Bidding Zone Review Consultative Group (BZR CG)

5 November 2024 – online conference

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Reliable Sustainable Connected

Agenda

1. Introduction	5 min	BZ TF Convenor
2. Outcome and update on the report following the public consultation	55 min	
2.1 Liquidity study and transition costs study	45 min	CL representative
2.2 Mitigation measures	10 min	BZ TF representative
Coffee Break	10 min	
3. BZRR CE general simulation results	45 min	Central EU representative
Coffee Break	10 min	
4. Nordic Region general simulation results	25 min	Nordic Region representative
5. Next steps	5 min	BZ TF Convenor

1. Introduction

Bidding Zone Review: process

Overview

All TSOs' proposal for methodology and configurations submitted in October 2019 was transferred to ACER.

We are here

2019-20

Methodology and assumptions

- ACER's decision 29-2020
- Approved: 24 Nov 2020
- Target year: 2025 (input data fixed in 2020)

2021-22

Locational Marginal Pricing (LMP) study

- by All TSOs
- Delivered: Mar 2022

2022

Alternative configurations

- ACER's decision 11-2022
- Approved: 8 Aug 2022

2022-24

Bidding Zone Review study

- by TSOs of BZRRs

Relevant MSs: decision to maintain or amend the BZ

ACER's approved methodology split in two steps:

1. Methodology + request to TSOs to deliver LMP
2. Definition of alternative configurations

Deliverables:

1. Final **report** with assessment of **22** indicators
2. Joint **proposal** to governments of involved Member States (MSs) for future configuration.

2. Outcome and update on the report following the public consultation

2.1 Liquidity study and transition costs study - Agenda

1. Feedback received in consultation on transition cost report
2. Feedback received in consultation on liquidity report
3. Liquidity drivers as identified by practitioners' experience
4. Updated analysis of historical liquidity metrics
5. Analysis of simulated reconfigurations

Feedback received in consultation on transition cost report

Summary transition cost feedback

Draft

The feedback on the transition cost study stresses the inability to assess transition costs due to methodological limitations pointed out in the study and the existence of additional costs not considered.

Uncertainty about reasonableness of costs

- accurately estimating the costs seems challenging, noting the **wide range of estimates** and the **high uncertainty** in the results.
- uncertainty on whether the transition costs are **reasonable** or **feasible**, because of **methodological limitations** and **data insufficiencies** (small data basis, no audit).
- **Transparency** of the process and underlying data has been in parts been considered insufficient (e.g.wrt the exclusion of the outlier)
- Several stakeholders provided this feedback

Other costs not considered

Several stakeholders provided this feedback. Recurring theme that **other costs** beyond those identified in the study should not be ignored, including:

- **Investment risks**.
- **Asset value changes**.
- **Spillover effects** to other countries.
- **Economic benefits** from potential system flexibility are also overlooked.

Biases and limitations of estimates

Some argue that the results are not **robust** due to:

- Exclusion of an **outlier**.
- **Limited dataset**.
- **Self-selection** bias: Those expecting higher costs may be more likely to respond to the survey, leading to **overestimation**.
- **Status quo bias** and **risk aversion** also potentially skew the estimates.

Assessment of costs

- Some respondents believe that **costs are reasonable**, particularly for **TSOs**
- It has been considered reasonable that **Germany's costs are higher than other countries**
- Some argue that **transition costs per capita** may align with provided estimates
- Some respondents believe costs are likely at the **upper bound** provided due to **system complexity** and **exclusion of key data**. *(Comment: some of this feedback seems not to be robust in its line of argumentation)*

Transition costs should be seen as investments

- Some respondents stated the transition costs are a necessary **investment** to make the system more **flexible** and adaptable in the future, while recognizing that current estimates may have inherent limitations.

Feedback received in consultation on liquidity report

Draft

Summary liquidity & transaction feedback

The feedback on the liquidity study reiterates the expected negative effect on liquidity by BZ splits. It notes concerns regarding insufficient analyses of cross-border effects and the balance of production & demand.

Statements on expected observations, both in and irrespective of the report

- Liquidity is expected to **reduce in smaller bidding zones**, which could negatively impact the ability to hedge and increase transaction costs.
- The **impact on liquidity might be underestimated** in the report. The effects of market splits could be more severe than indicated.
- Several respondents highlight that **liquidity will significantly decrease in Germany**, leading to increased volatility, transaction costs, and market power. The overall picture remains unclear in the report.
- Concerns are raised about the negative impact of the **Italian split** on long-term market liquidity, especially with the transition from PUN to TIDE.
- Potential negative impacts on liquidity and cross-border trading due to the **Dutch** split are noted.

Concerns about the completeness of the analyses

- There's a concern that **market power** could increase as liquidity decreases, potentially leading to less competitive markets.
- The report is criticized for not adequately considering **cross-border effects** and the **behaviour of market participants**.
- There are concerns that the **balance of production and demand** is not well addressed.
- **Literature on IT** should have been a starting point (comment: no literature was provided)
- A respondent views the report **underestimates the complexity** of the transition
- There is **confusion** on the data basis and treatment of **Sweden** and the Nordics.

General/Other observations

- **Regulatory Oversight:** Increased market power may lead to additional regulatory oversight, which some stakeholders view as undesirable.
- **Predictability:** Adjustments in bidding zones need to be carried out with high predictability and legal certainty to avoid negative impacts on liquidity and transparency.
- **Correlation:** implicit correlation in the status quo before a BZ split would be 1. Neglecting this may lead to wrong comparisons of correlatedness. Also, OTC trade is not included in implicit market coupling and liquidity thereof decreases impact of increased correlation finding is overestimated.
- Disagreement with elements in text box page 20/21

Literature review & practitioners‘ experience (selection)

Practitioner's experience – Drivers of market liquidity

To complement the literature review, we interviewed practitioners regarding their view on the market characteristics driving or impeding transaction costs and liquidity.

Additional market characteristics

Price volatility:

- Price volatility influences **margining requirements**. This impacts trading as cash limits may be reached earlier (in case of increased margining requirements) or later.
- Volatility implies **risk**. Pending this risk, market participants may schedule trades to fulfil their hedging policy or change the hedging policy altogether.
- Volatile prices may lead to **(re-)adjustments of trade positions**.
- Given sufficient liquidity, **proprietary trader** may capitalize from volatility.

Supply-demand imbalance

- If availability of supply and demand do not match, **finding a trade counterpart** is limited and participants may need to rely on few players and cross-border capacity.

Market participant mix

- Besides the overall balance of supply and demand, the diversity of market participants influence liquidity. Different market participants have different trading needs, abilities, and pattern such that a more diverse participant mix provides more options to find a **suitable trade counterpart**.

Liquidity attracts liquidity

- Besides characteristics of the bidding zones, market participants **favour liquidity** such that liquid markets attract further liquidity.

Metrics to assess liquidity

- The **traded volume** is a principal metric to assess liquidity, as established by the ACER methodology.[1]
- The **churn rate**, the ratio between total traded volume and the volume of the product, is a meaningful indicator for continuous* markets, because of the possibility of secondary trading of products.[2]
- **Bid-ask spreads** and the **time to maturity** are relevant indicators for continuous markets as well.

Source: Compass Lexecon analysis of stakeholder interviews. The TSOs and Compass Lexecon have conducted a series of interviews (+10) with traders and similar market participants active in multiple European countries. The interviews served as background information to better understand which market characteristics are considered when participating in an electricity market.

Historic analysis (selection)

Draft

General considerations for model determination

The relationship between liquidity and other market metrics shall be substantiated through regression analysis that identifies the presence of structural relationships in historic data.

Dependent Variable

Which variables are used to indicate liquidity?

Traded volume (for all)
- (Demand + supply) / 2 (coupled markets); and across products

Churn Ratios (for all)
- Traded volume / total load

Bid-Ask Spreads (for futures)
- (ask price – bid price) for all new events on a given day
- Min., unweighted avg., max. across a day of all BAS
- Product-specific → min., avg., max across products for selected products

=

Explanatory Variables

Which variables are assumed to impact the dependent variable?

Market Size
- Total Load

Participant mix
- Generation or capacity from RES / total gen.

Price volatility
- Standard deviation of DA prices

Supply-demand imbalance
- Abs. difference in share of supply and share of demand

Market Concentration
- HHI values

Cross-border participation
- Avg. price correlation to connected BZs weighted by XB-trade

Time
- auto-correlation

+

Controlling for Noise

What should be expected as how the missing information is distributed?

Time
- Time trends

Location
- Country fixed effects
- Separate regressions for different markets

Seasonality
- Avg. Temperature

Functional form

What is the expected relationship between explanatory variable and dependent variable
- Linear, log-linear, non-linear relationships?

Note: Green text = added variables compared to the previous analysis.
Sources: Compass Lexecon analysis of stakeholder interviews

Relationship of liquidity metrics with market characteristics: Short-term

The regression model analysis of liquidity metrics on market characteristics of the Day-Ahead and the Intraday market, shows that total load displays the highest level of correlation among the assessed characteristics.

	Variables	Relationship	Explanation and interpretation
Explanatory and confounding variables in focus	Total load	↗	• Liquidity (in terms of traded volume) and market size (in terms of total load) go hand in hand. This relationship is more pronounced for DA than for ID. • The relationship is also less pronounced for Germany and France on the DA market and for France on the ID market. This may be explained by the various design differences between the European countries, particularly considering the relevance of OTC trades of short term products. • No clear relationship was identified between churn ratios and total load.
	RES share	↗	• The share of RES and liquidity tend to be positively correlated but the impact is limited
	Average weighted correlation	↗	• Products for countries that are highly correlated to its neighbours tend to have a higher liquidity (not across all metrics/products).
	HHI	↘	• Market concentration shows a negative correlation with liquidity but the strength of the model result (due to annual data) is not high
	Volatility	↗	• Positive relationship is robust across models for ID, for traded volumes and churn ratio • Positive relationship also for DA, though not as predominant as for ID
	S/D-Balance	↘	• For ID, models mostly exhibit negative relationship for traded volumes and churn ratio • For DA traded volumes tendency for positive relationship, and negative for churn ratio
	Temperature	↗↘	• The relationship is inconclusive. It may be that this is because much of the variation of traded volumes is due to total load changes that also follow temperature.
Others	Time trend	↗	• The data shows that over time liquidity generally increases in Europe

Legend for relationships: Direction of the arrow: direction of coefficient, if in both directions: Inconclusive direction among models. Size of arrow: Relative size of coefficient.
Colour of coefficient: Significance (black = significant) of coefficient.
Note: The underlying regression models are based on monthly data (but for HHI) and use data from the NEMOs, ACER, ENTSO-E and EUROSTAT, ECAD
Source: Compass Lexecon analysis

Relationship of liquidity metrics with market characteristics: Long-term

The analysis of the updated model implies changes across variables. The identified relationship largely confirms the expectations.

	Variables	Relationship	Explanation and interpretation
Explanatory and confounding variables in focus	Total load	↗	• Larger countries (in terms of demand) show higher traded volumes for their long-term products and lower bid-ask spreads. This seems not to be the case for the churn rate.
	RES share	↗	• The share of RES and liquidity is positively correlated, but for non-cleared volumes
	Price spread / correlation	↗	• "Correlatedness" positively relates to liquidity. • The price spread to Germany is inconclusive when considering within and across country analysis
	HHI	↘	• Market concentration is negatively correlated with liquidity
	Volatility	↘	• Negative relationship can be perceived both within a country and across countries • Different relationship between exchange-based, cleared, and non-cleared volumes
	S/D-Balance	↘	• Negative relationship can be perceived both within and across countries, but not robust across all models
	Autocorrelation	↗	• Positive relationship across models
Others	Time trend	↗	• Liquidity tends to increase over time but model results often not robust

Legend for relationships: Direction of the arrow: direction of coefficient, if in both directions: Inconclusive direction among models. Size of arrow: Relative size of coefficient. Colour of coefficient: Significance (black = significant) of coefficient.
Note: The underlying regression models are based on monthly data (but for HHI) and use data from EEX, NASDAQ, ICE, LEBA, ENTSO-E and EUROSTAT
Source: Compass Lexecon analysis

Analysis of simulated reconfigurations (selection)

Methodological approach

The analysis of the state of liquidity in the proposed alternative BZ configurations is based on simulated market parameters that have shown a significant correlation to liquidity metrics in historical data.

1. First, we **analyse the simulated data** provided to us by the TSOs and identify specifications of the market characteristics.
2. Then, we assess the identified **implications for the alternative configurations** between liquidity metrics and the parameters as provided by the TSOs based on the historical analysis.
3. We derive, where possible, **expectations on changes to liquidity metrics** from the proposed alternative configurations.

Market size	Market concentration	Price correlation	Price volatility	Supply-demand imbalance	Participant mix
Approximated by the parameters generation and load volume as provided by the TSOs. Based on the results of the historical analysis, we consider **increases in market size** as, ceteris paribus, **increases of liquidity metrics** both for the short- and long-term markets	Portrayed by HHI values for the Nordics and RSI and PSI values for Central Europe as provided by the TSOs. An **increase in the HHI** an **increase in market concentration.** Noting the uncertainty of the **RSI and PSI** value computation (limited data and uncertain cross-zonal impacts), we consider the indication from these variables **inconclusive**.[1]	Calculated as the market size-weighted average of price correlation across directly connected BZ to the BZ in question[2] and can take values between -1 and 1. Based on the results of the historical analysis, we consider **increases in price correlation** are, ceteris paribus, **liquidity enhancements** for short-term markets.	Calculated as the average of the daily standard deviation of DA prices in the respective BZ. Based on the results of the historical analysis, we consider **increases in price volatility** are, ceteris paribus, **liquidity enhancements** for short-term markets (primarily for ID) and **impediments** for LT markets..	Calculated as absolute difference between the share of demand and the share of supply over the sum of demand and supply in a BZ. Based on the results of the historical analysis, we consider **increases in supply-demand imbalance** to imply, ceteris paribus, **liquidity impairments** for ST (especially for ID) and LT markets.	Calculated as the share of wind and PV generation of total generation per month in the respective BZ. This is used as proxy for a more divers participant mix. Based on the results of the historical analysis, we consider **increases in the RES share** imply, ceteris paribus, **liquidity enhancements** for ST and LT markets.

Note: green = new text [1] The uncertainty concerns primarily incomplete ownership data as well as lack of information on bidding behaviour that may result in underestimated market concentration levels for both the status quo and the alternative configurations.

[2] We have assessed the robustness of the correlations by computing the parameter twice: First, only including neighbouring BZ that are also part of the CORE region. Then including all neighbouring BZ, i.e. also those that assume a NTC border in the model. We conclude that the model simplification used for NTC borders does not impact the robustness of the parameter. The fact that correlation to regions that were previously part of the Status quo bidding zone has been 1 must not be considered here, as this implicit correlation is considered in the market size indicator. If it were considered here as well, it would double-count the liquidity-supporting characteristic of market size.

Overall observations and expected changes to liquidity metrics

We have assessed the market characteristics of the simulated bidding zones that have historically shown a significant relationship to liquidity metrics.

Countries	ACER ID (# zones)	Market concentration[1]	Price correlation	Market size	Price volatility	Supply-Demand imbalance	Participant mix	Expected changes to liquidity metrics ST	Expected changes to liquidity metrics LT
Sweden	8 (3)	Mostly decreasing	Decreasing, but only to a small extent	Mostly increasing	Limited change	Decrease	Decrease	**Improvement**	**Improvement**
Sweden	9 (3)	Mostly decreasing	Decreasing, but only to a small extent	Mostly increasing	Limited change	Decrease	Decrease	**Improvement**	**Improvement**
Sweden	10 (4)	Mostly decreasing	Mostly decreasing, but only to small extent	Significant decrease	Limited change	Significant increase	Decrease	**Impairment**	**Impairment**
Sweden	11 (4)	Limited change	Decreasing, but only to small extent	Two-sided	Limited change	Decrease	Decrease	**Inconclusive**	**Inconclusive**
Germany; Luxembourg	2 (2)	Inconclusive	Mostly increasing, but only to a small extent	Significant decrease	Mostly increase	Partially significant increase	Two-sided	**Inconclusive with tendency to impairment**	**Impairment**
Germany; Luxembourg	12 (3)	Inconclusive	Mostly increasing, but partially to a small extent	Significant decrease	Mostly increase	Partially significant increase	Two-sided		
Germany; Luxembourg	13 (4)	Inconclusive	Mostly increasing	Significant decrease	Mostly increase	Partially significant increase	Two-sided		
Germany; Luxembourg	14 (5)	Inconclusive	Mostly increasing	Significant decrease	Mostly increase	Partially significant increase	Two-sided		
France	5 (3)	Inconclusive	Increase	Significant decrease	Two-sided	Two-sided	Two-sided	**Impairment**	**Impairment**
Northern Italy	6 (2)	Inconclusive	Two-sided	Significant decrease	Decrease	Decrease	Decrease but to a small extent	**Impairment**	**Impairment**
Netherlands	7 (2)	Inconclusive	Increasing, but only to a small extent	Significant decrease	Limited change	Increase	Limited change	**Impairment**	**Impairment**

Note: green = new text. The BZ liquidity and its metrics materialising after a BZ reconfiguration may significantly differ from the expectations formed in a "ceteris paribus" analysis such as this one. [1] Noting the data limitations, a higher weight in the analysis is given to the conservative input assumption.
Legend: "Significant" means a change of 50% or more.

Discussion of the results – Aspects not considered in the analysis

When interpreting the expected liquidity metric changes from the analysis, it's important to keep in mind that some key aspects were not considered because they were out of scope.

Market participant behaviour

BZ reconfiguration itself may trigger behavioural changes. Other trends may occur independently of it.

- **Uncertainty during transition period:** Identifying fair value for electricity both on short- and long-term markets becomes more difficult, potentially impacting liquidity. Some market participants may take advantage of this uncertainty by offering products at higher risk premiums, further influencing market dynamics.
- **Impact on asset valuation and investment:** Changes in prices and capture rates influence the valuation of generation and demand assets, leading to different investment decisions and potentially impacting liquidity in the long-term.
- **Concentration of liquidity and nonlinearities:** Liquidity tends to cluster in certain markets, making them “Hub Markets”. In the context of a BZ reconfiguration, it is unclear if market participants would shift their trading activity and which changes in costs and risks would coincide with such changes. Such effects are likely a reason for non-linear relationships between liquidity metrics and drivers of liquidity.
- **Changes in netting and hedging behaviour:** Vertically integrated suppliers may continue netting generation and demand as long as both remain within the same BZ. However, if supply and demand are split between BZs, market participants may for instance opt for increased participation in coupled short-term markets or adjust their ownership portfolio altogether. Their decision will largely depend on the expected profitability of the affected assets, weighed against higher transaction costs and added risks such as increased volatility and basis risk.
- **Energy transition:** As the market continues its transition toward clean energy, investments in generation and consumption assets may be driven more by decarbonization policies than by market characteristics of BZ configurations alone. The growing share of intermittent renewable generation may influence how participants manage their hedging strategies and induce market liquidity.
- **Prop traders:** Prop trading plays a relevant role in the electricity market and market participants have said to see an inflow of additional prop traders. This inflow could further impact liquidity irrespective of the market characteristics affected by a BZ reconfiguration.
- **Regulatory risk:** A BZ reconfiguration may alter the perception of regulatory risk, impacting long-term liquidity. One the one hand, market participants might anticipate further reconfigurations, viewing the current case as setting a precedent. On the other hand, they may expect fewer future changes, assuming that the new BZ configuration already accounts for anticipated network constraints.

Regulation/ market design

- **Mitigation measures:** The assessment of the potential impact of mitigation measures were out of scope of this analysis. However, these might have an impact on liquidity and might include virtual trading hubs, long-term transmission rights (LTTRs or FTRs), and innovative approaches such as the provision of supply or demand by TSOs (e.g., SVK's pilot initiative).
- **Other market design changes:** A BZ reconfiguration would coincide with other market design changes that may affect liquidity, for example changes to intraday coupling, the introduction of intraday auctions, and the provision of new or alternative long-term products.

2.2 Mitigation measures

Mitigation measures

- The methodology and assumptions that are to be used in the bidding zone review process foresee a public consultation on the possible measures to mitigate negative impacts of specific alternative BZ configurations with regard to (at least) the criteria ‘Market liquidity and transaction costs’ and ‘Transition costs’

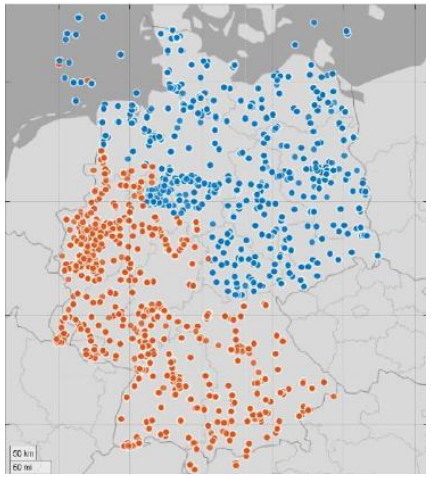
- While the picture for short-term markets is less clear, the Compass Lexecon study on liquidity and transaction costs concludes that liquidity of long-term markets tends to be impaired by splits of the current BZ configurations
  - Many stakeholders expressed concerns about the expected negative impact on the liquidity of forward markets
  - Measures proposed to mitigate those impacts focus on reestablishing liquidity via various interventions (market making, easing collateral requirements, improved hedging products)

- ENTSO-E is currently investigating improvements to the European forward market design and the role of cross-border hedging instruments (cf. ENTSO-E Advocacy Note on Forward Markets)
  - (Cross-border) hedging requires liquid hubs
  - The added value of a Virtual Hub is mostly not demonstrated

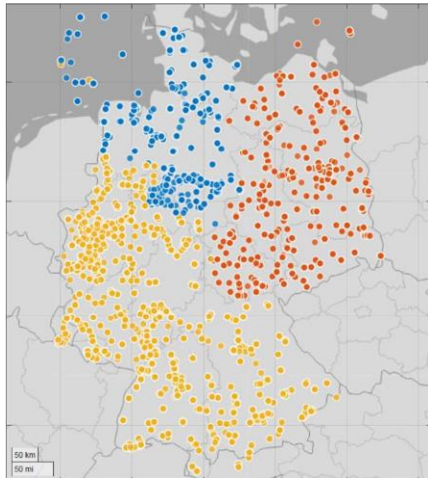
Coffee Break

3. BZRR CE general simulation results

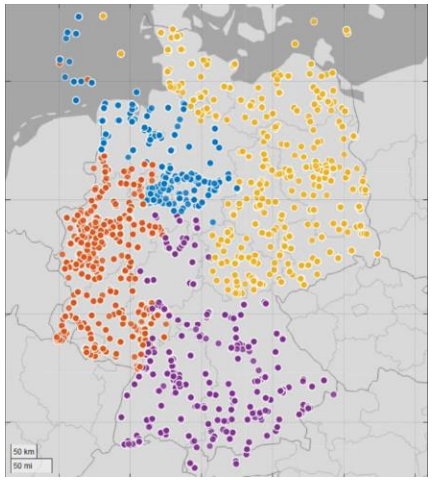
Alternative configurations assessed for BZRR CE*



DE2



DE3



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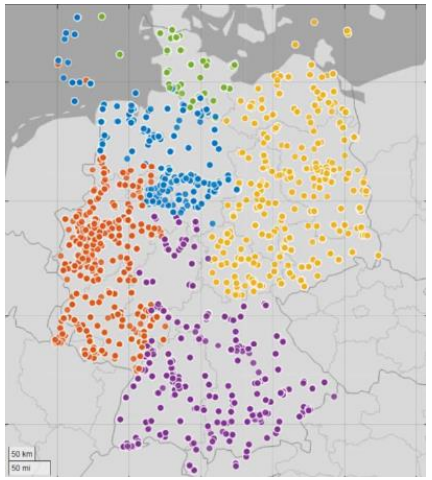

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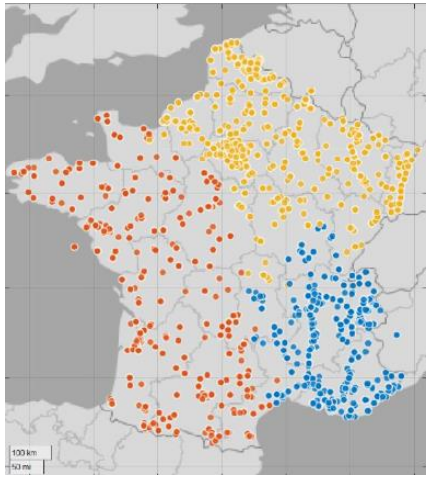

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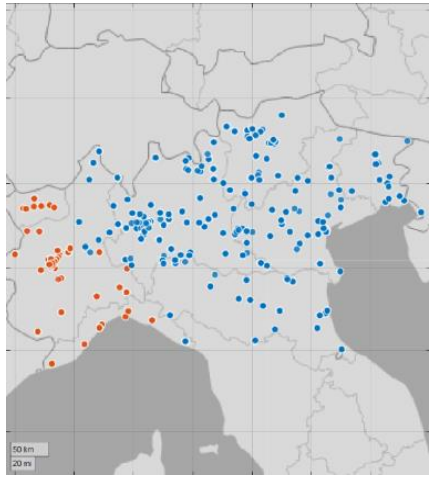
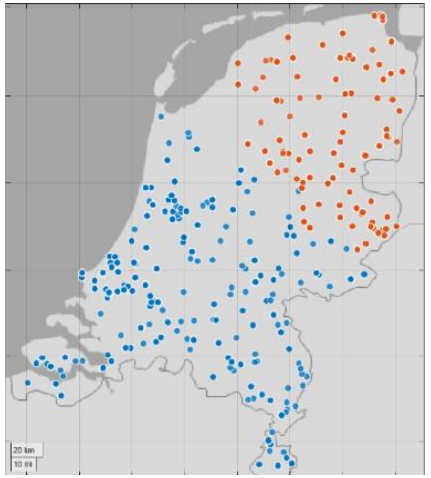


IT2



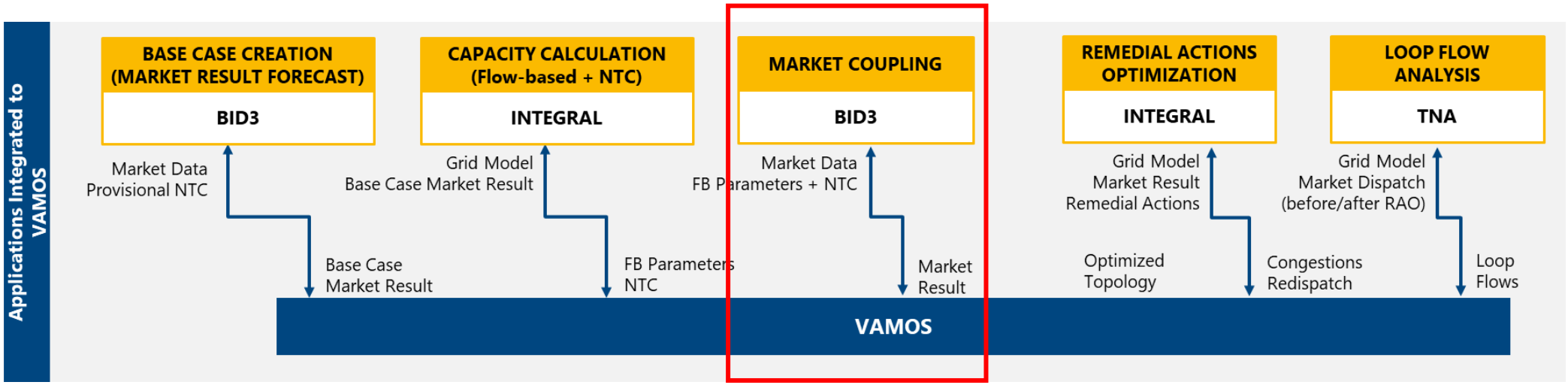
NL2

*according to ACER decision 11-2022

3.1. BZRR CE Market Coupling results

- Change in fuel types
- Absolute average market prices
- Net positions

BZRR CE: DA market dispatch results

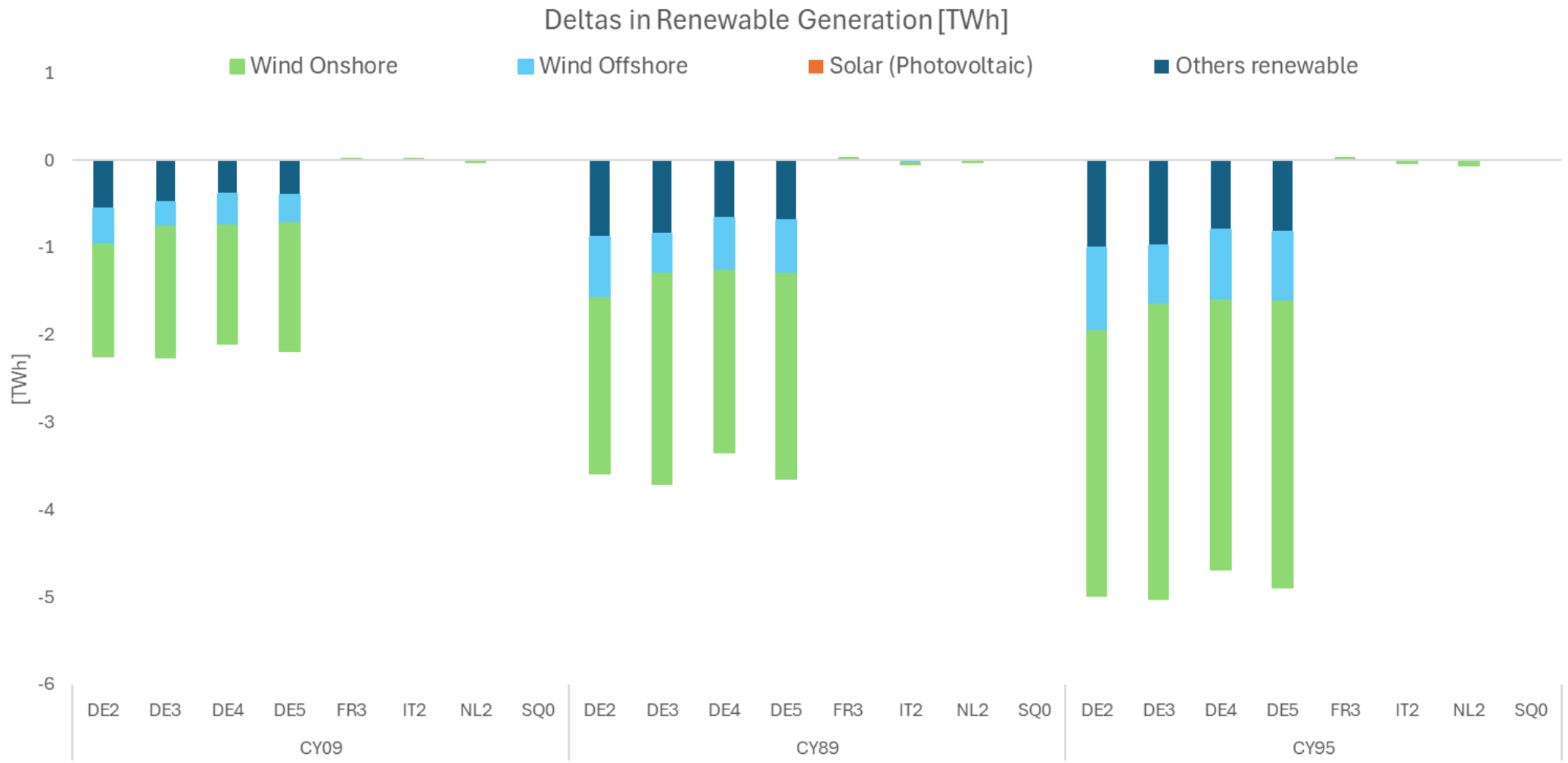


3.1. BZRR CE Market Coupling results

- **Change in fuel types**
- Absolute average market prices
- Net positions

Draft

Change in renewable generation compared to status quo



Change in renewable generation is only noticeable for the German splits configurations (with an increase in RES market based curtailment).

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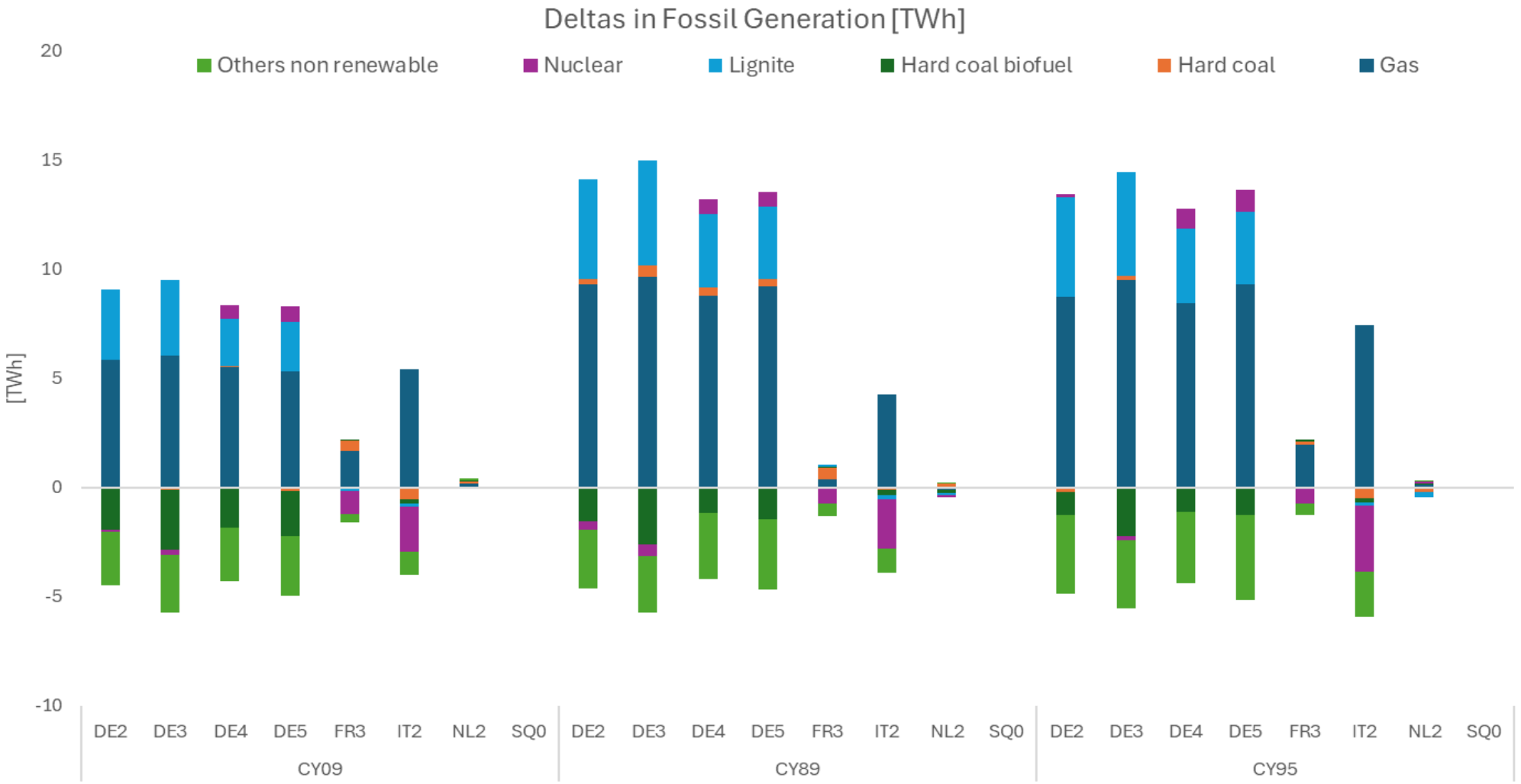
Change in fossil generation compared to status quo



For most configurations, increase in gas and lignite production, decrease in nuclear, biofuel and other non renewable generation (to compensate RES market based curtailment).

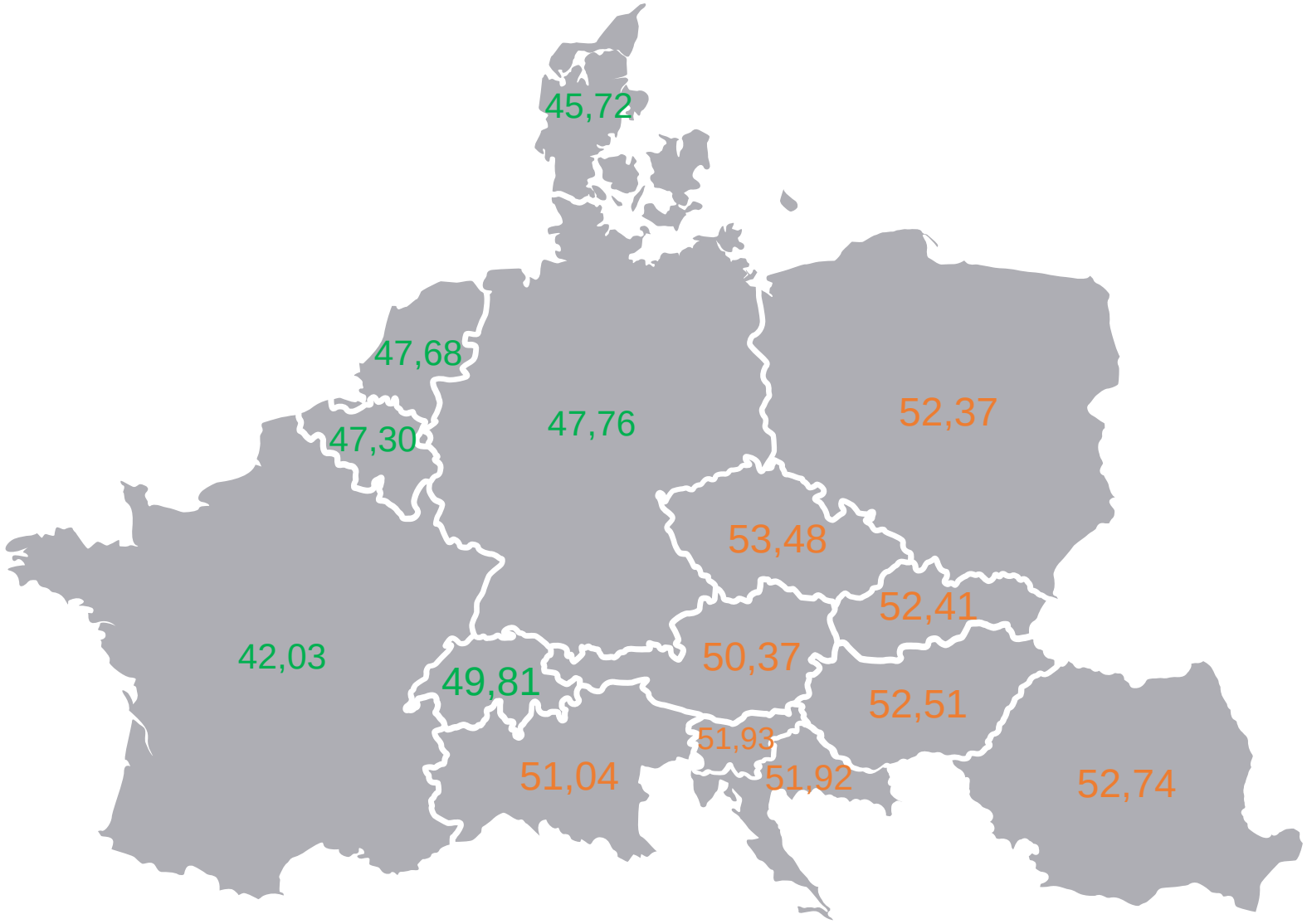
3.1. BZRR CE Market Coupling results

- Change in fuel types
- **Absolute average market prices**
- Net positions

Draft

Status Quo - Absolute Average Market Clearing Price EUR/MWh

Zone	SQ 89	SQ 95	SQ 09	Average
AT00	50,28	50,19	50,64	50,37
BE00	46,83	46,61	48,46	47,30
CH00	49,64	49,51	50,27	49,81
CZ00	54,03	53,64	52,77	53,48
DE00	46,93	47,11	49,23	47,76
DKW1	43,23	45,38	48,56	45,72
FR00	42,61	39,92	43,55	42,03
HR00	52,05	51,70	52,00	51,92
HU00	52,69	52,41	52,42	52,51
ITN1	51,05	50,88	51,18	51,04
NL00	46,77	47,03	49,25	47,68
PL00	52,01	52,14	52,97	52,37
RO00	52,81	52,63	52,78	52,74
SI00	52,05	51,69	52,06	51,93
SK00	52,51	52,34	52,38	52,41

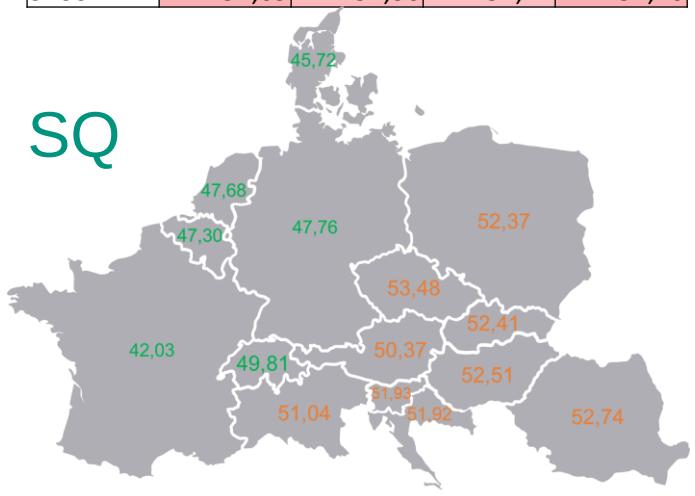


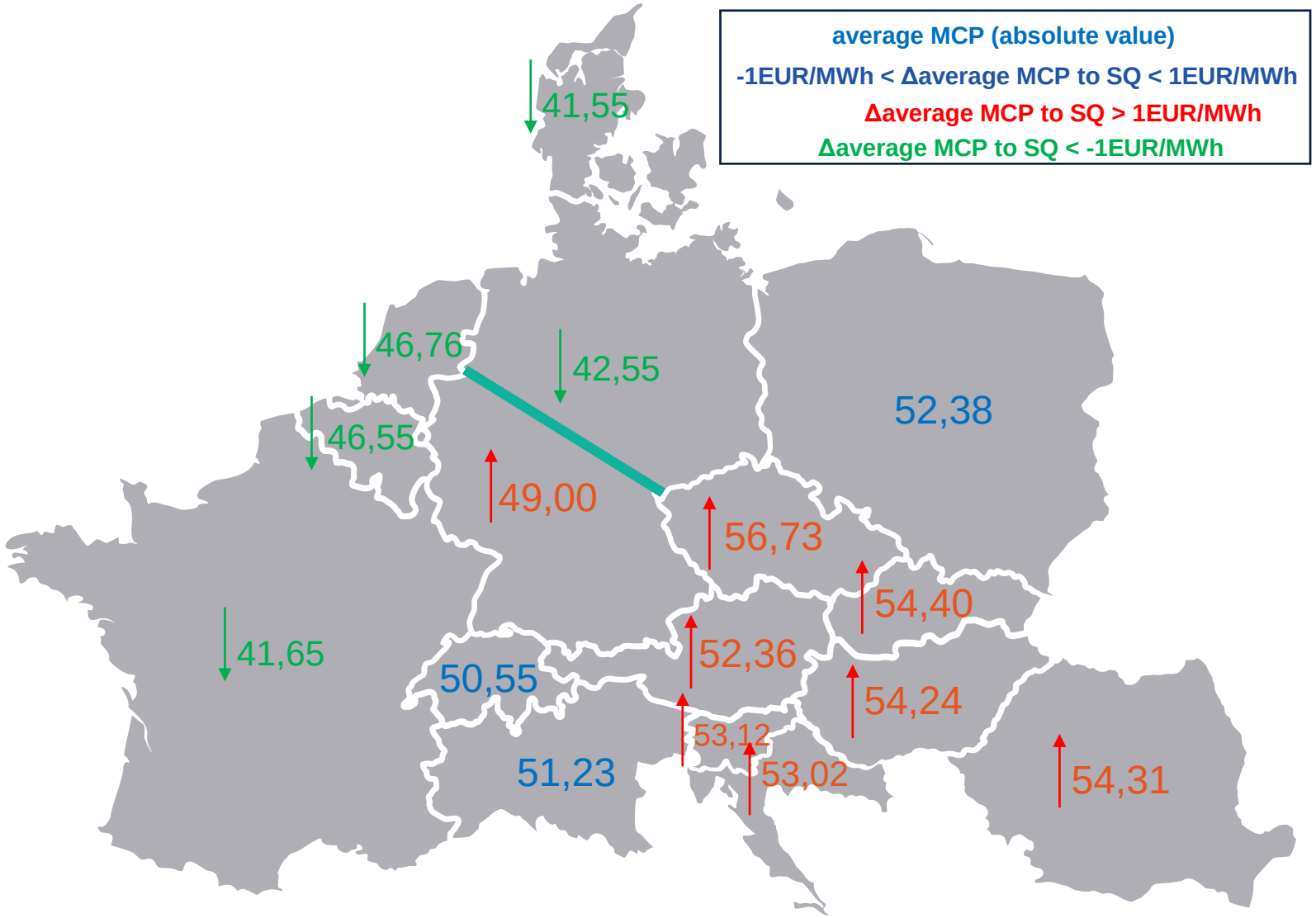
Market Coupling Simulation results

Draft

DE2- Absolute Average Market Clearing Price EUR/MWh

DE2				
MCP	89	95	9	Average
AT00	52,60	52,19	52,30	52,36
BE00	46,17	45,98	47,94	46,70
CH00	50,56	50,37	50,73	50,55
CZ00	57,51	56,97	55,72	56,73
DEJ1	41,10	41,50	45,04	42,55
DEJ2	48,68	48,51	49,81	49,00
DKW1	39,27	40,60	44,79	41,55
FR00	42,44	39,42	43,09	41,65
HR00	53,25	52,89	52,91	53,02
HU00	54,61	54,20	53,92	54,24
ITN1	51,25	51,09	51,36	51,23
NL00	45,81	46,27	48,19	46,76
PL00	52,04	52,09	53,02	52,38
RO00	54,65	54,28	54,00	54,31
SI00	53,35	52,97	53,06	53,12
SK00	54,69	54,36	54,14	54,40



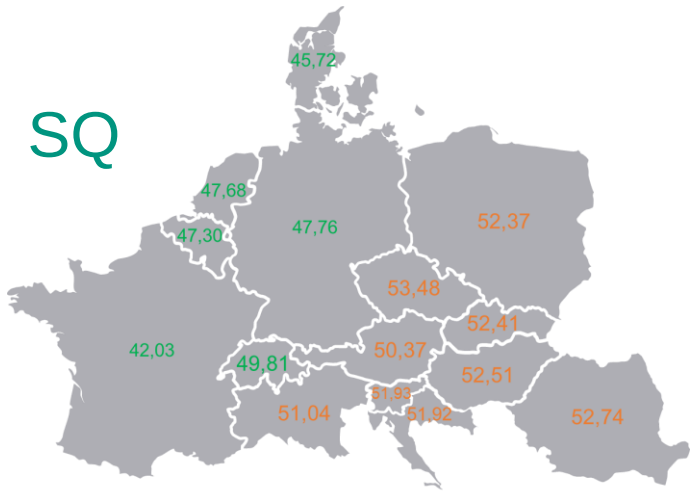


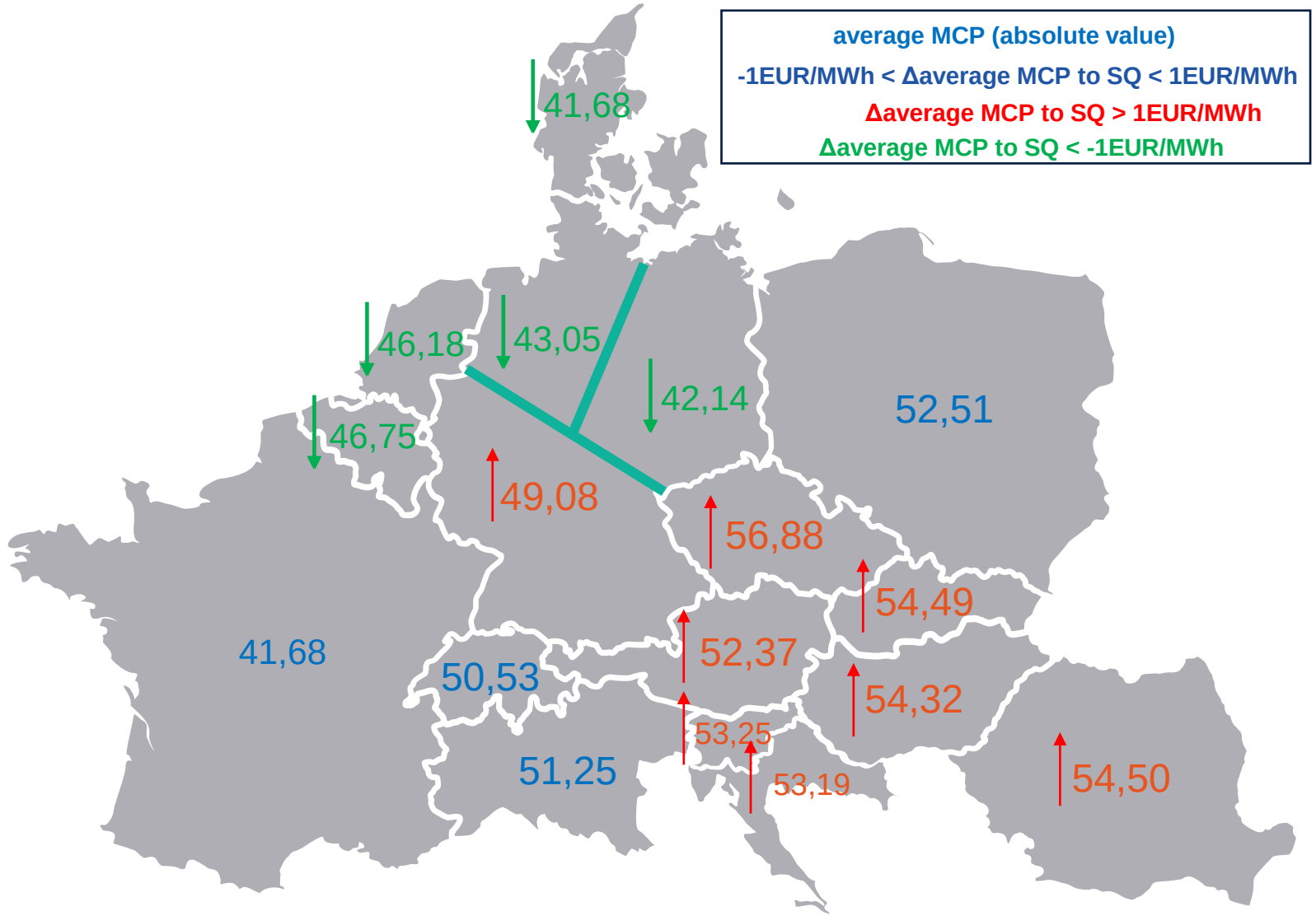
Draft

Market Coupling Simulation results

DE3- Absolute Average Market Clearing Price EUR/MWh

Zone	DE3 89	95	09	Average
AT00	52,61	52,27	52,22	52,37
BE00	46,27	46,12	47,86	46,75
CH00	50,63	50,37	50,60	50,53
CZ00	57,66	57,13	55,84	56,88
DEJ1	41,62	41,88	45,65	43,05
DEJ2	40,70	41,26	44,45	42,14
DEJ3	48,82	48,68	49,73	49,08
DKW1	39,23	40,64	45,17	41,68
FR00	42,49	39,44	43,11	41,68
HR00	53,55	53,09	52,92	53,19
HU00	54,73	54,30	53,93	54,32
ITN1	51,32	51,12	51,30	51,25
NL00	45,08	45,60	47,85	46,18
PL00	52,17	52,22	53,13	52,51
RO00	54,83	54,48	54,19	54,50
SI00	53,59	53,13	53,03	53,25
SK00	54,82	54,47	54,18	54,49



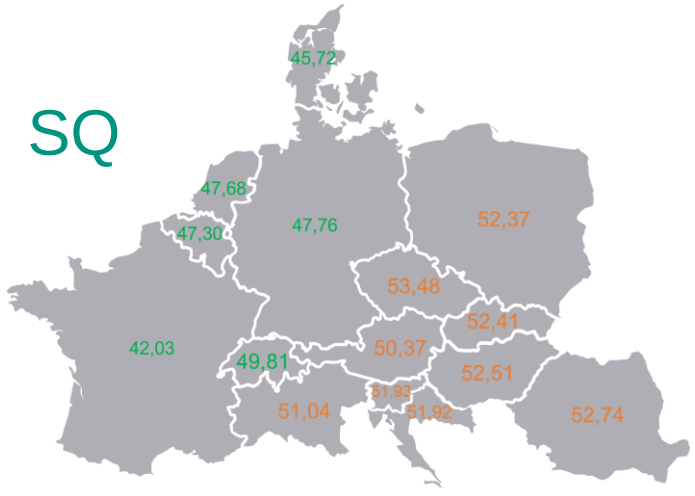


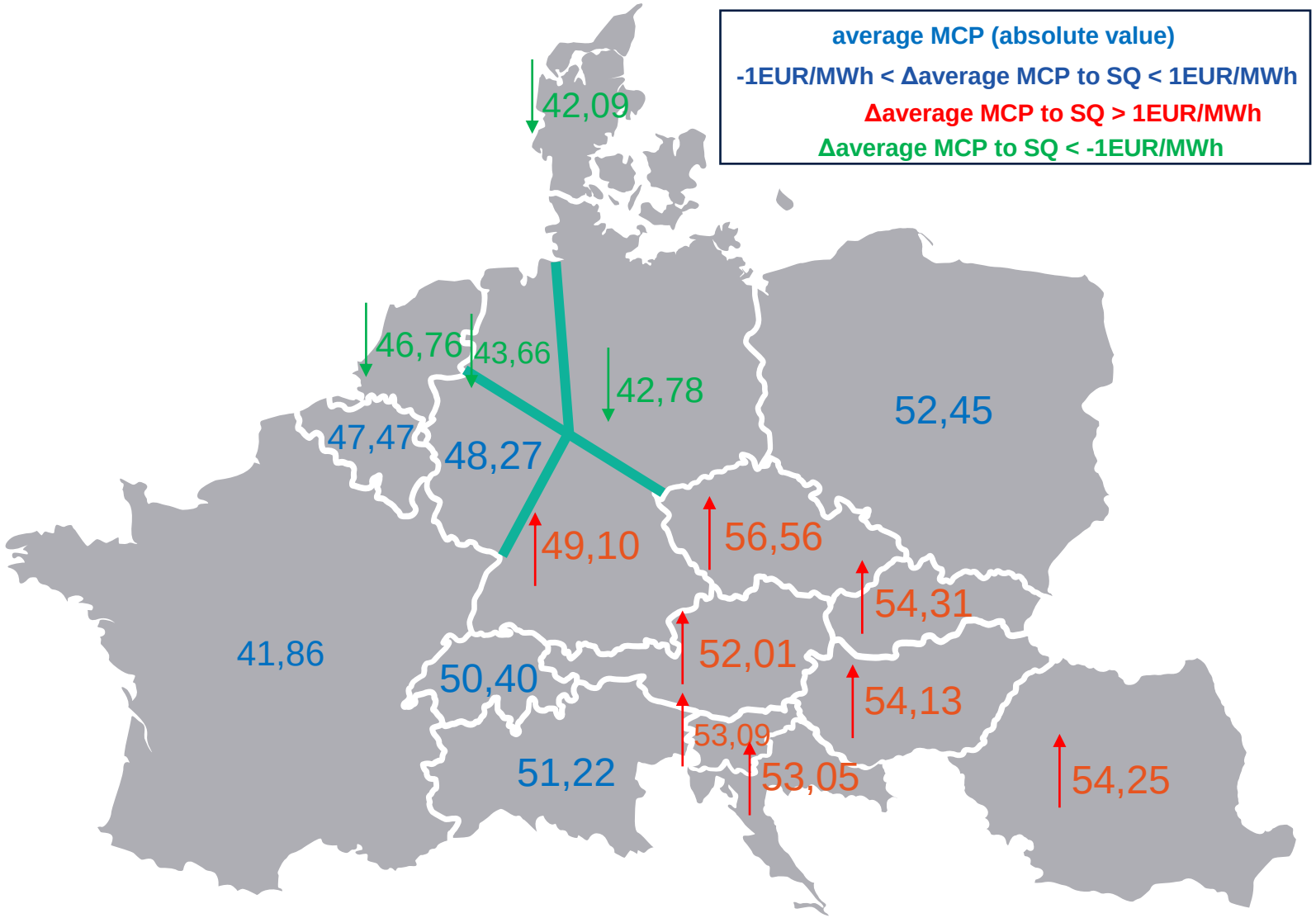
Market Coupling Simulation results

Draft

DE4- Absolute Average Market Clearing Price EUR/MWh

Zone	DE4 89	95	09	Average
AT00	52,18	51,90	51,94	52,01
BE00	47,10	46,81	48,51	47,47
CH00	50,44	50,25	50,52	50,40
CZ00	57,34	56,80	55,54	56,56
DEJ1	42,22	42,45	46,30	43,66
DEJ2	47,83	47,78	49,19	48,27
DEJ3	41,26	41,74	45,34	42,78
DEJ4	48,88	48,67	49,75	49,10
DKW1	39,60	41,01	45,67	42,09
FR00	42,60	39,70	43,27	41,86
HR00	53,35	52,93	52,87	53,05
HU00	54,50	54,11	53,79	54,13
ITN1	51,27	51,08	51,30	51,22
NL00	45,76	46,06	48,45	46,76
PL00	52,11	52,13	53,11	52,45
RO00	54,53	54,33	53,89	54,25
SI00	53,38	52,93	52,96	53,09
SK00	54,63	54,28	54,02	54,31





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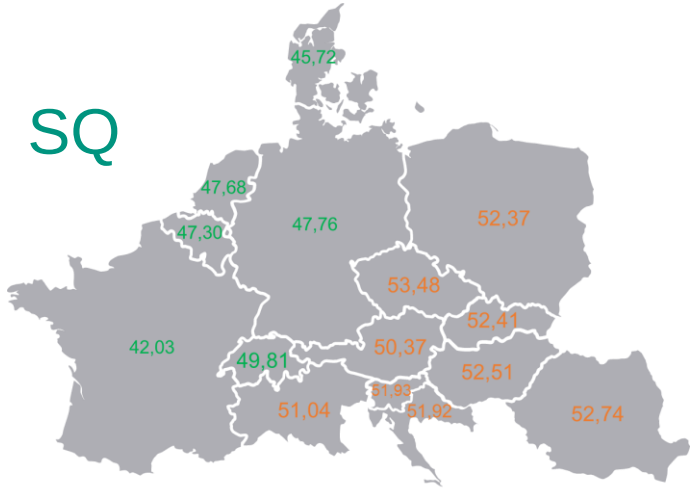
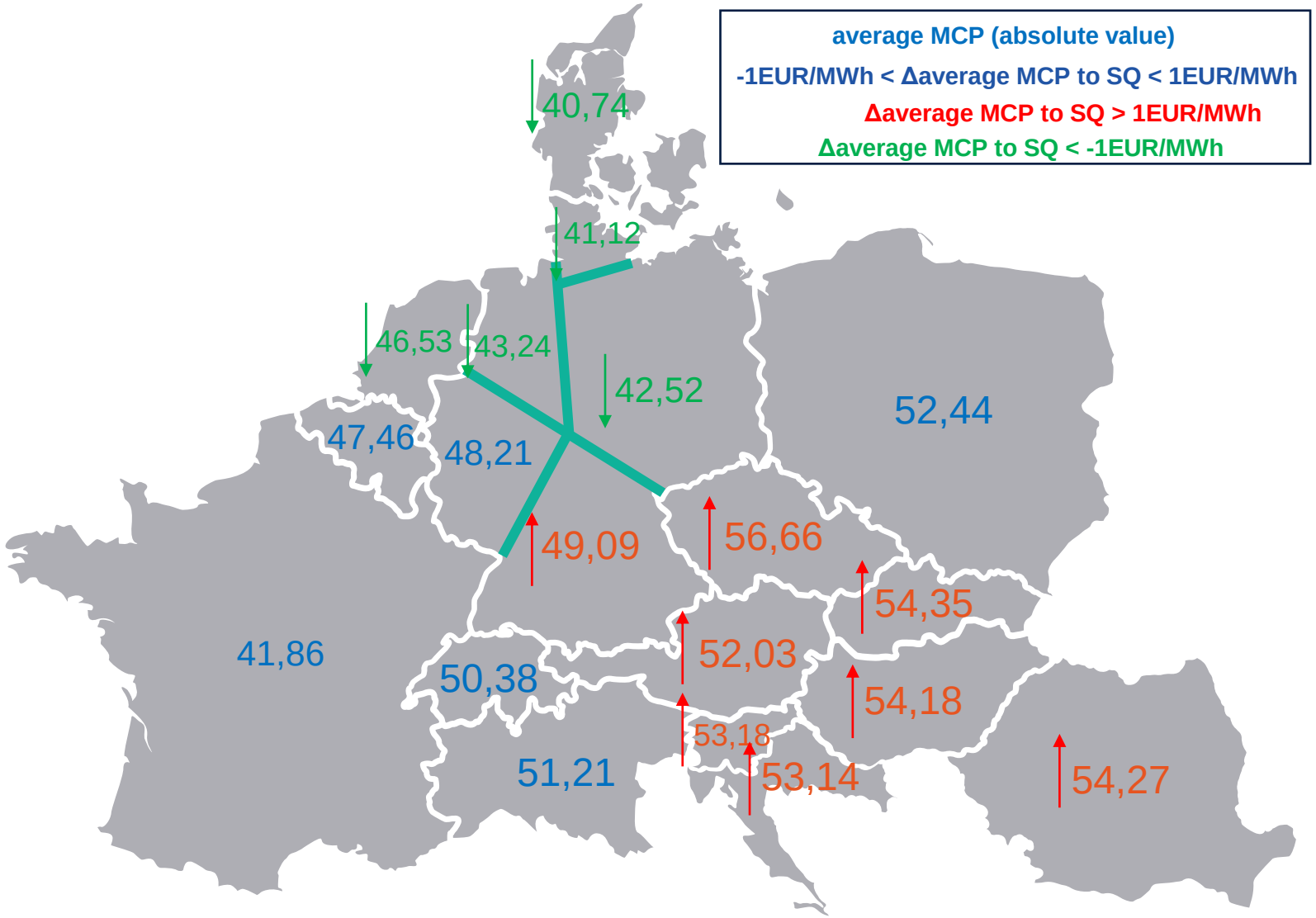
Market Coupling Simulation results

DE5- Absolute Average Market Clearing Price EUR/MWh

Zone	DE5 89	95	09	Average
AT00	52,22	51,93	51,94	52,03
BE00	47,09	46,83	48,46	47,46
CH00	50,44	50,23	50,47	50,38
CZ00	57,38	56,88	55,71	56,66
DEJ1	41,93	41,99	45,80	43,24
DEJ2	47,83	47,75	49,04	48,21
DEJ3	41,17	41,50	44,88	42,52
DEJ4	48,90	48,70	49,68	49,09
DEJ5	38,49	39,60	45,26	41,12
DKW1	37,68	39,32	45,23	40,74
FR00	42,63	39,68	43,26	41,86
HR00	53,44	53,01	52,97	53,14
HU00	54,53	54,14	53,86	54,18
ITN1	51,26	51,08	51,29	51,21
NL00	45,47	45,77	48,34	46,53
PL00	52,12	52,13	53,08	52,44
RO00	54,55	54,27	53,99	54,27
SI00	53,47	53,01	53,07	53,18
SK00	54,65	54,31	54,10	54,35

SQ



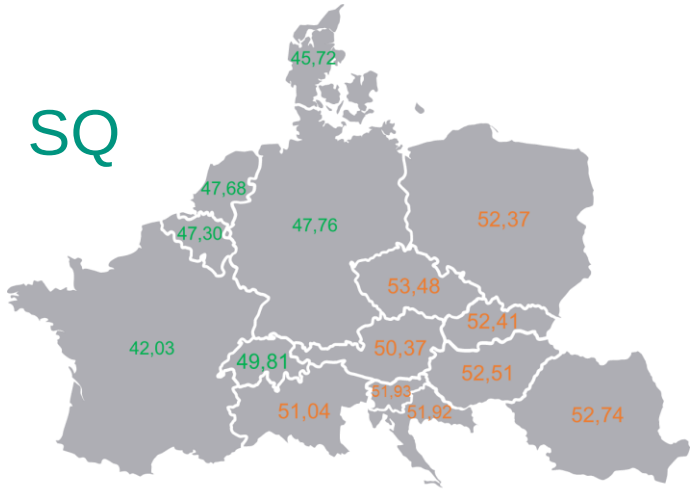


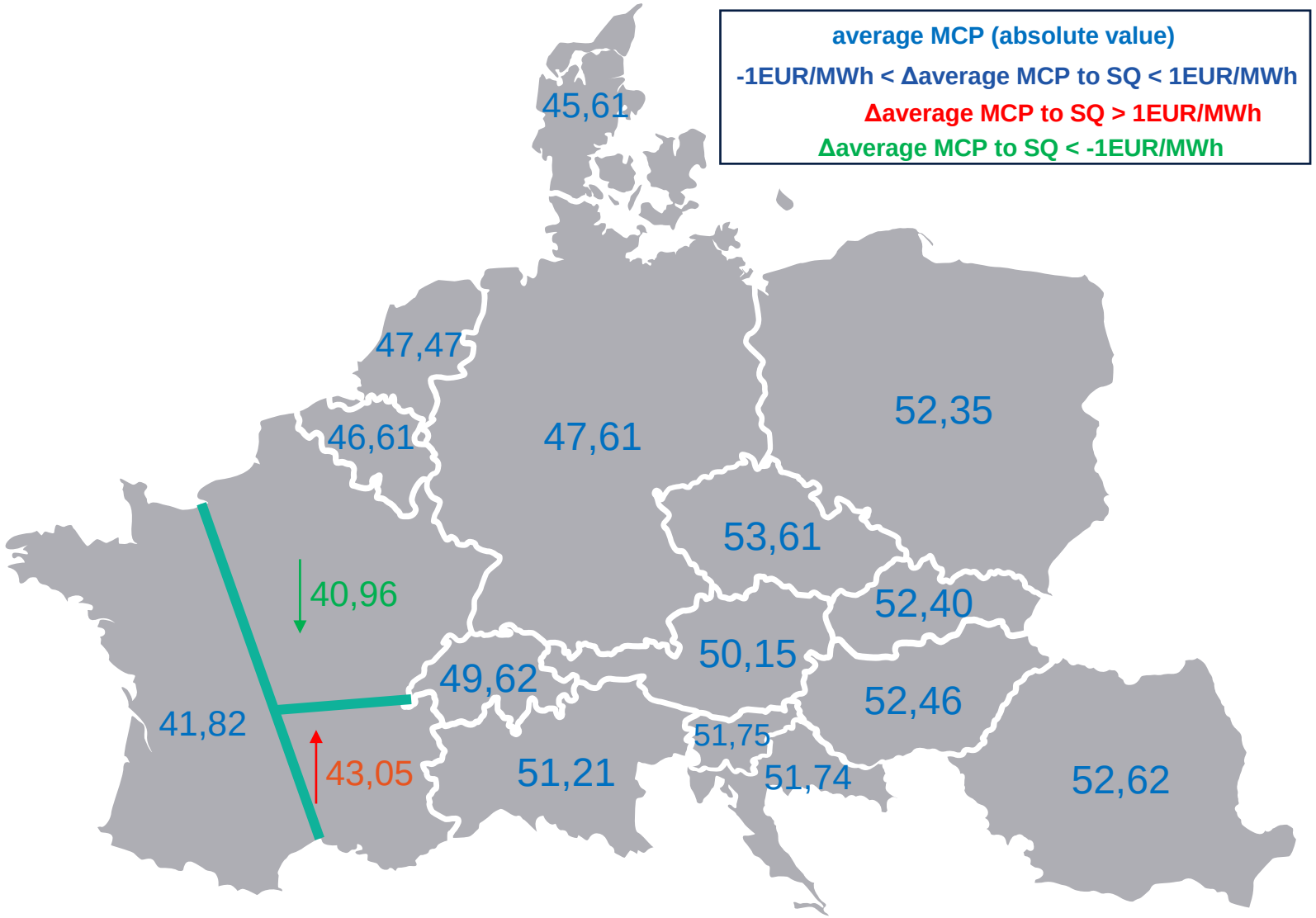
Draft

Market Coupling Simulation results

FR3- Absolute Average Market Clearing Price EUR/MWh

Zone	FR3 89	95	09	Average
AT00	50,12	49,91	50,43	50,15
BE00	46,18	45,79	47,85	46,61
CH00	49,54	49,22	50,10	49,62
CZ00	54,21	53,73	52,88	53,61
DE00	46,83	46,82	49,17	47,61
DKW1	43,06	45,14	48,62	45,61
FRF1	43,73	40,58	44,83	43,05
FRF2	42,52	39,50	43,44	41,82
FRF3	41,56	38,88	42,43	40,96
HR00	51,87	51,55	51,79	51,74
HU00	52,64	52,39	52,34	52,46
ITN1	51,23	51,10	51,30	51,21
NL00	46,60	46,69	49,11	47,47
PL00	51,98	52,11	52,96	52,35
RO00	52,72	52,62	52,51	52,62
SI00	51,86	51,53	51,86	51,75
SK00	52,53	52,29	52,37	52,40



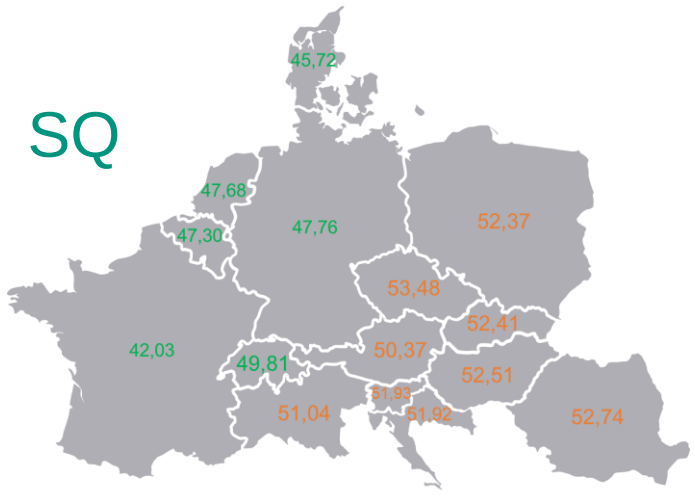


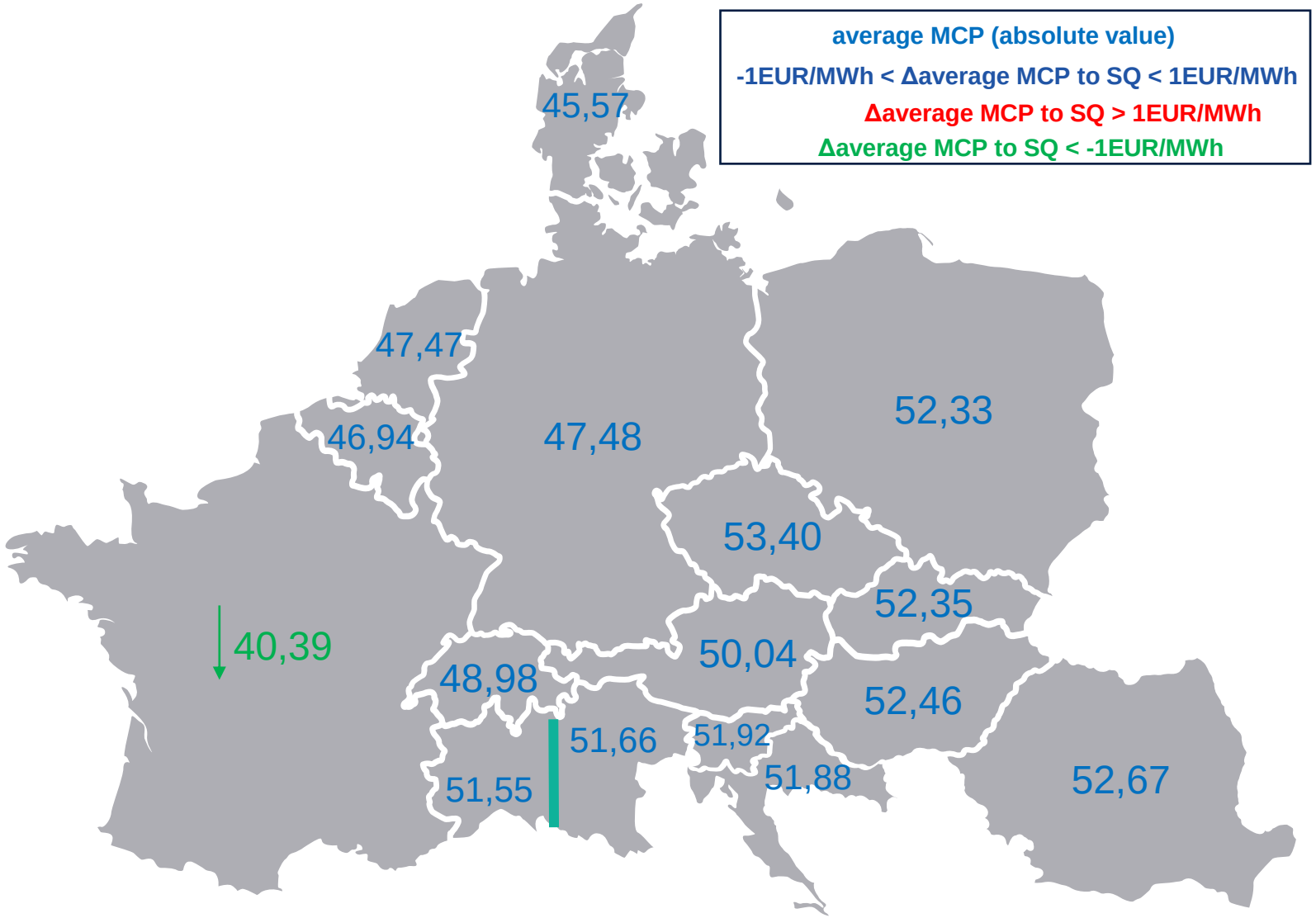
Draft

Market Coupling Simulation results

IT2- Absolute Average Market Clearing Price EUR/MWh

Zone	IT2 89	95	09	Average
AT00	49,99	49,79	50,34	50,04
BE00	46,53	46,14	48,14	46,94
CH00	48,89	48,46	49,58	48,98
CZ00	53,93	53,55	52,71	53,40
DE00	46,68	46,75	49,00	47,48
DKW1	43,07	45,09	48,56	45,57
FR00	41,40	37,79	41,99	40,39
HR00	51,98	51,65	52,02	51,88
HU00	52,60	52,40	52,39	52,46
ITI1	51,63	51,61	51,75	51,66
ITI2	51,54	51,51	51,60	51,55
NL00	46,57	46,75	49,08	47,47
PL00	51,99	52,09	52,90	52,33
RO00	52,73	52,65	52,62	52,67
SI00	51,99	51,65	52,12	51,92
SK00	52,45	52,28	52,33	52,35



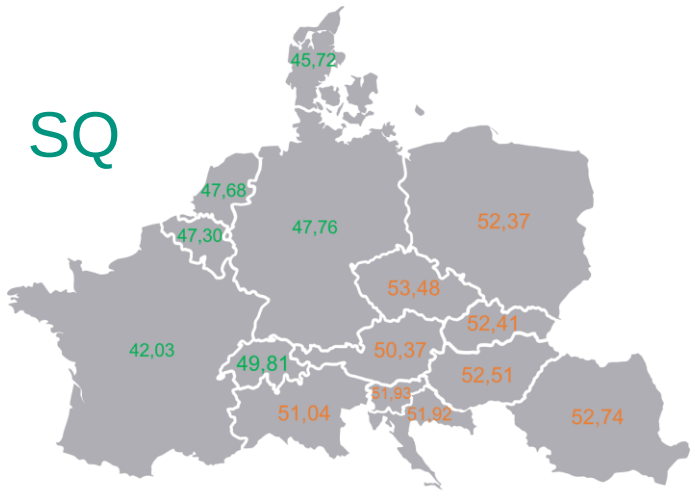


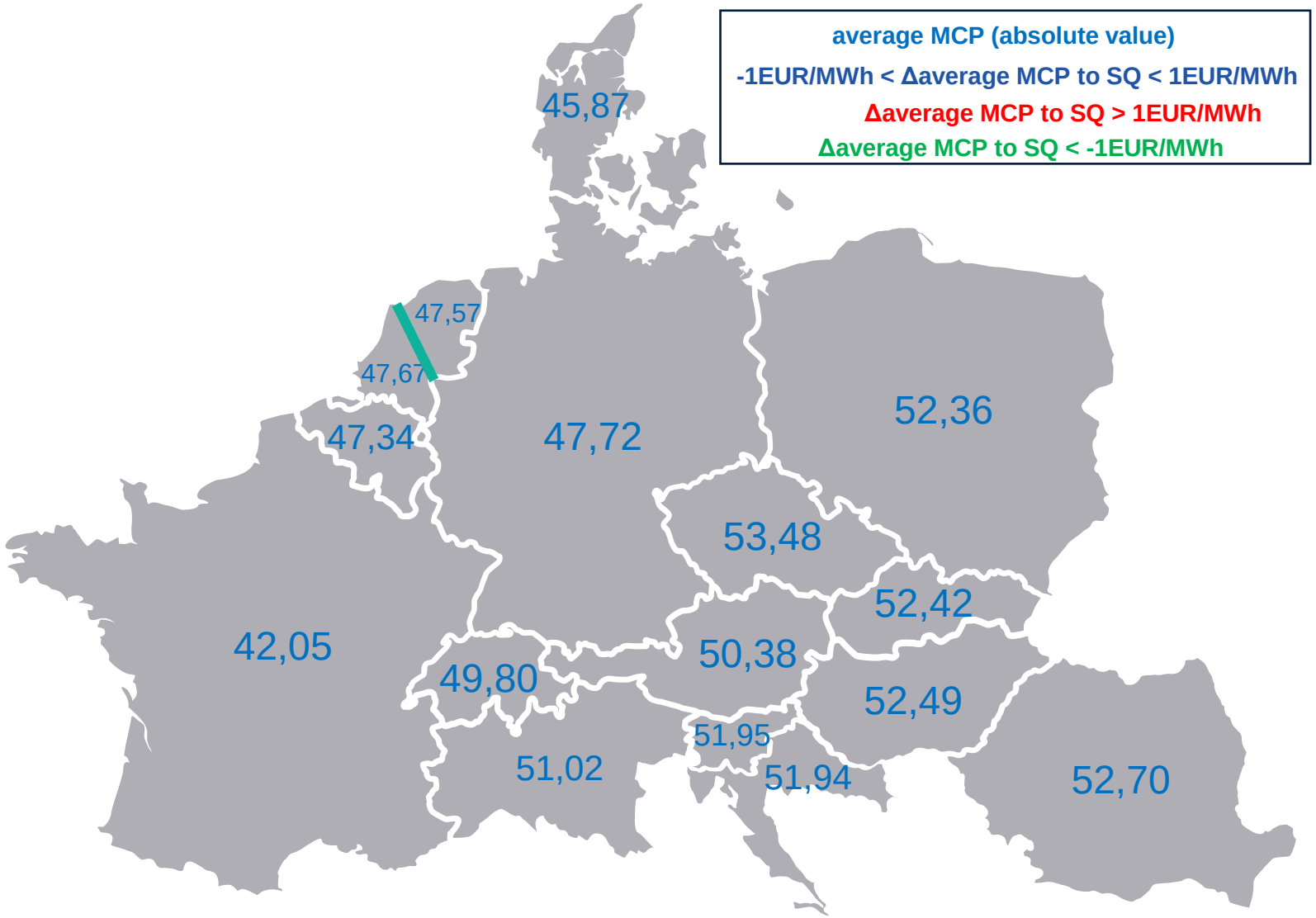
Market Coupling Simulation results

Draft

NL2- Absolute Average Market Clearing Price EUR/MWh

Zone	NL2 89	95	09	Average
AT00	50,30	50,17	50,68	50,38
BE00	46,86	46,63	48,52	47,34
CH00	49,63	49,46	50,30	49,80
CZ00	54,03	53,62	52,78	53,48
DE00	46,90	47,03	49,23	47,72
DKW1	43,46	45,42	48,73	45,87
FR00	42,66	39,93	43,55	42,05
HR00	52,09	51,71	52,01	51,94
HU00	52,67	52,41	52,40	52,49
ITN1	51,03	50,86	51,17	51,02
NLN1	46,85	46,98	49,18	47,67
NLN2	46,57	46,86	49,29	47,57
PL00	52,00	52,11	52,96	52,36
RO00	52,80	52,66	52,63	52,70
SI00	52,08	51,68	52,08	51,95
SK00	52,53	52,33	52,39	52,42





3.1 BZRR CE Market Coupling results

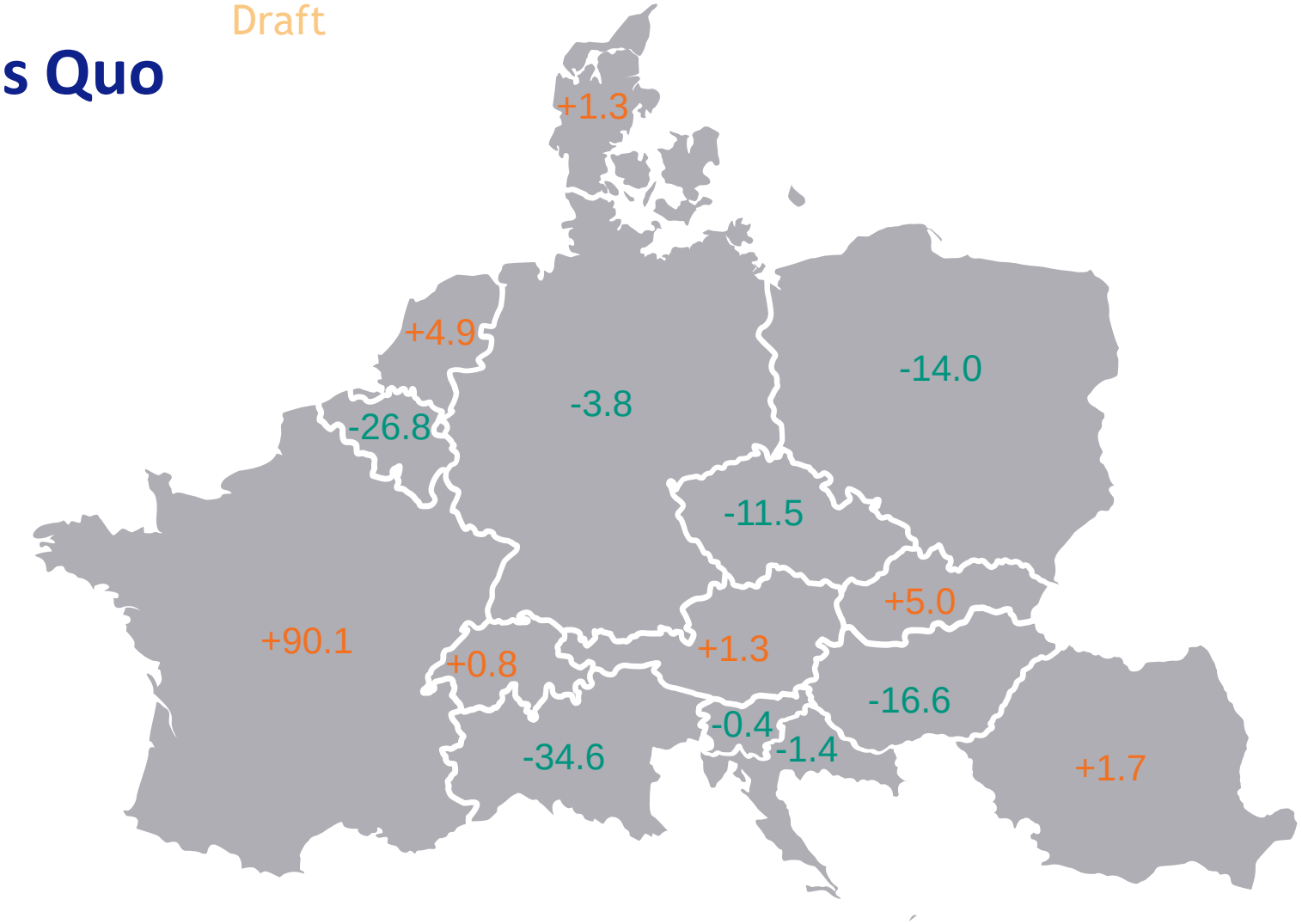
- Change in fuel types
- Absolute average market prices
- **Net positions**

Market Coupling
Simulation results

Draft

Net Positions Status Quo

	SQ[TWh]			
BZ	89	95	09	Average
AT00	0,1	0,4	3,5	1,3
BE00	-25,9	-28,7	-26,0	-26,8
CH00	-0,9	0,8	2,4	0,8
CZ00	-11,3	-11,3	-12,0	-11,5
DE00	-7,7	-3,1	-0,8	-3,8
DKW1	1,4	1,7	0,9	1,3
FR00	82,6	97,7	90,1	90,1
HR00	-2,6	-1,2	-0,5	-1,4
HU00	-16,1	-16,9	-17,0	-16,6
ITN1	-31,3	-37,9	-34,5	-34,6
NL00	3,5	4,7	6,6	4,9
PL00	-13,8	-13,7	-14,5	-14,0
RO00	1,6	0,8	2,8	1,7
SI00	-1,1	-0,4	0,2	-0,4
SK00	4,8	4,9	5,3	5,0

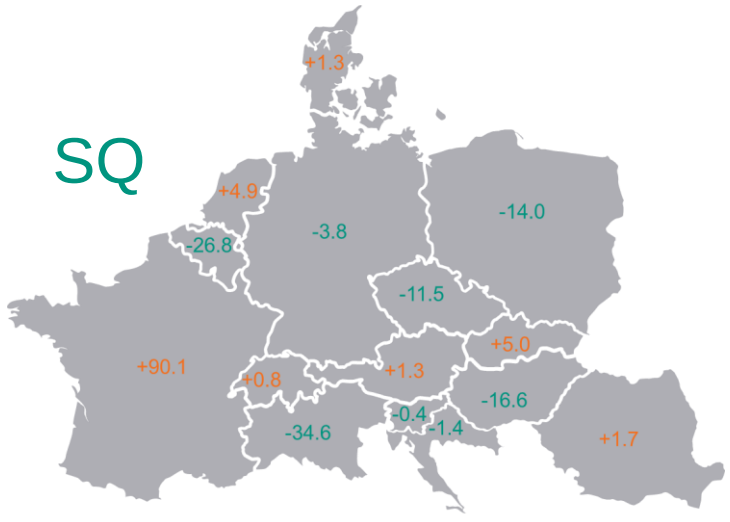


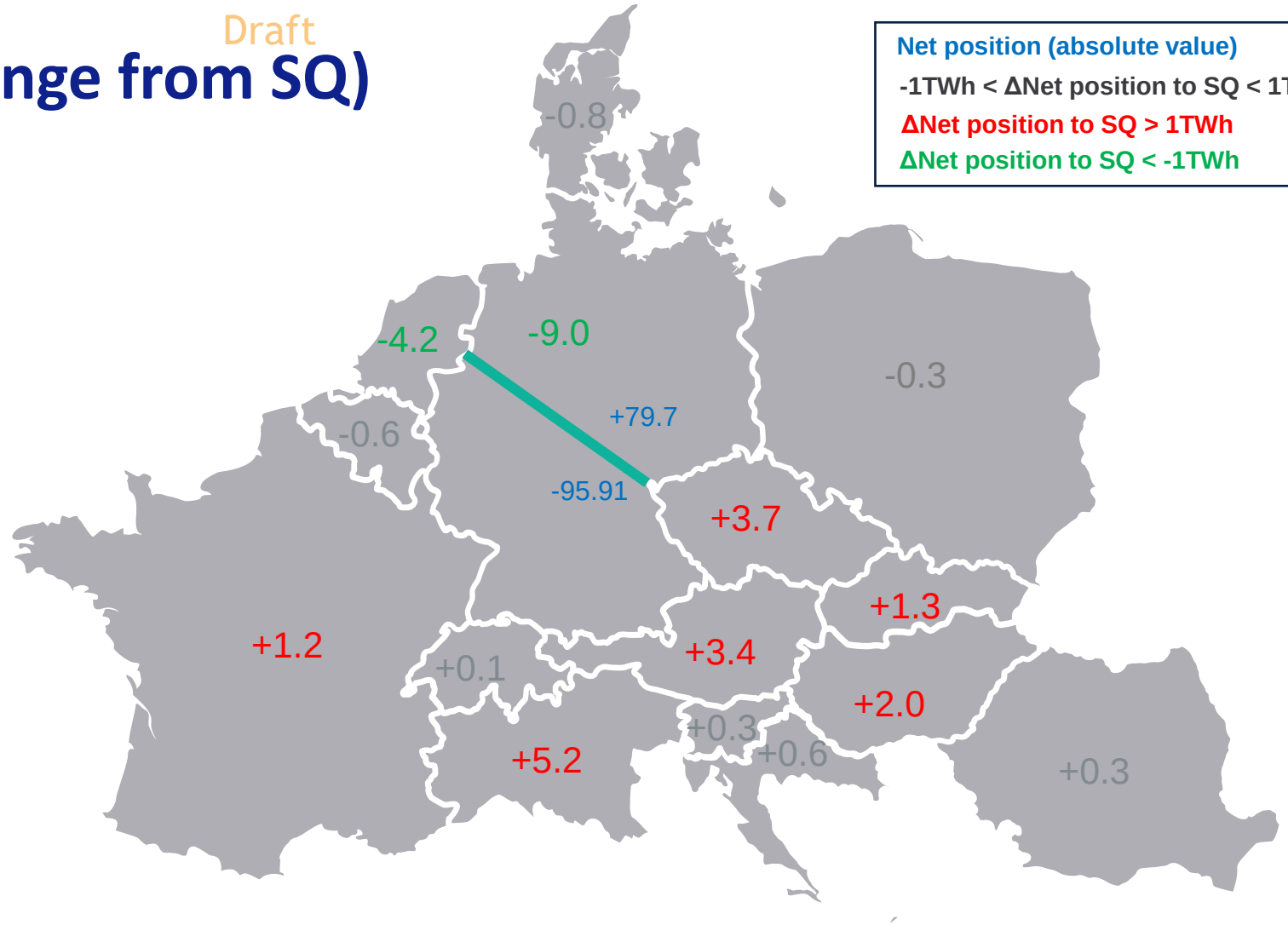
Market Coupling Simulation results

Draft

Net Positions DE2 (change from SQ)

DE2				
Delta TwH	89	95	9	Average
AT00	3,6	3,4	3,3	3,4
BE00	-1,3	-0,5	0,1	-0,6
CH00	0,0	0,1	0,1	0,1
CZ00	4,2	3,8	3,1	3,7
DE00	-7,6	-11,0	-8,5	-9,0
DKW1	-0,8	-0,9	-0,7	-0,8
FR00	1,2	0,9	1,4	1,2
HR00	0,6	0,7	0,5	0,6
HU00	2,1	2,1	1,6	2,0
ITN1	6,1	5,7	3,8	5,2
NL00	-4,3	-3,3	-4,9	-4,2
PL00	-0,3	-0,5	-0,2	-0,3
RO00	0,4	0,3	0,2	0,3
SI00	0,3	0,3	0,2	0,3
SK00	1,5	1,3	1,1	1,3





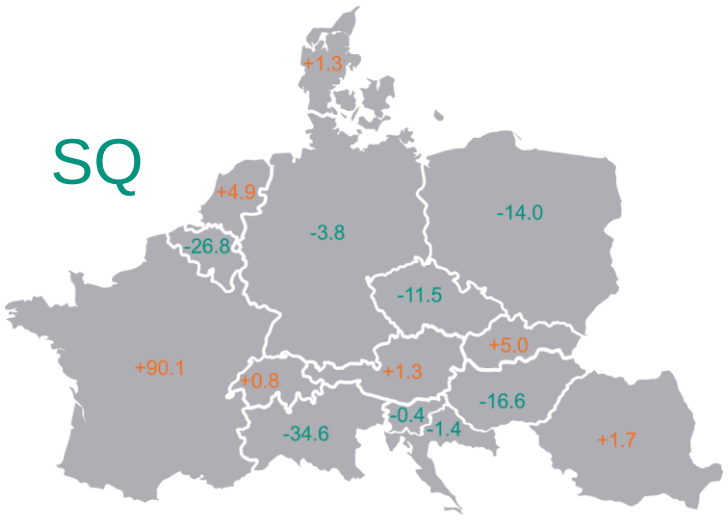
- Germany net position decreases by apprx. 9 TWh due to RES curtailment and reduction of imports from Nordics
- Decrease in Netherlands of -4.2 TWh
- Italy sees an increase of 5.2 TWh, Czechia by 3.7 TWh, and Austria by 3.4 TWh.

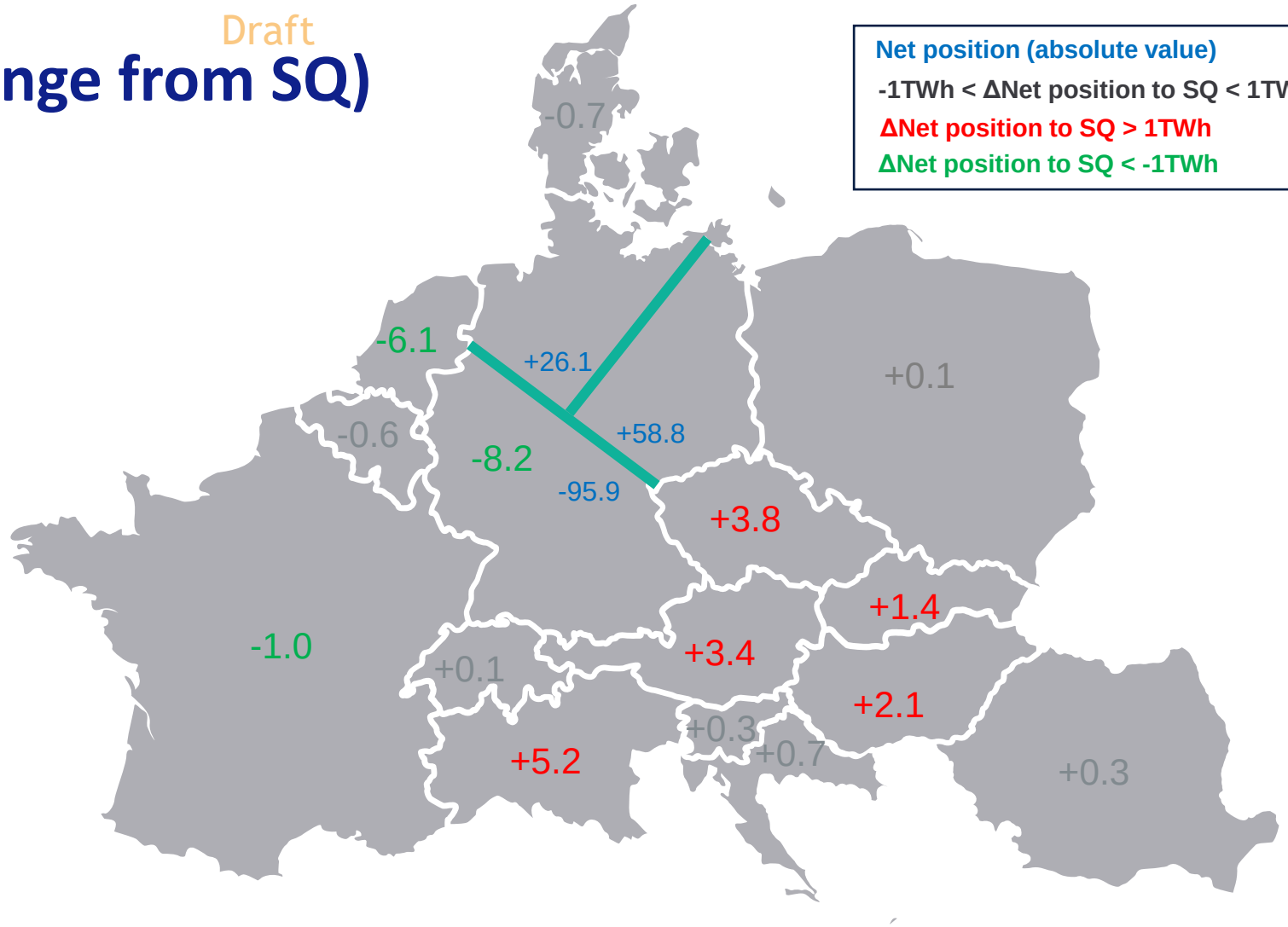
Market Coupling Simulation results

Draft

Net Positions DE3 (change from SQ)

	DE3[TWh]			
BZ	89	95	09	Average
AT00	3,6	3,4	3,1	3,4
BE00	-1,4	0,1	-0,3	-0,6
CH00	0,1	0,0	0,2	0,1
CZ00	4,1	3,6	3,6	3,8
DE00	-6,5	-9,5	-8,6	-8,2
DKW1	-0,7	-0,8	-0,6	-0,7
FR00	1,7	0,3	1,0	1,0
HR00	0,7	0,7	0,6	0,7
HU00	2,1	2,1	2,1	2,1
ITN1	5,9	6,1	3,8	5,2
NL00	-6,7	-5,5	-6,1	-6,1
PL00	0,0	-0,1	0,4	0,1
RO00	0,4	0,4	0,1	0,3
SI00	0,4	0,4	0,0	0,3
SK00	1,6	1,6	1,2	1,4





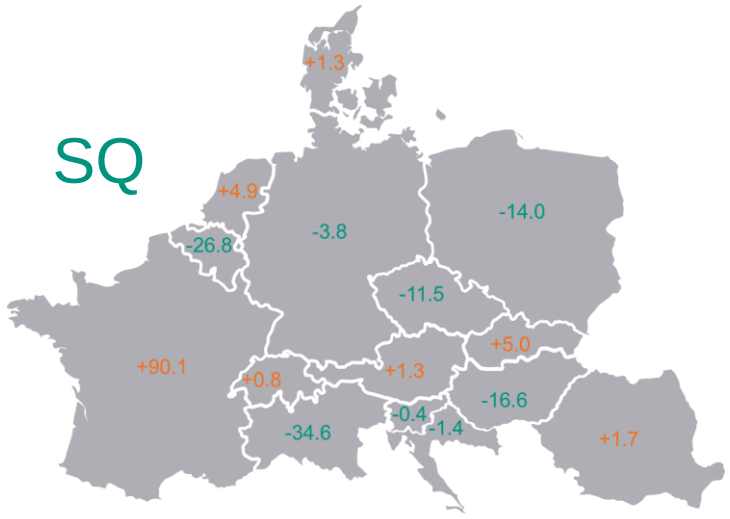
- Germany net position decreases by approximately 8.2 TWh.
- Italy sees an increase of 5.2 TWh, Czechia by 3.8 TWh, and Austria by 3.4 TWh.
- Decrease in Netherlands of -6.1 TWh

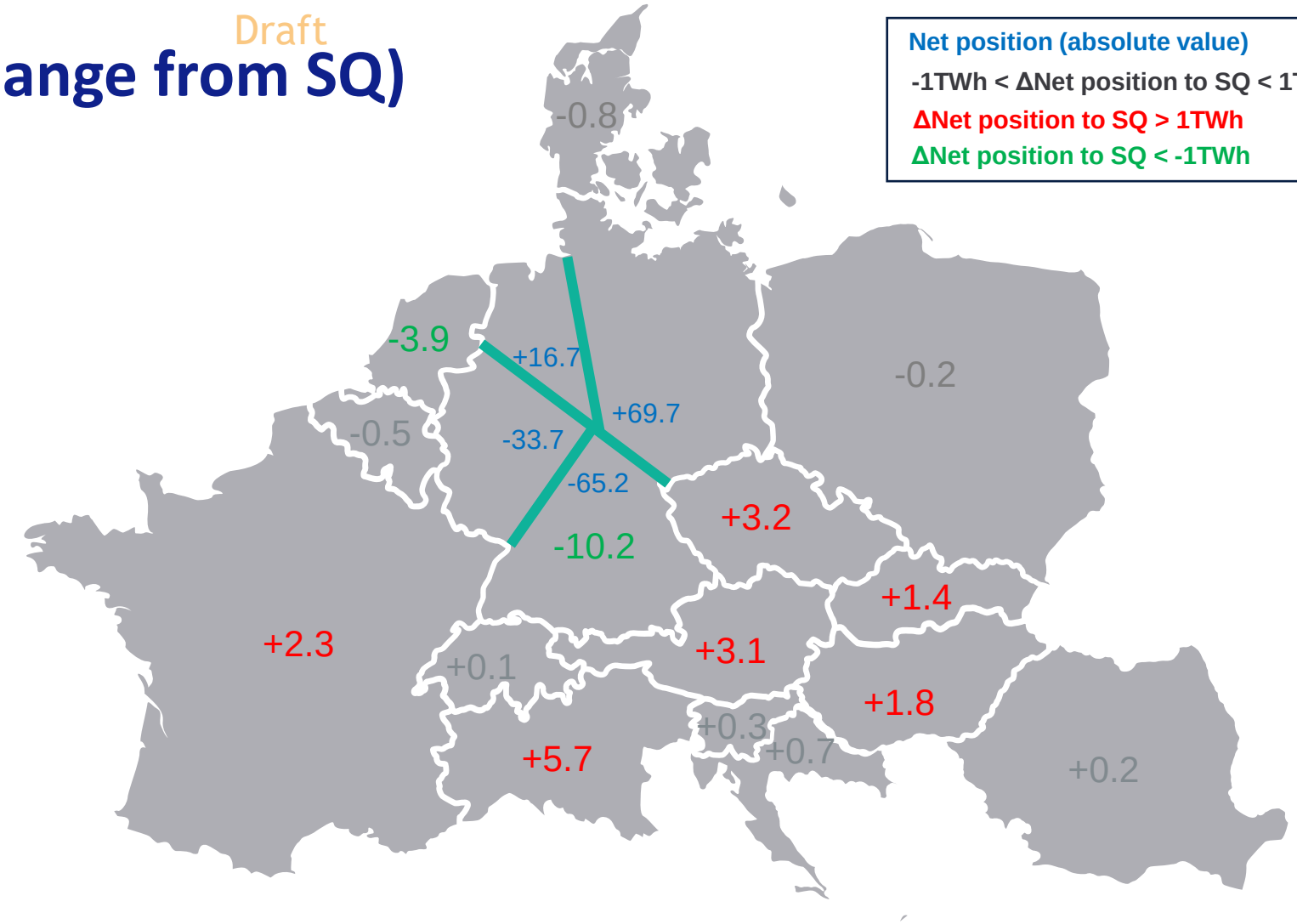
Market Coupling Simulation results

Draft

Net Positions DE4 (change from SQ)

BZ	DE4 [TWh] 89	95	09	Average
AT00	3,2	3,0	3,0	3,1
BE00	-0,9	0,3	-1,1	-0,5
CH00	0,1	0,1	0,1	0,1
CZ00	3,5	3,2	2,8	3,2
DE00	-9,4	-11,7	-9,6	-10,2
DKW1	-0,8	-0,8	-0,7	-0,8
FR00	2,7	2,1	2,1	2,3
HR00	0,6	0,9	0,7	0,7
HU00	1,9	1,9	1,6	1,8
ITN1	6,8	5,9	4,4	5,7
NL00	-4,0	-3,7	-4,1	-3,9
PL00	-0,3	-0,3	0,2	-0,2
RO00	0,3	0,3	0,0	0,2
SI00	0,3	0,4	0,2	0,3
SK00	1,5	1,3	1,4	1,4





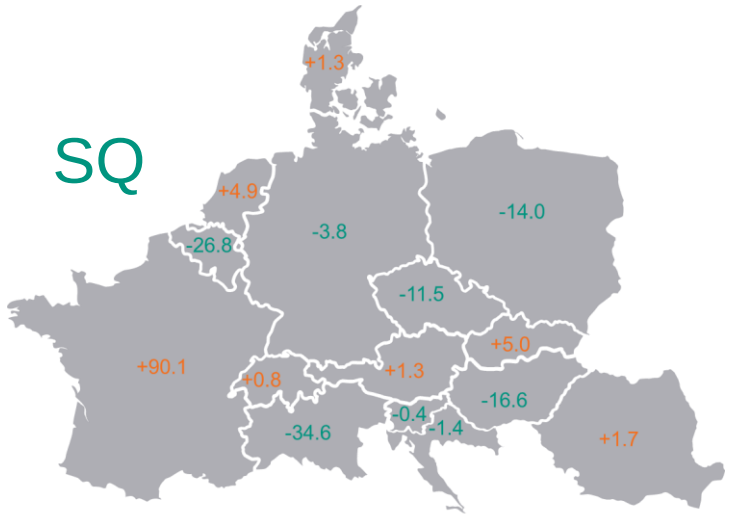
- Germany net position decreases by approximately 10.2 TWh.
- Italy sees an increase of 5.7 TWh, Czechia by 3.2 TWh, and Austria by 3.1 TWh.
- Decrease in Netherlands of -3.9 TWh

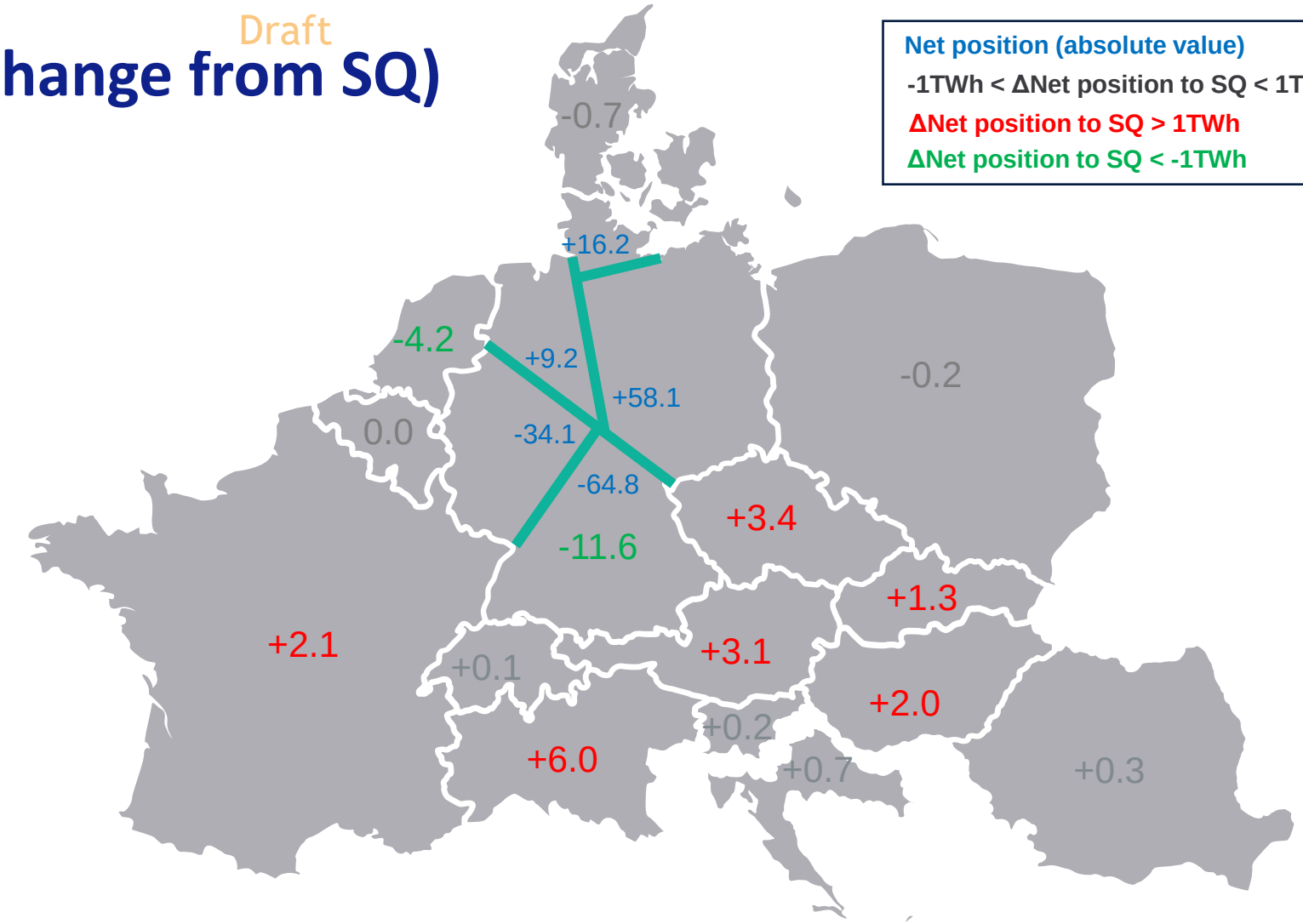
Market Coupling
Simulation results

Draft

Net Positions DE5 (change from SQ)

BZ	DE5 [TWh] 89	95	09	Average
AT00	3,3	3,1	2,8	3,1
BE00	-0,8	0,4	0,3	0,0
CH00	0,1	0,1	0,1	0,1
CZ00	3,5	3,3	3,3	3,4
DE00	-10,9	-12,7	-11,2	-11,6
DKW1	-0,8	-0,8	-0,5	-0,7
FR00	2,8	2,0	1,3	2,1
HR00	0,7	0,8	0,6	0,7
HU00	1,9	2,2	1,9	2,0
ITN1	7,4	6,4	4,4	6,0
NL00	-4,3	-3,9	-4,6	-4,2
PL00	-0,4	-0,5	0,4	-0,2
RO00	0,4	0,3	0,1	0,3
SI00	0,4	0,3	0,0	0,2
SK00	1,6	1,3	1,2	1,3





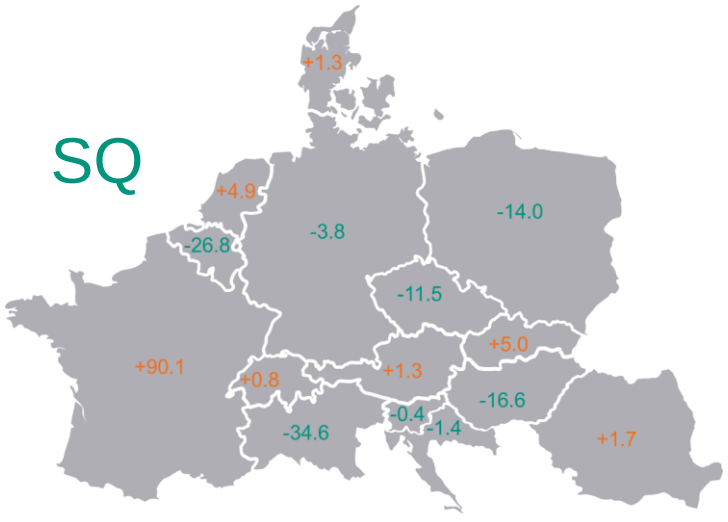
- Germany net position decreases by approximately 11.6 TWh.
- Italy sees an increase of 6 TWh, Czechia by 3.4 TWh, and Austria by 3.1 TWh.
- Decrease in Netherlands of -4.2TWh

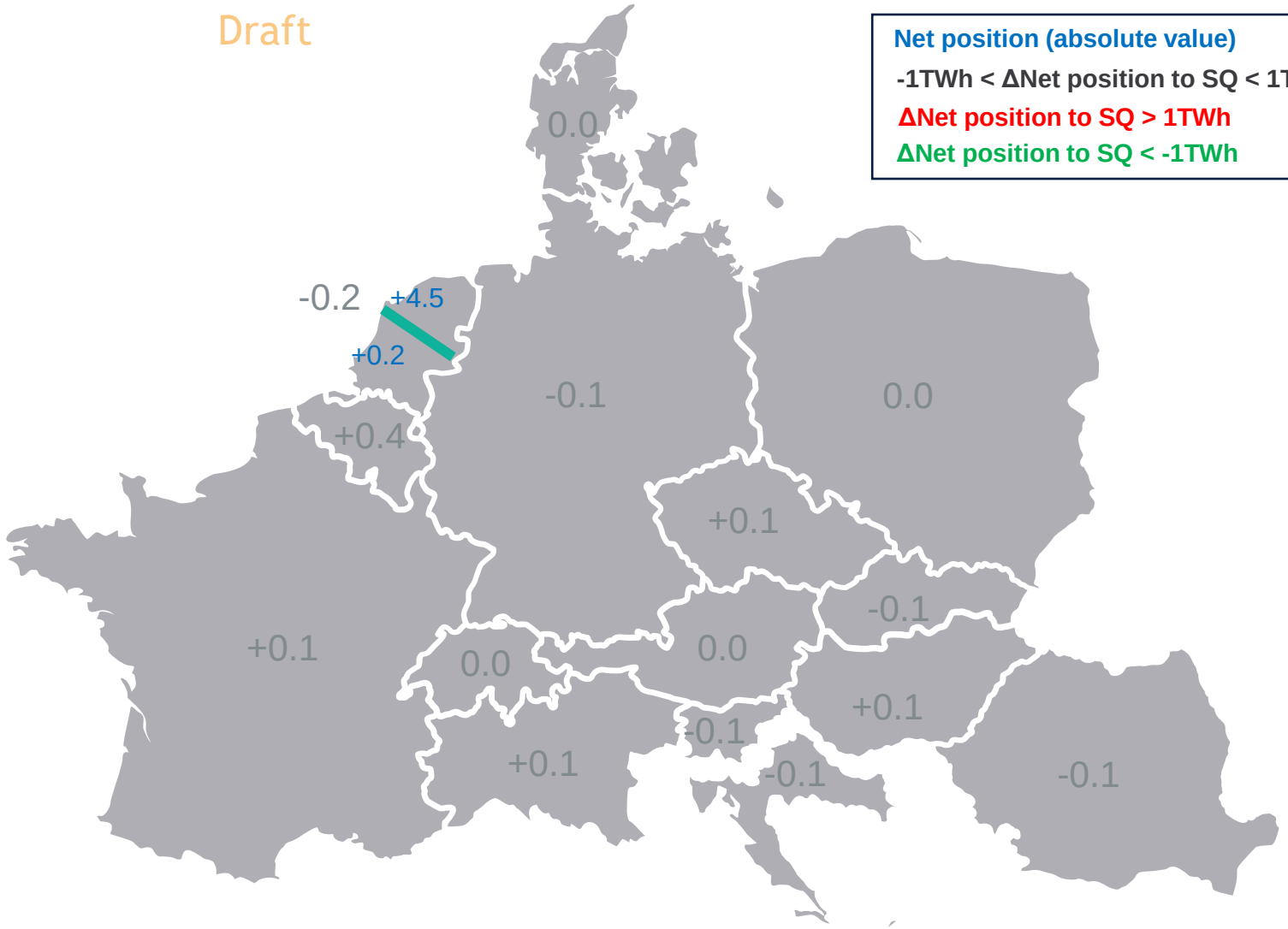
Market Coupling Simulation results

Net Positions NL2

Draft

BZ	NL2 [TWh] 89	95	09	Average
AT00	0,1	-0,1	-0,1	0,0
BE00	0,2	0,6	0,2	0,4
CH00	0,0	0,0	0,1	0,0
CZ00	0,0	0,0	0,3	0,1
DE00	-0,3	-0,6	0,5	-0,1
DKW1	0,0	0,0	0,0	0,0
FR00	0,5	0,1	-0,4	0,1
HR00	0,0	0,0	-0,1	-0,1
HU00	-0,1	0,0	0,2	0,1
ITN1	0,1	0,1	0,0	0,1
NL00	-0,4	-0,2	-0,1	-0,2
PL00	-0,2	-0,2	0,2	0,0
RO00	0,0	0,0	-0,1	-0,1
SI00	0,0	0,0	-0,3	-0,1
SK00	-0,1	-0,1	-0,1	-0,1





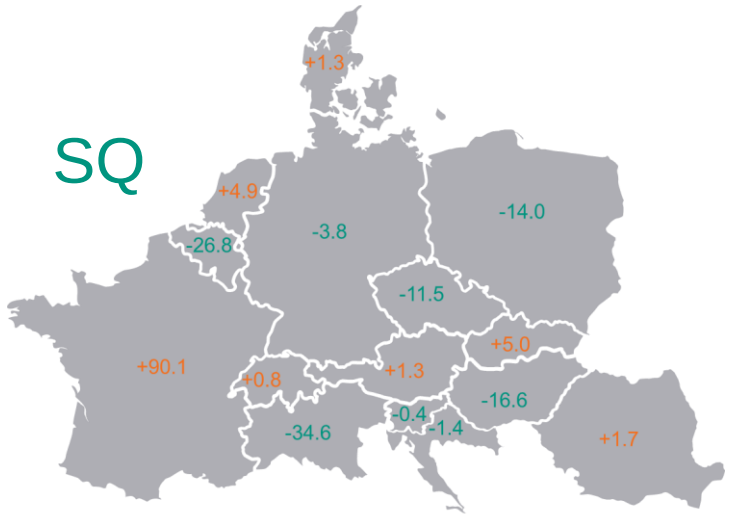
- Minor impact on all regions.

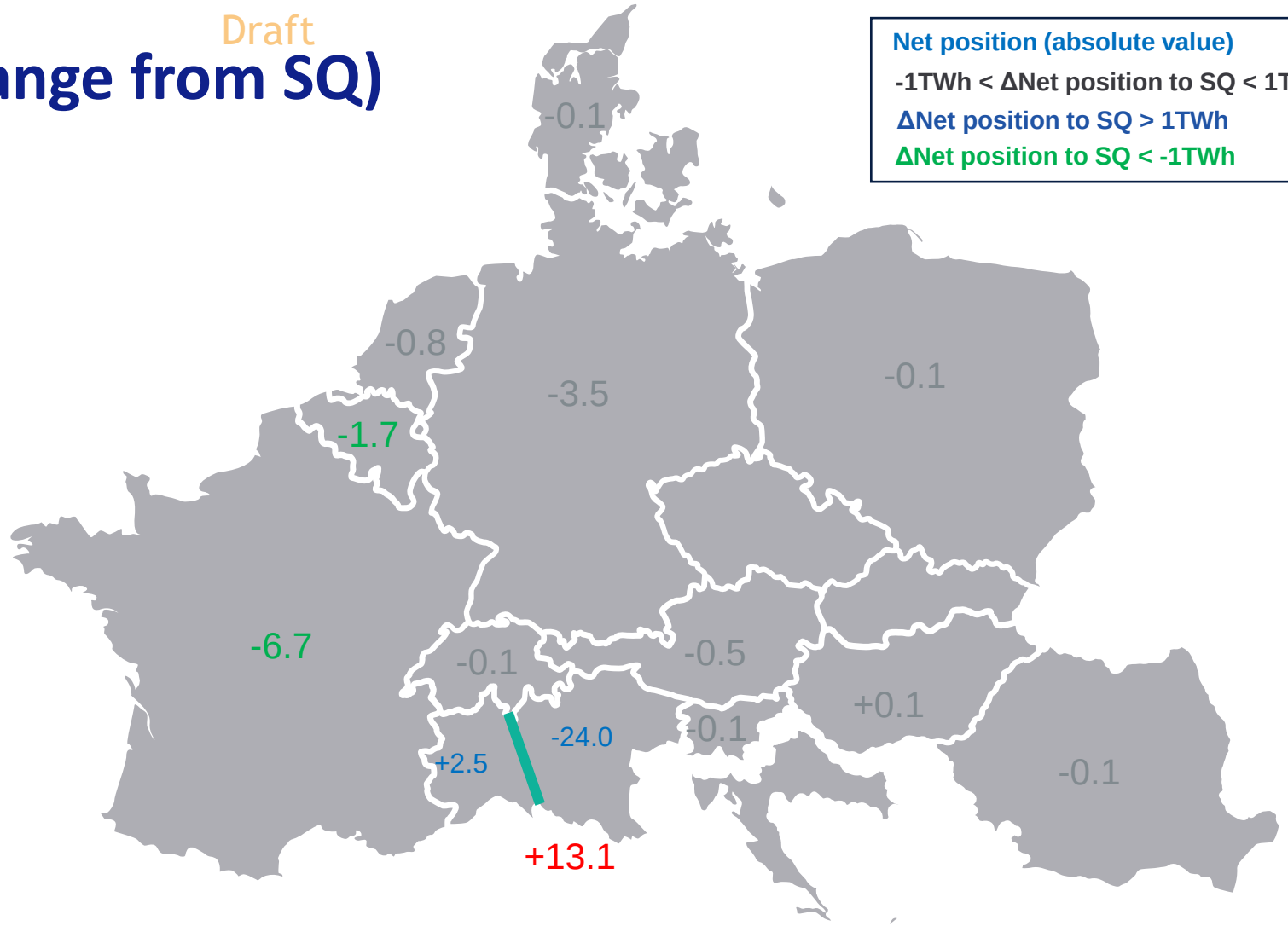
Market Coupling
Simulation results

Draft

Net Positions IT2 (change from SQ)

	IT2 [TWh]			
BZ	89	95	09	Average
AT00	-0,3	-0,5	-0,8	-0,5
BE00	-1,4	-1,5	-2,3	-1,7
CH00	-0,2	-0,2	0,0	-0,1
CZ00	-0,1	-0,1	0,2	0,0
DE00	-2,7	-4,1	-3,6	-3,5
DKW1	-0,1	-0,1	0,0	-0,1
FR00	-5,8	-7,1	-7,1	-6,7
HR00	0,0	0,0	0,0	0,0
HU00	-0,1	0,0	0,4	0,1
ITN1	10,9	14,4	13,9	13,1
NL00	-0,8	-1,1	-0,4	-0,8
PL00	-0,3	-0,4	0,2	-0,1
RO00	0,0	0,0	-0,1	-0,1
SI00	0,0	0,0	-0,2	-0,1
SK00	0,0	-0,1	0,0	0,0





Net position (absolute value)
-1TWh < ΔNet position to SQ < 1TWh
ΔNet position to SQ > 1TWh
ΔNet position to SQ < -1TWh

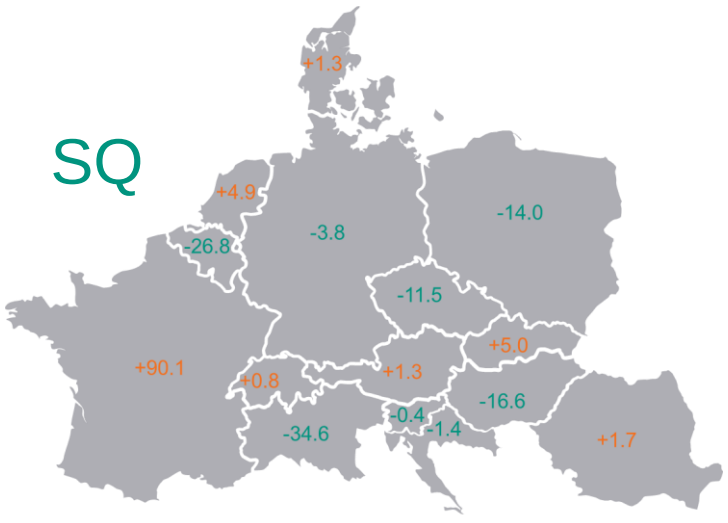
- Reduced exchanges between IT and FR due to the split. Italy net positions increases due to increased gas generation within country and France reduces its nuclear exports to Italy.

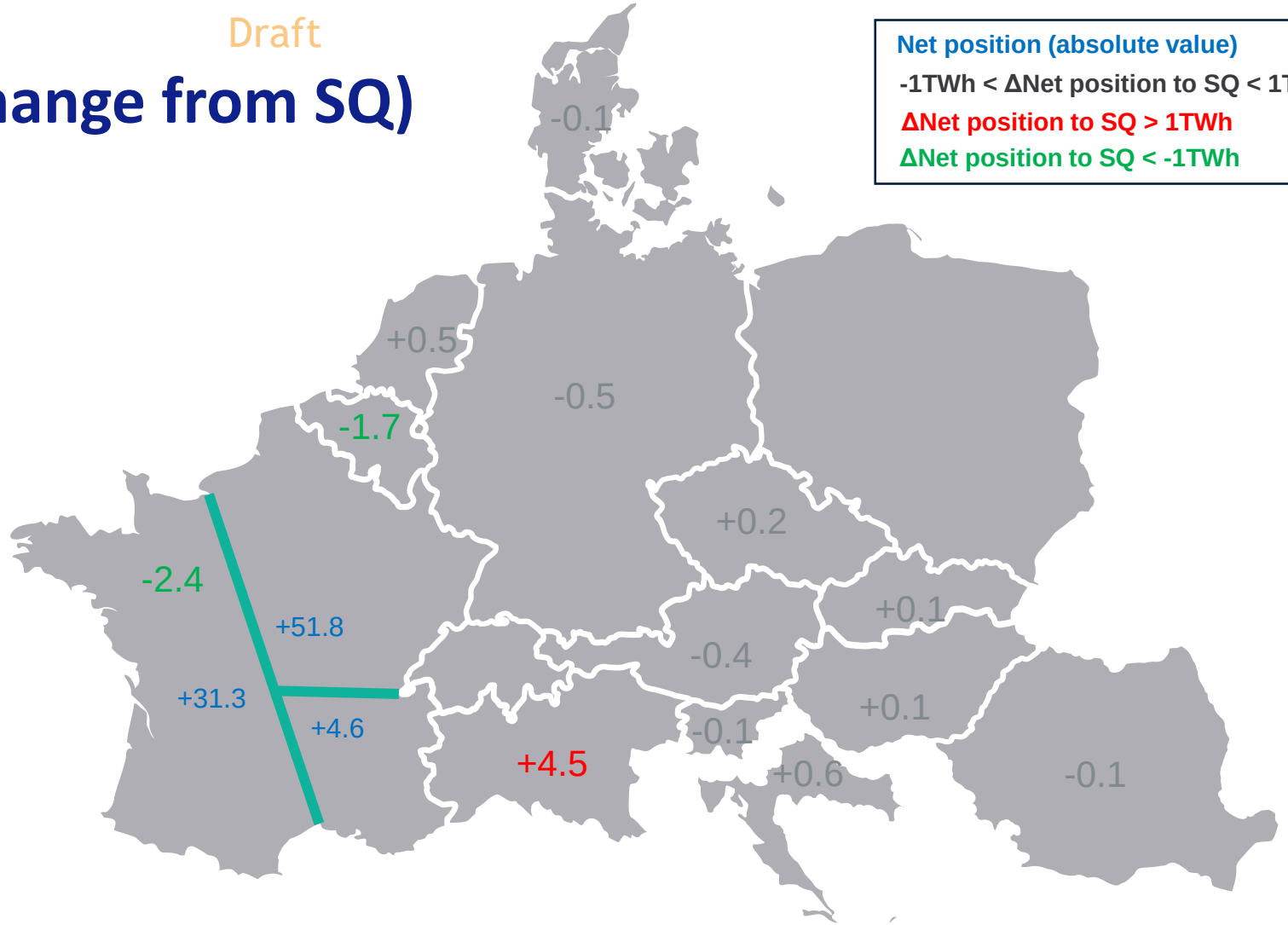
Market Coupling Simulation results

Draft

Net Positions FR3 (change from SQ)

BZ	FR3 [TWh] 89	95	09	Average
AT00	0,0	-0,6	-0,5	-0,4
BE00	-1,5	-1,8	-1,9	-1,7
CH00	0,0	-0,1	0,0	0,0
CZ00	0,1	0,1	0,3	0,2
DE00	-0,6	-1,2	0,3	-0,5
DKW1	-0,1	-0,1	0,0	-0,1
FR00	-1,7	-2,0	-3,5	-2,4
HR00	-0,2	-0,1	-0,1	-0,1
HU00	-0,2	0,1	0,4	0,1
ITN1	3,7	5,2	4,6	4,5
NL00	0,1	0,7	0,8	0,5
PL00	-0,4	0,0	0,5	0,0
RO00	-0,1	-0,1	-0,2	-0,1
SI00	0,1	0,0	-0,2	-0,1
SK00	0,3	0,0	0,0	0,1

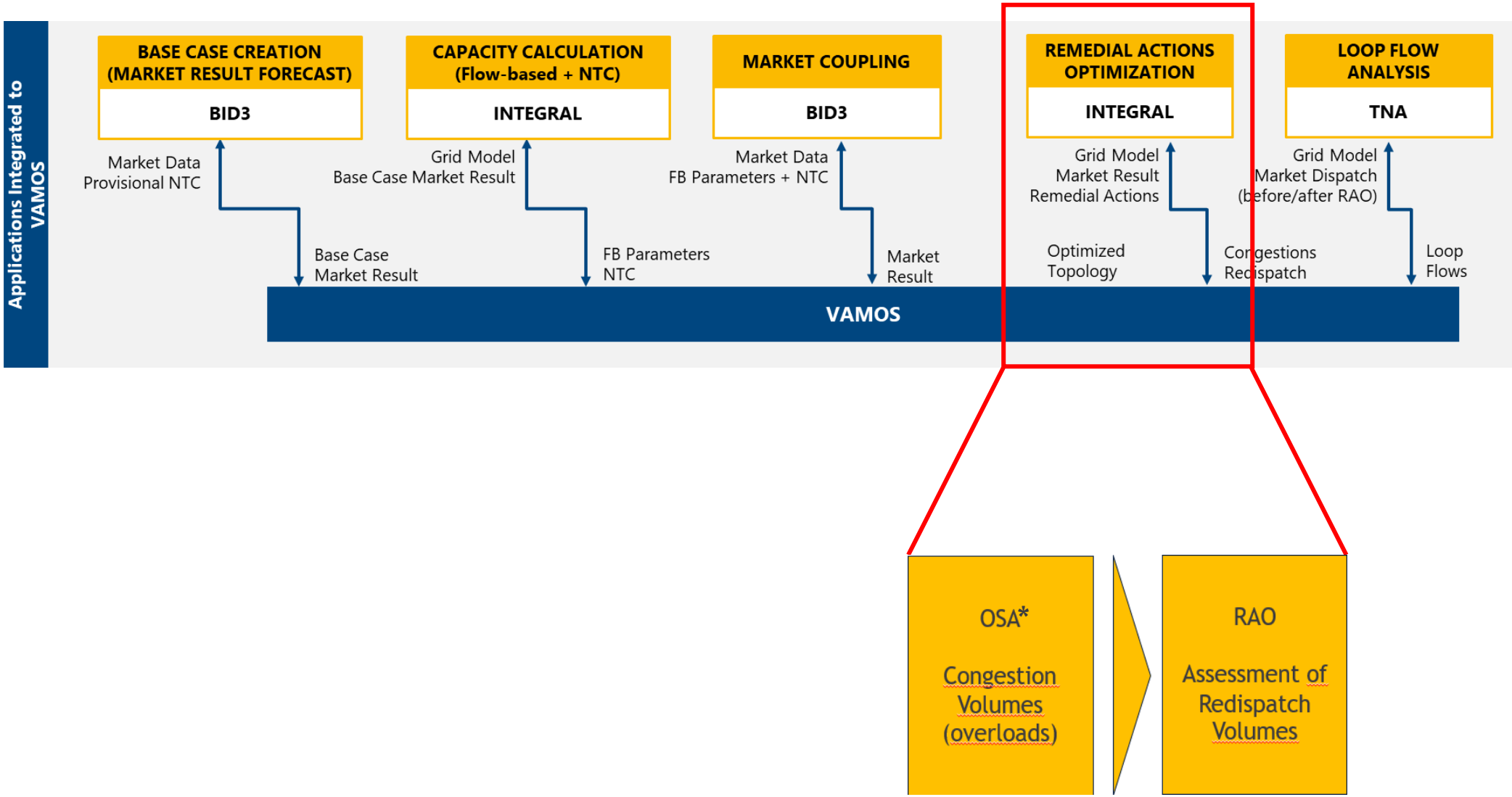




- Notable increase in Italy of 4.5 TWh and a reduction in Belgium of 1.7 TWh
- Minor impact on remaining bidding zone regions

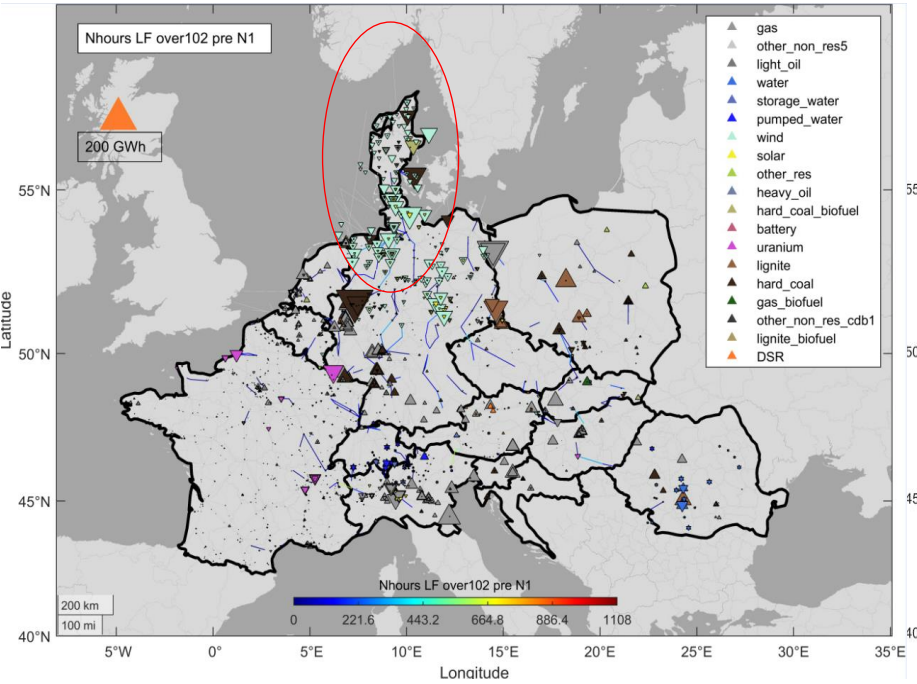
3.2 BZRR CE RAO results

BZRR CE: redispatch results

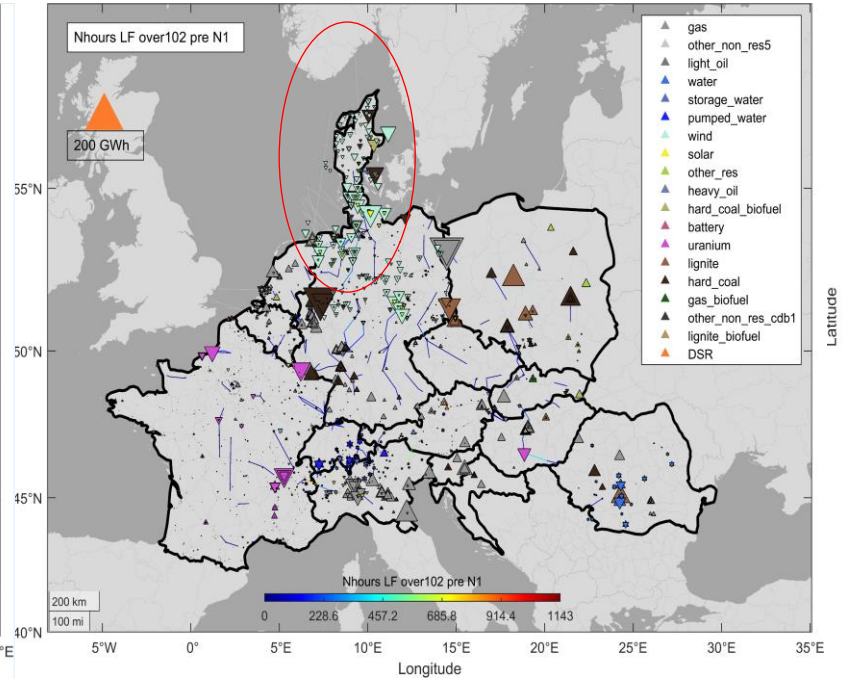


*: Operational Security Analysis

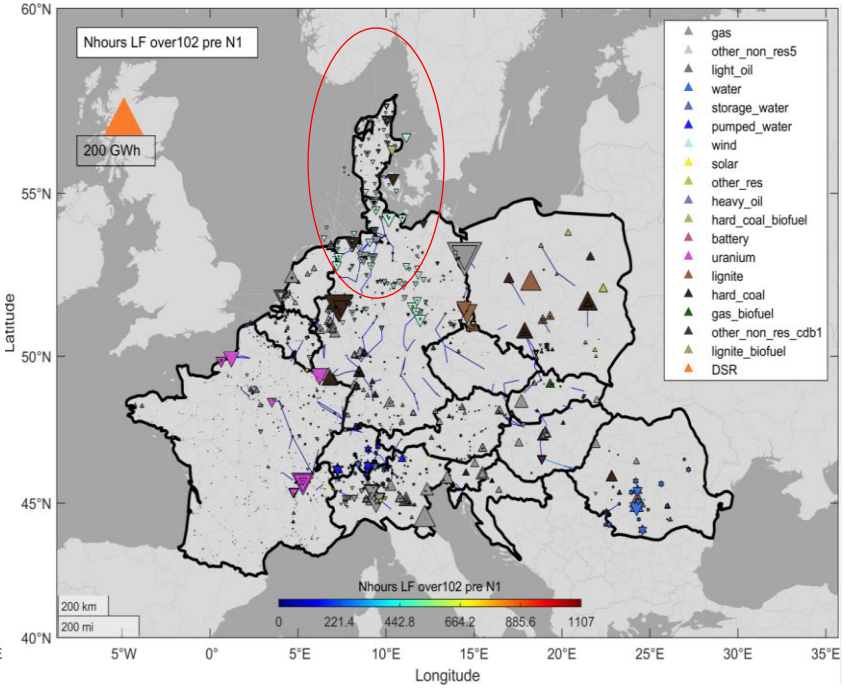
Status Quo Scenario: Redispatch volumes for 50 days



CY89



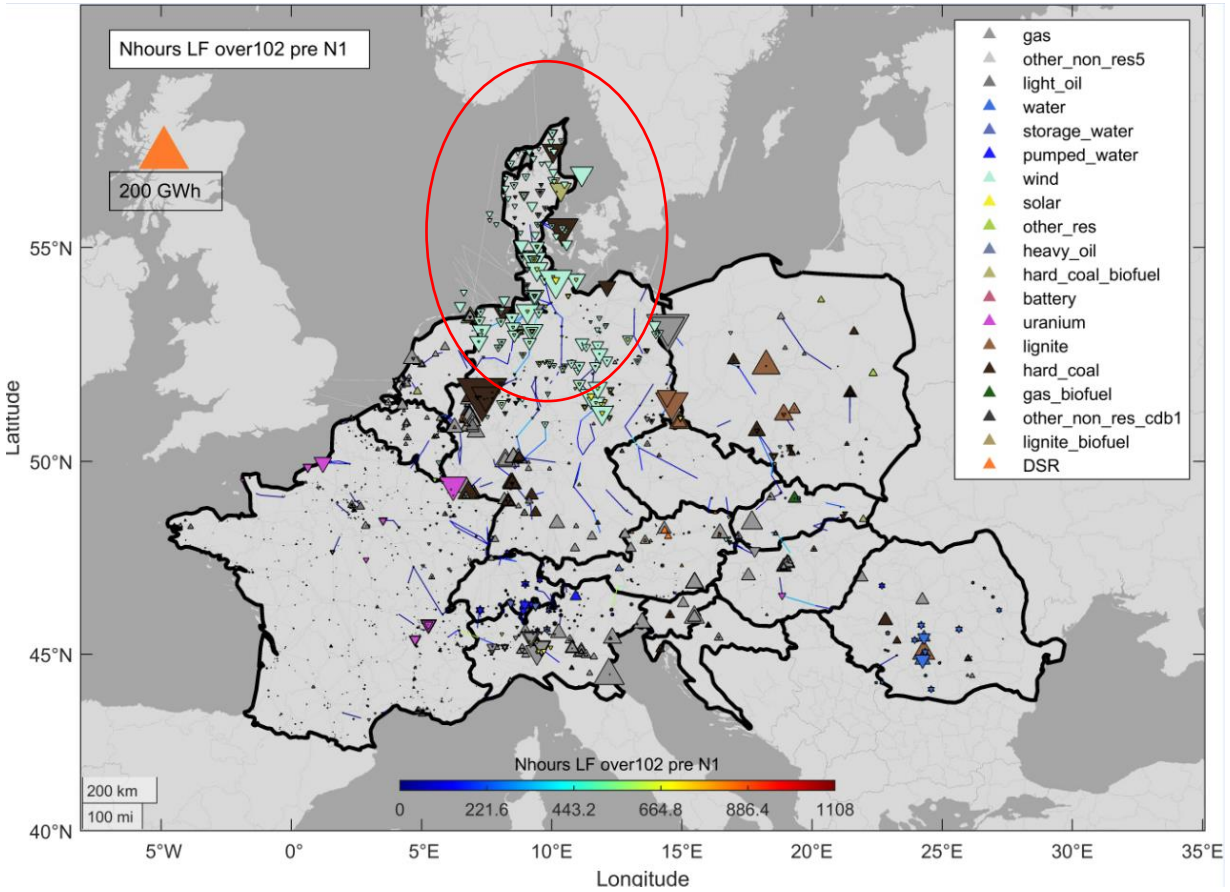
CY95



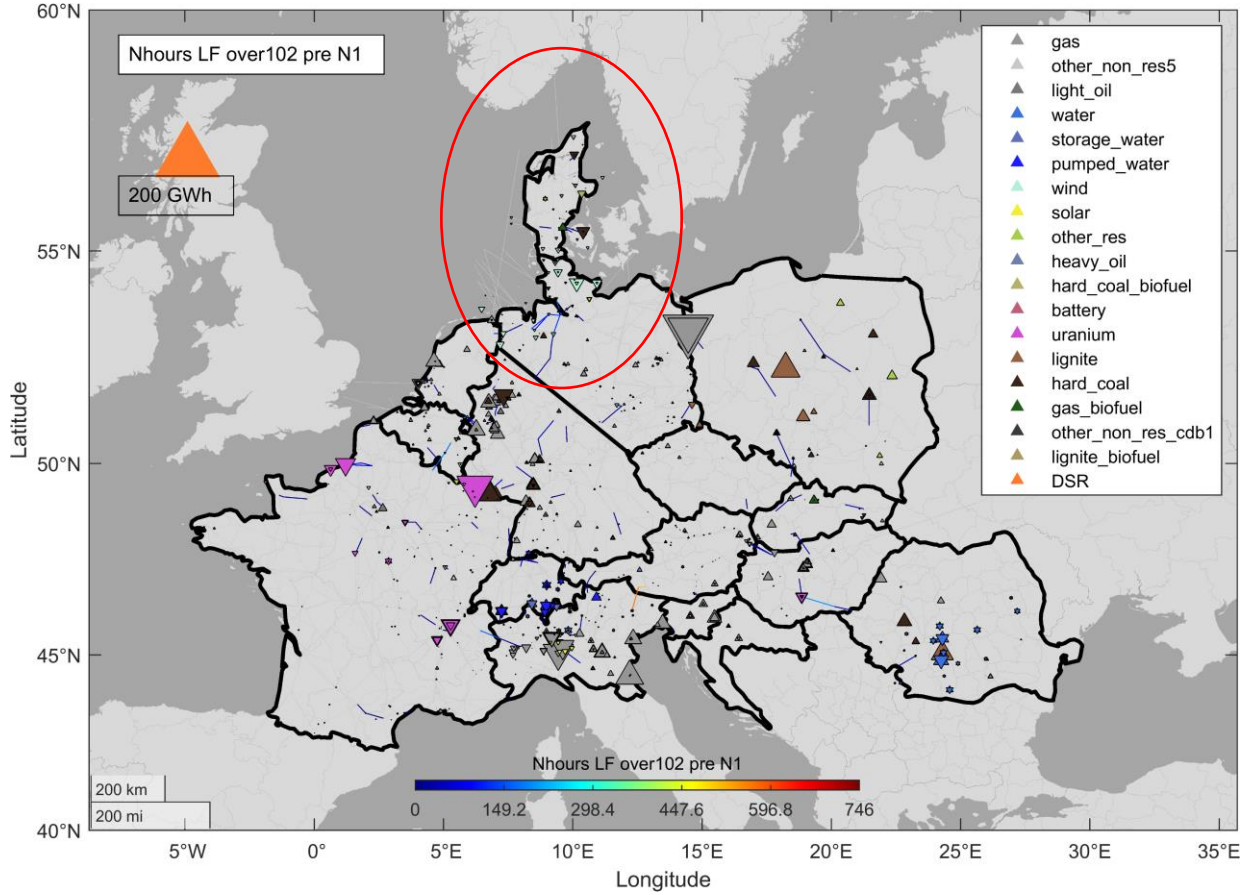
CY09

- High variability between Climate Years, CY1989 results to highest RD volumes
- High downward redispatch volumes of wind in North Germany / Denmark

Change in Redispatch volumes between Status Quo and DE2 (for 50 days)



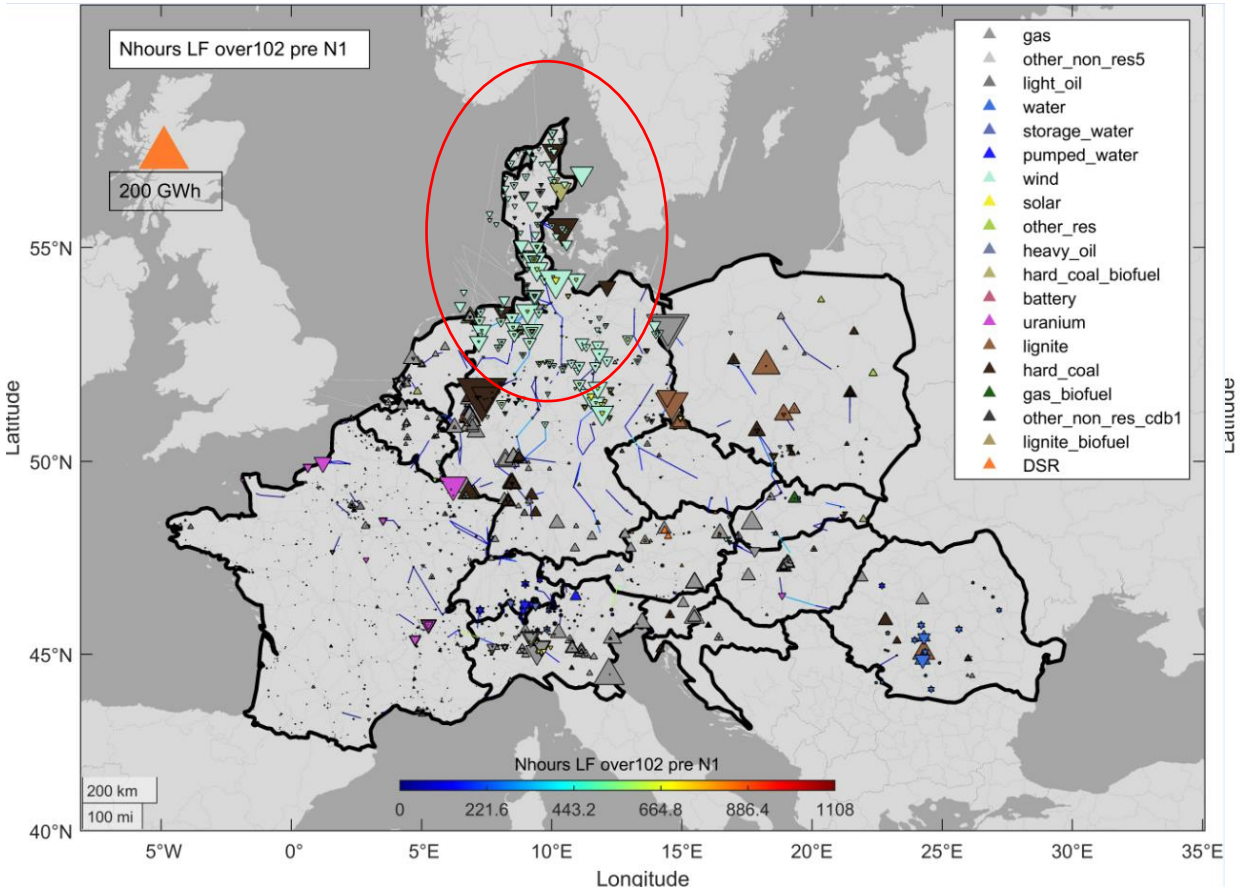
Status Quo - CY89



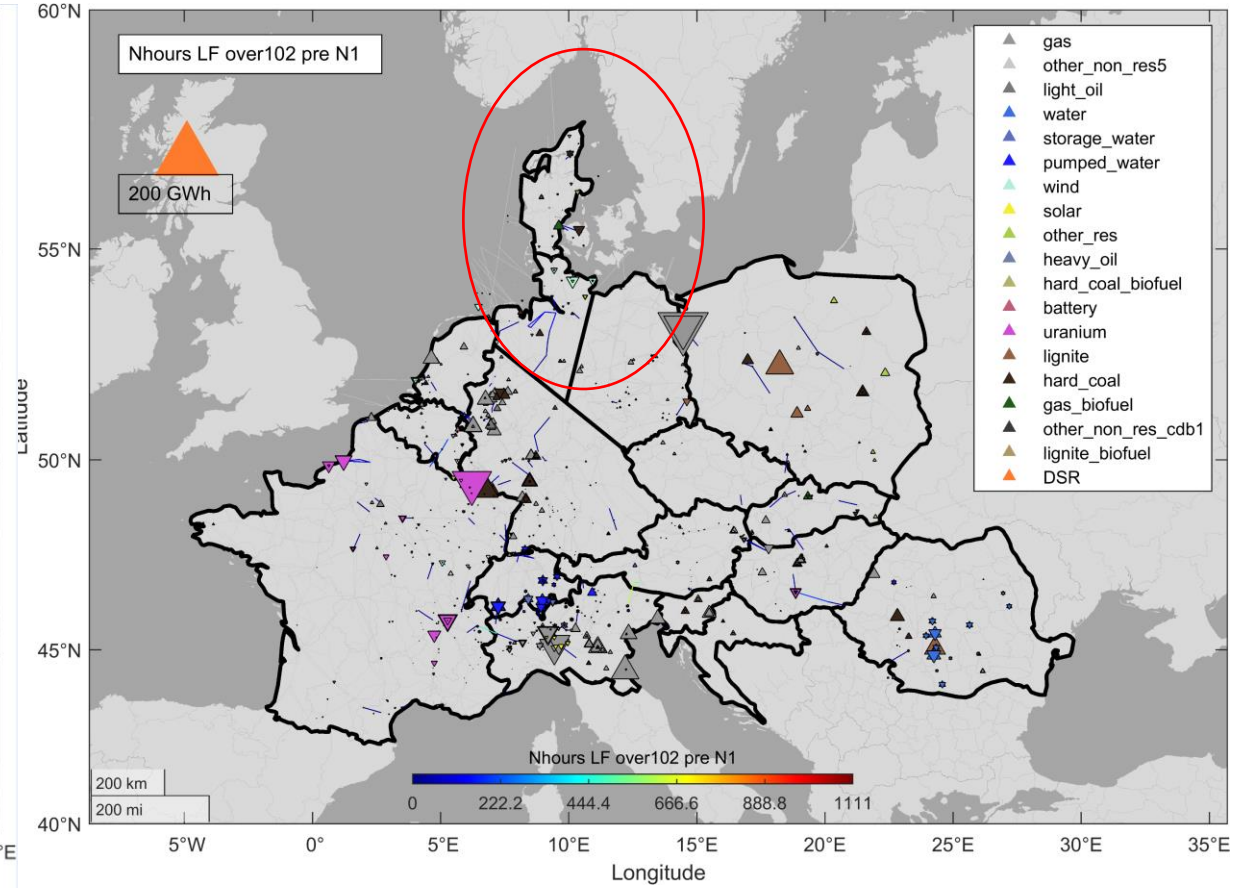
DE2 - CY89

Reduced RES downward redispatch in north DE/DK (due to the increase in RES market-based curtailment – see slide 29).
Reduced intensity of the North-South Transit within Germany is observed in DE2 compared to status quo.

Change in Redispatch volumes between Status Quo and DE3 (for 50 days)



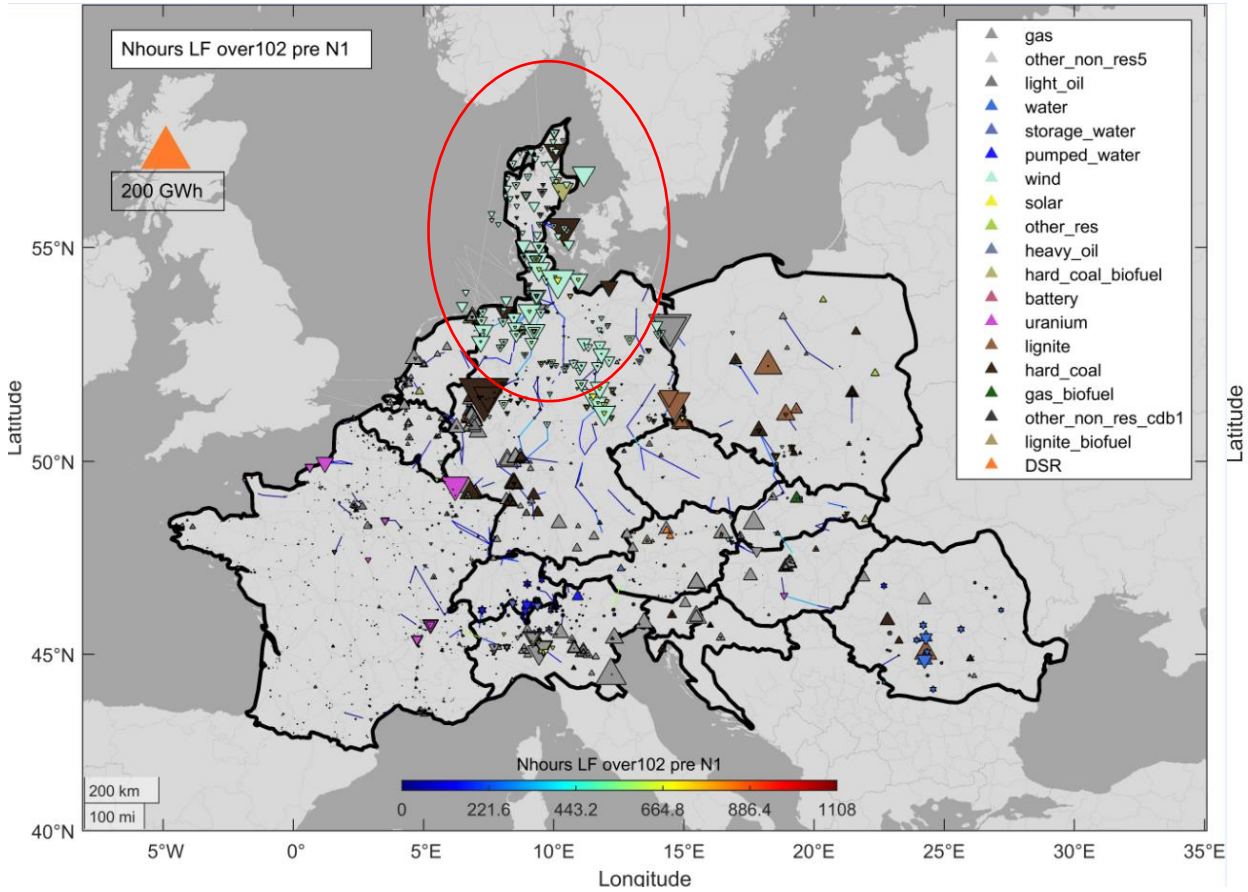
Status Quo - CY89



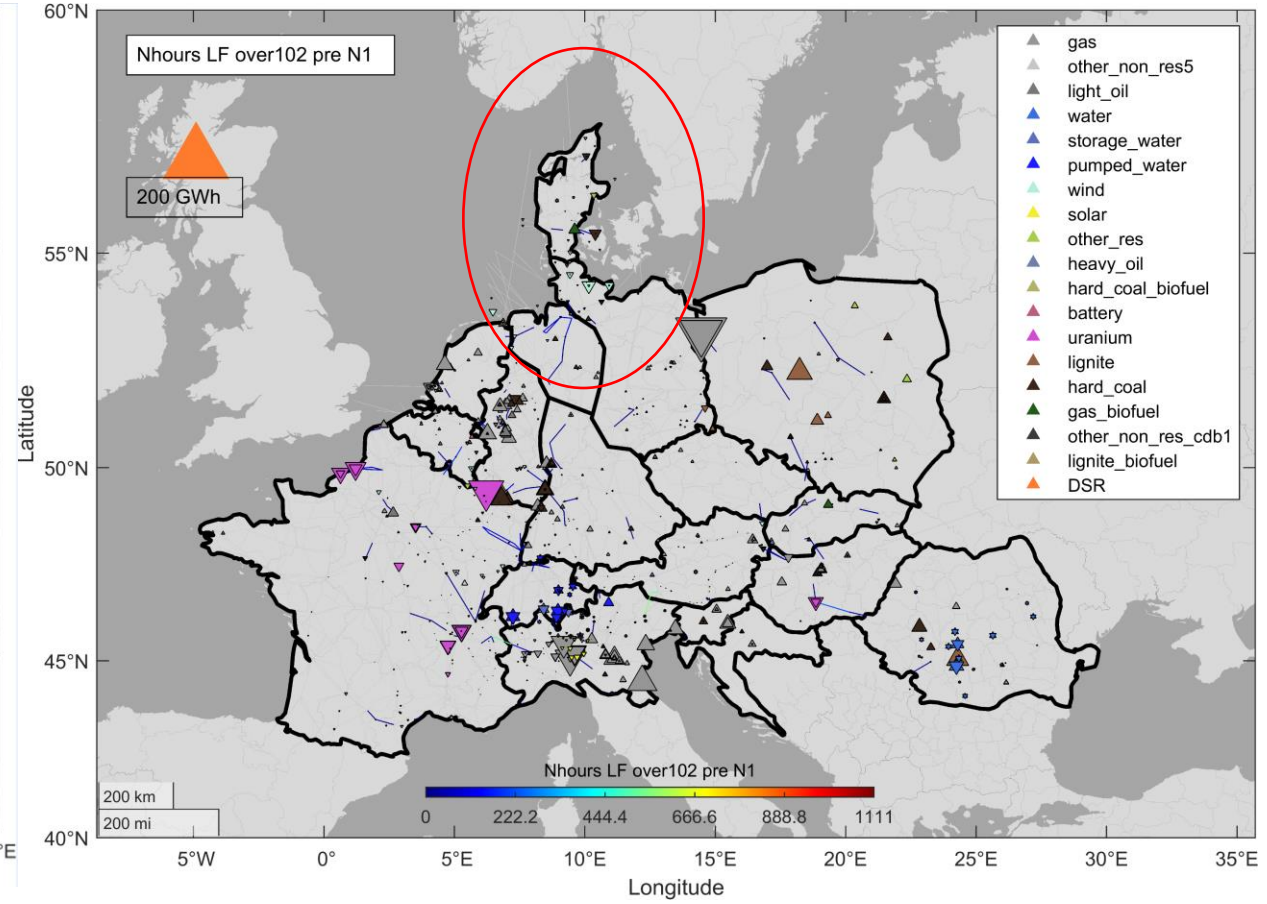
DE3 - CY89

Reduced RES downward redispatch in north DE/DK (due to the increase in RES market-based curtailment – see slide 29).
Reduced intensity of the North-South Transit within Germany is observed in DE2 compared to status quo.

Change in Redispatch volumes between Status Quo and DE4 (for 50 days)



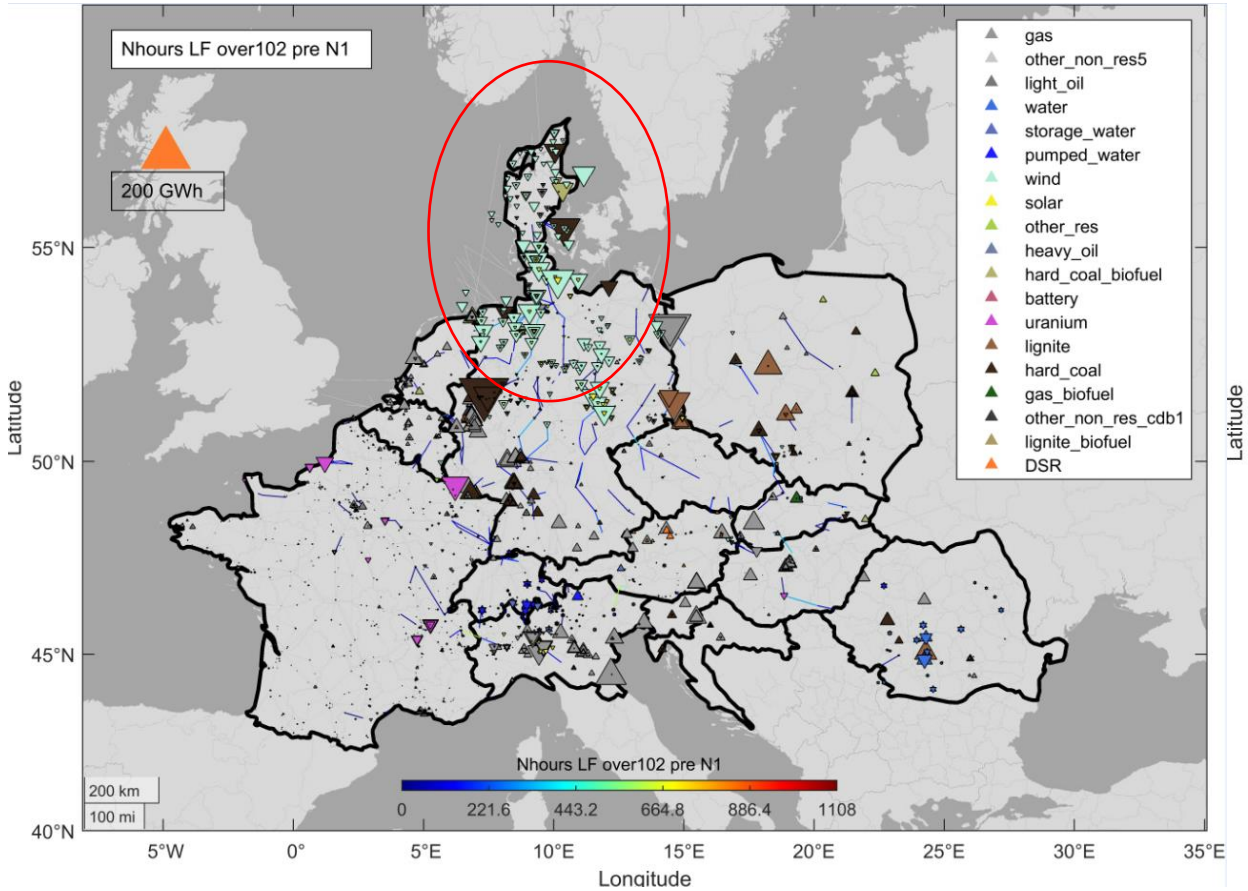
Status Quo - CY89



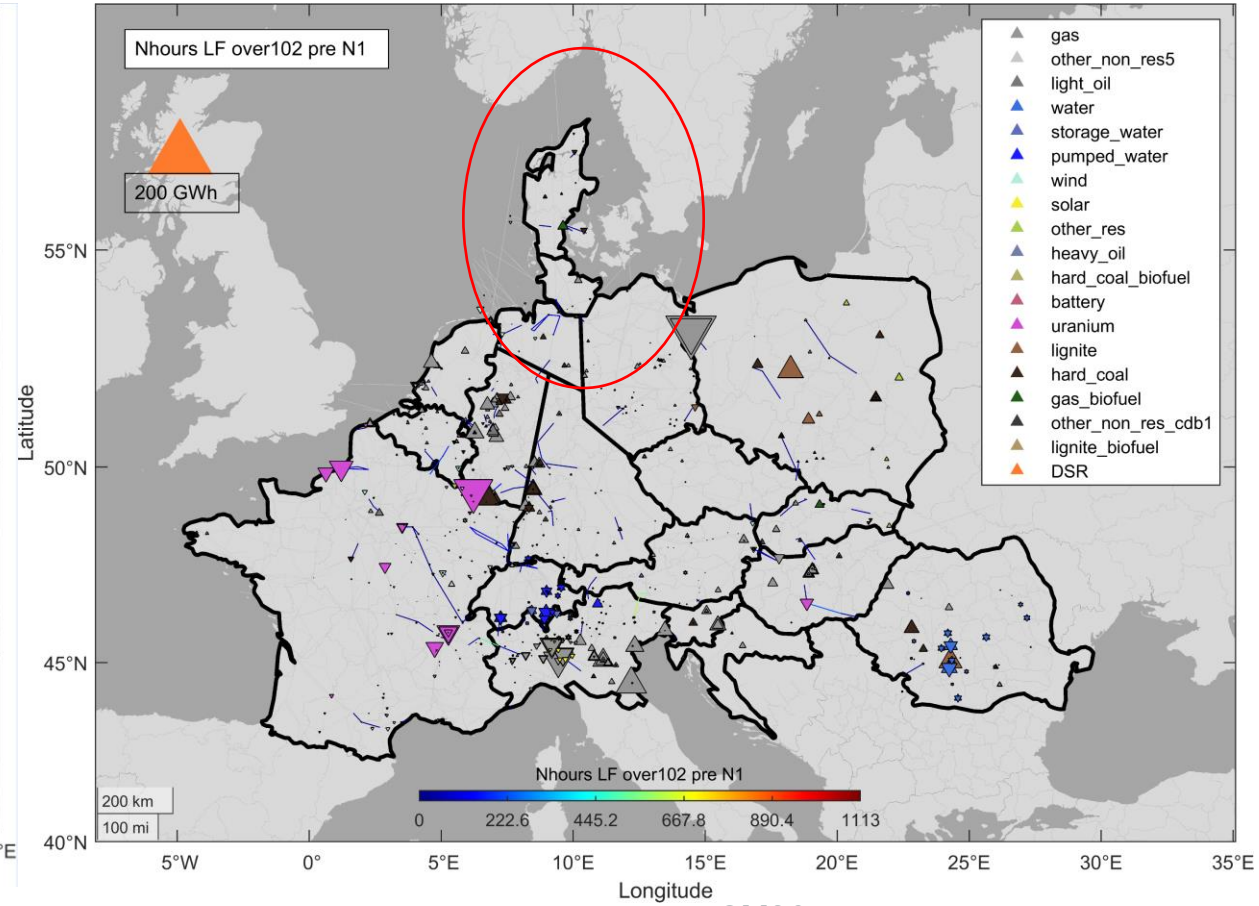
DE4 - CY89

Reduced RES downward redispatch in north DE/DK (due to the increase in RES market-based curtailment – see slide 29).
Reduced intensity of the North-South Transit within Germany is observed in DE2 compared to status quo.

Change in Redispatch volumes between Status Quo and DE5 (for 50 days)



Status Quo - CY89

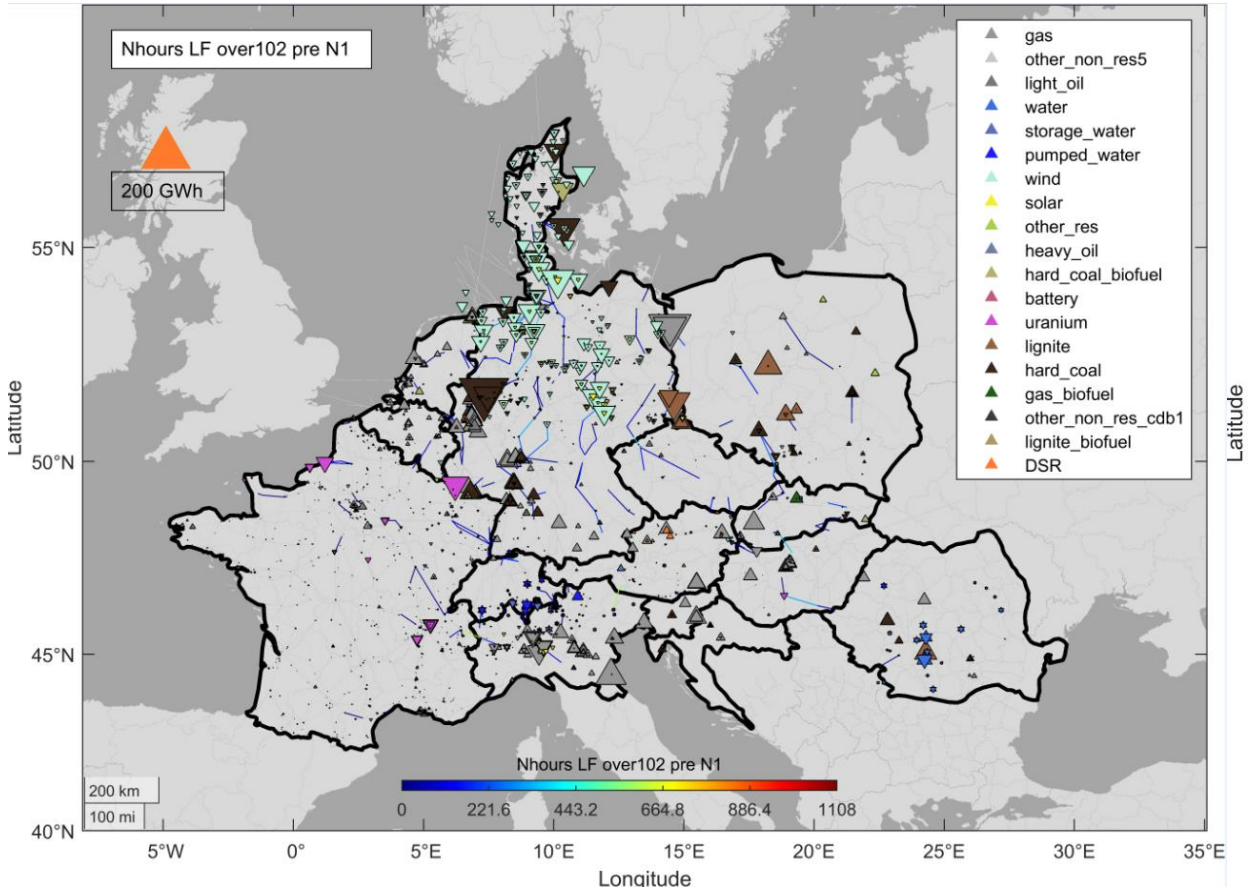


DE5 - CY89

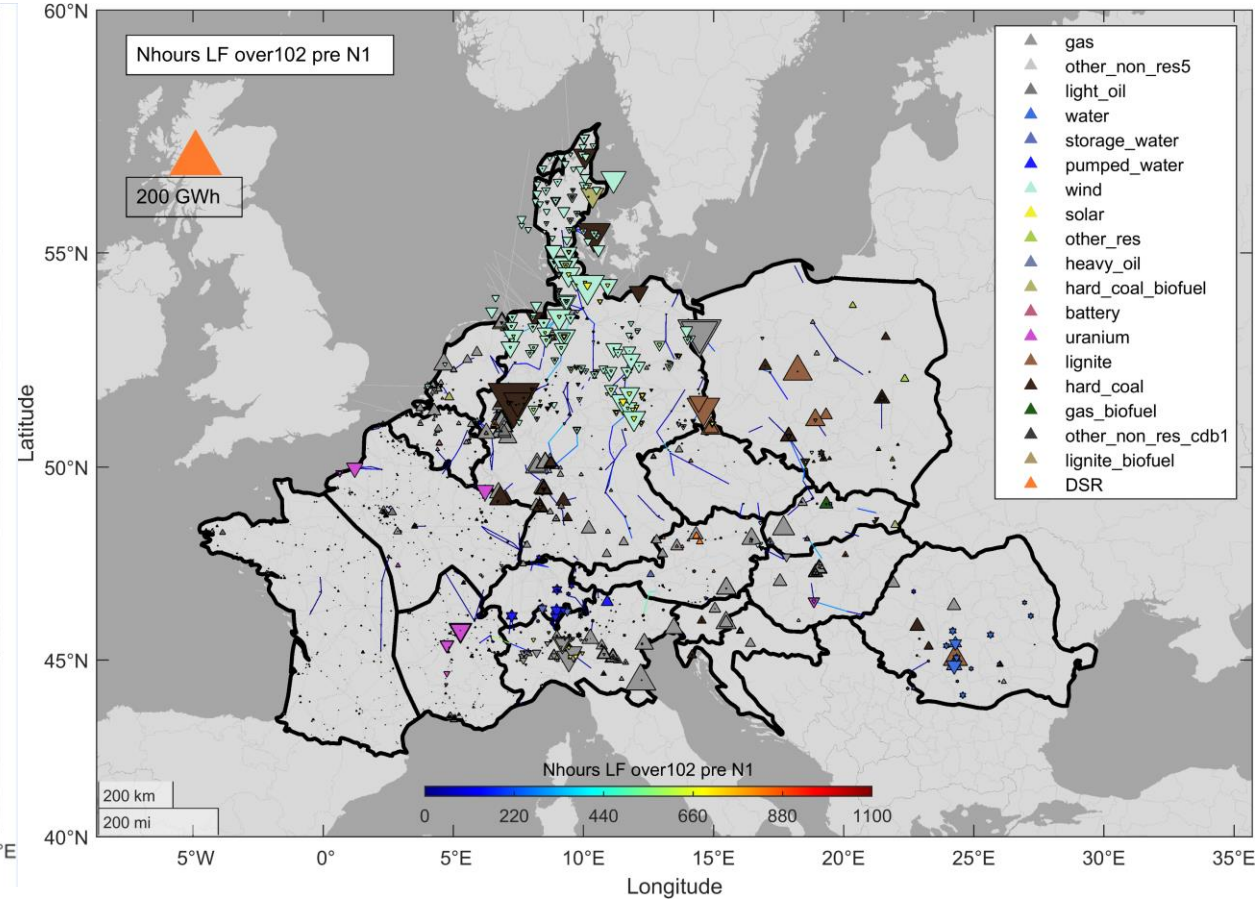
Reduced RES downward redispatch in north DE/DK (due to the increase in RES market-based curtailment – see slide).
Reduced intensity of the North-South Transit within Germany is observed in DE2 compared to status quo.

Draft

Change in Redispatch volumes between Status Quo and FR3 (for 50 days)



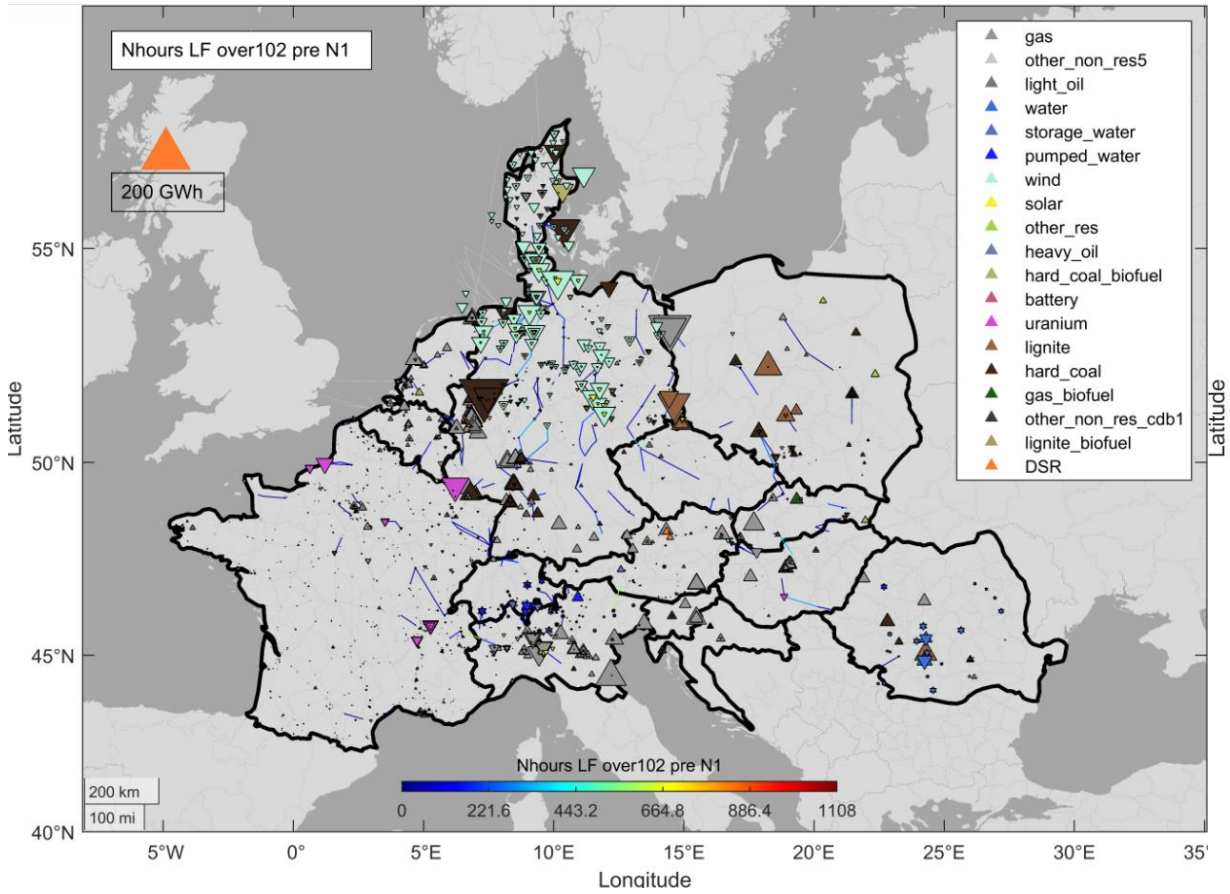
Status Quo - CY89



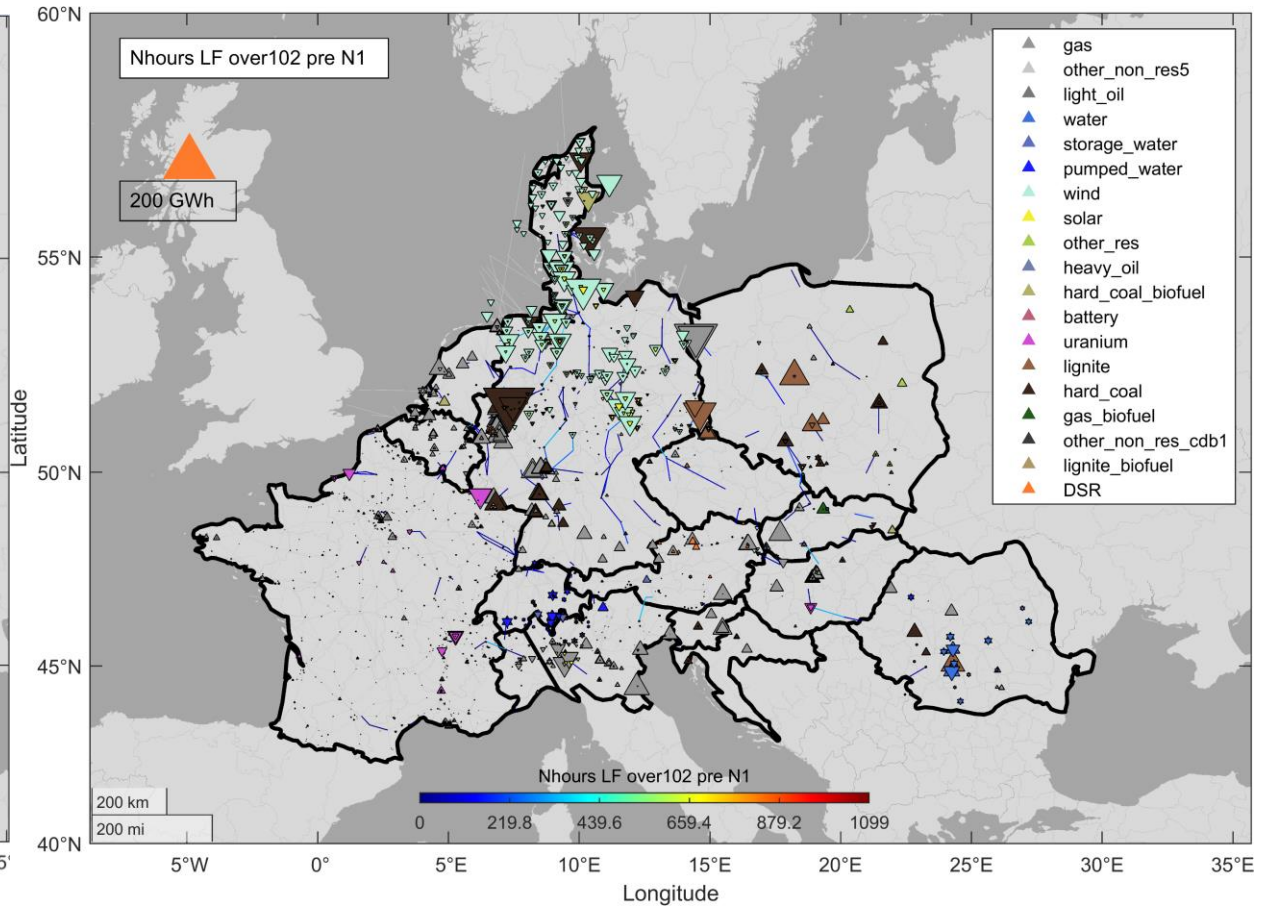
FR3 - CY89

No significant impact on redispatch volumes, minor reduction in downward redispatch of nuclear in France, minimal impact on redispatch in other market areas

Change in Redispatch volumes between Status Quo and IT2 (for 50 days)



Status Quo - CY89

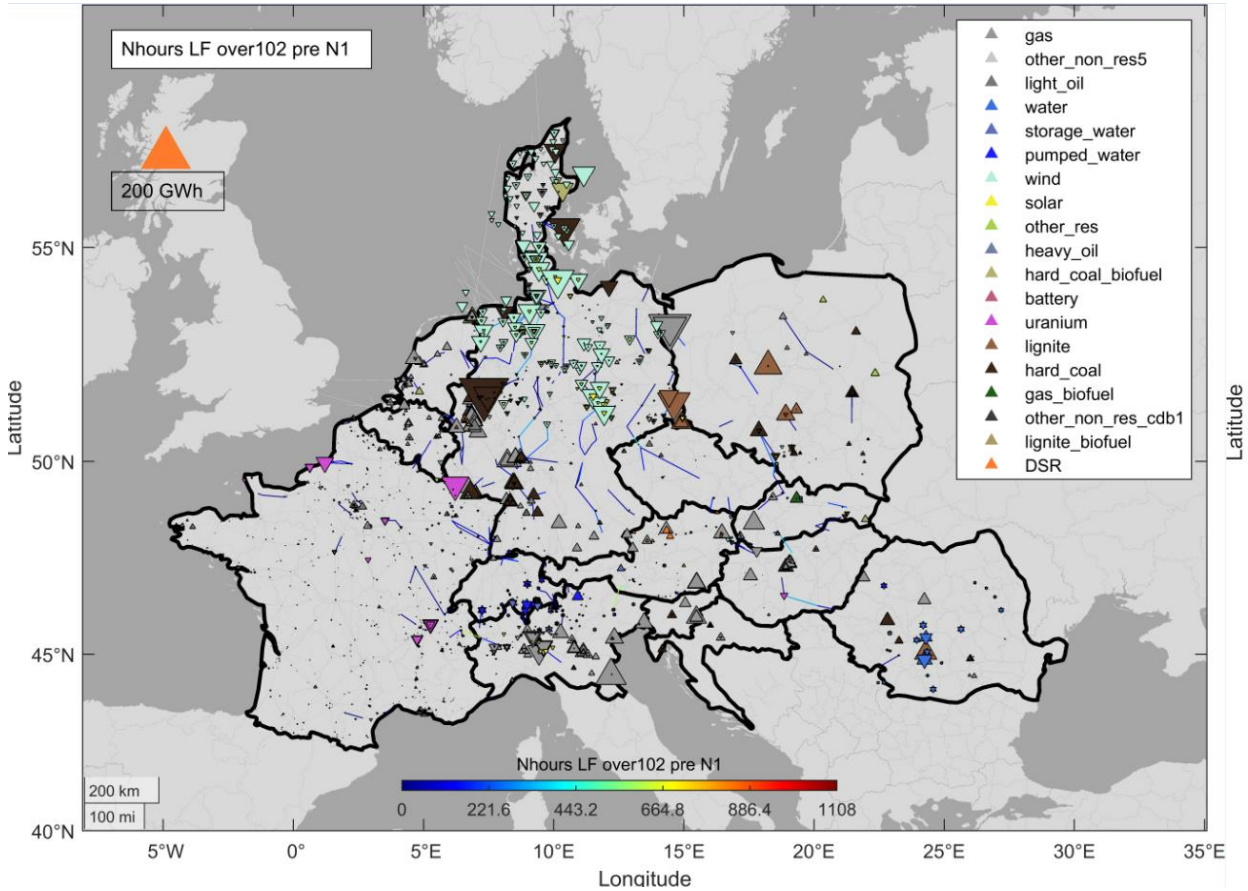


IT2 - CY89

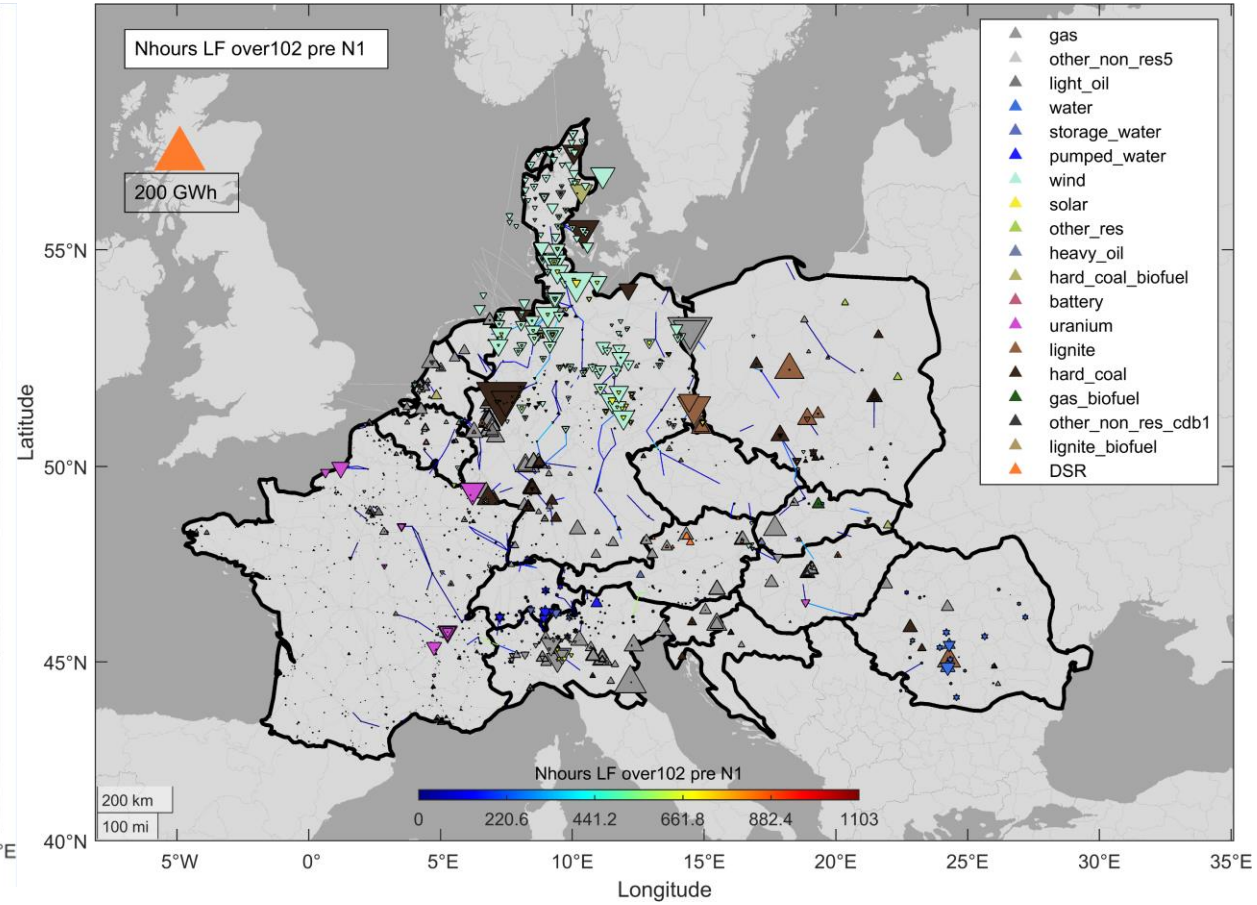
Minor impact on redispatch volumes, minor reduction in downward redispatch of nuclear in France and of gas in Italy, minimal impact on redispatch in other market areas

Draft

Change in Redispatch volumes between Status Quo and NL2 (for 50 days)



Status Quo - CY89



NL2 - CY89

NL2 split shows the least significant impact on redispatch volumes compared to Status Quo

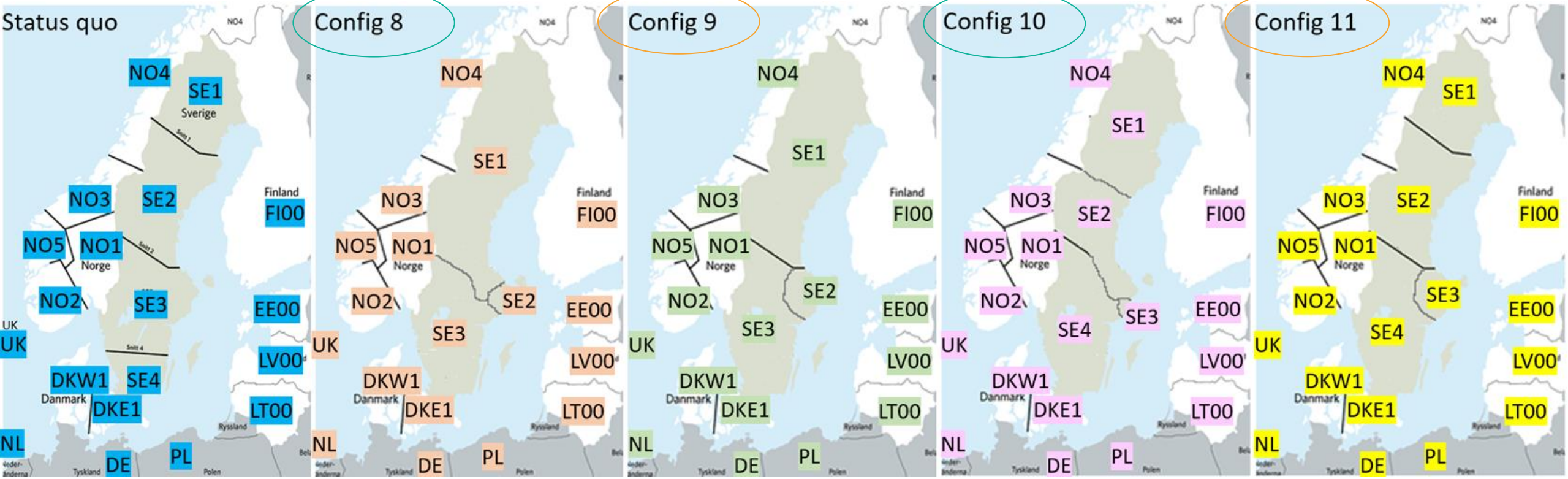
Coffee Break

4. Nordic Region general simulation results

Bidding zone configurations to evaluate

ACER

Svenska kraftnät



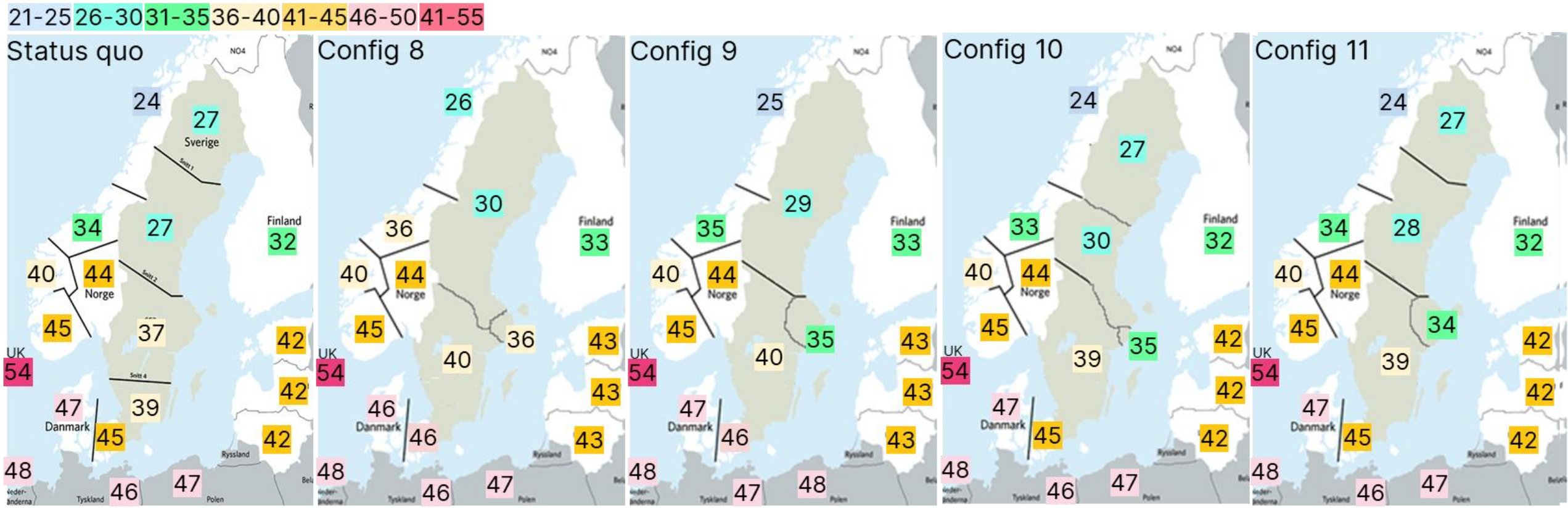
Modelling chain in the Nordic BZR

4.1 Nordic Region - Day ahead market dispatch

Annual Power Prices
Production, demand and net position

Annual power prices

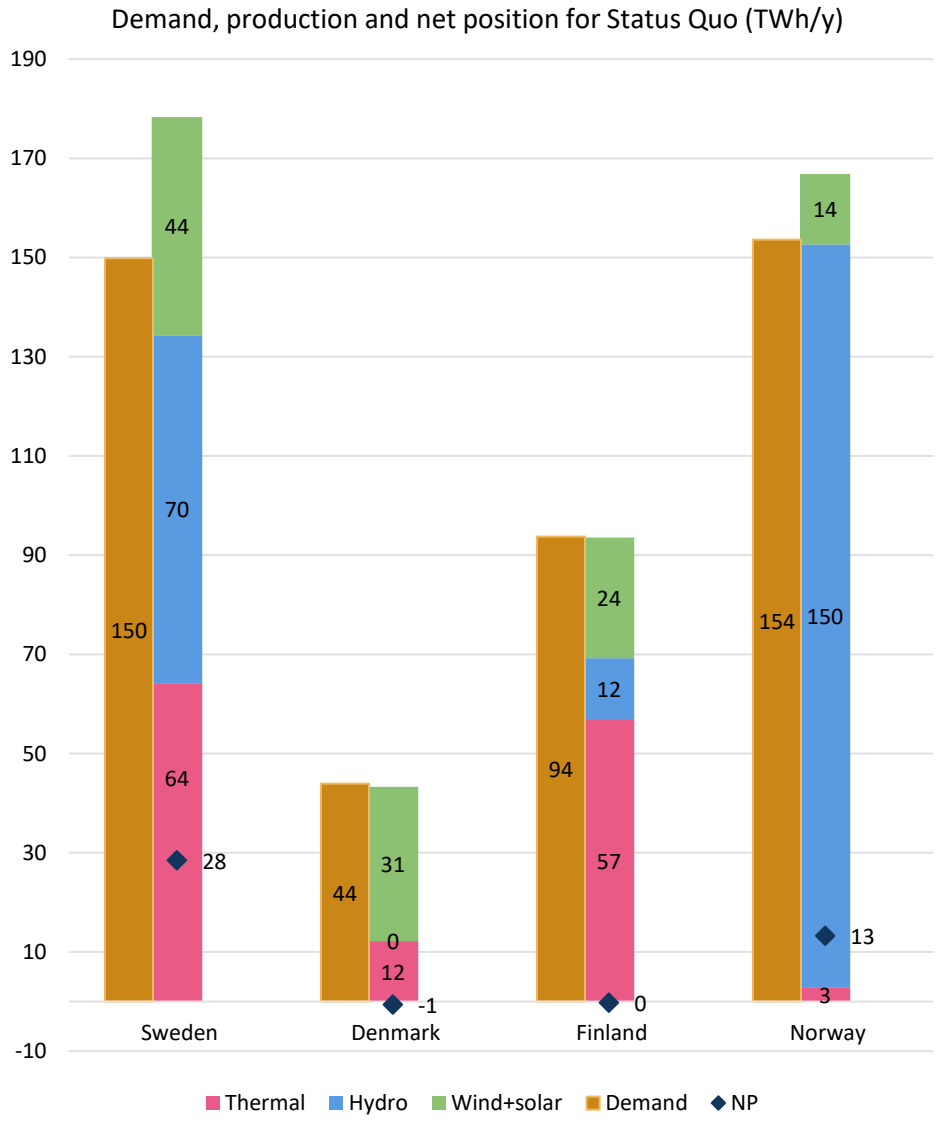
Draft



- For **Config 8 and 9** prices are increasing mainly in the northern bidding zones of the Nordics as well as in Finland and the Baltics.
- For **Config 10** "SE2"-bidding zone have a higher price compared to Status quo (although not exactly same geographical area).
- Central east area have lower price compared to SE3 in Status quo in **all configurations**.
- The prices in the southern Swedish BZ are increasing in all configurations to price levels comparable to those of SE4 in status quo. As a result, an increase can be seen in the former SE3 BZ.

Production, demand & net position #1

Draft



Configurations compared to Status quo (GWh/y)

	Country	Thermal	Hydro	Wind+solar	Demand	NP
Config 8	Tot Nordics	42.4	471.2	48.6	4.3	558.0
	Sweden	2.4	-373.4	304.3	3.9	-70.7
	Denmark	17.3	0.0	-22.3	0.0	-5.0
	Finland	24.8	-108.5	-220.1	0.3	-304.2
	Norway	-2.1	953.1	-13.2	0.1	937.8
	Rest of Europe	-674.5	138.1	-12.4	-0.9	-547.9
	Tot	-632.1	609.3	36.2	3.4	10.0

	Country	Thermal	Hydro	Wind+solar	Demand	NP
Config 9	Tot Nordics	99.5	-1483.2	-44.1	-3.4	-1424.3
	Sweden	38.1	-796.0	97.4	-3.6	-656.8
	Denmark	52.4	0.0	4.4	0.0	56.8
	Finland	9.4	-112.2	-134.9	0.0	-237.7
	Norway	-0.4	-575.1	-11.0	0.2	-586.6
	Rest of Europe	1324.8	91.9	-4.9	-1.2	1413.0
	Tot	1424.3	-1391.3	-49.0	-4.7	-11.3

	Country	Thermal	Hydro	Wind+solar	Demand	NP
Config 10	Tot Nordics	25.7	-89.7	88.5	-3.7	28.0
	Sweden	27.1	-110.4	15.6	-4.1	-63.5
	Denmark	-0.2	0.0	-1.4	0.0	-1.6
	Finland	2.1	35.9	82.5	0.3	120.2
	Norway	-3.3	-15.3	-8.3	0.2	-27.1
	Rest of Europe	22.5	-57.0	9.7	0.3	-25.2
	Tot	48.1	-146.8	98.1	-3.4	2.8

	Country	Thermal	Hydro	Wind+solar	Demand	NP
Config 11	Tot Nordics	17.1	-9.2	-14.2	-3.0	-3.3
	Sweden	31.0	0.4	-6.6	-3.5	28.3
	Denmark	-1.4	0.0	3.9	0.0	2.5
	Finland	-12.6	6.8	-13.5	0.6	-19.9
	Norway	0.0	-16.4	2.0	-0.1	-14.3
	Rest of Europe	12.1	-19.7	9.0	-0.1	1.6
	Tot	29.2	-28.9	-5.2	-3.1	-1.7

Production, demand & net position #2

Draft

- For **Config 8** Norway are producing more hydro power compared to Status quo leading to a higher net position for the Nordics. Thermal production is reduced in Europe.
- The opposite is valid for **Config 9** where less hydro power is produced in the Nordics which is compensated with increased thermal power production in Europe.
- For **Config 10 and 11** there are only small changes in production.

Configurations compared to Status quo (GWh/y)

	Country	Thermal	Hydro	Wind+solar	Demand	NP
Config 8	Tot Nordics	42.4	471.2	48.6	4.3	558.0
	Sweden	2.4	-373.4	304.3	3.9	-70.7
	Denmark	17.3	0.0	-22.3	0.0	-5.0
	Finland	24.8	-108.5	-220.1	0.3	-304.2
	Norway	-2.1	953.1	-13.2	0.1	937.8
	Rest of Europe	-674.5	138.1	-12.4	-0.9	-547.9
	Tot	-632.1	609.3	36.2	3.4	10.0

	Country	Thermal	Hydro	Wind+solar	Demand	NP
Config 9	Tot Nordics	99.5	-1483.2	-44.1	-3.4	-1424.3
	Sweden	38.1	-796.0	97.4	-3.6	-656.8
	Denmark	52.4	0.0	4.4	0.0	56.8
	Finland	9.4	-112.2	-134.9	0.0	-237.7
	Norway	-0.4	-575.1	-11.0	0.2	-586.6
	Rest of Europe	1324.8	91.9	-4.9	-1.2	1413.0
	Tot	1424.3	-1391.3	-49.0	-4.7	-11.3

	Country	Thermal	Hydro	Wind+solar	Demand	NP
Config 10	Tot Nordics	25.7	-89.7	88.5	-3.7	28.0
	Sweden	27.1	-110.4	15.6	-4.1	-63.5
	Denmark	-0.2	0.0	-1.4	0.0	-1.6
	Finland	2.1	35.9	82.5	0.3	120.2
	Norway	-3.3	-15.3	-8.3	0.2	-27.1
	Rest of Europe	22.5	-57.0	9.7	0.3	-25.2
	Tot	48.1	-146.8	98.1	-3.4	2.8

	Country	Thermal	Hydro	Wind+solar	Demand	NP
Config 11	Tot Nordics	17.1	-9.2	-14.2	-3.0	-3.3
	Sweden	31.0	0.4	-6.6	-3.5	28.3
	Denmark	-1.4	0.0	3.9	0.0	2.5
	Finland	-12.6	6.8	-13.5	0.6	-19.9
	Norway	0.0	-16.4	2.0	-0.1	-14.3
	Rest of Europe	12.1	-19.7	9.0	-0.1	1.6
	Tot	29.2	-28.9	-5.2	-3.1	-1.7

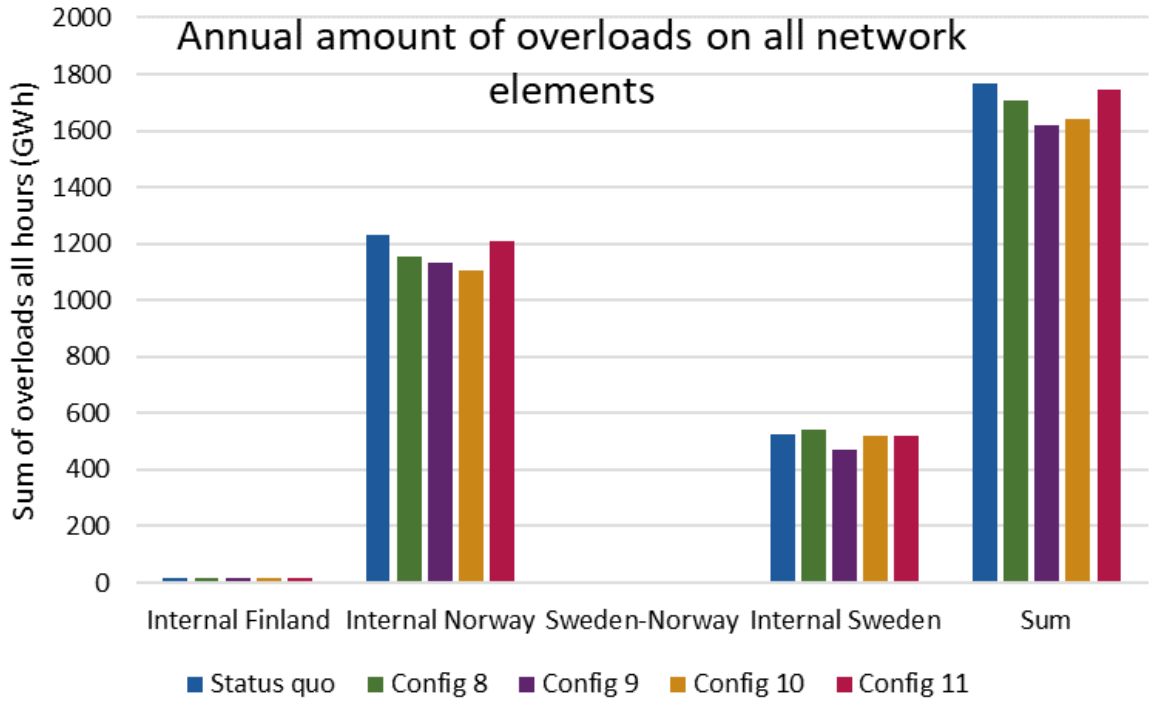
4.2 Nordic Region – OSA and RAO

Volumes of overloads
Remedial action volumes

Draft

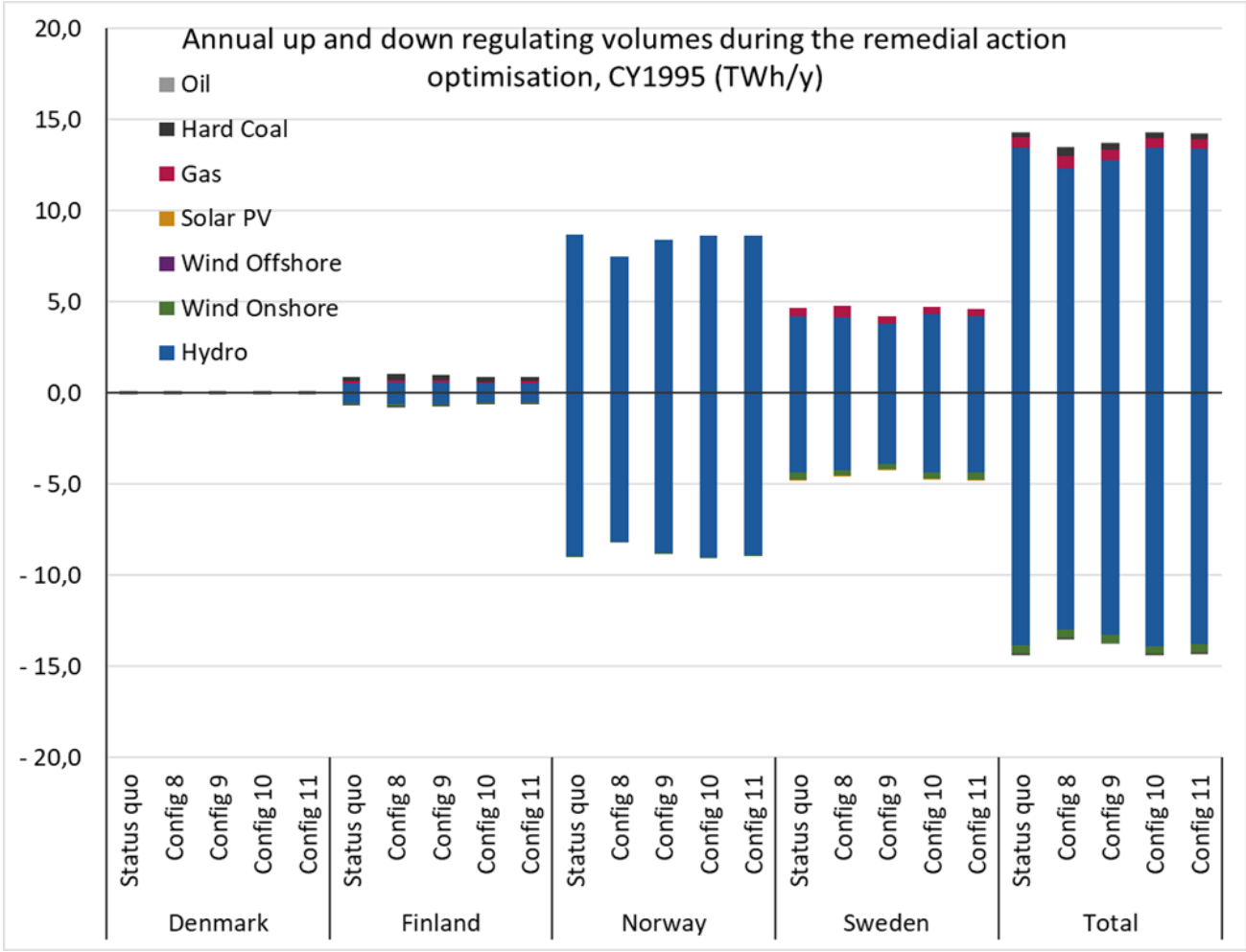
OSA – sum of overloads

- The sum of violations/overloads ranges between 1.5 TWh to 1.9 TWh annually depending on configuration and climate year.
- Approx 70%, on internal network elements in Norway, 30% on internal network elements in Sweden.
- Magnitudes of the overloads are high compared to the current operational practice.



RAO – up- and downregulating volumes

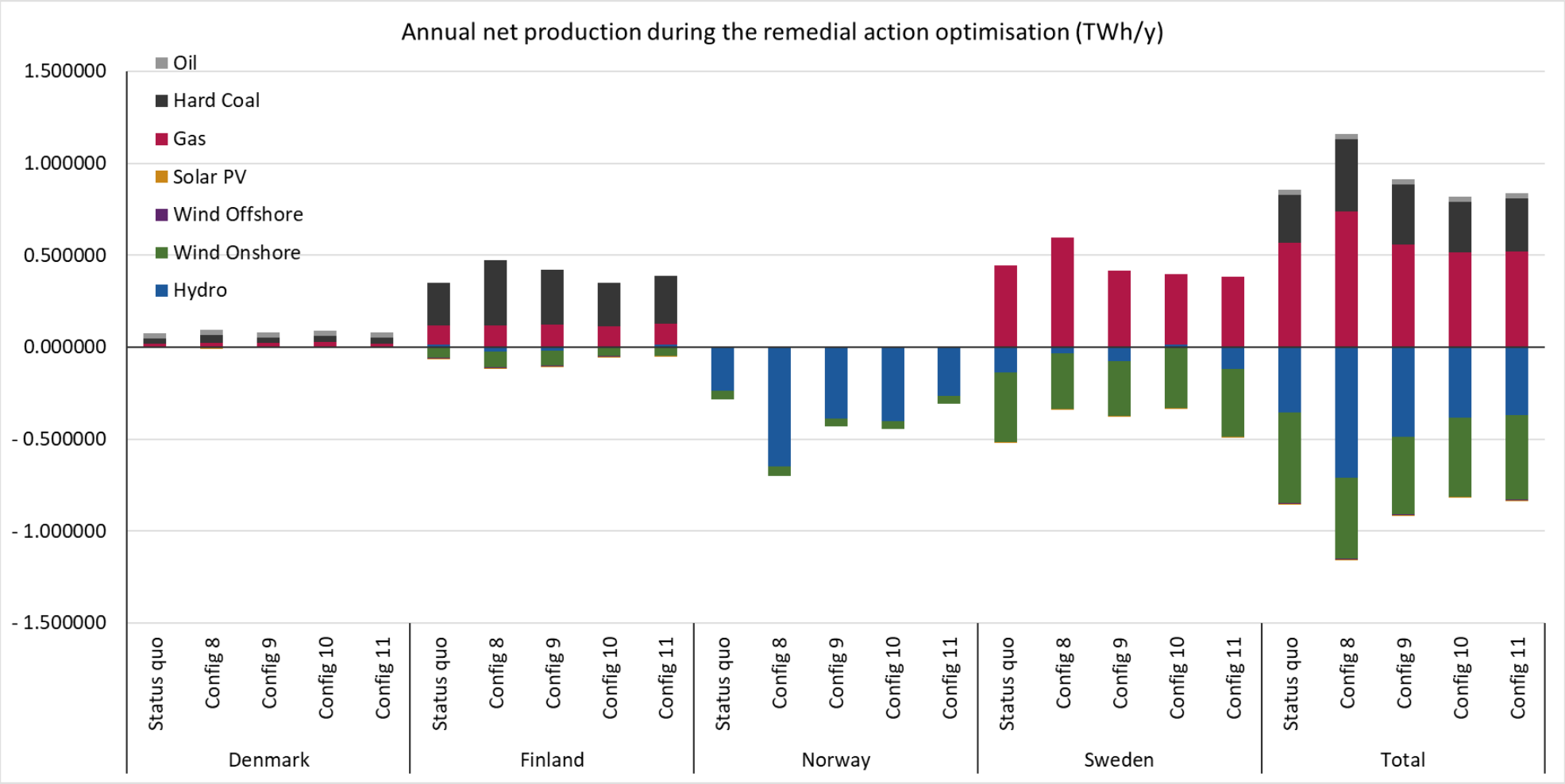
- Overloads solved mainly by up- and downregulating the hydro power production in Norway and Sweden
- Norway downregulating hydro power 9 TWh and upregulating 8.7 TWh (internal overloads in Norway 1.2 TWh), Sweden use 4.4 down and 4.2 up (internal overloads in Sweden 0.5 TWh)
- Regulating volume shall be larger than the overloads as the plants do not have 1:1 impact on congestions (meshed grids) and the model also has to make sure no new overloads occur.



Draft

RAO – net regulating volumes

- On a net level renewable energy sources decrease and the use of fossil fuel increase during the RAO for all configurations including the status quo



5. Next steps

ENTSO-E Mission Statement

Who we are

ENTSO-E, the European Network of Transmission System Operators for Electricity, is the **association for the cooperation of the European transmission system operators (TSOs)**. The 42 member TSOs, representing 35 countries, are responsible for the secure and coordinated operation of Europe's electricity system, the largest interconnected electrical grid in the world. In addition to its core, historical role in technical cooperation, ENTSO-E is also the common voice of TSOs.

ENTSO-E **brings together the unique expertise of TSOs for the benefit of European citizens** by keeping the lights on, enabling the energy transition, and promoting the completion and optimal functioning of the internal electricity market, including via the fulfilment of the mandates given to ENTSO-E based on EU legislation.

Our mission

ENTSO-E and its members, as the European TSO community, fulfil a common mission: Ensuring the **security of the interconnected power system in all time frames at pan-European level and the optimal functioning and development of the European interconnected electricity markets**, while enabling the integration of electricity generated from renewable energy sources and of emerging technologies.

Our vision

ENTSO-E plays a central role in enabling Europe to become the first **climate-neutral continent by 2050** by creating a system that is secure, sustainable and affordable, and that integrates the expected amount of renewable energy, thereby offering an essential contribution to the European Green Deal. This endeavour requires sector integration and close cooperation among all actors.

Europe is moving towards a sustainable, digitalised, integrated and electrified energy system with a combination of centralised and distributed resources. ENTSO-E acts to ensure that this energy system **keeps consumers at its centre** and is operated and developed with **climate objectives** and **social welfare** in mind.

ENTSO-E is committed to use its unique expertise and system-wide view – supported by a responsibility to maintain the system's security – to deliver a comprehensive roadmap of how a climate-neutral Europe looks.

ENTSO-E Mission Statement

Our values

ENTSO-E acts in solidarity as a community of TSOs united by a shared responsibility.

As the professional association of independent and neutral regulated entities acting under a clear legal mandate, ENTSO-E serves the interests of society by optimising social welfare in its dimensions of safety, economy, environment, and performance.

ENTSO-E is committed to working with the highest technical rigour as well as developing sustainable and innovative responses to prepare for the future and overcoming the challenges of keeping the power system secure in a climate-neutral Europe. In all its activities, ENTSO-E acts with transparency and in a trustworthy dialogue with legislative and regulatory decision makers and stakeholders.

Our contibutions

ENTSO-E **supports the cooperation** among its members at European and regional levels. Over the past decades, TSOs have undertaken initiatives to increase their cooperation in network planning, operation and market integration, thereby successfully contributing to meeting EU climate and energy targets.

To carry out its **legally mandated tasks**, ENTSO-E's key responsibilities include the following:

- Development and implementation of standards, network codes, platforms and tools to ensure secure system and market operation as well as integration of renewable energy;
- Assessment of the adequacy of the system in different timeframes;
- Coordination of the planning and development of infrastructures at the European level (Ten-Year Network Development Plans, TYNDPs);
- Coordination of research, development and innovation activities of TSOs;
- Development of platforms to enable the transparent sharing of data with market participants.

ENTSO-E supports its members in **the implementation and monitoring** of the agreed common rules.

ENTSO-E is the common voice of European TSOs and provides expert contributions and a constructive view to energy debates to support policymakers in making informed decisions.

Our values define who we are, what we stand for and how we behave.
We all play a part in bringing them to life.

EXCELLENCE

We deliver to the highest standardss. We provide an environment in which people can develop to their full potential.

TRUST

We trust each other, we are transparent and we empower people. We respect diversity.

INTEGRITY

We act in the interest of ENTSO-E

TEAM

We care about people. We work transversal and we support each other. We celebrate success.

FUTURE THINKING

We are a learning organisation. We explore new paths and solutions.

We are ENTSO-E