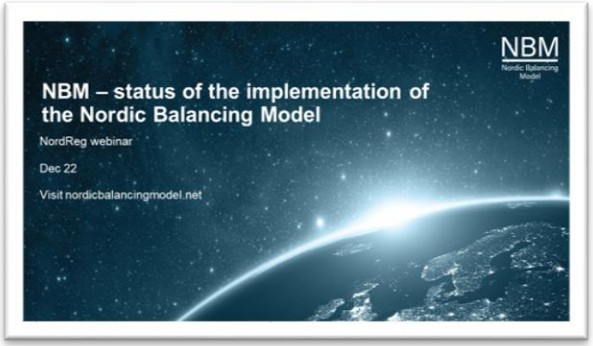
TSO-presentation - Implementation and Winter Outlook

NordREG Wholesale and Transmission Developments Webinar

Webinar, 5. December 2022

Content

- Status, implementation
- Winter outlook 2022-2023, 1. December 2022
- Nordic and Baltic Sea Winter Power Balance 2022–2023, 19 October 2022

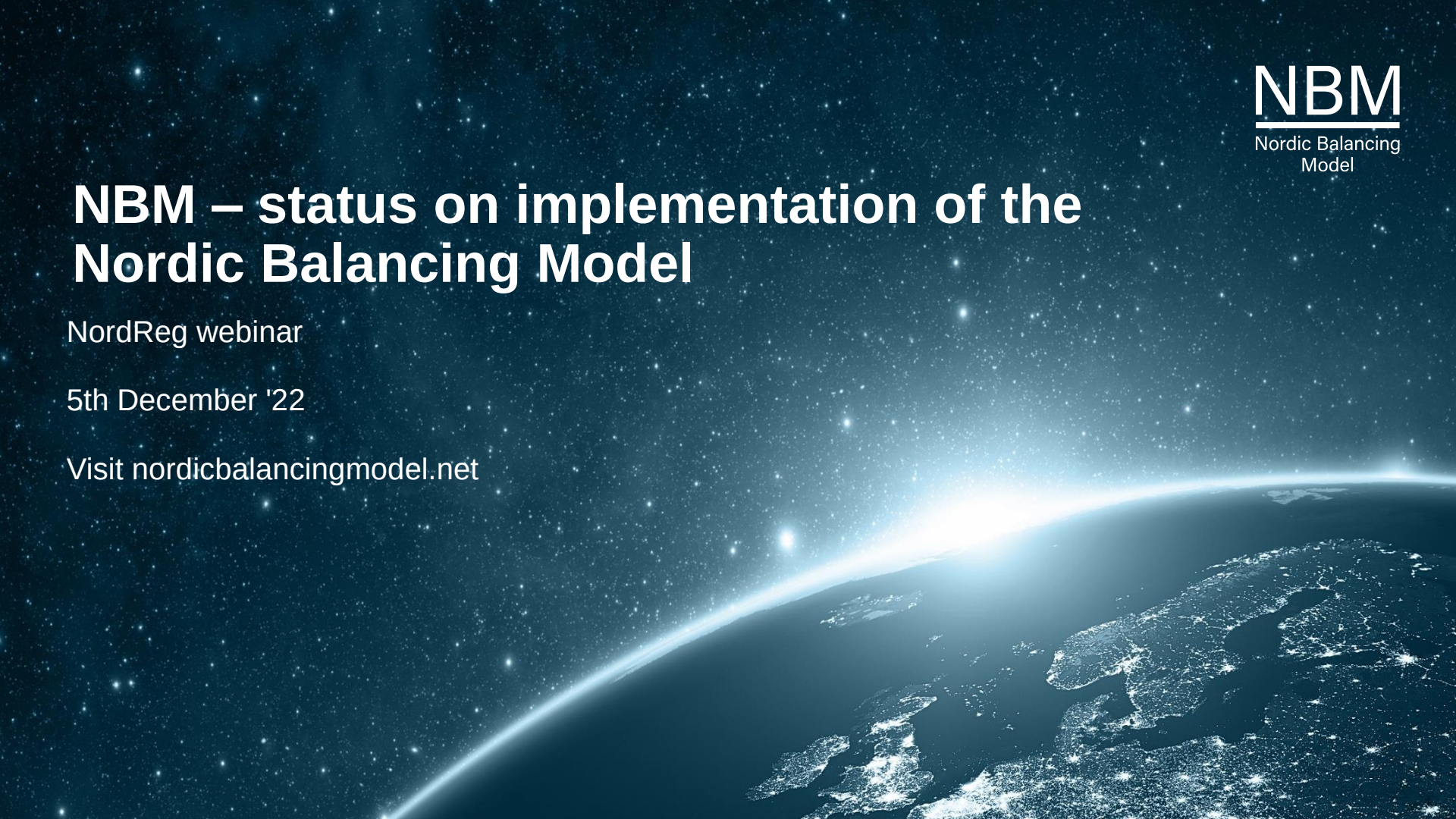


Flow based marked coupling

NBM
Nordic Balancing Model

NORDIC RCC

entsoe
Reliable Sustainable Connected



NBM
Nordic Balancing Model

NBM – status on implementation of the Nordic Balancing Model

NordReg webinar

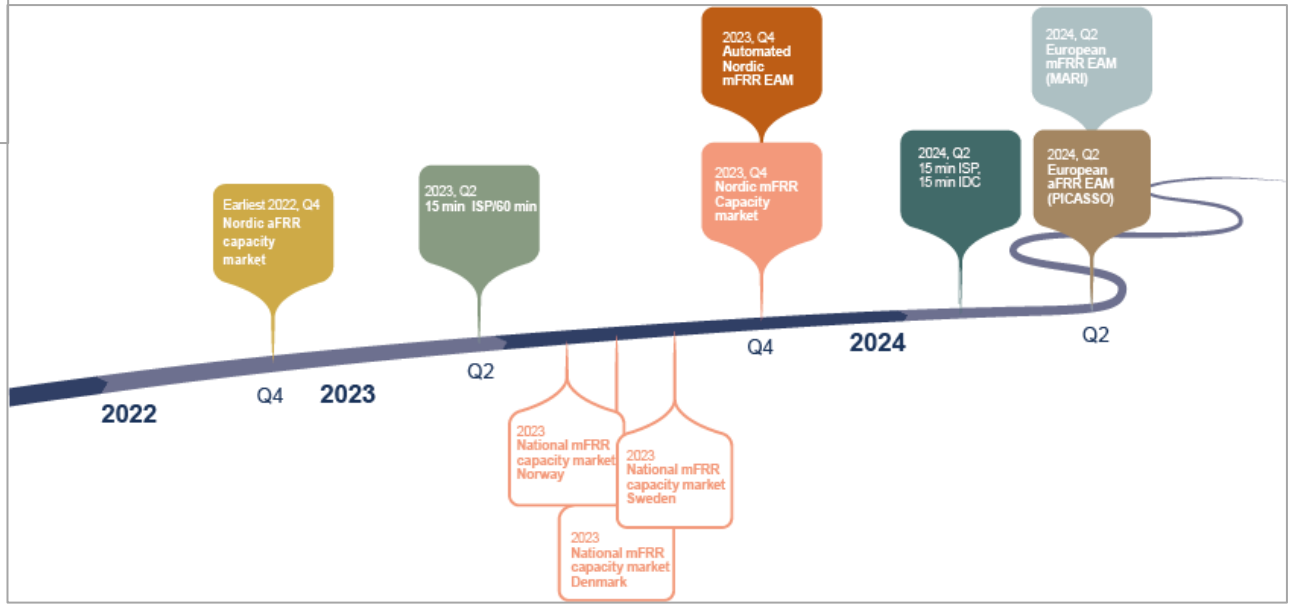
5th December '22

Visit nordicbalancingmodel.net

Selected items in the NBM roadmap

- Nordic **aFRR capacity market**
- Nordic **mFRR EAM**
- **MARI/PICASSO**

NBM
Nordic Balancing Model



Nordic aFRR capacity market go-live in December!

NBM
Nordic Balancing Model

- ✓ The Nordic aFRR capacity market enables **efficient procurement of aFRR reserves** in the Nordic countries according to approved methodology. It contribute to significant socio-economic welfare gains across the Nordic borders
- ✓ The aFRR capacity market is an important cornerstone for the NBM program – a new balancing process requires **aFRR in all parts of the Nordic system**
- ✓ The aFRR capacity market is an important tool for managing **aFRR liquidity issues** for the upcoming winter

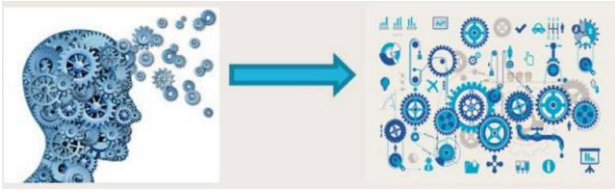
FIFTY Nordic MMS

Significant cooperation between TSOs/NRAs/market participants!

Nordic mFRR Energy Activation Market (EAM)

NBM
Nordic Balancing Model

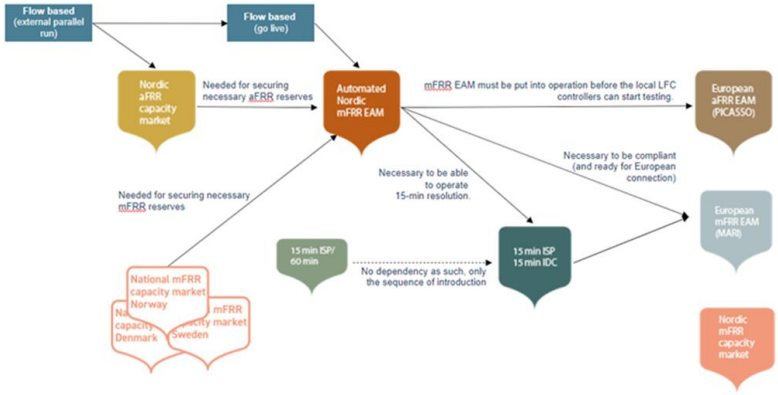
- ✓ Implementing a **new balancing model** in the Nordic is a huge transformation. It completely changes the process for how we balance the system
  - Manual to **automatic balancing** process
  - All processes to be done four times as often (**15min**)
  - **Major changes** for the mFRR and aFRR markets, affecting all parties (TSO, BSPs, vendors,…)
  - **Significant IT-development** (TSOs, BSPs)
- ✓ The Nordic mFRR EAM enables a **safe transition** and transformation of TSO organisations, while **maintaining the large scale socio economic value** of a Nordic common balancing market.
- ✓ Thus, implementation of a Nordic mFRR EAM is a necessary **enabler** for successful introduction of **15min time resolution** as well as the **accession to MARI and PICASSO**.



NBM
Nordic Balancing Model

Accession to MARI, PICASSO

- ✓ Deadline for **Nordic accession to MARI and PICASSO** is Q2'24 according to granted derogation by Nordic NRAs
- ✓ Implementation of the Nordic mFRR EAM is **dependent on the introduction of Flowbased**
- ✓ The TSOs are assessing the impact of a delayed introduction of Flowbased on the introduction of the mFRR EAM, as well as on the accession to MARI and PICASSO



Winter Outlook 2022/2023

1 December 2022

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Reliable Sustainable Connected

Introduction

The European energy context is in a more critical situation than previous winters

- Winter outlooks provide **an assessment of the security of the electricity / gas supply for the upcoming winter season across Europe**. They identify adequacy risks that the European system faces. The assessment is based on a reference scenario and of various sensitivities, which consider uncertainties that could materialise.

- Winter outlooks give insights for actions by authorities and market actors. It informs on **measures ENTSO-E, ENTSOG and the TSOs** are taking to prepare for the winter and coordinate at all levels to build resilience to the uncertainties/risks for the power system in the current context of energy scarcities.

- Measures need to be taken by all actors of the system. Continuous & **close dialogue between TSOs, and with European and national authorities** is ongoing to enable timely coordination and support risk preparedness efforts at all levels.

Earlier and deeper analyses in a specific context

1 July

Summer outlook with winter anticipation

Gas dependency qualitative analysis based on the Winter Outlook 2021-2022 model results:

- Calculation of gas volume needed for electricity adequacy
- Pushing gas to the end of the merit order to save gas

Sensitivity to Russian gas supply

- TSO survey on gas import dependency from Russia
- Proportion of gas import needed for gas-fired power generation
- Potential for reduction of gas for power in Europe

2 October

Early insights report

2022-2023 winter period from October to March, based on data collected in July

Reference scenario (best estimate projection by TSOs)

Multiple sensitivities show additional electricity adequacy risks:

- Prolonged or increased unavailability of nuclear plants in France, Sweden, and Finland
- Constraints on the availability of coal/lignite fuel supply in Poland and Germany
- Increased demand for electricity caused by a switch from gas to electric residential heating

Sensitivities reducing demand for electricity consumption by 10% and peak load by 5%

For each sensitivity the critical gas volume (CGV) is assessed on country and weekly basis

3 December

Winter 2022-2023 Outlook

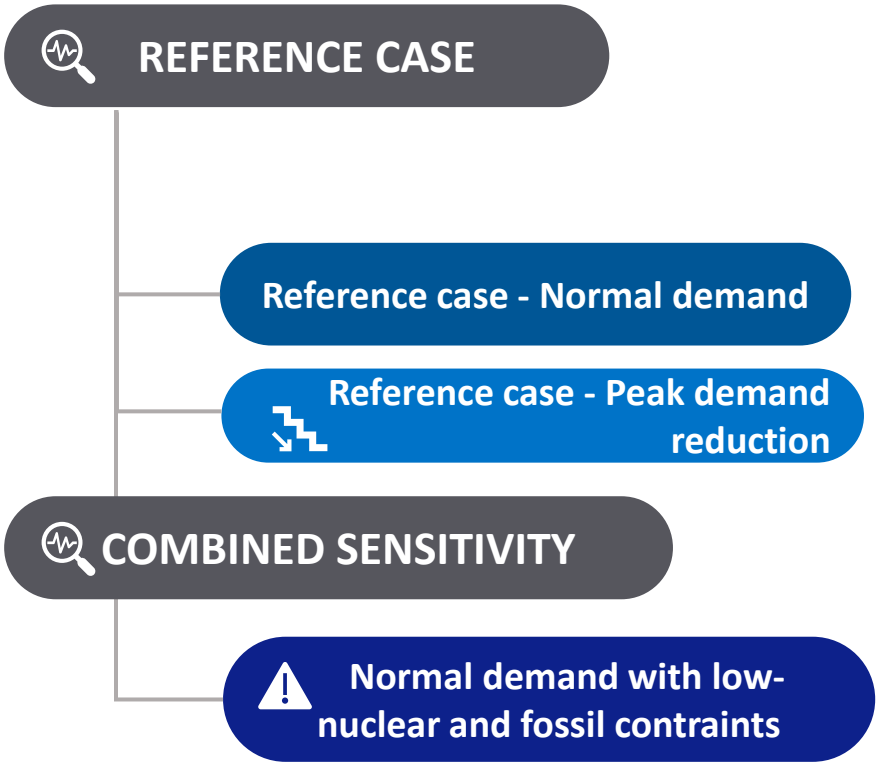
2022-2023 winter period from December to March, based on data updates in September

Three scenarios:

- Reference scenario - Normal demand, and additional run with out-of-market resource
- Reference scenario - Low demand (reducing peak load by 5%)
- Combined sensitivity: normal demand with low nuclear and fossil availability

Update in CGV assessments

Winter Outlook 2022/2023 scenarios assessed



Best estimate projections for period December to March

- **All available market resources**
- **Including confirmed national mitigation measures**
- **Gas considered last in the merit order**
- **Efficient integrated European market system**

Based on initial demand data, not accounting for demand reduction measures. In case of issues, supplementary analysis with available non-market resources

Effect of EU Emergency Intervention for a 5% power reduction during peak hours

Potential increased/ prolonged unavailabilities of plants in France, Sweden, Finland. Together with constraints on supply of coal and lignite in Poland and Germany during scarcity

Reference Scenario – Normal Demand : Adequacy Situation

- Higher adequacy risk compared to recent winter periods.
- Adequacy is especially stressed in Jan./Feb. (W1-W8). Some countries see issues already in Dec.

Adequacy (over winter)

Highest adequacy risks in **France, Ireland**.

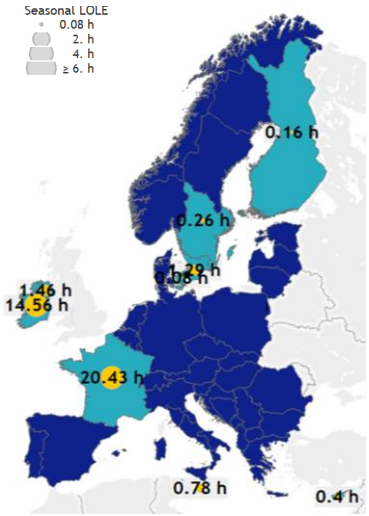
— **Uncertain import availability** to Ireland
— **Risks increase in Ireland** compared to initial insights report due to **update in thermal fleet unplanned outage** and **modest demand recalibration**

Risks emerge in **Sweden and Finland**.

— Risk decreases in Nordic region due to **improved situation in Germany** (extended nuclear availability).

— **Risks in Finland appear** due to **update/reduction in DSR availability**.

Risks in isolated/peripheral systems such as **Malta and Cyprus** as every winter.
— **Risks decrease in Malta as planned outage of interconnection is done** before December.

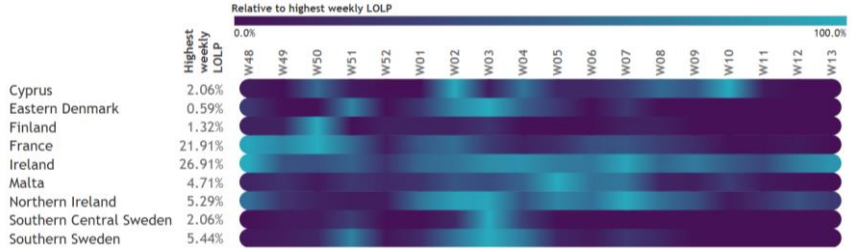


Adequacy (week)

Ireland and Malta experience higher risks before end of 2022(*).

Most risks in other countries emerge **as of January 2023** (W01) until end of February (W8).

Some countries see constant risk levels throughout winter, others are more focused on specific weeks.

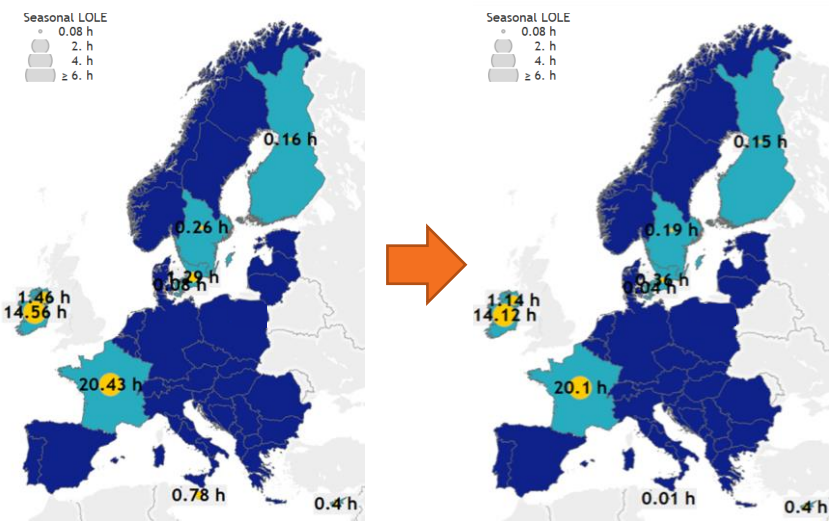


(*) In France the combined effect of lower nuclear availability and lower consumption levels in France according to RTE's updated projections (18/11/2022) lead to observing a medium risk for December and beyond end-February, and a higher risk for January 2023 compared to the Winter Outlook analyses.

Reference Scenario – Normal Demand with non-market resources

- Risks substantially decrease in countries facing adequacy risks and having own non-market resources (Malta, Sweden)
- Same weeks with risks are identified

Adequacy



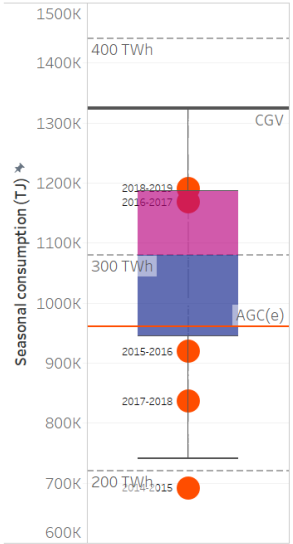
Before activation *After activation*

- Non-market resources can be dispatched if adequacy issues materialise. These are available and considered in the Outlook for Germany, UK (GB area), Southern Sweden and Malta. Poland also has such resources, but impact was not assessed due to complex modelling.
- In countries facing adequacy risks and having own non-market resources when activated
  - **Malta**: risk fully mitigated
  - **Sweden:** risk substantially reduced
- Other countries see marginal improvement, but not changing the overall situation.
- Note, other operational measures such as voltage reduction are not considered in resource adequacy assessments.

Reference Scenario – Normal Demand : Critical Gas Volume

- Gas for electricity generation needed to ensure system adequacy over the four-month winter period becomes higher than historical volumes.
- Gas consumption on weekly basis surges as of January for most countries.

Critical Gas Volume (Europe)



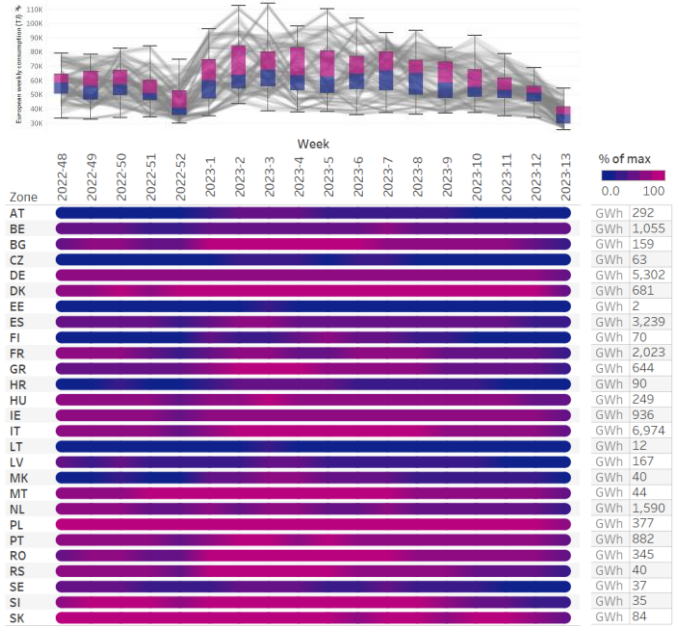
Distribution of gas consumption for power from December to March is **above historical consumption**, with CGV still around a third of the Working Gas Volume in Europe (**~368 TWh$_{GCV*}$**).

Major volumes in **Italy, Germany, Spain, France, Netherlands**.

CGV projections are **spread over winter**. Actual volumes will depend on weather conditions.

Increased volumes compared to early analyses mainly due to **updates in must-run units**.

Critical Gas Volume (country/week)

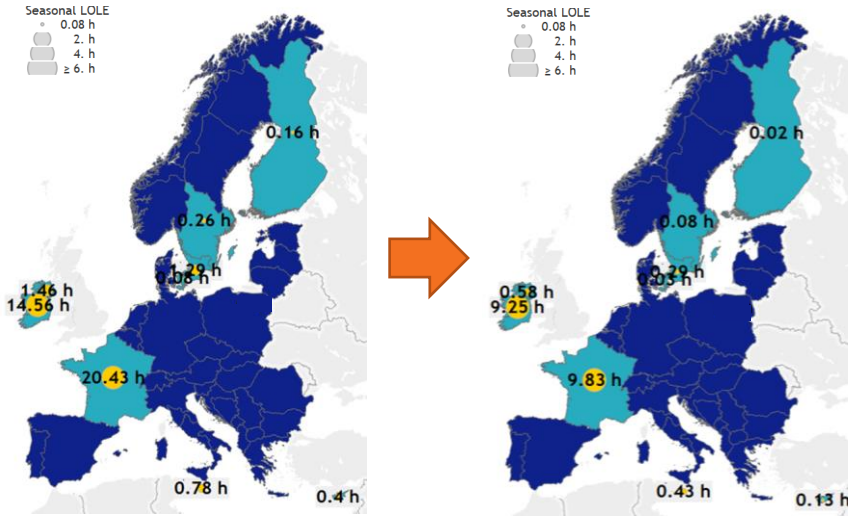


Note: Gas offtake data reported in Gross Calorific Value.
In early insights report the reporting was in Net Calorific Value.
Conversion takes 1 TWh_GCV = 1.108 TWh_NCV

Reference Scenario – 5% Reduced Peak Demand: Adequacy Situation

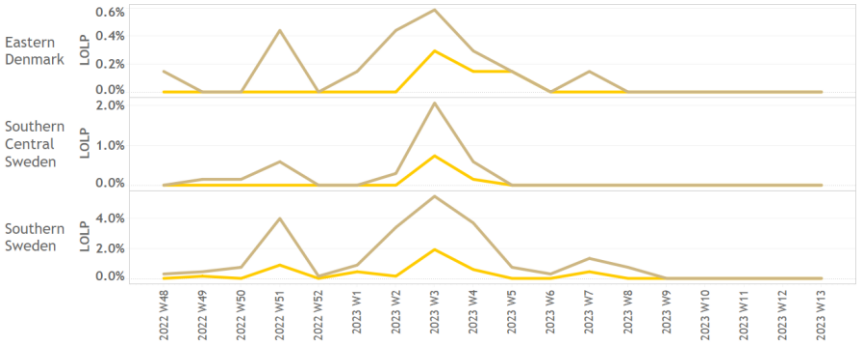
- Efforts to reduce demand peaks can address adequacy risks.
- Notable risks remain in France and Ireland, very limited risks in other systems.
- Risks in all weeks would be mitigated.

Adequacy



Reference scenario Normal Demand

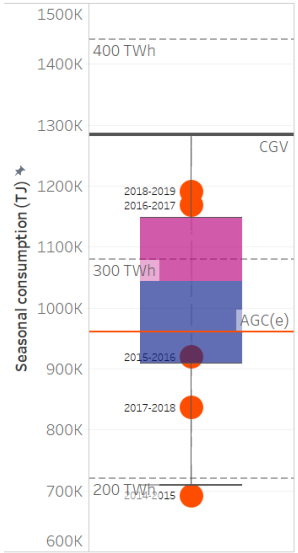
Reference scenario Reduced Peak Demand



Reference Scenario – 5% Reduced Peak Demand: Critical Gas Volume

- Gas consumption (for electricity generation) to ensure system adequacy over the 4-month winter period is higher than historical volumes, also with reduced demand (-5% for the peak 10% hours).
- Gas consumption on weekly basis surges as of January for most countries.

Critical Gas Volume (Europe)



Peak demand reduction causes a **-3% downwards shift** of results distribution with respect to the reference scenario with unchanged demand.

CGV decreases by ~11 TWh_{GCV} compared to the first reference (now around 357 TWh_{GCV*}).

Relative impact is the highest for **Netherlands and Greece**.
France is almost unaffected.

Increased figures with respect to early insights explained mainly by **adjustments in must-run units**.

Critical Gas Volume (country/week)

Note: Gas offtake data reported in Gross Calorific Value.
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Conversion takes 1 TWh_GCV = 1.108 TWh_NCV

Combined Sensitivity – scenario assumptions

Assessing the combined impact of

- **Prolonged unavailability of nuclear power-plants** in France, Finland and Sweden
- **Limitation of fossil fuel production** in Germany and Poland
- **Demand at projected levels**, not accounting for peak demand reductions

France: 5GW less nuclear for the whole winter compared to reference scenario, which is consistent with RTE's lower bounds of the "intermediate scenario'' in national winter outlook published on 14 September

Finland: 1.6 GW not available throughout the winter compared to availability from mid-December in reference scenario, due to delay in commissioning of Olkiluoto 3. However, import capacity increases by 300 MW if Olkiluoto 3 is not operational.

Sweden: 1.1 GW less as of February due to the risks of planned outage extension of Ringhals 4. In addition, internal NTC drops for the second half of March, decreasing by 800 MW from SE02 to SE03 and by 1700 MW from SE03 to SE04.

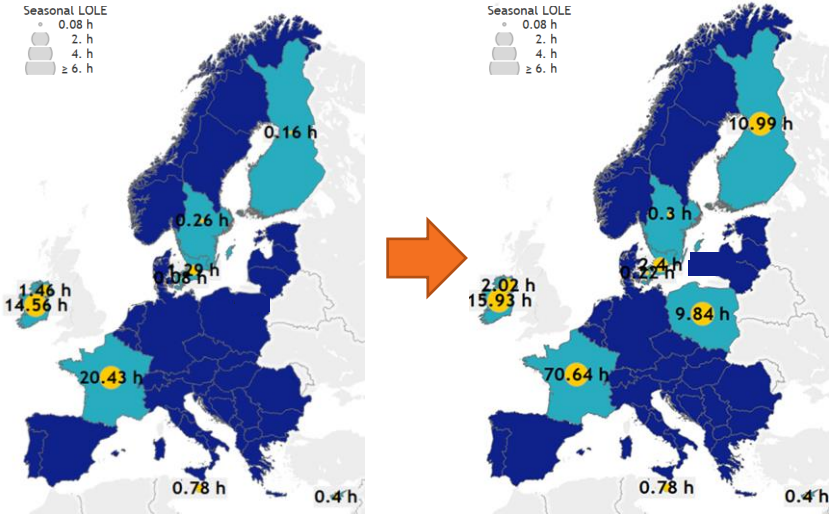
Germany: reduced hard coal (- 4.65 GW on average) and lignite (- 0.27 GW on average) power plant availability

Poland: limitation on seasonal generation from hard coal (-7 TWh) and lignite (-2.3 TWh) with respect to historical generation from December until March of winter 2021/2022

Combined Sensitivity – Adequacy Situation

- Risks appears in Poland and significantly increases in Finland and France.
- In Finland continuous risks appear for December–February months.
- In Poland risks emerge from January until end of winter.

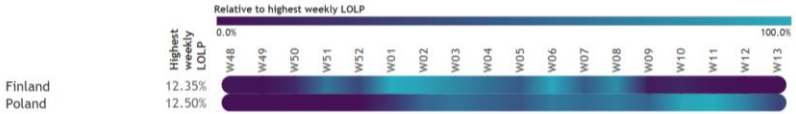
Adequacy



Reference scenario *Combined sensitivity*

Risk increases notably in few countries

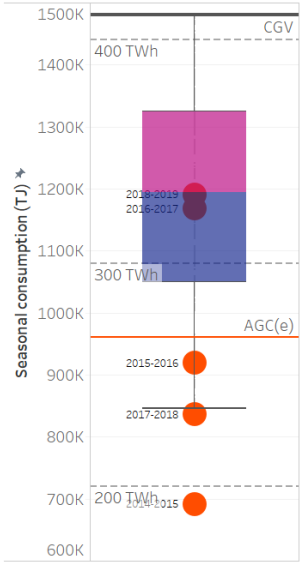
- Risks appear in **Poland** (> 9h LOLE) compared to the reference scenarios. Risks appear from January and peaks in mid-March.
- Risks significantly increase in **Finland** (11h LOLE) and **France** (70 h LOLE). In Finland risks appear in December–February months.
- Modest risk increase in southern **Sweden**



Combined Sensitivity: Critical Gas Volume

- Gas consumption (for electricity generation) needed to ensure system adequacy over the 4-months winter period increases significantly with respect to reference, impacting not only countries directly affected by constraints.
- Gas consumption on weekly basis surges as of January for most countries.

Critical Gas Volume (Europe)

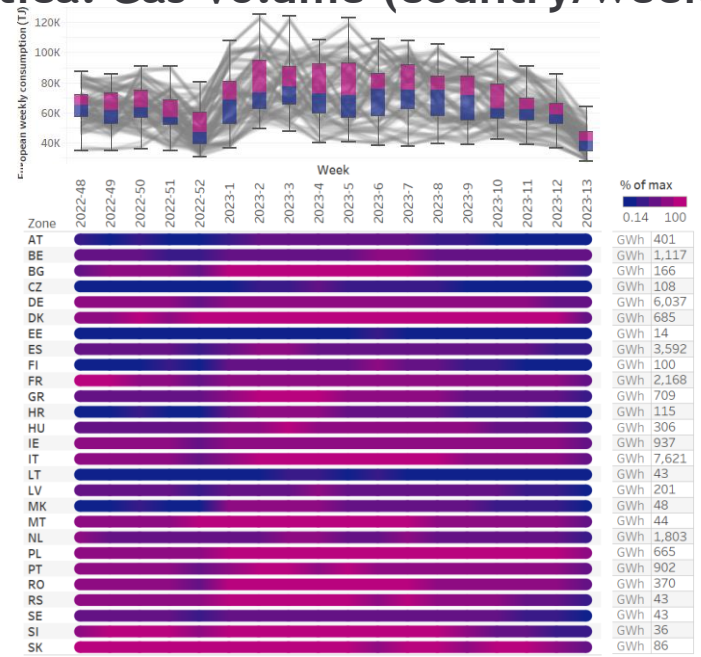


Coinciding unavailability of coal and nuclear would give a **12% upwards shift** of gas offtake compared to the reference scenario if demand reductions are not met.

CGV increases by ~44 TWh_{GCV} compared to the reference scenario (~411 TWh_{GCV*}).

Relative impact is the highest for **Finland, Poland and Czech Republic.** Highest CGV in absolute figures in same high demand countries as in the reference scenario.

Critical Gas Volume (country/week)



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Key messages for Winter 2022/2023

1

Tight periods foreseen with best available projections (reference case)

- Situation this winter is critical but manageable with operational measures.
- Hydrological situation to be closely monitored.
- Nuclear availability is low and adds stress to the system.
- Electricity supply depends strongly on gas in all winter scenarios.
- Simultaneous scarcity situations in various countries need close attention.

- System stress in Irish system, France, Southern Sweden, Finland, Malta and Cyprus when counting on use of market resources, non-market resources reduces the risk in Sweden and Malta.
- Loss of Load Expectation raises to higher levels than last winters.
- Minimum gas needs for electricity adequacy equals about one third of total European usable gas storage.

2

Additional risks can materialise (sensitivities)

- Additional stress elements can materialise, especially if they coincide.
- Nuclear availability, if lower than foreseen, will have local but strong impact.
- Further constraints in fuel supply increase adequacy risks.

- Additional nuclear unavailability in Nordic system has notable impact
- French nuclear unavailability has high local impact.
- Further fuel constraints in Germany and Poland would have a rather local impact on adequacy.
- Combined impact shows increased risk mainly in Poland and Finland

3

Need for early coordinated measures (preparedness)

- TSOs are pro-actively taking measures at national level and closely coordinating at regional and pan-European levels.
- Coordination and cooperation among the European countries and acting on National Risk Preparedness Plans are key for this winter.
- Efficient demand reduction measures reduce significantly system risk
- System adequacy relies on all market participants.

- A 5% peak shaving can mitigate most risks in continental Europe, with a remaining substantial risk in France and Ireland.
- Transmission exchange capacities remain an essential resource for system adequacy.

Effective coordination and mitigation strategies at all levels is key

Adequacy risks for the interconnected power system this winter can be mitigated with concerted preparation, coordination and cooperation at national, regional and European level.

	National	Regional	European
Planning cooperation	▪ *TSOs national study updates & raising awareness;* ▪ *Continuously optimised outage planning;* ▪ *Risk preparedness with governments, NRAs, market actors*	▪ *TSOs coordination via established regional STA (short-term adequacy) processes;* ▪ *Outage planning coordination via established OPC (outage planning coordination) processes*	▪ *TSOs coordination via established PAN-EU STA (short-term adequacy) processes* ▪ *Close ENTSO-E monitoring of the situation and potential Outlook updates*
Market integration	▪ *Facilitate markets & incentives for demand response measures as well as cross-border cooperation*	▪ *Cross-border exchanges and cooperation to maximise capacities in a secure manner regionally*	▪ *Efficient pooling of resources is also key for adequacy support*
Operational coordination	▪ *Coordination with governments, NRAs, key stakeholders;* ▪ *Data sharing;* ▪ *Operational mitigation measures*	▪ *Weekly monitoring in RCCs regional short-term adequacy assessments;* ▪ *Established inter-TSO and RCC processes*	▪ *Close coordination across ENTSO-E* ▪ *Alignment ENTSOG/ENTSO-E*

Nordic and Baltic Sea Winter Power Balance 2022–2023

19.10.2022
Regional adequacy working group under
Baltic Sea System Development Steering Committee

AST elering ENERGINET Litgrid FINGRID Statnett SVENSKA KRAFTNÄT 50hertz | Elia Group

"The leaders of the Baltic Sea electricity transmission system operators met in Helsinki on 2nd of November…

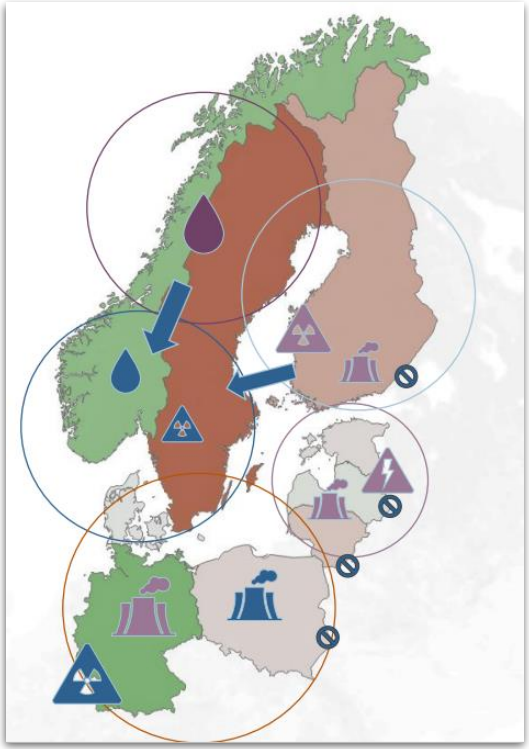
….The transmission system operators of the Baltic Sea region actively cooperate and share information on the security and the electricity supply situation in the region …

...The transmission system operators are ready to work in cooperation to facilitate electricity adequacy and provide each other the necessary information as well as system services to reduce risks."

AST elering ENERGINET Litgrid FINGRID Statnett SVENSKA KRAFTNÄT 50hertz | Elia Group

Main messages

- One of the most challenging winters in recent history
- Positive power balances for both average and cold winter, but small margins – significant differences between countries
- Regardless of electricity adequacy, it is expected that the electricity prices will be high
- Analyze the energy balance for two separate cases – average winter consumption and the coldest projected winter's consumption



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1. Many adequacy risks realised and identified in the Baltic Sea region

Energy import restriction from third countries

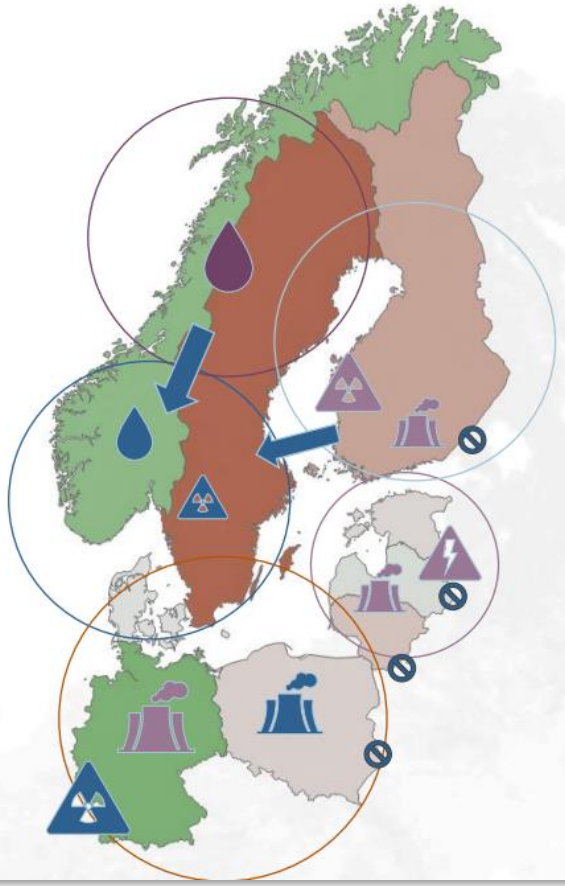
Fossil fuel supply challenges in Poland and risks in Germany, Finland, and the Baltics

Low hydro reservoir levels

Nuclear generation outages and/or risks for delays in start-ups

Grid bottlenecks

Risk of Baltic countries desynchronisation from Russian electricity system



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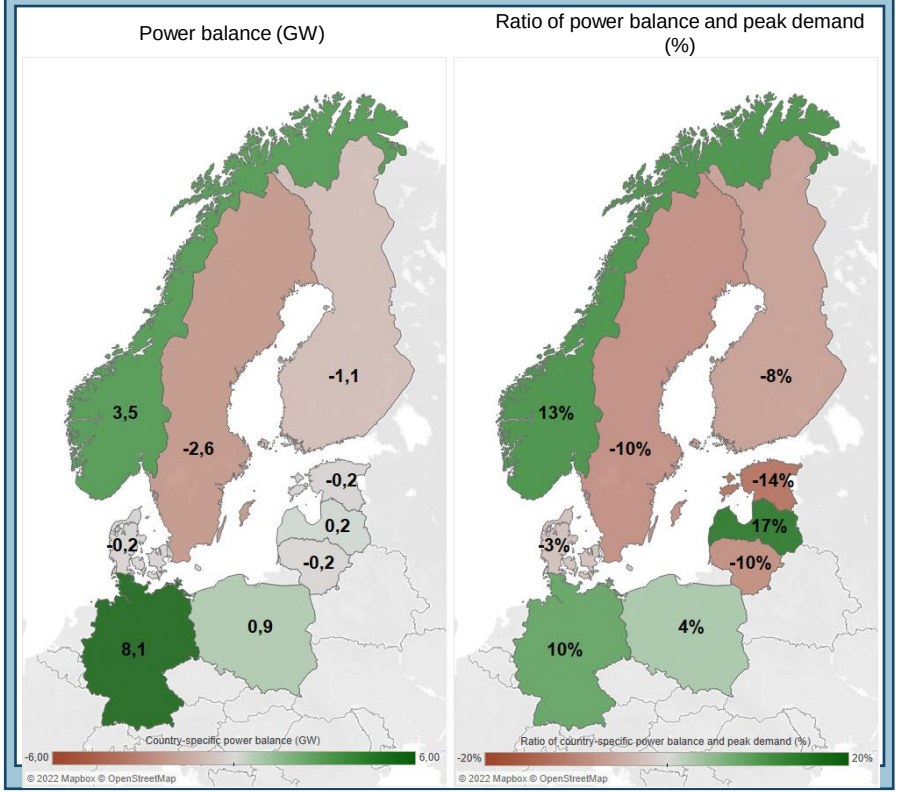
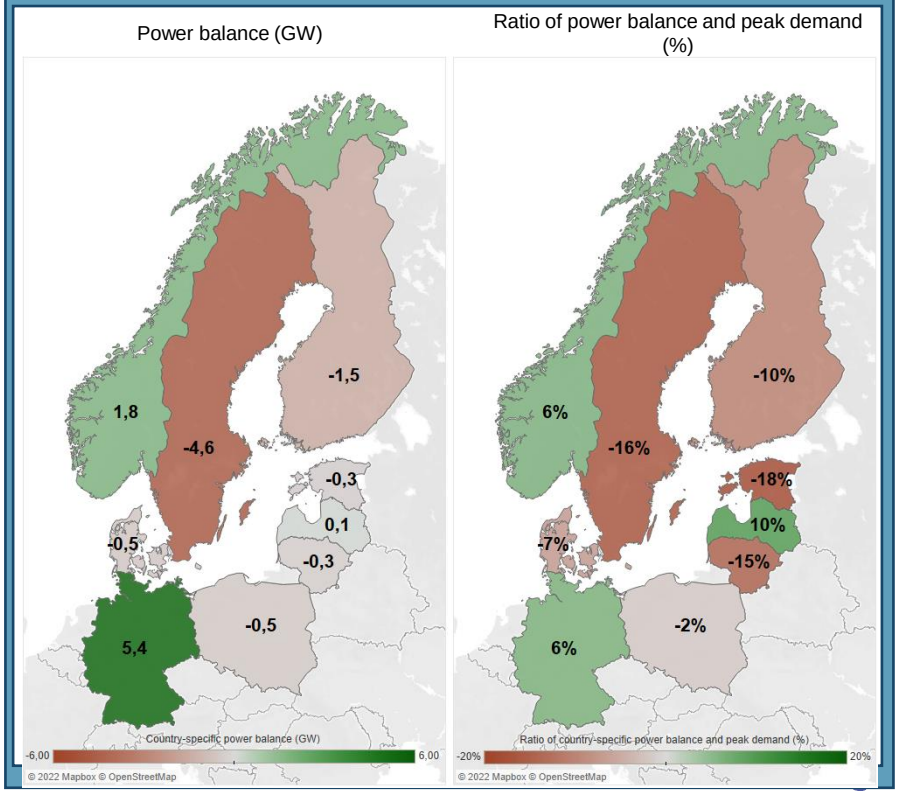
Country-specific power balances

Average winter peak demand



Cold winter peak demand



Reminder: These country peak demands can happen at different times and should not be summed together. The regional simulateneous peak demand is always lower than sum of individual country peak demands.

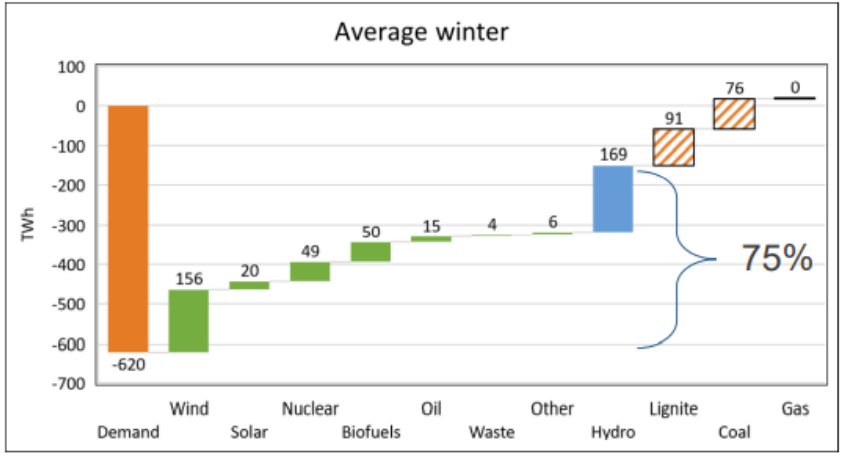
Regional energy balance considering known restrictions

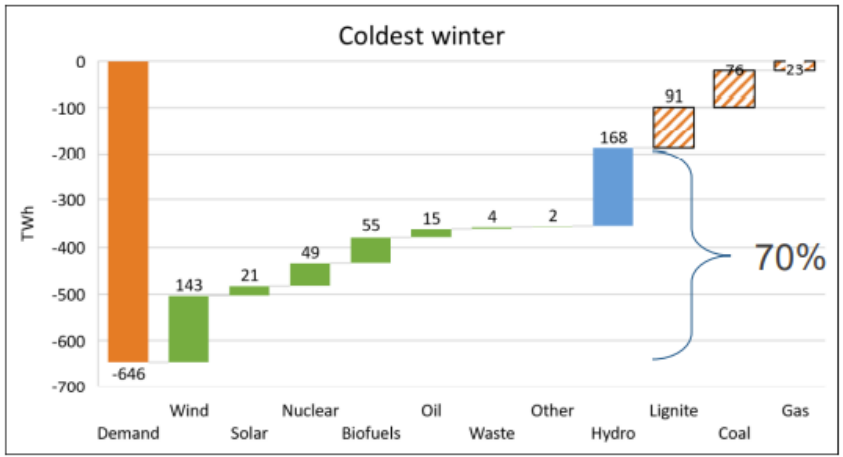
Average winter

- 75% of electricty can be produced from sources without fuel supply issues.
- 25% needs to generated from coal, lignite and/or gas depending on the price
- Hydro resources could produce around 169 TWh
- Wind generation could produce around 156 TWh

Coldest winter

- 30% needs to generated from coal, lignite and/or gas
- In this case around 23 TWh of electricity is needed from gas, which translates to around 48 TWh of gas for the winter.
- For reference as of 11th October there is 291 TWh of gas stored in gas storages around the Baltic Sea area countries





Thank you