
EV Transitions for 2026: Executive Summary

Resilient Connectivity for EV Charging Infrastructure

The hidden cost of connectivity downtime, why most
"multi-network" SIMs don't protect you, and how to fix it

Version:

2.0.0

Date:

February 2026

The Hidden Vulnerability

The UK's public EV charging network has grown to over 88,000 devices, yet reliability remains the top barrier to EV adoption. Industry KPIs report 95–99% "uptime",¹ but independent analysis shows **driver session success rates are 10–20 percentage points lower** than reported device uptime.^{1,2,3}

The gap is connectivity. Most operators rely on **multi-RAN, single-core** cellular architectures: multiple radio networks, but all traffic routed through a single MVNO core. When that core fails, every device goes down simultaneously.

The false sense of security: A "multi-network" SIM gives the impression of redundancy. In reality, if all profiles route through the same MVNO core, a single infrastructure failure takes down the entire estate. UK MNO core outages affect millions of connections and can last multiple hours; occasionally longer.

Independent vs correlated outages

An **independent outage** affects a single device (local signal loss, hardware fault). A **correlated outage** takes down entire estates when a shared dependency fails: the MVNO core, an authentication platform, or a certificate authority. A single correlated event can generate more revenue exposure in one afternoon than a year of independent faults.

Fleet depot risk: When overnight charging fails, vehicles don't deploy. A single outage grounding 12 vans can cost **£6,300 per incident** in direct costs, with annual exposure reaching £12,600–£18,900 for recurring faults.

Regulatory pressure is building

- **UK PCPR 2023:** 99% reliability target for rapid chargers; annual reporting to OPSS now live (first submissions January 2026)
- **US NEVI:** 97% uptime threshold for federally funded sites
- **EU AFIR (Alternative Fuels Infrastructure Regulation):** Open data and availability reporting obligations

Operators who build resilient connectivity now will meet these thresholds with margin. Those who don't face escalating compliance costs.

88,513

UK public charge point devices (Zapmap, Jan 2026)

10–20%

Gap between reported uptime and actual driver session success rate

2–4 / yr

Typical correlated outage events per estate per year

¹ Canary Media: true station uptime ~84% vs ~92% self-reported. ² Rempel et al. (2023), UC Berkeley: 72.5% of Bay Area DC fast chargers functional vs 95–98% claimed. ³ J.D. Power 2025 EVX Study: 14% of drivers unable to charge on a visit. Charge points: Zapmap Jan 2026. Outage frequency: Industry and CSL data.

What fails when connectivity drops

- **Payment:** Contactless/app transactions require real-time authorisation
- **Roaming:** Credential validation for cross-network sessions
- **Monitoring:** Remote diagnostics, reboot, and OCPP (Open Charge Point Protocol) status updates
- **Security:** Certificate renewal, signed firmware, security event reporting
- **Grid:** Energy management and demand response signals



The Architecture Gap

The previous page established the risk. This page asks: **why don't existing "multi-network" SIMs fix it?** The answer lies in network architecture, not radio coverage.

The diagram opposite illustrates the difference. In a typical deployment, multiple radio access networks converge on a single MVNO core (the shared dependency that multi-RAN diversity cannot protect). CSL's Dual-Core architecture maintains two fully independent core network paths, so a failure in one triggers autonomous failover to the other.

Why this matters financially

A single correlated event affecting a 50-site estate for 4 hours can generate more lost revenue than a year of independent device faults. The cost model on the following pages quantifies this exposure across charging types: from AC destination chargers to ultra-rapid hubs and fleet depots.

Real-world outage patterns

UK mobile network core outages are not rare: major carriers have experienced multi-hour national disruptions. For EV charging, the consequence is that operators wait for the carrier to restore service, with typical resolution times of several hours or more and no local workaround available.

With CSL DualCore, the same event triggers an automatic profile switch. Chargers resume operation autonomously, without manual intervention or truck rolls.



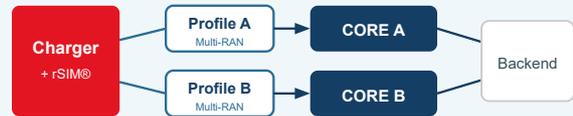
TYPICAL: Multi-RAN, Single-Core



X Core failure = total estate outage

X All RANs share one vulnerable dependency

CSL DualCore: Multi-RAN, Multi-Core



✓ Core A fails → automatic failover to Core B

✓ SIM-resident logic: no cloud dependency for failover

Failover speed comparison

Method	Failover time	Core diversity?
Single-core MVNO	4–24+ hours (wait for fix)	No
Device-level network switching [†]	Device-dependent (shared core negates speed)	Typically no
CSL DualCore rSIM®	Autonomous (configurable)	Yes: always

[†] Switching times vary by device type, firmware, and network conditions. Figures are indicative field ranges.

CSL product formats

- **rSIM®:** eUICC SIM with dual operator profiles in standard form factor. Drop-in for existing charger hardware. SGP.32 remote provisioning.
- **CSL Routers:** Site routers with built-in CSL DualCore for installations needing higher bandwidth or site-wide coverage.
- **CSL Outpost:** Four modems, four SIM slots delivering PACE (Primary, Alternate, Contingency, Emergency)-level redundancy for larger charging hubs (see below).

Key point: All formats include private APN, VPN encryption, remote diagnostics, and OTA provisioning as standard. No shared public internet. No cloud dependency for failover decisions.



The Cost of Connectivity Downtime

Revenue at risk = Power (kW) × Utilisation × Tariff (£/kWh) × Downtime hours. Using GFI utilisation benchmarks, RAC Charge Watch and Zapmap Price Index tariff data, and CSL field monitoring:

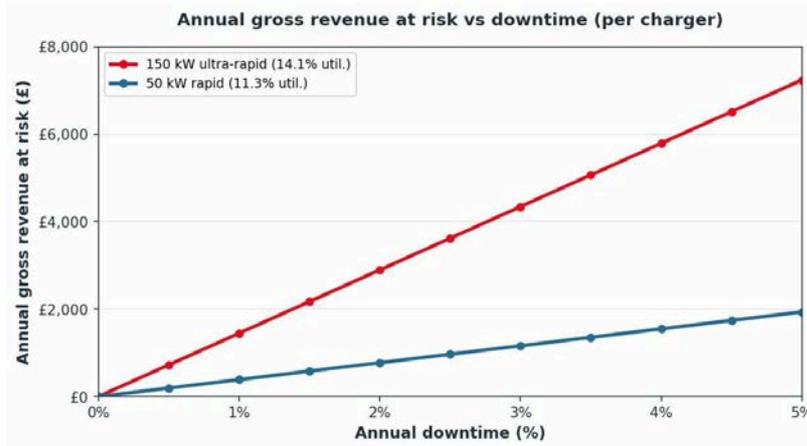


Figure 1. Annual gross revenue at risk vs downtime (per charger). Utilisation: GFI Q1 2024 (latest available; likely conservative as UK charging sessions have increased materially since). Tariff: AC slow/fast rows use typical destination tariffs (£0.40–0.54/kWh, per Zapmap Price Index Jan 2026); rapid/ultra rows use RAC Charge Watch PAYG benchmark (~£0.78/kWh; Zapmap weighted average: £0.76/kWh). Nameplate kW (upper bound; ultra-rapid apply 0.6–0.8×).

Charging type	Revenue at risk/hr	At 16 hrs/yr downtime	6-unit hub (annual)	Fleet depot (20 units)
7 kW AC Slow	~£1.26/hr	~£20/yr	£121	—
22 kW AC Fast	~£2.40/hr	~£38/yr	£230	—
50 kW DC Rapid	~£4.40/hr	~£70/yr	£422	—
150 kW Ultra-rapid	~£16.50/hr	~£264/yr	£1,584	—
Fleet depot (50 kW)	varies [†]	—	—	£12,600[†]

[†] Fleet depot costs reflect vehicle grounding and SLA penalties, not energy revenue alone. Illustrative depot: 20 chargers serving a fleet where ~12 vehicles are affected per correlated event; a single such outage costs ~£6,300 per incident (see p. 1); annual exposure of £12,600–£18,900 assumes 2–3 recurring events.

Beyond revenue: Correlated outages create SLA breaches, regulatory exposure, contract risk, and reputational damage. Estate-wide carrier failures can create £100k+ exposure (e.g. 50+ ultra-rapid sites, single correlated event).



What Does This Mean for Your Network?

Worked Example: 6-Charger Motorway Hub

Site: 6 × 150 kW ultra-rapid. Utilisation: 14.1%. Tariff: £0.78/kWh PAYG.

Revenue at risk (16 hrs/yr): 6 × £264 = **£1,584/yr**

Avoided truck rolls (CSL data): 3–4 × £220 = **£660–£880/yr**

Potential exposure reduced: £2,244–£2,464/yr (illustrative). Actual savings depend on incident frequency, detection speed, and operational context. Request a resilience audit to compare this exposure against the cost of protection for your estate.

Is the investment case viable at lower utilisation?

Early-stage hub: 4 × 50 kW at 5% utilisation = £7.80/hr site total. At 16 hrs downtime: ~£125 revenue at risk + 2 truck rolls (£440) = **~£565/yr**. At low utilisation, truck roll avoidance drives the case; as usage grows, revenue protection compounds rapidly.

Sensitivity (±30% around base assumptions)	Low	Base	High
Utilisation	9.9%	14.1%	18.3%
Tariff	£0.55	£0.78	£1.01
Downtime (hrs/yr)	11	16	21
Revenue at risk (150 kW)	£90/yr	£264/yr	£582/yr

Low and High apply ±30% to utilisation, tariff and downtime simultaneously (rounded).

How to use these numbers

Use £/hr exposure to compare and prioritise sites. Annualise using your connectivity-attributable downtime hours. Add truck roll and SLA costs where they apply. Treat outputs as decision-support framing the order of magnitude of exposure, not a guaranteed ROI.



The Solution: CSL DualCore & PACE

True resilience requires **core independence**, not just radio diversity. CSL's architecture addresses the root cause: shared infrastructure dependencies.

CSL DualCore rSIM

Two fully independent operator profiles, each with its own core network, embedded on a single UICC. Failover logic resides on the SIM itself, not on an external platform that may be unreachable during the outage it needs to resolve.

- **Eliminates single-core SPOF:** When one operator core fails, the device autonomously switches to the second profile (switching speed is configurable and depends on device type)
- **True diversity:** Independent authentication, independent routing, independent infrastructure
- **SIM-resident logic:** No cloud dependency for failover decisions
- **OTA reprovisioning:** Remote profile updates for 2G/3G sunset and technology transitions without truck rolls

PACE Architecture (for hubs)

CSL DualCore protects against core-level failure. For high-value sites where even radio-layer disruption is unacceptable, PACE adds successive fallback layers — each activating only when the layer above it degrades:

Layer	What it does	When it activates
P Primary	Broadband (bonded multi-link)	Always on, primary path
A lternate	Cellular (independent radio path)	Primary degradation detected
C ontingency	Alternative cellular path	Primary and alternate paths fail
E mergency	Satellite backup	All terrestrial links fail

Implementation Paths

Not every site needs every layer. Match the investment to the risk:

Basic

Single-link cellular + monitoring. Limited to AC destination chargers where revenue per unit is modest. Leaves correlated failures unprotected.

Recommended

Multi-link bonded + core diversity (CSL DualCore). For rapid chargers, regulatory sites, roaming hubs.

Maximum Resilience

CSL DualCore + PACE (multi-cellular, satellite). For fleet depots, motorway hubs, safety-critical sites.

Why CSL

- **Genuine core independence:** Two separate operator cores — not multiple profiles routed through a shared MVNO, which is the industry norm
- **3.5M+ active connections:** Proven at scale across critical IoT in Europe
- **Private APN / VPN:** Secure, isolated connectivity with end-to-end encryption
- **Single managed service:** Connectivity, failover, monitoring, and OTA lifecycle management in one contract



Next Steps

The business case for resilient connectivity rests on four pillars: revenue protection from avoided downtime, operational savings from remote fault resolution, regulatory compliance with tightening uptime mandates, and tail-risk mitigation against correlated outages.

Connectivity downtime carries quantifiable costs across every charging type, from AC destination chargers where silent failures and truck rolls accumulate at estate scale, to ultra-rapid hubs and fleet depots where correlated outages create exposure of tens of thousands per site.

Book a Resilience Audit

We review your current connectivity architecture against the resilience dimensions in this paper and identify single points of failure. Typically 2 weeks, no commitment.

Explore Your ROI

Share your estate profile (charger count, mix, and utilisation) and we'll work with you to model the risk and build a resilience business case tailored to your network.

Get in touch

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This is a summary of the full white paper *Resilient Connectivity for EV Charging Infrastructure* (v2.0.0, February 2026). The full paper includes detailed analysis by charging type, outage taxonomy, and comprehensive worked examples.

About CSL Group

CSL Group is a UK and EU-based telecommunications company specialising in resilient connectivity for critical IoT applications. With over **3.5 million active connections** (as of Q4 2025) and VPN + private APN infrastructure across Europe, CSL supports high-availability connectivity for critical infrastructure.

RFP Checklist: Minimum Resilience Requirements

Copy into procurement documents to benchmark providers:

- Dual-path** with independent core networks
- Autonomous failover** (SIM/device-resident)
- Private APN / VPN** end-to-end encryption
- Remote diagnostics** without truck roll
- Session success observability**
- Offline policy** for WAN loss continuity
- Certificate lifecycle** auto-renewal
- OTA reprovisioning** extends asset lifecycle without truck rolls



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