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FROM SENSORS TO STRATEGY

Operational data as the bridge between asset value decarbonisation and healthier buildings

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The Core Argument

A building's value is beginning to depend on what it can prove in operation.

Sustainability, resilience, efficiency and health are becoming harder to separate from commercial performance.

Design intent and commissioning records matter, but in-use performance tells the truth of the occupied building.

A sensor network gives the BEMS the context it needs to optimise, evidence and adapt.

We cannot manage, prove or value what we do not measure.

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Who this is really for

Commercial stakeholders

Building owners need to protect asset value and reduce operational risk.

Occupiers increasingly expect comfort, wellbeing and proof.

Investors and agents need credible evidence of performance.

Facilities managers need visibility before complaints become patterns.

Consulting engineers need infrastructure that lasts beyond handover.

BEMS professionals need better inputs to produce better control.

This is not a sensor lecture. It is a performance conversation.

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START WITH THE BUILDING, NOT THE SENSOR.

The sensor is only interesting
because of the decision it enables.

The value of a building is changing

Operational performance is moving from engineering detail to commercial evidence.

Traditional signals

Location, floor area, condition, covenant strength, rental income and comparables.

Emerging signals

Energy intensity, carbon risk, climate resilience, indoor environmental quality and operational data.

The question

If two buildings look similar on paper, but only one can prove how it performs in use, are they truly equivalent?

The market is asking: how does this building actually perform?

Green premium or brown discount?

The question may be shifting from reward to risk.

72%

RICS Europe respondents believed green buildings command higher rents.

63%

Respondents reported higher sales prices can be achieved for green buildings.

37%

Saw the phenomenon more as a "brown discount" than a green premium.

Poor performance may become a liability, not merely a missed opportunity.

The performance gap is where strategy becomes real

A building is not static after handover.

What changes?

Occupancy rarely matches design assumptions.

Spaces are reconfigured and repurposed.

Setpoints drift and overrides become normal.

Plant efficiency changes as filters, valves, dampers and sensors age.

Why data matters

Commissioning is a point-in-time test.

Design models are based on assumptions.

Operation is live and continually changing.

Operational data is the feedback loop.

Operational data is not an insult to design, it helps design intent survive reality.

What data improves sustainability?

Not data for its own sake-data that changes a decision.

Environmental context

Temperature + occupancy:
avoid conditioning empty zones.

CO_2 + occupancy:
match ventilation to demand.

Humidity + temperature:
manage condensation, mould risk and comfort.

Operational context

PM / VOC + outdoor air:
choose ventilation, filtration or recirculation.

Pressure / flow:
detect filter loading and plant degradation.

Energy + operating state:
find simultaneous heating/cooling and out-of-hours waste.

Sustainability is created by the better decisions the datapoint enables.

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THE CHEAPEST KILOWATT-HOUR IS STILL THE ONE THE BUILDING DID NOT NEED TO CONSUME.

But first, the building has to know why it was consuming it.

From measurement to action

The BEMS needs context, not isolated numbers.

Measurement chain

Measure the condition.

Compare it against target, baseline or outdoor conditions.

Interpret what the pattern means.

Control the building response.

Evidence the outcome and improve again.

Two simple examples

Meeting room: occupancy low + CO_2 low + stable temperature = reduce unnecessary ventilation/cooling.

Outdoor PM high + indoor PM acceptable = control ventilation and protect filtration decisions.

Data alone is not intelligence. Context turns data into action.

Small capital shifts can create long-term optionality

The cost of extra sensing can be modest; the cost of missing data can be strategic.

Specify only for today

Lower initial scope.

Limited future flexibility.

Retrofit later may require disruption, access, cabling and fresh budget approval.

Specify for tomorrow

A richer data layer can support future optimisation.

Useful for certification, reporting, maintenance and analytics.

Creates options that may not be active on day one.

A building with no data is cheap only until someone needs the evidence.

Climate change changes the conversation

Not necessarily "we will all stay indoors more"
but indoor environments will need to work harder.

The UK Climate Change Committee says heatwaves have become hotter, longer and more frequent and recognises that building controls will contribute to 60% of energy-efficiency-related savings in public and commercial buildings by 2040.

UKHSA says climate change is already making heatwaves more frequent, longer-lasting and more severe.
Overheating, comfort and air quality are becoming resilience issues, not just comfort issues.

Buildings may increasingly operate as controlled environments during heat, pollution and extreme weather events.

What if the future building is not just shelter from weather, but shelter from climate?

The overheating problem

Cooling demand, comfort risk and productivity risk are becoming connected.

Heat exposure

Extreme heat creates health, comfort and productivity risks, especially for vulnerable people and poorly adapted buildings.

Operational tension

More cooling can protect occupants but increase electricity demand and carbon pressure if poorly managed.

Data-led response

Measure temperature, RH, occupancy, outdoor temperature and operating state to target cooling intelligently.

Resilience is not only about adding capacity, it is about using capacity intelligently.

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THE SUSTAINABILITY PARADOX

Ventilate more? Cool more? Filter more?
Or use data to deliver only what is needed, when it is needed?

Air quality is central because air is invisible

People can see light. They can feel temperature.
They cannot reliably sense the pollutants that matter.

80–90%

UK Parliamentary POST notes people spend around 80–90% of their time indoors.

Complex exposure

Pollutant sources and concentrations vary significantly between and within buildings.

Measurable reality

CO_2, PM2.5, VOCs, CO, temperature and humidity only become actionable when measured.

Sensors give buildings senses. Data gives those senses meaning.

What should we measure for healthier buildings?

A richer IAQ picture is built from multiple indicators, not a single number.

Core IAQ indicators

CO_2: ventilation effectiveness and occupancy context.

PM2.5 / PM10: fine particles, filtration and outdoor air impact.

TVOC: chemical pollutant trend signals.
CO: combustion risk and safety context

Environmental context

Relative humidity: comfort, mould risk and condensation.

Temperature: comfort, overheating and HVAC control.

Outdoor air quality: baseline for ventilation decisions.

Placement and calibration determine whether data can be trusted.

Healthy and sustainable are not opposing objectives

Measurement allows the building to reconcile them.

Without data

Fixed schedules, fixed ventilation rates, broad assumptions and manual intervention.

With data

Demand-led ventilation, smarter cooling, targeted filtration, better fault detection and evidence-led operation.

With strategy

Portfolio baselines, targeted retrofit, ESG evidence, occupier communication and asset-risk reduction.

The objective is not “less ventilation”. It is the right ventilation.

From sensor network to strategic data layer

A simple architecture for future-ready buildings.

1) Field sensors

Capture the condition: temperature, RH, CO_2, PM, VOC, pressure, flow, occupancy and energy.

2) Edge & gateway

Translate diverse device data into usable protocols.

3) BEMS & analytics

Apply control logic, dashboards, alarms and optimisation.

4) Strategy layer

Convert performance data into carbon reporting, asset planning, resilience and compliance evidence.

A sensor is only as useful as the pathway that carries its data into decisions.

Wired and wireless both have strategic roles

Future-ready does not mean one technology everywhere.
It means the right architecture for the estate.

Wired sensing

Excellent for core plant, critical systems, stable new-build infrastructure and continuous power.

Wireless sensing

Powerful for retrofit, occupied buildings, heritage constraints, rapid pilots and low-disruption data expansion.

Hybrid strategy

Robust wired foundations plus flexible wireless layers where data needs evolve.

The future is not wired versus wireless. It is fixed infrastructure plus adaptable intelligence.

More data is not automatically better

The value is in reliable, relevant, accessible and actionable data.

Good data is…

Relevant:
linked to a control, compliance or asset decision.

Reliable: correctly specified, placed and maintained.

Accessible: available to the BEMS and stakeholders.

Actionable: connected to a response.

Bad data creates risk

Poor placement can mislead control logic.

Uncalibrated readings can create false confidence.

Siloed data cannot support strategy.

Noise without purpose creates confusion, not intelligence.

Sensor quality becomes data quality. Data quality becomes decision quality.

Operational data supports net-zero credibility

The industry is moving from modelled claims towards measured performance.

Design model

Useful for prediction and compliance, but based on assumptions.

In-use data

Shows actual energy use and operational outcomes once occupied.

Continuous improvement

Allows the estate to measure, understand, act and measure again.

A decarbonisation strategy without feedback is just a plan.

The asset-owner lens

Operational data reduces uncertainty.

Questions owners can answer

Which buildings consume more energy than expected?

Which assets carry comfort or overheating risk?

Where does poor IAQ create complaints or reputational risk?

Which retrofit interventions actually delivered savings?

Strategic value

Better evidence and comparability across assets.

Better prioritisation of capital expenditure.

Better tenant and investor conversations.

Better visibility of operational risk.

Data does not guarantee value, but lack of data increases uncertainty.

The FM and BEMS lens

Better sensing creates better intervention points.

Control

Demand-led ventilation, occupancy-led scheduling, adaptive temperature control and smarter start/stop.

Fault detection

Find sensor drift, passing valves, blocked filters, simultaneous heating/cooling and out-of-hours operation.

Communication

Turn invisible performance into evidence that can be explained to occupants and stakeholders.

The BEMS cannot optimise a condition it cannot see.

What should consultants specify differently?

Move from minimum control points to strategic sensing zones.

Design questions

What might this building need to prove in 5, 10 or 15 years?

Which decisions should each datapoint support?

Where will retrofit expansion be likely?

Specification principles

Protect interoperability and avoid data silos. Plan placement, access, calibration and replacement.

Think portfolio comparability, not only room-by-room control.

Specify the sensing infrastructure for tomorrow's questions.

Where TIAQ naturally fits

A quiet example of how sensing itself is evolving.

Old view

A single-purpose input to support a local control loop.

New view

A richer environmental datapoint that supports BEMS control, reporting, wellbeing and operational intelligence.

TIAQ context

Total indoor air quality monitoring reflects the shift from isolated readings to environmental understanding.

The product is proof of the trend, not the subject of the talk.

The five shifts delegates should remember

This is the talk in one slide.

Sensors as components	Sensors as infrastructure
Data for control	Data for decisions
Design performance	Measured performance
Building automation	Building intelligence
Energy efficiency	Environmental performance

From Sensors to Strategy.

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IF WE DO NOT MEASURE THE BUILDING TODAY, HOW WILL WE PROVE IT IS BETTER TOMORROW?

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Q&A

Thank you