

Buildings, energy use and energy management

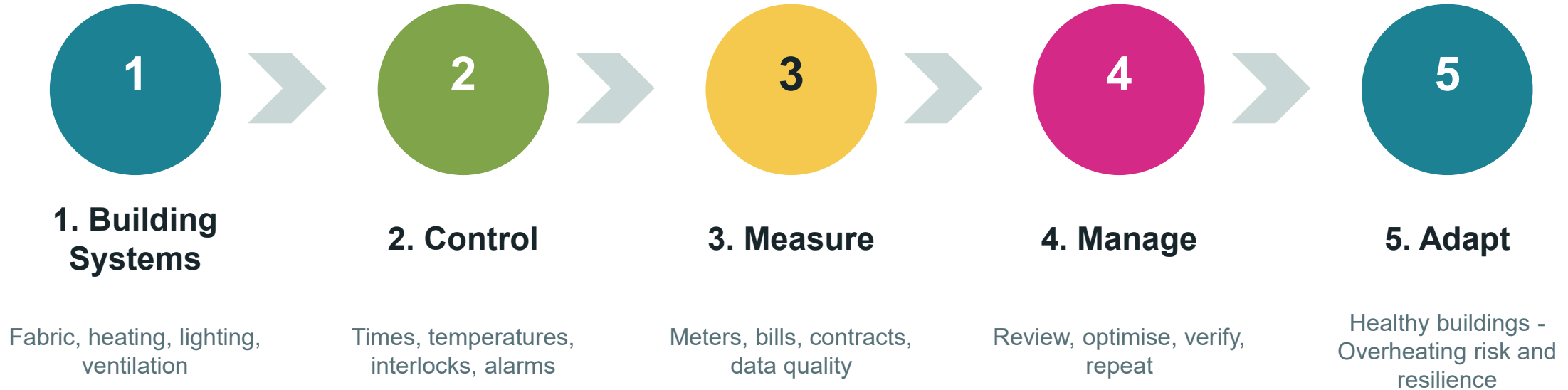
GETTING IT RIGHT

Alan Barber | APSE Energy Associate | Director, Salvis



Today's route through the building

From physical condition to operational control and evidence



The common thread: match energy use to genuine service need

Start with the service, not the technology

What must the building reliably provide?

People & use

Opening hours, occupancy patterns, vulnerable users, critical rooms, comfort requirements.

Building & fabric

Condition, airtightness, insulation, glazing, solar gain, moisture and ventilation paths.

Systems & operation

Heat, hot water, cooling, ventilation, lighting, controls, maintenance and operator capability.



**Right temperature • Right light • Right air quality • Right time •
Lowest practical waste**

"By 2050, around 80% of the buildings we will occupy already exist today. Net zero is therefore not primarily a new-build challenge, it is a retrofit and building-management challenge."

What to look for: a practical walk-round

Observe, ask, measure, then test the explanation

Fabric

Draughts, damaged seals, uninsulated roof edges, thermal bridges, uncontrolled doors

Heating & DHW

Simultaneous heat and cooling, high return temperatures, standing losses, poor zoning

Lighting

Lights on in daylight or empty areas, control overrides, unsuitable switching zones, lighting quality

Ventilation

Fans running continuously, dirty filters, failed dampers, heat recovery bypassed

Small power

Servers, vending, catering, pumps and plug loads with unnecessary baseload

Maintenance

Temporary fixes, disabled alarms, undocumented settings, inaccessible plant

Prioritise in the right order

Avoid paying to decarbonise avoidable demand

1

Eliminate waste

Schedules, setpoints, overrides, leaks, unnecessary plant

2

Optimise existing systems

Commissioning, balancing, sensors, maintenance

3

Improve the building

Fabric, ventilation, lighting, distribution and zoning

4

Decarbonise supply

Heat pumps, renewables and low-carbon heat sized to reduced demand

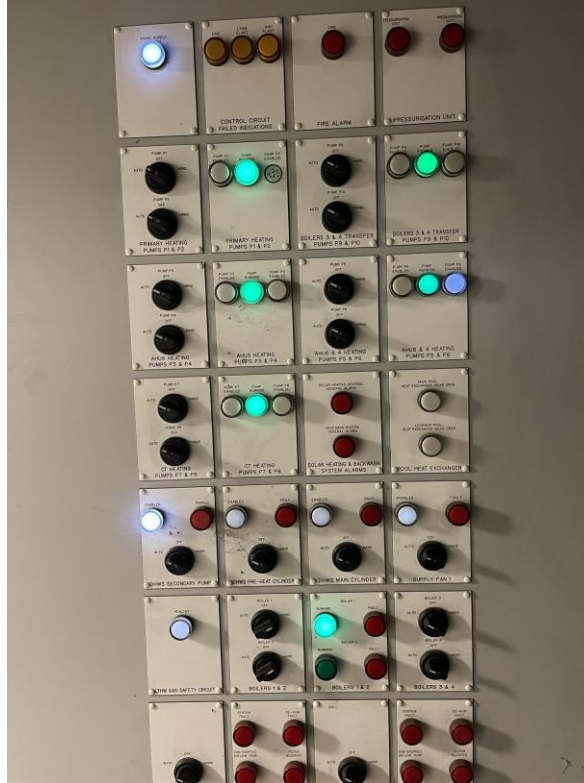
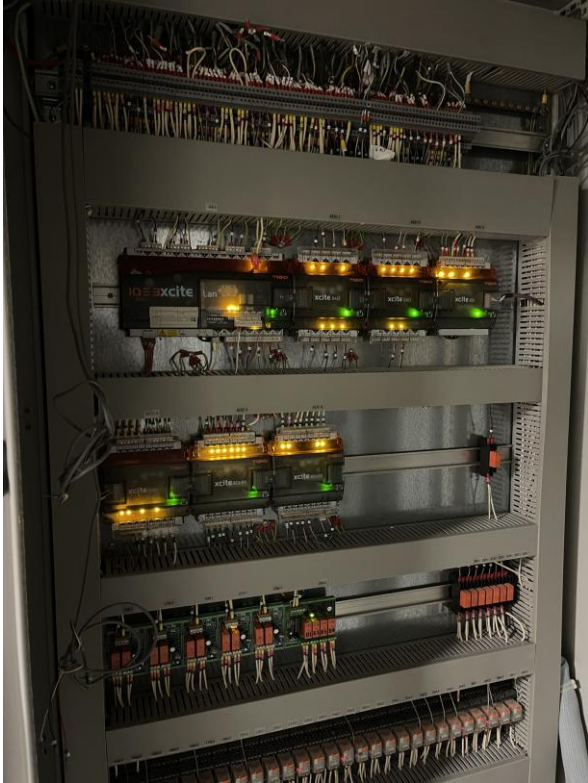
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Verify and sustain

Meter, compare, investigate drift and maintain accountability

Controlling the equipment

A BMS is only useful when the strategy, sensors and operators are right



Time

Match schedules to occupancy; include warm-up, optimum start/stop and holidays.

Temperature

Agree sensible setpoints, weather compensation and high-limit lockouts.

Sequence

Prevent plant conflict; define lead/lag, interlocks and responses to faults.

Key test: can a competent operator explain what should happen, what is happening, and why?

Common controls failures

The “invisible” causes of wasted energy

- Default schedules never updated
- Heating enabled year-round
- Setpoints changed to solve local complaints
- Sensors in poor locations or out of calibration
- Manual overrides left permanently active
- Heating and cooling fighting each other
- Pumps and fans running with no demand
- Alarms suppressed rather than resolved
- New plant added without revising sequences
- No trend review after commissioning

Fix the root cause, document the change, then confirm the energy response

Meters, bills and contracts

Meter

Correct utility, location, multiplier, ownership and condition

Data

Reliable reads, gaps and communications

Bill

Tariff, standing charges, taxes, estimated reads and adjustments

Contract

Account, supply identifier, service level, risk and renewal dates

Action

Exception owner, escalation, recovery and prevention

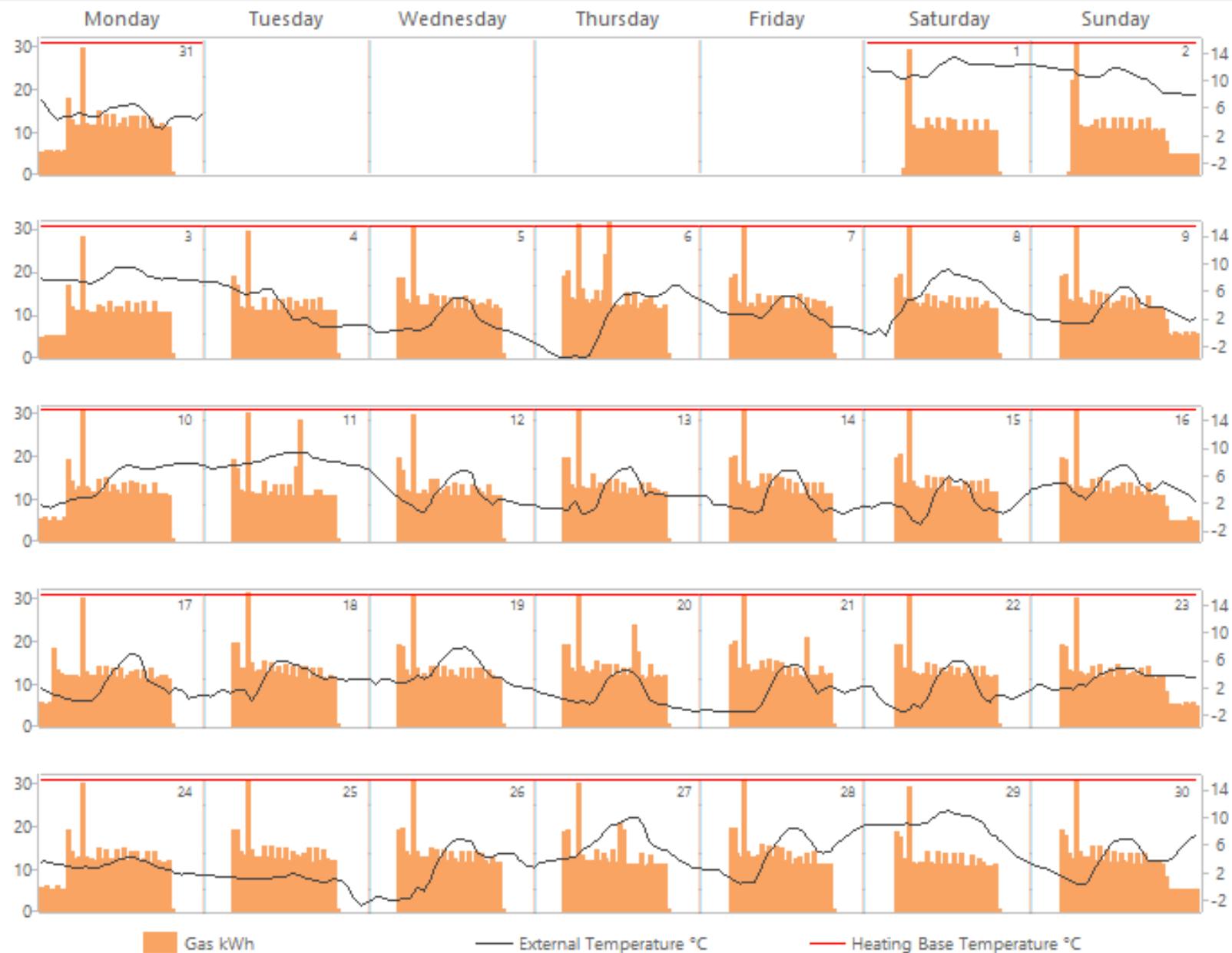


Use data as an operational control

A repeatable monthly energy-management rhythm



The value comes from taking action, not from collecting more data



Consumption

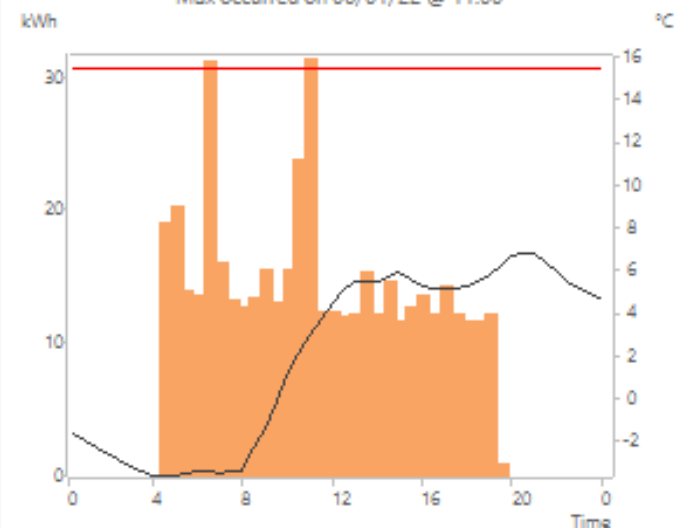
Total (kWh)	13,048
Average Interval (kWh)	8.8
Maximum Interval (kWh)	31.4
Minimum Interval (kWh)	0.0

Temperature

Average (°C)	4.0
Maximum (°C)	13.6
Minimum (°C)	-3.6

Heating Degree Days @ HBT of 15.5°C	348.4
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Profile of the Day with the Maximum Interval
Max occurred on 06/01/22 @ 11:00



Overheating is an estates risk

Assess exposure, vulnerability and the ability to respond



Risk factors

Solar gain, internal loads, urban heat, poor ventilation, limited night cooling and changing weather.

High-consequence settings

Homes, schools, care settings, offices, libraries, leisure and spaces with vulnerable occupants.

Mitigation hierarchy

Reduce gains, improve passive measures and controls, then consider efficient active cooling where justified.

In the UK, **there is currently no legal maximum indoor temperature** at which a building must be vacated or occupancy restricted. The law requires employers and building operators to maintain a **"reasonable" temperature** and manage heat-related risks through risk assessments and control measures

Getting it right means...

Understand the service need

Stop avoidable waste

Control systems intentionally

Trust but verify the data

**Prepare for heat and
overheating**

**Keep a fundable project
pipeline**

What is the first building or recurring issue you will investigate?

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Two APSE practical guides

Turn recurring operational weaknesses into a structured review

Building controls

- What controls are and why they matter
- Common council-building problems
- A simple controls review
- Using energy data to identify issues
- Low- and no-cost optimisation
- Metering, monitoring and continuous improvement
- Emerging tools without “magic box” thinking

Metering, billing & energy management

- Survey the physical metering estate
- Map electricity, gas, heat and water
- Address shared supplies and tenant allocation
- Improve compatibility with energy software
- Define gaps in coverage and data quality
- Link metering to billing and management decisions

Use the guides as review frameworks, not shelf documents