Electric Vehicle Fleet Charging Energy and Demand

Daily charging energy, average power over the charging window, peak demand with diversity and number of chargers needed for a fleet of electric vehicles.

Method: Fleet charging energy balance

Input parameters

Unit system: SI

Parameter	Value	Unit
Vehicles	50.000	
Distance per vehicle per day	180.00	km
Consumption at the wheels from the battery	220.00	Wh/km
Charging efficiency (grid to battery)	90.000	%
Charging window	8.0000	h
Charger power	22.000	kW
Diversity factor (share charging at once)	80.000	%

Calculated results

Parameter	Value	Unit
Grid energy per day	2.2000	MWh
Average power over the window	275.00	kW
Chargers needed (each runs the whole window)	13.000	
Peak demand with diversity	275.00	kW

Notes for this case

• Energy = N·d·e/η; chargers so that energy fits the window; peak = chargers × power × diversity (not below the average). Smart charging can flatten the peak towards the average power.

Formula and method

$$E = \frac{Nde}{\eta_c}, \quad n_c = \left\lceil \frac{E}{P_c t_w} \right\rceil, \quad P_{pk} = n_c P_c k_d$$

Variables

N	Vehicles	-
d	Distance per vehicle per day	m
e	Consumption at the wheels from the battery	J/m
η_c	Charging efficiency (grid to battery)	-
t_w	Charging window	s
P_c	Charger power	W
k_d	Diversity factor (share charging at once)	-
E	Grid energy per day	J
$\bar{P}$	Average power over the window	W
n_c	Chargers needed (each runs the whole window)	-
P_{pk}	Peak demand with diversity	W

Method and standards

Fleet charging.

Assumptions and limits

- Daily average duty; one charging window.

References

Fleet charging energy balance

Report details

Report reference	FCC-MQDF-RP4R (the same inputs always give the same reference)
Generated	23 November 2026, 18:18 UTC
Calculator	Electric Vehicle Fleet Charging Energy and Demand
Method last reviewed	17 November 2026
Software release	FireCAD Calc, release of 22 November 2026
Release checks	3 reference cases of this calculator, computed independently, are checked on every release

Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

https://calc.firecad.com/automotive/electric-vehicles/ev-fleet-charging-demand

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.