The time dependence of charging any electric car starts at 0 charge added, goes to a peak and then exponentially declines to the final State-Of-Charge (SOC). This article collects data for several Tesla Supercharging charging events of a Tesla Model 3 Long-Range BEV.

The author has observed that the following function can fit the Tesla-Model-3-Long-Range Supercharger charging curves reasonably accurately:

$$\text{Verhulst}(t-t_o)\tanh(t) \text{ where }$$
$$\text{Verhulst}(t-t_o) = \frac{Q_x}{n\tau} \frac{(2^\alpha + 1)\exp\left(\left(\frac{(t-t_o)}{\tau}\right)\right)}{1 + (2^\alpha + 1)\exp\left(\left(\frac{(t-t_o)}{\tau}\right)\right)^{\left(\frac{1}{\alpha}\right)}}$$

and $\tanh(t) = \frac{\exp(t) - \exp(-t)}{\exp(t) + \exp(-t)}$.

The follow red curves are a fit of this function to the charging-power data.
Supercharging 0.06\% \rightarrow 100\%

These data are from

https://www.youtube.com/watch?v=HUseaY0IduU
Supercharging 2% -> 98%

These data are from

Supercharging 20%->88%

![Graph showing supercharging 20% to 88%](https://i.imgur.com/3G5J5X.png)

These data are from

https://model3ownersclub.com/threads/request-to-an-owner-supercharging-rate.5427/#post-128114
Supercharging 51% ->99%

These data were crudely measured by the author.
Supercharging 68% -> 96%

These data were crudely measured by the author.
Combining the Four Supercharging Events

**TM3LR Power (kW)**

![Graph showing power over time for different charge scenarios.](image)

**TM3LR SOC (%)**

![Graph showing state of charge over time for different charge scenarios.](image)

**Peak (kW)**

![Graph showing peak power against initial state of charge for different scenarios.](image)
Conclusion

The ratio of SOC in % to full-charging time in minutes is about 1.25 for the three charging events starting at 0.6%, 2% and 20% and about 0.8 for the two charging events starting at 51% and 68%.

As often stated, it is faster to charge when the SOC is low than when it is high.

http://www.roperld.com/personal/roperldavid.htm

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