Unlocking Operational Data: From Data Silos to Digital Twin Intelligence

Smart Buildings Show 2026

Dr. Jason Mc Guire
Lead Data & Analytics Architect
15th October 2026

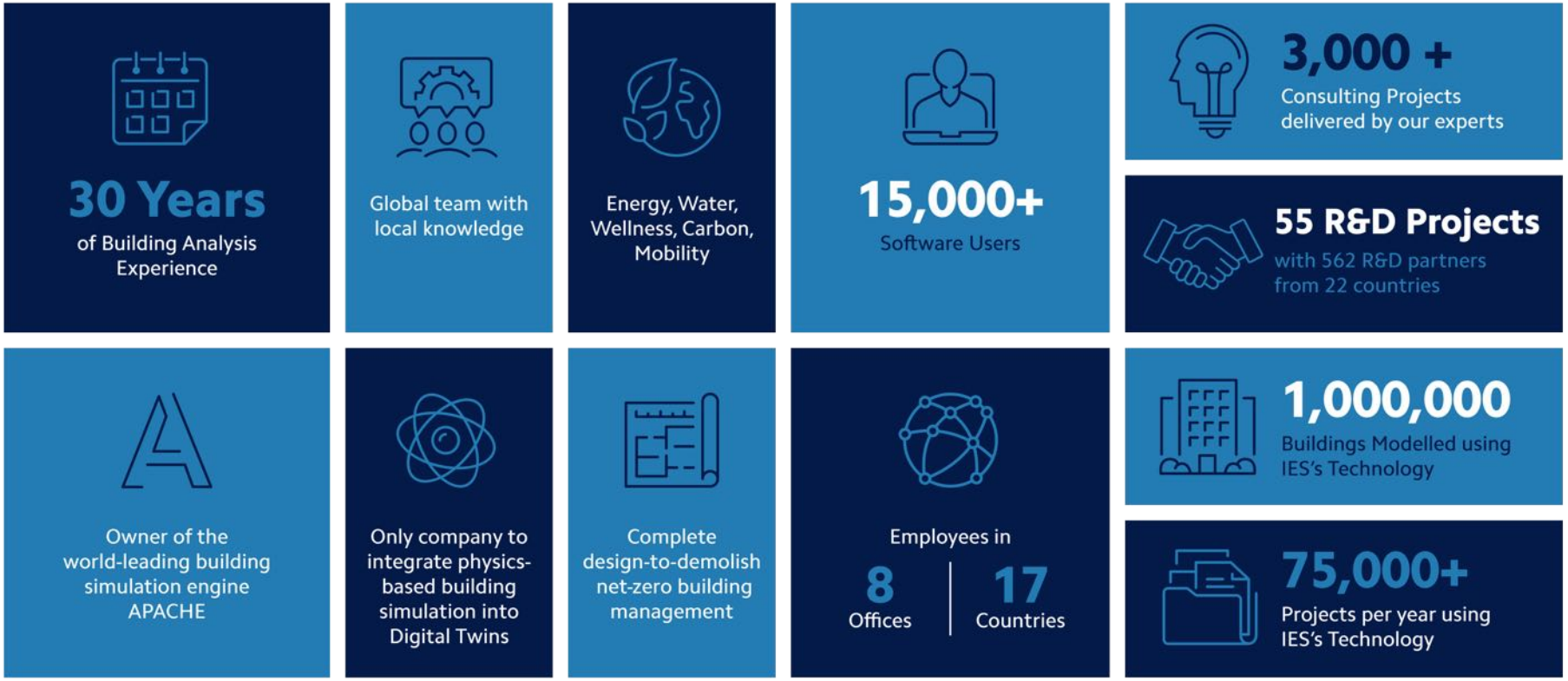


Agenda

- Background
- Building Data
- Modelling
- IES Live & Tracking
- Case Study

Integrated Environmental Solutions

Who are we?



The Opportunity

Room for Improvement

- The energy performance gap (EPG) ranges from **20% to 550%** depending on building type, data source, methodology, and time period[1].
- A primary requirement to address the EPG is the collection of operational performance data[2]. 86.4% of data never leaves the system that generated it[3].
- LEED v5 requires 3 years of post-occupancy data. The UK Net Zero Carbon Buildings Standard requires 12 months of metered data to make any net zero claim.



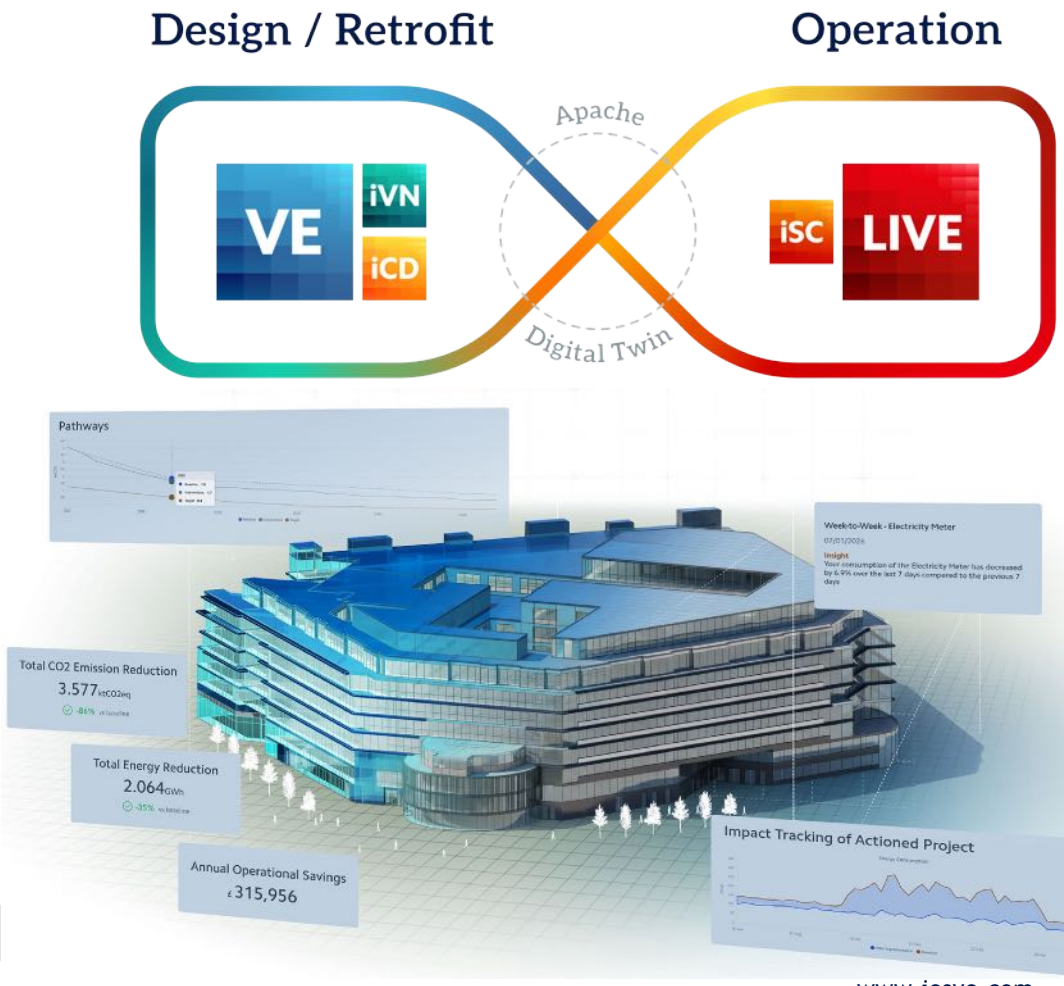
1. A Review of the Energy Performance Gap between Predicted and Actual Use in Buildings, IBPSA Building Simulation Conference, Shanghai, September 2023. DOI: 10.26868/25222708.2023.1430
2. CIBSE TM61: Operational Performance of Buildings (CIBSE, 2020)
3. Savadkoohi, M., Macarulla, M., Tejedor, B. et al. Analyzing the implementation of predictive control systems and application of stored data in non-residential buildings. Energy Efficiency 17, 70 (2024).

Design Meets Operation

Data · Model · Tracking

- Design and operation have historically existed in separate worlds. That separation is a primary driver of the energy performance gap.

- IES connects design[1] and operation[2] by combining operational building data with physics-based simulation and ongoing performance evaluation all on one platform



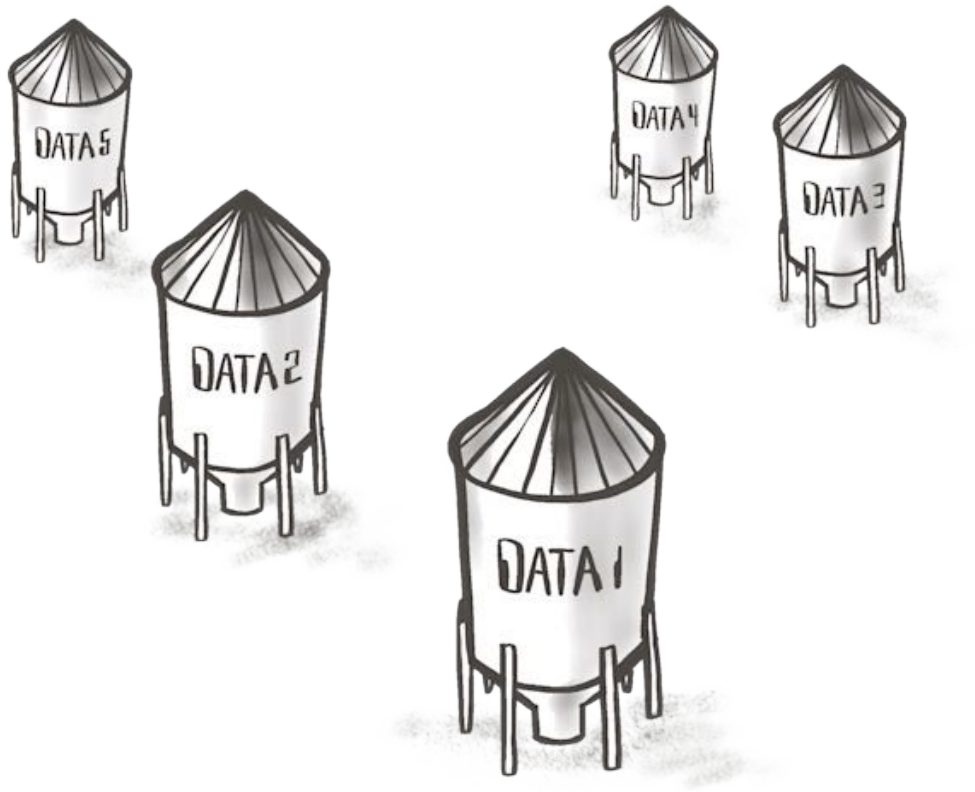
1. IESVE - https://www.iesve.com/software/virtual-environment
2. IES Live - https://www.iesve.com/ies-live

Data
Overview

The Building Data Overview

Separate systems, separate truths, no shared reality

- Modern buildings rely on many independent data systems: BMS, metering, lighting, safety, access, IAQ, occupancy.
- Most systems are installed at a different times[1], by different contractors, using different communication protocols. These systems are not designed to share data.
- **Example:** Most buildings now operate at 41–60% utilisation, compared to 60–80% before the pandemic[2]. Conditioning for peak occupancy wastes energy



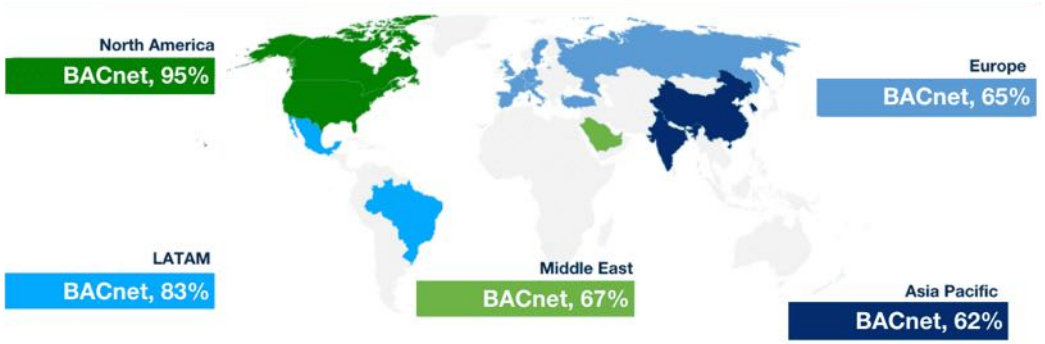
1. UKGBC, Delivering Net Zero: Key Considerations for Commercial Retrofits https://ukgbc.org/resources/delivering-net-zero-key-considerations-for-commercial-retrofits/
2. CBRE, Office Occupier Sentiment Survey 2024 – Europe, Adaptive Spaces. cbre.com

The Control Data Landscape

BACnet the Language of Control Systems

- Building Automation and Control Systems (BACS) is now mandatory for non-residential buildings under EU EPBD 2024[1]. BACnet is the dominant open protocol, specified on 77% of projects globally and rising.[2]

- BACnet/SC (Secure Connect) is the next evolution — TLS-encrypted, IP-native and designed for secure routed connectivity.[3]



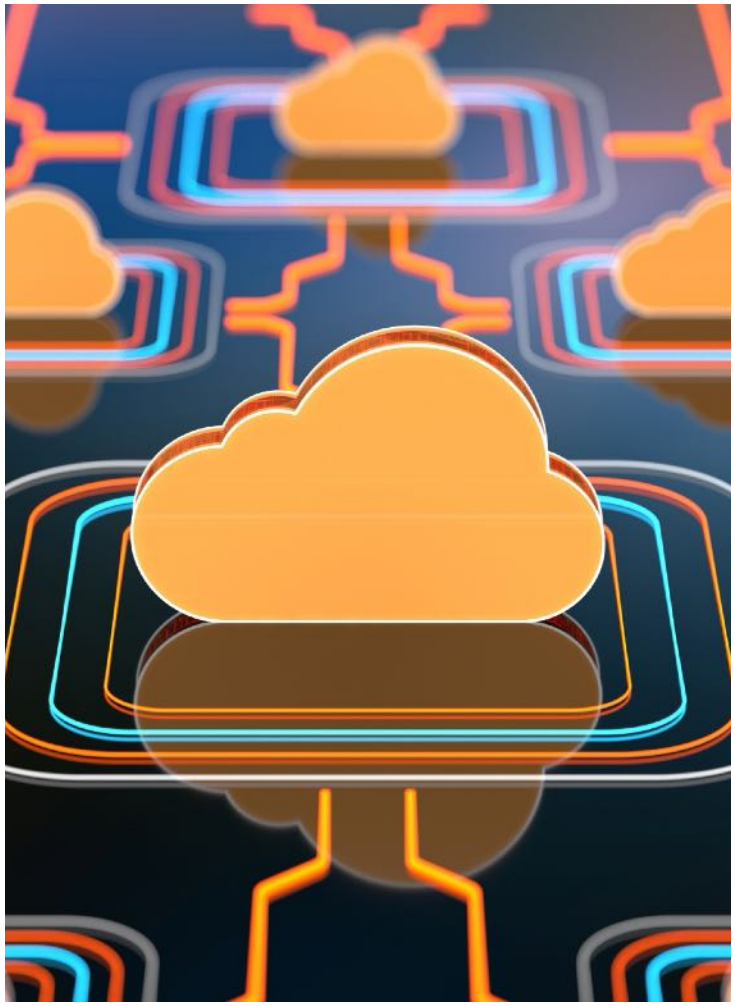


1. Directive (EU) 2024/1275 — Energy Performance of Buildings (recast), European Parliament and Council. Article 22. Official Journal of the EU, 8 May 2024.
2. BSRIA, Market Penetration of Communications Protocols 2018–2027, via BACnet International Market Adoption Report
3. Dataintelo, BACnet Secure Connect Deployment Market Report, 2025–2034

Data Acquisition

What data is required?

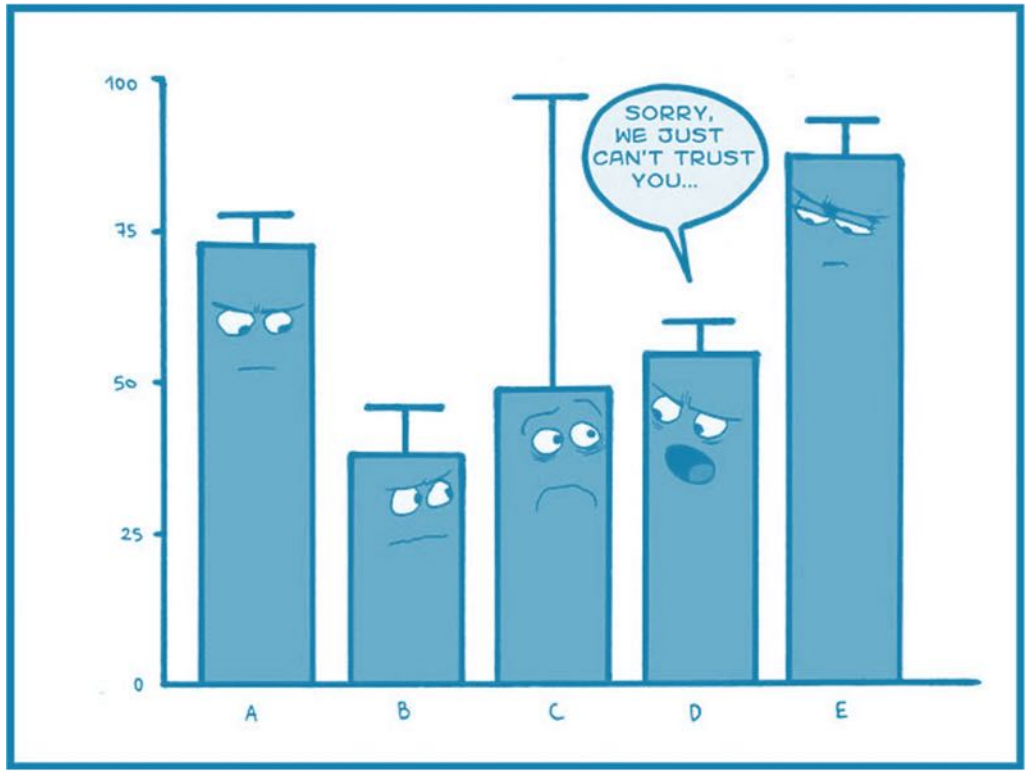
- The first question is: what data is needed to deliver the project, does that data exist and if so where is it?
- Integrating building systems is rarely straightforward. Export capabilities and protocols vary.
- Having a Plan B when direct integration isn't available.



Data Quality

Do we trust the data?

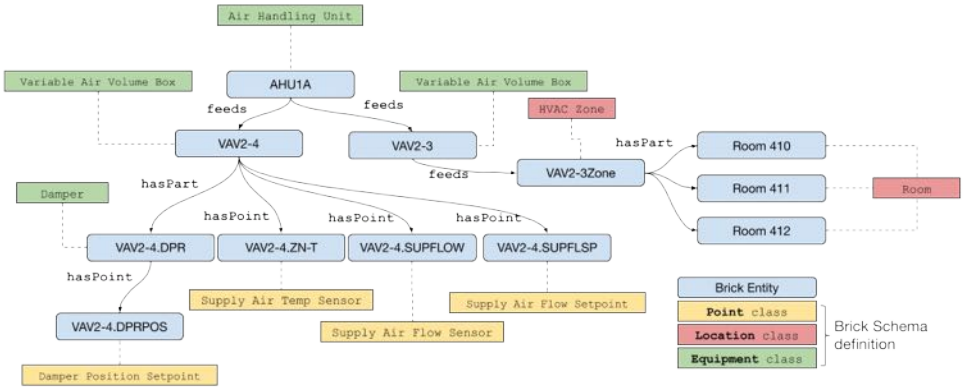
- Getting connected is only the first step. The greater challenge is ensuring that incoming data is accurate, complete, and consistent enough to be trusted.
- Sensor drift, uncalibrated readings, missing trend logs, and inconsistent naming conventions often go unnoticed. These issues can silently and continuously undermine insights.



Data Management

Data needs context

- Data needs to describe what is being measured, where it is measured, and how it relates to equipment, systems and spaces.
- Open semantic standards help create that structure. Project Haystack uses tags to describe building data, while Brick Schema models the relationships between points, equipment and spaces.
- Structured data is the foundation[2], not the destination. Once the building data has meaning and relationships, we can combine it with physics to understand how the building should perform.





1. ASHRAE 223P – Semantic Modelling for Building Control and Monitoring Applications (in development). Project Haystack (project-haystack.org). Brick Schema (brickschema.org)
2. UKGBC, Delivering Net Zero: Key Considerations for Commercial Retrofits https://ukgbc.org/resources/delivering-net-zero-key-considerations-for-commercial-retrofits/

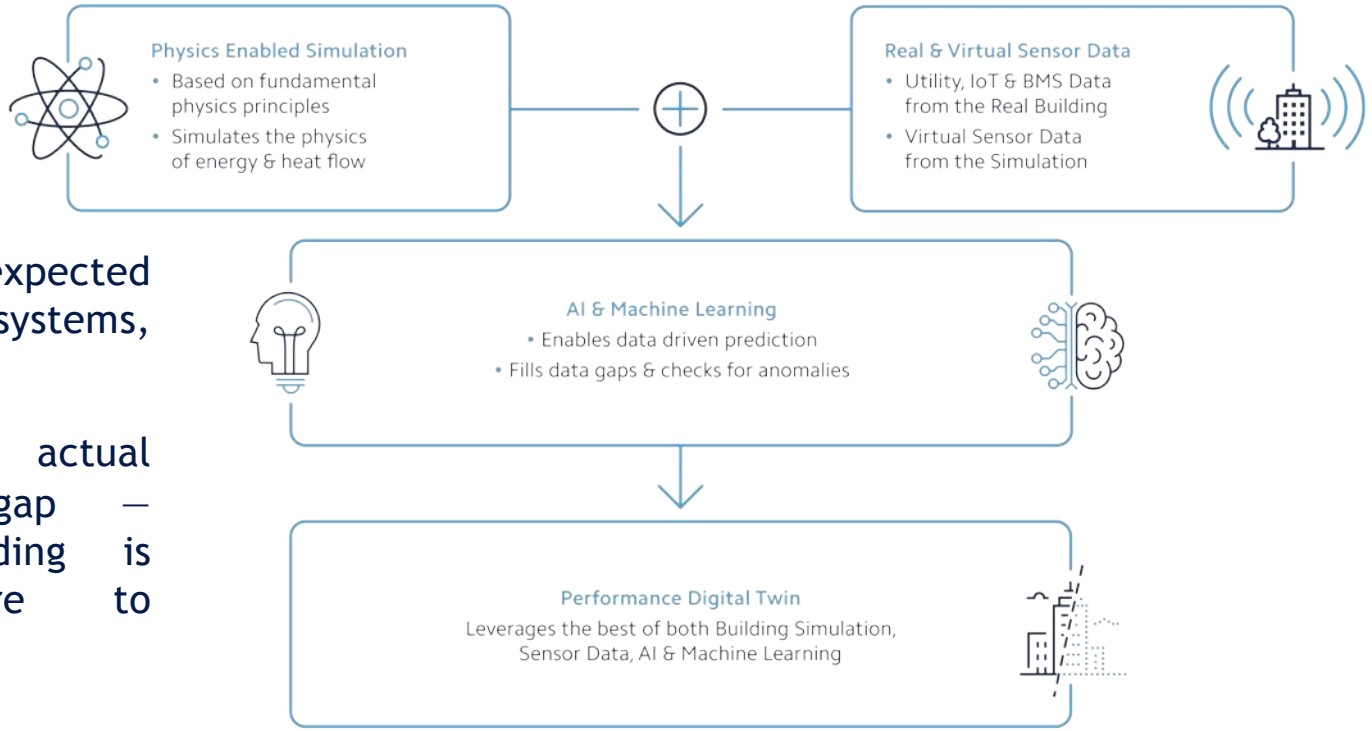
Modelling

Overview

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Why physics matters

Data tells you what. Physics tells you why.

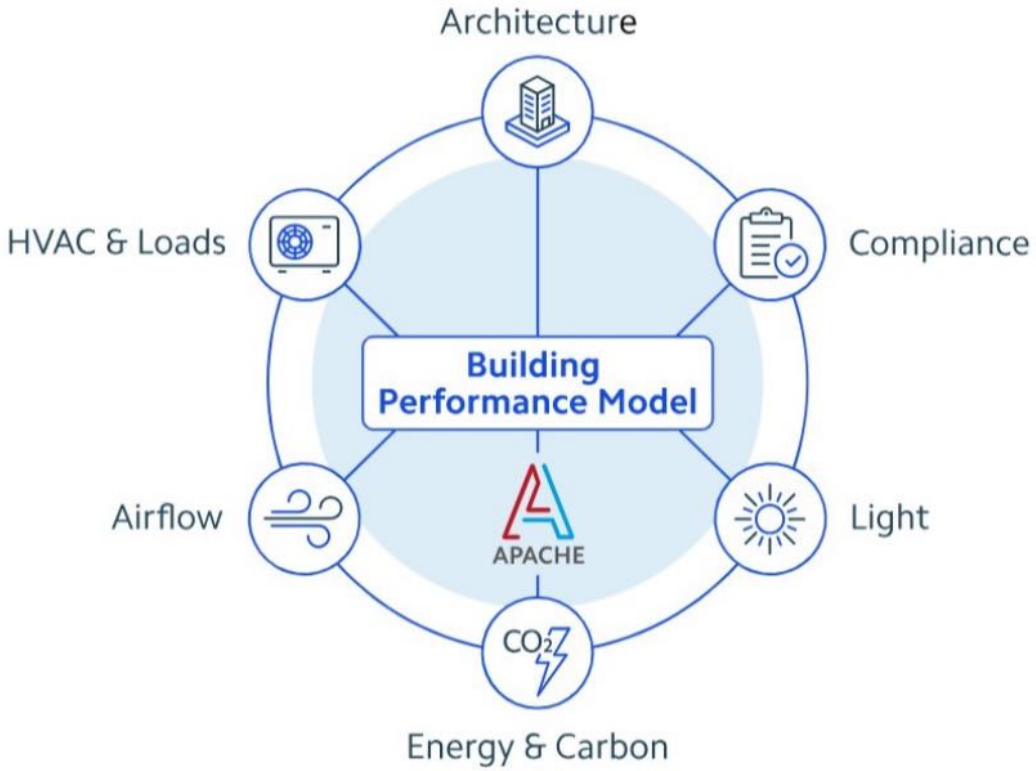


- A physics model creates an expected baseline based on the building, systems, weather and operating conditions.
- Comparing expected vs. actual performance exposes the gap — highlighting where the building is underperforming and where to investigate.

Virtual Environment (VE) Model

Used by sustainable design experts around the globe

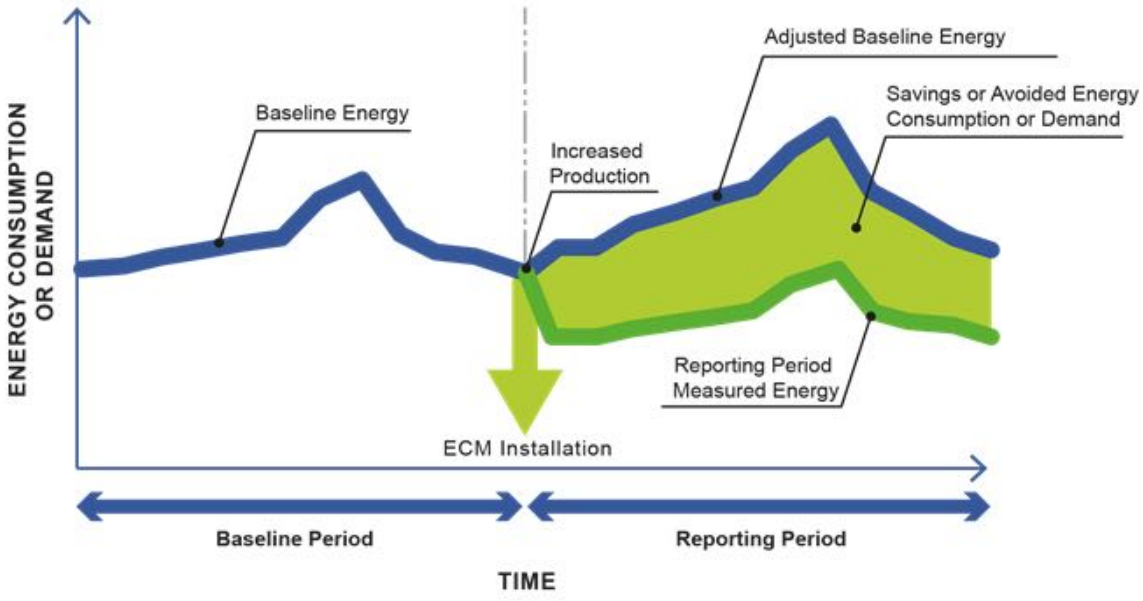
- IES VE is a whole-building performance simulation platform built on the Apache physics engine — covering energy, thermal comfort, HVAC sizing, daylighting, airflow, and carbon from a single central building model
- VE covers the global compliance landscape from one platform — Part L, ASHRAE 90.1, LEED v4 and v5, BREEAM, and Passivhaus.



Look before you leap

Testing ECMs before spending a penny

- Before committing capital, test the intervention virtually and quantify the expected impact.
- After implementation, IES Live continues monitoring. Verifying that predicted savings are being realised and detecting drift.

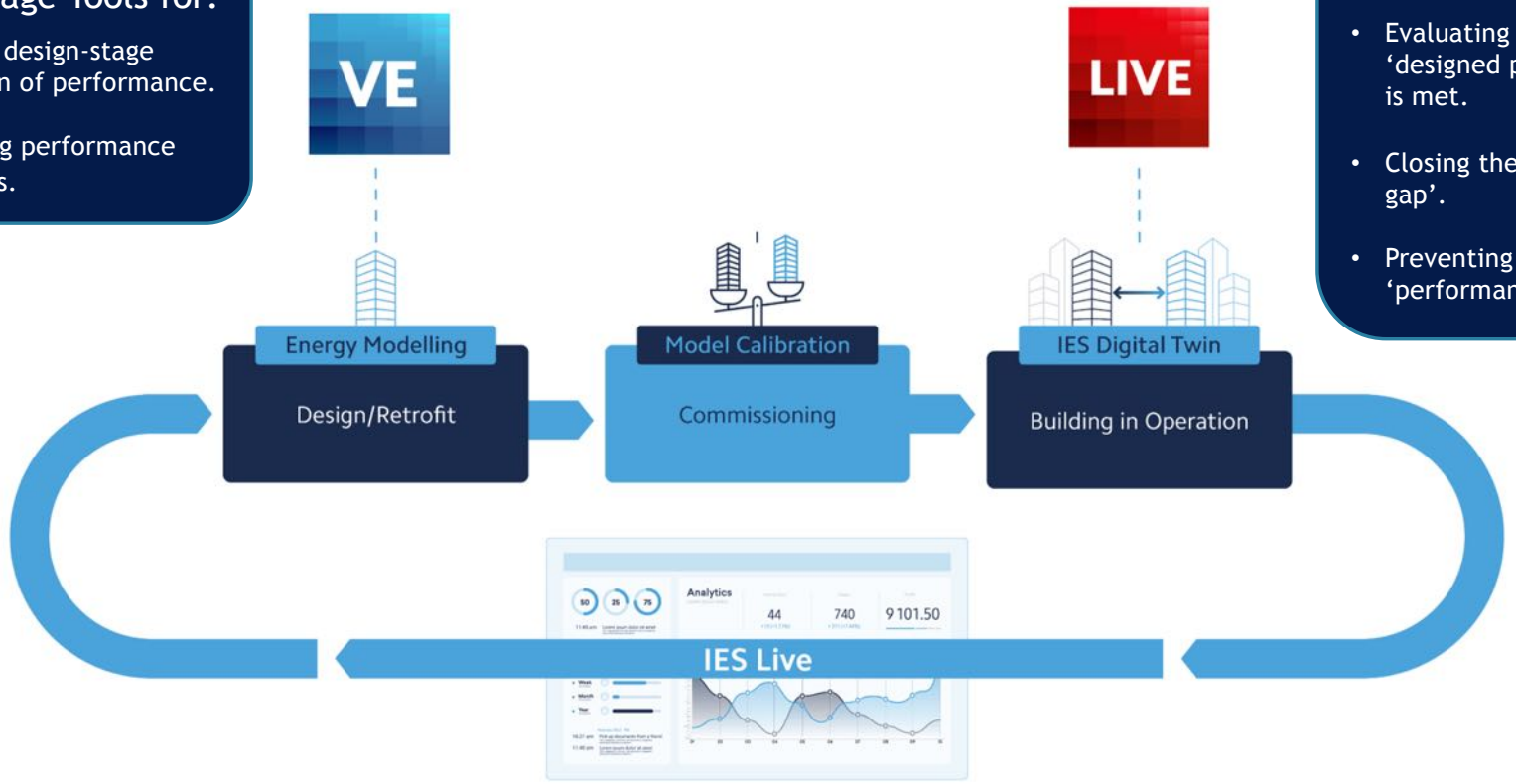


Model-informed decisions

Modelling doesn't replace engineering judgement — it quantifies it

Design-Stage Tools for:

- Accurate design-stage prediction of performance.
- Evaluating performance trade-offs.



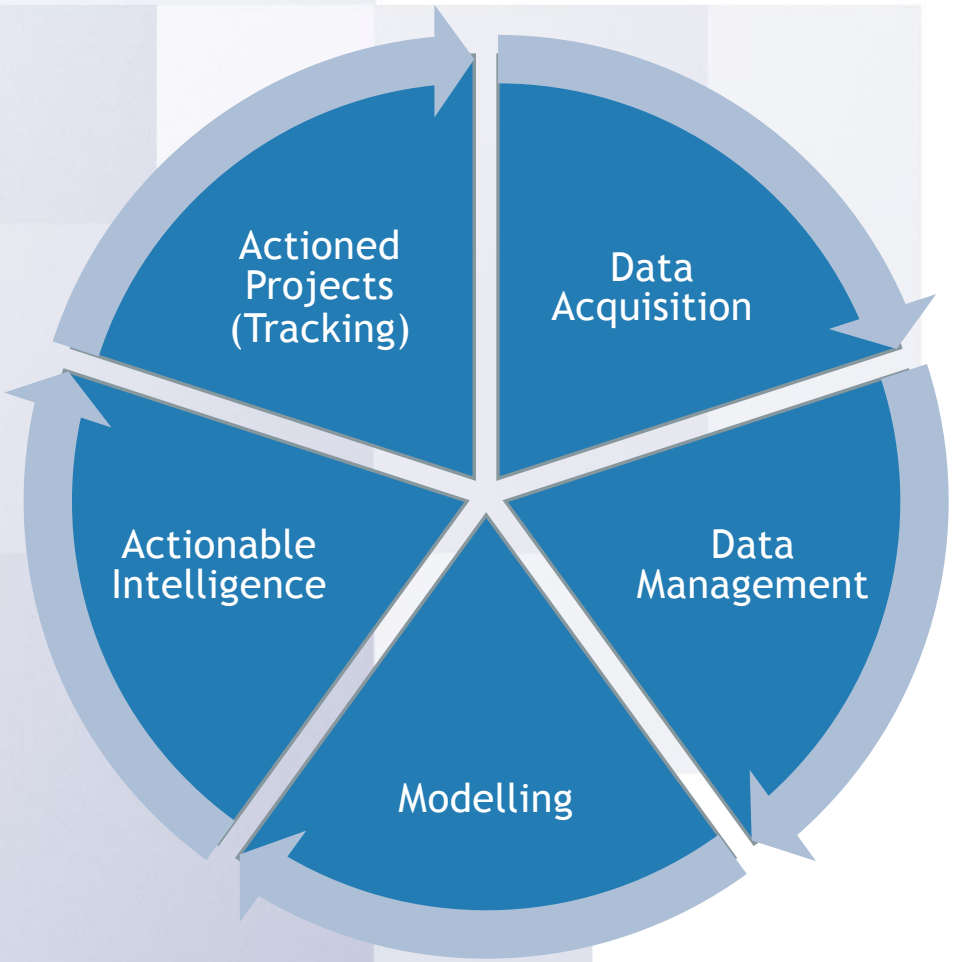
In-use Performance Verification tools for:

- Evaluating whether the 'designed performance' is met.
- Closing the 'performance gap'.
- Preventing long-term 'performance drift'.

IES Live

Overview

www.iesve.com



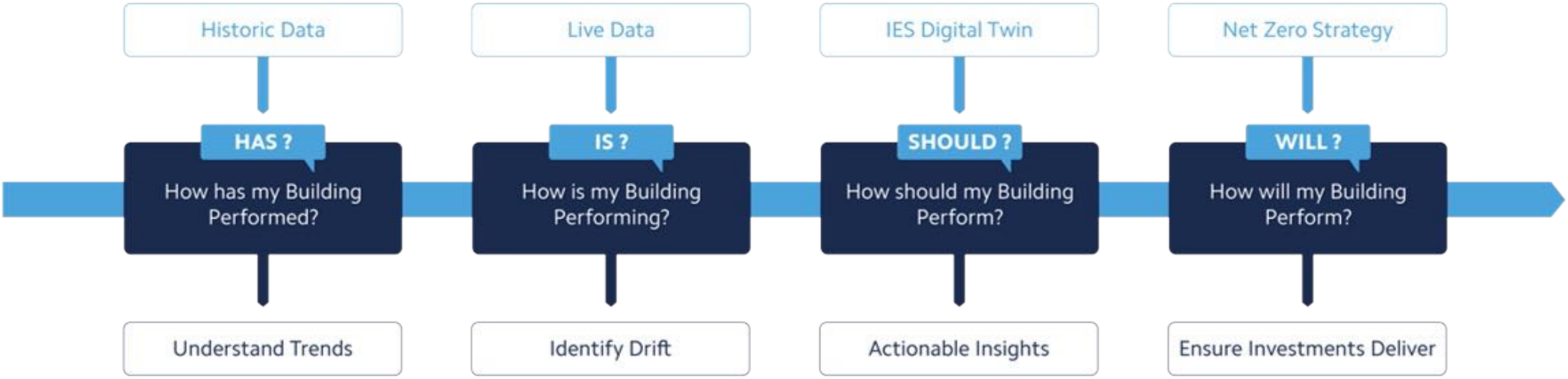
The continuous improvement cycle

More data isn't the answer.
Trusted data you can act on is.

IES Live

An operational data layer

- Most energy dashboards answer: How has it performed? How is it performing?
- IES Live can also answer: How should it be performing? And how will it perform if we act?



Energy performance analysis

Automated Insights

- Fault detection
- Energy spike detection
- Performance deviation
- Runtime analysis

Actionable Intelligence

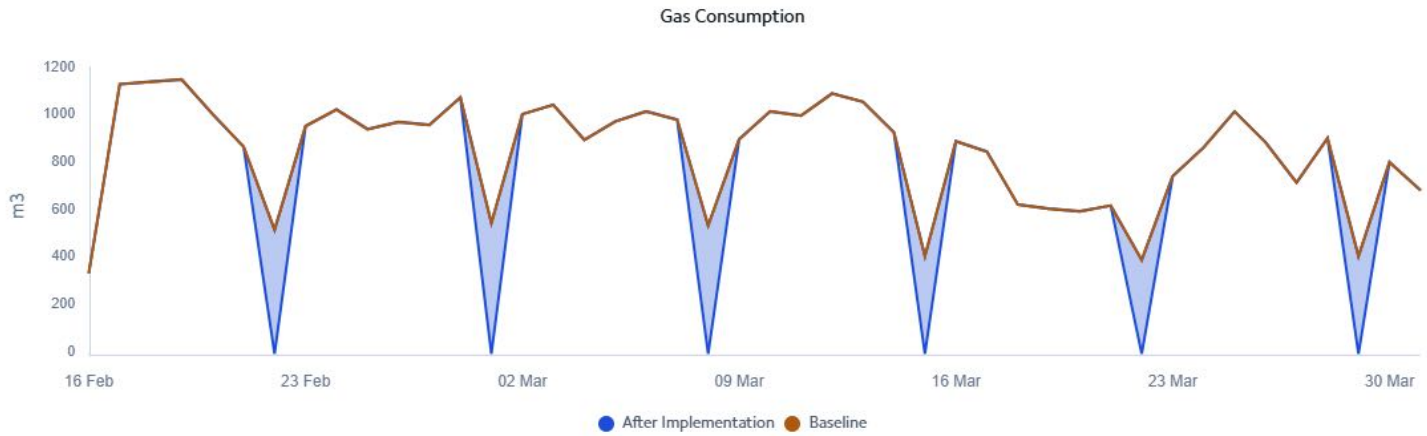
- Root cause analysis
- ECM identification
- Net zero pathway modelling
- Performance verification

Closing the loop

Actioned Projects

Hourly gas metering reveals that the heaters continue to run during unoccupied periods despite no heating being scheduled. Although a BMS heater schedule is configured for out-of-hours shutoff, analysis of the energy data indicates the heaters are bypassing these automated parameters, typically caused by manual hardware overrides. Clearing manual overrides, implementing strict adherence to the programmed heater schedule, and restricting manual intervention will ensure the heaters remain off when the building is empty. Sticking to the schedule will drive substantial reductions in gas consumption and energy costs.

01 Feb 2026 to 31 Mar 2026 | 48 Hours | 30 Days | 1 Year | Group By (One Day)



Total Gas Baseline	Total Gas After Implementation	Gas Reduction	Gas Reduction %	Cost Savings
MWh 418	MWh 386.3	MWh 31.75	% 7.594	£ 9,048

Queen Margaret University

Case Study

www.iesve.com

Queen Margaret University

Deep Dive Analysis

- Analysed BMS data to find inefficiencies
- Created an operational baseline to accurately calculate savings potential
- Energy modelling highlighting key site energy drivers
- Actionable roadmap combined analytics and modelling to target specific, energy saving opportunities



1. Queen Margaret University: IES Live Performance Monitoring & Decarbonisation Planning - https://www.iesve.com/services/projects/65239/queen-margaret-university-ies-live-performance-monitoring-and-decarbonisation-planning

Operational Savings

- Potential savings: ~£64k/yr (~11%)
- £14k Boiler savings
- £30k Free cooling



www.iesve.com

1. https://www.iesve.com/discoveries/view/65245/queen-maragaret-university-ies-live-performance-monitoring-and-decarbonisation-planning



Are you listening to your building?

Thank you. Any Questions?

Dr. Jason Mc Guire,
Lead Data & Analytics Architect