Survey on Ancillary services procurement
Balancing market design 2021

ENTSO-E | WGAS | 20.06.2022

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Table of content

Introduction [1]

ENTSO-E Survey on Ancillary services procurement, Balancing market design 2021.

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, Luxembourg, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland and the Netherlands.

Introduction [2]

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.

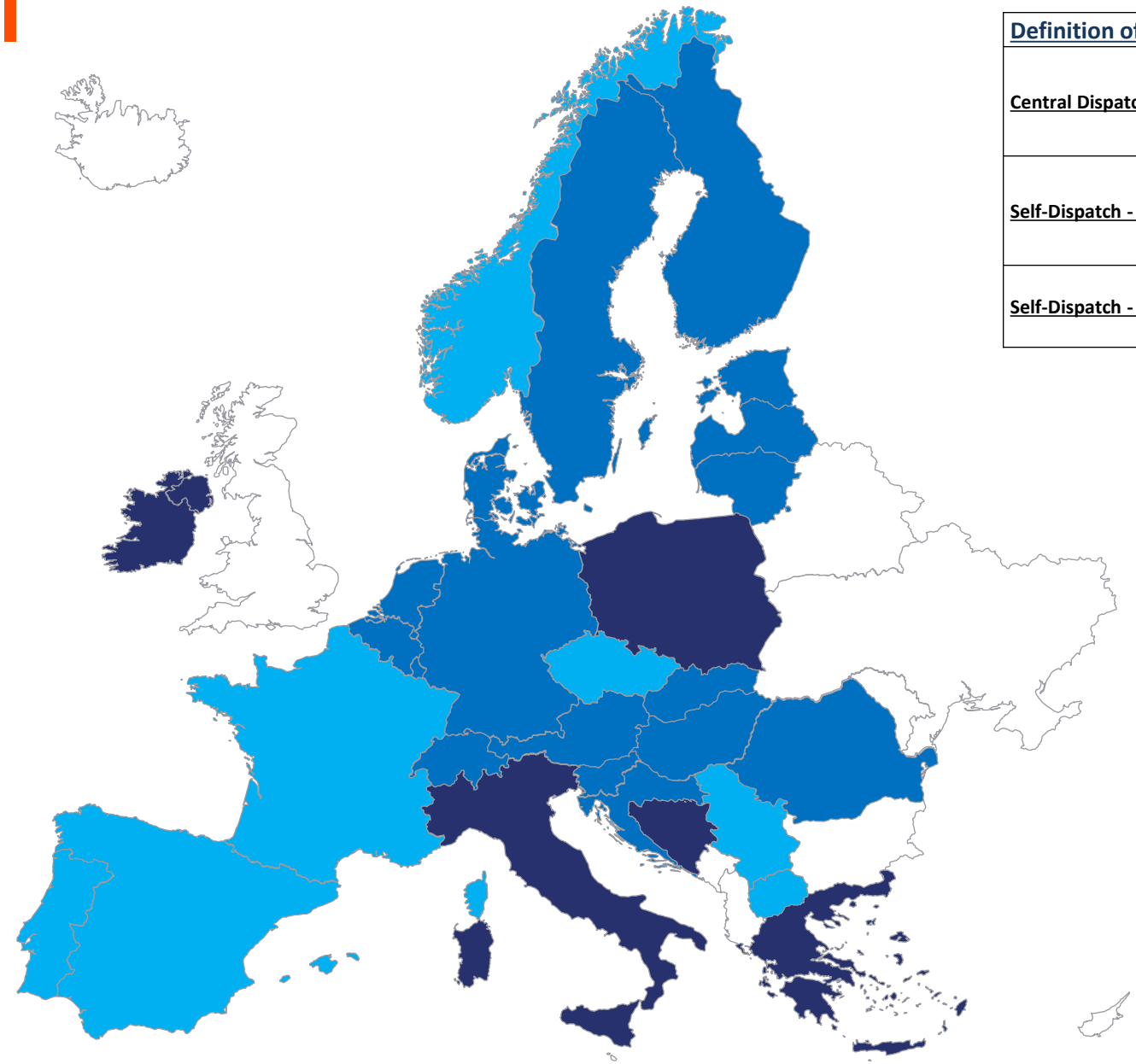
Caveats:

- 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. Therefore, in some specific cases, the position of a country in a certain group might be debatable.
- This is based on information updated in May 2022 and describes the mechanisms in place in 2021, 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?



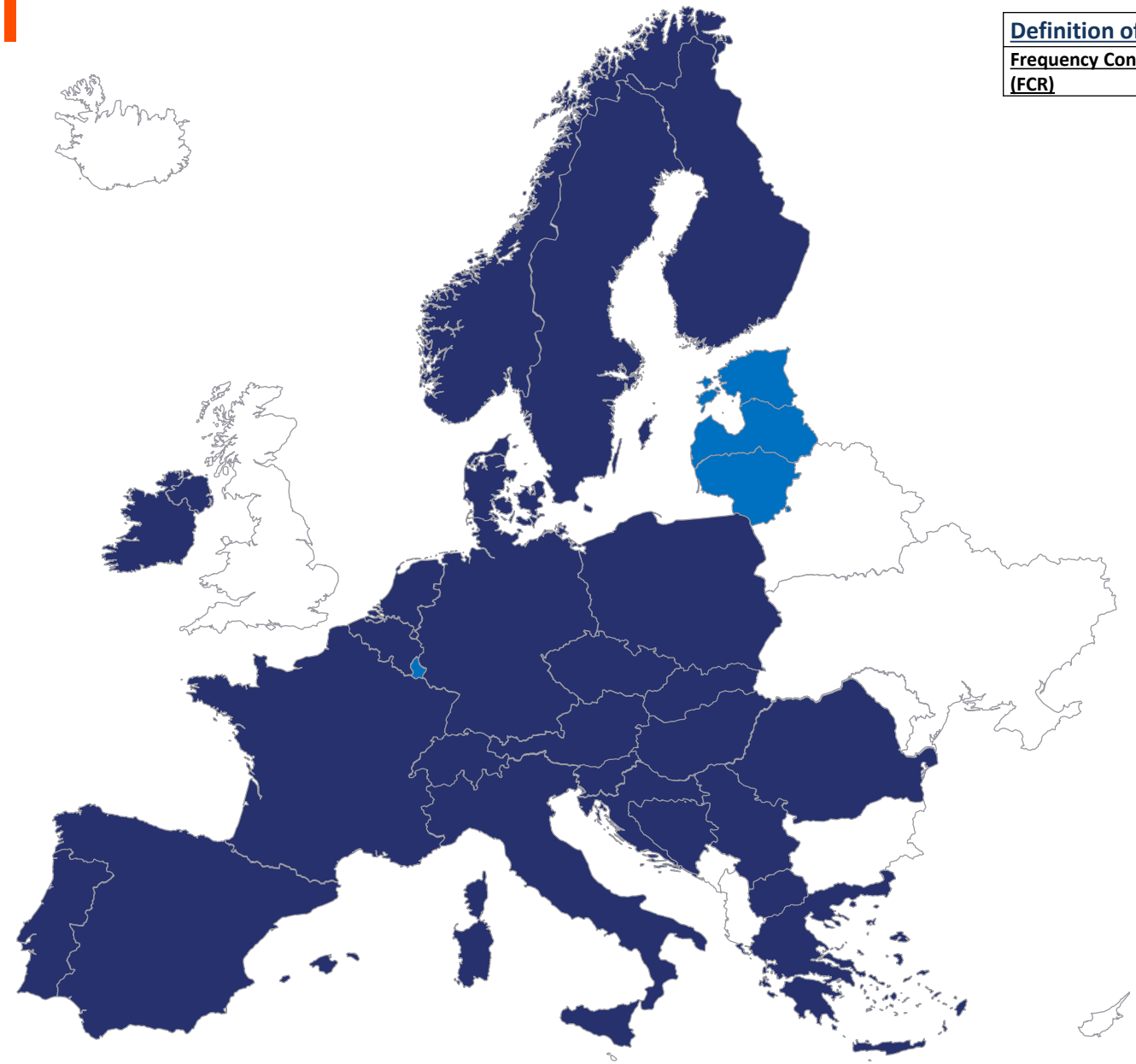
Definition of answer	
Central Dispatch	Central dispatch means a scheduling and dispatching model where the generation schedules and consumption schedules as well as dispatching of power generating facilities and demand facilities, in reference to dispatchable facilities, are determined by a TSO within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

Key:

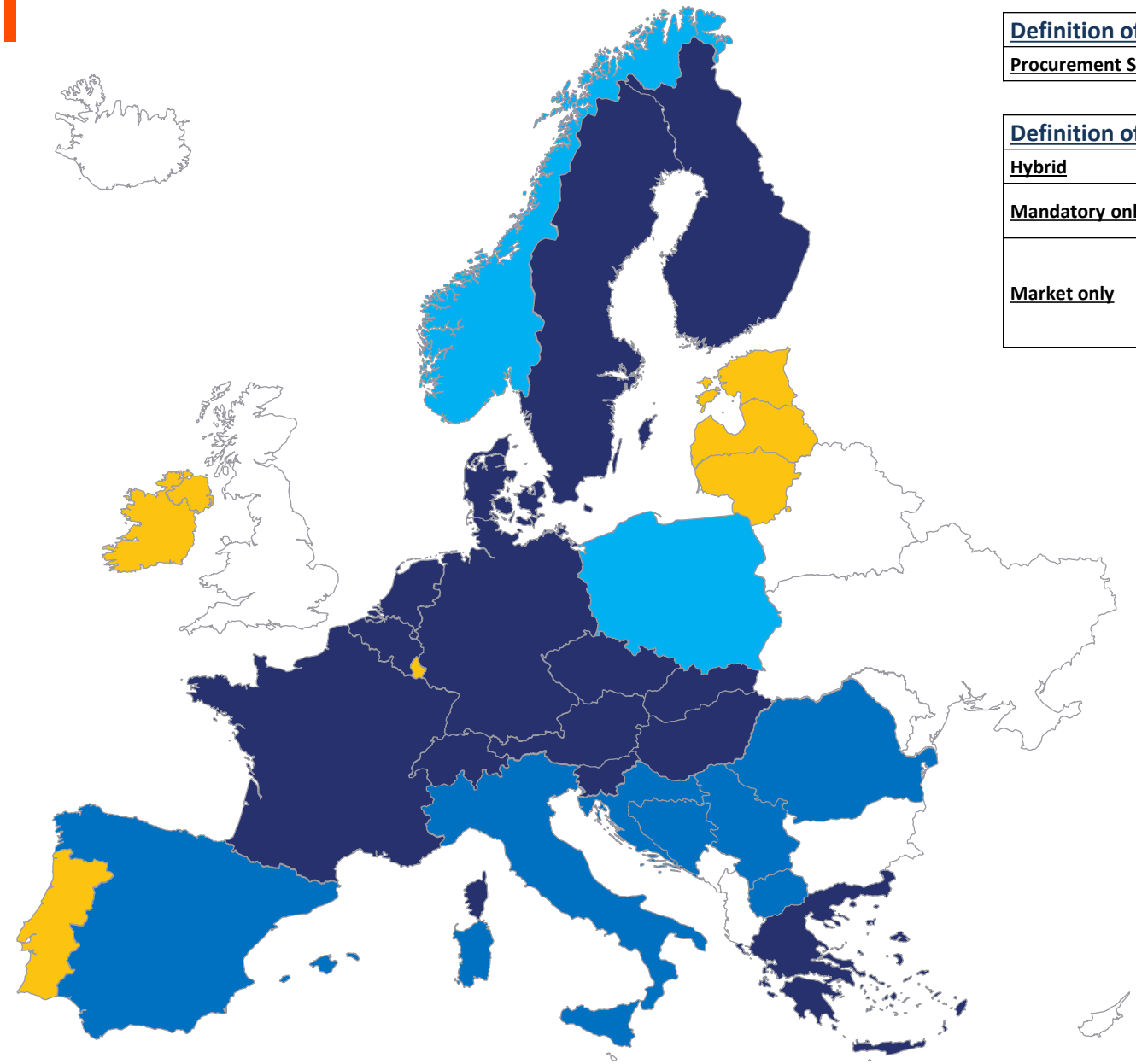
- Missing data
- N/A
- Central Dispatch
- Self-Dispatch – Portfolio Based
- Self-Dispatch – Unit Based

Using Frequency Containment Reserve?

Definition of question	
Frequency Containment Reserve (FCR)	Operating reserves activated for stabilizing System Frequency after an imbalance.



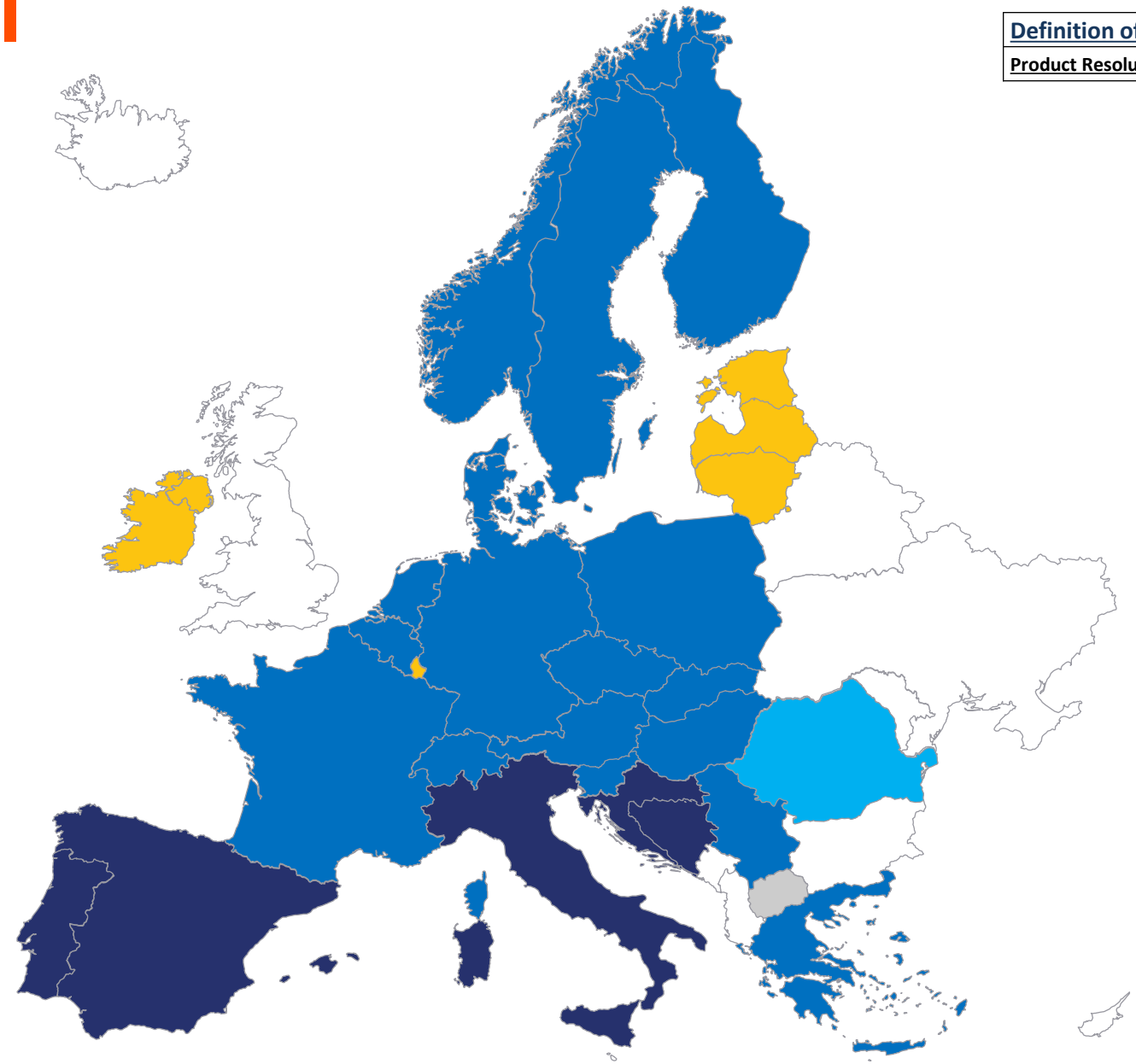
Frequency Containment Reserve – Capacity – Procurement Scheme



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

Definition of answer	
Hybrid	Combination of given options.
Mandatory only	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.
Market only	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.

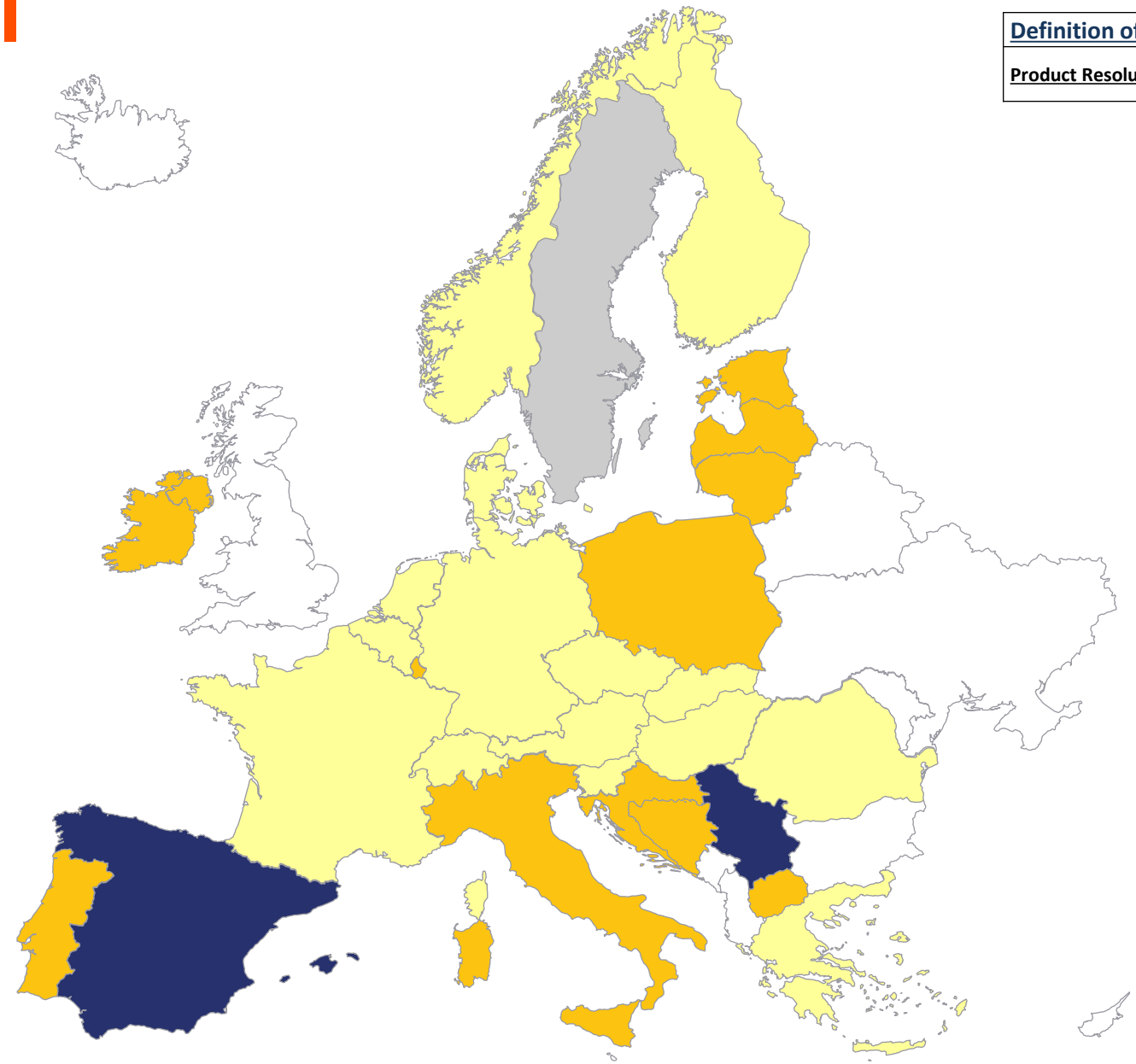
Frequency Containment Reserve – Capacity – Product Resolution (in MW)



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

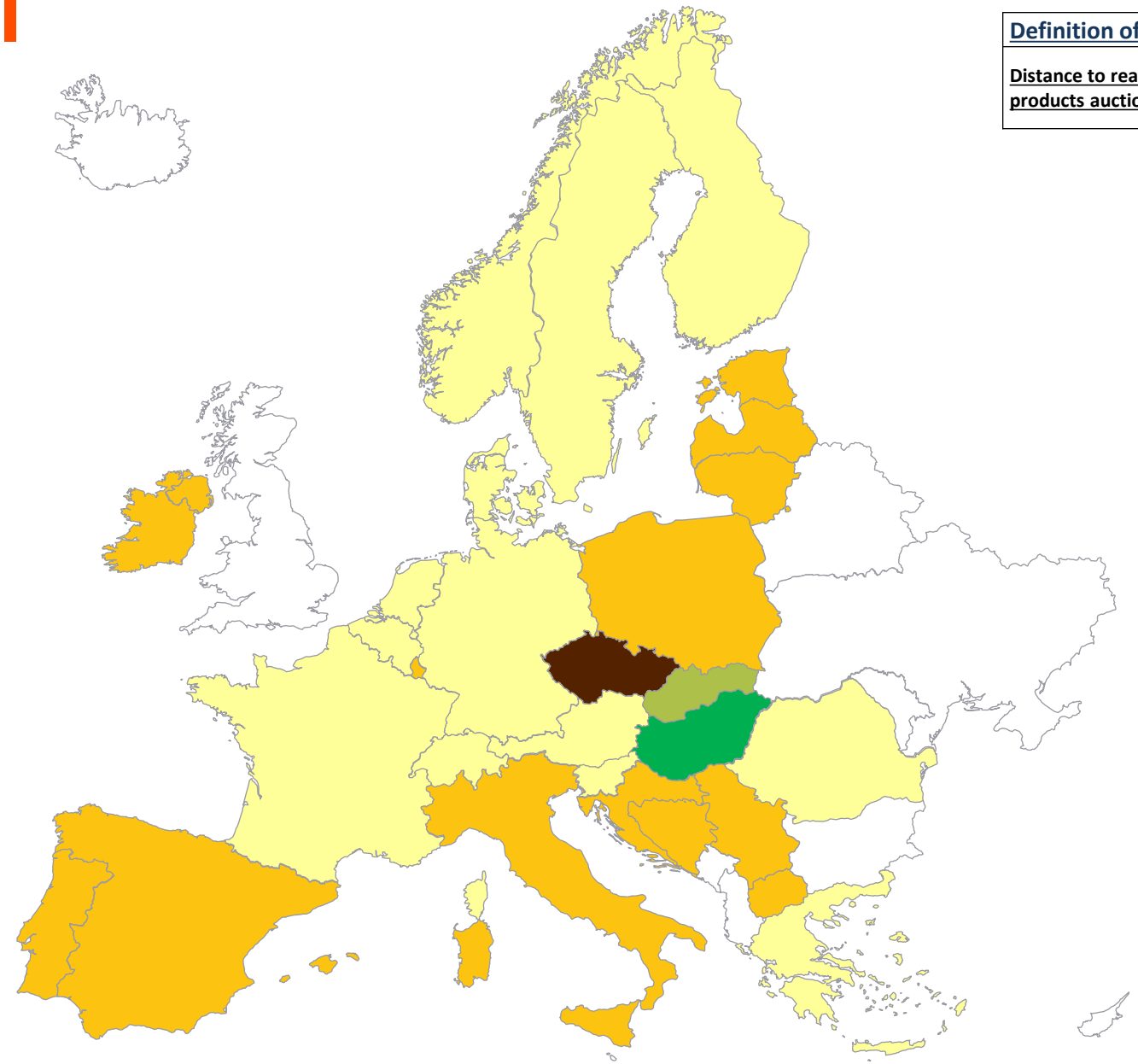
Frequency Containment Reserve – Capacity – Product Resolution (in time)

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).



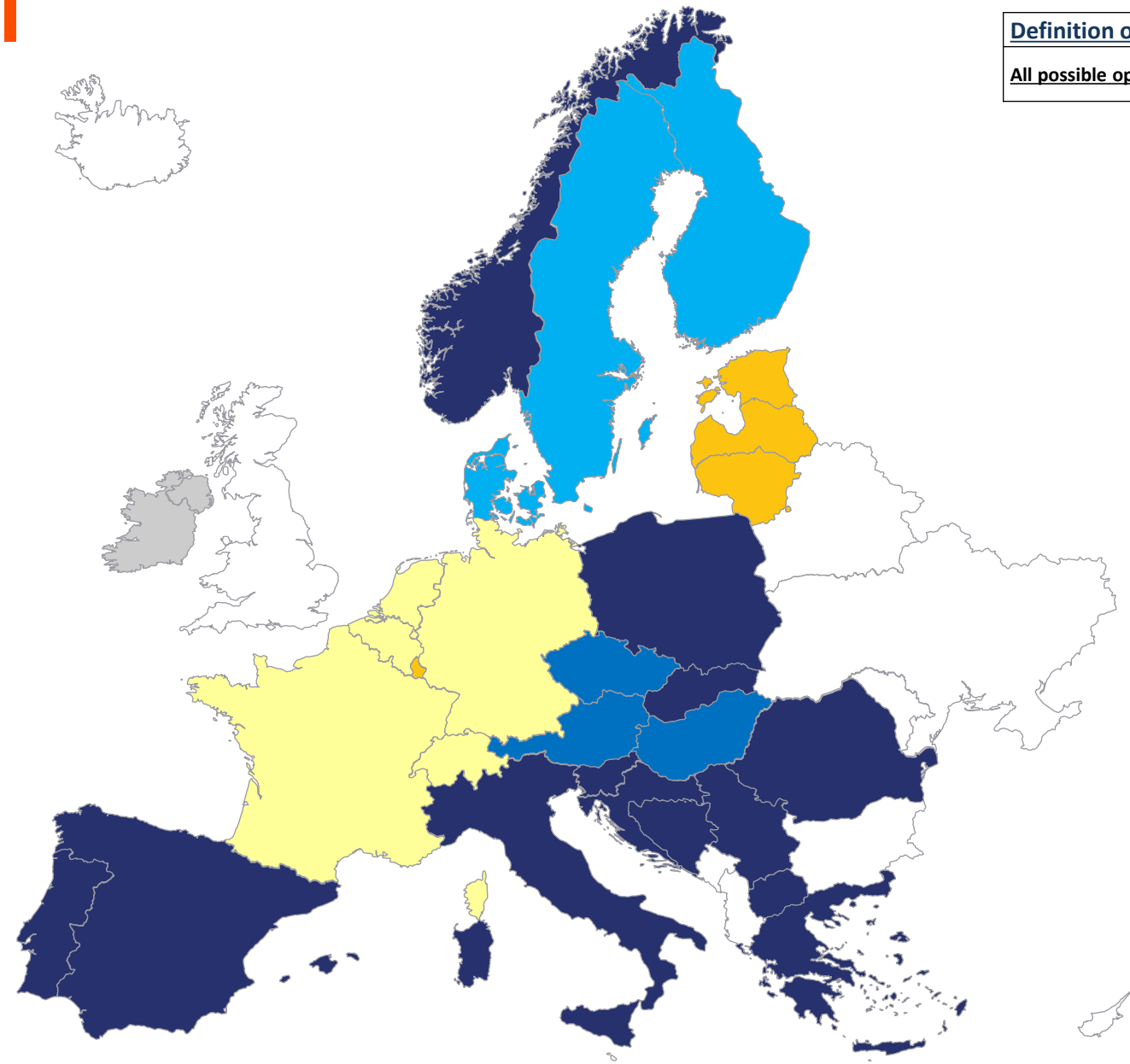
Frequency Containment Reserve – Capacity – Distance to real time of reserve products auctions

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).



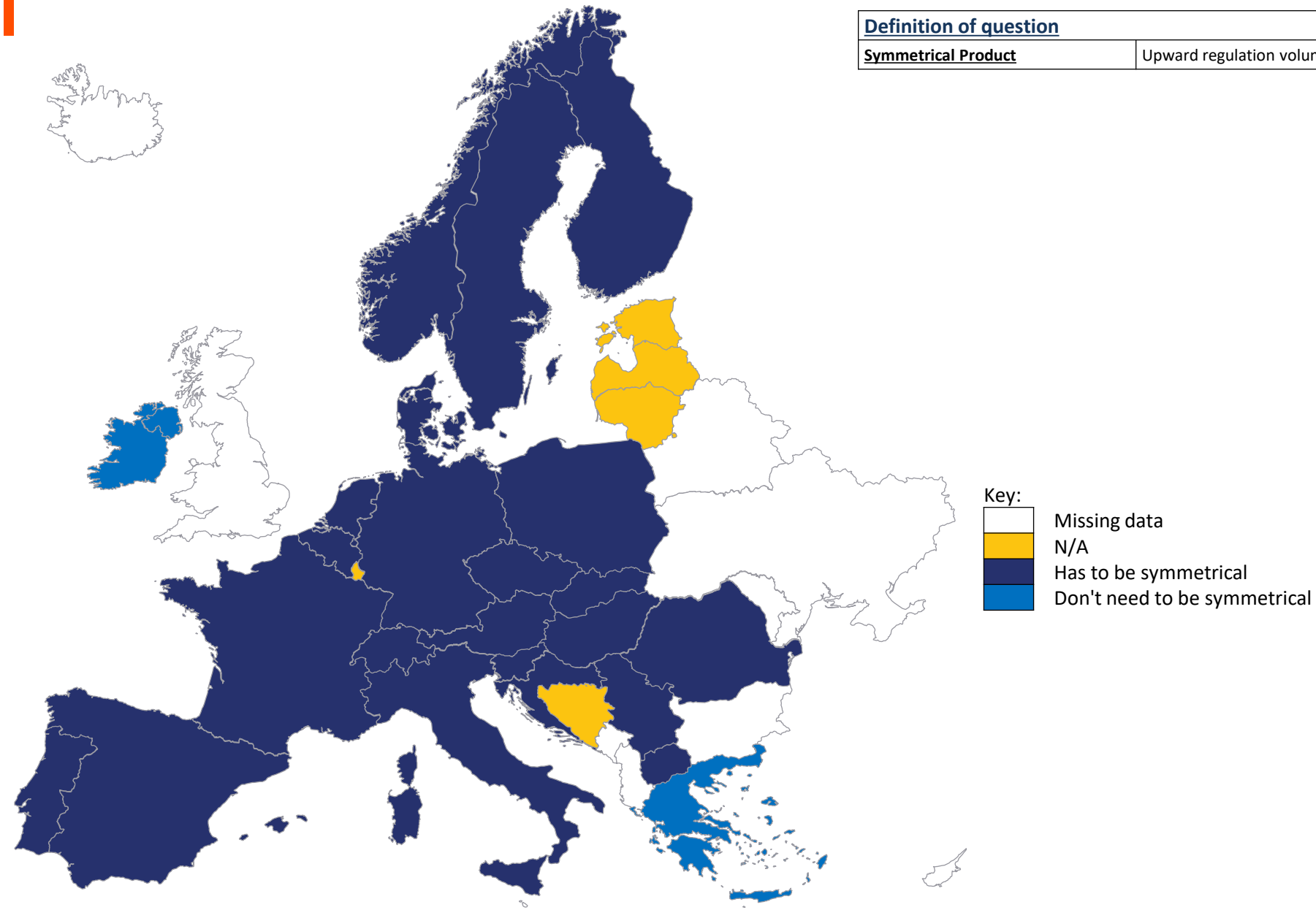
Frequency Containment Reserve – Capacity – Provider

Definition of answer	
All possible options	In this case all possible provider types were chosen (Generator + Demand-side response + Pump Storage + Batteries + Distributed generation)

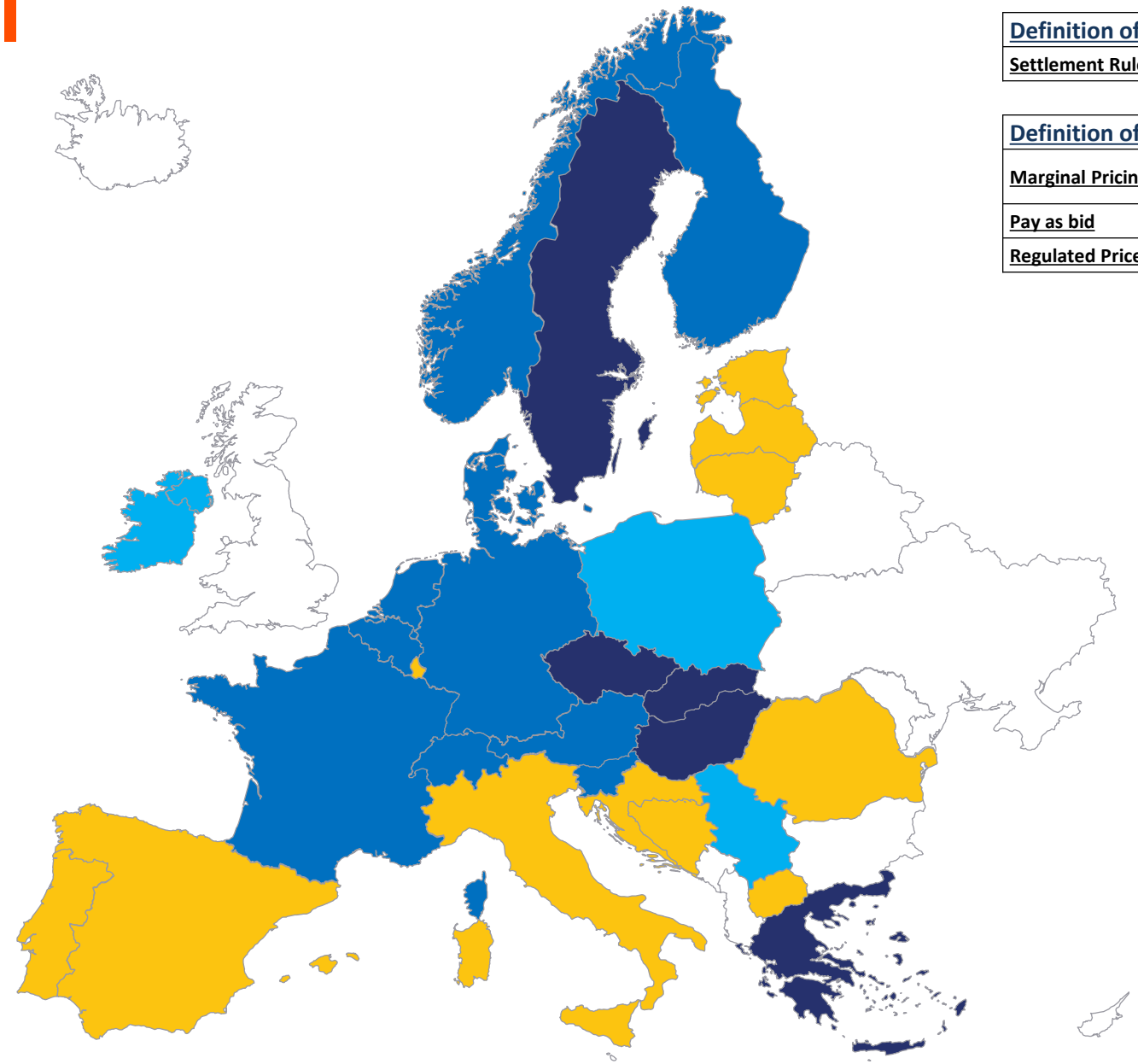


Frequency Containment Reserve – Capacity – Symmetrical Product

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



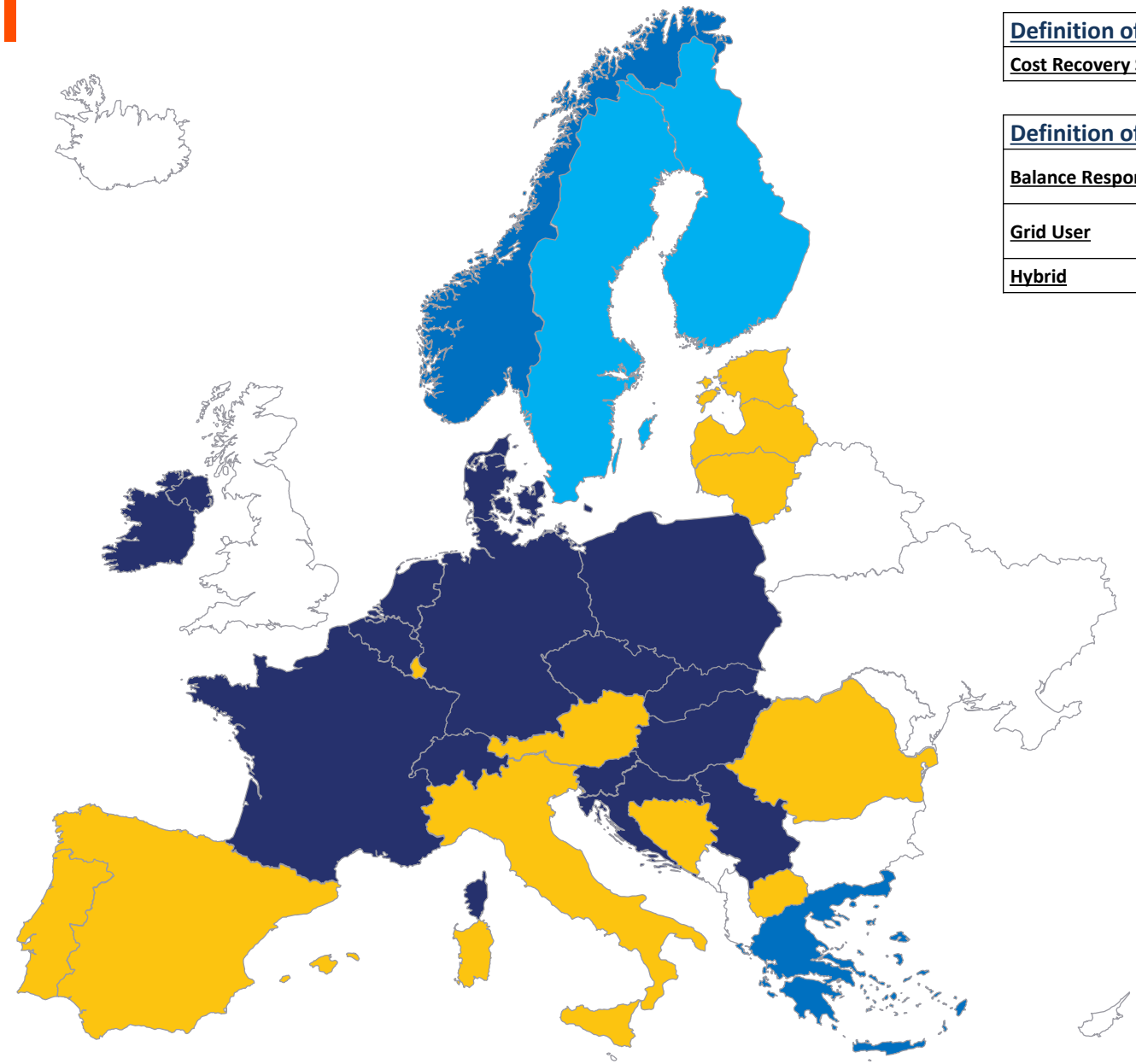
Frequency Containment Reserve – Capacity – Settlement Rule



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.

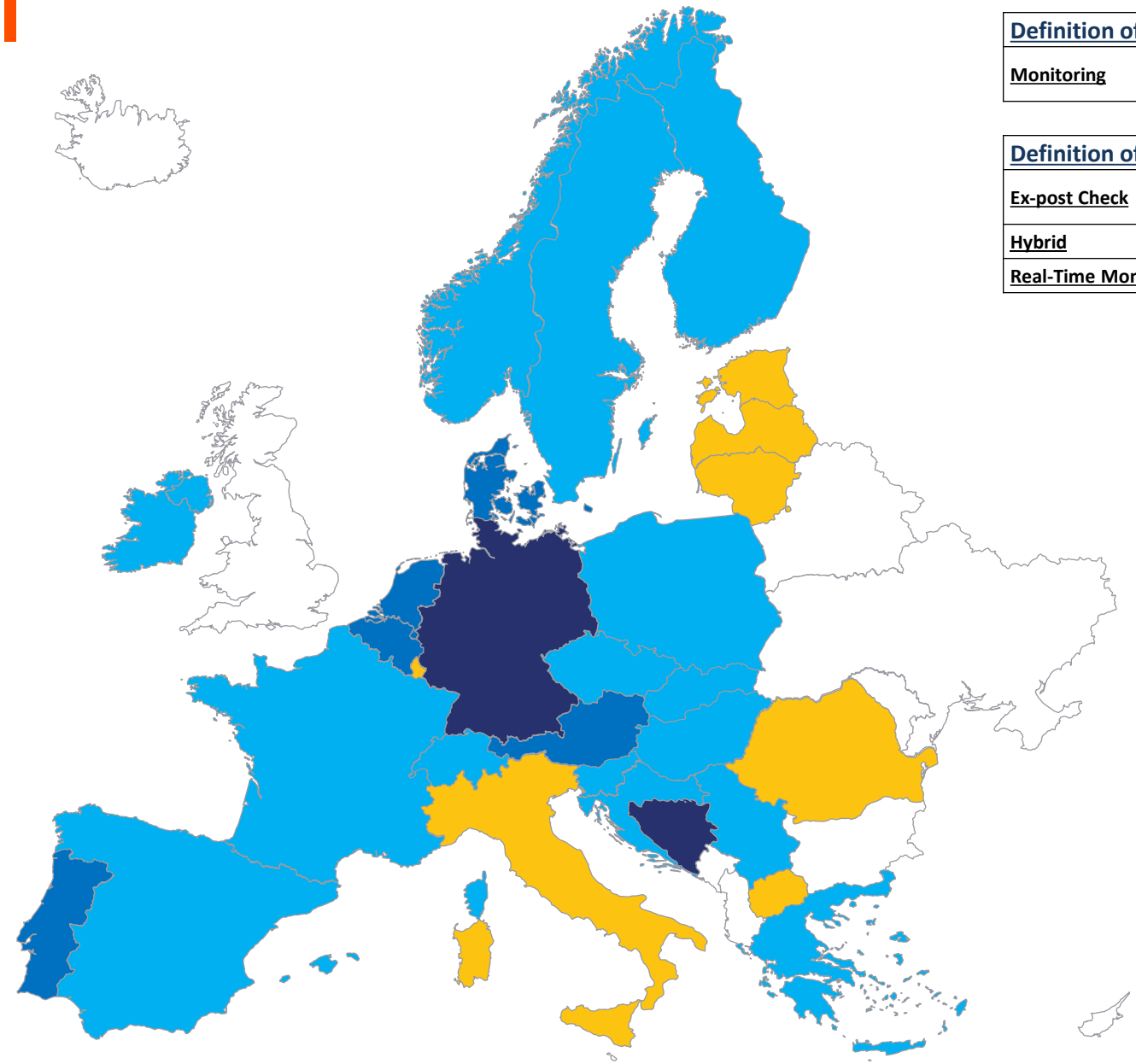
Frequency Containment Reserve – Capacity – Cost Recovery Scheme



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 of given options.

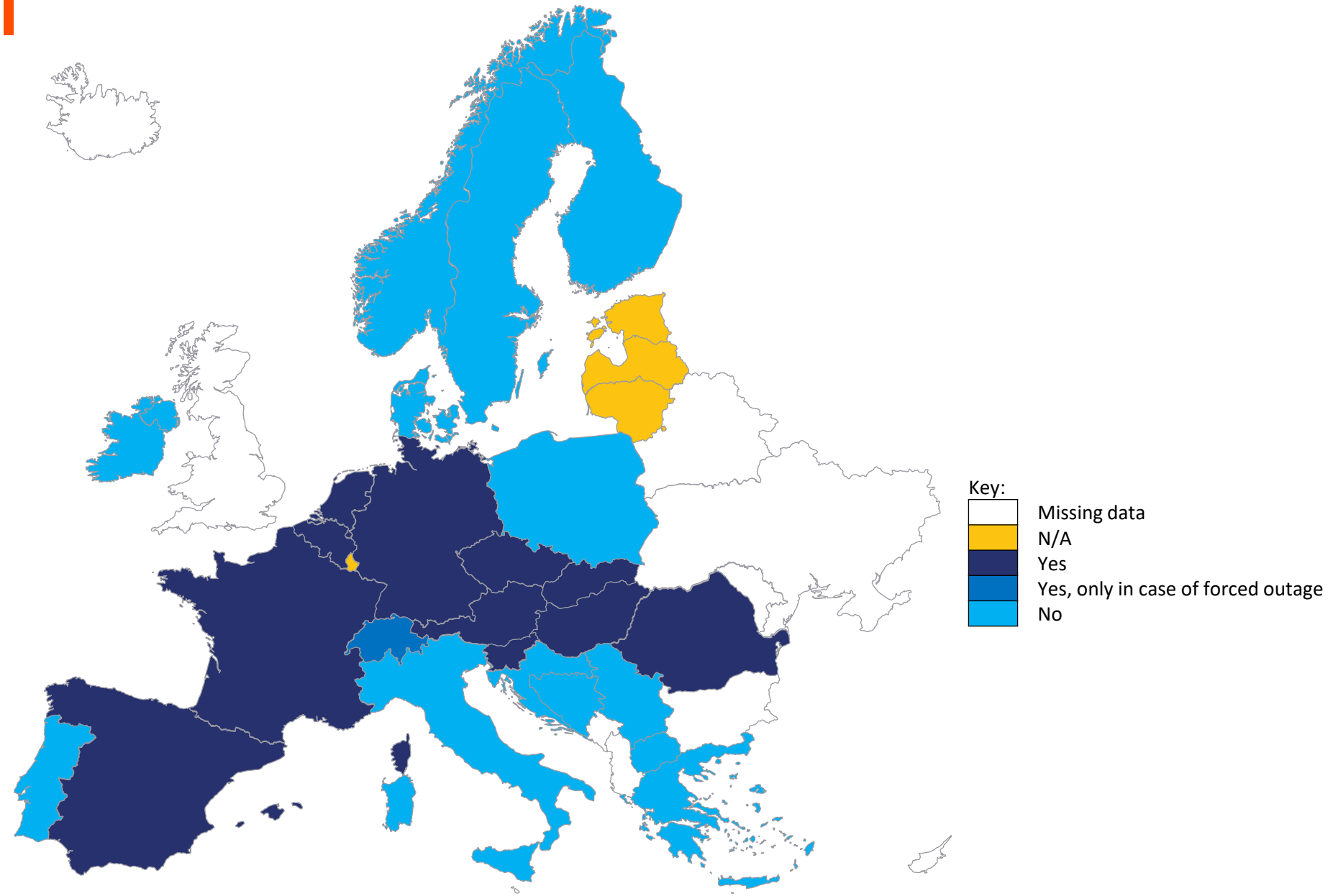
Frequency Containment Reserve – Capacity – Monitoring



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

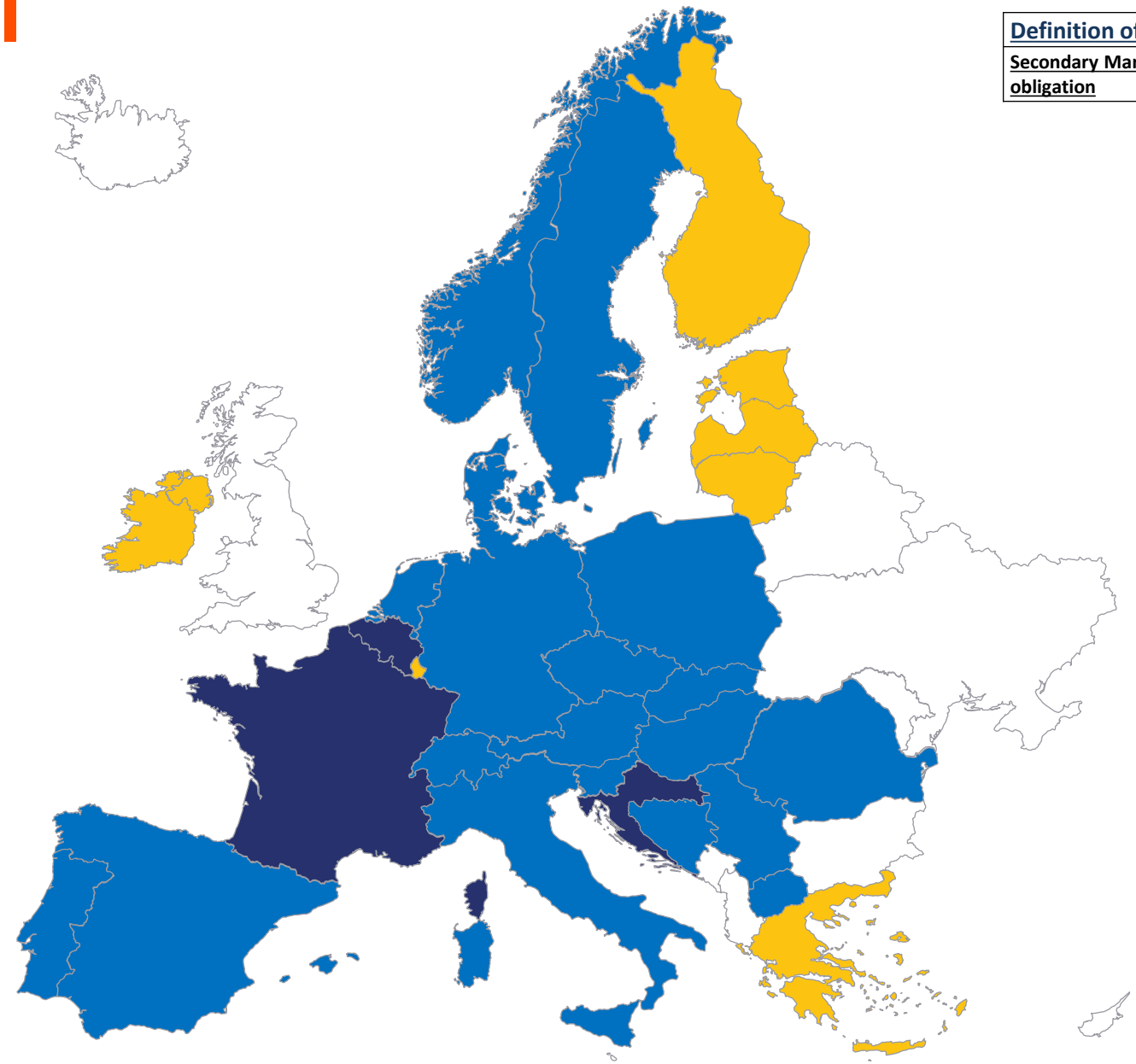
Definition of answer	
Ex-post Check	When the monitoring of performance of plant carried out 24 hours after the delivery period.
Hybrid	Combination of given options.
Real-Time Monitoring	Monitoring of delivery of ancillary services in real time.

Frequency Containment Reserve – Capacity – Transfer of BSPs obligation allowed

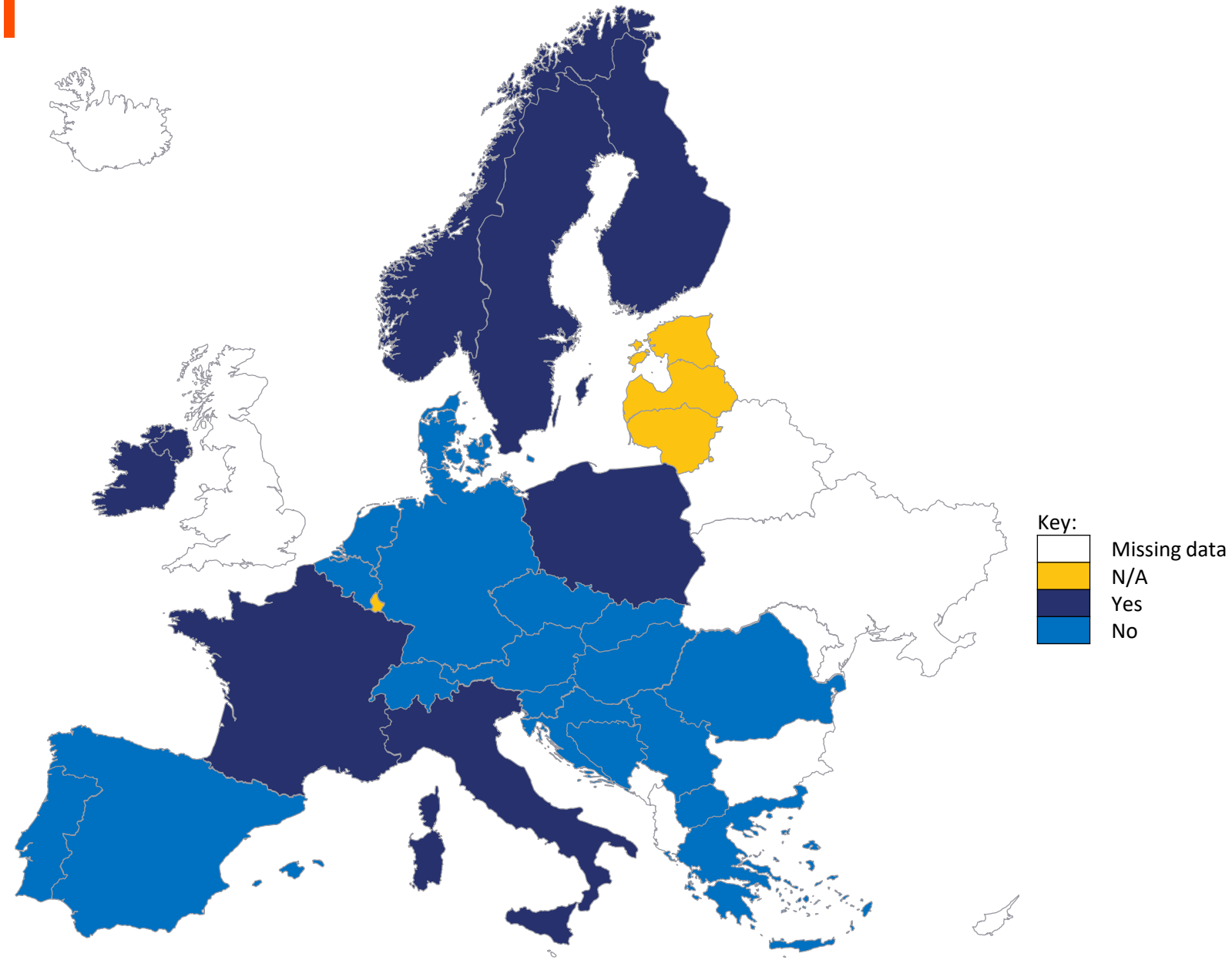


Frequency Containment Reserve – Capacity – In case transfer obligation is allowed, is there an organised secondary market?

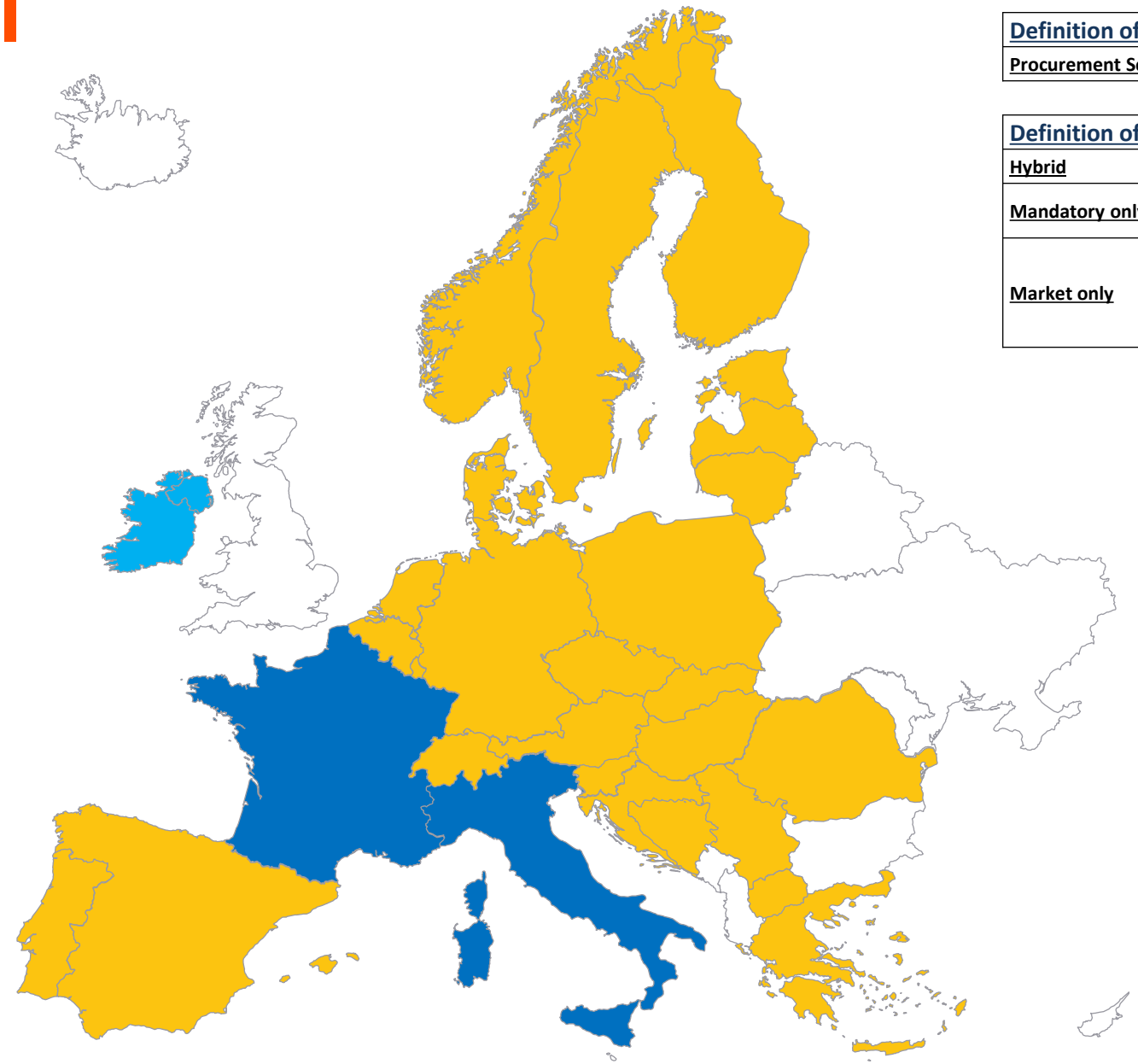
Definition of answer	
Secondary Market for reserve obligation	Trading procedure between the BSPs (where at least one BSP has contract with the TSO) to ensure the prescribed reserve amount of the TSO.



Frequency Containment Reserve – Energy – Is balancing energy settled?



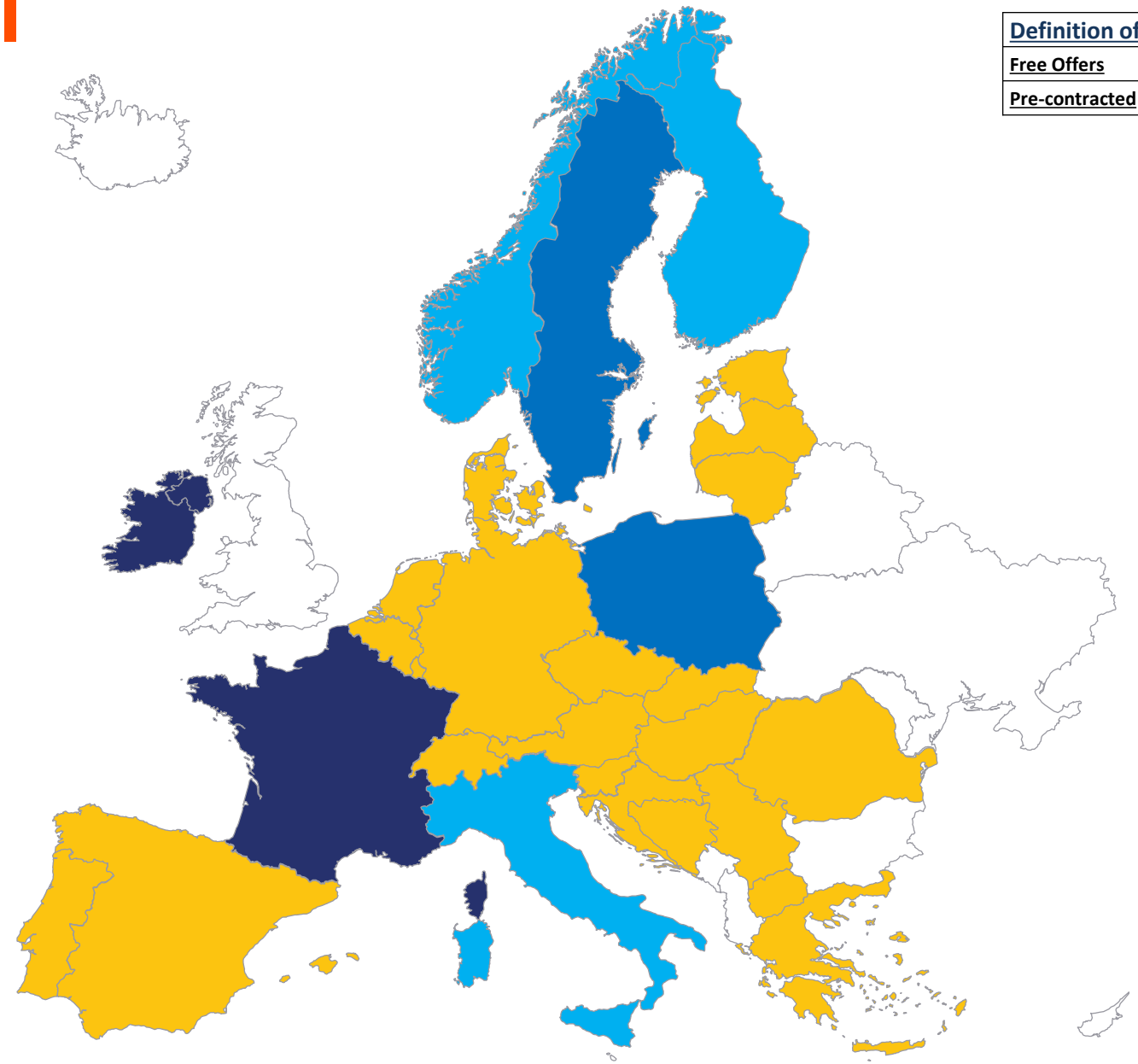
Frequency Containment Reserve – Energy – Procurement Scheme



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

Definition of answer	
Hybrid	Combination of given options.
Mandatory only	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.
Market only	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.

Frequency Containment Reserve – Energy – Free Bids allowed



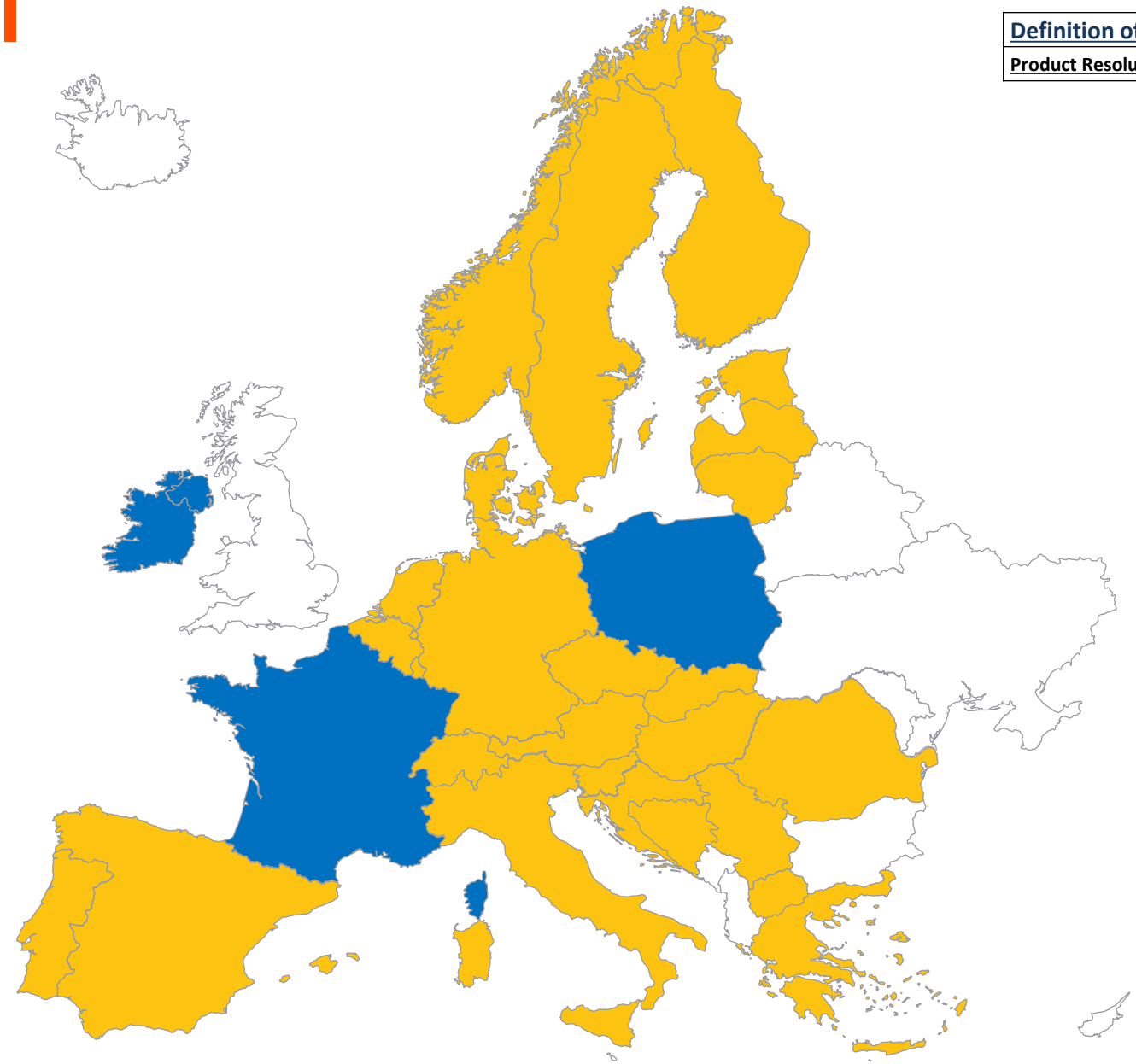
Definition of question	
Free Offers	Possibility to offer balancing energy bids without a contract for Balancing Capacity
Pre-contracted	BSP has sold/procured Balancing Capacity to TSO.

Key:

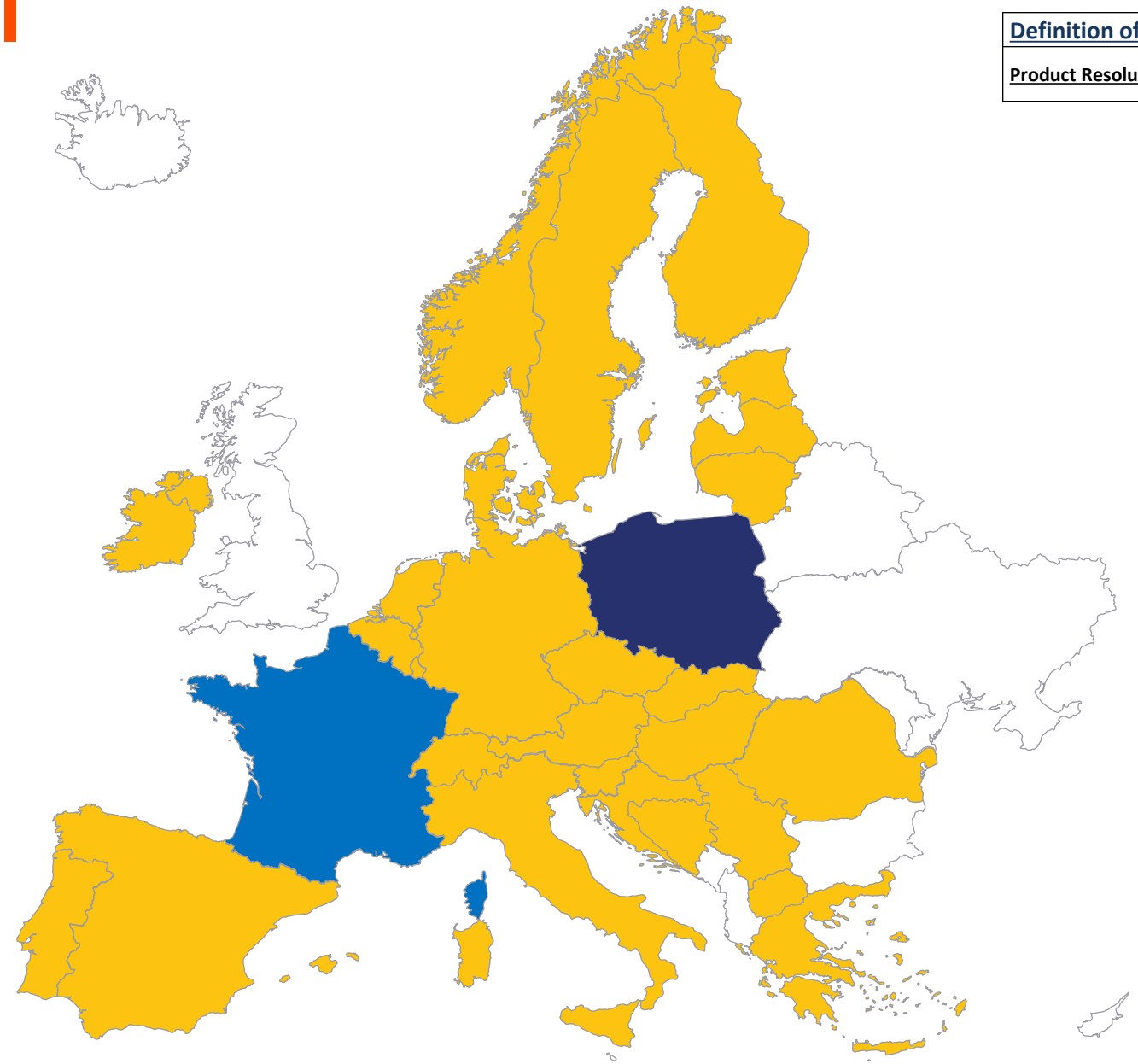
- Missing data
- N/A
- Yes
- No
- No, there is no FCR balancing energy market

Frequency Containment Reserve – Energy – Product Resolution (in MW)

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



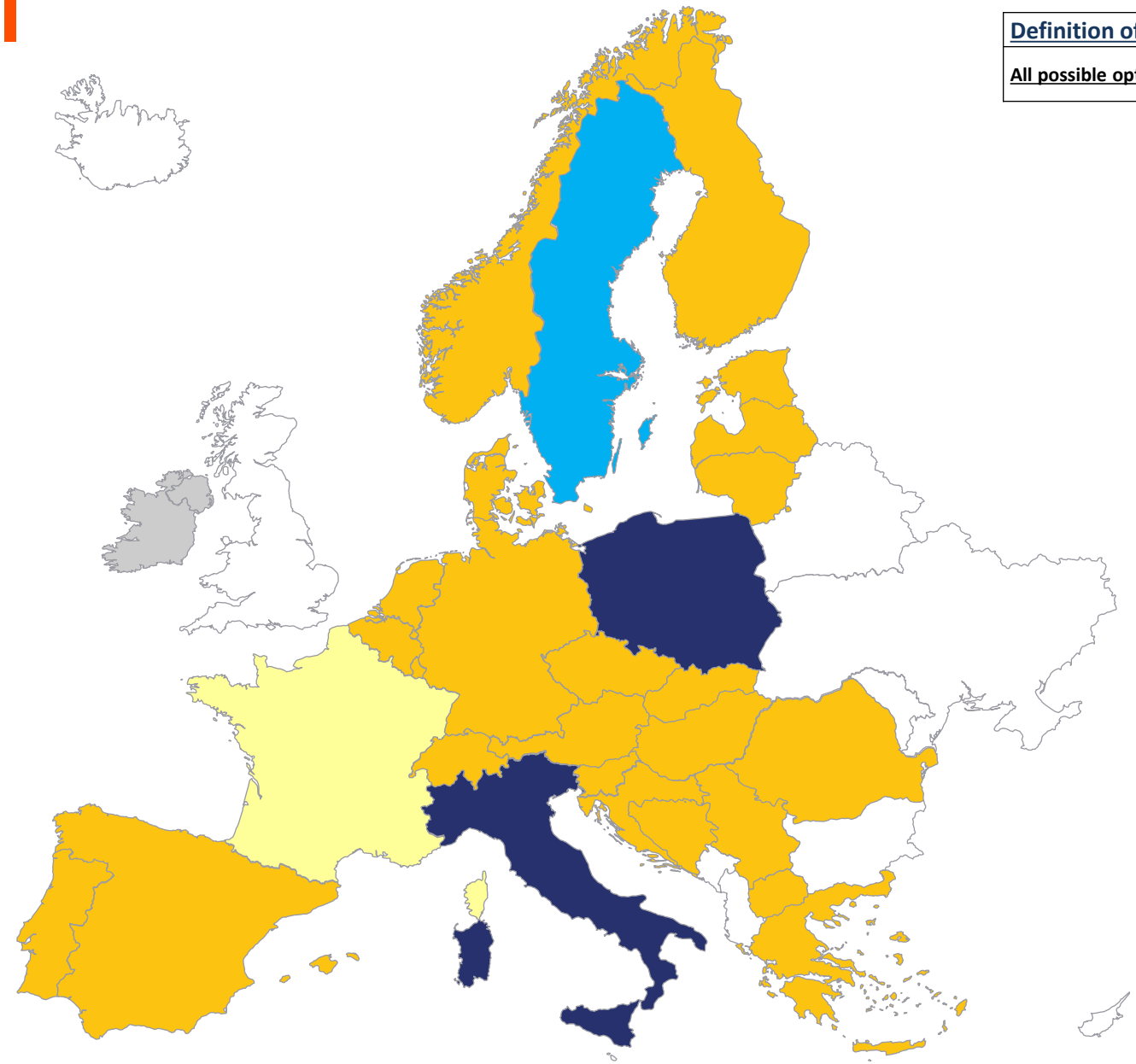
Frequency Containment Reserve – Energy – Product Resolution (in time)



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 Containment Reserve – Energy – Provider

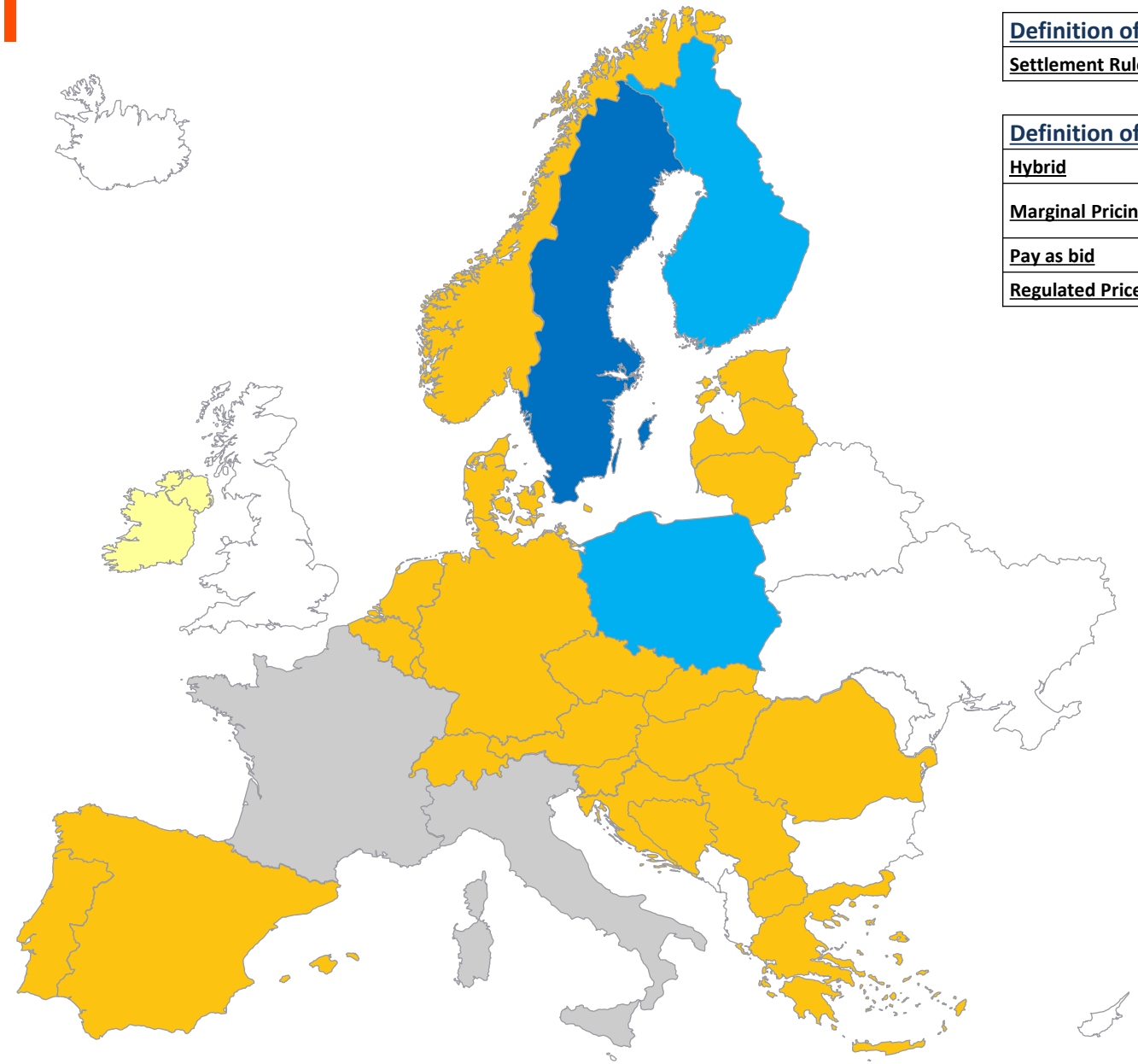
Definition of answer	
All possible options	In this case all possible provider types were chosen (Generator + Demand-side response + Pump Storage + Batteries + Distributed generation)



Key:

- Missing data
- N/A
- Generators Only
- Generators + Batteries
- Generators + Demand-side response + Batteries
- Generators + Demand-side response + Pump Storage + Batteries
- All possible options

Frequency Containment Reserve – Energy – Settlement Rule



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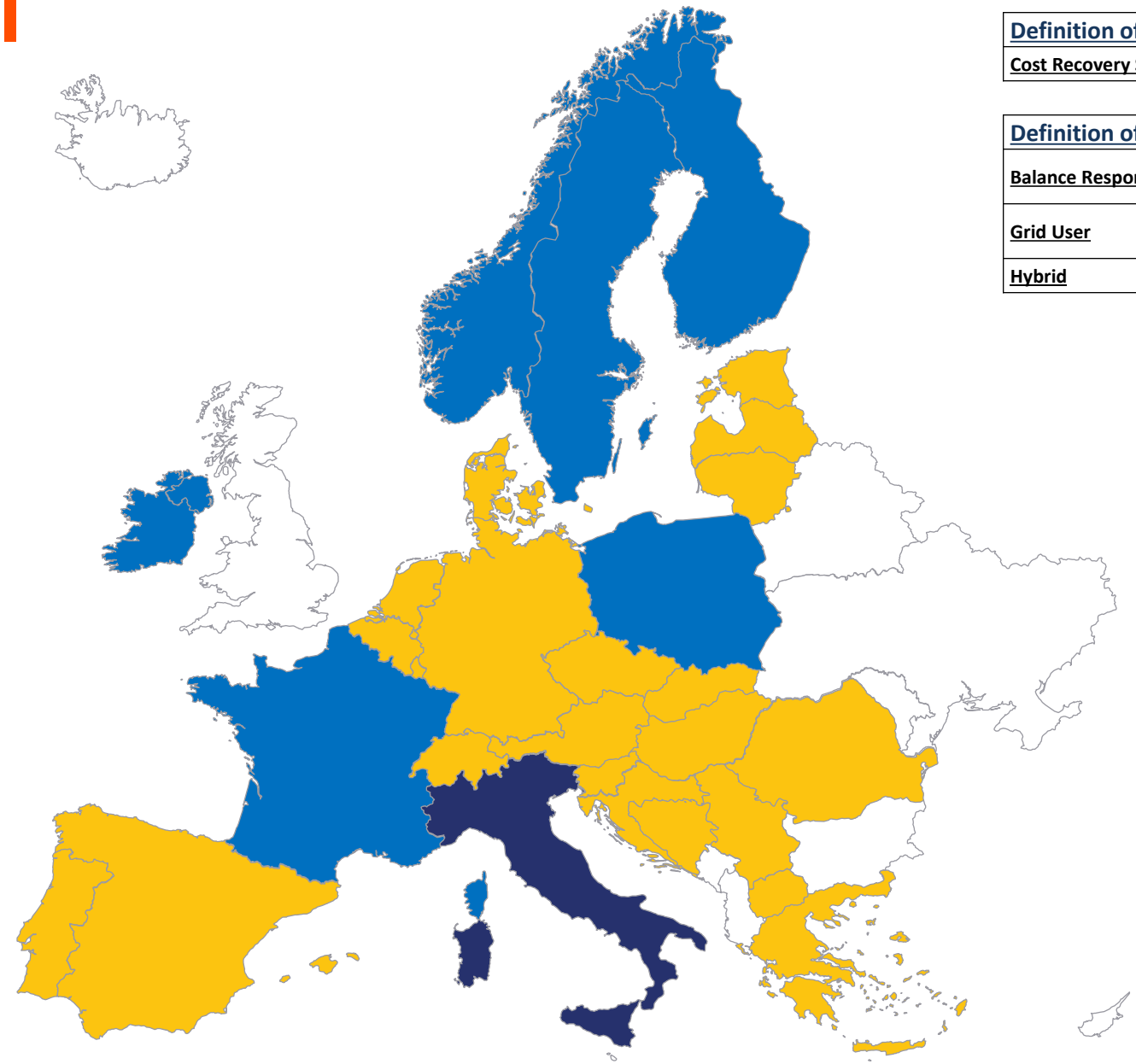
Frequency Containment Reserve – Energy – Cost Recovery Scheme



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Cost Recovery Scheme	From who are the costs recovered.

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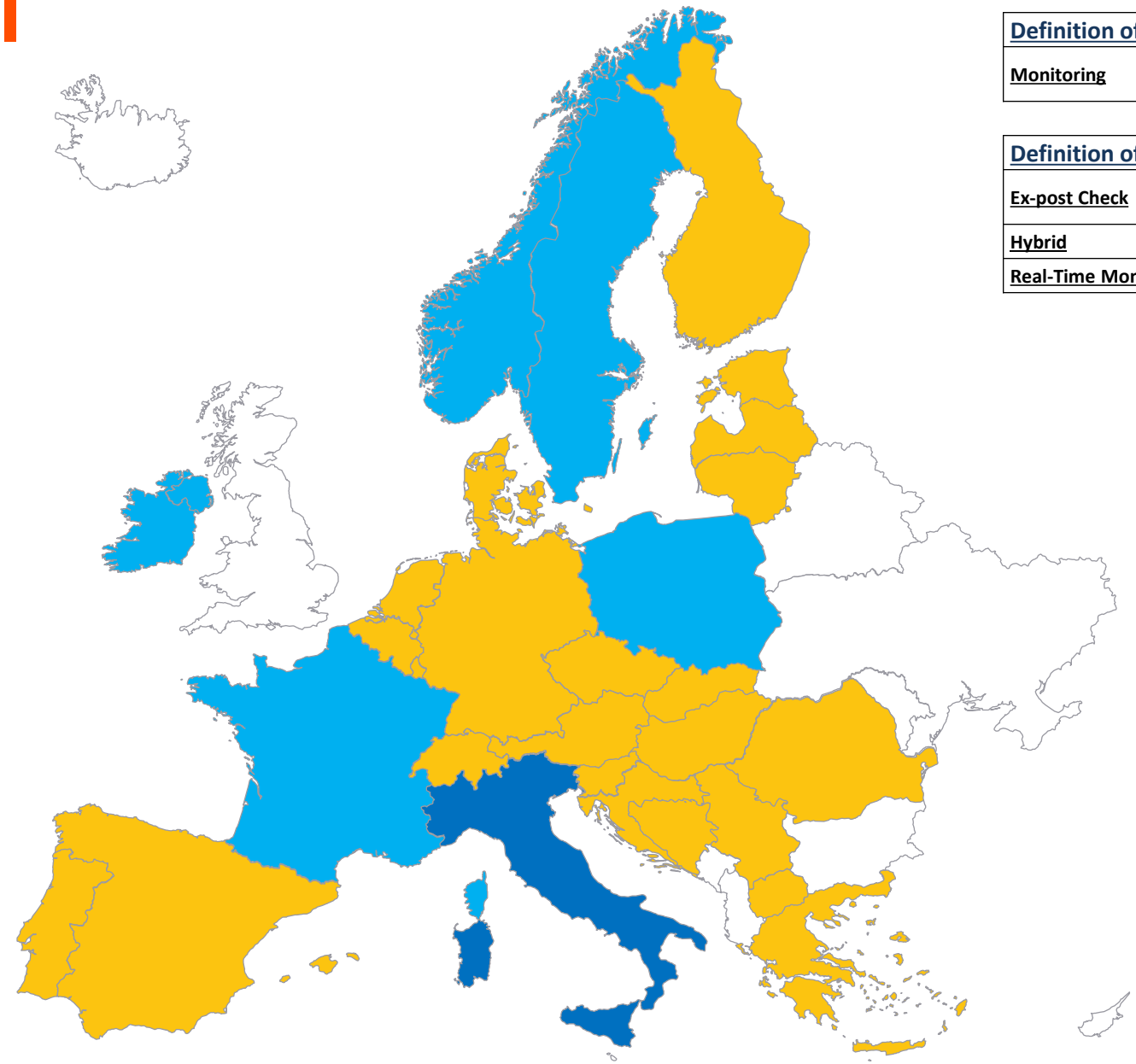
Frequency Containment Reserve – Energy – Monitoring



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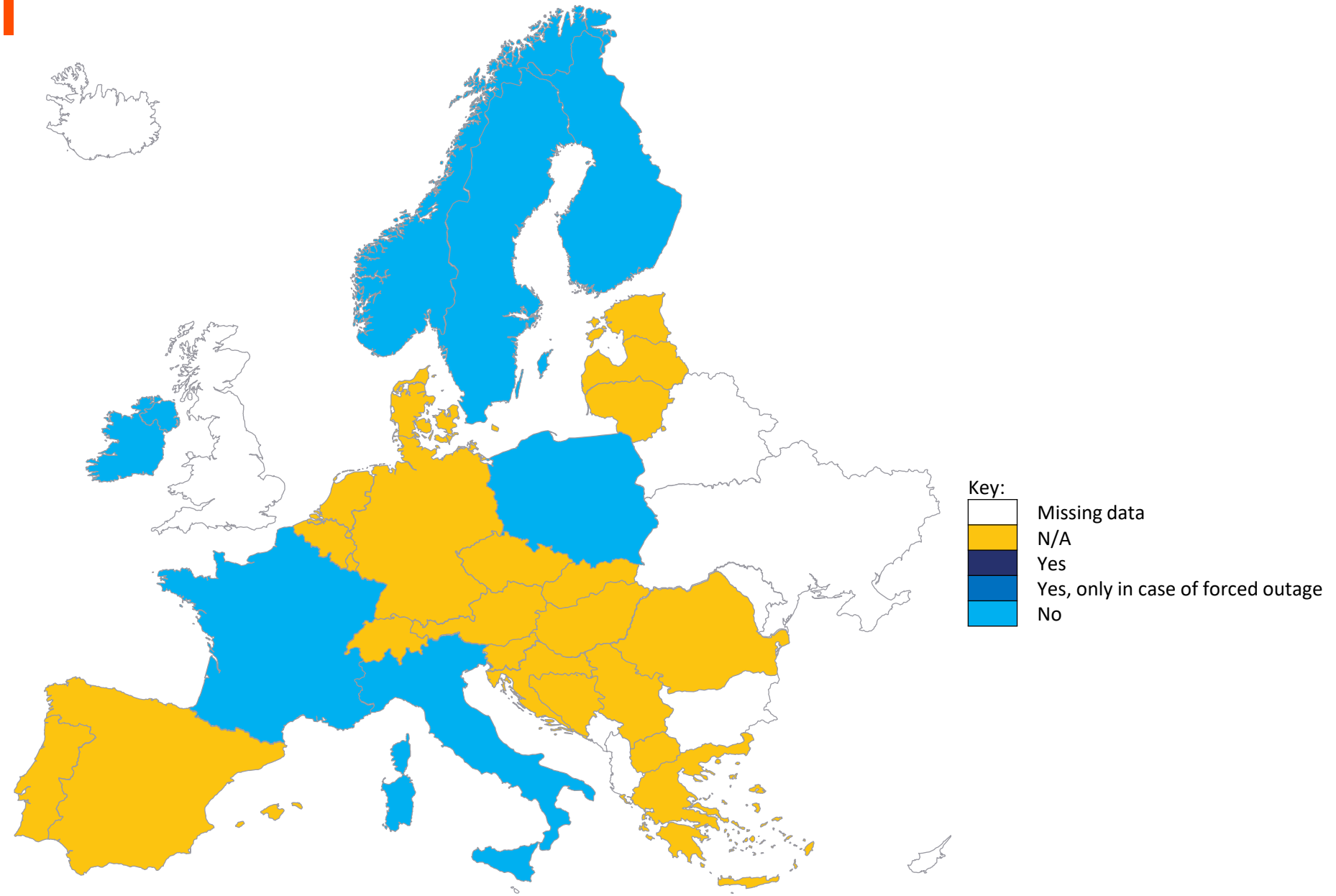
Frequency Containment Reserve – Energy – Transfer of BSPs obligation allowed



Frequency Containment Reserve – Energy – In case transfer obligation is allowed, is there an organised secondary market?

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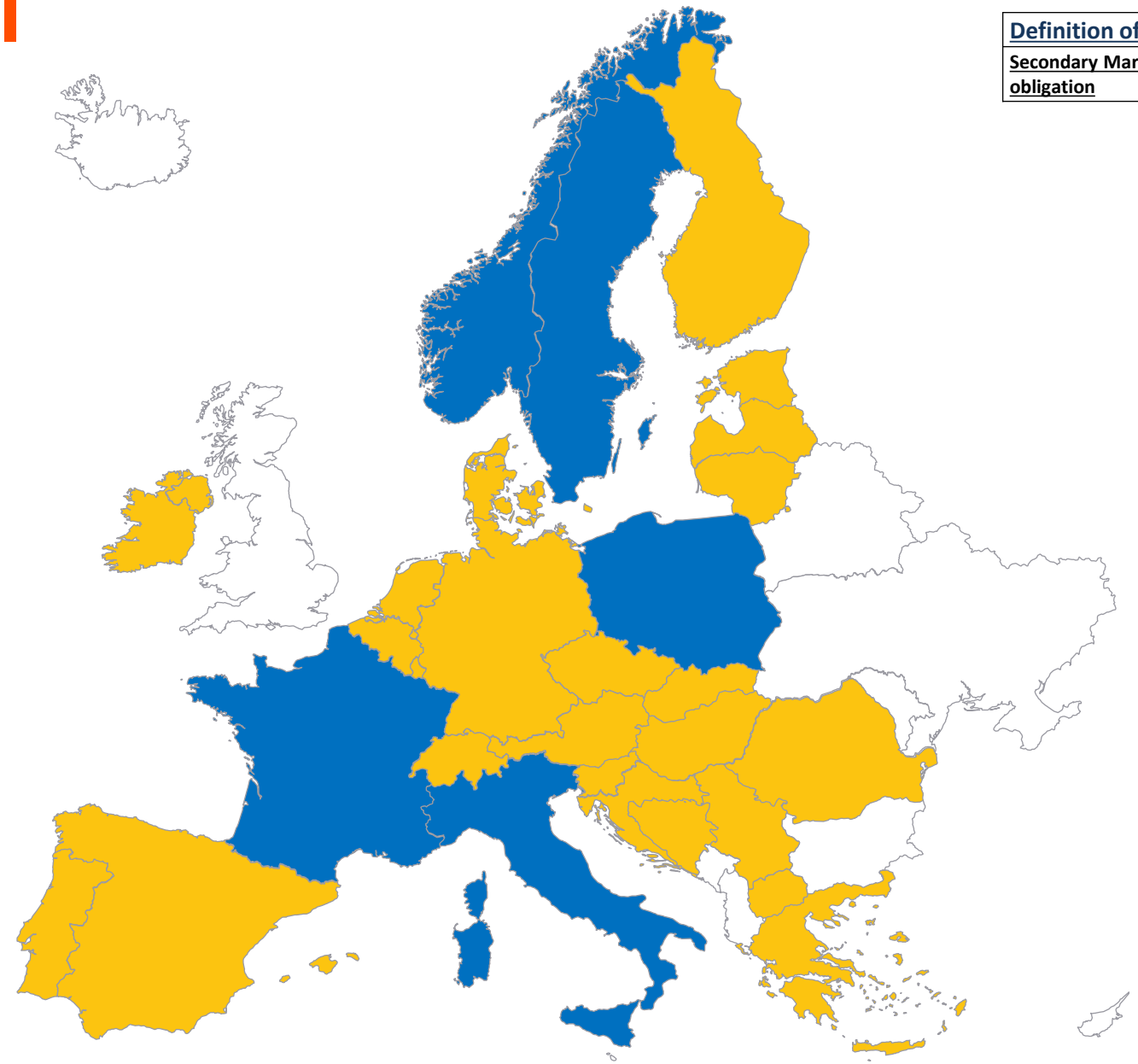
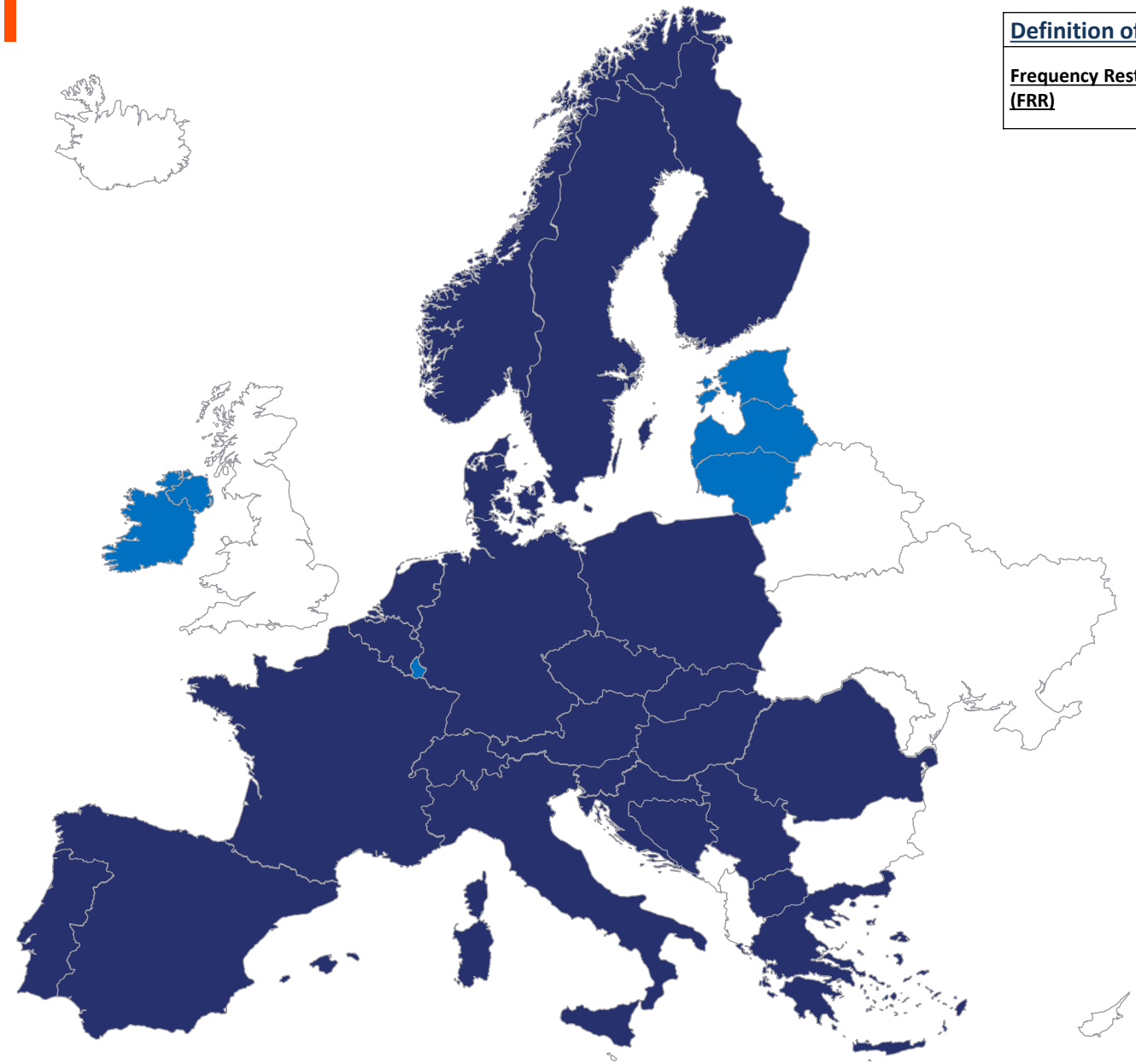
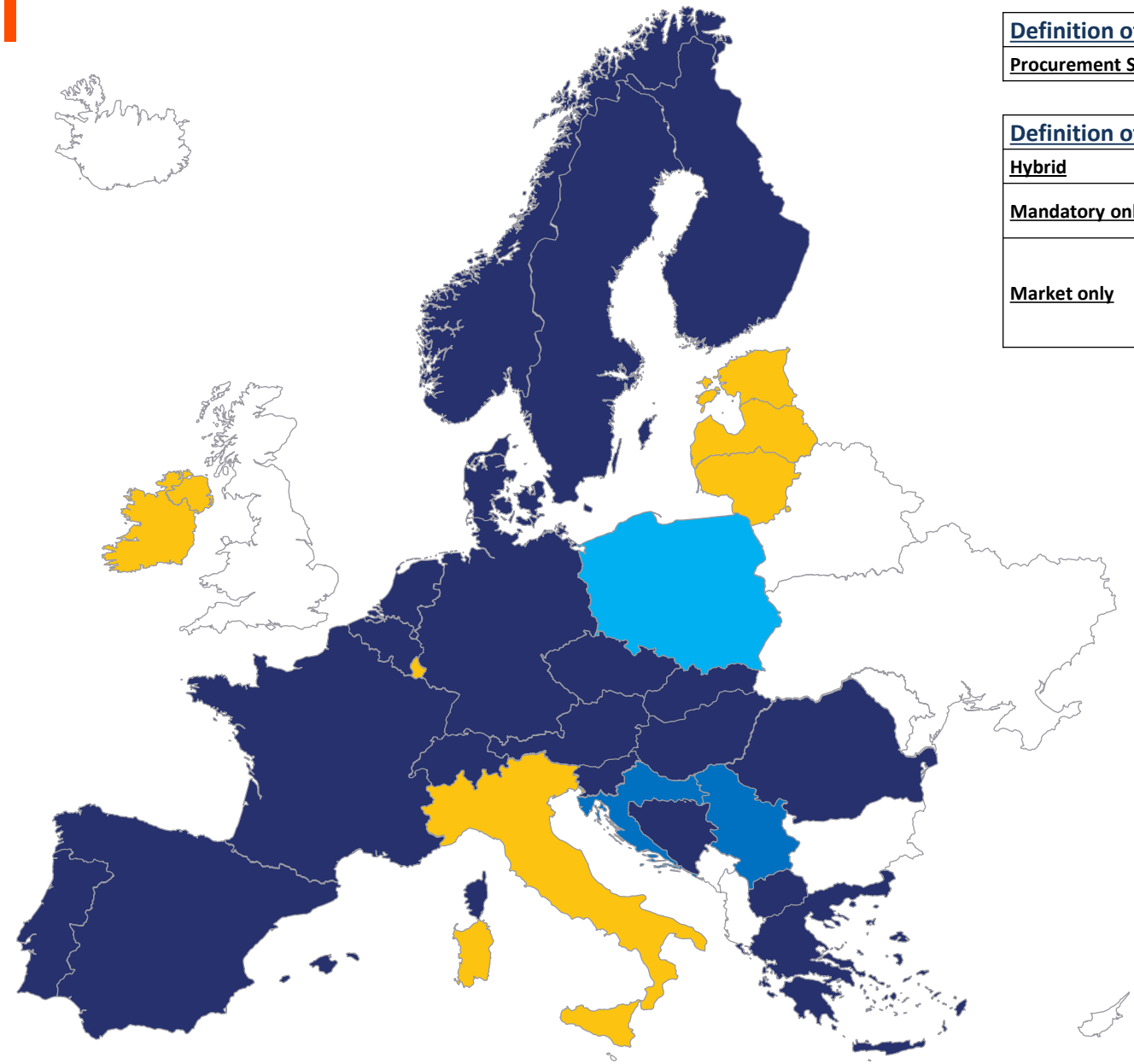


Using Frequency Restoration Reserve (Automatic)?



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.

Frequency Restoration Reserve (Automatic) – Capacity – Procurement Scheme



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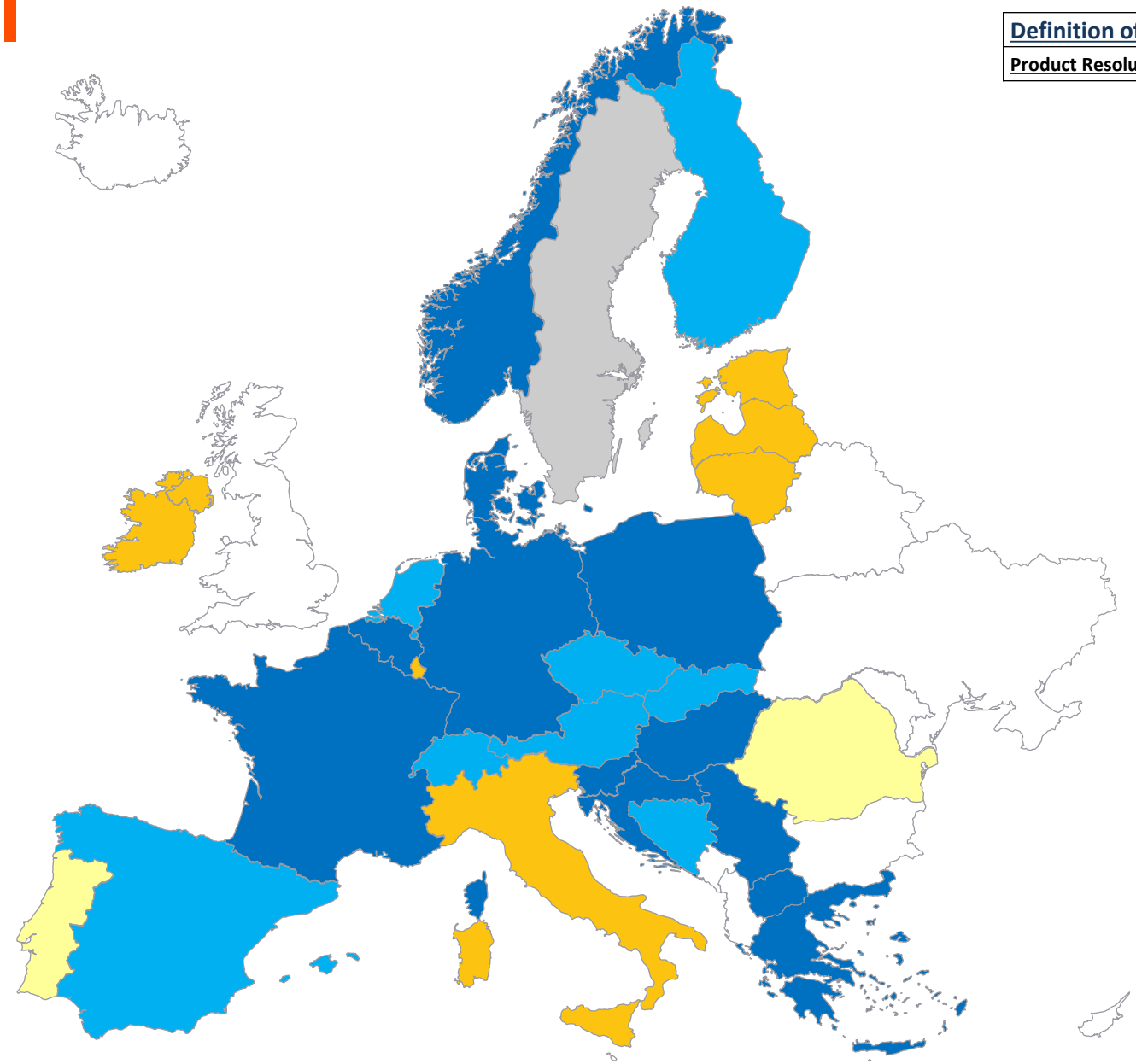
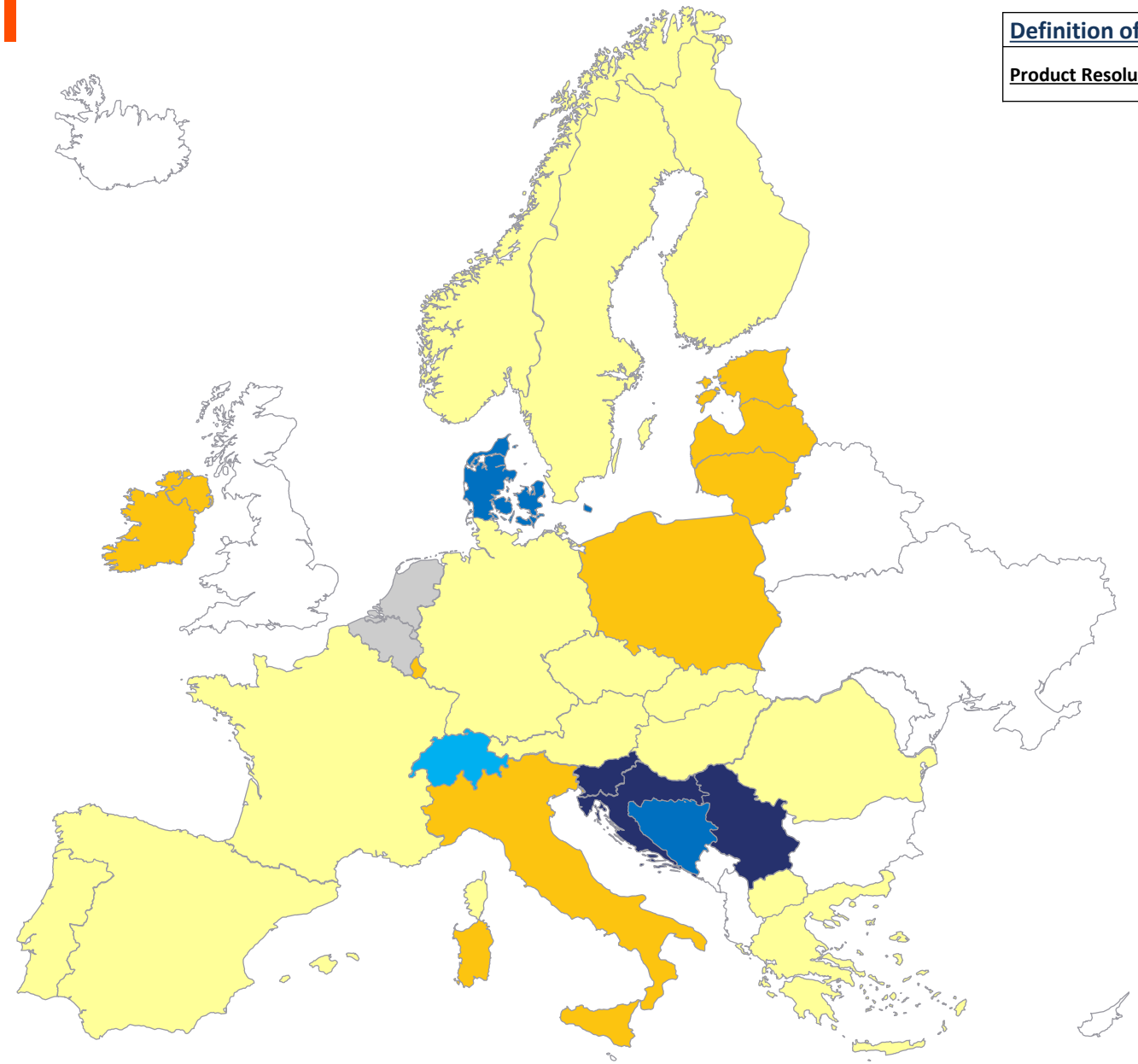
Frequency Restoration Reserve (Automatic) – Capacity – Product Resolution (in MW)



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

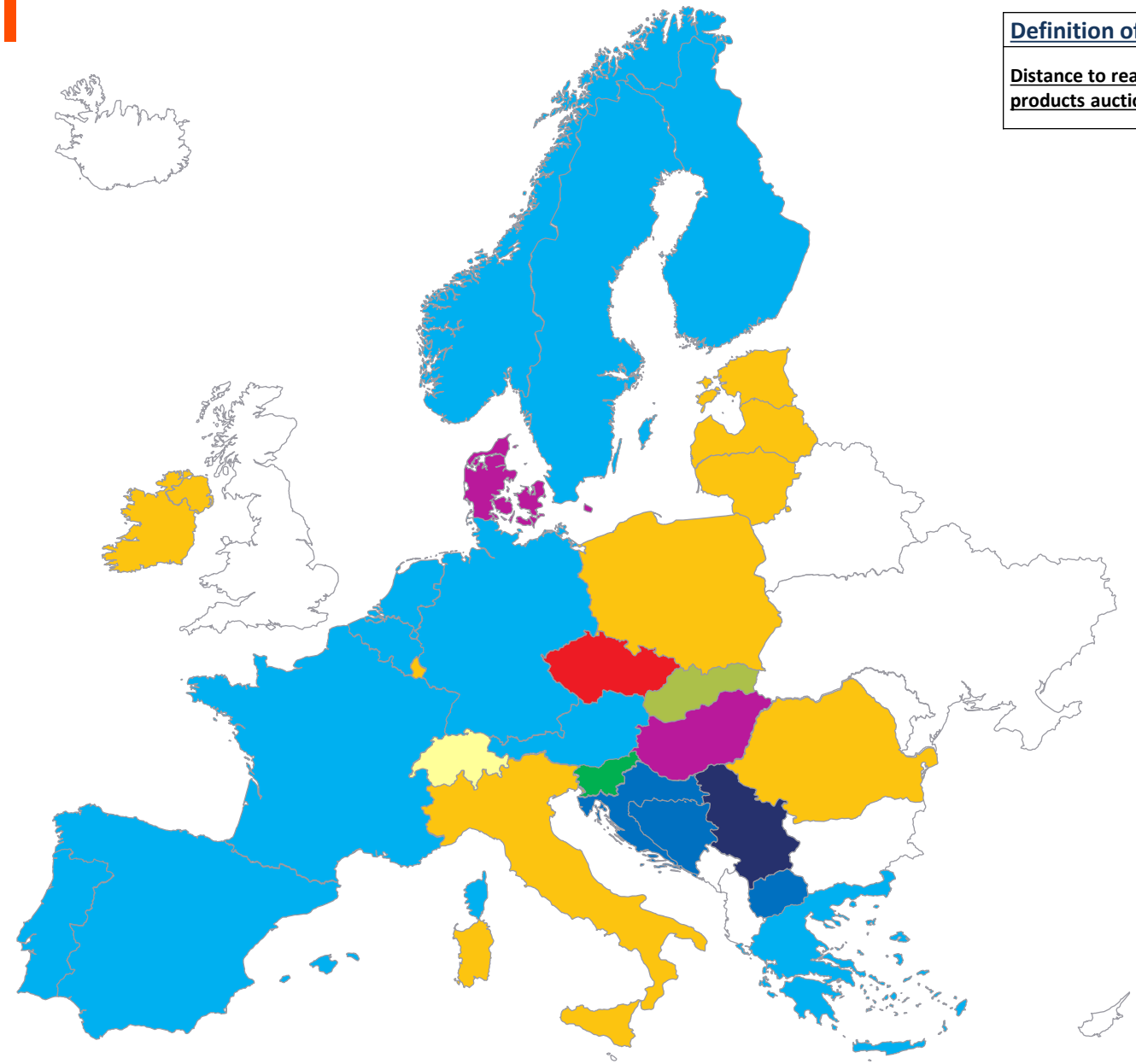
Frequency Restoration Reserve (Automatic) – Capacity – Product Resolution (in time)

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).



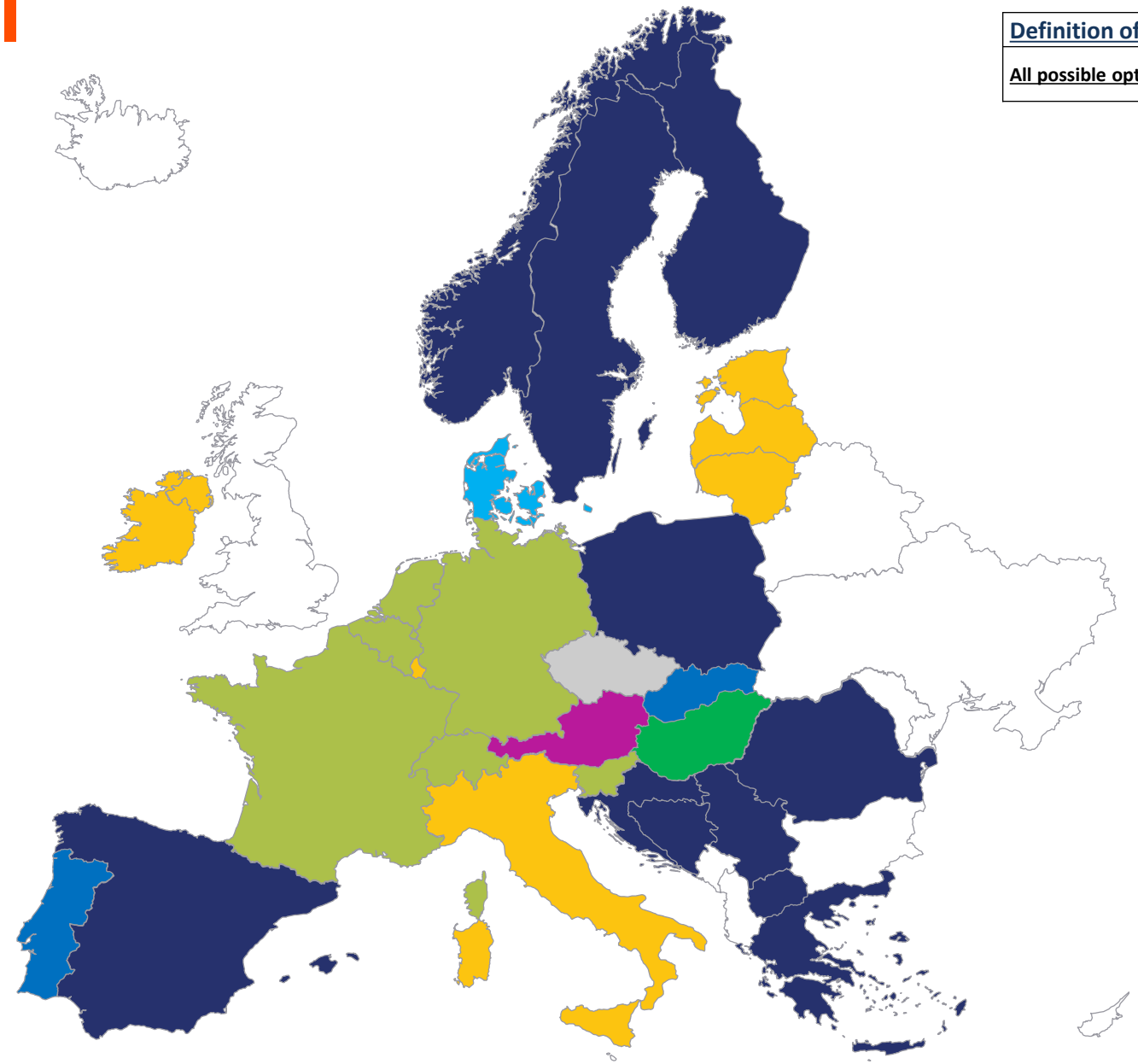
Frequency Restoration Reserve (Automatic) – Capacity – Distance to real time of reserve products auctions

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).



Frequency Restoration Reserve (Automatic) – Capacity – Provider

Definition of answer	
All possible options	In this case all possible provider types were chosen (Generator + Demand-side response + Pump Storage + Batteries + Distributed generation)

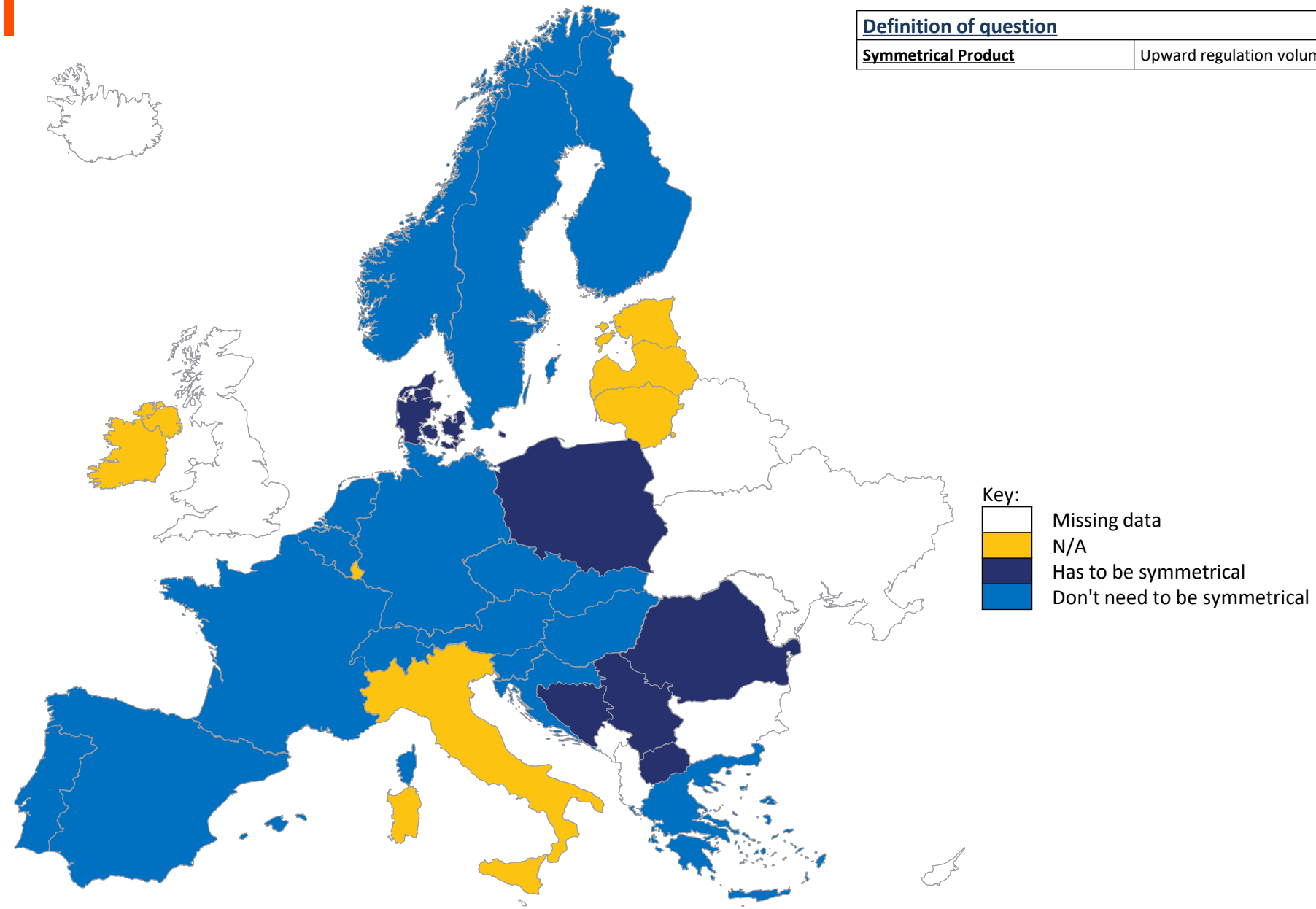


Key:

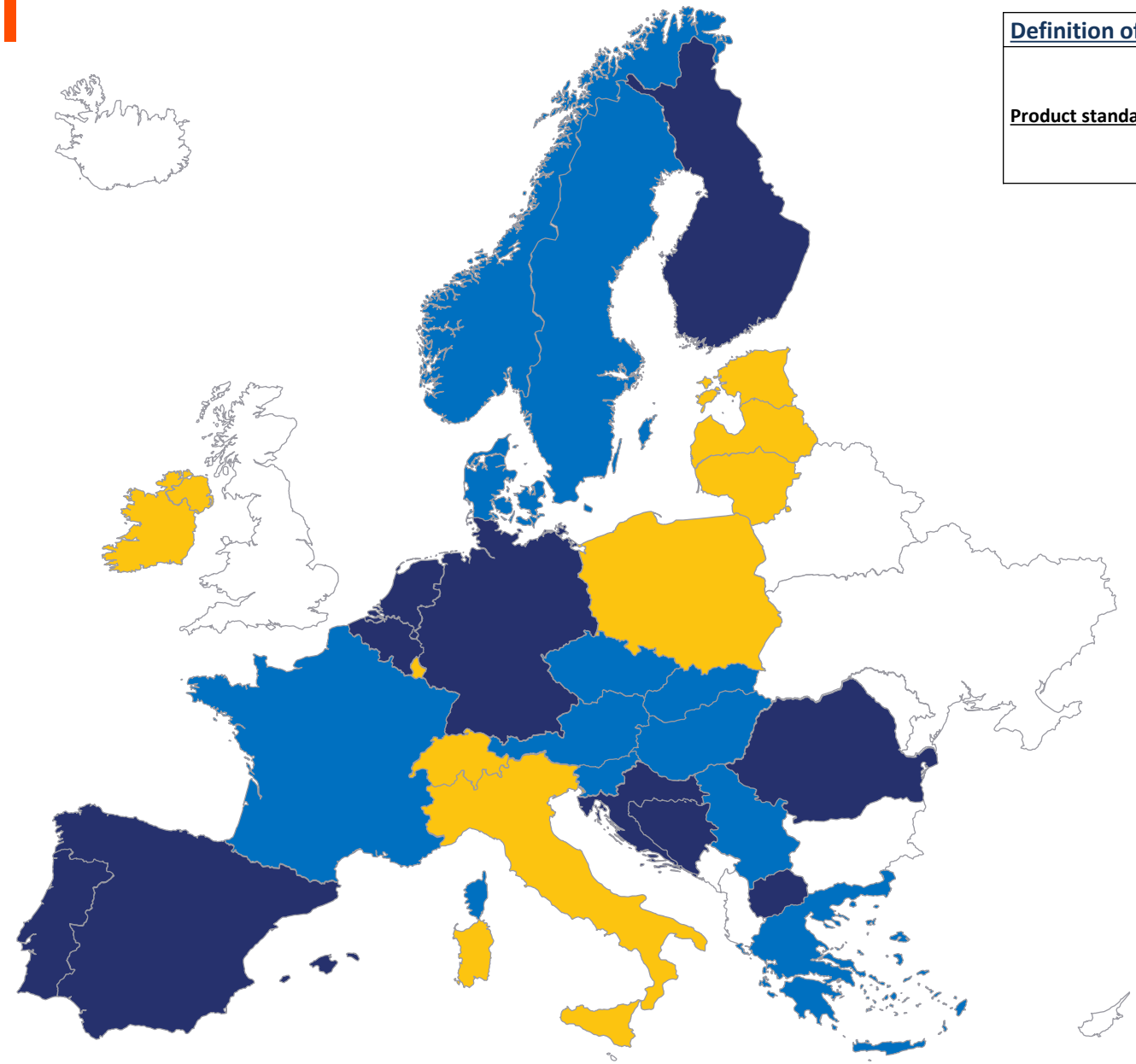
- Missing data
- N/A
- Generators Only
- Generators + Pump Storage
- Generators + Demand-side response
- Generators + Demand-side response + Batteries
- Generators + Demand-side response + Batteries + Pump Storage
- Generators + Demand-side response + Pump Storage
- Generators + Demand-side response + Batteries + Distributed generation
- All possible options

Frequency Restoration Reserve (Automatic) – Capacity – Symmetrical Product

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

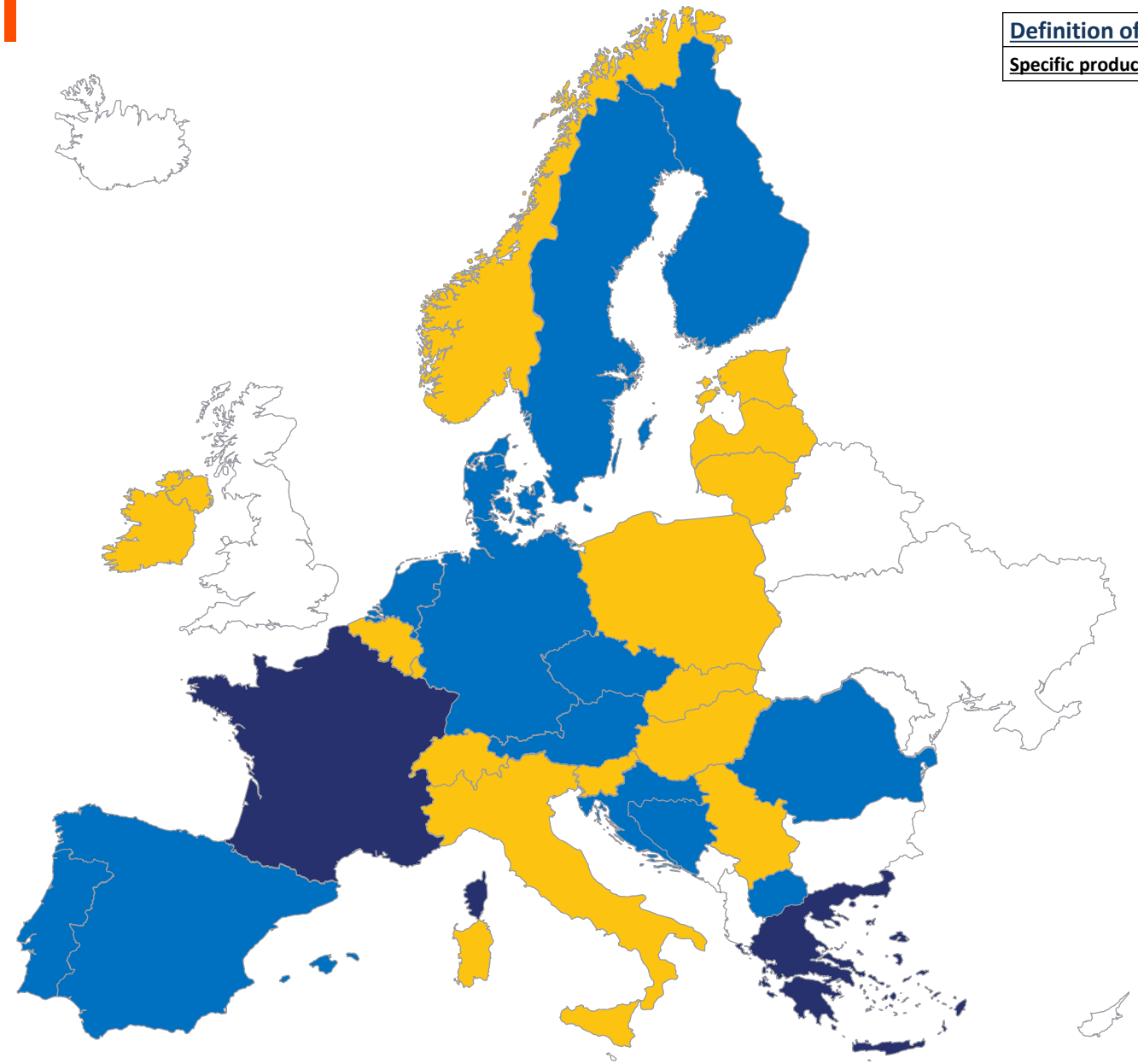


Frequency Restoration Reserve (Automatic) – Capacity – Is product standardisation finished?



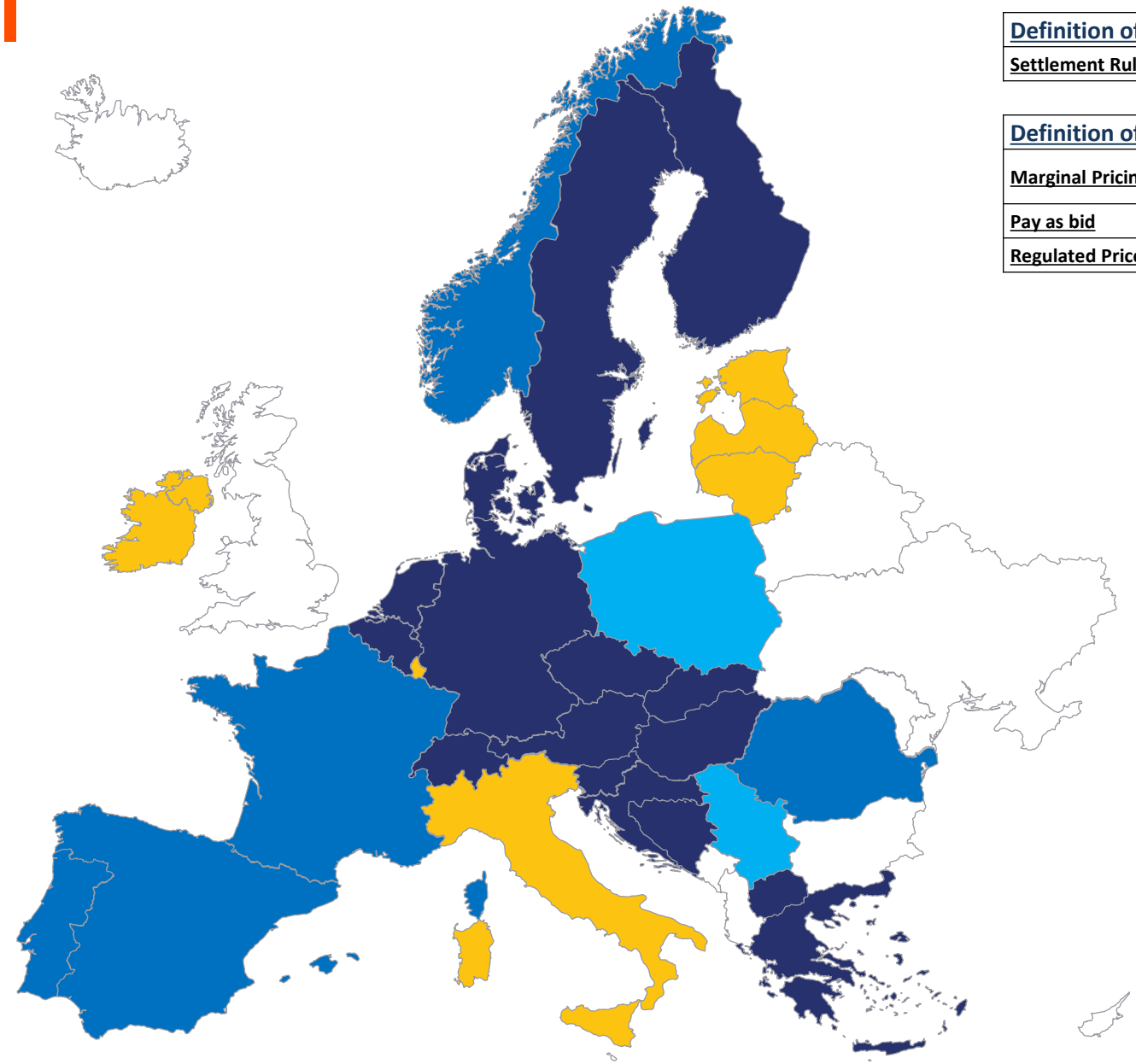
Definition of answer	
Product standardisation	EB Regulation defines only two products: standard products in Article 25 and specific products in Article 26. Standardisation process is finished if TSO implemented standard capacity balancing product(s) in line with Annex of the SPBC methodology or if national NRA approved usage of the specific product in line with national process and Article 26 of the EB Regulation.

Frequency Restoration Reserve (Automatic) – Capacity – Using specific products?



Definition of answer	
Specific product	Specific product implemented in line with Article 26 of the EB Regulation.

Frequency Restoration Reserve (Automatic) - Capacity - Settlement Rule



Definition of question	
Settlement Rule	The pricing rules for settlement.

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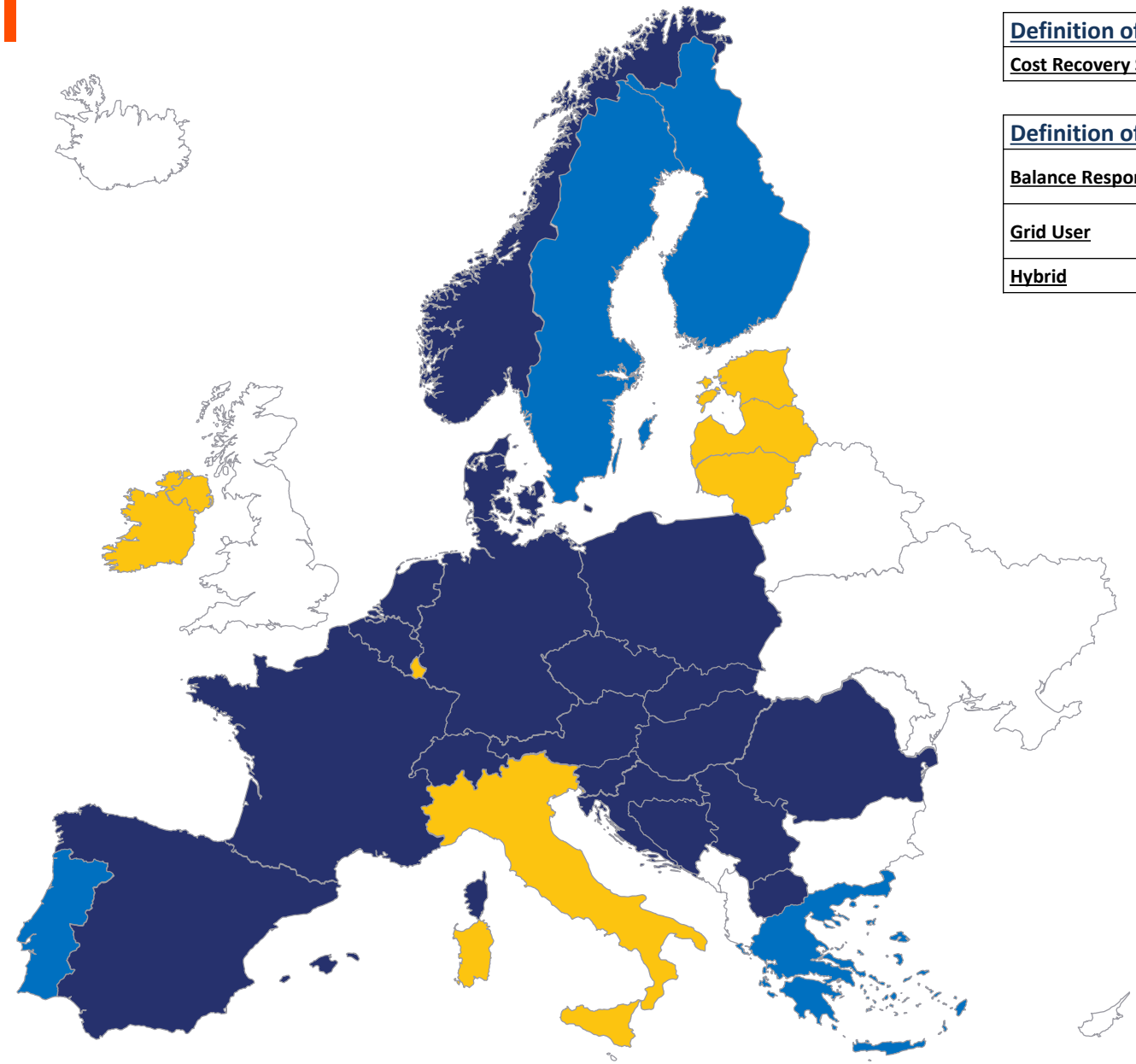
Frequency Restoration Reserve (Automatic) - Capacity - Cost Recovery Scheme



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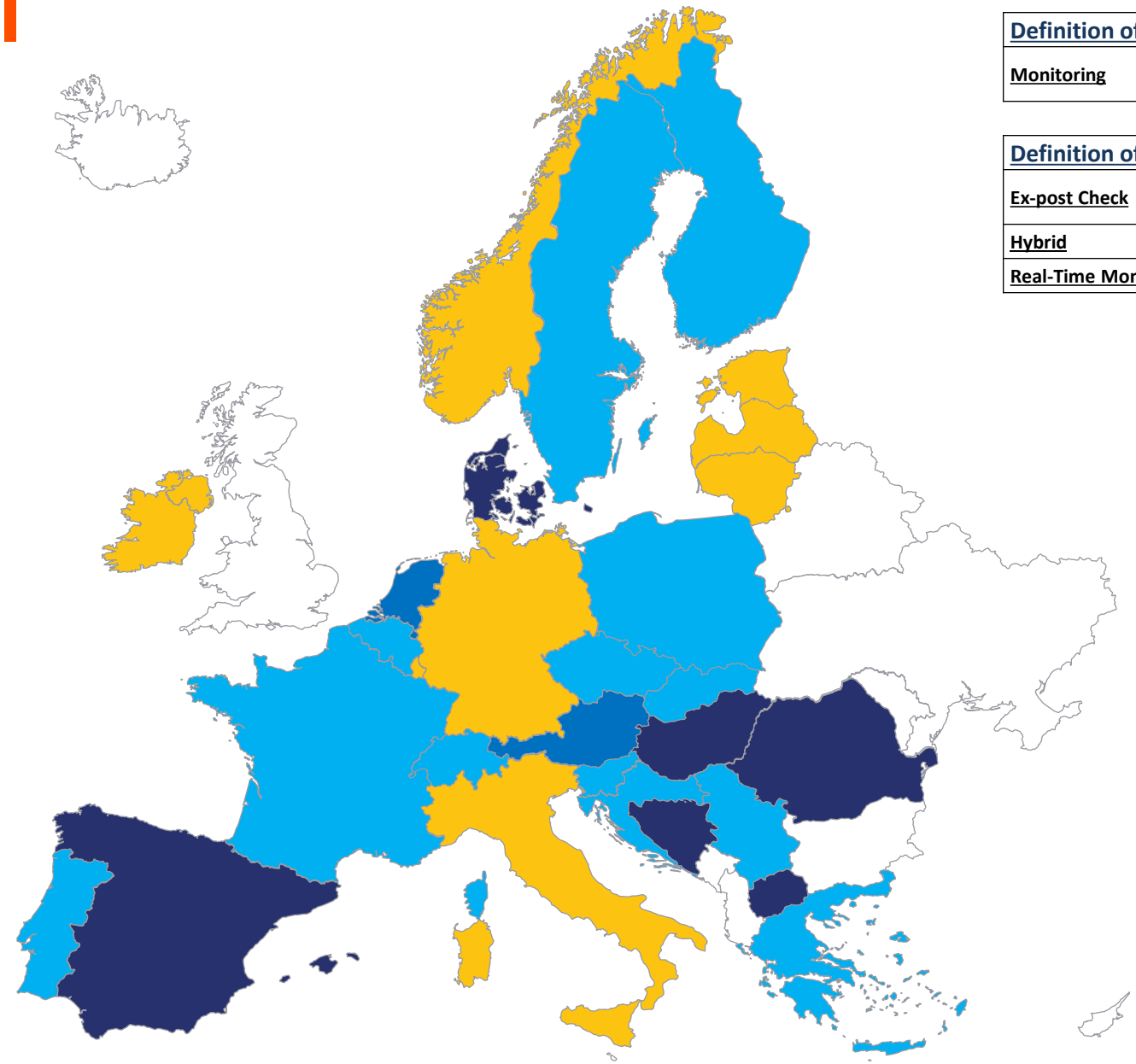
Grid User	The natural or legal person supplying to, or being supplied with active and/or reactive power by a TSO or DSO.
Hybrid	Combination of given options.

Frequency Restoration Reserve (Automatic) - Capacity - Monitoring



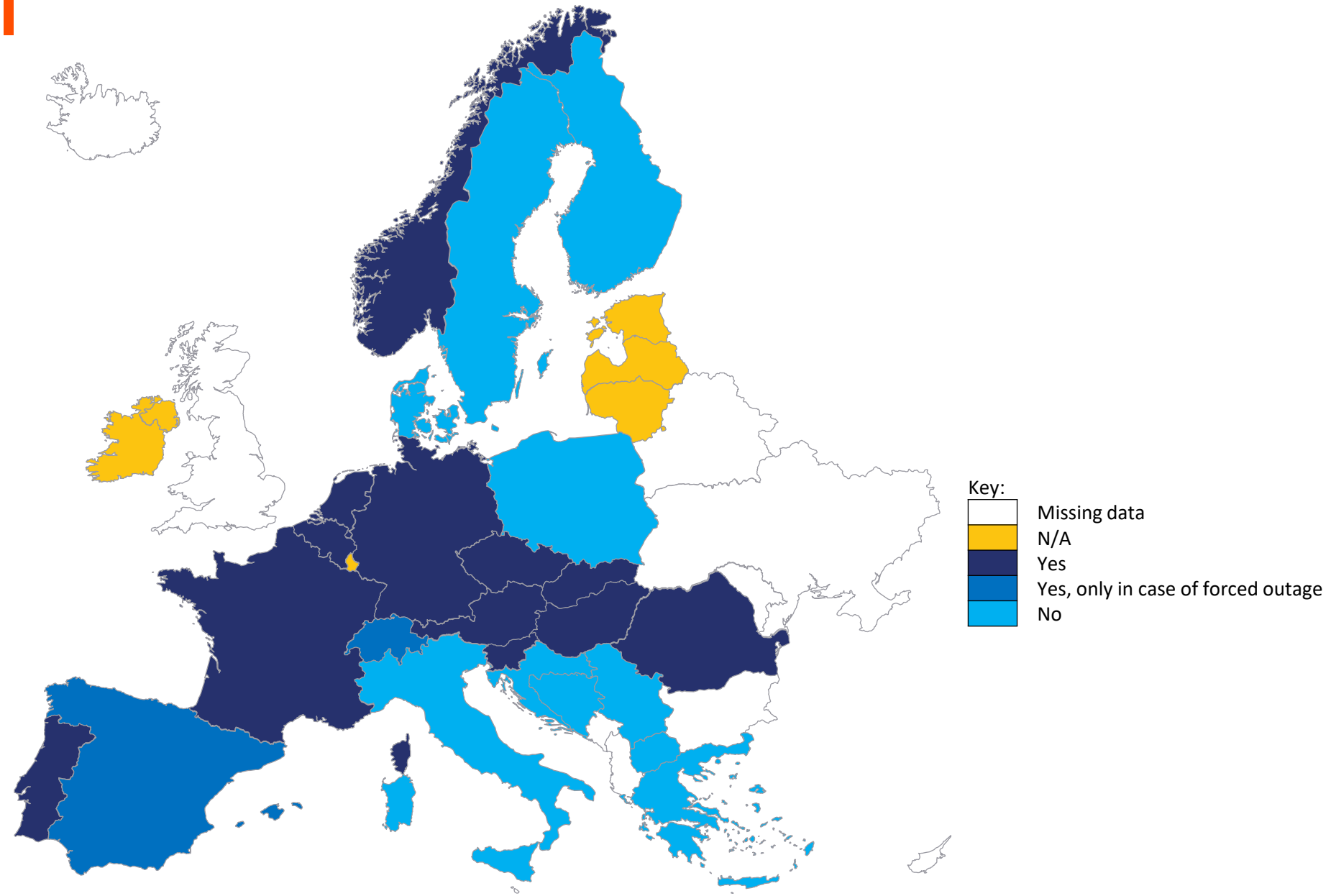
Definition of question	
Monitoring	Refers to the type of monitoring in place by the system operator to ensure performance of plant.

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

Key:

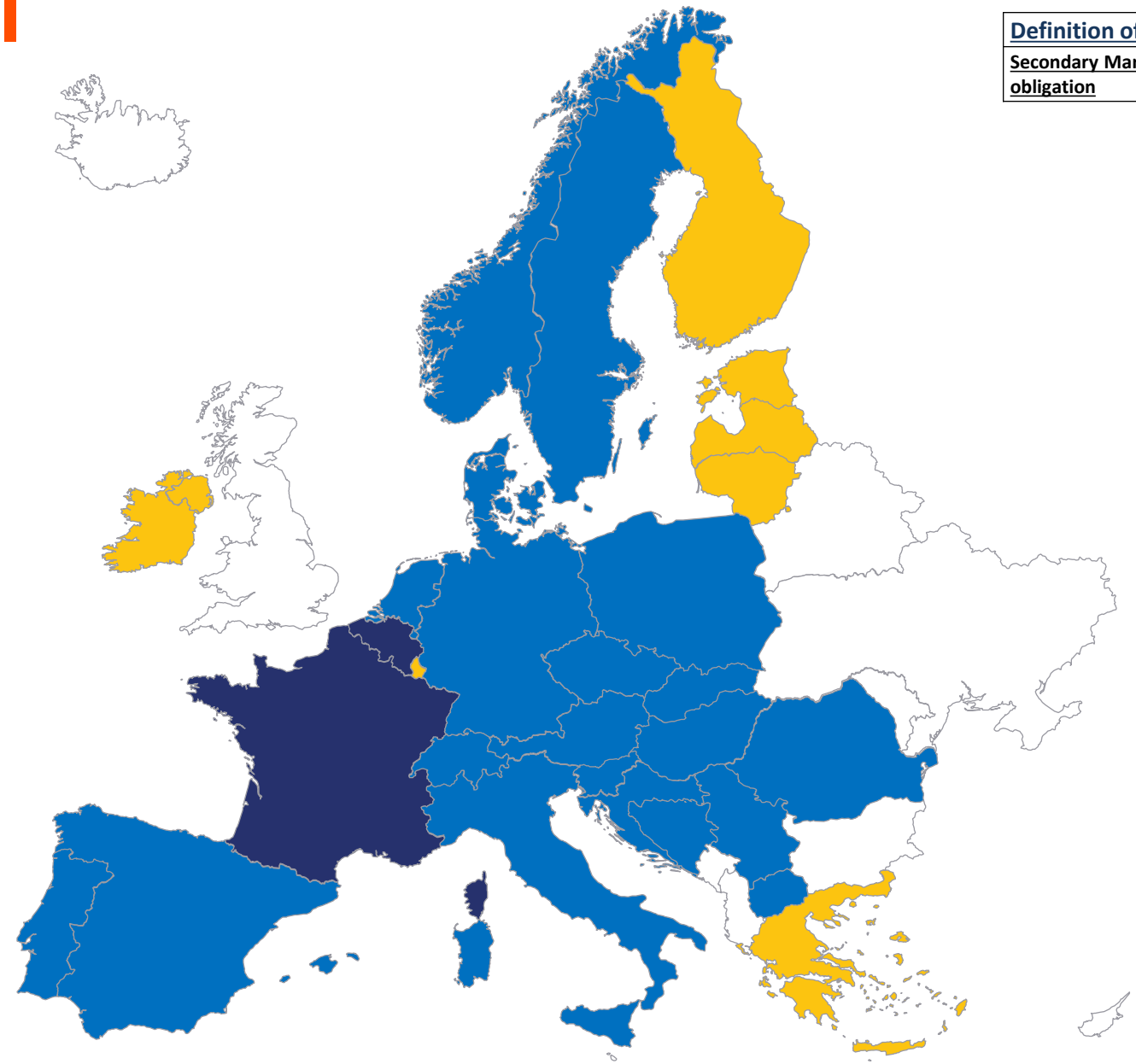
- Missing data
- N/A
- Real-Time Monitoring
- Ex-Post Check
- Hybrid

Frequency Restoration Reserve (Automatic) - Capacity - Transfer of BSPs obligation allowed

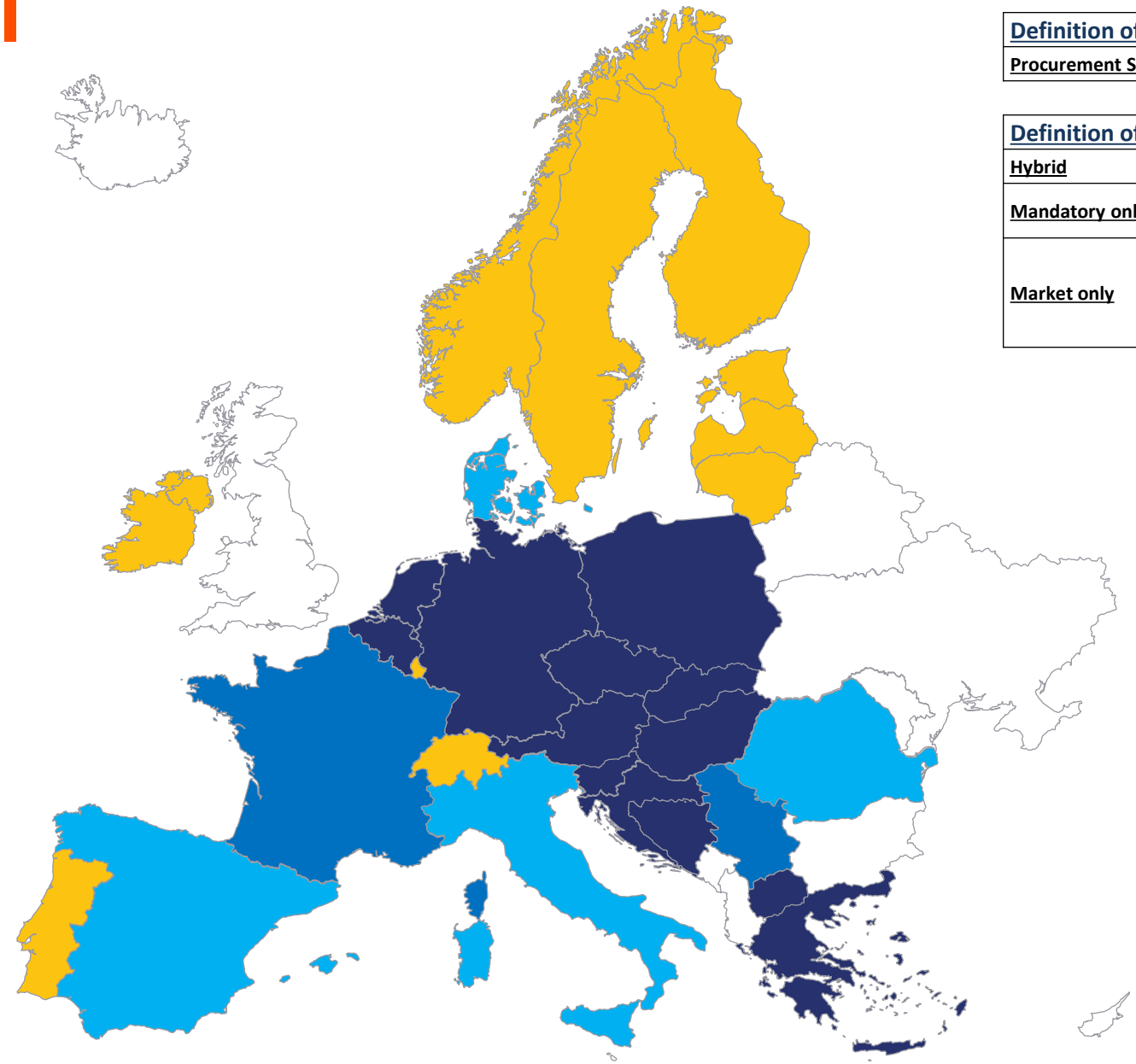


Frequency Restoration Reserve (Automatic) - Capacity - In case transfer obligation is allowed, is there an organised secondary market?

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.



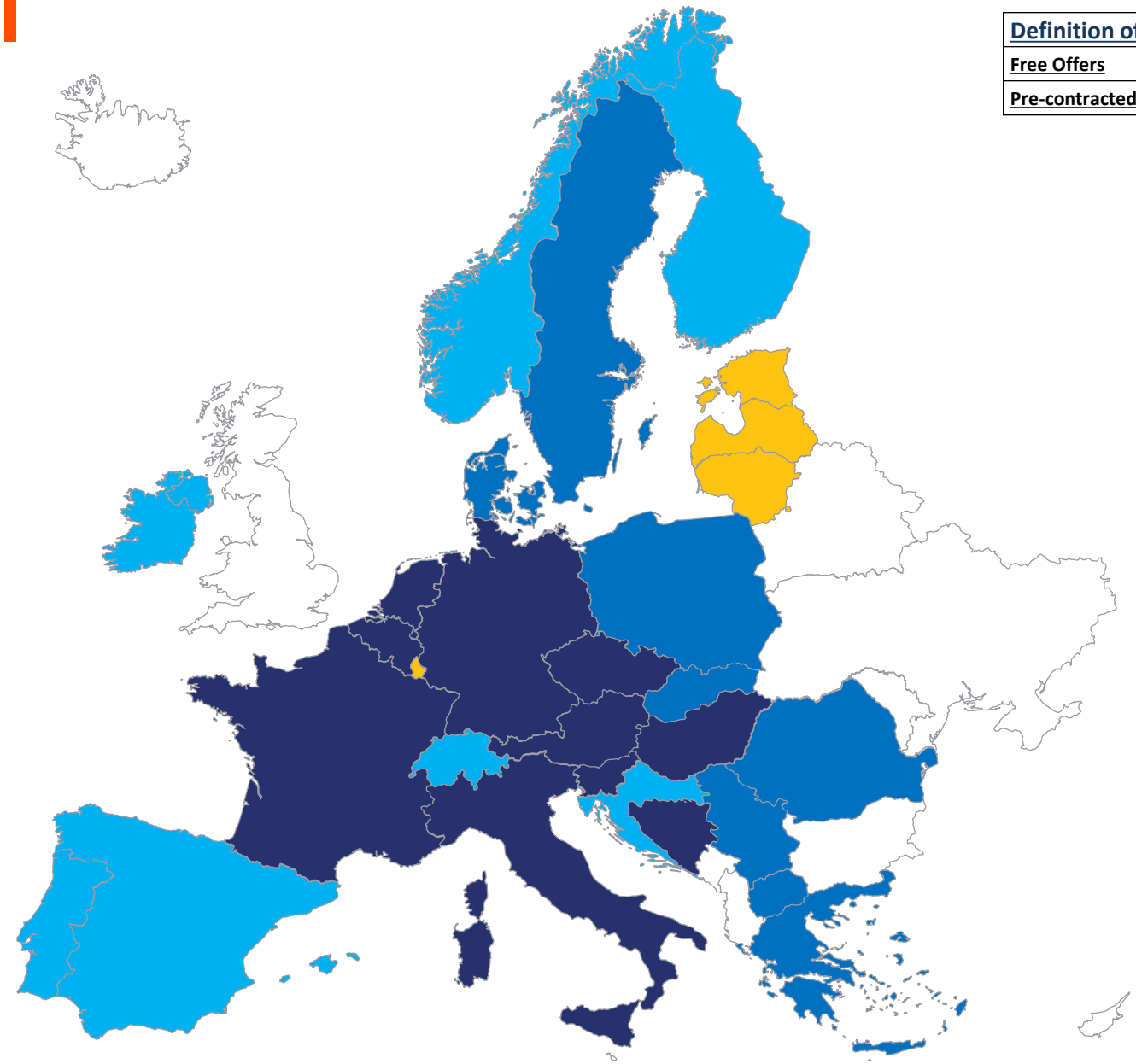
Frequency Restoration Reserve (Automatic) - Energy - Procurement Scheme



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

Definition of answer	
Hybrid	Combination of given options.
Mandatory only	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.
Market only	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.

Frequency Restoration Reserve (Automatic) - Energy - Free Bids allowed

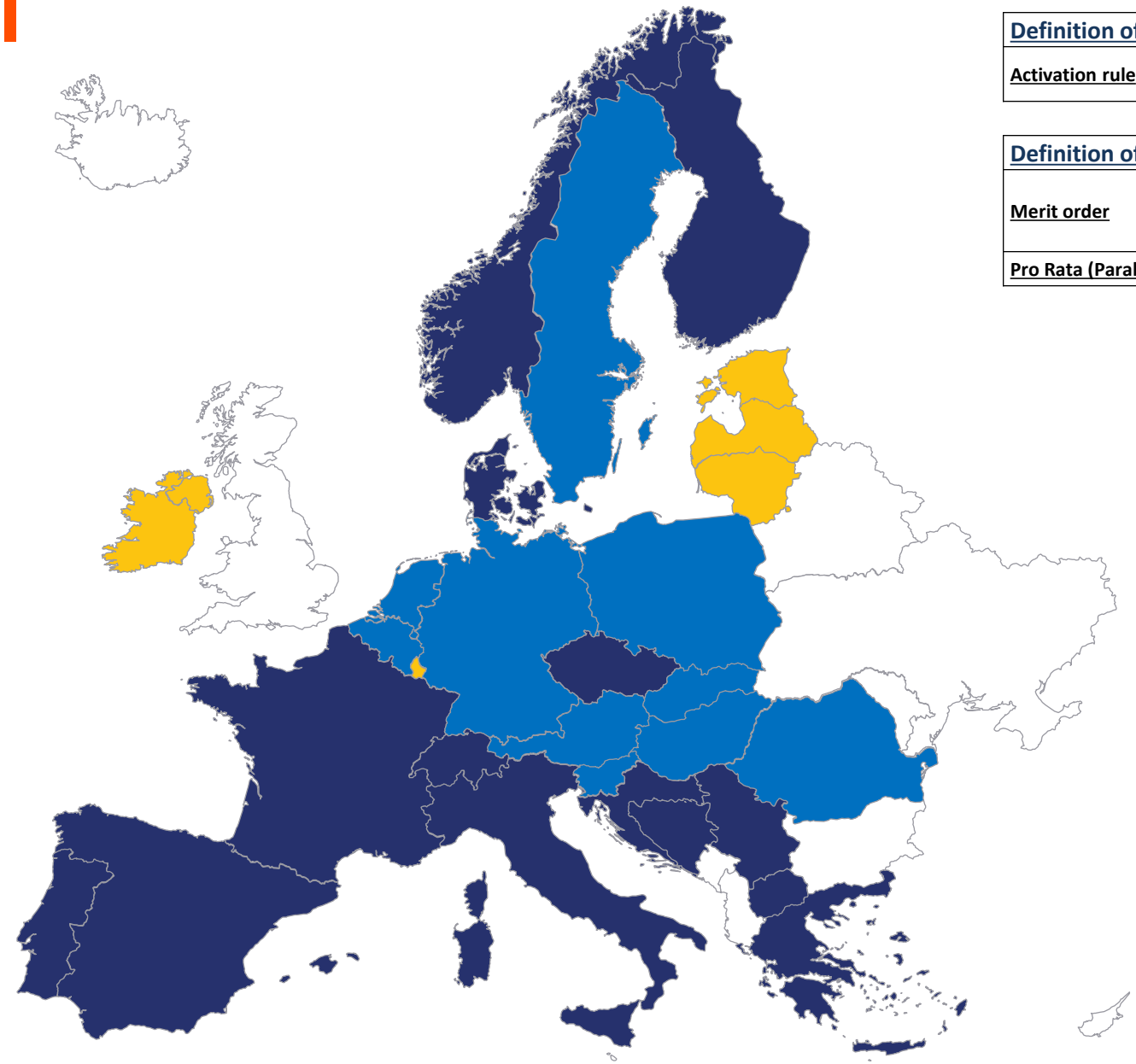


Definition of question	
Free Offers	Possibility to offer balancing energy bids without a contract for Balancing Capacity
Pre-contracted	BSP has sold/procured Balancing Capacity to TSO.

Key:

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

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).

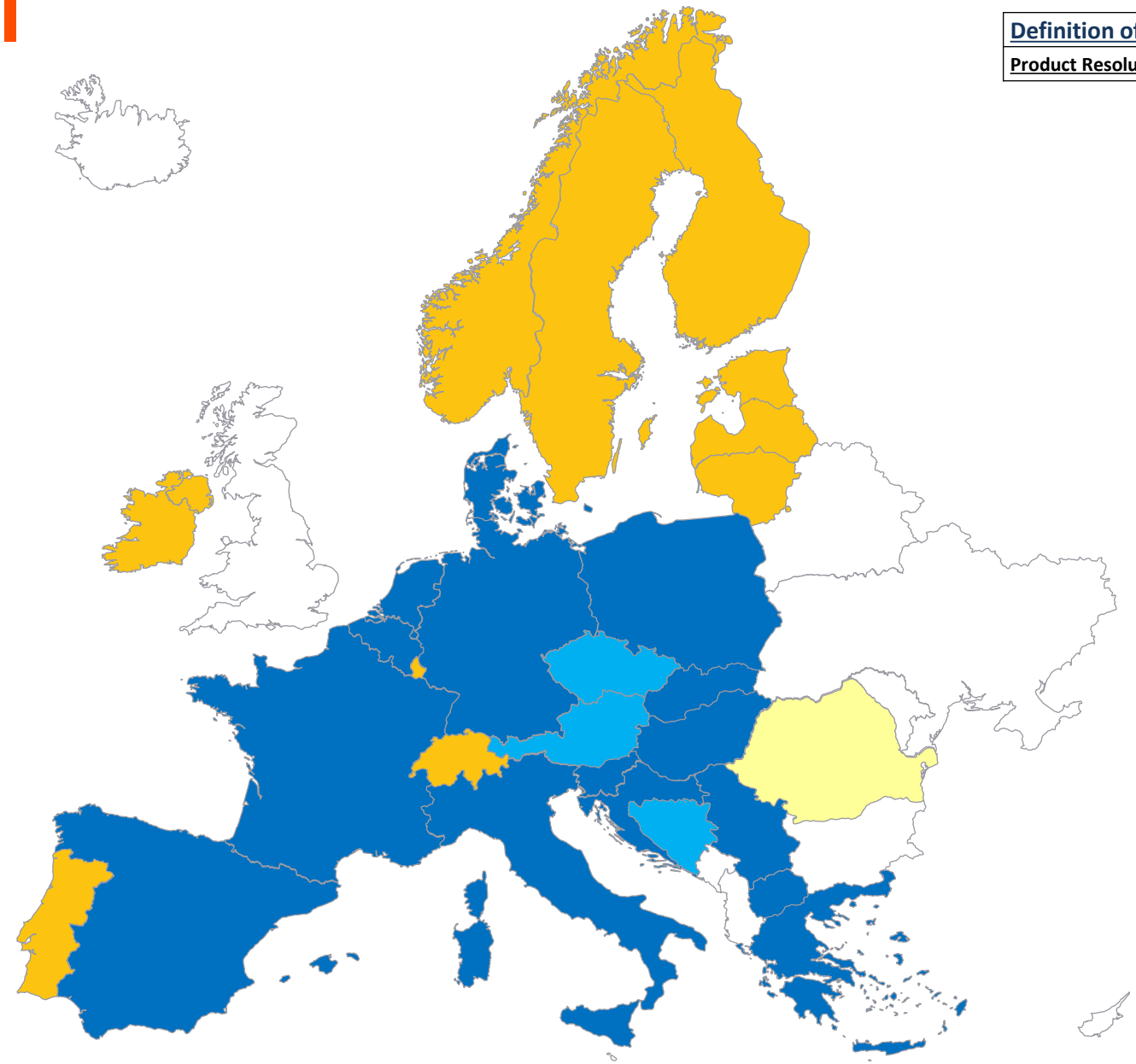
Definition of answer	
Merit order	A merit order is a way of ranking available sources of energy in ascending order of their short run marginal costs of production, so that those with the lowest marginal costs are the first ones to be brought online to meet demand.
Pro Rata (Parallel Activation)	All bids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

Key:

- Missing data
- N/A
- Pro Rata (Parallel Activation)
- Merit order

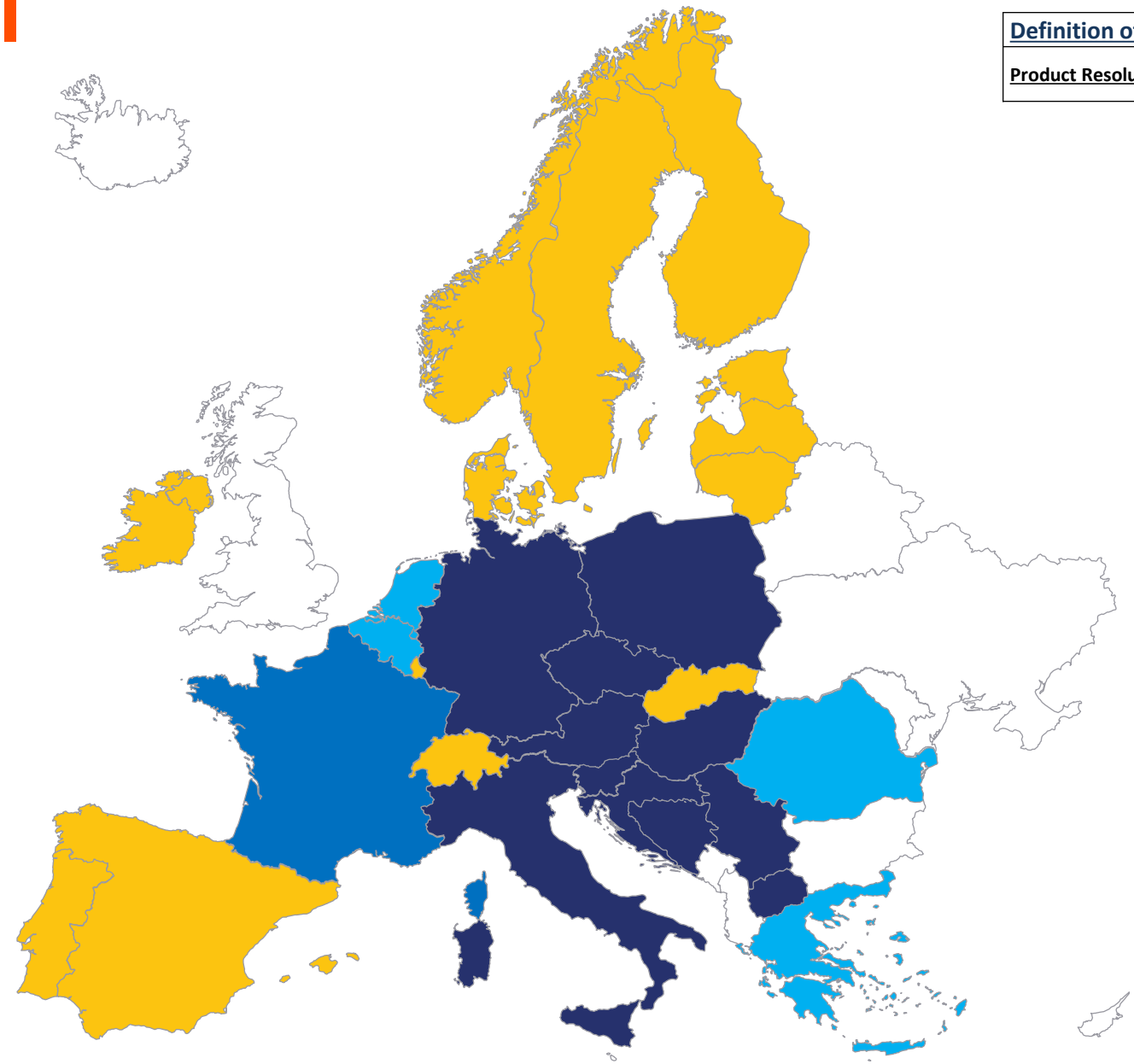
Frequency Restoration Reserve (Automatic) - Energy - Product Resolution (in MW)

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



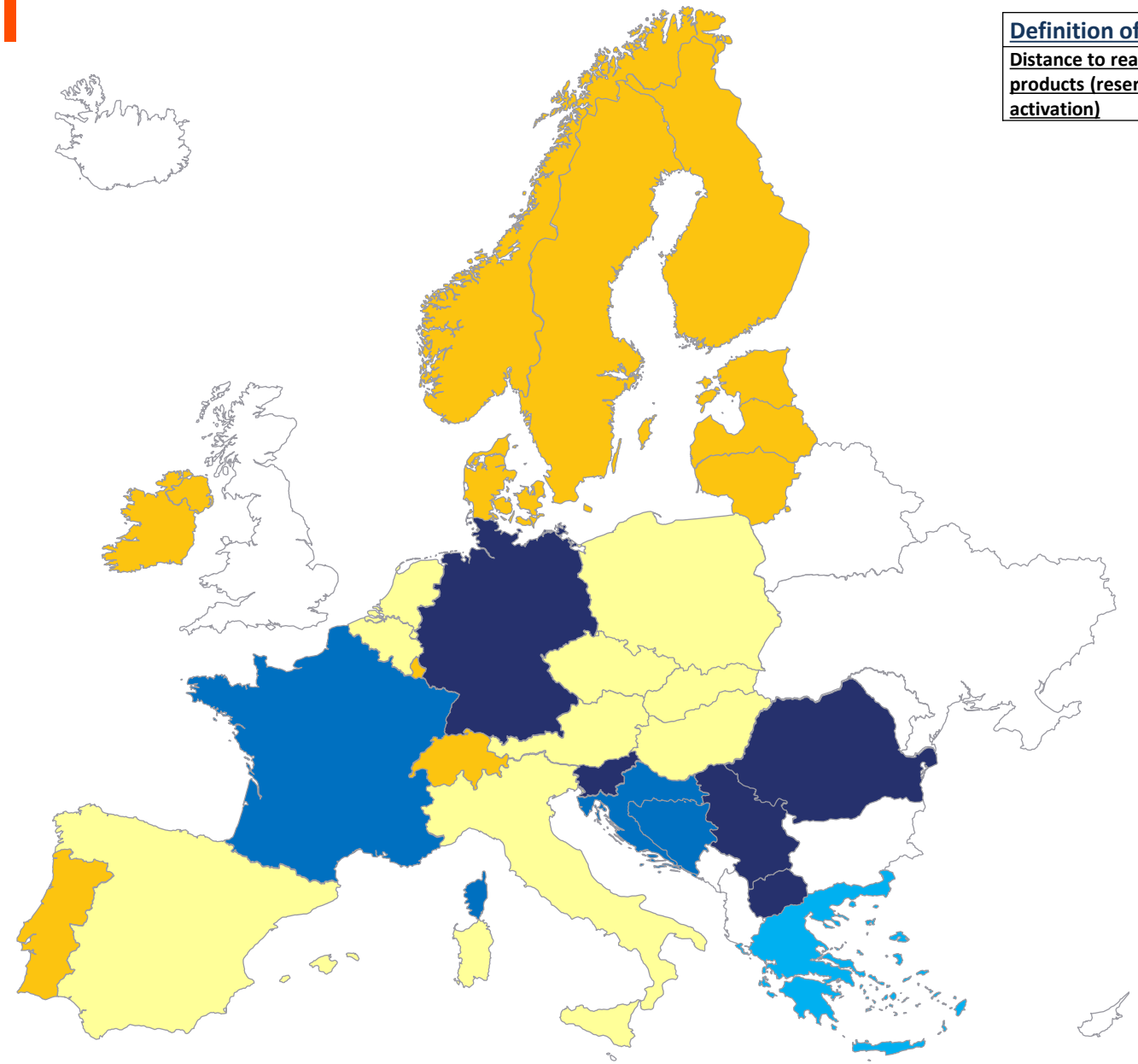
Frequency Restoration Reserve (Automatic) - Energy - Product Resolution (in time)

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).



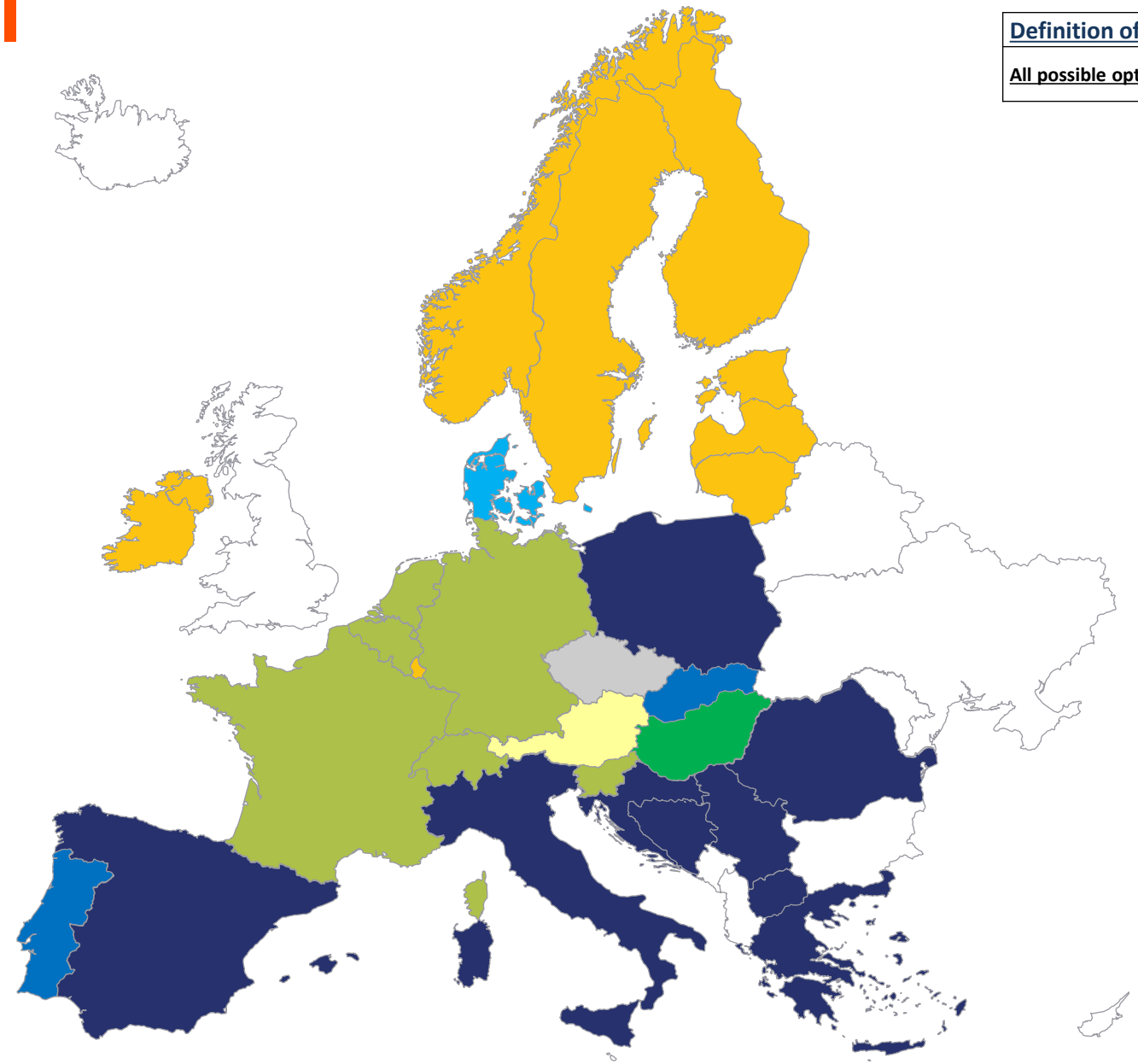
Frequency Restoration Reserve (Automatic) - Energy - Distance to real time of energy products

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).

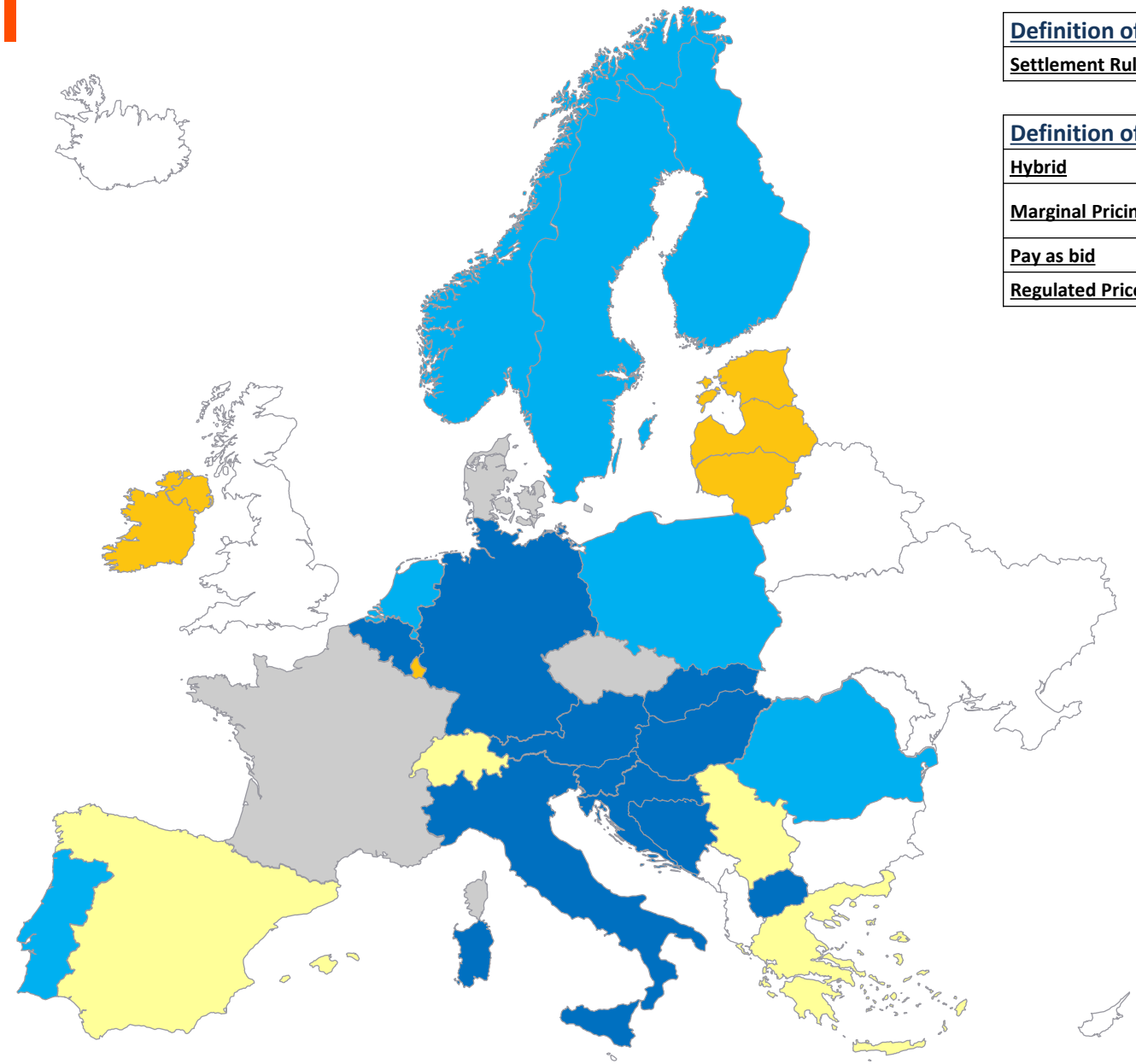


Frequency Restoration Reserve (Automatic) - Energy - Provider

Definition of answer	
All possible options	In this case all possible provider types were chosen (Generator + Demand-side response + Pump Storage + Batteries + Distributed generation)



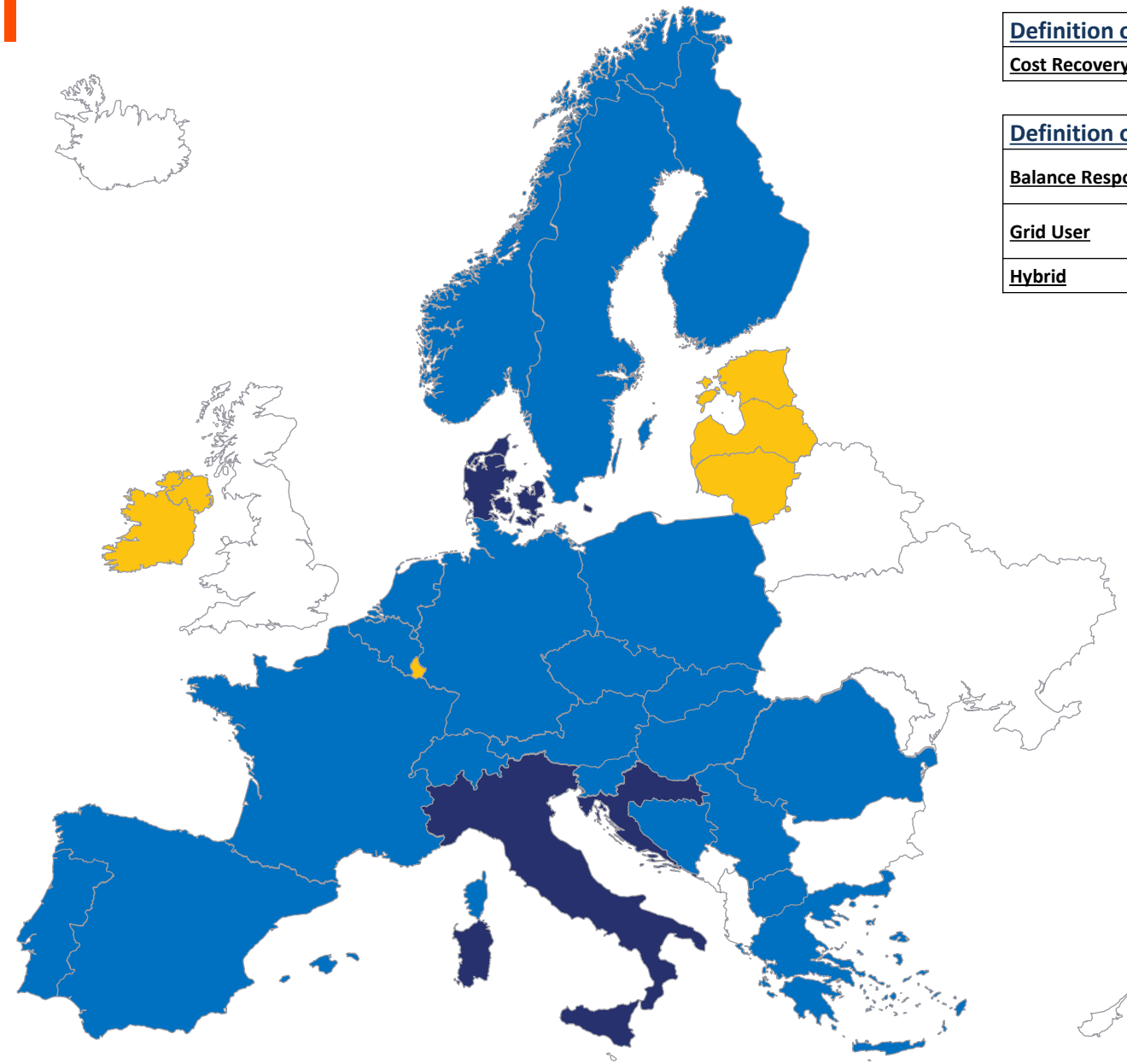
Frequency Restoration Reserve (Automatic) - Energy - Settlement Rule



Definition of question	
Settlement Rule	The pricing rules for settlement.

Definition of answer	
Hybrid	Combination of given options.
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.

Frequency Restoration Reserve (Automatic) - Energy - Cost Recovery Scheme

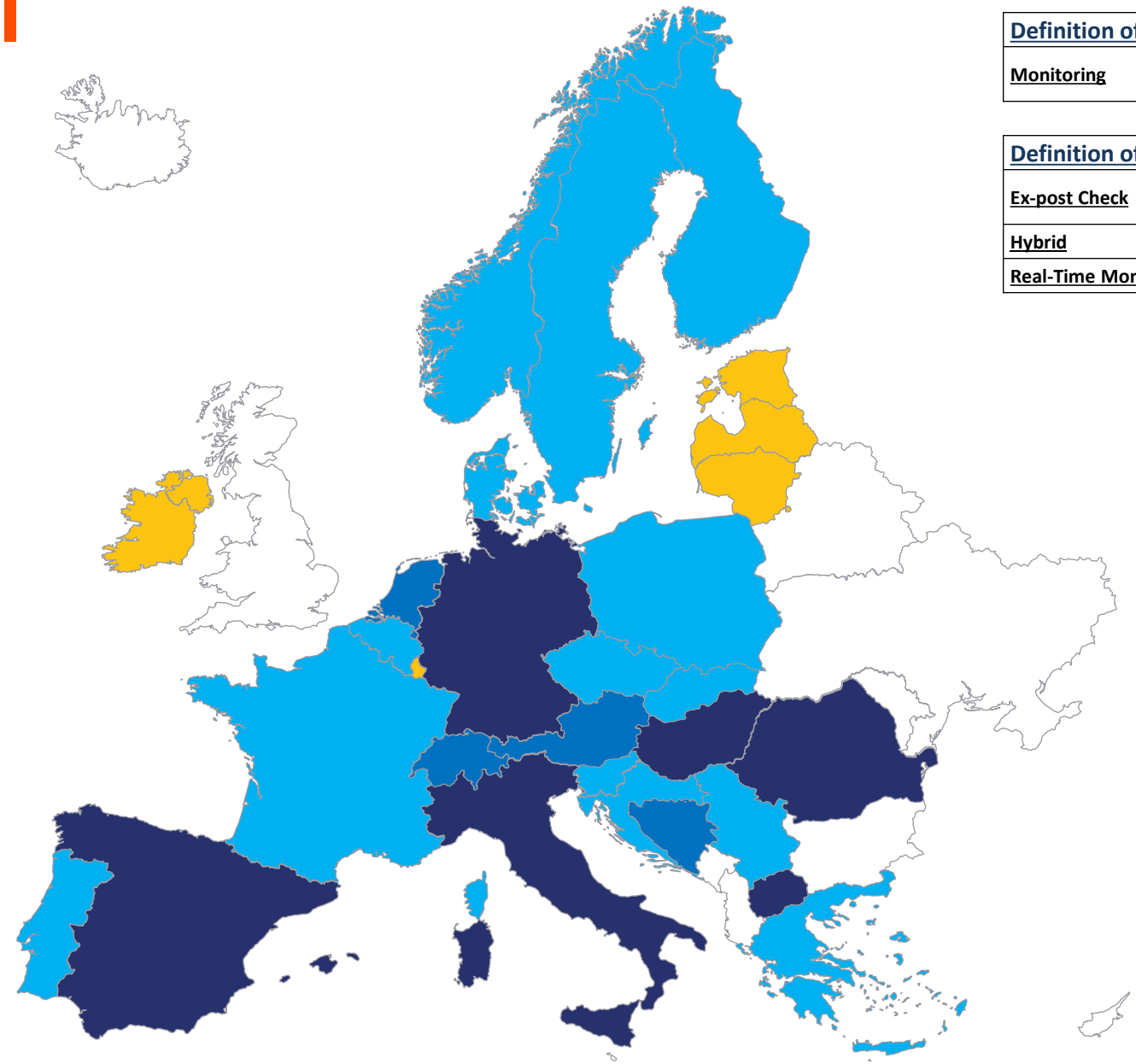


Key:
- Missing data
- N/A
- 100% Grid Users (through tariff)
- 100% BRP
- Hybrid

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 of given options.

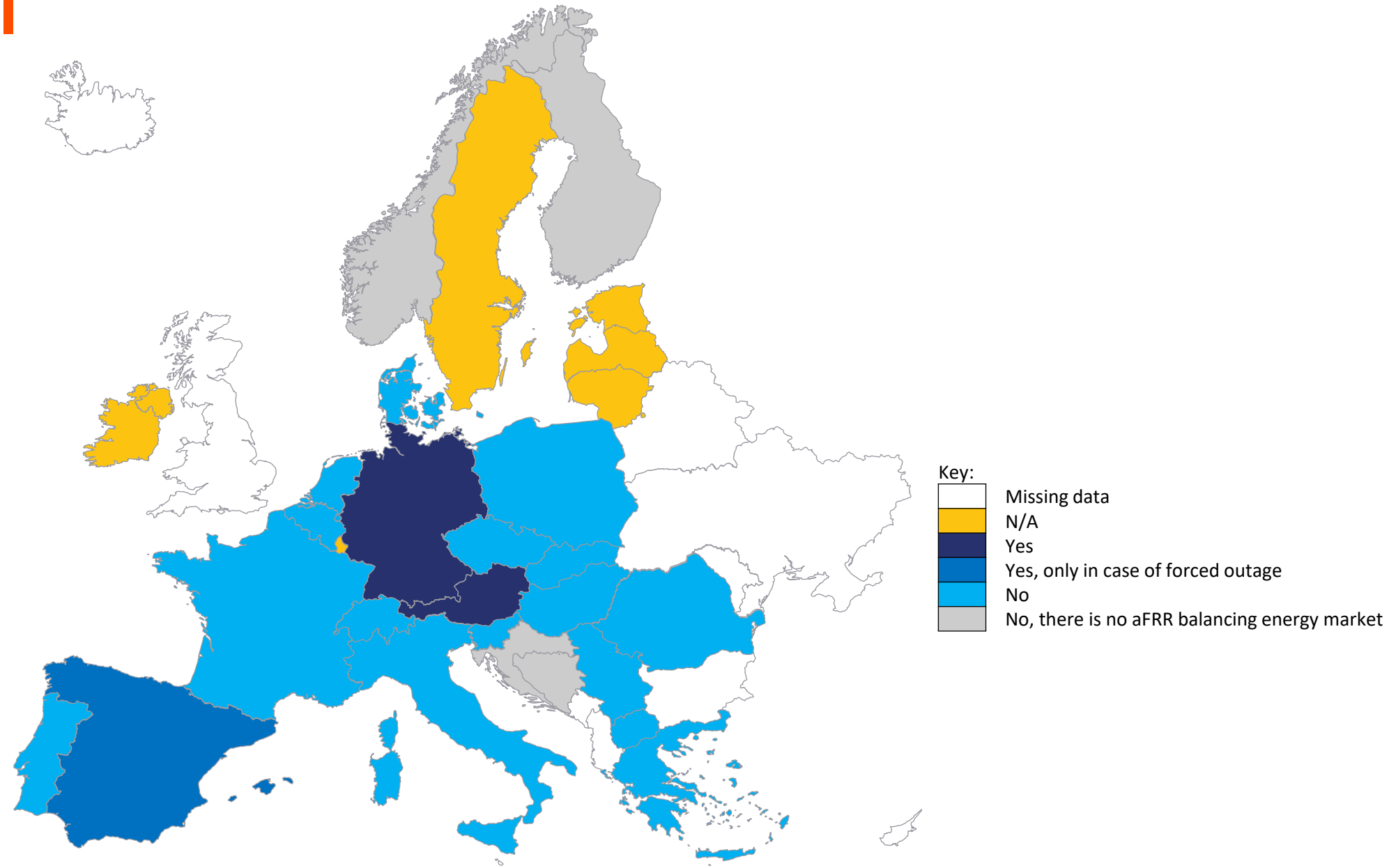
Frequency Restoration Reserve (Automatic) - Energy - Monitoring



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

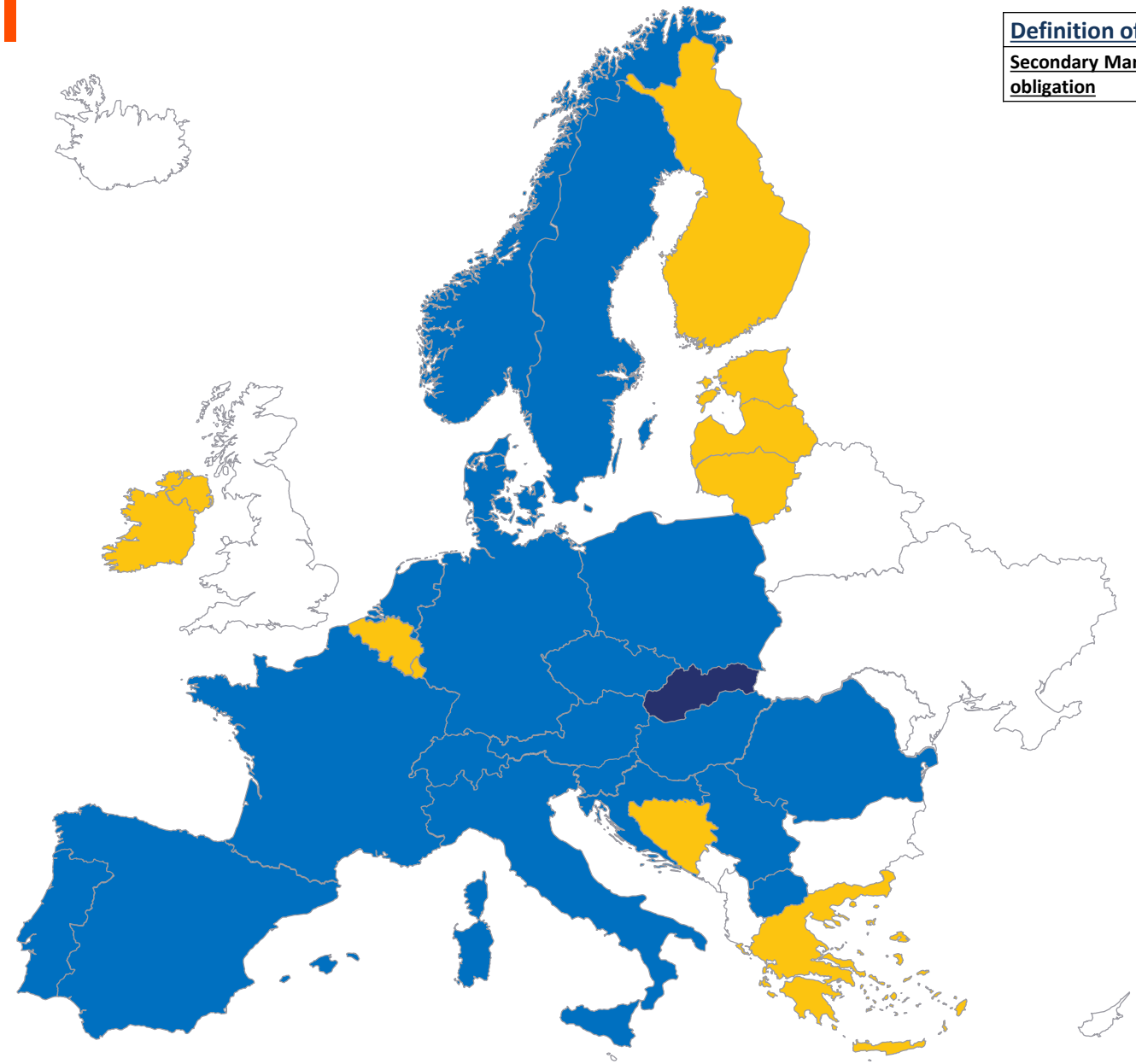
Definition of answer	
Ex-post Check	When the monitoring of performance of plant carried out 24 hours after the delivery period.
Hybrid	Combination of given options.
Real-Time Monitoring	Monitoring of delivery of ancillary services in real time.

Frequency Restoration Reserve (Automatic) - Energy - Transfer of BSPs obligation allowed



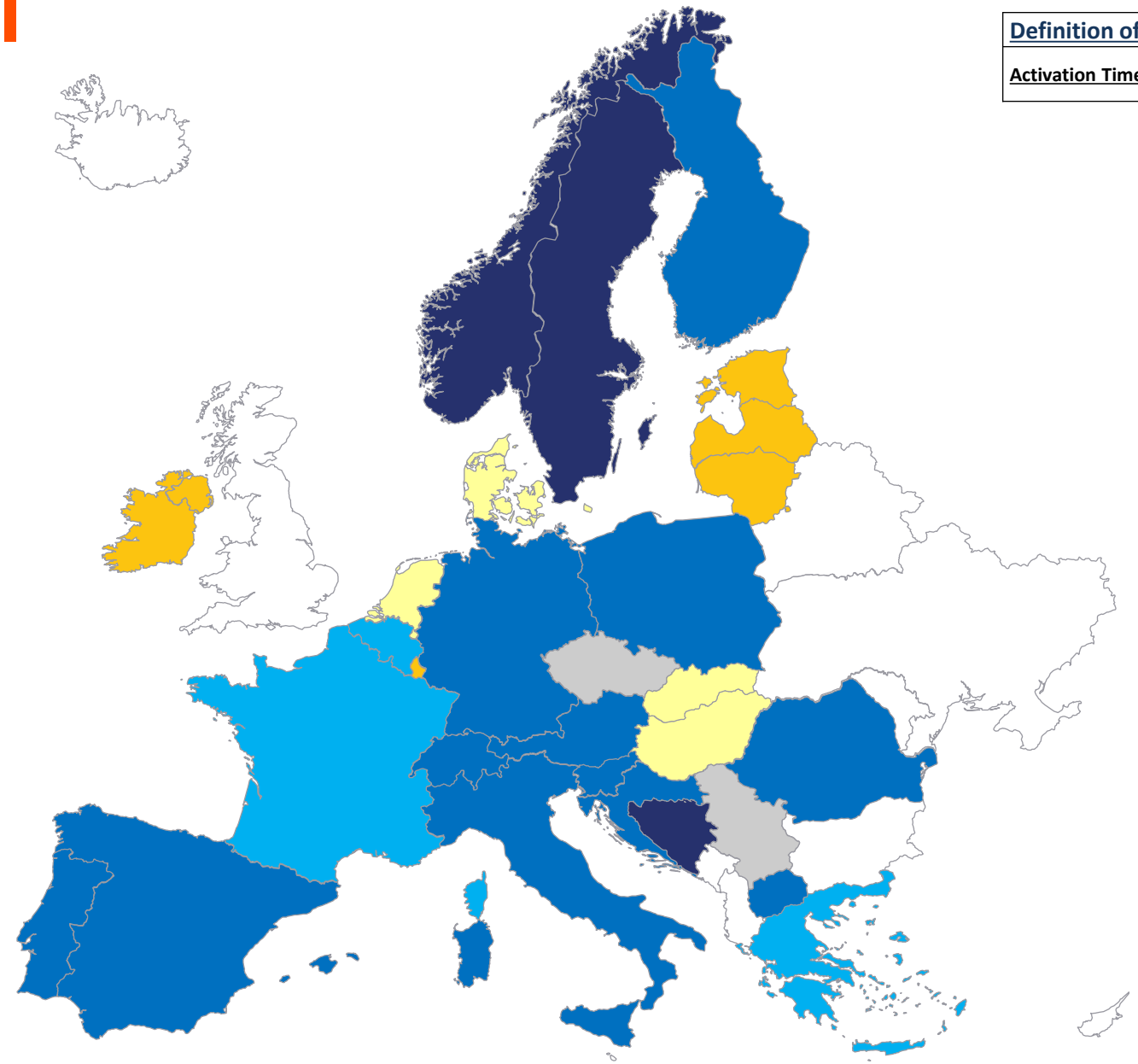
Frequency Restoration Reserve (Automatic) - Energy - In case transfer obligation is allowed, is there an organised secondary market?

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.

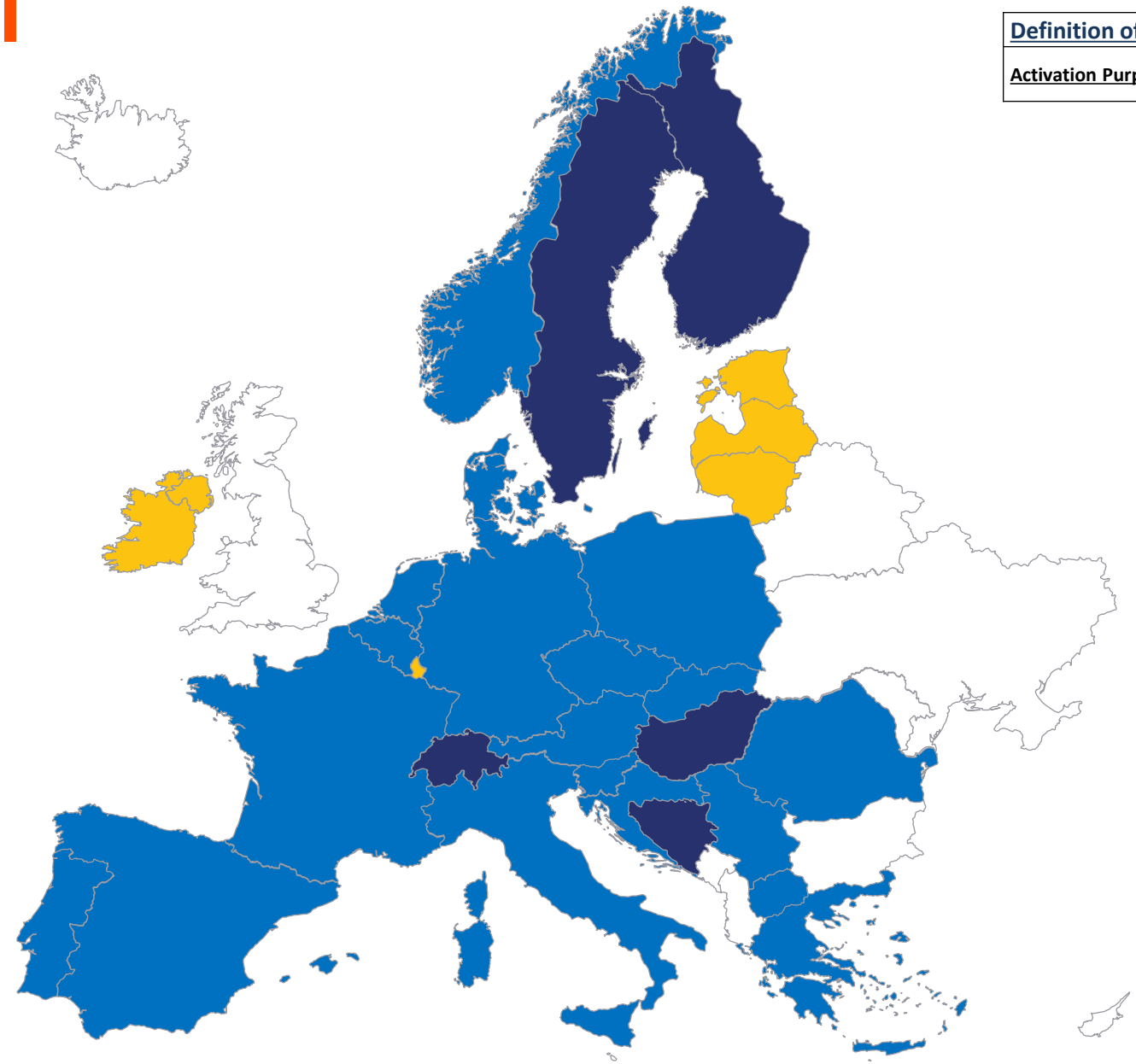


Frequency Restoration Reserve (Automatic) - Energy - Activation time of aFRR from 0 to max

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.

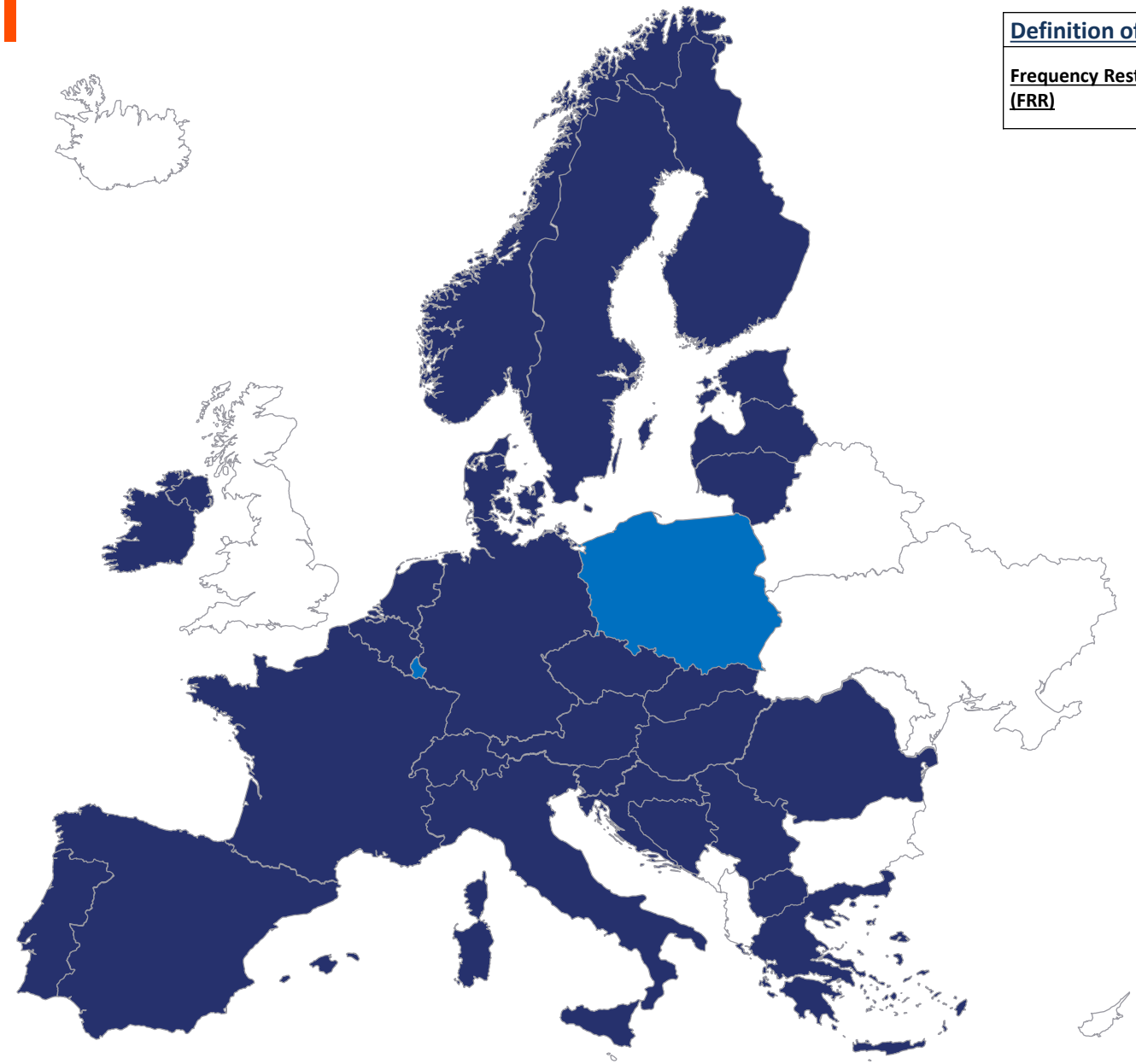


Frequency Restoration Reserve (Automatic) - Energy - Are activations possible for other purposes than for balancing?



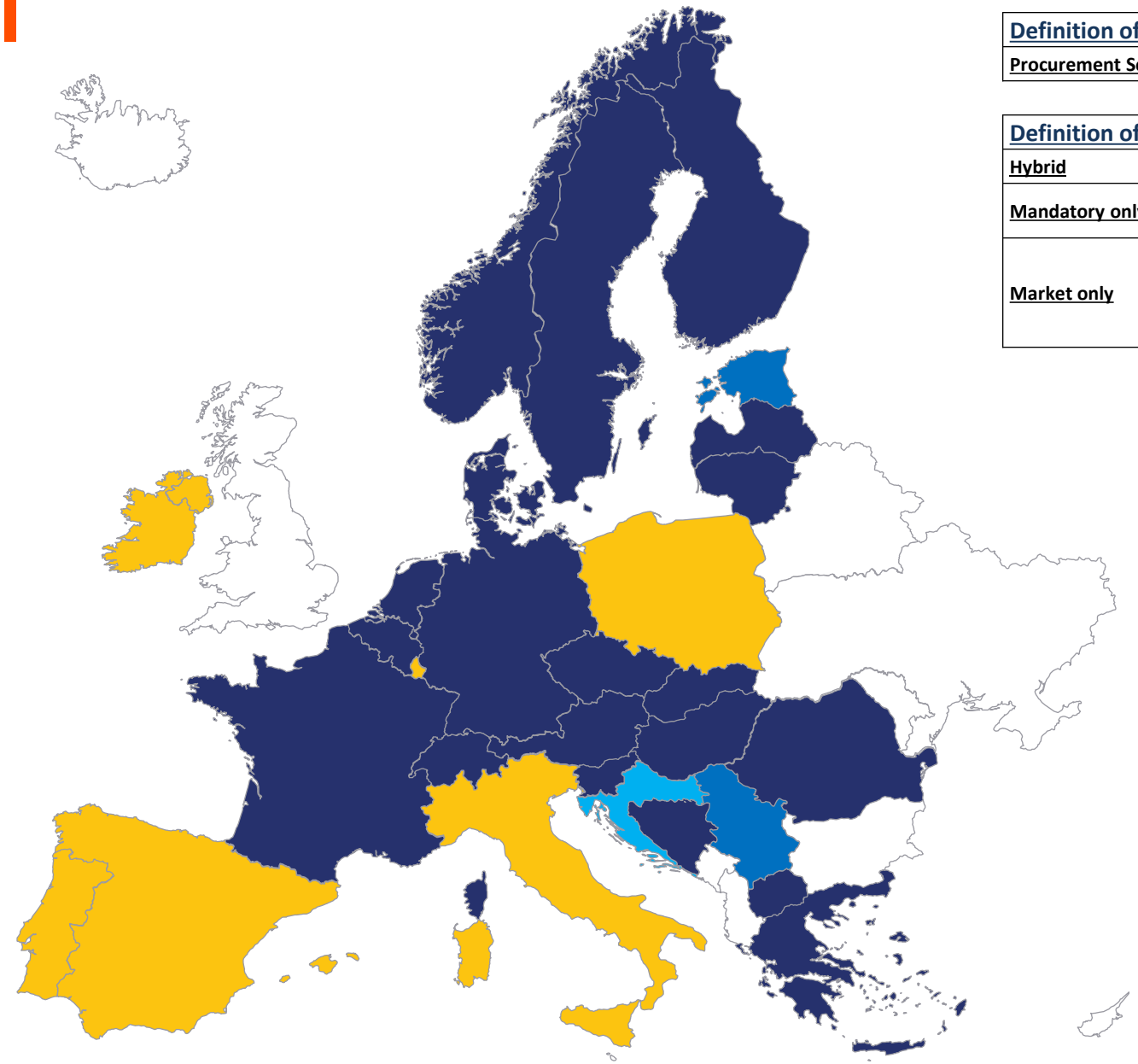
Definition of question	
Activation Purpose	Are activations for other purposes than Balancing (e.g. congestion management) possible?

Using Frequency Restoration Reserve (Manual)?



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.

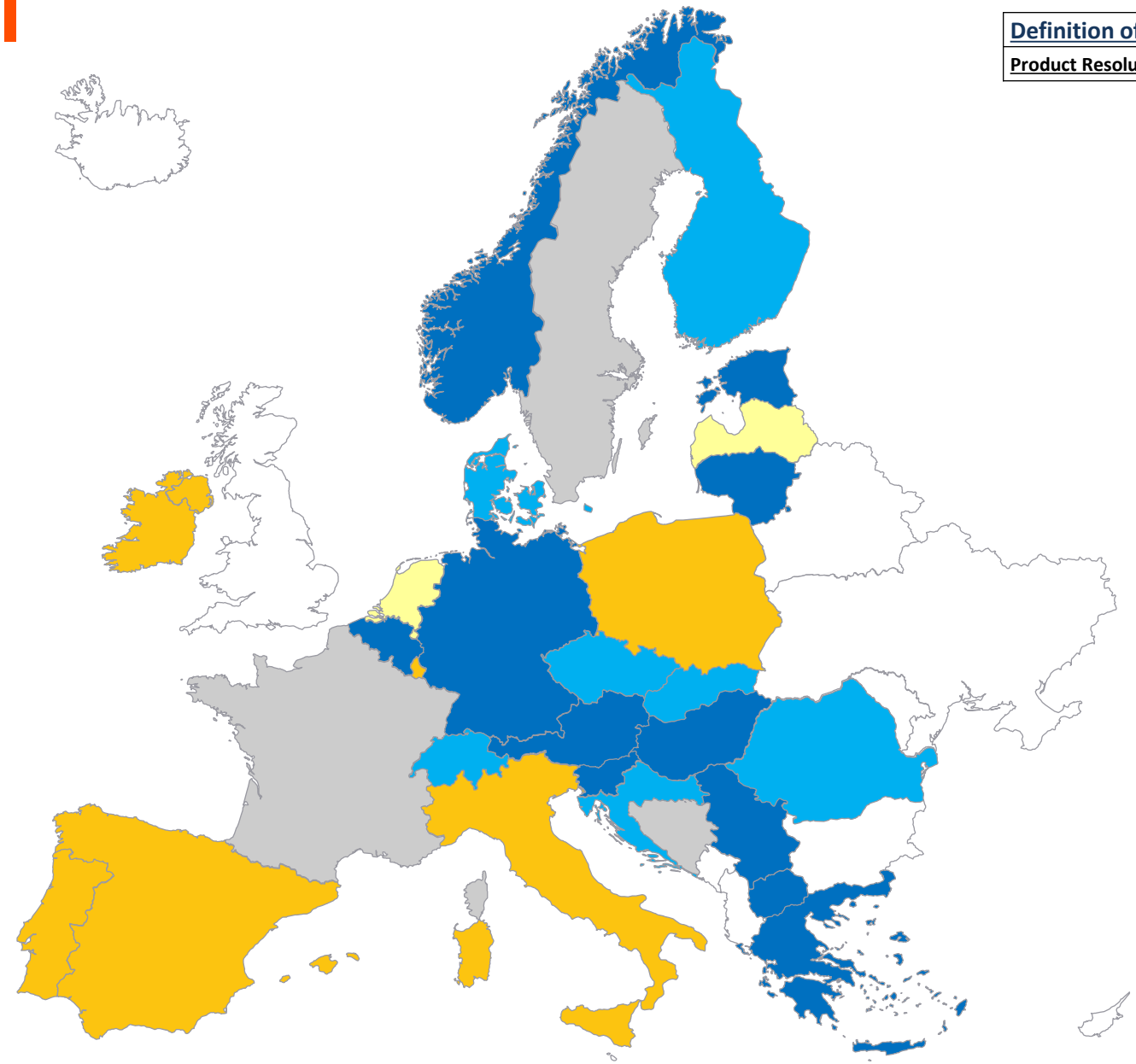
Frequency Restoration Reserve (Manual) - Capacity - Procurement Scheme



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

Definition of answer	
Hybrid	Combination of given options.
Mandatory only	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.
Market only	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.

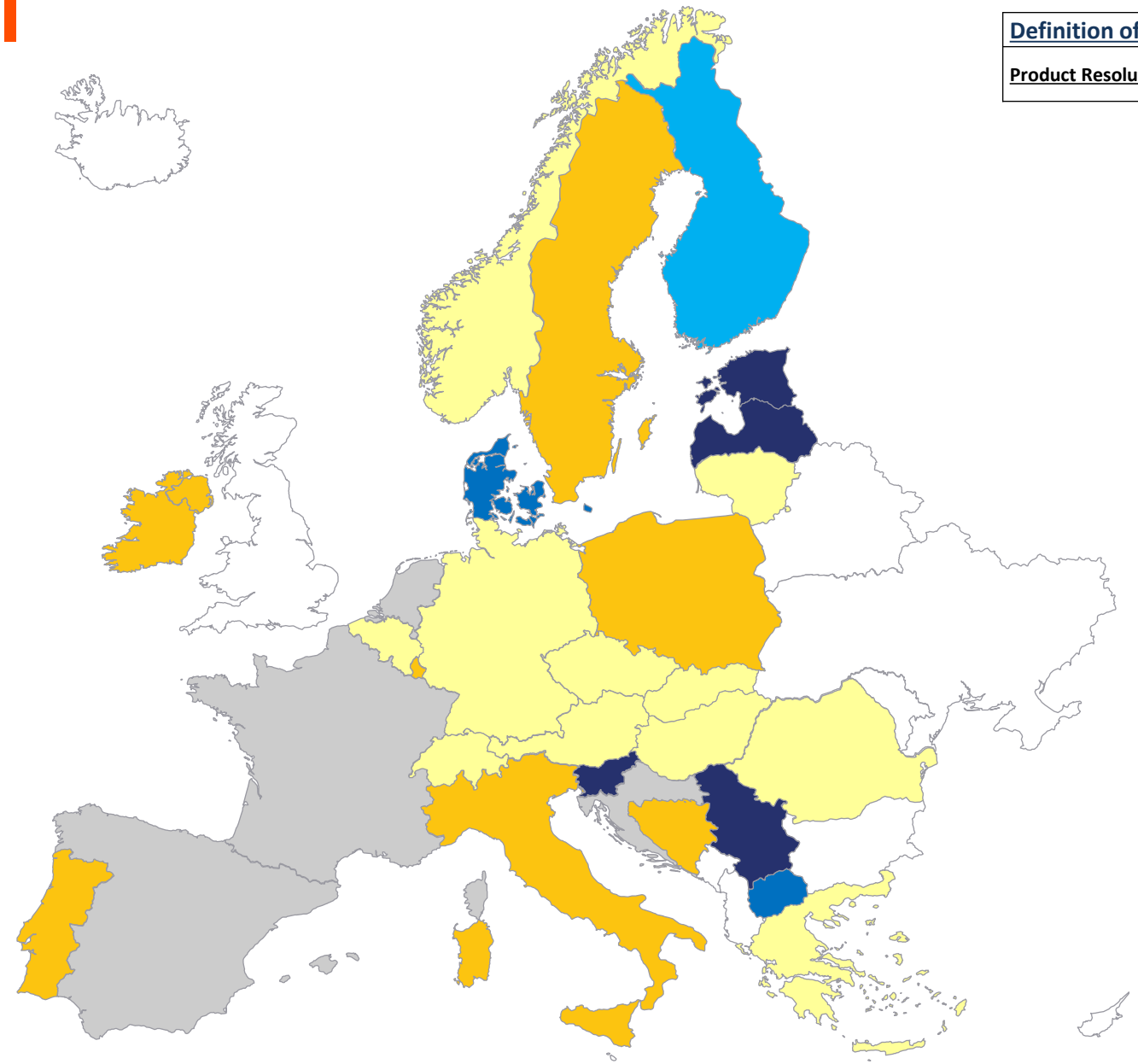
Frequency Restoration Reserve (Manual) - Capacity - Product Resolution (in MW)



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

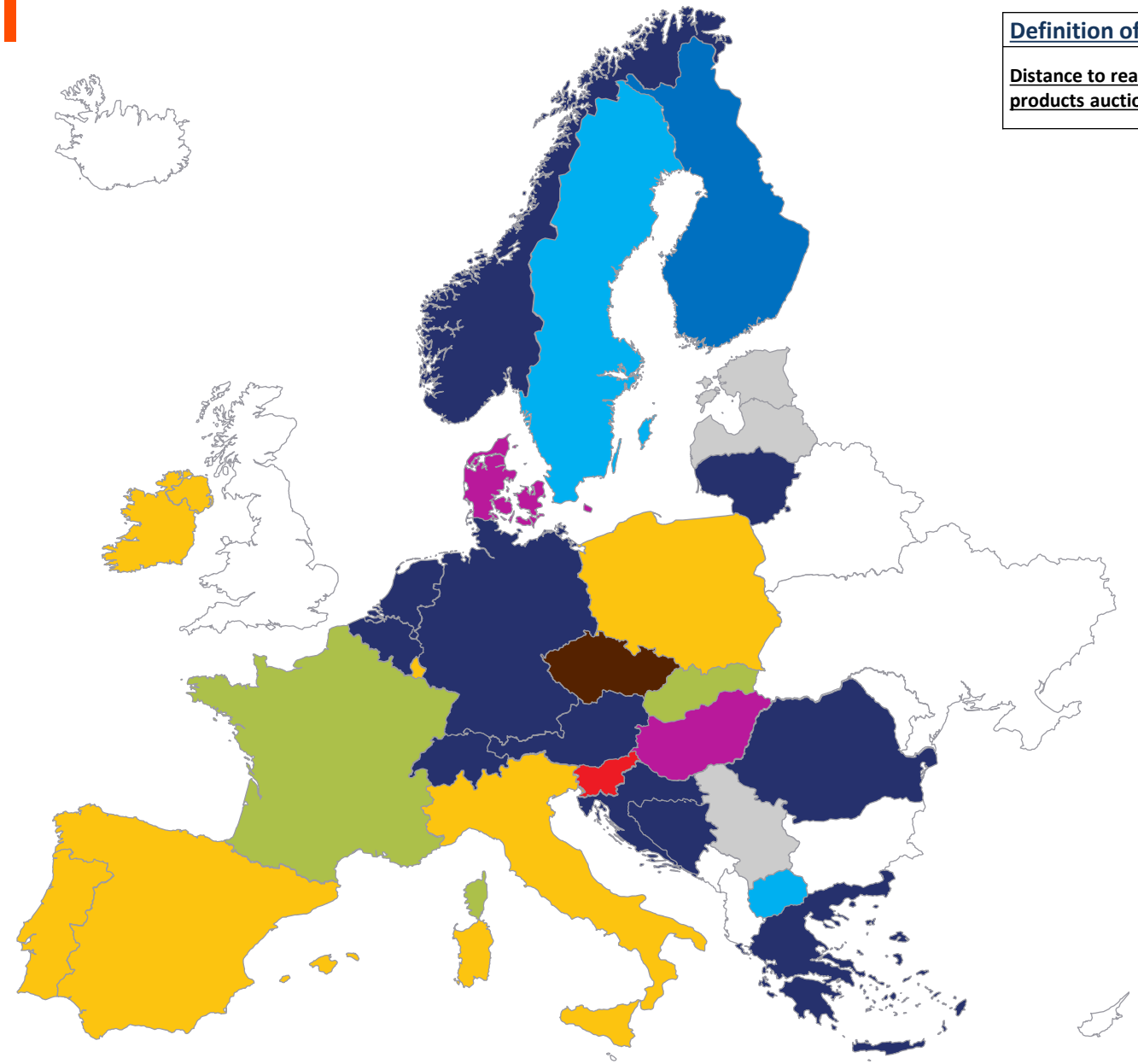
Frequency Restoration Reserve (Manual) - Capacity - Product Resolution (in time)

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).

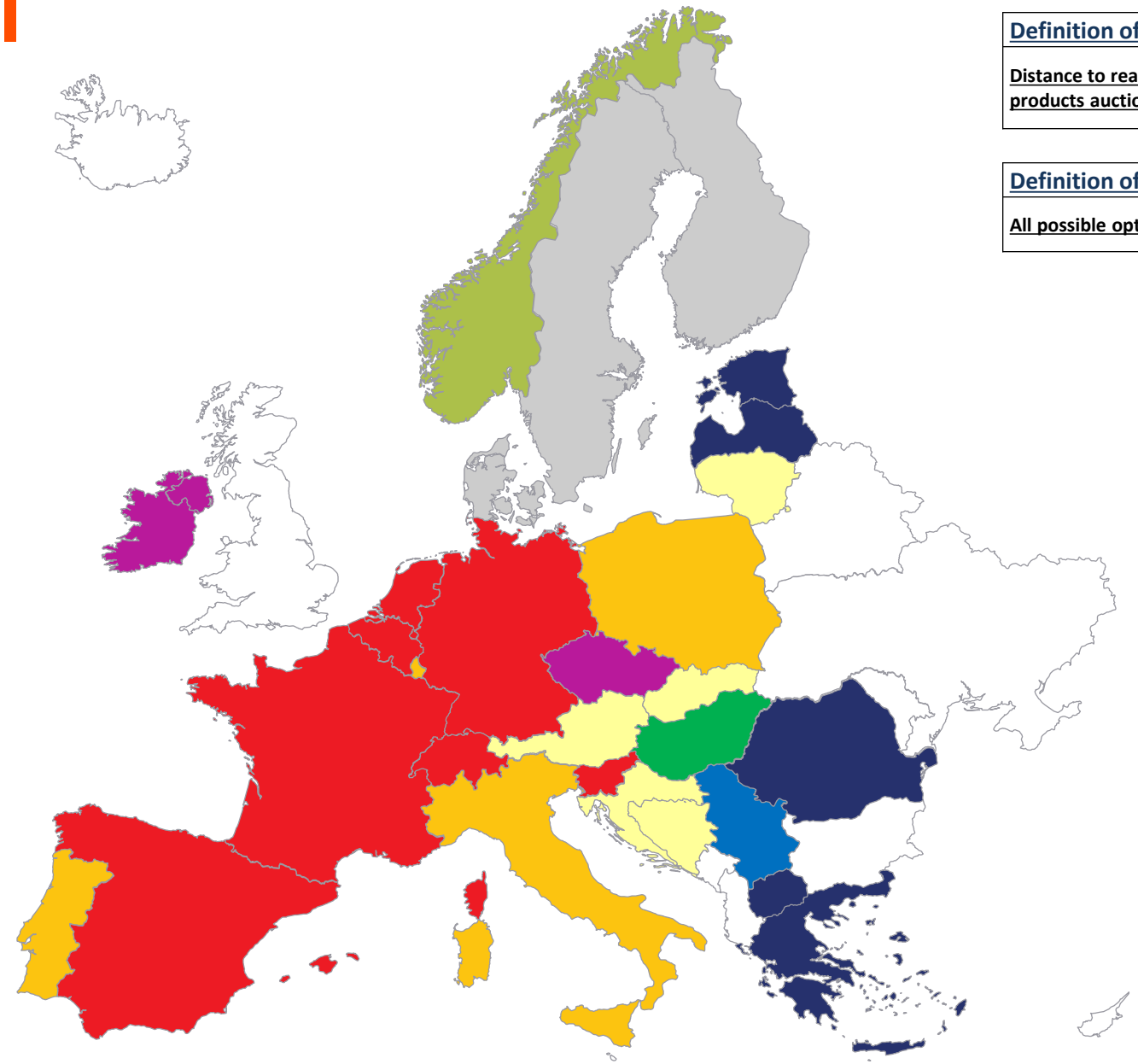


Frequency Restoration Reserve (Manual) - Capacity - Distance to real time of reserve products auctions

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).



Frequency Restoration Reserve (Manual) - Capacity - Provider



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).

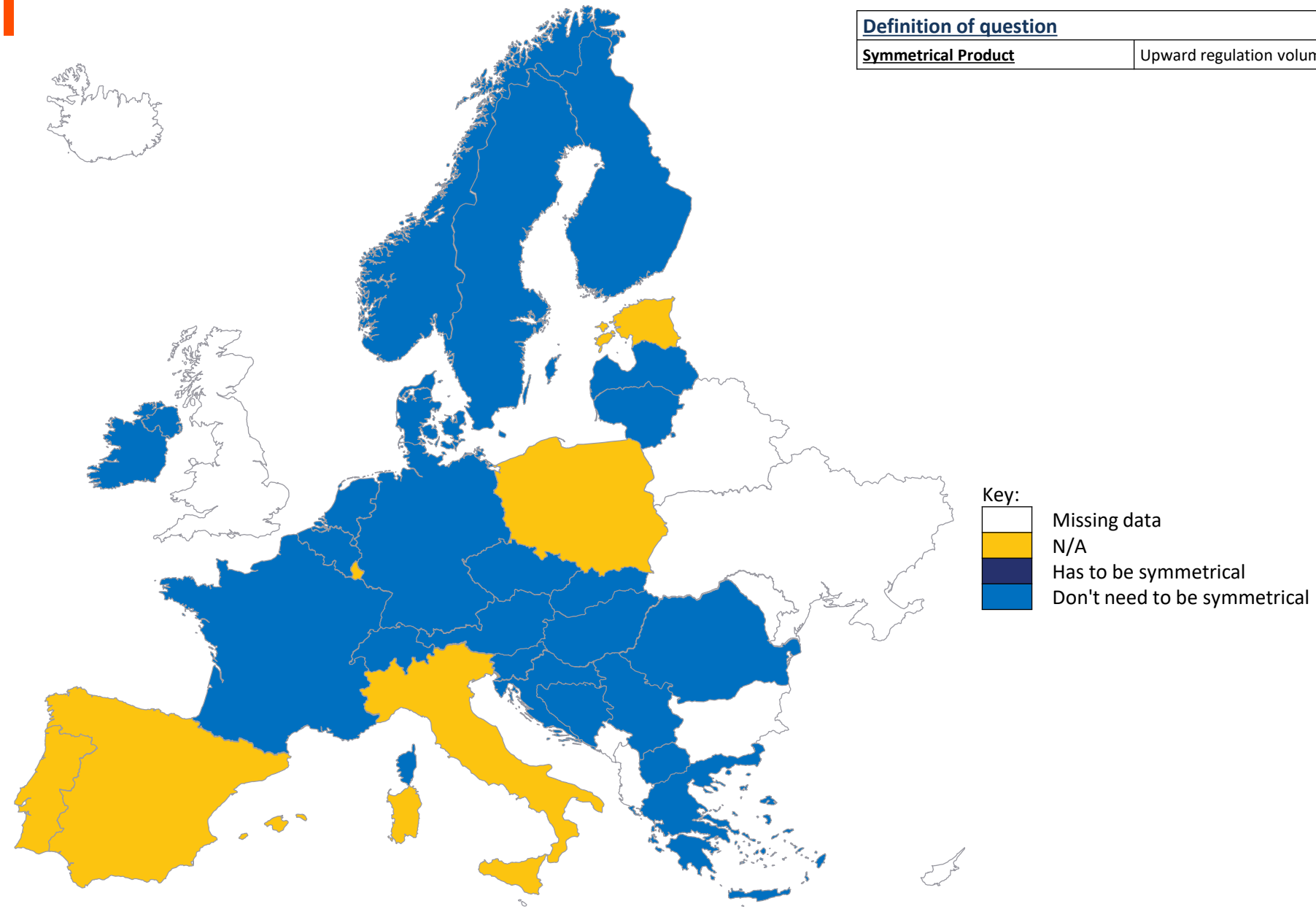
Definition of answer	
All possible options	In this case all possible provider types were chosen (Generator + Demand-side response + Pump Storage + Batteries + Distributed generation)

Key:

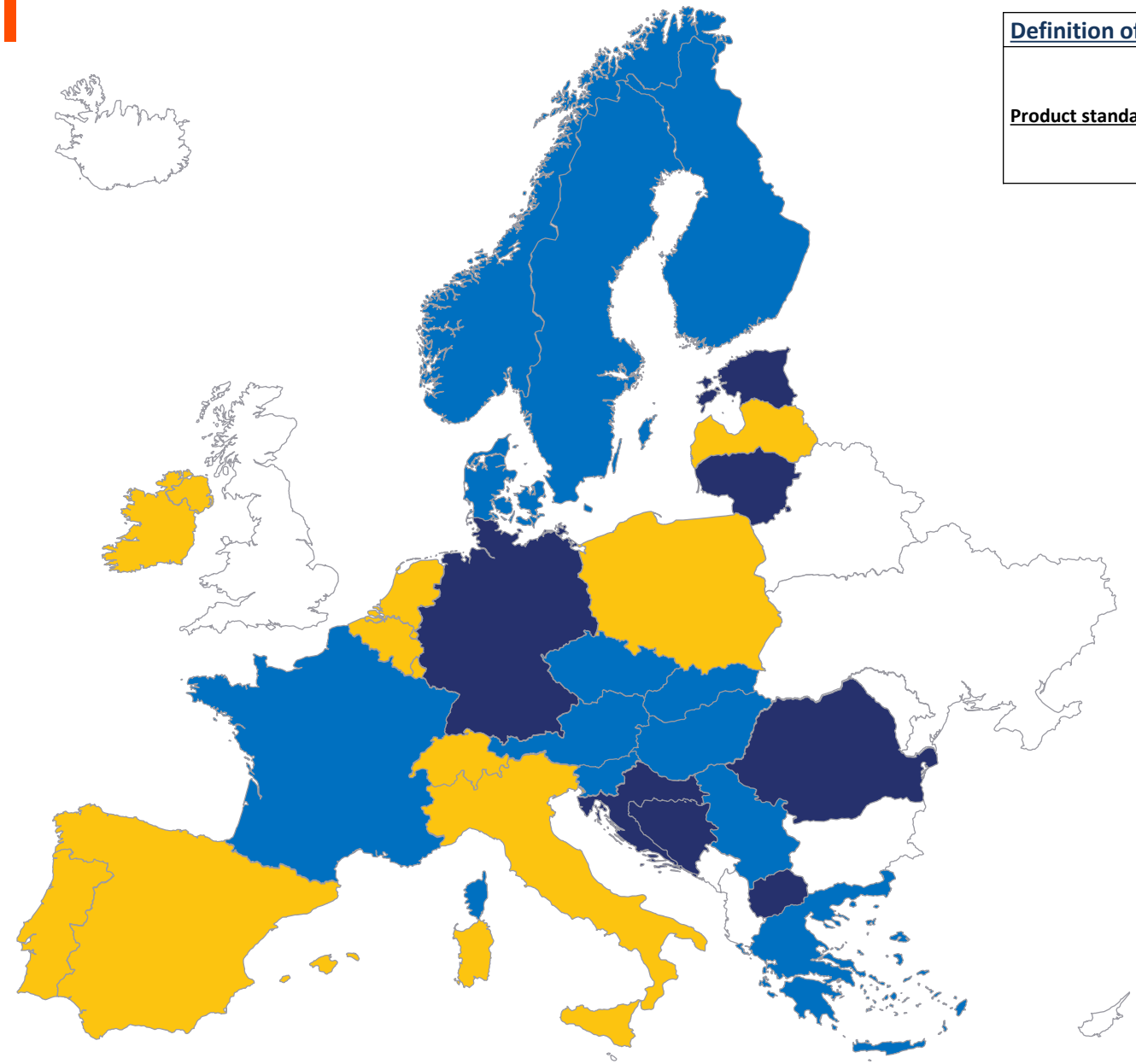
- Missing data
- N/A
- Generators Only
- Generators + Pump Storage
- Generators + Pump Storage + Distributed generation
- Generators + Demand-side response
- Generators + Demand-side response + Pump Storage
- Generators + Demand-side response + Pump Storage + Batteries
- Generators + Demand-side response + Batteries + Distributed generation
- Generators + Demand-side response + Distributed generation
- All possible options

Frequency Restoration Reserve (Manual) - Capacity - Symmetrical Product

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

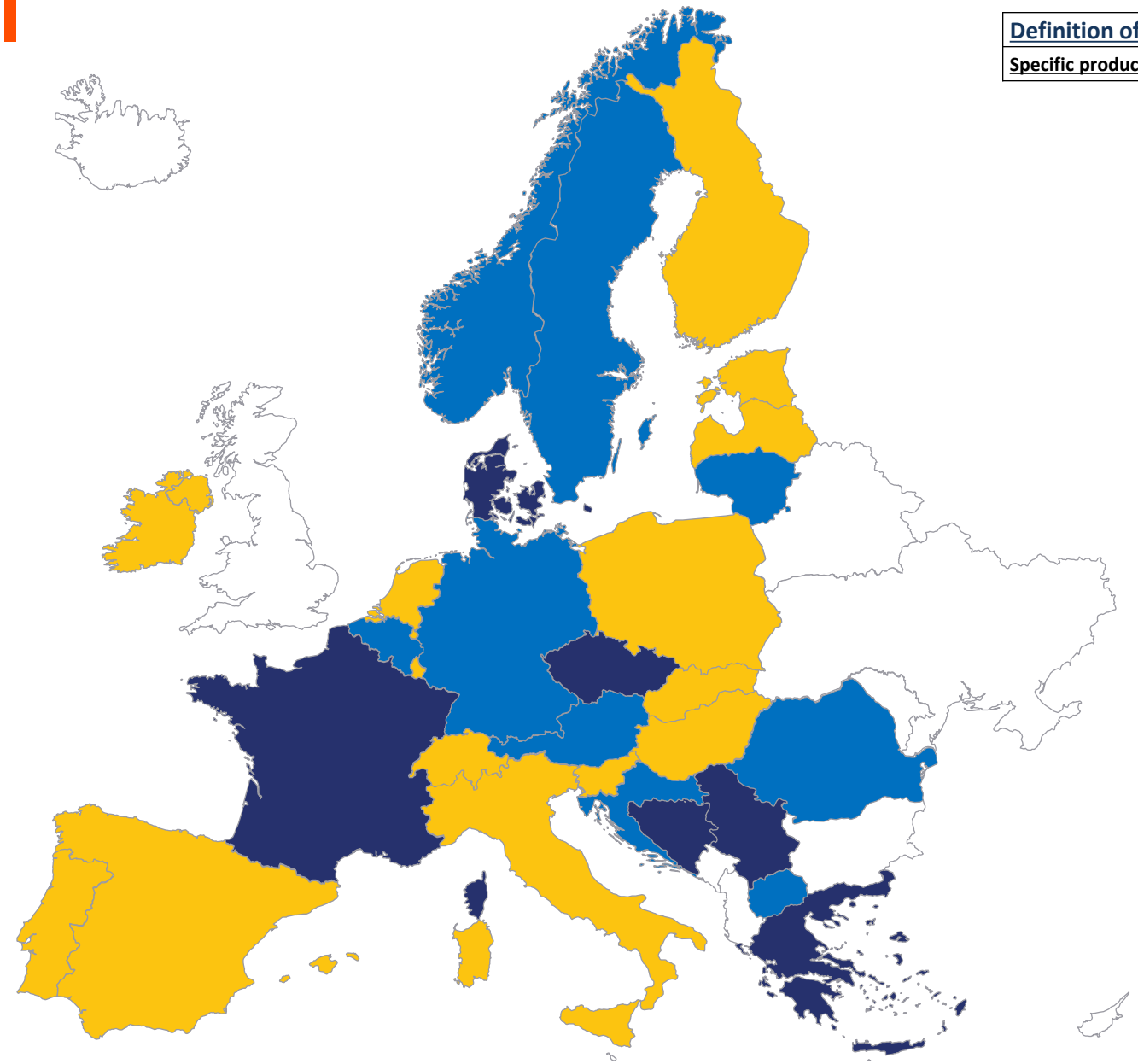


Frequency Restoration Reserve (Manual) – Capacity – Is product standardisation finished?



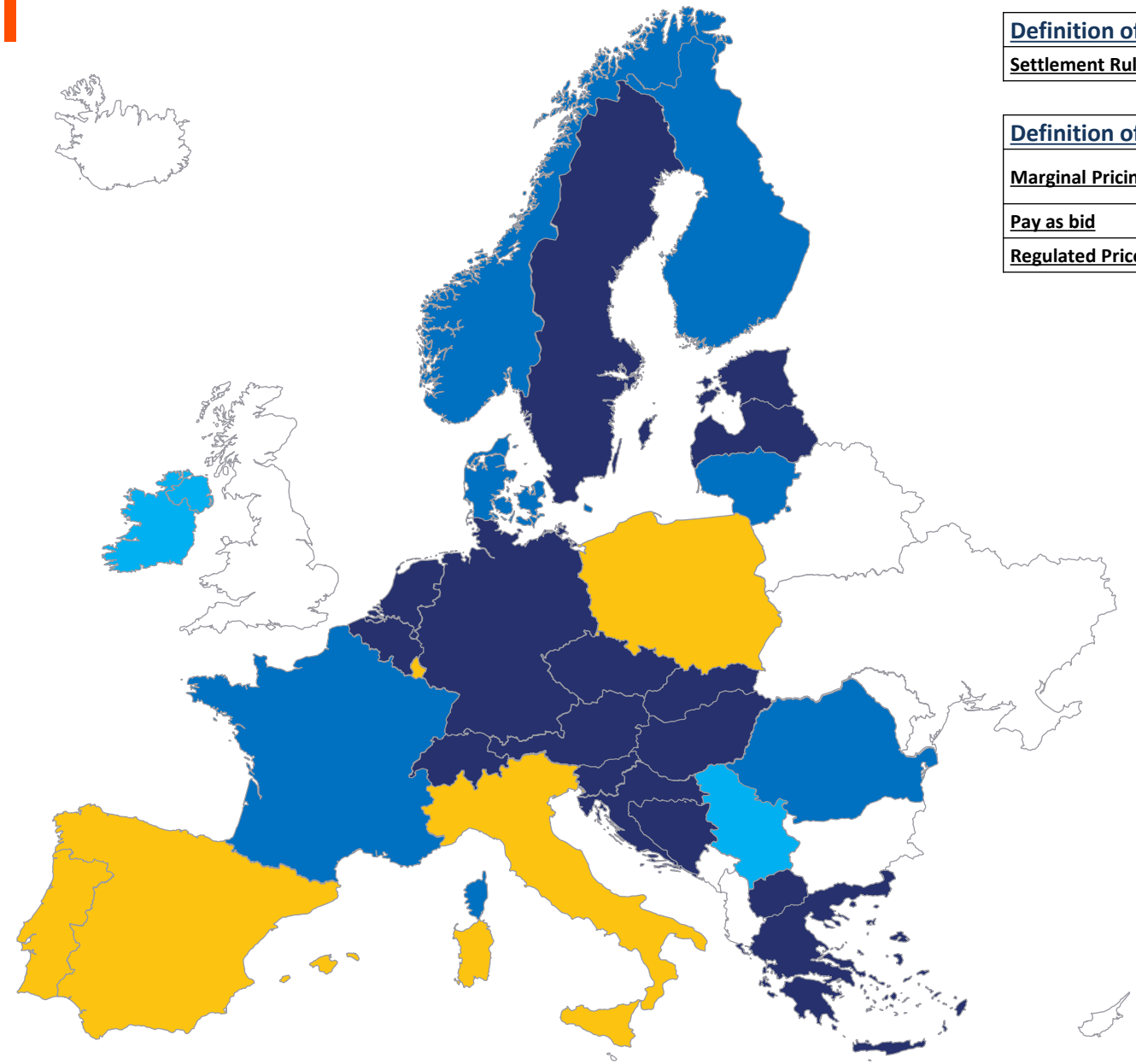
Definition of answer	
Product standardisation	EB Regulation defines only two products: standard products in Article 25 and specific products in Article 26. Standardisation process is finished if TSO implemented standard capacity balancing product(s) in line with Annex of the SPBC methodology or if national NRA approved usage of the specific product in line with national process and Article 26 of the EB Regulation.

Frequency Restoration Reserve (Manual) – Capacity – Using specific products?



Definition of answer	
Specific product	Specific product implemented in line with Article 26 of the EB Regulation.

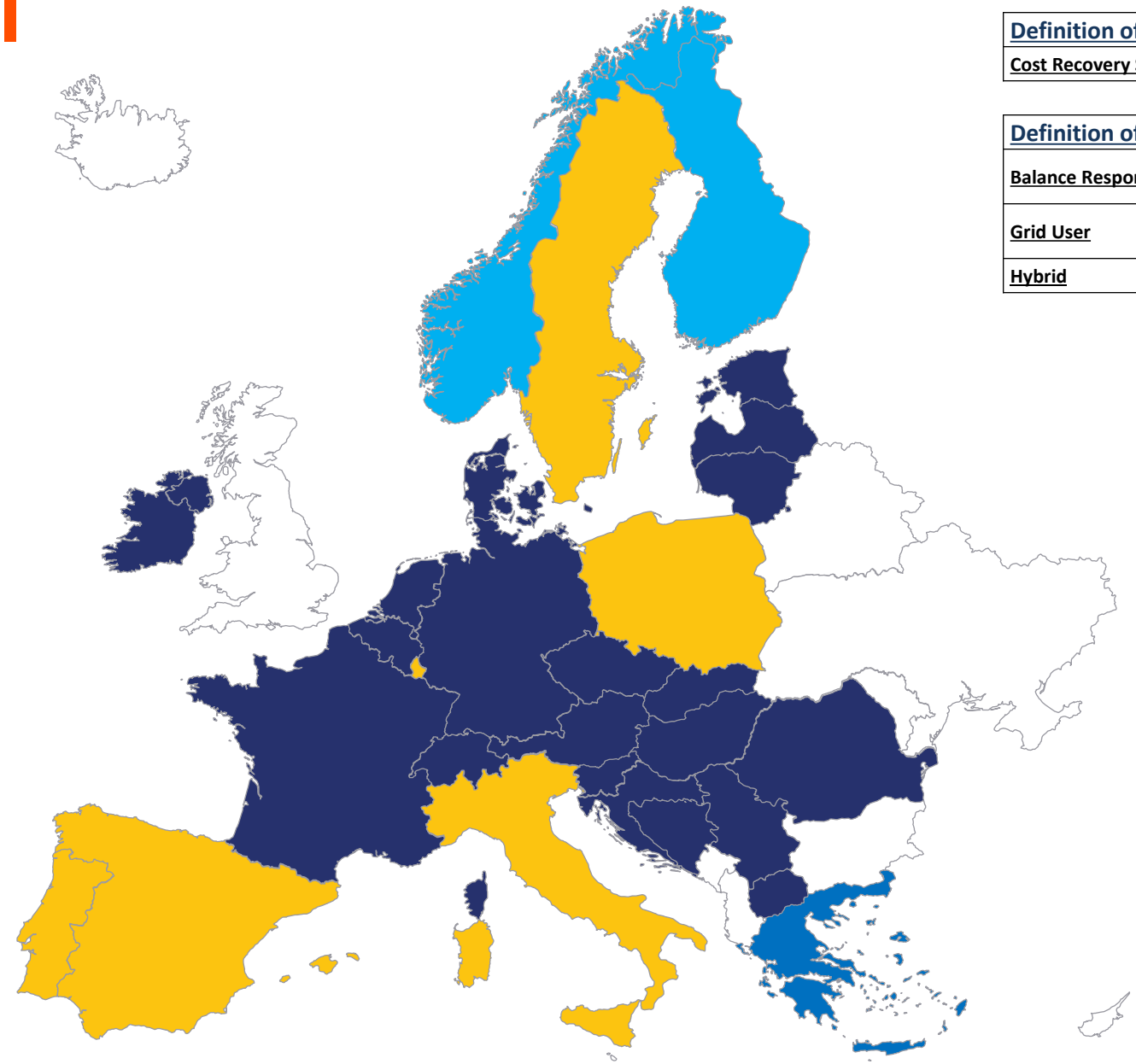
Frequency Restoration Reserve (Manual) - Capacity - Settlement Rule



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.

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

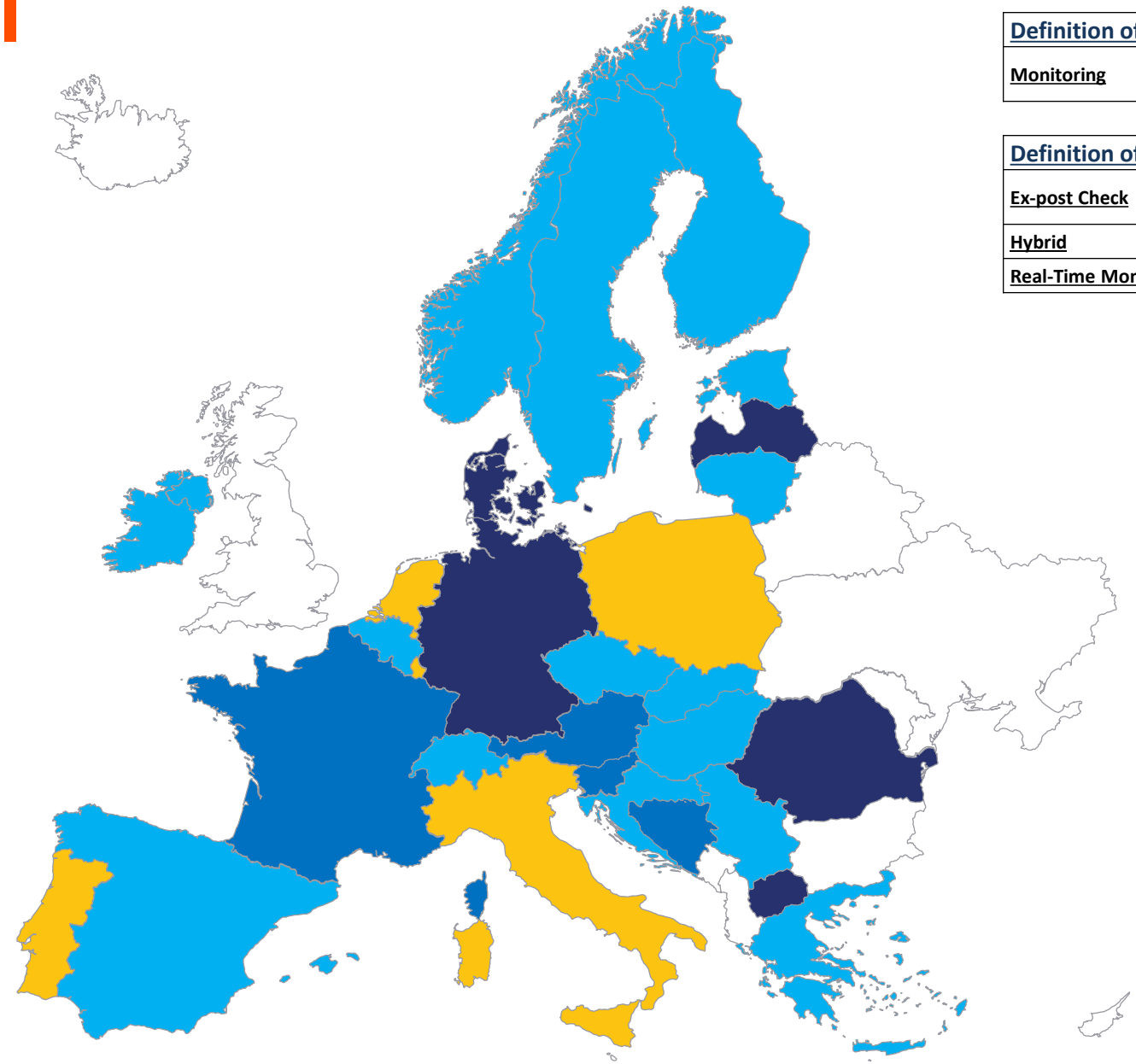


Key:
- Missing data
- N/A
- 100% Grid Users (through tariff)
- 100% BRP
- Hybrid

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 of given options.

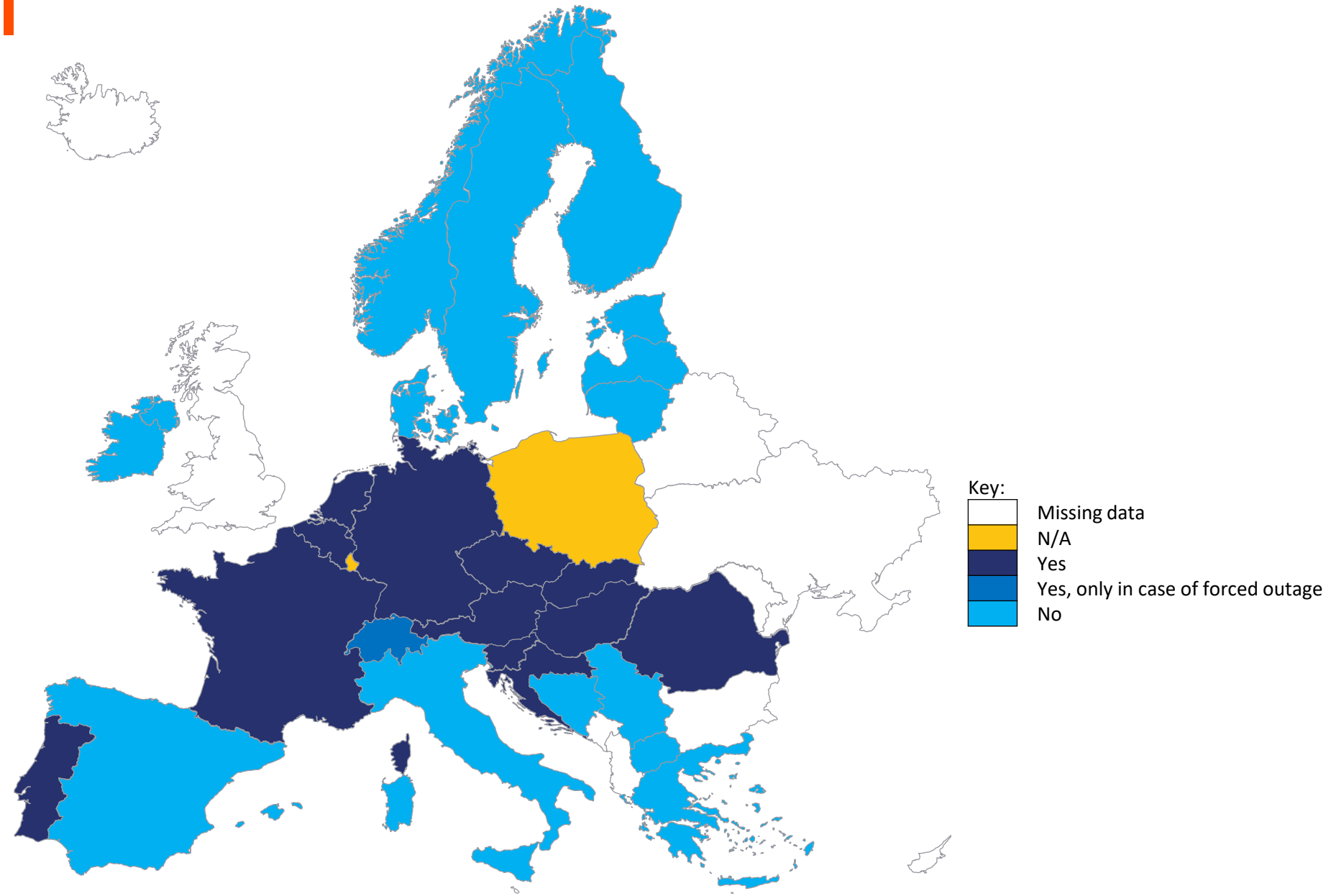
Frequency Restoration Reserve (Manual) - Capacity - Monitoring



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

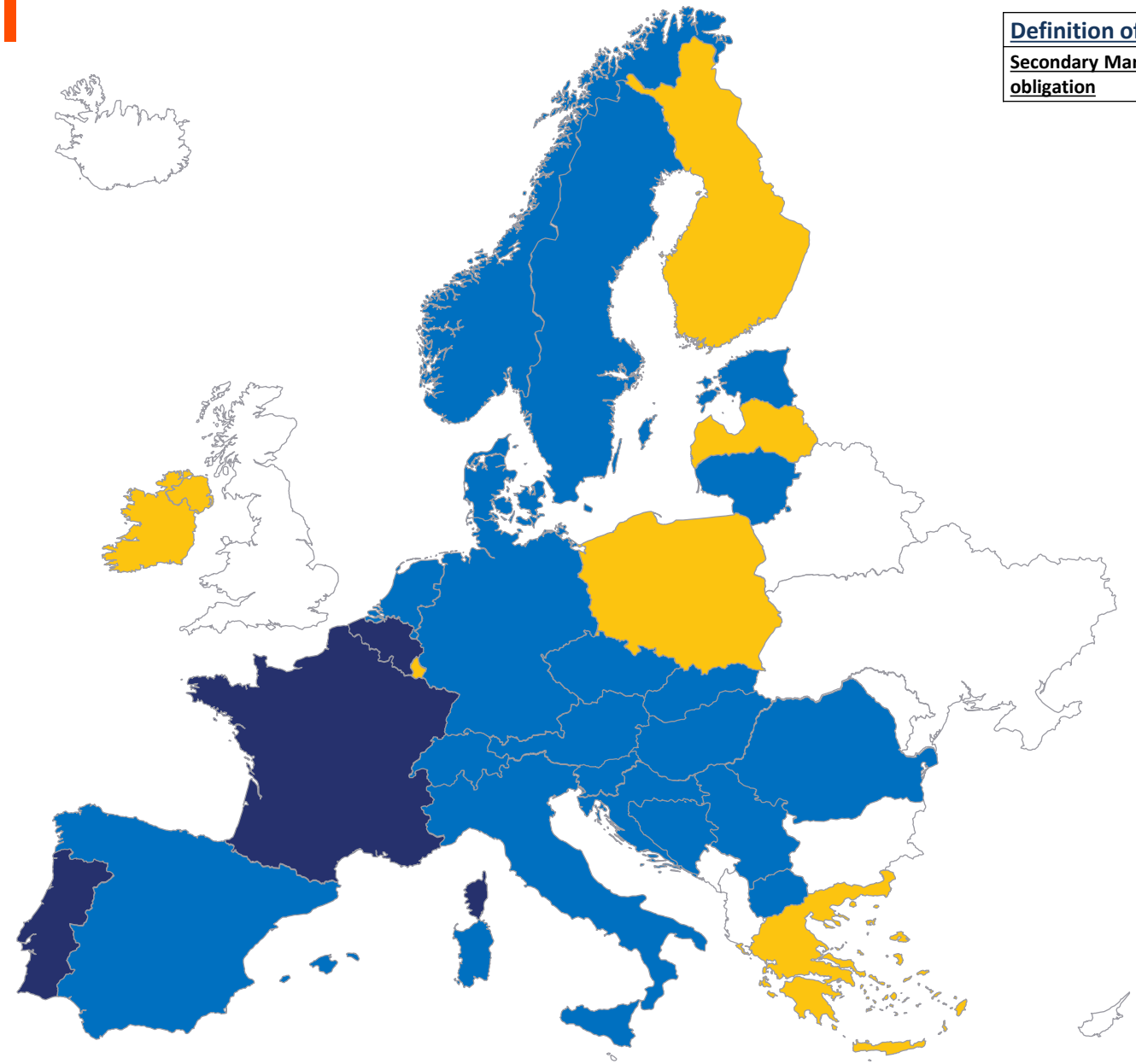
Definition of answer	
Ex-post Check	When the monitoring of performance of plant carried out 24 hours after the delivery period.
Hybrid	Combination of given options.
Real-Time Monitoring	Monitoring of delivery of ancillary services in real time.

Frequency Restoration Reserve (Manual) - Capacity - Transfer of BSPs obligation allowed

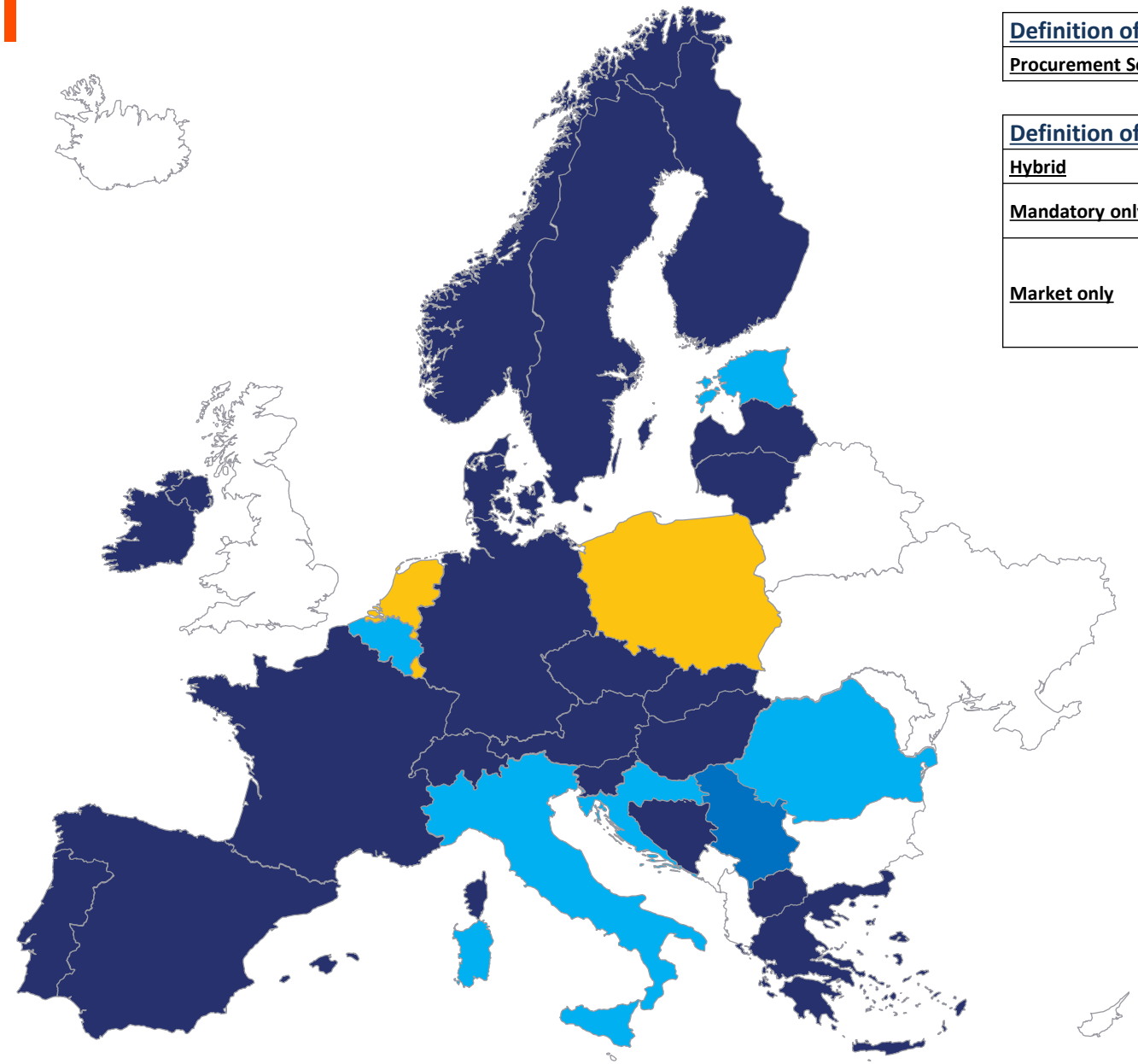


Frequency Restoration Reserve (Manual) - Capacity - In case transfer obligation is allowed, is there an organised secondary market?

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.



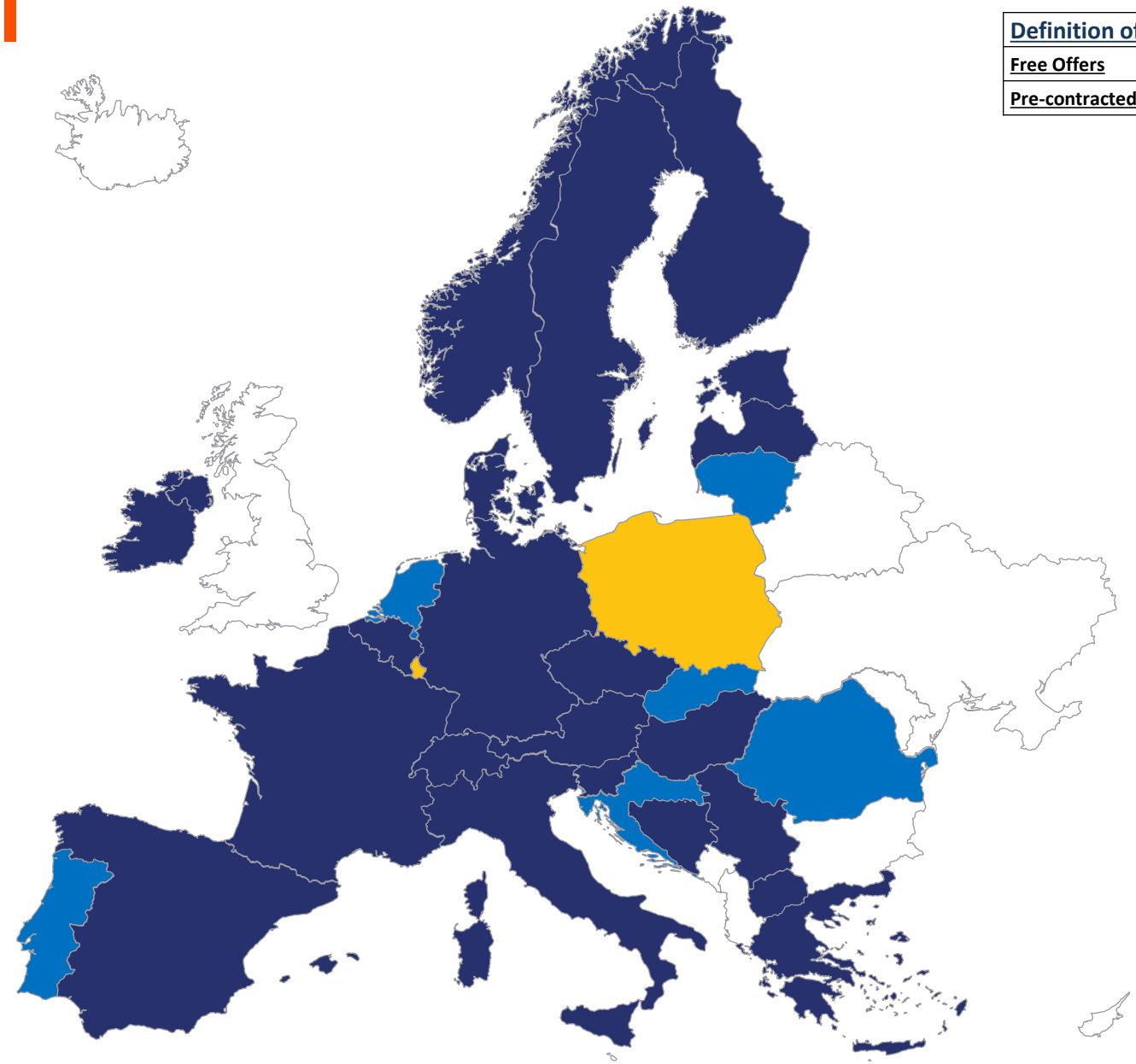
Frequency Restoration Reserve (Manual) - Energy - Procurement Scheme



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

Definition of answer	
Hybrid	Combination of given options.
Mandatory only	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.
Market only	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.

Frequency Restoration Reserve (Manual) - Energy - Free Bids allowed

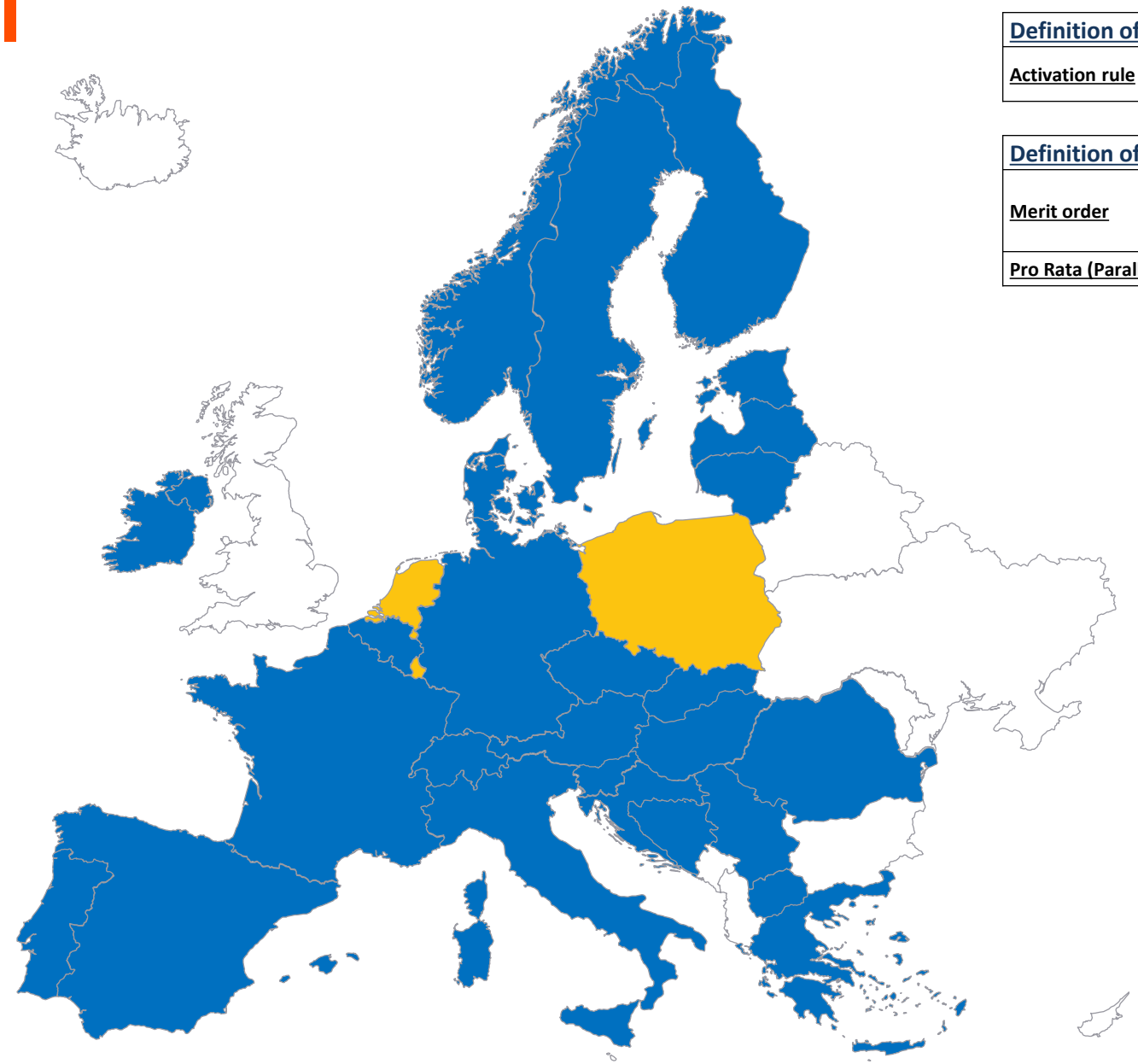


Definition of question	
Free Offers	Possibility to offer balancing energy bids without a contract for Balancing Capacity
Pre-contracted	BSP has sold/procured Balancing Capacity to TSO.

Key:

- Missing data
- N/A
- Yes
- No
- No, there is no mFRR balancing energy market

Frequency Restoration Reserve (Manual) - Energy - Activation Rule

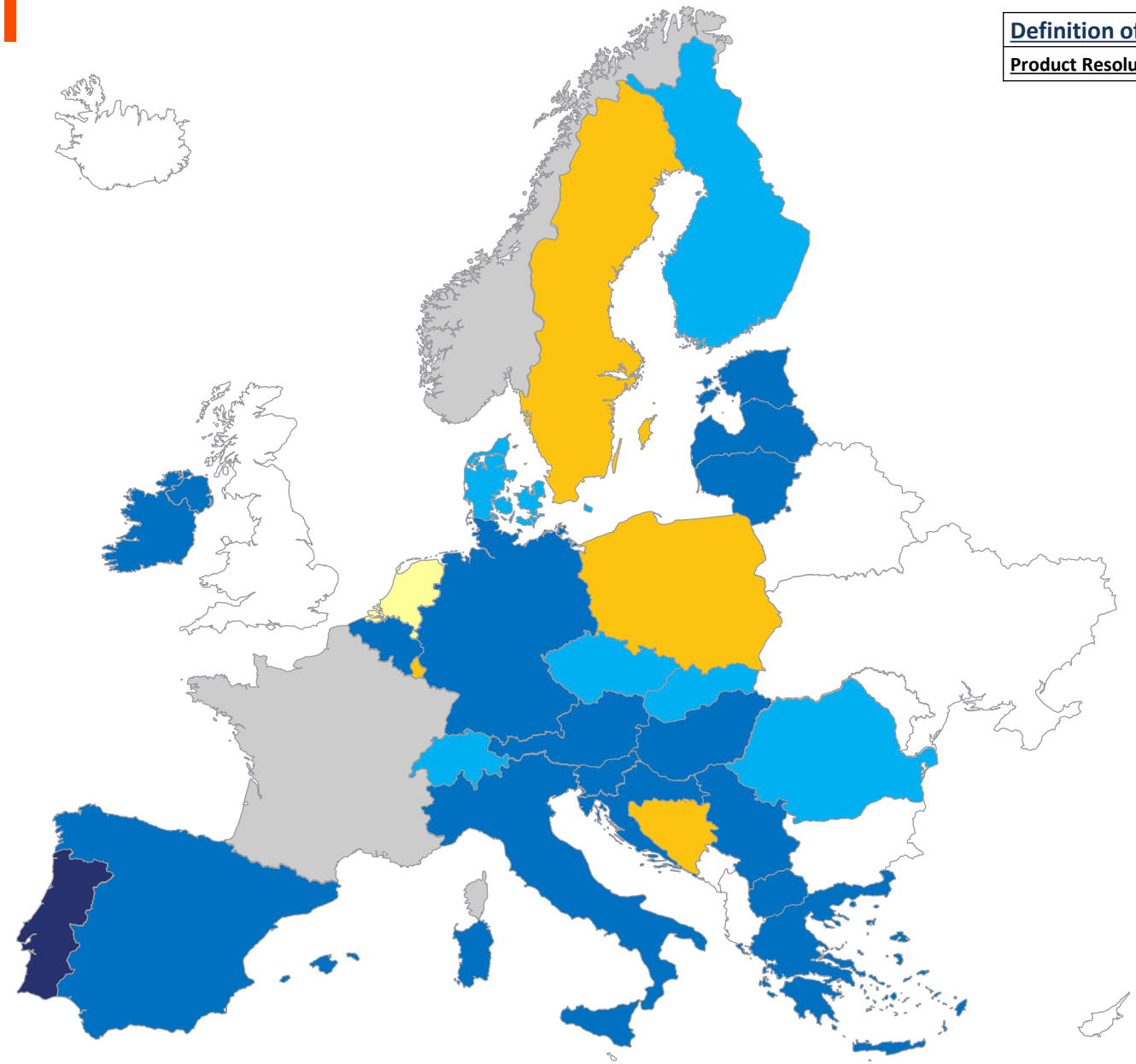


Key:
- Missing data
- N/A
- Pro Rata (Parallel Activation)
- Merit order

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).

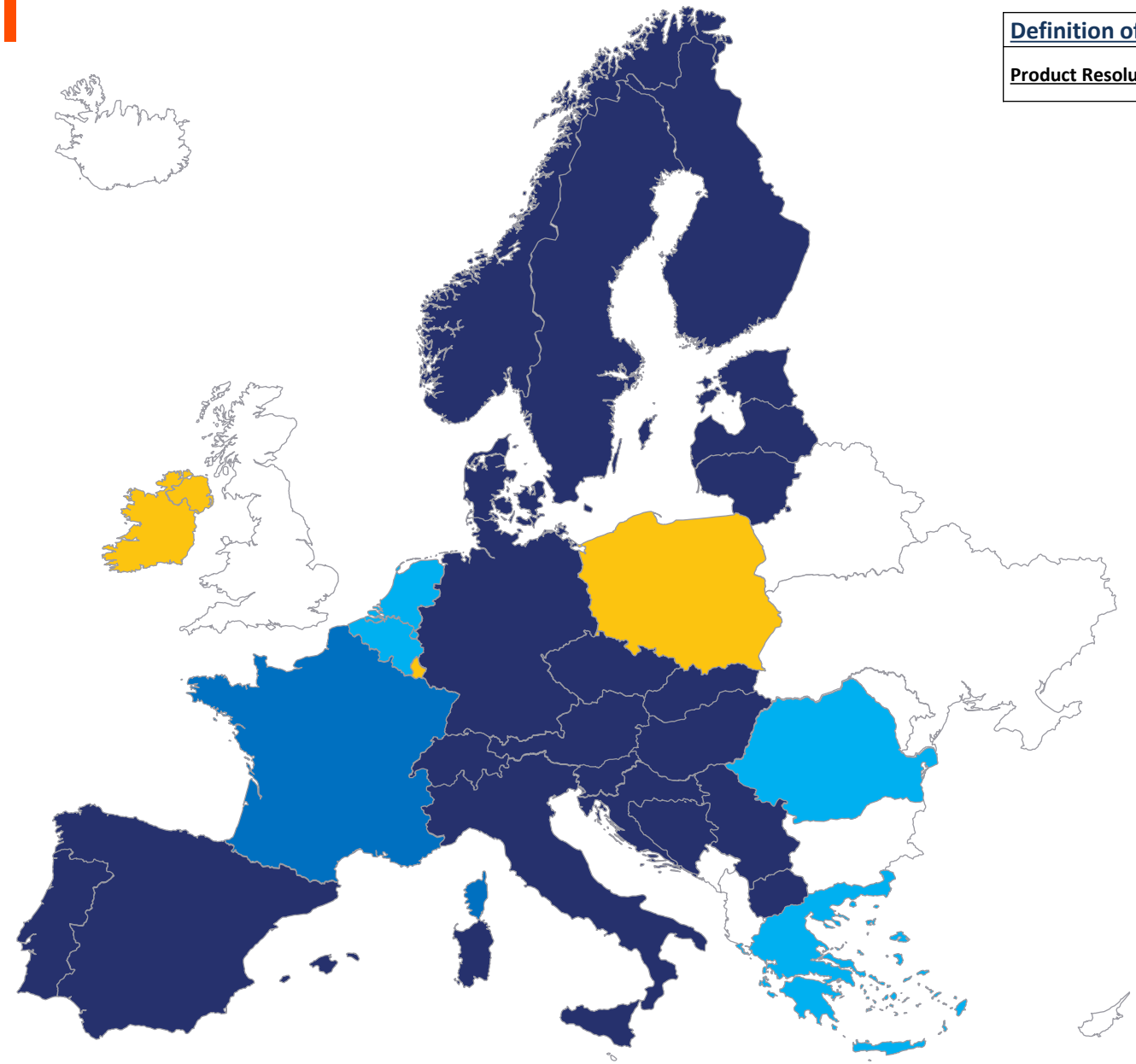
Definition of answer	
Merit order	A merit order is a way of ranking available sources of energy in ascending order of their short run marginal costs of production, so that those with the lowest marginal costs are the first ones to be brought online to meet demand.
Pro Rata (Parallel Activation)	All bids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

Frequency Restoration Reserve (Manual) - Energy - Product Resolution (in MW)



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

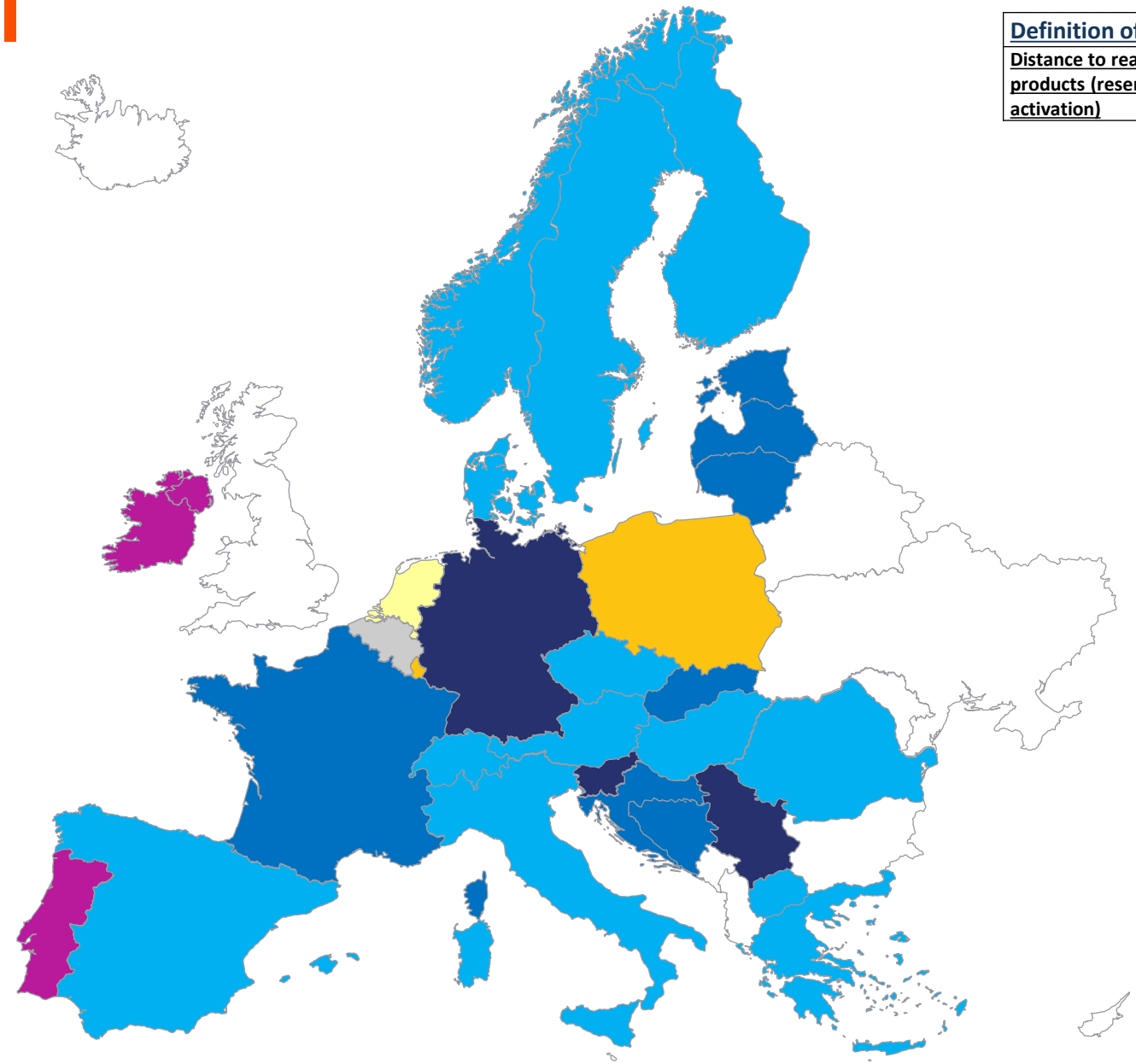
Frequency Restoration Reserve (Manual) - Energy - Product Resolution (in time)



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).

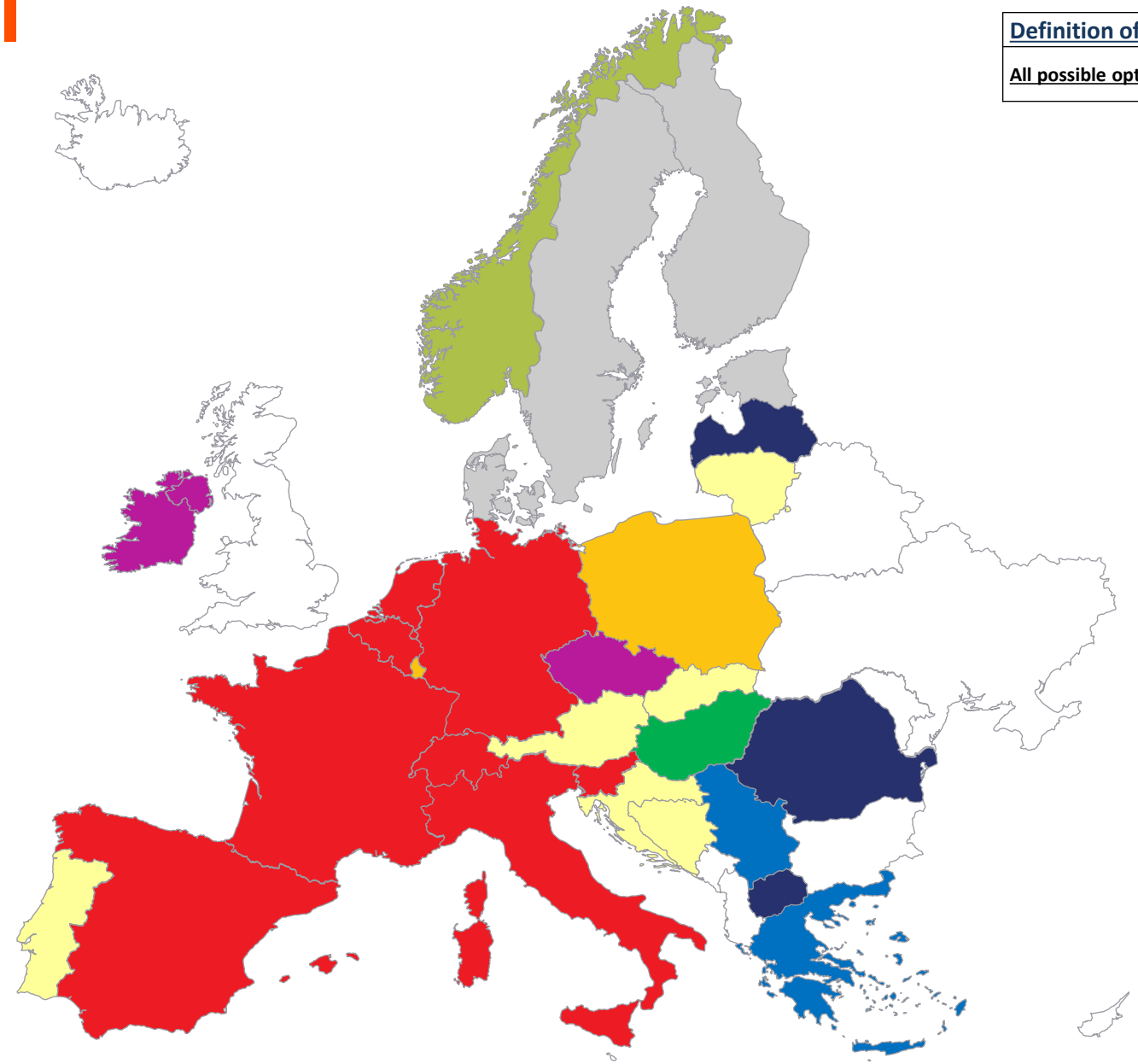
Frequency Restoration Reserve (Manual) - Energy - Distance to real time of energy products

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).



Frequency Restoration Reserve (Manual) - Energy - Provider

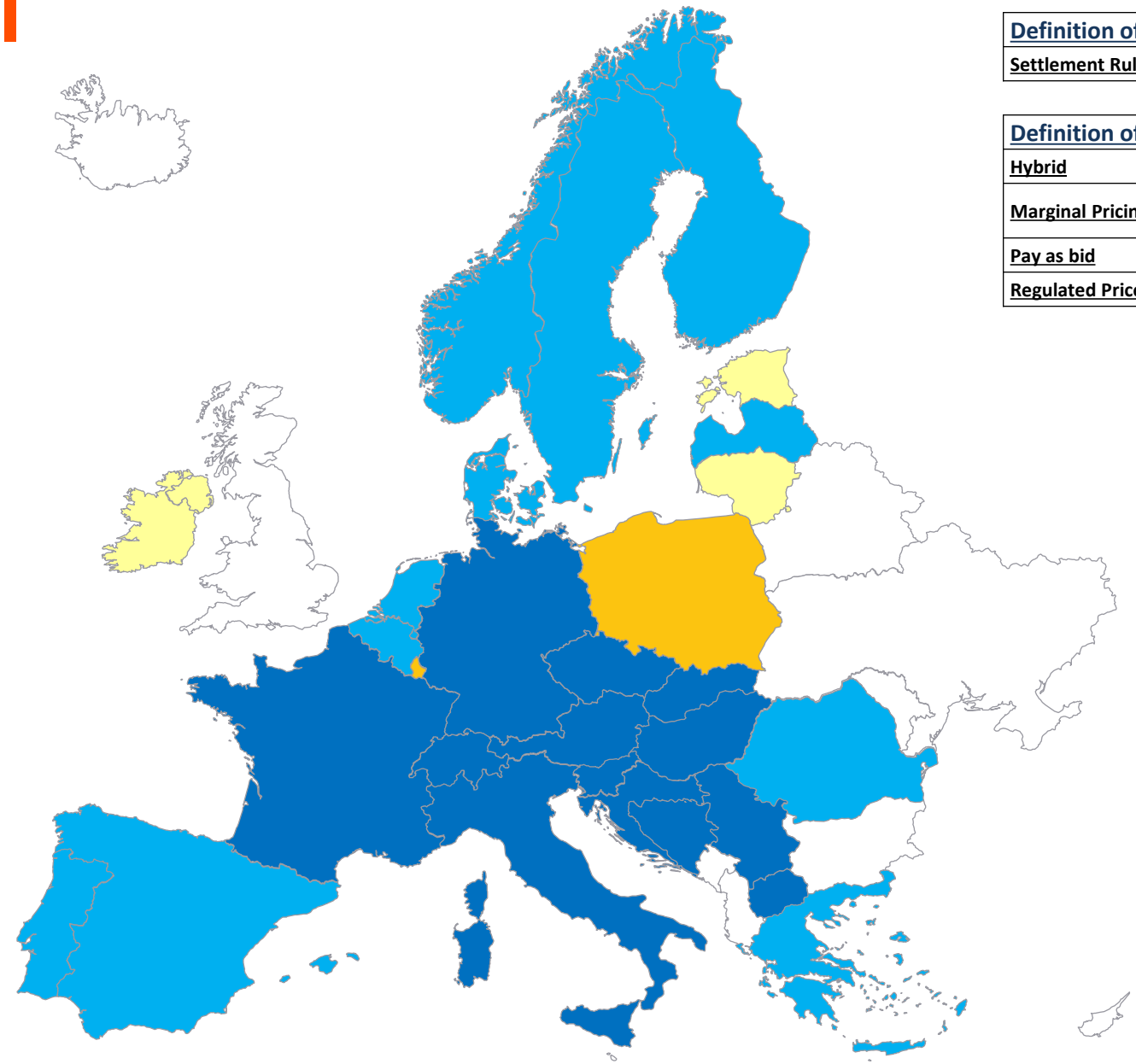
Definition of answer	
All possible options	In this case all possible provider types were chosen (Generator + Demand-side response + Pump Storage + Batteries + Distributed generation)



Key:

- Missing data
- N/A
- Generators Only
- Generators + Pump Storage
- Generators + Pump Storage + Distributed generation
- Generators + Demand-side response
- Generators + Demand-side response + Pump Storage
- Generators + Demand-side response + Pump Storage + Batteries
- Generators + Demand-side response + Batteries + Distributed generation
- Generators + Demand-side response + Distributed generation
- All possible options

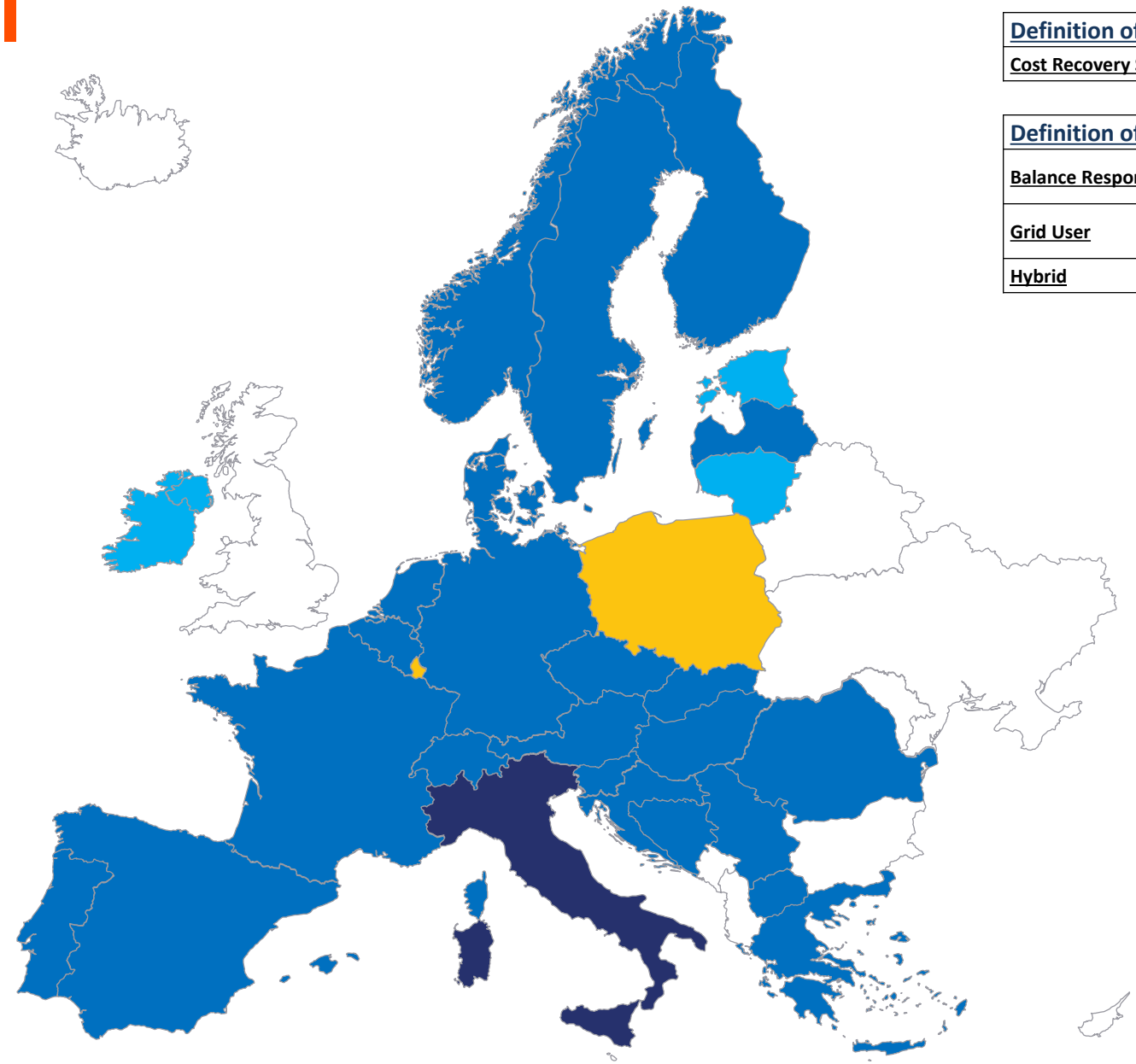
Frequency Restoration Reserve (Manual) - Energy - Settlement Rule



Definition of question	
Settlement Rule	The pricing rules for settlement.

Definition of answer	
Hybrid	Combination of given options.
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.

Frequency Restoration Reserve (Manual) - Energy - Cost Recovery Scheme

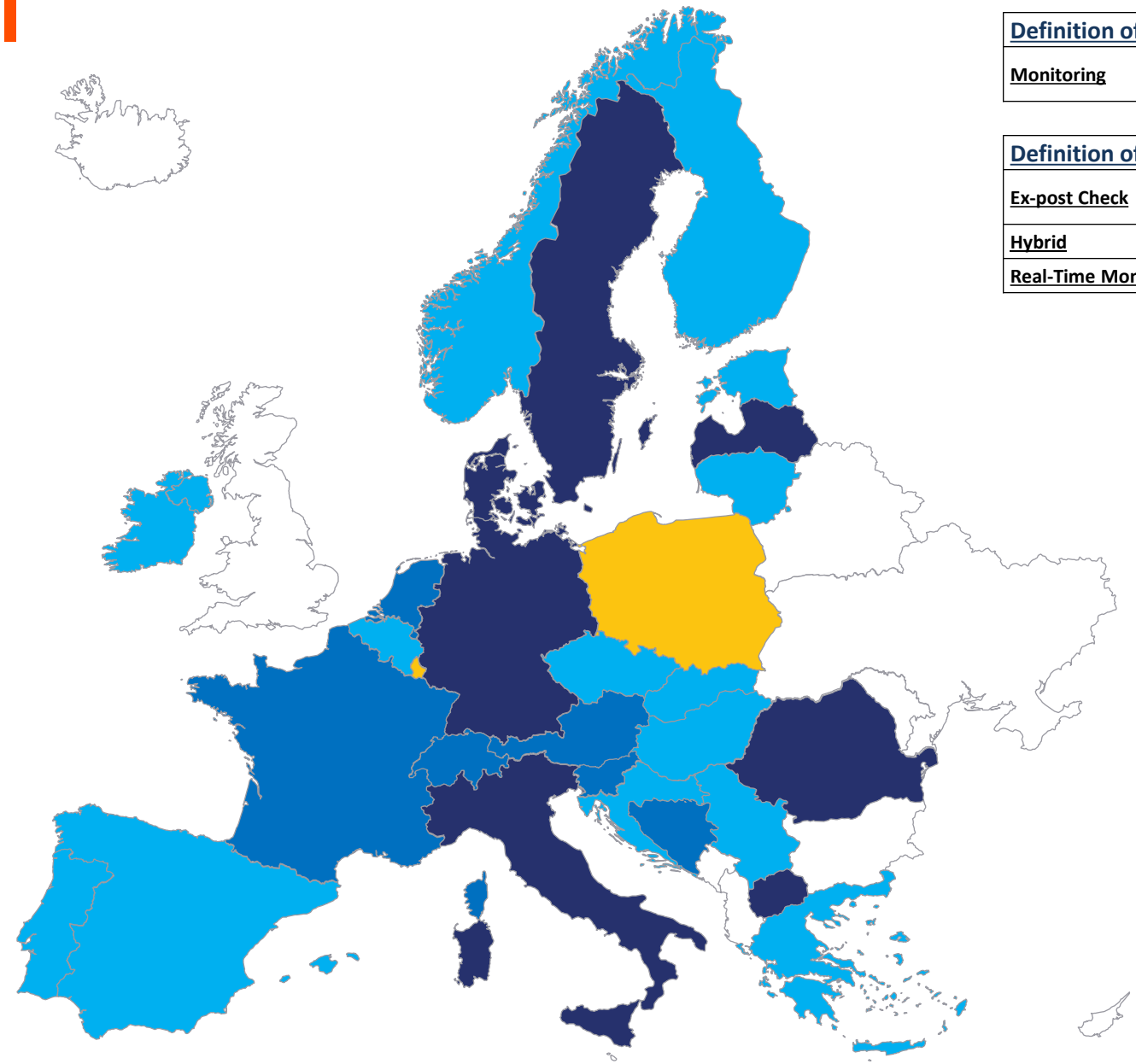


Key:
- Missing data
- N/A
- 100% Grid Users (through tariff)
- 100% BRP
- Hybrid

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 of given options.

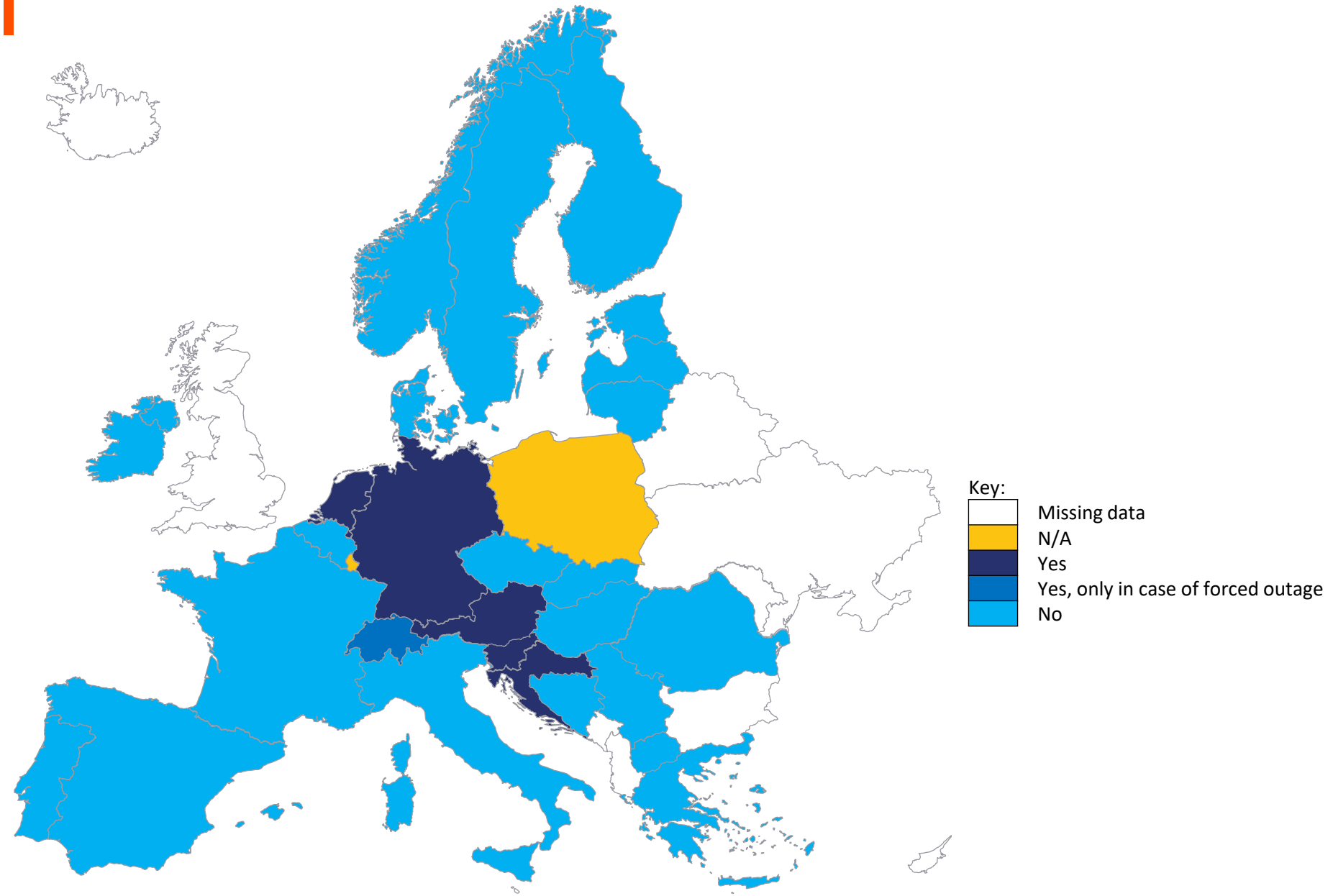
Frequency Restoration Reserve (Manual) - Energy - Monitoring



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

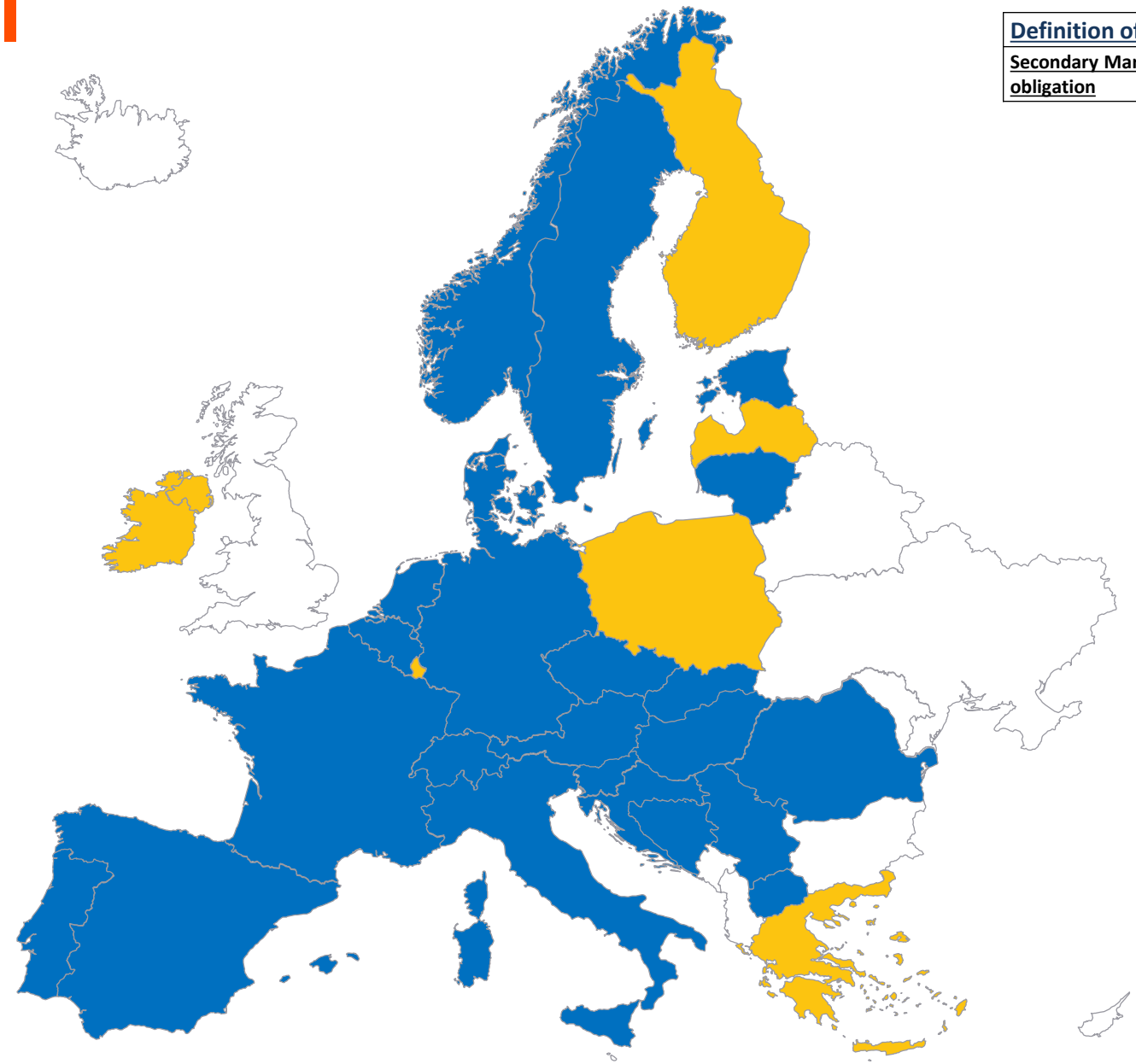
Definition of answer	
Ex-post Check	When the monitoring of performance of plant carried out 24 hours after the delivery period.
Hybrid	Combination of given options.
Real-Time Monitoring	Monitoring of delivery of ancillary services in real time.

Frequency Restoration Reserve (Manual) - Energy - Transfer of BSPs obligation allowed

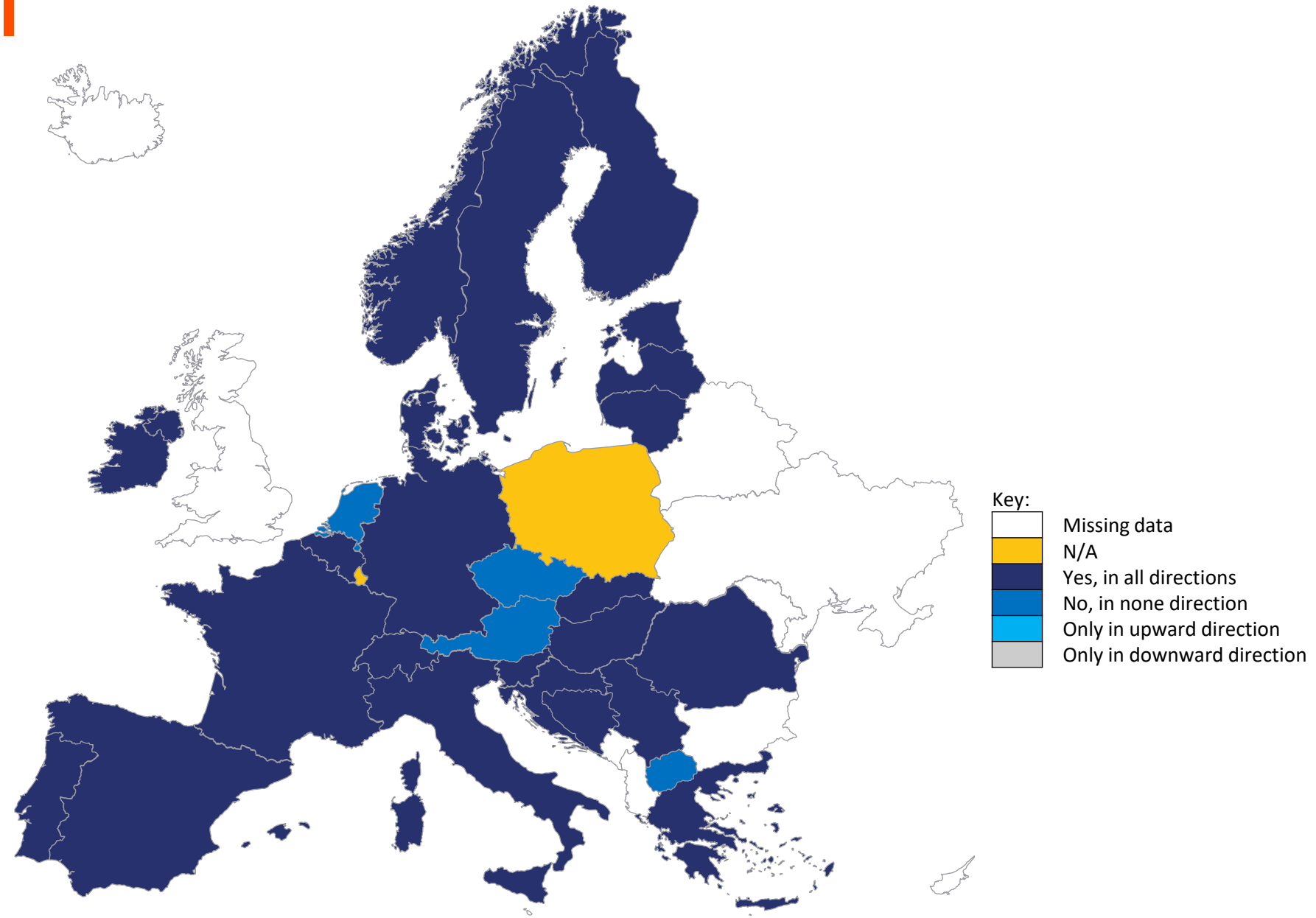


Frequency Restoration Reserve (Manual) - Energy - In case transfer obligation is allowed, is there an organised secondary market?

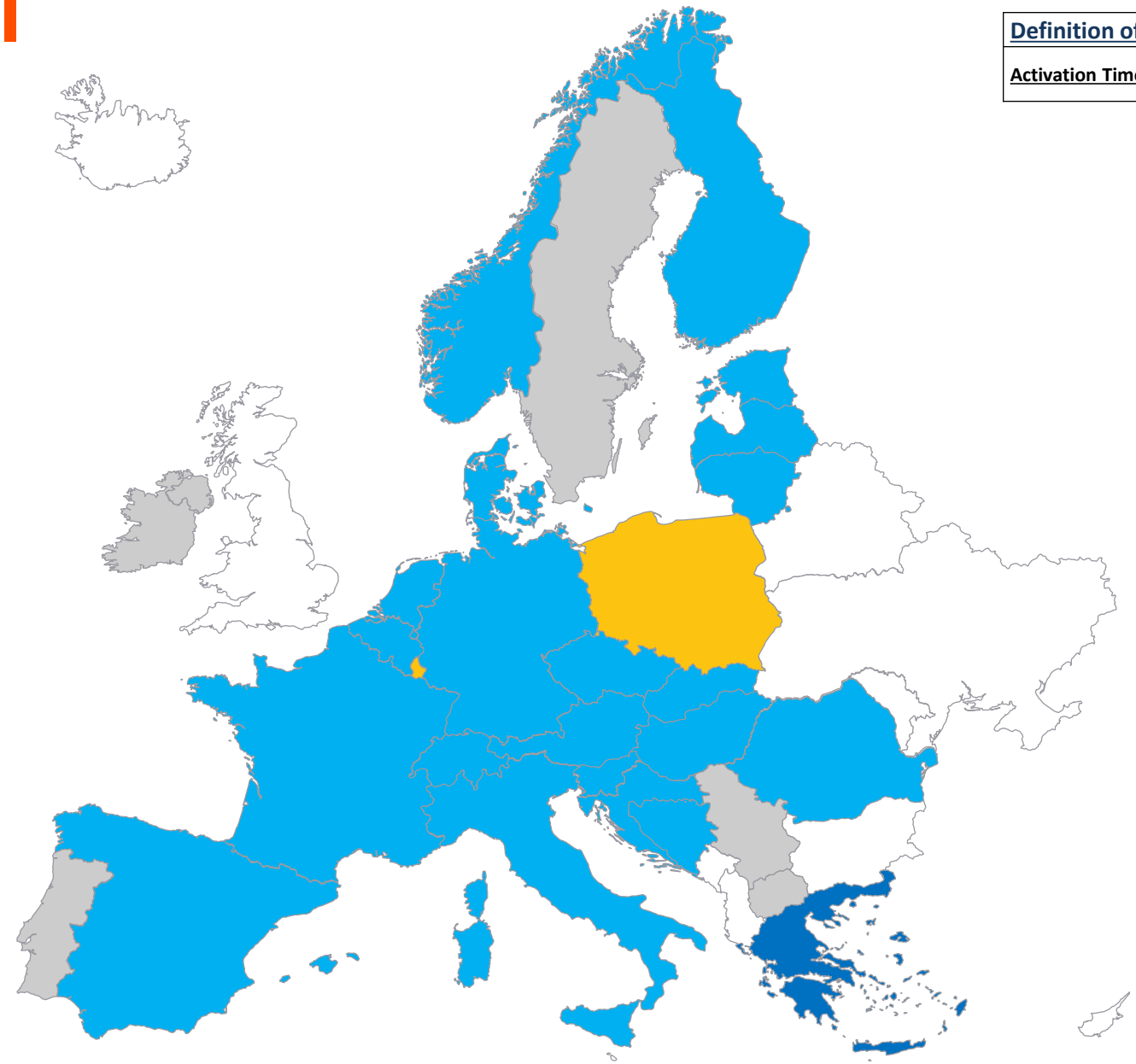
Definition of answer	
Secondary Market for reserve obligation	Trading procedure between the BSPs (where at least one BSP has contract with the TSO) to ensure the prescribed reserve amount of the TSO.



Frequency Restoration Reserve (Manual) - Energy - Can offered products be partially activated?



Frequency Restoration Reserve (Manual) - Energy - Activation time of mFRR from 0 to max



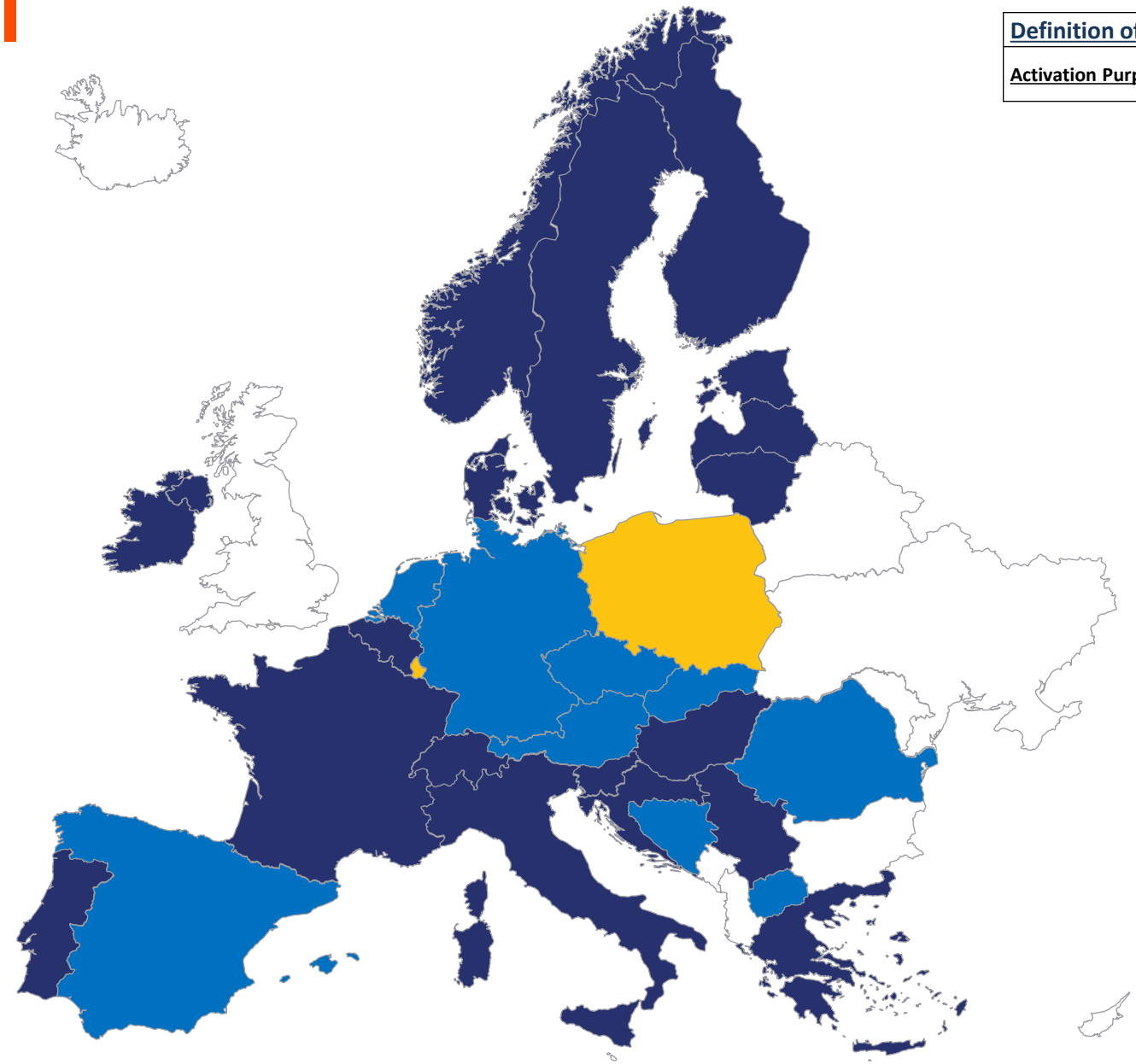
Definition of question	
Activation Time	Activation Time means the period of time between receipt of a valid instruction by the Activation Optimisation Function and the end of ramping to meet that instruction.

Key:

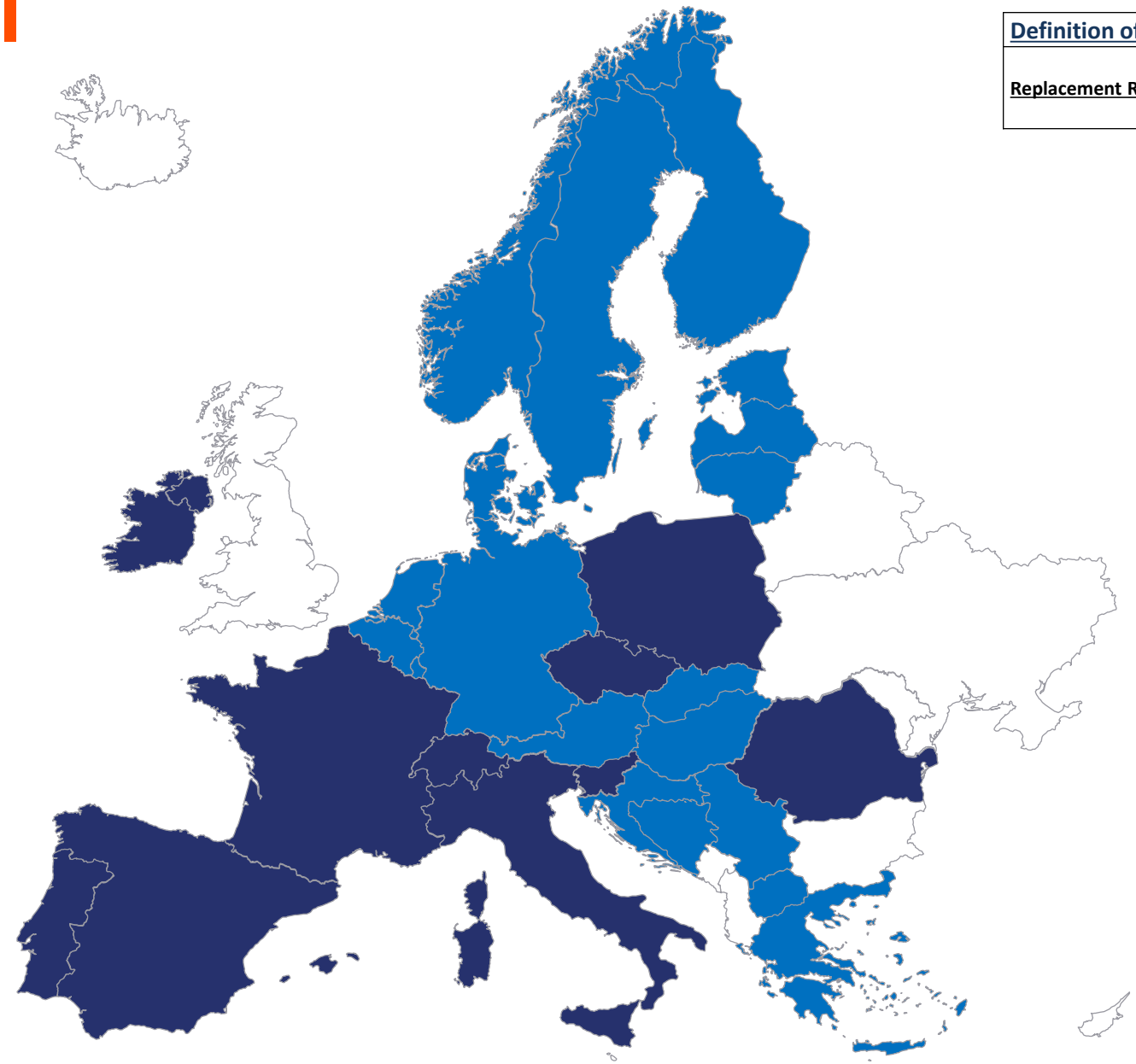
- Missing data
- N/A
- 90 s < x <= 5 min
- 5 min < x <= 10 min
- 10 min < x <= 15 min
- Depends on the unit

Frequency Restoration Reserve (Manual) - Energy - Are activations possible for other purposes than for balancing?

Definition of question	
Activation Purpose	Are activations for other purposes than Balancing (e.g. congestion management) possible?

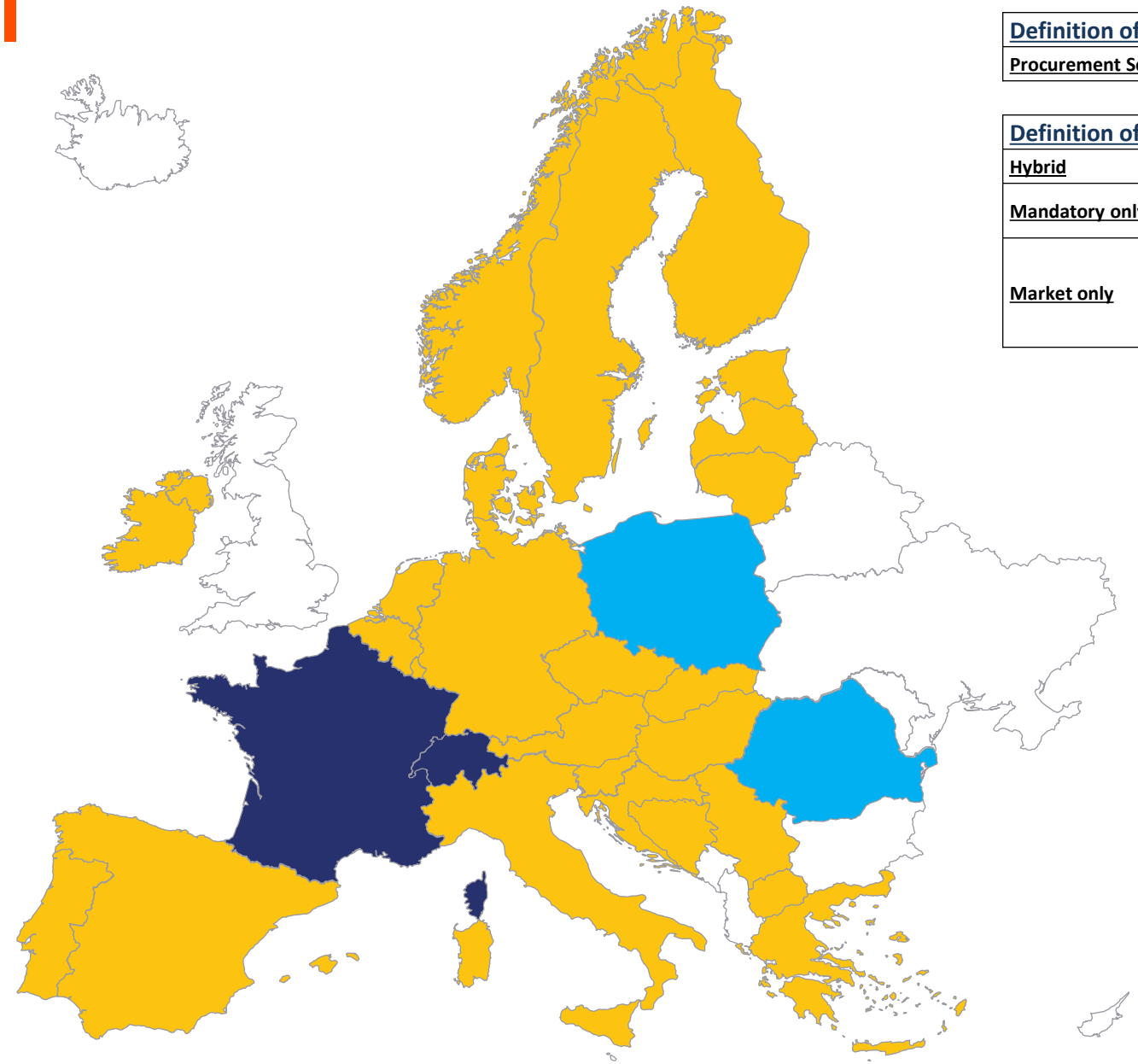


Using Replacement Reserve?



Definition of answer	
Replacement Reserve (RR)	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.

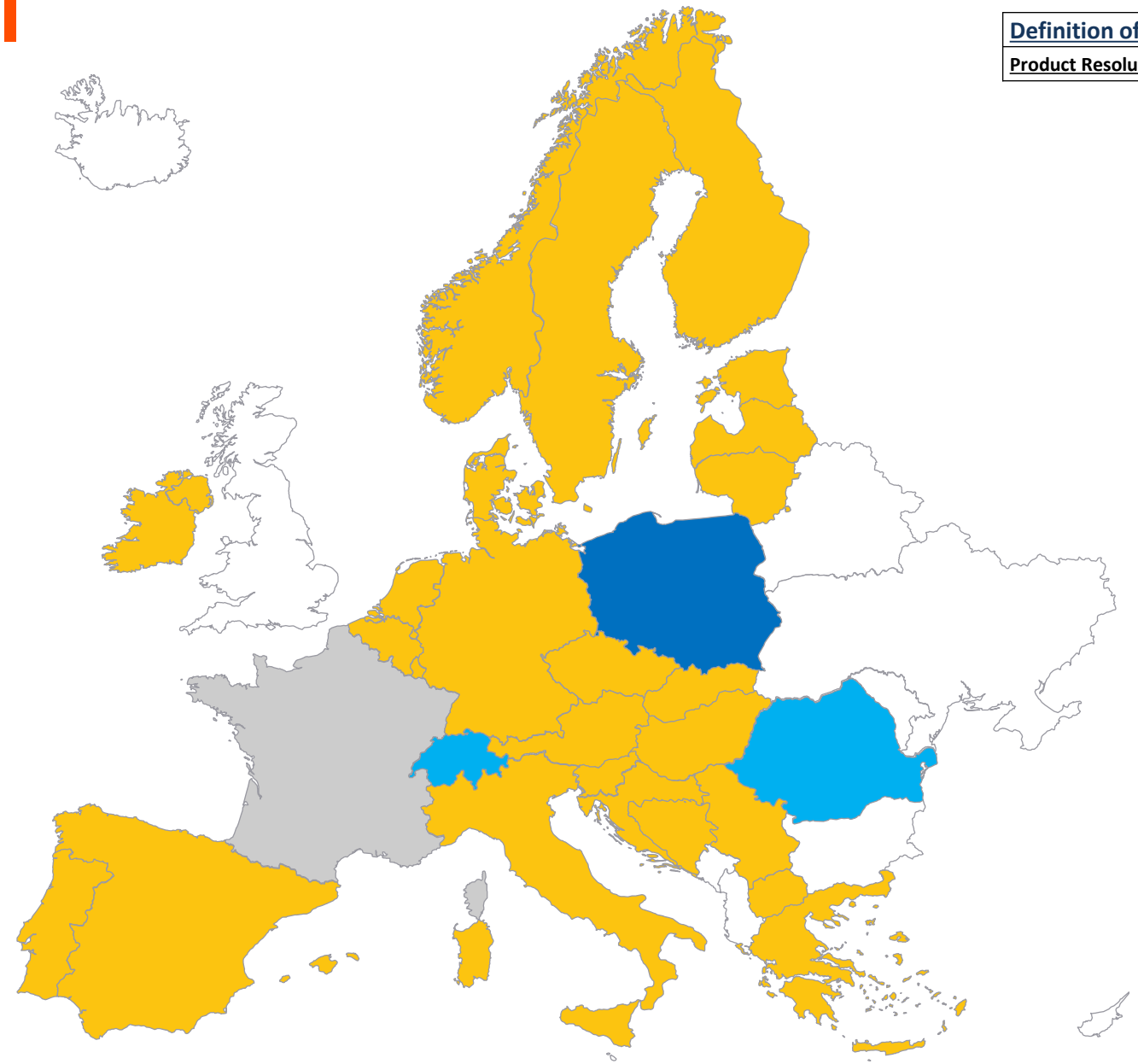
Replacement Reserve – Capacity – Procurement Scheme



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

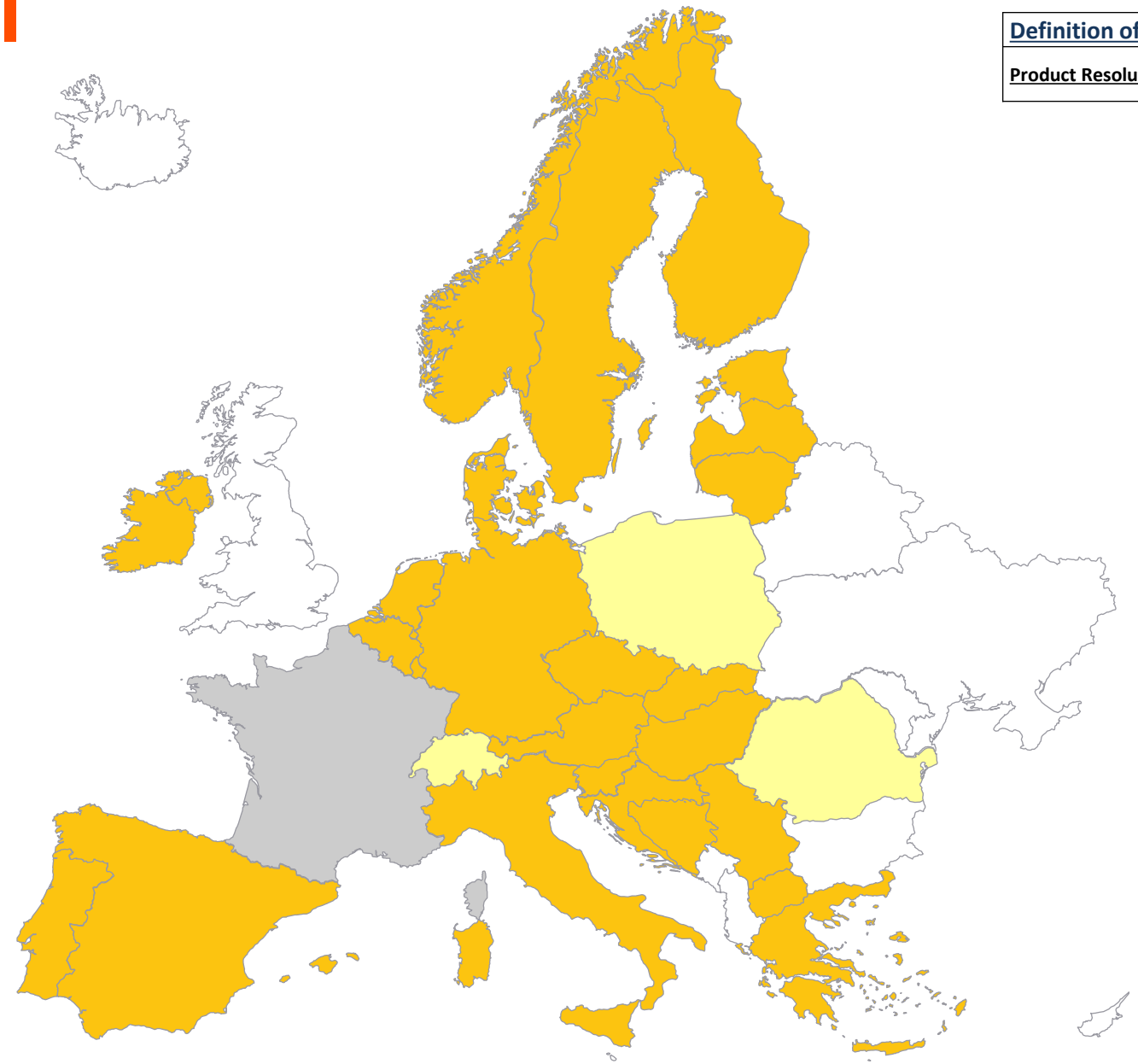
Definition of answer	
Hybrid	Combination of given options.
Mandatory only	Generators connected to the grid are obligated to reserve a certain amount of capacity in order to meet TSO requirements, for a fixed price set by TSO, NRA or for free.
Market only	There is no contract or obligation for a grid 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.

Replacement Reserve – Capacity – Product Resolution (in MW)



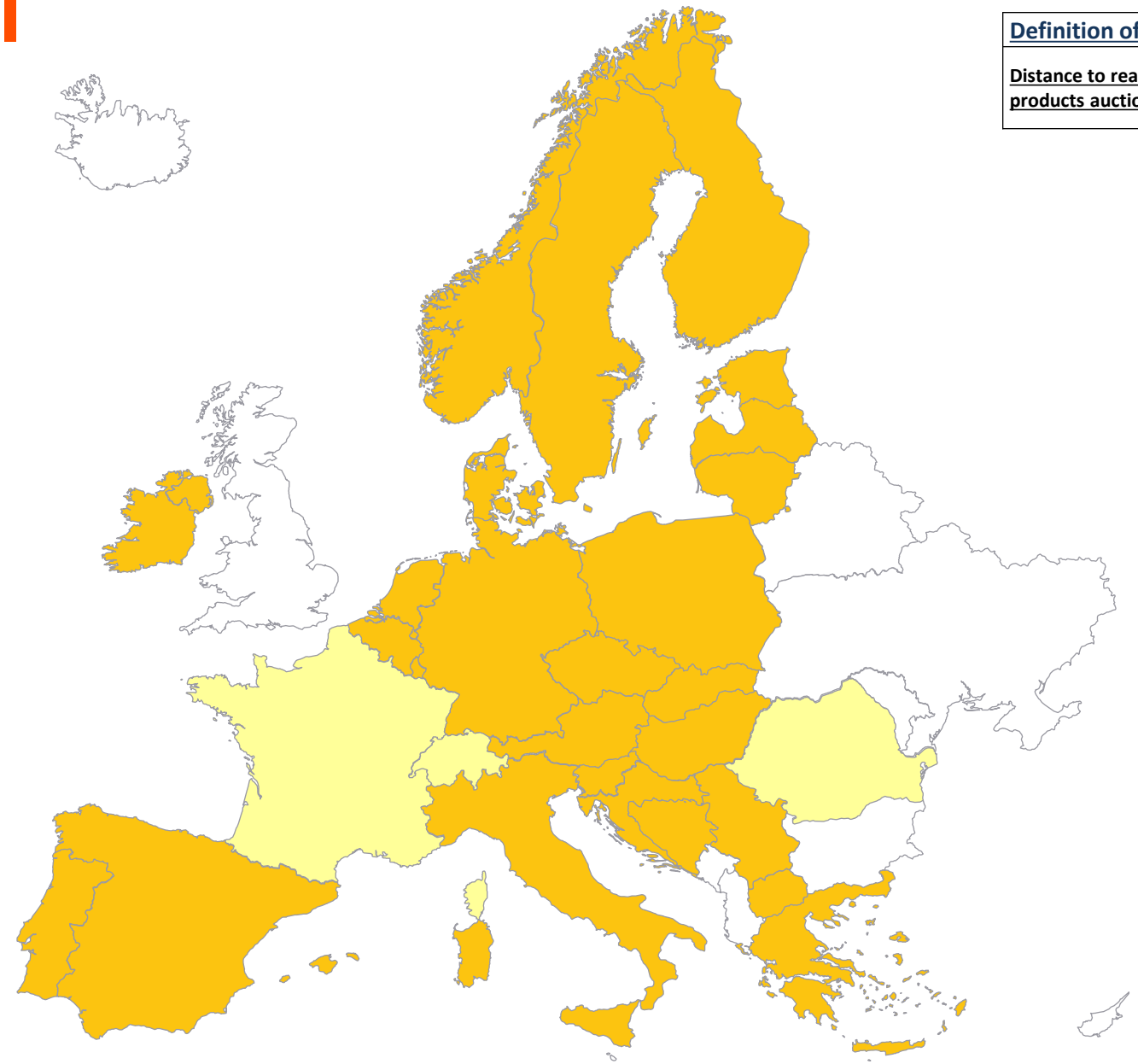
Definition of question	
Product Resolution (in MW)	The minimum bid size into the balancing market.

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).

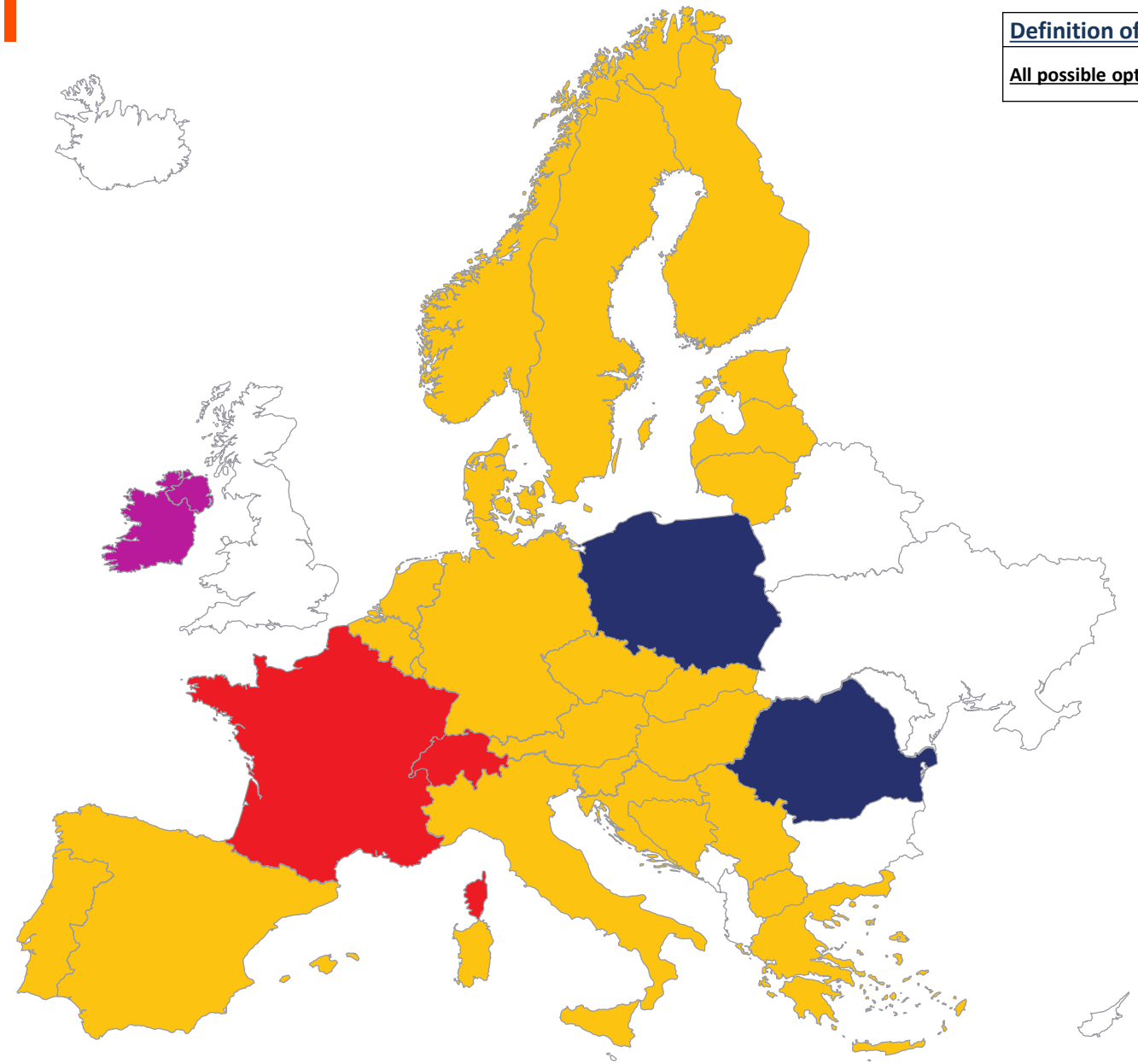
Replacement Reserve – Capacity – Distance to real time of reserve products auctions



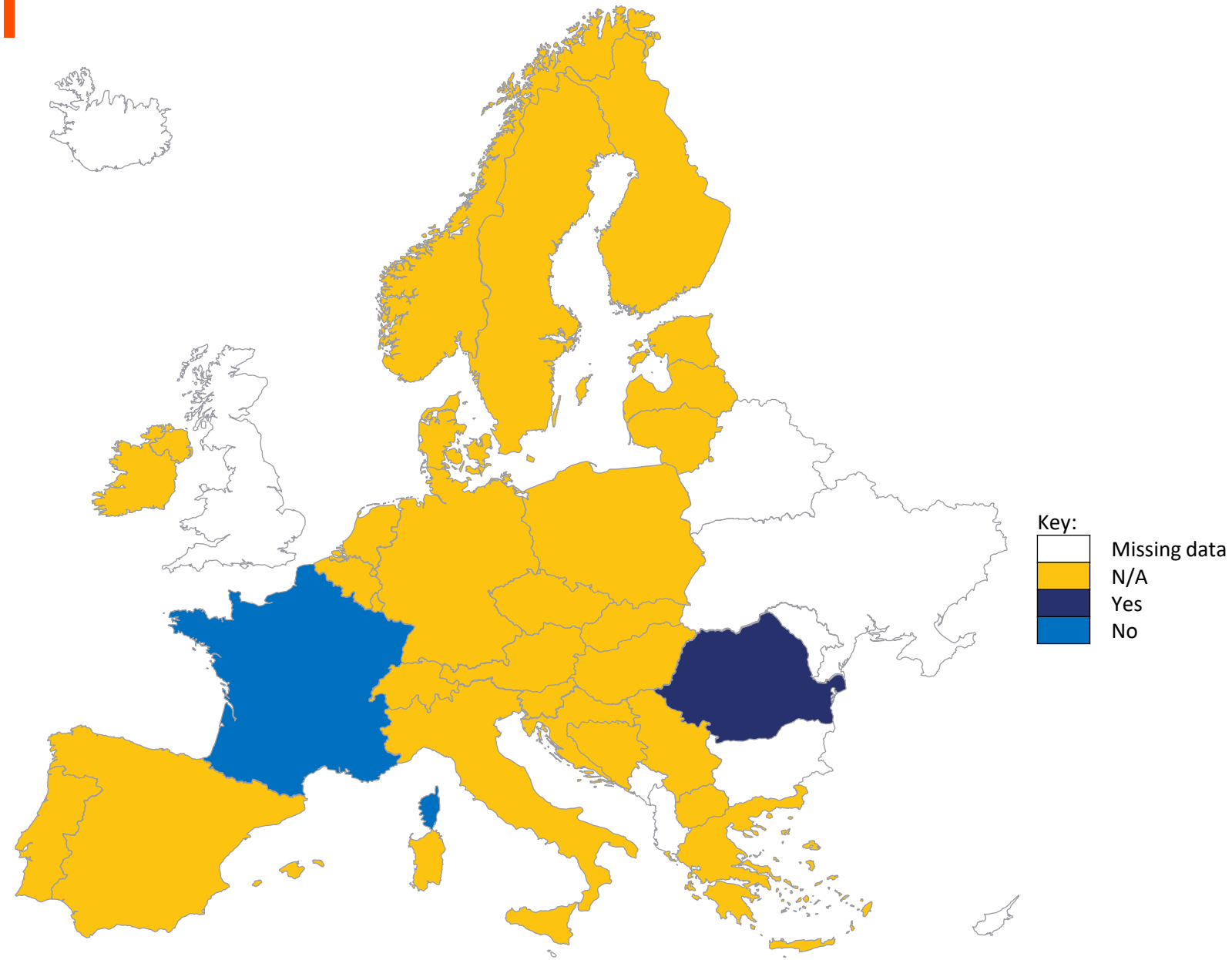
Definition of question	
Distance to real time of reserve products auctions	The time ahead from real time when auction/agreement for an specific balancing product takes place (for instance = 1 year in the case of a reserve agreement signed 1 year ahead of real time).

Replacement Reserve – Capacity – Provider

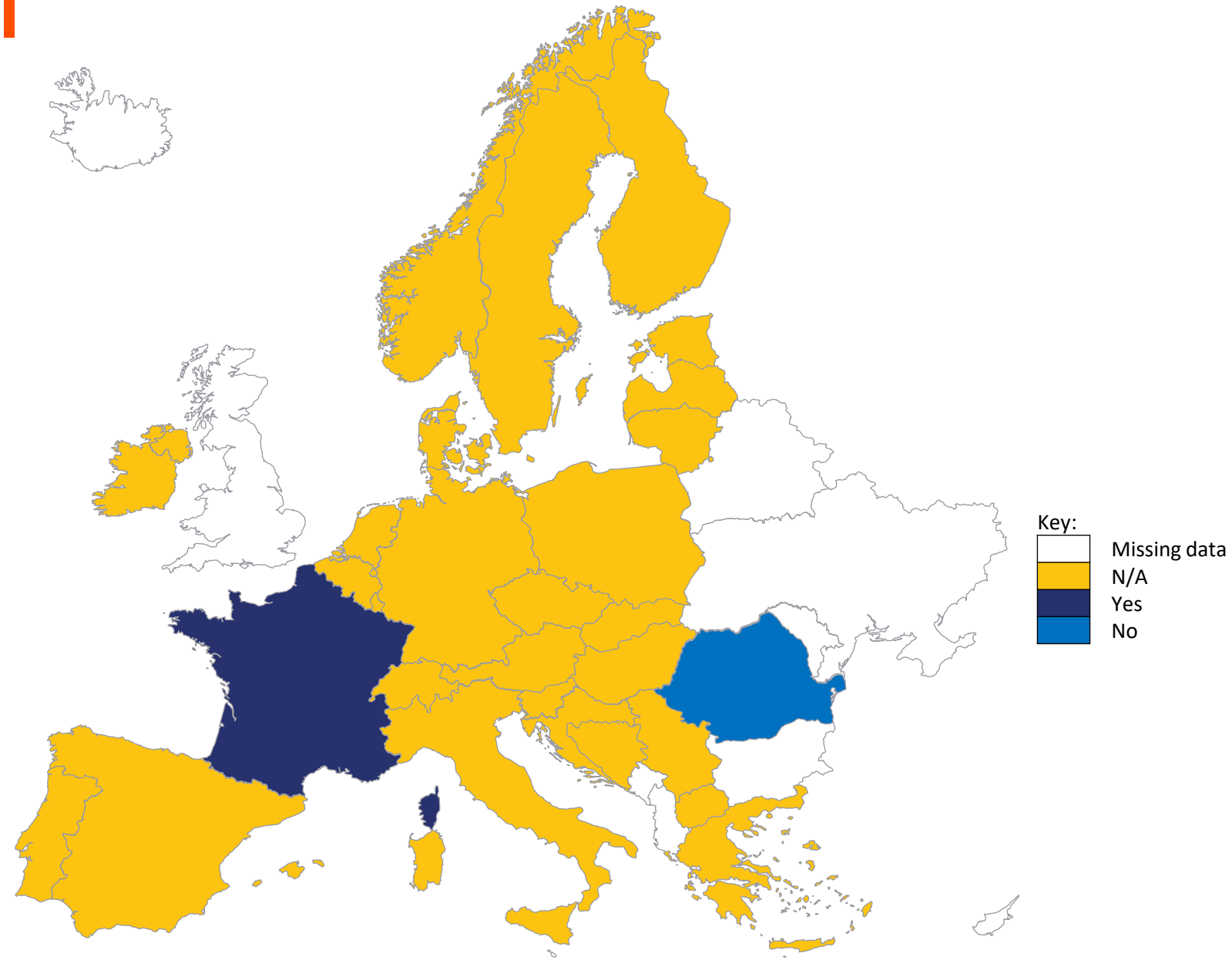
Definition of answer	
All possible options	In this case all possible provider types were chosen (Generator + Demand-side response + Pump Storage + Batteries + Distributed generation)



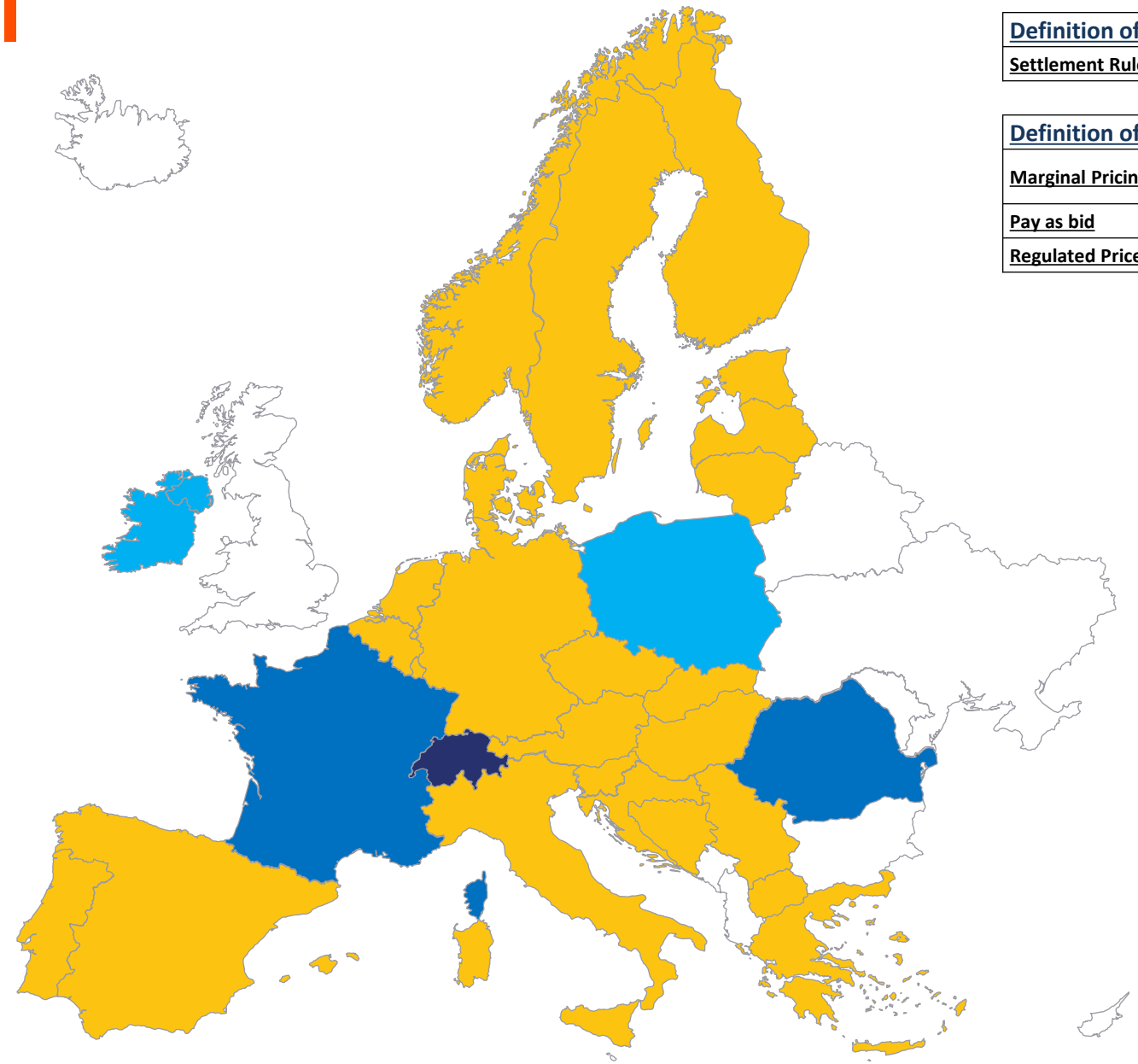
Replacement Reserve – Capacity – Product standardisation finished



Replacement Reserve – Capacity – Using specific products?



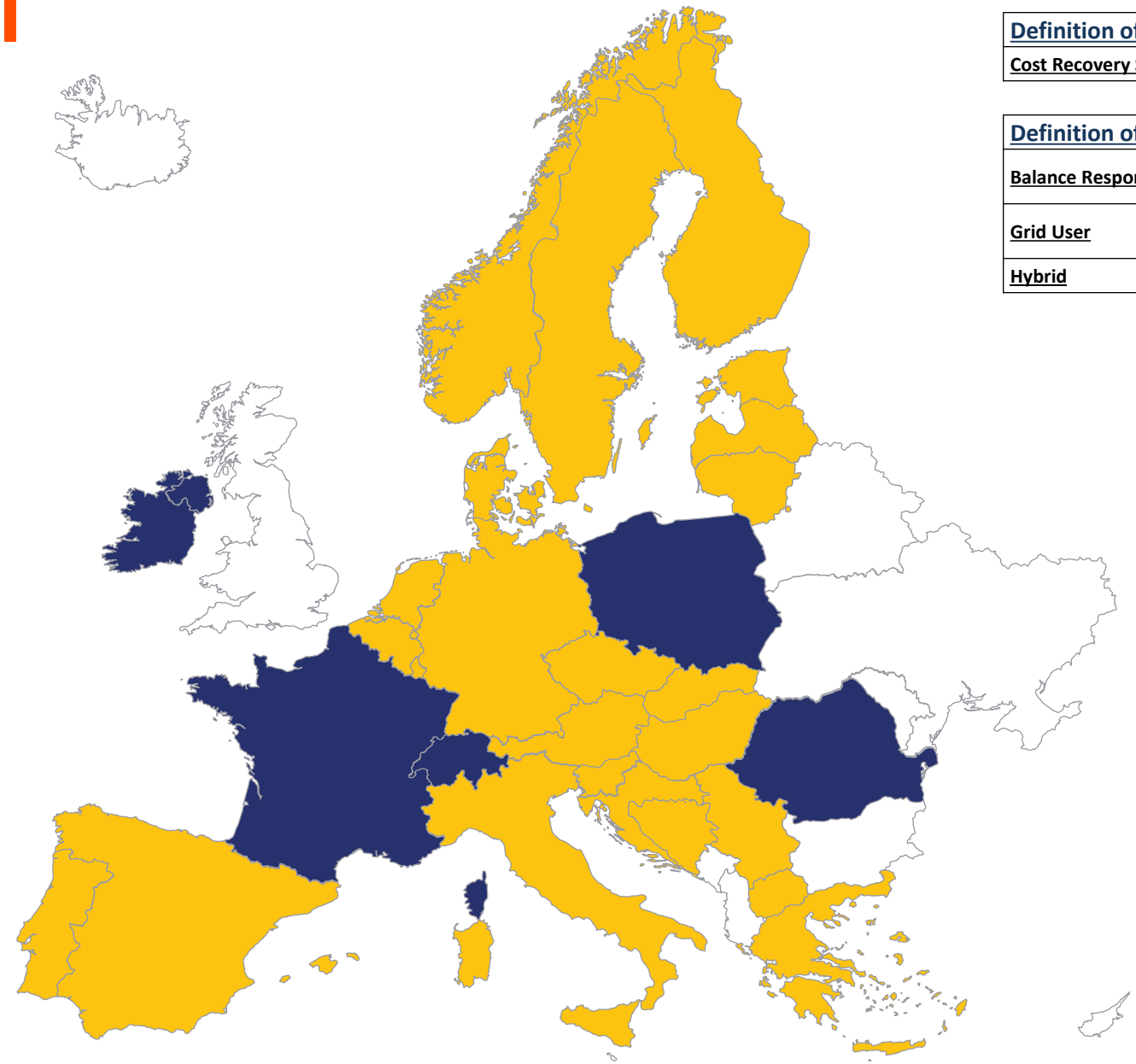
Replacement Reserve – Capacity – Settlement Rule



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.

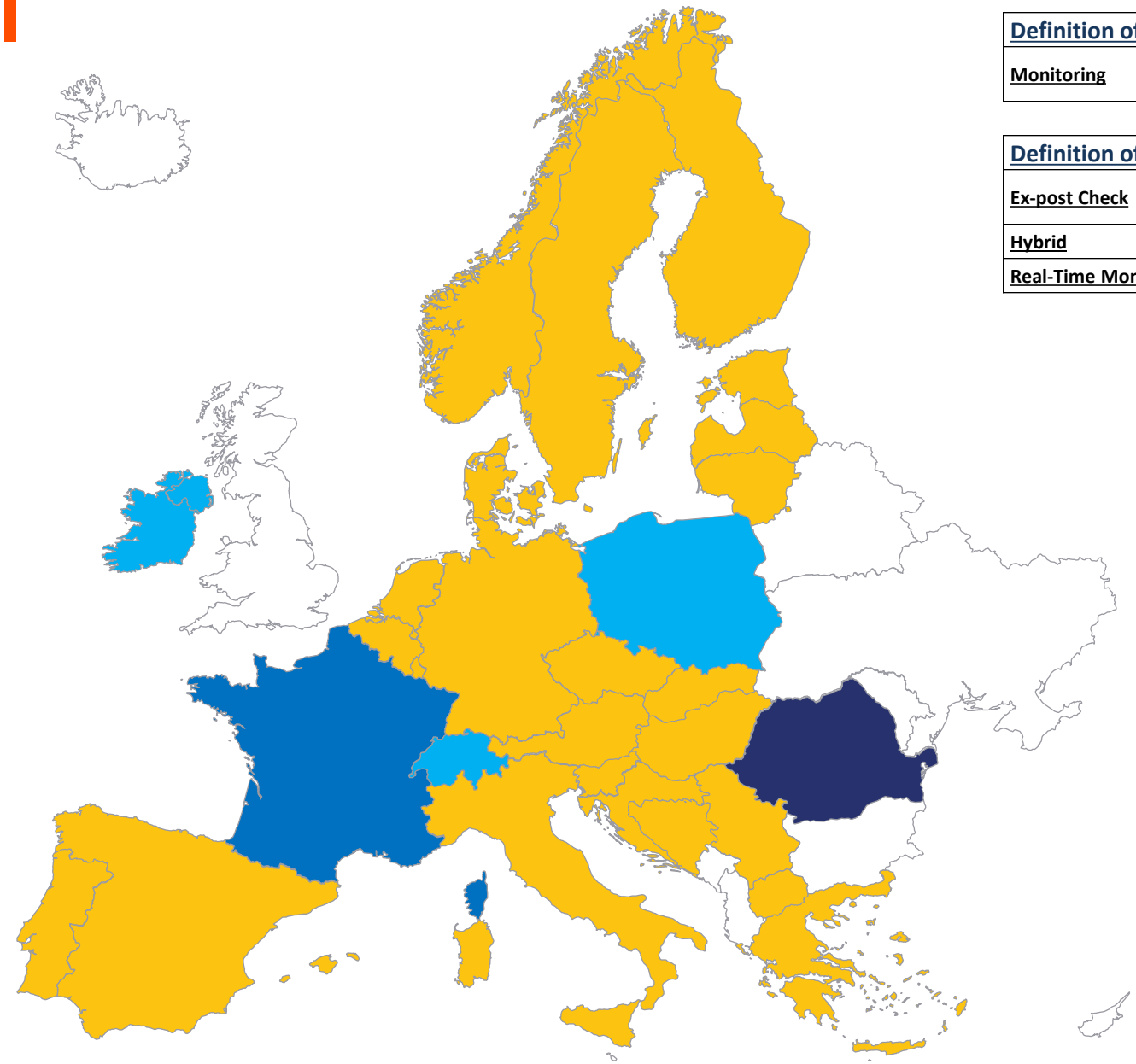
Replacement Reserve – Capacity – Cost Recovery Scheme



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 of given options.

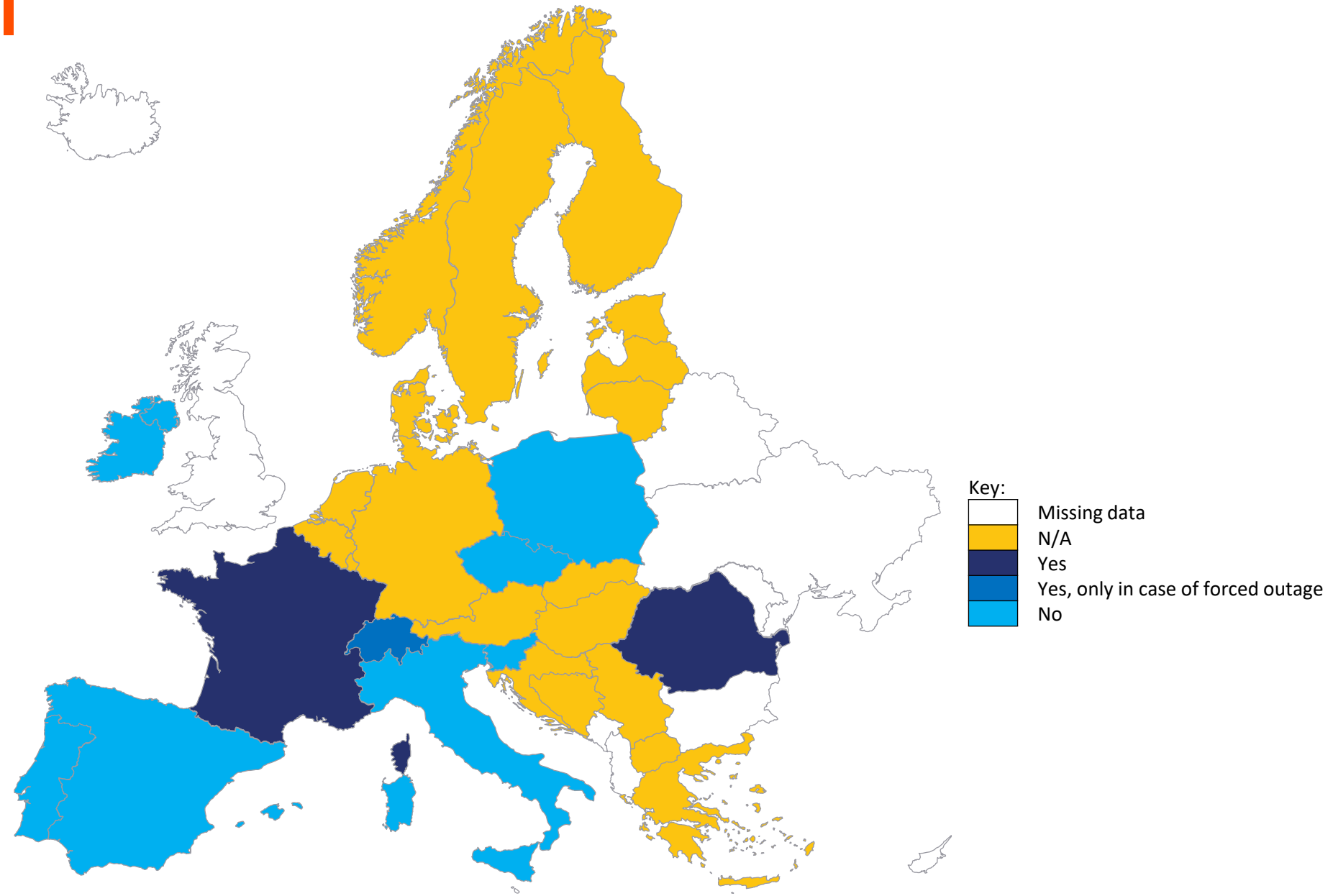
Replacement Reserve – Capacity – Monitoring



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

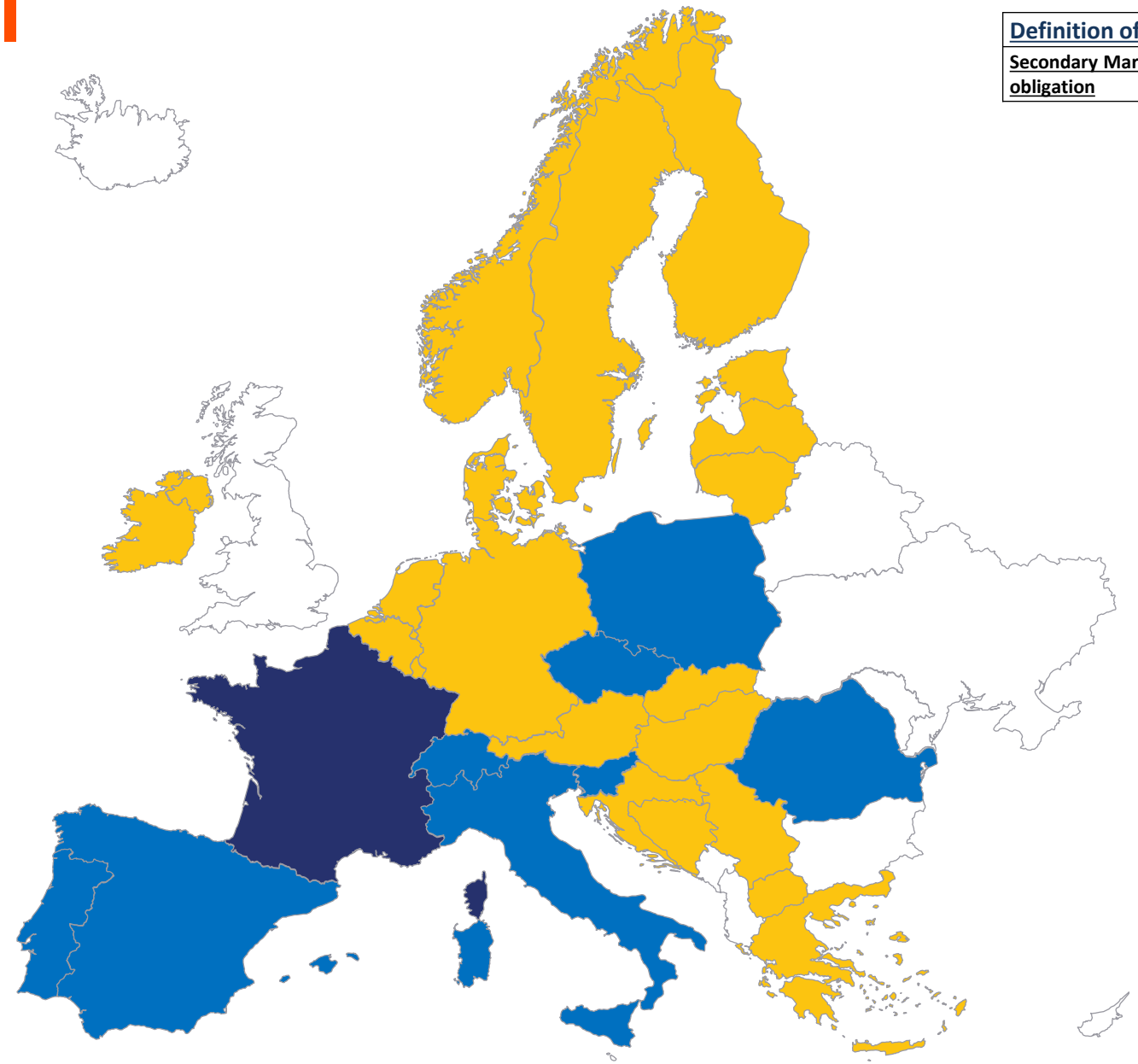
Definition of answer	
Ex-post Check	When the monitoring of performance of plant carried out 24 hours after the delivery period.
Hybrid	Combination of given options.
Real-Time Monitoring	Monitoring of delivery of ancillary services in real time.

Replacement Reserve – Capacity – Transfer of BSPs obligation allowed

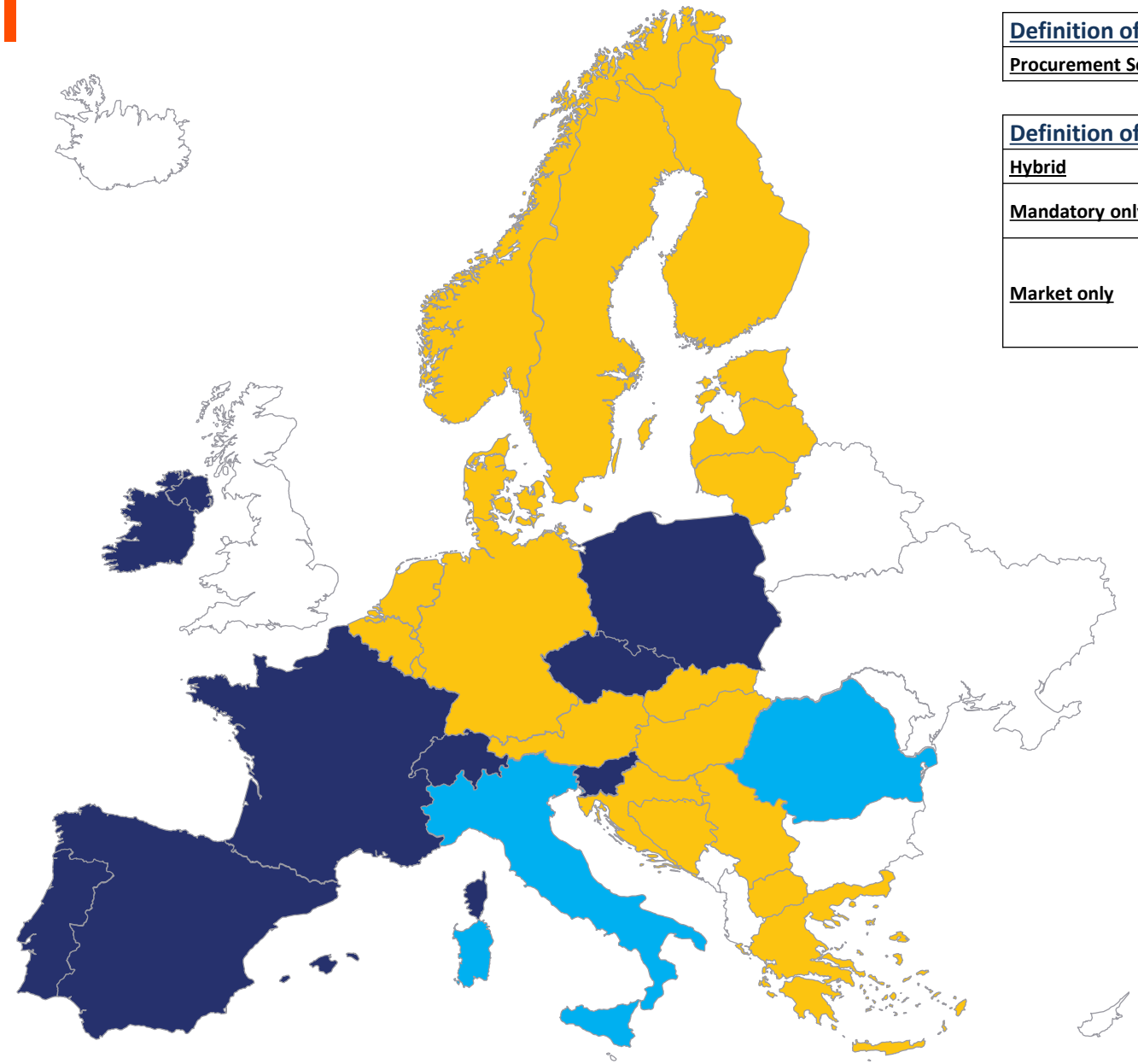


Replacement Reserve – Capacity – In case transfer obligation is allowed, is there an organised secondary market?

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.



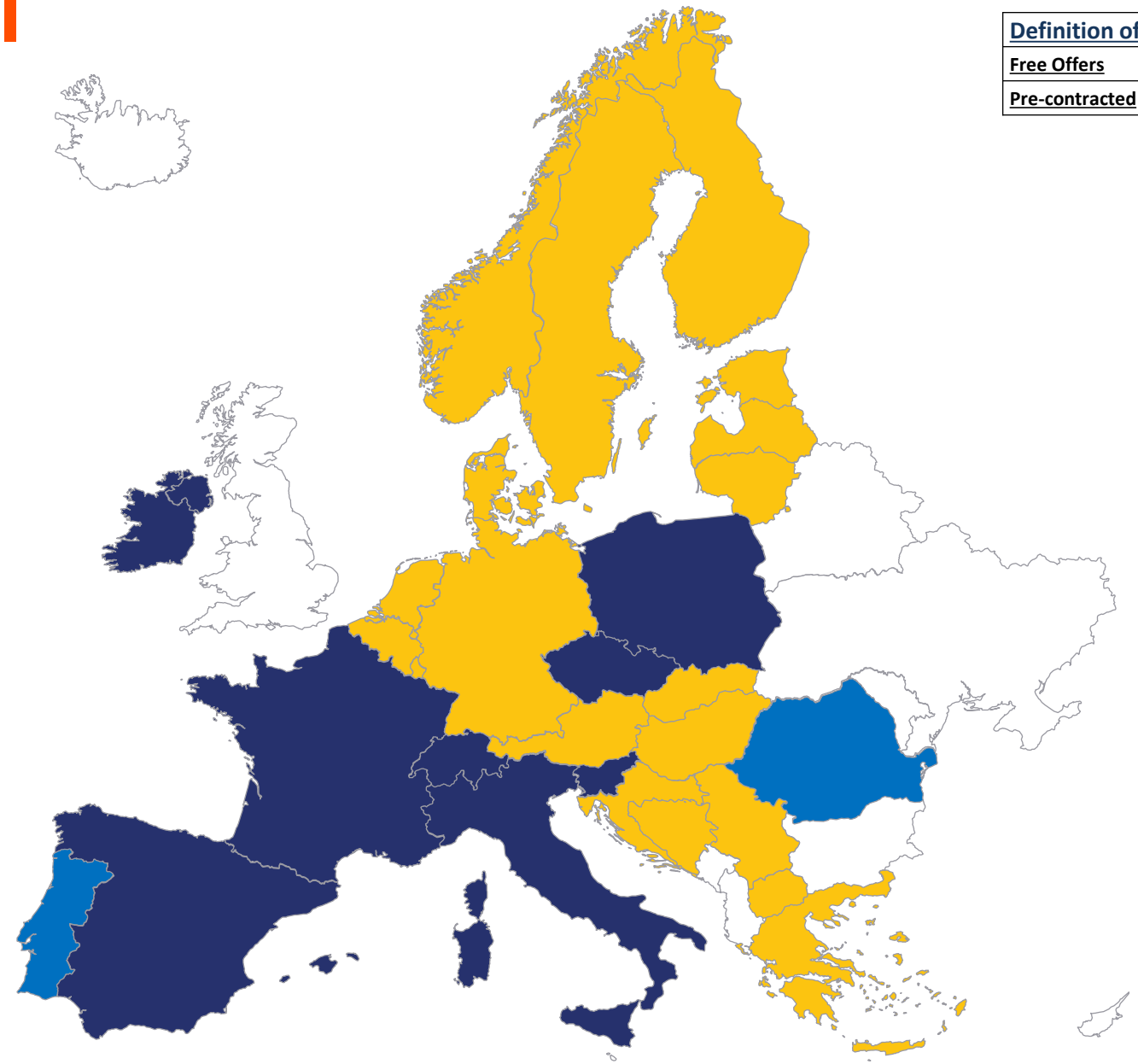
Replacement Reserve – Energy – Procurement Scheme



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

Definition of answer	
Hybrid	Combination of given options.
Mandatory only	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.
Market only	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.

Replacement Reserve – Energy – Free Bids allowed?

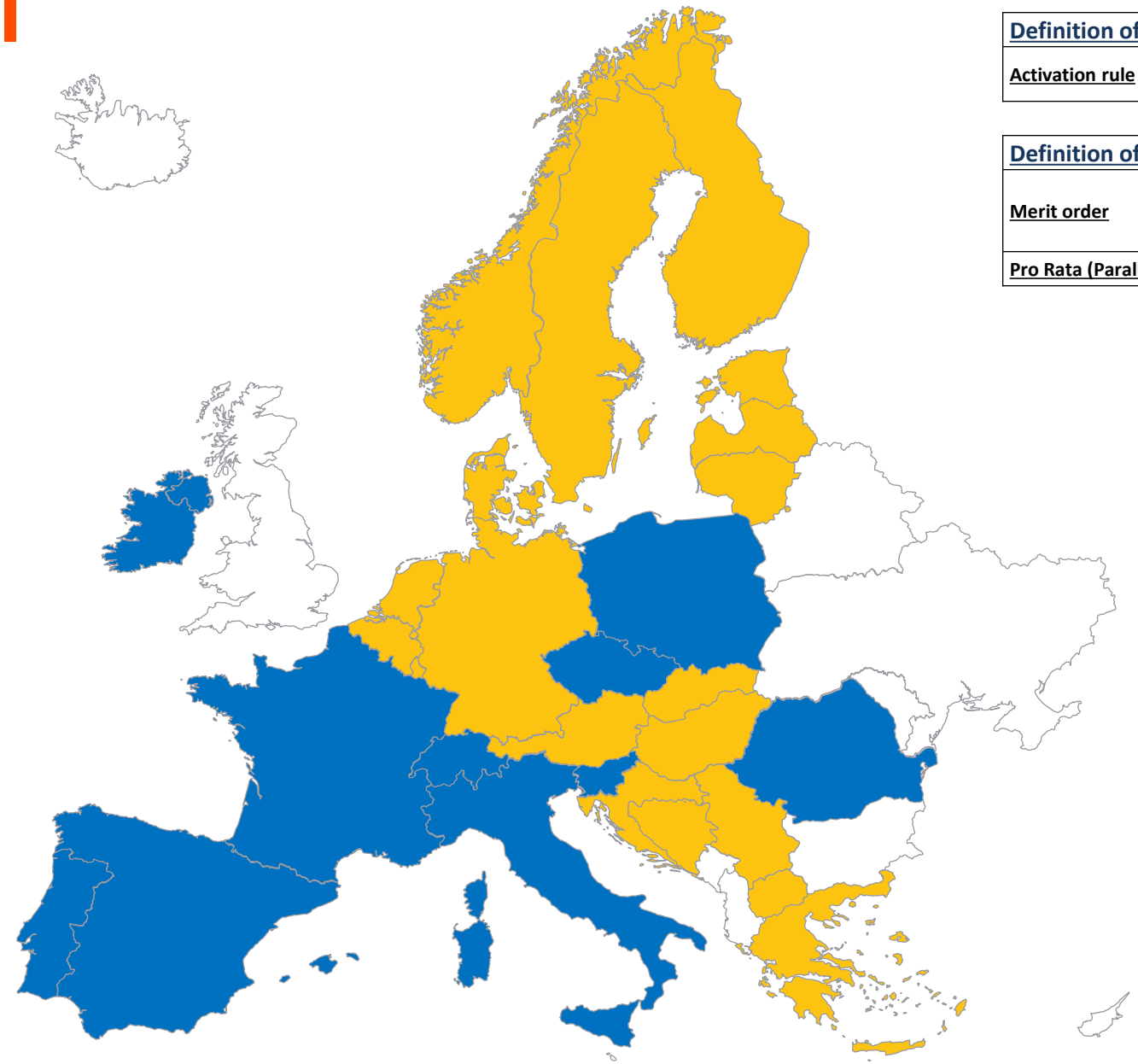


Definition of question	
Free Offers	Possibility to offer balancing energy bids without a contract for Balancing Capacity
Pre-contracted	BSP has sold/procured Balancing Capacity to TSO.

Key:

- Missing data
- N/A
- Yes
- No
- No, there is no RR balancing energy market

Replacement Reserve – 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).

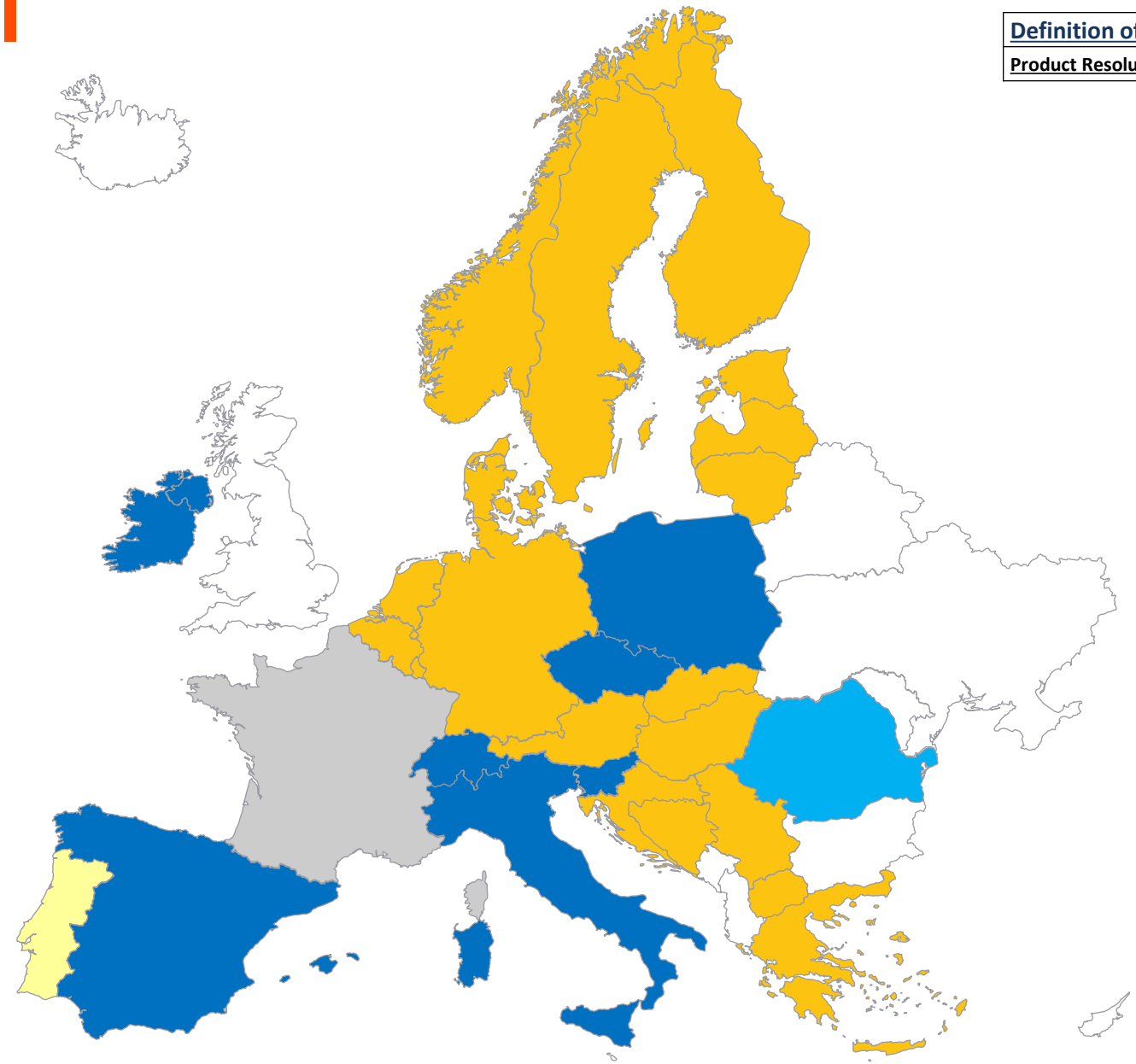
Definition of answer	
Merit order	A merit order is a way of ranking available sources of energy in ascending order of their short run marginal costs of production, so that those with the lowest marginal costs are the first ones to be brought online to meet demand.
Pro Rata (Parallel Activation)	All bids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

Key:

- Missing data
- N/A
- Pro Rata (Parallel Activation)
- Merit order

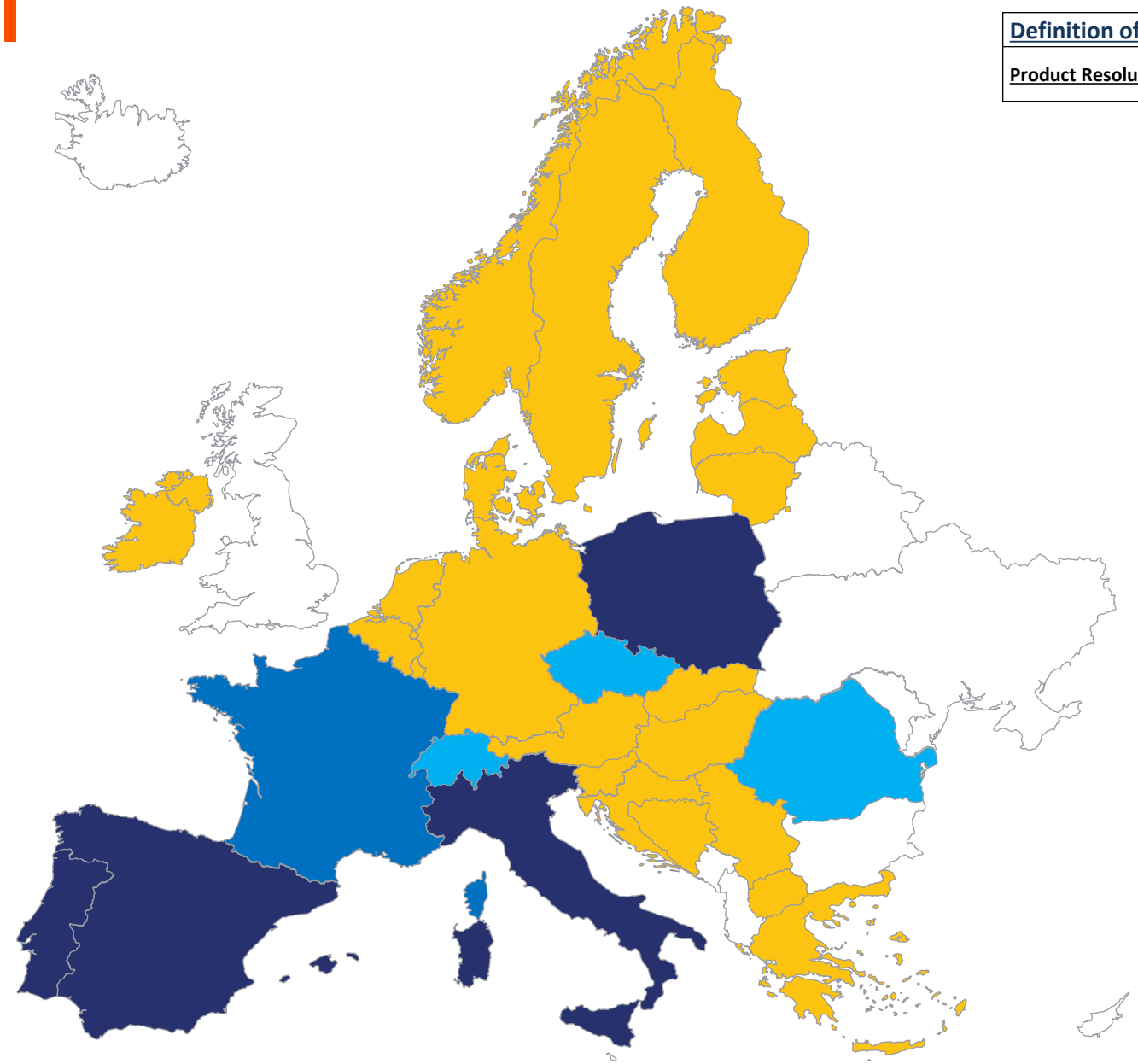
Replacement Reserve - Energy - Product Resolution (in MW)

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



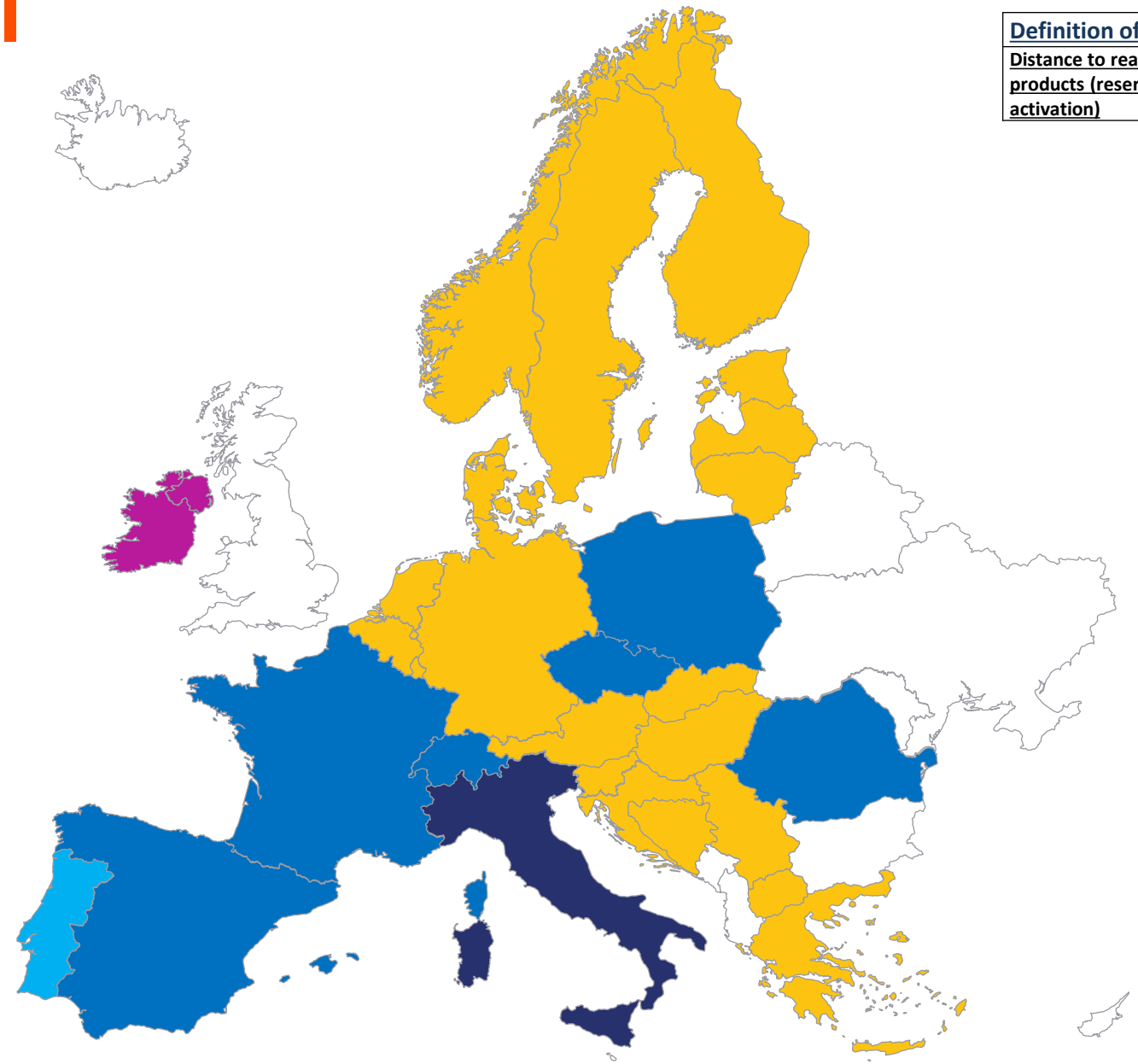
Replacement Reserve - Energy - Product Resolution (in time)

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).



Replacement Reserve - Energy - Distance to real time of energy products

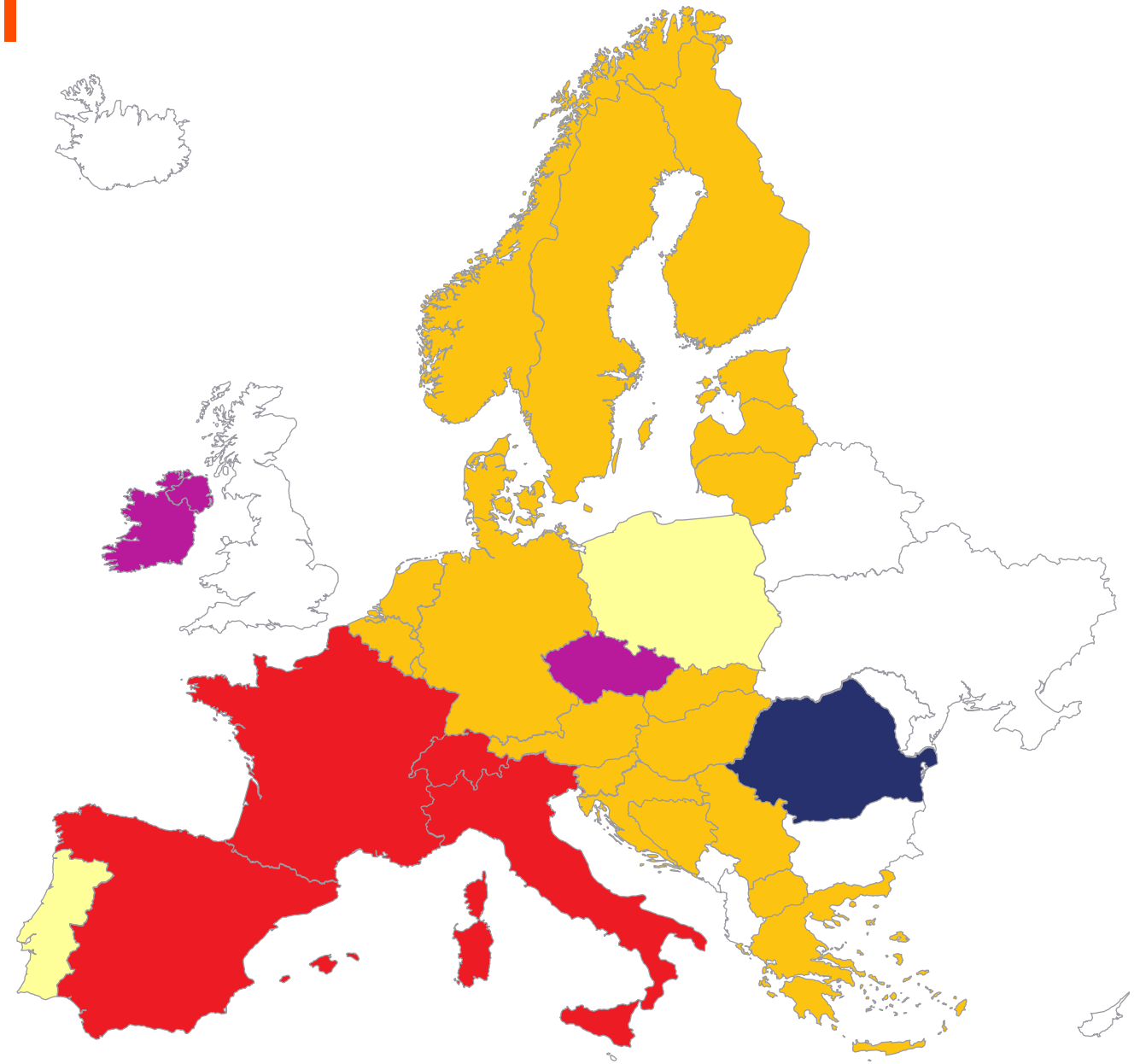
Definition of question	
Distance to real time of energy products (reserve products activation)	The time ahead from real time when TSO activates a given product (for instance 15 minutes in the case of mFRR/tertiary energy).



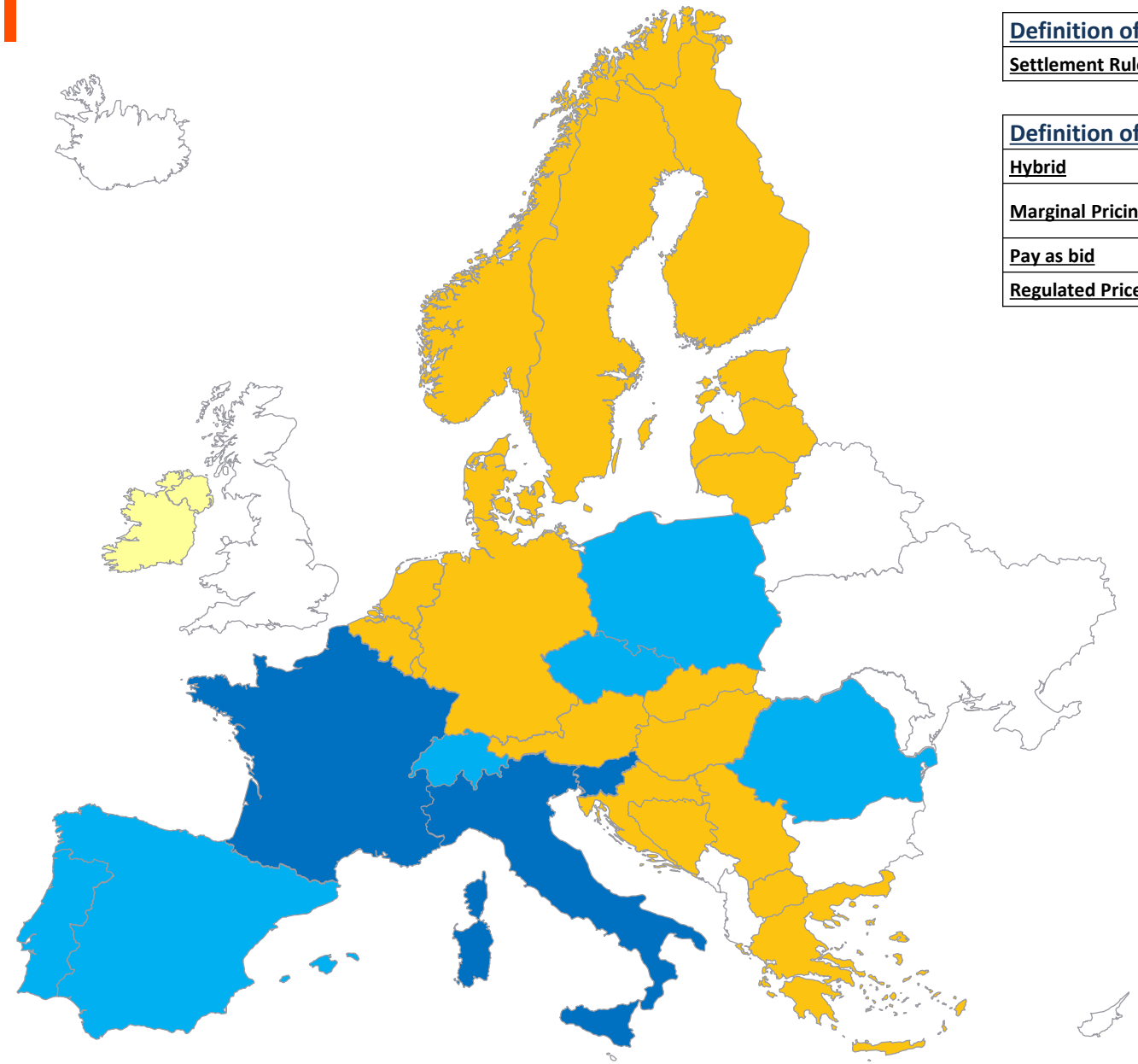
Key:

- 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

Replacement Reserve - Energy - Provider



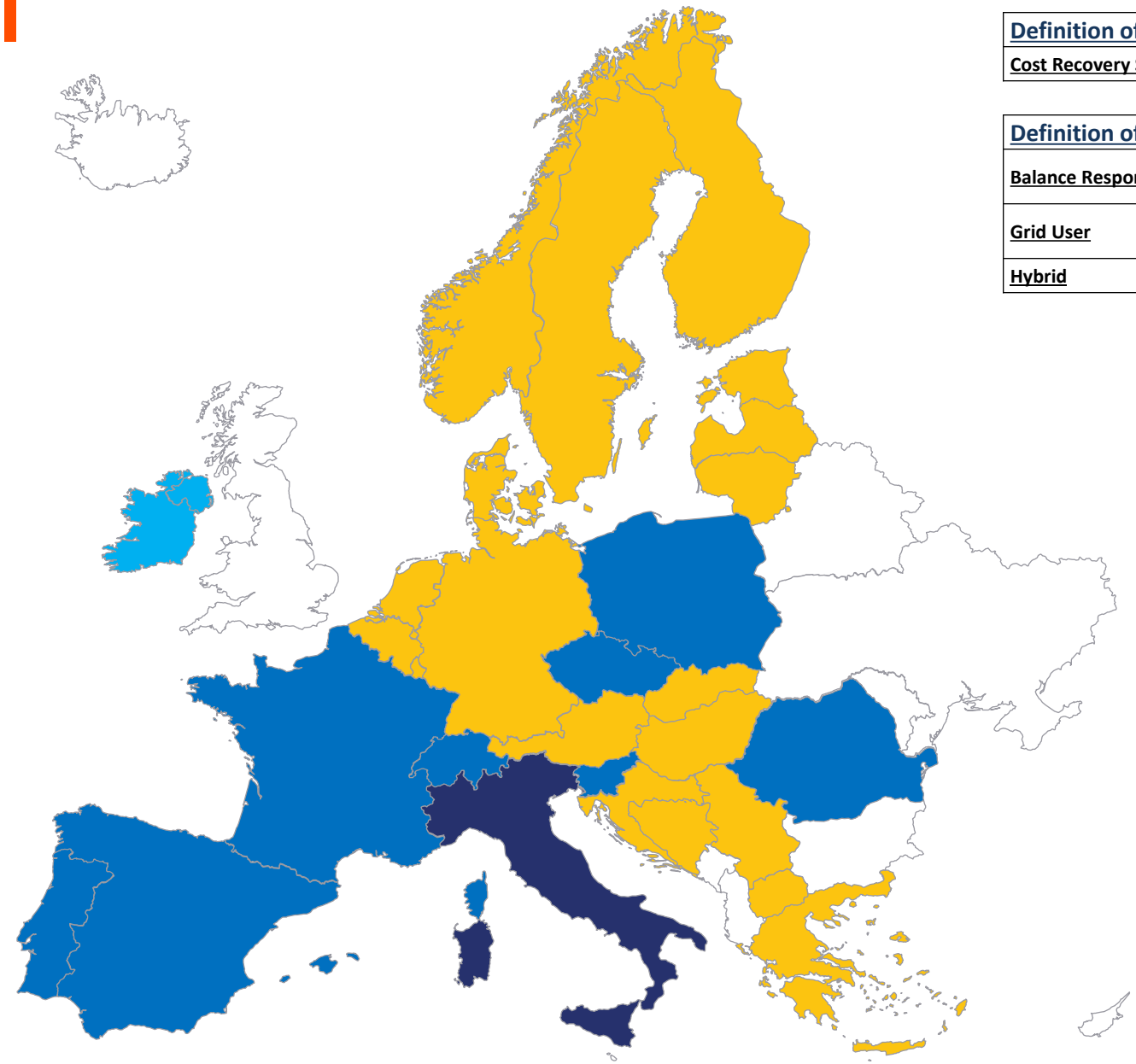
Replacement Reserve - Energy - Settlement Rule



Definition of question	
Settlement Rule	The pricing rules for settlement.

Definition of answer	
Hybrid	Combination of given options.
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.

Replacement Reserve - Energy - Cost Recovery Scheme

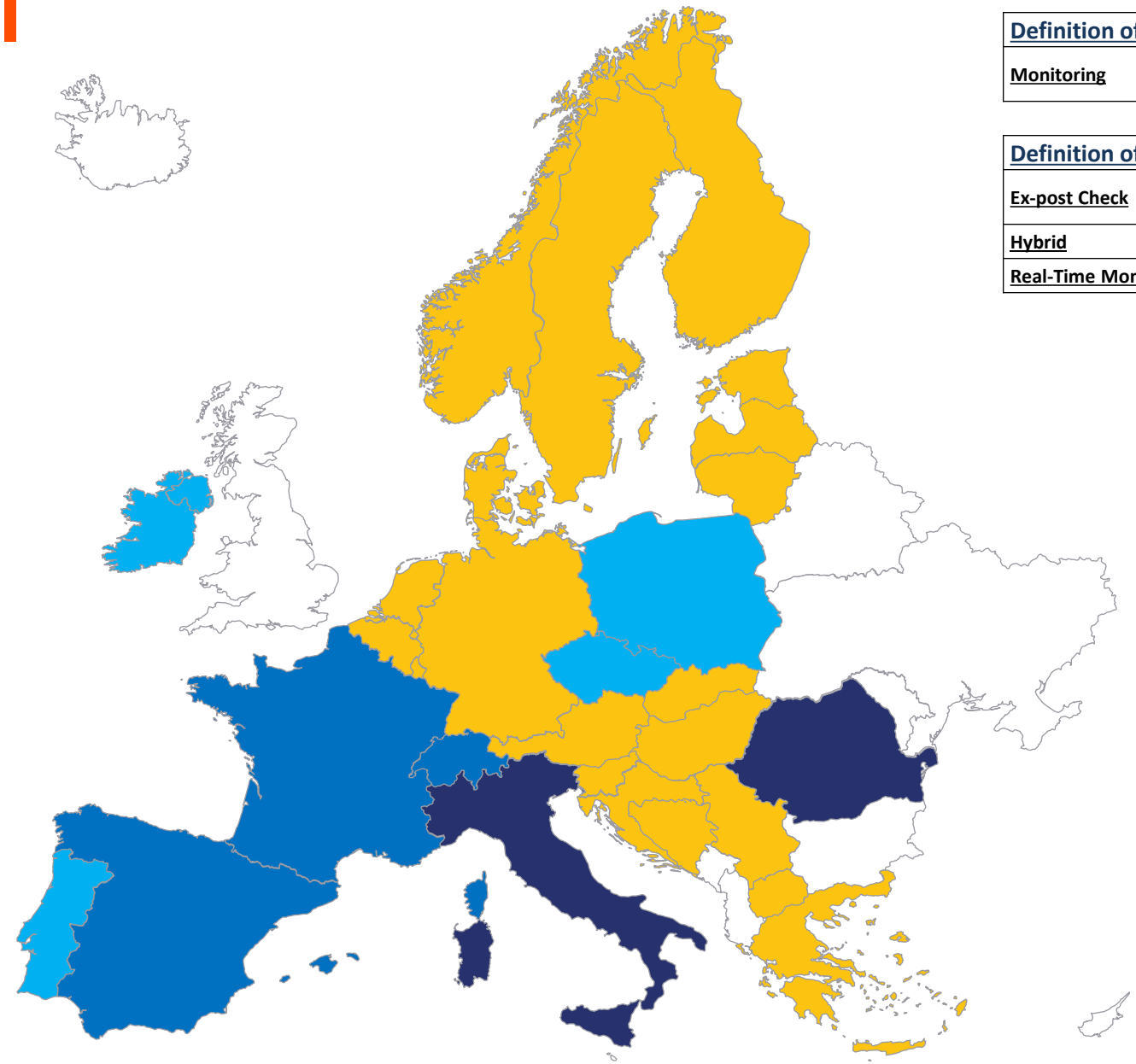


Key:
- Missing data
- N/A
- 100% Grid Users (through tariff)
- 100% BRP
- Hybrid

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 of given options.

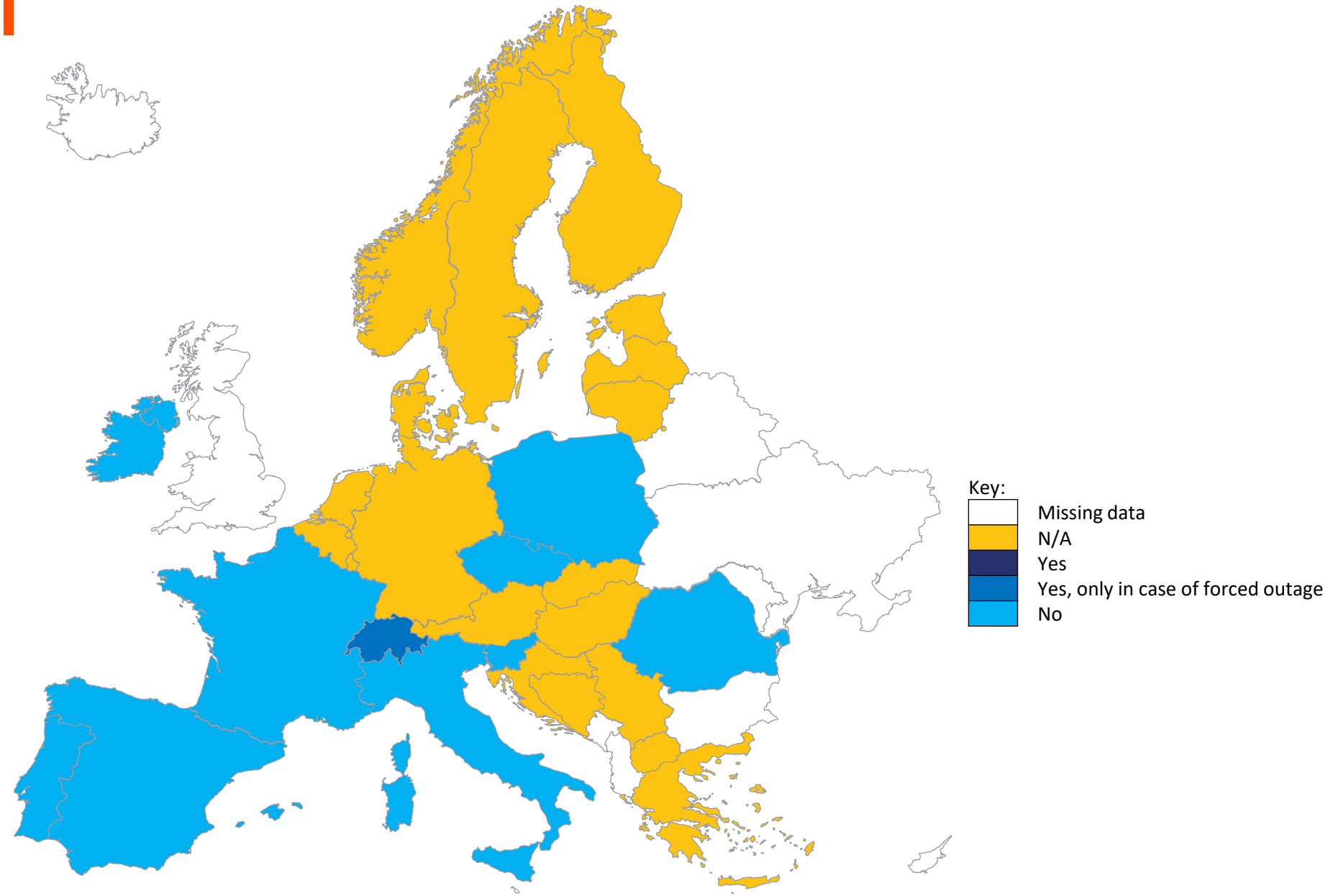
Replacement Reserve - Energy - Monitoring



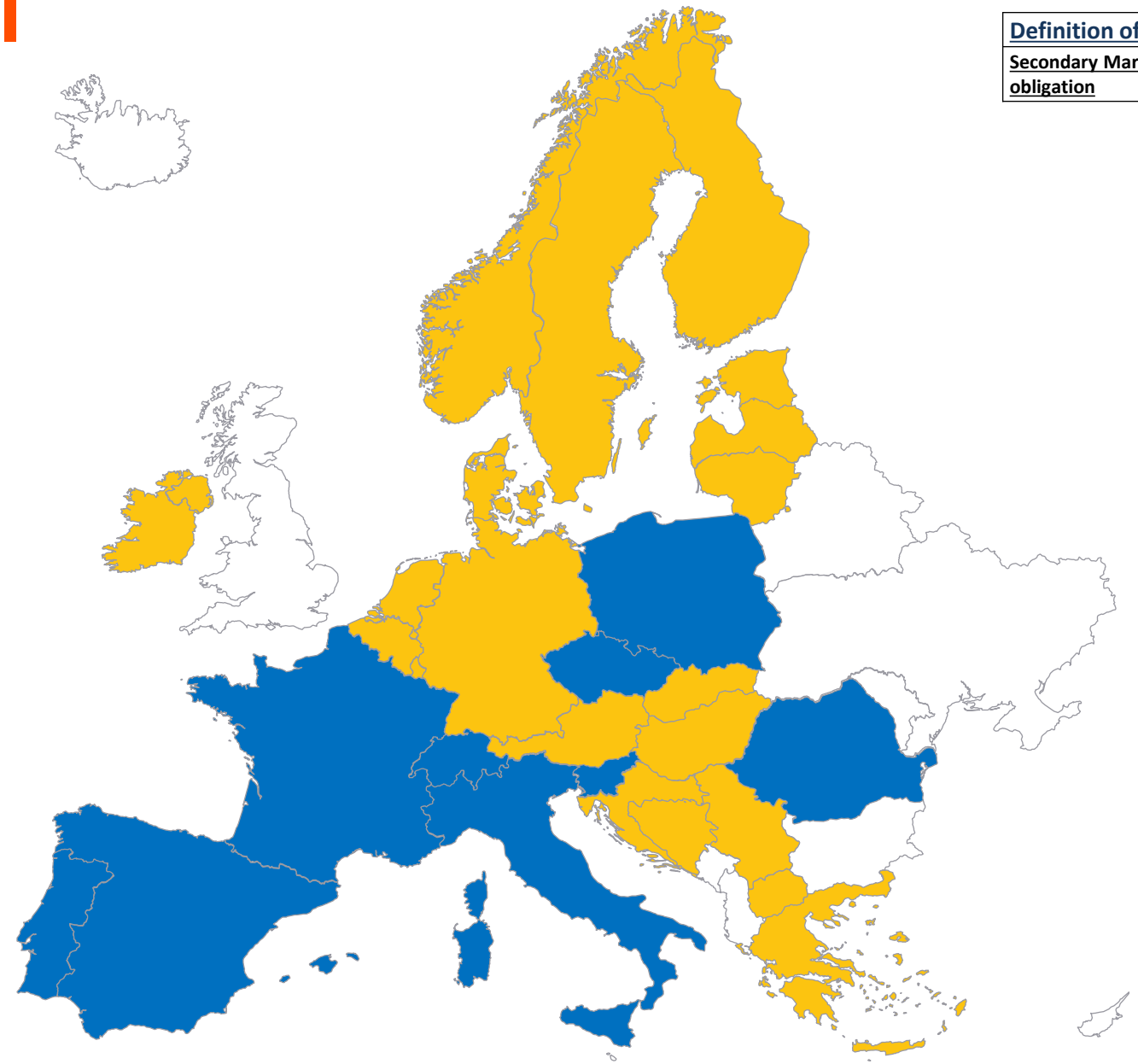
Definition of question	
Monitoring	Refers to the type of monitoring in place by the system operator to ensure performance of plant.

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

Replacement Reserve - Energy - Transfer of BSPs obligation allowed

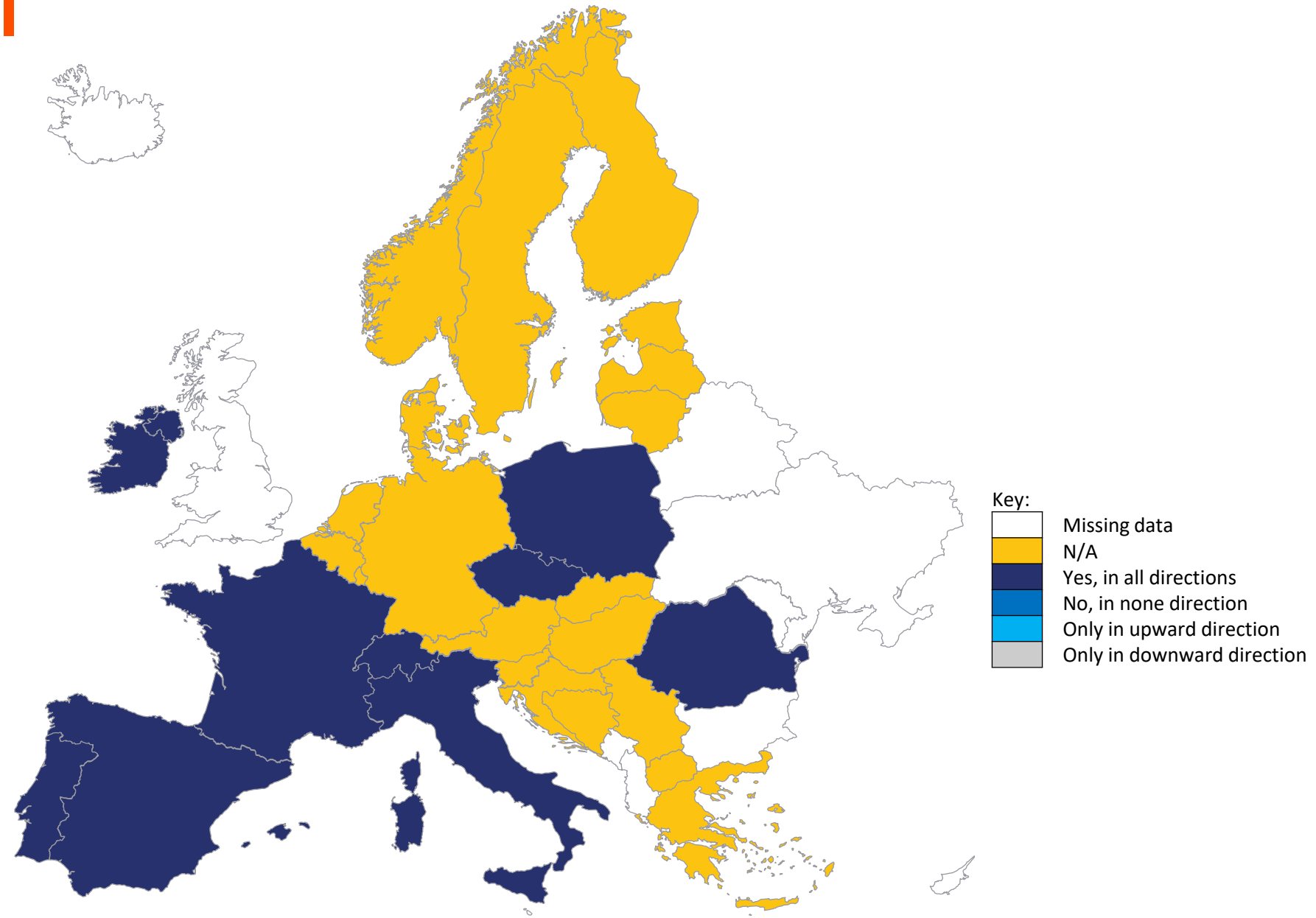


Replacement Reserve - Energy - In case transfer obligation is allowed, is there an organised secondary market?



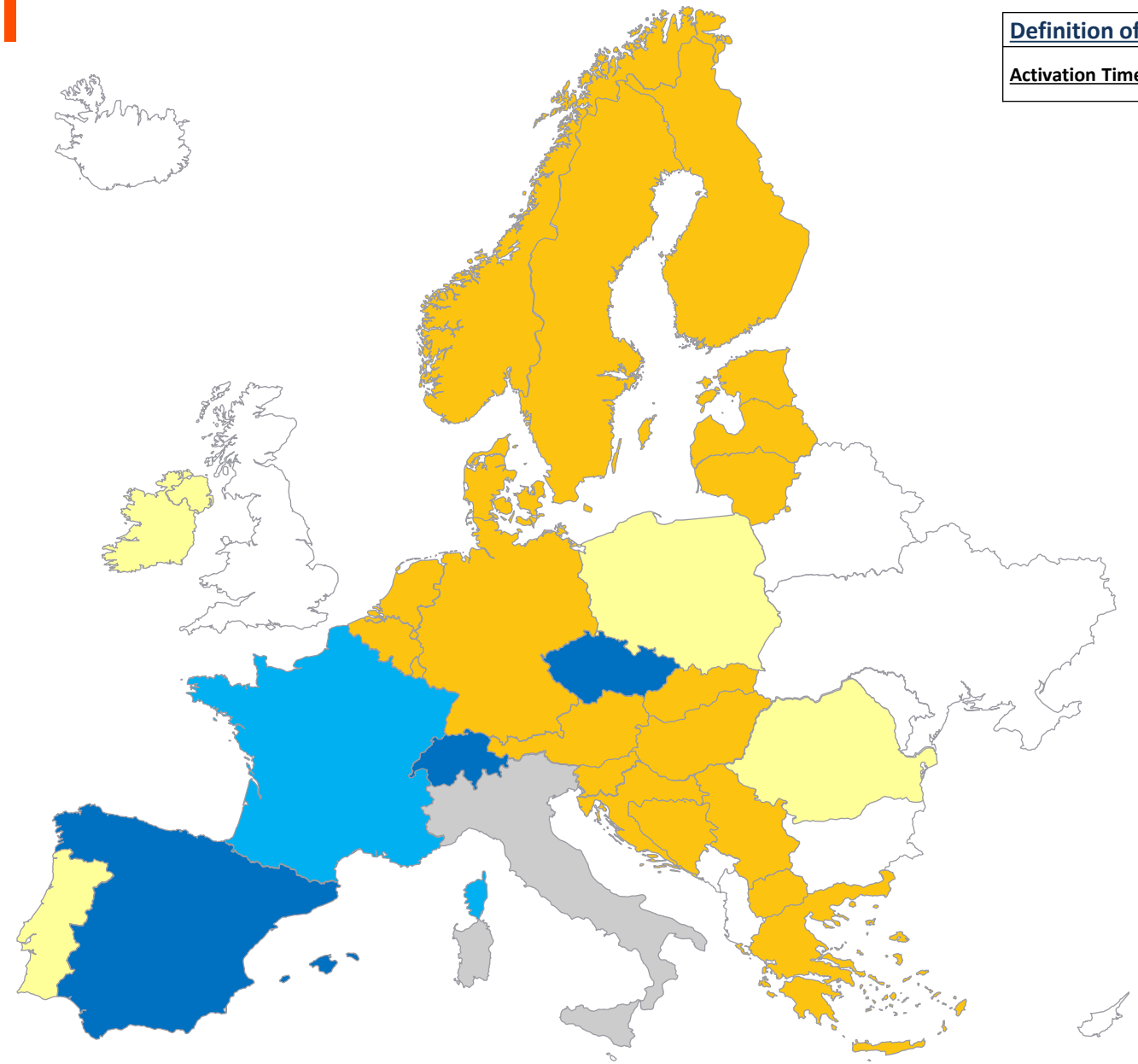
Definition of answer	
Secondary Market for reserve obligation	Trading procedure between the BSPs (where at least one BSP has contract with the TSO) to ensure the prescribed reserve amount of the TSO.

Replacement Reserve - Energy - Partially activated product



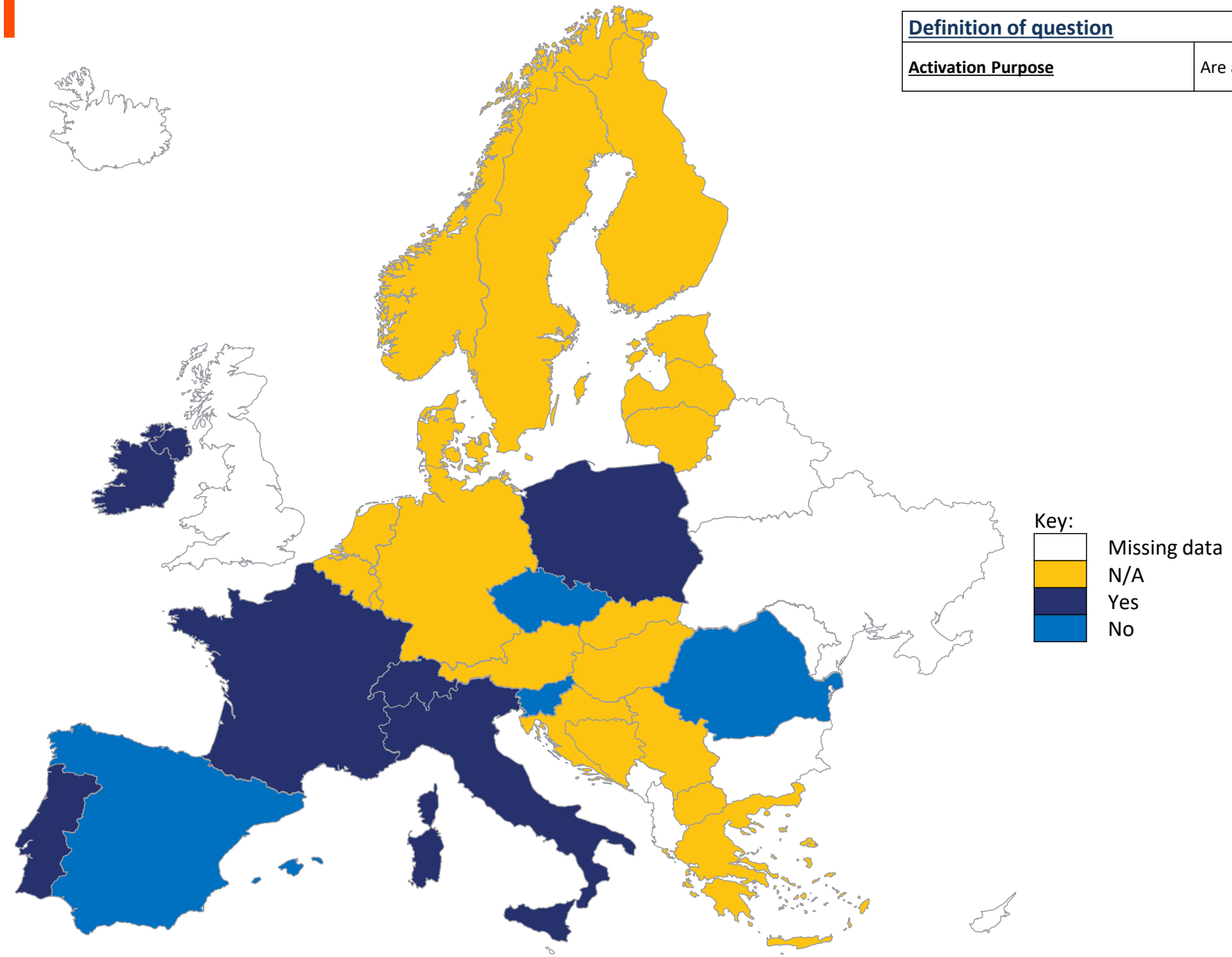
Replacement Reserve - Energy - Activation time of RR from 0 to max

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.

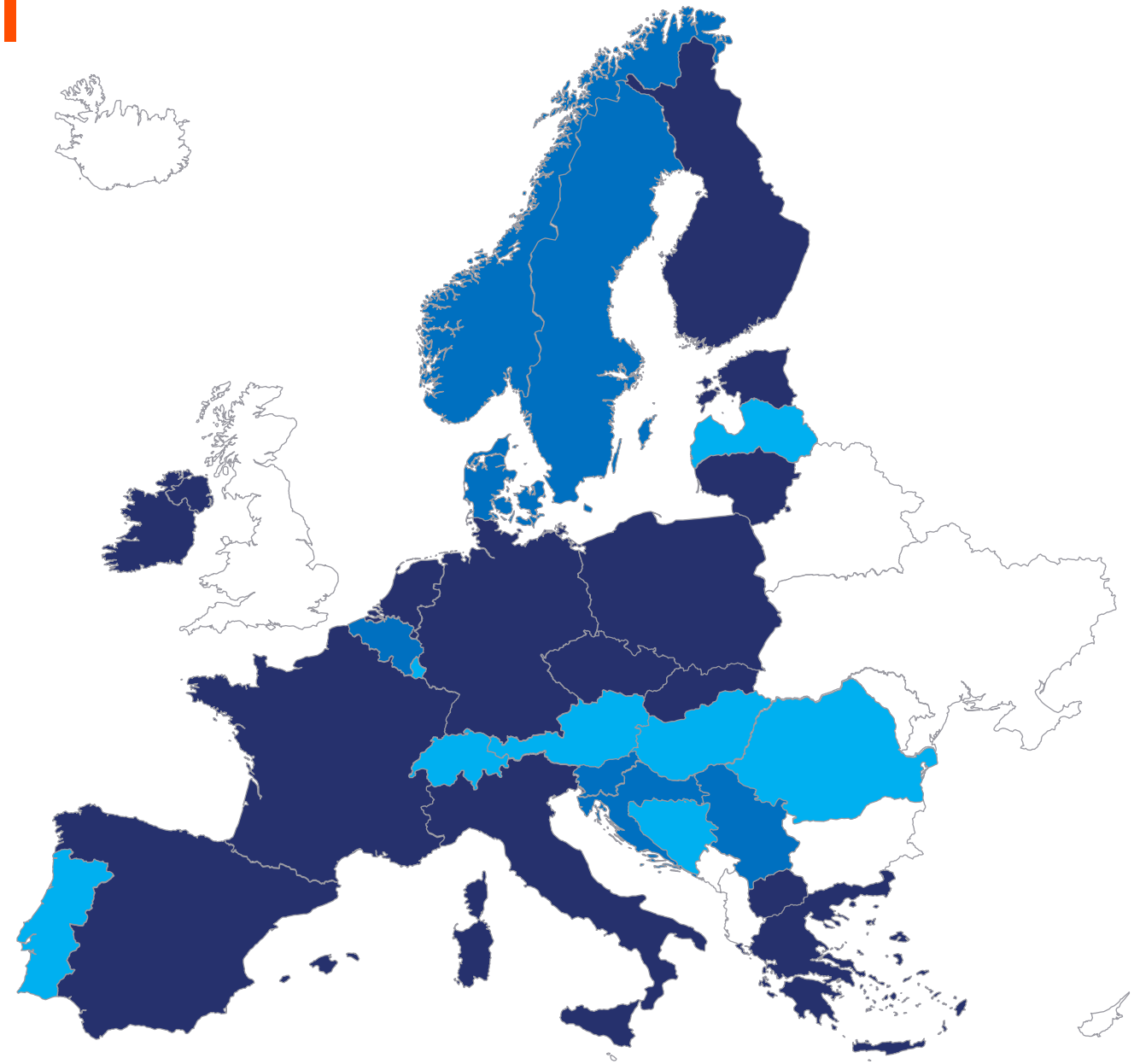


Replacement Reserve - Energy - Are activations possible for other purposes than for balancing?

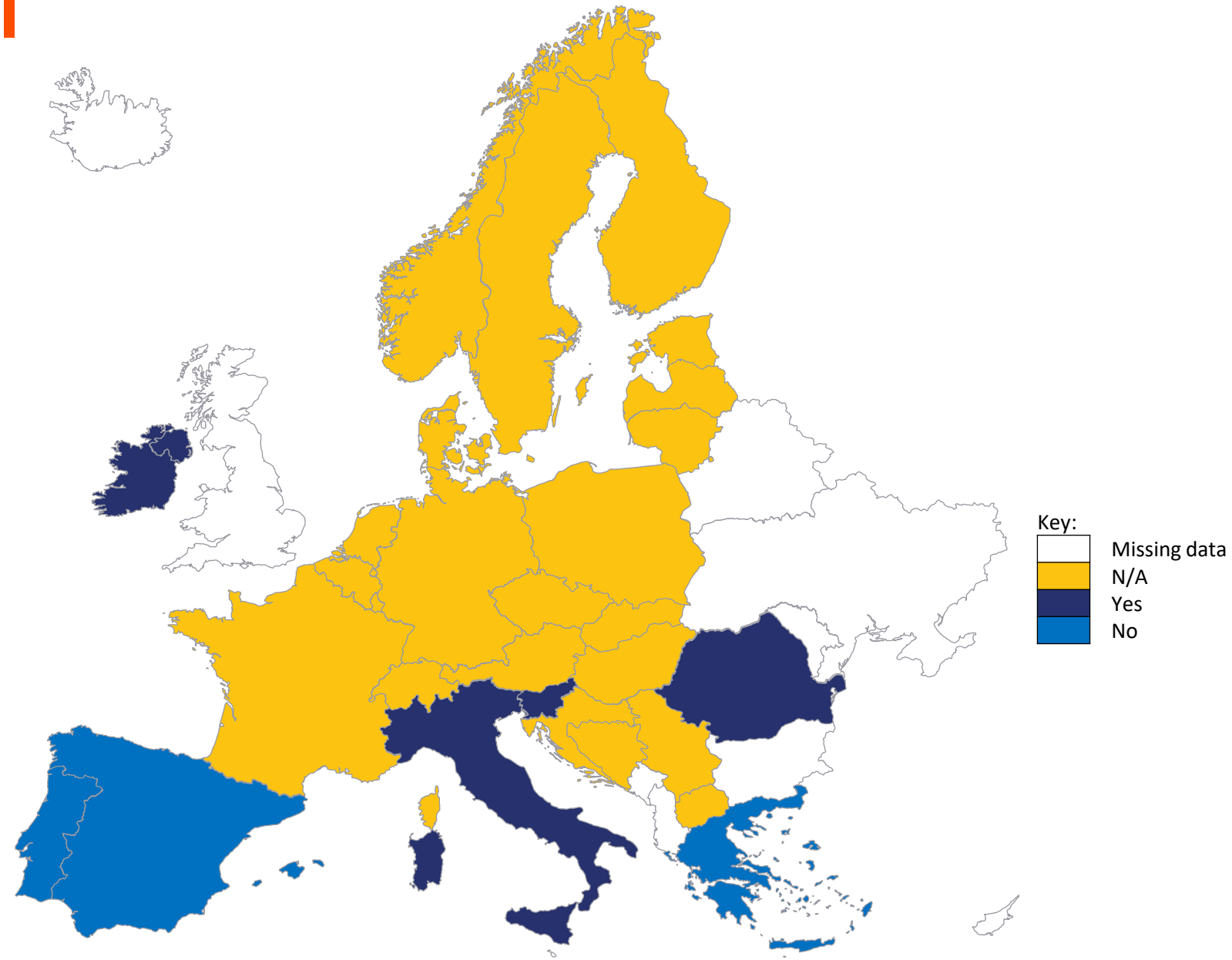
Definition of question	
Activation Purpose	Are activations for other purposes than Balancing (e.g. congestion management) possible?



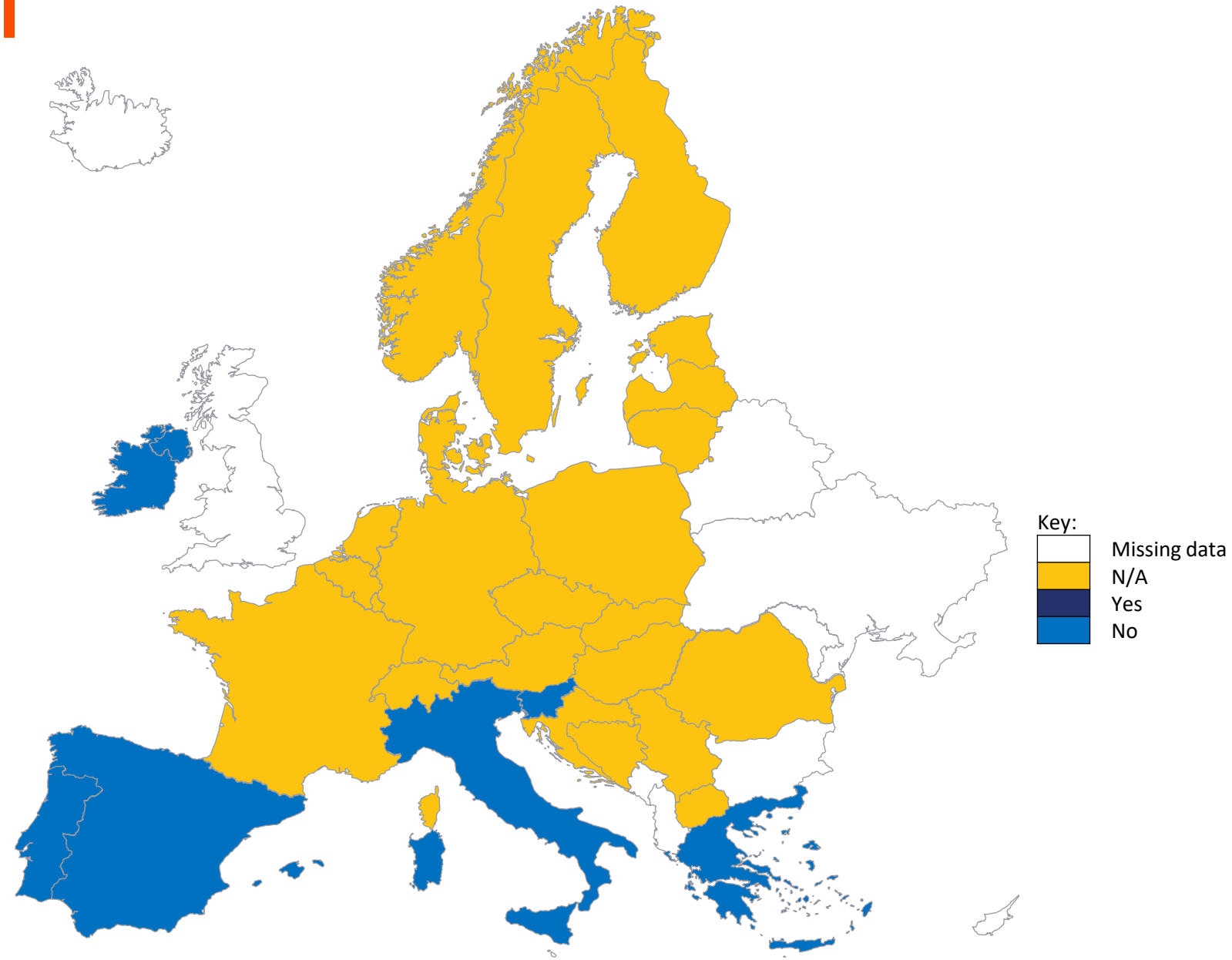
Do you consider changes significant/important regarding the ancillary services?



Existence of “new” AS such as fast frequency response or markets for non-frequency AS such as inertia or reactive power?



Locational information in balancing bids: Is there location information in place, aside from unit-bidding?



Please, explain significant/important changes regarding the ancillary services in line with/aimed to requirements of EB Regulation (and the reason behind) in comparison to the year 2020! (1/3)

TSO	Answer
ČEPS	Changes due to accession to balancing energy platforms and implementation of standard balancing products.
Eirgrid	Future arrangements still under design considerations.
Elering	Changes will come due to the Baltic electricity grid synchronization with the Continental European Network.
Energinet	Daily auctions for mFRR capacity
German TSOs	Implementation of EB GL target market design.
HOPS	Pursuant to Article 18 of EU Commission Regulation 2017/2195 of 23 November 2017 establishing a Guideline on Electricity Balancing (Text with EEA relevance), HOPS has started to prepare new balancing market rules, and new rules for the market organization.

Please, explain significant/important changes regarding the ancillary services in line with/aimed to requirements of EB Regulation (and the reason behind) in comparison to the year 2020! (2/3)

TSO	Answer
Litgrid	In context of Baltic electricity grid synchronization with Continental Europe Network changes in balancing markets are foreseen: 1. Creating Common Baltic capacity market for mFRR, aFRR and FCR 2. Joining MARI 3. Creating local aFRR market 4. Joining PISACCO
MEPSO	The resolution for minimum bids for mFRR is changed from 5MW to 1MW. Conducting monthly auctions for aFRR for a more competitive market. Conducting auctions for procurement of aFRR and mFRR capacity as portfolio (starting from December 2021).
PSE	Alignment of balancing product with products defined in EBGL and Implementation frameworks, introduction of balancing capacity products.
REE	Opening of demand units to participate at balancing markets. Preparation of Spanish system along 2021, for future PICASSO and MARI platforms on going.

Please, explain significant/important changes regarding the ancillary services in line with/aimed to requirements of EB Regulation (and the reason behind) in comparison to the year 2020! (3/3)

TSO	Answer
RTE	D-1 market-based procurements for 33 % of mFRR and RR reserves since June 2021 D-1 market-based procurement for aFRR reserve aFRR since November 2021 but has been suspended until further notice.
SONI	Future arrangements still under design considerations
TenneT NL	aFRR energy bids FAT to be aligned with EB Regulation standard product, exact date not yet determined. mFRR bids (local balancing energy product, similar to 15 min. whole sale trade product) removed from Tableau since not in line with mFRR standard product.
Terna	From December 2021 DSR, distributed resources, RES, and storage can participate to a pilot project to test aFRR provision (energy payments only). These resources can offer asymmetric bands of aFRR.
Terna	From December 2021 DSR, distributed resources, RES, and storage can participate to a pilot project to test aFRR provision (energy payments only). These resources can offer asymmetric bands of aFRR.

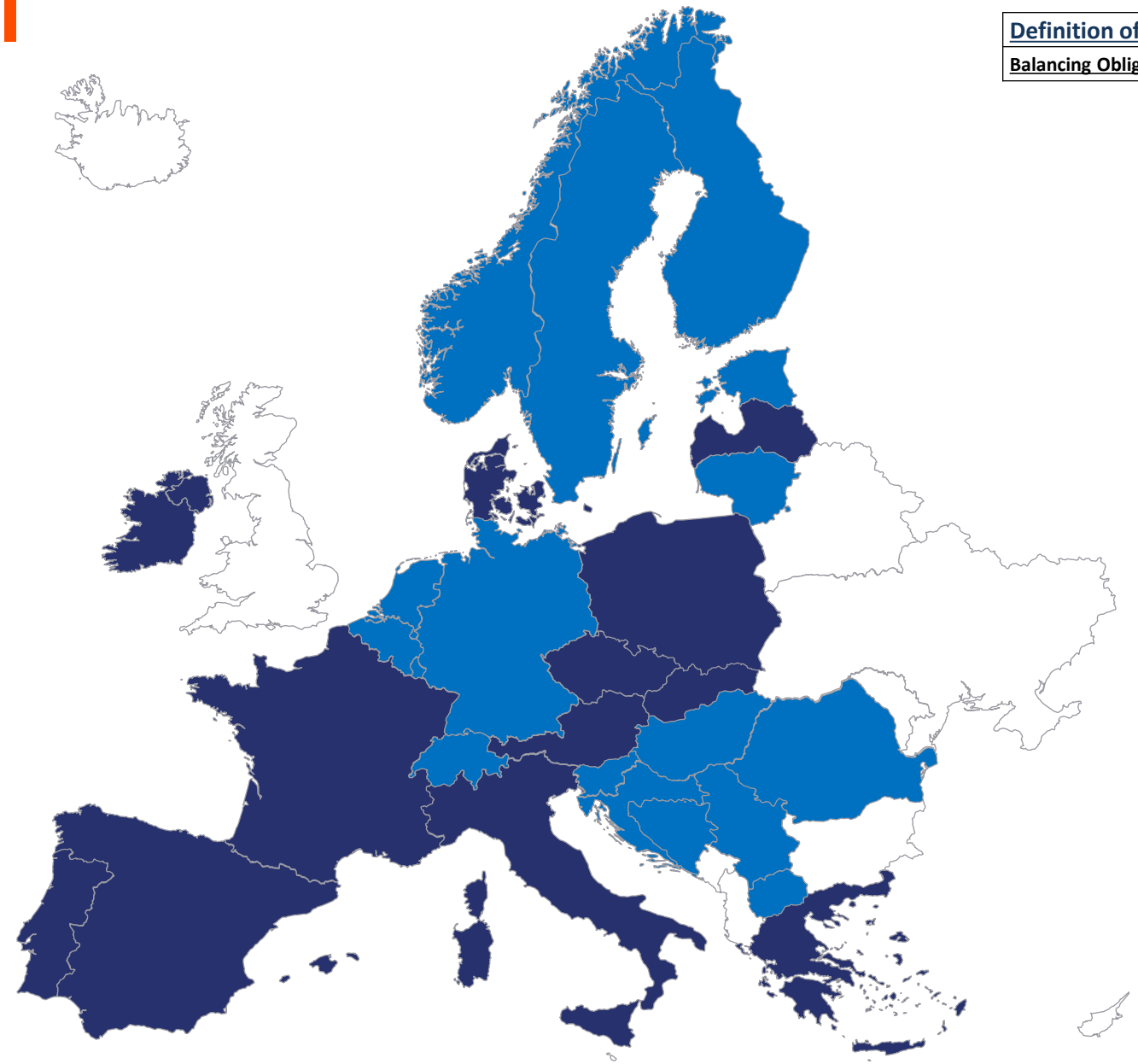
Please, explain significant/important changes regarding the ancillary services NOT in line with/aimed to requirements of EB Regulation (and the reason behind) in comparison to the year 2020!

TSO	Answer
Eirgrid	Future arrangements still under design considerations.

Imbalance settlement

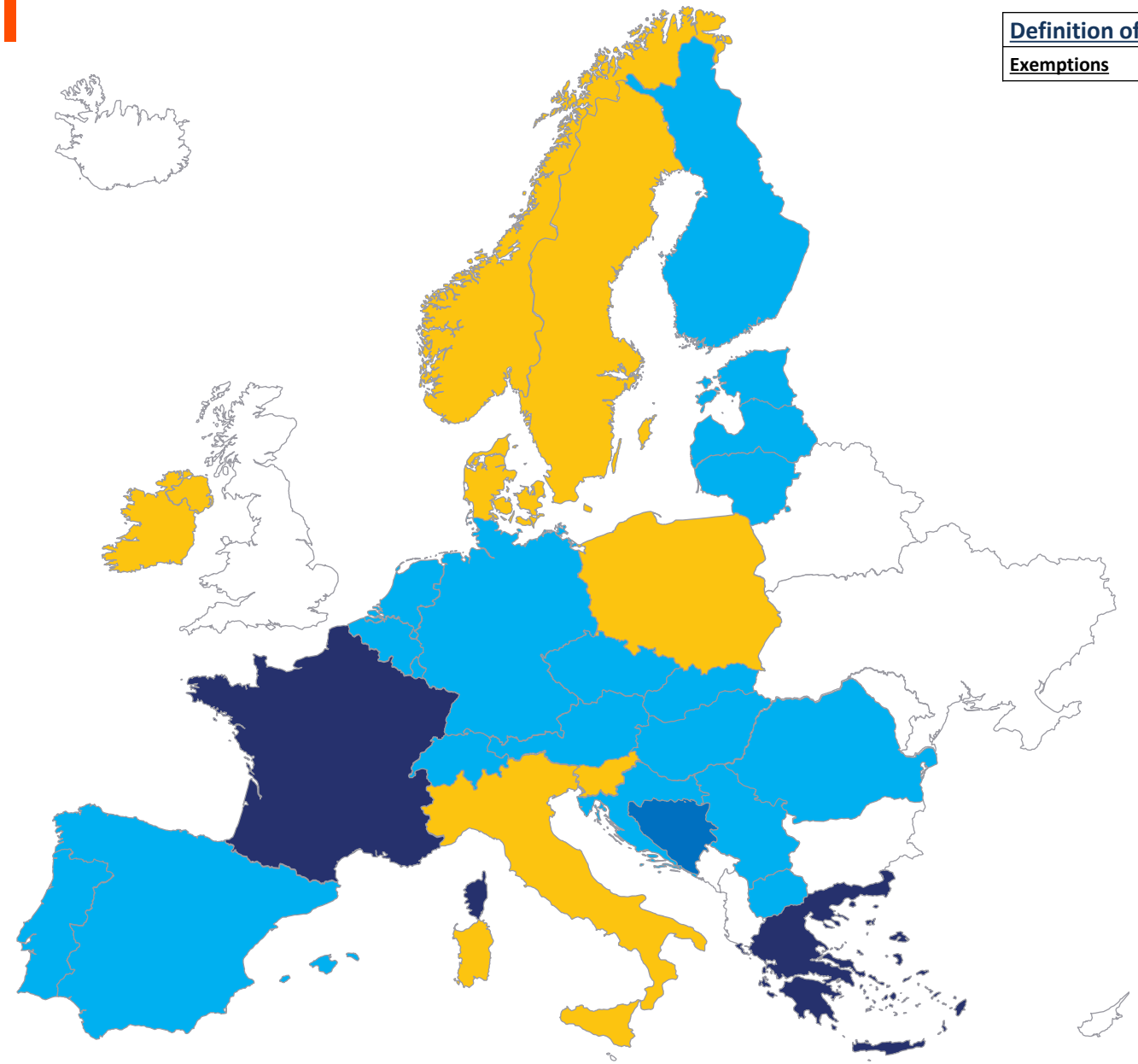
(Referring to questions of AS survey from IS1.0 to IS20.2)

Imbalance settlement – Nature of the Balancing Obligation Enforcement



Definition of question	
Balancing Obligation Enforcement	Nature of balance responsibility enforcement.

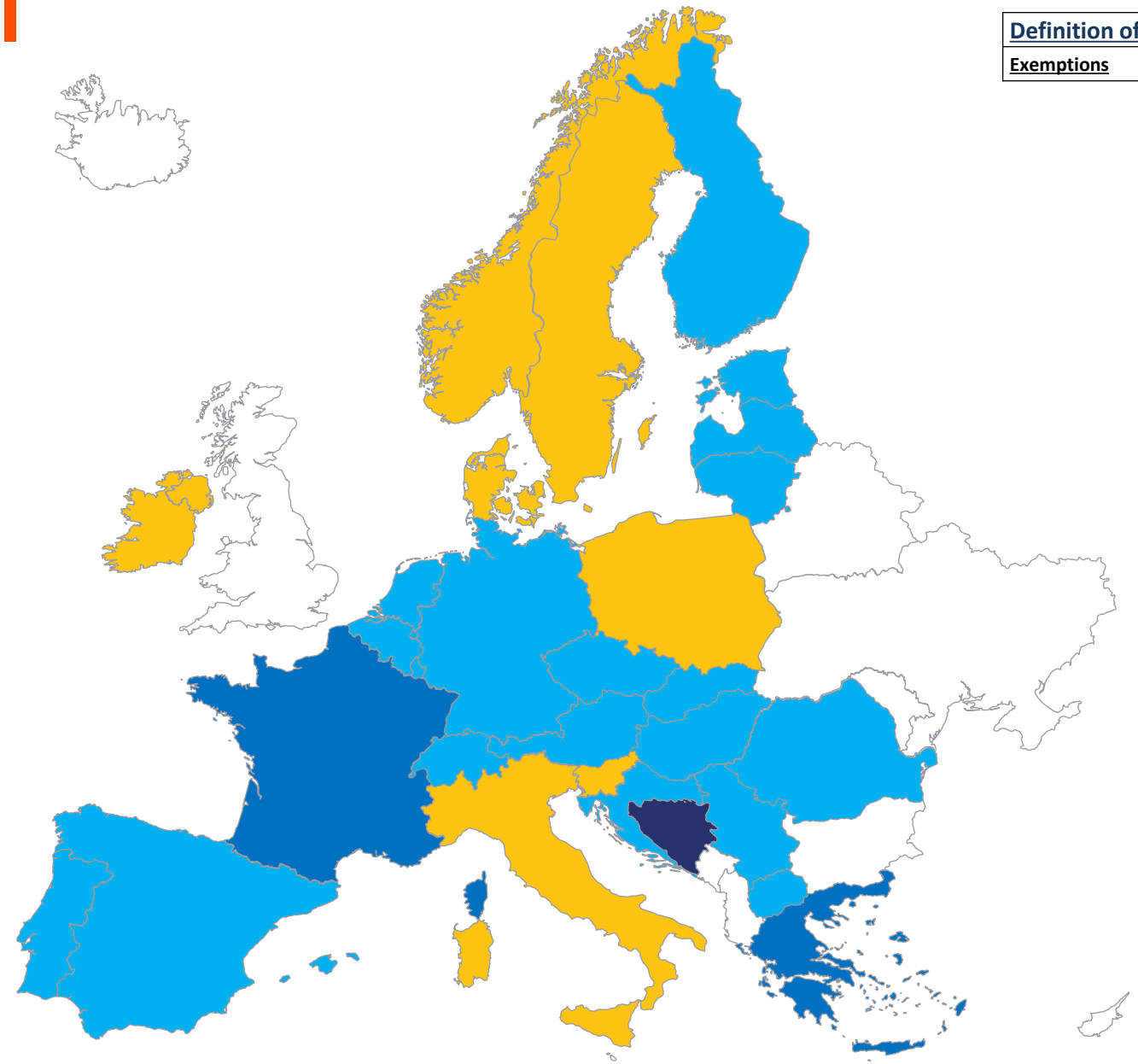
Imbalance settlement – Exemptions for RES



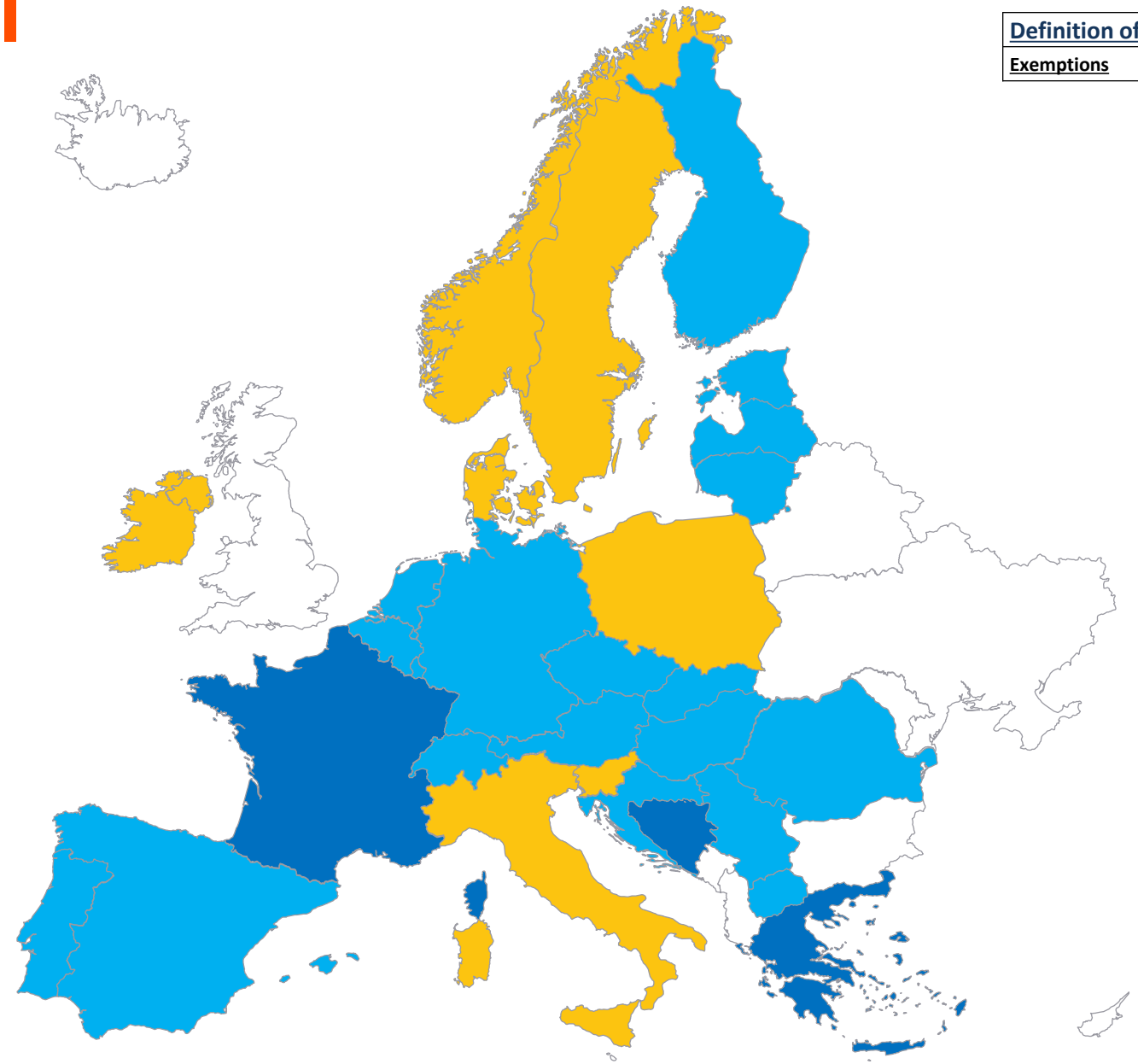
Definition of question	
Exemptions	Market participants which do not have obligations to be responsible for its imbalance.

Imbalance settlement – Exemptions for generators licensed for the AS market

Definition of question	
Exemptions	Market participants which do not have obligations to be responsible for its imbalance.



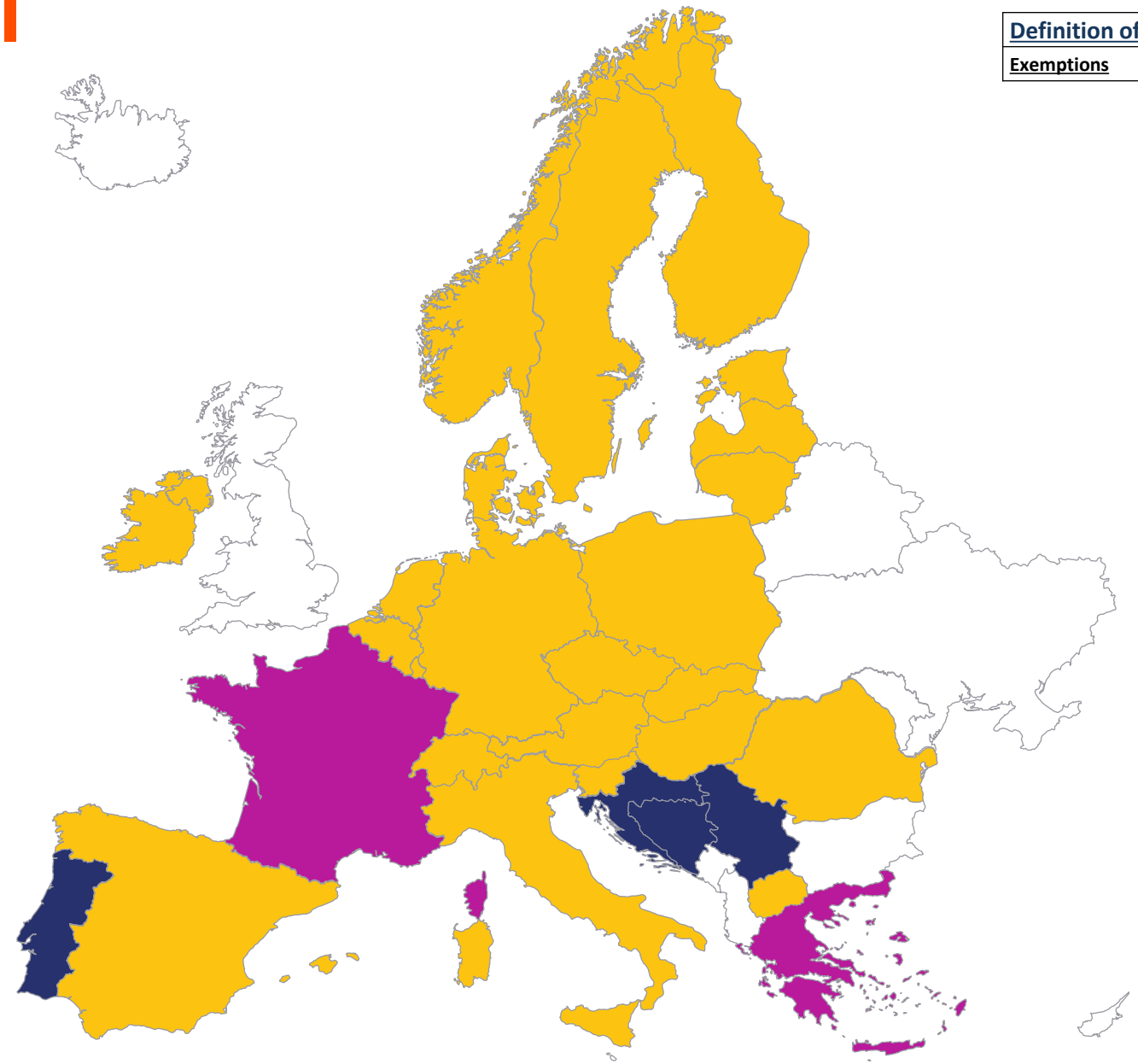
Imbalance settlement – Other form of exemptions



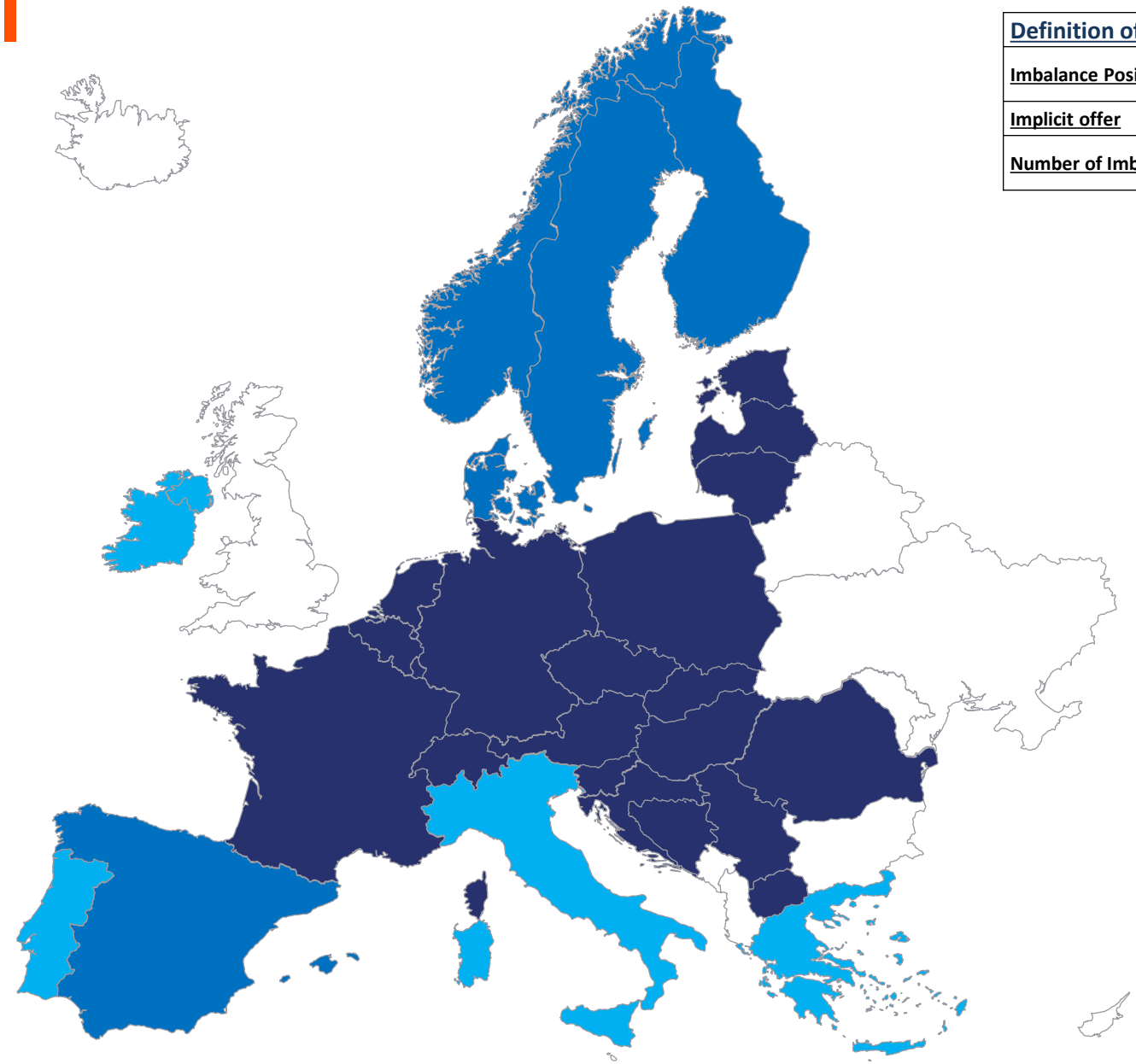
Definition of question	
Exemptions	Market participants which do not have obligations to be responsible for its imbalance.

Imbalance settlement – Limit to exemption

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



Imbalance settlement – Number of Imbalance Positions



Definition of question	
Imbalance Position	The declared energy volume of a balance responsible party used for the calculation of its imbalance.
Implicit offer	
Number of Imbalance Position	Number of Imbalance Positions is a property of local market design. For each Imbalance Position Imbalance Volume is calculated.

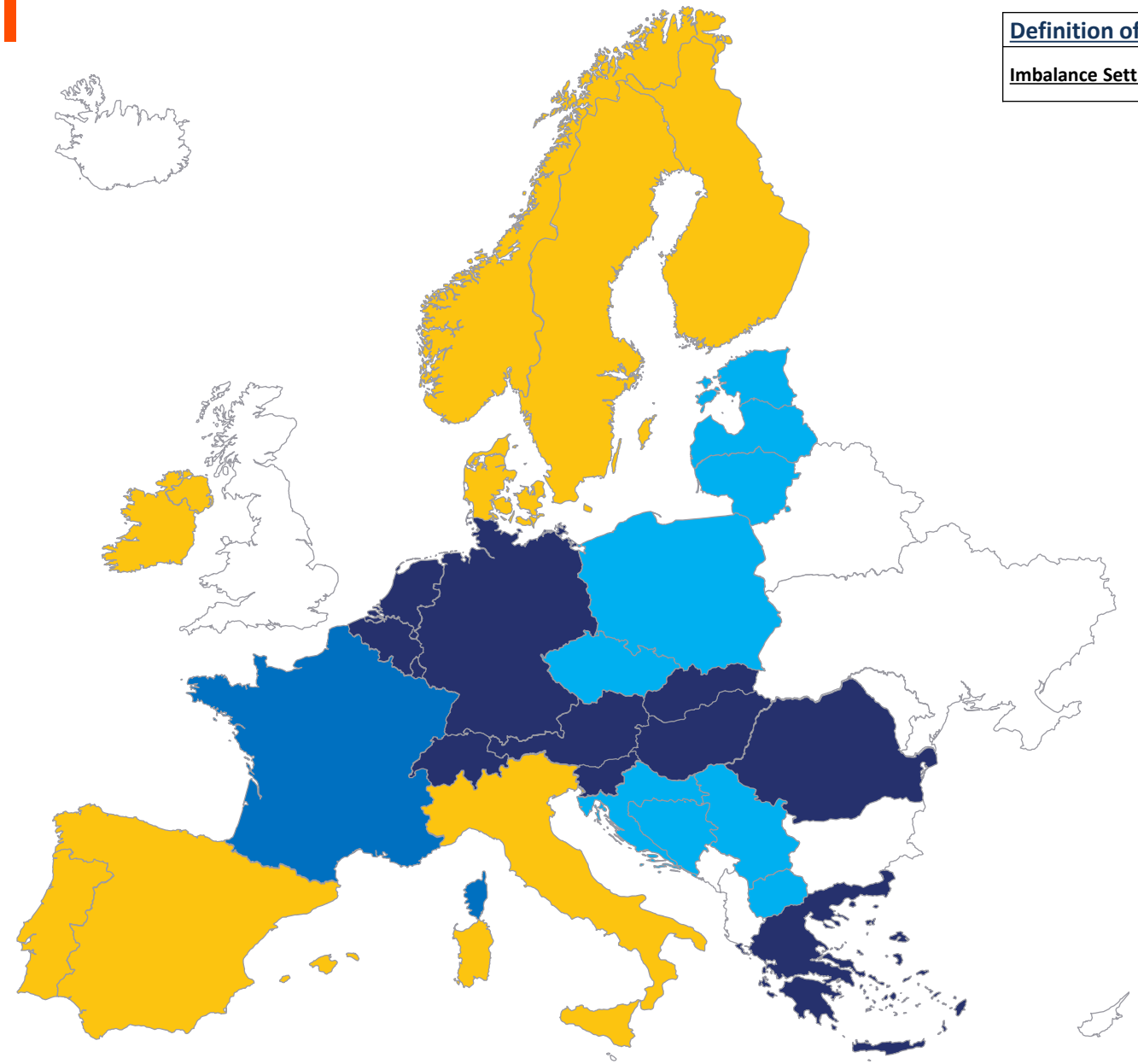
Key:

- 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!

TSO	Answer
Eirgrid	A single imbalance position for each Scheduling Unit under the Balance Responsible Party as allowed for Central Dispatch Systems.
IPTO	For generation there is one position per generation unit.
REN	For generation the imbalance is calculated by imbalance area. A market player can have more than one imbalance area.
SONI	A single imbalance position for each Scheduling Unit under the Balance Responsible Party as allowed for Central Dispatch Systems.
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.

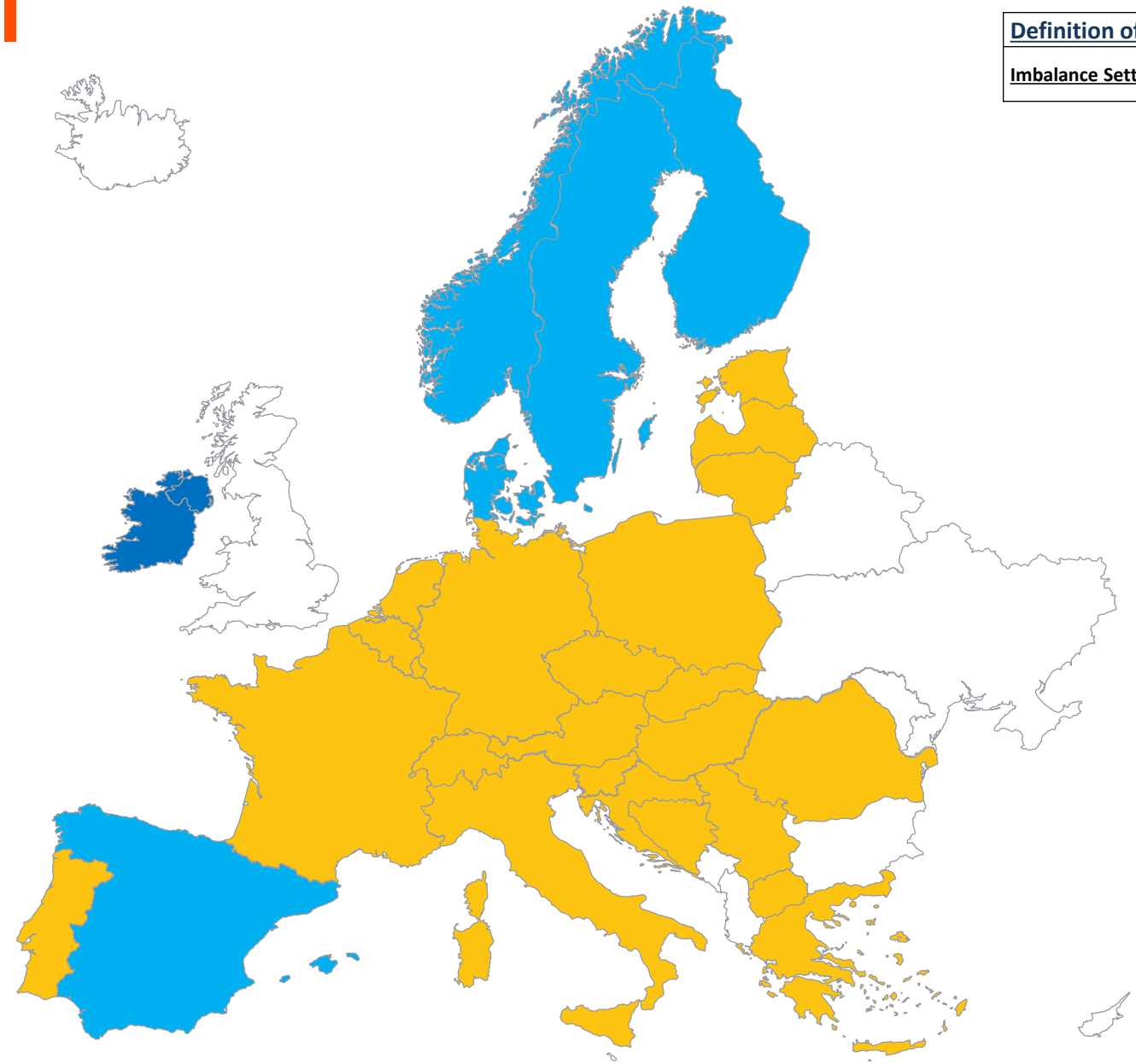
Imbalance settlement – Imbalance Settlement Period – If 1 position



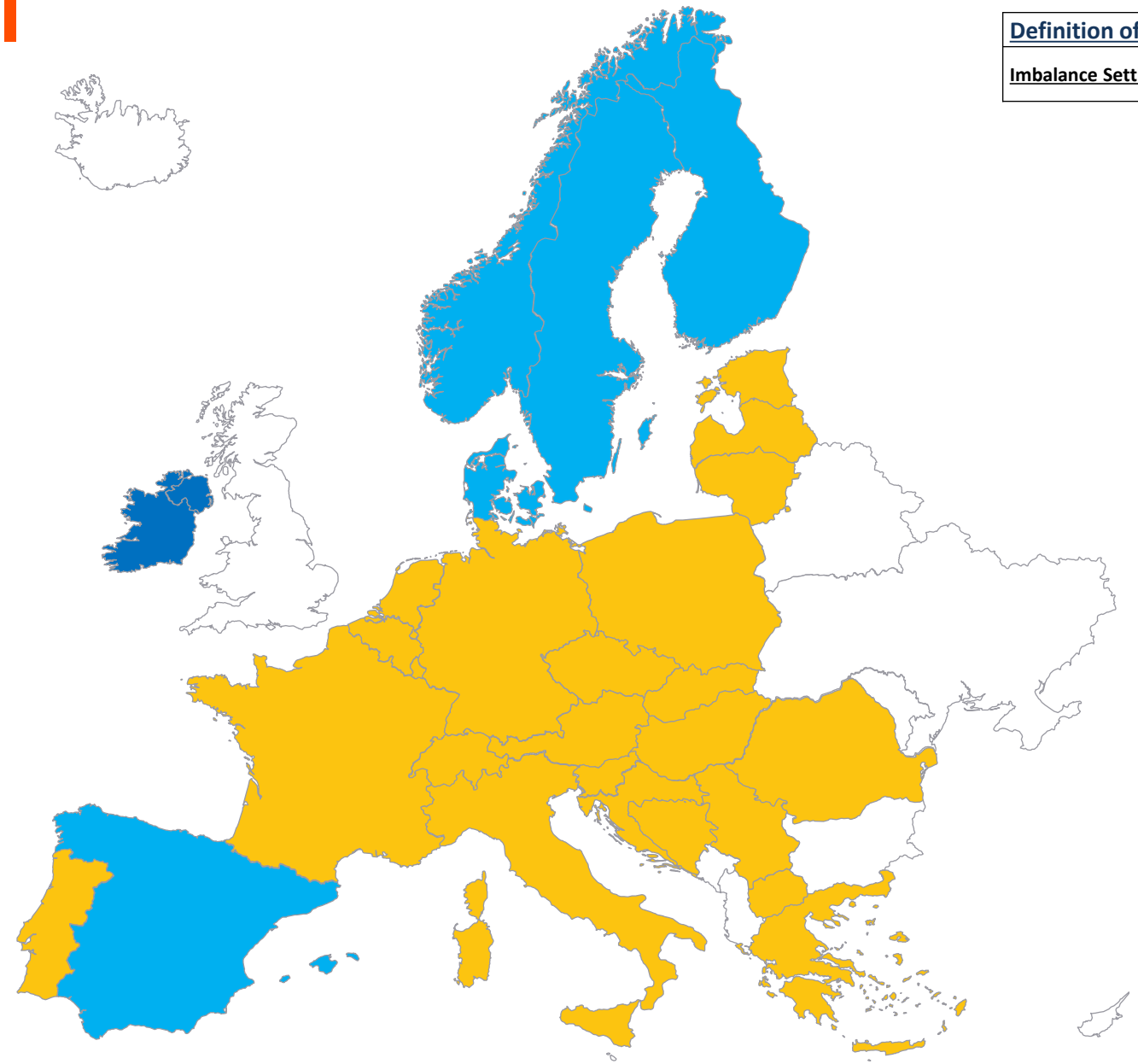
Definition of question	
Imbalance Settlement Period	The unit of settlement that is applied to the quantities in which the time series is expressed.

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.

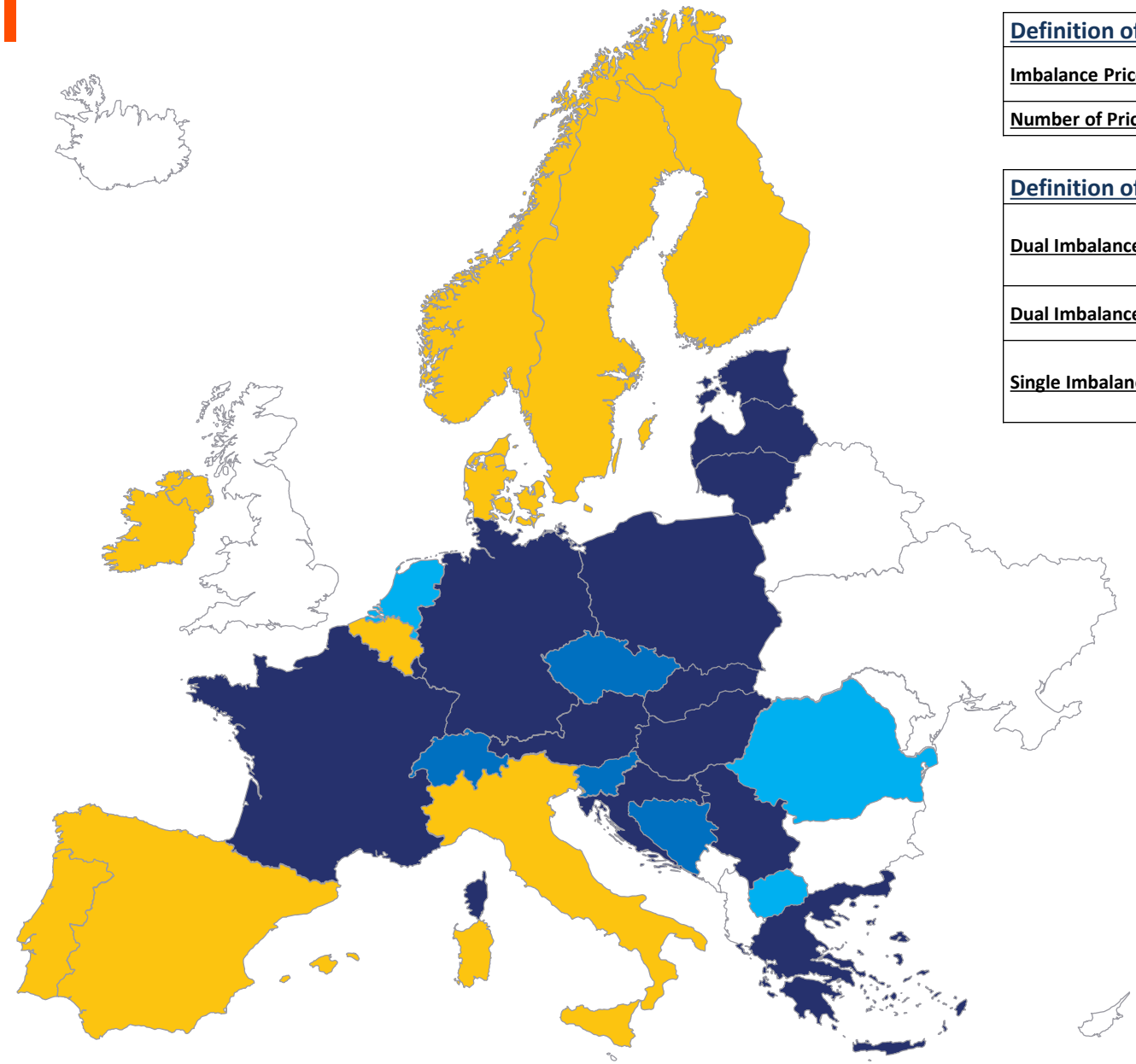


Imbalance settlement – Imbalance Settlement Period – If 2 positions – Consumption



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

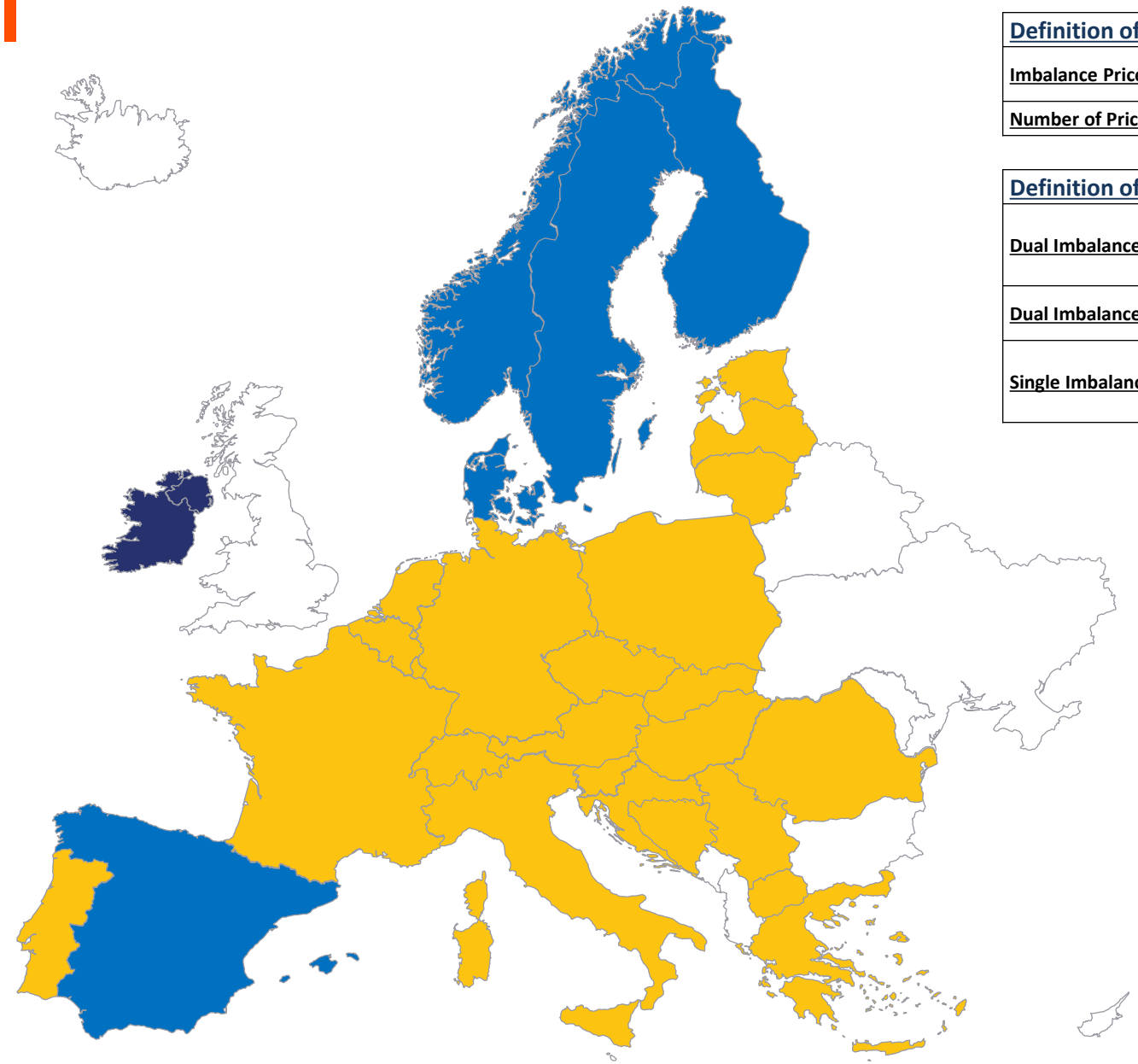
Imbalance settlement – Number of Prices – If 1 position



Definition of question	
Imbalance Price	The price, be it positive, zero or negative, in each imbalance settlement period for an imbalance in each direction.
Number of Prices	Number of prices for Imbalance Position.

Definition of answer	
Dual Imbalance Pricing	Dual imbalance pricing means that, for a given ISP in a given imbalance price area, the price for negative imbalance is not equal to the price for positive imbalance in sign and/or size.
Dual Imbalance Pricing some ISPs	Dual imbalance pricing is applied only for some ISPs and for others the Single Imbalance Pricing is applied.
Single Imbalance Pricing	Single imbalance pricing means that, for a given ISP in a given imbalance price area, the price for negative imbalance and the price for positive imbalance are equal in sign and size.

Imbalance settlement – Number of Prices – If 2 positions – Generation



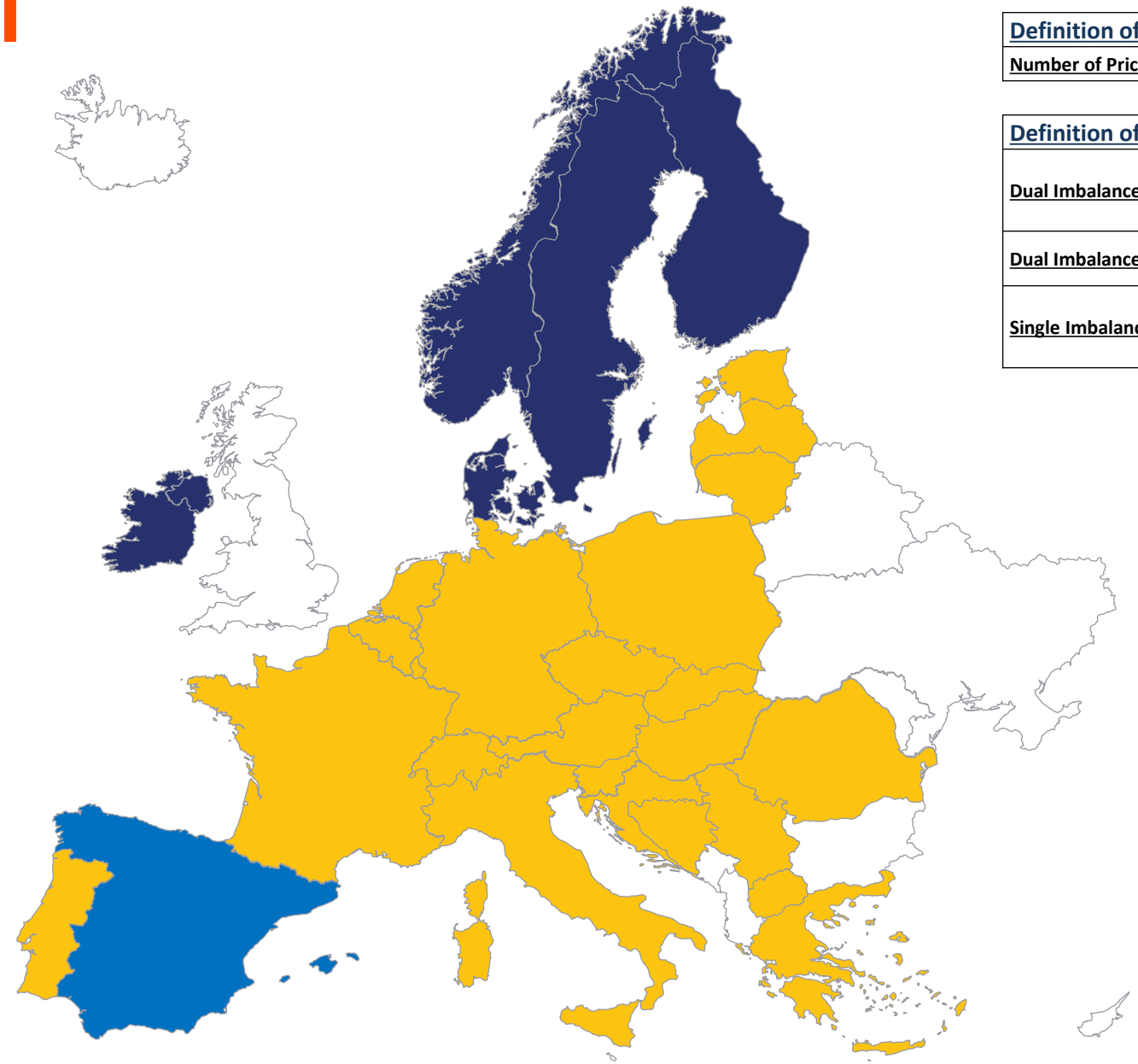
Definition of question	
Imbalance Price	The price, be it positive, zero or negative, in each imbalance settlement period for an imbalance in each direction.
Number of Prices	Number of prices for Imbalance Position.

Definition of answer	
Dual Imbalance Pricing	Dual imbalance pricing means that, for a given ISP in a given imbalance price area, the price for negative imbalance is not equal to the price for positive imbalance in sign and/or size.
Dual Imbalance Pricing some ISPs	Dual imbalance pricing is applied only for some ISPs and for others the Single Imbalance Pricing is applied.
Single Imbalance Pricing	Single imbalance pricing means that, for a given ISP in a given imbalance price area, the price for negative imbalance and the price for positive imbalance are equal in sign and size.

Key:

- Missing data
- N/A
- Single Imbalance Pricing all ISPs
- Dual Imbalance Pricing all ISPs
- Dual Imbalance Pricing some ISPs
- Other

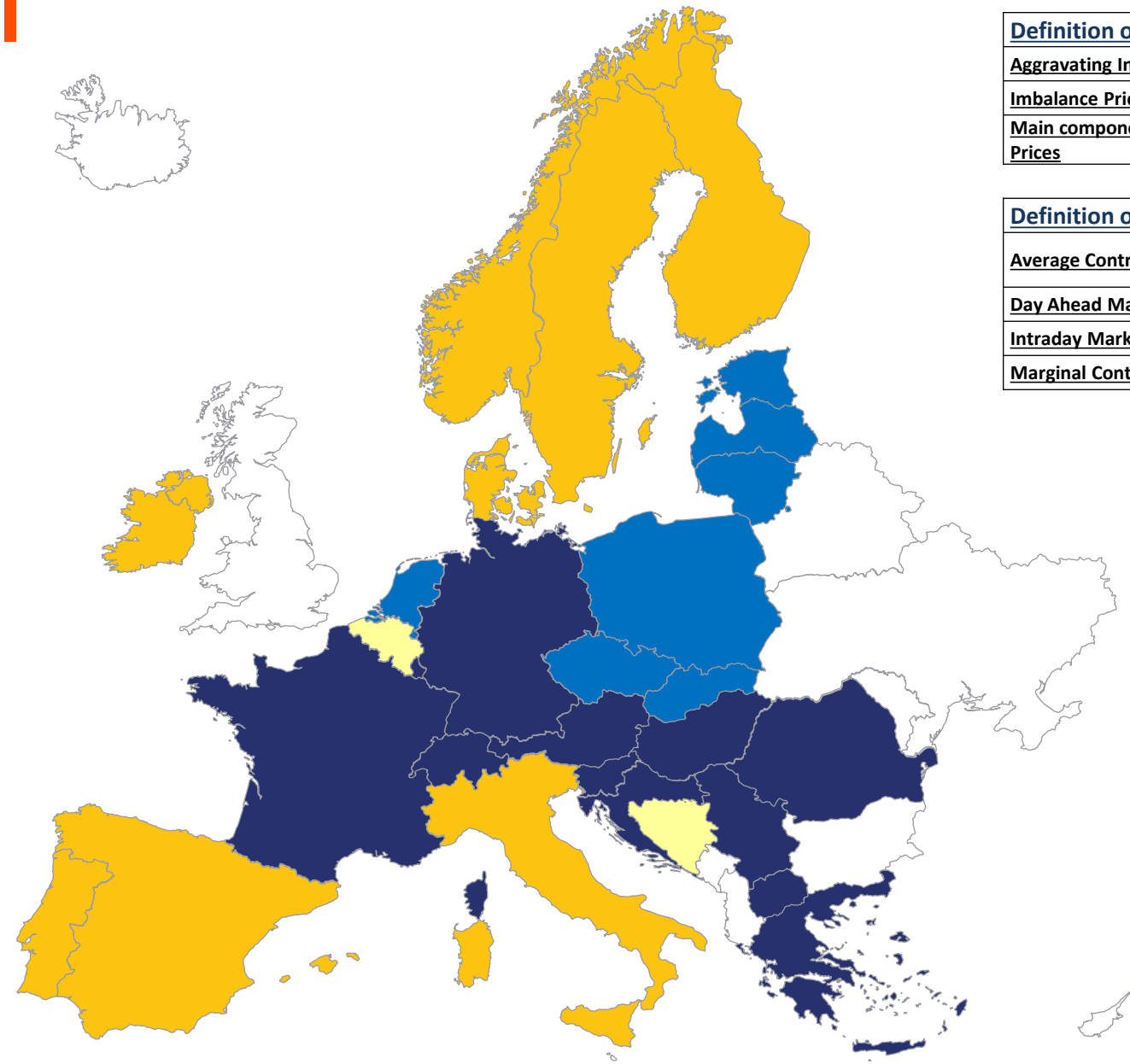
Imbalance settlement – Number of Prices – If 2 positions – Consumption



Definition of question	
Number of Prices	Number of prices for Imbalance Position.

Definition of answer	
Dual Imbalance Pricing	Dual imbalance pricing means that, for a given ISP in a given imbalance price area, the price for negative imbalance is not equal to the price for positive imbalance in sign and/or size.
Dual Imbalance Pricing some ISPs	Dual imbalance pricing is applied only for some ISPs and for others the Single Imbalance Pricing is applied.
Single Imbalance Pricing	Single imbalance pricing means that, for a given ISP in a given imbalance price area, the price for negative imbalance and the price for positive imbalance are equal in sign and size.

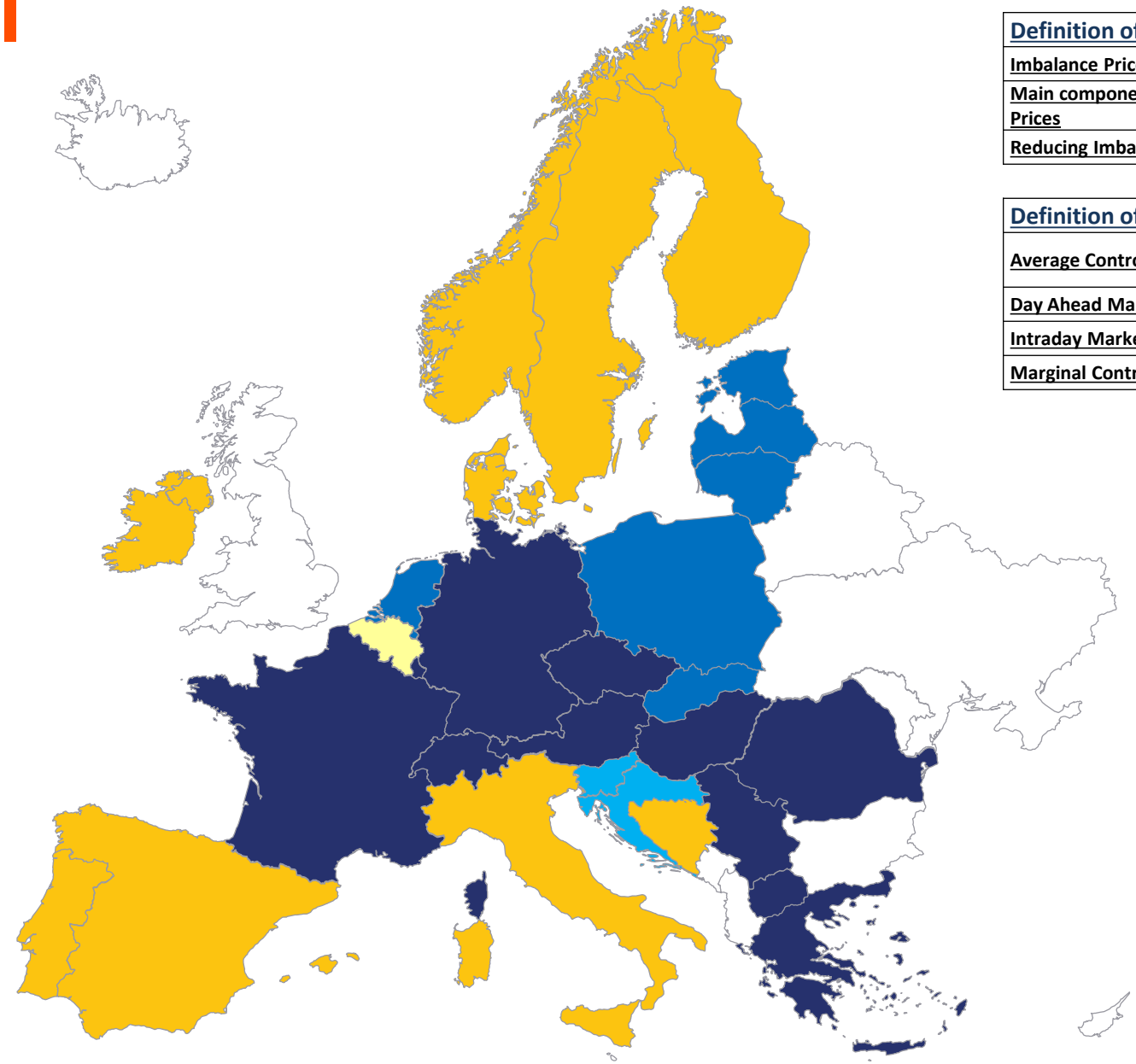
Imbalance settlement – Main comp. of Imb. Prices – If 1 position – Aggravating imb.



Definition of question	
Aggravating Imbalance	BRP imbalance same direction as Imbalance Price Area imbalance.
Imbalance Price Area	The area for the calculation of an imbalance price.
Main component of Imbalance Prices	The component that determines imbalance charges most of the time.

Definition of answer	
Average Control Energy Price	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.
Day Ahead Market Price	Price which evolved on the day ahead market.
Intraday Market Price	The price of the market within regular business hours, short-term prices.
Marginal Control Energy Price	The highest price, which can be acceptable.

Imbalance settlement – Main comp. of Imb. Prices – If 1 position – Reducing imb.



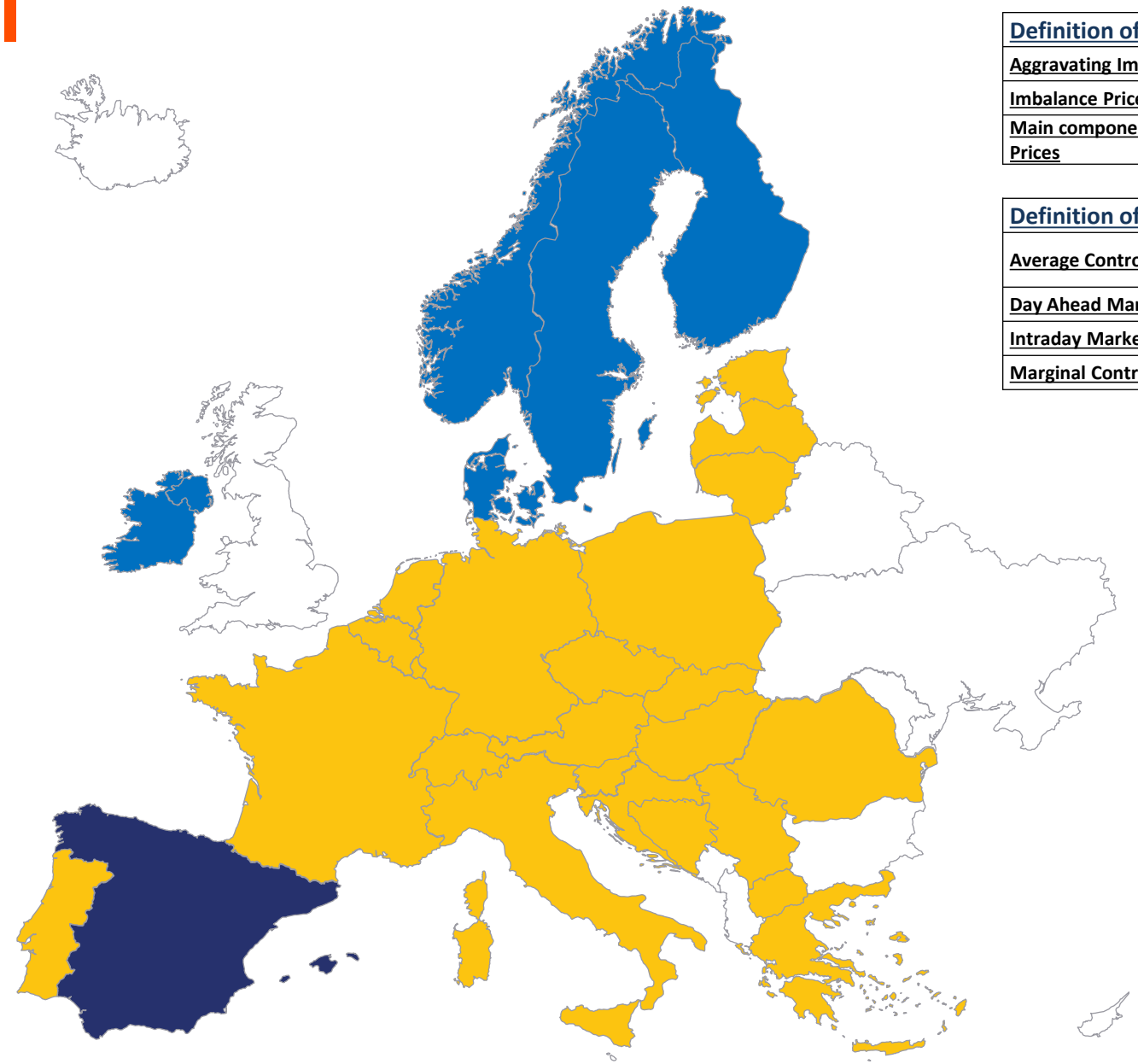
Definition of question	
Imbalance Price Area	The area for the calculation of an imbalance price.
Main component of Imbalance Prices	The component that determines imbalance charges most of the time.
Reducing Imbalance	BRP imbalance opposite direction as Imbalance Area imbalance.

Definition of answer	
Average Control Energy Price	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.
Day Ahead Market Price	Price which evolved on the day ahead market.
Intraday Market Price	The price of the market within regular business hours, short-term prices.
Marginal Control Energy Price	The highest price, which can be acceptable.

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 generation "aggravating imb."



Definition of question	
Aggravating Imbalance	BRP imbalance same direction as Imbalance Price Area imbalance.
Imbalance Price Area	The area for the calculation of an imbalance price.
Main component of Imbalance Prices	The component that determines imbalance charges most of the time.

Definition of answer	
Average Control Energy Price	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.
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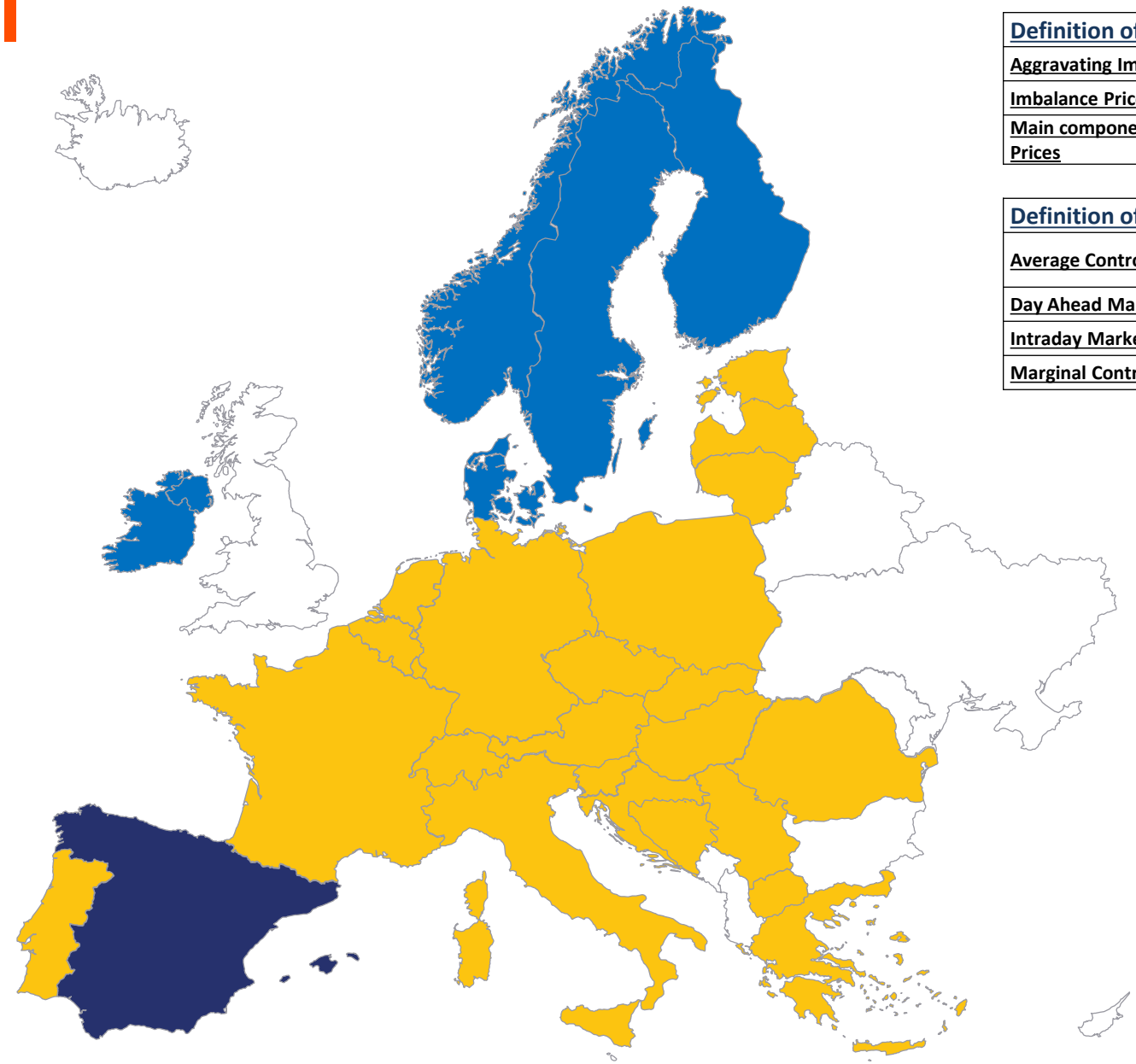
Intraday Market Price	The price of the market within regular business hours, short-term prices.
Marginal Control Energy Price	The highest price, which can be acceptable.

Imbalance settlement – Main comp. of Imb. Prices – If 2 positions – For consumption "aggravating imb."



Definition of question	
Aggravating Imbalance	BRP imbalance same direction as Imbalance Price Area imbalance.
Imbalance Price Area	The area for the calculation of an imbalance price.
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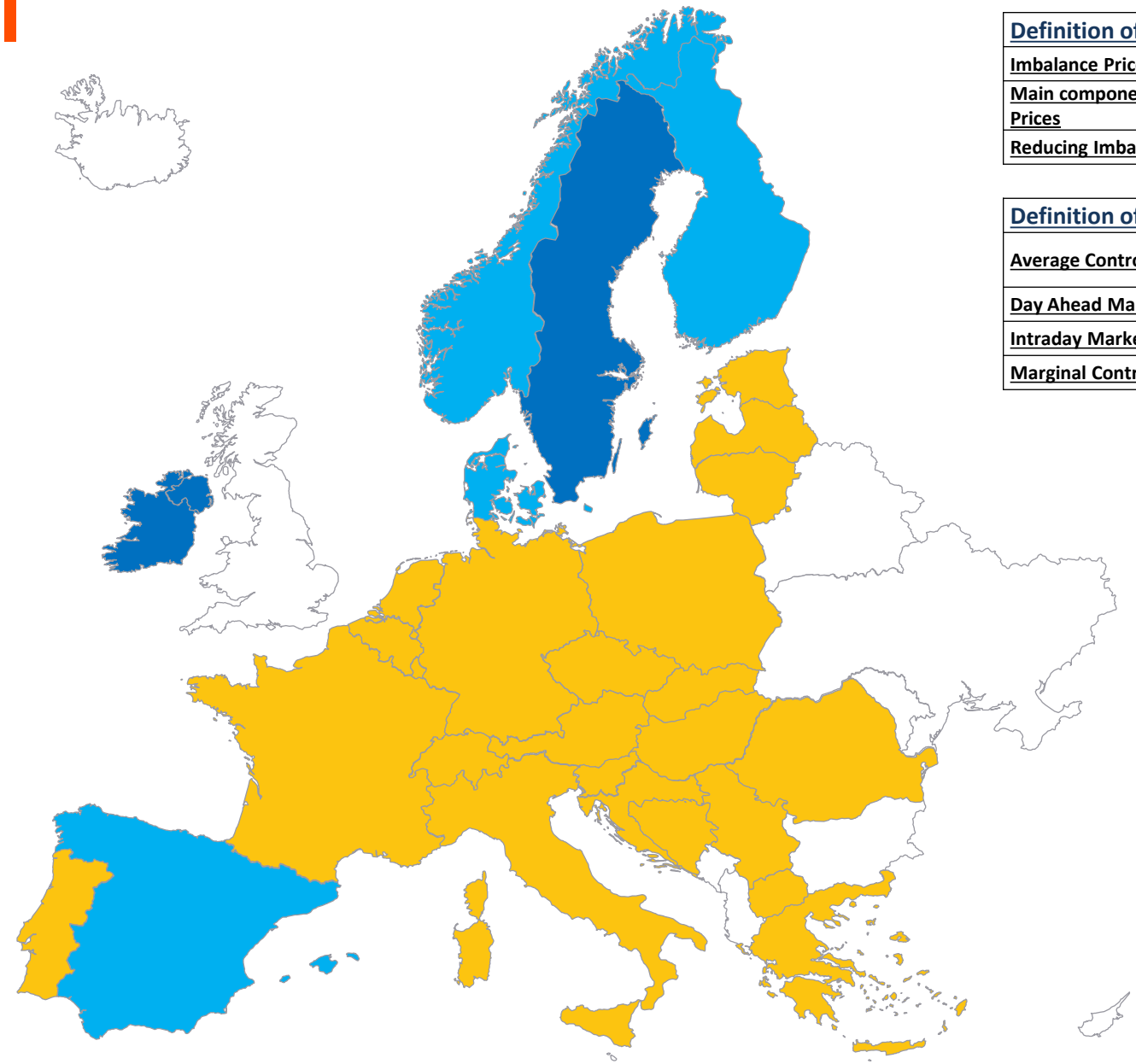
Marginal Control Energy Price	The highest price, which can be acceptable.

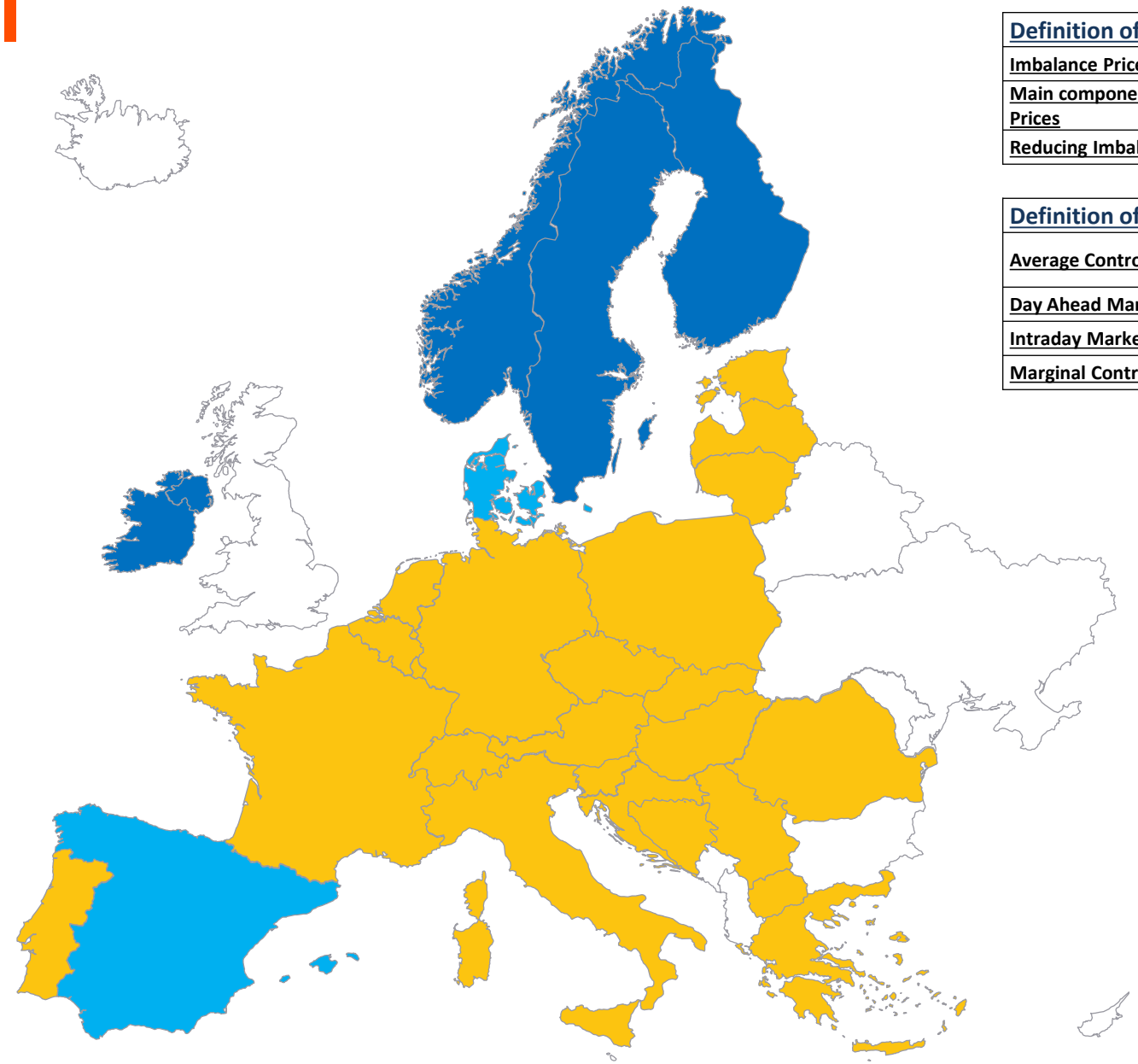
Imbalance settlement – Main comp. of Imb. Prices – If 2 positions – For generation “reducing imb."



Definition of question	
Imbalance Price Area	The area for the calculation of an imbalance price.
Main component of Imbalance Prices	The component that determines imbalance charges most of the time.
Reducing Imbalance	BRP imbalance opposite direction as Imbalance Area imbalance.

Definition of answer	
Average Control Energy Price	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.
Day Ahead Market Price	Price which evolved on the day ahead market.
Intraday Market Price	The price of the market within regular business hours, short-term prices.
Marginal Control Energy Price	The highest price, which can be acceptable.

Imbalance settlement – Main comp. of Imb. Prices – If 2 positions – For consumption “reducing imb."

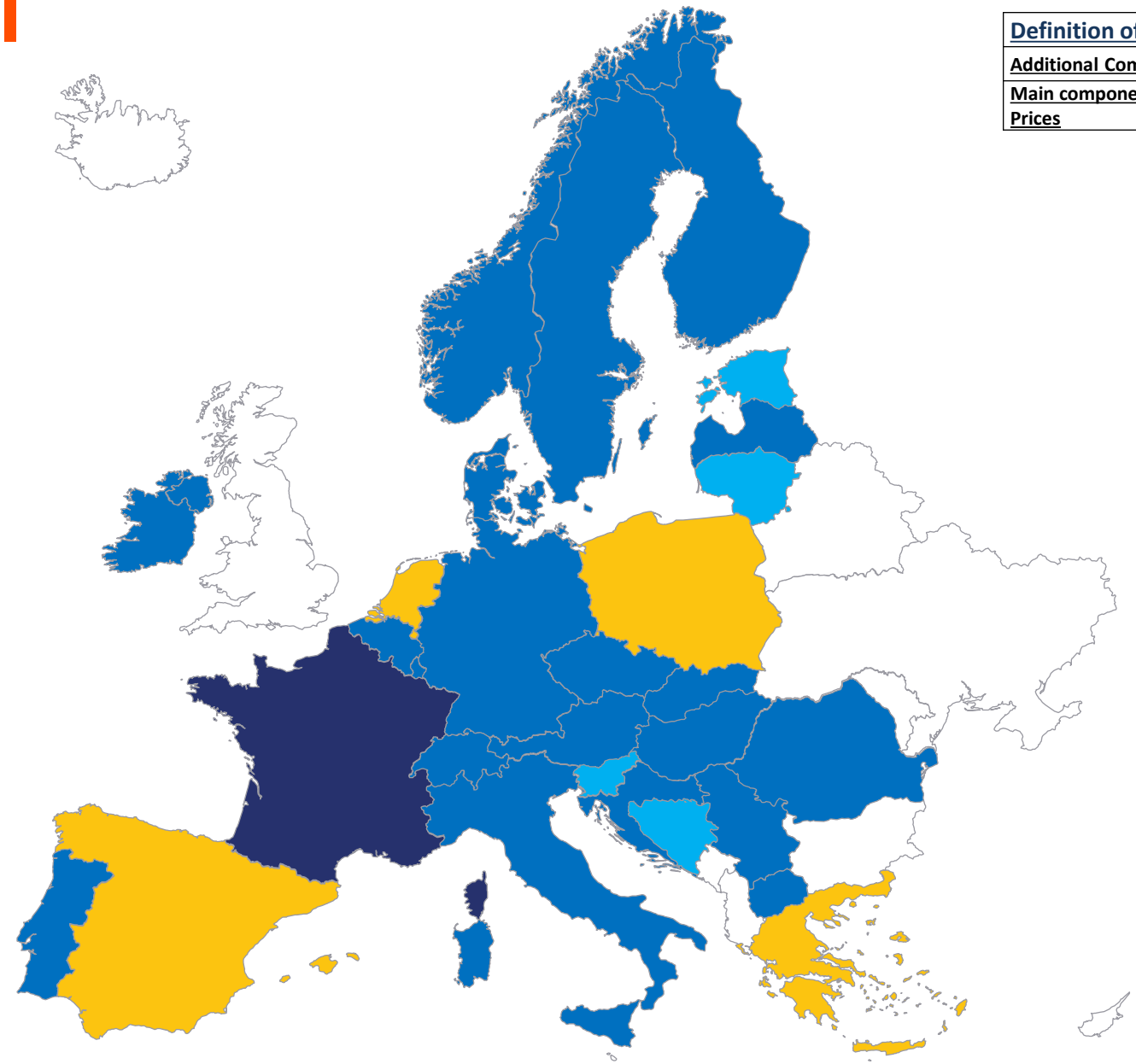


Definition of question	
Imbalance Price Area	The area for the calculation of an imbalance price.
Main component of Imbalance Prices	The component that determines imbalance charges most of the time.
Reducing Imbalance	BRP imbalance opposite direction as Imbalance Area imbalance.

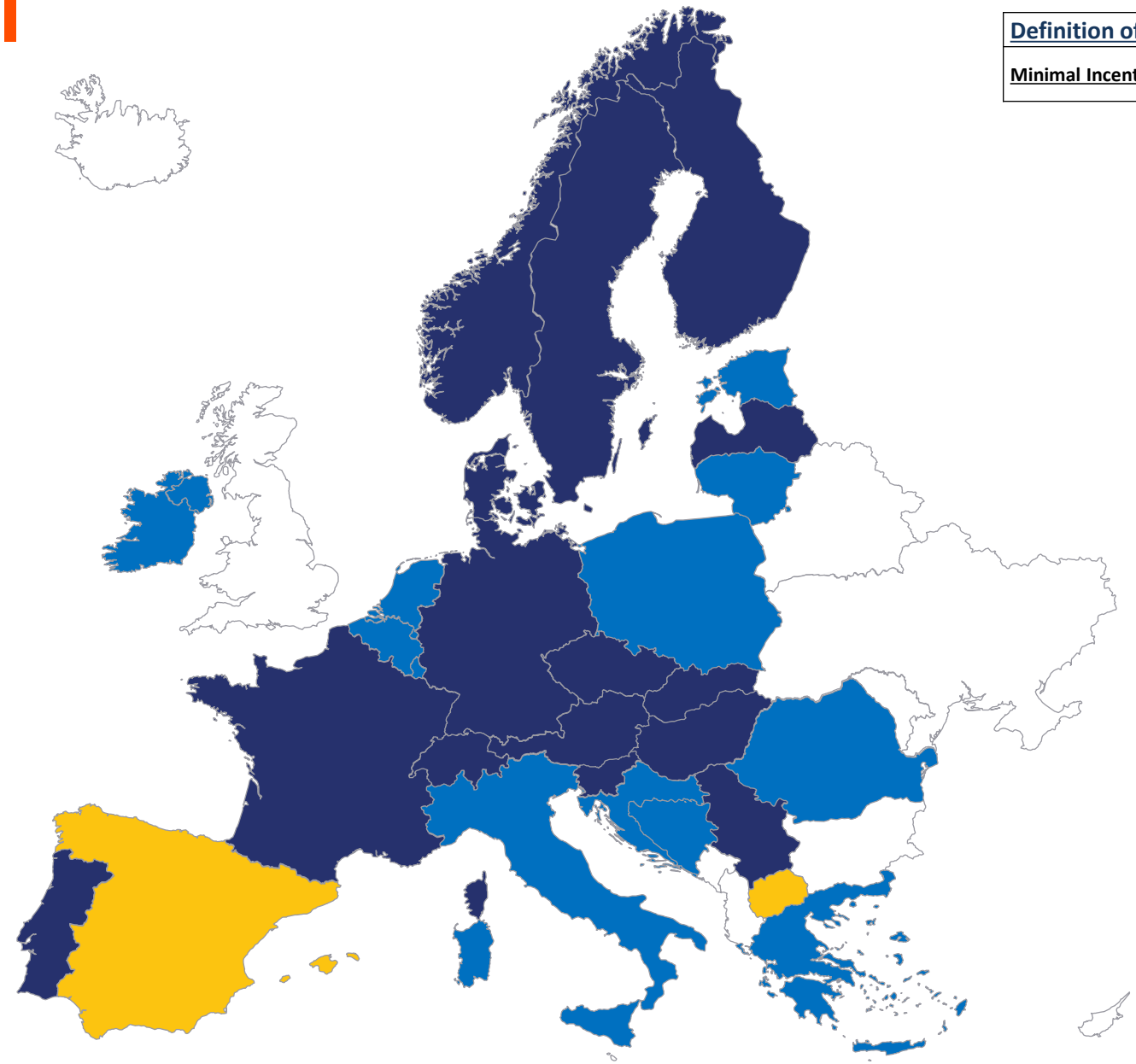
Definition of answer	
Average Control Energy Price	Average Control Energy Price is calculated by taking the sum of the control energy prices and dividing it by the number of the prices being examined.
Day Ahead Market Price	Price which evolved on the day ahead market.
Intraday Market Price	The price of the market within regular business hours, short-term prices.
Marginal Control Energy Price	The highest price, which can be acceptable.

Imbalance settlement – Main comp. of Imb. Prices – Additional Components

Definition of question	
Additional Components	Other components which determine imbalance charges.
Main component of Imbalance Prices	The component that determines imbalance charges most of the time.

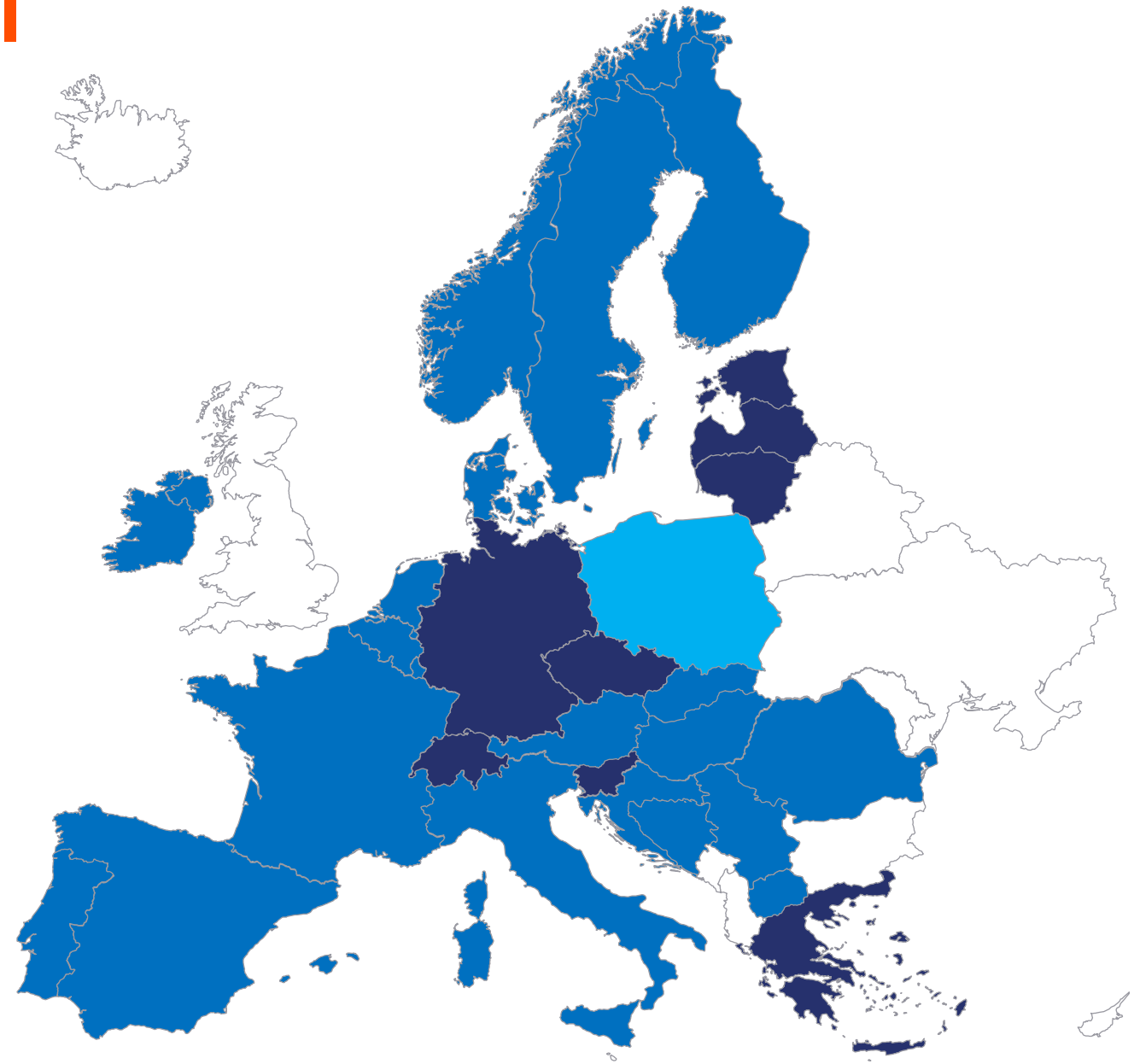


Imbalance settlement – Is there a minimal incentive?

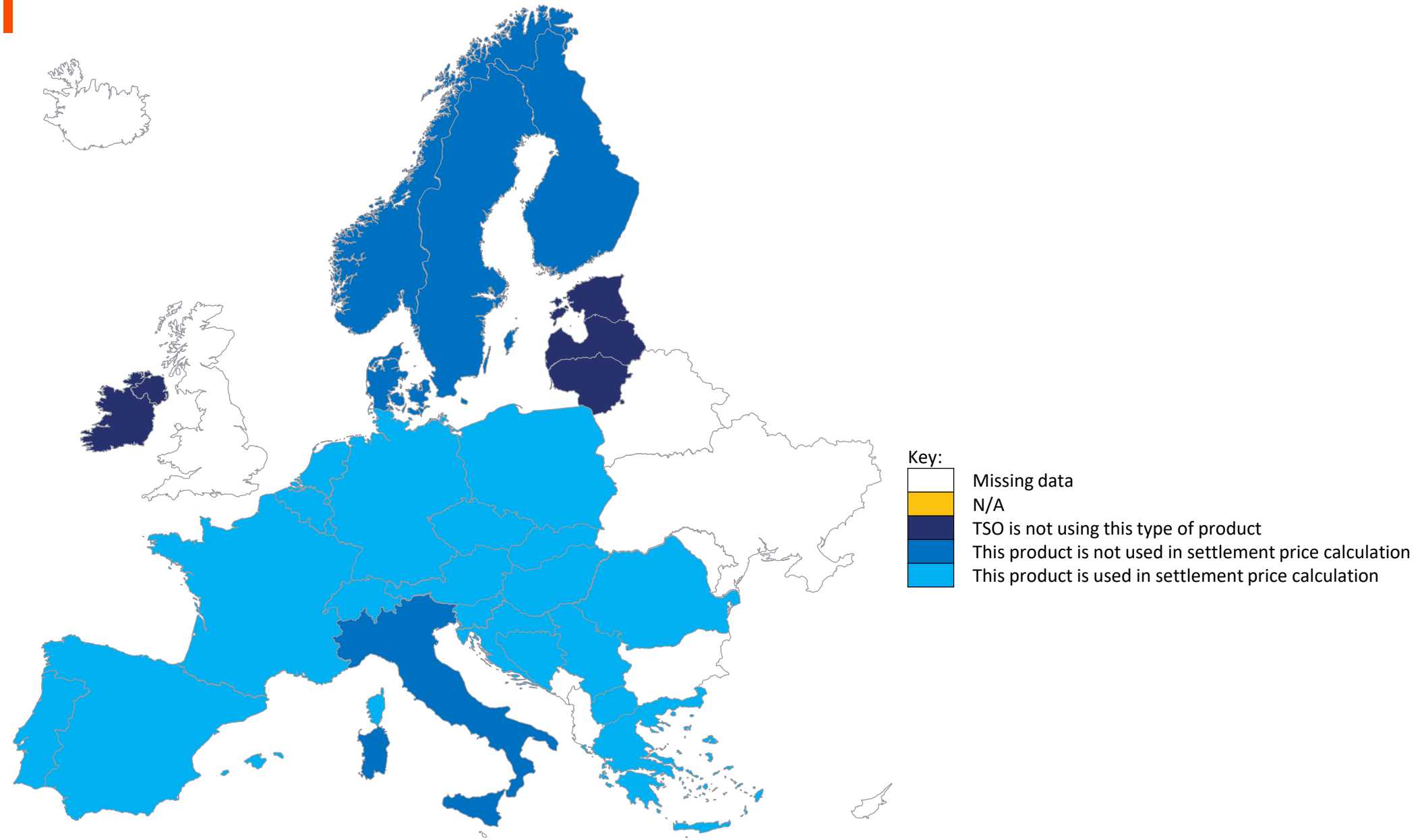


Definition of question	
Minimal Incentives	Minimal incentives means that there is some method which leads the BRPs to balance their schedules.

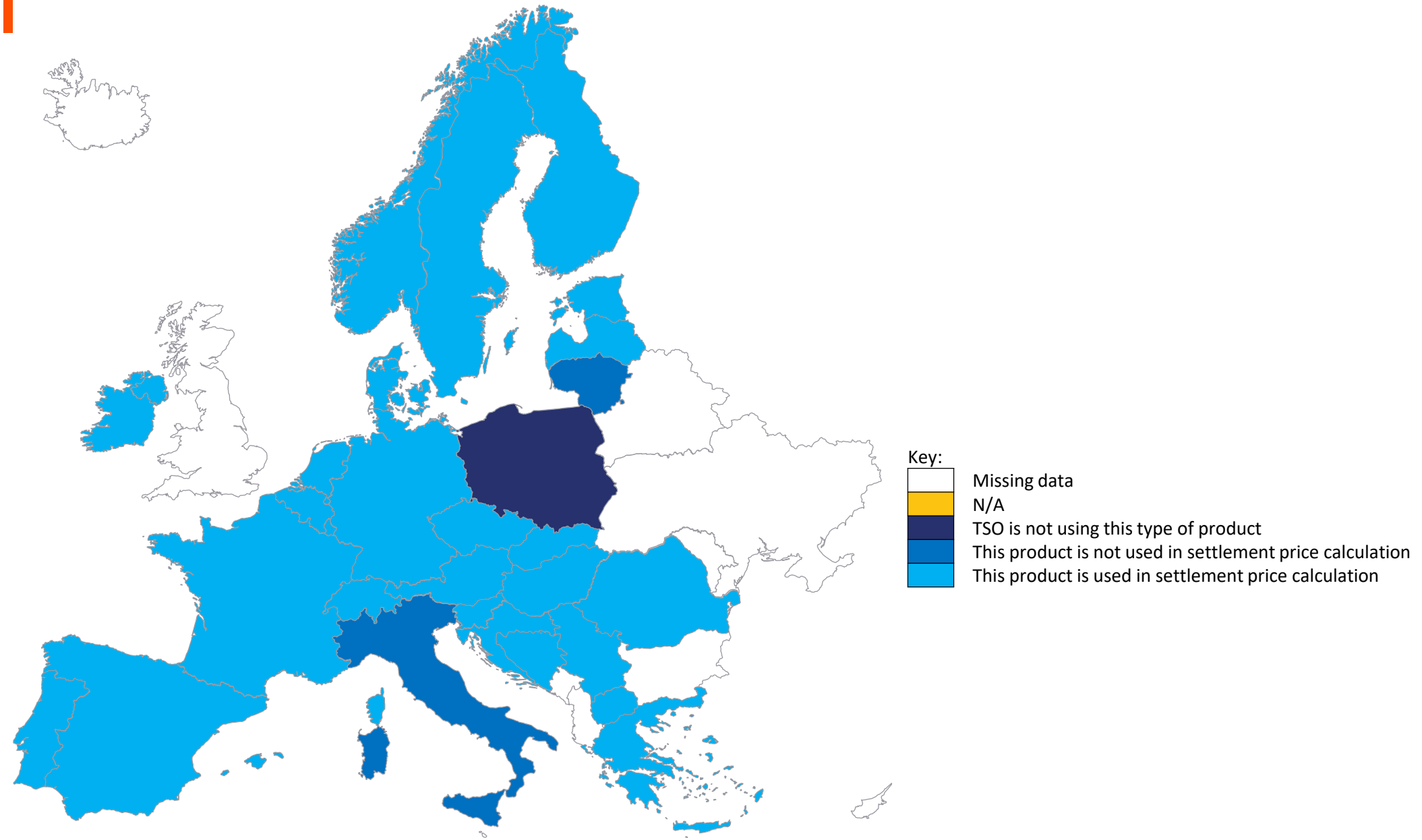
Imbalance settlement – Control energy prices used – FCR



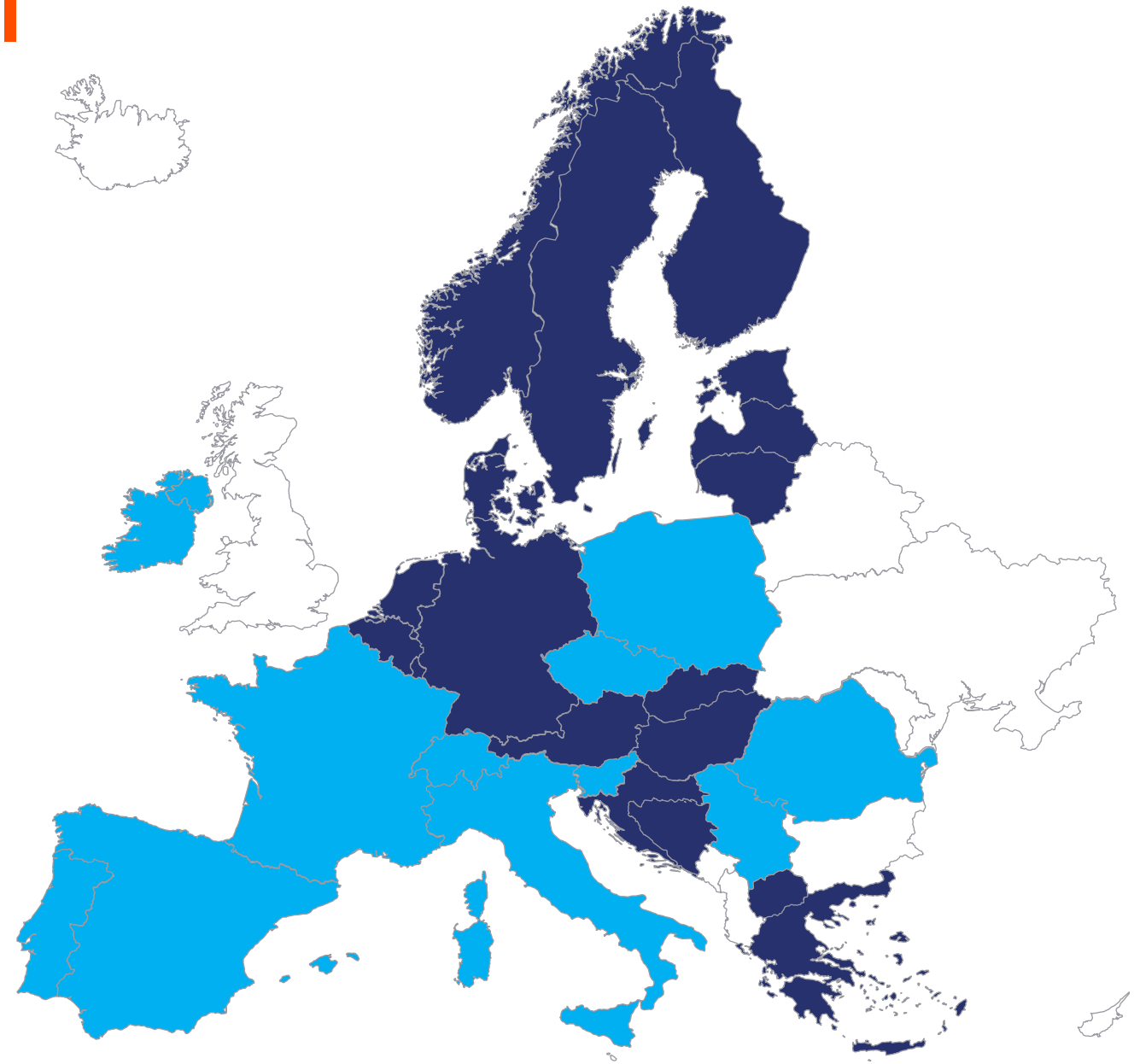
Imbalance settlement – Control energy prices used – aFRR



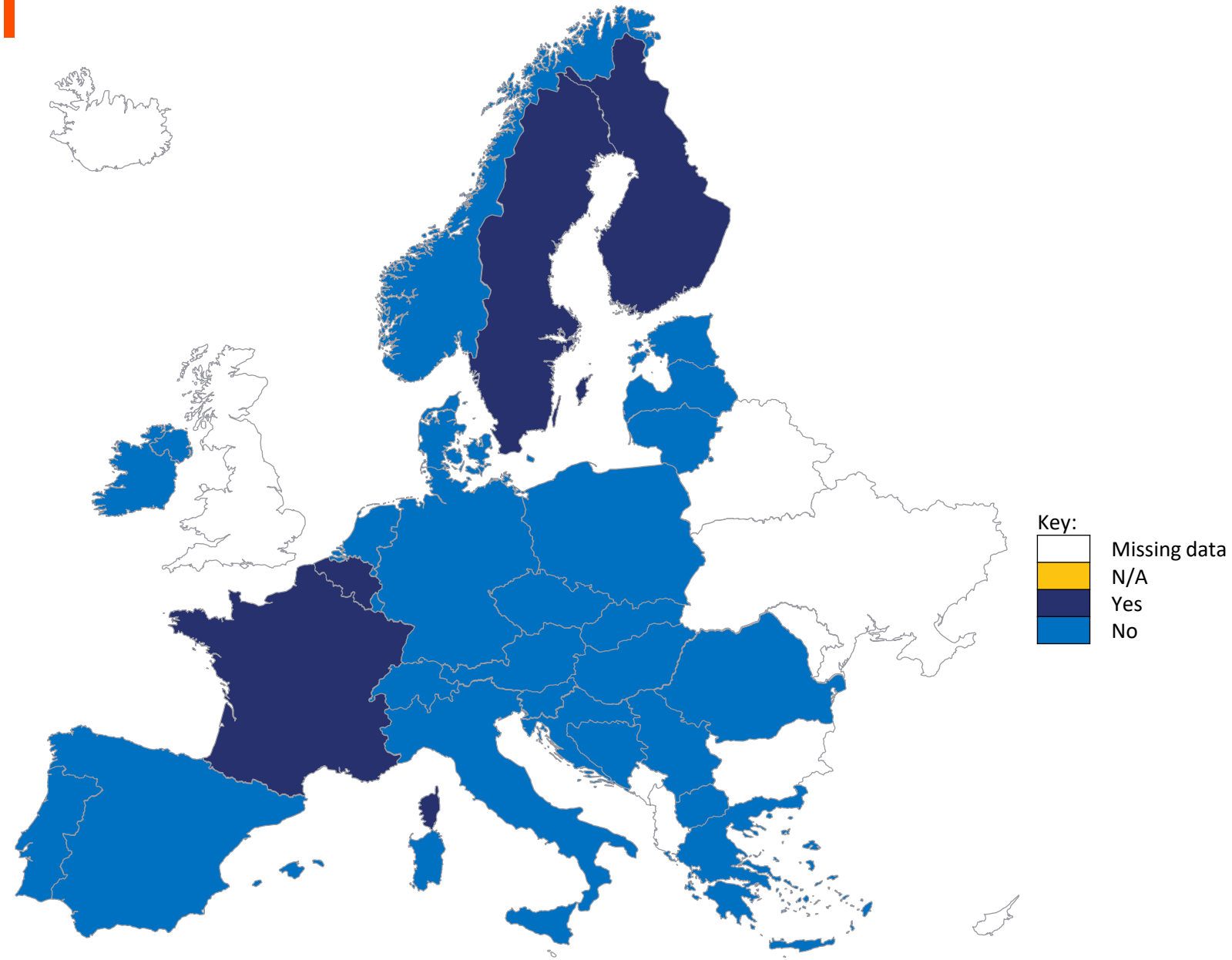
Imbalance settlement – Control energy prices used – mFRR



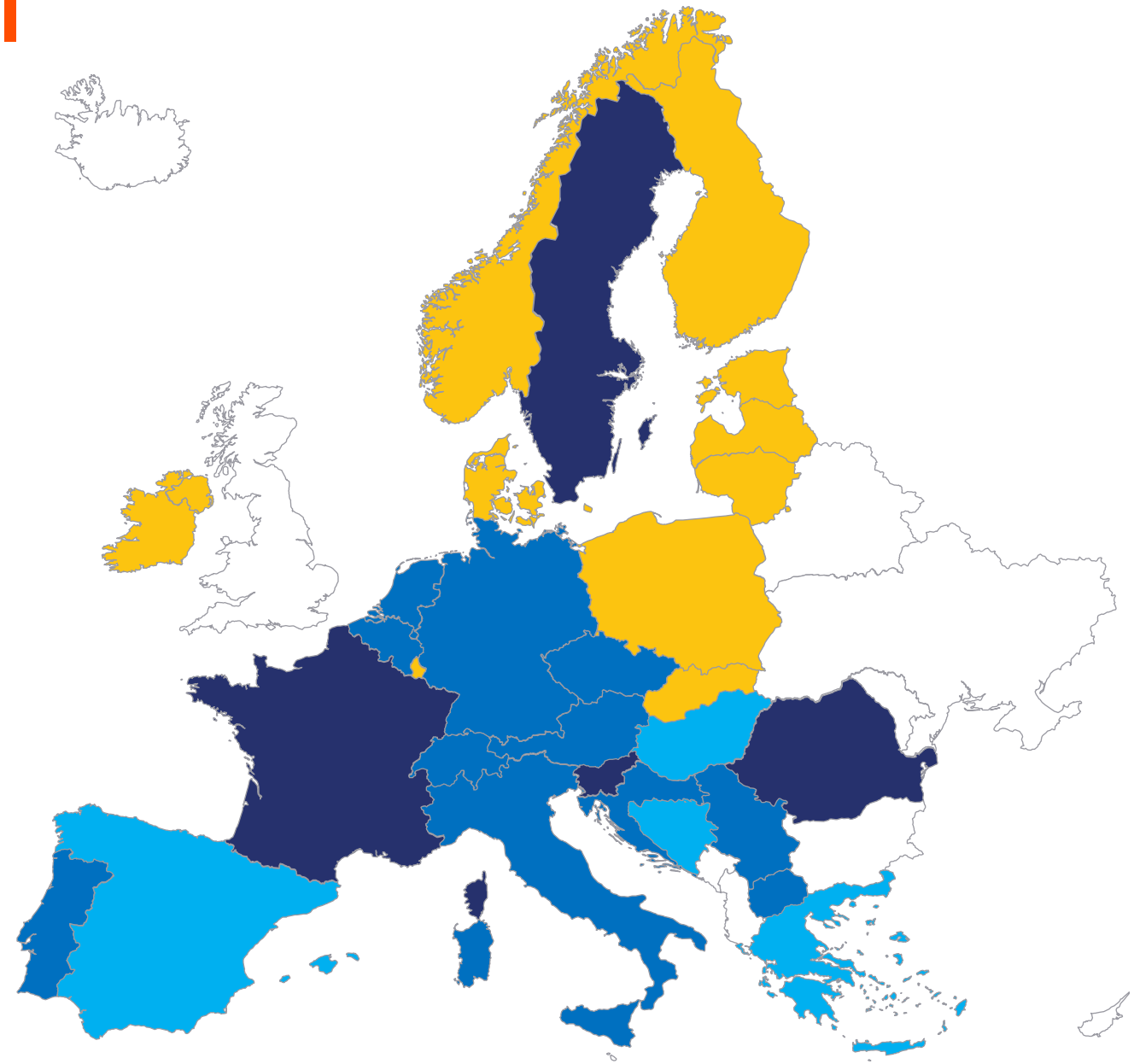
Imbalance settlement – Control energy prices used – RR



Imbalance settlement – Start/Stop costs in Imbalance Charges



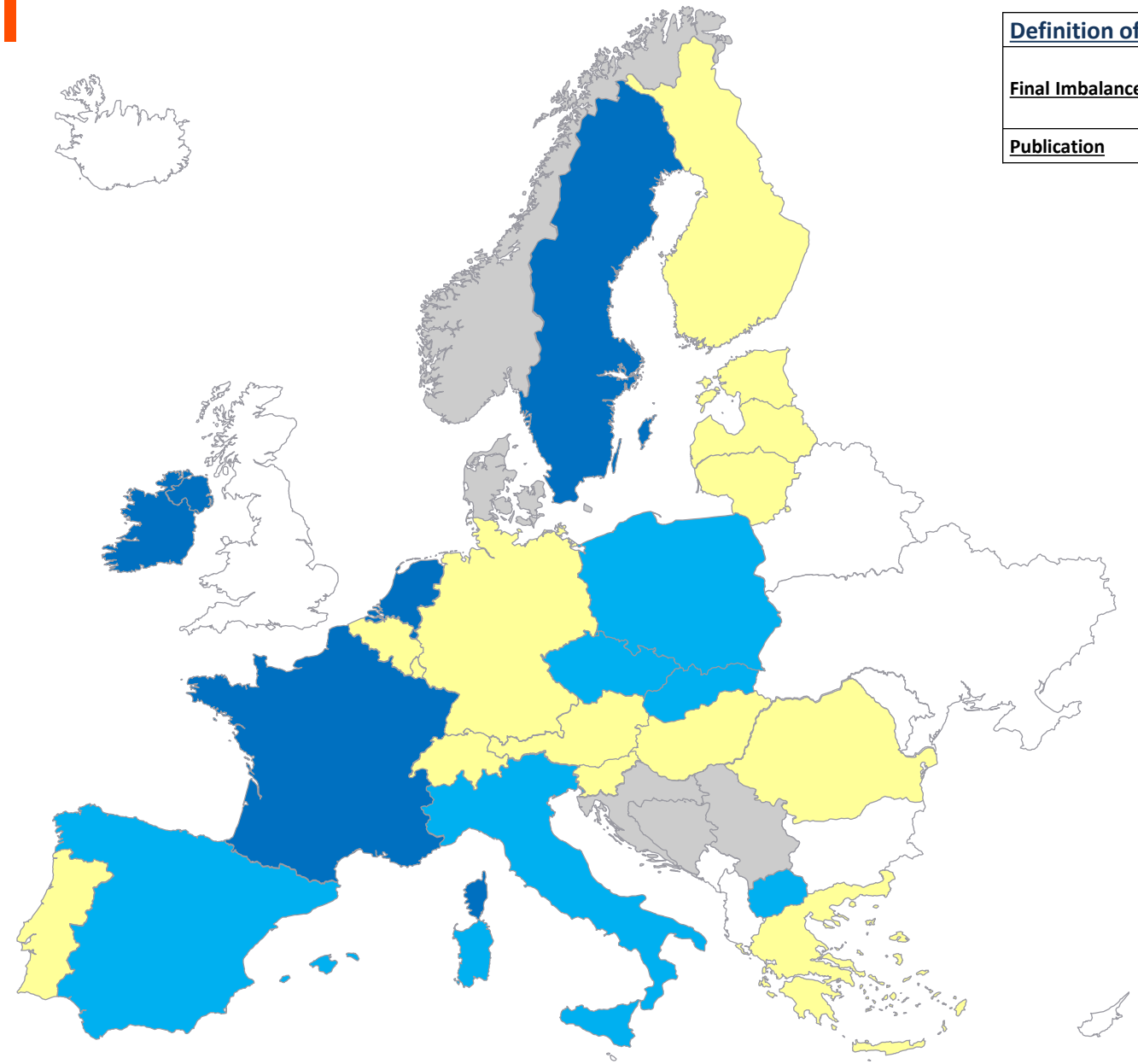
Imbalance settlement – FSkar results in Imbalance Charges



Key:

- Missing data
- N/A
- Yes, Input for imbalance settlement ISH Methodology Art 9(6)(c)
- No, Regulated grid tariff EB Regulation Art 44(2)
- No, additional settlement mechanism EBGL Art 44(3)

Imbalance settlement – Publication

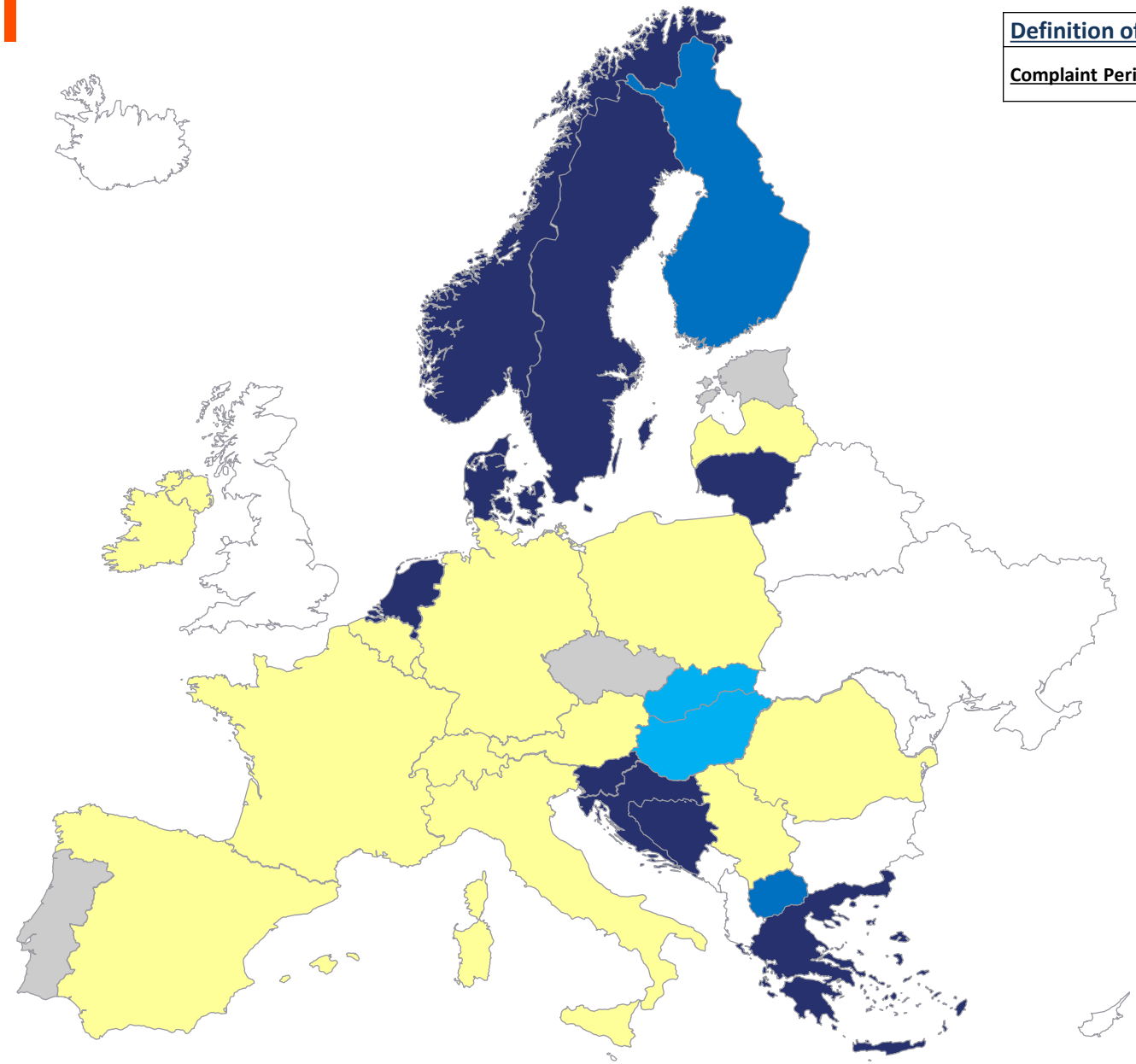


Definition of question	
Final Imbalance Price	Imbalance price means the price, be it positive, zero or negative, in each imbalance settlement period for an imbalance in each direction. Final imbalance price is calculated price for settlement period that cannot be changed anymore.
Publication	Publication of final Imbalance Price.

Key:

- Missing data
- N/A
- Prior to delivery
- x <= 1 hour after delivery
- x <= 1 day after delivery
- x <= 1 week after delivery
- x > 1 week after delivery

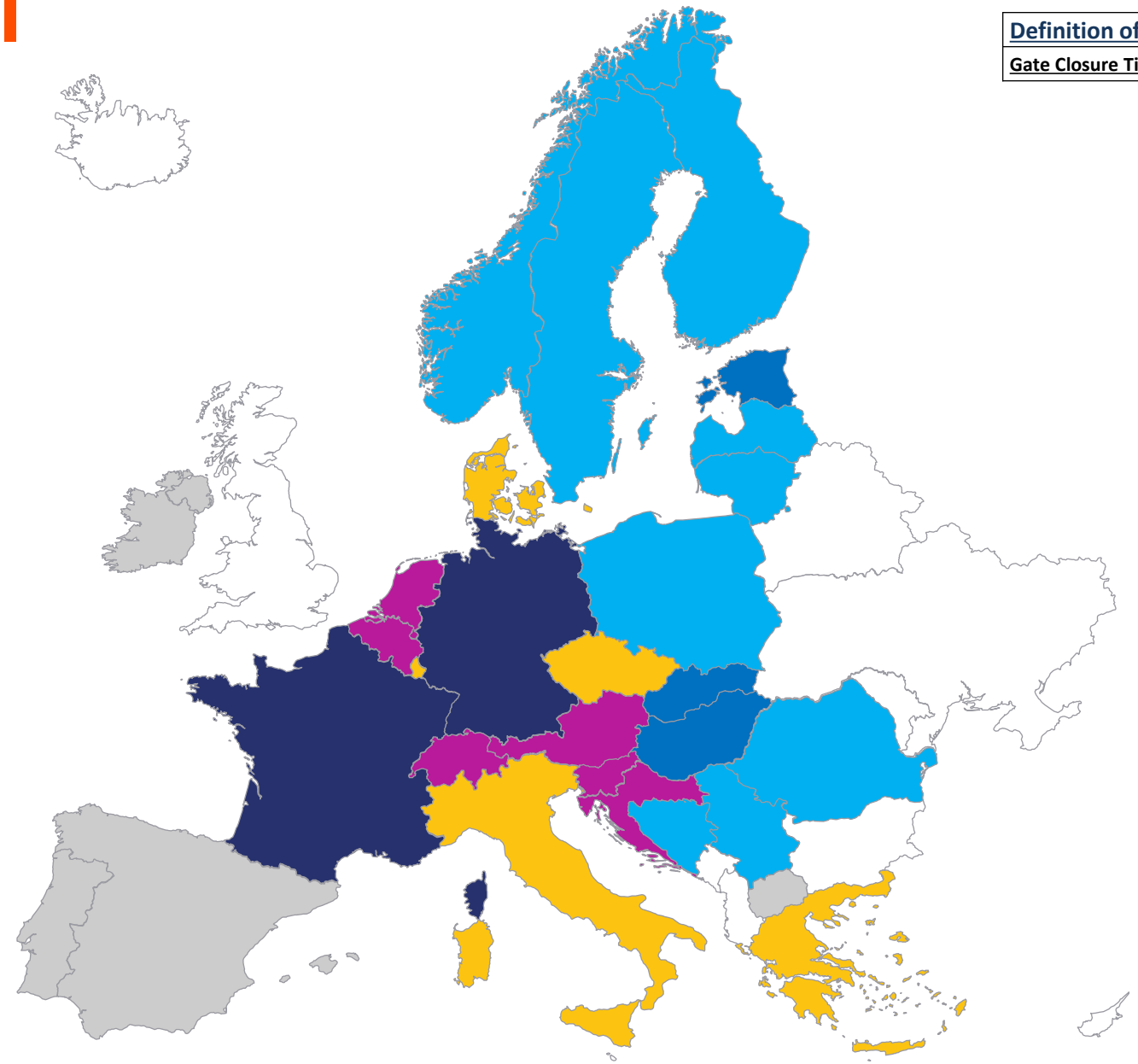
Imbalance settlement – Complaint Period



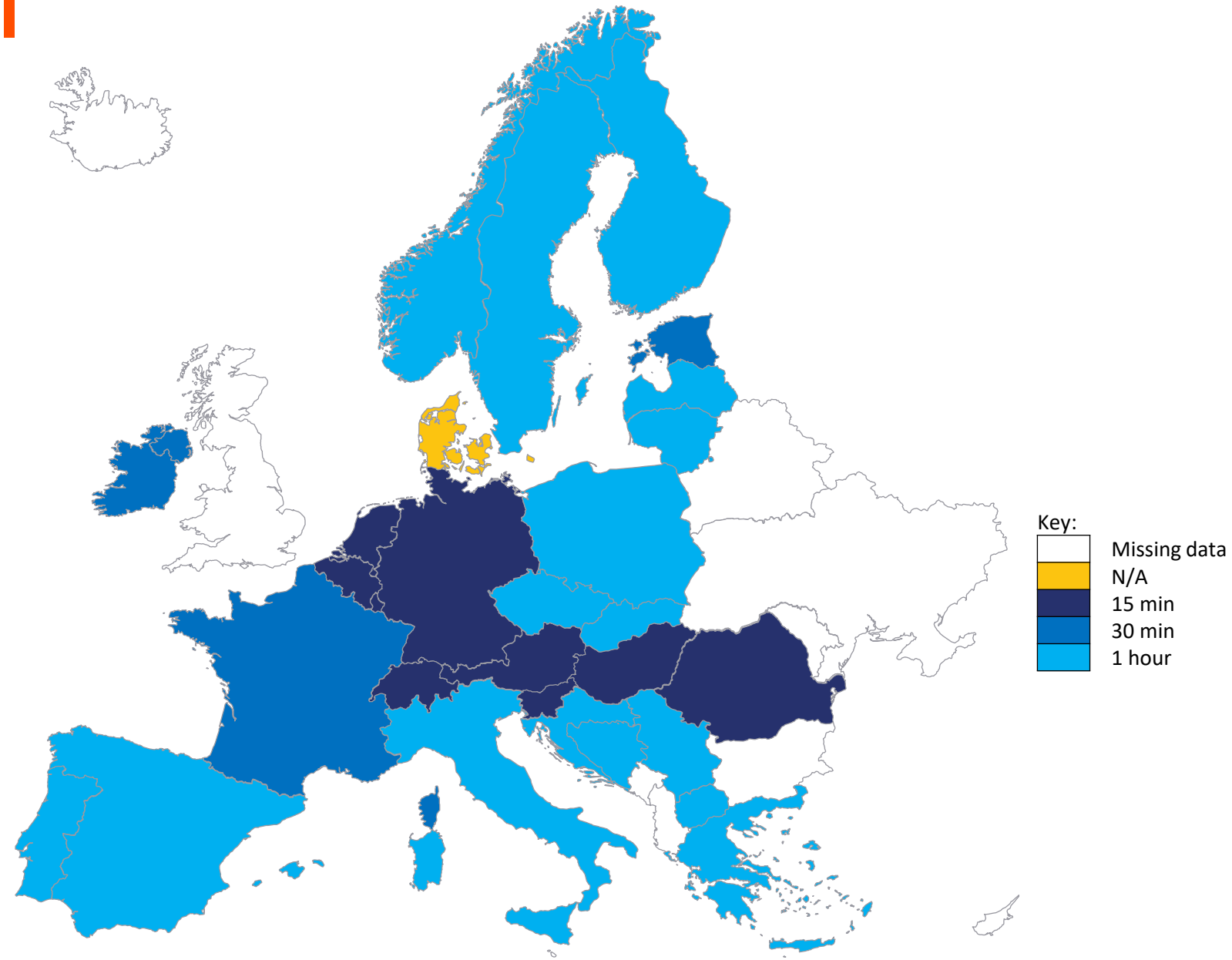
Definition of answer	
Complaint Period	Length of time for which complaints can be made which will be considered in relation to settlement (after the finalized data are produced).

Imbalance settlement – Gate Closure time for notification of Internal Trade Schedules

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

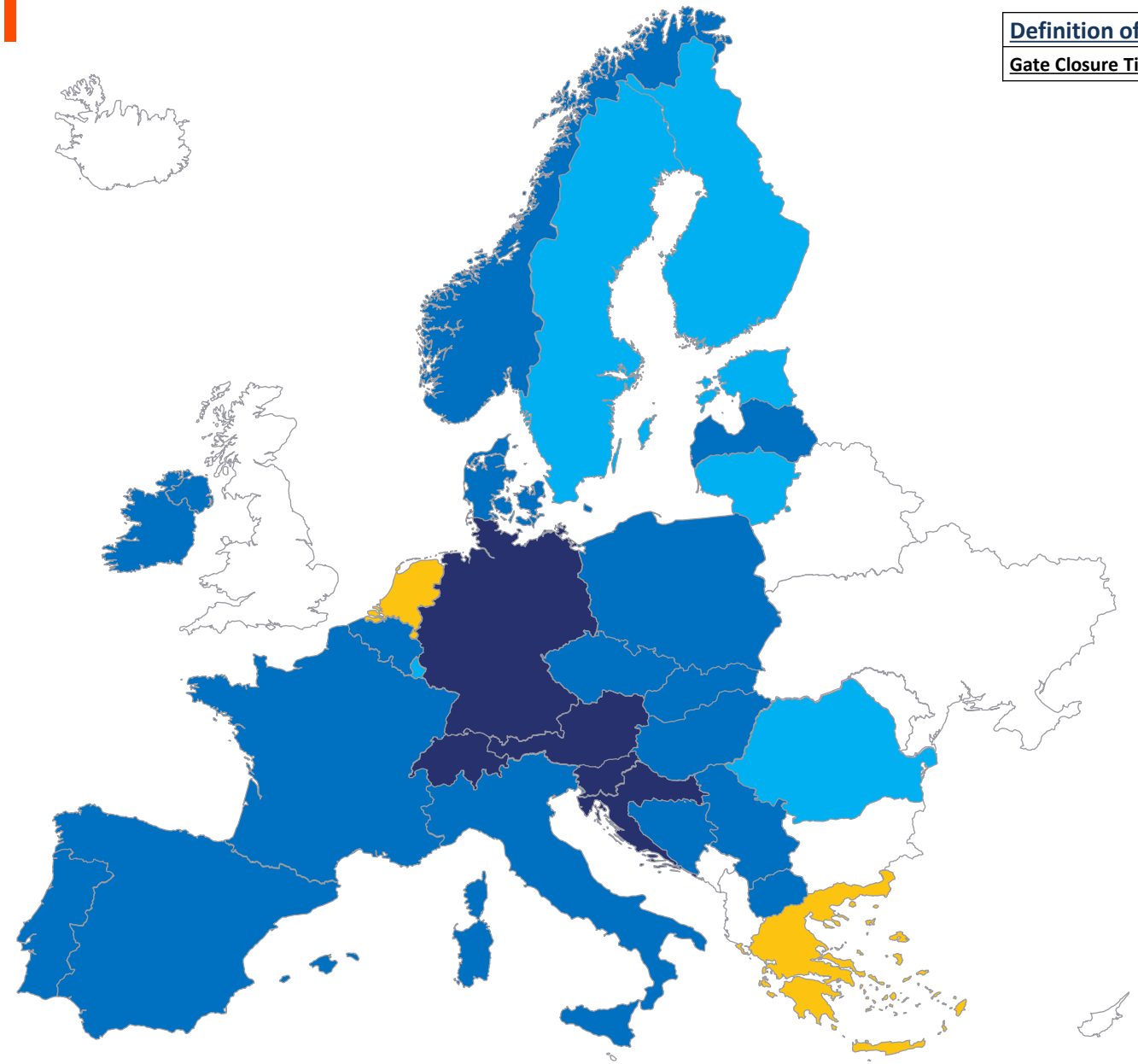


Imbalance settlement – Internal Intra Day Market time period

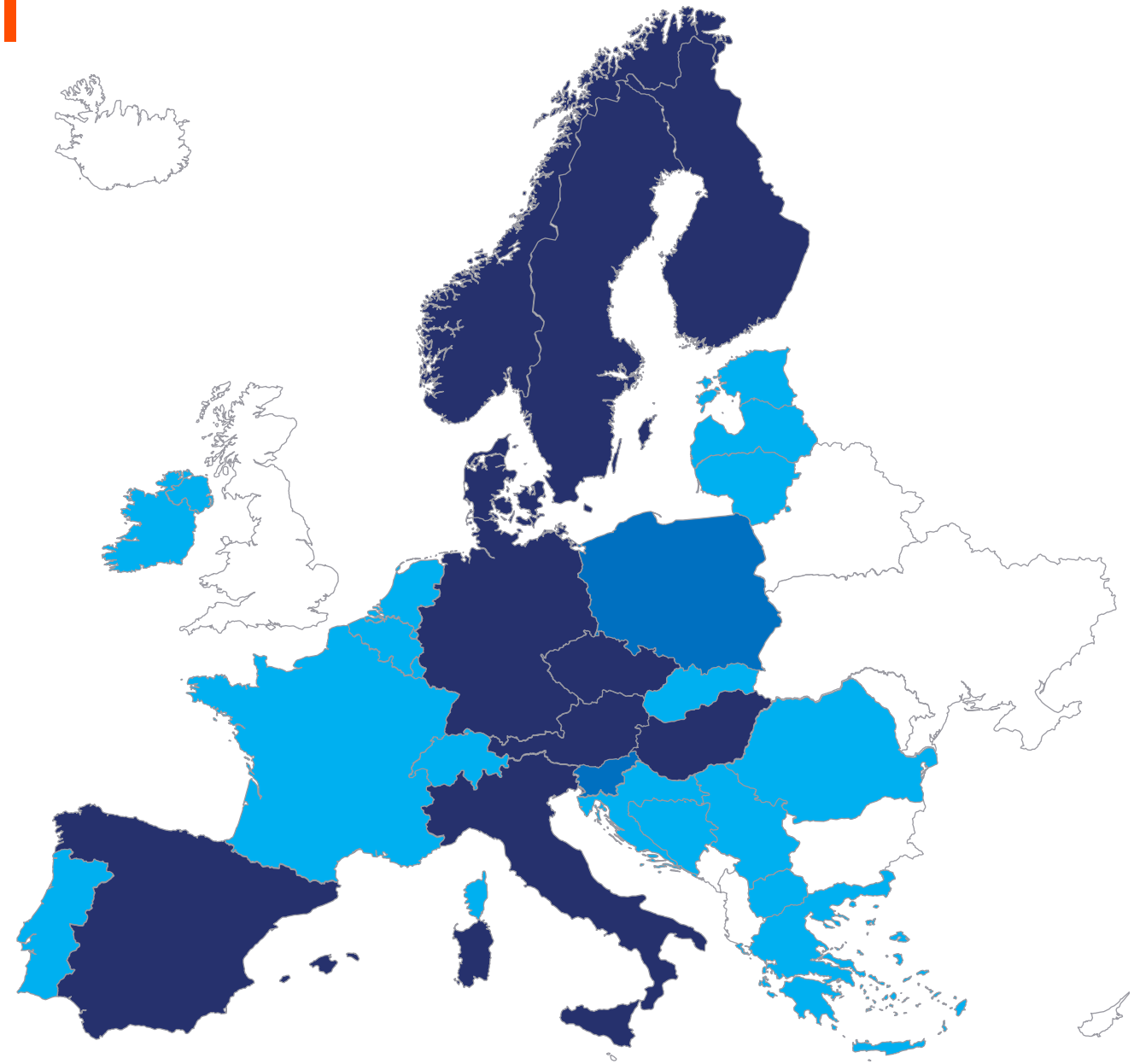


Imbalance settlement – Can market participants change the approved schedules after Delivery?

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



Do you consider changes significant/important regarding the imbalance settlement?



Please, explain significant/important changes regarding the imbalance settlement in line with/aimed to requirements of EB Regulation (and the reason behind) in comparison to the year 2020! (1/2)

TSO	Answer
APG	A minimum incentive in scarcity situations is introduced in Q3/2021 by application of a scarcity component, as foreseen in the imbalance settlement harmonization methodology.
ČEPS	Changes to comply with the ISHM - added an additional incentive component and financial neutrality component.
ELES	ISH methodology not implemented yet
Energinet	Nordic harmonisation towards one price model
Fingrid	The go-live of Single Price and Single Position imbalance settlement as of 1 November 2021.
German TSOs	ISHM implementation
MAVIR	Implementation of ISH
REE	Regulatory changes in 2021 in the Spanish system towards ISHP application in 2022.
RTE	After 31/12/2021, RTE removed the FCR, IGCC and Imbalances at the borders from the Volume-Weighted Average Price (used in the Imbalance Settlement Price) calculation according to ISH methodology.

Please, explain significant/important changes regarding the imbalance settlement in line with/aimed to requirements of EB Regulation (and the reason behind) in comparison to the year 2020! (2/2)

TSO	Answer
Statnett	Single-price model
Terna	Imbalance prices changes due to RR platform connection

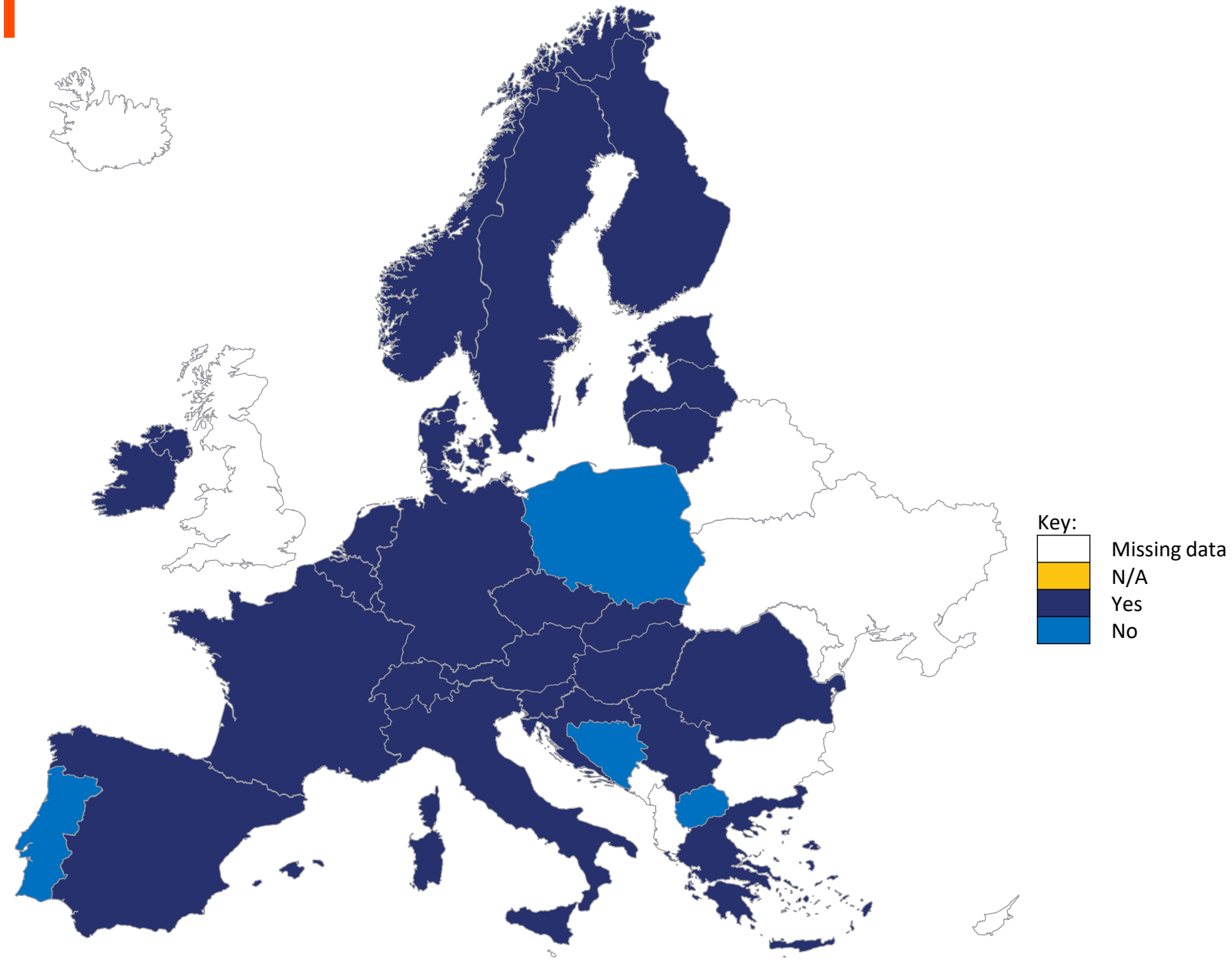
Please, explain significant/important changes regarding the imbalance settlement NOT in line with/aimed to requirements of EB Regulation (and the reason behind) in comparison to the year 2020!

TSO	Answer
APG	None.
ELES	ISH methodology not implemented yet.
Energinet	None
PSE	There was no such changes.
REE	N/A

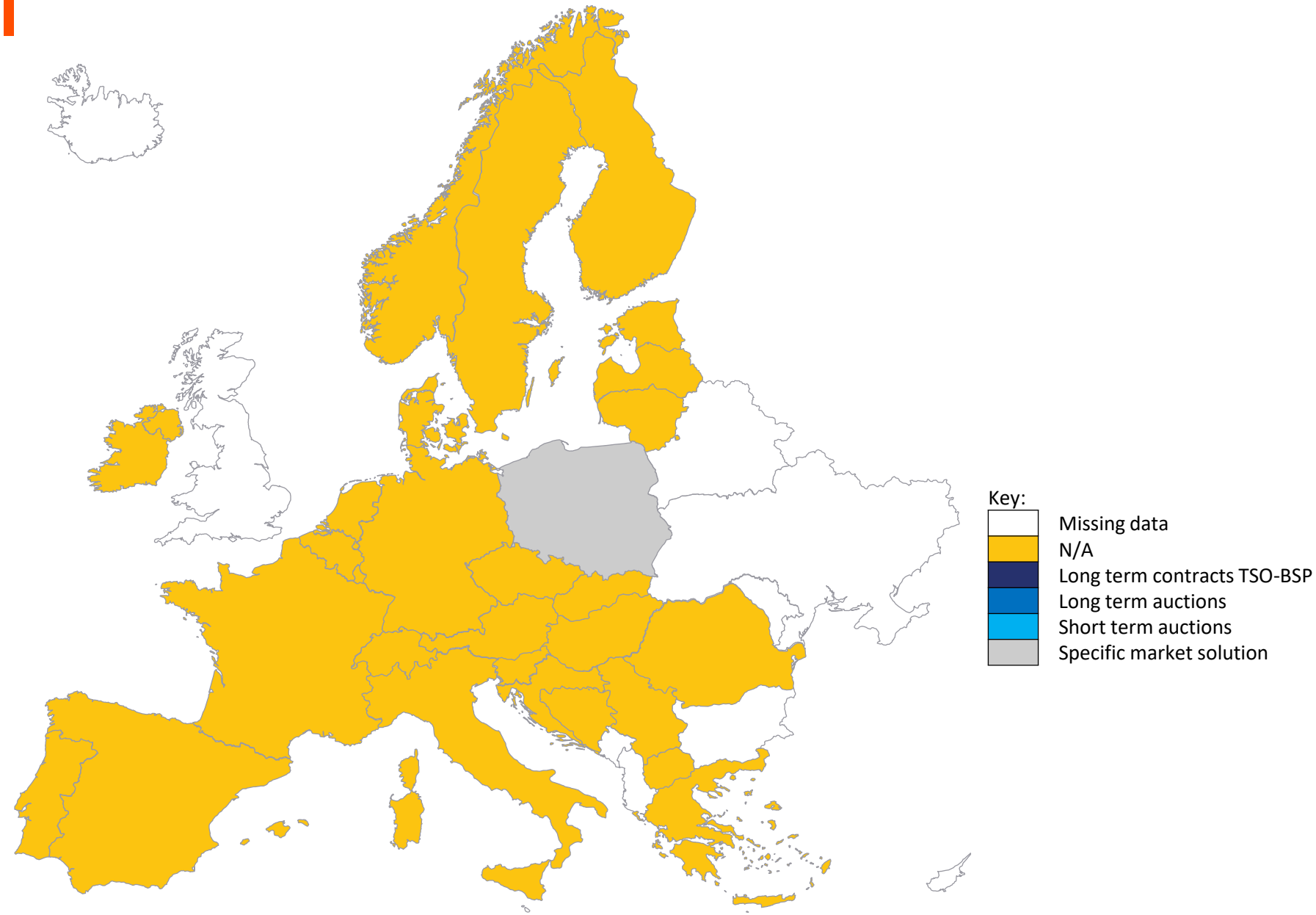
Demand-side response

(Referring to questions of AS survey from DS1.0 to DS20.1)

Demand-side response – Facilities use the same market mechanism and activation process as generation (capacity and energy)?

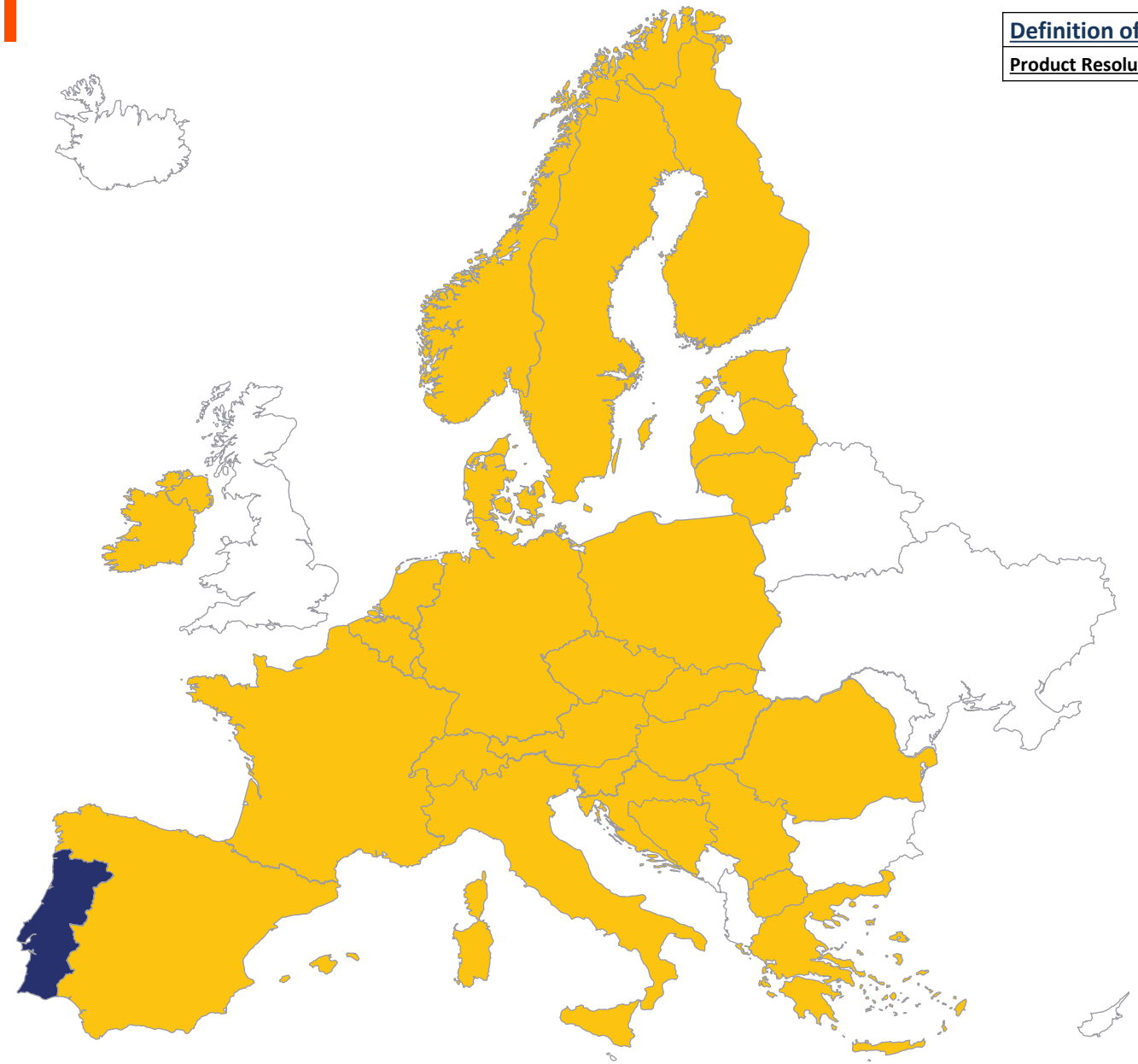


Demand-side response – Specific market solution use for demand-side providers of balancing services (capacity and energy)

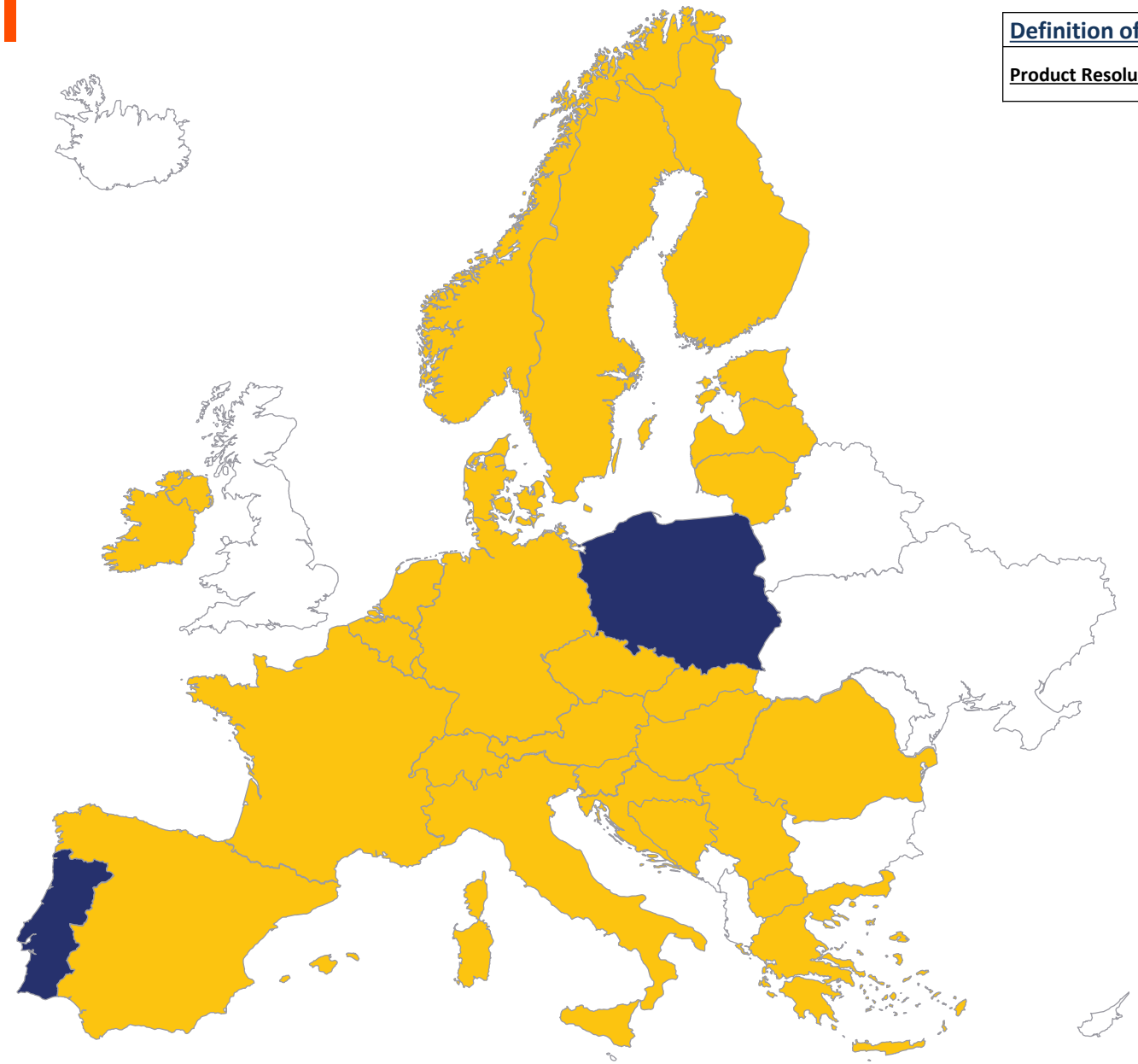


Demand-side response – What is the product resolution for demand-side response BSP´s to participate at these balancing services?

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

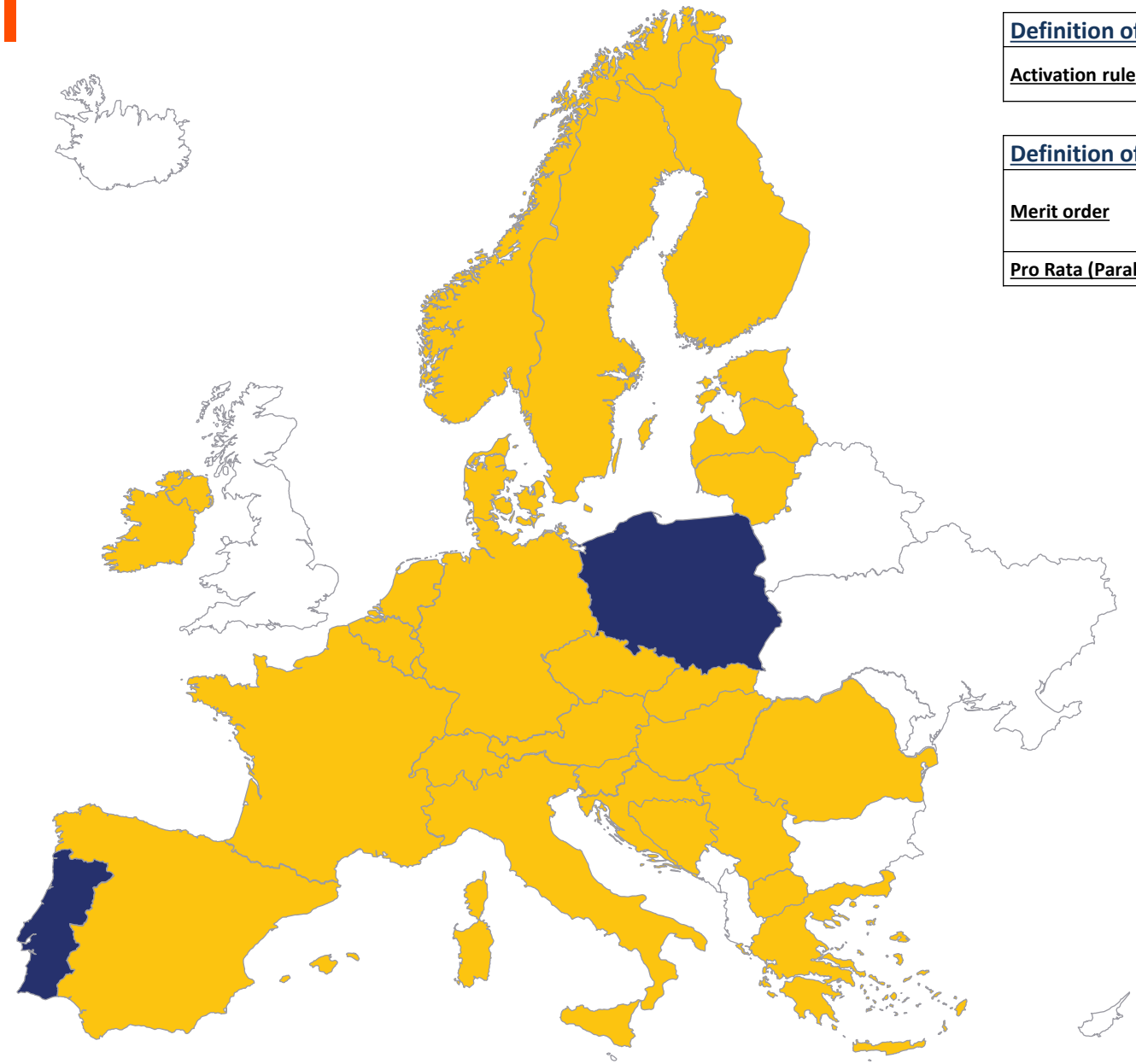


Demand-side response – Product Resolution (in time)



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).

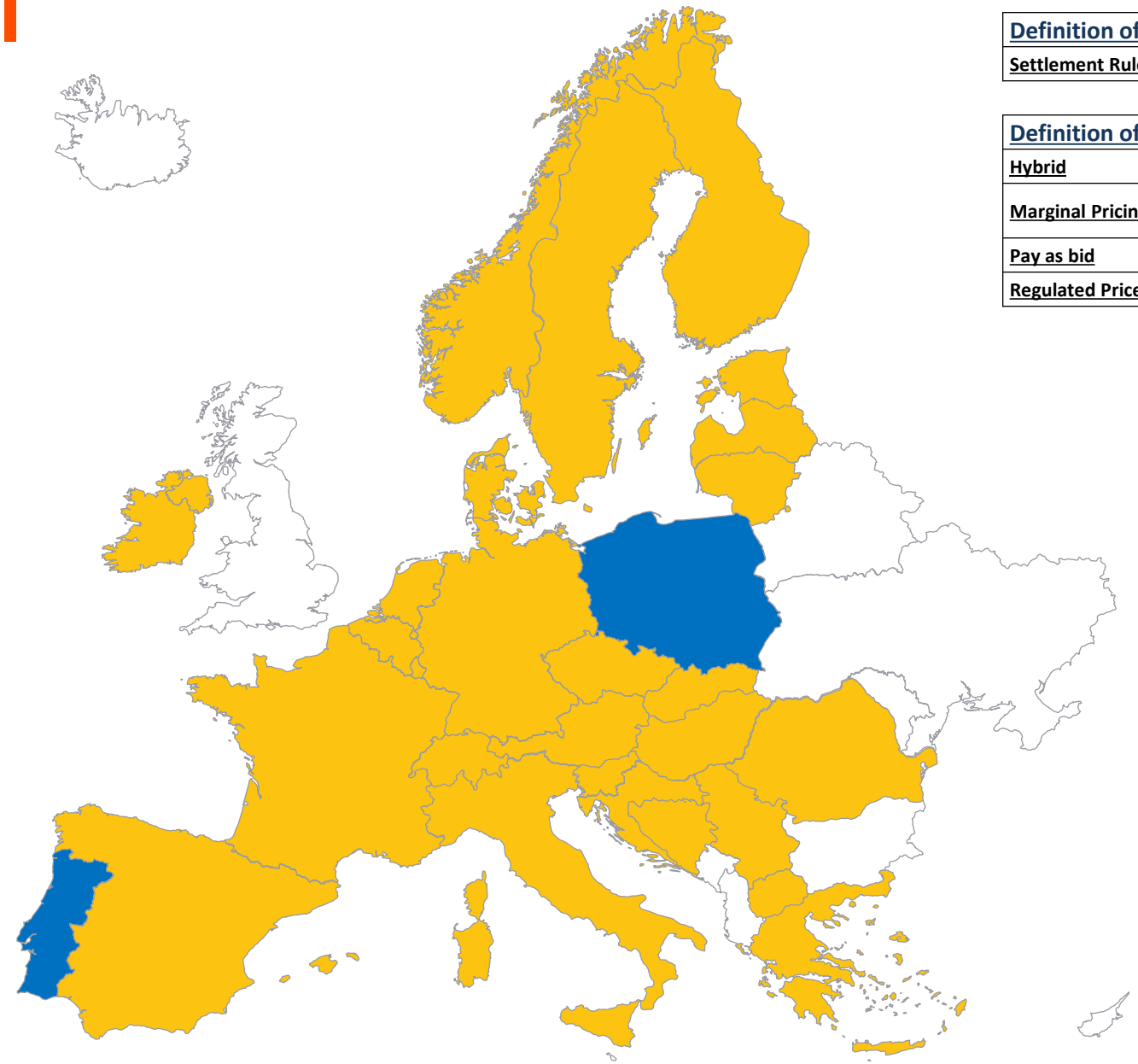
Demand-side response – What type of specific activation rule do you follow with demand-side response type BSP´s?



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	
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.

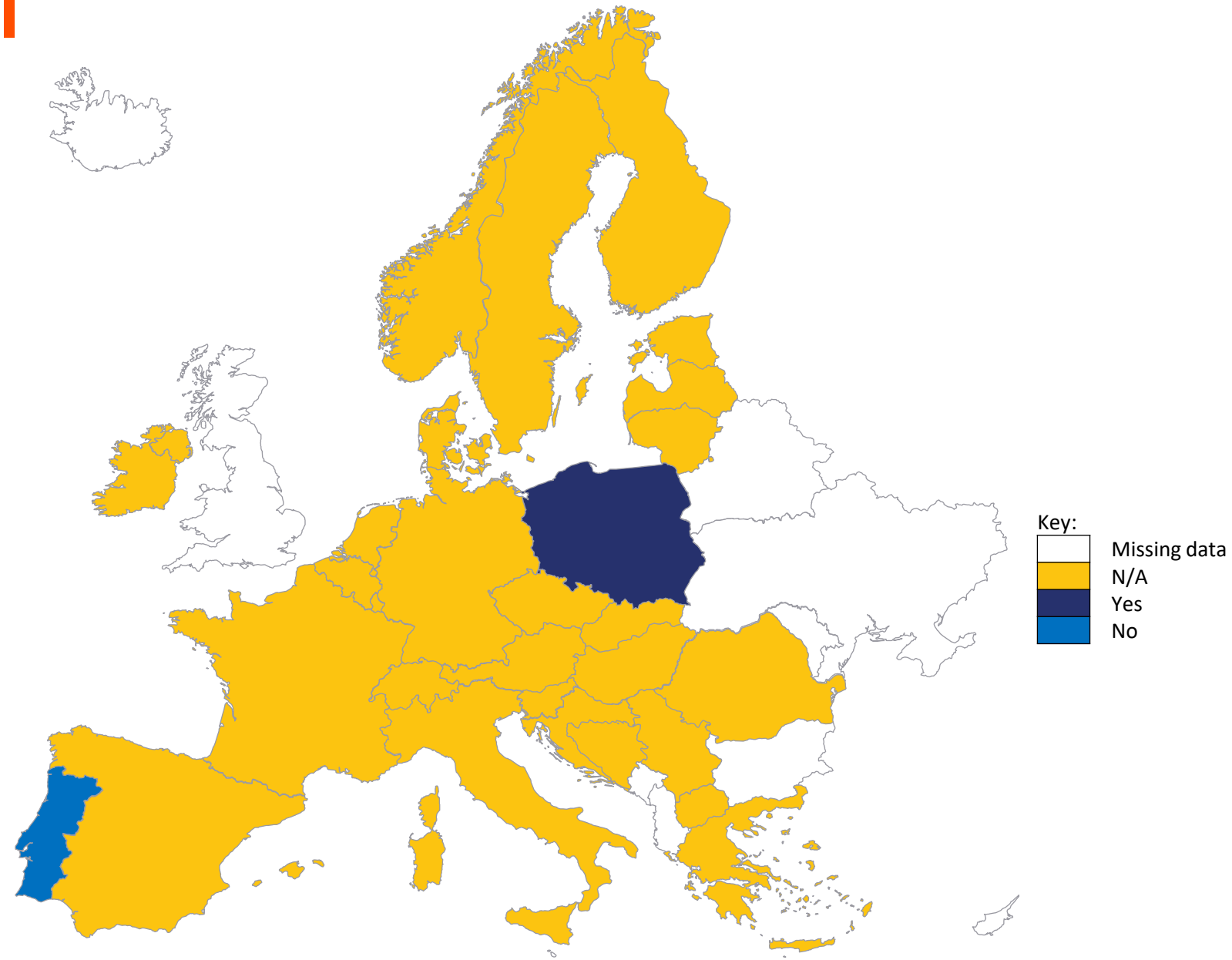
Demand-side response – Settlement Rule



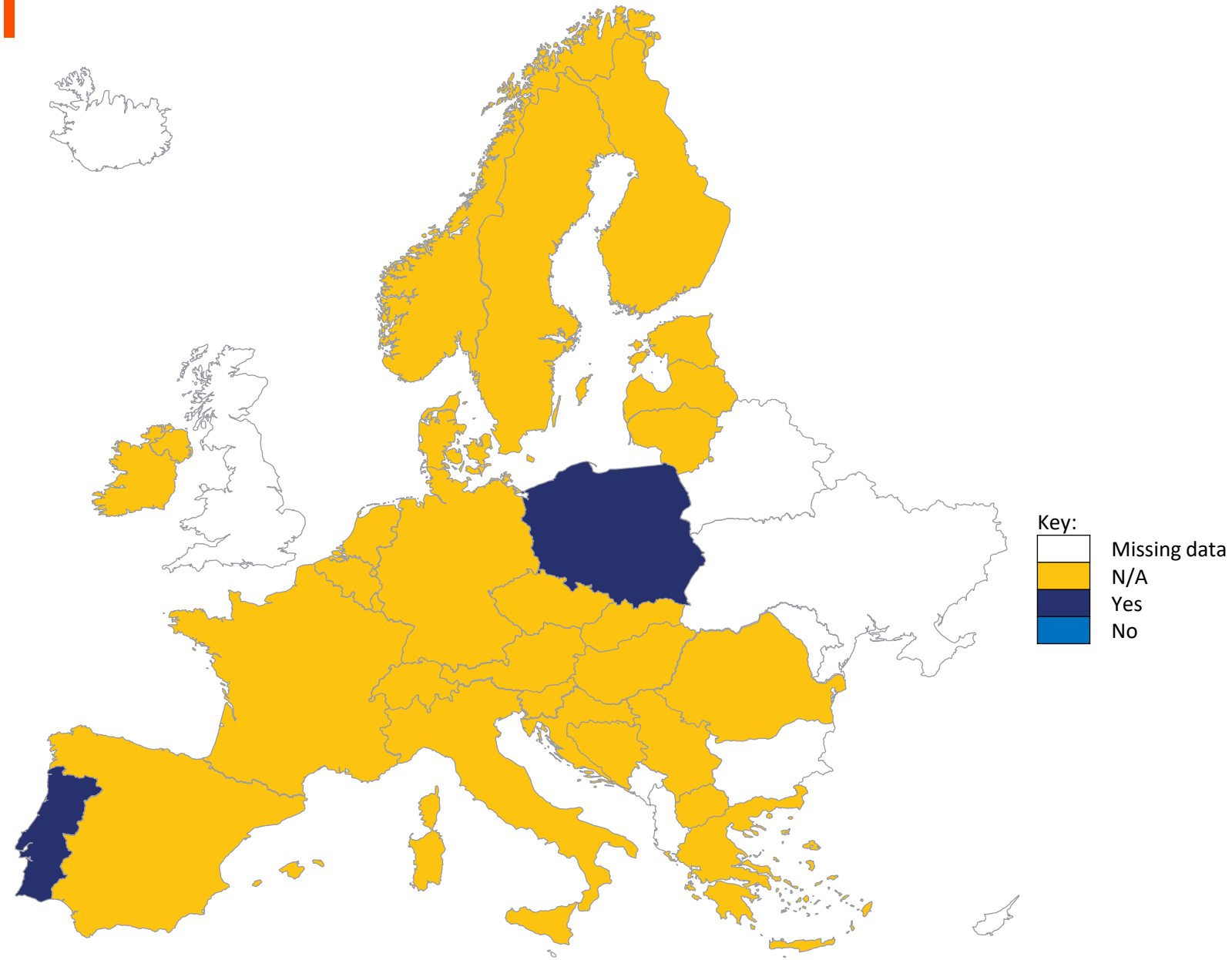
Definition of question	
Settlement Rule	The pricing rules for settlement.

Definition of answer	
Hybrid	Combination of given options.
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.

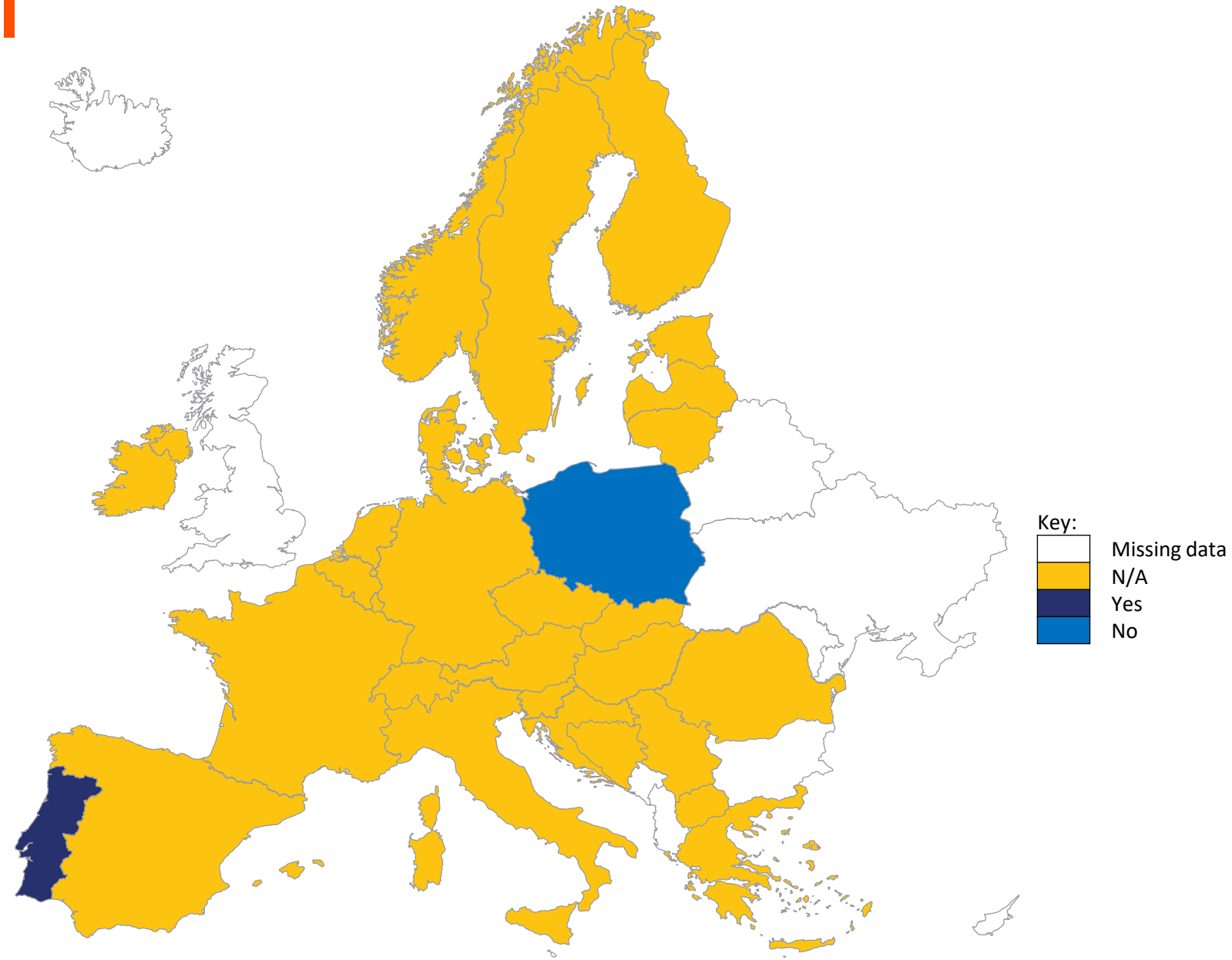
Demand-side response – Participates in these balancing services – Aggregators



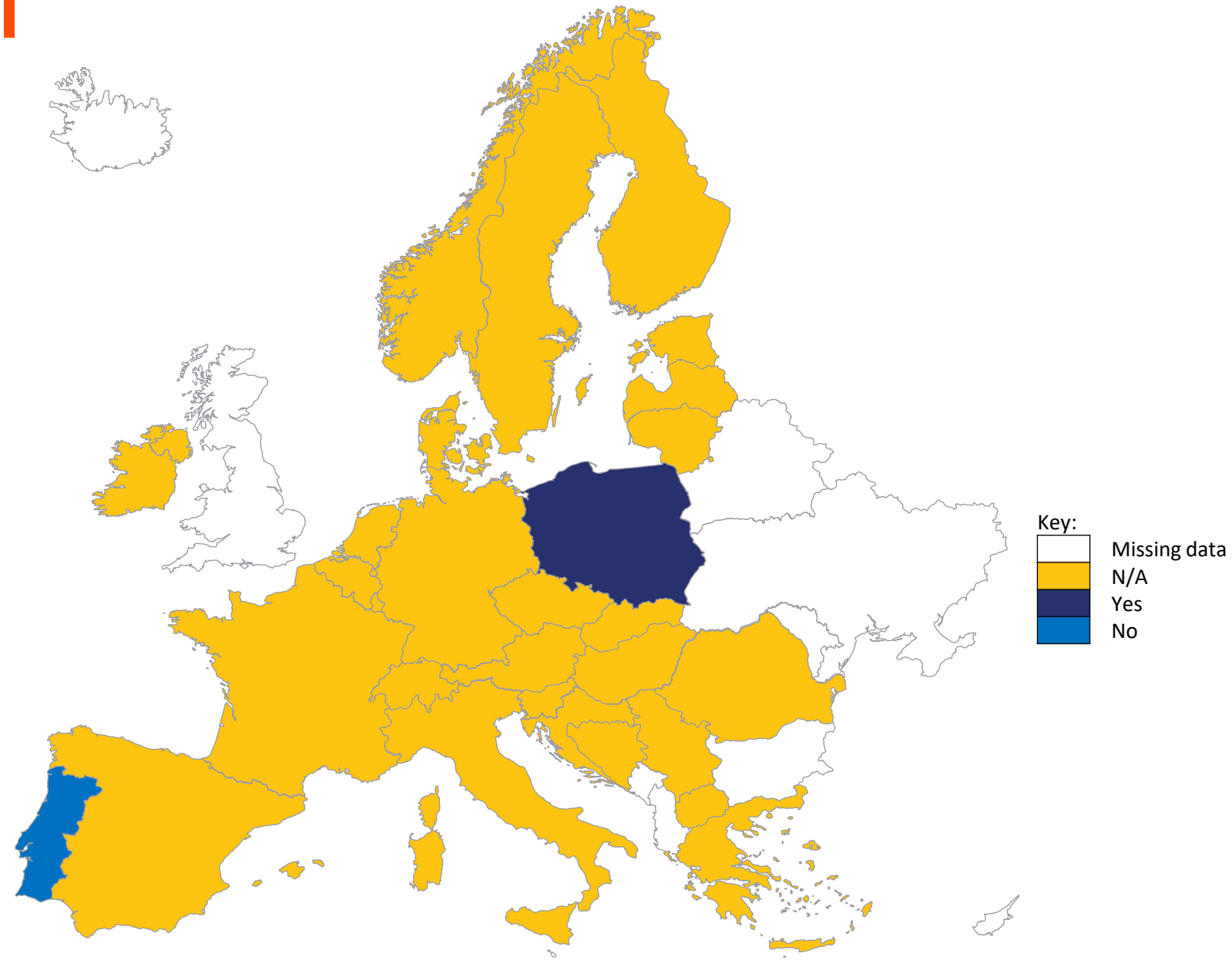
Demand-side response – Participates in these balancing services – Large consumers



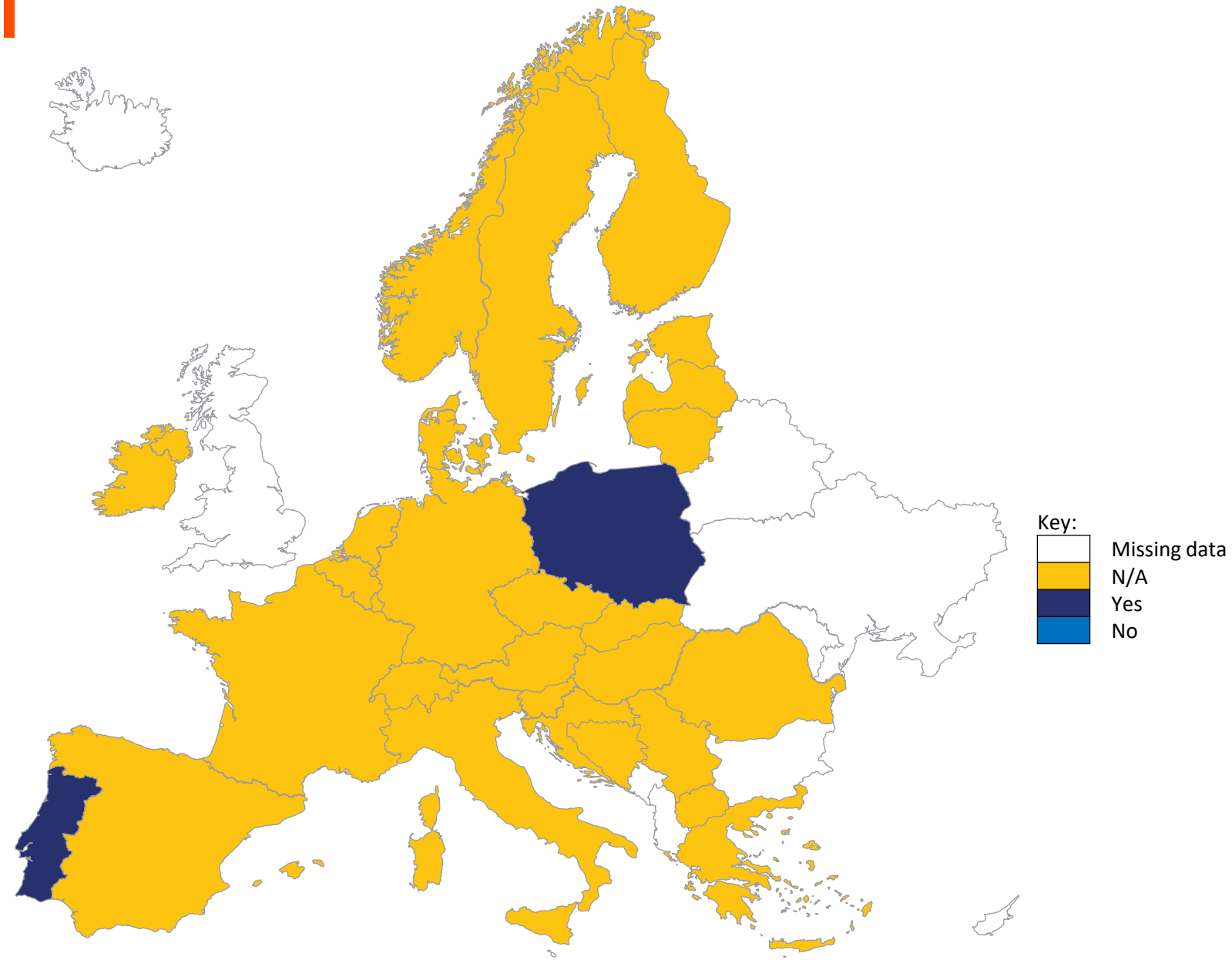
Demand-side response – Participates in these balancing services – Pump storage units



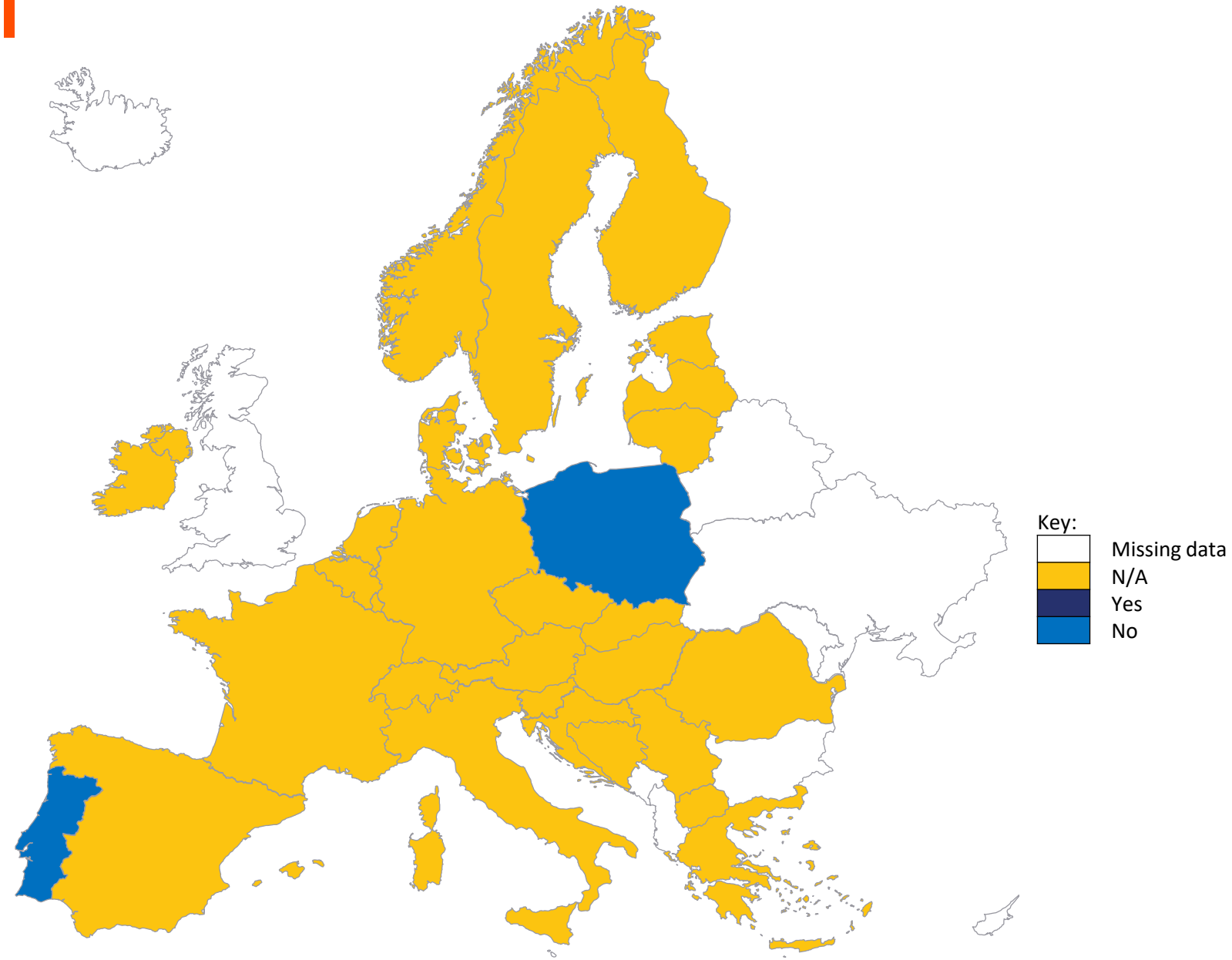
Demand-side response – Participates in these balancing services – Aggregated small size consumers



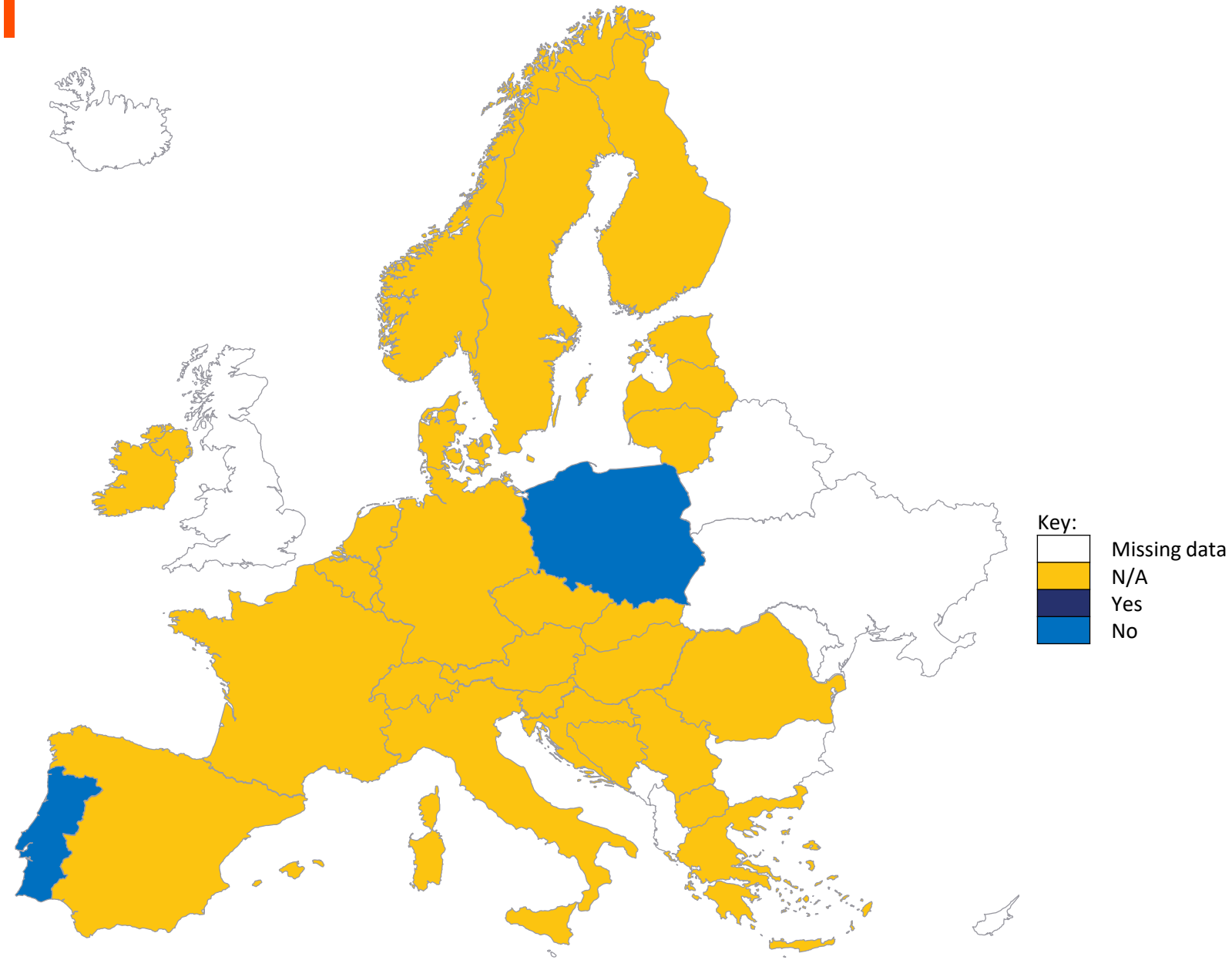
Demand-side response – Participates in these balancing services – Small consumers



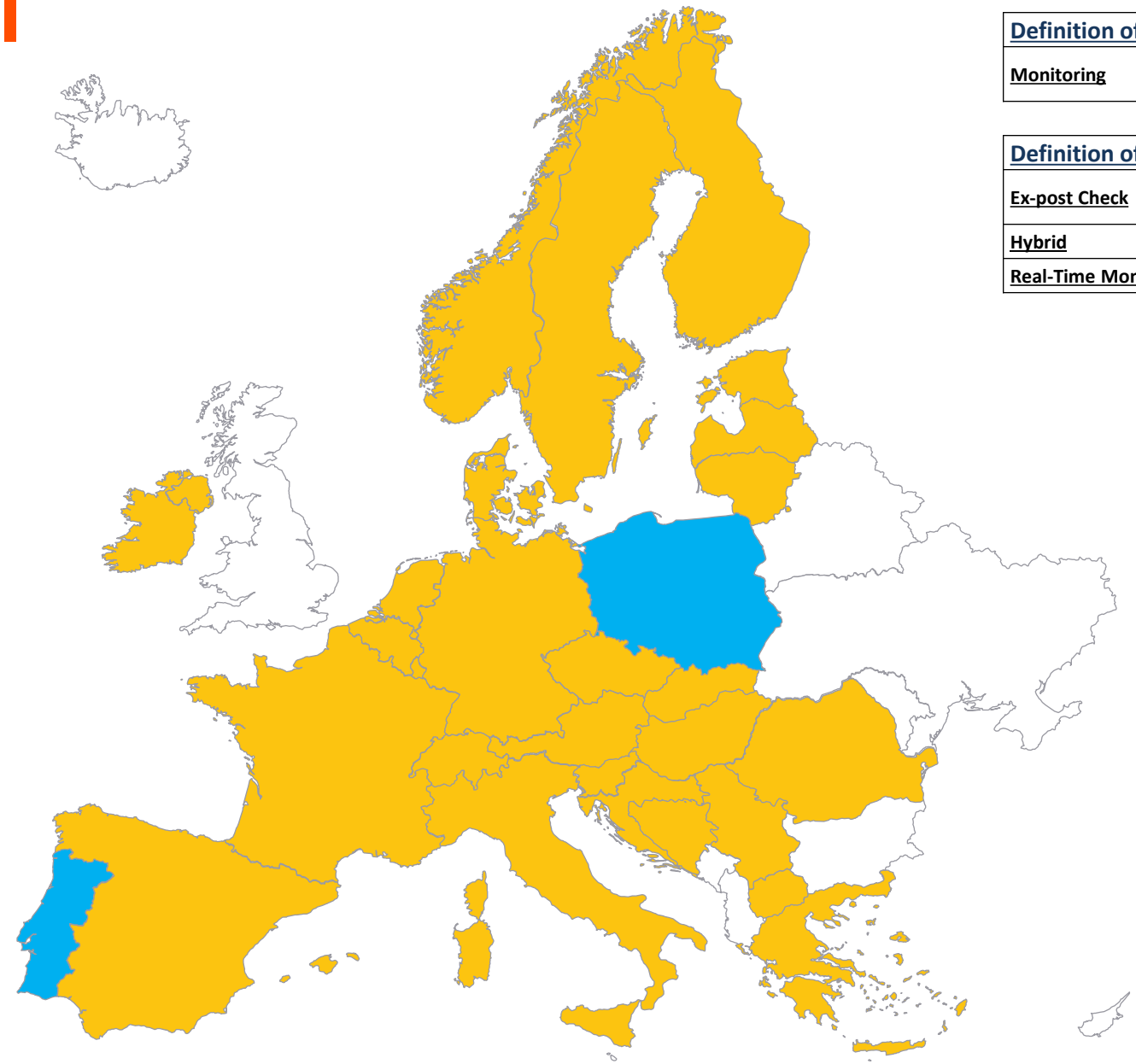
Demand-side response – Participates in these balancing services – Other storage



Demand-side response – Participates in these balancing services – Other



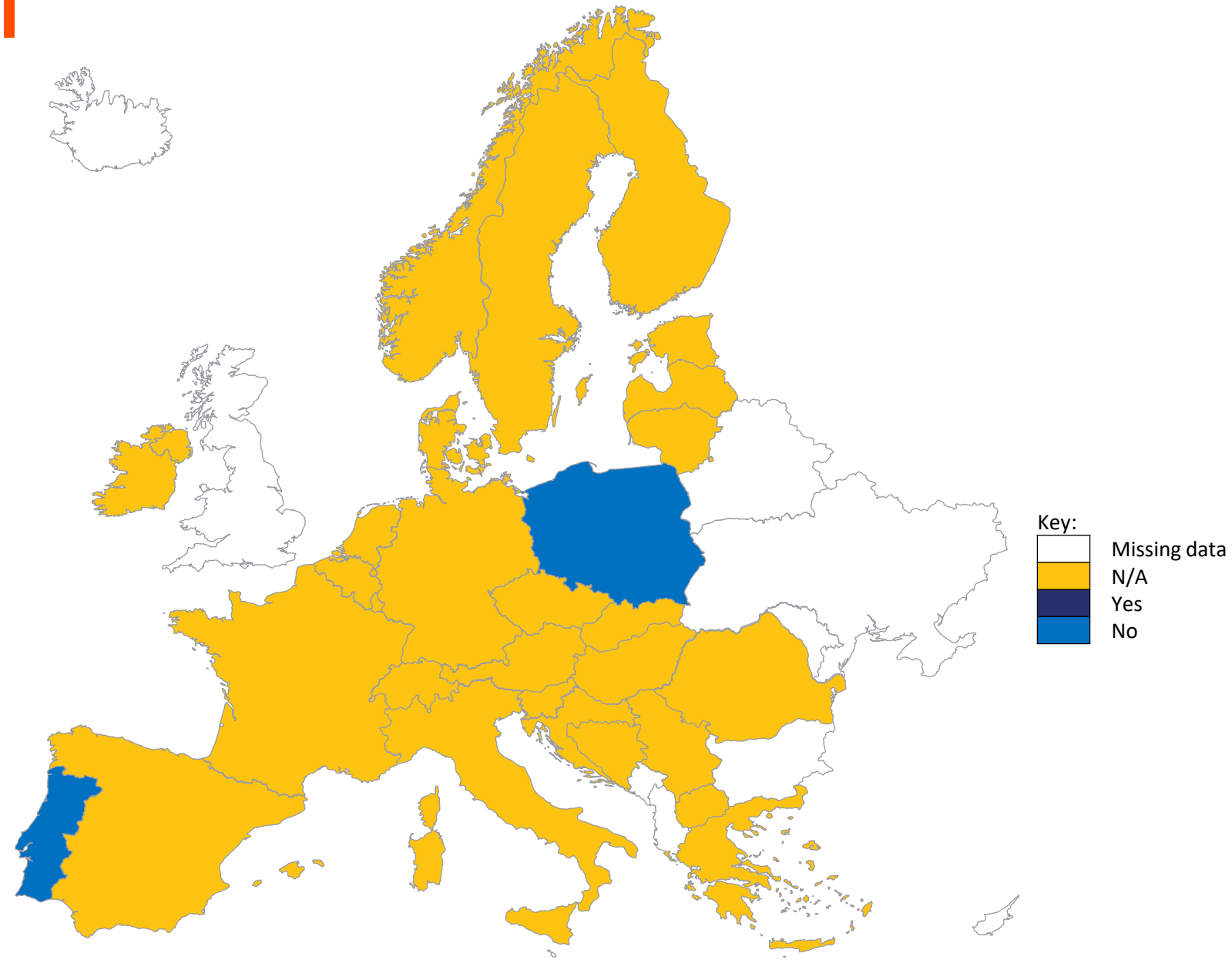
Demand-side response – Monitoring



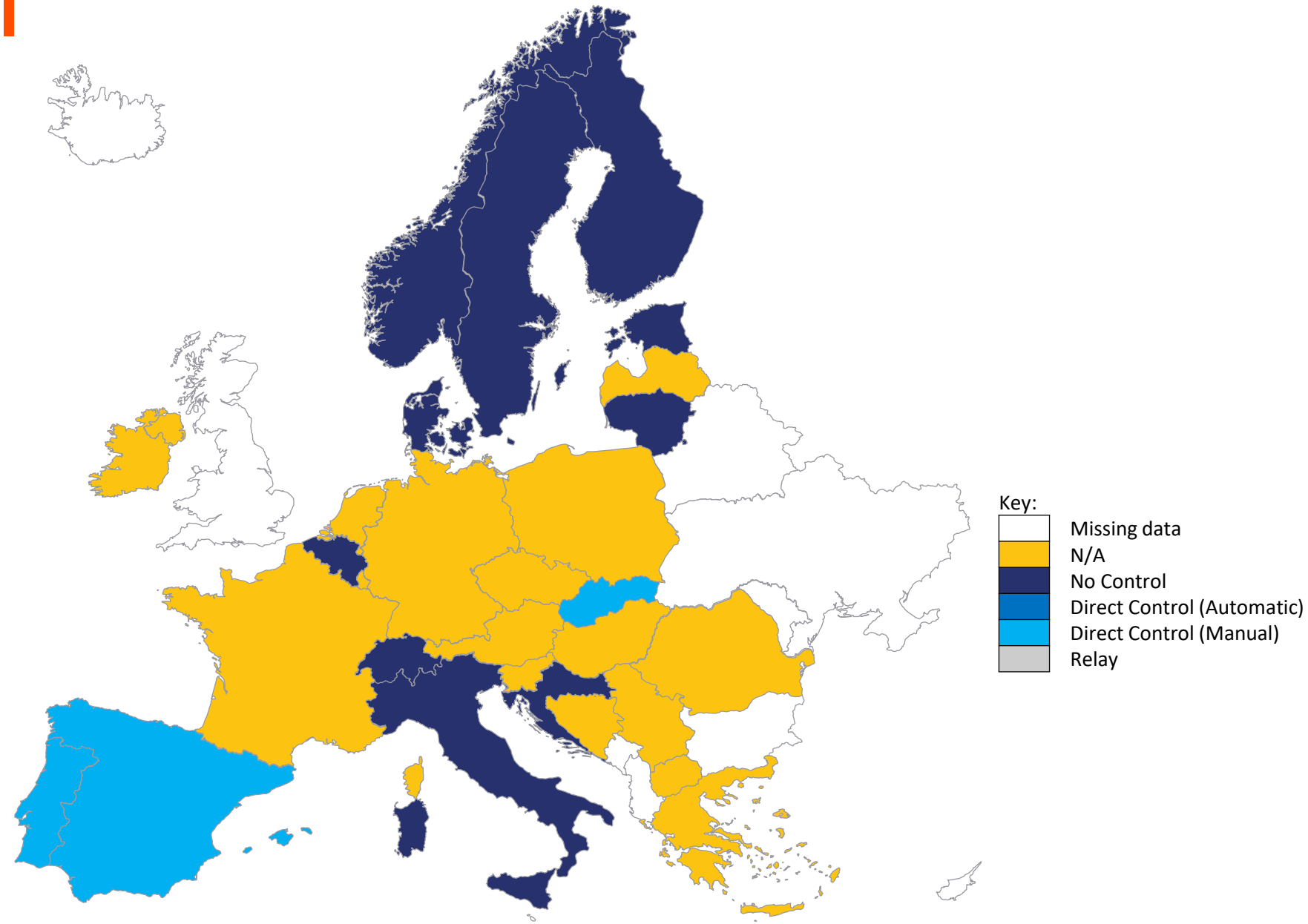
Definition of question	
Monitoring	Refers to the type of monitoring in place by the system operator to ensure performance of plant.

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

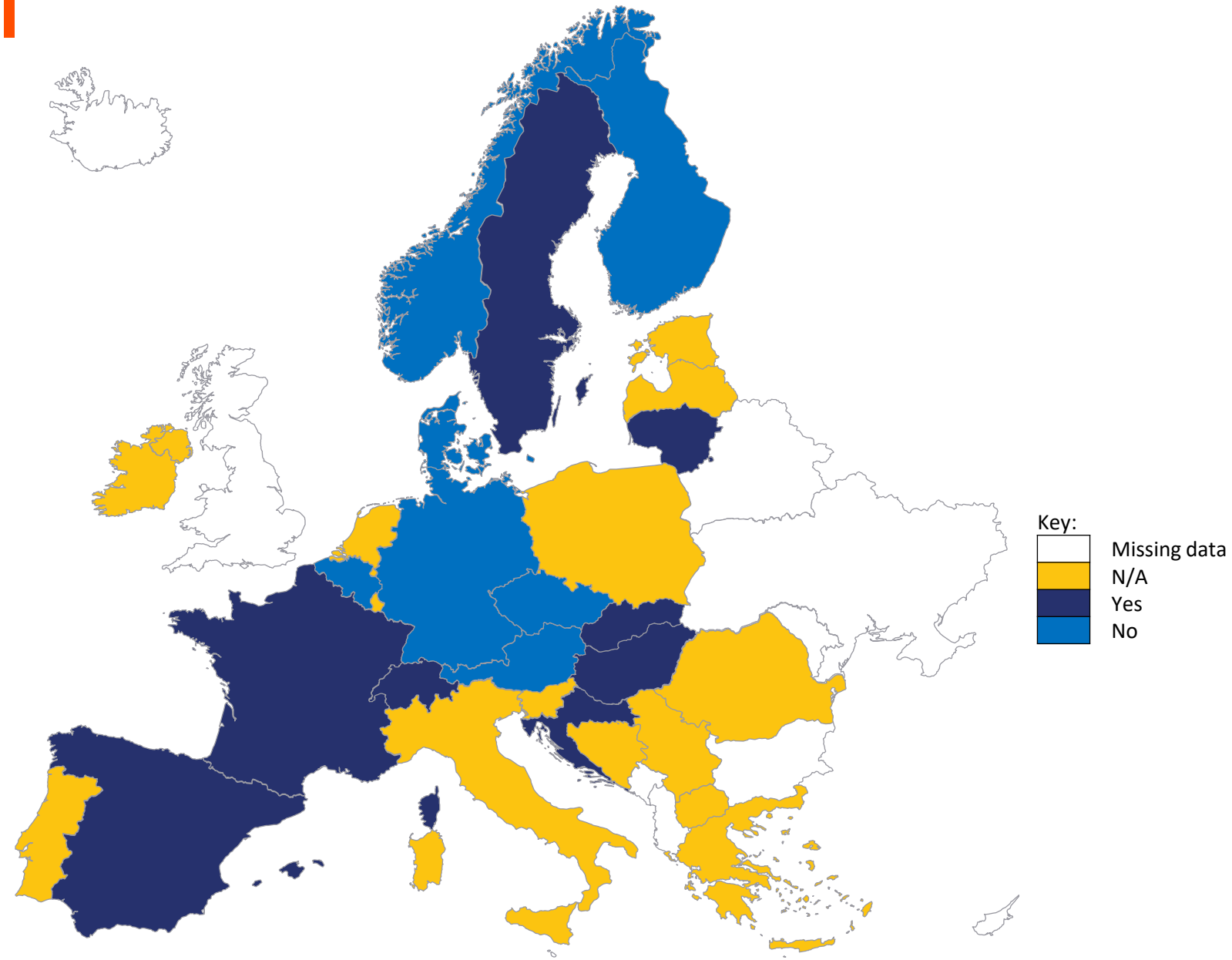
Demand-side response – Using DSR facilities in order to solve local constraints?



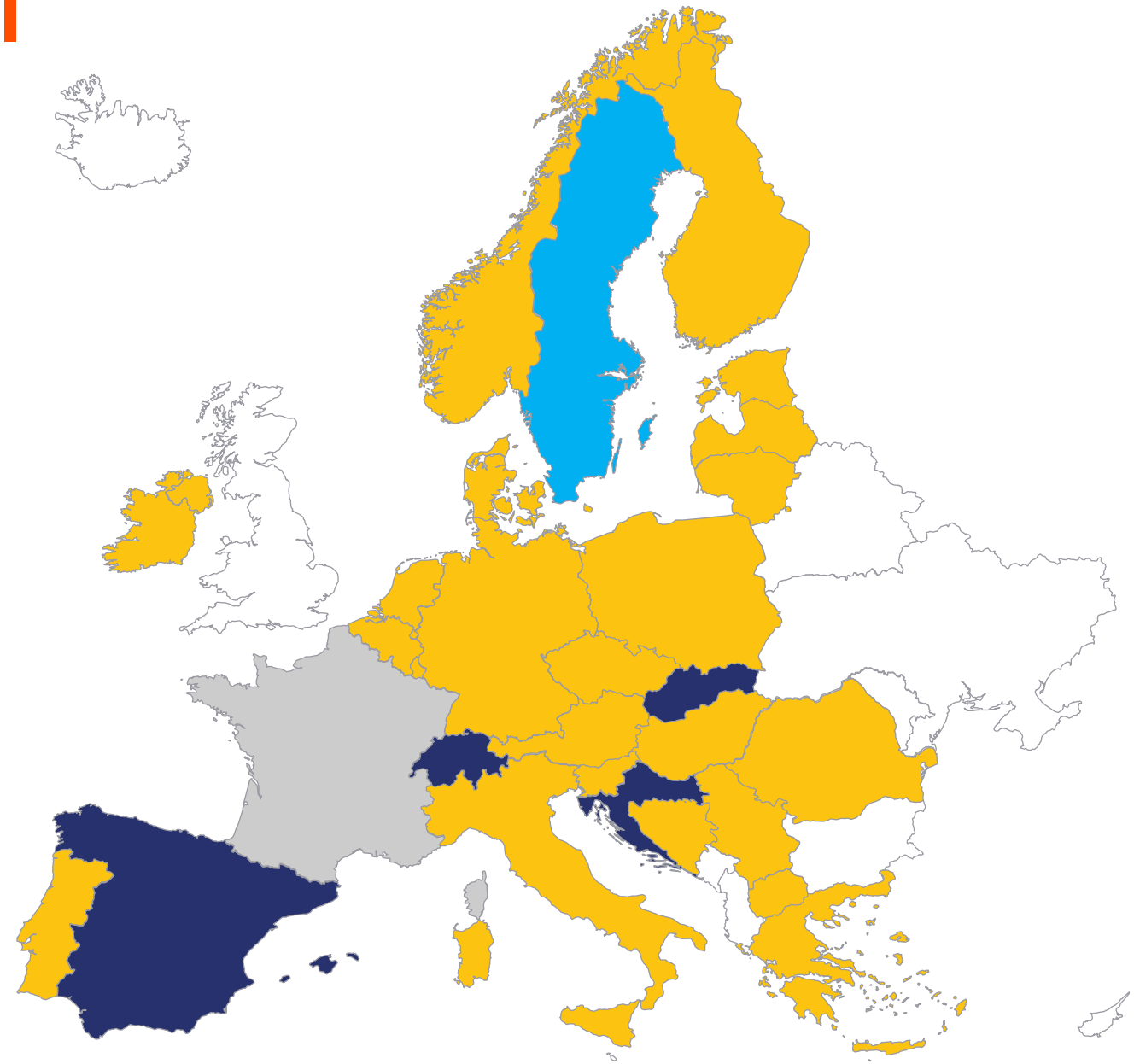
Demand-side response – What level of control of the demand side facilities does the TSO have?



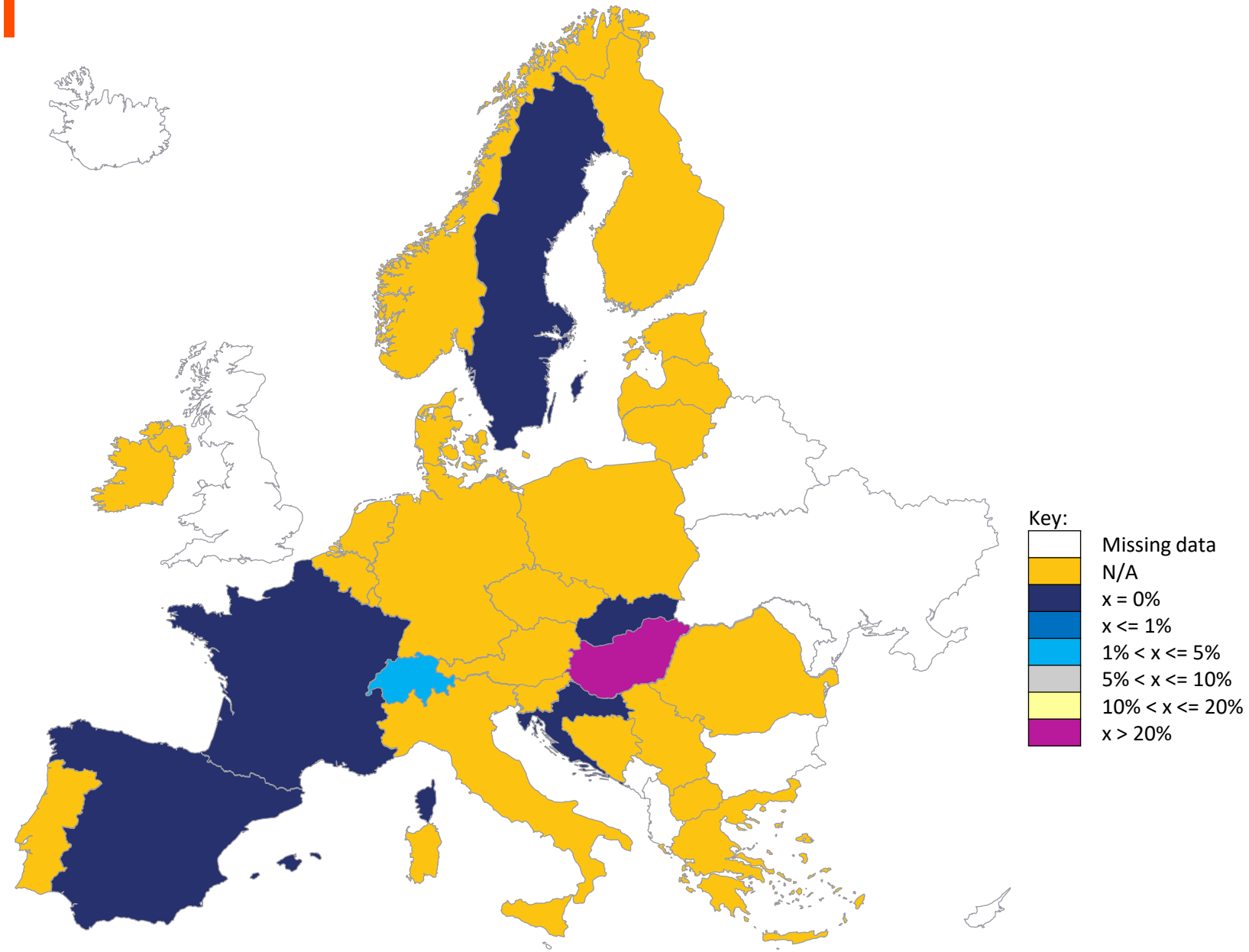
Demand-side response – Are you able to calculate share of demand-side response facilities in procured volume of balancing capacity?



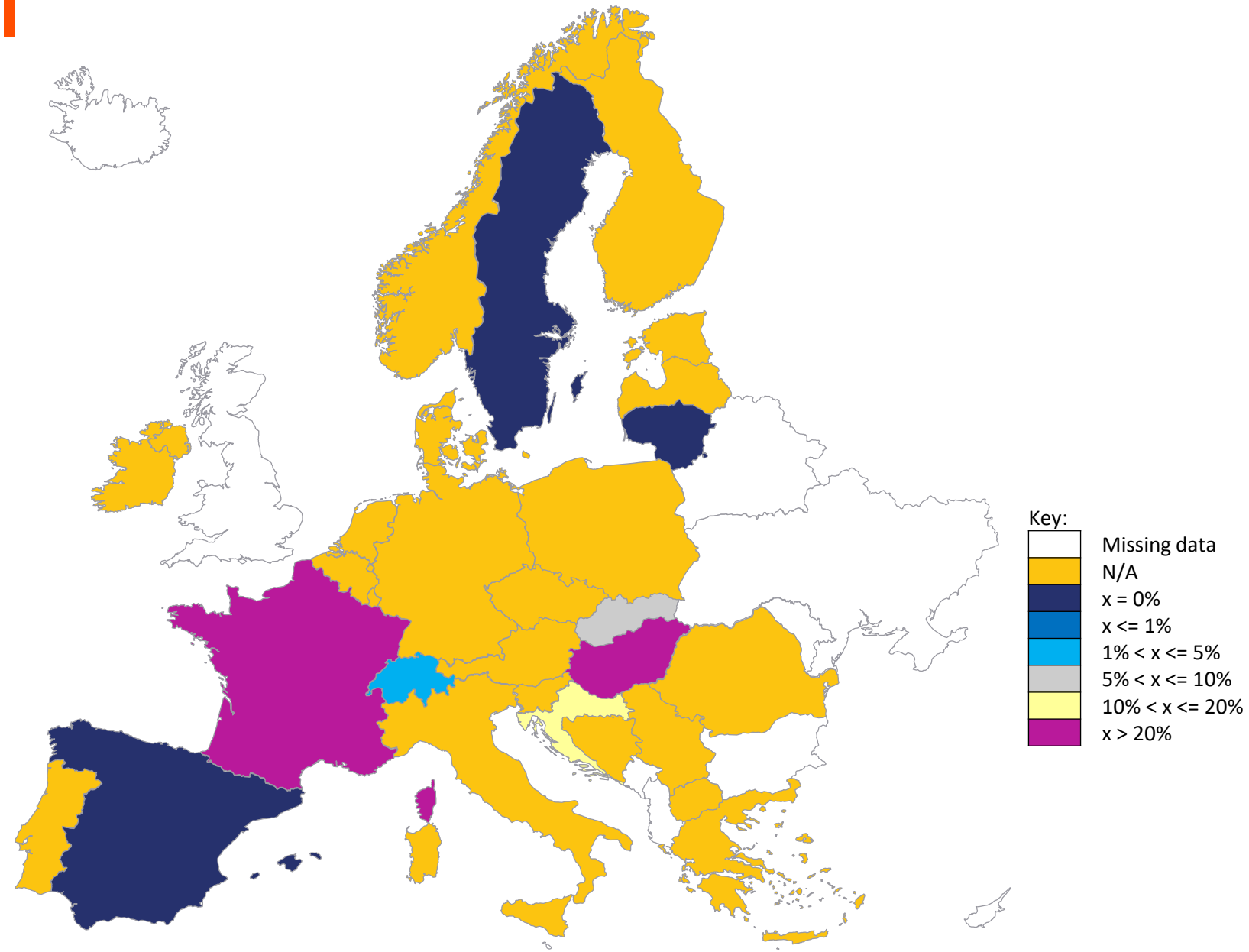
Demand-side response – What is percentage of balancing capacity volume procured from DSR facilities in comparison to total procured balancing capacity for FCR?



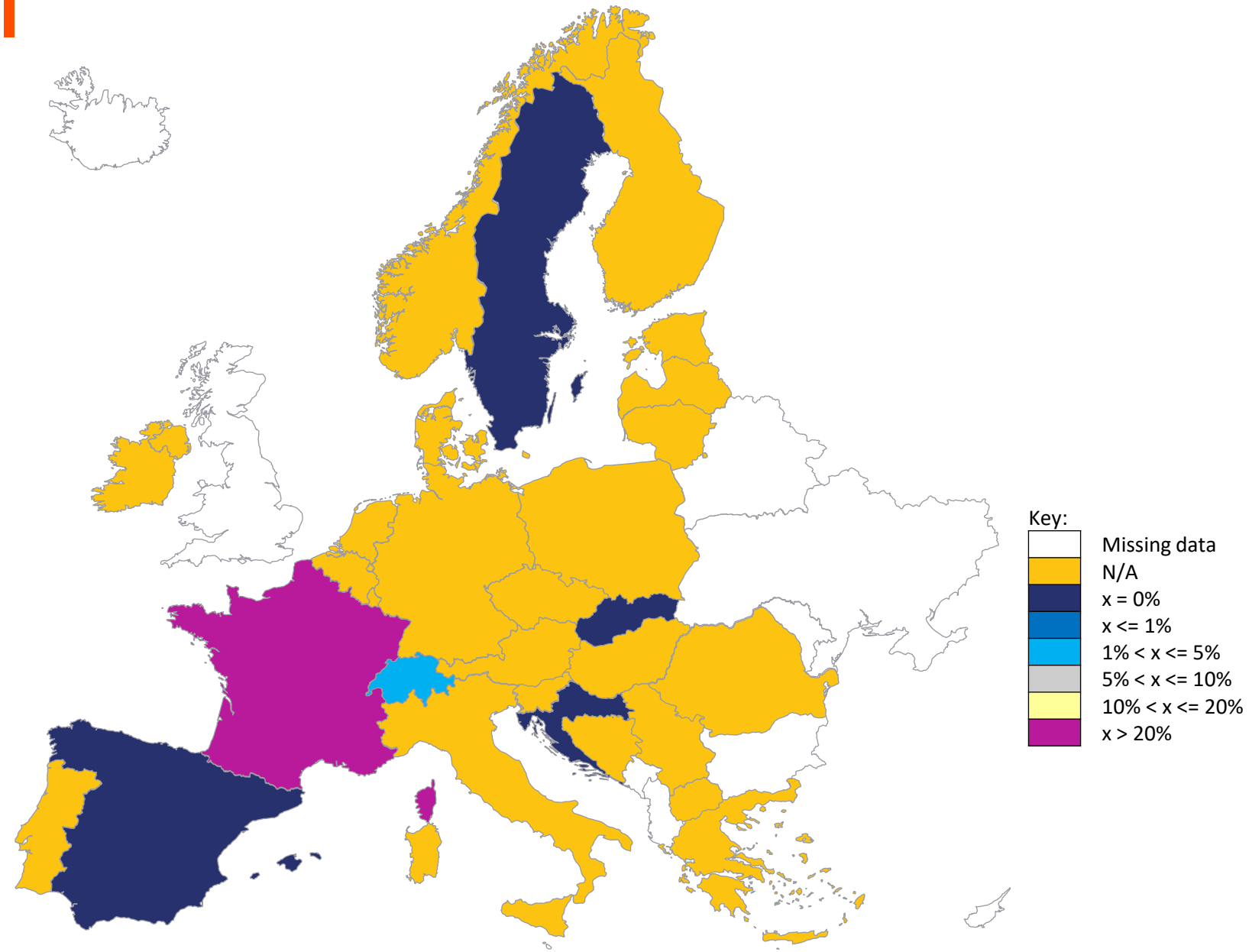
Demand-side response – What is percentage of balancing capacity volume procured from DSR facilities in comparison to total procured balancing capacity for aFRR?



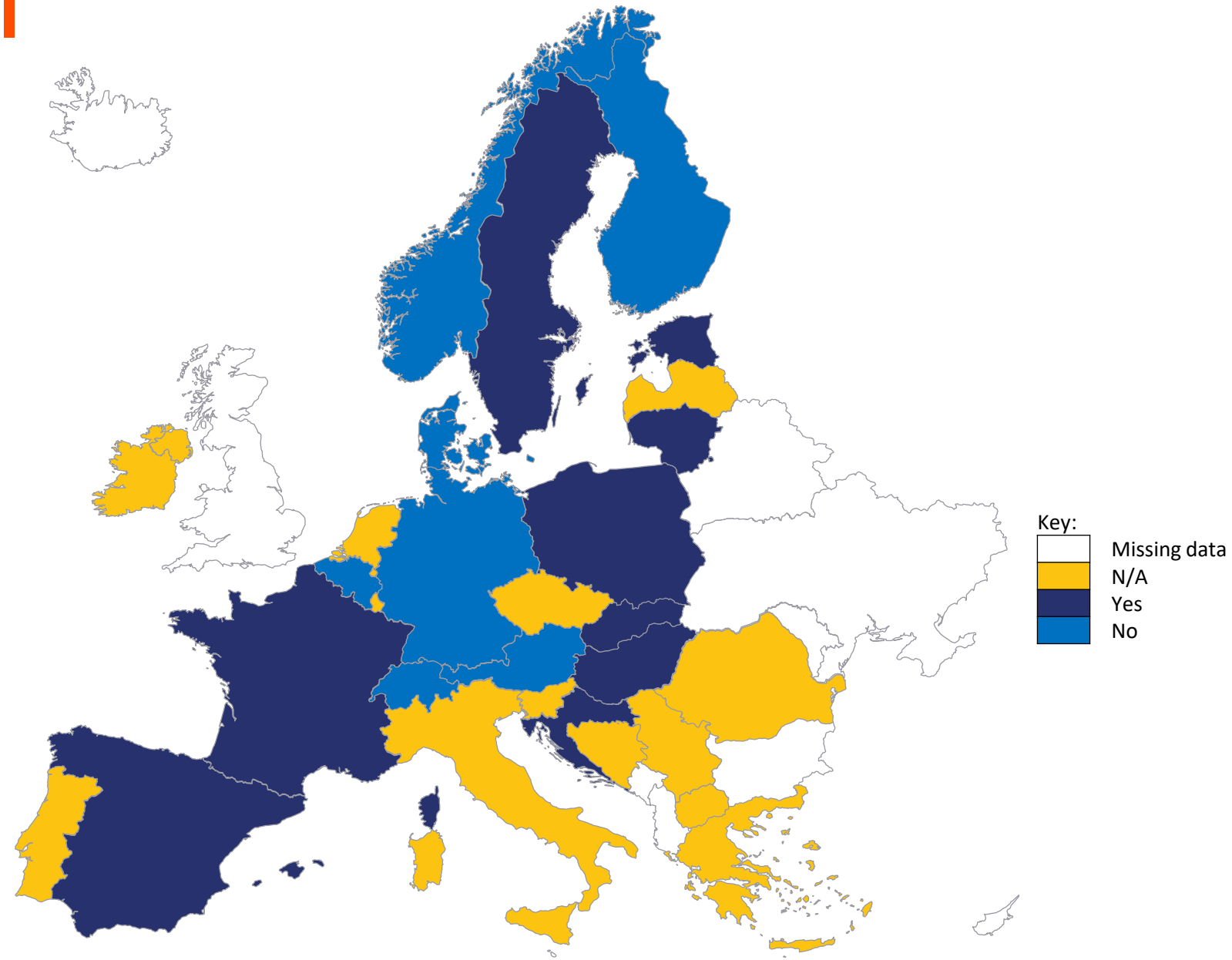
Demand-side response – What is percentage of balancing capacity volume procured from DSR facilities in comparison to total procured balancing capacity for mFRR?



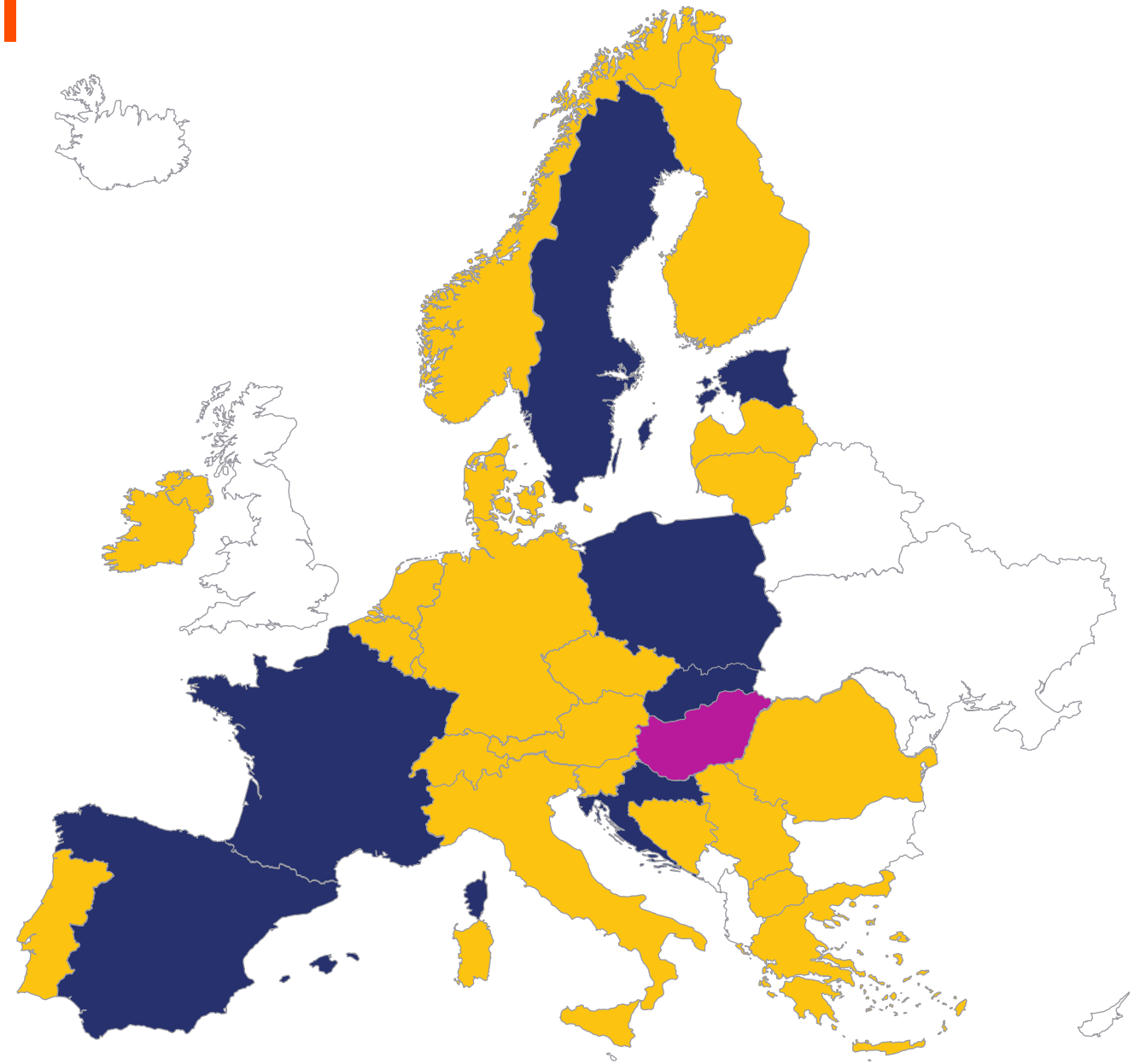
Demand-side response – What is percentage of balancing capacity volume procured from DSR facilities in comparison to total procured balancing capacity for RR?



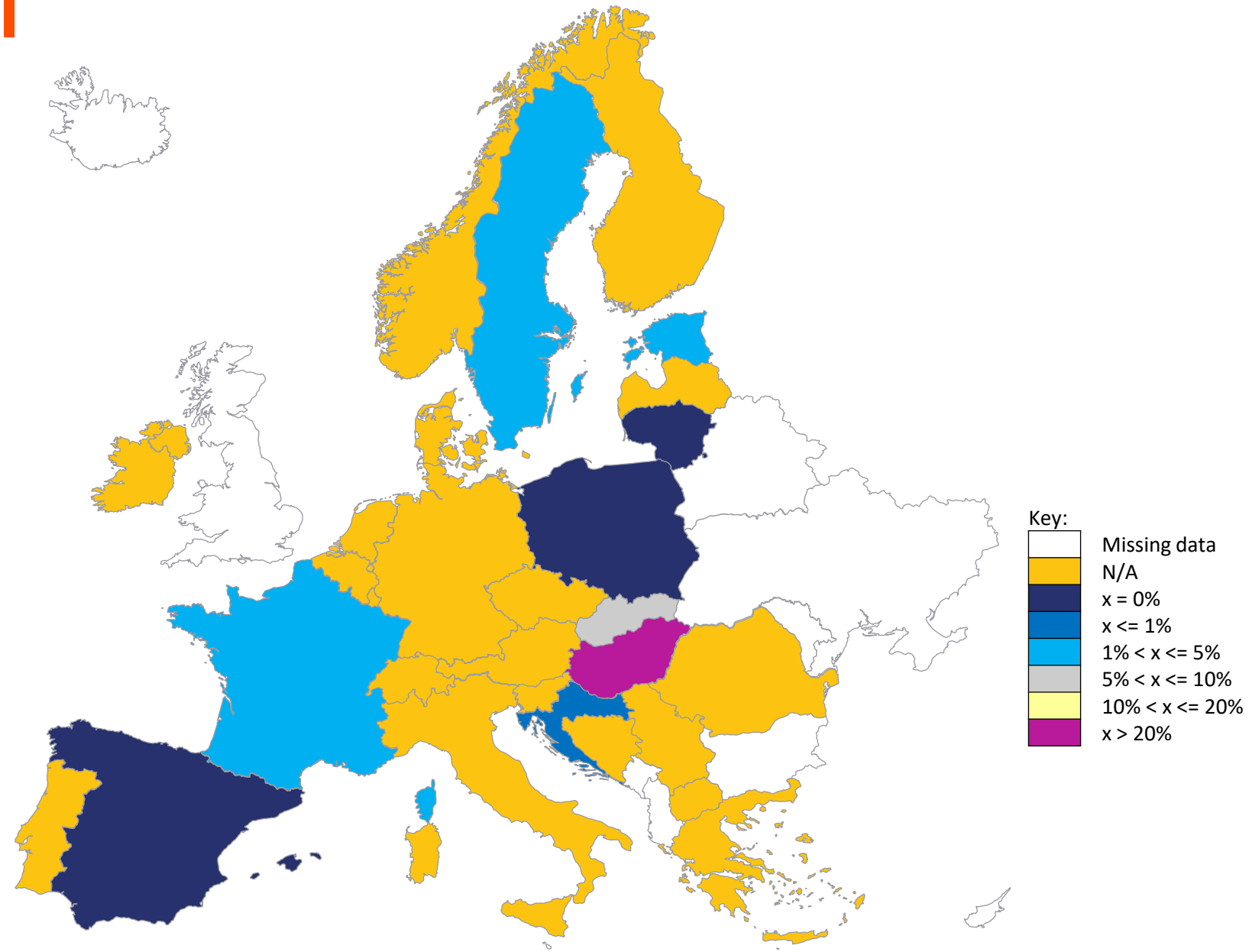
Demand-side response – Are you able to calculate share of demand-side response facilities in volume of activated balancing energy?



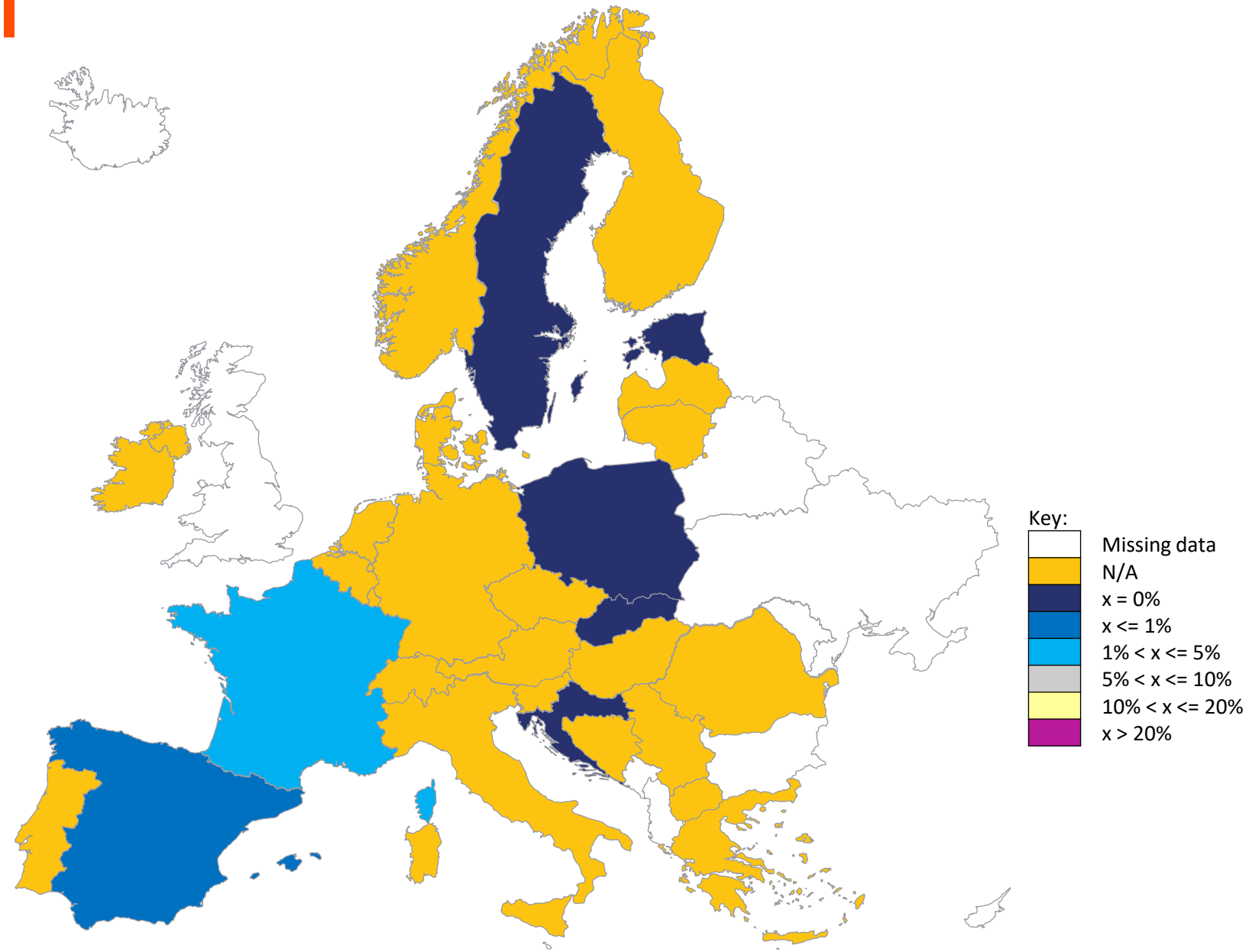
Demand-side response – What is percentage of balancing energy volume activated from demand-side response facilities in comparison to total annually activated balancing energy for aFRR?



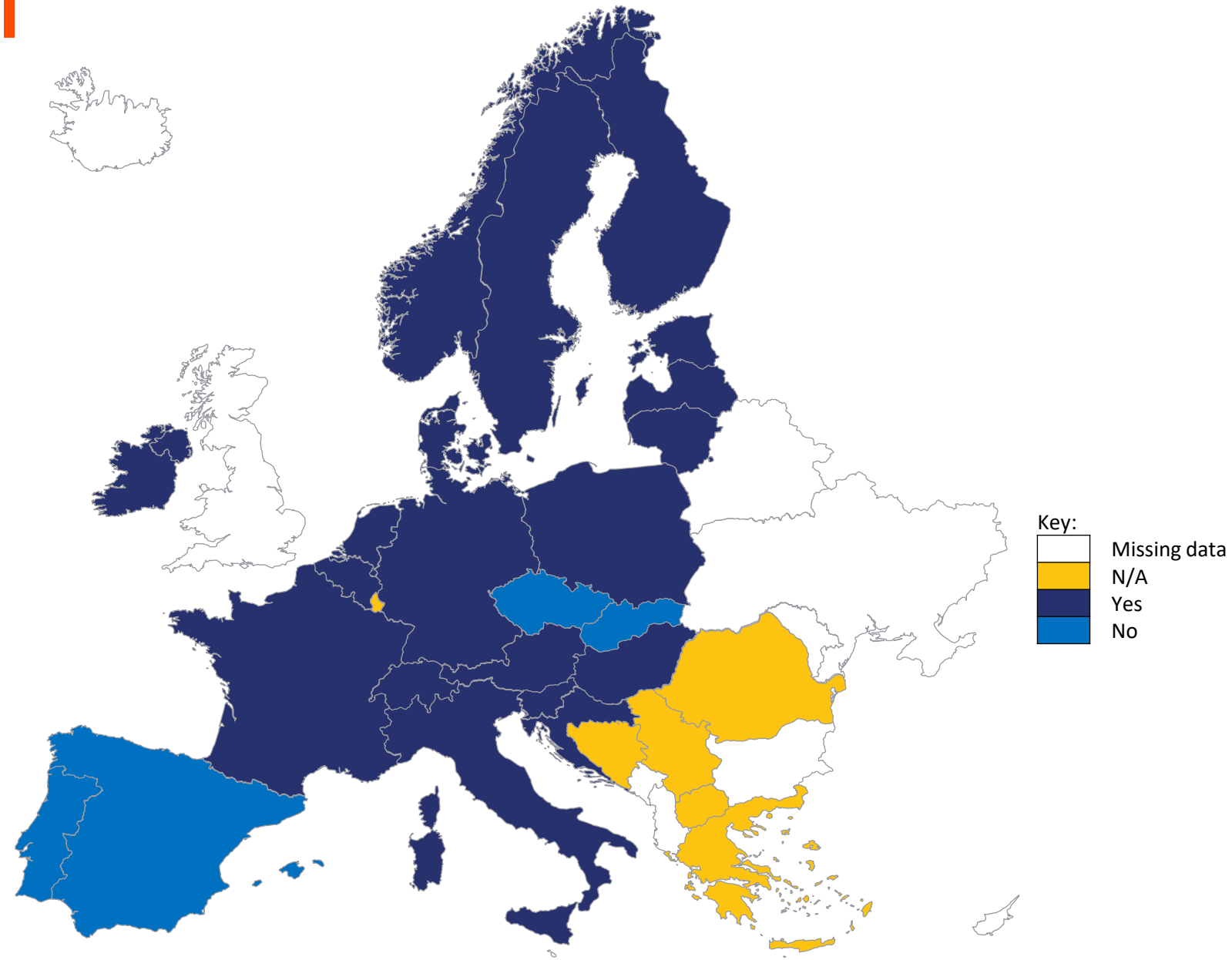
Demand-side response – What is percentage of balancing energy volume activated from demand-side response facilities in comparison to total annually activated balancing energy for mFRR?



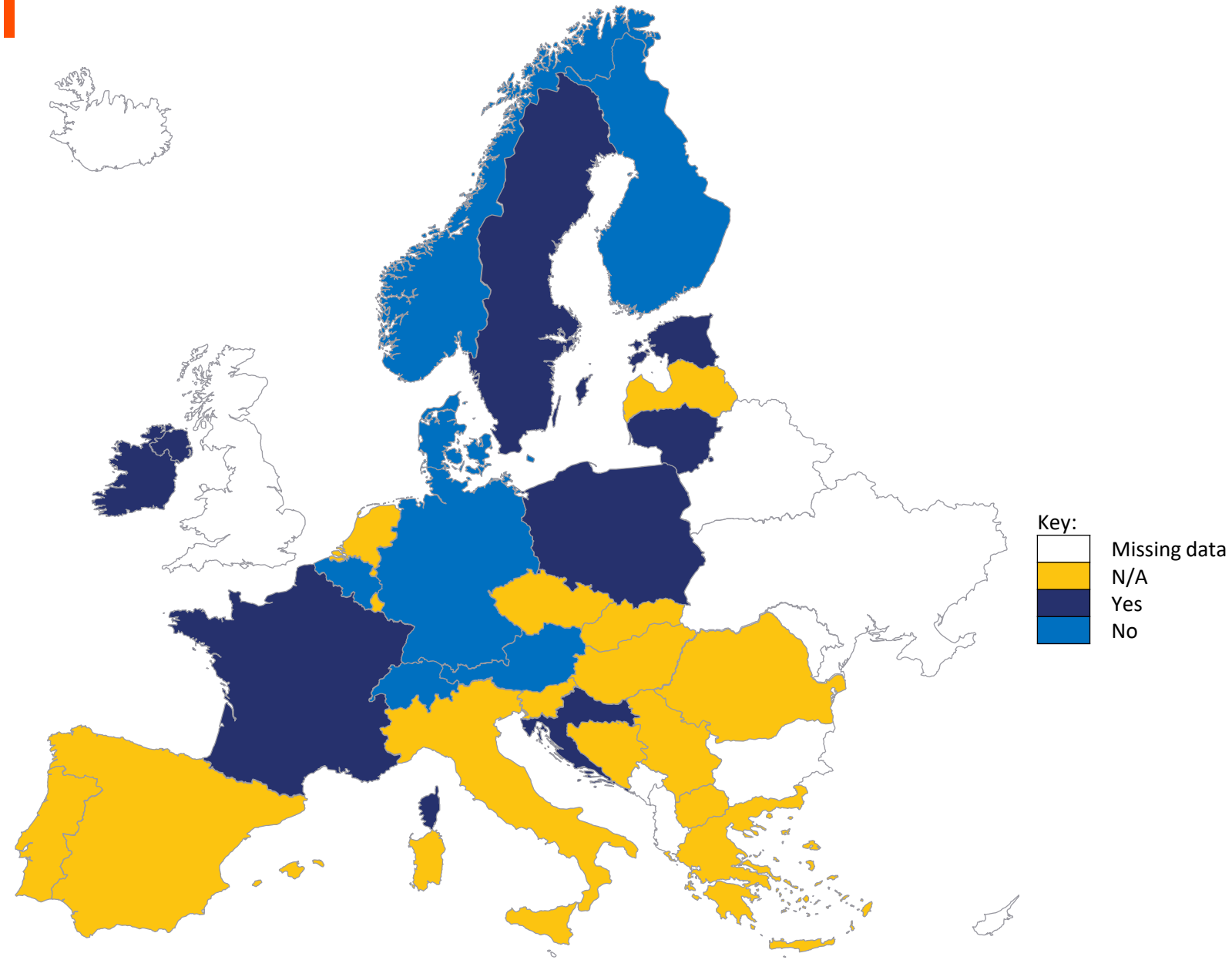
Demand-side response – What is percentage of balancing energy volume activated from demand-side response facilities in comparison to total annually activated balancing energy for RR?



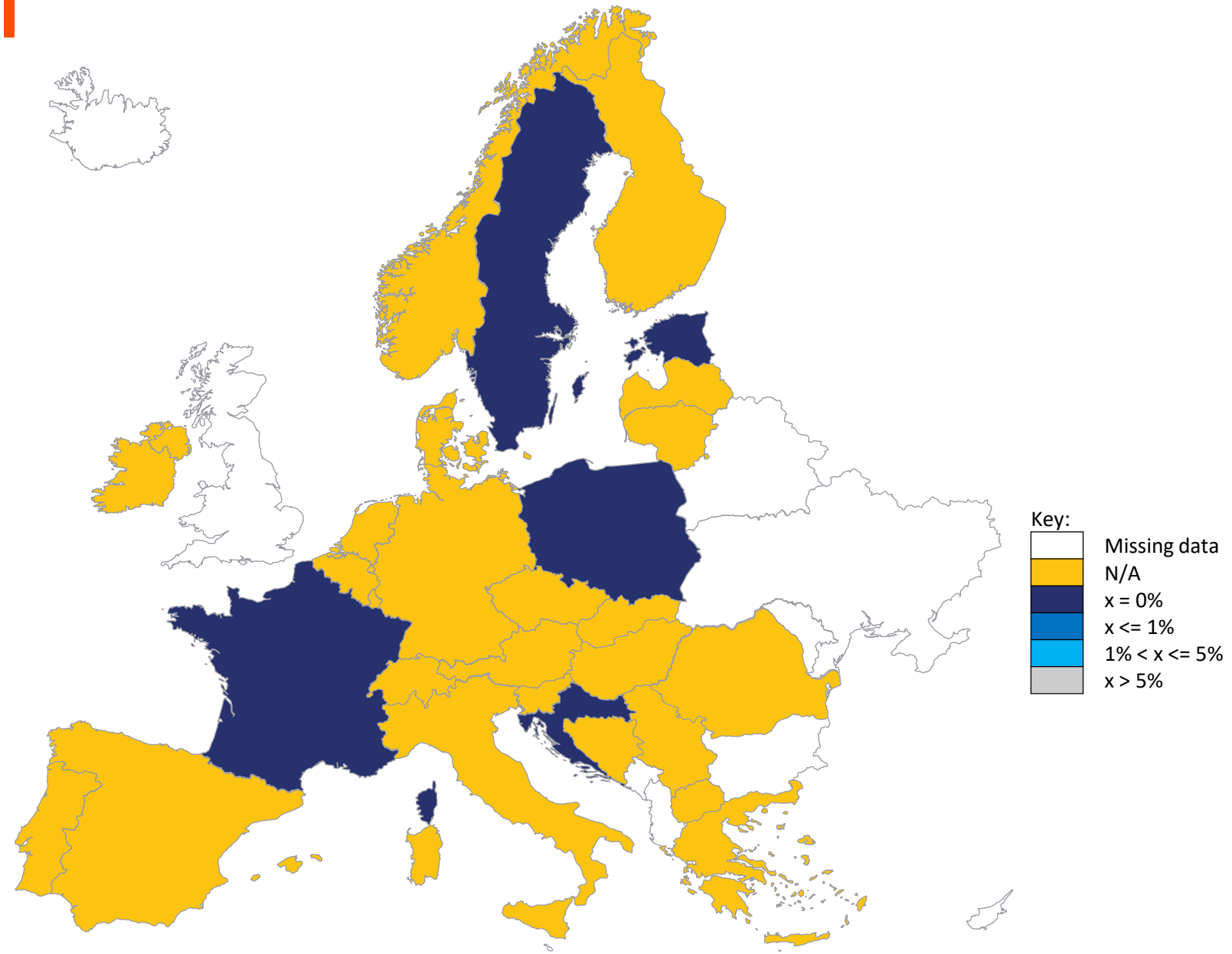
Demand-side response – Is aggregation of demand facilities allowed?



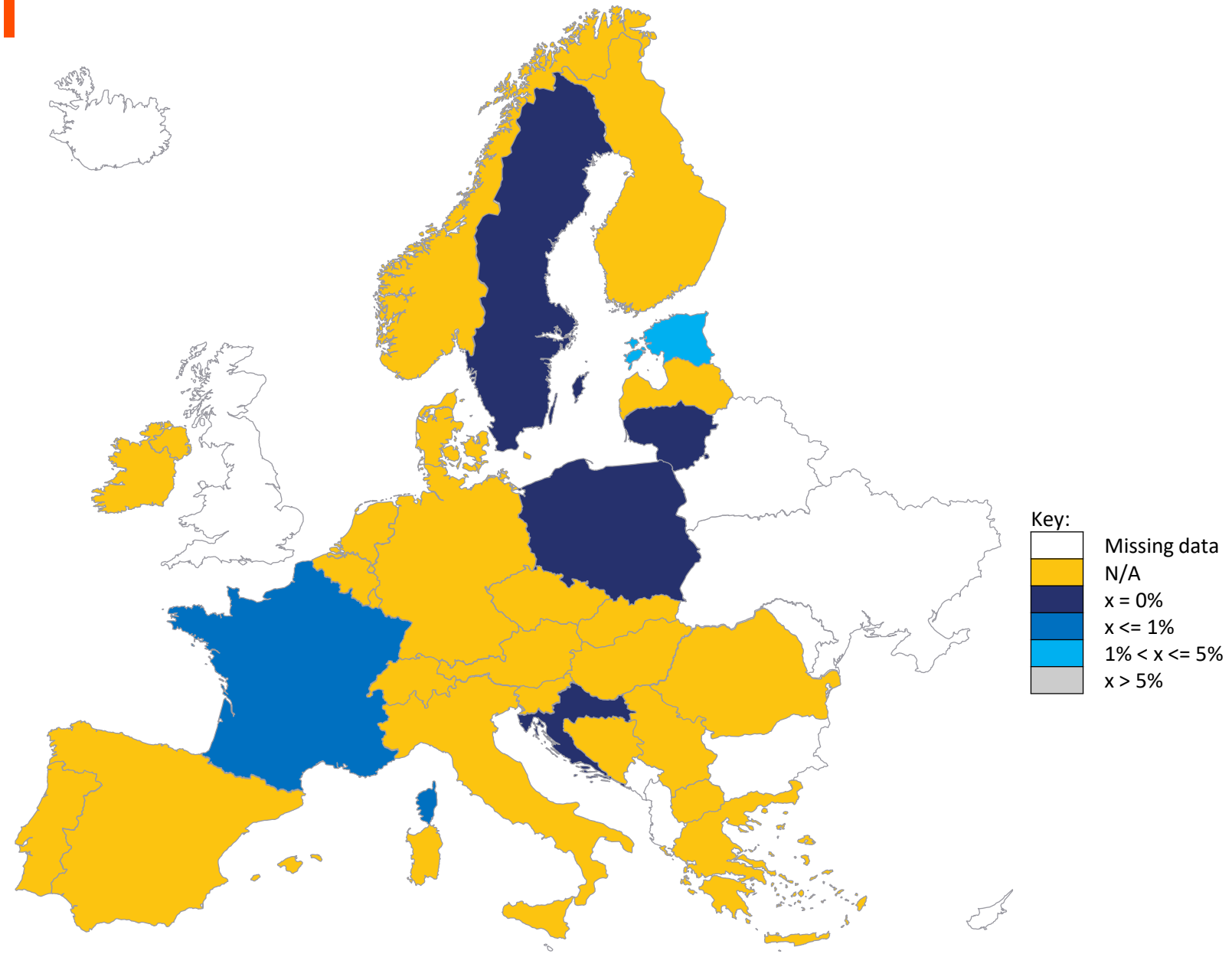
Demand-side response – Are you able to calculate share of activated balancing energy from demand-side aggregation facilities in comparison to total volume of activated balancing energy?



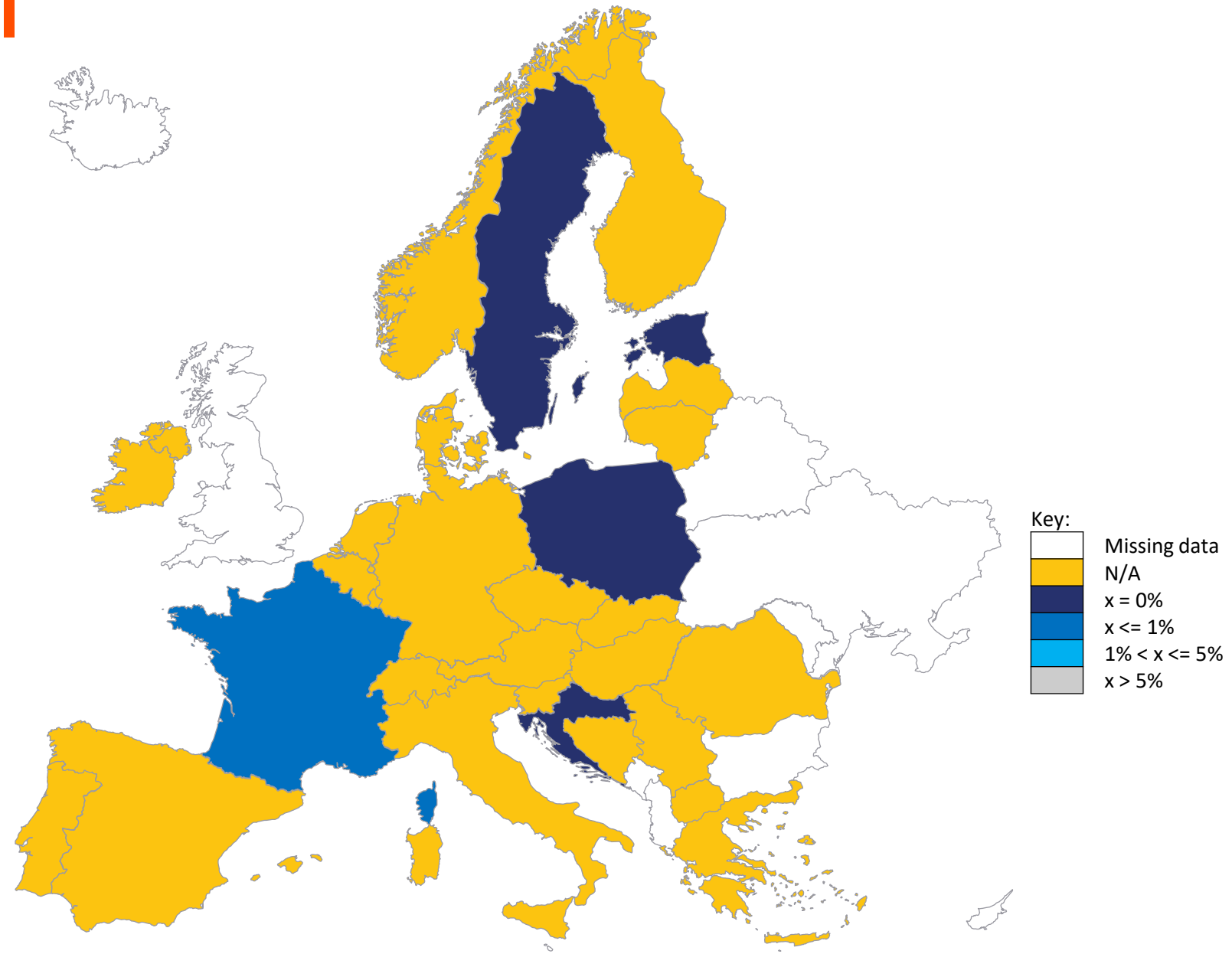
Demand-side response – What is percentage of balancing energy activated from demand-side aggregation facilities in comparison to total activated balancing energy for aFRR?



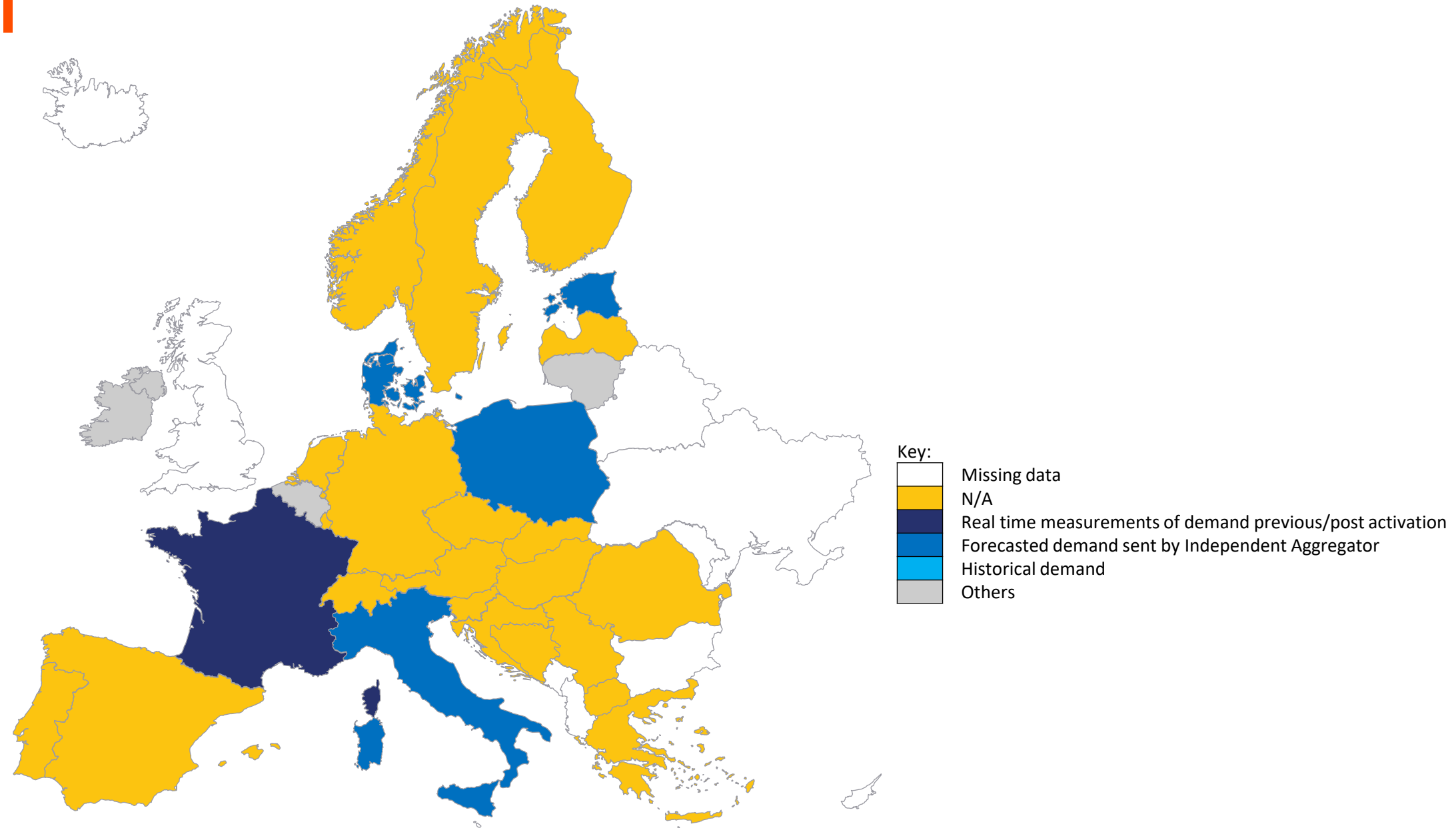
Demand-side response – What is percentage of balancing energy activated from demand-side aggregation facilities in comparison to total activated balancing energy for mFRR?



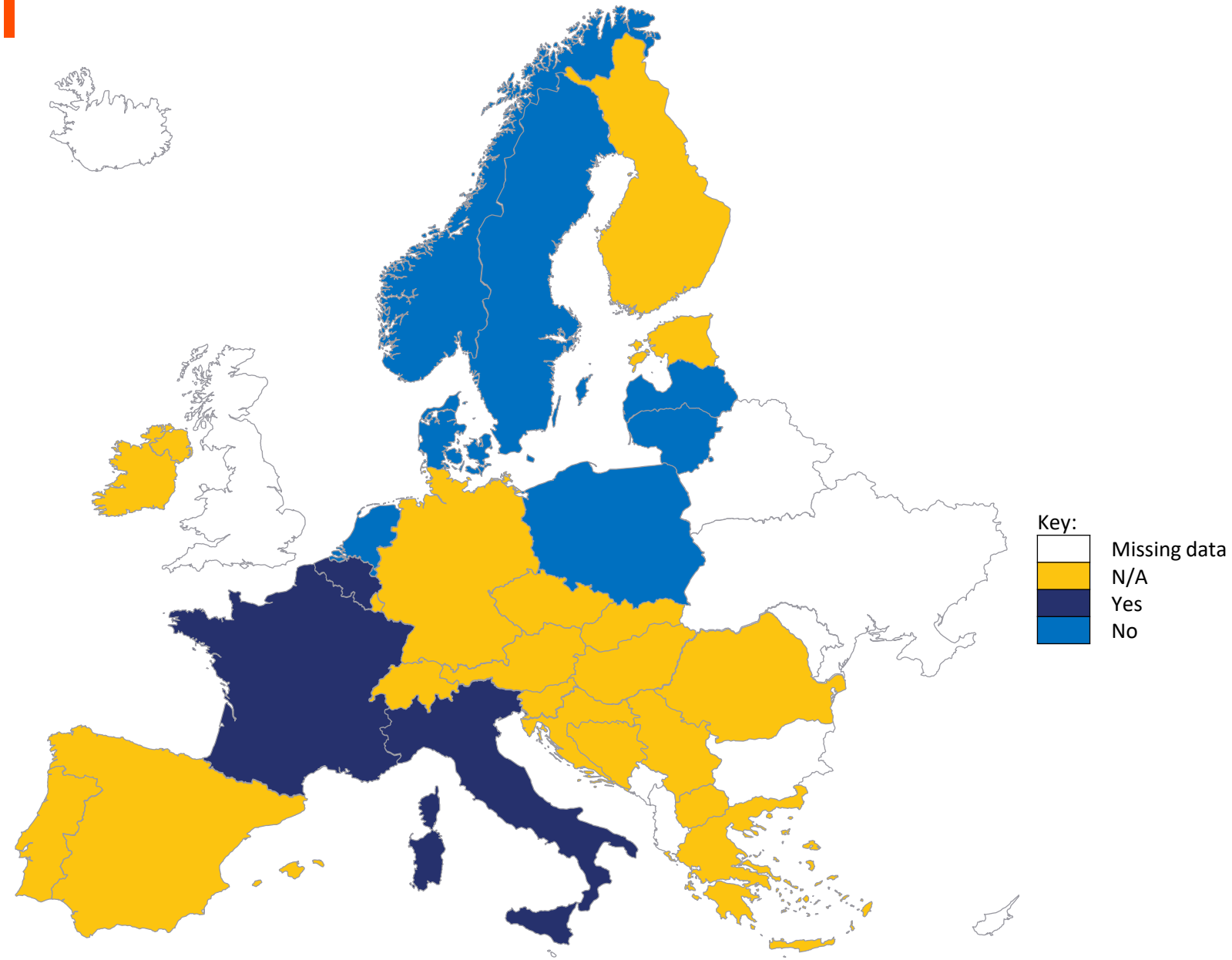
Demand-side response – What is percentage of balancing energy activated from demand-side aggregation facilities in comparison to total activated balancing energy for RR?



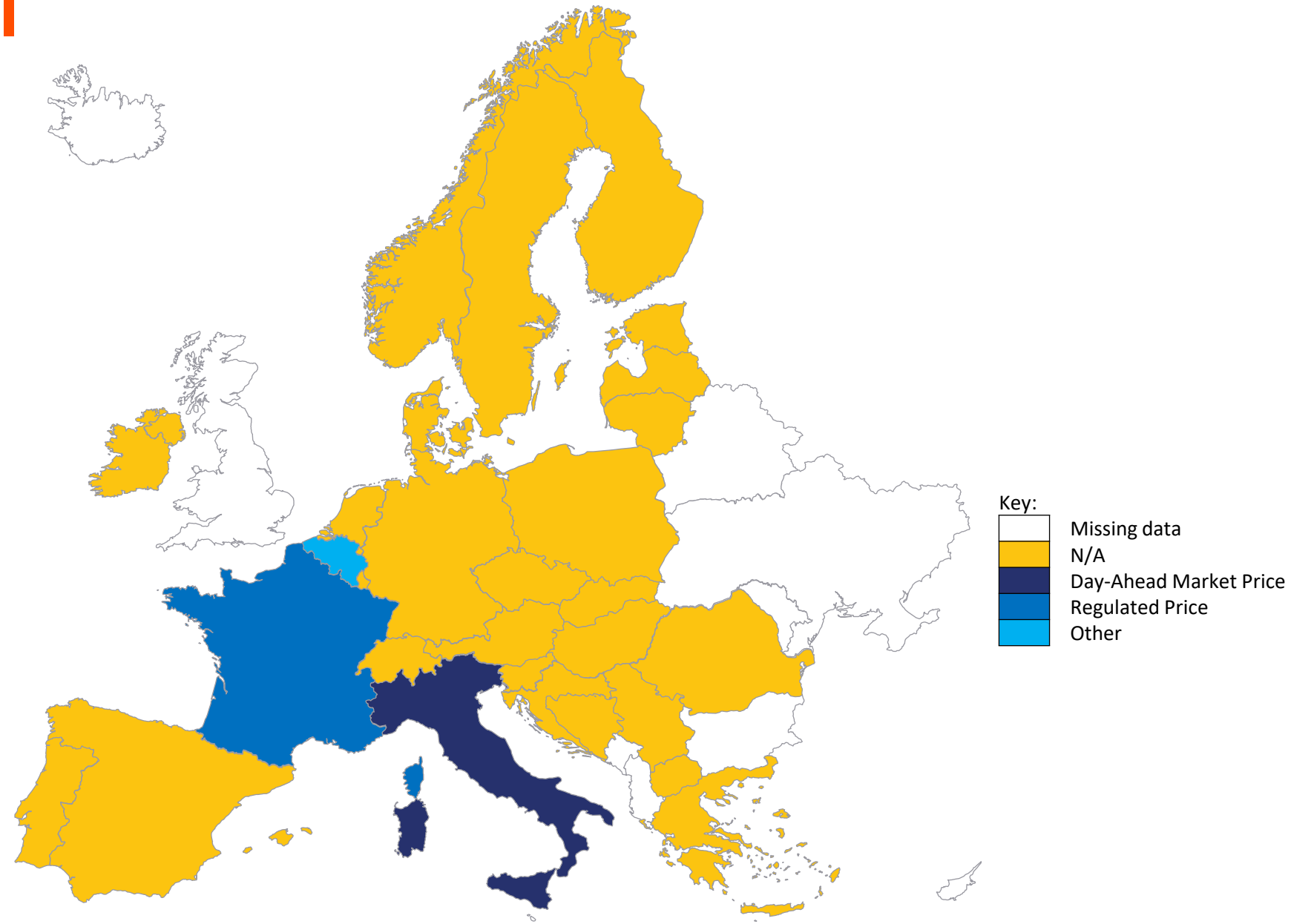
Demand-side response – In case of demand-side aggregation facilities, baseline mechanism used in your country?



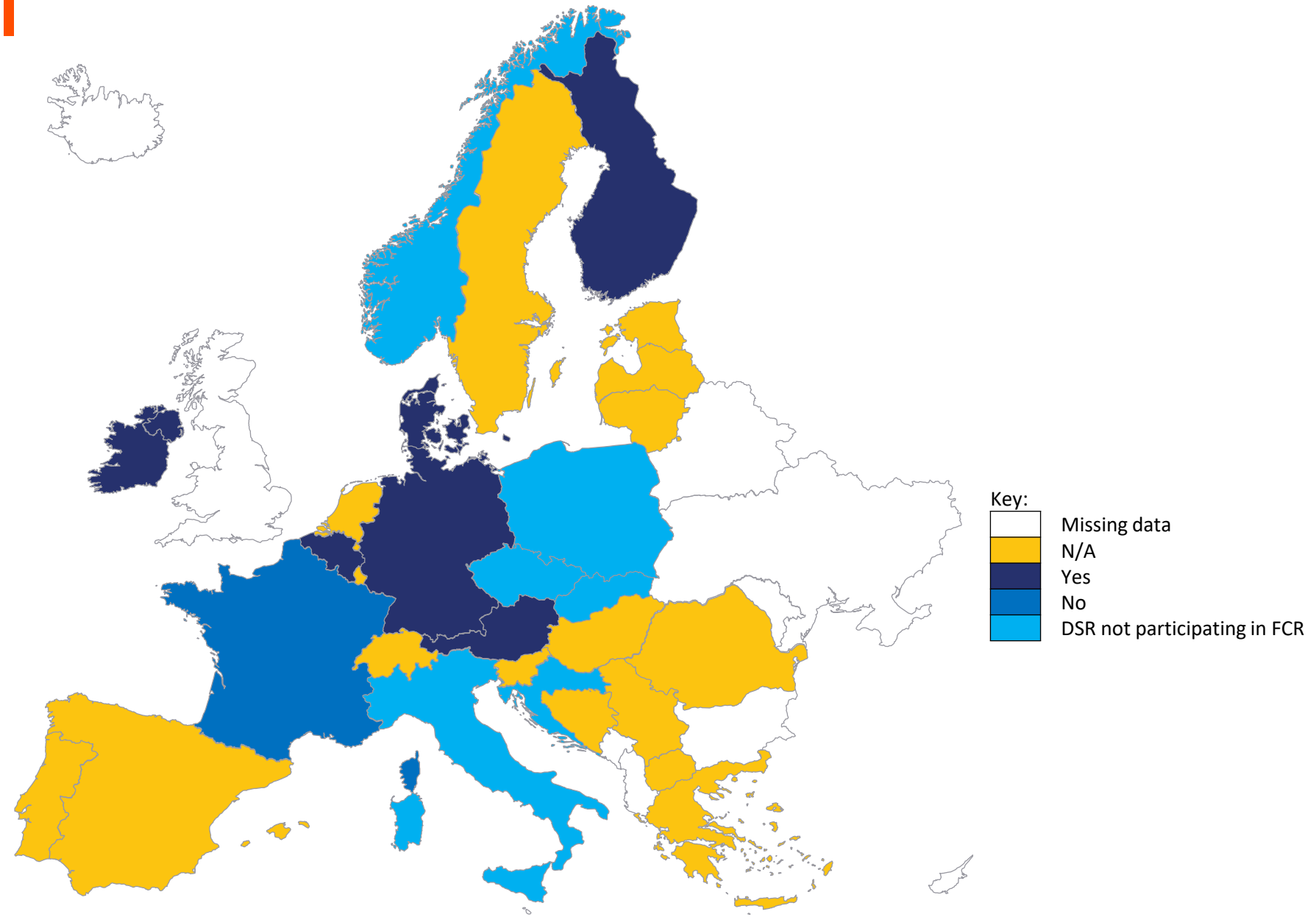
Demand-side response – In case of demand-side aggregation facilities, is there a compensation mechanism in your country?



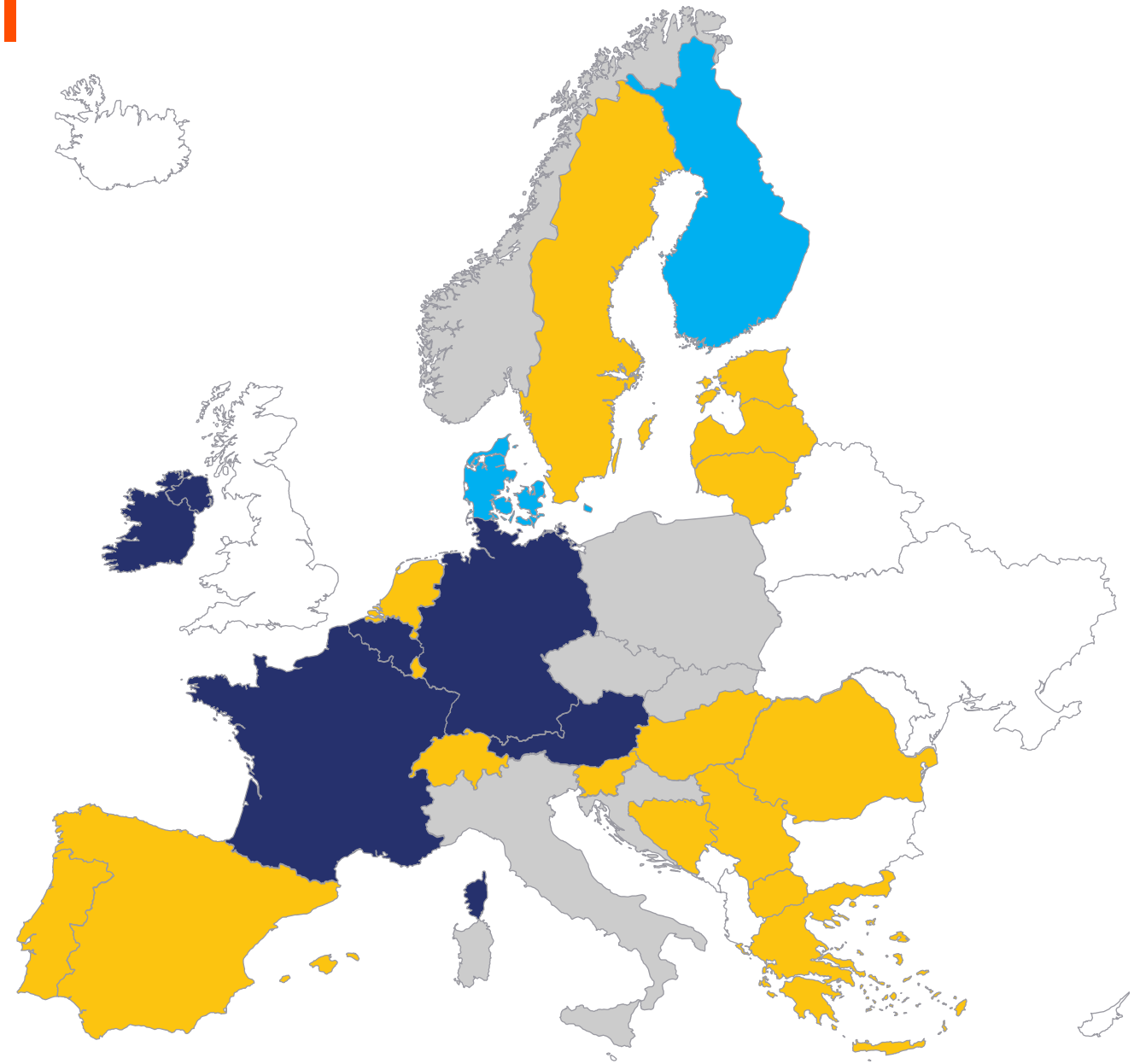
Demand-side response – What type of compensation mechanism is used for demand-side aggregation facilities?



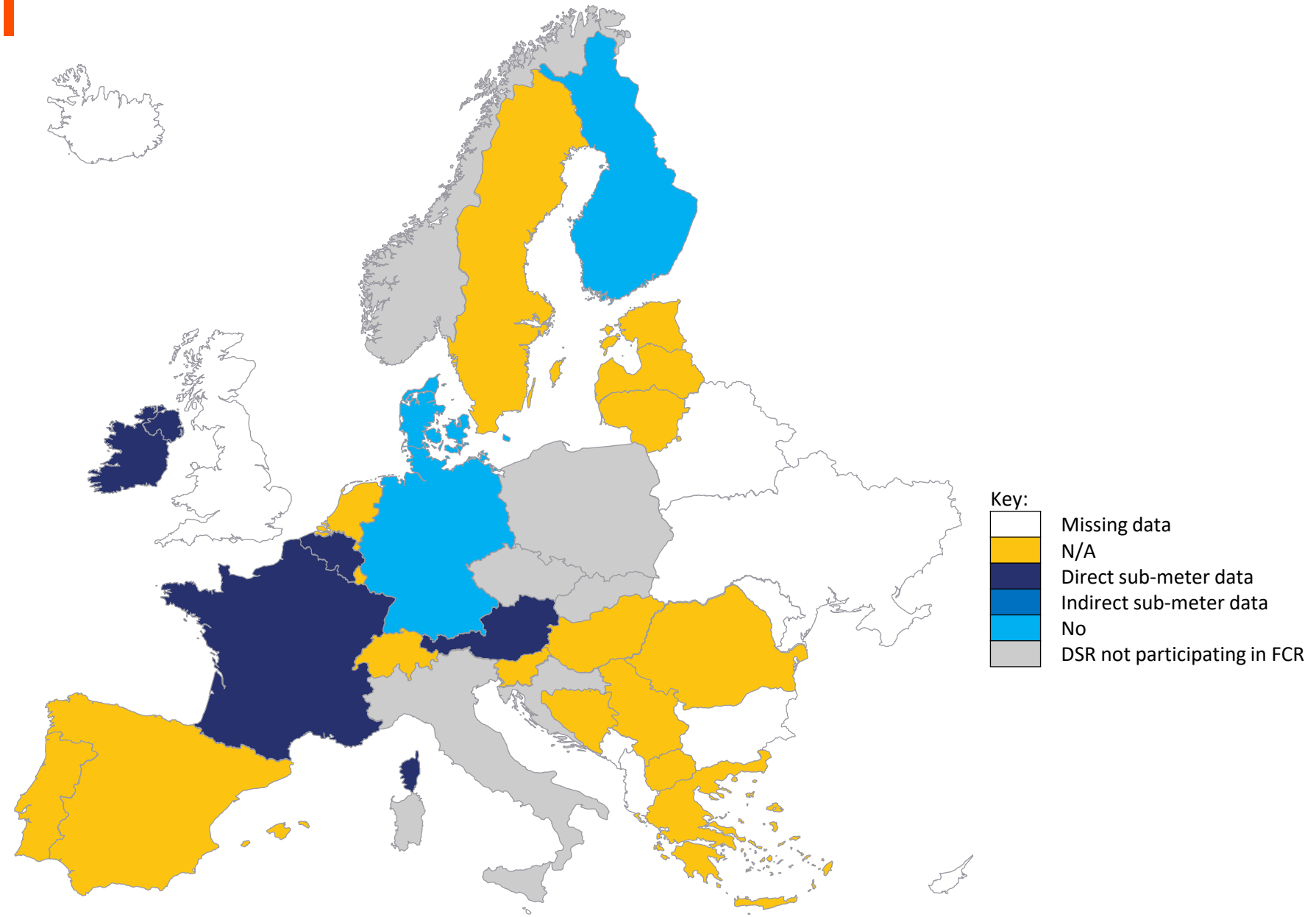
Demand-side response – Monitoring of aggregation facilities – if case DSR participates in FCR – Aggregated data



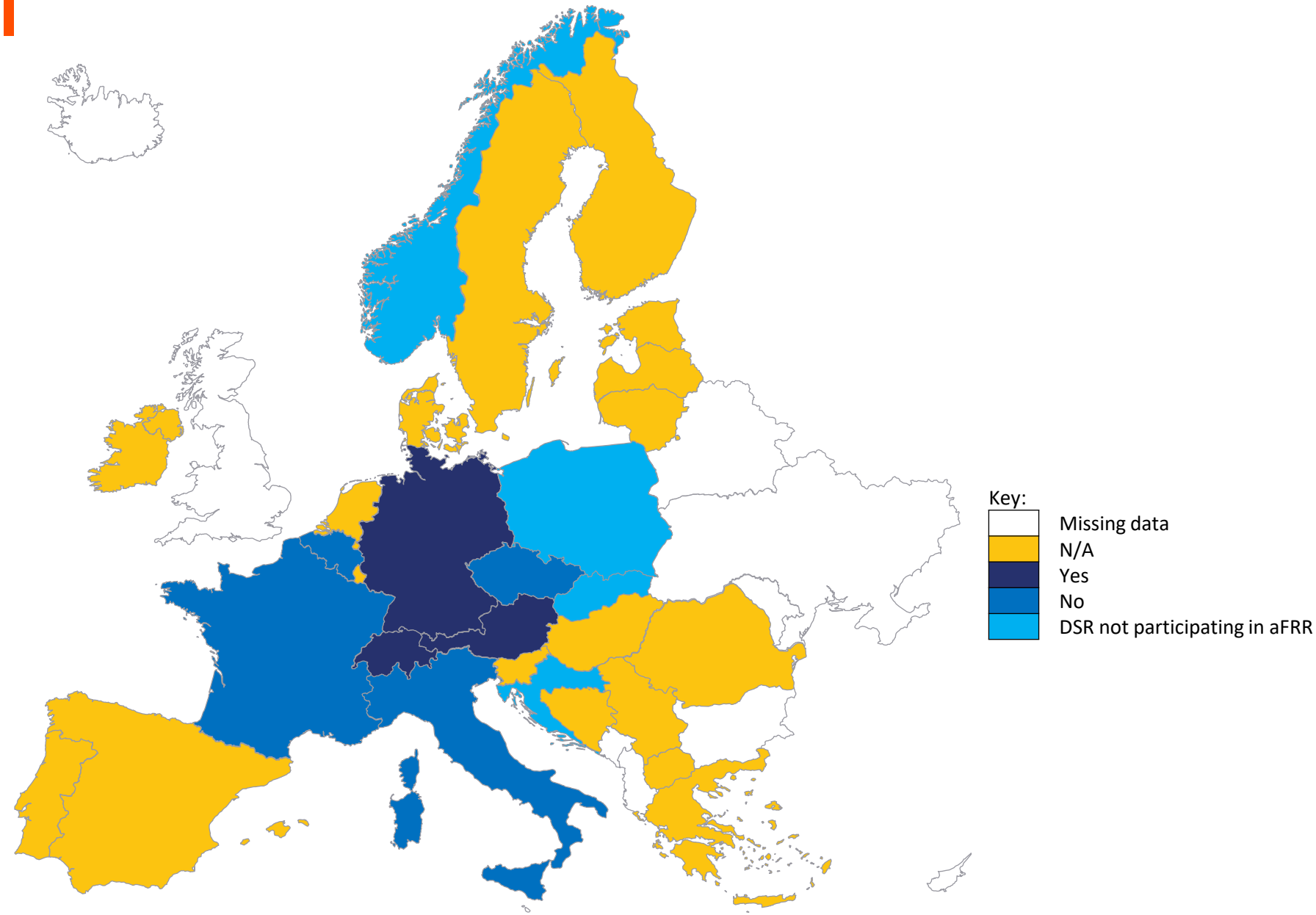
Demand-side response – Monitoring of aggregation facilities – if case DSR participates in FCR – Single point of delivery



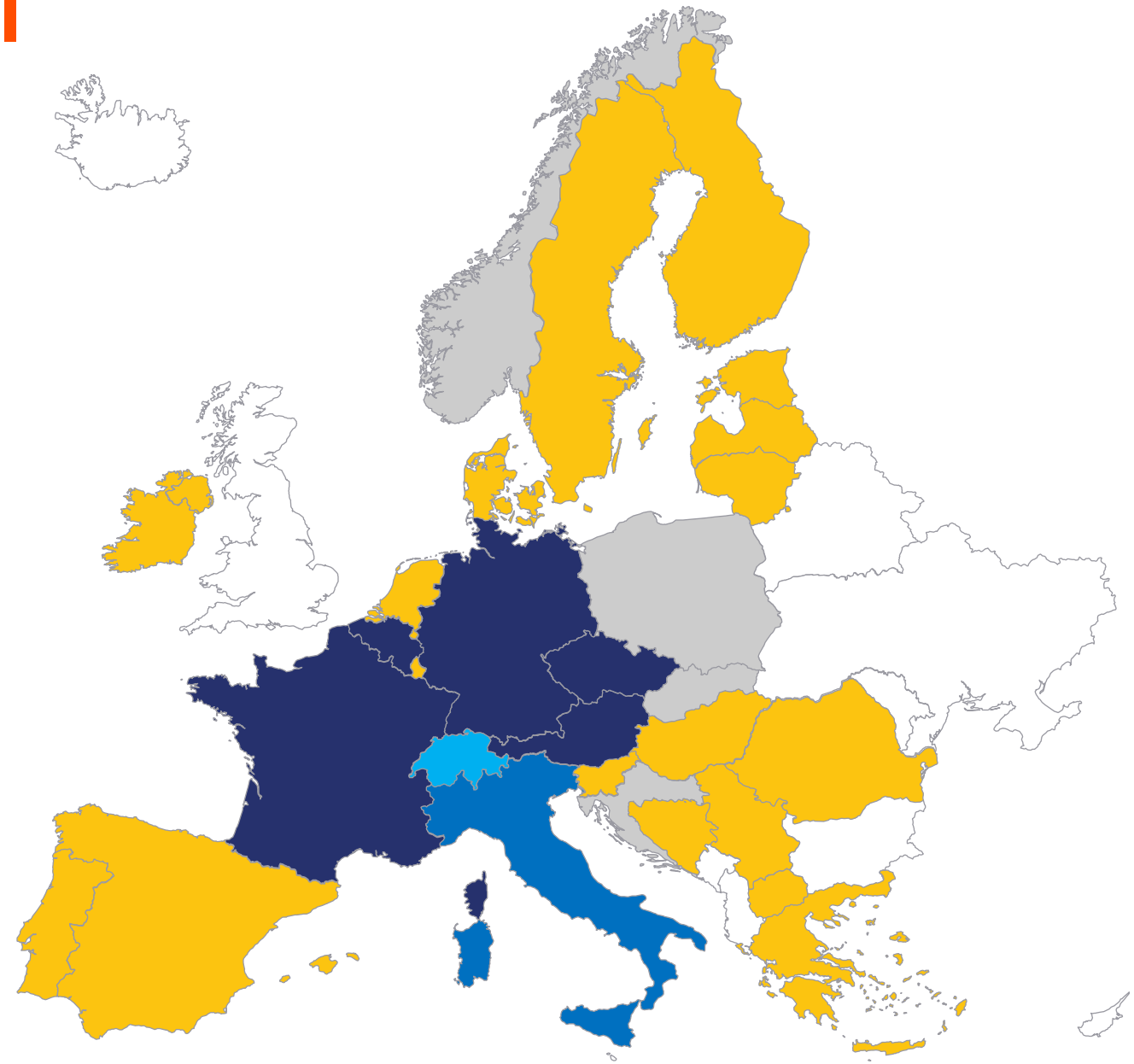
Demand-side response – Monitoring of aggregation facilities – if case DSR participates in FCR – Direct/Indirect sub-meter data



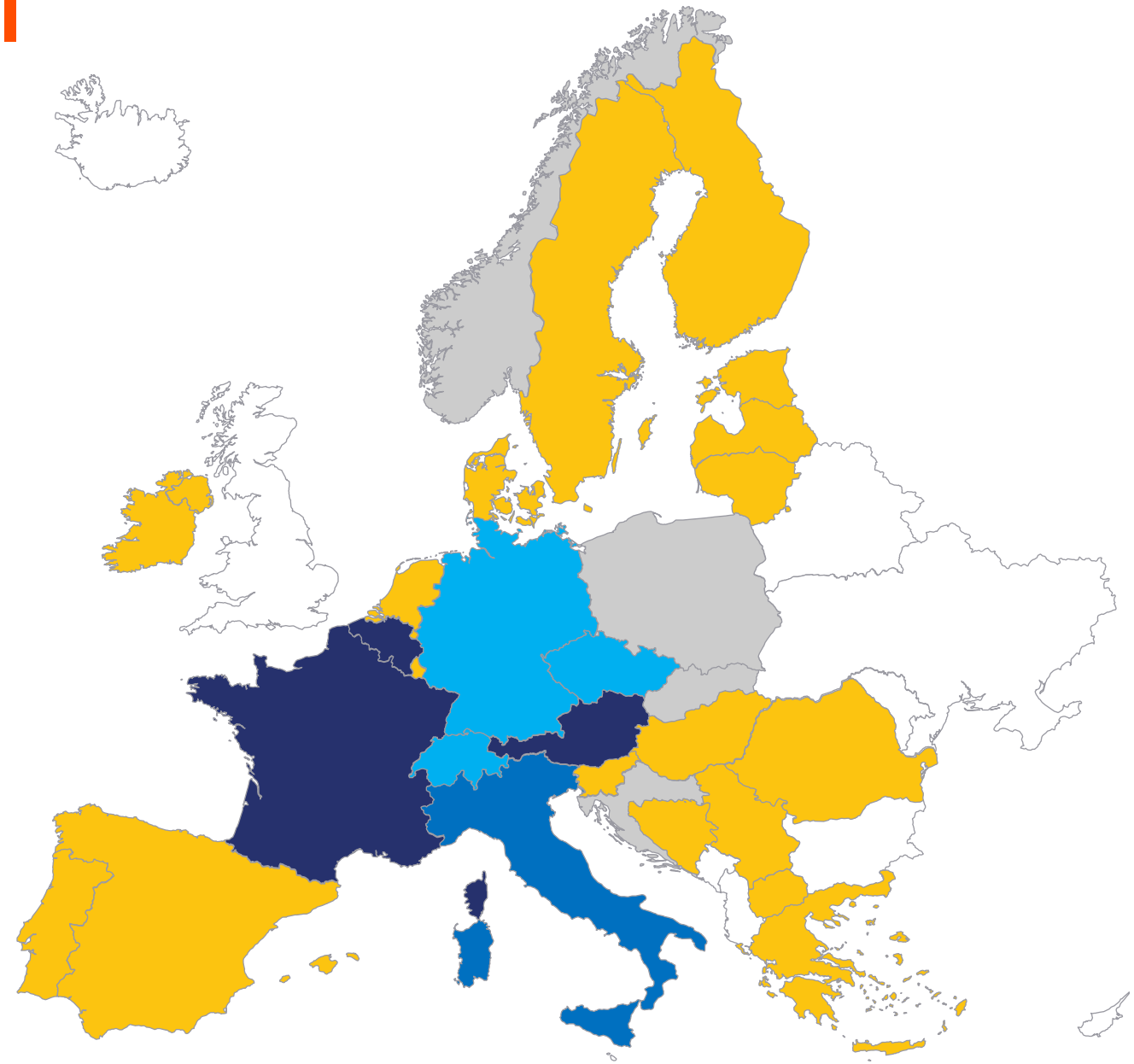
Demand-side response – Monitoring of aggregation facilities – if case DSR participates in aFRR – Aggregated data



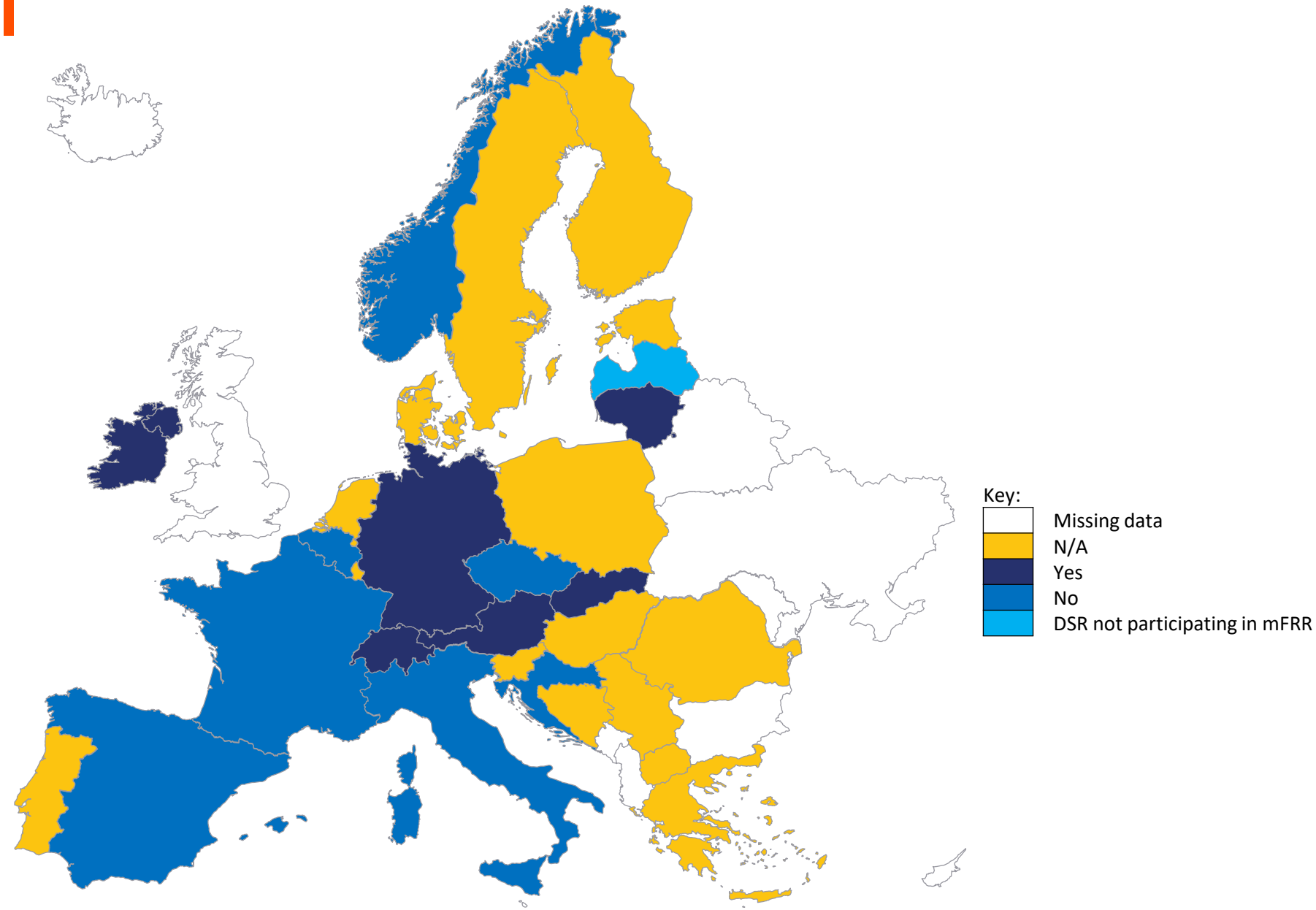
Demand-side response – Monitoring of aggregation facilities – if case DSR participates in aFRR – Single point of delivery



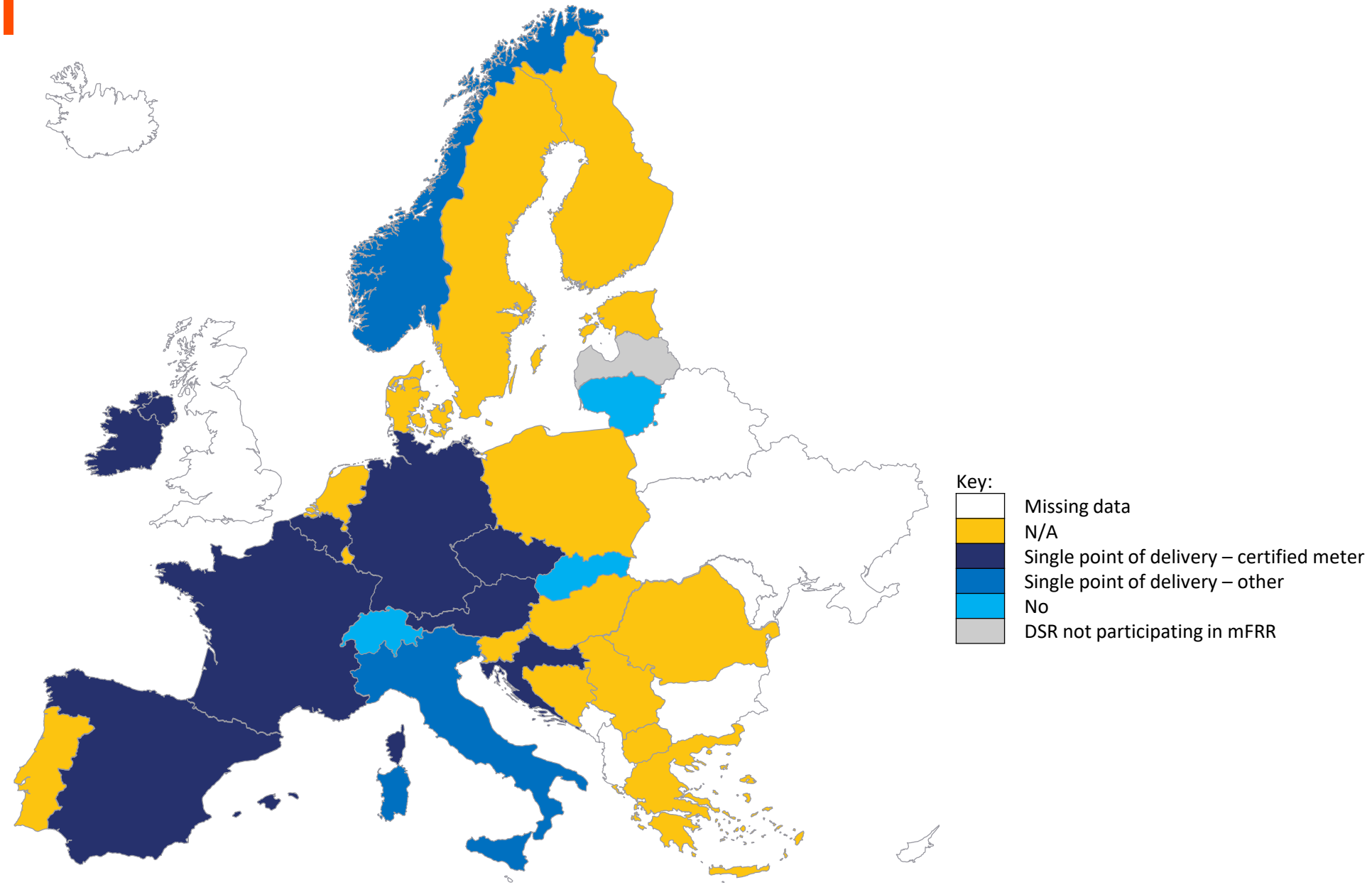
Demand-side response – Monitoring of aggregation facilities – if case DSR participates in aFRR – Direct/Indirect sub-meter data



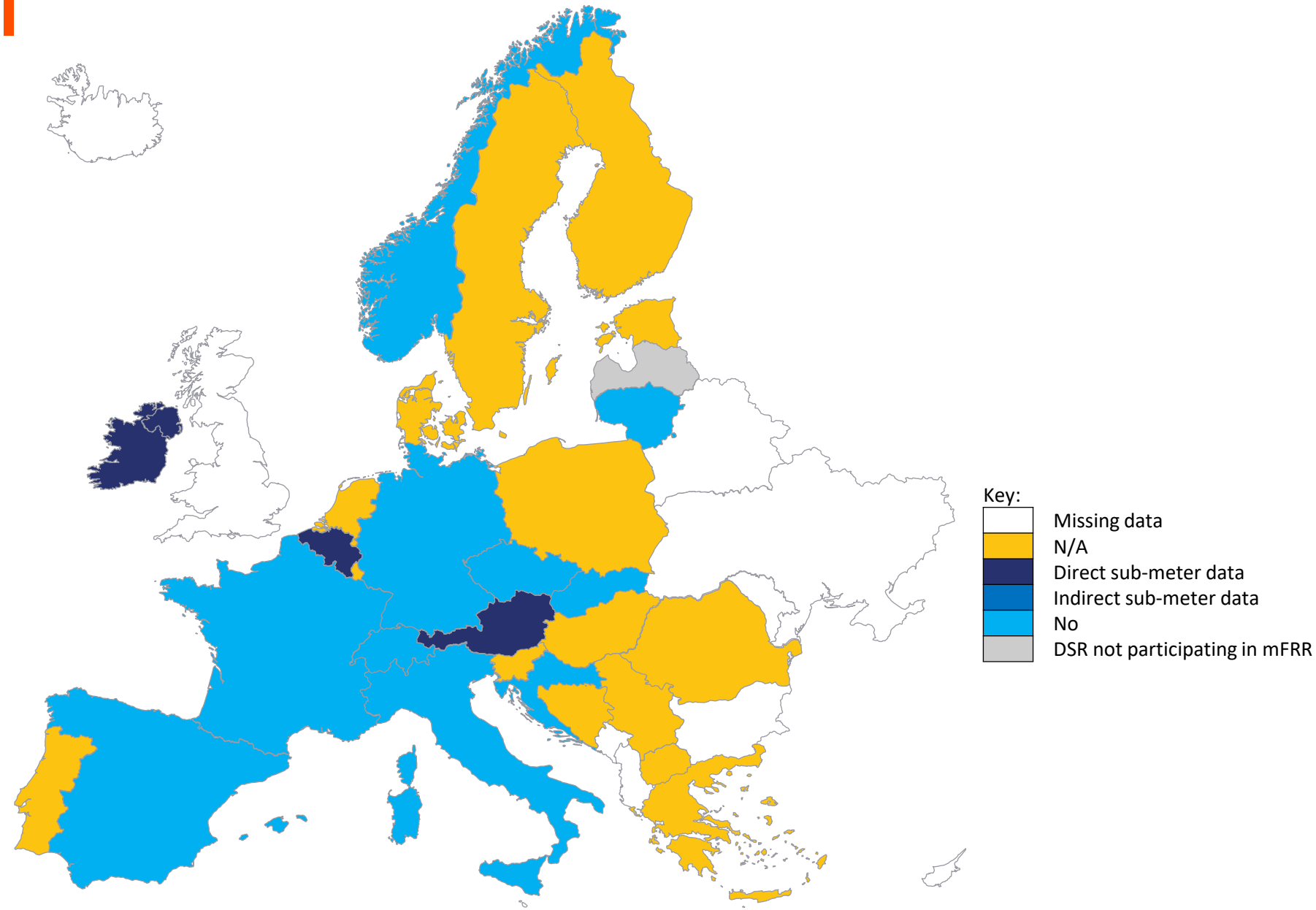
Demand-side response – Monitoring of aggregation facilities – if case DSR participates in mFRR – Aggregated data



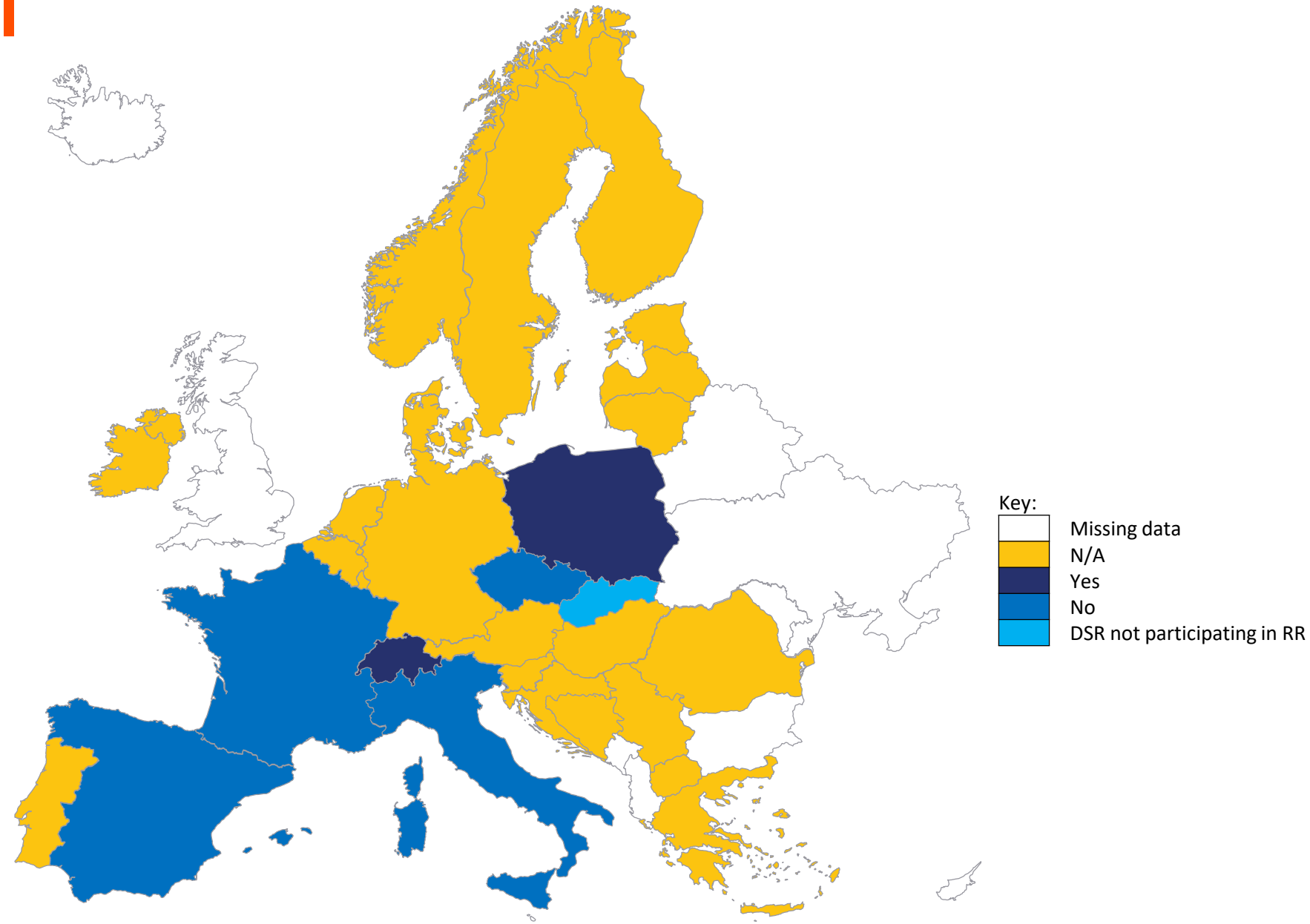
Demand-side response – Monitoring of aggregation facilities – if case DSR participates in mFRR – Single point of delivery



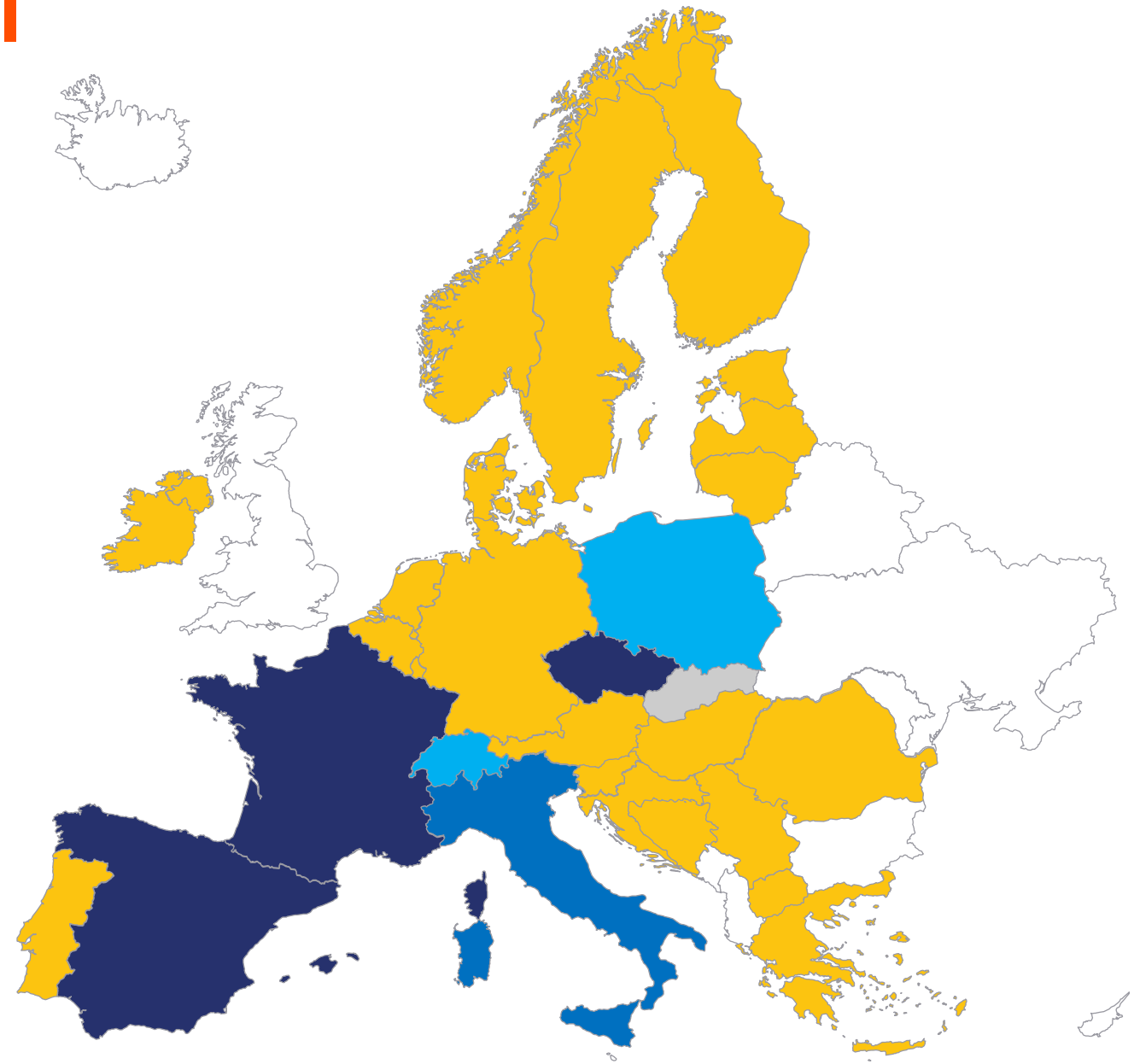
Demand-side response – Monitoring of aggregation facilities – if case DSR participates in mFRR – Direct/Indirect sub-meter data



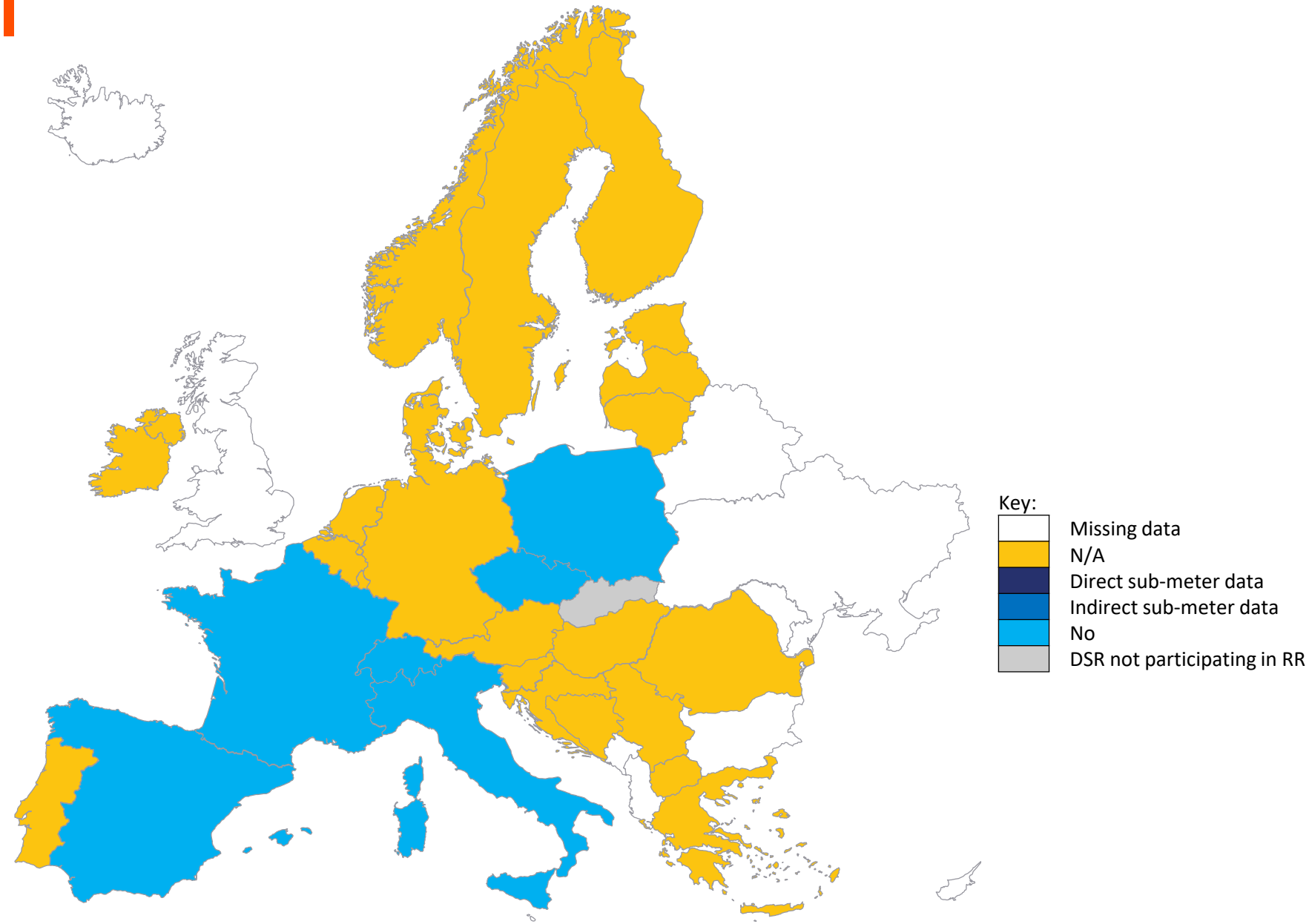
Demand-side response – Monitoring of aggregation facilities – if case DSR participates in RR – Aggregated data



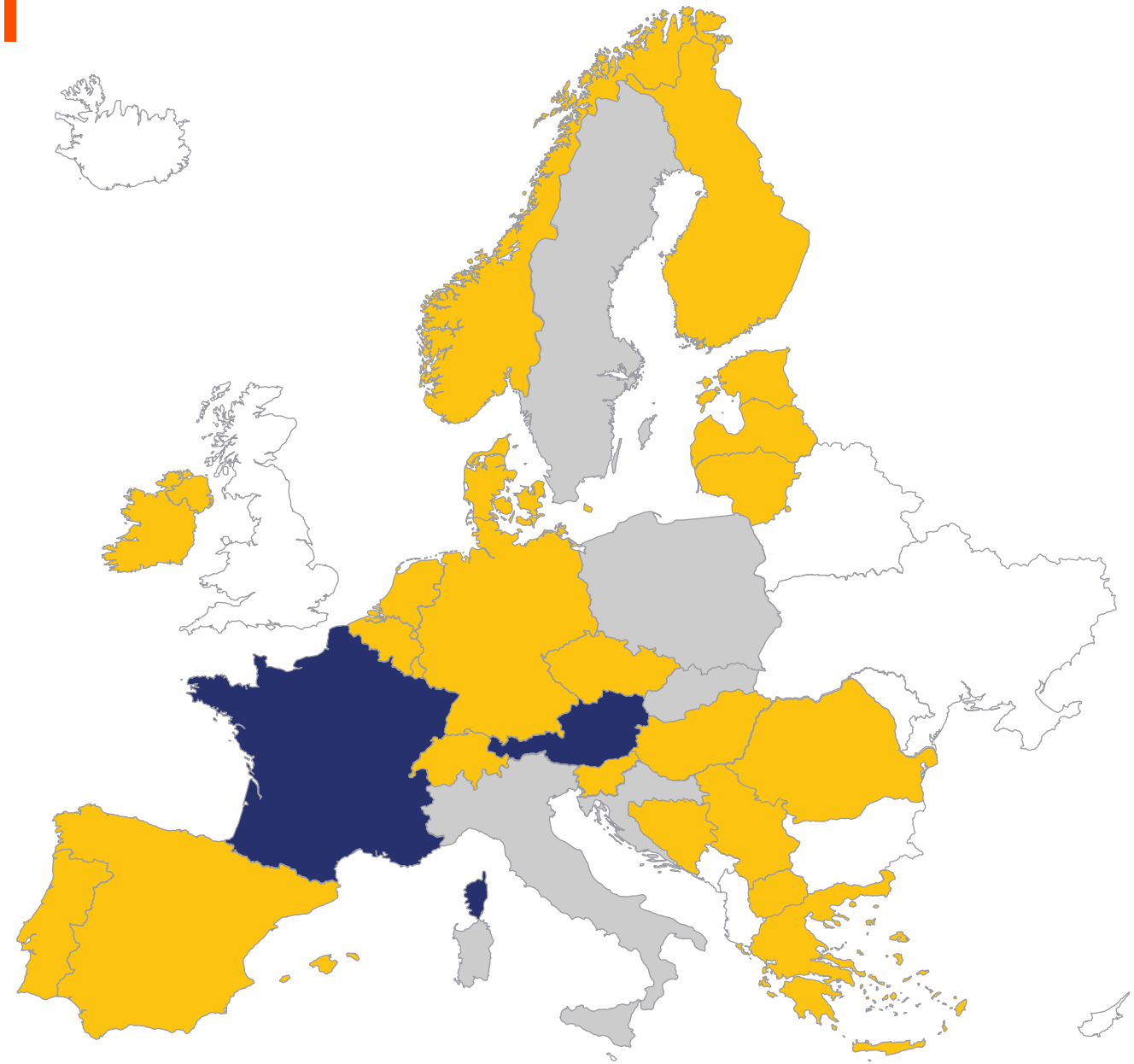
Demand-side response – Monitoring of aggregation facilities – if case DSR participates in RR – Single point of delivery



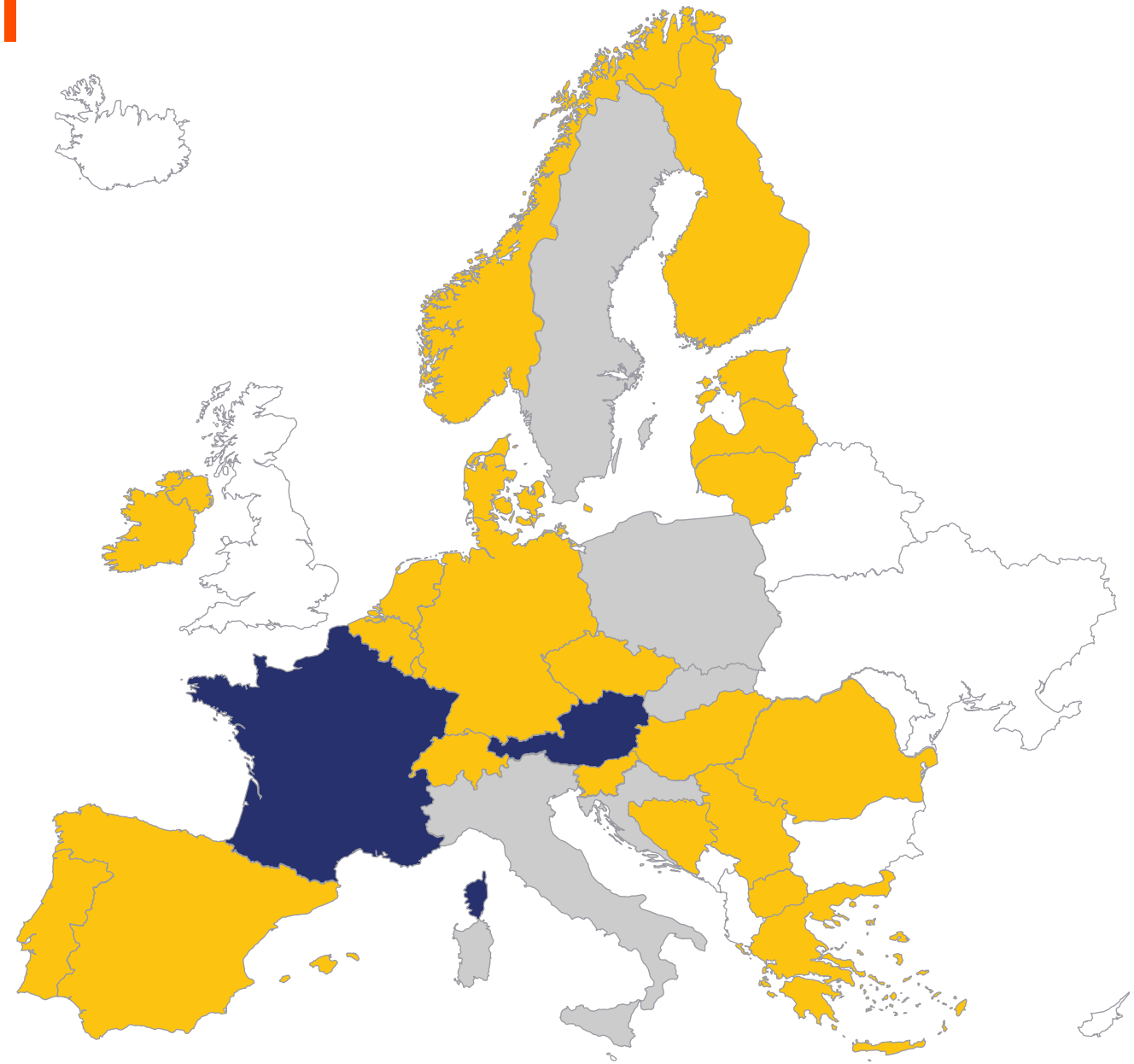
Demand-side response – Monitoring of aggregation facilities – if case DSR participates in RR – Direct/Indirect sub-meter data



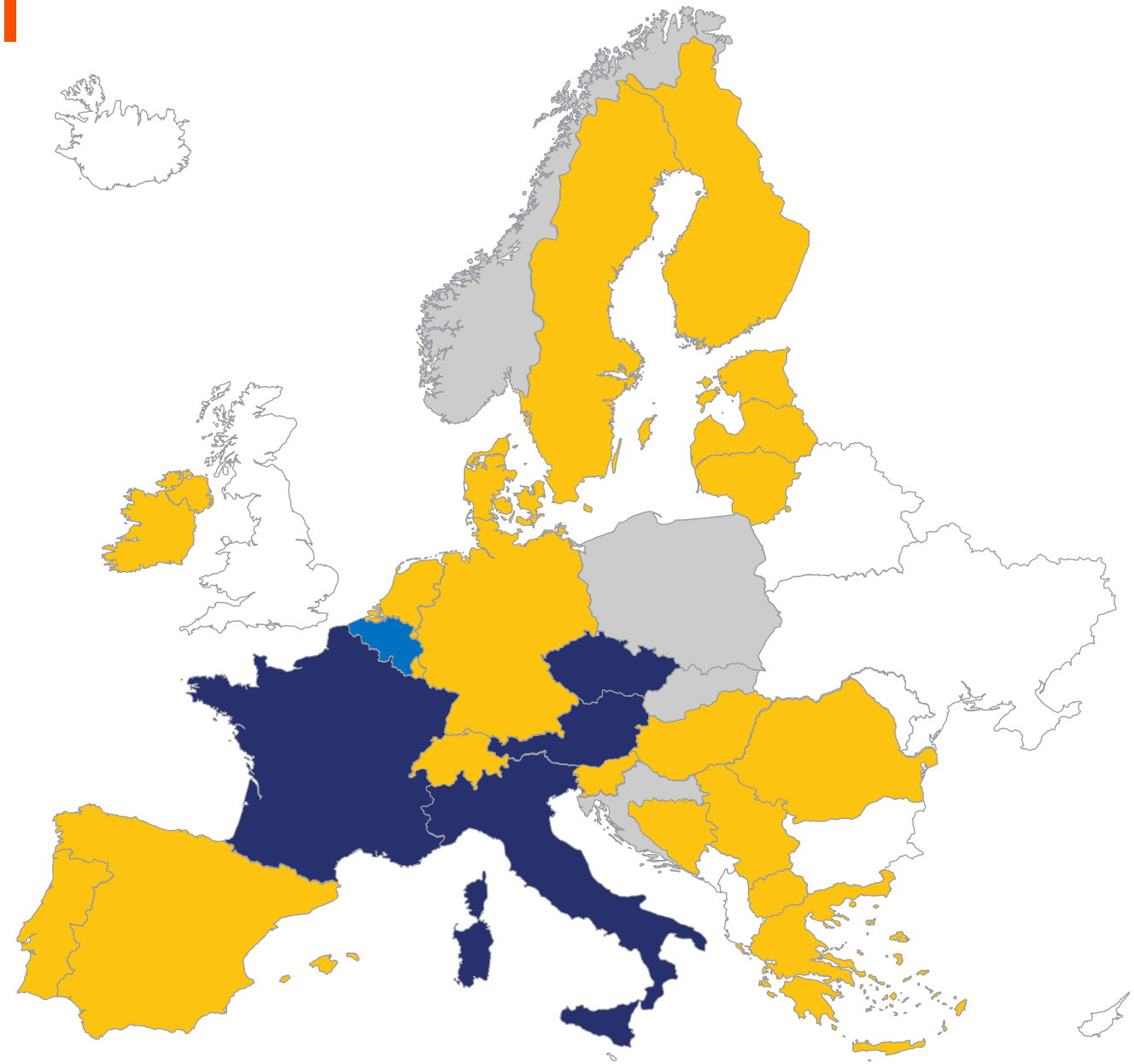
Demand-side response – Allowed measurement for the settlement of balancing energy – in case DSR participates in FCR – Single point of delivery



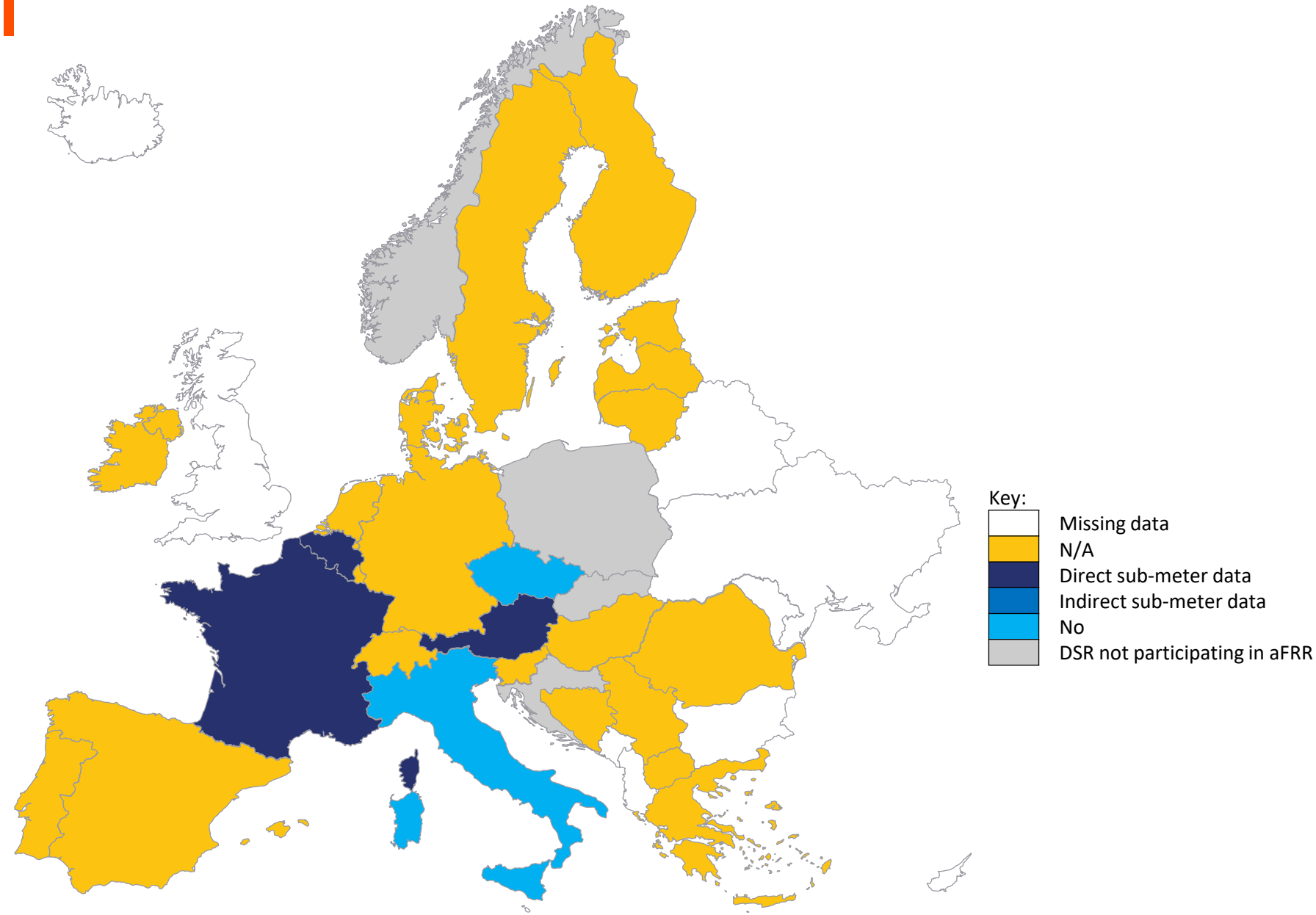
Demand-side response – Allowed measurement for the settlement of balancing energy – in case DSR participates in FCR – Direct/Indirect sub-meter data



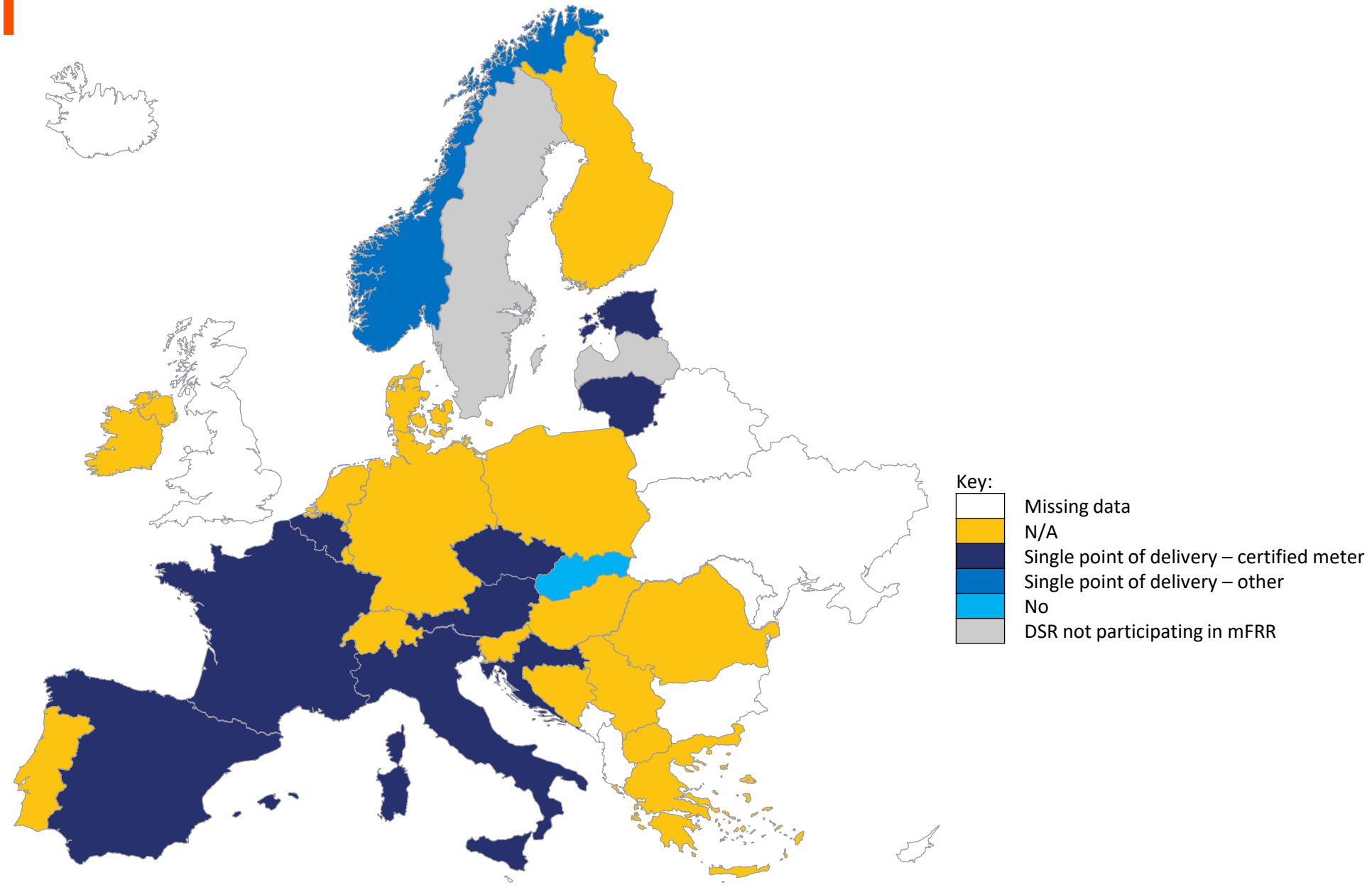
Demand-side response – Allowed measurement for the settlement of balancing energy – in case DSR participates in aFRR – Single point of delivery



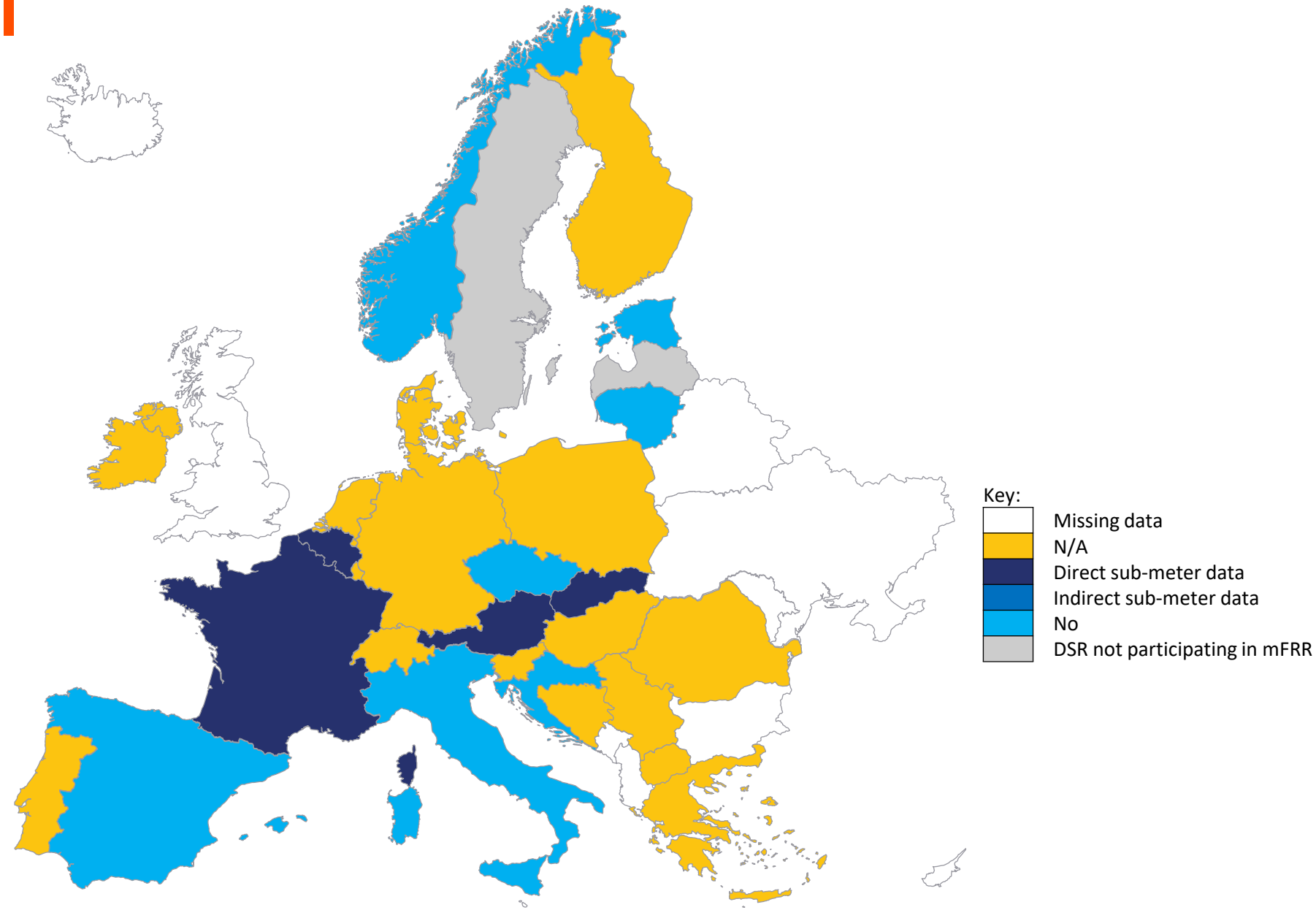
Demand-side response – Allowed measurement for the settlement of balancing energy – in case DSR participates in aFRR – Direct/Indirect sub-meter data



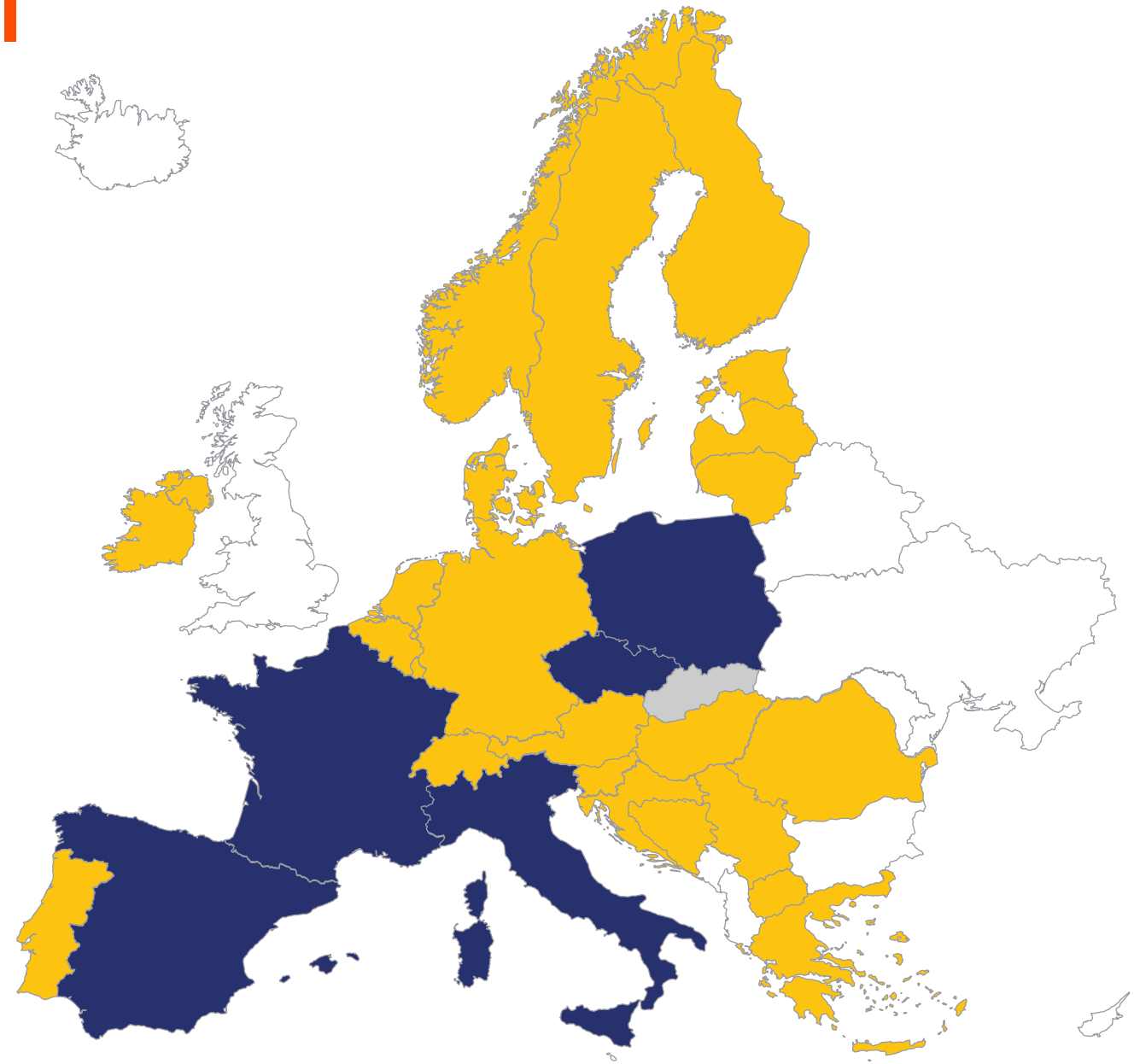
Demand-side response – Allowed measurement for the settlement of balancing energy – in case DSR participates in mFRR – Single point of delivery



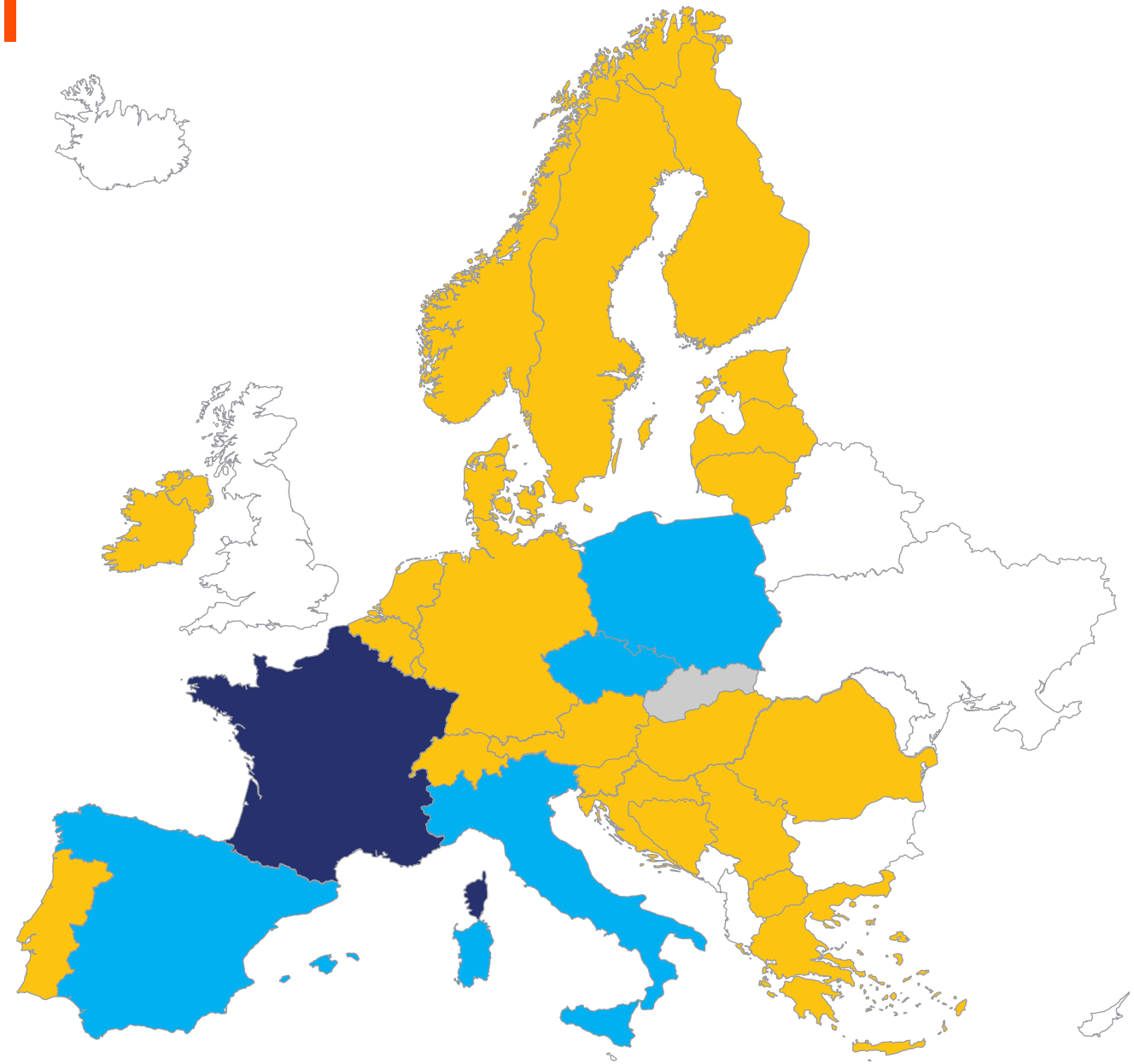
Demand-side response – Allowed measurement for the settlement of balancing energy – in case DSR participates in mFRR – Direct/Indirect sub-meter data



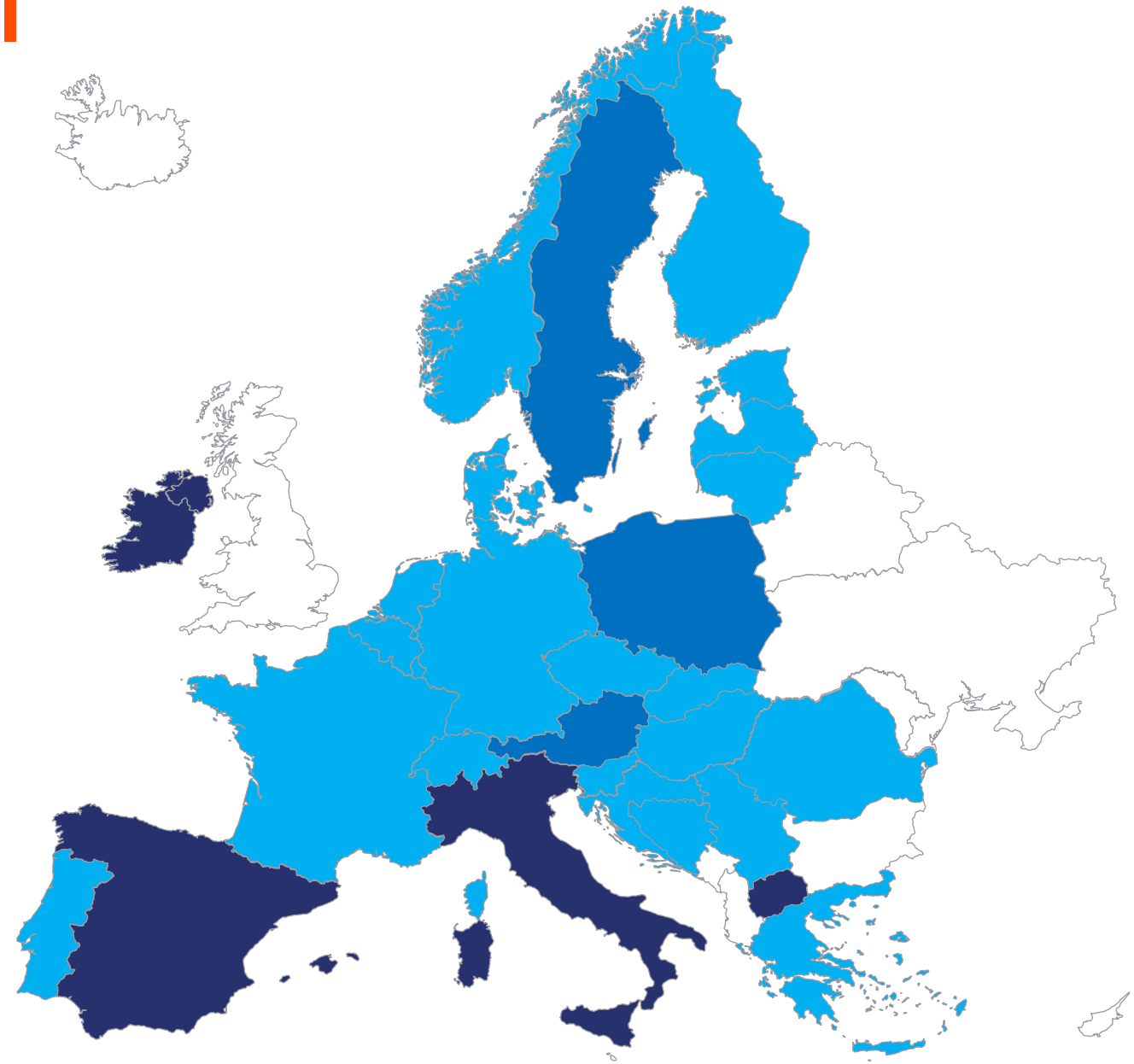
Demand-side response – Allowed measurement for the settlement of balancing energy – in case DSR participates in RR – Single point of delivery



Demand-side response – Allowed measurement for the settlement of balancing energy – in case DSR participates in RR – Direct/Indirect sub-meter data



Demand-side response – Do you consider changes significant/important regarding the demand side response?



Please, explain significant/important changes regarding the demand-side response in line with/aimed to requirements of the EB Regulation (and the reason behind) in comparison to the year 2020! (1/2)

TSO	Answer
APG	Simplified data connection planned.
Eirgrid	Interim energy settlement approach developed and enduring approach in design. Please see attached links to decision paper and consultation: • https://www.semcommittee.com/sites/semc/files/media-files/SEM-019-013%20DSU%20State%20aid%20compliance%20-%20consultation.pdf • https://www.semcommittee.com/sites/semc/files/media-files/SEM-19-029%20-%20DSU%20State%20aid%20compliance%20-%20Decision%20paper_0.pdf
MEPSO	Introduction of DSR.
REE	aFRR entities will allow in the future both generation and demand units participate at porfolio aFRR BSP (once ISHP Will entry into force in 2022)

Please, explain significant/important changes regarding the demand-side response in line with/aimed to requirements of the EB Regulation (and the reason behind) in comparison to the year 2020! (2/2)

TSO	Answer
SONI	Interim energy settlement approach developed and enduring approach in design. Please see attached links to decision paper and consultation: • https://www.semcommittee.com/sites/semc/files/media-files/SEM-019-013%20DSU%20State%20aid%20compliance%20-%20consultation.pdf • https://www.semcommittee.com/sites/semc/files/media-files/SEM-19-029%20-%20DSU%20State%20aid%20compliance%20-%20Decision%20paper_0.pdf
Terna	From December 2021 DSR can participate to a pilot project to test aFRR provision (energy payments only).

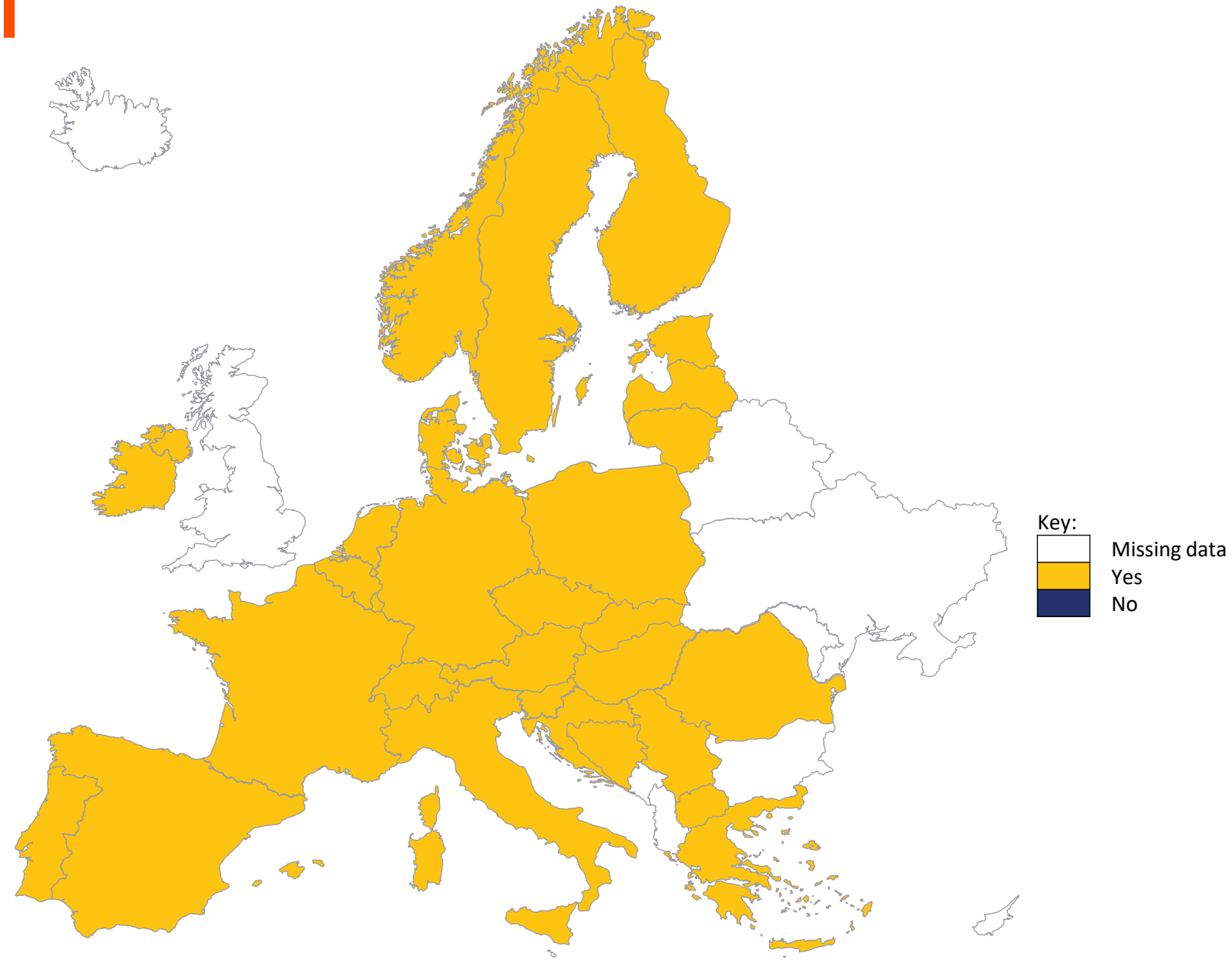
Please, explain significant/important changes regarding the demand side response NOT in line with/aimed to requirements of the EB Regulation (and the reason behind) in comparison to the year 2020!

TSO	Answer
RTE	Work between TSO and DSO is in progress, in order to study the potential use of the production units connected to the distribution network for the transmission network voltage control. Some first units successfully participated in 2021.

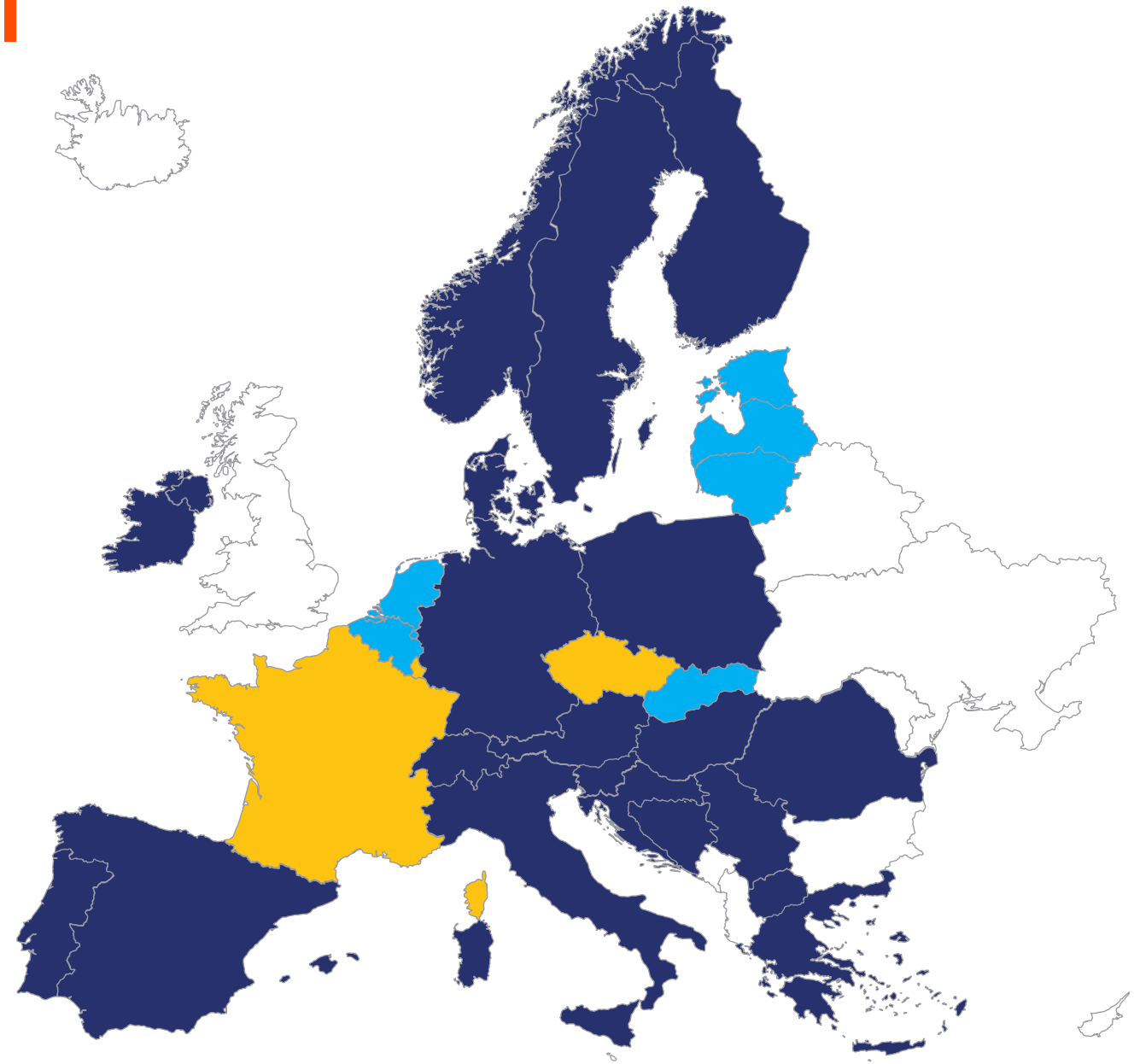
Voltage control

(Referring to questions of AS survey from VC1.0 to VC20.1)

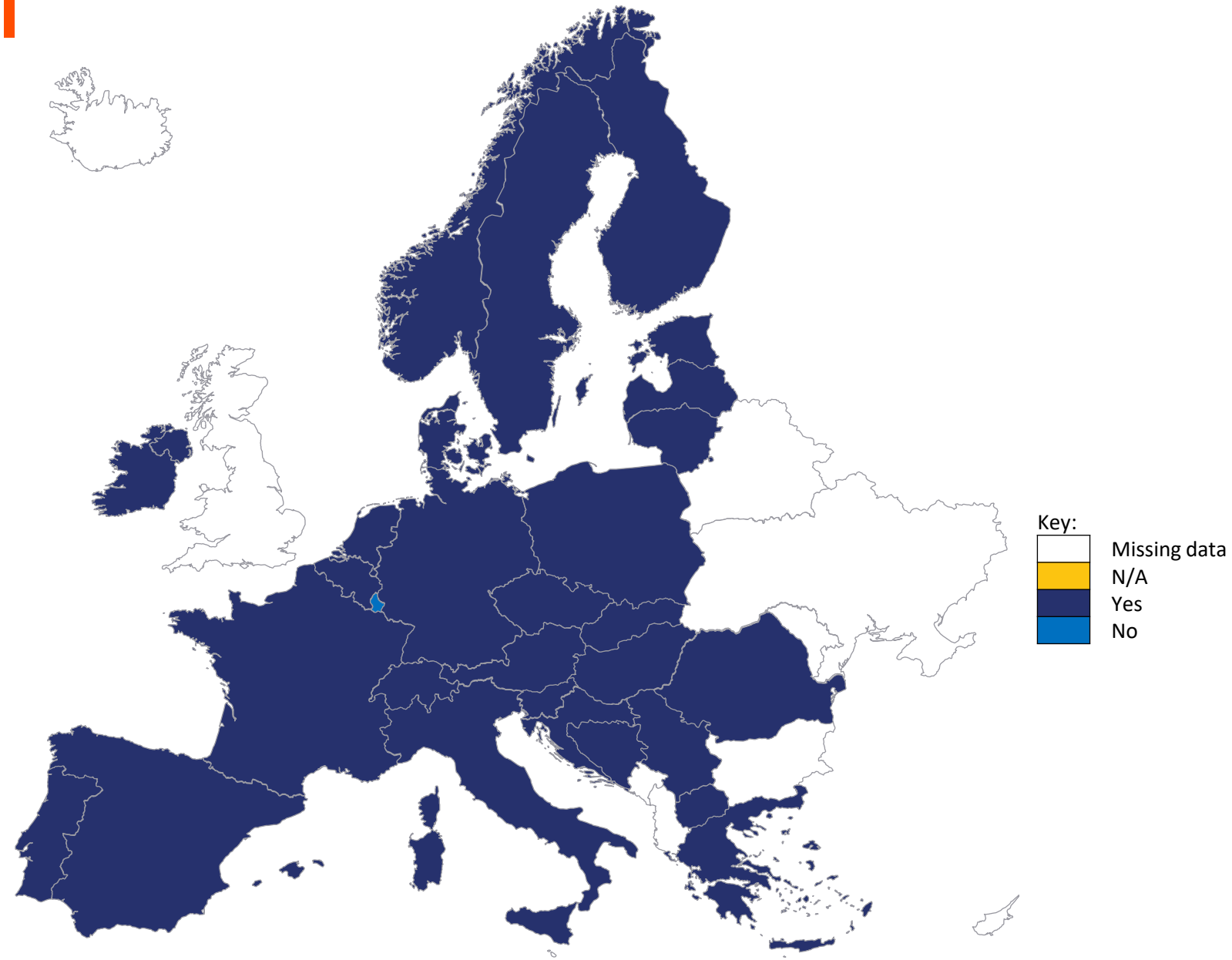
Voltage control – Voltage support as part of ancillary services?



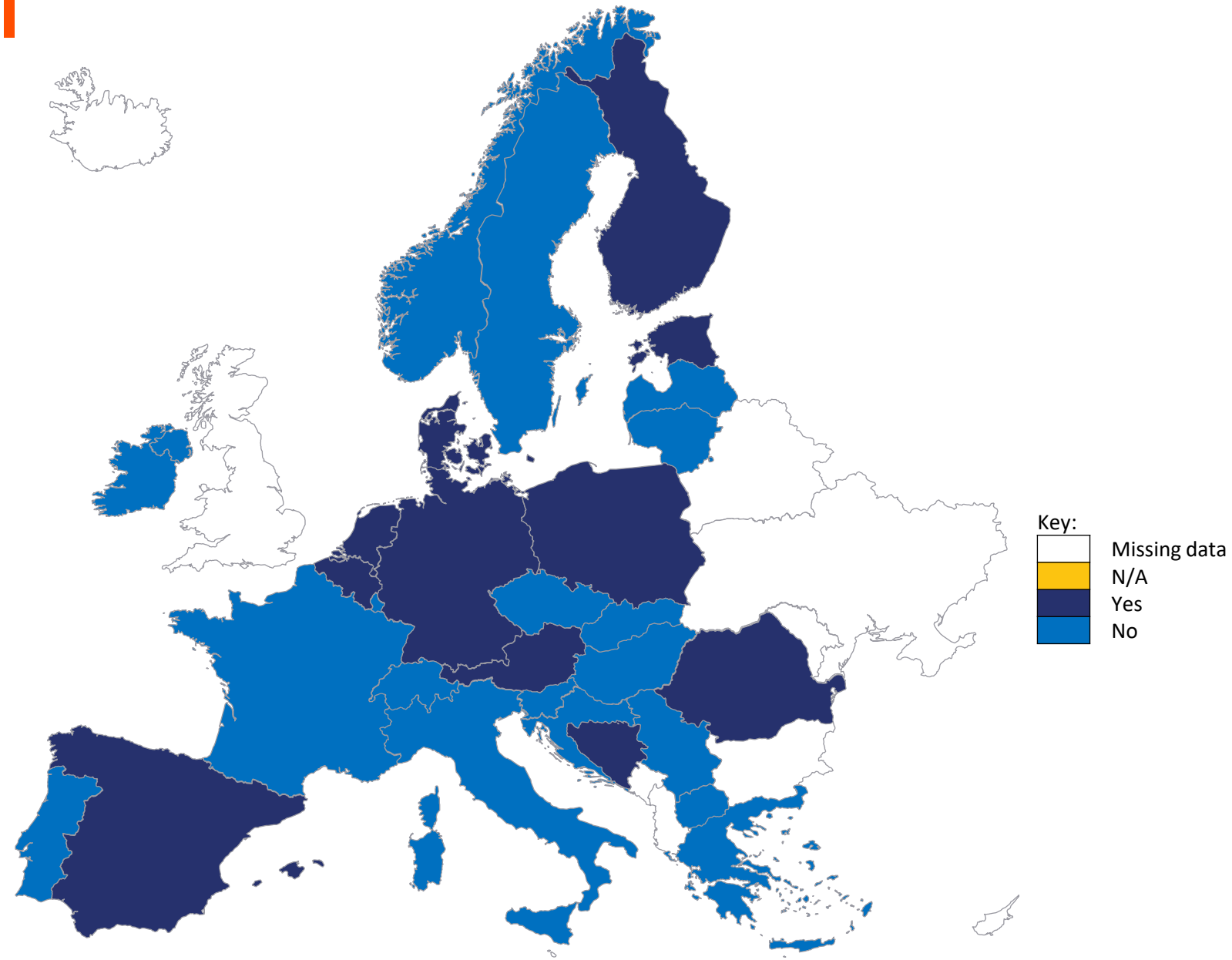
Voltage control – Voltage control procurement scheme



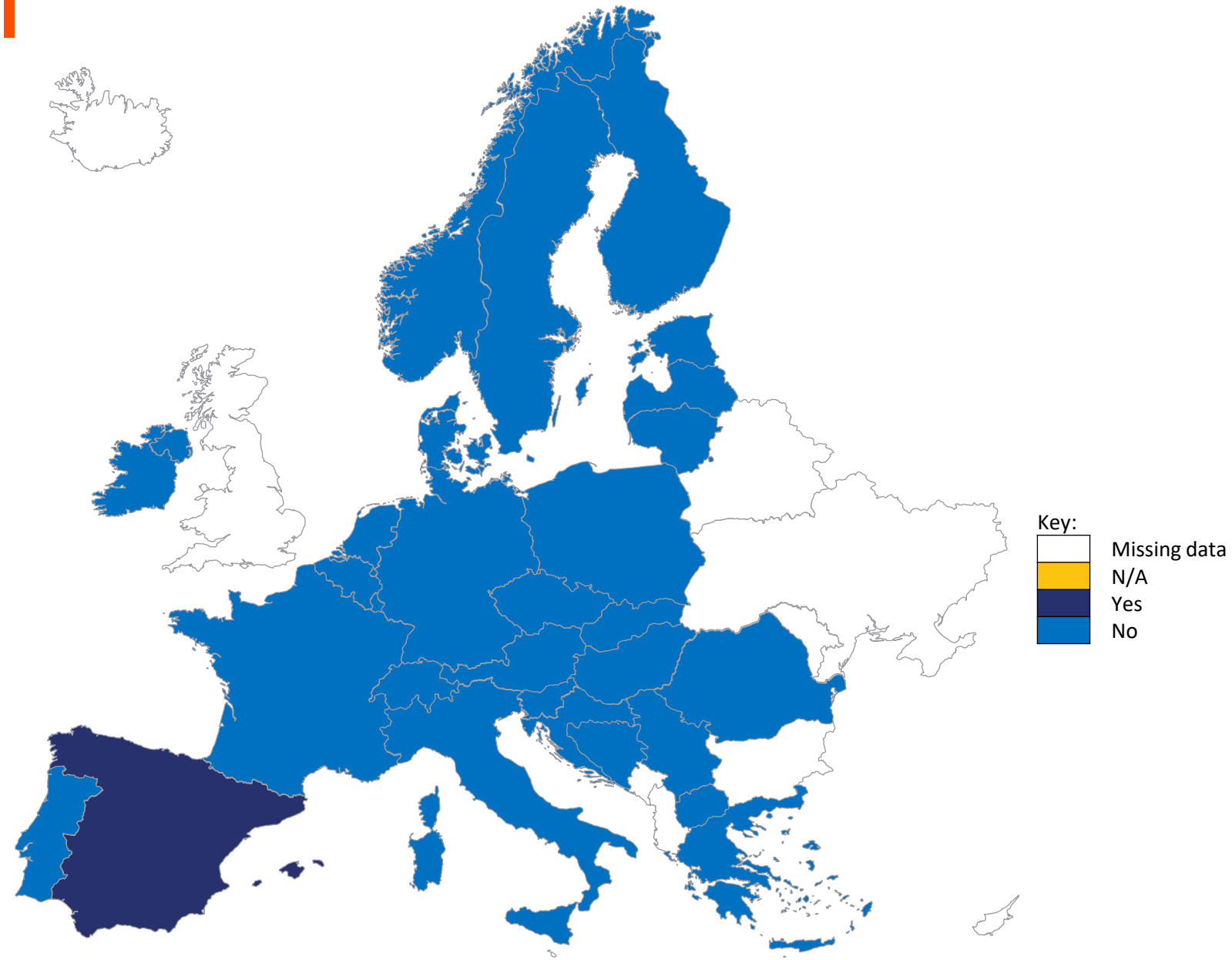
Voltage control – Providers of the voltage control service – Conventional power plants



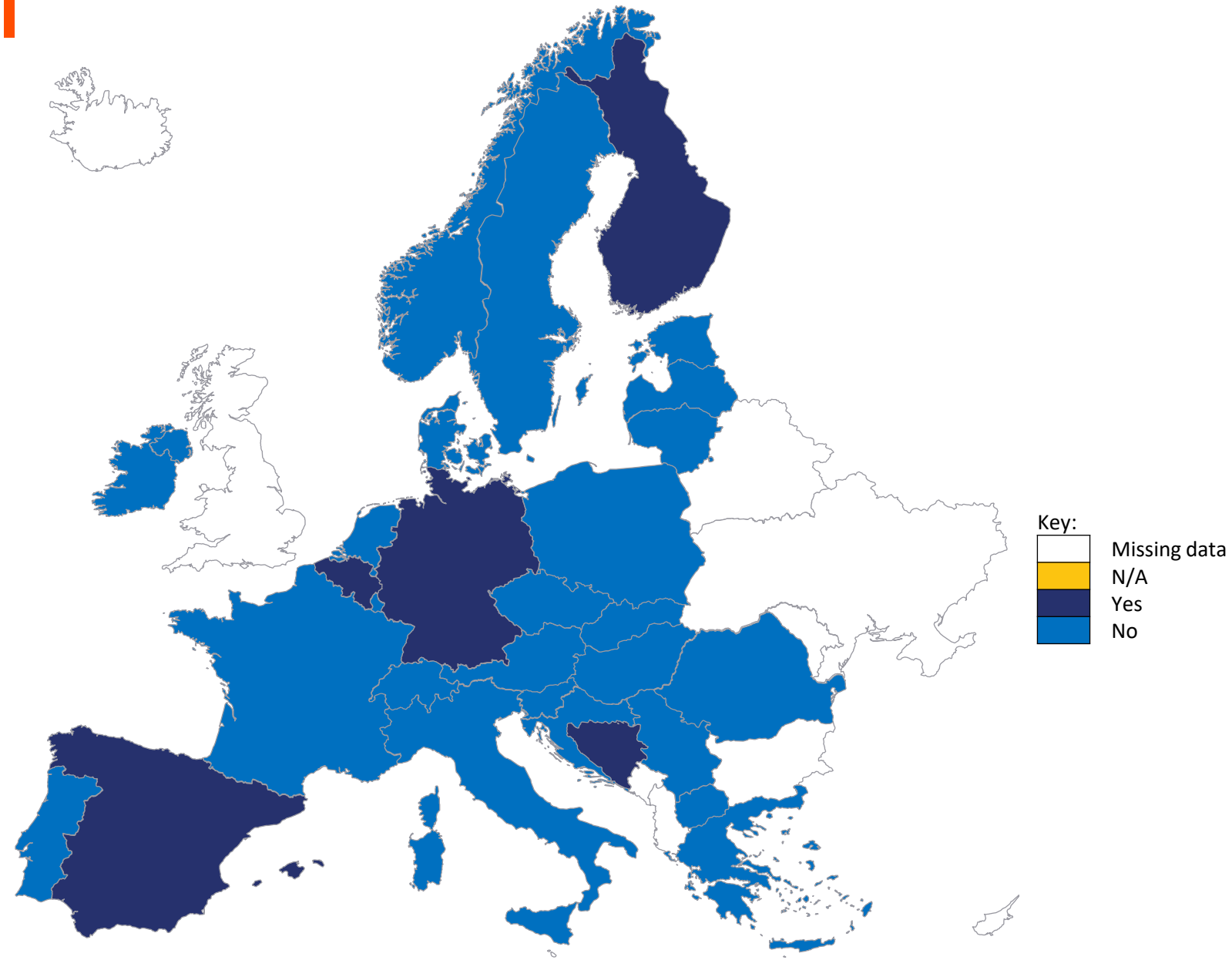
Voltage control – Providers of the voltage control service – RES



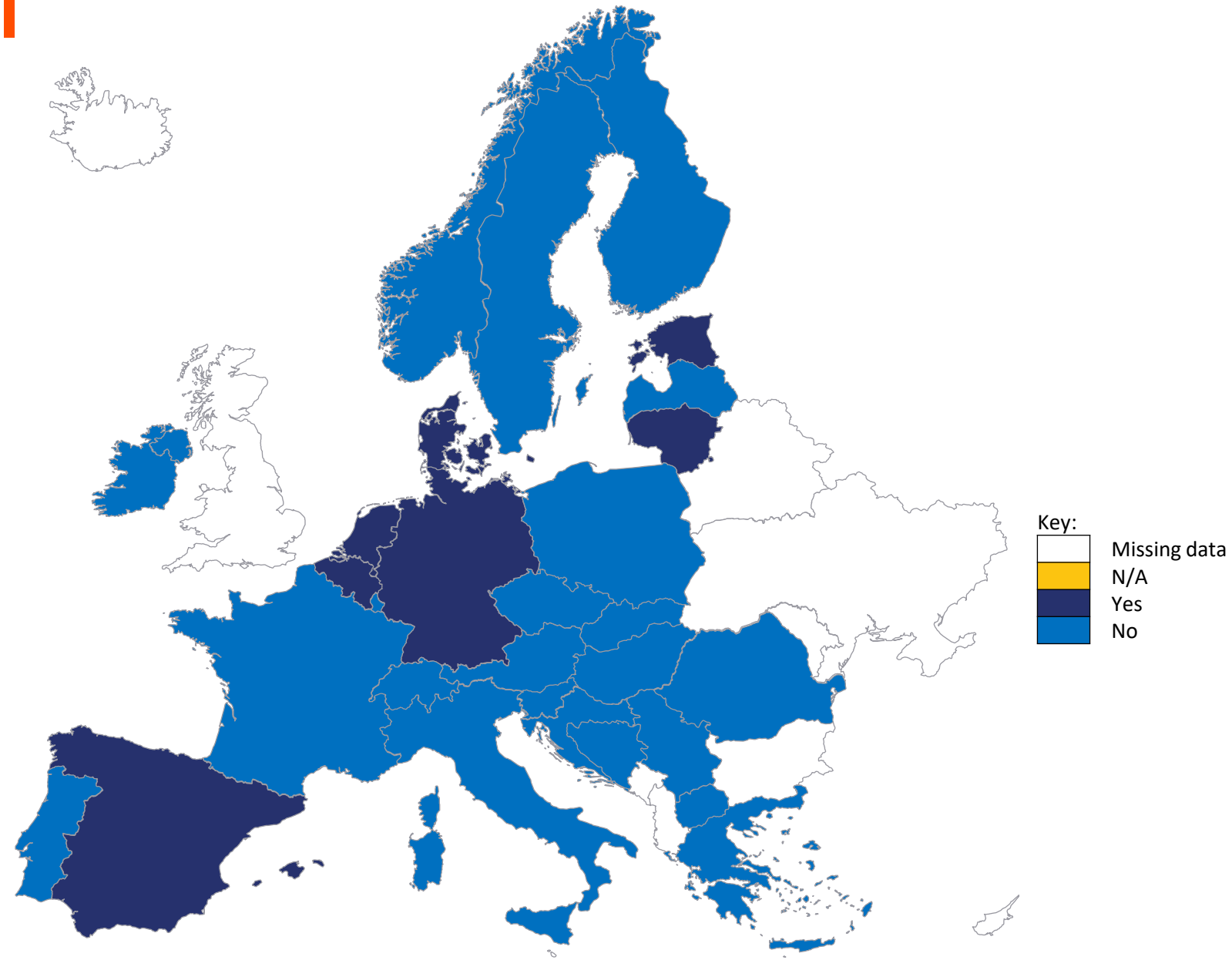
Voltage control – Providers of the voltage control service – Demand side



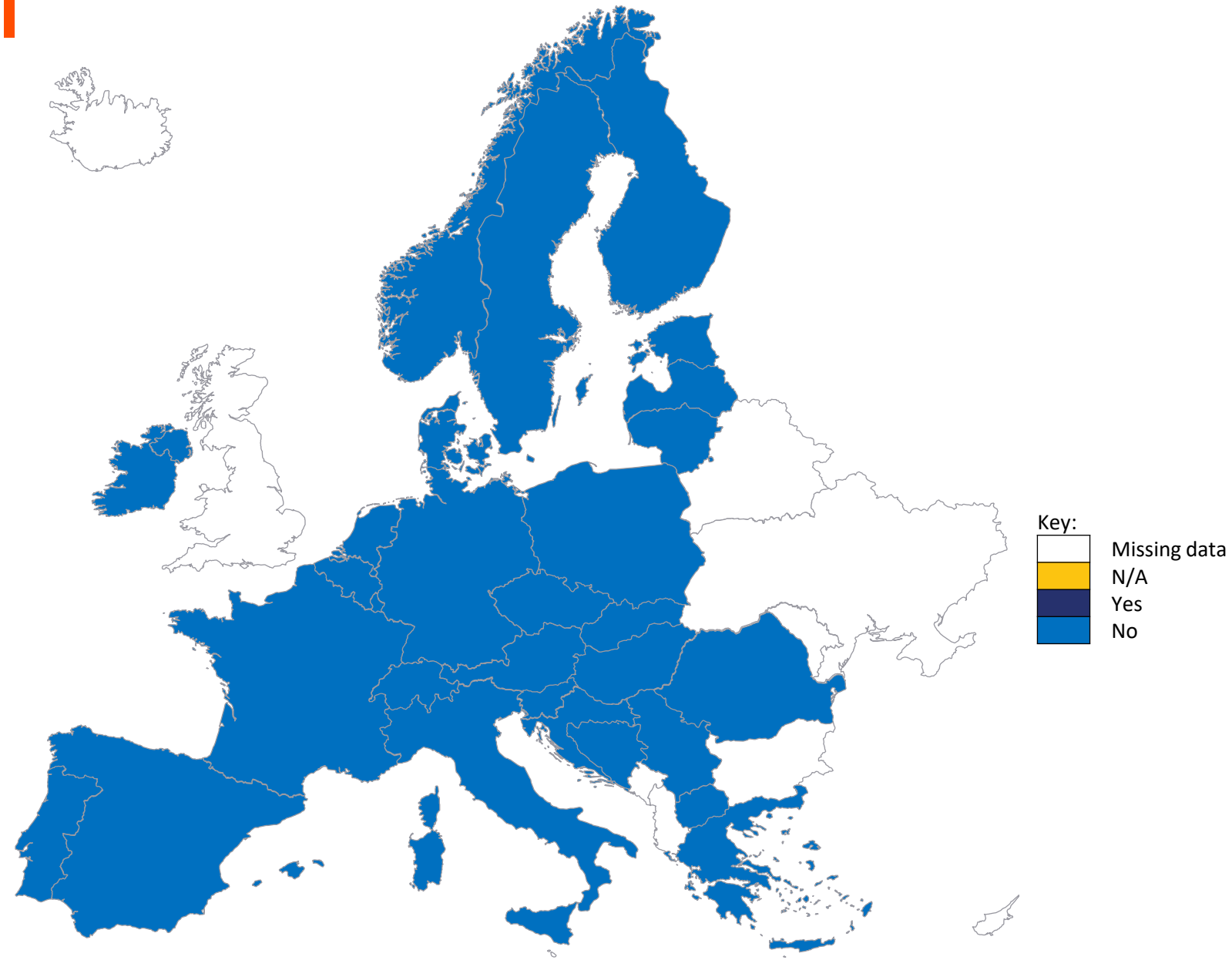
Voltage control – Providers of the voltage control service – Storage



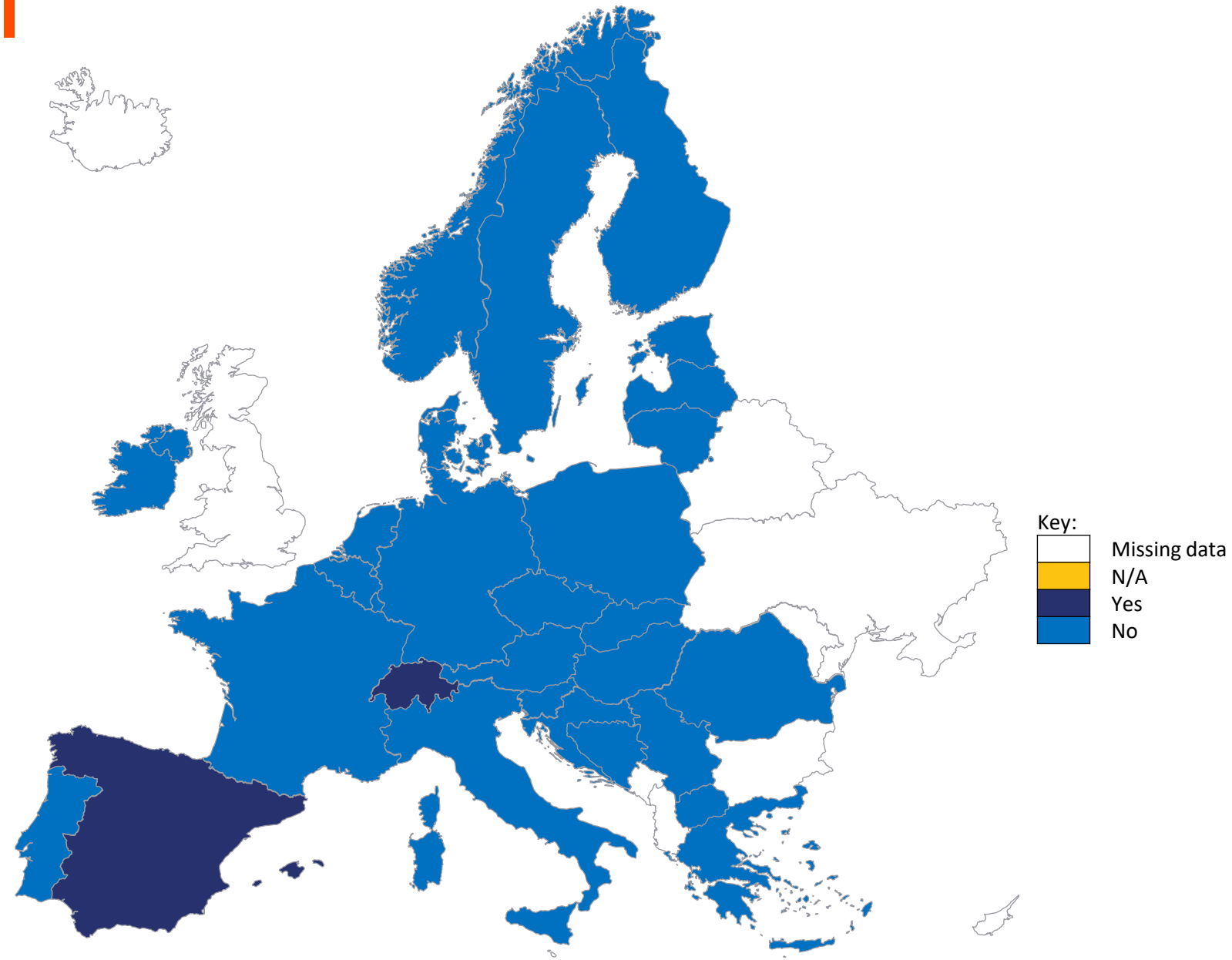
Voltage control – Providers of the voltage control service – HVDC links



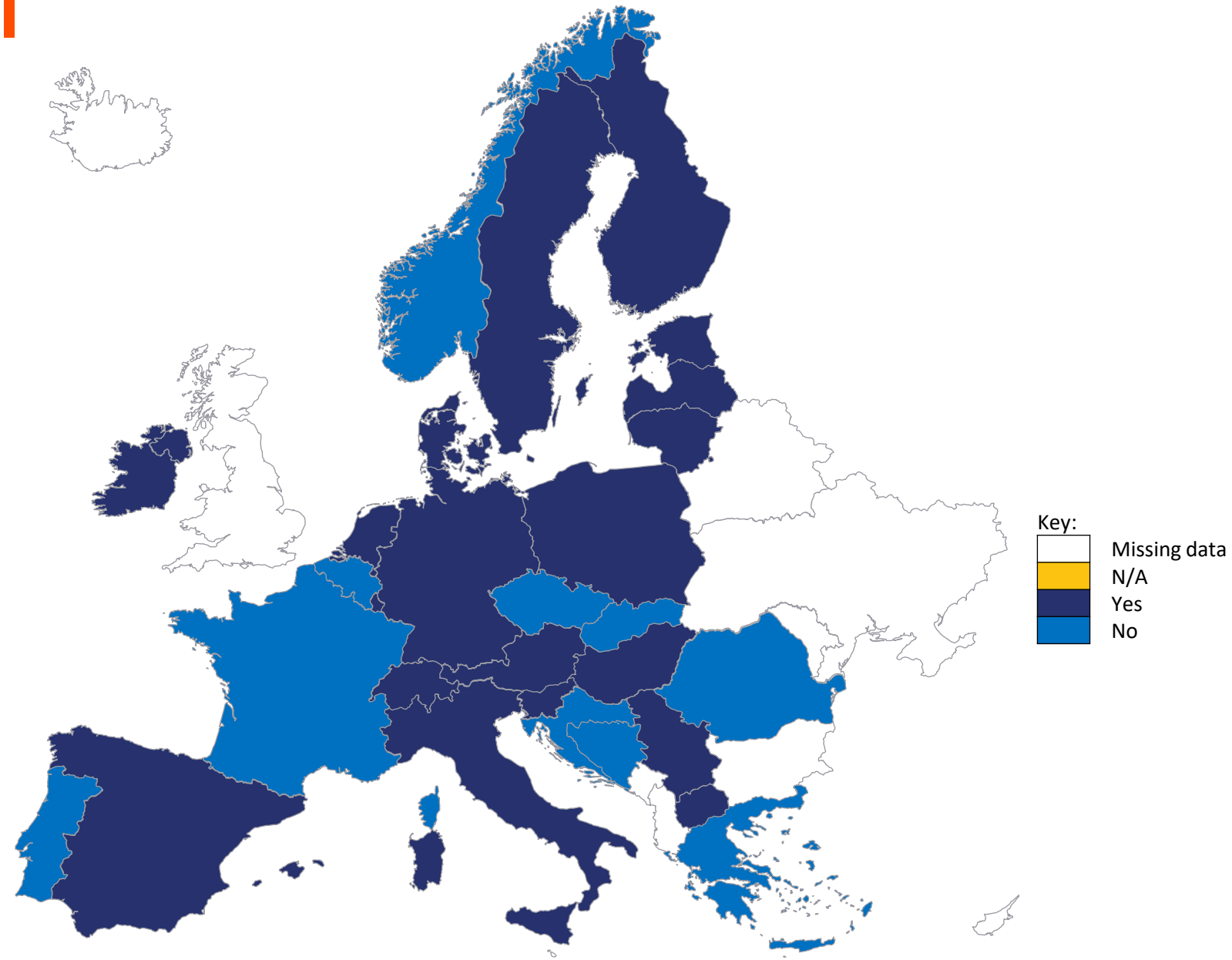
Voltage control – Providers of the voltage control service – Independent Aggregator



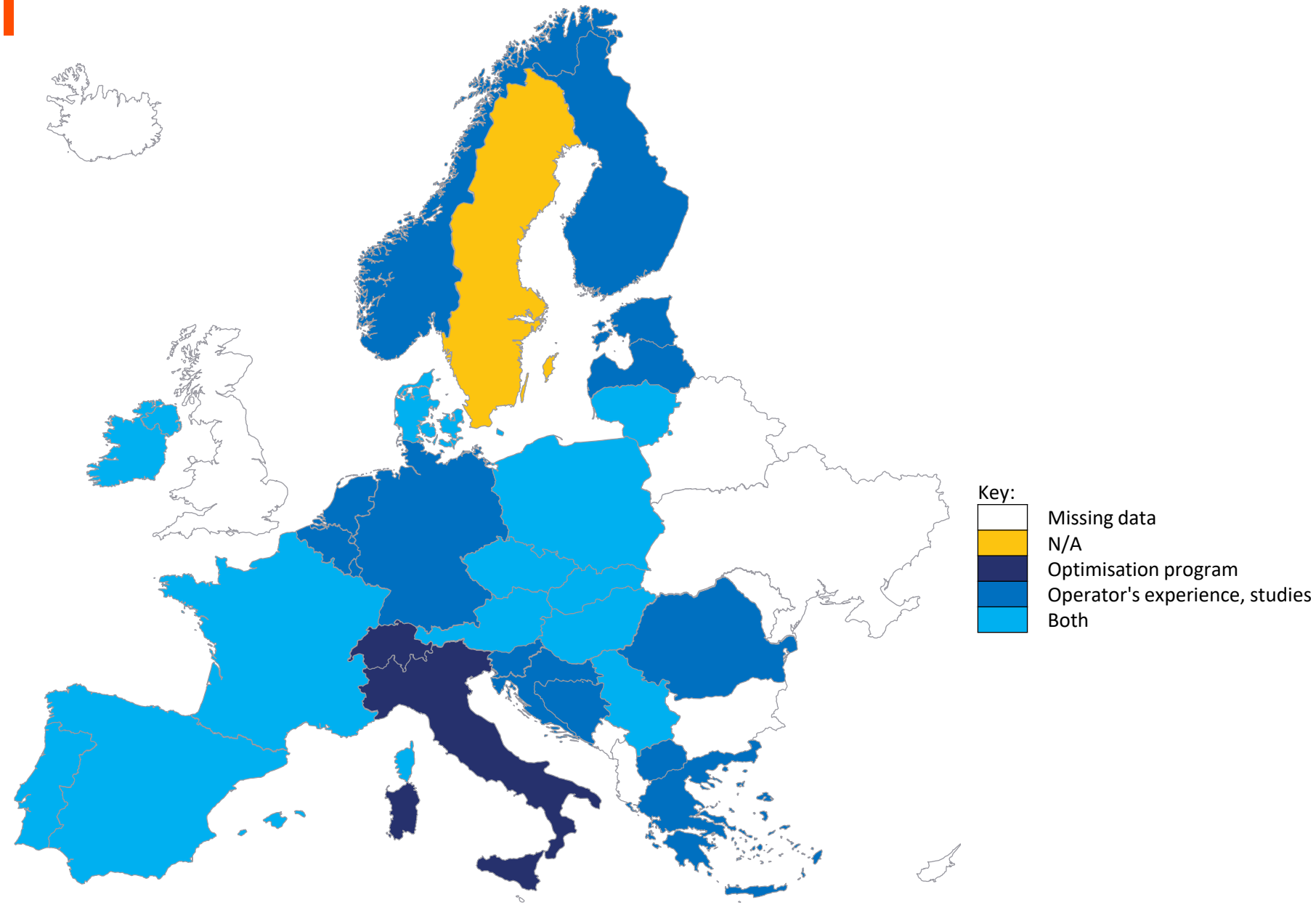
Voltage control – Providers of the voltage control service – Distribution system operators



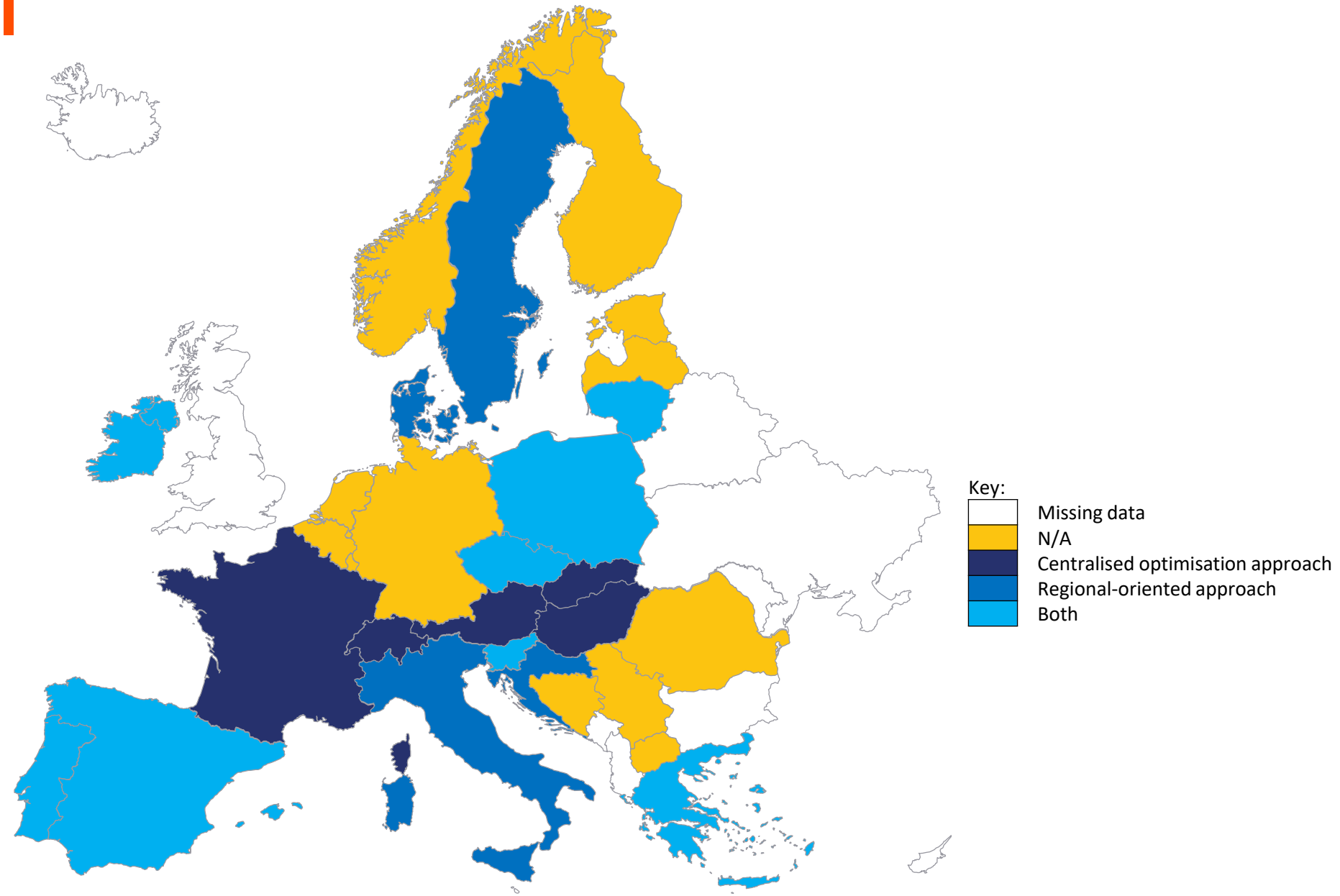
Voltage control – Providers of the voltage control service – Transformers of the transmission grid



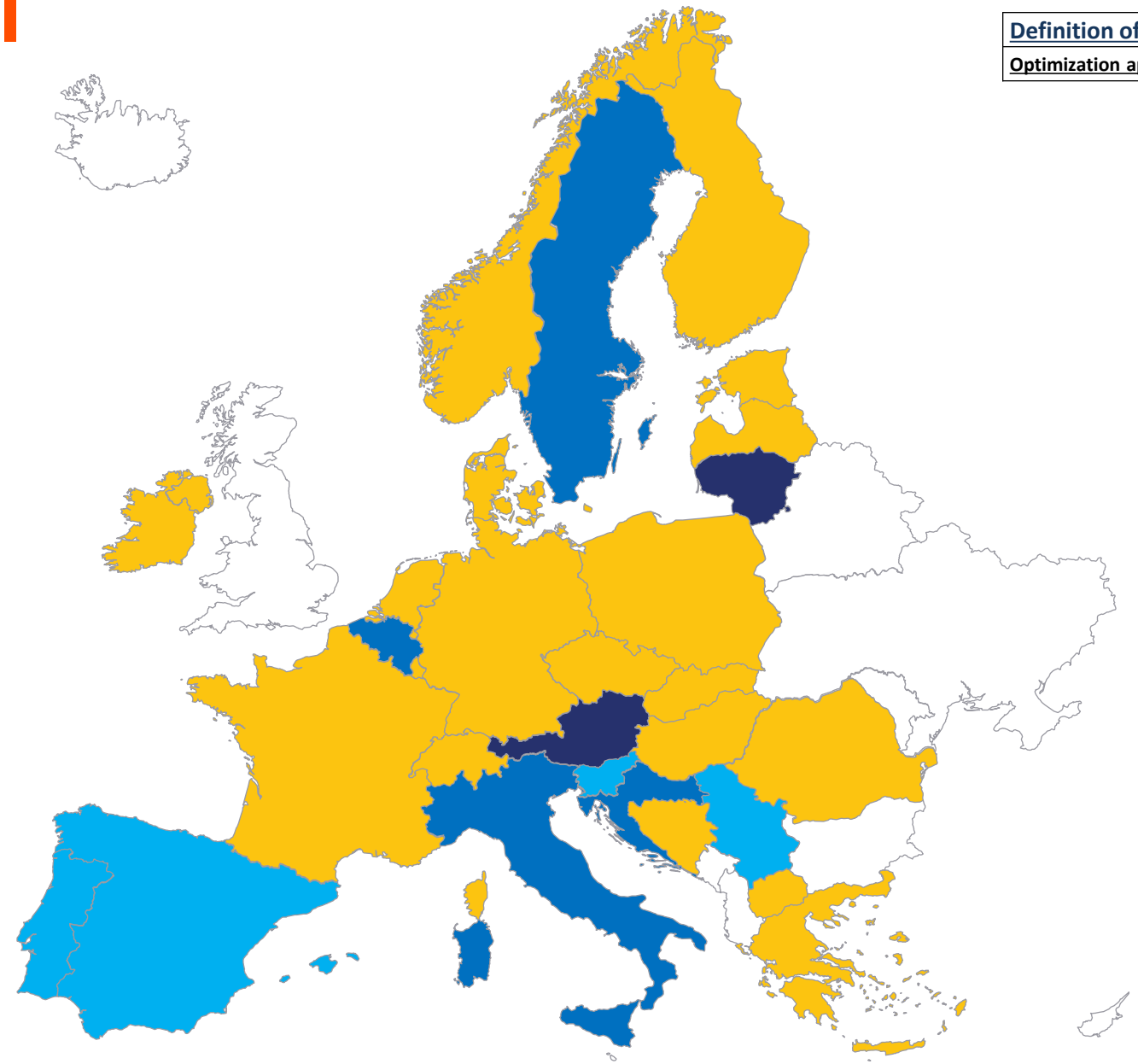
Voltage control – Determination the optimal use of reactive energy



Voltage control – Type of optimisation approach for secondary voltage control



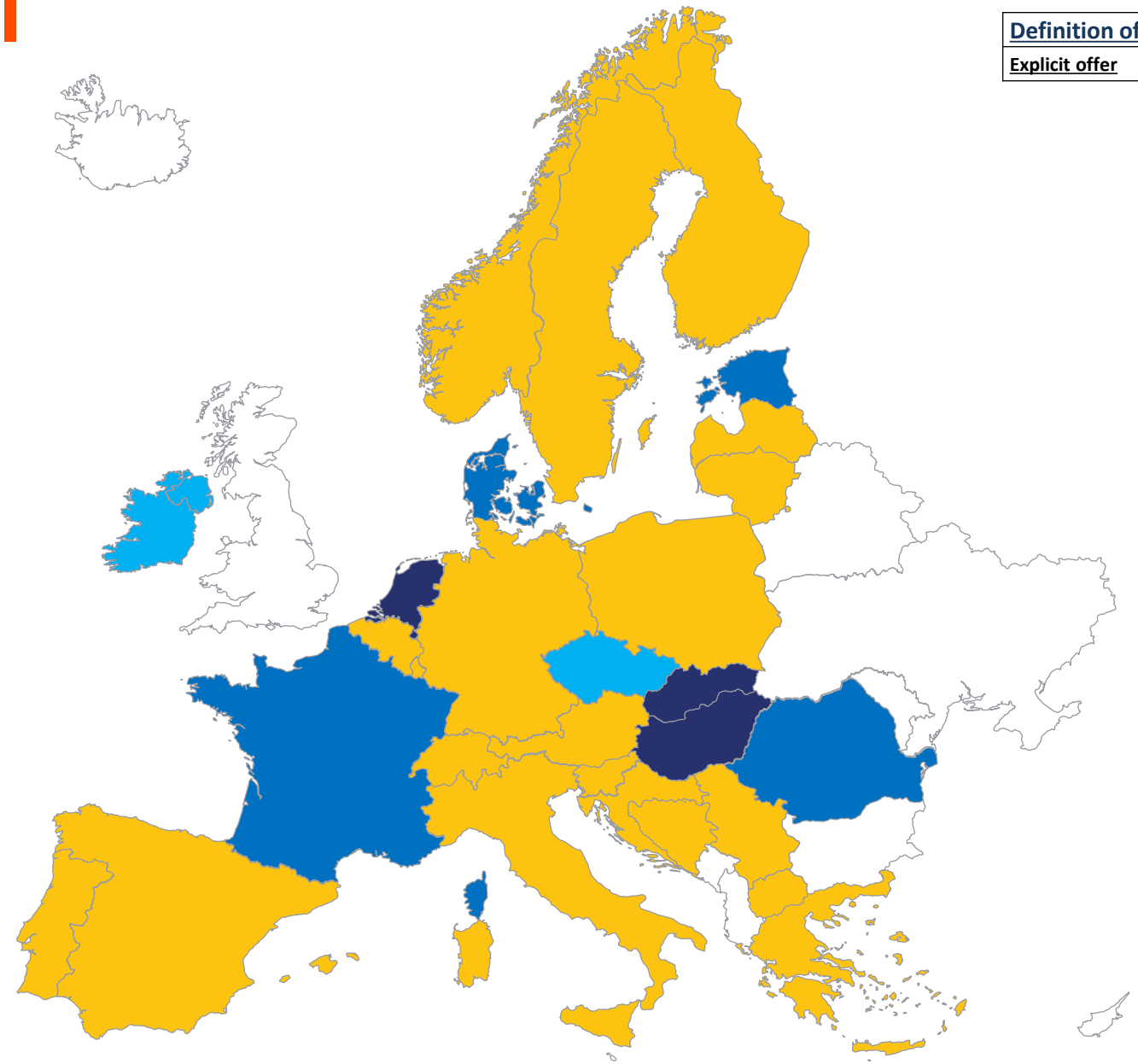
Voltage control – Type of optimisation approach for tertiary voltage control



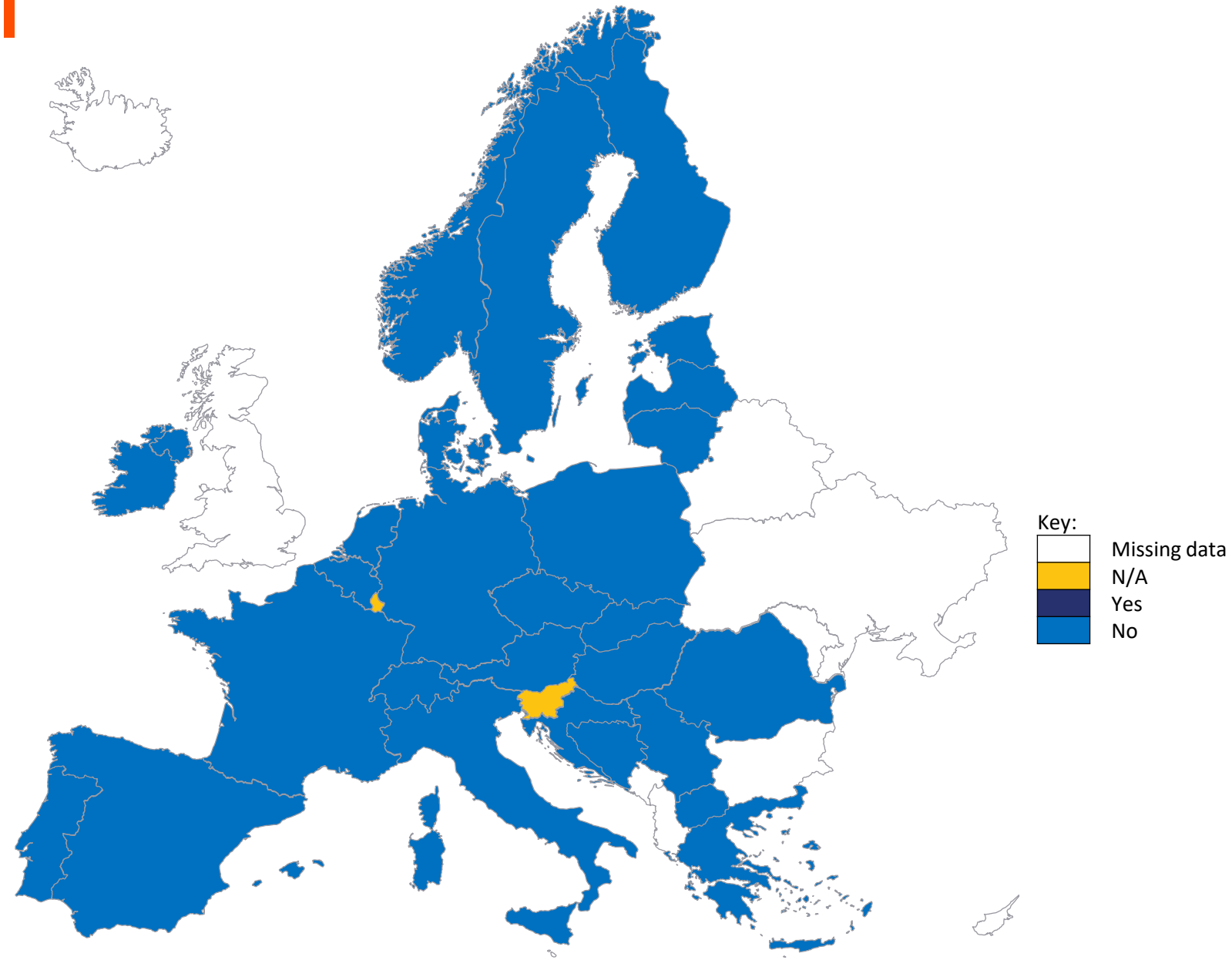
Definition of question	
Optimization approach	What kind of Voltage Control optimization is available in your control area?

Voltage control – Implicit / explicit offers bids from BSP

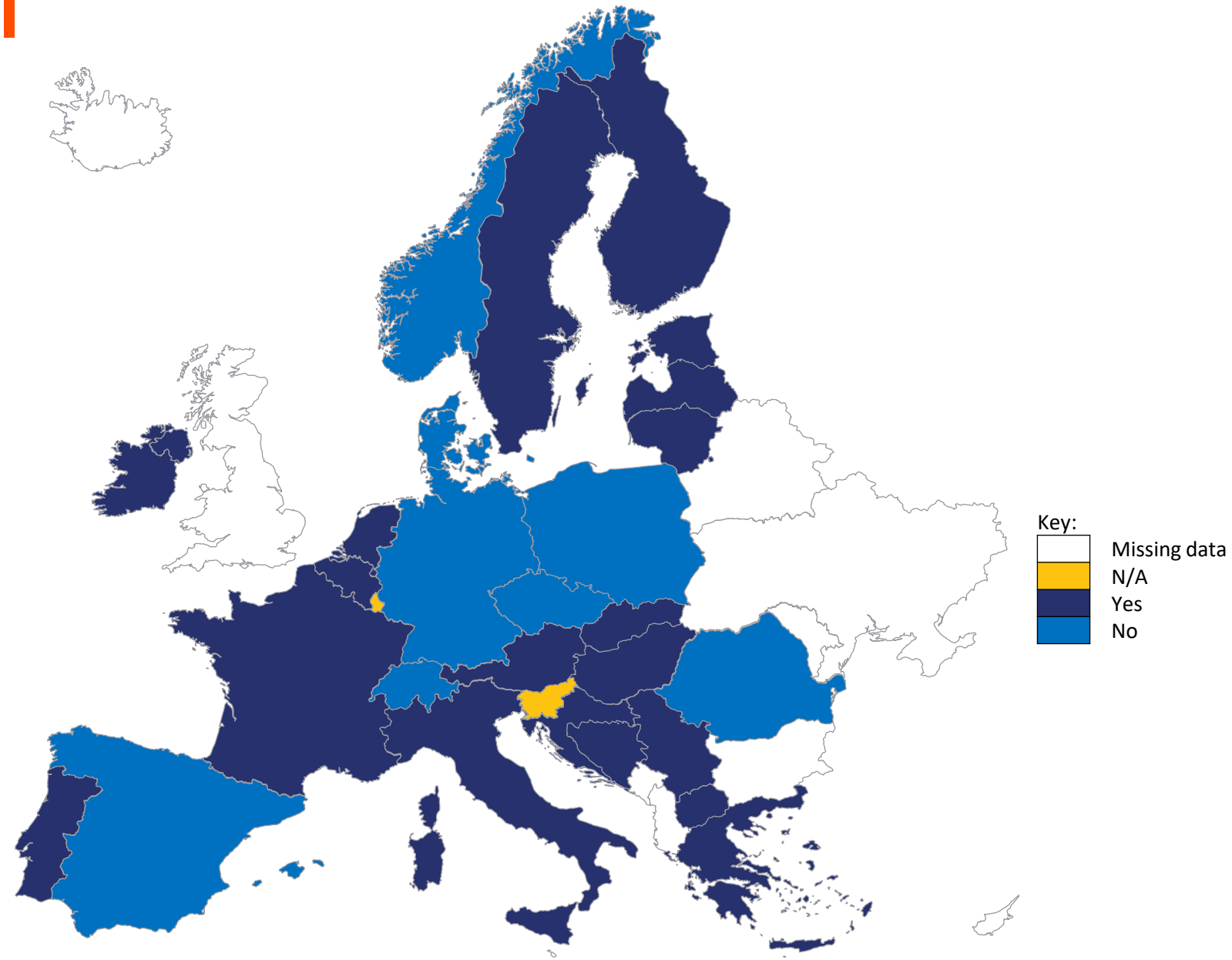
Definition of question	
Explicit offer	Specified and limited bids - for Standing unit



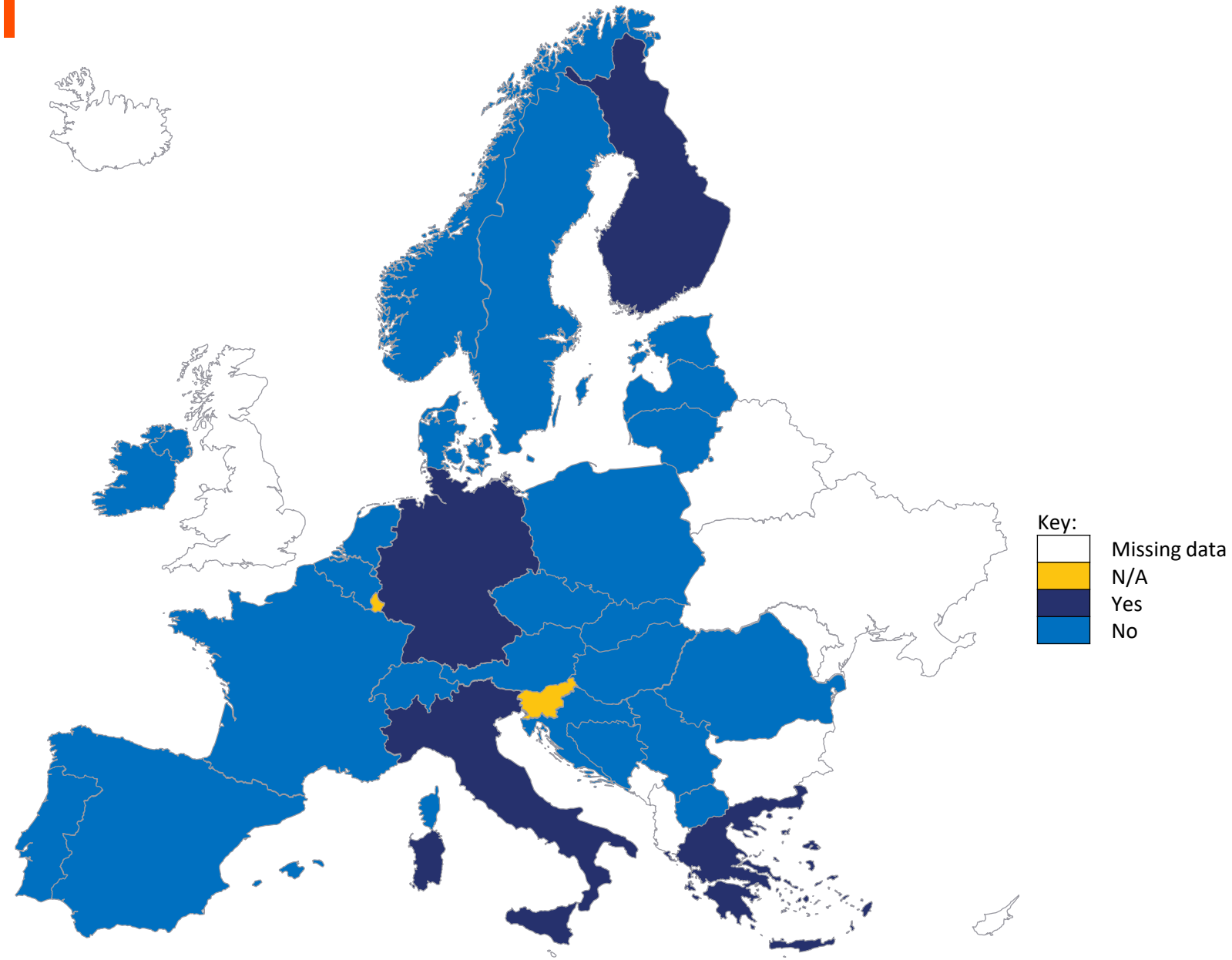
Voltage control – Type of regulations for the voltage control demanded to the power plants – No regulation



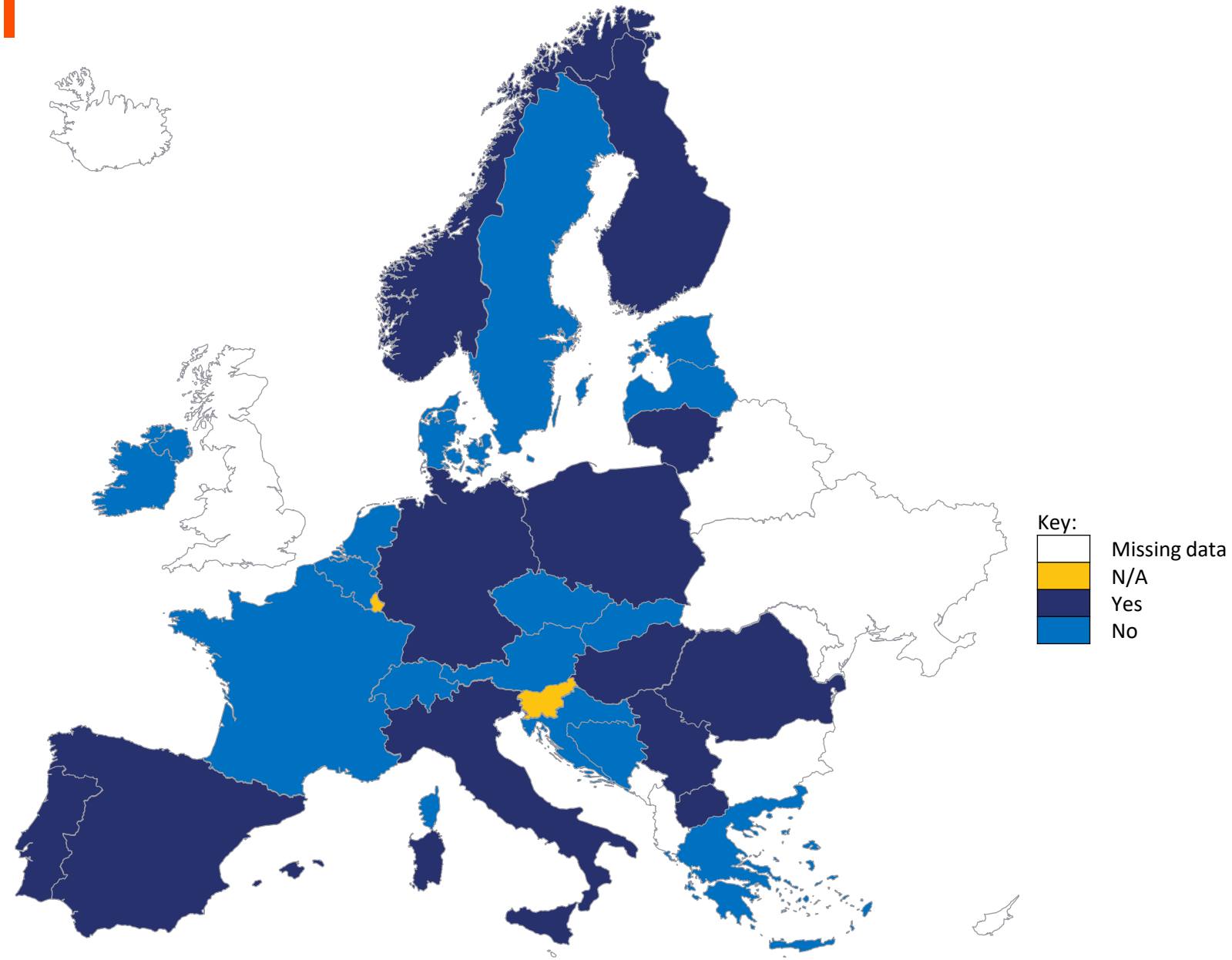
Voltage control – Type of regulations for the voltage control demanded to the power plants – Reactive setpoint



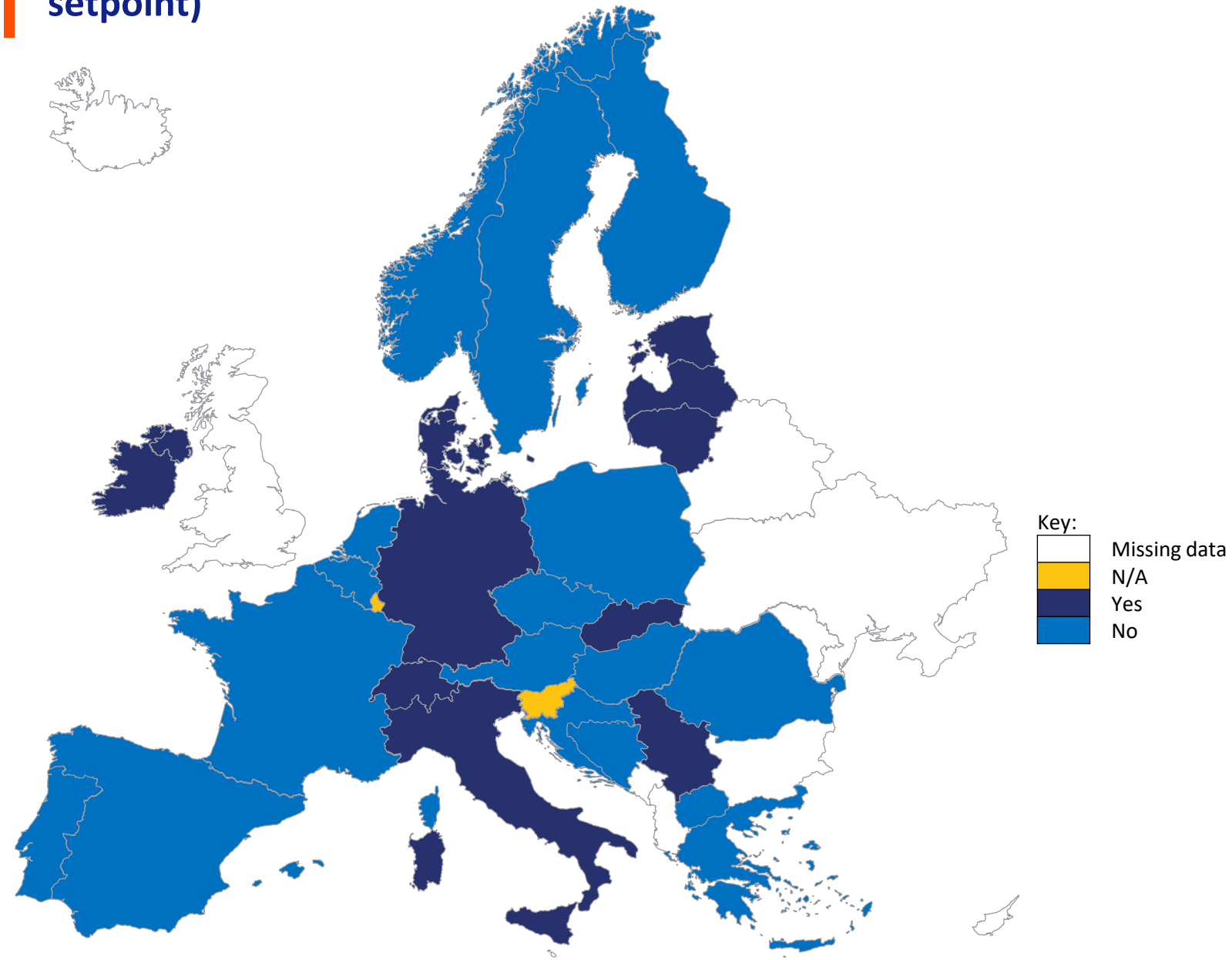
Voltage control – Type of regulations for the voltage control demanded to the power plants – Voltage stator setpoint



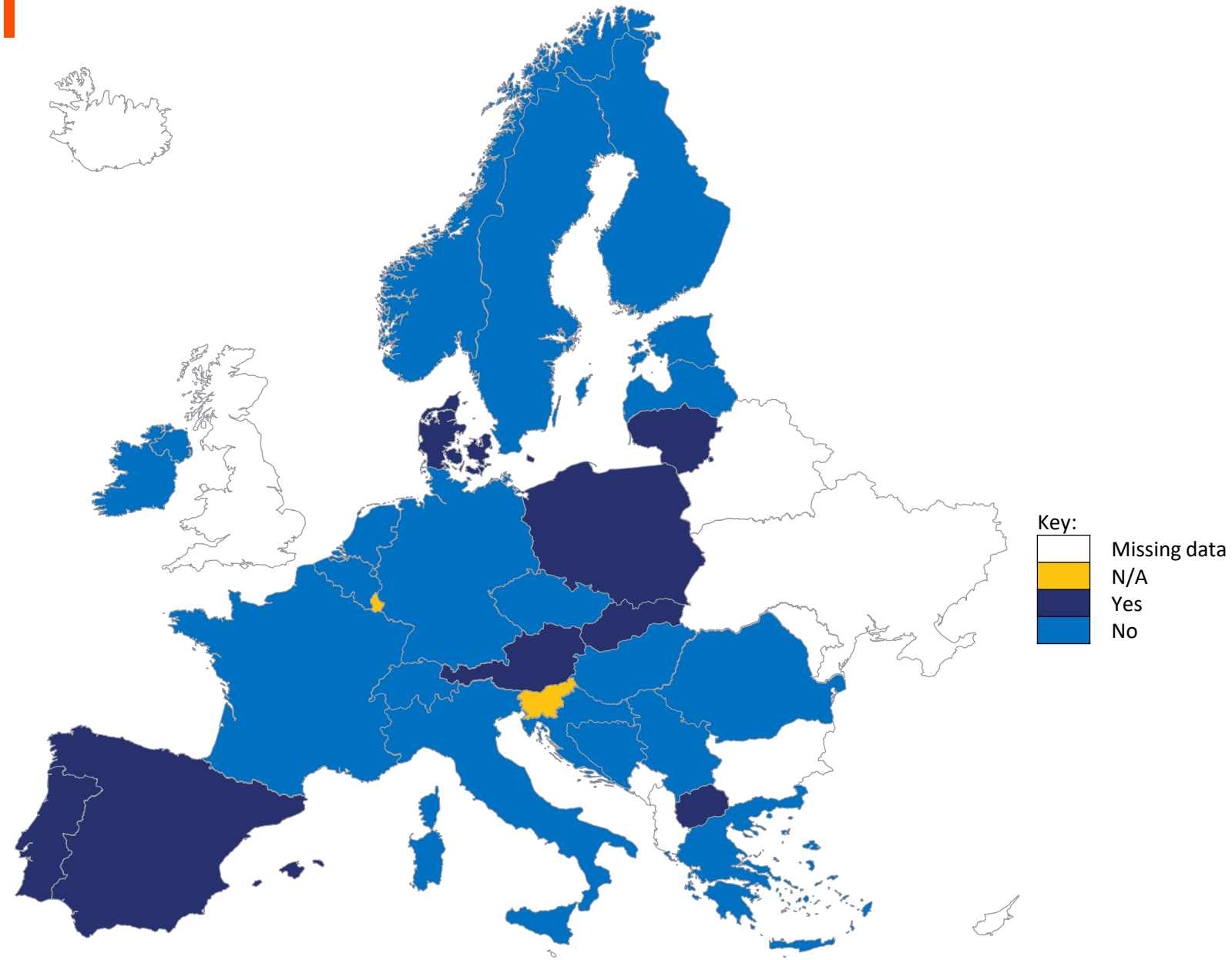
Voltage control – Type of regulations for the voltage control demanded to the power plants – Voltage setpoint at the connexion point (fixed value at EHV point)



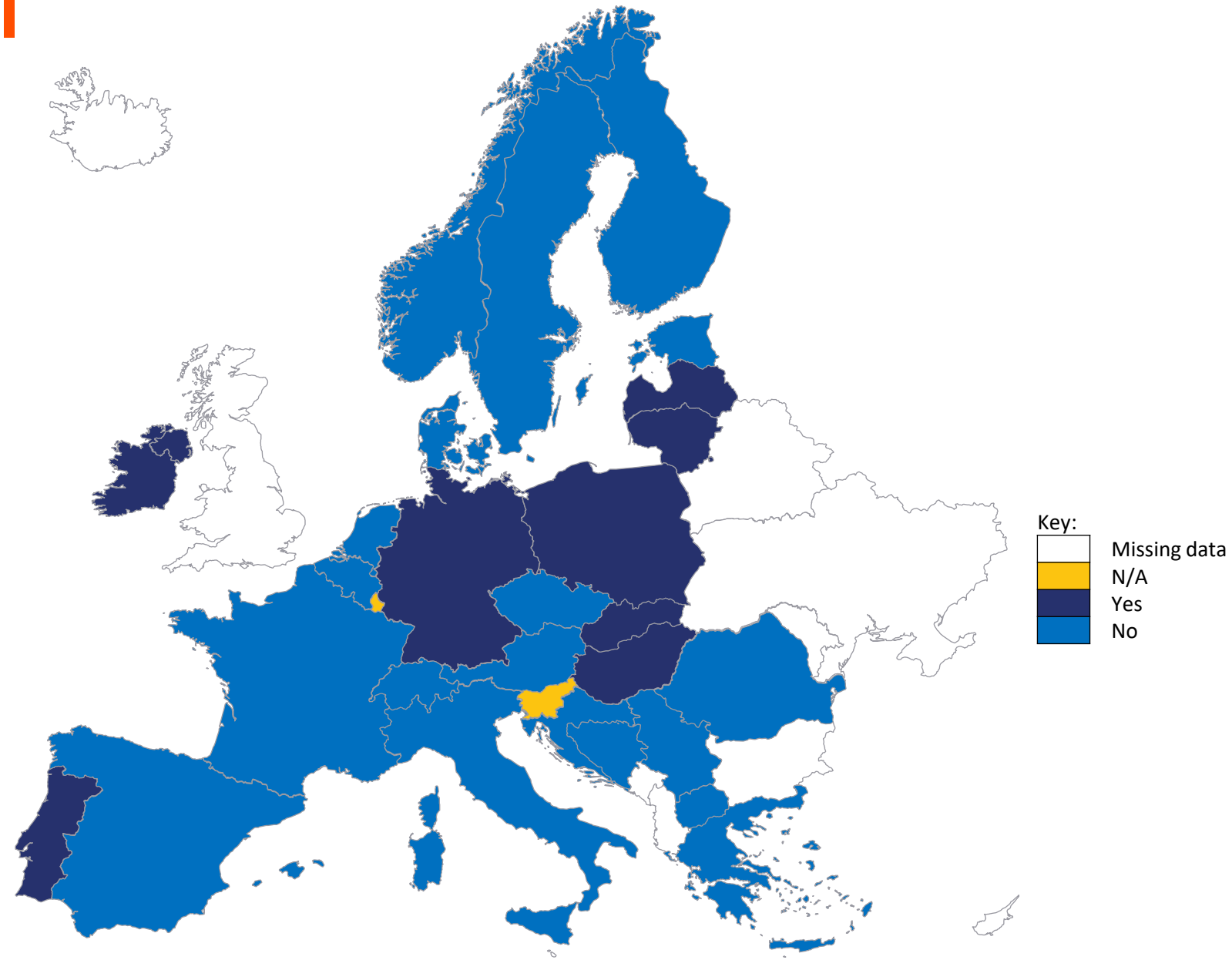
Voltage control – Type of regulations for the voltage control demanded to the power plants – Voltage setpoint at the connexion point function of a signal sent by the TSO (possibility of variation of the EHV setpoint)



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 – What methodology do you use to decide the number of pilot nodes number, its location and the generators associated to each of them? (1/2)

TSO	Answer
CEPS	Each substation, where power plants are connected to the TS, is considered as the pilot node. Each substation can be divided into several nodes depending on topology of the substation, therefore there are several control loops for automatic voltage control.
Eirgrid	N/A. All transmission connected generators provide reactive power control.
PSE	We use voltage stability assessment.
SEPS	All generators connected to the Transmission network need to be able to provide reactive power. Substations where generators, inductance compensation system or transformers are connected are pilot nodes.
SONI	N/A. All transmission connected generators provide reactive power control.
Statnett	Generators >= 10 MVA

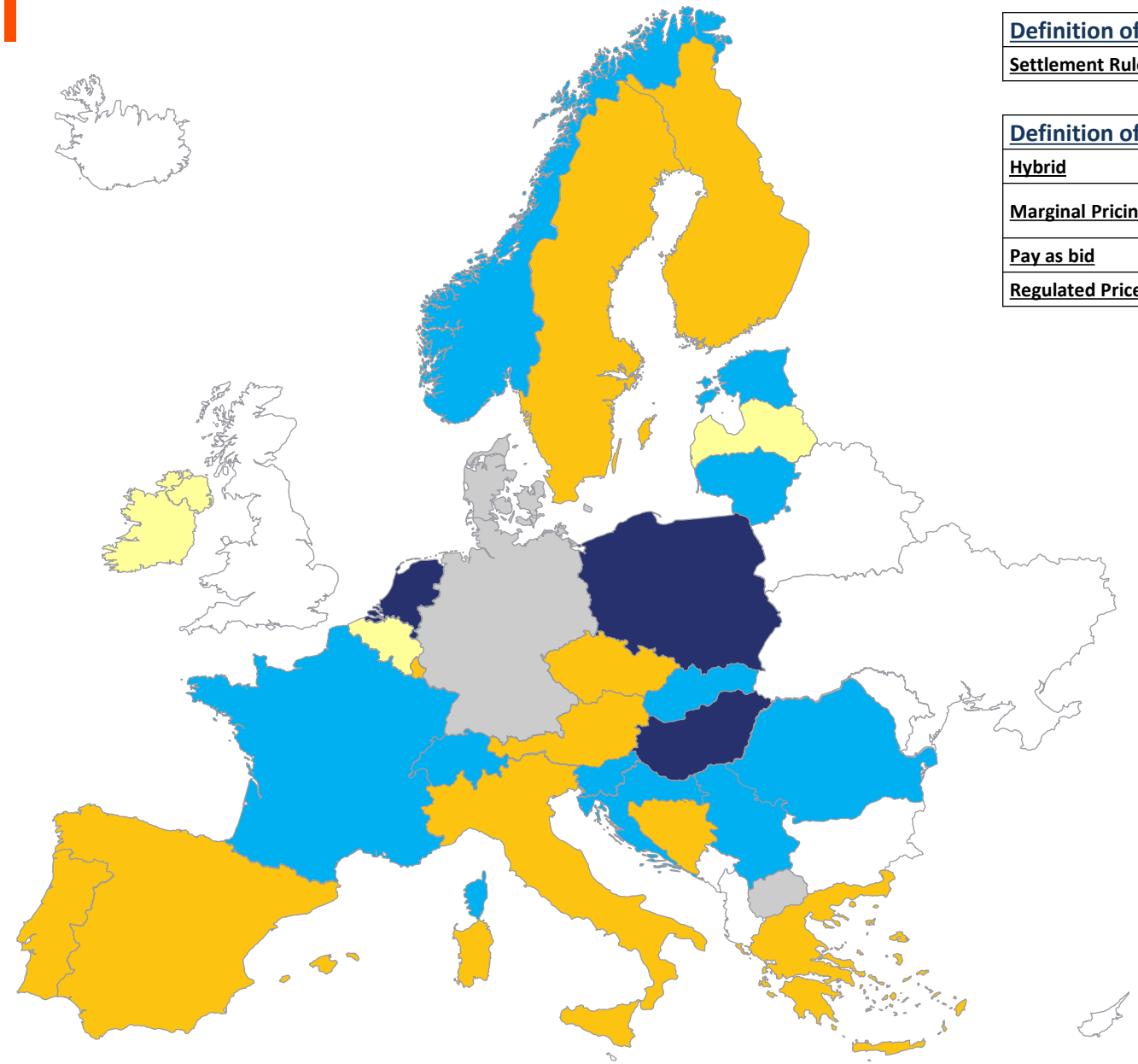
Voltage control – What methodology do you use to decide the number of pilot nodes number, its location and the generators associated to each of them? (2/2)

TSO	Answer
TenneT NL	No methodology including pilot nodes is used, generators must determine the local voltage set-point themselves based on the reactive power set-point supplied by the network operator.
Terna	Short circuit power and electrical coupling sensitivity with other possible nodes and power plants (node to node and node to power plant).

Voltage control – Any issue in your experience with voltage control regarding voltage stability (mainly interactions between U, Q and PF controlled devices)?

TSO	Answer
CEPS	In case of ancillary services we use just the automatic voltage control system for controlling the voltage at the pilot nodes.
Eirgrid	Some PPMs (Power Park Modules) that are electrically close together have experienced hunting (in U control). Mitigation can include keeping one in U mode and one in Q mode.
Energinet	All units connected to TSO are in U regulation mode.
PSE	No
SONI	Some PPMs (Power Park Modules) that are electrically close together have experienced hunting (in U control). Mitigation can include keeping one in U mode and one in Q mode.
TenneT NL	None
Terna	No

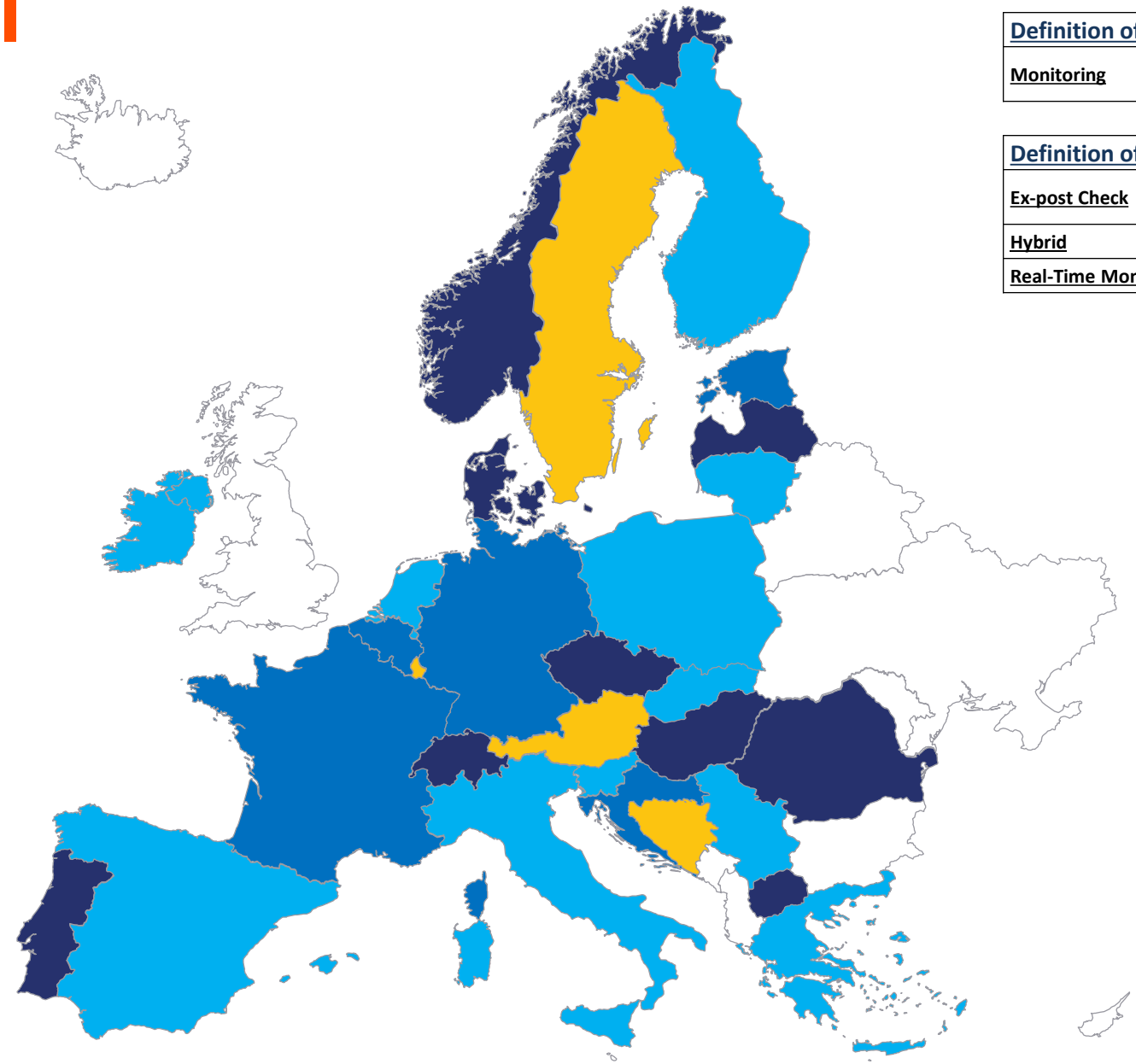
Voltage control – Settlement Rule



Definition of question	
Settlement Rule	The pricing rules for settlement.

Definition of answer	
Hybrid	Combination of given options.
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.

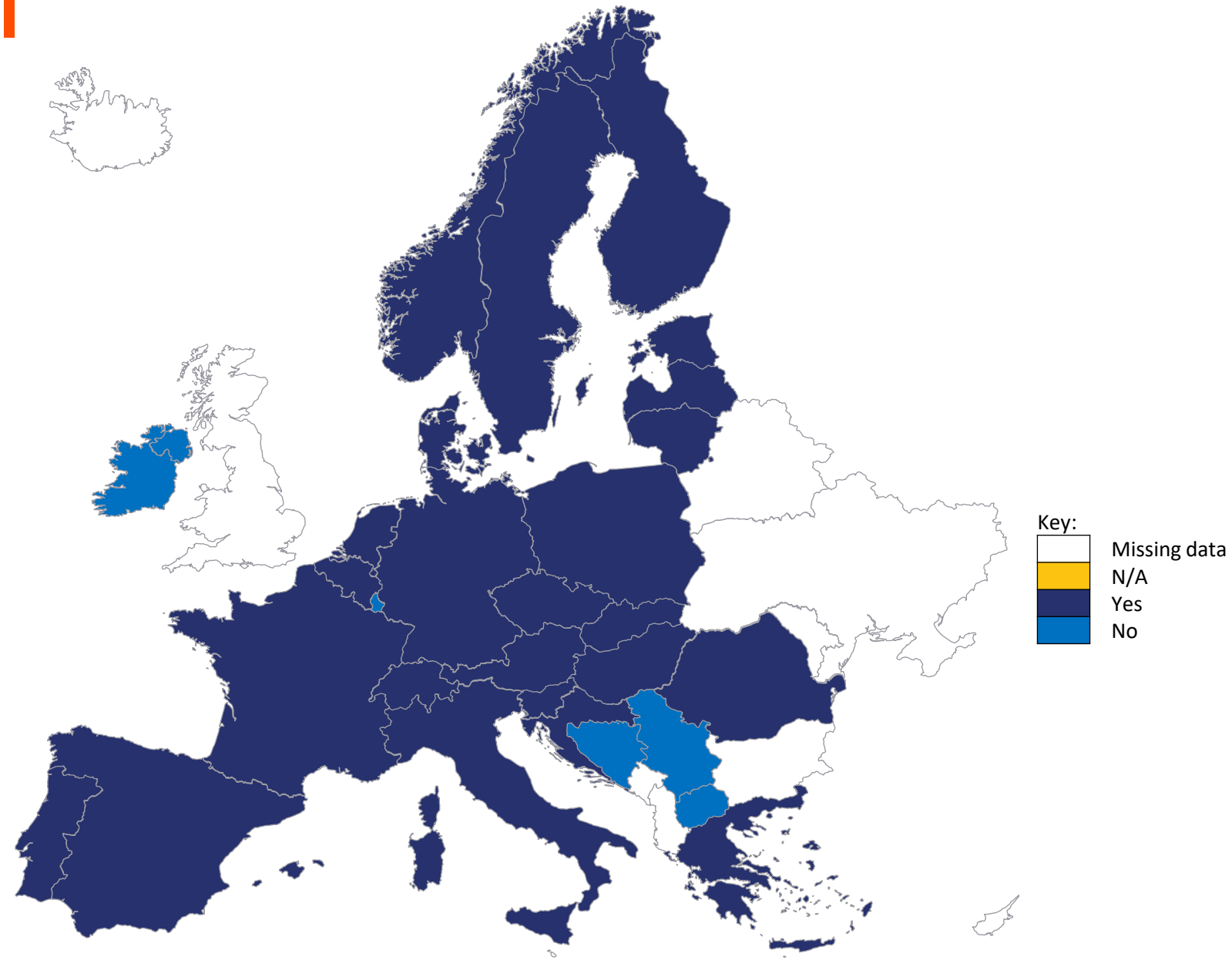
Voltage control – Monitoring



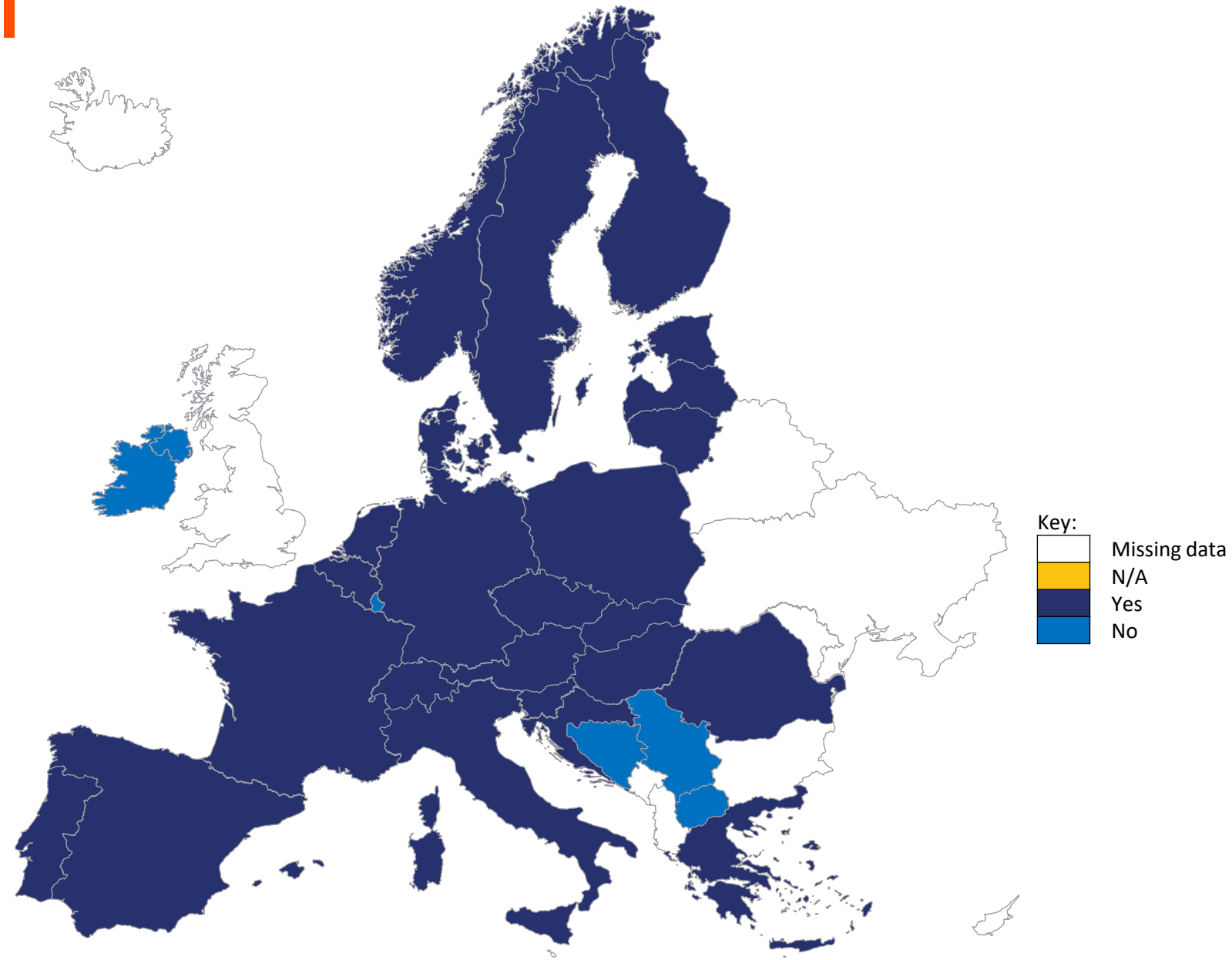
Definition of question	
Monitoring	Refers to the type of monitoring in place by the system operator to ensure performance of plant.

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

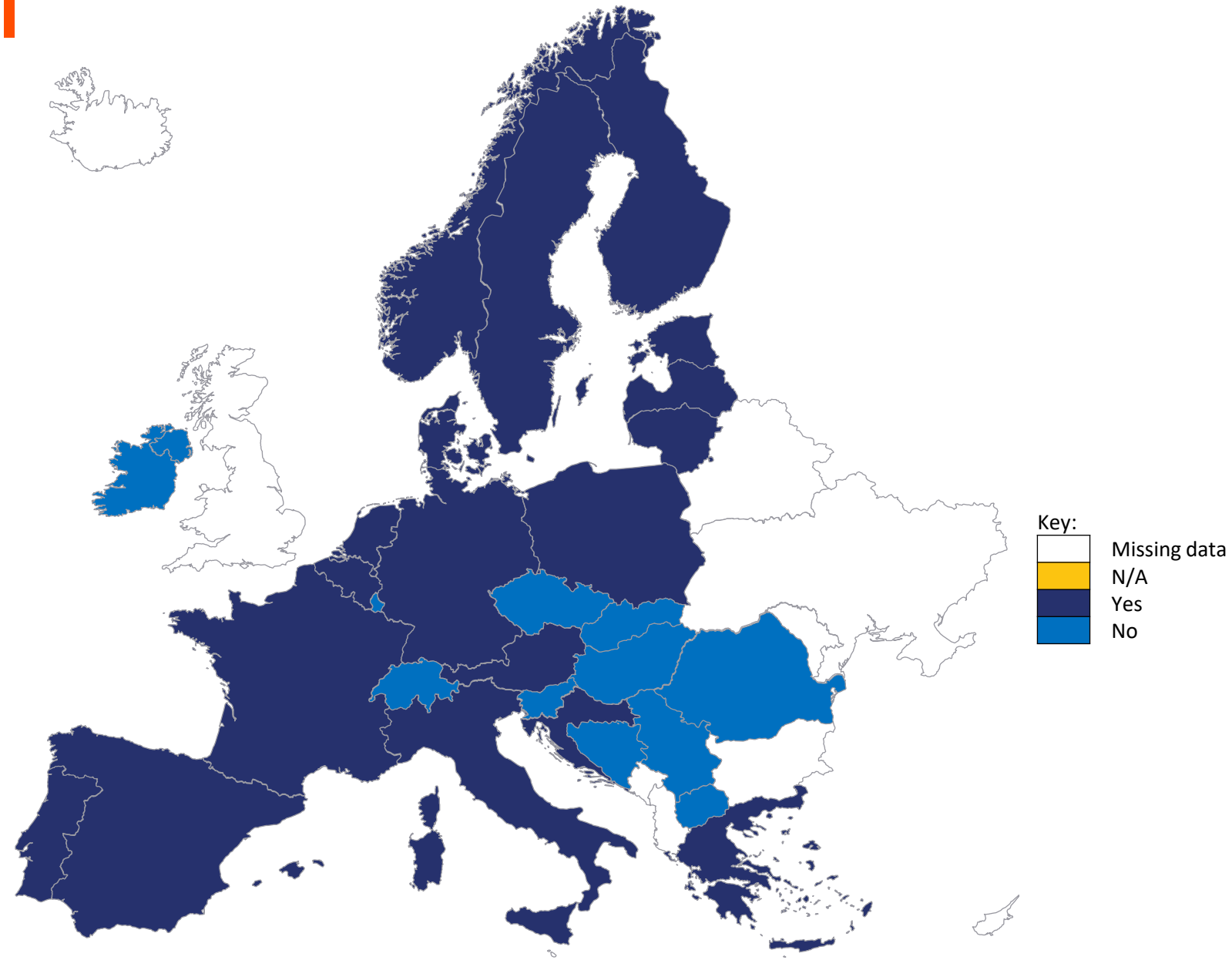
Voltage control – Does the TSO own reactive power compensation systems?



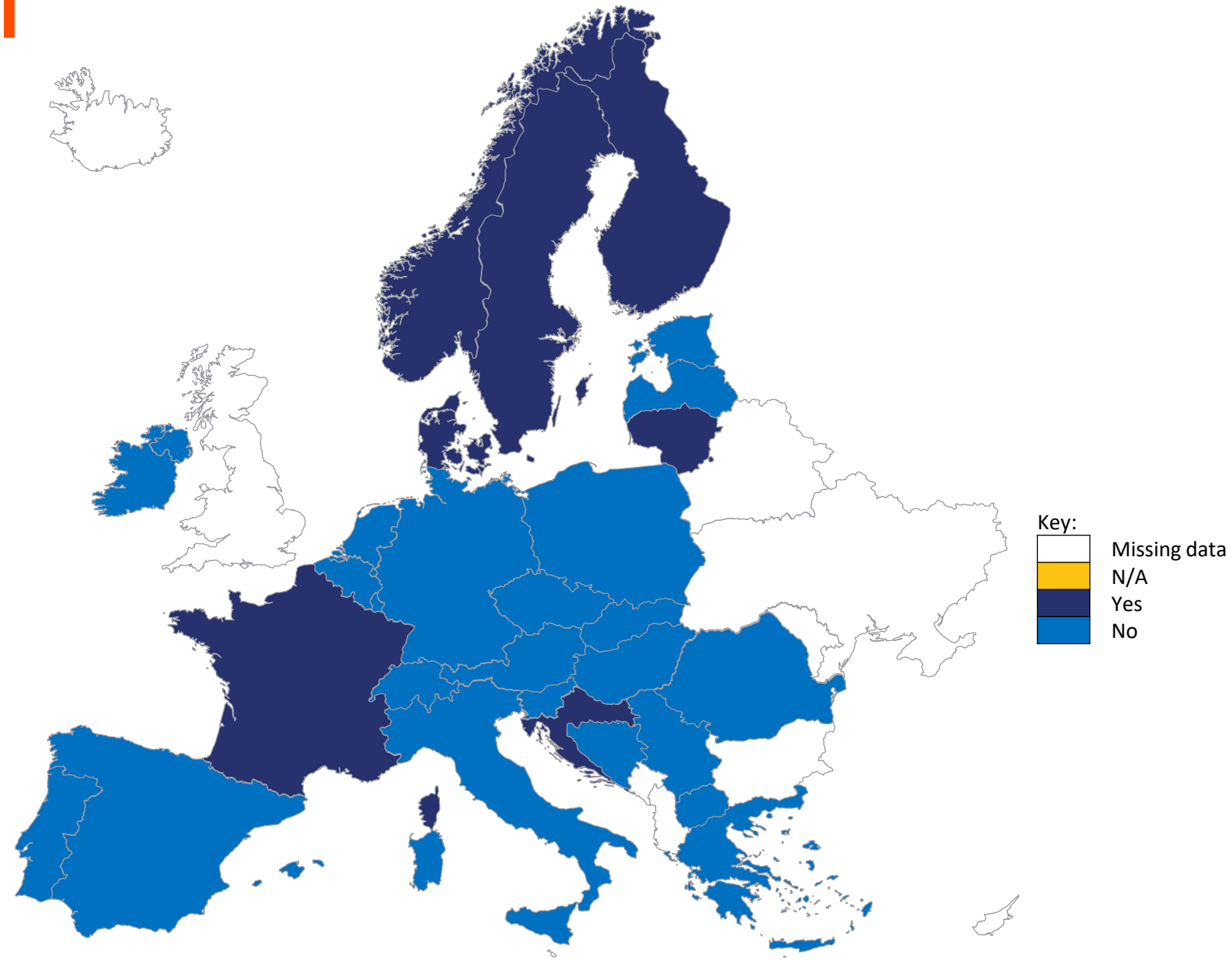
Voltage control – Owning by the TSO the reactive power compensation systems – Inductance



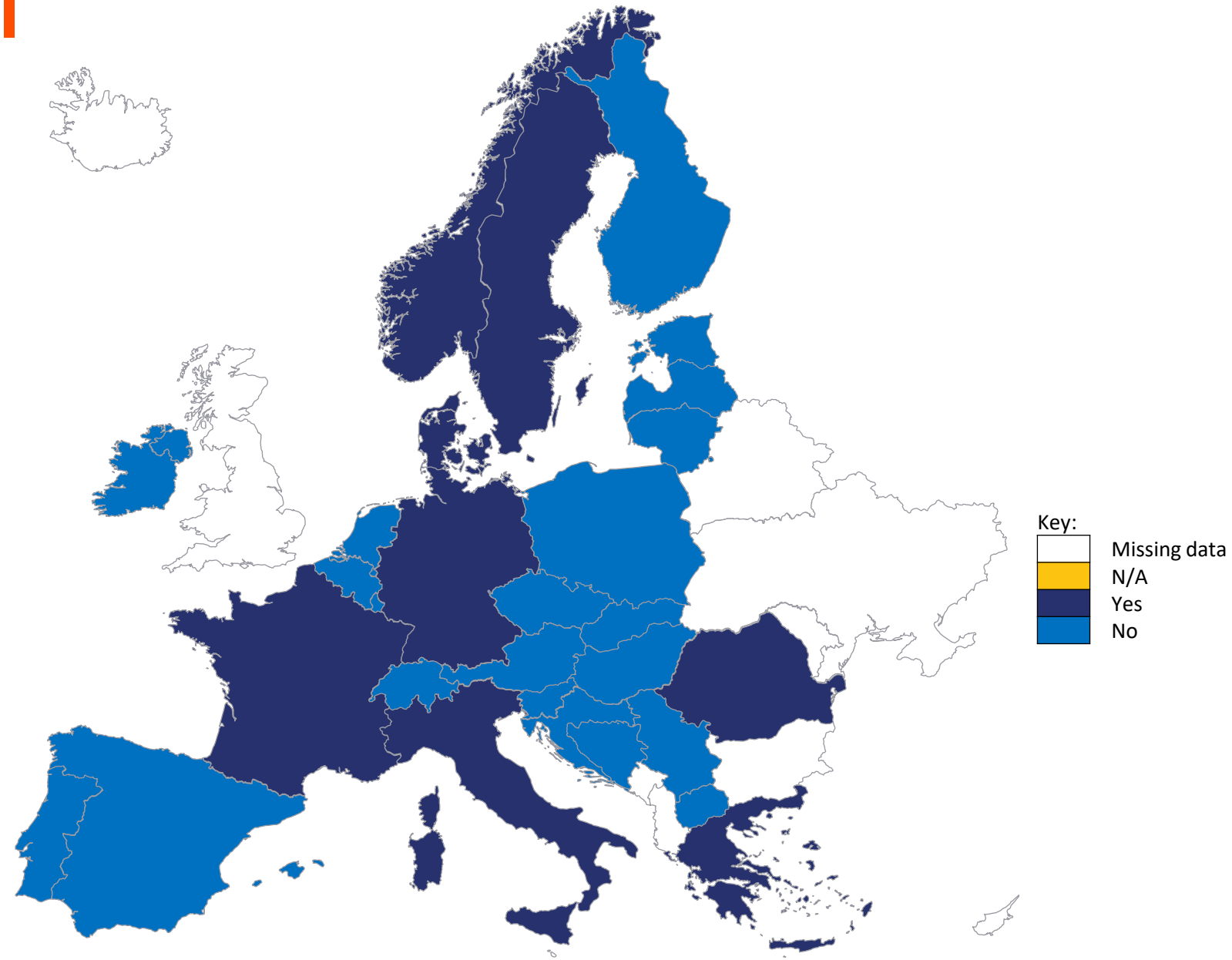
Voltage control – Owning by the TSO the reactive power compensation systems – Capacitor banks



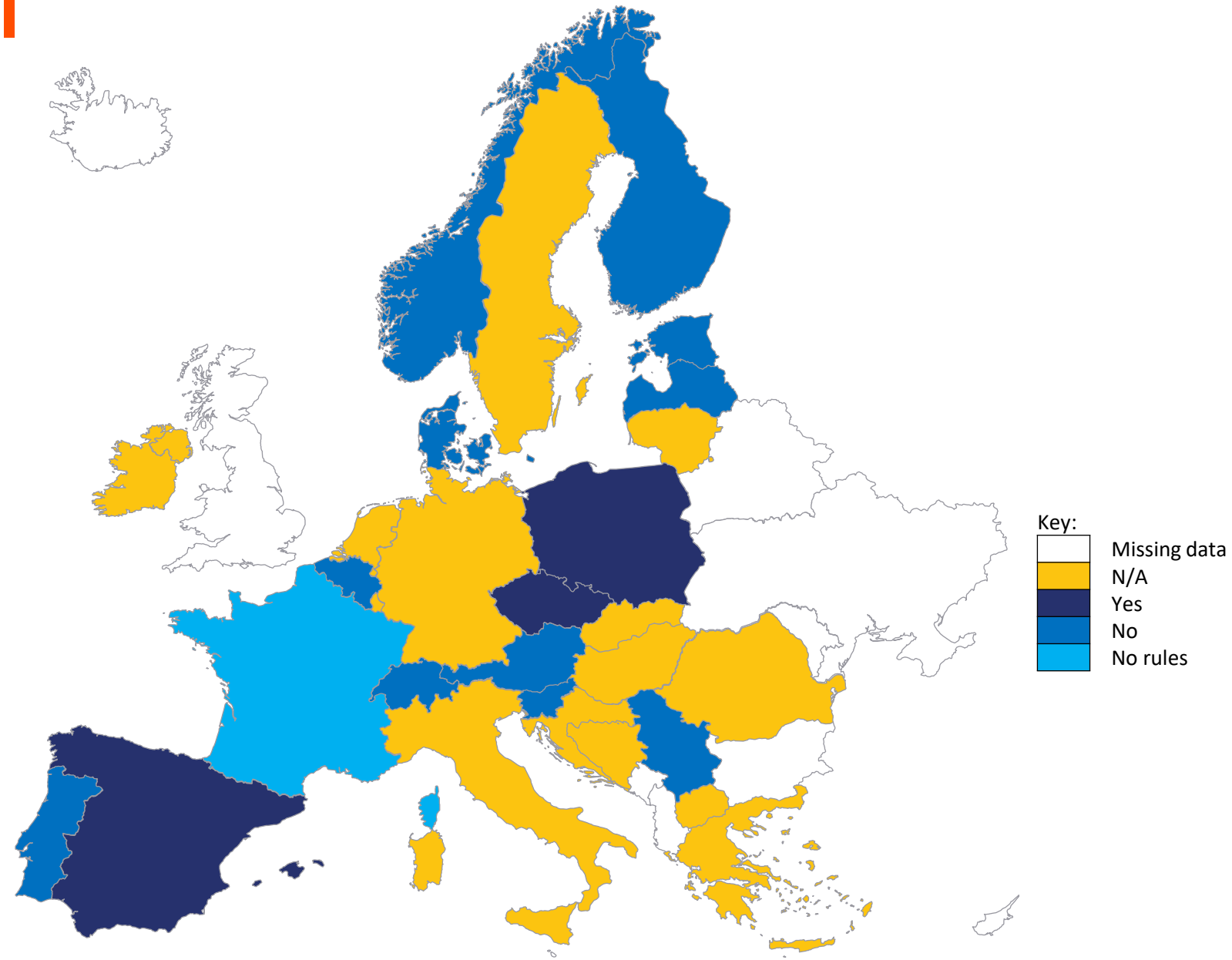
Voltage control – Owning by the TSO the reactive power compensation systems – SVC



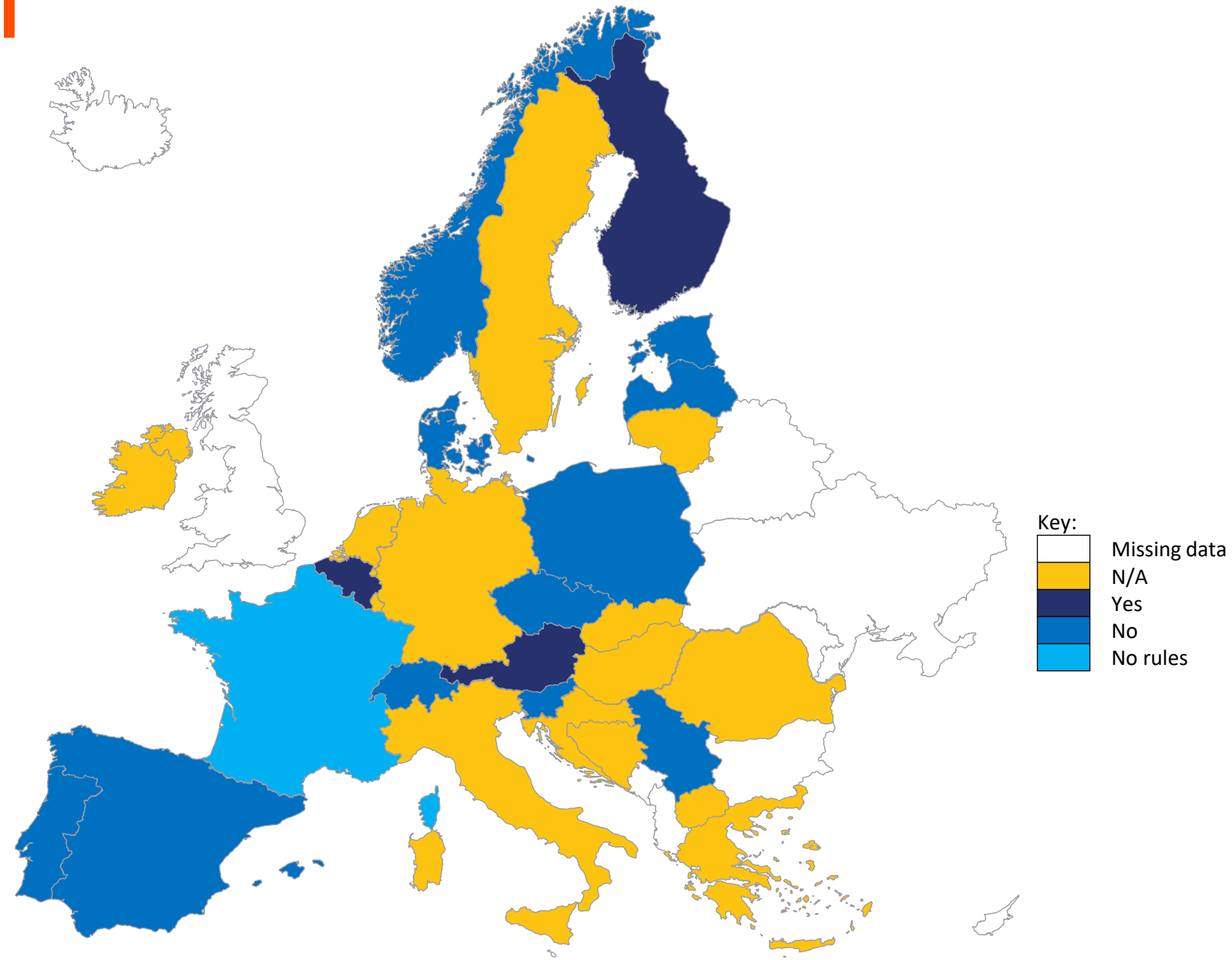
Voltage control – Owning by the TSO the reactive power compensation systems – Synchronous compensator



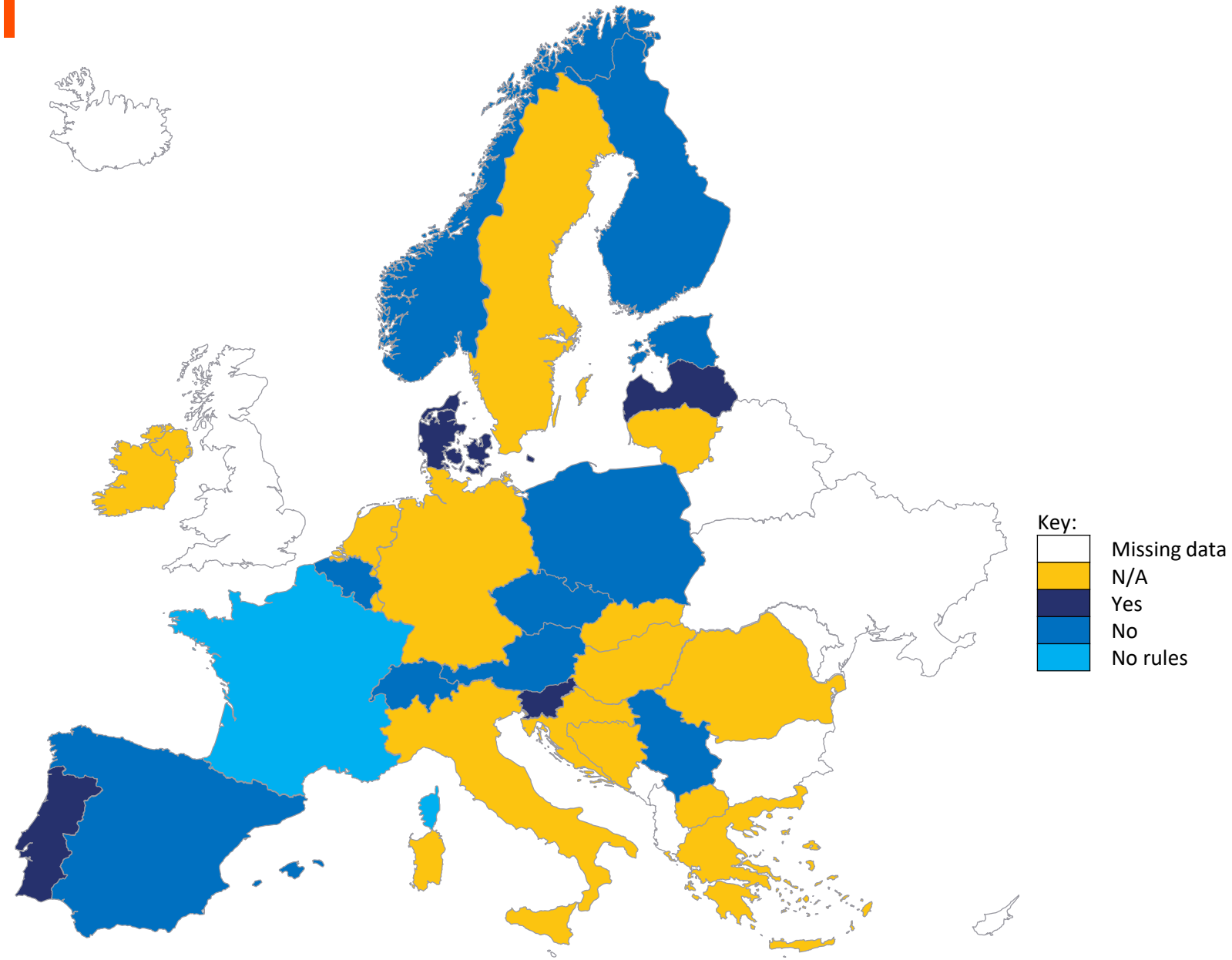
Voltage control – Settlement rules for the exchange of reactive power between transmission and distribution grids – Respect a Reactive/Active power ratio



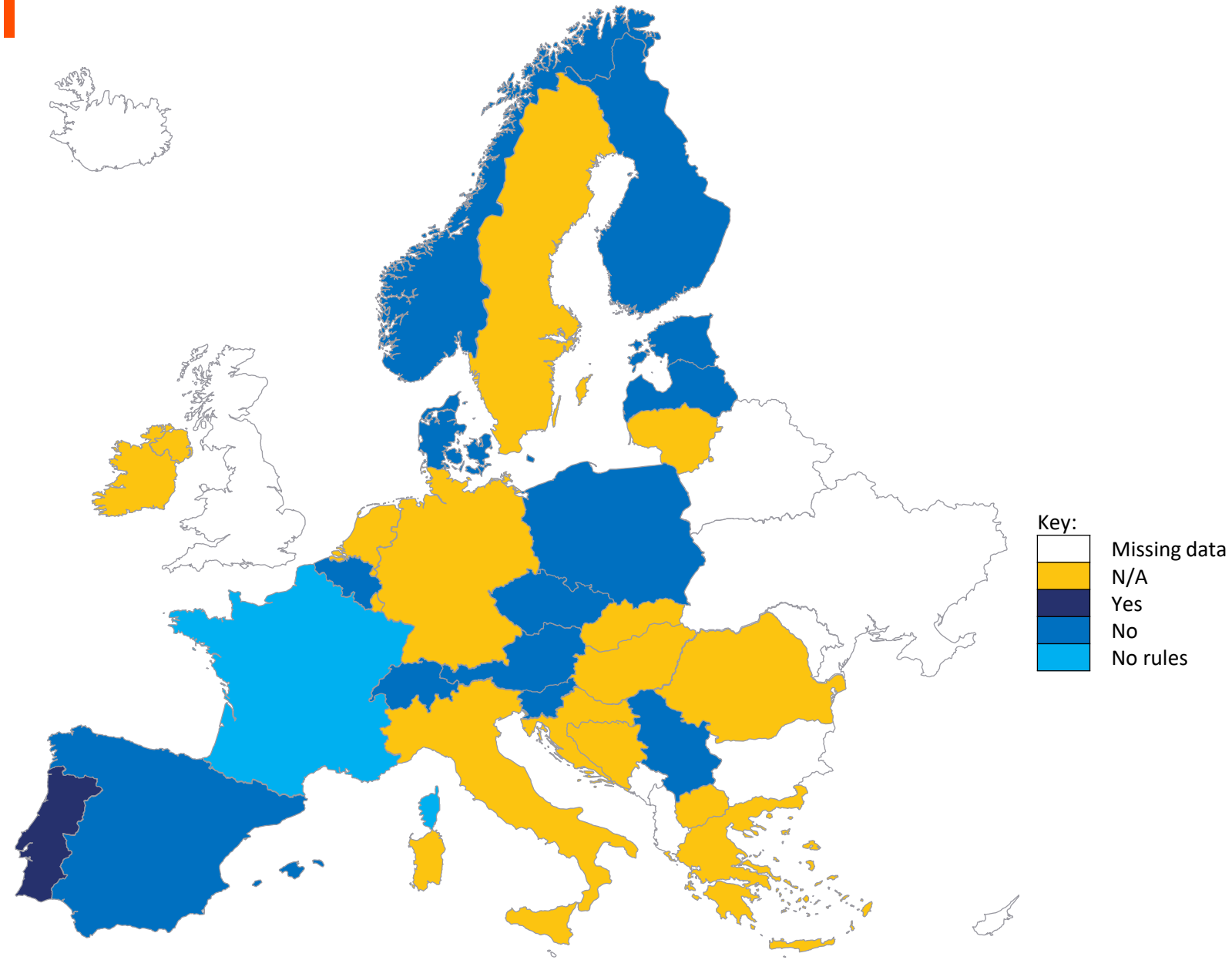
Voltage control – Settlement rules for the exchange of reactive power between transmission and distribution grids – Respect of an Active/Reactive Power Diagram at the connexion point



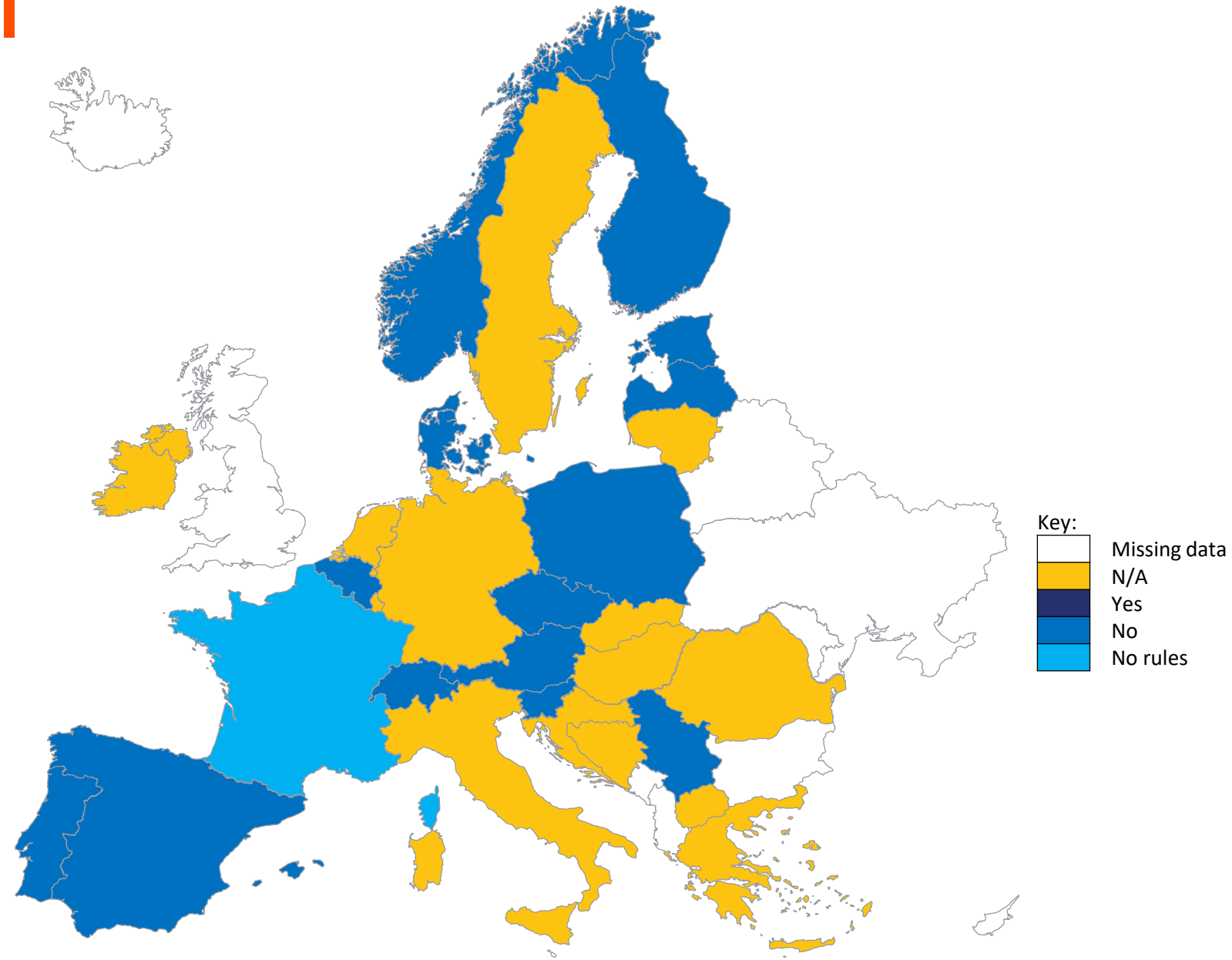
Voltage control – Settlement rules for the exchange of reactive power between transmission and distribution grids – Min/max fixed value of reactive power



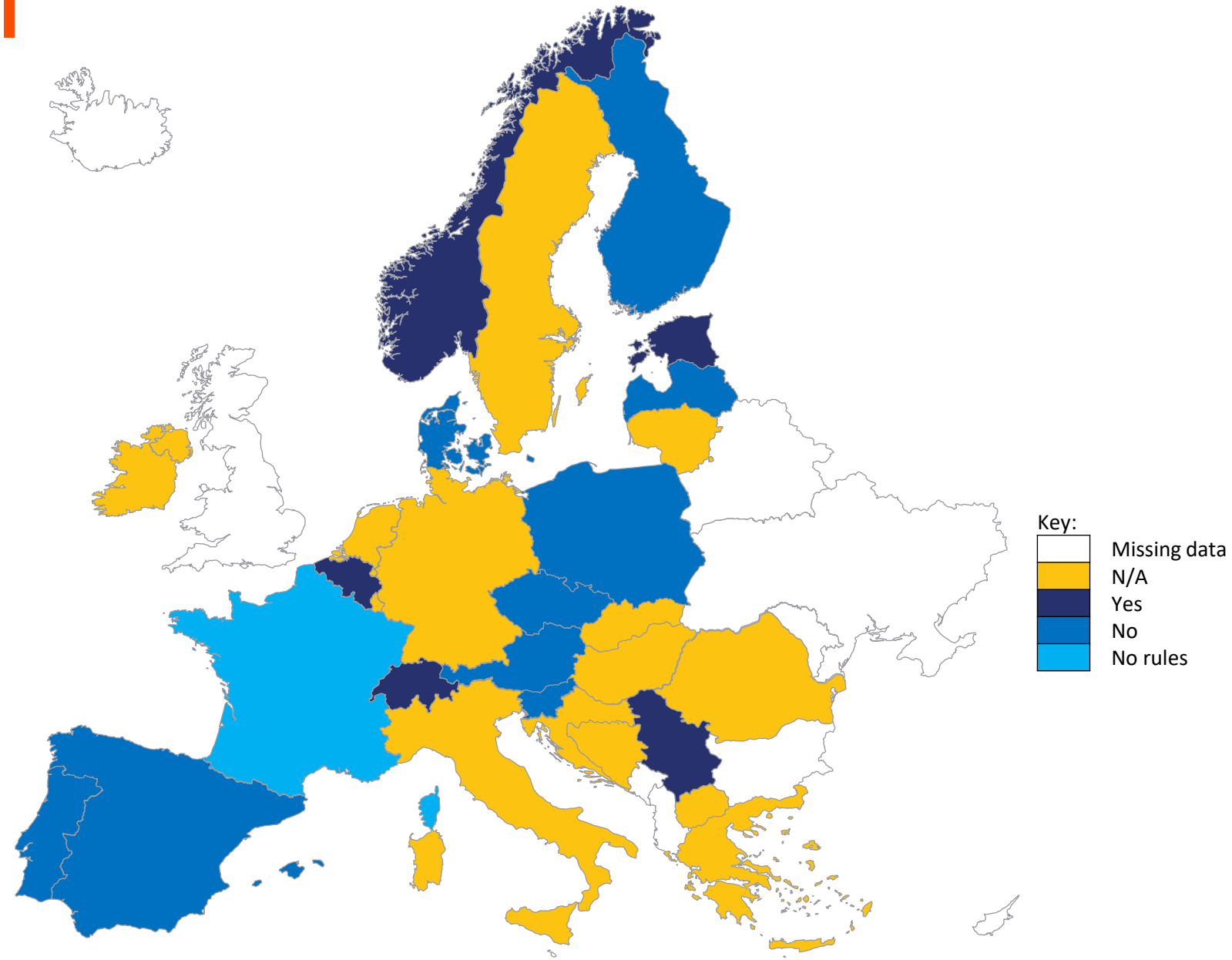
Voltage control – Settlement rules for the exchange of reactive power between transmission and distribution grids – Depending of the period of the day and/or year



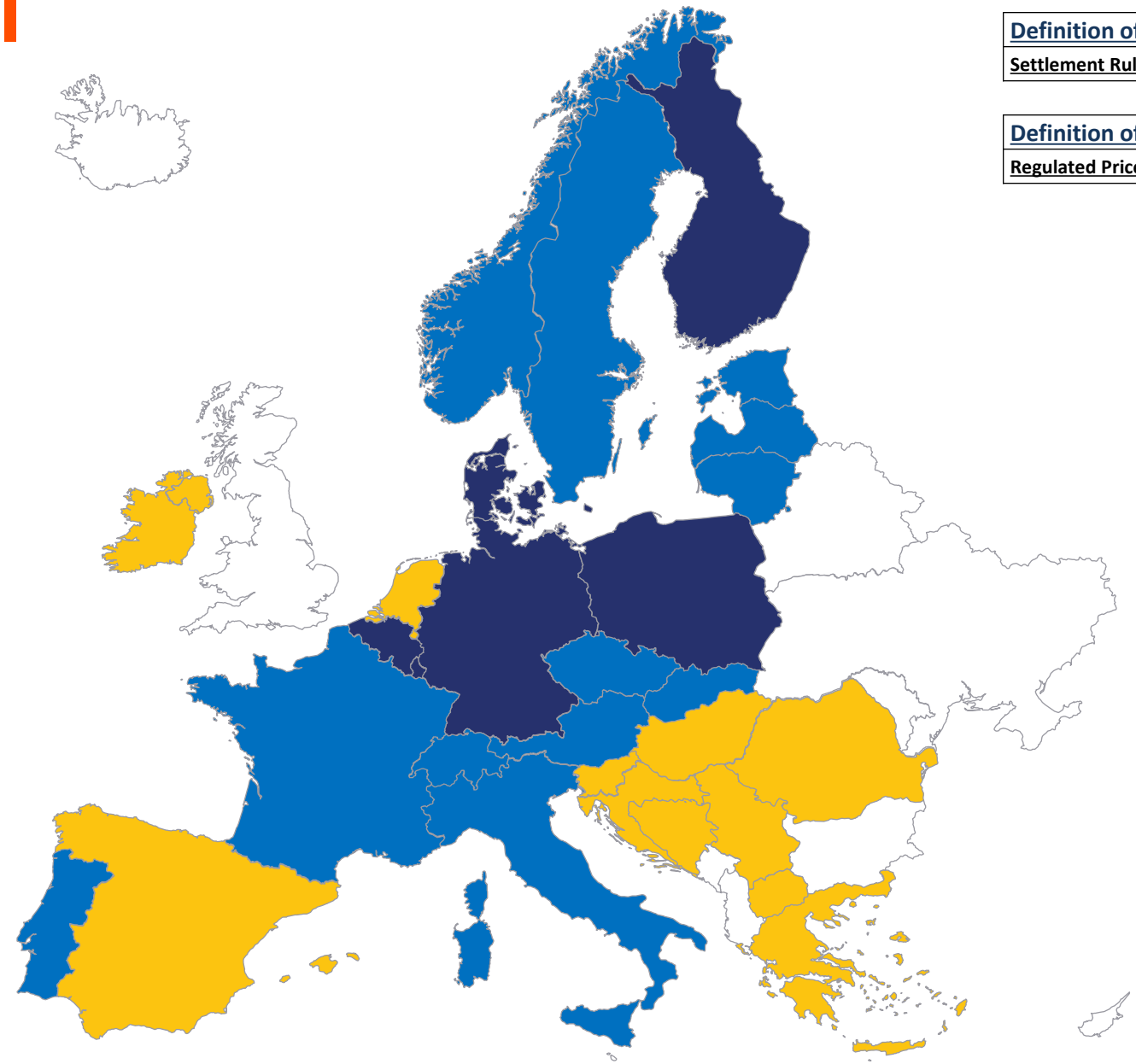
Voltage control – Settlement rules for the exchange of reactive power between transmission and distribution grids – Depending on the localization of the DSO



Voltage control – Settlement rules for the exchange of reactive power between transmission and distribution grids – According to the measurement



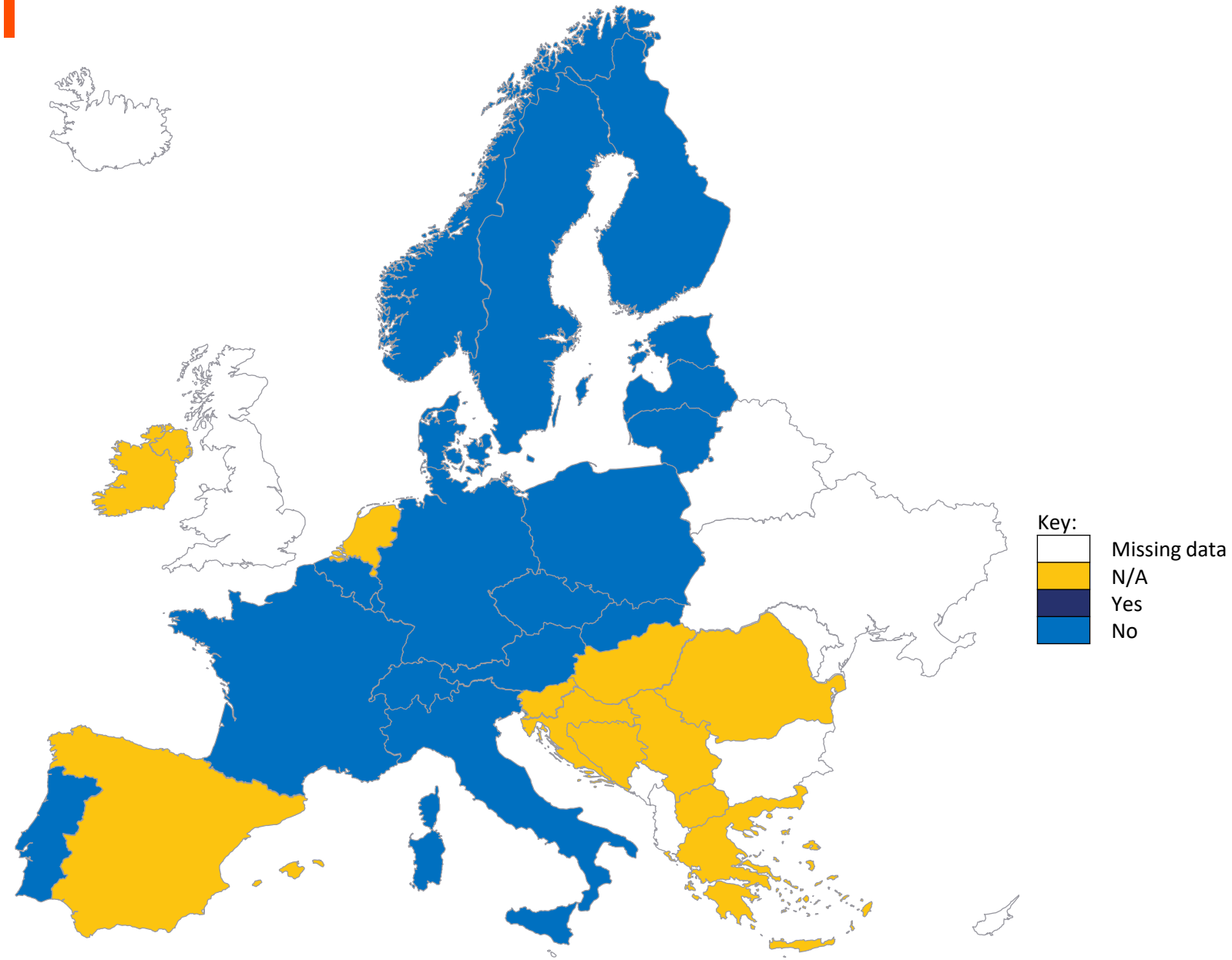
Voltage control – Settlement rules for the price of reactive power between transmission and distribution grids – Charges and/or fees if the DSO does not respect the tan Phi and/or the diagram rule



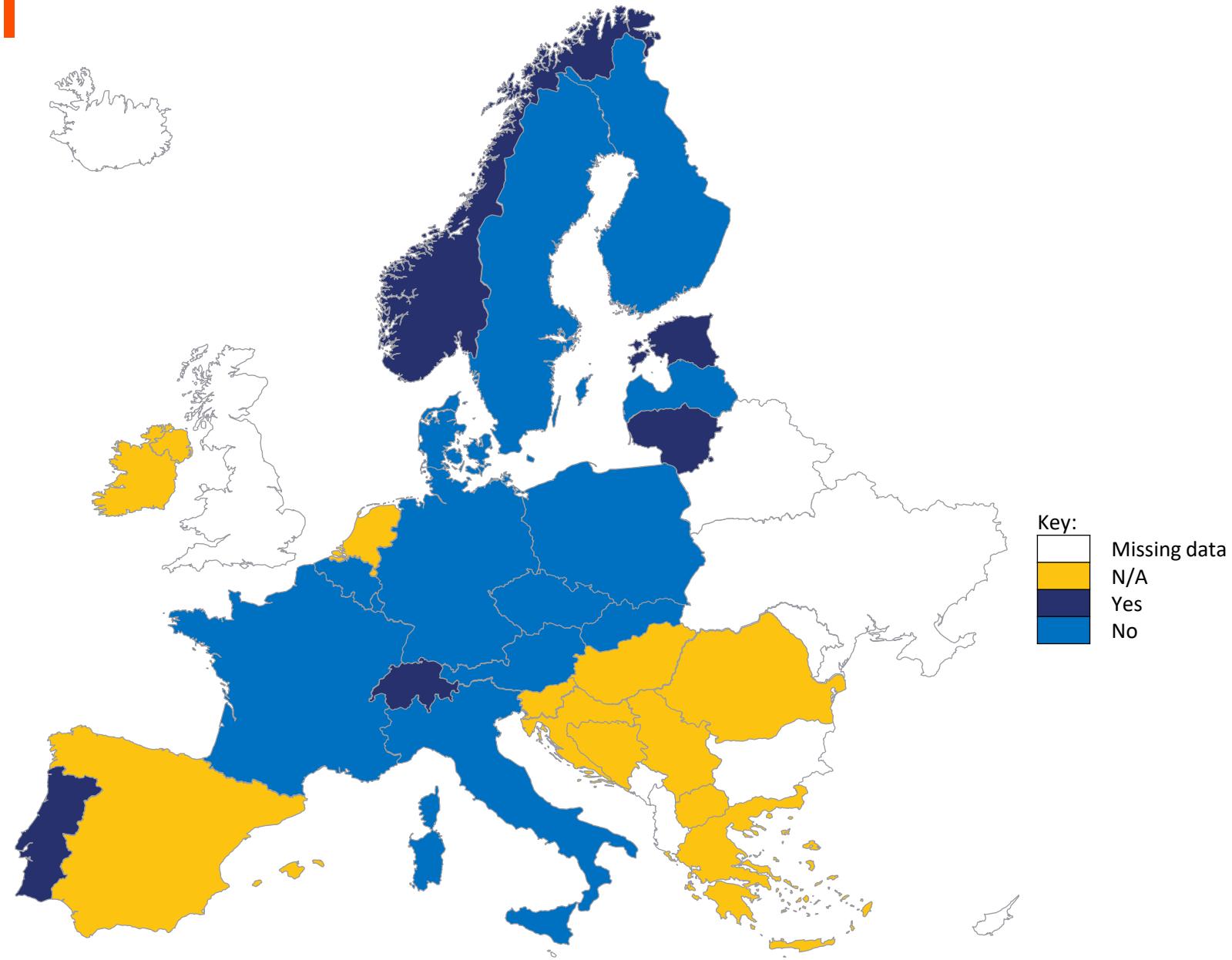
Definition of question	
Settlement Rule	The pricing rules for settlement.

Definition of answer	
Regulated Price	Price for this service is based on a price that is set by the relevant regulatory authority.

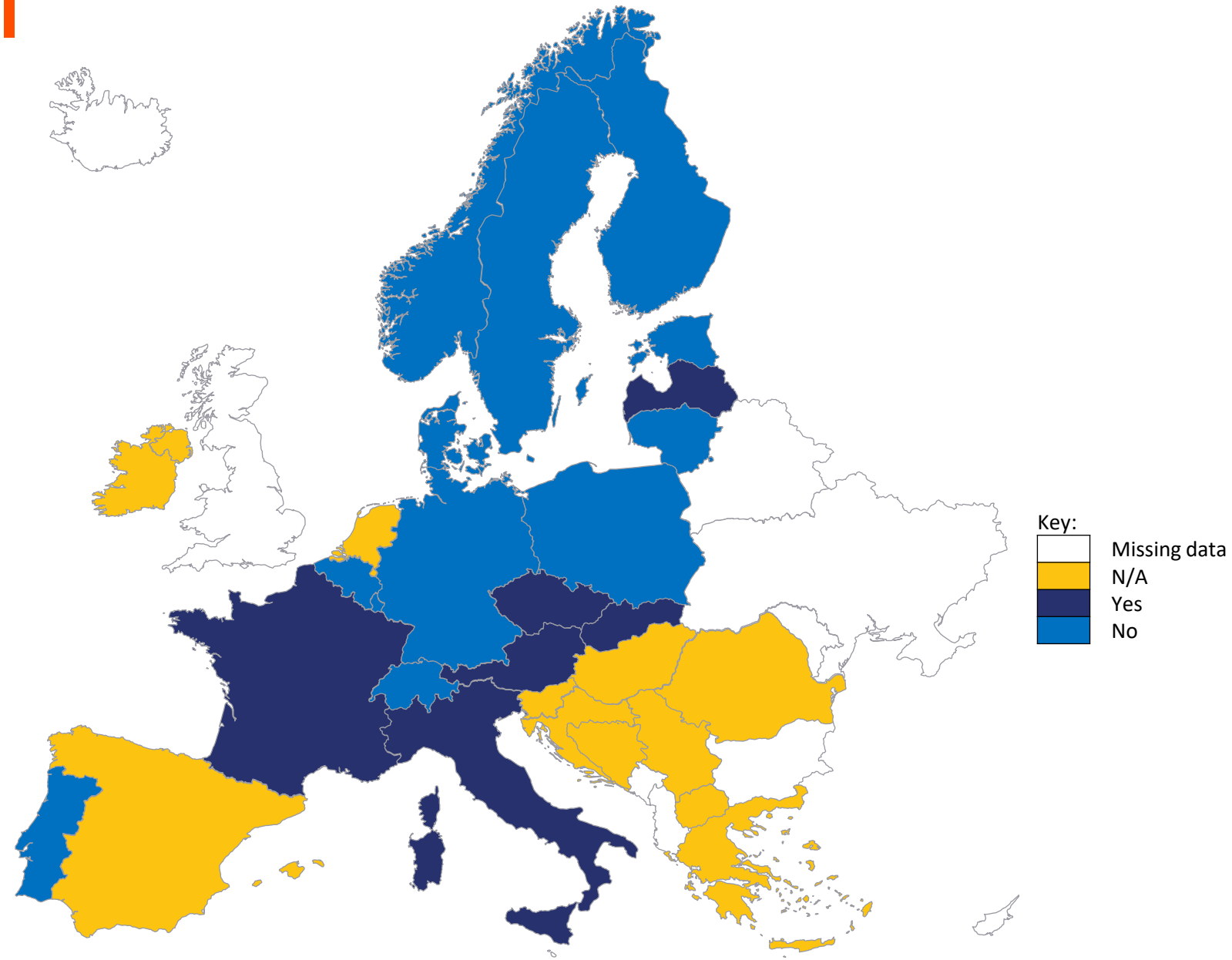
Voltage control – Settlement rules for the price of reactive power between transmission and distribution grids – Bonus link to a specific diagram



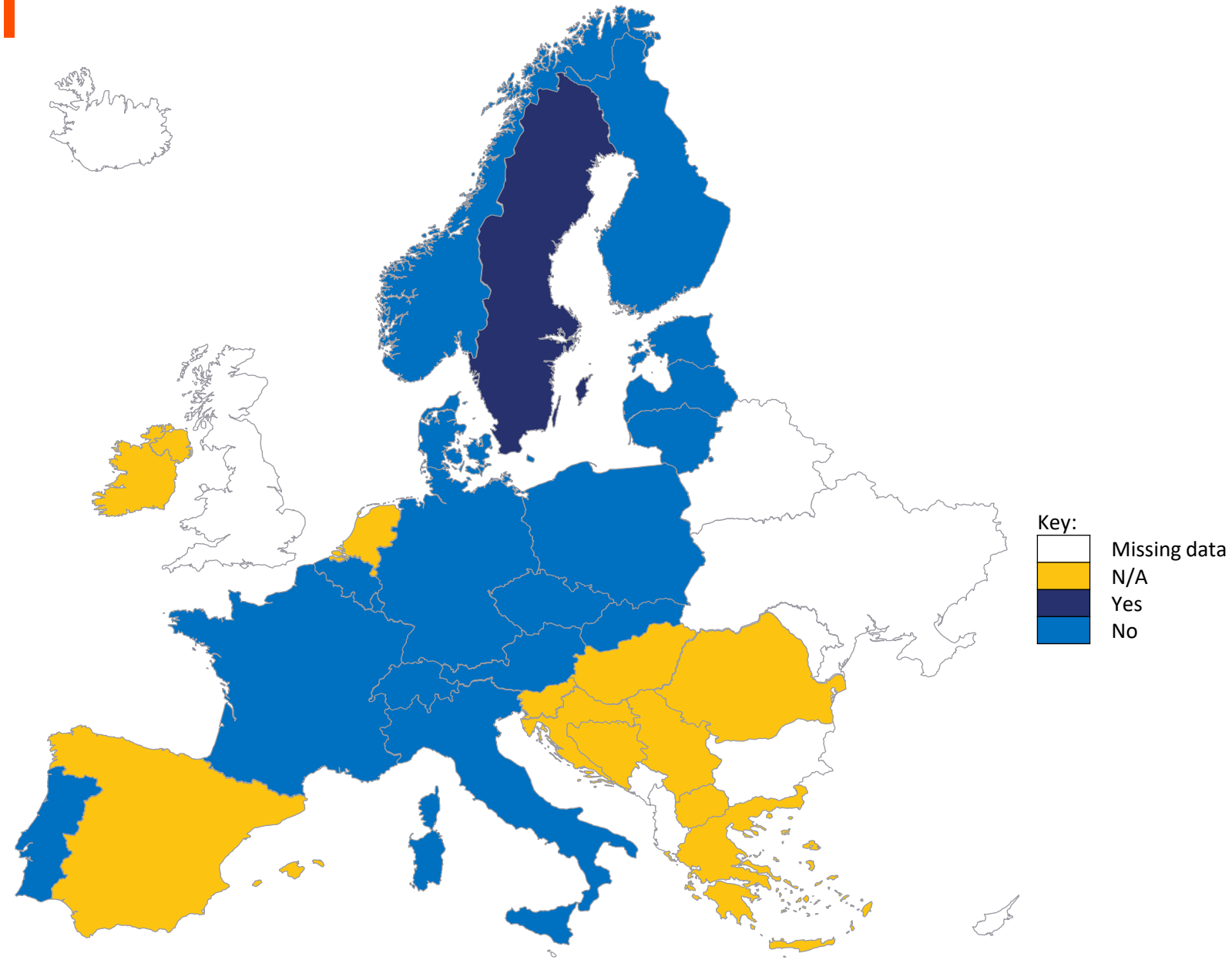
Voltage control – Settlement rules for the price of reactive power between transmission and distribution grids – Regulated price



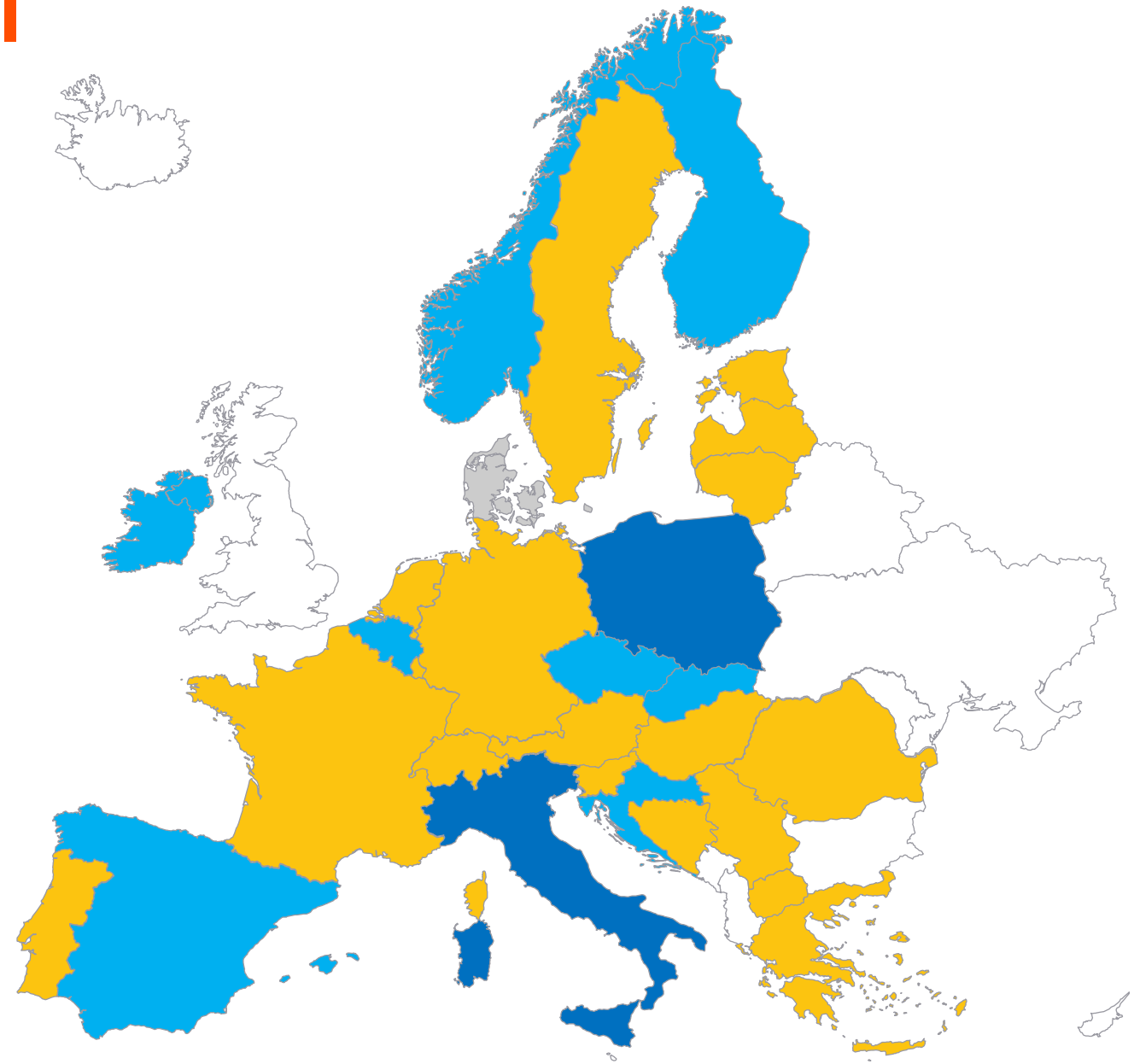
Voltage control – Settlement rules for the price of reactive power between transmission and distribution grids – No rules



Voltage control – Settlement rules for the price of reactive power between transmission and distribution grids – Free



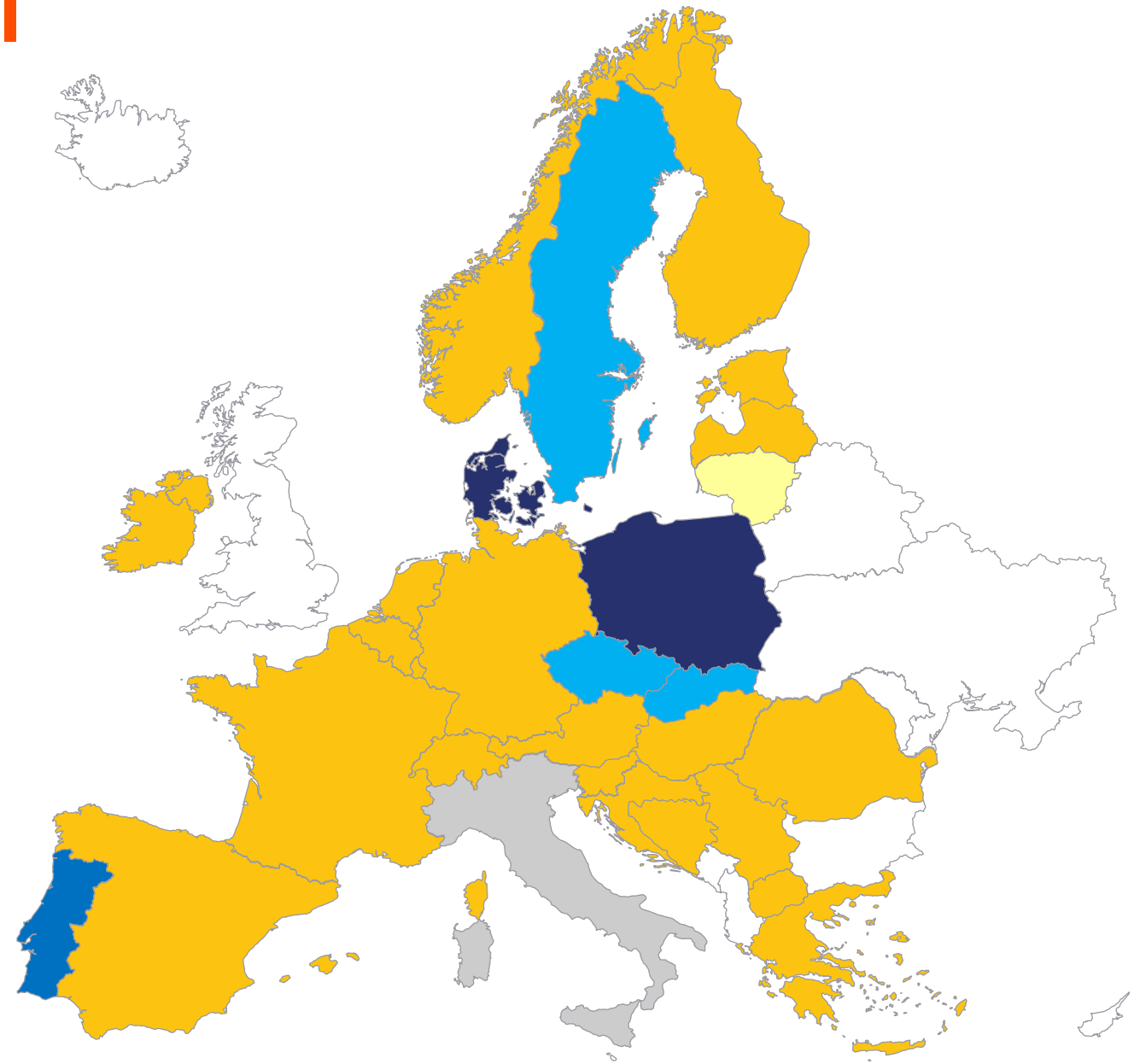
Voltage control – Are the primary voltage control parameters (proportional integral parameters) same for each node?



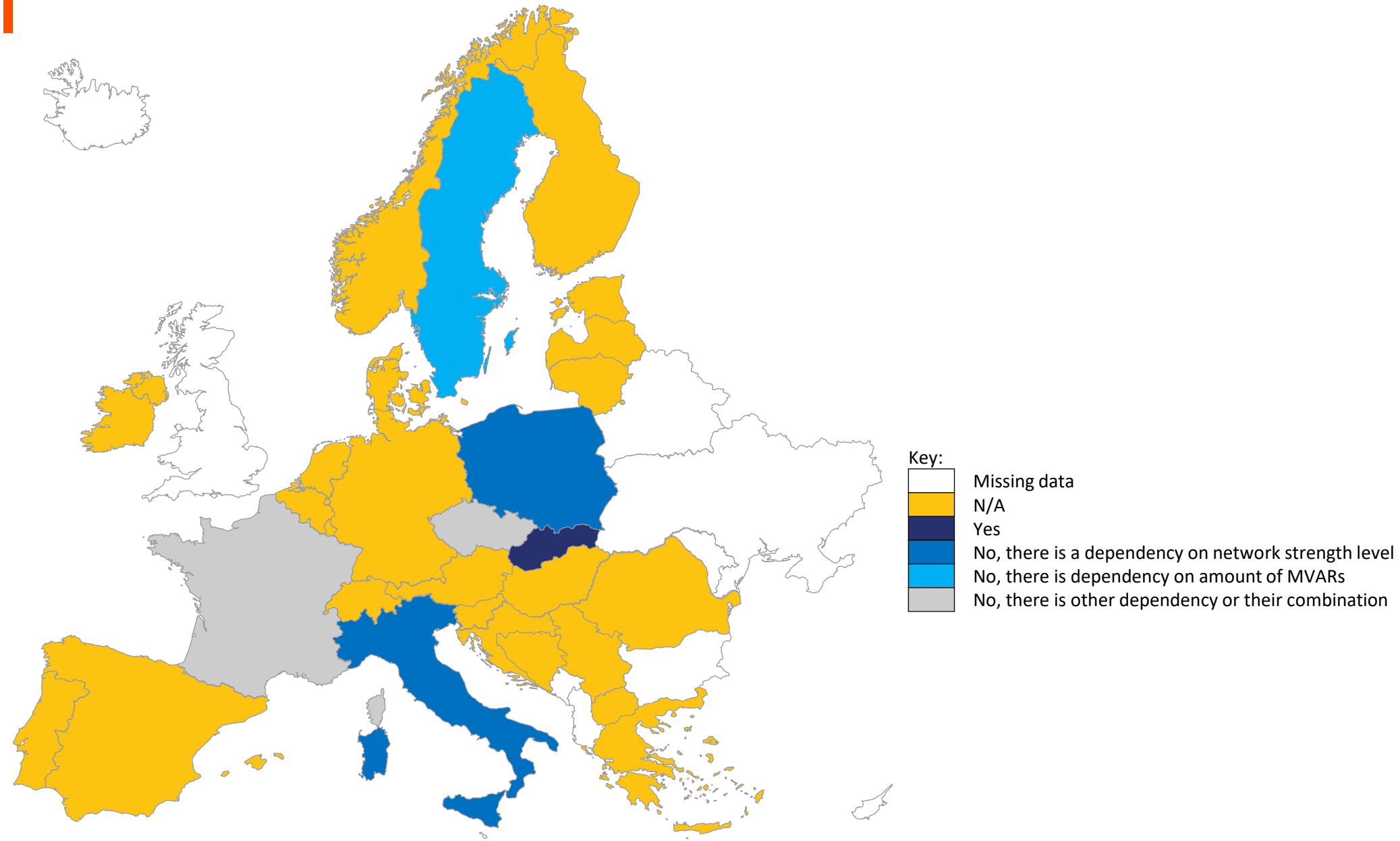
Key:

- Missing data
- N/A
- Yes,
- No, there is a dependency on the node strength level (short circuit current)
- No, there is dependency on the characteristics of the generator (generation type)
- No, there are other dependencies

Voltage control – Existing of secondary voltage control (SecVolCon) voltage control for the nominated mains?



Voltage control – Are secondary voltage control parameters (proportional integral parameters) the same for each pilot node?



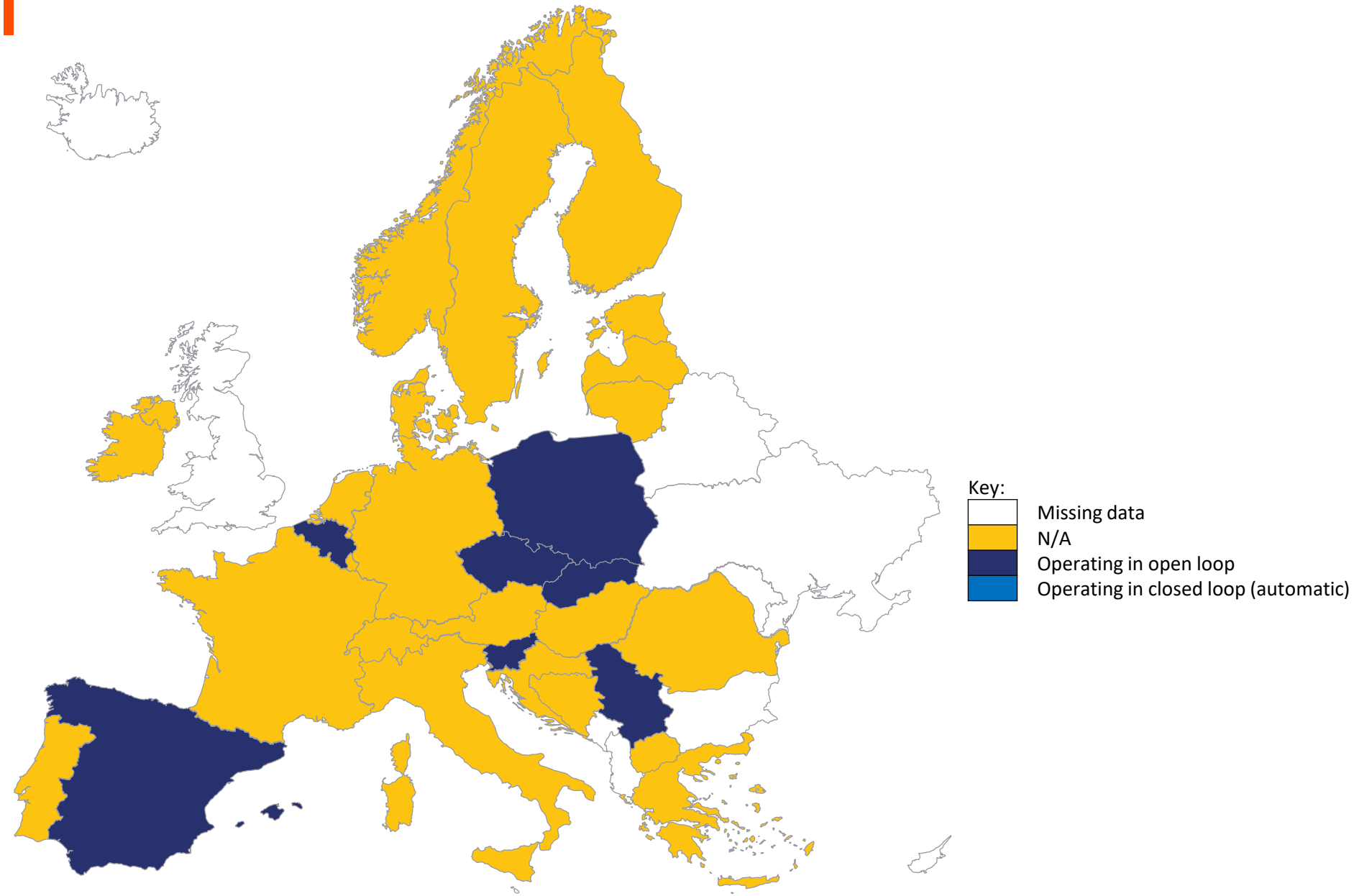
Voltage control – Are secondary voltage control parameters (proportional integral parameters) the same for each pilot node? (1/2)

TSO	Answer
APG	N/A
CEPS	The input value for the automatic (secondary) control loop is a voltage set-point. The automatic voltage control system sends a certain value of reactive-power set-point to each power plant unit according to a voltage set-point change.
Eirgrid	N/A
ELES	N/A
HOPS	N/A
MAVIR	N/A
PSE	Dispatcher updates voltage level according to the situation in the system based on voltage stability assessment results.
SONI	N/A

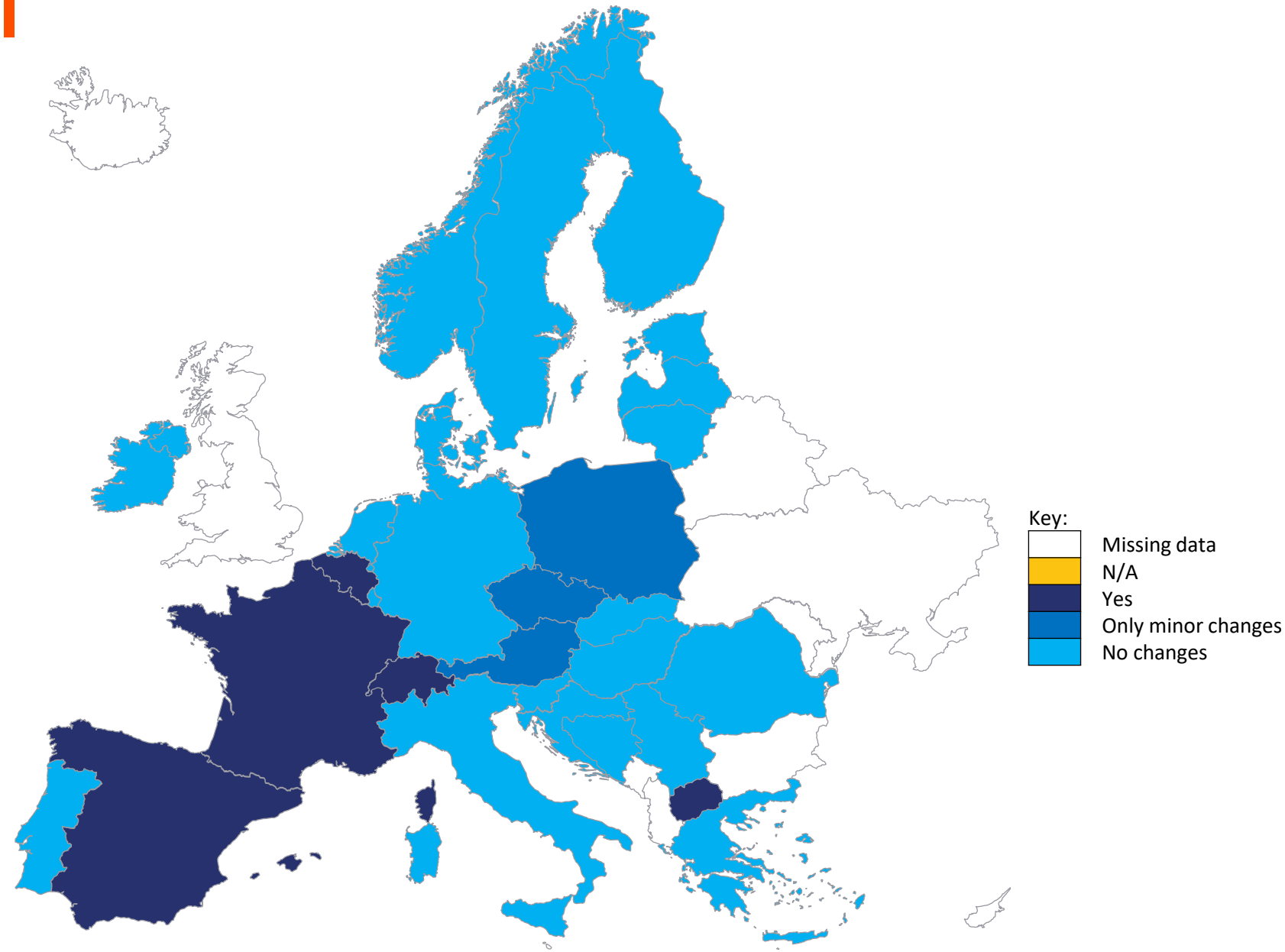
Voltage control – Are secondary voltage control parameters (proportional integral parameters) the same for each pilot node? (2/2)

TSO	Answer
Swissgrid	N/A
Terna	The update is done every 4 seconds; the update is fundamental, so if it does not work, after 40s the secondary loop is automatically stopped and the voltage control continues locally using the same voltage reference as when the missing update occurred

Voltage control – Existing of tertiary voltage control



Voltage control – Do you consider changes significant/important regarding the voltage control?



Please, explain changes regarding the voltage control (and the reason behind) in comparison to the year 2020! (1/2)

TSO	Answer
APG	Implementation of automatic QU/Control of power plants in the HV grid envisaged for the middle future. First pilot generators implemented. Comprehensive voltage control concept planned.
CEPS	Minor changes in 2021. Variable shunt reactors were installed in the transmission system in 2021. These facilities are included for automatic voltage control in pilot nodes.
REE	Envisaged that Spanish system will evolve in the future towards a tertiary/secondary/primary voltage control scheme jointly with local reactive power inductive/capacitive reserve markets.
Swissgrid	Modifications in the operational layout of some transformers. Development of visualization tools for different voltage control-related KPIs to improve monitoring of the voltage situation. More resources are available from distribution systems as a result

Please, explain changes regarding the voltage control (and the reason behind) in comparison to the year 2020! (2/2)

TSO	Answer
ELIA	Elia introduced in 2021 a new design for the voltage and reactive power control service. The main changes are: • The introduction of a mandatory participation to the service for the units (connected to transmission grid only) that are capable to control the voltage and the reactive power according to the requirements from the European network codes and national grid codes • The introduction of a voluntary participation to the service for the non-mandatory units. The voluntary participation to the service is technology-neutral and open to units connected to transmission/distribution and closed-distribution grids. • The introduction of the role of “Voltage Service Provider (VSP)” which delivers the service to Elia and signs the contract. The VSP can be the grid user of a unit or a third party designated by him. • The introduction of a remuneration for the service based on the “reactive power requested by the TSO” instead of the reactive power measured. The related settlement (activation control, penalties) have been adapted accordingly. The drivers for these changes were described in a study published on Elia website in 2018. The main driver was the inefficiency of the previous market-based procurement process (based on voluntary participation at free prices via a public procurement process) that lead to systematic price imposition by the regulator. The objective of the new design is to evolve to a mandatory participation for some units and voluntary participation for the other units (as described above) at regulated price(s) and without tendering process. The evolution to regulated prices and removal of the tendering process need still to be finalized.

Black Start

(Referring to questions of AS survey from BSQ1.0 to BSQ20.1)

Black Start – Which power plants have to provide black start (for example: capacity, technology etc.)? Is it a mandatory service in your country? (1/4)

TSO	Answer
APG	Hydro storage power plants.
AST	No special rules - agreement with hydro power plant for providing the service.
CEPS	No obligations to provide black start for any unit.
CREOS	No possibility to provide Black Start from LU.
Eirgrid	It is not mandatory. Technologies currently providing black start: Hydro, Pumped Storage, Interconnector, Open Cycle Gas Turbines.
Elering	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.
ELES	HPP, CCGT, No mandatory service.
Elia	The Black-Start service is not mandatory and is procured via a market-based procedure. The power plants willing to participate to the service have to satisfy the technical requirements described in the Black-start contract.

Black Start – Which power plants have to provide black start (for example: capacity, technology etc.)? Is it a mandatory service in your country? (2/4)

TSO	Answer
EMS	Hydro power plants defined by System Restoration document are obliged to provide Black start capability. Black start service is not mandatory for all HPP.
Energinet	Contracted gas turbines, procured through tender.
Fingrid	Not mandatory, agreed bilaterally with suitable power plants.
German TSOs	Black start provision according to respective black-start concepts, based on grid connection and specific contracts. Mandatory if TSO requests power plants to offer black start service.
HOPS	All the units that are able to provide BS must provide it.
IPTO	Power plants with such an obligation in their license have to provide Black Start service.
LITGRID	Power plants that are included in the black start plan must provide the black start service (due totechnology).
MAVIR	It is mandatory above 500 MW gross installed capacity, below that bilaterally agreed.
MEPSO	Mandatory HPP with self-starting option.

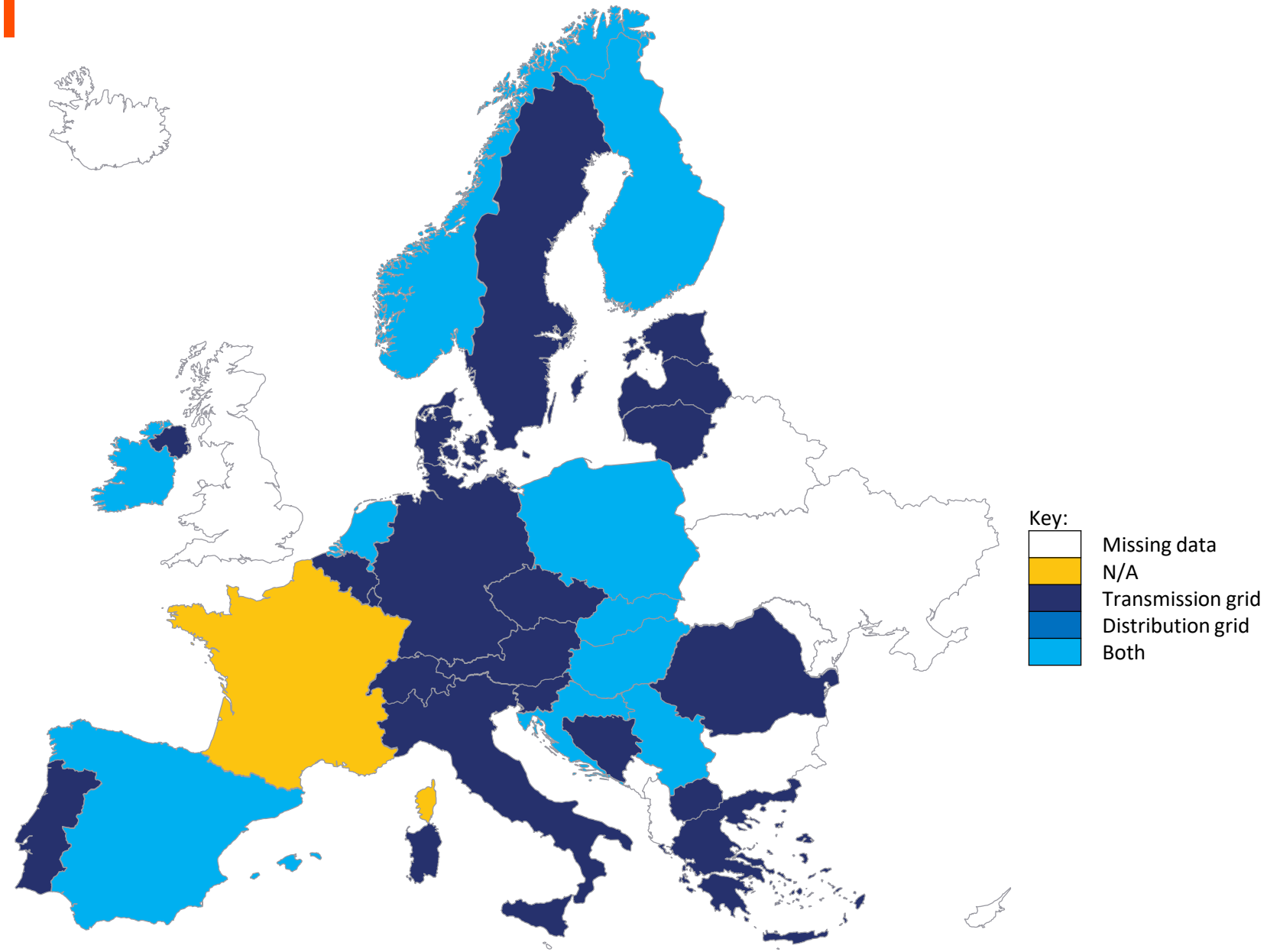
Black Start – Which power plants have to provide black start (for example: capacity, technology etc.)? Is it a mandatory service in your country? (3/4)

TSO	Answer
NOSBiH	Hydroelectric power Yes, Black start is mandatory service
SONI	Conventional (Thermal) Power Stations must have black start capability.
PSE	It is not a mandatory service in Poland.
REE	Mainly hydro units; not a mandatory service
REN	BS is not a mandatory service in Portugal. We have a CCGT and a Hydro that provide that service.
RTE	No blackstart service is required in France for the restoration service since the restoration service is fulfilled through “tripping to houseload” capability for all the French restoration service providers.
SEPS	No, it is not mandatory.
Statnett	Power plants that have a significant impact on the reconstruction of the network or other critical functions.

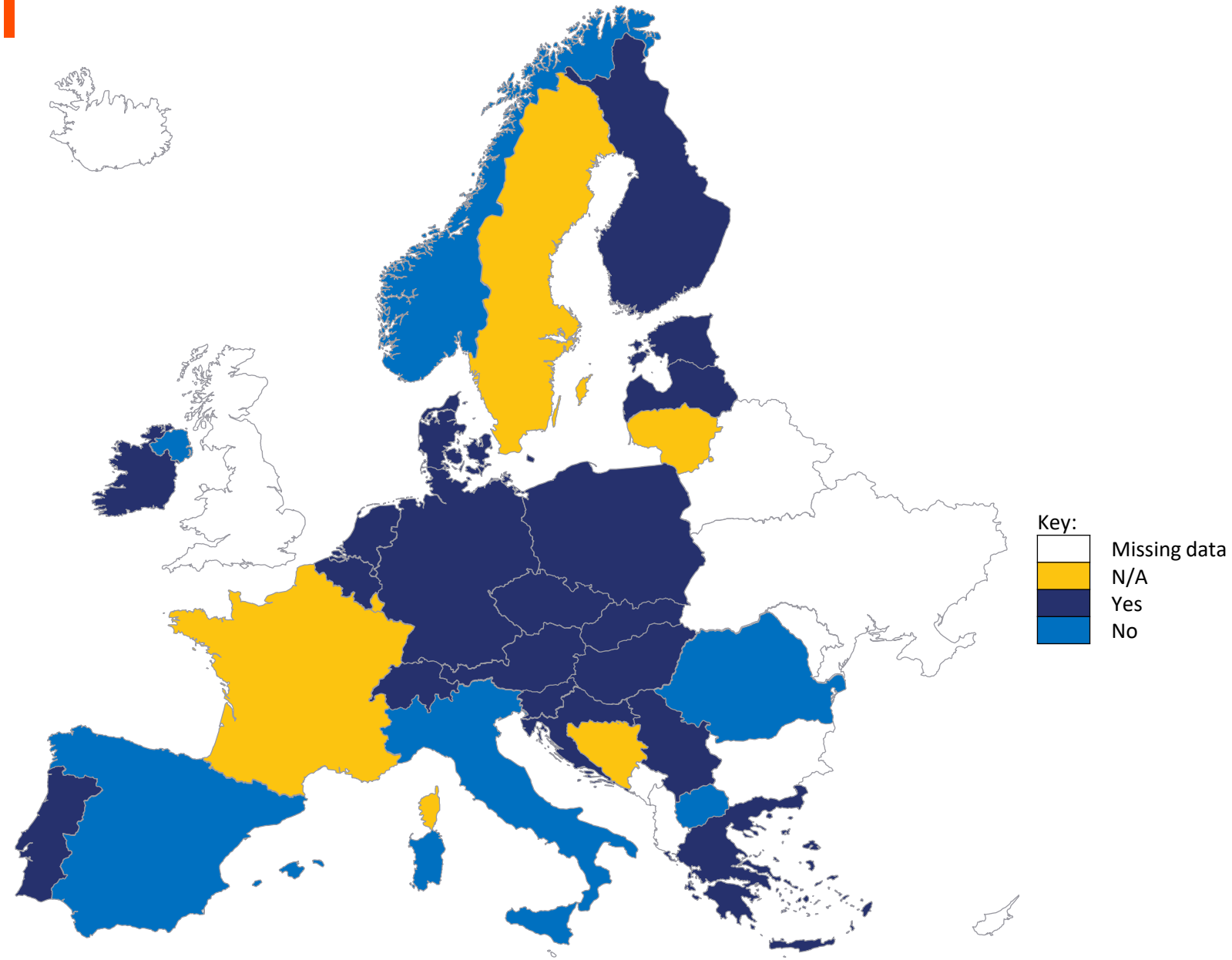
Black Start – Which power plants have to provide black start (for example: capacity, technology etc.)? Is it a mandatory service in your country? (4/4)

TSO	Answer
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 stations 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 NL	The Black Start service is a contracted and not a mandatory service.
Terna	Black start up service is provided mainly by hydroelectric power plants and in some cases to some typologies of gas turbine based power plant. 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.

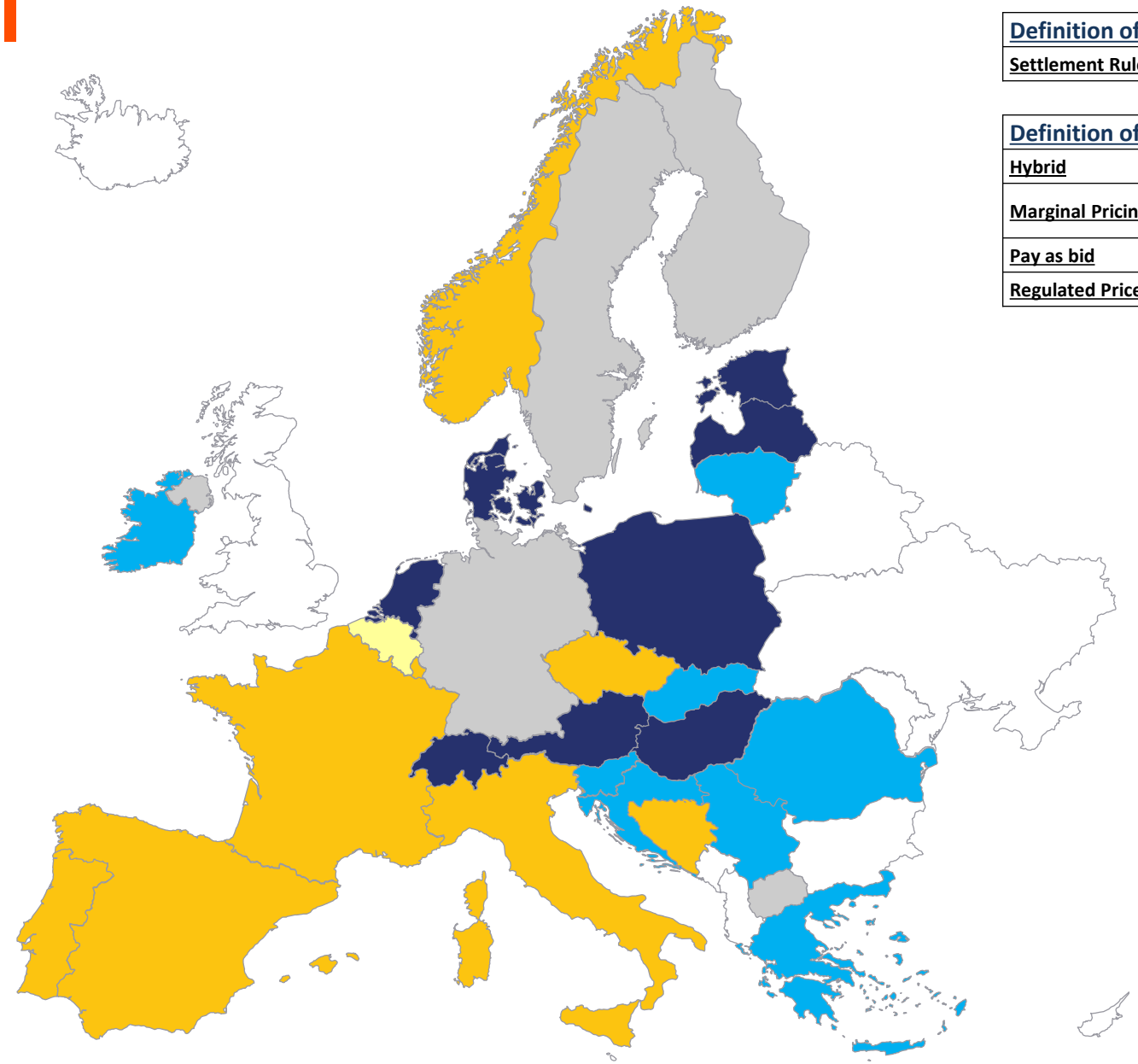
Black Start - If a power plant is able to provide black start service, which grid it should be connected to?



Black Start - Is it a service paid by the TSO?



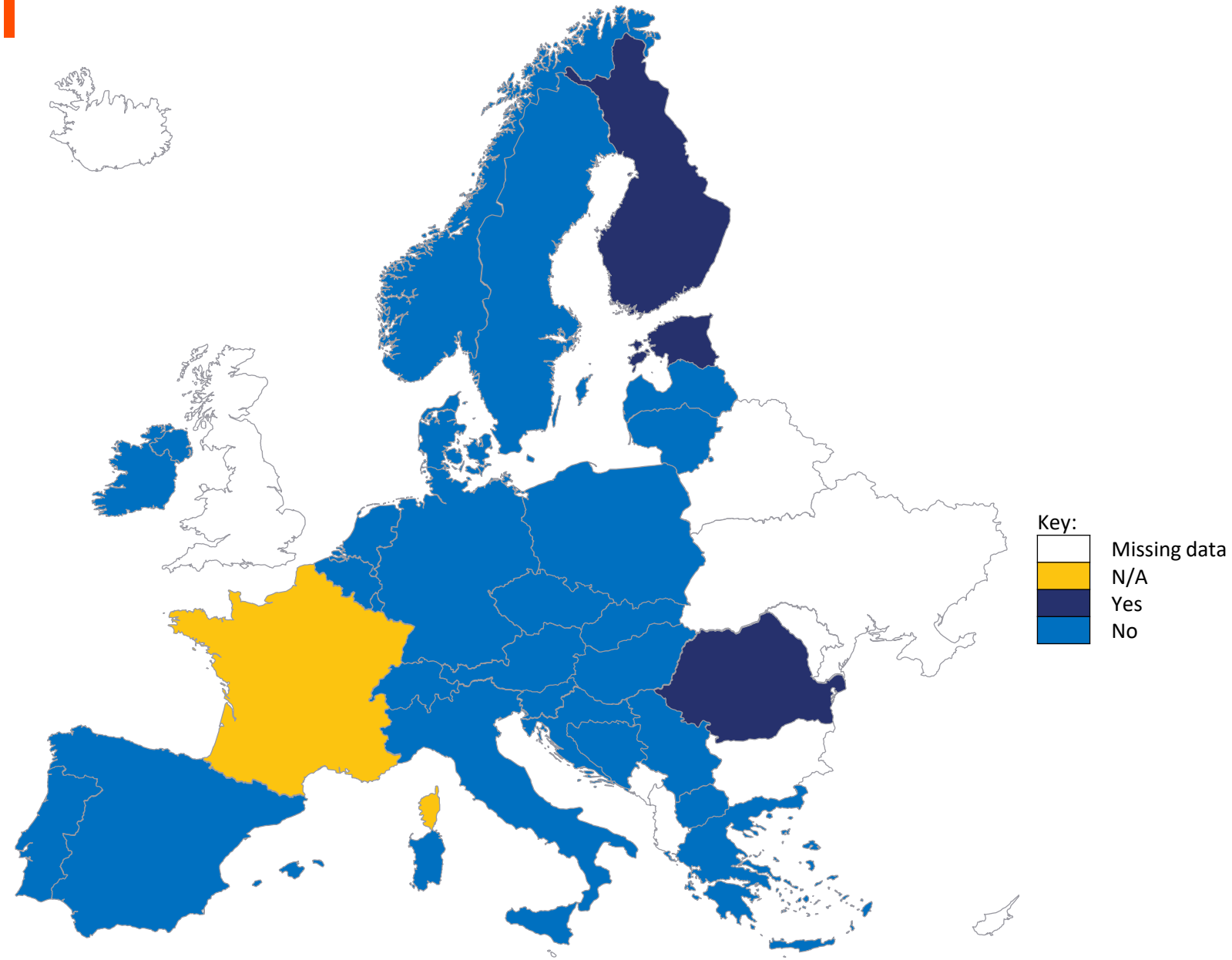
Black Start - Settlement Rule



Definition of question	
Settlement Rule	The pricing rules for settlement.

Definition of answer	
Hybrid	Combination of given options.
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.

Black Start - Does the TSO own unit for Black start service?



Black Start – Does the TSO have some special rules for the distribution/location/number etc. of black start service units? (1/3)

TSO	Answer
APG	Black start units geographically separated.
AST	No.
CEPS	N/A. For each case it is necessary to carry out the feasibility study and check BS path conditions.
Creos	No.
Eirgrid	The TSO considers regional requirements when awarding BS contracts.
ELES	Yes, according to local operation rules.
Elia	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.
EMS	No
Energinet	Yes, two per bidding area - at least one power generating unit.

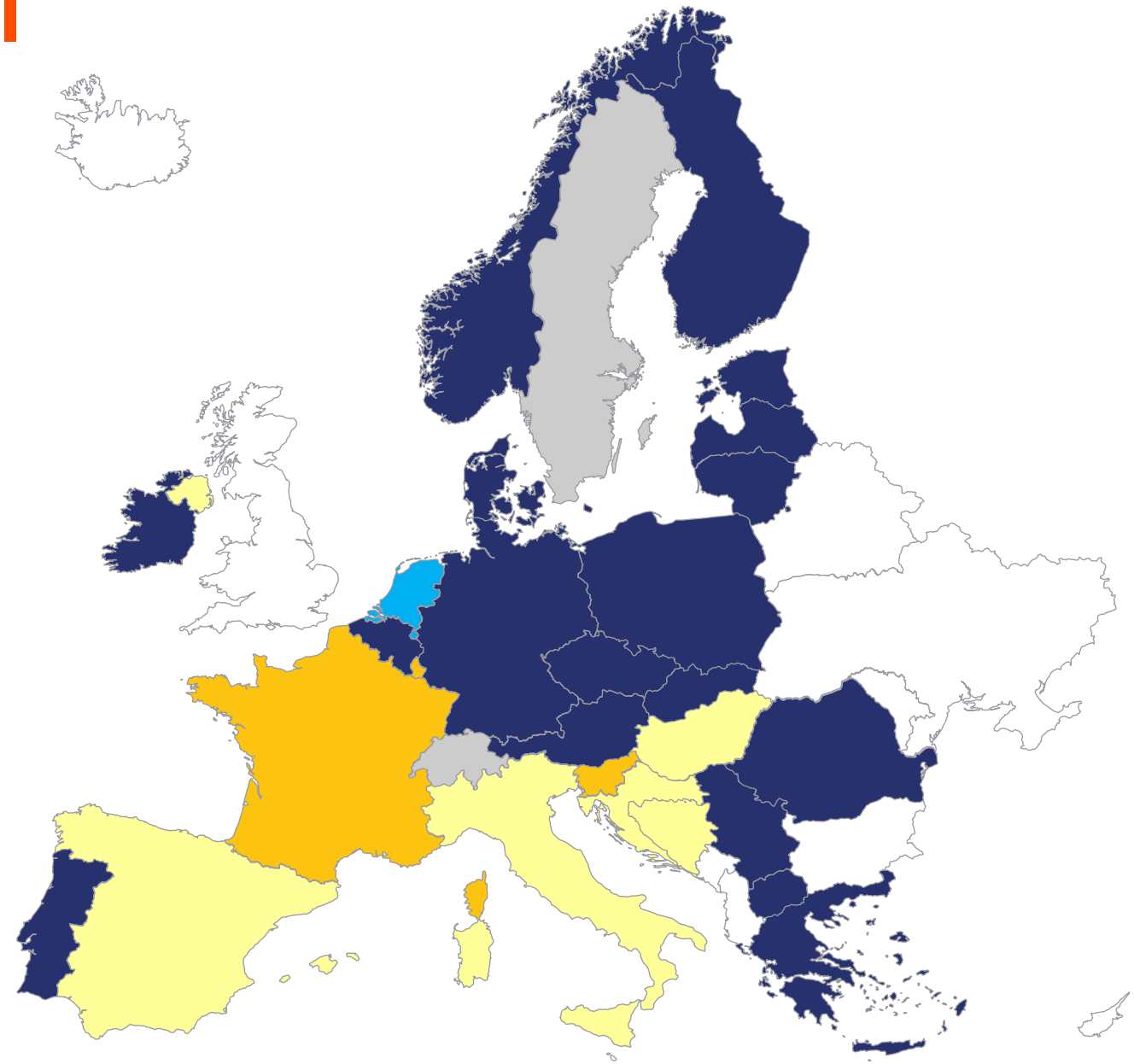
Black Start – Does the TSO have some special rules for the distribution/location/number etc. of black start service units? (2/3)

TSO	Answer
Fingrid	No special rules.
German TSOs	According to respective black-start concept
HOPS	All the units that are able to provide BS must provide it.
IPTO	No.
LITGRID	No special rules for distribution, black start service unit shall be located in such a place, where is feasible to restart main generation units.
MEPSO	No special rules.
NOSBIH	No.
PSE	TSO is obliged to fulfil standards from OH Policy 5.
REE	Yes

Black Start – Does the TSO have some special rules for the distribution/location/number etc. of black start service units? (3/3)

TSO	Answer
REN	No special rules.
SEPS	Yes, we have a set of different rules. Each application for BS providing is assessed separately.
SONI	N/A. For each case it is necessary to carry out the feasibility study and check BS path conditions.
Statnett	Power plants that have a significant impact on the reconstruction of the network or other critical functions.
Swissgrid	Distribution of CH in 4 network restoration regions (West, South, Cetraland East): Each region must have 1 buildup-cell
TenneT NL	Black Start services are contracted on units in different parts of the network
Terna	We have a predefined number of "restoration paths" included in the Restoration Plan.
Transelectrica	Geographical distance according to respective Black-Start concept.

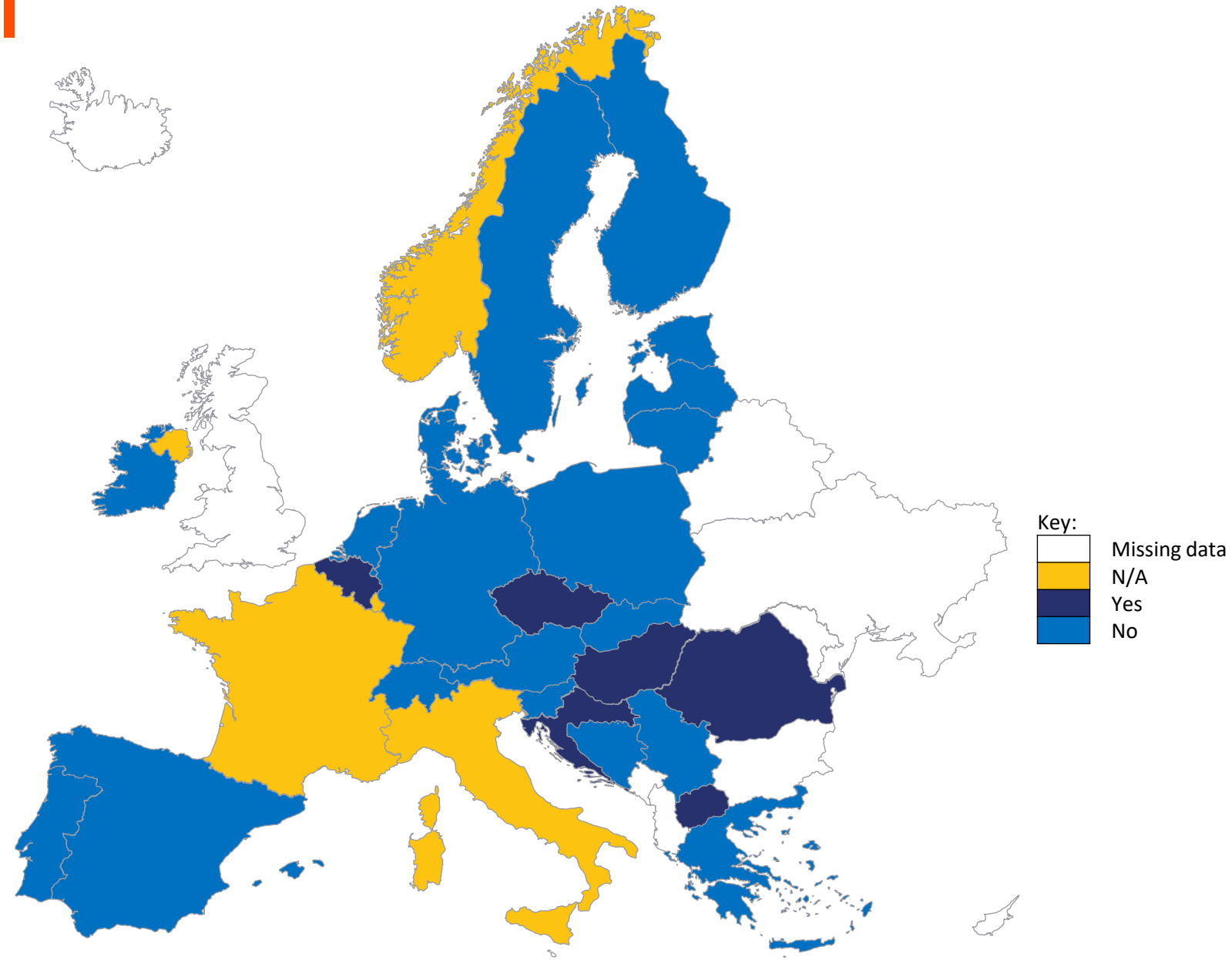
Black Start – Does the TSO have a regulated amount of BS control (regarding the whole control area)?



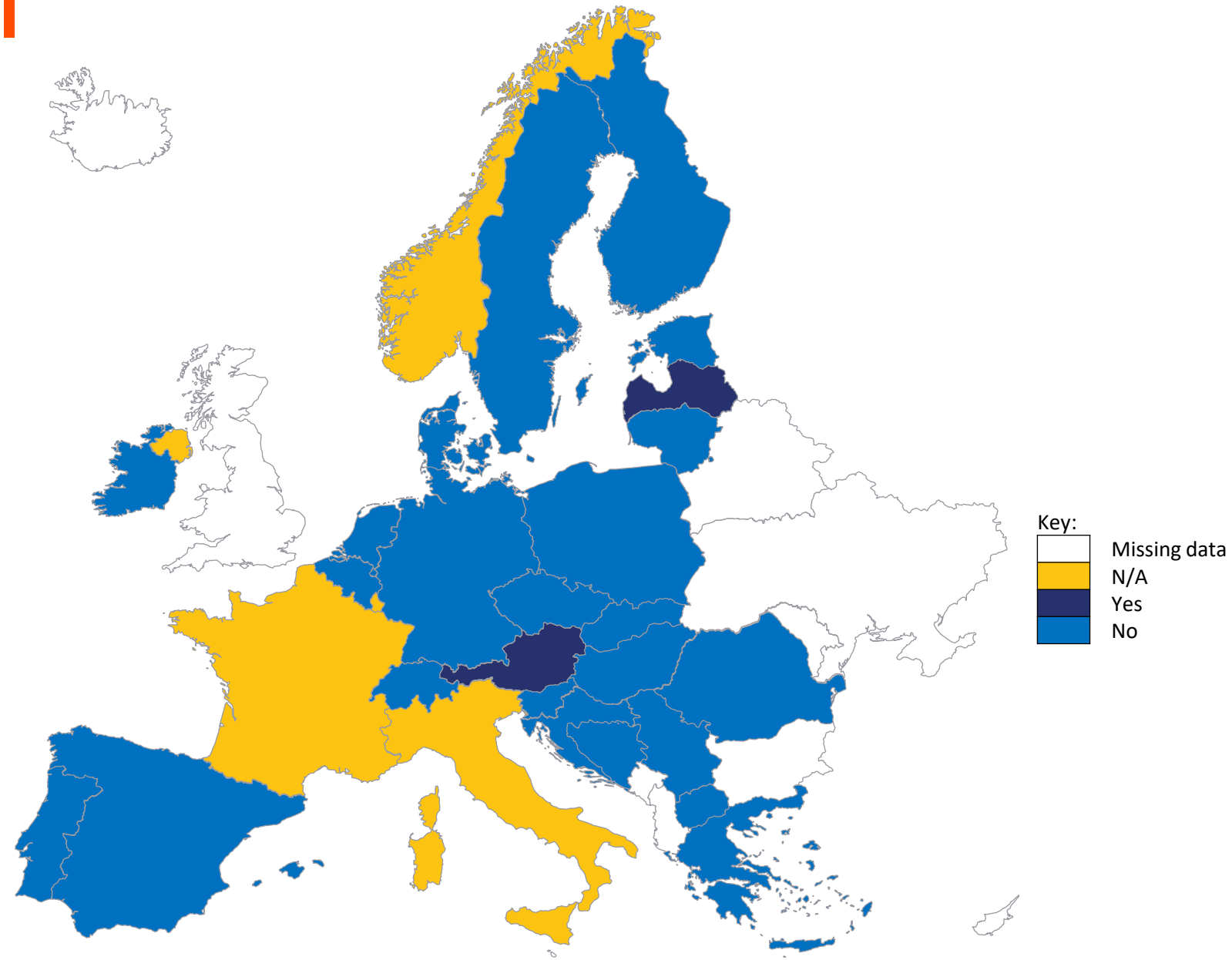
Key:

- 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

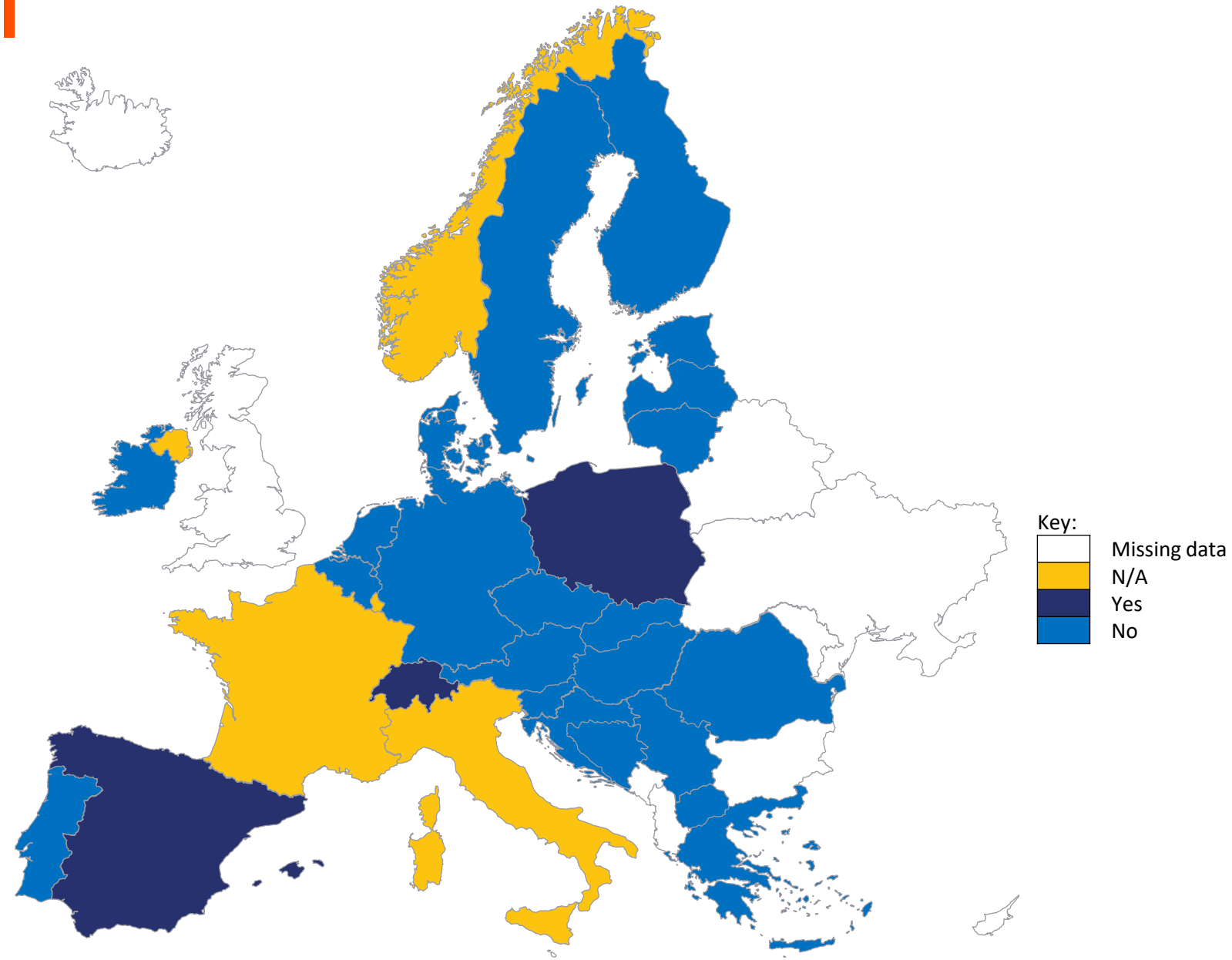
Black Start – Testing the BS ability by the TSO – During the accreditation process only



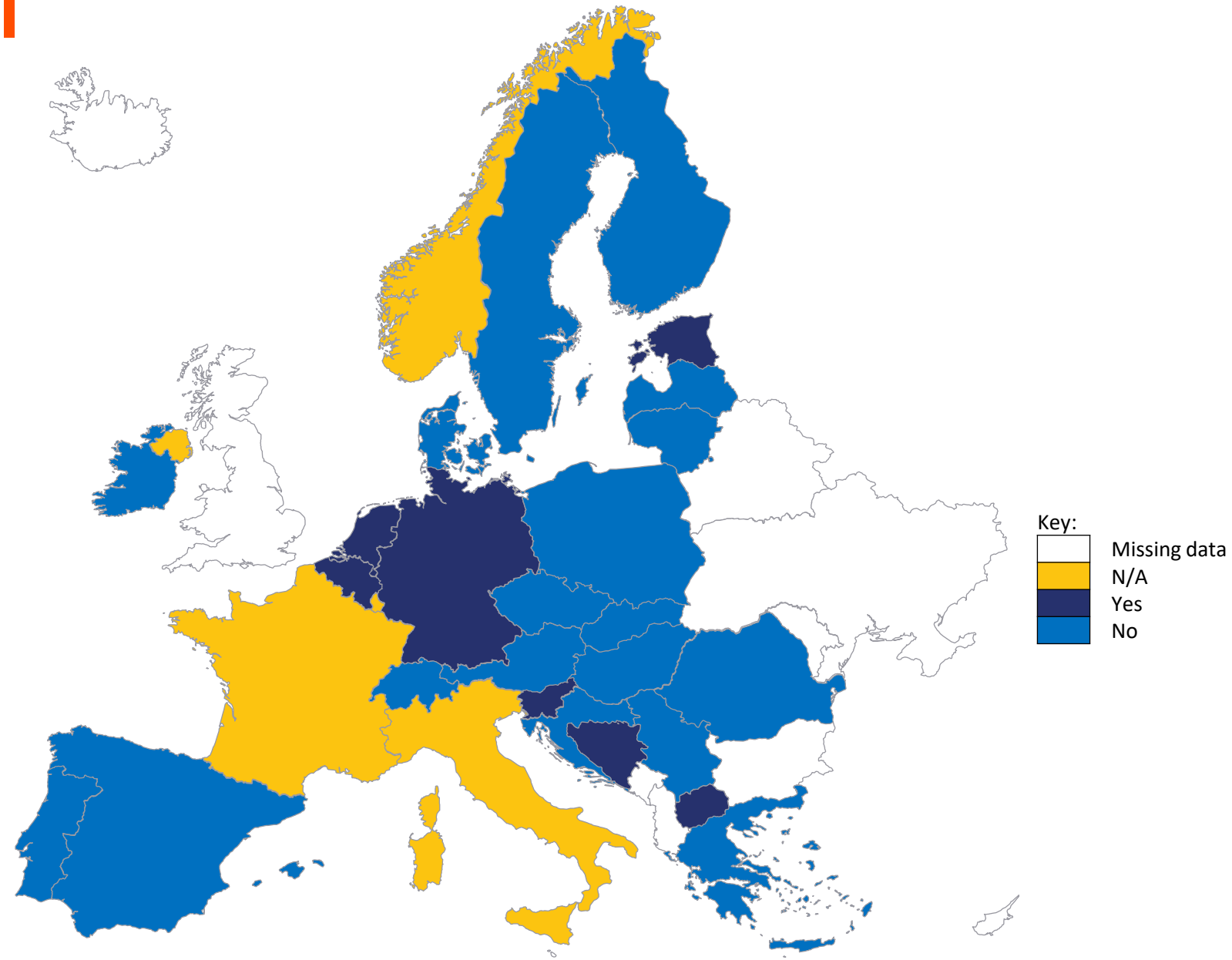
Black Start – Testing the BS ability by the TSO – After the accreditation process/ Only the operational function of the BS unit (unit is working, not connected to the grid)/Once a year



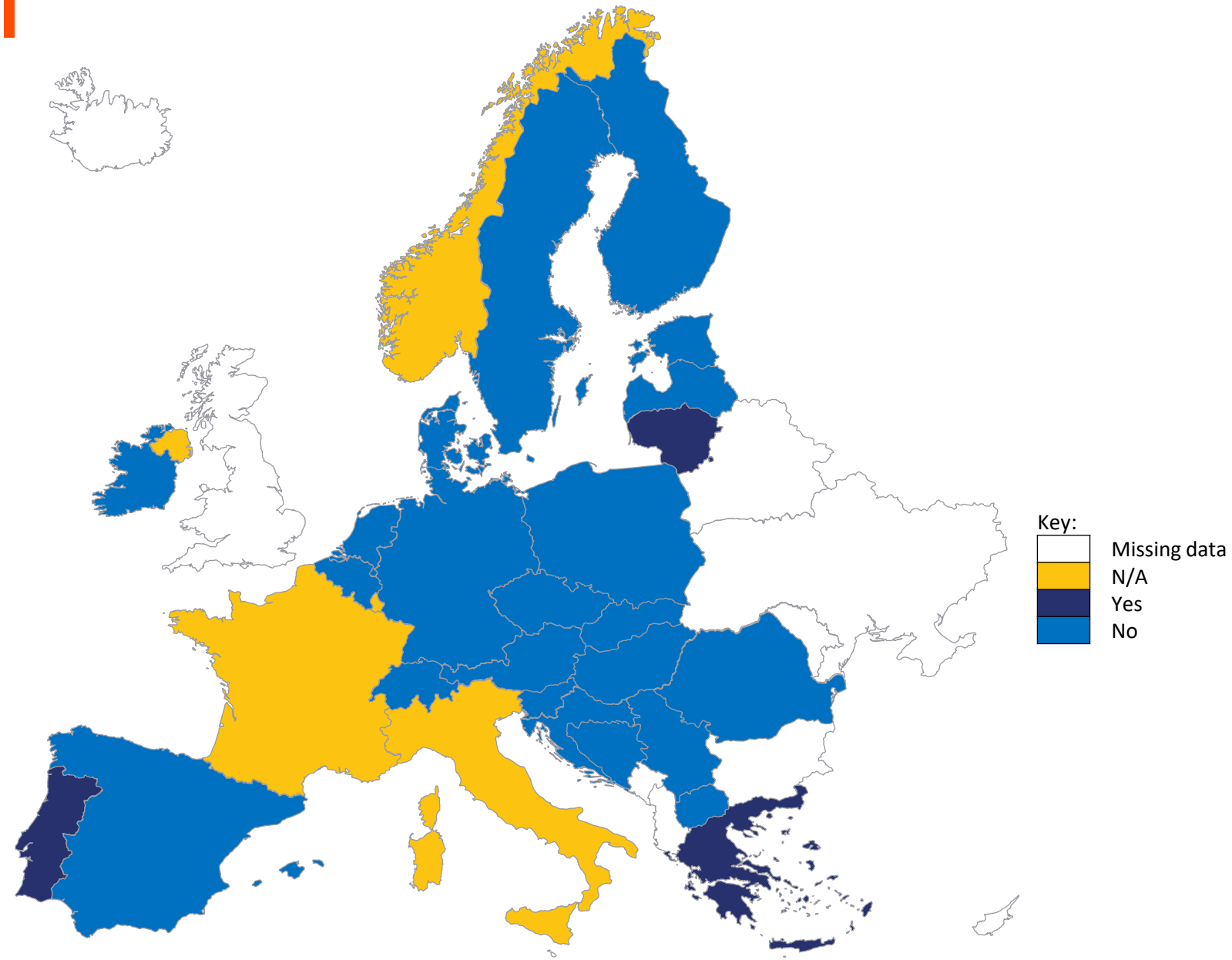
Black Start – Testing the BS ability by the TSO – After the accreditation process/ Only the operational function of the BS unit (unit is working, not connected to the grid)/Several times a year



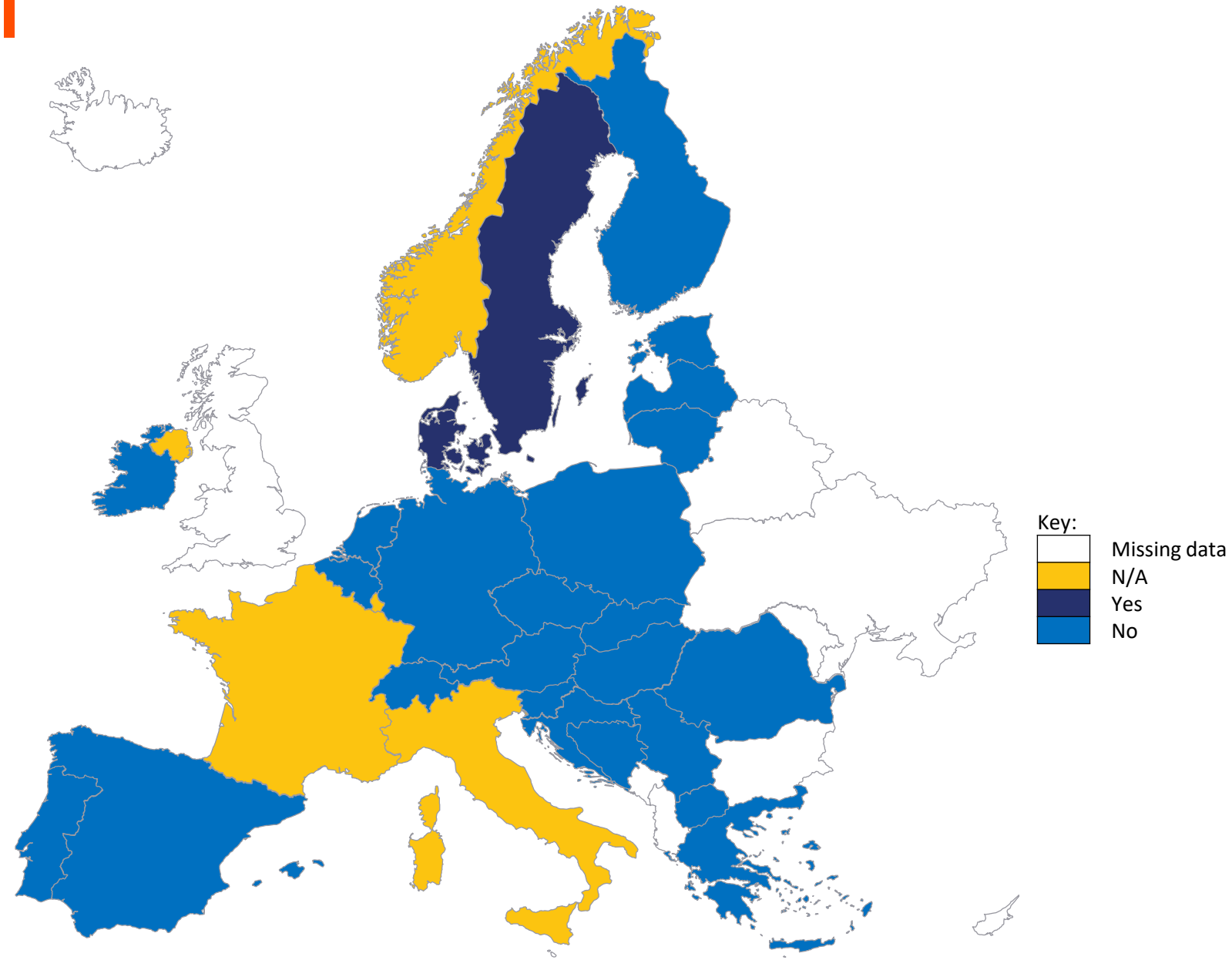
Black Start – Testing the BS ability by the TSO – After the accreditation process/ Only the operational function of the BS unit (unit is working, not connected to the grid)/Occasionally



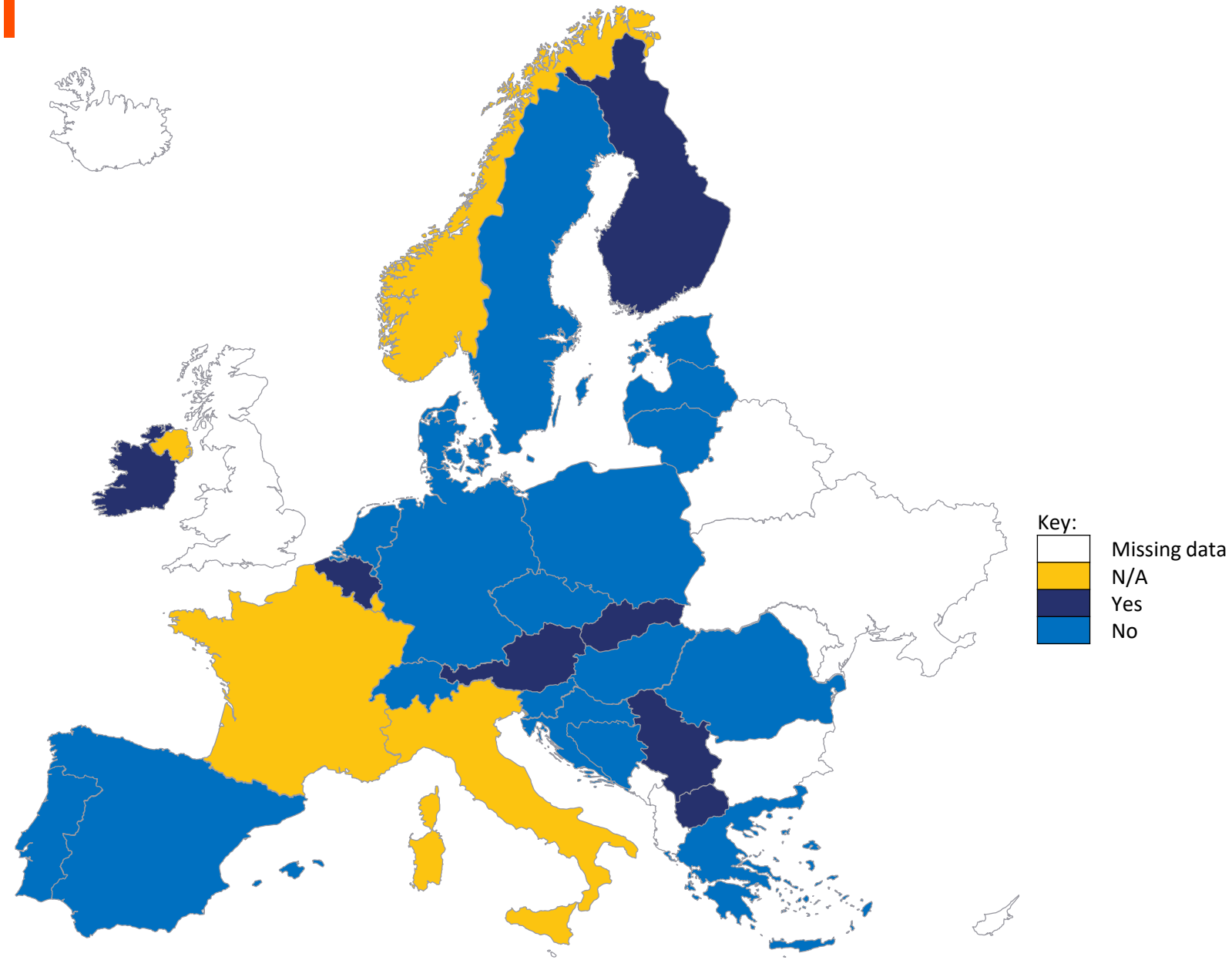
Black Start – Testing the BS ability by the TSO – After the accreditation process/ Control function of the BS unit (unit is working, connected to the grid and has to provide some predefined orders)/Once a year



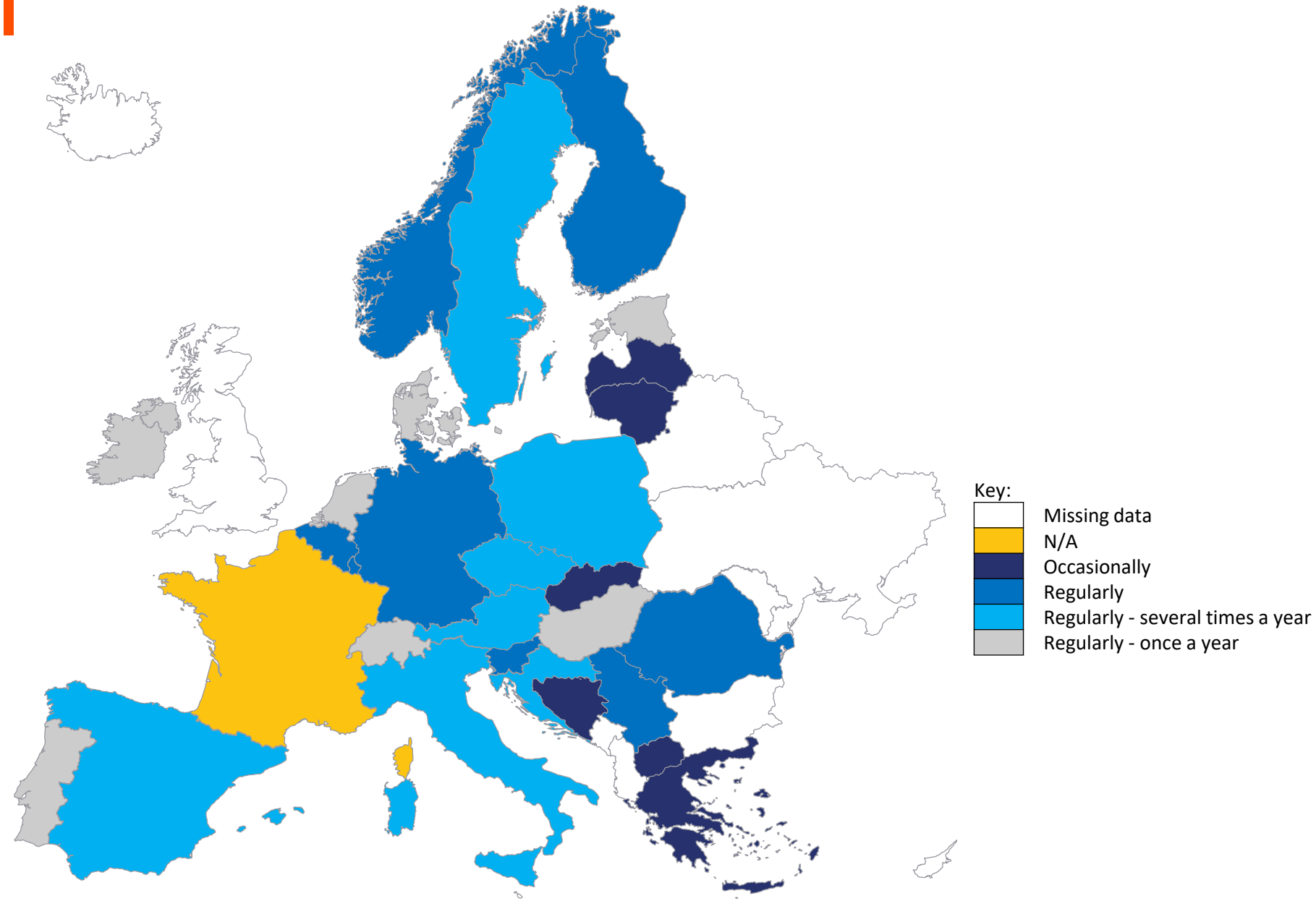
Black Start – Testing the BS ability by the TSO – After the accreditation process/ Control function of the BS unit (unit is working, connected to the grid and has to provide some predefined orders)/Several times a year



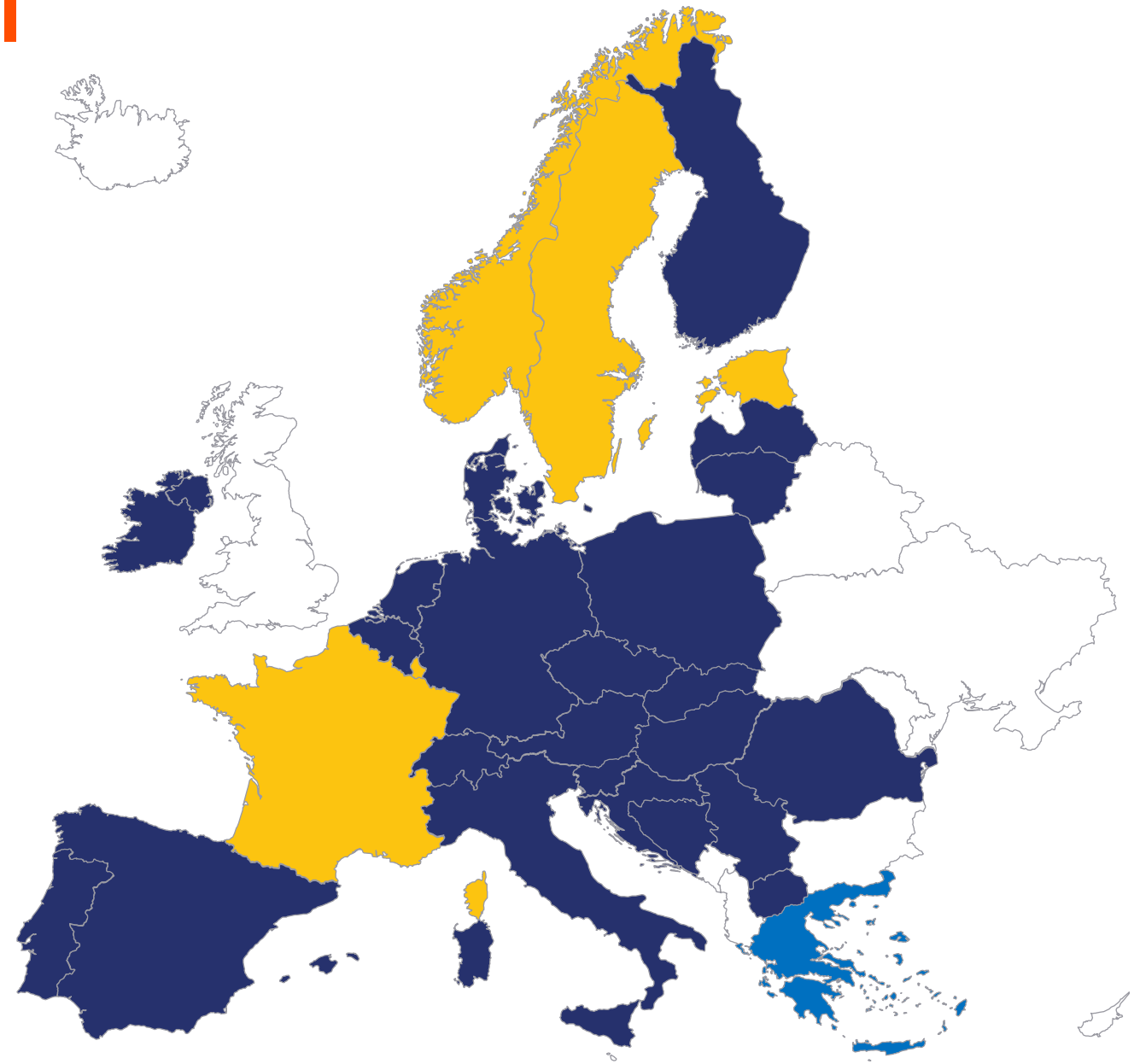
Black Start – Testing the BS ability by the TSO – After the accreditation process/ Control function of the BS unit (unit is working, connected to the grid and has to provide some predefined orders)/Occasionally



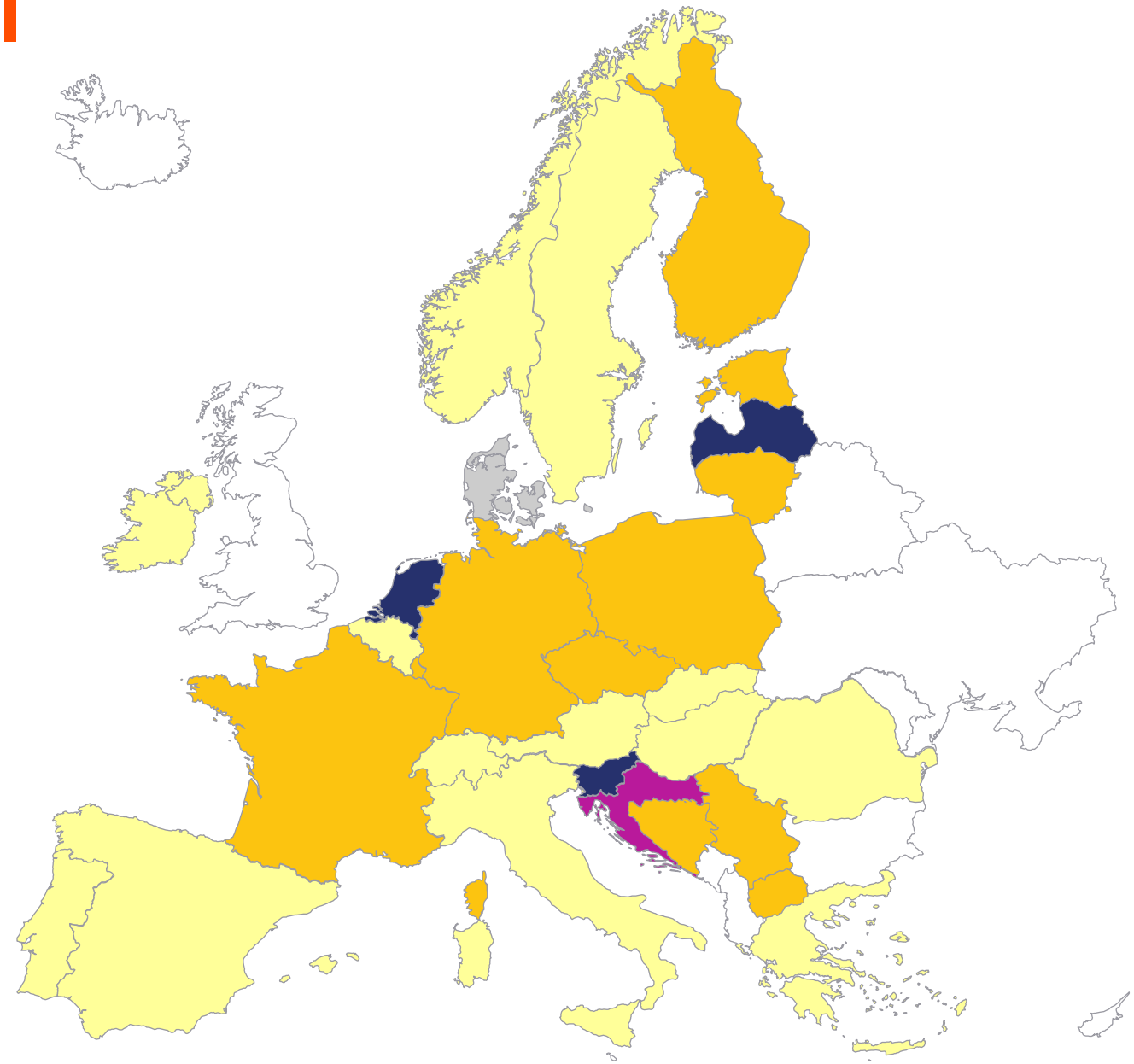
Black Start – How often does the TSO practise the method of the BS process (for example using a training simulator)?



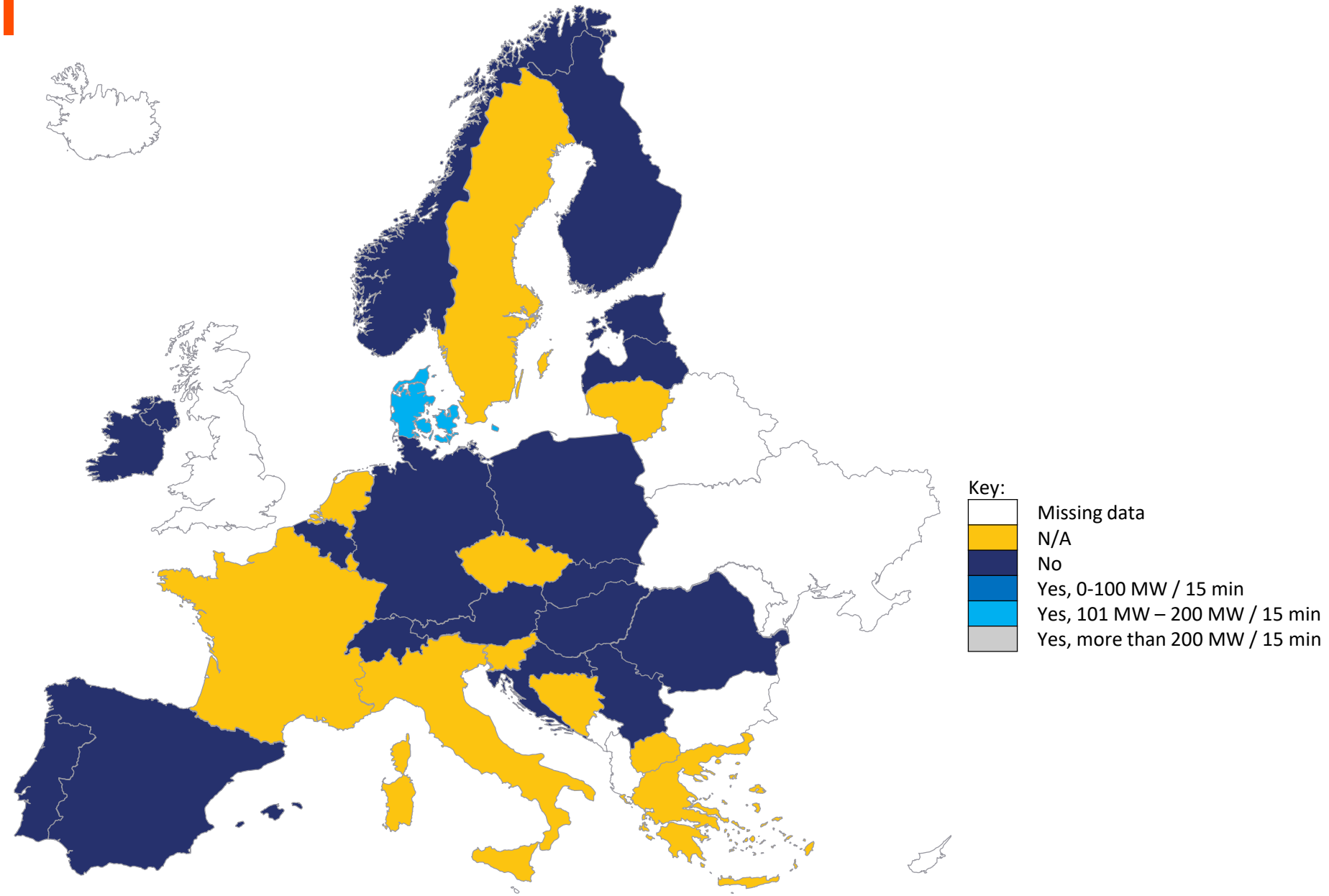
Black Start – Should be the Black start service provided by a single unit or it is allowed to be a part of a power plant?



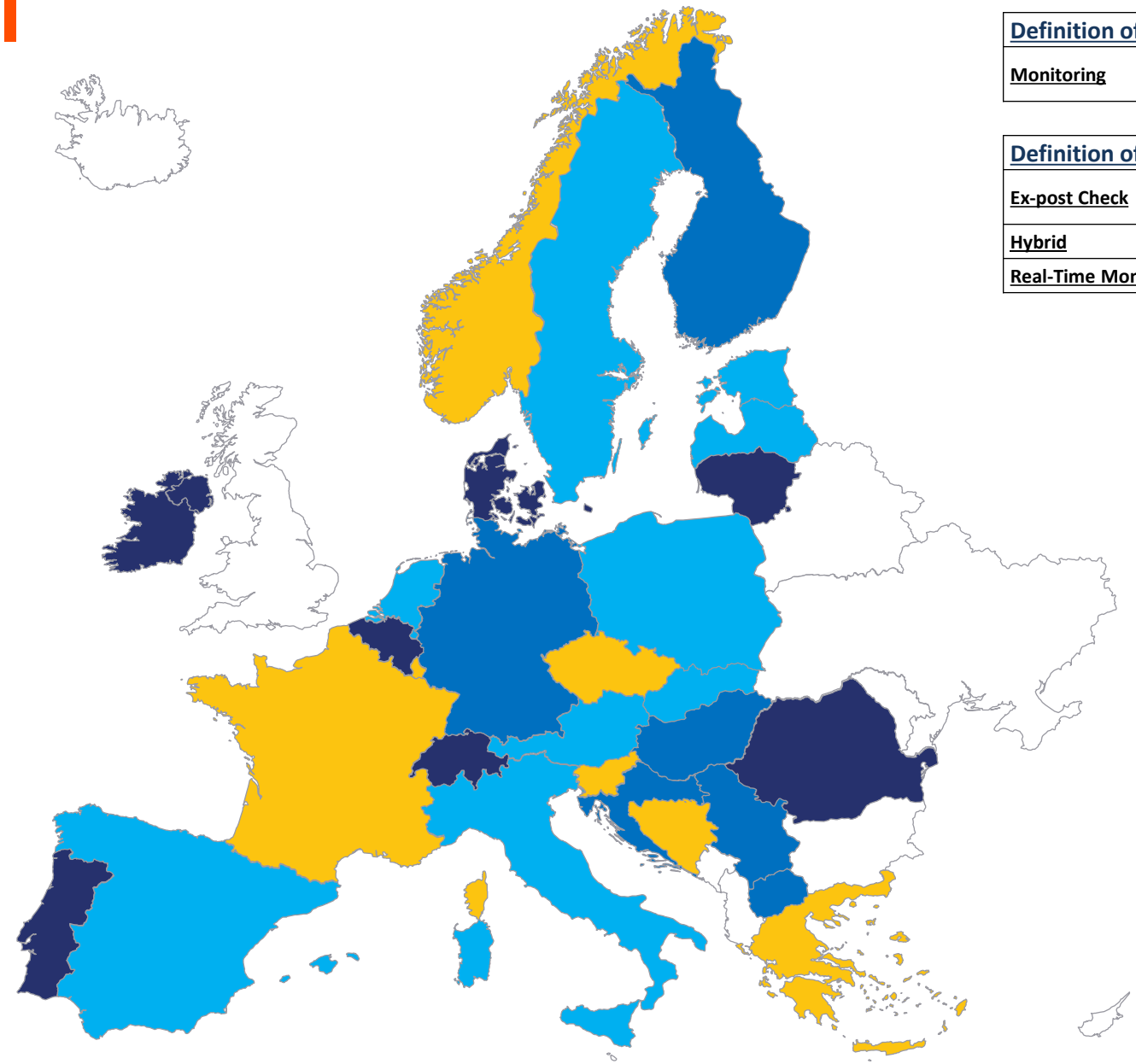
Black Start – How long is the acceptable non–availability period of the BS unit (planned, for example: resurrection & maintenance of the unit)?



Black Start – Is there a regulated gradient for the BS unit?



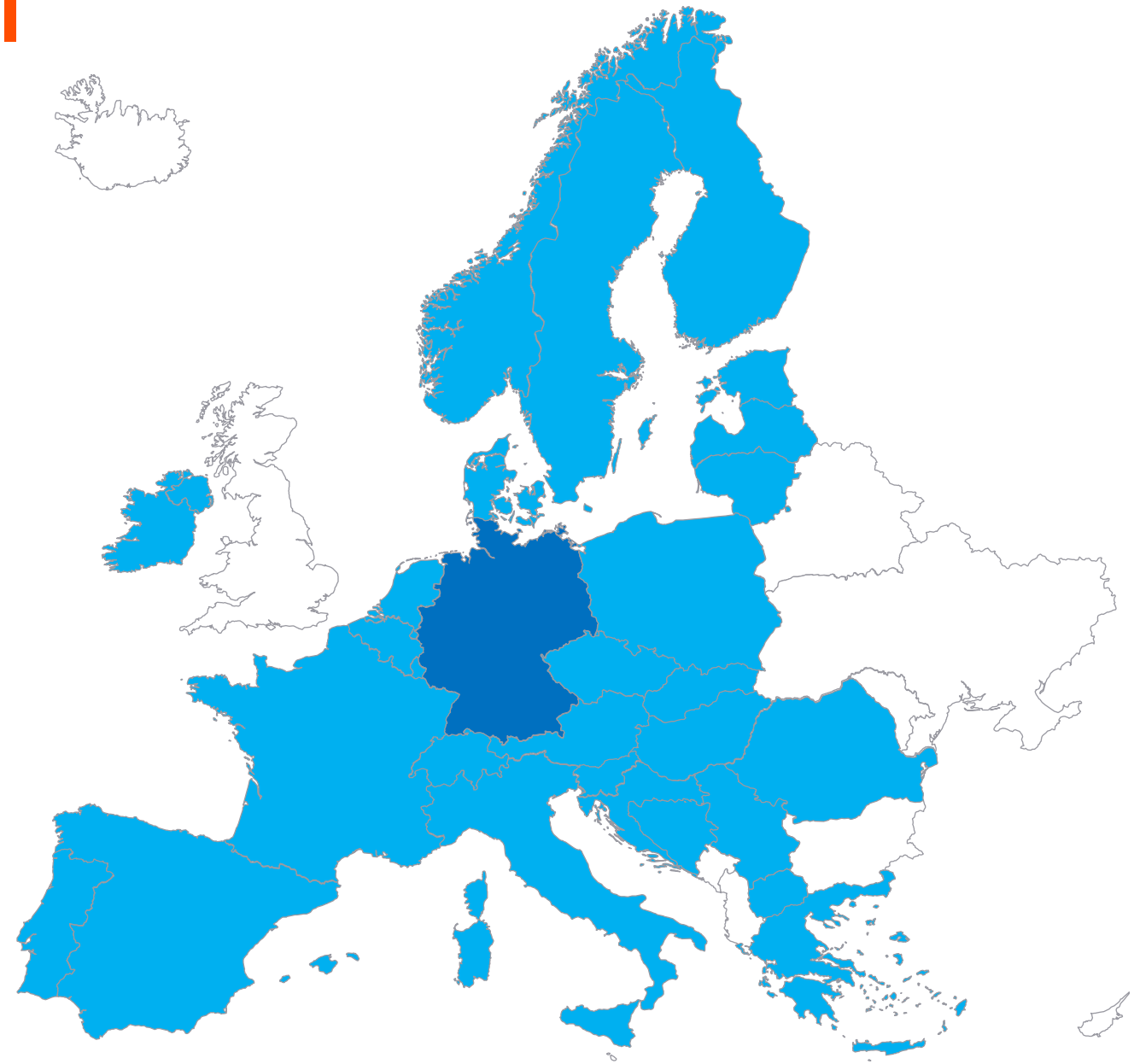
Black Start – Monitoring of the black start service?



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

Black Start – Do you consider changes significant/important regarding the voltage control?



Black Start – Black Start – Please, explain changes regarding the black start (and the reason behind) in comparison to the year 2020!

TSO	Answer
German TSOs	Market based procurement of black start services.