How to Charge Your LFP Battery

Prepared for new Tesla Model 3 and Y standard range owners

Glen Maxson

glen@tocpa.club

Assumptions

- You’re charging at home with the Tesla Wall Connector, Mobile Connector, or something similar
- You’re interested in prolonging the life of your Tesla battery (if you’re leasing your car, you might not care as much), and
- You strive for simplicity in all things!

My setup

- I’m driving a 2023 Tesla Model 3 RWD (standard range) with the LFP battery made by CATL
- I installed a Tesla Wall Connector on a 50 amp circuit (overkill for this car since it will only use 32 amps max), in an enclosed garage
- I started charging once per week, Sunday morning between midnight and 6am (scheduled charge, off-peak), and to 100% each charge

This worked just fine for me, and was as simple as it gets!

So what changed?

1) I learned about ‘vampire drain’ (aka parasitic drain)
2) I learned that having your car ‘plugged in’ all the time is better for your battery, not worse
3) I learned that it’s good practice to plug in when you arrive home and your battery is still warm – saves reheating before the next charge cycle
4) And having your car plugged in presents other benefits like preconditioning on wall power, rather than on battery

Bottom line: Your car wants to be plugged in whenever possible!

Note: In the past, I wouldn’t precondition due to the battery cost, but now I do (and it’s winter, so it just makes sense)

Listen to the experts (source)

- *If you're optimizing for battery health and want to minimize degradation, keep the battery SoC as low as comfortably possible to minimize calendar aging (yes, LFP still suffers from calendar aging), but still charge to 100% once a week.*
- *It's still a Lithium Ion Battery. It's not advisable to keep any Lithium Ion Battery charged to, or close to, 100%.*
- *The reason to charge an LFP battery to 100% once a week is to recalibrate the Battery Management System and to balance the charge across all the cells.*

Listen to the experts (continued)

- *I drive about 250 - 300 Km every day, I charge my LFP battery to 85% every night, except Friday 100% (Saturday is my busy day).*
  - *Keeping lfp at 85% compared to 100% is basically no difference (~0-2%). Between 20-60% seemed to be a slight benefit ~2%.*
  - *Wouldn't degradation eventually plateau to the same point in 2-3 years? Seems like a great sacrifice to the convenience of operation. Range is not even important to the operation of your car unless you experience significant degradation well above expected…*

Listen to the experts (continued)

- *The voltage of an LFP actually changes a lot between 80 or 90 to 100%. The slope of the Voltage/ SOC graph is steepest here. Charging to max voltage allows BMS to recalibrate the range because that is the only place where SOC is accurately known.*
- *Even for LFP charging to 100% is never good for the battery - because in the end it is still a lithium ion battery. Tesla only recommends charging to 100% because the BMS only accurately predicts SOC and therefore range, when the voltage is maximum.*

And finally,

- *I charge to 85% every day but Thursday. Charge to 100% on Thursdays to keep the BMS calibrated. I've lost 1 mile of range in my first 3000 miles.*

So, how have my charging habits changed?

1) My Model 3 is plugged in and will start charging when I get home, unless I have other trips planned for the day. In this case, I'll plug in after the final trip. No more 'vampires'!
   Note: I'll plug in even if the set charge limit is less than the current SOC
2) Mine is set to charge to 65% (at 24 amps) every day (except Saturday) when I'm done driving for the day. On Saturday it's set to charge to 100%, which is the weekly full charge that makes the BMS (and Elon) happy
   Note: 100% charge, at least weekly, is Tesla's current recommendation for LFP batteries
3) I precondition now, on days when the temperature is low (and always while on wall power)
   Note: This preconditions the cabin and the battery when needed

Benefits: Happy battery, warmer car/happier wife, acceptable range always available, less vampires to worry about…

Resources: Battery University: Charging LFP, Prolong Lithium-based Batteries

Final note

- Is plugging in each day more difficult than plugging in once a week?
  - Not really
- Is never having to worry about daily range a benefit?
  - Absolutely
- Does all this really extend the life of my LFP battery?
  - Most likely, but regardless, this car is going to outlive me, so do I care? Yup, still do! Plus, taking care of your battery will improve resale value.

How to get better range in cold weather (source)

1. **Warm up the battery and cabin prior to your journey** – warm up the cabin and battery before you set off to get maximum performance and range. Do this through Scheduled Departure on the control screen or the Climate functions on the Tesla app.
2. **Use navigation even for regular routes** – Tesla recommends that you put your destination into the car's navigation system – even if you know where you're going. Its Trip planner will send you to any required Superchargers, preheating the battery to maximize charging speed. You can navigate directly to Superchargers, too.
3. **Plug in your vehicle** – leaving your Tesla plugged in – and keeping the charge level above 20% when it's not plugged – in will help reduce the effects of cold weather.
4. **Charge after a drive** – aim to charge your vehicle straight after you drive, as the battery will already be warmed up.
5. **Defrost the vehicle** – you can use the defrost function in the Tesla app to remotely clear your car from ice, while you're warm and comfortable inside.
6. **Invest in winter tires** – less about range, more about safety, Tesla recommends purchasing winter tires and tire chains for cold conditions. Plus, you should maintain proper tire pressures as tires lose one PSI for every 10°F (6° C) drop in temperature.
7. **Turn down the heat** – you can reduce energy use and increase range by relying on your seat heaters and heated steering wheel to keep warm.
8. **Slow down** – Tesla says that drivers should slow down and avoid accelerating quickly and frequently to save energy. Read the road and plan ahead.
9. **Park and plug** – if you're parking a Model 3 for a while, Tesla suggests you charge the vehicle while it's parked up to prevent normal range loss. This also keeps the battery at an optimal temperature.
10. **Use the Tesla Energy app** – The Tesla app has plenty of features and tips to help you check and improve your range. Be sure to take advantage of this innovative useful resource.

Supercharging an LFP battery

- Even at a 250kw Tesla V3 Supercharger, your Tesla Model 3 RWD will charge at a max rate of 175kw (credit)
  - from 20%-100% it takes about 40 minutes, plus an additional 10 minutes to calibrate at the end.
  - from 20-80% it's about 20-25 minutes (at 60° F temp)
- Minimize the amount of charge time by using Trip Planner to warm the battery while driving to a Supercharger.

Question: Is it rude to occupy a supercharger the additional 25 minutes it takes to charge to 100% AND complete BMS calibration?

Answer: Yes, if the chargers are busy. Wait to complete calibration when they're not. *That's just my opinion… be courteous.*