ampverve

ENTERPRISE WHITE PAPER | JULY 2026

AI for the Adaptive Energy System

How intelligent orchestration turns EVs, batteries, buildings, data centres, factories and homes into flexible, resilient and commercially valuable energy systems.

- Predict, reason and act in real time
- Edge autonomy with cloud scale
- Operational savings and flexibility revenue
- Explainable, auditable and secure

WHY THIS PAPER

Energy is becoming a software defined system.

Electrification is adding new loads. Renewable generation is adding variability. Distributed assets are adding operational complexity. Artificial intelligence can convert that complexity into coordinated action.

This white paper explains where AI creates practical value across the energy ecosystem, what architecture is required to operate safely in the physical world, and how organisations can move from isolated analytics to trusted, autonomous orchestration.

It is written for utility leaders, chief information officers, chief technology officers, enterprise architects, fleet operators, data centre executives, facilities teams, industrial leaders, investors and public sector decision makers.

The strategic question is no longer whether AI will enter energy operations. It is whether organisations will deploy AI as a controlled operating capability or as a disconnected collection of models and dashboards.

Scope. This paper covers utilities, fleets, V2G, VPPs, flexibility, data centres, buildings, industry, factories, commercial sites, homes, predictive analytics, predictive maintenance, cyber security and enterprise governance.

A connected energy system links transport, buildings, storage and grid infrastructure through real time data and control.

AI is the coordination layer

Its value comes from continuously matching asset capability, customer outcomes, physical constraints and market signals.

Trust is part of the architecture

Critical energy decisions require explainability, policy controls, operator oversight and verifiable outcomes.

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A practical blueprint for AI in energy.

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One platform, many asset classes, multiple operational and market outcomes.

01

EXECUTIVE SUMMARY

AI can become the operating system for the energy transition.

The energy system is moving from centralised and predictable to distributed, dynamic and increasingly bidirectional.

Electric vehicles, batteries, solar, heat pumps, flexible industrial processes and data centres are creating millions of controllable energy decisions. At the same time, system operators must balance reliability, affordability and decarbonisation across increasingly constrained networks.

Traditional automation is effective when operating conditions are known and rules are stable. Modern energy operations are different. Prices change, weather changes, assets move, customer priorities change, faults emerge and market opportunities appear in minutes or seconds. The control problem is therefore probabilistic, multi objective and continuous.

AI provides the forecasting, classification, optimisation and coordination needed to respond. Yet prediction alone is insufficient. Energy systems require decisions that can be executed across physical assets, understood by operators, constrained by policy and verified after delivery.

The core proposition

AmpVerve AI orchestrates distributed energy assets in real time, balancing operational requirements, energy cost, resilience, carbon and market value through an edge to cloud control architecture.

24/7
Continuous forecasting, optimisation and execution

Multi asset
EVs, batteries, buildings, heat, solar and flexible loads

Multi market
Local, national and wholesale value streams

Audit ready
Decision evidence, delivery verification and settlement support

The winners will not be the organisations with the most AI models. They will be the organisations that can safely convert intelligence into repeatable physical and commercial outcomes.

THE VALUE THESIS

AI creates value when it coordinates outcomes that were previously managed separately.

Most energy software solves one layer of the problem. A charger management system operates charge points. A building management system controls HVAC. A battery optimiser targets market revenue. A utility platform runs a demand response programme. Value is lost when these systems optimise independently.

Enterprise energy AI must create a common decision layer across the site, portfolio and market. It must understand the operational service that each asset exists to provide, then identify the safe flexibility envelope available at each moment.

For a fleet, that means every vehicle is ready for departure. For a building, comfort and critical services remain protected. For a factory, production quality and throughput stay within plan. For a data centre, service levels and priority workloads remain intact. For a household, the customer remains in control.

Within those constraints, AI can lower energy cost, manage peaks, increase renewable utilisation, protect asset health, participate in flexibility markets and support grid resilience.

> **The objective is not maximum dispatch. The objective is maximum risk adjusted value while preserving the primary mission of every asset.**

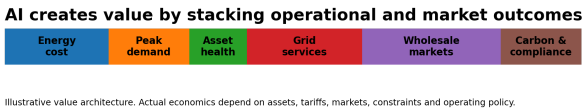


Figure 1. Integrated energy value stack. The illustration is conceptual; actual value depends on site and market conditions.

Five design principles

- **Operations first.** Flexibility is subordinate to service delivery and safety.
- **Portfolio aware.** Decisions optimise across assets and sites, not one device at a time.
- **Market native.** Forecasts and dispatch reflect real market rules and obligations.
- **Edge resilient.** Local control continues when cloud connectivity is degraded.
- **Evidence based.** Every action is traceable from intent to measured outcome.

02

A NEW OPERATING ENVIRONMENT

Four forces are reshaping electricity.

Electrification

Transport, heat, manufacturing and digital infrastructure are increasing electricity demand and changing load profiles.

Decentralisation

Generation, storage and controllable demand are moving to the grid edge, often below traditional visibility.

Digitalisation

Sensors, smart meters, APIs and edge devices are creating the data and control channels required for automation.

Decarbonisation

Variable renewable generation increases the value of flexibility, forecasting and coordinated demand.

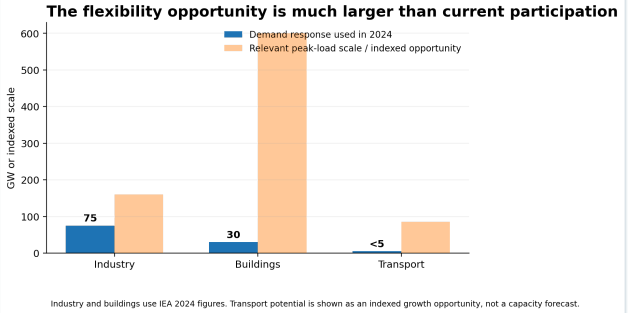


Figure 2. Current demand response participation remains small relative to the flexible load opportunity in industry and buildings. Source: IEA Electricity 2026.[2]

The International Energy Agency estimates that only around 100 GW of demand response was actively used globally in 2024. Industry provided the largest share at around 75 GW, buildings around 30 GW and transport less than 5 GW. The same analysis highlights much larger flexible load pools in aluminium production and air conditioning alone.[2]

> **The system challenge is not a shortage of flexible assets. It is a shortage of trusted orchestration, commercial access and automated verification.**

03

DIFFERENT AI, DIFFERENT JOBS

The energy AI stack is layered.

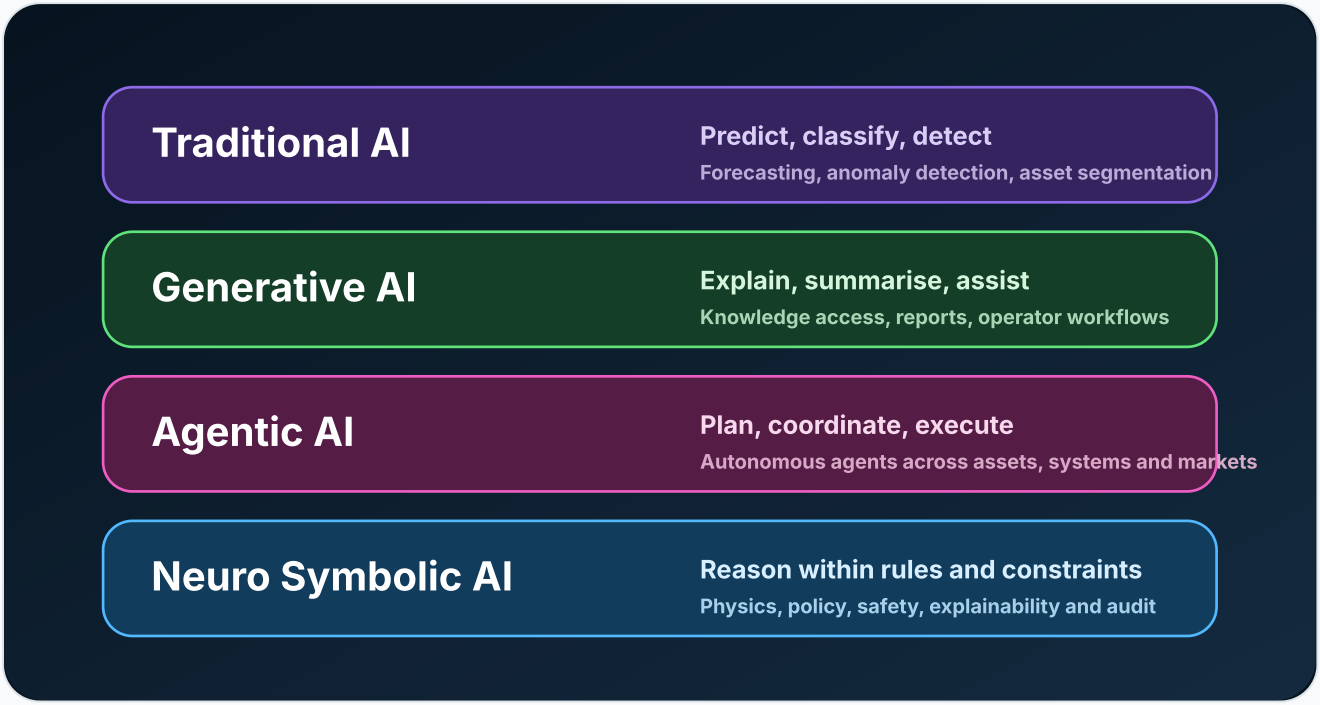


Figure 3. Four complementary AI capability layers. AmpVerve combines agentic AI with neuro symbolic AI for autonomous yet constrained energy decisions.

Traditional AI produces forecasts, classifications and anomaly signals. It estimates demand, generation, prices, state of charge, asset health and failure probability.

Generative AI improves access to operational knowledge. It can summarise incidents, draft reports, explain recommendations and help operators navigate technical and market information.

Agentic AI coordinates multi step work. Agents can gather data, run forecasts, propose schedules, test constraints, execute approved actions and monitor delivery.

Neuro Symbolic AI combines learned models with explicit rules, physical constraints, contractual obligations and operating policies. This is critical where a statistically attractive action may still be unsafe, non compliant or commercially invalid.

04

THE CLOSED DECISION LOOP

Energy AI must sense, reason, act and verify.

A production energy system is not a model. It is a continuous operating loop.

The loop begins with telemetry from meters, chargers, inverters, building controls, industrial systems and market interfaces. Data is reconciled into a digital representation of each asset and site. Forecasts estimate what will happen. Optimisation evaluates what should happen. Policy and safety controls determine what may happen.

Execution then converts the decision into commands through local controllers, cloud APIs or partner systems. Measurement and verification determine whether the expected response occurred. The result updates forecasts, confidence scores, baselines and future control policy.

Autonomy without measurement is automation theatre. Every dispatch should have a defined intent, expected response, measured outcome and accountable decision record.

An AI control loop must bridge probabilistic intelligence and deterministic operational safeguards.

Human oversight remains essential

Operators define strategy, risk limits, fallback modes and escalation policy. AI increases the speed and consistency of execution, but governance determines where autonomy is permitted.

05

UTILITIES AND NETWORK OPERATORS

AI turns the grid edge into a controllable resource.

Utilities face simultaneous growth in electric transport, heating, distributed generation and large digital loads. Traditional planning remains necessary, but network reinforcement alone cannot address every constraint at the speed or cost required.

AI can improve load and generation forecasting at transformer, feeder and portfolio level. It can identify emerging congestion, quantify local flexibility, prioritise interventions and coordinate customer assets around locational network needs.

For operations teams, the value is earlier awareness and more precise response. For planning teams, AI can simulate future electrification scenarios and compare reinforcement with non wires alternatives. For customer teams, it enables targeted programmes and incentives instead of broad, undifferentiated demand response.

Utility value therefore spans three timescales: long range investment planning, day ahead and intraday flexibility, and near real time operational control.

Priority utility use cases

- Transformer and feeder load forecasting
- Constraint prediction and locational dispatch
- DER visibility and dynamic hosting capacity
- Demand response and VPP programme orchestration
- Outage risk, vegetation, weather and asset failure prediction
- Automated performance measurement and settlement

The grid increasingly needs to know not only how much flexibility exists, but exactly where it is, when it is available and whether it delivered.

GRID AWARE ORCHESTRATION

A utility grade platform combines visibility, prediction, portfolio control and evidence.

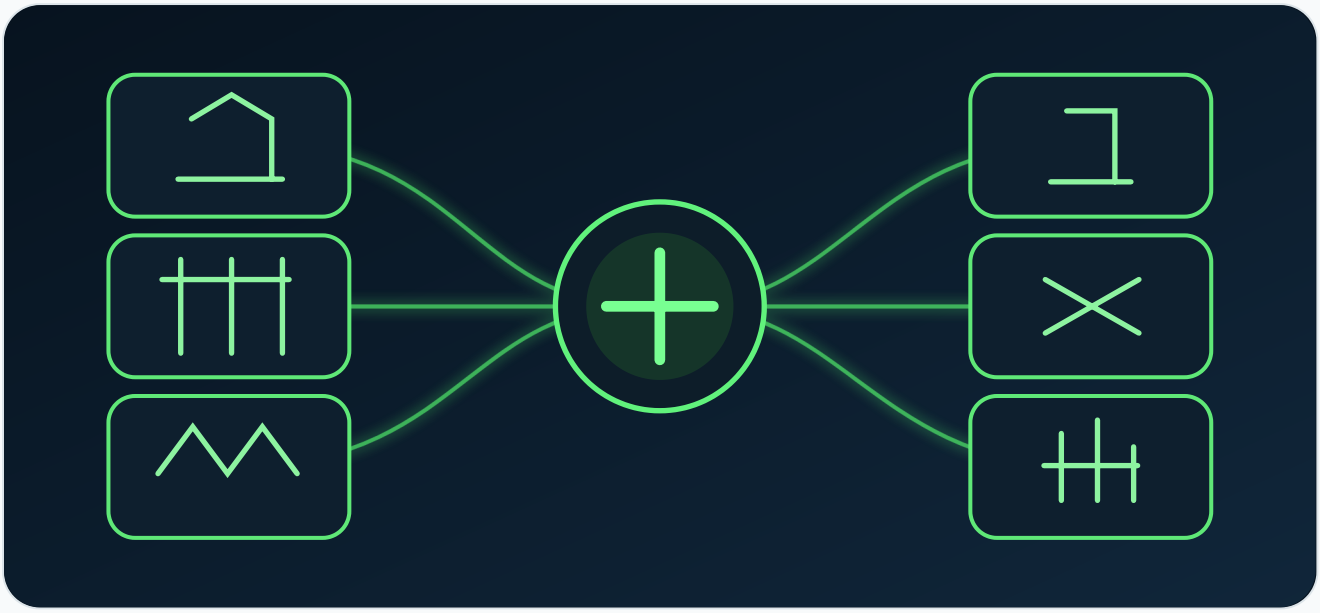


Figure 4. A virtual power plant aggregates diverse flexible resources into a coordinated operational capability.

Visibility

Normalise device telemetry, asset state, customer availability and network context into a consistent operational model.

Grid aware optimisation

Allocate flexibility according to transformer, feeder, regional and bulk system needs rather than treating all devices as equivalent.

Programme intelligence

Forecast enrolment, response, opt out risk, rebound and persistence to improve programme design and dispatch confidence.

Multi DER dispatch

Coordinate EVs, batteries, HVAC, heat pumps, water heating and other loads as one portfolio while respecting device specific limits.

Market integration

Translate portfolio capability into compliant bids, schedules, dispatch instructions and performance evidence.

Customer protection

Preserve comfort, mobility, equipment limits, consent, privacy and transparent programme rules.

A mature utility operating model brings these capabilities together rather than treating them as separate programmes. The same portfolio view should support network constraints, customer programmes, asset operations, market participation and performance evidence. This reduces duplicated integration, improves dispatch confidence and creates a consistent control framework as new asset classes are added.

06

FLEET ENERGY INTELLIGENCE

Every parked vehicle is a scheduling decision.

Fleet electrification shifts operational risk from fuel logistics to power, charging and infrastructure coordination.

A depot may contain vehicles with different routes, arrival times, departure deadlines, battery sizes, state of charge, charger compatibility and maintenance status. The site may also have solar, a stationary battery, a constrained grid connection and time varying tariffs.

AI can create a feasible charging schedule that protects readiness while minimising energy cost and peak demand. It can reserve charger capacity for urgent vehicles, respond to route changes and use on site storage to reduce connection pressure.

With bidirectional capability, the optimisation extends from V1G smart charging to V2B and V2G. The vehicle can support the building or market when its mobility requirement, battery limits, connection status and customer policy allow.

Commercial fleet charging requires asset, route, charger and site constraints to be optimised together.

OPERATIONAL HIERARCHY

Readiness comes first. Flexibility is created inside the remaining envelope.

1. Protect the transport mission

Minimum state of charge, route energy, departure time, contingency reserve and driver requirements define the non negotiable operating boundary.

2. Optimise site power

Schedule chargers, solar, battery storage and building loads to remain within the grid connection, reduce peaks and avoid unnecessary capacity upgrades.

3. Monetise verified flexibility

Offer only the power and duration that the fleet can reliably deliver after operational, warranty and charger constraints are satisfied.

Control dimension	Examples of constraints	AI contribution
Vehicle	State of charge, battery temperature, warranty, departure readiness	Forecast energy requirement and calculate safe flexibility
Charger	Power rating, connector, availability, OCPP status, faults	Allocate charging dynamically and reroute around failures
Site	Grid import limit, demand charge, solar, battery, building demand	Co optimise all loads and generation behind the meter
Market	Minimum bid size, response time, duration, baselines, penalties	Translate fleet capability into compliant offers and schedules
Customer	Operational policy, opt out, revenue share, carbon preference	Apply portfolio policy consistently and explain decisions

V2G economics are not created by export alone. They are created by stacking energy cost reduction, connection optimisation, building support, flexibility revenue and resilience while controlling battery and operational risk.

07

DIGITAL INFRASTRUCTURE MEETS THE POWER SYSTEM

Data centres can become grid interactive without compromising compute.

The IEA projects global data centre electricity consumption to reach around 945 TWh by 2030, more than double the 2024 level. Accelerated servers, mainly associated with AI, account for a large share of the increase.[1]

Power availability is therefore becoming a strategic constraint on new capacity. The traditional response is to secure more generation, interconnection and backup infrastructure. AI introduces another lever: coordinate computing demand and facility systems around power conditions.

Not every workload has the same urgency. Training jobs, batch analytics, data preparation and some inference tasks may have scheduling or location flexibility. Cooling systems, UPS assets, batteries and generators provide additional controllable capacity. The opportunity is to combine workload awareness with facility and grid intelligence.

A power flexible data centre does not treat electricity as an unlimited background service. It makes power a first class scheduling input alongside compute, latency, service level and carbon.

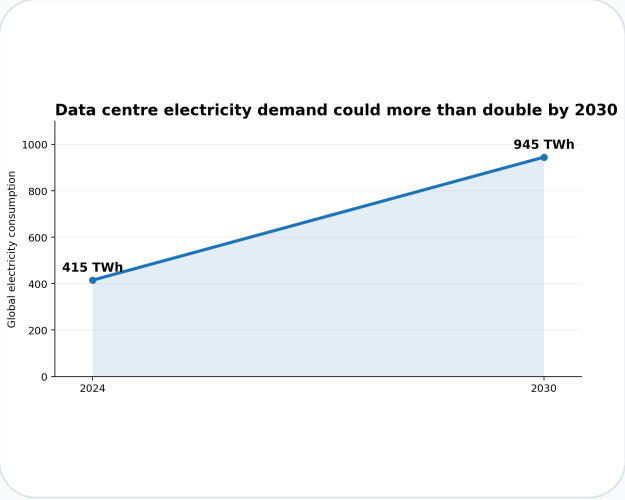


Figure 5. IEA base case for global data centre electricity consumption.[1]

08

COMMERCIAL BUILDINGS AND CAMPUSES

Buildings contain large, underused thermal and electrical flexibility.

Heating, cooling, ventilation, hot water, EV charging, batteries, solar and controllable equipment create multiple forms of flexibility. The operational challenge is to coordinate them without compromising comfort, indoor air quality, safety or tenant experience.

AI can forecast occupancy, weather, thermal response and site demand. It can pre heat or pre cool when energy is cheaper or cleaner, reduce short peaks, align EV charging with building load and use batteries to manage both energy cost and flexibility commitments.

Campuses add another layer. Multiple buildings may share a grid connection, central plant, generation, storage and transport infrastructure. Portfolio optimisation can allocate capacity dynamically rather than sizing each building for its independent worst case.

The building becomes a thermal battery, an electrical system and a market participant, but only when control is continuous and occupant outcomes remain protected.

HVAC intelligence

Occupancy and weather forecasting, set point optimisation, fault detection and comfort aware demand response.

EV coordination

Align charging with site capacity, tariff windows, solar generation and fleet or employee priorities.

Storage orchestration

Peak shaving, renewable firming, backup readiness and flexibility participation.

Performance verification

Baselines, avoided cost, carbon, comfort and operational KPI evidence.

09

INDUSTRIAL AND MANUFACTURING OPERATIONS

AI can reduce energy cost while protecting throughput, quality and safety.

Industrial flexibility is operationally valuable because large electrical loads are concentrated in motors, compressors, refrigeration, furnaces, pumps, process heating, material handling and batch operations. Yet the cost of disruption can be far greater than the value of an energy event.

The correct starting point is the production plan. AI should model process dependencies, minimum run times, temperature bands, quality parameters, buffers, maintenance windows and restart behaviour. It can then identify where energy demand may be shifted, reduced or increased without affecting output.

Predictive maintenance strengthens the case. By combining vibration, temperature, electrical signature, process and maintenance data, AI can identify degradation before failure. The same asset model can inform energy optimisation, avoiding aggressive dispatch when equipment risk is elevated.

Industrial AI use cases

- Production aware energy scheduling
- Compressor, refrigeration and pumping optimisation
- Power quality and abnormal consumption detection
- Predictive maintenance and remaining useful life
- On site generation and battery dispatch
- Demand response with rebound management

The best industrial flexibility event is invisible to the production team and measurable to the energy market.

Cost
Tariff optimisation, demand reduction and market income

Reliability
Failure prediction, condition aware dispatch and resilience

Carbon
Load shifting to lower carbon periods and renewable output

10

HOMES AND PROSUMERS

The home energy system can optimise itself around the customer.

Residential energy is becoming more complex. A home may have an EV, charger, solar panels, battery, heat pump, hot water storage, smart tariff and export capability. Each device has a separate app, control policy and commercial model.

AI can unify these assets around simple customer outcomes: keep the home comfortable, keep the vehicle ready, use low cost energy, maximise on site solar and earn from flexibility when the customer permits.

For utilities and retailers, residential orchestration creates scalable demand shaping and VPP capability. For customers, the experience must remain transparent and low effort. The system should explain what it did, how much was saved or earned and how preferences were respected.

> **Residential flexibility scales only when automation is trustworthy, benefits are visible and the customer can override the system at any time.**

Residential orchestration combines energy assets, customer preference and grid signals into one automated operating plan.

Customer outcome

Comfort, mobility, savings, resilience and control.

System outcome

Peak reduction, renewable integration and local flexibility.

11

FROM DISTRIBUTED ASSETS TO A DISPATCHABLE PORTFOLIO

A virtual power plant is a commercial and operational control system.

A VPP connects distributed energy resources and flexible demand so they can be managed as a coordinated portfolio. The portfolio may provide capacity, balancing, congestion management, demand response, wholesale optimisation, renewable firming or bilateral services.

The difficult work sits between enrolment and revenue. Assets must be connected, qualified and modelled. Availability must be forecast. Dispatch must respect customer and device constraints. Performance must be measured against an accepted baseline. Revenue must be allocated and exceptions managed.

AI improves each stage. It estimates deliverable capacity and confidence, selects the highest value compatible opportunity, coordinates dispatch across heterogeneous assets and learns from response behaviour. Neuro symbolic controls ensure market rules, minimum durations, recovery periods and asset limits are applied consistently.

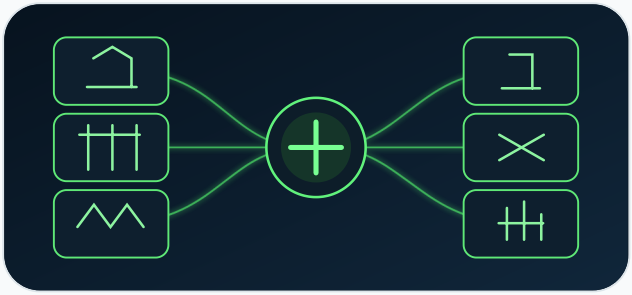


Figure 6. A VPP coordinates diverse resources as one reliable market facing capability.

Revenue stacking requires conflict resolution

The same asset cannot be promised to incompatible services. The optimiser must account for energy state, power limits, activation probability, penalties, customer value and the opportunity cost of reserving capacity.

Forecast

Availability, prices, demand, generation and response confidence.

Optimise

Select compatible value streams across time and markets.

Execute

Dispatch devices and sites through secure control channels.

Verify

Measure delivery, settle value and improve future decisions.

12

ASSET INTELLIGENCE

Prediction becomes valuable when it changes an operating decision.

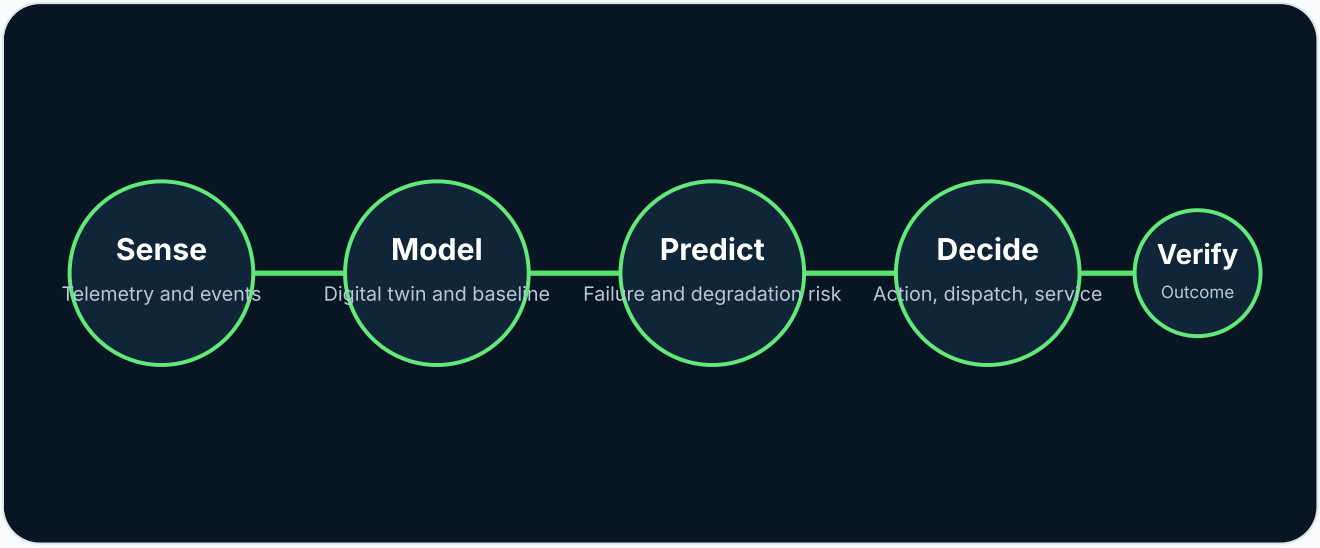


Figure 7. Predictive maintenance is a closed loop from sensing to verified intervention.

Energy assets generate rich time series data, but data volume does not guarantee insight. Useful predictive maintenance begins with failure modes, operational context and the cost of action or inaction.

AI can detect abnormal electrical signatures, thermal drift, charger communication instability, battery degradation, HVAC inefficiency, inverter faults and industrial equipment wear. It can also estimate remaining useful life and prioritise inspection based on risk.

The strongest systems combine condition data with operating history, environmental conditions, maintenance records and digital twin models. This reduces false positives and helps distinguish a genuine fault from a normal change in load or operating mode.

From alerting to decision support

- Detect deviation from expected behaviour
- Identify likely failure mode and confidence
- Quantify operational, safety and financial consequence
- Recommend inspection, derating, rescheduling or repair
- Confirm whether the intervention restored performance

Predictive maintenance and energy optimisation should share the same asset health model. A damaged or degraded asset should not be dispatched as if it were healthy.

13

THE AMPVERVE PLATFORM

One control plane from device edge to energy market.

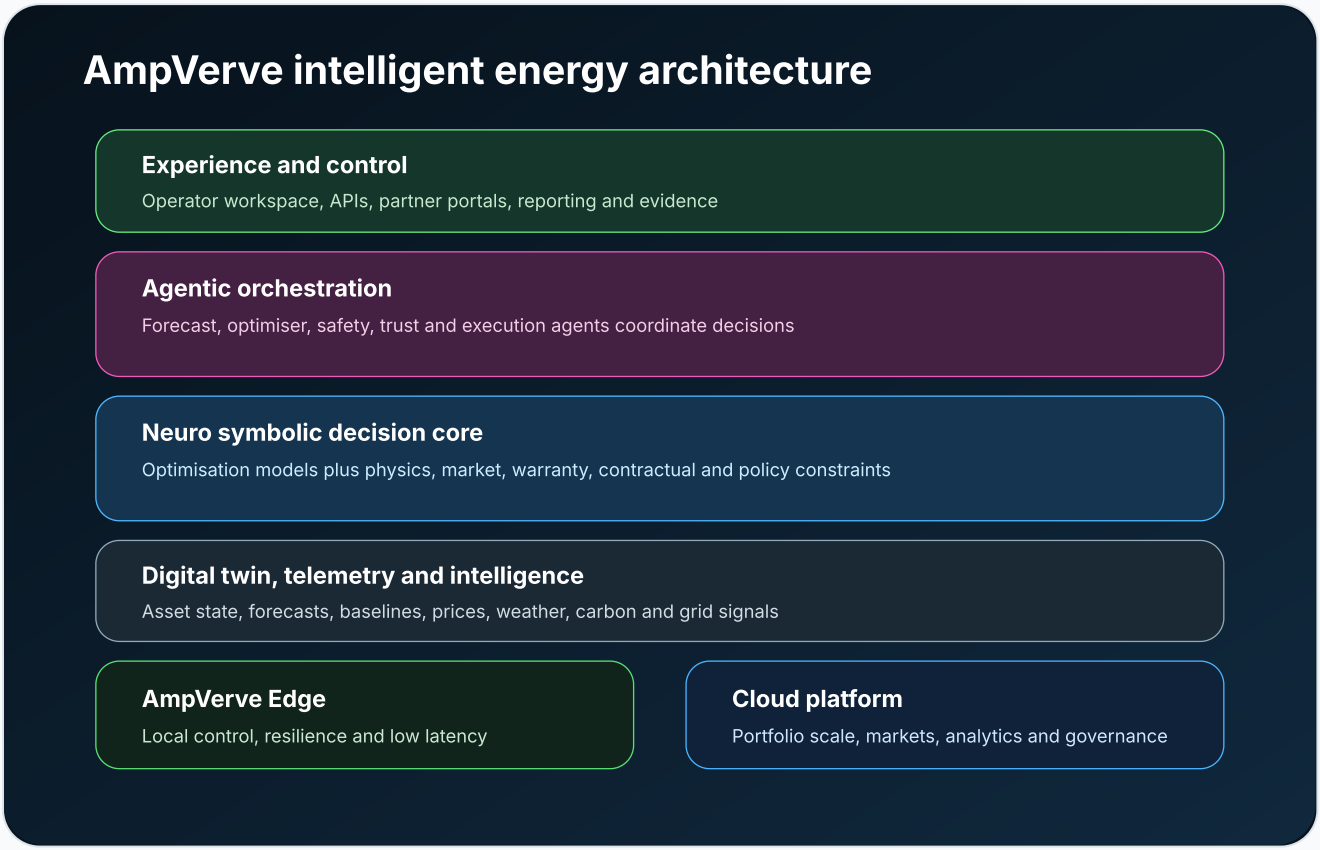


Figure 8. AmpVerve combines device connectivity, edge control, digital twins, agentic orchestration, neuro symbolic optimisation and market operations.

AmpVerve publicly positions its platform as enterprise grid infrastructure for EV fleets, batteries, solar, heat pumps, HVAC, meters and chargers across depots, buildings, data centres and homes.[6]

The architecture separates intelligence from execution while keeping them tightly coordinated. Cloud services provide portfolio scale, forecasting, optimisation, market integration, reporting and governance. AmpVerve Edge maintains local control, resilience and fast response at the site.

The agentic layer coordinates specialist functions such as forecasting, optimisation, safety, trust and execution. The neuro symbolic decision core combines learned models with explicit physical, commercial, market and regulatory constraints.

This structure supports a practical enterprise requirement: intelligence may evolve quickly, but safety boundaries, authorisation, audit and service continuity must remain stable.

14

ARCHITECTURE FOR THE PHYSICAL WORLD

Edge and cloud are complementary, not competing, control domains.

Cloud platforms are ideal for portfolio optimisation, market data, machine learning, analytics and enterprise integration. Physical sites require local resilience, deterministic control, low latency and continued operation when connectivity is impaired.

An effective architecture therefore assigns responsibilities deliberately. The cloud develops the operating plan and coordinates the portfolio. The edge enforces local limits, executes commands, manages fast control and preserves site safety.

When communication is lost, the edge should enter a defined autonomy mode rather than fail open or fail unpredictably. It may continue the last approved schedule, protect minimum state of charge, enforce import limits, maintain building or process constraints and buffer telemetry for later reconciliation.

The edge is not a miniature cloud. It is the local authority for safe, resilient execution.

Interoperability requirements

Open device protocols

Charging, building, solar, battery, industrial and grid protocols must coexist.

Canonical asset models

Normalise device specific data into consistent operational concepts.

Enterprise APIs

Integrate with CPMS, BMS, SCADA, fleet, utility, market and settlement systems.

Store and forward telemetry

Preserve data quality and evidence through intermittent connectivity.

Design principle. Avoid hard coding commercial logic into device integrations. Connectivity, asset modelling, optimisation, policy and market functions should remain modular.

15

TRUSTWORTHY AI FOR CRITICAL ENERGY OPERATIONS

Security and governance must be designed into every decision path.

AI energy systems influence physical equipment, customer services and market obligations. The risk model therefore extends beyond data confidentiality. It includes unsafe control, service interruption, manipulation of telemetry, unauthorised dispatch, market misconduct, privacy harm and failure to explain material decisions.

NIST AI RMF provides a practical structure around governance, mapping, measurement and management of AI risk. In energy, these principles should be integrated with cyber security, operational technology controls, safety engineering and sector regulation.[4]

Every autonomous capability should have an explicit operating envelope. This includes permitted assets, action limits, confidence thresholds, approval requirements, fallback behaviour, monitoring and escalation. The platform should distinguish advisory, supervised and autonomous modes.

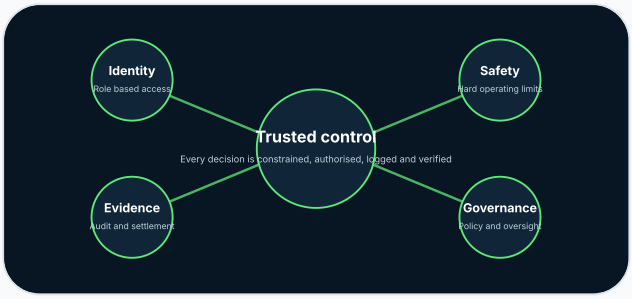


Figure 9. Trusted control combines identity, safety constraints, evidence and governance.

Identity

Strong device, user, service and partner authentication.

Least privilege

Limit who and what can issue, approve or modify control.

Policy as code

Make operating limits testable, versioned and reviewable.

Auditability

Record input, rationale, command, response and outcome.

16

SCALING INTELLIGENCE RESPONSIBLY

Energy AI creates value when technology, controls and operating ownership mature together.

Moving from dashboards to autonomous orchestration is not simply a model upgrade. It is an operating model transformation that aligns data, decision rights, safety controls, human oversight and measurable outcomes.

STAGE 1

Observe

Unify telemetry, establish baselines, improve data quality and create trusted operational visibility.

STAGE 2

Advise

Use forecasts, anomaly detection and optimisation to recommend actions for human approval.

STAGE 3

Coordinate

Optimise multiple assets together, execute supervised dispatch and automate market workflows.

STAGE 4

Autonomise

Deploy policy-constrained agents with edge execution, verification and continuous improvement.

The production standard

Dimension	Foundation	Production-grade standard
Operating ownership	Innovation or analytics team	Named business owner, control authority, service levels and escalation paths
Decision model	Recommendations for isolated assets	Portfolio optimisation across assets, sites, constraints and markets
Risk controls	Manual review and static limits	Policy as code, confidence thresholds, approval modes, fallbacks and hard safety boundaries
Evidence	Model metrics and dashboards	Traceable intent, command, response, measured delivery, settlement and audit records
Scaling pattern	Project-specific integrations	Reusable adapters, digital twins, common data contracts and edge-to-cloud deployment standards

The target state is not maximum autonomy. It is appropriate autonomy: each decision operates at the highest level of automation justified by its safety, commercial and operational risk.

17

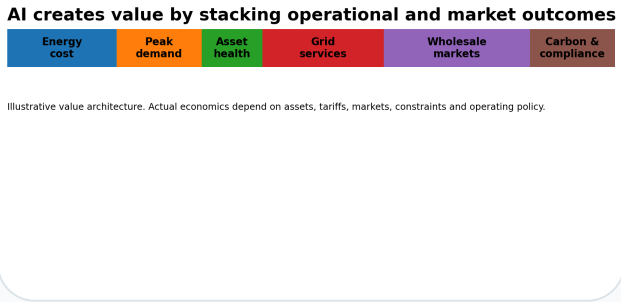
FROM TECHNICAL CAPABILITY TO INVESTMENT CASE

Build the business case around measurable operating outcomes.

Energy AI should not be justified by model accuracy alone. The investment case must link data and control capability to economic, operational and risk outcomes.

The baseline is critical. Without a credible counterfactual, savings and flexibility delivery cannot be distinguished from weather, production, occupancy or tariff changes. Baseline design should therefore be agreed before control begins.

Value should be measured at portfolio and site level, then decomposed by source. Energy savings, peak reduction, avoided reinforcement, market income, improved availability, carbon and staff productivity should not be double counted.



Outcome	Example KPIs	Evidence
Energy cost	£/MWh, tariff capture, import cost, export value	Meter, tariff and settlement data
Peak and capacity	Maximum demand, connection headroom, avoided upgrade	Interval load and network limits
Operations	Readiness, comfort, throughput, SLA, intervention rate	Fleet, BMS, SCADA and service records
Asset health	Availability, failure rate, degradation, maintenance cost	Telemetry, alarms, work orders
Flexibility	Qualified MW, availability, response, delivery, penalty	Bid, dispatch and performance records
Carbon	Marginal emissions, renewable utilisation, avoided curtailment	Energy and carbon intensity data

A high quality business case states which benefits are guaranteed, which are expected, which are market dependent and which are strategic options.

18

A CONTROLLED PATH TO PRODUCTION

Start with one operating problem, but design for portfolio scale.

PHASE 1 | 0 TO 30 DAYS

Discover

- Define operational objective and owner
- Inventory assets, systems and data
- Map constraints, approvals and risks
- Agree baseline and value model

PHASE 2 | 30 TO 60 DAYS

Connect and model

- Integrate telemetry and control paths
- Build digital twin and forecasts
- Validate data quality and fallback
- Run shadow optimisation

PHASE 3 | 60 TO 90 DAYS

Control and verify

- Enable supervised execution
- Measure operational response
- Test exception and recovery modes
- Validate savings and flexibility

PHASE 4 | 90 DAYS ONWARD

Scale

- Expand sites, assets and markets
- Increase autonomy by risk class
- Automate settlement and reporting
- Continuously improve models

Architecture decisions to make early

Control ownership, edge autonomy, data retention, identity, safety limits, system of record, market responsibility and evidence requirements shape the entire deployment. Delaying these decisions creates rework and operational risk.

What success looks like after 90 days

A production grade path is visible when data is reliable, control is reversible, operator confidence is increasing, measured value is credible and the same architecture can support additional sites without redesign.

Do not automate an undefined process. First define the operating policy, then encode, test and govern it.

19

STRATEGIC CONCLUSION

The next energy platform is a control and trust system.

AI will create durable value in energy when it can coordinate physical assets, act within explicit constraints and prove the result.

The opportunity spans the entire energy ecosystem. Utilities can use distributed flexibility to manage constraints and defer infrastructure. Fleets can protect vehicle readiness while reducing depot cost. Data centres can coordinate compute and power. Buildings and factories can turn operational flexibility into savings, resilience and revenue. Homes can automate complex energy choices around customer preferences.

The common requirement is a platform that understands assets, operations, markets and risk at the same time. Forecasting must connect to optimisation. Optimisation must connect to execution. Execution must connect to measurement, verification and settlement.

AmpVerve's strategic position is to provide this integrated control plane across EVs, batteries, buildings, data centres, heat, solar and flexible demand, combining agentic AI with neuro symbolic reasoning and edge to cloud execution.

Autonomous where it should be.
Explainable when it matters.
Trustworthy by design.

Three decisions for leaders

- Which operating problem creates the clearest measurable value?
- Which decisions can safely move from advisory to autonomous?
- What evidence will prove value, safety and compliance?

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GLOSSARY

Key terms

DER Distributed energy resource.

DERMS Distributed energy resource management system.

V1G Managed unidirectional EV charging.

V2G Bidirectional power exchange between vehicles and the grid.

V2B Vehicle energy used to support a building.

VPP Virtual power plant, an aggregated portfolio of controllable resources.

BMS Building management system.

SCADA Supervisory control and data acquisition.

OCPP Open Charge Point Protocol.

Digital twin Operational model representing asset state, behaviour and constraints.

Agentic AI AI agents that plan, use tools, coordinate and execute tasks.

Neuro Symbolic AI Machine learning combined with explicit logic, rules and knowledge.

Baseline Counterfactual estimate of what consumption or generation would have been without an event.

Flexibility The ability to change the timing or amount of electricity use or generation.

Edge Local compute and control close to the physical asset.

M&V Measurement and verification of delivered performance.

Validation note. Commercial outcomes depend on asset capability, site constraints, tariffs, market rules, data quality and operating policy. Every deployment should be validated against current technical, regulatory, cyber security and contractual requirements.