

Monitor of Electricity Market Opening

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July 2019 – February 2020

Executive Summary

- I. The legislative framework is volatile and is re-shaping while the market faces challenges. There is no steady environment for market participants, especially for newcomers. The market does not function properly as ancillary services segment is not yet operational.
- II. The 'reforms' are mostly minor tweaks focused on re-regulation rather than liberalisation and limiting the market power of existing market participants. Most changes attempted to manually control prices and redistribute financial flows rather than address the elephant in the room – a high market concentration.
- III. IPS and BEI are very different trading zones, and separate tailor-made approaches should be used. Most changes in legislation focused on IPS, while they did not address structural deficiencies in Bursthyn zone.
- IV. We identified 4 phases of market development in IPS, with different factors kicking-in and affecting price. Nuclear power, channelled exclusively through organised segments of the market, has a dominant share, and its oversupply had a decisive impact on price. The thermal generation, mostly private, faces no significant competition on bilateral agreements segment, as import from Russia and Belarus have a very limited effect.
- V. The overall overcapacity in Ukraine creates conditions for oversupply and contributes to dramatic price drops. This situation will persist if market players like Energoatom do not follow economic reasoning but rather an administrative directive regarding the volume they produce, and if thermal and nuclear generation do not compete in all market segments.
- VI. The loopholes in market rules created a dangerous positive feedback effect in Jan'-Feb'20, driving DAM prices below economically reasonable levels in some weeks, and syphoned millions of hryvnias from the system.
- VII. Debts are now accumulating in the system, adding to an unaddressed legacy of UAH 30 bln from the old market. Non-payments on the balancing market threaten the stability of PSO schemes and Energoatom, as more and more nuclear is sold as imbalances due to surplus in the system.
Debt from water supply companies and national coal mines continue to hoard and affect the BM as well. In addition, underfinancing of RES in TSO tariffs undermines financials of the GB and PSO design.
- VIII. In the BEI, increased import has no significant impact on competition and price. A significant share of imports is traded on the DAM, just to be bought and re-exported to EU countries. Most likely, DTEK has established control over cross-border allocation via auctions, managing to keep DAM prices high.
- IX. Increased transparency is a big upside of the new market. A lot of previously hidden data became available, enabling better assessment of trends. Much is to be done to reach levels of transparency of established markets, to attract new players.
- X. If fundamental flaws of the market structure will not be addressed, any minor change or tweak will not make the market function properly. Market concentration and lack of competition, both on wholesale and retail side, should be addressed as soon as possible. The administrative price control should be phased out.

Ukraine opened its electricity wholesale market on July 1st, 2019. The Monitor of Electricity Market Opening (MEMO) is an analytical publication series that aims to present key developments in an emerging market. It is designed to provide professional and independent in-depth assessment and fact-based analysis of the Ukrainian electricity market.

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Glossary

Abbr.	Full name	Details
AS	Ancillary services	Part of the balancing market in form of reserve services provided to system operator by market participants
BAM	Bilateral agreements market	Non-regulated market segment
BEI	Burshtyn energy island	A trading zone synchronized with ENTSO-e
BESS	Battery energy storage system	
BM	Balancing market	Last stage for trading electric energy
BRP	Balancing responsible party	Market participant responsible for settling imbalances
CHP	Combined heat and power plant	
CMU	The Cabinet of Ministers of Ukraine	
DAM	Day-ahead market	Market to sell or buy energy for the next 24 hours
DSO	Distribution system operator	
EA	Energoatom	State-owned single operator of nuclear power plants
EML	Electricity market law	
ESS	Energy storage system	
FCR	Frequency containment reserve	Ancillary service type, primary reserve
FIT	Feed-in Tariff	Policy mechanism to accelerate investment in renewable energy
FRR	Frequency restoration reserve	Ancillary service type, secondary reserve: automatic (aFRR) and manual (mFRR)
GB	The Guaranteed Buyer	State-owned enterprise, offtaker of RE energy and part of public service obligations for households
HPP	Hydro power plant	
IDM	Intraday market	Market to sell or buy energy intraday
IPS	Integrated power system	Ukrainian mainland trading zone, synchronized with Russia
LCU	Low Carbon Ukraine project	
MEEP	The Ministry of Energy and Environmental Protection of Ukraine	
MMS	Market Management System	A software used by UE to operate and manage the balancing market
MO	Market operator	State-owned enterprise, operator of day-ahead and intraday market
NEURC	National Commission for State Regulation of Energy and Public Utilities	Energy market regulator
NPP	Nuclear power plant	
OTC	Over-the-counter market	Trading between two parties without supervision of an exchange
PHES	Pumped hydro energy storage	
PSO	Public service obligations	Regulatory tool responding to energy sector needs
REMIT	Regulation on wholesale energy market integrity and transparency	
RES	Renewable energy sources	
RR	Replacement reserve	Ancillary service type, tertiary reserve
SOE	State-owned enterprise	
SOLR	Supplier of Last Resort	
TPP	Thermal power plant	
TSO	Transmission system operator	
UE	Ukrenergo	Ukrainian transmission system operator, operator of balancing market
UEEX	Ukrainian Energy Exchange	A private company, independent energy commodities exchange
UHE	Ukrhydroenergo	State-owned enterprise, operator of large hydro power plants
USS	Universal Services Supplier	Supplier at regulated prices
WEM	Wholesale electricity market	

Legal Framework review

Overview

Since launching Ukraine's electricity market eight months ago, legal frameworks have been changing constantly. 16 changes to different documents were made, expecting at least four more in the next quarter. These include changes to primary and secondary legislative acts.

We highlight significant changes and group them to related legislation, both primary and secondary, across four subgroups (Figure 1):

- Electricity market law (EML);
- Market rules on DAM/IDM and balancing/ancillary services markets (Rules);
- Grid Codes (Codes);
- Public service obligations as to supplying households (PSO).

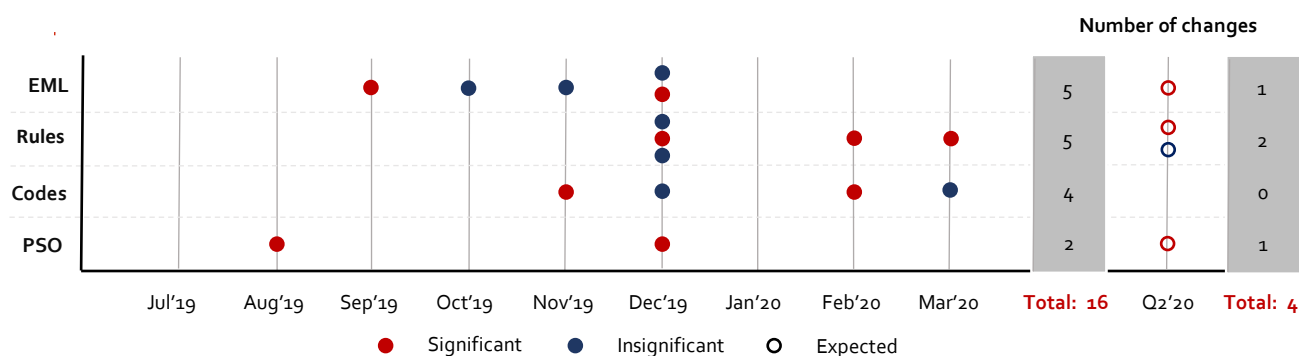
Implications

Numerous changes in a short timeframe created uncertainty for market participants. Most changes introduced were not intended to increase competition, but rather to increase the level of administrative control.

Under current rules, the regulator is authorised by law to set price caps on market segments. The state-owned Guaranteed Buyer is controlling a third of market volume under the PSO scheme. Changes to balancing market rules created havoc in Jan-Feb'20, pushing prices uneconomically low during some hours.

Such volatility shows inconsistency in the authorities' approach to regulation and signals the continuity of tight state regulation.

Figure 1. Changes to electricity market legal framework



Significant changes

Bid caps

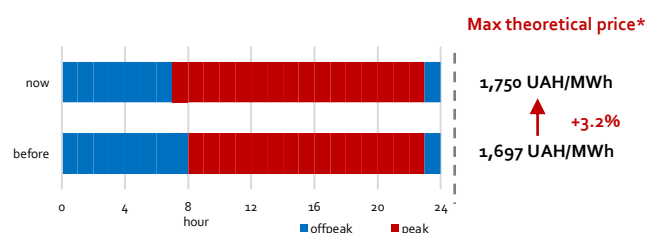
Changes to EML in Dec'19 authorised the NEURC to set price caps on DAM, IDM and BM indefinitely, the previous deadline being Apr'20. Definition of DAM/IDM peak hours was extended since Mar'20, which theoretically may raise market prices (Figure 2).

In Dec'19, imbalance pricing rules have been changed as well as bid caps on the BM, now linked to DAM prices. That somehow warped the behaviour of market participants, pushing the price unnaturally low during some hours in Dec'19-Feb'20. We analyse consequences on page 8.

Changes to market rules provided a new formula for imbalance pricing and lowered the minimum price cap on the BM. Starting from Mar'20, EA is allowed to participate in the BM.

The NEURC was also authorised to review bid caps on the DAM, IDM and BM in case of substantial price fluctuations. 'Substantial' assumes 10% deviation compared to the previous 10 days, on the DAM and 20% on the IDM and BM. These bid cap may not exceed 2,500 UAH/MWh.

Figure 2. Peak/offpeak bid caps distribution on DAM and IDM



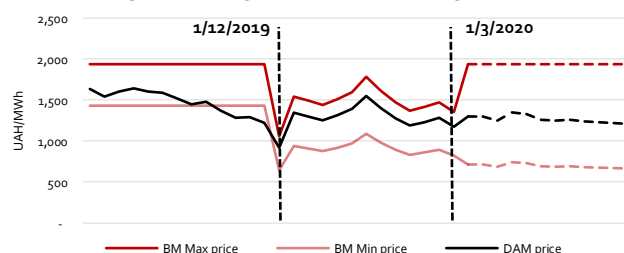
*based on DAM trade volumes profile during Feb'20

Changes to cross-border trading

Eastern border. Import of electricity from Russia and Belarus under bilateral agreements was prohibited at the start of the market. It was allowed from Oct'19, but after a political backlash was again limited from Jan'20. Currently, import from Belarus is not limited to any market segment, Import from Russia via bilateral agreement or the IDM is explicitly forbidden, with the possibility for the CMU to lift the prohibition in order to prevent emergencies in Ukraine's IPS. The parliament is still considering banning any imports from the east, including Belarus, of any segment.

Western border, Burshtyn energy island (BEI). Since beginning of 2020, UE started monthly capacity allocations across Slovakian and Romanian borders, in addition to the Hungarian one in 2019. On April 3, the NEURC has adopted important changes to rules for cross-border capacity allocation. Among key changes are the introduction of capacity limits allocated to a single participant, penalties for underutilisation of allocated capacity, and changes to financial guarantees. These measures are designed to limit market power and lower entry barriers for competition. We analyse further details on page 15.

Figure 3. Changes of caps on balancing market



Legal Framework review

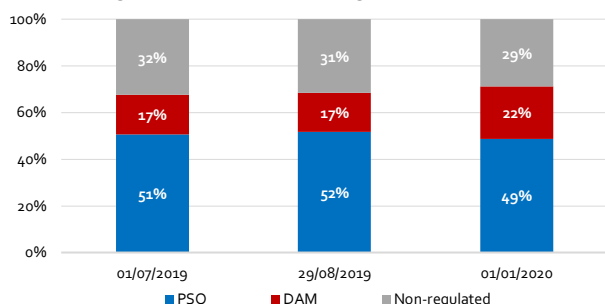
Changes to PSO

The general approach to supplying households below market prices (PSO) remained unchanged. PSO forces state-owned EA and UHE to sell a share of their output to the Guaranteed Buyer at low regulated prices. The GB then sells power at a low price to suppliers and may sell the remaining power on the DAM and IDM.

Specific bid caps for the GB, linked to market-wide bid caps, were introduced. This affected market participants behaviour, as the GBs strategy became easily predictable.

Current PSO design still adds significant distortion to the market, decreasing competition on different segments, keeping half of it under strict administrative control.

Figure 4. Market volumes regulations development



Source: LCU calculations based on Forecast electricity balance for 2020

Ancillary services market

The ancillary services market segment has not yet been launched with market opening, nor is it fully operational. AS segments were restrained by unrealistic performance monitoring procedures and lack of certified service providers.

In Nov'19, a simplified certification of AS providers was introduced, changes to pricing methodology in Mar'20.

As of today, two suppliers with ten certified generation units (two thermal and eight hydro) can provide ancillary services. **UE has assessed that the AS market has no competition.** For this reason, UE will not conduct long-term auctions for AS in 2020. Only daily auctions are scheduled.

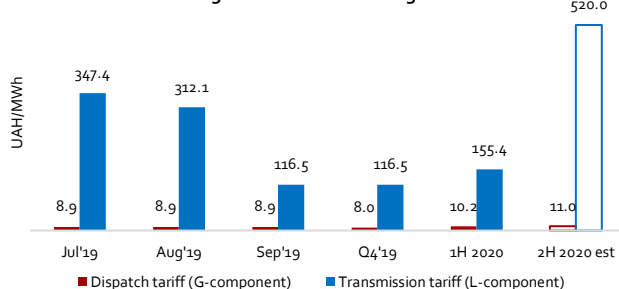
Prices for AS are also regulated: 801 UAH/MW for primary and automatic secondary reserve, 512.27 UAH/MW for manual secondary up and 289.27 UAH/MW for manual secondary down reserve. There is a lack of transparency in this segment, which we analyse in detail in the Market Transparency section on page 19.

TSO tariffs changes

Since market opening, TSO tariffs have been reviewed four times. (Figure 6) The main driver is estimated to be the RES support payments socialised via the TSO load-component tariff. The tariff effective from Jan'2020 has increased mostly due to:

- 1) technical losses covered by system operators on the market
- 2) adjustments to the growing RES output

Figure 6. TSO tariffs changes

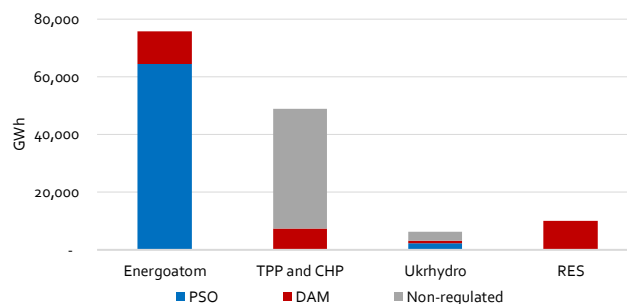


Market volumes regulation

Until 31/12/2025, mandatory sale of electricity on the DAM was increased from 10% to 15% for all generators (except RES). Importers are required to sell 15% of their volume on the DAM since 2020. The NEURC may increase this threshold to 30%. RES are sold by the GB on the DAM/IDM in full volume.

Under the current market design, around 1/5 of volumes are guaranteed to be traded on the DAM. Thermal generation dominates the volumes which are not regulated – mainly via over-the-counter bilateral agreements. All nuclear power is expected to be traded on regulated segments, most of it at regulated prices. Such divisions create separate monopolistic situations in different market segments.

Figure 5. Market volumes regulations per market players



Source: LCU calculations based on Forecast electricity balance for 2020

In Feb'20, the NEURC obliged electricity exporters to pay transmission tariffs. This change was opposed by exporters and criticised by the Energy Community Secretariat, as it contradicts ENTSO-e tariffs principles. The NEURC's decision is currently blocked in court.

LCU estimates that RES support in the current TSO tariff lacks around 2/3 of required amount. This has already led to debt accumulation from UE to the GB, and to RES operators, respectively, which we briefly analyse in Structural Market issues on page 18. We estimate that a review of the transmission tariff in late 2020 is inevitable to stabilise the system.

Expectations

UE is working on further amendments to the grid codes, market rules and the commercial metering code in order to "reboot" the ancillary services market, make the balancing market more efficient and provide more transparency on the electricity market.

The draft law with changes to EML concerning energy storage is currently debated in the Parliament's Energy Committee. LCU analyses this initiative in a separate policy evaluation.

The draft of amendments to the market rules published by the NEURC suggests eliminating bid caps on the balancing market completely.

For public discussion, the NEURC published the draft of amendments to the RAB tariff methodology changing the compensation rate for DSOs' assets from 12.5% (for both old and new assets) to 1% for old assets and 15% for new assets.

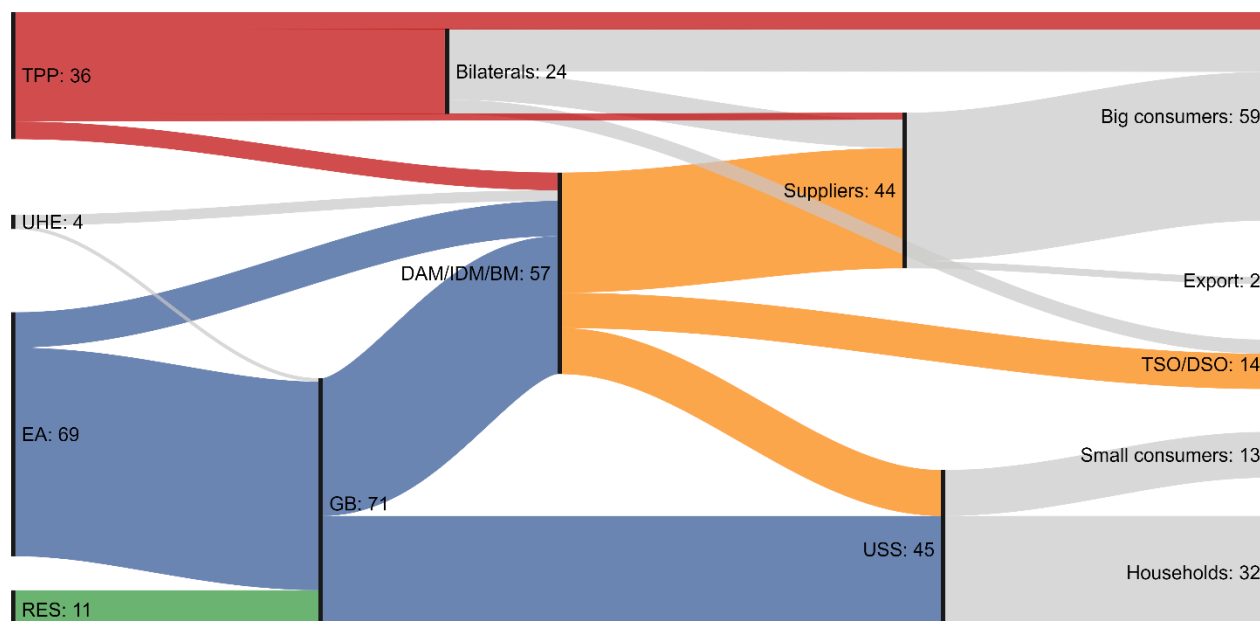
The MEEP expressed its intention to redesign the PSO mechanism later in 2020 to minimise or even get rid of market distortions. However, a recently published draft does not introduce any significant changes. The key suggestions include the possibility for the GB to sell power via bilateral agreements and to set a lower GB-specific bid cap for the DAM/IDM, in an attempt to decrease the DAM price.

This section gives a simplified graphical representation of electricity volumes and money flow on the Ukrainian market. Calculations are made by LCU based on the electricity forecast balance for 2020, our analysis and assumptions of key market data, and consider current legislation.

Figures below show net electricity flows between main groups of market participants and segments (left to right). Monetary flows (right to left) are presented for the electricity component only, meaning all other components of the final electricity price (TSO, DSO tariffs, taxes and levies etc.) are excluded for simplification.

The IPS trading zone is heavily regulated, PSO for households distorting competition and affecting money flow. Organised market segments (DAM/IDM/BM on Figures 7, 8) are mostly dominated by nuclear power and divided between the two big market players, the GB and EA. Bilateral agreements are controlled mostly by private TPPs with no competition. Such a design allows TPPs to withdraw intragroup consumers and household consumption via PSO from the market, thereby decreasing the demand on organised segments. Prices for households are regulated and set below WEM prices. The GB's activity on the market is heavily regulated.

Figure 7. Electricity volumes flow on the market [IPS, TWh]

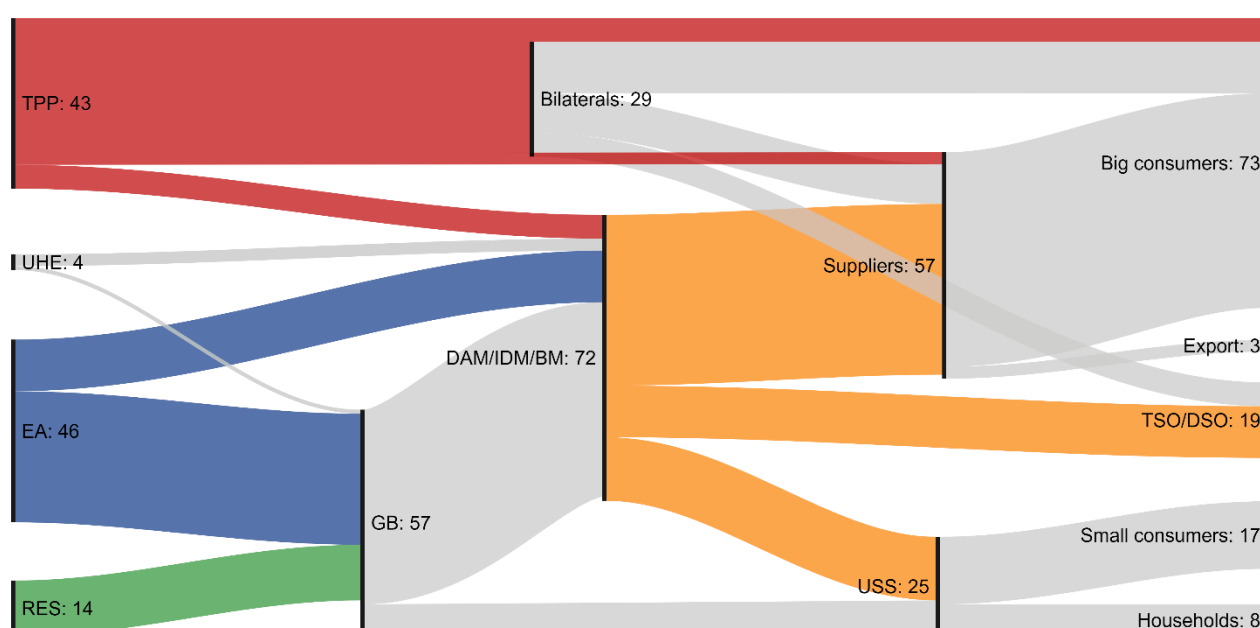


Source: LCU estimates

Total market turnover is around 121 TWh and around 120 UAH bln (only the electricity component, all other tariffs, RES surcharge etc. are excluded).

Under the PSO scheme, EA sell to GB at 567 UAH/MWh, UHE sells to BG at 674 UAH/MWh, while the household tariff in some regions does not cover even these low prices.

Figure 8. Money flow on the market* [IPS, UAH bln]



*electricity component only, other final price components, e.g. TSO/DSO tariffs, are excluded

Source: LCU estimates

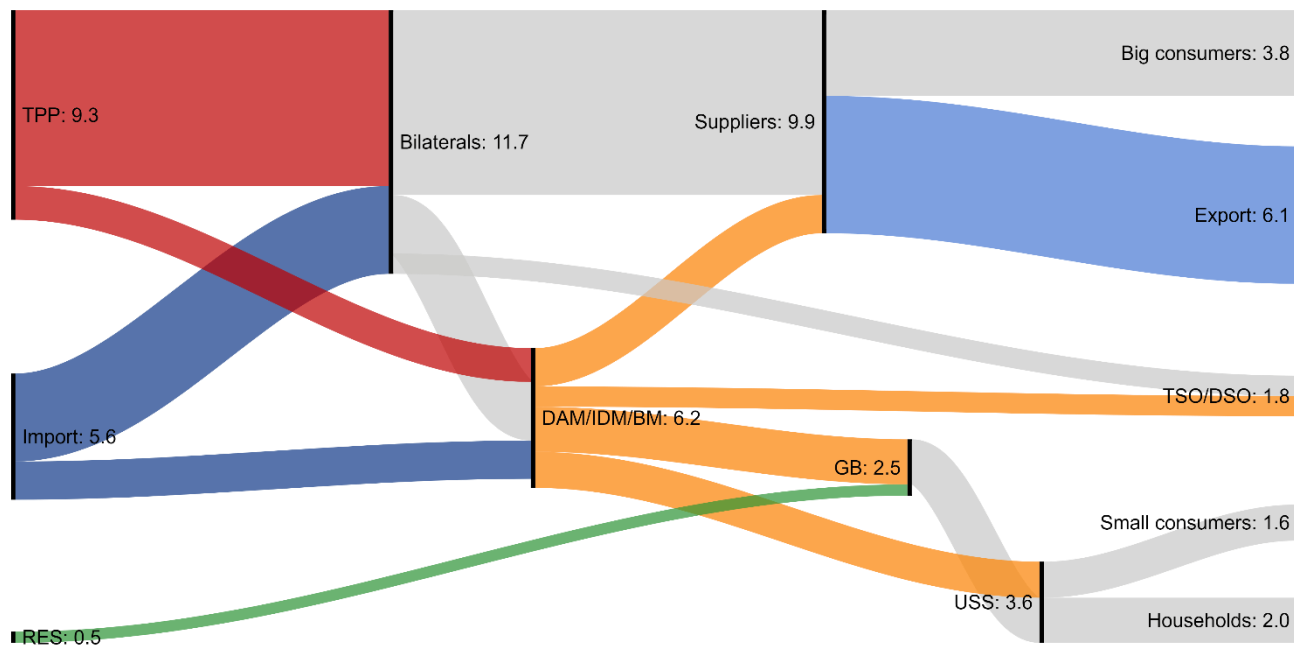
The BEI trading zone is synchronised with ENTSO-e and disconnected from the mainland's IPS, creating a completely different market environment.

In the BEI, the GB is buying electricity for households on the market, under the PSO scheme since there is no supply from NPP or HPPs. At the same time, the GB is also selling RES on the DAM, sometimes effectively buying electricity from itself.

LCU estimates that a significant volume of electricity imported to the BEI goes through the DAM (details on page 15). This electricity is most likely re-exported back to EU.

BEI's generation is highly concentrated, the DTEK-owned Bursthyn TPP controlling over 90%. Our analysis indicates that DTEK is also controlling most of the import allocations, which allows them to establish a strong control over prices on all market segments.

Figure 9. Electricity volumes flow on the market [BEI, TWh]

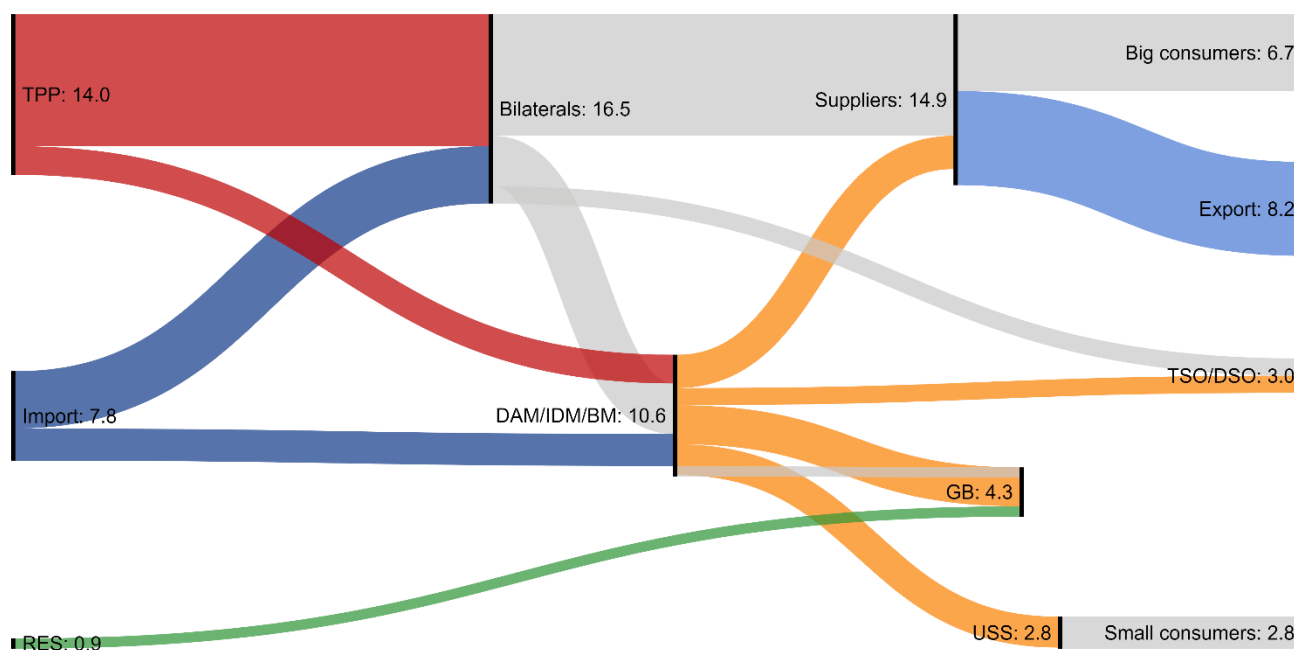


Source: LCU estimates

Total market turnover is around 15 TWh and around 13 UAH bln (only the electricity component, all other tariffs, charges and re-export are excluded).

The BEI's prices have always been higher than in the IPS, due to the exercise of market power.

Figure 10. Money flow on the market [BEI, UAH bln]



*electricity component only, other final price components, e.g. TSO/DSO tariffs, are excluded

Source: LCU estimates

The wholesale electricity market had experienced a certain period of stability and then went into ongoing turbulence. For the period covered, our analysis identifies four phases on the wholesale market. Each is described by a set of metrics across organised market segments, giving a comprehensive picture of market reactions.

Phase I: Jul-Sep'19. Stable DAM volumes, supply matches demand closely during peak hours and 'deficit' of supply persists during off-peak hours (Figures 11, 15). This resulted in stable high prices, with minimal deviation from price caps.

This coincides with a stable average load, relatively low NPP output and few balancing market activations. Phase I is a period of stable exercise of market power.

During Phase I, prices are at their highest possible level. There is close correlation between NPP generation and DAM supply (Figure 16). Stable load and NPP output fixed the balance of market powers for three months, while the impact of changes to the legislation was insignificant.

Phase II: Oct-Nov'19. Prices begin to drop, significantly deviating from caps, reaching results under 1,000 UAH/MWh for a week. This is most likely driven by increased NPP output during a partial withdrawal of demand from the DAM. Fluctuations in TPP generation did not affect supply significantly. TPPs seem to have no significant DAM impact, as shown in market shares (Figure 17). TPPs shifted their volumes to the BM, challenged by excess nuclear on the DAM.

Average DAM shares decreased and remained stable. While the load increased, NPP output followed. DAM structure on seller side being dominated by nuclear (Figure 17), this increase of NPP supply resulted in the deficit of supply gradually turning into surplus, during both peak and off-peak hours.

This surplus in the system has also affected TPPs, struggling on the DAM. We see significant increase of down activations in the balancing market, lowering average TPP output for several weeks. On the contrary, BM prices for up-regulation increased, likely a result of limited supply. Data on TSO commands beyond the BM merit order is being published, starting Nov'19. Our analysis shows a significant number of such emergency commands, hinting to market players creating an artificial scarcity of bids.

DAM prices dropped below existing minimum BM price caps, triggering a review of BM rules. This linked the price caps to DAM results, starting from Dec'19.

Phase III: Dec'19-mid Jan'20. DAM shares recover to levels comparable to Phase I - mainly due to increased demand, as TSO and DSOs join the market in 2020. Prices begin to slowly rise, peak prices staying below caps, while the off-peak price returns to a capped level. Meanwhile, DAM supply exceeds demand for all peak and off-peak hours. Off-peak supply starts to steadily grow, at unchanged prices. Missing impact on the off-peak prices at growing supply level signals that market players tend to bid at the highest possible level.

At the same time, the GB starts to sell less and less on the DAM, pushing its surplus to be sold as imbalance at lower prices.

Phase IV: Mid Jan-Feb'20. DAM prices fall again, surplus goes higher than ever before, even at a stable load and NPP output. EA and the GB struggle to sell most of their power on the DAM. Intraday volumes increase, as the GB and EA try to avoid lower imbalance prices. Even more nuclear goes to imbalances, lowering BM prices, being linked to DAM prices. TPPs are pushed out of the DAM even more while BM activations go down. Again, low prices may keep players away from bidding on the BM.

Imperfect balancing market rules and 'artificial' supply on DAM

During Phase III and IV, nuclear surplus flooded the DAM. According to market regulation, there was no way for NPPs or the GB to sell surplus via bilateral agreements, resulting in significant parts of nuclear output – and during some hours, all of it – being sold as imbalances. According to BM rules, the price was always up to 30% lower than DAM results.

These stable conditions allowed traders to adjust strategy and adapt to market rules. They could sell any amount on the DAM, only limited by financial guarantees, even lacking a source for that power. The DAM clears daily, with instant cash inflow. Later on the BM, the imbalance position for such traders is negative, forcing them to buy power at imbalance prices. Those being, during surplus, consistently lower than on the DAM, traders made a margin simply off a price difference.

This scheme pushed DAM supply unreasonably high, squeezing even more nuclear out of the day-ahead into imbalances, creating a positive feedback effect. This loophole effectively syphoned away millions of hryvnias from the system by redistributing money flow from EA and the GB to speculative suppliers.

Changes to BM rules effective from Mar'20 set two different prices for balancing responsible parties. BRPs now either sell their positive imbalance below DAM price or buy their negative imbalance above it. This effectively closed the loophole, but the damage has already been done, fuelling growing crisis in the market, which we briefly describe on page 19.

DAM structure

The DAM is dominated by nuclear and renewable sources. EA and the GB's share is 65-70%. On the demand side, half the volumes are bought by non-regulated suppliers. Increased demand in Jan'20 was driven by changed PSO, effective from Jan'20. Stricter control over household consumption was introduced, forcing USSs to buy less from the GB at low prices and go to the market. System operators are now buying power to cover technical losses. USSs-TSO-DSOs combined DAM share is about 45%.

During Phase IV, DAM demand went down, against stable consumption. This means that demand shifted from the DAM, most likely to the BM. Suppliers may have just waited to buy their imbalance at a lower than DAM price, while they could also pay with a delay – contrary to DAM daily clearing.

TPPs' DAM share is 10-15%. They most likely tend to sell via bilateral agreements, as they have almost exclusive access to this segment. We analyse details in bilateral agreements on page 16.

Figure 11. DAM/IDM prices [IPS]

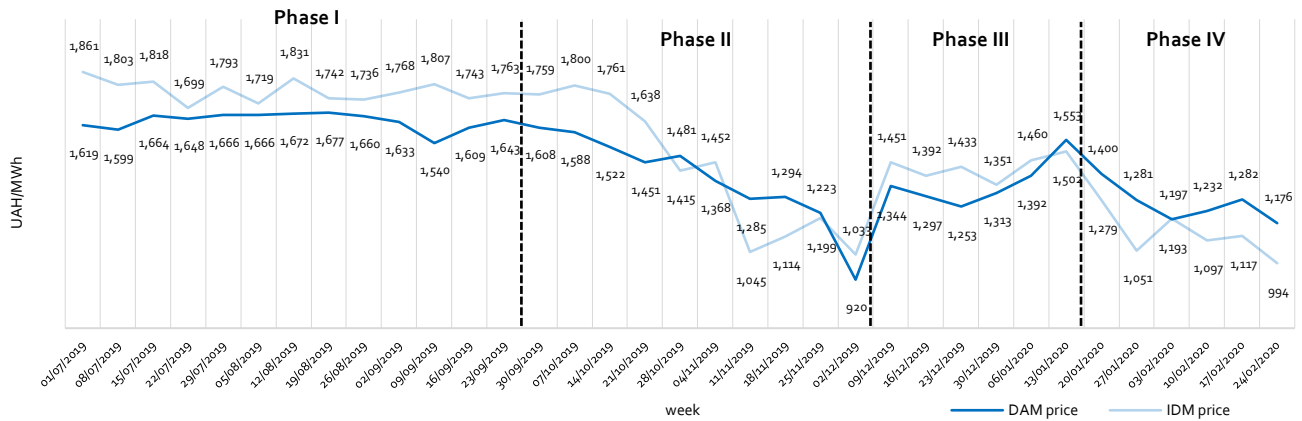


Figure 12. Trade volumes [IPS]

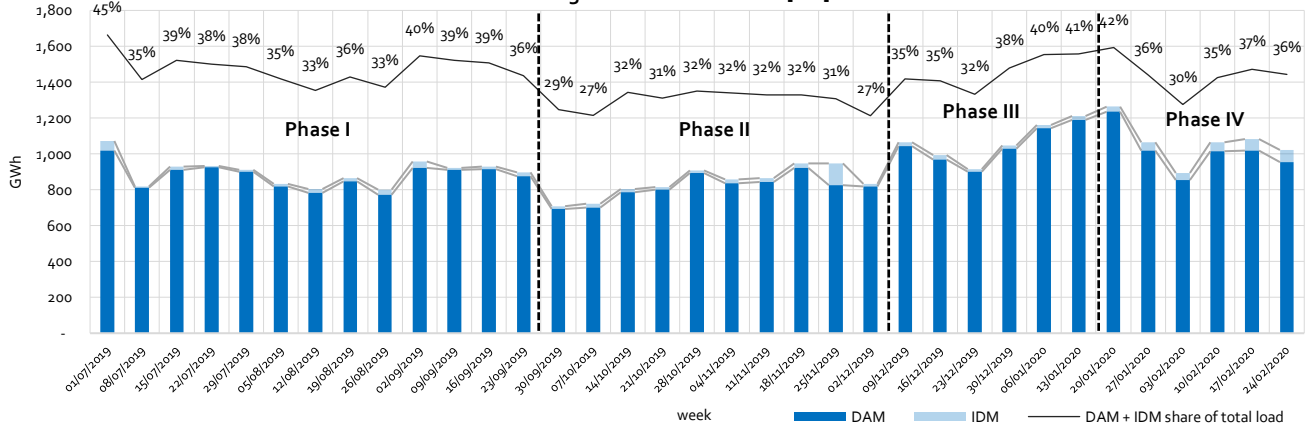


Figure 13. Balancing market prices [IPS]

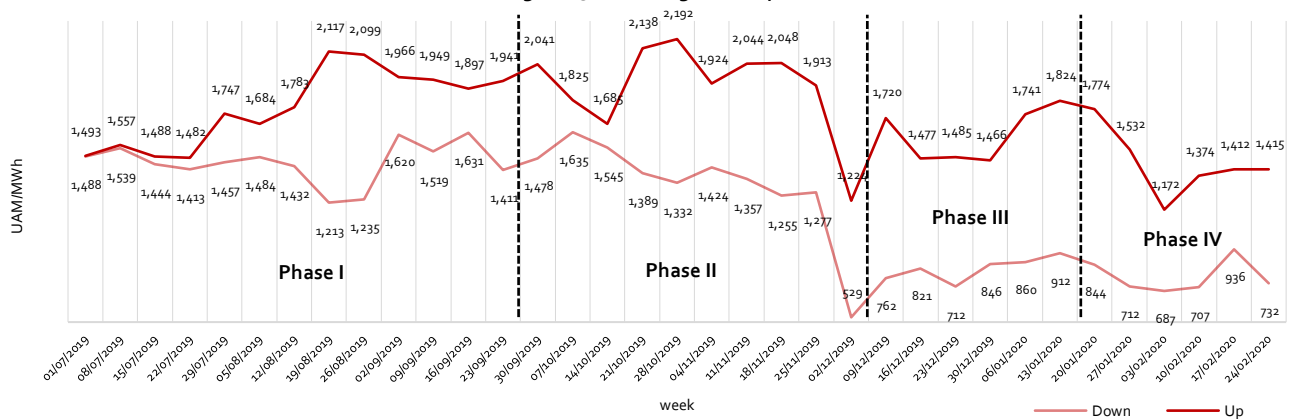
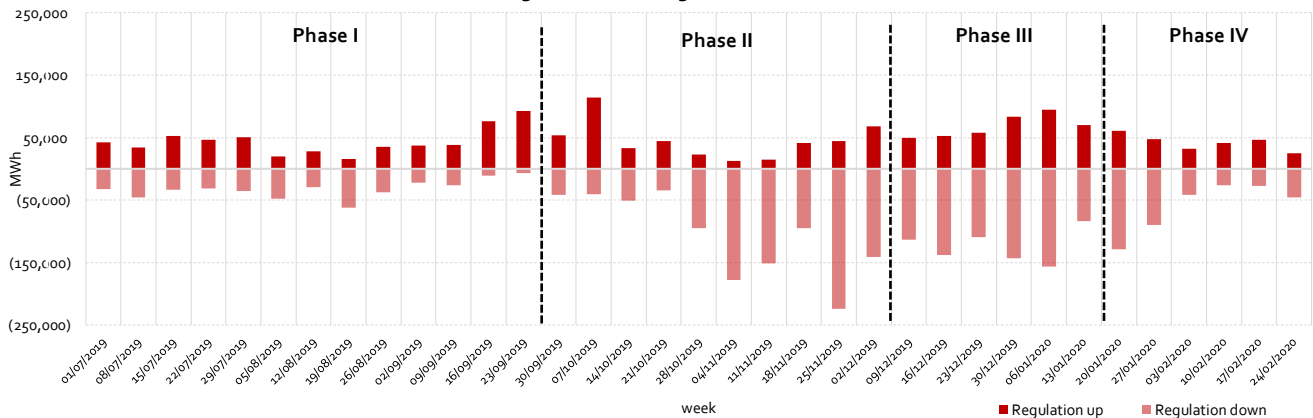


Figure 14. Balancing market activations [IPS]



Source: Market operator, Ukrenergo data, LCU calculations

Figure 15. Hourly average declared supply-demand spreads and price deviations from caps on DAM [IPS]

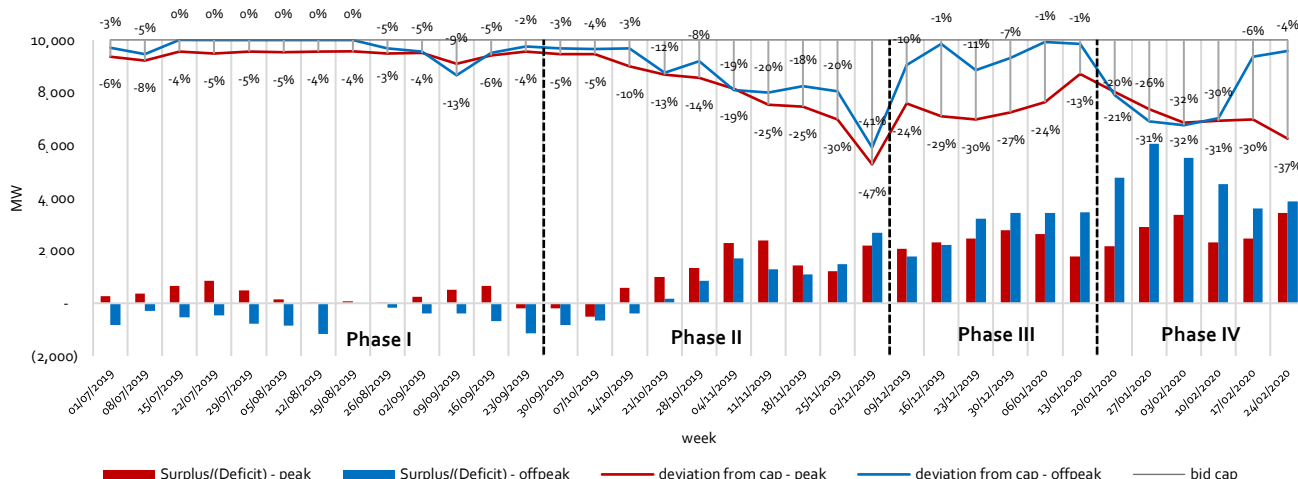


Figure 16. Average load profiles and DAM supply/demand [IPS]

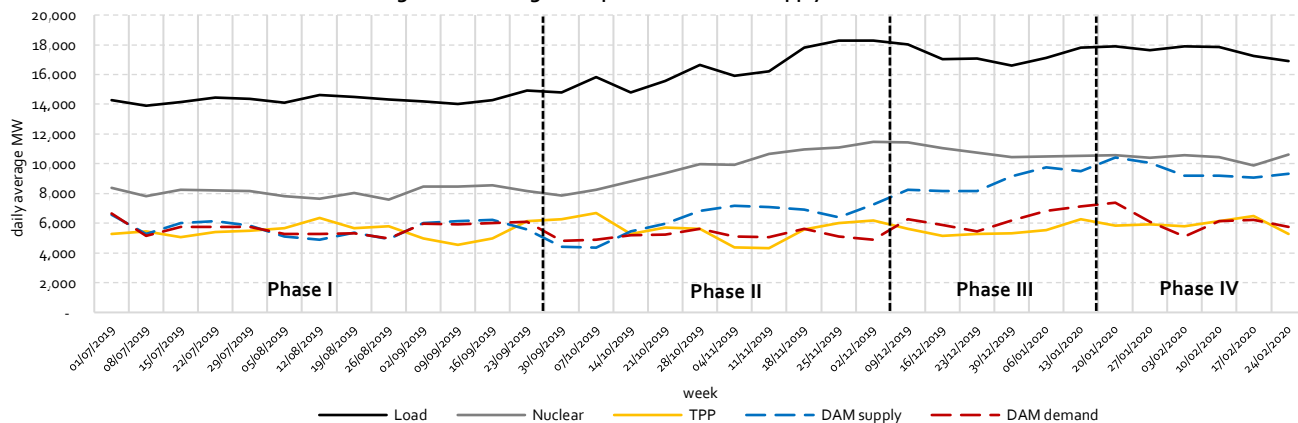


Figure 17. Buyers (left) and sellers (right) on DAM - trade volume structure [IPS]

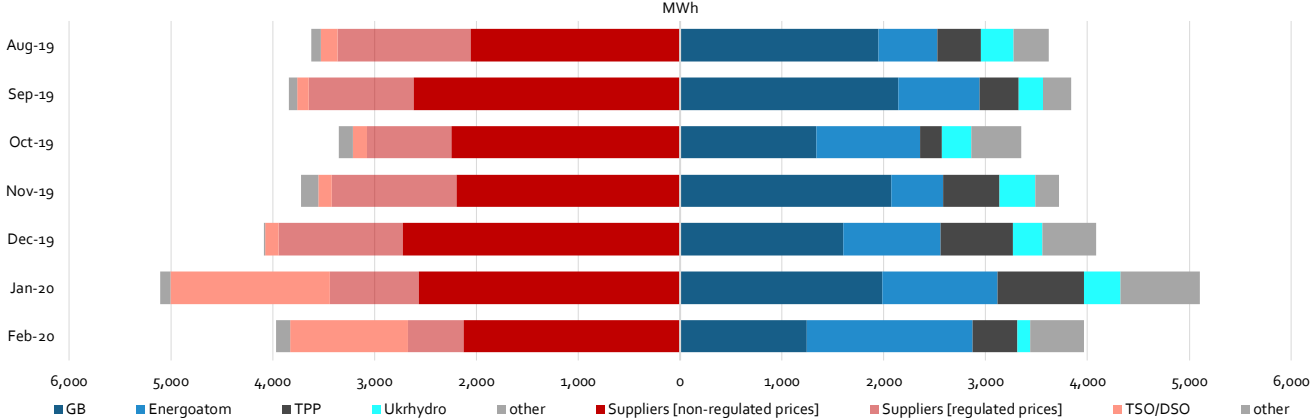
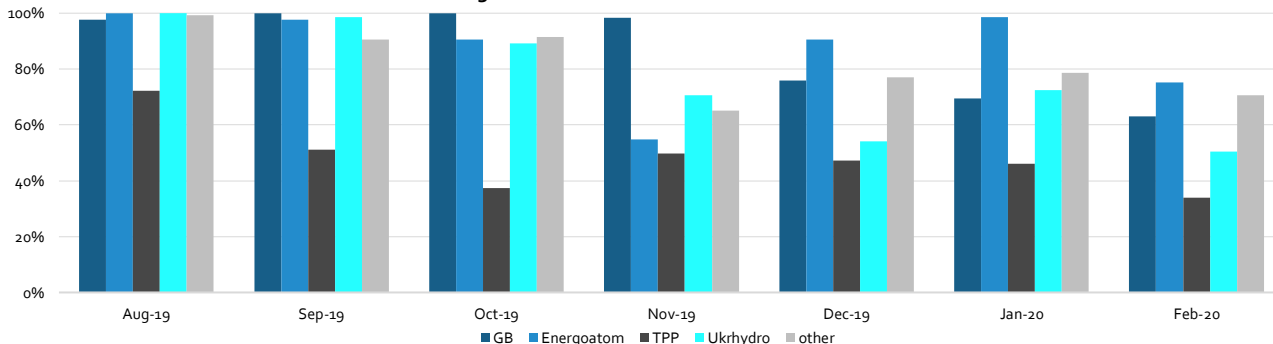


Figure 18. Realisation of bids on DAM [IPS]



Source: Market Operator data, Ukrenergo data, LCU calculations

Import from Russia and Belarus was allowed since the start of the market. A limitation was, that volumes could not be sold via bilateral agreements, forcing importers to market on organised segments. In Oct'19 this limitation was lifted. Traders started importing from Russia and most likely selling via bilateral agreements. This triggered a political debate, leading to certain new limitations, effective from Jan'20.

Import from Russia is now allowed only to be sold on the DAM, the CMU having a right to ban it during system emergencies. Import from Belarus has no marketing limitations. However, all importers now have to sell at least 15% of their volumes on the DAM – in both the IPS and BEI.

This resulted in insignificant import volumes in Jan-Feb'20, around 2% of DAM trade volumes (Figure 19). Today import to the IPS is curtailed in many cases by the system operator. Import has been effectively stopped in Apr'20 until the end of the quarantine.

As seen from cross-border capacity allocation auctions (Figure 20), a significant share was bought by a trader related to coal-fired generator Donbasenergo – contrasting active critique of import as a threat to Ukraine's system stability by DTEK. They were buying import allocations at market opening but started to criticise import from Russia after failing to secure allocations since Nov'19. Notably, DTEK controls most of the export capacity and even has booked allocation for export to Belarus for 2020.

Figure 19. Import from Russia and Belarus [IPS]

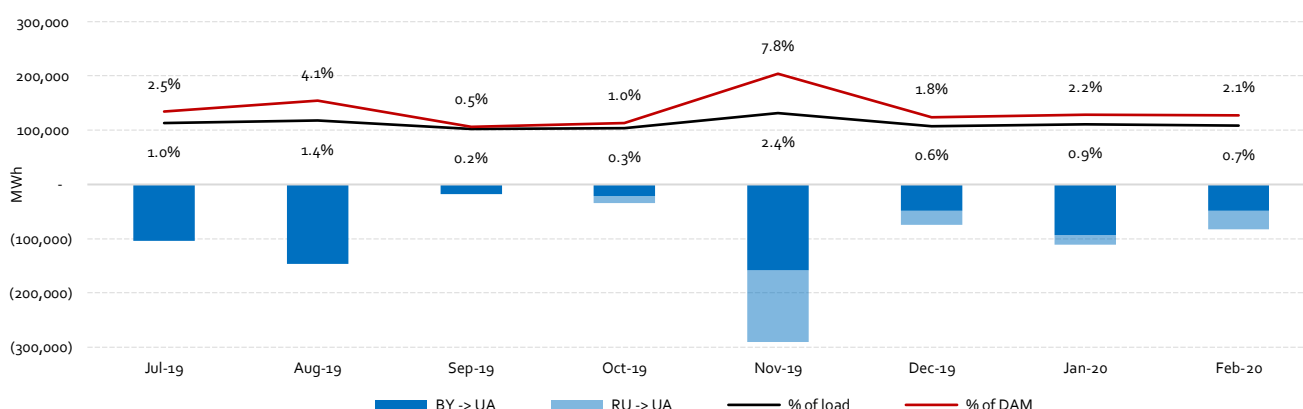
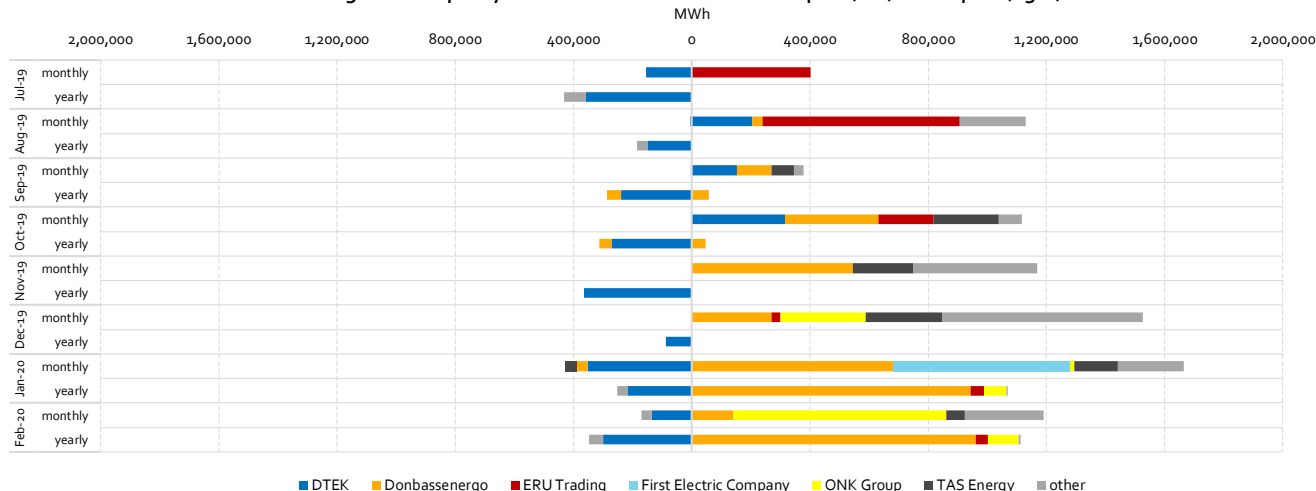


Figure 20. Capacity allocation on auctions in IPS - Export (left) and Import (right)



Note: Companies' names represent an aggregation of companies related to a stated group (e.g. DTEK includes two companies DTEK Pavlogradugol and D.Trading)
Source: Ukrenergo data, LCU calculations

LCU did an in-depth analysis of imports from Russia and Belarus in Dec'19 and identified both positive and negative potential impact. Increase of competition did affect market participants' behaviour, resulting in fewer bids at high prices on the DAM. Meanwhile, increased import means loss of revenue for Ukrainian generators.

In any case, imports observed during Jul'19-Feb'20 could not affect the market prices significantly. The DAM price drop in Nov'19 is likely caused by domestic factors and change in market behaviour, rather than the direct impact of imports on total supply. Most were likely sold via bilateral agreements, as before 2020 imports were not DAM exclusive.

Summary.

- Import volumes from Russia and Belarus are insignificant and couldn't impact DAM prices directly.
- Import capacity is very concentrated by three or four big traders.
- Export capacity is dominated by DTEK (MD, PL and even to Belarus)
- The sheer fact of possible competition from the side of cheaper imports may have forced market participants to bid at lower prices on the DAM.
- The most active criticism of imports from Russia and Belarus was forced by a market player who failed to secure import capacity and competes on bilaterals.

The BEI trading zone is synchronised with ENTSO-e and disconnected from the UA mainland system (IPS). It is used by neighbouring EU system operators as a transit zone between coupled markets of Hungary, Slovakia and Romania. Certain limitations are imposed on net transferring capacities between UA-BEI and the EU. The net export (export minus import) cannot exceed 650 MW at any time. This means the more electricity is exported out of the BEI, the more can be imported.

Market structure in this zone is very different from the IPS where two big competitors, EA and DTEK, are separated into different market segments. Here in the BEI, DTEK may only be challenged by importers. In theory, total cross-border capacity can supply most of the BEI's consumption. But stably high DAM prices indicate that import has no substantial effect (Figure 21). We identified three phases in the wholesale market with distinctive patterns.

Phase I: Jul-Sep'19. Prices do not deviate far from bid caps. DAM price is gradually rising, while trade volumes are dropping (Figure 21). Less and less electricity is traded during low-price off-peak hours.

There is a constant close match of supply and demand volumes during peak hours (Figure 26). A deficit of DAM supply during off-peak hours starts on week 5. At the same time, the number of balancing market activations rises substantially (Figure 25). Burshtyn TPP has most likely shifted volumes from the DAM with a capped price to the BM during off-peak, with higher prices. Declining DAM/IDM share at stable load and rising DAM price confirms the shift of trading to other market segments.

Phase II: Oct-Dec'19. DAM prices begin to drop, most likely due to an increase in supply during peak hours. Off-peak prices remain high for most of this phase. Trade volumes are volatile. In some weeks, DAM volumes approach BEI's total load. One week's trading result even exceeded total consumption, due to increased import in Oct'19. We indicated an increase of import from SK and HU, with a simultaneous increase of export to RO and – to a lesser extent – back to HU (Figure 31). It increased supply on the DAM during peak hours and may have contributed to a price decrease. A one-off case of DAM surplus during off-peak hours resulted in the lowest DAM price for the BEI at a time of lower overall consumption, end of Dec'19.

Imports may have impacted DTEK's strategy, as balancing market activations shrink, while DAM deficits during off-peak hours decrease almost by half. Spikes in DAM demand and supply levels, sometimes higher than the actual consumption, correlate with increased export and import.

Phase III: Jan-Feb'20. DAM prices start rising again while supply exceeds demand during off-peak hours. DAM volumes are rising, while IDM volumes drop to insignificant levels. This coincides with new long-term monthly allocations for cross-border capacity, half of which is secured by DTEK (page 13).

Total supply and demand on average exceed total consumption in the region. It's dominated by traders and importers. The Market Operator classifies them as 'others' on the supply-side in its reports (Figure 28). This indicates that even more import, reaching a historical maximum, goes through the DAM and is bought for re-export – as the share of non-regulated suppliers on demand-side reaches 70%. Burshtyn TPP has gradually left the DAM, probably by selling all the domestic output to related intragroup traders directly (Figure 29).

Off-peak hours are still close to a deficit in most weeks, as most of the import comes during peak hours, when the price differential is the highest. Export remains relatively stable during both peak- and off-peak hours. This means that traders are trying to take advantage of low capped off-peak prices to import to the EU.

Summary.

The BEI remains a classical representation of a monopoly. DTEK companies control >90% of generation, most of the cross-border transmission capacity – and by this, they control the supply. The result is a relatively stable high DAM price, above the IPS and neighbouring EU.

A significant share of DAM turnover is comprised of imports, which is most likely re-exported to EU countries. It's unclear why traders chose to exchange electricity among each other at high DAM prices only to export to the EU at lower prices.

Market power can be exercised by buying out most of both import capacities – blocking potential competitors willing to sell in the BEI – and export capacities, to disincentivize traders aiming at re-export from the cheaper SK trading zone to HU or RO.

Import did have an impact on DAM prices but was limited by the significant market power of DTEK and their control over cross-border capacity (page 15-16). A significant share of imports may be traded at higher prices to maintain market power.

The question remains why imports pass the DAM for re-export. Explanations might be tax optimisation or transfer of money outside Ukraine, accumulating profits in other jurisdictions.

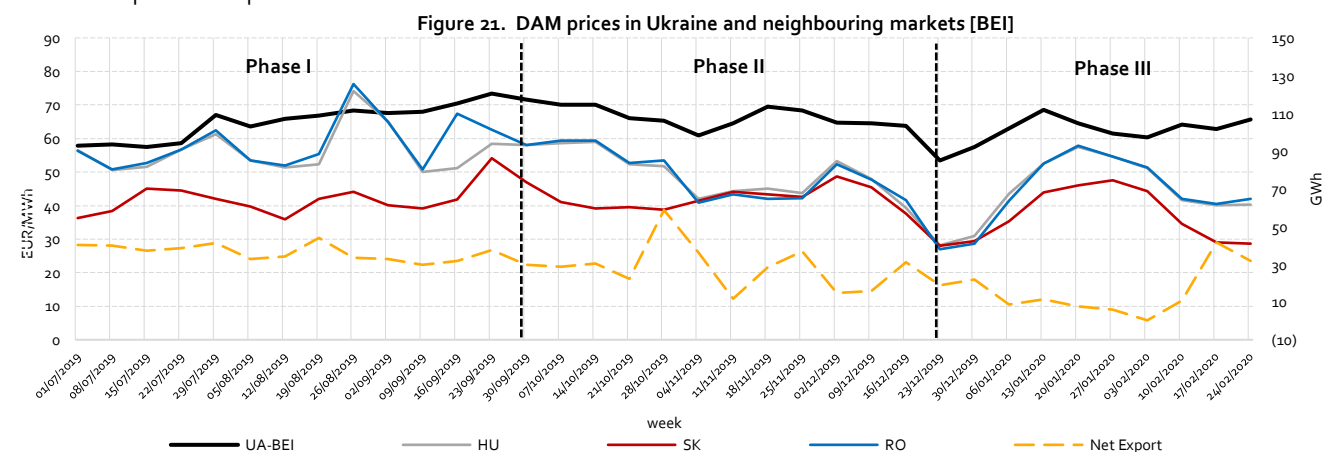


Figure 22. Prices dynamics [BEI]

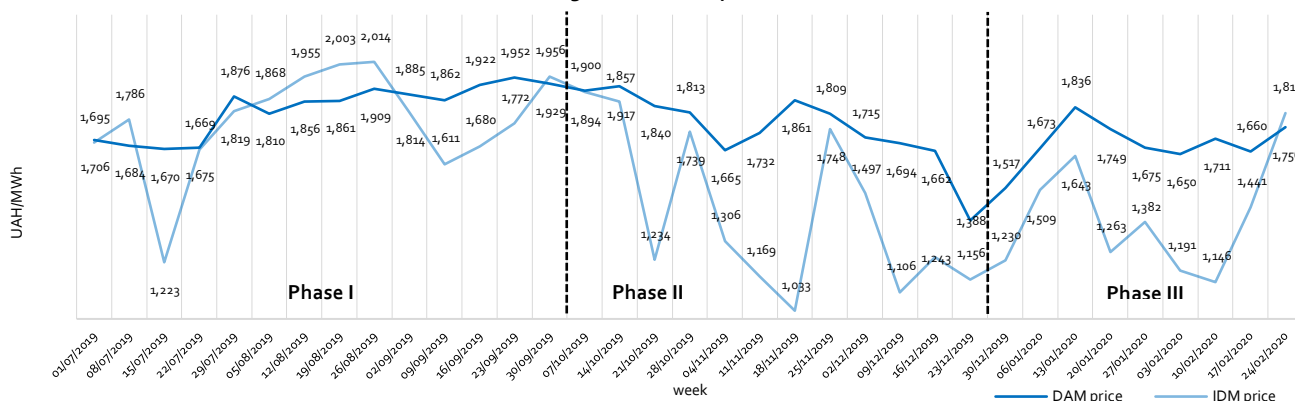


Figure 23. Trade volumes [BEI]

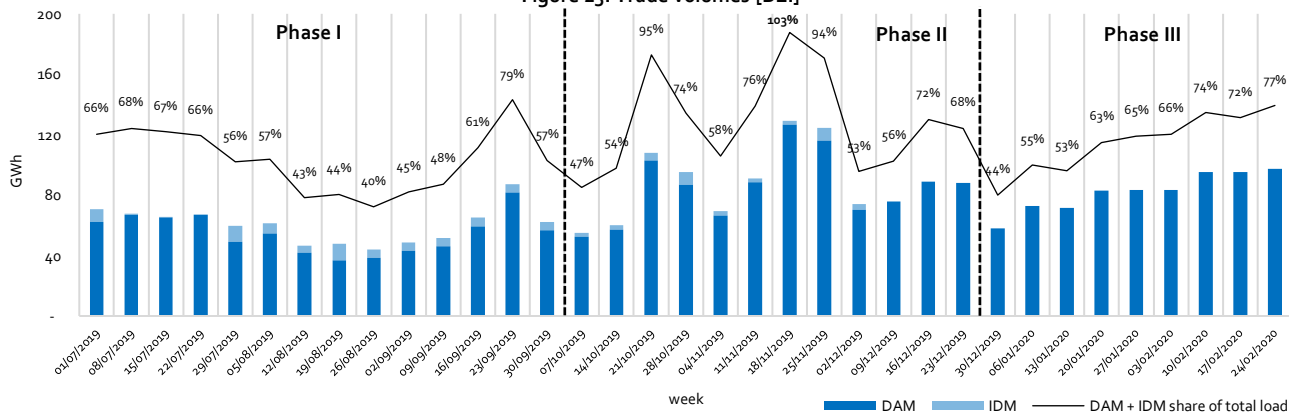


Figure 24. Balancing market prices [BEI]

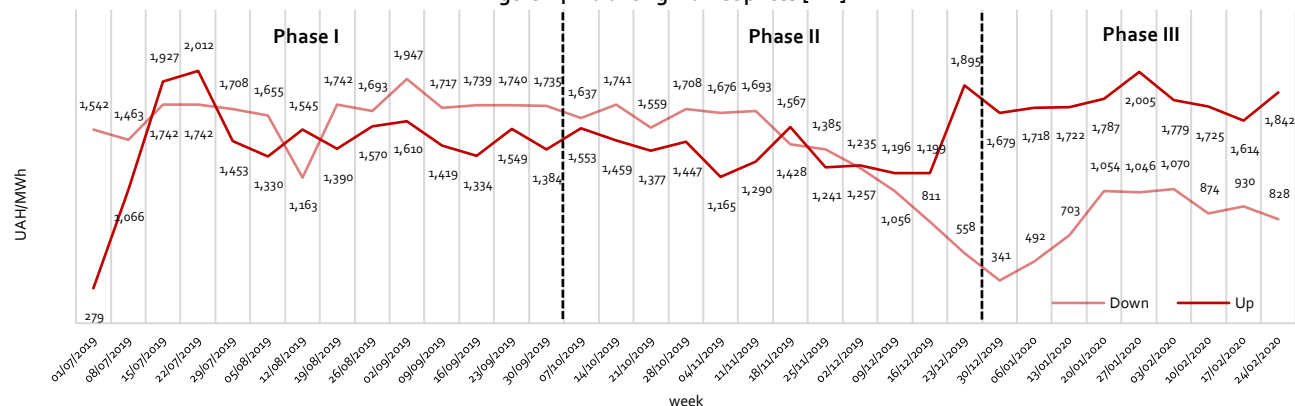
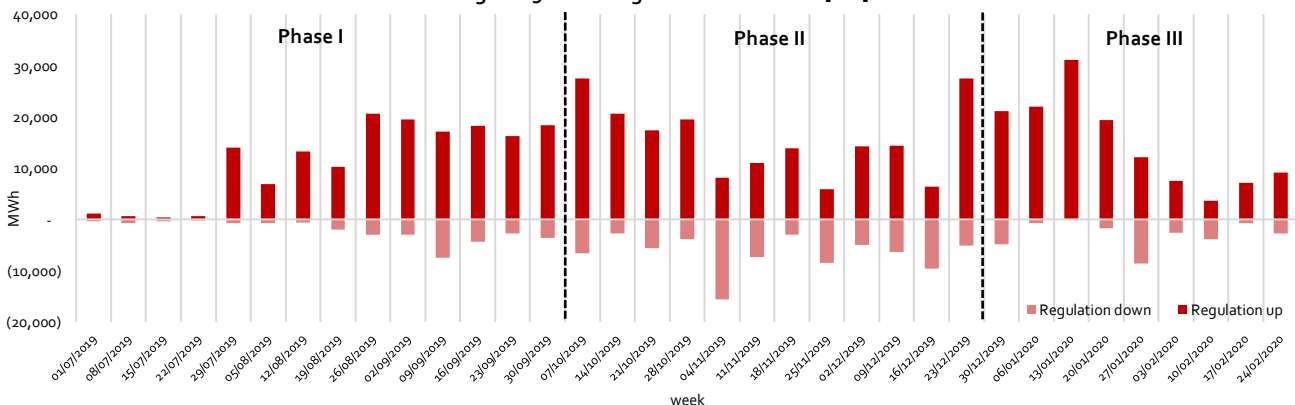


Figure 25. Balancing market activations [BEI]



Source: Market operator, Ukrenergodata, LCU calculations

Figure 26. Hourly average declared supply-demand spreads and price deviations from caps on DAM [BEI]

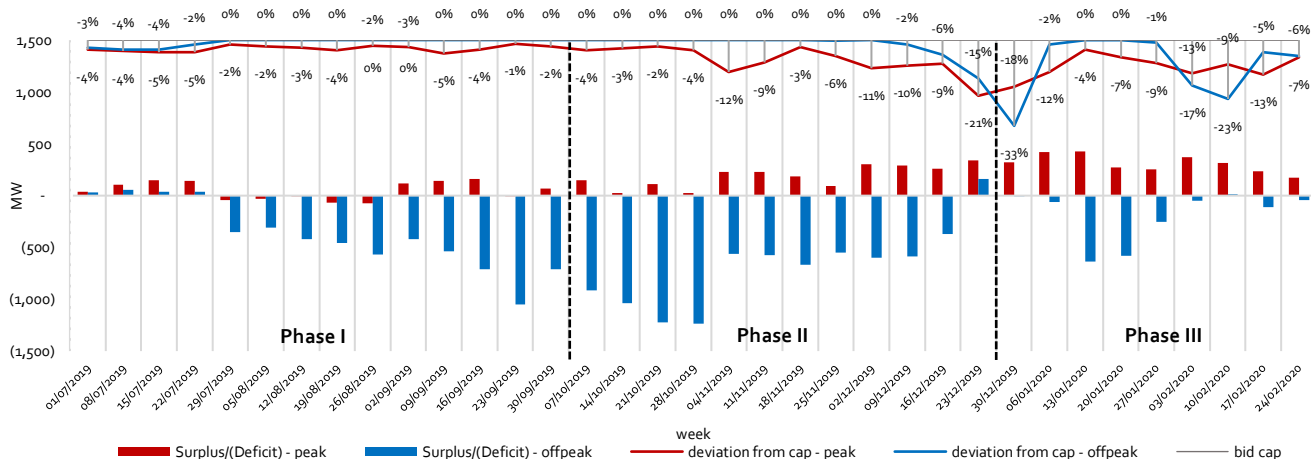


Figure 27. Average loads and supply/demand on DAM [BEI]

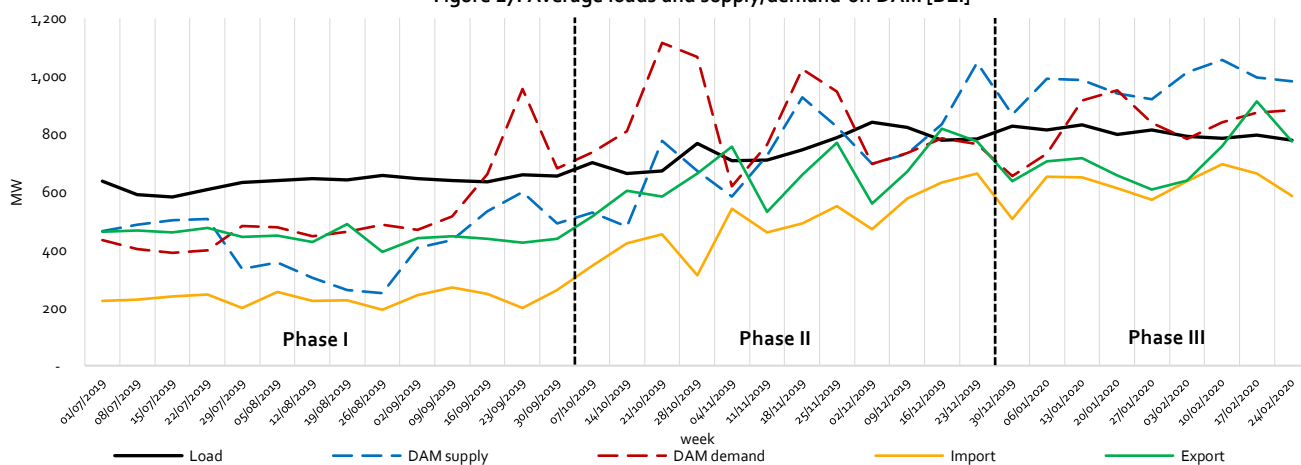


Figure 28. Buyers (left) and sellers (right) on DAM - trade volume structure [BEI]

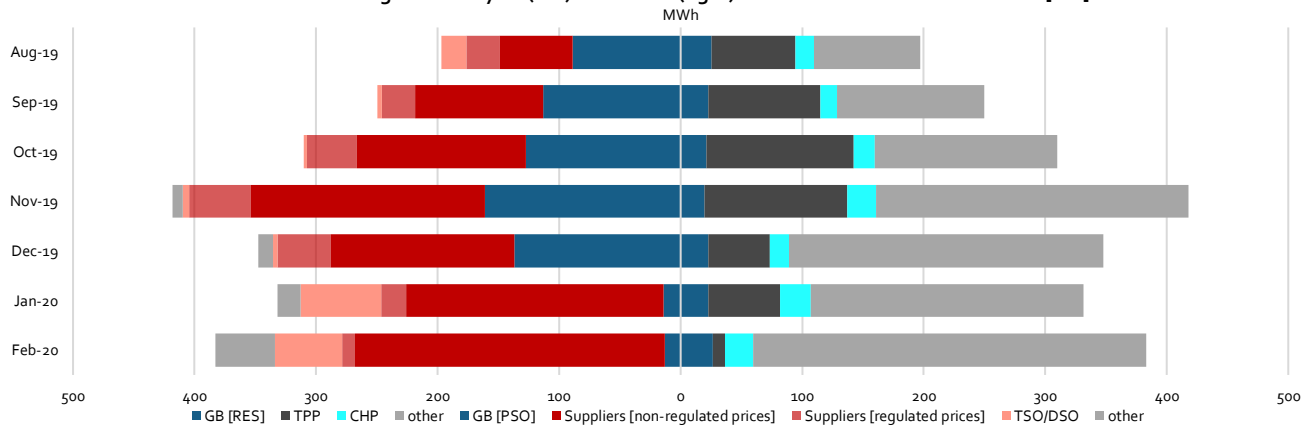
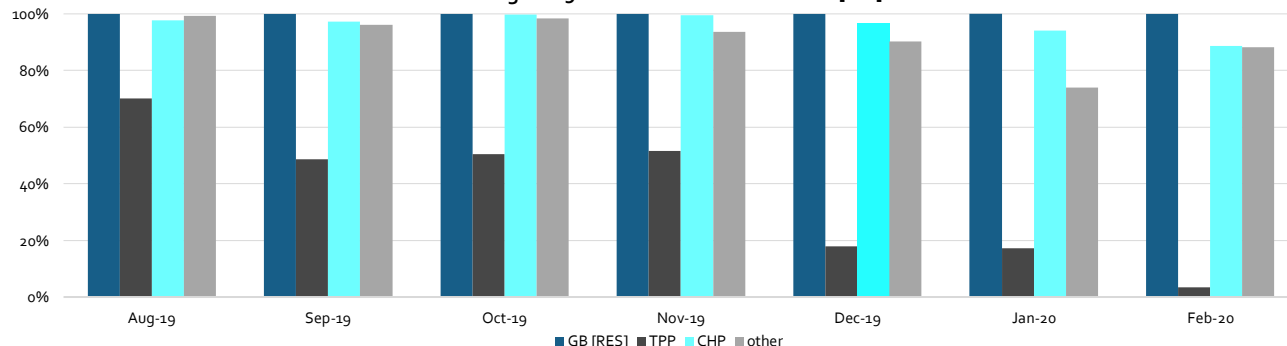


Figure 29. Realisation of bids on DAM [BEI]



Source: Market operator, Ukrenergo data, LCU calculations

Transmission capacities across EU borders are allocated via explicit auctions, meaning two commodities, capacity and electricity, are traded separately, and the final price is the sum of them.

Capacity is allocated in portions: via annual, monthly and daily auctions. E.g., a daily auction may include part of the capacity allocated on monthly auctions, but not used during this period. Starting from 2020, no annual auctions are conducted in the BEI.

Our analysis shows that since Sep'19, most cross-border capacity, both import and export, is booked by DTEK-related companies (Figures 30). Increase in export capacity allocation starting from Jan'20 is due to opening monthly auctions for UA-SK and UA-RO borders. This coincides with an increase of commercial import schedules from Slovakia and re-export to Romania in Jan'20 (Figure 31).

This concentration of transmission capacity booked implies that DTEK-related companies may control imports on the DAM. The data also implies that most of re-export is also dominated by DTEK. Such a strategy of capacity booking limits competitors' market access.

On April 3, the NEURC has adopted a decree to change the rules for cross-border capacity allocation, effective in six months. Key changes are:

- no more than 50% of total capacity can be allocated to a single company or affiliated group of companies;
- yearly auctions will allocate 35% of total cross border capacity, monthly 35%, daily ones 30% plus all free capacity not nominated by previous auctions;
- changes to financial guarantees and payments with the introduction of ESCROW accounts.
- no requirement to publish detailed auction results with allocations to each participant. Currently, this data is available on the website.
- introducing a "use-it-or-lose-it" principle: a penalty for auction participants if their allocated capacity on daily auctions has been used for less than 80%.

These changes are designed to limit the market power of companies willing to block transfer capacity and not use it. However, the step back in transparency is not clear.

Figure 30. Capacity allocation on the auctions in BEI - Export (left) and Import (right)

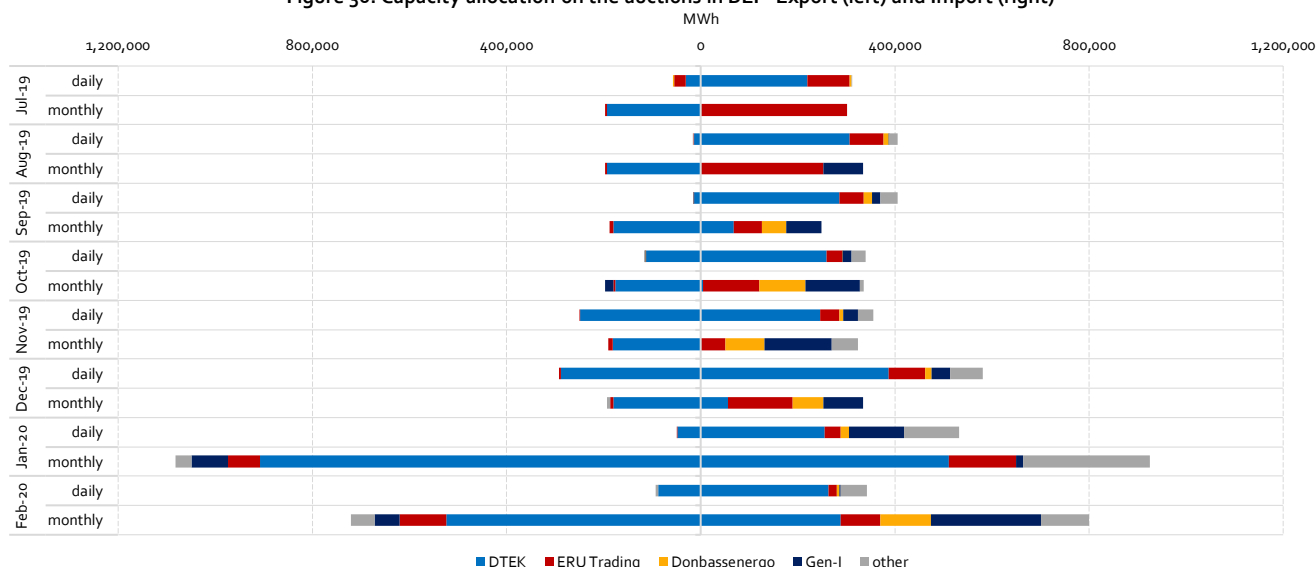
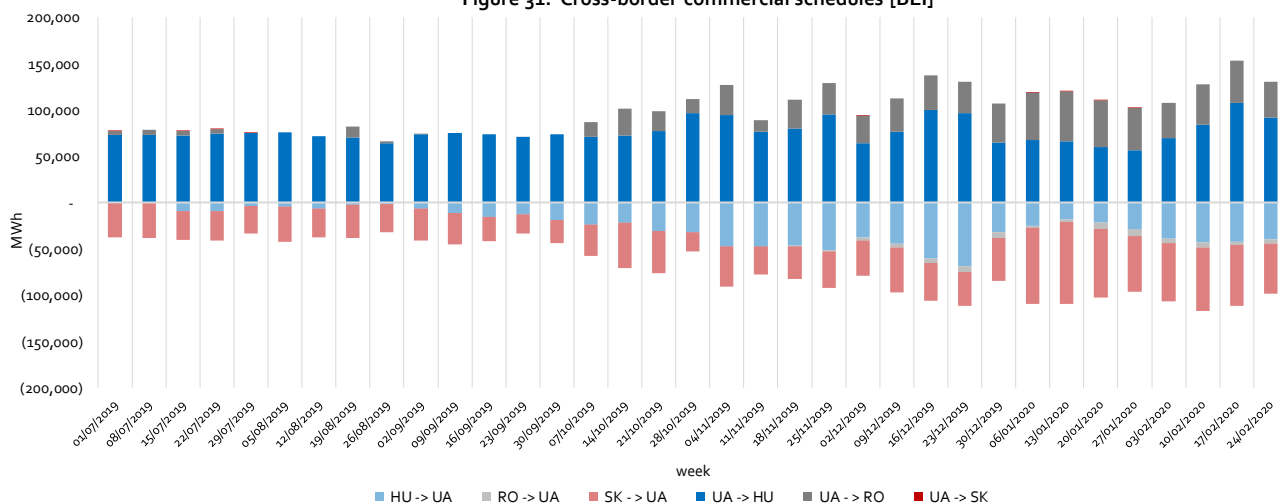


Figure 31. Cross-border commercial schedules [BEI]



Source: ENTSO-e data, Ukrenerg data, LCU calculations

Per LCU estimation, bilateral contracts comprise around two thirds of the market, in two parts:

- 1) OTC trading, with no public information available;
- 2) Trading on the organised UEXX platform.

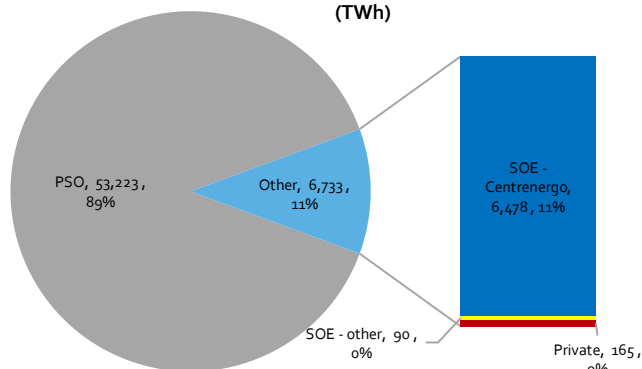
Non-regulated OTC trade is about a third of the total market, or half of bilateral agreements. It is dominated by thermal generation, as seen from data available on organised segments – with no substantial competition. LCU estimates that half the OTC segment may be intragroup trading.

The remaining third of the market is represented by direct supply contracts from the GB to USSs, to cover household consumption. These contracts are part of PSO and are administratively regulated. The price for these contracts is calculated for each USS, considering distribution and transmission tariffs. In some cases the price can be negative, meaning that GB must supply power free of charge and even pay a premium to certain suppliers.

LCU identified a deficiency in the mechanism. Households consumptions are submitted by USSs in advance and then approved by commercial metering operators, which are now represented by DSOs, some of which are related to USSs. This inherent conflict of interests creates a risk that volumes claimed to be consumed by households can be higher than the actual consumption.

Dec'19 changes to PSO design triggered a reconciliation procedure which resulted in a UAH 2.5 bln reimbursement from USSs to the GB. This stopped the blatant overestimation of household consumption. However, it did not mitigate that risk completely. The load profiles submitted as household consumption may still differ significantly from supplier to supplier. The problem will persist until a regulatory auditing procedure for households' consumption is established or the regulated below-market electricity prices are discontinued.

Figure 32. UEXX trade volumes in IPS, Jul'19-Feb'20 (TWh)



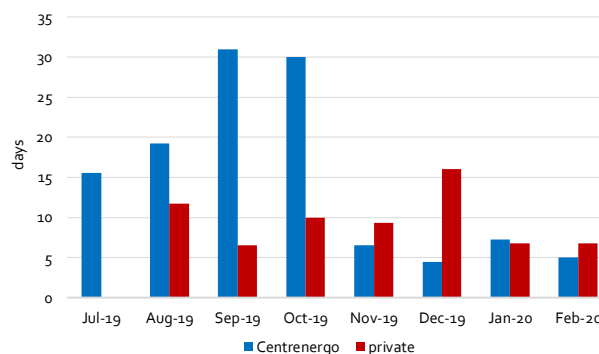
Source: UEXX data, LCU calculations

Trading on UEXX

Trading on the UEXX is obligatory for volumes sold under PSO and for state-owned enterprises but is also open for private commercial trades. No other trade platform has yet offered their services. There is currently no demand for such a market agent, as the segment is monopolised, and due to a high share of intragroup trading.

PSO 'auctions' are conducted under regulated prices and with only one buyer, thus cannot be considered as auctions by design. We exclude PSO volumes from our analysis. The remaining IPS trade is represented mostly by electricity sold by Centrenergo,

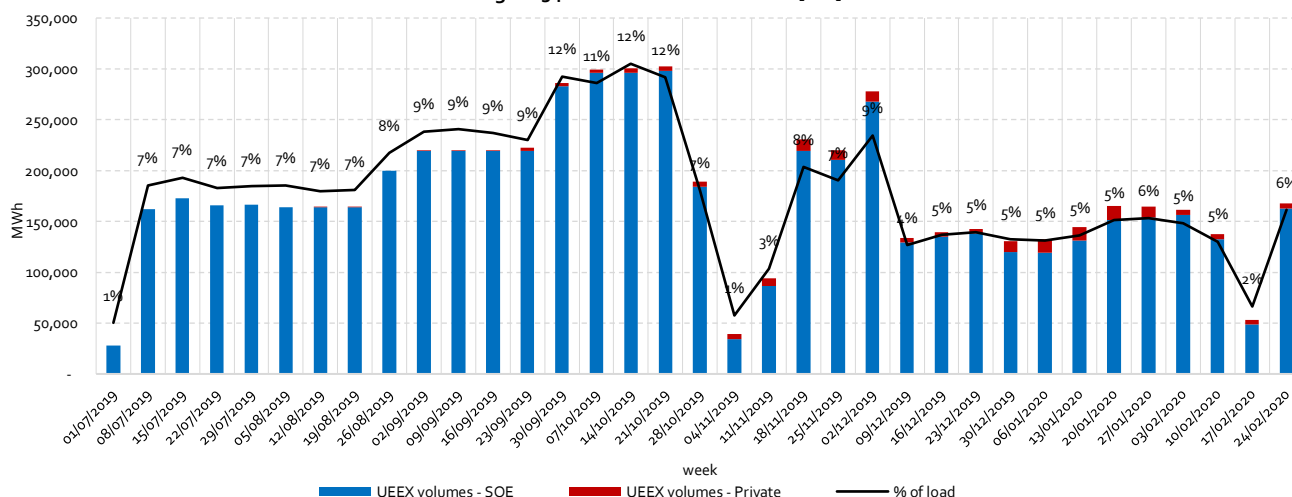
Figure 33. Average contract duration



with insignificant portions of other SOE and private auctions conducted during the first 8 months after market opening. UEXX trading volumes in the BEI are insignificant.

Average contract duration for Centrenergo decreased dramatically since Nov'19. Private contracts somehow follow the same pattern, except for Dec'19 (Figure 33). This coincides with Phase II on the DAM, when prices were continuously plunging. The short-term nature of Centrenergos bilateral contracts is a reaction to DAM price volatility. This has also been reflected in volumes traded.

Figure 34. Trade volumes on UEXX [IPS]



Source: UEXX data, LCU calculations

Volume traded on UEXX has dropped dramatically in Nov'19 as a reaction of Centrenergo to plunging DAM prices. As soon as their 30-days contracts expired, they've changed the approach and switched to 5-7 days contracts and lower volumes sold on UEXX.

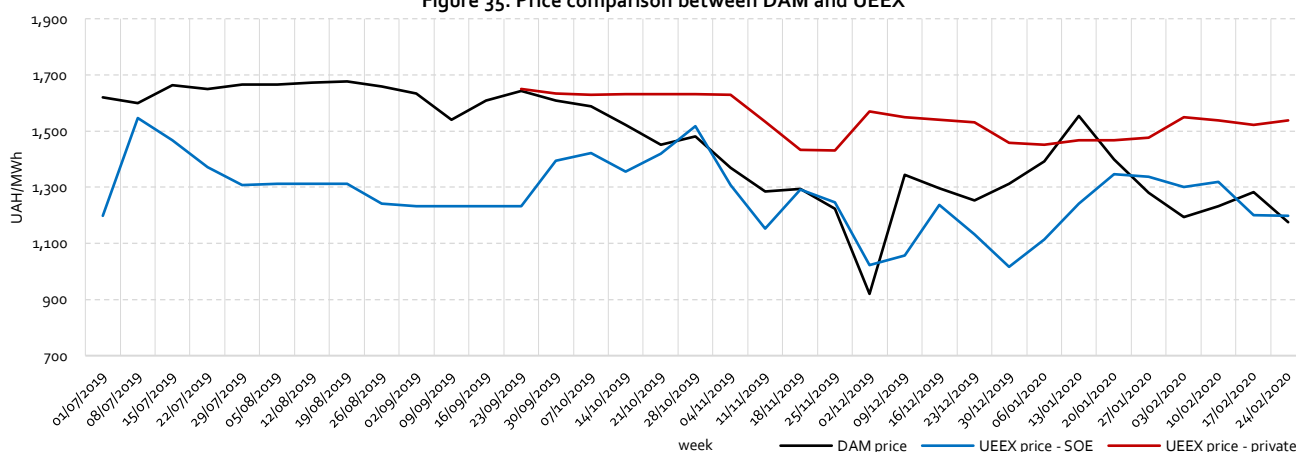
Private trades started to increase since Nov'19. During this period a new company, which is also an importer from Russia-Belarus, started trading on UEXX. Another noticeable increase in private trades happened during Jan-Feb'20, which coincides with the period of volatility on the market during imperfect balancing market rules.

UEEX strike prices show that on average, private companies were selling above DAM prices, while Centrenergo was selling below for

most of the time (Figure 35). The logical explanation would be low competition during Centrenergo auctions and high competition for private ones. This is not the case in reality. Centrenergo usually announced very high starting prices and high requirements in financial guarantees for auction participants, which drove potential competition away.

For private auctions, buyers are ready to pay more than DAM prices. In most cases, in 2019 these buyers are municipally owned water supply companies (data available for 2019 only, buyers are not disclosed for private sessions since Dec'19). This may indicate that these companies are feeling pushed by prices they are being offered by their suppliers.

Figure 35. Price comparison between DAM and UEXX



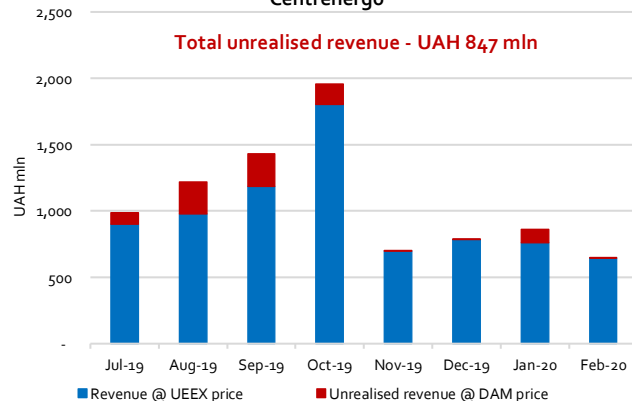
Source: Market Operator, UEXX data, LCU calculations

Effect for state-owned enterprises

LCU has estimated how much revenue state-owned companies had lost by selling at lower prices at auctions, compared to DAM prices. Calculations are made under "other conditions being equal", meaning no impact on the DAM equilibrium price, resulting from additional supply. We assume that if SOEs would sell on the DAM, their additional supply would match the additional demand and that their volumes would always be included in the merit order.

Our estimates showed that UHE did not lose any potential revenue by selling at the auctions. At the same time, Centrenergo has foregone UAH 847 mln revenue for the period Jul'19-Feb'20. This is effectively translated into 141 UAH/MWh discount to DAM prices on average, or 11%. Most of it occurred during Jul-Oct'19, when DAM prices were stable (Figure 36).

Figure 36. Theoretical unrealised revenue of Centrenergo



Source: LCU calculations

This brings us to the conclusion that the design of auctions for SOEs may not be perfect and require an in-depth analysis.

Auction rules for SOE sessions are regulated and designed by the MEEP. Rules and products for private trades are managed by the UEXX. Most SOE sessions, especially Centrenergo, showed that trades were announced with relatively high starting prices, while strike price was lower than the starting one. These auctions are not designed as a Dutch auction allow participants to suggest their price and volumes during the session. Seller are free to review the price and volume for the lot during the trading. LCU identified certain deficiencies of the auction design for SOEs, which will be covered in a separate analysis.

Summary

Bilateral agreements are also monopolised. Non-regulated trade is dominated by TPP operators. Intragroup trading is significant, drawing demand away from competitive procedures. Auction design for SOEs may include some flaws that allow certain players to push out potential competition. The market situation did not encourage significant trading on a centralised platform.

PSO design has significant impact on the segment. Long-term contracts from EA to the GB are linked to forecasting electricity balance, adopted by the MEEP. However, this approach had resulted in significant distortion of organised market segments, prompting the GB to sell excess power as imbalance, effectively losing money. Starting from February 2020, EA has decreased volumes sold under bilateral agreements to the GB, as it fails to pay. From late March 2020, EA has started to sell power on UEXX, which had a significant impact on the market. This will be covered in the next report.

Non-payments and debt accumulation

The previous model has resulted in UAH 30 bln accumulated before opening a new liberalised market. Around 1/3 of that debt is attributed to state-owned coal mines, and around 6 UAH bln is due to supply of power to non-controlled territories in the east. The main reason for this debt is that non-payments were tolerated and not being addressed. Today these 30 bln are still on the books of SOE Energorynok, and nothing has been done either to manage the debt or address the source of it in the new model. In the current market model, new debts already start to accumulate.

1. Market participants to UE on the balancing market

SOE Ukrinterenergo, which was appointed as the last resort supplier, is supplying power to state-owned coal mines and to SOE Voda Donbasu, a water company serving both controlled and non-controlled territories of Donbas region. These clients have had troubles paying for electricity during previous market model. And this problem was transferred to another entity, supplier of last resort, which now accumulates this debt and is unable to pay to UE for imbalances. These debts are the product of a political decision, they don't have a direct source of finance at the moment and should be addressed as soon as possible as they threaten the market's stability.

2. UE to GB for RES support

This problem has two sources. The first one is the non-payments of transmission tariff by several companies. These companies do not pay the tariff in full as they have filed several court cases claiming the amount of TSO tariff inadequate. There is an ongoing court case regarding payment of TSO tariff by the exporters (the main exporter is DTEK).

The second is underestimated RES surcharge component in a TSO tariff approved by the Regulator for 2020. As per LCU calculation, instead of forecasted UAH 30-35 bln (depending on market price assumptions), UE can amount only 8.5 bln or ¼ of a required amount. These two factors combined have resulted in more than 5 bln of debt from UE to GB as of the end of March. The Regulator is reluctant to increase the TSO tariff as it doesn't want to increase the final price for the industrial consumers.

3. GB to EA for electricity under PSO design

A current model of PSO for households forces EA to sell nuclear power at a low regulated price to an intermediary, GB. The volumes sold exceed the total consumption of households. GB is supposed to use the profit from selling excess power on the DAM to cover the subsidy of the prices to households.

Havoc in the market during Jan-Feb'20 pushed most of the nuclear output to imbalances. Selling power as imbalances under surplus pricing yielded not enough money for GB to pay to EA even at a low regulated price under bilateral agreements as part of the PSO. In Feb-Mar'20 EA has decreased amount of electricity sold to GB as an attempt to gain cash-flow directly from the market. In late Mar-Apr'20 EA stopped supplying to GB half the power under PSO design and marketed it via bilateral agreements auctions. This has decreased demand on the DAM, pushing GB into an even more difficult situation. GB struggles to sell power as RE supply is growing. At the same time, GB is forced buying at the DAM during some peak hours to cover the households' consumption profile.

Non-market incentives

EA's output and PSO volumes supplied to GB are linked to a forecast electricity balance which is drafted by UE and adopted by

MEEP. EA is driven by output maximization, not profit maximization. This contributed to a surplus on the market and problems with balancing the grid. Constant surplus of electricity on the market allows TPPs to regularly bid for regulation down on the balancing market. This gives them a clear strategy to adjust to. The ancillary services market is still not working, which distorts the supply on other market segments. Balancing market lacks the supply, which forces UE to issue a lot of emergency commands.

GB can sell only on the organized segments while he also has specific administrative bid caps imposed, which were designed to limit its market power. RES output is to be sold by GB at lowest possible level, while the rest supply is limited by a max bid which cannot exceed 75% of max bid caps on DAM. These regulations are now used as an attempt to manipulate the market price to reach some target value, which should balance the unbalanced market system.

As RES output grows and demand on the DAM is shrinking, prices tend to drop very low during some hours. RES is not bid on the market based on economic rationale. Were RES operators to participate in the market directly, there would be no such artificial distortions.

PSO's effect on competition

The price for households in Ukraine is the lowest in Europe. In some regions in Ukraine, it doesn't even cover the cost of electricity. Under current design, EA eventually covers the cost of this subsidy. However, the introduction of the GB as an intermediary, combined with far from perfect market rules, has unbalanced the system and created a string of debts in the process.

The volume redistribution approach in PSO has divided the market into two self-contained territories. On the organized segments, nuclear is dominating with a competition between only EA and GB. On the OTC segment, privately owned thermal generation faces no competition. Such distortion has a massive impact on the market, creating a non-competitive environment.

Mixing up RES support with PSO for households is just another product of administrative manipulations on the market trying to manage financial flows between market players. In an attempt to limit the growth of final prices, RES support is now underfinanced and is threatening an even higher price increase if not addressed promptly.

Households' consumption profiles are submitted to GB by USSs and are confirmed by DSOs each month. Most of the USS's and DSOs are related parties, and there is no third-party audit over households' actual consumption, as they are not metered directly. There is a significant risk that USS use the power they claim to buy for households to supply to commercial clients. According to the law, since Apr'20 the supply companies should have been completely independent of DSOs, but this has not happened.

Summary

Manual control over the market has brought nothing but more problems. Regulation tends to focus on the price, not on increasing competition and liquidity of the markets while decreasing market power. The market in its current form is inefficient and requires immediate comprehensive structural reforms. Small tweaks and price regulations will not bring balance to the market but will make the situation even worse.

The focus of the authorities should now be on too low household prices, redesign of PSO that will not distort the competition, gradual phase-out of all price regulations and addressing the accumulating debts without a source of financing.

Market Transparency

Overview

Transparency is important for all stakeholders on the market. For authorities – to closely monitor market development and safeguard competition. For market players – to evaluate competitor's behaviour and to adjust own strategies. For potential newcomers – to access whether the new market is worth investing into. The more transparent a market, the more effective competition is, and consumers get the best value in the services provided.

Disclosure of information on the Ukrainian electricity market is regulated by several documents. Electricity market law and respective market rules are one side. On the other are separate documents, like:

- CMU decree #768-p of 27/09/2017 on implementation of EU Regulation No 543/2013 of 14 June 2013 on submission and publication of data in the electricity market;
- NEURC decree #459 of 19.06.2018 to meet EU Regulation on market transparency using ENTSO-e transparency platform.

In this section, LCU focuses on the assessment of data disclosure according to active Ukrainian legislation. We do not assess gaps in data compared to the best market practices.

Wholesale Market Transparency

DAM/IDM

Responsible: The Market Operator

These segments are the most transparent, data is regularly published on the website, most of it available in English. Regular 10-day and monthly reports share a more in-depth analysis of the segments. We identified one significant issue in the market rules regarding data disclosure: non-accepted block bids are not shown on the supply-demand curve. In a highly monopolized market, this may be used by market participants for collusion.

Balancing and Ancillary Services Market

Ukrenergo

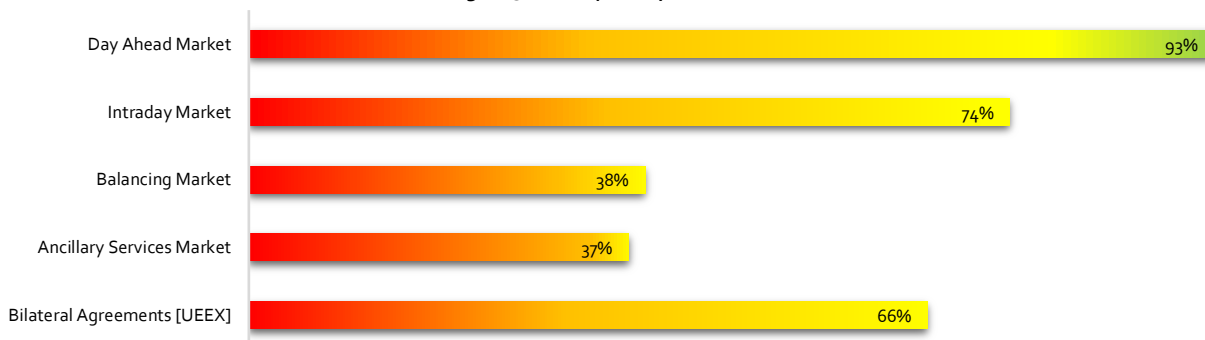
Least transparent market segment. Data publication seems not to be synchronised with the MMS software. Data is provided with certain time lags in form of Word/Excel files, sometimes are hard to navigate. Some required data, like on imbalance volumes and AS market results, is still not published.

Bilateral Agreements Market

UEEX

UEEX meets all legislation requirements on data publication, however, navigation and data search is not user-friendly. We do not assess any data on OTC trading since it is not by law required to be published. OTC volumes not being available makes an assessment of churn ratio and market liquidity impossible for private sector analysts.

Figure 37. Transparency of market data



EU transparency standards implementation

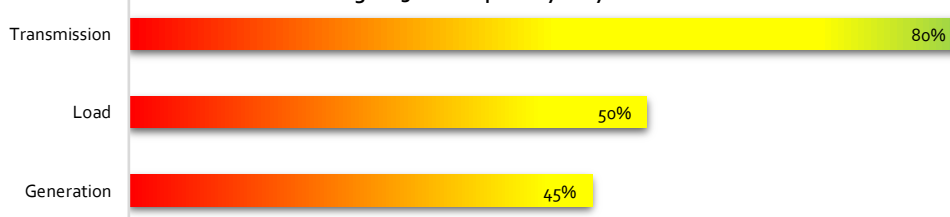
The use of ENTSO-e transparency platform is a requirement for market participants since 2018. As of today, only UE is publishing data on the platform. Other market participants do not publish the data there, referring to deficiencies in local legislation. Working groups have been going on since Nov'19 to address legislative gaps. However, progress is slow.

Data essential for the market is not limited to wholesale market segments. We classified the data for analysis into three groups (Figure 38). While most of the essential data is there, we also identified several gaps. Data on congestion management not related to cross-border lines is not disclosed. Generation-related data is mostly published in an over-aggregated form, not on a detailed level. RES forecasts are not published as required. One of

the main issues is accessibility. Part of the data is published on the ENTSO-e platform and available in English, while the other part is available only in Ukrainian on the UE website, sometimes in many separate files. Data on cross-border trade is accessible in full on yet another platform.

In December 2019 the NEURC has adopted a draft decree «On approval of the Requirements for bans and prevention of abuse in the wholesale energy markets» which is part of the REMIT implementation. The text review is in process. On March 20, EU4Energy Governance launched a project to assist Ukraine in the transposition of Regulation (EU) 1227/2011 on wholesale energy market integrity and transparency (REMIT) into Ukrainian legislation.

Figure 38. Transparency of system data



Retail market transparency

The NEURC is in charge of monitoring and publishing data on retail electricity market segment. Currently, NEURC is publishing cumulative data on suppliers in the retail market on a monthly basis. The latest publication is Dec'19. These monthly reports focus on regulated supplier and include the following data:

- Monthly volumes traded and shares per supplier groups (non-regulated suppliers, USS, last resort supplier);
- Consumer structure of each supplier group;
- Monthly consumption of households per USS;
- Total monthly turnover per USS;
- Data on payment discipline and debts of consumers;

A comprehensive look at the retail market is published by the NEURC on a quarterly basis. The latest publication is Q3 2019 report. These reports add the following data:

- Number of suppliers on the market;
- Final consumer prices analysis;
- Analysis of DSO activities;
- Quality of supply (e.g. SAIDI);
- Retail market concentration and competition assessment.

All this data is presented in reports only and is not available for download on the NEURC website.

The most interesting takeaways from these reports are:

- 1) the number of suppliers have been steadily increasing since the market opening and reached 575 companies as of 30/09/2019.
- 2) DTEK-related companies control 44% of non-regulated supply, with the closest rival reaching only 9%.
- 3) Share of the 5 biggest suppliers is 54%.
- 4) Concentration index HHI is estimated at 2,175 (range from 0 to 10,000). This level indicated a moderately concentrated market.
- 5) Final consumer prices range from 0.84 to 3.05 UAH/MWh.

LCU methodology for transparency assessment

LCU's integral assessment is based on the multivariate mean method. We formulated a list of data required to be published according to the Ukrainian legislation and grouped it into relevant market segments. Some data sets are grouped into one category where appropriate. Each category has been given a value, from 1 to 3, representing our assessment of the data's importance.

Each category is then assessed through four dimensions, each with attributed weight – 100% in total:

- Regularity (40%)

How regularly and timely is the data published, how big are the time lags?

- Quality (30%)

How detailed is the data provided, how appropriate its level aggregation?

- Accessibility (20%)

How easy is it to access, download and process the data? Is the format machine-readable, does one need to perform additional work?

- Availability in English (10%)

Is the data available in English and accessible to international audiences?

The result is a weighted average of all categories. For detailed calculations, please refer to an Excel file, which is published on the website with this report.

This project is part of the International Climate Initiative (IKI). The Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) supports this initiative on the basis of a decision adopted by the German Bundestag.

All results of the project are available online at www.LowCarbonUkraine.com.

We will be grateful for your feedback on the Monitor of Electricity Market Opening, in particular, comments how to make it even more useful for parties interested in understanding processes and outcomes in the emerging electricity market in Ukraine. Please get in touch via info@LowCarbonUkraine.com.

Editor: Dr. Georg Zachmann

Contributors: Oleksii Mykhailenko, Anastasiia Vereshchynska, Vadim Mukha, Kima Avetyan

BE Berlin Economics GmbH | Schillerstraße 59 D-10627 Berlin | +49 30 / 20 61 34 64 - 0 | info@berlin-economics.com | [Impressum](#)