Learn EV Charging

FUNDAMENTALS

# The EV Charging Cheat Sheet

Levels, connectors, kW vs kWh, and why charging speed changes — the one-page mental model for anyone new to EV charging.

Plain-English fundamentals for drivers, and a fast refresher for the people building charging.

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CHEAT SHEET

# What's inside

Everything here is accurate for 2026, with North American and European connectors given equal weight — because the plug on your car depends on where you are.



**ONE RULE TO REMEMBER**

Charging speed is set by the **slowest** link in the chain — the charger, your car, the battery's state, and its temperature. A 350 kW charger won't help a car that accepts 50.

01 · THE THREE LEVELS

# Level 1, Level 2, DC fast

Charging is grouped into three levels by how much power they deliver. More power = faster, but also more expensive equipment and wiring.

| Level | Power source | Typical power | Range added per hour |
|---|---|---|---|
| **Level 1** | Standard wall outlet (120 V in North America) | 1.4–1.9 kW | ~3–5 mi (5–8 km) — overnight top-ups |
| **Level 2** | 240 V (NA) / 230–400 V single- or three-phase (Europe) | 3.7–22 kW | ~12–40 mi (20–65 km) — home, work, public |
| **DC fast** | High-voltage DC, straight to the battery | 50–350+ kW | ~100+ mi in 20–30 min — highways, hubs |

### Level 1 & 2 are AC

The car's onboard charger converts AC to DC. That converter caps your AC speed — often 7.4, 11, or 22 kW — no matter how big the charger is.

### DC fast is different

The station does the AC→DC conversion itself and feeds DC straight to the battery, bypassing the onboard charger. That's why it's so much faster.

**RULE OF THUMB**

Level 1 for plug-in hybrids or very low mileage. **Level 2** is the daily-driver sweet spot at home and work. DC fast is for road trips, not everyday use.

02 · CONNECTORS

# The plugs — North America & Europe

Which plug you use depends on your region and whether you're charging AC or DC. The two markets are converging on combined AC+DC connectors.

## North America

| Connector | Charging | Notes |
|---|---|---|
| **NACS (SAE J3400)** | AC + DC | Tesla's connector, now the North American standard — most automakers are adopting it. One small plug for both. |
| **J1772 (Type 1)** | AC (L1/L2) | The long-standing AC standard; adapters to/from NACS are common. |
| **CCS1** | DC fast | J1772 plus two DC pins. Widespread, now being superseded by NACS. |
| **CHAdeMO** | DC fast | Legacy — older Nissan Leaf. Being phased out in North America. |

## Europe

| Connector | Charging | Notes |
|---|---|---|
| **Type 2 (Mennekes)** | AC | The AC standard, single- or three-phase (three-phase enables 11–22 kW at home/public). |
| **CCS2** | DC fast | Type 2 plus DC pins — the European DC fast standard. |
| **CHAdeMO** | DC fast | Legacy, phasing out in favour of CCS2. |

Elsewhere: China uses its own **GB/T** connectors (separate AC and DC). Adapters bridge many combinations, but always confirm both the plug *and* the charging speed it supports.

03 · THE UNITS

# kW vs kWh — power vs energy

These two get mixed up constantly. One is a *rate*; the other is an *amount*.

### kW = power (the rate)

How fast energy flows *right now*. A charger's speed is in kW. Think of it as the width of the hose.

### kWh = energy (the amount)

How much energy in total. Your battery's capacity is in kWh. Think of it as the size of the bucket.

THE ONE EQUATION

**Power (kW) × Time (h) = Energy (kWh)**

Deliver 1 kW for 1 hour and you've moved 1 kWh. A 60 kWh battery, charging at 10 kW, needs roughly 6 hours to go empty-to-full (before real-world losses and slow-down).

## Where each shows up

- **Battery size** → kWh (e.g. a 77 kWh pack).
- **Charging speed** → kW (e.g. 11 kW at home, 150 kW at a fast charger).
- **Efficiency** → Wh/mi or kWh/100 km (how far a given amount of energy takes you).
- **Your bill** → usually per kWh (energy used), sometimes per minute (time plugged in).

04 · CHARGING SPEED

# What actually sets your speed

Your real charging speed is whichever of these is **lowest** at that moment:

1. **The charger's maximum power** — its rated kW.
2. **Your car's maximum accepted rate** — the onboard charger for AC (e.g. 11 kW), or the battery/architecture for DC (e.g. 150 kW).
3. **The battery's state of charge** — DC charging slows as the battery fills (the "curve," next page).
4. **Battery temperature** — a cold battery charges slowly. Many EVs *precondition* (warm) the battery on the way to a fast charger to fix this.

> **GOTCHA**
>
> Plugging a 50 kW-max car into a 350 kW charger still gives you 50 kW. And a 22 kW home charger does nothing extra for a car whose onboard charger tops out at 11 kW. Match expectations to the *slowest* link.

> **COLD-WEATHER TIP**
>
> In winter, precondition the battery before a fast-charge stop (many cars do this automatically when you navigate to a charger). A cold pack can cut fast-charging speed dramatically.

# AC vs DC & the charging curve

## Why DC is fast

Batteries store **DC**. On AC charging the car's onboard charger converts AC→DC, and that small converter is the ceiling (often 7–11 kW). DC fast chargers do the conversion in the (big, expensive) station and send DC straight to the pack — so they can push far more power.

## The charging curve

DC charging is **not** a constant speed. It's fastest when the battery is low and tapers as it fills — sharply above ~80% — to protect the cells. That's why fast-charge stops are quoted as **10–80%**, not 0–100%.

> **ROAD-TRIP MATH**
> Charging 10→80% is usually far faster than 80→100%. On a long trip, several short stops to 80% beat one long stop to 100%.

### Use AC when...

You're parked a while — home, work, overnight, all-day. Cheaper, gentler on the battery, and speed doesn't matter when you're asleep.

### Use DC when...

You're on the road and need range fast. Stop to ~80%, then go — chasing the last 20% wastes time.

# Cost, battery care & glossary

### Cost

Home charging is usually cheapest (your residential kWh rate, lowest overnight). Public DC costs more — priced per kWh or per minute, sometimes with idle fees for staying plugged in after you're done.

### Battery care

For daily use, keep it roughly **20–80%**. Charge to 100% only before a long trip, and don't leave it sitting full or near-empty for long. Occasional DC fast charging is fine; AC is gentler.

## Glossary

| | |
|---|---|
| **SoC** | State of Charge — how full the battery is, as a %. |
| **EVSE** | Electric Vehicle Supply Equipment — the proper name for "the charger." |
| **Onboard charger** | The AC→DC converter in the car; sets your maximum AC speed. |
| **Charging curve** | How DC speed tapers as the battery fills. |
| **Preconditioning** | Warming the battery before fast charging so it accepts full power. |
| **Efficiency** | Energy per distance — Wh/mi or kWh/100 km. Lower is better. |

Learn EV Charging

KEEP GOING

# Now you speak EV charging.

Go a level deeper with the full explainers on the site (tap to read):

- What is EV charging — the whole picture, start to finish
- kW vs kWh, explained — with everyday examples
- Every fundamentals guide — the full library

Free, vendor-neutral guides and tools for everyone in EV charging — from first-time drivers to the people building it.

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