

## Location

Shooting Star Casino  
777 South Casino Road  
Mahnomen MN, 56557

# Mahnomen fast-charging station

This site is conveniently located in Mahnomen off US Highway 59 at Shooting Star Casino. Plug into the station for a fast charge and pay through the Shell Recharge App or by card.

## Factors that may impact EV charging

There are many factors that play a role in a vehicle's output and charging speed—from the vehicle itself, to the charging equipment capabilities. While the charger is set up to deliver a maximum power output, the car battery itself decides how much of that power it can draw from the charger at any one time.

### Battery temperature

**Batteries don't like to be too hot or too cold.**

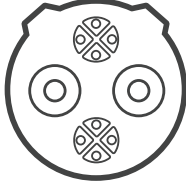
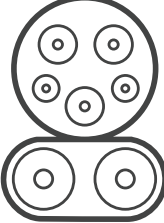
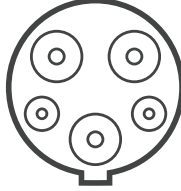
EV batteries operate optimally at average outdoor temperatures. This means that in extreme weather, an EV's charge rate is slower. When temperatures drop, your vehicle uses a portion of the incoming charge energy to warm the battery, which optimizes the charge and battery health, but also results in a slower charging speed. Similarly, if the battery is exposed to high temperatures, an EV requires more energy to cool the battery down, which also results in slower charging speeds.

### State of charge

**Batteries charge fastest when they're nearly empty.**

How full your battery is when you start charging—called your vehicle's State of Charge (SoC)—can affect your charging speed. As the battery's SoC increases, the charging speed requested by the vehicle's battery management system slows to protect the battery. So, when you arrive to a charger with an already high SoC (> 60 percent), your battery will take longer to charge.

Look up your vehicle model's charge profile to find which SoC levels are optimal for your vehicle's charge.

Direct Current Fast Chargers (DCFC) BTC 50 kW		Level 2 Charger BTC 7.2 kW
Plug types		Plug type
CHAdeMO (1) 	CCS (1) 	J-1772 (2) 
Maximum power output		
50 kW	50 kW	
Maximum voltage output		
150-500 VDC	150-920 VDC	
Maximum current output		
125 Amps	125 Amps	

## Loads in use while charging

### Using other loads takes away from your charge.

When you remain in your vehicle during fast charging, energy intended for your battery is diverted to maintain radio, climate control, lights, and other accessories. Think of it like using your cell phone while it's plugged in to charge. Although it's pulling energy for the battery to charge, you're also using some of that energy to watch videos, scroll social media, or text—which leads to a slower charge than if the phone wasn't in use while charging.

## Other vehicle and charger capabilities

**Both the vehicle and charger have voltage and current limits.** When plugged in, the vehicle communicates with the charger and provides a maximum current request. If the vehicle requests more than the charger's capable, the charger limits charging speeds. The current is limited by either the charger or the vehicle (whichever is lower). The manufacturer sets these parameters and builds a charging profile based off the peak amps to best maintain battery health. The peak amps the vehicle can achieve is often calculated based off the vehicles max kW charge rate capabilities. See the examples below to help better understand these capabilities.

### Guide

**Basic energy equation:** Volts X Amps = Watts

**Volts:** Electric vehicle battery voltage

**Amps:** Amps received when charging

**Watts:** 1000 Watts = 1 kilowatt (kW)

### Vehicle Profile 1

- 400 volt charging capability
- 155 kW (155,000 Watts) max charging power

### Charging station profile

- 180 kW charging station
- 200 Amp maximum output of CCS-1 plug

### Finding the maximum Amp capability

#### Equation

Vehicle Watts ÷ Vehicle Volts = Amps

#### Answer

155,000 Watts ÷ 400 volts = 387.5 Amps

**Maximum Amp capability of 387.5 Amps**

### Finding maximum kW when charging

#### Equation

Vehicle Volts X Amp max of charging station = Watts

#### Answer

400 volts X 200 Amp max = 80,000 watts (80 kW)

**The maximum kW the vehicle will reach is 80**

### Vehicle Profile 2

- 700 volt charging capability
- 240 kW (240,000 Watts) max charging power

### Charging station profile

- 180 kW charging station
- 200 Amp maximum output of CCS-1 plug

### Finding the maximum Amp capability

#### Equation

Vehicle Watts ÷ Vehicle Volts = Amps

#### Answer

240,000 Watts ÷ 700 volts = 342.8 Amps

**Maximum Amp capability of 342.8 Amps**

### Finding maximum kW when charging

#### Equation

Vehicle Volts X Amp max of charging station = Watts

#### Answer

700 volts X 200 Amp max = 140,000 watts (140 kW)

**The maximum kW the vehicle will reach is 140.**

Learn more about EV charging options, rates, and rebates at [otpc.com/DriveOn](http://otpc.com/DriveOn).

