Winter Outlook 2022/2023

1 December 2022 – Stakeholder webinar

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Housekeeping rules

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In Sli.do, feel free to vote for the most relevant questions posted.

Indicate your name and company when posting your question.

The moderator will select a couple of questions and ask the relevant speakers to comment.

Chat & ‘raise the hand’ features of Gotowebinar will not be used.

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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.
Electricity Winter Outlook
Different risks are addressed within different timeframes

**Long term**
>10 years

**Mid term**
10 years  5 years

**Short term**
1 year  6 months  1 week

Policy decisions
Investment decisions
Operational decisions

**REAL TIME**

UNCERTAINTY INCREASES OVER TIME
Earlier and deeper analyses in a specific context

1 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 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 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

**REFERENCE CASE**

- **Reference case - Normal demand**
- **Reference case - Peak demand reduction**

**COMBINED SENSITIVITY**

- **Normal demand with low-nuclear and fossil constraints**

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

- 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\textsubscript{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**.

Note: Gas offtake data reported in Gross Calorific Value. In early insights report the reporting was in Net Calorific Value. Conversion takes 1 TWh\textsubscript{GCV} = 1.108 TWh\textsubscript{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.
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. In early insights report the reporting was in Net Calorific Value. 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**: 5 GW 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 appear 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

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.

**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
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.

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.

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.

- 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.
- 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.
- 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.

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<thead>
<tr>
<th>National</th>
<th>Regional</th>
<th>European</th>
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<tr>
<td><strong>Planning cooperation</strong></td>
<td>▪ TSOs national study updates &amp; raising awareness;</td>
<td>▪ TSOs coordination via established regional STA (short-term adequacy) processes;</td>
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<td>▪ Continuously optimised outage planning;</td>
<td>▪ Outage planning coordination via established OPC (outage planning coordination) processes</td>
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<td>▪ Risk preparedness with governments, NRAs, market actors</td>
<td>▪ Close ENTSO-E monitoring of the situation and potential Outlook updates</td>
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<td><strong>Market integration</strong></td>
<td>▪ Facilitate markets &amp; incentives for demand response measures as well as cross-border cooperation</td>
<td>▪ Cross-border exchanges and cooperation to maximise capacities in a secure manner regionally</td>
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<td><strong>Operational coordination</strong></td>
<td>▪ Coordination with governments, NRAs, key stakeholders;</td>
<td>▪ Weekly monitoring in RCCs regional short-term adequacy assessments;</td>
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<td>▪ Data sharing;</td>
<td>▪ Established inter-TSO and RCC processes</td>
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<td>▪ Operational mitigation measures</td>
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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 standards. 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 transversally 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
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Winter Supply Outlook 2022-2023 and prolonged disruption of Russian supply

ENTSOG – ENTSOE Webinar

Jacques Rebérol - System Development - Modelling Subject Manager
WSO concept and assumptions

Assumptions

- System assessment under different demand scenarios: Reference Winter and Cold Winter (highest demand since 2009/10),
- sensitivity analysis -15% demand response
- Peak day (1-in-20 years) and 2-Week Cold Spell (1-in-20 years),
- Import Potentials based on 10 years of historical data,
- Russia supply limitation via Ukraine to Slovakia and via Turk Stream (870 GWh/d)

Supply situation

The storage inventory level on 1 October 2022 (985 TWh, 89%) is one of the highest in any ENTSOG Winter Supply Outlook (985TWh), with different situations among countries. European Commission EC has strongly encouraged member countries to inject during the summer a minimum of 90% or 35% of the winter gas demand (when the WGV allows it).
Demand assumptions

<table>
<thead>
<tr>
<th>Year</th>
<th>Demand (GWh/d)</th>
<th>2week cold spell Demand (GWh/d)</th>
<th>Peak Day Demand (GWh/d)</th>
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AVERAGE OF LAST 10 WINTERS

- 11.4%
- 35.0%
- 4.0%
- 0.8%
- 15.0%
- 14.0%
- 7.8%
- 7.6%
- 5.4%
- 27.3%
- 21.7%
- 8.2%
- 3.7%
- Cold
- Reference - Cold -15%
In both scenarios, 30% target can’t be reached.

Ca. 10% of demand curtailment in Cold Winter.

With 15% demand reduction, 30% target can be reached in Reference winter but not in Cold Winter.

No risk of demand curtailment in both scenarios.
Supply Mix

- UGS can provide the necessary flexibility in case of Reference winter – not in Cold Winter
- Indigenous production keeps on decreasing
- Additional supply (LNG) can reduce demand curtailment down to 2%.
- Russian supply potential is limited (only Ukraine route and Turkstream available to some extent)

Demand curtailment - Monthly - Cold Winter - unrestricted LNG access

Adequacy gap
High demand – 2-Week cold spell and Peak day

2-Week cold spell
European countries are exposed to 10% demand curtailment in Cold Winter scenario only.
30% storage level by mid-February can fully mitigate demand curtailment.
15% demand reduction can fully mitigate any risk of demand curtailment.

Peak Day
Reference Winter and Cold Winter
European countries are exposed to demand curtailment in case of Peak day (6% in reference winter, 9% to 27% in cold winter).
30% storage level by mid-February can fully mitigate demand curtailment.
15% demand reduction can fully mitigate any risk of demand curtailment.
Russian supply disruption - Reference and Cold Winter

In both scenarios, 30% target can’t be reached.

Ca. 12% of demand curtailment in Cold Winter.

With 15% demand reduction, 30% target can be reached in Reference winter but not in Cold Winter.

No risk of demand curtailment in both scenarios.
Russian supply disruption – 2-Week cold spell and Peak day

2-Week cold spell
European countries are exposed to 10% demand curtailment in Cold Winter scenario.

30% storage level by mid-February can fully mitigate demand curtailment (except 14% in RO)

15% demand reduction can fully mitigate any risk of demand curtailment (except 7% in RO)

Peak Day
Reference Winter and Cold Winter

Most European countries are exposed to demand curtailment in case of Peak day (12% in reference winter, 20% in cold winter).

50% and 30% storage level by mid-February can mitigate demand curtailment:
– down to resp. 3% and 9% in reference winter
– Down to resp. 5% and 20% in cold winter

15% demand reduction can fully mitigate any risk of demand curtailment in reference winter and reduce it down to 4% in cold winter
Gas demand started to decrease and reached 2015/16 equivalent level.

During the winter 2021/2022 LNG and NO supply reached highest level compared to last 10 years. Russia supply was minimized to the lowest level ever observed before.

Algeria and Libya supply sources decreased and have been compensated by Caspian supply source.

The storage level at end of the winter season reached 291.3 TWh, the lowest seen in last 5 winters, due to the low UGS level in October 2021.

European gas prices increased during winter without reaching unusual level (> 120 €/MWh).
Conclusions

− High storage levels and the gas infrastructure, including new projects to be commissioned in the upcoming winter, can efficiently reduce the dependence on Russian supply thanks to enhanced cooperation and additional LNG import capacities.

− In case of Russian supply disruption, cooperation among all European countries can partially mitigate the risk of demand curtailment. However, without demand reduction most countries would be exposed to significant risk of demand curtailment in case of a cold winter.

− An early and significant storage withdrawal will result in low storage levels at the end of the winter season. This will have a negative impact on the flexibility of the gas system - and may increase exposure to demand curtailment in the second half of the winter season especially in case of cold and high demand events. Therefore, it is important that all European storages continue to inject gas to the extent possible and that European system continues to maximize import to prepare for high demand situations as well as to ensure security of supply also in the following periods.

− Reminder from the Yearly Outlook 2022-2023 report: Storages play an essential role to ensure security of supply. However, without preparedness for Winter 2023/2024, the situation could deteriorate over the next gas year 2022/2023: storages would be depleted in April 2023 and sites located in Central and South-Eastern Europe would be filled less than 15% on 1 October 2023, leaving the EU more exposed to risks of SoS for the winter 2023/2024.

− The European gas system is also capable of cooperating with Energy Community Contracting Parties and other EU neighbouring countries to mitigate the exposure to demand curtailment to the minimum possible extent,

− ENTSOG will monitor the evolution of the storage levels and import volumes throughout the Winter and report on the situation on regular basis.
Thank you for your attention
Q&A with the audience

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