SURVEY ON ANCILLARY SERVICES PROCUREMENT, BALANCING MARKET DESIGN 2019

ENTSO-E WGAS

May 2020

05.05.2020
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The purpose of this survey is to provide an overview of the different market arrangements in place throughout Europe regarding to Ancillary services procurement and Balancing market design.

The maps illustrate how different approaches have been taken to the design elements across Europe.

The Ancillary Services Working Group members who responded to the questionnaire are as follows:

- Austria, Belgium, Bosnia & Herzegovina, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland & NI, Italy, Latvia, Lithuania, Luxemburg, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, The Netherlands, United Kingdom.
This document is expected to help the introduction of the Network Code Electricity Balancing. It is meant as a quite comprehensive, but user-friendly set of information on the existing arrangements.

Caveats:

• This is a relatively high-level exercise (not all details are captured).
• Developing a single set of definitions for the purpose of this survey, we experienced the difficulty to match the various concepts used in different countries. As a consequence, in some specific cases, the position of a country in a certain group might be debatable.
• This is based on information updated in April 2020 and describes the mechanisms in place in 2019, irrespective of any updates which might already be foreseen for the future.
• Visualizing the answers we distinguished the TSO who responded the questionnaire, but doesn't have answer to the certain question (marked with "N/A") from the TSO who did not response the questionnaire (marked with "Missing data").
Ancillary Services

(Referring to questions of AS survey from AS1.0 to AS17.8)
What is the balancing process in place?

<table>
<thead>
<tr>
<th>Definition of answer</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Central Dispatch</strong></td>
</tr>
<tr>
<td>Central dispatch means a scheduling and dispatching model where the generation</td>
</tr>
<tr>
<td>schedules and consumption schedules as well as dispatching of power generating</td>
</tr>
<tr>
<td>facilities and demand facilities, in reference to dispatchable facilities, are</td>
</tr>
<tr>
<td>determined by a TSO within the integrated scheduling process.</td>
</tr>
<tr>
<td><strong>Self-Dispatch - Portfolio Based</strong></td>
</tr>
<tr>
<td>Self Dispatch System – Portfolio based means a scheduling and dispatching model</td>
</tr>
<tr>
<td>where the aggregated generation schedules and consumption schedules as well as</td>
</tr>
<tr>
<td>dispatching of power generating facilities and demand facilities are determined by</td>
</tr>
<tr>
<td>the scheduling agents of those facilities.</td>
</tr>
<tr>
<td><strong>Self-Dispatch - Unit Based</strong></td>
</tr>
<tr>
<td>Self Dispatch System – Unit based means a scheduling and dispatching model where</td>
</tr>
<tr>
<td>power generating facilities and demand facilities follow their own generation</td>
</tr>
<tr>
<td>schedules or consumption schedules.</td>
</tr>
</tbody>
</table>

Key:                                                                                   |
- Missing data                                                                         |
- N/A                                                                                 |
- Central Dispatch                                                                     |
- Self-Dispatch - Portfolio Based                                                      |
- Self-Dispatch - Unit Based                                                            |
Using Frequency Containment Reserve

<table>
<thead>
<tr>
<th>Definition of question</th>
<th>Frequency Containment Reserve (FCR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating reserves activated for stabilizing System Frequency after an imbalance.</td>
<td></td>
</tr>
</tbody>
</table>

Key:
- Missing data
- N/A
- Yes
- No
**Definition of question**

| Procurement Scheme | Background of the offer, which is closest to the real operation time. |

**Definition of answer**

<table>
<thead>
<tr>
<th>Key</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hybrid</td>
<td>Combination.</td>
</tr>
<tr>
<td>Mandatory only</td>
<td>Generators connected to the grid are obligated to reserve a certain amount of capacity in order to meet TSO requirements, for a fixed price set by TSO, NRA or for free.</td>
</tr>
<tr>
<td>Market only</td>
<td>There is no contract or obligation for a grid user to offer the reserve (before the offer). The grid user can voluntary participate in the market (e.g. tender, auction, market platform (like PX)) and bid a price or customize his offer (e.g. the volume, timeframe). The market result may lead to a bilateral contract.</td>
</tr>
</tbody>
</table>

Key:  
- Missing data  
- N/A  
- Market only  
- Mandatory only  
- Hybrid
**Definition of question**

**Product Resolution (in MW)**

The minimum bid size into the balancing market.
Frequency Containment Reserve - Capacity - Product Resolution (in time)

Definition of question

| Product Resolution (in time) | The maximum resolution for which the product can be bid into the market (for instance =1 hour in the case of a 24 auctions day ahead market for reserve provision). |

Key:
- Missing data
- N/A
- Year or more
- Month(s)
- Week(s)
- Day(s)
- Hour(s)
Frequency Containment Reserve - Capacity - Distance to real time of reserve products auctions

<table>
<thead>
<tr>
<th>Definition of question</th>
<th>The time ahead from real time when auction/agreement for an specific balancing product takes place (for instance = 1 year in the case of a reserve agreement signed 1 year ahead of real time).</th>
</tr>
</thead>
</table>

**Key:**
- Missing data
- N/A
- Year or more
- Quarter year
- Month(s)
- Week(s)
- Day(s)
- Month(s) + Week(s)
- Year or more + Month(s) + Day(s)
- Year or more + Month(s) + Week(s)
- Week(s) + Day(s)
- Quarter year + Day(s)
Frequency Containment Reserve - Capacity - Provider

Key:
- Missing data
- N/A
- Generators Only
- Generators + Load
- Generators + Pump Storage
- Generators + Load + Pump Storage
- Generators + Batteries
- Generators + Load + Batteries
- Generators + Load + Pump Storage + Batteries
Frequency Containment Reserve - Capacity - Symmetrical Product

Definition of question
Symmetrical Product
Upward regulation volume and for downward regulation volume has to be equal.

Key:
- Missing data
- N/A
- Has to be symmetrical
- Don't need to be symmetrical
### Frequency Containment Reserve - Capacity - Settlement Rule

<table>
<thead>
<tr>
<th>Definition of question</th>
<th>Settlement Rule</th>
<th>The pricing rules for settlement.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Definition of answer</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Marginal Pricing</strong></td>
<td></td>
<td>All capacity or balancing energy settled at the same price – price of the most expansive capacity bid procured or most expansive balancing energy bid activated.</td>
</tr>
<tr>
<td><strong>Pay as bid</strong></td>
<td></td>
<td>Contracted parties who provide a service are paid based on their offer price.</td>
</tr>
<tr>
<td><strong>Regulated Price</strong></td>
<td></td>
<td>Price for this service is based on a price that is set by the relevant regulatory authority.</td>
</tr>
</tbody>
</table>

Key:
- Missing data
- N/A
- Pay as bid
- Marginal Pricing
- Regulated Price
**Frequency Containment Reserve - Capacity - Cost Recovery Scheme**

<table>
<thead>
<tr>
<th>Definition of question</th>
<th>Cost Recovery Scheme</th>
<th>From who are the costs recovered.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Definition of answer</th>
<th>Balance Responsible Party (BRP)</th>
<th>Balancing Responsible Party means a market participant or its chosen representative responsible for its imbalances.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grid User</td>
<td>Grid User</td>
<td>The natural or legal person supplying to, or being supplied with active and/or reactive power by a TSO or DSO.</td>
</tr>
<tr>
<td>Hybrid</td>
<td>Hybrid</td>
<td>Combination.</td>
</tr>
</tbody>
</table>

**Key:**
- Missing data
- N/A
- 100% Grid Users (through tariff)
- 100% BRP
- Hybrid
<table>
<thead>
<tr>
<th>Definition of question</th>
<th>Monitoring</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Refers to the type of monitoring in place by the system operator to ensure performance of plant.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Definition of answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ex-post Check</td>
</tr>
<tr>
<td>When the monitoring of performance of plant carried out 24 hours after the delivery period.</td>
</tr>
<tr>
<td>Hybrid</td>
</tr>
<tr>
<td>Combination.</td>
</tr>
<tr>
<td>Real-Time Monitoring</td>
</tr>
<tr>
<td>Monitoring of delivery of ancillary services in real time.</td>
</tr>
</tbody>
</table>

**Key:**
- Missing data
- N/A
- Real-Time Monitoring
- Ex-Post Check
- Hybrid
Frequency Containment Reserve - Capacity - Transfer of BSPs obligation allowed

Key:
- Missing data
- N/A
- Yes
- Yes, only in case of forced outage
- No
Frequency Containment Reserve - Capacity - In case transfer obligation is allowed, is there an organised secondary market?

**Definition of answer**

| Secondary Market for reserve obligation | Trading procedure between the BSPs (where at least one BSP has contract with the TSO) to ensure the prescribed reserve amount of the TSO. |

**Key:**
- Missing data
- N/A
- Yes
- No
### Definition of question

| Procurement Scheme | Background of the offer, which is closest to the real operation time. |

### Definition of answer

<table>
<thead>
<tr>
<th>Combination.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hybrid</td>
</tr>
<tr>
<td>Mandatory only</td>
</tr>
</tbody>
</table>

### Key:

- Missing data
- N/A
- Market only
- Mandatory only
- Hybrid
Frequency Containment Reserve - Energy - Free Bids allowed

Definition of question

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy Bids</td>
<td>Acceptable Energy Bids.</td>
</tr>
<tr>
<td>Free Offers</td>
<td>Offers without a pre-contract for balancing capacity are allowed.</td>
</tr>
<tr>
<td>Pre contracted</td>
<td>Balancing Capacity has been procured from BSP.</td>
</tr>
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</table>

Key:

- Missing data
- N/A
- Yes
- No
- No, there is no FCR balancing energy market
### Definition of question

<table>
<thead>
<tr>
<th>Product Resolution (in MW)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>The minimum bid size into the balancing market.</td>
<td></td>
</tr>
</tbody>
</table>

### Key:
- Missing data
- N/A
- No minimum bid size
- \( x \leq 1\text{MW} \)
- \( 1\text{MW} < x \leq 5\text{MW} \)
- \( 5\text{MW} < x \leq 10\text{MW} \)
- \( x > 10\text{MW} \)
Frequency Containment Reserve - Energy - Product Resolution (in time)

<table>
<thead>
<tr>
<th>Definition of question</th>
<th>Product Resolution (in time)</th>
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<tbody>
<tr>
<td></td>
<td>The maximum resolution for which the product can be bid into the market (for instance =1 hour in the case of a 24 auctions day ahead market for reserve provision).</td>
</tr>
</tbody>
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Key:
- Missing data
- N/A
- Hour (or blocks)
- 30 minutes
- 15 minutes
Key:
- Missing data
- N/A
- Generators Only
- Generators + Load
- Generators + Pump Storage
- Generators + Load + Pump Storage
- Generators + Batteries
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### Definition of question

| Settlement Rule | The pricing rules for settlement. |

### Definition of answer

<table>
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<td>Price for this service is based on a price that is set by the relevant regulatory authority.</td>
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Frequency Containment Reserve - Energy - Cost Recovery Scheme

Definition of question
Cost Recovery Scheme From who are the costs recovered.

Definition of answer
Balance Responsible Party (BRP) Balancing Responsible Party means a market participant or its chosen representative responsible for its imbalances.
Grid User The natural or legal person supplying to, or being supplied with active and/or reactive power by a TSO or DSO.
Hybrid Combination.

Key:
- Missing data
- N/A
- 100% Grid Users (through tariff)
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- Hybrid
Frequency Containment Reserve - Energy - Monitoring

<table>
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<tbody>
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</tbody>
</table>

Key:
- Missing data
- N/A
- Real-Time Monitoring
- Ex-Post Check
- Hybrid
Frequency Containment Reserve - Energy - Transfer of BSPs obligation allowed

Key:
- Missing data
- N/A
- Yes
- Yes, only in case of forced outage
- No
Frequency Containment Reserve - Energy - In case transfer obligation is allowed, is there an organised secondary market?

**Definition of answer**

| Secondary Market for reserve obligation | Trading procedure between the BSPs (where at least one BSP has contract with the TSO) to ensure the prescribed reserve amount of the TSO. |

**Key:**
- Missing data
- N/A
- Yes
- No
**Definition of question**

| Frequency Restoration Reserve (FRR) | Reserves activated to restore System Frequency to the Nominal Frequency and, where applicable, power balance to the scheduled value. 

aFRR means automatic FRR, mFRR means manual FRR. |

---

**Key:**

- Missing data
- N/A
- Yes
- No
### Definition of question

**Procurement Scheme**  
Background of the offer, which is closest to the real operation time.

### Definition of answer

<table>
<thead>
<tr>
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<th>Description</th>
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</tbody>
</table>

### Map

The map in the document depicts the European Union with different regions colored to represent the procurement schemes. The key to the colors is as follows:

- **Missing data**
- **N/A**
- **Market only**
- **Mandatory only**
- **Hybrid**
Definition of question
Product Resolution (in MW) The minimum bid size into the balancing market.

Key:
- Missing data
- N/A
- No minimum bid size
- x <= 1MW
- 1MW < x <= 5 MW
- 5 MW < x <= 10 MW
- x > 10MW
Frequency Restoration Reserve (Automatic) - Capacity - Product Resolution (in time)

<table>
<thead>
<tr>
<th>Definition of question</th>
<th>Product Resolution (in time)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The maximum resolution for which the product can be bid into the market (for instance =1 hour in the case of a 24 auctions day ahead market for reserve provision).</td>
</tr>
</tbody>
</table>

Key:
- Missing data
- N/A
- Year or more
- Month(s)
- Week(s)
- Day(s)
- Hour(s)
Frequency Restoration Reserve (Automatic) - Capacity - Distance to real time of reserve products auctions

### Definition of question

**Distance to real time of reserve products auctions**

The time ahead from real time when auction/agreement for an specific balancing product takes place (for instance = 1 year in the case of a reserve agreement signed 1 year ahead of real time).

### Key:

- Missing data
- N/A
- Year or more
- Quarter year
- Month(s)
- Week(s)
- Day(s)
- Month(s) + Day(s)
- Year or more + Month(s)
- Year or more + Month(s) + Day(s)
- Week(s) + Day(s)
- Quarter year + Day(s)
**Definition of question**

**Symmetrical Product**
Upward regulation volume and for downward regulation volume has to be equal.

---

**Key:**
- Missing data
- N/A
- Has to be symmetrical
- Don't need to be symmetrical

---

**Frequency Restoration Reserve (Automatic) - Capacity - Symmetrical Product**

---

---
## Frequency Restoration Reserve (Automatic) - Capacity - Settlement Rule

<table>
<thead>
<tr>
<th>Definition of question</th>
<th>Settlement Rule</th>
<th>The pricing rules for settlement.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Definition of answer</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marginal Pricing</td>
<td>All capacity or balancing energy settled at the same price – price of the most expansive capacity bid procured or most expansive balancing energy bid activated.</td>
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<td>Pay as bid</td>
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<tr>
<td>Regulated Price</td>
<td>Price for this service is based on a price that is set by the relevant regulatory authority.</td>
<td></td>
</tr>
</tbody>
</table>

### Key:
- Missing data
- N/A
- Pay as bid
- Marginal Pricing
- Regulated Price
### Definition of question

| Cost Recovery Scheme | From who are the costs recovered. |

### Definition of answer

| Balance Responsible Party (BRP) | Balancing Responsible Party means a market participant or its chosen representative responsible for its imbalances. |
| Grid User | The natural or legal person supplying to, or being supplied with active and/or reactive power by a TSO or DSO. |
| Hybrid | Combination. |

### Key:
- Missing data
- N/A
- 100% Grid Users (through tariff)
- 100% BRP
- Hybrid
Frequency Restoration Reserve (Automatic) - Capacity - Monitoring

Definition of question

| Monitoring | Refers to the type of monitoring in place by the system operator to ensure performance of plant. |

Definition of answer

| Ex-post Check | When the monitoring of performance of plant carried out 24 hours after the delivery period. |
| Hybrid | Combination. |
| Real-Time Monitoring | Monitoring of delivery of ancillary services in real time. |

Key:
- Missing data
- N/A
- Real-Time Monitoring
- Ex-Post Check
- Hybrid
Frequency Restoration Reserve (Automatic) - Capacity - Transfer of BSPs obligation allowed

Key:
- Missing data
- N/A
- Yes
- Yes, only in case of forced outage
- No
Frequency Restoration Reserve (Automatic) - Capacity - In case transfer obligation is allowed, is there an organised secondary market?

**Key:**

- **N/A**
- **Yes**
- **No**
- **Missing data**

**Definition of answer**

**Secondary Market for reserve obligation**

Trading procedure between the BSPs (where at least one BSP has contract with the TSO) to ensure the prescribed reserve amount of the TSO.
### Definition of question

| Procurement Scheme | Background of the offer, which is closest to the real operation time. |

### Definition of answer

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>Hybrid</td>
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</tbody>
</table>

**Key:**
- Missing data
- N/A
- Market only
- Mandatory only
- Hybrid
Frequency Restoration Reserve (Automatic) - Energy - Free Bids allowed

<table>
<thead>
<tr>
<th>Definition of question</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy Bids</td>
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<td>Free Offers</td>
<td>Offers without a pre-contract for balancing capacity are allowed.</td>
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<tr>
<td>Pre contracted</td>
<td>Balancing Capacity has been procured from BSP.</td>
</tr>
</tbody>
</table>

Key:
- Missing data
- N/A
- Yes
- No
- No, there is no aFRR balancing energy market

Map showing geographical distribution of aFRR balancing energy market status across Europe.
**Frequency Restoration Reserve (Automatic) - Energy - Activation Rule**

**Definition of question**

**Activation rule**

How the frequency restoration reserves are activated i.e. by a Pro-Rata system or on the basis of a Merit Order (cheapest being activated first).

**Definition of answer**

**Merit order**

A merit order is a way of ranking available sources of energy in ascending order of their short run marginal costs of production, so that those with the lowest marginal costs are the first ones to be brought online to meet demand.

**Pro Rata (Parallel Activation)**

All bids always activated in parallel – proportionally.

---

**Key:**

- Missing data
- N/A
- Pro Rata (Parallel Activation)
- Merit order
Frequency Restoration Reserve (Automatic) - Energy - Product Resolution (in MW)

<table>
<thead>
<tr>
<th>Definition of question</th>
<th>Product Resolution (in MW)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The minimum bid size into the balancing market.</td>
</tr>
</tbody>
</table>

Key:
- Missing data
- N/A
- No minimum bid size
- \( x \leq 1 \text{ MW} \)
- \( 1 \text{ MW} < x \leq 5 \text{ MW} \)
- \( 5 \text{ MW} < x \leq 10 \text{ MW} \)
- \( x > 10 \text{ MW} \)
Definition of question

Product Resolution (in time)
The maximum resolution for which the product can be bid into the market (for instance = 1 hour in the case of a 24 auctions day ahead market for reserve provision).
Frequency Restoration Reserve (Automatic) - Energy - Distance to real time of energy products

Definition of question

Distance to real time of energy products (reserve products activation)

The time ahead from real time when TSO activates a given product (for instance 15 minutes in the case of mFRR/tertiary energy).

Key:
- Missing data
- N/A
- x > H-1
- 15 minutes < x ≤ H-1
- 5 minutes < x ≤ 15 minutes
- 1 minute < x ≤ 5 minutes
- x ≤ 1 minute
- Depends on the unit
**Definition of question**

**Settlement Rule**
The pricing rules for settlement.

**Definition of answer**

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>Hybrid</td>
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Definition of question
Cost Recovery Scheme From who are the costs recovered.

Definition of answer
<table>
<thead>
<tr>
<th>Balance Responsible Party (BRP)</th>
<th>Balancing Responsible Party means a market participant or its chosen representative responsible for its imbalances.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grid User</td>
<td>The natural or legal person supplying to, or being supplied with active and/or reactive power by a TSO or DSO.</td>
</tr>
<tr>
<td>Hybrid</td>
<td>Combination.</td>
</tr>
</tbody>
</table>

Key:
- Missing data
- N/A
- 100% Grid Users (through tariff)
- 100% BRP
- Hybrid
## Frequency Restoration Reserve (Automatic) - Energy - Monitoring

### Definition of question

| Monitoring | Refers to the type of monitoring in place by the system operator to ensure performance of plant. |

### Definition of answer

| Ex-post Check | When the monitoring of performance of plant carried out 24 hours after the delivery period. |
| Hybrid | Combination. |
| Real-Time Monitoring | Monitoring of delivery of ancillary services in real time. |

---

**Key:**
- Missing data
- N/A
- Real-Time Monitoring
- Ex-Post Check
- Hybrid
Frequency Restoration Reserve (Automatic) - Energy - Transfer of BSPs obligation allowed

Key:
- Missing data
- N/A
- Yes
- Yes, only in case of forced outage
- No
- No, there is no aFRR balancing energy market
Frequency Restoration Reserve (Automatic) - Energy - In case transfer obligation is allowed, is there an organised secondary market?

**Definition of answer**

| **Secondary Market for reserve obligation** | Trading procedure between the BSPs (where at least one BSP has contract with the TSO) to ensure the prescribed reserve amount of the TSO. |

---

**Key:**
- Missing data
- N/A
- Yes
- No
Frequency Restoration Reserve (Automatic) - Energy - Activation time of aFRR from 0 to max

**Definition of question**

**Activation Time**
Activation Time means the period of time between receipt of a valid instruction by the Activation Optimisation Function and the end of ramping to meet that instruction.

**Key:**
- Missing data
- N/A
- $x \leq 2$ min
- $2 \text{ min} < x \leq 5$ min
- $5 \text{ min} < x \leq 7.5$ min
- $7.5 \text{ min} < x \leq 10$ min
- $10 \text{ min} < x \leq 15$ min
Frequency Restoration Reserve (Automatic) - Energy - Are activations possible for other purposes than for balancing?

<table>
<thead>
<tr>
<th>Definition of question</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activation Purpose</td>
</tr>
<tr>
<td>Are activations for other purposes than Balancing (e.g. congestion management) possible?</td>
</tr>
</tbody>
</table>

Key:
- Missing data
- N/A
- Yes
- No
Using Frequency Restoration Reserve (Manual)

Definition of question

<table>
<thead>
<tr>
<th>Frequency Restoration Reserve (FRR)</th>
<th>Reserves activated to restore System Frequency to the Nominal Frequency and, where applicable, power balance to the scheduled value.</th>
</tr>
</thead>
<tbody>
<tr>
<td>aFRR</td>
<td>aFRR means automatic FRR, mFRR means manual FRR.</td>
</tr>
</tbody>
</table>

Key:
- Missing data
- N/A
- Yes
- No
### Definition of question

**Procurement Scheme**

Background of the offer, which is closest to the real operation time.

### Definition of answer

<table>
<thead>
<tr>
<th>Hybrid</th>
<th>Combination.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mandatory only</td>
<td>Generators connected to the grid are obligated to reserve a certain amount of capacity in order to meet TSO requirements, for a fixed price set by TSO, NRA or for free.</td>
</tr>
<tr>
<td>Market only</td>
<td>There is no contract or obligation for a grid user to offer the reserve (before the offer). The grid user can voluntarily participate in the market (e.g. tender, auction, market platform (like PX)) and bid a price or customize his offer (e.g. the volume, timeframe). The market result may lead to a bilateral contract.</td>
</tr>
</tbody>
</table>

**Key:**
- Missing data
- N/A
- Market only
- Mandatory only
- Hybrid
Frequency Restoration Reserve (Manual) - Capacity - Product Resolution (in MW)

<table>
<thead>
<tr>
<th>Definition of question</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product Resolution (in MW)</td>
</tr>
<tr>
<td>The minimum bid size into the balancing market.</td>
</tr>
</tbody>
</table>

Key:
- Missing data
- N/A
- No minimum bid size
- $x \leq 1$ MW
- $1$ MW $< x \leq 5$ MW
- $5$ MW $< x \leq 10$ MW
- $x > 10$ MW
Frequency Restoration Reserve (Manual) - Capacity - Product Resolution (in time)

**Definition of question**

**Product Resolution (in time)**
The maximum resolution for which the product can be bid into the market (for instance =1 hour in the case of a 24 auctions day ahead market for reserve provision).
Frequency Restoration Reserve (Manual) - Capacity - Distance to real time of reserve products auctions

**Definition of question**

| Distance to real time of reserve products auctions | The time ahead from real time when auction/agreement for an specific balancing product takes place (for instance = 1 year in the case of a reserve agreement signed 1 year ahead of real time). |

**Key:**
- Missing data
- N/A
- Year or more
- Quarter year
- Month(s)
- Week(s)
- Day(s)
- Month(s) + Day(s)
- Year or more + Month(s)
- Year or more + Month(s) + Day(s)
- Week(s) + Day(s)
- Quarter year + Day(s)
Definition of question

**Distance to real time of reserve products auctions**
The time ahead from real time when auction/agreement for an specific balancing product takes place (for instance = 1 year in the case of a reserve agreement signed 1 year ahead of real time).
Frequency Restoration Reserve (Manual) - Capacity - Symmetrical Product

<table>
<thead>
<tr>
<th>Definition of question</th>
<th>Symmetrical Product</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Upward regulation volume and for downward regulation volume has to be equal.</td>
</tr>
</tbody>
</table>

Key:
- Missing data
- N/A
- Has to be symmetrical
- Don’t need to be symmetrical
### Frequency Restoration Reserve (Manual) - Capacity - Settlement Rule

**Definition of question**

| Settlement Rule | The pricing rules for settlement. |

**Definition of answer**

<table>
<thead>
<tr>
<th>Marginal Pricing</th>
<th>All capacity or balancing energy settled at the same price – price of the most expansive capacity bid procured or most expansive balancing energy bid activated.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pay as bid</td>
<td>Contracted parties who provide a service are paid based on their offer price.</td>
</tr>
<tr>
<td>Regulated Price</td>
<td>Price for this service is based on a price that is set by the relevant regulatory authority.</td>
</tr>
</tbody>
</table>

**Key:**
- Missing data
- N/A
- Pay as bid
- Marginal Pricing
- Regulated Price
## Definition of question

<table>
<thead>
<tr>
<th>Question</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost Recovery Scheme</td>
<td>From who are the costs recovered.</td>
</tr>
</tbody>
</table>

## Definition of answer

<table>
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<tr>
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<th>Definition</th>
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<td>Balance Responsible Party (BRP)</td>
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<td>Combination.</td>
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</table>

### Frequency Restoration Reserve (Manual) - Capacity - Cost Recovery Scheme

![Map of Europe with different grid colors indicating cost recovery schemes](image)

**Key:**
- Missing data
- N/A
- 100% Grid Users (through tariff)
- 100% BRP
- Hybrid
Definition of question

Monitors

Refers to the type of monitoring in place by the system operator to ensure performance of plant.

Definition of answer

Ex-post Check

When the monitoring of performance of plant carried out 24 hours after the delivery period.

Hybrid

Combination.

Real-Time Monitoring

Monitoring of delivery of ancillary services in real time.

Key:

- Missing data
- N/A
- Real-Time Monitoring
- Ex-Post Check
- Hybrid
Frequency Restoration Reserve (Manual) - Capacity - In case transfer obligation is allowed, is there an organised secondary market?

Definition of answer

| Secondary Market for reserve obligation | Trading procedure between the BSPs (where at least one BSP has contract with the TSO) to ensure the prescribed reserve amount of the TSO. |

Key:
- Missing data
- N/A
- Yes
- No
Frequency Restoration Reserve (Manual) - Energy - Procurement Scheme

<table>
<thead>
<tr>
<th>Definition of question</th>
<th>Procurement Scheme</th>
<th>Background of the offer, which is closest to the real operation time.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Definition of answer</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hybrid</td>
<td>Combination.</td>
<td></td>
</tr>
<tr>
<td>Mandatory only</td>
<td>Generators connected to the grid are obligated to reserve a certain amount of capacity in order to meet TSO requirements, for a fixed price set by TSO, NRA or for free.</td>
<td></td>
</tr>
<tr>
<td>Market only</td>
<td>There is no contract or obligation for a grid user to offer the reserve (before the offer). The grid user can voluntary participate in the market (e.g. tender, auction, market platform (like PX)) and bid a price or customize his offer (e.g. the volume, timeframe). The market result may lead to a bilateral contract.</td>
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Key:
- Missing data
- N/A
- Market only
- Mandatory only
- Hybrid
**Definition of question**

<p>| | |</p>
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<th></th>
</tr>
</thead>
<tbody>
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<td><strong>Energy Bids</strong></td>
<td>Acceptable Energy Bids.</td>
</tr>
<tr>
<td><strong>Free Offers</strong></td>
<td>Offers without a pre-contract for balancing capacity are allowed.</td>
</tr>
<tr>
<td><strong>Pre contracted</strong></td>
<td>Balancing Capacity has been procured from BSP.</td>
</tr>
</tbody>
</table>

**Key:**
- Missing data
- N/A
- Yes
- No
- No, there is no mFRR balancing energy market
**Definition of question**

| Activation rule | How the frequency restoration reserves are activated i.e. by a Pro-Rata system or on the basis of a Merit Order (cheapest being activated first). |

**Definition of answer**

| Merit order | A merit order is a way of ranking available sources of energy in ascending order of their short run marginal costs of production, so that those with the lowest marginal costs are the first ones to be brought online to meet demand. |
| Pro Rata (Parallel Activation) | All bids always activated in parallel – proportionally. |

*Key:*
- Missing data
- N/A
- Pro Rata (Parallel Activation)
- Merit order
Frequency Restoration Reserve (Manual) - Energy - Product Resolution (in MW)

**Definition of question**

| Product Resolution (in MW) | The minimum bid size into the balancing market. |

**Key:**
- Missing data
- N/A
- No minimum bid size
- $x \leq 1$ MW
- $1$ MW $< x \leq 5$ MW
- $5$ MW $< x \leq 10$ MW
- $x > 10$ MW
Definition of question

Product Resolution (in time) | The maximum resolution for which the product can be bid into the market (for instance =1 hour in the case of a 24 auctions day ahead market for reserve provision).
Frequency Restoration Reserve (Manual) - Energy - Distance to real time of energy products

**Definition of question**

| Distance to real time of energy products (reserve products activation) | The time ahead from real time when TSO activates a given product (for instance 15 minutes in the case of mFRR/tertiary energy). |

**Key:**
- Missing data
- N/A
- x > H-1
- 15 minutes < x <= H-1
- 5 minutes < x <= 15 minutes
- 1 minute < x <= 5 minutes
- x <= 1 minute
- Depends on the unit
Frequency Restoration Reserve (Manual) - Energy - Settlement Rule

**Definition of question**

| Settlement Rule | The pricing rules for settlement. |

**Definition of answer**

| Hybrid | Combination. |
| Marginal Pricing | All capacity or balancing energy settled at the same price – price of the most expansive capacity bid procured or most expansive balancing energy bid activated. |
| Pay as bid | Contracted parties who provide a service are paid based on their offer price. |
| Regulated Price | Price for this service is based on a price that is set by the relevant regulatory authority. |

**Key:**
- Missing data
- N/A
- No settlement
- Pay as bid
- Marginal Pricing
- Regulated Price
- Hybrid

- [Image of an EU map with various countries shaded in different colors to represent different settlement rules]
**Definition of question**

Cost Recovery Scheme  
From who are the costs recovered.

**Definition of answer**

<table>
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<tr>
<th>Term</th>
<th>Description</th>
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<td>Balance Responsible Party (BRP)</td>
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<td>The natural or legal person supplying to, or being supplied with active and/or reactive power by a TSO or DSO.</td>
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<td>Combination.</td>
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</table>

**Key:**

- **Missing data**
- **N/A**
- **100% Grid Users (through tariff)**
- **100% BRP**
- **Hybrid**
**Definition of question**

| Monitoring | Refers to the type of monitoring in place by the system operator to ensure performance of plant. |

**Definition of answer**

| Ex-post Check | When the monitoring of performance of plant carried out 24 hours after the delivery period. |
| Hybrid | Combination. |
| Real-Time Monitoring | Monitoring of delivery of ancillary services in real time. |

Key:

- Missing data
- N/A
- Real-Time Monitoring
- Ex-Post Check
- Hybrid
Frequency Restoration Reserve (Manual) - Energy - Transfer of BSPs obligation allowed

Key:
- Missing data
- N/A
- Yes
- Yes, only in case of forced outage
- No
Frequency Restoration Reserve (Manual) - Energy - In case transfer obligation is allowed, is there an organised secondary market?

**Definition of answer**

| Secondary Market for reserve obligation | Trading procedure between the BSPs (where at least one BSP has contract with the TSO) to ensure the prescribed reserve amount of the TSO. |

**Key:**
- Missing data
- N/A
- Yes
- No
Definition of question

<table>
<thead>
<tr>
<th>Activation Time</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activation Time</td>
<td>means the period of time between receipt of a valid instruction by the Activation Optimisation Function and the end of ramping to meet that instruction.</td>
</tr>
</tbody>
</table>

Key:
- Missing data
- N/A
- 90 s < x <= 5 min
- 5 min < x <= 10 min
- 10 min < x <= 15 min
- Depends on the unit
Frequency Restoration Reserve (Manual) - Energy - Are activations possible for other purposes than for balancing?

<table>
<thead>
<tr>
<th>Definition of question</th>
<th>Activation Purpose</th>
<th>Are activations for other purposes than Balancing (e.g. congestion management) possible?</th>
</tr>
</thead>
</table>

Key:
- Missing data
- N/A
- Yes
- No
Using Replacement Reserve

**Definition of answer**

<table>
<thead>
<tr>
<th>Query</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Replacement Reserve (RR)</td>
<td>Replacement Reserves (RR) means the reserves used to restore/support the required level of FRR to be prepared for further system imbalances. This category includes operating reserves with activation time from Time to Restore Frequency up to hours.</td>
</tr>
</tbody>
</table>

Key:

- Missing data
- N/A
- Yes
- No
Replacement Reserve - Capacity - Procurement Scheme

**Definition of question**

**Procurement Scheme**
Background of the offer, which is closest to the real operation time.

**Definition of answer**

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hybrid</td>
<td>Combination.</td>
</tr>
<tr>
<td>Mandatory only</td>
<td>Generators connected to the grid are obligated to reserve a certain amount of capacity in order to meet TSO requirements, for a fixed price set by TSO, NRA or for free.</td>
</tr>
<tr>
<td>Market only</td>
<td>There is no contract or obligation for a grid user to offer the reserve (before the offer). The grid user can voluntary participate in the market (e.g. tender, auction, market platform (like PX)) and bid a price or customize his offer (e.g. the volume, timeframe). The market result may lead to a bilateral contract.</td>
</tr>
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</table>

**Key:**
- Missing data
- N/A
- Market only
- Mandatory only
- Hybrid
Replacement Reserve - Capacity - Product Resolution (in MW)

**Definition of question**

**Product Resolution (in MW)**  The minimum bid size into the balancing market.
Replacement Reserve - Capacity - Product Resolution (in time)

Definition of question

Product Resolution (in time) | The maximum resolution for which the product can be bid into the market (for instance =1 hour in the case of a 24 auctions day ahead market for reserve provision).
--- | ---

Key:
- Missing data
- N/A
- Year or more
- Month(s)
- Week(s)
- Day(s)
- Hour(s)
Replacement Reserve - Capacity - Distance to real time of reserve products auctions

**Definition of question**

**Distance to real time of reserve products auctions**

The time ahead from real time when auction/agreement for an specific balancing product takes place (for instance = 1 year in the case of a reserve agreement signed 1 year ahead of real time).
### Replacement Reserve - Capacity - Settlement Rule

**Definition of question**
Settlement Rule: The pricing rules for settlement.

**Definition of answer**
- **Marginal Pricing**: All capacity or balancing energy settled at the same price – price of the most expansive capacity bid procured or most expansive balancing energy bid activated.
- **Pay as bid**: Contracted parties who provide a service are paid based on their offer price.
- **Regulated Price**: Price for this service is based on a price that is set by the relevant regulatory authority.

### Map Key
- **Missing data**
- **N/A**
- **Pay as bid**
- **Marginal Pricing**
- **Regulated Price**

[Map of Europe showing different areas colored according to the key.]

**Key:**
- Missing data
- N/A
- Pay as bid
- Marginal Pricing
- Regulated Price
Cost Recovery Scheme
From who are the costs recovered.

Balance Responsible Party (BRP)
Balancing Responsible Party means a market participant or its chosen representative responsible for its imbalances.

Grid User
The natural or legal person supplying to, or being supplied with active and/or reactive power by a TSO or DSO.

Hybrid
Combination.

Key:
- Missing data
- N/A
- 100% Grid Users (through tariff)
- 100% BRP
- Hybrid
**Definition of question**

| Monitoring | Refers to the type of monitoring in place by the system operator to ensure performance of plant. |

**Definition of answer**

| Ex-post Check | When the monitoring of performance of plant carried out 24 hours after the delivery period. |
| Hybrid | Combination. |
| Real-Time Monitoring | Monitoring of delivery of ancillary services in real time. |

**Key:**
- Missing data
- N/A
- Real-Time Monitoring
- Ex-Post Check
- Hybrid
Replacement Reserve - Capacity - Transfer of BSPs obligation allowed

Key:
- Missing data
- N/A
- Yes
- Yes, only in case of forced outage
- No
Replacement Reserve - Capacity - In case transfer obligation is allowed, is there an organised secondary market?

**Definition of answer**

| Secondary Market for reserve obligation | Trading procedure between the BSPs (where at least one BSP has contract with the TSO) to ensure the prescribed reserve amount of the TSO. |

Key:
- Missing data
- N/A
- Yes
- No
**Definition of question**

| Procurement Scheme | Background of the offer, which is closest to the real operation time. |

**Definition of answer**

<table>
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<th>Hybrid</th>
<th>Combination.</th>
</tr>
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**Key:**
- Missing data
- N/A
- Market only
- Mandatory only
- Hybrid
Replacement Reserve - Energy - Free Bids allowed

**Definition of question**

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy Bids</td>
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</tr>
<tr>
<td>Free Offers</td>
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<td>Balancing Capacity has been procured from BSP.</td>
</tr>
</tbody>
</table>

**Key:**
- Missing data
- N/A
- Yes
- No
- No, there is no RR balancing energy market
**Definition of question**

| Activation rule | How the frequency restoration reserves are activated i.e. by a Pro-Rata system or on the basis of a Merit Order (cheapest being activated first). |

**Definition of answer**

| Merit order | A merit order is a way of ranking available sources of energy in ascending order of their short run marginal costs of production, so that those with the lowest marginal costs are the first ones to be brought online to meet demand. |
| Pro Rata (Parallel Activation) | All bids always activated in parallel – proportionally. |

**Key:**
- Missing data
- N/A
- Pro Rata (Parallel Activation)
- Merit order
Replacement Reserve - Energy - Product Resolution (in MW)

Definition of question

| Product Resolution (in MW) | The minimum bid size into the balancing market. |

Key:
- Missing data
- N/A
- No minimum bid size
- x ≤ 1MW
- 1MW < x ≤ 5 MW
- 5 MW < x ≤ 10 MW
- x > 10MW
Definition of question

**Product Resolution (in time)**

The maximum resolution for which the product can be bid into the market (for instance =1 hour in the case of a 24 auctions day ahead market for reserve provision).
Definition of question

**Distance to real time of energy products (reserve products activation)**: The time ahead from real time when TSO activates a given product (for instance 15 minutes in the case of mFRR/tertiary energy).

**Key:**
- Missing data
- N/A
- x > H-1
- 15 minutes < x <= H-1
- 5 minutes < x <= 15 minutes
- 1 minute < x <= 5 minutes
- x <= 1 minute
- Depends on the unit
## Definition of question

| Settlement Rule | The pricing rules for settlement. |

## Definition of answer

<table>
<thead>
<tr>
<th>Key:</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Missing data</td>
<td>N/A</td>
</tr>
<tr>
<td>No settlement</td>
<td>Pay as bid</td>
</tr>
<tr>
<td>Pay as bid</td>
<td>Marginal Pricing</td>
</tr>
<tr>
<td>Regulated Price</td>
<td>Hybrid</td>
</tr>
</tbody>
</table>

- **Hybrid**: Combination.
- **Marginal Pricing**: All capacity or balancing energy settled at the same price – price of the most expansive capacity bid procured or most expansive balancing energy bid activated.
- **Pay as bid**: Contracted parties who provide a service are paid based on their offer price.
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### Definition of question

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<th>Question</th>
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<td>From who are the costs recovered.</td>
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### Definition of answer

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<td>Combination.</td>
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</table>

**Key:**
- Missing data
- N/A
- 100% Grid Users (through tariff)
- 100% BRP
- Hybrid
**Definition of question**

**Monitoring**
Refers to the type of monitoring in place by the system operator to ensure performance of plant.

**Definition of answer**

**Ex-post Check**
When the monitoring of performance of plant carried out 24 hours after the delivery period.

**Hybrid**
Combination.

**Real-Time Monitoring**
Monitoring of delivery of ancillary services in real time.

---

**Key:**
- Missing data
- N/A
- Real-Time Monitoring
- Ex-Post Check
- Hybrid
Replacement Reserve - Energy - Transfer of BSPs obligation allowed

Key:

- Missing data
- N/A
- Yes
- Yes, only in case of forced outage
- No
Replacement Reserve - Energy - In case transfer obligation is allowed, is there an organised secondary market?

**Definition of answer**

**Secondary Market for reserve obligation**
Trading procedure between the BSPs (where at least one BSP has contract with the TSO) to ensure the prescribed reserve amount of the TSO.

**Key:**
- Missing data
- N/A
- Yes
- No
Replacement Reserve - Energy - Partially activated product

Key:
- Missing data
- N/A
- Yes, in all directions
- No in none direction
- Only in upward direction
- Only in downward direction
Replacement Reserve - Energy - Activation time of RR from 0 to max

<table>
<thead>
<tr>
<th>Key:</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Missing data</td>
<td>N/A</td>
</tr>
<tr>
<td>x &lt;= 15 min</td>
<td>15 min &lt; x &lt;= 30 min</td>
</tr>
<tr>
<td>30 min &lt; x &lt;= 1 hour</td>
<td>x &gt; 1 hour</td>
</tr>
<tr>
<td>Depends on the unit</td>
<td></td>
</tr>
</tbody>
</table>

**Definition of question**

**Activation Time**

Activation Time means the period of time between receipt of a valid instruction by the Activation Optimisation Function and the end of ramping to meet that instruction.
Definition of question

Activation Purpose
Are activations for other purposes than Balancing (e.g. congestion management) possible?
Imbalance settlement

(Referring to questions of AS survey from IS1.0 to IS15.0)
Imbalance settlement - Nature of the Balancing Obligation

<table>
<thead>
<tr>
<th>Definition of question</th>
</tr>
</thead>
<tbody>
<tr>
<td>Balancing Obligation Enforcement</td>
</tr>
<tr>
<td>Nature of balance responsibility enforcement.</td>
</tr>
</tbody>
</table>
Imbalance settlement - Exemptions for RES

**Definition of question**

**Exemptions**
- Market participants which do not have obligations to be responsible for its imbalance.

**Key:**
- Missing data
- N/A
- Yes
- No
Imbalance settlement - Exemptions for Generators licensed for the AS market

<table>
<thead>
<tr>
<th>Definition of question</th>
<th>Exemptions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Market participants which do not have obligations to be responsible for its imbalance.</td>
</tr>
</tbody>
</table>
Imbalance settlement - Exemptions for Other

<table>
<thead>
<tr>
<th>Definition of question</th>
<th>Exemptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Market participants which do not have obligations to be responsible for its imbalance.</td>
<td></td>
</tr>
</tbody>
</table>

Key:
- Missing data
- N/A
- Yes
- No
Imbalance settlement - Limit to exemption

Definition of question
Exemptions
Those parties that do not have a balancing obligation.

Key:
- Missing data
- N/A
- No limit
- x <= 1MW
- 1MW < x <= 5 MW
- 5 MW < x <= 10 MW
- x > 10MW
- Other
- % of nominations
### Imbalance settlement - Number of Imbalance Positions

#### Definition of question

<table>
<thead>
<tr>
<th>Description</th>
<th>Definition/Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Imbalance Position</strong></td>
<td>The declared energy volume of a balance responsible party used for the calculation of its imbalance.</td>
</tr>
<tr>
<td><strong>Number of Imbalance Position</strong></td>
<td>Number of Imbalance Positions is a property of local market design. For each Imbalance Position Imbalance Volume is calculated.</td>
</tr>
</tbody>
</table>

#### Map Key

- **Missing data**
- **N/A**
- **1 position**
- **2 positions** – separate positions for generation and consumption
- **> 2 positions**
**Imbalance Settlement** - **If there are more than 2 positions, please, clarify!**

<table>
<thead>
<tr>
<th>TSO</th>
<th>Answer</th>
</tr>
</thead>
</table>
| ADMIE | - 1 position for consumption  
- Several positions for generation (one per generation unit)  
- 1 position for imports  
- 1 position for exports |
| REN | For generation the imbalance is calculated by imbalance area. A market player can have more than one imbalance area. |
| Terna | In Italy we calculate an imbalance volume for each production -different for qualified/not qualified unit in the Ancillary Service Market - and consumption unit. |
| EirGrid | A single imbalance position for each Scheduling Unit under the Balance Responsible Party as allowed for Central Dispatch Systems |
### Definition of question

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Imbalance Settlement Period</strong></td>
<td>The unit of settlement that is applied to the quantities in which the time series is expressed.</td>
</tr>
</tbody>
</table>
Imbalance settlement - Imbalance Settlement Period - If 2 positions - Generation

| Definition of question | Imbalance Settlement Period | The unit of settlement that is applied to the quantities in which the time series is expressed. |

Key:
- Missing data
- N/A
- 15 min
- 30 min
- 1 hour
- x > 1 hour
Definition of question

| Imbalance Settlement Period | The unit of settlement that is applied to the quantities in which the time series is expressed. |

Key:
- Missing data
- N/A
- 15 min
- 30 min
- 1 hour
- x > 1 hour
### Imbalance settlement - Number of Prices - If 1 position

#### Definition of question

<table>
<thead>
<tr>
<th>Key</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Missing data</td>
<td></td>
</tr>
<tr>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Single Pricing</td>
<td></td>
</tr>
<tr>
<td>Dual Pricing</td>
<td></td>
</tr>
</tbody>
</table>

#### Definition of answer

<table>
<thead>
<tr>
<th>Key</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dual Pricing</td>
<td>Imbalance Price does not take system state into account. Different prices for aggravating and non-aggravating imbalance.</td>
</tr>
<tr>
<td>Single Pricing</td>
<td>Imbalance Price takes system state into account, same price for aggravating and non-aggravating imbalance.</td>
</tr>
</tbody>
</table>

* Single Pricing, occasionally dual pricing for TenneT Netherlands.
### Definition of question

<table>
<thead>
<tr>
<th>Imbalance Price</th>
<th>The price, be it positive, zero or negative, in each imbalance settlement period for an imbalance in each direction.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Prices</td>
<td>Number of prices for Imbalance Position.</td>
</tr>
</tbody>
</table>

### Definition of answer

<table>
<thead>
<tr>
<th></th>
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</table>

#### Map Key:

- **Missing data**
- **N/A**
- **Single Pricing**
- **Dual Pricing**
- **Other**
### Imbalance settlement - Number of Prices - If 2 positions - Consumption

#### Definition of question

| Number of Prices | Number of prices for Imbalance Position. |

#### Definition of answer

<table>
<thead>
<tr>
<th>Pricing Method</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dual Pricing</td>
<td>Imbalance Price does not take system state into account. Different prices for aggravating and non-aggravating imbalance.</td>
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#### Map Key

- **Missing data**
- **N/A**
- **Single Pricing**
- **Dual Pricing**
- **Other**
**Definition of question**

<table>
<thead>
<tr>
<th>Term</th>
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<tbody>
<tr>
<td>Aggravating Imbalance</td>
<td>BRP imbalance same direction as Imbalance Price Area imbalance.</td>
</tr>
<tr>
<td>Imbalance Price Area</td>
<td>The area for the calculation of an imbalance price.</td>
</tr>
<tr>
<td>Main component of Imbalance Prices</td>
<td>The component that determines imbalance charges most of the time.</td>
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<td>Average Control Energy Price</td>
<td>Average Control Energy Price is calculated by taking the sum of the control energy prices and dividing it by the number of the prices being examined.</td>
</tr>
<tr>
<td>Day Ahead Market Price</td>
<td>Price which evolved on the day ahead market.</td>
</tr>
<tr>
<td>Intraday Market Price</td>
<td>The price of the market within regular business hours, short-term prices.</td>
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<td>Marginal Control Energy Price</td>
<td>The highest price, which can be acceptable.</td>
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**Key:**

- Missing data
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- Average Control Energy Price
- Marginal Control Energy Price
- Day-Ahead Market Price
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<td>BRP imbalance opposite direction as Imbalance Area imbalance.</td>
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**Key:**
- Missing data
- N/A
- Average Control Energy Price
- Marginal Control Energy Price
- Day-Ahead Market Price
- Intraday Market Price
- Other
Imbalance settlement - Main comp. of Imb. Prices - If 2 positions - For consumption "aggravating imb."

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Key:

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- Average Control Energy Price
- Marginal Control Energy Price
- Day-Ahead Market Price
- Intraday Market Price
- Other
Imbalance settlement - Main comp. of Imb. Prices - If 2 positions - For generation "reducing imb."

### Definition of question

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### Key

- **Missing data**
- **N/A**
- **Average Control Energy Price**
- **Marginal Control Energy Price**
- **Day-Ahead Market Price**
- **Intraday Market Price**
- **Other**
Definition of question

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Key:
- Missing data
- N/A
- Average Control Energy Price
- Marginal Control Energy Price
- Day-Ahead Market Price
- Intraday Market Price
- Other
### Definition of question

<table>
<thead>
<tr>
<th>Question</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Additional Components</td>
<td>Other components which determine imbalance charges.</td>
</tr>
<tr>
<td>Main component of Imbalance Prices</td>
<td>The component that determines imbalance charges most of the time.</td>
</tr>
</tbody>
</table>

### Map

- **Key:**
  - Missing data
  - N/A
  - Constant component
  - Variable component
  - Other

Imbalance settlement - Main comp. of Imb. Prices - Additional Components
Imbalance settlement - Is there a minimal incentive?

<table>
<thead>
<tr>
<th>Definition of question</th>
<th>Minimal Incentives</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Minimal incentives means that there is some method which leads the BRPs to balance their schedules.</td>
</tr>
</tbody>
</table>

Key:
- Missing data
- N/A
- Yes
- No
Imbalance settlement - Control energy prices used - FCR

Key:
- Missing data
- N/A
- TSO is not using this type of product
- This product is not used in settlement price calculation
- This product is used in settlement price calculation
Key:
- Missing data
- N/A
- TSO is not using this type of product
- This product is not used in settlement price calculation
- This product is used in settlement price calculation
Imbalance settlement - Control energy prices used - mFRR

Key:
- Missing data
- N/A
- TSO is not using this type of product
- This product is not used in settlement price calculation
- This product is used in settlement price calculation
Imbalance settlement - Control energy prices used - RR

Key:
- Missing data
- N/A
- TSO is not using this type of product
- This product is not used in settlement price calculation
- This product is used in settlement price calculation
**Definition of question**

<table>
<thead>
<tr>
<th>Final Imbalance Price</th>
<th>Imbalance price means the price, be it positive, zero or negative, in each imbalance settlement period for an imbalance in each direction. Final imbalance price is calculated price for settlement period that cannot be changed anymore.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Publication</td>
<td>Publication of final Imbalance Price.</td>
</tr>
</tbody>
</table>

**Key:**
- Missing data
- N/A
- Prior to delivery
- $x \leq 1$ hour after delivery
- $x \leq 1$ day after delivery
- $x \leq 1$ week after delivery
- $x > 1$ week after delivery
Imbalance settlement - Complaint Period

**Definition of answer**

<table>
<thead>
<tr>
<th>Complaint Period</th>
<th>Length of time for which complaints can be made which will be considered in relation to settlement (after the finalized data are produced).</th>
</tr>
</thead>
</table>

**Key:**

- Missing data
- N/A
- $x \leq 3$ weeks
- $3 < x \leq 6$ weeks
- $6 < x \leq 9$ weeks
- $9 < x \leq 12$ weeks
- $x > 12$ weeks
Imbalance settlement - Gate Closure time for notification of Internal Trade Schedules

<table>
<thead>
<tr>
<th>Definition of answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gate Closure Times (GCT)</td>
</tr>
<tr>
<td>Deadline for the participation to a given market or mechanism.</td>
</tr>
</tbody>
</table>

**Key:**
- Missing data
- N/A
- 15 min before delivery
- 30 min before delivery
- 45 min before delivery
- 1 hour before delivery
- \(x > 1\) hour before delivery
- Ex-post notification allowed
Imbalance settlement - Internal Intra Day Market time period

Key:
- Missing data
- N/A
- 15 min
- 30 min
- 1 hour
Imbalance settlement - Can market participants change the approved schedules after Delivery?

**Definition of answer**

| Gate Closure Times (GCT) | Deadline for the participation to a given market or mechanism. |

**Key:**
- Missing data
- N/A
- Always (GCT after delivery)
- Never (GCT before delivery)
- Only in case of IT or any other problems (TSO approval)
Part three

Load participation

(Referring to questions of AS survey from L1.0 to L7.0)
Load participation - Load providers use the same market mech. and act. proc. as generation (cap.&energy)
Load participation - Specific market solution use for load providers of balancing services (cap.&energy)
Load participation - Product Resolution (in MW)

Definition of question
Product Resolution (in MW) The minimum bid size into the balancing market.

Key:
- Missing data
- N/A
- $x \leq 1$ MW
- $1 \text{ MW} < x \leq 5$ MW
- $5 \text{ MW} < x \leq 10$ MW
- $x > 10$ MW
- Other

Diagram showing the distribution of load participation across different regions in Europe, with different colors representing various resolution levels.
Load participation - Product Resolution (in time)

**Definition of question**

| Product Resolution (in time) | The maximum resolution for which the product can be bid into the market (for instance 1 hour in the case of a 24 auctions day ahead market for reserve provision). |

**Key:**
- Missing data
- N/A
- Hour (or blocks)
- 30 minutes
- 15 minutes
Load participation - What type of specific activation rule do you follow with load type BSP’s?

**Definition of question**

| Activation rule | How the frequency restoration reserves are activated i.e. by a Pro-Rata system or on the basis of a Merit Order (cheapest being activated first). |

**Definition of answer**

<table>
<thead>
<tr>
<th>Key</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Missing data</td>
<td></td>
</tr>
<tr>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Merit Order</td>
<td>A merit order is a way of ranking available sources of energy in ascending order of their short run marginal costs of production, so that those with the lowest marginal costs are the first ones to be brought online to meet demand.</td>
</tr>
<tr>
<td>Pro Rata (Parallel Activation)</td>
<td>All bids always activated in parallel – proportionally.</td>
</tr>
</tbody>
</table>
Load participation - Settlement Rule

**Definition of question**

| Settlement Rule | The pricing rules for settlement. |

**Definition of answer**

<table>
<thead>
<tr>
<th>Hybrid</th>
<th>Combination.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marginal Pricing</td>
<td>All capacity or balancing energy settled at the same price – price of the most expansive capacity bid procured or most expansive balancing energy bid activated.</td>
</tr>
<tr>
<td>Pay as bid</td>
<td>Contracted parties who provide a service are paid based on their offer price.</td>
</tr>
<tr>
<td>Regulated Price</td>
<td>Price for this service is based on a price that is set by the relevant regulatory authority.</td>
</tr>
</tbody>
</table>

**Key:**

- Missing data
- N/A
- Pay as bid
- Marginal Pricing
- Regulated Price
- Hybrid
Load participation - Participating in the balancing services - Aggregators

Key:
- Missing data
- N/A
- Yes
- No
Load participation - Participating in the balancing services - Large consumers

Key:
- Missing data
- N/A
- Yes
- No

[Map of Europe showing participation status.]
Load participation - Participating in the balancing services - Pump storage units

Key:
- Missing data
- N/A
- Yes
- No
Load participation - Participating in the balancing services - Small consumers

Key:
- Missing data
- N/A
- Yes
- No

[Map showing load participation by countries in Europe]
Load participation - Participating in the balancing services - Other storage

Key:
- Missing data
- N/A
- Yes
- No
Load participation - Participating in the balancing services - Other

Key:
- Missing data
- N/A
- Yes
- No
Load participation - What is the product resolution for load BSP’s to participate at these balancing services?

Key:
- Missing data
- N/A
- $x \leq 1\, \text{MW}$
- $1\, \text{MW} < x \leq 5\, \text{MW}$
- $5\, \text{MW} < x \leq 10\, \text{MW}$
- $x > 10\,\text{MW}$
- Other
Load participation - Monitoring

**Definition of question**

| Monitoring | Refers to the type of monitoring in place by the system operator to ensure performance of plant. |

**Definition of answer**

| Ex-post Check | When the monitoring of performance of plant carried out 24 hours after the delivery period. |
| Hybrid | Combination. |
| Real-Time Monitoring | Monitoring of delivery of ancillary services in real time. |

Key:
- Missing data
- N/A
- Ex-Post Check
- Real-Time Monitoring
- Hybrid
Load participation - Using load BSP’s in order to solve local constraints

<table>
<thead>
<tr>
<th>Definition of question</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Local constraint</strong></td>
</tr>
<tr>
<td>Local constraint means a situation in which there is a need to implement Remedial Action in order to respect Operational Security Limits in the matter of the location.</td>
</tr>
</tbody>
</table>

Key:
- Missing data
- N/A
- Yes
- No
Load participation - What level of control of the load does the TSO have?

Key:
- Missing data
- N/A
- No Control
- Direct Control (Automatic)
- Direct Control (Manual)
- Relay
Voltage control

(Referring to questions of AS survey from VC1.0 to VCQ12.0)
Voltage control - Voltage support as part of ancillary services

Key:
- Missing data
- N/A
- Yes
- No
### Voltage Control - Which power plants have to provide voltage control? Is it a mandatory service in your country? 1/3

<table>
<thead>
<tr>
<th>TSO</th>
<th>Answer</th>
</tr>
</thead>
</table>
| APG      | The capability to provide reactive power is mandatory (activation based on contract)  
In emergency state (according to SOGL) voltage control/Q(U) is mandatory for Type B/C/D. |
| AST      | All power plants connected to the transmission grid are obliged to provide Voltage Control service.                                     |
| ČEPS     | All units connected to the transmission grid (220kV +) must be capable of voltage control.                                             |
| EirGrid  | Mandatory Grid Code requirement for transmission connected units. Commercial opportunities for all other providers (or provisions over and above mandatory requirement). |
| Elering  | It is mandatory. All power plants that are connected to the main grid must have voltage control capability.                           |
| Elia     | The provision of the voltage control service is not mandatory but is based on a voluntary participation of production units via a tendering procedure. |
| EMS      | Hydro and thermal power plants. It is mandatory.                                                                                       |
| Fingrid  | Mandatory service for all power plants.                                                                                                 |
| German TSOs | The framework of voltage control requirements for plants connected to the high-voltage grid is provided by the German Transmission Code. Concrete requirements within the given framework are agreed between connecting TSO and power plant operator and included in the grid connection contracts. A similar framework does also exist for medium-voltage grids. |
Voltage Control - Which power plants have to provide voltage control? Is it a mandatory service in your country? 2/3

<table>
<thead>
<tr>
<th>TSO</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>HOPS</td>
<td>All power plants need to provide voltage control in mandatory range by grid code.</td>
</tr>
<tr>
<td>LITGRID</td>
<td>All power plant connected to transmission grid. All running generator shall provide voltage support according technical possibilities from generator.</td>
</tr>
<tr>
<td>MAVIR Zrt.</td>
<td>If the gross installed capacity is more than 50 MW and the power plant is connected to the transmission grid, or 132 kV, the service is mandatory.</td>
</tr>
<tr>
<td>National Grid</td>
<td>Mandatory Service (Grid Code Provision) for Conventional Generators and Windfarms connected to the transmission system. Commercial Service for Conventional Generators and Windfarms connected to the transmission system for provision over and above Mandatory levels.</td>
</tr>
<tr>
<td>NOSBiH</td>
<td>Yes.</td>
</tr>
<tr>
<td>PSE S.A.</td>
<td>All generating units according to Grid Code are obliged to control the voltage, centrally dispatched units are contracted for such service.</td>
</tr>
<tr>
<td>Red Eléctrica de Espana</td>
<td>Mandatory for units &gt;= 30 MW of rated power and connected to transmission grid.</td>
</tr>
<tr>
<td>REN</td>
<td>All conventional generators and solar power plants have to provide.</td>
</tr>
<tr>
<td>RTE</td>
<td>No.</td>
</tr>
</tbody>
</table>
## Voltage Control - Which power plants have to provide voltage control? Is it a mandatory service in your country?

<table>
<thead>
<tr>
<th>TSO</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>SEPS</td>
<td>Primary voltage control is mandatory and secondary voltage control is paid service. We use secondary voltage control just at transmission level (400 kV and 220 kV).</td>
</tr>
<tr>
<td>Statnett SF</td>
<td>Generators &gt;= 1MVA. Yes, it is a mandatory service.</td>
</tr>
<tr>
<td>Swissgrid</td>
<td>All power plants directly connected to the transmission system which are in operation (production, pump mode or synchronous/phase shifting mode), within the scope of their available reactive power that can be exchanged with the transmission system without compromising the active power.</td>
</tr>
<tr>
<td>TenneT Netherlands</td>
<td>Not mandatory.</td>
</tr>
<tr>
<td>TERNA</td>
<td>It’s mandatory for the power units which have nominal power greater or equal than 10 MVA and for all the new HV connected PPM and synchronous generators (formerly PPM had only obligation on power factor cosine phi).</td>
</tr>
</tbody>
</table>
Voltage control - Determination the optimal use of reactive energy

Key:
- Missing data
- N/A
- Optimisation program
- Operator's experience, studies
- Both
**Definition of question**

**Optimization approach**
What kind of Voltage Control optimization is available in your control area?

**Key:**
- Missing data
- N/A
- Centralised optimisation approach
- Regional-oriented approach
- Both

---

Voltage control - Type of optimization approach
Voltage control - Implicit / explicit offers bids from BSP

<table>
<thead>
<tr>
<th>Definition of question</th>
<th>Explicit offer</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Specified and limited bids - for Standing unit</td>
</tr>
</tbody>
</table>

Key:
- Missing data
- N/A
- Explicit
- Implicit
- Both

Legend:
- European Union
- Non-European Union
- Transition countries
- Other regions
- Non-compliant regions
Voltage control - Provider - Photovoltaic systems

Key:
- Missing data
- N/A
- Yes
- No
Voltage control - Provider - Windfarm producers or photovoltaic systems connected on the DSO
Voltage control - Provider - Transformers of the transmission grid
Voltage control - Type of regulations for the voltage control demanded to the power plants - No regulation

Key:
- Missing data
- N/A
- Yes
- No
Voltage control - Type of regulations for the voltage control demanded to the power plants - Reactive setpoint

Key:
- Missing data
- N/A
- Yes
- No
Voltage control - Type of regulations for the voltage control demanded to the power plants - Voltage stator setpoint

Key:
- Missing data
- N/A
- Yes
- No
Voltage control - Type of regulations for the voltage control demanded to the power plants - Voltage setpoint at the connexion point (fixed value at EHV point)
Voltage control - Type of regulations for the voltage control demanded to the power plants - Voltage setpoint at the connexion point function of a signal sent by the TSO (possibility of variation of the EHV setpoint)

Key:
- Missing data
- N/A
- Yes
- No
Voltage control - Type of regulations for the voltage control demanded to the power plants - OLTC on the main transformer (manual control)
Voltage control - Type of regulations for the voltage control demanded to the power plants - OLTC on the main transformer (automatic control of the EHV voltage)
Voltage control - If a power plant is able to provide voltage control, which grid it should be connected to?

Key:
- Missing data
- N/A
- Transmission grid
- Distribution grid
- Both
Voltage control - Is it a service paid by the TSO?

Key:
- Missing data
- N/A
- Yes
- No
- Partly

[Map showing distribution of voltage control services paid by TSOs across Europe]
### Definition of question

| Settlement Rule | The pricing rules for settlement. |

### Definition of answer

<table>
<thead>
<tr>
<th>Key</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Missing data</td>
<td></td>
</tr>
<tr>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Pay as bid</td>
<td>Contracted parties who provide a service are paid based on their offer price.</td>
</tr>
<tr>
<td>Marginal pricing</td>
<td>All capacity or balancing energy settled at the same price – price of the most expansive capacity bid procured or most expansive balancing energy bid activated.</td>
</tr>
<tr>
<td>Regulated price</td>
<td>Price for this service is based on a price that is set by the relevant regulatory authority.</td>
</tr>
</tbody>
</table>

**Voltage control - Settlement Rule**

![Map of Europe showing different voltage control regions.](image-url)
**Voltage control - Monitoring**

<table>
<thead>
<tr>
<th>Key:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Missing data</td>
<td>N/A</td>
</tr>
<tr>
<td>Real time monitoring</td>
<td>Ex post check</td>
</tr>
<tr>
<td>Hybrid</td>
<td>Hybrid</td>
</tr>
</tbody>
</table>

**Definition of question**

| Monitoring | Refers to the type of monitoring in place by the system operator to ensure performance of plant. |

**Definition of answer**

<table>
<thead>
<tr>
<th>Ex-post Check</th>
<th>When the monitoring of performance of plant carried out 24 hours after the delivery period.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hybrid</td>
<td>Combination.</td>
</tr>
<tr>
<td>Real-Time Monitoring</td>
<td>Monitoring of delivery of ancillary services in real time.</td>
</tr>
</tbody>
</table>
Voltage control - Does the TSO own reactive power compensation systems?

Key:
- Missing data
- N/A
- Yes
- No

[Map showing ownership of reactive power compensation systems across Europe]
Voltage control - Owning by the TSO the reactive power compensation systems - Inductance
Voltage control - Owning by the TSO the reactive power compensation systems - Capacitor banks

Key:
- Missing data
- N/A
- Yes
- No
Voltage control - Owning by the TSO the reactive power compensation systems - SVC
Voltage control - Owning by the TSO the reactive power compensation systems - Synchronous compensator

Key:
- Missing data
- N/A
- Yes
- No
Voltage control - Settlement rules for the exchange of reactive power between transmission and distribution grids - Respect a Reactive/Active power ratio

Key:
- Missing data
- N/A
- Yes
- No
Voltage control - Settlement rules for the exchange of reactive power between transmission and distribution grids - Respect of an Active/Reactive Power Diagram at the connexion point
Voltage control - Settlement rules for the exchange of reactive power between transmission and distribution grids - Min/max fixed value of reactive power
Voltage control - Settlement rules for the exchange of reactive power between transmission and distribution grids - Depending of the period of the day and/or year

Key:
- Missing data
- N/A
- Yes
- No
Voltage control - Settlement rules for the exchange of reactive power between transmission and distribution grids - Depending on the localization of the DSO
Voltage control - Settlement rules for the exchange of reactive power between transmission and distribution grids - According to the measurement
Voltage control - Settlement rules for the exchange of reactive power between transmission and distribution grids - No rules

Key:
- Missing data
- N/A
- Yes
- No
Voltage control - What are the settlement rules for the price of reactive power between transmission and distribution grids?

<table>
<thead>
<tr>
<th>Definition of question</th>
<th>Settlement Rule</th>
<th>The pricing rules for settlement.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Definition of answer</td>
<td>Charges and/or fees</td>
<td>Charges and/or fees if the DSO does not respect the tan Phi and/or the diagram rule.</td>
</tr>
<tr>
<td></td>
<td>Regulated Price</td>
<td>Price for this service is based on a price that is set by the relevant regulatory authority.</td>
</tr>
</tbody>
</table>

Key:
- Missing data
- N/A
- Charges and/or fees
- Bonus link to a specific diagram
- Regulated price
- No rules
- Free
- Charges and/or fees if the DSO does not respect the tan Phi and/or the diagram rule + Free
Voltage control - Existing of secondary voltage control (SecVolCon) voltage control for the nominated mains?

**Definition of answer**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SecVolCon reactive</td>
<td>SecVolCon sending a reactive setpoint to the units (manually or automatically)</td>
</tr>
<tr>
<td>SecVolCon voltage</td>
<td>SecVolCon sending a voltage setpoint to the units (manually or automatically)</td>
</tr>
</tbody>
</table>

**Key:**
- Missing data
- N/A
- Operating in open loop
- Operating in closed loop
- SecVolCon reactive
- SecVolCon voltage
- SecVolCon reactive + SecVolCon voltage
- Operating in closed loop + SecVolCon voltage
- Operating in closed loop + SecVolCon reactive + SecVolCon voltage
Voltage control - Existing of tertiary voltage control

Key:
- Missing data
- N/A
- Operating in open loop
- Operating in closed loop (automatic)
Black start

(Referring to questions of AS survey from BSQ1.0 to BSQ13.0)
<table>
<thead>
<tr>
<th>TSO</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADMIE</td>
<td>Predefined power plants have to provide Black Start service.</td>
</tr>
<tr>
<td>APG</td>
<td>Hydro storage power plants. Not mandatory for power plants.</td>
</tr>
<tr>
<td>AST</td>
<td>No special rules - agreement with hydro power plant for providing the service.</td>
</tr>
<tr>
<td>CREOS Luxembourg</td>
<td>No possibility to provide Black Start from LU</td>
</tr>
<tr>
<td>ČEPS</td>
<td>No obligations to provide black start for any unit.</td>
</tr>
<tr>
<td>EirGrid</td>
<td>It is not mandatory. Technologies currently providing black start: Hydro, Pumped Storage, Interconnector, Open Cycle Gas Turbines.</td>
</tr>
<tr>
<td>Elering AS</td>
<td>Black start service is provided by power plants which are included in the restoration plan as black start service providers. It is not a mandatory service.</td>
</tr>
<tr>
<td>ELES</td>
<td>Yes.</td>
</tr>
<tr>
<td>Elia</td>
<td>The black-start service is not mandatory and is based on a voluntary participation via a tendering process.</td>
</tr>
<tr>
<td>EMS</td>
<td>Some HPP.</td>
</tr>
<tr>
<td>Fingrid</td>
<td>Not mandatory, agreed bilaterally with suitable plants.</td>
</tr>
<tr>
<td>German TSOs</td>
<td>Black start provision according to respective black-start concepts, based on grid connection and specific contracts.</td>
</tr>
<tr>
<td>TSO</td>
<td>Answer</td>
</tr>
<tr>
<td>------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>HOPS</td>
<td>All the units who are able to provide BS must provide it.</td>
</tr>
<tr>
<td>LITGRID</td>
<td>Power plants that are included in the black start plan must provide the black start service (due to technology).</td>
</tr>
<tr>
<td>MAVIR ZRt.</td>
<td>If the gross installed capacity is more than 500 MW and the power plant is connected to the transmission grid, the service is mandatory. But there are some power plants who are able to provide BS capability, but their gross installed capacities are less than 500 MW.</td>
</tr>
<tr>
<td>National Grid</td>
<td>Not a mandatory service for generators. However, mandatory for NG to maintain black start capability - Grid Code and Transmission Licence requirements. Black Start services are procured via contracts with power stations.</td>
</tr>
<tr>
<td>NOSBiH</td>
<td>Yes.</td>
</tr>
<tr>
<td>PSE S.A.</td>
<td>It is not a mandatory service in Poland.</td>
</tr>
<tr>
<td>Red Eléctrica de Espana</td>
<td>Mainly hydro units.</td>
</tr>
<tr>
<td>REN</td>
<td>BS is not a mandatory service in Portugal. We have a CCGT and a Hydro that provide that service.</td>
</tr>
<tr>
<td>RTE</td>
<td>BS not mandatory. Nuclear power plants provide VSC w/o BS.</td>
</tr>
<tr>
<td>SEPS</td>
<td>No, this service is not mandatory.</td>
</tr>
<tr>
<td>TSO</td>
<td>Answer</td>
</tr>
<tr>
<td>---------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>SONI</td>
<td>Conventional (Thermal) Power Stations must have black start capability.</td>
</tr>
<tr>
<td>Statnett SF</td>
<td>Power plants that have a significance impact on the reconstruction of the network or other critical functions.</td>
</tr>
<tr>
<td>Svenska kraftnät</td>
<td>We have contracts with some suppliers of blackstart capability.</td>
</tr>
</tbody>
</table>
| Swissgrid           | A buildup-cell is defined as a small subnet, limited in area and electrical network, which consists of one power station equipped with black start facilities and one or more power station with islanding functionality being able to keep frequency, voltage and power stable in this buildup-cell, with an adequate load at its disposal. The buildup-cell needs:  
- to have a direct connection to the 220kV-level  
- to be connected to the same or neighboring nodes  
- its rotating mass (power output) to be between 200 and 250 MW and a switchable load of 10%. |
| TenneT Netherlands   | Black start is contracted and not a mandatory service.                                                                                   |
| Terna              | It is mandatory for the power plants defined in the restoration plan.                                                                     |
| Transelectrica      | Power plants that are included in the Black Start Plan must provide the Black Start Service - due to technology.                         |
Black Start - If a power plant is able to provide black start service, which grid it should be connected to?

Key:
- Missing data
- N/A
- Transmission grid
- Distribution grid
- Both
Black Start - Is it a service paid by the TSO?

Key:
- Missing data
- N/A
- Yes
- No

BSO3.0
Black Start - Settlement Rule

**Definition of question**

| Settlement Rule | The pricing rules for settlement. |

**Definition of answer**

| Hybrid | Combination. |
| Marginal Pricing | All capacity or balancing energy settled at the same price – price of the most expansive capacity bid procured or most expansive balancing energy bid activated. |
| Pay as bid | Contracted parties who provide a service are paid based on their offer price. |
| Regulated Price | Price for this service is based on a price that is set by the relevant regulatory authority. |

**Key:**
- Missing data
- N/A
- Pay as bid
- Marginal pricing
- Regulated price
- Free
- Hybrid
Black Start - Does the TSO own unit for Black start service?

Key:
- Missing data
- N/A
- Yes
- No

Click to edit Master title style
### Black Start - Does the TSO have some special rules for the distribution/location/number etc of black start service units? 1/3

<table>
<thead>
<tr>
<th>TSO</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADMIE</td>
<td>No.</td>
</tr>
<tr>
<td>APG</td>
<td>Black start units geographically separated.</td>
</tr>
<tr>
<td>AST</td>
<td>No.</td>
</tr>
<tr>
<td>CREOS Luxembourg</td>
<td>No.</td>
</tr>
<tr>
<td>ČEPS</td>
<td>N/A</td>
</tr>
<tr>
<td>EirGrid</td>
<td>The TSO considers regional requirements when awarding BS contracts.</td>
</tr>
<tr>
<td>Elering AS</td>
<td>No.</td>
</tr>
<tr>
<td>ELES</td>
<td>Prescribed amount of BS is area-dependent.</td>
</tr>
<tr>
<td>Elia</td>
<td>Elia procured the Black Start service according to the rules described in its Restoration Plan. Typically Elia procured 1 BS unit for the restoration of each regional zone and 1 for the restoration of the 380 kV backbone.</td>
</tr>
<tr>
<td>EMS</td>
<td>No.</td>
</tr>
</tbody>
</table>
## Black Start - Does the TSO have some special rules for the distribution/location/number etc of black start service units? 2/3

<table>
<thead>
<tr>
<th>TSO</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fingrid</td>
<td>No.</td>
</tr>
<tr>
<td>German TSOs</td>
<td>According to respective black-start concept.</td>
</tr>
<tr>
<td>HOPS</td>
<td>No.</td>
</tr>
<tr>
<td>LITGRID</td>
<td>No special rules for distribution, black start service unit shall be located in such a place, where is feasible to restart main generation units.</td>
</tr>
<tr>
<td>MAVIR ZRt.</td>
<td>No special rules.</td>
</tr>
<tr>
<td>National Grid</td>
<td>Restoration strategy is to split GB into 6 geographical zones and contract for at least 3 black start providers from each zone.</td>
</tr>
<tr>
<td>NOSBiH</td>
<td>No.</td>
</tr>
<tr>
<td>PSE S.A.</td>
<td>TSO is obliged to fulfil standards from OH Policy 5.</td>
</tr>
<tr>
<td>Red Eléctrica de Espana</td>
<td>It is warranted a good geographical distribution of BS resources.</td>
</tr>
</tbody>
</table>
### Black Start - Does the TSO have some special rules for the distribution/location/number etc of black start service units? 3/3

<table>
<thead>
<tr>
<th>TSO</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>REN</td>
<td>No special rules.</td>
</tr>
<tr>
<td>RTE</td>
<td>N/A</td>
</tr>
<tr>
<td>SEPS</td>
<td>Yes, we have a set of different rules. Each application for BS providing is assessed separately.</td>
</tr>
<tr>
<td>SONI</td>
<td>N/A</td>
</tr>
<tr>
<td>Statnett SF</td>
<td>Power plants that have a significance impact on the reconstruction of the network or other critical functions.</td>
</tr>
<tr>
<td>Svenska kraftnät</td>
<td>Yes, we have a set of different criterias.</td>
</tr>
<tr>
<td>Swissgrid</td>
<td>Distribution of CH in 4 network restoration regions (West, South, Centraland East): Each region must have 1 buildup-cell.</td>
</tr>
<tr>
<td>TenneT Netherlands</td>
<td>Black Start units are contracted in different parts of the network.</td>
</tr>
<tr>
<td>Terna</td>
<td>We have a fixed number of &quot;restoration path,.</td>
</tr>
<tr>
<td>Transelectrica</td>
<td>Geographical distance according to respective Black-Start concept.</td>
</tr>
</tbody>
</table>
Black Start - Does the TSO have a regulated amount of BS control (regarding the whole control area)?

Key:
- Missing data
- N/A
- No
- Yes, 1-500 MW
- Yes, 501-800 MW
- Yes, more than 800 MW
- All the units who are able to provide BS must to provide it
Black Start - Testing the BS ability by the TSO - During the accreditation process only

Key:
- Missing data
- N/A
- Yes
- No
Black Start - Testing the BS ability by the TSO - After the accreditation process/ Only the operational function of the BS unit (unit is working, not connected to the grid)/Once a year
Black Start - Testing the BS ability by the TSO - After the accreditation process/ Only the operational function of the BS unit (unit is working, not connected to the grid)/Several times a year
Black Start - Testing the BS ability by the TSO - After the accreditation process/ Only the operational function of the BS unit (unit is working, not connected to the grid)/Occasionally

Key:
- Missing data
- N/A
- Yes
- No
Black Start - Testing the BS ability by the TSO - After the accreditation process/Control function of the BS unit (unit is working, connected to the grid and has to provide some predefined orders)/Once a year
Black Start - Testing the BS ability by the TSO - After the accreditation process/ Control function of the BS unit (unit is working, connected to the grid and has to provide some predefined orders)/Several times a year

Key:
- Missing data
- N/A
- Yes
- No
Black Start - Testing the BS ability by the TSO - After the accreditation process/ Control function of the BS unit (unit is working, connected to the grid and has to provide some predefined orders)/Occasionally
Black Start - How often does the TSO practise the method of the BS process (for example using a training simulator)?

Key:
- Missing data
- N/A
- Regularly/once a year
- Regularly/several times a year
- Occasionally
- Regularly
Black Start - Should be the Black start service provided by a single unit or it is allowed to be a part of a power plant?

Key:
- Missing data
- N/A
- Yes, it can be part of the power plant
- No, it has to be a single unit
Black Start - How long is the acceptable non-availability period of the BS unit (planned, for example: resurrection & maintenance of the unit)?

Key:
- Missing data
- N/A
- It is not allowed
- Less than one day
- Between 1 and 3 days
- Between 4 and 7 days
- Depending on the availability of other BS units
- More than one week
Black Start - Is there a regulated gradient for the BS unit?

Key:
- Missing data
- N/A
- No
- Yes, 0-100MW/15 min
- Yes, 101MW-200MW/15 min
- Yes, more than 200 MW/15 min

BSQ12.0
**Definition of question**

| Monitoring | Refers to the type of monitoring in place by the system operator to ensure performance of plant. |

**Definition of answer**

| Ex-post Check | When the monitoring of performance of plant carried out 24 hours after the delivery period. |
| Hybrid        | Combination. |
| Real-Time Monitoring | Monitoring of delivery of ancillary services in real time. |

**Key:**
- Missing data
- N/A
- Real time monitoring/tests
- Ex post check
- Hybrid