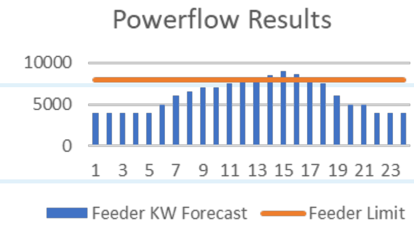
$$\min. \sum_{t=1}^{T} C^t P^t_{sub}$$



$$\boxed{P^t_{sub} \leq P_{subMax} \text{ (given)}}$$

8000 KW

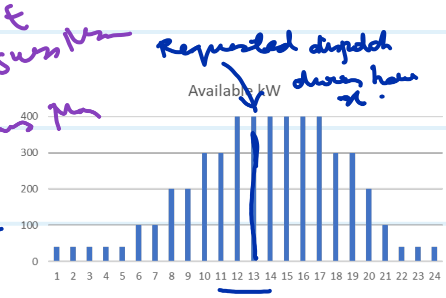
t_0: Dispatch requested
13

$\min.\ P^t_{subMax}$

P_{subMax}

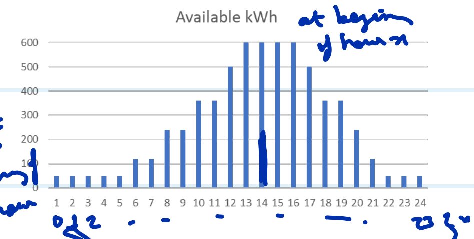
$P_E(t_0),\ P_E(t_0+1),\ P_E(t_0+2)$
$\leq \overline{P_E(t_0)},\ \overline{P_E(t_0+1)},\ \overline{P_E(t_0+2)}$

P_E



2. 8000 KW ($P_{subLimit}$ is hard limit or soft limit)?

1. kWh resets on the 4th hour?



B^t: Beginning 13th hour

0 1 2 . . . . 23 24

$B^{12}_j = E^{12} = 600 \quad P^{13}_{E_j} = 350 \quad \overline{P^{13}_{E_j}} = 400$

$B^{13}_j = 600 - (1.0) \times 350$

$B^{13}_j = 250$

$B^{13}_j = \min(600, 250)$

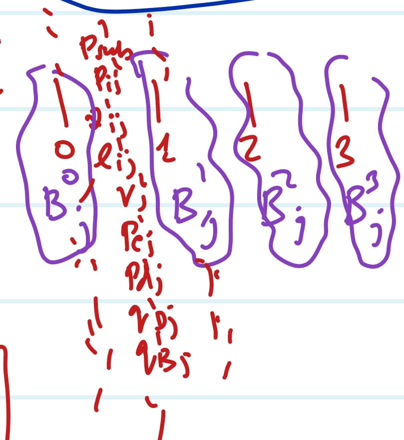
$0 \leq P^{13}_{E_j} \leq \overline{P^{13}_{E_j}}$

$0 \leq P^{14}_{E_j} \leq \overline{P^{15}_{E_j}}$

$0 \leq P^{13}_{E_j} \leq \overline{P^{16}_{E_j}}$

Edo Node Dispatch Limits

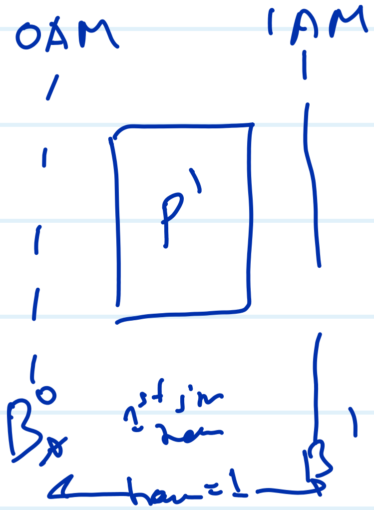
P_{ij} q d v_j^2

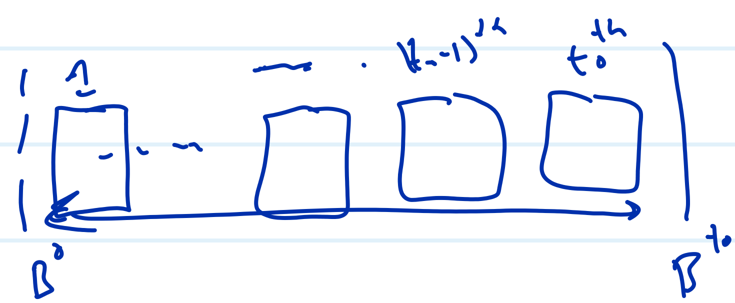


$$\boxed{B^{13}_j = B^{12}_j - \Delta t \cdot \overline{P^{13}_E}}$$

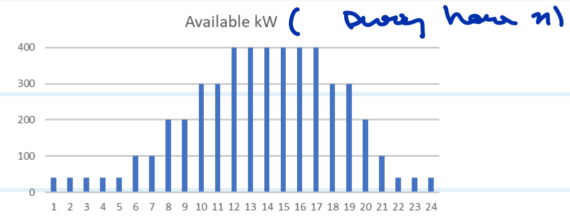
$k=13$

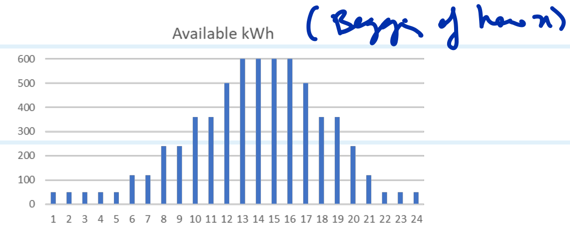
$B^{13}_j = \min(\ \ ,\ E^{13}_j)$





$$B_j^{13} = \min.\left(B_j^{12} - \Delta t\, \eta_c P_{E_j}^{13} ,\ E_j^{13} \right)$$





$t_0 = 17$

$E^{16} = B^{16} = 500$ $\qquad \overline{P_E^{17}} = 400$

(i) $P_E^{17} = 350$

$B_{calc}^{17} = 500 - 350 = 150$

$E^{17} = 350$

$B_{real}^{17} = \min(150, 350) = 150$

(ii) $P_E^{17} = 100$

$B_{calc}^{17} = 500 - 100 = 400$

$E^{17} = 350$

$B_{real}^{17} = \min(400, 350) = 350$

EDO Node Model:

If dispatch for Ed Node j requested at hour t_0. ($t_0 - 1$ to t_0)

B^{t_0-1}, E^{t_0-1}, E^{t_0}, E^{t_0+1}, E^{t_0+2}

1) $0 \le P_{E_j}^{t_0} \le \overline{P_{E_j}^{t_0}}$

2) $0 \le P_{E_j}^{t_0+1} \le \overline{P_{E_j}^{t_0+1}}$

3) $0 \le P_{E_j}^{t_0+2} \le \overline{P_{E_j}^{t_0+2}}$ $\qquad$ 7) $B_j^{t_0+2} = 0$

4) $B_j^{t_0} = \min\left(B_j^{(t_0-1)} - \Delta t\, \eta_c P_{E_j}^{t_0} ,\ E_j^{t_0} \right)$

5) $B_j^{t_0+1} = \min\left(B_j^{t_0} - \Delta t\, \eta_c P_{E_j}^{t_0+1} ,\ E_j^{t_0+1} \right)$

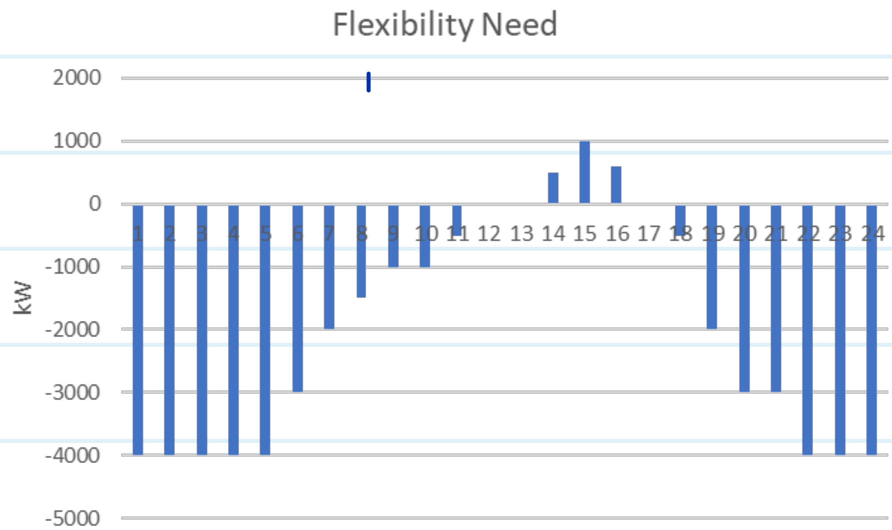
6) $B_j^{t_0+2} = \min\left(B_j^{t_0+1} - \Delta t\, \eta_c P_{E_j}^{t_0+2} ,\ E_j^{t_0+2} \right)$

7) $B_j^{t_0+3} = E_j^{t_0+3}$ and so on.....

(6) and (7) τ)

(6)

$$0 = B_j^{t_0+1} - \Delta t\, \eta \cdot P_{F_j}^{t_0+2}$$



Soft limiting $P_{sub\,max}$ when a desired $P_{sub\,limit}$ is given but we're not sure (8000) if it will be abided by.

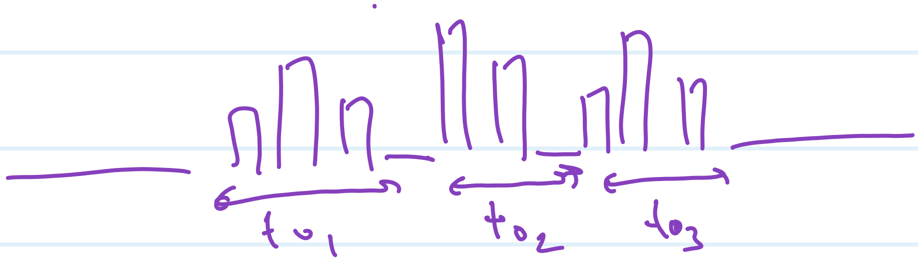
min. $P_{sub\,max}$

s.t.

$$0 \le P^t_{subs} \le P_{sub\,max} \quad \forall\, t = 1{:}\tau$$

$$P_{sub\,limit} \le P_{sub\,max}$$
(8000)

$\vdots$



(2) → Obj. Function? → Peak Shaving;

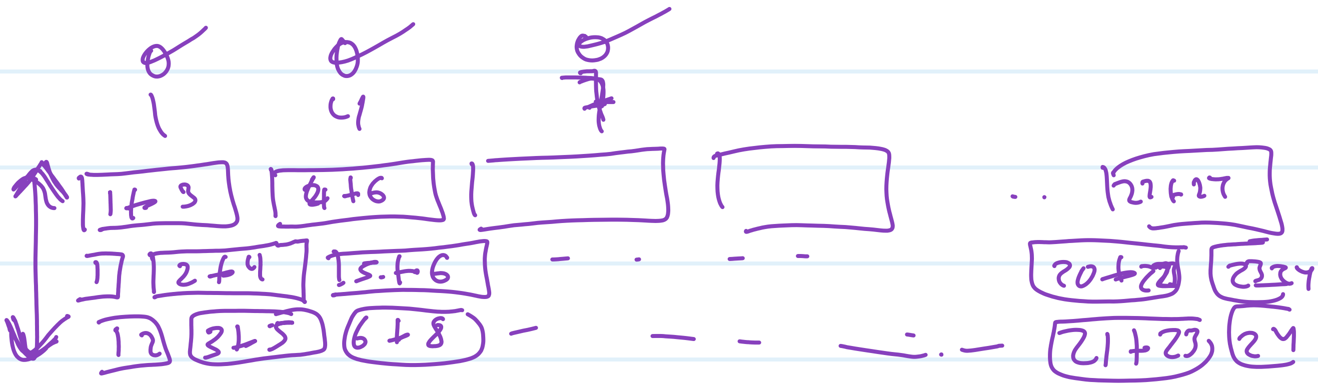
$P^t_{subs} \le 8000$ kwh

min. P_{subs}^{max} ..
s.t.
$P_{subs}^{max} \ge 8000$

Obj. Func.?
Feasibility? min. 0

$\sum c^t P^t_{subs}$

(3) greedily request edge nodes only in flexibility need hours or other hours too.



(4) How many requests per edge nodes?
As many as possible?

$$\min. \sum_{t=1}^{T} C^t P^t_{subs}$$

s.t.

$$P^t_{subs} \in [0,\ 800] \quad g_{1,2} \quad \forall t$$

$$P^t_{ij} = P^t_{Lj} + \sum_{(j,k)\in L} P^t_{jk} - P^t_{Ej} \quad \forall t \quad h_1$$

$$Q^t_{ij} = q^t_{Lj} + \sum Q^t_{jk} \quad \forall t \quad h_2$$

$$V^t_j = V^t_i - 2\left(r_{ij} P^t_{ij} + x_{ij} Q^t_{ij}\right) \quad \forall t \quad h_3$$

$$V^t_j \in [V^2_{min},\ V^2_{max}] \quad g_{3,4} \quad \forall t$$

$$0 \le P^t_{E_j} \le \overline{P^t_{E_j}} \quad \forall t \quad g_{5,6}$$

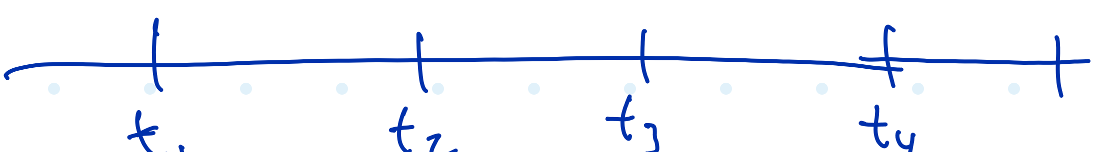
$\forall t \in \{t_1, t_2, t_3, \dots, t_8\}$

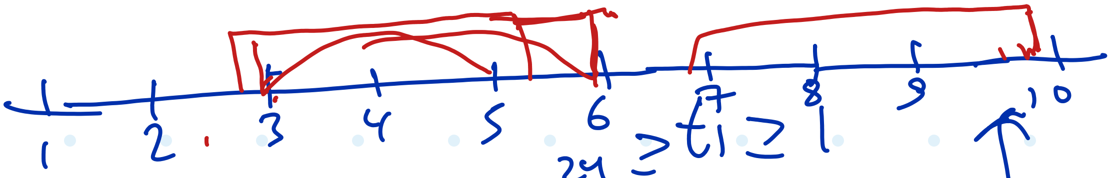
$\forall t \in \{1, 4, 7, 10, 13, 16, 19, 22\}$

$$B^t_j = \min.\left(E^t_j,\ E^{t-1}_j - \Delta t\, \eta_c \cdot P^t_{E_j}\right)$$

$$B^{t+1}_j = \min\left(E^{t+1}_j,\ B^t_j - \Delta t\, \eta_c\, P^{t+1}_{E_j}\right)$$

$$\underset{B_j^{t+2}}{0} = B^{t+1}_j - \Delta t\, \eta_c\, P^{t+2}_{E_j} \quad h_{B,t\ 1,2,3}$$





$24 \geq t_1 \geq 1$

$24 \geq t_2 \geq t_1+3$

$24 \geq t_3 \geq t_2+3$

$24 \geq t_4 \geq t_3+3$

$24 \geq t_5 \geq t_4+3$

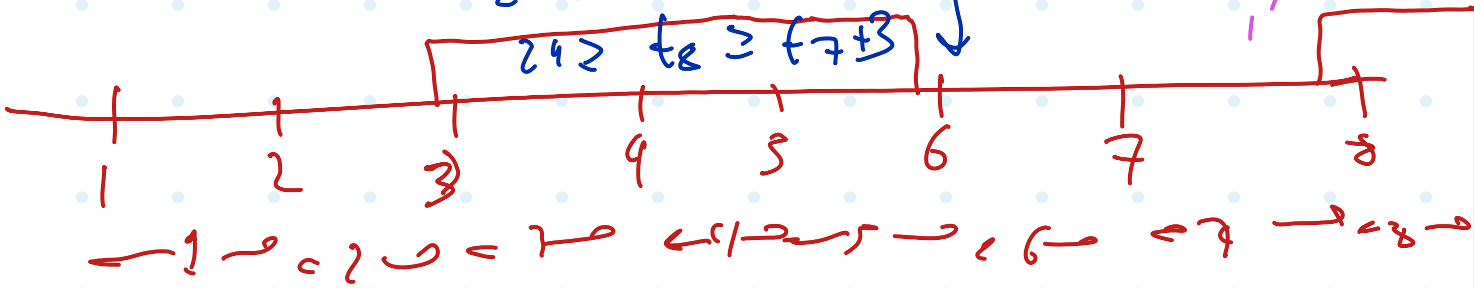
$24 \geq t_6 \geq t_5+3$

$24 \geq t_7 \geq t_6+3$

$24 \geq t_8 \geq t_7+3$

2 to 4	3 to 5
6 to 8	6 to 8
9 to 11	9 to 11
12 to 14	13 to 15
17 to 19	17 to 19
22 to 24	23 to 24

6



3 to 5
8 to 10
13 to 15
18 to 20
23 to 24 (2)

5

1 to 3
4 to 6
⋮
21 to 24

8