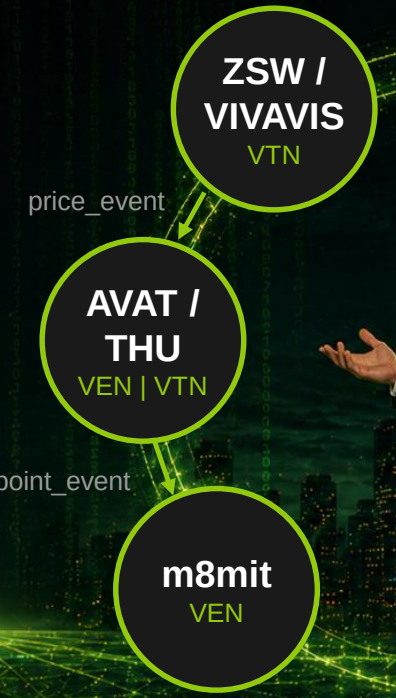
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OpenADR 3.0 meets the German energy market

Lessons from the research project CACTUS



Dr.-Ing. Hannes Schwarz
m8mit / Kraftwerk Software Systems GmbH (formerly msu solutions)
OpenADR Alliance Webinar · 4 November 2026

About us – kraftwerk and m8mit

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kraftwerk group

6
companies at 8 sites

450+
specialists

500+
customers

€50 M+
revenue

Sites: Halle (Saale) · Leipzig · Erfurt · Braunschweig · Regensburg · Heidelberg · Emsdetten · Viersen

Kraftwerk Software Systems GmbH (kraftwerk)

formerly msu solutions · Halle (Saale)

1. **ERP for utilities**
   Microsoft Dynamics 365 Business Central: electricity, heat / contracting, water, public utilities
2. **Smart metering**
   Smart meter gateway administration (GWA), aEMT / pEMT, tenant electricity, CRM
3. **E-mobility – m8mit**
   CPO backend with fully integrated billing and app – our OpenADR VEN in CACTUS
4. **Certified**
   ISO 9001:2015 and ISO 27001 · more than 200 utilities in D-A-CH

Three takeaways

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01

Price signals decided it

CACTUS needed tariffs and price incentives, not only capacity limits. That ruled out OSCP and made OpenADR 3.0 the choice.

02

It works end to end

Grid tariff → district optimiser → CPO backend → charge point. Round-trip test across the full OpenADR 3.0.1 chain on 26 March 2026.

03

“Ready” ≠ interoperable

Two OpenADR-ready systems still can't talk without bilateral agreements on IDs, programs and reports. The energy sector needs a shared notation.

CACTUS at a glance

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Connect, Assist & Control: transparency and system stability for smart energy systems

Goal: optimise grid utilisation in distribution grids by unlocking the flexibility of charging clusters and districts – steered by (virtual) price signals, so that hard curtailment in the red traffic-light phase is avoided. Assets are free to react to the signals or not.

- Funded by the German Federal Ministry for Economic Affairs (BMWK, now BMWE), 7th Energy Research Programme, call “Stromnetze”
- Project management: Projektträger Jülich (PtJ)
- Five work packages: regulation · grid transparency · Assist & Control · black-start · system test

42

months

01/2023 – 06/2026, incl. 6-month cost-neutral extension

8 + 3

partners

8 funded partners, 3 associated utilities

€2.8 M

total budget

≈ €1.7 M public funding (as applied)

185

gateways installed

smart meter gateways in the Ulm/Neu-Ulm test area

Consortium – who did what

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VIVAVIS AG

Consortium lead · grid control system

ZSW

Assist & Control algorithm · dynamic grid tariffs

AVAT Automation

District energy management (SE²DIRECTOR / SE²OPTIMIZER)

m8mit / kraftwerk

CPO/EMP backend with expertise in Accounting Billing & · lead WP OpenADR

PPC

Power Plus Communications · grid sensors, gateway data

TH Ulm

Grid simulation · lab and system test

SW Schwäbisch Hall

DSO · field test, black-start

SWU Netze Ulm

DSO · field test Hittistetten

Associated utilities

SW Ludwigsburg-Kornwestheim

District “Energiehafen West”

Stadtwerke Bernburg

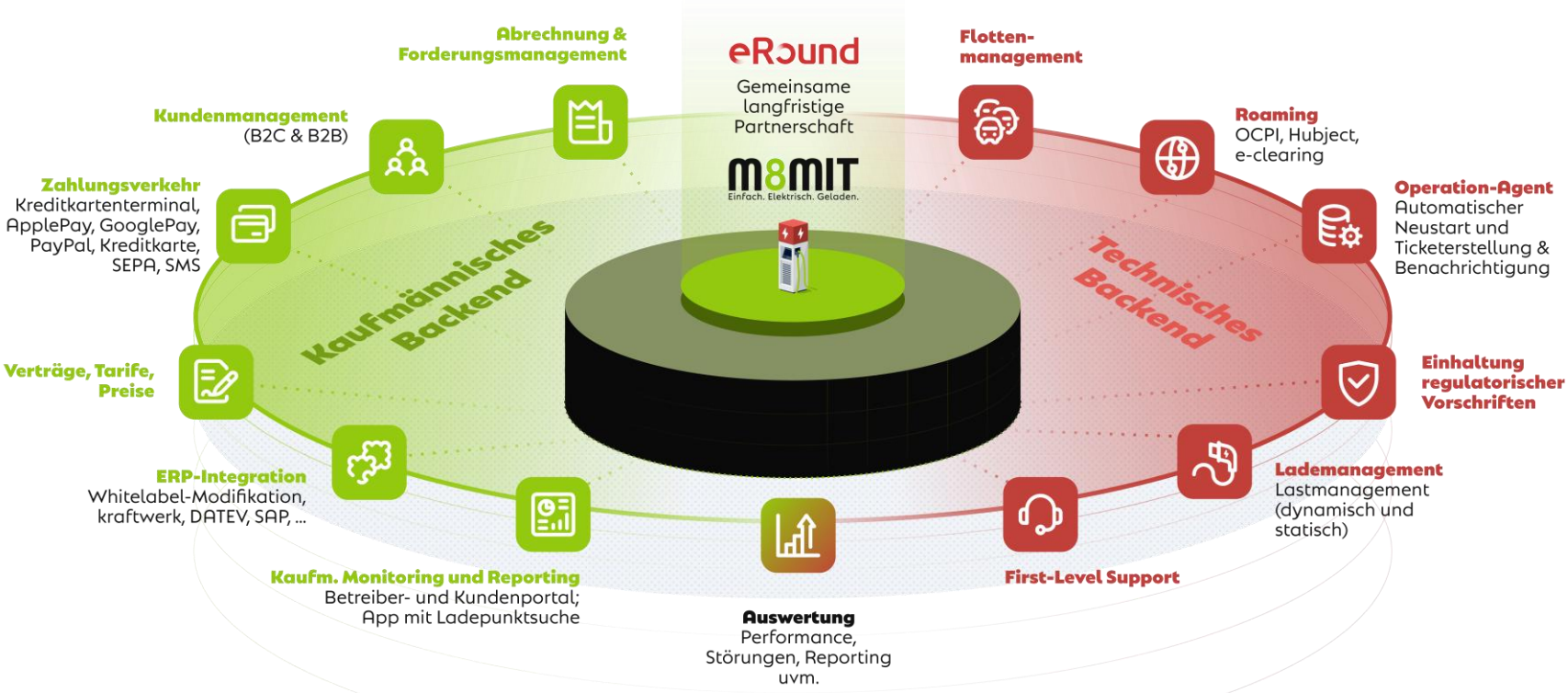
Depot demonstrator (planned)

Stadtwerke Ettlingen

Supporting partner

m8mit – the platform behind our VEN

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Fully integrated charging infrastructure management

m8mit – the platform behind our VEN

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m8mit platform (SaaS): operator portal for charging, customer and tariff management with real-time monitoring + portal and app for customers, employees and guests

DirectPay	Debit	B2B	Roaming	Homecharge	Fleet
Ad-hoc payment at the charge point	Registered customers and companies	Billing of EMPs and sub-partners	Charging on third-party networks	Company cars charged at home, reimbursed	Ledger, billing and market communication

fully integrated charging infrastructure management

Commercial backend m8mit

- Customers B2C / B2B, contracts, tariffs, prices
- Payments: card terminal, Apple / Google Pay, PayPal, SEPA
- Billing, dunning, reporting · ERP integration (kraftwerk, DATEV, SAP)

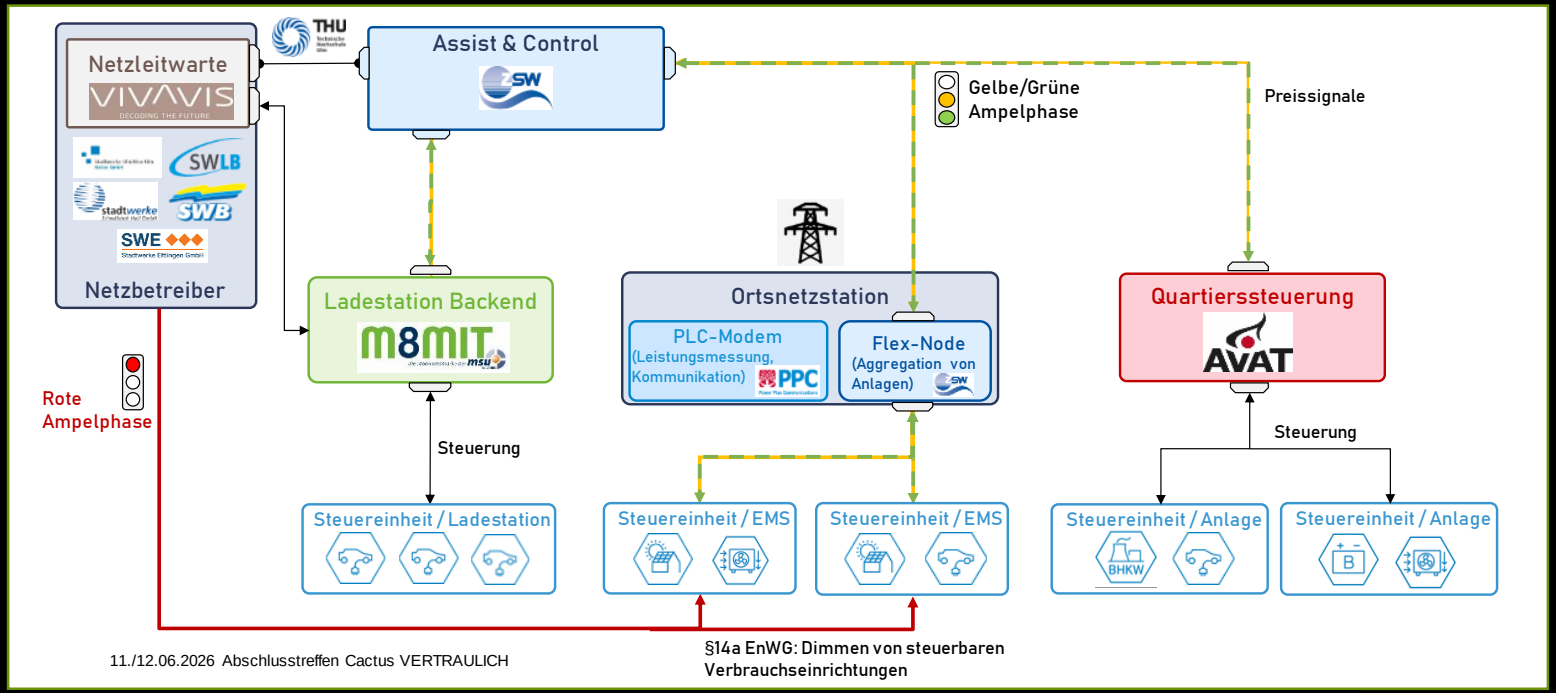
Technical backend

- OCPP operations, roaming (OCPI, Hubject), fleet management
- Operation agent: automatic restart, ticketing, alerts
- Static and dynamic load management · first-level support

Where OpenADR plugs in

The CACTUS VEN feeds grid signals into load management: setpoint_event → charging profile via OCPP → usage_report back to the VTN. Tariffs from OpenADR programs flow into the commercial backend.

Consortium – what was our objective



Traffic light phases and recommendations:

- Grid status analysis indicates a critical situation in the forecast; Implementation of preventative measures
  - Solution within the project: time-varying grid tariffs
- Grid status analysis indicates an acute critical situation; Implementation of remedial measures
  - Solution within the project: ad hoc control of CLS/SMGW (Section 14a of the Energy Industry Act)

Connect → Assist → Control

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1 Connect

Grid transparency

- Sensors in substations and cable cabinets
- Smart meter gateway data (iMSys)
- Probabilistic load & generation forecasts

2 Assist

Support the control room

- Grid model and congestion forecast
- Recommendations and schedules for the operator
- Flexibility bands per grid node

3 Control

Steer flexibility

- Green/amber phase: price or management incentives (OpenADR)
- Red phase: hard limits via smart meter gateway / CLS (§14a EnWG)
- Districts, charging parks, heat pumps

Where OpenADR sits: the incentive path between grid algorithm, energy managers and CPOs.

Why OpenADR 3.0 – and not OSCP

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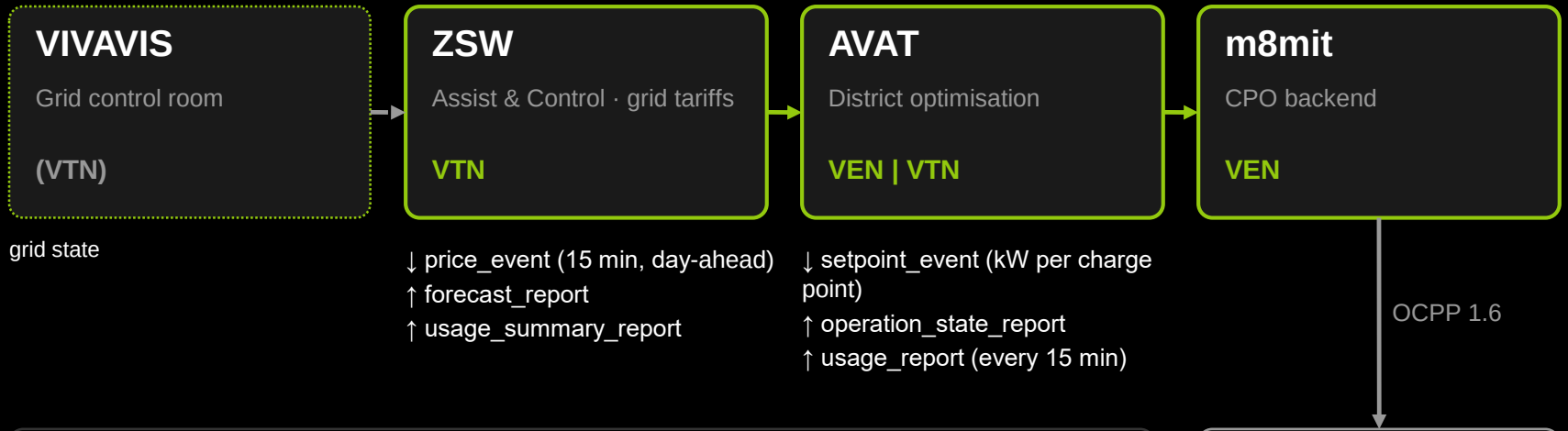
Criterion	OSCP 2.0	OpenADR 3.0
Price / tariff signals	No pricing module	Native price payloads and tariff programs
Object model	Capacity forecasts (DSO → CPO)	Programs, events, reports, subscriptions
Forecasts & feedback	Capacity, basic usage	Report descriptors: forecast, usage, operating state
Scope	EV charging	Any DER: districts, CHP, storage, EV
Cascading roles	Provider / optimiser roles	VEN and VTN in one system (AVAT)
Maintenance	Not actively developed by OCA*	Active: 3.1.0 (Aug 2025) adds MQTT

* per Open Charge Alliance website (2025). OpenADR 2.0b is standardised as IEC 62746-10-1; OpenADR 3.x is maintained by the OpenADR Alliance.

Decision driver: CACTUS is incentive-based. Without price signals there is no project.

Architecture – three OpenADR layers

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- **Webhooks, no polling:** every VEN subscribes to events, every VTN to reports
- **OpenADR 3.0.1** servers at ZSW and AVAT, VEN client in the m8mit backend
- **Shared conventions:** server-side UUIDs, UTC/ISO 8601, token auth

Use case 1 – charge point control via m8mit

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1. **Register**
   m8mit registers as VEN and its charge points as resources
2. **Program + anchor event**
   AVAT creates a program per tenant plus an “anchor” event
3. **Session starts**
   operation_state_report (IDLE_NORMAL) incl. tariff choice
4. **Setpoint**
   setpoint_event: CONTROL_SETPOINT in kW for one charge point
5. **Meter feedback**
   usage_report every 15 min: READING · OPERATING_STATE · SETPOINT

Outlook: tariffs via OpenADR

- **Flex vs. standard tariff:** the driver states flexibility in the m8mit app
- **Program = tariff:** the OpenADR-native model – charge points enrol in a tariff program
- **Booster:** full power on demand at a higher price
- **Flexcoin:** reward for controllable sessions
- **Time-variable grid fees** (§14a EnWG, module 3) passed through to the driver

Use case 2 – price signals for districts

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ZSW

price_event: grid tariff
96 × 15 min, day-ahead + updates

→

AVAT optimiser

grid tariff + EPEX day-ahead
= total price per interval

→

District assets

CHP schedule shifts,
6 charge points scheduled

↑ forecast_report (start of day, on change) ↑ usage_summary_report (end of day)

€4.88

(pure) exchange trading revenue

€12.70

grid-serving operation revenue

Scenario C – revenue transparency
The CHP only shifts if the operator gains. AVAT shows both revenue streams side by side.

Test day 26 Mar 2026, simulated district – illustrative values, not a business case.

Demonstrators – plan vs. reality

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Ludwigsburg

SWLB · district “Energiehafen West”

Plan

Former industrial site: CHP (330 kWel), PV, battery, heat storage, 2 × 50 kW DC chargers*

Outcome

Use cases 1–3 with AVAT: grid tariffs from ZSW drive CHP and charging. CHP not live-controlled – district simulated; revenue view deployed at the utility’s plant.

Bernburg

SWB · utility depot

Plan

VIVAVIS control system, charge stations, PV and battery on site – ideal for direct DSO → CPO control via OpenADR

Outcome

Dropped: production control system would need firewall opening, software upgrade, security certification and staff training. Replaced by a test at THU.

Ulm/Neu-Ulm

SWU Netze · Hittistetten

Plan

Rural LV grid with high PV share; incentive signals for fleet charging and households

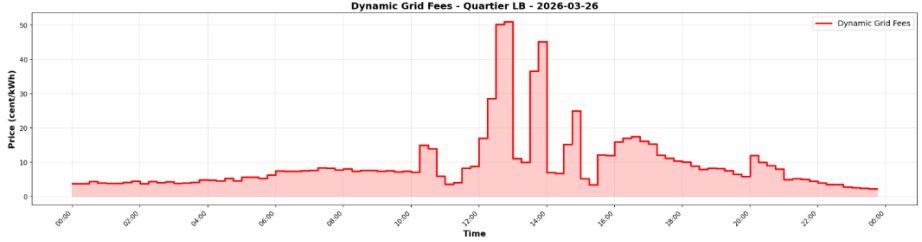
Outcome

185 smart meter gateways installed, CLS control command from the LV control system tested, LV measurements to THU. Control path: iMSys/CLS (§14a), not OpenADR.

* SWLB/AVAT planning data (KEA-BW Contracting Congress 2020)

Round-trip test – 26 March 2026

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Dynamic grid tariff sent by ZSW as price_event



Charge power at the charge point after setpoint events (kW)

Setup

- THU site + local grid area
- AVAT SE²OPTIMIZER (energy system optimizer)
- Easee Home and ABL eMH3 Twin (OCPP 1.6)
- Hyundai Ioniq 5, Cupra Born
- OpenADR 3.0.1 VTN/VEN at ZSW, AVAT, m8mit

Result

- Process chain passed: all events and reports sent and received
- Charge points followed the setpoints (11 kW reduced to ≈ 6–7 kW)

“OpenADR-ready” is not interoperable – yet

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What we had to agree bilaterally – the standard leaves it open:

? **Which ID names a charge point?**
EVSE-ID, OCPP chargeBoxId + connectorId, backend UUID?

? **Which ID names a grid connection?**
MaLo-ID, MeLo-ID, transformer, feeder?

? **What is a program?**
Per tenant, per tariff, per grid area?

? **How is a new session reported?**
Reports need an eventID → anchor-event workaround

? **Which payloads, units, value sets?**
OPERATING_STATE values, kW vs. A, kWh vs. meter reading

? **Where does master data go?**
Power, AC/DC, controllable, tariffs – outside OpenADR today

resourceName in our field test

DE*MSU*ETHU*ABL1*02

An EVSE-ID – because we agreed on it. Another backend may send its internal UUID. Both are valid OpenADR.

“OpenADR is designed as a very broad, cross-domain protocol. For charging infrastructure in the energy sector, application-specific notations and conventions are currently missing.”
VIVAVIS AG

Our contribution: an energy-sector notation

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1 · Resource identity – one ID scheme per object type

Object	Proposed ID scheme	Example
Charge point (EVSE)	EVSE-ID (ISO 15118 / eMI³)	`DE*MSU*ETHU*ABL1*02`
Charging station	OCPP chargeBoxId (aux.)	`ABL1`
Grid connection	MaLo-ID (11 digits)	`5xxxxxxxxxx`
Metering point	MeLo-ID (33 characters)	`DE000…`
Generation unit	MaStR number	`SEE9…`

Market IDs follow the German BDEW market communication; the pattern transfers to other markets.

Effect: a DSO can address a charge point at a given grid connection without a bilateral mapping table.

Proposed resource payload

```
{
 "objectType": "RESOURCE",
 "resourceName": "DE*MSU*ETHU*ABL1*02",
 "venID": "<uuid>",
 "attributes": [
  {"type":"ID_SCHEME",
   "values":["EVSE_ID"]},
  {"type":"MALO_ID",
   "values":["5xxxxxxxxxx"]},
  {"type":"MAX_POWER_KW","values":[11]},
  {"type":"CURRENT_TYPE","values":["AC"]},
  {"type":"CONTROLLABLE","values":[true]},
  {"type":"TARIFFS",
   "values":["FLEX","STANDARD"]}
 ]
}
```

Program templates and report profiles

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2 DYNAMIC_GRID_TARIFF

PRICE in EUR/kWh, PT15M × 96, day-ahead + updates. Mandatory reports: USAGE_FORECAST, USAGE.

3 EV_SETPOINT

CONTROL_SETPOINT in kW per EVSE-ID. Mandatory report every interval: READING, OPERATING_STATE, SETPOINT.

4 Session lifecycle

Fixed mapping OCPP status → OPERATING_STATE; session reports without dummy events.

5 Tariff = program

Each customer tariff (flex, standard, booster) is one program; resources enrol.

Numbers continue the notation from the previous slide (1 = resource identity).

Our ask to the Alliance

- Application note “OpenADR 3 for DSO ↔ CPO / EMS”
- Working group with DSOs, CPOs and EMS vendors
- Certification test profile, so that “ready” means interoperable
- Alignment with OCPP 2.x and ISO 15118
- CACTUS published as reference implementation

Summary and outlook

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Achieved

- OpenADR 3.0.1 chain ZSW → AVAT → m8mit implemented and tested
- Two use cases fully specified (programs, events, reports)
- m8mit backend “OpenADR-ready” as VEN
- Consortium membership in the OpenADR Alliance

Open

- Master data inside OpenADR
- Integration into production grid control systems
- Field test with real production data on a broader scale

Next

- Reference implementation via the Alliance
- Tariffs via OpenADR in m8mit (2027)
- Extend to heat pumps and storage
- Contribute the energy-sector notation

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Thank you

Funding
CACTUS was funded by the German Federal Ministry for Economic Affairs and Climate Action (BMWK) on the basis of a decision by the German Bundestag.

Let’s make “ready” mean interoperable. Questions, feedback and interest in the notation work are welcome.

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