



Coordinating V2X energy services

D2.4.2 | PUBLIC OUTPUT SUMMARY

Architecture overview based on draft version 0.2 from May 2026

Purpose and contribution

A vehicle-to-everything (V2X) service requires coordination between electric vehicles, chargers, local generation, buildings and the wider energy system. V4Grid Deliverable D2.4.2 describes an energy management system (EMS) architecture for that purpose. The EMS brings measurements, user requirements, forecasts and control requests into a common operational view.

The intended applications include household use of local solar electricity, building peak management, price-responsive energy exchange and aggregated flexibility. Their practical availability depends on compatible equipment, site conditions, permissions and validation. The source is a draft architecture and integration framework, not a final testing report or confirmation that all services are market-ready.

Functional organisation

Function	Public description
Observe assets	Collect measurements and status from meters, chargers, solar generation, stationary batteries and site loads.
Manage data	Validate incoming information and represent devices through consistent concepts and histories.
Coordinate operation	Combine asset state, user priorities and site limits in a common management layer.
Plan energy use	Use forecasting and optimisation services to support charging and discharging schedules.
Control and explain	Send permitted actions, observe responses and provide users and operators with traceable information.

The architecture separates these responsibilities so that individual components can evolve without redesigning the entire service. Device adapters translate differences between equipment, while a digital representation of each asset records its capabilities, operating limits and current state.

The operating loop

The public design follows a repeating sequence: observe the site, validate information, plan operation, issue control requests and measure the response. New observations can inform updated plans. Forecasting and scheduling support this process, while actual equipment behaviour supplies the feedback needed to judge whether an intended action occurred.



D2.4.2 | *Methods and interpretation*

Users and operational constraints

Mobility needs define an important boundary for energy management. Expected departure, required energy and user overrides need to be considered alongside battery limits, equipment capability and site power constraints. A connected vehicle should not be treated as continuously available storage. Missing or unreliable measurements must remain visible and should not silently determine control actions.

Communication failure and invalid requests also need defined handling. The architecture calls for fallback behaviour that respects operating limits, preserves user requirements and records exceptions. These are design requirements whose implementation must be verified for the equipment and site concerned.

Security and interoperability

The public framework covers authenticated access, suitable permissions, encrypted communication and protection of sensitive stored information. Operators should be able to trace control actions, configuration changes and alarms. Resilience measures and clear responsibility for data and system access support continued operation when a device or connection is imperfect.

Common asset descriptions and documented interfaces are intended to make heterogeneous hardware manageable and support expansion across sites. A digital twin, in this context, is the system's representation of an asset, its capabilities, state, limits and history. This common view does not remove the need to validate the behaviour of each connected device.

A staged route to deployment

The proposed route begins with connecting assets and establishing trustworthy monitoring. Local energy management can then be assessed against observed behaviour and user requirements. Coordination across multiple sites adds the need for consistent records, dispatch visibility and exception handling. Grid-facing services require further checks of response performance, permissions and commercial arrangements.

Validation must cover the complete chain from a field measurement to a planning decision, a control request and the equipment response. Operators need evidence that the system sees the correct state, respects relevant limits and can explain what happened. Adding sites should also be assessed for consistency. The architecture describes this route; it does not demonstrate that every stage has been completed.

How this public summary was prepared

This document condenses the supplied D2.4.2 public brief and retains its high-level architecture, user protections and readiness conditions. Partner identities, site addresses, equipment inventories, operational datasets and historical market data are omitted. Internal infrastructure, detailed interfaces, configurations, control logic and commercial references are not reproduced.

Source basis: V4Grid D2.4.2 Public Brief, based on Management System for V2X Service, draft v0.2, May 2026. This public architecture summary is not a certification or a claim of completed end-to-end validation.