APIS GUIDE 08 · ENERGY

EV charging for *commercial and fleet sites.*

The chargers are the cheap part. How to size to dwell time rather than power, why the grid connection decides the project, and what to settle before anyone quotes.

APIS · EV CHARGING DIVISION

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ABOUT THIS GUIDE

The chargers are *the cheap part.*

Almost every charging proposal is a list of charge points: this many units, at this power, at this price. It is the visible part of the project and usually the smaller part of the cost — and it is very rarely the part that decides whether the project happens.

The charge points are equipment. They arrive on a lorry, they are replaceable, and their technology will change twice within the life of what sits behind them. What sits behind them — the grid connection, the transformer, the switchgear, the cable routes, the trenches under the yard — is expensive, slow to obtain, disruptive to install and effectively permanent. That is where the money and the programme risk are, and it is barely mentioned in most quotations.

This guide covers how to establish what the charging is actually for, why the connection is the binding constraint and how to find out early, how to size to dwell time rather than to headline power, what load management does and what it cannot do, the infrastructure and civils, the fire and safety questions, and what the software and payment layer commits you to. It ends with a forty-point checklist you can attach to a tender.

> WHAT THIS GUIDE DOES NOT CONTAIN, AND WHY
>
> **No power ratings in kilowatts, no charging times, no prices, no tariffs and no payback figures.** Charge point power bands shift with each product generation and with the vehicles actually on the road, and any figure printed here would be obsolete before the project it was quoted for was finished.
>
> The guide works instead from the input that does not shift: **how long the vehicle is parked.** Dwell time is a property of your operation, not of the market, and everything else follows from it. Section 03 sets out how.

Who this is written for

- Operators of vehicle fleets, depots, logistics sites and bus or municipal garages
- Employers providing workplace charging, and landlords providing it to tenants
- Retail, hospitality and leisure sites considering charging for customers
- Public bodies and municipalities procuring charging on their own estate
- Boards, banks and investment committees evaluating a proposal somebody else prepared

What this guide is not

It covers **charging infrastructure on private sites** — depots, yards, car parks and workplaces. It does not cover public charging networks as a commercial business, motorway charging hubs, or vehicle procurement and fleet transition planning, each of which is a separate discipline. It is not a design document and does not replace a qualified electrical designer or a fire engineer.

How to use it

If you are considering charging: Sections 01 to 03 are the feasibility stage and should be worked through before anyone is invited to quote. If you have quotations in front of you: Sections 04 to 07 are how to compare them. Section 09 is the checklist.

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SECTION 01

What is the charging *for?*

Five purposes, and they produce five different installations. Most proposals are written as though there were only one.

A charge point is not a product you select from a catalogue and install. It is the visible end of a system whose shape is determined by who is charging, when, for how long, and who pays. Get that wrong and you will build the right equipment for the wrong operation.

The five purposes

Purpose	What it looks like	What decides the design
Fleet and depot	Own vehicles, returning to a known place, on a known schedule	The **easiest case to design well and the one most often over-specified.** Vehicles are parked overnight for many hours, so power per vehicle can be low and load management is highly effective. The binding requirement is that every vehicle is ready at departure — not that any individual vehicle charges quickly
Workplace	Employee vehicles, parked for a working day	Long dwell, but more vehicles than charge points. The design problem is **allocation and fairness**, not power — who gets a bay, for how long, and how the queue is managed. Frequently solved with more low-power points rather than fewer fast ones
Customer and visitor	Retail, hospitality, leisure, offices with visitors	Dwell time is set by the visit, not by the charge. A restaurant and a supermarket have different answers. Reliability and payment experience matter more than raw power, because a charge point that does not work is a complaint about your brand
Logistics and heavy vehicle	Trucks, buses, municipal vehicles, plant	Large batteries and often short turnaround. The most demanding case: connection capacity is usually the constraint from the outset, and depot layout, cable handling and vehicle movement all become design inputs
Compliance or provision	A requirement attached to a building, a lease, a permit or a policy	Establish exactly what is required — installed points, or cabled bays, or ducting only. The three differ by an order of magnitude in cost, and meeting the requirement with the wrong one is expensive in both directions

> THE DISTINCTION THAT SAVES THE MOST MONEY
>
> **Charging quickly and charging enough are different requirements, and only one of them is usually yours.**
>
> A vehicle parked from six in the evening to six in the morning does not need fast charging. It needs to be full by six. A fleet operator who specifies rapid charging for an overnight depot is buying connection capacity, switchgear and equipment to solve a problem the parking schedule already solved.
>
> Fast charging is expensive precisely where it is least needed and necessary precisely where dwell time is short. Establish the dwell time first, and let it decide the power — not the reverse.

The questions that separate the cases

1. **Whose vehicles?** Yours, your staff's, your customers', your tenants'. This decides who pays, how they pay, and what the software layer in Section 07 must do.
2. **How long are they parked?** The single most important input in this guide. Not how long you would like charging to take — how long the vehicle is actually there.
3. **How many at once?** Not how many vehicles in total, but how many plugged in simultaneously. Section 03 turns this into a number.
4. **What happens if a vehicle is not charged?** A fleet vehicle that cannot run a route is an operational failure. A visitor who charges less than they hoped is an inconvenience. These are not the same requirement and should not be given the same redundancy.
5. **How will this change in five years?** Fleets electrify progressively. A design that exactly fits today's vehicle count will be rebuilt, and Section 05 explains why that rebuild is disproportionately expensive.

> IF THE BUILDING IS TENANTED OR THE SITE IS SHARED
>
> Establish before any design begins: whose electrical supply the charging sits on, who is billed for the energy, whether the lease permits onward supply, what happens at lease end, and who owns the equipment. These are legal and commercial questions and they determine where the installation connects — which is the one thing that is expensive to change afterwards.

SECTION 02

The connection — *the real constraint.*

The longest lead item, the largest hidden cost, and the one most projects investigate last.

Charge points are available quickly and installed in days. A grid connection upgrade is an application, an assessment, a quotation, a contract, a construction programme and an energisation — and it can take many months, cost more than all the equipment combined, and come back as a refusal or a figure that ends the project.

> START HERE, BEFORE ANYTHING ELSE
>
> **Establish your existing available capacity, and apply to the distribution system operator, before any equipment is selected or any budget is presented.**
>
> Every other decision in this guide depends on the answer, and the answer takes the longest to obtain. A proposal that specifies charge points before the connection position is known has been written backwards — and the correction, when it comes, will be presented as a variation.

What to establish, in order

1 · What capacity do you already have, and how much of it is free?

Not the rating on the transformer — the **actual measured peak demand** of the site, from interval data, across a full year. The difference between the two is your headroom, and it is very often larger than assumed, because most sites are connected for a load they no longer have.

This is the cheapest capacity you will ever obtain. A site that can charge within its existing connection avoids the entire reinforcement question, and finding that out costs nothing but the effort of reading your own meter data.

2 · What does the operator permit, and at what cost?

- The maximum capacity available at the existing connection without reinforcement
- What reinforcement would be required for a larger capacity, at what cost and over what programme — both of which are frequently the deciding numbers for the whole project
- Whether the connection is subject to any curtailment or flexible connection arrangement, and what that means operationally
- Metering requirements, and whether separate metering of the charging load is required or advantageous
- Any requirement to notify or obtain approval for the load itself, as distinct from the connection

3 · What does your own installation allow?

The connection is one limit; the site's own electrical infrastructure is another, and it is yours to fix. Establish the capacity and condition of the main switchboard, the spare ways available, the earthing arrangement, the protection discrimination, and whether the existing distribution can carry the new load to where the vehicles are.

THREE COSTS THAT APPEAR LATE AND ARE RARELY IN THE FIRST QUOTATION

- **Network reinforcement**, where the operator requires it. Can exceed the cost of everything else combined
- **A new or upgraded transformer and its housing**, including the civil works, access and any required separation or enclosure
- **The route from the switchboard to the vehicles** — trenching, ducting, reinstatement, and working around an operating site. On a large yard this is a construction project, not an electrical one

Require every tenderer to state these explicitly, or to state that they are excluded. An offer that is silent on them is not comparable to one that includes them.

Three ways to avoid buying capacity you do not need

1. **Load management.** The most effective by a wide margin, and the subject of Section 04. Charging within existing capacity by controlling when and how fast vehicles draw power, rather than by increasing the supply.
2. **Shifting the charging window.** A site whose demand peaks during the working day may have very large headroom overnight — which is exactly when depot vehicles are parked. The two curves frequently fit together without any new capacity at all.
3. **On-site generation or storage.** Solar can offset daytime charging; storage can supply short high-power peaks from a smaller connection. Both are separate investments with their own cases — see Guides 03 and 06 in this series — and neither should be bundled in to make the charging case work.

The programme

The connection determines the programme, and the programme is usually longer than expected. Establish at the outset: the operator's stated timescale for assessment, for quotation, and for construction if reinforcement is required; the permitting required for any transformer, enclosure or excavation; and the constraints of working on an operating site.

Then work backwards from the date the vehicles arrive. Fleet transitions fail more often on infrastructure programme than on vehicle availability, and the failure is expensive because the vehicles are already on lease.

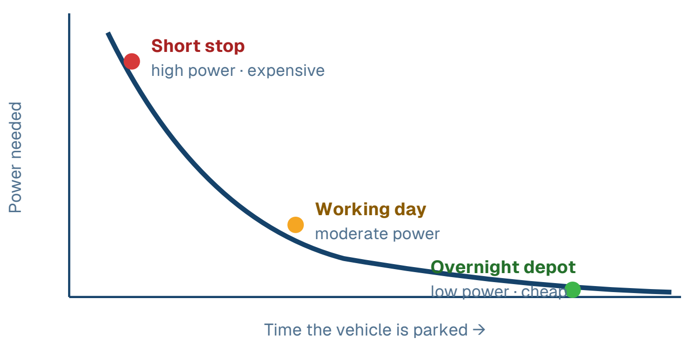
SECTION 03

Sizing to dwell time, *not to power.*

The design input is how long the vehicle is parked. Everything else is derived from it, and almost every over-specified installation got this backwards.

Charge point power is the wrong starting point because it is the answer, not the question. The question is: how much energy does this vehicle need to take on, and how long is it standing still? Power is simply energy divided by time — and on most commercial sites, time is abundant and free while power is scarce and expensive.

DWELL TIME SETS THE POWER — NOT THE OTHER WAY AROUND



Same energy, three costs

Each vehicle needs the same energy. Only the time available differs.

The curve is why over-specifying power on a long-dwell site buys connection capacity, switchgear and equipment for nothing.

Ask: what time do the vehicles need to be ready — not how fast can this charger go.

Figure 3.1 — The relationship between available time and required power. The curve is illustrative of the relationship, not of any specific vehicle or duty.

The four inputs

Energy required per vehicle per day	From actual duty — distance driven, load, terrain, climate, and the vehicle's own consumption. Fleet telematics answer this precisely; assumptions do not
Dwell time	How long the vehicle is genuinely stationary and connected. Not the shift length — the time between plugging in and needing to leave
Simultaneity	How many vehicles are plugged in at the same moment. Almost always fewer than the total, and this is the number that sizes the supply
Tolerance for failure	What happens if a vehicle is not ready. Determines redundancy, spare bays and whether a backup arrangement is required

ASK FOR THE PROFILE, NOT THE SCHEDULE OF RATES

"Show me the modelled site demand profile across a day, from my own vehicle schedule, with the proposed number of points and the proposed power — and show me the peak against my available capacity."

A proposal built on the analysis produces this immediately, because it is how the design was arrived at. One that cannot has selected equipment from a catalogue and counted parking bays. The difference is visible in a minute and it separates most proposals you will receive.

Charge points and parking bays are not the same number

Three arrangements, and the choice has a large effect on both cost and operation:

- **One point per bay.** Simplest to operate, most expensive, and on a long-dwell site the least efficient use of equipment — most points are idle most of the night
- **Shared points serving multiple bays**, by cable reach or by a dual-outlet unit. Fewer units for the same coverage, at the cost of some operational discipline
- **Fewer points with a rotation**, where vehicles are moved. Cheapest in equipment and most expensive in labour and risk — a vehicle that nobody moved is a vehicle that cannot run

On a depot with long dwell, the first arrangement is frequently specified and rarely justified. On a customer site, it usually is justified, because nobody will move a stranger's car.

Design for the fleet you will have

Fleets electrify progressively — a few vehicles, then a route, then a depot. The temptation is to size for today and extend later. Section 05 explains why the civils should be sized for the end state even when the equipment is not: **the trench is dug once, and reopening it costs a multiple of making it larger the first time.**

> THE VEHICLE ALSO LIMITS THE CHARGE
>
> A charge point cannot deliver more than the vehicle will accept, and acceptance varies with state of charge, battery temperature and the vehicle's own limits — falling substantially as the battery fills. Specifying charge point power above what your vehicles can accept buys nothing at all.
>
> Establish the on-board acceptance of the vehicles you actually operate, or intend to operate, before power is specified. This is a question for the vehicle supplier, and it should be answered in writing.

SECTION 04

Load management — what it does *and does not do.*

The single most effective way to avoid buying grid capacity, and the single most over-promised item in a charging proposal.

Load management is the control of when and how fast vehicles draw power, so that the total never exceeds a set limit. It is what makes it possible to connect many charge points to a supply that could not serve them all at full power simultaneously — which is almost every commercial site.

What it does

- **Caps the total charging load** at a value you set, by reducing the power delivered to individual vehicles when the total would otherwise exceed it
- **Shares available capacity** between connected vehicles, by a rule you choose — equally, by priority, by departure time, or by a queue
- **Follows the rest of the site**, where it measures the whole-site demand rather than only the chargers, so that charging uses whatever the building is not using at that moment. This is the arrangement that unlocks the most capacity and it should be the default ask
- **Shifts charging in time**, to overnight, to a cheaper period, or to when on-site generation is available

> SPECIFY WHOLE-SITE LOAD MANAGEMENT, NOT CHARGER-GROUP LOAD MANAGEMENT
>
> Two arrangements are sold under the same name and they are not equivalent.
>
> **Charger-group management** shares a fixed allocation between the charge points. Simple, and it wastes whatever the rest of the site is not using.
>
> **Whole-site management** measures the total site demand at the incoming supply and gives charging the remainder in real time. It requires a meter at the incoming supply and a communication path to the controller — a small cost that frequently avoids a connection upgrade entirely.
>
> Ask which is offered. If a proposal says “load management” without saying which, assume the first.

What it does not do

1. **It does not create energy.** If the vehicles collectively need more energy overnight than the capacity can deliver in those hours, load management cannot resolve it. It reshapes the demand; it does not reduce the total. Establish the energy balance before relying on it.
2. **It does not fix a short dwell window.** Where vehicles are parked briefly, there is nothing to shift and load management delivers little.
3. **It does not work if it is not commissioned.** The most common failure is not technical: the limit is set to a default, or set generously, or disabled during a fault and never re-enabled. Section 07 covers what to verify.
4. **It does not remove the need for protection coordination.** The electrical design must still be safe at the maximum the system can physically draw, whatever the controller is set to.

What to require in the specification

- **Whole-site measurement** at the incoming supply, with the limit stated as a settable value

- **Defined behaviour on communication loss —** the system must fail to a safe low value, not to full power. This is a specific question to ask, and the answer is occasionally uncomfortable
- **The allocation rule**, and whether priority or departure-time scheduling is supported, which matters on a fleet site where some vehicles leave earlier
- **Demonstration at commissioning —** the limit proved by test, with vehicles or a load bank, not asserted in a document
- **Visibility —** that you can see the limit, the current total and the allocation, and that you are told when the system has been throttling

> THE QUESTION THAT REVEALS WHETHER IT WAS ACTUALLY DESIGNED
>
> **“What happens on the worst night — every vehicle back, every vehicle empty, all plugged in at once? Show me the modelled outcome and tell me which vehicles are not ready by departure.”**
>
> Load management always works on an average night. The design question is what it does on the bad one, and whether the answer is acceptable to the operation. If the response is that this cannot happen, ask what happens if it does.

SECTION 05

Infrastructure, civils *and the things done once.*

Equipment is replaceable. Trenches are not. The decisions that are effectively permanent are made early and cost almost nothing to make well.

A charging installation has two halves with completely different lifetimes. The charge points will be replaced — technology moves, units fail, standards evolve, and a fifteen-year-old charge point is an obsolete one. The infrastructure behind them — ducts, cables, foundations, switchgear rooms — will still be there long after, and every one of those elements is disproportionately expensive to change once the surface is closed.

> SIZE THE CIVILS FOR THE END STATE, EVEN IF YOU INSTALL A FRACTION OF THE EQUIPMENT
>
> The excavation, the ducting, the reinstatement and the disruption of working across an operating yard are largely independent of how many cables go into the trench. Installing spare ducts and larger cable routes at the time of the first trench costs a small fraction of what it will cost to reopen the ground in three years.
>
> This is the highest-return decision in the entire project, it is made on a drawing, and it is the first thing removed when a budget is tightened — because its benefit falls in a later financial year than its cost.

What to design for the end state

- **Duct capacity and route** — spare ducts, draw pits at sensible intervals, and a route that reaches every bay you might ever use rather than only those being equipped now
- **Cable sizing** to the final load, not the first phase. Cable is a modest part of the cost of installing cable
- **Switchboard capacity and spare ways**, and physical space in the switch room for the boards that phase two will need
- **Transformer position and space**, including access for eventual replacement and any required enclosure or separation
- **Foundations and mounting** — bases, bollards and pedestals installed for bays that will be equipped later, which are cheap while the ground is open
- **Communication routes** — data cabling or conduit to every position, since retrofitting a wired connection is the same excavation problem as the power

Layout — the part decided by how the site actually works

- **Cable reach and handling.** Where the connector is on each vehicle differs between models, and a layout that assumes one arrangement will not suit a mixed fleet. Establish the connector positions on the vehicles you operate
- **Vehicle movement.** Charging bays must work with how the yard is driven — reversing, turning circles, trailer swing, and the route a vehicle takes on arrival
- **Cable protection.** Cables lying across a trafficked yard are a hazard and a failure mode. Overhead arrangements, retractors and cable management belong in the layout, not in an operational instruction
- **Protection of the units themselves** from vehicle impact, which is the commonest cause of physical damage
- **Lighting and visibility** at the bays, since much depot charging happens in the dark

- **Accessibility** — bay dimensions, approach and reach for users with reduced mobility, where the charging serves staff, visitors or the public

> INSTALLED, CABLED, OR DUCTED — DECIDE PER BAY
>
> Three levels of provision, and a well-designed site uses all three:
>
> - **Installed** — charge point in place and energised. For bays needed now
> - **Cabled** — cable and protection in place, unit not fitted. Adding the unit later is a day's work with no excavation
> - **Ducted** — route and draw pits in place, no cable. Adding a bay later means pulling cable, not digging
>
> Deciding this bay by bay, at design stage, is how a phased rollout stays affordable. It is also frequently what a compliance requirement actually specifies — see Section 01.

Where the vehicles are undercover

Charging in a multi-storey or underground car park raises questions that do not arise in an open yard: ventilation, drainage, fire compartmentation, structural loading of the equipment, and access for emergency services. These are addressed in Section 06 and they should be raised at concept stage, because they can determine where charging is permitted at all.

SECTION 06

Safety, fire *and standards.*

Two conversations that arrive late and can constrain the design after it has been drawn — and the standards that make equipment comparable between tenderers.

The electrical requirements

Charging installations have specific requirements that differ from general electrical installation practice, and they are the ones most often missed by an installer working outside their normal field.

- **Residual current protection.** Electric vehicle charging has particular requirements regarding the type of residual current protection and the detection of direct current fault currents. This is addressed within IEC 60364-7-712 and the equipment standards, and it is a specific question to put to the designer rather than an assumption
- **Earthing arrangement.** The site's earthing system and its suitability for outdoor charging positions must be established, and where it is not suitable the alternative arrangement designed rather than improvised
- **Protection coordination** across the added load, at the maximum the installation can physically draw regardless of the load management setting
- **Surge protection**, given that charge points are frequently the most exposed equipment on the site, at the end of long external cable runs. IEC 62305 addresses lightning protection more generally
- **Isolation and emergency stop** — where the isolation points are, whether an emergency stop is required, and who can operate it
- **Ingress and impact protection** appropriate to an outdoor, trafficked environment

> FIRE: RAISE IT AT CONCEPT STAGE, PARTICULARLY UNDERCOVER
>
> Electric vehicle fires are less frequent than internal combustion vehicle fires but behave differently, and the fire strategy for a building is written on assumptions about what is parked in it. Where charging is proposed inside a structure — a multi-storey car park, an underground car park, or an enclosed depot — **the existing fire strategy must be reviewed by a fire engineer, and it may need to change.**
>
> The questions include the location of charging within the structure, separation and compartmentation, detection and suppression provision, ventilation and smoke control, structural protection, water supply and drainage, and access and information for the fire service.
>
> **This guide states no requirement and no distance**, because the applicable position varies by country and by building and is changing. What it states is that the question must be asked by a competent fire engineer, in writing, before the layout is fixed — and that the insurer must be asked at the same time, because insurers hold their own requirements for charging installations and they vary.

Standards to name in the specification

Naming the standards is what makes equipment comparable between tenderers rather than a matter of brand assertion.

- **IEC 61851 series** — electric vehicle conductive charging systems, covering general requirements, alternating current charging, direct current charging stations and the digital communication between vehicle and charging station

- **IEC 62196 series —** plugs, socket-outlets, vehicle connectors and vehicle inlets for conductive charging, which defines the connector types
- **ISO 15118 series —** vehicle-to-grid communication interface, which underlies automatic authentication at the connector and bidirectional charging where supported
- **IEC 60364-7-712 —** low-voltage installations, requirements for supplies for electric vehicles
- **IEC 61439 series —** low-voltage switchgear and controlgear assemblies, for the distribution equipment
- **IEC 62305 series —** protection against lightning
- **EN 17186 —** identification of compatibility between vehicles and charging infrastructure, which governs the labelling users see at the connector

Where bidirectional charging or vehicle-to-site export is intended, the connection requirements for generating plant also apply — **EN 50549** is the European reference, and the distribution system operator's own requirements govern above it. Establish that position before specifying bidirectional equipment, because permission is not automatic.

> ASK FOR THE CERTIFICATES, FOR THE PRODUCTS ACTUALLY OFFERED
>
> Require type test certificates and declarations of conformity for the specific charge point and switchgear models being supplied — not for a similar model, an earlier version, or the manufacturer's range in general. Then check at delivery that what arrives matches what was certified.
>
> Where the charging will be billed to a third party, also establish that the energy metering within the charge point is of a type approved for billing purposes in your jurisdiction. This is a specific approval and not every unit carries it. Section 07 returns to this.

Operational safety

- Cable management so that connecting cables are not a trip hazard or a driving hazard
- A defined procedure for damaged cables, connectors and units, and for a vehicle that cannot be disconnected
- Competence requirements for anyone maintaining the installation, which is electrical work in an outdoor trafficked environment
- Signage and user instruction at the bays, in the languages the users actually read
- Information for the fire service on the presence, location and isolation of charging

SECTION 07

Software, payment, access *and data.*

The part of the system with the shortest life, the longest contract, and the most potential to lock you in.

Every charge point above the simplest connects to a back-office platform that authorises sessions, records energy, produces billing, monitors faults and applies the load management settings. That platform is usually supplied by the manufacturer or the installer, on a subscription, under terms that are rarely examined at tender stage — and it is where the long-term commercial exposure of a charging installation sits.

SPECIFY AN OPEN PROTOCOL, AND CONFIRM IT IS GENUINELY IMPLEMENTED

OCPP — the Open Charge Point Protocol — is the open standard by which a charge point communicates with a back office. Where it is properly implemented, you can change platform provider without changing hardware. Where it is not, you cannot, and the equipment is tied to one supplier for its life.

Specify the protocol and a minimum version. Then ask the harder question: **"which functions are implemented, which are proprietary extensions, and can you name a site where this hardware has been migrated to a different back office?"** Partial implementations are common, and a charge point that speaks the protocol for basic sessions but requires proprietary tooling for firmware, configuration or load management is locked in for every purpose that matters.

What the platform must do, by purpose

Purpose	What matters
Fleet and depot	Scheduling against departure times, per-vehicle energy records, alerting when a vehicle will not be ready, and integration with fleet management or telematics. Payment is irrelevant; readiness is everything
Workplace	Access control by employee, fair allocation, queueing or notification when a bay frees, and a defensible record if energy is recharged to staff or treated as a benefit
Customer and visitor	Payment without an app or an account being mandatory, clear pricing displayed before the session, reliability, and a support route for a user who cannot start a charge. A visitor stuck at a charge point is a complaint about your business, not about your supplier
Tenant or shared site	Per-user metering and billing accurate enough to be recharged, and a clear answer on whose contract the energy sits under

Six questions to settle before contract

1. **What does the subscription cost, per point, per year, and for how long is the price held?** Over ten years this frequently exceeds the hardware cost, and it is rarely shown alongside it.
2. **What happens if you stop paying?** Do the charge points continue to work in a reduced local mode, or do they stop? The answer determines how much leverage the provider holds at every renewal.
3. **Who owns the data?** Session records, energy, vehicle identifiers, user identities and site demand. Establish that you can export it, in a usable format, at any time and at the end.

4. **Who can change settings remotely, including the load management limit?** A third party able to alter your site demand limit without your knowledge is an operational and a contractual exposure.
5. **What are the firmware update arrangements?** Who initiates them, what testing occurs, and what happens if an update breaks compatibility — which has happened across the industry.
6. **What are the support terms?** Response times, remote versus attendance, spares holding, and what “uptime” is actually defined to mean in the contract.

> IF YOU ARE BILLING ANYONE FOR THE ENERGY
>
> Two requirements follow, and both are specific.
>
> **Metering.** The energy measurement used as the basis of a charge to a third party must be of a type approved for that purpose in your jurisdiction. Not every charge point carries that approval, it cannot be added afterwards, and discovering the gap after installation means either replacing units or not billing.
>
> **Data protection.** Charging records identify individuals and their movements. Establish the lawful basis, the retention period, what the platform provider does with the data and where it is held. In Kosovo and the surrounding region this is governed by the applicable personal data protection law, and it is a question for counsel rather than for the equipment supplier.

Roaming and public access

Where charge points are to be usable by drivers outside your organisation, the platform must support roaming — commonly through OCPI, the Open Charge Point Interface — so that sessions can be authorised and settled across providers. Establish which roaming arrangements are supported, what they cost per session, and whether joining one is a decision you can reverse.

SECTION 08

Contract, operation *and the business case.*

No figures here — only the positions to establish before any number you are shown means anything.

Establish these, in writing, before evaluating anything

Position	From	Why it decides the case
Existing available capacity and measured site peak	Your own interval data	Determines whether a connection upgrade is needed at all — the largest single variable in the cost
Cost and programme of any reinforcement	DSO, in writing	Can exceed everything else combined, and can end the project
The full delivered electricity price, by component	Supplier and tariff	The running cost of charging, and the basis of any recharge to users
Whether demand charges apply, and how they are measured	Supplier	A single charging peak can set a demand charge for a whole period. This is often the strongest argument for load management
Any time-of-use structure	Supplier	Determines whether shifting charging overnight has value beyond capacity
Fire and insurer position	Fire engineer, insurer	Can constrain location and layout. See Section 06
Metering approval requirement, if billing	Legal / metrology authority	Determines which equipment is eligible at all
Lease and site ownership position	Legal	Determines whose supply, whose equipment, and what happens at lease end
Vehicle acceptance and arrival dates	Fleet / vehicle supplier	Sets both the technical requirement and the programme deadline

The cost structure

Grid connection	Application, assessment, any reinforcement, transformer, energisation
Electrical infrastructure	Switchgear, distribution, protection, cabling, metering, earthing and surge protection
Civils	Excavation, ducting, foundations, bollards, reinstatement, working around an operating site
Charge points	The visible equipment — and typically the smaller share
Load management and controls	Controller, incoming supply metering, communications
Design, permitting and fire assessment	Including the fire engineering input, frequently omitted from budget proposals
Recurring	Subscription and back office, maintenance, support, insurance, electricity
Replacement within life	Charge points will be replaced at least once within the life of the infrastructure. This belongs in the case from the start

COMPARE ON LIFETIME COST, NOT ON THE PRICE OF THE POINTS

Two proposals with similar equipment prices can differ substantially once the connection works, the civils, the subscription over ten years and the eventual replacement of the units are included — and the cheaper equipment is frequently the one tied to the more expensive platform.

Guide 07 in this series sets out how to build that comparison and how to write it into a tender so that bidders compete on it. Charging is a case where it changes the answer more often than not.

Operation and maintenance

Activity	Why
Availability monitoring	The core activity. Faults are frequently invisible until someone cannot charge. Set an expectation, monitor against it, and define who is called
Physical inspection	Cables, connectors, enclosures, impact damage, water ingress. Connectors and cables are the highest-wear items and the commonest failure
Electrical inspection and testing	Per the applicable regime, including verification of the residual current protection
Load management verification	Confirm the limit is still set and still enforced. This drifts, and nobody notices until a demand charge or a trip reveals it
Firmware and platform updates	Controlled, tested, and with a route back if an update causes a problem
Energy and session review	Consumption against expectation, and per-vehicle records against duty. Also how you find a vehicle that is not charging properly
Cleaning and access	Bays kept clear and usable. The commonest operational failure on a workplace site is a charging bay occupied by a vehicle that is not charging

On payback claims generally. Any payback figure quoted for a charging installation depends on the connection position, the electricity price, the duty of the vehicles and whether the energy is recharged to users. A figure quoted before anyone has read your interval data and confirmed your connection headroom is marketing, not engineering.

SECTION 09

The forty-point *checklist.*

Attach it to the tender. If every box can be ticked before contract, the installation will do what the paper said.

A · DEFINITION AND DATA

- [ ] Purpose stated — fleet, workplace, customer, heavy vehicle or compliance
- [ ] Whose vehicles, and who pays for the energy, established
- [ ] Dwell time established from actual operation, not from assumption
- [ ] Energy required per vehicle per day established from duty or telematics
- [ ] Simultaneity established — how many plugged in at once, not how many vehicles
- [ ] Consequence of a vehicle not being ready defined
- [ ] Five-year fleet growth reflected in the design
- [ ] Lease and site ownership position settled where the site is shared or tenanted

B · THE CONNECTION

- [ ] Measured site peak obtained from twelve months of interval data
- [ ] Existing available headroom established before any equipment selected
- [ ] DSO application submitted early, in parallel with design
- [ ] Maximum capacity without reinforcement confirmed in writing
- [ ] Reinforcement cost and programme obtained in writing where required
- [ ] Any flexible or curtailable connection terms understood operationally
- [ ] Metering requirements confirmed with the operator
- [ ] Existing switchboard capacity, spare ways and earthing arrangement assessed
- [ ] Programme worked backwards from vehicle arrival dates

C · SIZING AND LOAD MANAGEMENT

- [ ] Modelled site demand profile produced from your own vehicle schedule
- [ ] Modelled peak shown against available capacity
- [ ] Worst-case night modelled, with vehicles not ready identified
- [ ] Vehicle on-board acceptance confirmed in writing from the vehicle supplier
- [ ] Charge points per bay decided deliberately, not by default
- [ ] Whole-site load management specified, not charger-group only
- [ ] Failure behaviour on communication loss specified as fail-to-low
- [ ] Allocation rule and departure-time priority specified where relevant
- [ ] Load limit demonstrated by test at commissioning

D · INFRASTRUCTURE, SAFETY AND FIRE

- [ ] Civils, ducts and cable routes sized for the end state, not phase one
- [ ] Bay provision decided individually — installed, cabled or ducted
- [ ] Layout checked against vehicle movement, connector positions and cable handling
- [ ] Impact protection, lighting and accessibility addressed
- [ ] Residual current protection type confirmed by the designer
- [ ] Earthing arrangement confirmed suitable, or an alternative designed
- [ ] Protection coordinated at the maximum physical draw, not the managed limit
- [ ] Equipment standards named for the specific products offered, certificates checked at delivery
- [ ] Fire engineer engaged in writing before layout is fixed, especially undercover
- [ ] Insurer position obtained in writing at feasibility stage

E · SOFTWARE AND OPERATION

- [ ] Open protocol specified, with implemented functions and a migration reference confirmed
- [ ] Subscription cost, term, price protection and end-of-contract behaviour agreed
- [ ] Data ownership, export and remote-change rights agreed before contract
- [ ] Billing-approved metering confirmed where energy is recharged, and data protection basis established

Project readiness sign-off

Complete and retain with the tender documents.

EV CHARGING READINESS SIGN-OFF

Item	Name and role	Date and signature
Site and purpose		
Measured site peak and headroom		
DSO application submitted		
Dwell time and simultaneity confirmed by		
Fire assessment by		
Insurer position confirmed		
Checklist points 1–40 confirmed		
Released for tender by		

IF YOU CAN ONLY DO THREE THINGS

One. Read your own interval data and apply to the distribution system operator before anyone selects equipment. The connection decides the project.

Two. Establish dwell time, and let it set the power. Fast charging is expensive exactly where it is least needed.

Three. Size the ducts and cable routes for the end state while the ground is open. It is the cheapest decision in the project and the most expensive to reverse.

REFERENCE

Standards referred to *in this guide.*

Listed by number and subject so that you can obtain and read them. Confirm the current edition and the applicable national adoption before citing any of them.

STANDARDS REGISTER

Reference	Subject
IEC 61851 series	Electric vehicle conductive charging system — general requirements, alternating current charging, direct current charging stations, and digital communication between vehicle and charging station
IEC 62196 series	Plugs, socket-outlets, vehicle connectors and vehicle inlets — conductive charging of electric vehicles
ISO 15118 series	Road vehicles — vehicle to grid communication interface
IEC 60364-7-712	Low-voltage electrical installations — requirements for special installations: supplies for electric vehicles
IEC 61439 series	Low-voltage switchgear and controlgear assemblies
IEC 62305 series	Protection against lightning
EN 17186	Identification of compatibility between vehicles and charging infrastructure — user labelling at the connector
EN 50549 series	Requirements for generating plants connected in parallel with distribution networks — relevant where bidirectional charging or export is intended
ISO 50001	Energy management systems — relevant where the site operates a formal energy programme
OPEN PROTOCOLS REFERRED TO	
OCPP	Open Charge Point Protocol — communication between charge point and back-office platform. An open industry protocol, not an ISO or IEC standard
OCPI	Open Charge Point Interface — roaming and interoperability between charging networks. Likewise an open industry protocol

HOW TO USE THIS REGISTER — AND WHAT GOVERNS ABOVE IT

Standards are revised, withdrawn and superseded. Verify the current edition with the national standards body applicable to your project, and confirm that the clause you intend to rely on still says what you think it says. Nothing in this guide should be relied upon as a statement of the content of any standard or protocol.

For a charging installation specifically, the requirements of the distribution system operator, the authority responsible for permitting and fire safety at the site, the metrology authority where energy is billed, and the insurer govern above all of the above. Where they differ from anything in this guide, they prevail.

About APIS

APIS is an integrated engineering group founded in Kosovo, operating across the Western Balkans and into the European Union. The Group delivers mechanical, electrical, energy and infrastructure works through twenty-one delivery divisions across two strategic business units — Building Systems & Technologies, and Energy, Industry & Infrastructure — supported by four engineering excellence centres. APIS operates management systems certified to ISO 9001, ISO 14001, ISO 45001 and ISO 50001.

The **EV Charging Division** designs and delivers charging infrastructure for fleets, depots, workplaces and commercial sites — from connection assessment and load modelling through electrical design, civils, installation and commissioning to long-term operation. Work is delivered under the Group's DBOM lifecycle model — design, build, operate and maintain — so that the party which sizes the installation is accountable for it working on the worst night, not the average one.

Prepared by the APIS EV Charging Division · **Document** APS-GD-08 issue v1.0 of 20 August 2026 · **Contact** apisgroup.net/contact

Been quoted a number of chargers, *but not a connection?*

Most sites are. Our engineers will read your interval data, establish what your existing connection can already carry, model your vehicles against it hour by hour, and tell you what you actually need to build — including whether you need a connection upgrade at all.

SPEAK TO THE EV CHARGING DIVISION

Connection assessment and headroom analysis · dwell-time and load modelling · whole-site load management · electrical design and civils · fire and insurer coordination · installation and commissioning · long-term operation and monitoring

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