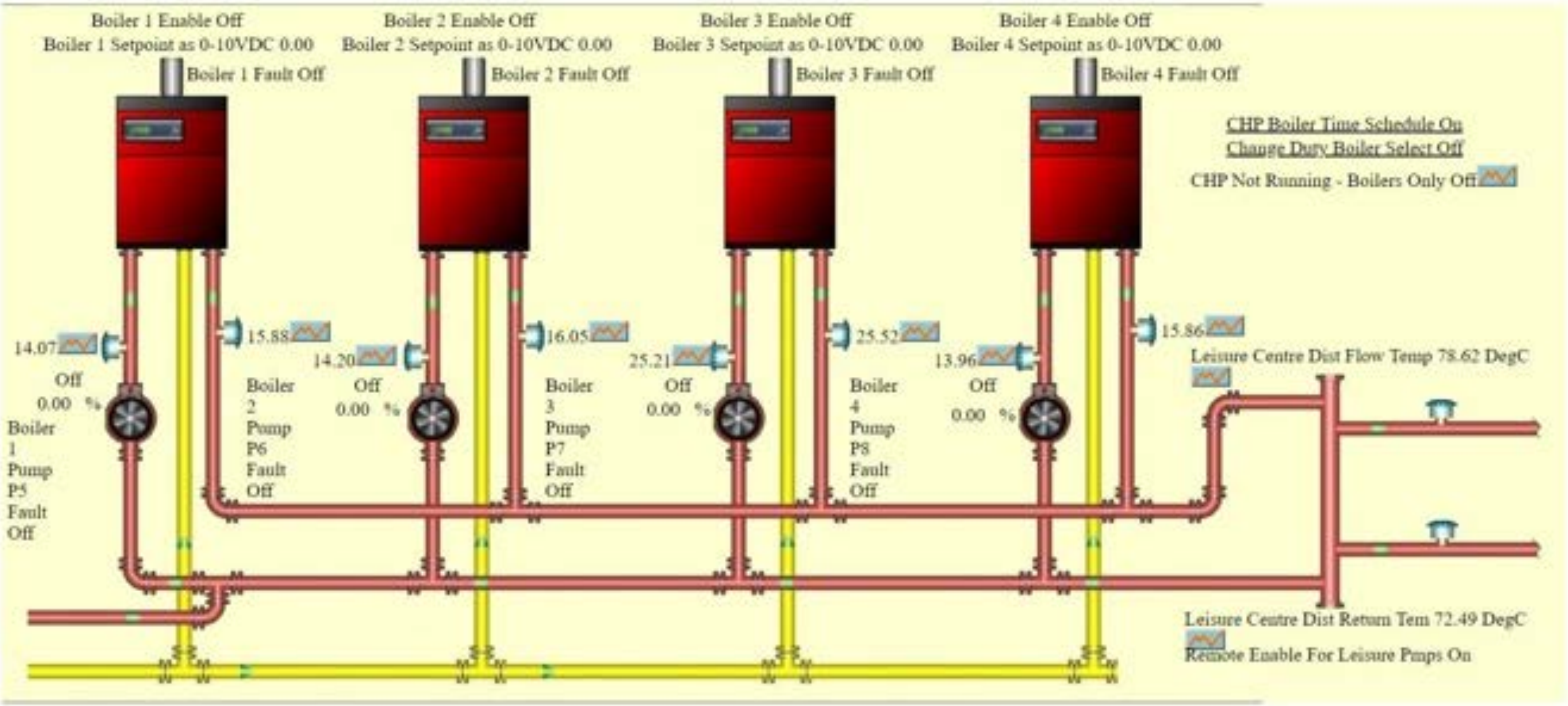
Daylight sensors + cleaning rooflights (because lights were on despite strong daylight): annual saving ~£938; capex ~£5,040; payback ~5.4 years

Variable speed drives where not fitted: e.g., “Fit inverters on all heating circulation pumps” (annual saving ~£393; capex ~£4,000; payback ~10.2 years)

Building Management Systems (BMS)



BMS


Boiler 1 Enable Off
Boiler 1 Setpoint as 0-10VDC 0.00
Boiler 1 Fault Off
Boiler 2 Enable Off
Boiler 2 Setpoint as 0-10VDC 0.00
Boiler 2 Fault Off
Boiler 3 Enable Off
Boiler 3 Setpoint as 0-10VDC 0.00
Boiler 3 Fault Off
Boiler 4 Enable Off
Boiler 4 Setpoint as 0-10VDC 0.00
Boiler 4 Fault Off
CHP Boiler Time Schedule On
Change Duty Boiler Select Off
CHP Not Running - Boilers Only Off
14.07
15.88
Off
0.00 %
Boiler 1 Pump P5 Fault Off
14.20
16.05
Off
0.00 %
Boiler 2 Pump P6 Fault Off
25.21
25.52
Off
0.00 %
Boiler 3 Pump P7 Fault Off
13.96
15.86
Off
0.00 %
Boiler 4 Pump P8 Fault Off
Leisure Centre Dist Flow Temp 78.62 DegC
Leisure Centre Dist Return Tem 72.49 DegC
Remote Enable For Leisure Pmps On

BMS Control Strategies

- Weather compensation for heating and cooling
- Timed control and optimum start/ stop
- Frost protection
- Fault alarms
- Energy excess alarms
- Remote monitoring and control
- Zone control

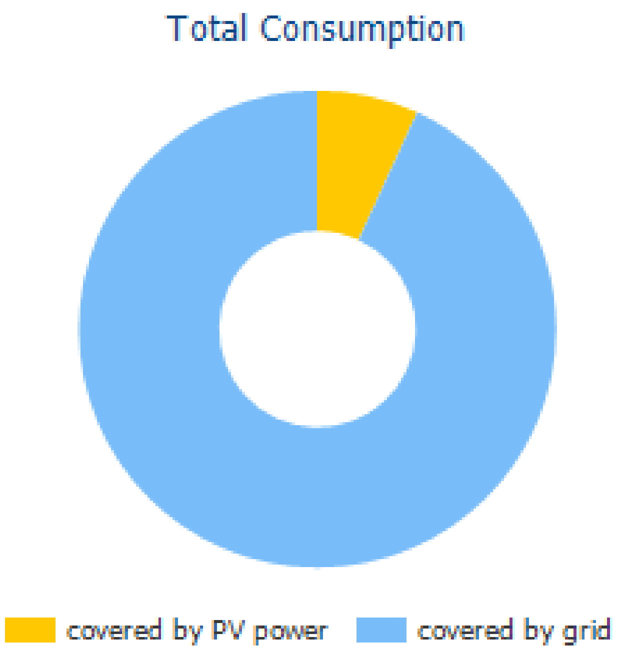
Medium investments: tackle the big energy consumers (pool hall ventilation)

Replace older pool AHUs with units incorporating **heat recovery** (cross-flow / thermal wheel) to improve efficiency (annual saving ~£7,327; capex ~£42,500; payback ~5.80 years)

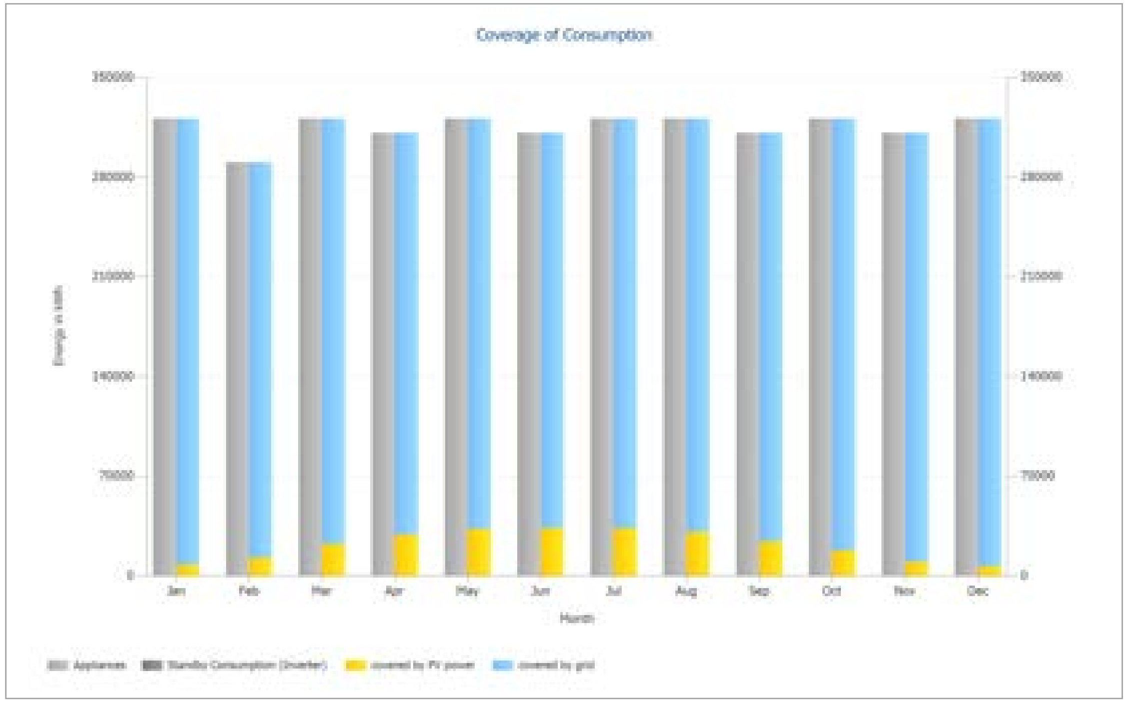
Pool covers minimise evaporation and that covering when not in use is the **single most effective** means of reducing pool heating costs, with **50%–70% savings possible**

High impact - *reduce evaporation + recover heat + tighten schedules.*

Solar Photovoltaic Energy Generation



246kWp Solar Canopy



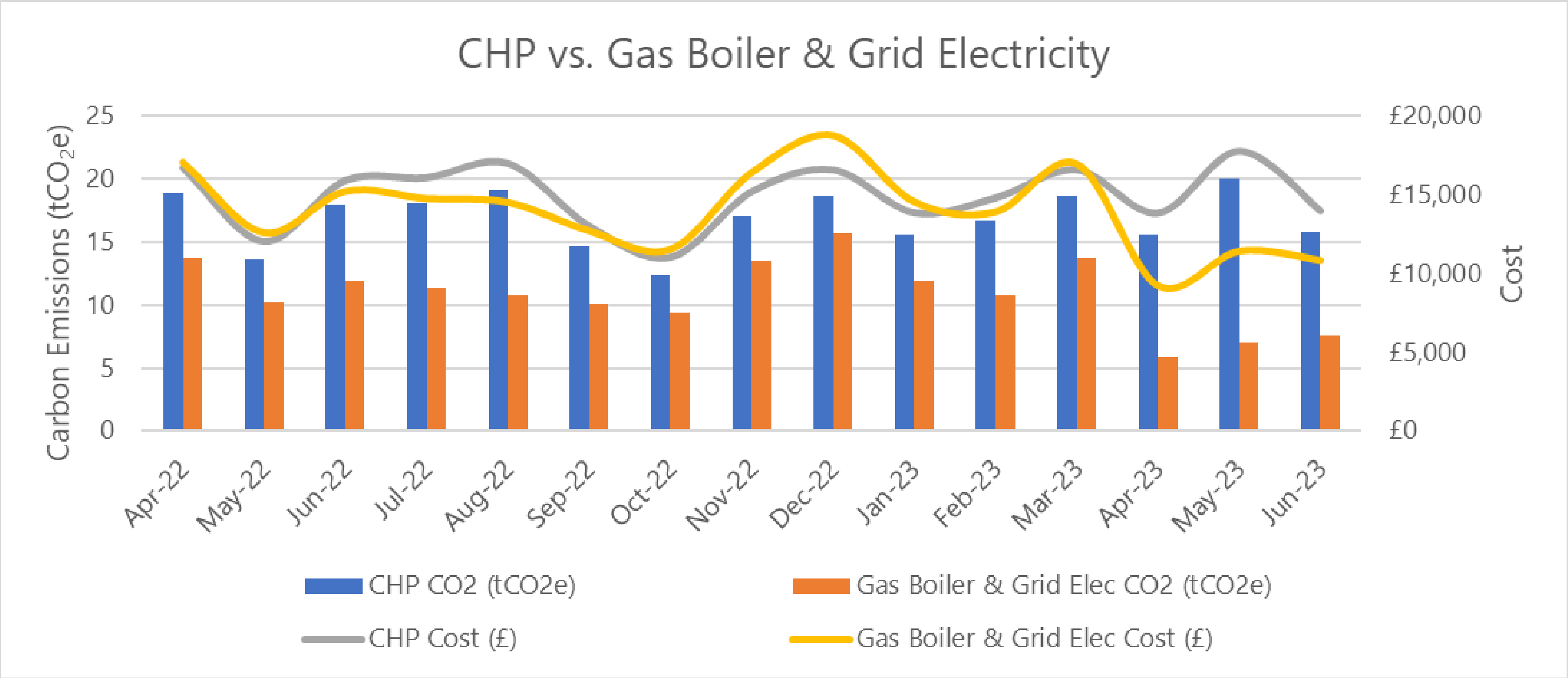
Solar Photovoltaic and Solar Thermal

- PV can help reduce costs of electrifying a building
- But will not power your whole building
- PV can be more beneficial compared to solar thermal as buildings become electrified
- PV is a bill-reducer and volatility-hedge, but it must sit behind “reduce and control” first.

246kWp Solar Canopy provided 9% of total electricity

Combined Heat and Power (CHP)

- Historically a low carbon technology and cost effective
- Unlikely to be a low carbon solution nor cost effective in the future



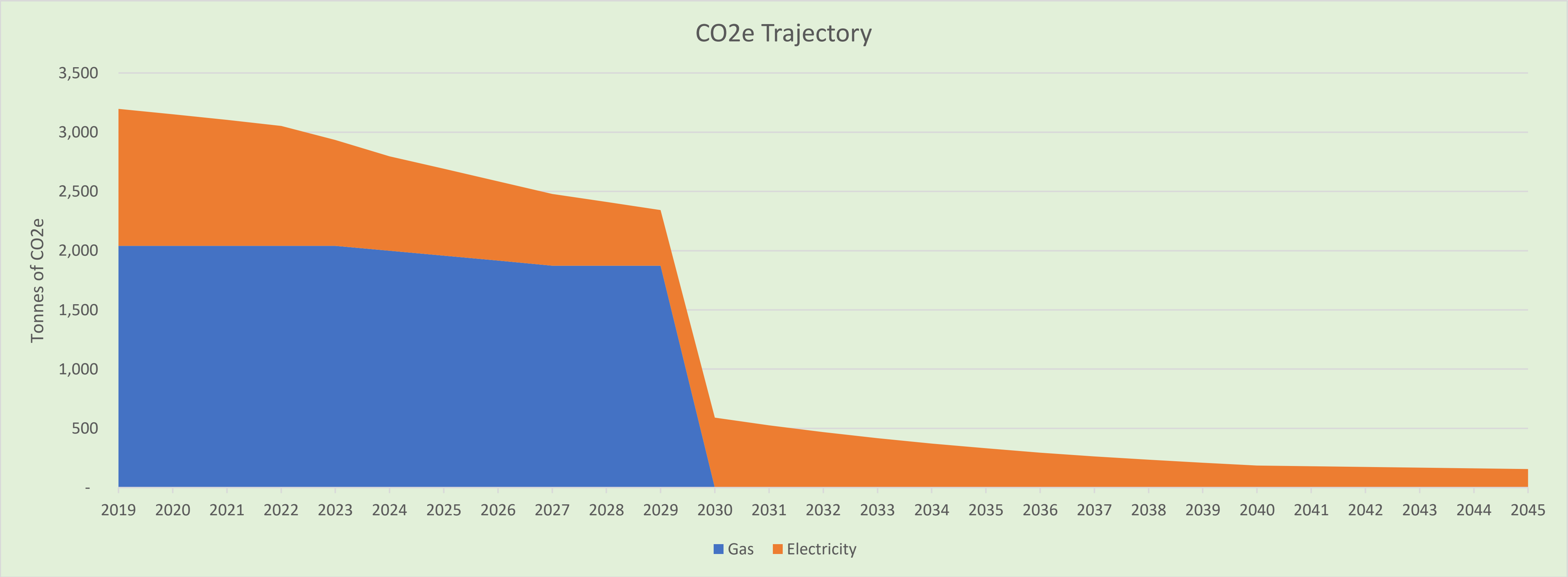
Low Carbon Heating

- Heat Pumps – High Coefficient of Performance (COP)
- Considerations for a low temperature system
- A 4-pipe multifunctional chiller is a heat pump that simultaneously provides heating and cooling. This works by recovering the heat absorbed from the cooling system to be utilised within the heating system, rather than being rejected to atmosphere. This leads to much higher COPs (4-8) compared to traditional chillers (2-4)
- Unit of electricity is around 25p/kWh and gas is 5p/kWh (elec is 5x higher than gas)
- High capital cost that will likely require external funding

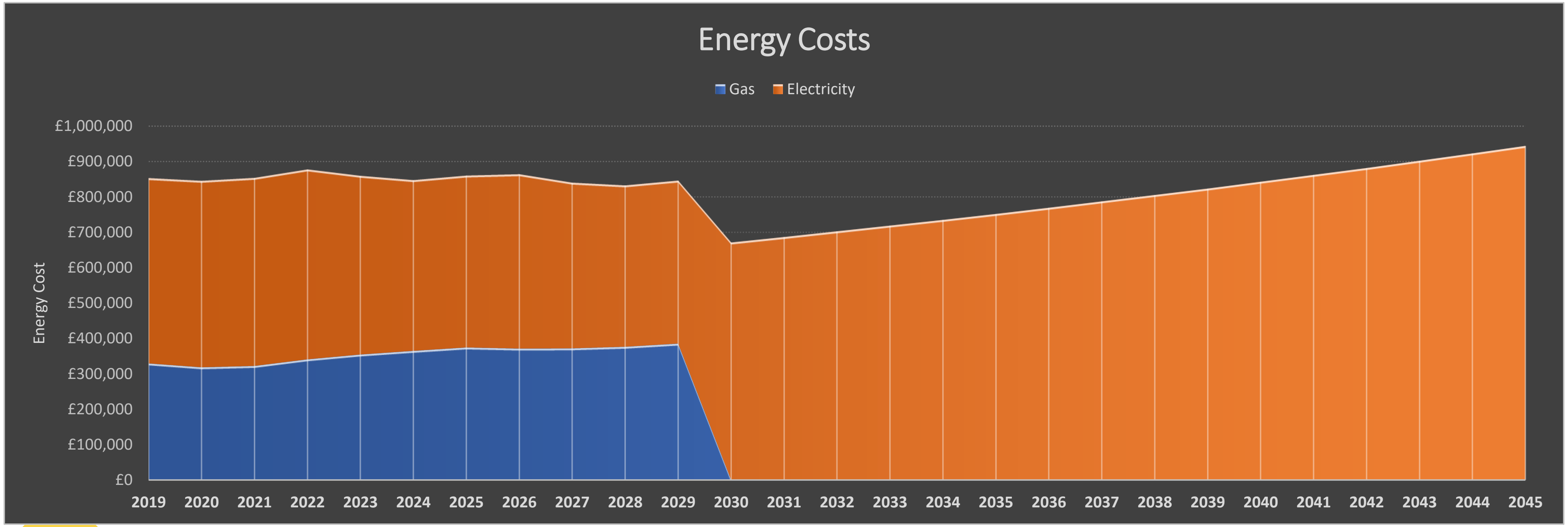
Electrical Capacity

- Critical to consider at an early stage
- Can be very expensive to upgrade the network
    - Recent example cost:
        - Dry leisure centre was 400m away from substation = £350,000
        - Wet leisure centre needed large increase = £142,000

Heat Pump Carbon Trajectory



Heat Pump Energy Costs



Case Study Capital Cost

Item	Recommendation	Annual Electricity Savings (kWh)	Annual Gas Savings (kWh)	Annual Saving (£)	Capital Cost (£)	Payback in Years	Carbon Saving (tCO_2) per year
1a	Triple Glazing		74,771	£4,120	£137,730	33.4	13.7
1b	External Wall Insulation		22,739	£1,253	£191,280	152.7	4.2
2a	ASHP (Space Heating)	-166,681	933,400	-£25,180	£1,840,500	NA	136.2
2b	HT-ASHP (DHW)	-10,779	35,113	-£3,020	£258,500	NA	4.2
3	130.8 kWp Solar PV (used on site)	93,631	-	£43,035	£160,900	3.7	23.0
4	LED lighting	24,872	-	£11,432	£37,200	3.3	5.2
	Total	-41,712	1,066,023	£32,502	£2,626,110		186.4

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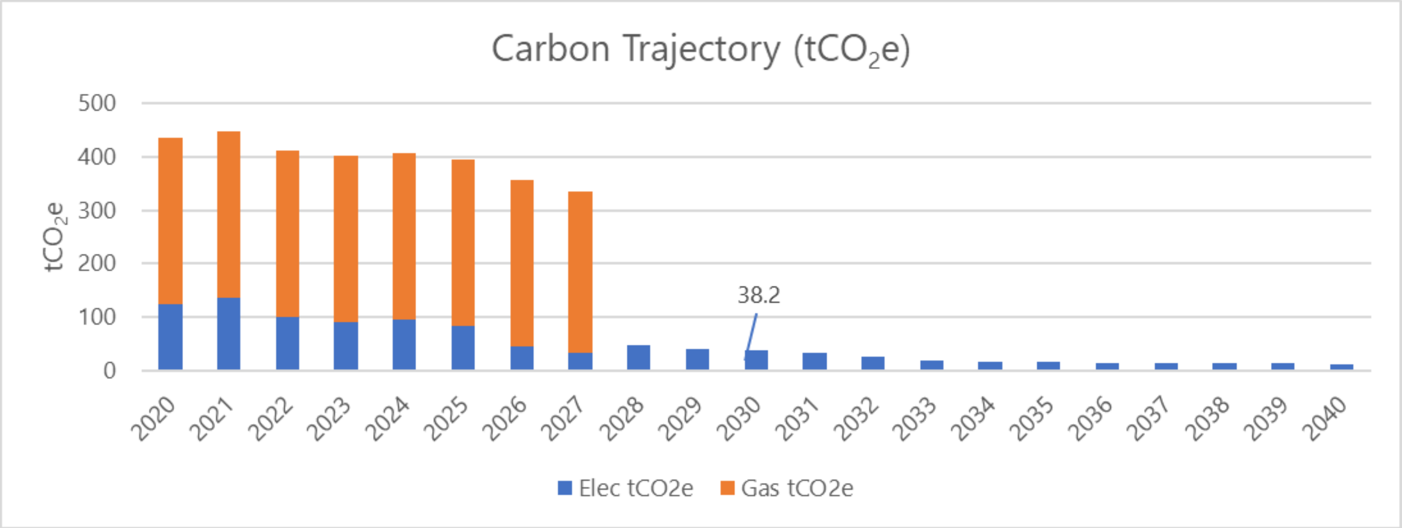
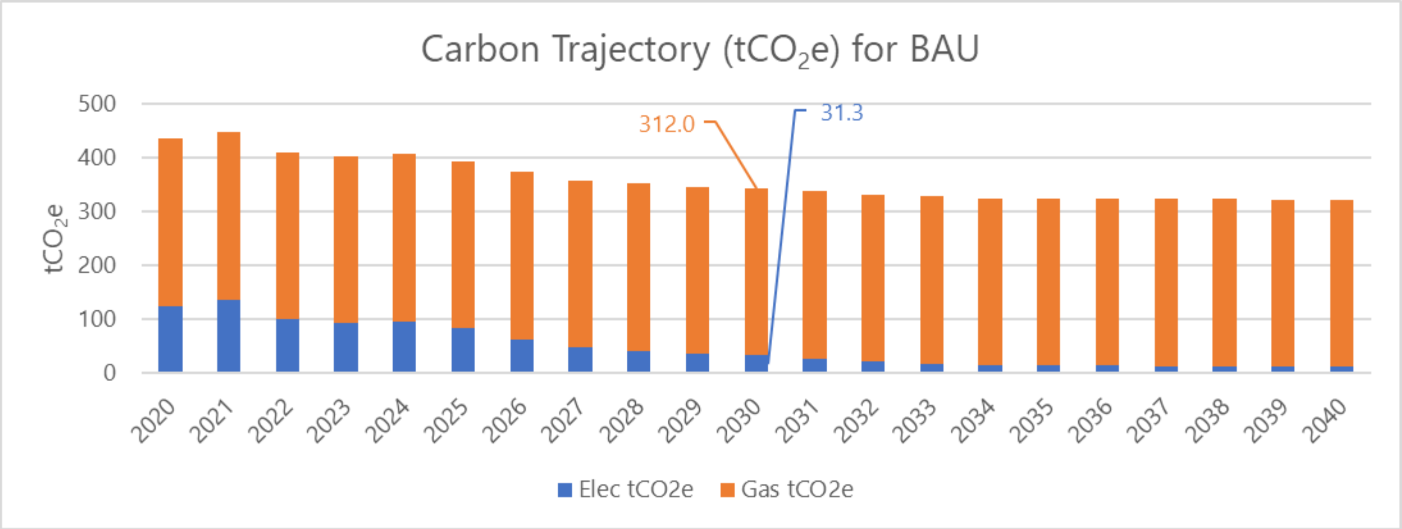
Costing Detail: ASHP

Item	Description	Costs
1	Preliminaries	£19,000
2	**ASHP and Plant Room**	
	Construction Compound	£79,000
	Heating Air Source Heat Pump(s)	£239,000
	Acoustic Attenuation	£29,000
	Buffer Vessel(s)	£8,000
	Heating Primary Pump(s)	£26,000
	Heating Secondary Pump(s)	£32,000
	Pressurisation Unit(s) & Expansion Vessel(s)	£5,000
	Plant Room Pipework, Valves, & Ancillaries	£55,000
	Automatic Controls, Control Panel & BMS	£60,000
	Electrical Works	£24,000
	Interconnecting Pipework to Plant Room	£10,000
	Builders' Work	£27,000

3	**HEATING DISTRIBUTION**	
	Removal of Existing Building Plant & Equipment	£27,000
	Heat Emitters (Radiators)	£32,000
	Distribution Pipework	£74,000
	New AHU Heating Coils	£20,000
	Heat Exchangers for Pools	£28,000
4	Upgrading Main Incoming Electrical Supply	£122,810
5	Testing & Commissioning	£10,000
	Demonstration & Training	£2,000
	Record Information	£3,500
6	Contingency Sum	£94,000
7	**Works Budget Total**	**£1,026,310**
8	Design Fees	£93,000
	Project Management Fees	£47,000
9	**Project Budget Total**	**£1,166,310**

Carbon Trajectory





Building Fabric

- Reducing heat loads can reduce capital cost of replacement heating system
- Can be very expensive
- Low cost measures include:
    - Draught proofing
    - Loft insulation
    - Cavity wall insulation

Control ownership + accountability

- Site manager reported the council remotely controls the BMS, and schedules/setpoints don’t align with typical occupancy.
- Define who “owns” schedules, who can change setpoints, and who reviews performance monthly.
- Layout of utility contract gave Leisure Operator no incentive to reduce cost

Energy and Water Procurement

- Review current contracts and options
- Flexible / Fixed / Green?
- Smart Export Guarantee (SEG) - 2p/kWh-25p/kWh
- Bill validation
- Water contract and tariff optimisation
- AMR installation
- Review non-commodity charges
    - Capacity charges
    - DUoS bands
    - Reactive power penalties
    - Gas AQ assumptions

Funding

- Sport England
- Public Sector Decarbonisation Scheme not extended as part of the spending review
- Energy Performance Contract (EPC)
- Borrow
- Energy security could [hopefully] result in more funding

Different funding streams are released regularly so keep an eye out for opportunities

The Net Zero Journey Summary

- Get your **Data** & estate in order
- Calculate **Baseline Emissions** & **Set Net Zero Targets**
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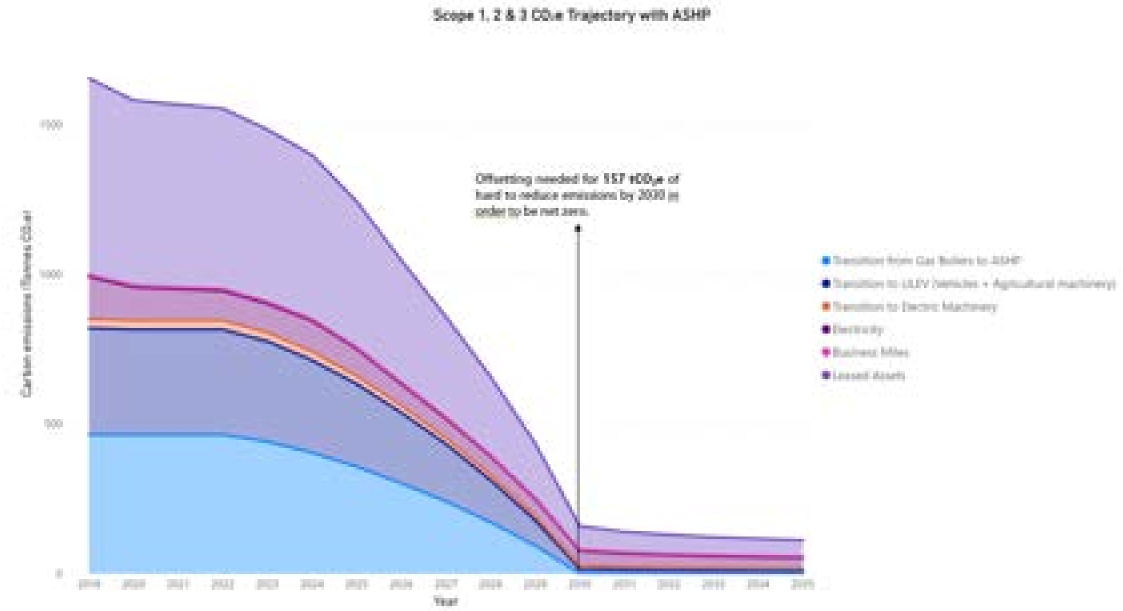

Prioritising projects

- Analysing existing and proposed building loads
- Comparing technologies
- Maintenance requirements and cost
- Carbon savings
- Cost savings
- Funding opportunities
- Payback and ROI

Larger, aging, inefficient buildings offer greater opportunities than smaller, newer efficient buildings

How Can APSE Help?

- Detailed energy audits / feasibility studies / heat decarbonisation plan
- Out of hours survey
- Data analysing and identifying anomalies
- BMS audit
- Billing review
- Funding application support

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Carbon Literate Organisation
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Next Steps

Ready to take action?

Contact Phil Brennan for further details on delivery of projects

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