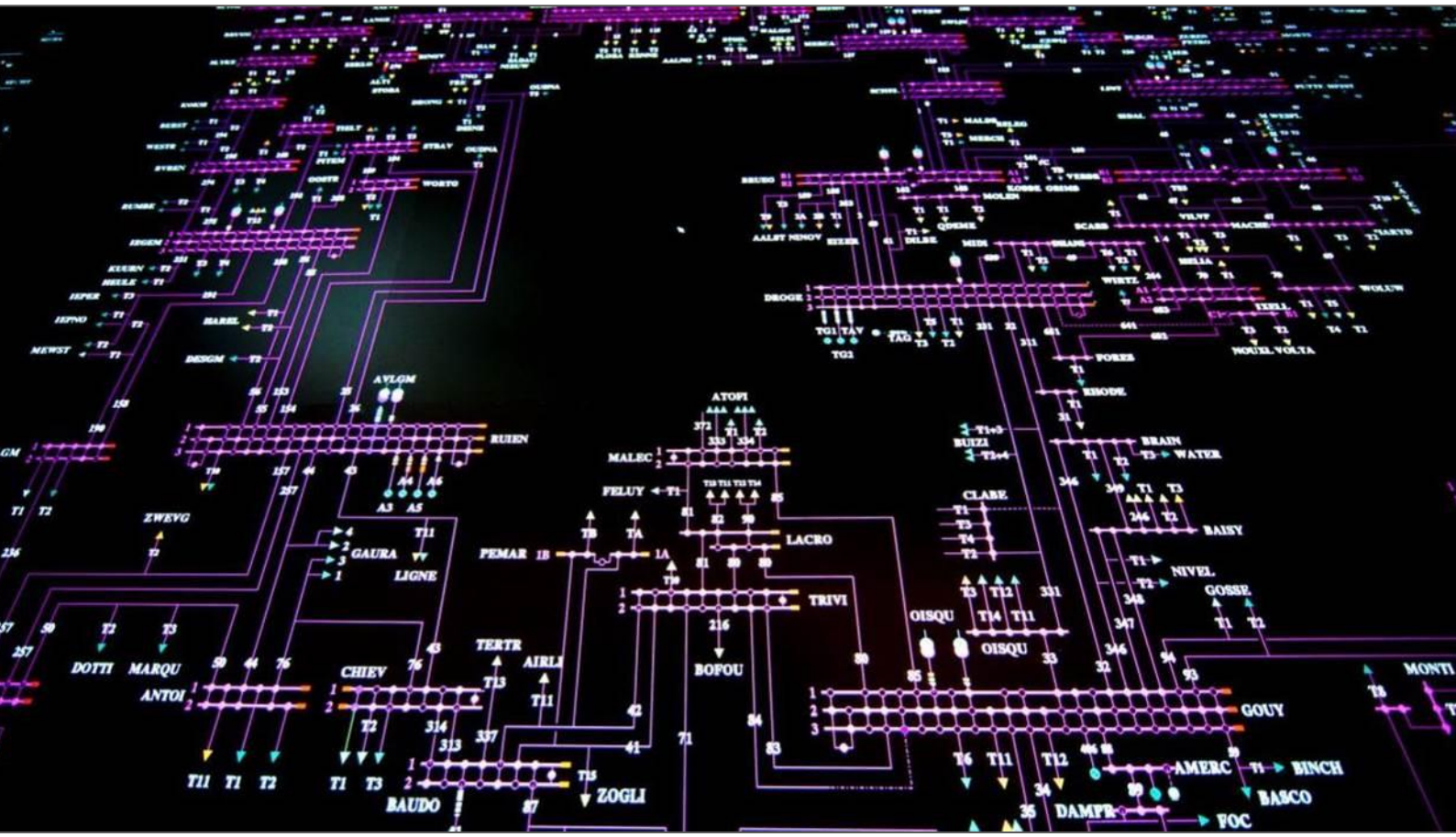

DESIGN NOTE FOR THE COORDINATION OF ASSETS:

PART III – CONGESTION RISK INDICATOR

Market Development

Original: 11/12/2017 / Last update: 12/04/2018

EXECUTIVE SUMMARY

As Belgium's transmission system operator ELIA oversees that the generated electricity is efficiently transported towards the demand. To this end ELIA is responsible for developing and maintaining the grid as well as for the operational use of the system, guarding the state of its critical factors such as frequency, voltage, and load flows. The deployment of ancillary services (such as the balancing reserves) and the management of congestion risks contribute to this objective.

More concretely, ELIA aims to prevent that the use of ancillary services does not cause local congestions on the grid. One of the instruments supporting ELIA in this task is the Congestion Risk Indicator (CRI).

The CRI shows the level of congestion risk forecasted by ELIA**; it is determined per zone and per direction (incremental, decremental) and can evolve throughout the day**. The CRI is used by ELIA to activate or prepare the activation of remedial actions, and also to evaluate the availability of reserves.

There are three CRI levels, which are used by ELIA in the following way:

- **"Low CRI"** indicating that ELIA forecasts no congestion risk

  Balancing bids that include solely delivery points in low CRI zones are available.

  Transfers of reserve obligations to assets located in low CRI zones are acceptable as far as the risk for internal congestion is concerned.

- **"Medium CRI"** indicating that ELIA forecasts a potential congestion risk

  Balancing bids that include delivery points in medium CRI zones (but none in high CRI zones) risk to be labelled as unavailable for activation.

  Transfers of reserve obligations to assets located in medium CRI zones risk to be rejected for reasons of internal congestion risk.

- **"High CRI"** indicating that ELIA forecasts a certain congestion risk

  Balancing bids that include delivery points in high CRI zones are not available for activation.

  Transfers of reserve obligations to assets located in high CRI zones are not acceptable.

ELIA will publish the CRI levels for day D at the end of day D-1 to inform the Balancing Service Providers of the above mentioned risks of unavailability of balancing bids and unacceptability of reserve transfers. Throughout the Intraday ELIA will adapt the published CRI levels in case of substantial updates to the forecasted congestion risk.

TABLE OF CONTENTS

TERMINOLOGY

The table below provides a list of **definitions and concepts referred to in the design notes on the coordination of assets**. Some definitions are copied from external sources, such as the European Guidelines; in this case the reference is added in the description.

(Physical) Congestion
(GL CACM, ref [5]) "any network situation where forecasted or realised power flows violate the thermal limits of the elements of the grid and voltage stability or the angle stability limits of the power system"
Day-ahead procedure
The time frame of the Day-ahead procedure for the coordination of assets is from 12:00 to 18:00 hour on day D-1
Delivery Point (DP)
A point on an electricity grid or within the electrical installations of a grid user connected to TSO or DSO grid where the concerned ancillary service is delivered. This is associated with a metering system that enables ELIA to control and assess the delivery of the service.
ELIA grid
ELIA operates the following grids: - Belgian transmission grid: above 70kV to 380kV high-voltage transmission system (legal monopoly for ELIA) - Local or regional transmission grids until 70kV in Flanders (Plaatselijk Vervoernet), Wallonia, and the Brussels-Capital region Throughout the design note "TSO" or "TSO-connected" in the Belgian context refers to these grids.
Forced Outage
(GL SO, ref [1]) "the unplanned removal from service of a relevant asset for any urgent reason that is not under the operational control of the operator of the concerned relevant asset"
Grid User
Each natural or legal entity owning an asset connected to the transmission or (closed) distribution grid with the possibility to take electricity off the grid or to inject electricity on the grid.
Intraday procedure
The time frame of the Intraday procedure for the coordination of assets is from day D-1 18:00 until real-time.

1. Introduction

As Belgium's transmission system operator **ELIA plays a pivotal role in supplying the system with the electricity needed to run the community**, from major industrial companies directly connected to ELIA's grid to the households supplied indirectly via the distribution systems. This task requires ELIA to operate over 8 000 kilometers of cables and lines and about 800 high-voltage substations. ELIA aims to perform this task while collaborating with other players in the energy sector to promote well-working electricity markets.

In the transmission of electricity throughout the system **ELIA oversees that the system's critical factors are maintained at the right level**, such as the balance between demand and supply, frequency, and voltage. The **deployment of ancillary services** (such as the balancing reserves) contributes to this objective. **In addition ELIA guards the use and performance of its grid to avoid the violation of the thermal limits of the grid elements**. Even in a balanced system the load flows in the grid may be concentrated on a limited set of elements, thereby causing local congestions. Overloads that push the grid elements above their limits may cause an outage of the element or local grid, making ELIA's grid management less efficient (from daily system operations dealing with the outage to more frequent asset repairs and replacements) or even resulting in producers and consumers being temporarily cut off the grid.

ELIA's congestion management serves to prevent such circumstances. One of the instruments supporting ELIA in this task is the Congestion Risk Indicator (CRI).

The underlying document describes the Congestion Risk Indicator, its use by ELIA in an efficient and effective congestion and balancing management, and its impact on the roles in the market. It is part of an analysis to redesign the coordination of assets discussed with relevant stakeholders in the iCAROS[1] Task Force. **The iCAROS project focuses on the replacement of the CIPU[2] contract** (the procedures relating to outage planning, scheduling and redispatching[3]) **which contained the Green/Red Zone Mechanism, the predecessor of the Congestion Risk Indicator.** The Green/Red Zone Mechanism was introduced together with the launch of the Belpex Intraday market to indicate the degrees of freedom for producers to change Day-ahead generation schedules. A Green zone was giving an indication that a request for an Intraday schedule update could be validated by Elia, as opposed to a Red Zone which was giving an indication for a refusal of schedule updates.

Within the new design proposed using the Congestion Risk Indicator, active power schedules (provided by the Scheduling Agent) may be updated regardless of the CRI level (bringing more flexibility to the system in the Intraday time frame). However, no **balancing actions are allowed in zones with congestion risks. Therefore balancing bids that may cause congestion will be blocked from activation by ELIA** independent of the source or size of the flexibility as actions closer to real-time leave insufficient time for ELIA to respond via redispatching. The changing use also reflects a change in determination and interpretation, hence requiring the change of name to "Congestion Risk Indicator".

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[1] iCAROS refers to "integrated Coordination of Assets for Redispatching and Operational Security".

[2] CIPU refers to "Coordination of the Injection of Power Units".

[3] See the "Design note for the coordination of assets: Part I – Outage Planning" and the "Design note for the coordination of assets: Part II – Scheduling and Redispatching".

This document describes an instrument used by ELIA for congestion management and the link to balancing services, **not a specific agreement between ELIA and a specific role**. The design note reflects only on the impact of the CRI on the Scheduling Agent and the Balancing Service Provider. This note indicates how ELIA intends to use the CRI but specific modalities regarding the impact of the CRI on balancing services are subject to reviews of the Terms & Conditions for the Balancing Service Provider.

The described design principles apply to flexibility for balancing services on all assets regardless of their connection to the **ELIA grid, CDS grids, or DSO grids.**

1.1. Document structure

This note describes in more detail the Congestion Risk Indicator (CRI):

- the description of the Congestion Risk Indicator
- the determination of congestion risks by ELIA
- the use of the Congestion Risk Indicator by ELIA and its influence on roles, in specific the impact on Scheduling Agents and Balancing Service Providers
- the publication of the Congestion Risk Indicator

1.2. Indicative timeline

ELIA will implement the Congestion Risk Indicator together with the other modifications in the coordination of assets resulting from the iCAROS project (which depends on the trajectory for the adaptation of the Federal Grid Code). Parallel the timeline is determined by the implementation of the European Guideline on Electricity Balancing (e.g., with respect to the creation of the European platforms). The European Guideline on Electricity Balancing will enter into force on December 18, 2017; the European platforms should be operational four years later (December 2021).

1.3. Regulatory and Contractual Framework

Historically the restriction on schedules and ancillary services in zones with congestion risk was described only in the CIPU contract because the Green/Red Zone Mechanism affected only the scheduling and balancing of large power units. Following the changing European framework for balancing, the impacted scope of the Congestion Risk Indicator broadens to include flexibility from smaller delivery points that are not subject to outage and scheduling procedures in the coordination of assets. The CRI principles will therefore nationally be embedded in Terms & Conditions of related ancillary service products and providers.

European Guideline on Electricity Balancing

The European Guideline on Electricity Balancing contains several sections which provide the fundamental principles related to the impact of congestion management on balancing services. The articles that are of particular relevance are listed in Annex 1.

Federal Grid Code

The core rules and principles of the coordination of assets will be laid out in the Federal Grid Code so as to provide a sustainable future framework for coordination of assets and in particular outage planning and congestion management..

ELIA's proposal of the design aspects that are to be referred to in the Grid Code are added at the end of this document (chapter "Summary & Impact on Federal Grid Code").

Terms & Conditions for the Balancing Service Provider / Terms & Conditions for the Scheduling Agent / Terms & Conditions for the Balance Responsible Party

While the European Guideline describes the core rules and principles, the detailed design aspects will be laid down in Terms and Conditions. The impact of the Congestion Risk Indicator on the services of the Scheduling Agent, Balancing Service Provider, and Balance Responsible Party will be included in respective Terms and Conditions.

Figure 1. Hierarchy of regulatory and contractual documentation
(T&C = Terms & Conditions)

2. The Congestion Risk Indicator (CRI)

The Congestion Risk Indicator signals the level of congestion risk that is expected in a particular zone in Belgium at a particular moment.

Specifically the CRI is given:

- for each **electrical zone** on the high voltage grid: there are currently[4] 10 zones, namely:

380 kV grid	Merksem
Langerbrugge East	Schaerbeek
Langerbrugge West	Liège
Ruien	Hainaut East
Stalen	Hainaut West

- for one or both **directions:** incremental, decremental
- for a **duration:** start hour – end hour

ELIA works with three levels of congestion risk:

	**No forecasted congestion risk** No constraint on the use of flexibility
	**Forecasted potential congestion risk** Constraint on use of flexibility depending on Intraday evolutions
	**Forecasted congestion risk** Certain constraint on use of flexibility

[4] Note that the electrical zones may be reviewed.

3. Impact on roles for the delivery of ancillary services

Contrary to the other parts of the design notes on the coordination of assets[5] the Congestion Risk Indicator does not involve an agreement with a particular party. Rather it is an instrument used by ELIA to manage the congestion on the grid during the balancing timeframe and it can in that function have an impact on the use of ancillary services and therefore on the providers of ancillary services. The interdependency between the CRI and market parties is summarized here below. The following chapters in this design note elaborate further on them.

The specific impact of the CRI on market roles is indicated throughout the document in a blue frame. Here is a summary:

Impact on the Balancing Service Provider – Coordinated by ELIA:

- The CRI will be used to filter out aFRR/mFRR balancing bids that may create or aggravate congestion risks, and prevent them from being activated.

  ELIA will label those balancing bids as "unavailable" for activation for balancing purposes and communicate on such actions in a transparent manner. In normal circumstances the Balancing Service Provider will be warned of the unavailability of the balancing bid before Balancing Gate Closure Time.

  See chapter 7 in this document.

- Transfers of aFRR/mFRR obligations in the Intraday secondary market are to be submitted to ELIA for approval. ELIA will not approve transfers of reserves towards zones with congestion risks, which would lead to the unavailability of the transferred flexibility for balancing purposes.

  ELIA will use the CRI in its evaluation of reserve transfers and inform the Balancing Service Provider in case the CRI leads to a rejection of the transfer. The CRI will be published in advance so the Balancing Service Provider can take it into account before searching for a transfer transaction.

  See chapter 7 in this document.

Impact on Scheduling Agent – Coordinated by ELIA:

- As the CRI represents congestion risks, it also gives an indication of the probability that ELIA may activate congestion bids in a particular zone.
- ELIA will not block schedule amendments because the asset is located in a zone with congestion risks.[6]

[5] Part I on Outage Planning and Part II on Scheduling & Redispatching.

[6] The rules on schedule amendments are to be found in the "Design note for the coordination of assets: Part II – Scheduling & Redispatching." Schedule amendments are subject to approval of ELIA in cases when the schedule would be amended in the opposing direction of an earlier activation or agreement.

- ELIA will activate Return-to-Schedule requests in zones with congestion risks (in case of deviations in the problematic direction), in real-time or proactively in response to a new set point communication received after the scheduling deadline.

  The Scheduling Agent will notice the impact via the standard redispatching procedures[7].

  See chapter 5 in this document.

Impact on the Balance Responsible Party – Coordinated by Grid User:

- No balancing actions are allowed in zones with congestion risks. The CRI represents congestion risks, therefore limiting the use of the asset by the Balance Responsible Party for purposes of reactive balancing or self-balancing. Nonetheless if ELIA observes deviations, ELIA will force the Scheduling Agent to return to the announced schedule in a particular zone thereby reducing or even countering the actions of the BRP.

  Coordination to be agreed between Grid User, Scheduling Agent and Balance Responsible Party.

[7] See the "Design note for the coordination of assets: Part II – Scheduling and Redispatching".

4. The determination of the CRI

ELIA defines the CRI based on own information and information received from the market. The CRI determination takes into account the following data:

- The **grid model** (grid topology as known in Day-ahead and possibly updated in Intraday) allowing to identify the N and N-1 situations to be analyzed for day D
- **Schedules** received in Day-ahead (and possible updates in Intraday) from the Scheduling Agent on the active power exchanges of Power-Generating Modules and Energy Storage devices types B/C/D, and large Demand Facilities/CDS (≥ 25MW contractual offtake capacity)[8]
- **Forecasts** that ELIA makes of the active power on nodes and assets for which ELIA does not receive a MW schedule[9].
- **Available flexibility** offered in Day-ahead (and possibly updates in Intraday) from the Scheduling Agent for redispatching purposes[10] and from the Balancing Service Provider for balancing purposes (energy available on free or reserved capacity).

Security analyses for specific moments during the day verify whether, based on this information, congestion is to be expected on a grid element in an N or N-1 situation (meaning when there is an unforeseen outage of a grid element that is presumed available in the grid model). The analysis is performed first for **the scenario in which the available flexibility is not used** therefore solely taking into account schedules and forecasts. Secondly, ELIA estimates whether the **potential schedule modifications** (due to deployment of available flexibility) may aggravate or cause additional congestion risk (see Figure 2).

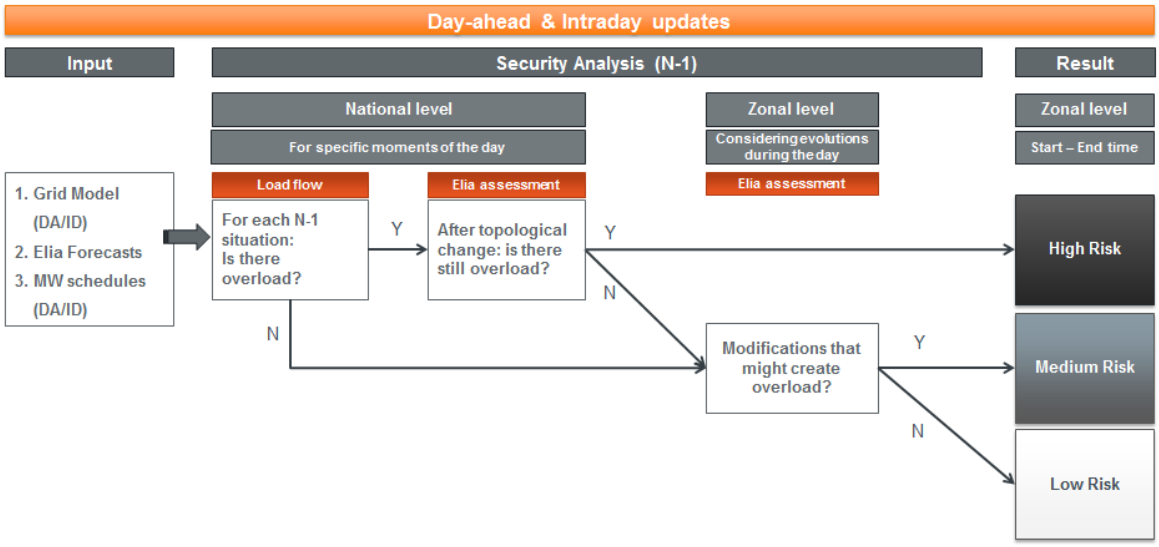


Figure 2. The determination of the Congestion Risk Indicator level

[8] For more information on schedules see the "Design note for the coordination of assets: Part II – Scheduling and Redispatching".

[9] The forecasts are corrected to 0MW in case ELIA receives an OFF schedule on a Power-Generating Module or Energy Storage Device type B for the concerned quarter-hour.

[10] For more information on redispatching see the "Design note for the coordination of assets: Part II – Scheduling and Redispatching".

When a congestion risk is identified, **the ELIA operator evaluates the scope of the risk and possible topological changes in the ELIA grid** (that can remove or reduce the congestion risk in the zone) before labelling the zone with a specific level of CRI.

There are three levels of CRI:

- **"Low CRI":** the security analysis identifies no overloads in N or N-1 in the zone. In general there is no need for ELIA to prepare remedial actions and no impact on the market parties in the zone.

- **"Medium CRI":** the security analysis identifies overloads in N or N-1 in the zone in the case of schedule modifications (use of the available flexibility). There are no topological changes on the ELIA grid possible to reduce the risk completely. This is a signal for ELIA to prepare remedial actions to respond if the schedule would be modified later on in Intraday. There may be an impact on the market parties in the zone, depending on whether or not schedules are changed.

  ELIA estimates the margin available for the use of flexibility throughout Intraday. However, as ELIA does not possess scheduled information on the use of every 1 MW capacity in the Belgian system[11], the margin cannot be exactly defined.

  ELIA uses the CRI to avoid that the activation of reserves is jeopardized: **reserved balancing capacity in the zone has priority** and consequently it is possible that no margin remains for schedule modifications in Intraday (in which case ELIA will respond via redispatching).

- **"High CRI":** the security analysis identifies overloads in N or N-1 in the zone based on the last communicated schedules and forecasts (therefore regardless of the available flexibility that remains and that could aggravate the risk if used). There are no topological changes on the ELIA grid possible to reduce the risk completely. This is a signal for ELIA to prepare or activate remedial actions and there is a likely impact on the market parties in the zone.

  A high CRI indicates that there is no margin available for the activation of flexibility for schedule modifications in Intraday (ELIA will respond via redispatching) nor for balancing purposes (regardless of whether the capacity has been reserved).

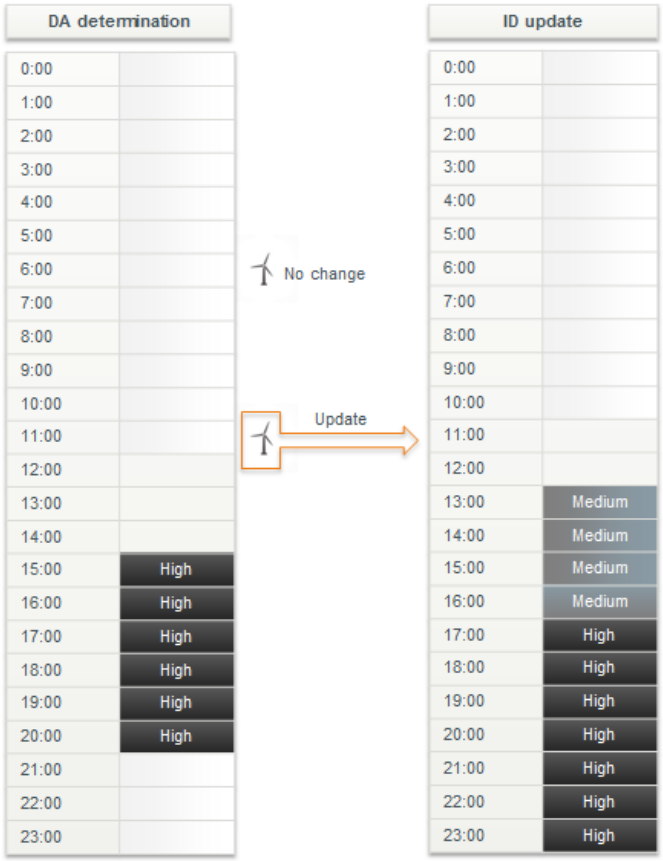
  Throughout the Intraday **ELIA will monitor the expected availability of aFRR/mFRR energy bids and take action to restore the availability** of offered volume if there is a risk of the availability dropping below the minimum reserve needs.

When setting the CRI levels the ELIA operator evaluates the expected duration of congestion risks, based on changes in grid models, schedules, and forecasts in the hours before and after the moment for which the risk was detected.

[11] ON/OFF schedules instead of MW schedules are possible for Power-Generating Modules and Energy Storage devices with an installed capacity of less than 25MW. Some ELIA-connected Demand Facilities are exempted from providing schedules and all DSO-connected Demand Facilities have no scheduling obligation.

As the CRI depends on information that may change throughout Intraday, for example due to a schedule amendment on a large Power-Generating Module or due to a significant change in the wind forecast, **the CRI itself is subject to change.** The change can happen in either direction: **the CRI level may be increased or decreased.**

Example of the incremental CRI for the zone of Langerbrugge West throughout day D and a CRI update following an update in the wind forecast on day D



The example shows that after the Day-ahead procedure the CRI level is set at "high" starting from 15:00 on day D.

An update of the wind forecast on day D at 6:00 shows no significant change in CRI.

An update of the wind forecast on day D at 11:00, however, shows higher wind production early afternoon, which in combination with the other production in the zone, increases the CRI from "low" to "medium" level starting from 13:00. The "high" risk is expected to arise later than forecasted in Day-ahead (at 17:00 rather than at 15:00).

5. CRI as a tool for ELIA congestion management

The CRI is an instrument that ELIA uses, starting from day D-1, to manage the congestion risks on the grid. It has **a signaling function for ELIA to prepare remedial actions** (including activation of congestion bids).

In first instance ELIA knows how topological adaptations may aid the grid elements to transmit the electricity flows. If topological changes do not bring a solution, the schedules and bidding information gives ELIA a view on the available redispatching possibilities.

The CRI level allows ELIA to determine the sense of urgency to activate redispatching. A "medium" CRI indicates that it is useful to prepare a list of possible redispatching if a N-1 situation would occur during day D or if the information would change in such a way that the CRI level would increase to "high". However, even in case of a change in situation, there may be no need for action by ELIA.

For example, the medium CRI might indicate a margin of about 50MW for an increase in net injection on a grid element. This indicates to the ELIA operator that a schedule increase on a Power-Generating Module of 15MW is no reason to take action. A schedule increase of more or less 50MW, however, will require a rerun of the security analysis and probably the activation of redispatching. Same in case of a high CRI: any change during day D requires specific attention and probable action.

The need for a redispatching activation may also result in an increase of the CRI level, for example, to prevent the activation of balancing bids in the zone (see further). **Redispatching may, however, also occur in zones with a low CRI without increasing the level of the CRI:** the CRI is determined per zone while redispatching may be needed to solve the congestion risk locally within the zone. The need for redispatching does not necessarily indicate a congestion risk on the zonal level.

CRI not used to reject MW schedule amendments in Intraday

This section discusses the possible impact of the CRI on the Scheduling Agent.

Power-Generating Modules and Energy Storage Devices are subject to Intraday scheduling obligation: the Scheduling Agent must inform ELIA without delay of schedule amendments (for any reason) and the latest before the asset's scheduling deadline[12].

ELIA will not prevent schedule amendments on assets located in zones with congestion risks subject to specific conditions[13]. If the schedule amendment necessitates that ELIA responds via redispatching to reduce congestion, ELIA should be able to redispatch at cost-reflective prices.

Thanks to this new proposal, the Scheduling Agent may amend the schedule reflecting closed transactions in response to opportunities on the Intraday electricity market and hence market parties will gain the benefits of the Intraday transaction. In practice ELIA will not reject the corresponding schedule modification but respond through redispatching,

[12] See the "Design note for the coordination of assets: Part II – Scheduling and Redispatching".

[13] An approval by ELIA is only required in case the amendment violates an earlier agreement (e.g., in case of the activation of a congestion bid, or a Must-Run or May-Not-Run request).

possibly by using the flexibility on the rescheduled asset. The result may therefore be that physically the traded energy is not delivered on the intended asset (and in the end, the schedule is not amended) but on another one. ELIA manages the congestion on the grid and the Intraday trade remains respected because ELIA redispatches the production of the energy to another unit (as shown in the following example).

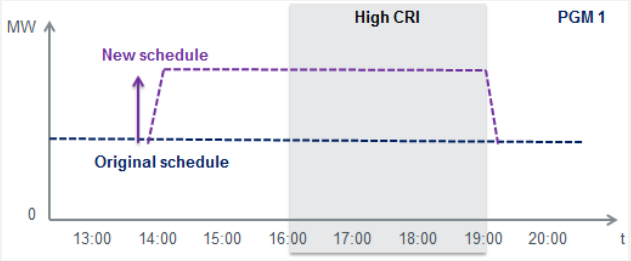
In such a way **ELIA reduces the impact of congestion management on the Intraday market and avoids potential opportunity costs for market parties** compared to previous practice.

Example of redispatching following a schedule amendment in a congested area

Power-Generating Module

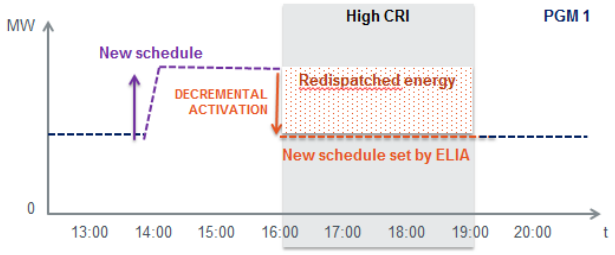
Zone with a **high CRI** in **incremental** direction between **16:00-19:00**

Step 1: Schedule amendment - The Scheduling Agent increases the scheduled active power output of the PGM for the period 14:00-19:00.

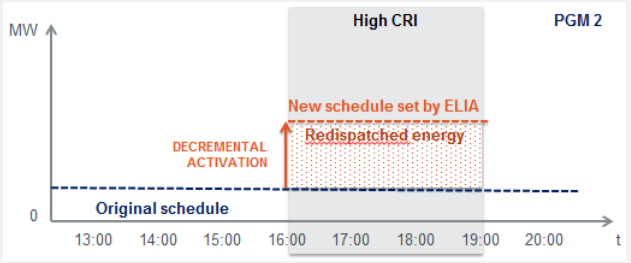


Step 2: Congestion bid - ELIA activates a decremental bid to make the PGM return to its original schedule from 16:00-19:00.

As ELIA redispatches at cost-based prices[14] the Scheduling Agent has to pay the costs avoided by the decremental activation to ELIA (given a positive price), but keeps the gain of the Intraday transaction.



Step 3: Compensation bid[15] - ELIA activates an incremental bid on another PGM for the same energy volume and pays the provider.



The cost of the remedial action for ELIA equals the remuneration for the incremental bid minus the amount that ELIA receives of the Scheduling Agent for the decremental activation.

[14] See the "Design note for the coordination of assets: Part II – Scheduling and Redispatching".

[15] Rules for compensation bid are explained in the "Design note for the coordination of assets: Part II – Scheduling and Redispatching".

6. Publication of the CRI

ELIA will publish online the CRI level (low/medium/high) for each hour of day D once determined by ELIA at the end of day D-1. The publication is important for purpose of transparency towards Balancing Service Providers as the Congestion Risk Indicator affects the use of the ancillary services they offer to ELIA (see next chapter):

- before the Balancing Gate Closure Time, providing information to the Balancing Service Provider to update balancing bids so to withdraw delivery points in congested zones (therefore unavailable for activation) from portfolio bids;
- and during the timeframe of the Intraday Secondary Market for the transfer of balancing capacity, providing information to the Balancing Service Provider on the acceptability of proposed transfers.

In case of a medium CRI ELIA will publish an indicative interval to represent the available margin for flexibility in the zone (e.g., using categories 0 – 50 MW, 50 – 100 MW, ...) as the precise margin that is available for flexibility cannot be forecasted in advance.

ELIA will throughout **Intraday update** the CRI publication in case of substantial changes. The CRI level may change in either direction.

7. The role of the CRI in the activation of ancillary services

This chapter discusses the possible impact of the CRI on the Balancing Service Provider.

In addition to signaling the need for ELIA to take action, the CRI serves to prevent that ELIA activates ancillary services which may create or aggravate congestion risk.

Specifically, the CRI is used:

- To **restrict transfers of aFRR/mFRR reserve obligations** towards congested areas in the **Intraday secondary market**.
- To **filter out balancing bids of contracted and non-contracted aFRR/mFRR** that are (partly) located in congested areas.

Throughout the Intraday ELIA will monitor the expected availability of aFRR/mFRR energy bids and take action to restore the availability of offered volume if there is a risk of the availability dropping below the minimum reserve needs.

The CRI is determined based on, among other information, the active power schedules resulting from the Day-ahead market and updates received through Intraday.

ELIA will only use the CRI to check the feasibility and hence to allow for transfers and activations of aFRR and mFRR services, not FCR services.

7.1. CRI as filter on reserve transfers

European Guideline on Electricity Balancing

Article 34 Transfer of balancing capacity

[...] 3. The transfer of balancing capacity shall be allowed if the following conditions are met:

(a) the receiving balancing service provider has passed the qualification process for the balancing capacity for which the transfer is performed;

(b) the transfer of balancing capacity is not expected to endanger operational security;

(c) the transfer of balancing capacity does not exceed the operational limits set out in Chapters 1 and 2 of Part IV Title VIII of Commission Regulation (EU) 2017/000 [SO].

[...]

5. If a TSO does not allow the transfer of balancing capacity, the concerned TSO shall explain the reason for the rejection to the balancing service providers involved.

According to article 34 the **European Guideline on Electricity Balancing** the TSO should not approve transfers of reserves that may cause congestion.

Concretely ELIA will not approve transfers of aFRR/mFRR obligations in the Intraday secondary market towards delivery points in zones with high CRI; transfers to medium CRI zones will depend on the available margin in the zone for the activation of flexibility[16].

This also gives each Balancing Service Provider the time to transfer the reserves to low CRI zones if possible.

ELIA will not compensate the Balancing Service Provider for the rejection of the transfer.

7.2. CRI as filter on balancing bids

European Guideline on Electricity Balancing

Article 12 Publication of information

[...] 3. Each TSO shall publish the following information as soon as it becomes available:

[...] (b) information on all balancing energy bids from its scheduling area or scheduling areas, anonymised where necessary, no later than 30 min after the end of the relevant market time unit. The information shall include:
(i) type of product;
(ii) validity period;
(iii) offered volumes;
(iv) offered prices;
(v) information on whether the bid was declared as unavailable;

[16] See "Study on the extension of the existing secondary market for reserves" (discretionary incentive, 31/03/2017).

Article 29 Activation of balancing energy bids from common merit order list

[...] 5. In the event that the activation of balancing energy bids deviates from the results of the activation optimisation function, the TSO shall publish the information about the reasons for the occurrence of such deviation in a timely manner.

[...] 14. Each TSO may declare the balancing energy bids submitted to the activation optimisation function unavailable for the activation by other TSOs because they are restricted due to internal congestion or due to operational security constraints within the connecting TSO scheduling area.

In article 29 the **European Guideline on Electricity Balancing** allows the TSO to label balancing bids that may cause or aggravate congestion, as "unavailable" for activation for balancing purposes. ELIA will accordingly apply such a **filter on balancing energy bids of aFRR and mFRR, regardless of whether the energy bid was offered as a free bid or following the execution of a reserve capacity contract.** In compliance with article 12 of the guideline ELIA will transparently publish the information.

European Guideline on Electricity Balancing

Article 2 Definitions

(27) 'balancing energy gate closure time' means the point in time when submission or update of a balancing energy bid for a standard product on a common merit order list is no longer permitted;

(38) 'TSO energy bid submission gate closure time' means the latest point in time when a connecting TSO can forward the balancing energy bids received from a balancing service provider to the activation optimisation function;

(39) 'activation optimisation function' means the function of operating the algorithm applied to optimise the activation of balancing energy bids;

Article 31 Activation optimisation function

1. All TSOs shall establish an activation optimisation function in accordance with Article 29 and this Article for the optimisation of the activation of balancing energy bids from different common merit order lists. This function shall take into account at least:
(a) activation processes and technical constrains from different balancing energy products;
(b) operational security;
(c) all balancing energy bids included in the compatible common merit order lists;
(d) the possibility to net the counteracting activation requests from TSOs;
(e) submitted activation requests of all TSOs;
(f) available cross-zonal capacity.

[...] 6. Each TSO shall submit its activation requests for balancing energy bids to the activation optimisation function.

7. The activation optimisation function shall select balancing energy bids and request the activation of selected balancing energy bids from the connecting TSOs where the balancing service provider, associated with the selected balancing energy bid, is connected. [...]

The European Guideline on Electricity Balancing prescribes the rules on gate closure times for submission of energy bids by the Balancing Service Providers and the TSOs, and on the Activation Optimization Function which determines on a European level the optimal activation of balancing energy based on the merit order lists and the needs of each TSO.

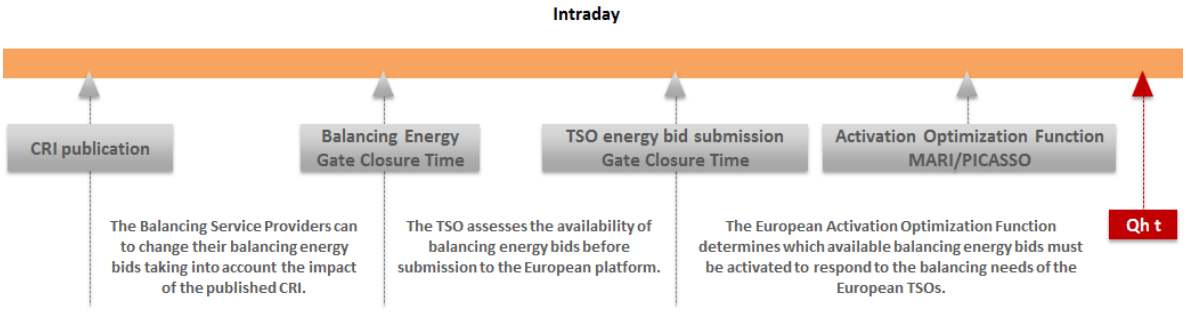


Figure 3. Timeline for submission of balancing energy bids

The Balancing Service Providers must send firm energy bids of contracted and non-contracted aFRR/mFRR to the TSO before Balancing Gate Closure Time (BAL GCT). **Then the TSO must transfer all aFRR/mFRR bids to their respective European platforms**[17] **including when necessary the label as "unavailable for activation" (due to congestion risks for the TSO).** ELIA will set balancing bids at unavailable in case of the following CRI levels[18]:

- if the bid contains **at least one delivery point located in a zone with a high CRI** in the direction of the needed activation for balancing for the concerned quarter-hour.
- if the bid contains **at least one delivery point located in a zone with a medium CRI** in the direction of the needed activation for balancing for the concerned quarter-hour, and the **margin that was available for activation** in the zone is assigned to balancing energy ranked better in the merit order list.

ELIA is aware of the location of the delivery points as it is mandatory to provide the locational information to ELIA. **If one delivery point in a (portfolio) bid is labelled as unavailable** for activation in the zone where it is located**, then the entire balancing bid is labelled as unavailable,** as ELIA does not know the probability that the flexibility on the concerned delivery point will be activated.

To stimulate maximum availability of balancing flexibility outside of zones with congestion risks, **ELIA will therefore publish the CRI before Balancing Gate Closure Time.** The publication warns the Balancing Service Providers of delivery points located in congestion risk areas and allows them **the time to update the balancing bids** that were already submitted to the bidding platform when possible, by removing the problematic delivery points from the portfolio bids. New bids that are submitted to the bidding platform after the

[17] The European platform for aFRR is referred to as "PICASSO", the European platform for mFRR as "MARI".

[18] Note that also balancings bids will be set at unavailable if offered on an asset on which the flexibility in opposing direction has been activated by ELIA for redispatching purposes, regardless of the level of the CRI.

CRI has been published will not be allowed to contain delivery points that would be labelled as unavailable.

The published information will represent the level of the CRI, to be interpreted as follows:

- "Low CRI" means that based on the information available at the time balancing bids with only delivery points in low CRI zones will be labeled as "available" by ELIA.

- "Medium CRI" means that based on the information available at the time balancing bids including at least one delivery point in a medium CRI zone (and no delivery point in a high CRI zone) may be labelled as "available" or as "unavailable" by ELIA. Delivery points with a reference power larger than the available margin in the zone will be labelled as unavailable. However, unavailability risk is uncertain for delivery point with a reference power that is smaller than the available margin in the zone.

- "High CRI" means that based on the information available at the time balancing bids including at least one delivery point in a high CRI zone will be labelled as "unavailable" by ELIA.

ELIA will not compensate the Balancing Service Providers for the opportunity costs of bids which were not activated due to internal congestion risk. Compensation principles must be harmonized across European TSOs (no sense in one TSO applying a separate remuneration mechanism in a regional market). There is no indication that other TSOs are considering the compensation of bids set at unavailable due to internal congestions.

Bids may nonetheless become unavailable without announcement due to unforeseen events after the Balancing Energy Gate Closure Time (e.g., due to a congestion activation by ELIA). In this case, ELIA will label the bid as unavailable when transferring the bids to the European platform.

Bids may also become unavailable without announcement after the TSO Energy Bid Submission Gate Closure Time. If the bid would be selected for activation in the European merit order, ELIA will not influence the settlement of the balancing service but ELIA will prevent the physical activation of energy by using redispatching because activation of this energy would cause congestion.

ELIA will not penalize the Balancing Service Providers for the unavailability of the flexibility on the delivery points ~~bids imposed by~~ due to the application of the CRI.

Example of CRI filtering on balancing bids

Step 1: Balancing Service Providers offer balancing bids to ELIA including delivery points spread across zones with low, medium, or high CRI.

	LA1	LA2	HT1	HT2	LG	MK	RU	SK	ST	380
CRI	H	L	L	L	L	H	L	M	L	L
Bid 1	1DP									
Bid 2						1DP	3DP		5DP	
Bid 3			3DP					7DP		
Bid 4										1 DP
Bid 5				5DP	5DP					

Step 2: The application of the CRI indicates which delivery points may not be activated due to congestion risk in the zone, i.e. delivery points in Langerbrugge 1, Merksem, and Schaerbeek.

	LA1	LA2	HT1	HT2	LG	MK	RU	SK	ST	380
CRI	H	L	L	L	L	H	L	M	L	L
Bid 1	1DP									
Bid 2						1DP	3DP		5DP	
Bid 3			3DP					7DP		
Bid 4										1 DP
Bid 5				5DP	5DP					

Step 3: ELIA sets each balancing with at least 1 delivery point located in a congestion risk area as “unavailable”, i.e. bid 1, bid 2 and bid 3.

	LA1	LA2	HT1	HT2	LG	MK	RU	SK	ST	380
CRI	H	L	L	L	L	H	L	M	L	L
Bid 1	1DP									
Bid 2						1DP	3DP		5DP	
Bid 3			3DP					7DP		
Bid 4										1 DP
Bid 5				5DP	5DP					

SUMMARY & IMPACT ON FEDERAL GRID CODE

The Congestion Risk Indicator (CRI) shows the congestion risk in each of the 10 zones of the ELIA grid for each hour of day D, forecasted by ELIA after the Day-ahead schedules are received and updated in Intraday. The CRI indicates the congestion risk in case of active power exchanges in a specific direction: incrementally (more net injection) or decrementally (more net offtake).

The CRI is based on the Green/Red Zones Mechanism used in the CIPU contract. The review of CIPU and of the coordination of assets in general in the iCAROS project motivated a review of the Green/Red Zones Mechanism. While this mechanism was historically created to indicate the operational freedom to use (or not) the flexibility on CIPU units in the Intraday and Balancing markets, the CRI serves a wider utilization by providing a transparent view on the forecasted congestion risks on the grid.

Firstly, **the CRI is no longer designed to prevent schedule modifications of Power-Generating Modules.** Schedule amendments will not be subject to approval by ELIA for reasons of CRI, thereby allowing Scheduling Agents to grasp the opportunities in the electricity markets. When needed ELIA will respond to a schedule amendment via cost-based redispatching in order to avoid congestion.

Secondly, under the Green/Red Zones Mechanism, situations with congestion risk but in which the congestion risk could not be aggravated due to hypothetical schedule modifications of CIPU units would be reported as “Green”, meaning no risk**. CRI shows the risk of congestion on the grid, regardless of whether a schedule amendment can aggravate the situation or not.** This change in interpretation will result in more zones with medium or high congestion risks reported than there were red zones (all else equal).

Thirdly, the change in interpretation is linked to the change in impacted assets. Green/Red Zones solely applied on CIPU units (if CIPU units were already at the maximum schedule causing a congestion risk, they could not be blocked further and there was no reason to declare a zone as red). **The CRI will apply to all types of flexibility, regardless of whether or not the asset is subject to scheduling obligation.** The CRI therefore serves to transparently inform all providers of ancillary services of the congestion risks on the ELIA grid.

In particular the CRI informs the Balancing Service Providers of aFRR and mFRR services of the probability that **reserve transfers** will not be allowed by ELIA or that the **balancing bids** will be regarded as unavailable for activation due to congestions. Transfers towards delivery points or activations of delivery points in **low CRI** zones will not be blocked, in **high CRI** zones they will certainly be blocked, and in **medium CRI** zones there is an uncertain risk depending on the margin that remains available for use of flexibility.

The availability of balancing bids will depend on the availability of the delivery points. First ELIA assess the availability of each delivery point depending on their location in low, medium, or high CRI zones. An unavailable delivery point automatically sets the entire balancing bid at unavailable (regardless of the total amount of delivery points within the bid).

ELIA will publish the CRI levels in day D-1 (and update in Intraday) to allow sufficient time for Balancing Service Providers to take the risks into account and when needed update balancing bids or search for reserve transfers towards zones without congestion risk.

Impact on the draft proposal for the new Federal Grid Code

This section lists the aspects of the design which ELIA will propose to embed in the Federal Grid Code. The specific text proposal will be sent to the concerned stakeholder in preparation of the *Federal Grid Code Workshop* at ELIA headquarters on February 7th, 2018. The list is a first proposal based on the current analysis and can evolve until the workshop in February 2018 as well as until the final proposal for the grid code submitted for formal public consultation in March 2018. The evolutions will depend on conclusions of further analyses and/or comments received by the stakeholders.

Principles proposed to include in the new Federal Grid Code:

ELIA will set balancing bids at unavailable in case of risk for internal congestion, as granted by the European Guideline on Electricity Balancing (article 29).

Note that the following key principles are imposed in the European Guideline on Electricity Balancing and therefore do not require repetition in the Federal Grid Code:

- The TSO may set balancing bids at unavailable in case of risk for internal congestion. (article 29)

- The TSO must transparently publish information on the reason of unavailability of balancing bids. (article 12)

- The TSO may reject the transfer of balancing capacity for reasons of internal congestions endangering operational security. (article 34)

- The TSO must inform the Balancing Service Provider of the reason for rejecting a transfer of balancing capacity. (article 34)

In addition, framework agreements for the implementation of the European balancing platforms and for the harmonization of terms and conditions related to balancing are to be set-up within one year after the entry into force of the European Guideline for Electricity Balancing (see articles 20-21 in the European Guideline on Electricity Balancing).

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[3] European Commission (2016). “COMMISSION REGULATION (EU) 2016/1388 of 17 August 2016 establishing a Network Code on Demand Connection,” Official Journal of the European Union, http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32016R1388&from=EN (consulted 9/11/2017)

[4] European Commission (2016). “COMMISSION REGULATION (EU) 2016/631 of 14 April 2016 establishing a network code on requirements for grid connection of generators,” Official Journal of the European Union, http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32016R0631&from=EN (consulted 27/10/2017)

[5] European Commission (2015). “COMMISSION REGULATION (EU) 2015/1222 of 24 July 2015 establishing a guideline on capacity allocation and congestion management,” Official Journal of the European Union, http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32015R1222 &from=EN (consulted 9/11/2017)

QUESTIONS & ANSWERS

Q1. What changes in the future design for units subject to a CIPU contract today?

A1. Contrary to the Green/Red Zones Mechanism, the Congestion Risk Indicator is not used by ELIA to approve or reject schedule amendment on Power-Generating Modules. Producers are free to grasp the opportunities of the Intraday electricity market. ELIA will respond via redispatching when necessary to bring the amended schedule back to its original level.

Q2. What changes in the future design for units not subject to a CIPU contract today?

A2. All flexibility, independent of its role in the coordination of assets and independent of scheduling obligation, will be subject to the CRI: each delivery point (and consequently the balancing bid it is a part of), regardless of asset type or size, will be set at "unavailable" if located in a zone with congestion risk in the direction of the balancing service.

Q3. What impact does the change of Green/Red Zones Mechanism to Congestion Risk Indicator (CRI) have on ELIA's congestion management?

A3. The change is expected to result in:

- More zones with a high or medium CRI than there were red zones (all else equal).
- More redispatching needs to respond to schedule modifications in zones with congestion risk.

ANNEX

Annex 1. Overview of relevant articles in the European Guideline for Electricity Balancing

TITLE I GENERAL PROVISIONS

Article 12 Publication of information

- Obligation for the TSO to publish information on the 'unavailability' of balancing bids due to congestion risks.
- See this document: chapter 7

TITLE II ELECTRICITY BALANCING MARKET

CHAPTER 2 European platforms for the exchange of balancing energy

Article 20 European platform for the exchange of balancing energy from frequency restoration reserves with manual activation

Article 21 European platform for the exchange of balancing energy from frequency restoration reserves with automatic activation

- Two articles on the trajectory for implementation of the European platforms for mFRR and aFRR.

TITLE III PROCUREMENT OF BALANCING SERVICES

CHAPTER 1 Balancing energy

Article 29 Activation of balancing energy bids from common merit order list

- Rules on the activation of balancing bids and the role of the European platform and common merit orders, including the rule that the TSO may set bids at unavailable in case of risk for internal congestions.
- See this document: chapter 7

Article 31 Activation optimisation function

- The functionality of the Activation Optimisation Function and the factors it takes into account in the optimisation (including the availability of bids)
- See this document: chapter 7

CHAPTER 2 Balancing capacity

Article 34 Transfer of balancing capacity

- Rules on the transfer of reserve obligations (balancing capacity) and the approval of the TSO therein. The TSO has the right to reject the transfer for reasons of internal congestions endangering operational security.

- See this document: chapter 7