# Electricity and gas supply in Ukraine: Winter 2025/26

## Update January 2026


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- Vladyslav MIKHNYCH, Rouven STUBBE, Georg ZACHMANN



20 January 2026 – V2.3

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Federal Ministry of Research, Technology and Space

The following four slides, developed **after the massive attacks on 6-7 January 2026**, are **an update to the main version of this slide deck which was originally published at the end of November 2025**. Due to the dynamic situation surrounding the power and energy sector in Ukraine, regular updates are necessary to keep policymakers from Germany, the EU, and Ukraine as well-informed as possible.

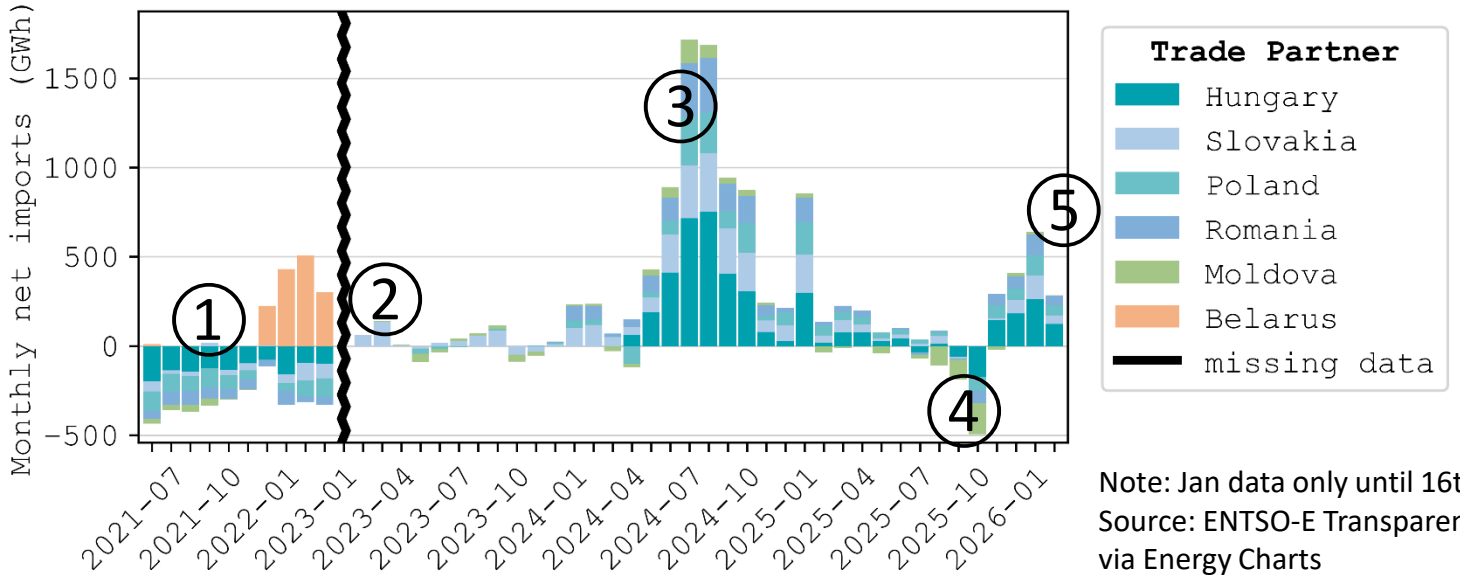
**Content:**



Disclaimer to the reader: Developments in Ukraine occur rapidly during wartime. Information in this slide deck may become outdated at any time.

# January marks fourth consecutive month of net electricity imports

**Ukraine Cross-Border electricity trade – monthly net imports (GWh)**




Note: Jan data only until 16th
Source: ENTSO-E Transparency via Energy Charts

Changes in NTC:
1.7 -> 2.10 GW (Dec 2024)
2.1 -> 2.30 GW (Dec 2025)
2.3 -> 2.45 GW (Jan 2026)

① **Prior to February 2022**, Ukraine was a net electricity exporter, integrated within the IPS/UPS system.

② **After full invasion**, synchronization with ENTSO-E in early 2022 accompanied by a loss of imports from Belarus.

③ **Strong import surge** in mid-2024 (over 1.5 TWh/month) to cover domestic shortfalls after Russian attacks in spring 2024.

④ **Following capacity repairs in 2024,** imports stabilised, declined and net exports restarted from mid-2025 onwards.

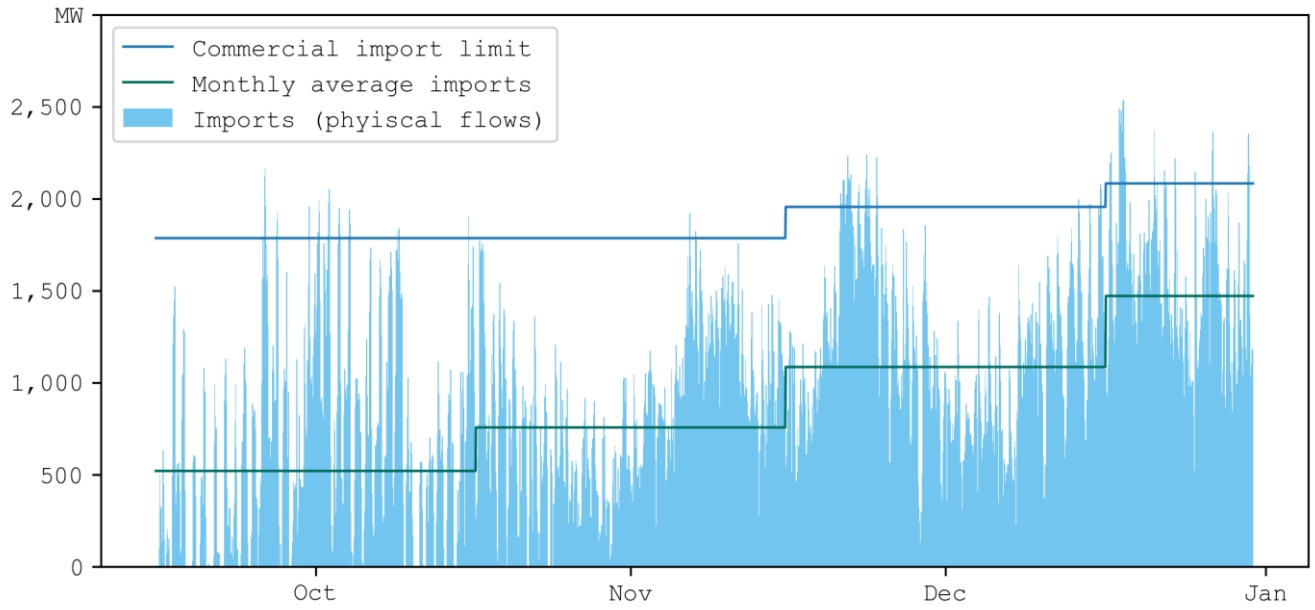
⑤ **Import dependency rises again in October 2025** following further attacks by Russia. December 2025 saw highest volume of imports since January 2025

# Power flows and deviations from import limits

- The volume of necessary imports has been determined in recent months primarily by the level of domestic production capacity and less by price differentials.
- **An increase in commercial import limits** in December 2024, December 2025, and January 2026 has directly led to an increase in monthly imports in each case.
- **A decline in imports** is always a sign that capacity is being brought back into operation, such as at the beginning of December 2025 after restoration of more than 1 GW of thermal capacities

- The figure depicts the transmission flows and import limits for Ukraine
- In most hours, imports remain largely below the limits.
- Exceeding the import limits is particularly evident after attacks (such as beginning of November 2025 and in January 2026).

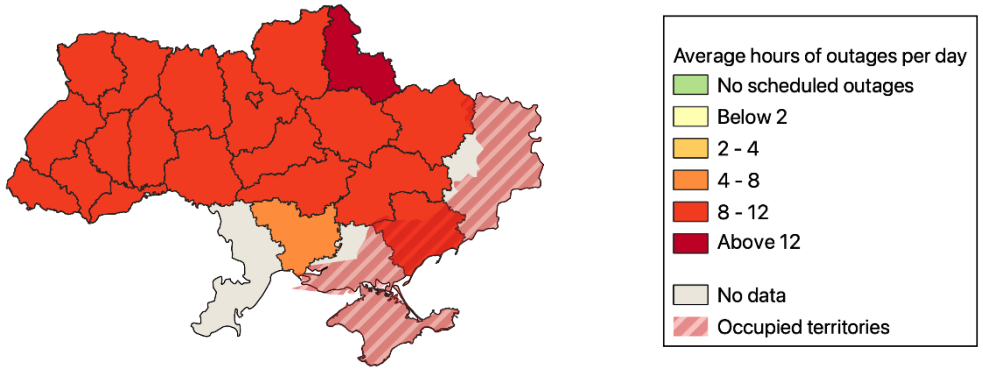
**Electricity imports and limits (UA) End of October 2025 – January 2026**



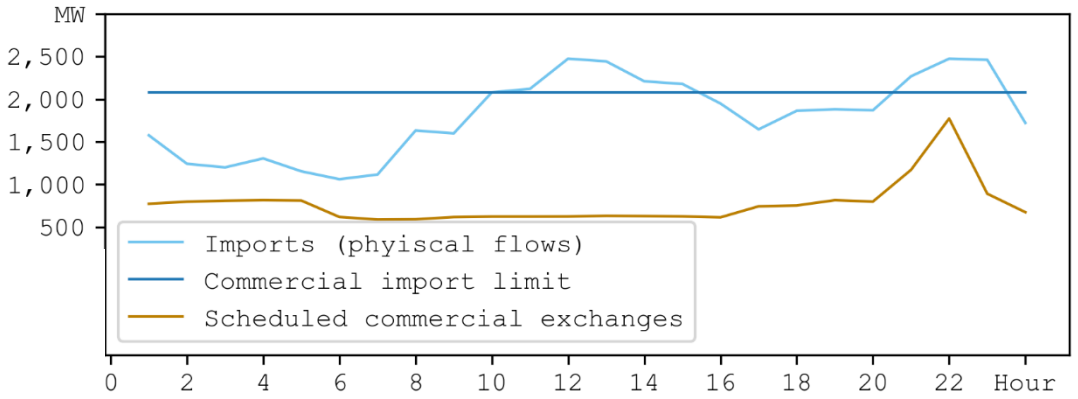

Source: Based on ENTSO-E Transparency platform
Note: Commercial import limit for Ukraine based on maximum import limit for Ukraine-Moldova block (2450 MW since Jan. 2026) and splitting rule between Ukraine and Moldova (85%/15%)

# Counterintuitive data, an analysis for 13th of January

***Outage schedules, hours per day for 13th January 2026***

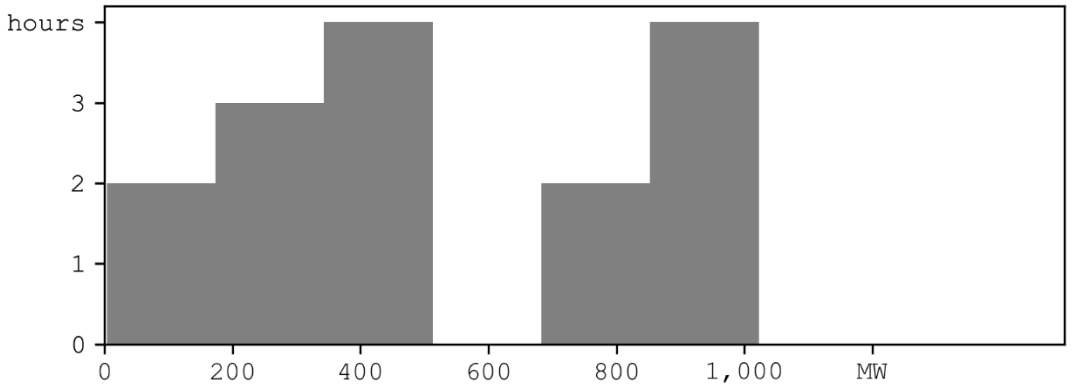



***Physical imports on 13th January and commercial import limit (Ukraine)***




While power outages lasting approximately 10 hours were planned for the entire territory of Ukraine on January 13, the import limits were reached in just four hours. In eight hours, more than 1000 MW of import capacity was not used.

***Histogram of deviation from import limit (unused capacities) for 13th January***




Source: GDU assessment based on ENTSO-E Transparency platform
Note: Commercial import limit for Ukraine based on maximum import limit for Ukraine-Moldova block (2450 MW) and splitting rule between Ukraine and Moldova (85%/15%)

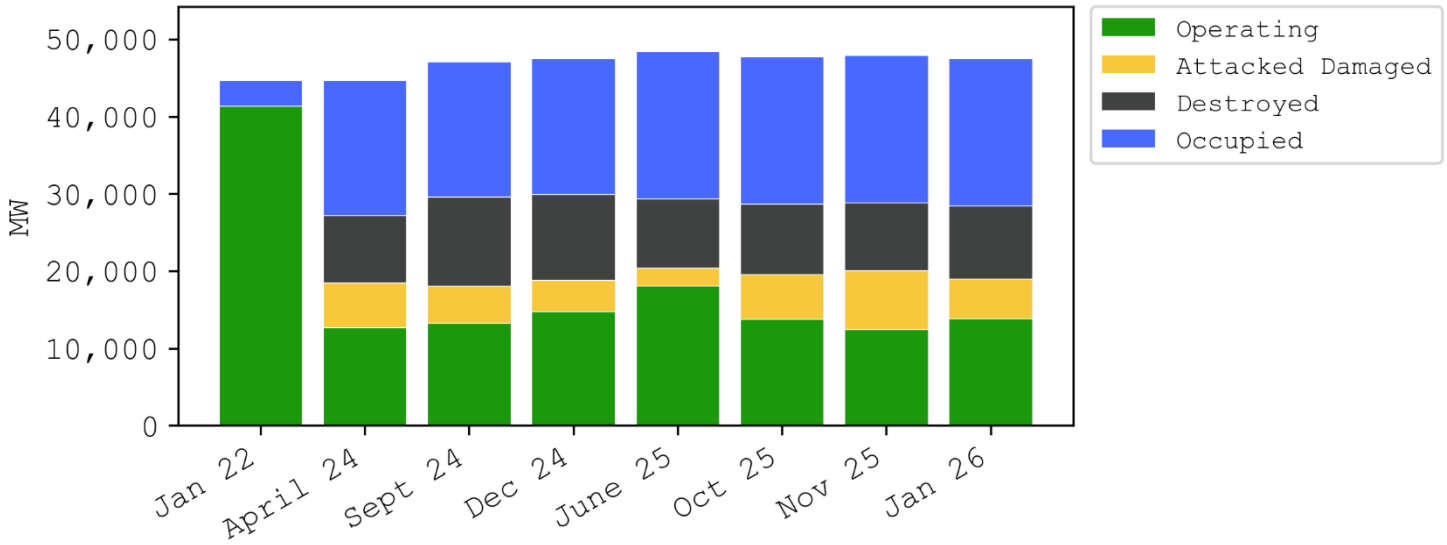
**The following explanations should be considered:**

- Incorrect data at ENTSO-E
- Significant bilateral contracts, not covered by the data
- Significant deviation of planned outages from actual outages
- Inefficient planning of outages and capacity provided abroad
- Balancing reserves (or voltage support) requires a certain amount of spinning capacities within Ukraine (or certain regions), preventing higher shares of imports
- Severe technical constraints on Ukraine's internal grid
- Import price caps hinder more commercial flows and thus physical flows

*unlikely*, *possible*, *likely*

# ~ 1.4 GW capacity returned to operation from December 2025 to January 2026

**Installed capacity by operating status over time (excluding wind and PV capacities)**



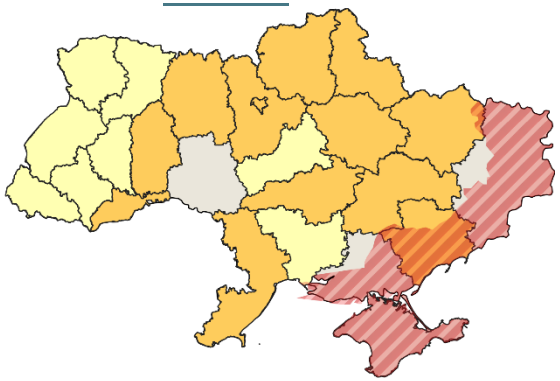

Source: GDU assessment

- Conventional plants have been repeatedly subject to **attacks by Russia, damaging the already old, inefficient infrastructure**.
- Destruction from **attacks in October 2025 mainly affected CHPs, and infrastructure at DSO level**, such as transformers.
- Due to occupation and destruction, **renewable energy capacity fell from 9.6 GW (January 2022) to 7.4 GW in October 2025**.
- **November 2025 attacks** have hit coal-plants particularly hard, dropping available conventional capacity below 13 GW for the first time since April 2024.
- Repairs over the last month have restored around 1.4 GW of net capacity (majority thermal) when accounting for more recent attacks in December/January.

# Scheduled power outages for household consumers by Oblast (ø hours per day)

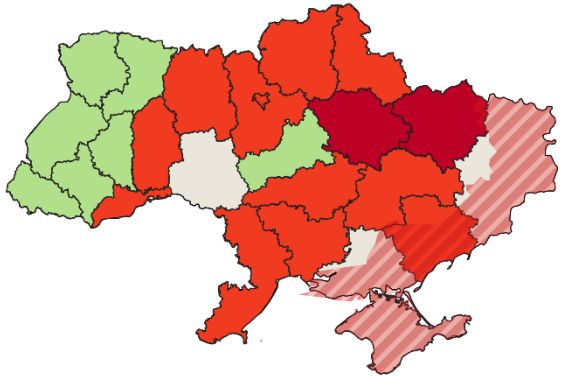
**27 October – 2 November**

**Before attacks on 7-8 November**



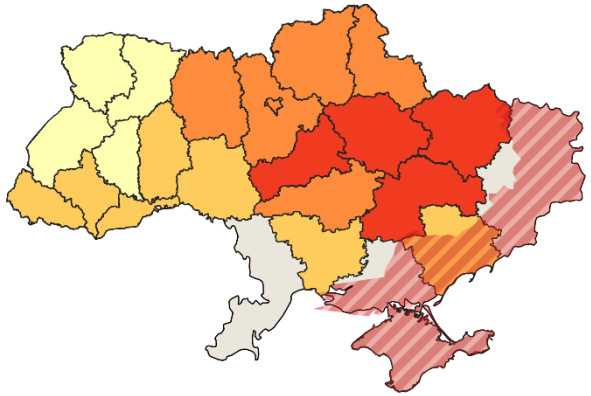
**10 – 16 November**

**After attacks on 7-8 November**



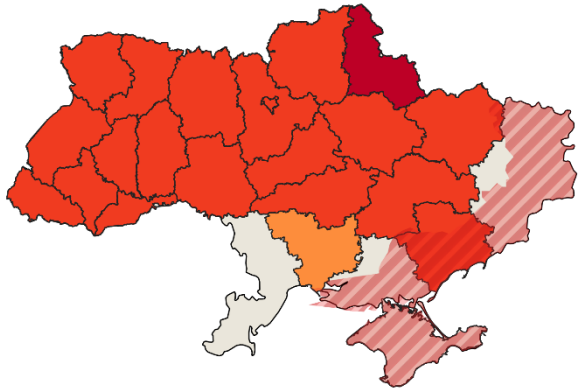
**2 January – 8 January**

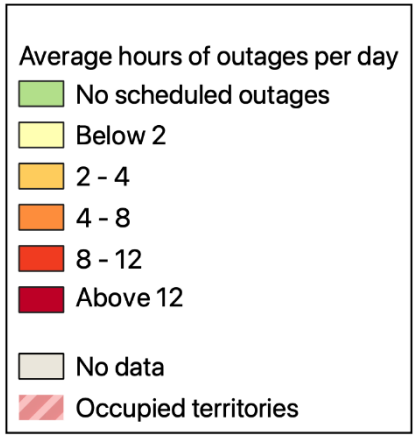
**Update for start of 2026**



**13 January**

**After attacks on 6-7 January**






Source: GDU assessment based various local DSO posts

# Governance problems have become apparent in 2025

**At Ukrenergo:**

Showcased by power struggle within the Supervisory Board

1) **September 2024:** Ukrenergo-CEO Kudrytskyi was dismissed
2) **September 2025:** Attempts to undermine the powers of the supervisory board has resulted in an open conflict.
3) **October 2025:** Arrest of Kudrytskyi



**Since 2022, total KfW contract volume with Ukrenergo: EUR 450 mn.**

**At Energoatom:**

Energoatom was transformed into a joint-stock company in January 2024, and its Supervisory Board was appointed in June 2024. However, disputes over contracts, remuneration, and insurance delayed the board's operational launch until 2025. As a result, Timothy Stone, an international expert who had been selected as a member, resigned from the Supervisory Board.

Ministry initiated the "Great Nuclear Construction" initiative to expand the Khmelnytskyi Nuclear Power Plant by fitting Russian reactors never meant to be built there on 1980s infrastructure at up to $25 bn by 2030. Significant doubts this project can be delivered in a cost-effective way.

Ukrainian anti-corruption agencies launched a large-scale investigation into the energy sector, including alleged schemes involving Energoatom. Some individuals were allegedly involved in extracting kickbacks of around 10 %-15 % from contractors, including in work related to protective structures. An estimated $100 million may have passed through these illicit arrangements.

Government response: dismissal of the Justice Minister (a former Energy Minister) and the current Energy Minister.

November 2025: Cabinet of Ministers terminated the powers of Energoatom's supervisory board prematurely.

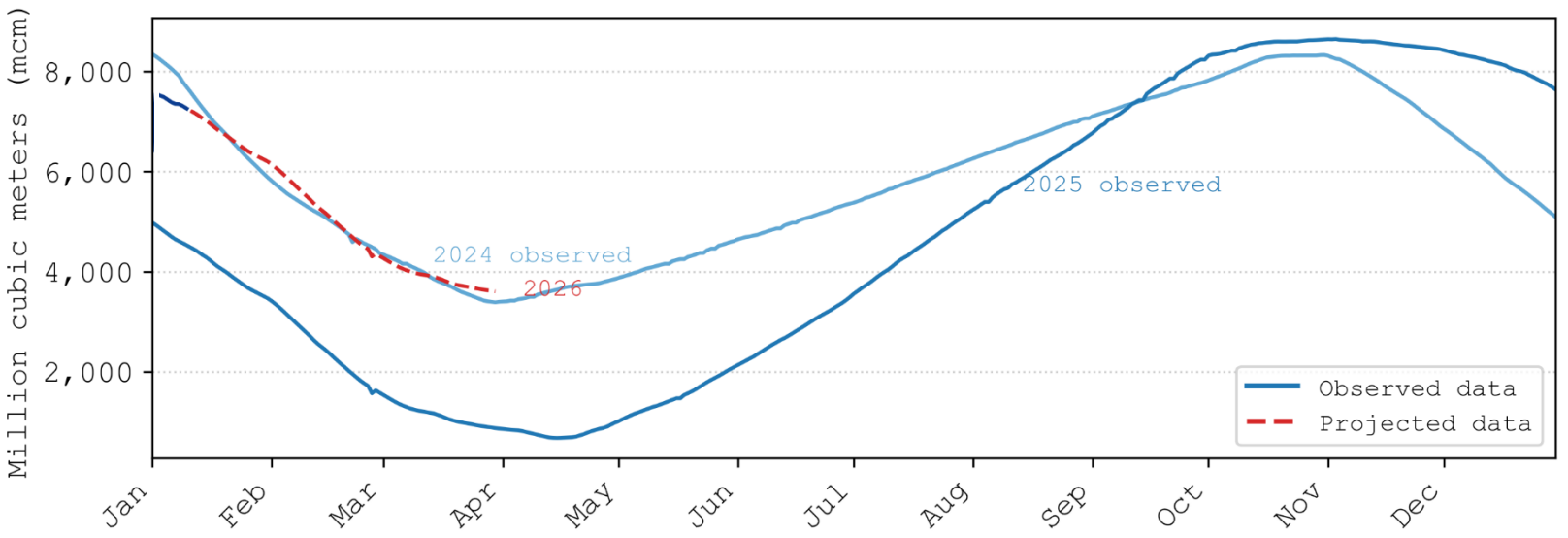
# and will lead to restructuring measures in 2026

- **Still in November 2025:** Approval of an action plan to update the composition of the supervisory boards and executive bodies of state-owned companies in the energy following OECD corporate governance guidelines; Implementation coordination is given to the Ministry of Economy

| State-owned Company | Proposed Measure | Developments so far |
|---|---|---|
| **Energoatom** | Formation of a new composition of the supervisory board | **Jan 2026:** four independent members appointed to the supervisory board of Energoatom |
| **Naftogaz** | Competitive selection for the supervisory board and formation of the Group's executive bodies *(Ukrgazvydobuvannia, Ukrnafta, Gas Distribution Networks of Ukraine)* | **Nov 2025:** open competition launched for Supervisory Board<br>**Dec 2025:** Rostyslav Shurma dismissed from his role in the Supervisory Board<br>**Jan 2026:** term of the current Supervisory Board expires |
| **Ukrhydroenergo** | Appointment of a state representative to the supervisory board; competition for the head of the executive body | **Nov 2025:** Korn Ferry appointed as the leadership advisory consultant to assist in the selection of the new General Director<br>**Jan 2026:** €75 million EBRD loan for modernization and restoration of hydropower facilities – which Ukrhydroenergo portrayed as a sign for international confidence into the company's governance |
| **Gas Transmission System Operator of Ukraine** | Update of the state representative on the supervisory board; completion of the competition for the head of the executive body | **Nov 2025:** competition for the new CEO was halted **Dec 2025:** powers of Supervisory boards terminated |
| **Ukrenergo** | Renewal of the state representative on the supervisory board | **Dec 2025:** creation of Ethics and Anti-Corruption Committee & approval of an anti-corruption plan |
| **Centrenergo, Ukrainian Distribution Networks** | Formation of a new composition of supervisory boards | **Dec 2025:** powers of Supervisory boards terminated |
| **Guaranteed Buyer** | Transformation into a joint-stock company and formation of a new supervisory board; renewal of the charters, regulations on supervisory boards and principles of their formation | **Dec 2025:** Cabinet of Ministers of Ukraine adopted a resolution establishing a joint-stock company "Guaranteed Buyer", but no transformation in corporate form yet |

# Storage levels have gradually returned to January 2024 levels

**Storage levels by week: 2024 - 2026 actual & projected**




Source: GDU assessment, based on data from AGSI
Note: Without technical gas

- Excluding technical gas, storage levels were refilled from less than 1000 mcm in May 2025 to around 8600 mcm by November 2025.
- If daily gas consumption and production in 2026 follow the same trends as 2025 (in terms of absolute injections/withdrawals in mcm), just under 4000 mcm would be left in storage by the end of the heating season, again excluding technical gas.
- This marks an improvement compared to the same period in early 2025, suggesting that repairs to domestic production facilities have been largely successful (based on unofficial sources) and imports were substantially ramped up.

# Conclusion and Policy Recommendations

- **Consider containerised solutions** to flexibly redeploy generators/turbines to most affected regions
- **Available import capacities** should be used more efficiently

→ this involves identifying the main bottlenecks/reasons for inefficient import schedules and addressing the root causes (incl. increasing/removing price caps on spot markets, etc.)

- **Import limits** should be increased if possible

→ regular revision of import limits by TSCNET, accelerated implementation of smart valve project by PSE at Rzeszów–Khmelnytskyi interconnector

- **Transmission bottlenecks within Ukraine** (esp. East-West transmission) should be addressed

→ including dynamic line rating (DLR)

- **Needs and priorities for next winter 2026/27** should be assessed by February/March 2026

→ support measures take several months to implement, proactive preparation is more efficient than only reacting during the winter

# Electricity and gas supply in Ukraine: Winter 2025/26

## Security of supply analysis following the November 2025 attacks

Robert Devon CARR, Frank MEISSNER & Vladyslav MIKHNYCH

26. November 2025 – V1.2

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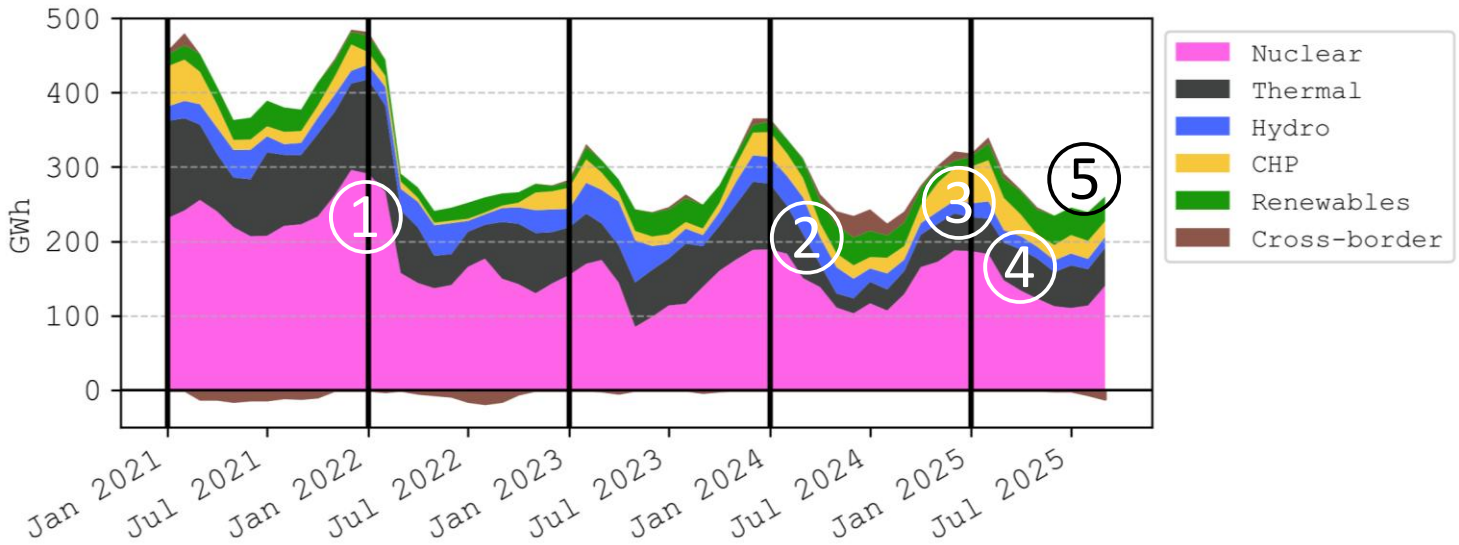
# Scope and boundaries of our analysis

- Since late October, **Russia's intensified attacks on Ukraine's** energy system have caused the previously manageable winter electricity supply situation to deteriorate rapidly. A reassessment of the security of supply is needed.
- Our analysis rests on ever-shrinking and **uncertain data**:
  - Publication of official data is restricted, so we depend largely on long-term monitoring of Ukrainian news outlets and social-media sources.
  - The status of generators, the grid and transformers remains unclear; local outages may be worse than projected here if electricity cannot be transported within the country or from imports.
  - We are working to close these gaps, i.e by monitoring satellite data and collecting outage schedules.
- We provide an **overview of the power and gas infrastructure as of mid-November** and a forecast of gas storage levels through the heating season, based on domestic production and expected import increases after the late-October destruction. Unconfirmed reports of a near-full restoration of gas-production are not included.
- We present expected power outages, using capacity data from mid-November 2025, assuming no further attacks and no countermeasures.
- Finally, we show how the duration of scheduled outages for households increased after the attacks in November.

# **Electricity sector:**
# Review of the last 3 years of Russia’s war on the Ukrainian energy sector

# Ukraine's electricity mix constantly adapts to Russian attacks

**Average daily electricity supply in Ukraine by month (2021 – present)**




**Since the start of the Russian aggression, four major disruptions to the power supply in Ukraine have been identified:**

① annexation of the **Zaporizhzhia NPP** in the winter of 2022 led to a loss of 6 GW of generation capacities,

② extensive destruction of **thermal capacities** in Spring 2024 resulted in significant generation losses,

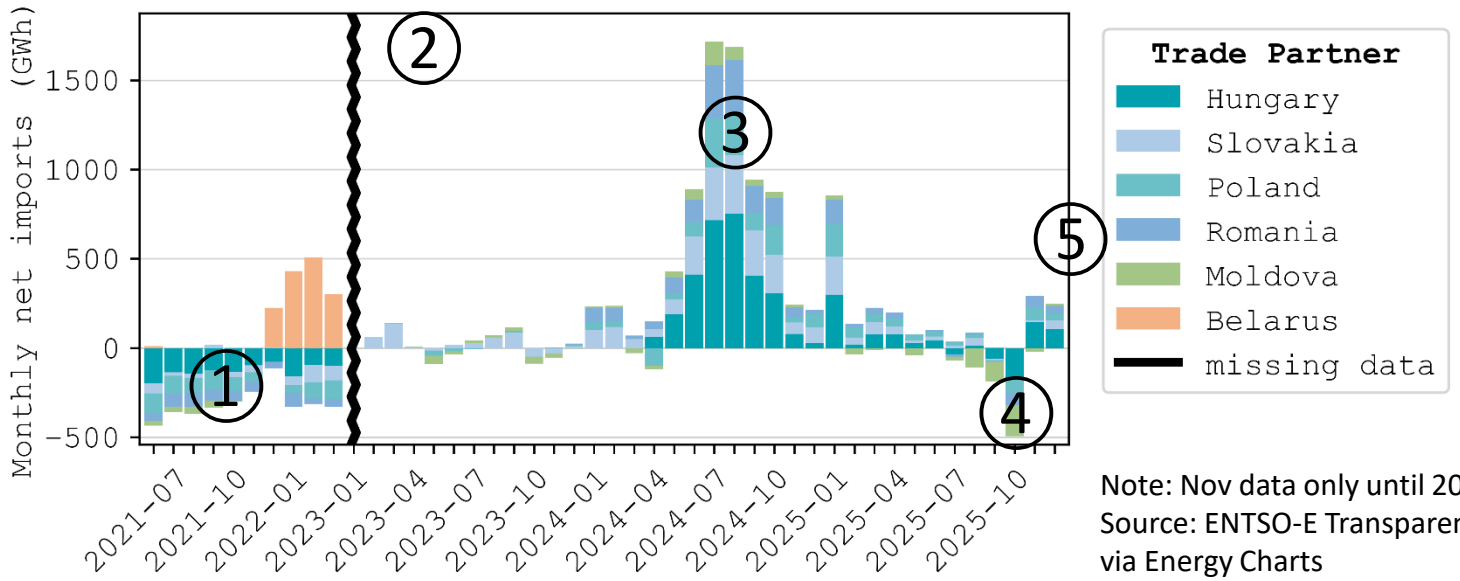
③ increase the **import limit for Ukraine** from 1700 to 2100 MW from 1st December 2024,

④ targeted attacks have continuously impaired **hydro capacities** - Ukraine's most flexible and fast-responding sources and

⑤ despite wartime damage and grid stress, **RES growth** remained resilient.

# Ukraine turned back to a net importer in October following recent attacks

**Ukraine Cross-Border electricity trade – monthly net imports (GWh)**




Note: Nov data only until 20th
Source: ENTSO-E Transparency via Energy Charts

① **Prior to February 2022**, Ukraine was a net electricity exporter, integrated within the IPS/UPS system.

② **After full invasion**, synchronization with ENTSO-E early 2022 accompanied by a loss of imports from Belarus.

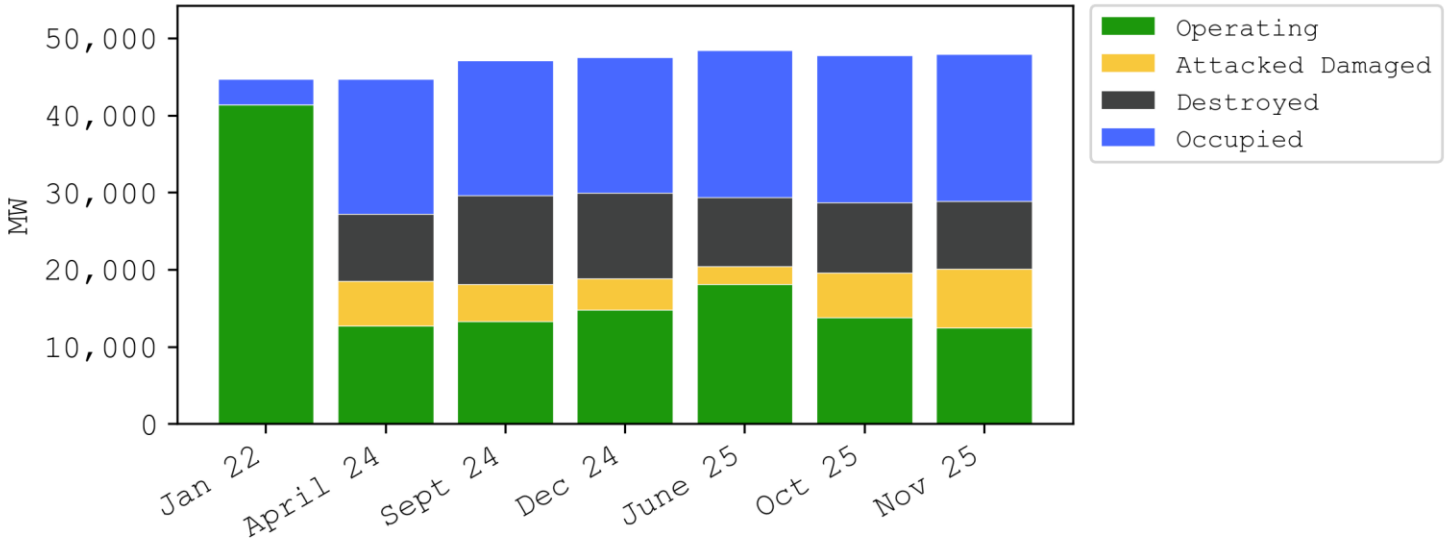
③ **Strong import surge** in mid-2024 (over 1.5 TWh/month) to cover domestic shortfalls after Russian attacks in spring 2024.

④ **Following capacity repairs in 2024,** imports stabilised, declined and net exports restarted from mid-2025 onwards.

⑤ **Import dependency rises again in October 2025** following further attacks by Russia.

# Successful repair campaign over the spring/summer month

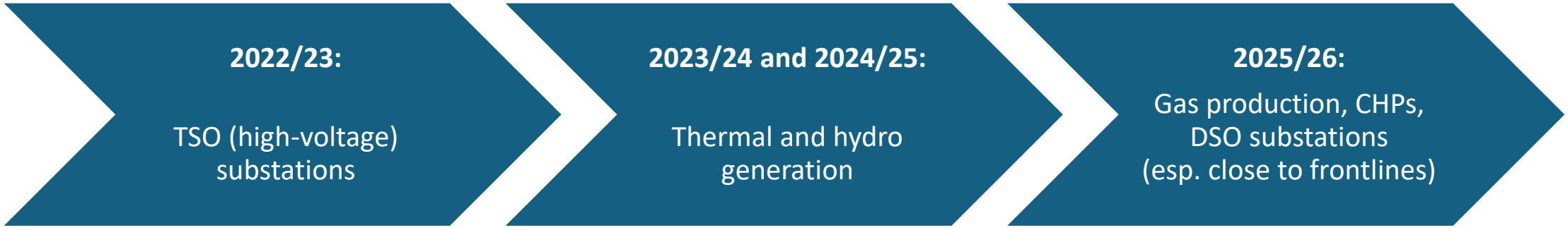
**Installed capacity by operating status over time (excluding wind and PV capacities)**




Source: GDU assessment

- Ukraine had **excess generation capacity before 2022**. This was particularly true for coal-fired power plants.
- Those were repeatedly subjected to **attacks by Russia, damaging the already old and inefficient infrastructure**.
- Destruction from **attacks in October 2025 has mainly affected CHPs, and infrastructure at DSO level**, such as transformers.
- Due to occupation and destruction, **renewable energy capacity fell from 9.6 GW (January 2022) to 7.4 GW in October 2025**.
- **November 2025 attacks** have hit coal-plants particularly hard, dropping available conventional capacity below 13 GW for the first time since April 2024.

# Russians employ a variety of strategies to damage UA energy infrastructure

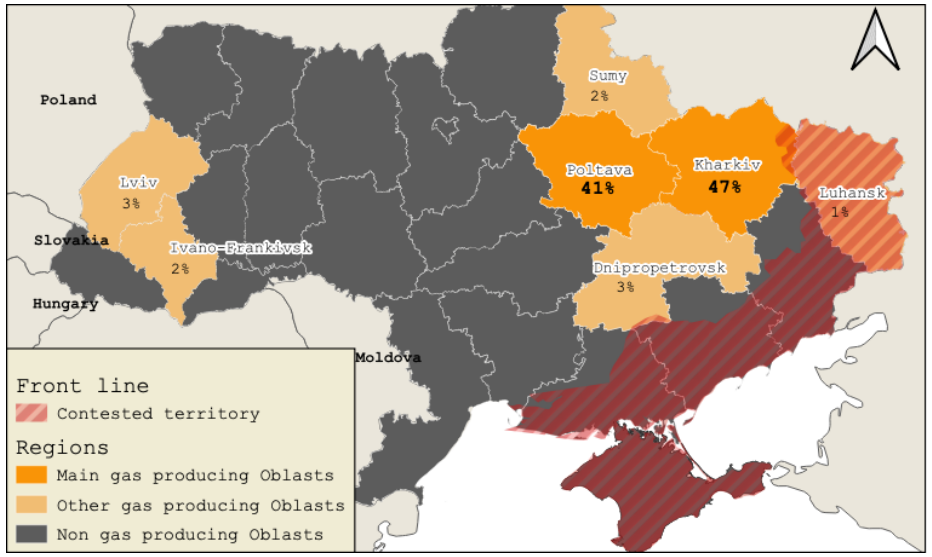



- During the first winter of the full-scale invasion, attacks focused mostly on the **high-voltage grid**, in particular high-voltage substations, in attempts to disrupt system operations.
- During the second and third winter, and especially since March 2024, Russia launched large-scale attacks on Ukraine's **thermal and hydroelectric power plants**. Electricity generation capacities take longer (and cost more) to restore than transmission, leading to extensive rolling blackouts after major attacks.
- In February 2025, and especially since October 2025, **gas production** was significantly affected by large-scale attacks, some sources imply losses of ~60% of production capacities.
- In the lead-up to the 2025/26 winter, we also observed an increase in attacks on **combined heat-and-power plants (CHPs)** and **medium/low-voltage substations** of the Distribution System Operators (DSOs), especially in areas close to the frontline.
- These strategies are **not mutually exclusive**, we still see continued attacks on high-voltage substations and power plants, but the shift in focus shows how the aggressor is adapting its strategy, requiring constant adaptation by Ukraine and its international allies to keep lights on and houses warm.

# Gas sector:
## Technical situation and winter 2025 – 2026 outlook

# Overview of the gas sector in Ukraine

### Regional shares of gas production (as of 2019)




Source: GDU based on Radio Free Europe

### Key gas sector facts

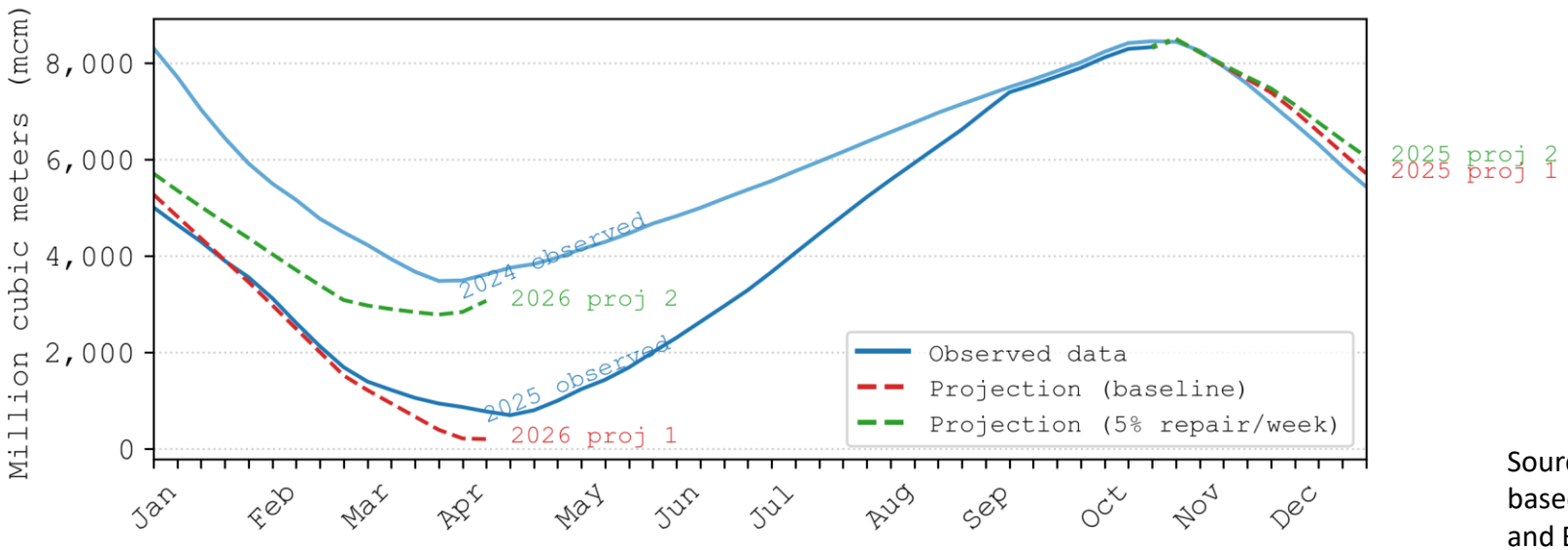
- Gas **consumption** declined from 80 million cubic metres per day (mcm/d) in 2021 to 55 mcm/d in 2023.
- During the winter, consumption is around 100 mcm/d, whereas in the summer it is only 23 mcm/d (2023).
- Over winter 2023, over 80% of gas was consumed by households, district heating, and CHPs.

- Gas **production** is concentrated in Eastern Ukraine.
- Total production was about 50 mcm/d in 2024, covering above 90% of consumption. Production reached 52mcm/d in July 2025.
- Russian attacks in October 2025 are said to have affect 60% of production capacities - this would imply a decline to 21 mcm/d.
- **Imports** must cover the difference. Available import capacities exceed 50 mcm/d.
- In July 2025 it was planned to import 26 mcm/d during the heating season 2025/26.
- An increase in winter imports of around 30% (+8 mcm/d) is planned from November onwards.
- **Storage** levels were at 8500 mcm in mid-October
- **Unconfirmed information from mid-November** indicates that 95% of production capacity is operational again (this is not reflected in our scenario).

Sources: IEA, Expro, Reuters, EIA, Interfax, Bruegel

# October destructions could be managed with increased imports

**Storage levels by week: 2024 - 2025 actual & projected (2 scenarios)**




Source: GDU assessment, based on Bruegel, and Bloomberg

- Assuming the reported 60% lower gas production to continue from November 2025 to March 2026, and the same level of consumption and imports as last year, **gas storage would be depleted by March 2026.**
- Significant **reverse flows (imports) from EU** are expected to cover demand in this case (baseline).
- An **additional restarting of production** gradually (repairing ~5% of the currently destroyed capacities per week) would result in a stock of 3,000 mcm by March 2026.

# **Electricity sector:**
# Winter 2025 – 2026 outlook

# Methodology

- We analyse two scenarios:
  - In a **baseline scenario**, we assess the load shedding needed, given our assessment of the current state of the system.
  - In a **“heat shock” scenario**, we assume that further destructions of CHPs in autumn 2025 (of about 1 GW thermal) are compensated for by additional usage of electric heaters in homes.

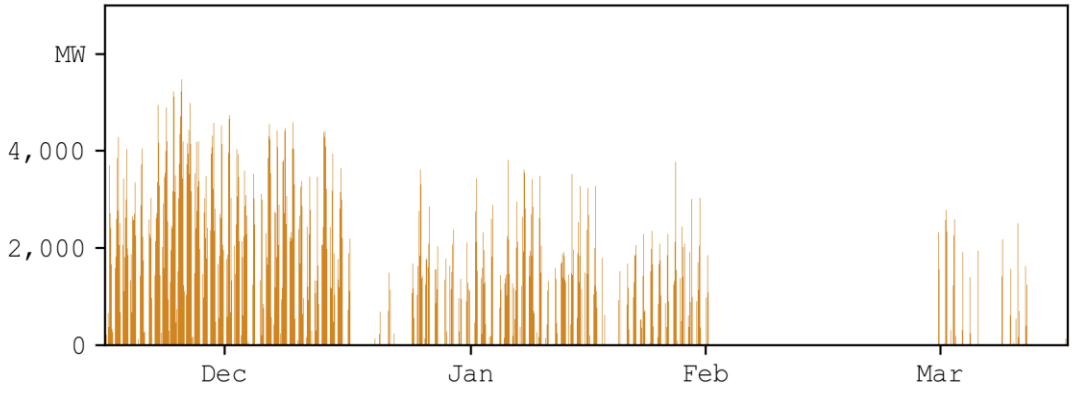
- This is based on an optimal hourly dispatch, taking into account:
  - fluctuating demand and generation from renewable capacities,
  - the technical parameters of thermal power plants,
  - maintenance schedule and the availability of nuclear power plants and
  - import capacities.

- We use a PyPSA-based (1) electricity system model, developed within the GDU project, to analyse the electricity sector. This model has already been used in previous analyses of necessary power outages.

(1) T. Brown, J. Hörsch, D. Schlachtberger, PyPSA: Python for Power System Analysis, 2018, Journal of Open Research Software, 6(1), arXiv:1707.09913, DOI:10.5334/jors.188

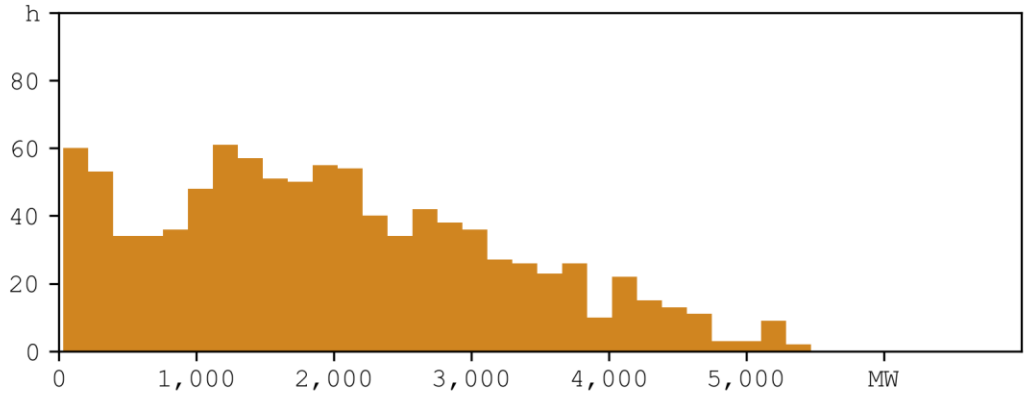
# November outage analysis: **Baseline Scenario**

### Load shedding trajectory




Source: GDU assessment based on PyPSA modelling outputs

### Load shedding histogram



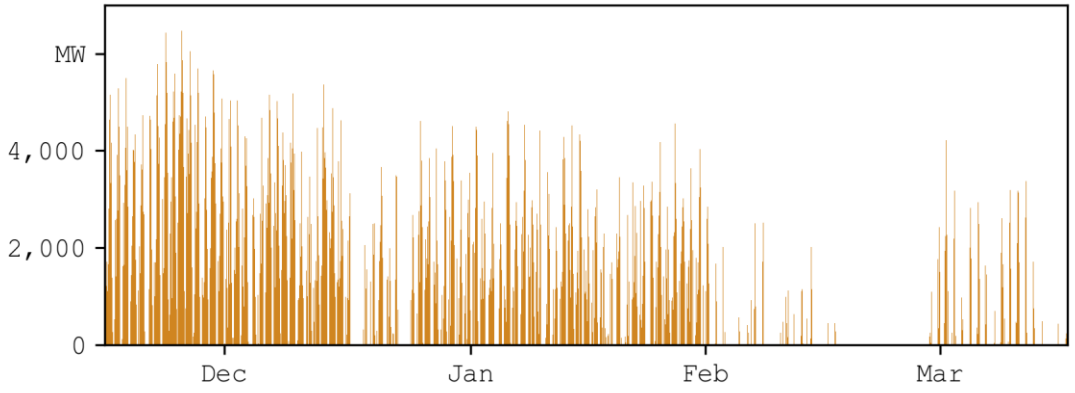

Source: GDU assessment based on PyPSA modelling outputs

- In the baseline scenario, we assume:
  - Our assessment of operating generation capacities is correct and remains unchanged till April 2026
  - Net electricity demand of 32TWh from December 2025 to March 2026.
  - Import capacities are increased from 2100 MW to 2300 MW in December 2025.

- Load shedding is required in 35% of hours and sums up to about 2 TWh.
- The maximum load shedding is about 5.5 GW, representing approx. 34% of the peak load.
- **Compared to our October outage analysis based on operating capacities as of October 24th, load shedding has increased sixfold.**

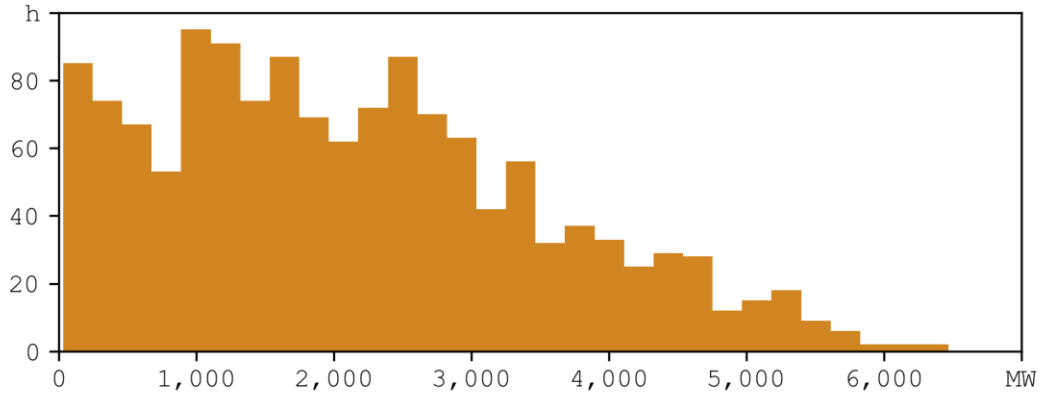
# November outage analysis: **Heat Shock Scenario**

### Load shedding trajectory




Source: GDU assessment based on PyPSA modelling outputs

### Load shedding histogram



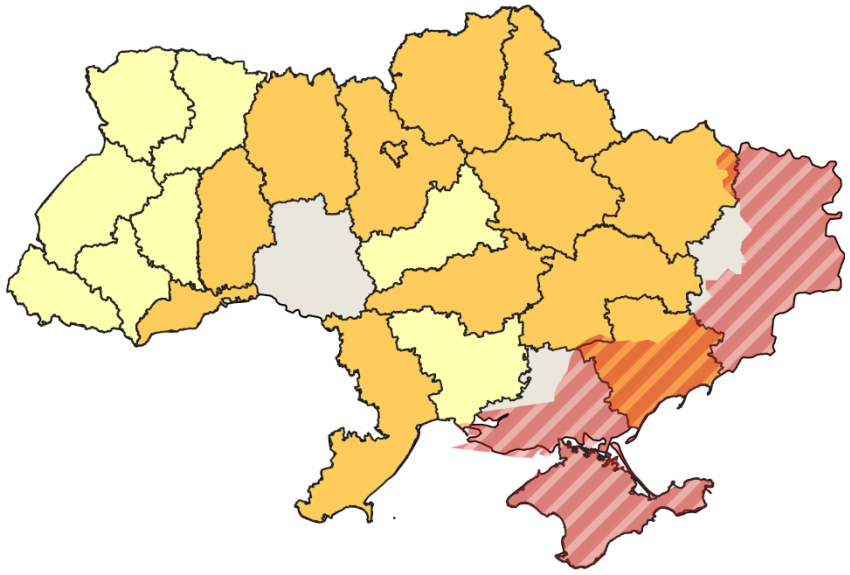

Source: GDU assessment based on PyPSA modelling outputs

- In the heat shock scenario, we assume:
  - Same assumptions as the baseline scenario, but
  - Electric heating increases electricity demand by 2 TWh: we assume households substitute district heat with electrical space-heaters in morning and evening hours of working days and from morning to evening on weekends.
  - The required electricity for additional electric heat (GW per hour) is temperature-adjusted based on climate year 2019.

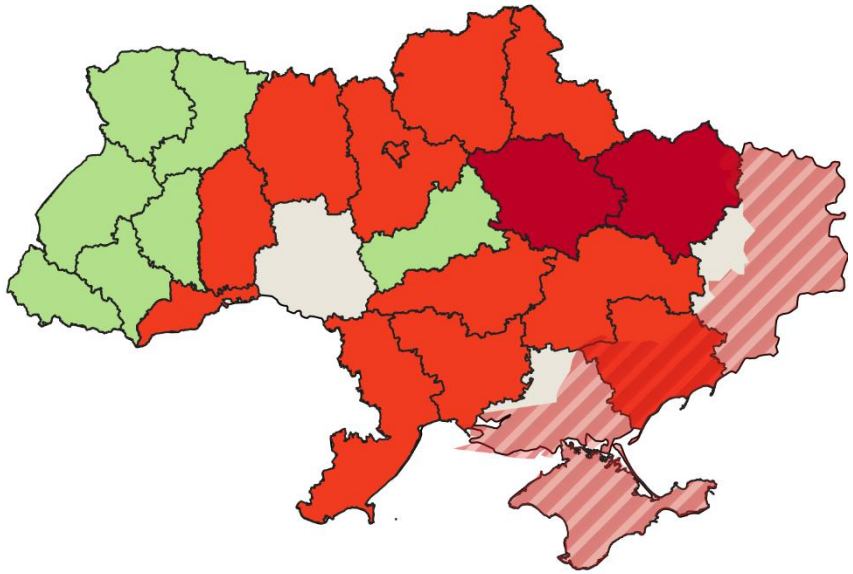
- Load shedding increases by 30% and sums up to 3 TWh.
- The maximum value is 6.5 GW (1 GW more than in baseline).
- Load shedding takes place in about 50% of the hours.
- Most load shedding occurs between 3 p.m. and 6 p.m.
- As unserved heating demand during load shedding hours will be compensated for later - additional electricity demand not modelled here might arise.

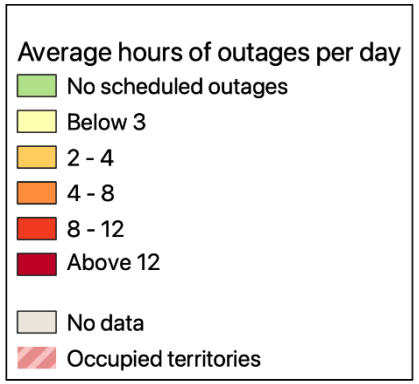
# Scheduled power outages for household consumers by Oblast (ø hours per day)

**27 October – 2 November**



**10 November – 16 November**






We compared scheduled power outages for household consumers by Oblast over two one-week periods: one before and one after the massive November attacks.

The results revealed a significant increase in the average length of outages.

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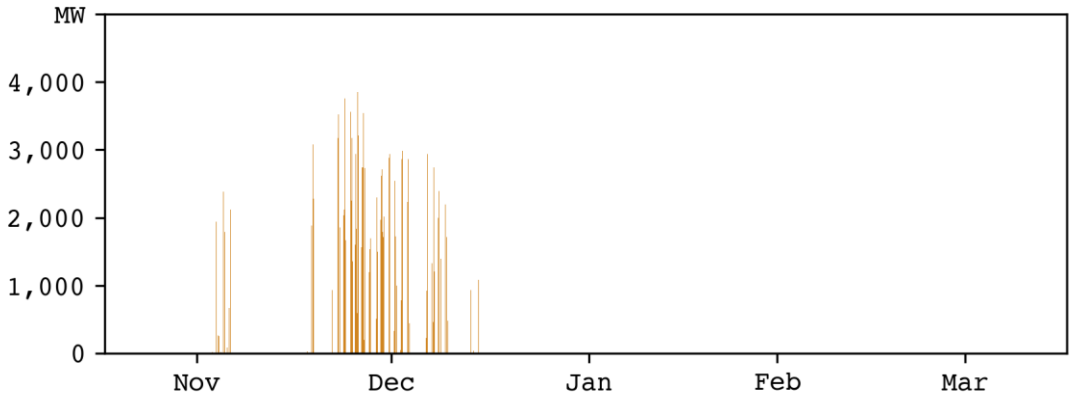
# For comparison: outage analysis based on state of the system in October

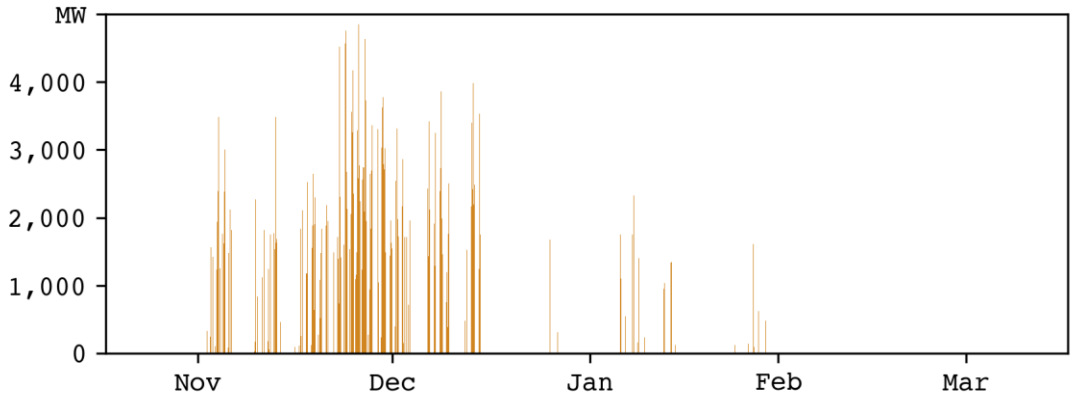
### Baseline scenario




Source: GDU assessment based on PyPSA modelling outputs

- **Analysis based on information available as of October 24th and the destruction that had occurred up to that point. Modelled period is from November 2025 to March 2026.**
- Total net electricity demand is assumed to be 40 TWh from Nov-2025 to Mar-2026.
- Load shedding is required in 5% of hours and sums to 0.3 TWh.
- The maximum load shedding is about 4 GW, representing approx. 22% of the peak load.

### Heat shock scenario

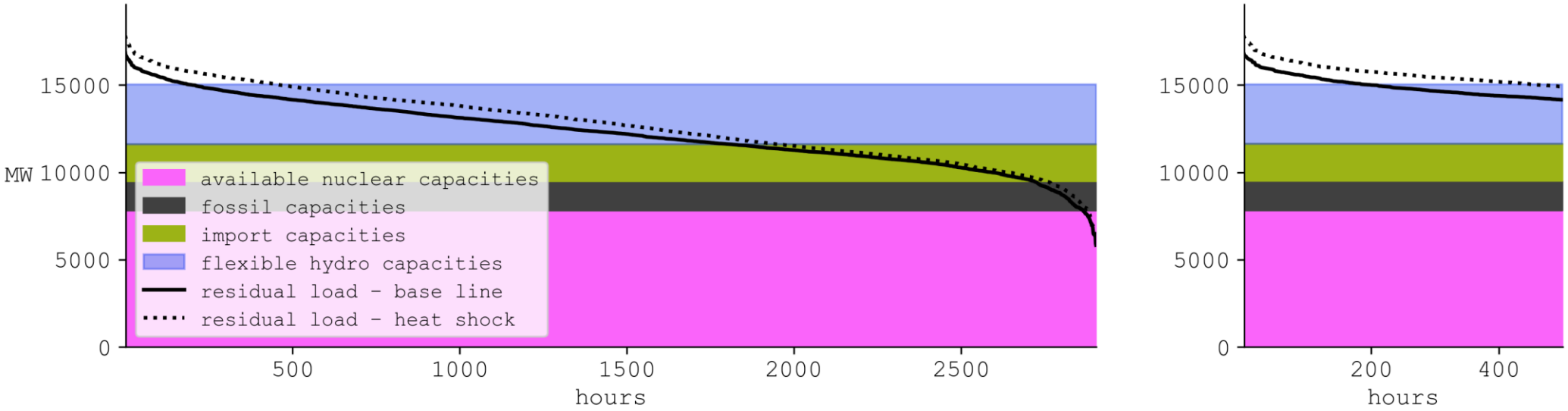



Source: GDU assessment based on PyPSA modelling outputs

- Assumption: a substitution of gas and district heating by electric heaters increase demand by 2 TWh mainly in the afternoon and evening hours.
- Under this assumption, load shedding takes place in 11% of the hours and sum up to 0.75 TWh.
- As unserved heating demand during load shedding hours will be compensated for later – additional electricity demand not modelled here might arise.

# Scenario comparison

**Load duration curve and available capacities for baseline and heat shock scenarios**




Source: GDU assessment based on PyPSA modelling outputs

- The figures show that imports and flexible, albeit uncertain, actions such as hydro power plants and storage facilities must bridge the gap between thermal and fossil fuel capacities and residual load (demand minus wind and PV generation).
- As can be seen from the right section of the graph, demand will definitely not be met within about 400 hours in the case of the heat shock scenario.