



TECHNICAL SELECTION

Building Performance, Proven.

AI energy management for better buildings

Technical selection guide for existing office
buildings.

AI Energy Management
Retrofit Engineering
Managed Performance

Illustrative building scene

Define the operating boundary before choosing the tools

Begin with one existing office building and owner-controlled common services.

One agreed building performance scope

Measurable systems
Agreed operating authority

- 01 Electricity, water and cooling consumption
- 02 On-site plant or customer-side district cooling
- 03 Owner-controlled HVAC and common areas
- 04 Relevant comfort and equipment-availability data

Tenant-controlled areas and future extensions follow a separate agreed scope.

The energy core connects to existing building systems

Separate software analysis from field integration, construction and site execution.

AI energy core

Energy facts, diagnostics, forecasting, scenarios, optimization, M&V, SLA and AI dialogue.

Existing digital systems

IoT, BMS/IBMS and FM provide data, operating context and external action status.

Engineering delivery

Metering, commissioning, control implementation and equipment works are separate delivery scopes.

Optional extensions

Connected services and 3D digital twins belong to the wider product family, not the core energy software.

Four workspaces support the operating decision cycle

The design connects everyday analysis with action and performance review.

Understand

Overview, Energy Explorer, meter balance and 2D system/equipment views.

Investigate

Data quality, anomaly evidence, root-cause hypotheses and impact assessment.

Improve

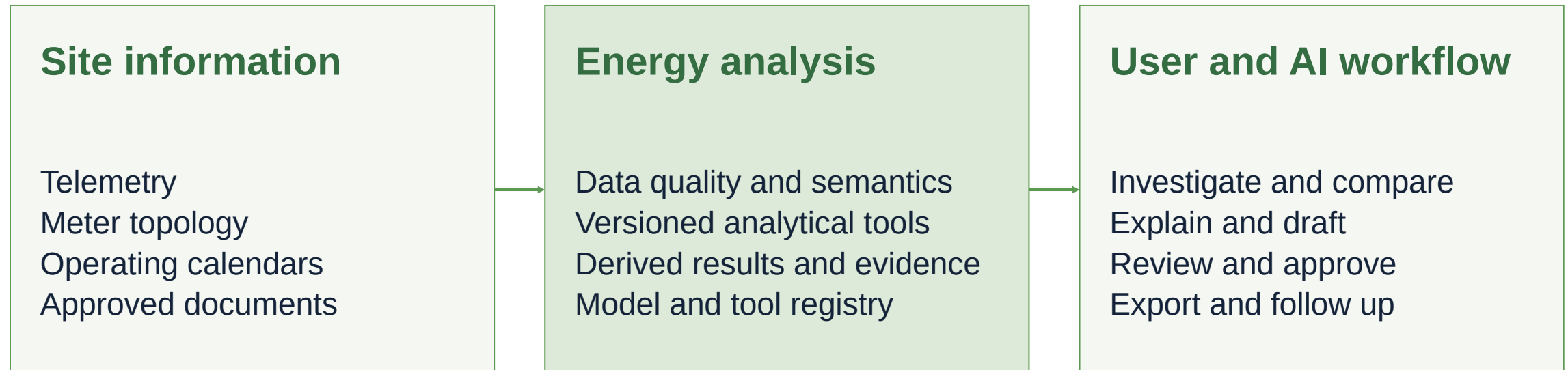
Forecasts, what-if scenarios, energy conservation measures and approved action drafts.

Verify

Baseline and M&V, Triple SLA, fixed reports and evidence packages.

Professional tools and AI dialogue share one evidence layer

The architecture makes the source of a number and the route to an action visible.



Approved intent goes to the external execution workflow. Site safety remains independent.

Reliable energy facts begin with semantics and quality

A useful trend needs the right object, unit, time interval and measurement state.

Point and object meaning

Map building, system, equipment, meter and common area to consistent engineering semantics.

Time and units

Align interval/cumulative readings, timestamps, time zones and electricity, water and cooling units.

Quality and balance

Check completeness, range, flatline, spikes, drift and consistency with the meter hierarchy.

Measured and estimated

Keep raw readings intact; identify derived or imputed values and their uncertainty.

Model Packs reuse engineering logic and adapt to the site

Configure a tested equipment family rather than writing a new model for every machine.

Reusable family

Object semantics, physical constraints, features, rules and candidate algorithms.

Site configuration

Equipment subtype, topology, operating modes, calibrated parameters and diagnostic signatures.

Three depth levels

Tier 0: rules/KPIs. Tier 1: physical/statistical models. Tier 2: ML and optimization.

Acceptance and operation

Backtest, boundary tests, shadow operation, expert approval and monitored release.

Cooling-side models explain plant and equipment performance

Main methods come first; alternatives are selected when data and validation justify them.

Whole building / meters

Change-point regression and energy-balance reconciliation. Alternatives: GAM or constrained gradient boosting.

Chillers

Heat balance, COP, kW per refrigeration ton and calibrated performance curves. Alternatives: Gordon-Ng or gradient boosting.

Water pumps

Affinity laws, hydraulic/system curves and site calibration. Alternatives: constrained regression or hydraulic-network models.

Cooling towers

Range/approach and wet-bulb-normalized performance. Alternatives: Merkel/NTU or constrained regression.

Airside models connect energy use with operating conditions

Sequence checks and physical relationships provide an interpretable starting point.

AHU / FAHU

Air and heat balance, operating-sequence rules and response residuals. Alternatives: grey-box dynamics or gradient boosting.

Fresh and exhaust air

Schedules, state rules and CO₂/pressure/flow proxies. Alternatives: mass-balance inversion or occupancy models.

Common-area terminals

Zone rules and first-order RC thermal response. Alternatives: constrained regression or GAM.

Indoor environment

Contract-configured temperature/humidity and occupied-time compliance. PMV/PPD or adaptive methods are optional with sufficient inputs.

Different analytical jobs use different model families

Keep a formal baseline distinct from a dynamic operating forecast.

Formal baseline

Multivariable change-point regression with residual and holdout checks. Alternatives: GAM, calibrated simulation or constrained ML.

Anomaly detection

Engineering rules, robust thresholds, baseline residuals and change points. ML detectors add supporting evidence.

Root-cause assessment

System causal graphs, fault signatures and evidence scoring. The AI agent organizes competing hypotheses and checks.

Load forecasts

Gradient boosting with calibrated prediction intervals. Alternatives: GAM, SARIMAX or grey-box RC models.

Use frequent local analysis and deeper AI review at different speeds

Cloud dialogue does not become a dependency for every high-frequency calculation.

Local professional tools

Physical, rule, statistical, ML and optimization analysis, typically at 1–15-minute cadence.

Local small models

Sensitive, repetitive or low-latency classification and summarization tasks.

Cloud or local orchestrator

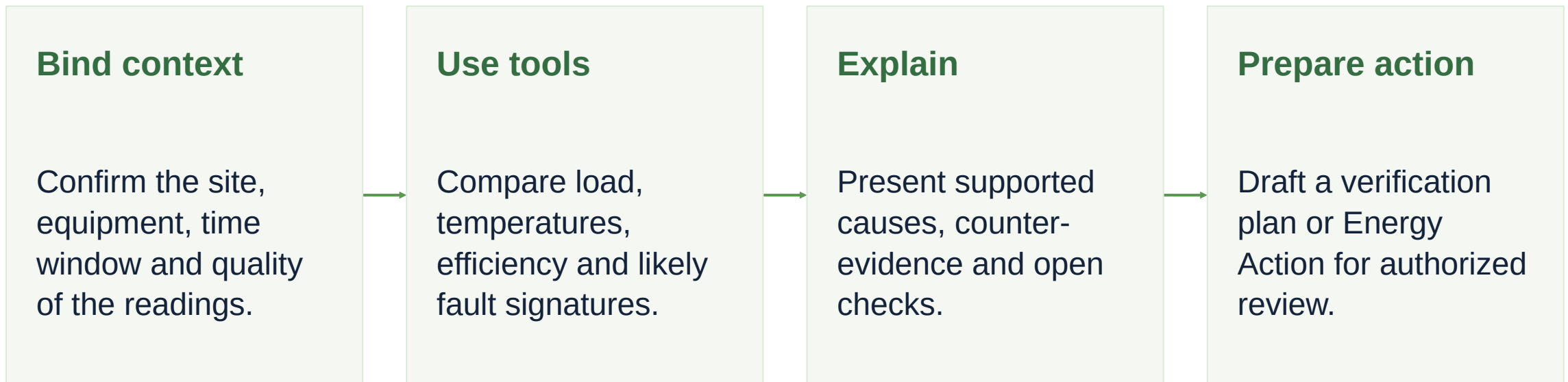
Tool-assisted investigation on significant events, on demand, or in daily/weekly review.

Human decisions

Approval of formal baselines, performance reports, high-risk intent and production model releases.

The assistant shows the evidence behind its recommendation

“Why did this chiller's efficiency change after 14:00?”



Illustrative investigation workflow

Optimization balances energy with practical operating limits

Use model outputs to evaluate a feasible strategy before site execution.

What-if scenarios

Use frozen prediction, physical performance or engineering-measure models appropriate to the question.

Rolling optimization

Constrained Model Predictive Control (MPC). Discrete equipment choices may use MILP/MINLP approximations.

Operating constraints

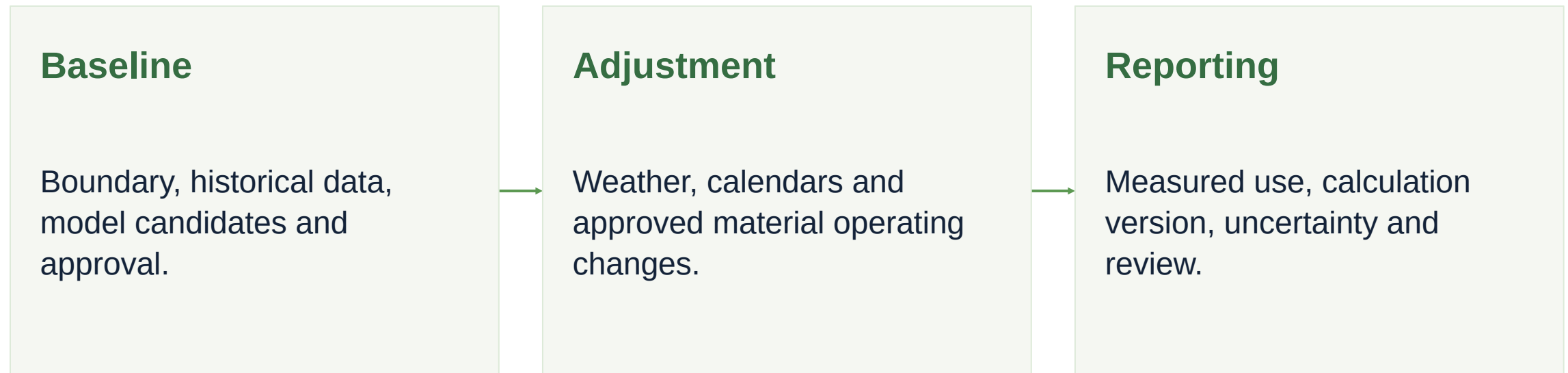
Respect comfort, equipment capacity, minimum run times, redundancy and approved operating limits.

Decision output

A proposed target, expected effect, constraints, approval route, rollback and verification window.

A versioned M&V ledger makes savings reproducible

Measurement and Verification (M&V) compares measured use with an approved, adjusted baseline.



Savings = adjusted baseline minus reporting use, with approved non-routine adjustments.

Three service outcomes keep the performance review balanced

Each outcome retains its own measurement, boundary and review status.

01 Energy & Water Performance

Normalized resource use and agreed savings/performance measures.

02 Indoor Environment

Agreed occupied-time environmental conditions in the service area.

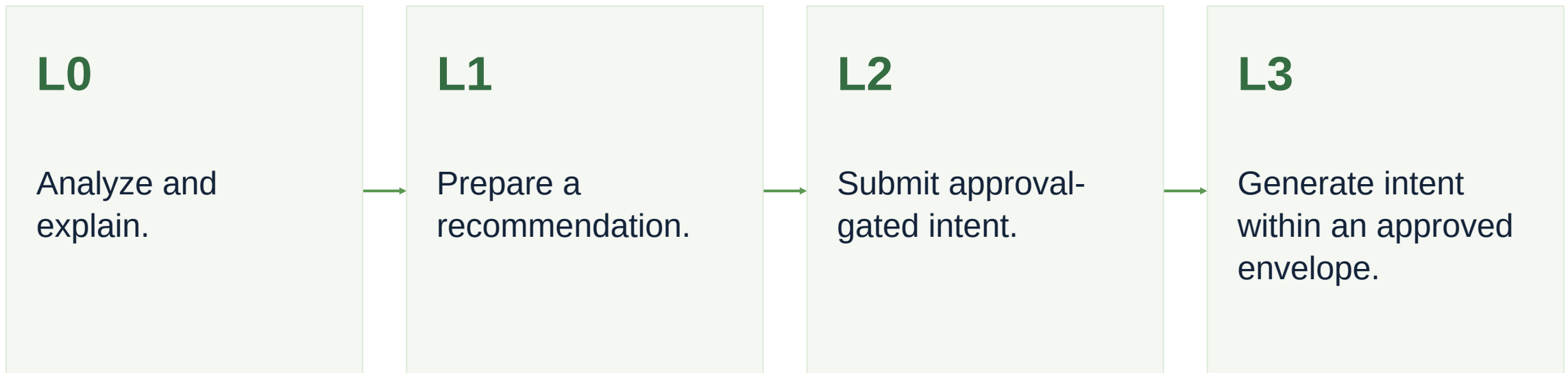
03 Contracted Equipment Availability

Availability of included equipment when its service is required.

Review the three outcomes separately, then apply the agreed contract rules.

Increase action authority only after the site is ready

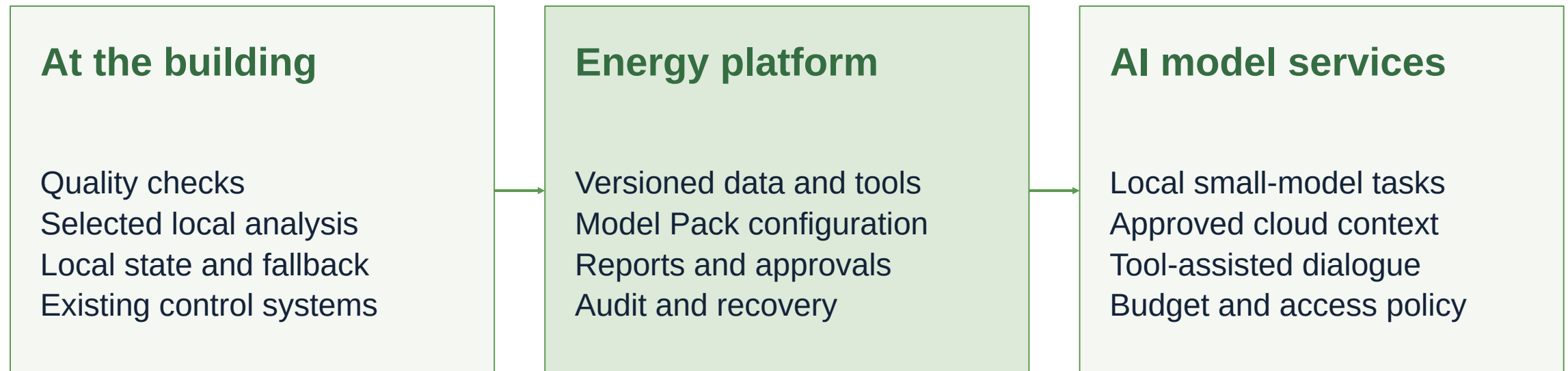
L0–L3 describe energy-system intent, while external systems retain control execution.



Existing control systems retain interlocks, safety, final commands and rollback execution.

Configure local and cloud responsibilities to the customer's needs

Data policy, resilience and operating requirements determine the deployment.



Agree data location, cloud access, recovery targets and operating ownership.

Governance makes model improvement controlled and reviewable

Learning feeds candidates, evaluation and approved release.

Evidence and knowledge

Scope retrieval to the site and user. Keep approved facts distinct from conversation state or suggestions.

Permissions and audit

Allowlisted tools, object scope, structured parameters and recorded formal actions.

Evaluation and release

Backtest, benchmark, security/boundary tests, shadow operation and expert approval.

Monitor and recover

Watch error, drift, false alarms and user corrections; use rollback or a new tested candidate.

Energy Actions connect software findings with engineering delivery

One measure carries its assumptions, implementation status and verification plan.

Define the measure

Describe the operating issue, proposed change, affected assets and expected energy effect.

Check the site

Confirm comfort/safety constraints, equipment condition, access and construction implications.

Deliver the work

Coordinate commissioning, equipment/control works and external FM implementation.

Verify and operate

Record acceptance, compare results and hand the measure into managed performance.

A phased deployment aligns capability with data and acceptance

Build from the metering and analysis foundation toward advanced energy workflows.

01

Foundation

Confirm objects, readings, quality, energy views and the initial boundary.

02

Site acceptance

Calibrate Model Packs, baseline and diagnostics; test agent tools and shadow workflows.

03

Advanced operation

Introduce forecasts, optimization and higher intent levels after the agreed gates.

Configured scope / replay and shadow evidence / acceptance record / operating and recovery plan

Reference experience spans energy, integration and engineering

Anonymous project records demonstrate relevant delivery experience.

Corporate headquarters

13.3%

Annual electricity savings

Integrated smart-building and energy-management applications.

Large commercial complex

23%

Average HVAC energy savings

Central HVAC optimization and coordinated operation.

Agree the selection questions and the next technical step

Use the discovery record and readiness checklist to turn interest into a scoped project.

Boundary and authority

Which meters, HVAC systems and common areas are included? Who can approve an operating change?

Data and deployment

Which points are reliable? What are the time/unit meanings, access conditions and cloud policies?

Performance and acceptance

Which outcomes matter? How will baseline, models, workflows and the service be accepted?

Delivery and ownership

Who supplies site access, engineering/FM coordination and the decisions for the assessment?