

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

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Trondheim, Norway



Agenda

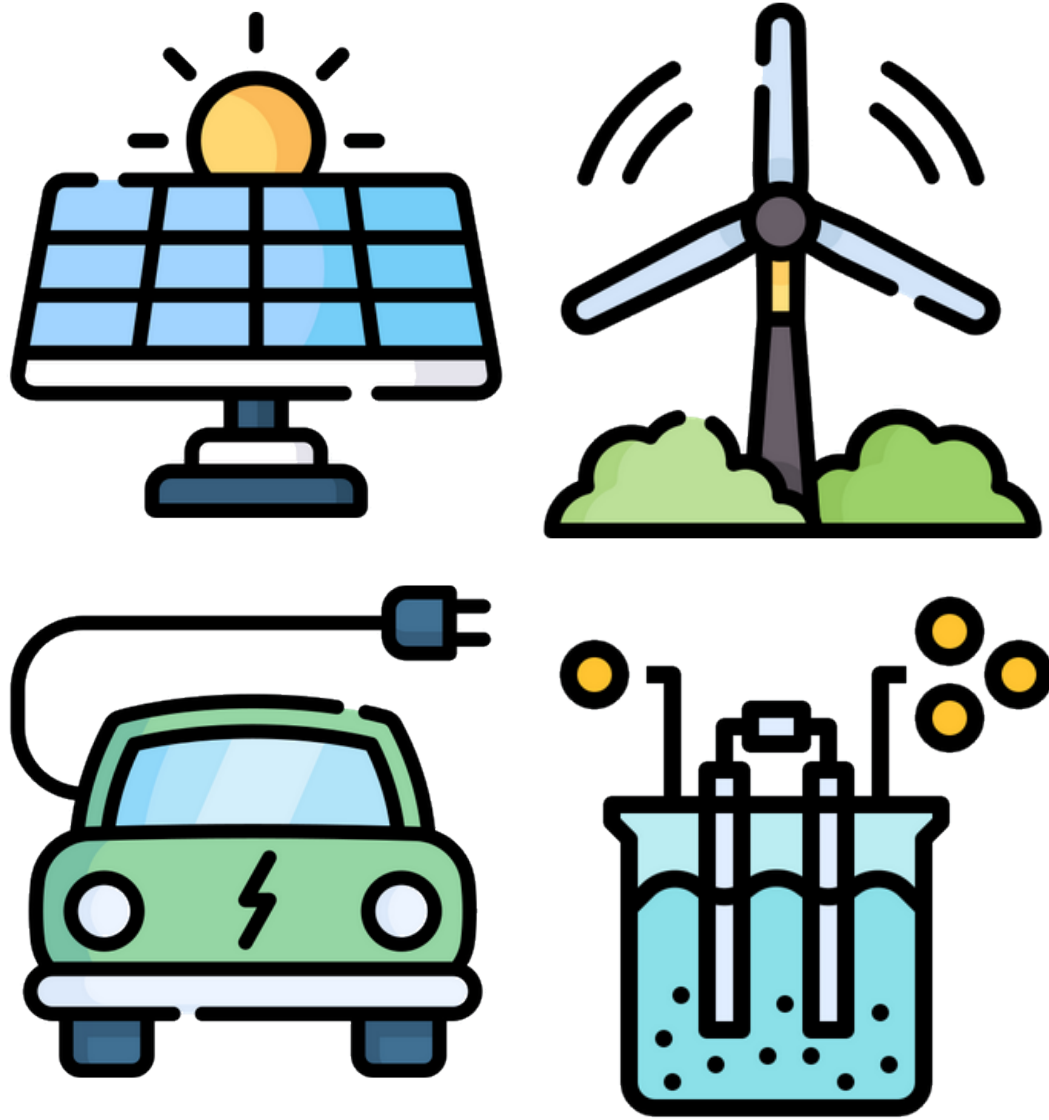
Motivation

Research Questions

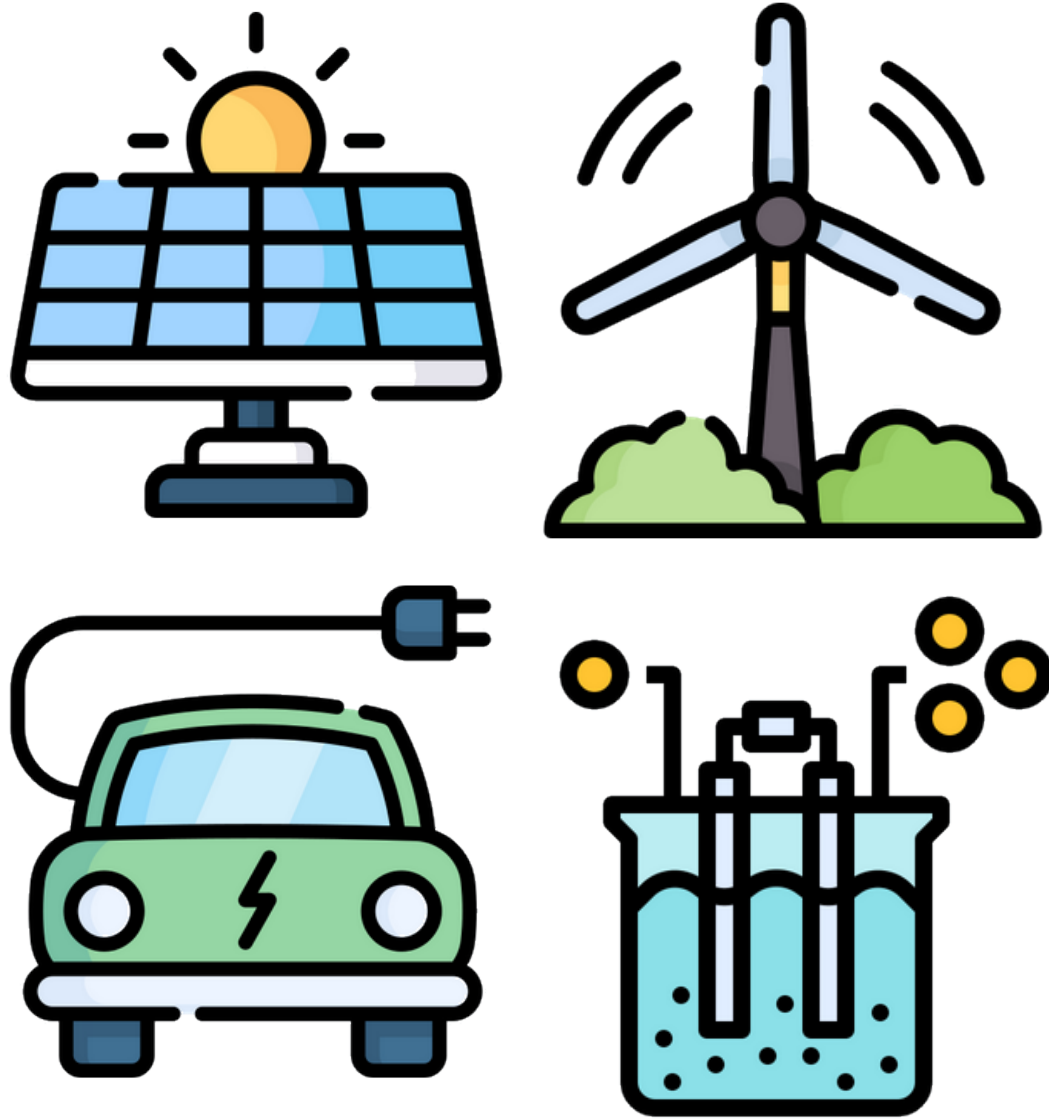
Publication

Future Plans

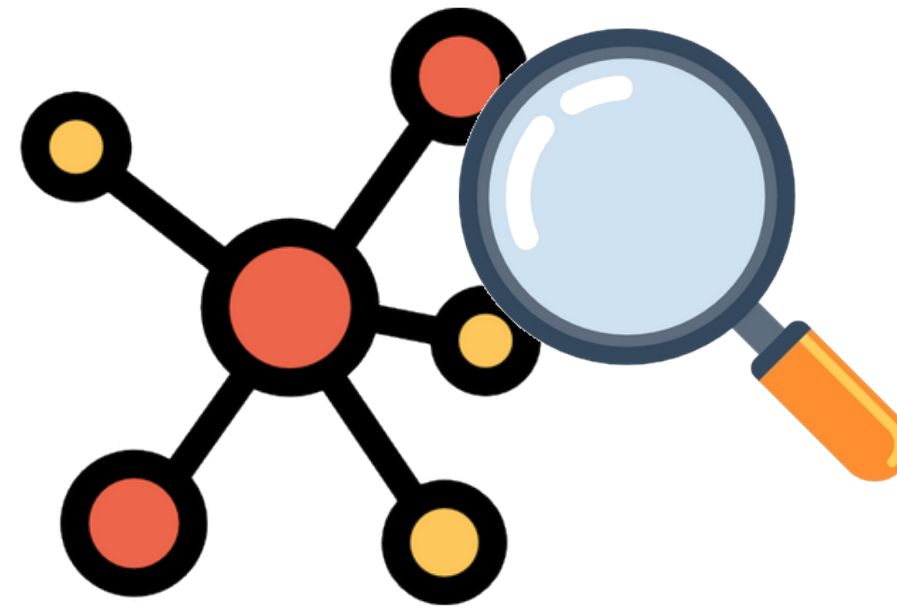
Motivation



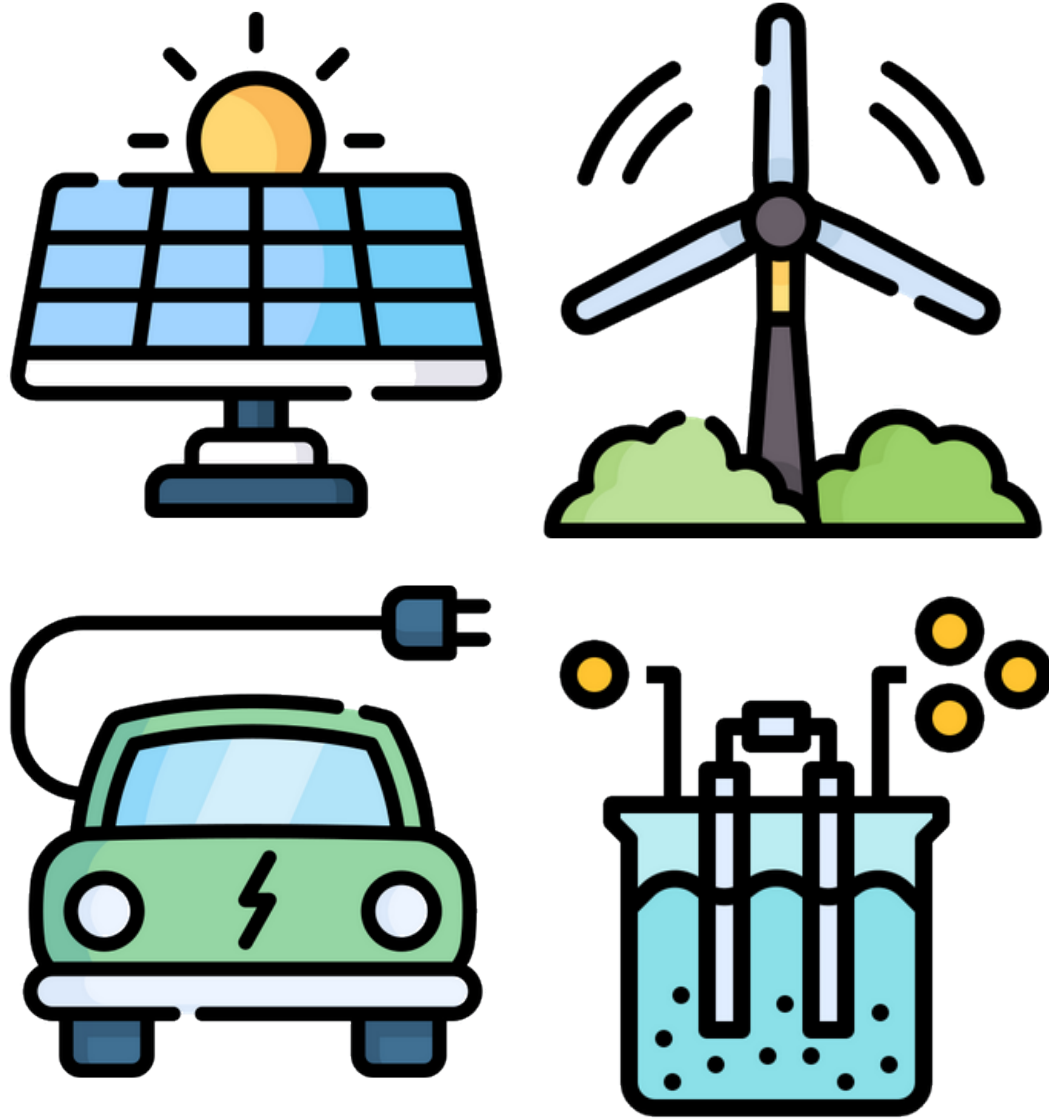
More variable
supply and demand



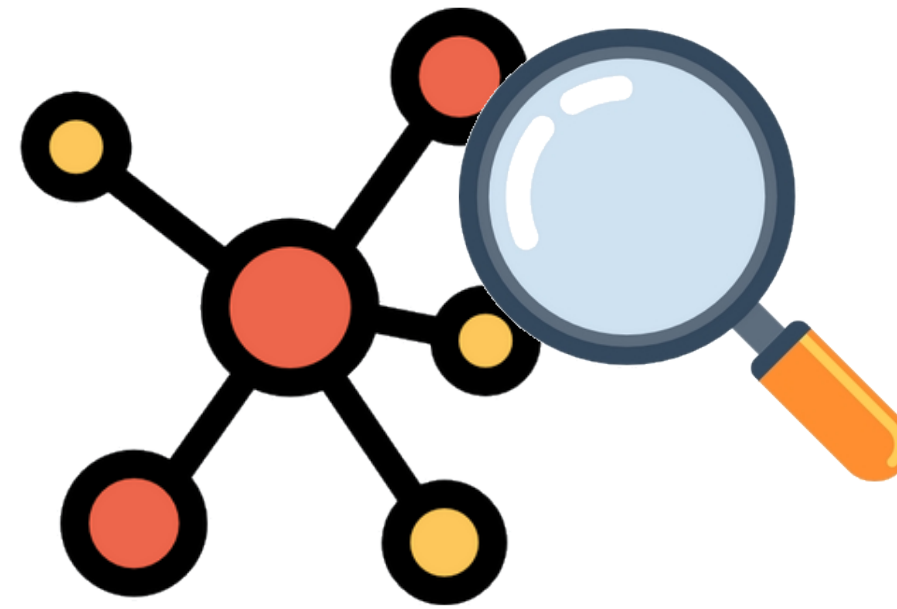
More variable
supply and demand



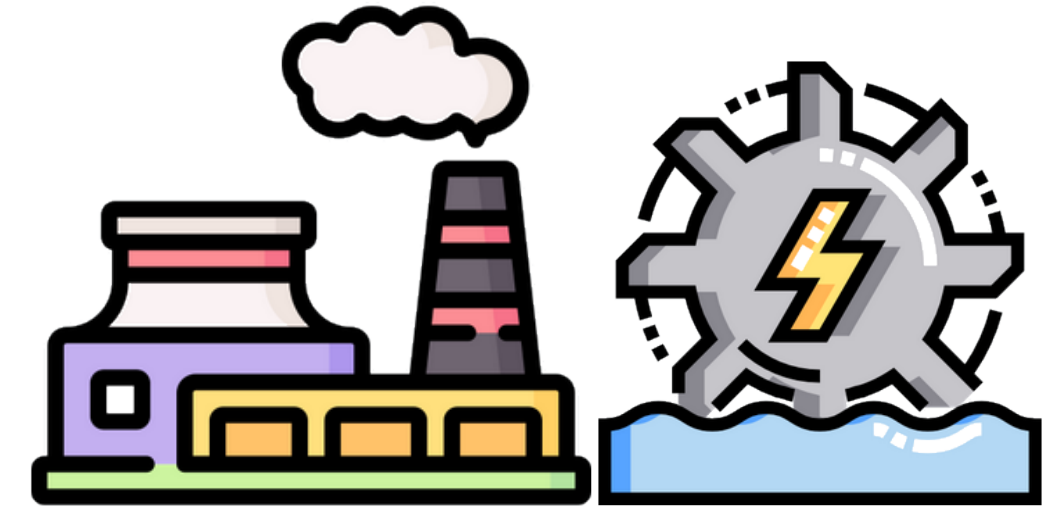
Need for flexibility on
the distribution grid

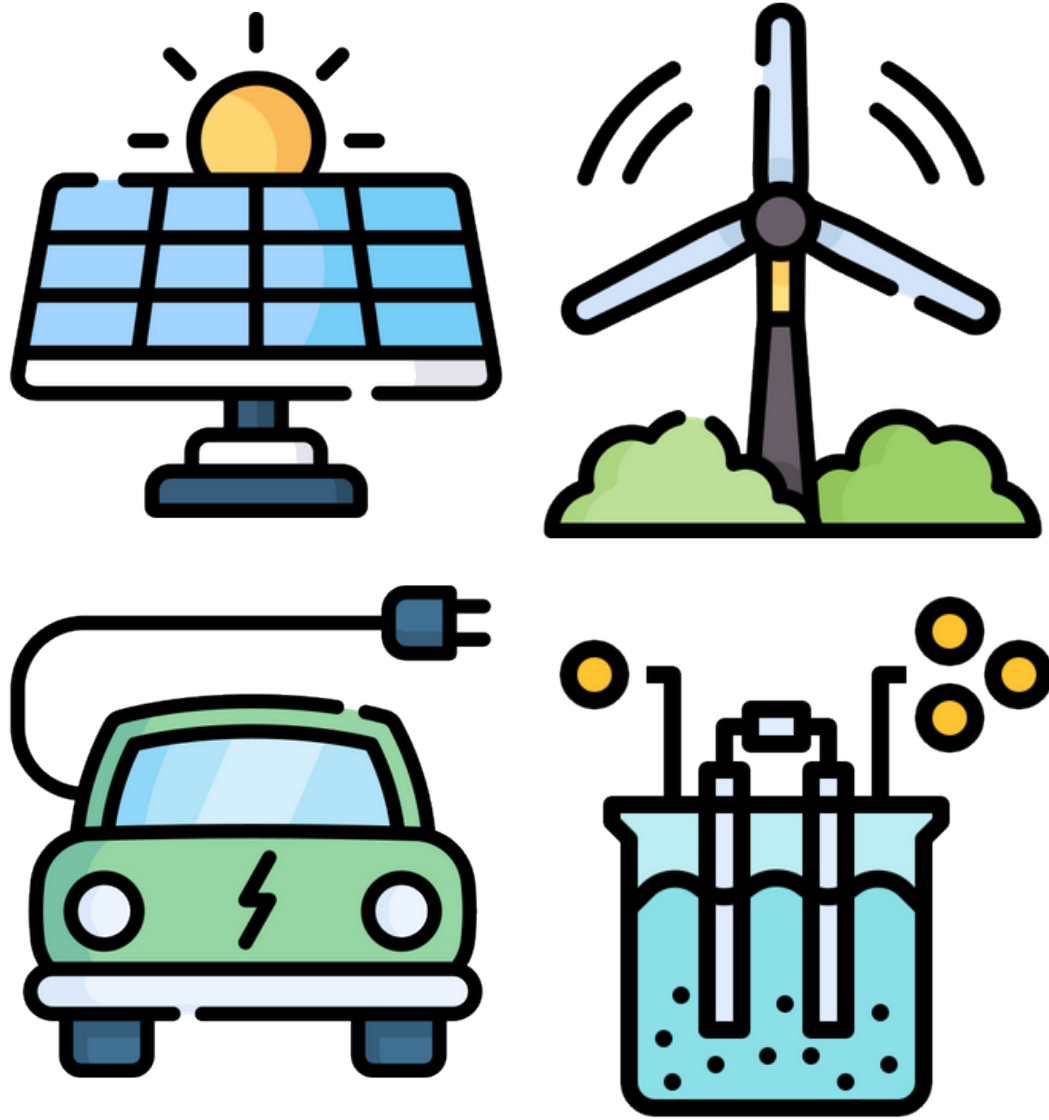


More variable
supply and demand

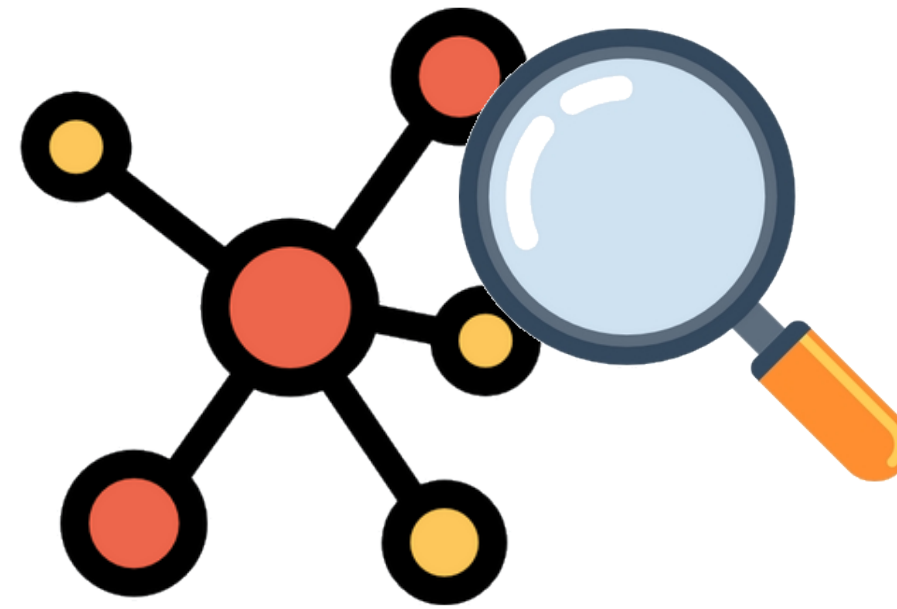


Need for flexibility on
the distribution grid





More variable
supply and demand



Need for flexibility on
the distribution grid



Research Questions

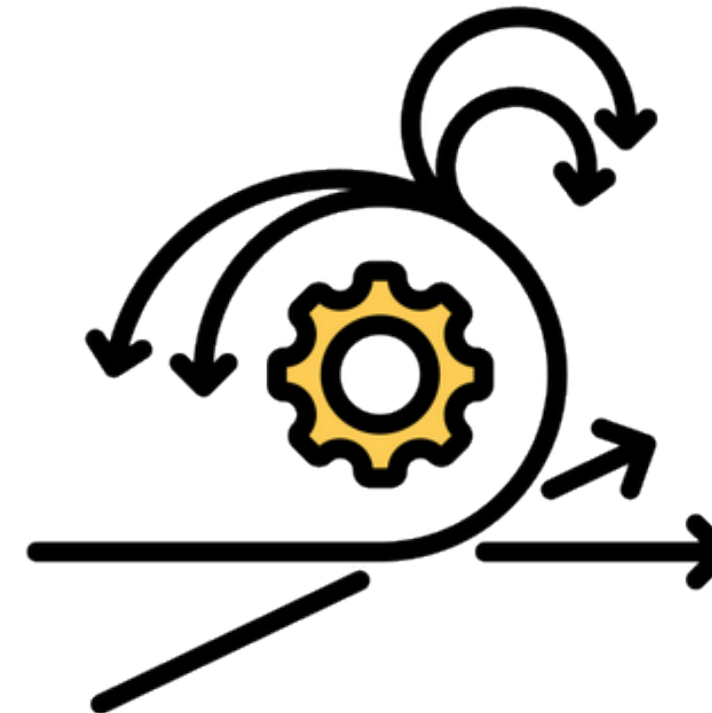
What are Active End-Users and DSOs' Roles in...



Short Term Operation



Long Term Transition



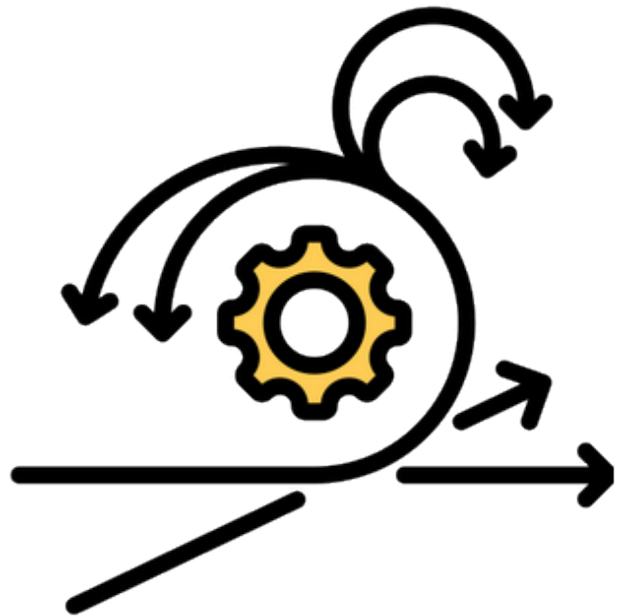
Pathway Sensitivity



1st & 2nd Paper



3rd Paper



4th Paper

Publication

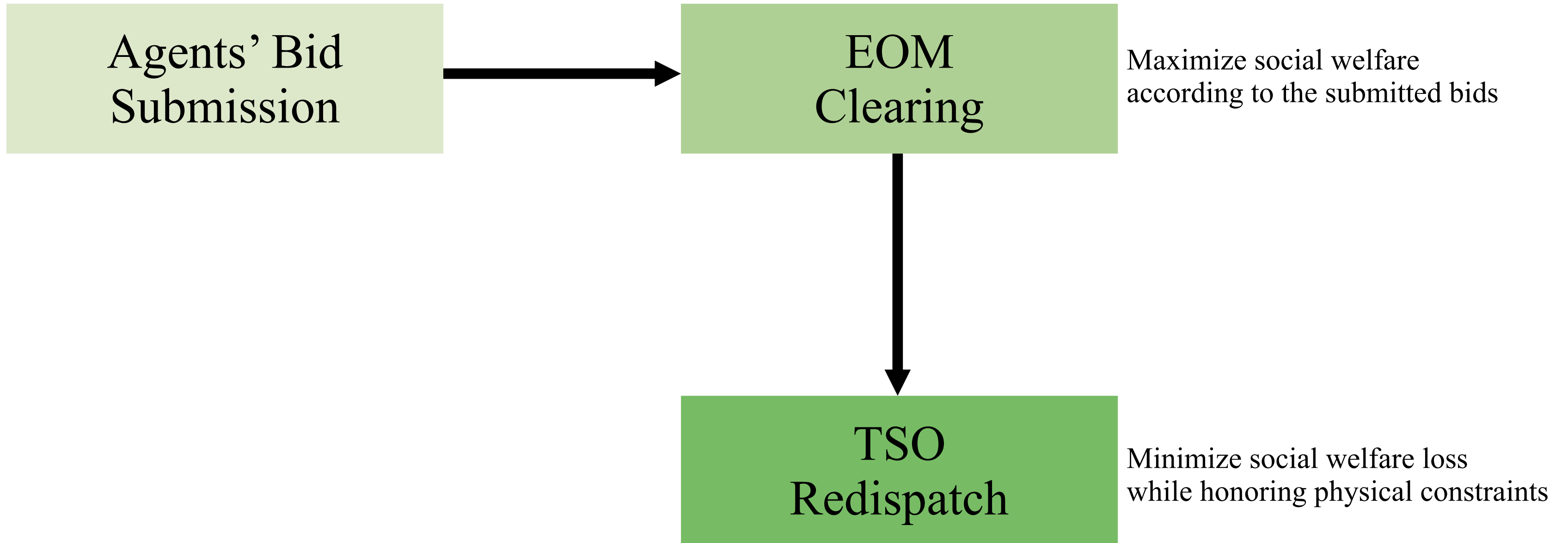
1st Paper:

Active End-User Participation under a TSO-DSO Coordination Scheme for Norway

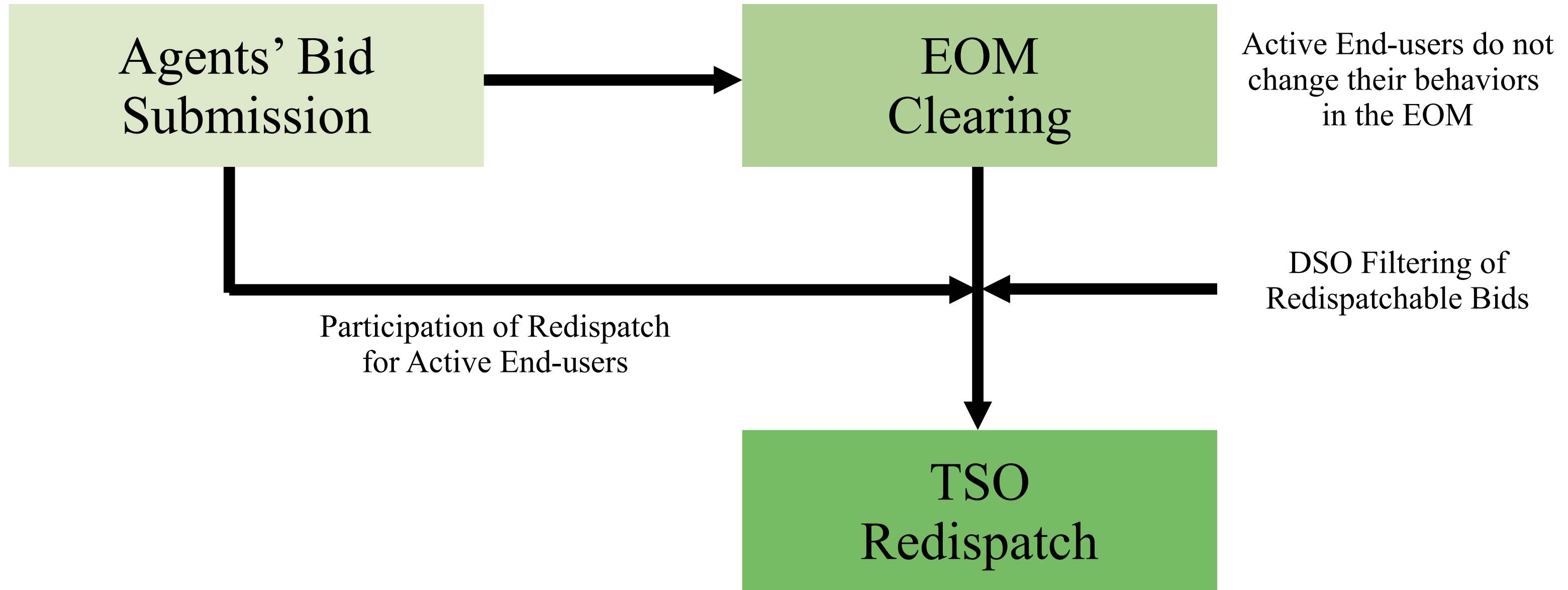
To what extent will flexibility from end-users affect the operation of the power system under the TSO-DSO coordination scheme?

How well will the TSO-DSO coordination scheme incentivize end-users flexibility?

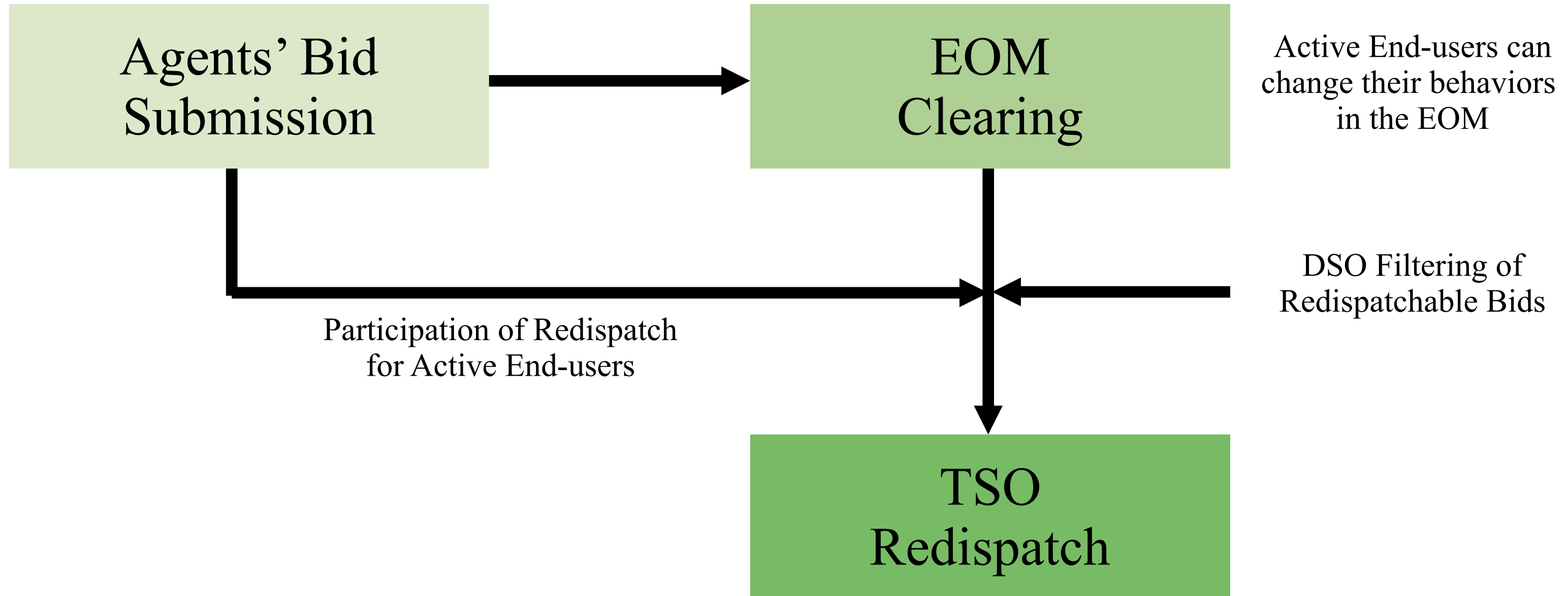
Reference Scenario



Partially Flexible Scenario



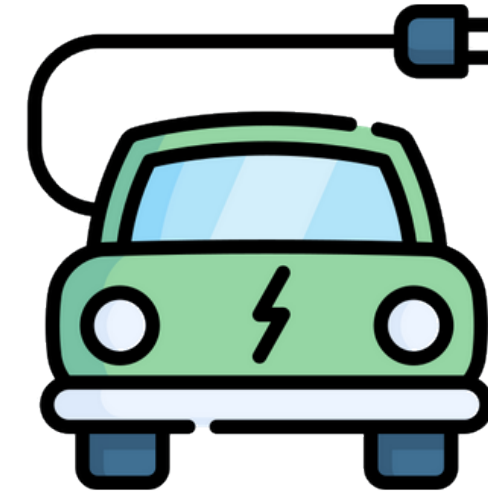
Fully Flexible Scenario



Inflexible
End-users



Passive
End-users



Active
End-users

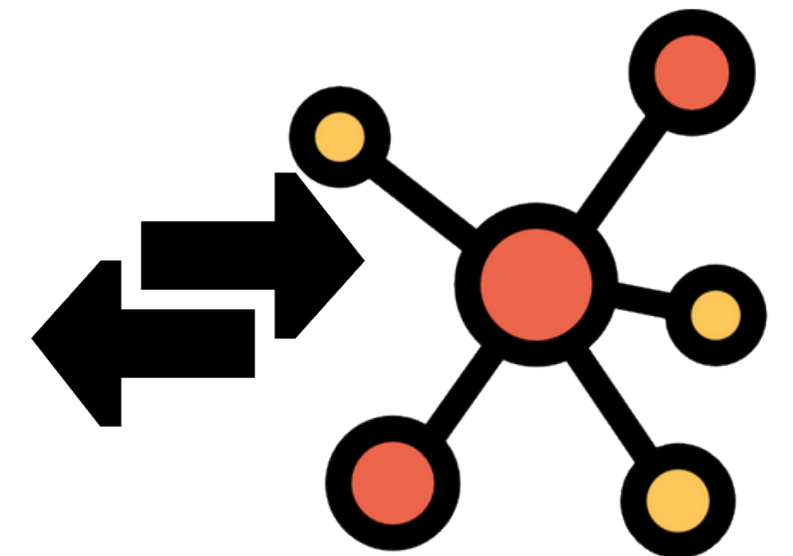
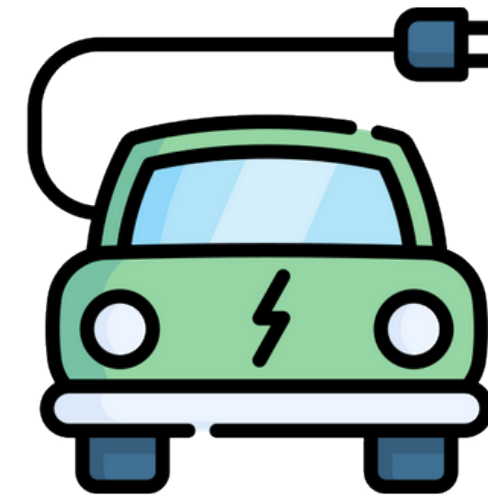




Table 3: Cost in EOM (in million EUR), redispatch cost (in million EUR), and total cost (in million EUR) in the scenarios between (a) 01 Jan to 14 Jan and (b) 01 July to 14 July.

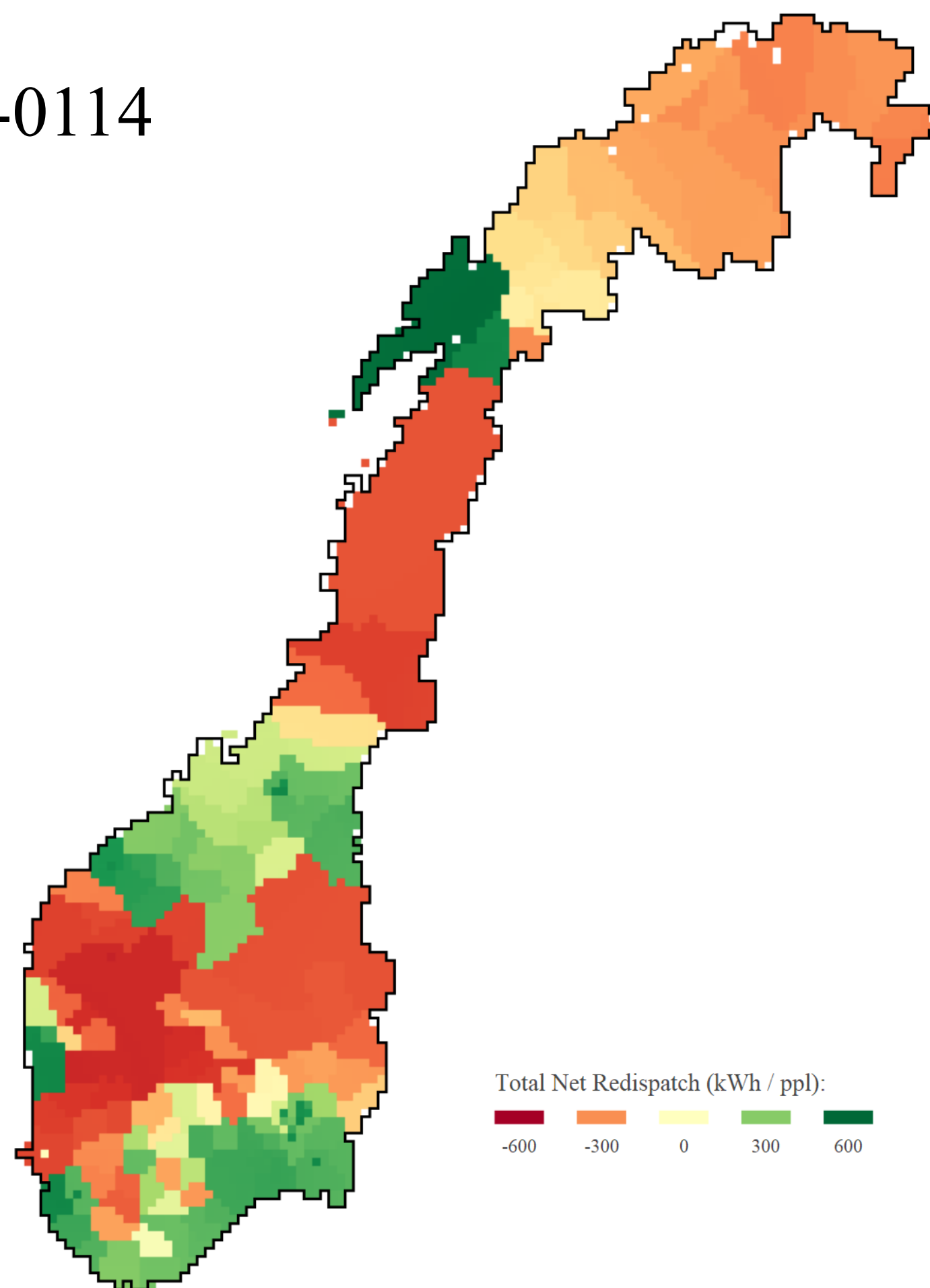
	(a)		
	Reference	Partially Flexible	Fully Flexible
Cost in EOM	262.945	262.945	267.927
Redispatch Cost	42.021	41.785	36.438
Total Cost	304.966	304.730	304.365
	(b)		
	Reference	Partially Flexible	Fully Flexible
Cost in EOM	96.245	96.245	96.036
Redispatch Cost	53.684	53.588	53.888
Total Cost	149.928	149.833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

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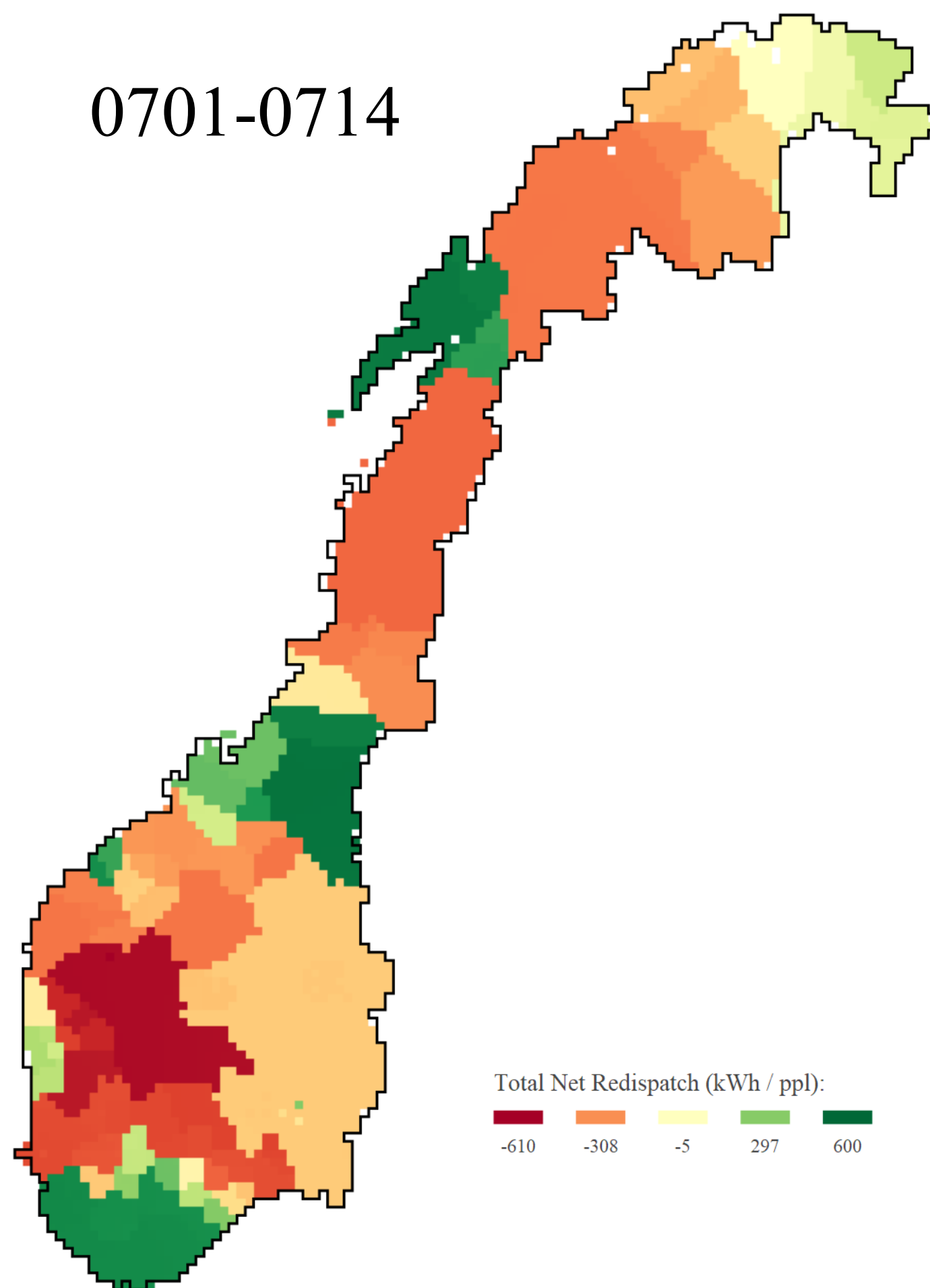
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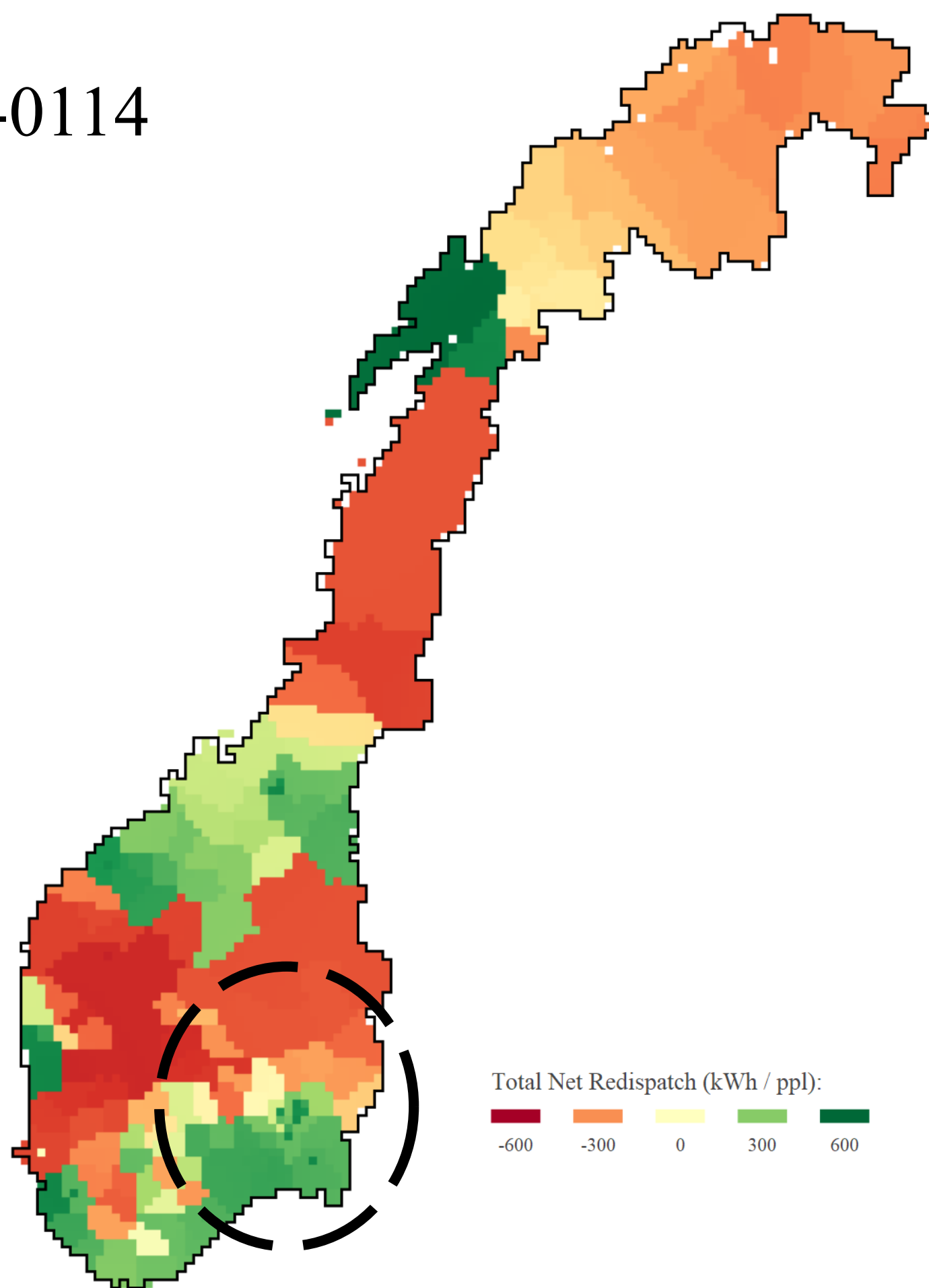
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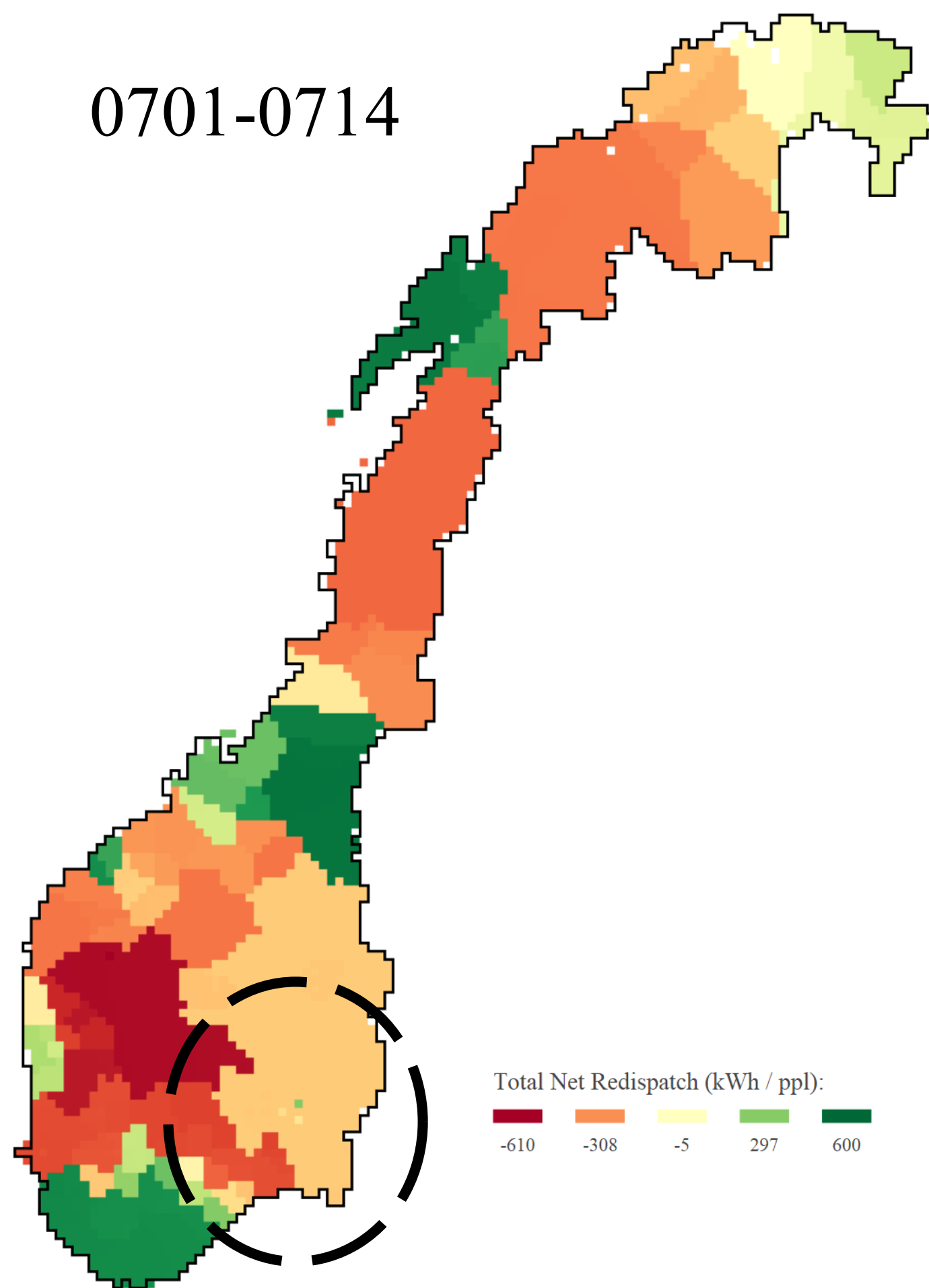
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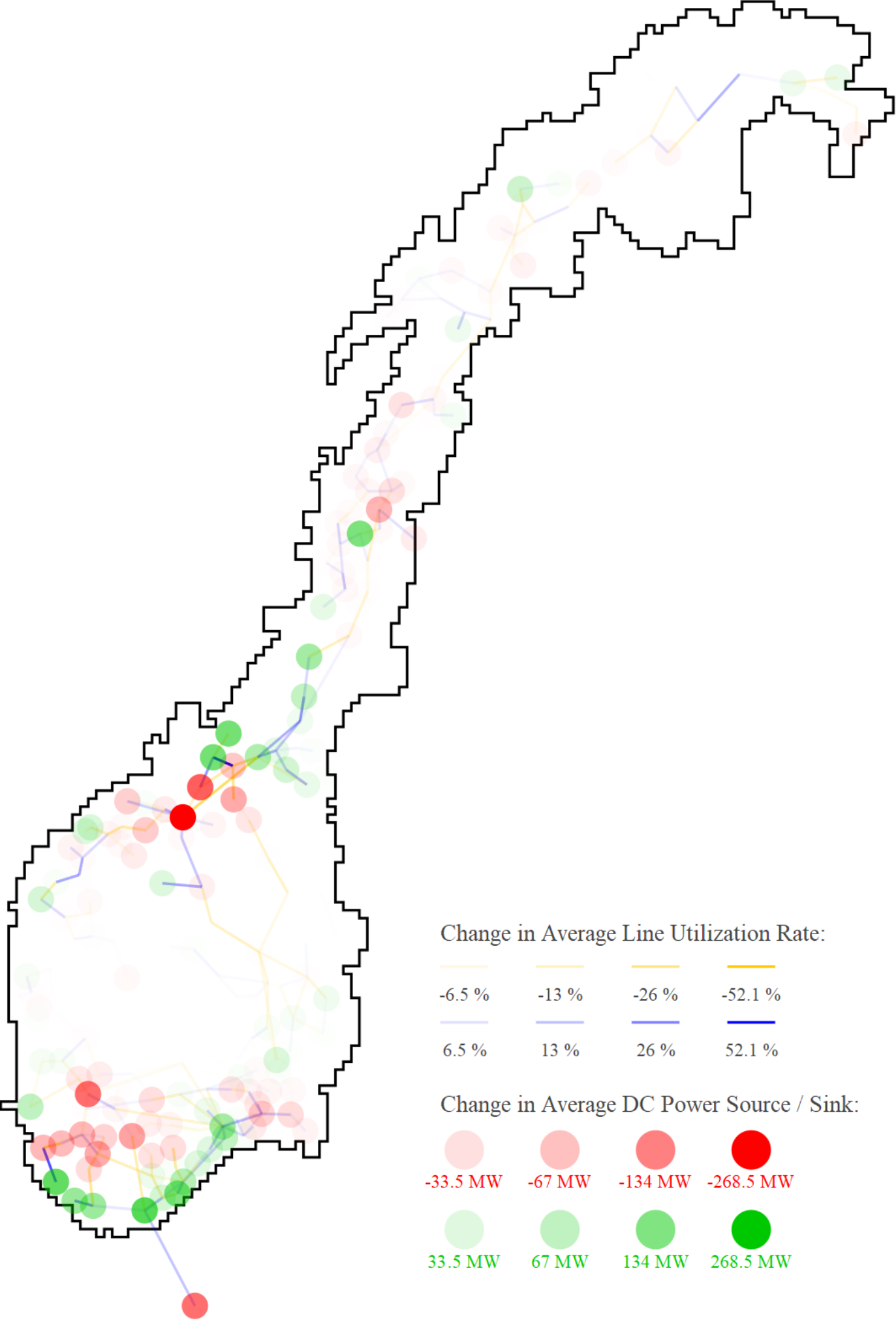
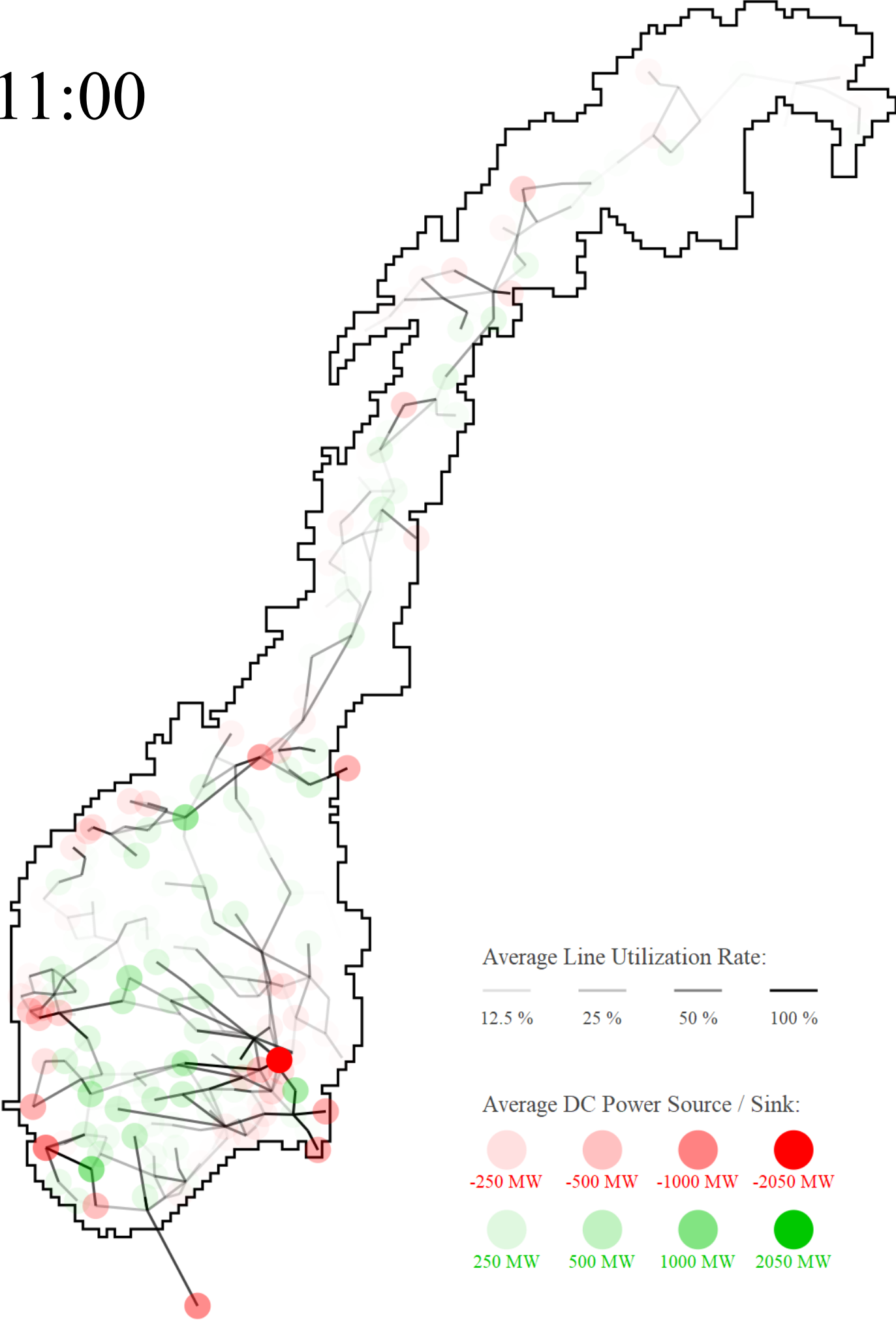
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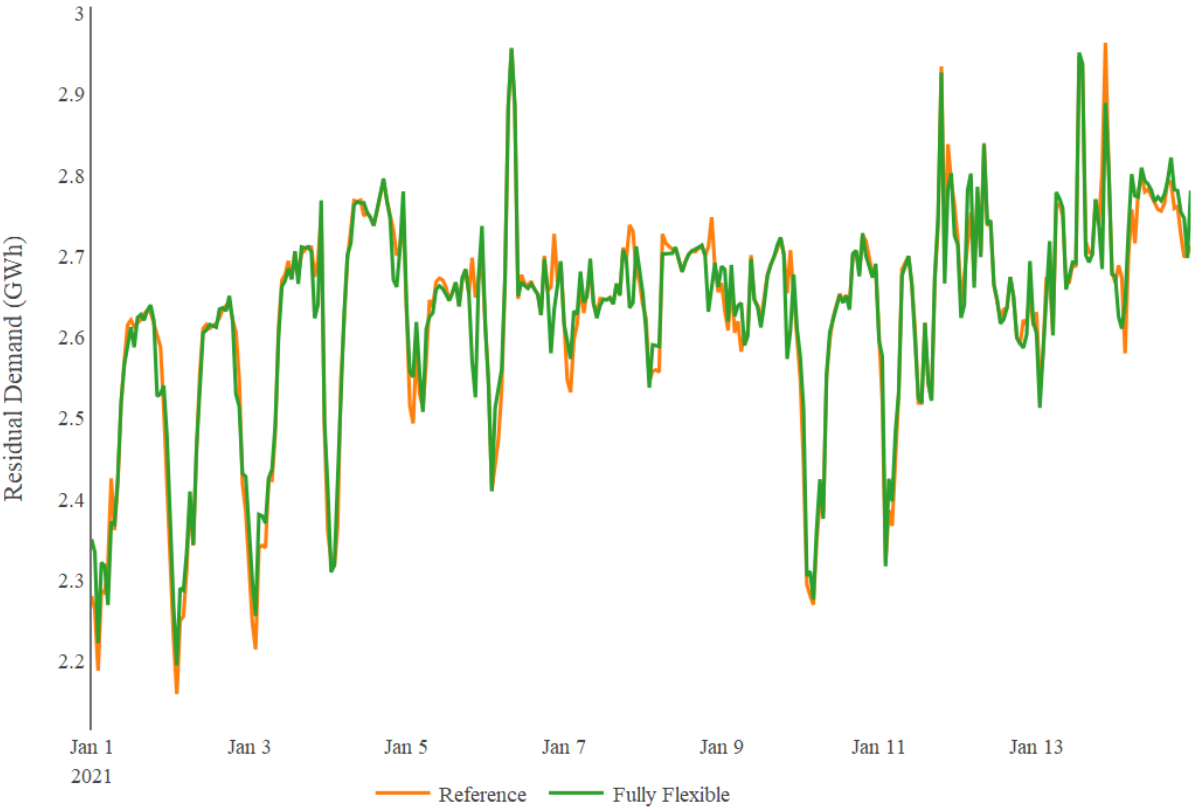
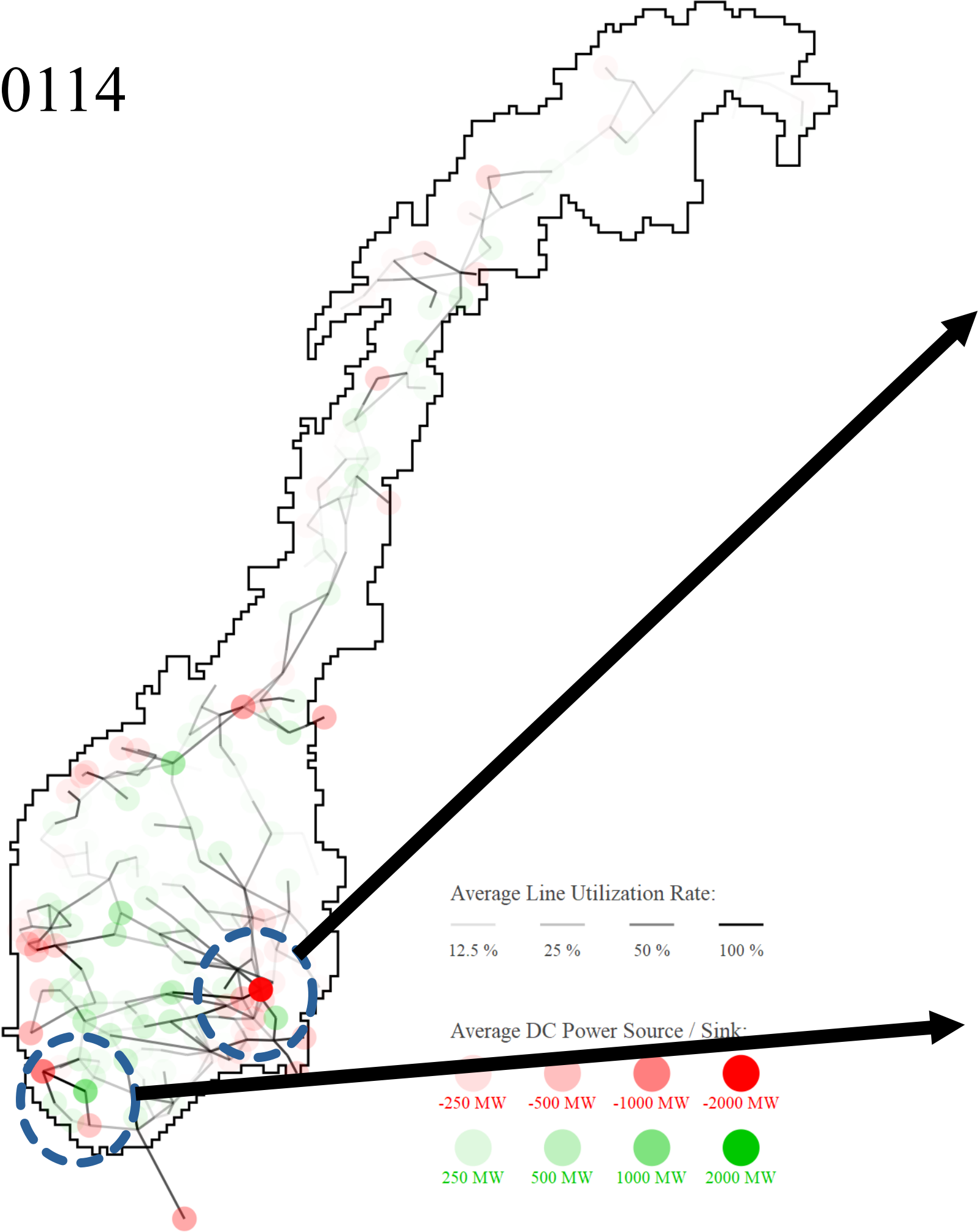


Table 6: Population density weighted median of average electricity prices (EUR / MWh) for different types of end-users in different bidding zones in scenario 3 between (a) 01 Jan to 14 Jan and (b) 01 July to 14 July.

(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

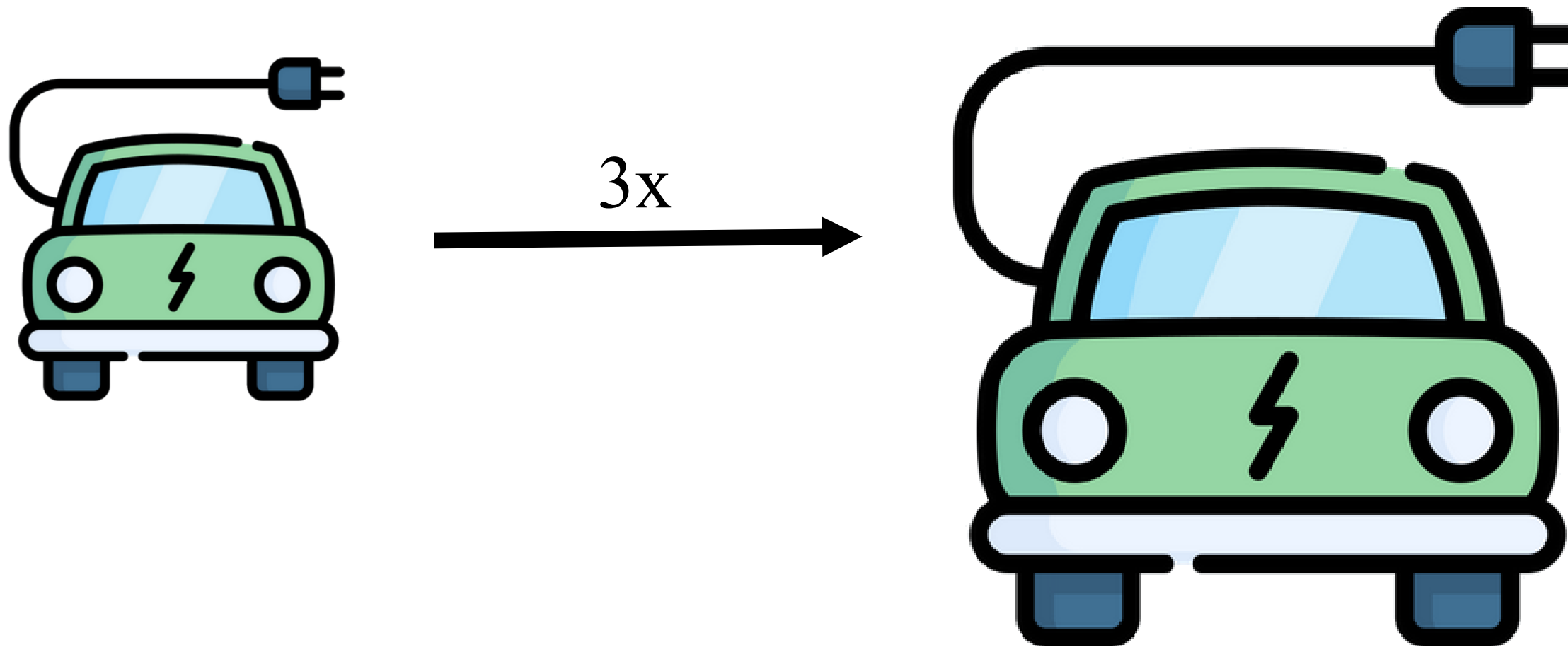


Table 4: Cost in EOM (in million EUR), redispatch cost (in million EUR), and total cost (in million EUR) in the 3x EV Scenario between (a) 01 Jan to 14 Jan and (b) 01 July to 14 July.

	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:

Quantifying the value of aggregated EV participation in the German Redispatch

How will the German power system in 2030 be affected by a large EV fleet?

How can the flexibility provided by EV batteries help reduce congestion in the power system and RES curtailment?

2nd Paper: Quantifying the value of aggregated EV participation in the German Redispatch

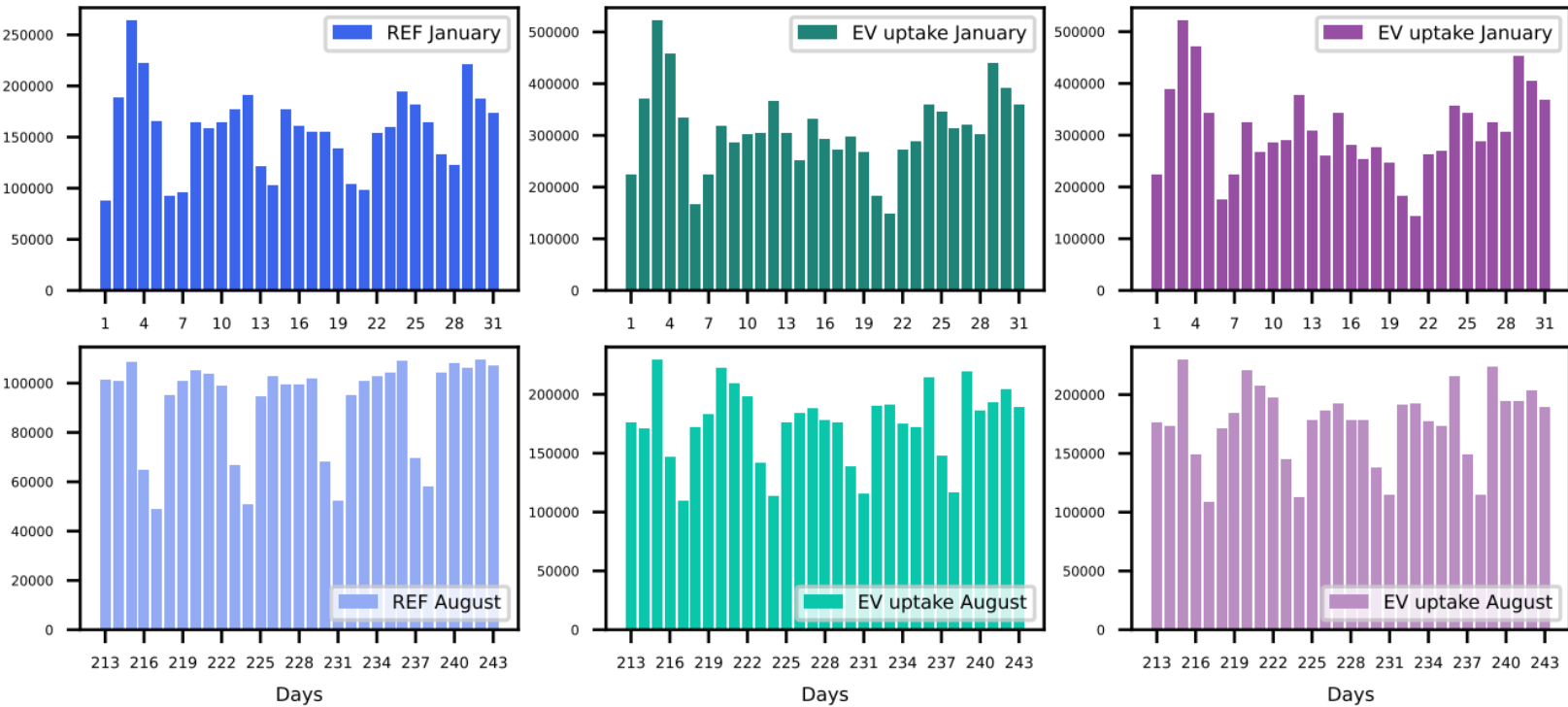


Figure 2: Comparison of the monthly (positive) redispatch volumes for all three cases

Table 1: Results of the indicators for the months of January and August for all three cases

Month	Indicator	REF	EV_{uptake}	$EV_{redispatch}$
January	Redispatch cost [Mio. €]	1,136.71	3,041.39	2,924.0
	Redispatch volume [TWh]	4.93	9.78	9.66
	Curtailment [TWh]	0.58	1.93	1.89
	Lost load [TWh]	0.43	1.28	1.214
	EV Flexibility [MWh]	0	0	325,854.56
	Conventional loadshift [MWh]	0	0	247,665.66
August	Redispatch cost [Mio. €]	542.75	1,481.6	1,439.26
	Redispatch volume [TWh]	2.85	5.49	5.54
	Curtailment [TWh]	0.23	2.16	2.33
	Lost load [TWh]	0.15	0.7	0.66
	EV Flexibility [MWh]	0	0	200,803.81
	Conventional loadshift [MWh]	0	0	156,634.42

3rd Paper (working title):
Investment Strategies of Active End-users and
DSOs during Transition of Distribution Grid

How will investment strategies of active end-users and system operators affect each other?

4th Paper (working title):
Impact of Active End-users and DSOs on the
Sensitivity of Different Transition Pathways

How will active end-users and DSOs affect the sensitivity of various transition pathways?

	Summer 23	Winter 23 / 24	Summer 24
Paper II	V		
Paper III	V	V	
Paper IV		V	V
Thesis			V



Thank You

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