Problem Formulation

i: Index for each 15 min chunk of a day. There are 96 chunks of 15 min in a day. So, i goes from 0 to 95.

t_i: Time interval for a given chunk of the day, which is 15 min = 1/4 hr.

j: Car index.

$P_{i,j}$: Power used from any charger at a given 15 min chunk (kW).

Trf_i: Customer's electricity tariff at a given 15 min chunk ($/kWh).

BL_i: Building load at a given 15 min chunk (kW).

Eff_j: Efficiency of the AC/DC converter in each car.

B_j: Battery capacity of each car (kWh).

E_j: Energy required for a given car (kWh).

DC: Demand cost for the maximum power used during the day, which is given as 16 $/kW.

$$minimize\left(Bill=\sum_{i=0}^{95}\sum_{j=0}^{3}(P_{i,j}+BL_i).Trf_i.t_i+max(\sum_{j=0}^{3}P_{i,j}+BL_i).DC\right) \tag{1}$$

S.T.

$$0<P_{i,j}<7 \tag{2}$$

$$Trf_i=\begin{cases}0.4 & if \quad 9AM<t_i<4PM\\0.1 & otherwise\end{cases} \tag{3}$$

$$Eff_{i,j}=\begin{cases}0.7 & if \quad P_i\leq 5\\0.9 & if \quad P_i>5\end{cases} \tag{4}$$

$$E_j=\sum_{i=0}^{55}P_{i,j}.Eff_{i,j}=U(15,35)_j-5 \tag{5}$$

$$E_j<B_j=40 \tag{6}$$

$$P_{i,j}=\begin{cases}0 & if \quad 12AM<t_i<10AM\\[0,7] & otherwise\end{cases} \tag{7}$$