OCPP-to-DSO communications: OCPP and CSIP-AUS

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Assessing OCPP 2.1 ↔ CSIP-AUS integration

Can the two open interfaces form one interoperable control chain for EV charging sites?

NETWORK-FACING

CSIP-AUS

Communicates site-level import, export, load and generation envelopes.

Integration + gap analyses

Can the site obligation be translated into standard OCPP 2.1 behaviour?

architecture • mapping • fallback • verification

DEVICE-FACING

OCPP 2.1

Controls charging stations, EVSEs and transactions through interoperable device mechanisms.

CSIP-AUS communicates an **electricity-network objective** to a site. OCPP communicates **operating instructions** to charging equipment. A translation and orchestration layer is required between them.

Integration analyses

How can a CSMS turn a CSIP-AUS site obligation into interoperable OCPP 2.1 behaviour while preserving the intended physical response at the PCC?

CSIP-AUS site obligation

Network objective at the site / PCC

CSMS translation + orchestration

Translate semantics, calculate feasible site behaviour, allocate and schedule device actions

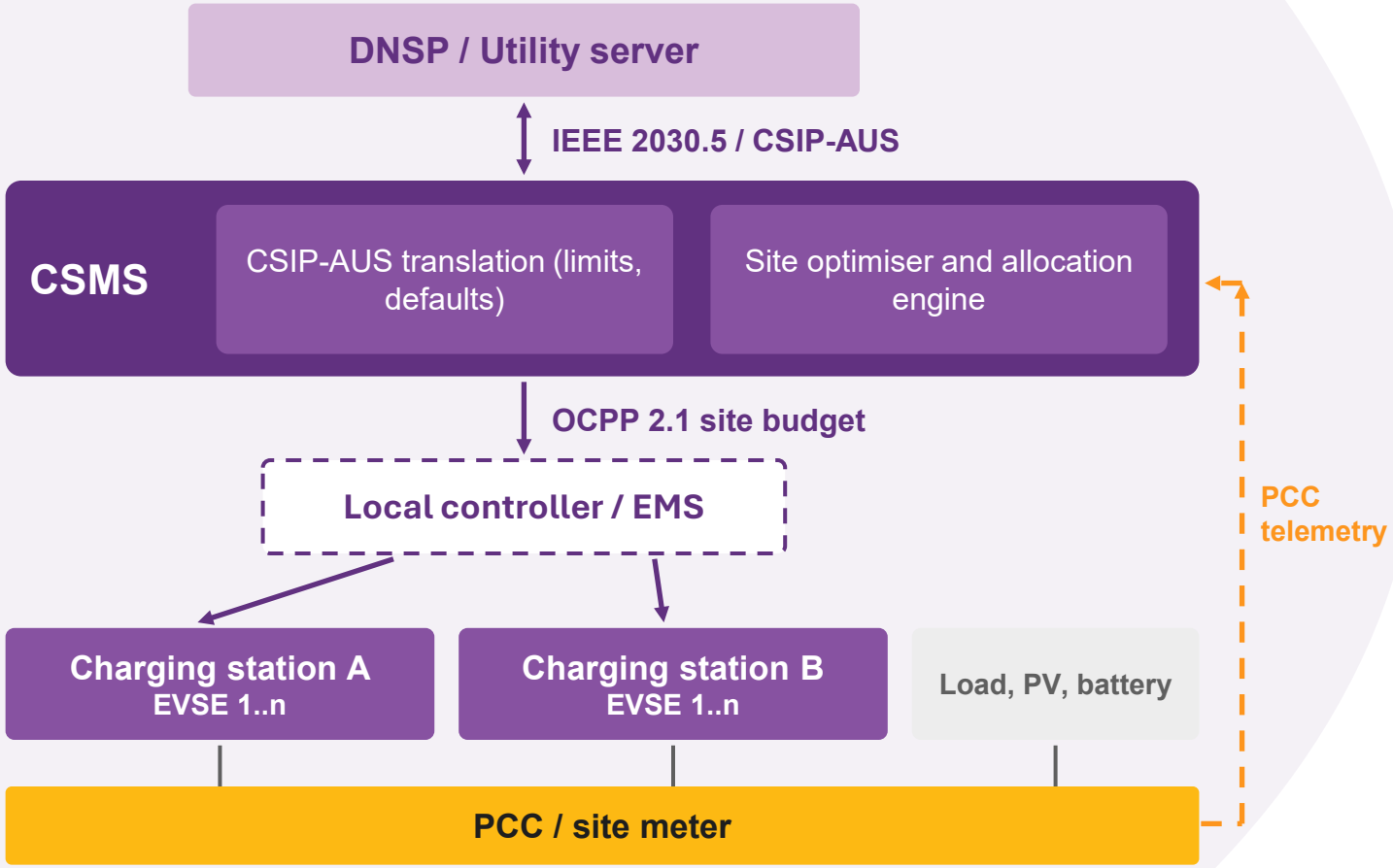
OCPP 2.1 behaviour

Device schedules that produce the intended PCC response

A correct solution is more than message mapping. It must also define:

Measurement authority	Sign conventions	Allocation
Scheduling	Event precedence	Communication-loss behaviour
Error handling	Security boundaries	End-to-end verification

Recommended architecture



Five logical CSMS functions

1. **CSIP-AUS client**
   registration, capabilities, events, responses, reporting
2. **Translation**
   semantics, time, units and sign into a canonical model
3. **Site optimisation**
   total EV budget after other site power flows
4. **Allocation**
   budget over stations, EVSEs and transactions
5. **Verification**
   compare instructed vs. measured; correct or escalate

Architecture variants

1

Single station

One station, no relevant non-EV load or generation. CSIP-AUS limit is close to a station constraint, but check that the station metering boundary matches the PCC.

2

CSMS-only control

Cloud CSMS sends limits to stations. Needs reliable PCC telemetry, adequate latency and conservative margins.

3

Local controller

Receives a site or cluster limit and allocates it locally over OCPP. Lower latency; keeps working during a WAN failure.

4

Most robust

Hybrid control

Cloud optimisation and utility integration; a local controller enforces the instantaneous site envelope.

OCPP cannot control non-OCPP PV, batteries or unmanaged chargers, and station telemetry alone does not reveal total PCC power: use an EMS, site meter or other protocol.

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Required OCPP 2.1 capabilities

SEC — **Core + Security**

Core profiles; security profile 2 as a minimum (TLS, mutual authentication, certificates)

SC — **Smart Charging**

Primary mechanism for time-varying active-power limits and schedules

V2X — **Bidirectional Charging**

Discharge scheduling and sign conventions when EVs export

DER — **DER Control**

Complementary: Gradients for default and soft-start ramp behaviour

MV — **Meter Values and events**

Power, energy, setpoint, current, voltage; verification of response

DM — **Device Management**

Capability discovery and commissioning

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How CSIP-AUS controls map into OCPP 2.1

CSIP-AUS control	Physical meaning	Primary OCPP mechanism	Extra responsibility
opModImpLimW	Max. net import at the PCC	ChargingStationMaxProfile and/or TxProfile (W)	Measure other load and generation; closed-loop PCC correction
opModLoadLimW	Max. consumption by the managed group	Aggregate cap via MaxProfile and/or TxProfile	Define managed group; allocate fairly
opModExpLimW	Max. net export at the PCC	Bidirectional schedules: negative setpoints, discharge limits	Account for PV, battery, site load, EV SoC
opModGenLimW	Max. generation by the managed group	Bidirectional discharge limits or setpoints	Define managed group; aggregate discharge
opModEnergize	Cease or resume consuming and generating	Zero charge and discharge allowance	No energy transfer; handle new transactions
opModConnect	**Electrical (dis)connection from grid**	**No interoperable OCPP command**	**Contactor, protection, EMS or extension**

How CSIP-AUS controls map into OCPP 2.1

positive = import / charging, negative = export / discharging

Physical state	OCPP representation	CSIP-AUS
EV charges at 20 kW	setpoint = 20000; Power.Active.Import = 20000	opModLoadLimW = 20000
EV discharges at 12 kW	setpoint = −12000; Power.Active.Export = 12000	opModGenLimW = 12000
Site imports 100 kW	Measured by external PCC meter	opModImpLimW = 100000
Site exports 30 kW	Measured by external PCC meter	opModExpLimW = 30000

Import limit: example

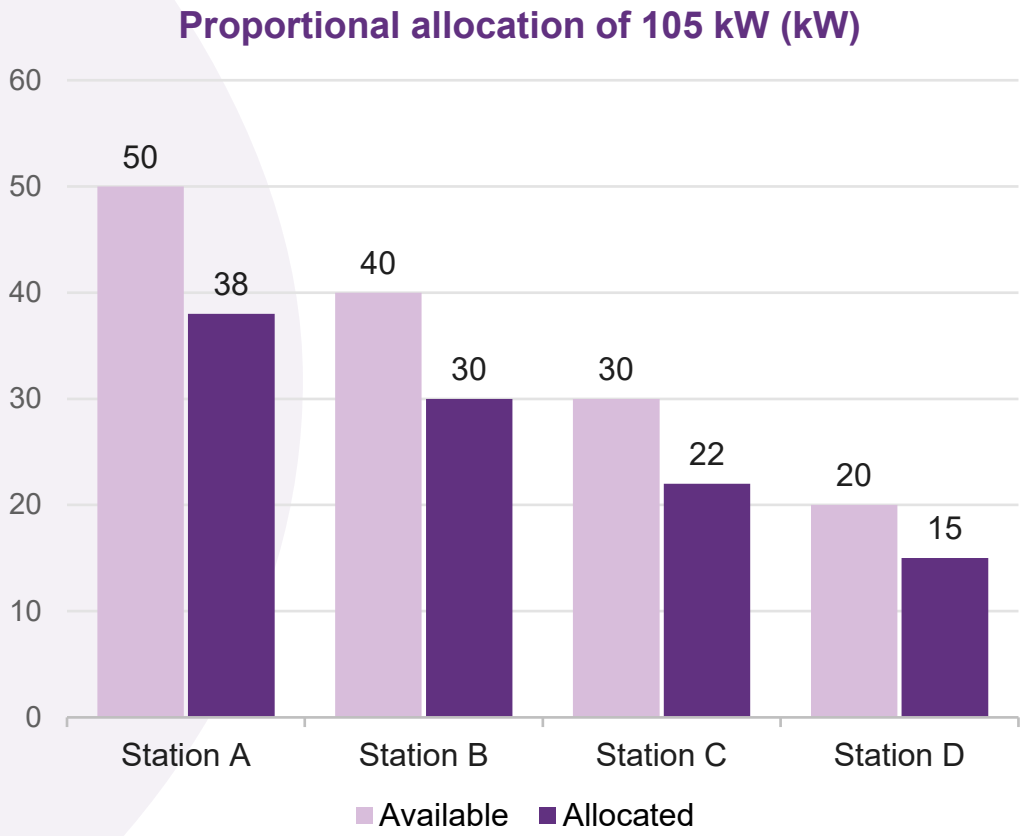
Fleet depot example

- Site import limit 150 kW, building load 55 kW
- PV 15 kW, reserve 5 kW
- Four stations able to take 50, 40, 30, 20 kW

CSIP-AUS input
150 kW import limit

Site state
55 building load · 15 PV . 5 reserve

Total budget
105 kW



V2G export limit: scenario examples

CSIP-AUS input: 40 kW export limit • PV 70 kW • reserve 3 kW

SCENARIO 1

Building load = 30 kW

Result: no EV discharge is available

Charge at least 3 kW if possible to preserve the reserve.

SCENARIO 2

Building load = 60 kW

Result: up to 27 kW aggregate EV discharge

Total discharge 27kW

OCPP action

SetChargingProfileRequest TxProfile	→	Apply a bidirectional schedule per active transaction using setpoint and dischargeLimit, e.g. −12 / −9 / −6 kW; reallocate when site conditions or EV availability change.

Energise is OCPP; connect is not

opModEnergize → OCPP can do this

Candidate actions

- Charging limit set to zero
- No discharge allowed (limits and setpoints)
- Idle schedule state where supported
- Stop transactions only if policy requires

Recommended: keep the transaction, apply zero power, block new energy transfer, verify power

opModConnect → not in OCPP

These are NOT a grid disconnect

- ChangeAvailability, RequestStopTransaction
- Zero-power charging profile, CSMS connection loss

Use instead

- Site contactor via local EMS or safety controller
- Inverter / protection interface, or documented vendor extension
- Dedicated utility-controlled disconnection device

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Fallback patterns for three types of failures

Pattern A

Persistent per-EVSE TxDefaultProfile

- Simple, device-local
- Survives CSMS loss and reboots
- Risk: sum of EVSE defaults exceeds site limit
- Ignores building load and PV

Pattern B

Online profile + lower-stack safe profile

- High-stack profile for normal operation
- maxOfflineDuration ends it when offline
- Lower-stack profile with the safe value takes over

Pattern C

Preferred

Local controller enforcement

- Stores default / safe site envelope
- Reads the PCC meter
- Keeps allocating during WAN or cloud failure

1. **Utility server ↔ CSIP-AUS client lost**
2. **CSMS / local controller ↔ charging station lost**
3. **Both cloud paths lost**

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Offline validity and watchdogs

maxOfflineDuration

Profile stops applying after this offline time.

- invalidAfterOfflineDuration = false: valid again when back online
- = true: permanently invalid after the timeout

Dynamic charging profile

One period; only the limit is refreshed.

- Push: UpdateDynamicScheduleRequest
- Pull: PullDynamicScheduleUpdateRequest every dynUpdateInterval
- Not updated in time → fallback, even when online (watchdog)

Fallback through the profile stack

stackLevel 10
Online CSIP-AUS profile

offline timeout or
no dynamic update

stackLevel 1
Safe default profile, e.g. 30 kW

maxOfflineDuration does not install a fallback.
The safe profile must already be there.

Ramp rates and Randomisation

setGradW → OCPP Gradients

Convert the rate — do not copy the number directly

- CSIP-AUS setGradW is expressed in 1/100 % per second
- OCPP Gradients are expressed in % per second
- Use the same rated-power base consistently in translation and testing
- Example: setGradW = 100 at 100 kW → 1 kW/s

OCPP Gradients are not available for AC unidirectional charging.

Randomised start

Avoid many resources changing state at once

- Use randomizedDelay in TxProfile or TxDefaultProfile
- randomizedDelay is not available on ChargingStationMaxProfile
- With direct CSMS control, per-transaction TxProfiles give better spreading
- A local controller can also distribute transitions across the site

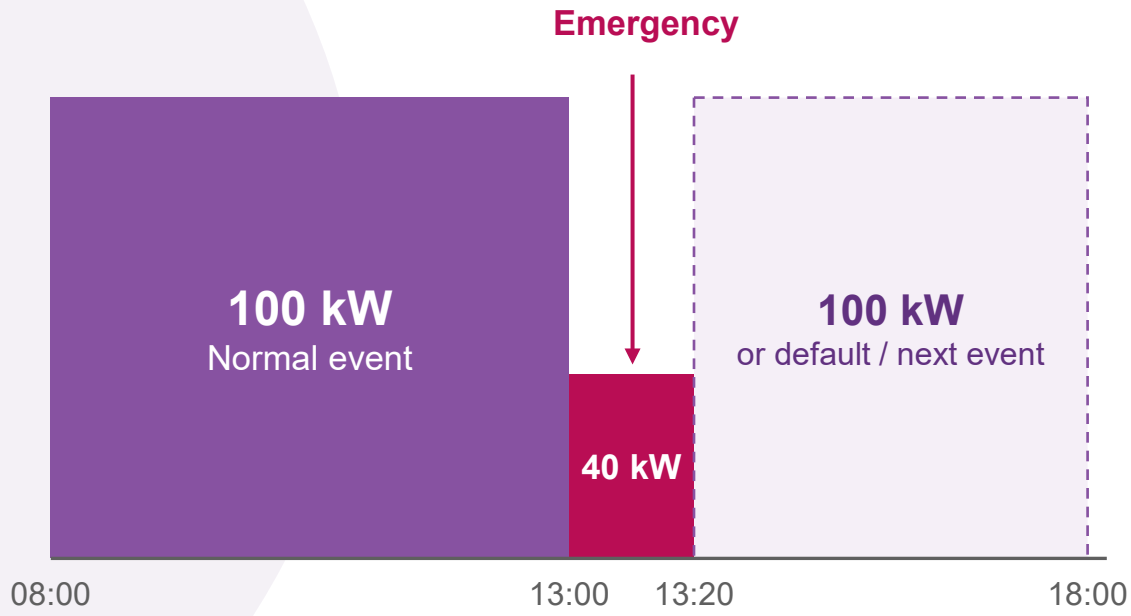
Randomisation belongs in the device schedules created by the translator / controller.

Primacy, stack levels and overlaps

Illustrative stack-level ranges (same purpose)

40-49	Operator / site protection
30-39	Urgent / emergency network event
10-29	Normal CSIP-AUS events
0-9	Baseline / site fallback

Example: emergency event inside a normal event



Time axis not to scale

What about OCPP 2.0.1 and 1.6?

Capability	OCPP 2.1	OCPP 2.0.1	OCPP 1.6
Bidirectional charging (export / generation limits)	Yes	No	No
DER control: setGradW → Gradients	Yes	No (stepwise profiles)	No
LocalGeneration profile purpose	Yes	No (via EMS)	No
maxOfflineDuration	Yes	No	No
Dynamic profiles with watchdog	Yes	No	No
randomizedDelay	Yes	No (random startPeriod)	No
ChargingStationExternalConstraints	Yes	Yes	No
ISO 15118 charging needs and schedules	Yes	Yes (-2)	No (PnC app note)

Advice

Upgrading from OCPP 2.0.1 to 2.1 is much easier than developing and testing customData extensions with all parties.

Workarounds on 2.0.1 need extra CSMS or EMS logic. OCPP 1.6 even lacks the external-constraints purpose.

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OCA recommends that implementers

1. Define PCC, managed group, sign convention, metering authority and fallback owner first
2. Keep import / load and export / generation separate in the data model
3. Use an authoritative PCC meter for site envelopes
4. Use closed-loop correction and conservative degraded operation
5. Configure deterministic event precedence and superseded-event resumption
6. Test offline-duration, persistence, reboot and profile scope on every product
7. Use a local controller when the safe fallback depends on fast-changing site load
8. Implement electrical disconnect outside standard OCPP where required
9. Require end-to-end physical testing, not only protocol conformance

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Conclusion

YES **OCPP 2.1 + CSIP-AUS are able to form an interoperable control chain for EV charging sites**

The integration works at system level. The only missing parts are on site orchestration level

1. **Site orchestration**

   Translate the site obligation into feasible device schedules.

2. **Trusted PCC metering**

   Verify the physical result and close the control loop.

3. **Tested fallback behaviour**

   Remain safe when utility, cloud or station communications fail.

4. **Electrical disconnect, if required**

   Implement grid disconnection outside standard OCPP.

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Thank you for your attention!