Power and Energy Calculator tool for Workplace Charging

This tool is designed to help Electric Vehicle (EV) owners and employers or property management calculate, decide, and plan for workplace charging (WPC). The numbers in these calculations should not be considered definitive, but rather as planning estimates.

If the EV owner has home charging, you should expect them to charge their vehicles at home and use the WPC only to top off the battery after the morning commute and trips that occur during the workday. If the EV owner doesn't have home charging option available, this calculation should include all driving. EVs also have a preheating/cooling function that allows users to preheat or cool the car to a chosen temperature using grid power before they leave. The WPC system can be used to provide energy for preheating/cooling when needed. If the parking is located in a heated/cooled garage, the user naturally does not need to use this function, but if the parking is outdoors and the weather is cold or hot, this is a good feature to have. The energy needed for this function should be considered when calculating energy needs. As a rough calculation number, we use 1kWh per heating event or 0.5kW per cooling event. Some Plug-in Hybrids (PHEVs) have relatively small batteries that might limit how much energy they can draw in a day.

Energy and Power needs:

		Numbers	Example
1	Vehicle make and model		Tesla Model 3
2	Charger size (in car, www.EVInfoList.com)	kW	11.5 kW
3	Electricity consumption (www.fueleconomy.gov)	kWh/mile	0.28 kWh/mile
4	Driving range on electricity (EPA)	miles	310 miles
5	Commuting distance	miles	10 miles
6	Average other daily driving	miles	5 miles
7	Total daily mileage (= Row 5 + Row 6)	miles	15 miles
8	Average daily energy needs from driving: Compare rows 4 and 7 and choose the smaller number then multiply it by row 3. (=Row 4 or 7 * row 3).	kWh	4.2 kWh (15 * 0.28)
9	If there is a need for preheating add 1 to this row. If just precooling add 0.5 to this row. If both add 1.	kWh	1 kWh
10	Total energy need (=Row 8 + Row 9)	kWh	5.2 kWh
11	Charging time using 110 V Level 1 charging cord (=Row 10 / 1.2)	Hours	4.3 Hours
12	Charging time using 240 V Level 2 EVSE (=Row 10 / Row 2) (In real life EVSE might limit this)	Hours	0.5 Hours
13	How long is the car parked during the day	Hours	8 Hours

Please compare the charging times in rows 11 and 12 to the parked time in row 13. If the Level 1 charging time (Row 11) is shorter than the time that the owner expects the car to be parked at work, then Level 1 charging can be considered, but if it is longer, then Level 2 EVSE is needed.

Next we will calculate the average energy consumption figures and average energy costs.

Average Energy Consumption and Energy Costs

		Numbers	Example
1	Vehicle make and model		Tesla Model 3
2	Charger size (in car, contact dealer for this info)		11.5 kW
3	Electricity consumption (EPA)	kWh/mile	0.28 kWh/mile
4	Driving range on electricity (EPA)	miles	310 miles
5	Commuting distance	miles	10 miles
6	Average other daily driving	miles	5 miles
7	Total daily mileage (= Row 5 + Row 6)	miles	15 miles
8	Average daily energy needs from driving Compare rows 4 and 7 and choose the smaller number then multiply it with row 3. (=Row 4 or 7 * row 3).	kWh	4.2 kWh (15 * 0.28)
9	How many days/year user expects to need the precooling	Days	30 days
10	Average preheating energy need (=Row 9 / 250 * 0.5kWh)	kWh	0.1 kWh
11	How many days/year user expects to need the preheating	days	50 days
12	Average preheating energy need (=Row 11 / 250 * 1kWh)	kWh	0.2 kWh
13	Total energy need (=Row 8 + Row 10 + Row 12)	kWh	4.7 kWh
14	Cost of energy	$/kWh	0.12$/kWh
15	Average daily energy cost (=Row 13 * Row 14)	dollars	0.54 dollars
16	Average monthly energy cost (=Row 15 * 22)	dollars	11.90 dollars

Rows 15 and 16 show the estimated average energy costs. These give a pretty good idea of how much charging energy the EV will consume and can be used as a base assumption when discussing the metering and payment options.

Exceptions and modifications to these calculations
- If the user expects a lot of variation in daily driving mileage, it might be good to do a “worst case scenario” calculation, too.

Remember that there is some seasonal variation to these numbers in cold climates. In the summer the power consumption will be somewhat lower and in the winter, it will be a bit higher. Variation can be expected to be +/- 20%.