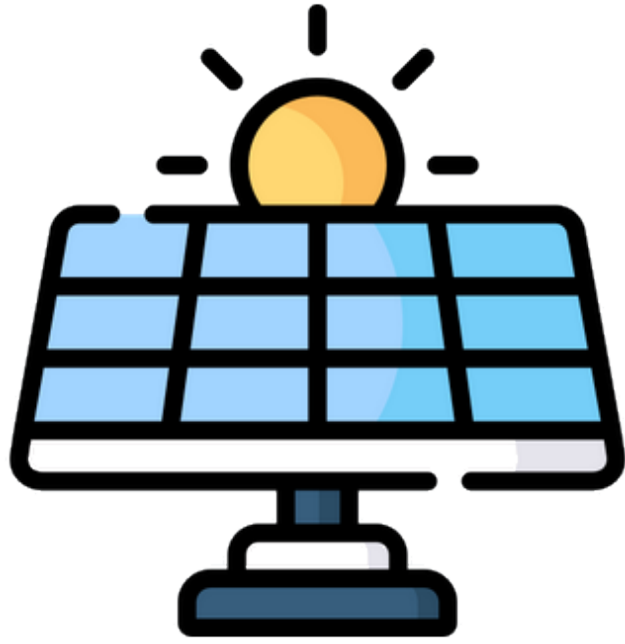


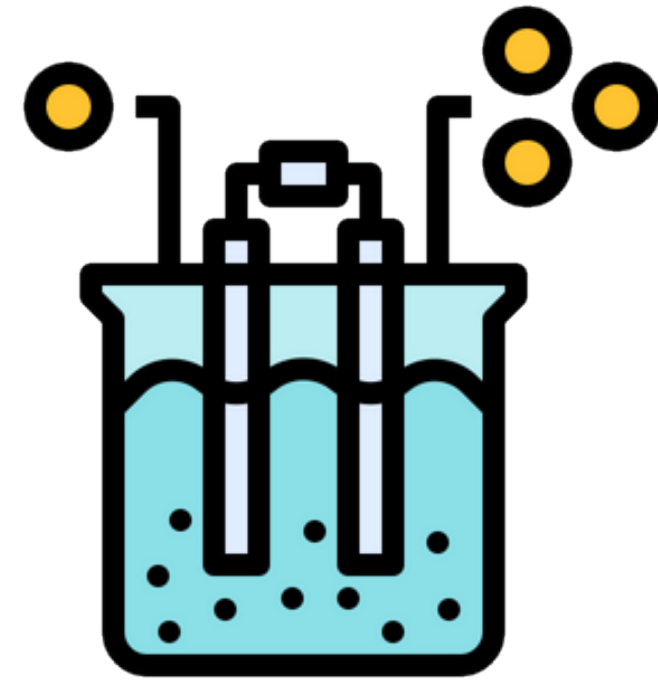
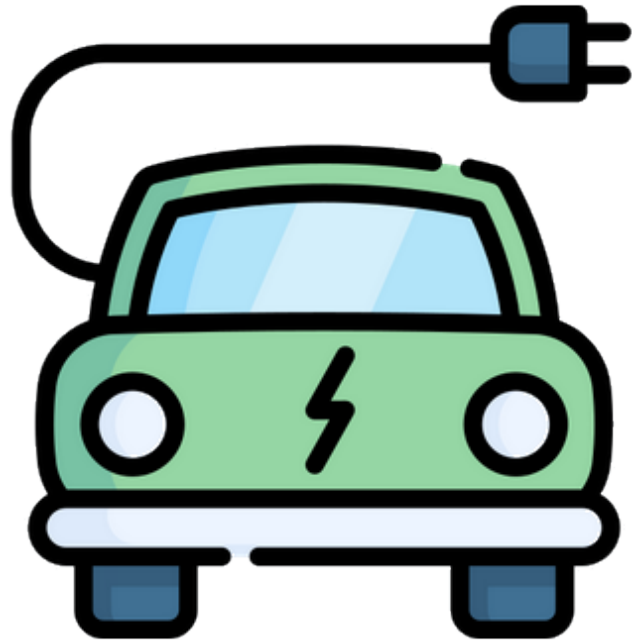
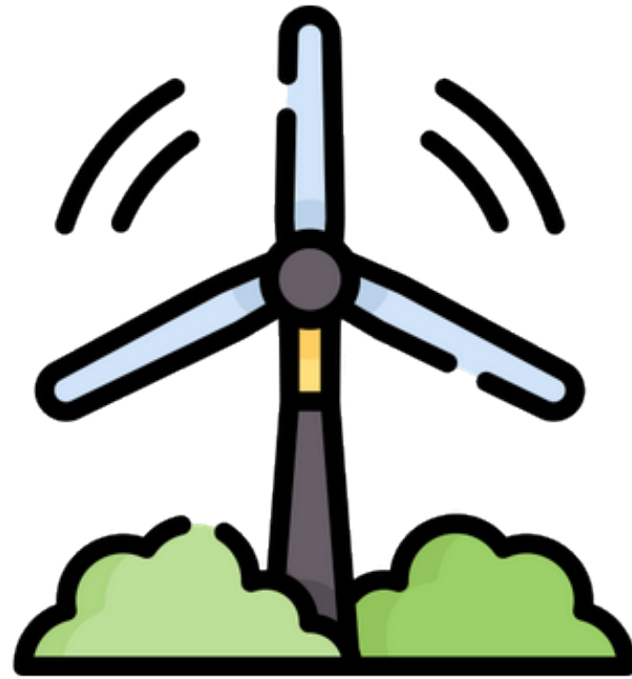
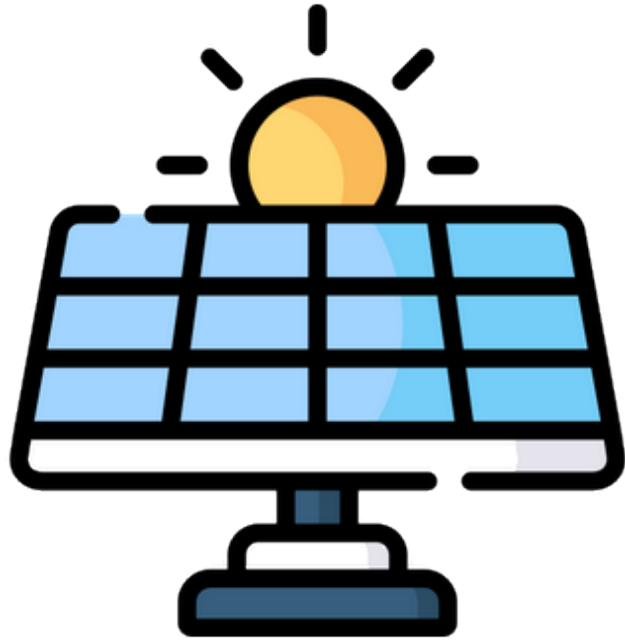
The roles and impacts of active end-users and DSOs during the transition towards smart distribution grids

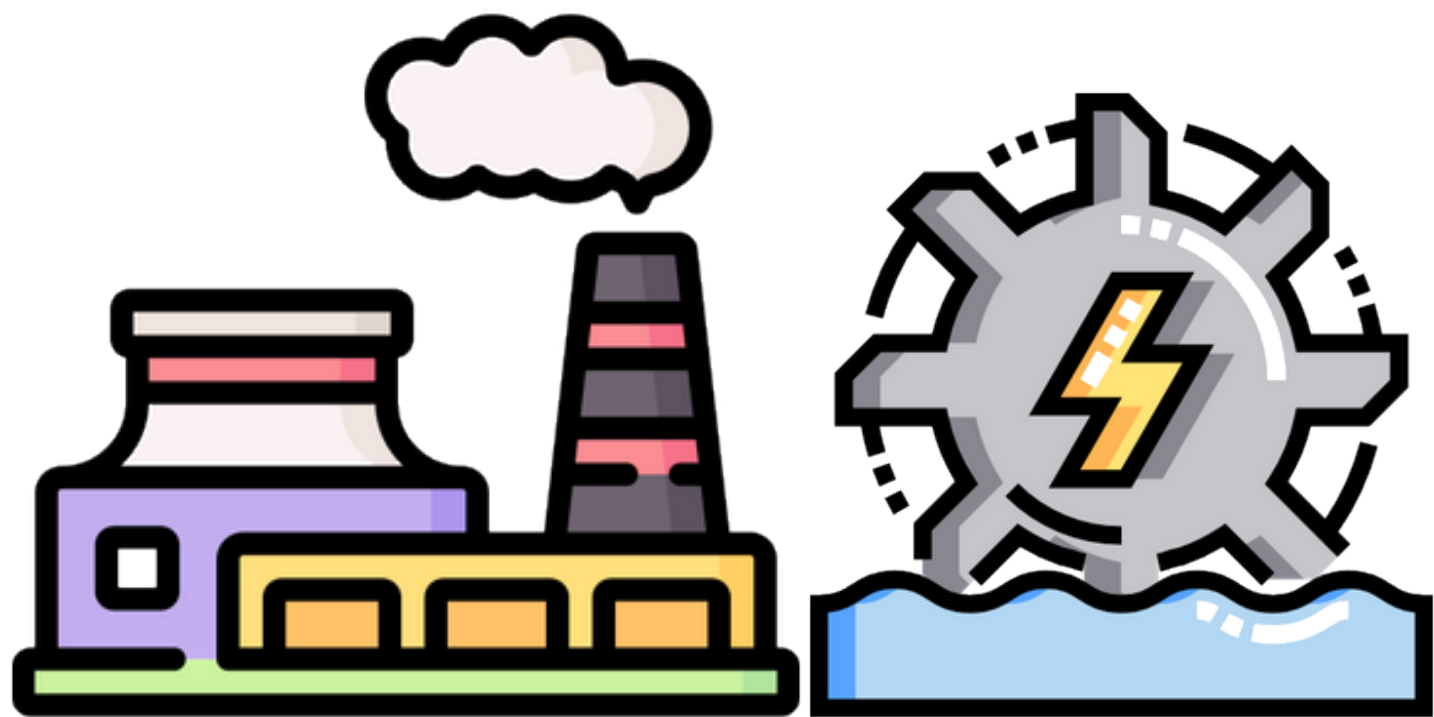
Dung-Bai (Tony) Yen
02.06.2023
Trondheim, Norway

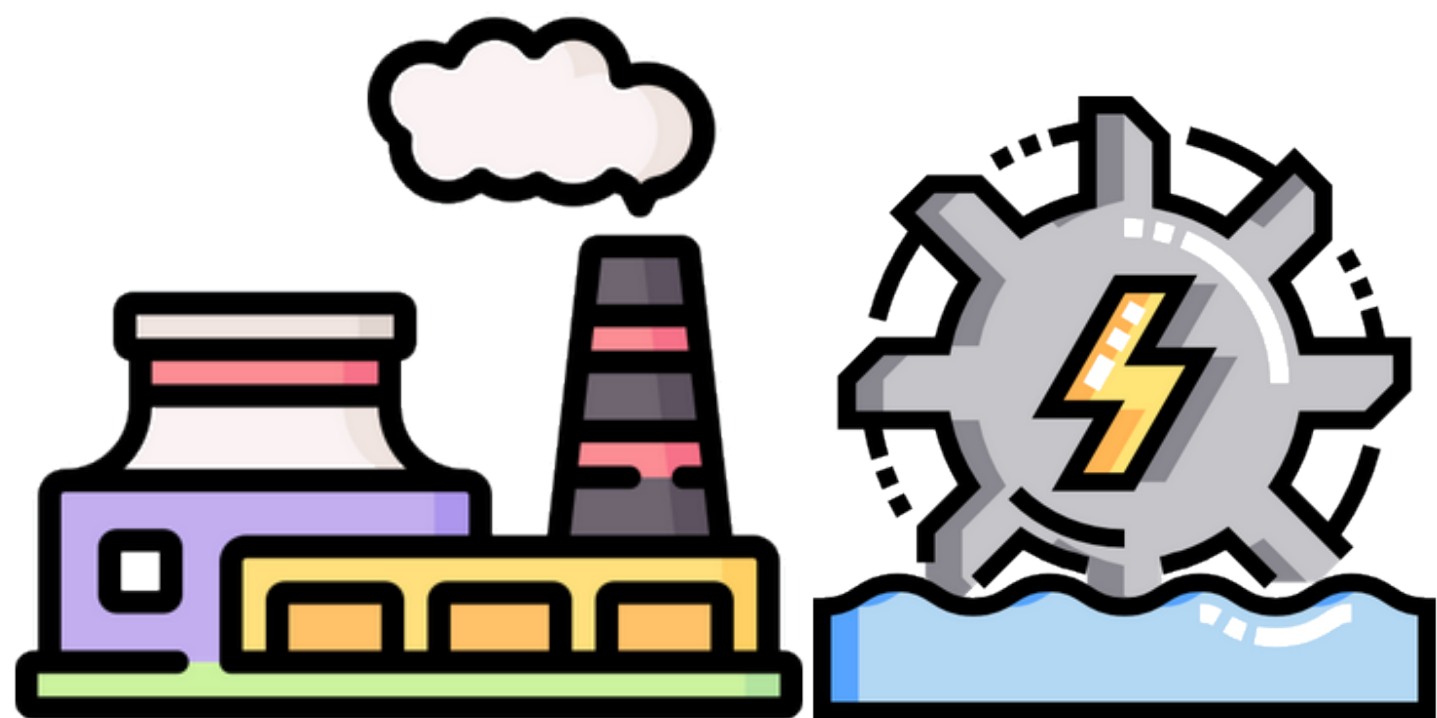


Motivation



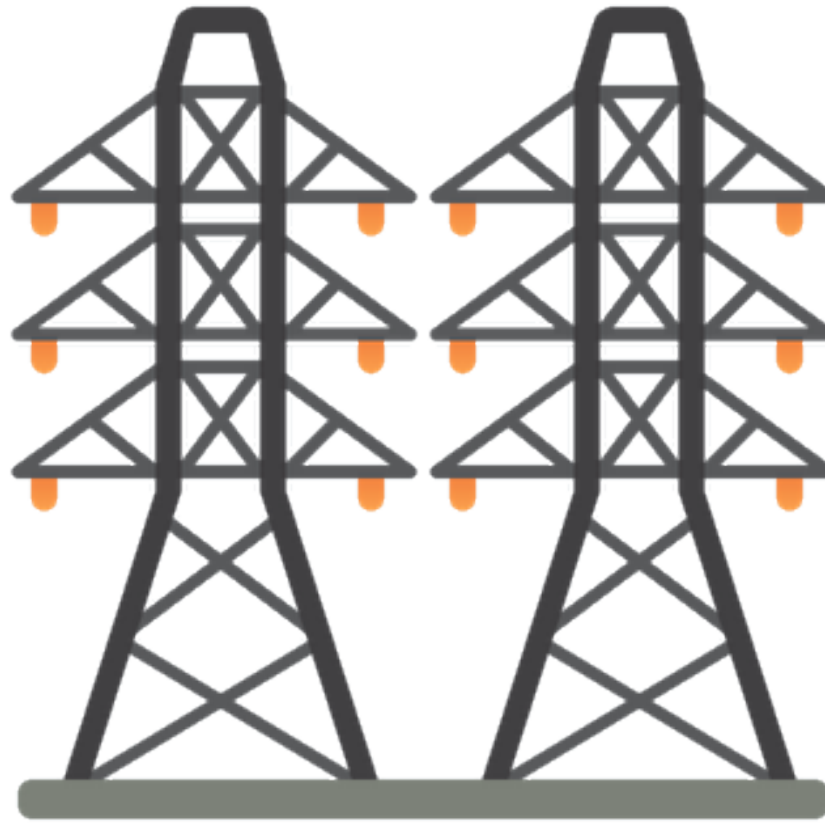






Research Questions





Active End-Users and DSOs' Roles in...

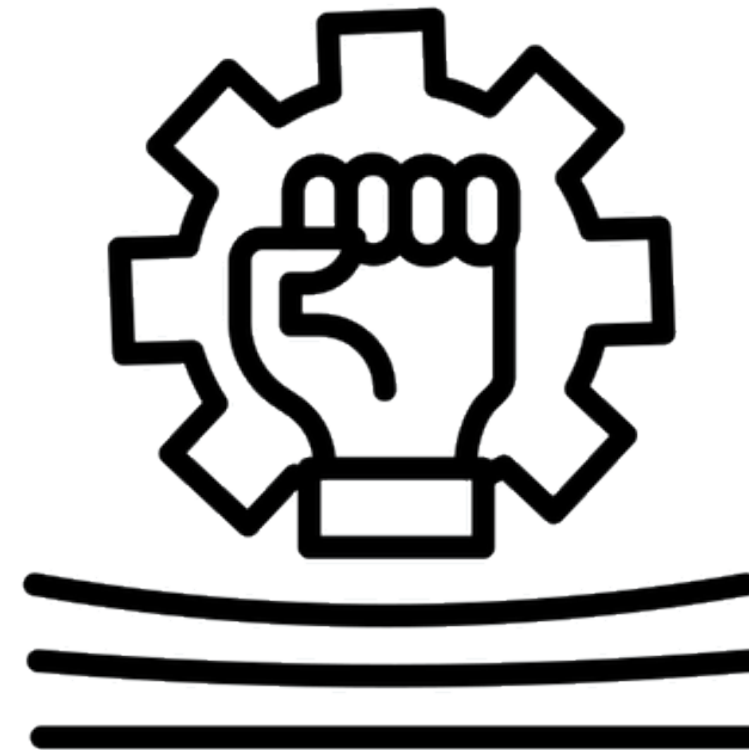


Short Term Operation

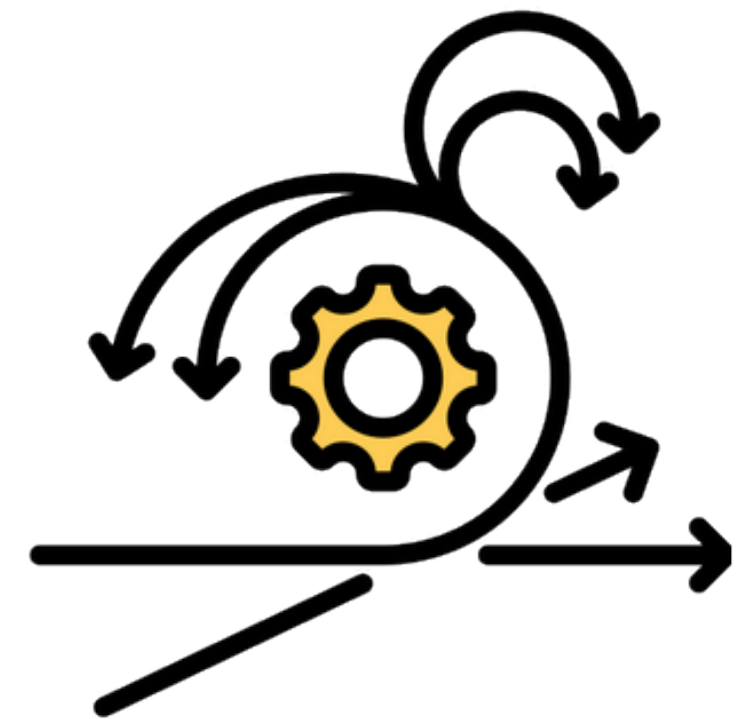


Long Term Transition

System Resilience

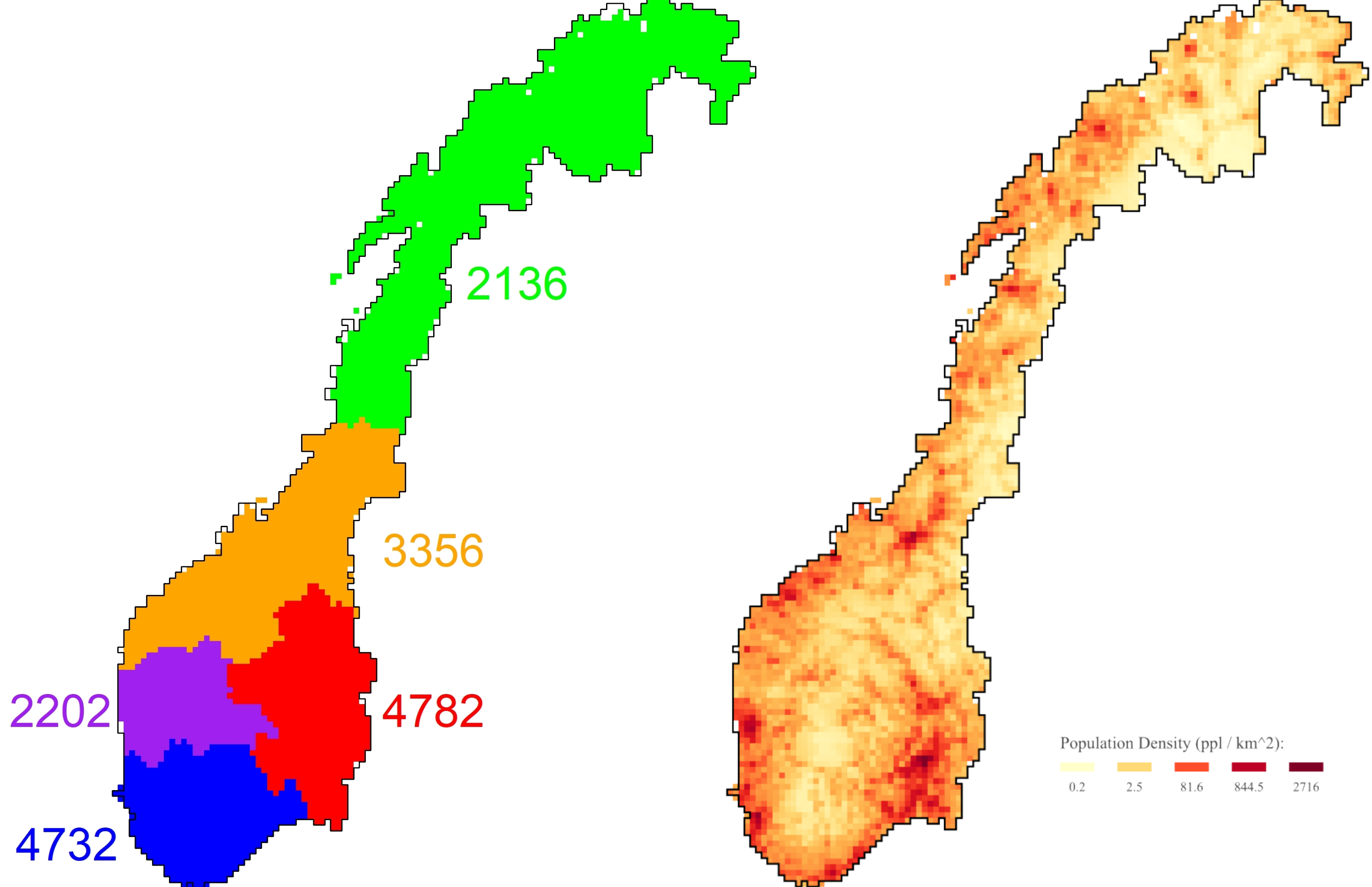


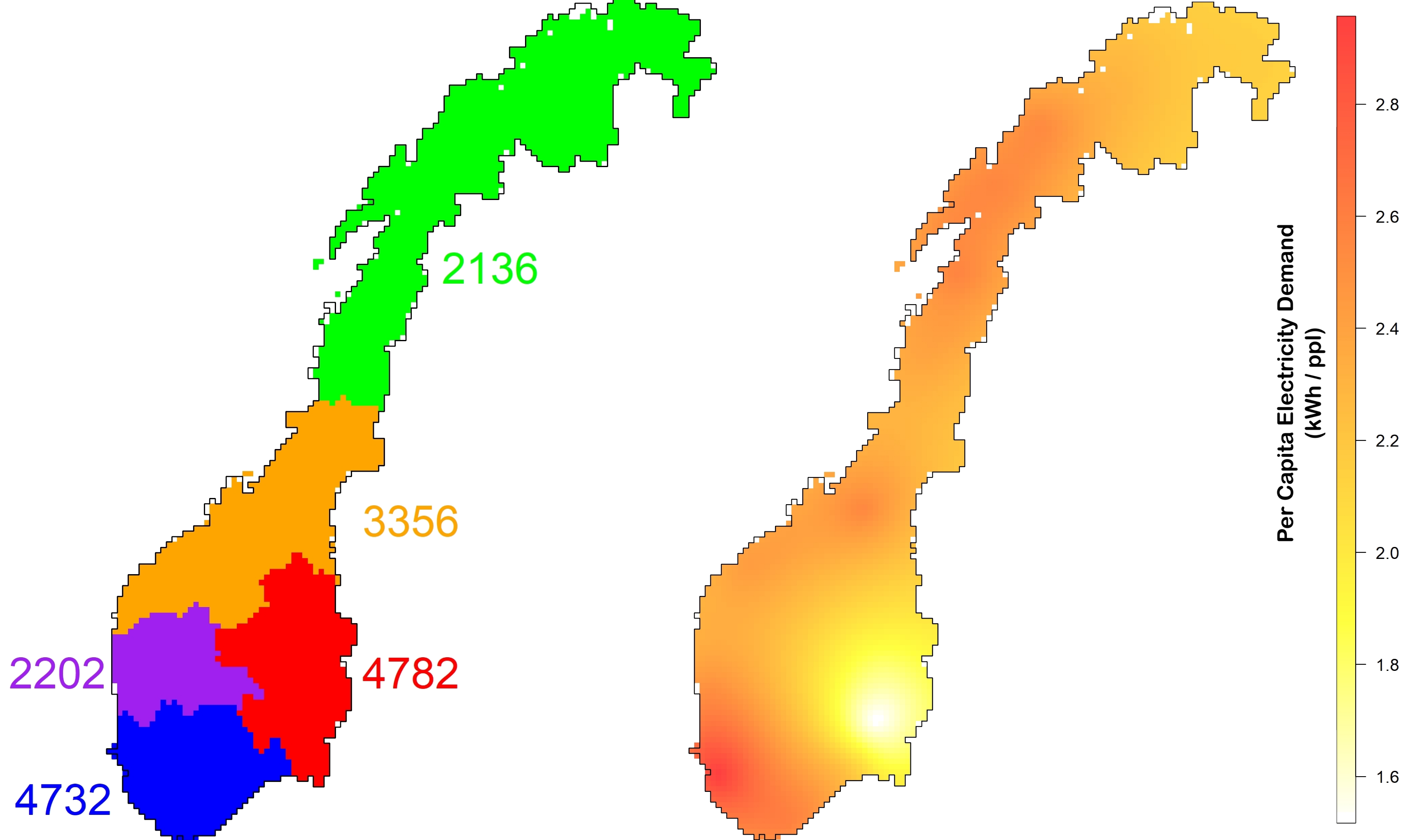
Pathway Sensitivity

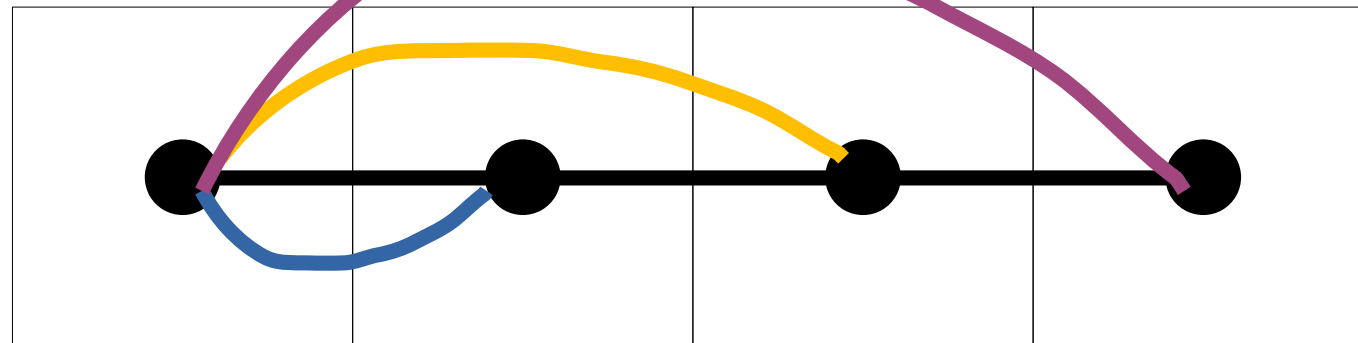
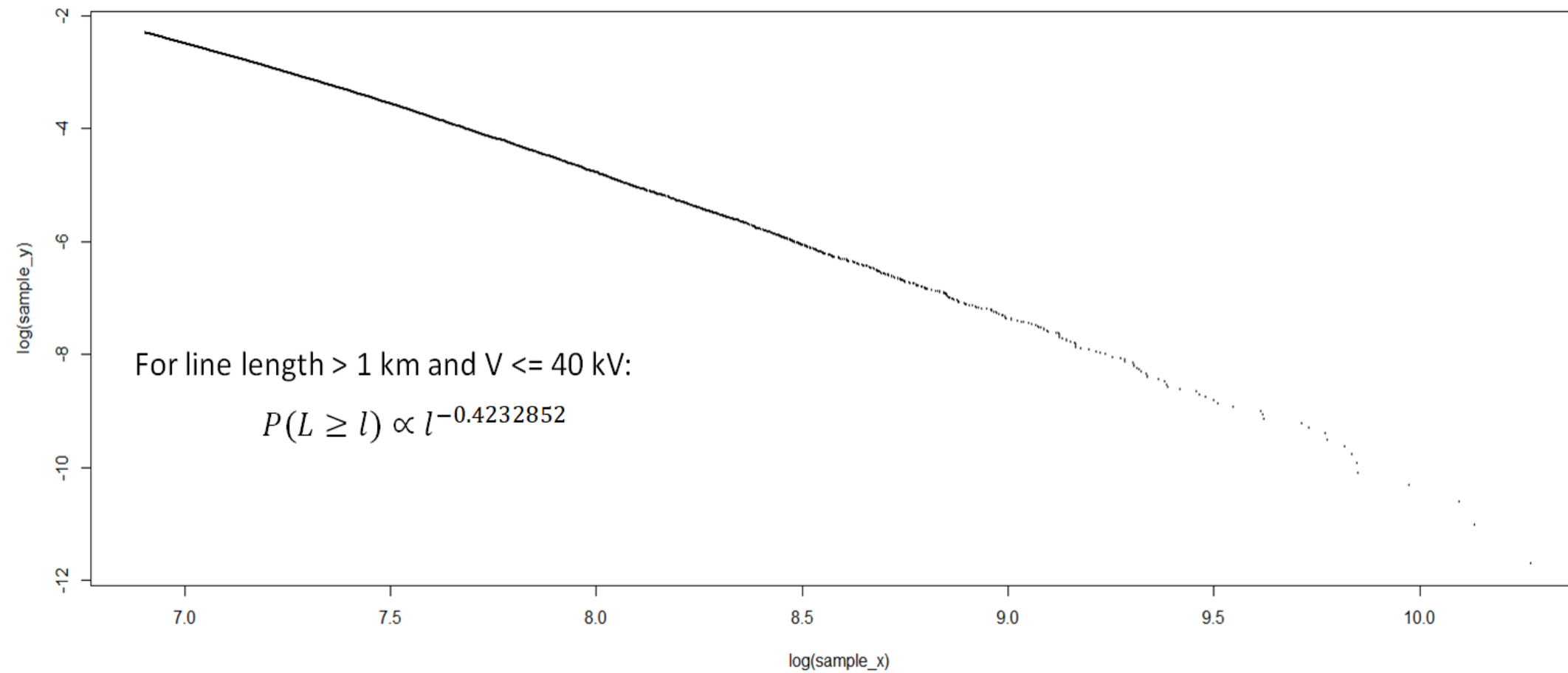


Publication

1st Paper:
Active End-User Participation under
a TSO-DSO Coordination Scheme for Norway



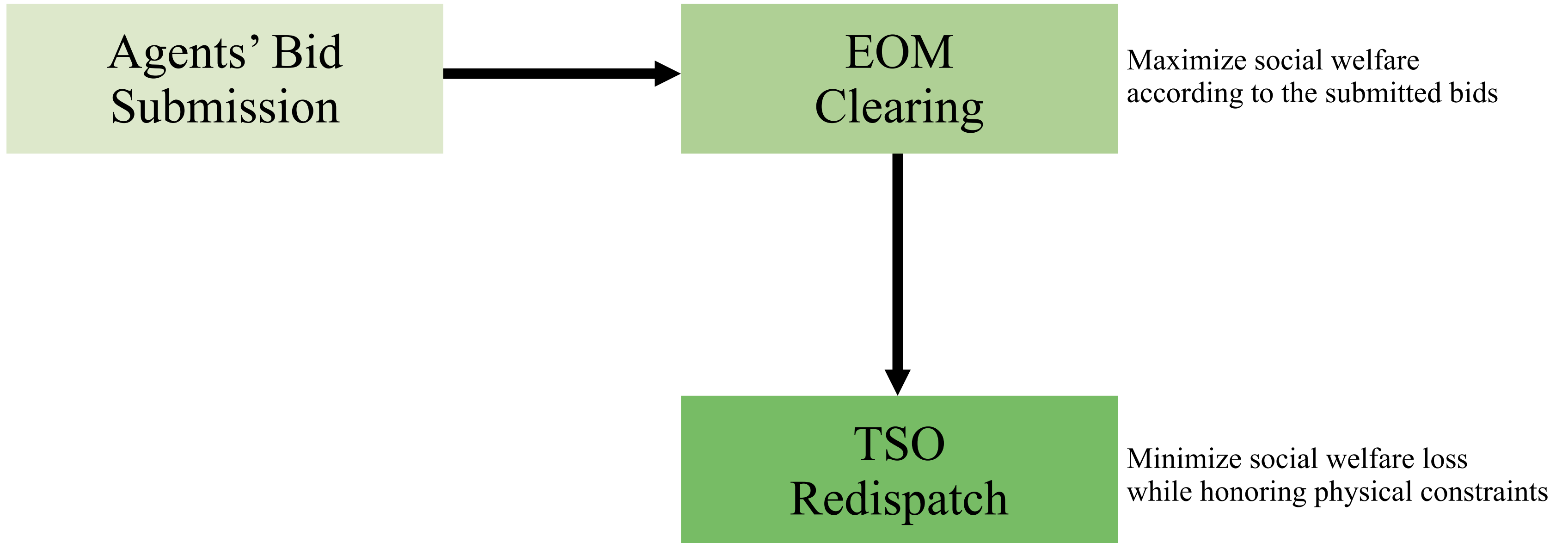




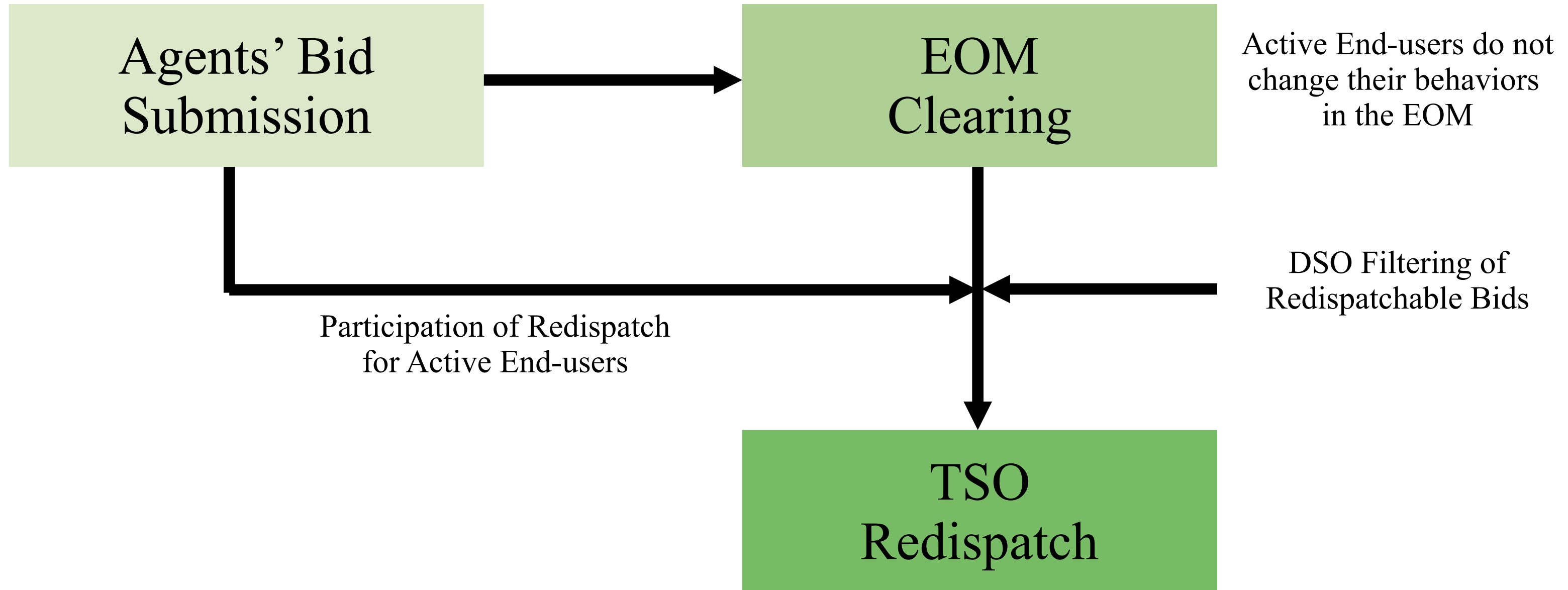
Conductivity of lines, blue: k
 Conductivity of lines, orange: $k * 2^{(-0.5 - 1 - 1 - 1)}$
 Conductivity of lines, purple: $k * 3^{(-0.5 - 1 - 1 - 1)}$

$$\Delta I(x_1) = \frac{\rho_N(\alpha - 1)l_m^{\alpha-1}}{2\pi z} \int_{\mathbf{R}^2 \setminus \mathbf{B}_{l_m}(x_1)} \frac{V(x_1) - V(x_2)}{|x_1 - x_2|^{2+\alpha}} dx_2 \longrightarrow \text{Fractional Laplacian operator acting on the voltage field}$$

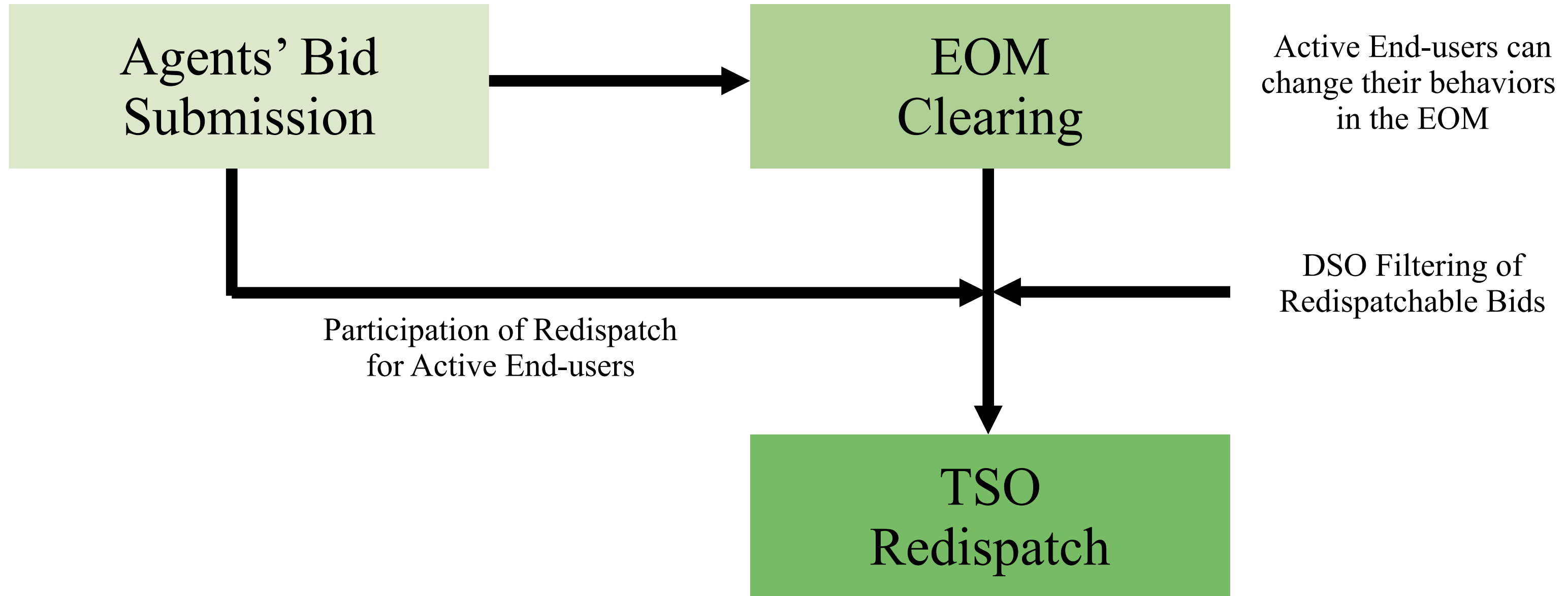
Reference Scenario



Partially Flexible Scenario



Fully Flexible Scenario



Inflexible
End-users



Passive
End-users



Active
End-users

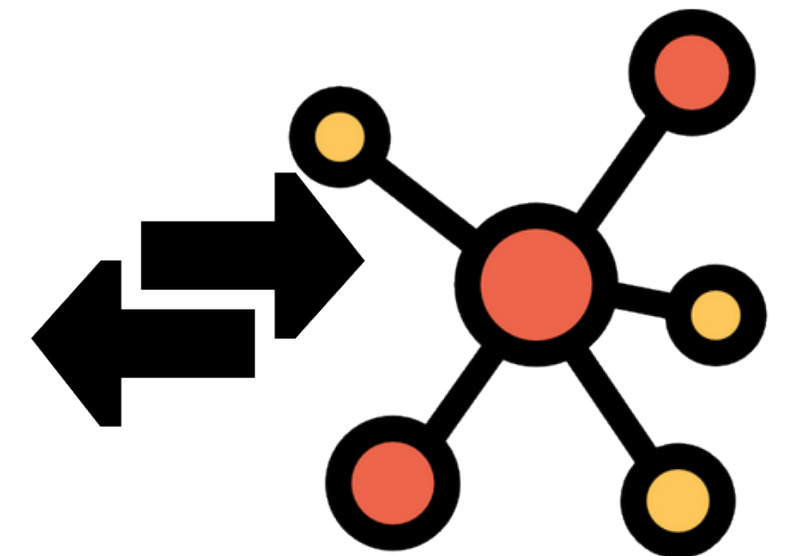
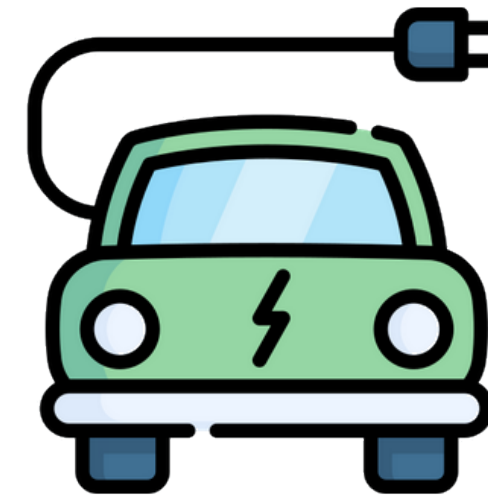






Table 3: Cost in EOM (in million EUR), redispatch cost (in million EUR), and total cost (in million EUR) in the scenarios between (a) 01 Jan to 14 Jan and (b) 01 July to 14 July.

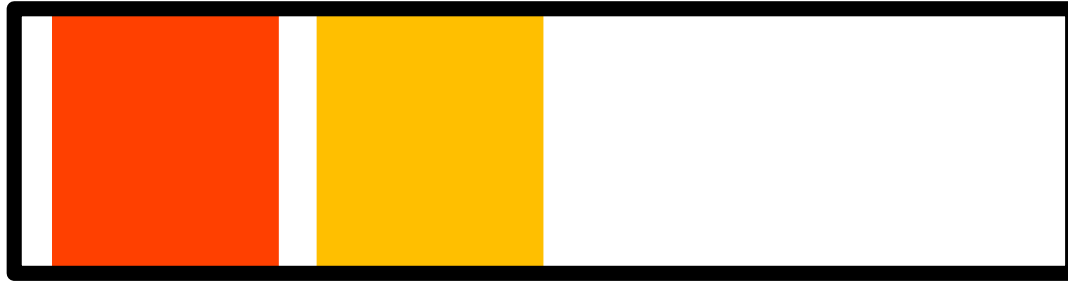
	(a)		
	Reference	Partially Flexible	Fully Flexible
Cost in EOM	262.945	262.945	267.927
Redispatch Cost	42.021	41.785	36.438
Total Cost	304.966	304.730	304.365
	(b)		
	Reference	Partially Flexible	Fully Flexible
Cost in EOM	96.245	96.245	96.036
Redispatch Cost	53.684	53.588	53.888
Total Cost	149.928	149.833	149.924

Table 3: Cost in EOM (in million EUR), redispatch cost (in million EUR), and total cost (in million EUR) in the scenarios between (a) 01 Jan to 14 Jan and (b) 01 July to 14 July.

	(a)			
	Reference	Partially Flexible	Fully Flexible	
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Cost in EOM	96.245	96.245	96.036	
Redispatch Cost	53.684	53.588	53.888	
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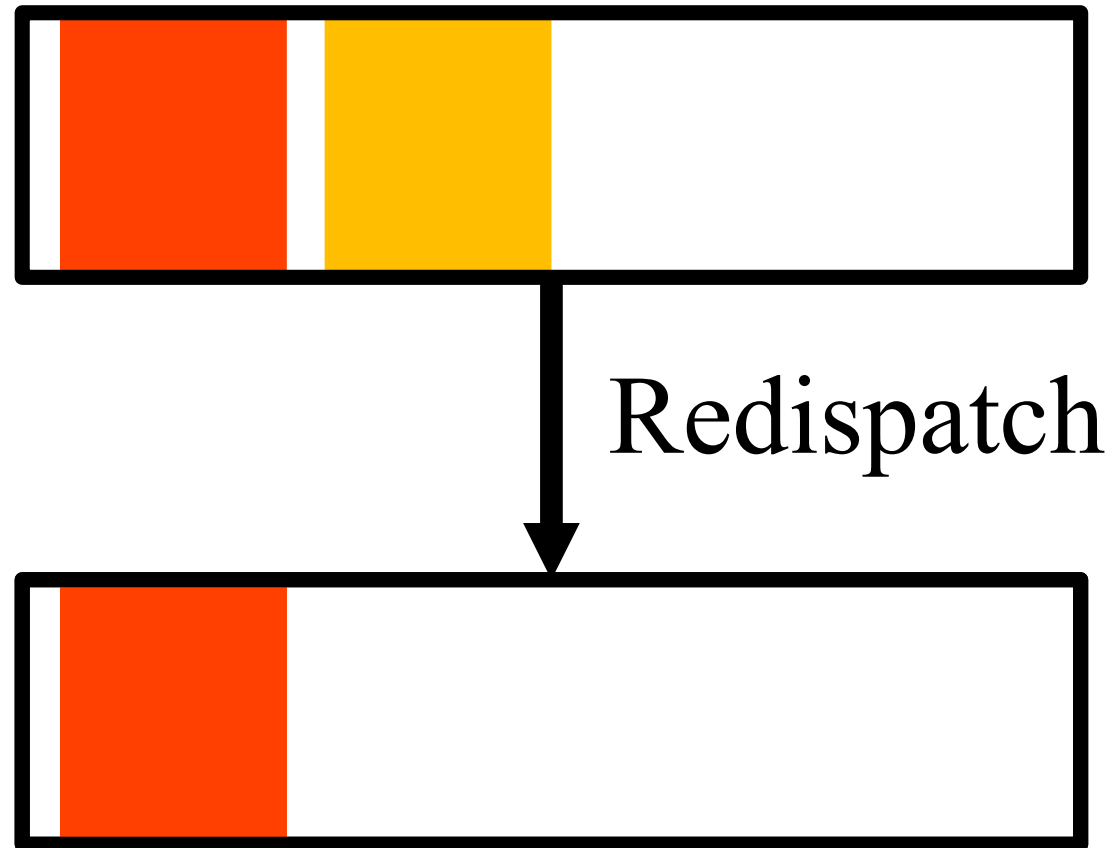





Upward Redispach



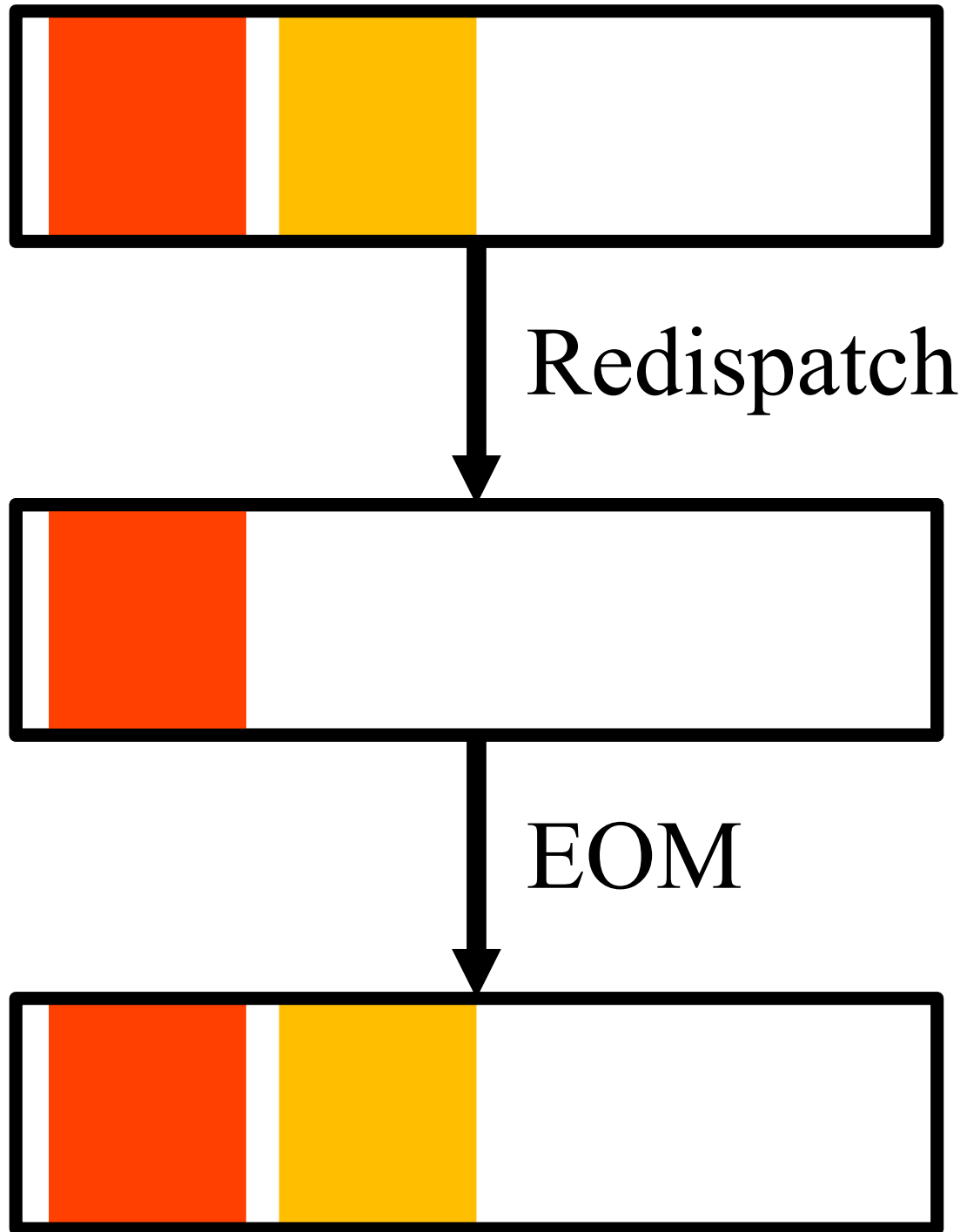
Downward Redispach

Upward Redispatch



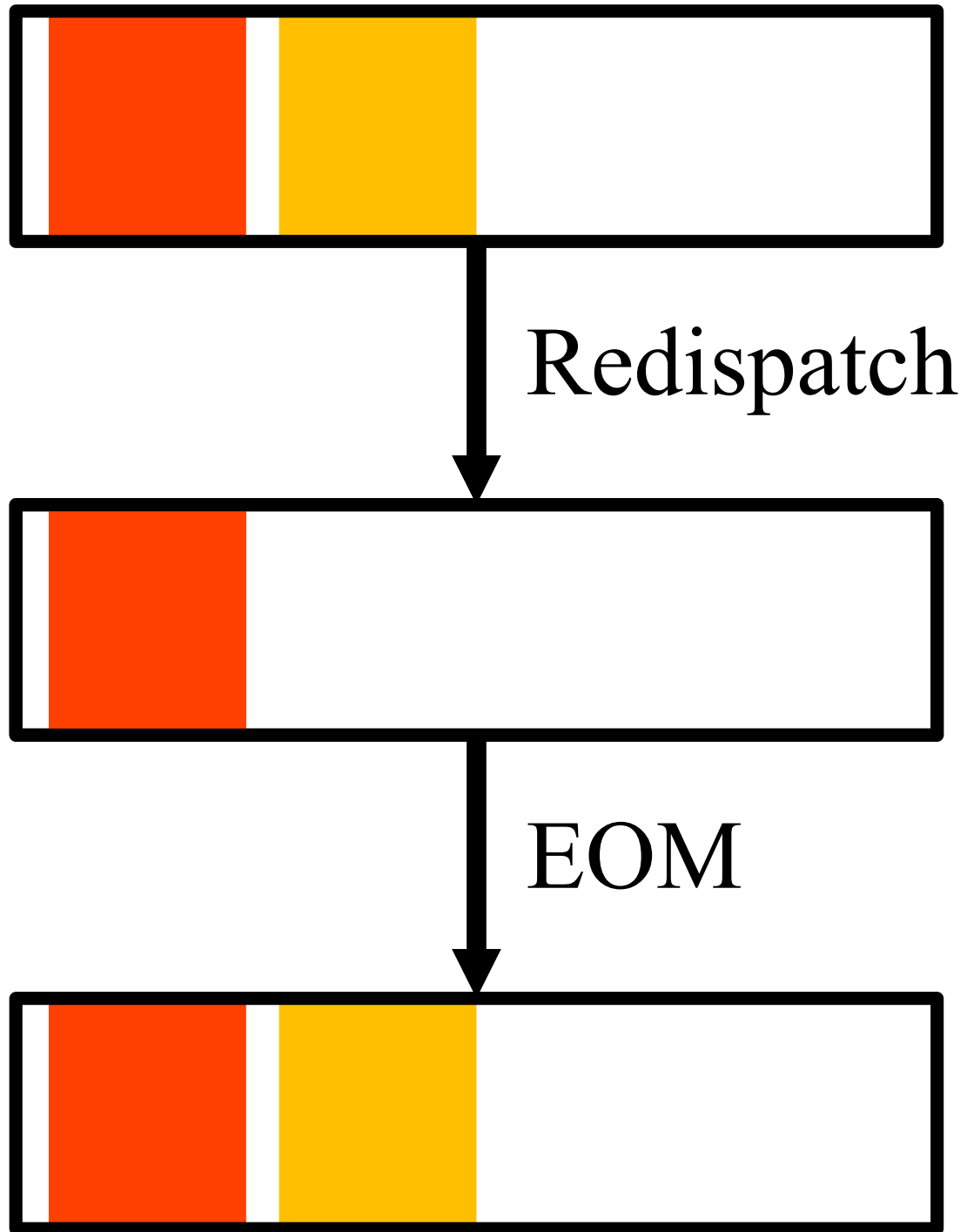
Downward Redispatch

Upward Redispatch

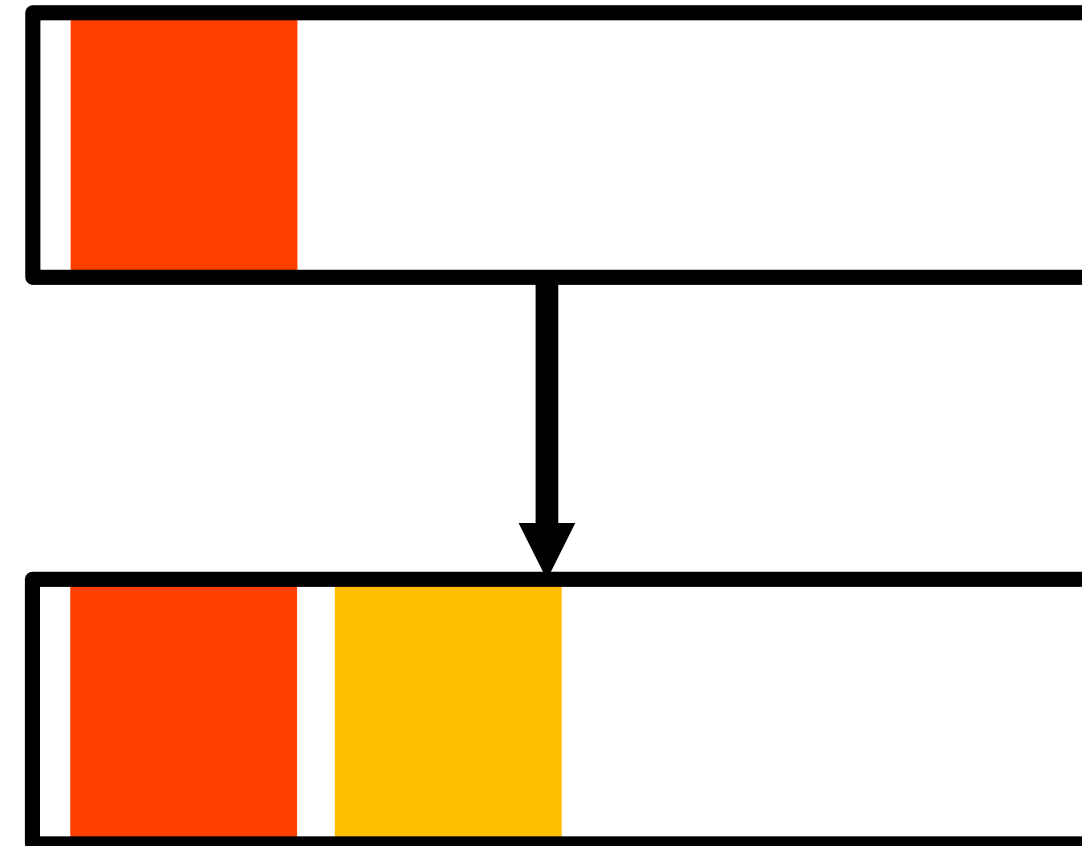


Downward Redispatch

Upward Redispatch



Downward Redispatch



Upward Redispatch



Redispatch



EOM



Downward Redispatch

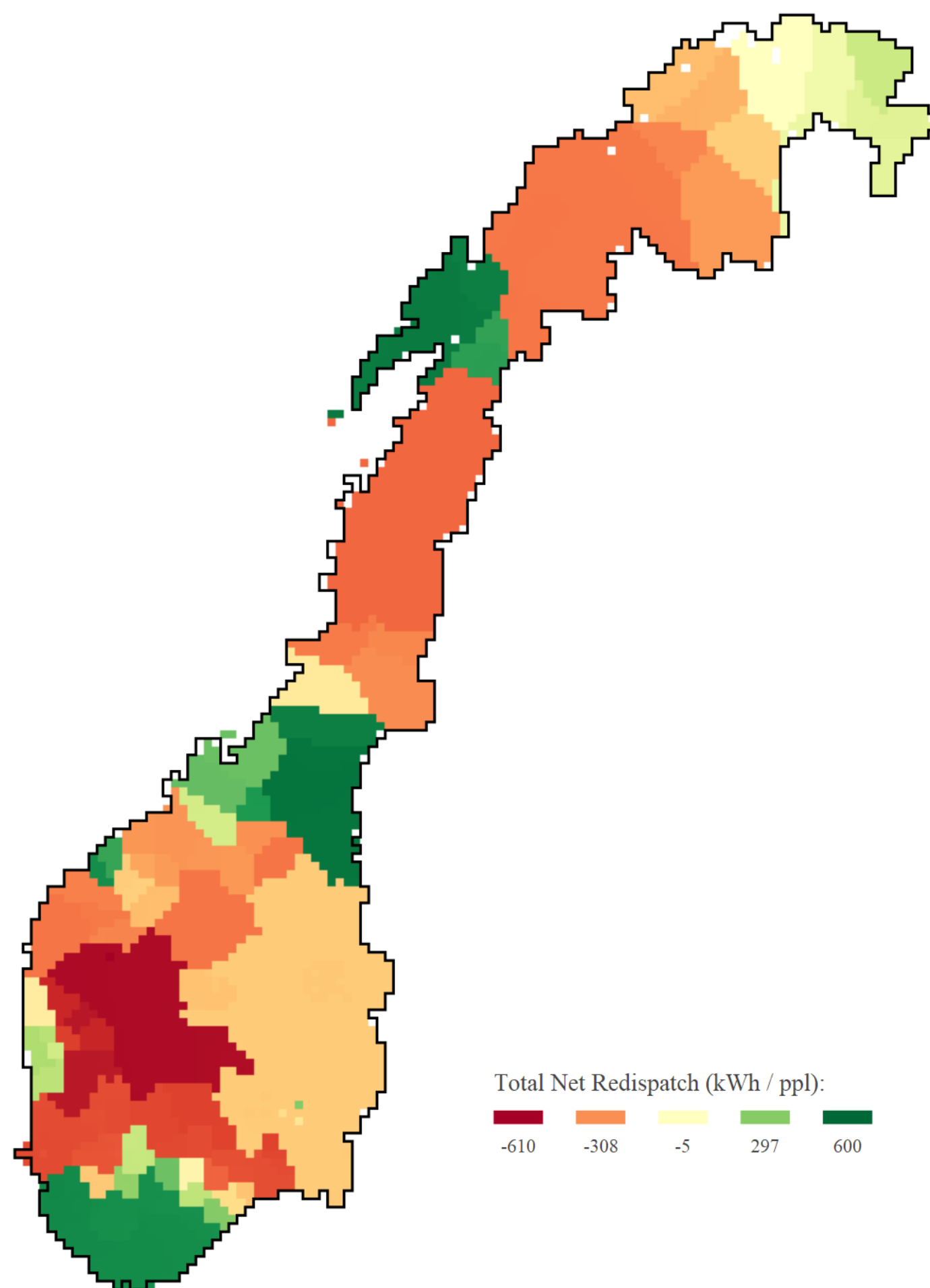
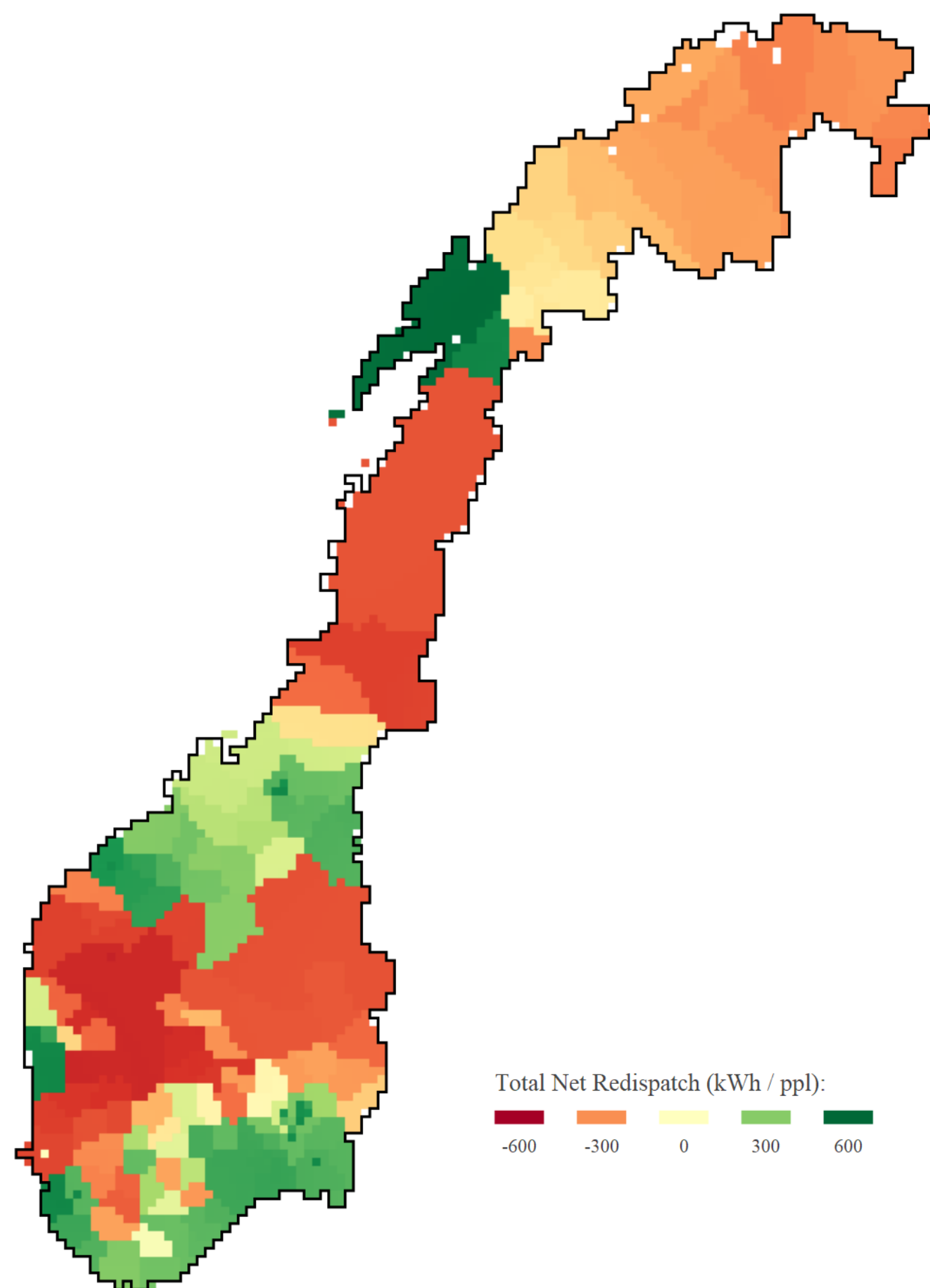


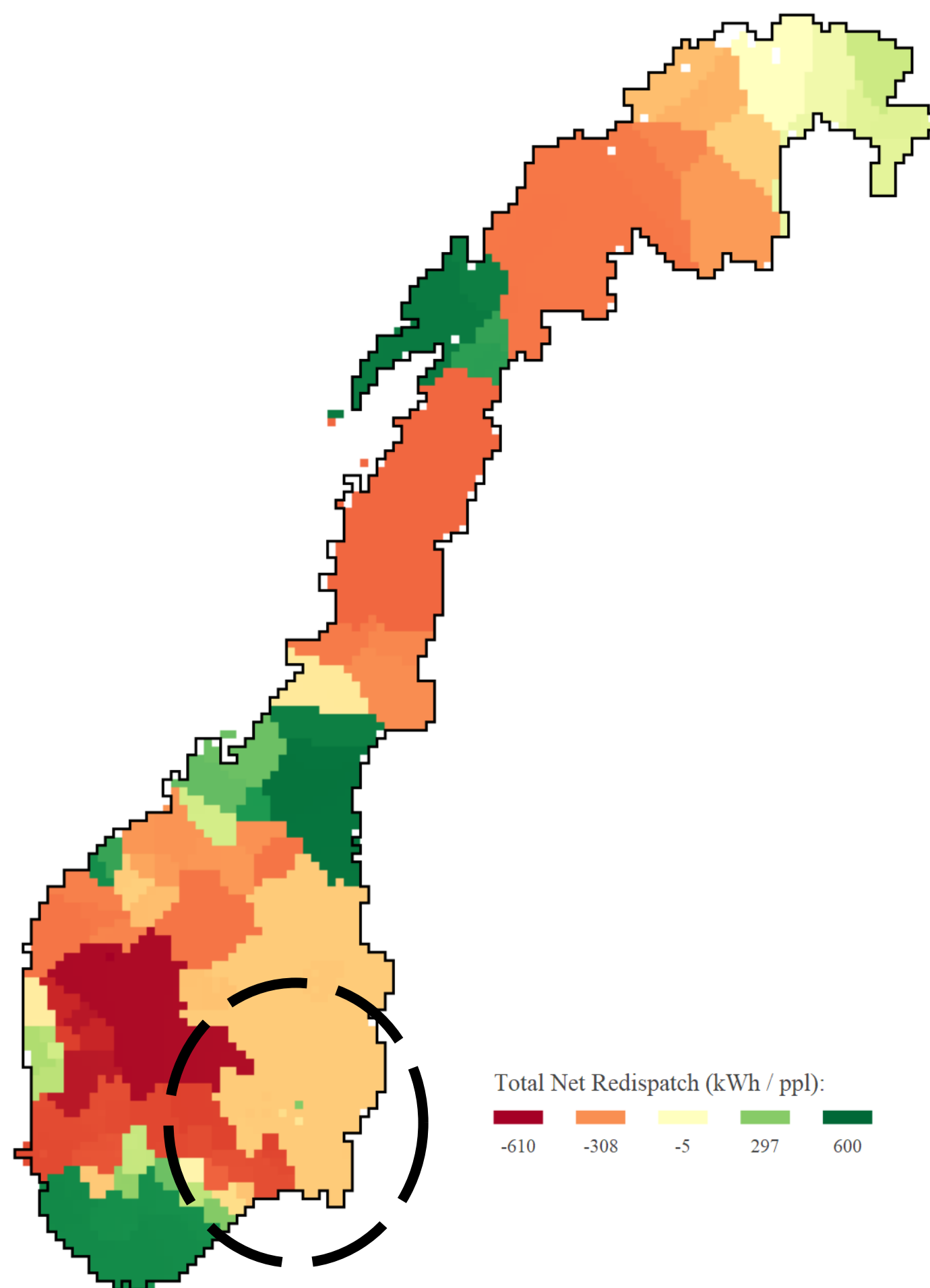
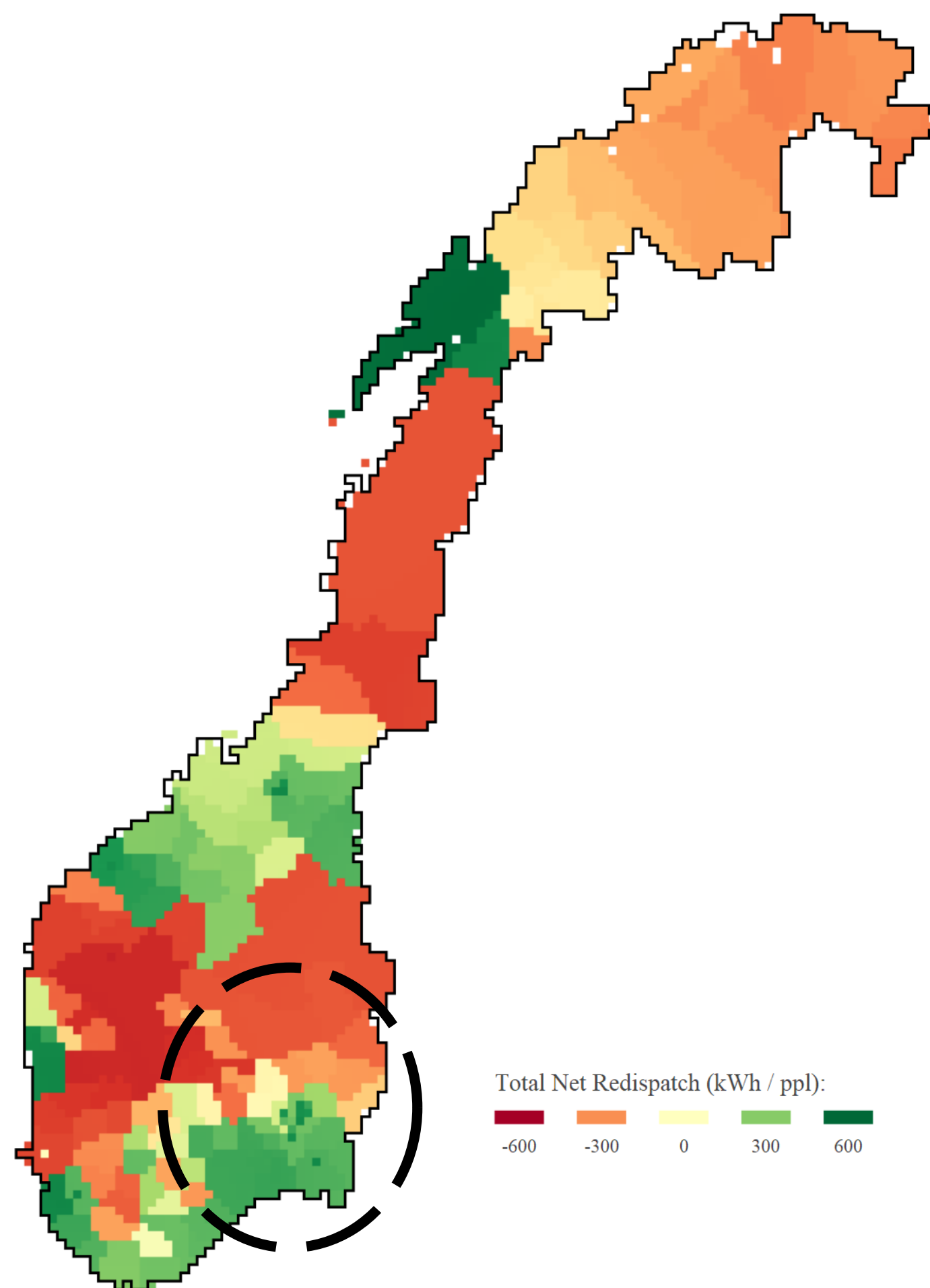
EOM

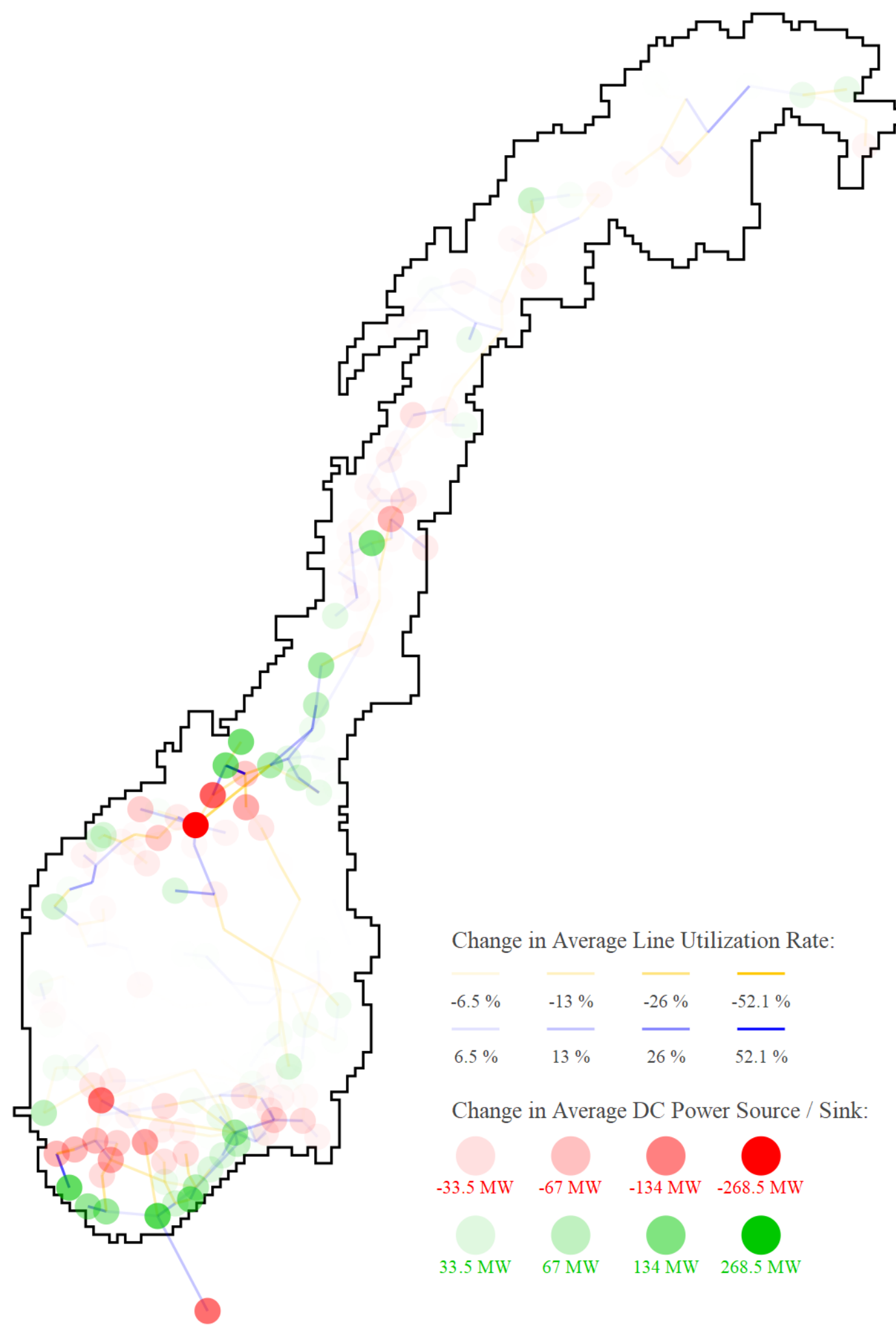
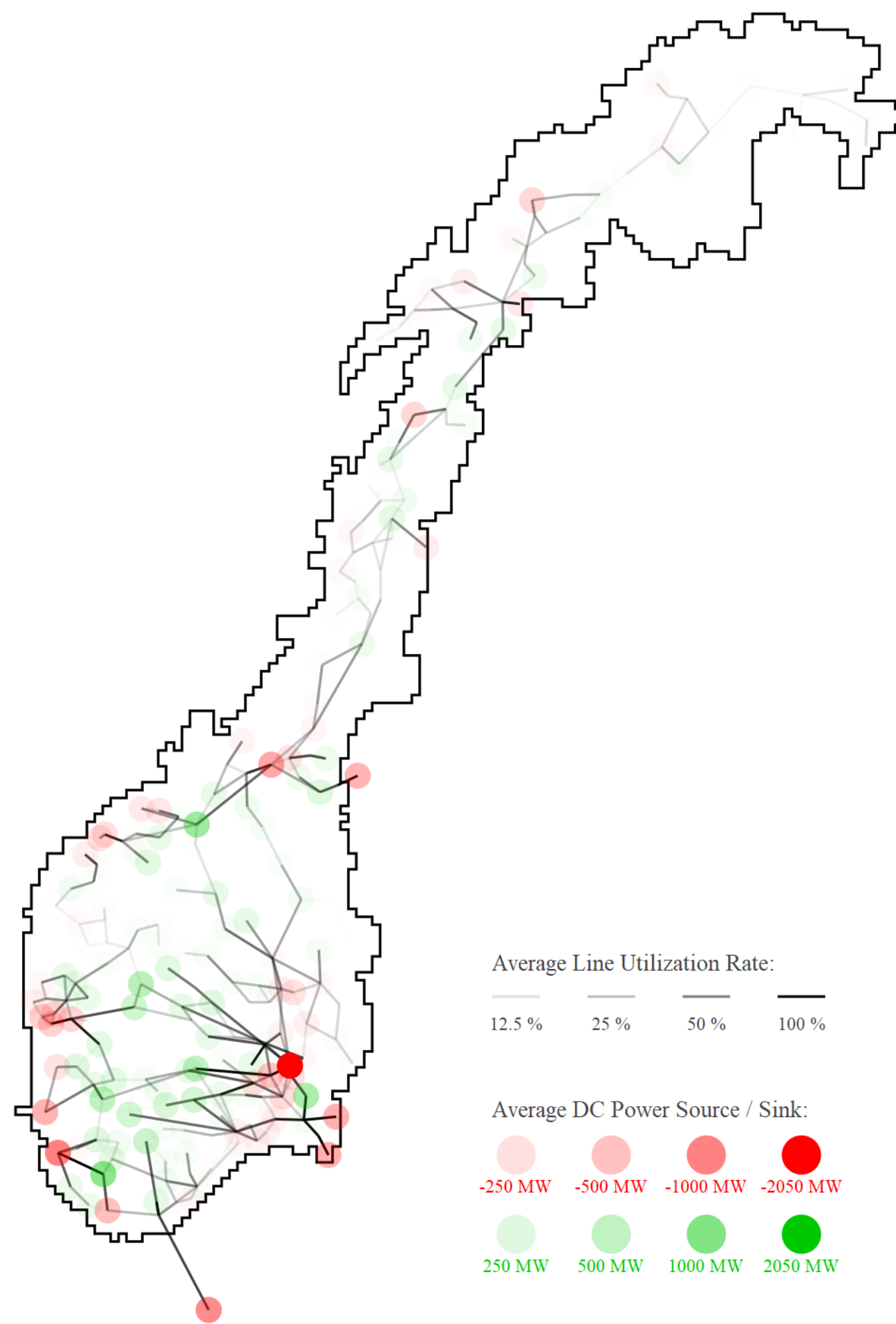


Redispatch









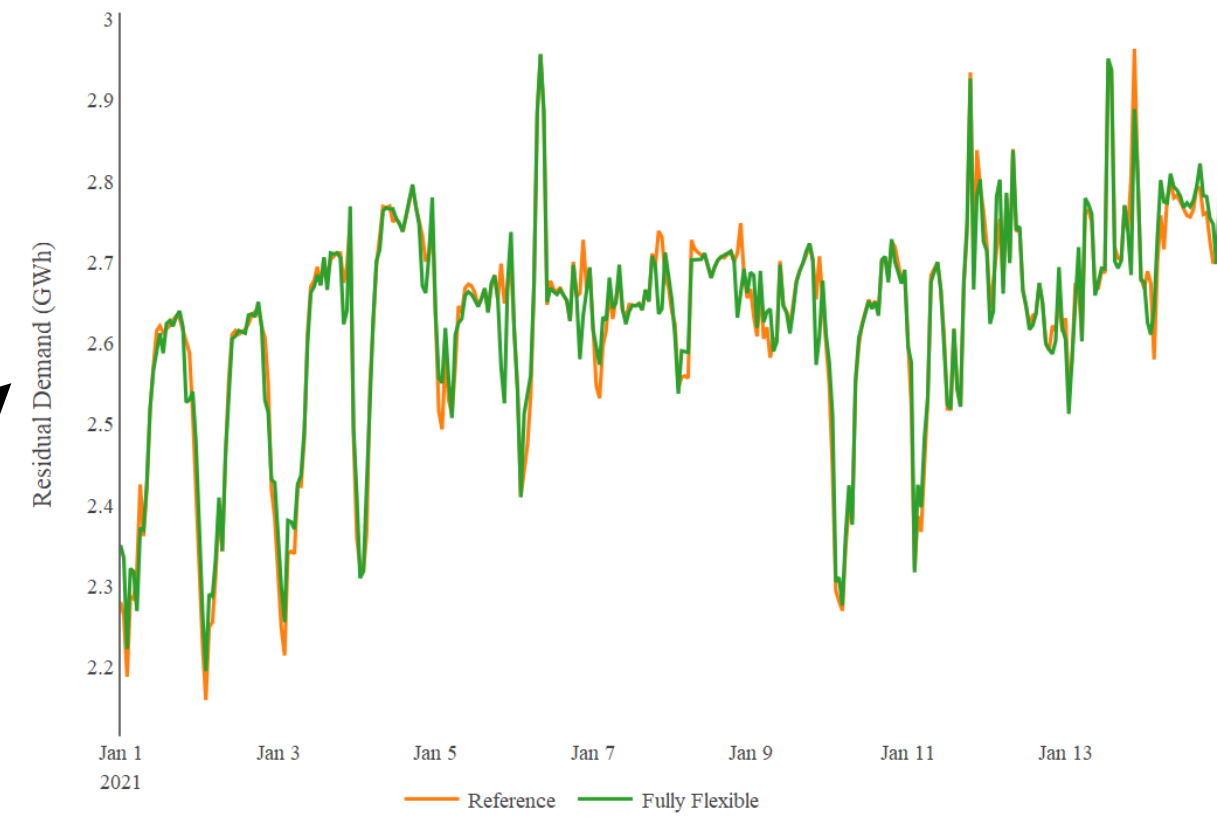
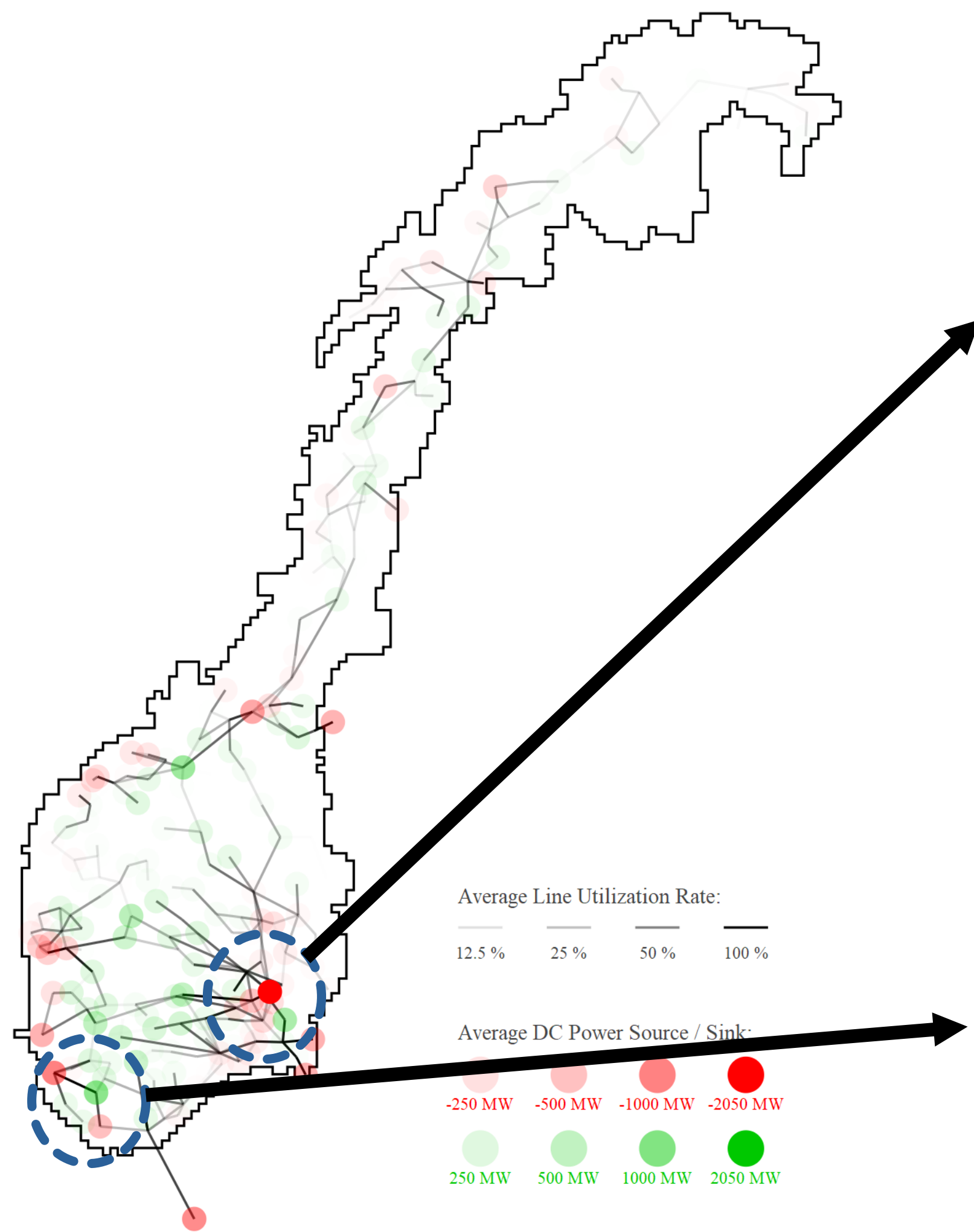


Table 6: Population density weighted median of average electricity prices (EUR / MWh) for different types of end-users in different bidding zones in scenario 3 between (a) 01 Jan to 14 Jan and (b) 01 July to 14 July.

(a)

Zones	Inflexible	Passive	Active Flexible
#1	75.816	75.474	62.506
#2	78.812	78.329	66.412
#3	48.951	48.674	42.389
#4	36.636	36.233	32.107
#5	77.353	77.134	68.280

(b)

Zones	Inflexible	Passive	Active Flexible
#1	72.882	74.285	64.491
#2	73.597	73.494	63.808
#3	38.086	38.021	32.101
#4	28.074	27.933	24.964
#5	68.445	68.349	58.001

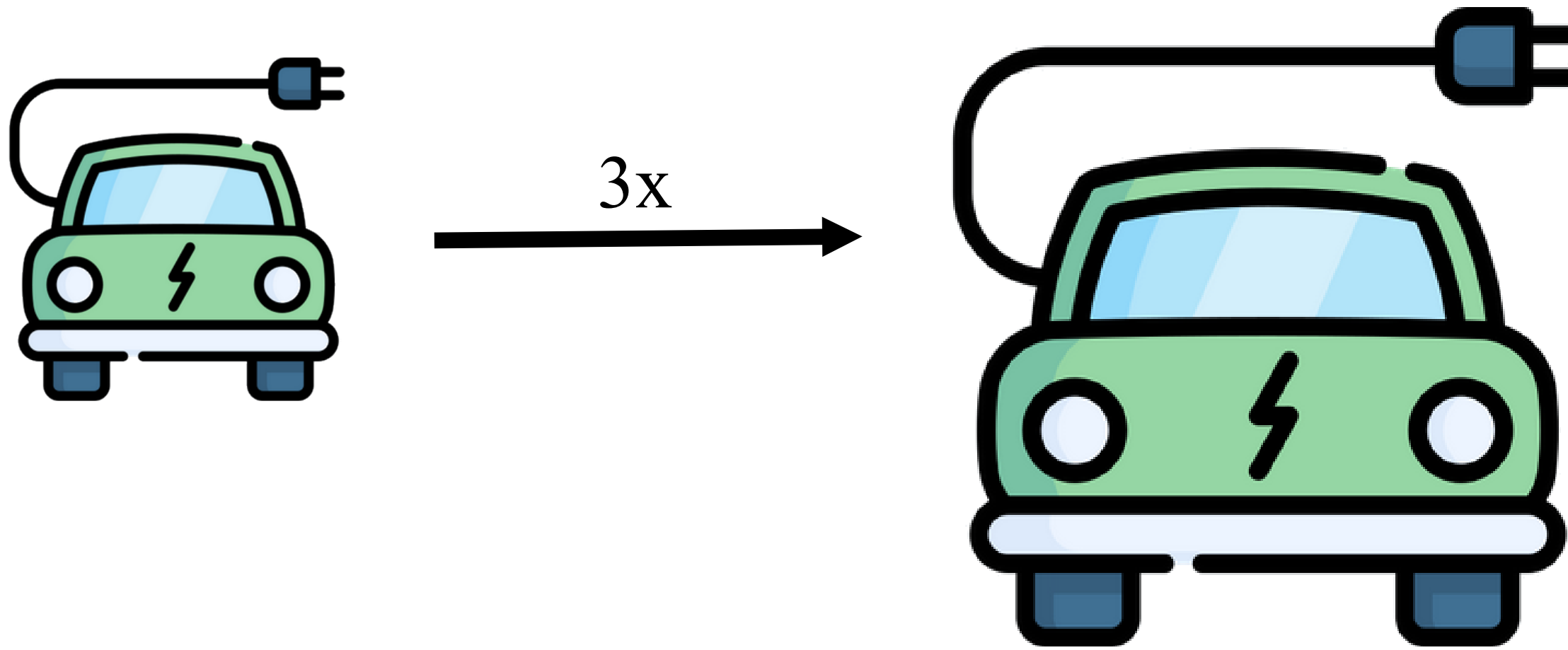


Table 4: Cost in EOM (in million EUR), redispatch cost (in million EUR), and total cost (in million EUR) in the 3x EV Scenario between (a) 01 Jan to 14 Jan and (b) 01 July to 14 July.

	0101 - 0114	0701-0714
Cost in EOM	268.042	95.983
Redispatch Cost	35.927	53.628
Total Cost	303.970	149.612

Future Plans

2nd Paper: 06 – 12.2023

3rd Paper: 09.2023 – 03.2024

4th Paper: 01 – 06.2024



Thank You

dung.b.yen@ntnu.no