



Testing methods for V2X energy management services

D2.4.3 | PUBLIC OUTPUT SUMMARY

Laboratory and functional work with proposed EMS validation from May 2026

Purpose and contribution

V4Grid Deliverable D2.4.3 explains how testing can progress from individual vehicle and charger interactions to coordinated energy services. Bidirectional operation involves communication, charging control, reverse energy flow and the response of connected assets. A successful connection alone does not establish that the full service works.

The source covers laboratory and functional testing and proposes a framework for higher-level energy management system (EMS) validation. Comprehensive EMS testing was not completed within the reporting period. This distinction is retained throughout this summary: performed activities and proposed assessments provide different kinds of evidence.

Testing scope and status

Assessment area	Purpose	Source status
Laboratory work	Observe grid interaction and selected disturbances under controlled conditions.	Testing activities reported.
Functional operation	Assess communication, charging control and bidirectional energy transfer.	Testing activities reported.
EMS supervision	Assess external commands, status information and user requirements.	Proposed validation method.
Multiple assets	Assess coordinated schedules across vehicles and other site resources.	Proposed validation method.

Laboratory and functional methods

Laboratory work examines charging and reverse energy transfer under simulated distribution-system conditions. It considers electrical power quality and responses to selected disturbances, together with exploratory disconnection and reconnection observations. These activities support understanding of grid interaction; they do not constitute universal product approval or certification.

Functional testing uses independent sessions: connect a vehicle, establish communication, carry out the relevant energy-transfer actions, stop and disconnect. Returning to an idle state between sessions helps assess repeatability. Several actions during one continuing connection are not treated as separate connection attempts. The underlying record must preserve exceptions and incomplete sessions.



D2.4.3 | Methods and interpretation

What functional testing examines

Communication assessment distinguishes negotiation of a session from the start of actual energy transfer. Charging-control assessment then examines whether requested changes are reflected in equipment behaviour and whether operation remains stable. Bidirectional assessment adds the transition from charging to discharging and observation of sustained reverse flow under the test conditions.

Requested modes, displayed status and measured energy flow may provide different information. Interpretation must therefore distinguish an issued command from an observed response, and a brief transition from continued operation. Vehicle, charger, software and communication configuration affect the context; individual observations cannot be turned into general compatibility guarantees.

Evidence and traceability

The methodology considers operational records, charger information, inverter telemetry and other monitoring outputs. Application recordings can provide supplementary evidence where direct telemetry is unavailable, but they are not automatically equivalent to complete instrument or device logs. Gaps and reconstruction limits must remain visible.

Structured sessions are also distinguished from supplementary exploratory operation. Additional observations may help explain behaviour without demonstrating that the complete methodology was executed. The public summary therefore explains evidence categories and interpretation principles rather than reproducing raw test records or configuration-specific performance comparisons.

Proposed system level validation

The next assessment level addresses external EMS supervision. It would examine whether connection status and user requirements are represented consistently and whether control requests are reflected in actual operation. Vehicle readiness and charging preferences remain part of the assessment alongside continuity of communication and command execution.

The proposed multi-asset method considers coordinated operation of vehicles, charging infrastructure, photovoltaic generation, stationary storage and site monitoring over an extended period. It would examine schedule execution, operational continuity and consistency between requested and observed behaviour as conditions change. These sections describe future validation; they do not report that the proposed tests were passed.

How this public summary was prepared

This document condenses the supplied D2.4.3 public brief, preserving its testing sequence and distinction between completed activities and proposed EMS assessments. Numerical results, acceptance thresholds, logs, timestamps, power settings, battery-state ranges and device-specific outcomes are excluded. Detailed configurations, dispatch scripts and internal control logic are not reproduced.

Source basis: V4Grid D2.4.3 Public Brief, based on Report on testing management system for V2X service, May 2026. This public methods summary is not a certification statement or proof of complete service validation.