SURVEY ON ANCILLARY SERVICES PROCUREMENT, BALANCING MARKET DESIGN 2020

ENTSO-E WGAS

May 2021

25.05.2021

Table of Contents

Introduction (1)

ENTSO-E Survey on Ancillary services procurement, Balancing market design 2020

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.

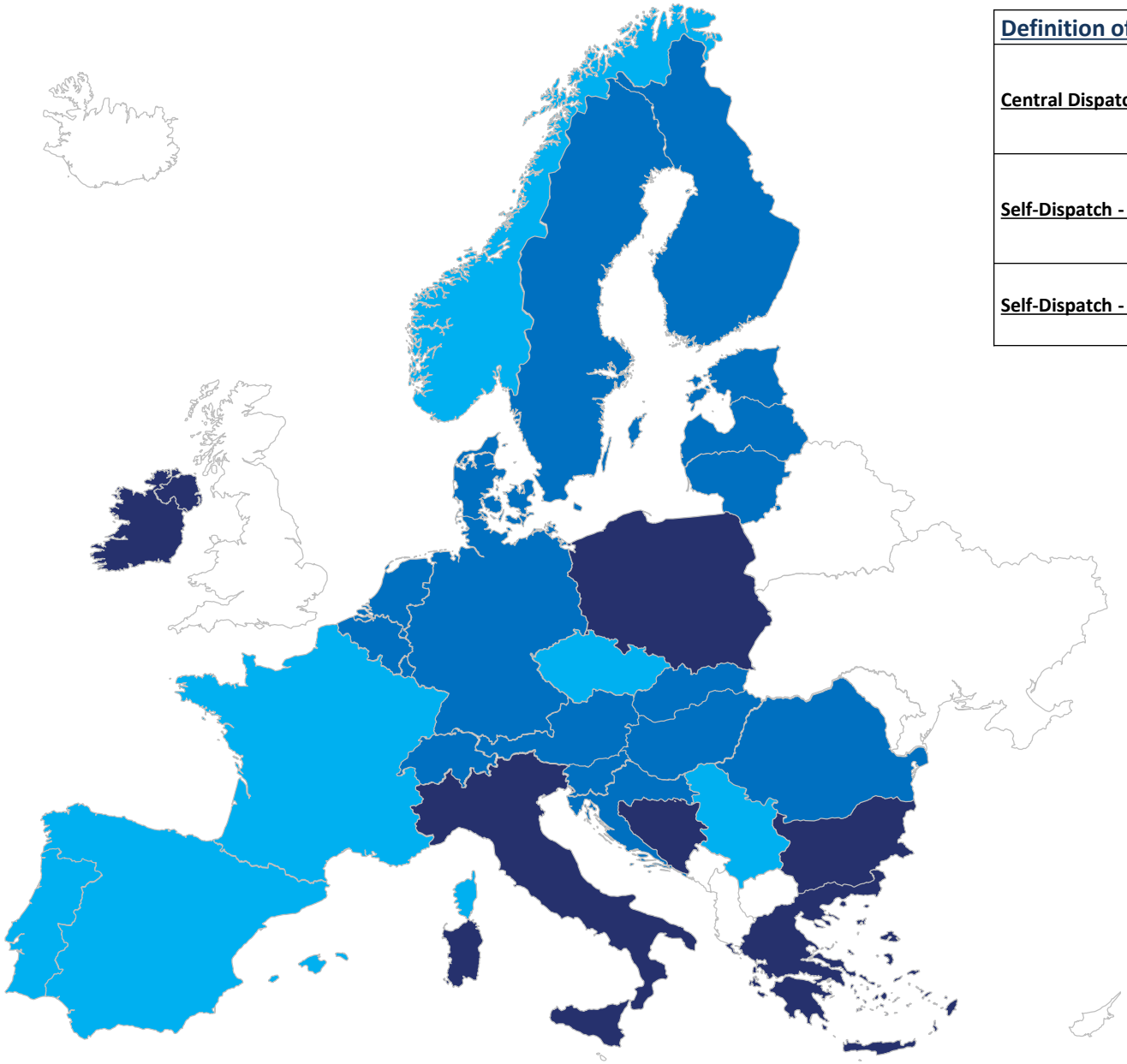
Caveats:

- 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. As a consequence, in some specific cases, the position of a country in a certain group might be debatable.
- This is based on information updated in May 2021 and describes the mechanisms in place in 2020, 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?

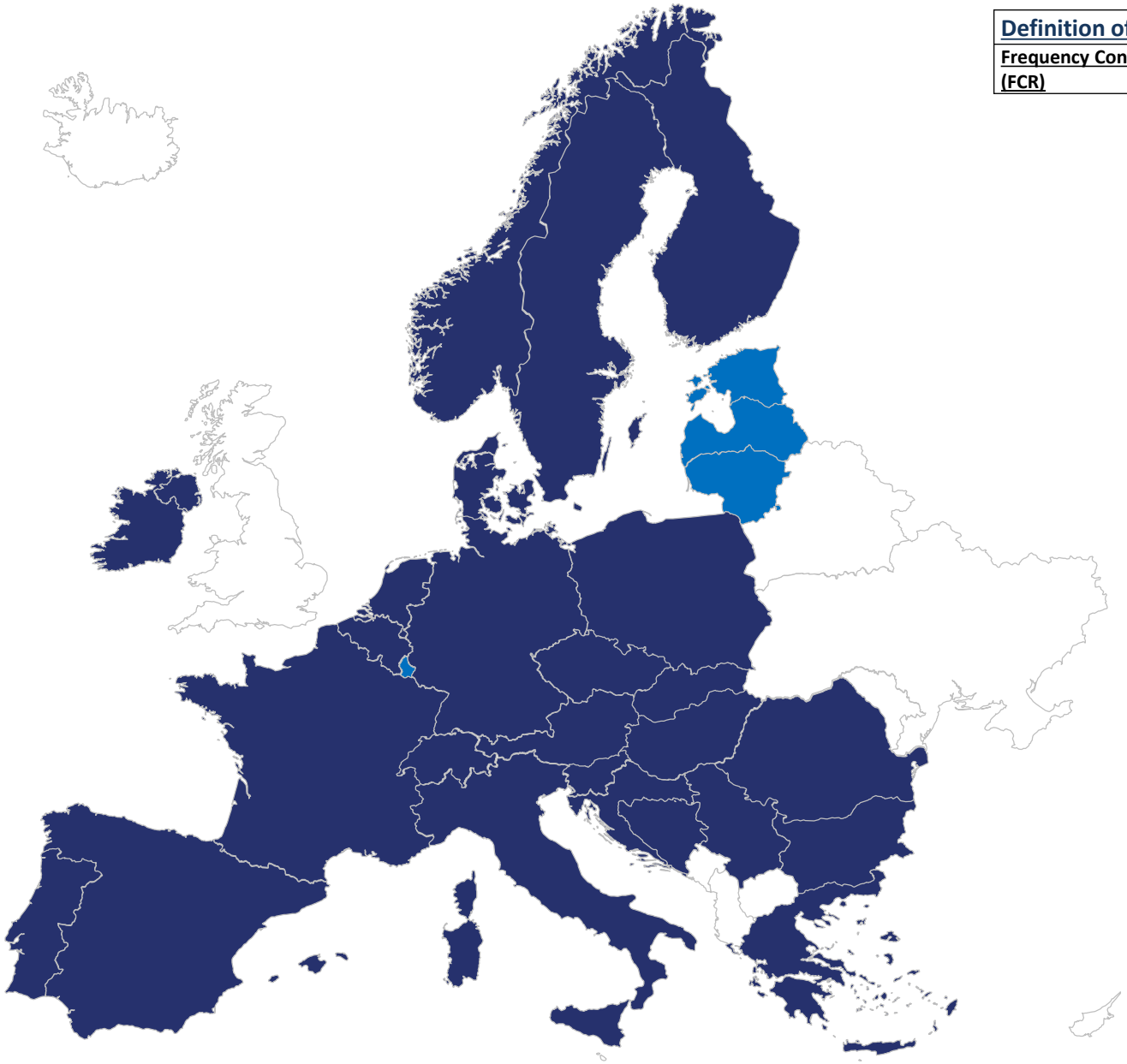


Definition of answer	
Central Dispatch	Central dispatch means a scheduling and dispatching model where the generation schedules and consumption schedules as well as dispatching of power generating facilities and demand facilities, in reference to dispatchable facilities, are determined by a TSO within 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

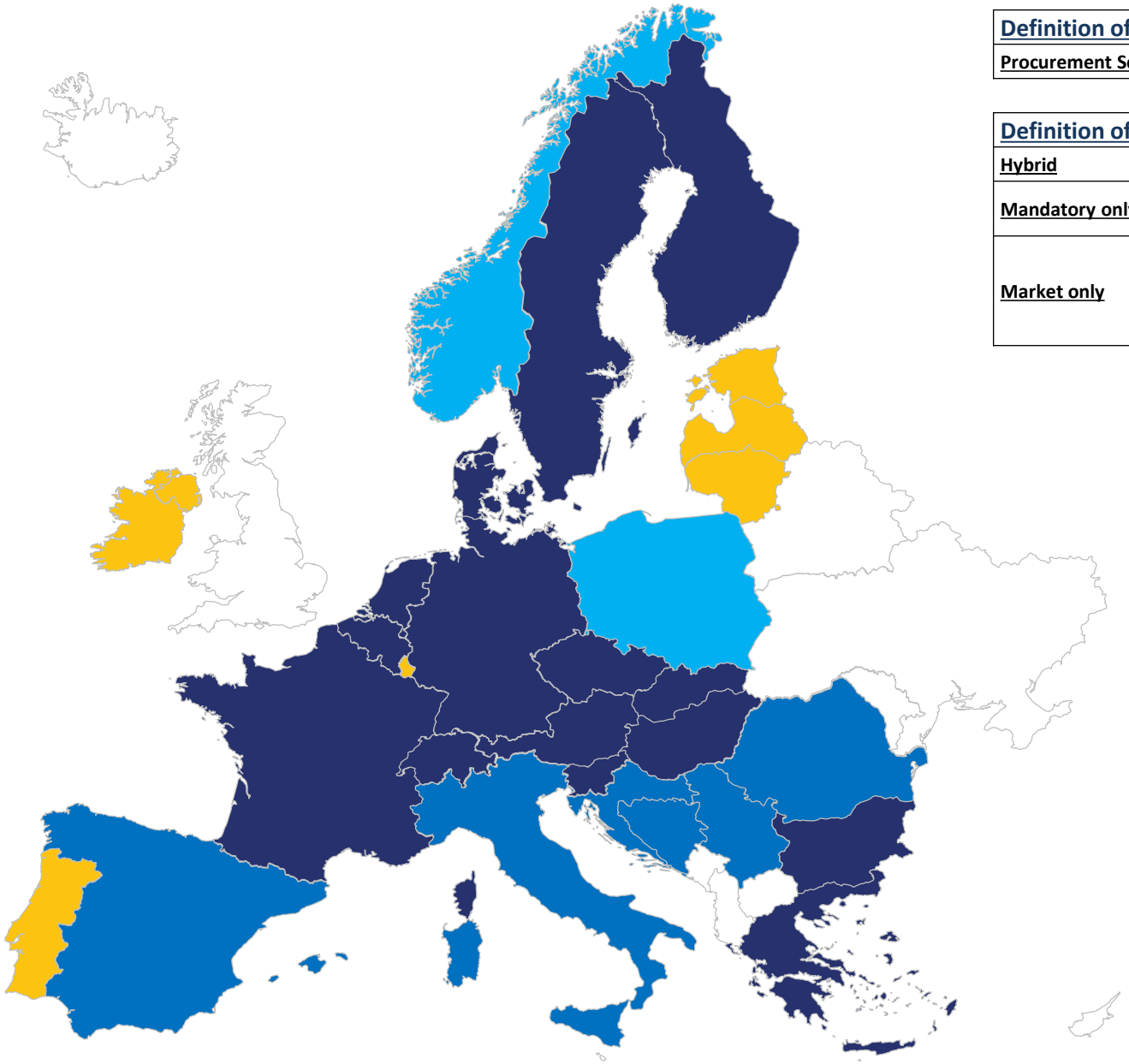
Using Frequency Containment Reserve?



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

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

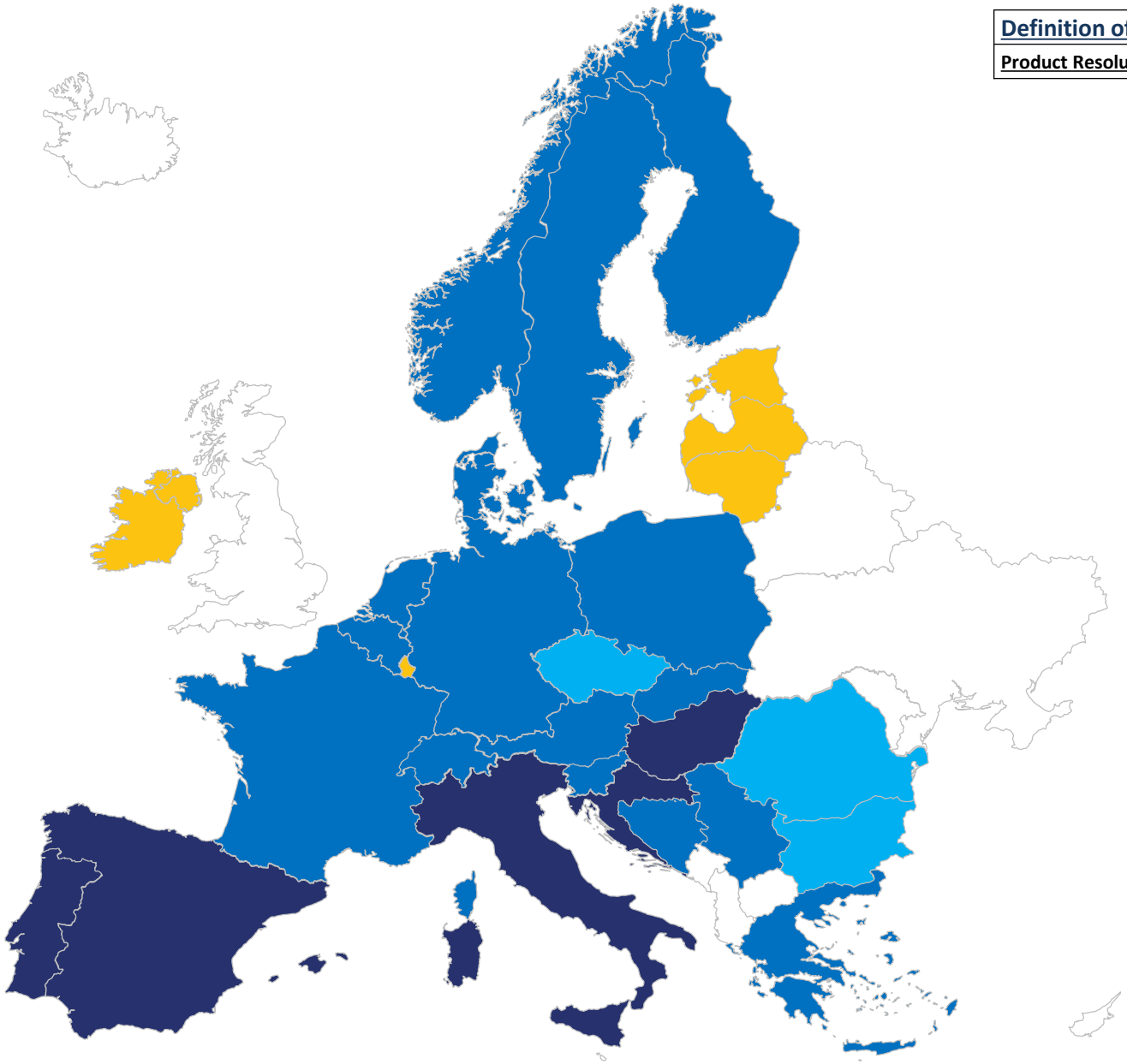
Frequency Containment Reserve – Capacity – Procurement Scheme



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)

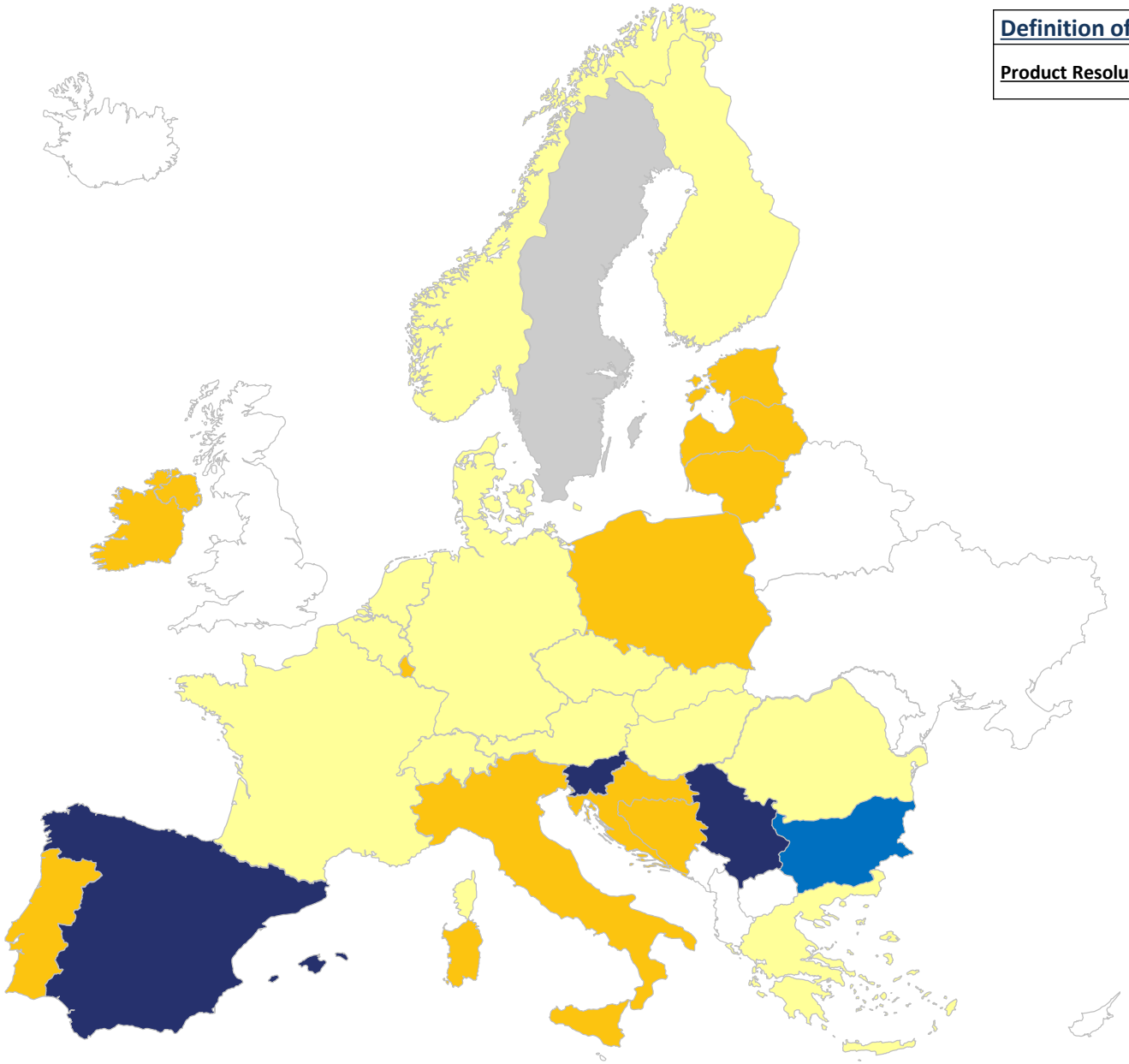


Definition of question	
Product Resolution (in MW)	The minimum bid size into the balancing market.

Key:

- Missing data
- N/A
- No minimum bid size
- x <= 1MW
- 1 MW < x <= 5 MW
- 5 MW < x <= 10 MW
- x > 10MW

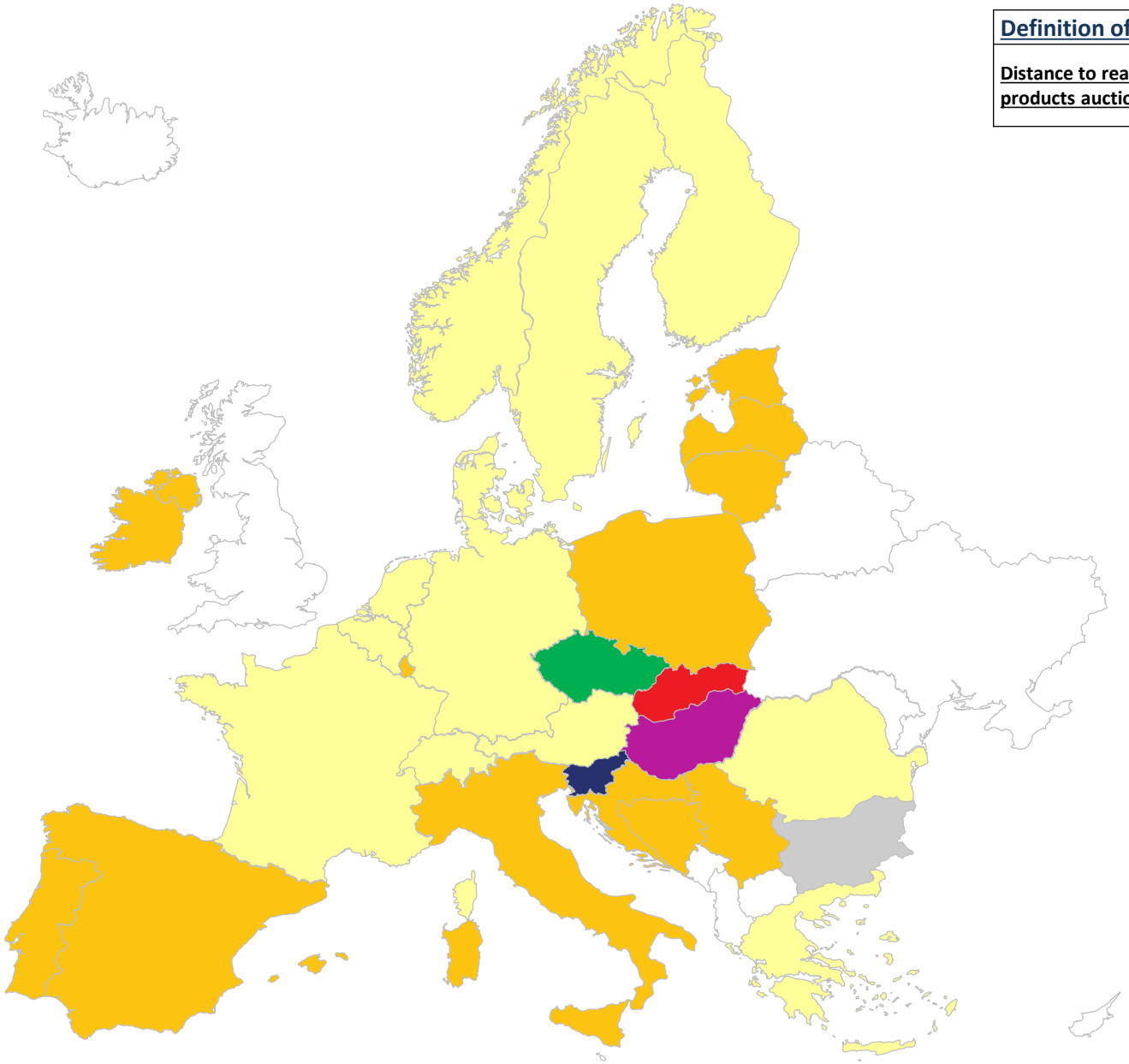
Frequency Containment Reserve – Capacity – Product Resolution (in time)



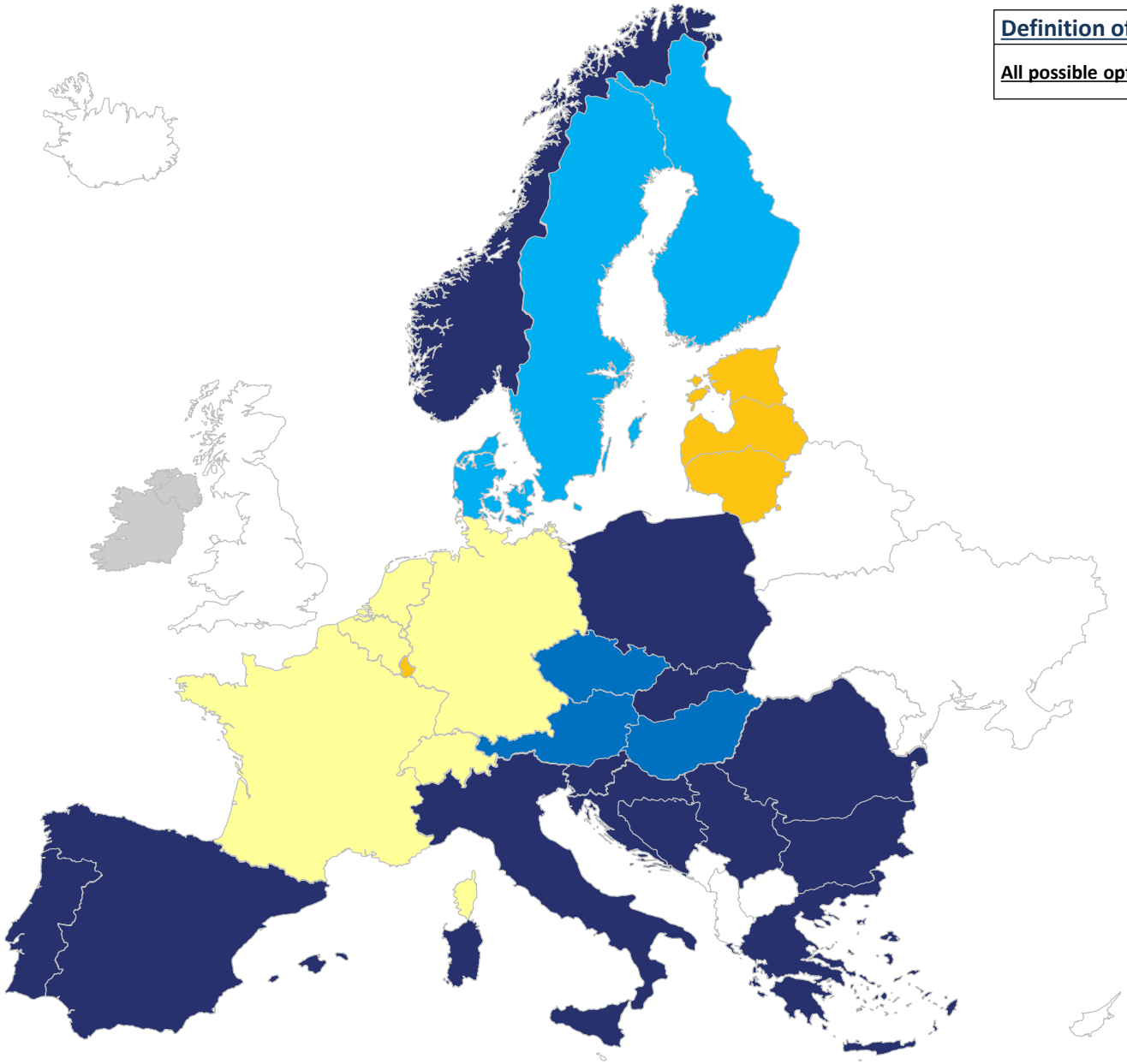
Definition of question	
Product Resolution (in time)	The maximum resolution for which the product can be bid into the market (for instance =1 hour in the case of a 24 auctions day ahead market for reserve provision).

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

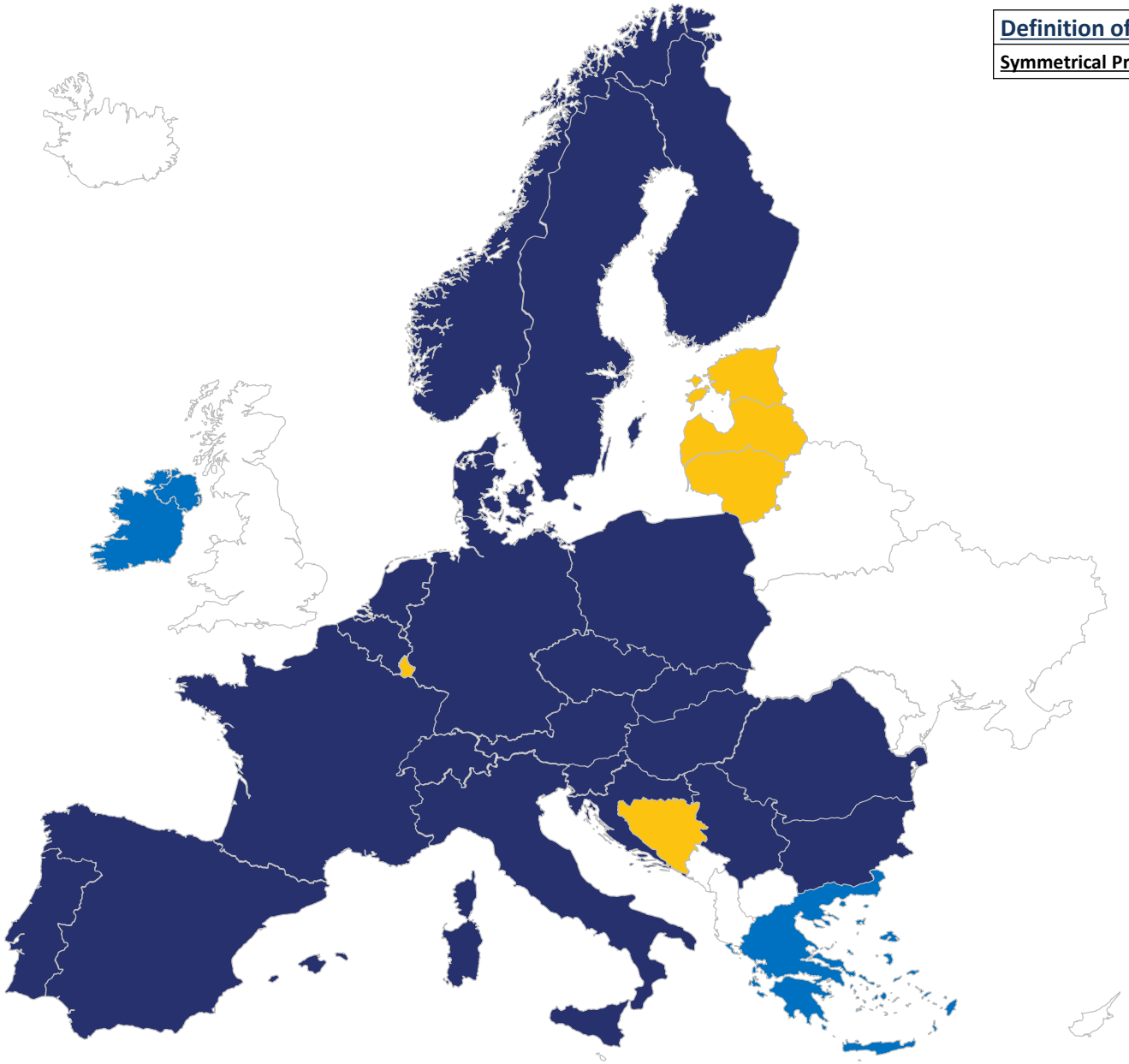


Definition of answer	
All possible options	In this case all possible provider types were chosen (Generator + Demand-side response + Pump Storage + Batteries + Distributed generation)

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 – Capacity – Symmetrical Product

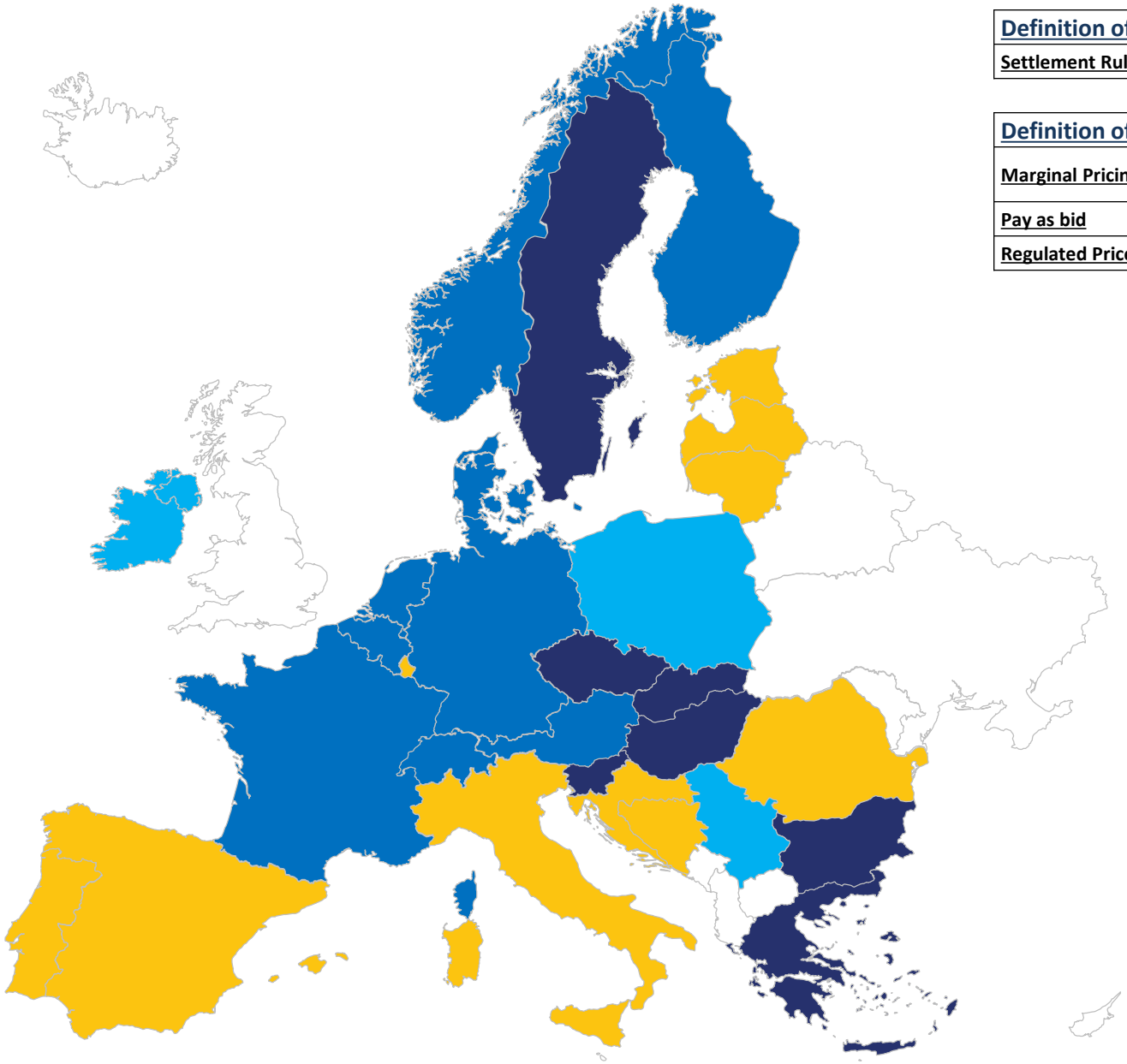


Definition of question	
Symmetrical Product	Upward regulation volume and for downward regulation volume has to be equal.

Key:

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

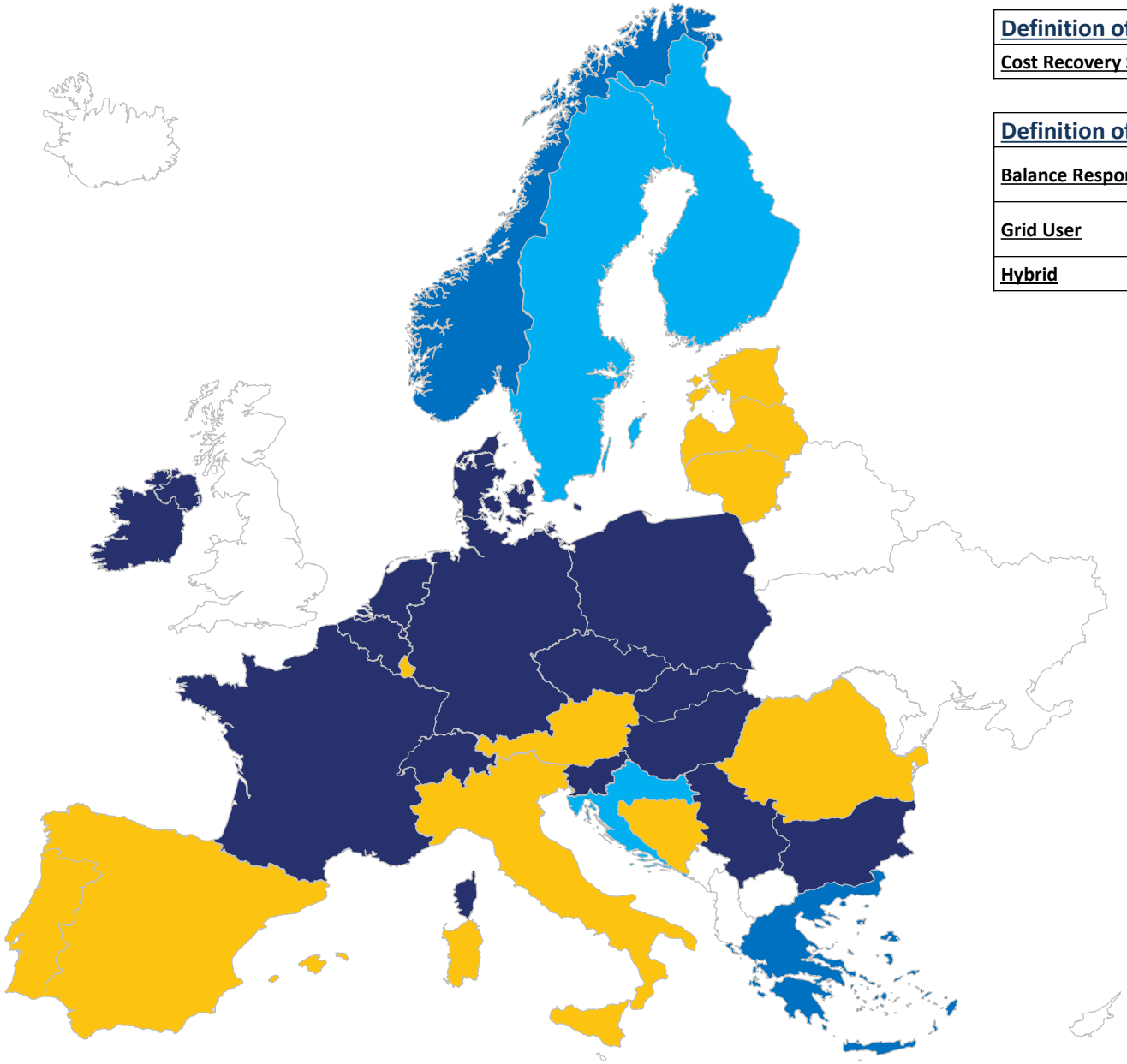
Frequency Containment Reserve – Capacity – Settlement Rule



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



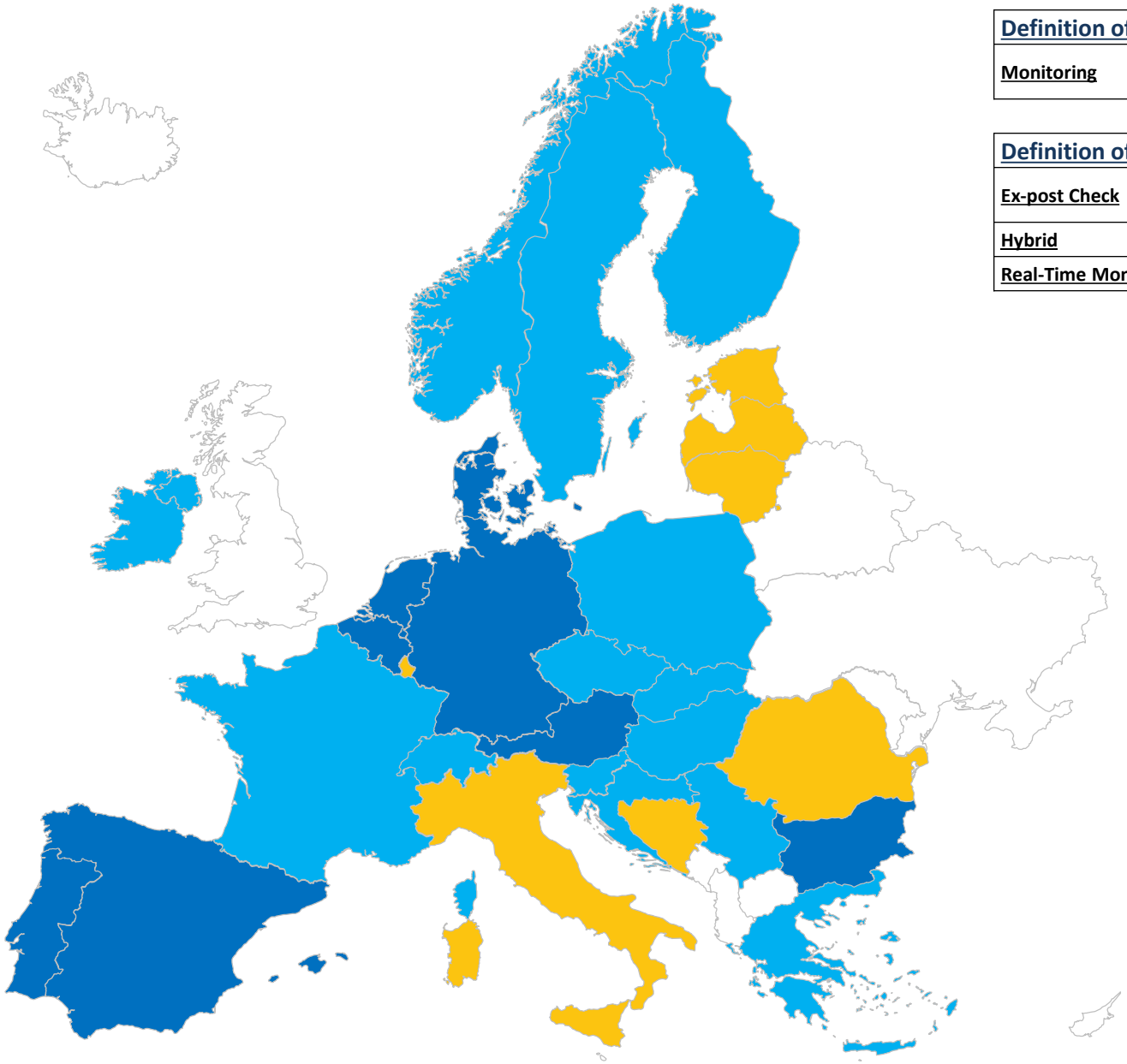
Key:

- 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 Containment Reserve – Capacity – Monitoring



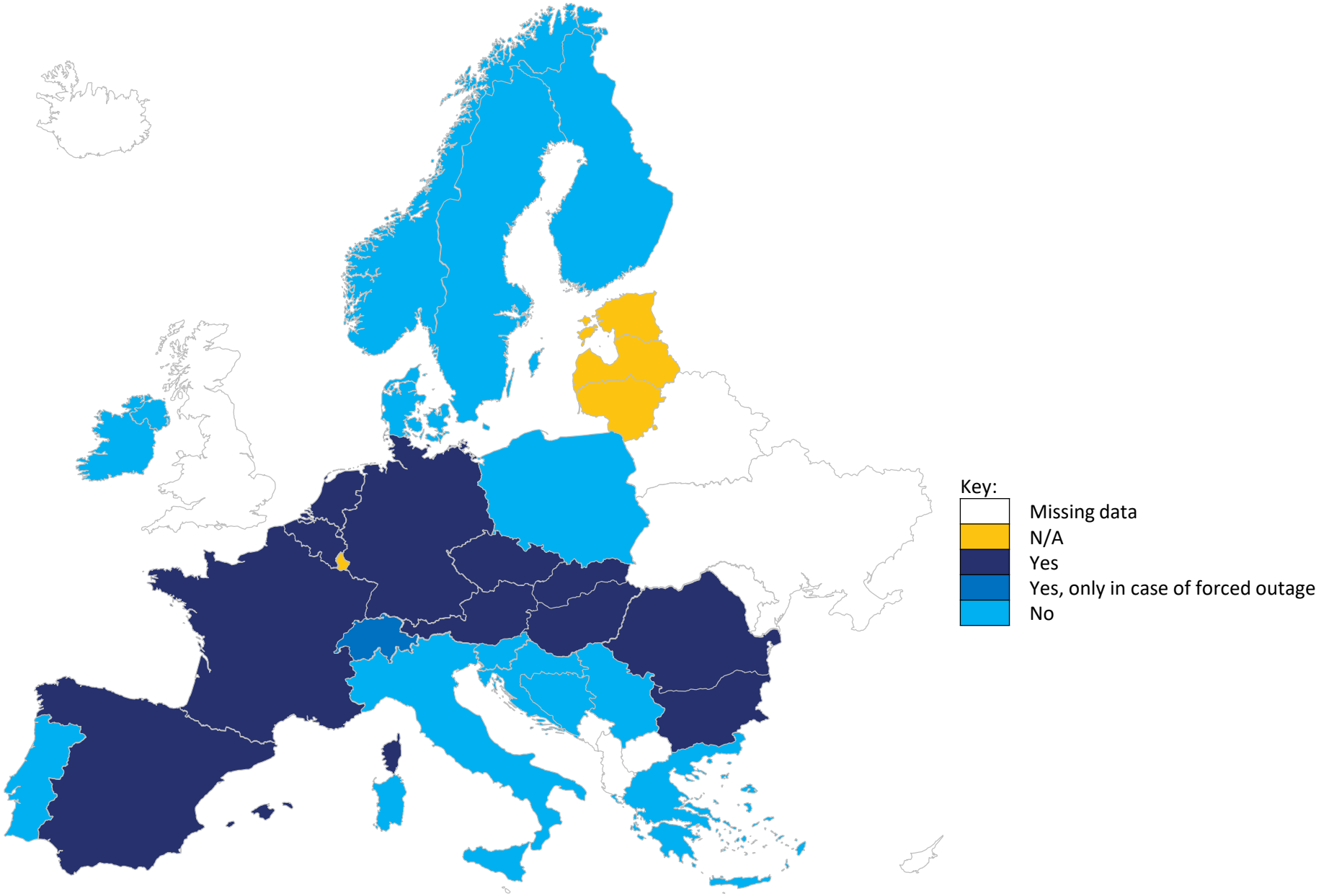
Definition of question	
Monitoring	Refers to the type of monitoring in place by the system operator to ensure performance of plant.

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.

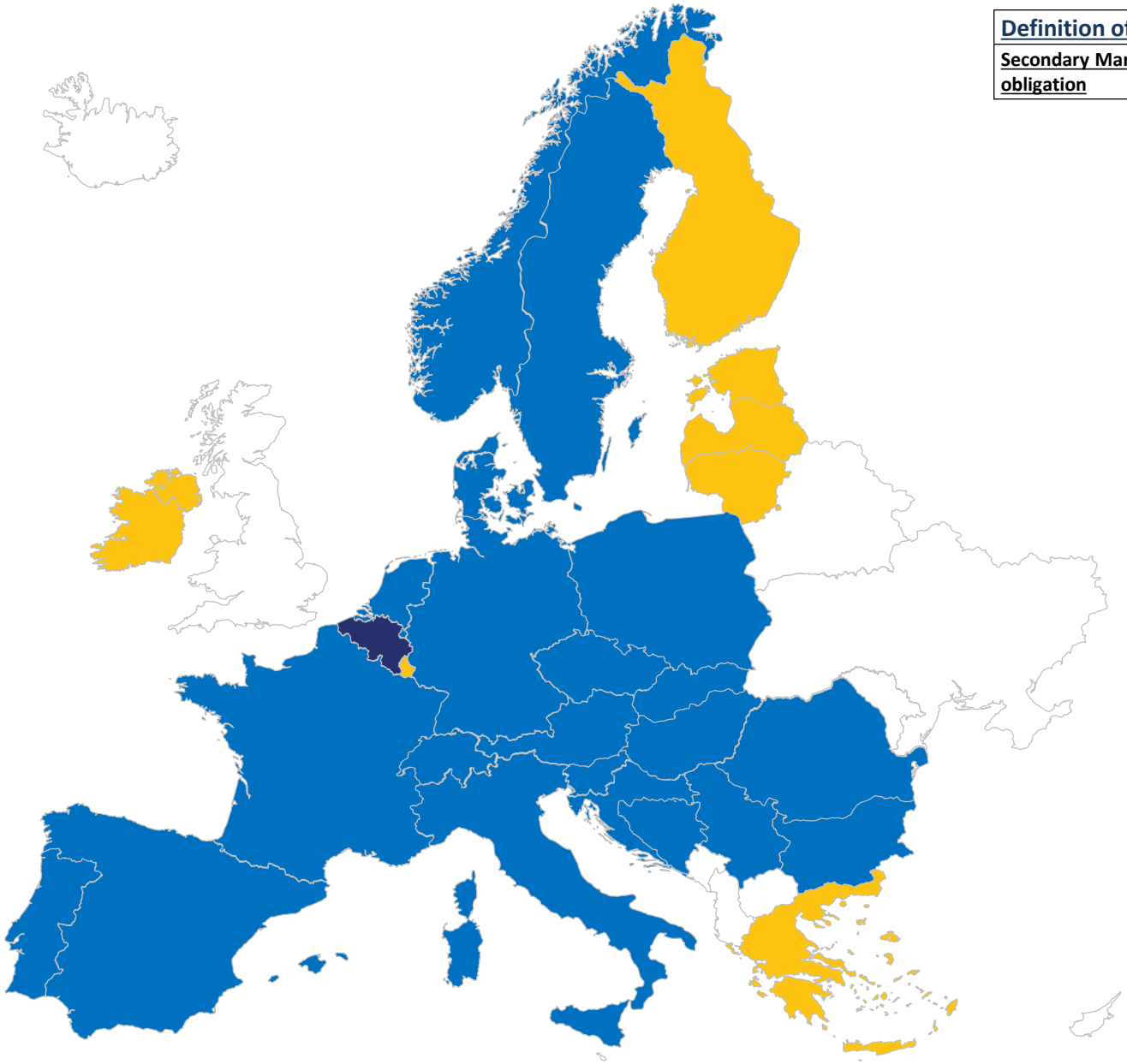
Key:

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

Frequency Containment Reserve – Capacity – Transfer of BSPs obligation allowed

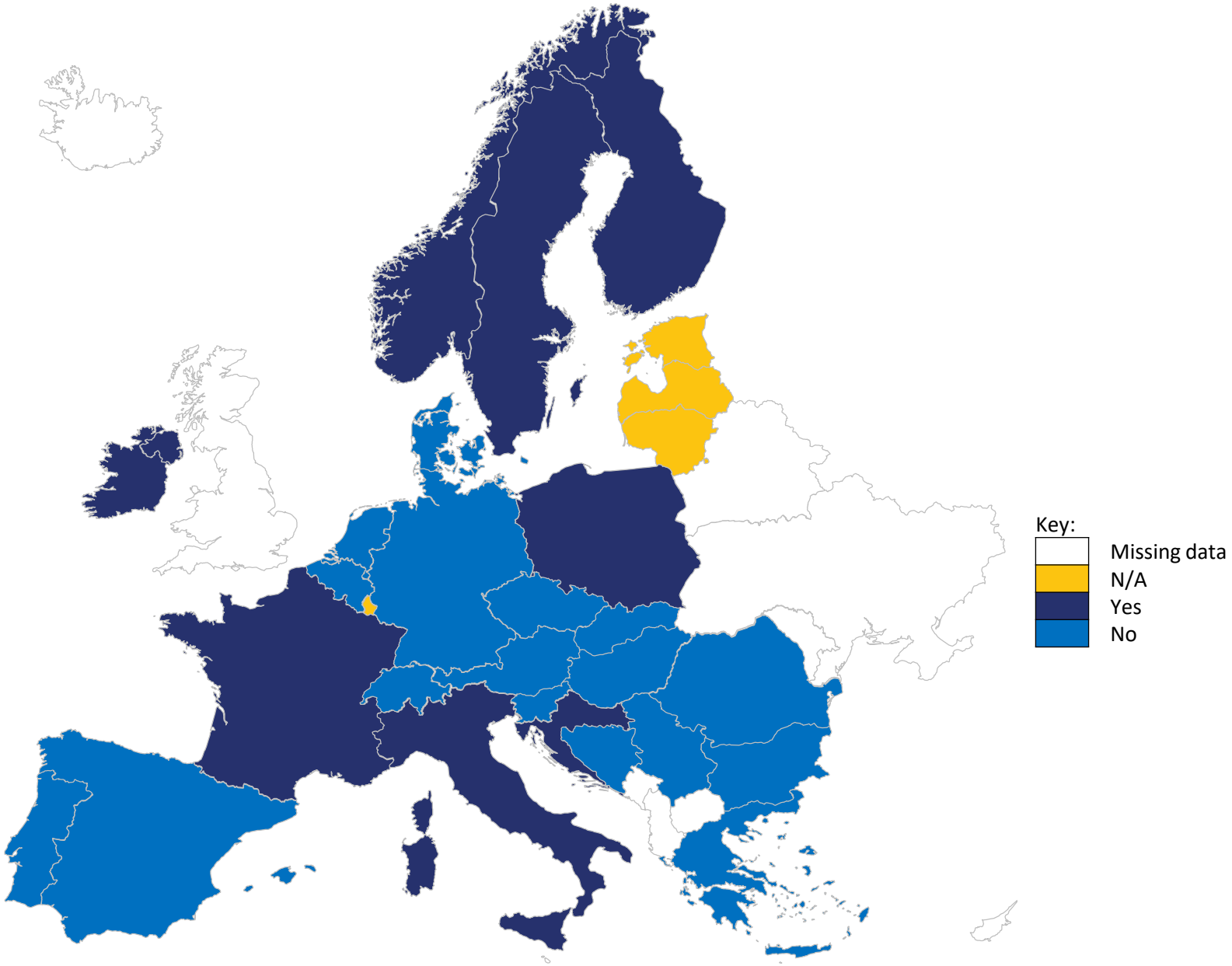


Frequency Containment Reserve – Capacity – In case transfer obligation is allowed, is there an organised secondary market?

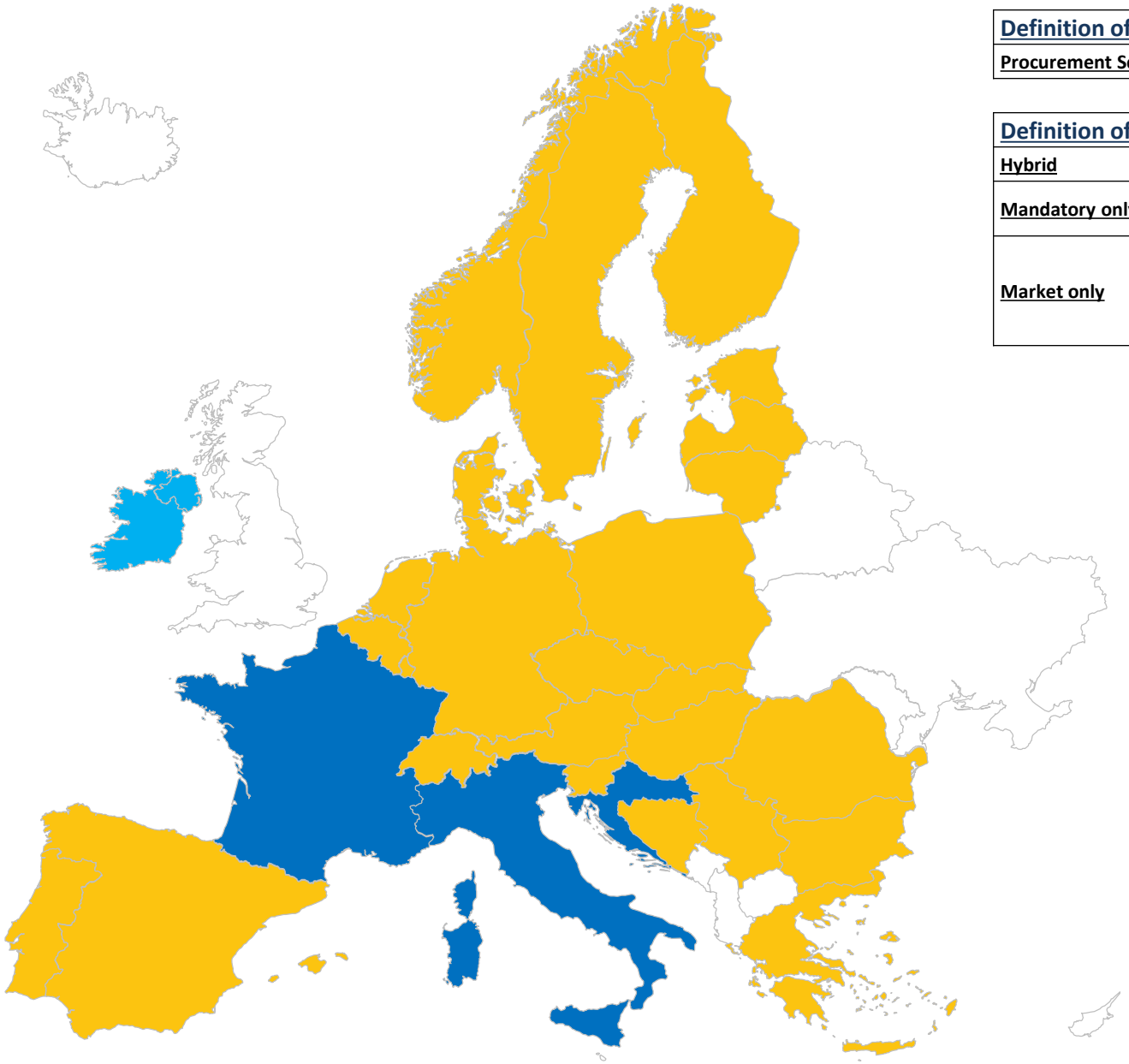


Definition of answer	
Secondary Market for reserve obligation	Trading procedure between the BSPs (where at least one BSP has contract with the TSO) to ensure the prescribed reserve amount of the TSO.

Frequency Containment Reserve – Energy – Is balancing energy settled?



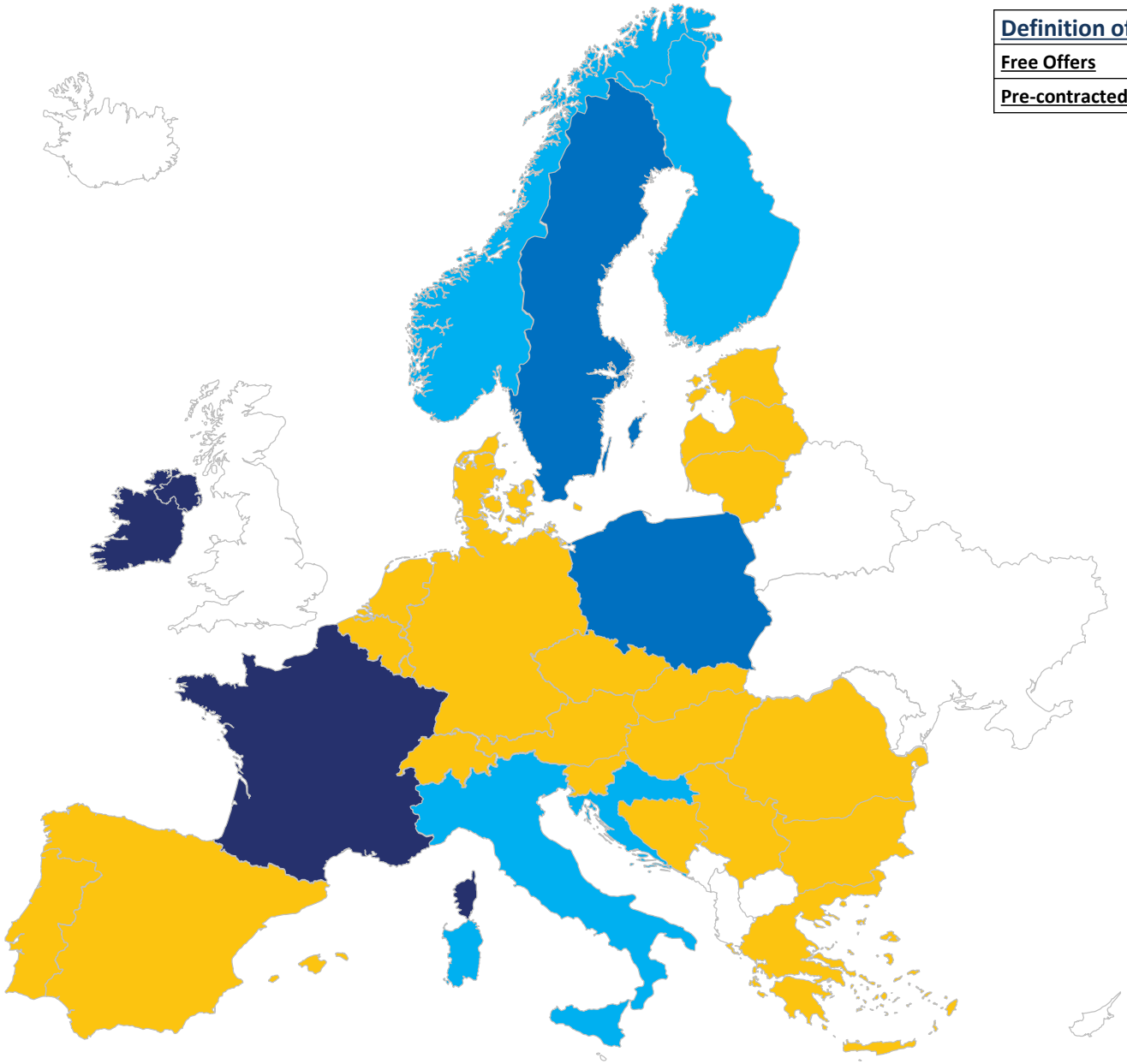
Frequency Containment Reserve – Energy – Procurement Scheme



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



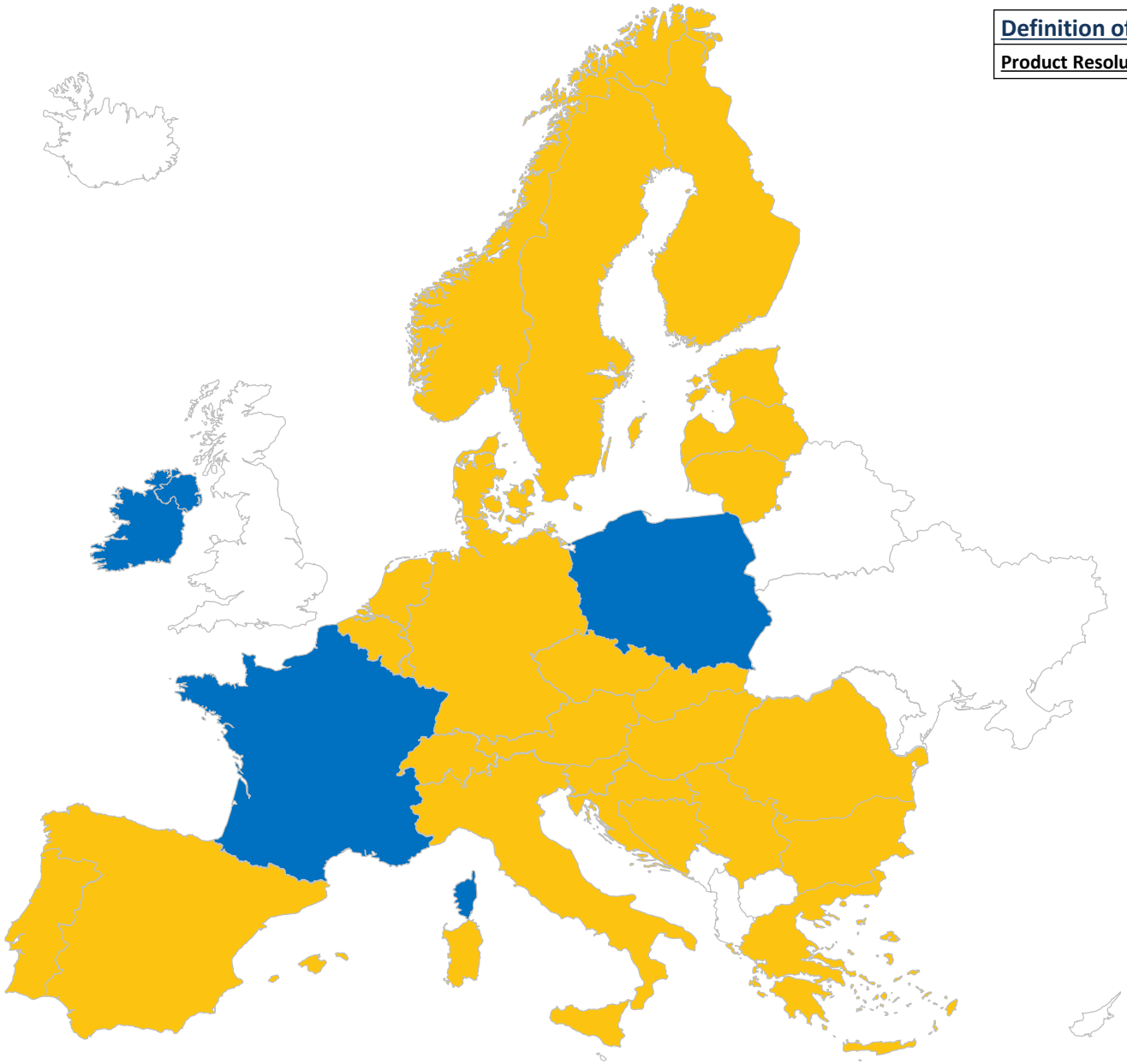
Definition of question	
Free Offers	Possibility to offer balancing energy bids without a contract for Balancing Capacity
Pre-contracted	BSP has sold/procured Balancing Capacity to TSO.

Key:

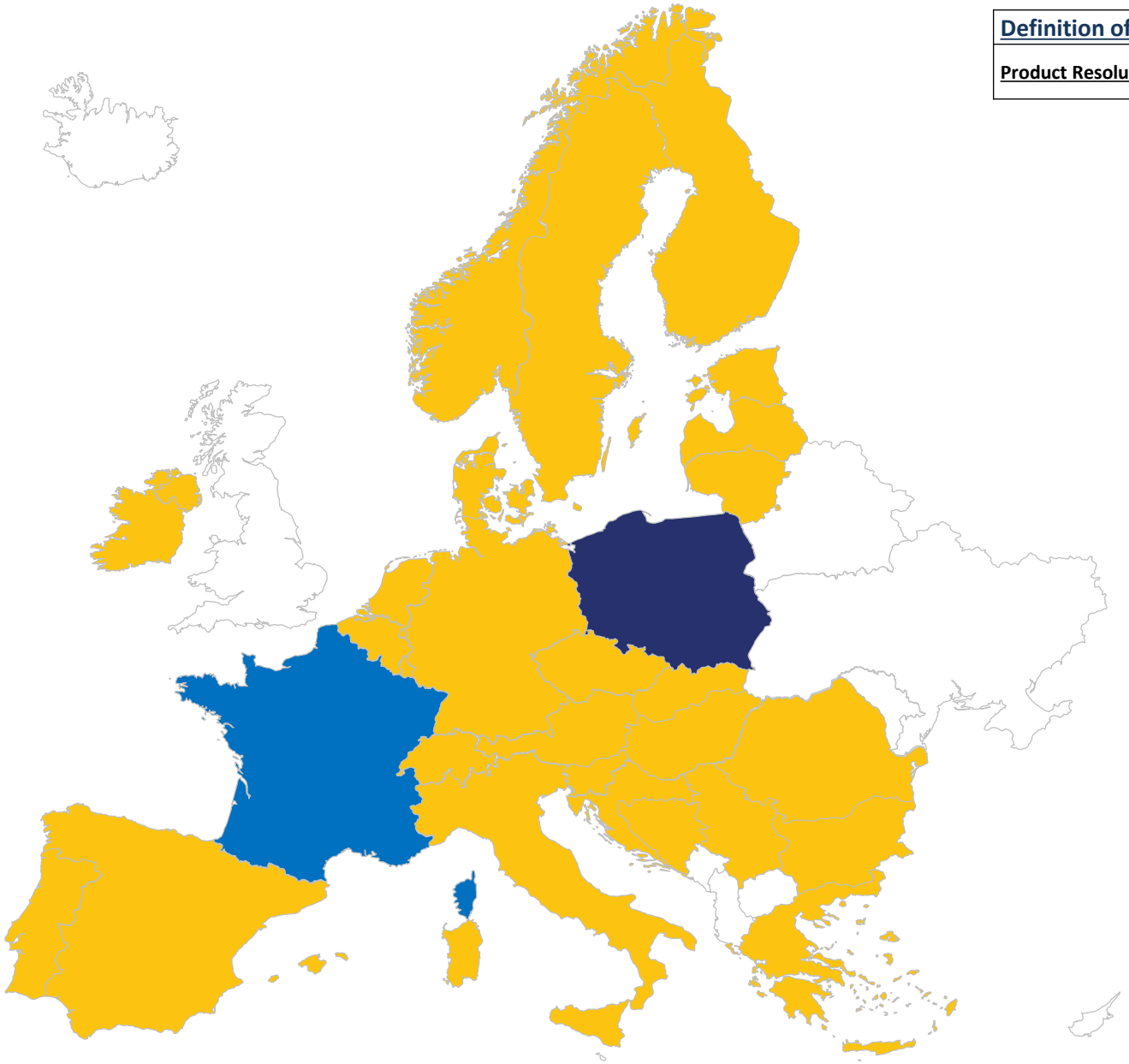
- Missing data
- N/A
- Yes
- No
- No, there is no FCR balancing energy market

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

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

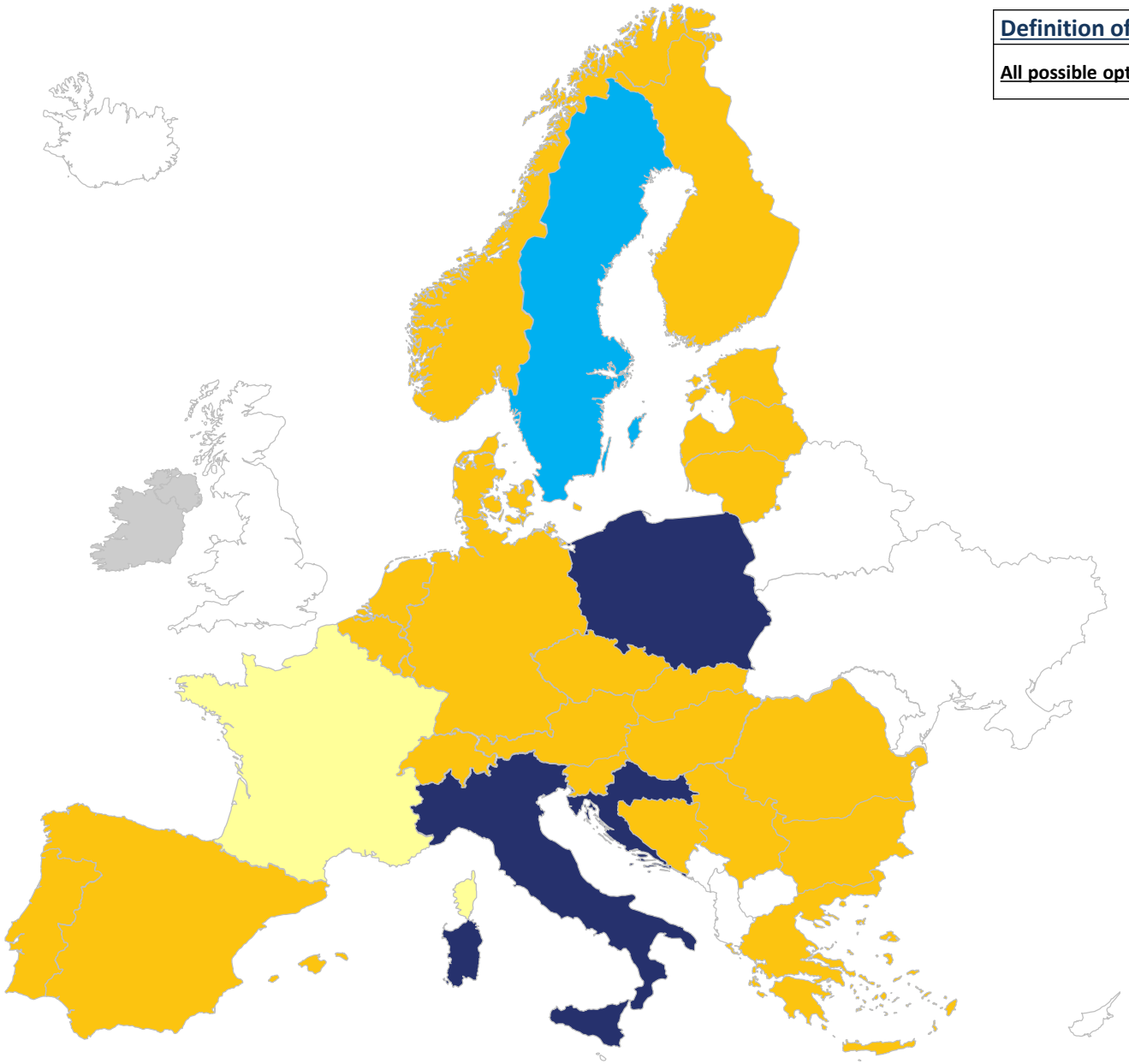


Frequency Containment Reserve – Energy – Product Resolution (in time)



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
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- Generators Only
- Generators + Batteries
- Generators + Demand-side response + Batteries
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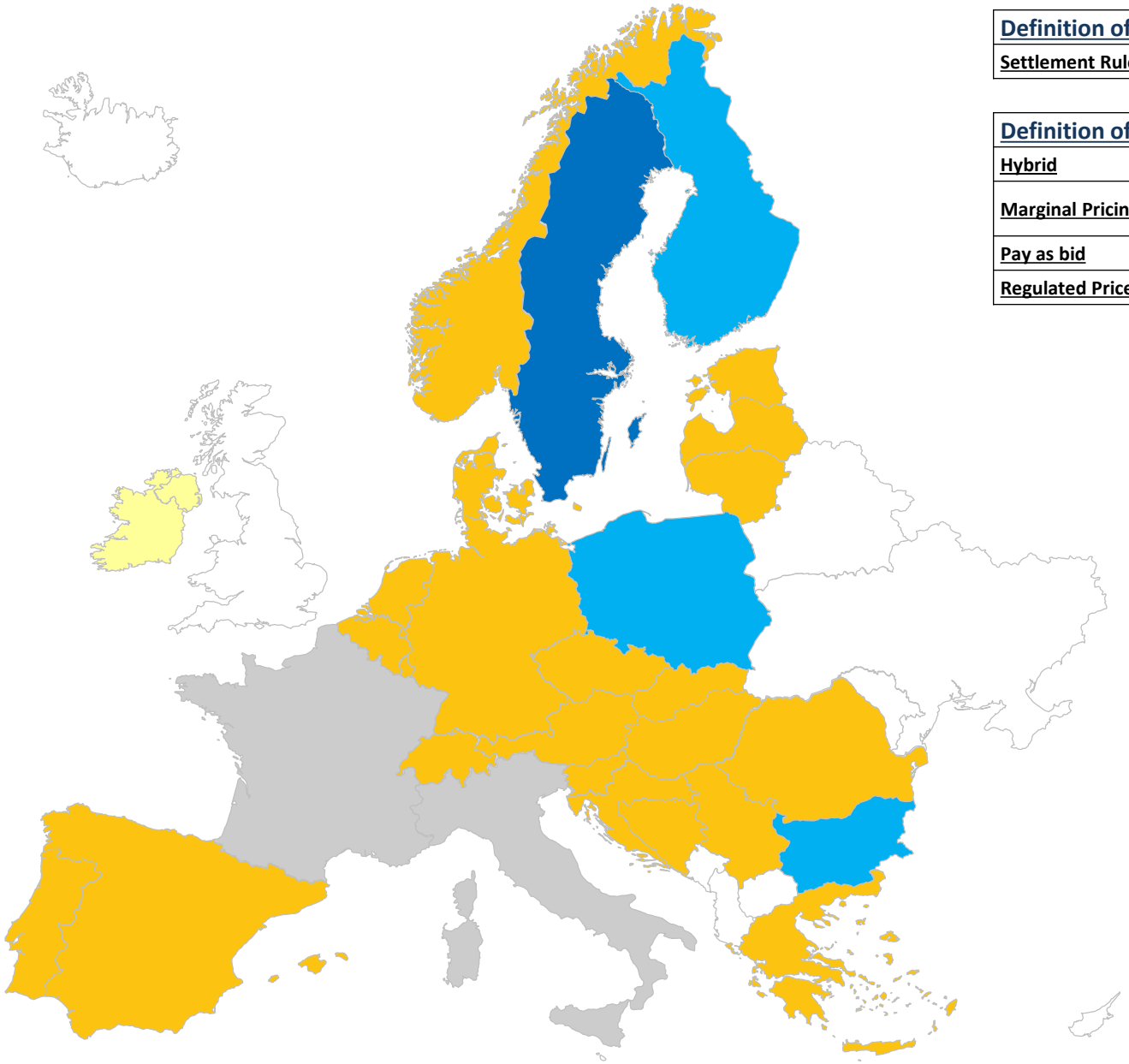
- All possible options

Frequency Containment 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.
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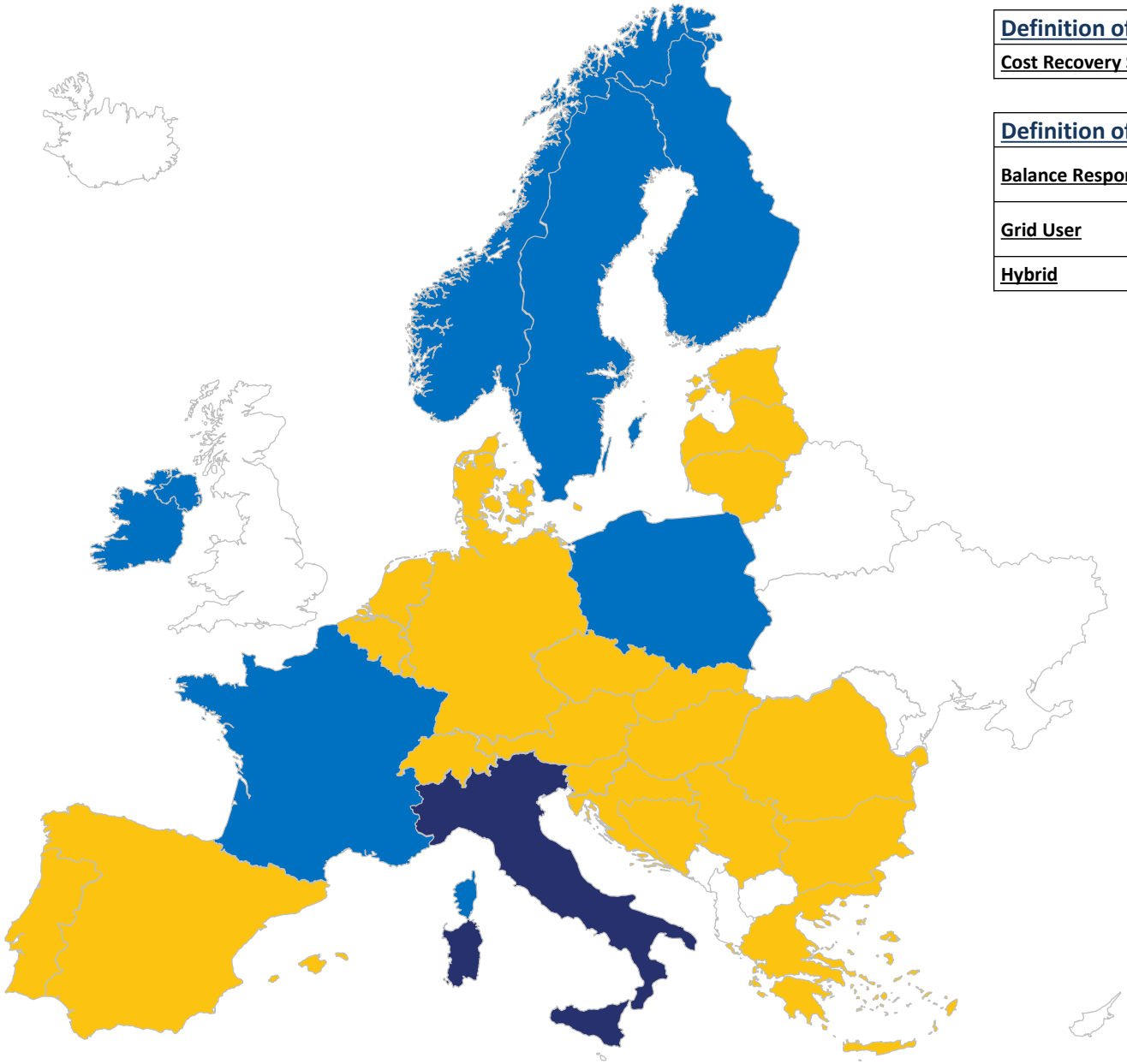
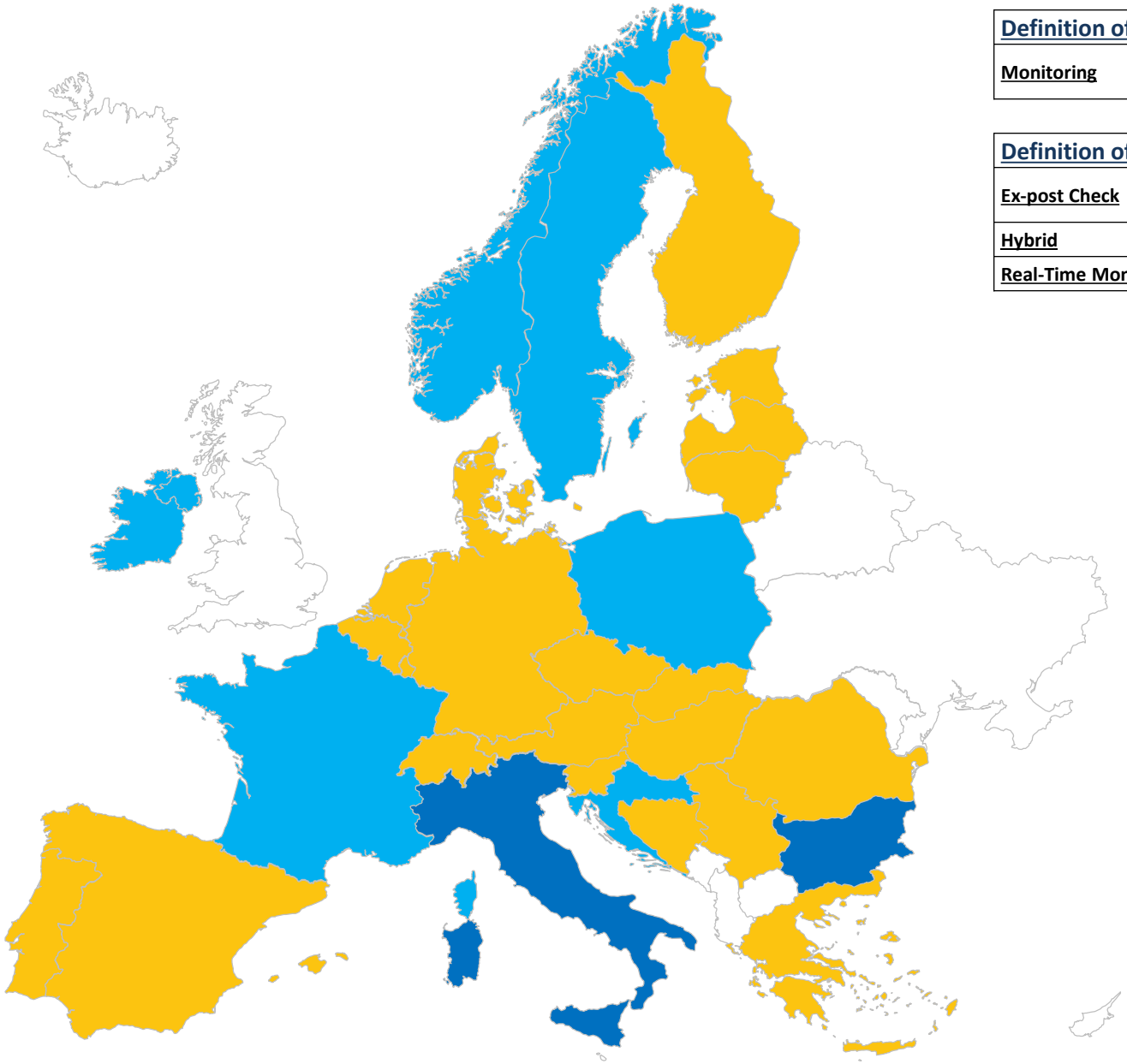
Frequency Containment Reserve – Energy – Cost Recovery Scheme



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

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

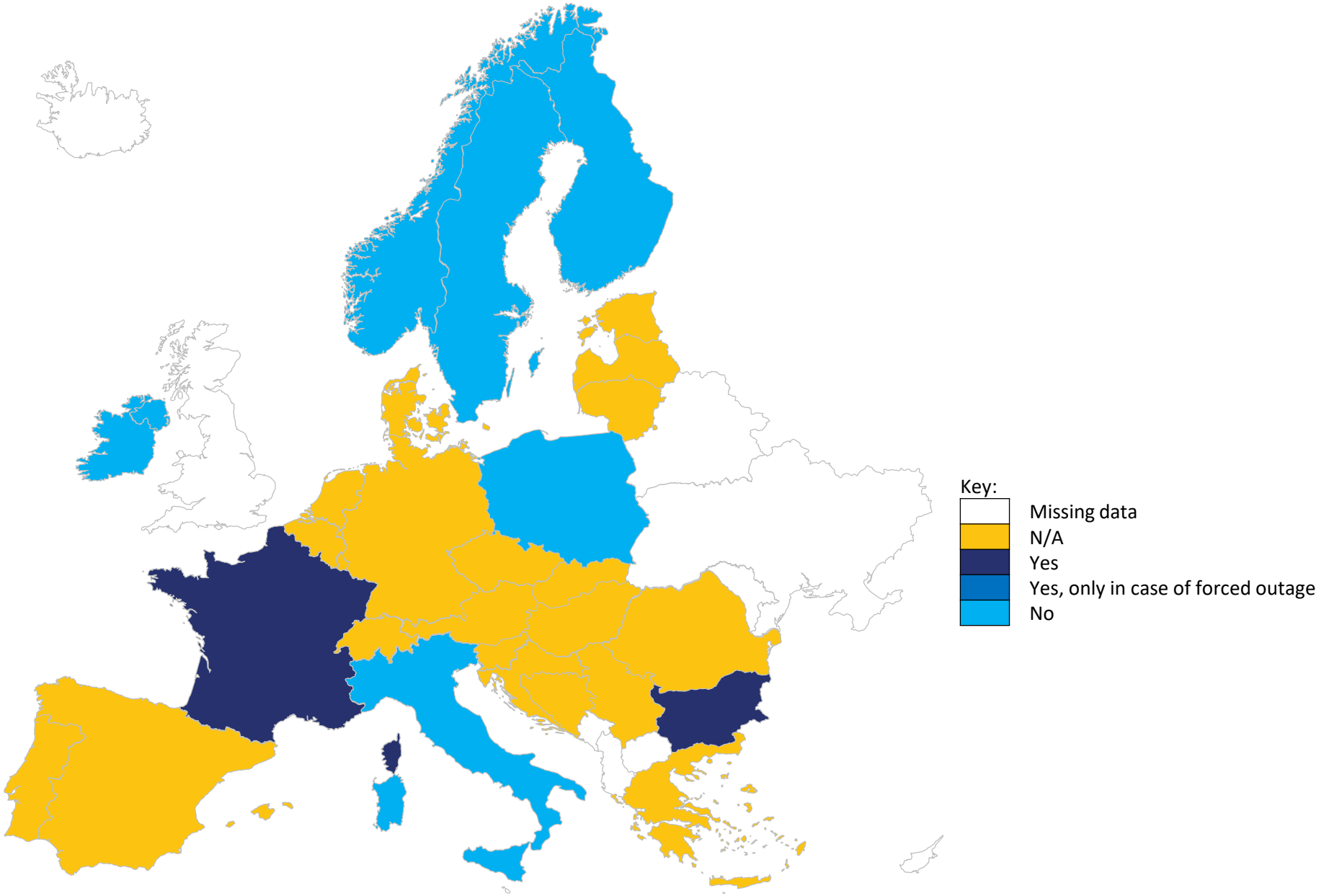
Frequency Containment Reserve – Energy – Monitoring



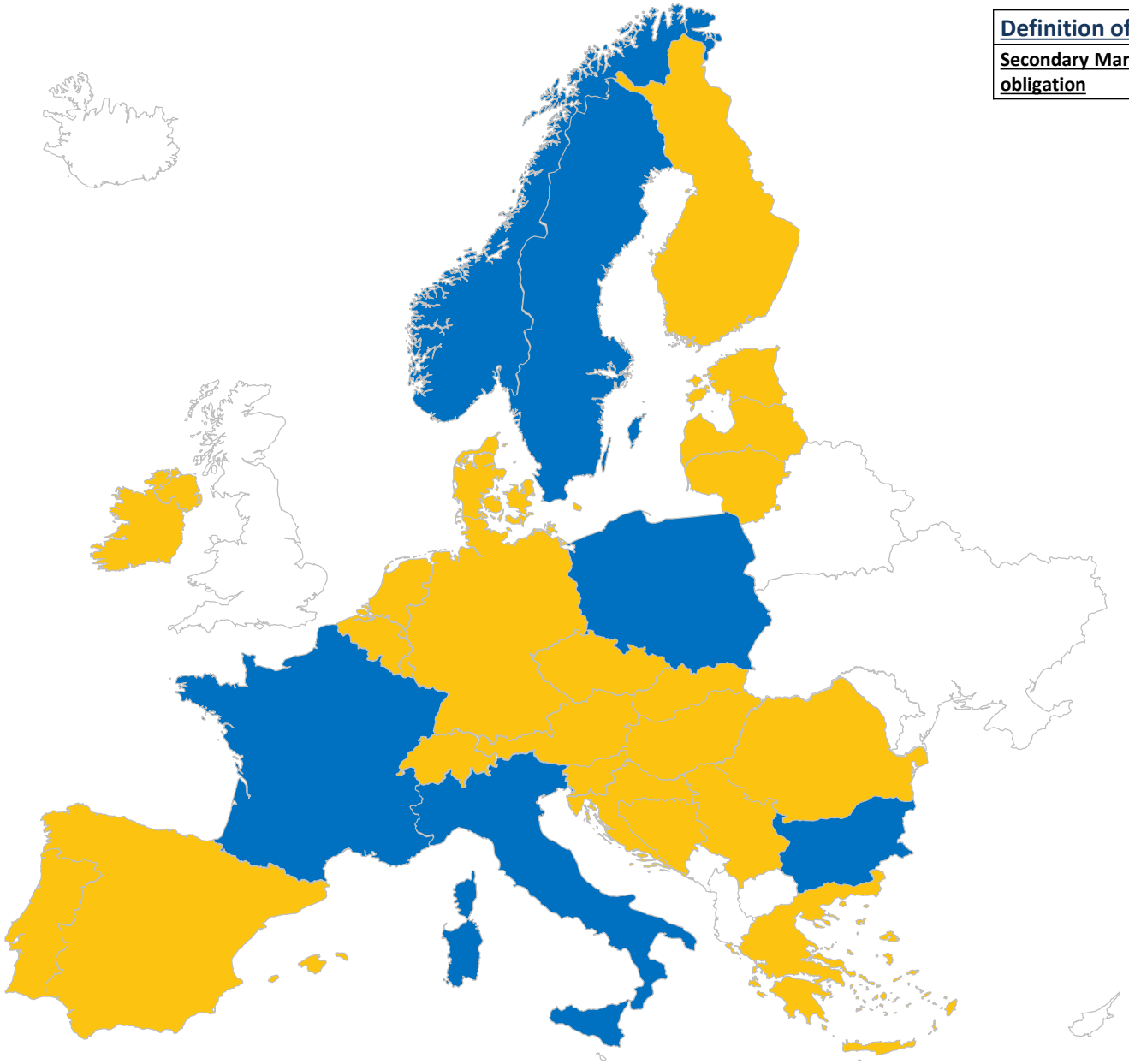
Definition of question	
Monitoring	Refers to the type of monitoring in place by the system operator to ensure performance of plant.

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.

Frequency Containment Reserve – Energy – Transfer of BSPs obligation allowed

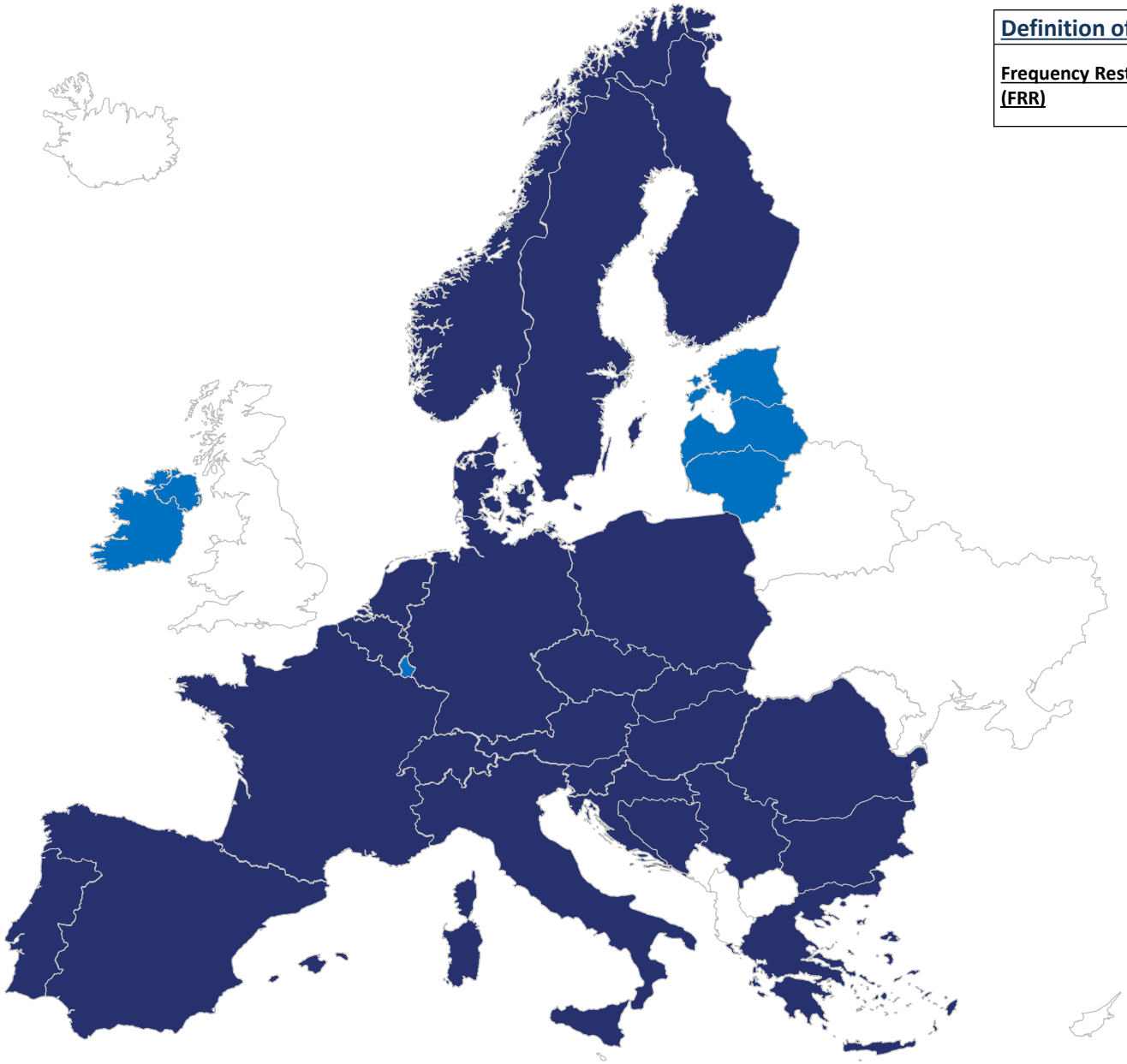


Frequency Containment Reserve – Energy – In case transfer obligation is allowed, is there an organised secondary market?



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.

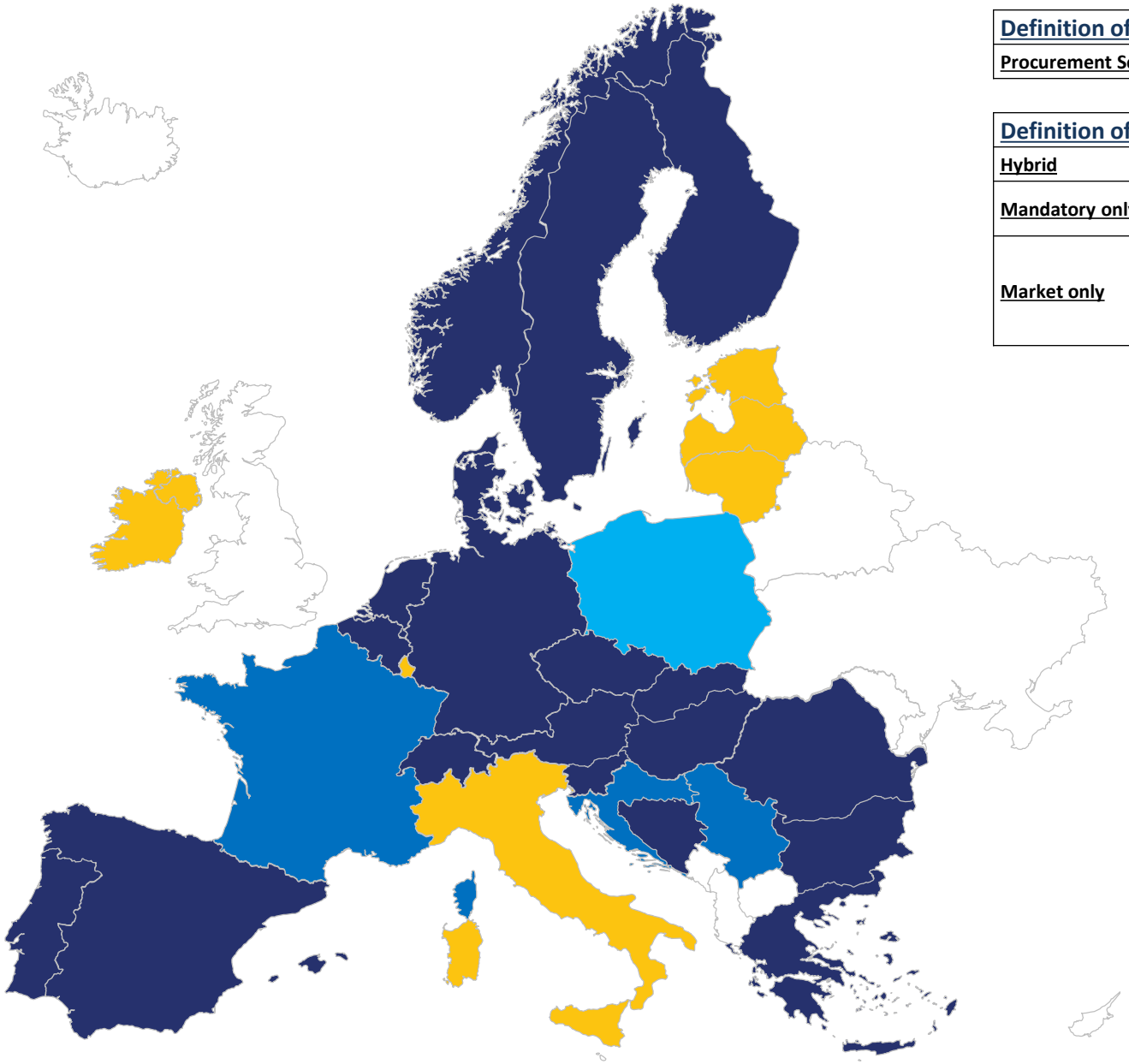
Using Frequency Restoration Reserve (Automatic)?



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

Definition of question	
Frequency Restoration Reserve (FRR)	Reserves activated to restore System Frequency to the Nominal Frequency and, where applicable, power balance to the scheduled value. aFRR means automatic FRR, mFRR means manual FRR.

Frequency Restoration Reserve (Automatic) – Capacity – Procurement Scheme



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

Definition of answer	
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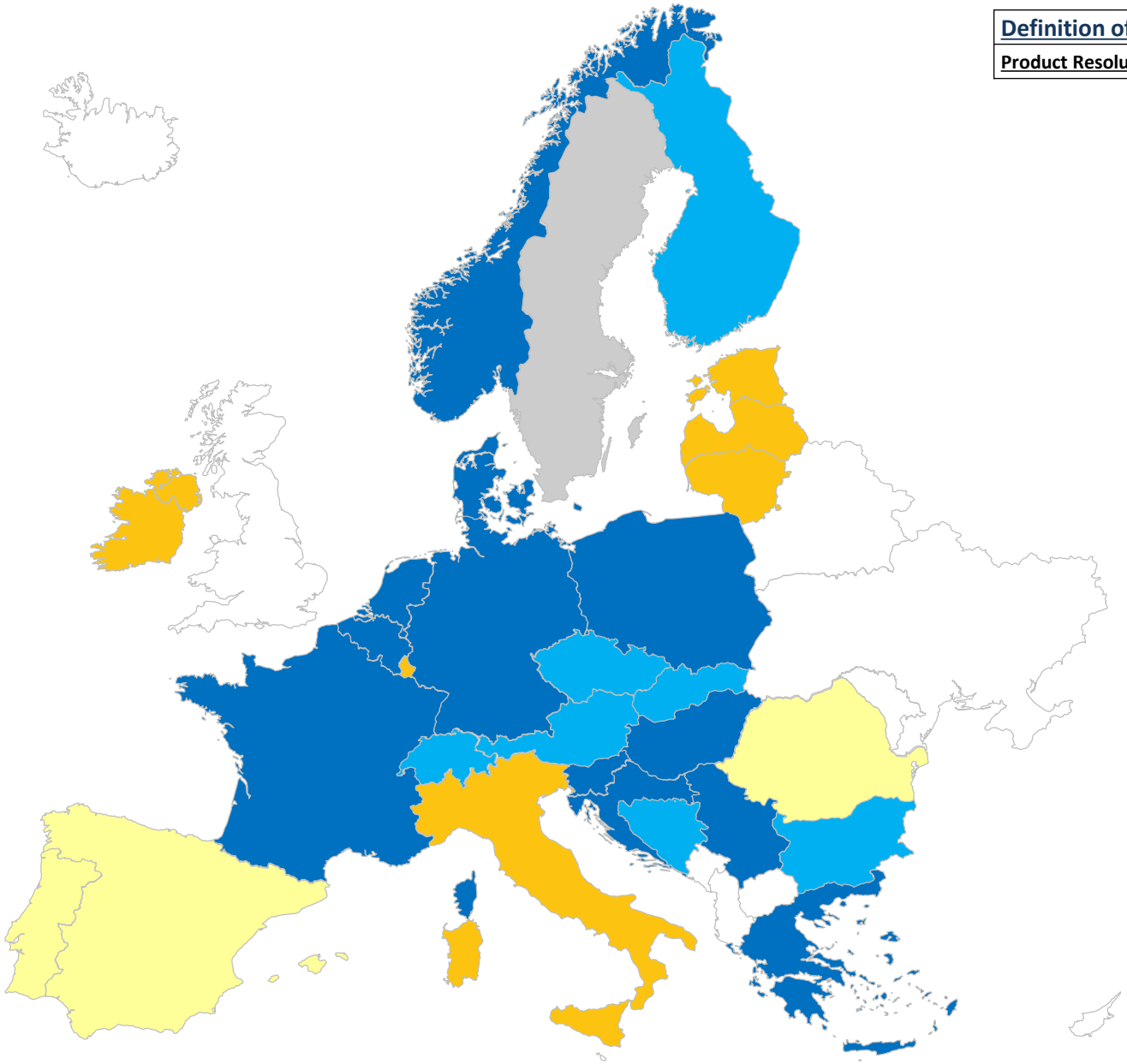
Mandatory only	Generators connected to the grid are obligated to reserve a certain amount of capacity in order to meet TSO requirements, for a fixed price set by TSO, NRA or for free.
Market only	There is no contract or obligation for a grid user to offer the reserve (before the offer). The grid user 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) – Capacity – Product Resolution (in MW)

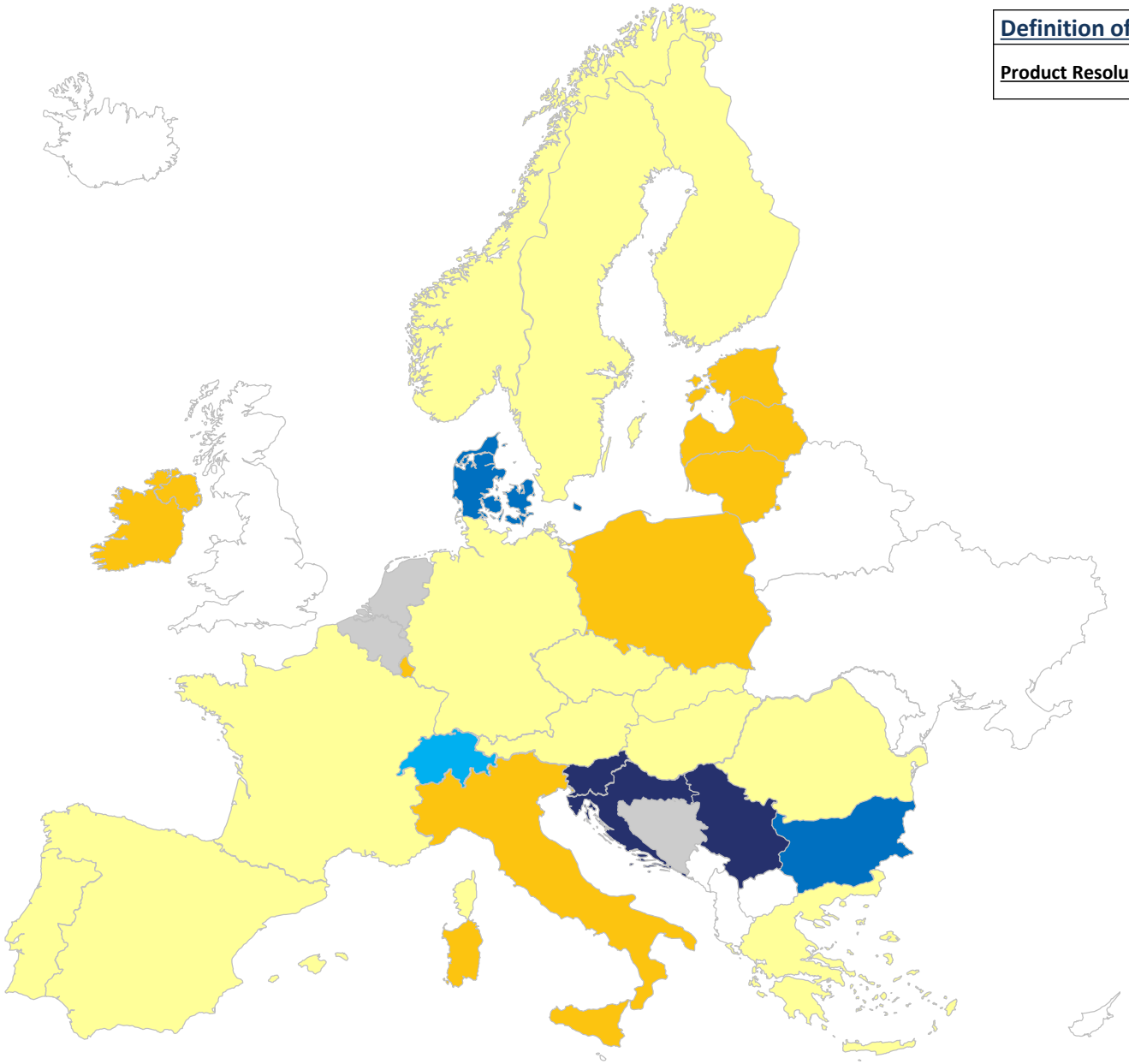


Definition of question	
Product Resolution (in MW)	The minimum bid size into the balancing market.

Key:

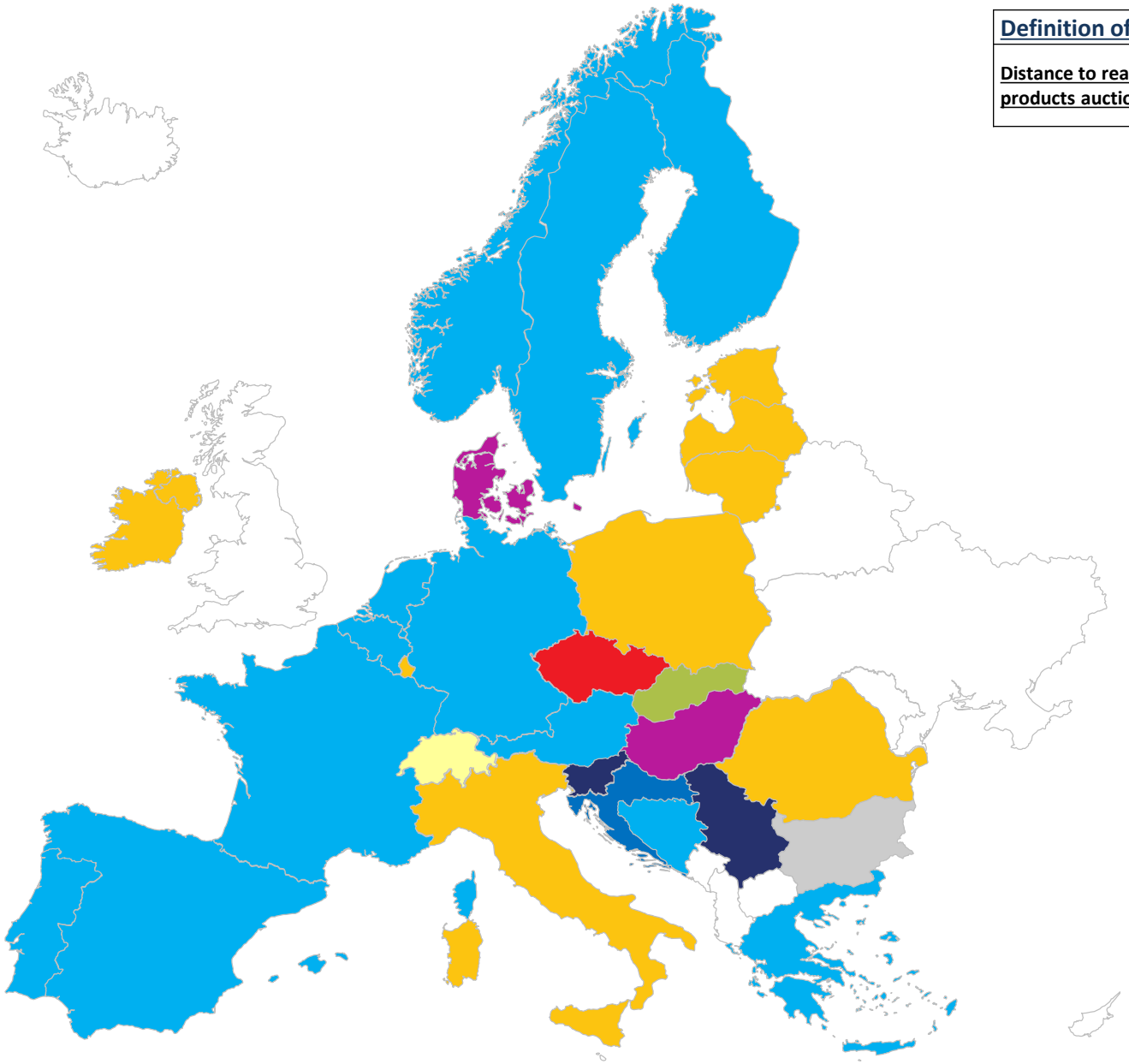
- Missing data
- N/A
- No minimum bid size
- x <= 1 MW
- 1 MW < x <= 5 MW
- 5 MW < x <= 10 MW
- x > 10 MW

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).

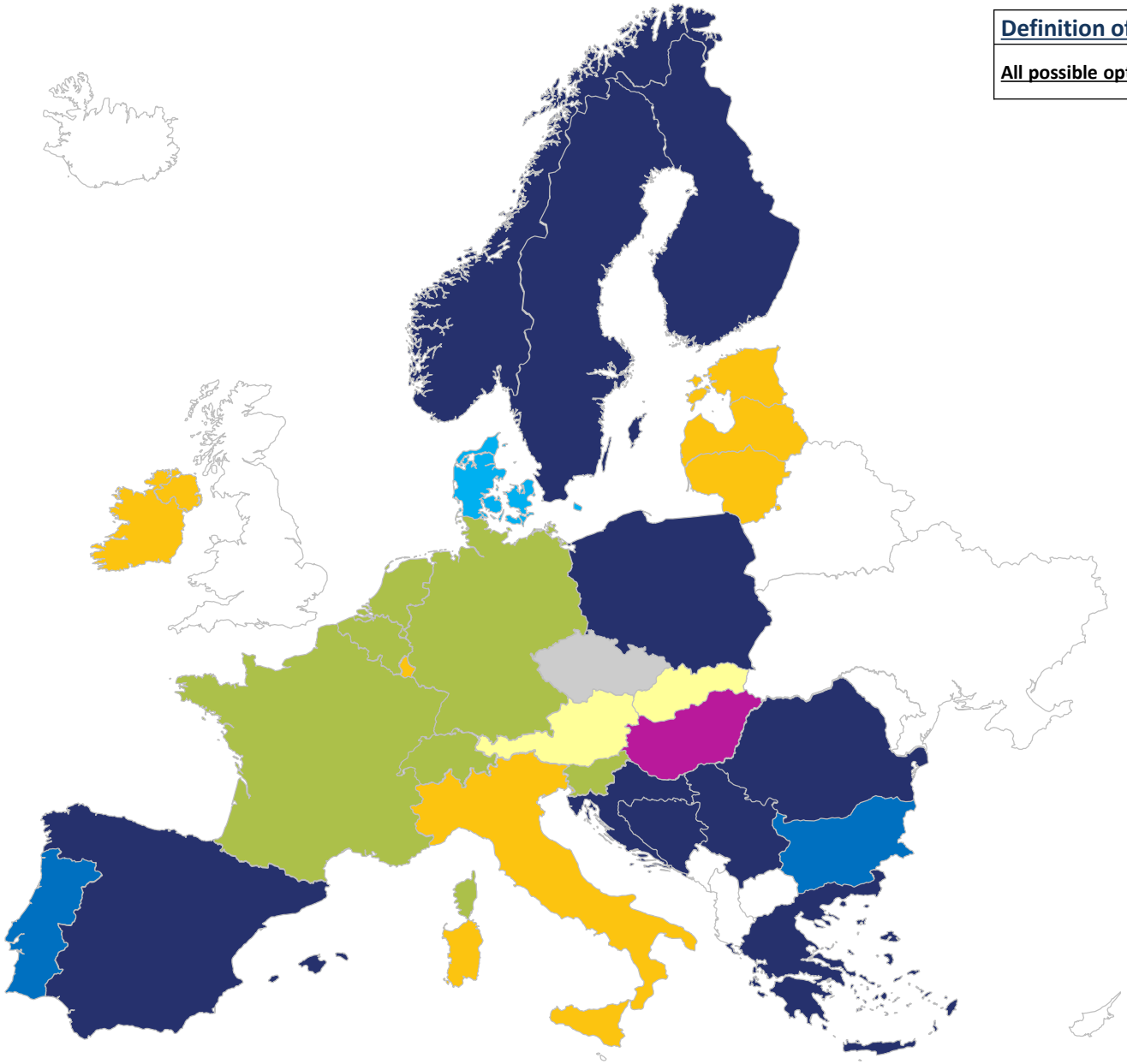
Frequency Restoration Reserve (Automatic) – Capacity – Distance to real time of reserve products auctions



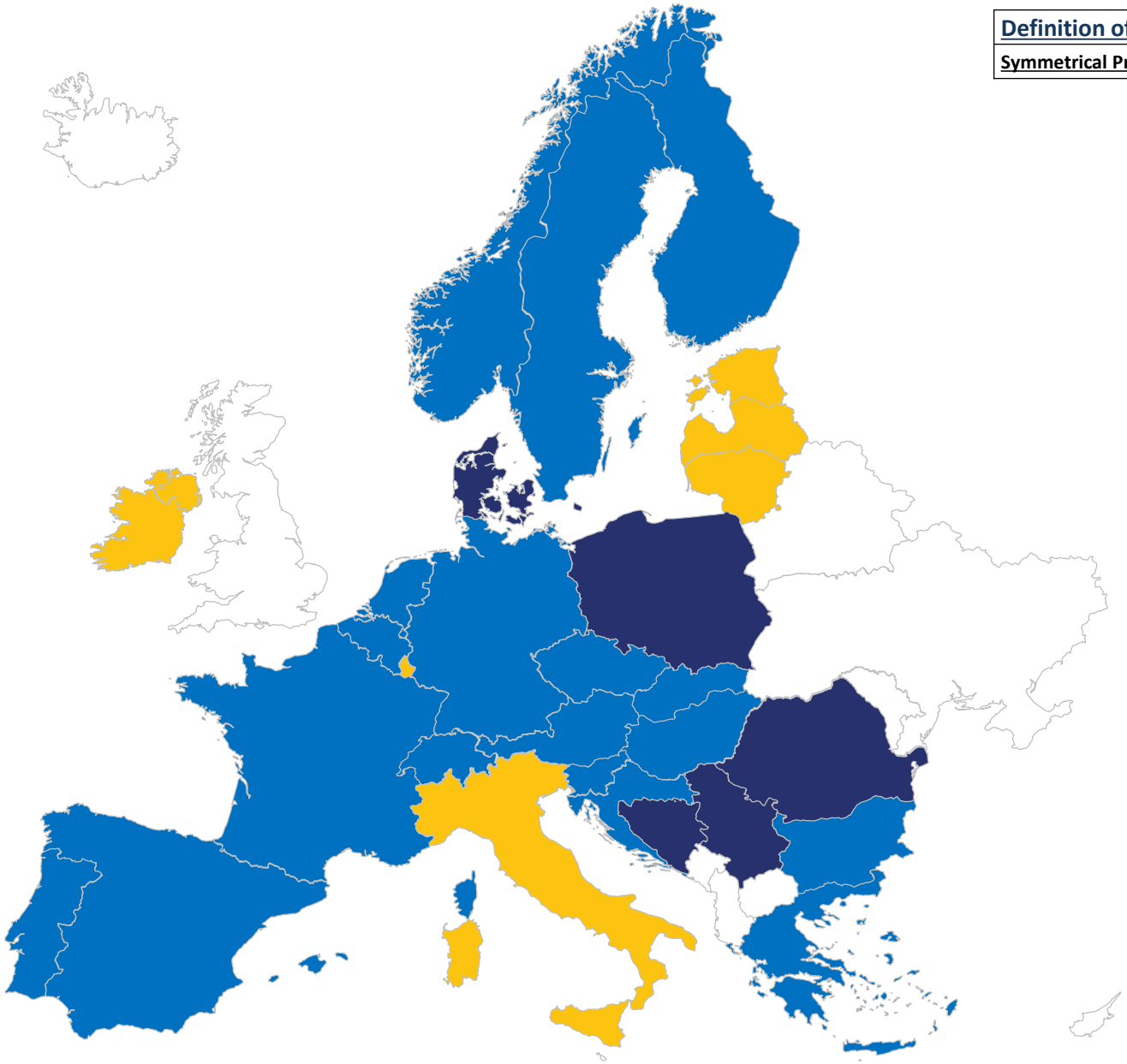
Definition of question	
Distance to real time of reserve products auctions	The time ahead from real time when auction/agreement for an specific balancing product takes place (for instance = 1 year in the case of a reserve agreement signed 1 year ahead of real time).

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)



Frequency Restoration Reserve (Automatic) – Capacity – Symmetrical Product

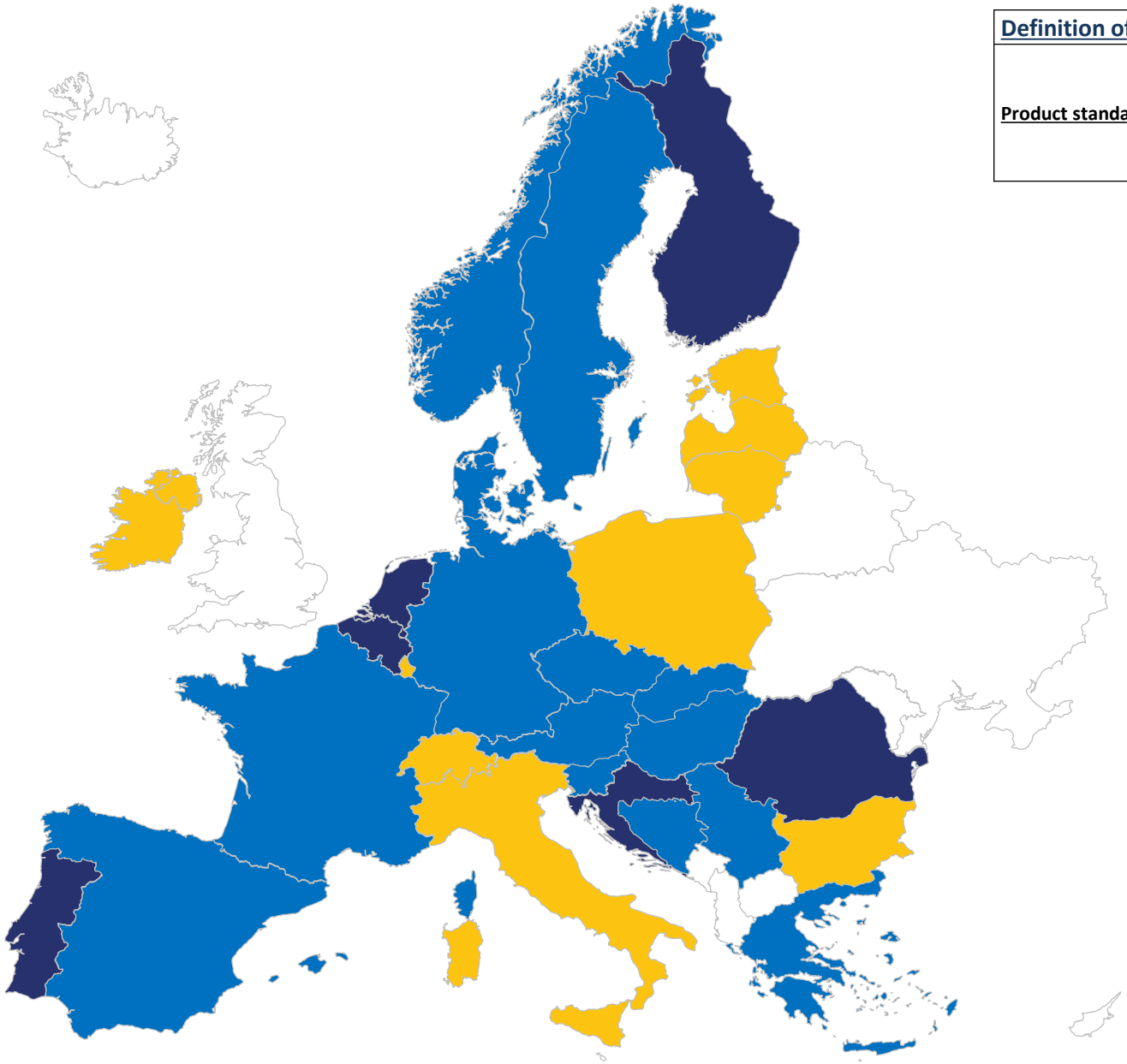


Definition of question	
Symmetrical Product	Upward regulation volume and for downward regulation volume has to be equal.

Key:

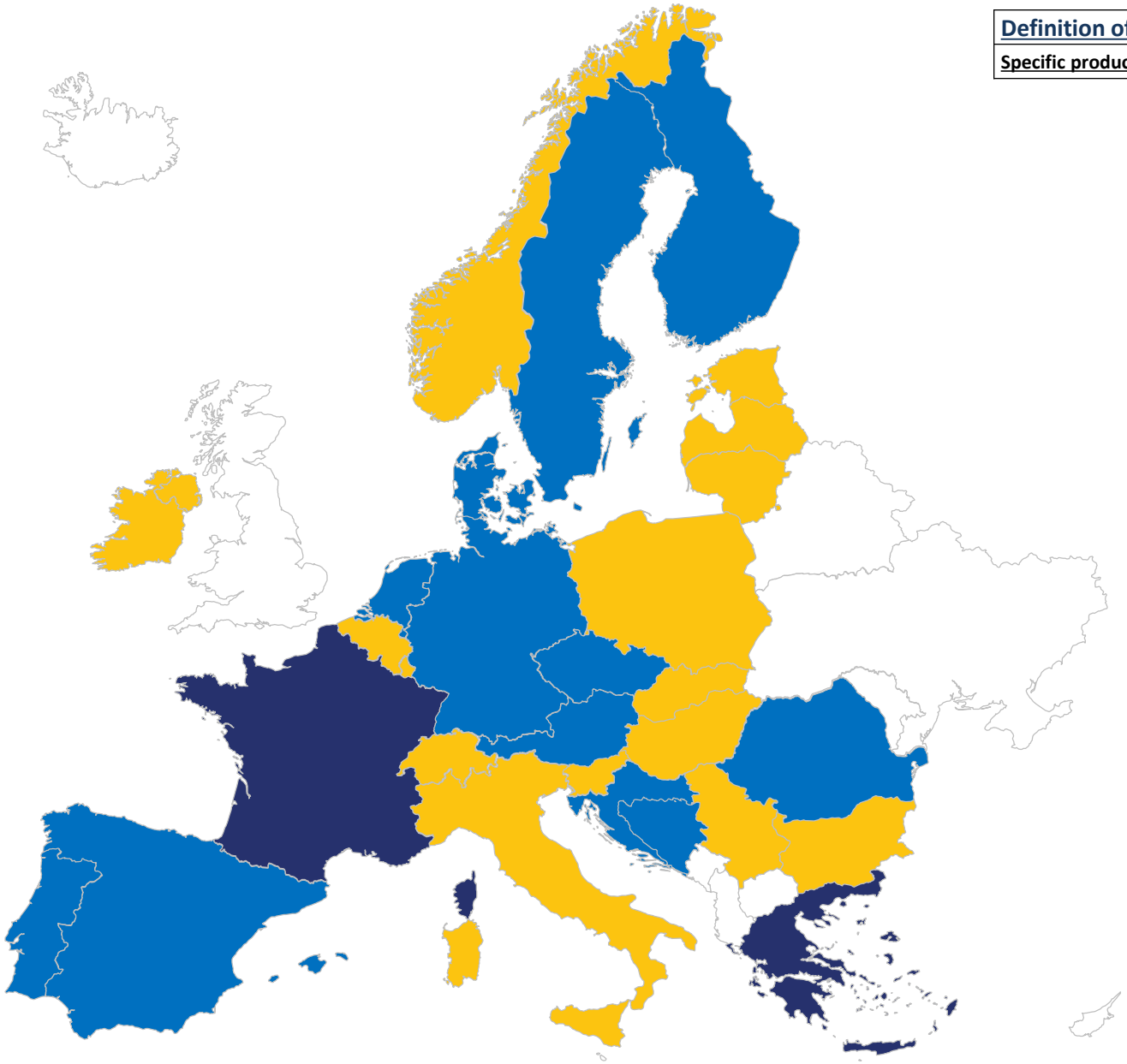
- Missing data
- N/A
- Has to be symmetrical
- Don't need to be symmetrical

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



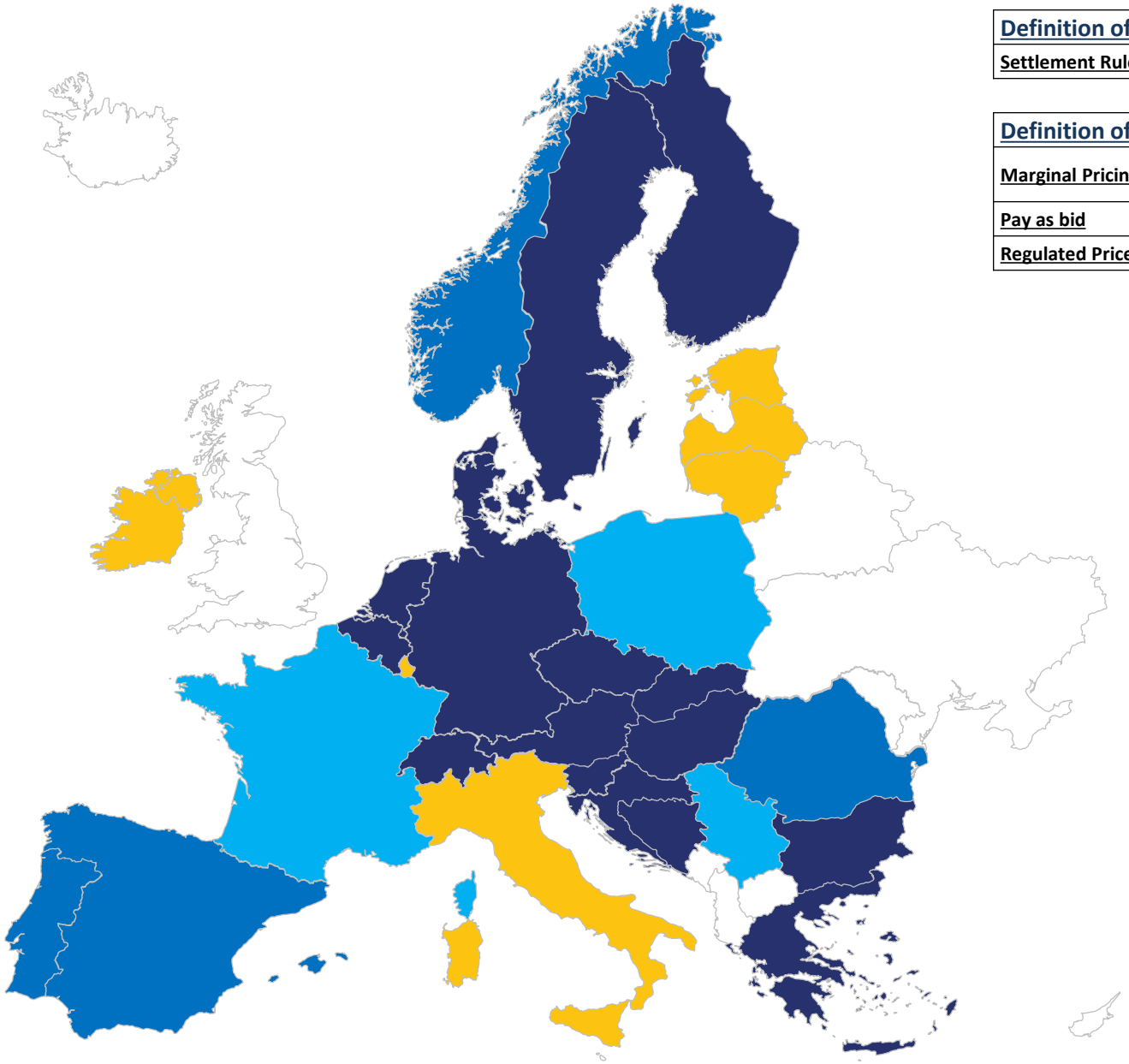
Definition of answer	
Product standardisation	EB Regulation defines only two products: standard products in Article 25 and specific products in Article 26. Standardisation process is finished if TSO implemented standard capacity balancing product(s) in line with Annex of the SPBC methodology or if national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

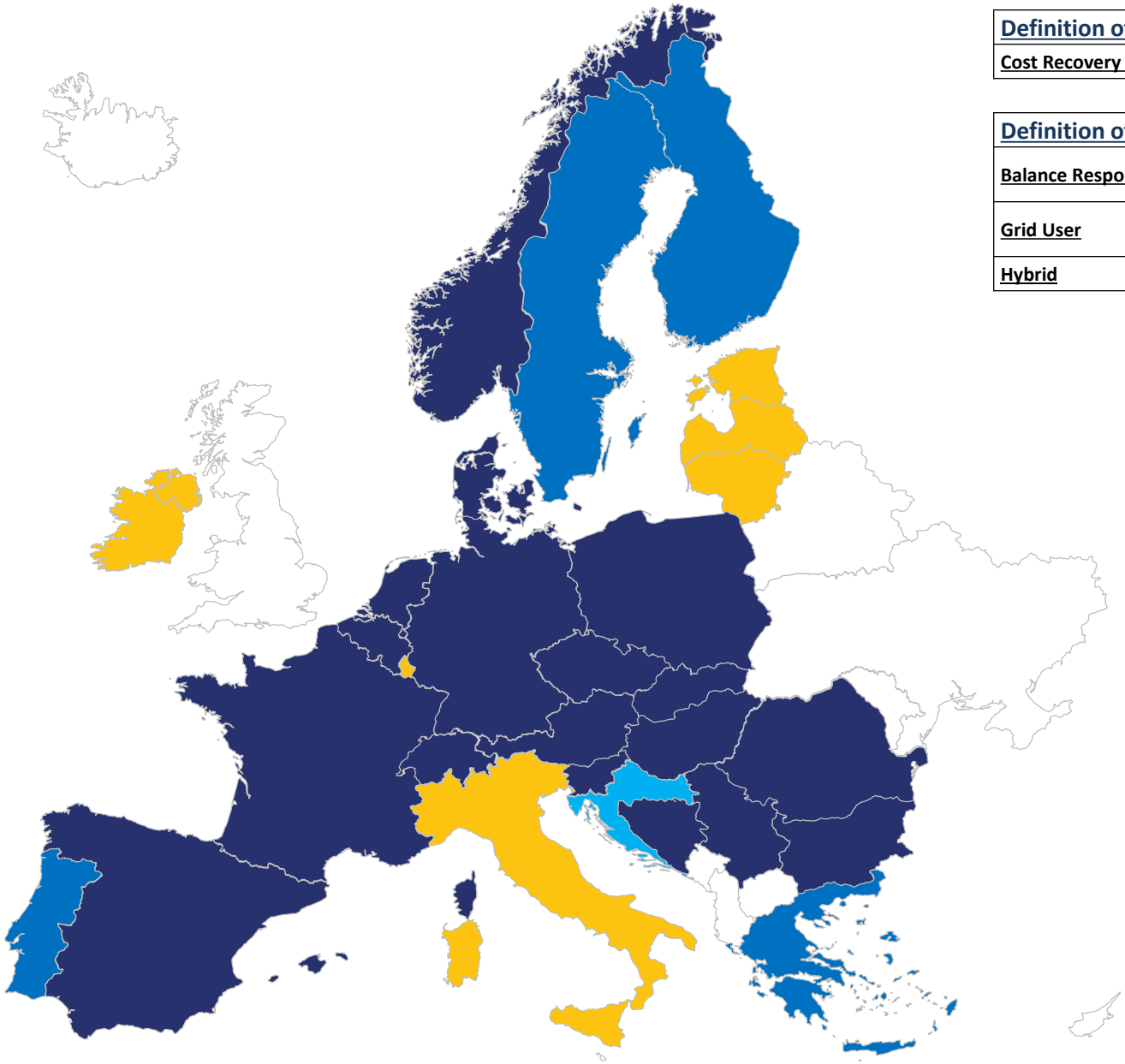
Frequency Restoration Reserve (Automatic) - Capacity - Settlement Rule



Definition of question	
Settlement Rule	The pricing rules for settlement.

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 (Automatic) - Capacity - Cost Recovery Scheme



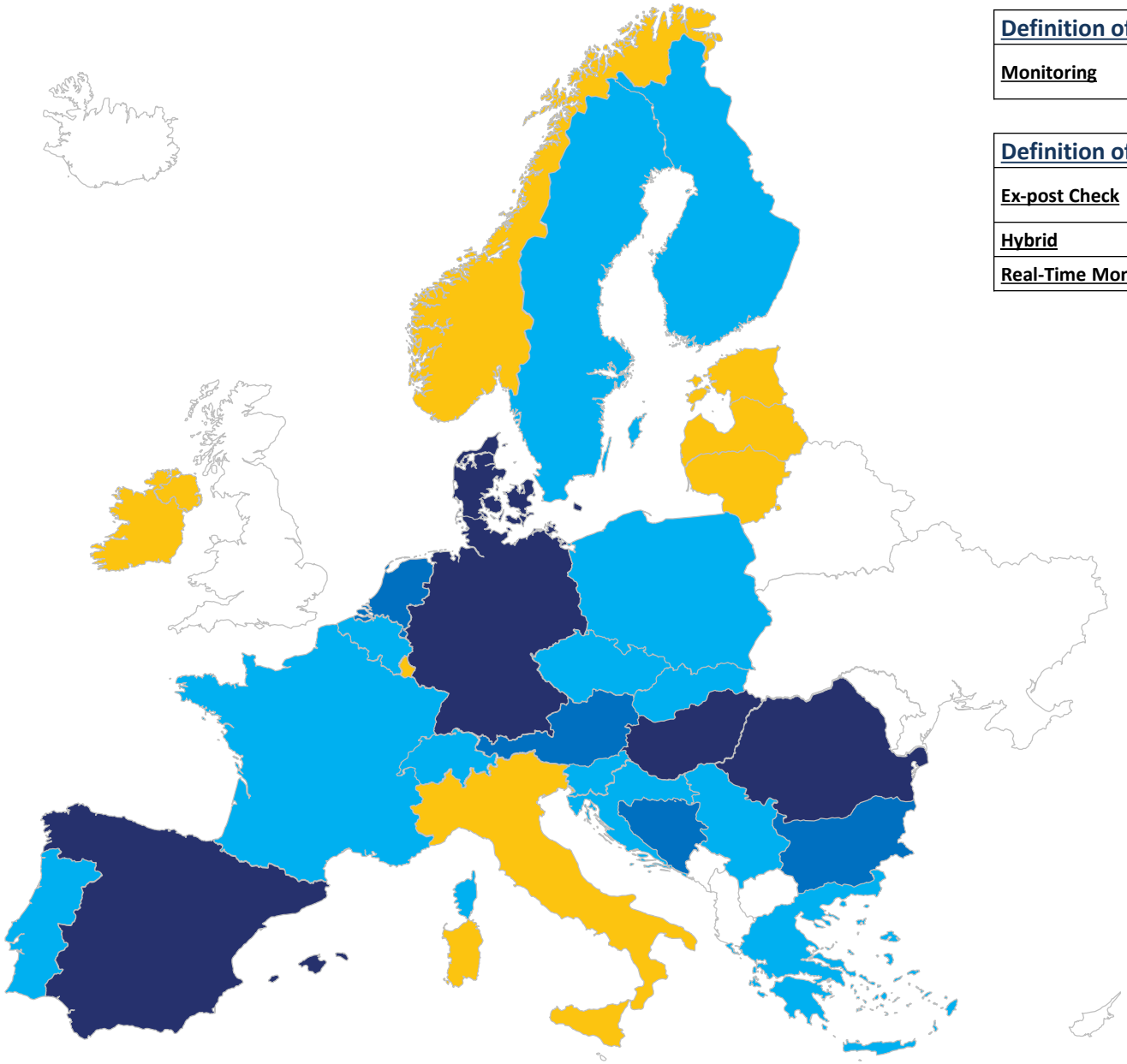
Definition of question	
Cost Recovery Scheme	From who are the costs recovered.

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.

Key:

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

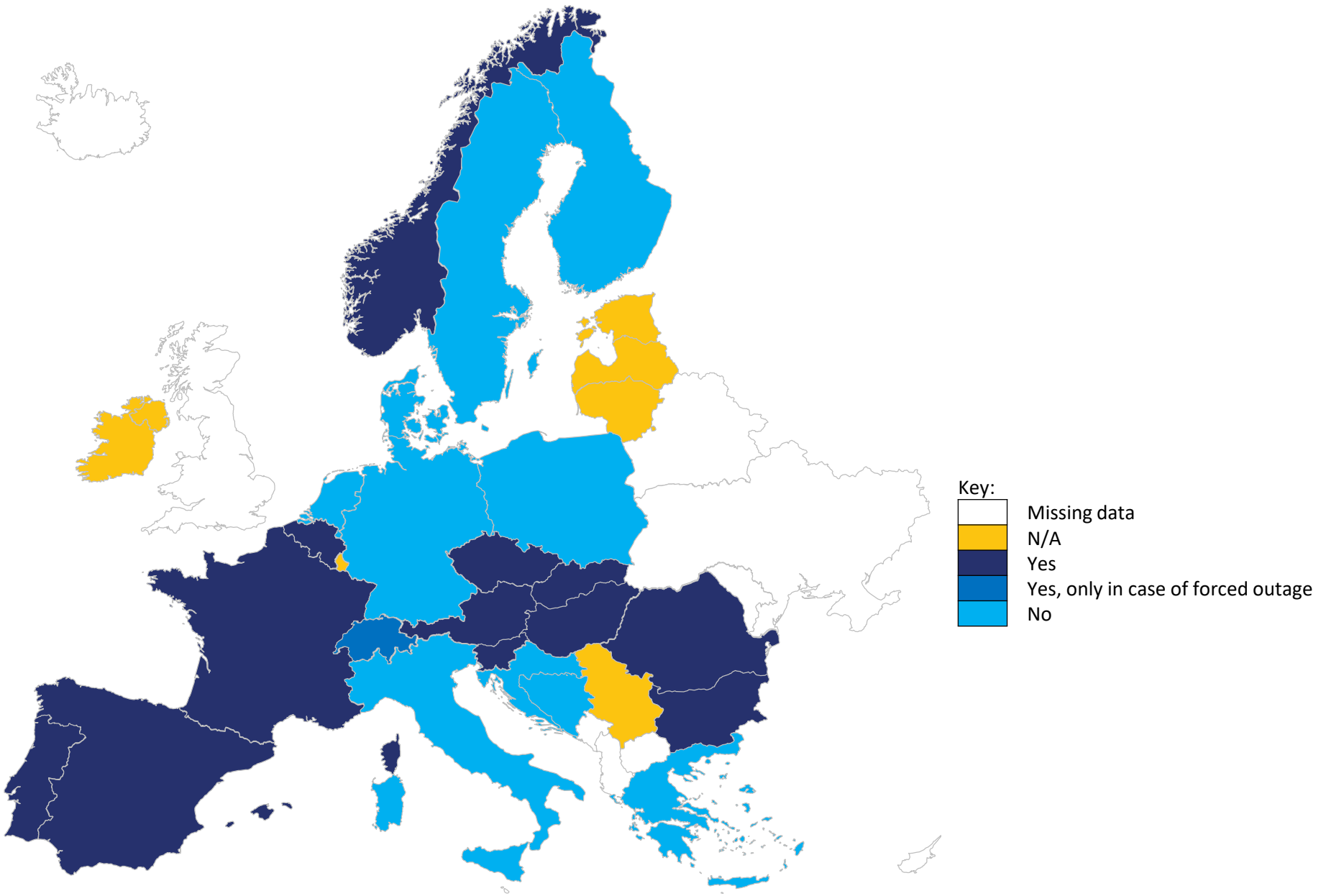
Frequency Restoration Reserve (Automatic) - Capacity - Monitoring



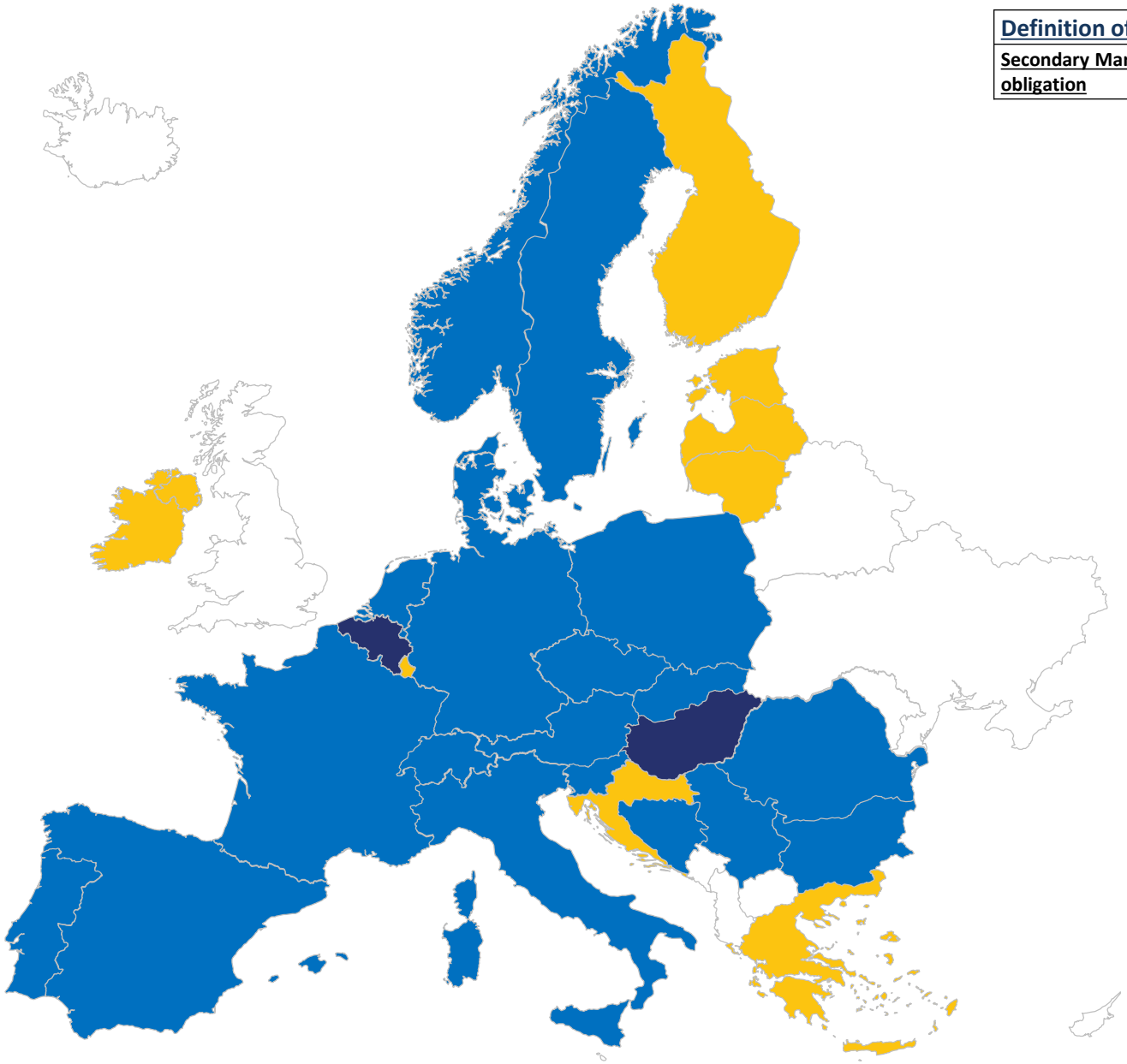
Definition of question	
Monitoring	Refers to the type of monitoring in place by the system operator to ensure performance of plant.

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

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

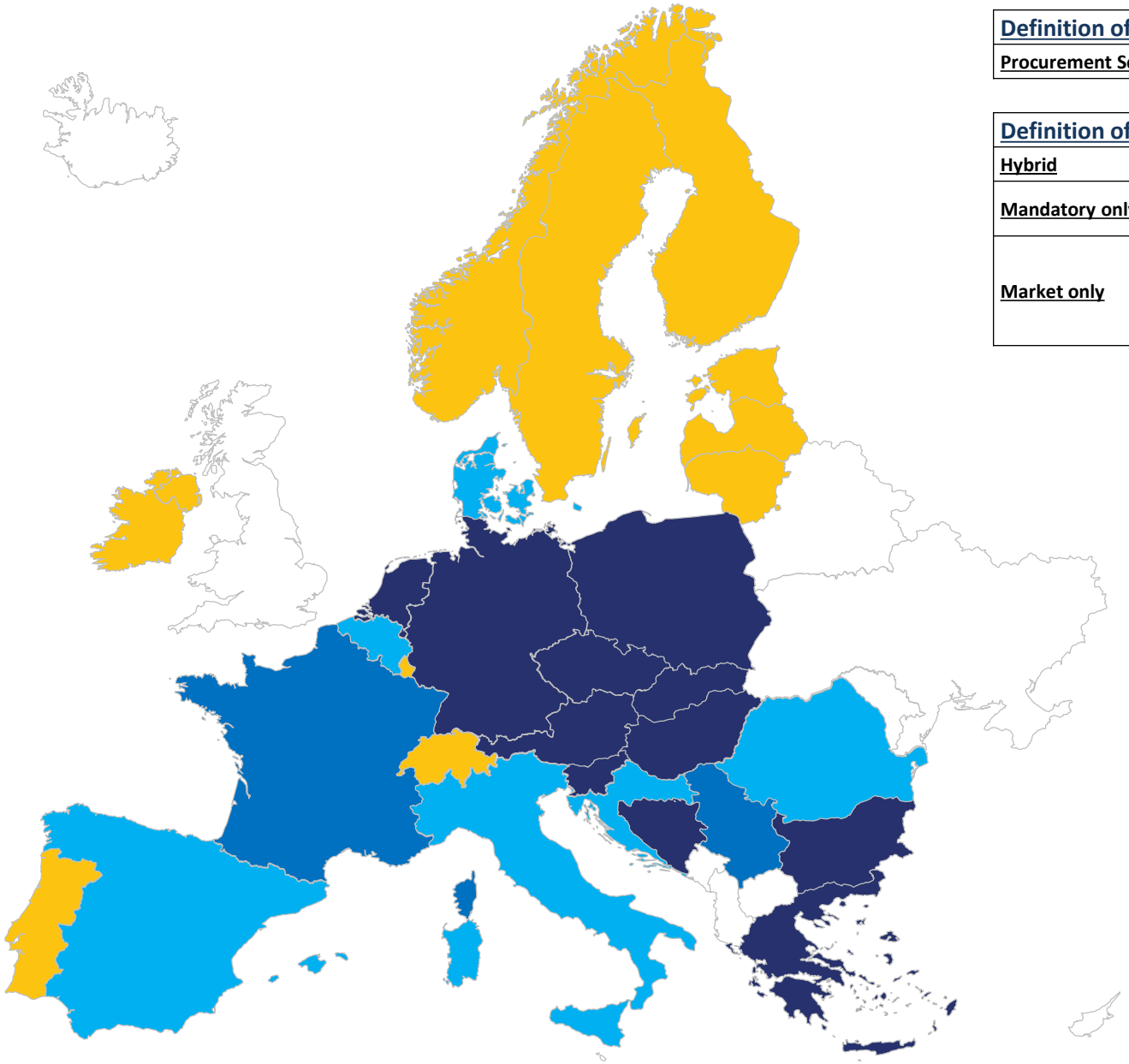


Frequency Restoration Reserve (Automatic) - Capacity - In case transfer obligation is allowed, is there an organised secondary market?



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.

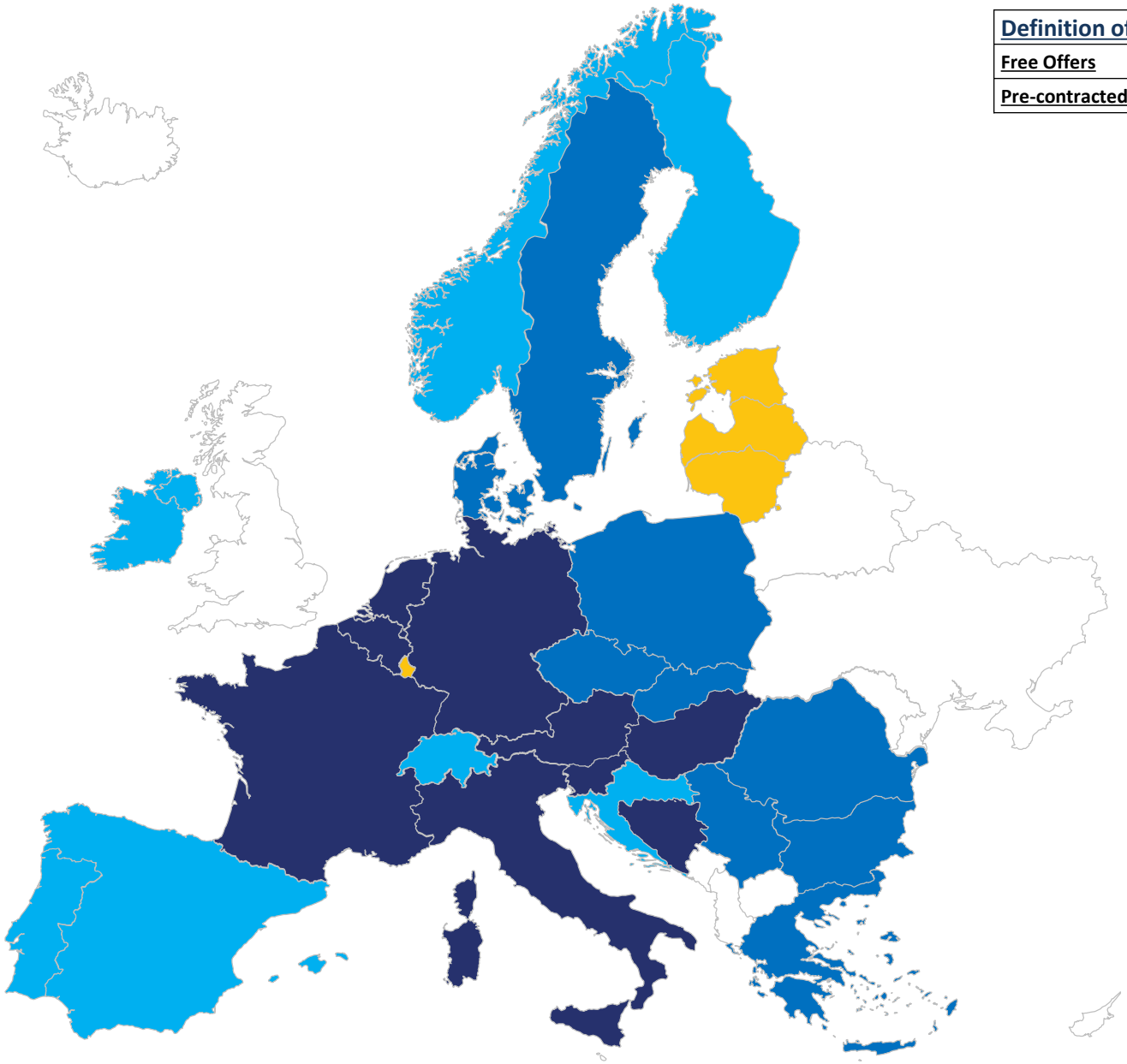
Frequency Restoration Reserve (Automatic) - Energy - Procurement Scheme



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

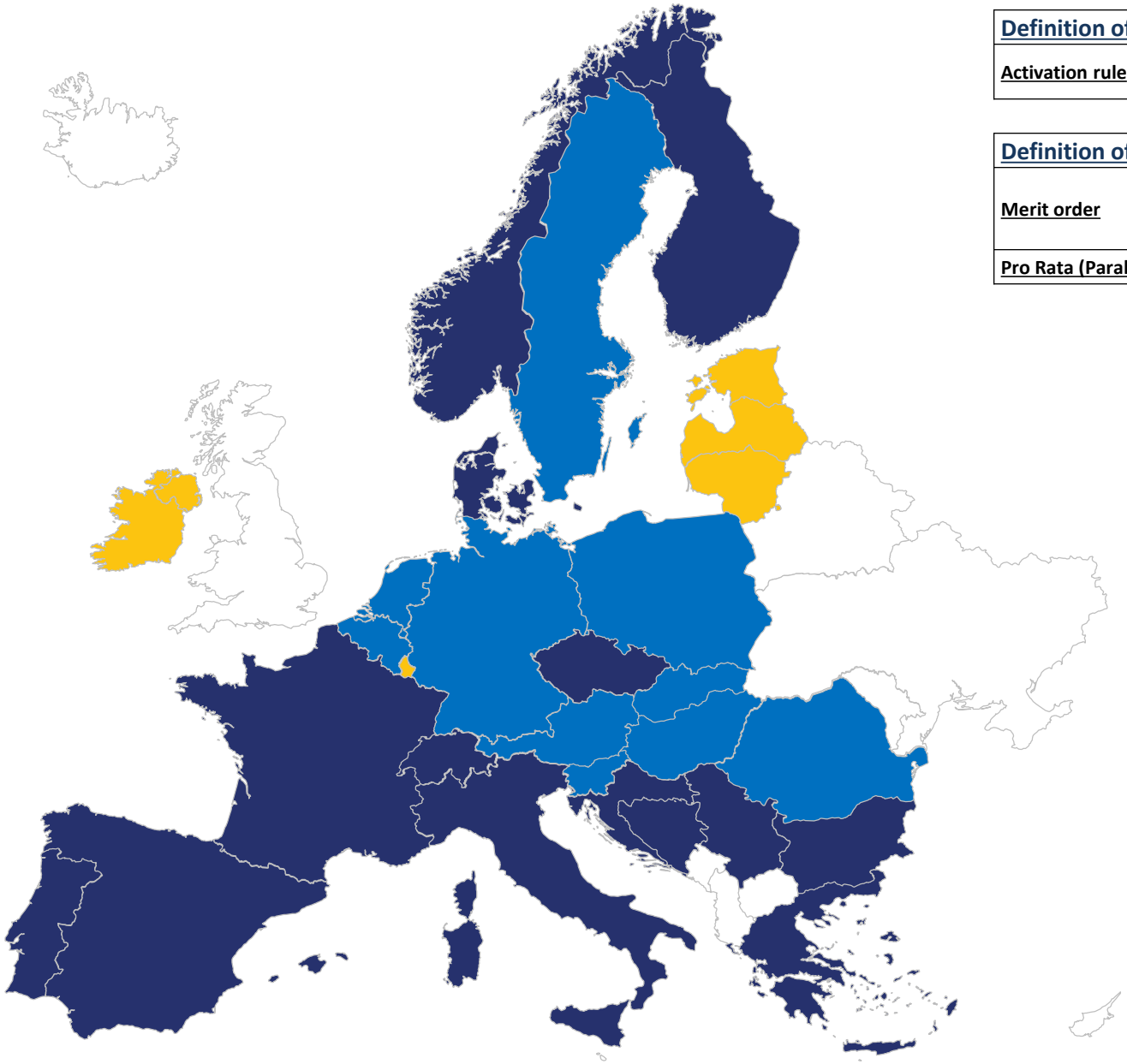


Definition of question	
Free Offers	Possibility to offer balancing energy bids without a contract for Balancing Capacity
Pre-contracted	BSP has sold/procured Balancing Capacity to TSO.

Key:

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

Frequency Restoration Reserve (Automatic) - Energy - Activation Rule



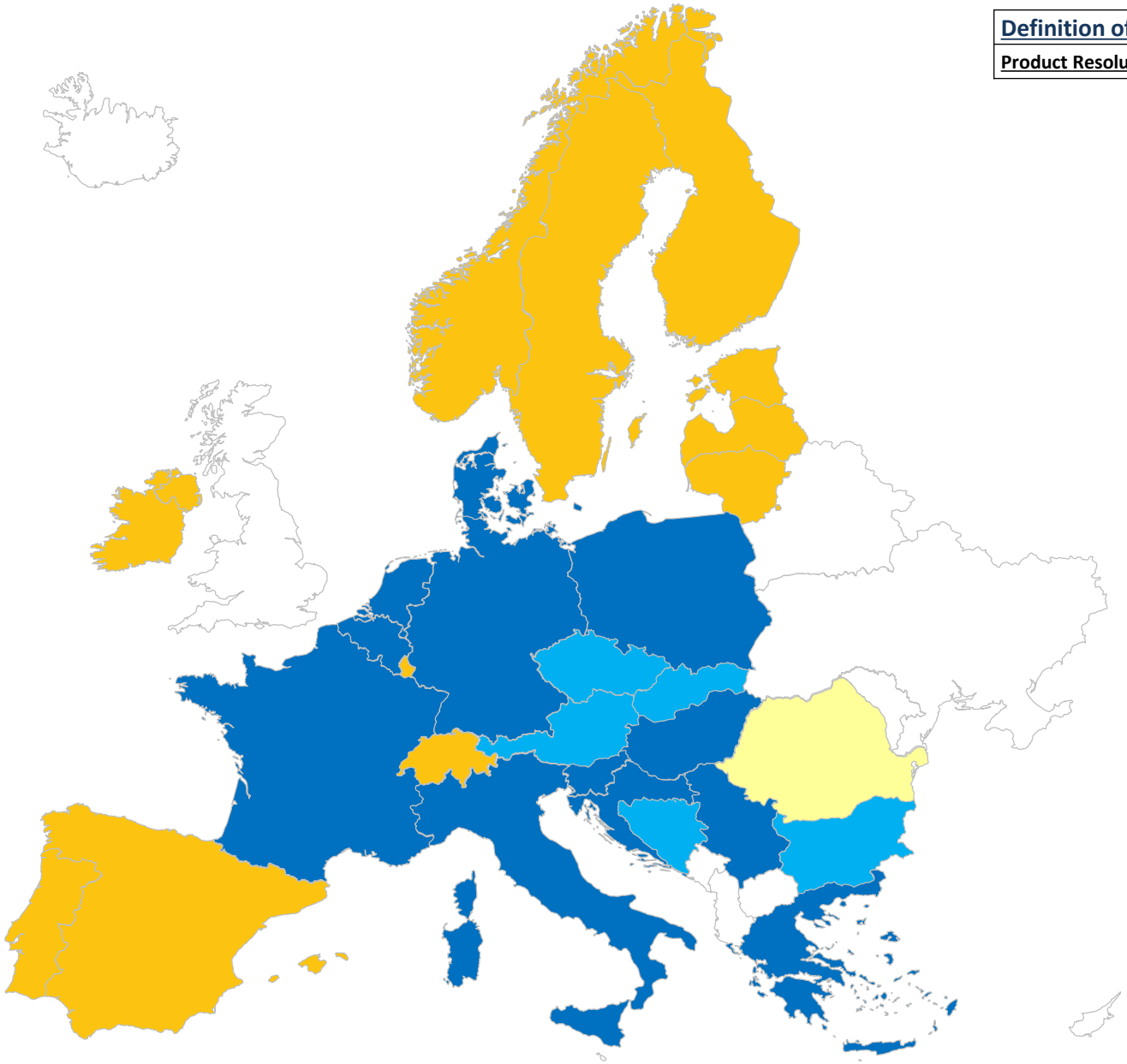
Definition of question	
Activation rule	How the frequency restoration reserves are activated i.e. by a Pro-Rata system or on the basis of a Merit Order (cheapest being activated first).

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)

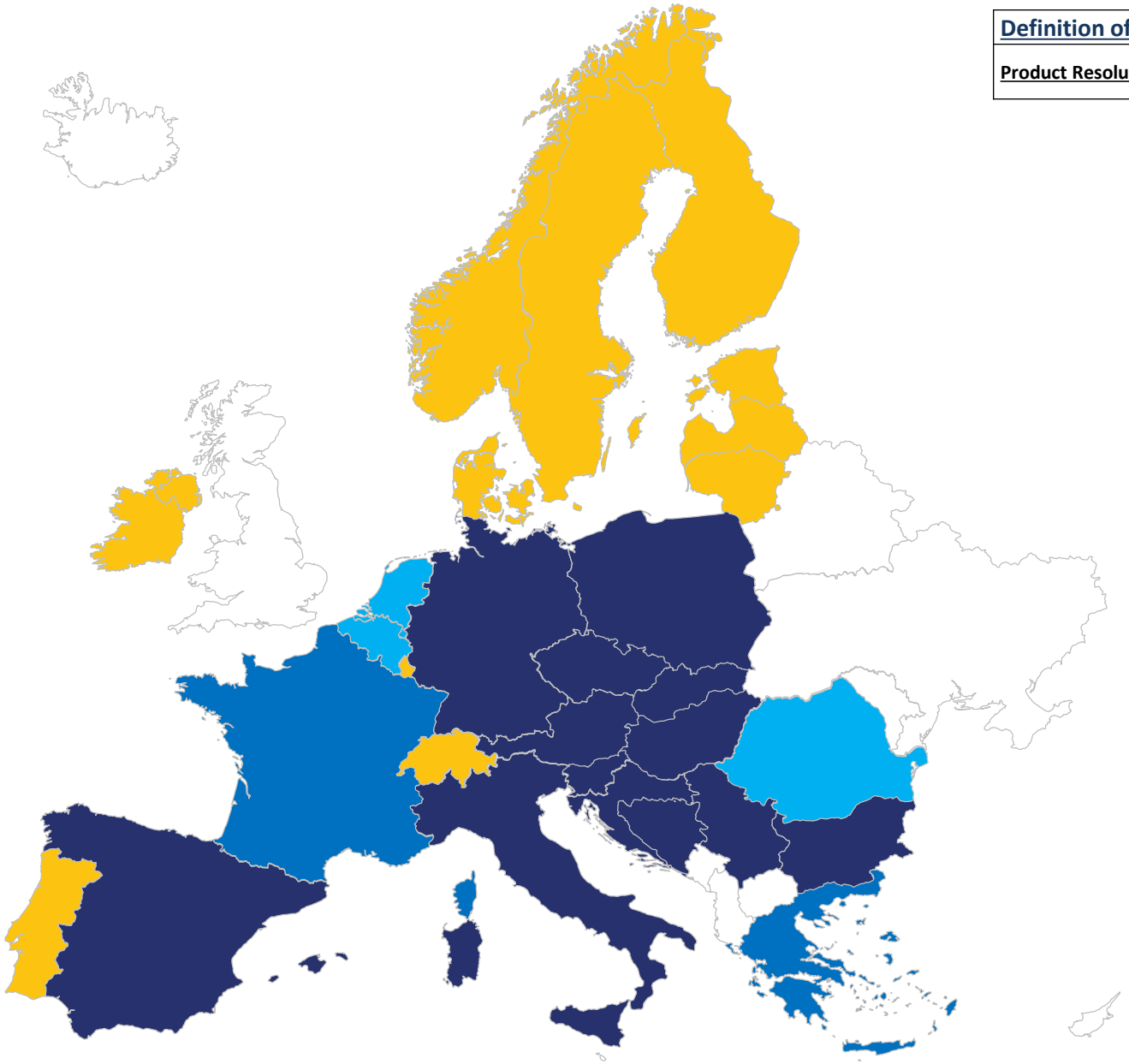


Definition of question	
Product Resolution (in MW)	The minimum bid size into the balancing market.

Key:

- Missing data
- N/A
- No minimum bid size
- x <= 1 MW
- 1 MW < x <= 5 MW
- 5 MW < x <= 10 MW
- x > 10 MW

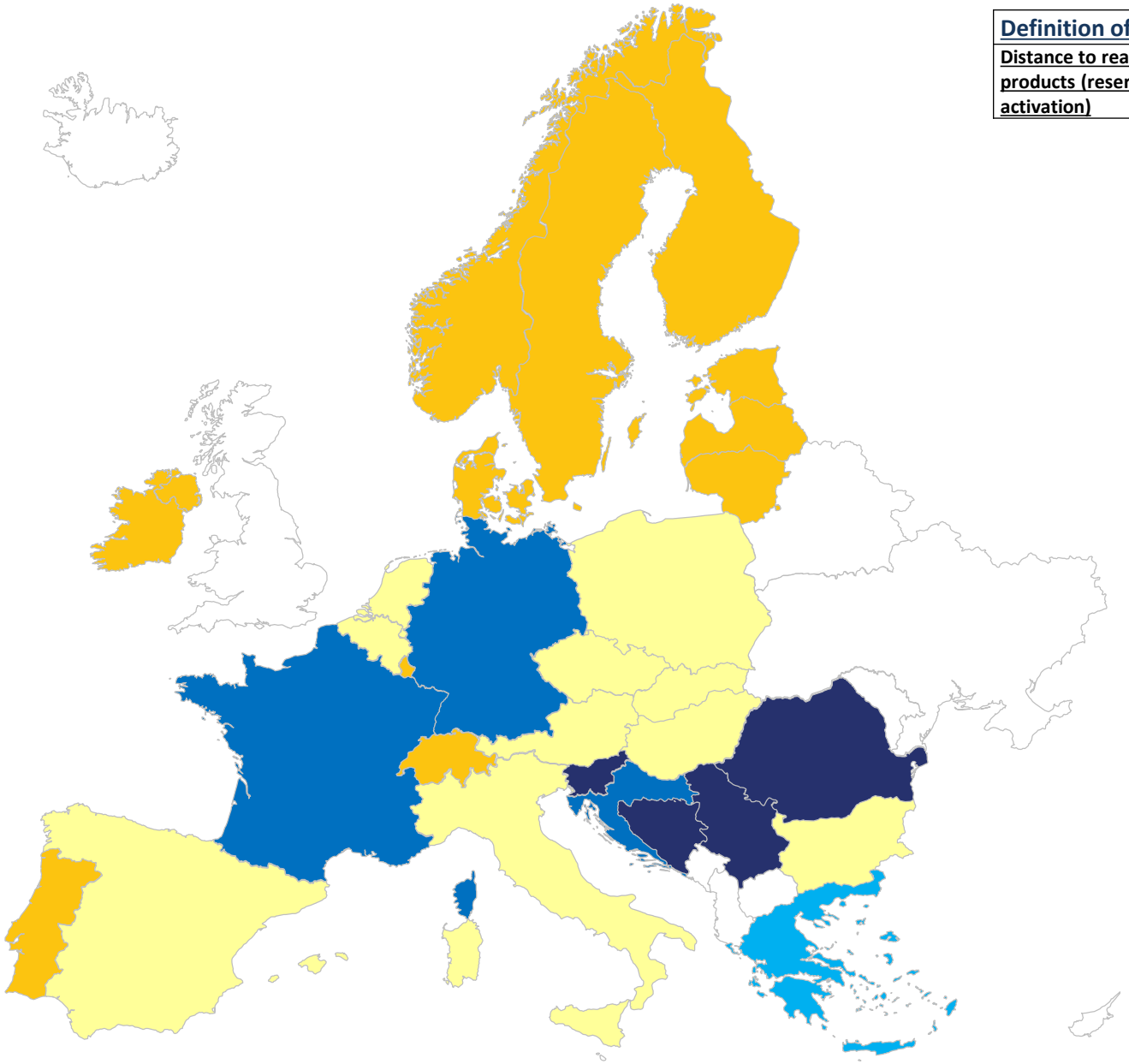
Frequency Restoration Reserve (Automatic) - Energy - Product Resolution (in time)



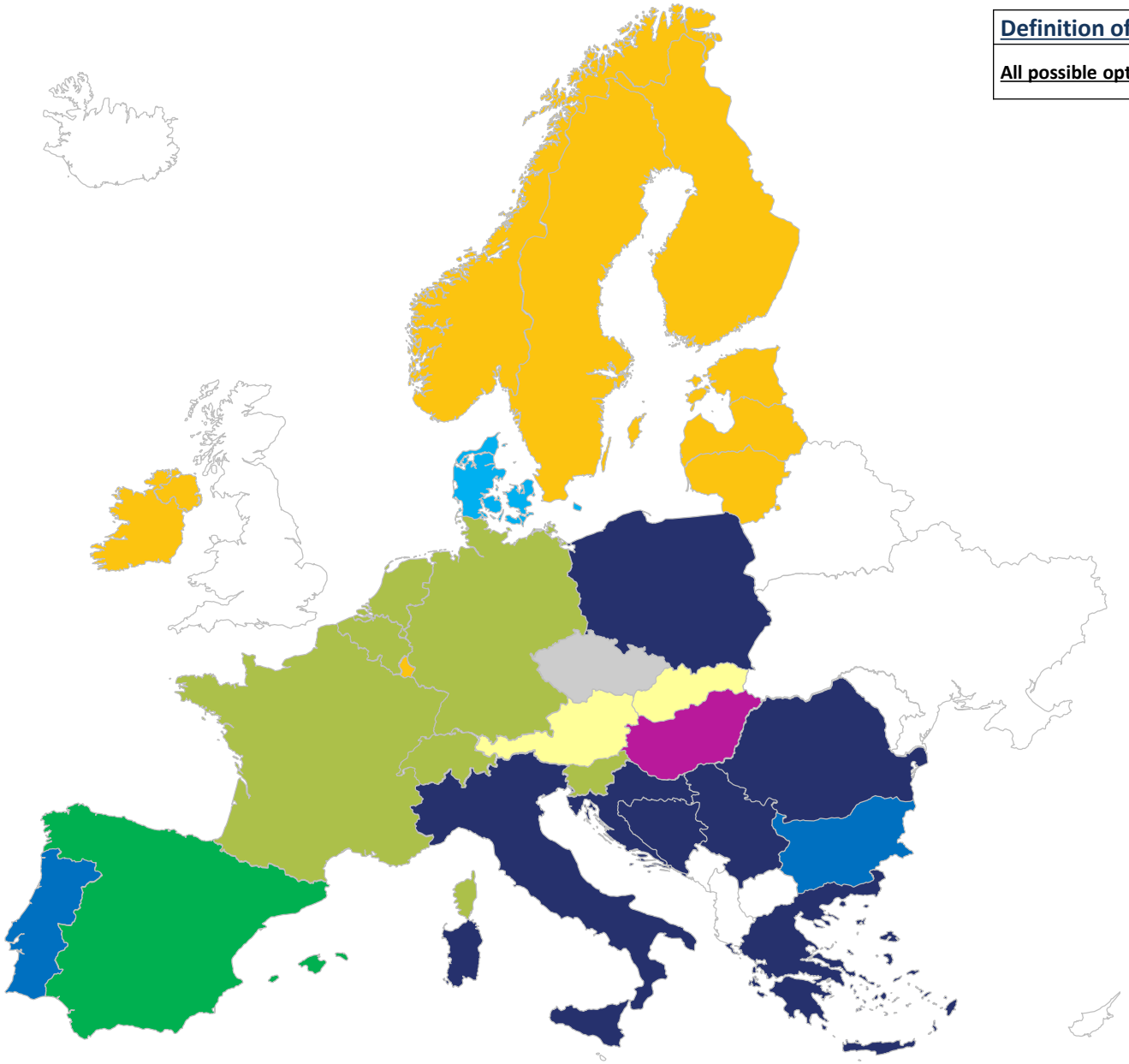
Definition of question	
Product Resolution (in time)	The maximum resolution for which the product can be bid into the market (for instance =1 hour in the case of a 24 auctions day ahead market for reserve provision).

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

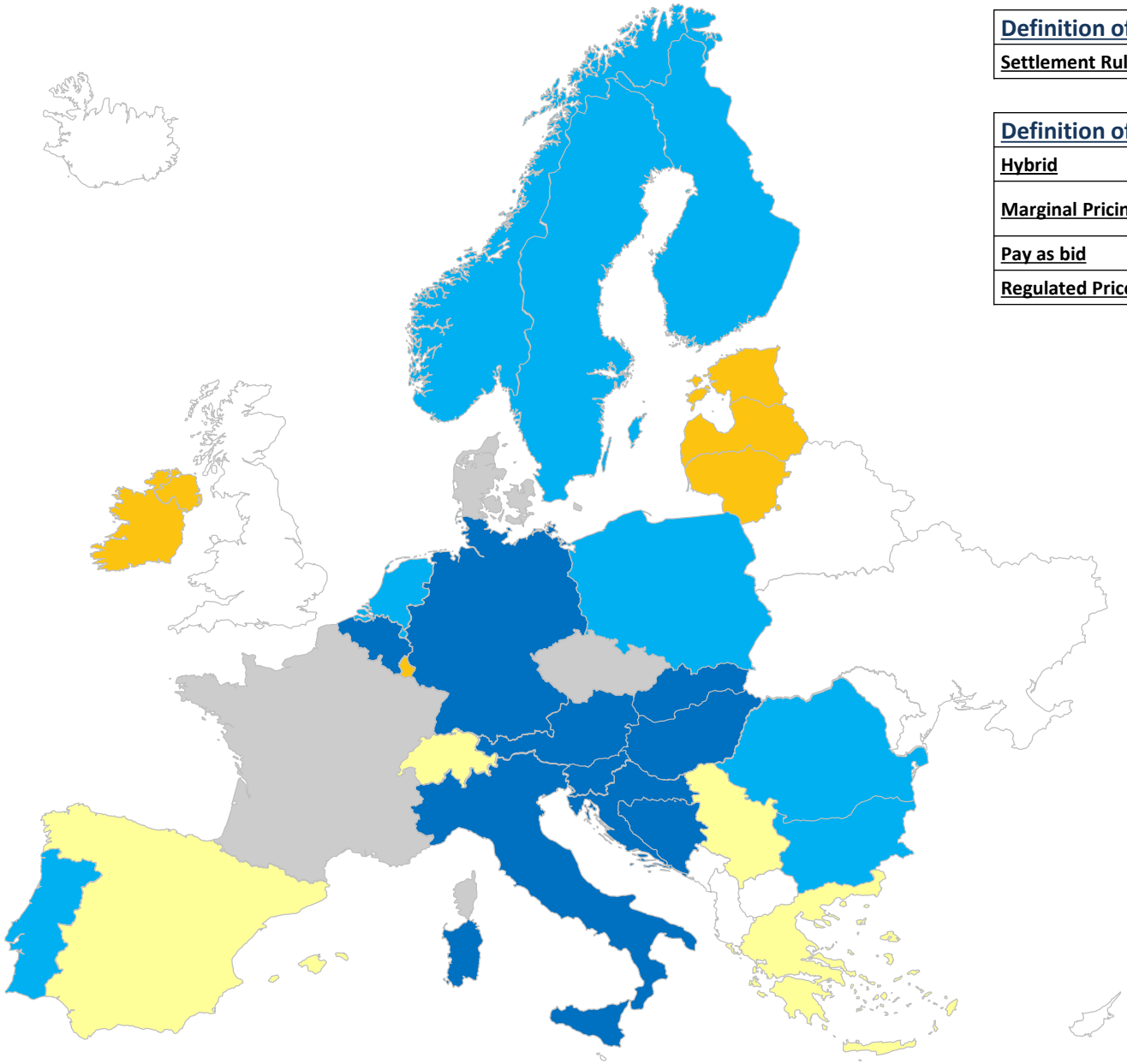


Definition of answer	
All possible options	In this case all possible provider types were chosen (Generator + Demand-side response + Pump Storage + Batteries + Distributed generation)

Key:

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

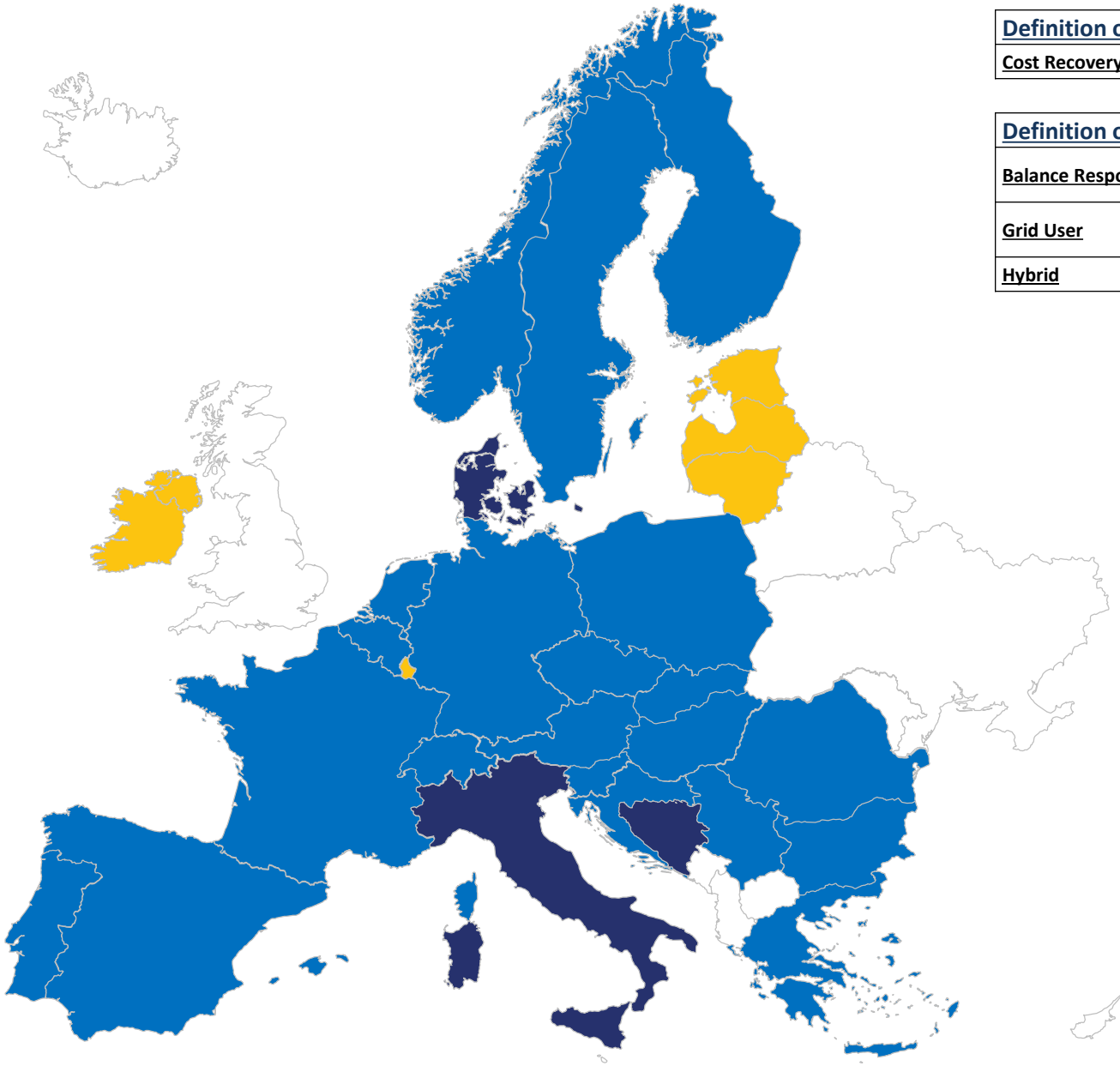
Frequency Restoration Reserve (Automatic) - Energy - Settlement Rule



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



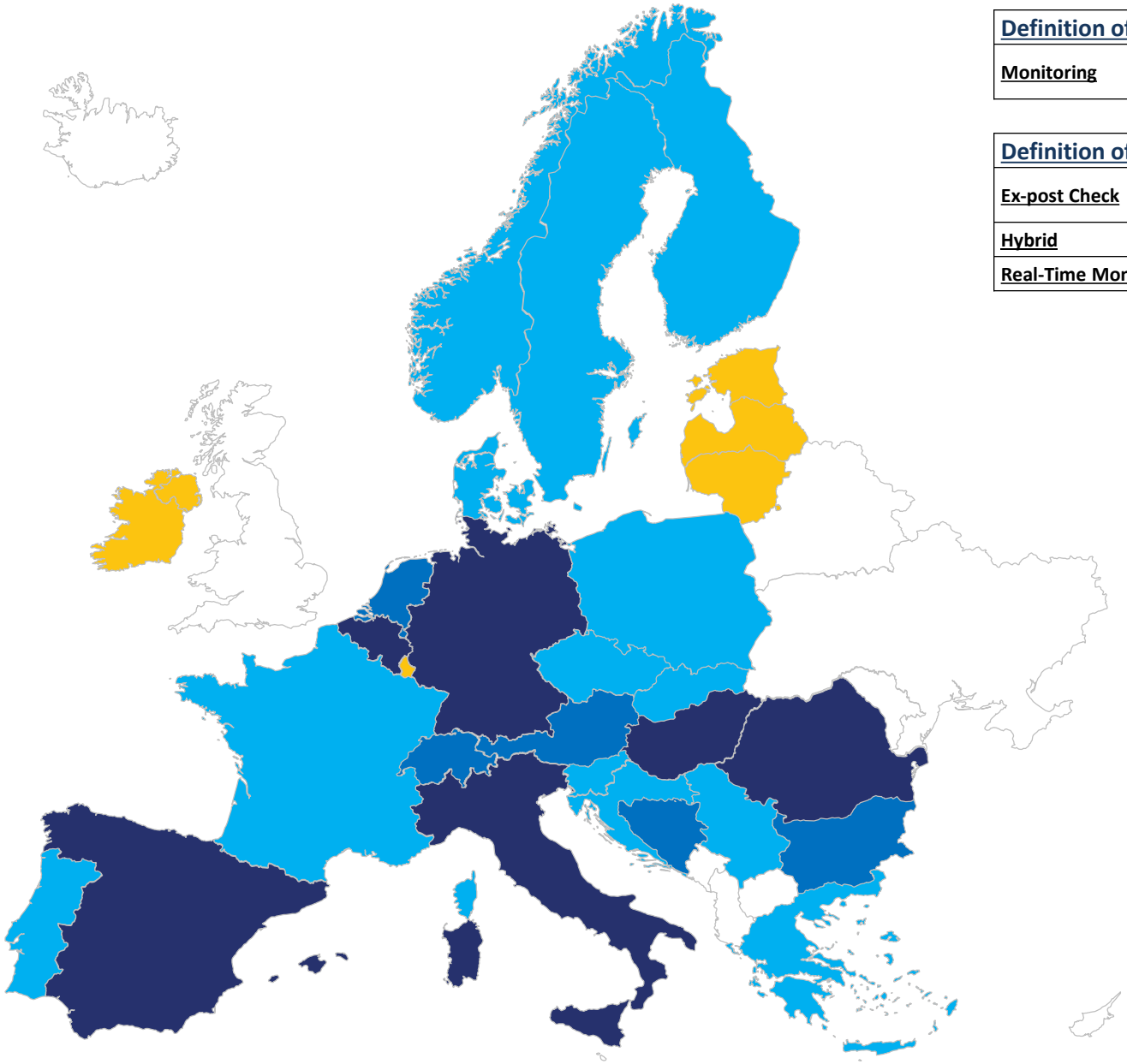
Key:

- 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



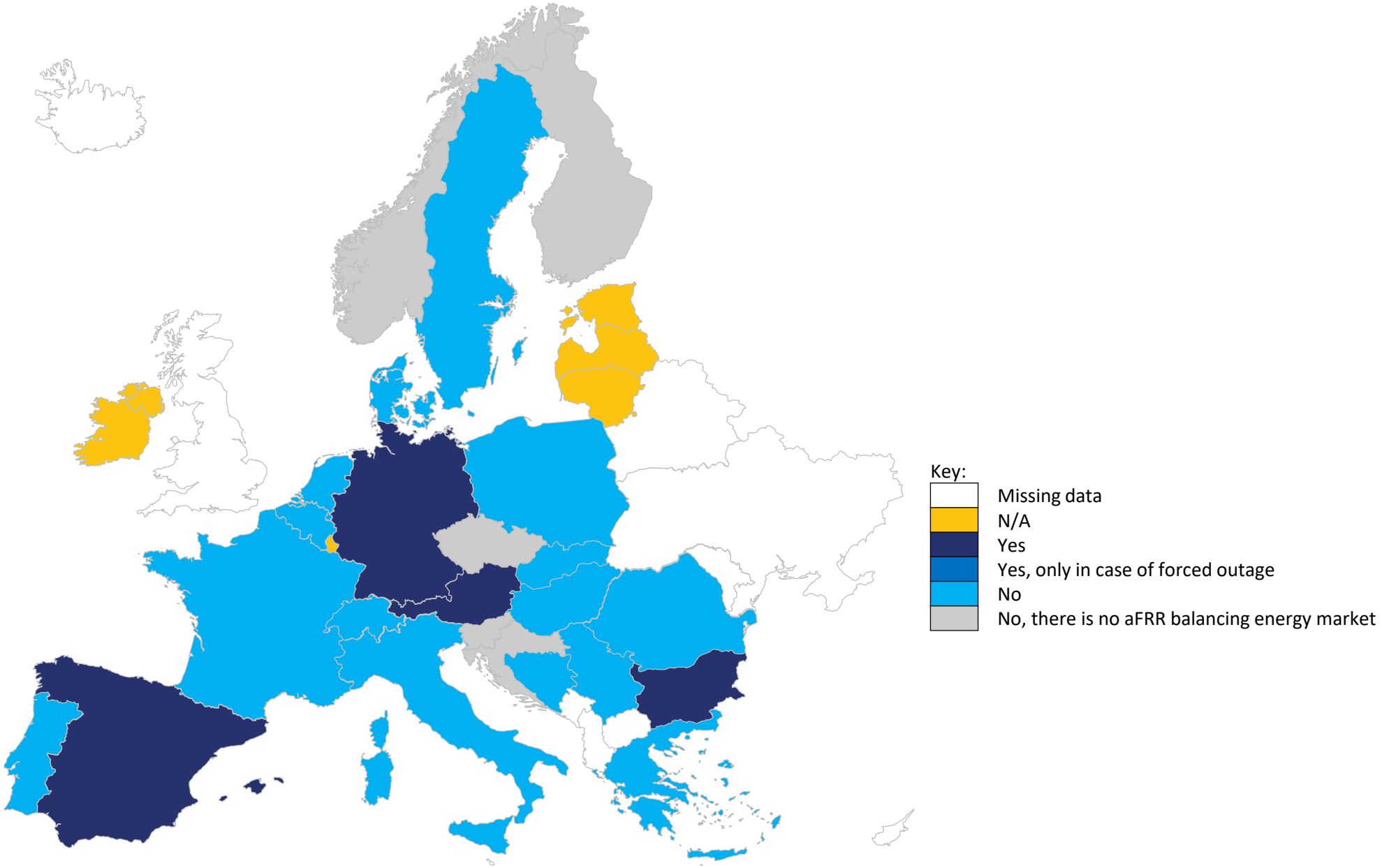
Definition of question	
Monitoring	Refers to the type of monitoring in place by the system operator to ensure performance of plant.

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.

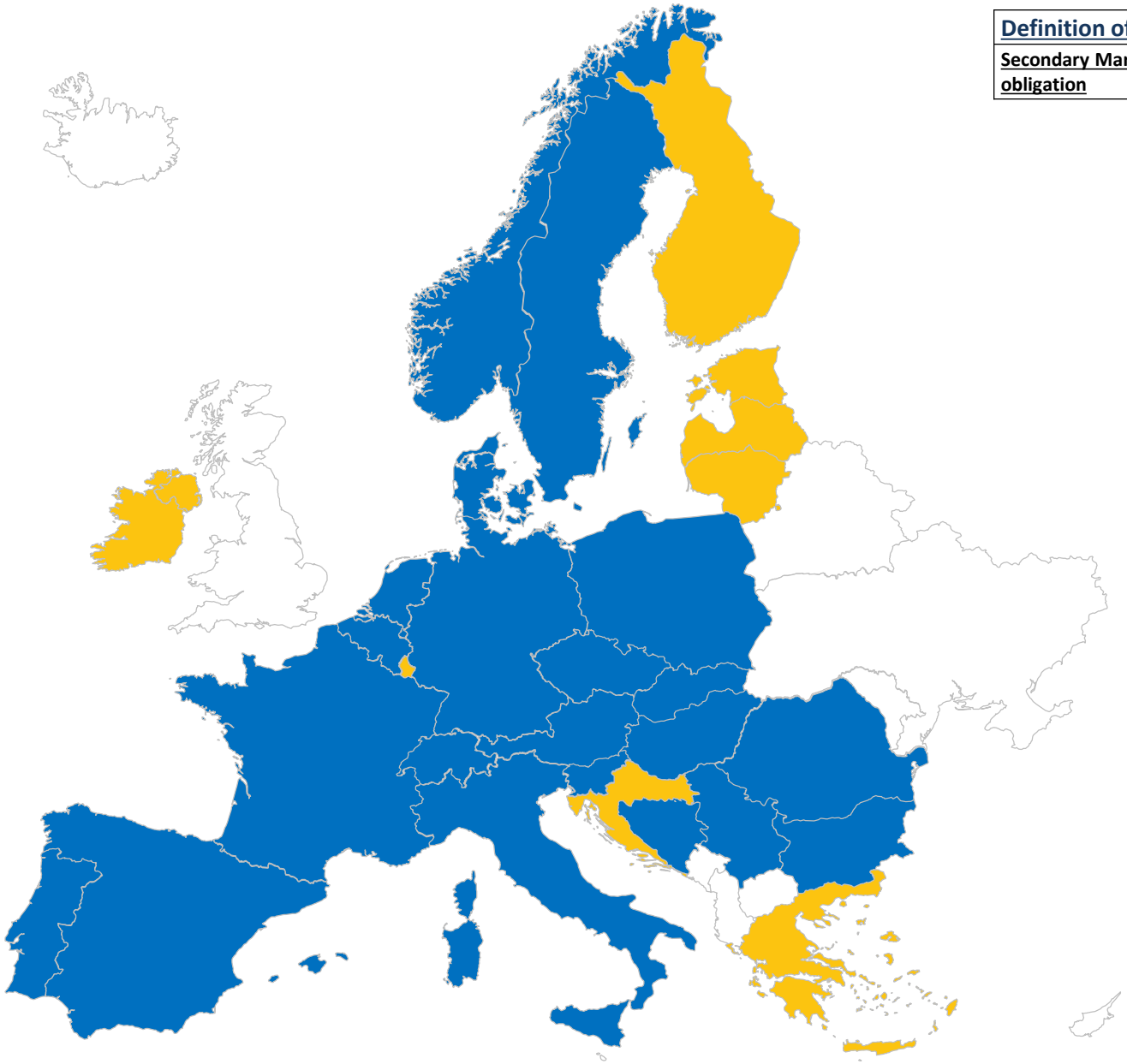
Key:

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

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

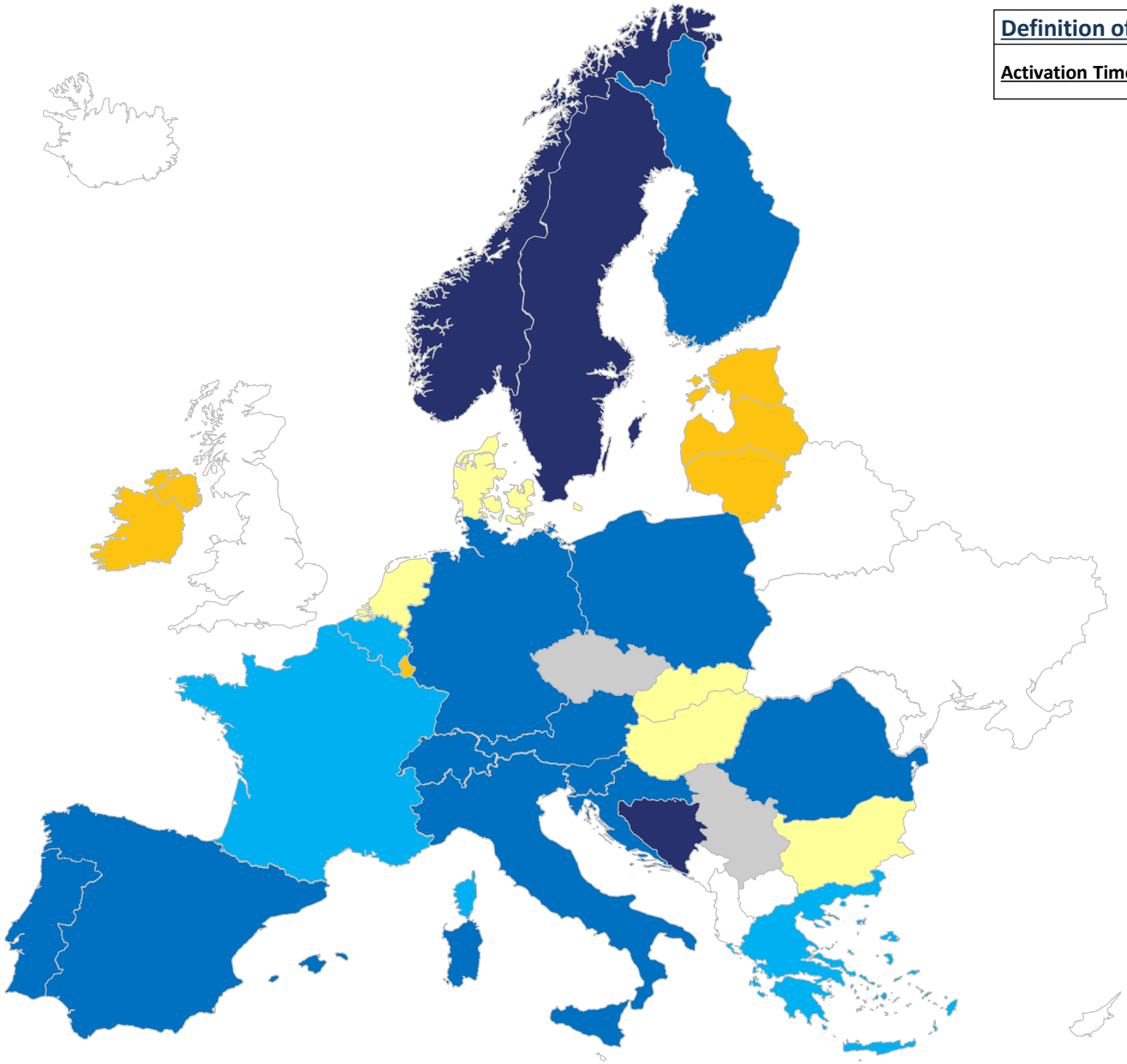


Frequency Restoration Reserve (Automatic) - Energy - In case transfer obligation is allowed, is there an organised secondary market?



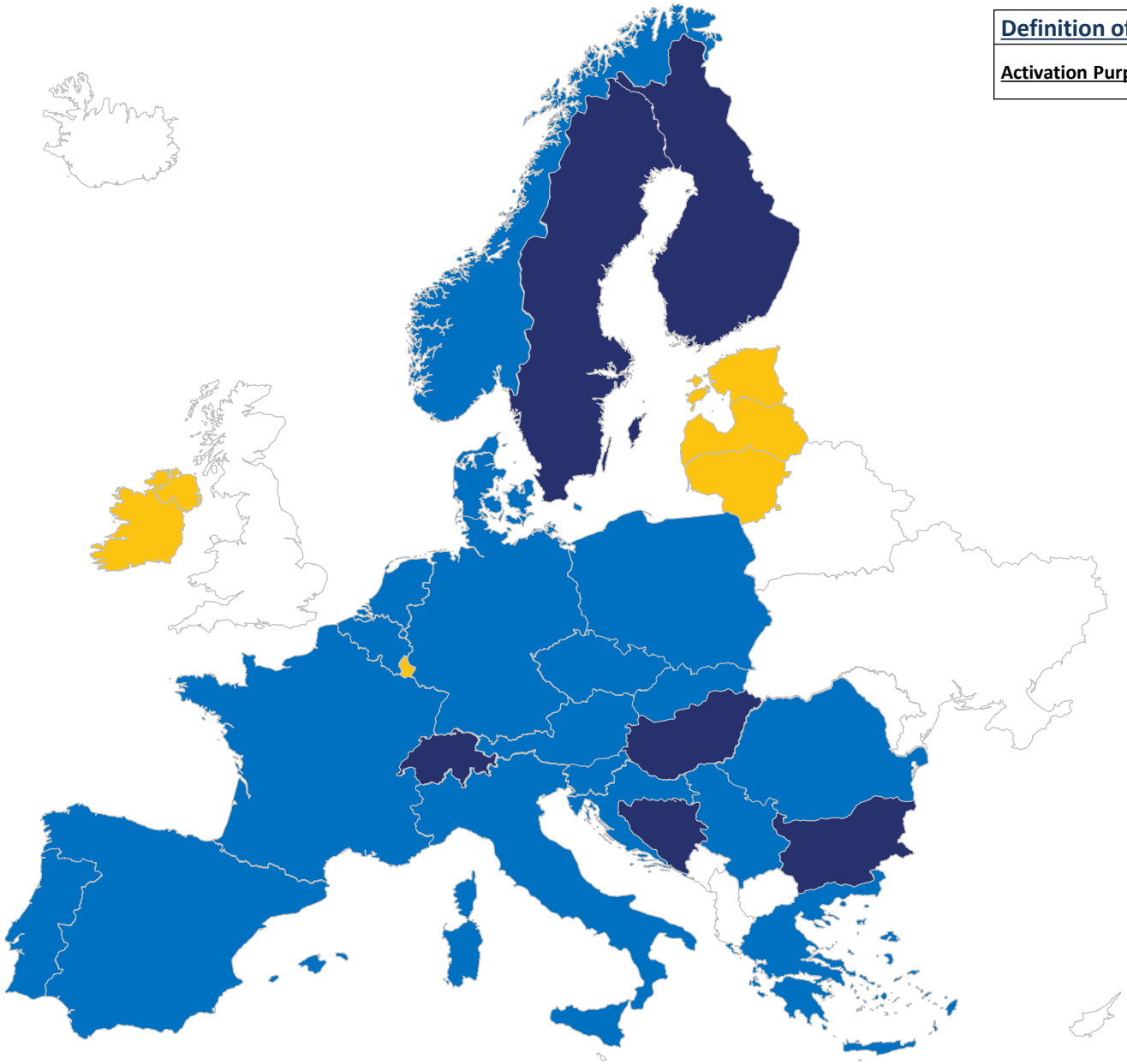
Definition of answer	
Secondary Market for reserve obligation	Trading procedure between the BSPs (where at least one BSP has contract with the TSO) to ensure the prescribed reserve amount of the TSO.

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



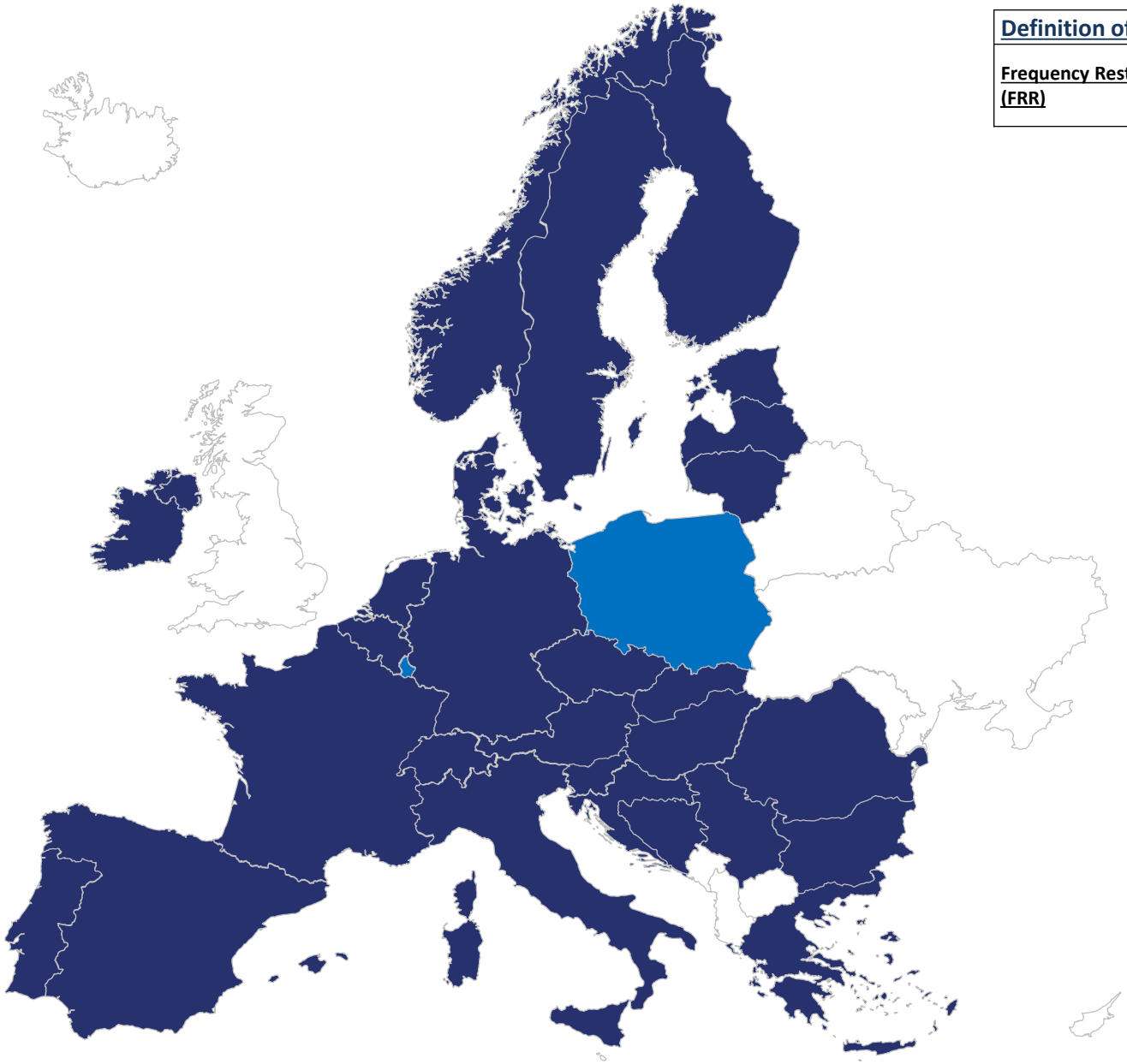
Definition of question	
Activation Time	Activation Time means the period of time between receipt of a valid instruction by the Activation Optimisation Function and the end of ramping to meet that instruction.

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



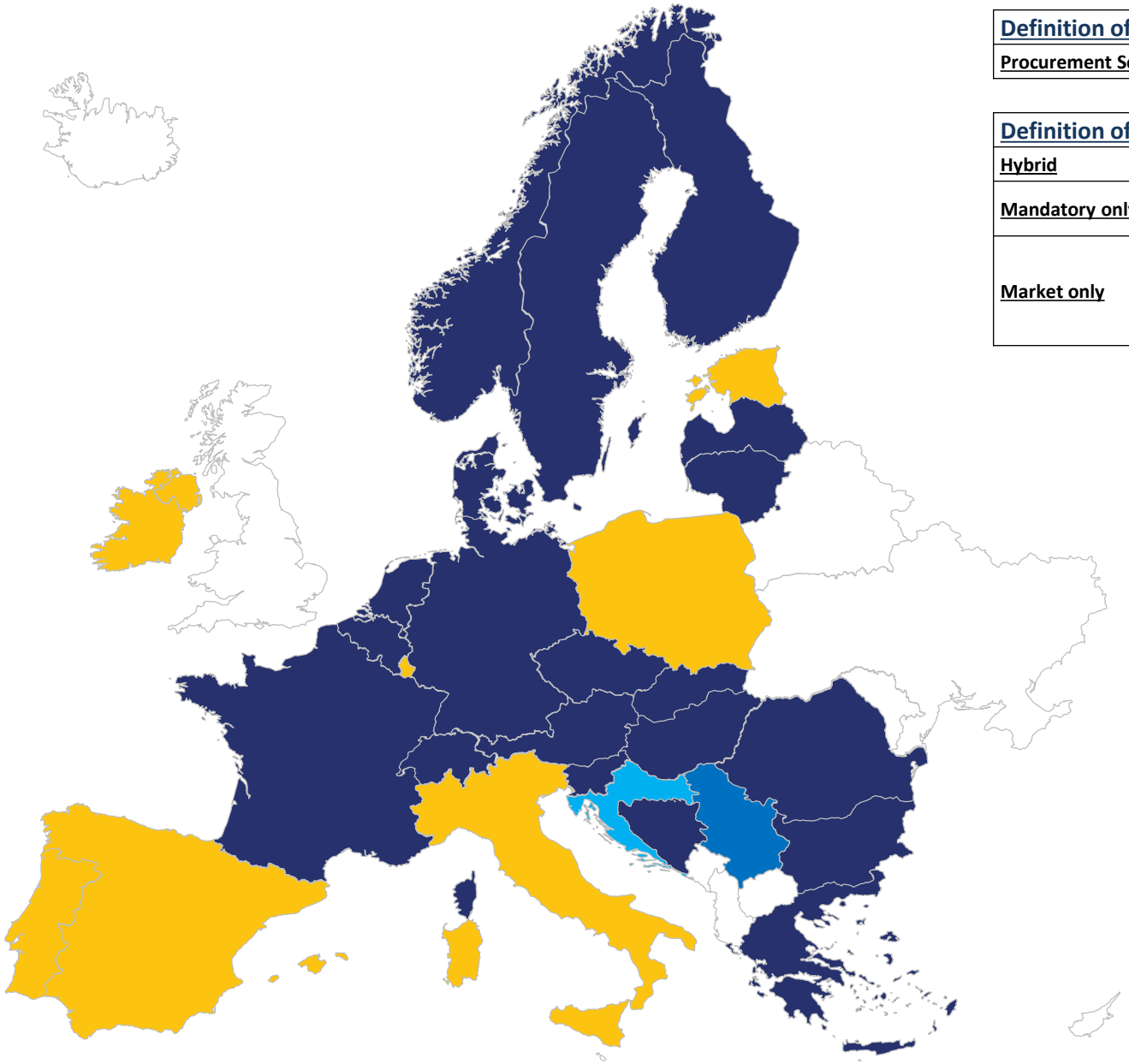
Definition of question	
Activation Purpose	Are activations for other purposes than Balancing (e.g. congestion management) possible?

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.

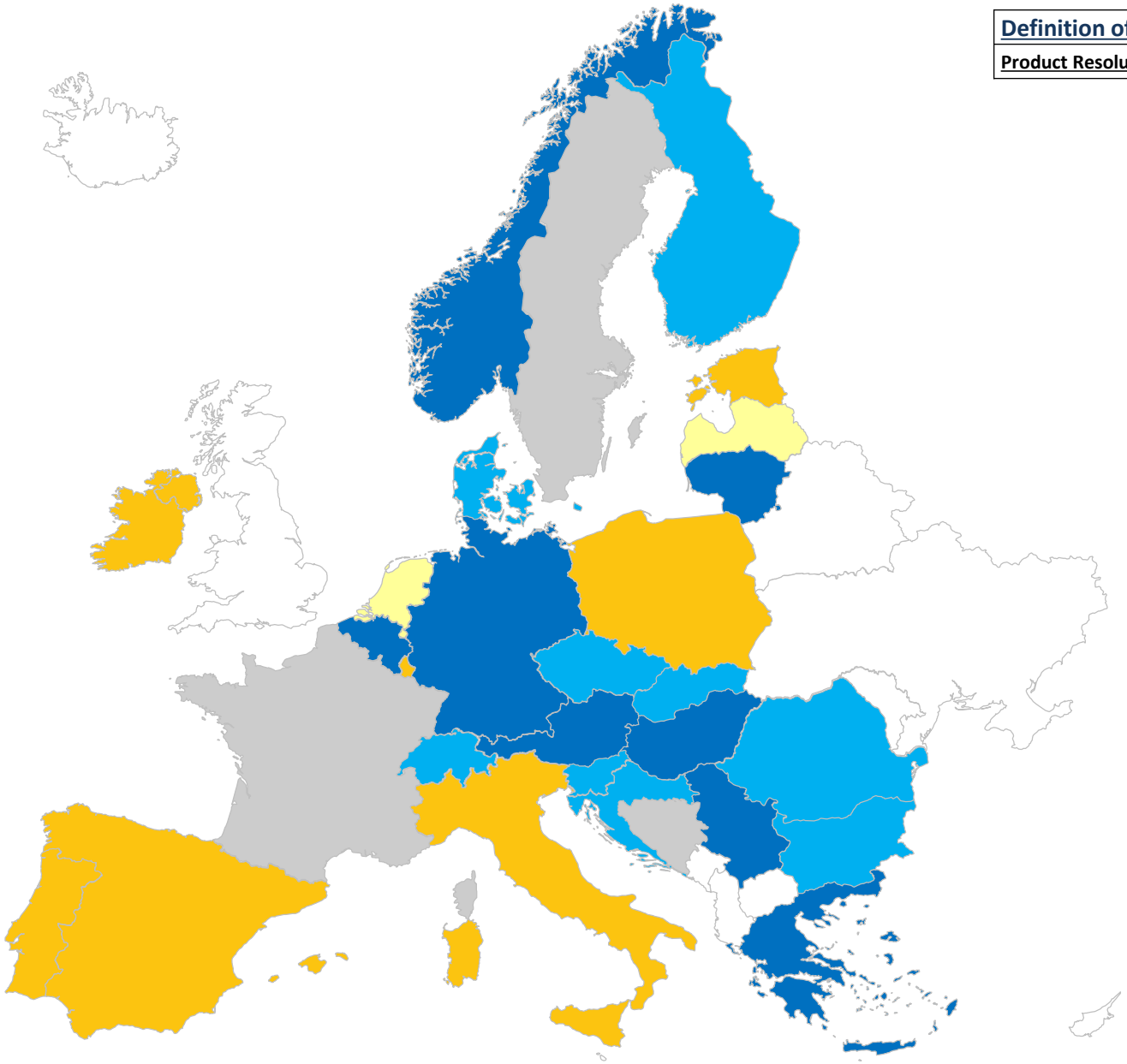
Frequency Restoration Reserve (Manual) - Capacity - Procurement Scheme



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)

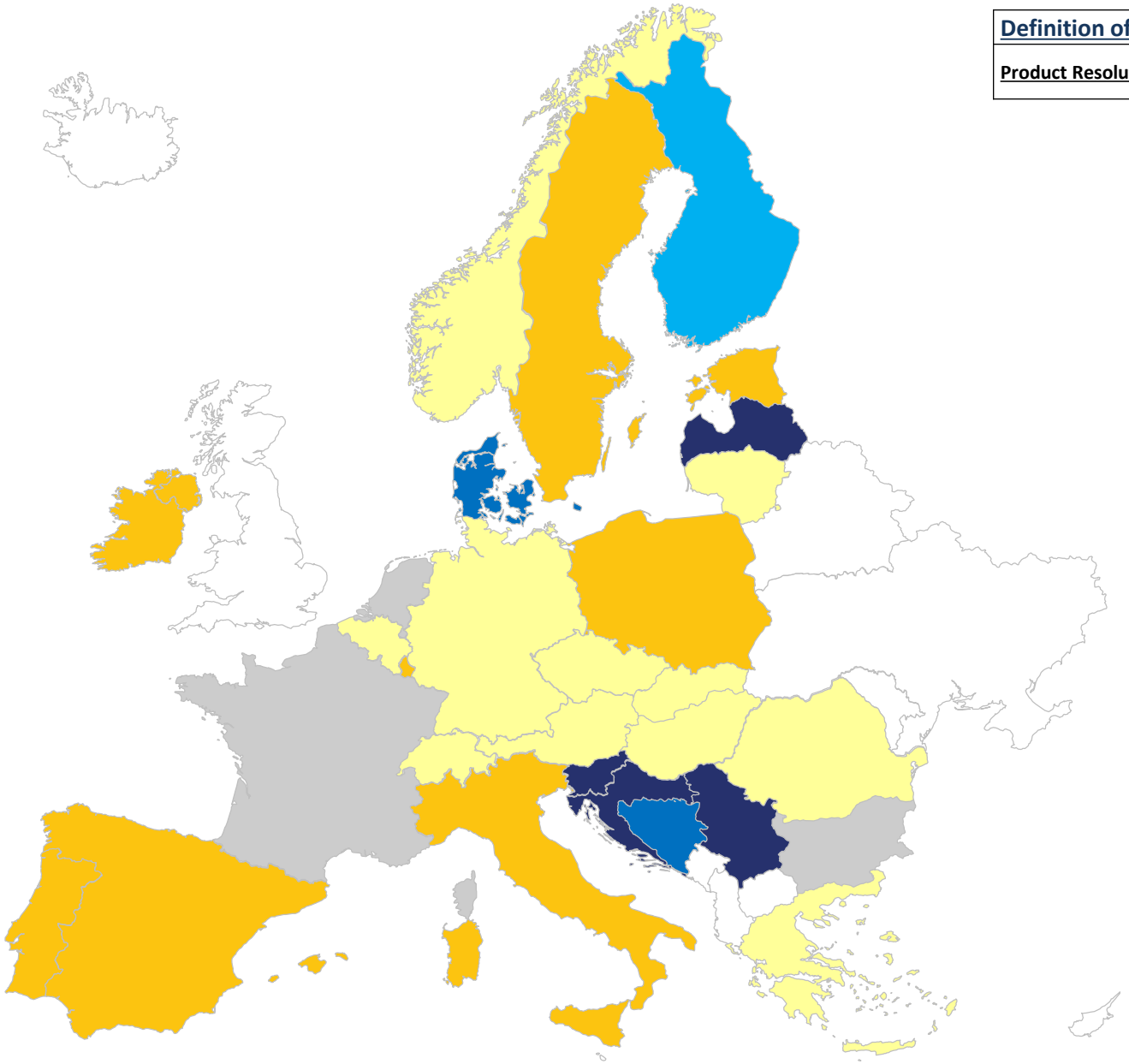


Definition of question	
Product Resolution (in MW)	The minimum bid size into the balancing market.

Key:

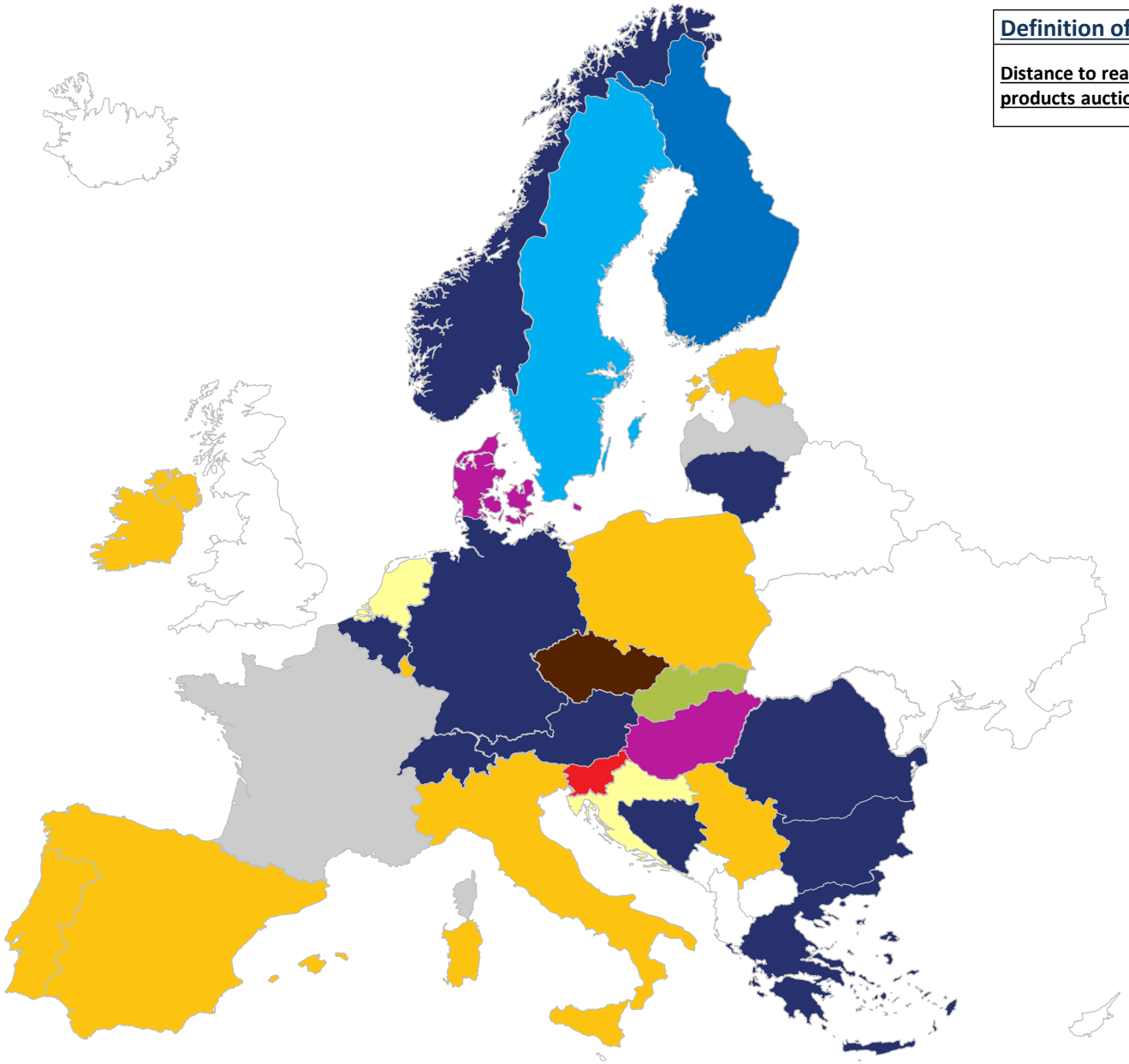
- Missing data
- N/A
- No minimum bid size
- x <= 1 MW
- 1 MW < x <= 5 MW
- 5 MW < x <= 10 MW
- x > 10 MW

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



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

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

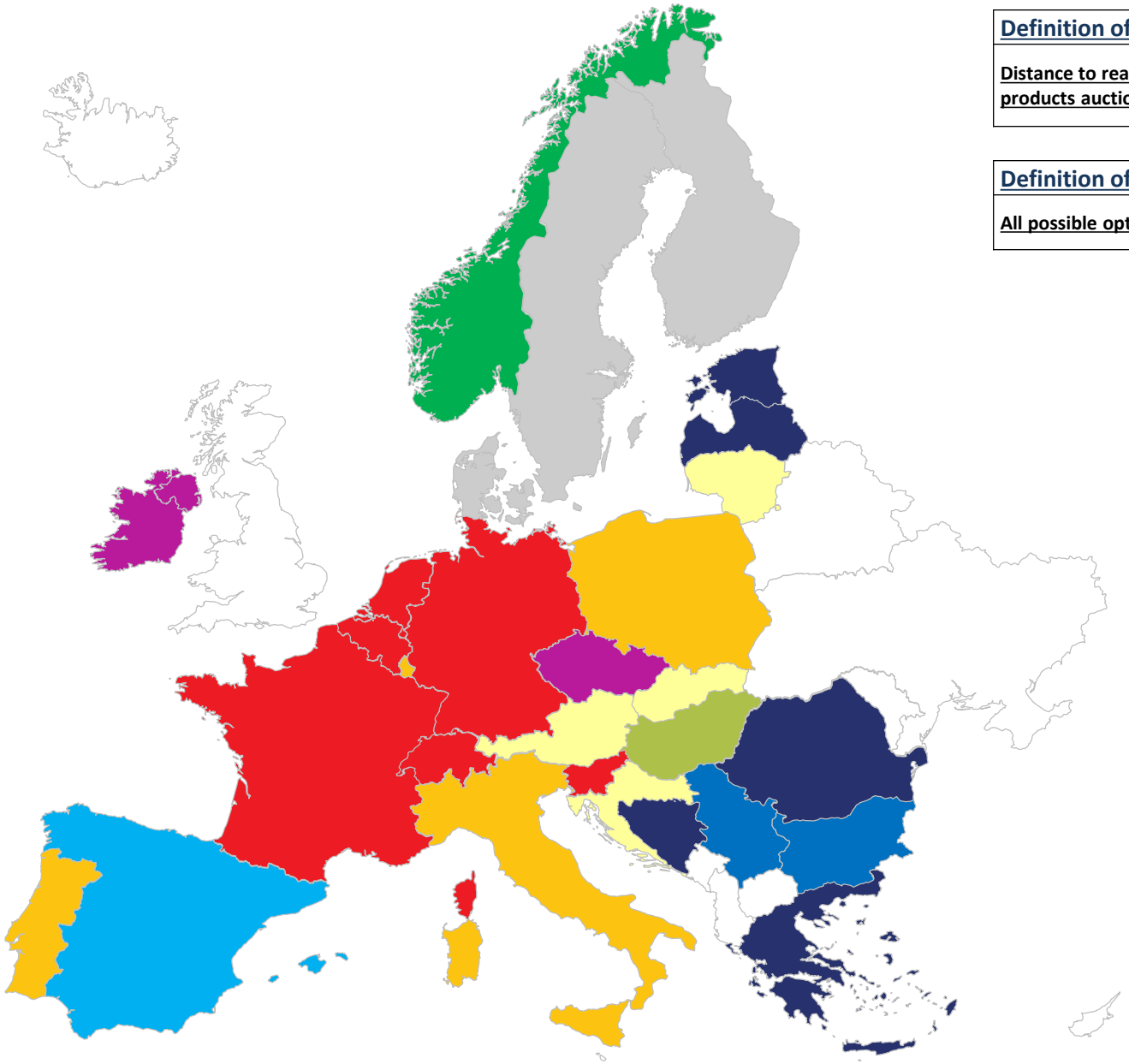


Definition of question	
Distance to real time of reserve products auctions	The time ahead from real time when auction/agreement for an specific balancing product takes place (for instance = 1 year in the case of a reserve agreement signed 1 year ahead of real time).

Key:

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

Frequency Restoration Reserve (Manual) - Capacity - Provider



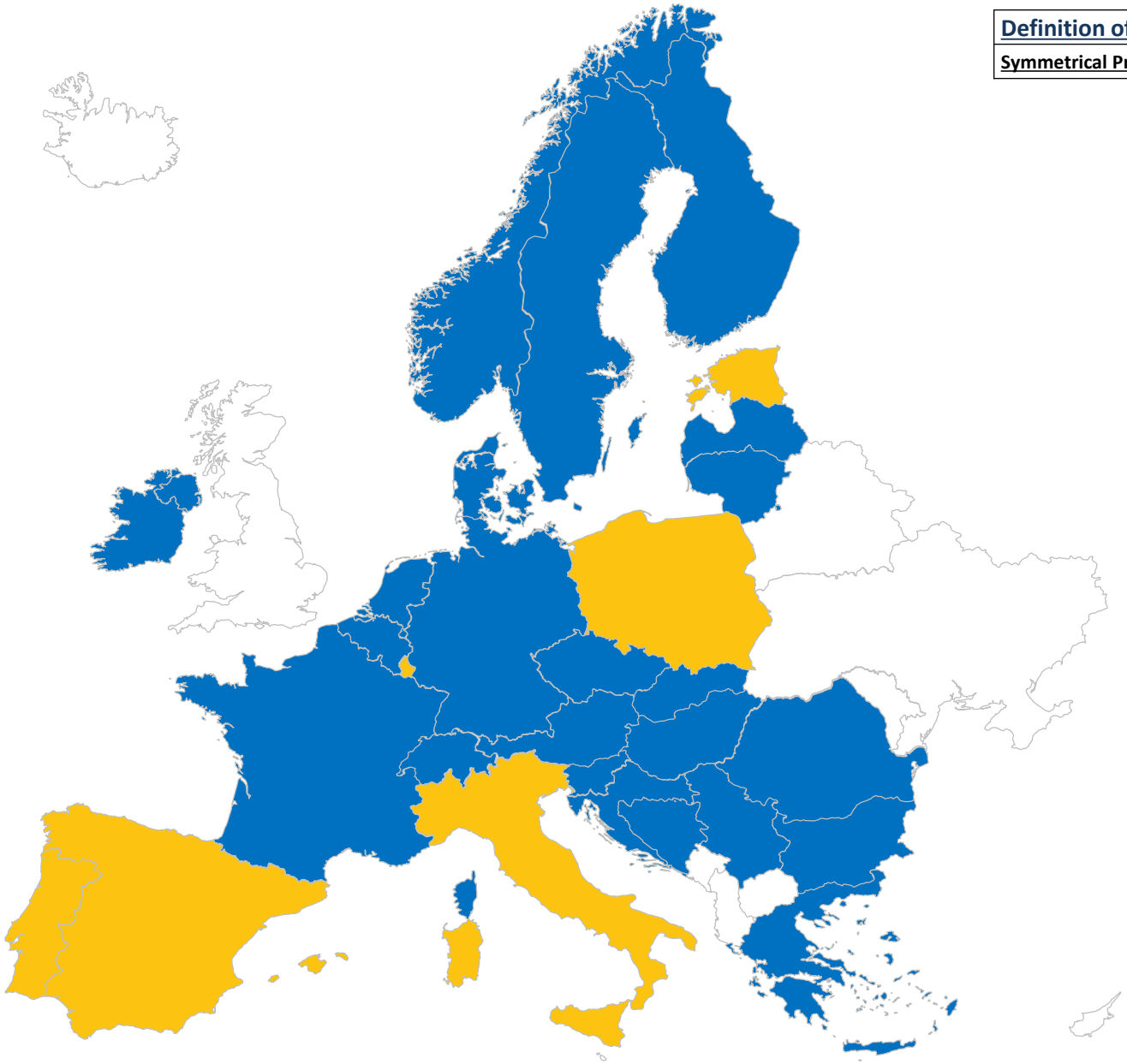
Definition of question	
Distance to real time of reserve products auctions	The time ahead from real time when auction/agreement for an specific balancing product takes place (for instance = 1 year in the case of a reserve agreement signed 1 year ahead of real time).

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 + Distributed generation
- Generators + Batteries + Distributed generation
- All possible options

Frequency Restoration Reserve (Manual) - Capacity - Symmetrical Product

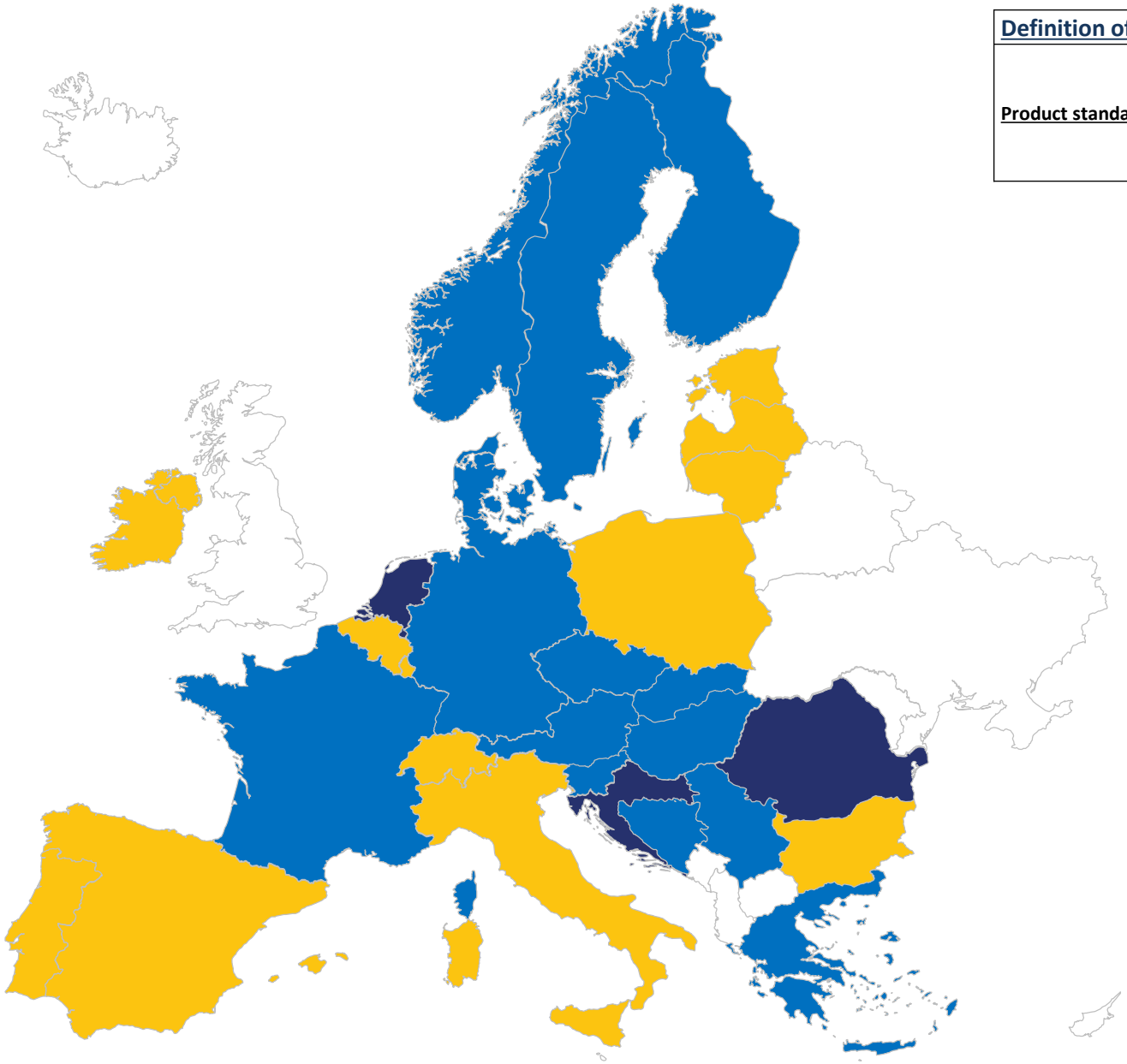


Definition of question	
Symmetrical Product	Upward regulation volume and for downward regulation volume has to be equal.

Key:

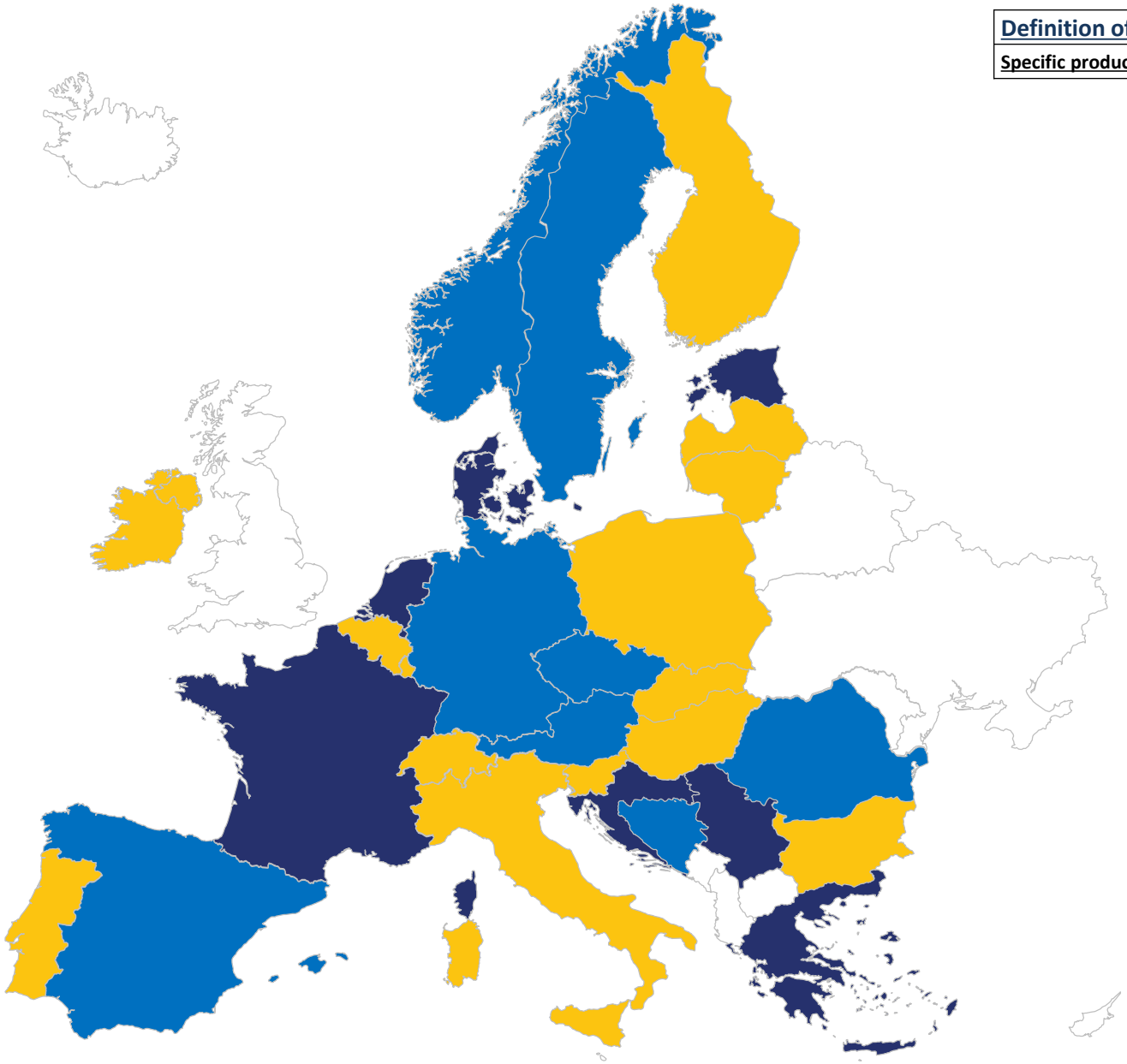
- Missing data
- N/A
- Has to be symmetrical
- Don't need to be symmetrical

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



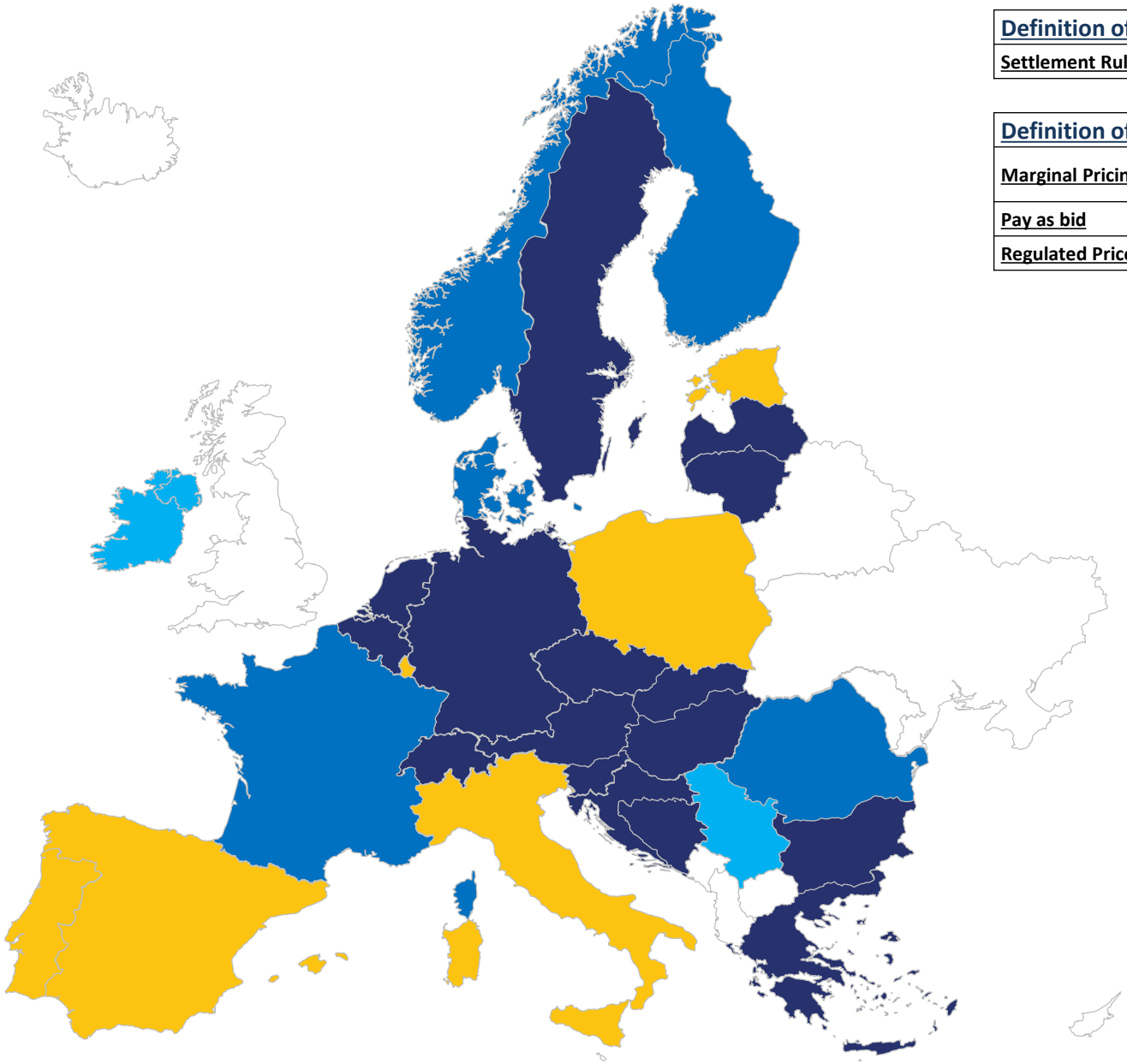
Definition of answer	
Product standardisation	EB Regulation defines only two products: standard products in Article 25 and specific products in Article 26. Standardisation process is finished if TSO implemented standard capacity balancing product(s) in line with Annex of the SPBC methodology or if national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

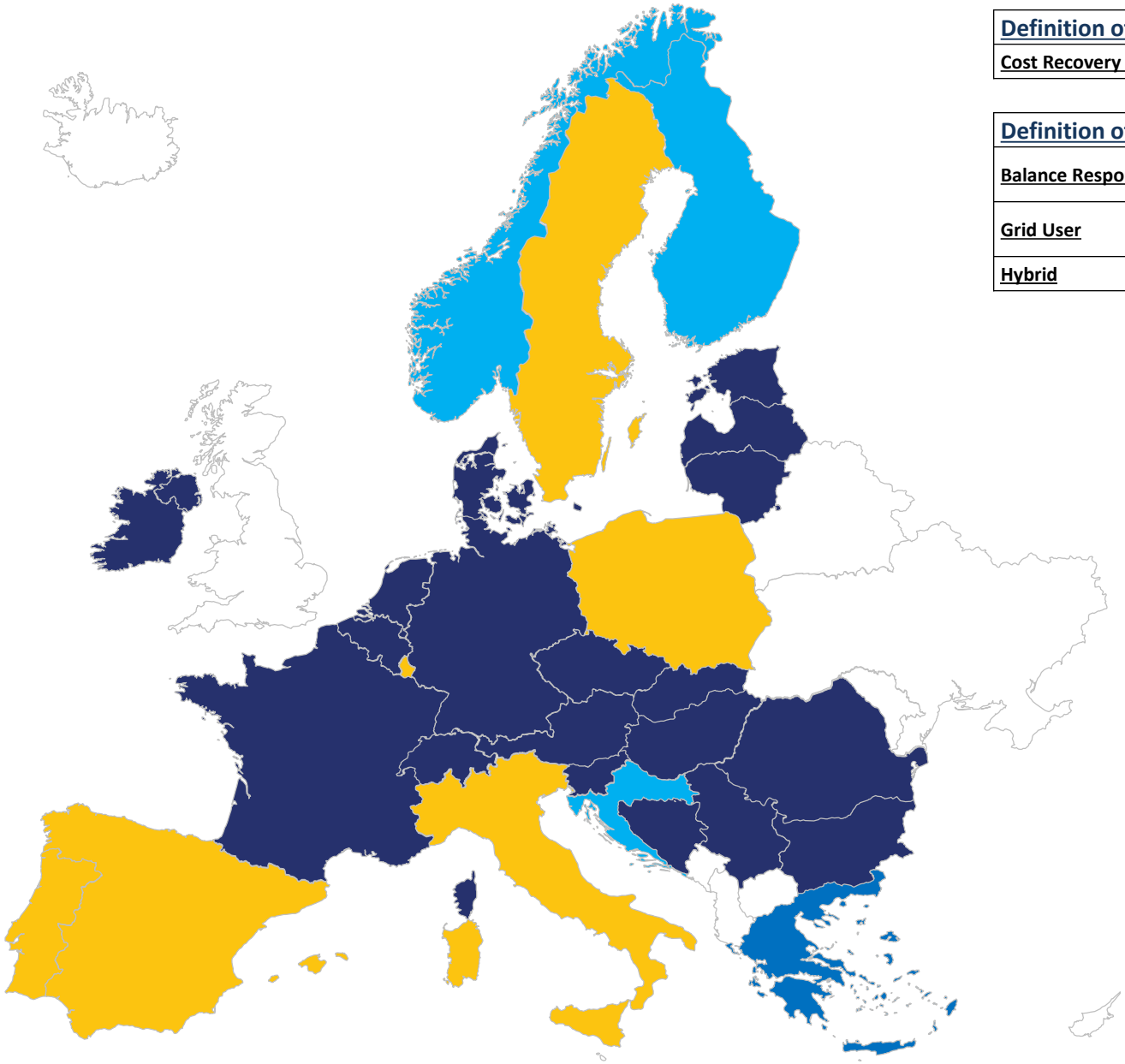
Frequency Restoration Reserve (Manual) - Capacity - Settlement Rule



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



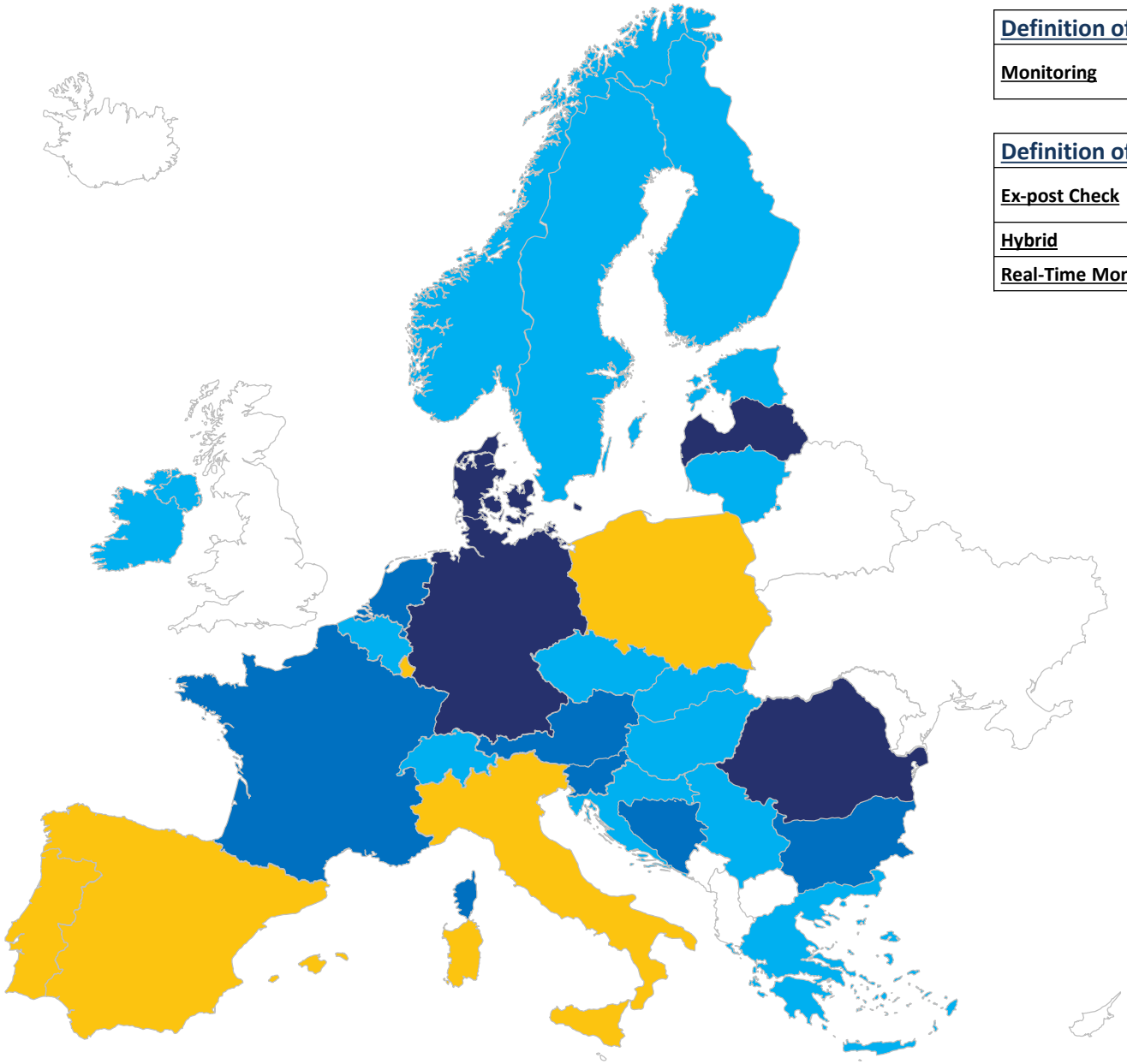
Definition of question	
Cost Recovery Scheme	From who are the costs recovered.

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.

Key:

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

Frequency Restoration Reserve (Manual) - Capacity - Monitoring



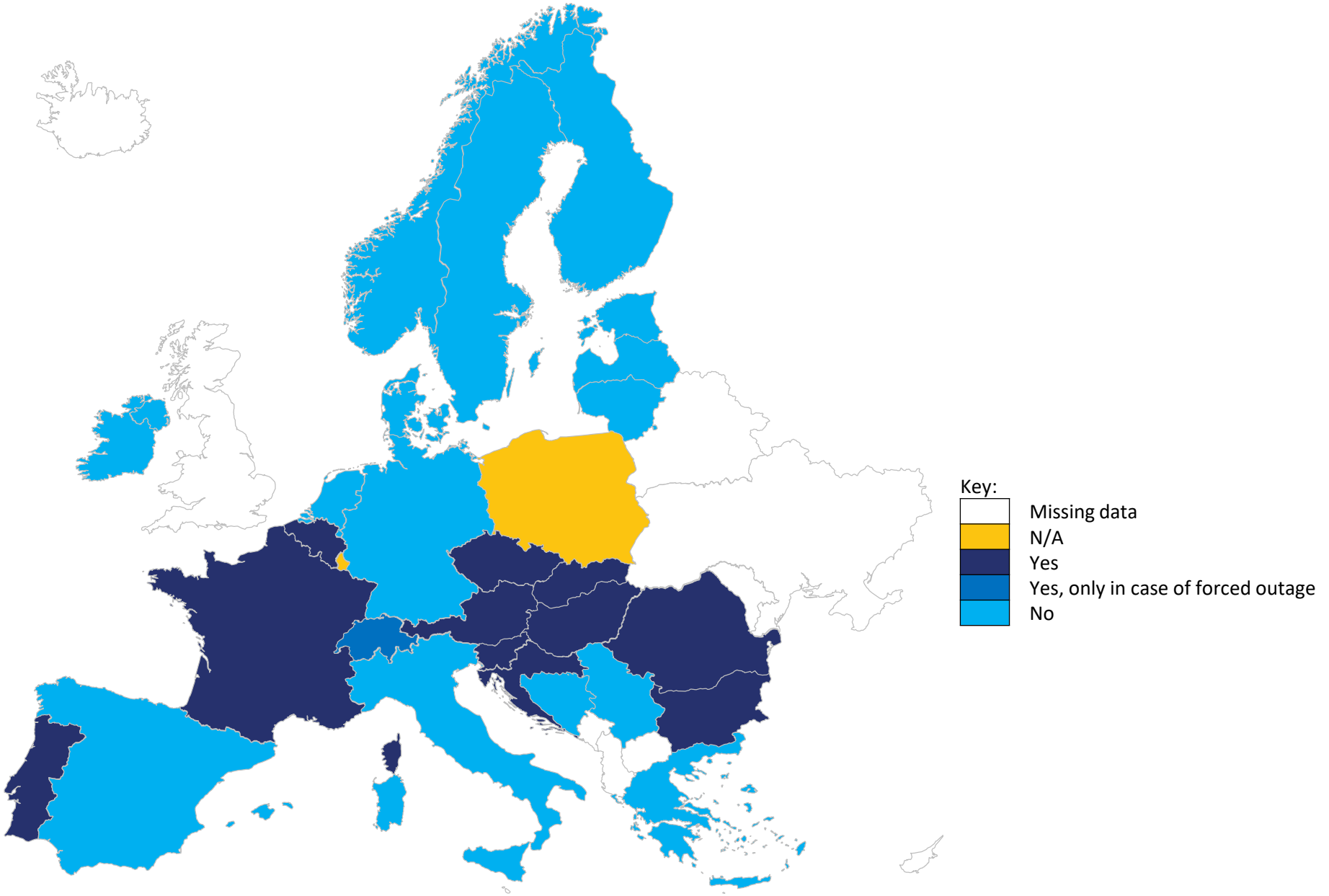
Definition of question	
Monitoring	Refers to the type of monitoring in place by the system operator to ensure performance of plant.

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.

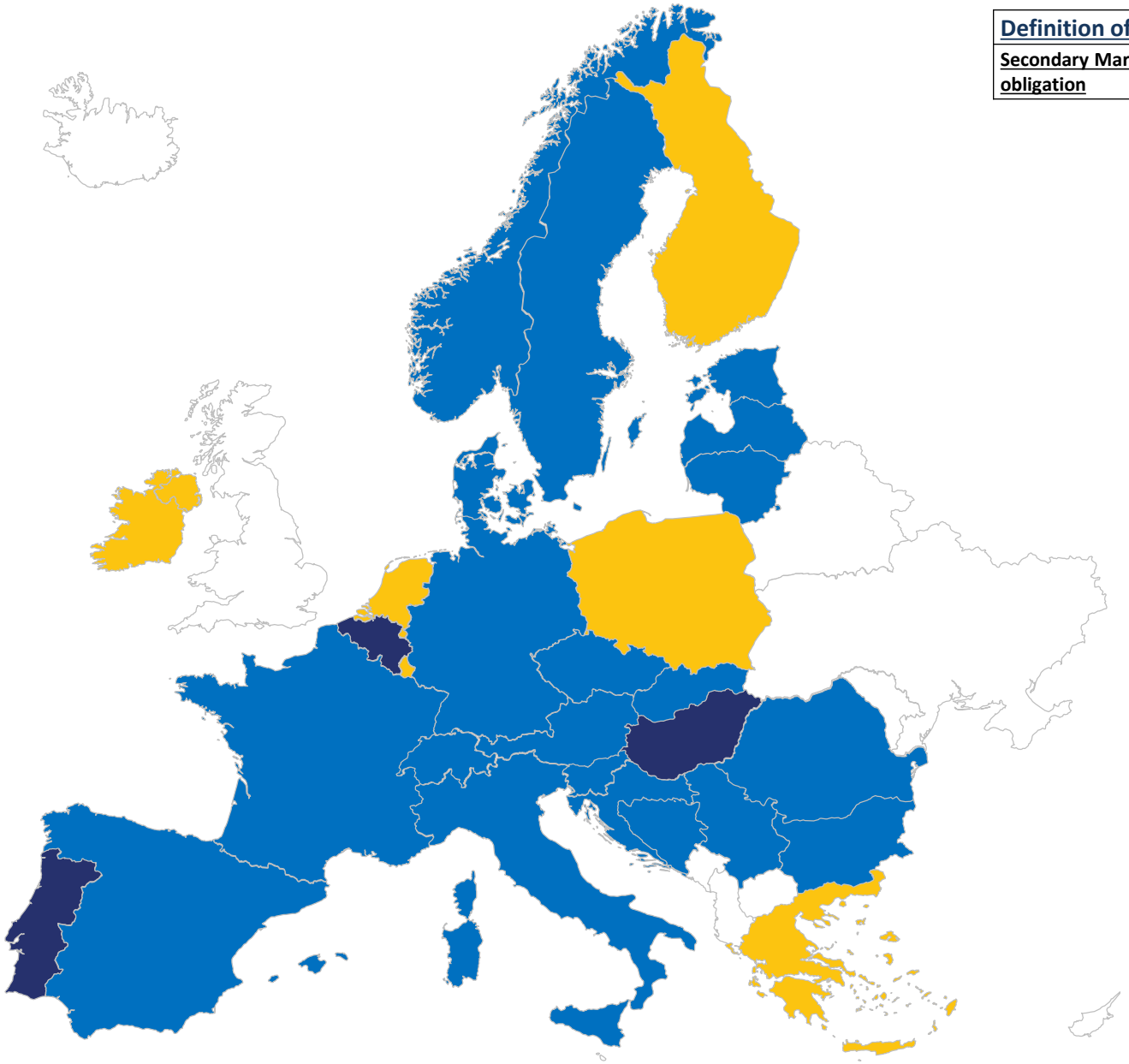
Key:

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

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

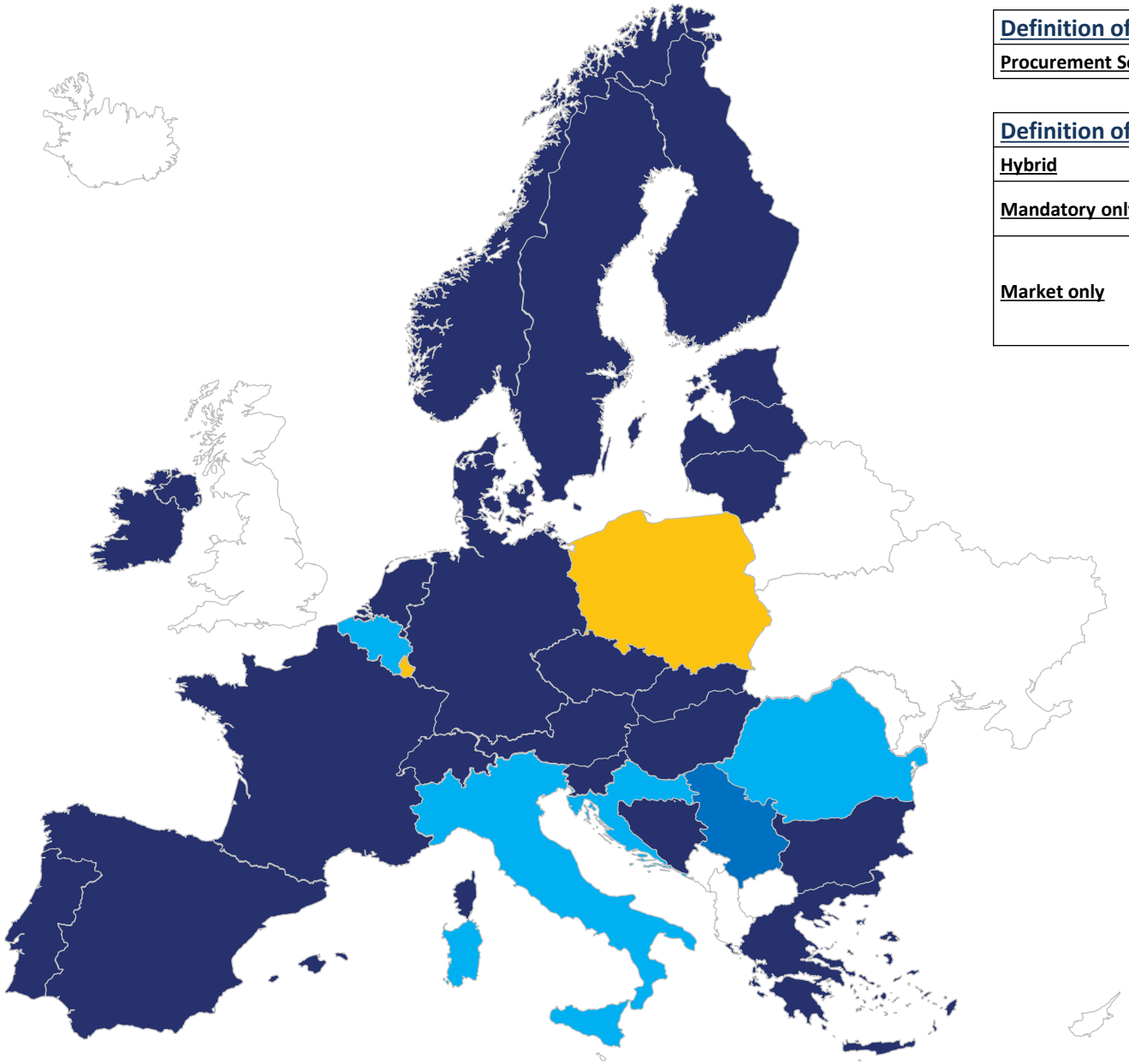


Frequency Restoration Reserve (Manual) - Capacity - In case transfer obligation is allowed, is there an organised secondary market?



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.

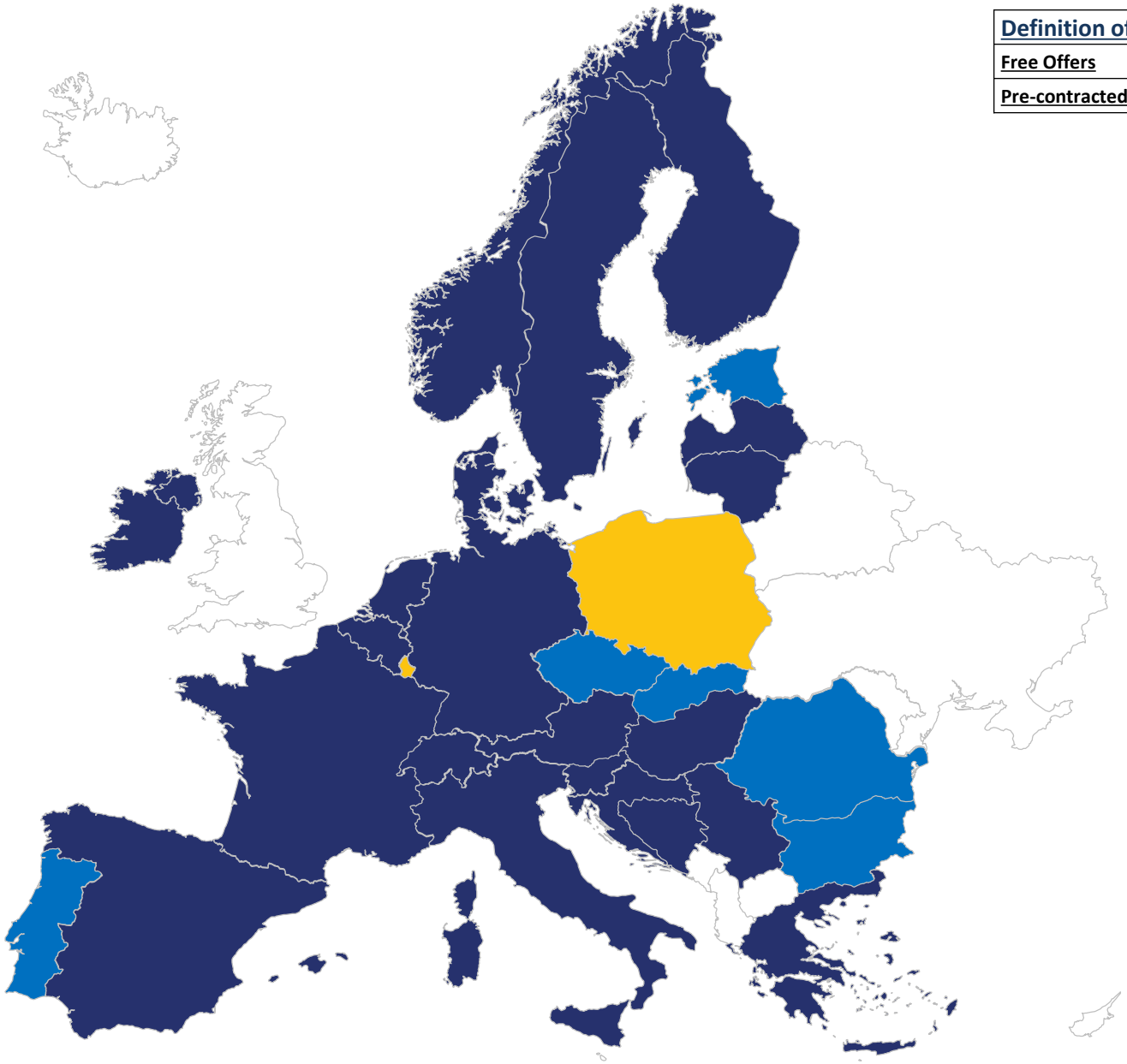
Frequency Restoration Reserve (Manual) - Energy - Procurement Scheme



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

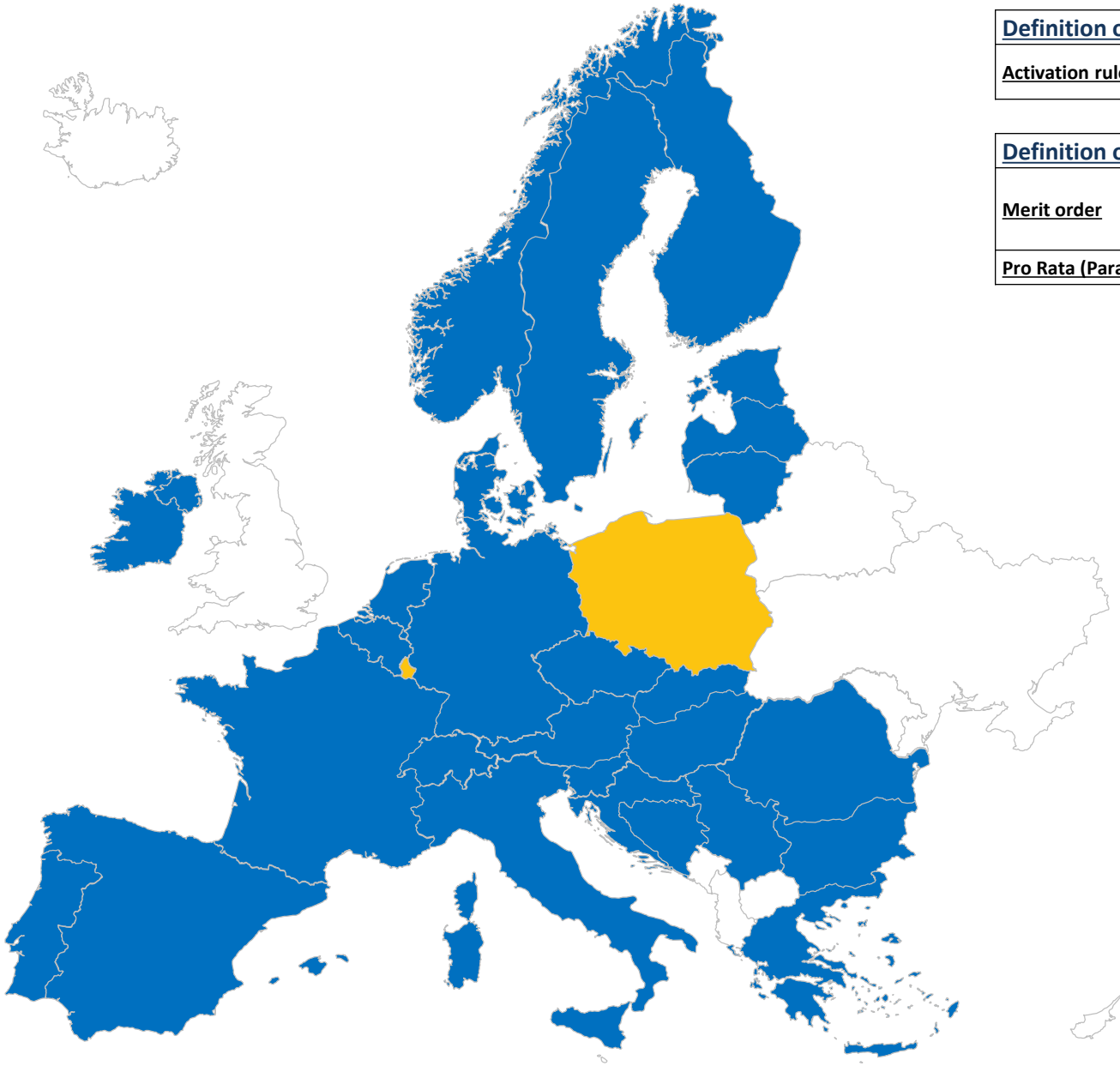


Definition of question	
Free Offers	Possibility to offer balancing energy bids without a contract for Balancing Capacity
Pre-contracted	BSP has sold/procured Balancing Capacity to TSO.

Key:

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

Frequency Restoration Reserve (Manual) - Energy - Activation Rule



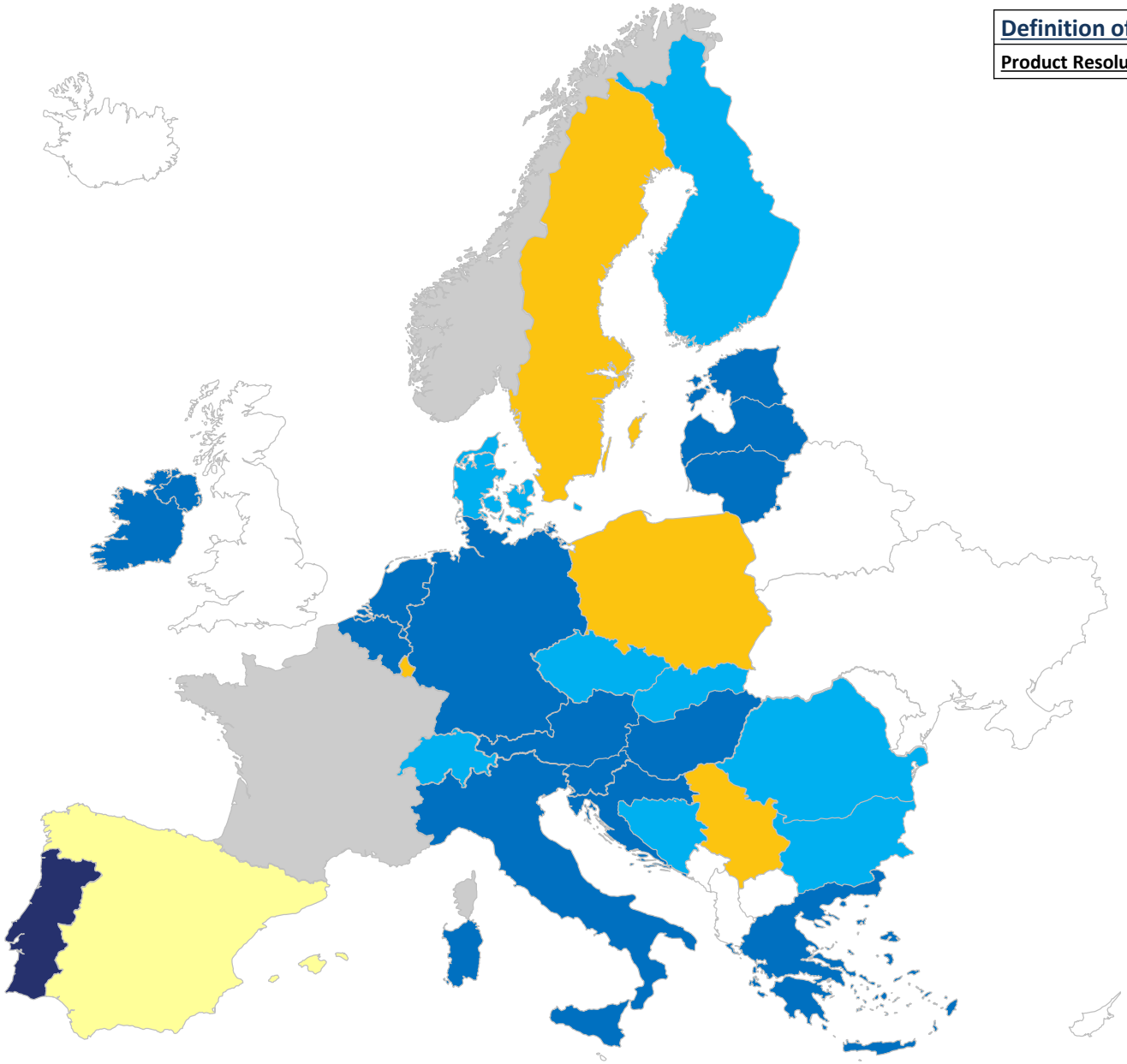
Definition of question	
Activation rule	How the frequency restoration reserves are activated i.e. by a Pro-Rata system or on the basis of a Merit Order (cheapest being activated first).

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

Key:

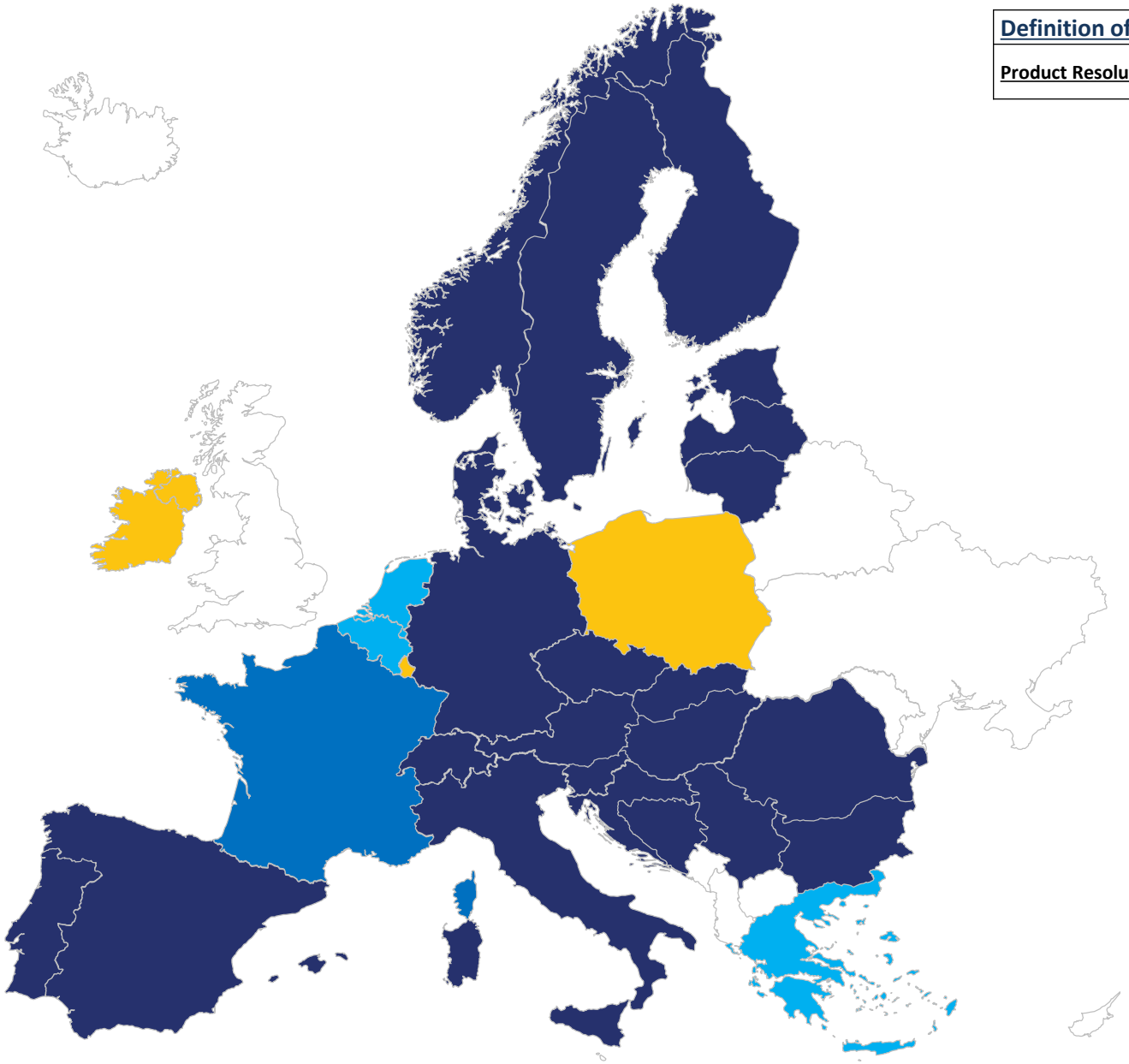
- Missing data
- N/A
- Pro Rata (Parallel Activation)
- Merit order

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



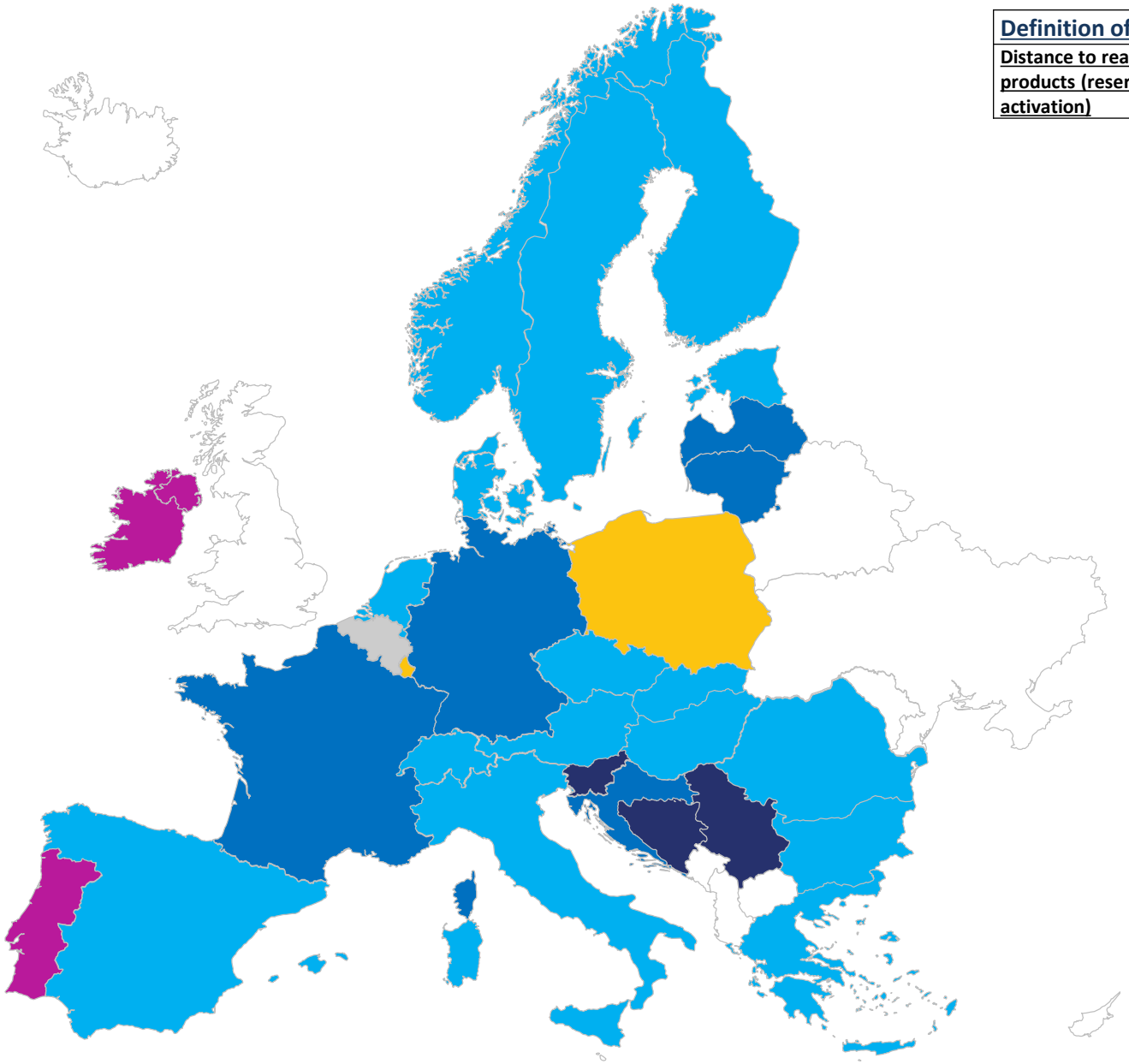
Definition of question	
Product Resolution (in MW)	The minimum bid size into the balancing market.

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

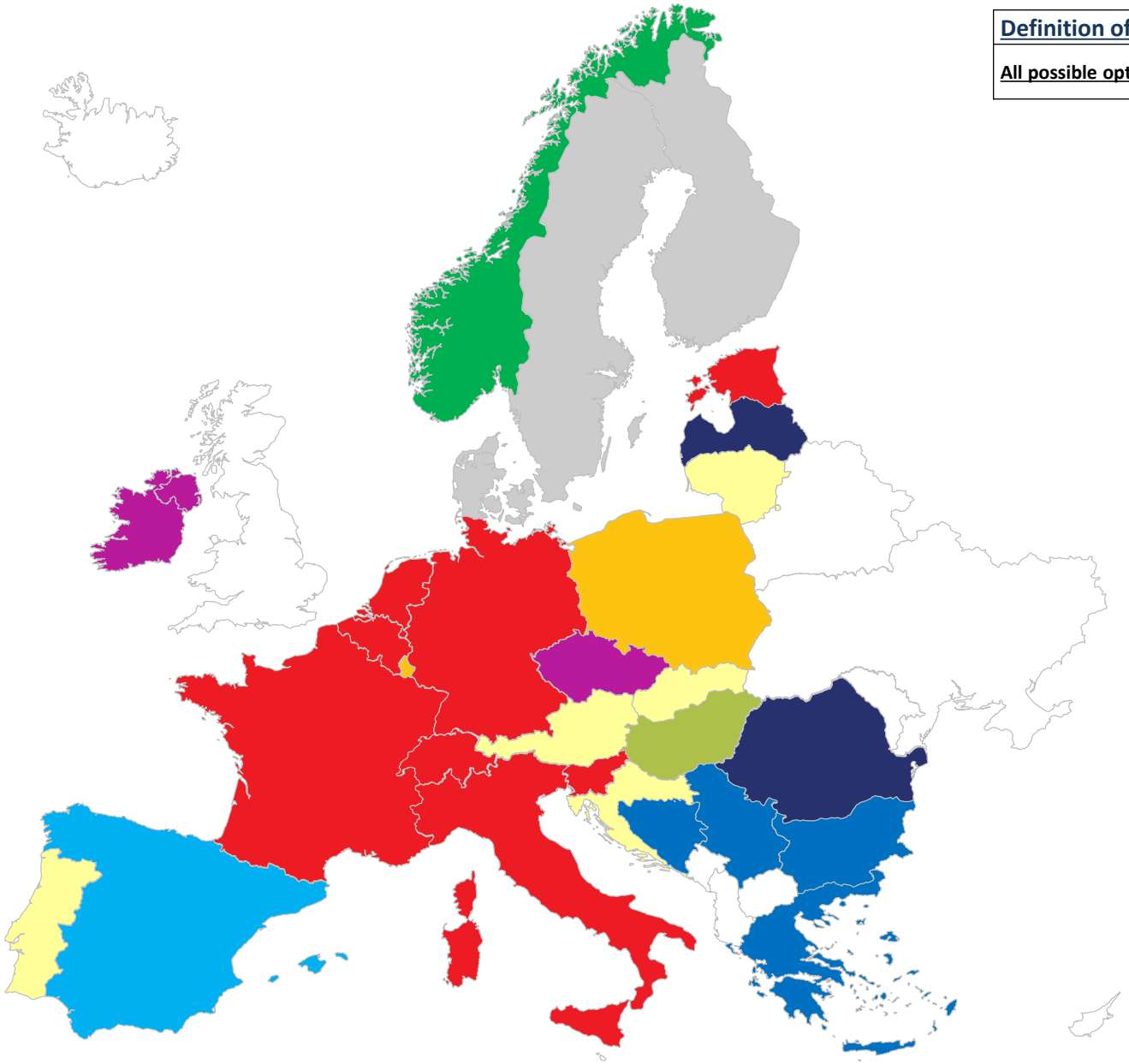


Definition of question	
Distance to real time of energy products (reserve products activation)	The time ahead from real time when TSO activates a given product (for instance 15 minutes in the case of mFRR/tertiary energy).

Key:

- Missing data
- N/A
- x > H-1
- 15 minutes < x <= H-1
- 5 minutes < x <= 15 minutes
- 1 minute < x <= 5 minutes
- x <= 1 minute
- Depends on the unit

Frequency Restoration Reserve (Manual) - Energy - Provider

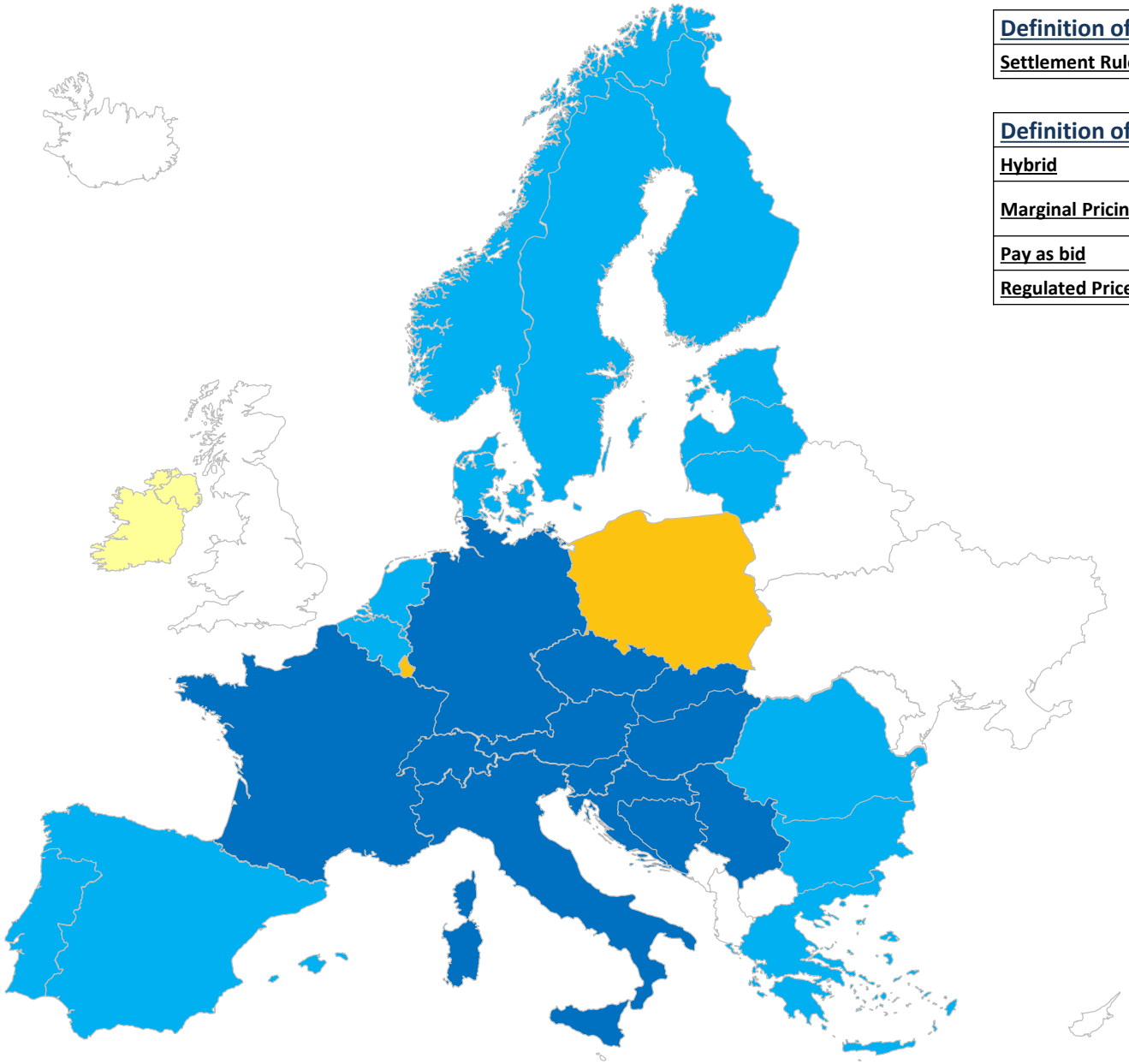


Definition of answer	
All possible options	In this case all possible provider types were chosen (Generator + Demand-side response + Pump Storage + Batteries + Distributed generation)

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 + Distributed generation
- Generators + Batteries + Distributed generation
- All possible options

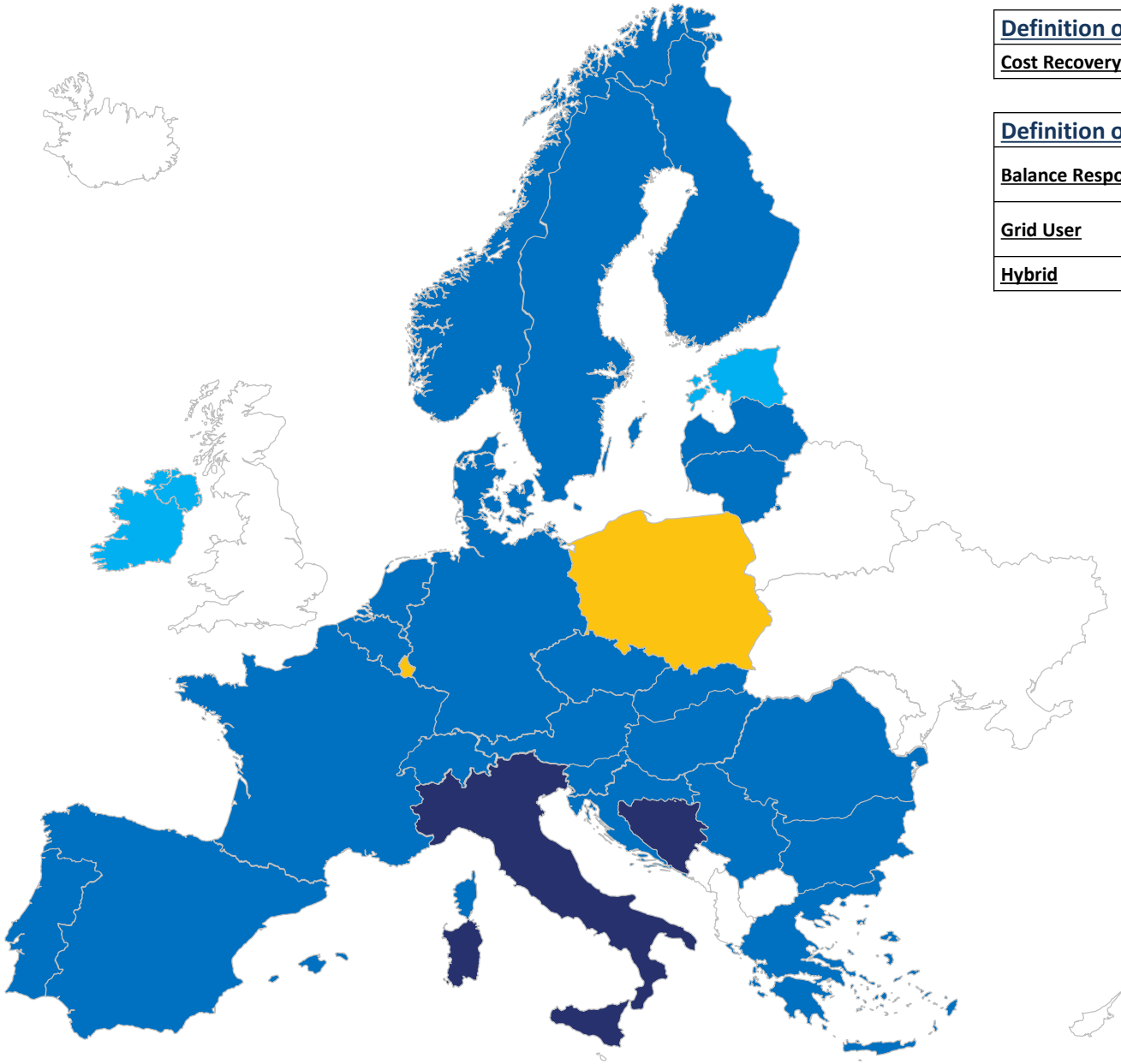
Frequency Restoration Reserve (Manual) - Energy - Settlement Rule



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



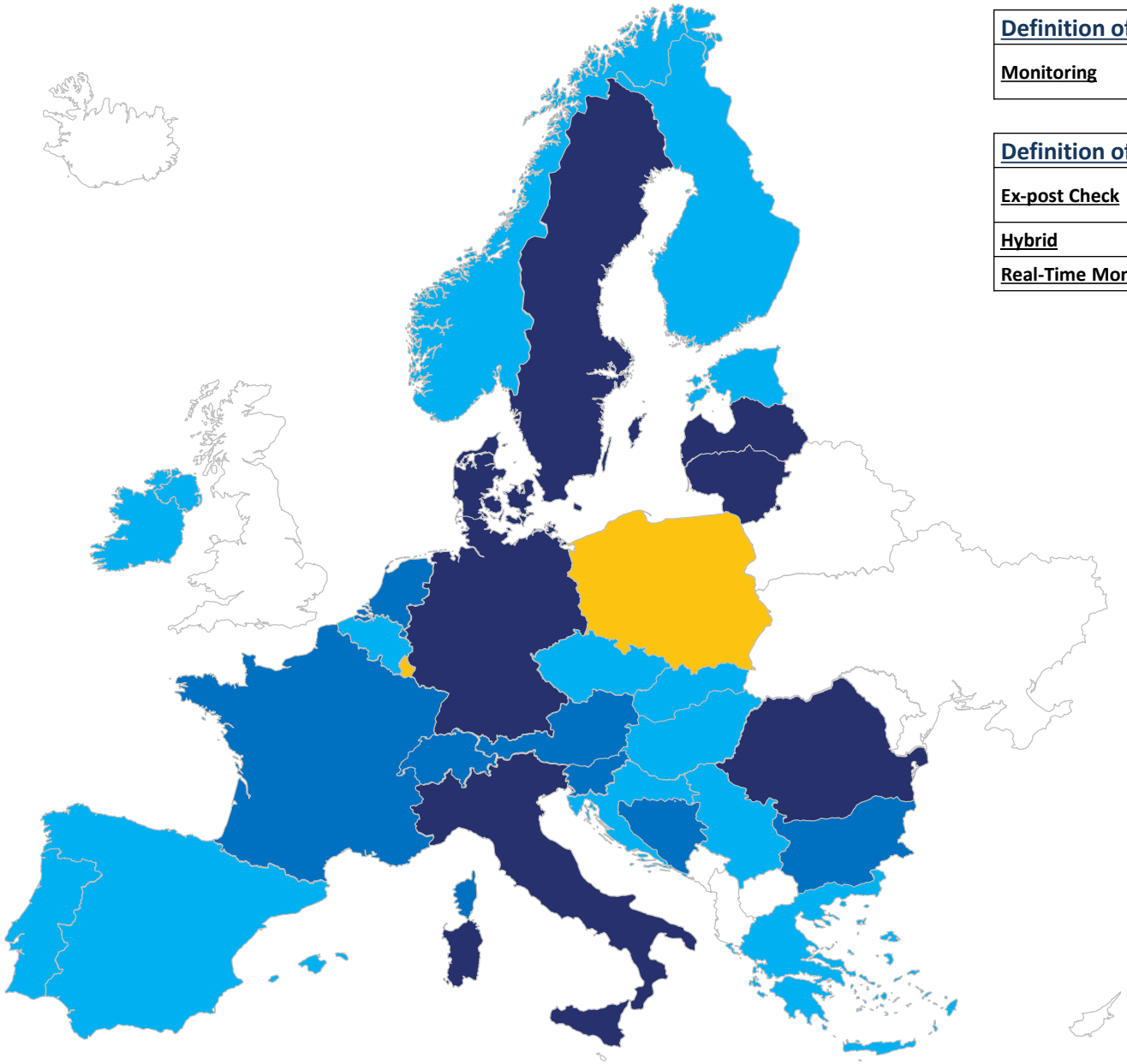
Definition of question	
Cost Recovery Scheme	From who are the costs recovered.

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.

Key:

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

Frequency Restoration Reserve (Manual) - Energy - Monitoring



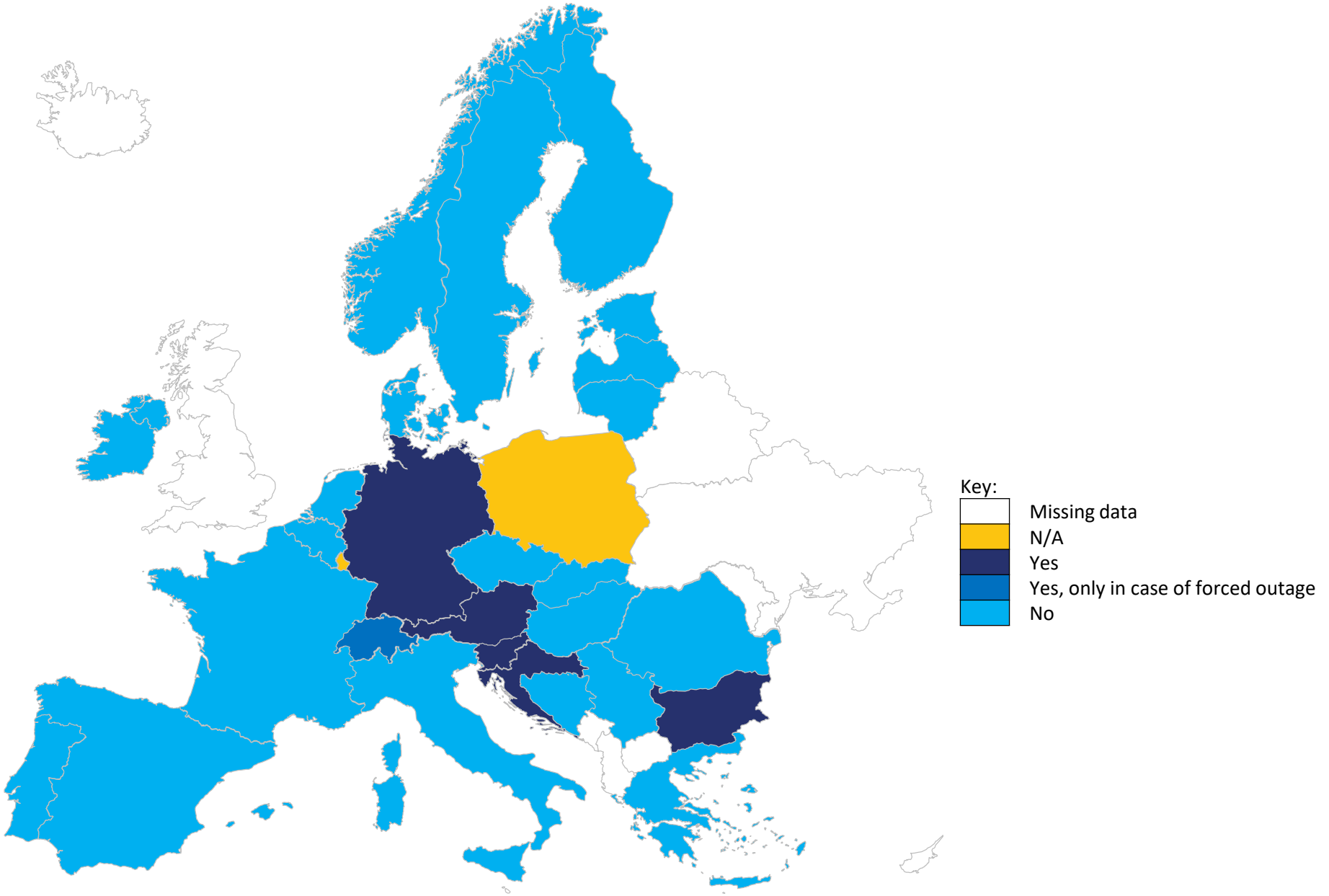
Definition of question	
Monitoring	Refers to the type of monitoring in place by the system operator to ensure performance of plant.

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.

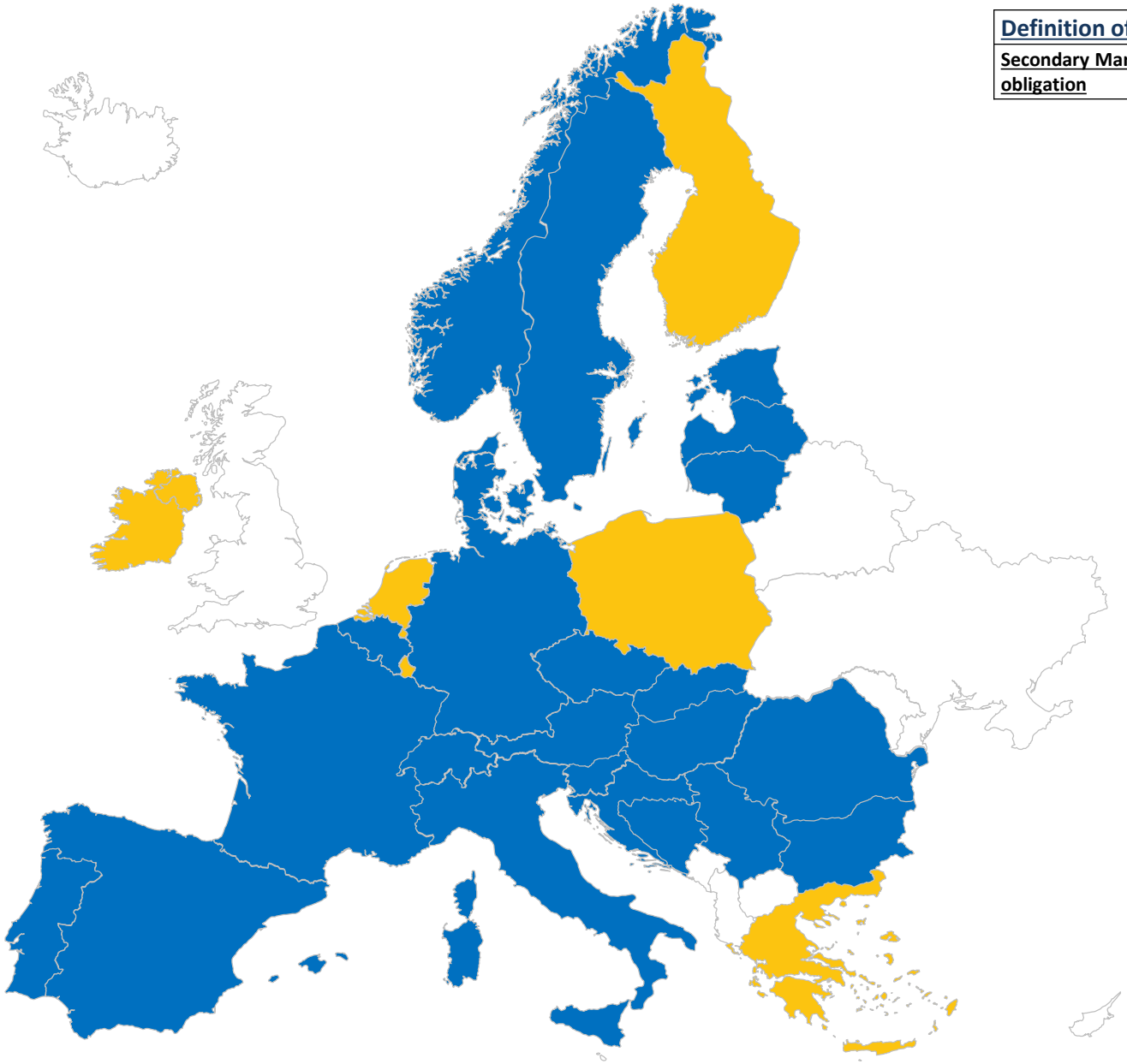
Key:

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

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

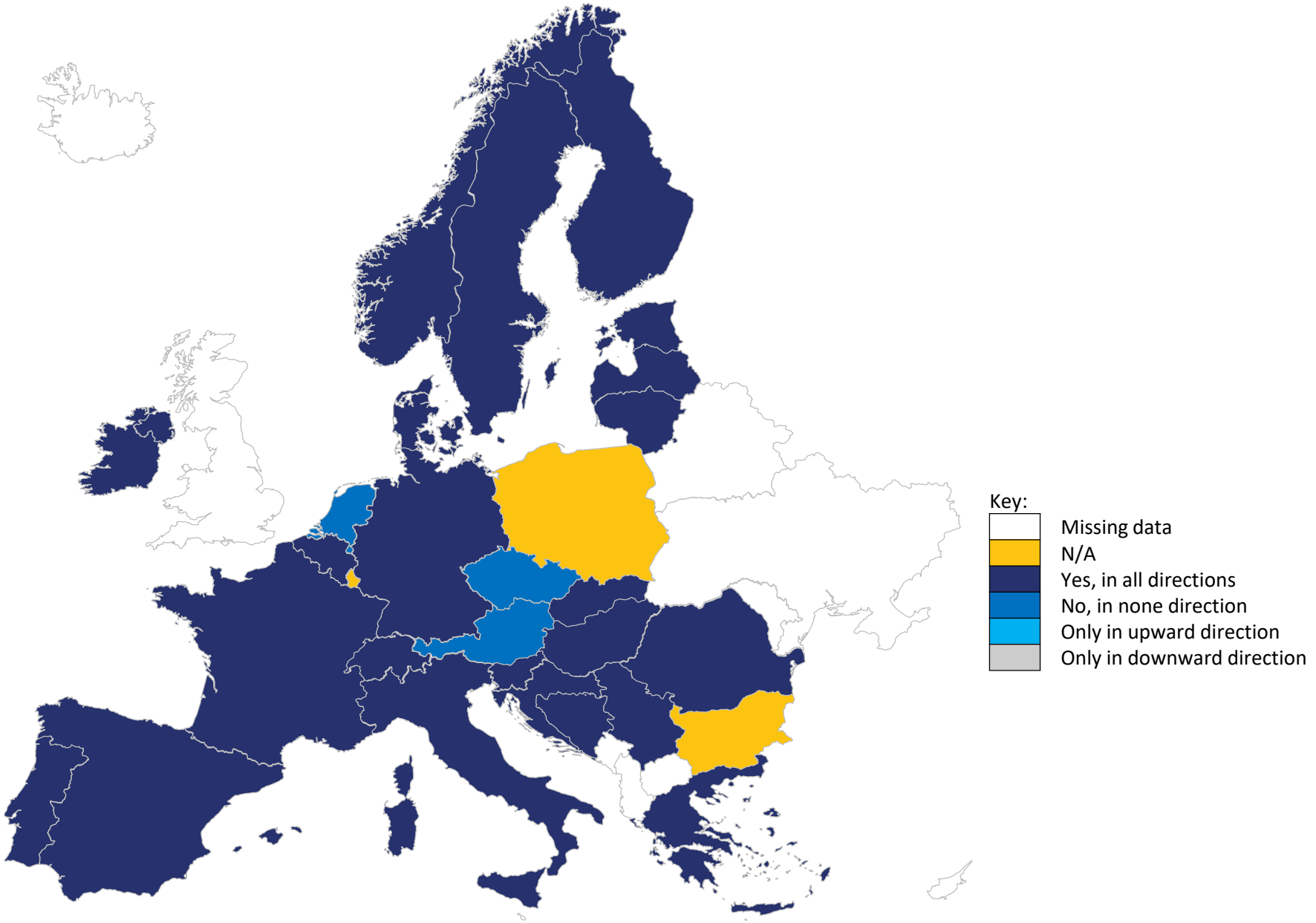


Frequency Restoration Reserve (Manual) - Energy - In case transfer obligation is allowed, is there an organised secondary market?

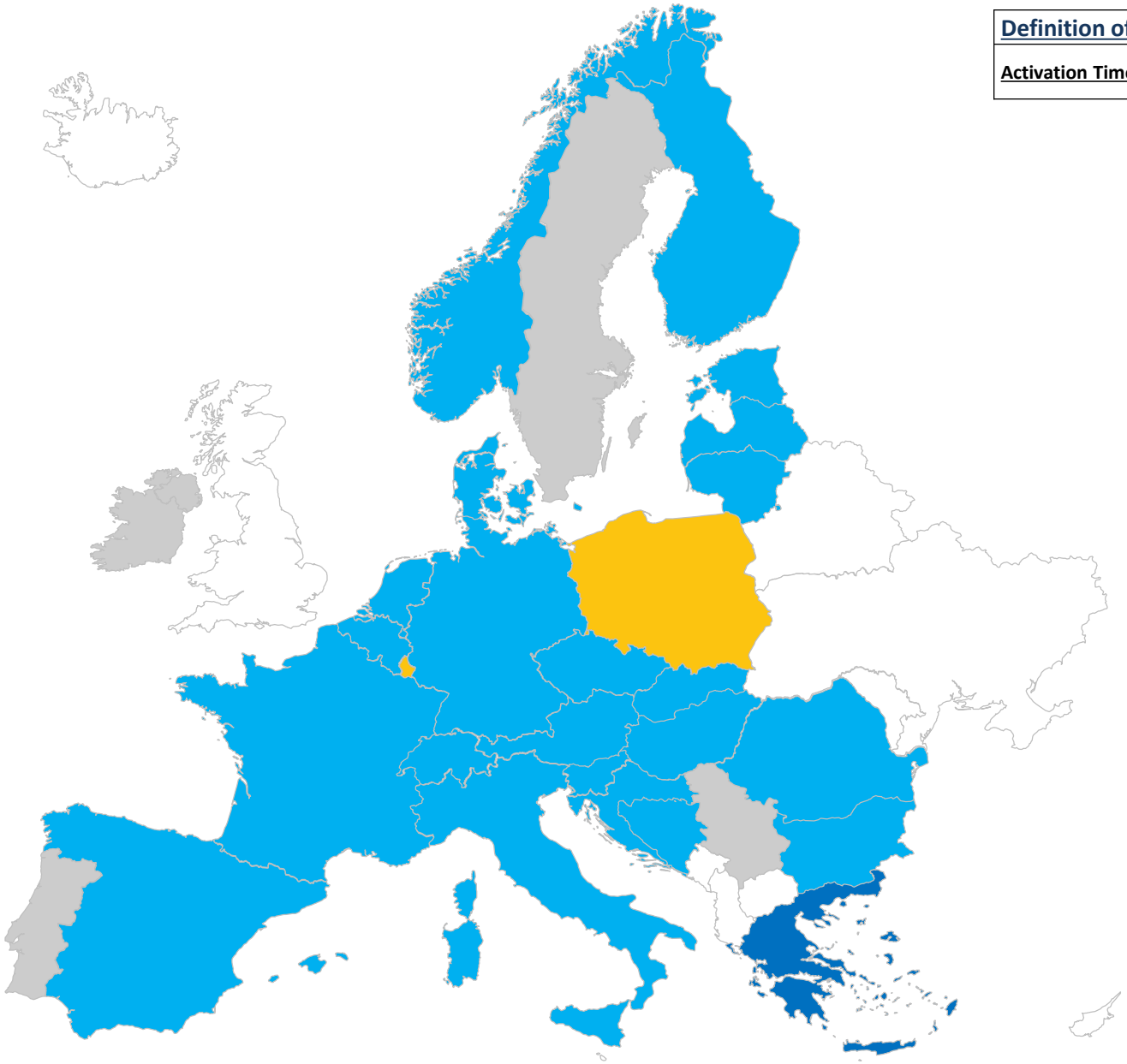


Definition of answer	
Secondary Market for reserve obligation	Trading procedure between the BSPs (where at least one BSP has contract with the TSO) to ensure the prescribed reserve amount of the TSO.

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



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

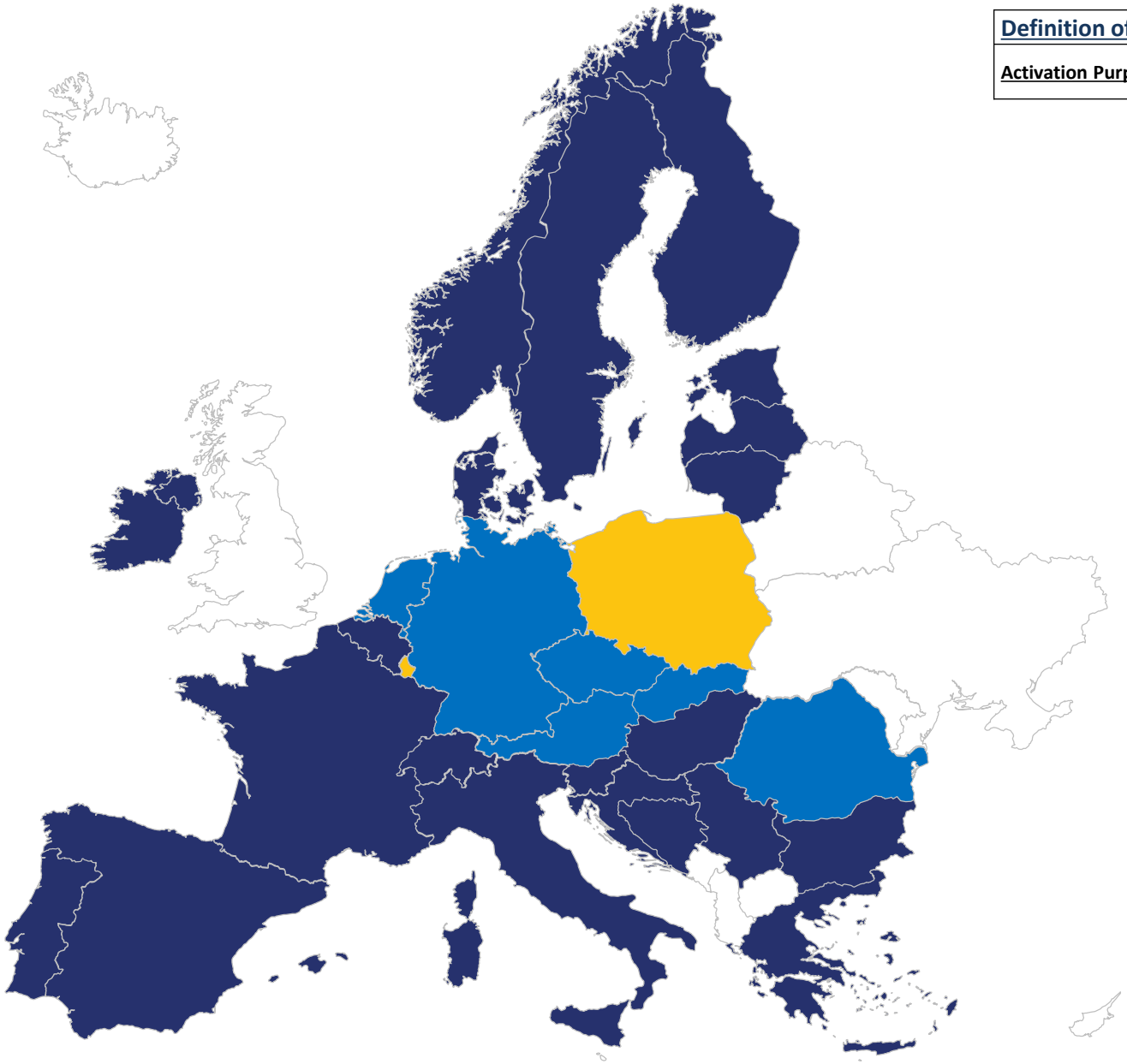


Definition of question	
Activation Time	Activation Time means the period of time between receipt of a valid instruction by the Activation Optimisation Function and the end of ramping to meet that instruction.

Key:

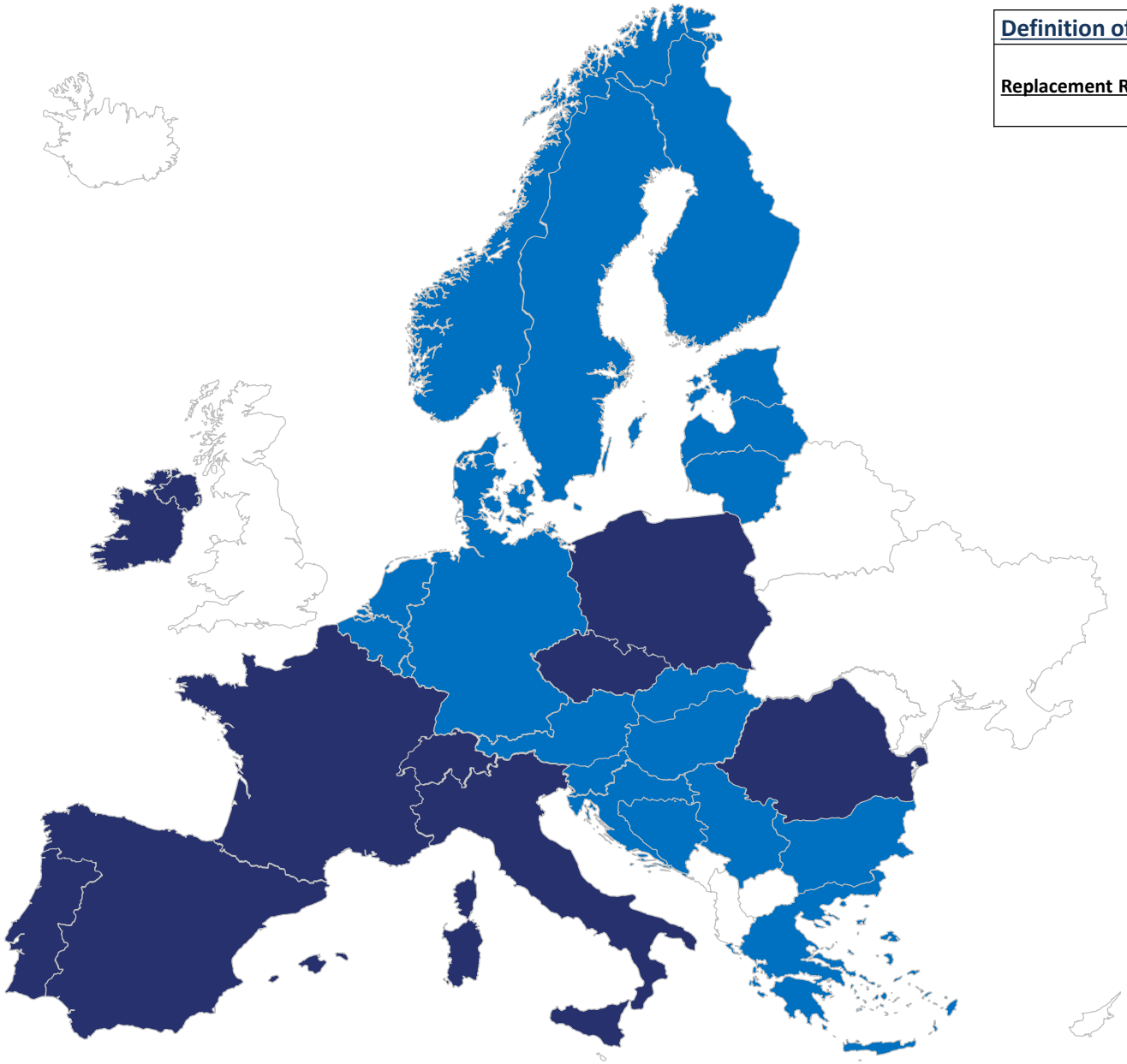
- Missing data
- N/A
- 90 s < x <= 5 min
- 5 min < x <= 10 min
- 10 min < x <= 15 min
- Depends on the unit

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?

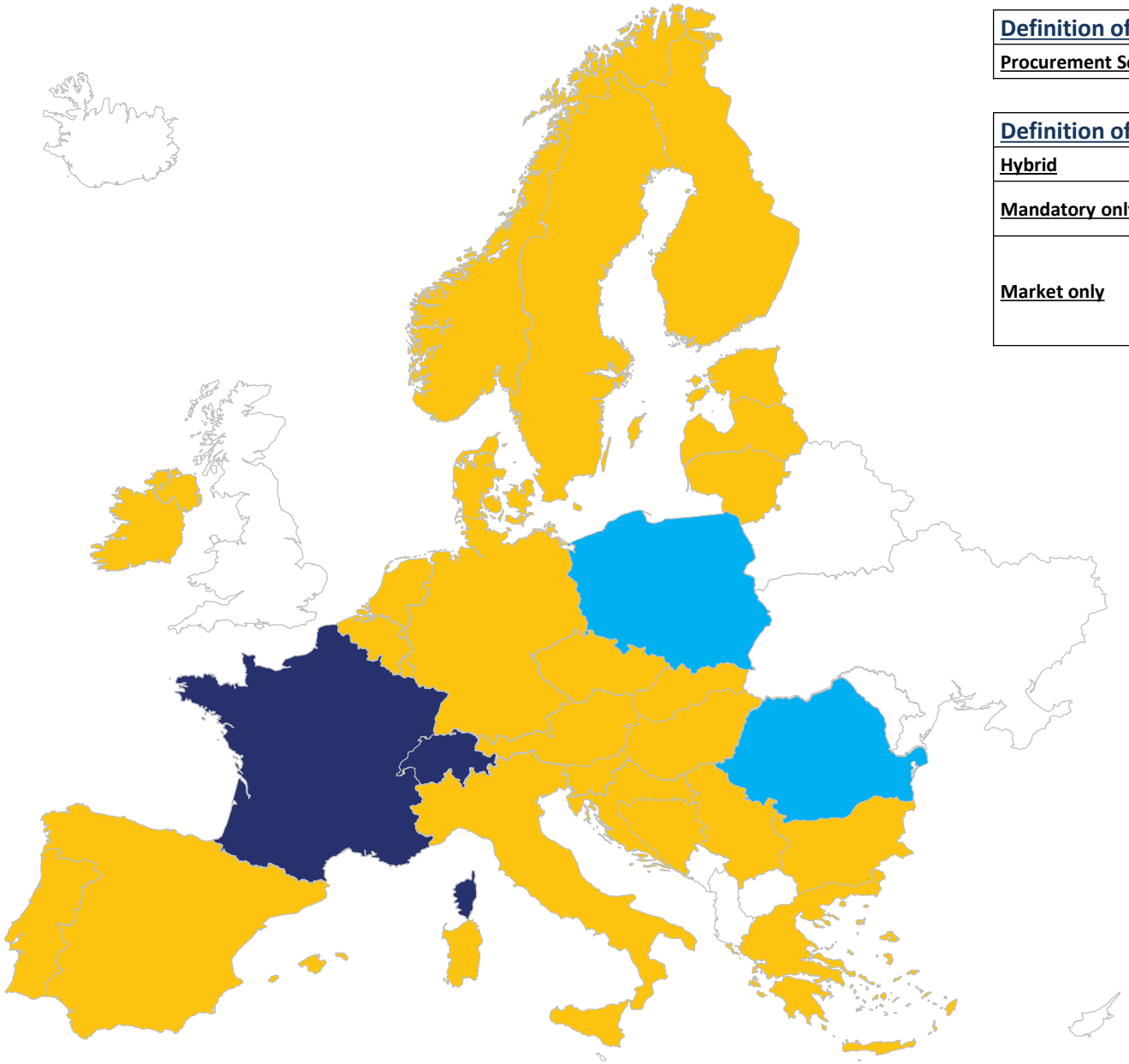
Using Replacement Reserve?



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

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.

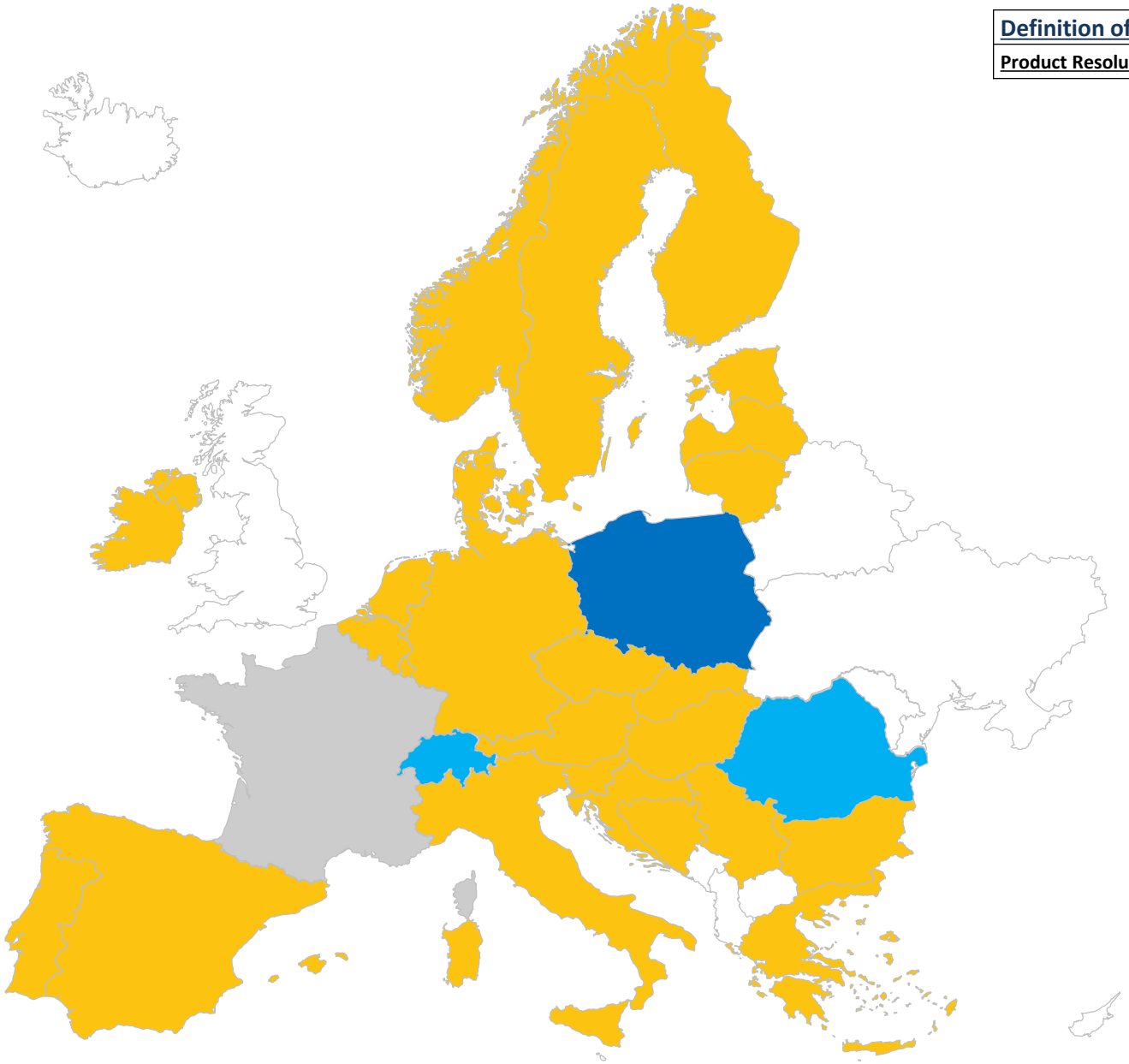
Replacement Reserve – Capacity – Procurement Scheme



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

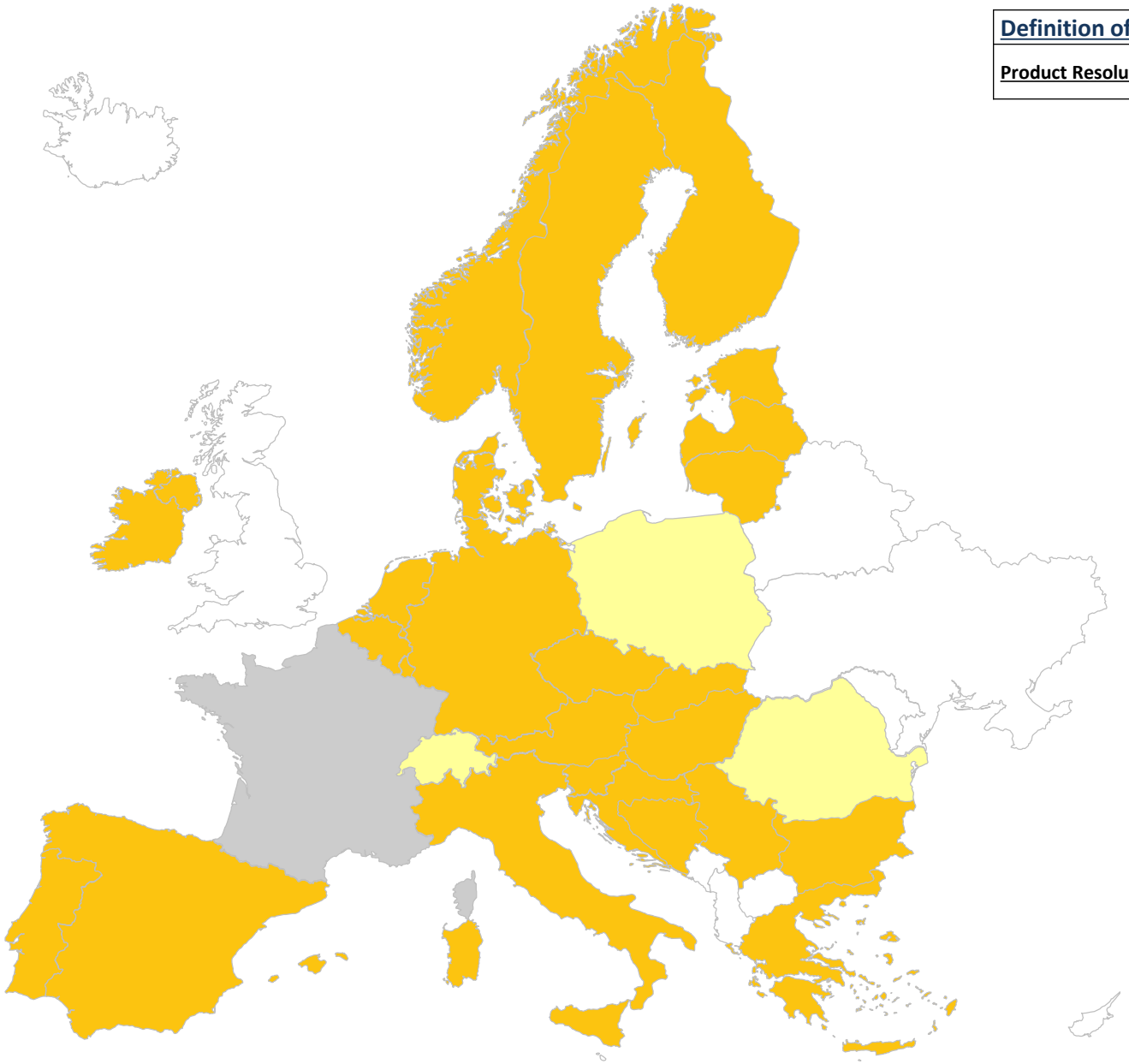
Definition of answer	
Hybrid	Combination of given options.
Mandatory only	Generators connected to the grid are obligated to reserve a certain amount of capacity in order to meet TSO requirements, for a fixed price set by TSO, NRA or for free.
Market only	There is no contract or obligation for a grid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



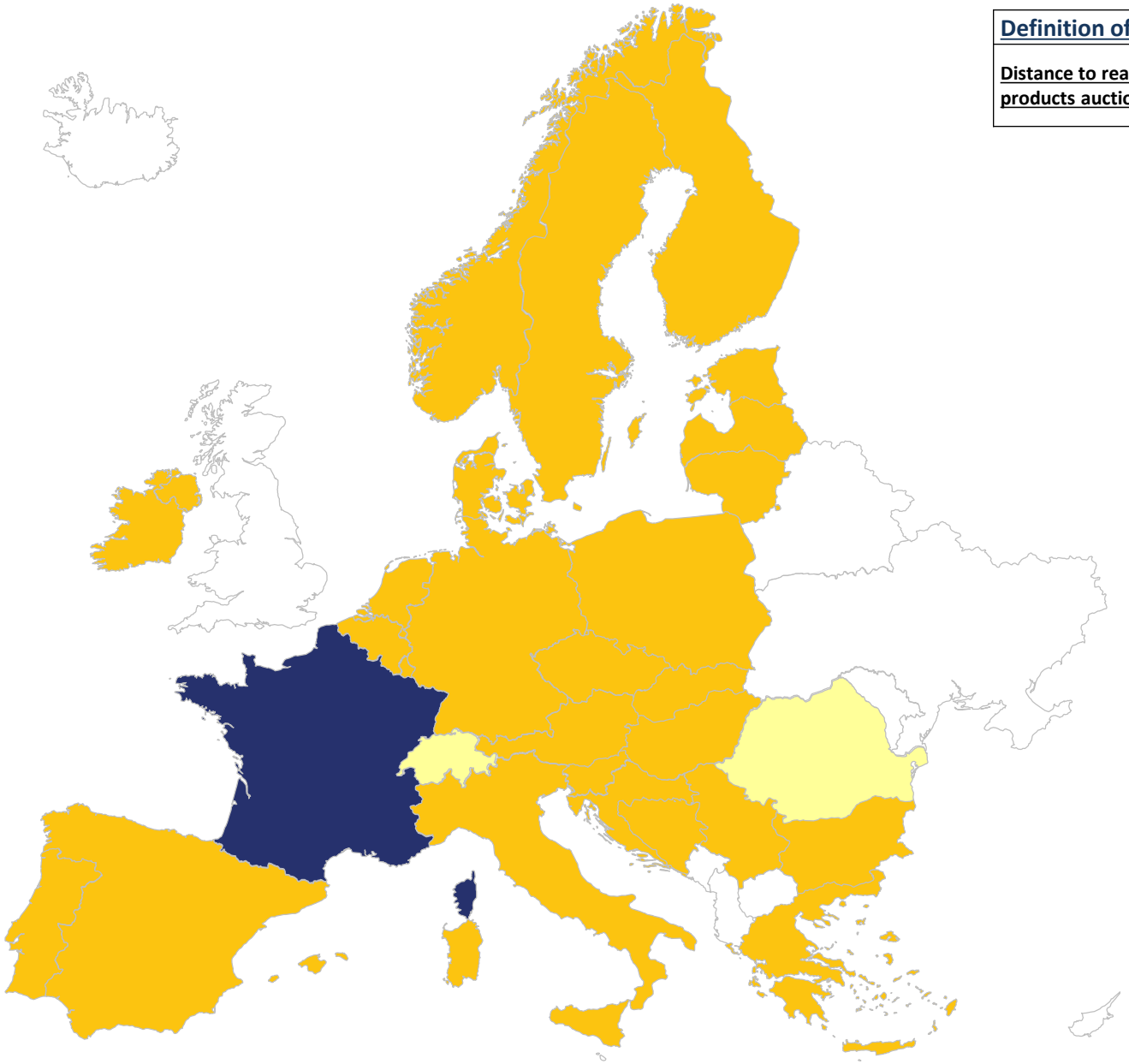
Definition of question	
Product Resolution (in MW)	The minimum bid size into the balancing market.

Replacement Reserve – Capacity – Product Resolution (in time)



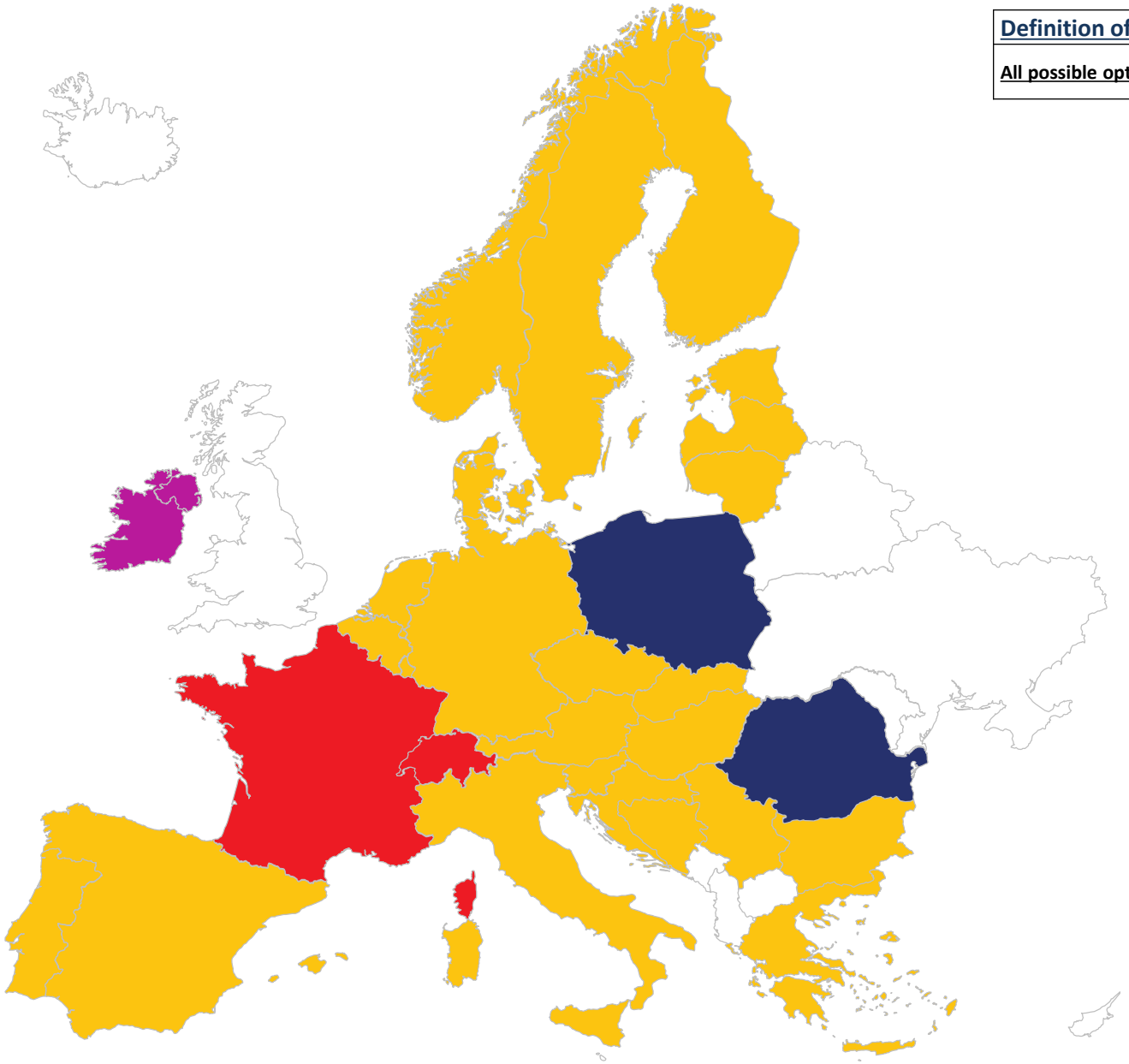
Definition of question	
Product Resolution (in time)	The maximum resolution for which the product can be bid into the market (for instance =1 hour in the case of a 24 auctions day ahead market for reserve provision).

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

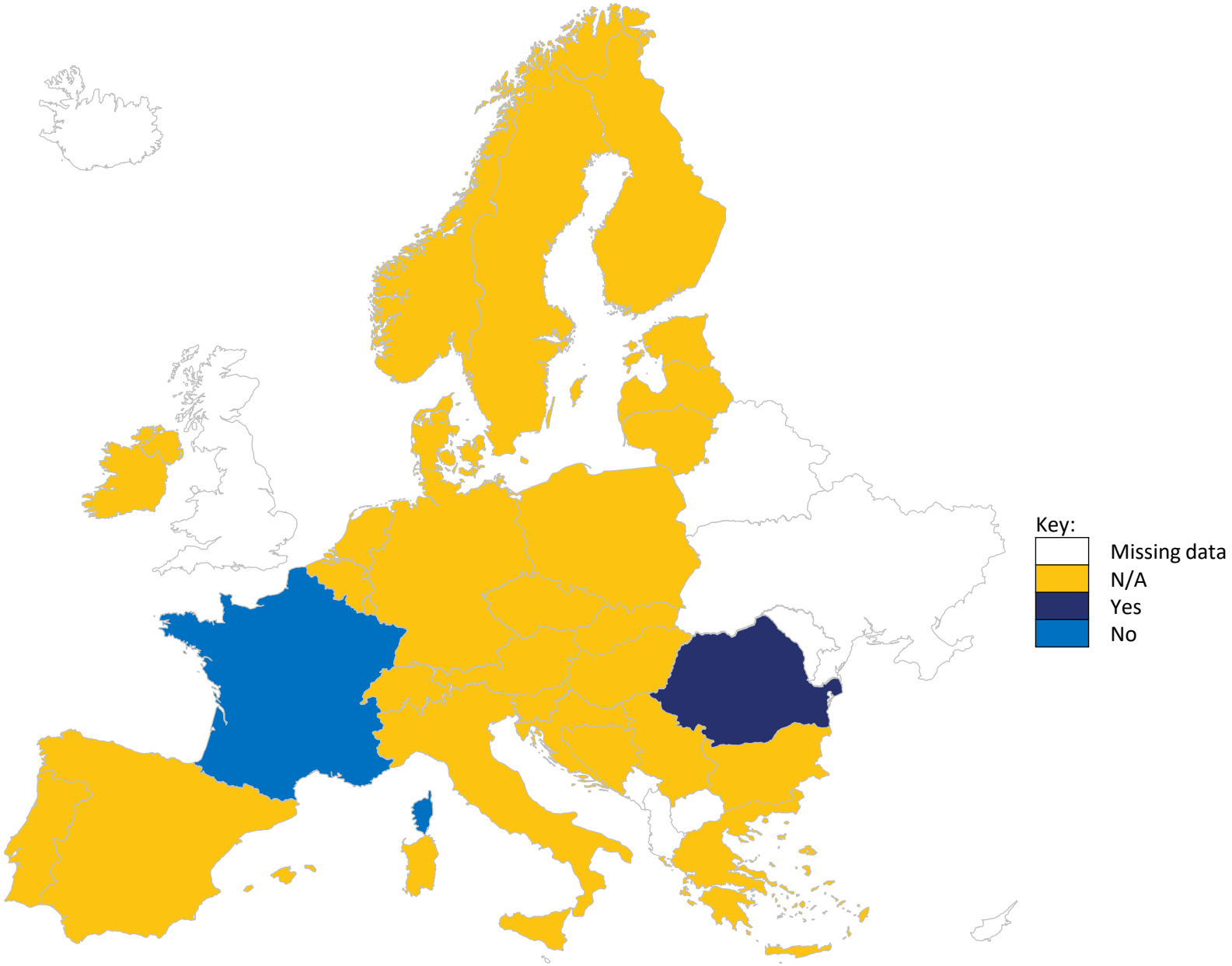


Definition of answer	
All possible options	In this case all possible provider types were chosen (Generator + Demand-side response + Pump Storage + Batteries + Distributed generation)

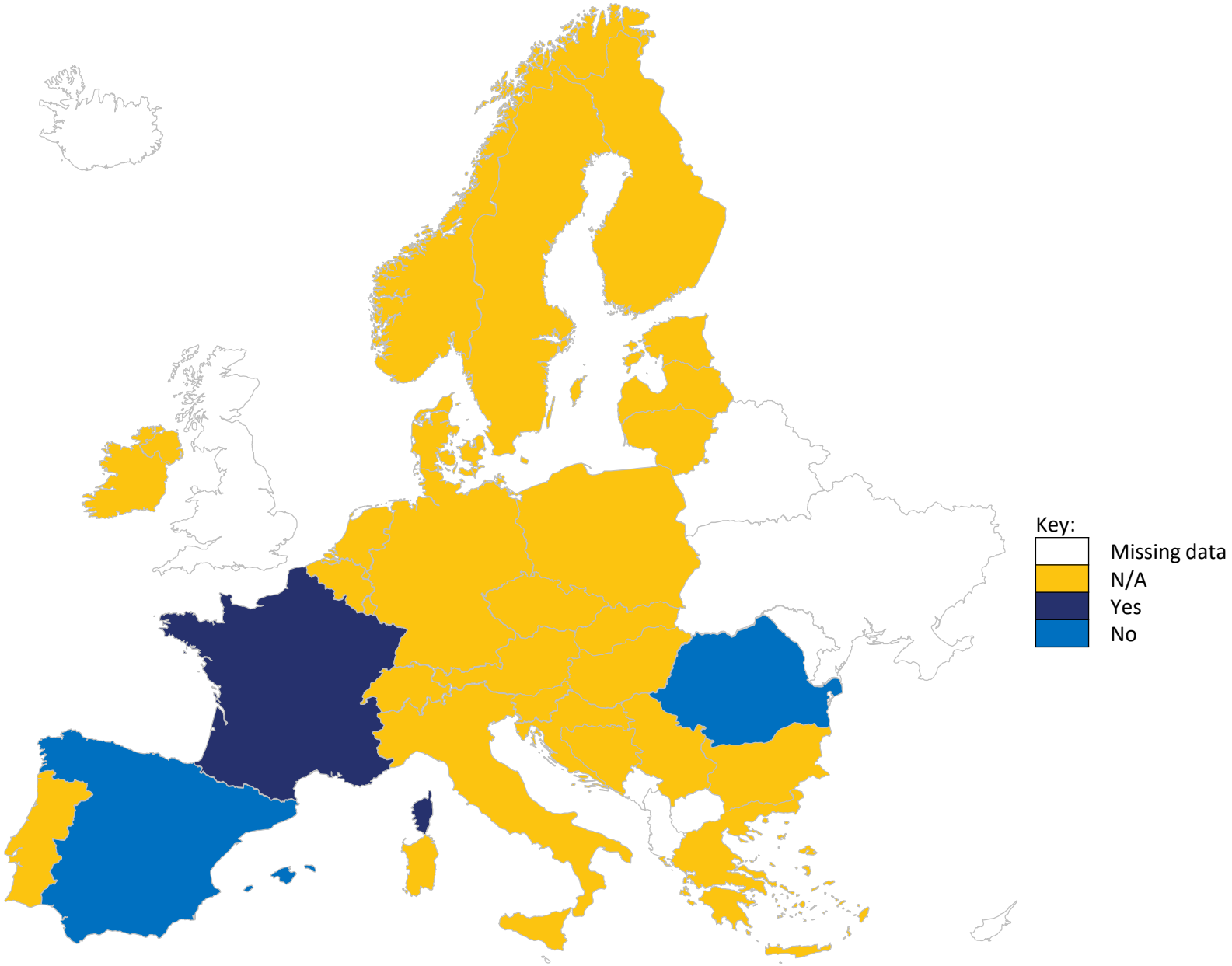
Key:

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

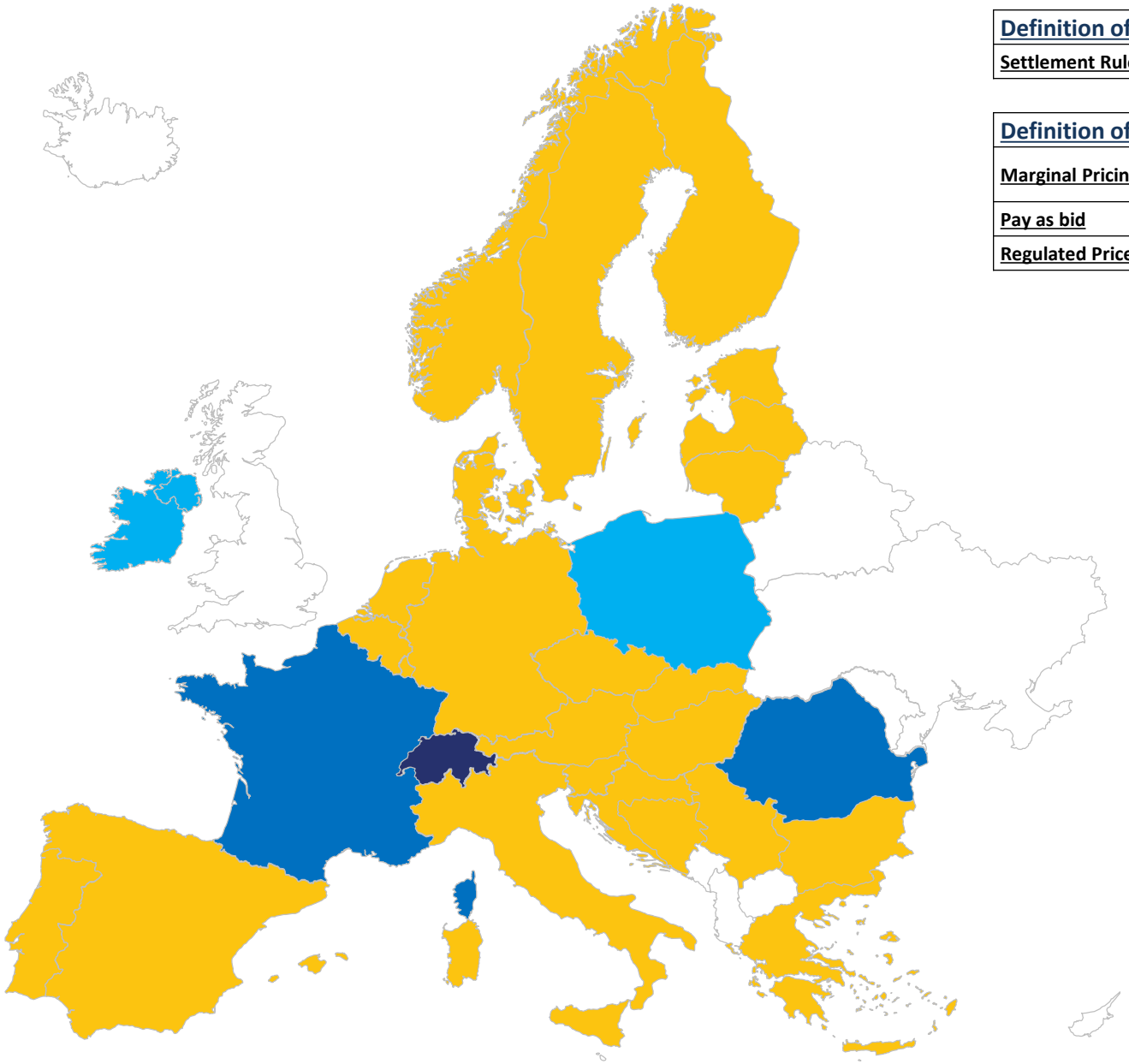
Replacement Reserve – Capacity – Product standardisation finished



Replacement Reserve – Capacity – Using specific products?



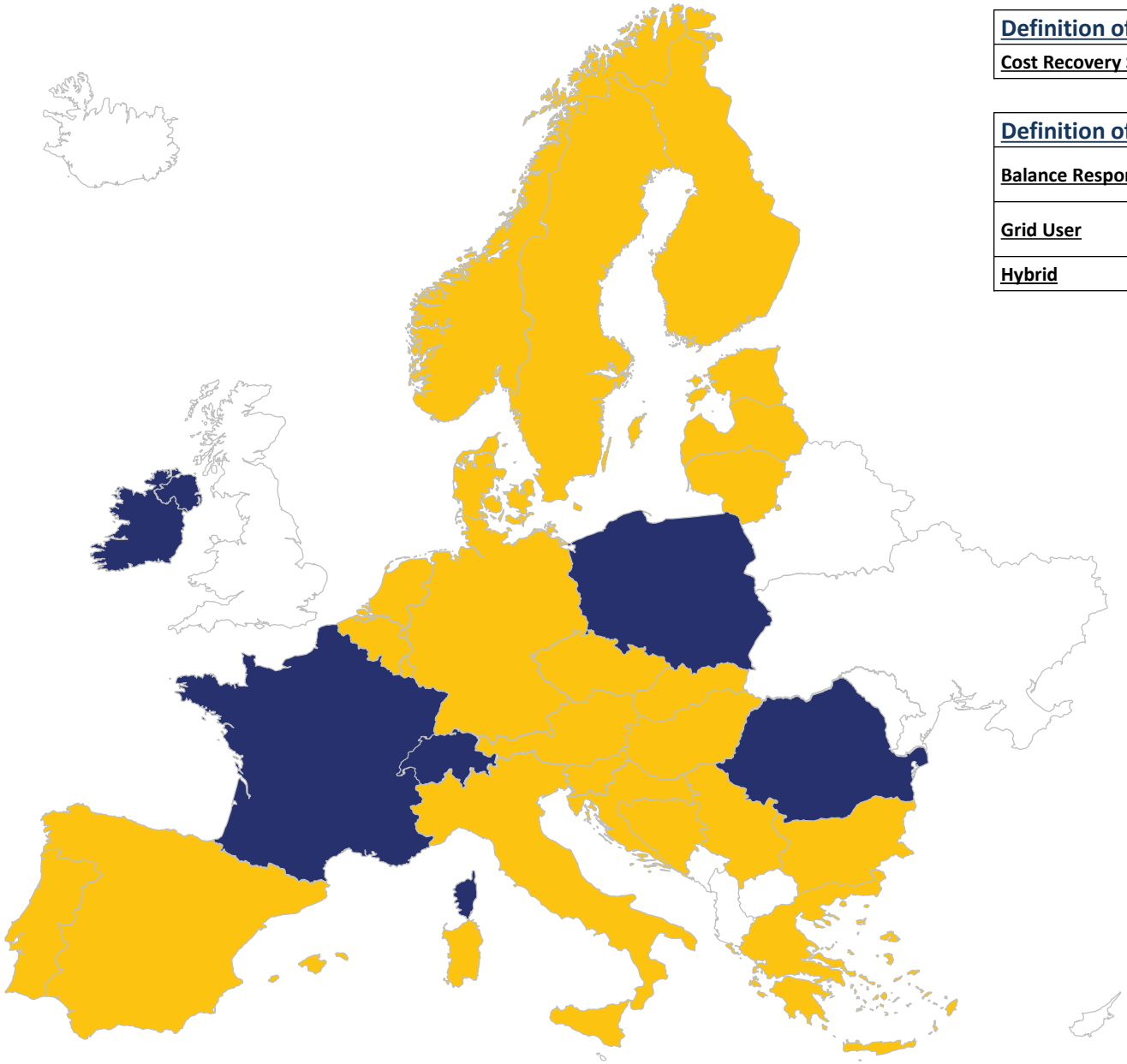
Replacement Reserve – Capacity – Settlement Rule



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



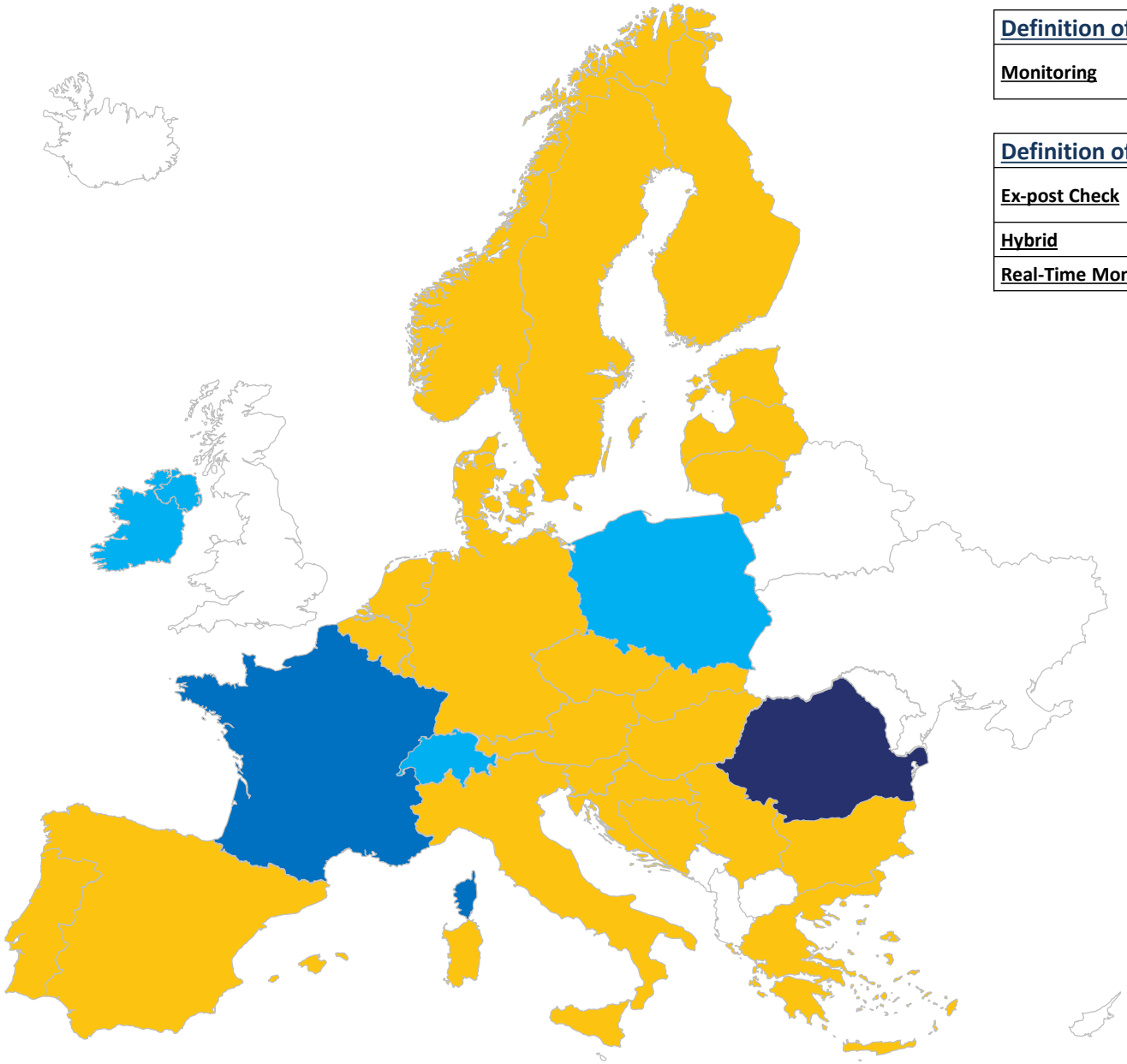
Definition of question	
Cost Recovery Scheme	From who are the costs recovered.

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.

Key:

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

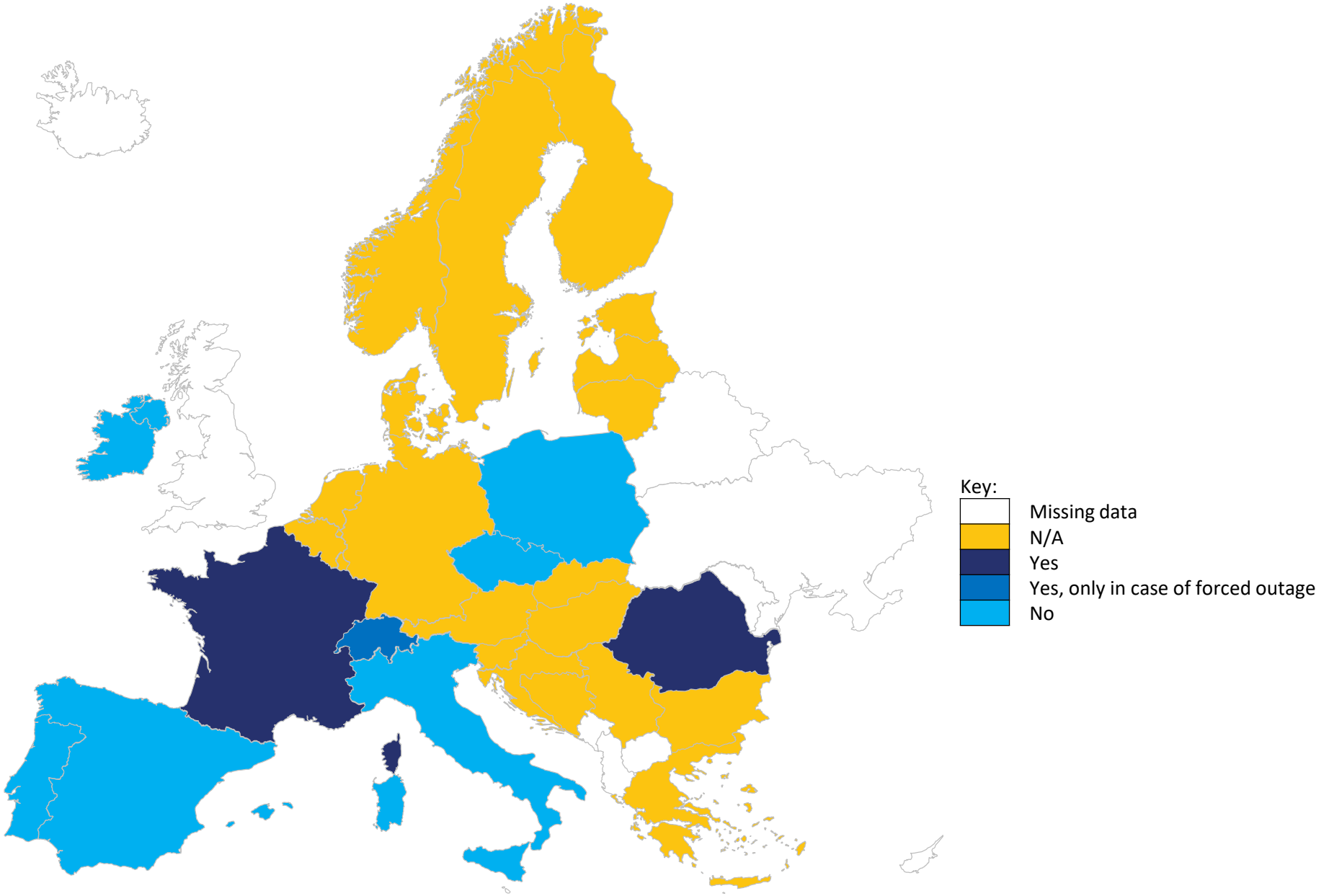
Replacement Reserve – Capacity – Monitoring



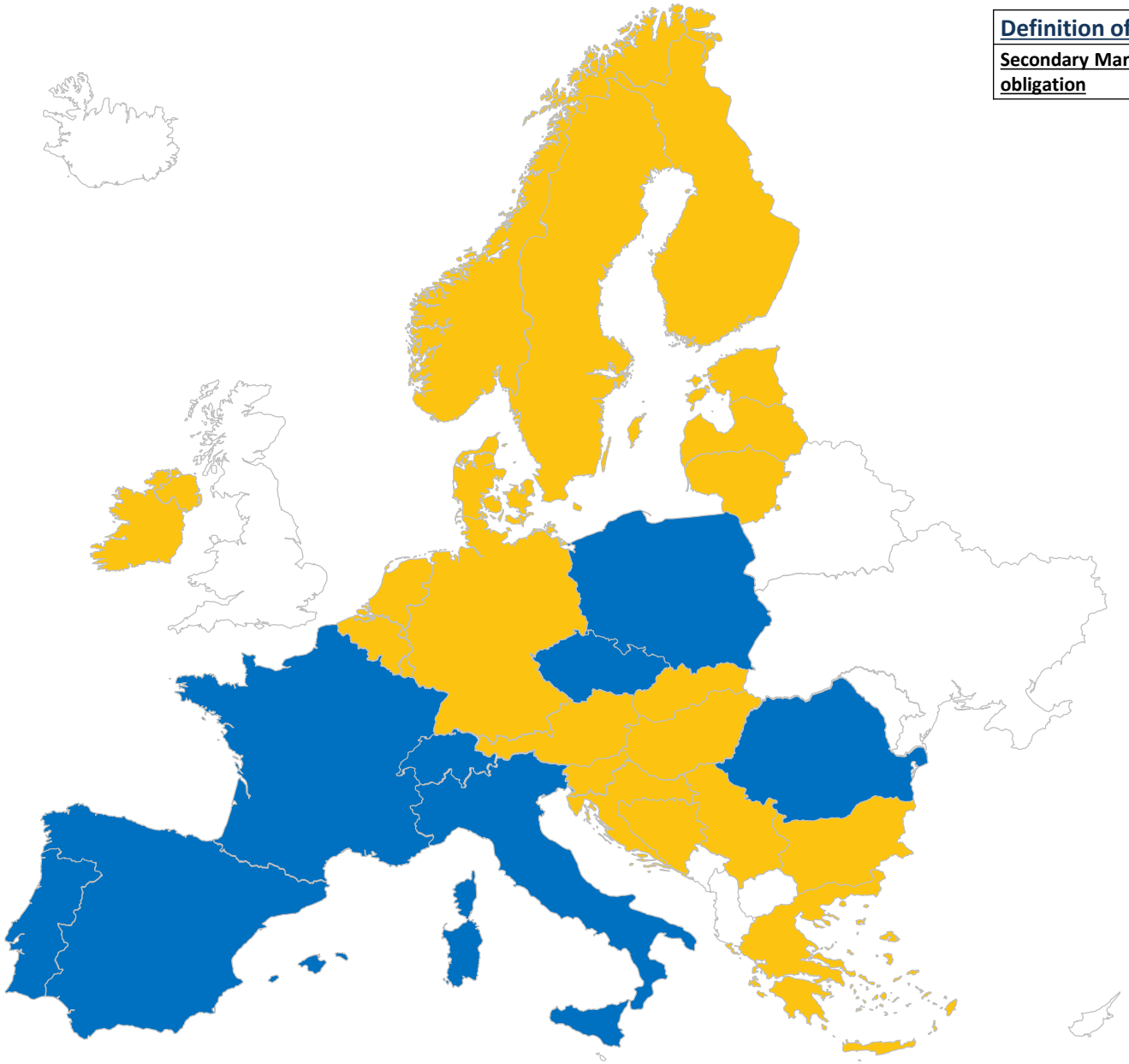
Definition of question	
Monitoring	Refers to the type of monitoring in place by the system operator to ensure performance of plant.

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

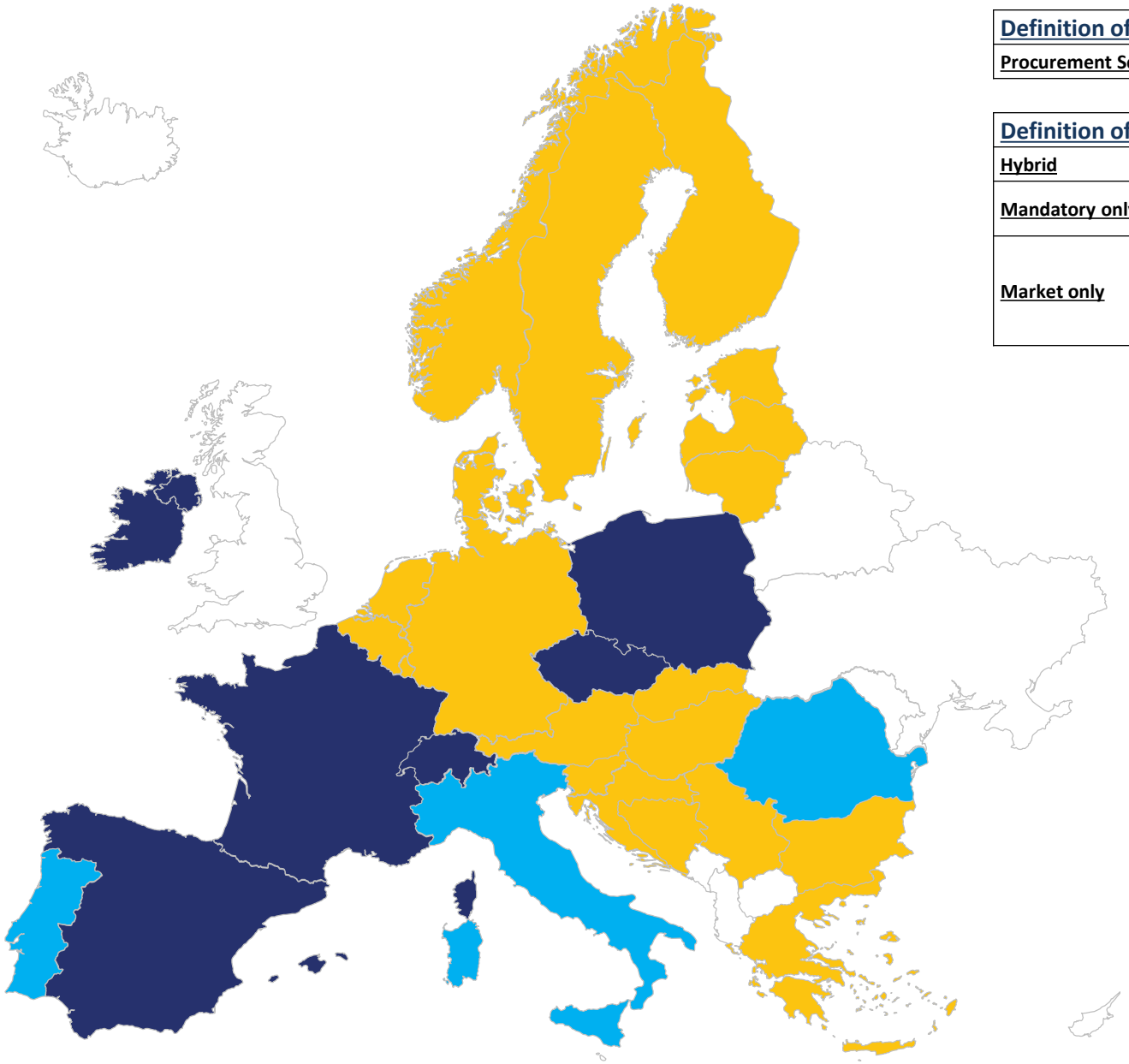


Replacement Reserve – Capacity – In case transfer obligation is allowed, is there an organised secondary market?



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.

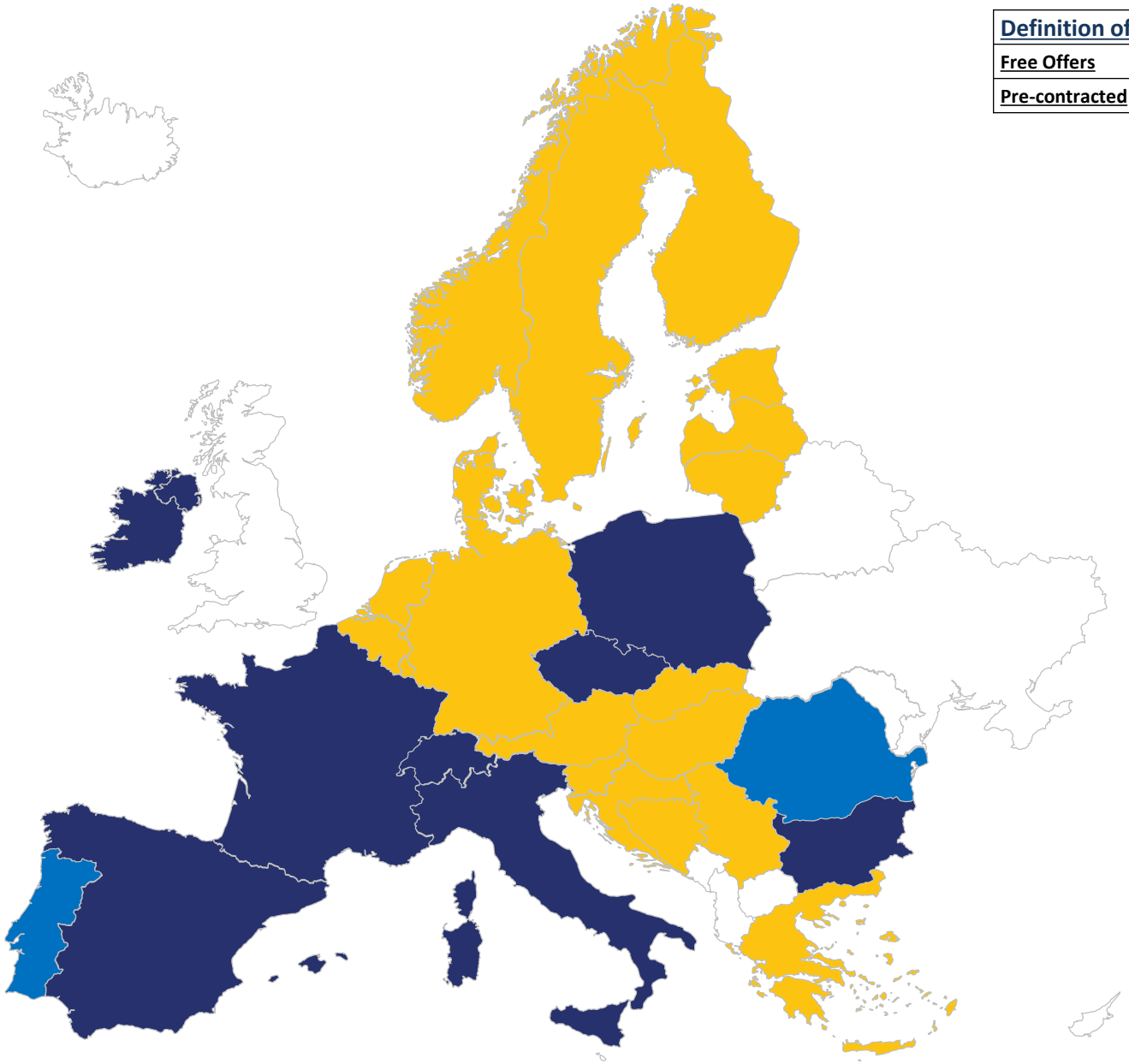
Replacement Reserve – Energy – Procurement Scheme



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?

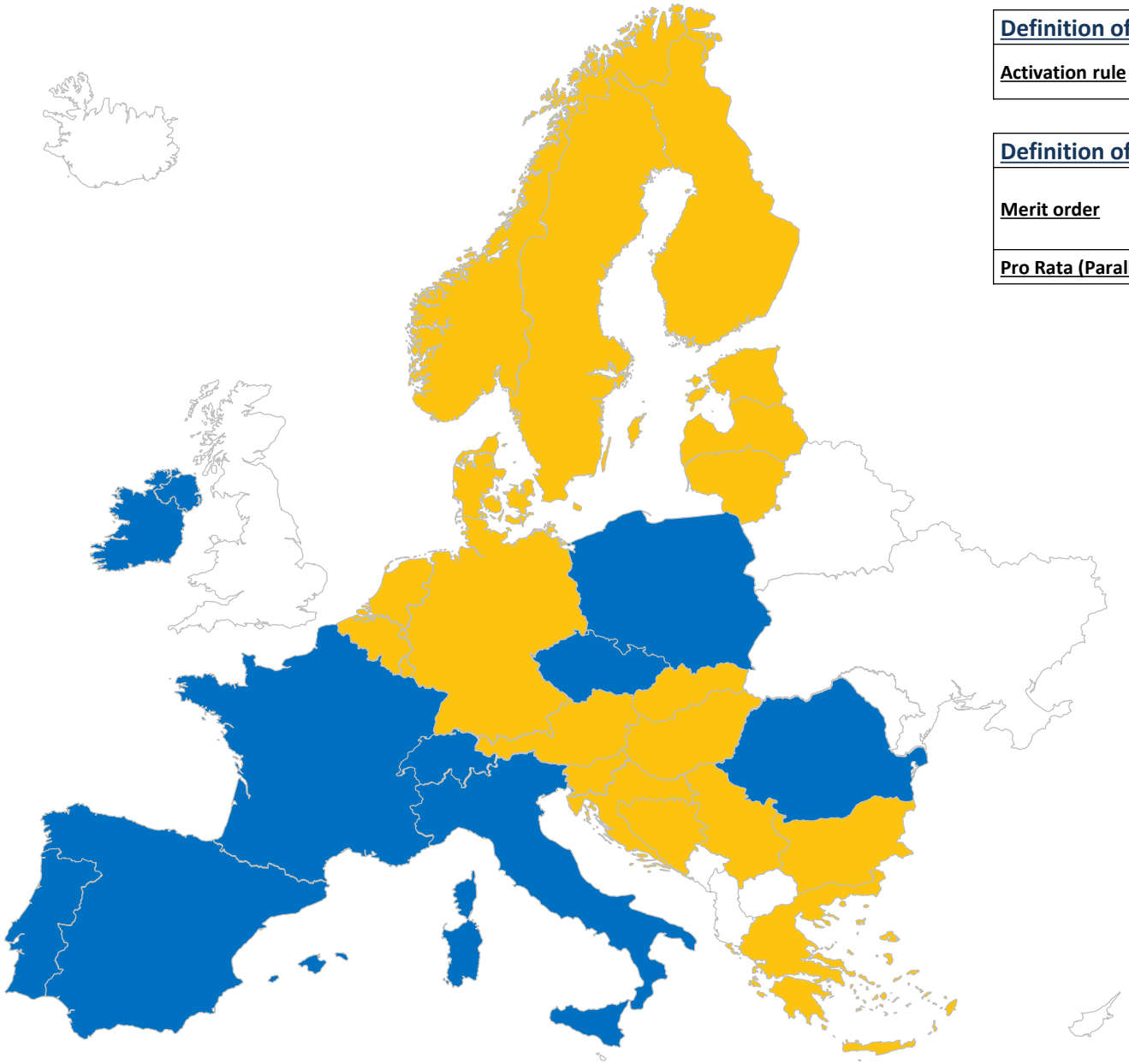


Definition of question	
Free Offers	Possibility to offer balancing energy bids without a contract for Balancing Capacity
Pre-contracted	BSP has sold/procured Balancing Capacity to TSO.

Key:

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

Replacement Reserve – Energy – Activation Rule



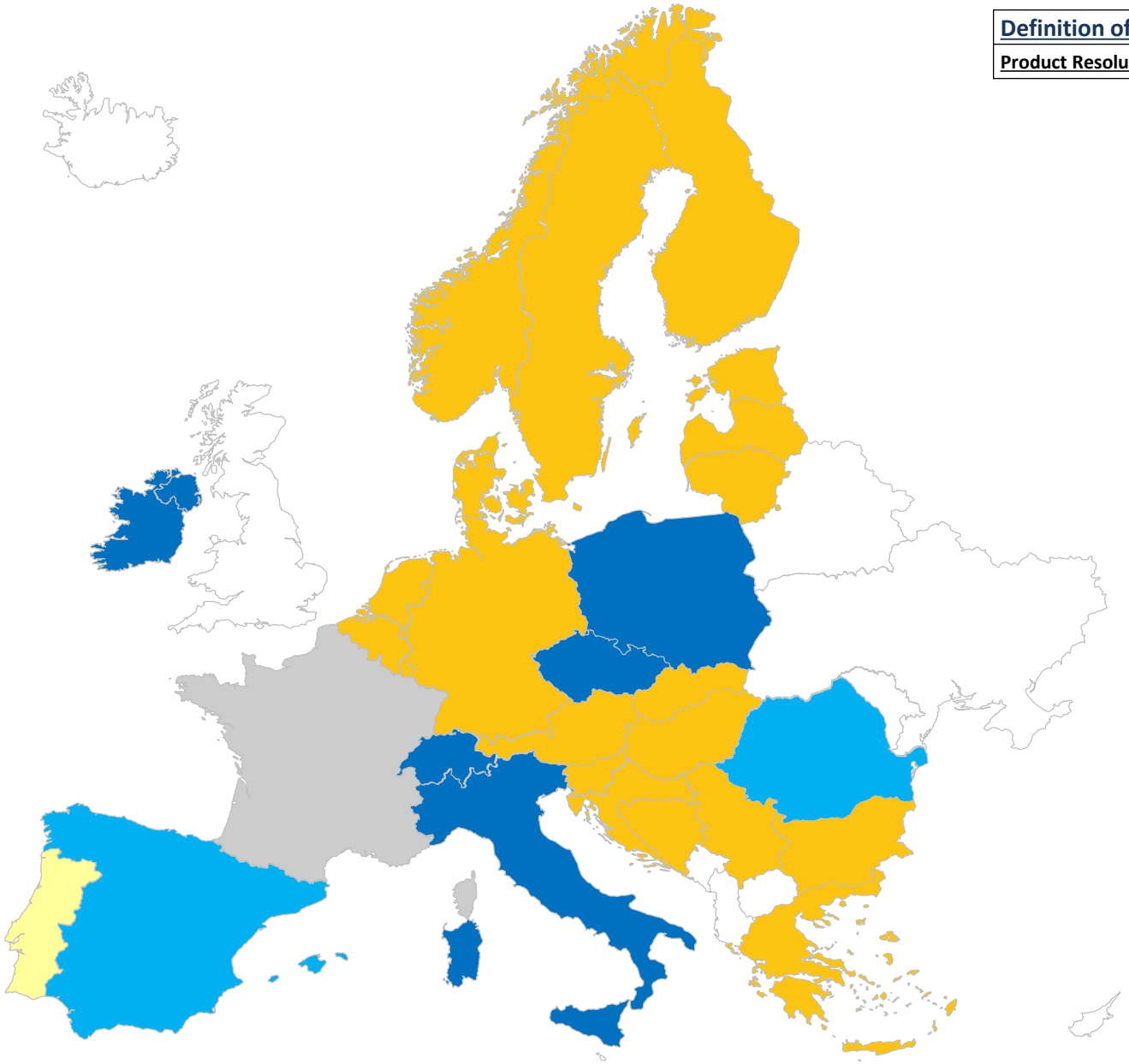
Definition of question	
Activation rule	How the frequency restoration reserves are activated i.e. by a Pro-Rata system or on the basis of a Merit Order (cheapest being activated first).

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:

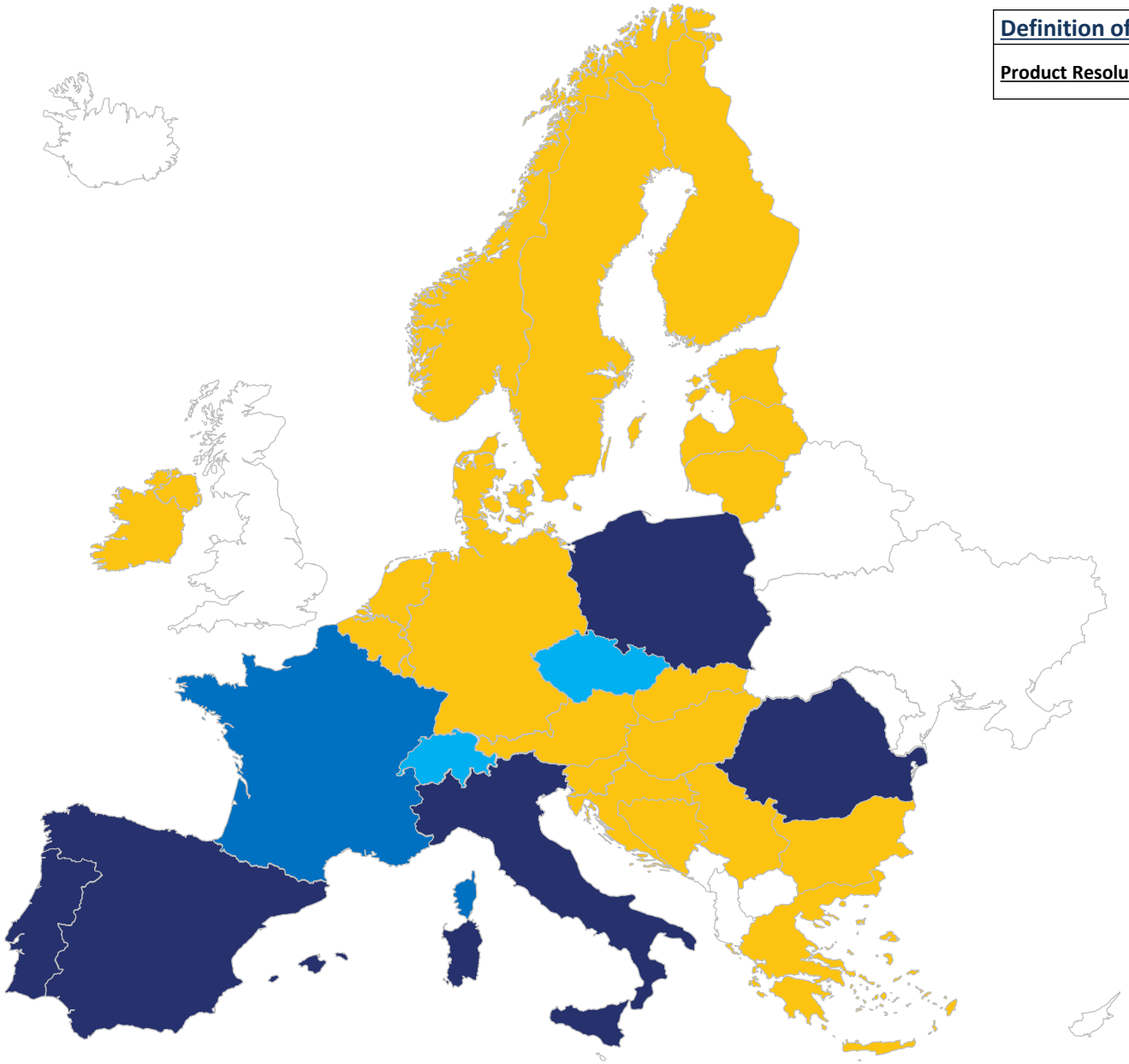
- Missing data
- N/A
- Pro Rata (Parallel Activation)
- Merit order

Replacement Reserve - Energy - Product Resolution (in MW)



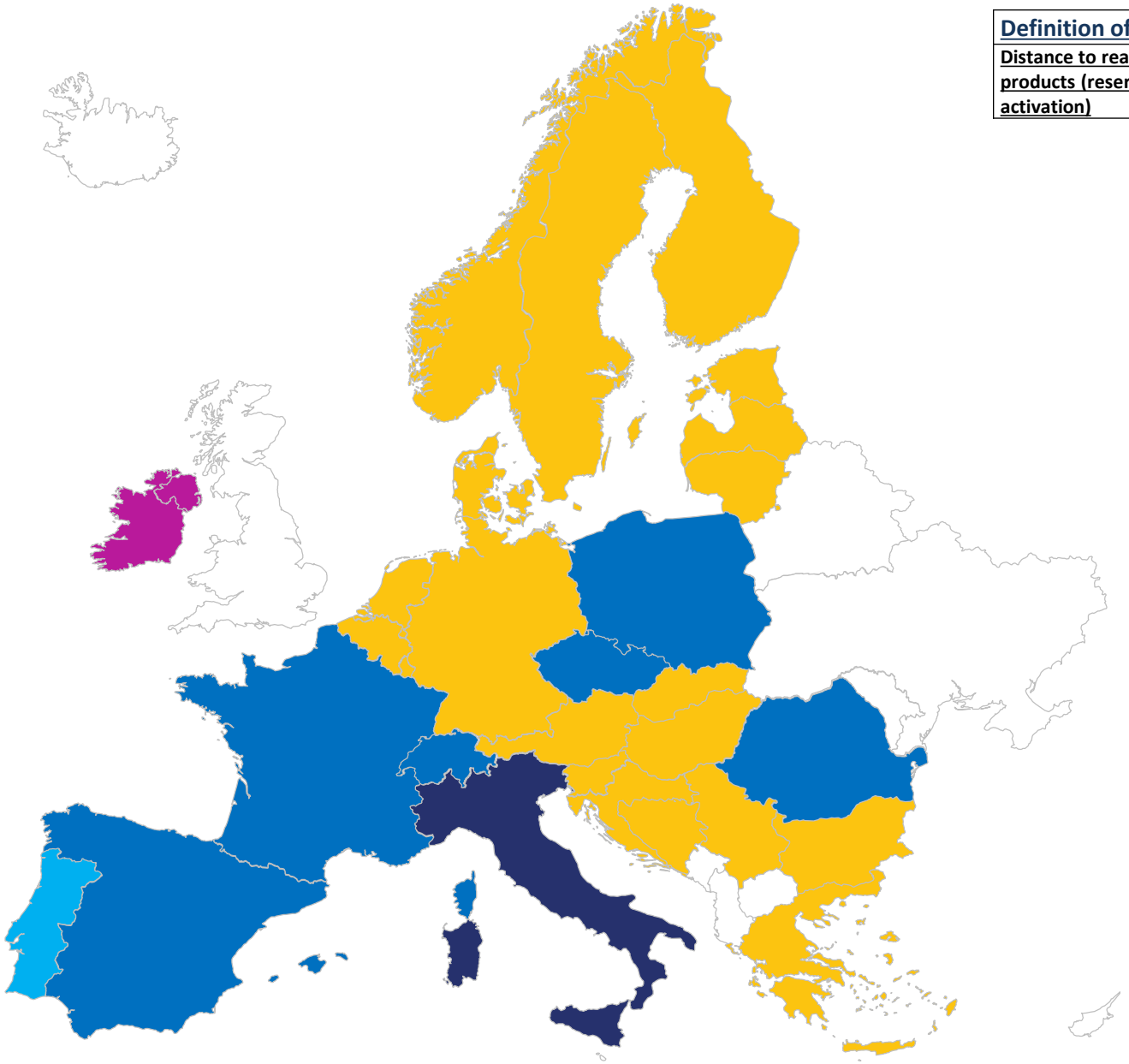
Definition of question	
Product Resolution (in MW)	The minimum bid size into the balancing market.

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:

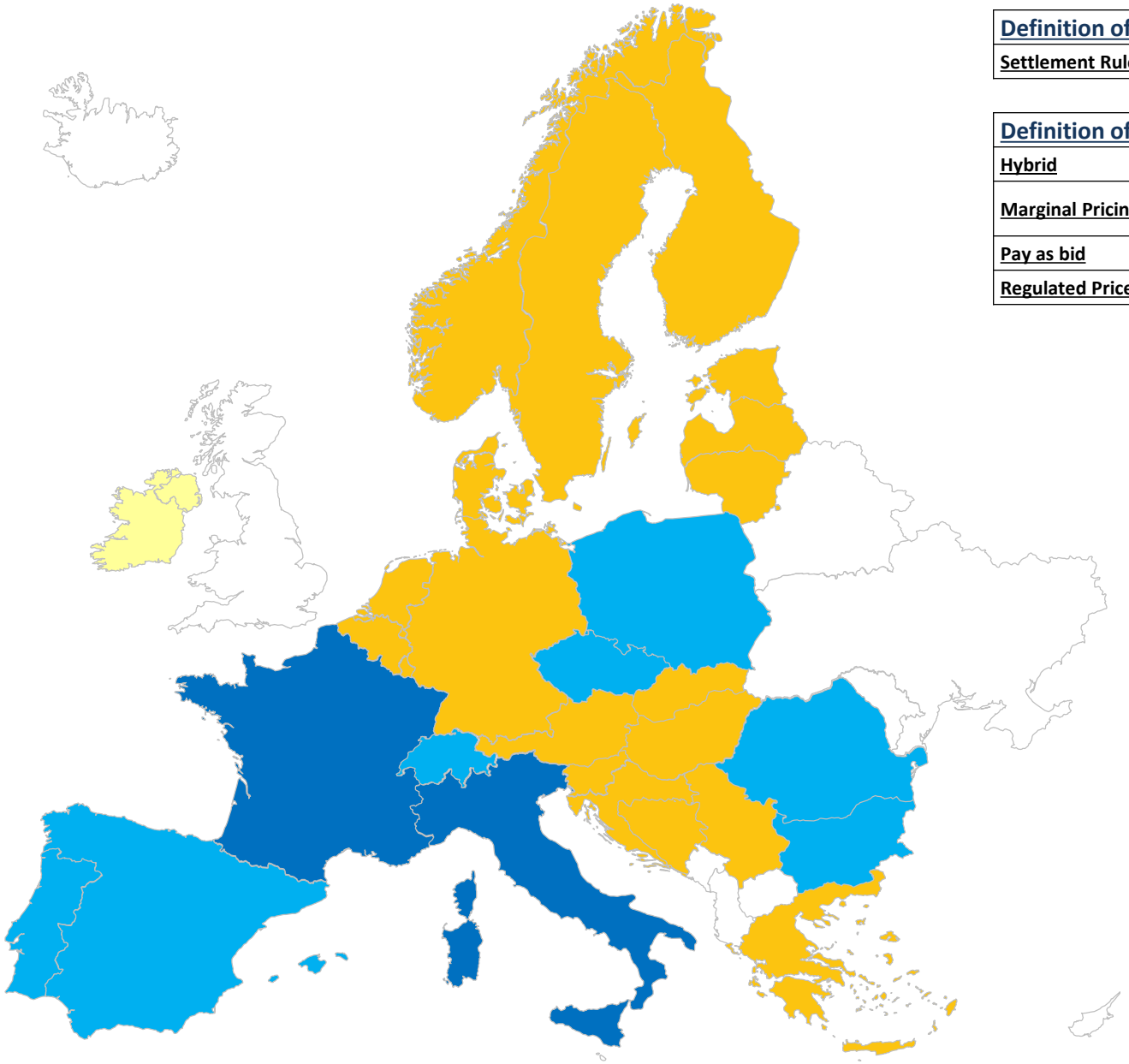
- Missing data
- N/A
- x > H-1
- 15 minutes < x <= H-1
- 5 minutes < x <= 15 minutes
- 1 minute < x <= 5 minutes
- x <= 1 minute
- Depends on the unit

Replacement Reserve - Energy - Provider

Key:

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

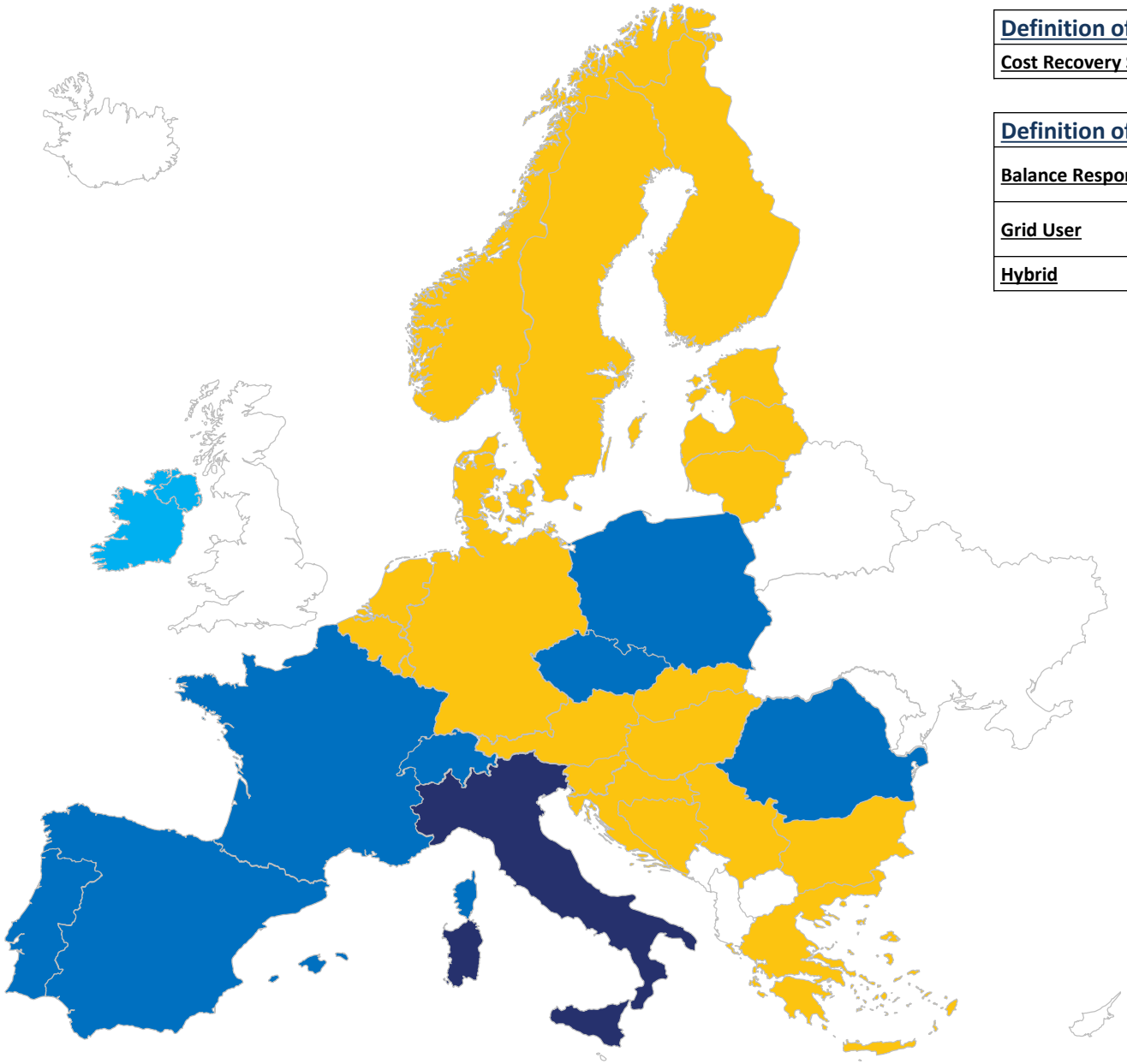
Replacement Reserve - Energy - Settlement Rule



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.

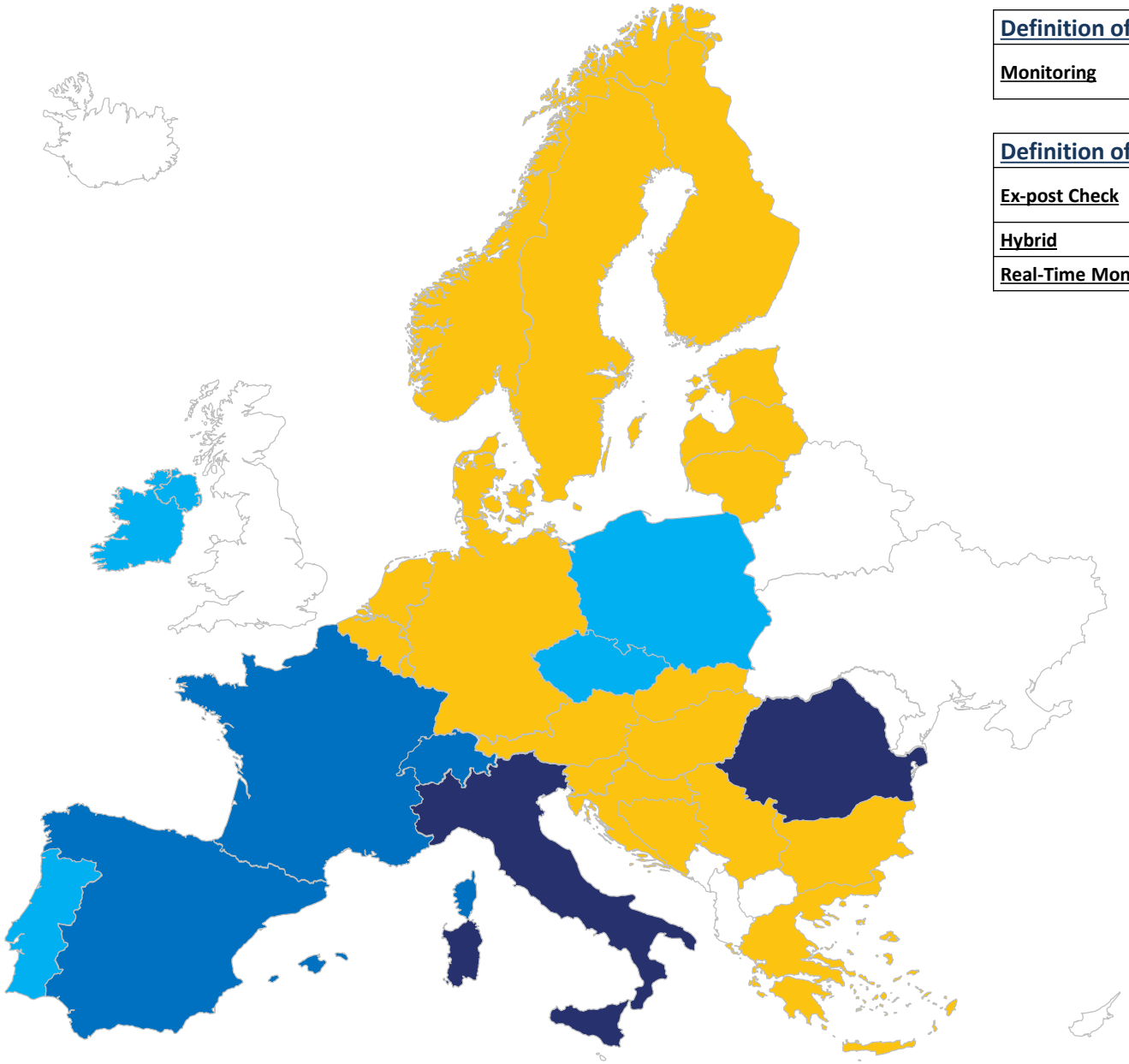
Replacement Reserve - Energy - Cost Recovery Scheme



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.

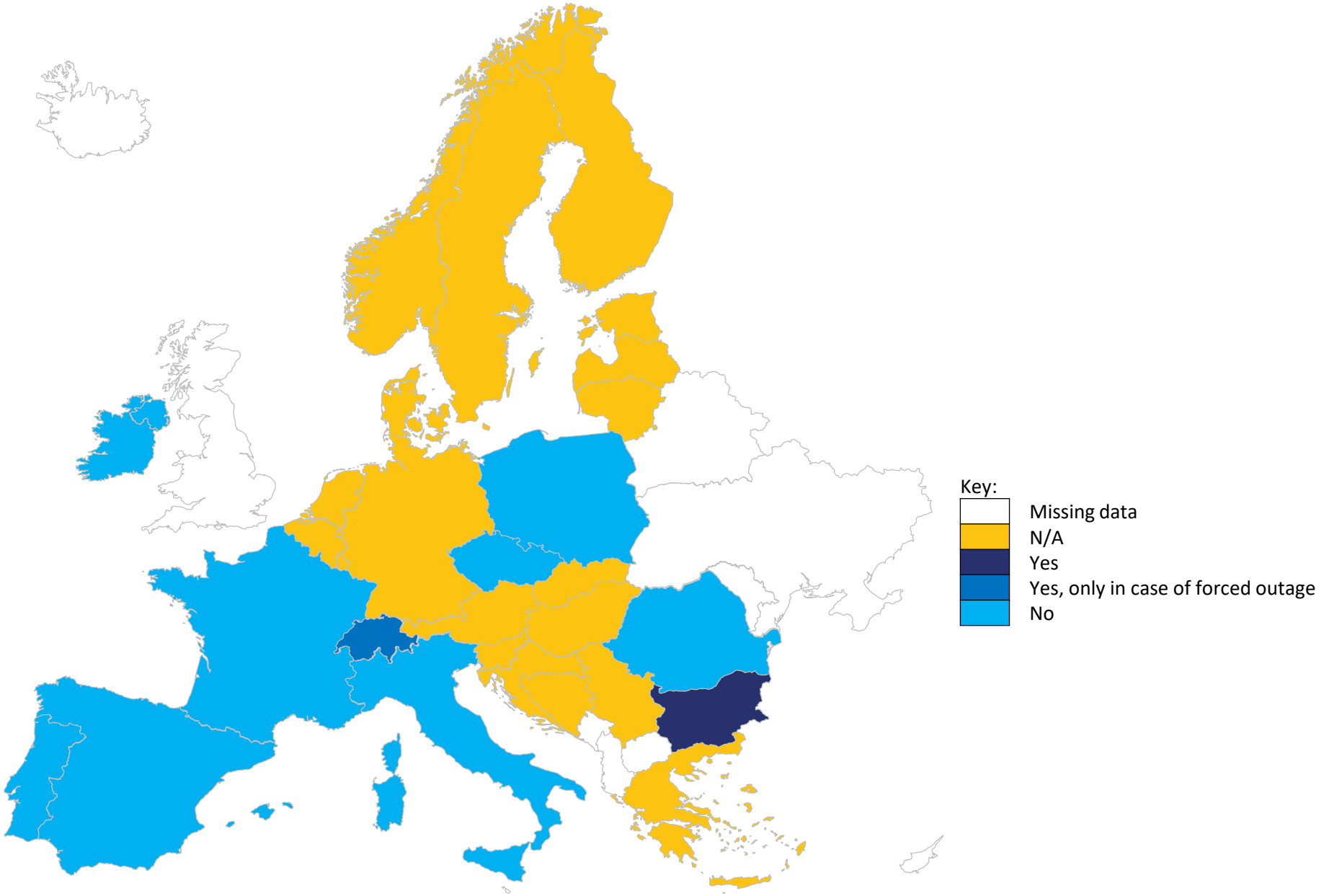
Replacement Reserve - Energy - Monitoring



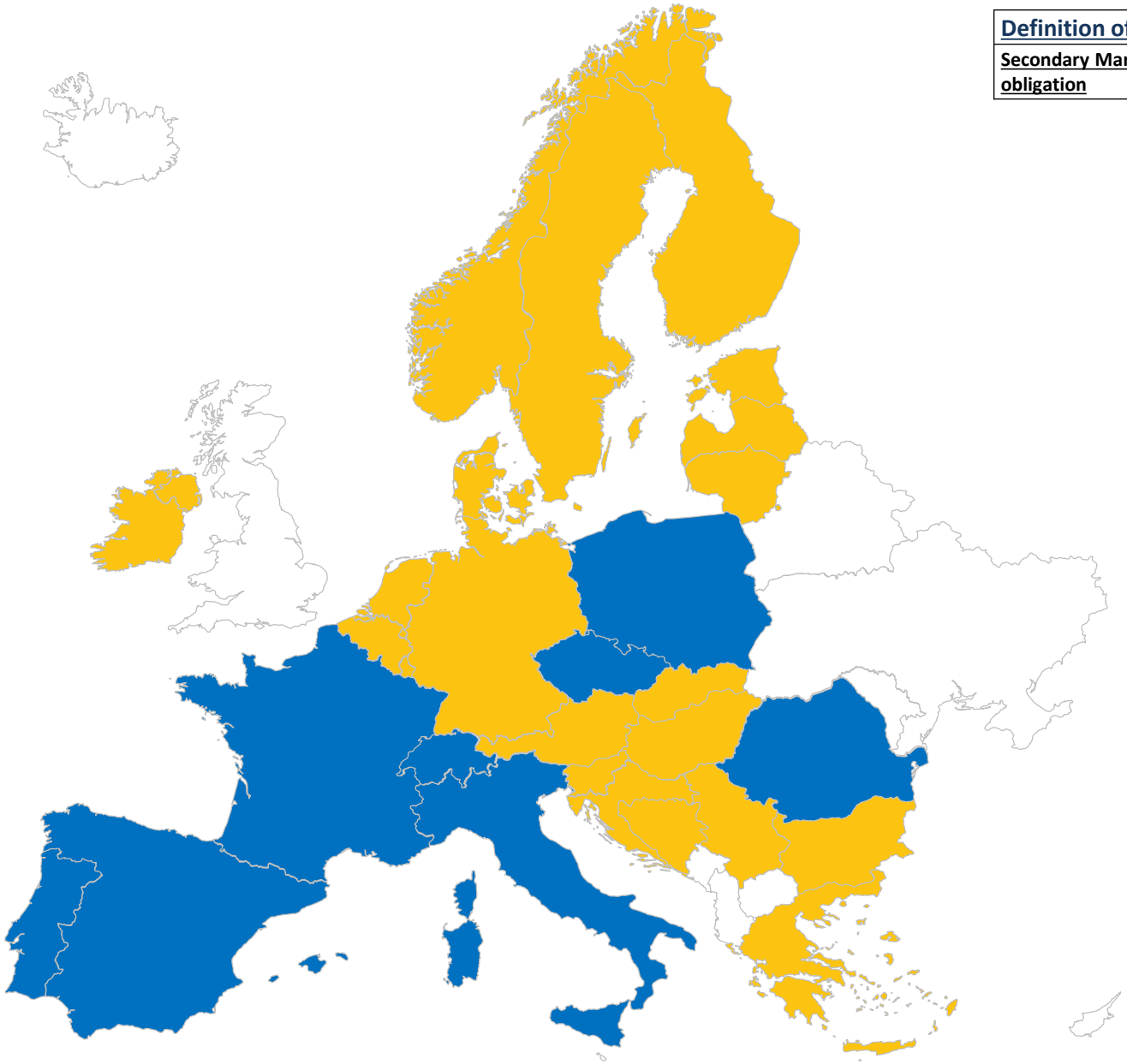
Definition of question	
Monitoring	Refers to the type of monitoring in place by the system operator to ensure performance of plant.

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

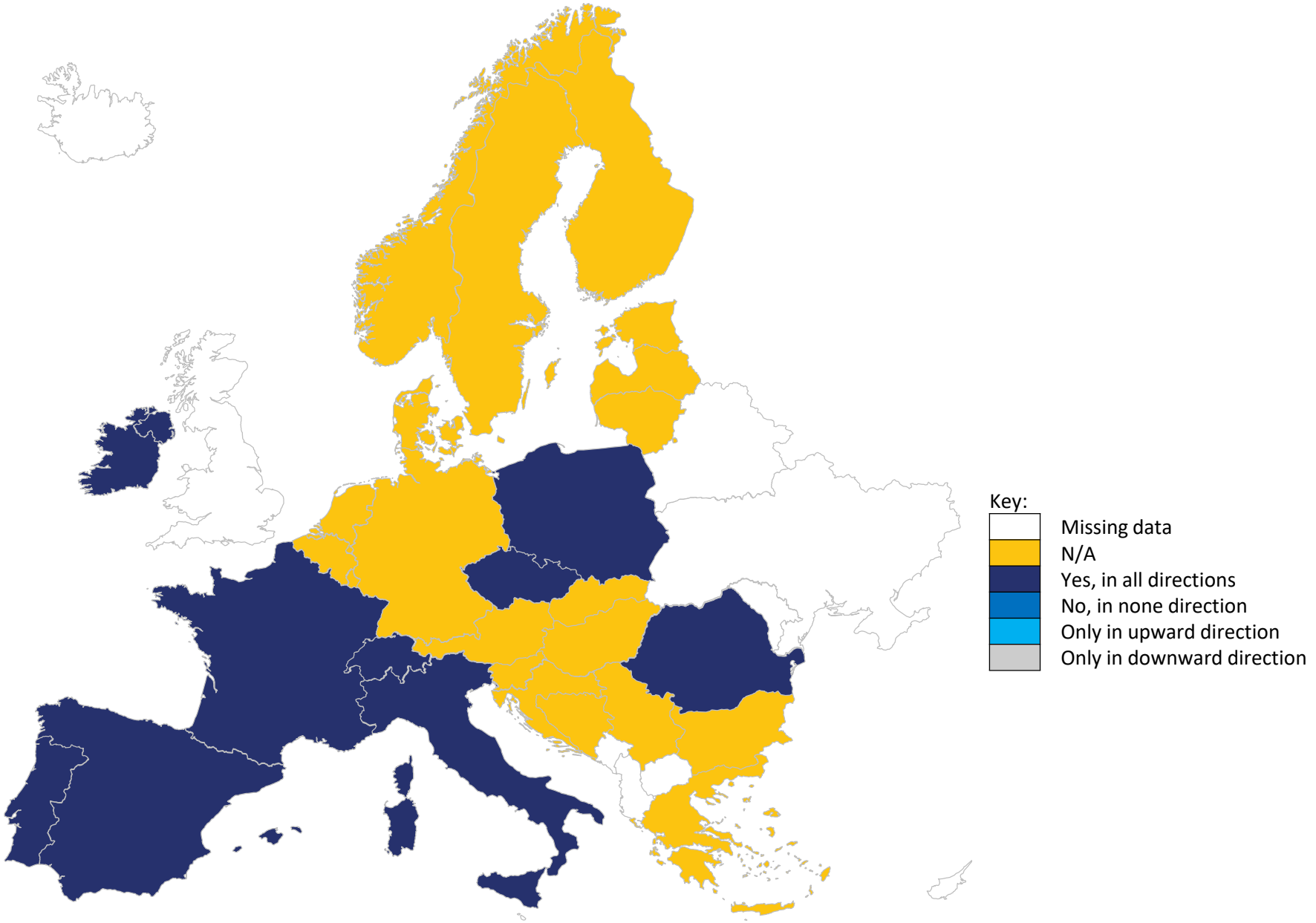


Replacement Reserve - Energy - In case transfer obligation is allowed, is there an organised secondary market?

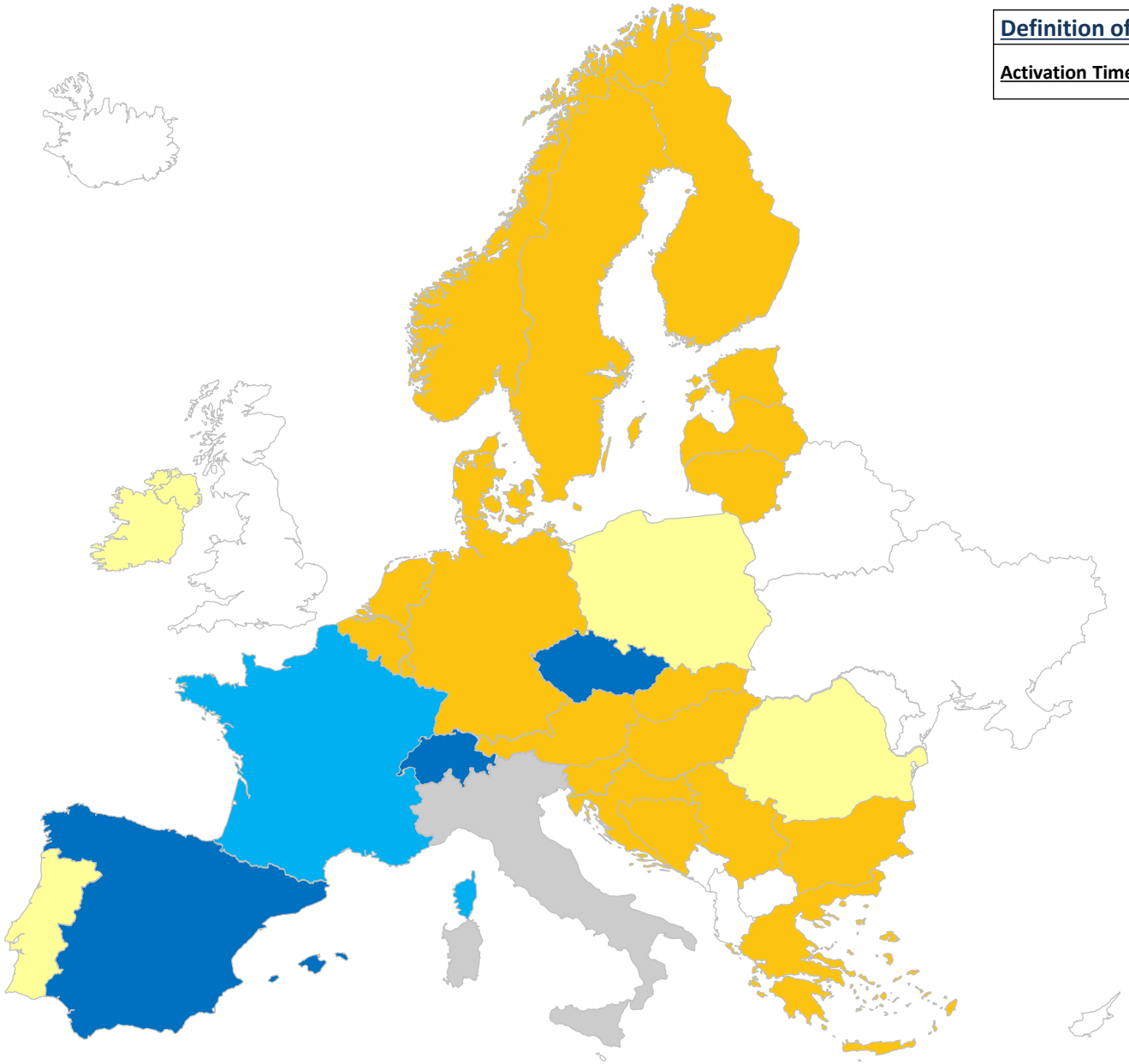


Definition of answer	
Secondary Market for reserve obligation	Trading procedure between the BSPs (where at least one BSP has contract with the TSO) to ensure the prescribed reserve amount of the TSO.

Replacement Reserve - Energy - Partially activated product



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

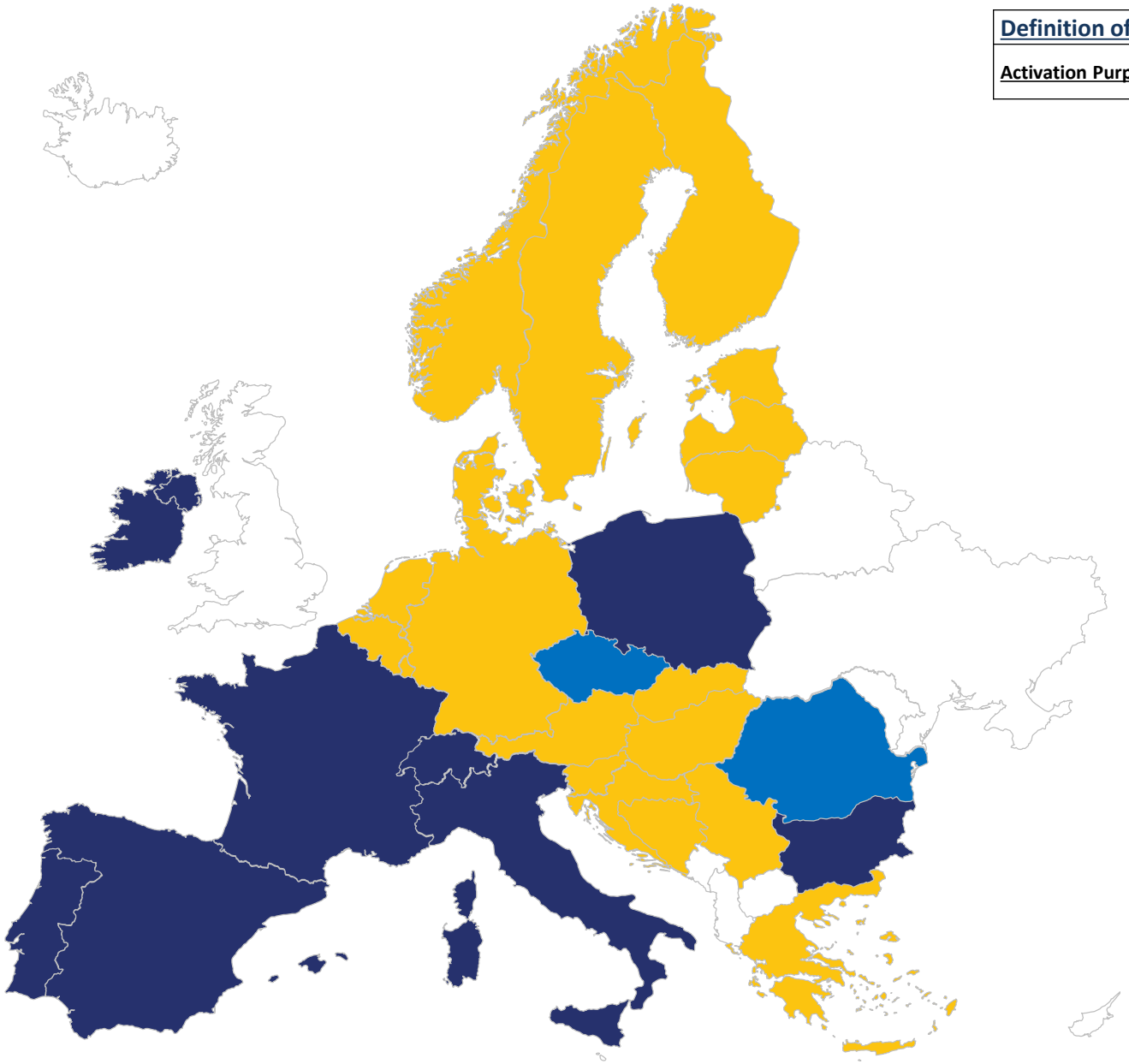


Definition of question	
Activation Time	Activation Time means the period of time between receipt of a valid instruction by the Activation Optimisation Function and the end of ramping to meet that instruction.

Key:

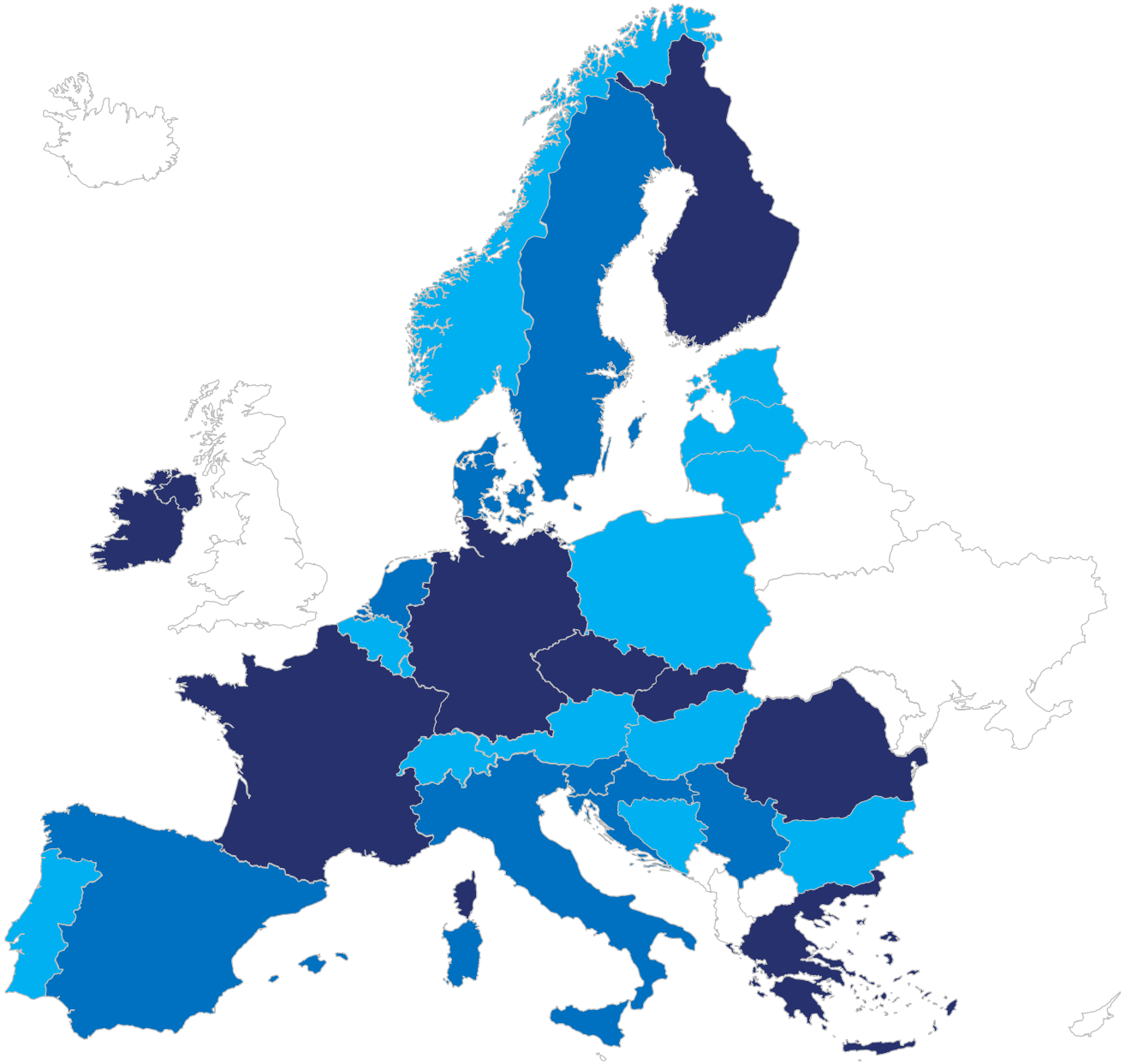
- Missing data
- N/A
- x <= 15 min
- 15 min < x <= 30 min
- 30 min < x <= 1 hour
- x > 1 hour
- Depends on the unit

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?



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 2019! (1/2)

TSO	Answer
EirGrid	Future arrangments still under design consderations
Energinet	Daily auctions for mFRR capacity
German TSOs	Implementation of EB Reg. target model and accession to the balanicng platforms in Q1/2022
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), EU Official Gazette L 312/6 of 28/11/2017 with the approval of the Croatian Energy Regulatory Agency, Class: 310-03/19-16/9, Reg. No.: 371-06-19-12 of 26 November 2019 the Management Board of the Croatian Transmission System Operator Ltd. hereby adopts the Electricity balancing rules in force from 1.1.2020.In line with Electricity balancing rules, HOPS conductes the process of procuring mFRR balancing capacity and/or balancing energy through public tenders as an improvement of the previous pilot project „Securing mFRR balancing service from Demand Side Response (‘DSR’) “
RTE	RR platform connexion D-1 market_based procurements for mFRR and RR reserves D-1 market-based procurement for aFRR reserve aFRR merit order activation

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 2019! (2/2)

TSO	Answer
SEPS	- Starting from 1st January 2020 aFRR balancing energy is activated according to local merit order list, - Starting from October 2020 aFRR for upward and downward directions balancing capacity bids don't need to be symmetrical
SONI	Future arrangments still under design consderations
TenneT NL	Most changes occured during 2020; situation postchange in survey More frequent auctions capacities: FCR, aFRR, specific mFRR; Consequently shorter capacity product lengths; aFRR capacity asymmetric auctions"
TERNA	Involvement of low-consumption resources in the tertiary and domestic sector (e.g. small batteries coupled with PV)
Transelectrica SA	All settlement rules are now Marginal Price.

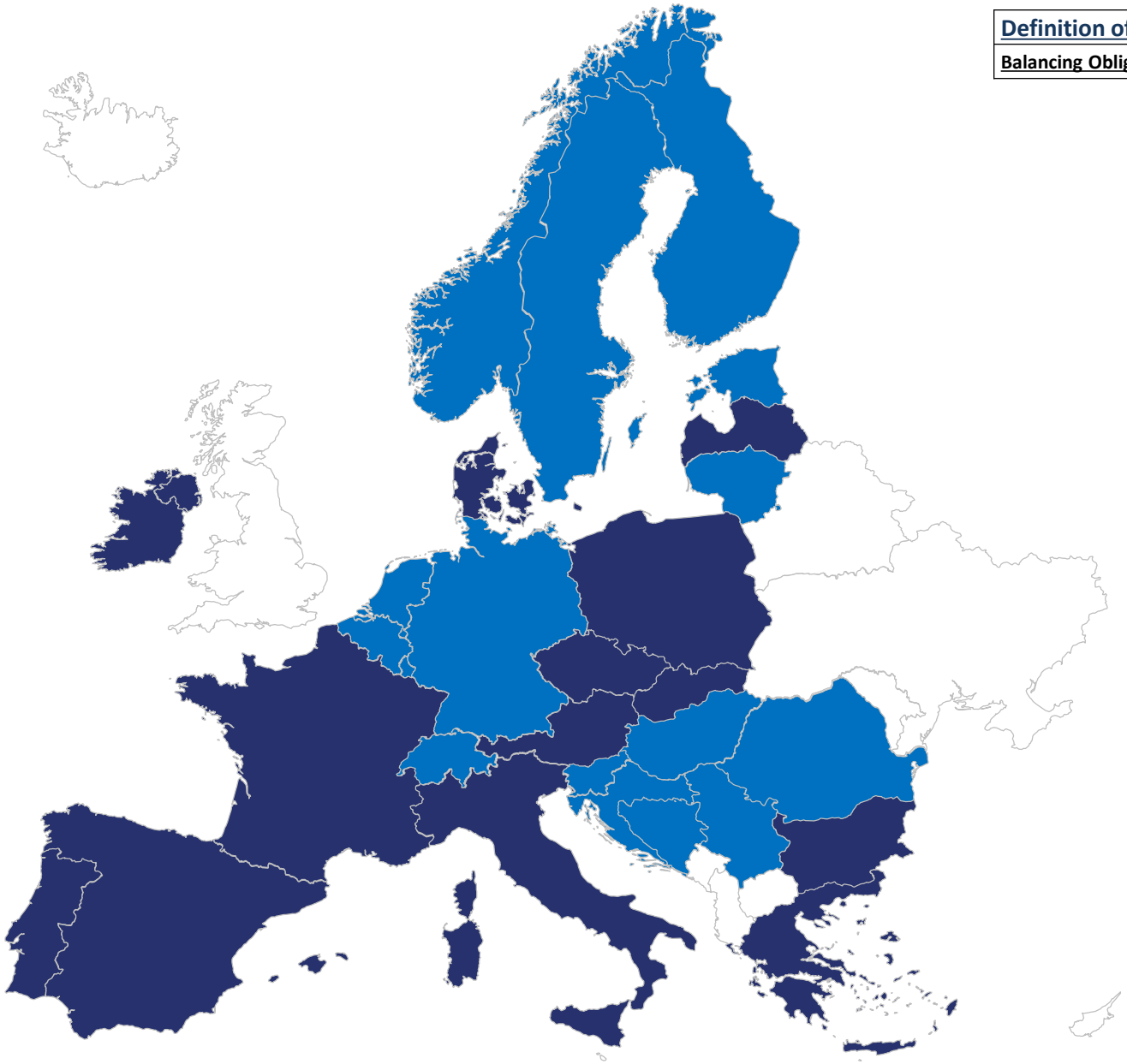
Please, explain significant/important changes regarding the ancillary services NOT in line with/aimed to requirements of EB Regulation (and the reason behind) in comparison to the year 2019!

TSO	Answer
EirGrid	Future arrangments still under design consderations
Fingrid	No changes to already existing products/markets, but a significant addition to ancillary services in the Nordics is the introduction of the new Fast Frequency Reserve in 2020. This product is procured in order to limit the instantaneous frequency minimum in low inertia situations, where FCR response alone is not fast enough in case of disturbances.
SEPS	None.
SONI	Future arrangments still under design consderations

Imbalance settlement

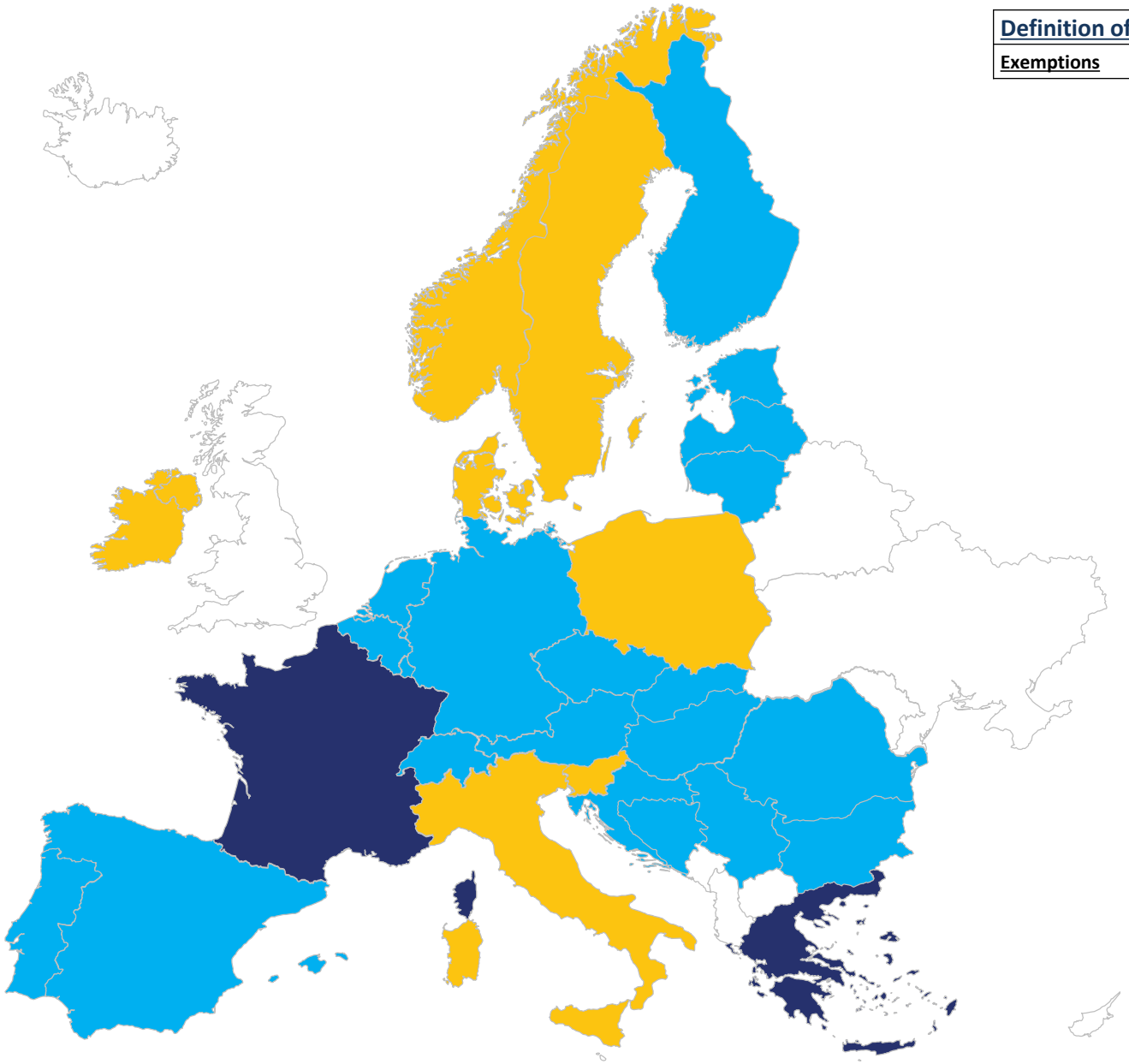
(Referring to questions of AS survey from IS1.0 to IS20.2)

Imbalance settlement – Nature of the Balancing Obligation Enforcement



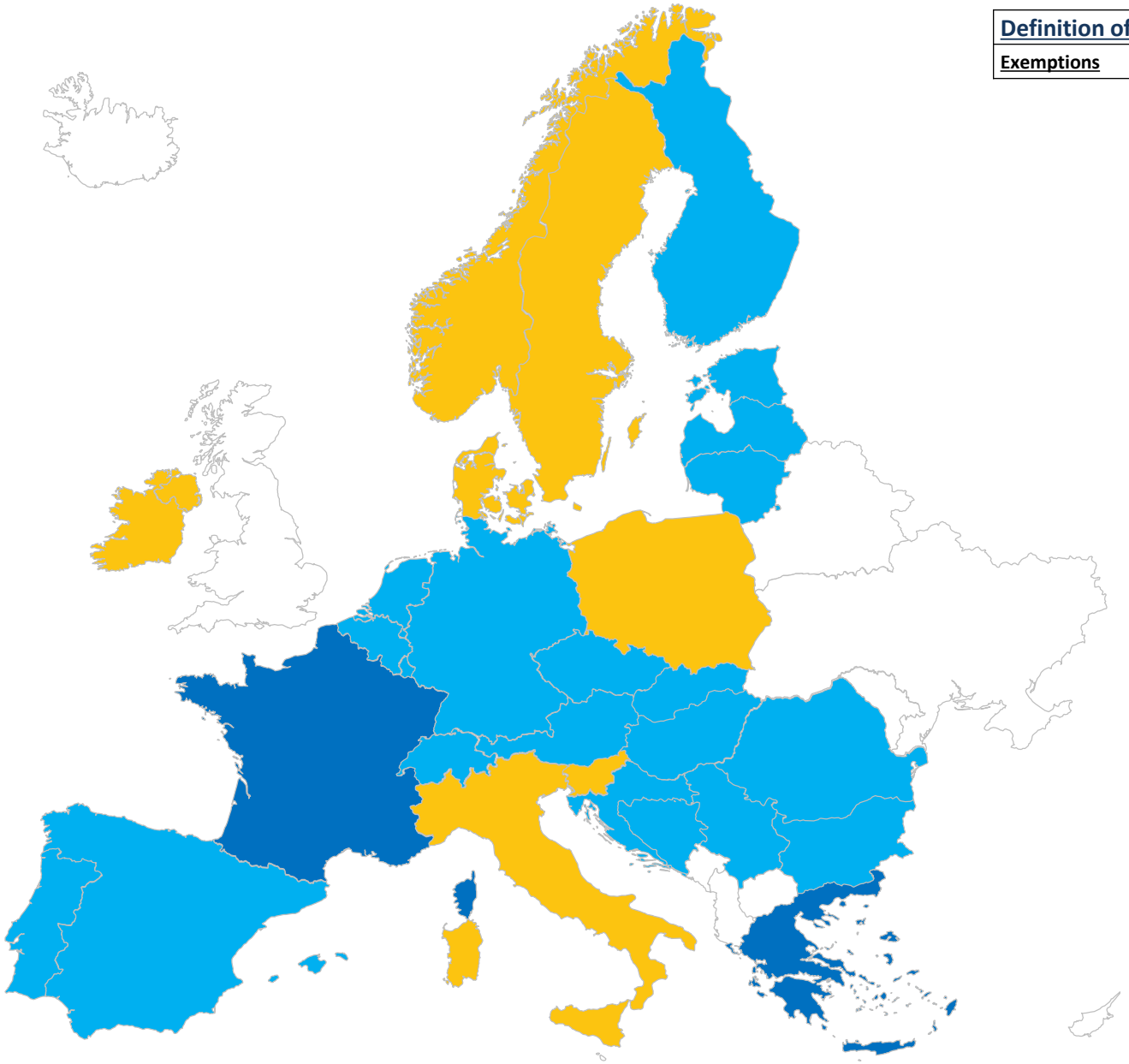
Definition of question	
Balancing Obligation Enforcement	Nature of balance responsibility enforcement.

Imbalance settlement – Exemptions for RES



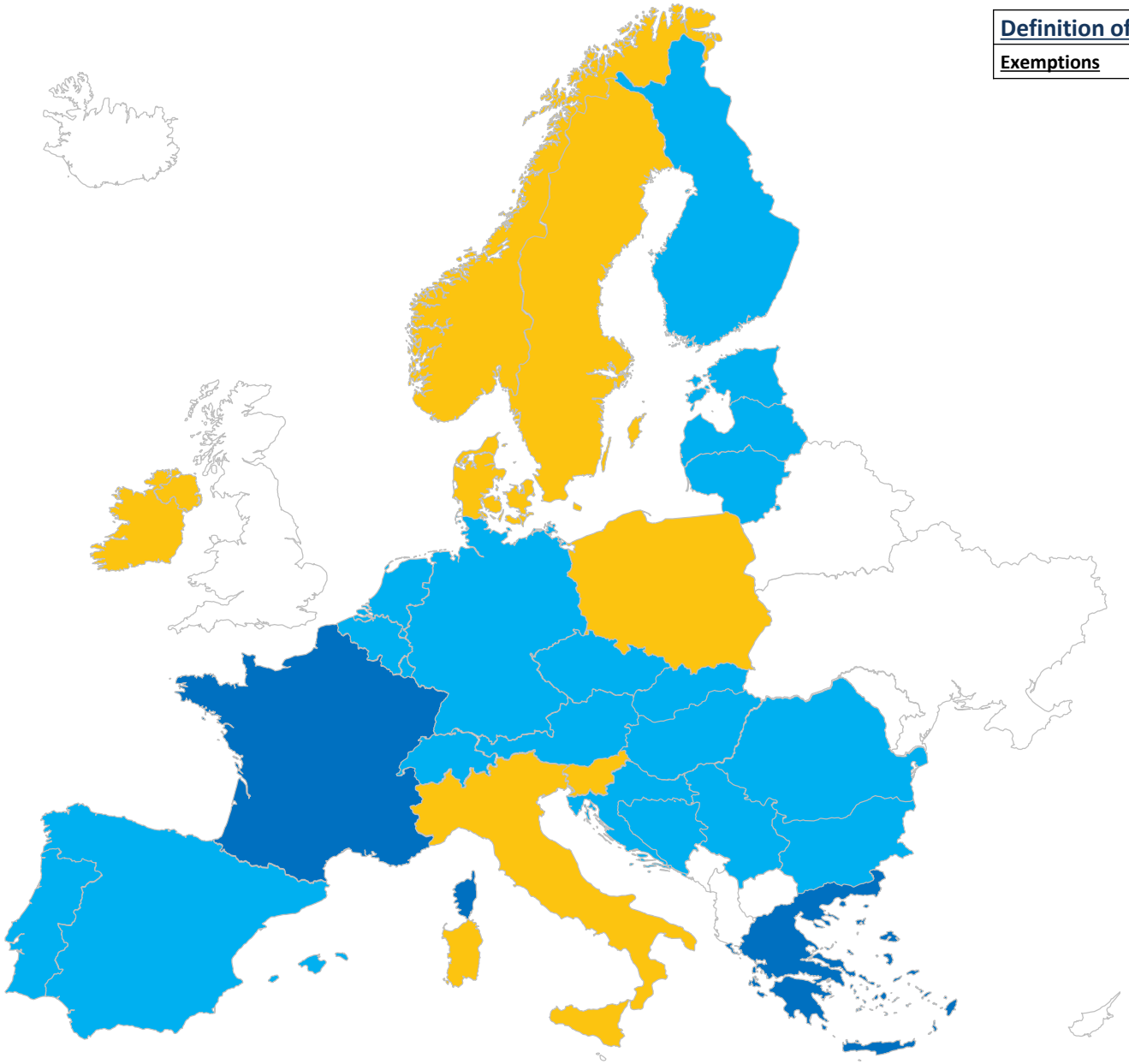
Definition of question	
Exemptions	Market participants which do not have obligations to be responsible for its imbalance.

Imbalance settlement – Exemptions for generators licensed for the AS market



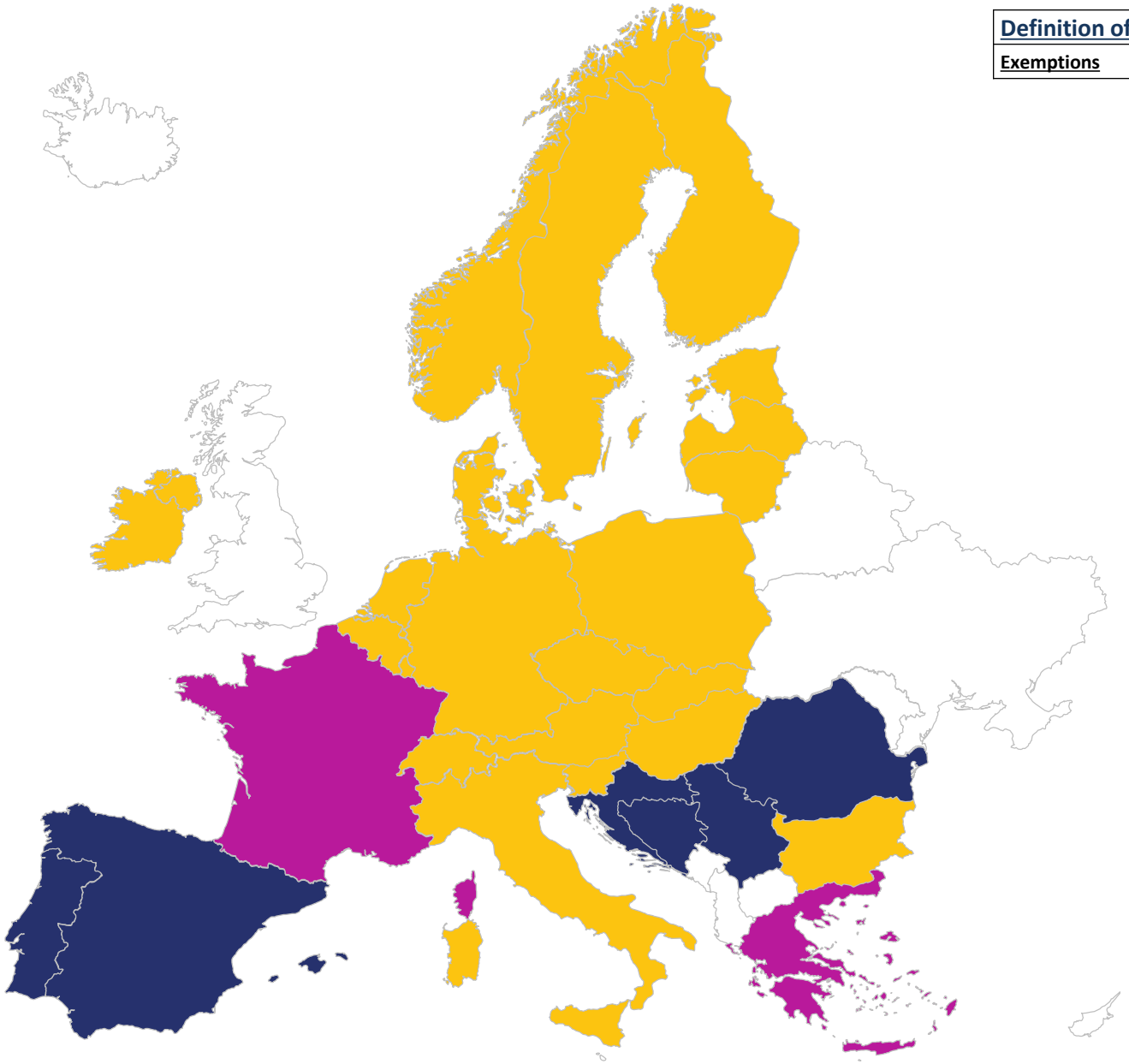
Definition of question	
Exemptions	Market participants which do not have obligations to be responsible for its imbalance.

Imbalance settlement – Other form of exemptions



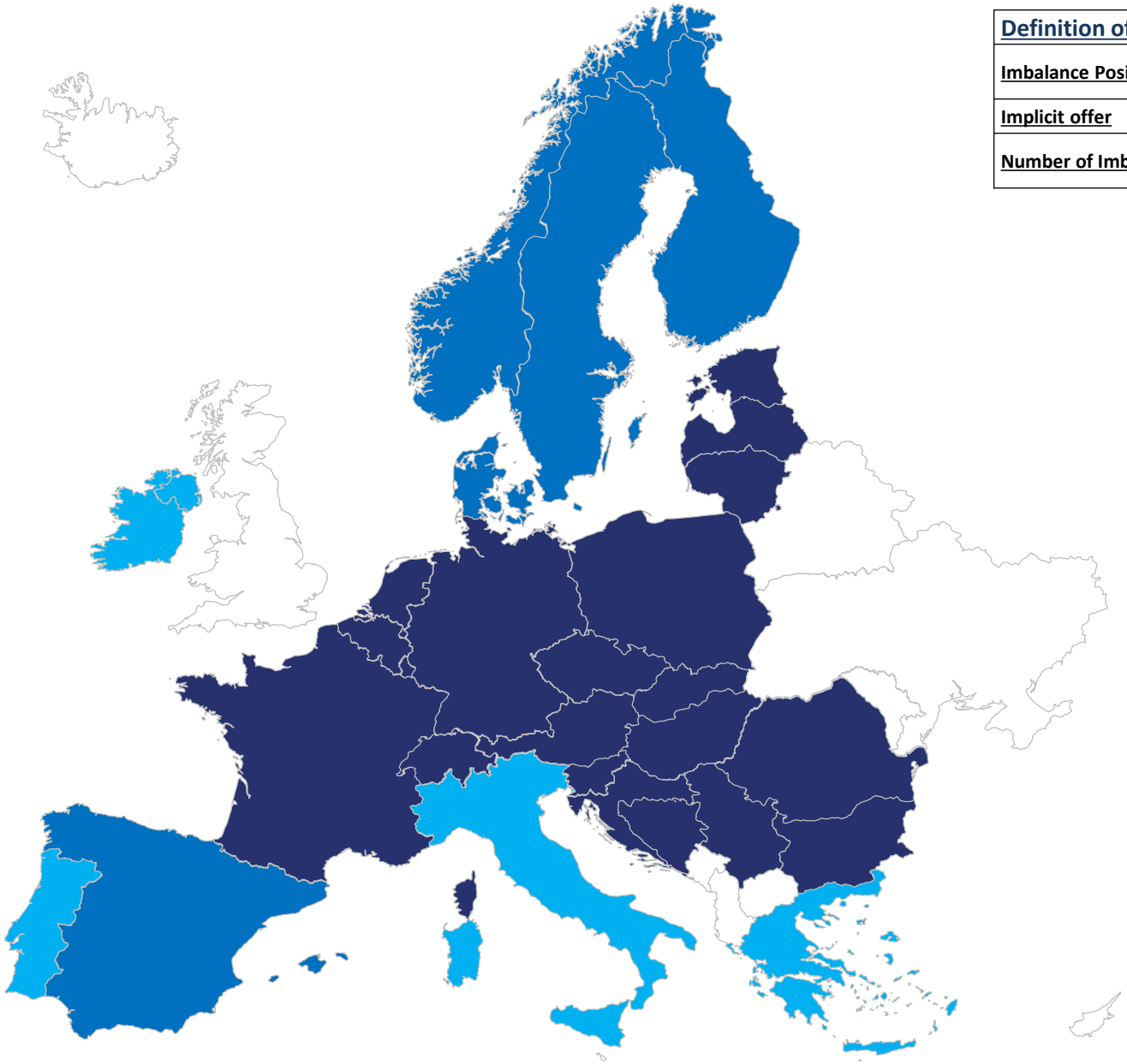
Definition of question	
Exemptions	Market participants which do not have obligations to be responsible for its imbalance.

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.

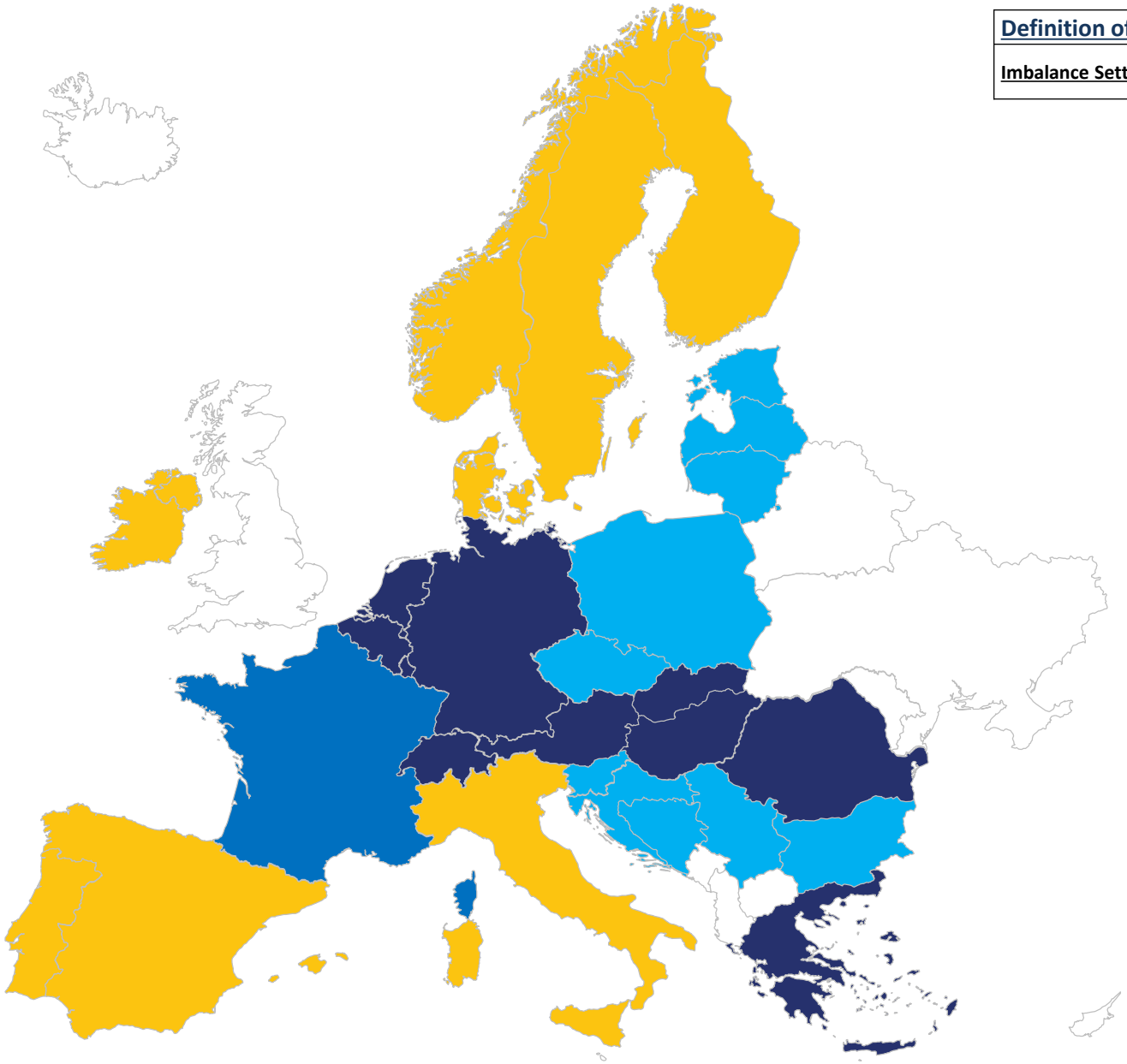
Key:

- 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!

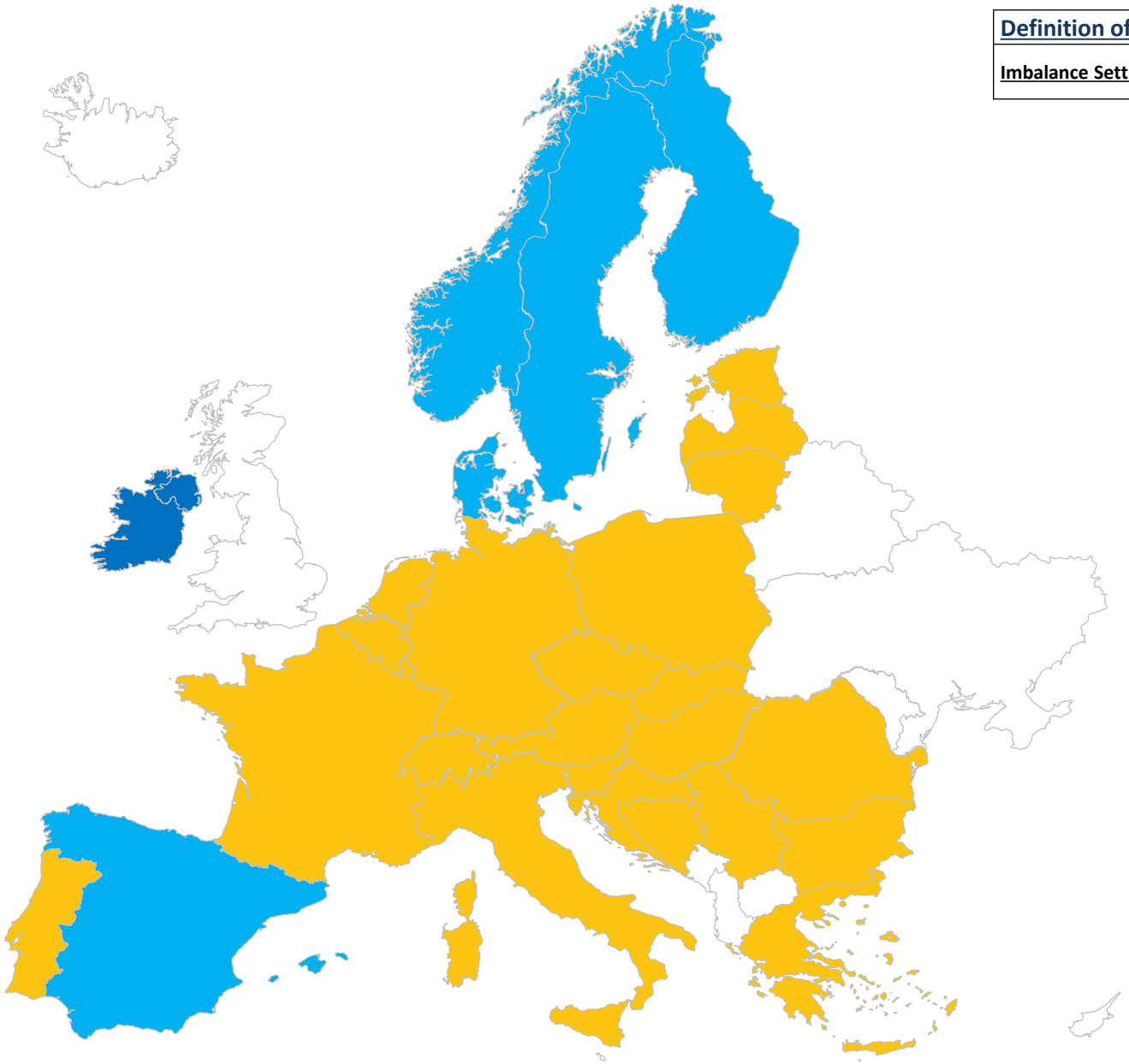
TSO	Answer
EirGrid	A single imbalance position for each Scheduling Unit under the Balance Responsible Party as allowed for Central Dispatch Systems
IPTO	For generation there is one position per generation unit
REN	For generation the imbalance is calculated by imbalance area. A market player can have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



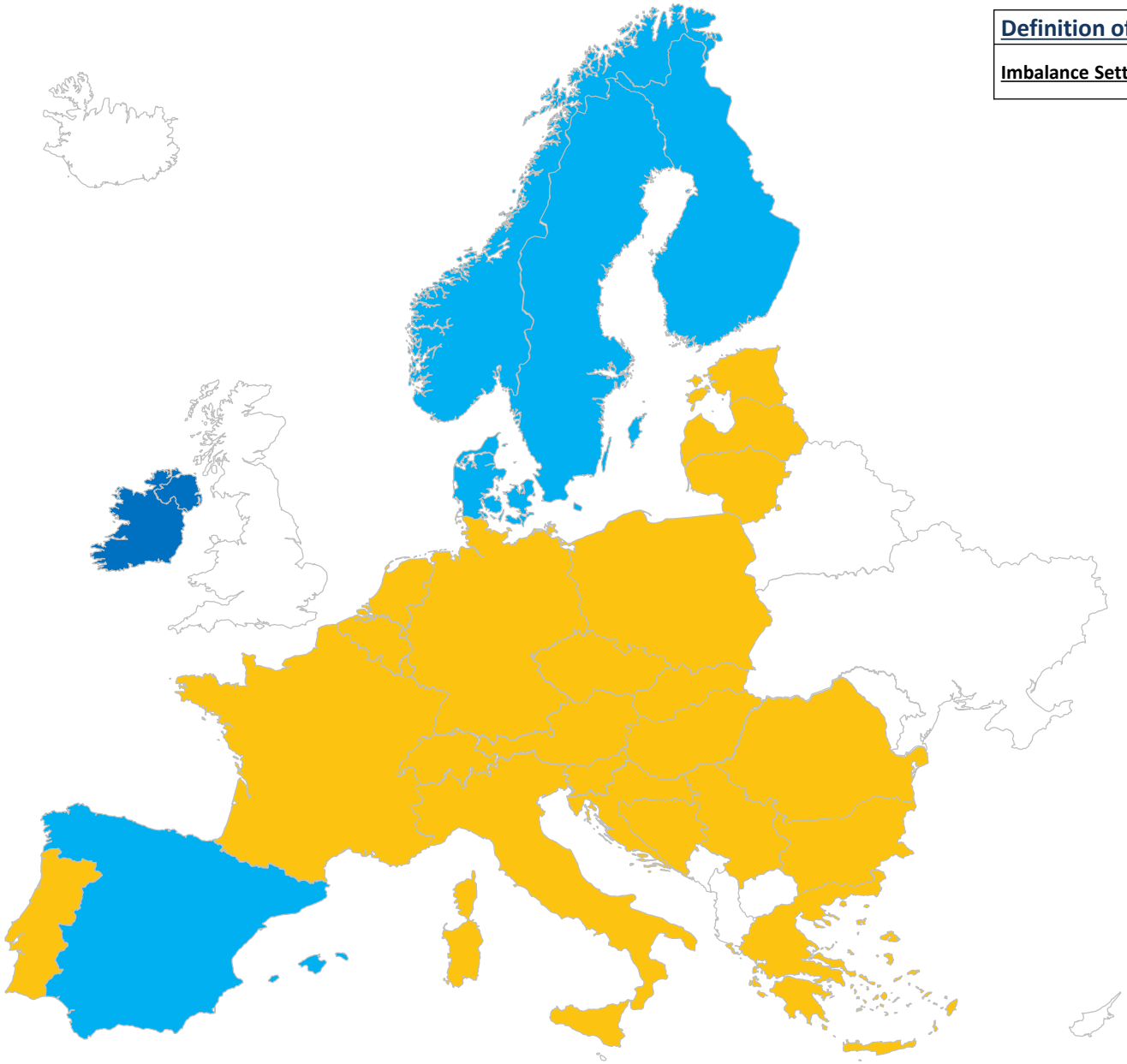
Definition of question	
Imbalance Settlement Period	The unit of settlement that is applied to the quantities in which the time series is expressed.

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



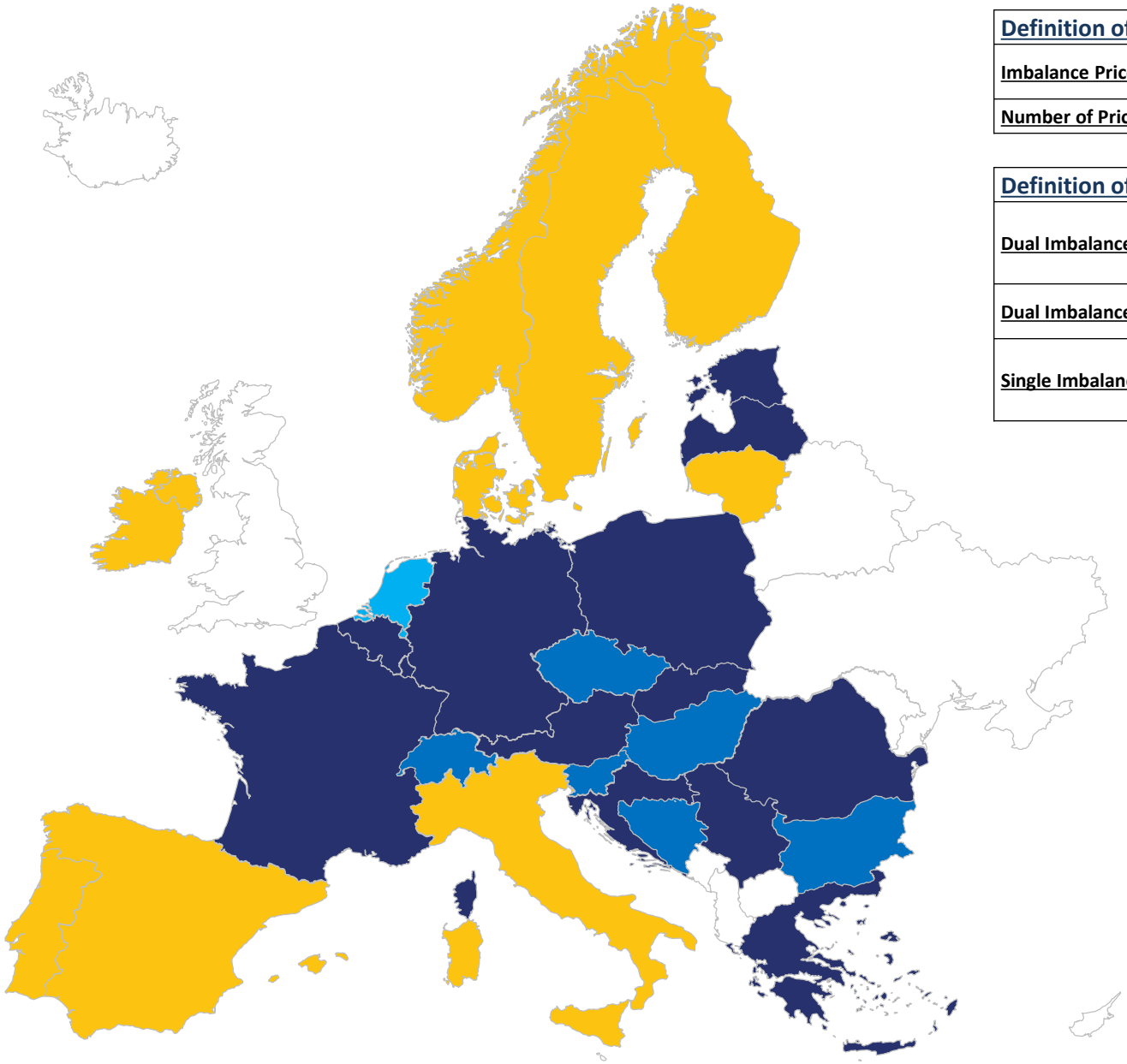
Definition of question	
Imbalance Settlement Period	The unit of settlement that is applied to the quantities in which the time series is expressed.

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



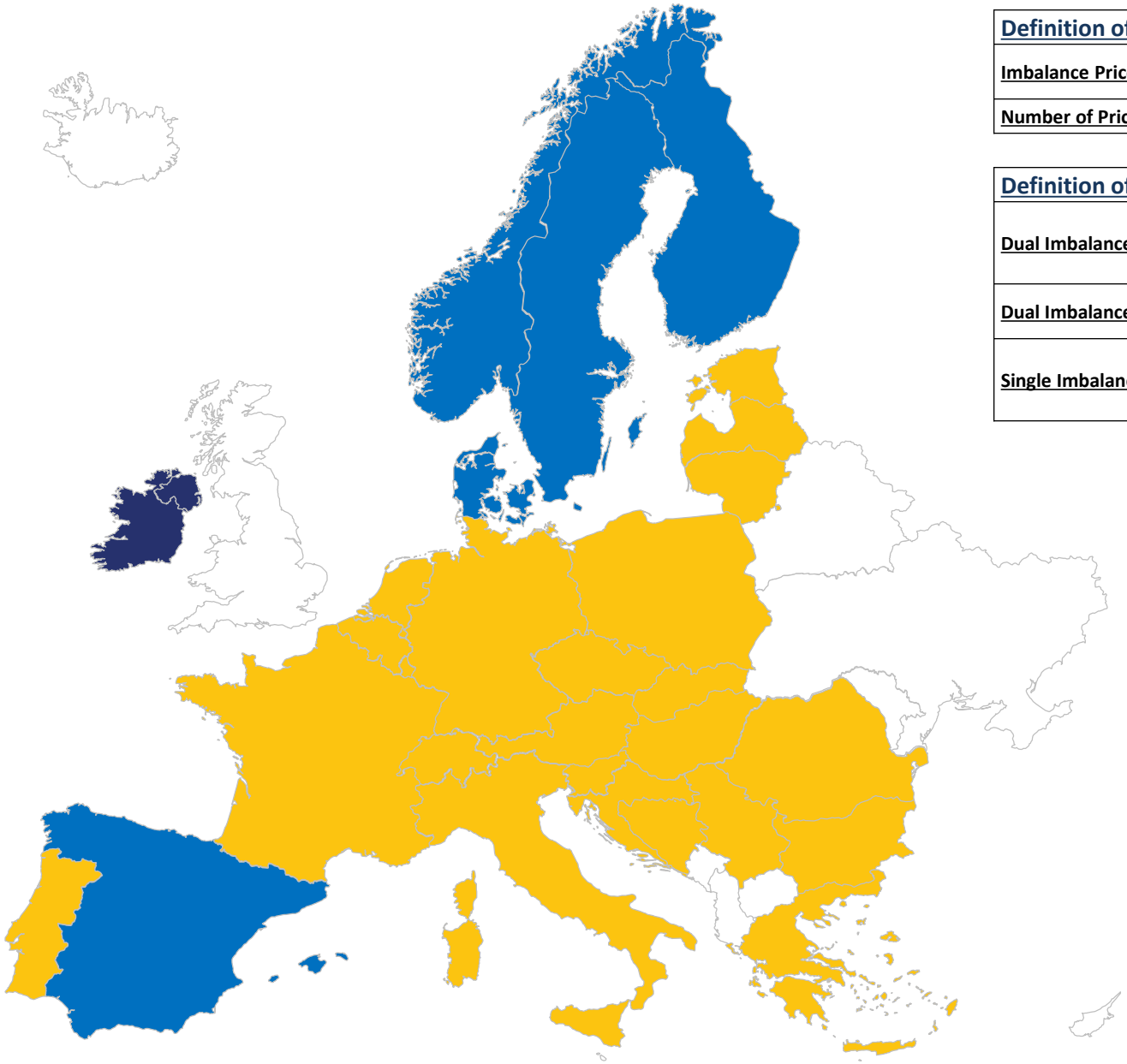
Definition of question	
Imbalance Price	The price, be it positive, zero or negative, in each imbalance settlement period for an imbalance in each direction.
Number of Prices	Number of prices for Imbalance Position.

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.

Key:

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

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



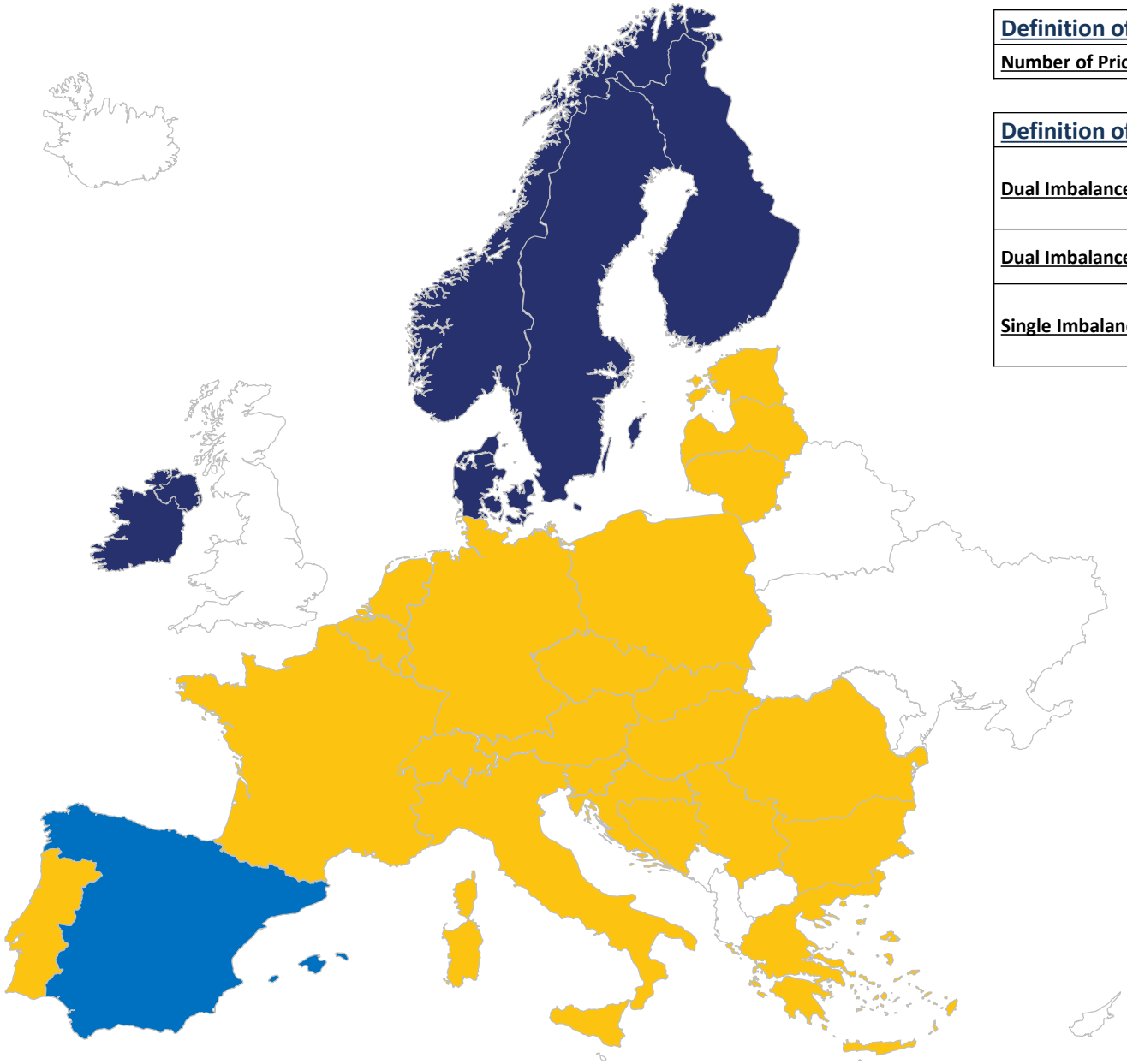
Definition of question	
Imbalance Price	The price, be it positive, zero or negative, in each imbalance settlement period for an imbalance in each direction.
Number of Prices	Number of prices for Imbalance Position.

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



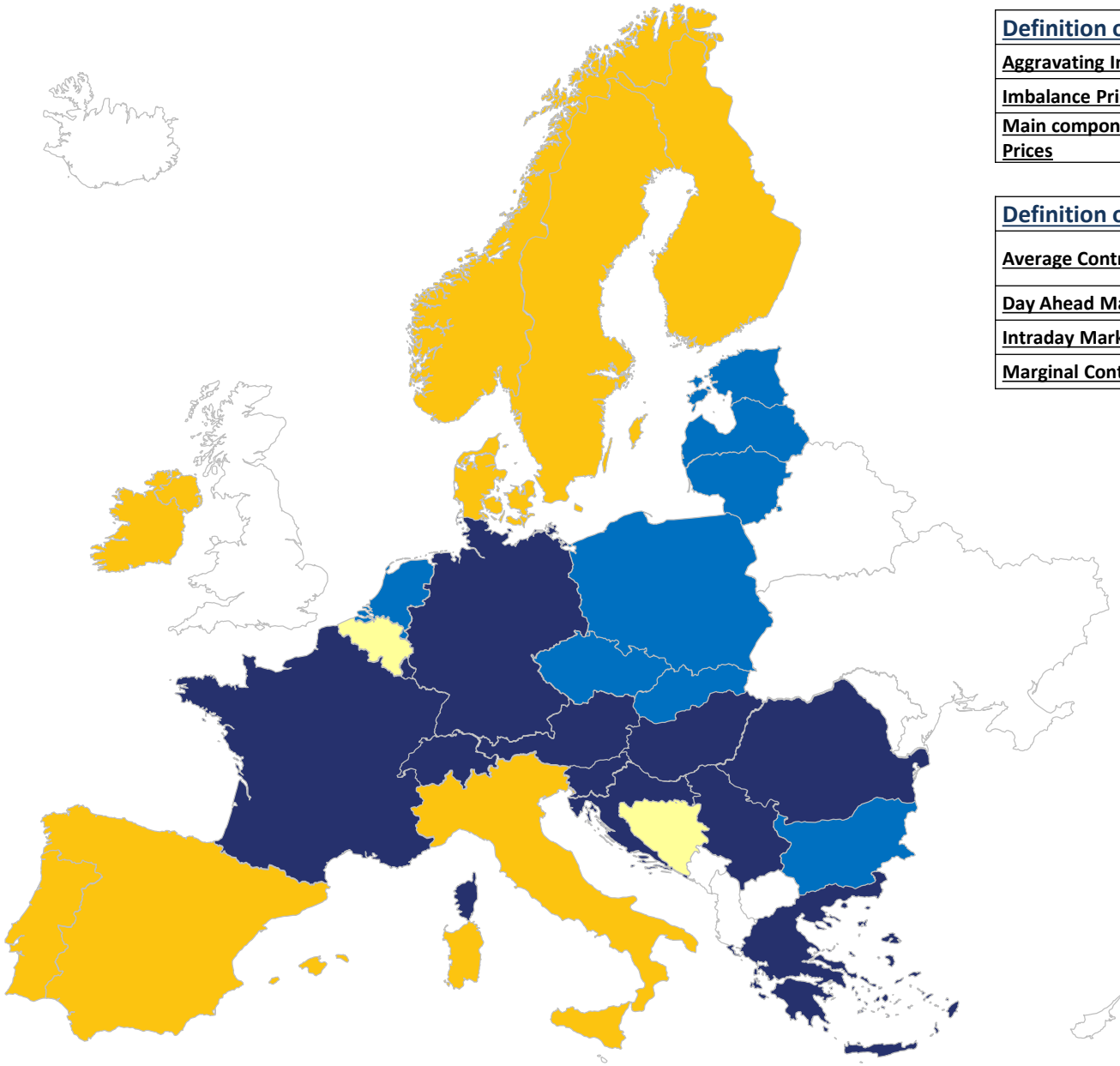
Definition of question	
Number of Prices	Number of prices for Imbalance Position.

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.

Key:

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

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



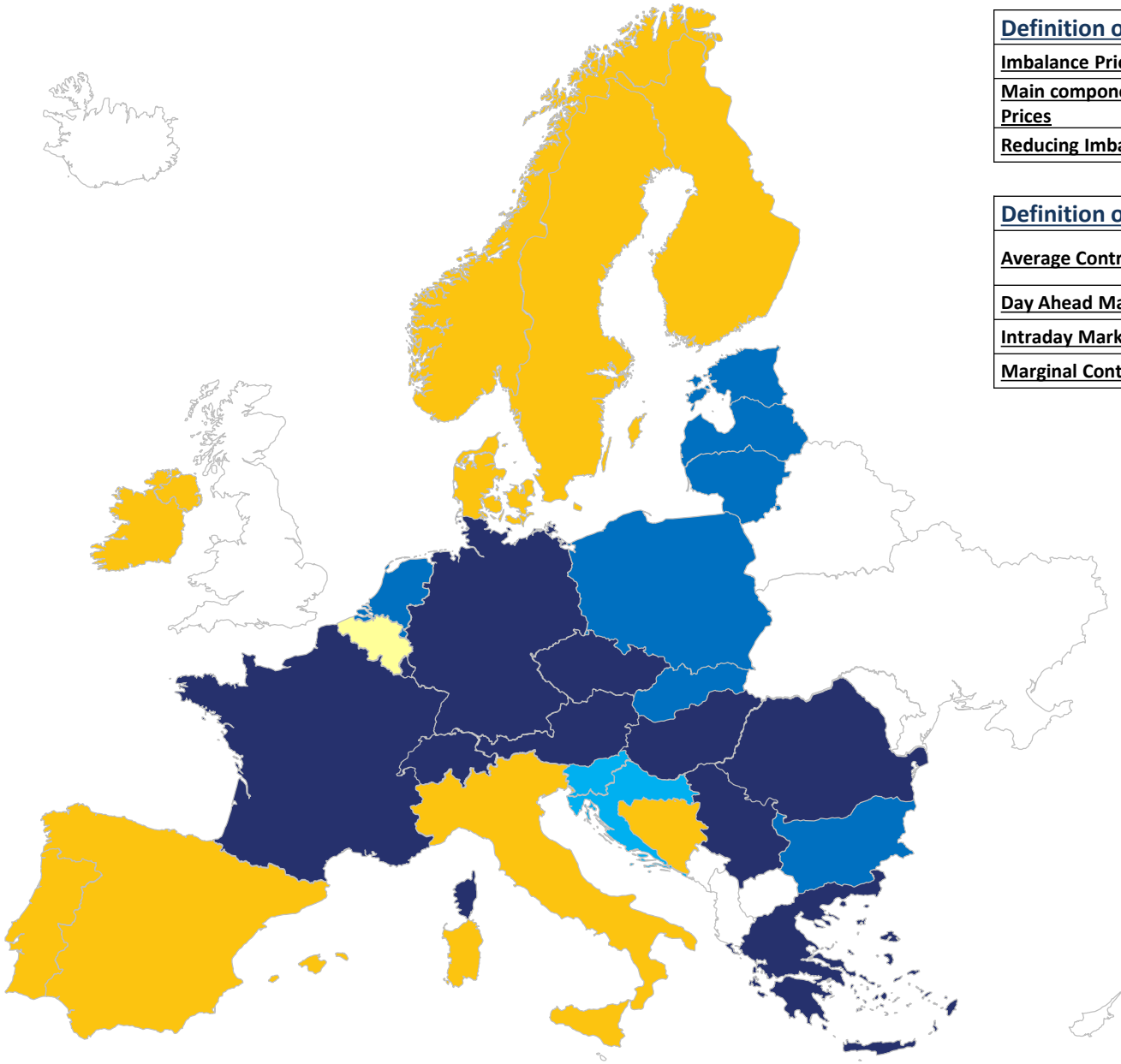
Definition of question	
Aggravating Imbalance	BRP imbalance same direction as Imbalance Price Area imbalance.
Imbalance Price Area	The area for the calculation of an imbalance price.
Main component of Imbalance Prices	The component that determines imbalance charges most of the time.

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.

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 1 position – Reducing imb.



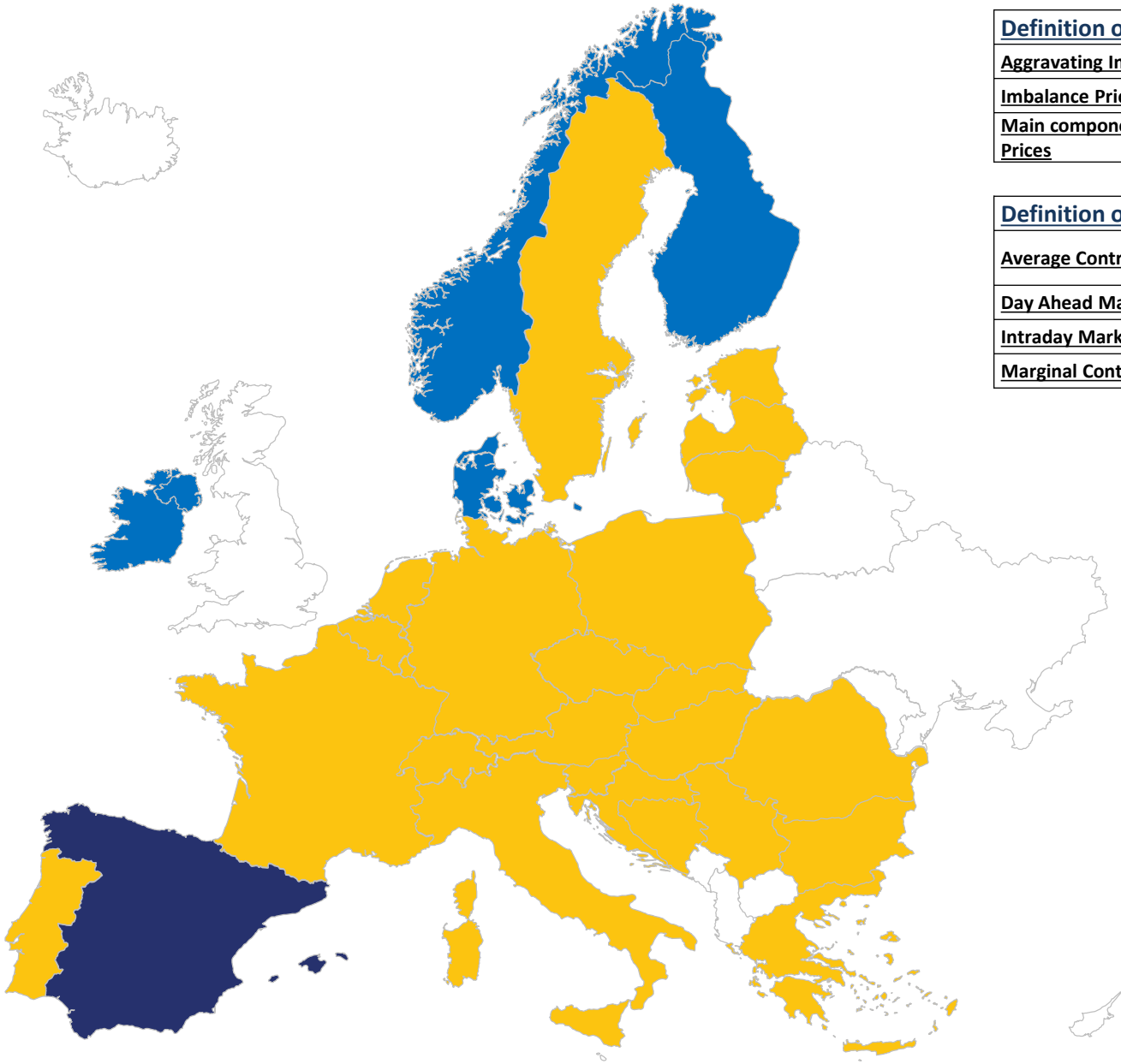
Definition of question	
Imbalance Price Area	The area for the calculation of an imbalance price.
Main component of Imbalance Prices	The component that determines imbalance charges most of the time.
Reducing Imbalance	BRP imbalance opposite direction as Imbalance Area imbalance.

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."



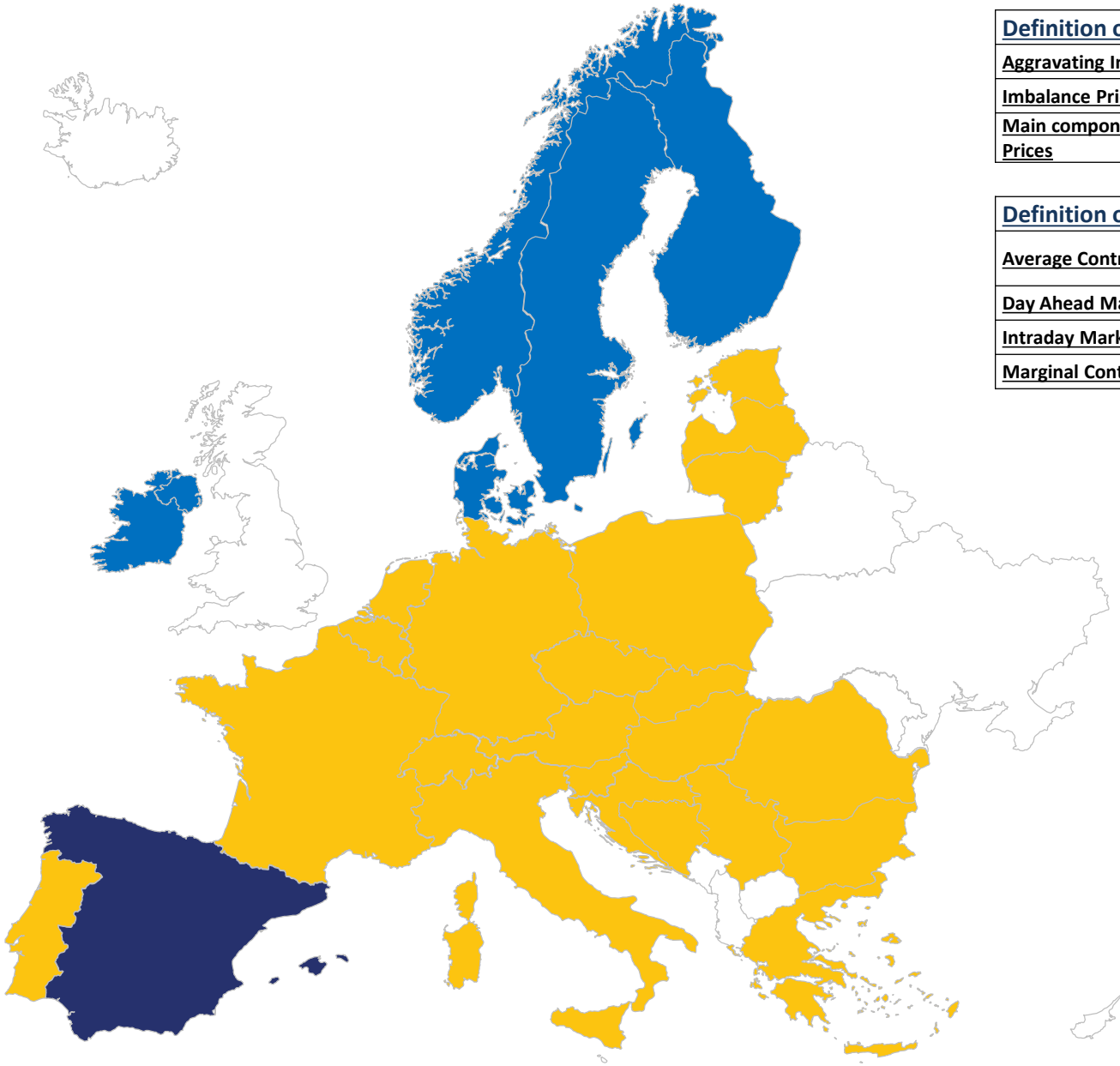
Definition of question	
Aggravating Imbalance	BRP imbalance same direction as Imbalance Price Area imbalance.
Imbalance Price Area	The area for the calculation of an imbalance price.
Main component of Imbalance Prices	The component that determines imbalance charges most of the time.

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.
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 consumption "aggravating imb."



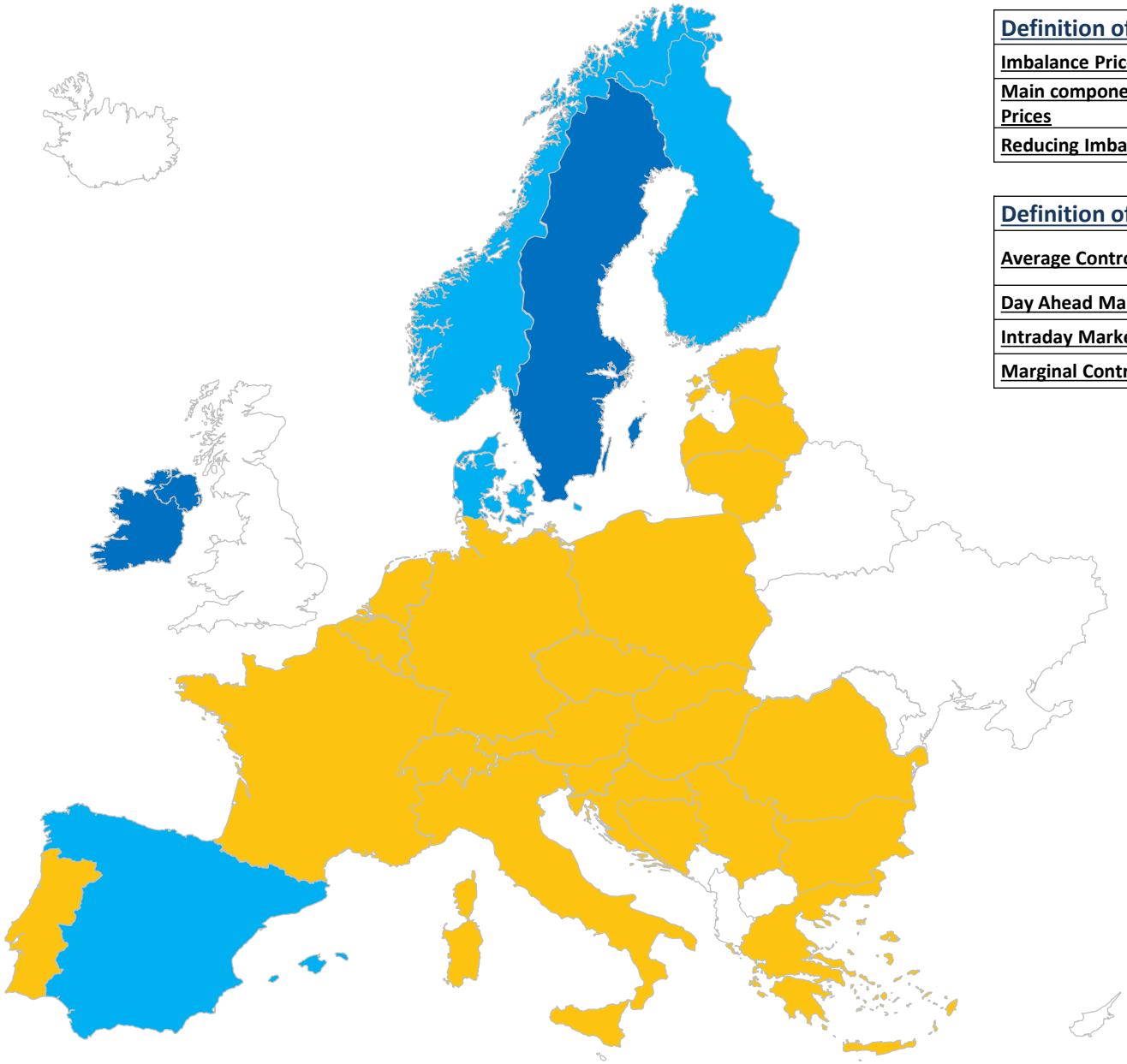
Definition of question	
Aggravating Imbalance	BRP imbalance same direction as Imbalance Price Area imbalance.
Imbalance Price Area	The area for the calculation of an imbalance price.
Main component of Imbalance Prices	The component that determines imbalance charges most of the time.

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.

Key:

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

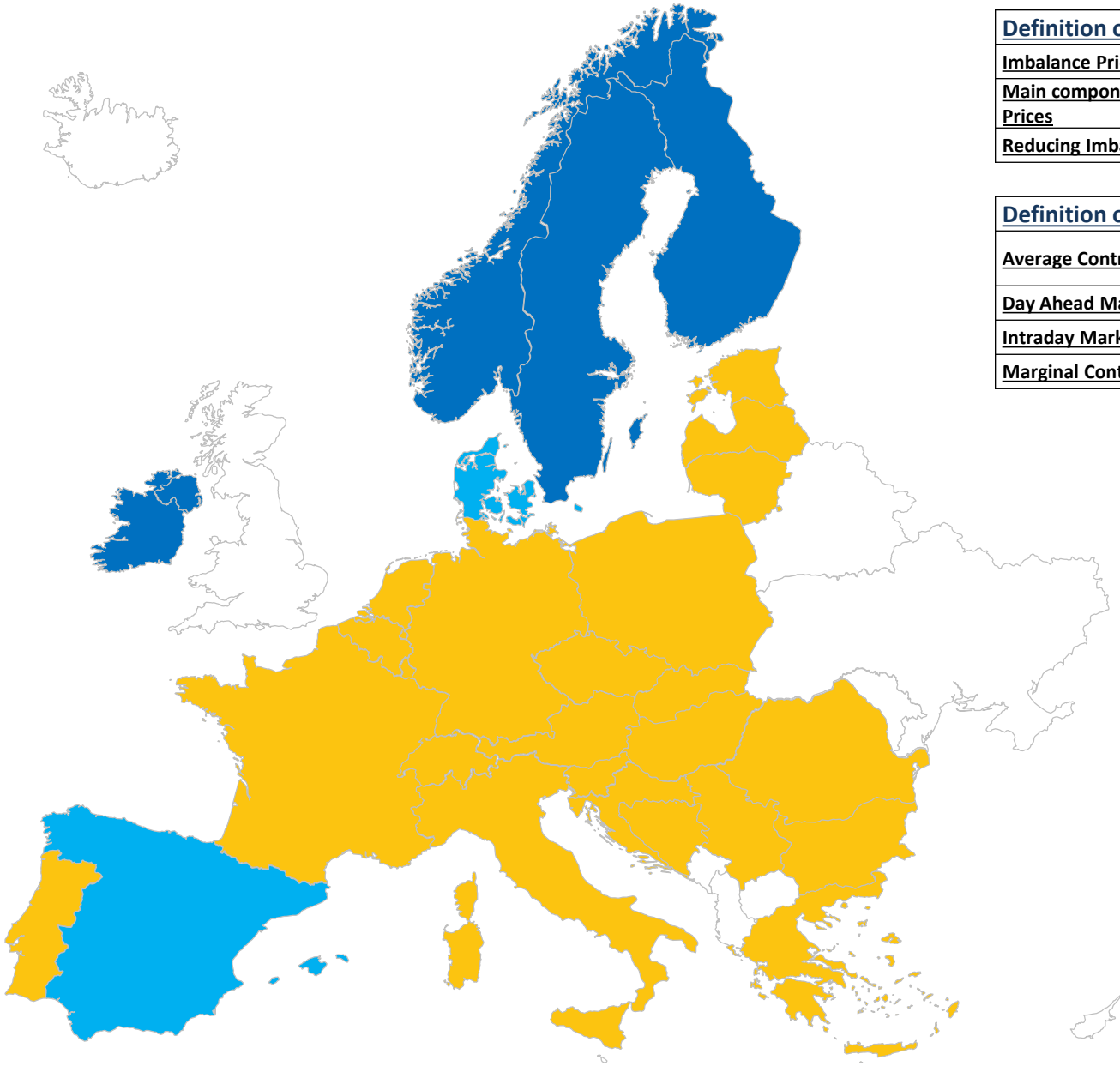
Imbalance settlement – Main comp. of Imb. Prices – If 2 positions – For generation “reducing imb."



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."



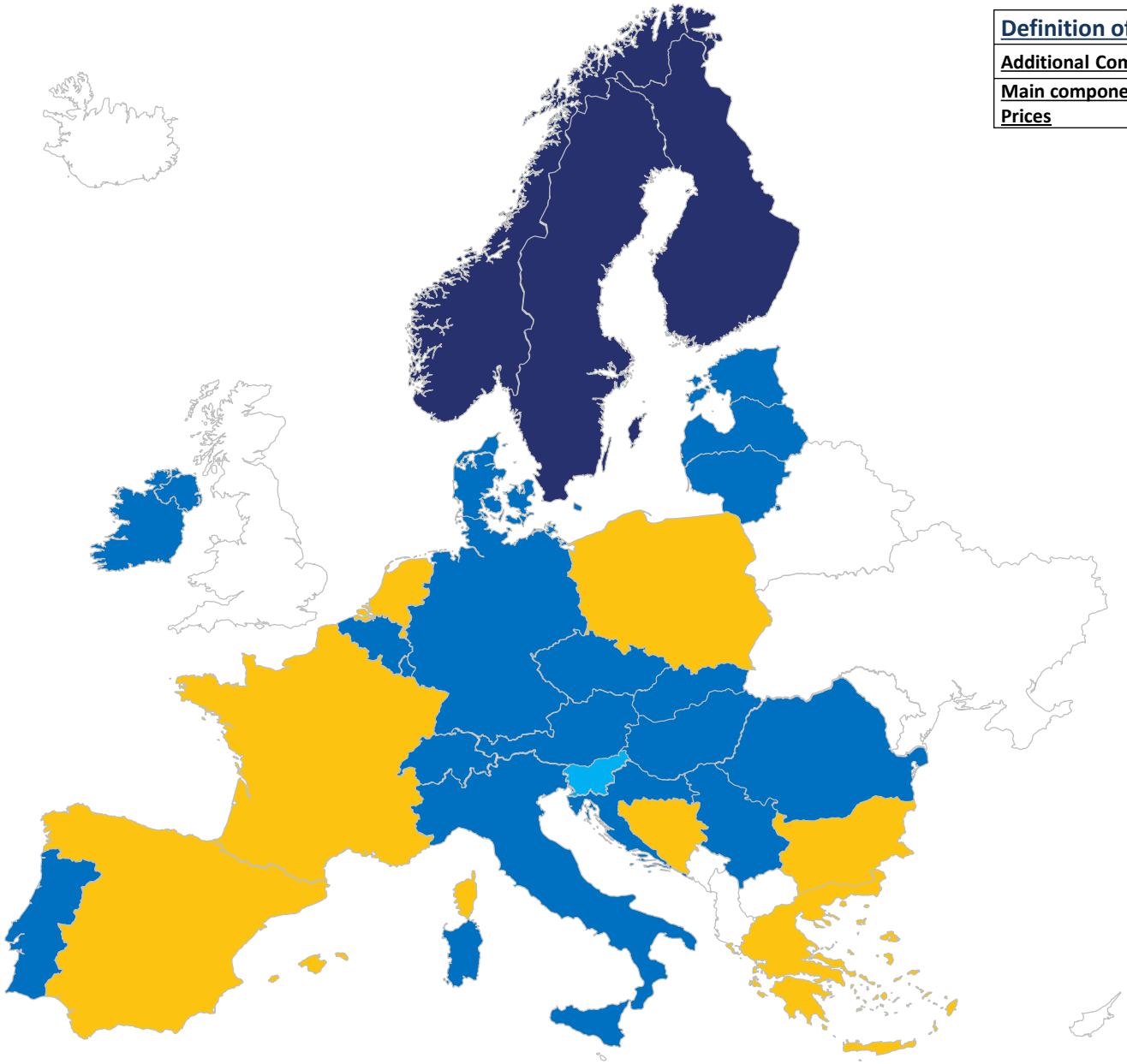
Definition of question	
Imbalance Price Area	The area for the calculation of an imbalance price.
Main component of Imbalance Prices	The component that determines imbalance charges most of the time.
Reducing Imbalance	BRP imbalance opposite direction as Imbalance Area imbalance.

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.

Key:

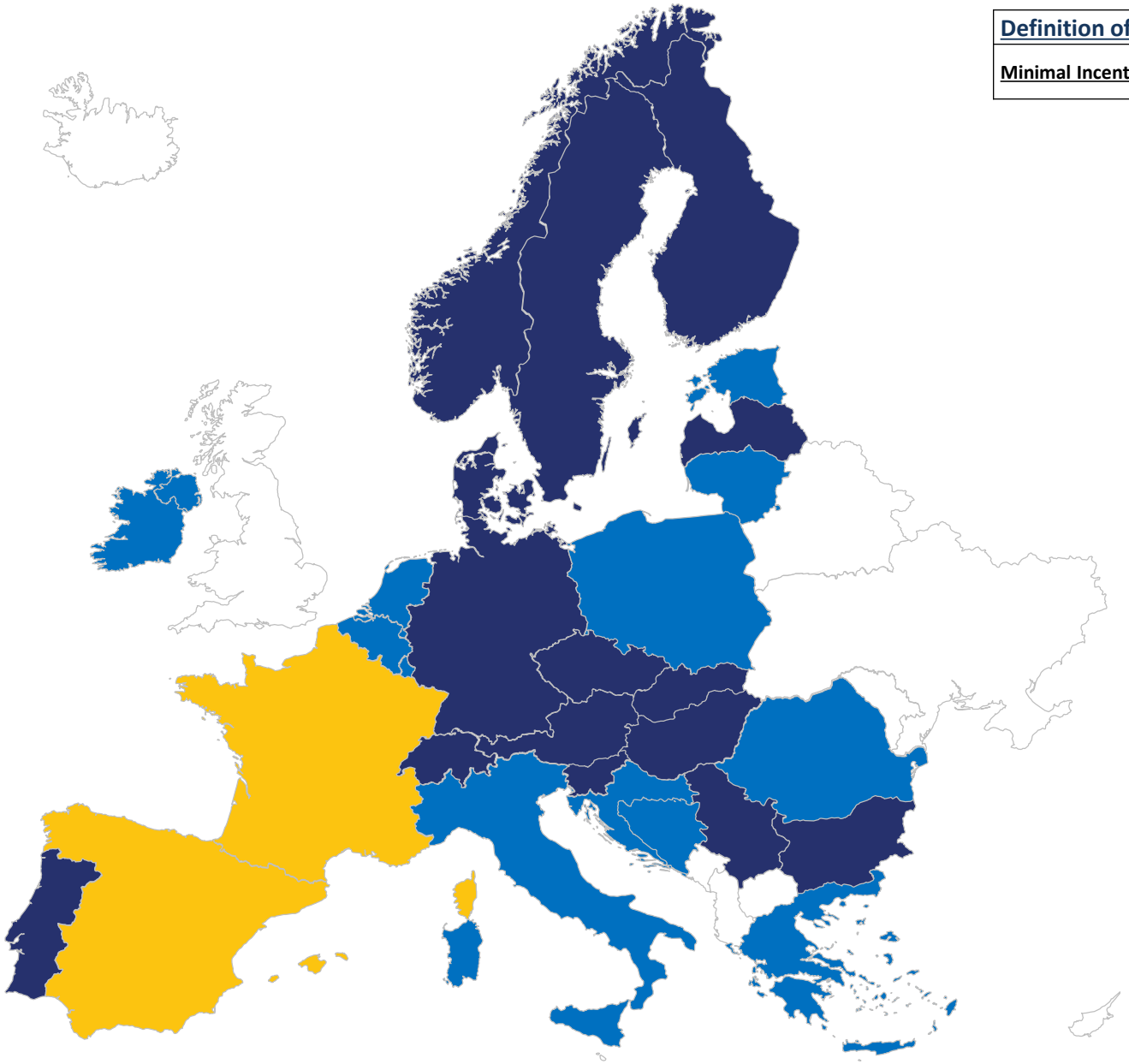
- Missing data
- N/A
- Average Control Energy Price
- Marginal Control Energy Price
- Day-Ahead Market Price
- Intraday Market Price
- Other

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



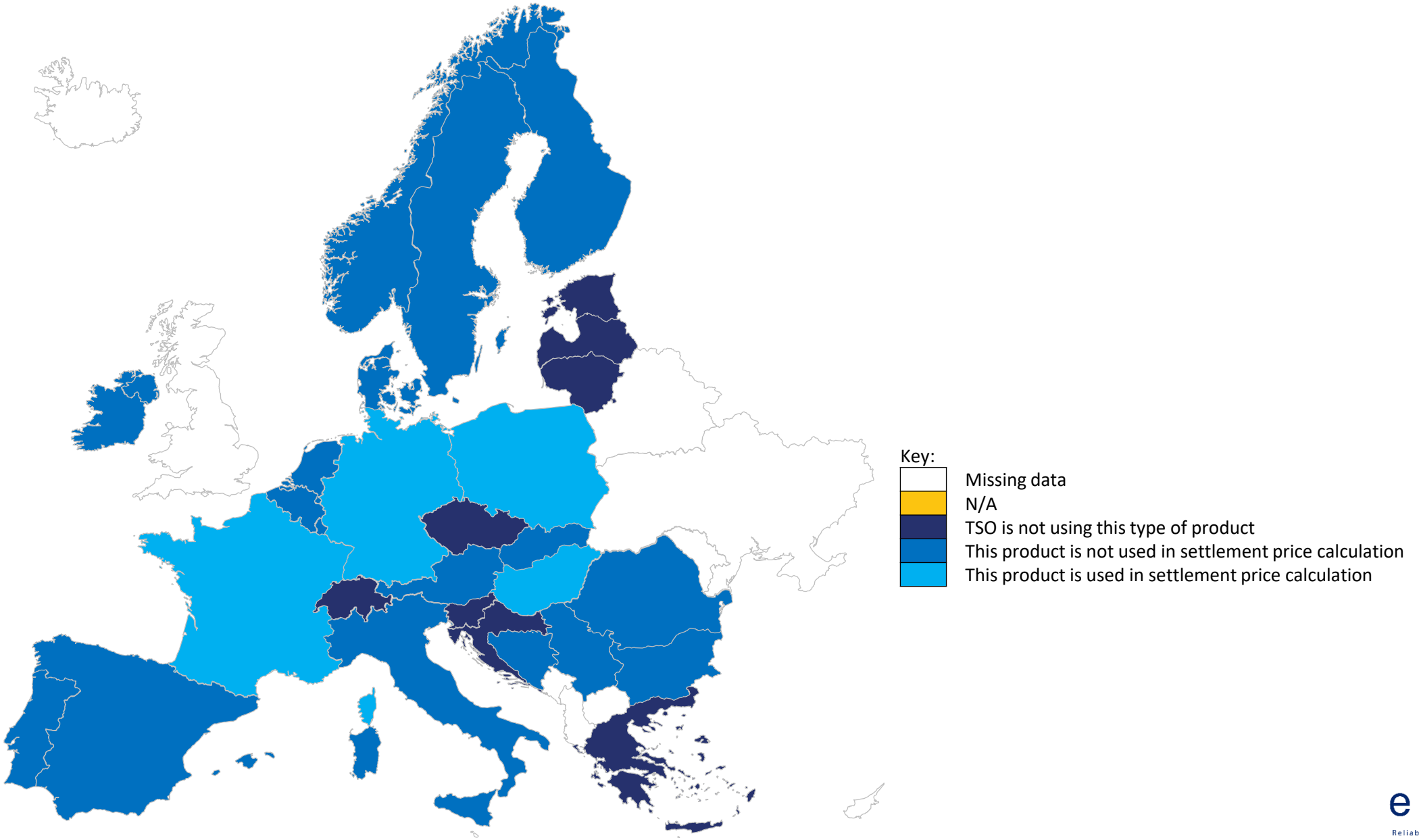
Definition of question	
Additional Components	Other components which determine imbalance charges.
Main component of Imbalance Prices	The component that determines imbalance charges most of the time.

Imbalance settlement – Is there a minimal incentive?

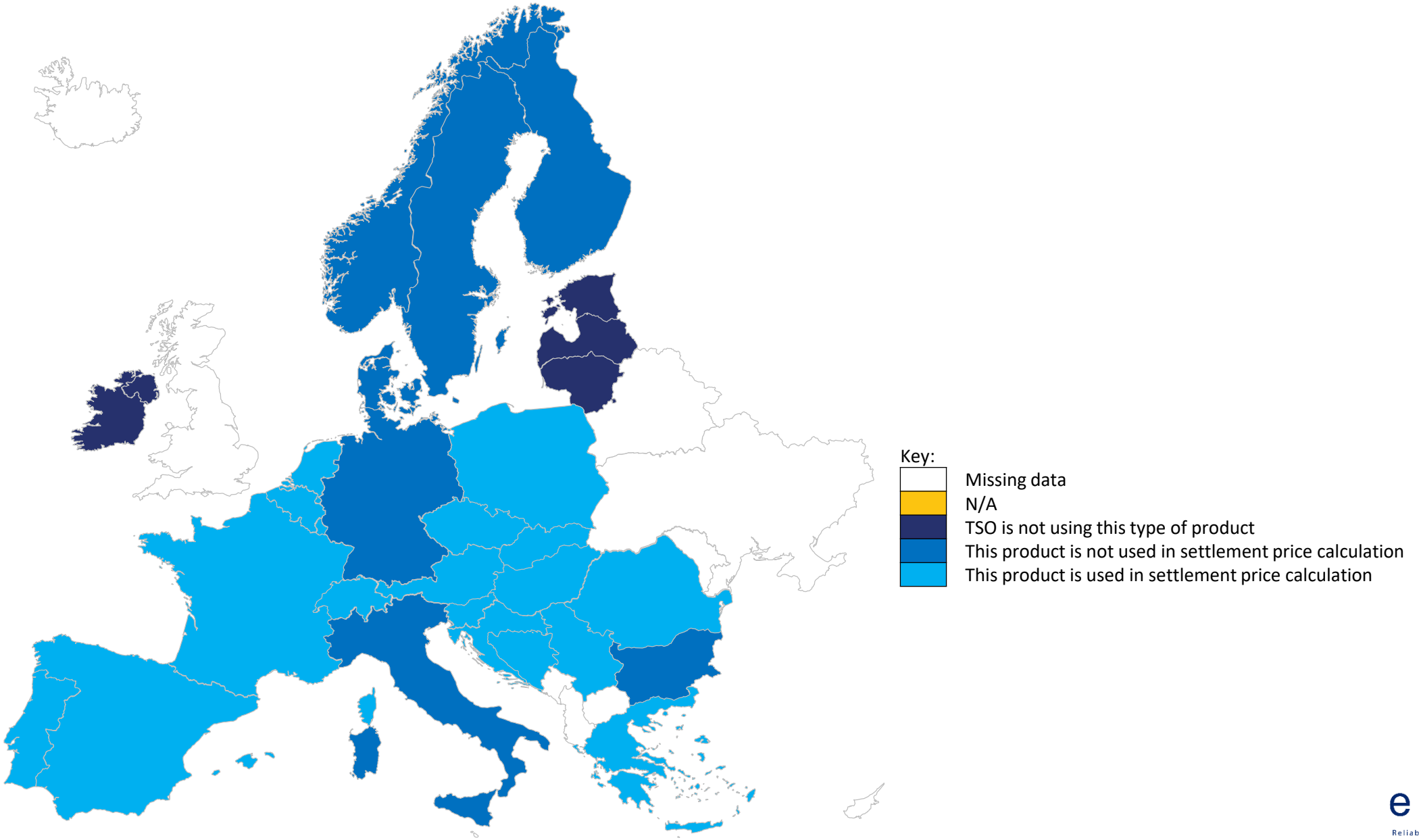


Definition of question	
Minimal Incentives	Minimal incentives means that there is some method which leads the BRPs to balance their schedules.

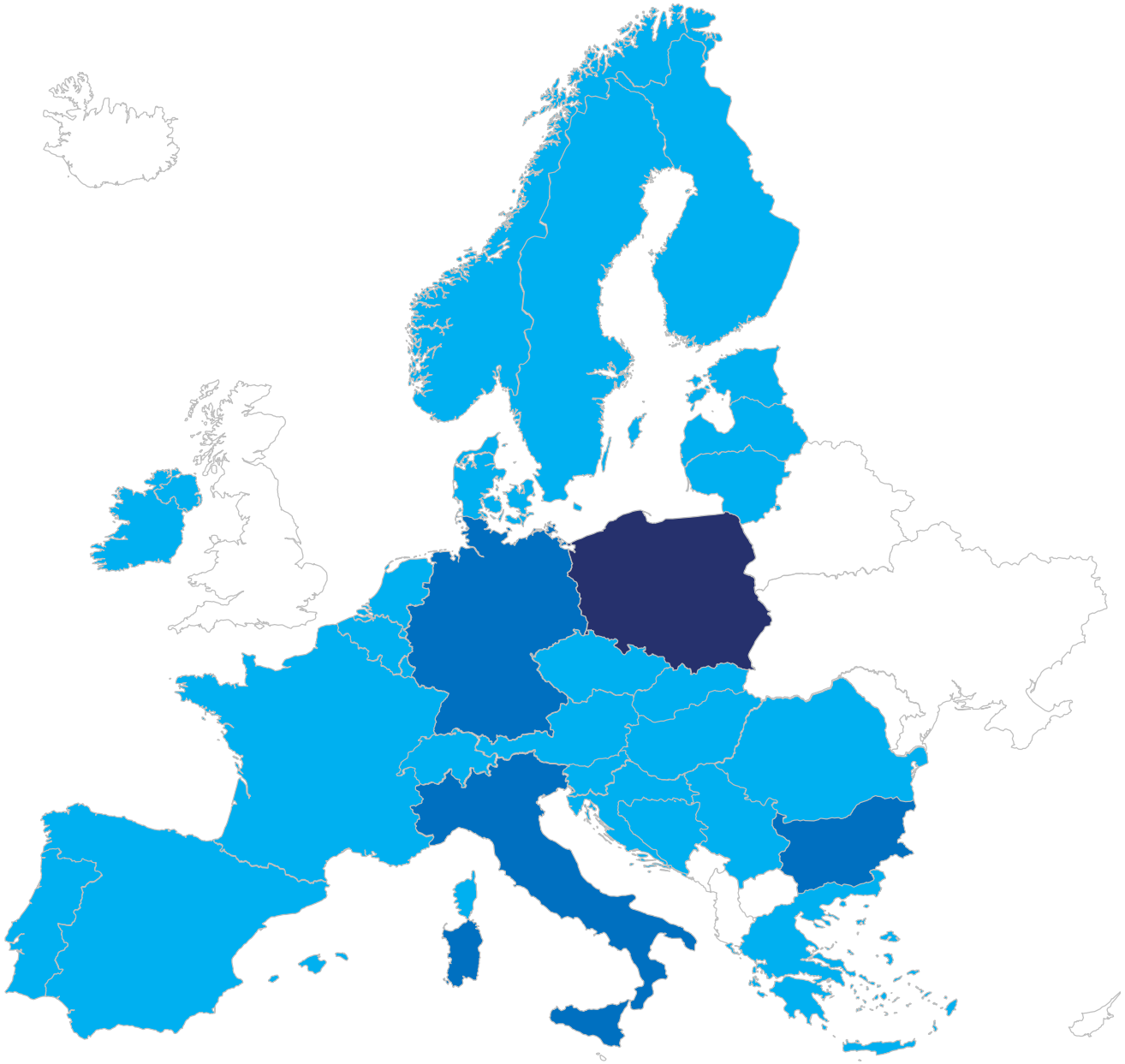
Imbalance settlement – Control energy prices used – FCR



Imbalance settlement – Control energy prices used – aFRR



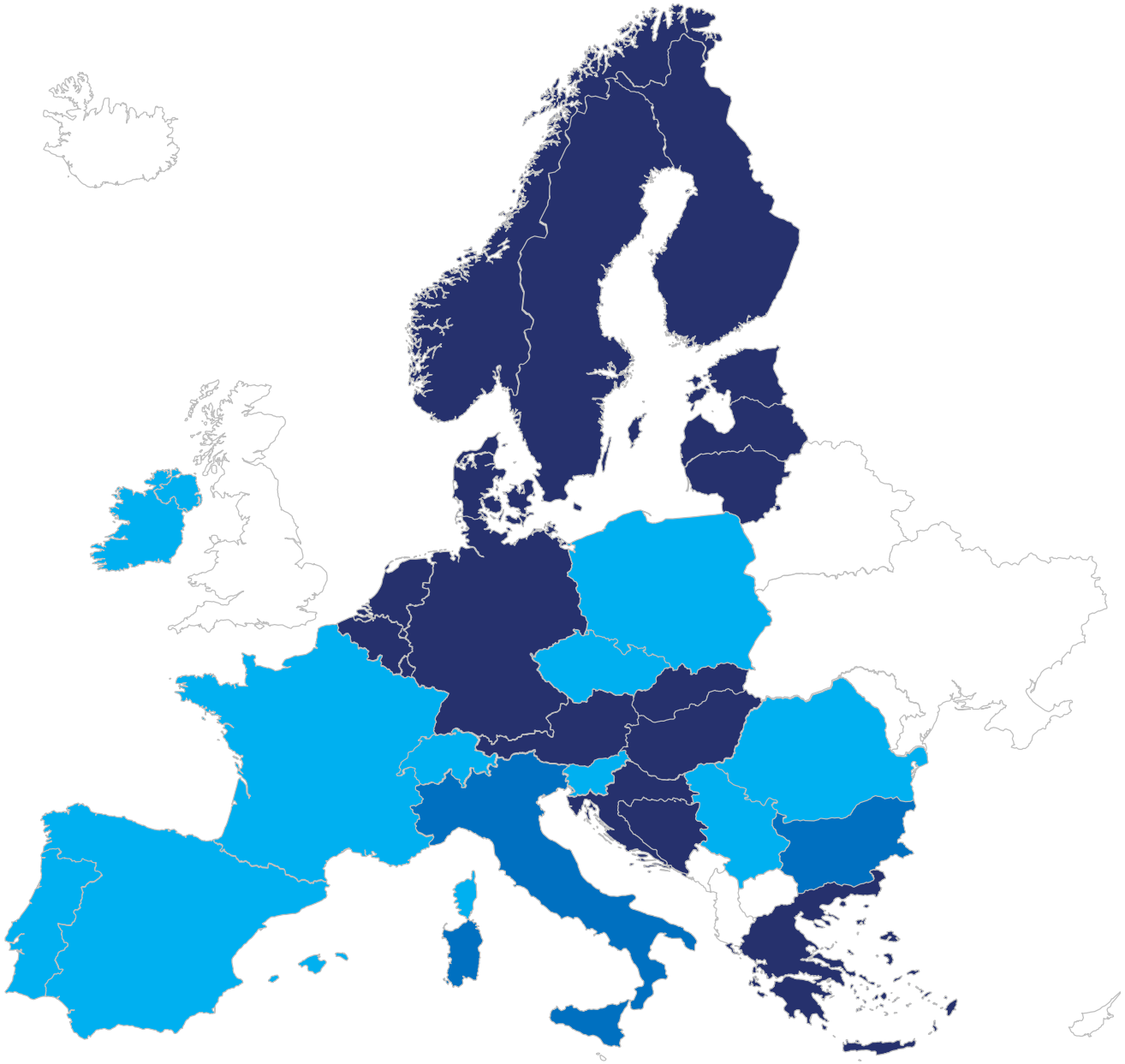
Imbalance settlement – Control energy prices used – mFRR



Key:

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

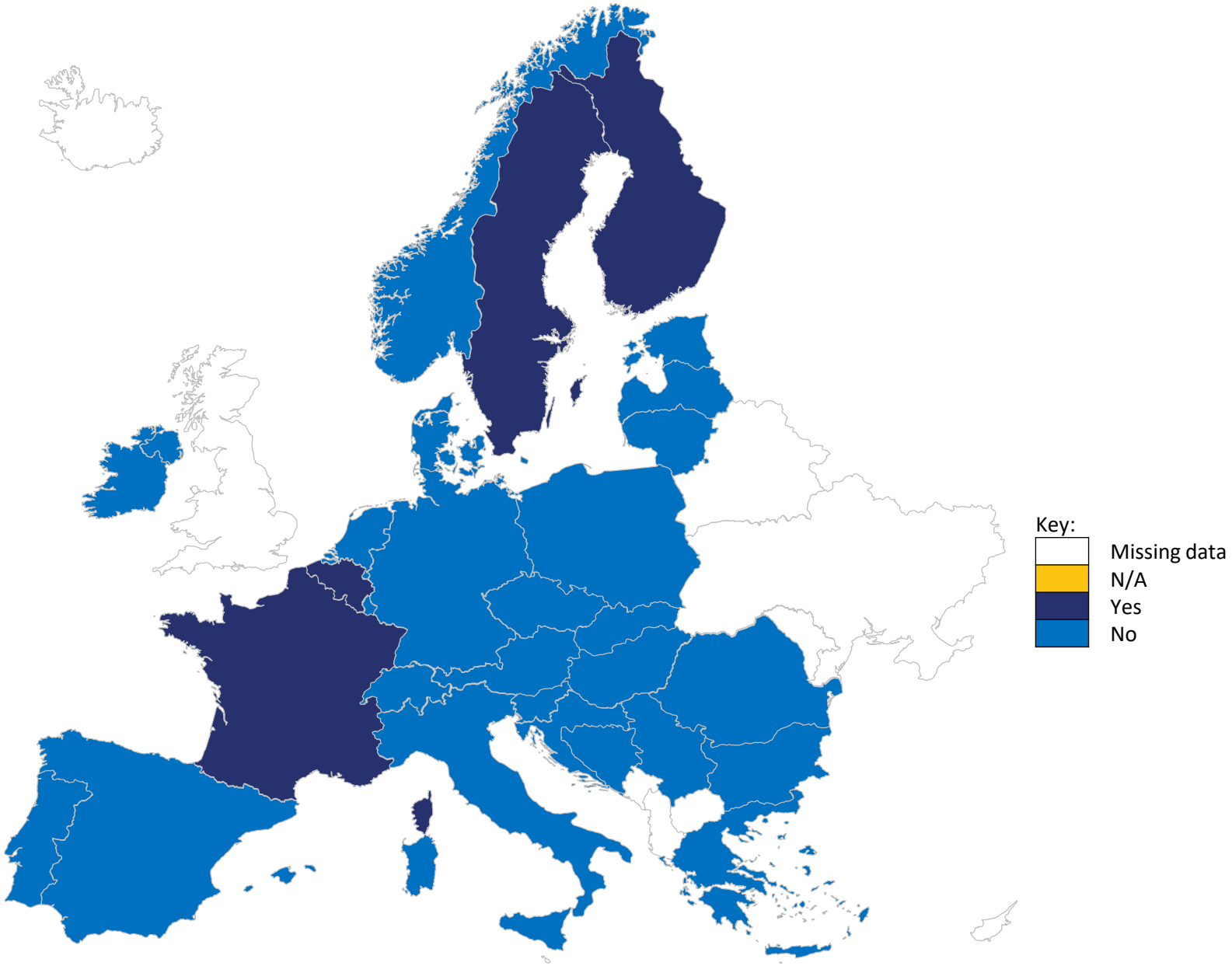
Imbalance settlement – Control energy prices used – RR



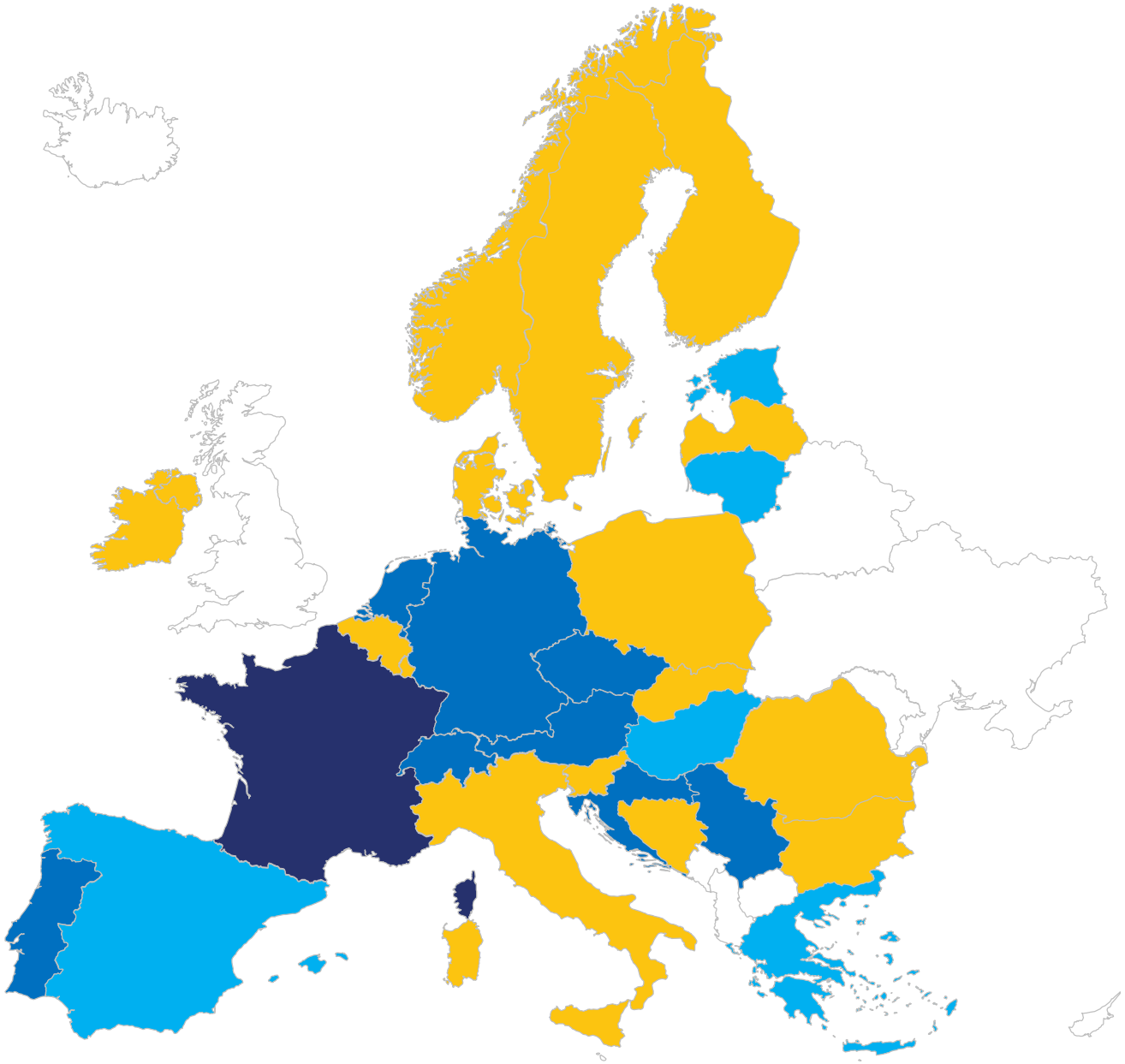
Key:

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

Imbalance settlement – Start/Stop costs in Imbalance Charges



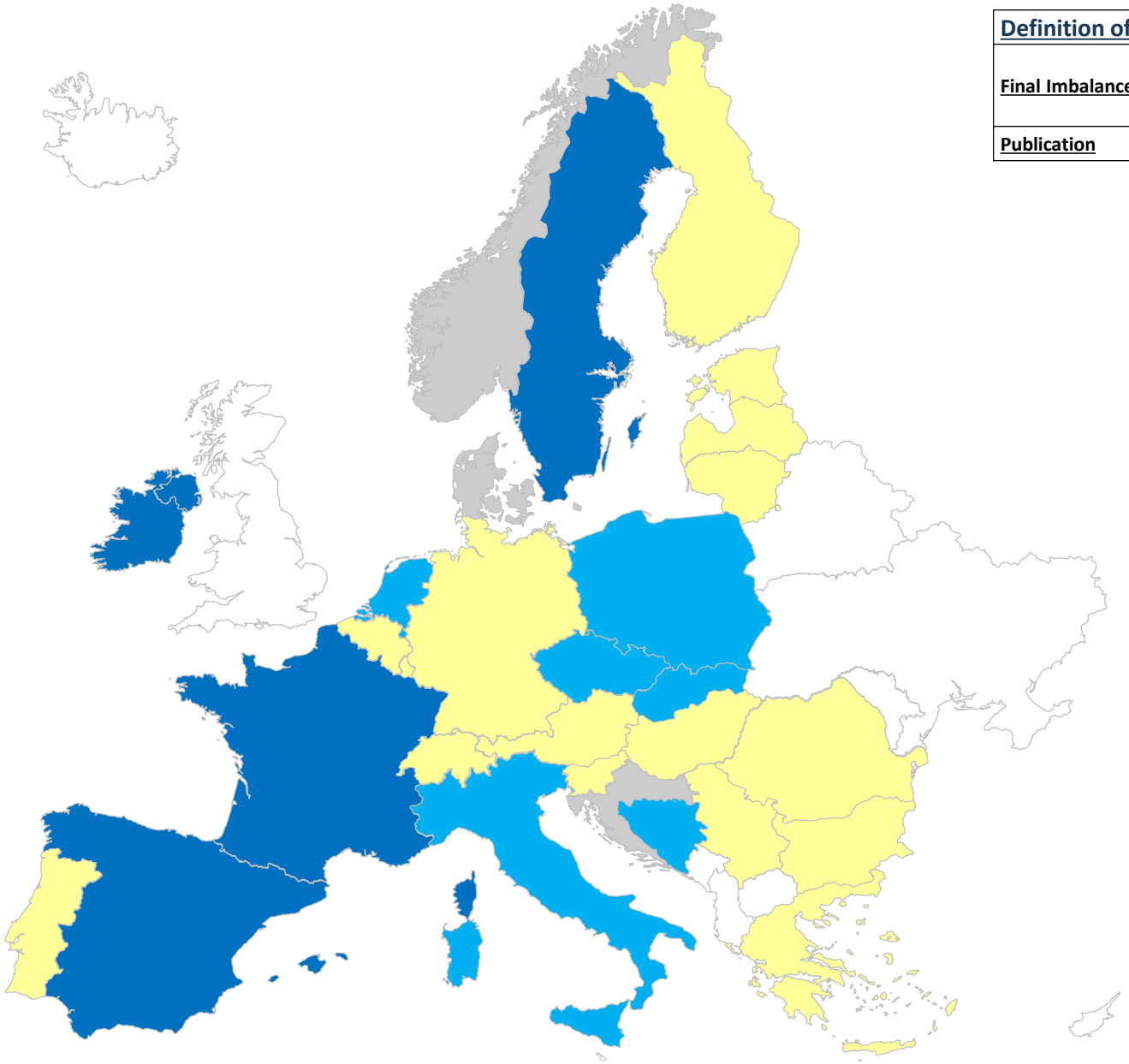
Imbalance settlement – FSkar results in Imbalance Charges



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

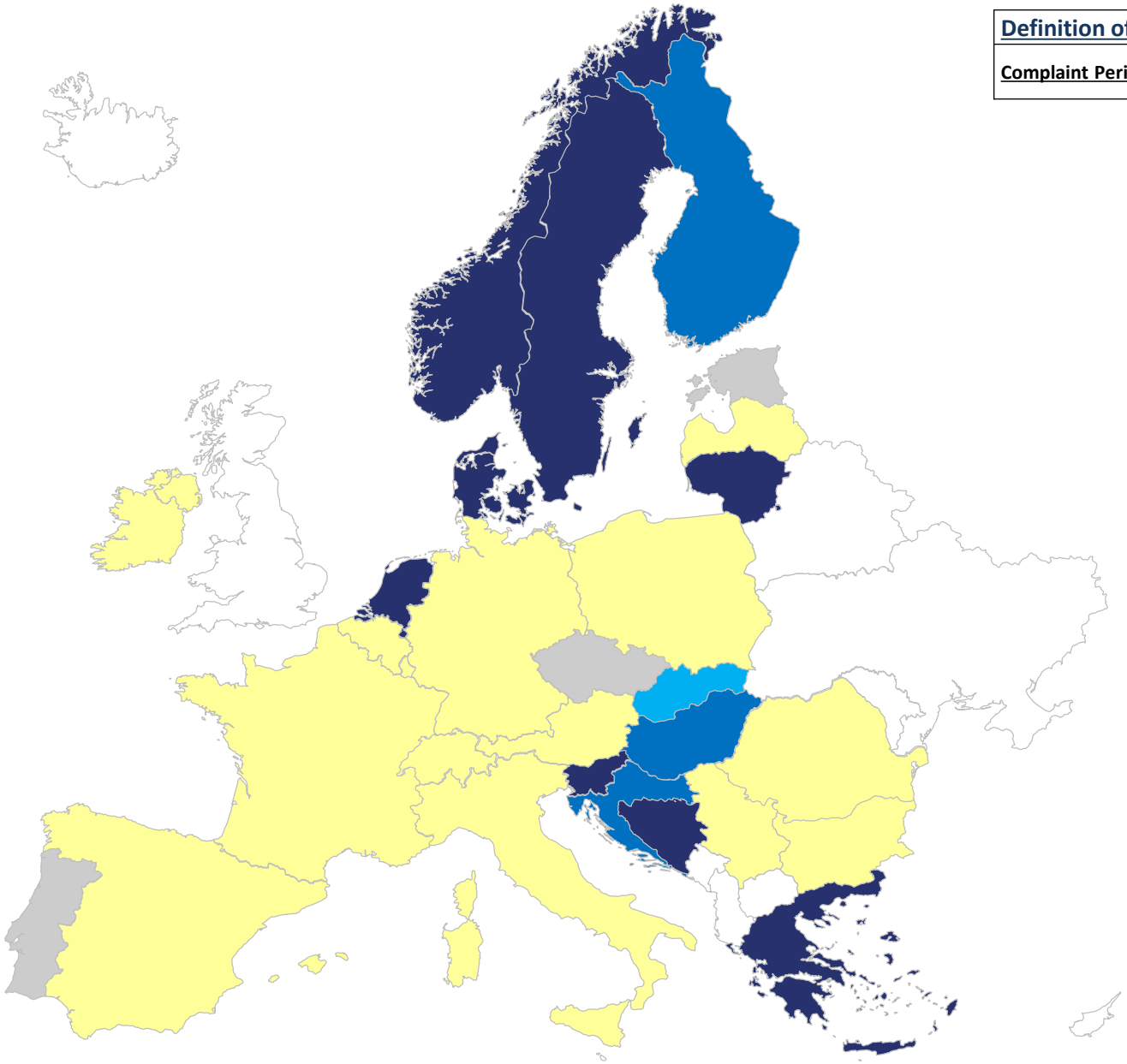


Definition of question	
Final Imbalance Price	Imbalance price means the price, be it positive, zero or negative, in each imbalance settlement period for an imbalance in each direction. Final imbalance price is calculated price for settlement period that cannot be changed anymore.
Publication	Publication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

Key:

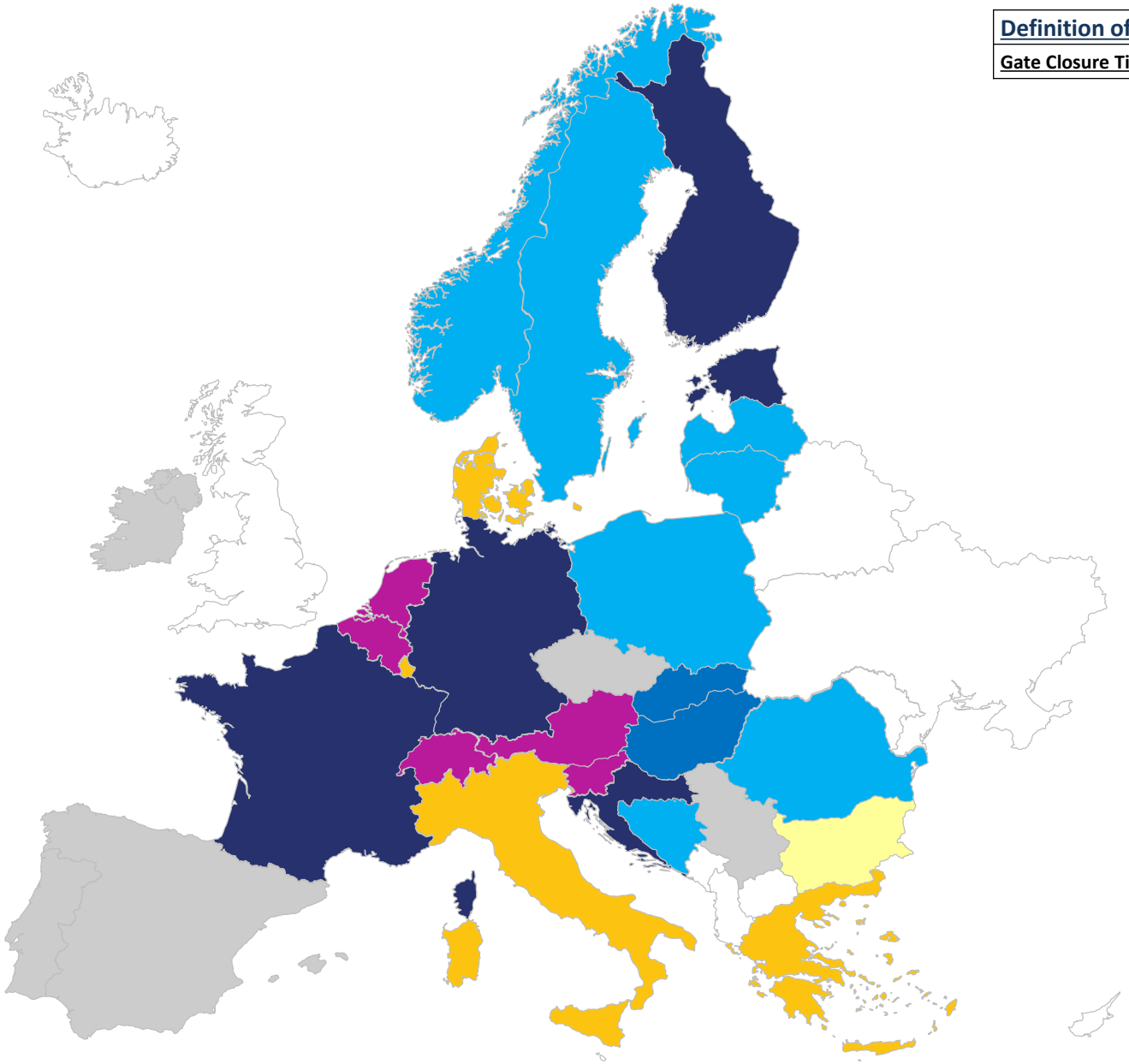
- Missing data
- N/A
- Prior to delivery
- x <= 1 hour after delivery
- x <= 1 day after delivery
- x <= 1 week after delivery
- x > 1 week after delivery

Imbalance settlement – Complaint Period



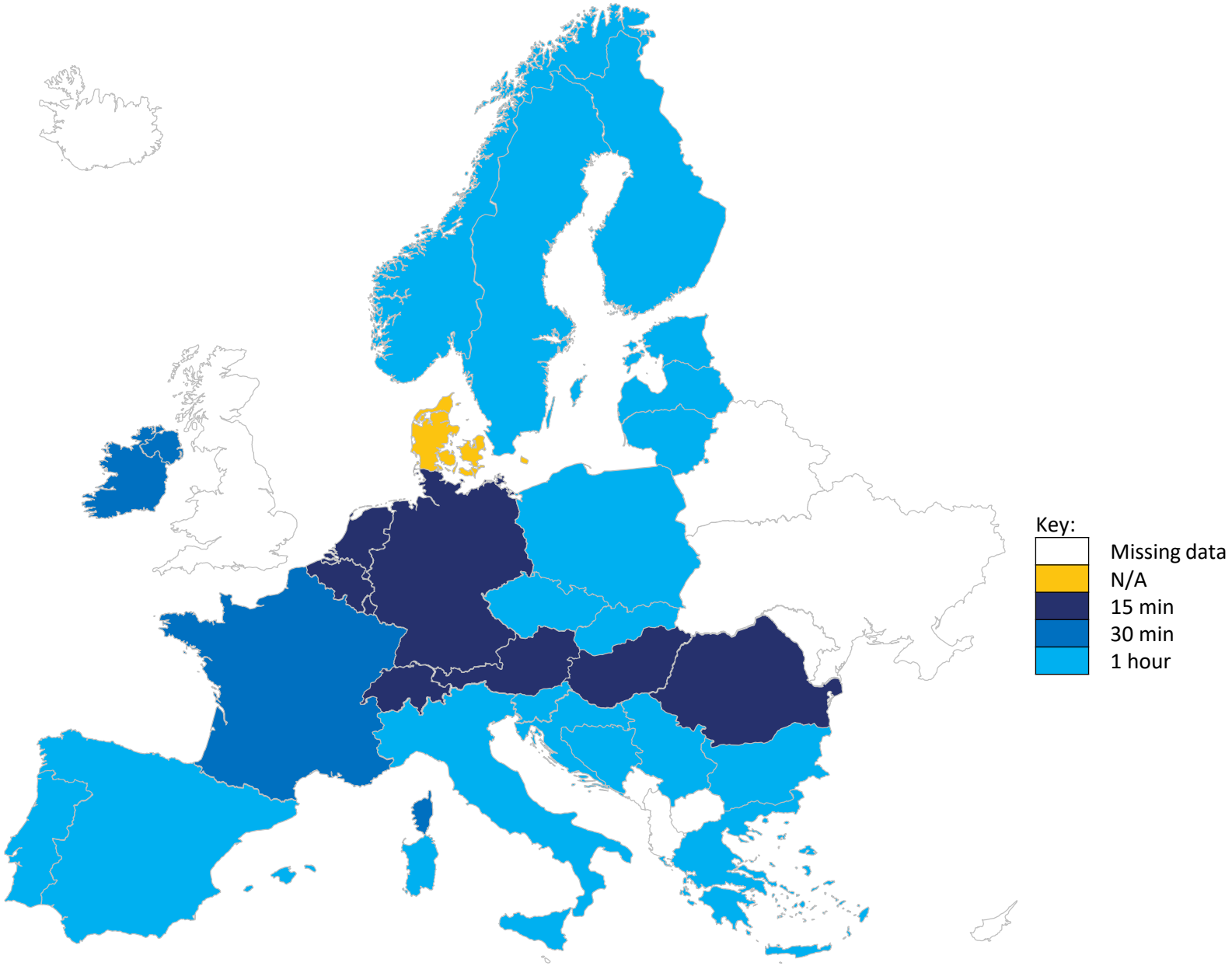
Definition of answer	
Complaint Period	Length of time for which complaints can be made which will be considered in relation to settlement (after the finalized data are produced).

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

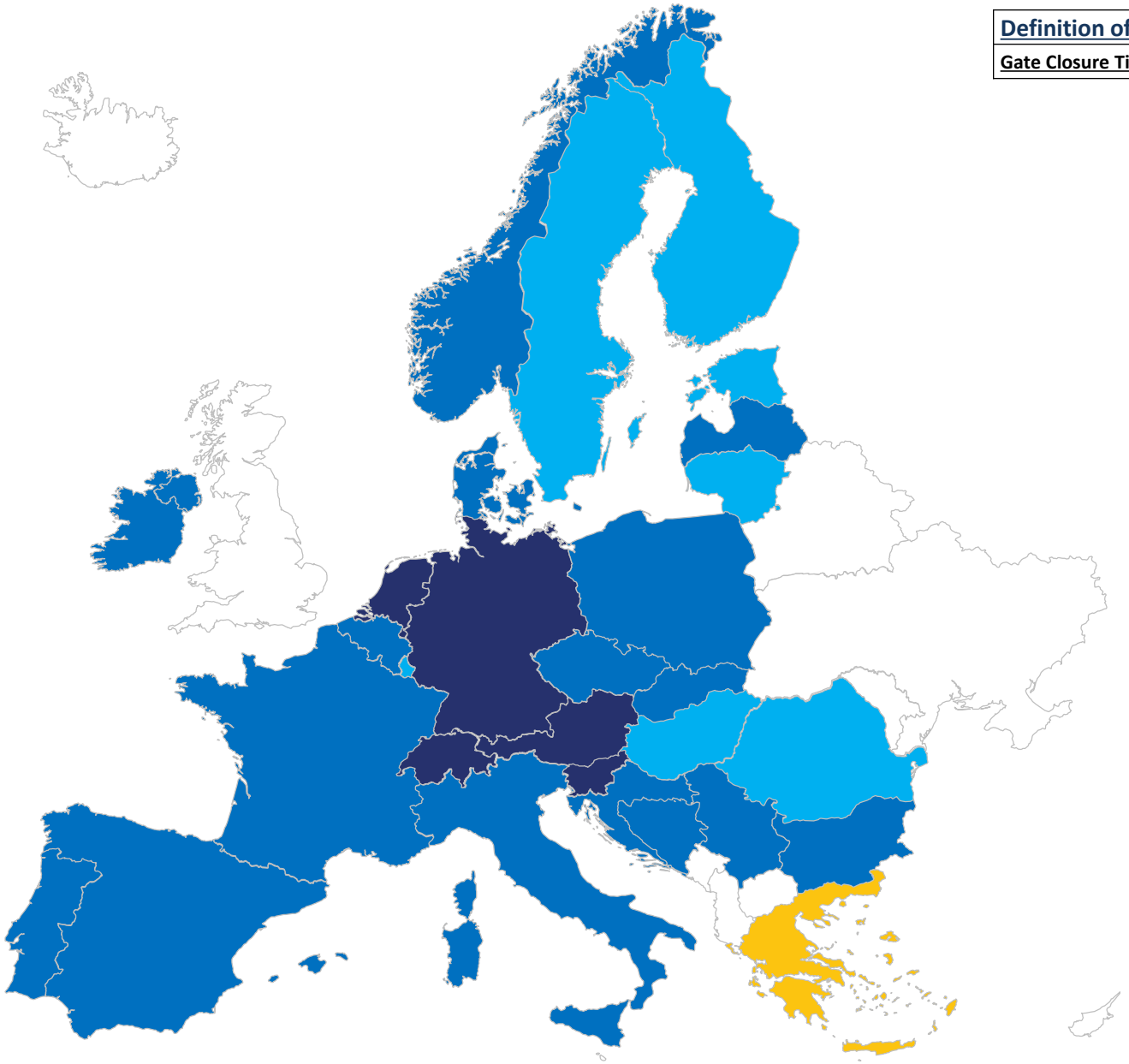


Definition of answer	
Gate Closure Times (GCT)	Deadline for the participation to a given market or mechanism.

Imbalance settlement – Internal Intra Day Market time period



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

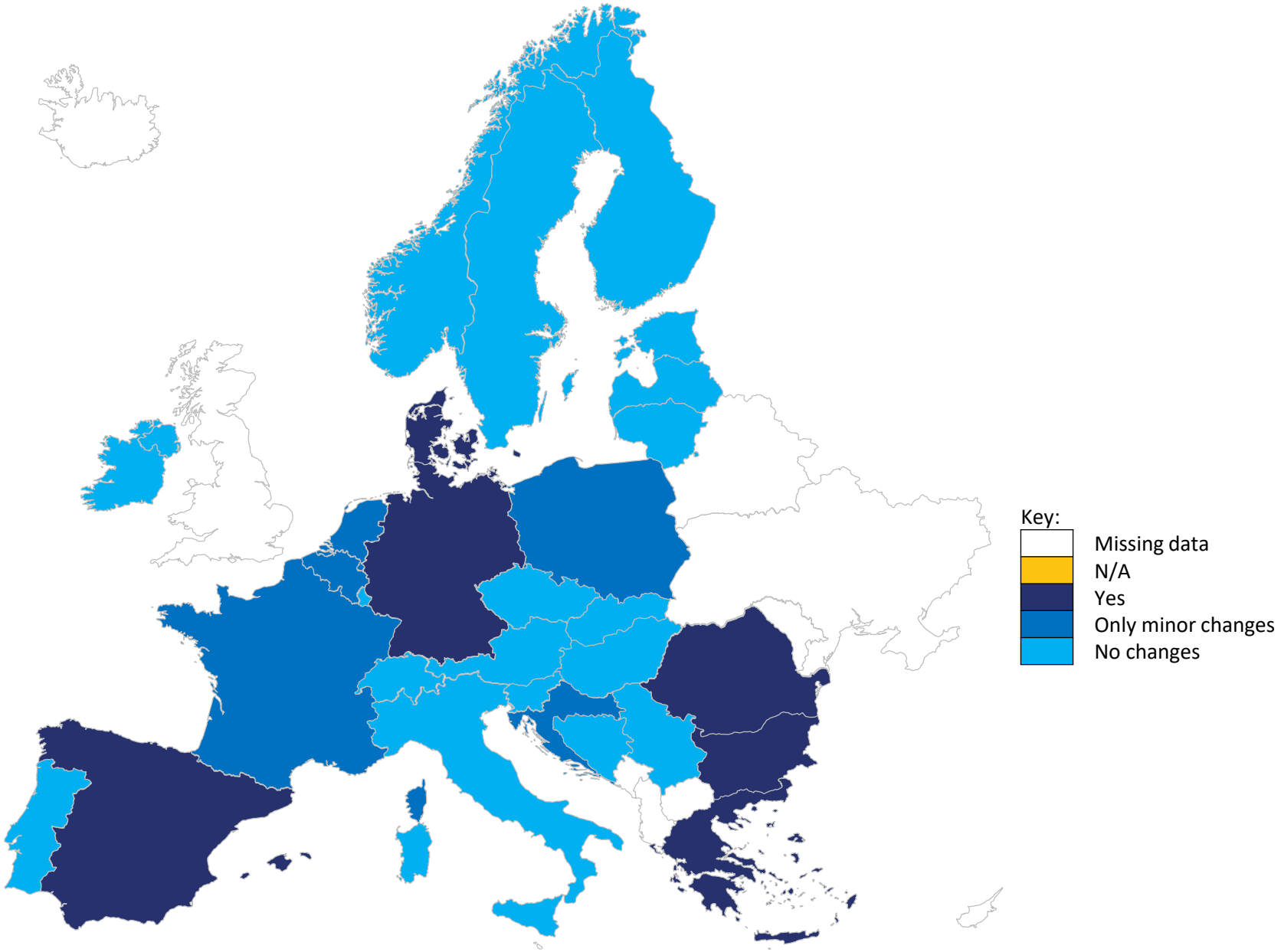


Definition of answer	
Gate Closure Times (GCT)	Deadline for the participation to a given market or mechanism.

Key:

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

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 2019!

TSO	Answer
Elia	change of alpha (variable component)
Energinet	Nordic harmonisation towards one price model
German TSOs	Introduction of scarcity component ISHM compliant imbalance settlement
PSE S.A.	The Polish regulatory framework allows applying dual pricing in the imbalance settlement, In previous years it was reported that PSE applies dual pricing in the sense that there are two imbalance price defined. However, according to the Polish T&C related to balancing these two imbalance prices are always the same. So, in fact the single price is used for imbalance settlement.
REE	ISHP hamonization process

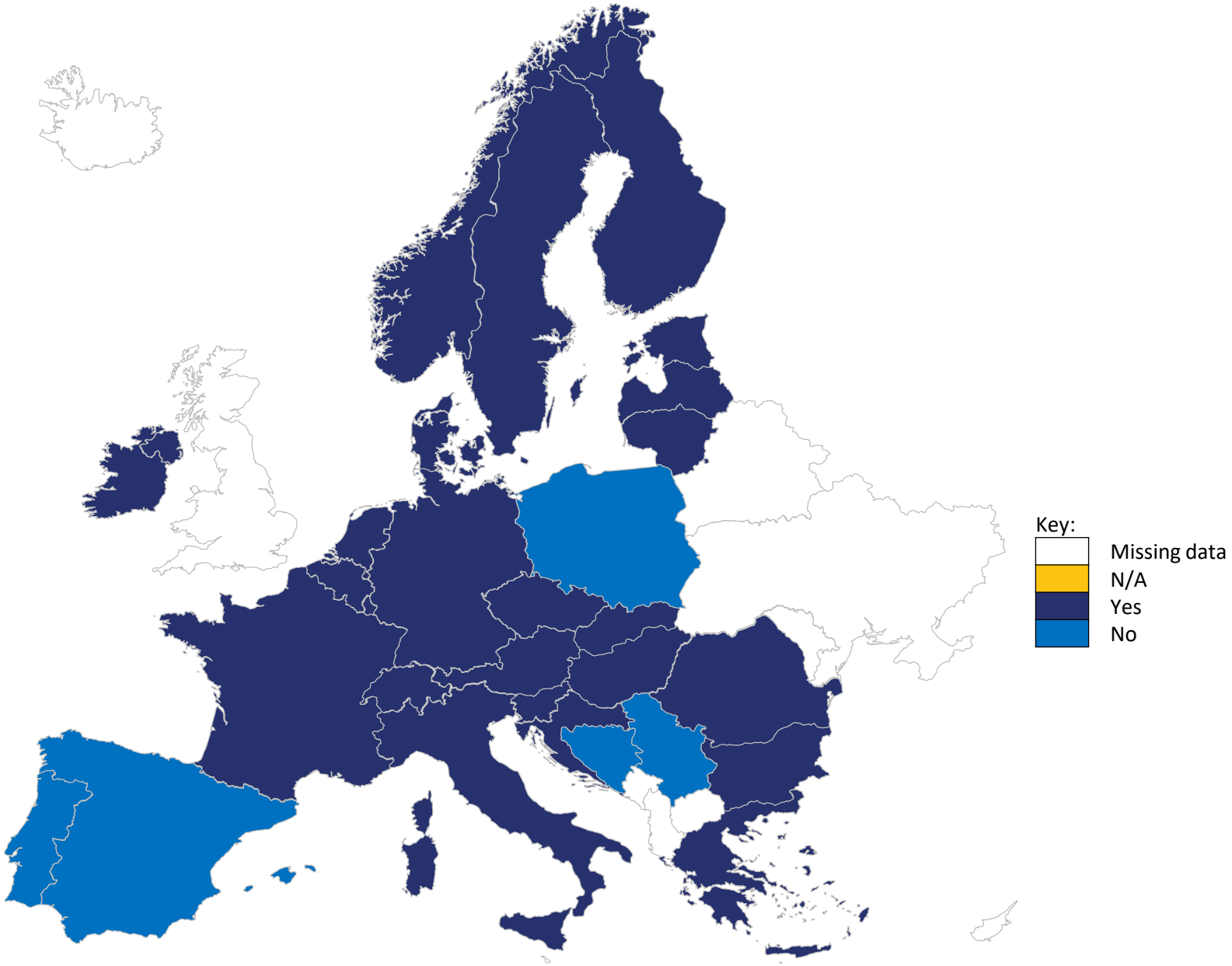
Please, explain significant/important changes regarding the imbalance settlement NOT in line with/aimed to requirements of EB Regulation (and the reason behind) in comparison to the year 2019!

TSO	Answer
PSE S.A.	There were no such changes.
REE	N/A

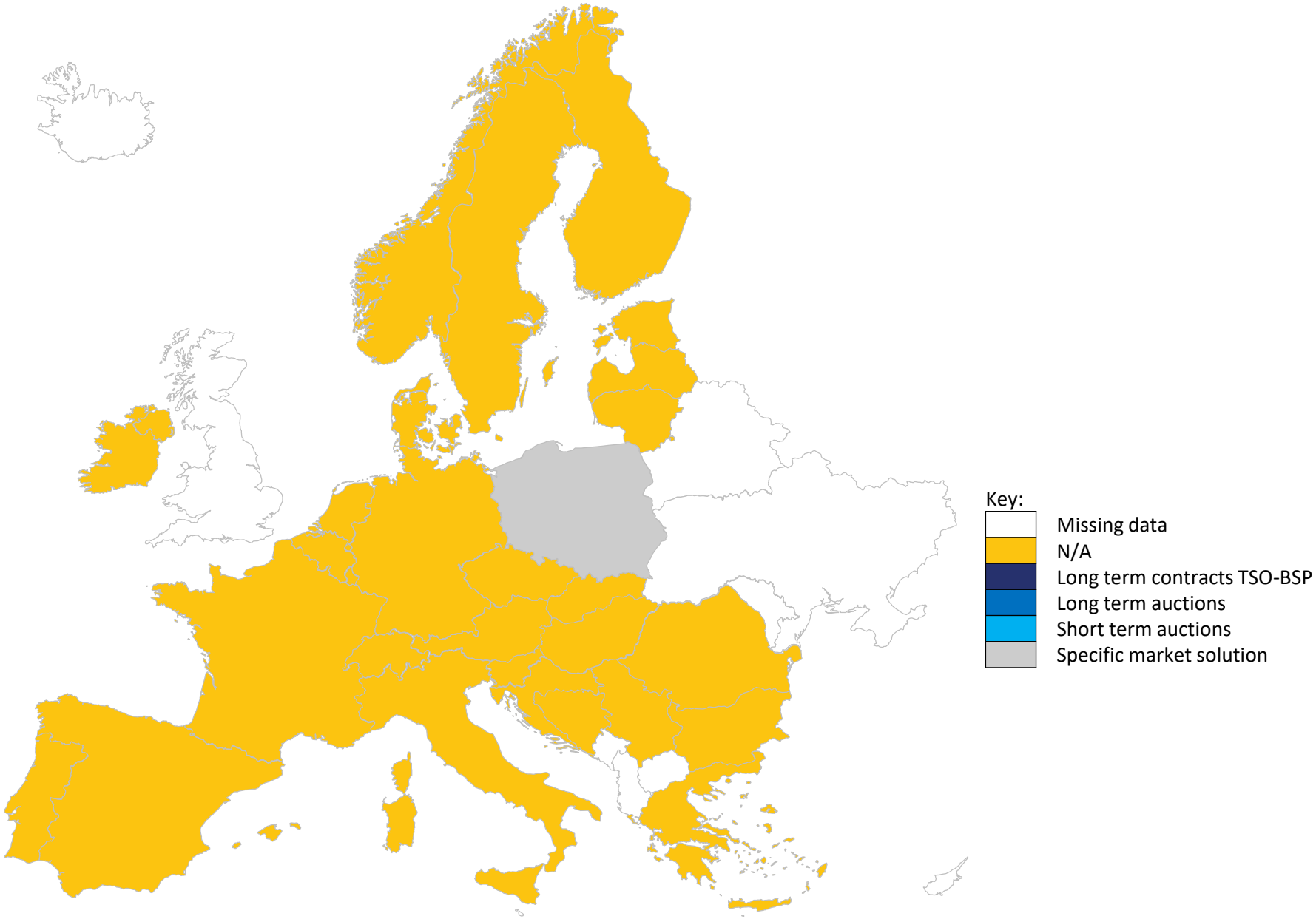
Demand-side response

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

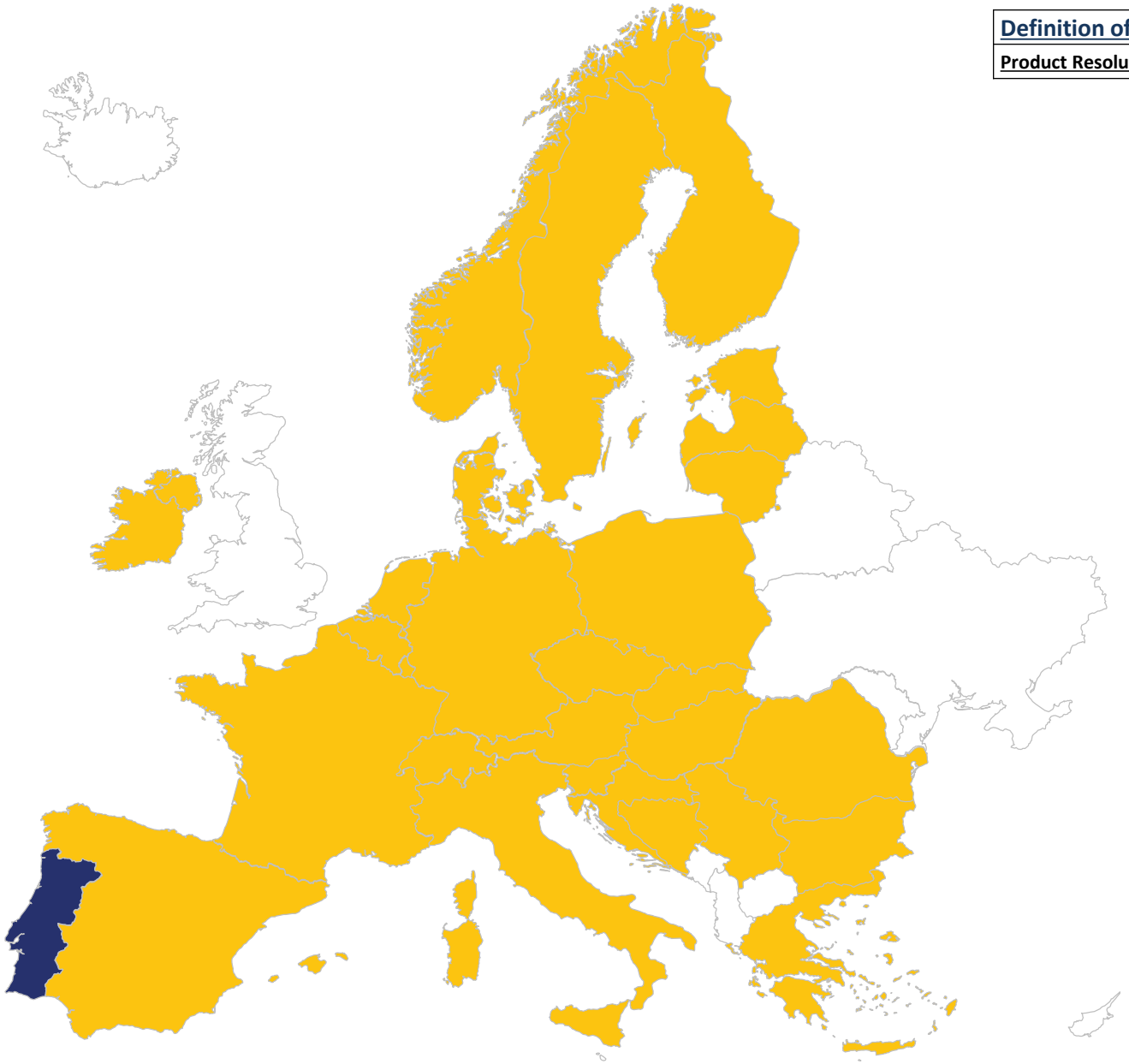
Demand-side response – Facilities use the same market mechanism and activation process as generation (capacity and energy)?



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

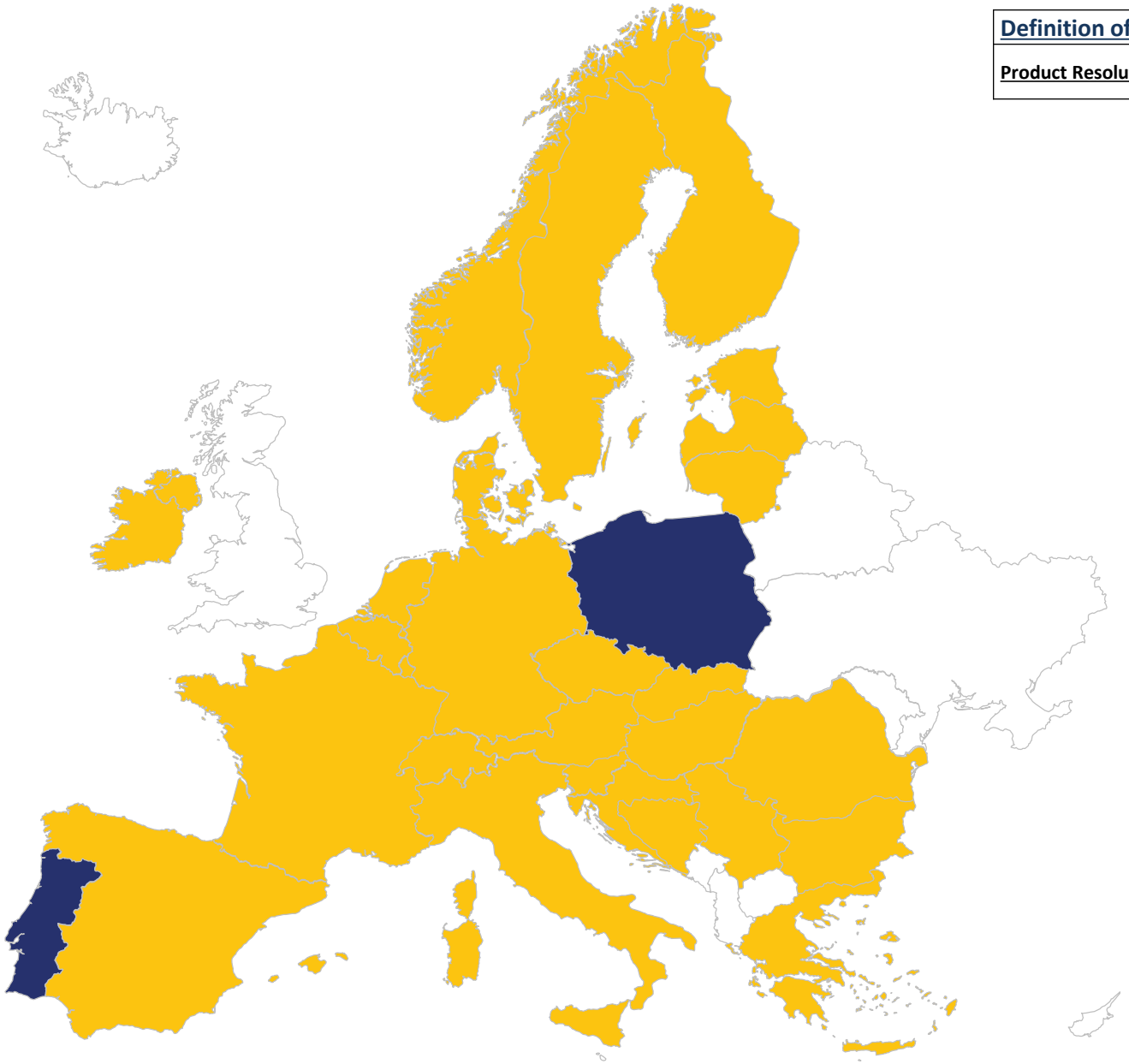


Demand-side response – What is the product resolution for demand-side response BSP´s to participate at these balancing services?



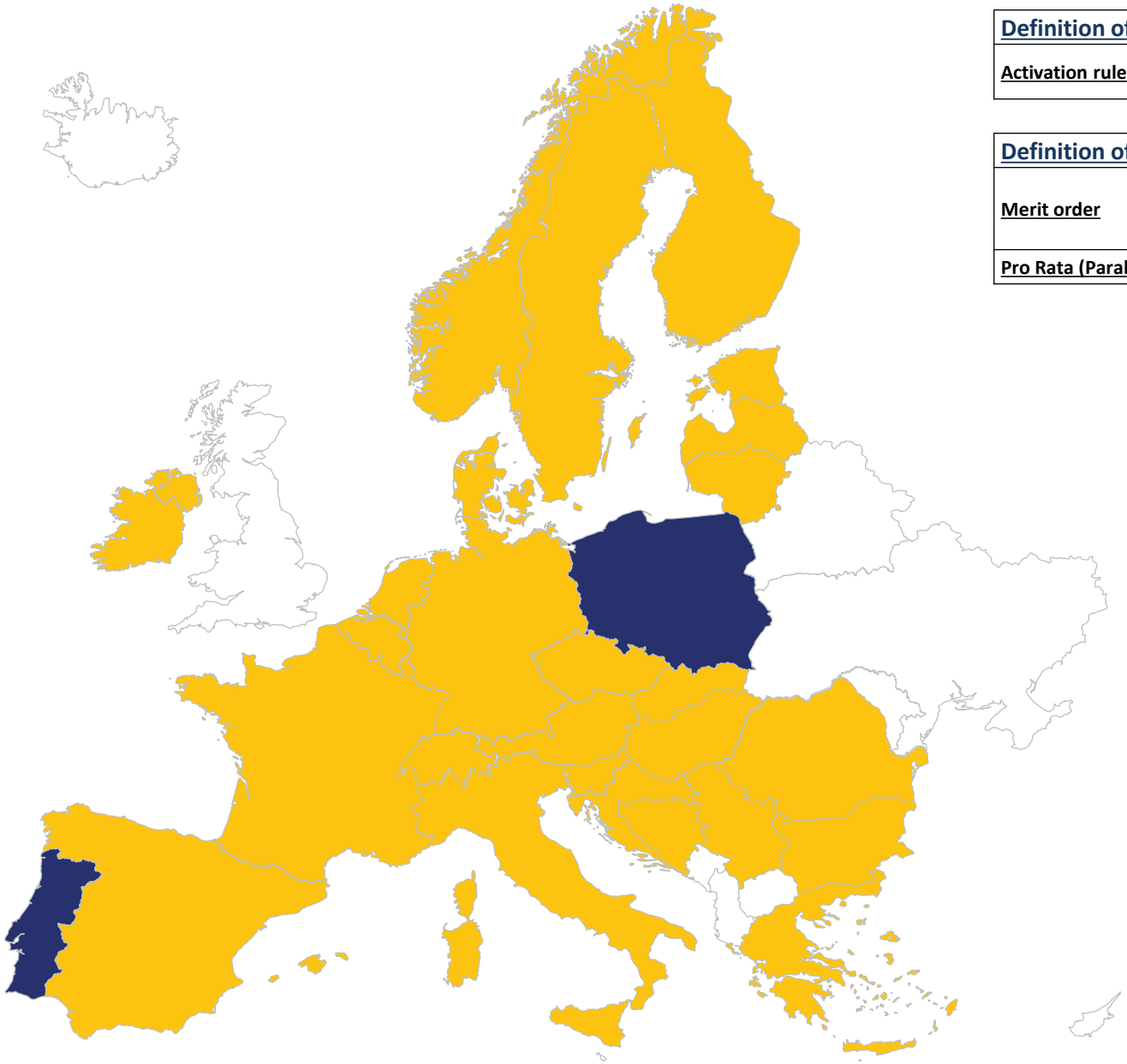
Definition of question	
Product Resolution (in MW)	The minimum bid size into the balancing market.

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).

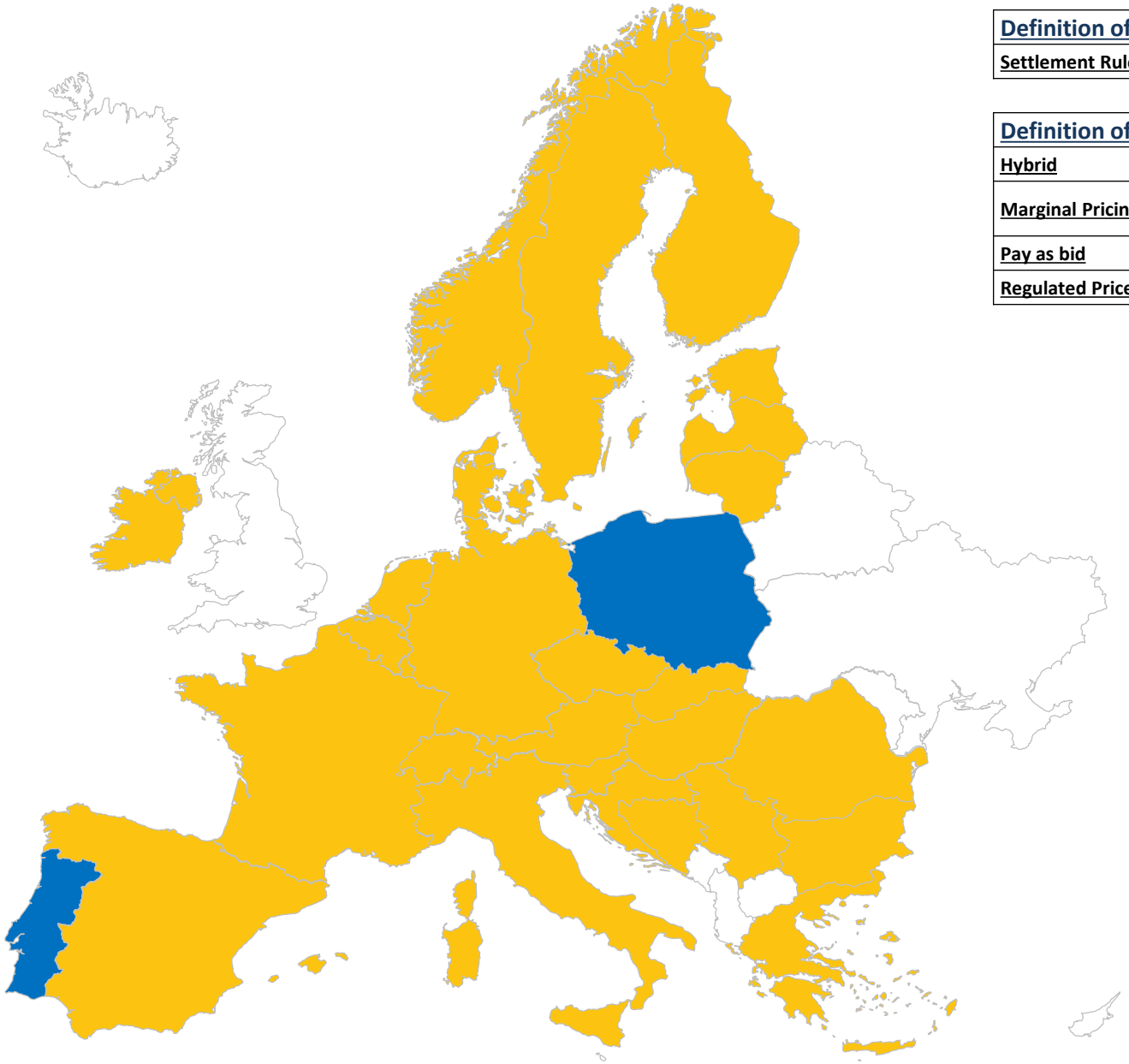
Demand-side response – What type of specific activation rule do you follow with demand-side response type BSP´s?



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

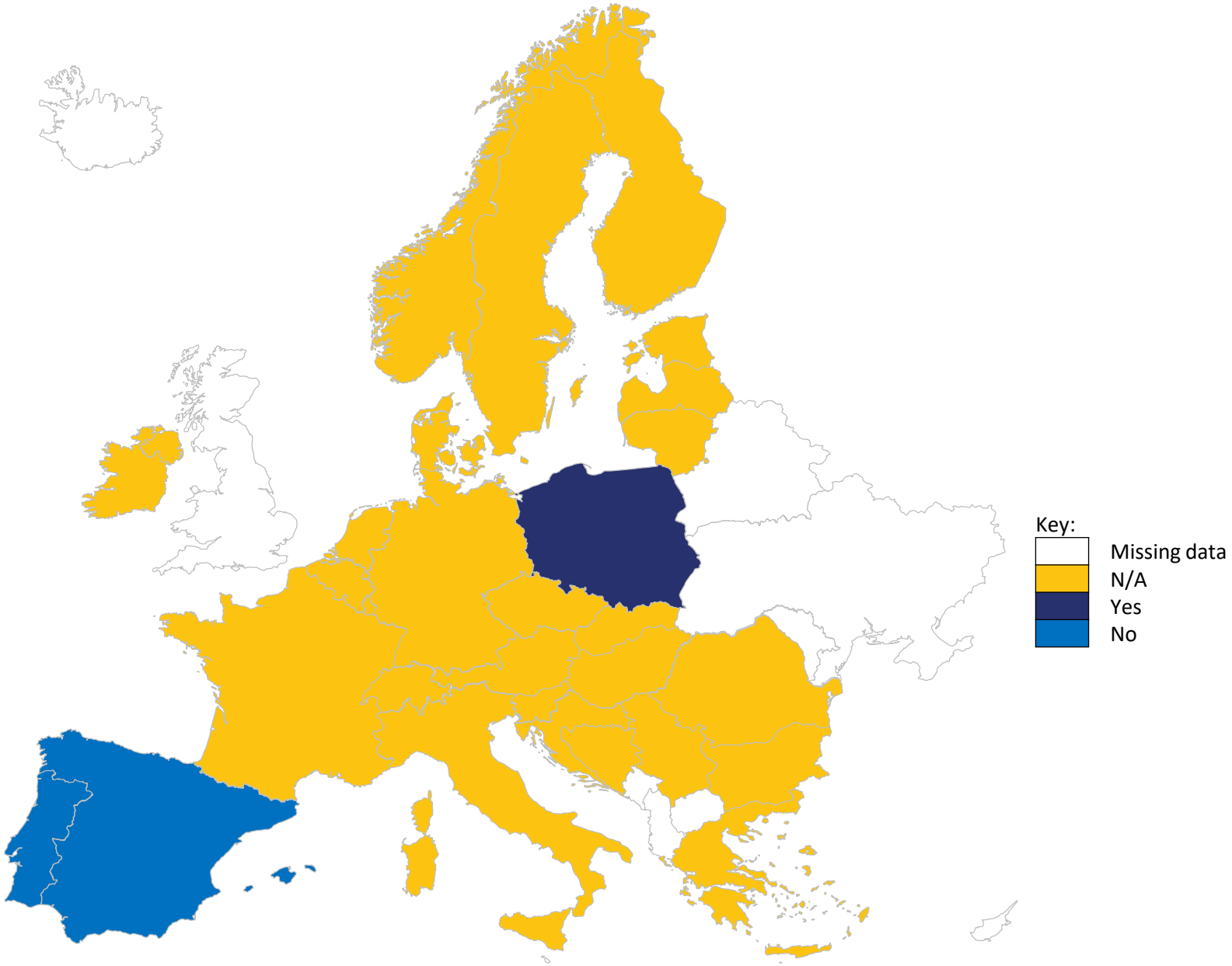


Key:
- Missing data
- N/A
- Pay as bid
- Marginal Pricing
- Regulated Price
- Hybrid

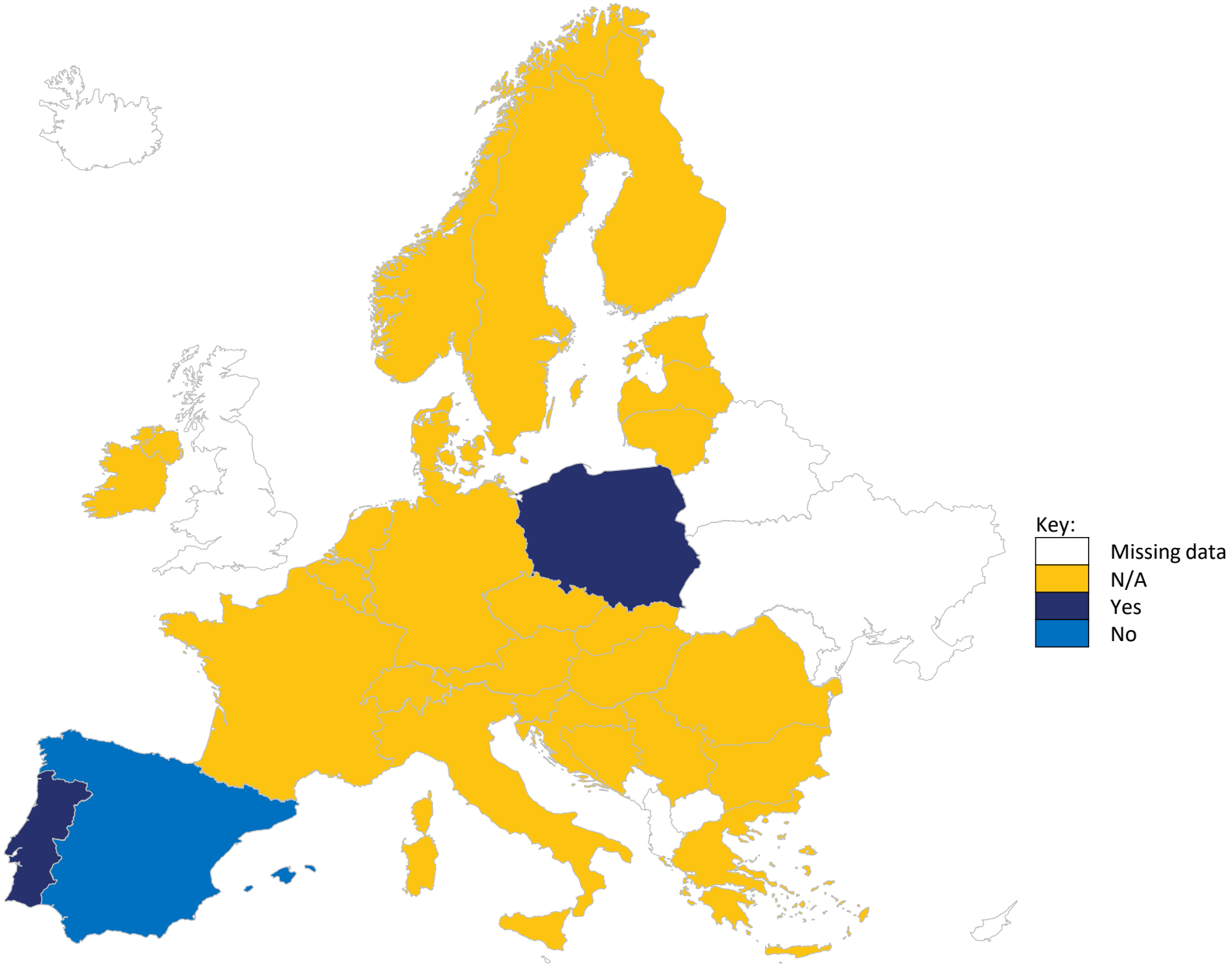
Definition of question	
Settlement Rule	The pricing rules for settlement.

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.

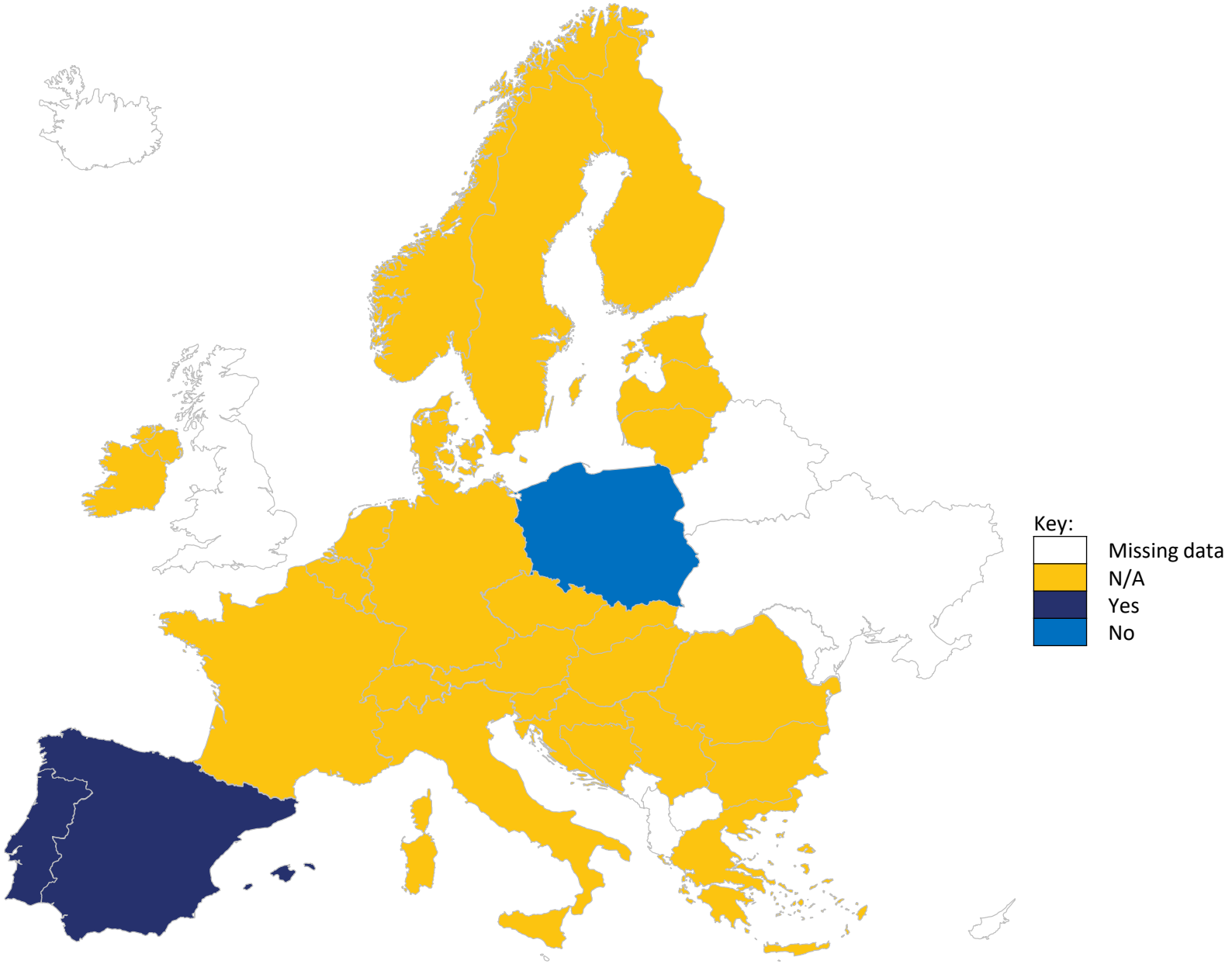
Demand-side response – Participates in these balancing services – Aggregators



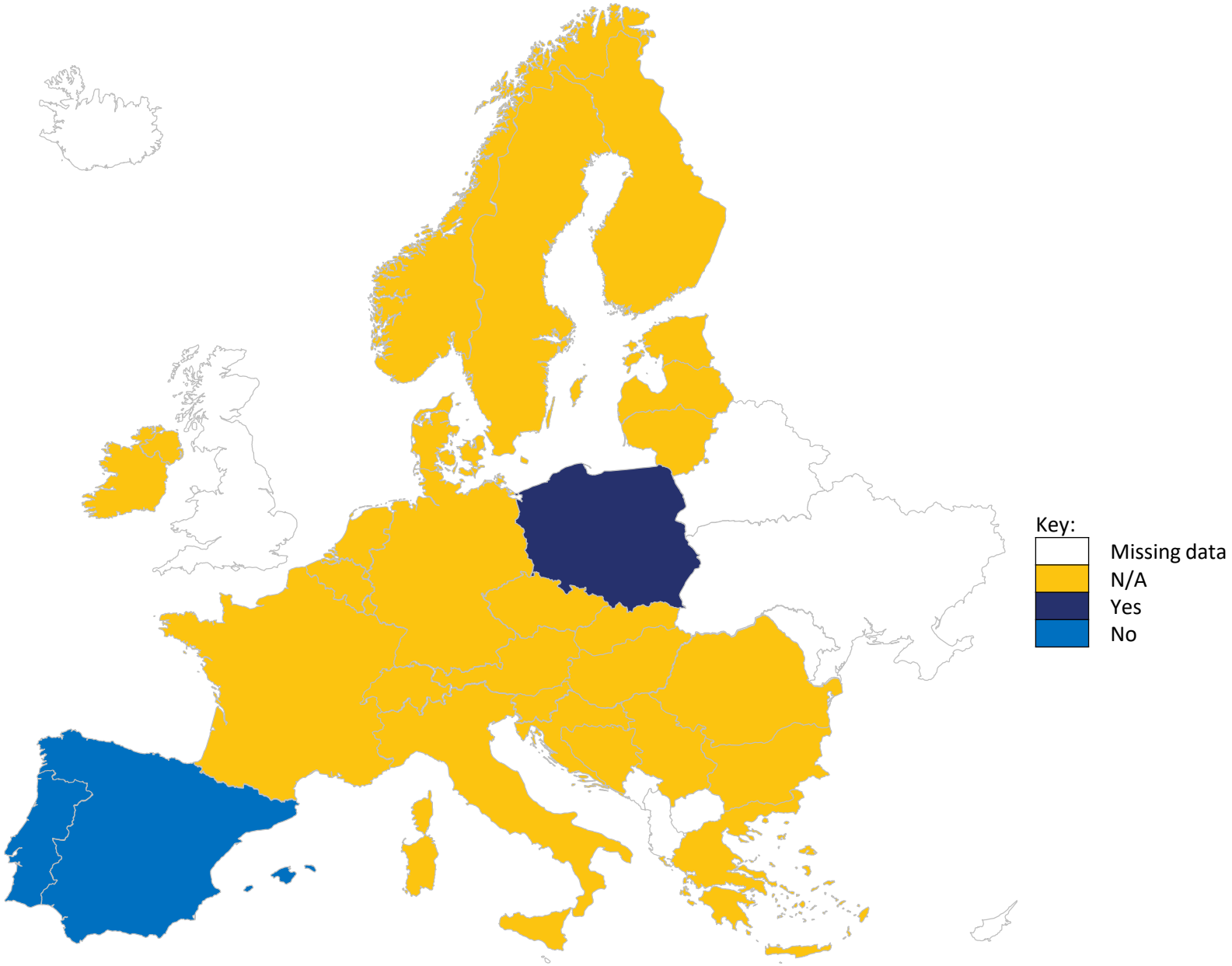
Demand-side response – Participates in these balancing services – Large consumers



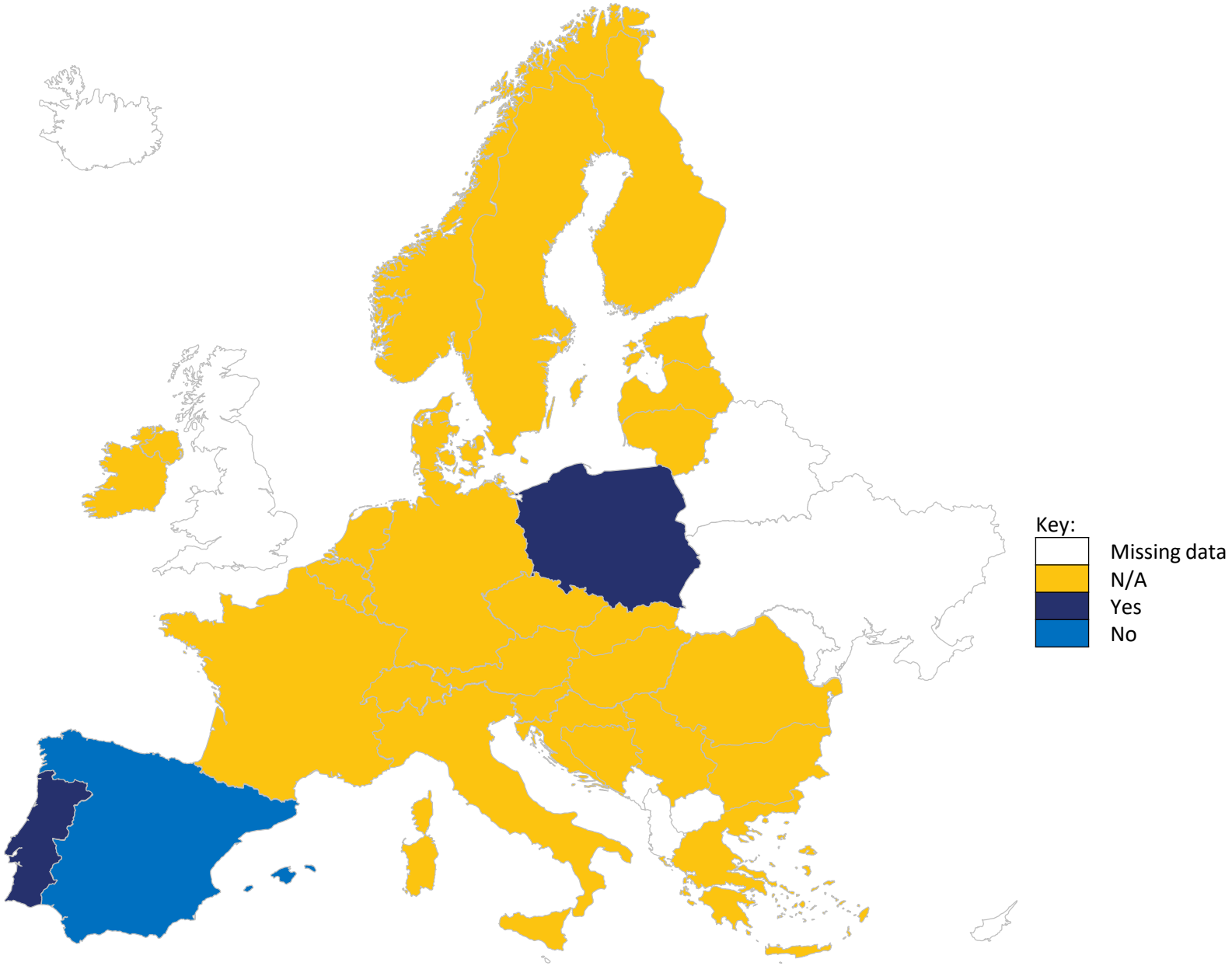
Demand-side response – Participates in these balancing services – Pump storage units



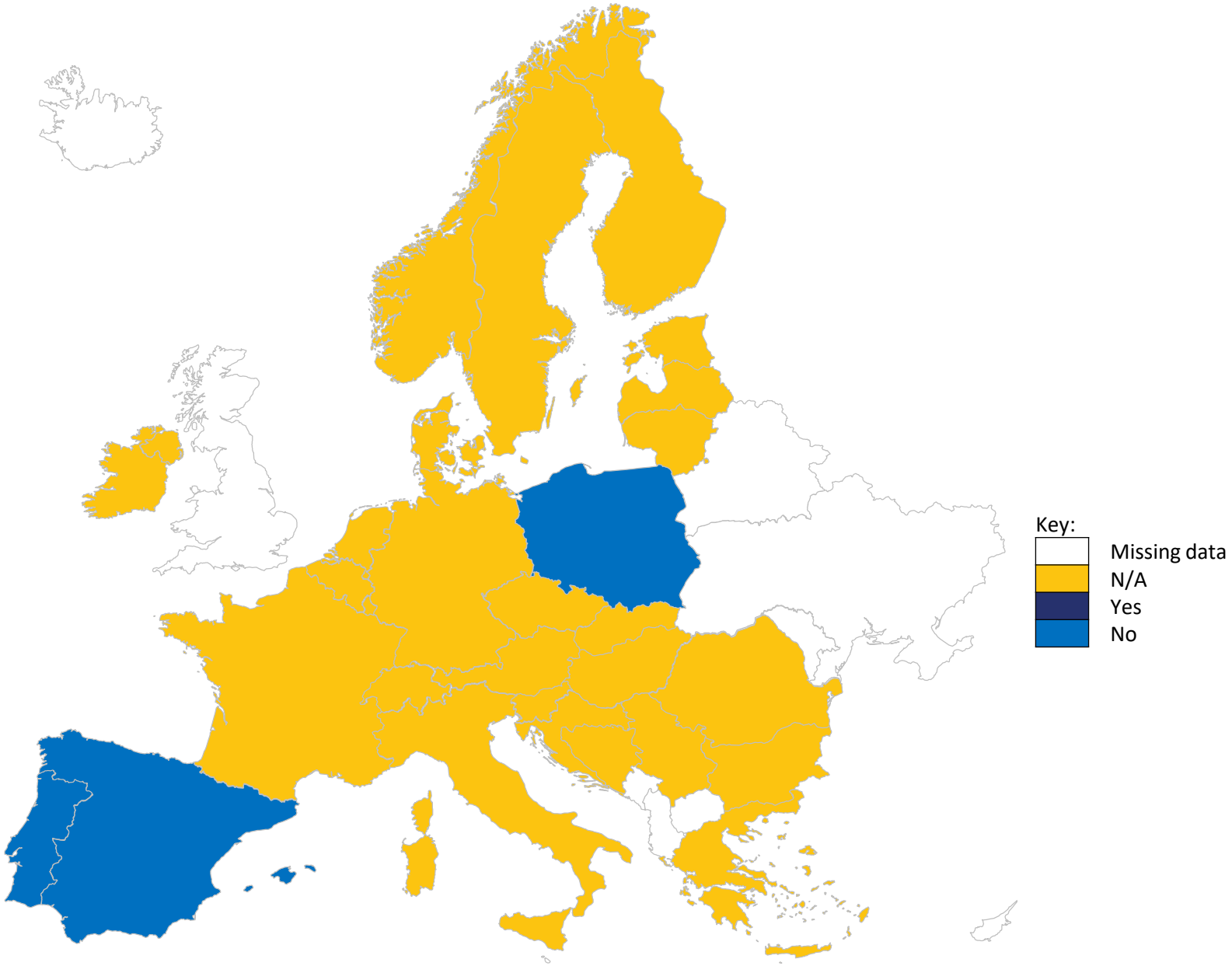
Demand-side response – Participates in these balancing services – Aggregated small size consumers



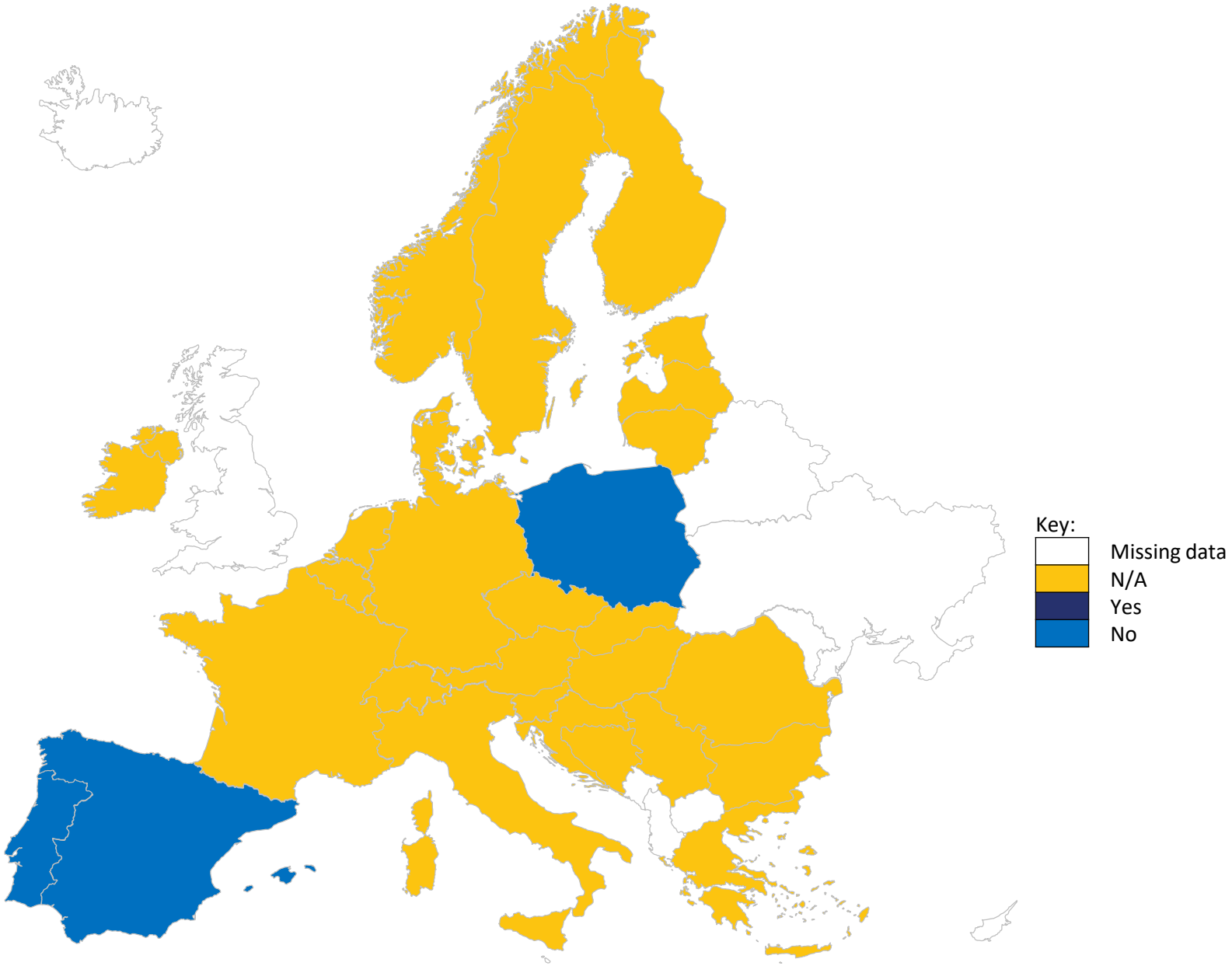
Demand-side response – Participates in these balancing services – Small consumers



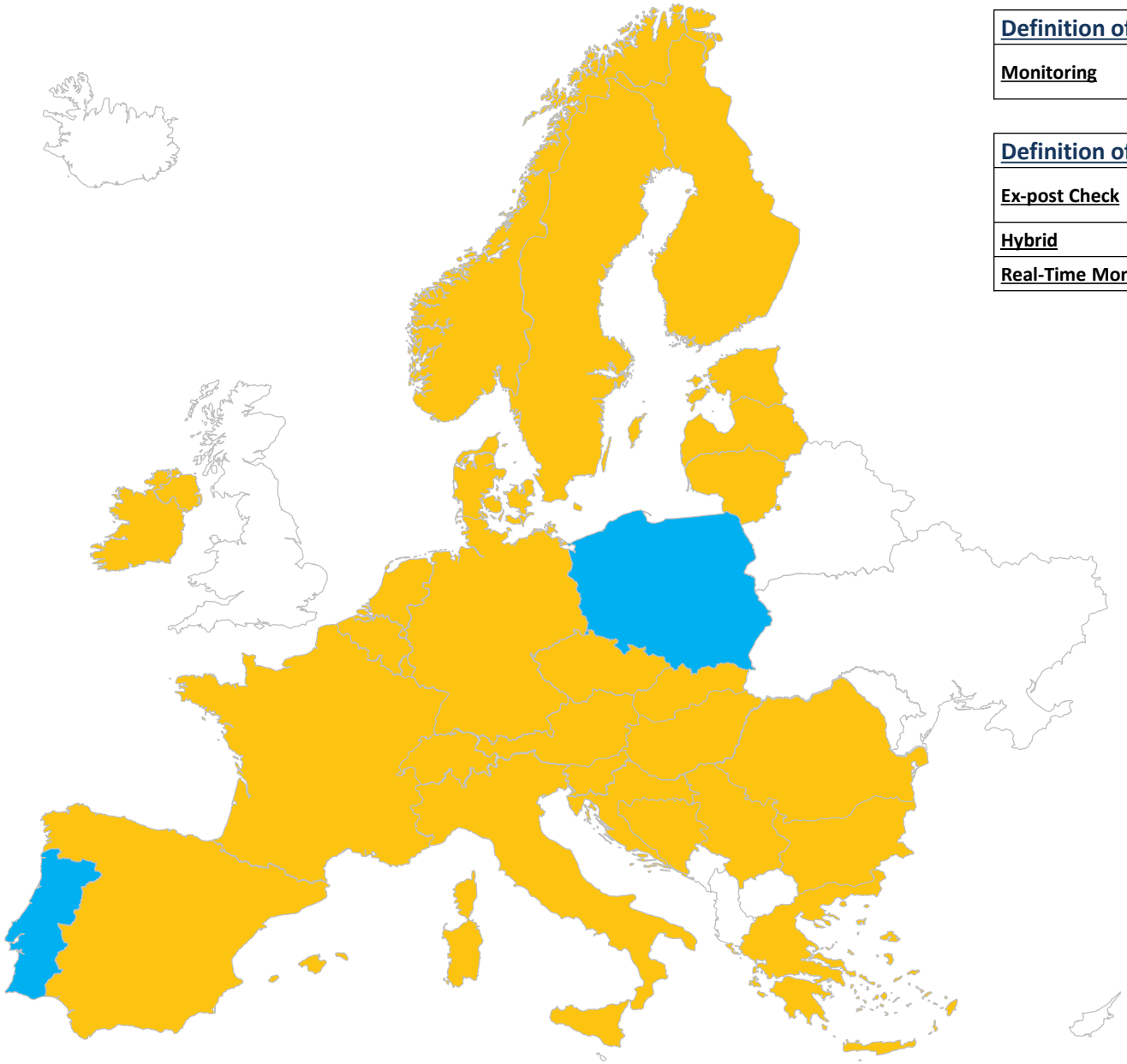
Demand-side response – Participates in these balancing services – Other storage



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



Demand-side response – Monitoring



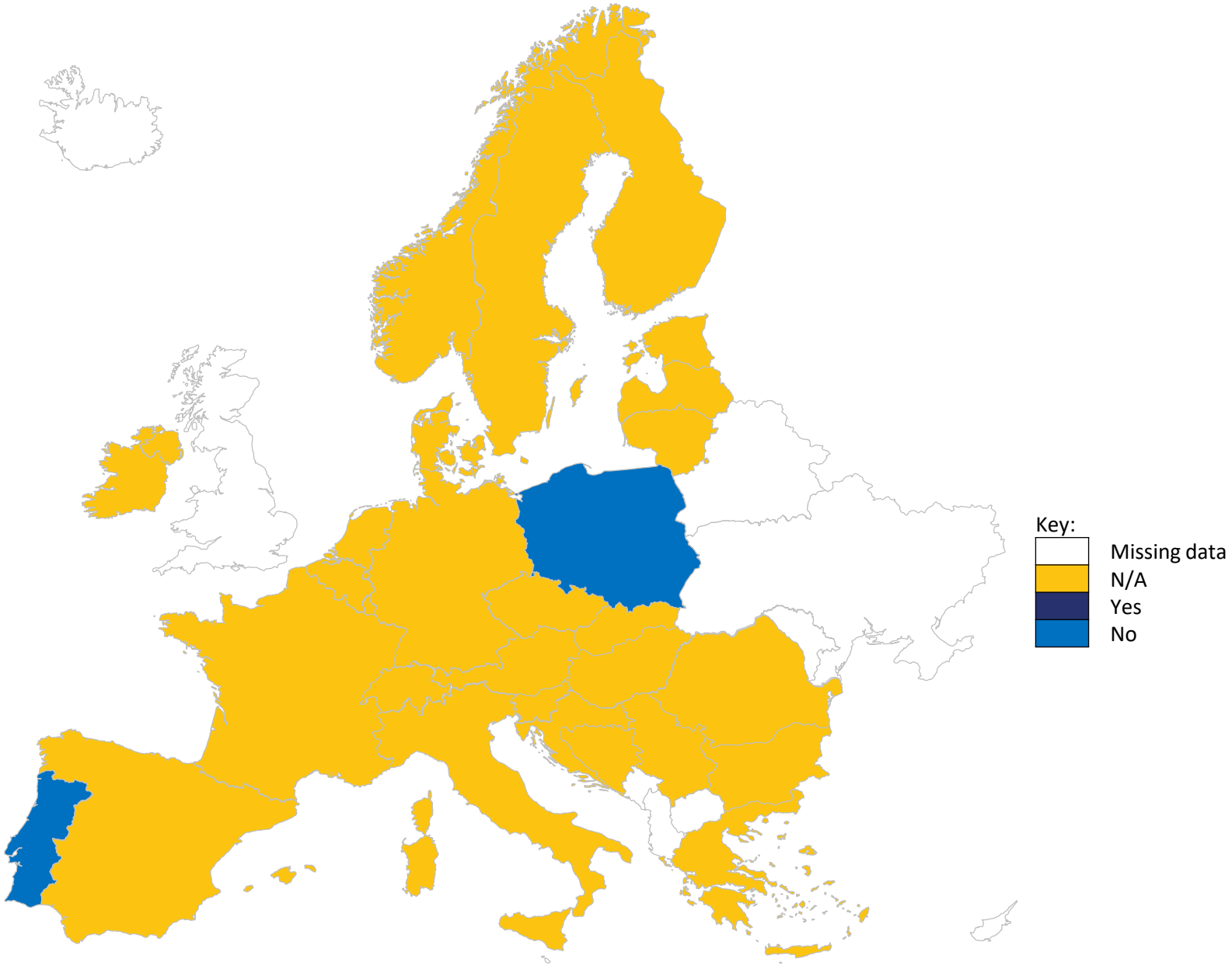
Definition of question	
Monitoring	Refers to the type of monitoring in place by the system operator to ensure performance of plant.

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.

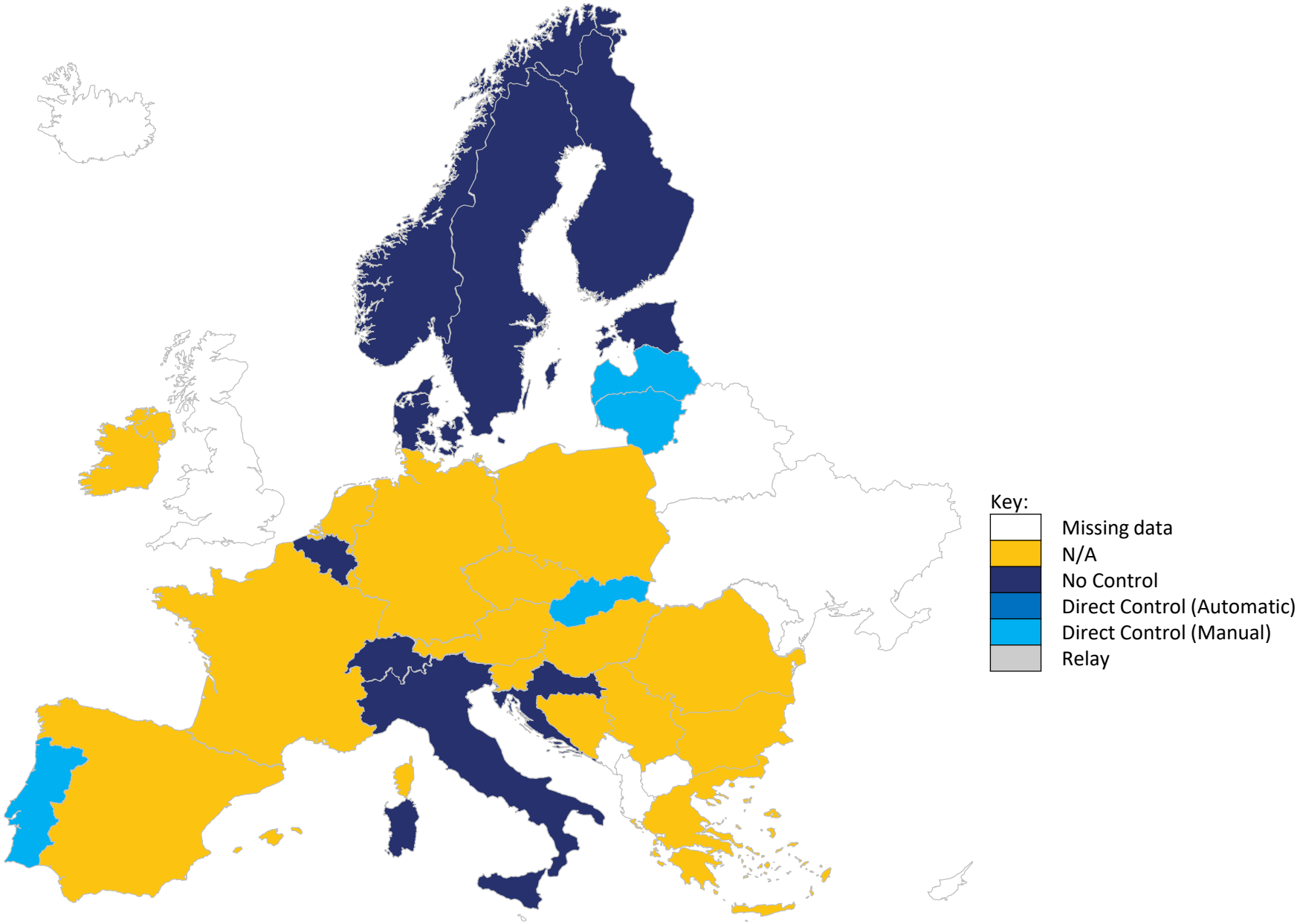
Key:

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

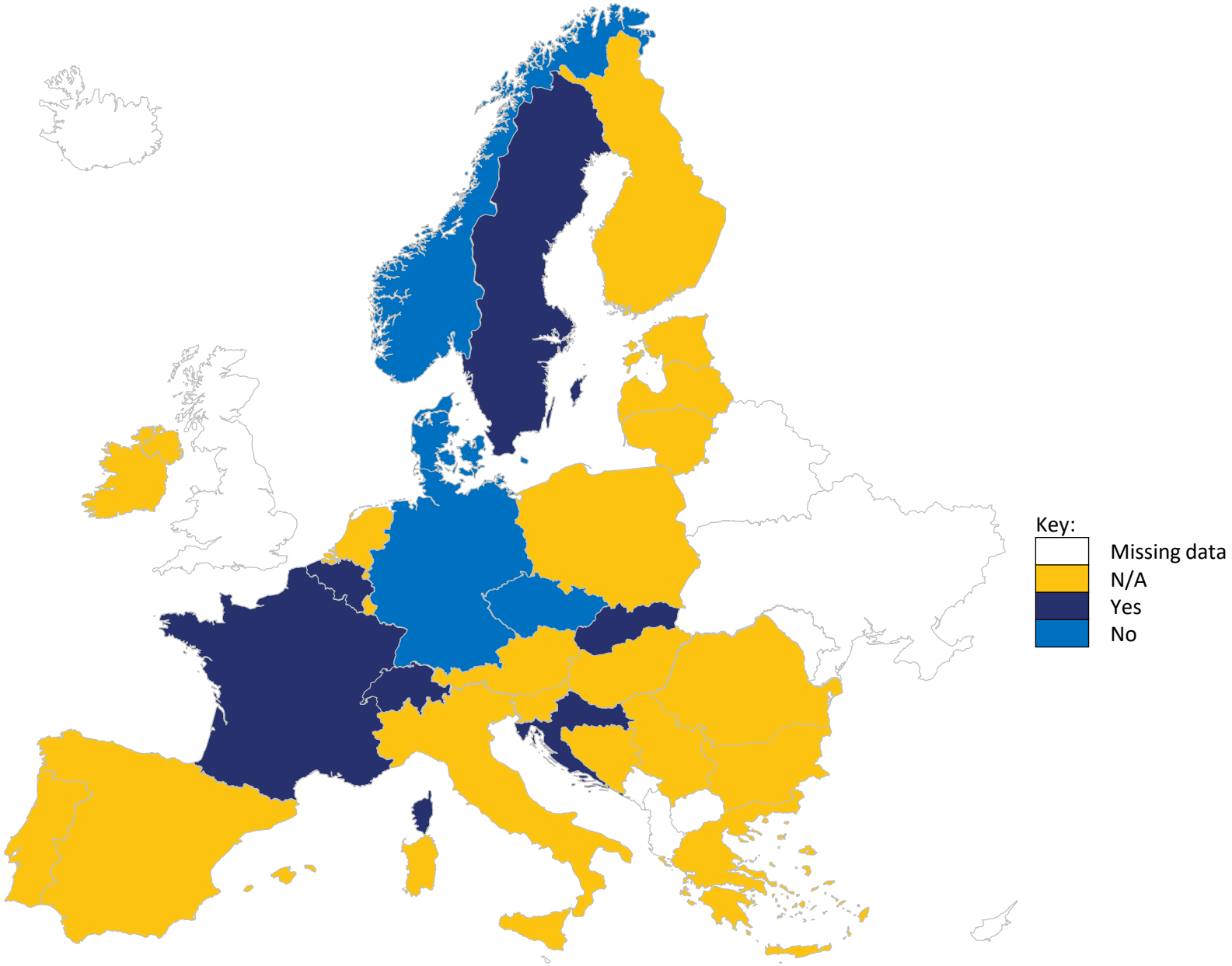
Demand-side response – Using DSR facilities in order to solve local constraints?



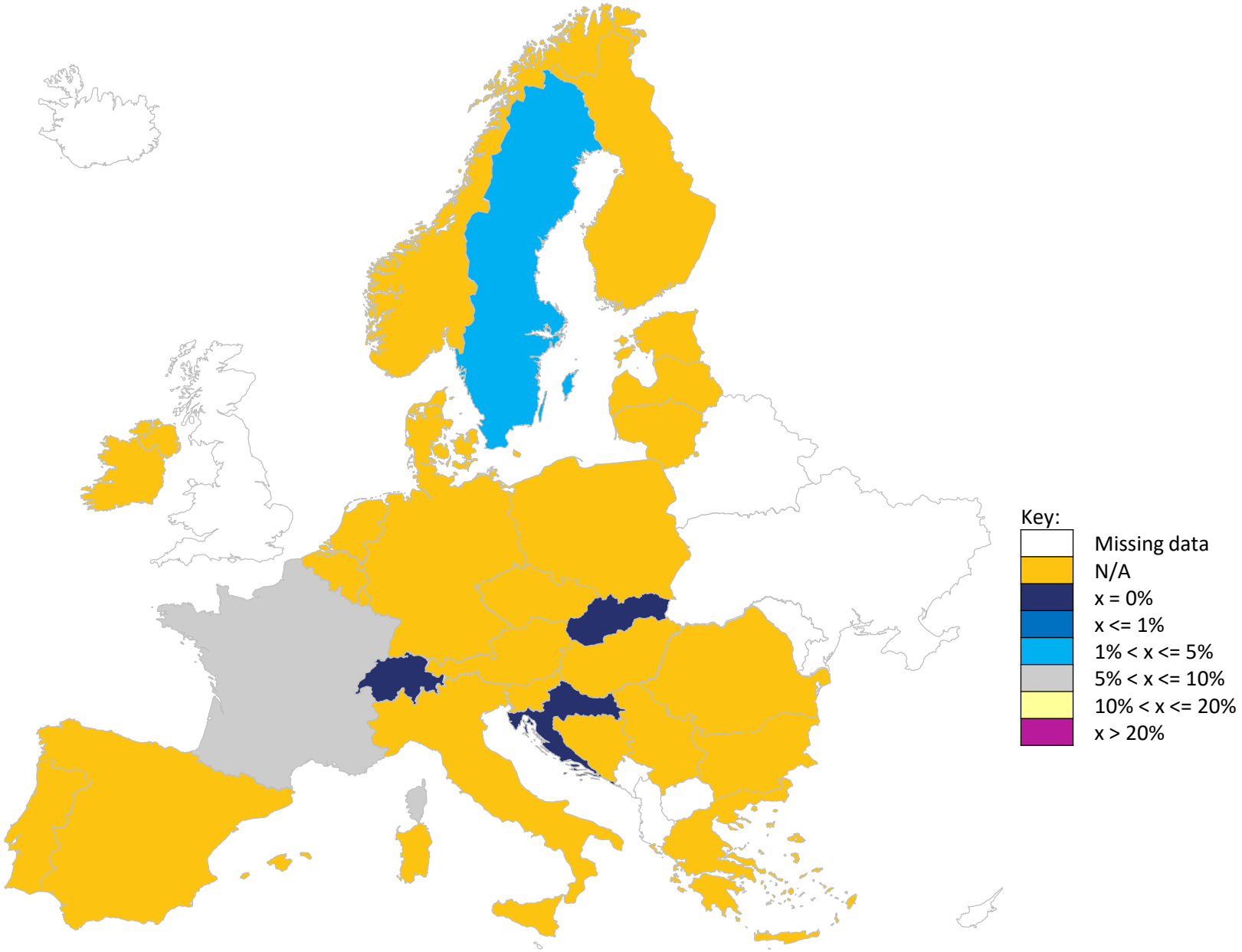
Demand-side response – What level of control of the demand side facilities does the TSO have?



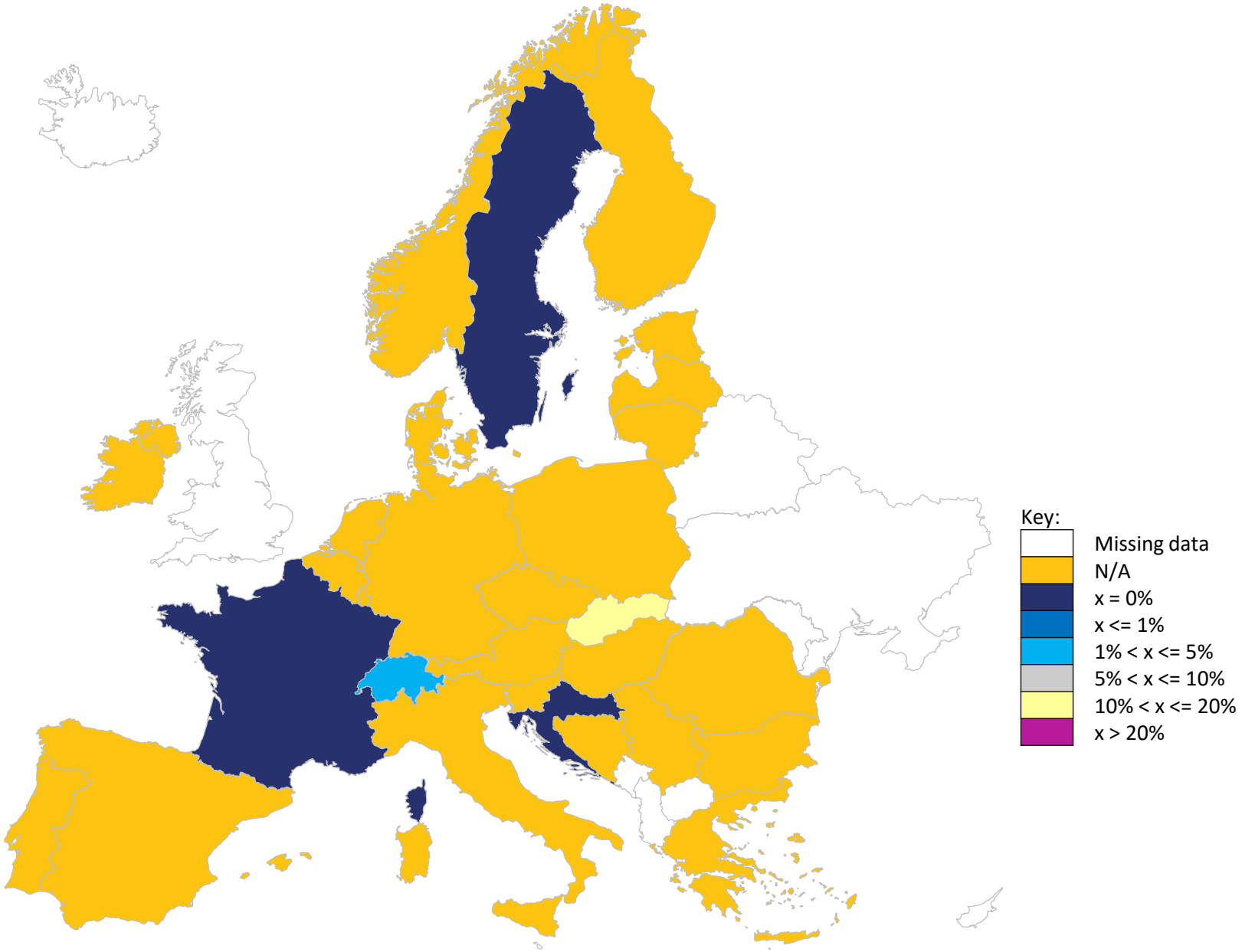
Demand-side response – Are you able to calculate share of demand-side response facilities in procured volume of balancing capacity?



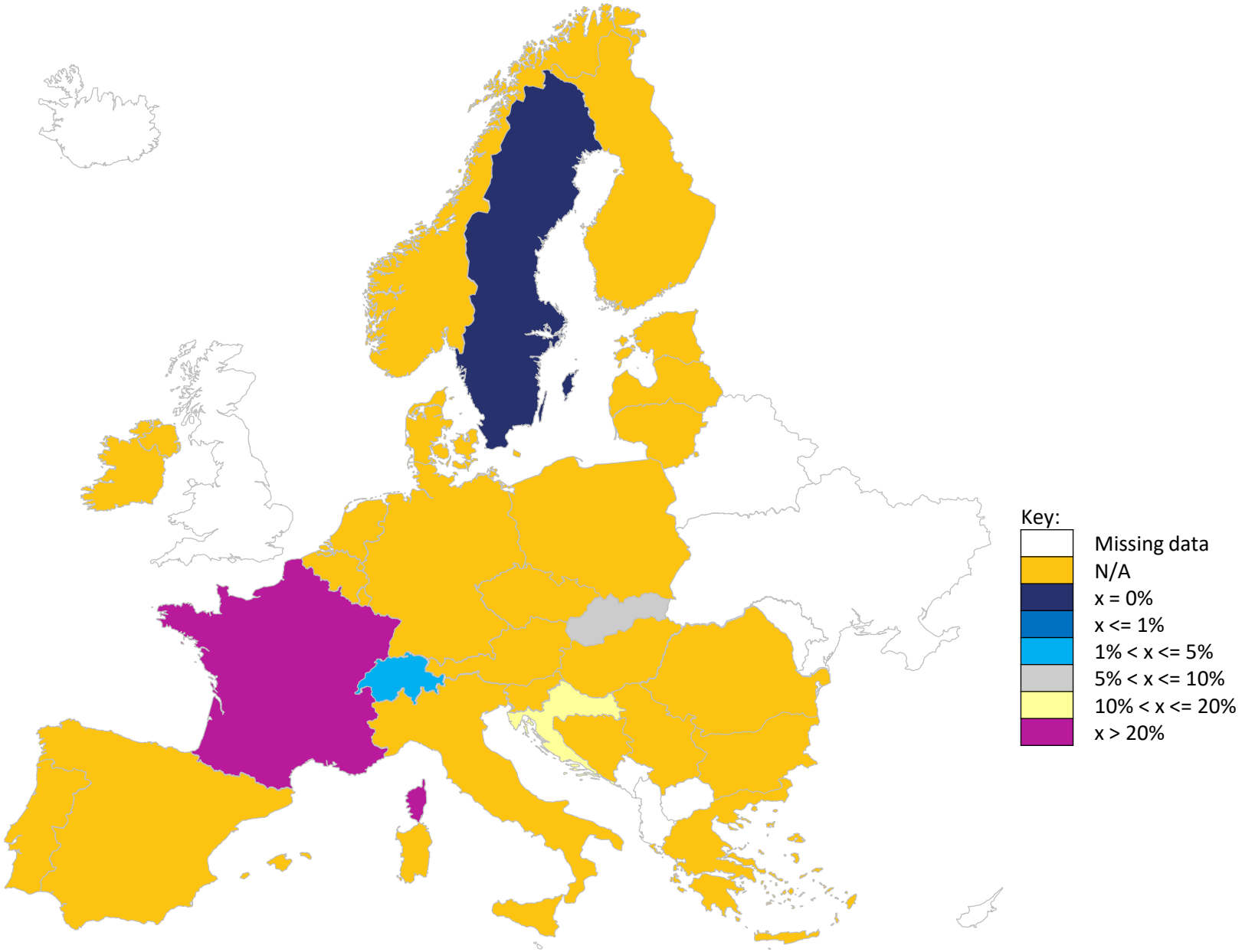
Demand-side response – What is percentage of balancing capacity volume procured from DSR facilities in comparison to total procured balancing capacity for FCR?



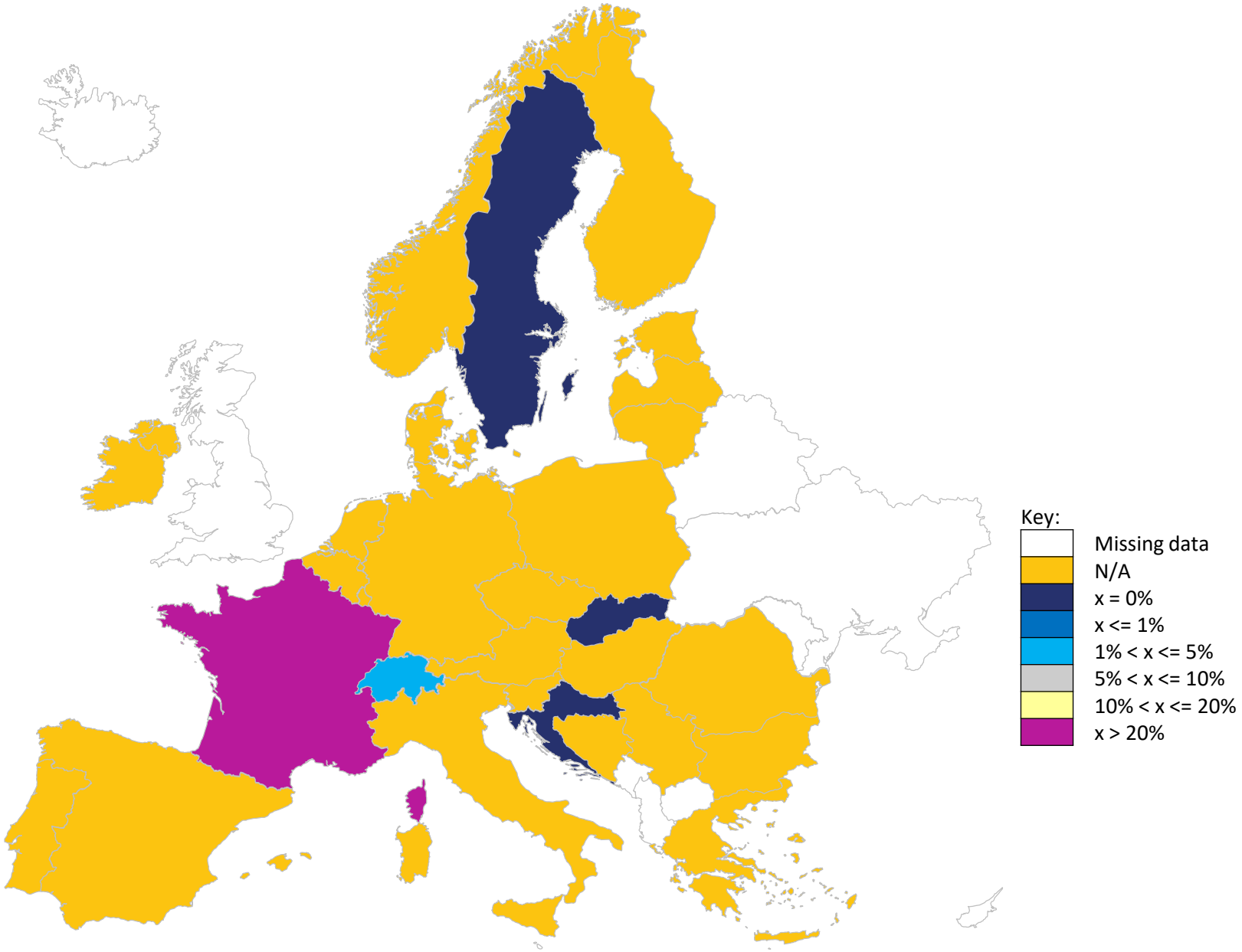
Demand-side response – What is percentage of balancing capacity volume procured from DSR facilities in comparison to total procured balancing capacity for aFRR?



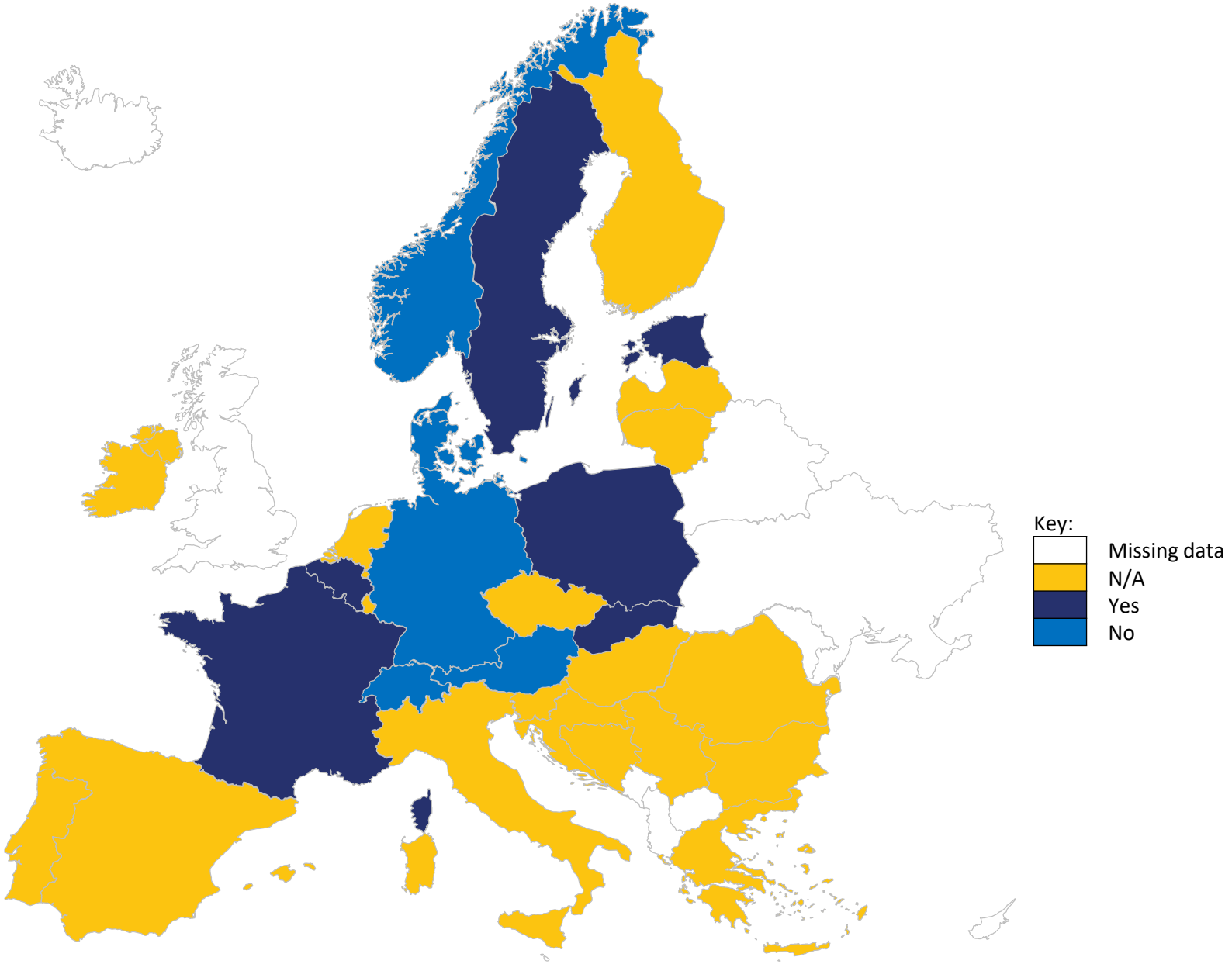
Demand-side response – What is percentage of balancing capacity volume procured from DSR facilities in comparison to total procured balancing capacity for mFRR?



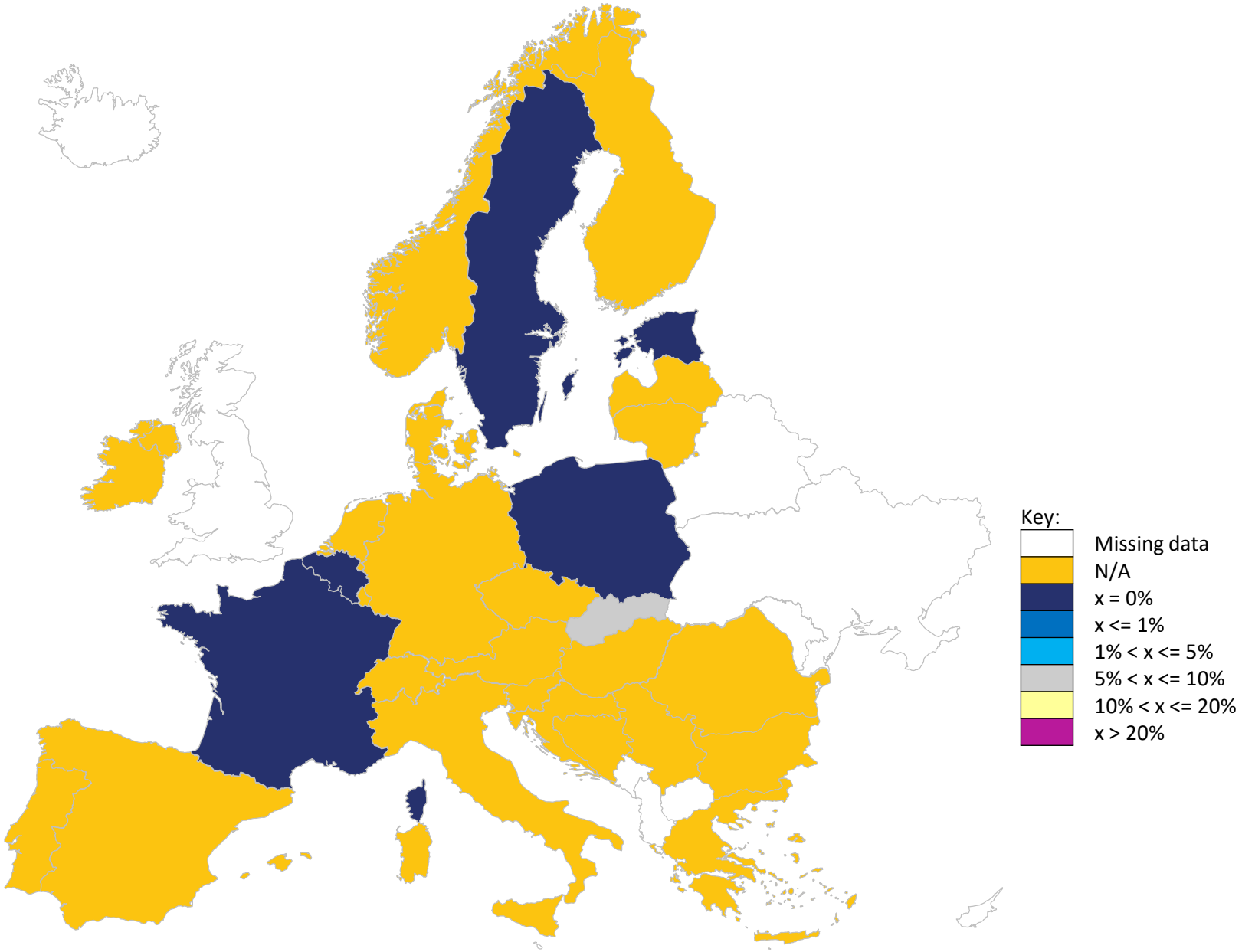
Demand-side response – What is percentage of balancing capacity volume procured from DSR facilities in comparison to total procured balancing capacity for RR?



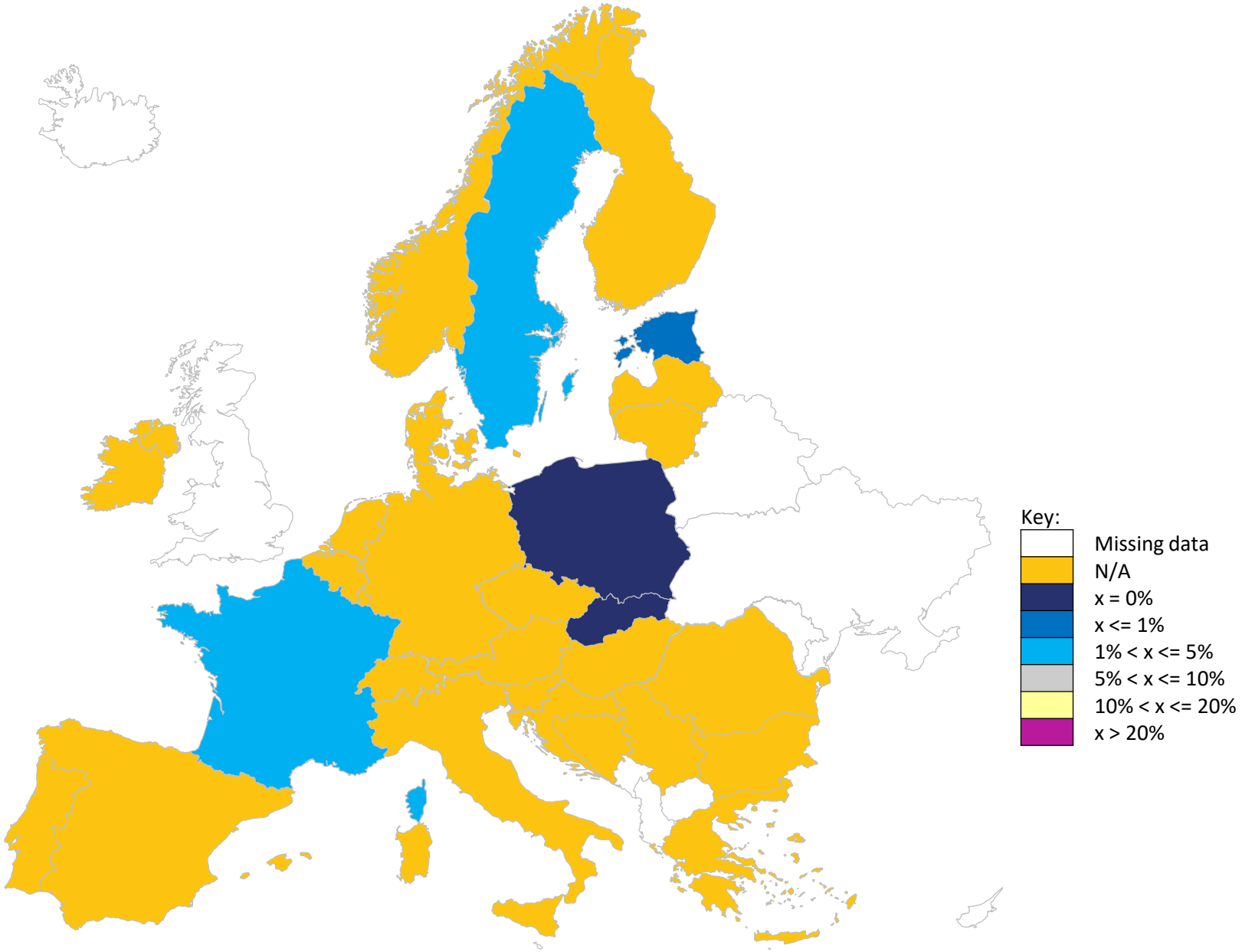
Demand-side response – Are you able to calculate share of demand-side response facilities in volume of activated balancing energy?



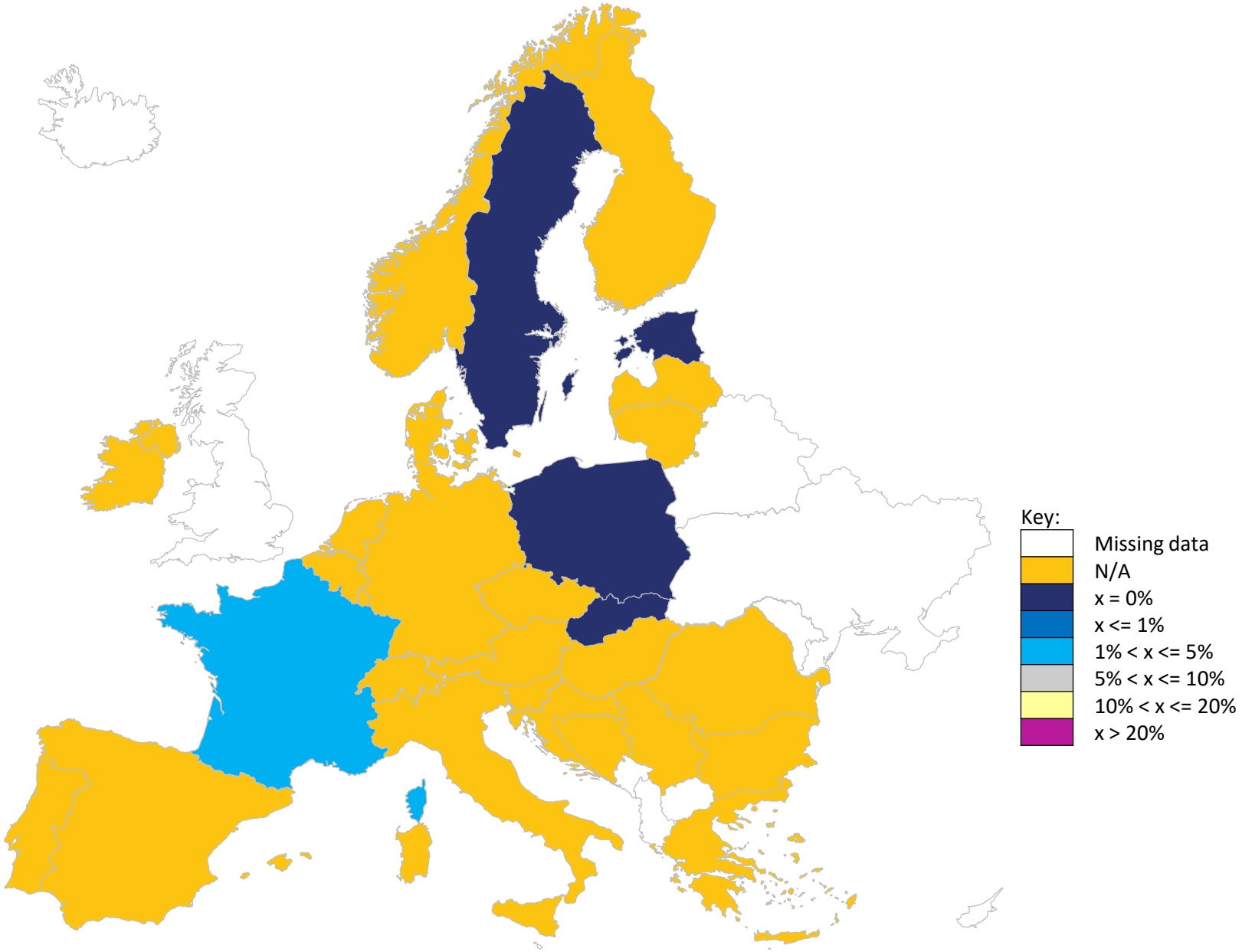
Demand-side response – What is percentage of balancing energy volume activated from demand-side response facilities in comparison to total annually activated balancing energy for aFRR?



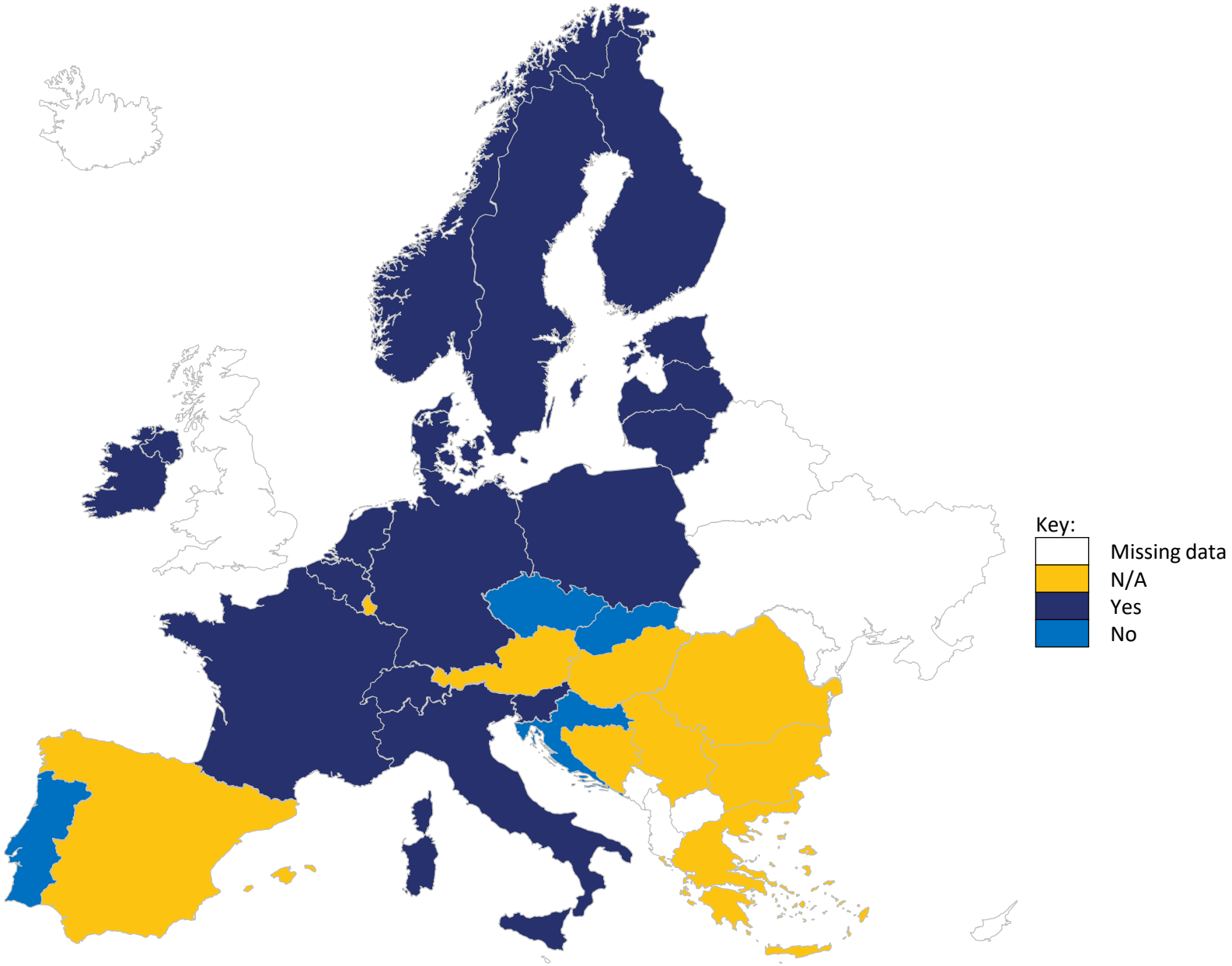
Demand-side response – What is percentage of balancing energy volume activated from demand-side response facilities in comparison to total annually activated balancing energy for mFRR?



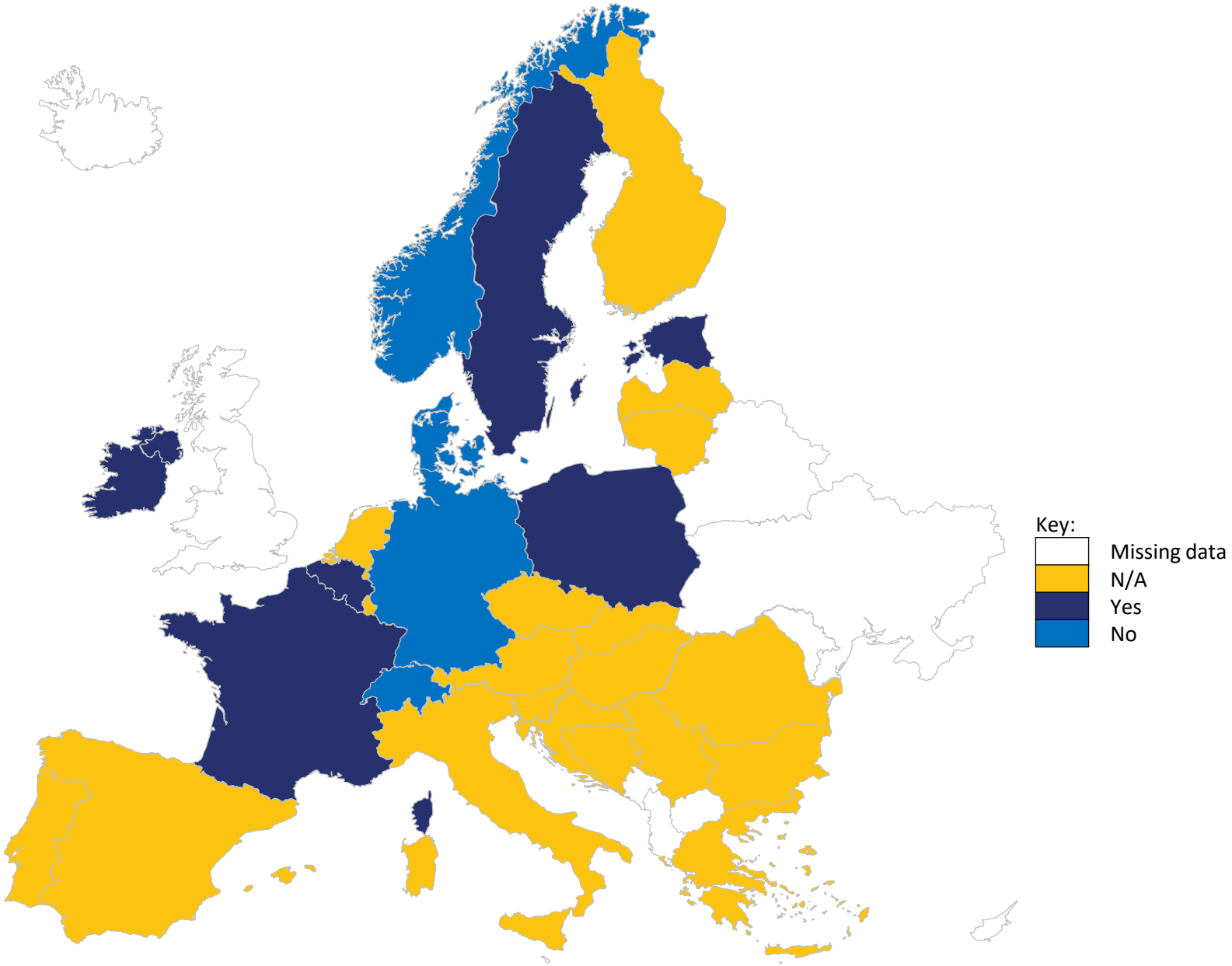
Demand-side response – What is percentage of balancing energy volume activated from demand-side response facilities in comparison to total annually activated balancing energy for RR?



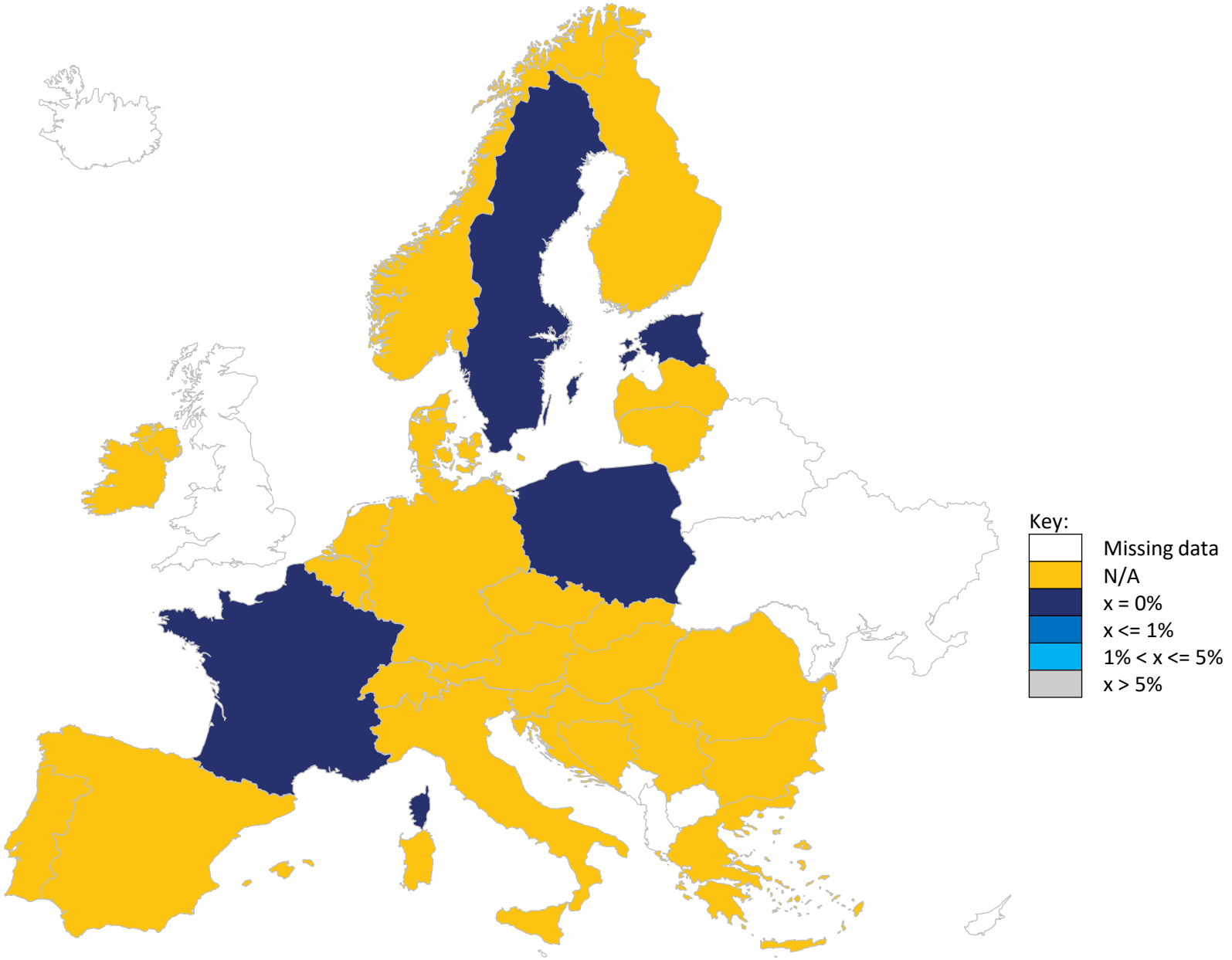
Demand-side response – Is aggregation of demand facilities allowed?



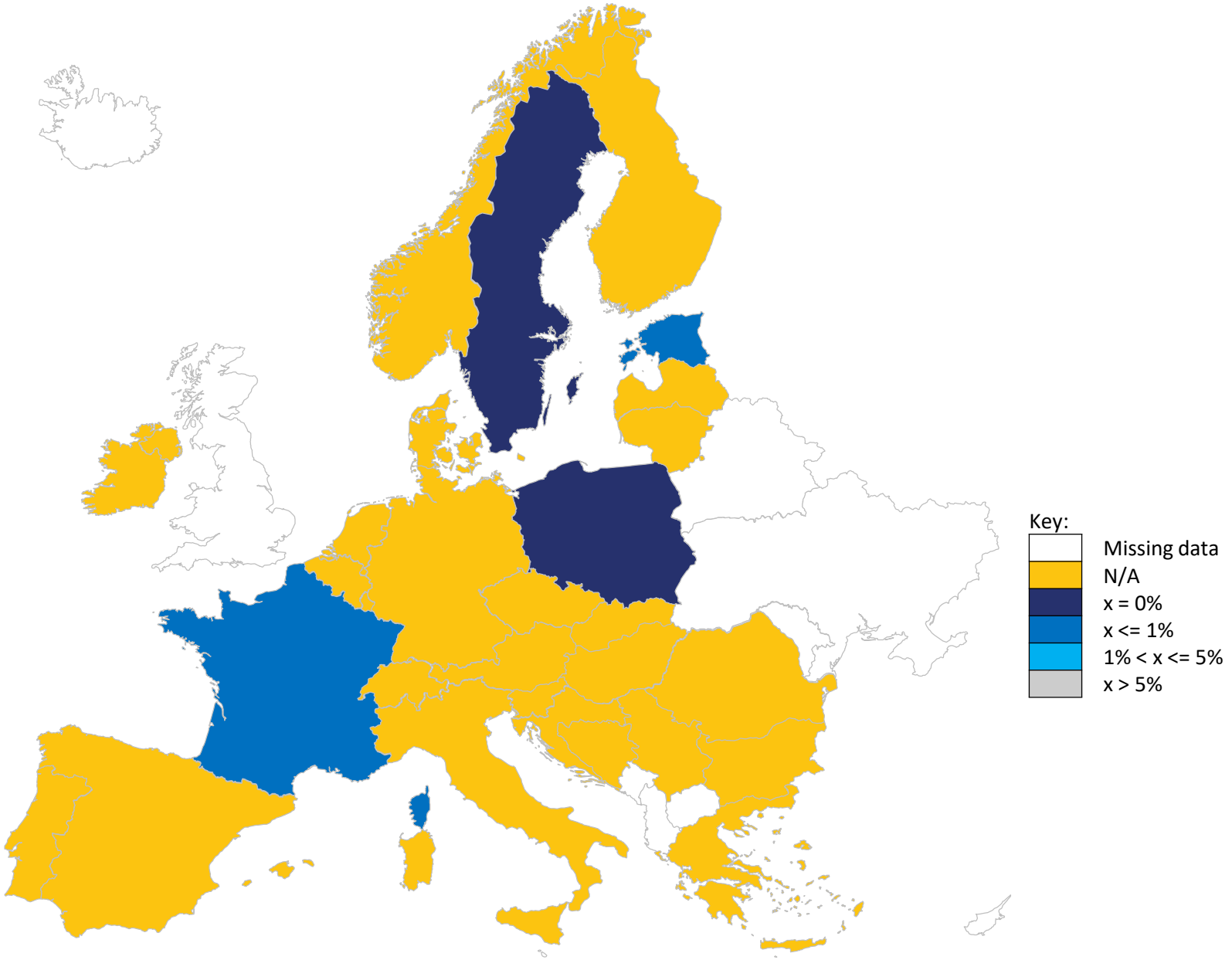
Demand-side response – Are you able to calculate share of activated balancing energy from demand-side aggregation facilities in comparison to total volume of activated balancing energy?



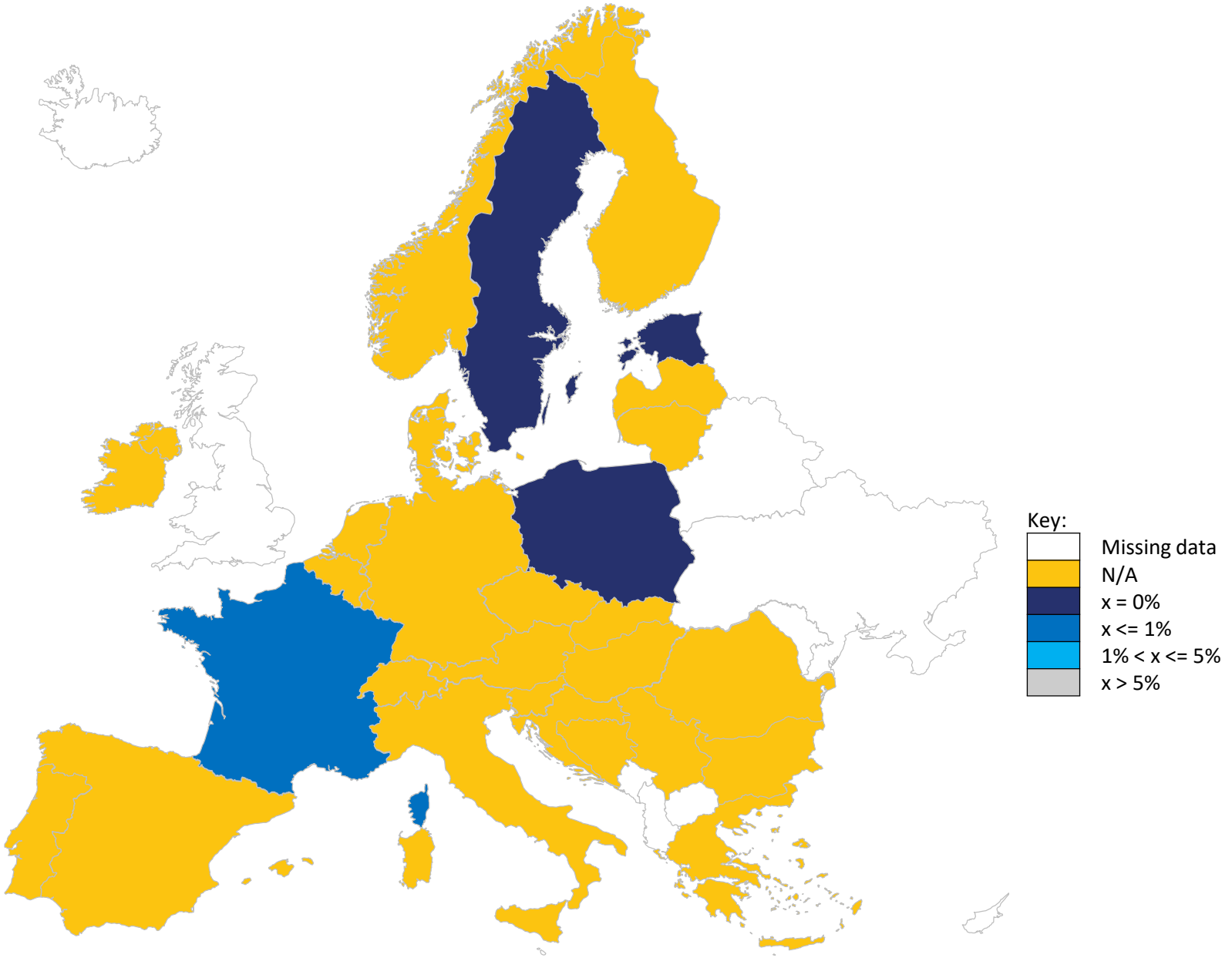
Demand-side response – What is percentage of balancing energy activated from demand-side aggregation facilities in comparison to total activated balancing energy for aFRR?



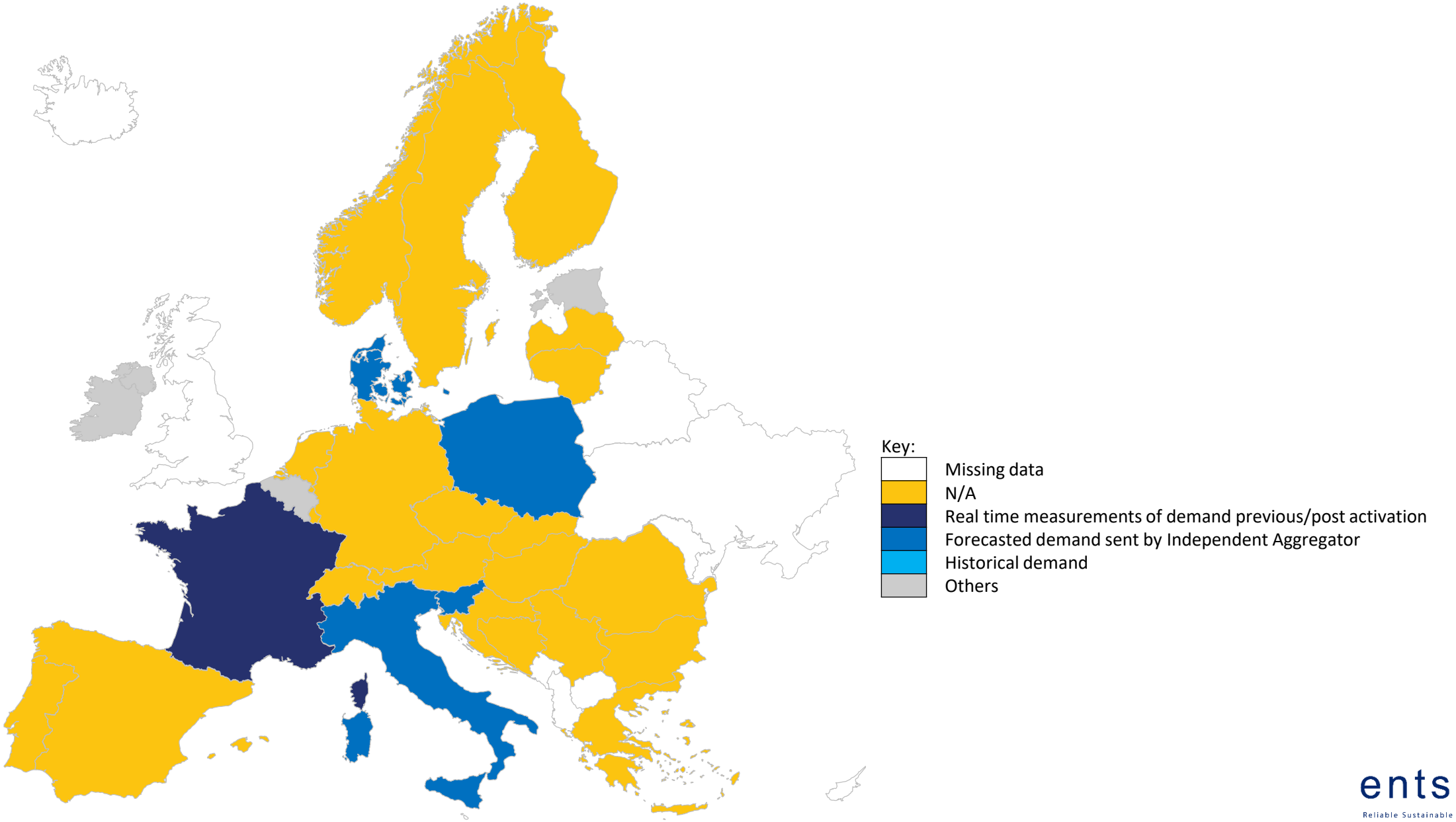
Demand-side response – What is percentage of balancing energy activated from demand-side aggregation facilities in comparison to total activated balancing energy for mFRR?



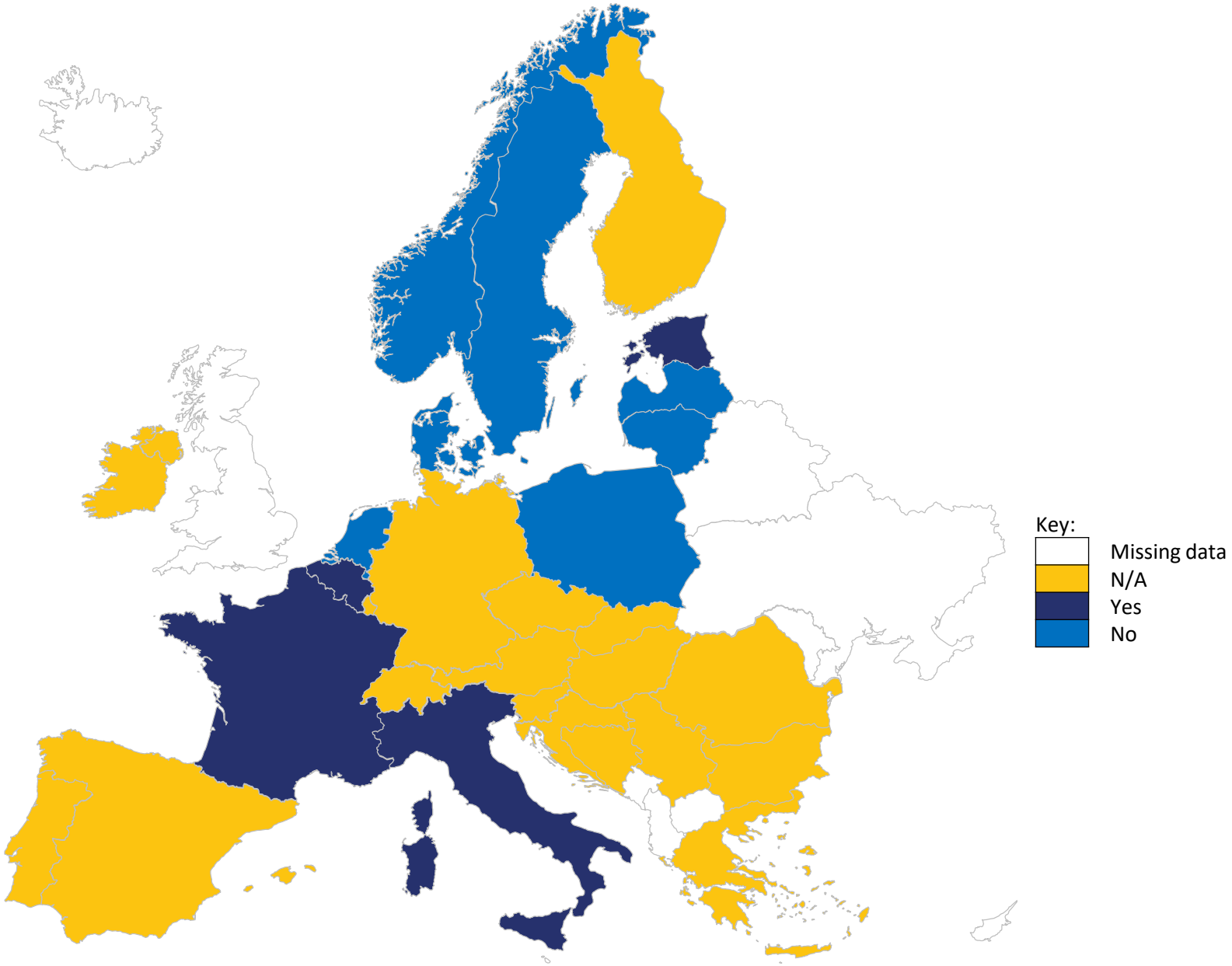
Demand-side response – What is percentage of balancing energy activated from demand-side aggregation facilities in comparison to total activated balancing energy for RR?



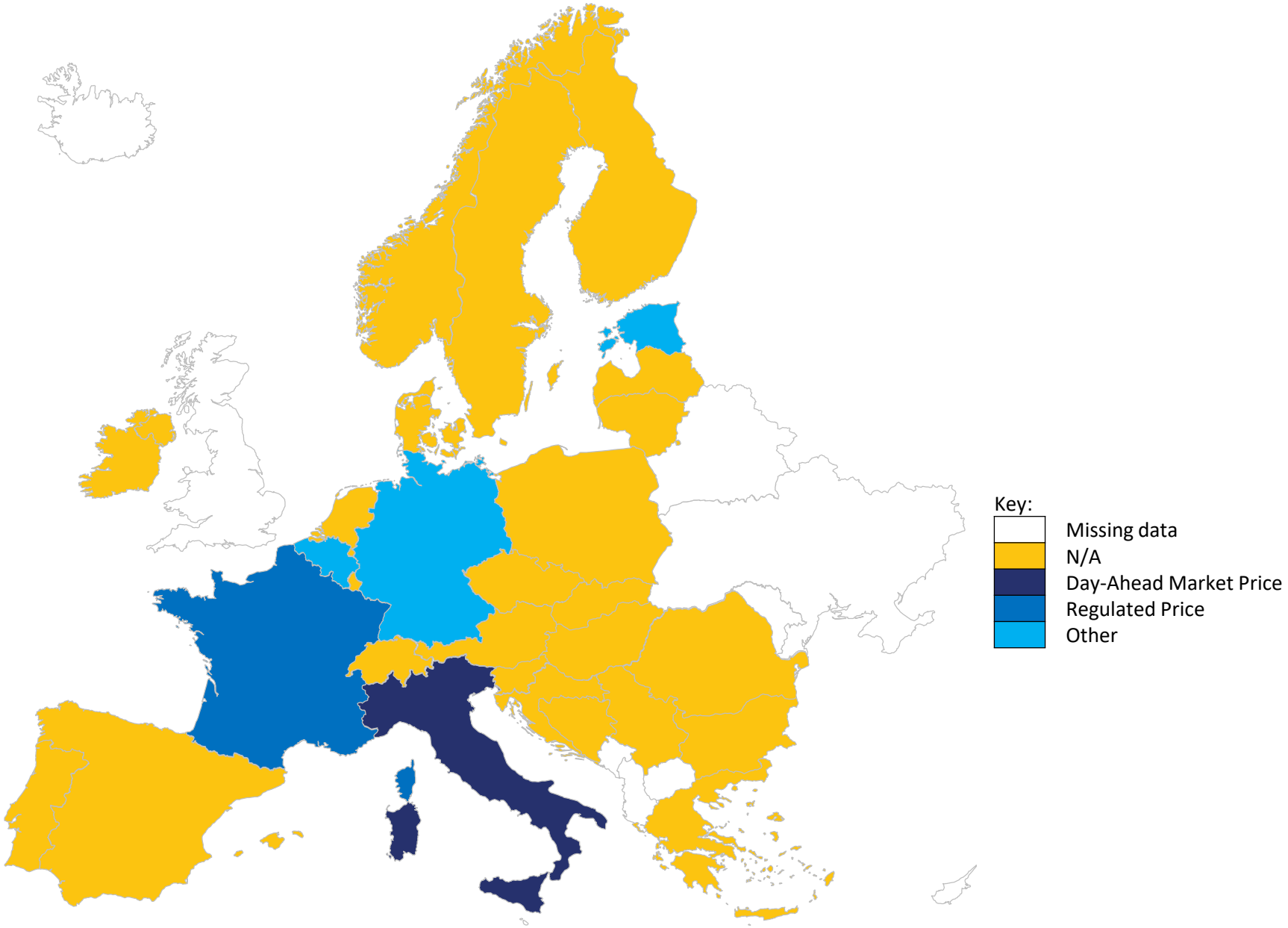
Demand-side response – In case of demand-side aggregation facilities, baseline mechanism used in your country?



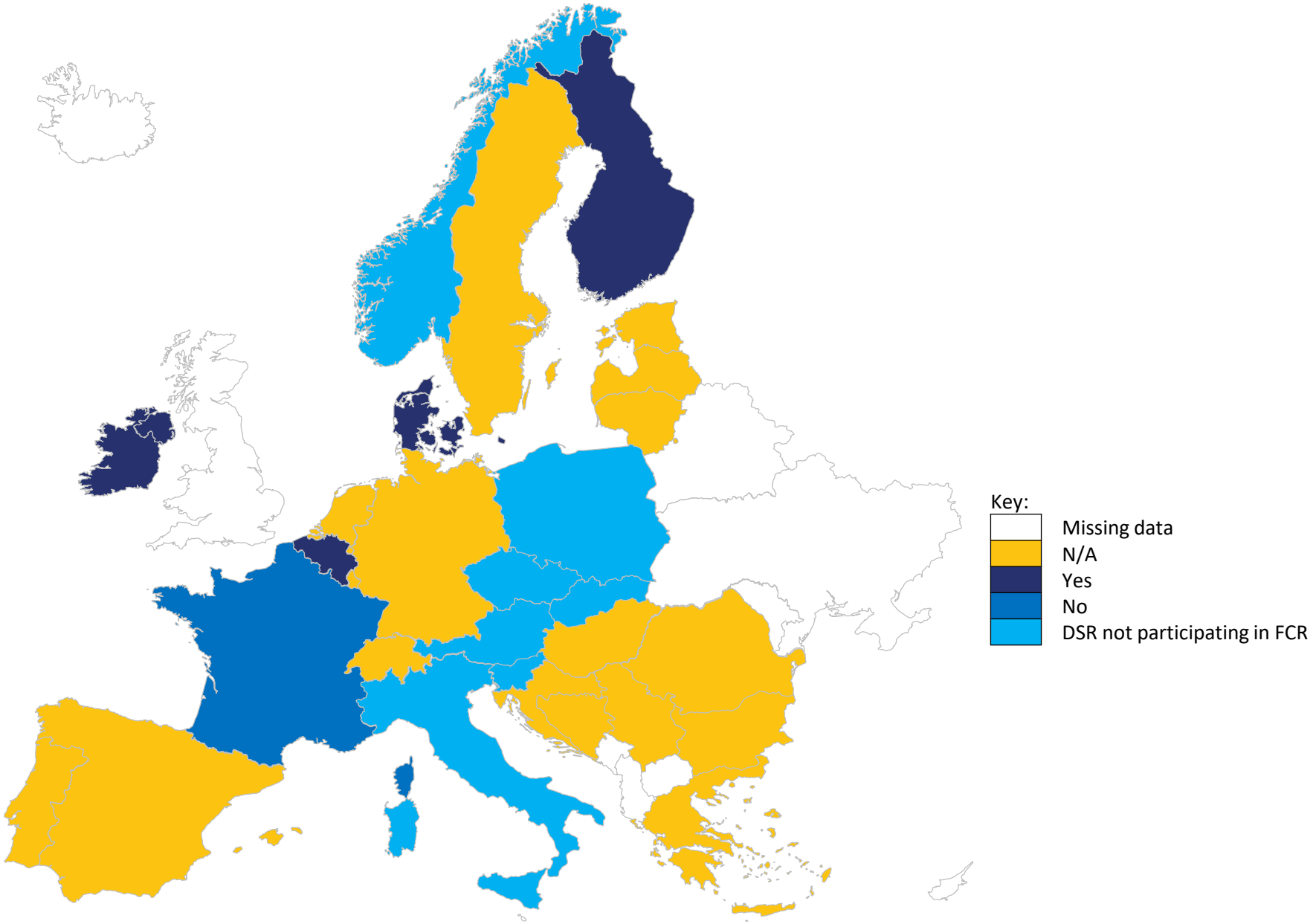
Demand-side response – In case of demand-side aggregation facilities, is there a compensation mechanism in your country?



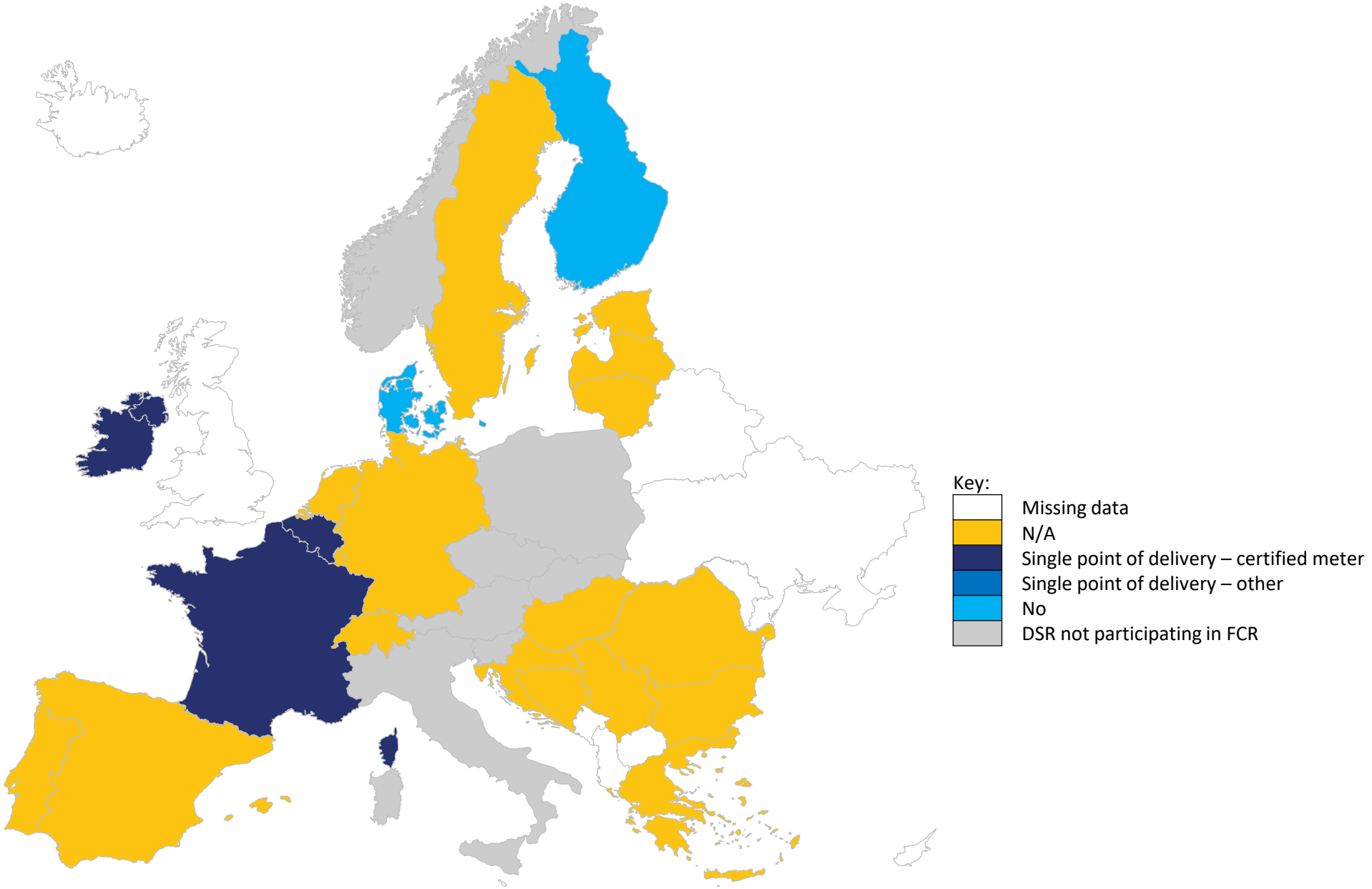
Demand-side response – What type of compensation mechanism is used for demand-side aggregation facilities?



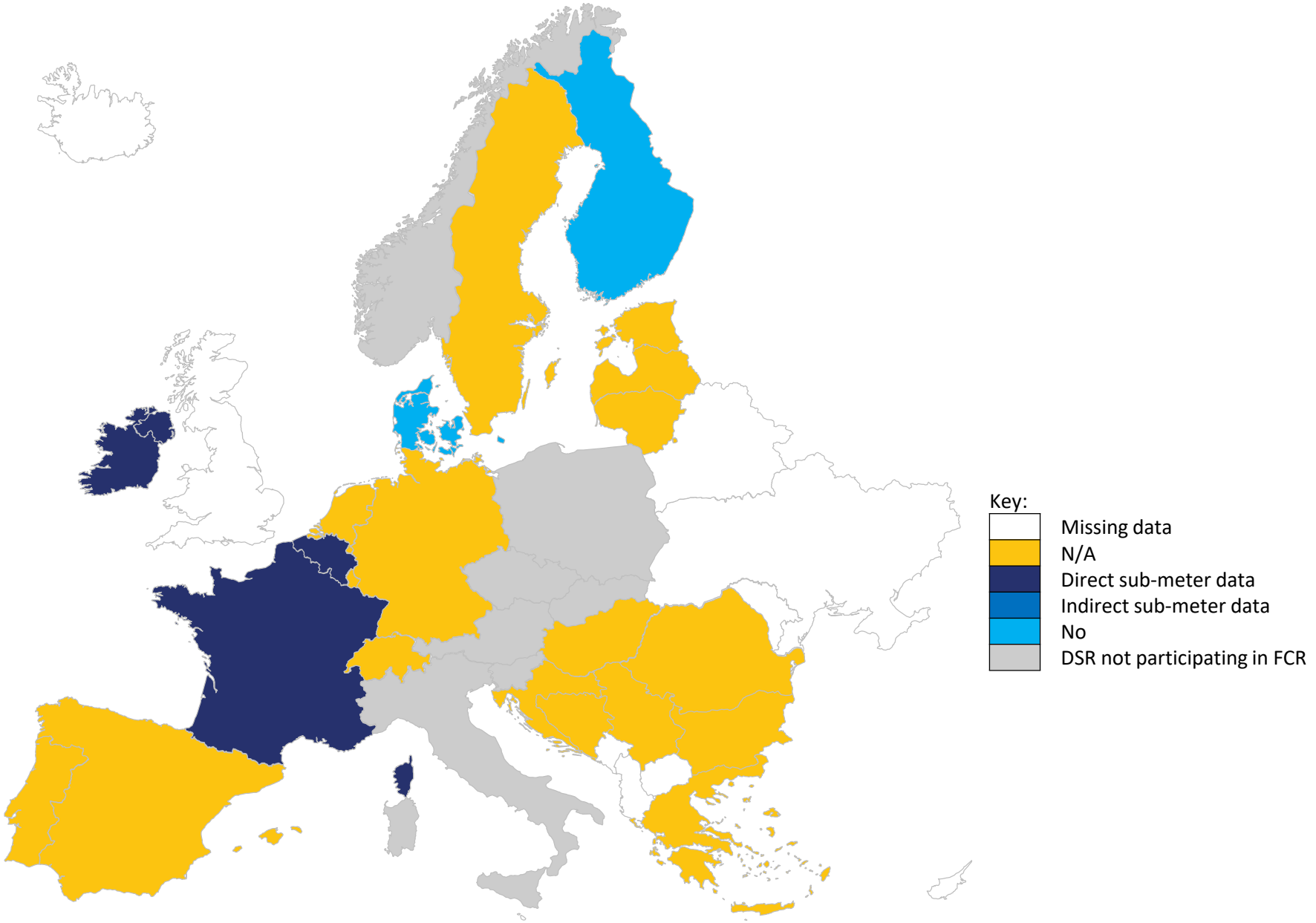
Demand-side response – Monitoring of aggregation facilities – if case DSR participates in FCR – Aggregated data



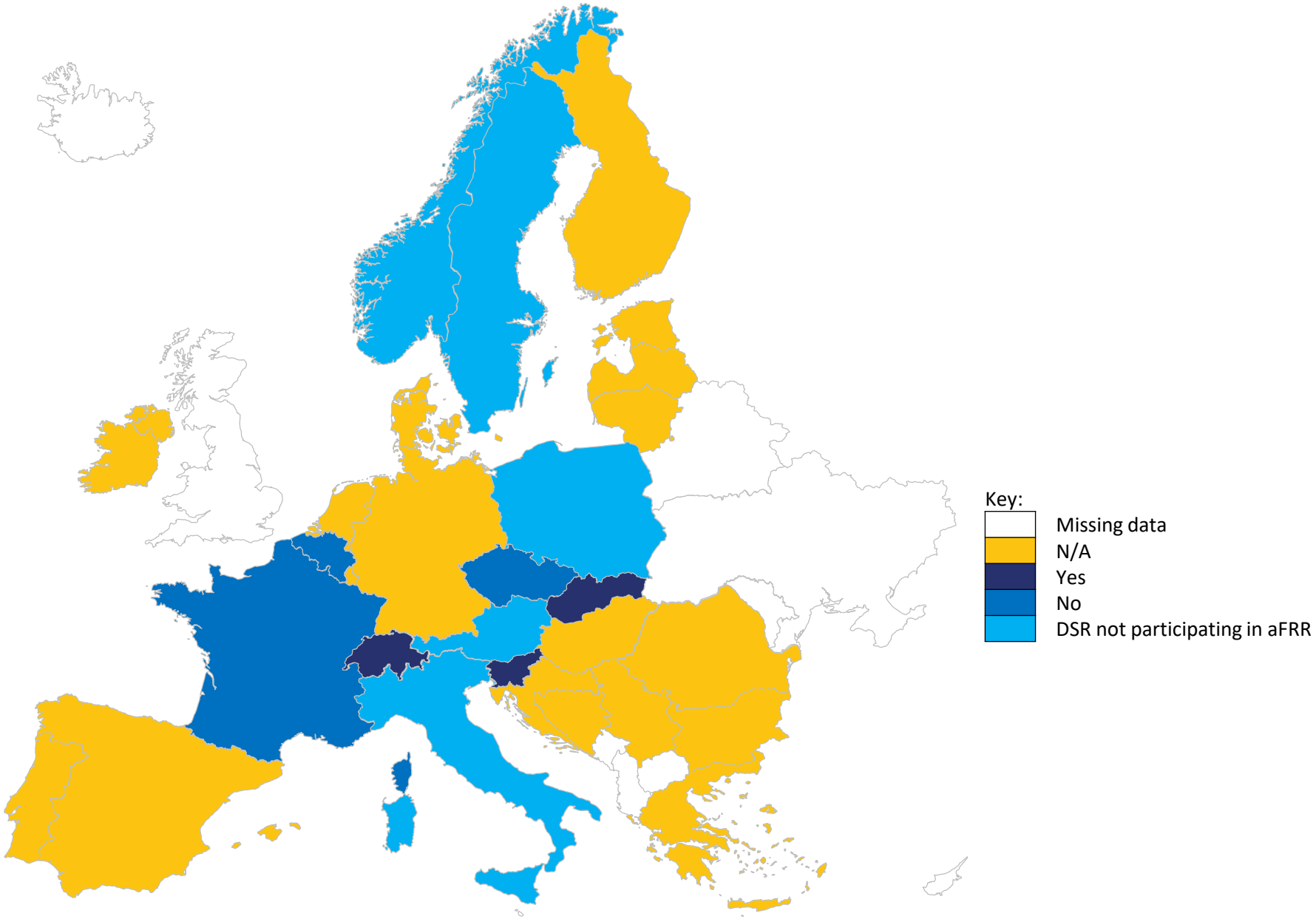
Demand-side response – Monitoring of aggregation facilities – if case DSR participates in FCR – Single point of delivery



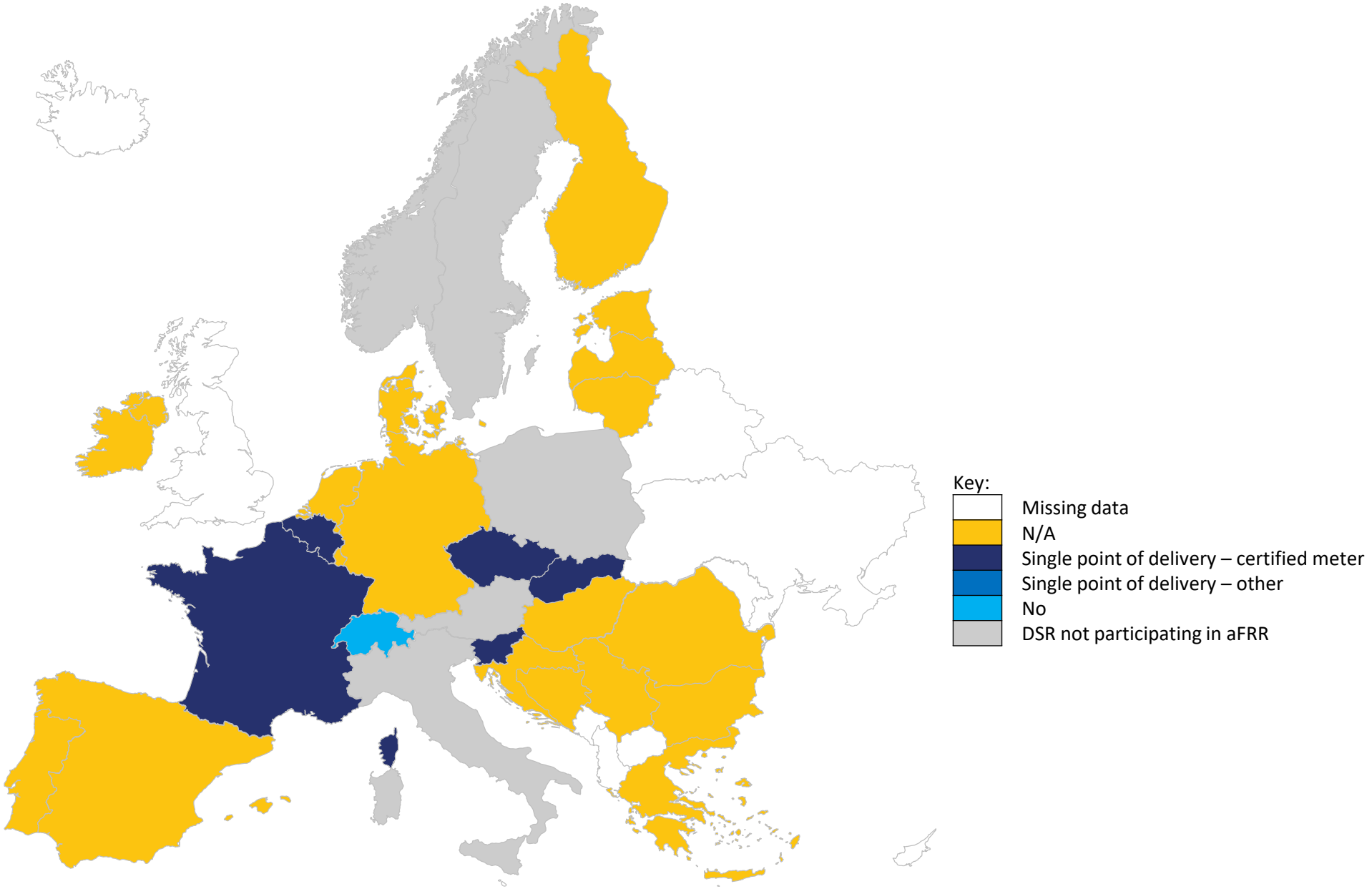
Demand-side response – Monitoring of aggregation facilities – if case DSR participates in FCR – Direct/Indirect sub-meter data



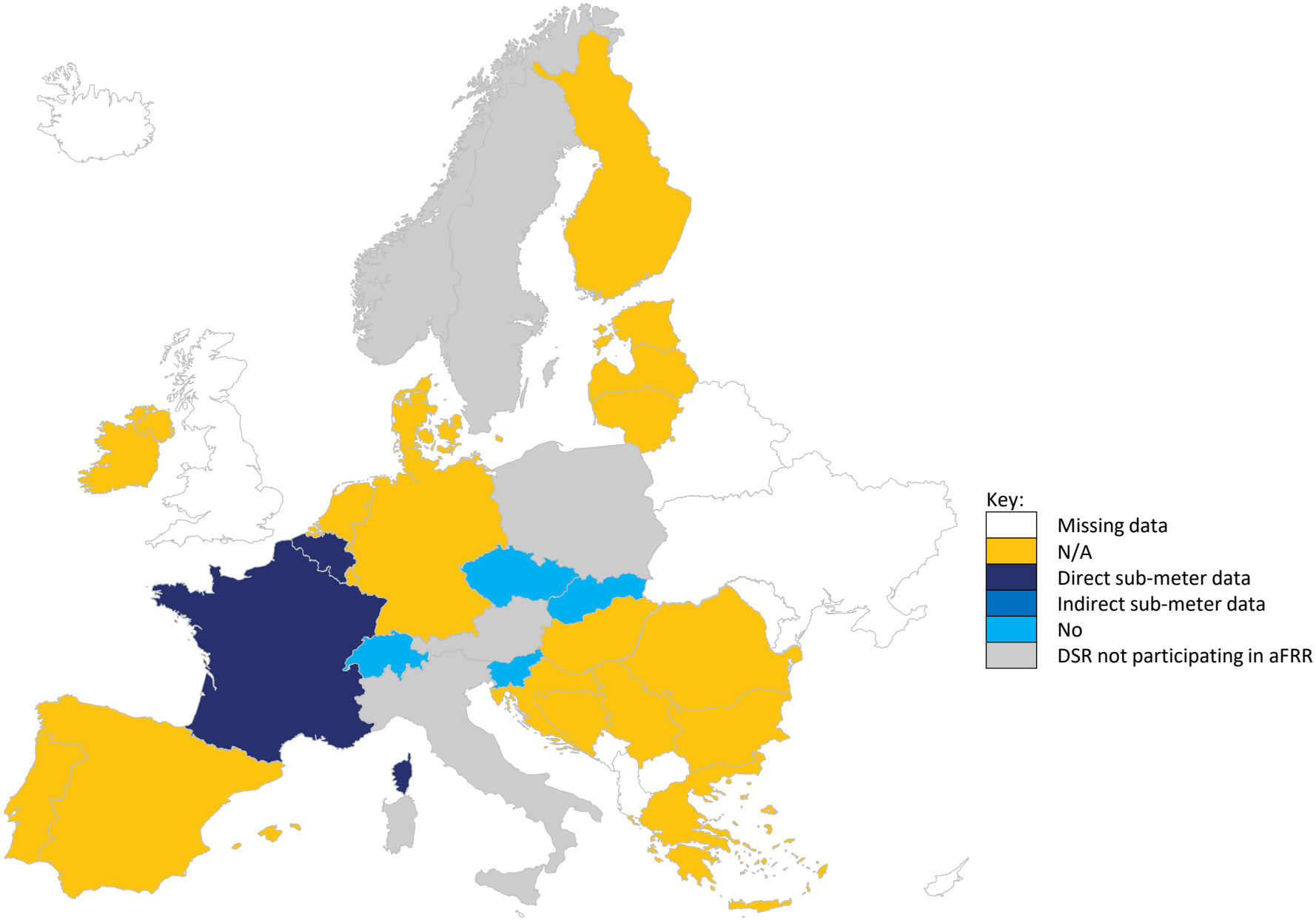
Demand-side response – Monitoring of aggregation facilities – if case DSR participates in aFRR – Aggregated data



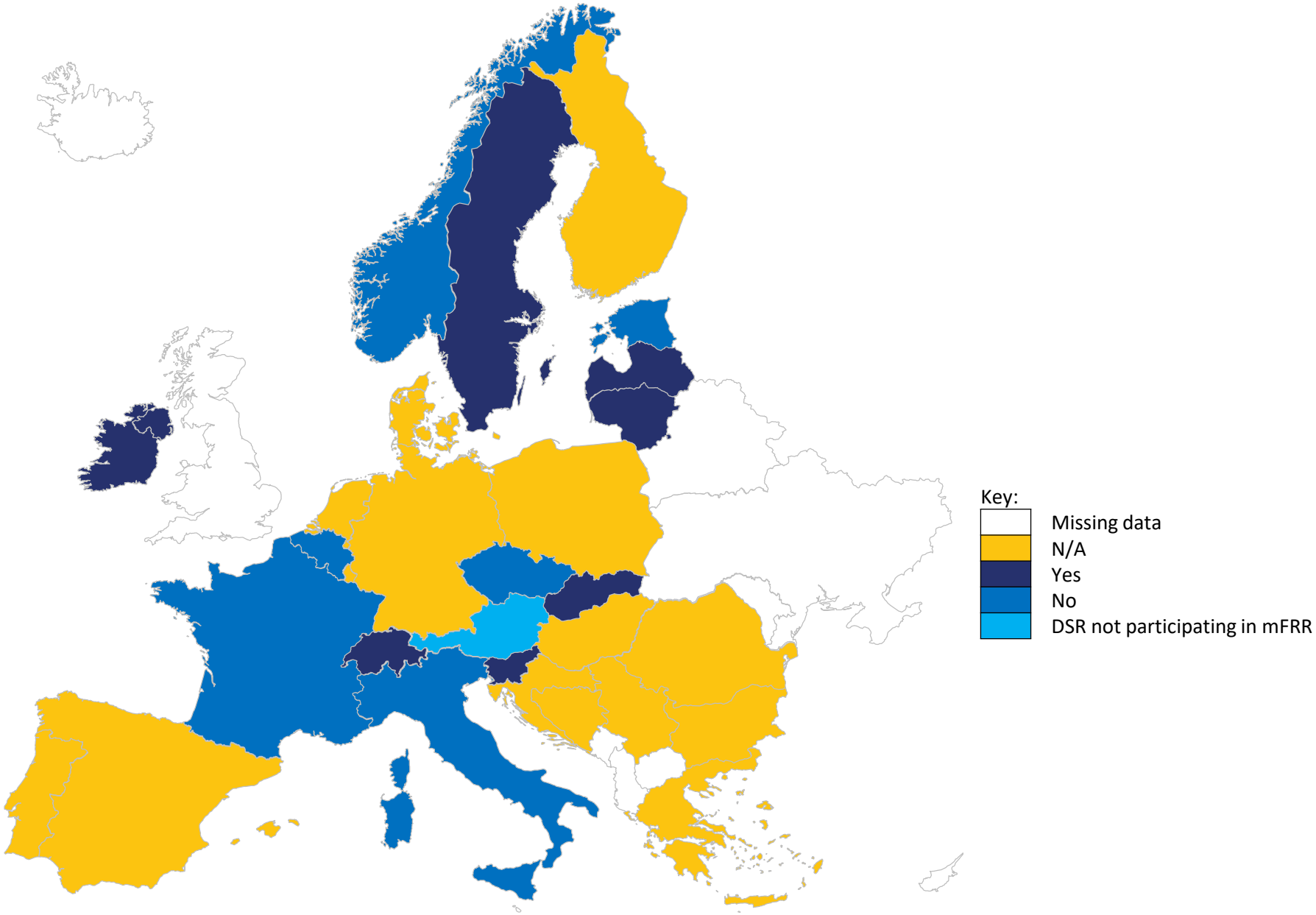
Demand-side response – Monitoring of aggregation facilities – if case DSR participates in aFRR – Single point of delivery



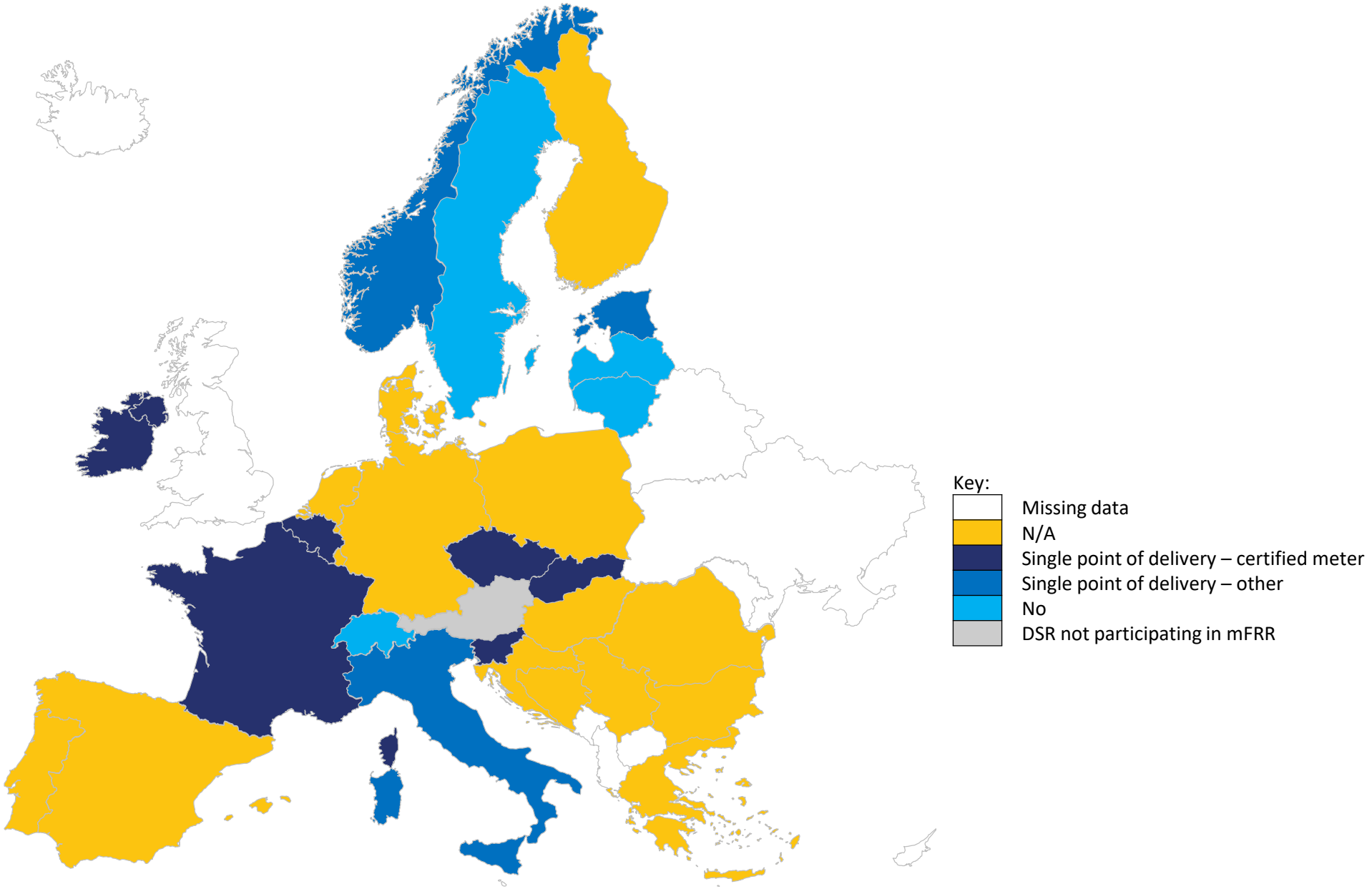
Demand-side response – Monitoring of aggregation facilities – if case DSR participates in aFRR – Direct/Indirect sub-meter data



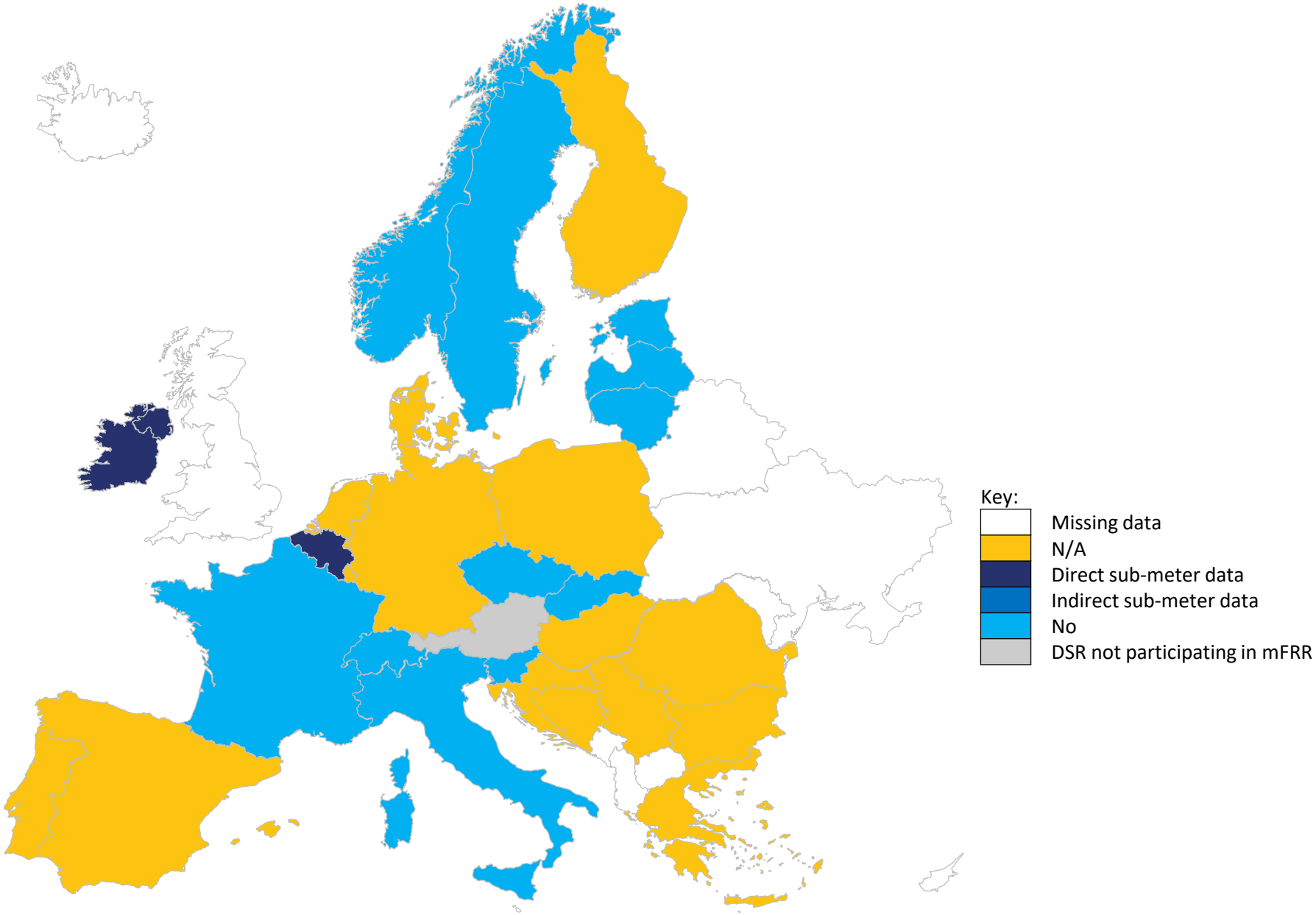
Demand-side response – Monitoring of aggregation facilities – if case DSR participates in mFRR – Aggregated data



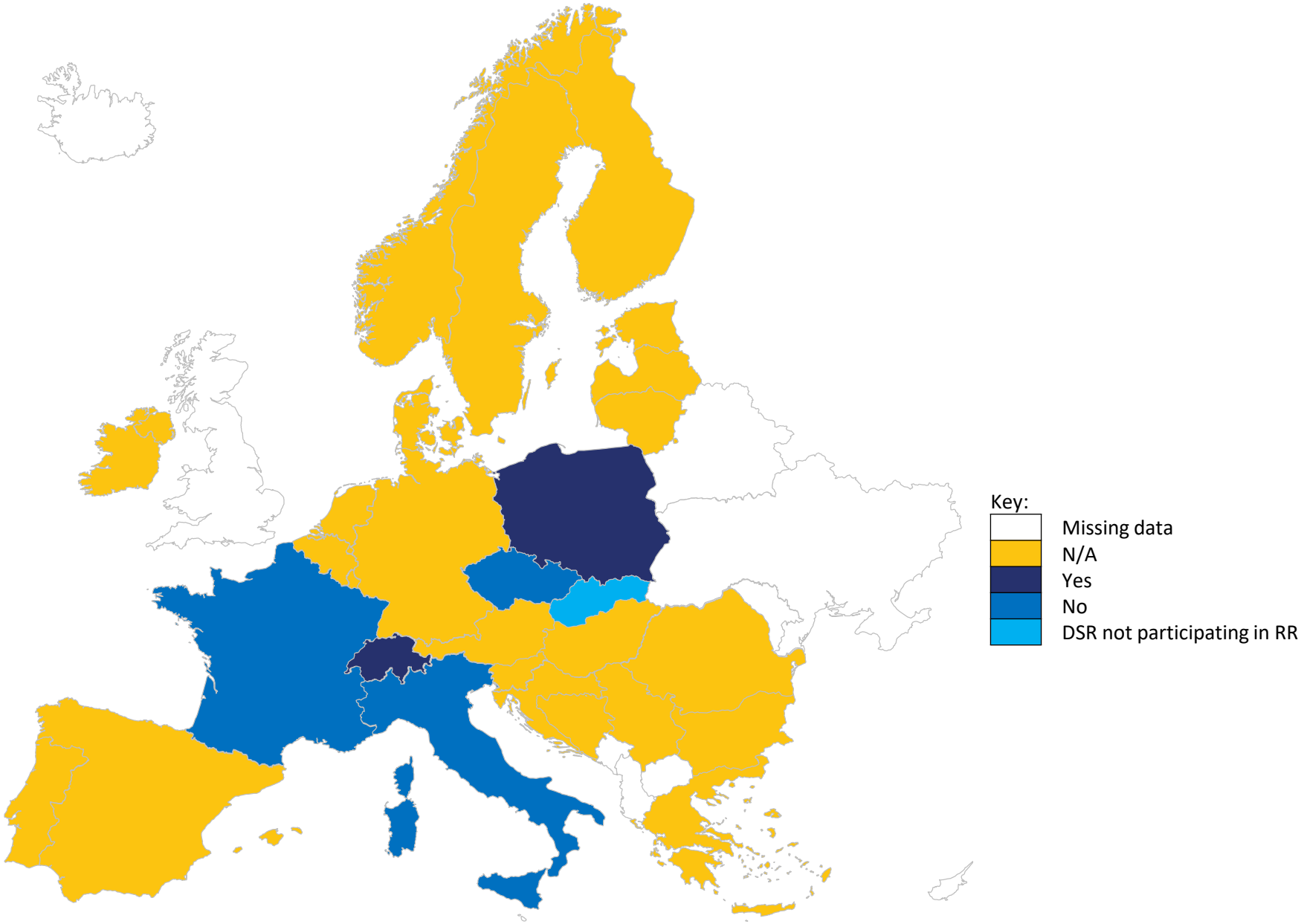
Demand-side response – Monitoring of aggregation facilities – if case DSR participates in mFRR – Single point of delivery



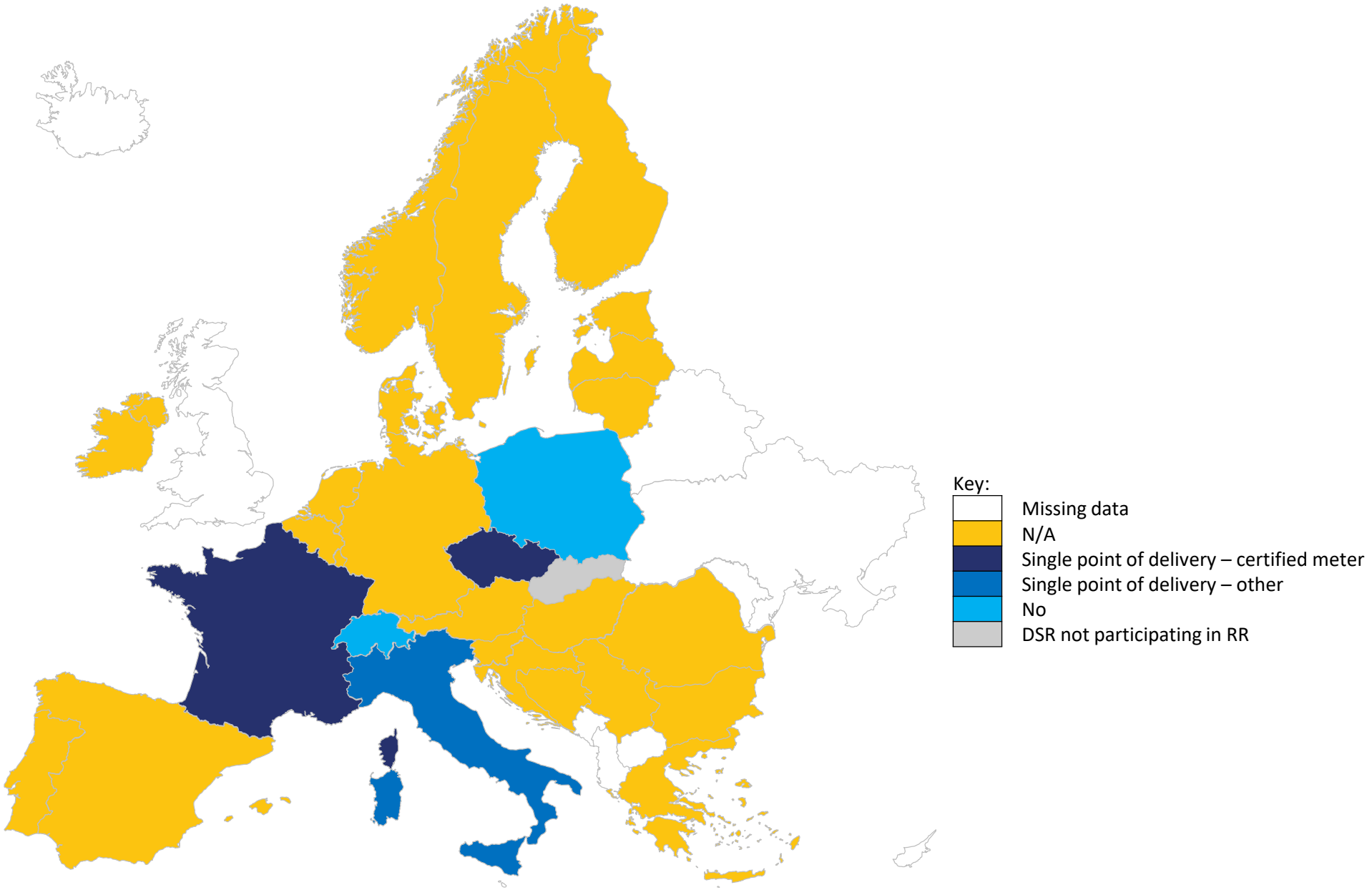
Demand-side response – Monitoring of aggregation facilities – if case DSR participates in mFRR – Direct/Indirect sub-meter data



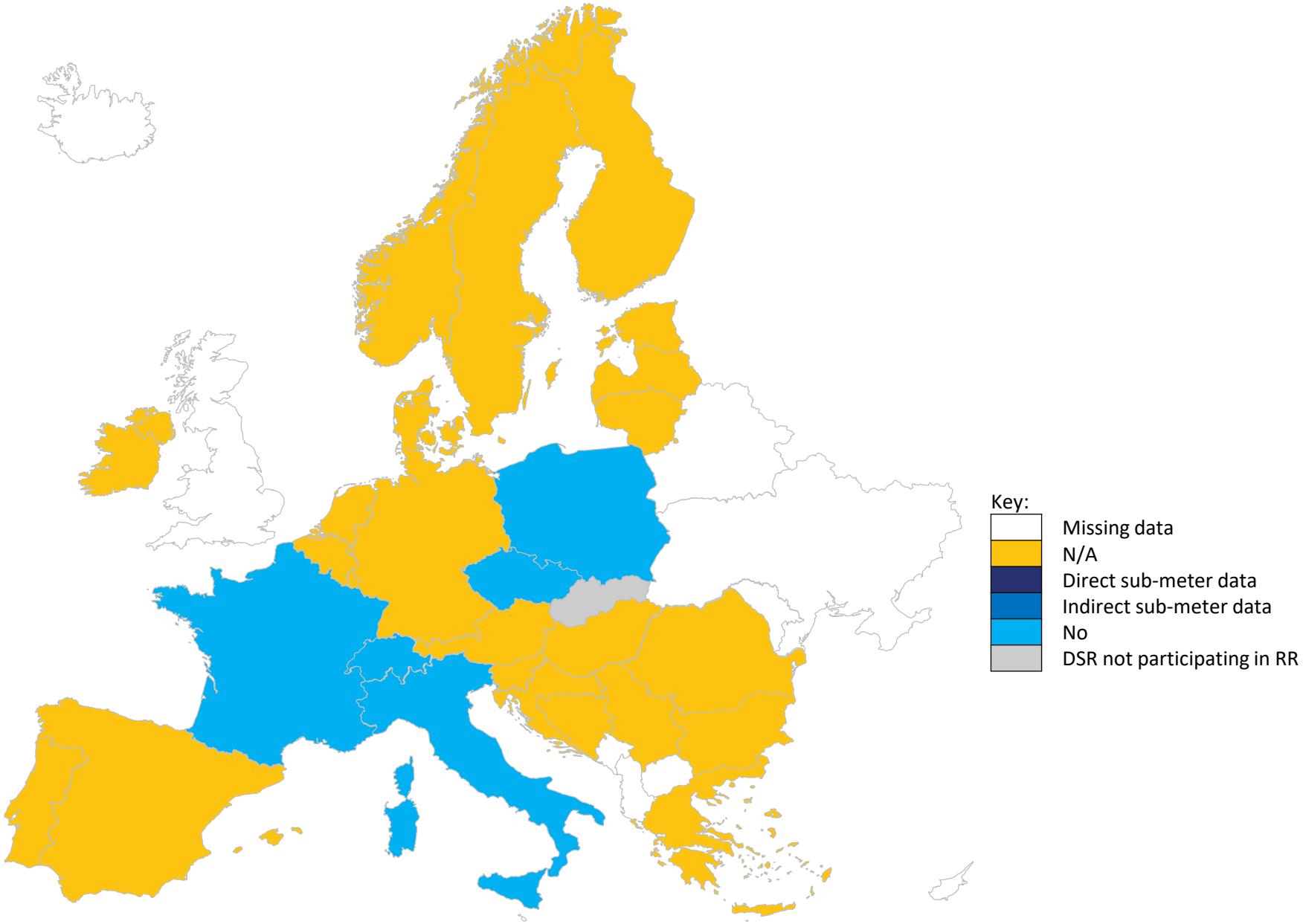
Demand-side response – Monitoring of aggregation facilities – if case DSR participates in RR – Aggregated data



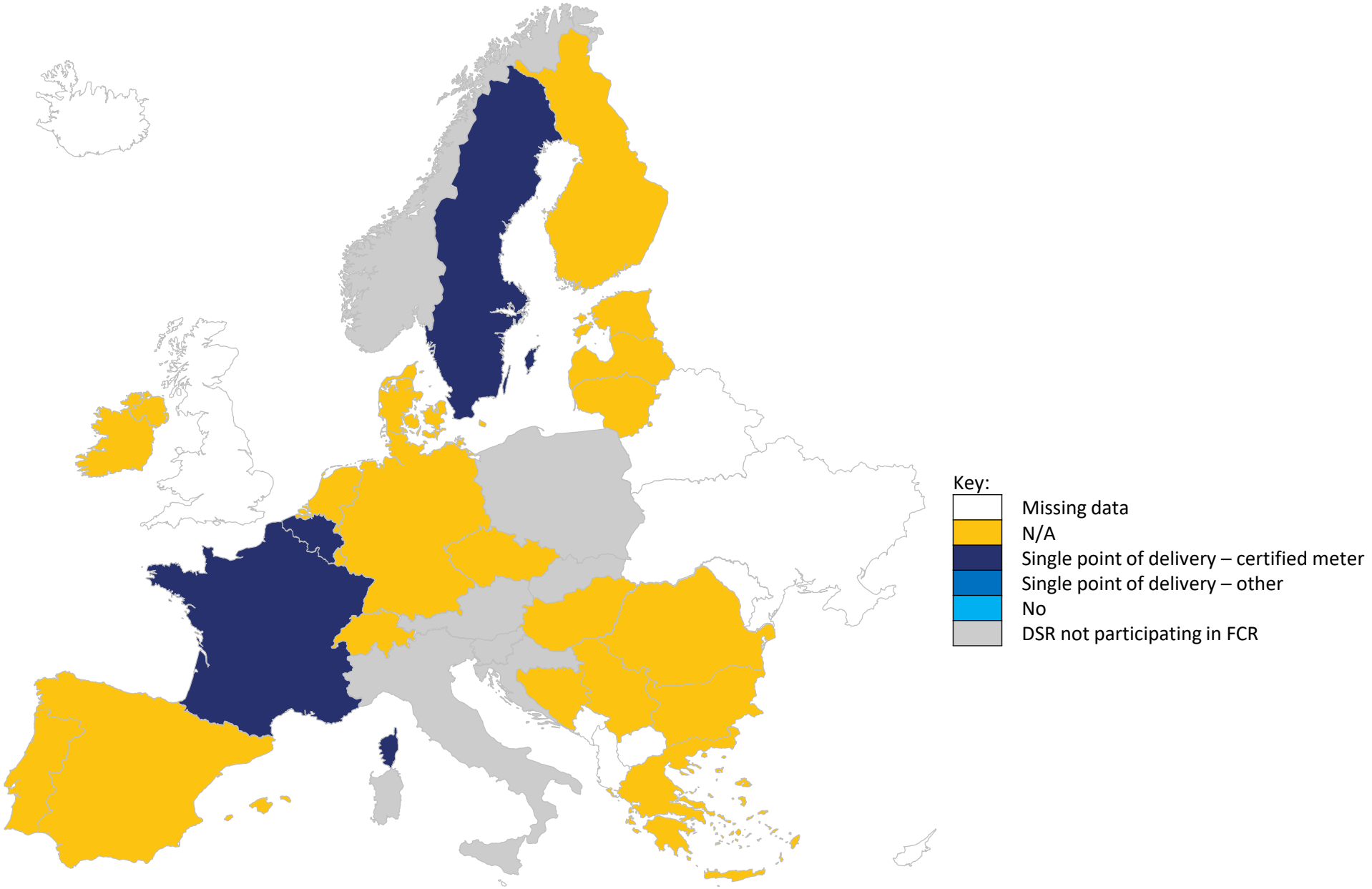
Demand-side response – Monitoring of aggregation facilities – if case DSR participates in RR – Single point of delivery



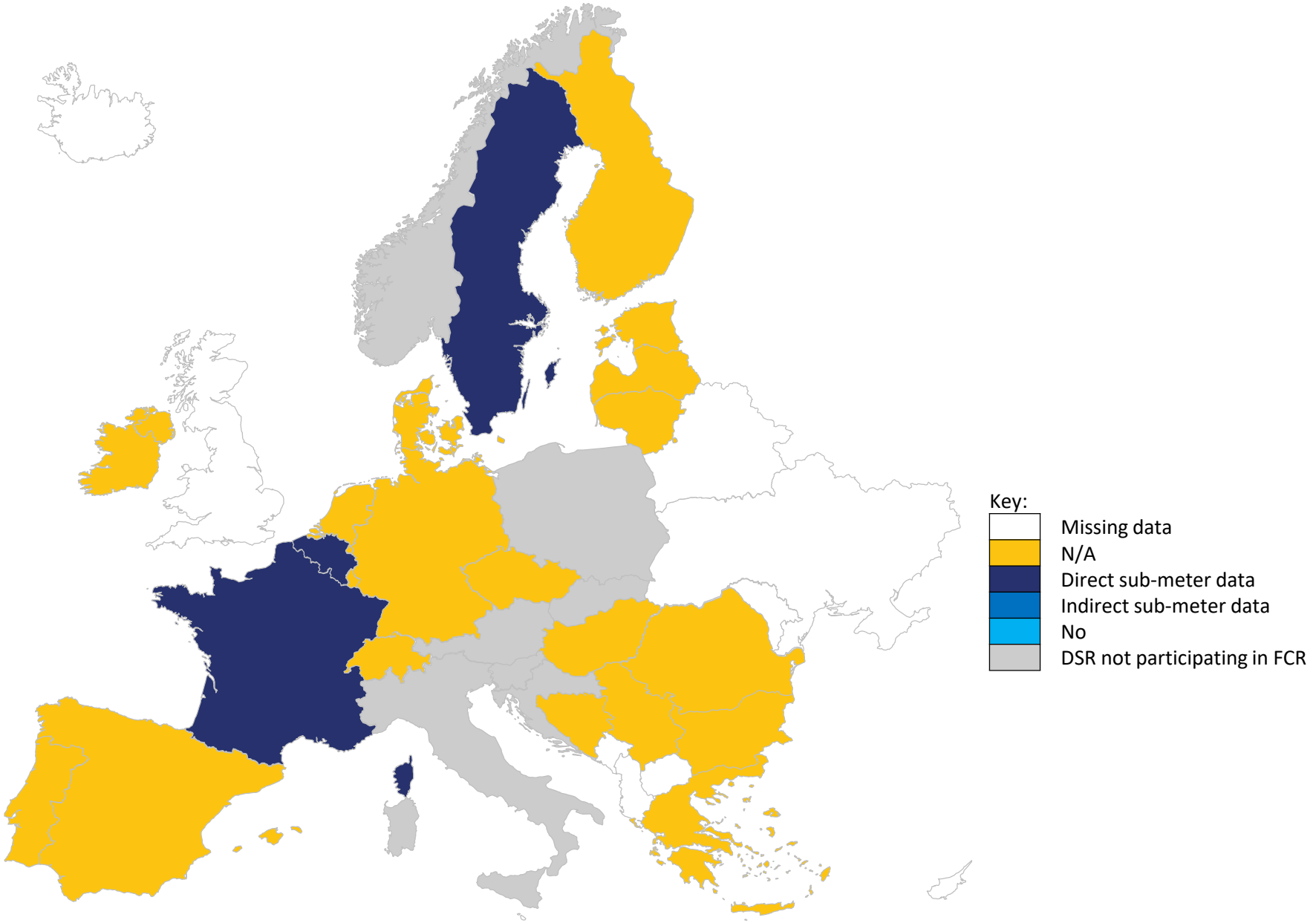
Demand-side response – Monitoring of aggregation facilities – if case DSR participates in RR – Direct/Indirect sub-meter data



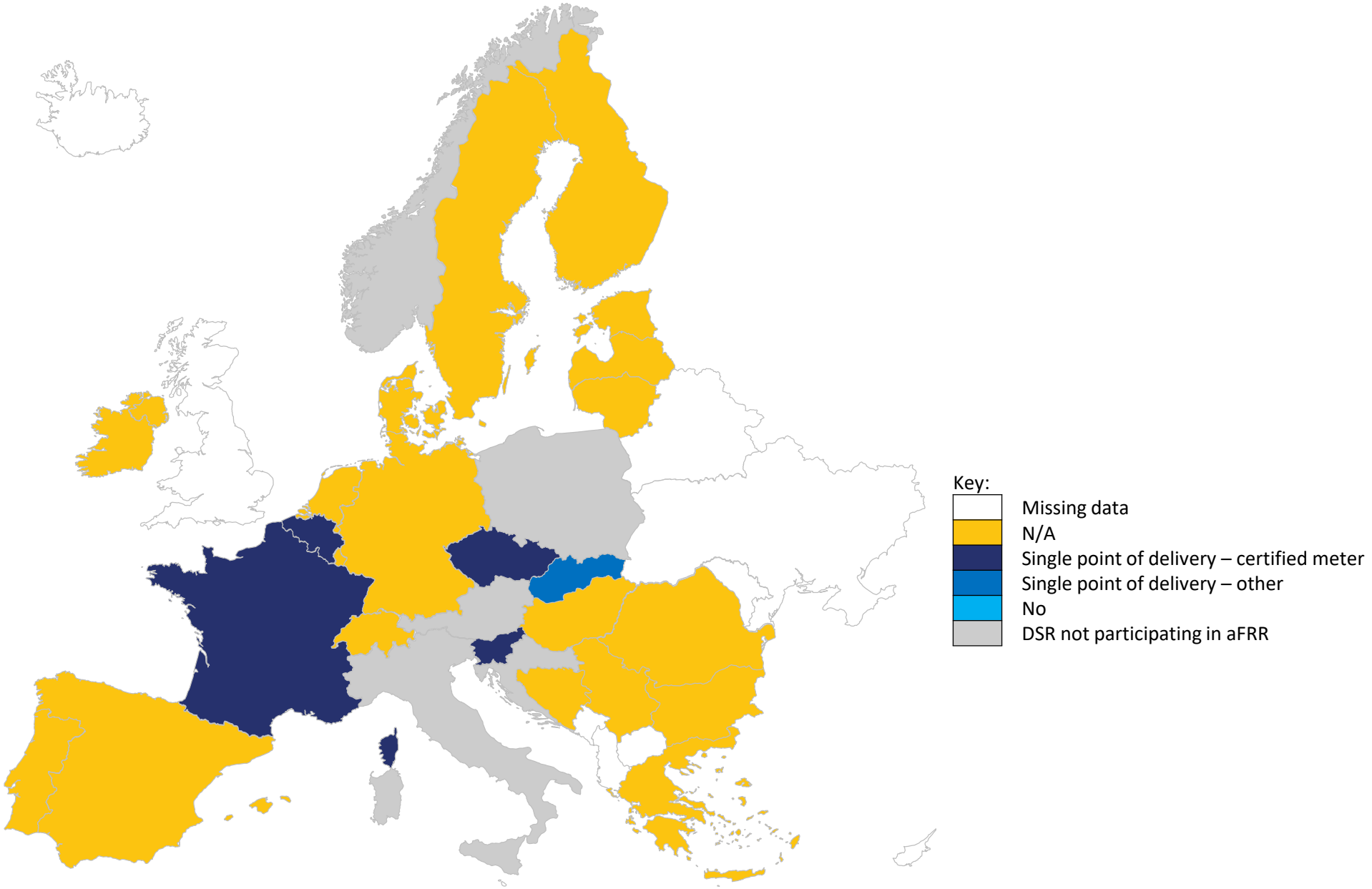
Demand-side response – Allowed measurement for the settlement of balancing energy – in case DSR participates in FCR – Single point of delivery



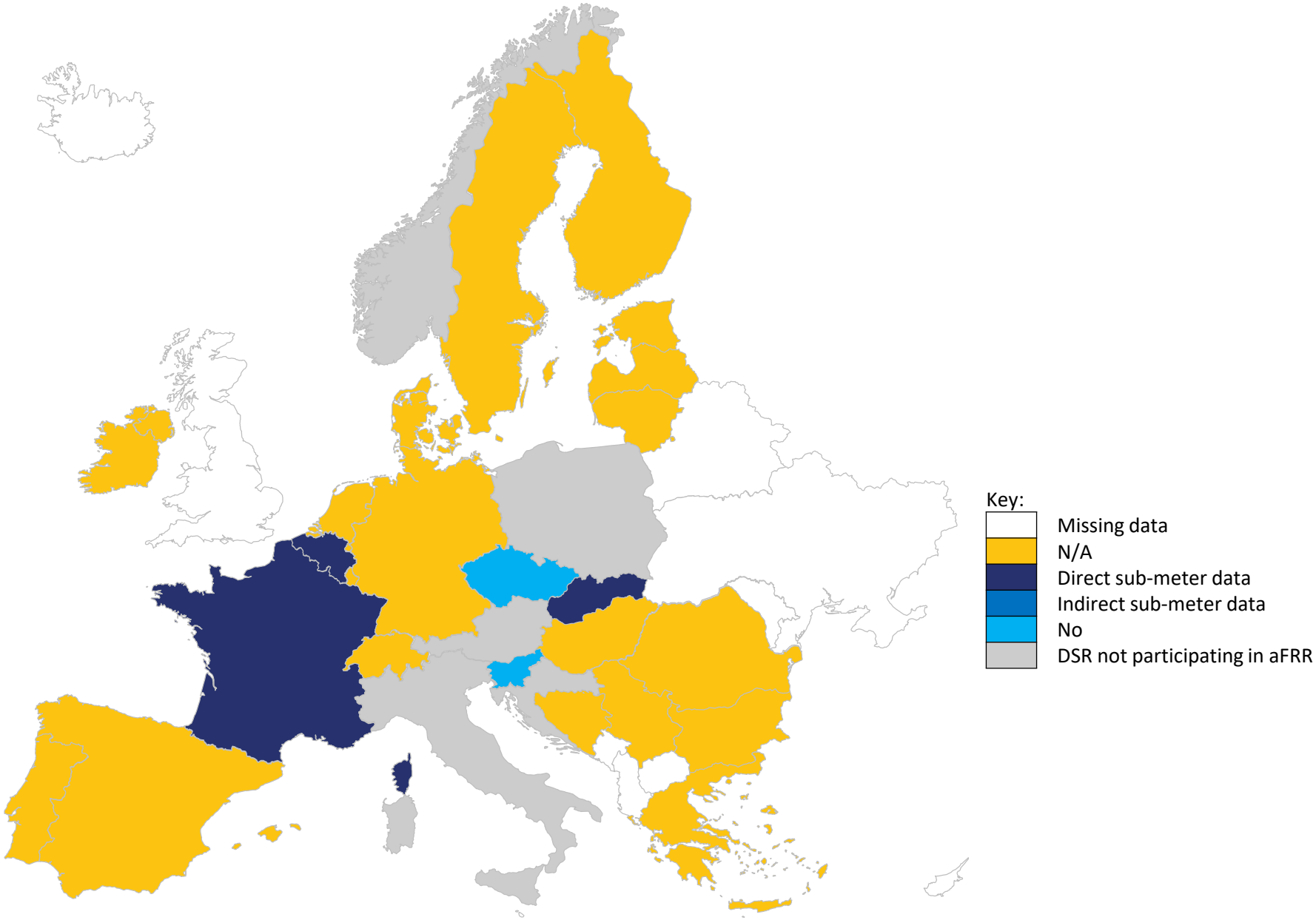
Demand-side response – Allowed measurement for the settlement of balancing energy – in case DSR participates in FCR – Direct/Indirect sub-meter data



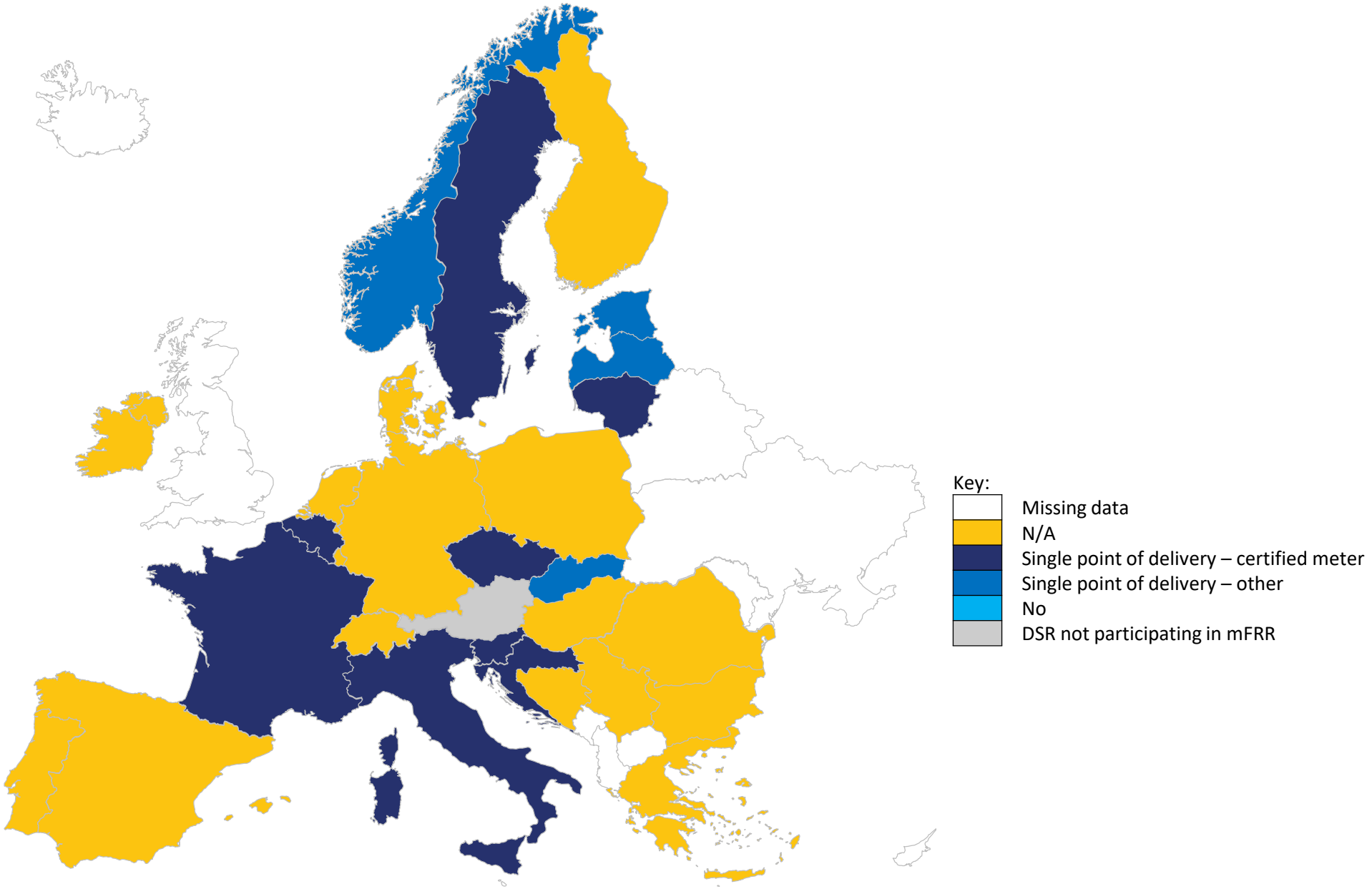
Demand-side response – Allowed measurement for the settlement of balancing energy – in case DSR participates in aFRR – Single point of delivery



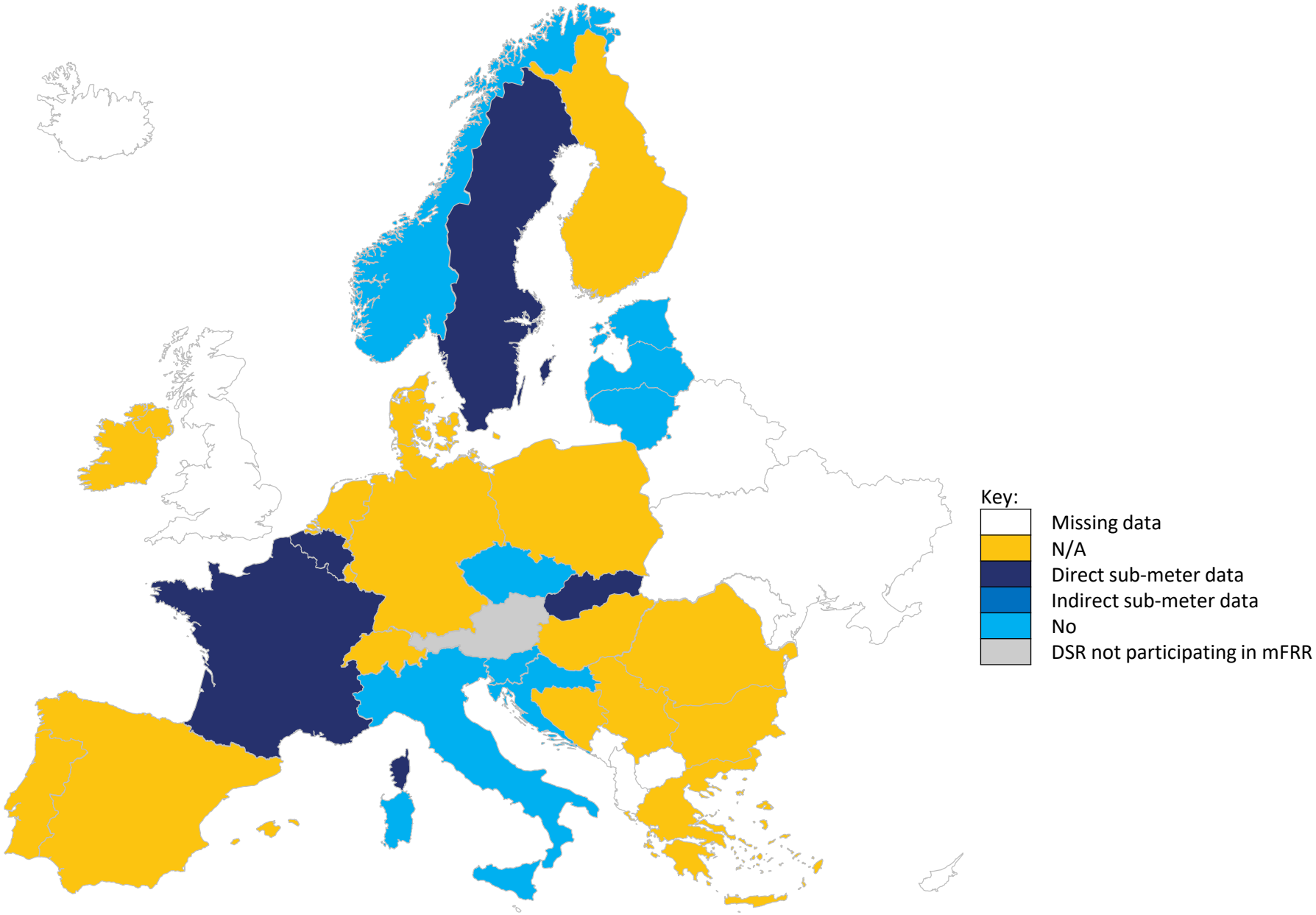
Demand-side response – Allowed measurement for the settlement of balancing energy – in case DSR participates in aFRR – Direct/Indirect sub-meter data



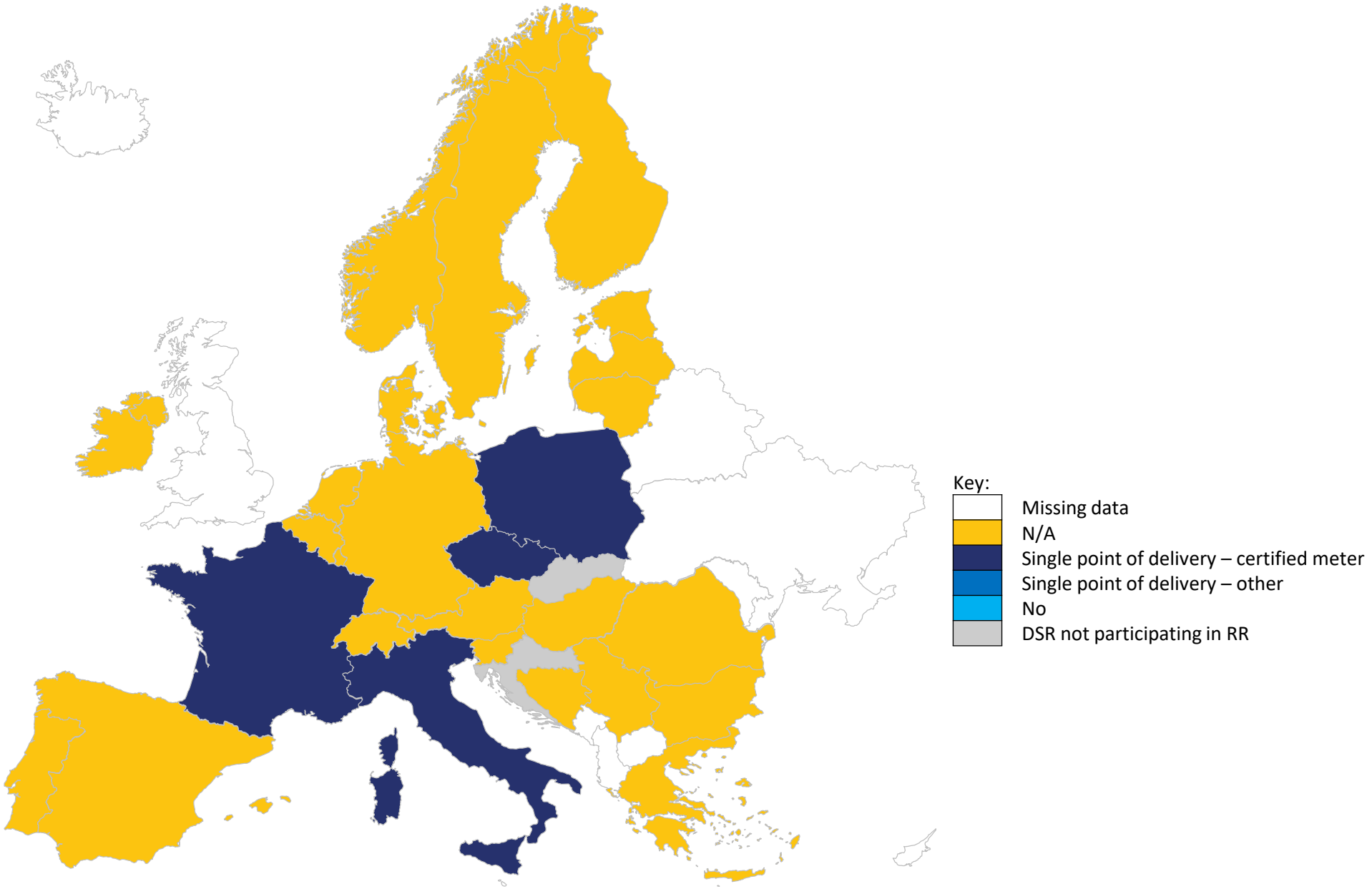
Demand-side response – Allowed measurement for the settlement of balancing energy – in case DSR participates in mFRR – Single point of delivery



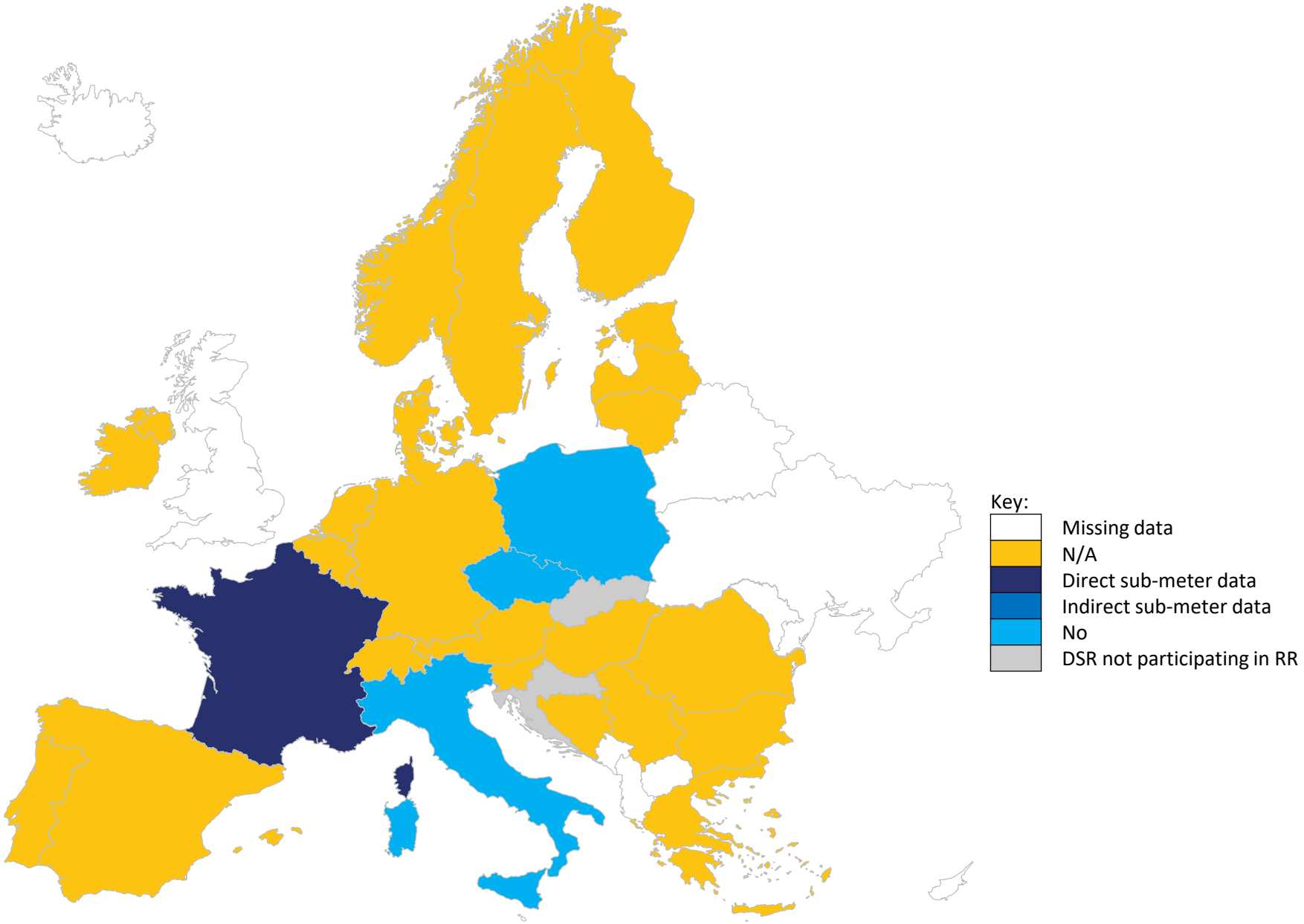
Demand-side response – Allowed measurement for the settlement of balancing energy – in case DSR participates in mFRR – Direct/Indirect sub-meter data



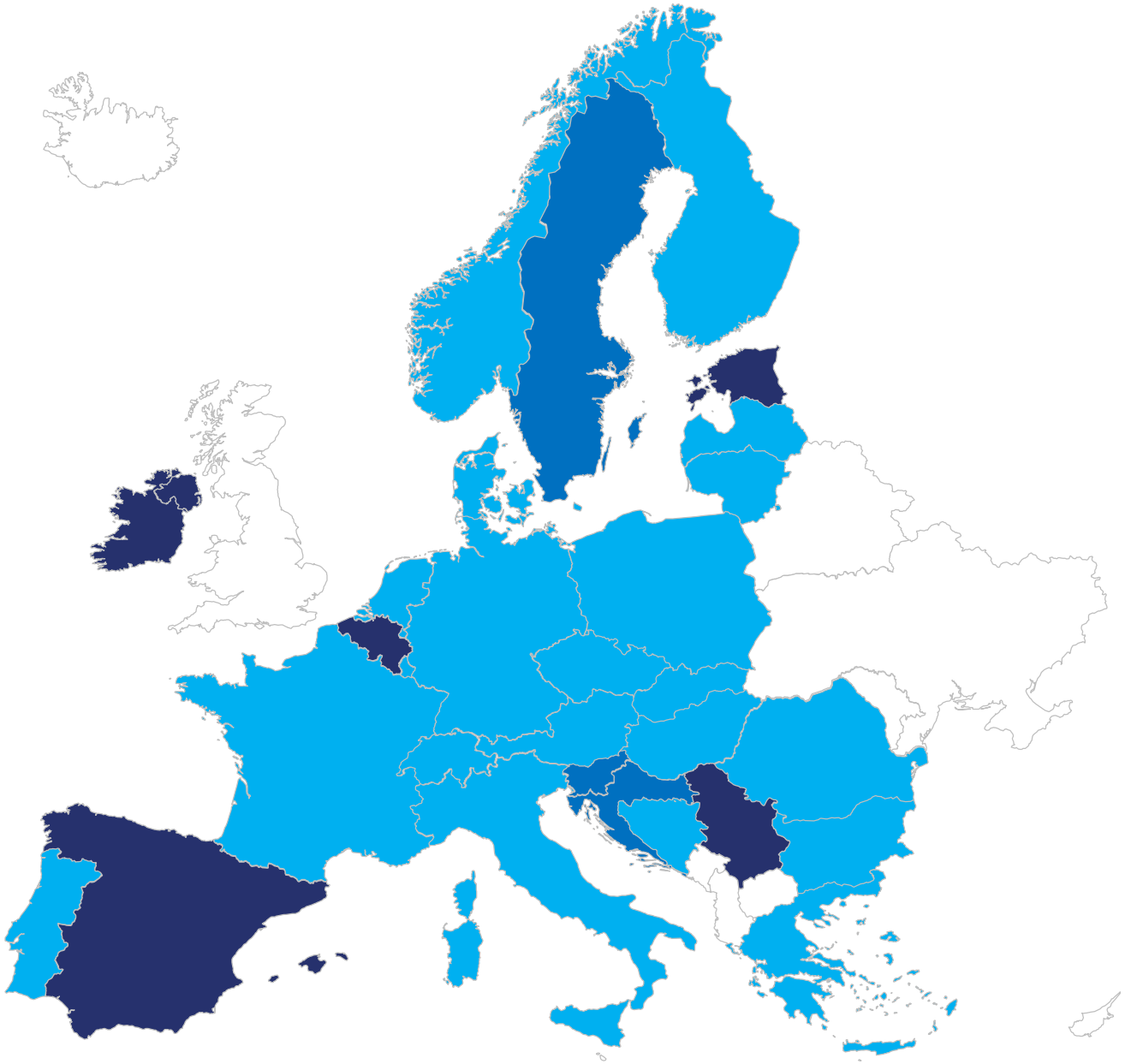
Demand-side response – Allowed measurement for the settlement of balancing energy – in case DSR participates in RR – Single point of delivery



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 2019! (1/2)

TSO	Answer
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
Elering	Central compensation settlement (TSO-BRP-BSP) according to day ahead market price.
Elia	- Technical neutrality - Pass-through contract for DSR
EMS	Introduction of DSR

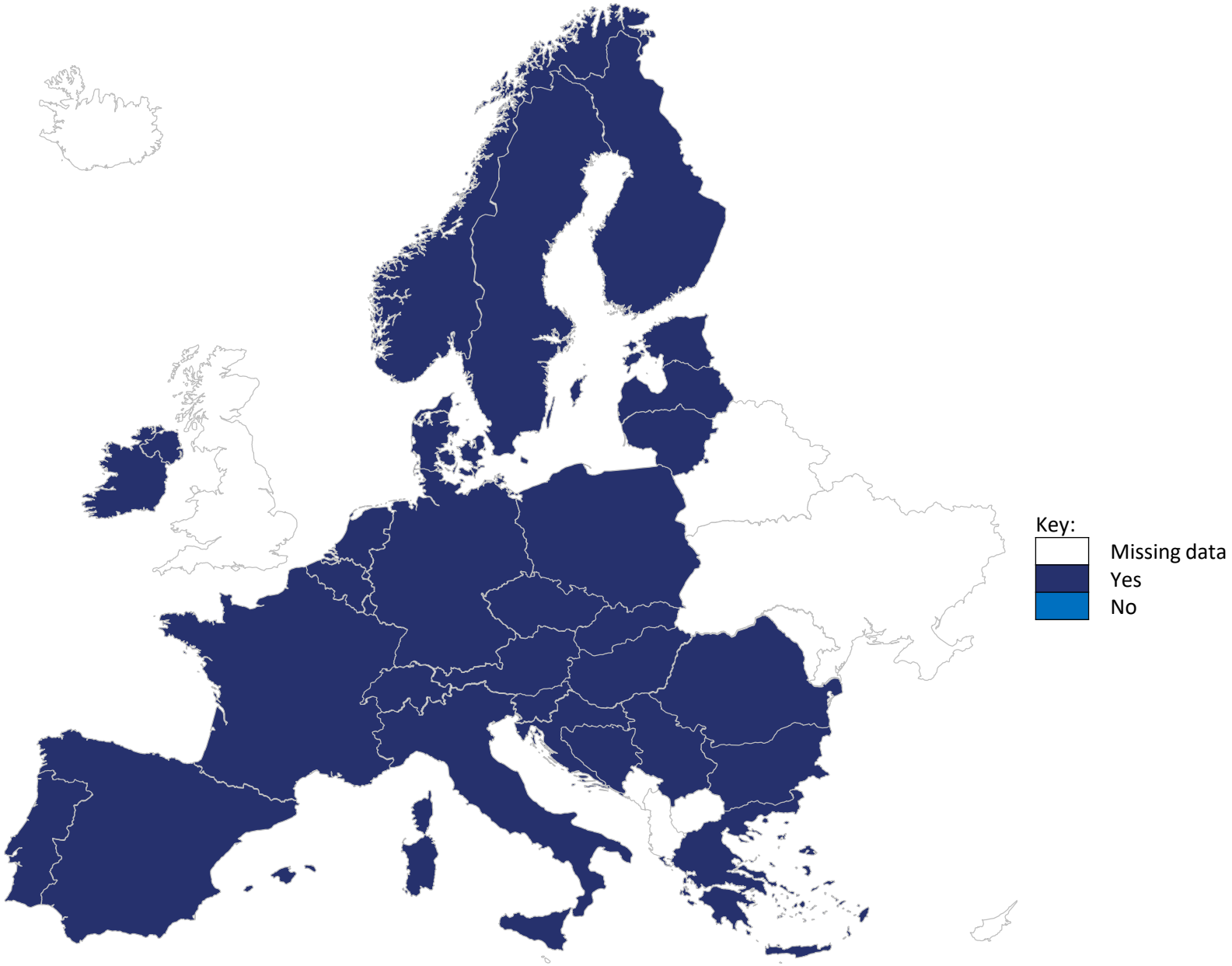
Please, explain significant/important changes regarding the demand-side response in line with/aimed to requirements of the EB Regulation (and the reason behind) in comparison to the year 2019! (2/2)

TSO	Answer
REE	Adaptation of Spanish Operating Procedures on January 26th 2021 to allow demand to participate in Balancing Services.
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

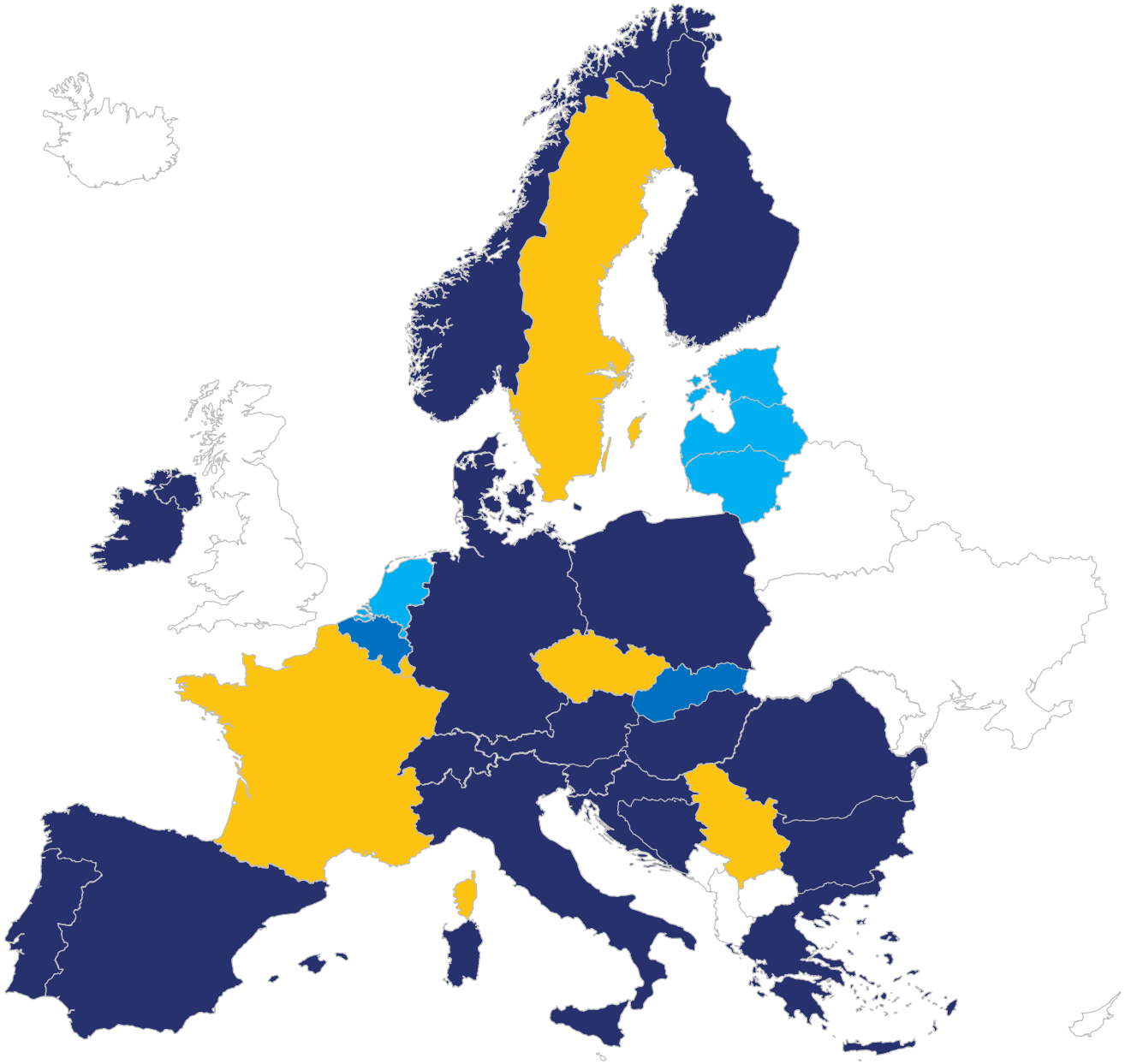
Voltage control

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

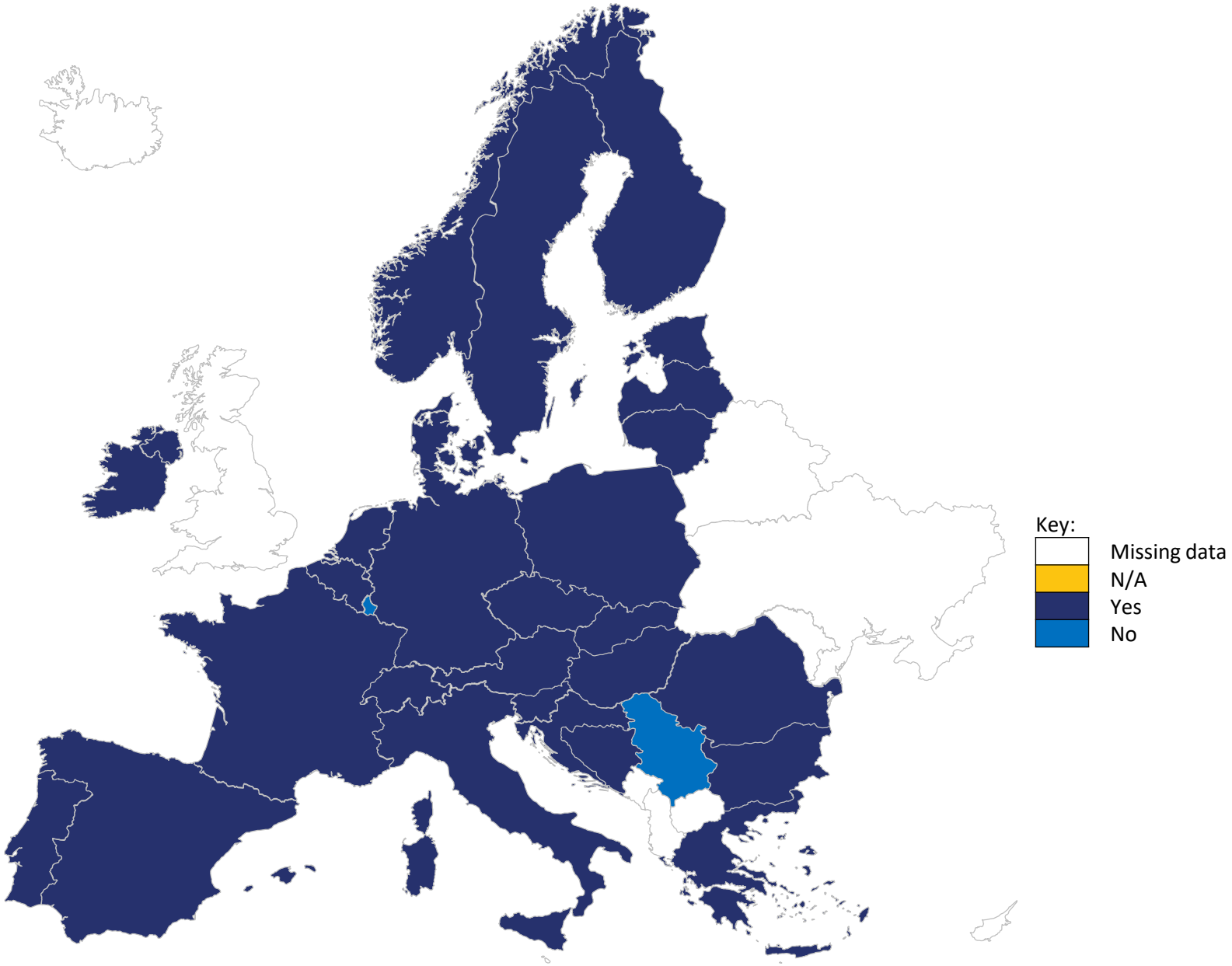
Voltage control – Voltage support as part of ancillary services?



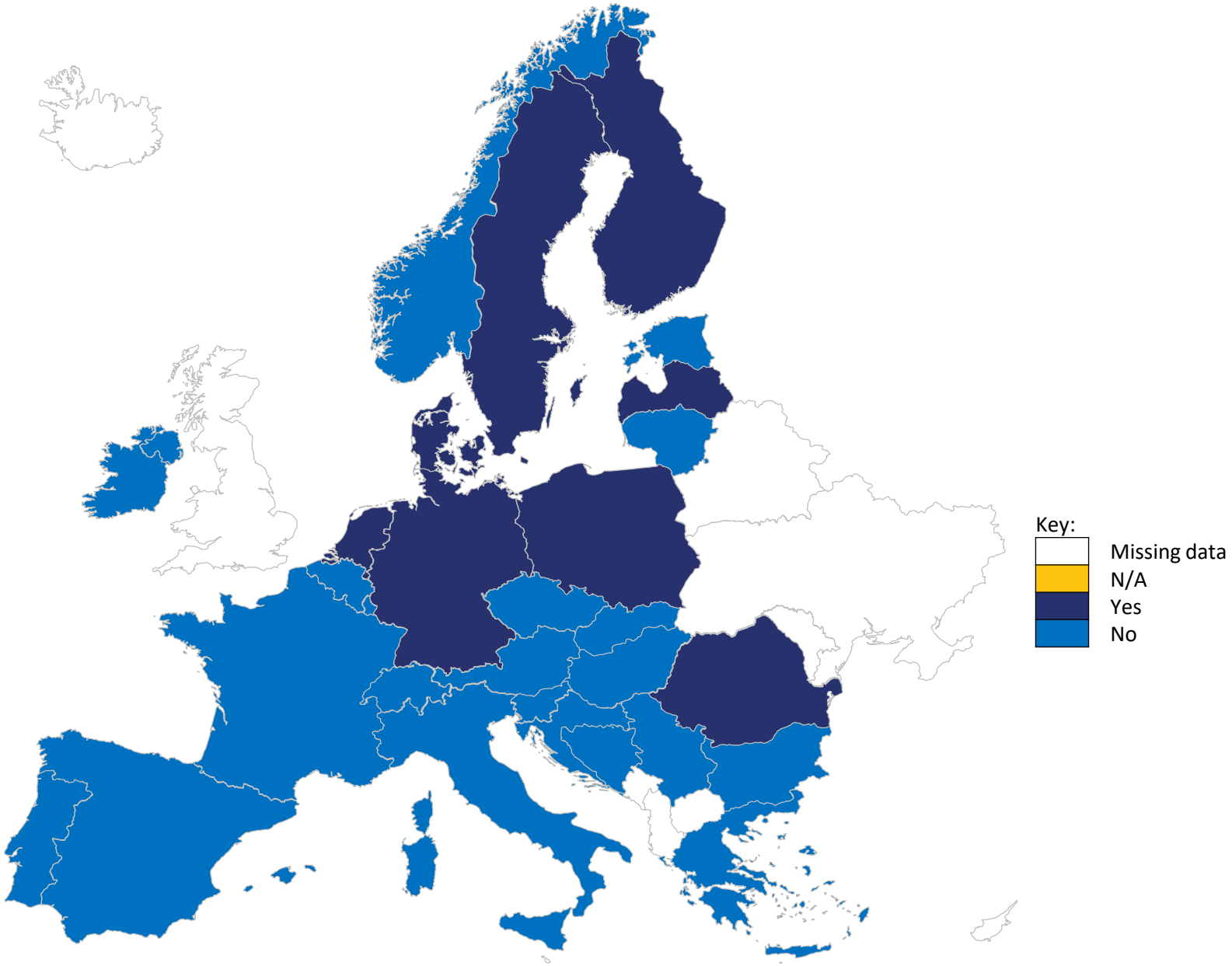
Voltage control – Voltage control procurement scheme



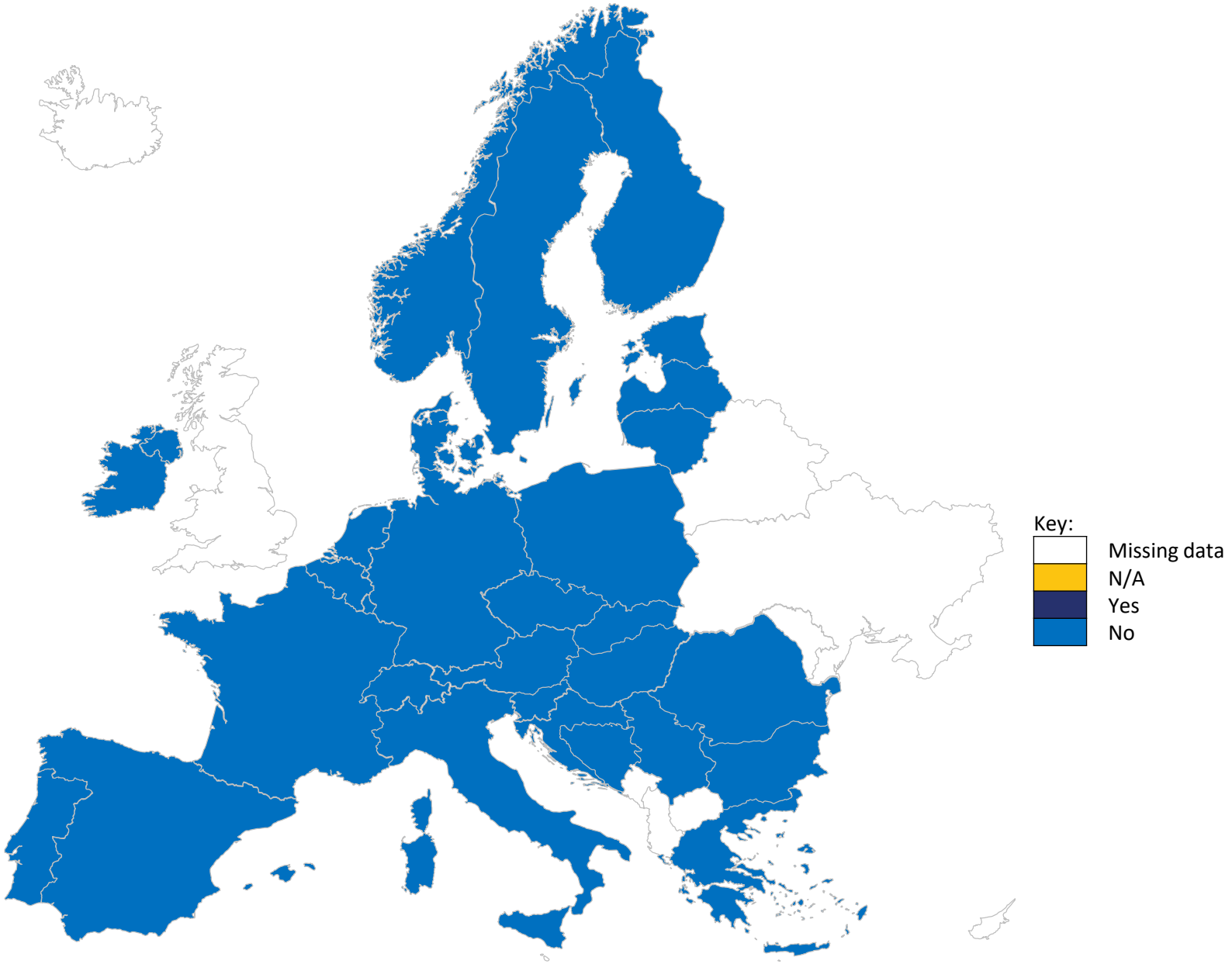
Voltage control – Providers of the voltage control service – Conventional power plants



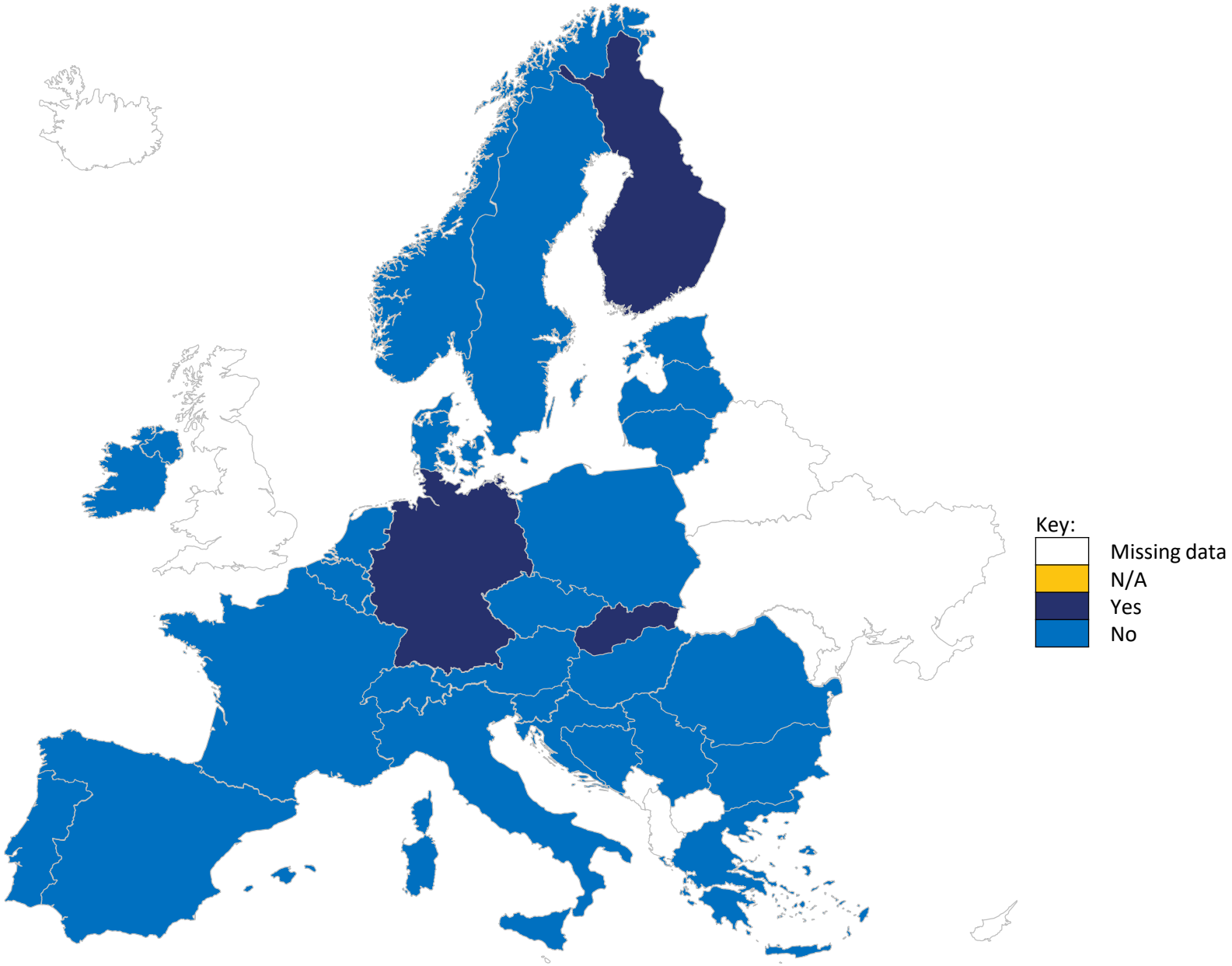
Voltage control – Providers of the voltage control service – RES



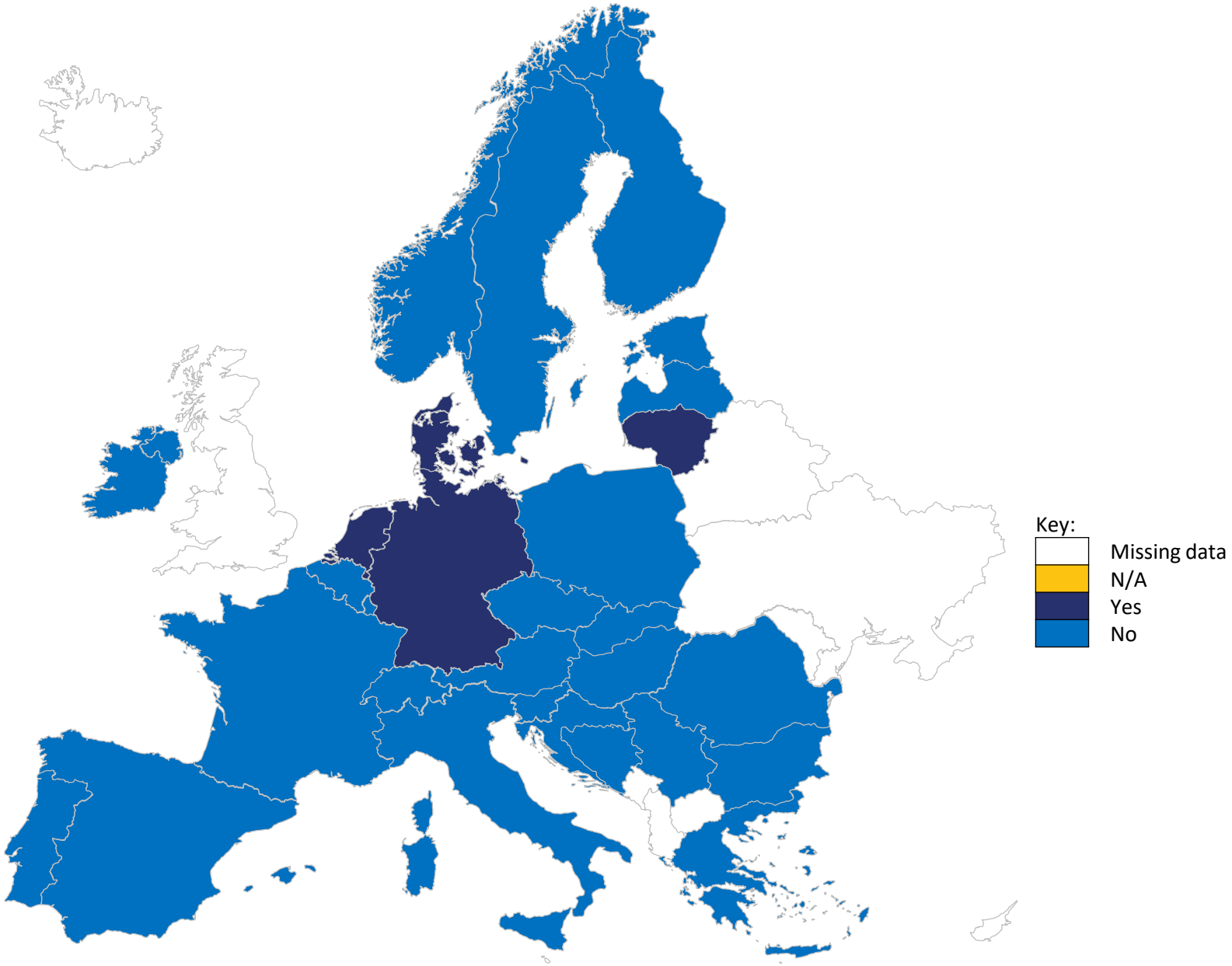
Voltage control – Providers of the voltage control service – Demand side



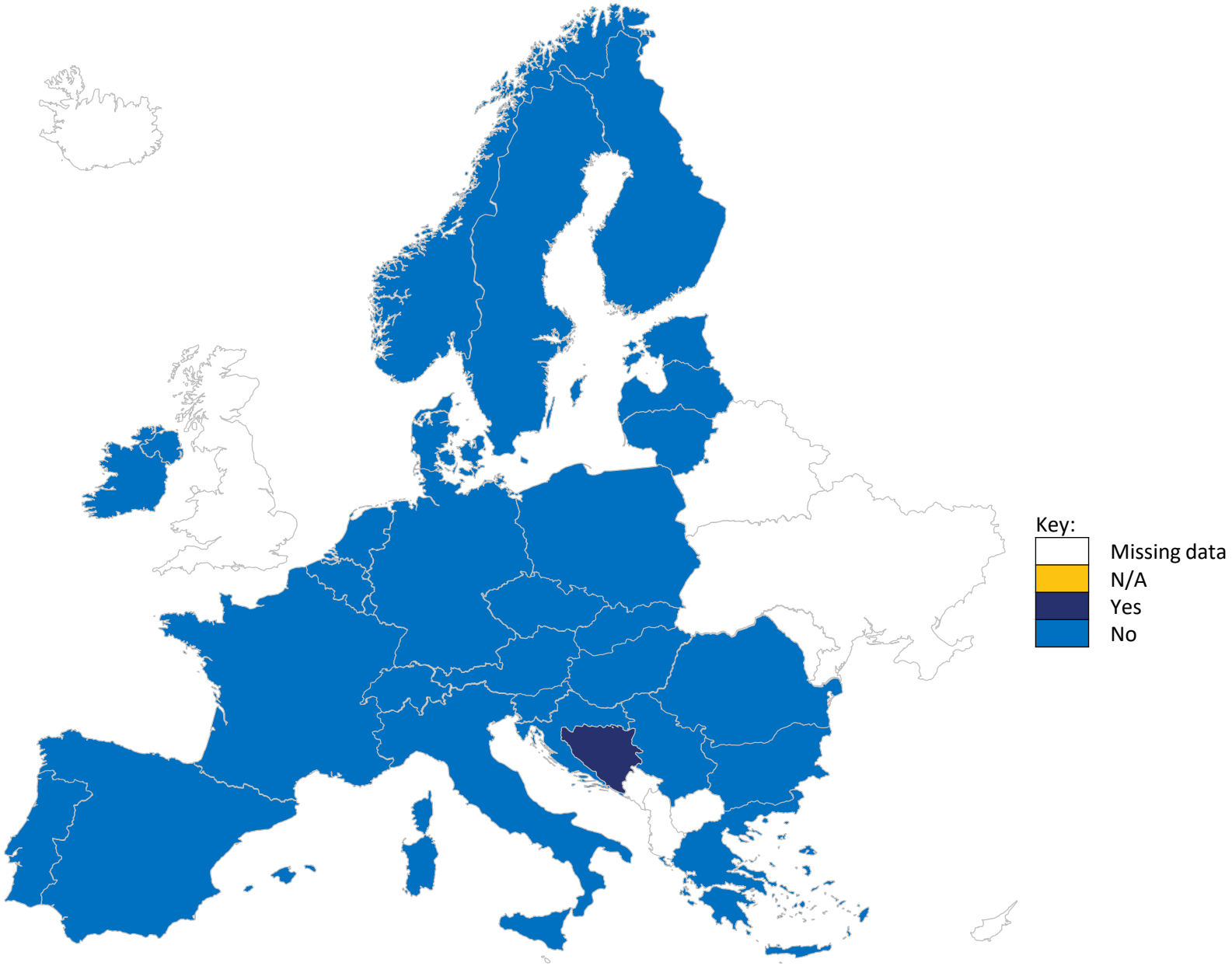
Voltage control – Providers of the voltage control service – Storage



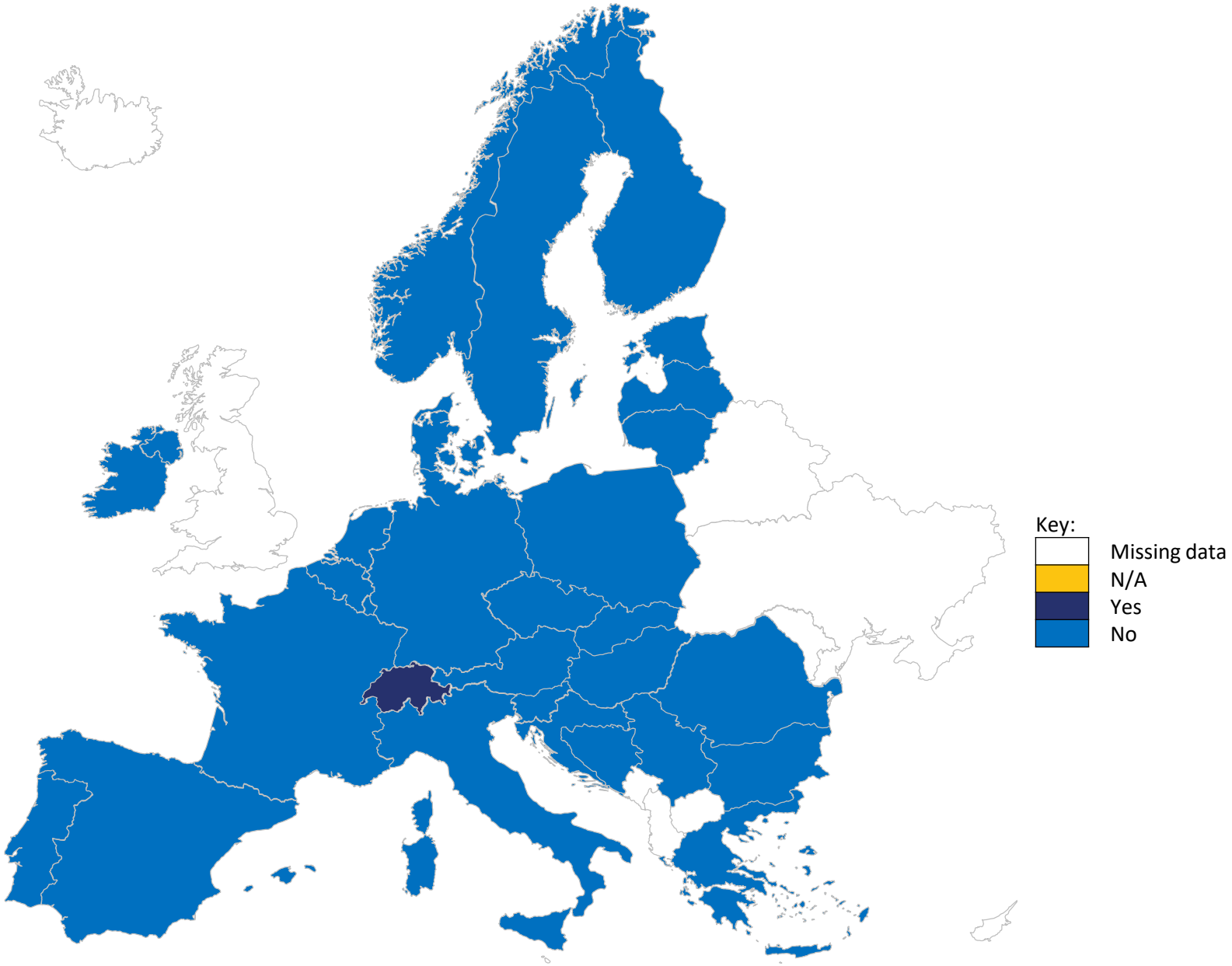
Voltage control – Providers of the voltage control service – HVDC links



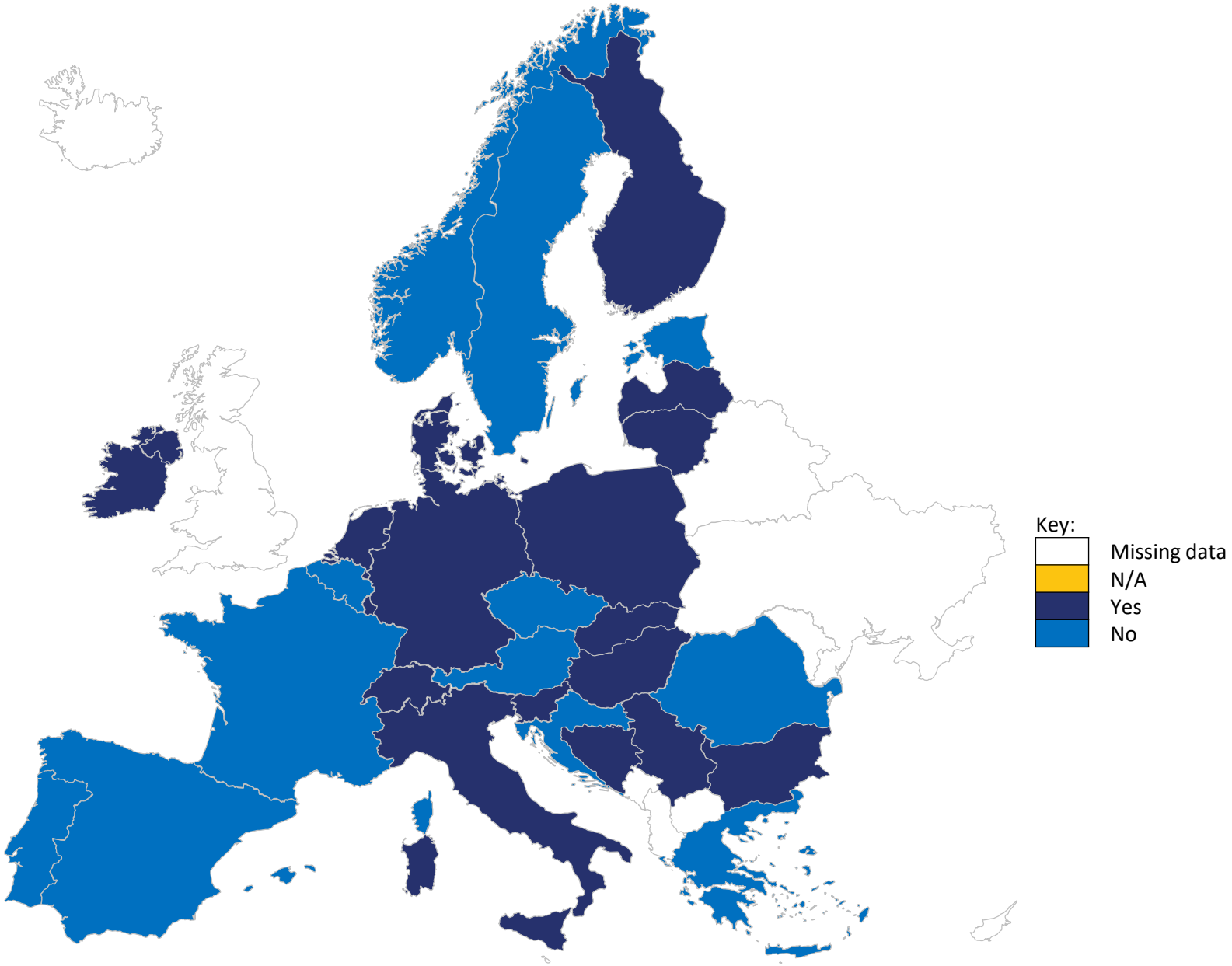
Voltage control – Providers of the voltage control service – Independent Aggregator



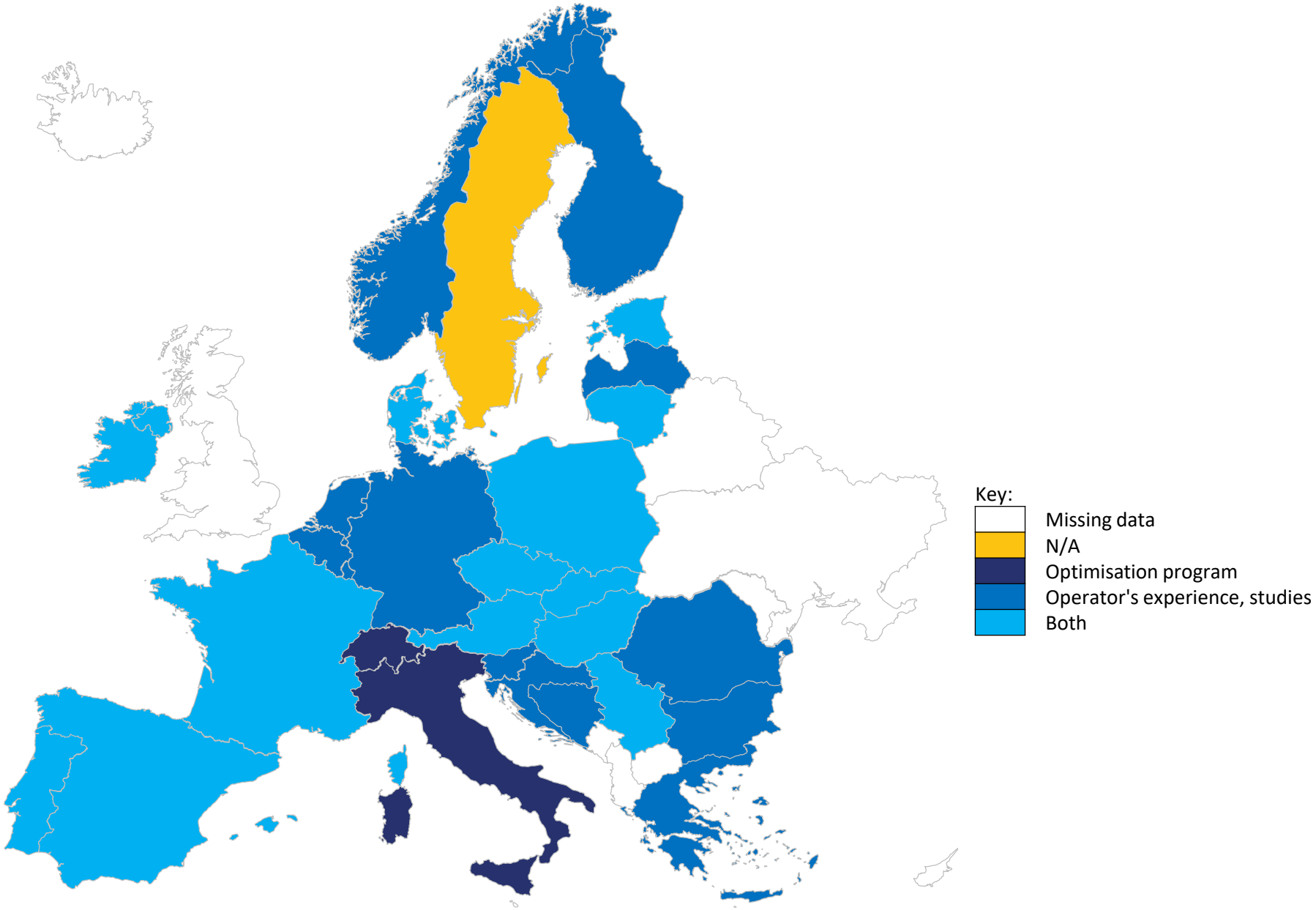
Voltage control – Providers of the voltage control service – Distribution system operators



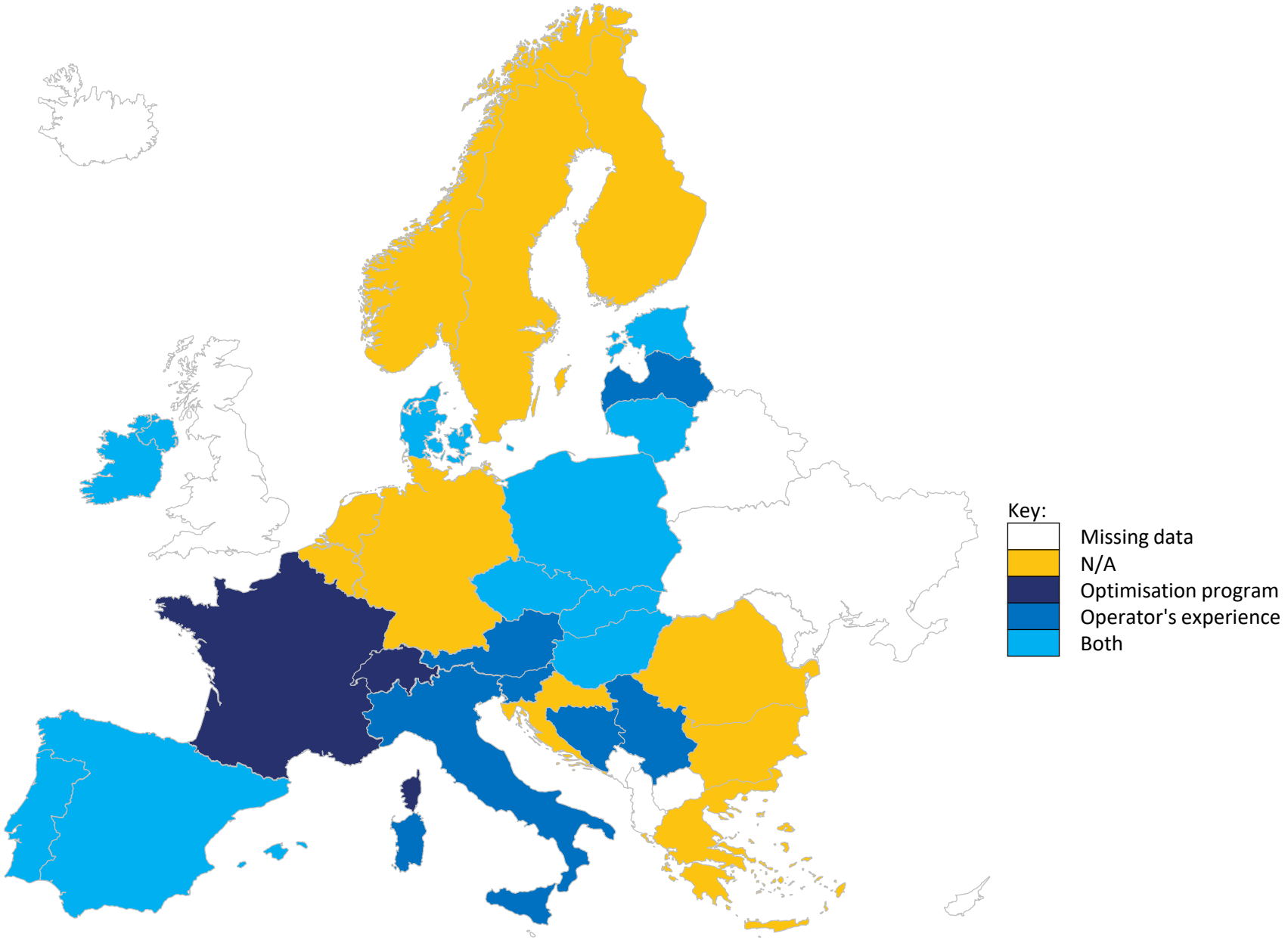
Voltage control – Providers of the voltage control service – Transformers of the transmission grid



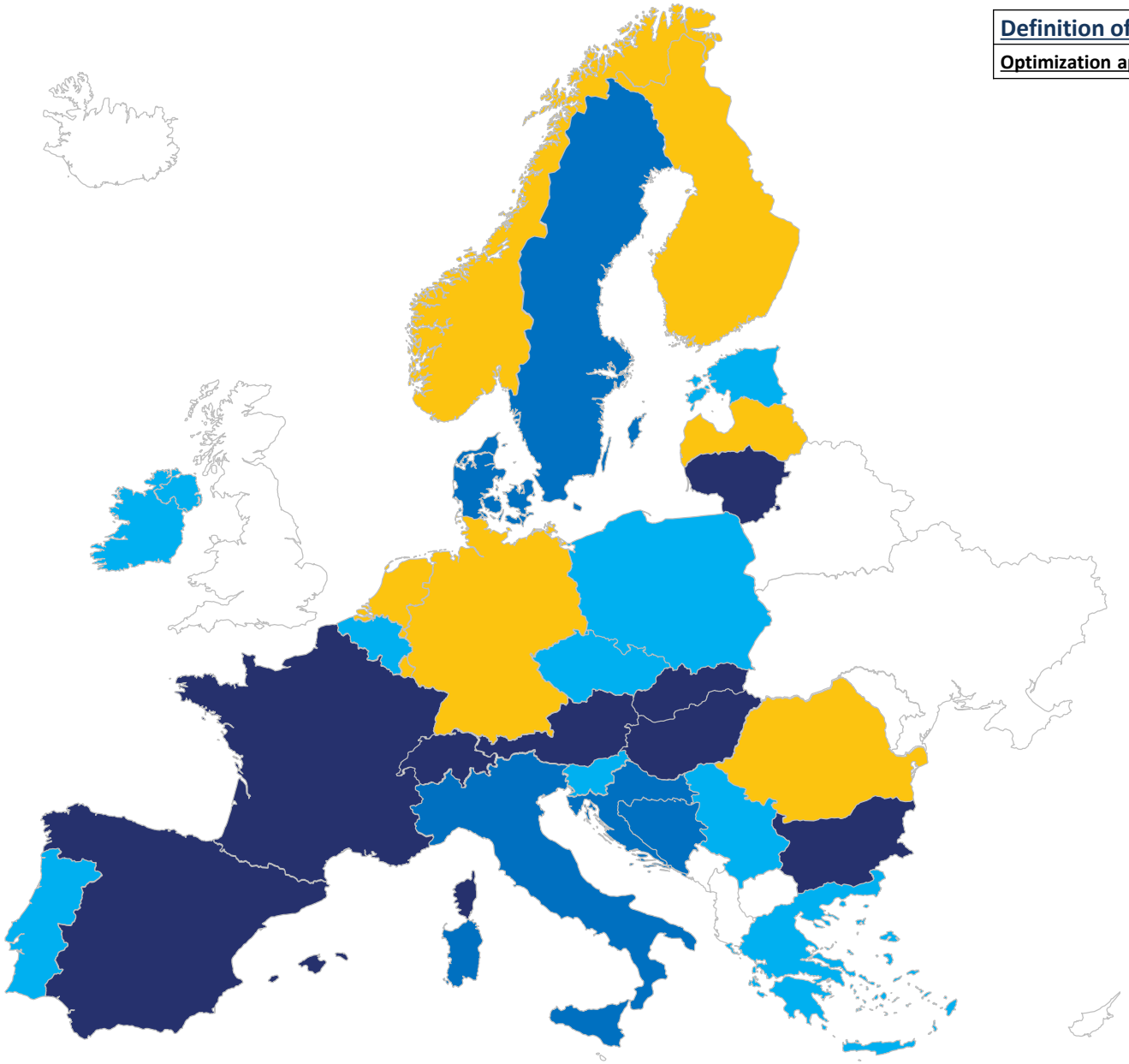
Voltage control – Determination the optimal use of reactive energy



Voltage control – In case of optimisation problem – objective function

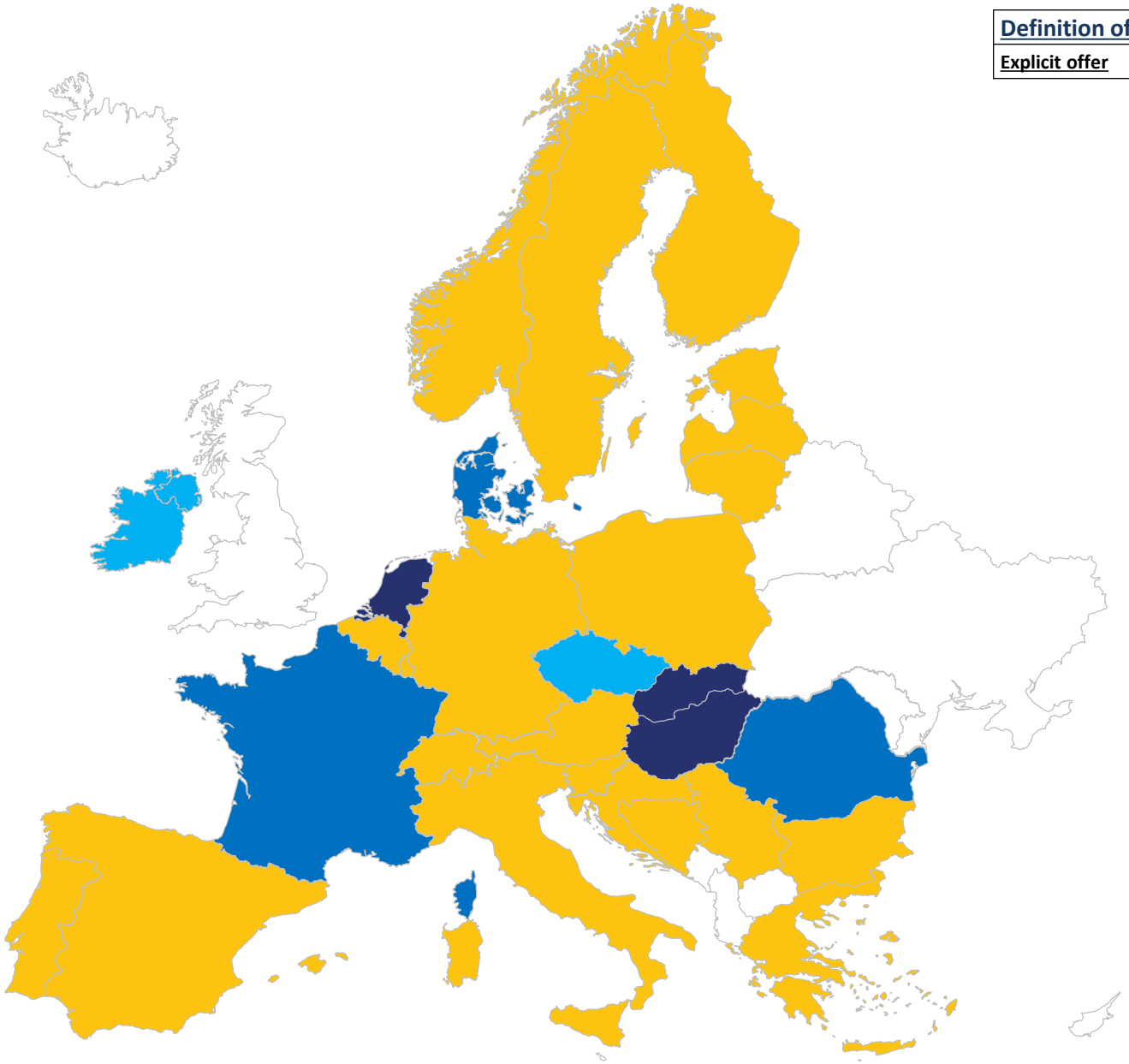


Voltage control – Type of optimisation approach



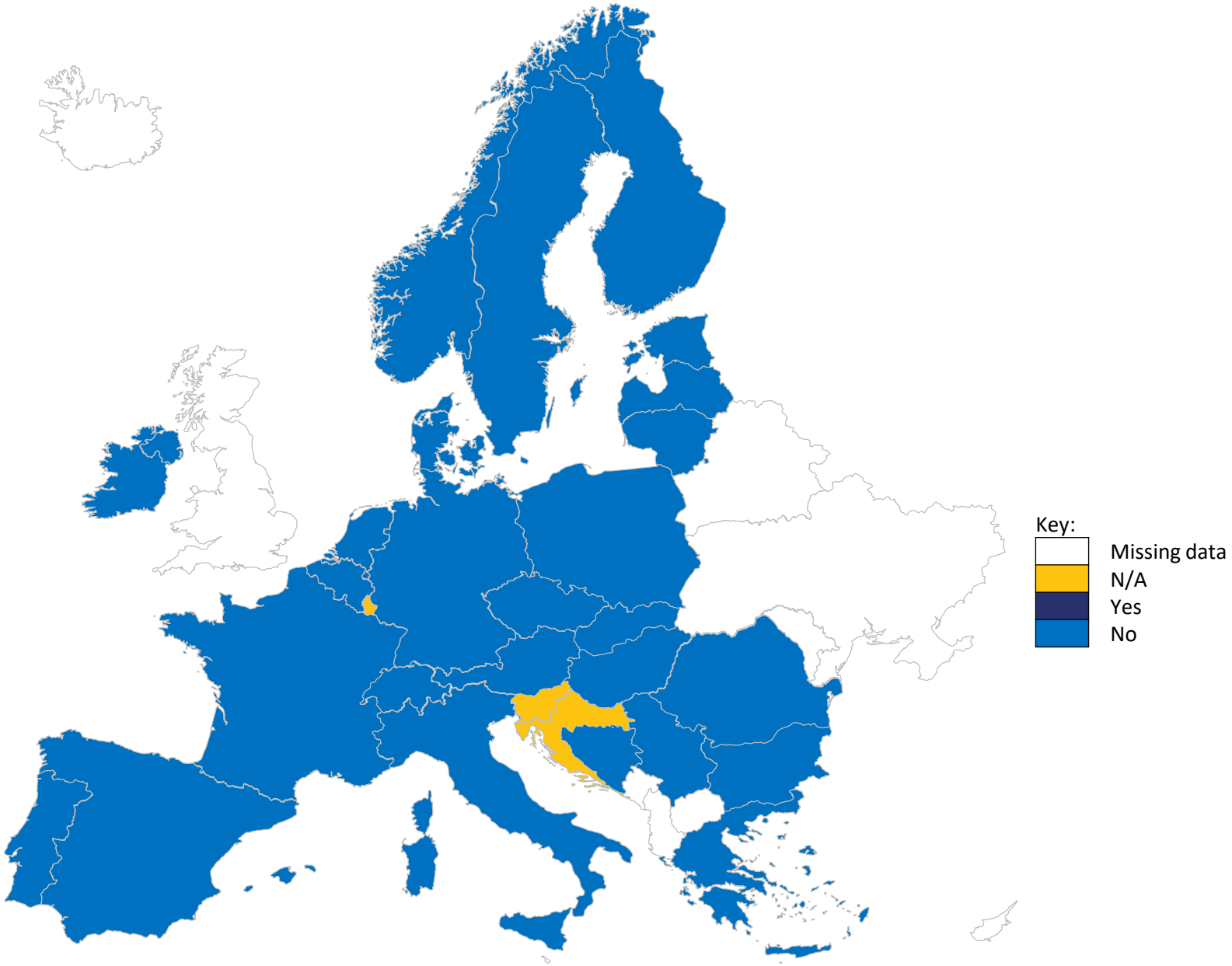
Definition of question	
Optimization approach	What kind of Voltage Control optimization is available in your control area?

Voltage control – Implicit / explicit offers bids from BSP

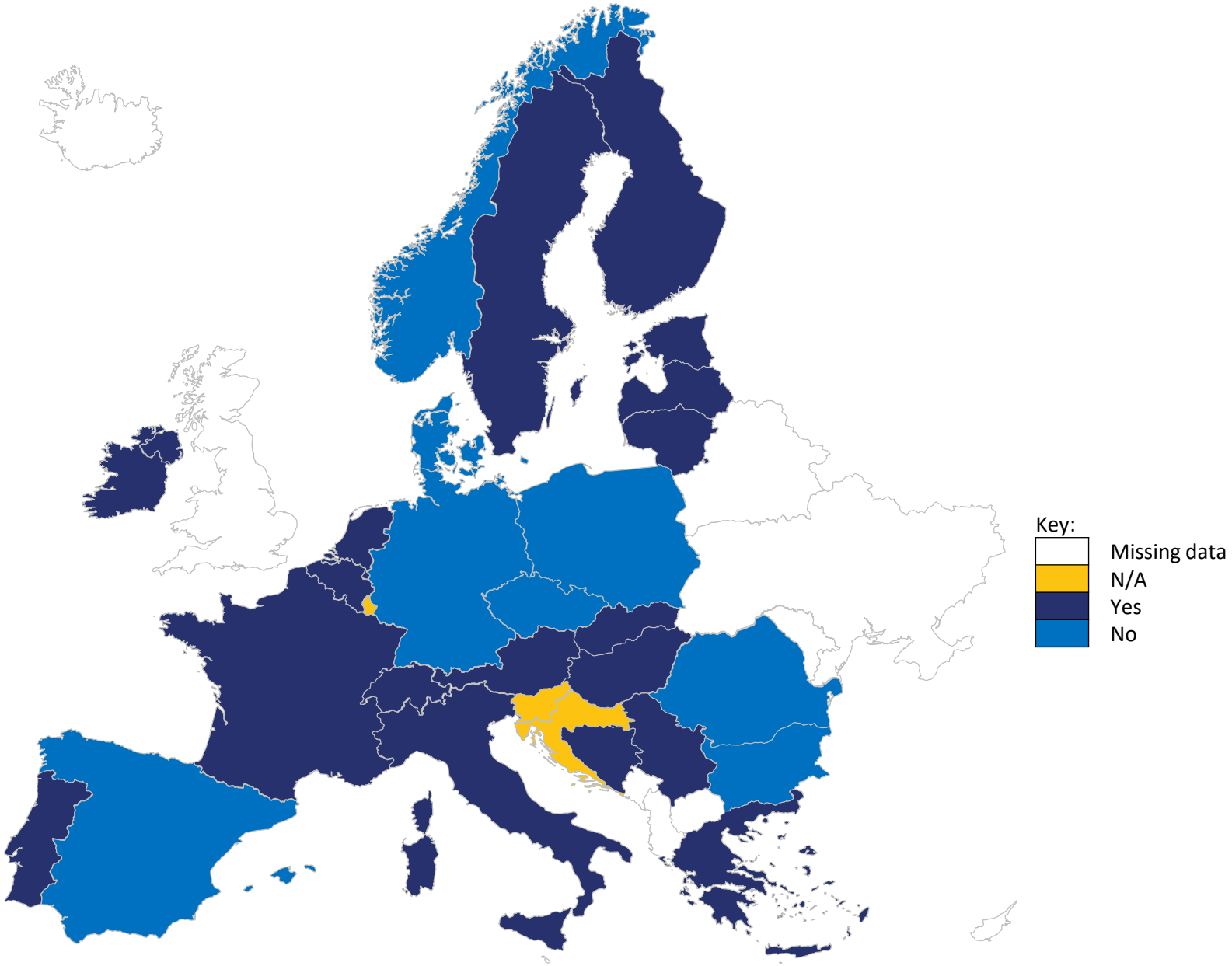


Definition of question	
Explicit offer	Specified and limited bids - for Standing unit

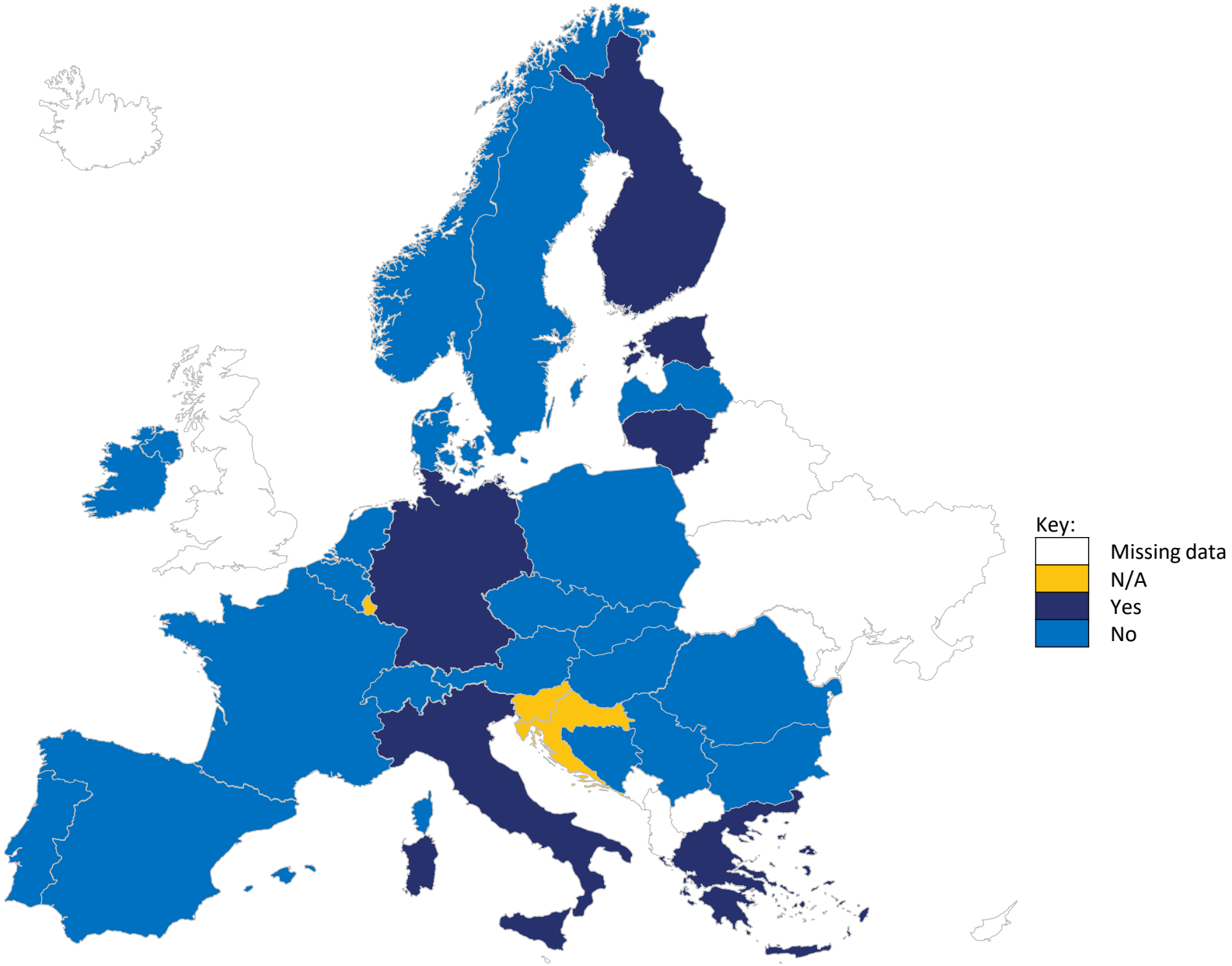
Voltage control – Type of regulations for the voltage control demanded to the power plants – No regulation



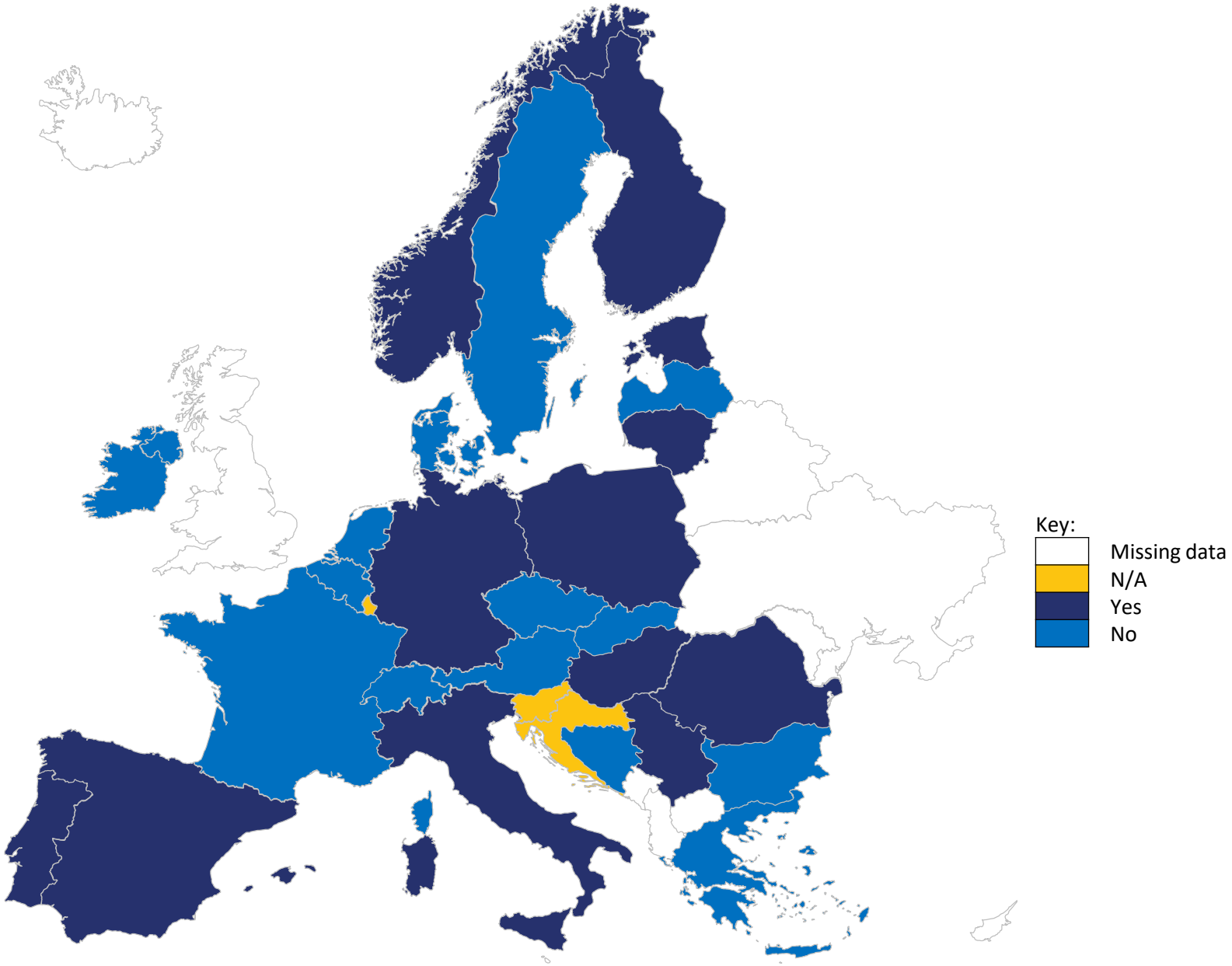
Voltage control – Type of regulations for the voltage control demanded to the power plants – Reactive setpoint



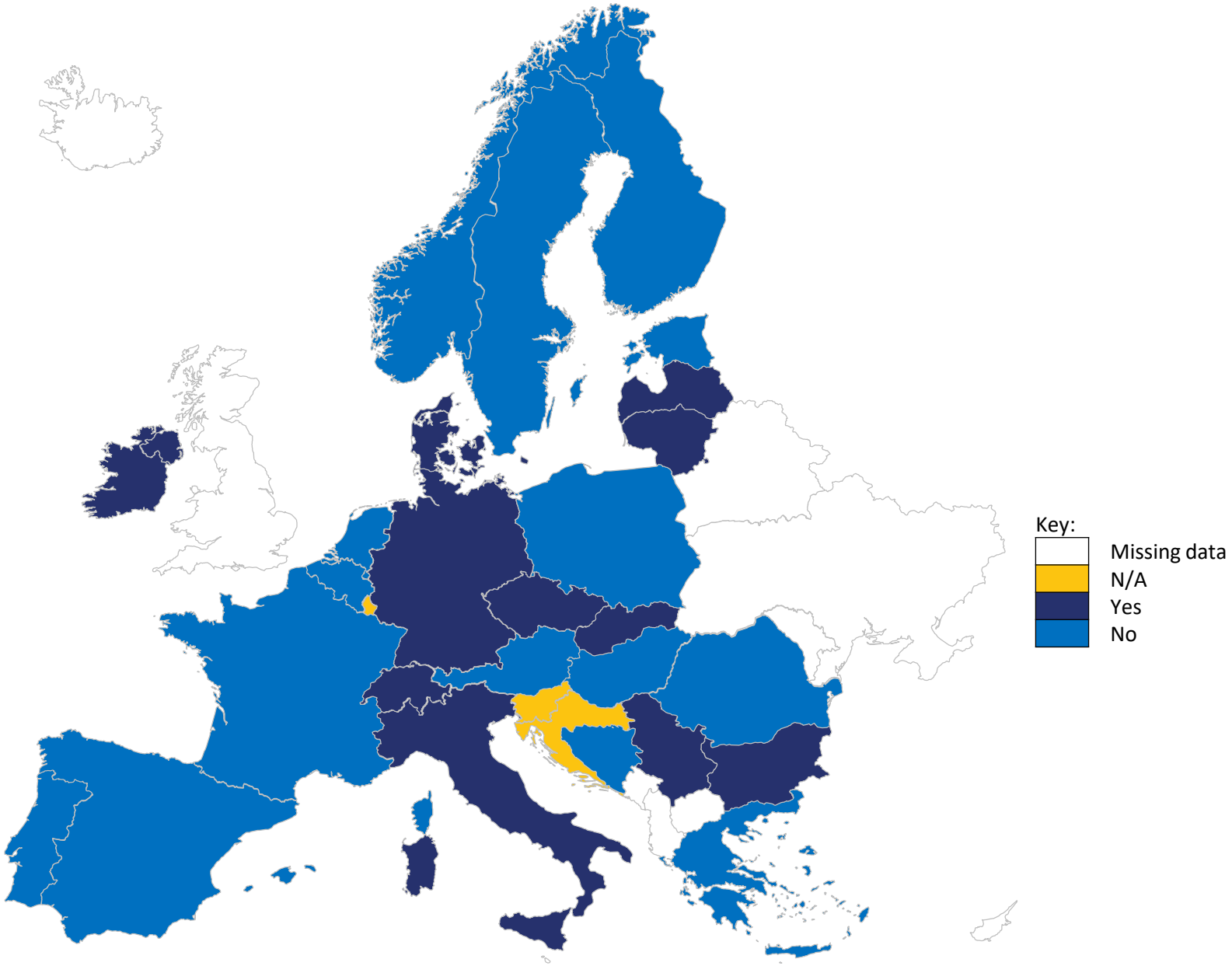
Voltage control – Type of regulations for the voltage control demanded to the power plants – Voltage stator setpoint



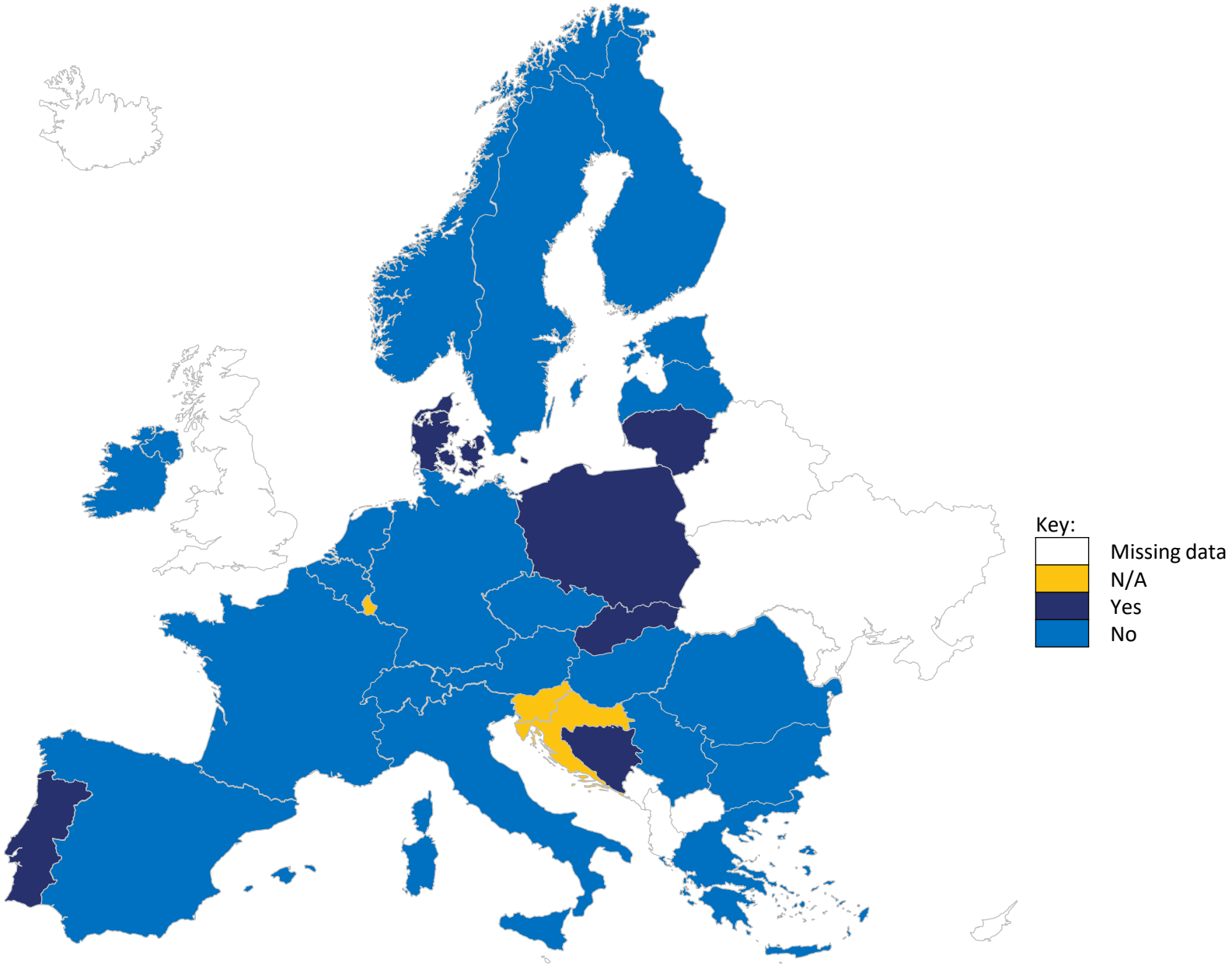
Voltage control – Type of regulations for the voltage control demanded to the power plants – Voltage setpoint at the connexion point (fixed value at EHV point)



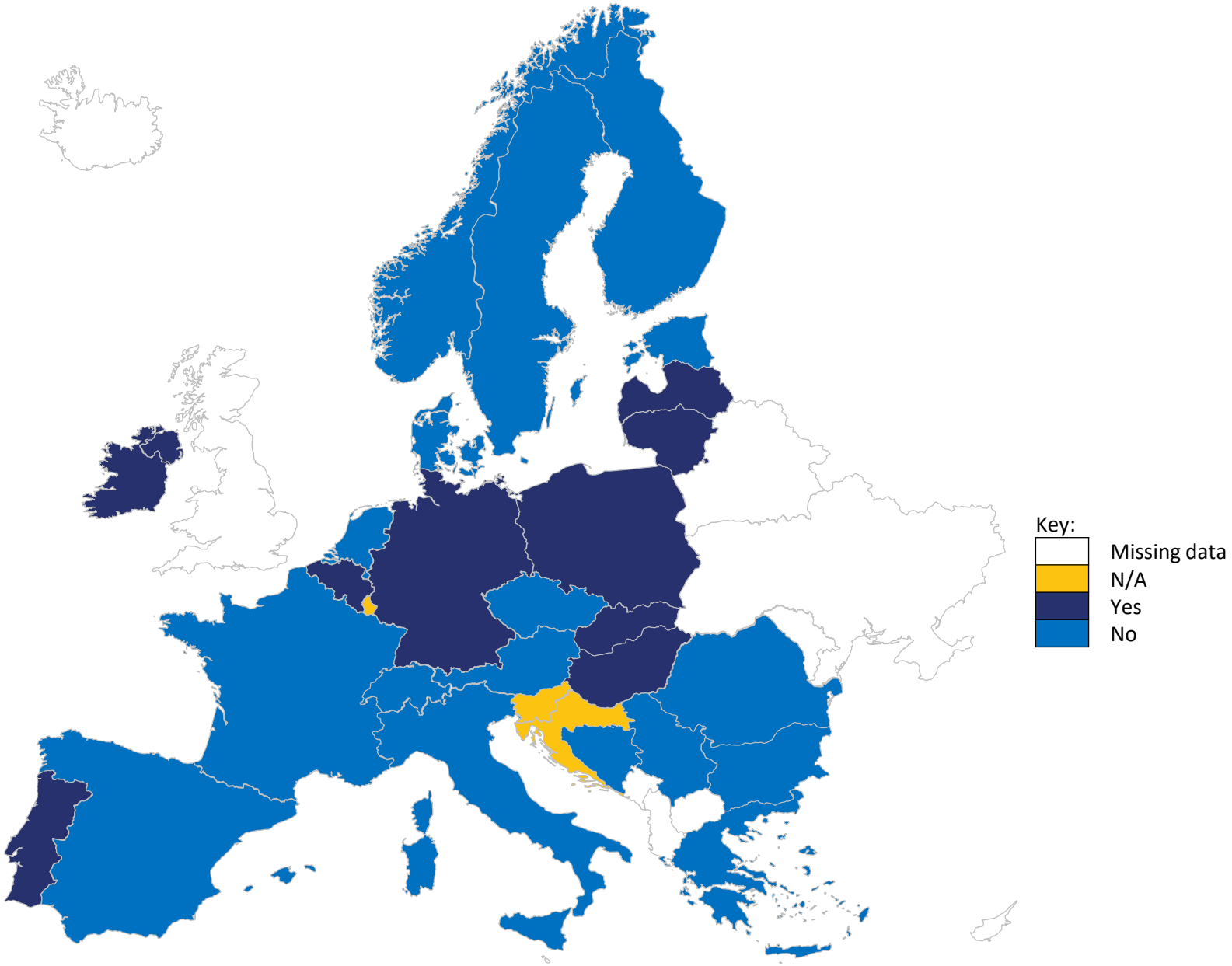
Voltage control – Type of regulations for the voltage control demanded to the power plants – Voltage setpoint at the connexion point function of a signal sent by the TSO (possibility of variation of the EHV setpoint)



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.
Elering	N/A
EMS	N/A
PSE S.A.	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.

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
SONI	N/A. All transmission connected generators provide reactive power control.
Statnett SF	Generators >= 10 MVA.
Swissgrid	N/A
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)

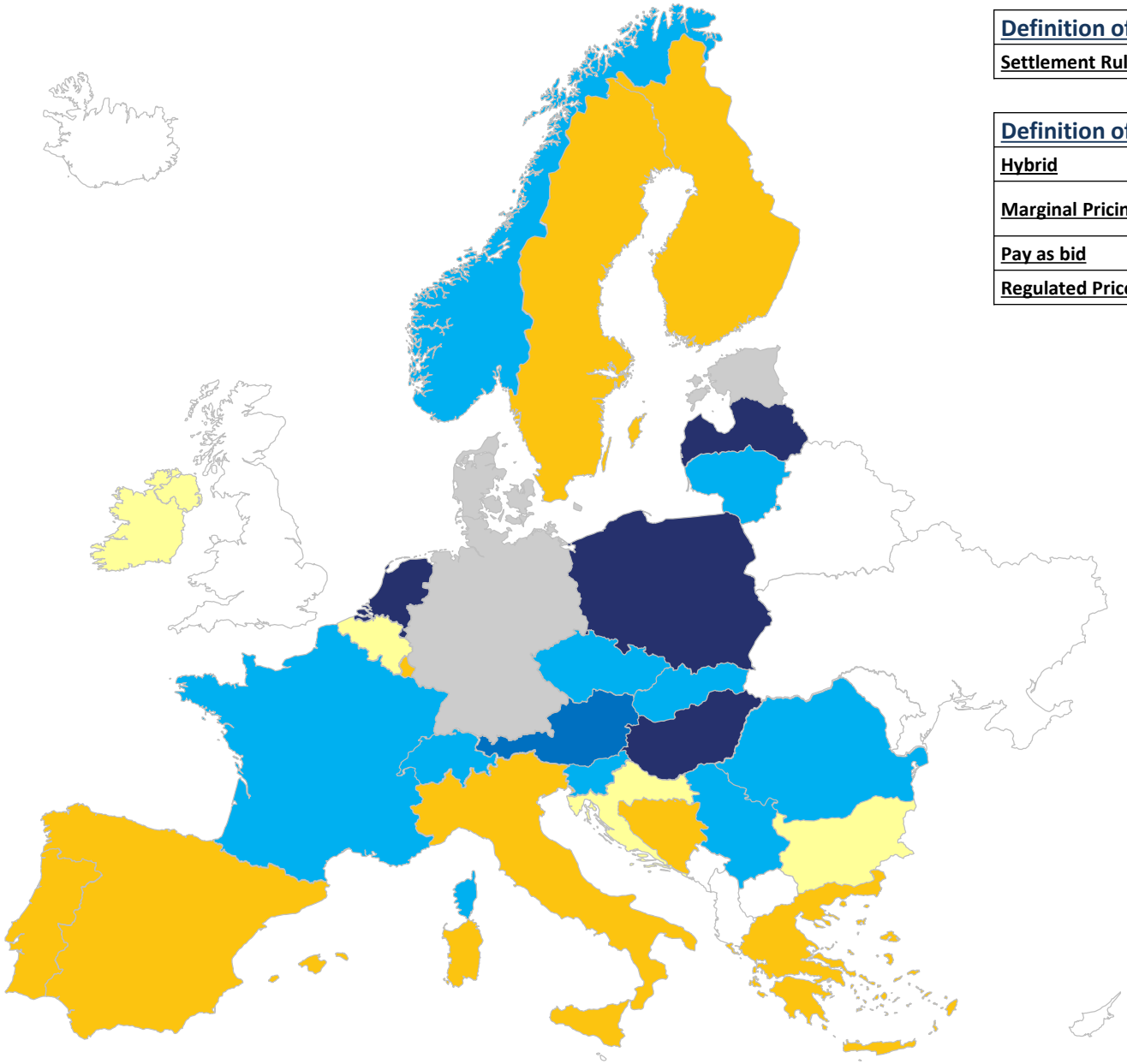
Voltage control – Any issue in your experience with voltage control regarding voltage stability (mainly interactions between U, Q and PF controlled devices)? (1/2)

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.
Elering	No
ELES	No
Energinet	All units connected to TSO are in U regulation mode.
PSE S.A.	No
SEPS	Automatic voltage control system and operators are controlling the voltage on the pilot nodes.

Voltage control – Any issue in your experience with voltage control regarding voltage stability (mainly interactions between U, Q and PF controlled devices)? (2/2)

TSO	Answer
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.
Swissgrid	N/A
Tennet NL	None
Terna	No

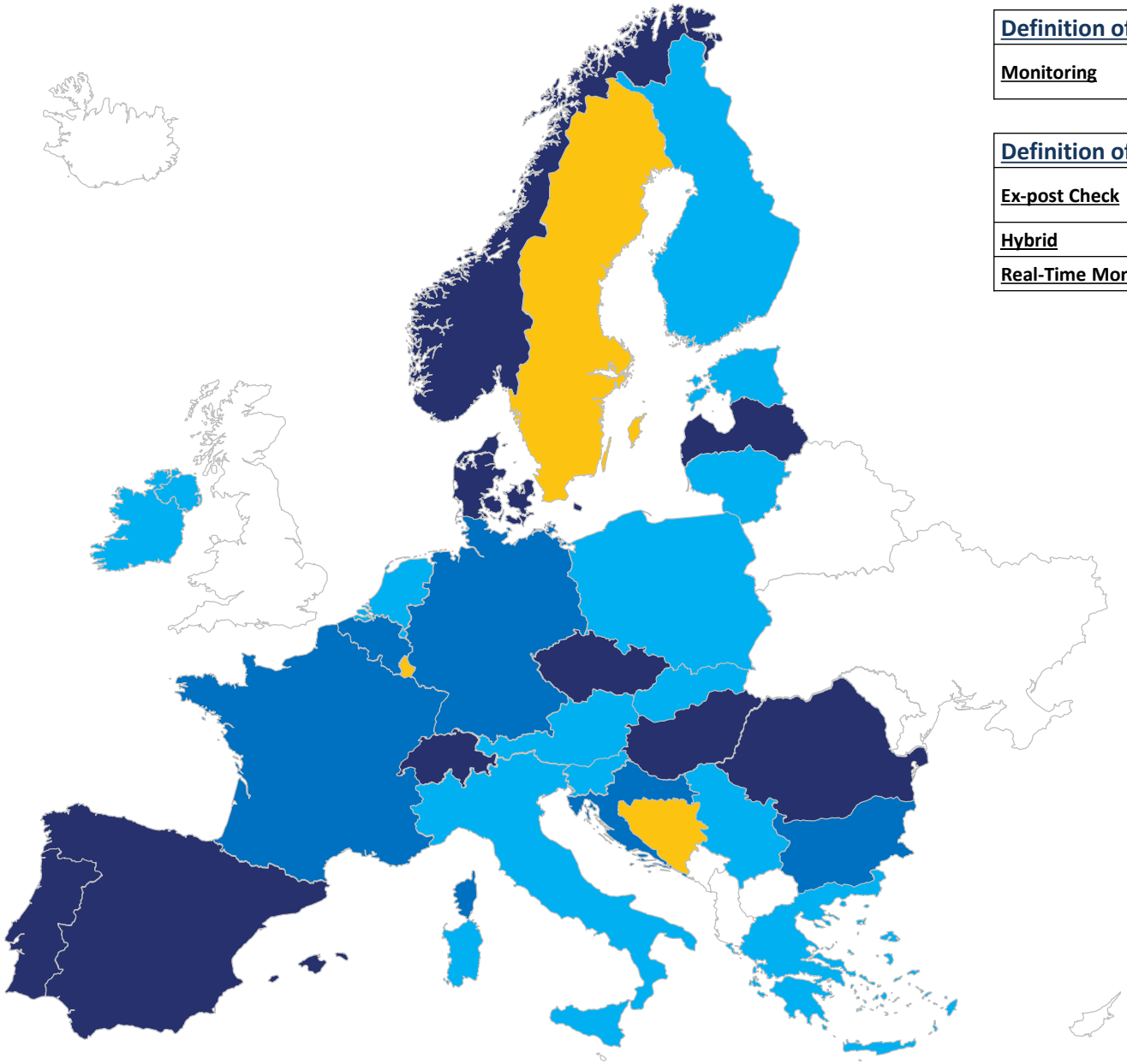
Voltage control – Settlement Rule



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



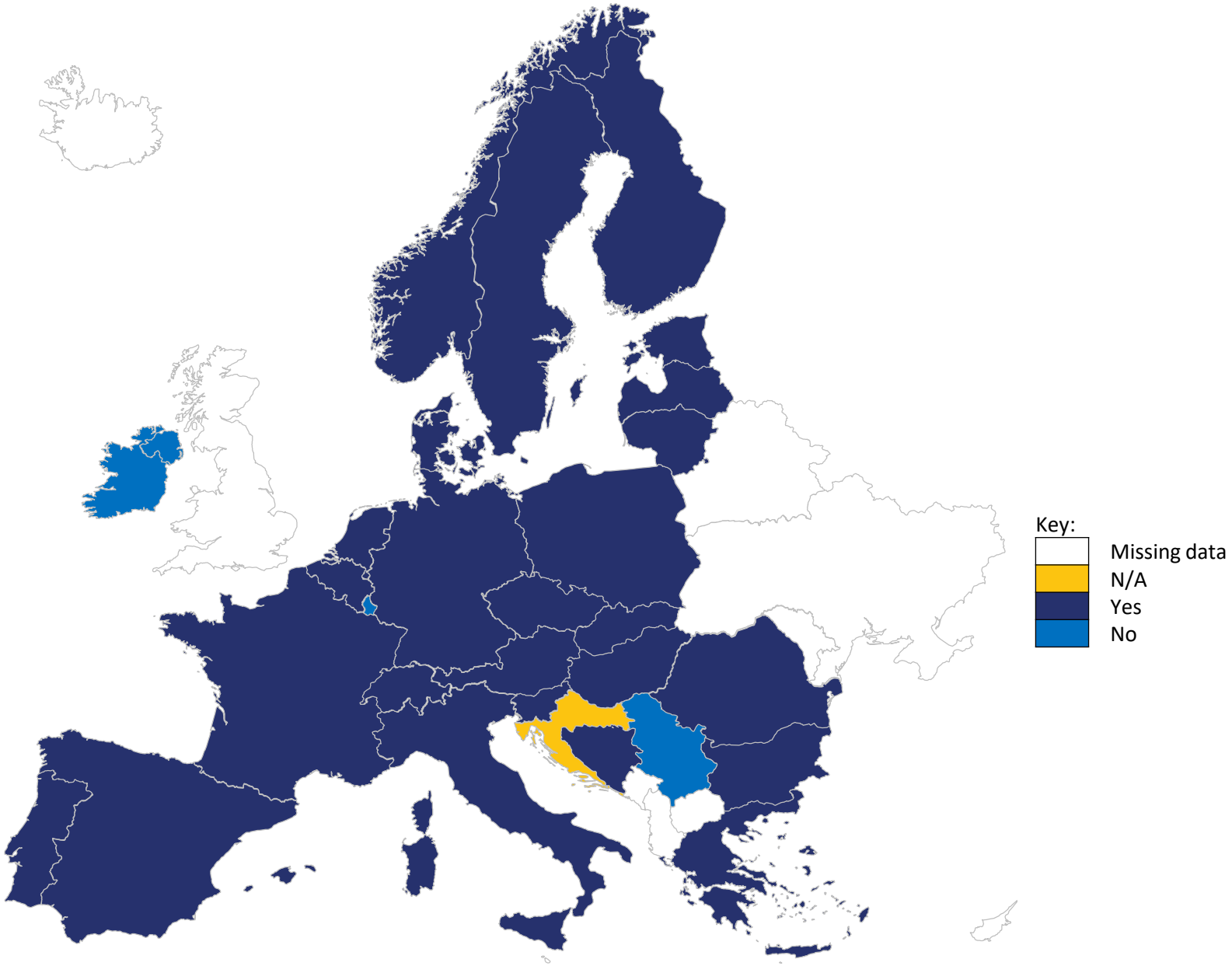
Definition of question	
Monitoring	Refers to the type of monitoring in place by the system operator to ensure performance of plant.

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.

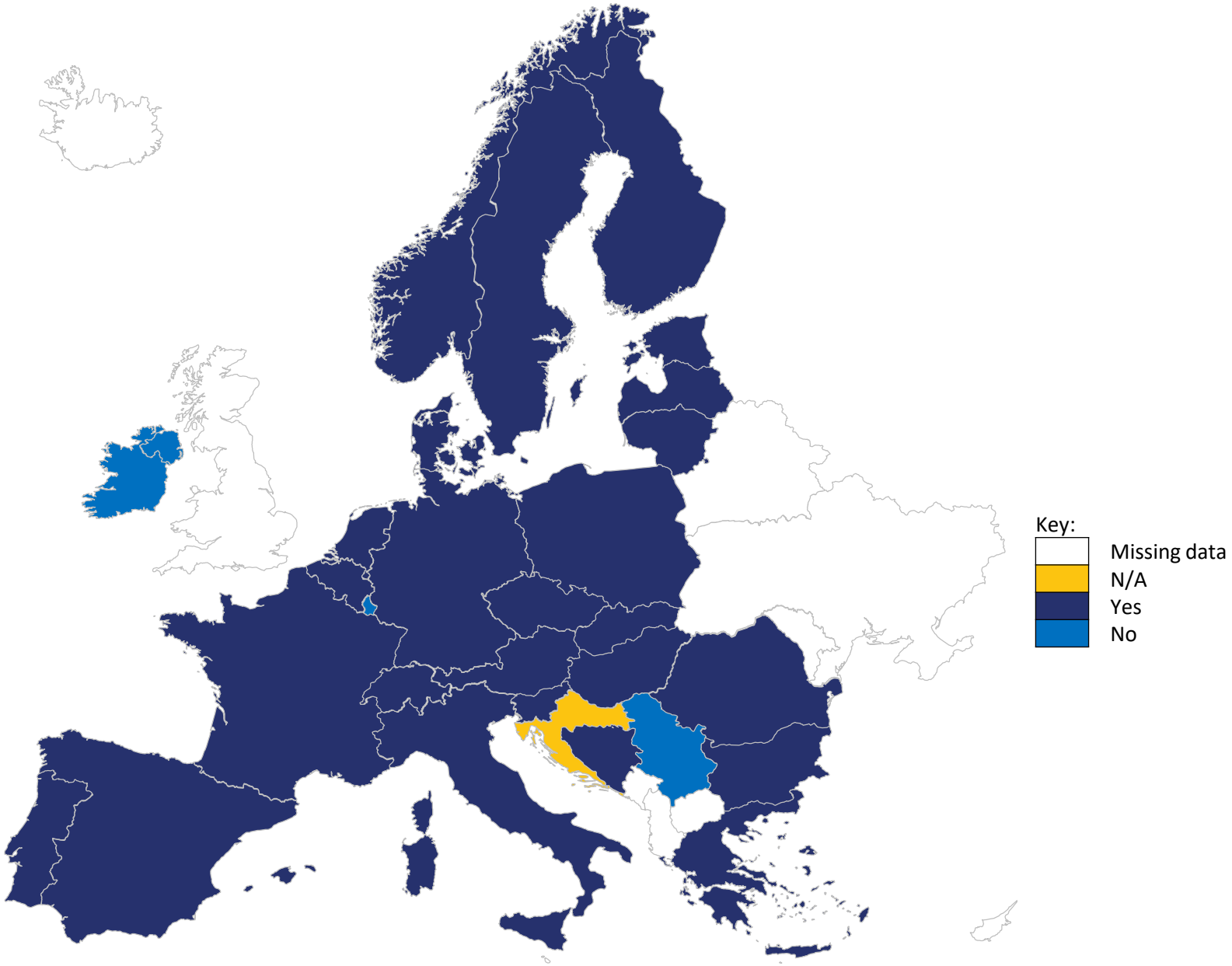
Key:

- Missing data
- N/A
- Real-time monitoring
- Ex-post check
- Hybrid

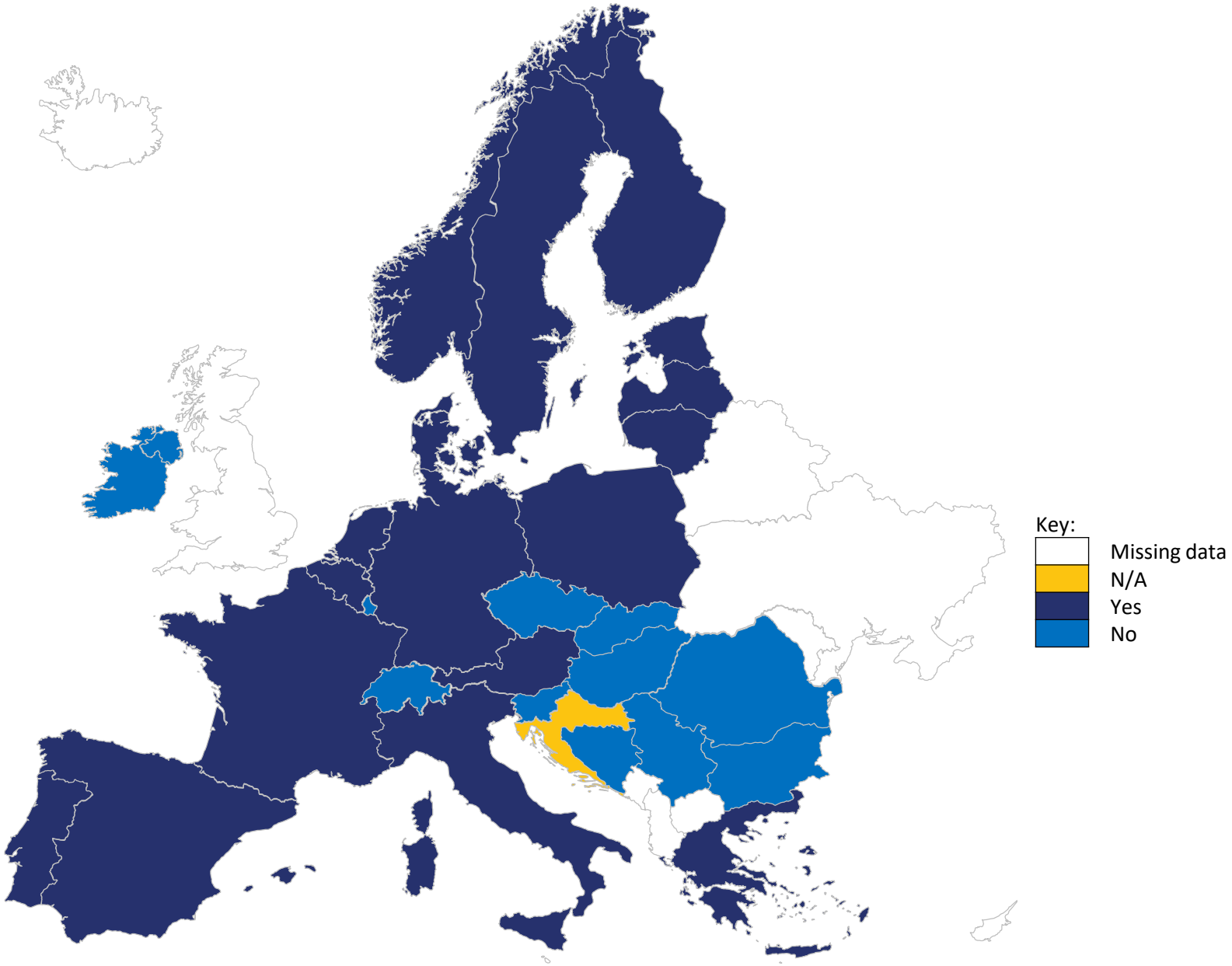
Voltage control – Does the TSO own reactive power compensation systems?



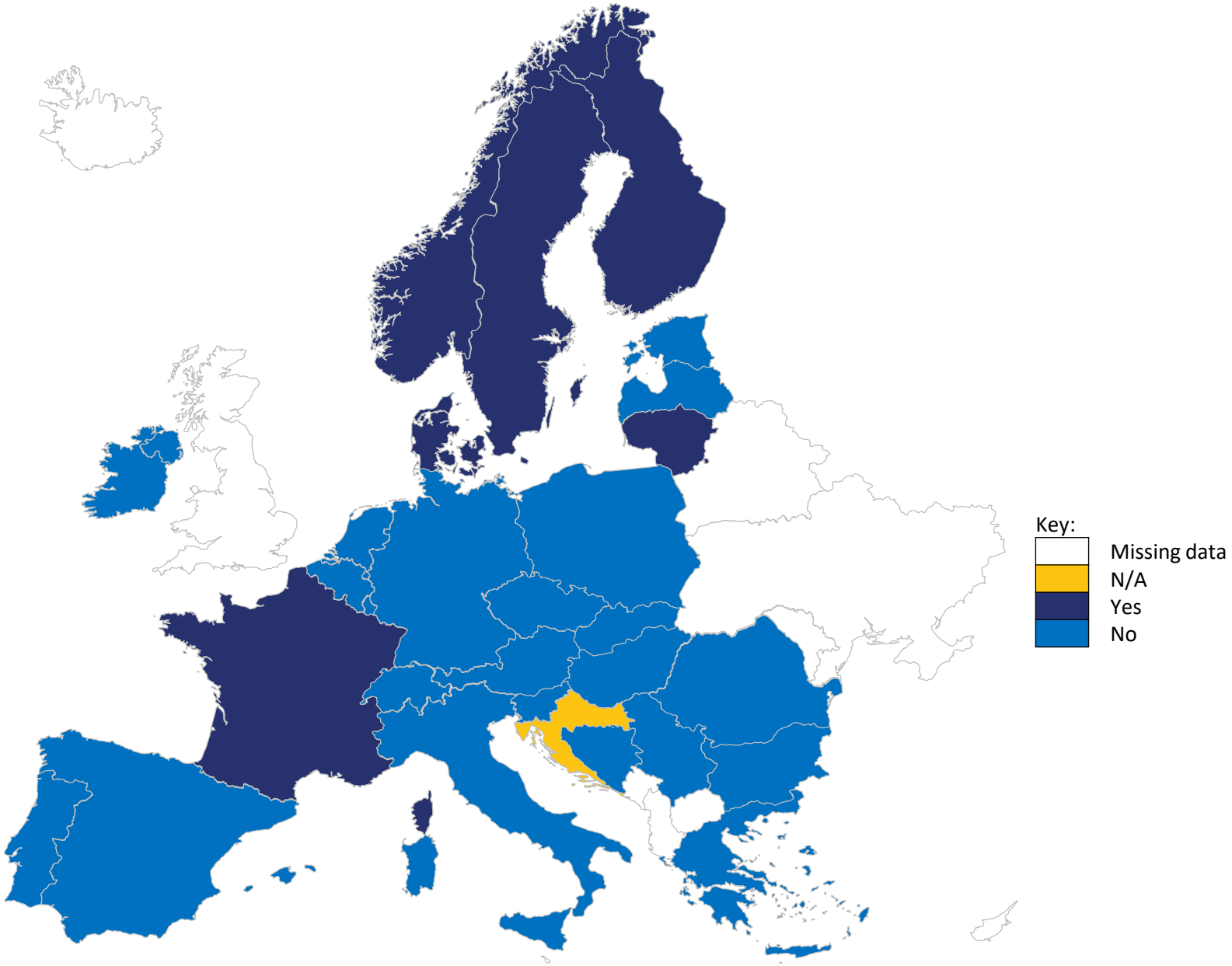
Voltage control – Owning by the TSO the reactive power compensation systems – Inductance



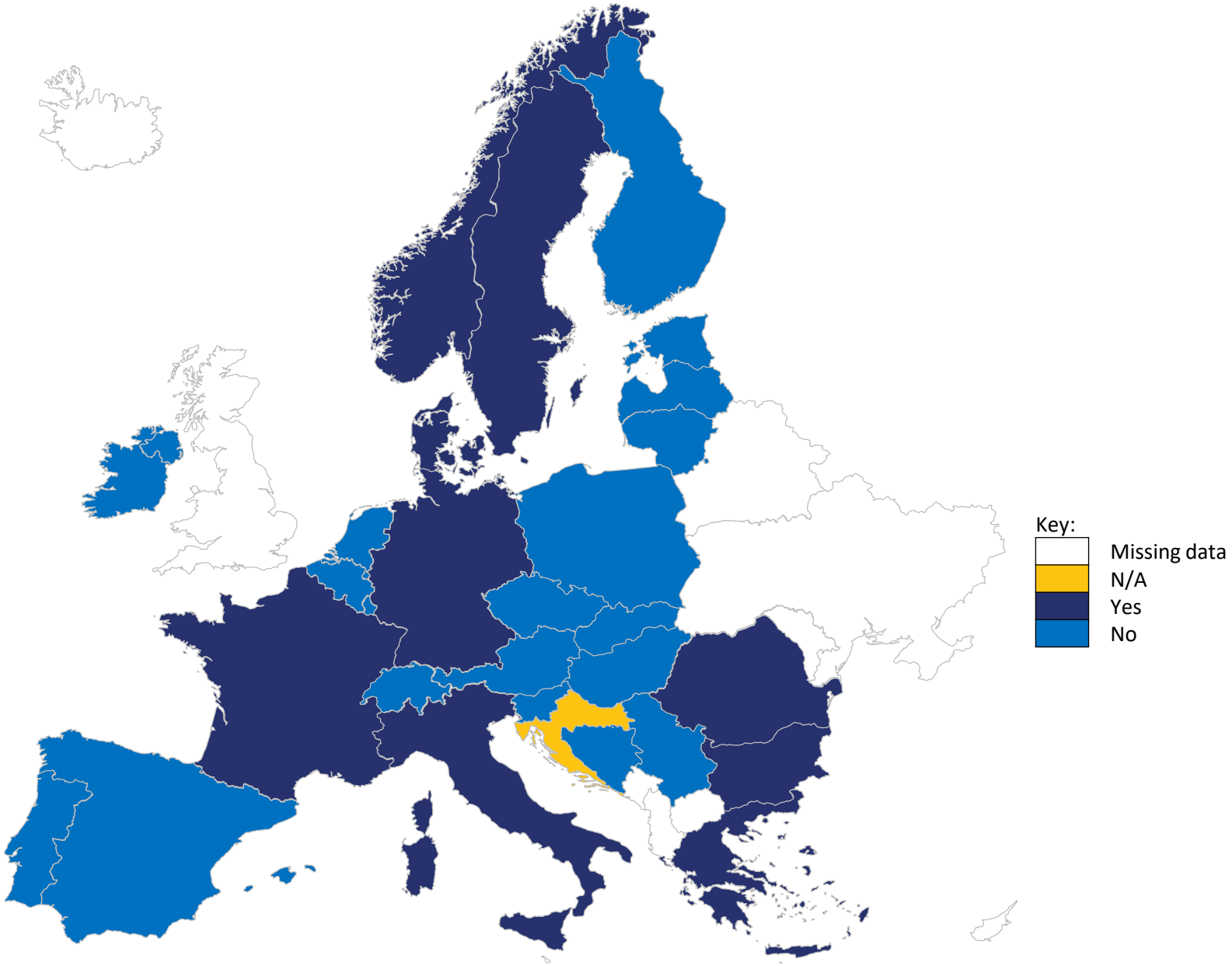
Voltage control – Owning by the TSO the reactive power compensation systems – Capacitor banks



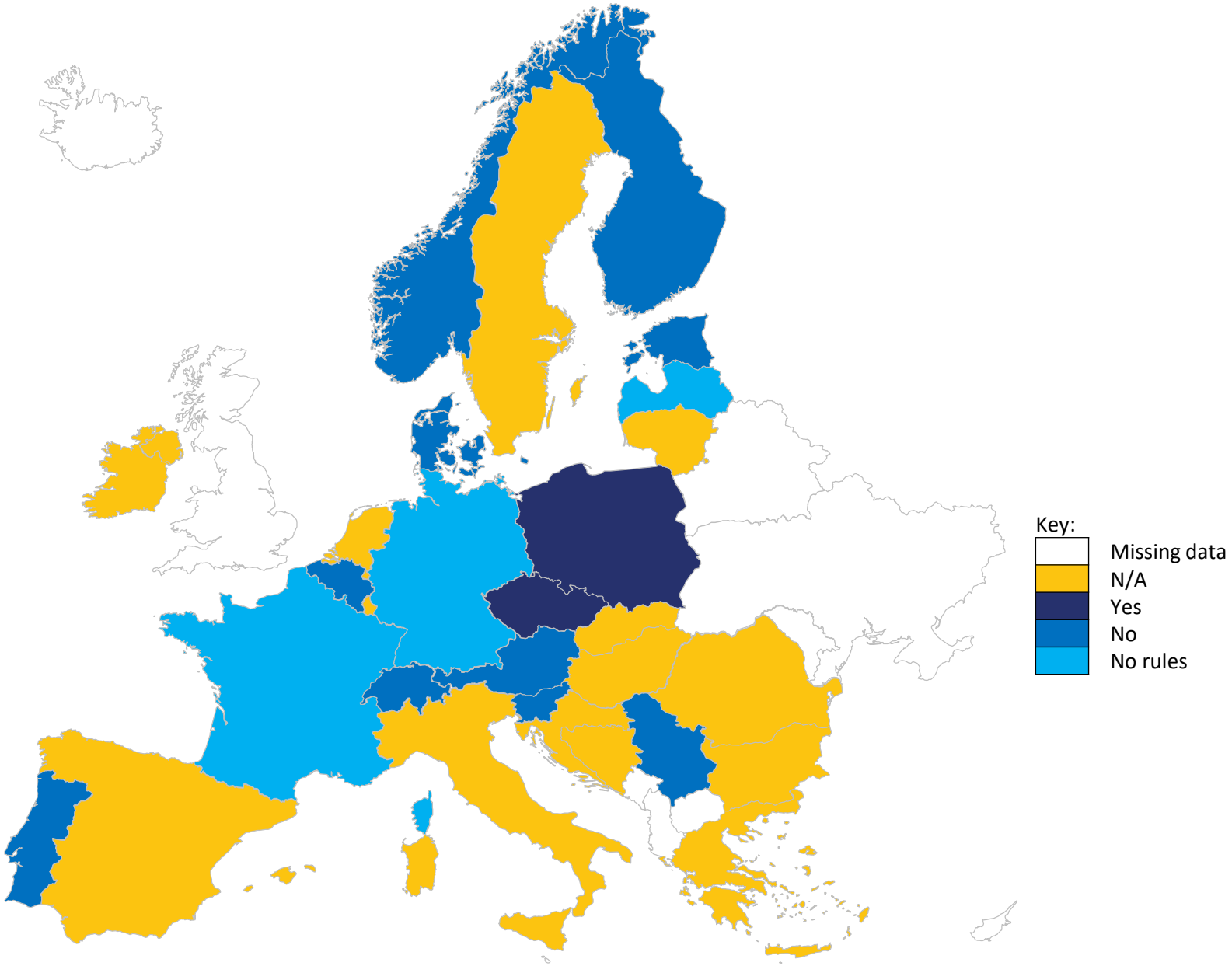
Voltage control – Owning by the TSO the reactive power compensation systems – SVC



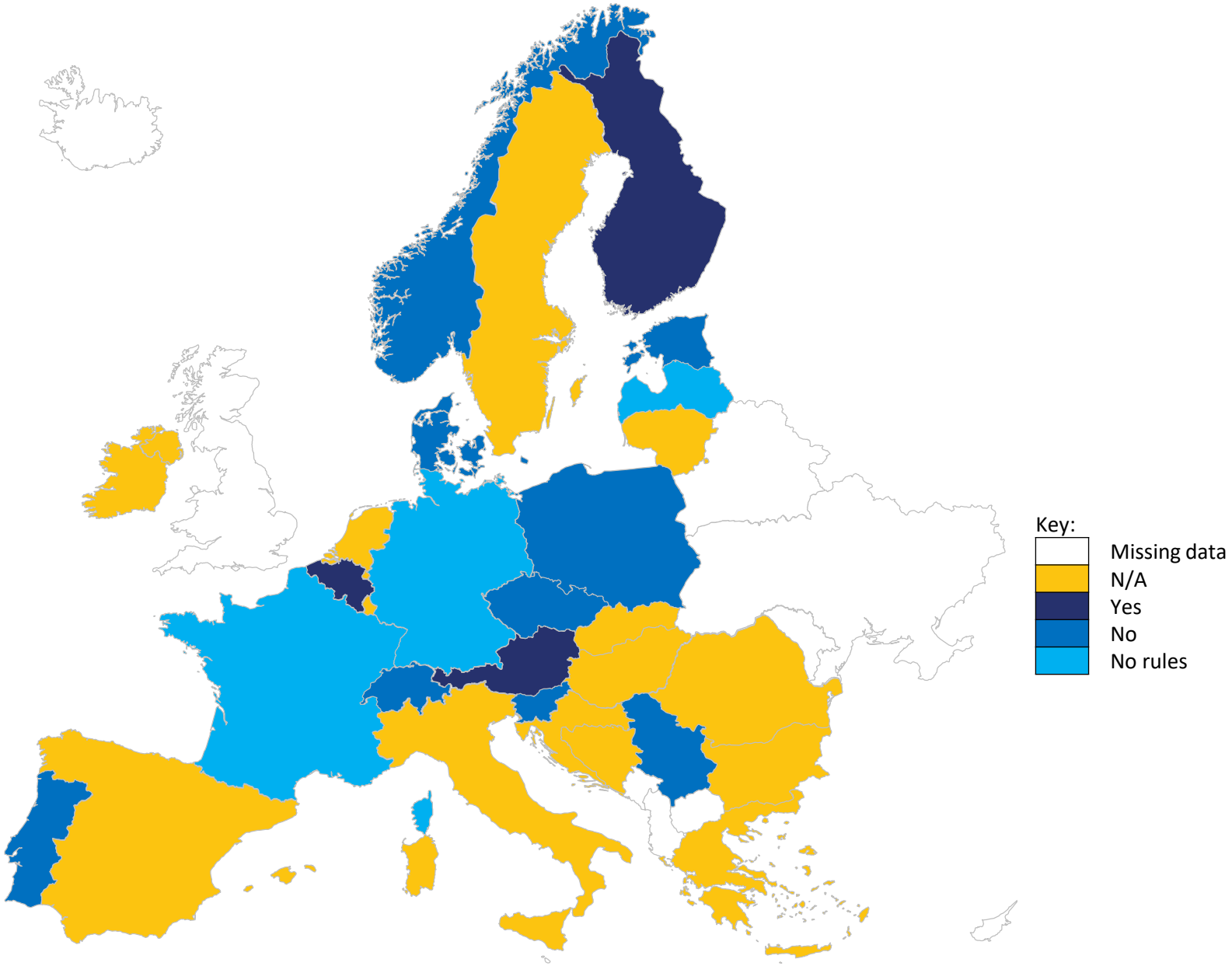
Voltage control – Owning by the TSO the reactive power compensation systems – Synchronous compensator



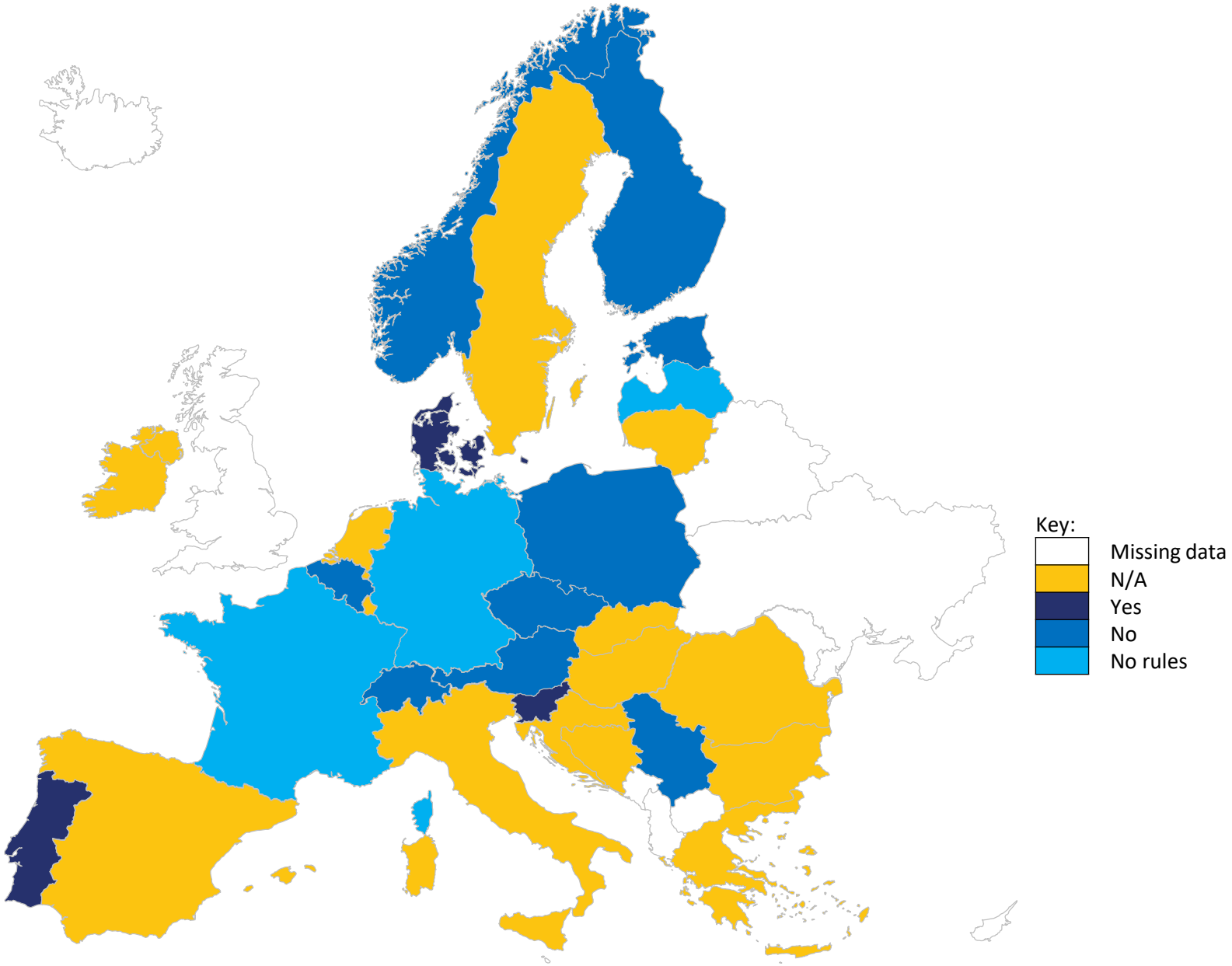
Voltage control – Settlement rules for the exchange of reactive power between transmission and distribution grids – Respect a Reactive/Active power ratio



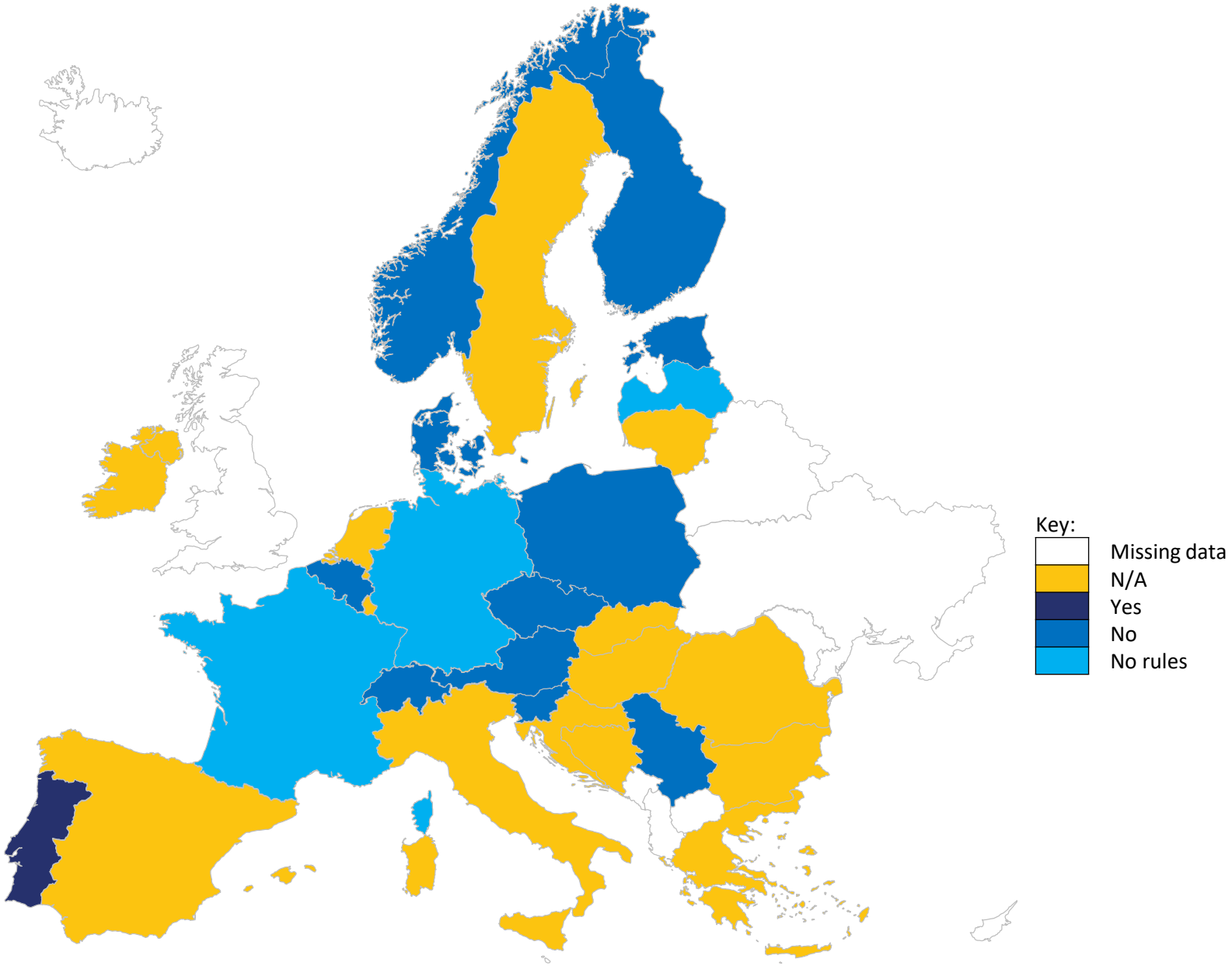
Voltage control – Settlement rules for the exchange of reactive power between transmission and distribution grids – Respect of an Active/Reactive Power Diagram at the connexion point



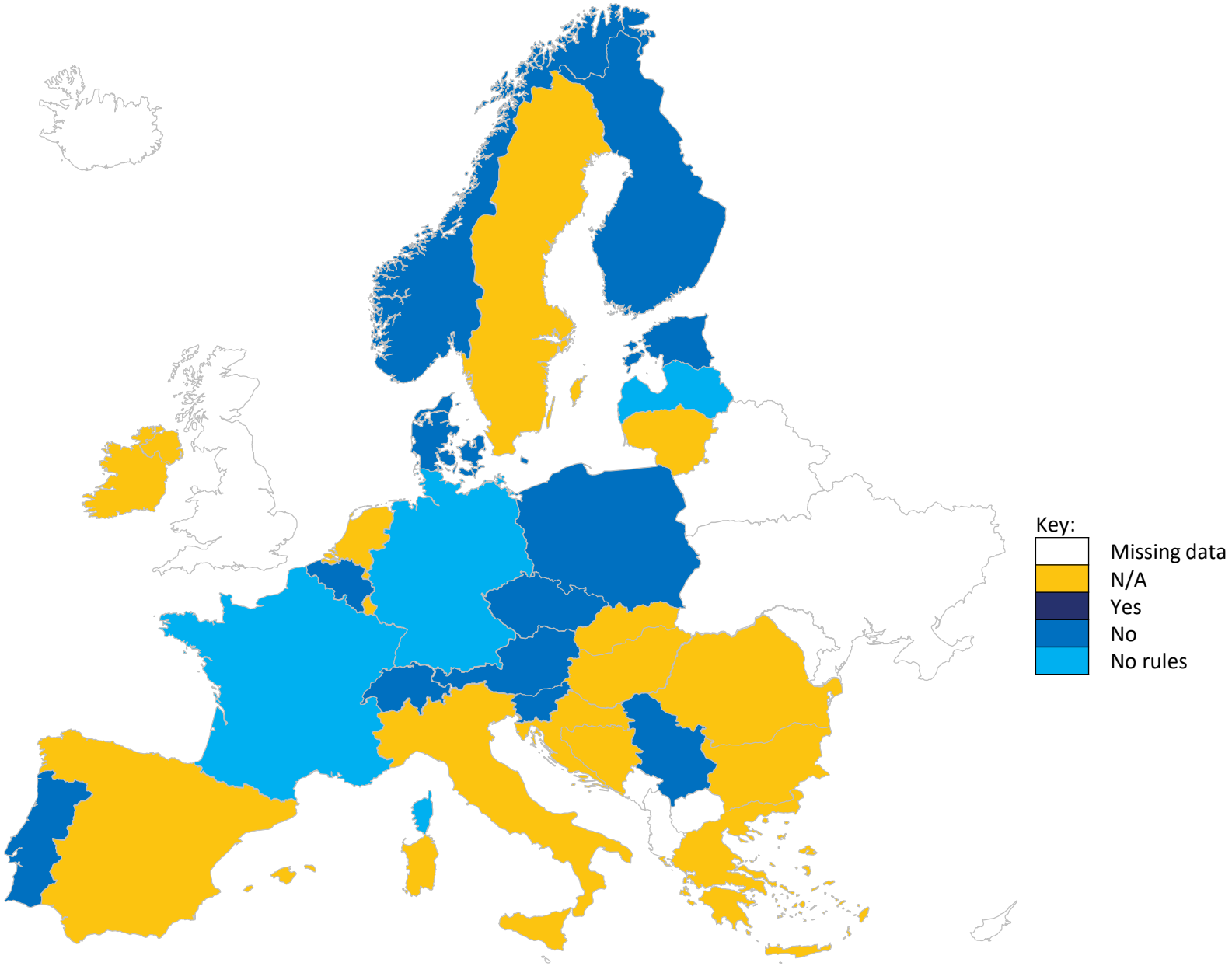
Voltage control – Settlement rules for the exchange of reactive power between transmission and distribution grids – Min/max fixed value of reactive power



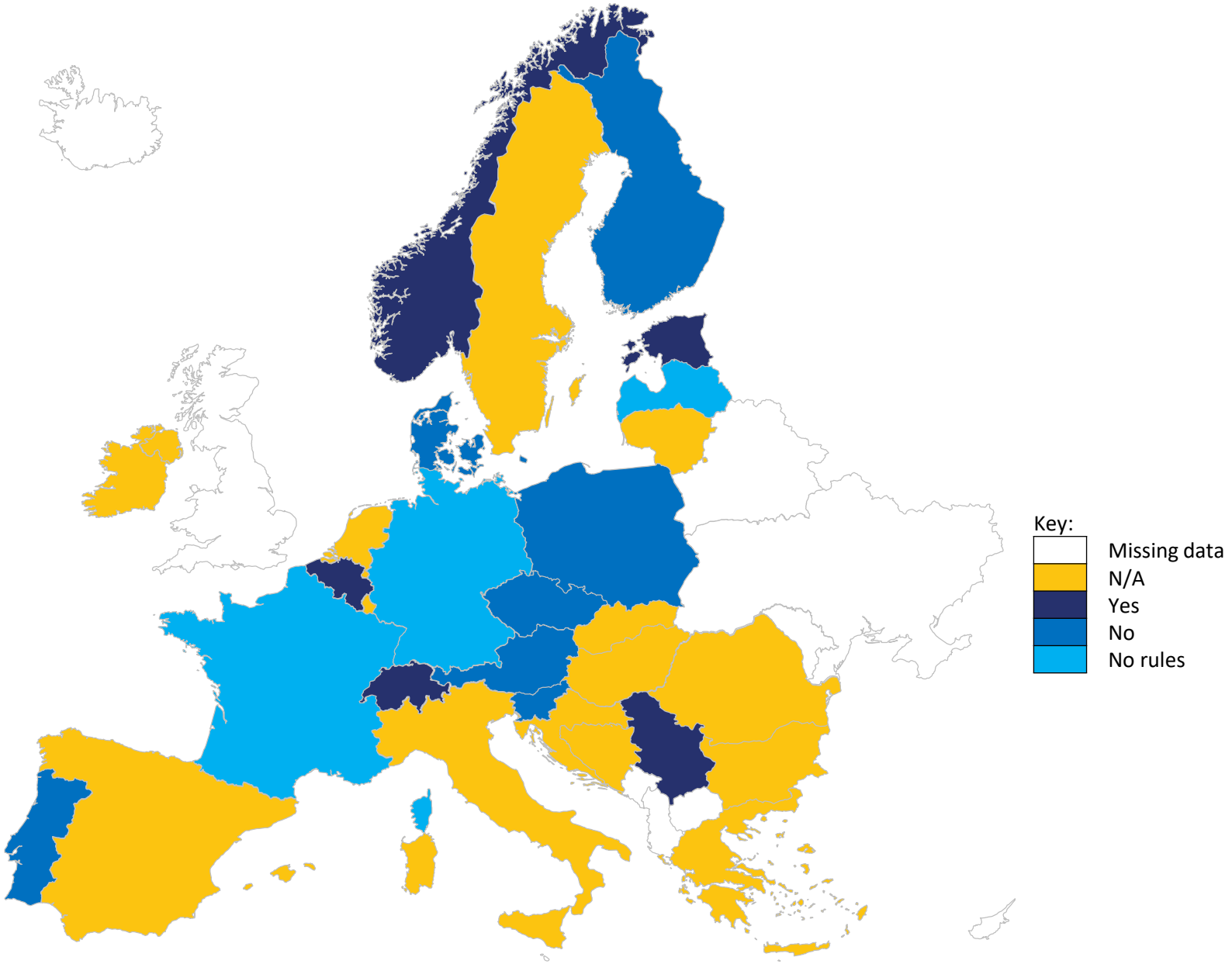
Voltage control – Settlement rules for the exchange of reactive power between transmission and distribution grids – Depending of the period of the day and/or year



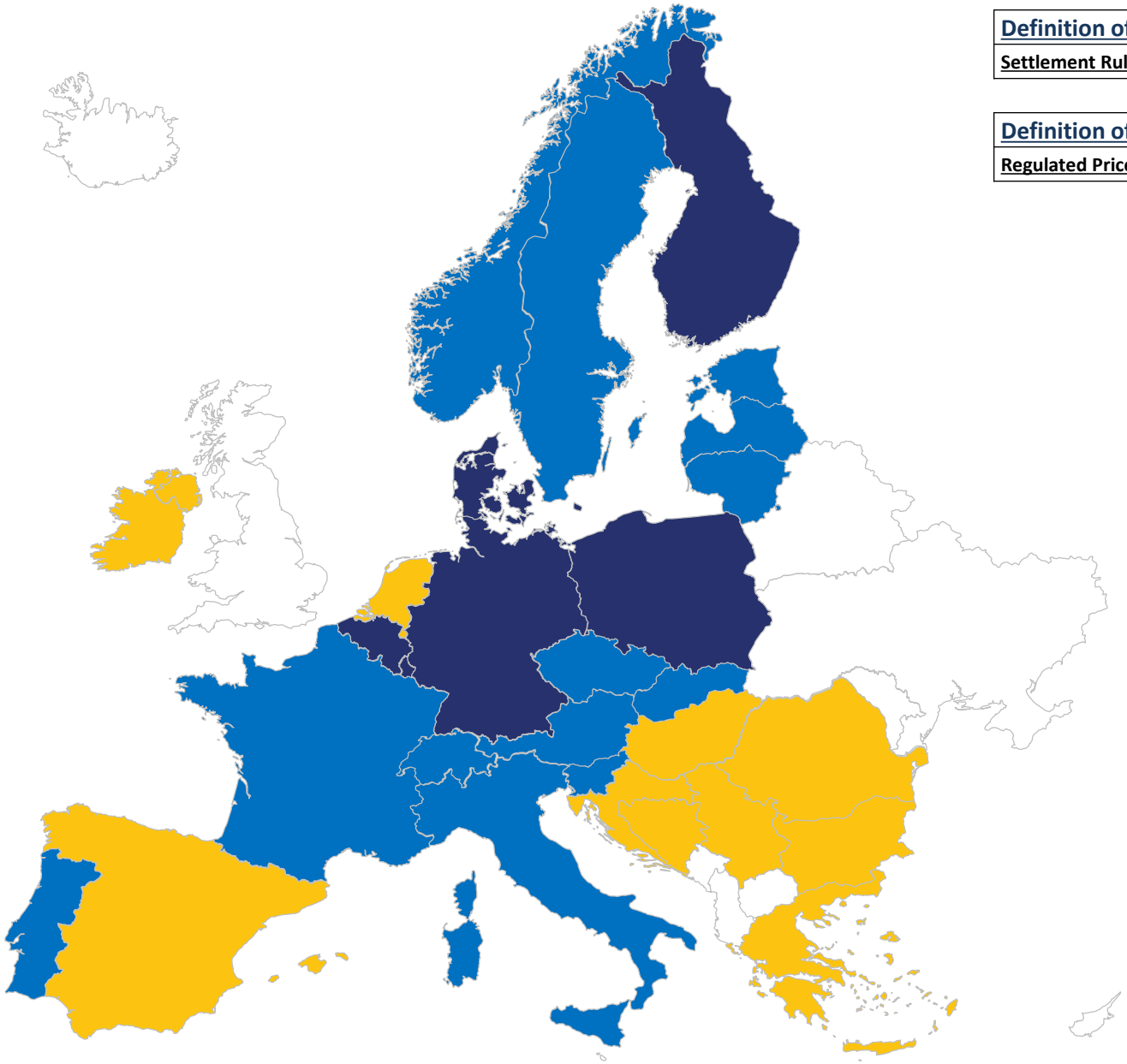
Voltage control – Settlement rules for the exchange of reactive power between transmission and distribution grids – Depending on the localization of the DSO



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



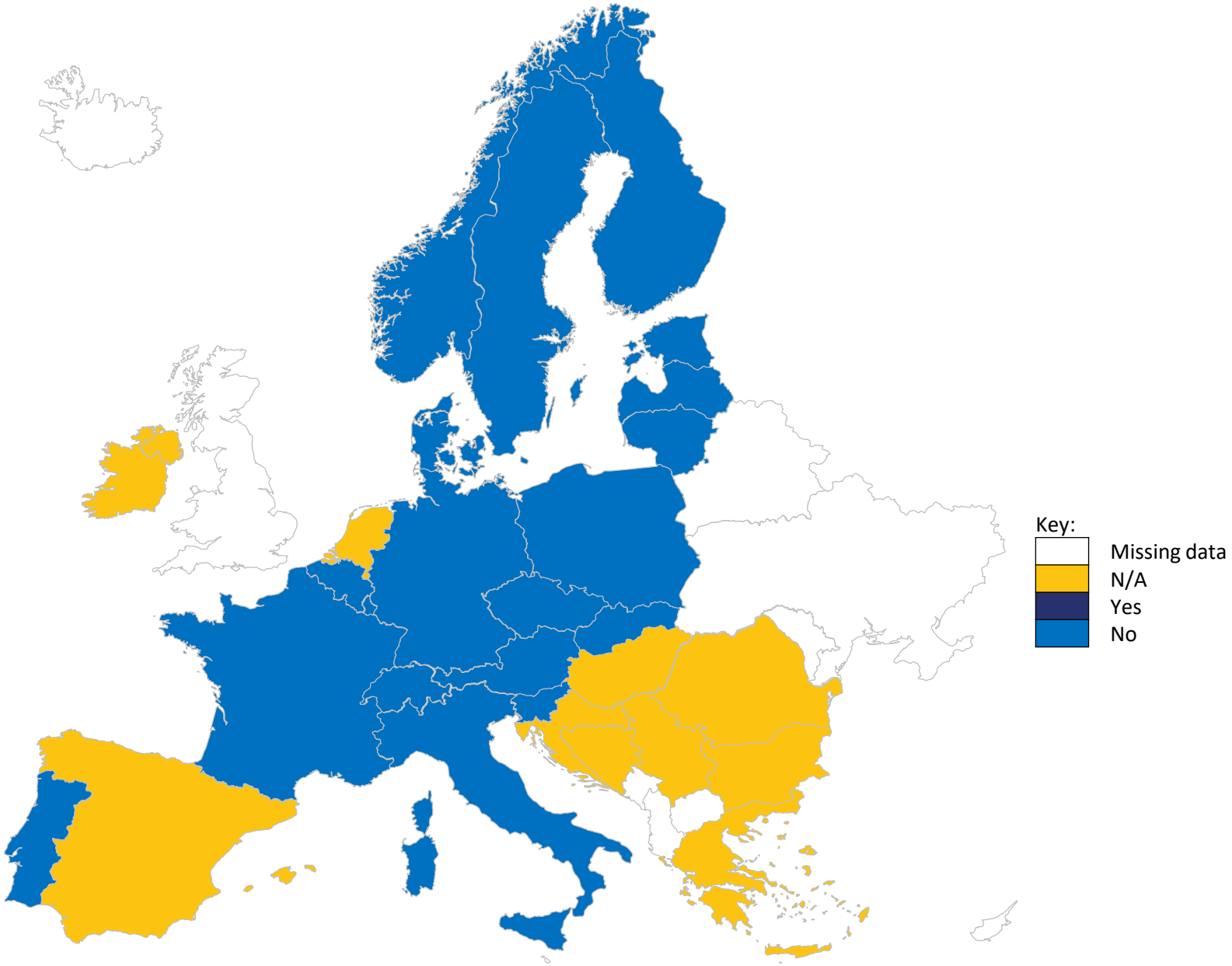
Voltage control – Settlement rules for the price of reactive power between transmission and distribution grids – Charges and/or fees if the DSO does not respect the tan Phi and/or the diagram rule



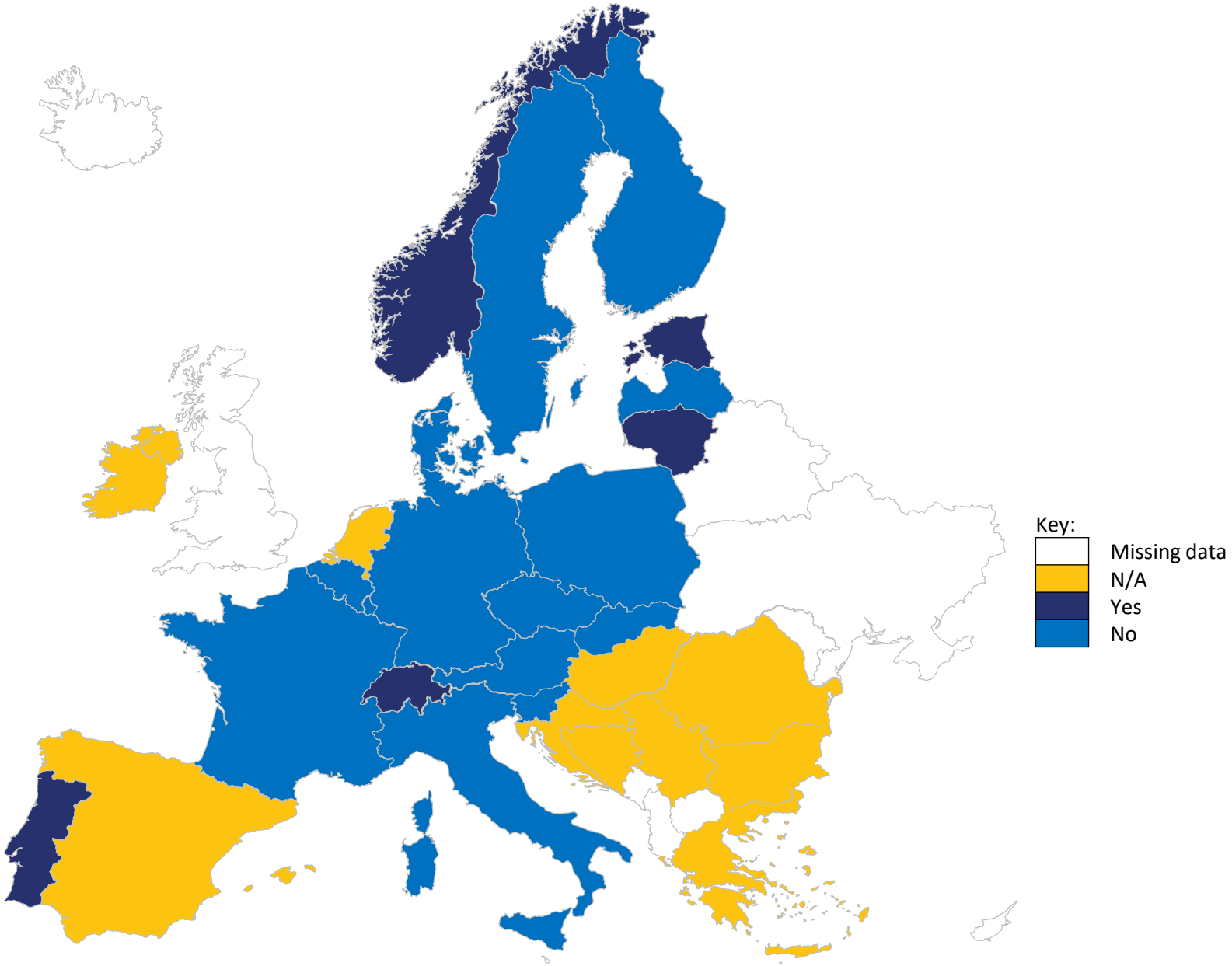
Definition of question	
Settlement Rule	The pricing rules for settlement.

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

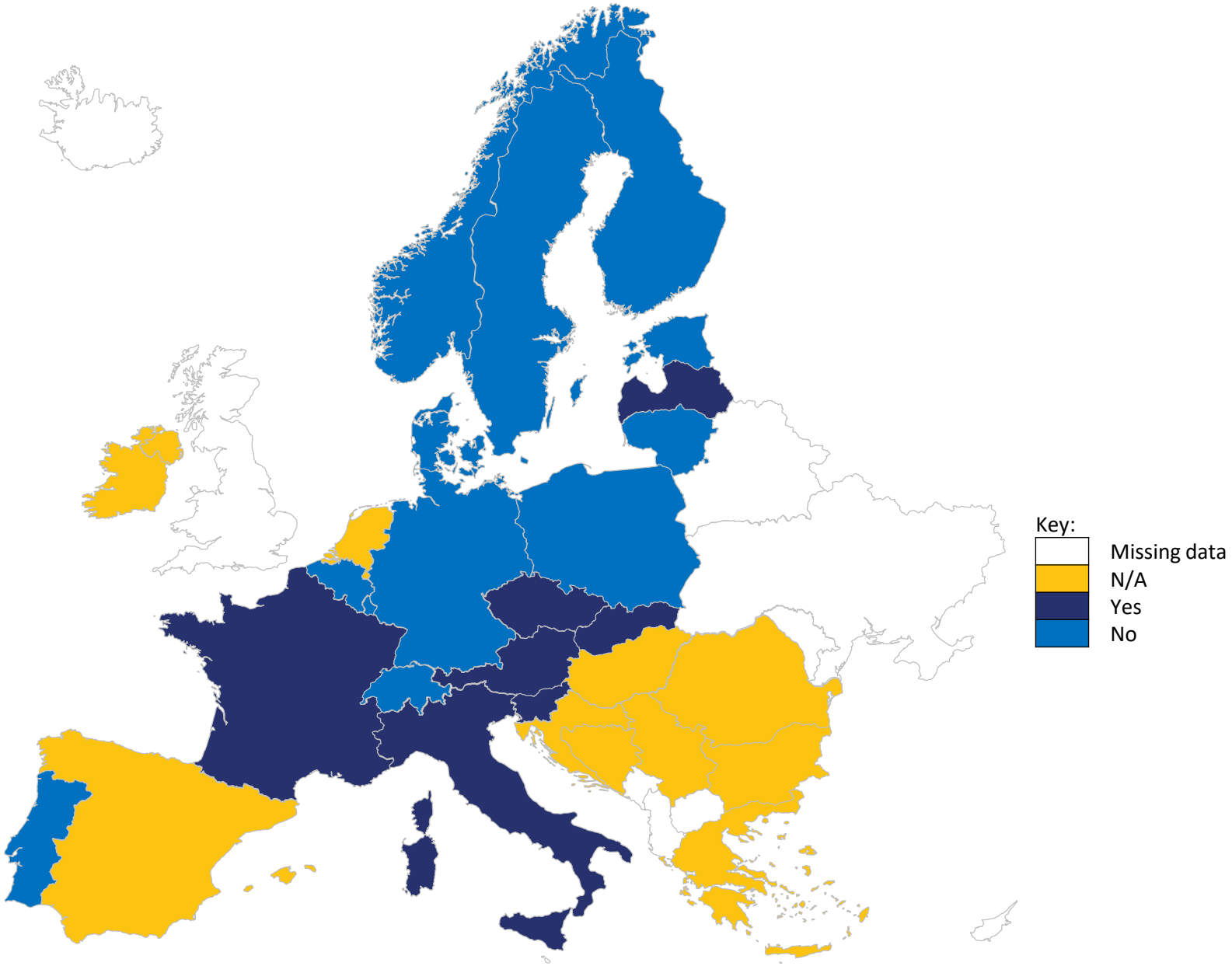
Voltage control – Settlement rules for the price of reactive power between transmission and distribution grids – Bonus link to a specific diagram



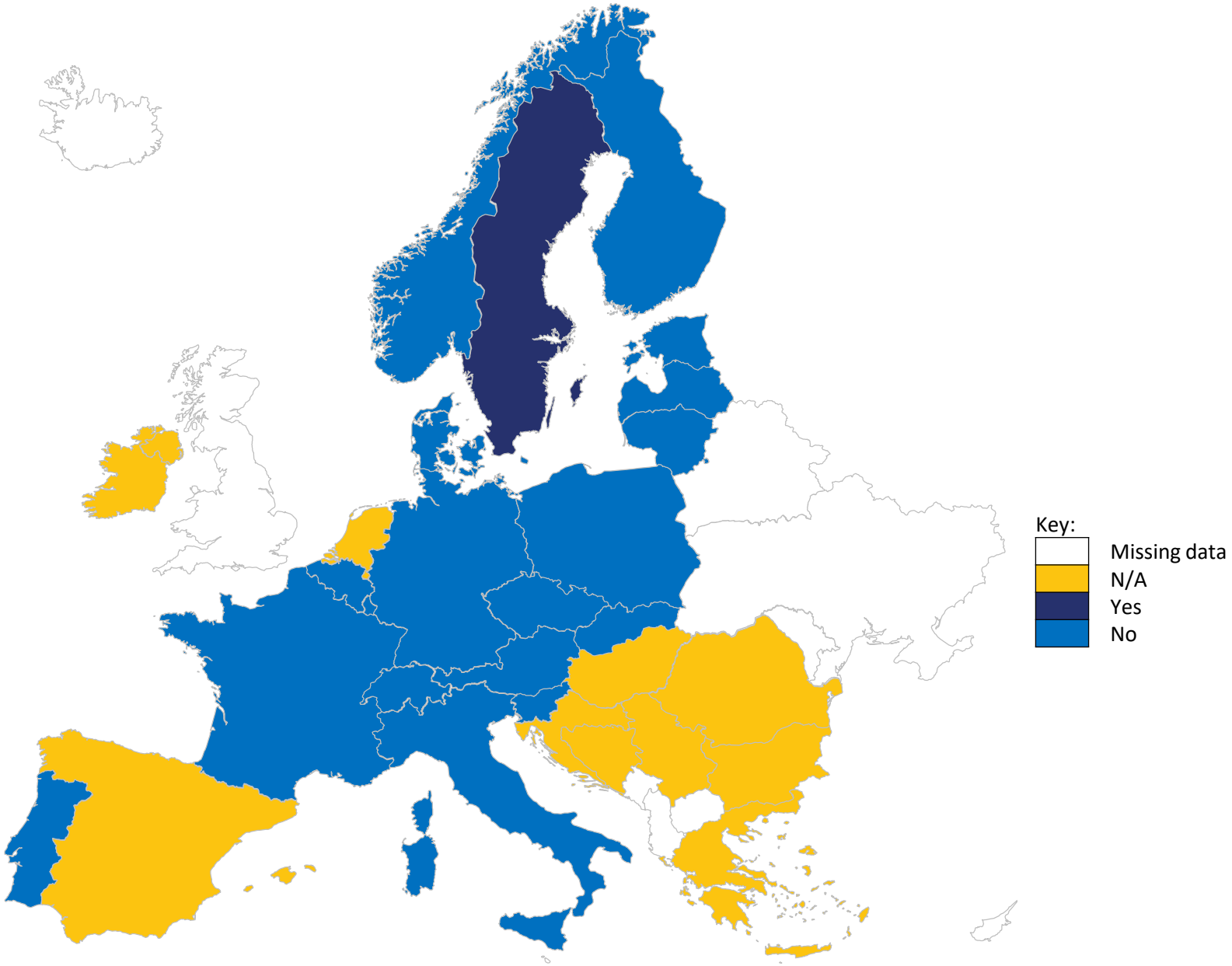
Voltage control – Settlement rules for the price of reactive power between transmission and distribution grids – Regulated price



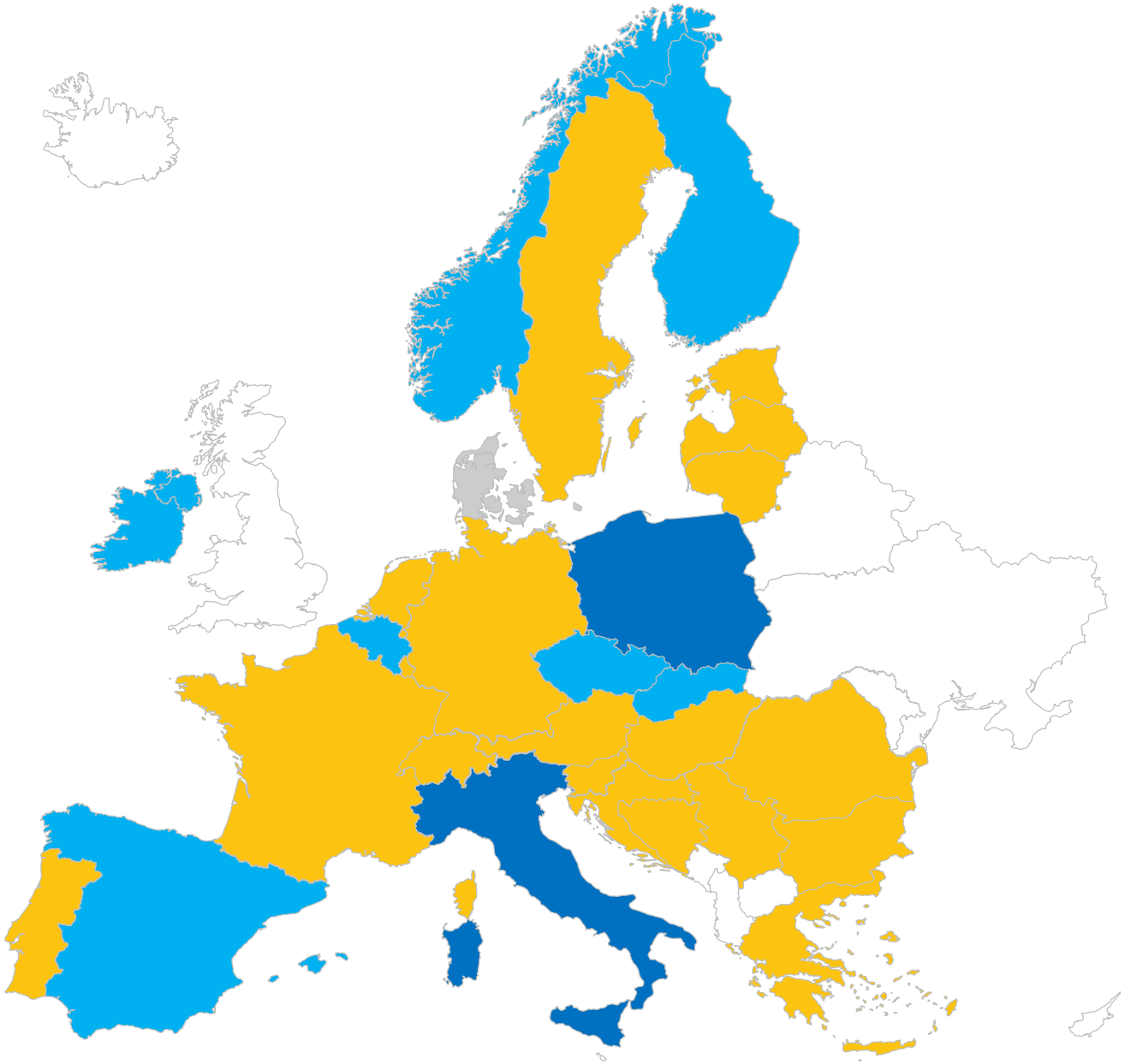
Voltage control – Settlement rules for the price of reactive power between transmission and distribution grids – No rules



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



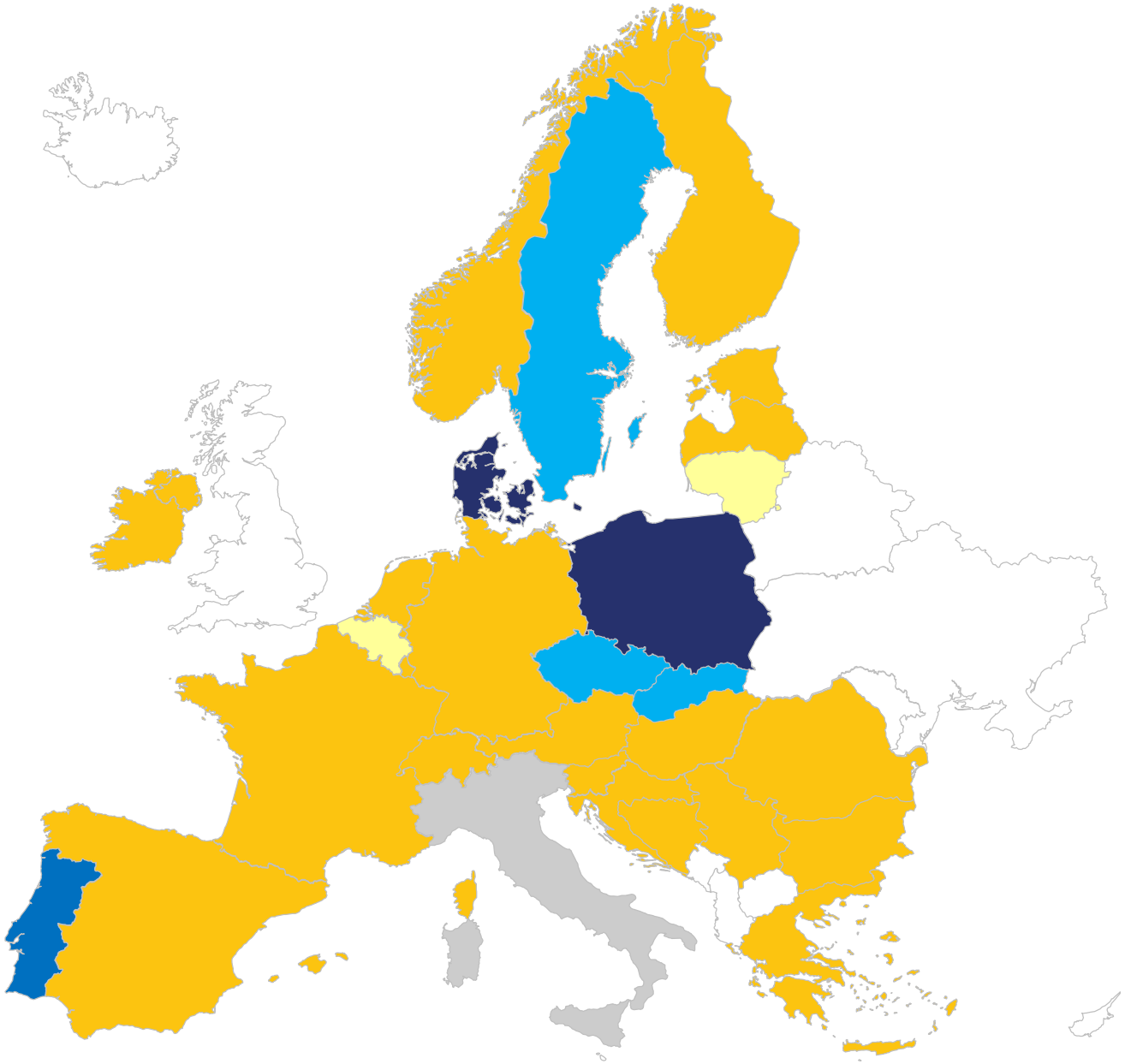
Voltage control – Are the primary voltage control parameters (proportional integral parameters) same for each node?



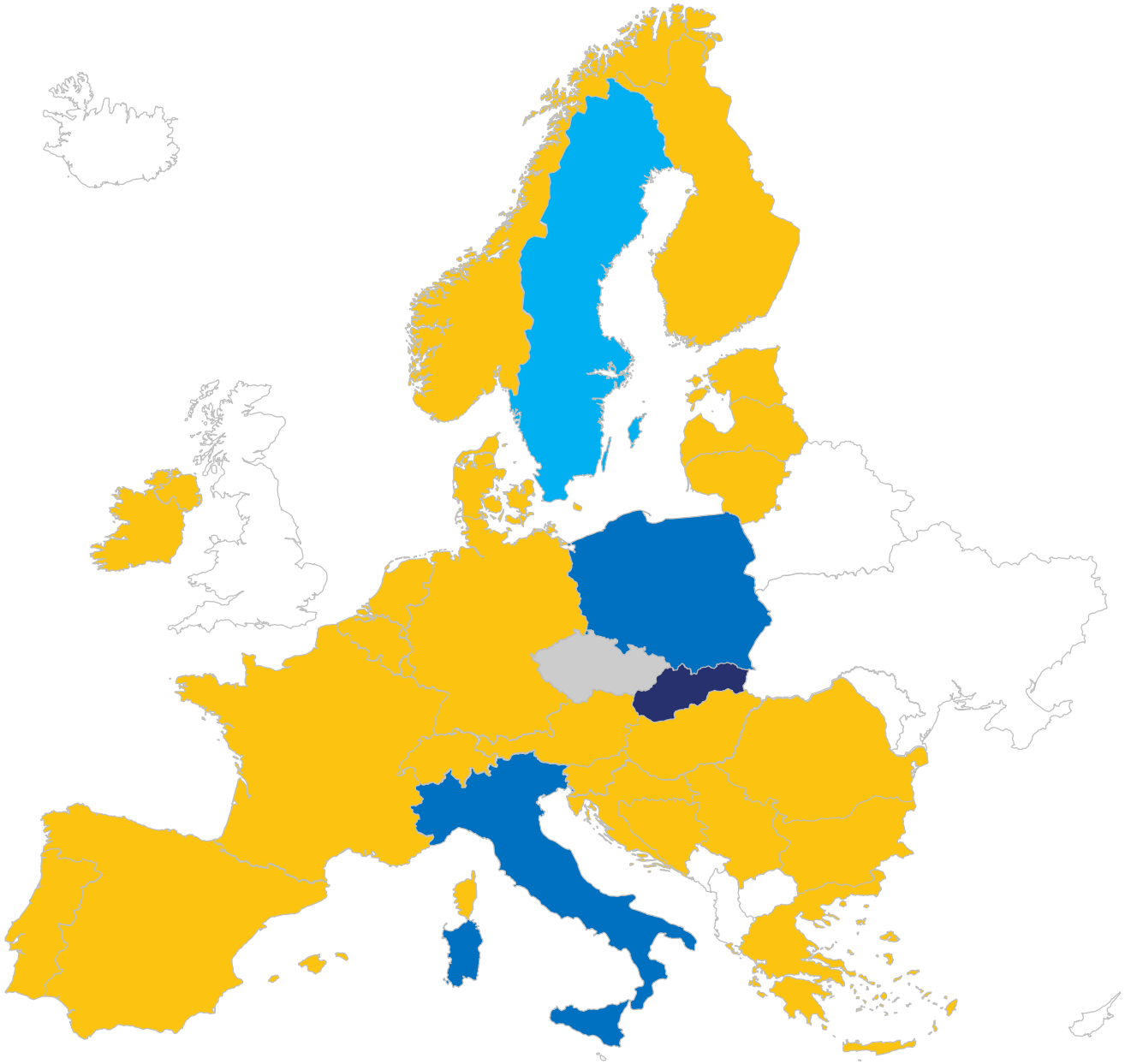
Key:

- 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?



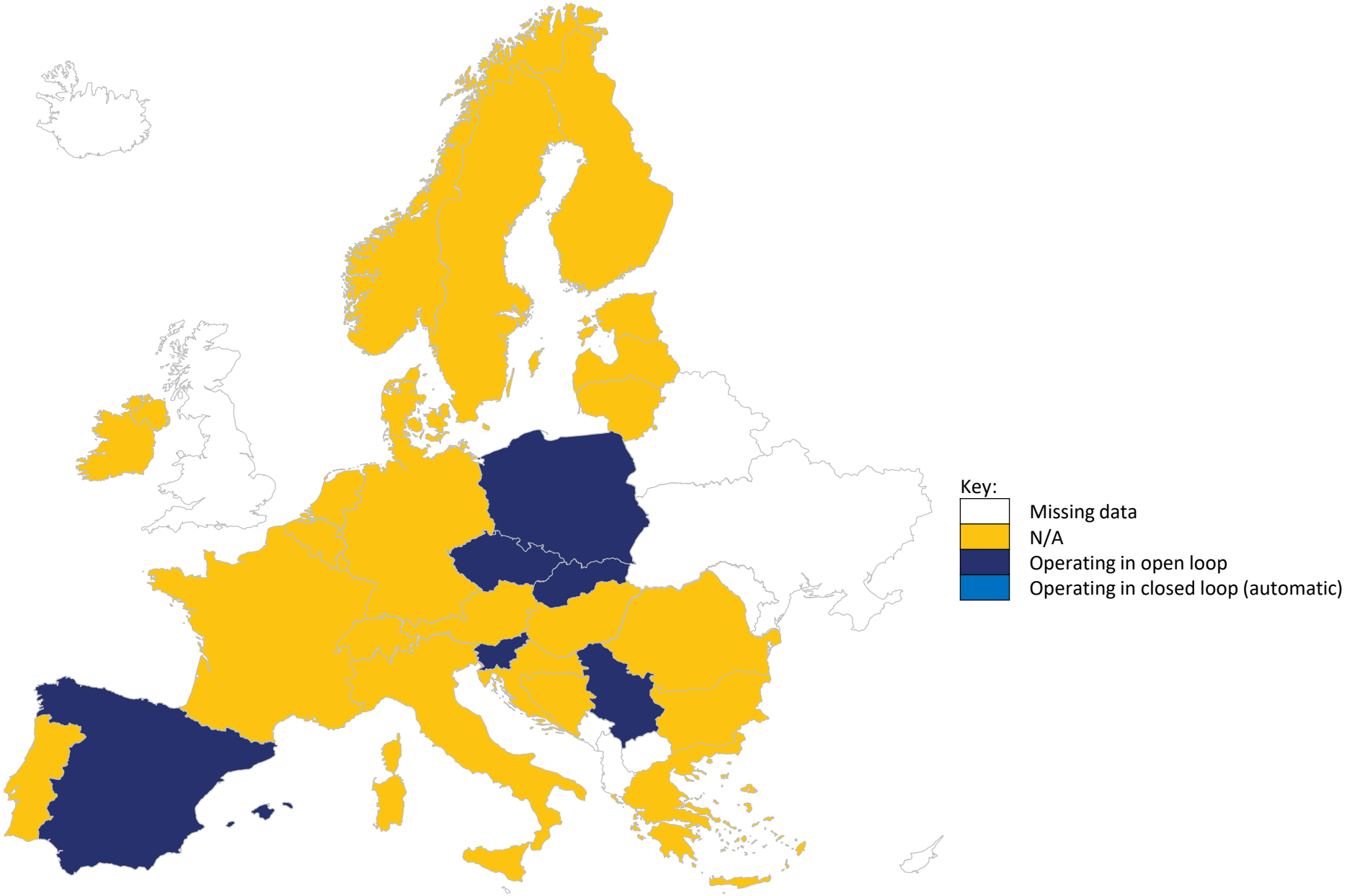
Key:

- Missing data
- N/A
- Yes
- No, there is a dependency on network strength level
- No, there is dependency on amount of MVARs
- No, there is other dependency or their combination

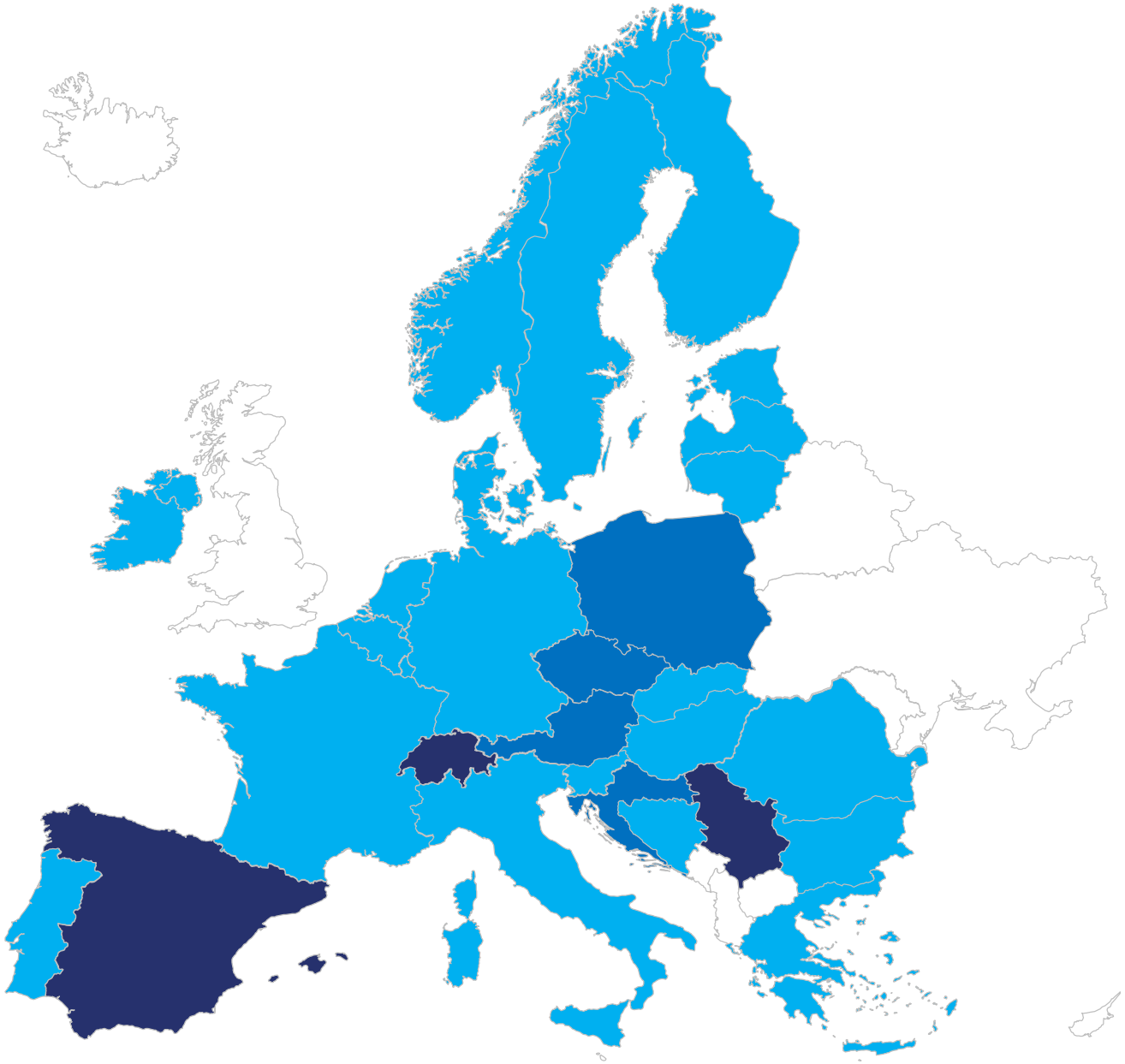
Voltage control – Are secondary voltage control parameters (proportional integral parameters) the same for each pilot node? 1/1

TSO	Answer
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
Elering	N/A
ELES	N/A
PSE S.A	Dispatcher updates voltage level according to the situation in the system based on voltage stability assessment results
SONI	N/A
Swissgrid AG	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 2019!

TSO	Answer
APG	Some plants changed from manual reactive power control to Q(U)-control
CEPS	No changes in 2020. Variable shunt reactors will be installed in the TS in 2021. These facilities will be included for automatic voltage control in pilot nodes.
PSE S.A	Need to clarify answers due to wrong interpretation concerning secondary voltage control in relation to primary voltage control. In PSE in every generation node and transmission node there are systems of primary voltage control (operating in close loop), sending a reactive setpoint to the units and OLTC setpoint on the main transformers automatically.
REE	At Q4 2021, it is envisaged the implementation of a daily reactive capacity market and also a secondary voltage control scheme in the Spanish system
Swissgrid	Since 2020, the 'passive' role to voltage control scheme that included a cost-free operating region is substituted with the 'semi-active' role. According to the new scheme the participants are given financial incentives to assist further the transmission system operator in the voltage control service (via a remuneration/penalization system).

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. Not mandatory for 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	N/A. No.
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.
ESO	The black start is mandatory for HPPs of systemic importance.
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 who 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 to technology).

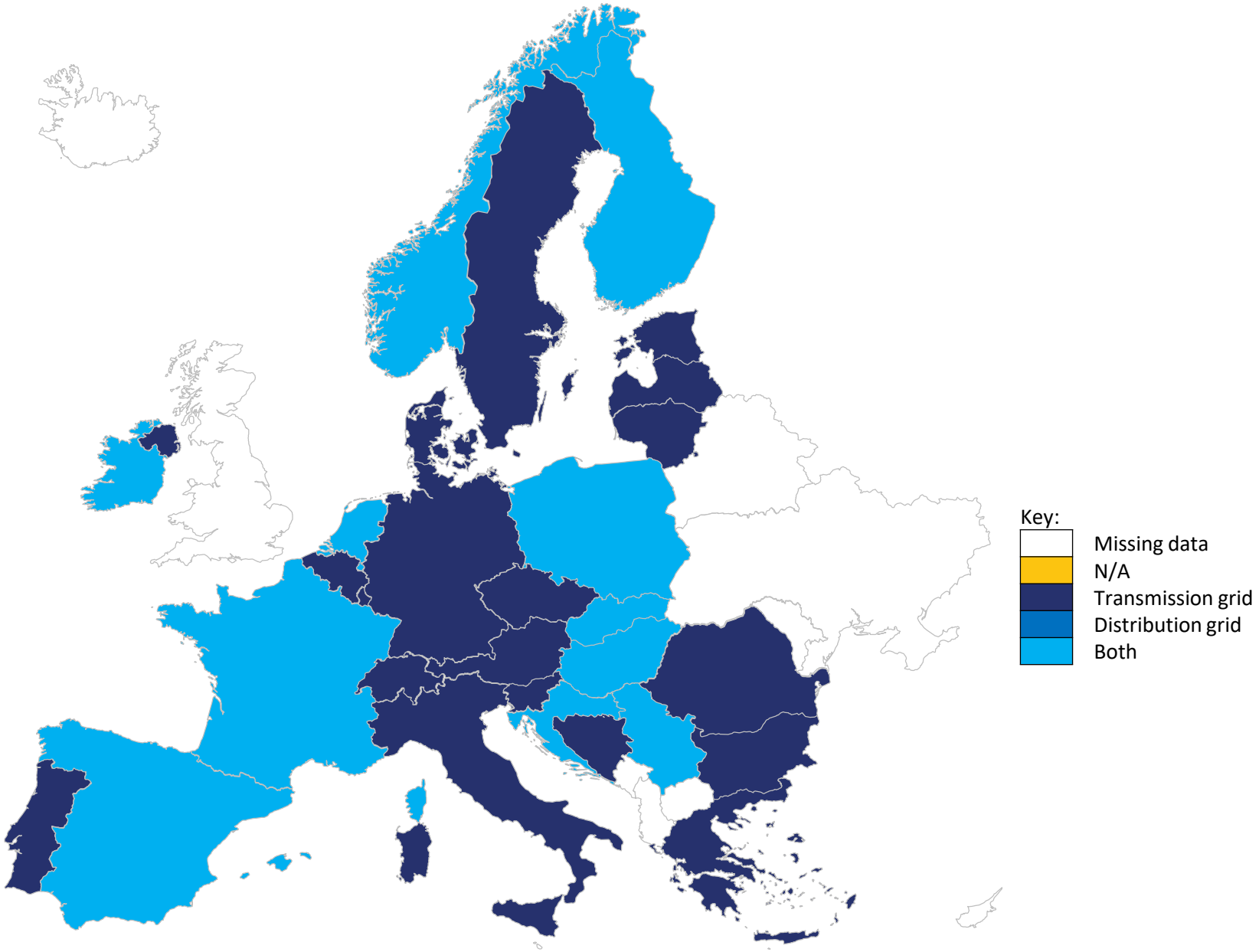
Black Start – Which power plants have to provide black start (for example: capacity, technology etc)? Is it a mandatory service in your country? 3/4

TSO	Answer
MAVIR	It is mandatory above 500 MW gross installed capacity, below that bilaterally agreed.
NOS BiH	Yes.
PSE S.A	It is not a mandatory service in Poland.
REE	Nowadays, mainly hydro units; it is 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	nuclear power plants provide black start
SEPS	No it is not mandatory.
SONI	Conventional (Thermal) Power Stations must have black start capability.

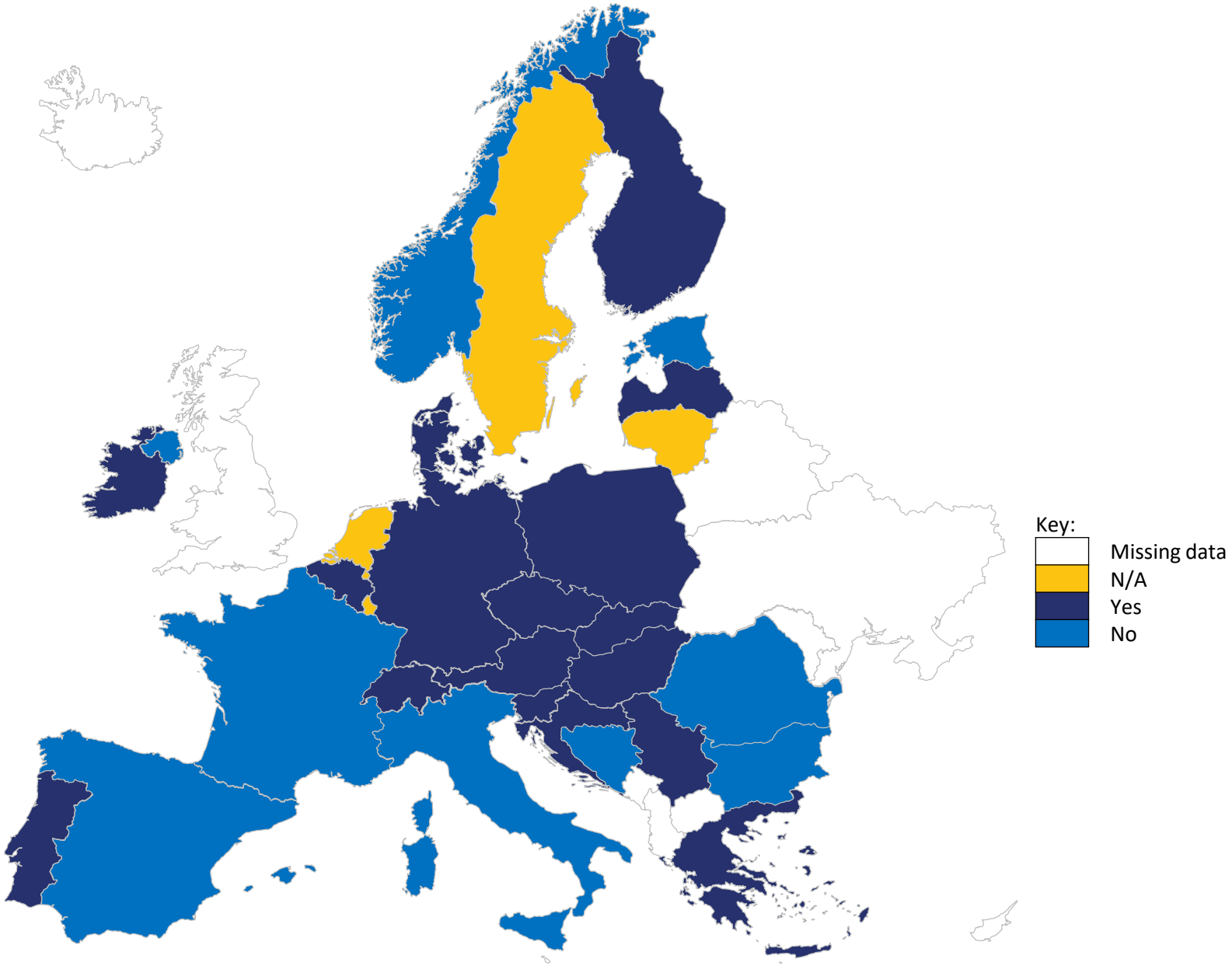
Black Start – Which power plants have to provide black start (for example: capacity, technology etc)? Is it a mandatory service in your country? 4/4

TSO	Answer
Statnett SF	Power plants that have a significance impact on the reconstruction of the network or other critical functions.
Svenska kraftnät	We have contracts with some suppliers of blackstart capability.
Swissgrid	A buildup-cell is defined as a small subnet, limited in area and electrical network, which consists of one powerstation equipped with black start facilities and one or more powerstations 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 SA	Power plants that are included in the Black Start Plan must provide the Black Start Service - due to technology.

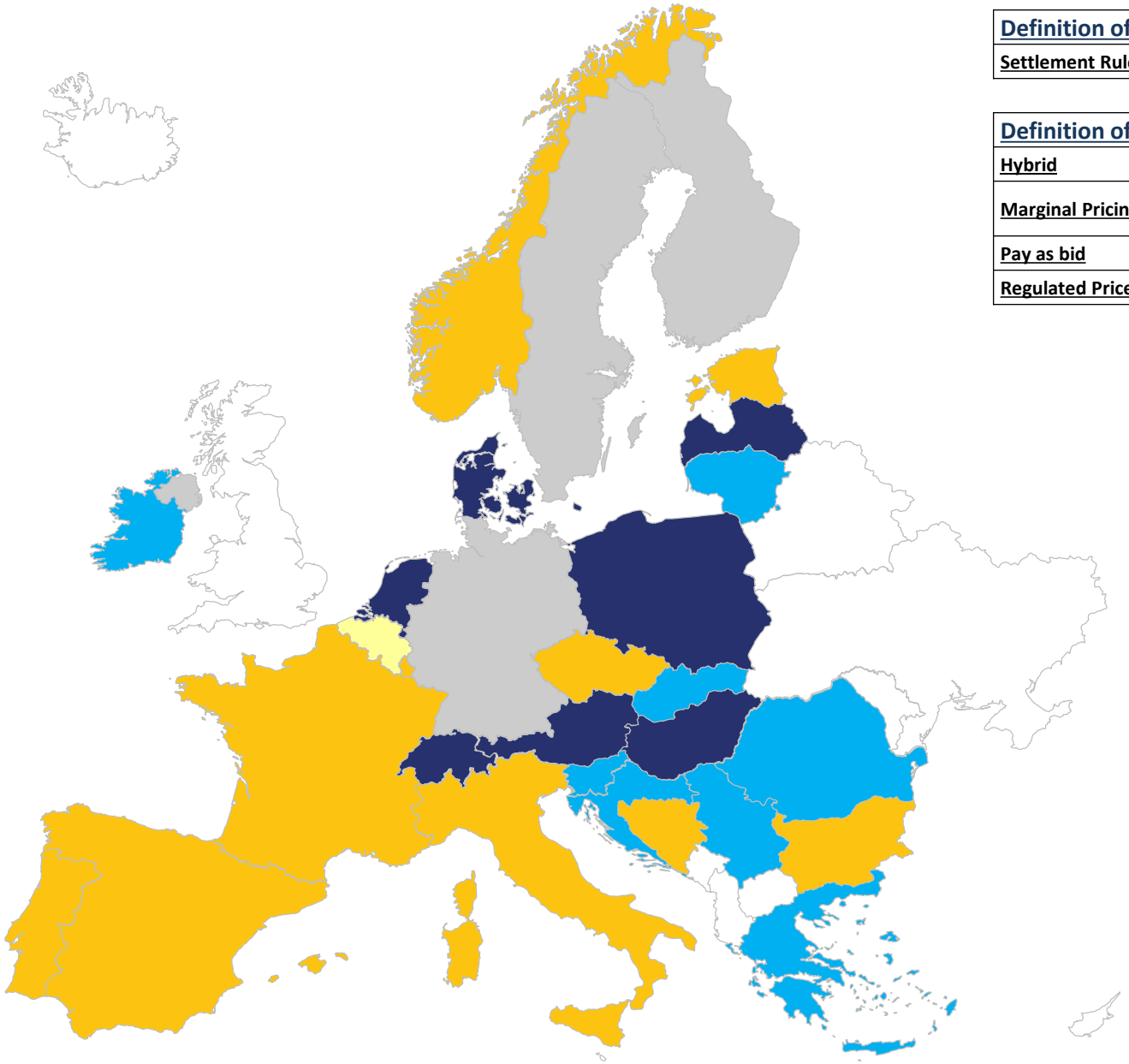
Black Start - If a power plant is able to provide black start service, which grid it should be connected to?



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



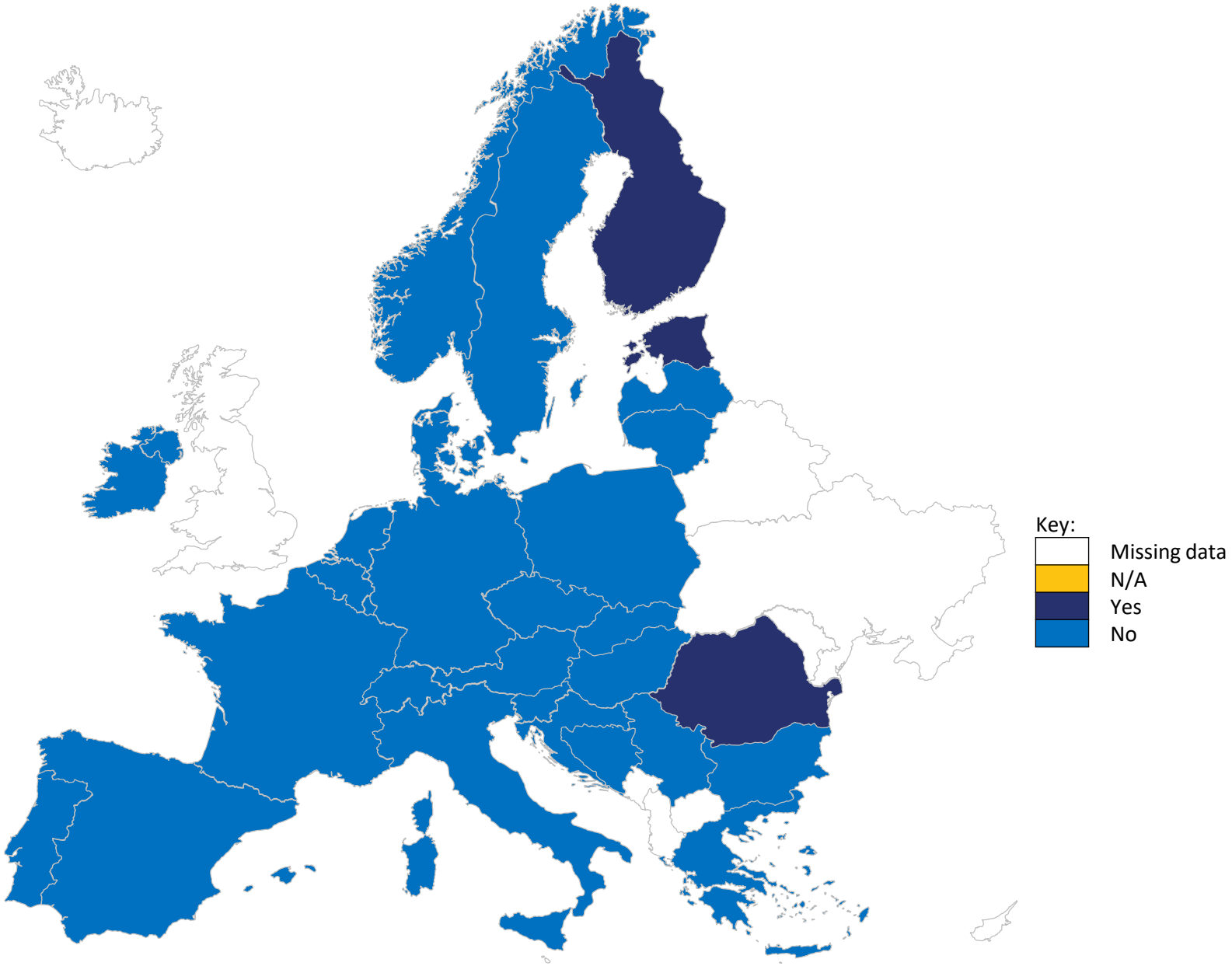
Black Start - Settlement Rule



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.
Elering	No.
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.

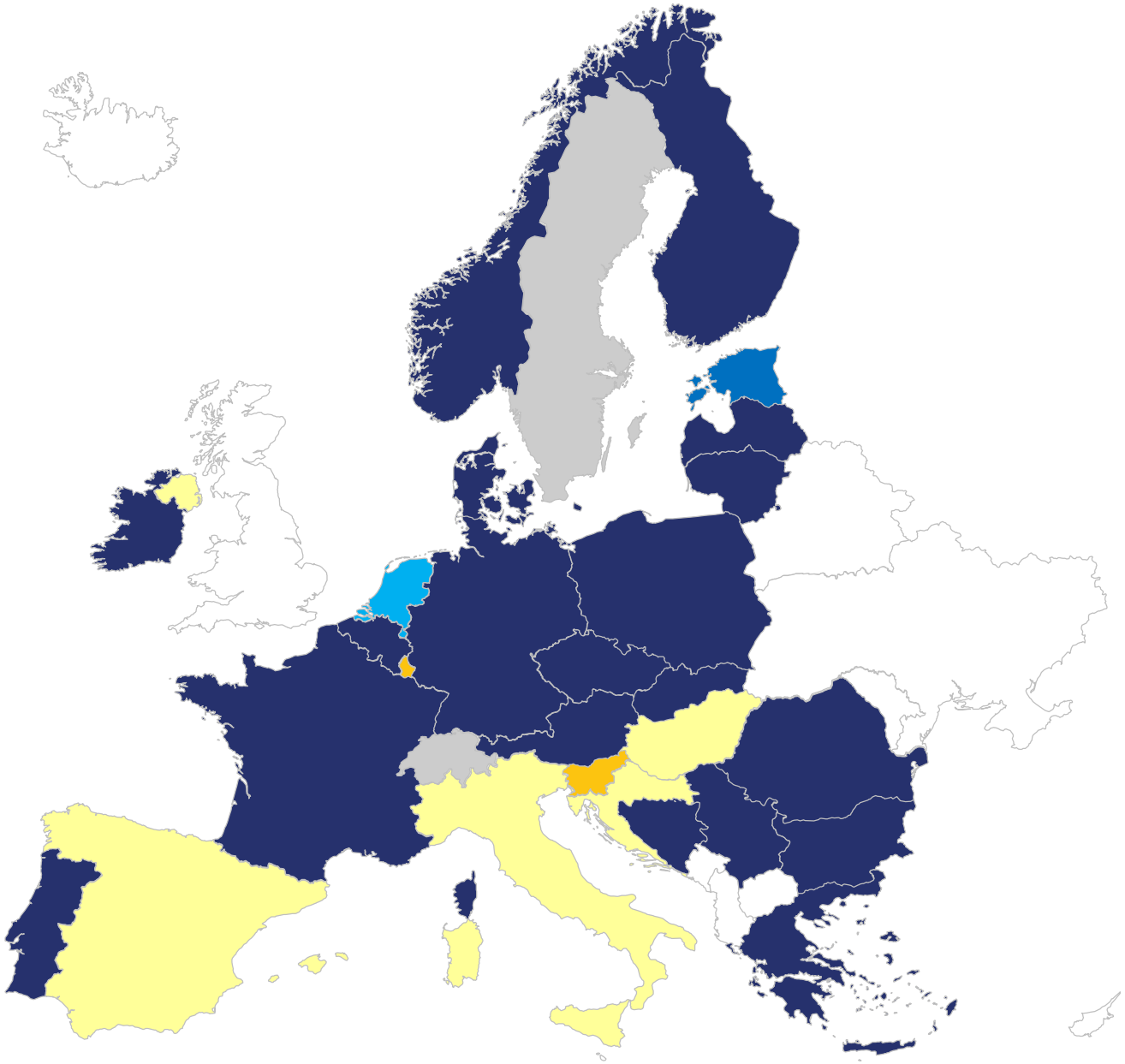
Black Start – Does the TSO have some special rules for the distribution/location/number etc. of black start service units? (2/3)

TSO	Answer
Energinet	Yes, two per bidding area - at least one power generating unit.
ESO	No
Fingrid	No
German TSOs	According to respective black-start concept
HOPS	All the units who are able to provide BS must to 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.
NOS BiH	No.
PSA S.A	TSO is obliged to fulfil standards from OH Policy 5.
REE	To ensure that all areas of the system have black start facilities and to carry out periodic training tests

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 SF	Power plants that have a significance impact on the reconstruction of the network or other critical functions.
Svenska kraftnät	Yes, we have a set of different criterias.
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 SA	Geographical distance according to respective Black-Start concept.

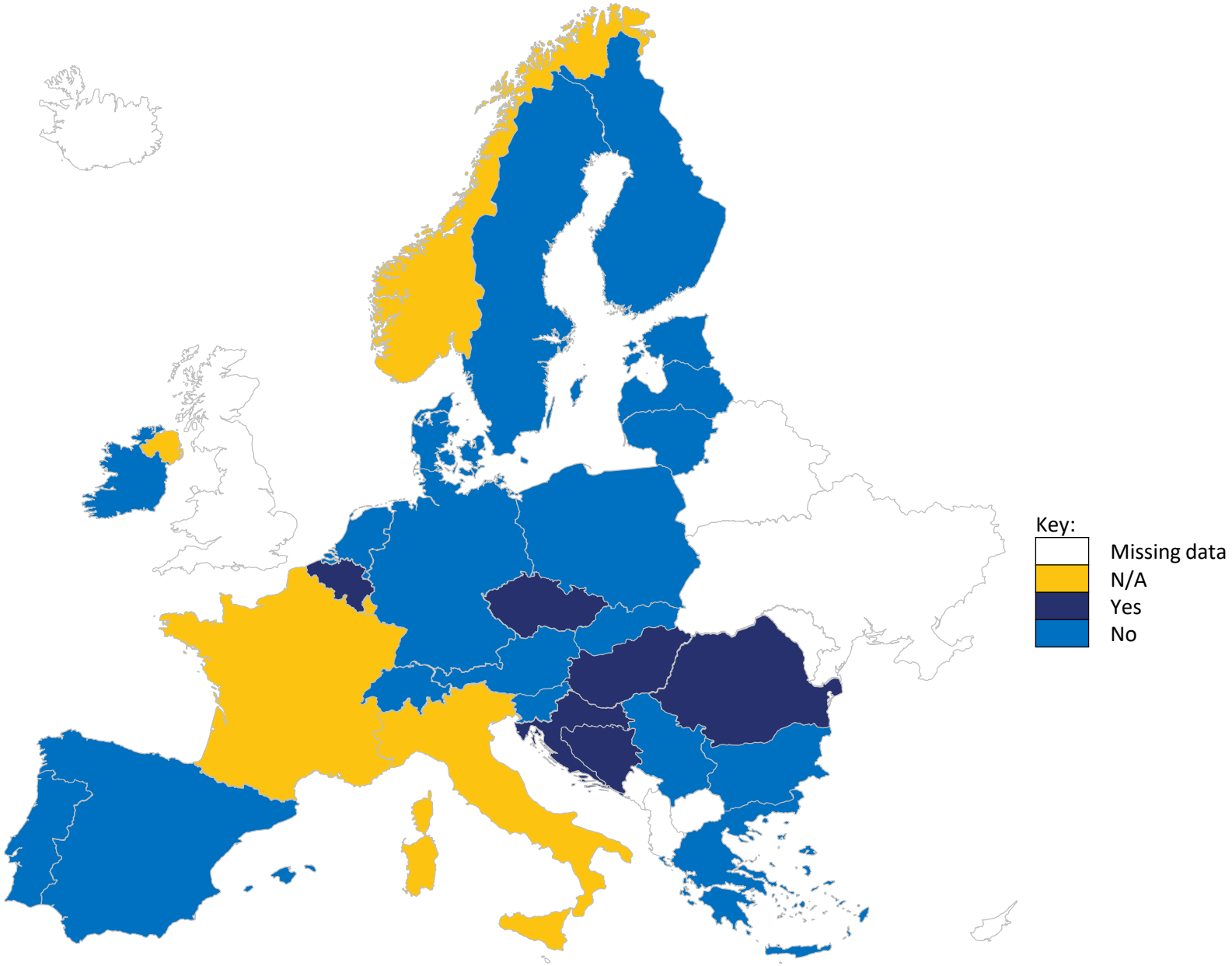
Black Start – Does the TSO have a regulated amount of BS control (regarding the whole control area)?



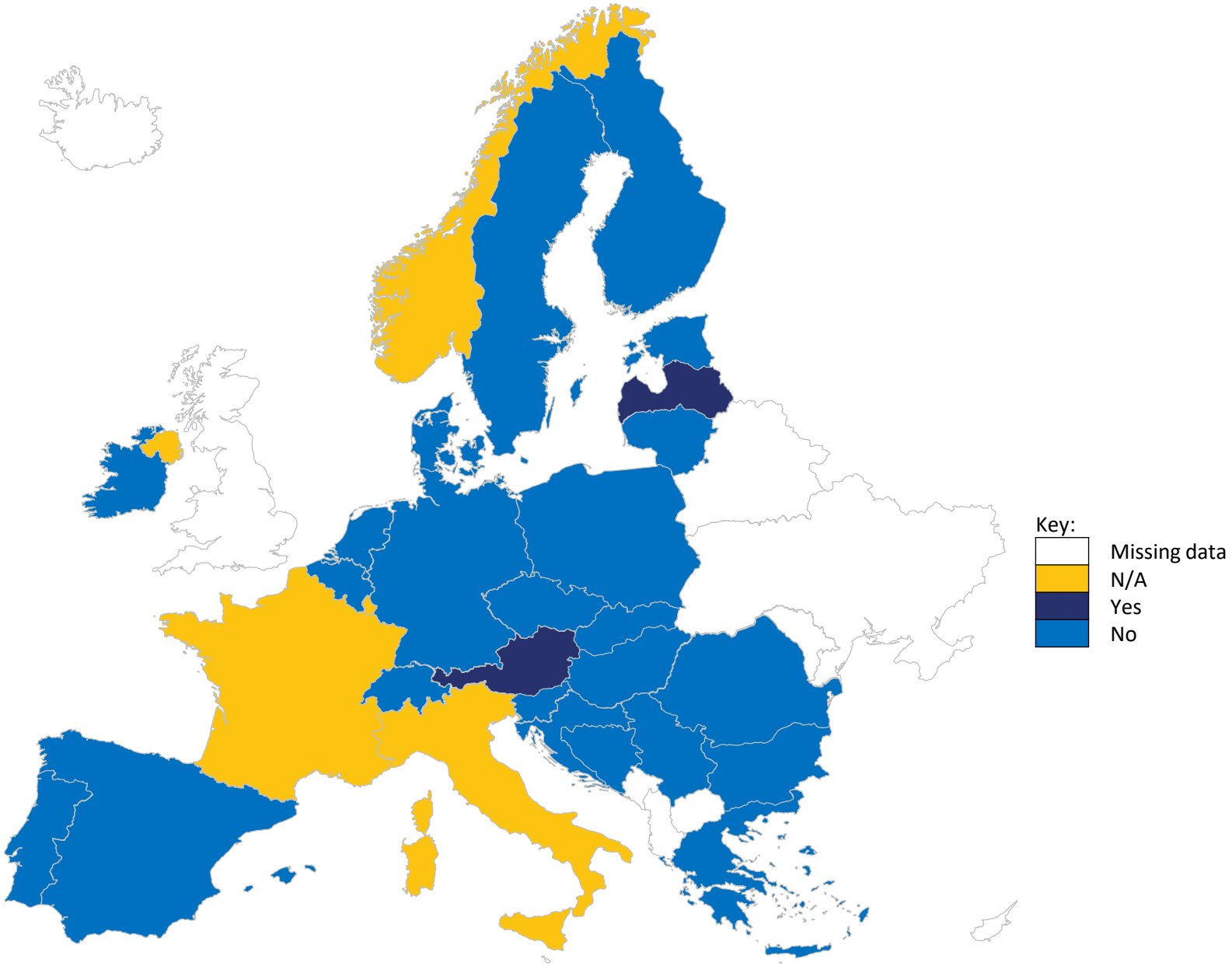
Key:

- 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

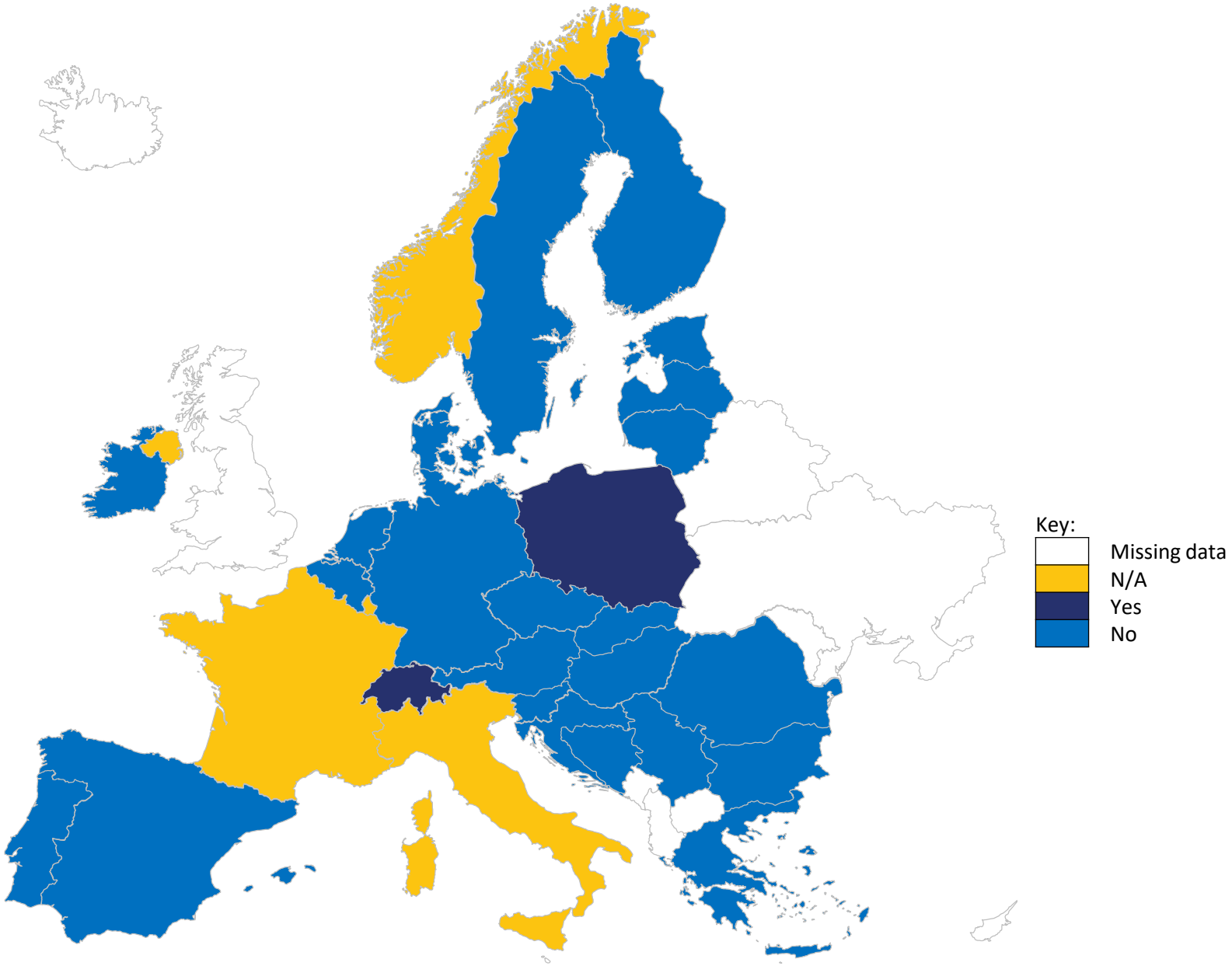
Black Start – Testing the BS ability by the TSO – During the accreditation process only



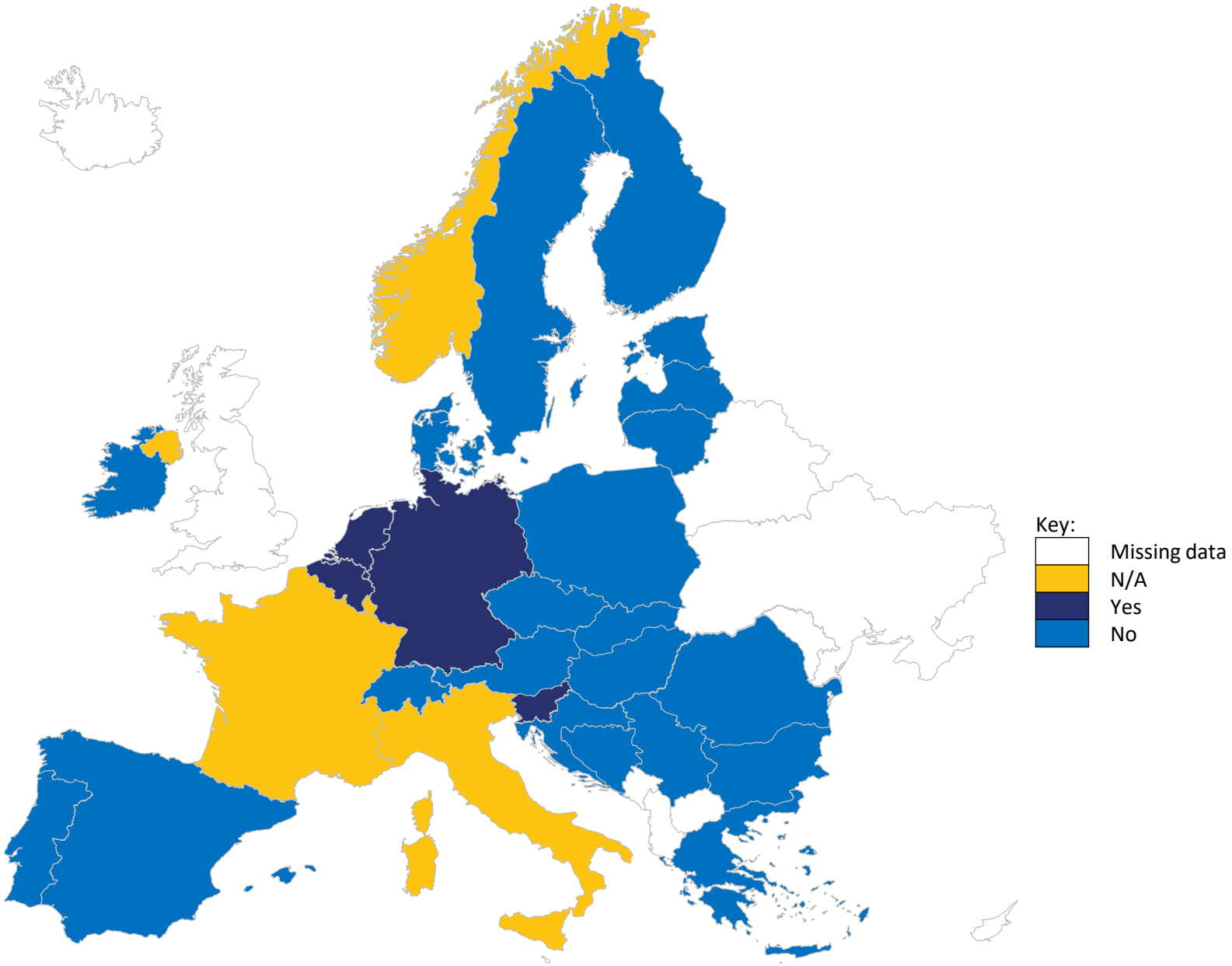
Black Start – Testing the BS ability by the TSO – After the accreditation process/ Only the operational function of the BS unit (unit is working, not connected to the grid)/Once a year



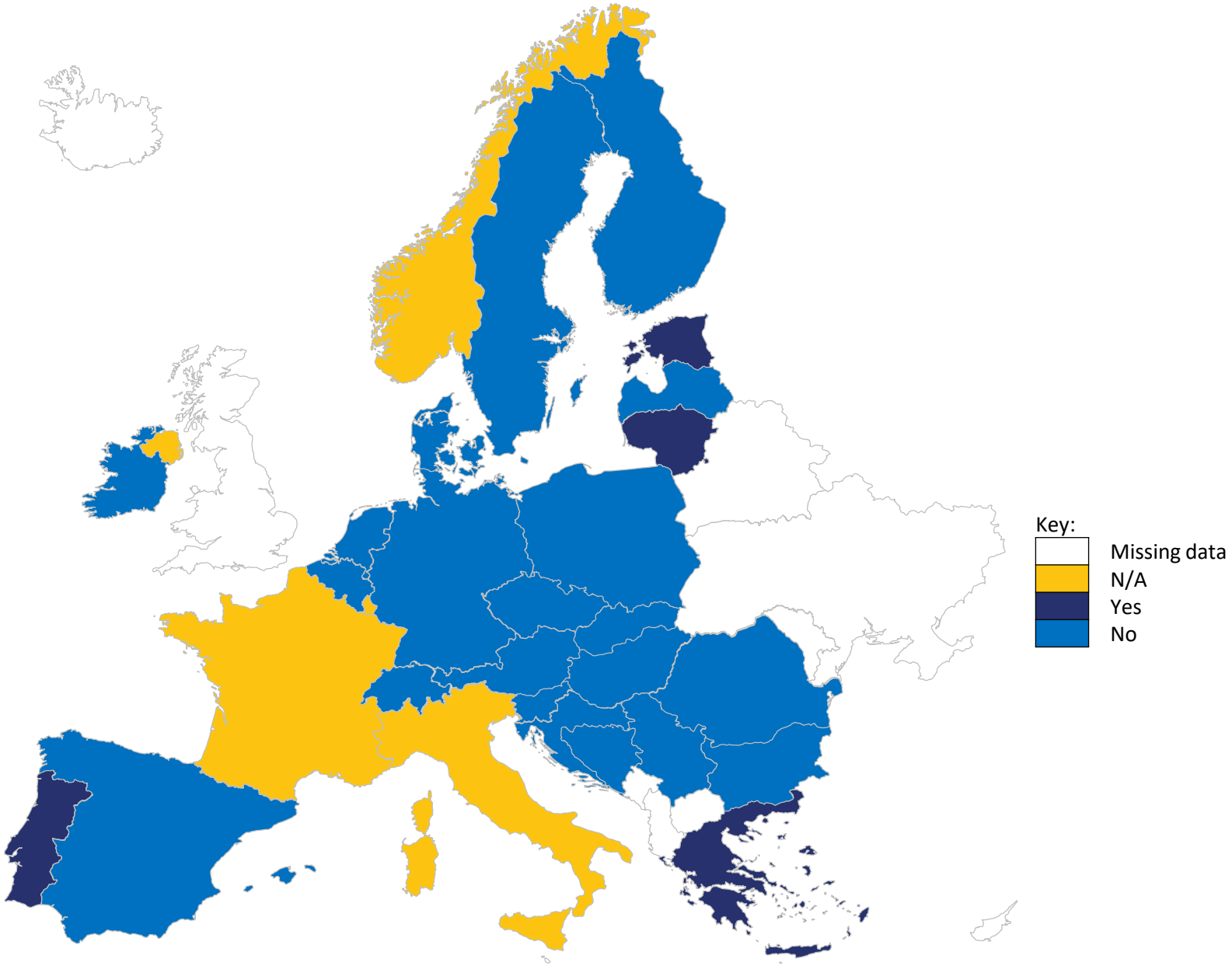
Black Start – Testing the BS ability by the TSO – After the accreditation process/ Only the operational function of the BS unit (unit is working, not connected to the grid)/Several times a year



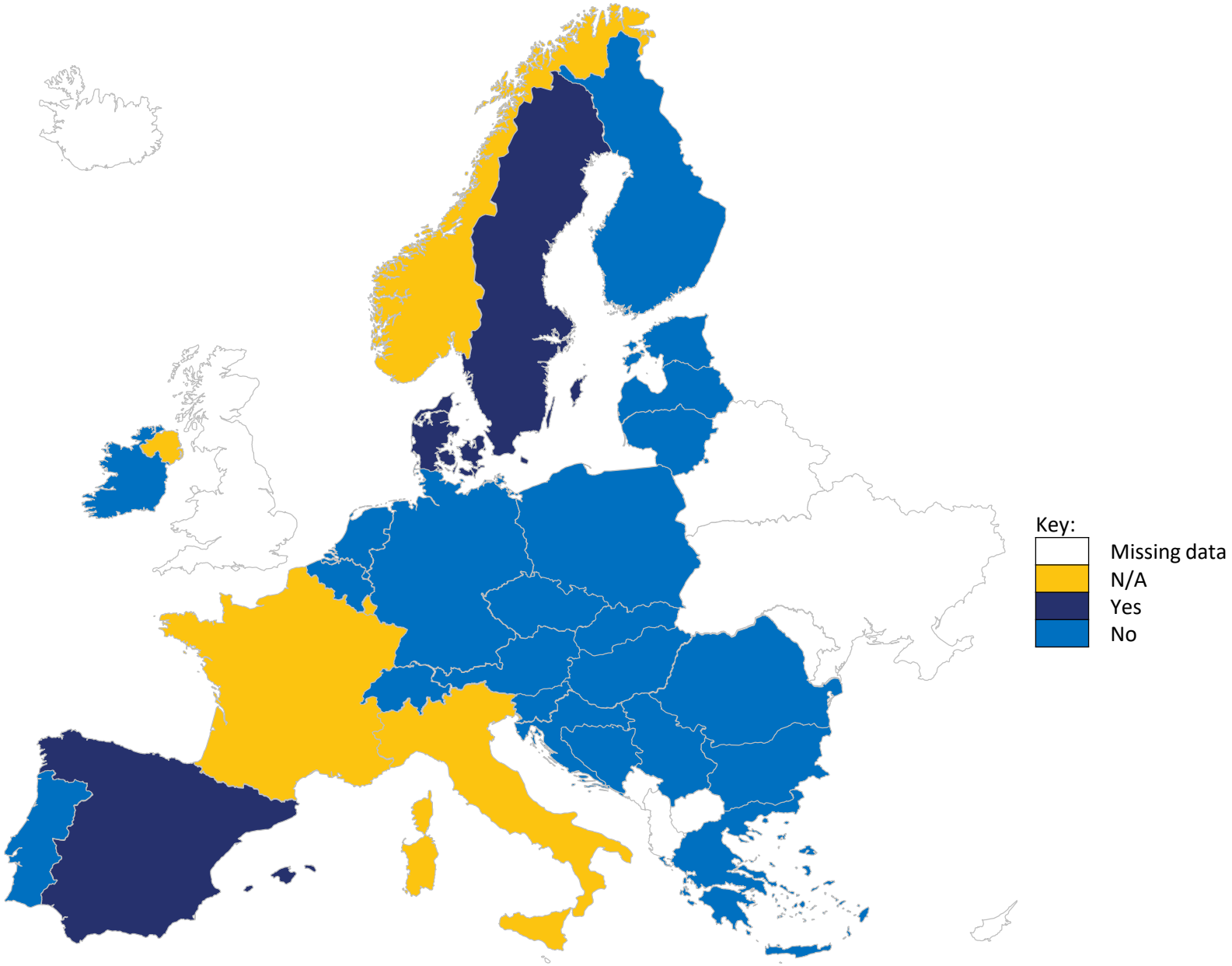
Black Start – Testing the BS ability by the TSO – After the accreditation process/ Only the operational function of the BS unit (unit is working, not connected to the grid)/Occasionally



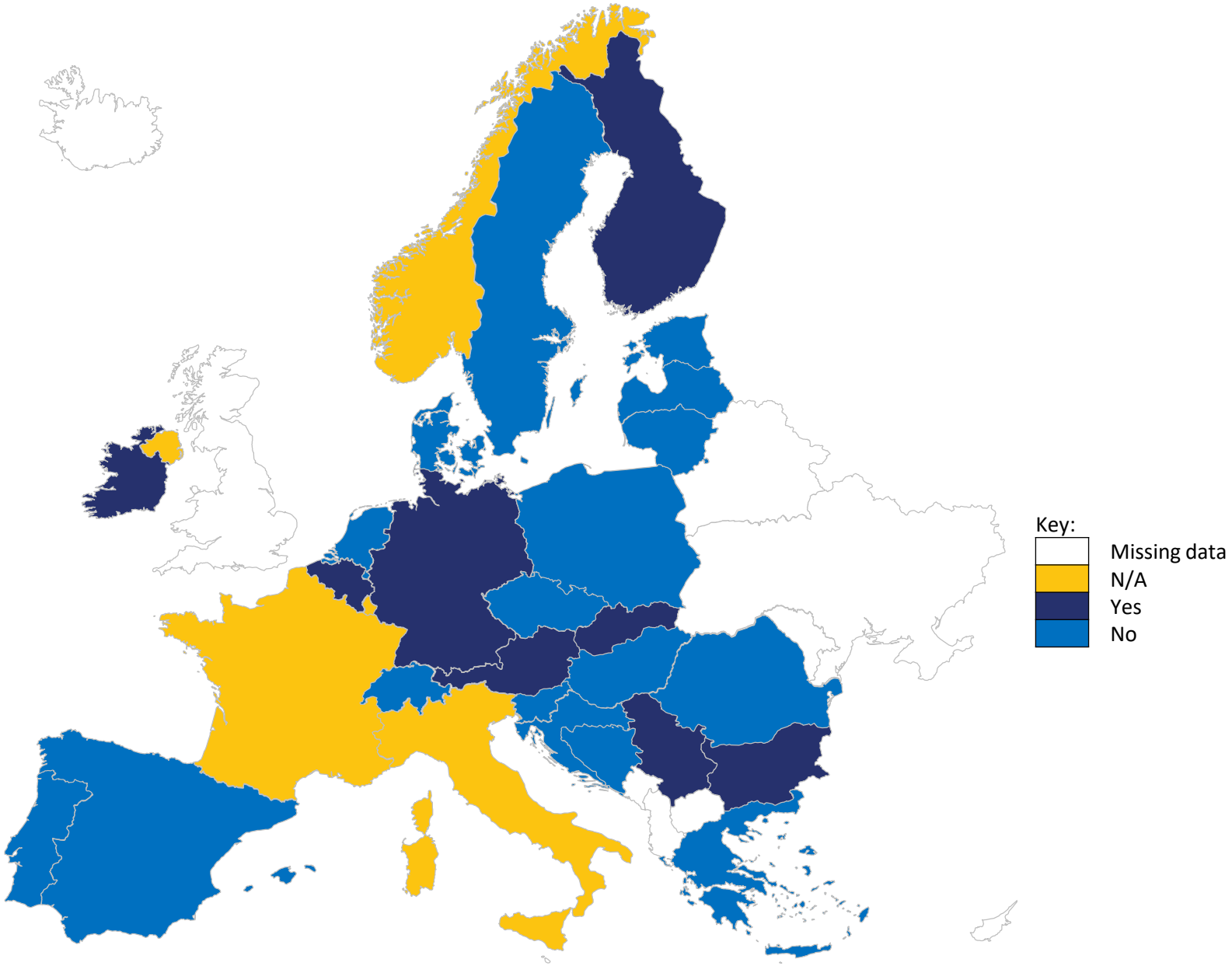
Black Start – Testing the BS ability by the TSO – After the accreditation process/ Control function of the BS unit (unit is working, connected to the grid and has to provide some predefined orders)/Once a year



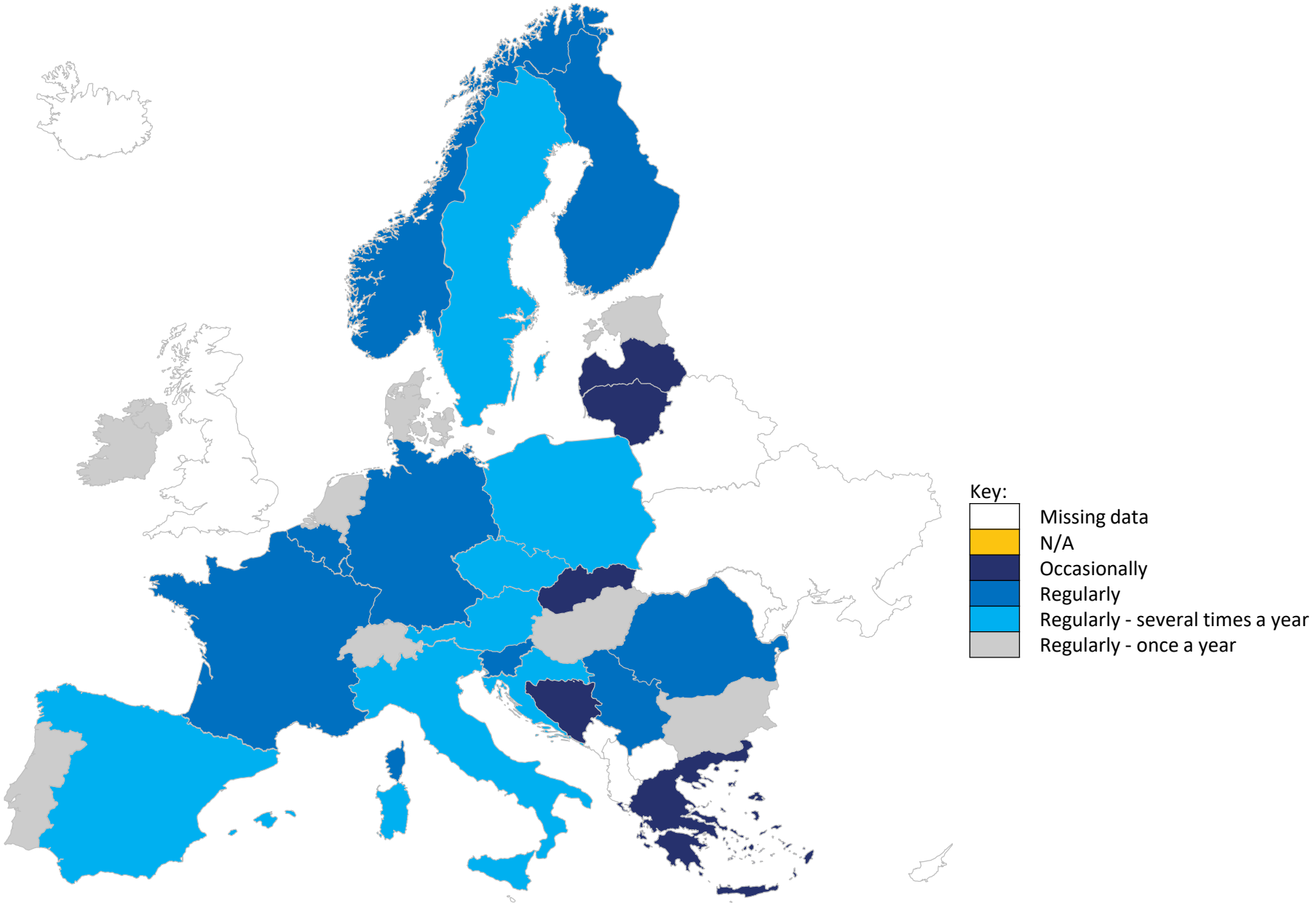
Black Start – Testing the BS ability by the TSO – After the accreditation process/ Control function of the BS unit (unit is working, connected to the grid and has to provide some predefined orders)/Several times a year



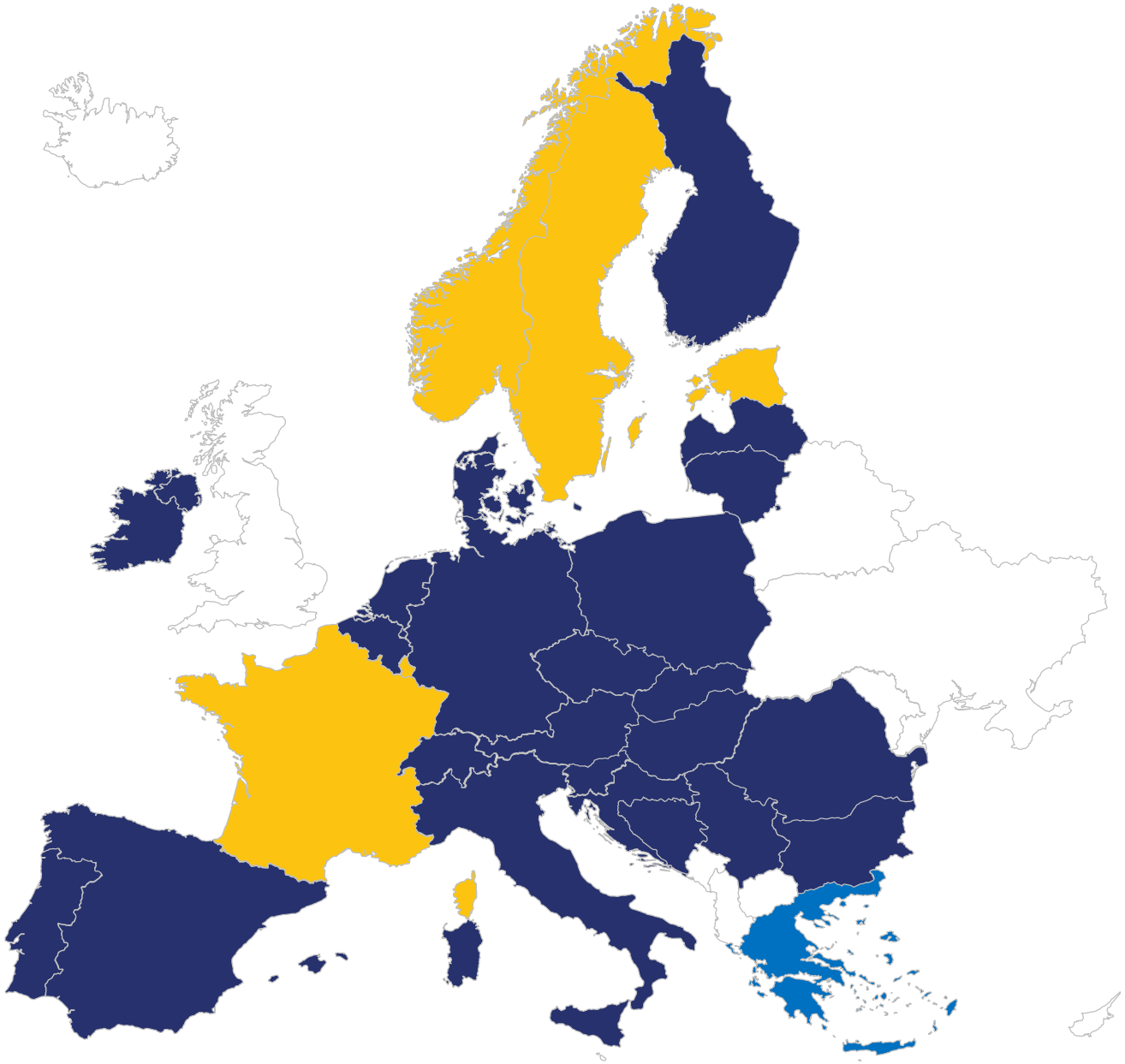
Black Start – Testing the BS ability by the TSO – After the accreditation process/ Control function of the BS unit (unit is working, connected to the grid and has to provide some predefined orders)/Occasionally



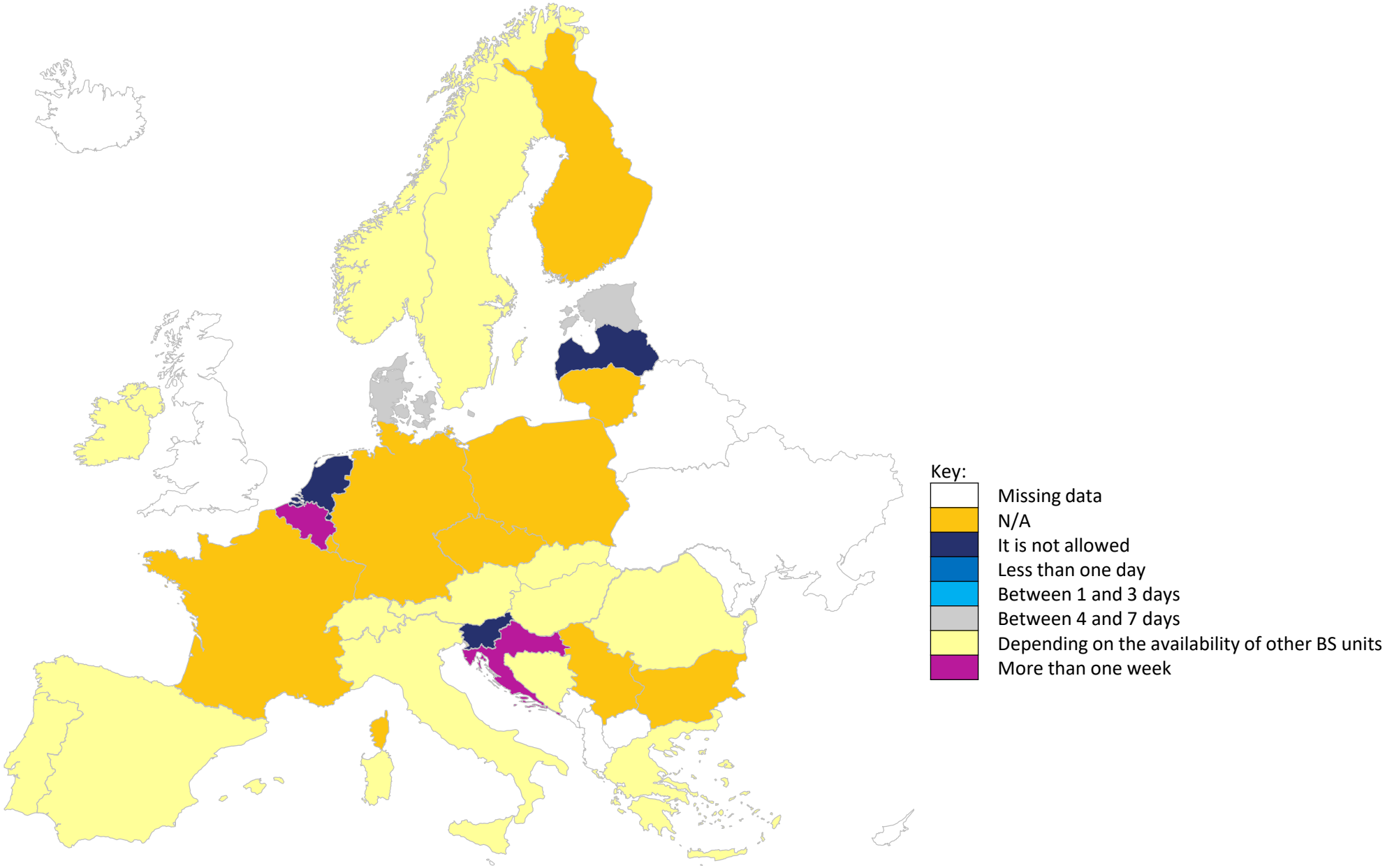
Black Start – How often does the TSO practise the method of the BS process (for example using a training simulator)?



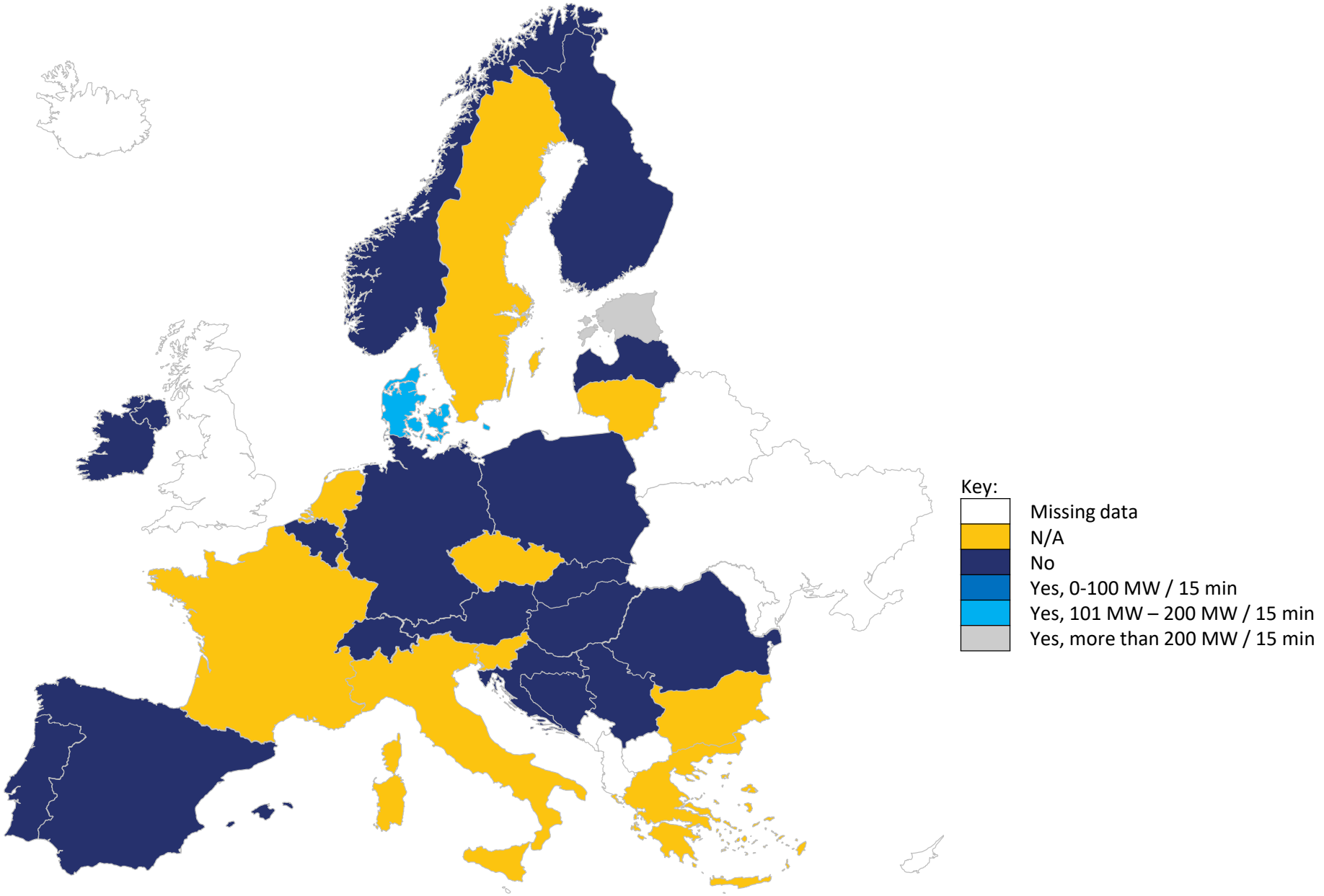
Black Start – Should be the Black start service provided by a single unit or it is allowed to be a part of a power plant?



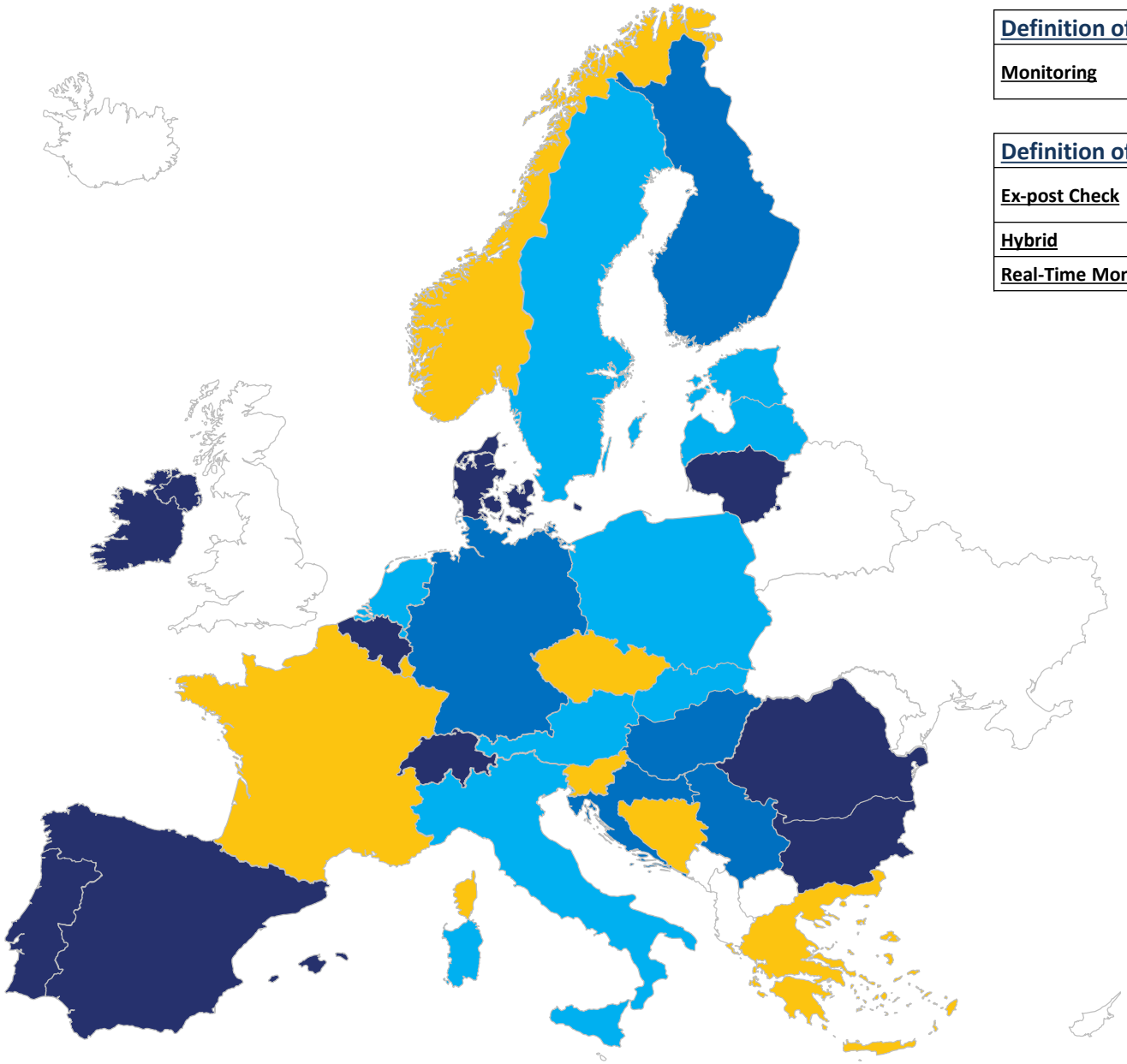
Black Start – How long is the acceptable non–availability period of the BS unit (planned, for example: resurrection & maintenance of the unit)?



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



Black Start – Monitoring of the black start service?



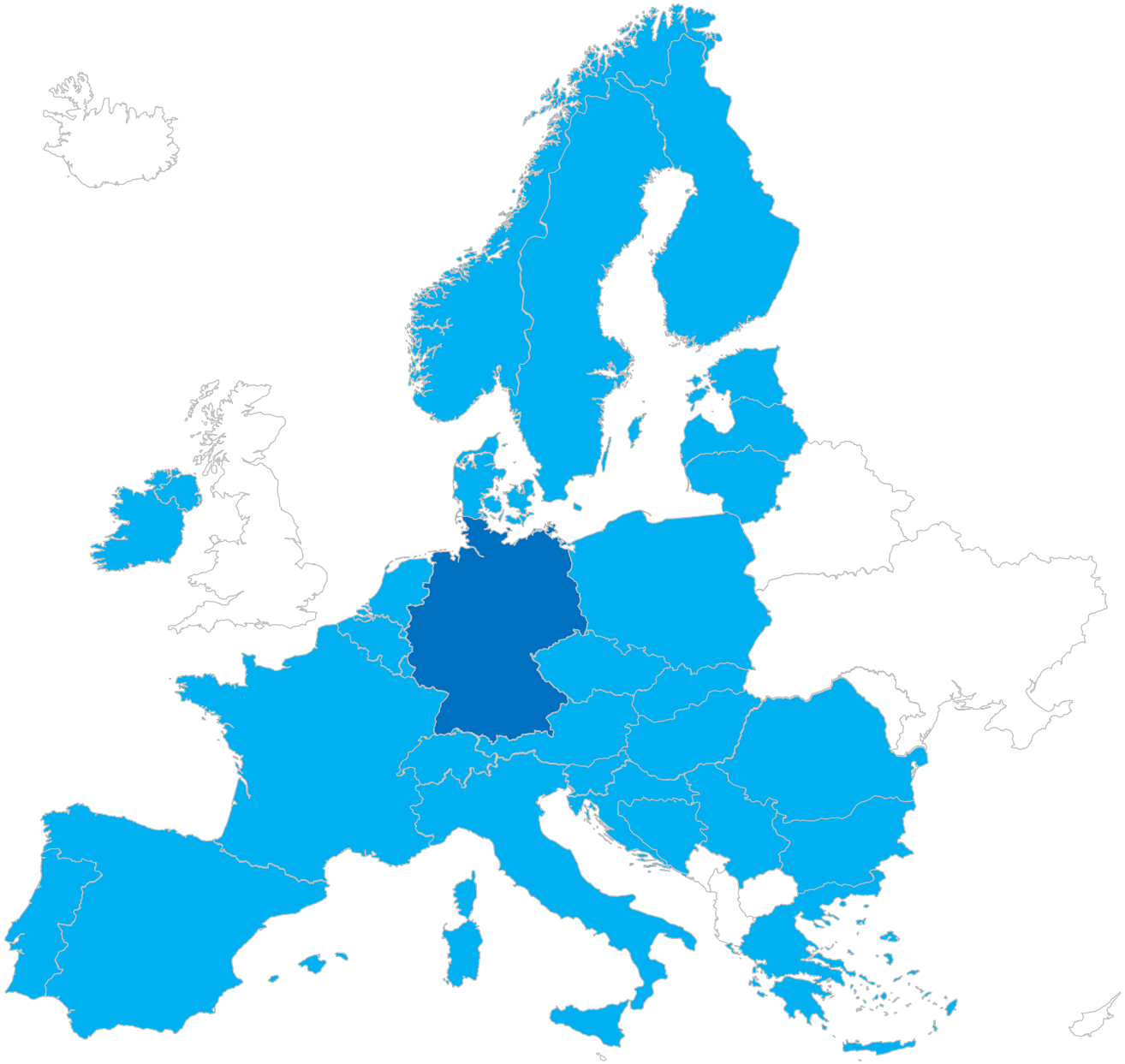
Definition of question	
Monitoring	Refers to the type of monitoring in place by the system operator to ensure performance of plant.

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.

Key:

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

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



Black Start – Do you consider changes significant/important regarding the black start?

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