Electric Vehicle Energy Model

Rabie Ramadan

July 22, 2020

1 Model Formula

The power consumption of the electric vehicle is $P(u, a)$, and it can be calculated as follows:

$$P_{\text{phys}}(u, a) = mau + C_0 + C_1 u + C_2 u^2 + C_3 u^3 \ ,$$

$$P_{\text{mod}}(u, a) = P_{\text{phys}}(u, a) + \max\left\{p_3 au,\ 0\right\} \ ,$$

$$P(u, a) = \max\left\{P_{\text{mod}}(u, a),\ \alpha P_{\text{mod}}(u, a),\ -\beta u\right\} \ ,$$

where

$$\begin{aligned} m &= 1663 \text{ kg} \\ C_0 &= 1.046 \text{ W} \\ C_1 &= 119.166 \text{ kg} \cdot \text{m/s}^2 \\ C_2 &= 0.337 \text{ kg/s} \\ C_3 &= 0.383 \text{ kg/m} \\ p_3 &= 296.66 \text{ kg} \\ \alpha &= 0.869 \\ \beta &= 2338 \text{ kg} \cdot \text{m/s}^2 \end{aligned}$$

$P(u, a)$ will be given in Watts. We are currently connecting with Ken to see how to convert this to SOC units.