Winter Outlook 2023-2024

Summer Review 2023

Country Comments

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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 inter-connected 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.

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Introduction

This document includes individual country reviews on the security of supply situation in their system during the last season, as well as comments on the expected adequacy situation or specific operational conditions during the coming season. It aims to present specific national insights provided by TSOs on a voluntary basis. These insights reflect only the positions of the concerned TSOs who have submitted their comments and should not be considered as ENTSO-E's statement.

The aim of the retrospective reviews is to present the most important events that occurred during previous season and to compare them to the previous Seasonal Outlook study results. Important or unusual events or conditions in the power system and the remedial actions taken by the TSOs are also mentioned.

Comments on the expected adequacy situation and any additional information are presented to provide more background information about the local power systems, which might not always be represented in pan-European adequacy models.

Countries did not provide comments or reviews if there was no relevant information to be reported.

Albania

Winter Outlook 2023-2024

No adequacy issues are expected for the Winter 2023-2024.

Summer Review 2023

No adequacy issues were recorded during the past season.

Austria

Winter Outlook 2023-2024

This year's Winter Outlook Report indicates no adequacy concerns for Austria, either in the reference scenario or in the various sensitivity analyses. Austria is making good progress towards achieving its photovoltaic expansion goals, a trend reflected in the input data for the Winter Outlook Report (WOR). However, the expansion of wind turbines, on the other hand, continues to stagnate.

Austrian Power Grid AG (APG) is working on the first iteration of Austria's National Resource Adequacy Assessment (NRAA). This assessment aligns with the methodology of the European Resource Adequacy Assessment (ERAA) and aims to investigate additional scenarios that could impact Austria's security of supply, alongside the ERAA and Seasonal Outlooks (SO).

Overall, Austria is well prepared for the coming winter: contracted grid reserve capacity is available, and gas fuel storages and pump storage hydro plant reservoirs are at high fill levels.

APG wants to stress that the cross-border representation using Net Transfer Capacities (NTCs) is outdated since the introduction of Flow Based CORE went live in 2022. Therefore, the values have been provided in a manner consistent with previous outlooks. APG wishes to incorporate Flow Based Market Coupling in the upcoming Seasonal Outlooks.

Summer Review 2023

Following the trend towards an increase of extreme weather events, heavy rainfall has led to extremely high run-of-river hydroelectric production during May (up to 40% above average) and August (up to 55% above average). This has resulted in record-breaking exports, with Austrian cumulative imports shaping up to be the lowest in 10 years.

The expansion of renewable energy sources in Austria is rapidly accelerating, leading to previously unprecedented levels of water pumping for hydroelectric plants during midday in summer. Unreported photovoltaic installations behind the meter are becoming an increasing problem due to their impact on demand curves, notably the "Duck Curve", and on the quality of demand forecasting.

Belgium

Winter Outlook 2023-2024

Next winter, the availability of the production park in Belgium is high during the whole winter period.

The expected demand remains in line with previous years with a target of 80.7 TWh.

For all planned outages during the winter that have an impact on the market, it is possible to delay the works in case of adequacy issues that require full exchange capacity. This is also the case on the request of neighboring countries.

Therefore, in normal conditions, Belgium expects to keep export potential. In severe conditions only (high load combined with low wind/CHP), would there be structural import needs to cover additional outages. Only in very extreme situations (low probability) would we expect an adequacy risk for Belgium.

Summer Review 2023

No adequacy issues were recorded during the past season.

Multiple days were recorded with negative prices on the day-ahead market and very limited downward reduction available in intra-day for Belgium.

Bosnia and Herzegovina

Winter Outlook 2023-2024

No adequacy issues are expected for the Winter 2023-2024.

Summer Review 2023

No adequacy issues were recorded during the past season.

Bulgaria

Winter Outlook 2023-2024

No adequacy issues are expected for the Winter 2023-2024.

Summer Review 2023

No adequacy issues were recorded during the past season.

Croatia

Winter Outlook 2023-2024

No adequacy issues are expected for the Winter 2023-2024.

Summer Review 2023

No adequacy issues were recorded during the past season.

Cyprus

Winter Outlook 2023-2024

Depending on the weather conditions, there is the possibility of some periods with reduced Replacement Reserve availability for the Winter 2023-2024.

Summer Review 2023

A small number of hours with reduced Replacement Reserve availability were recorded during the Summer 2023 period. No adequacy issues materialised.

Czech Republic

Winter Outlook 2023-2024

No adequacy issues are expected for the Winter 2023-2024.

Summer Review 2023

No adequacy issues were recorded during the past season.

Denmark

Winter Outlook 2023-2024

No adequacy issues are expected for the Winter 2023-2024.

Summer Review 2023

No adequacy issues were recorded during the past season.

Estonia

Winter Outlook 2023-2024

No adequacy issues are expected for the Winter 2023-2024.

Summer Review 2023

No adequacy issues were recorded during the past season.

Finland

Winter Outlook 2023-2024

During the winter season in Finland, adequacy of electricity supply faces its greatest challenges, particularly during cold and calm weather periods. This is because electricity demand is significantly influenced by outdoor temperatures, and power generation becomes increasingly reliant on wind conditions. Despite increase in domestic generation capacity, there is a necessity for importing electricity from neighbouring countries to meet peak demand, particularly when wind generation is low.

The most significant factor affecting adequacy, in contrast to the previous winter, is the start of commercial operation of Olkiluoto 3 nuclear power plant (1600 MW). Alongside a 1600 MW increase in thermal generation capacity, there will be a reduction of import capacity between Finland and Northern-Sweden by 300 MW when the generation of Olkiluoto 3 exceeds 1000 MW. In addition, installed wind power capacity has been rapidly increasing. In accordance with the usual practice, power plant and interconnector maintenances are not carried out during winter, apart from Olkiluoto 3 undergoing its annual maintenance in March.

There was no strategic reserve last winter, but the 565 MW Meri-Pori coal-fired power plant, which re-entered the market in 2022, has made an agreement with National Emergency Supply Agency (NESA) where NESA reserves the production of the Meri-Pori for severe disruptions and emergencies to guarantee security of supply in the electricity system. The agreement period is 1 March 2024 until 31 December 2026. Thus, Meri-Pori will not be available for the market starting from 1 March 2024.

Due to the damage in Balticconnector gas pipeline between Finland and Estonia, the gas-fired power plants will rely on the newly commissioned Inkoo LNG terminal. However, despite the pipeline not being in use during the upcoming winter, Inkoo LNG terminal is expected to meet the demand of gas during the winter season. As the electricity saving measures taken place during previous winter have been continued through summer, it is expected that the demand will keep staying at a lower level compared to time before the energy crisis.

Summer Review 2023

No adequacy issues were recorded during the past season. With peak demand reaching only 70% of the winter peak demand this year, the electricity adequacy was robust. This was a predictable trend, as electricity adequacy in Finland tends to be better during the summer season compared to the harsh winter months.

However, in the summertime, available capacity tends to be lower as power plants and interconnectors undergo annual maintenance to uphold the reliability of the energy infrastructure. Nevertheless, Finland's self-sufficiency in electricity generation is steadily improving each year, primarily driven by the growing contribution of wind power generation.

While Finland remained secure in terms of electricity supply, there was a notable period in August when generation capacity temporarily fell below the anticipated levels. This was a consequence of planned disruptions at the Swedish interconnector and technical issues in a parallel transmission line, momentarily limiting transfer capacity. Additionally, the cooling system malfunction at the Olkiluoto nuclear power plant

coincided with the scheduled maintenance of the Loviisa nuclear power unit. Unfavourable weather conditions further exacerbated the challenges in power production during this specific period. Despite all these challenges, the situation was effectively managed and there was no immediate threat of electricity shortage.

France

Winter Outlook 2023-2024

A very low risk of adequacy issues is expected in France for the upcoming winter, due to the following key drivers :

- An ongoing decrease in demand compared to pre-crisis averages (about 8% below), with similar levels to those of last winter
- A higher nuclear availability : as a result of successful maintenance work conducted throughout the year, the nuclear availability is now estimated to be better than last winter, even though it doesn't reach the pre-crisis historical levels
- Other positive factors compared to last winter (availability of gas and hydraulic stocks) combined with an increase in RES capacity

RTE's diagnosis of "Loss of Load Expectation" (LOLE) differs from the one resulting from ENTSO-E's analysis : the risk is expected to be way lower in national studies. Adequacy issues could appear in the case of a combination of unfavorable hazards, such as a cold winter (due to the high thermosensitivity of French electric demand), a structural increase in demand levels if energy saving efforts are not maintained, a lower-than-expected nuclear availability and/or limited exchanges compared to last winter.

RTE is closely monitoring all parameters contributing to the security of supply in France and remains specifically focused on the evolution of the French power demand and planned outages of nuclear power plants.

Summer Review 2023

No adequacy issues were recorded during the past season.

Germany

Winter Outlook 2023-2024

Preparations for Winter 2023/2024

Germany conducted intensive preparations for the Winter 2022/2023 due to the gas shortage caused by the war in Ukraine. This led to corresponding changes in legislation, which are still active or have been prolonged also for Winter 2023/24. The corresponding laws and ordinances allow coal-fired power plants

- already in grid reserve ("Netzreserve") or
- to be decommissioned in 2022 or 2023 due to coal phase-out or
- lignite power plants in supply reserve ("Versorgungsreserve")

to temporarily and conditionally return to or stay in the market (for grid reserve power plants generally all non-gas fired plants can return) to reduce gas consumption in the electricity sector and to support security of supply. The return to or stay in the market of those power plants is temporally limited until 31.03.2024.

For the Winter Outlook 2023/24 certain hard coal/lignite power plants out of these categories (comprising a total capacity of 7.5 GW) as of 31.12.23 were assumed to be (further) available for the market. Also the prolonged availability of supply reserve power plants of 1.8 GW at the market according to latest legislation was taken into account.
A return to the market of previously grid reserve or lignite power plants in stand-by alleviates adequacy risks during normal market operations, but consequently reduces the available non-market resources.

Since Winter 2023/24 with special network equipment power plants ("besondere netztechnische Betriebsmittel") also a further kind of reserve is available as non-market resource. It comprises a total of 0.9 GW.

Besides these measures affecting the electricity generation, the German government approved numerous measures for the winter period targeting at saving energy and particularly gas consumption in other sectors, e. g. heating.

Non-market Resources

Based on the knowledge/assumptions at the time of data collection, the non-market resources for Germany contain:

- Grid reserve: Used to resolve congestions and contains different types of power plants located in Germany. Currently, it comprises a total capacity of 3.9 GW as of 31.12.23.
- Capacity reserve: Since 1 October 2022 and until 30 September 2024, a total contracted capacity of 1.1 GW of power plants outside the market is available as reserve for unforeseeable demand balancing events. These power plants must be available within a maximum of 12 hours and are activated in case of a lack of market clearance (D-1 and ID). They can also be used to resolve grid congestions.
- Special network equipment power plants: 0.9 GW of gas-fired power plants to restore grid stability, that can also be used for adequacy purposes.

Parts of the above-mentioned non-market resources have primarily a different purpose than coping with resource adequacy risks, such as congestion management. Therefore, non-market resources may already partly be exhausted for their primary purpose and not be available for resource adequacy purposes.

Additional remarks on the German data collection

The pumped-storage power plants (PSPs) of the “Kraftwerksgruppe Obere Ill-Lünersee” (turbine capacity: 2.1 GW; pumping capacity: 1.4 GW), which are installed in Austria but assigned to the German control block, remain in the German dataset. For the same reason, the pumped-storage power plant Kühtai and storage power plant Silz (total turbine capacity: 0.8 GW; total pumping capacity: 0.25 GW) are also included in the German dataset.

Load

In average over all climate years (1981 to 2019) for calendar years 2023 and 2024 a baseline demand of **517 TWh and 519 TWh** is forecasted respectively.
For Electric vehicles a climate year independent annual consumption of 6.9 and 8.3 TWh for the years 2023 and 2024 respectively is calculated. The consumption of heat pumps is on average 3.6 TWh for calendar year 2023 and 4.9 TWh for 2024. Data centers and Industrial sites have a climate year independent annual consumption of 6.6 TWh and 3.3 TWh for calendar year 2023 and of 9.9 TWh and 4.9 TWh for 2024.

In sum this results in a total demand of **538 TWh** (averaged over climate years) for 2023 and **547** TWh for 2024 with a load maximum of 88.5 GW for January 2024 with climate year 1987.

These total demand figures can be seen in relation to an average total electricity consumption (including grid losses) for the past 5 years (2018 to 2022) of 530 TWh according to BDEW publications. However, the underlying yearly figures show an ongoing decreasing trend with a total consumption of 514 TWh in 2022, which could result in a total consumption of below 500 TWh in 2023 according to latest statistical data and forecasts. Therefore, the German load time series used for winter outlook represent more conservative assumptions. In the ENTSO-E energy savings scenario an overall demand and peak load reduction of 5% is considered for Germany, which from today’s perspective seems to be the more realistic scenario.

Summer Review 2023

Low water levels in the rivers Rhine and Neckar and high temperatures led partially to reduced availability of affected power plants in Southwestern Germany due to cooling water supply problems. However, impact was negligible due to mostly low market prices and thus very low usage of hard coal fired power plants.

Reduction of gas deliveries from Russia did not affect the availability of gas for electricity generation.

Greece

Winter Outlook 2023-2024

For the upcoming winter, there is no scheduled maintenance of generation units. Nevertheless, there is a high possibility that scheduled unit maintenances maybe urgently extended in the heart of winter causing adequacy uncertainty in case of high demand.

There is no decommissioning of old units in comparison to last winter.

In addition, two new units (lignite and gas unit) are in commissioning mode operation and are expected to enter the electricity market within 2023.

Water reservoir levels are similar to last year.

IPTO is in continuous contact with the Gas Transmission System Operator to be able to initiate the switch fuel procedure in some bi-fuel units (gas to oil) in case of emergency. The operation with alternative fuel is limited to a few days and is only considered as an urgent countermeasure in case of lack of gas supply and not a continuous operation mode.

The total import capacity increased as the new interconnection line with ESO (Greece-Bulgaria) commissioned in June 2023. There are no scheduled maintenances or capacity limitations on any interconnection lines for the upcoming winter.

An increase on consumption during the upcoming winter is expected in comparison with winter 2022-2023 which was very mild regarding environmental conditions and global energy saving measures were applied.

The expected generation and import capacity are sufficient to cover Greek energy needs under normal conditions and we do not expect any adequacy issues given that Gas supplies will be continuous and redundant to cover domestic demand.

However, Greek system in case of scarcity Gas supplies, will be highly depended on import transfers during high demand periods in order not to face any adequacy issues in high demand peaks.

Summer Review 2023

In context, during last summer period (May 2023 to September 2023) an insignificant increase in average electricity demand was observed. Compared to summer 2022 there was approximately + 0.5% in average load during the 5 months period.

Hower, there were three consecutive heating waves during summer (second fortnight of July and first week of August) which caused very high electricity demand and stressed the Transmission System.

Especially in July the average load increased more than 10% in comparison with July 2022 and in August more that 6% in comparison with August 2022.

The heating waves were combined with extended fires in all Greek territory. The impact of fires was insignificant and only caused limited outages on the local electricity systems (lines under which the fire occurred).

In September due to the severe consecutive rainfalls and thunderstorms caused by Daniel & Elias severe storm phenomena, extended floods resulted in Central Greece (Thessalia Region), causing significant local load interruption, and leading out of order one double EHV OHL 400KV due to fall of tower. In addition, many PV parks were heavily damaged.

No adequacy issues recorded during summer period.

Hungary

Winter Outlook 2023-2024

Based on previous years' system loads and observed typical trends, we do not expect a new peak, except in extreme weather conditions. The continuously increasing PV generation in the Hungarian system can cause higher uncertainty in operational planning periods and real time system operation as well, which causes a higher level of reserve requirement even in the winter period. In order to secure the estimated reserve requirement, new improvements are expected to be introduced, such as IT developments and consumer participation in the balancing market. Furthermore, the level of maintenance is low and according to our expectations the almost constantly required import will be available over the period under review. In addition, network developments were made recently to improve operational security.

As preparation for the previous winter period MAVIR tested almost all of the gas power plants' ability to switch to oil as an alternative fuel and its impact for the power plants' balancing capacity. We found that while most of the gas power plants can use oil as an alternative fuel, it causes a reduction in some of their balancing capacity.

Altogether, the Hungarian power system is expected to be safe during this winter period. However, it is important to note that the oil embargo and a possible natural gas crisis could have unforeseen effects.

Summer Review 2023

On average, moderate system load was observed in the summer period of 2023 compared to the previous year. The maximum load (6626 MW) was reached on 28th of August, which is still below the historical and this year's peak load. Besides during this year as well as this summer period, the PV output has been exceeded several times, peaking on 12th of August with a value of 2729 MW. This can be explained by the high level of PV integration and the beneficial weather conditions. This is also one of the reasons why import was lower and export was higher than a year earlier. In addition, on several occasions significant downward regulation was necessary, once approaching 1050 MW.

Even though some maintenances were longer than expected, but they were carefully distributed in time in order to guarantee the system adequacy. Furthermore, our reserve procurement methodology has been renewed to match current challenges and conditions before the period under review, so the amount of balancing capacity available was sufficient to secure the occurring reserve requirement.

On a few occasions, the Hungarian system entered the Alert state due to IT and network problems, but these have all been withdrawn within a few hours. Despite the fact that we have faced some difficulties due to extreme weather condition among other things, fortunately last summer passed without any adequacy issues thanks to the careful planning beforehand.

Ireland

Winter Outlook 2023-2024

There is an expectation that the system will enter the Alert State at times over the winter period, most likely at periods of low wind and low interconnector imports. There is a reasonable probability of the system entering the Emergency State at times, due to insufficient generation being available to meet the demand. However, emergency protocols are in place with large energy users that would mitigate the impact on homes and businesses, where sufficient notice of an event can be provided (minimum of 1 hour). A key assumption underpinning the winter outlook analysis, based on best information available at the time of writing, is that there will be uninterrupted reserves of natural gas from both the Moffat terminal and the Corrib gas field, with no shortage issues.

Summer Review 2023

Generation margins remained tight in Ireland throughout the summer period. The Ireland power system entered the Alert state due to tight generation margins on one occasion during the summer period:

- 15:15 to 19:45 on 10/07/2022

Italy

Winter Outlook 2023-2024

Upward adequacy assessment

Import from neighboring countries is expected to be necessary to restore adequacy margins and to cover consumption during critical hours (+2.1GW), with lower necessity than previous winters.

The main drivers of this improvement are:

- An increase of the expected hydro production.
- An increase of thermal available capacity
- A decrease of electrical demand, compared to past winters.

Analyses estimate that the risk for adequacy is within standard levels.

Critical situations could happen in the unlikely case of high demand due to cold spell, low import from neighboring countries, or if unplanned outages rate of generation units is higher than the typical values.

Postponement and/or cancellation of maintenances could be used as countermeasures together with demand response measures and additional market interventions.

In addition, improved regional coordination processes (including regional weekly adequacy assessment - STA project and Critical Grid Situation process) will support the definition of proper and efficient countermeasures in case the risk of incurring in critical situations will be detected at short term horizon.

Generation capacity in Italy

In the last year renewable generation capacity increased by more than 4.5 GW. There was also a smaller increase in thermal power capacity, due to new power plants selected in capacity market auctions and repowering of existing power plants, for a total increase of 1.4 GW.

Currently the total amount of installed renewable (wind, solar and hydro generation) is around 63 GW and has exceeded thermal capacity, that stands at 62 GW.

Downward regulation assessment

The worst weeks for downward regulation are expected to be the last week of December and the first week of January, characterized by several public holidays. In order to guarantee system security, Terna could adopt enhanced coordination with neighboring TSOs and special remedial actions, such as the curtailment of inflexible generation. Further special actions, such as application of allocation constraints to transmission capacity, could be planned in cooperation with neighboring TSOs.

Summer Review 2023

During last summer, the electricity demand showed a decrease (-4.2%) as compared to the same period of the previous year.

The decrease in demand was partly due to the lower consumptions. In fact, the drop in demand, without considering the effect of temperature, is reduced to -2.1%. Temperature values influenced the trend of the demand, being the summer 2023 on average cooler than 2022, especially in May and June, with a trend inversion in the last part of the season. The summer peak demand continues its increasing trend in the recent years: in summer 2023 it was about 58.7 GW, higher than in 2022 (+2,3%). After the lower-than-average availability in summer 2022, the availability of hydraulic resource came back into its historical range.

Furthermore, during the past season there were no significant consequences on the system security, or on the electricity supply to consumers.

Latvia

Winter Outlook 2023-2024

No adequacy issues are expected for the Winter 2023-2024.

Summer Review 2023

No adequacy issues were recorded during the past season.

Lithuania

Winter Outlook 2023-2024

For this winter season net generating capacity in Lithuania will be 4444 MW. Most noticeable changes were made in renewable energy generation. Wind net generating capacity increased by 108% and solar by 127% compared to last winter. These numbers will be rising through winter due to the rapid growth of solar power and an addition of new solar park connected to the transmission grid.

Average mFRR for this winter will be 350MW.

No adequacy or downward regulation issues are expected for the coming season.

Summer Review 2023

In summer 2023, national consumption was 12% lower than in summer 2022. Maximum total load (1162 MW) was reached on 29th of August 2023.

In general, the summer balance portfolio consisted of 45% local generation and 55% imports from neighboring countries. During the summer of 2023, total generation was 39% higher compared with 2022 summer. Thermal generation from fossil fuel increased by 3%. Wind generation increased by 85%, solar power more than doubled (143%) compared with last year's summer. Hydro generation reduced by 10%.

Moreover, the total solar capacity has increased by 113% and wind powered turbines capacity increased by 86% compared to the end of the summer of 2022. Increase in installed capacities caused for first time in the history to generate an excessive amount of electricity in Lithuania.

Lastly, Lithuania has successfully performed the Isolated Island test.

Luxembourg

Winter Outlook 2023-2024

No adequacy issues are expected for the Winter 2023-2024.

Summer Review 2023

No adequacy issues were recorded during the past season.

Malta

Winter Outlook 2023-2024

No adequacy issues are expected for the Winter 2023-2024.

Summer Review 2023

No adequacy issues were recorded during the past season.

Moldova

Winter Outlook 2023-2024

Forecasted system adequacy risks:

- electricity supply depends strongly on gas in all winter scenarios;
- uncertain import availability from Ukraine;
- uncertain import availability from Romania;
- weak interconnection at MD-RO border;
- high dependence on one power source, situated in Transnistrian region;
- high vulnerability risks in case of high disturbances in UA power system.
- lack of flexibility in power system;
- inability to operate the market due to lack of balancing service providers;
- no possibility for cross-border balancing to increase liquidity on Balancing Market;
- no local DAM and IDM;
- high imbalances due to lack of DAM/IDM;
- no contracts on balancing market;

Preparations for Winter 2023–2024

Moldova take actions to prepare for the upcoming winter in order to mitigate possible negative impacts:

- risk preparedness with Government, ANRE, main market actors;
- emergency state decisions on Electricity Market;
- nomination of the state company “Energocom” as single buyer / seller of electricity for regulated utilities (TSO, DSO, Universal Suppliers);
- Energocom has long-term PPA with local power sources (MGRES, CHP, RES);
- electricity sources diversification policy (bilateral agreements with UA, RO and BG electricity traders);
- cross-border exchanges and regional cooperation with neighboring TSOs;
- implementation of INTRADAY capacity allocation processes on MD-RO border.
- analysis of the possibility for synchronous connection of 110 kV tie-lines at MD-RO border for operation in loop mode;
- technical measures performed by TSO, DSO's such as upgrading of internal power grid infrastructure, maintenance works and planned outage revisions are performing before the start of the heating season, fuel-switching at some gas power plants to alternative fossil fuel options;
- stocking gas in storage facilities in Ukraine and Romania;
- efficient demand reduction measures significantly decreasing system risk.

An overview of the power system of Moldova

The power system of Moldova is part of joint Moldova and Ukraine LFC block. Following emergency synchronization, UA/MD control block was included into the FSkar mechanism.

The emergency electricity grid synchronization and the energy crisis shifted the focus to diversification of energy sources and ensuring security of supply.

Moldovan transmission system operator, Moldelectrica, was certified by the national regulator ANRE in July 2023. The next step to be done is to obtain the Observer status at ENTSO-E.

The new Wholesale Electricity Market based on Pan-European model was launched in June 2022, however electricity market reforms are still to be sped up, including the nomination of a Market Operator as well as launching DAM and IDM and introducing day ahead and intraday market coupling as a mid-term target.

The breakaway territory located within Moldova – Transnistria has a high degree of autonomy and its own government, including control over its energy sector. The largest power generation source – Moldavskaya GRES is owned by the Russian company Inter-RAO and located in Transnistria.

Due to emergency state declared by the Parliament on 24th February 2022 following unstable situation in the region (and extended until 31st December 2023), the implementation of market rules is constrained by Emergency Commission decisions. Namely, a public service obligation was imposed on the state-owned trader Energocom to directly negotiate contracts for the supply of electricity and sale to Moldovan market participants, instead of competitive procurement.

Figure 1 General overview of the power system of Moldova

Generation overview

Moldovan electricity sector relies on limited power generation sources, the main source of electricity being thermal power plants operating on gas, coal and oil, with a total installed capacity of 3000 MW. Some power units have technical possibility to operate both on natural gas and coal (flashing by gas) or natural gas and oil.

Table 1: Generation overview in Moldova's system

#	Description	Primary source	P_{inst}, MW	Available capacity (per primary source)			Location
				Gas P_{av_gas}, MW	Coal P_{av_coal}, MW	Oil P_{av_oil}, MW	
1	CHP-1 Chisinau	Gas	66	56	–	–	RB
2	CHP-2 Chisinau	Gas (alt. oil)	258	258	–	258	RB
3	CHP Balti	Gas	37	37	–	–	RB
4	HPP Costesti	Hydro	16	–	–	–	RB
5	RES	Wind, solar, biogas	205	–	–	–	RB

6	Moldavskaya GRES	Gas (alt. coal, oil)	2520	920 (+600[1])	800[2]	-	TR
7	CHE Dubasari	Hydro	48	–	–	–	TR

Two CHP plants in Chisinau operated by Termoelectrica, one CHP plant in Balti and a hydropower plant in Costesti, all together can cover up to 20% of electricity consumption of the right bank (RB) of the Dniester river.

The main electricity source, gas-fired power plant Moldavskaya GRES, with installed capacity of 2520 MW is owned by the Russian company Inter-RAO and located in Transnistria, covers up to 80% of consumption.

Renewables represent 6-7% of Moldova's energy mix, consisting of hydro, wind, solar and biogas units.

Demand overview

Electricity demand structure shows that approx. 50% of energy consumed by households and industry consume less than 10%.

Electricity demand in Moldova is characterized by a winter peak demand. The typical load variation in the winter season, based on 2022 operational data, is between a minimum base load of 500 MW and a maximum peak load of 1100 MW, while in the summer, it varies from a minimum of 410 MW and a peak load of 900 MW.

The right bank region of the Dniester river consumes approx. 70% of the total energy consumption; Transnistrian region consumes approx. 30%.

Electricity consumption dropped by 3% in 2022 due to energy crisis and energy efficiency programs implemented by the government aiming the reduction of electricity demand.

The reference scenario, based on TSO estimates, shows electricity demand with usual variability, comparable with last winter. The highest demand in Moldova is expected from mid-January until mid-February, although actual weather conditions will also have large impact.

Interconnection with neighboring countries

Moldovan electricity network is fully integrated and interconnected with the networks of its regional neighbors and runs in parallel with Central European grid.

High-voltage Interconnections with neighbouring countries include 21 110 – 330 kV tie-lines with Ukraine and 5 110 – 400 kV tie-lines with Romania.

1) Moldova – Ukraine border:
    - Unilateral daily auctions run by UA party (D-2 basis);
    - NTC MD>UA and UA>MD allocated by Ukrenergo is 0-800 MW;
      Due to current situation in UA, actual availability is subject of restrictions, which can limit IMPORT / EXPORT capability;
    - Next steps: harmonized yearly/ monthly/ daily joint allocation rules agreed between Moldelectrica and Ukrenergo.
2) Moldova – Romania border:

    - Joint auctions started on 11 October 2022;
    - Daily joint allocation run by RO party (D-1 basis);

[1] *coal capable units can provide up to 600MW on gas.*
[2] *coal capable units can provide up to 600MW on gas.*

- ATC is based on splitting rules of UA/MD control block limited by the RGCE decision (UAMD IN: 1200 MW; UAMD OUT: 400 MW).
    - ◊ under current situation, when UA has commercial exchanges with SK and PL, Moldova can use 33% of total capacity;
    - ◊ starting from November 2023, when UA launches commercial exchanges with RO, Moldova's share drops to 25% of total capacity;
    - ◊ if allocation would be performed on all UA/MD control block borders (expected at mid-January 2024), then Moldova could use only 15% of total block ATC (184 MW).
- Next steps: monthly auctions & intraday auctions.

Summer Review 2023

No adequacy issues were recorded during the past season.

Montenegro

Winter Outlook 2023-2024

No adequacy issues are expected for the Winter 2023-2024.

Summer Review 2023

No adequacy issues were recorded during the past season.

Netherlands

Winter Outlook 2023-2024

No adequacy issues are expected for the Winter 2023-2024.

Summer Review 2023

No adequacy issues were recorded during the past season.

Northern Ireland

Winter Outlook 2023-2024

No adequacy issues are expected for the Winter 2023-2024.

Summer Review 2023

On 10/07/2023 at 15:15 a System Alert (Amber) was triggered due to trip of conventional plant. At this time, a further three conventional units were all unavailable before the event. The alert was triggered because the unavailability of conventional generation sets meant the system was in breach of operational security constraints which states Northern Ireland must have minimum 3 conventional units on at all times. On this day in question Northern Ireland was limited to running with two units. During this time there was no immediate risk to security of supply due to high availability of renewable generation and sufficient interconnector support from Great Britain and Ireland. The alert was cleared at 19:45 when an additional unit returned from forced outage.

North Macedonia

Winter Outlook 2023-2024

No adequacy issues are expected for the Winter 2023-2024.

Summer Review 2023

No adequacy issues were recorded during the past season.

Norway

Winter Outlook 2023-2024

We don't expect any adequacy problems in Norway for the upcoming winter season.

This is somewhat opposite of what was the situation last year, when there was a worry about the energy supply in Southern Norway. This worry was caused by high power prices, high export, new cross-country connections, low reservoir fillings and uncertainty about needed import in the spring due to the energy situation in Europe. This situation changed (last autumn and winter) due to high precipitation, more water savings in the reservoirs and improvement in European energy situation.

The reservoir levels have been satisfactory during 2023 and are well above middle fillings. It is important to be aware that the adequacy issue in Norway still is more a question of lack of energy than lack of capacity.

Compared with last winter, the power prices have also been much lower, which is caused by high reservoir levels, internal bottlenecks, lower demand, lower fuel and lower power prices in connected countries. The southernmost area (NO2) is more exposed to continental prices. On the other hand, it must be mentioned that the governmental price subsidies for households will be continued (at least until the end of 2024), as well as the monitoring of production (and reservoir levels) from the major generation units in southern Norway. The intention of this reporting is to save water in the reservoirs in case of strained situations. Anyhow, the main driver for the adequacy situation in Norway is the weather, which historically has been rainfall, but wind has become more important the last years.

If it will be a wet or normal winter, we don't expect any shortages. If it turns out to be a very dry winter combined with long-lasting failures on large generating units and foreign connections, the situation may change. Anyhow such a strained situation is more likely to appear in the spring, meaning that this may be an issue for the summer outlook rather than the winter outlook.

In the longer mid-term perspective, there are some worries about the adequacy in Norway. This is due to a huge amount of new industries and electrification of offshore platforms waiting for grid connection. The grid is planned to be upgraded to reduce the internal bottlenecks. On the other hand, there are some worries if generation capacity will increase enough to match the demand in the next years. After about 2030 it is expected that offshore wind power will improve the balance. In the meantime, adequacy may be an issue, both from an energy and capacity point of view.

Summer Review 2023

No adequacy issues were recorded during the past season.

Poland

Winter Outlook 2023-2024

Input data.

For the Winter Outlook 2023/2024, no constraints on hard coal availability are expected in Poland. However, there are limitations with regards to lignite availability one of the lignite power plants (capacity of c.a. 1000MW), resulting from depleted lignite stocks and upcoming closure of the power plant - these constraints limit the available capacity and amount of possible generation for this power plants quite significantly. For the other two remaining lignite power plants, lignite supply restrictions shall not impact the available generation capacity, while the total possible generation of these plants might be slightly limited.

As for the previous winter, in order to avoid providing an incorrect picture of the situation with possible level of Polish export / import, PSE provided an estimate of allocation constrains for analysed time period. Given the fact, that the current fuel supply situation is significantly better that in the previous winter, these constrains are much less conservative than the last year values. It is however to be recalled that the actual allocation constraints are calculated daily, with best available up-to-date information, and might differ from the estimated values provided for the purpose of Winter Outlook 2023/24. For detailed description of the allocation constraints and the reasons for its application, see Polish country comments from Winter Outlook 2022/2023 here.

Adequacy situation:

Winter Outlook simulation shows no adequacy risk in Poland for coming winter. In case the situation worsens and a shortage does occur, PSE can activate a number of remedial measures to manage such shortages. One of such measures is activation of resources contracted under the Polish Capacity Market, which includes generating units and DSR. When PSE announces a system stress event and calls upon the resources contracted under the capacity market to be activated, all these resources are obliged to deliver their obligations. These obligations are applicable for all contracted resources, meaning that all generators and all DSR units must react adequately (it is thus non-selective).

Summer Review 2023

Due to the RES development observed, especially PV sources, PSE experienced the downward regulation problems on days with high RES infeed, PV in particular. It happened in days with low demand as weekends and in working days too during high wind infeed. Switching off of PV installations was necessary (as the very last measure according to **2019/943 Regulation Article 13.6. (a)** *„power-generating facilities using renewable energy sources shall only be subject to downward redispatching if no other alternative exists or if other solutions would result in significantly disproportionate costs or severe risks to network security"*) in order to recover downward regulation possibility just after energy emergency exchange to neighbouring TSO were exhausted.

It's worth saying, that PV switching off has been becoming a big challenge as most of capacity is disconnected from the 110 kV & medium voltage network, sometimes can be performed only manually.

Portugal

Winter Outlook 2023-2024

Portuguese national studies are performed using high detailed modelling, taking into account the specificities of the system, namely hydro generation.

As required by the current Portuguese national legal framework, REN collaborates with the Portuguese General Directorate of Energy in the elaboration of the annual National Adequacy Assessment Monitoring Report to identify the mix of resources required to comply with the reliability standards in force. The National Adequacy Assessment Monitoring Report (RMSA-E 2023) is currently under preparation and will address electricity security of supply for the horizon 2024–2040.

Although not fully comparable with Winter Outlook performed by ENTSO-E in terms of methodology and assumptions, on the expected report (RMSA-E 2023), for year 2024, it is foreseen that there will be some risk of dependence of the Portuguese system on imports from Spain and noncompliance with the current national reliability standards. Under these conditions, some mitigating measures may be necessary to handle operational reserve needs and ensure security of supply, as listed below:

#	Measures
(Demand)	Load reduction market product for eligible consumers with whom there are annual contracts for the provision of this service
(Supply)	Request for the activation of a support program with the Spanish System Operator
(Demand)	Occasional load shedding of non-priority consumptions, according to the protocol between the electricity transmission and distribution network operators

In RMSA-E 2023, load reduction needs (1st measure identified) will be identified, depending on hydro conditions. For this purpose, an auction for specific market product will be launched by the Portuguese NRA.

As mentioned in the Winter Outlook report, the security of electricity supply in Portugal is highly dependent on generation from natural gas. However, no risks for the gas supply are expected during winter as long as there is no stress in the gas markets (in the end of October the level of underground gas storage of 3.8 TWh was completely full).

Summer Review 2023

As expected, no adequacy issues were found during 2023 summer season and system's operation was performed without trouble as heat waves were less prevalent and severe than in recent years. However, temperatures were in general above the average so demand has increased from previous year levels.

During summer, conditions were favorable to renewables, in particular to wind power generation that performed above the average. In August renewables supplied about 46% of national demand, with a significant contribution from solar whose installed capacity has seen a large increase. Hydro storage was in a 10 year record highs.

However, essentially for market reasons, the generation/demand balance was met with a large contribution from imports.

Romania

Winter Outlook 2023-2024

Transelectrica expects possible adequacy issues for winter 2023 – 2024. In the case of the peak loads, the consumptions cannot be covered by the own resources in the absence of production in the wind and solar power plants. The consumption coverage can be achieved by importing from neighboring systems if electricity is available in the region. The situation will be critical in the case of unexpected unavailability of other generation units. The existence of sources available for export at the regional (European) level has a high degree of uncertainty.

Other aspects that will increase the risks for adequacy are the following: high values of the consumption at peak load, estimated decrease of the production in classical power plants, low production in solar power plants during the winter season, volatility of the wind power plants, limited capacity to compensate the deficit through the hydro power plants, lack of storage and demand side response, needs to supply Ukraine and Republic of Moldova.

Summer Review 2023

No adequacy issues were recorded during the past season.

Serbia

Winter Outlook 2023-2024

For the upcoming winter, the situation in the transmission system is stable, but in exceptional situations, problems in the supply of electricity to consumers can be expected and, therefore, a reduction of commercial and industrial consumers in the territory of the city of Belgrade and in the Kolubara region. By the end of November 2023, it is expected that all regular works on the maintenance of the transmission system (power lines and transformer stations) will be completed in preparation for the upcoming winter period.

Problems to cover demand might occur at extremely high peak loads under severe weather conditions, especially in January and February 2024, and then energy imports will be required.

Summer Review 2023

The last summer passed with some unexpected problems. Due to the mild winter of 2022/23. and a favorable hydrological situation in 2023, the prices of long-term stock exchange products of electricity have fallen compared to the record high prices in 2022, while on the day-ahead market the volume of trading is noticeably higher compared to previous years, and the price of electricity has stabilized at higher level than previous years. During 2023, investment projects were intensively implemented, both in the part of the reconstruction/construction of the transmission line and cable network (DV/KV), as well as in the part of the reconstruction of substations and switchgears (TS/RP). The implementation of investment projects achieves: increasing the reliability of the transmission system and the safety of power supply to consumers, renewing the infrastructure for electricity transmission, increasing transmission capacities, more efficient management and reducing losses in the transmission system, which in total contributes to a more reliable and safer supply of electricity to users/consumers on high voltage before the upcoming winter season 2023/2024. The reconstruction of high-voltage lines and facilities extends the life of facilities and improves the health index of the equipment.

On July 25, SEEPEX (Serbian Power Exchange) successfully launched the Serbian continuous intraday electricity market. The launch of the SEEPEX continuous intraday market represents a significant step towards completing the market framework and forming a unique regional solution for electricity trading in Central and SE Europe.

Slovakia

Winter Outlook 2023-2024

No adequacy issues are expected for the winter 2023-2024.

Summer Review 2023

No adequacy issues were recorded during the past season.

Slovenia

Winter Outlook 2023-2024

For the upcoming winter we don't expect any adequacy issues. Recent discovery of a minor fault in primary circuit of our nuclear power plant Krsko (NEK) resulted in a planned outage of this unit, expected to be finished by 30th of November. Fortunately, this period is usually of relatively low load and we expect our import capacities and reserves to be more than sufficient.

Update 10/11/2023: Based on latest information nuclear power plant Krško will be back online on 17th of November 2023.

Summer Review 2023

No adequacy issues were recorded during the past season.

Spain

Winter Outlook 2023-2024

No adequacy issues are expected for the Winter 2023-2024.

No gas supply issues are expected. However, the importance of the electricity generation from combined cycles and gas supply in Spain shall be highlighted.

The level of hydro reserves is at 37% in the end of October, which is 4% lower than the ten-year average value but 11% higher than the level of hydro reserves in the end of October of last year.

Summer Review 2023

No adequacy issues were recorded during the past summer.

Demand decreased substantially, despite high temperatures. Electrical demand decreased 5% in July and 2% in August 2023 compared to the same months of the previous year. Measures to reduce consumption and self-supply were the main drivers for demand decrease during summer.

Sweden

Winter Outlook 2023-2024

No adequacy issues are expected for the upcoming winter. The adequacy situation is improved compared to the previous winter due to higher filling levels of hydro reservoirs and higher expected availability of nuclear units. The filling level in Swedish reservoirs was 80% by the end of October, helped by low hydro production during June-August and a wet summer.

Summer Review 2023

No adequacy issues were recorded during the past season.

Switzerland

Winter Outlook 2023-2024

No adequacy issues are expected for the Winter 2023-2024.

Summer Review 2023

Switzerland experienced its fifth hottest summer since 1864. There were two strong heat waves north of the Alps and three strong heat waves south of the Alps. The amount of precipitation was below the average in Western Switzerland; in canton Valais, in Southern Switzerland and in Eastern Switzerland the amount of precipitation was equal to or slightly above the average. The insolation was above the average.

The loading of the grid was high, chiefly on the lines crossing the Swiss Alps. In order to mitigate the bottlenecks, exceptionally high quantities of redispatch energy were necessary. The unplanned load flows were high, especially on the borders to Germany and to France. Especially in August, more measures for reducing the voltage had to be taken. The ability to regulate was ensured almost all the time.

Turkey

Winter Outlook 2023-2024

No adequacy issues are expected for the Winter 2023-2024.

Summer Review 2023

No adequacy issues were recorded during the past season.

Ukraine

Winter Outlook 2023-2024

The significant attacks and damage to Ukrainian energy infrastructure with the onset of Russian attacks to Ukraine starting in February 2022, continues during 2023 and causesan increased levels of risk and uncertainty of generation and grid infrastructure guaranteed availability over the future winter season. This situation stimulated the fulfillment of unprecedented restoration and renovation programs of existing power equipment and implementation where possible additional missile strikes safety measures during summer 2023 including several programs realised by Ukrenergo (Ukrainian TSO), e.g., aimed on NTC increase with neighboring countries.

The result of simulations for coming winter season proves acceptable level of Ukrainian Integrated Power System adequacy under the situation close to the current one, which whilst will require higher as usual volumes of natural gas consumption by generation and some minimal required electricity import during whole winter season (table 1). But in most risky scenario, in cases of massive hardly predictable damage of generation equipment and grid infrastructure the amount of electricity import and natural gas consumption could be higher, or it could cause the load shedding.

2023			2024		
October	**November**	**December**	**January**	**February**	**March**
70	150	60	40	20	20

Table 2 Projected Monthly Volumes of Electricity Import to Ukrainian Integrated Power System, GWh

Summer Review 2023