

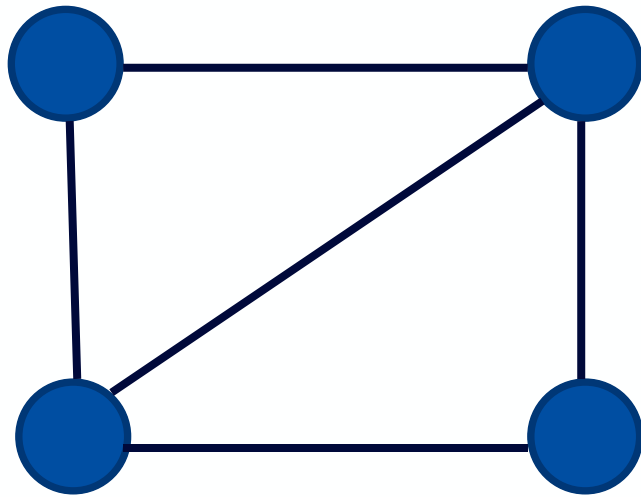


DIVIDE AND CONQUER: HACKING THE GRID

Alex Beeson, Paul Festor, James King, Xiaomei Mi,
Sharlin Utke

Turing Fellows community hackathon March 2023

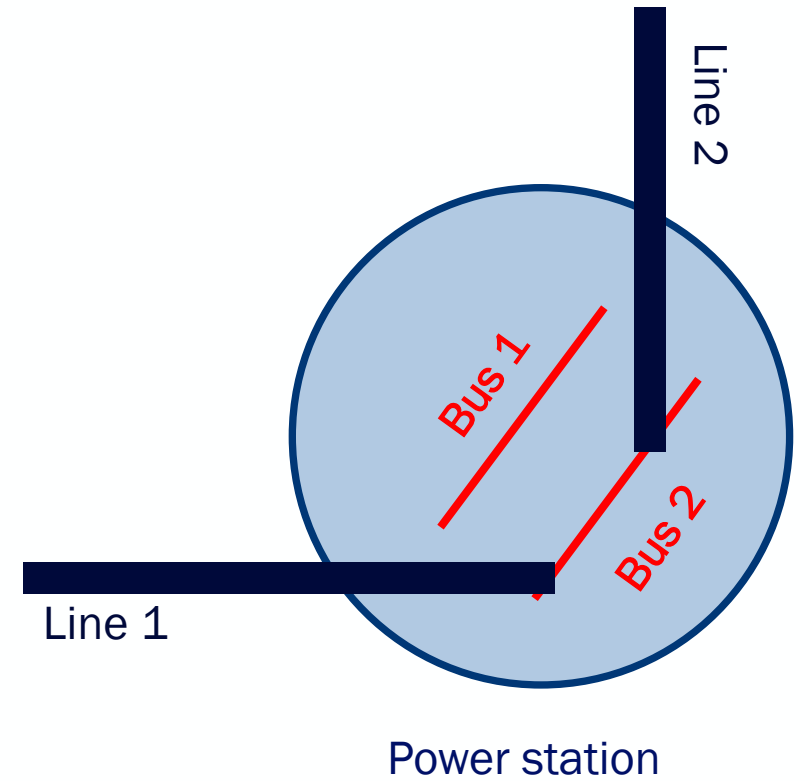
A grid of powerstations



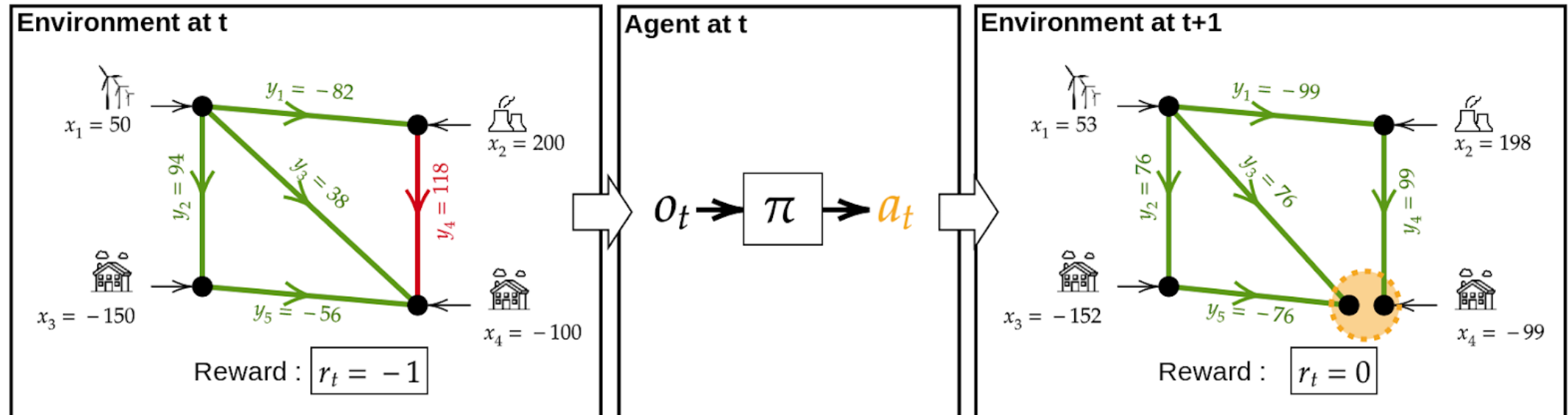
Power station



Power line



Managing a power grid: understanding



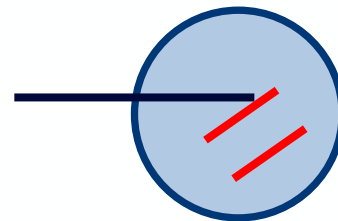
Modeling the grid as an MDP

■ State:



$[\rho_i]_{i=1\dots lines}$

■ Action:



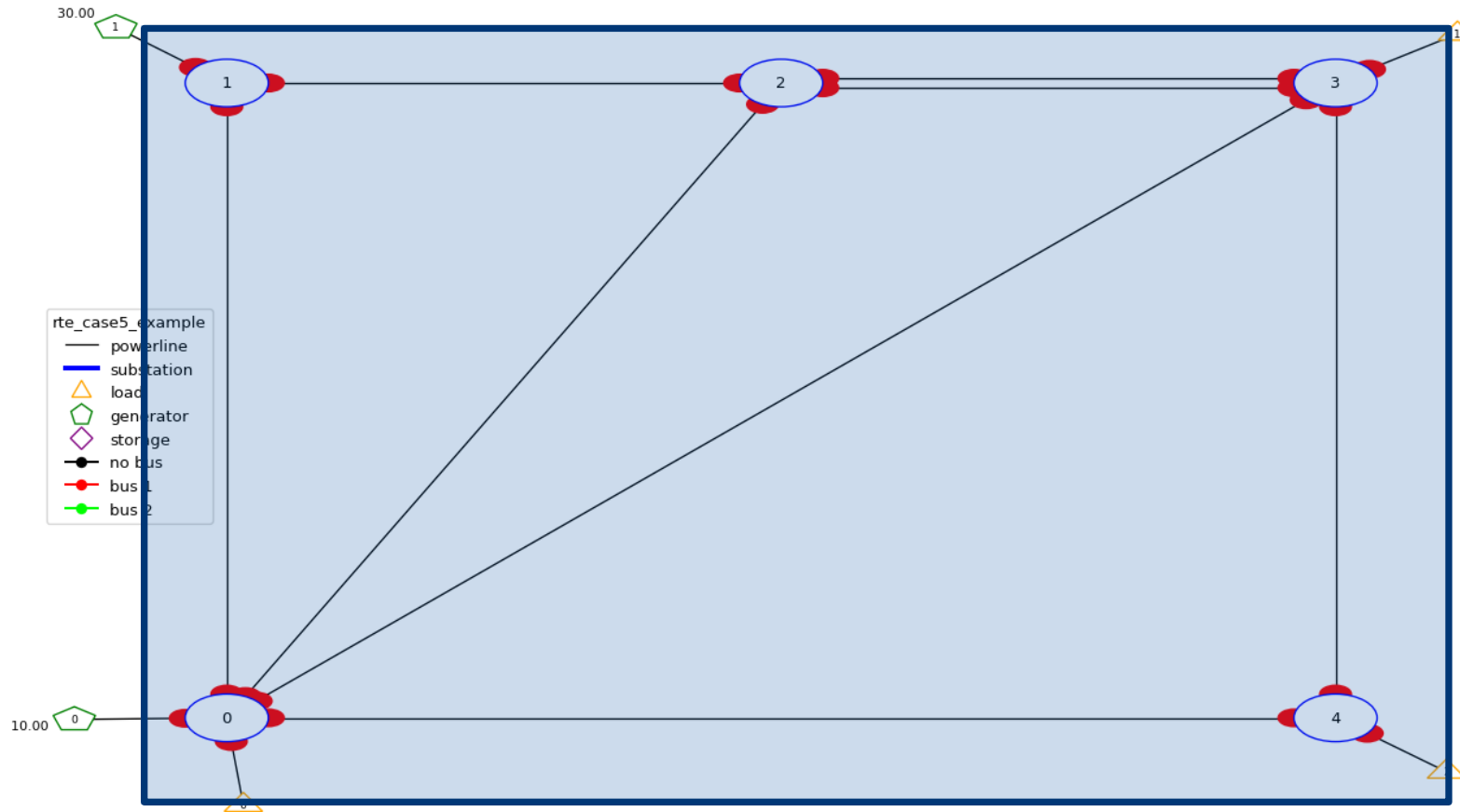
Change ?

$[b_i]_{i=1\dots connections}$

■ Reward:

- *Do not black out*
- *Supply the demand*
- *Be close to cable capacity` `*

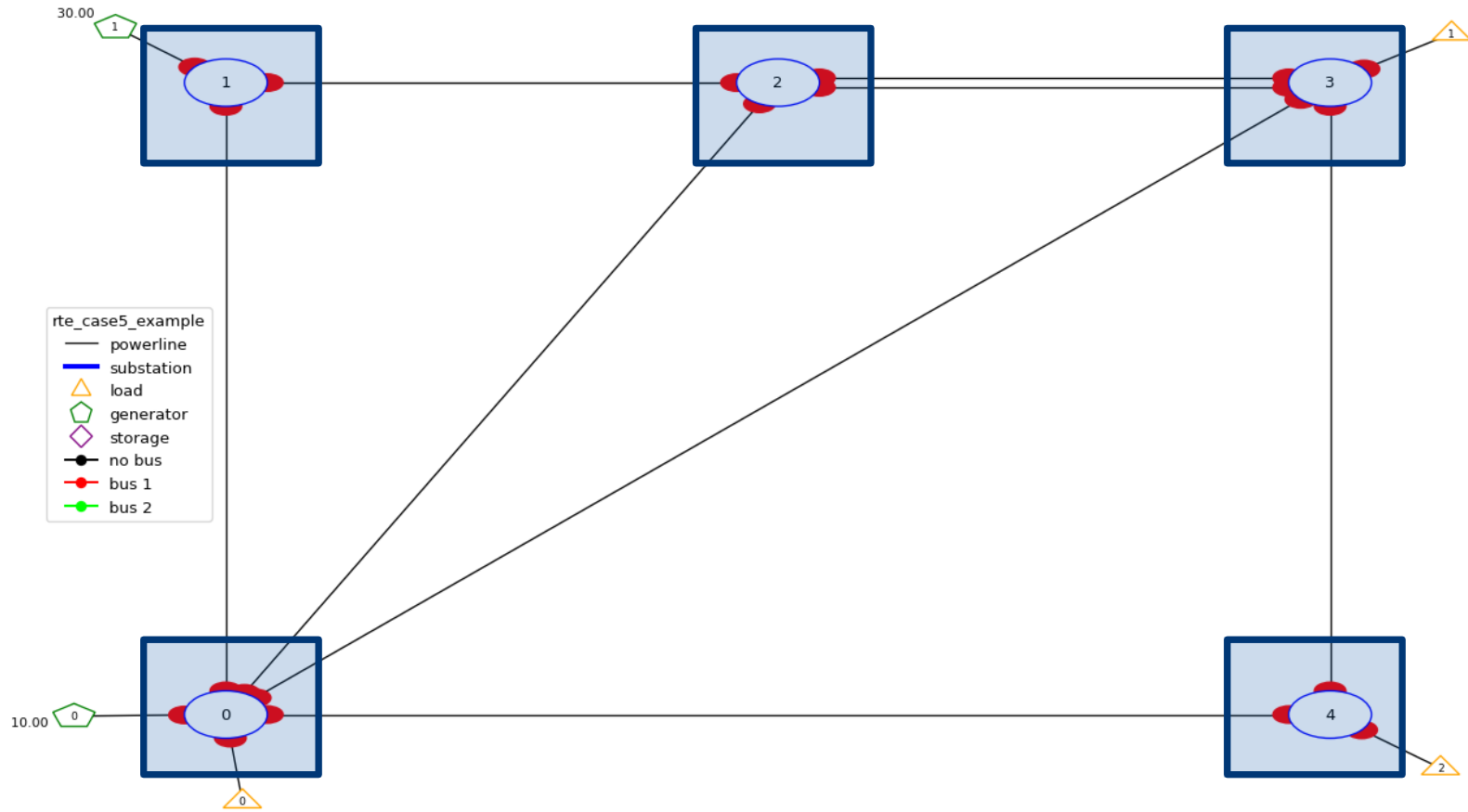
The single agent perspective



One agent
controls
everything

$2^{21} \rightarrow 2\text{M actions}$

The multi agent perspective



One agent
per
substation

→ 8-64 actions each

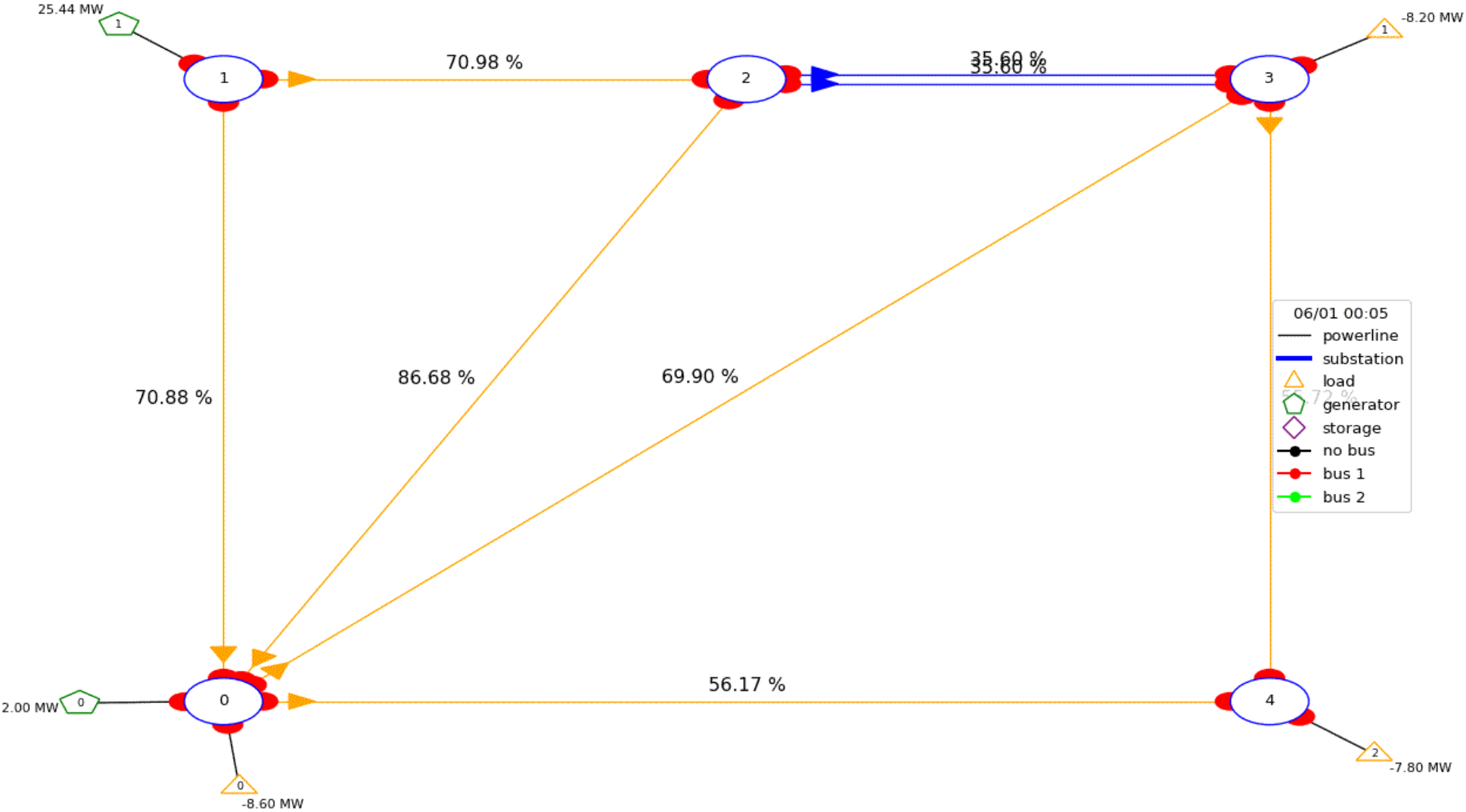
Algorithm: MAAC [1]

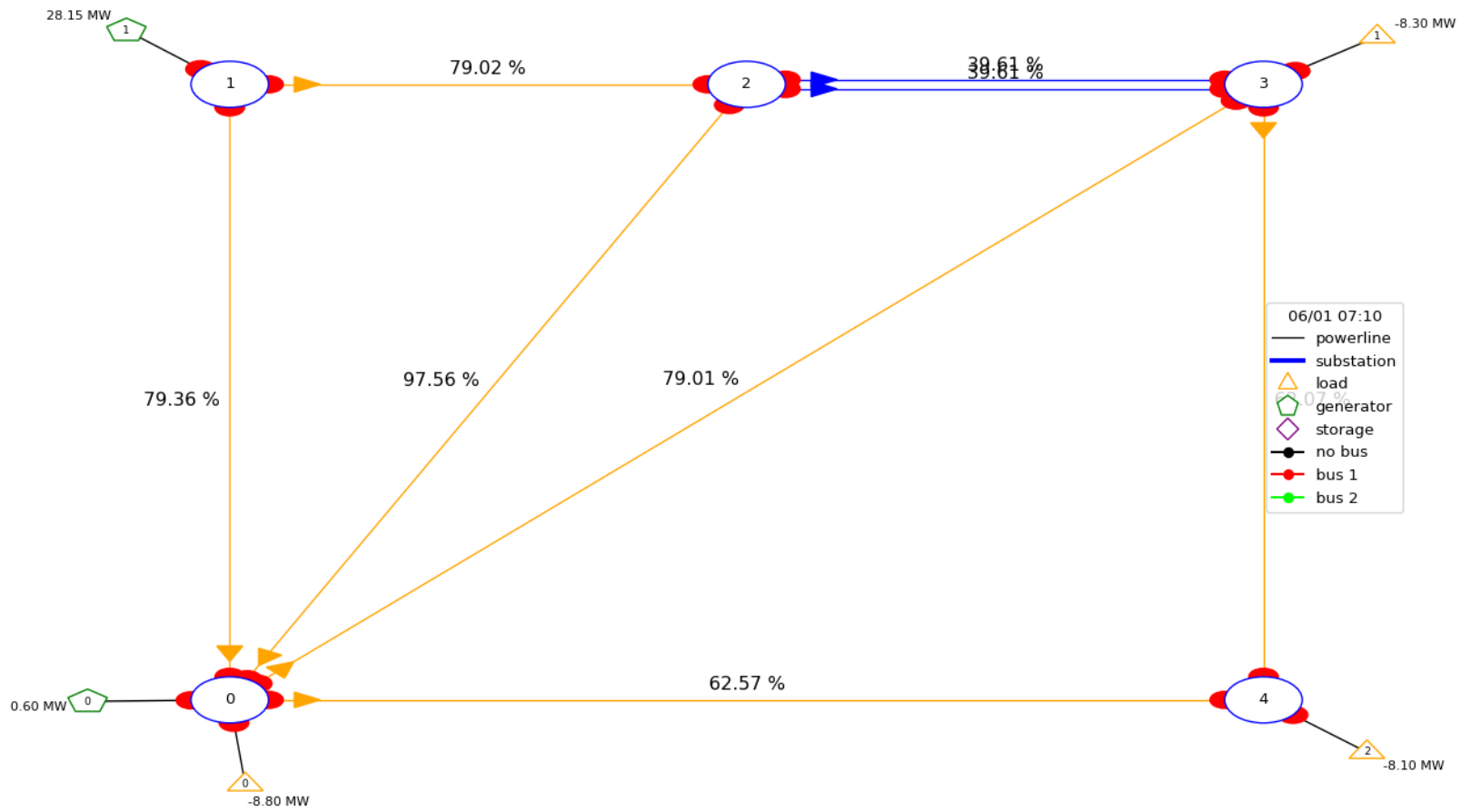


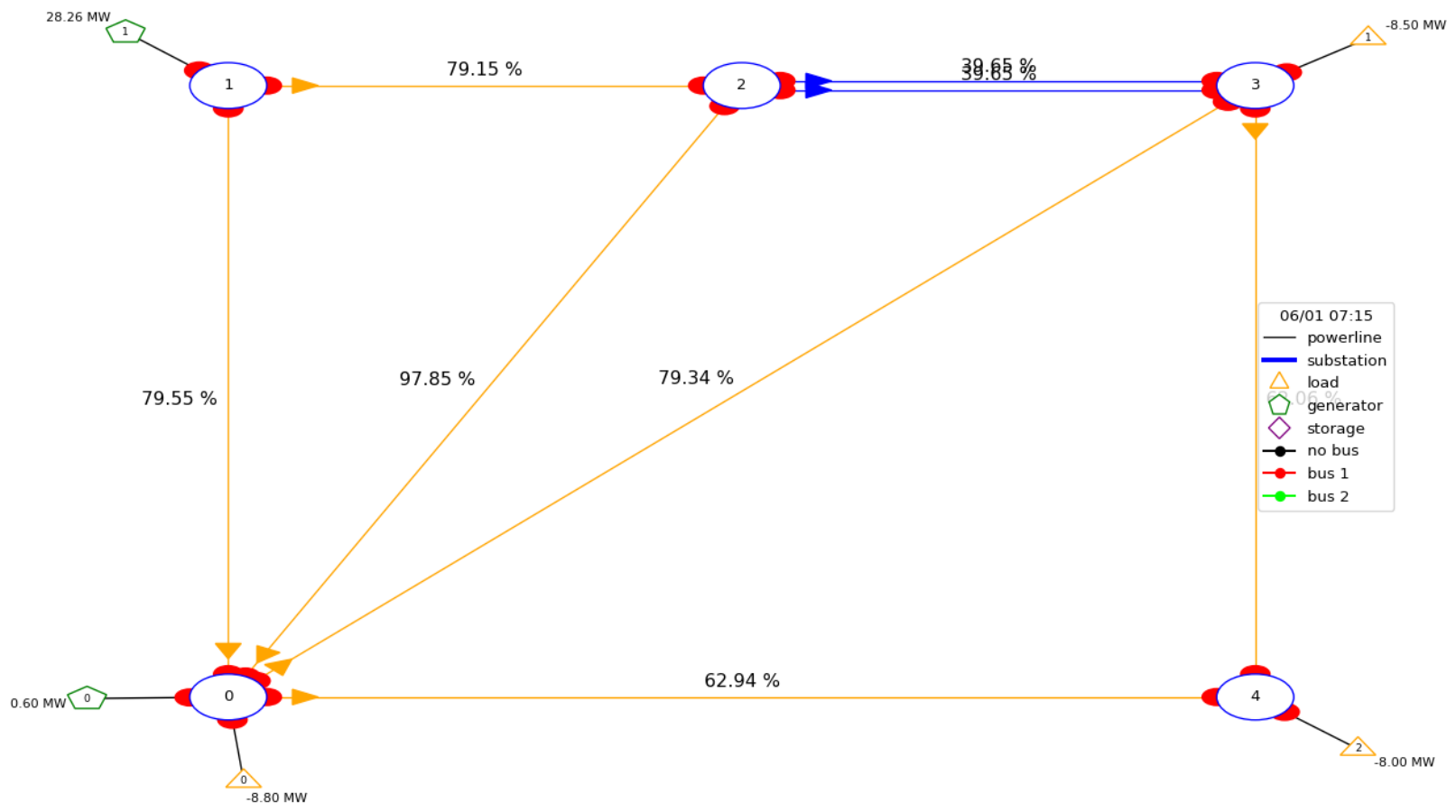
MODEL RESULTS

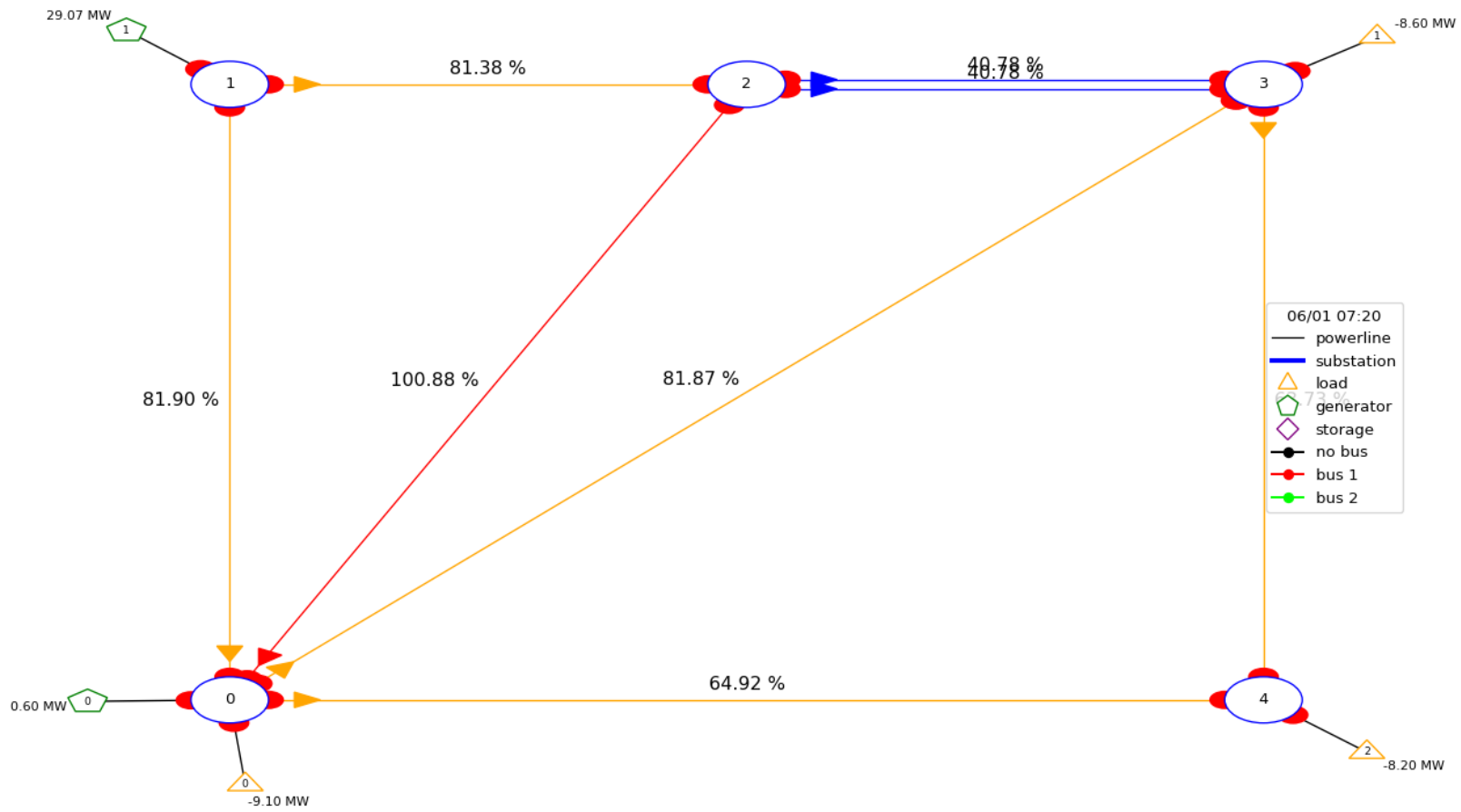


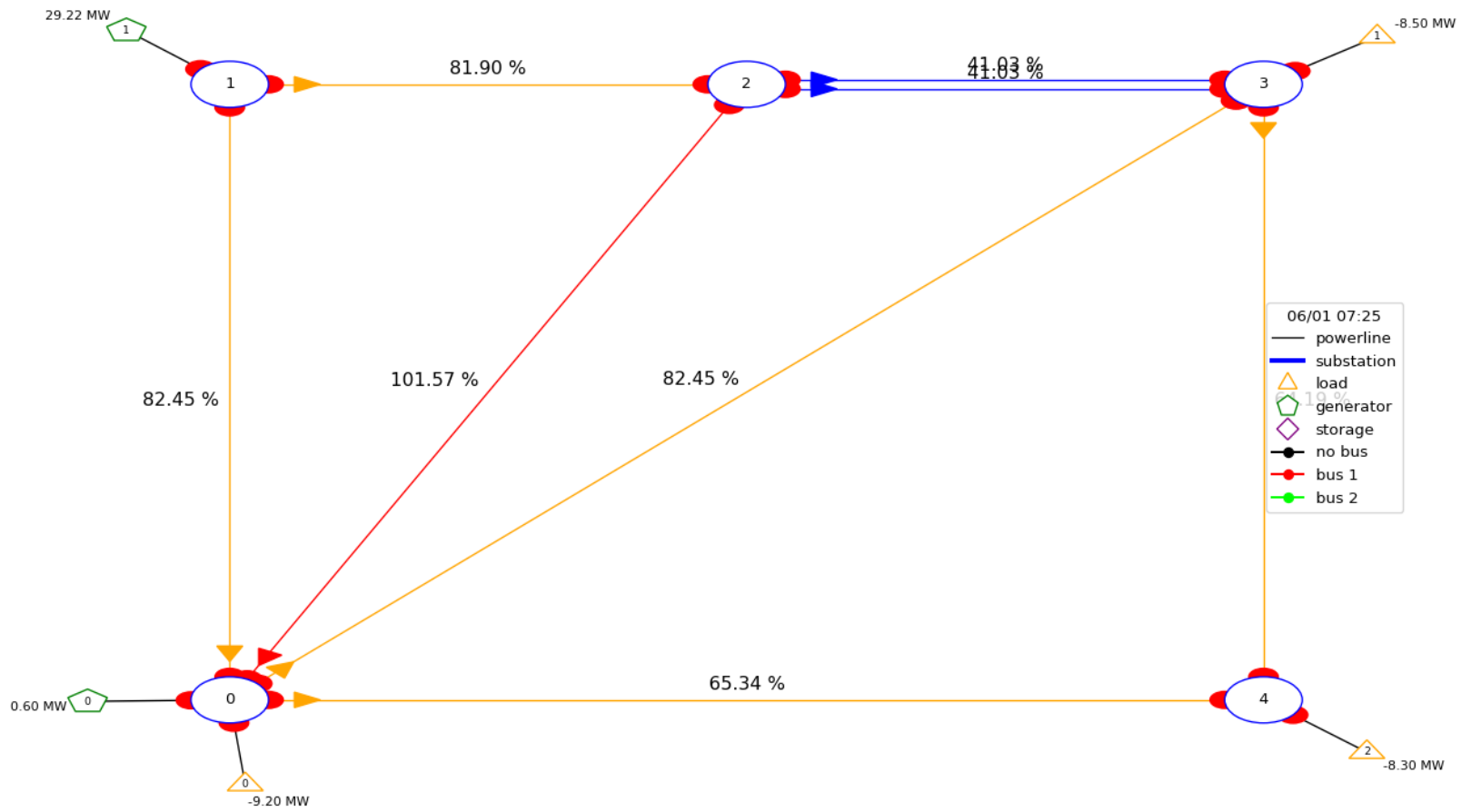
Always using the same action

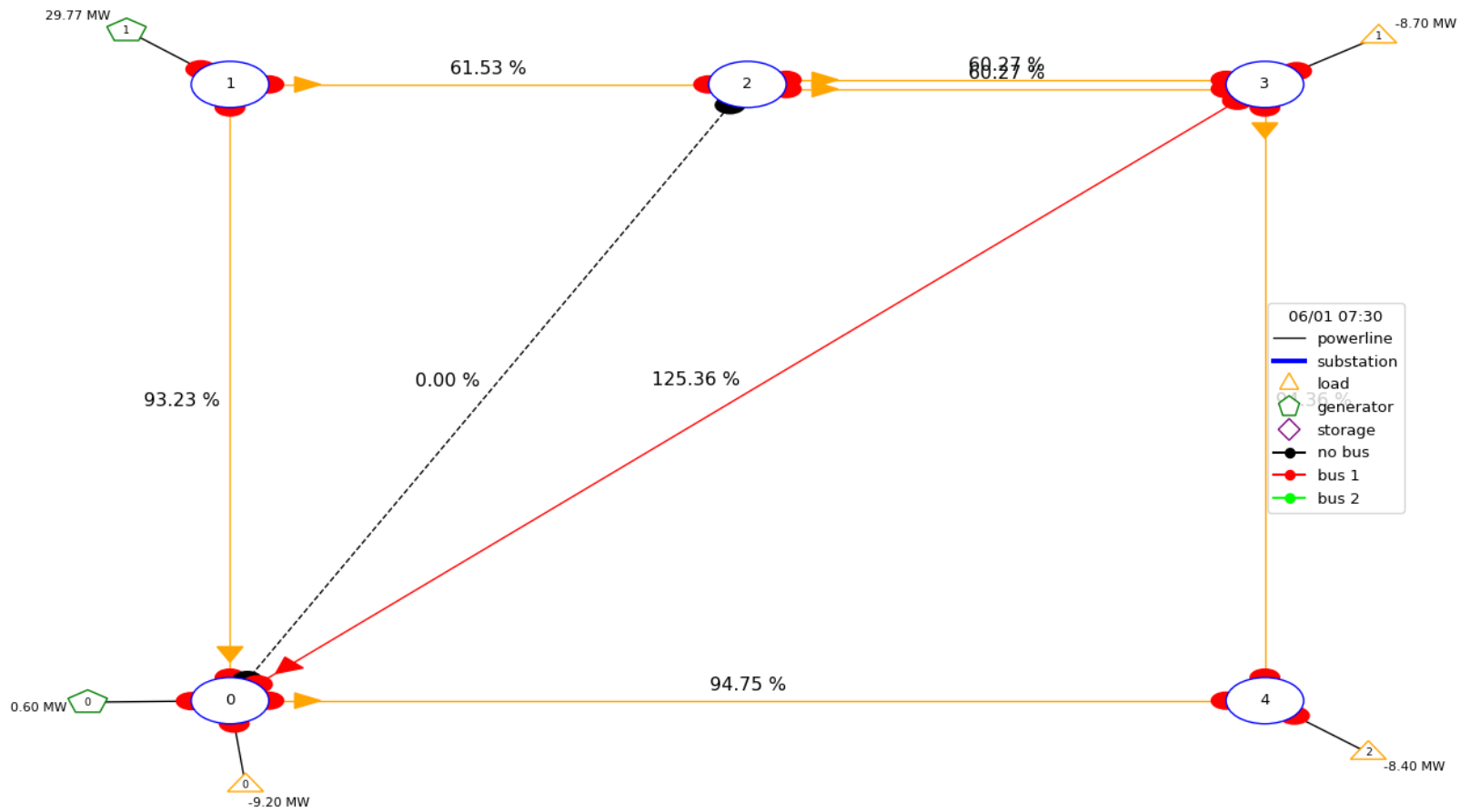


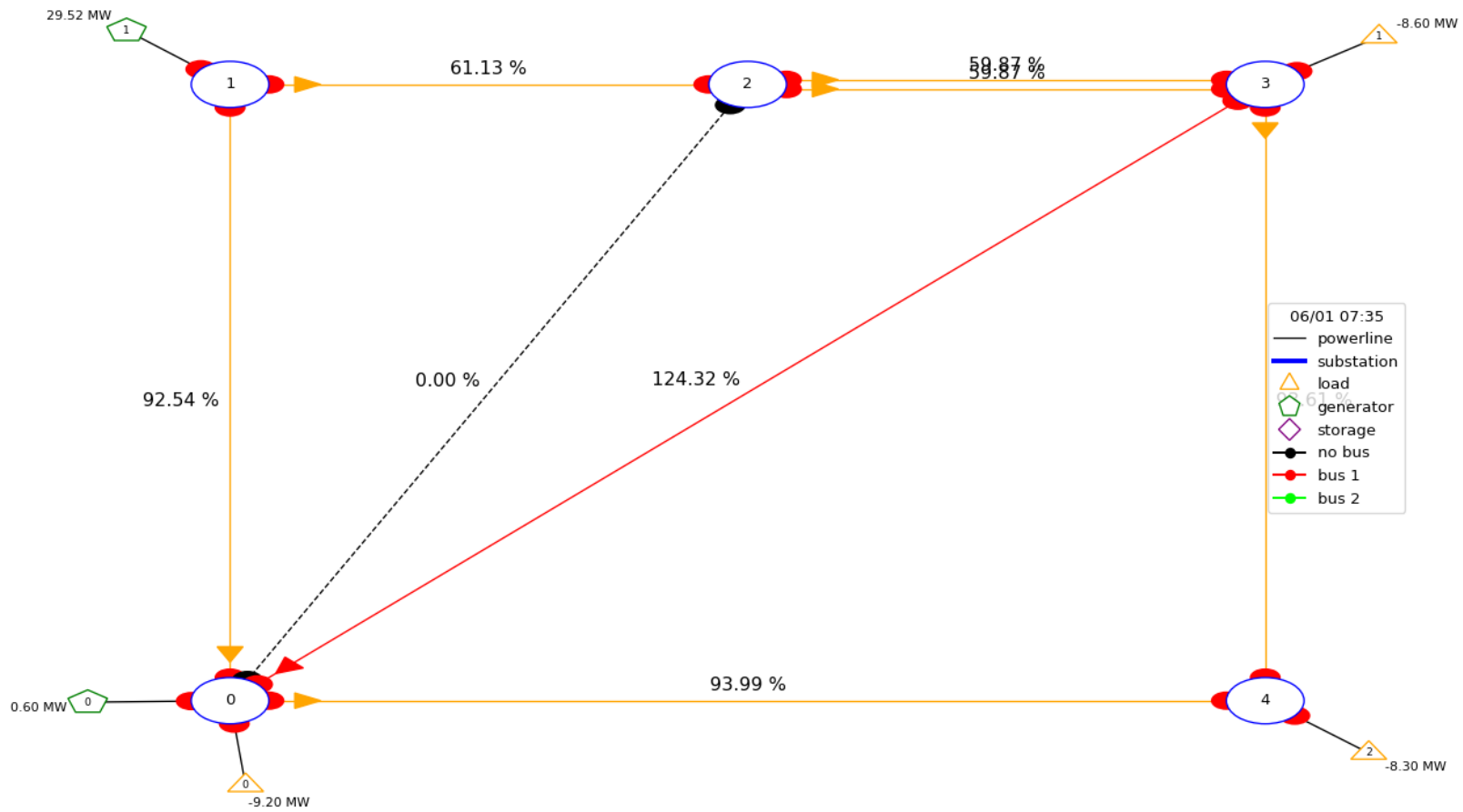


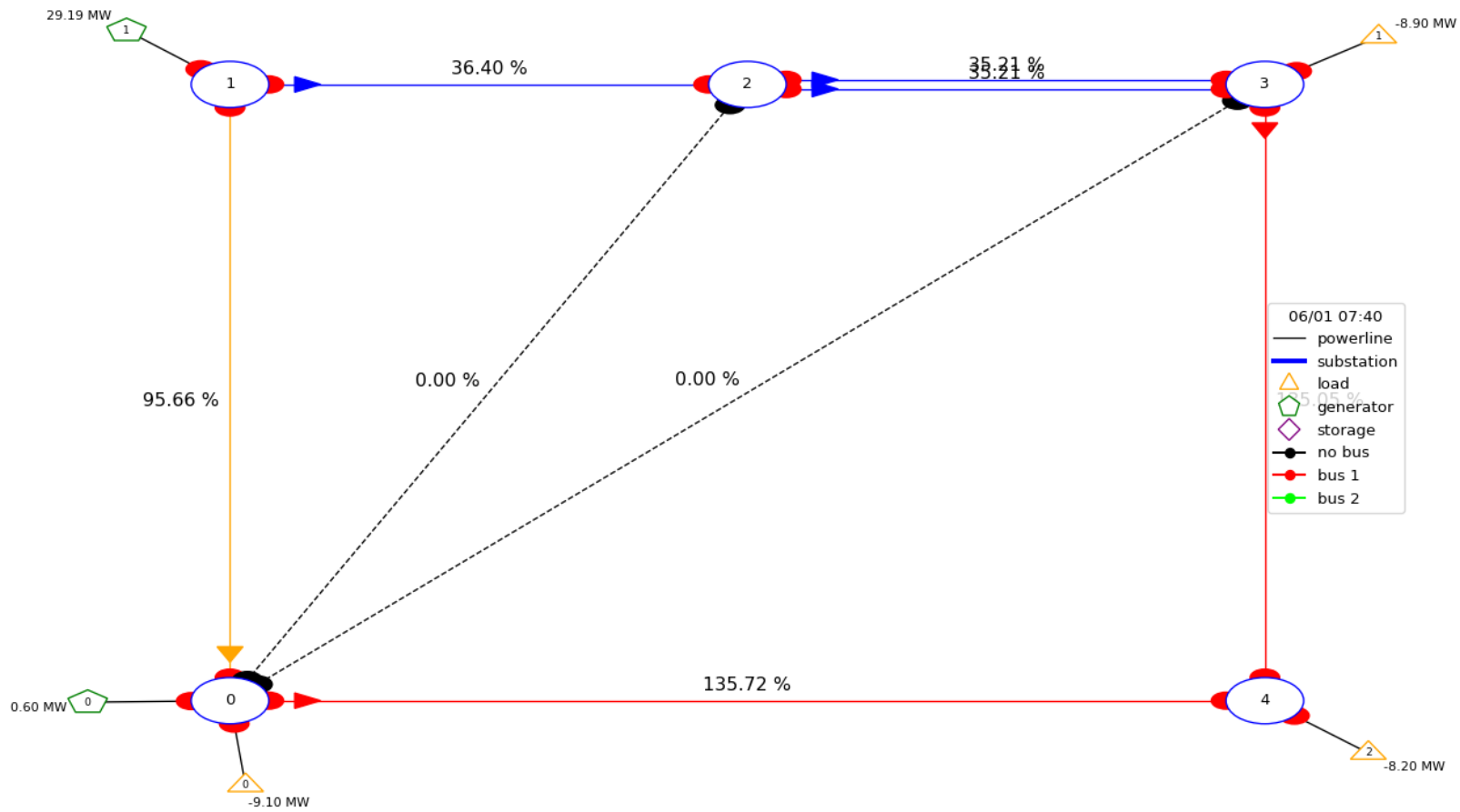


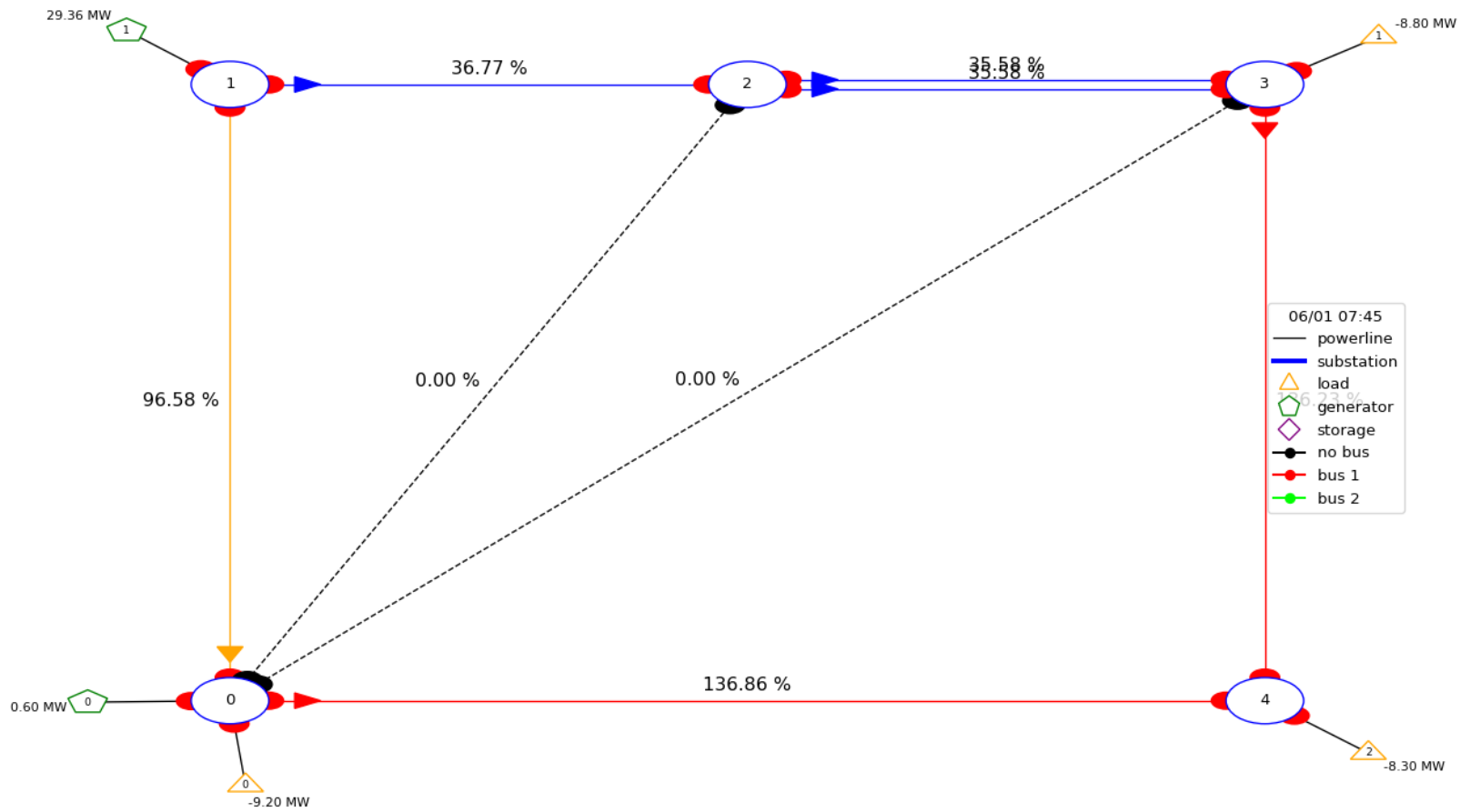


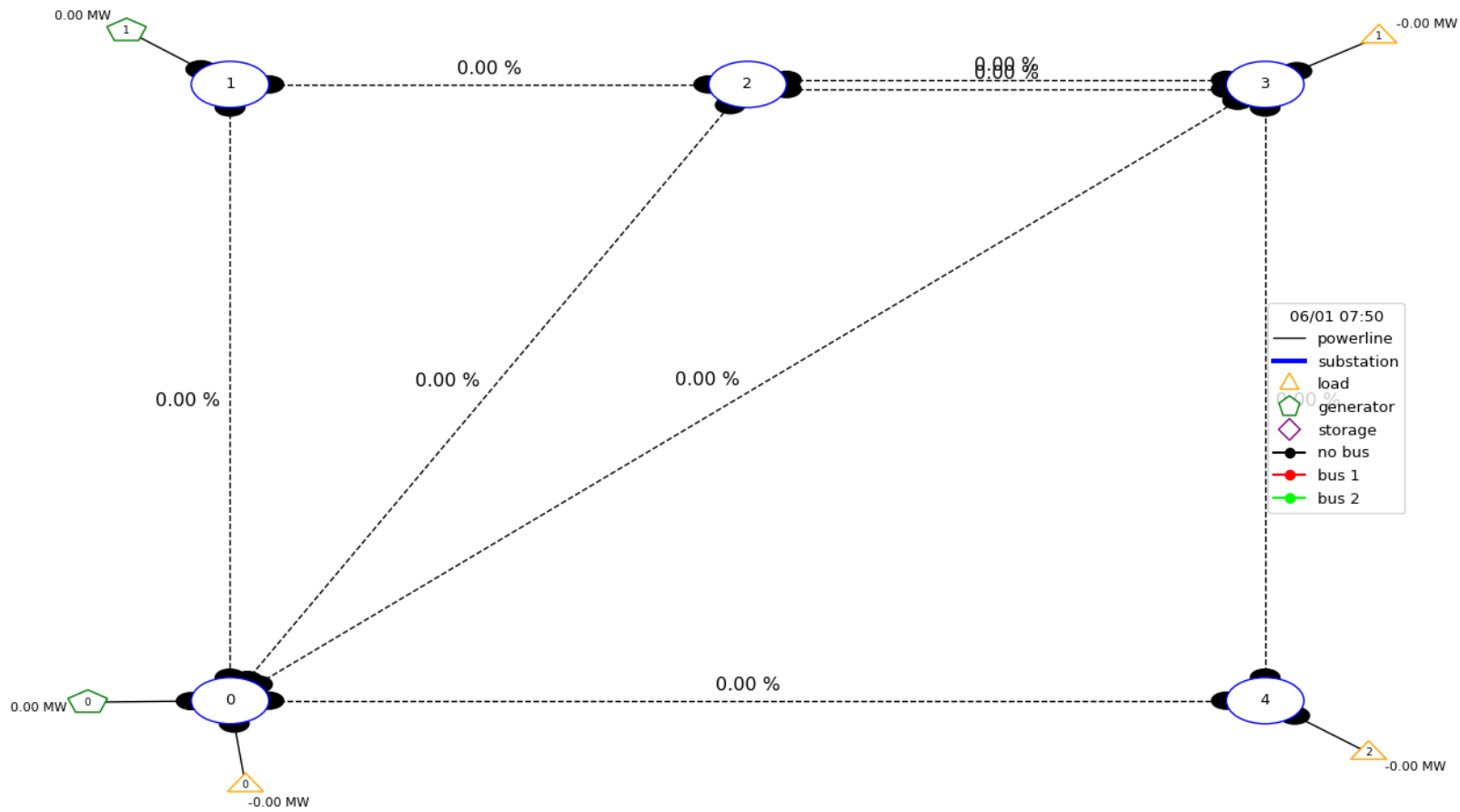










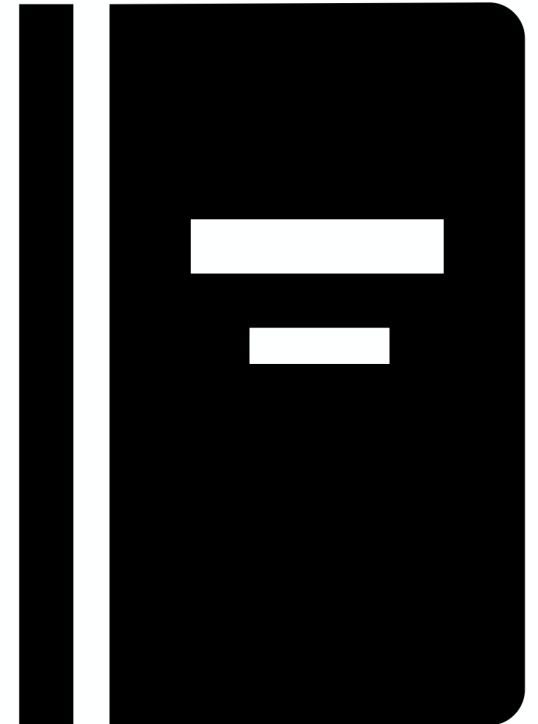




LEARNING CURVES PRESENTED LIVE

Conclusion

- Wins:
 - *Trained discrete SAC as benchmark*
 - *Reworked the environment for multi-agent*
 - *Trained multi-agent algorithm, all solve simple environment*
- Limitations
 - *We do not allow line disconnections*
 - *Only tried simple environments*
 - *Need for domain expertise*
- Opportunities:
 - *Test for scalability*
 - *Interpreting multi-agent attention*





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