

Fifth amendment of the Intraday capacity calculation methodology of the Core capacity calculation region

in accordance with article 20ff. of the Commission Regulation (EU)
2015/1222 of 24th July 2015 establishing a guideline on capacity allocation
and congestion management

November 2025

Whereas

TSOs of the Core CCR (“Core TSOs”), take into account the following:

1. With this amendment, PSE aims at extending the period of using AC by additional two years. Operational experience gathered over the previous two years has proven that allocation constraints are an effective measure to maintain the transmission system within operational security limits and cannot be transferred efficiently into maximum flows on critical network elements, as prescribed by provisions of the CACM Art. 23(3). Allocation constraints allowed to avoid any cases of insecure operation in Poland that could not have been resolved by operational means. Allocation constraints secure balancing reserves by limiting excess trade which could result in scarcity of available balancing capacity. To increase the available balancing capacity and limit Allocation Constraints impact on market, PSE launched an additional balancing capacity market mechanism which was implemented on 14 June 2024. Balancing capacities on the market are acquired separately for the direction of increasing the power introduced to the system and its reduction. The acquisition of balancing capacities for given day D takes place in the basic process at 8:30 on D-1 and in the supplementary process of Integrated Scheduling Process from the afternoon on D-1 until the time of delivery on D. The capacity bought by PSE in the basic process should not be offered anymore by BSPs on the SDAC and SIDC leading to significantly less frequently binding Allocation Constraints. Unfortunately, so far the market isn’t liquid enough to provide sufficient reserves despite that PSE buys all the available capacity on the market. Despite immaturity of morning balancing capacity market, the impact of retracting procured capacities on frequency of activation of Allocation Constraints is noticeable. They are the only means of ensuring sufficient regulation reserves and secure operation of the power system. They are for now the only effective measure to maintain the frequency stability. For the above reasons, the extension for using capacity allocation constraints is necessary to secure balancing reserves until the balancing capacity market is liquid enough to reliably and systematically provide them. The Allocation Constraints transition period is proposed to be extended by two years to four years and as it’s starting date is date of implementation of IDCC(b), it is expected to end in May 2028.

Article 1

Polish allocation constraints

1. Article 2. Definitions and interpretation shall be amended accordingly, a new definition shall be introduced:

“(II) ‘MTU’ is the intraday market time unit, which means the time unit for the intraday market;”

2. Article 7. Methodology for allocation constraints shall be amended by updating the paragraphs 3 and 4 accordingly:

“3. External constraints may be used by a concerned Core TSO as listed in Annex 1 during a transition period of four years following the implementation of this

methodology in accordance with Article 25(2)(b) and in accordance with the reasons and the methodology for the calculation of external constraints as specified in Annex 1 to this methodology. During this transition period, the concerned Core TSOs shall:

- (a) calculate the value of external constraints on a daily basis for each ID CC MTU;
- (b) if applicable and in case the external constraint had a non-zero shadow price in more than 0.1% of hours in a quarter, provide to the CCC a report analysing: (i) for each ID CC MTU when the external constraint had a non-zero shadow price the loss in economic surplus due to external constraint and the effectiveness of the allocation constraint in preventing the violation of the underlying operational security limits and (ii) alternative solutions to address the underlying operational security limits. The CCC shall include this report as an annex in the quarterly report as defined in Article 24(5);
- (c) if applicable and when more efficient, implement alternative solutions referred to in point (b)."

"4. In case the concerned TSOs could not find and implement alternative solutions referred to in the previous paragraph, it may, by forty two months after the implementation of this methodology in accordance with Article 25(2)(b), together with all other Core TSOs, submit to all Core regulatory authorities a proposal for amendment of this methodology in accordance with Article 9(13) of CACM Regulation. Such a proposal shall include the following:

- (a) the technical and legal justification for the need to continue using the external constraints indicating the underlying operational security limits and why they cannot be transformed efficiently into I_{max} and F_{max} ;
- (b) the methodology to calculate the value of external constraints including the frequency of recalculation.

In case such a proposal has been submitted by all Core TSOs, the transition period referred to in Article 7(3) shall be extended until the decision on the proposal is taken by all Core regulatory authorities."

3. ANNEX 1 shall be replaced and read accordingly:

"Allocation constraints may be used by the following Core TSOs:

The following section depicts in detail the justification of usage and methodology currently used by each Core TSO to design and implement allocation constraints, if applicable. The legal interpretation on eligibility of using allocation constraints and the description of their contribution to the objectives of the CACM Regulation is included in the Explanatory Note.

1. Poland

PSE may use an external constraint to limit the import and export of the Polish bidding zone.

Technical and legal justification

Capacity allocation constraints are a legally prescribed means, defined by Capacity Allocation and Congestion Management Regulation (Art. 23(3) and art. 21(1)(a)(ii) CACM).

These constraints limit the global net position of Polish zone and reflect the ability of Polish generators to increase generation (potential constraints in export direction) or decrease generation (potential constraints in import direction) subject to technical characteristics of individual generating units as well as the necessity to maintain minimum generation reserves required in the Polish power system to ensure secure operation. This is explained further in subsequent parts of this Annex.

Rationale behind implementation of external constraints on PSE side

Implementation of external constraints as applied by PSE is related to the fact that under the conditions of the integrated scheduling-based market model applied in Poland (also called central dispatching model) the responsibility of the Polish TSO on system balance is significantly extended comparing to such responsibility of TSOs in so-called self-dispatch market models. Central dispatching is one of the two dispatching models authorized by EU Commission Regulation 2017/2195. In self-dispatch markets, balance responsible parties (BRPs) are themselves supposed to take care about their generating reserves and load following, while TSO ensures them just for dealing with contingencies in the timeframe of up to one hour ahead. In a central dispatching model, it is the TSO who dispatches generating units taking into account their: operational constraints, transmission constraints and reserve capacity requirements, with the aim to balance national generation, demand and cross-border exchanges while ensuring secure operation of the transmission system. When TSO is preparing generation dispatch plans for the operational day, energy and reserves in the central dispatching model are ensured simultaneously (inherent feature of central dispatching systems with accordance to EU Commission Regulation 2017/2195). Results of the wholesale market together with the results of the balancing capacity reserves market serve as a basis for the generation dispatch performed under integrated scheduling process.

In central dispatching systems, the above process is realised within an Integrated Scheduling Process (ISP) run as a single optimisation problem called security constrained unit commitment (SCUC – where generation units are being dispatch on and off) and economic dispatch (SCED – where generation output for all dispatched generation units is determined). Integrated Scheduling Process starts in the late afternoon of D-1, already well after the day-ahead capacity calculation and SDAC, and continues iteratively by recalculating the future dispatch plans for each particular hour of day D until its real-time execution (new recalculation at least every hour). Within aforementioned integrated scheduling process, generation units connected to the transmission grid are dispatched by PSE with the aim to respect power purchase agreements concluded between market participants on the wholesale market, while minimizing overall costs of dispatch adjustments and balancing energy activation to cover the residual demand (being the part of end users demand not covered by commercial contracts). When doing so, PSE is obliged to respect power system operating conditions, as well as the technical characteristics of generation units both on the level of individual generation units and on the level of power plants. Unit capabilities, considering their inter-temporal limitations (ramping rates), are also considered in this process.

According to the national legislation, PSE is legally obliged ensure availability of sufficient level of generating reserves for the whole Polish power system in order to safeguard its secure operation in case of contingency, as well as in case of insufficient and ineffective balancing activities performed by market participants in Poland. However, if balancing service providers (generating units) would already sold too much energy in the day-ahead and intraday market in form of high exports, they may not be able to provide sufficient upward reserve capacity within the integrated scheduling process as required by national legislation. This conclusion equally applies for the case when market participants import significant amount of energy, as

it could result in balancing service providers being unable to provide downward regulation capabilities due to not securing enough generation levels in the markets. The strength of the imbalance settlement pricing is also important in this process, together with the maturity and the ability market participants to maintain balanced portfolios under objectively high RES and demand uncertainties and underdeveloped intraday markets.

This leads to implementation of external constraints, being the necessary means to ensure operational security of Polish power system in terms of securing generating capacities for upward or downward regulation, as well as in order to cover the national imbalances in the direction of shortage (i.e. cover the residual demand) and surplus (i.e. manage and regulate down the surplus of power during periods of oversupply). Excluding such a solution and depriving TSOs under central dispatching systems from the usage of external constraints to set appropriate limits to how much electricity can be imported or exported by the system as a whole may lead to insufficient balancing capacity reserves, making the provisions of Electricity Balancing Guideline void, and making it impossible or at least much more difficult to comply with System Operation Guideline.

The impact of external constraints is analysed and described in Quarterly and Annual Core Reports. The reports shows that the largest social welfare impact concerns Poland (order of magnitude higher than for other Core countries), resulting in a loss of social welfare in Poland due to application of external constraints. However, as demonstrated in the reports time after time, this apparent loss of social welfare in Poland avoids much higher welfare losses when secure operation of the Polish power system is threatened and extraordinary measures must be applied to mitigate this threat (e.g. demand curtailment or RES curtailment).

It needs to be highlighted that despite implementation of explicit balancing capacity procurement in Poland as per 14 June 2024, and despite maintaining the use of External Constraints, PSE still has to apply remedial measures at large scale in order to ensure equilibrium between demand and supply in the Polish power system. These measures are mostly the non-market-based curtailment of RES (in case of energy surplus) and emergency exchanges with neighbouring TSOs (in case of energy surplus or shortage). Both aforementioned measures have severe negative consequences, such as difficulties for TSO and DSO dispatching teams to manage hundreds of operational commands issued to dispersed RES facilities in very short time, difficulties of RES facility owners to respond to dispatching commands issued with short notice, as well as depletion of operational reserves of neighbouring TSOs when asked for emergency exchanges, reducing overall European power system resilience. In many instances of time, neighbouring TSOs are unable to provide the requested support.

Balancing market reform executed on 14 June 2024 has significantly improved market price signals, so that balancing responsible parties are better reacting to dynamically changing power system situation. Nonetheless, the observed levels of balancing energy that needs to be activated by PSE under ISP is still very high, often exceeding the procured balancing capacity. This implies that the new improved balancing market prices are still unable to convey sufficient incentives for market participants to improve generation and demand planning as BRPs still do not balance their portfolios earlier on more attractive day-ahead and intraday markets. Moreover, new balancing capacity reserves procurement process is still immature and suffers from lack of liquidity, low supply and low competition. Both aforementioned items are a subject of intensive analysis on PSE side with the aim to prepare improvements and increase effectiveness of price signals.

Due to the fact that no alternatives to using external constraints have been identified as plausible to be implemented until two years following implementation of flow-based in

Central Europe, which could both have lower overall cost while maintaining the similar level of operational security and which would not require a major overhaul of the whole market design, PSE aims at using external constraints in the Core region.

The reason why external constraints can't be expressed by maximum admissible power flow

This limitation cannot be efficiently expressed by translating it into transfer capacities of critical network elements offered to the market. If this limit was to be reflected in cross-zonal capacities offered by PSE in the form of an appropriate adjustment of cross-zonal capacities, this would imply that PSE would need to guess the most likely market direction (imports and/or exports on particular interconnectors) and accordingly reduce the cross-zonal capacities in these directions. In the flow-based approach, this would need to be done on each CNEC in a form of reductions of the RAM. However, from the point of view of market participants, due to the inherent uncertainties of market results, such an approach is burdened with the risk of suboptimal splitting of external constraints onto individual interconnections – overestimated on one interconnection and underestimated on the other, or vice versa. Also, such reductions of the RAM would limit cross-zonal exchanges for all bidding zone borders having impact on Polish CNECs (i.e. transit flows), whereas the external constraint has an impact only on the import or export of the Polish bidding zone, while the trading of other bidding zones is unaffected.

Determination of external constraints in Poland

External constraints are applied in intraday allocation process, with values determined before every capacity calculation process for the energy delivery day, per each Market Time Unit (MTU) individually based on expected generation adequacy analysis for this MTU as well as power system operation conditions and technical characteristics of generation units both on the level of individual generation units and on the level of power plants. External constraints are determined for the whole Polish power system, meaning that they are applicable simultaneously for all CCRs in which PSE has at least one bidding zone border.

When determining the external constraints, PSE takes into account the most recent information on the technical characteristics of generation units, forecasted power system load as well as minimum reserve margins required in the whole Polish power system to ensure secure operation and forward import/export contracts that need to be respected from previous capacity allocation time frames.

$$EXPORT_{\text{constraint}} = P_{CD} - P_{NA} + P_{NCD} - (P_L + P_{UPres}) \quad (1)$$

$$IMPORT_{\text{constraint}} = P_L - P_{DOWNres} - P_{CDmin} - P_{NCD} \quad (2)$$

Where:

P_{CD}	Sum of operating generating capacities of centrally dispatched units as declared by generators ⁶
P_{CDmin}	Sum of technical minima of centrally dispatched generating units in operation
P_{NCD}	Sum of schedules of generating units that are not centrally dispatched, as provided by generators (for wind farms: forecasted by PSE)

P_{NA}	Generation not available due to grid constraints (both planned outage and/or anticipated congestions)
P_L	Demand forecasted by PSE
P_{UPres}	Minimum reserve for upward regulation
$P_{DOWNres}$	Minimum reserve for downward regulation

The calculated values of Allocation Constraints are then adjusted to take into consideration already allocated capacities on Polish borders (current global net position of Poland including non-SDAC exchange): in case of export constraints their values are reduced by the global net positions and in case of import constraints their values are increased by the global net positions. Published values of Allocation Constraints are therefore relative to global net position value in the time they were calculated.

Equation (1) stems from requirement for system operators to maintain upward reserves to cover part of forecasted load with accordance to Polish grid codes. These reserves are a critical aspect of ensuring system reliability and stability, particularly in balancing supply and demand during unexpected events such as generation outages or sudden demand spikes. During periods of high energy demand combined with limited additional capacity from renewable sources, it becomes challenging to maintain adequate upward reserves. In such scenarios, the only viable solution to address the balancing challenge is to set the export capacity to zero.

Equation (2) refers to the need of securing the capacity that can be quickly reduced to balance supply and demand when there is an excess of power in the grid e.g. in case of loss of significant load.

The process of practical determination of external constraints in the framework of the intraday capacity calculation is illustrated below in Figures 1 and 2. The figures show how a forecast of the Polish power balance for each Market Time Unit of the delivery day is developed by PSE in the morning of D-1 in order to determine reserves in generating capacities available for potential exports and imports, respectively, for the intraday market.

External constraint in export direction is limits export from Polish zone. External constraint in import direction limits import to Polish zone.

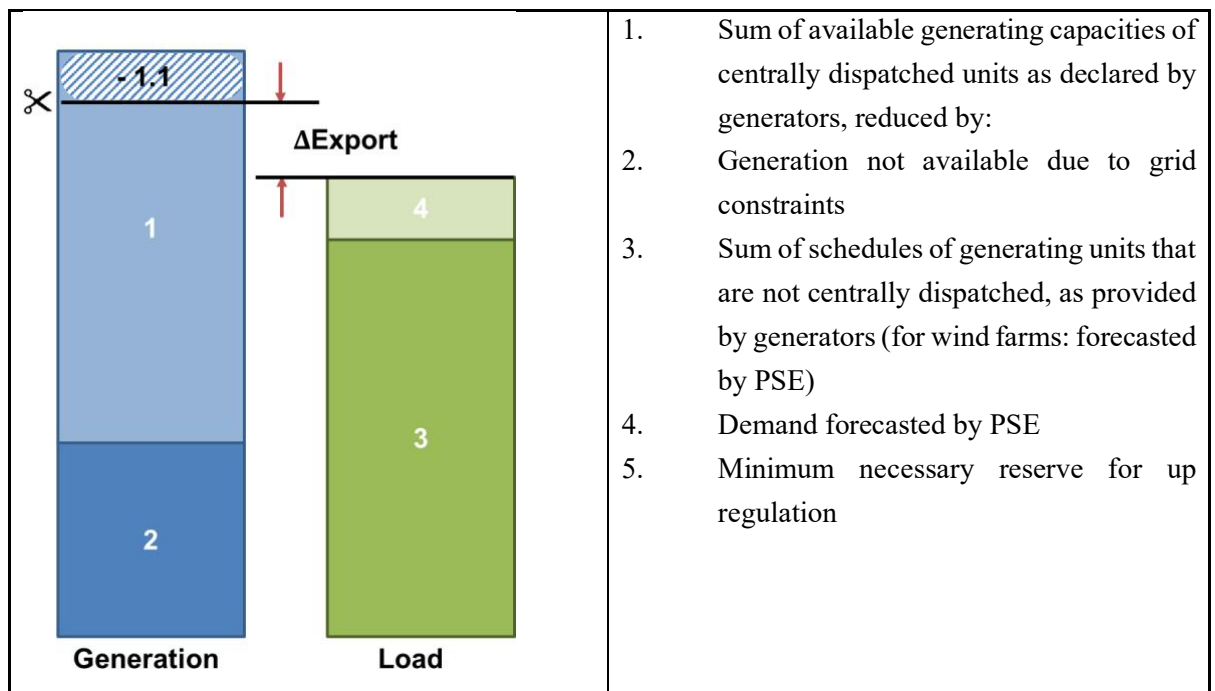


Figure 1: Determination of external constraints in export direction (generating capacities available for potential exports) in the framework of the intraday capacity calculation.

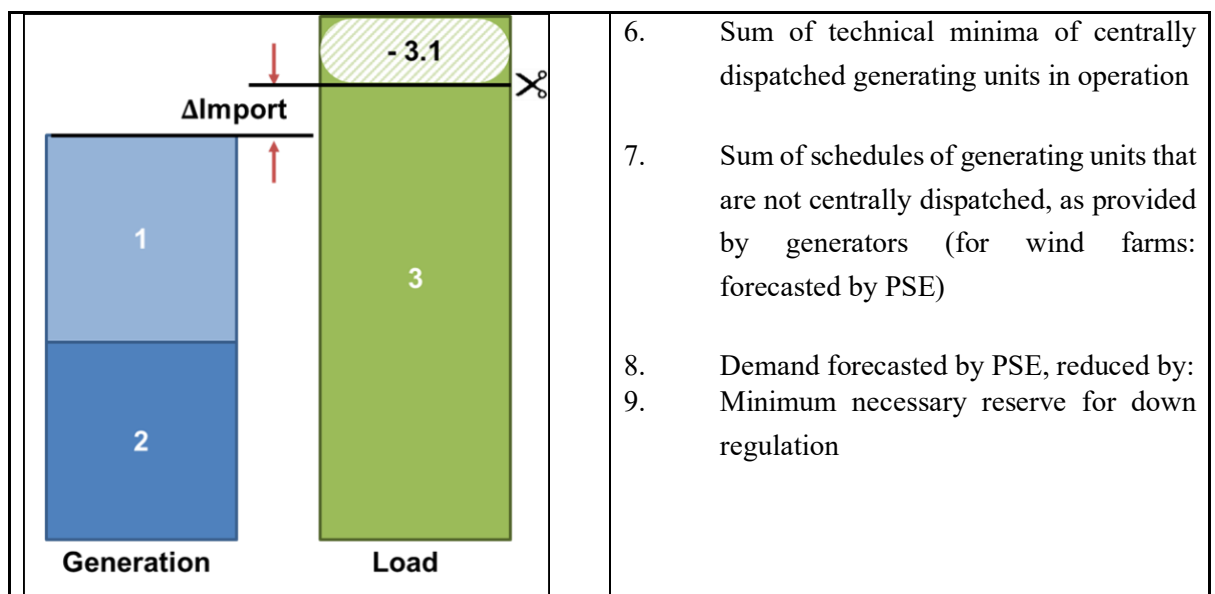


Figure 2: Determination of external constraints in import direction (reserves in generating capacities available for potential imports) in the framework of intraday capacity calculation.

Frequency of re-assessment

External constraints are determined in a continuous process based on the most recent information, for each capacity allocation time frame, from forward till day-ahead and intraday. In case of intraday process, these are calculated for each intraday capacity calculation timeframe in accordance with Article 4(2), resulting in independent values for each MTU, and separately for directions of import to Poland and export from Poland.

Time periods for which external constraints are applied

As described above, external constraints are determined in a continuous process for each capacity allocation timeframe, so they are applicable for all MTUs of the respective allocation day.