

ENTSO-E WGAS

Survey on Ancillary services procurement, Balancing market design 2015

May 2016



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ENTSO-E Survey on Ancillary services procurement, Balancing market design 2015

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, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, The Netherlands, United Kingdom.

Introduction (2)



This document is expected to help the introduction of the Network Code 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 November 2015 and describes the mechanisms in place in 2015, irrespective of any updates which might already be foreseen for the future.
- Elaborating the data we decided not to appear all the questions from the survey in this document, because majority of the given answers were „Not applicable” or „Missing data”.
- 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”).

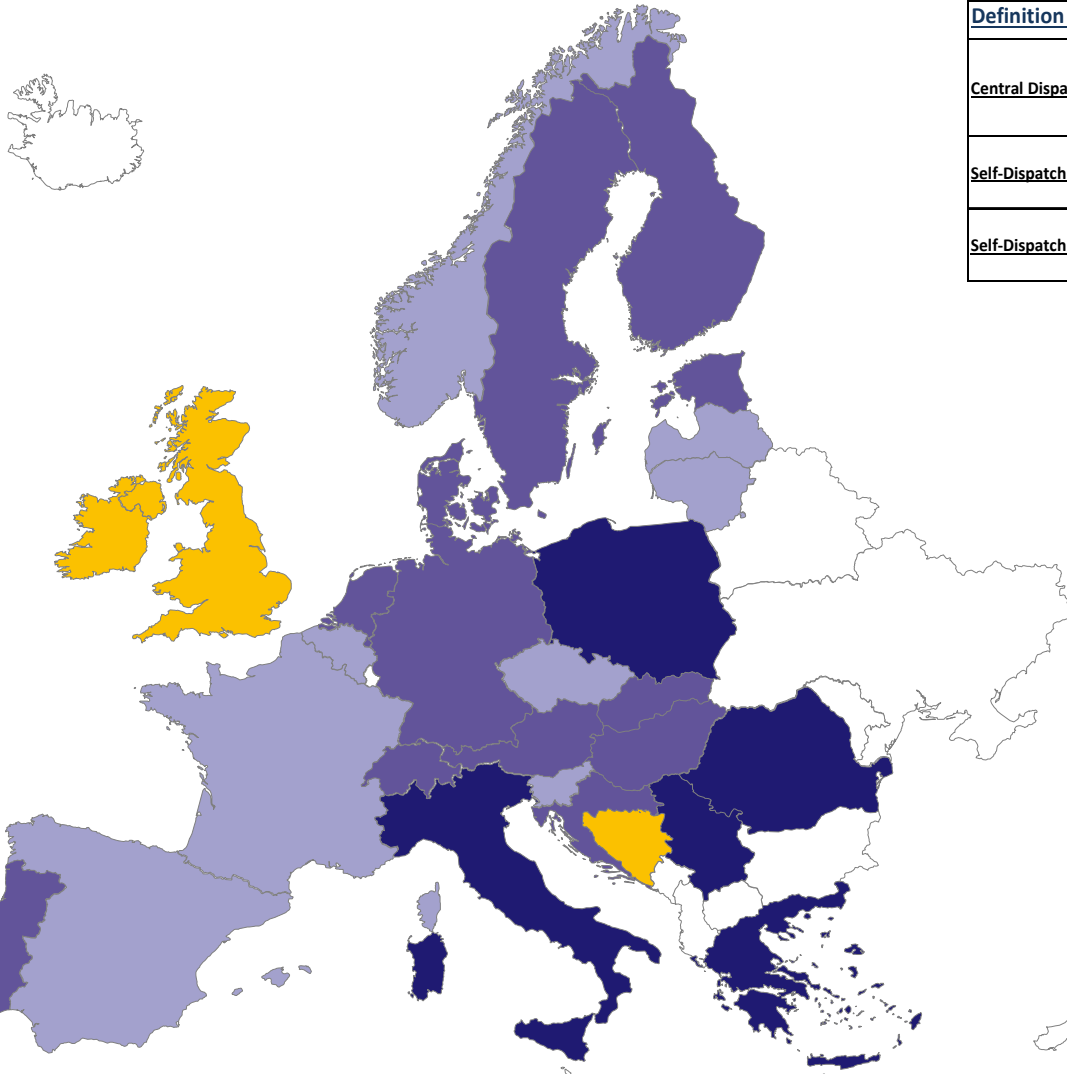
Note: please print in colour for distinction between answers!



Ancillary Services

(Referring to questions of AS survey from AS1.0 to AS15.0)

What is the balancing process in place?



Definition of answer	
Central Dispatch	Central dispatch means a dispatch arrangement in a Relevant Area where the Transmission System Operator determines the commitment and output of a majority of generation or demand and issues dispatch instructions directly to them.
Self-Dispatch - Portfolio Based	A portfolio of units/generators (or other plant types) follow an aggregated schedule of actions to start/stop/increase output/decrease output in real time.
Self-Dispatch - Unit Based	Generators (or other plant types) following their own schedules of actions to start/stop/increase output/decrease output in real time.

Key:

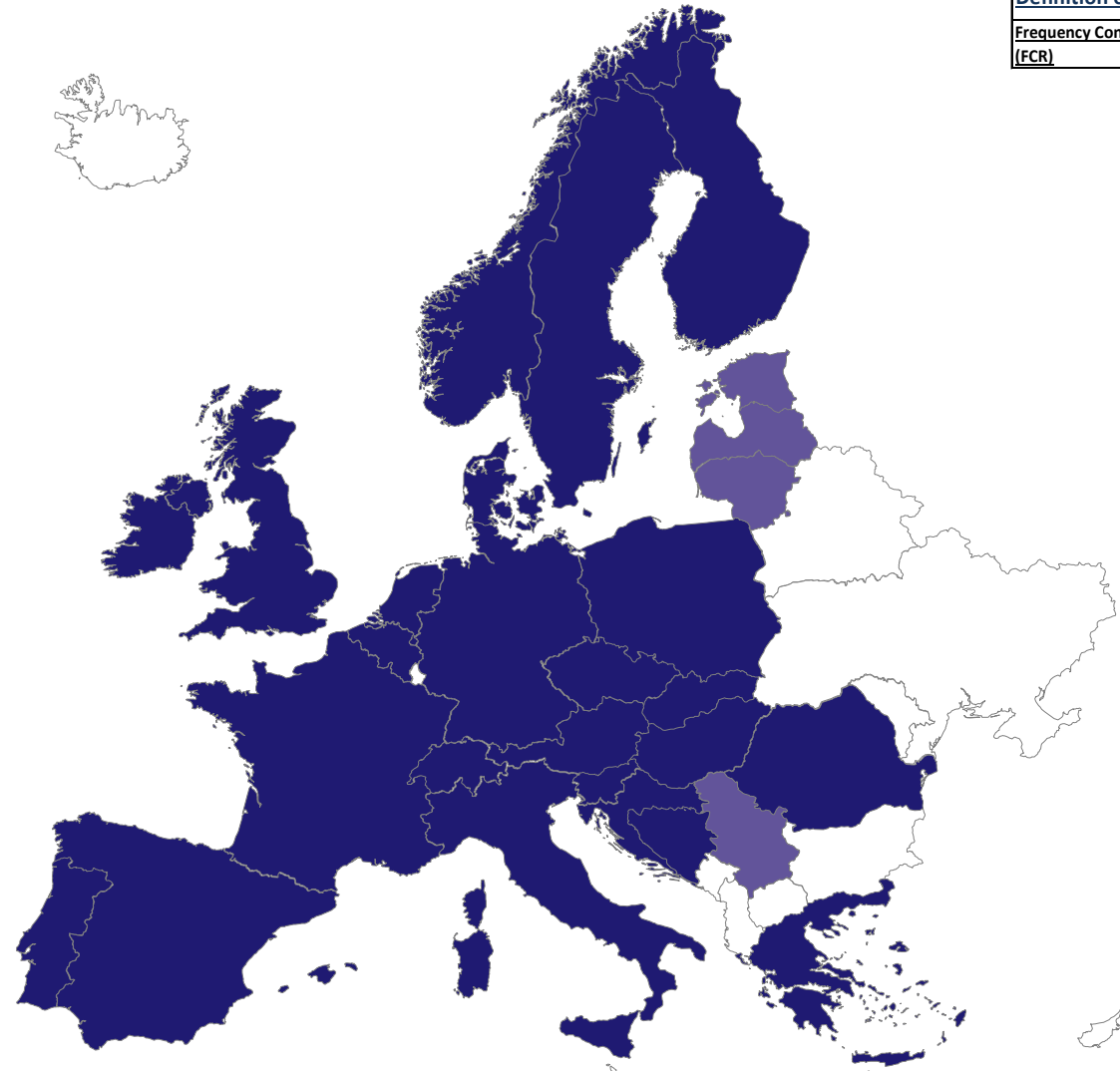
	Missing data
	N/A
	Central Dispatch
	Self-Dispatch - Portfolio Based
	Self-Dispatch - Unit Based

Using Frequency Containment Reserve

Definition of question

Frequency Containment Reserve (FCR)

Operating reserves activated for stabilizing System Frequency after an imbalance.



Key:



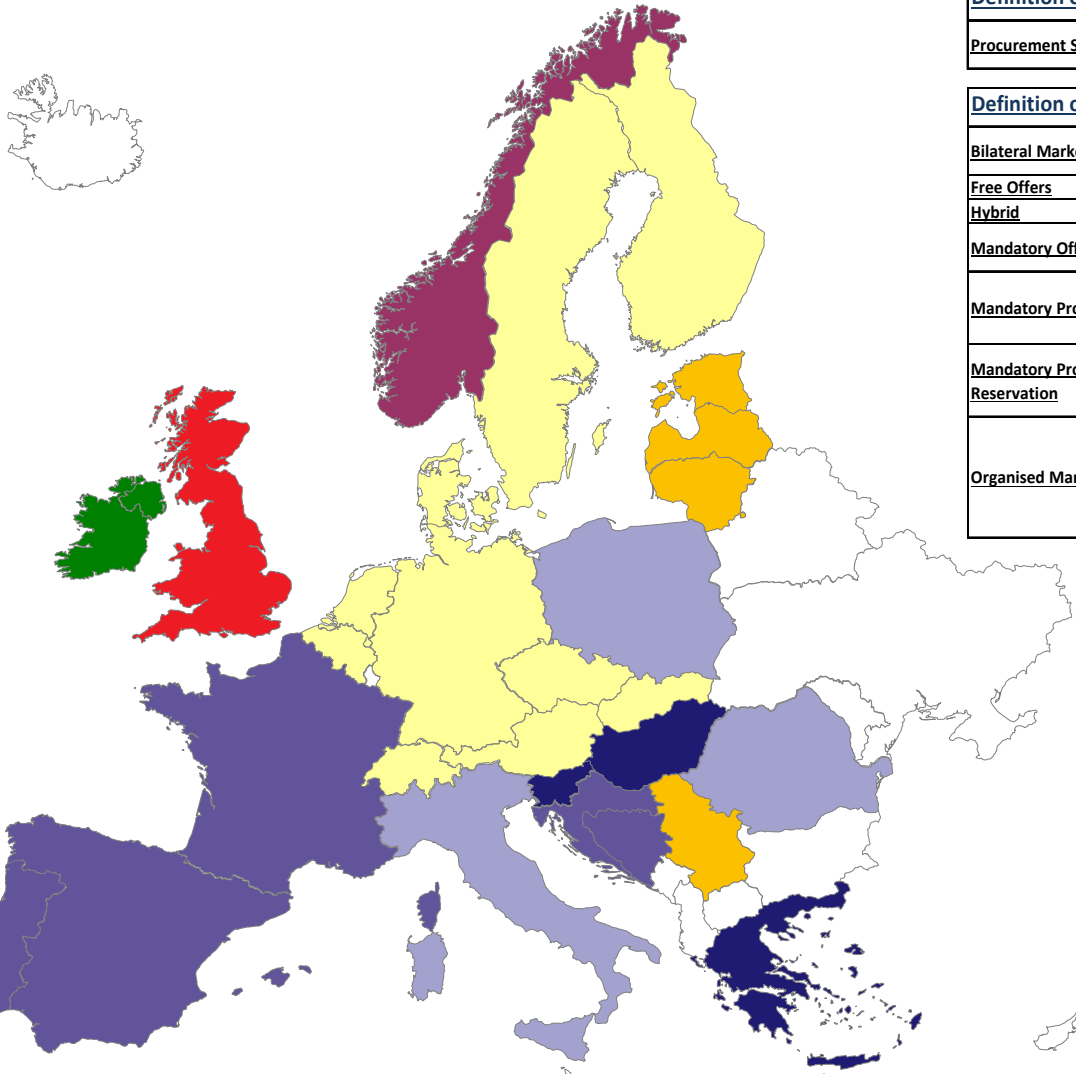
Missing data

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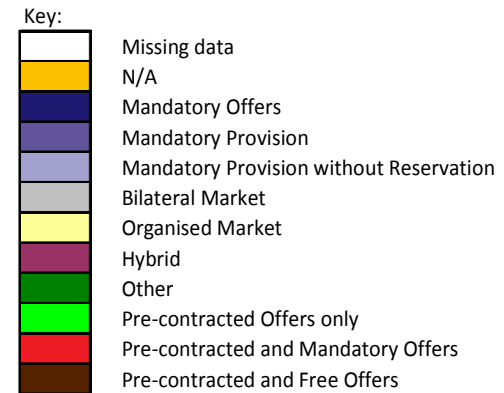
Yes

No

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	
Bilateral Market	A grid user and TSO negotiate a contract regarding the offered service and price/price system.
Free Offers	Non-regulated offers.
Hybrid	Combination.
Mandatory Offers	Generators connected to the grid are obligated to offer the remaining capacity/available capacity.
Mandatory Provision	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.
Mandatory Provision without Reservation	It is mandatory for dispatchable units to be able to provide frequency containment reserve, but these units are not required to reserve capacity to provide this service.
Organised Market	There is no contract or obligation for a grid user to offer the reserve (before the offer). The grid user can voluntarily participate in the market (e.g. tender, auction, market platform (like PX)) and bid a price or customize his offer (e.g. the volume, timeframe). The market result may lead to a bilateral contract.

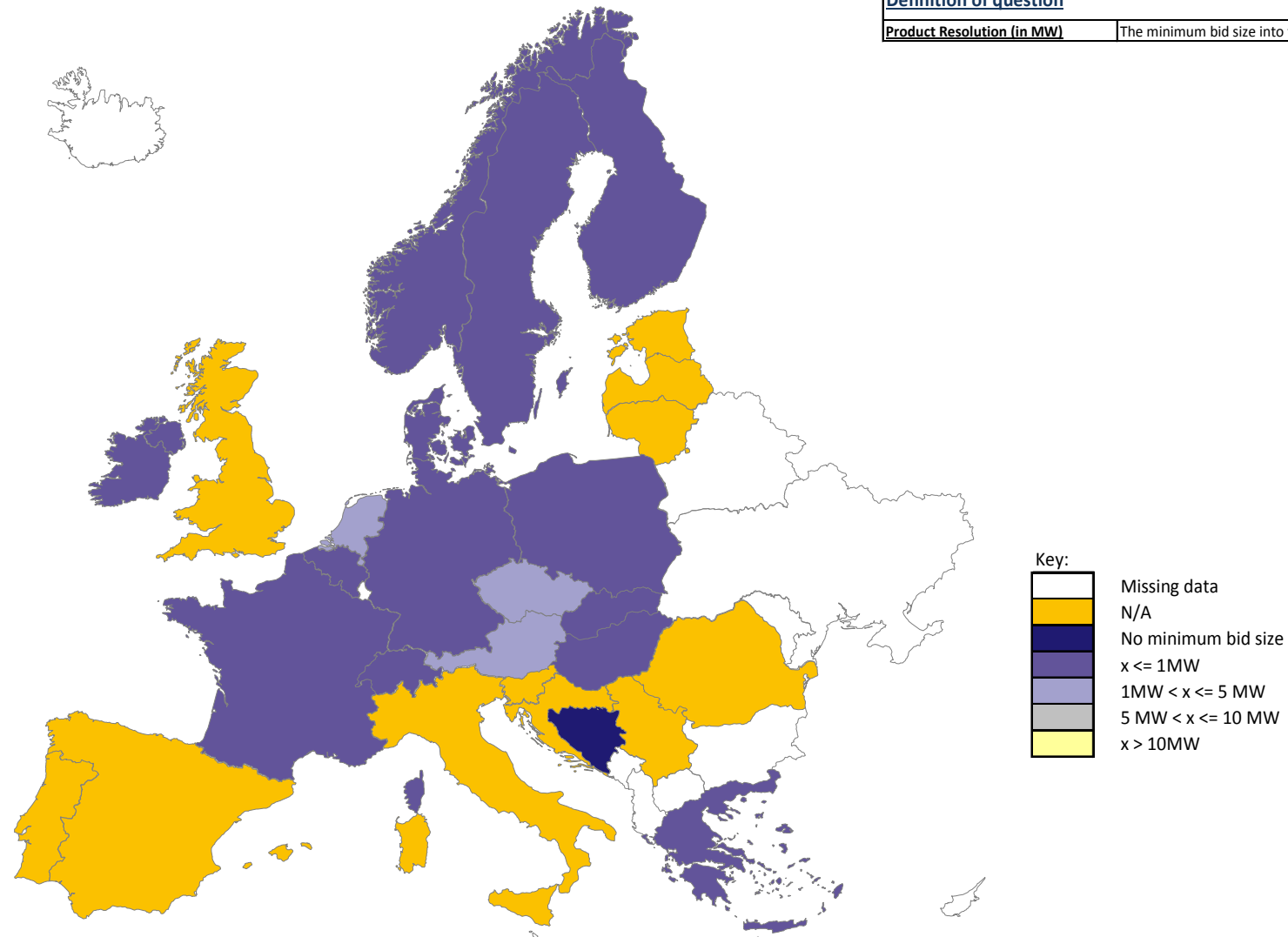


Frequency Containment Reserve - Capacity - Product Resolution (in MW)

Definition of question

Product Resolution (in MW)

The minimum bid size into the balancing market.

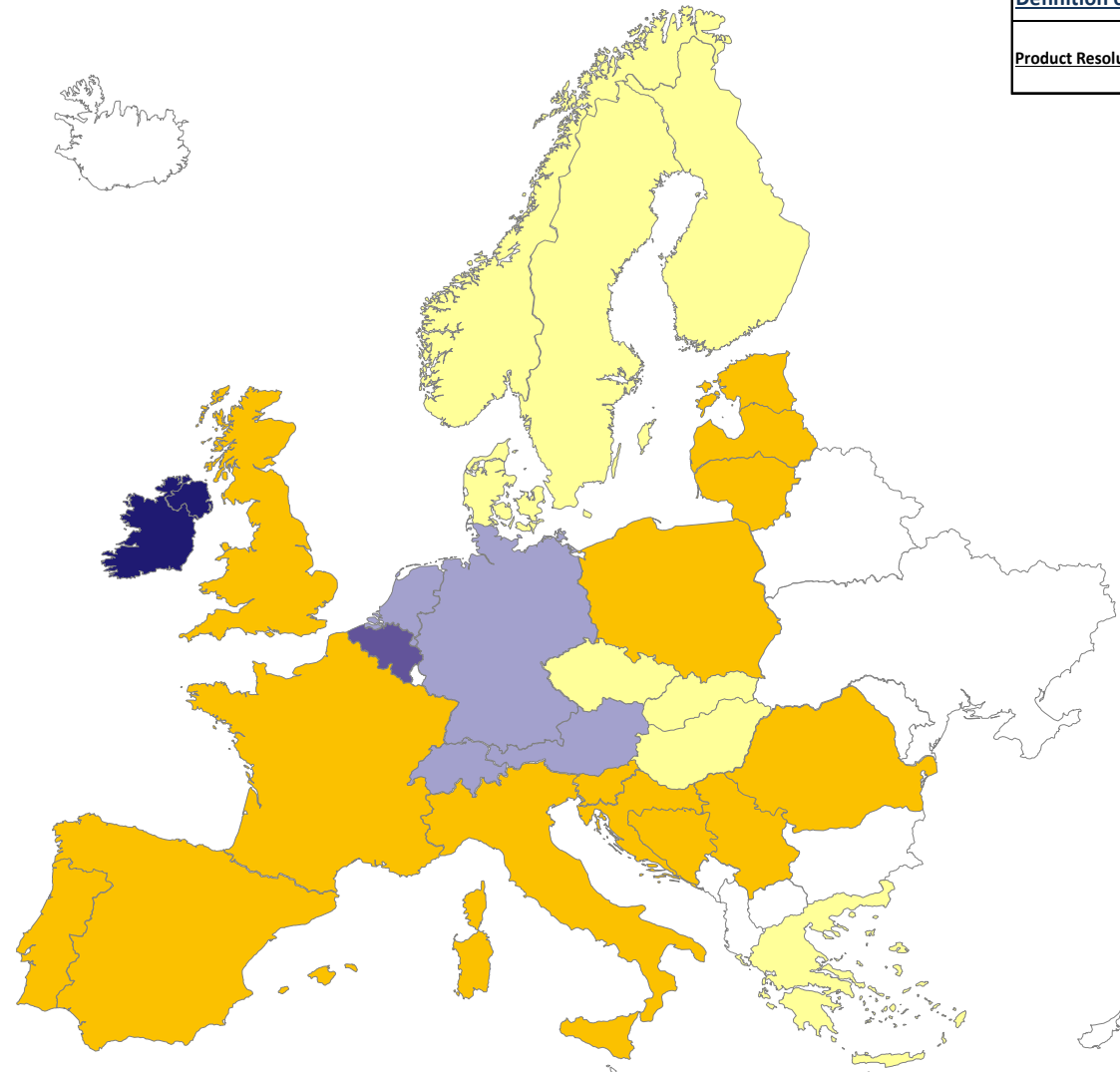


Frequency Containment Reserve - Capacity - Product Resolution (in time)

Definition of question

Product Resolution (in time)

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



Key:

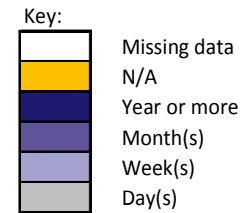
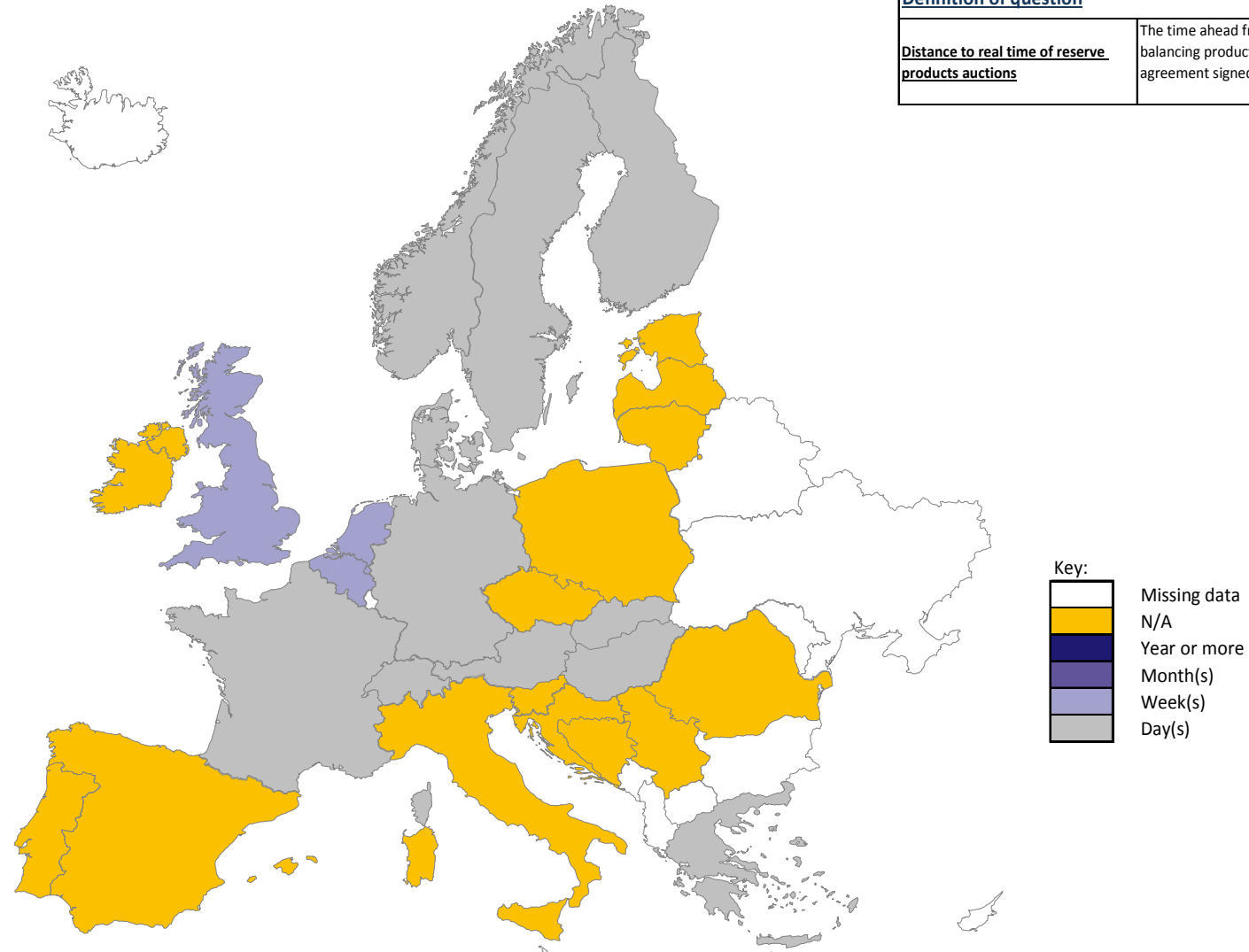
Missing data
N/A
Year or more
Month(s)
Week(s)
Day(s)
Hour(s)

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

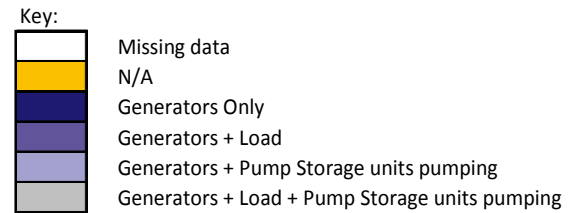
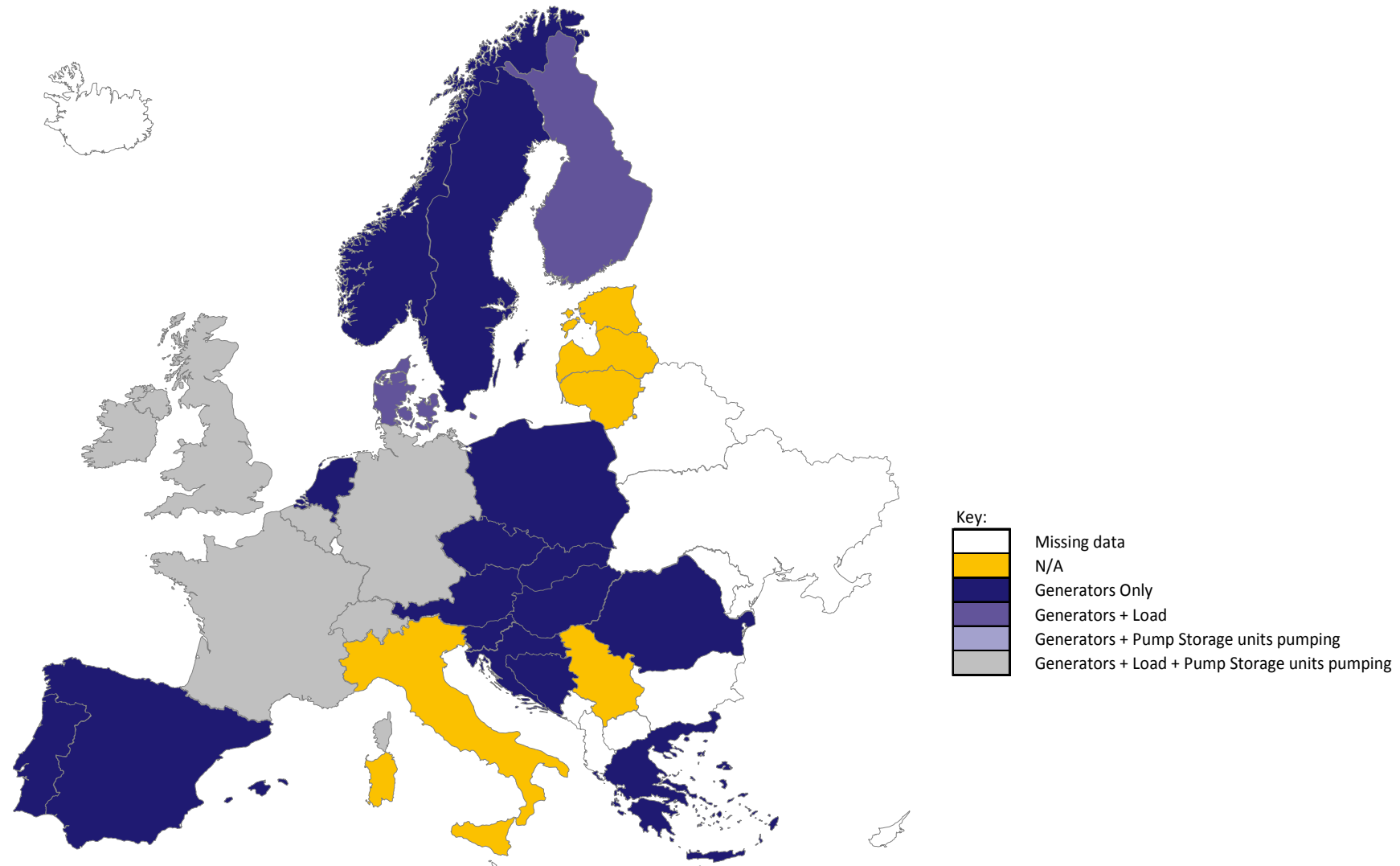
Definition of question

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).

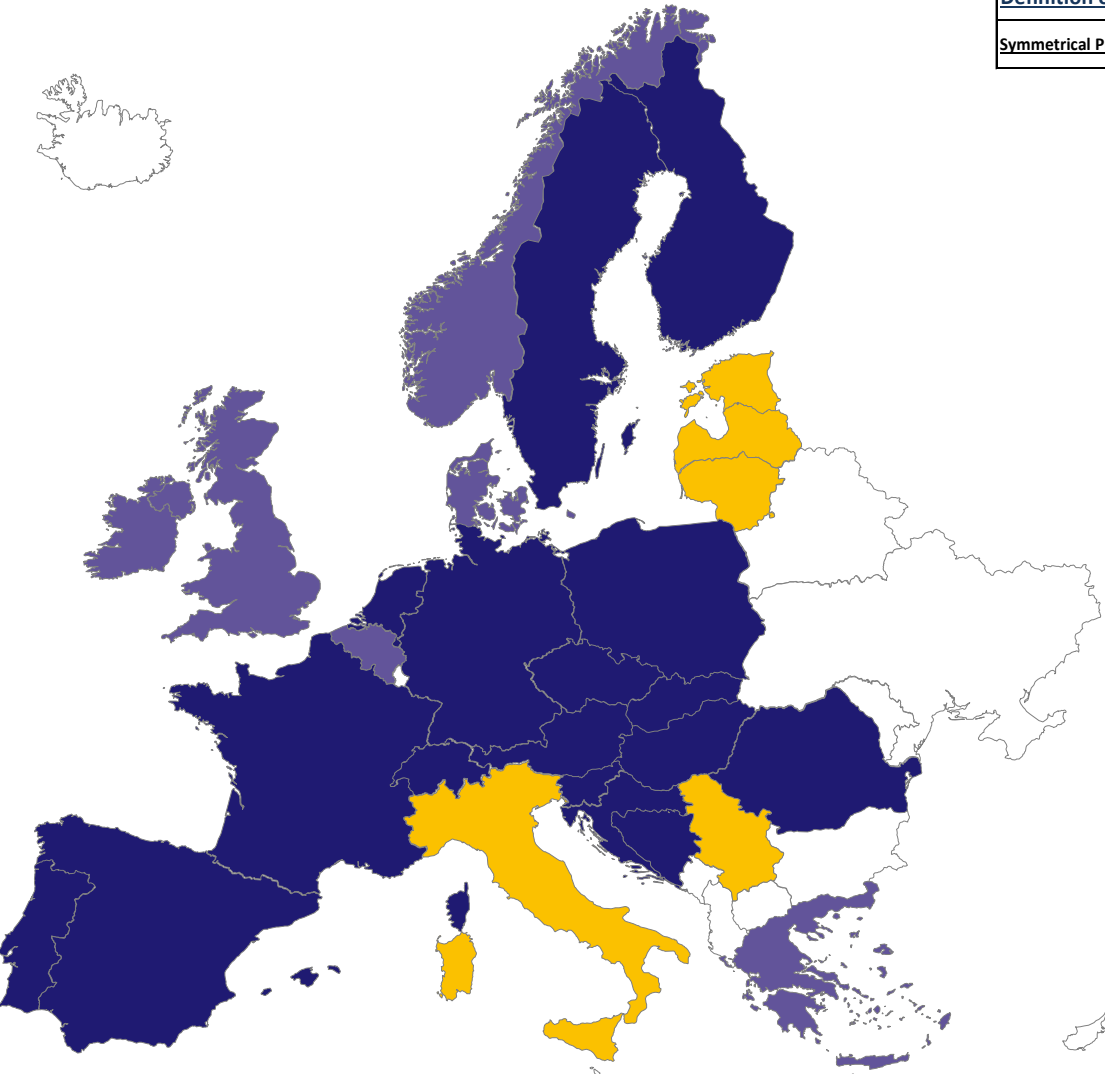


Frequency Containment Reserve - Capacity - Provider



Frequency Containment Reserve - Capacity - Symmetrical Product

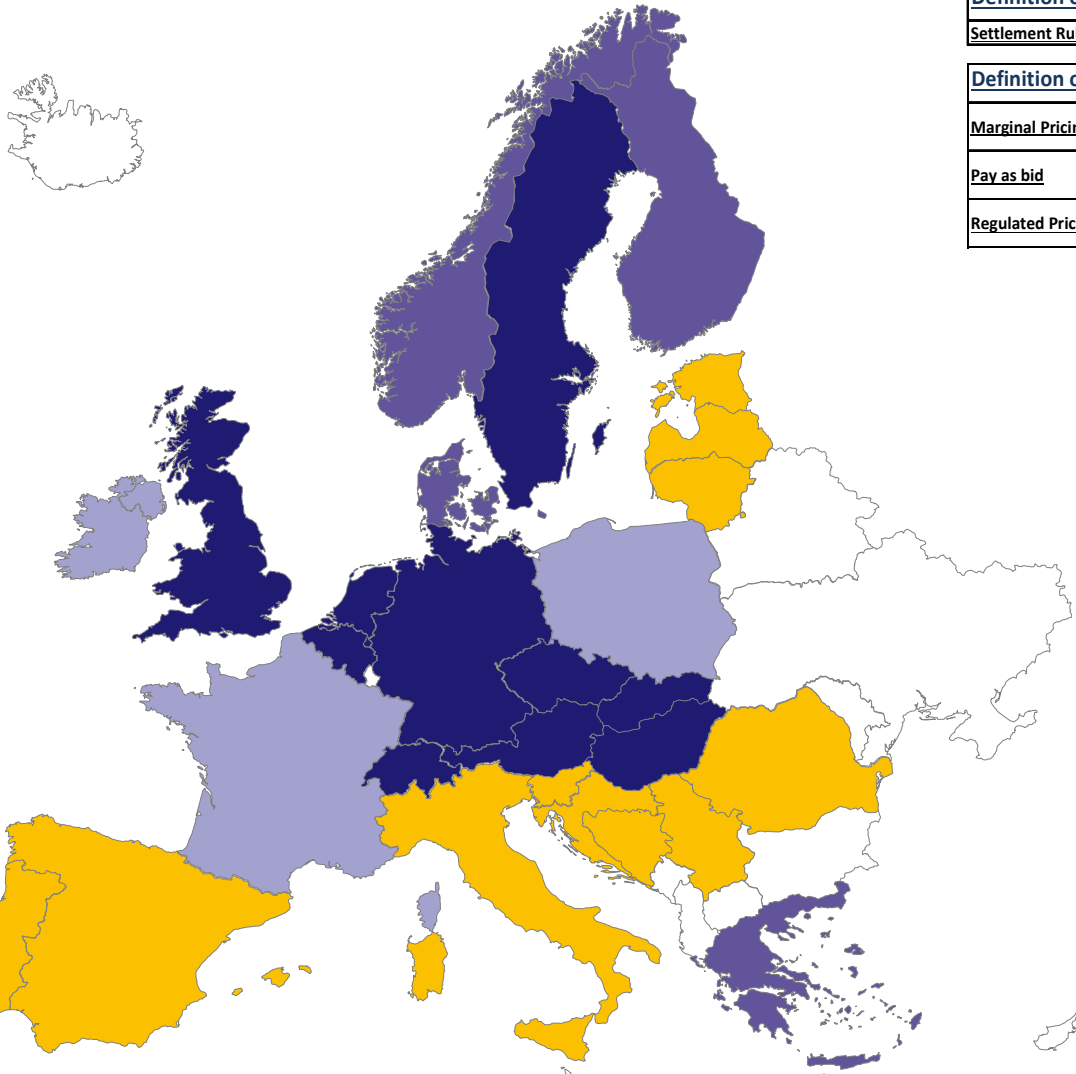
Definition of question	
Symmetrical Product	Upward regulation volume and for downward regulation volume has be equal.



Key:

White	Missing data
Yellow	N/A
Dark Blue	Has to be symmetrical
Purple	Don't need to be symmetrical






Frequency Containment Reserve - Capacity - Settlement Rule



<u>Definition of question</u>	
Settlement Rule	The pricing rules for settlement.

<u>Definition of answer</u>	
Marginal Pricing	Marginal pricing is the change in total cost that arises when the quantity produced changes by one unit.
Pay as bid	Contracted parties who provide a service are paid based on their offer price.
Regulated Price	Price for this service is based on a price that is set by the relevant regulatory authority.

Key:

	Missing data
	N/A
	Pay as bid
	Marginal Pricing
	Regulated Price

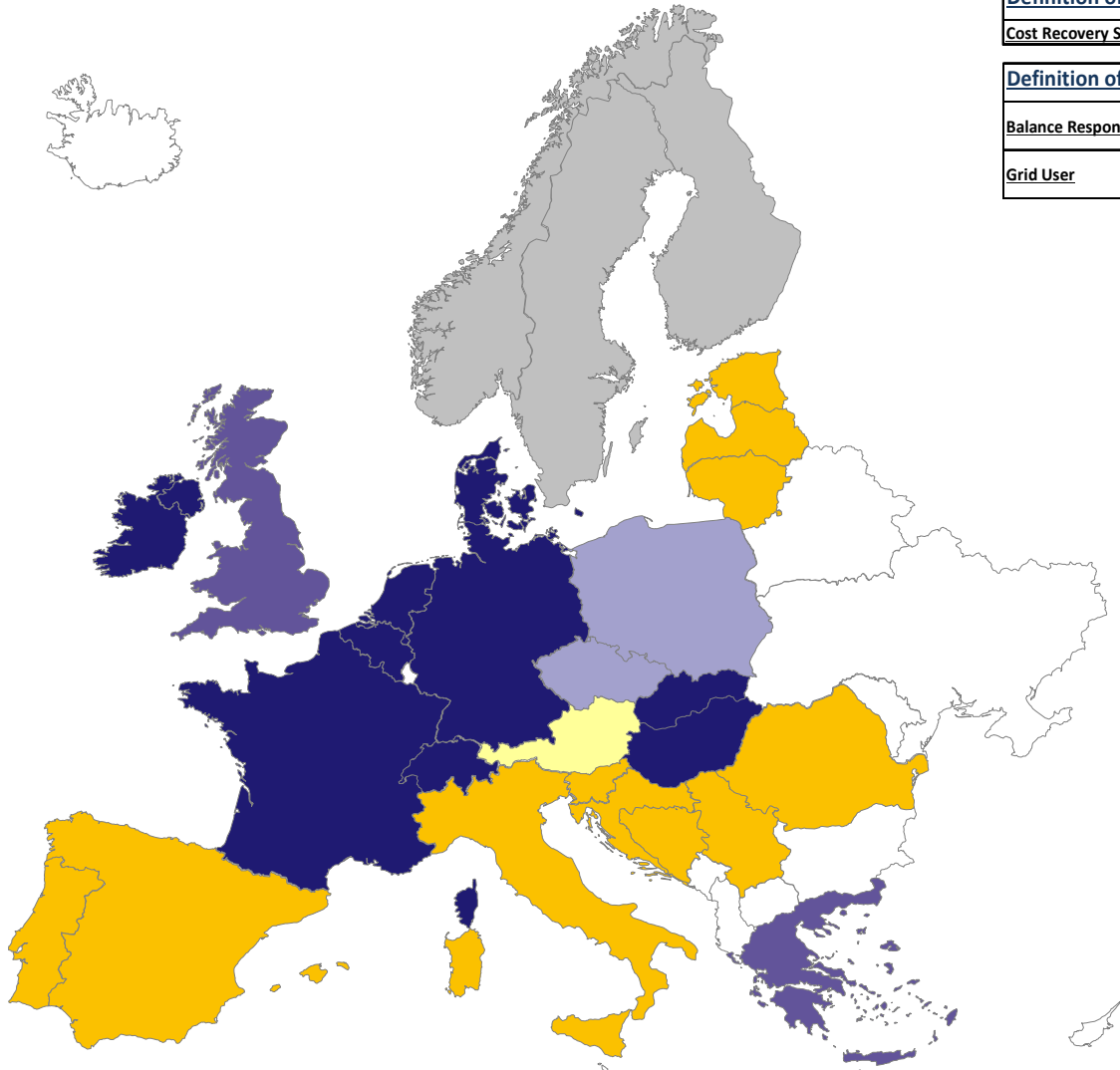
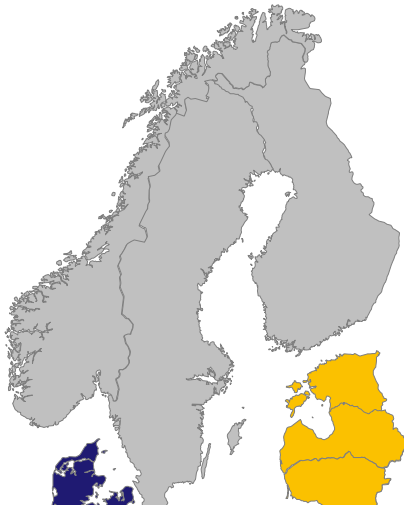
Frequency Containment Reserve - Capacity - Cost Recovery Scheme

Definition of question

Cost Recovery Scheme	From whom are the costs recovered.
-----------------------------	------------------------------------

Definition of answer

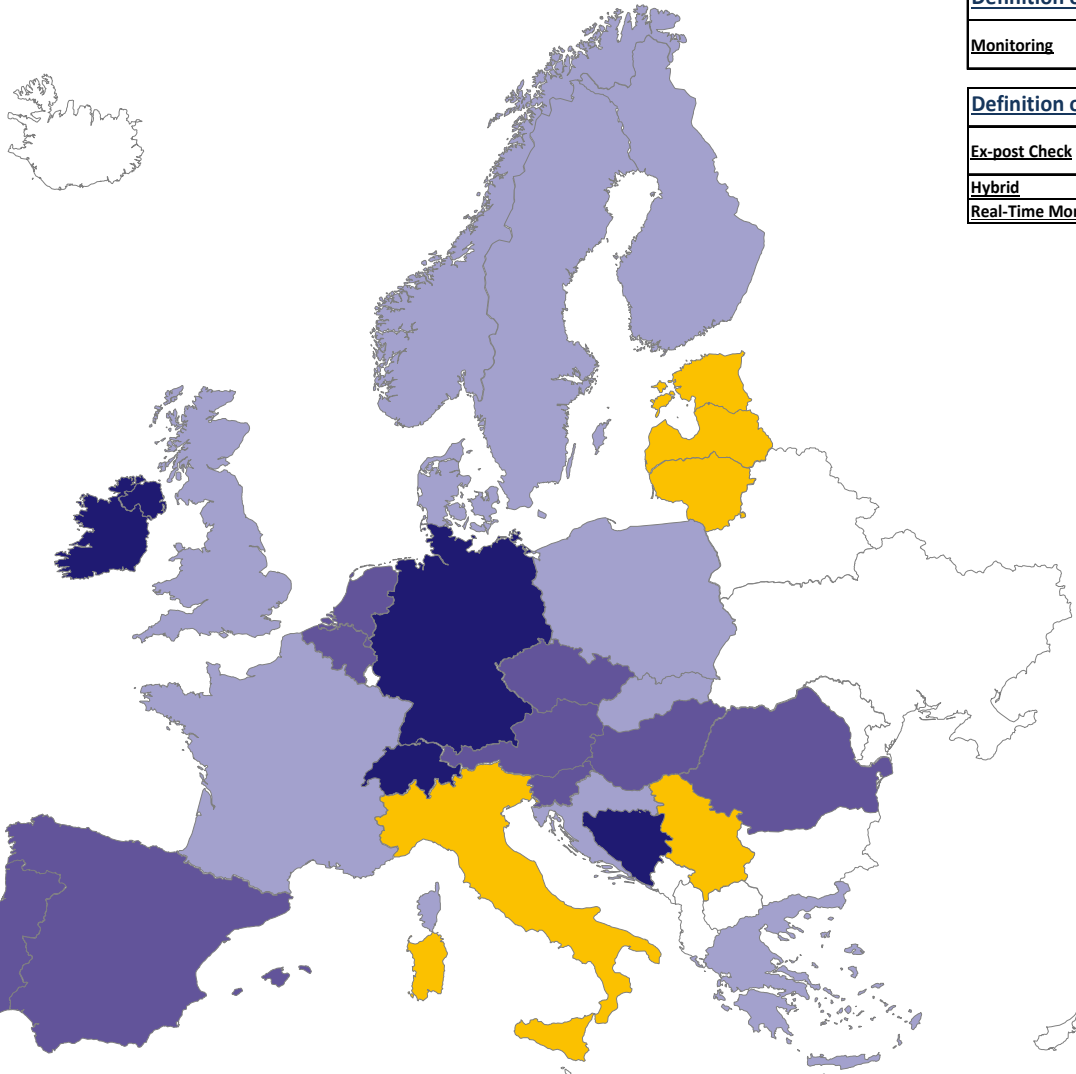
Balance Responsible Party (BRP)	Balancing Responsible Party means a market participant or its chosen representative responsible for its Imbalances.
Grid User	The natural or legal person supplying to, or being supplied with active and/or reactive power by a TSO or DSO.



Key:

	Missing data
	N/A
	100% Grid Users
	100% BRP
	100% end consumers
	Mix of Grid Users and BRP
	Generators
	Consumers

Frequency Containment Reserve - Capacity - Monitoring



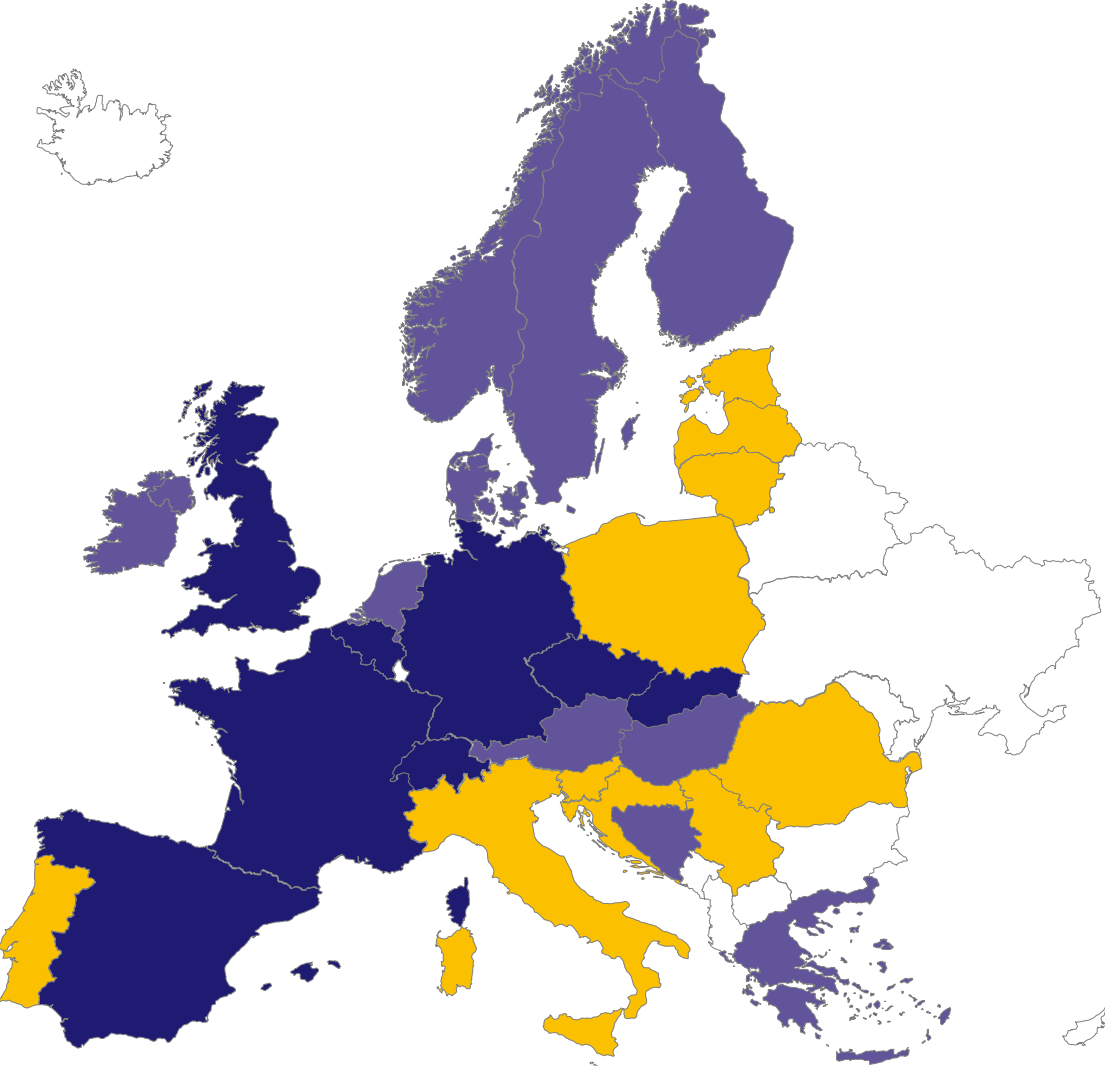
Definition of question	
Monitoring	Refers to the type of monitoring in place by the system operator to ensure performance of plant.

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

Key:

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

Frequency Containment Reserve - Capacity - Transfer of obligation allowed



Key:

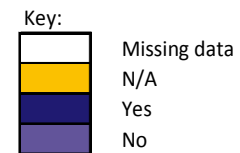
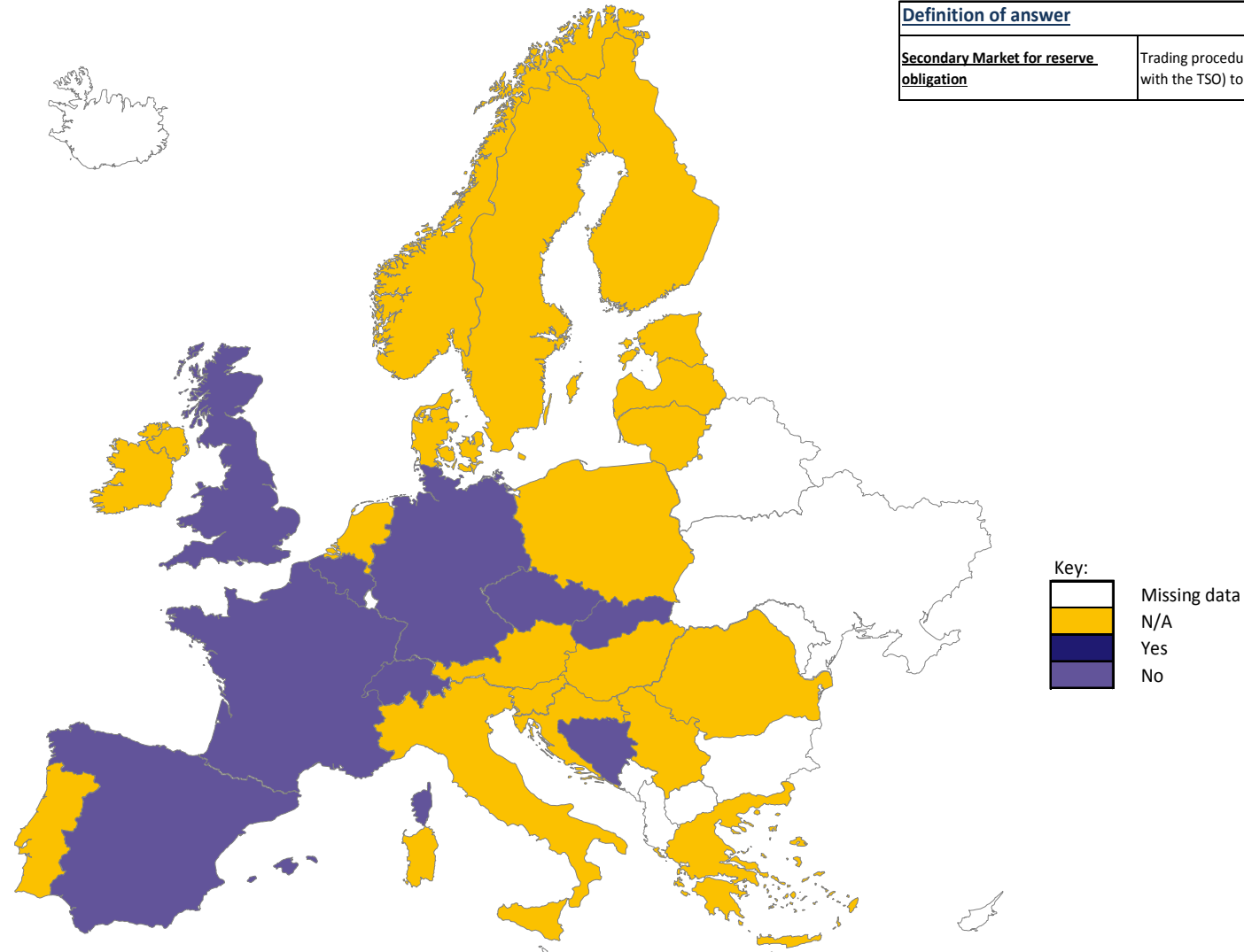
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Yellow	N/A
Dark Blue	Yes
Purple	No

Frequency Containment Reserve - Capacity - Obl. allowed, organised secondary market exists

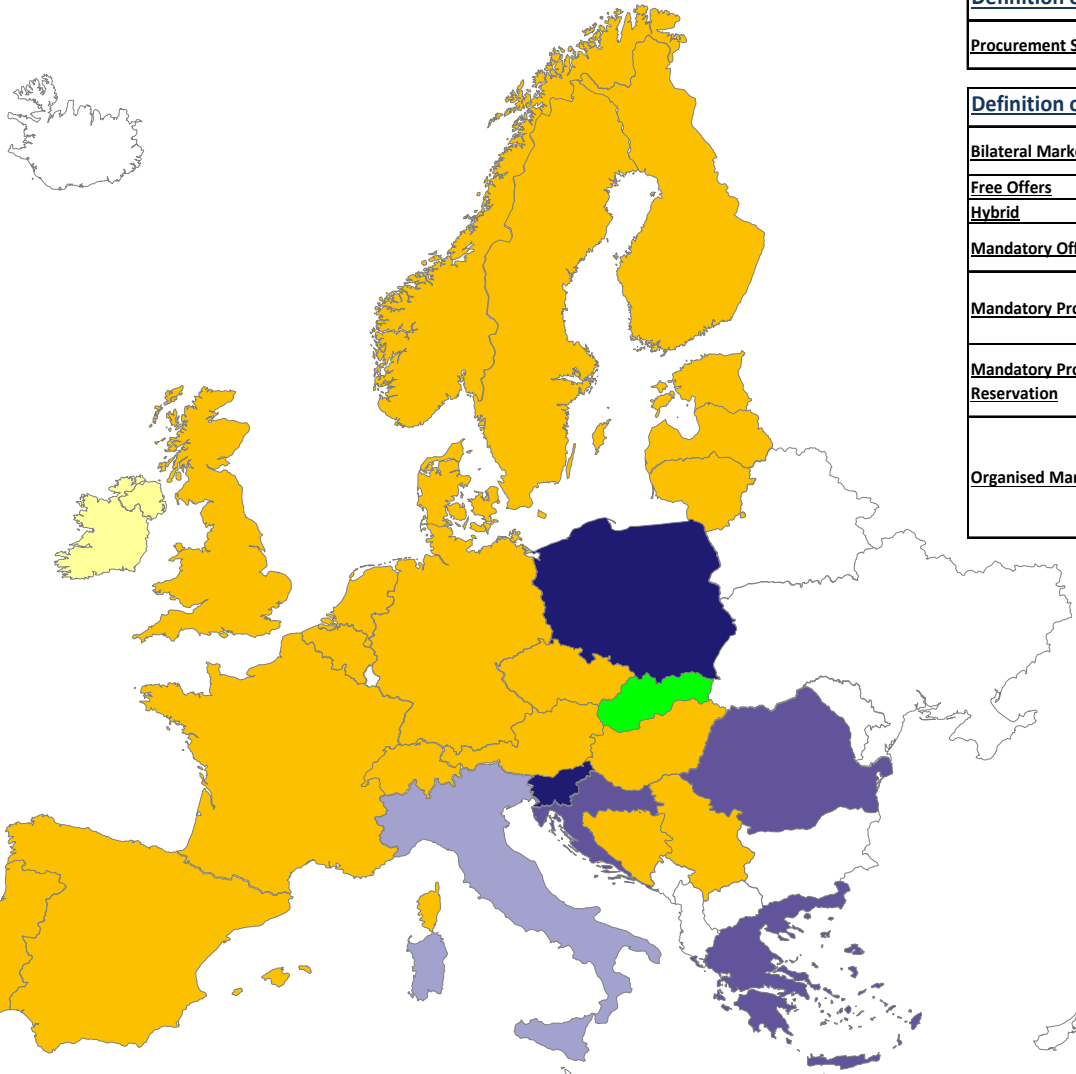
Definition of answer

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 - Procurement Scheme



Definition of question	
Procurement Scheme	Background of the offer, which is closest to the real operation time.
Definition of answer	
Bilateral Market	A grid user and TSO negotiate a contract regarding the offered service and price/price system.
Free Offers	Non-regulated offers.
Hybrid	Combination.
Mandatory Offers	Generators connected to the grid are obligated to offer the remaining capacity/available capacity.
Mandatory Provision	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.
Mandatory Provision without Reservation	It is mandatory for dispatchable units to be able to provide frequency containment reserve, but these units are not required to reserve capacity to provide this service.
Organised Market	There is no contract or obligation for a grid user to offer the reserve (before the offer). The grid user can voluntarily participate in the market (e.g. tender, auction, market platform (like PX)) and bid a price or customize his offer (e.g. the volume, timeframe). The market result may lead to a bilateral contract.

Key:

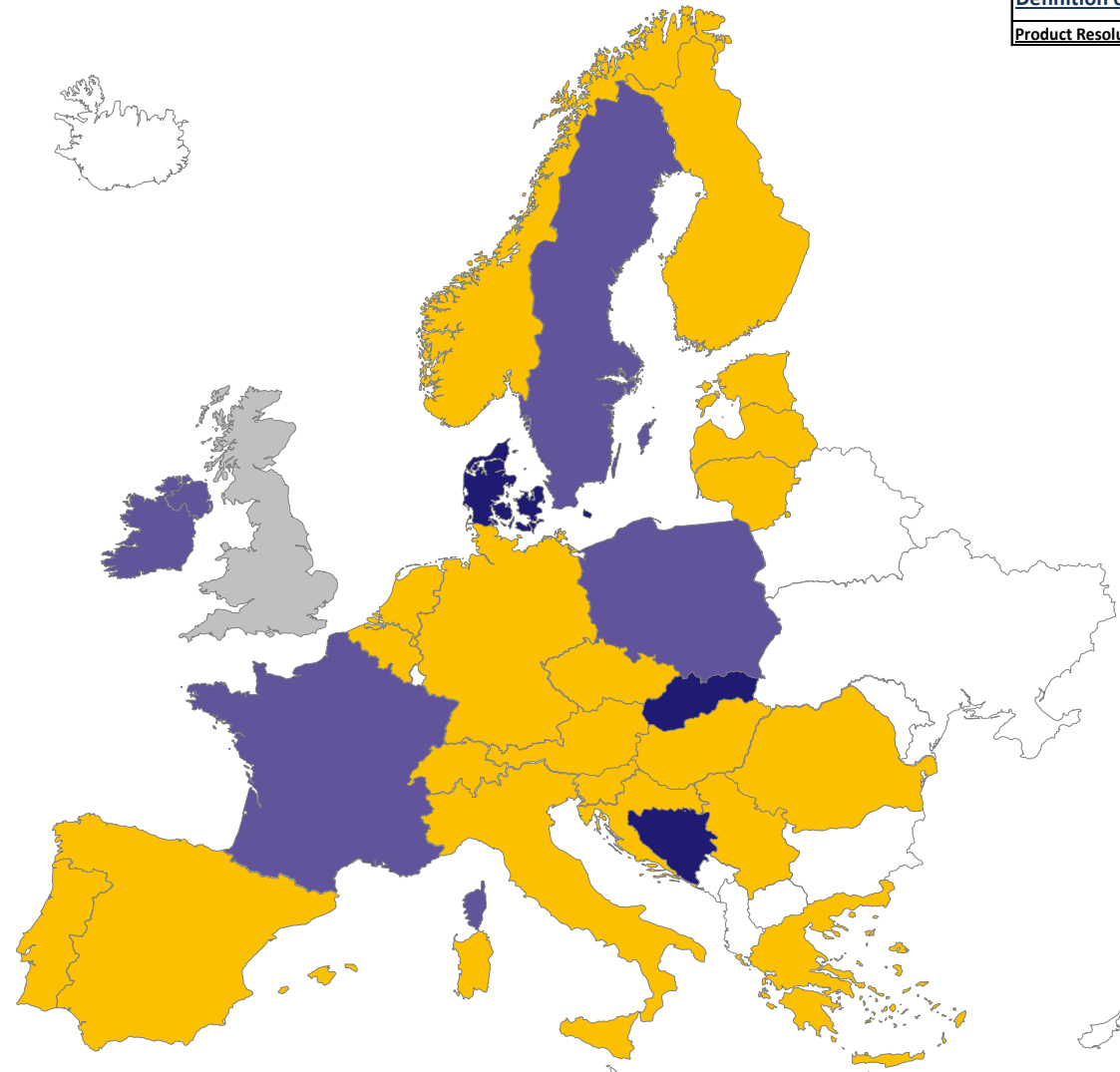
White	Missing data
Yellow	N/A
Dark Blue	Mandatory Offers
Purple	Mandatory Provision
Light Purple	Mandatory Provision without Reservation
Grey	Bilateral Market
Light Yellow	Organised Market
Maroon	Hybrid
Green	Other
Bright Green	Pre-contracted Offers only
Red	Pre-contracted and Mandatory Offers
Brown	Pre-contracted and Free Offers

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

Definition of question

Product Resolution (in MW)

The minimum bid size into the balancing market.



Key:



Missing data

N/A

No minimum bid size

$x \leq 1$ MW

$1 \text{ MW} < x \leq 5$ MW

$5 \text{ MW} < x \leq 10$ MW

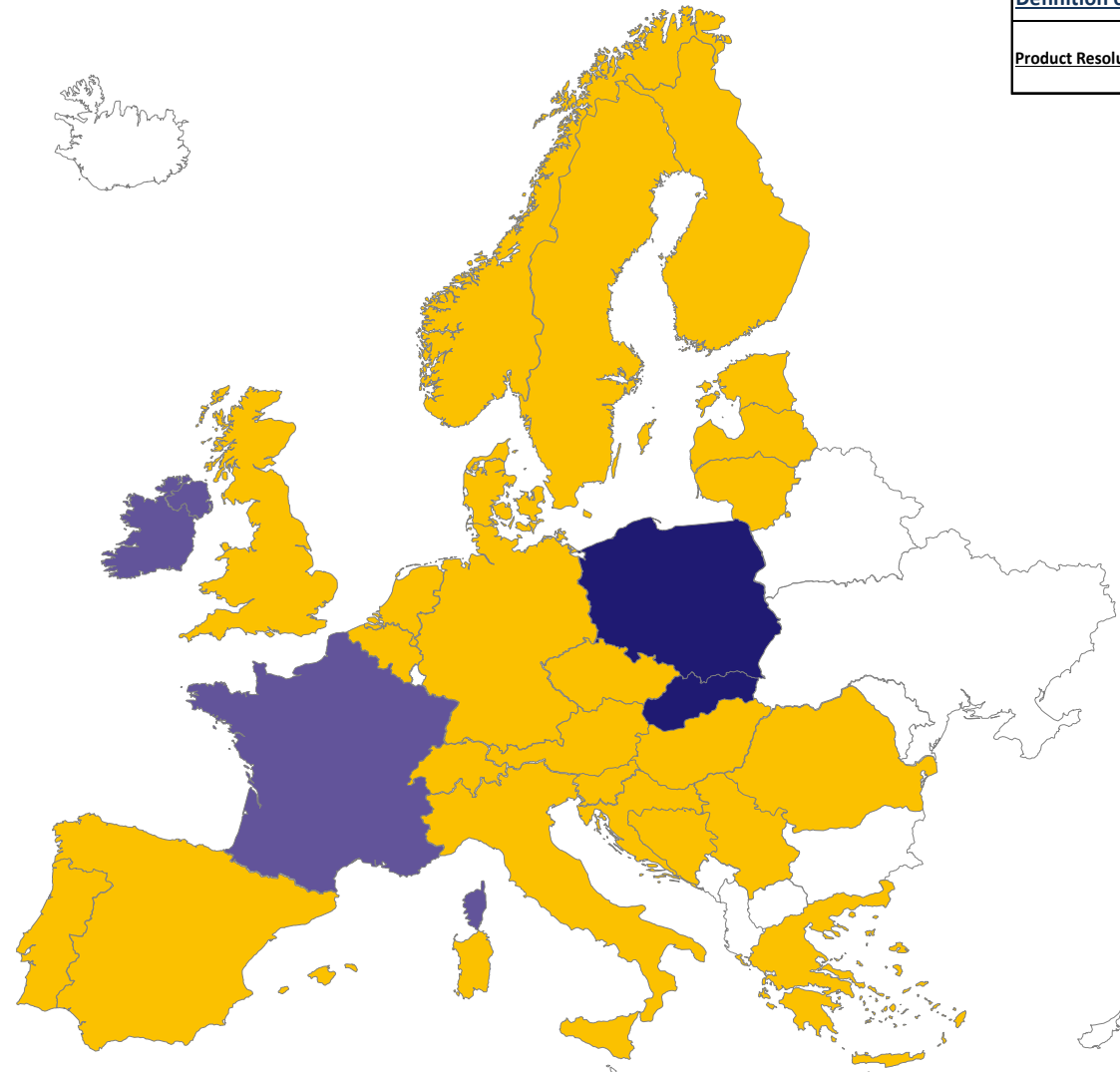
$x > 10$ MW

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).



Key:



Missing data

N/A

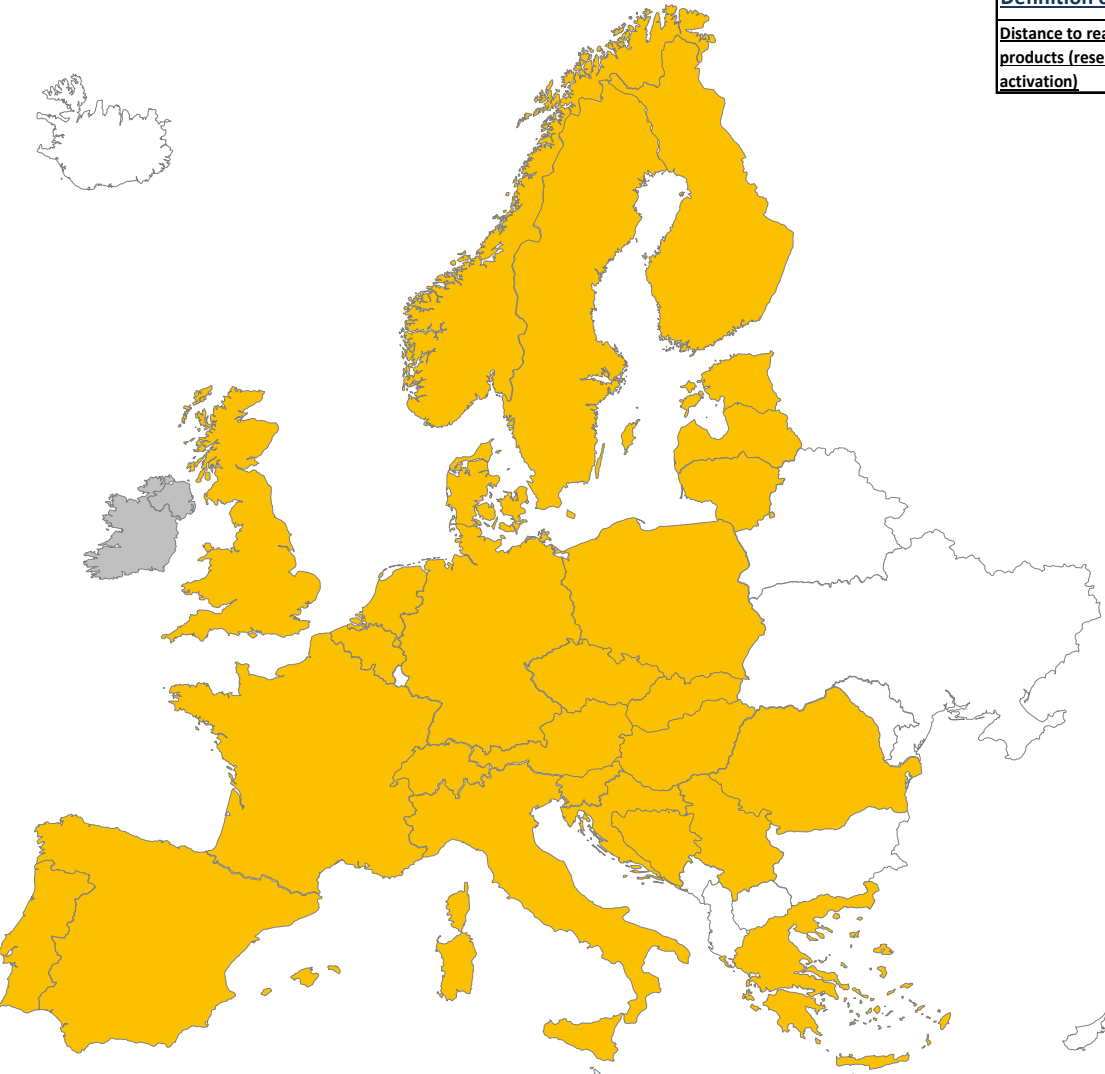
Hour (or blocks)

30 minutes

15 minutes

Frequency Containment Reserve - Energy - Distance to real time of energy products

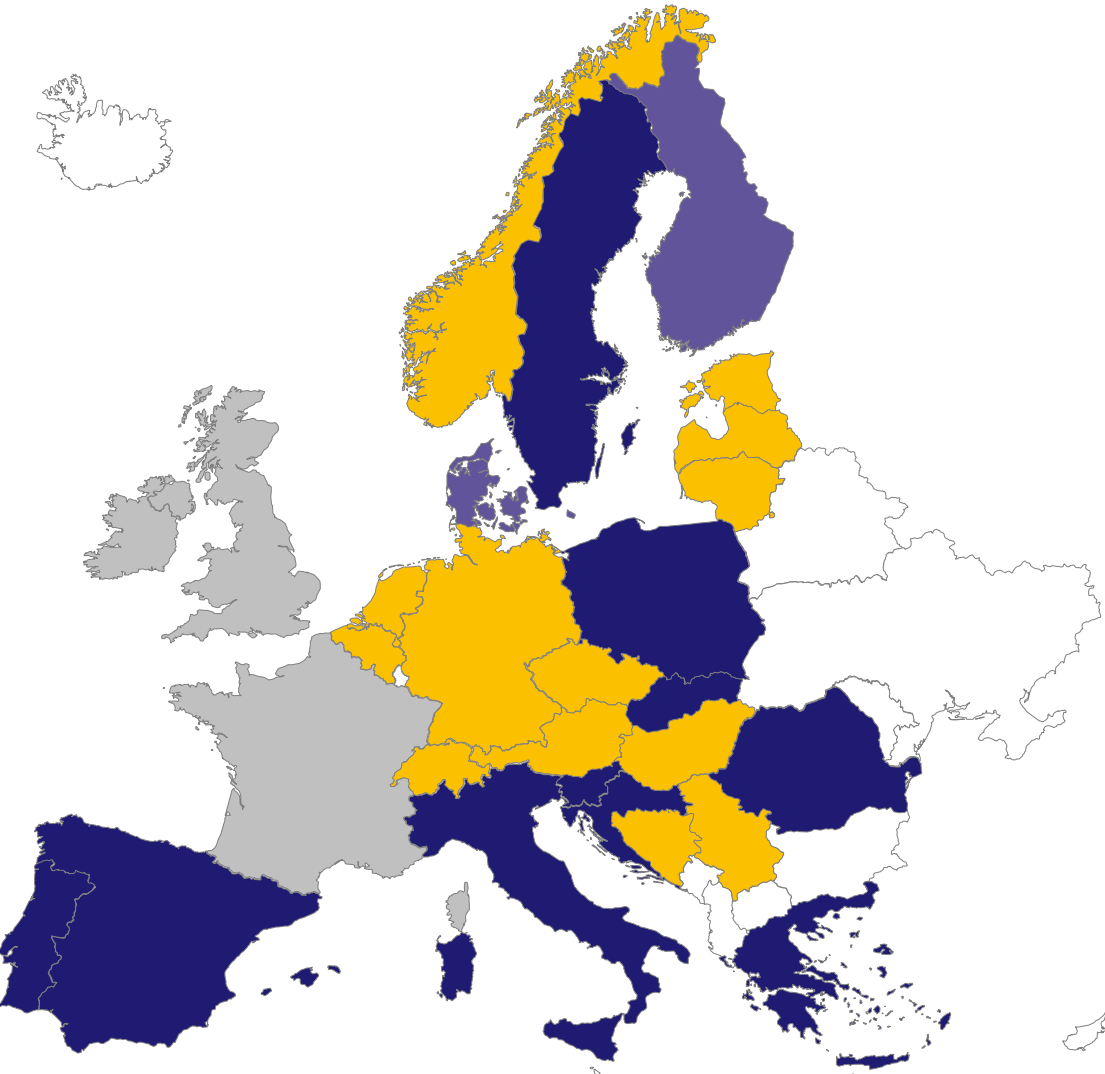
Definition of question	
Distance to real time of energy products (reserve products activation)	The time ahead from real time when TSO activates a given product (for instance 15 minutes in the case of mFRR/tertiary energy).



Key:

White	Missing data
Yellow	N/A
Blue	$x > D-1$
Purple	D-1
Light Purple	$x > H-1$
Grey	$x \leq H-1$

Frequency Containment Reserve - Energy - Provider



Key:

White	Missing data
Yellow	N/A
Dark Blue	Generators Only
Purple	Generators + Load
Light Purple	Generators + Pump Storage units pumping
Grey	Generators + Load + Pump Storage units pumping

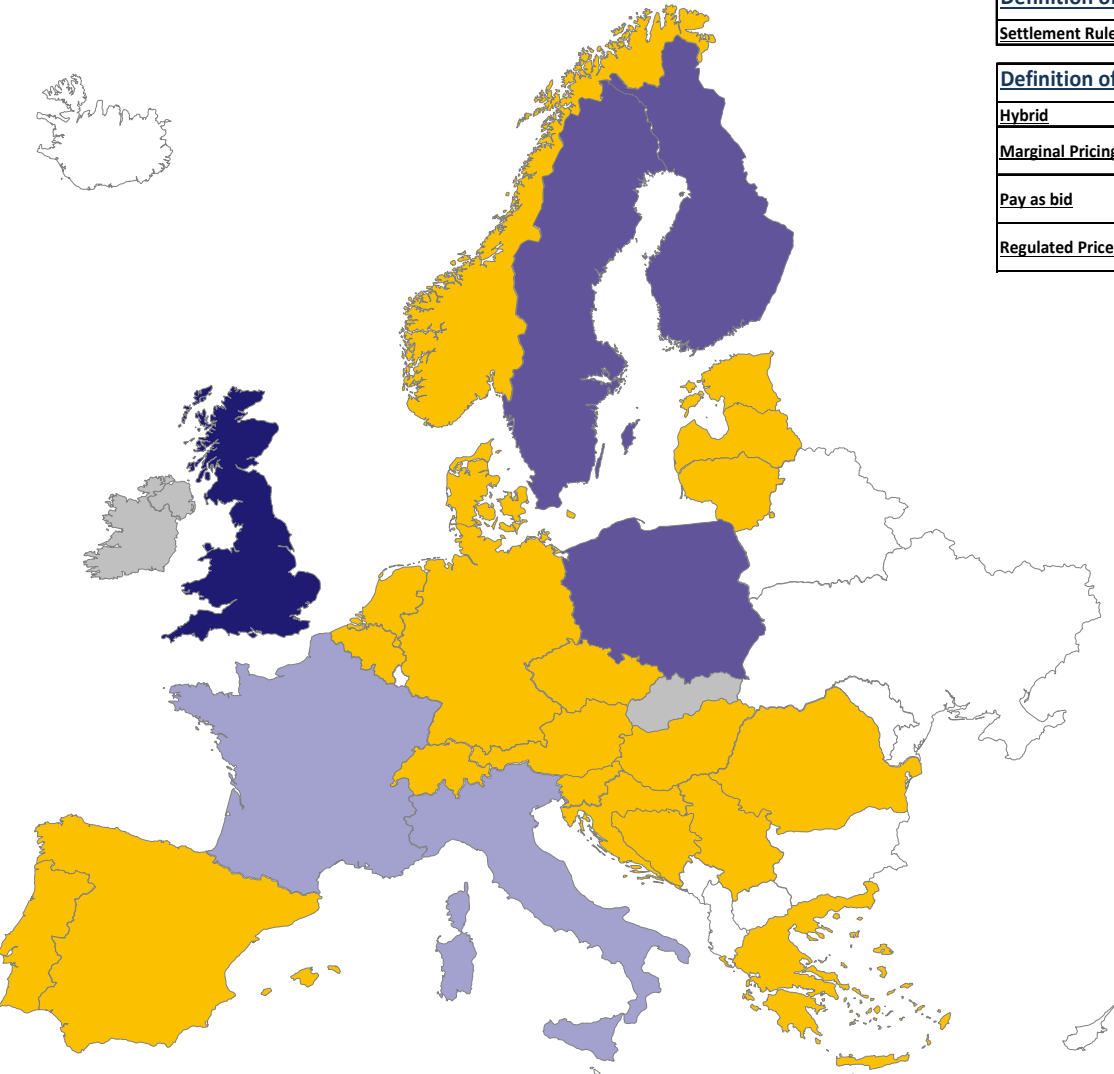
Frequency Containment Reserve - Energy - Settlement Rule

Definition of question

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

Definition of answer

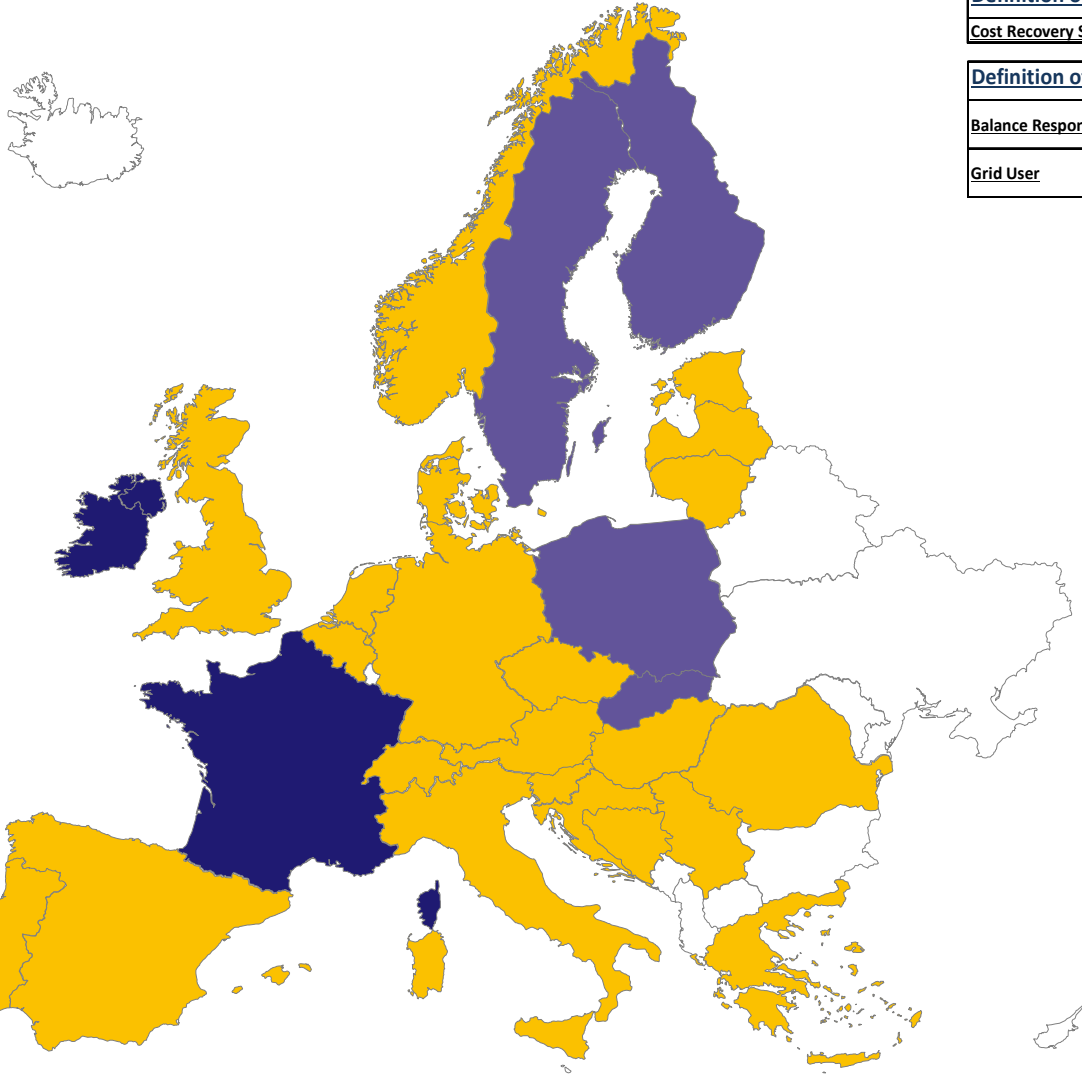
Hybrid	Combination.
Marginal Pricing	Marginal pricing is the change in total cost that arises when the quantity produced changes by one unit.
Pay as bid	Contracted parties who provide a service are paid based on their offer price.
Regulated Price	Price for this service is based on a price that is set by the relevant regulatory authority.



Key:

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

Frequency Containment Reserve - Energy - Cost Recovery Scheme

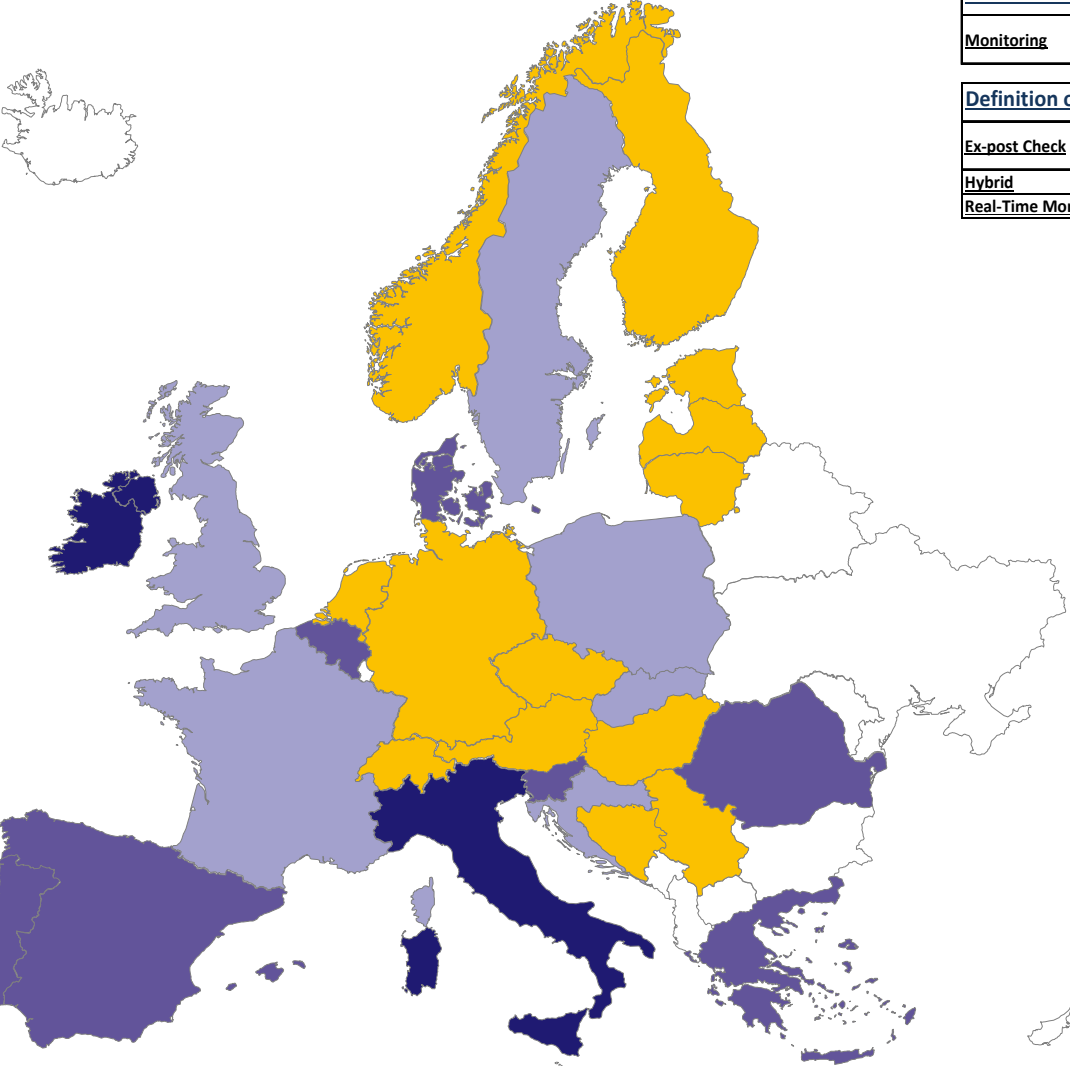


<u>Definition of question</u>	
Cost Recovery Scheme	From whom are the costs recovered.
<u>Definition of answer</u>	
Balance Responsible Party (BRP)	Balancing Responsible Party means a market participant or its chosen representative responsible for its Imbalances.
Grid User	The natural or legal person supplying to, or being supplied with active and/or reactive power by a TSO or DSO.

Key:

	Missing data
	N/A
	100% Grid Users
	100% BRP
	100% end consumers
	Mix of Grid Users and BRP

Frequency Containment Reserve - Energy - Monitoring



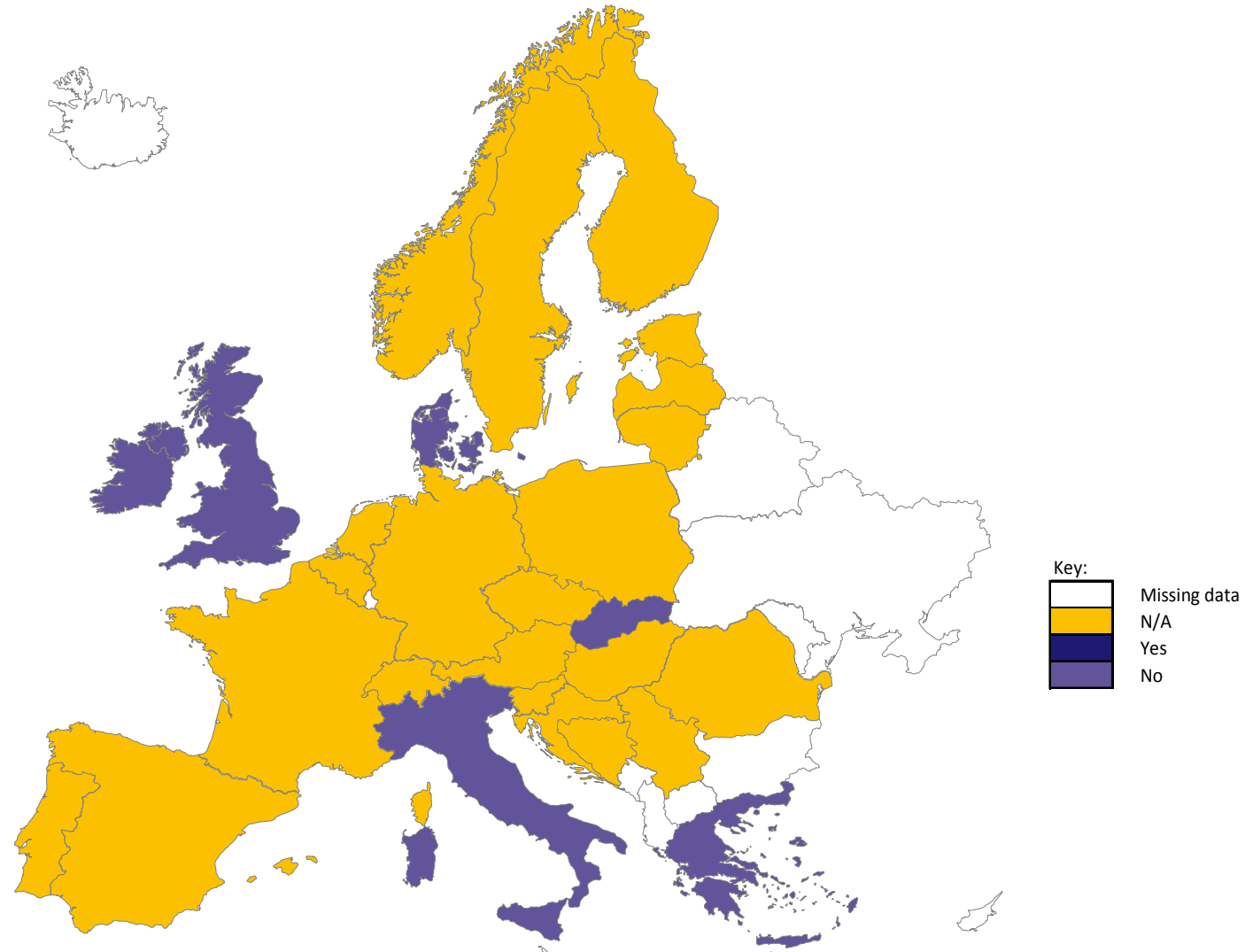
Definition of question	
Monitoring	Refers to the type of monitoring in place by the system operator to ensure performance of plant.

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

Key:

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

Frequency Containment Reserve - Energy - Transfer of obligation allowed

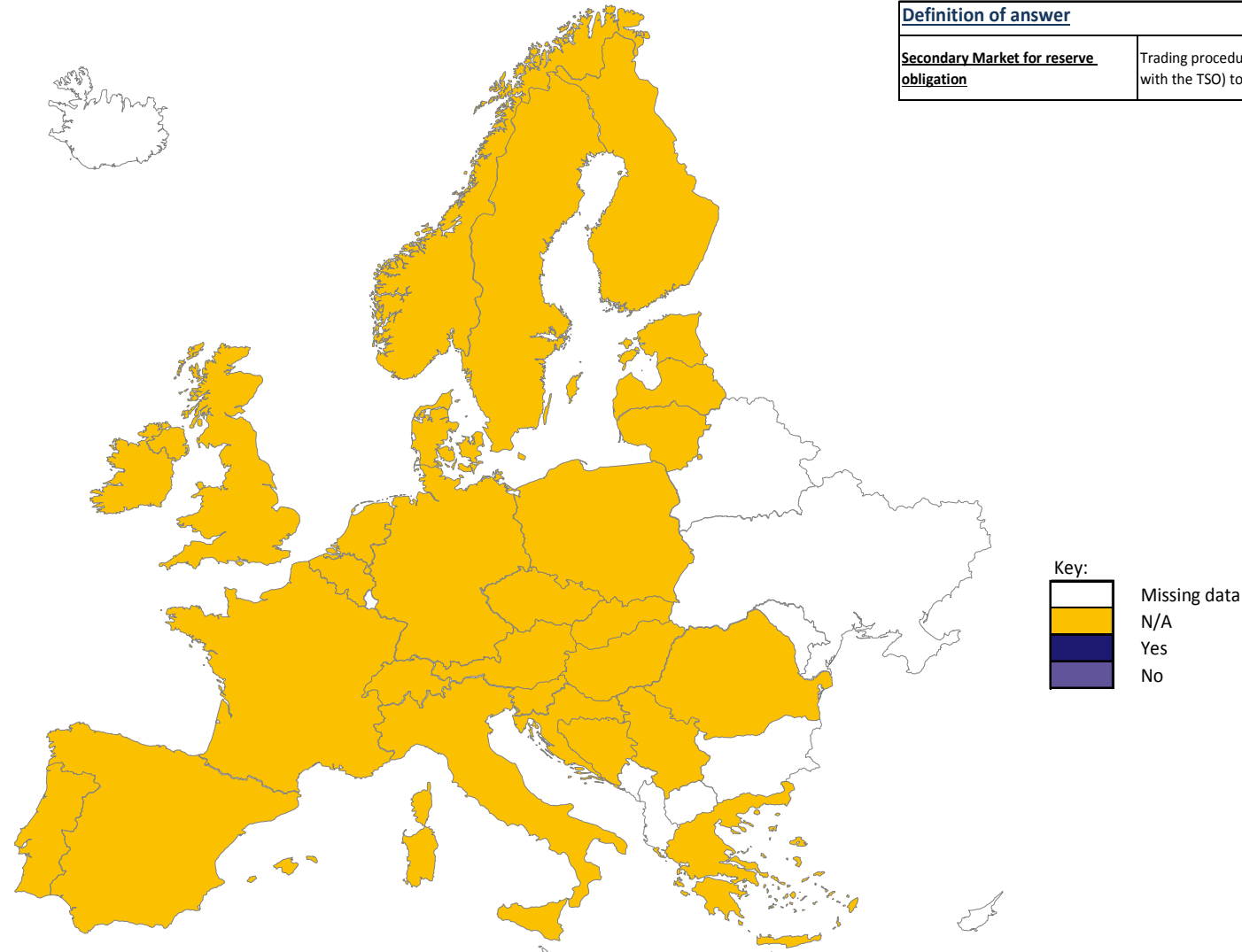


Frequency Containment Reserve - Energy - Obl. allowed, organised secondary market exists

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.

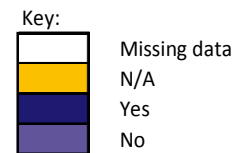
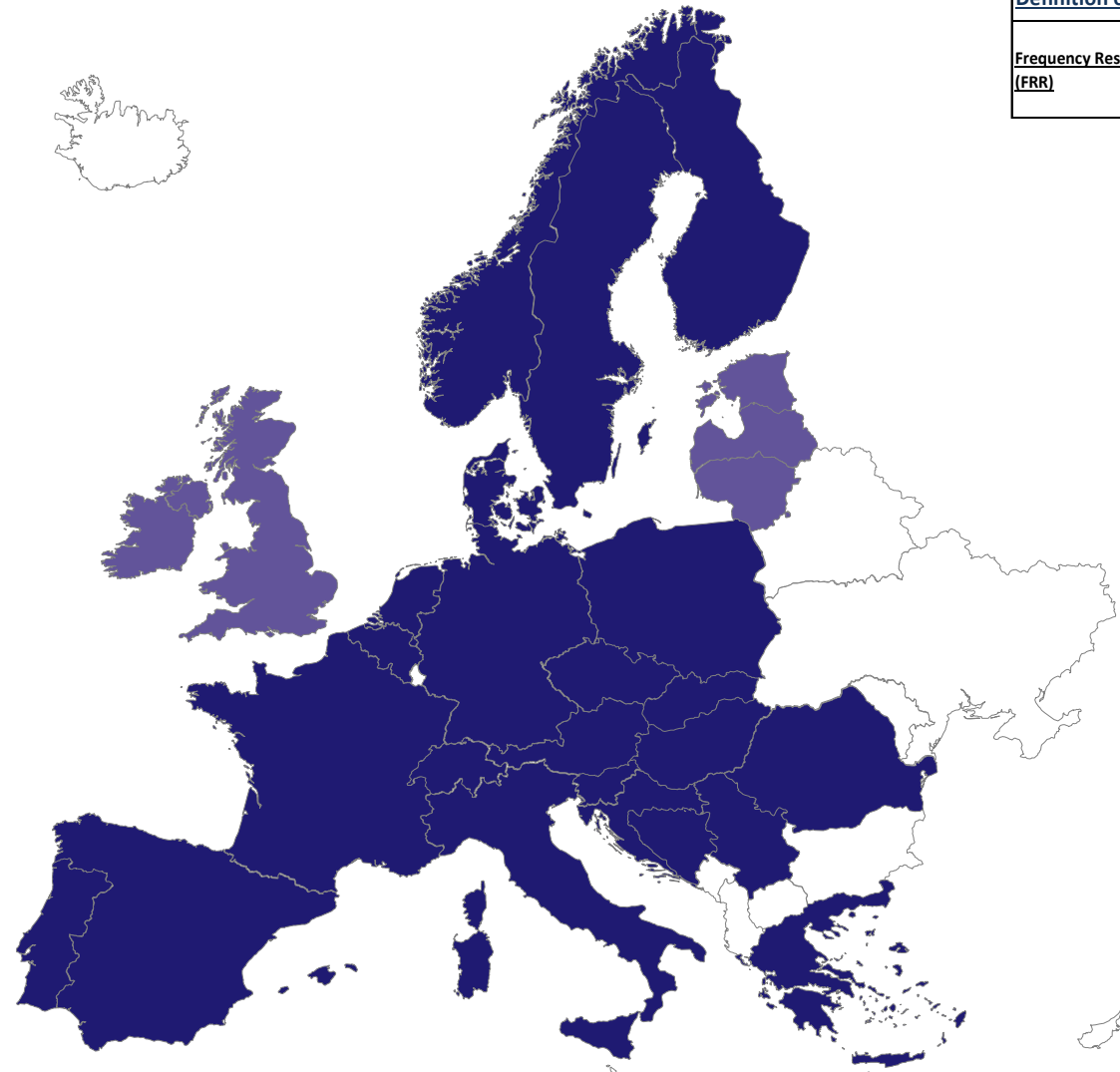


Using Frequency Restoration Reserve (Automatic)

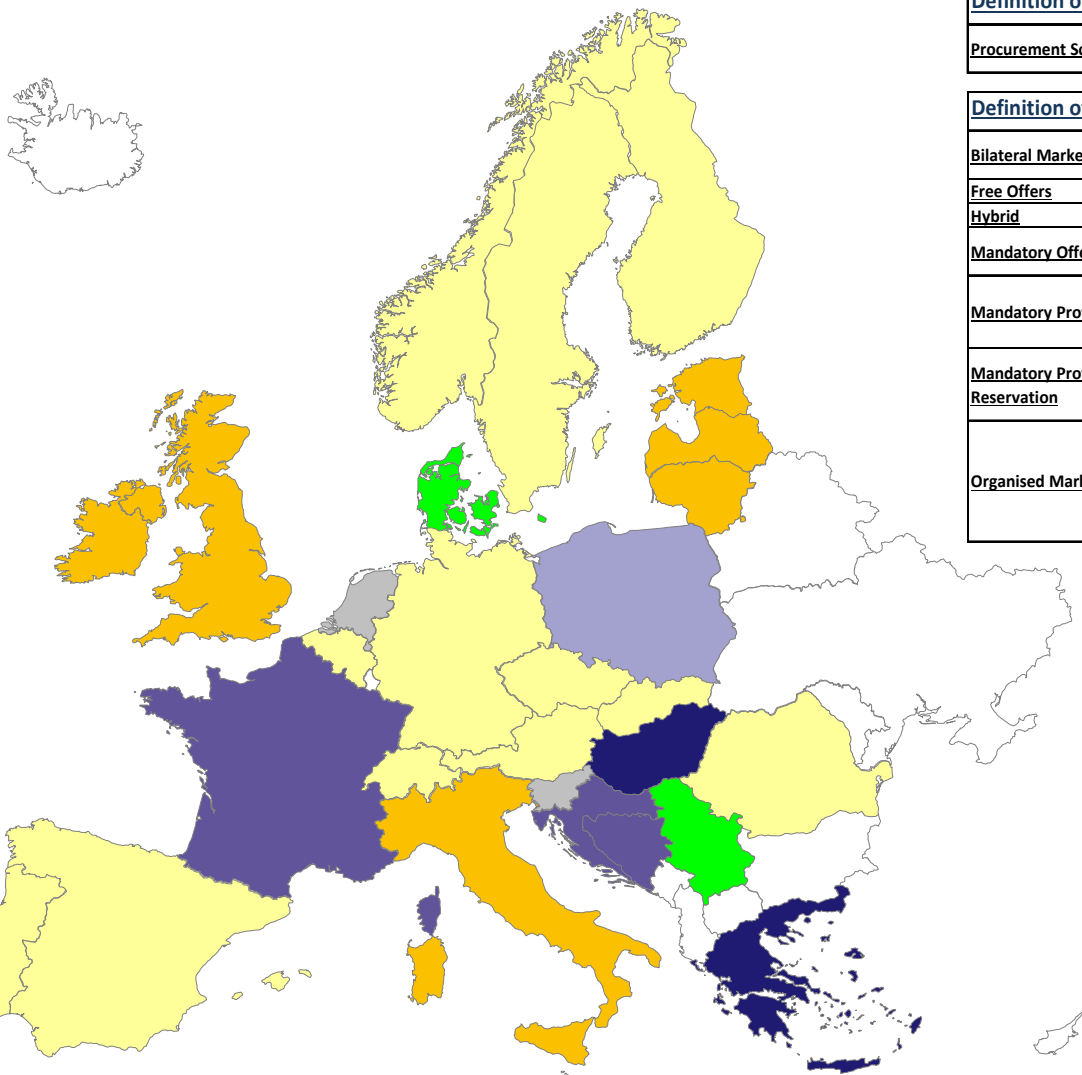
Definition of question

Frequency Restoration Reserve (FRR)

Reserves activated to restore System Frequency to the Nominal Frequency and, where applicable, power balance to the scheduled value.
FRRa means automatic FRR, FRRm 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	
Bilateral Market	A grid user and TSO negotiate a contract regarding the offered service and price/price system.
Free Offers	Non-regulated offers.
Hybrid	Combination.
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Key:

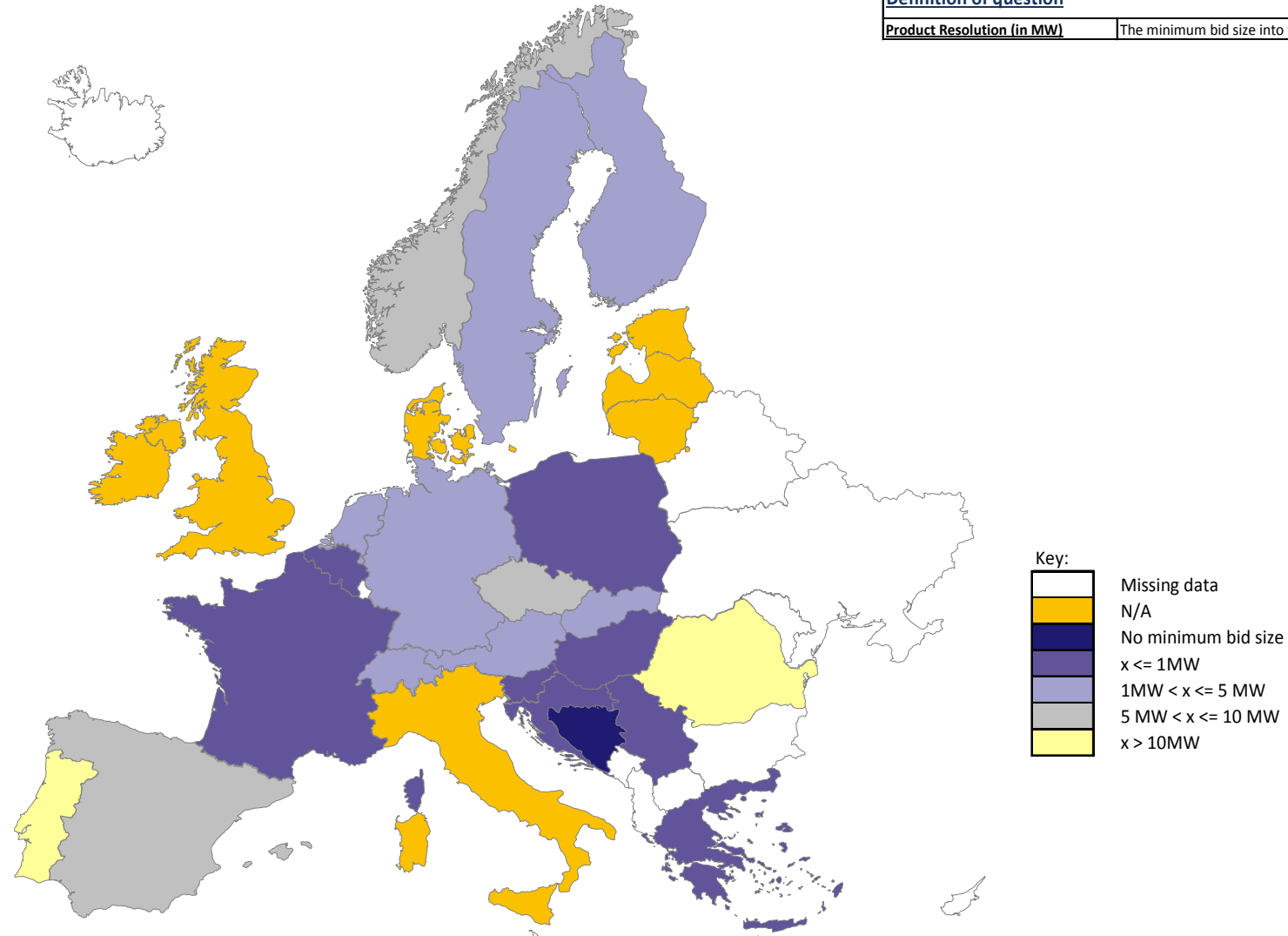
White	Missing data
Yellow	N/A
Dark Blue	Mandatory Offers
Light Blue	Mandatory Provision
Light Blue	Mandatory Provision without Reservation
Grey	Bilateral Market
Yellow	Organised Market
Green	Other
Red	Pre-contracted Offers only
Brown	Pre-contracted and Free Offers

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

Definition of question

Product Resolution (in MW)

The minimum bid size into the balancing market.

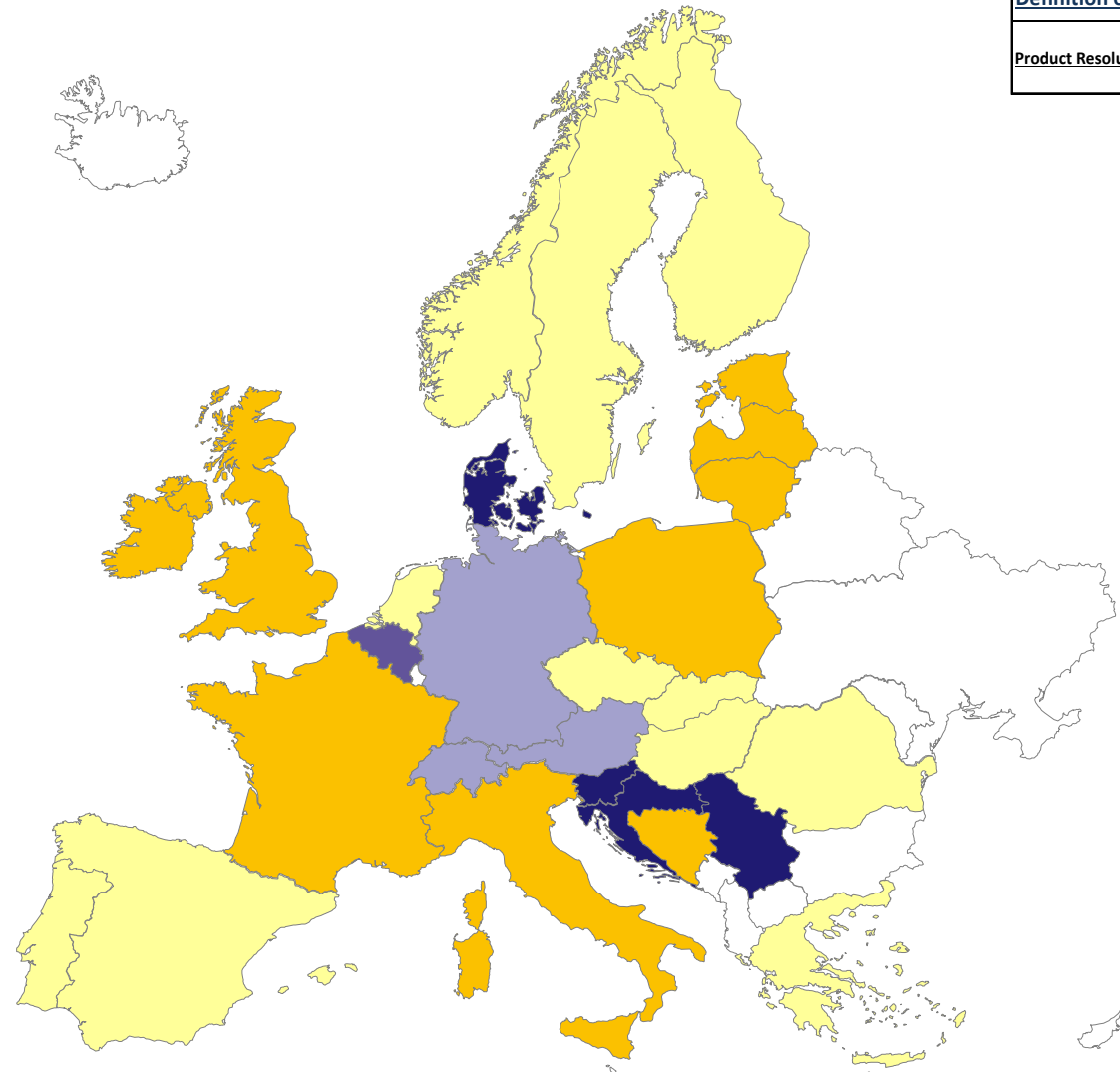


Frequency Restoration Reserve (Automatic) - Capacity - Product Resolution (in time)

Definition of question

Product Resolution (in time)

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



Key:

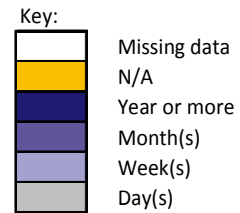
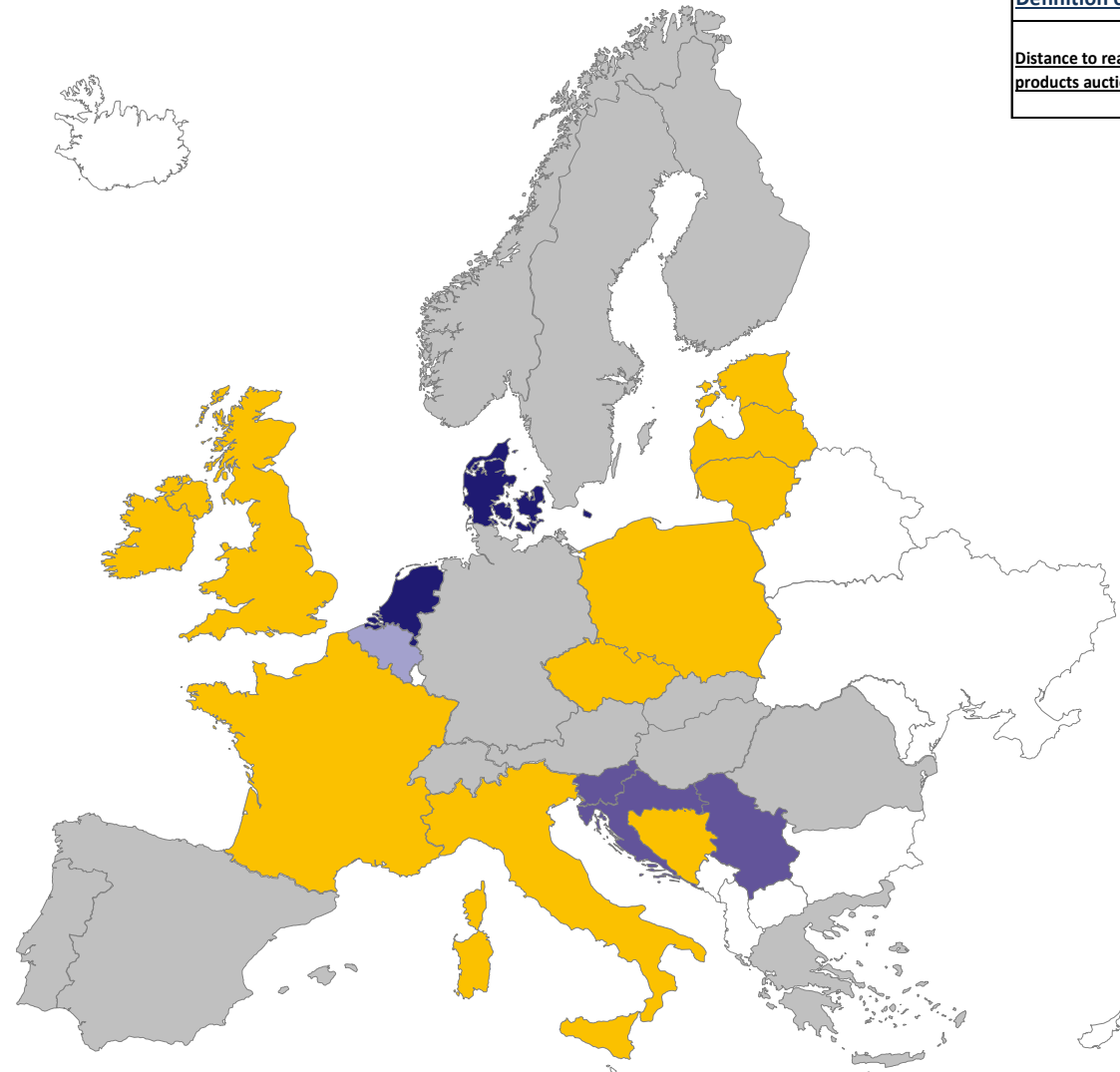
	Missing data
	N/A
	Year or more
	Month(s)
	Week(s)
	Day(s)
	Hour(s)

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

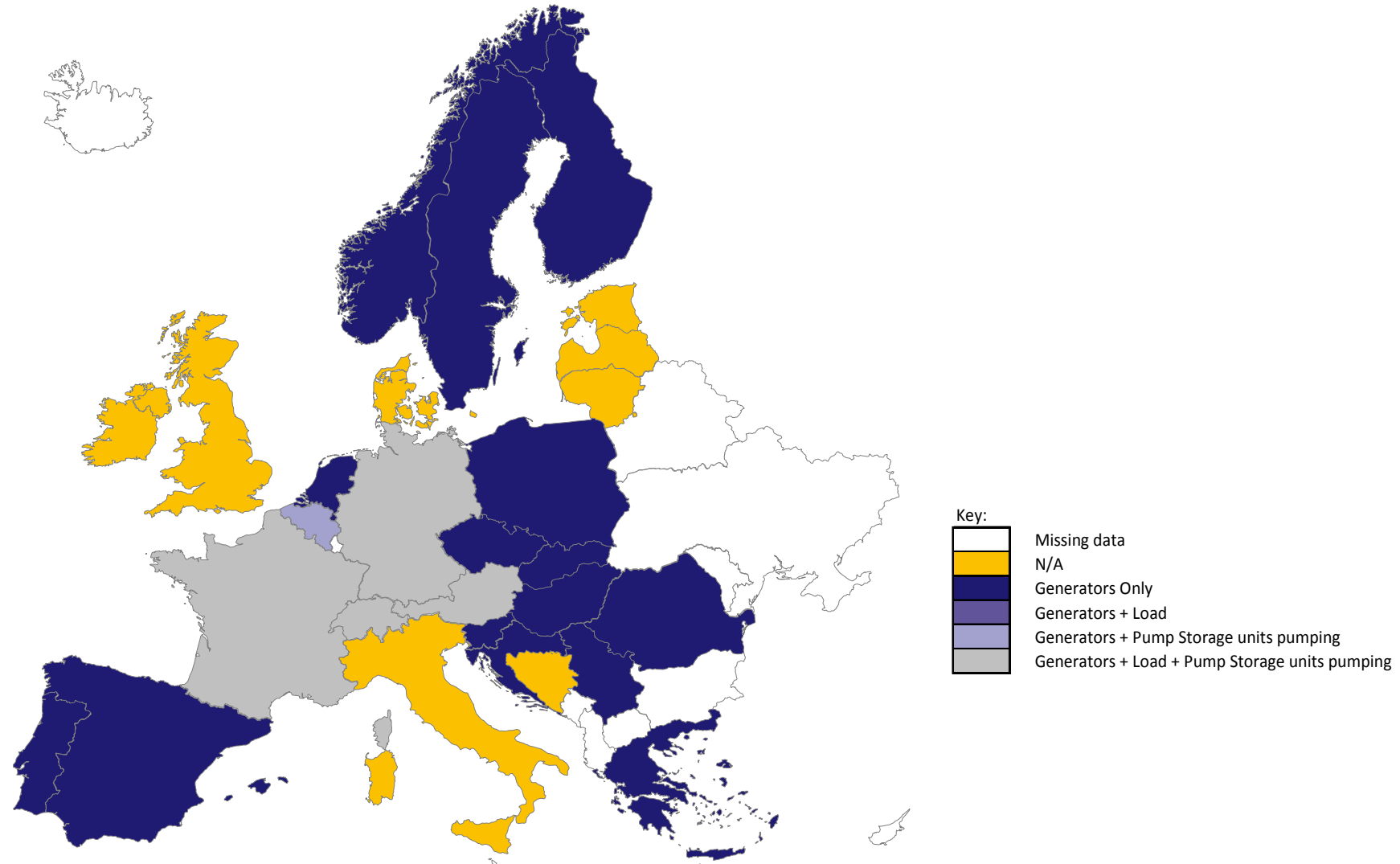
Definition of question

Distance to real time of reserve products auctions

The time ahead from real time when auction/agreement for a 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

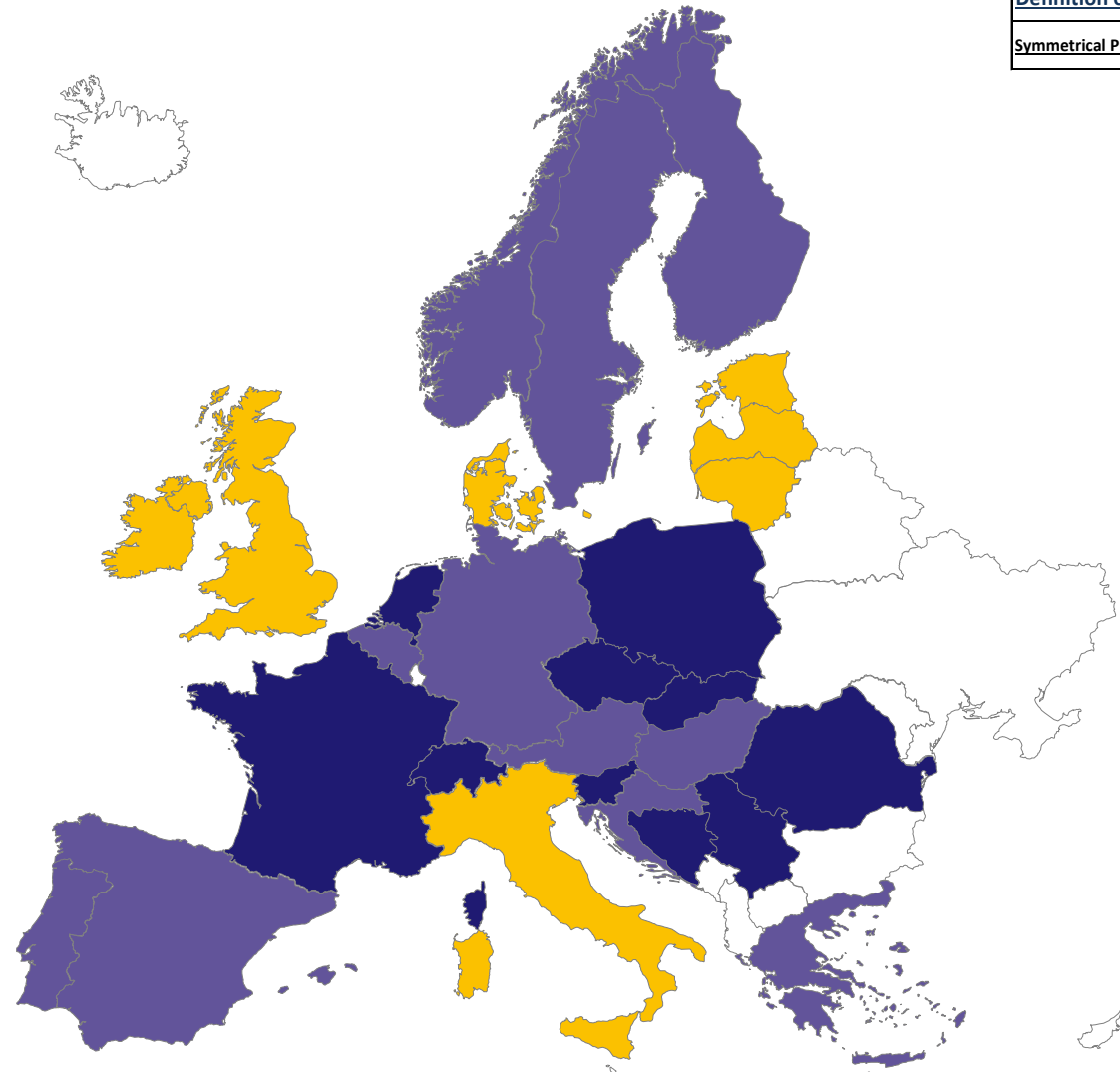


Frequency Restoration Reserve (Automatic) - Capacity - Symmetrical Product

Definition of question

Symmetrical Product

Upward regulation volume and for downward regulation volume has be equal.



Key:



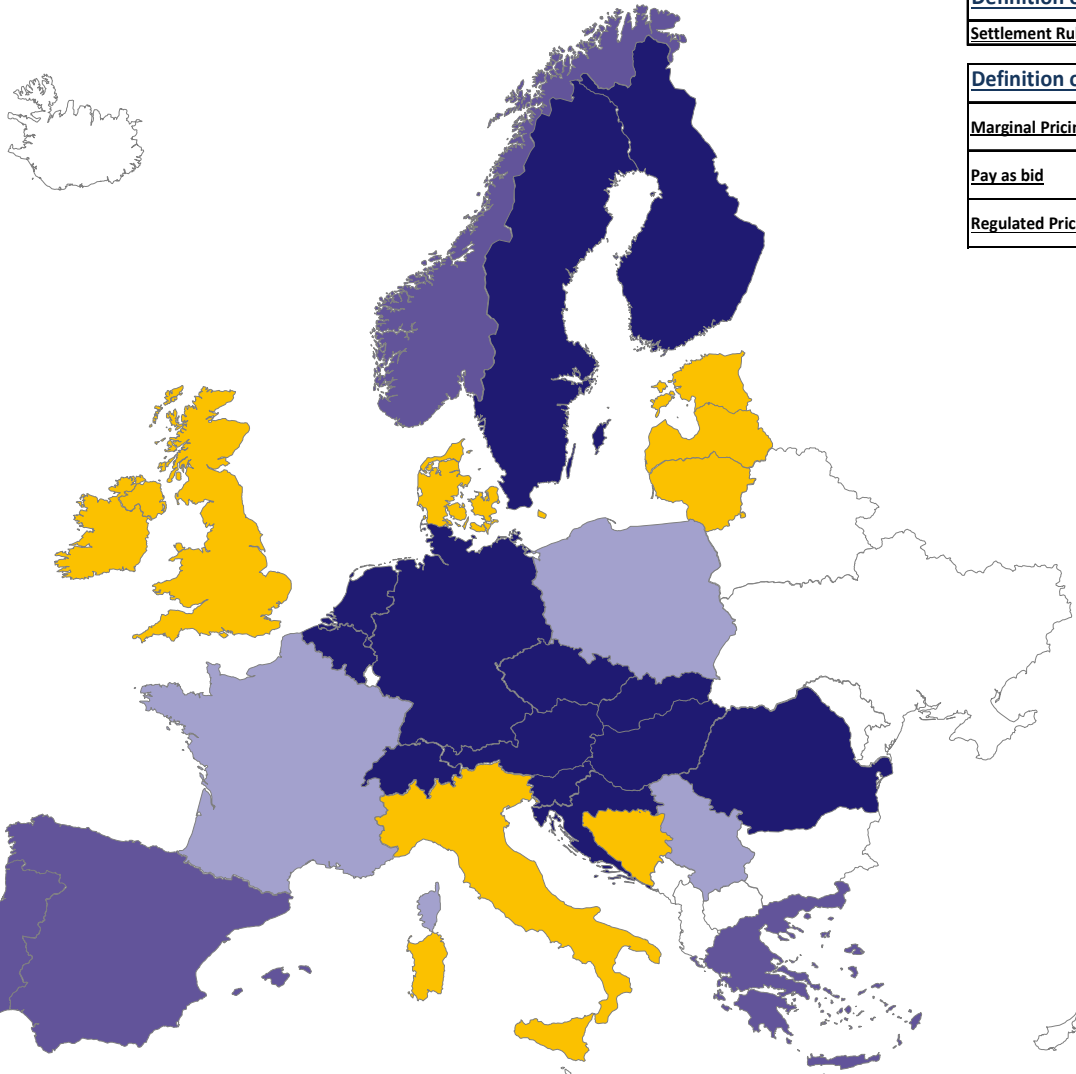
Missing data

N/A

Has to be symmetrical

Don't need to be symmetrical

Frequency Restoration Reserve (Automatic) - Capacity - Settlement Rule



Definition of question

Settlement Rule	The pricing rules for settlement.
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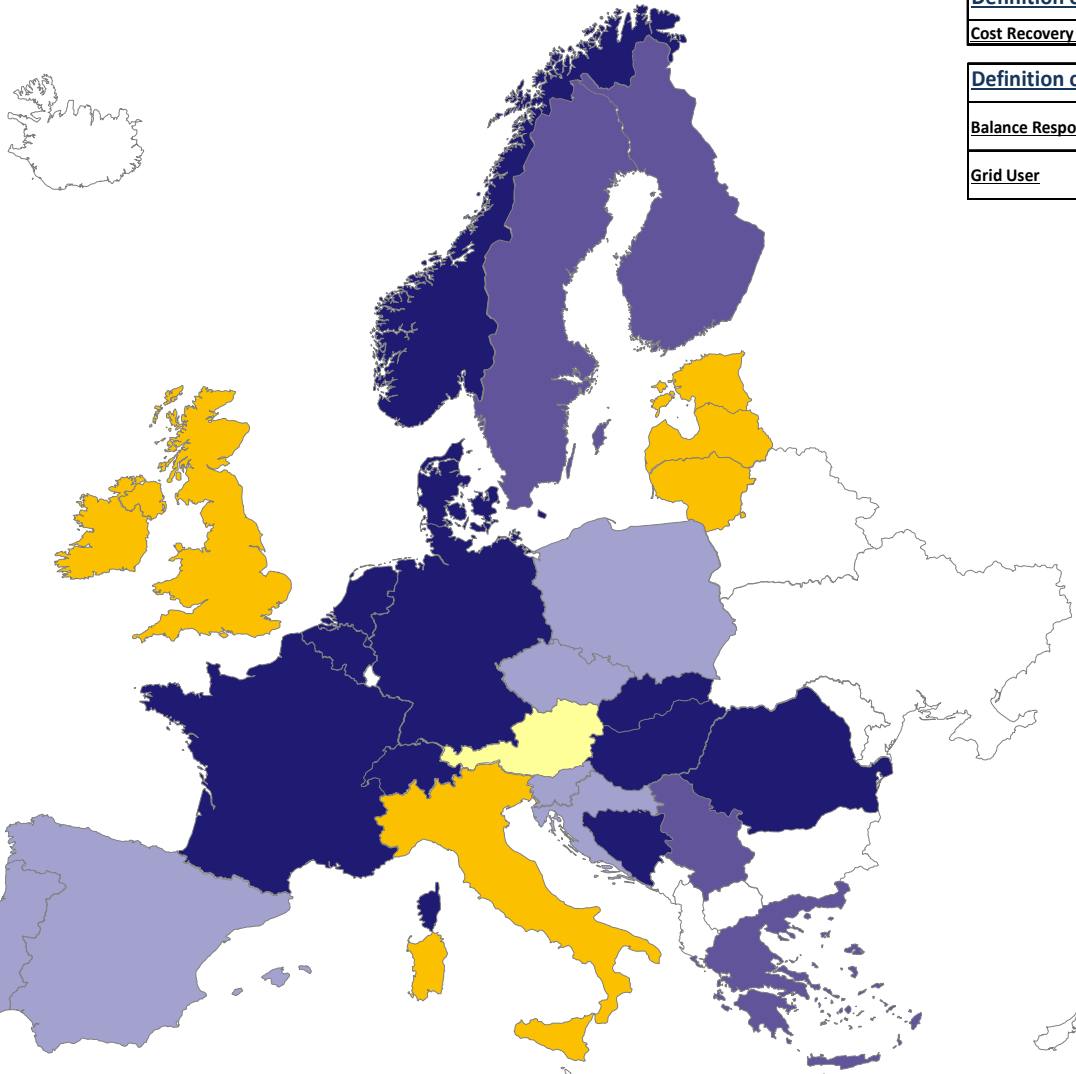
Definition of answer

Marginal Pricing	Marginal pricing is the change in total cost that arises when the quantity produced changes by one unit.
Pay as bid	Contracted parties who provide a service are paid based on their offer price.
Regulated Price	Price for this service is based on a price that is set by the relevant regulatory authority.

Key:

	Missing data
	N/A
	Pay as bid
	Marginal Pricing
	Regulated Price

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

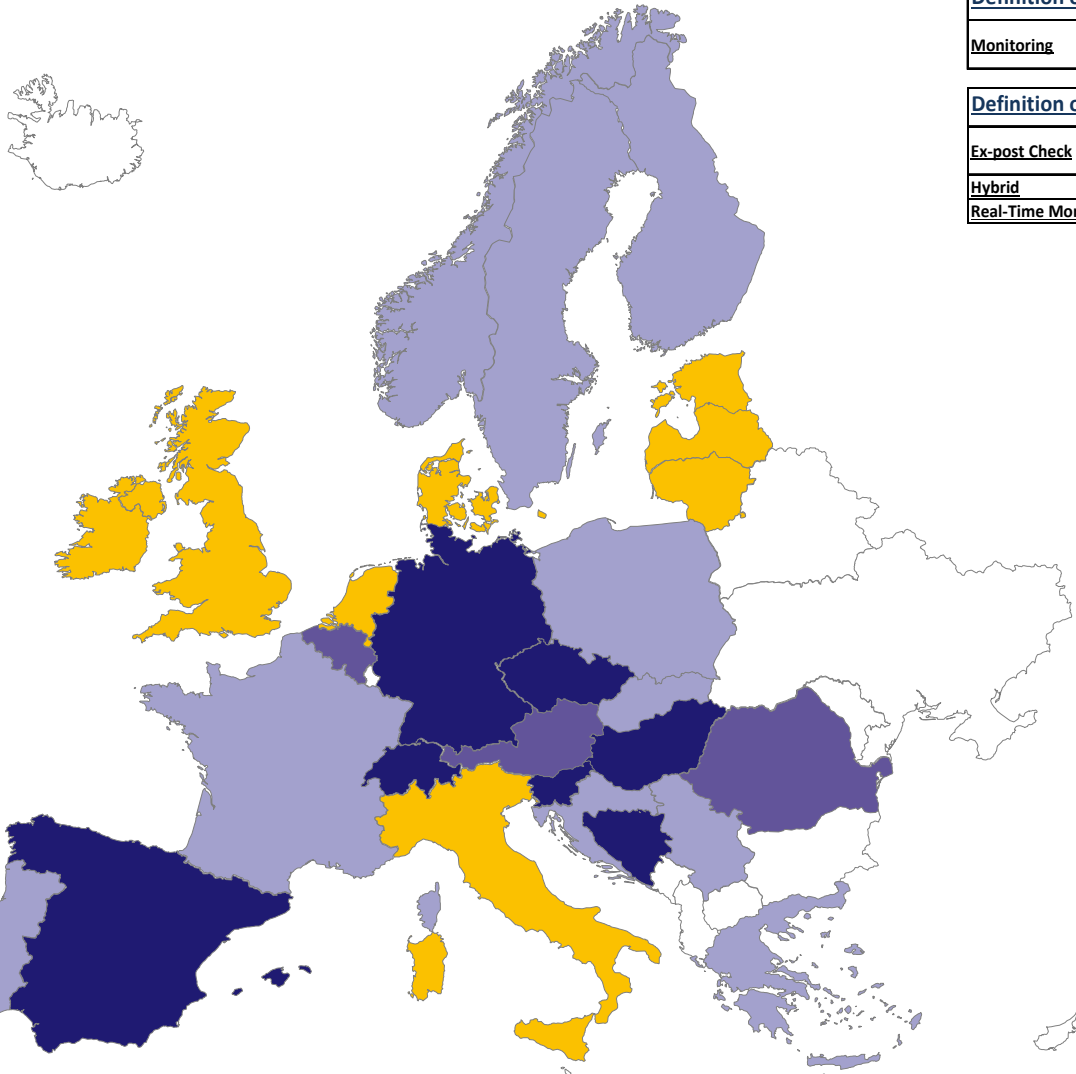


Definition of question	
Cost Recovery Scheme	From whom are the costs recovered.
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Grid User	The natural or legal person supplying to, or being supplied with active and/or reactive power by a TSO or DSO.

Key:






	Missing data
	N/A
	100% Grid Users
	100% BRP
	100% end consumers
	Mix of Grid Users and BRP
	Mix of generators and BRPs

Frequency Restoration Reserve (Automatic) - Capacity - Monitoring

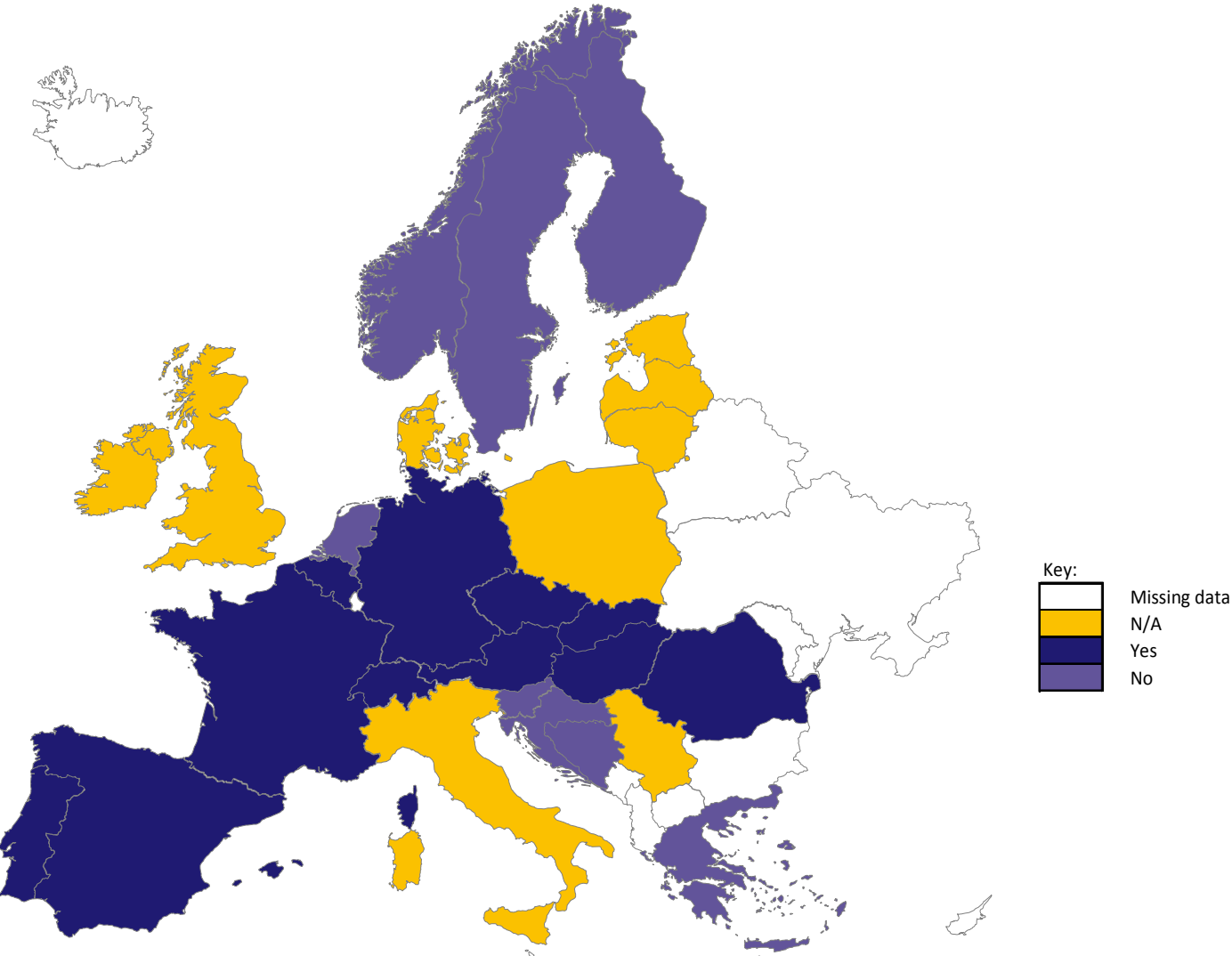


Definition of question	
Monitoring	Refers to the type of monitoring in place by the system operator to ensure performance of plant.

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

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

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

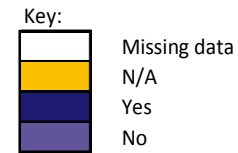
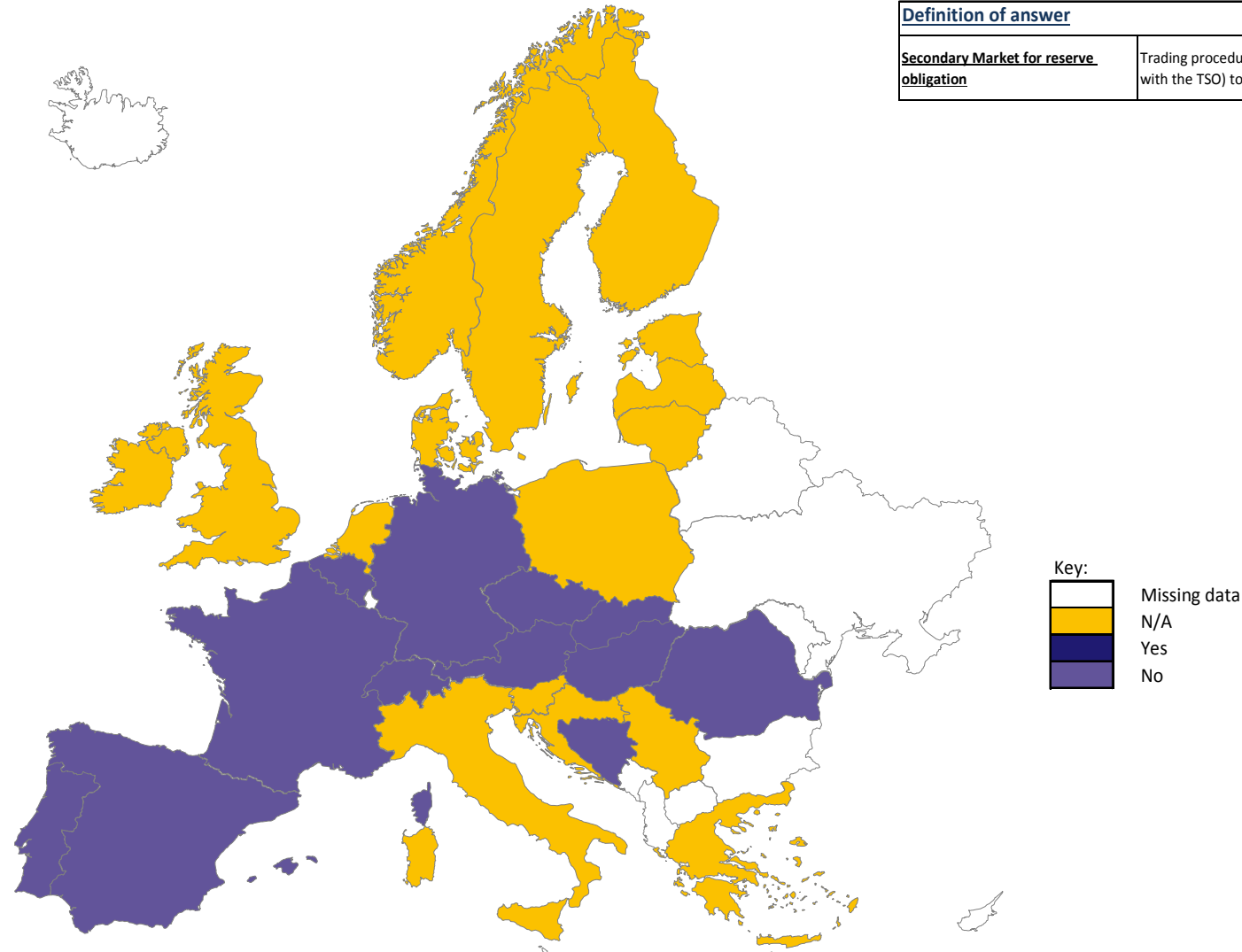


Frequency Restoration Reserve (Automatic) - Capacity - Obl. allowed, organised secondary market exists

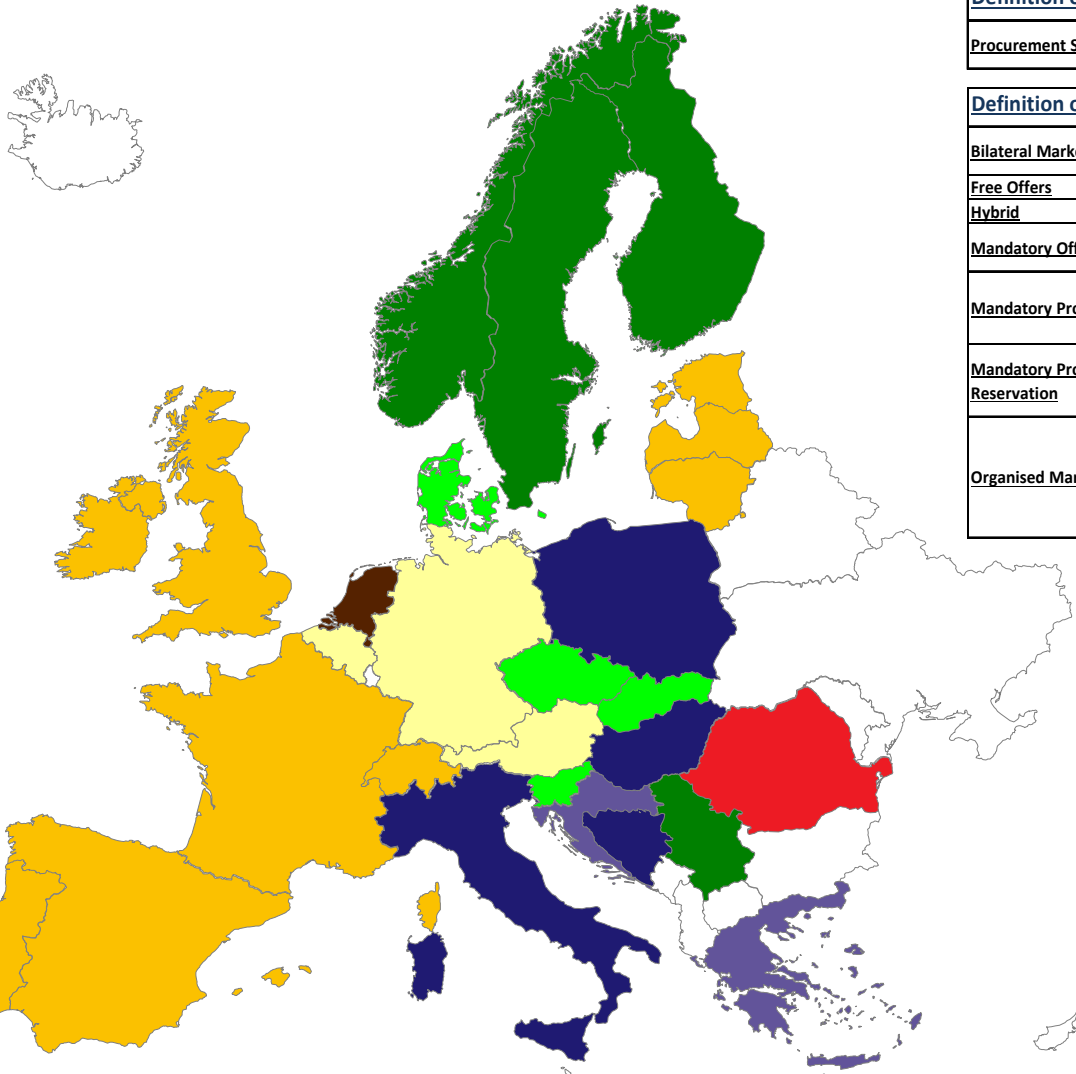
Definition of answer

Secondary Market for reserve obligation

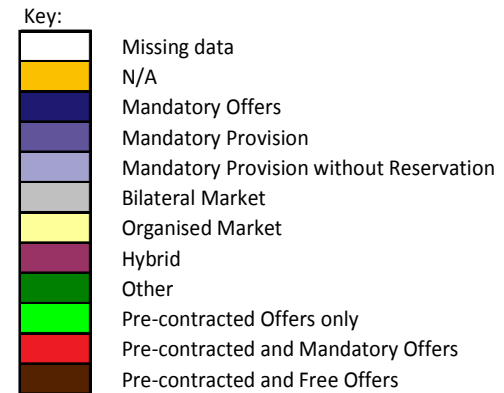
Trading procedure between the BSPs (where at least one BSP has contract with the TSO) to ensure the prescribed reserve amount of the TSO.



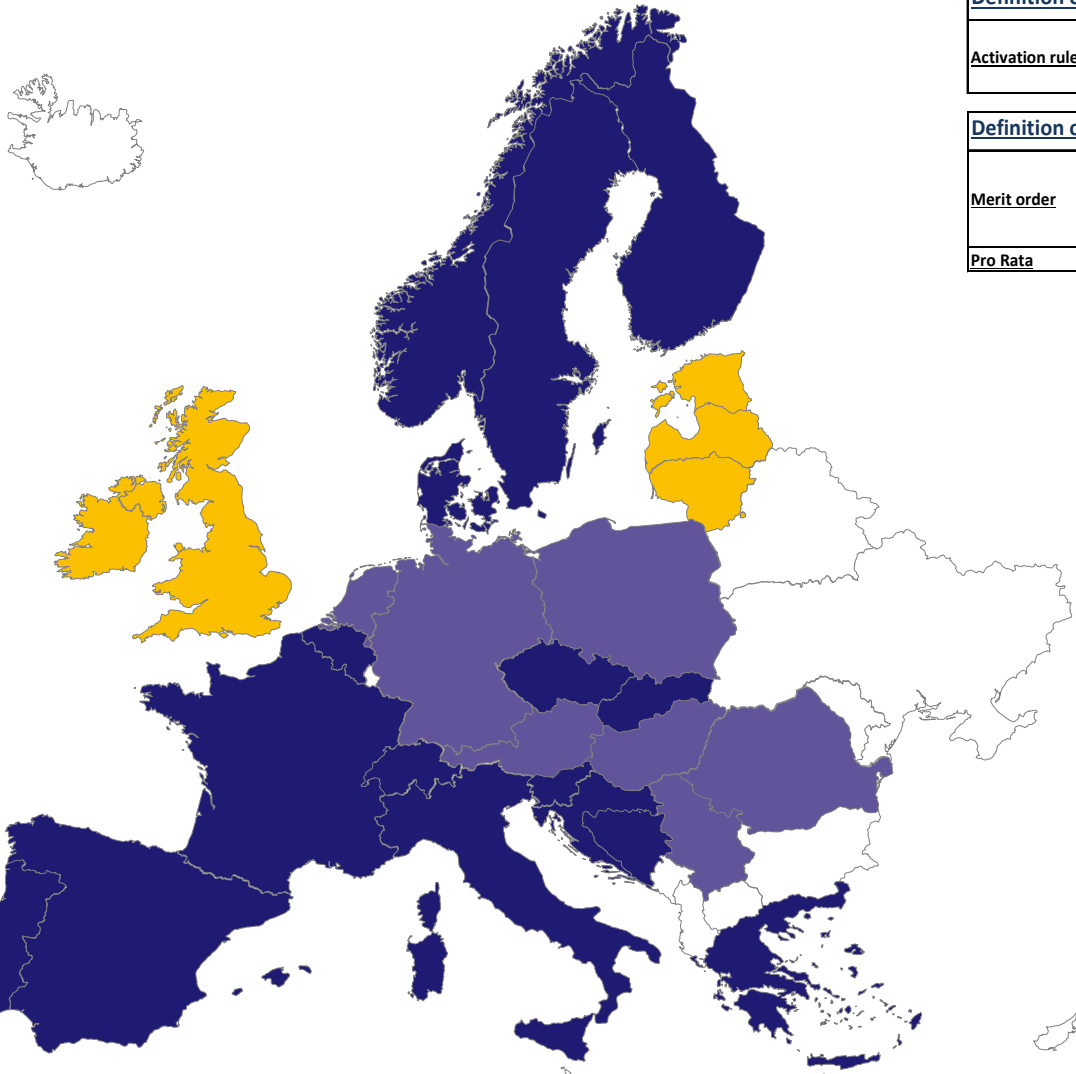
Frequency Restoration Reserve (Automatic) - Energy - Procurement Scheme



Definition of question	
Procurement Scheme	Background of the offer, which is closest to the real operation time.
Definition of answer	
Bilateral Market	A grid user and TSO negotiate a contract regarding the offered service and price/price system.
Free Offers	Non-regulated offers.
Hybrid	Combination.
Mandatory Offers	Generators connected to the grid are obligated to offer the remaining capacity/available capacity.
Mandatory Provision	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.
Mandatory Provision without Reservation	It is mandatory for dispatchable units to be able to provide frequency containment reserve, but these units are not required to reserve capacity to provide this service.
Organised Market	There is no contract or obligation for a grid user to offer the reserve (before the offer). The grid user can voluntarily participate in the market (e.g. tender, auction, market platform (like PX)) and bid a price or customize his offer (e.g. the volume, timeframe). The market result may lead to a bilateral contract.



Frequency Restoration Reserve (Automatic) - Energy - Activation Rule



<u>Definition of question</u>	
<u>Activation rule</u>	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).

<u>Definition of answer</u>	
<u>Merit order</u>	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.
<u>Pro Rata</u>	In Proportion (Parallel Activation).

Key:

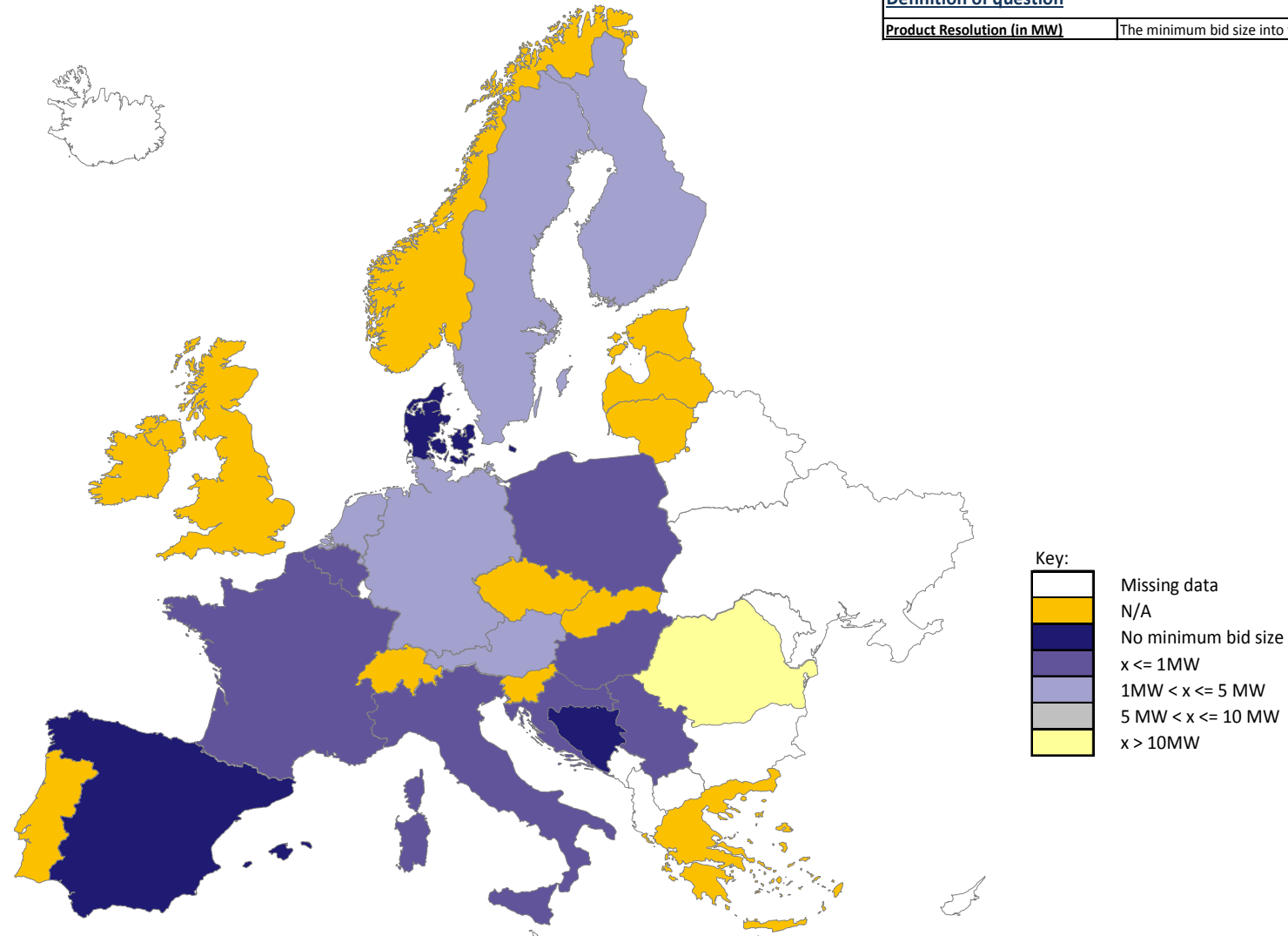
	Missing data
	N/A
	Pro Rata (Parallel Activation)
	Merit order

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

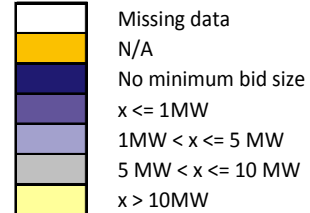
Definition of question

Product Resolution (in MW)

The minimum bid size into the balancing market.



Key:

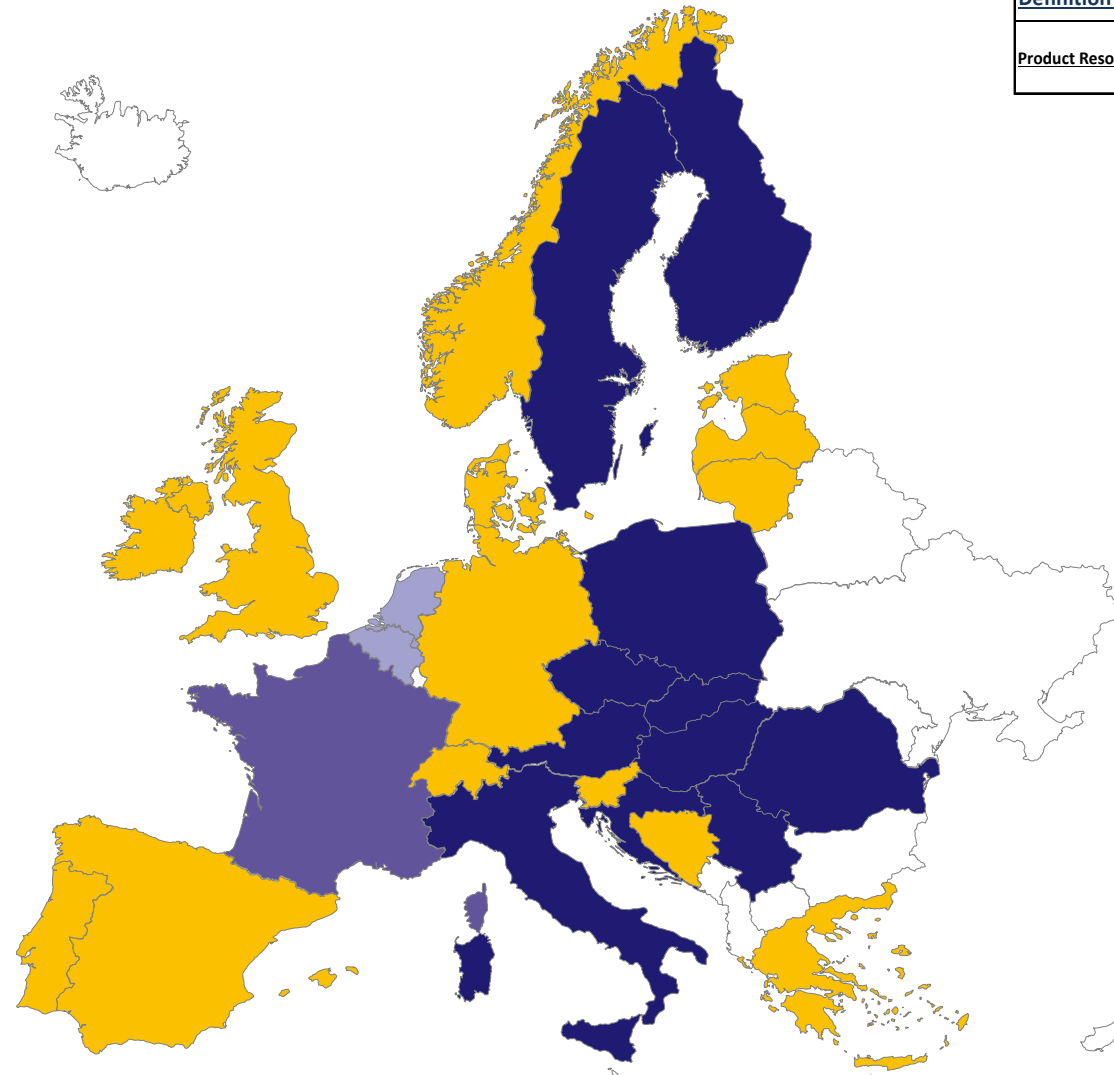


Frequency Restoration Reserve (Automatic) - Energy - Product Resolution (in time)

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).



Key:



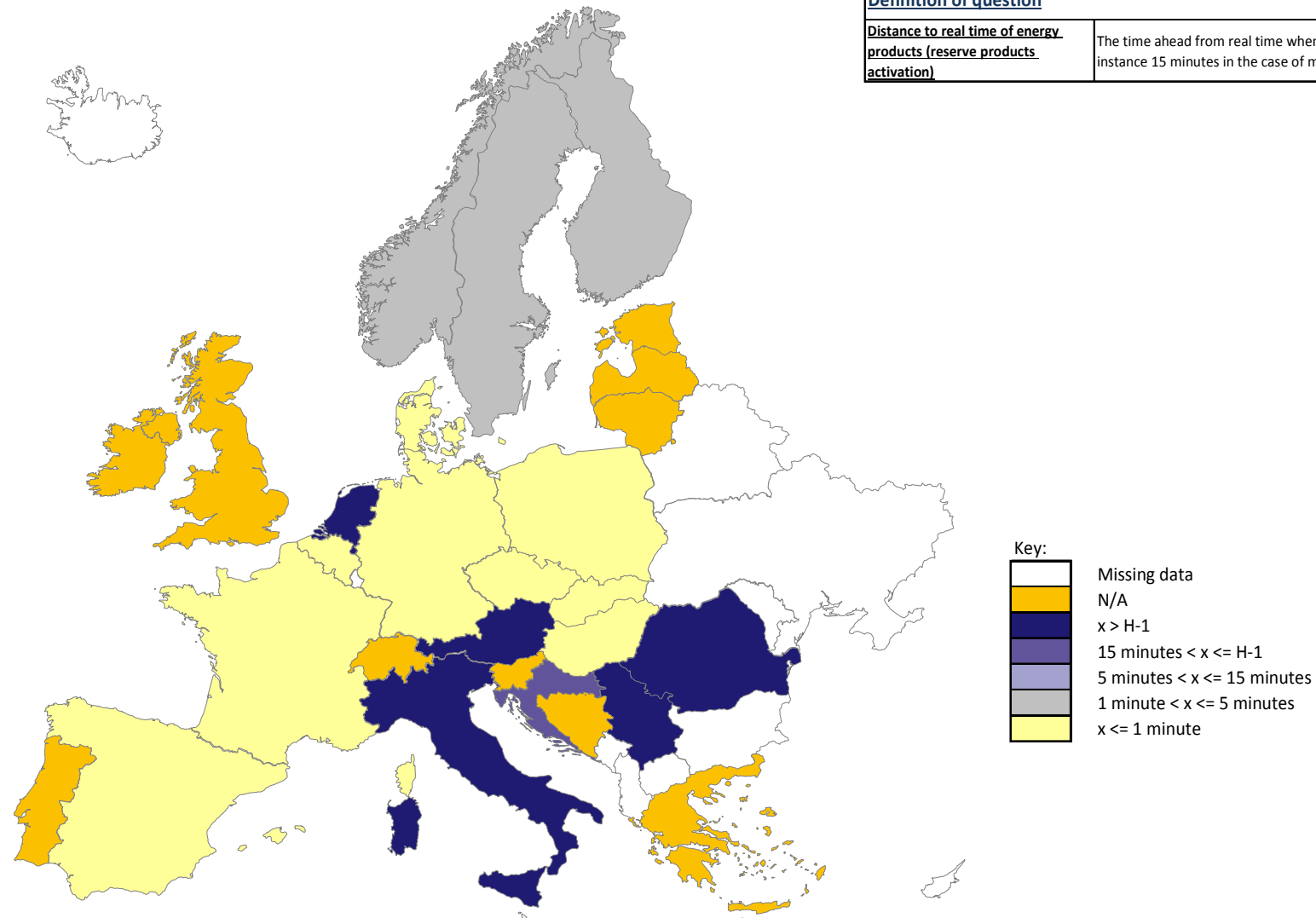
Missing data
N/A
Hour (or blocks)
30 minutes
15 minutes

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

Definition of question

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

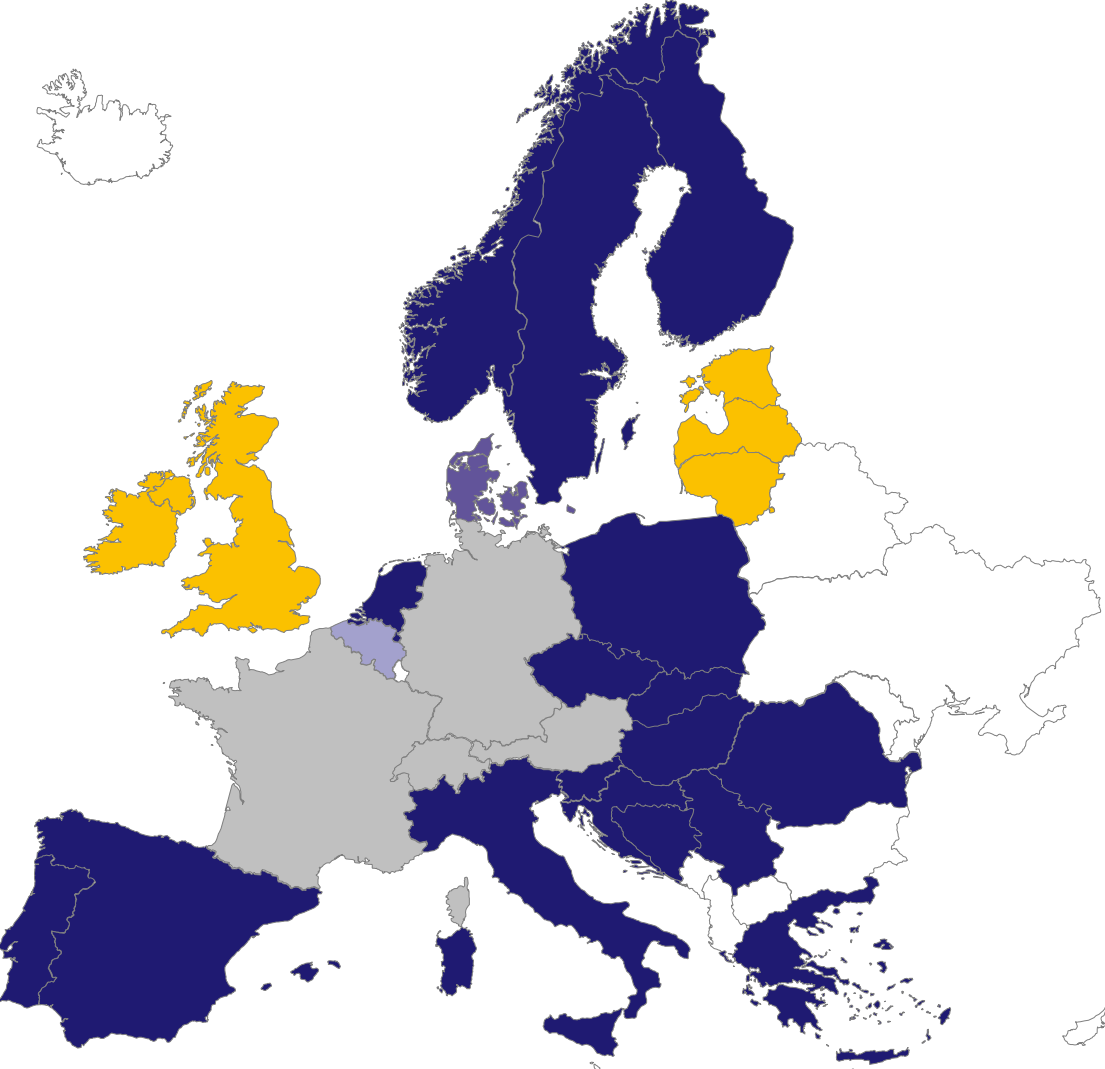
The time ahead from real time when TSO activates a given product (for instance 15 minutes in the case of mFRR/tertiary energy).



Key:

Missing data
N/A
$x > H-1$
$15 \text{ minutes} < x \leq H-1$
$5 \text{ minutes} < x \leq 15 \text{ minutes}$
$1 \text{ minute} < x \leq 5 \text{ minutes}$
$x \leq 1 \text{ minute}$

Frequency Restoration Reserve (Automatic) - Energy - Provider



Key:

White	Missing data
Yellow	N/A
Dark Blue	Generators Only
Purple	Generators + Load
Light Blue	Generators + Pump Storage units pumping
Grey	Generators + Load + Pump Storage units pumping

Frequency Restoration Reserve (Automatic) - Energy - Settlement Rule

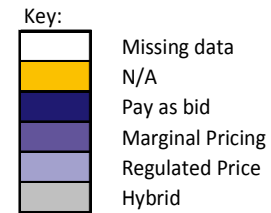
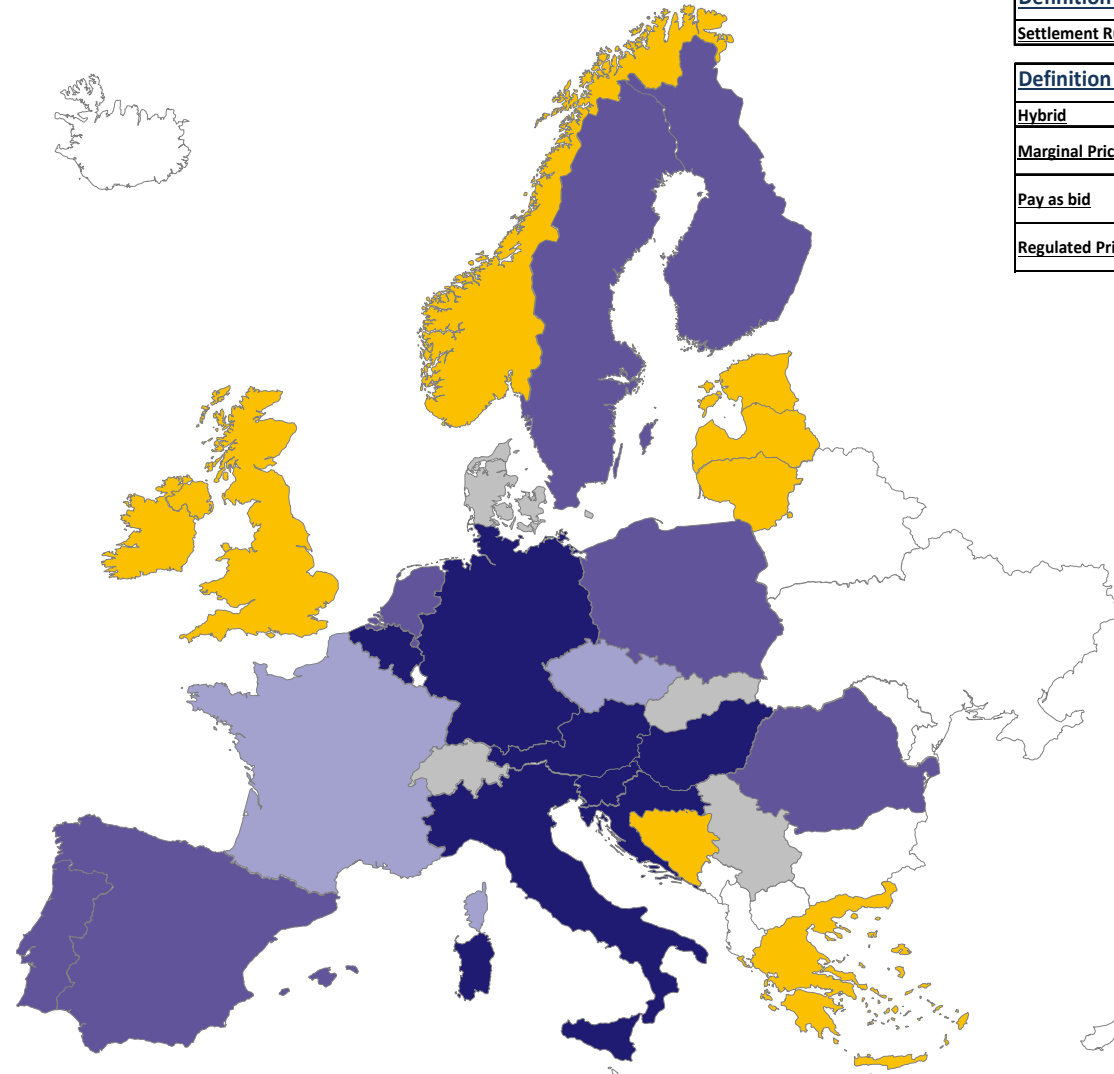


Definition of question

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

Definition of answer

Hybrid	Combination.
Marginal Pricing	Marginal pricing is the change in total cost that arises when the quantity produced changes by one unit.
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

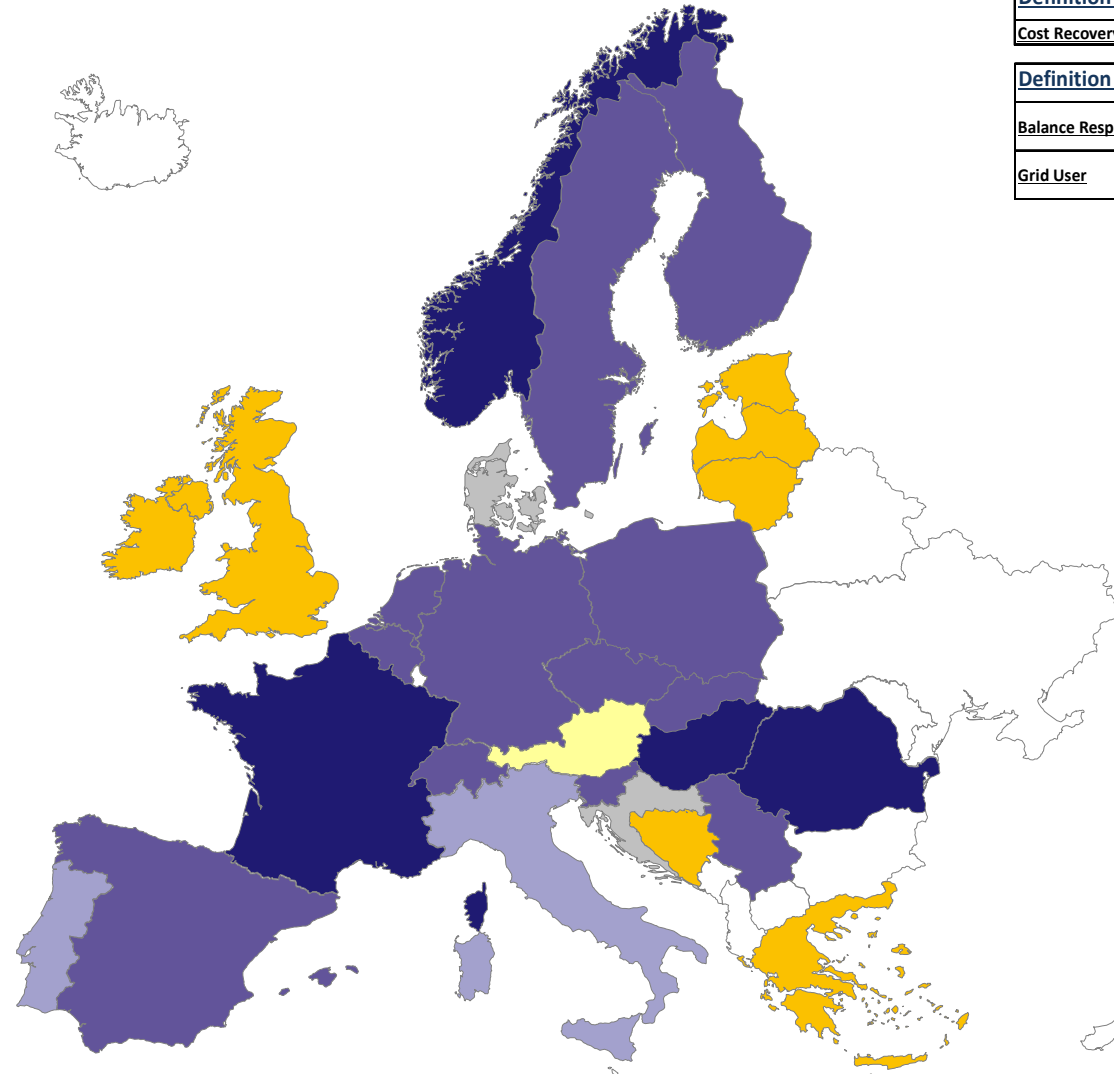


Definition of question

Cost Recovery Scheme	From whom are the costs recovered.
-----------------------------	------------------------------------

Definition of answer

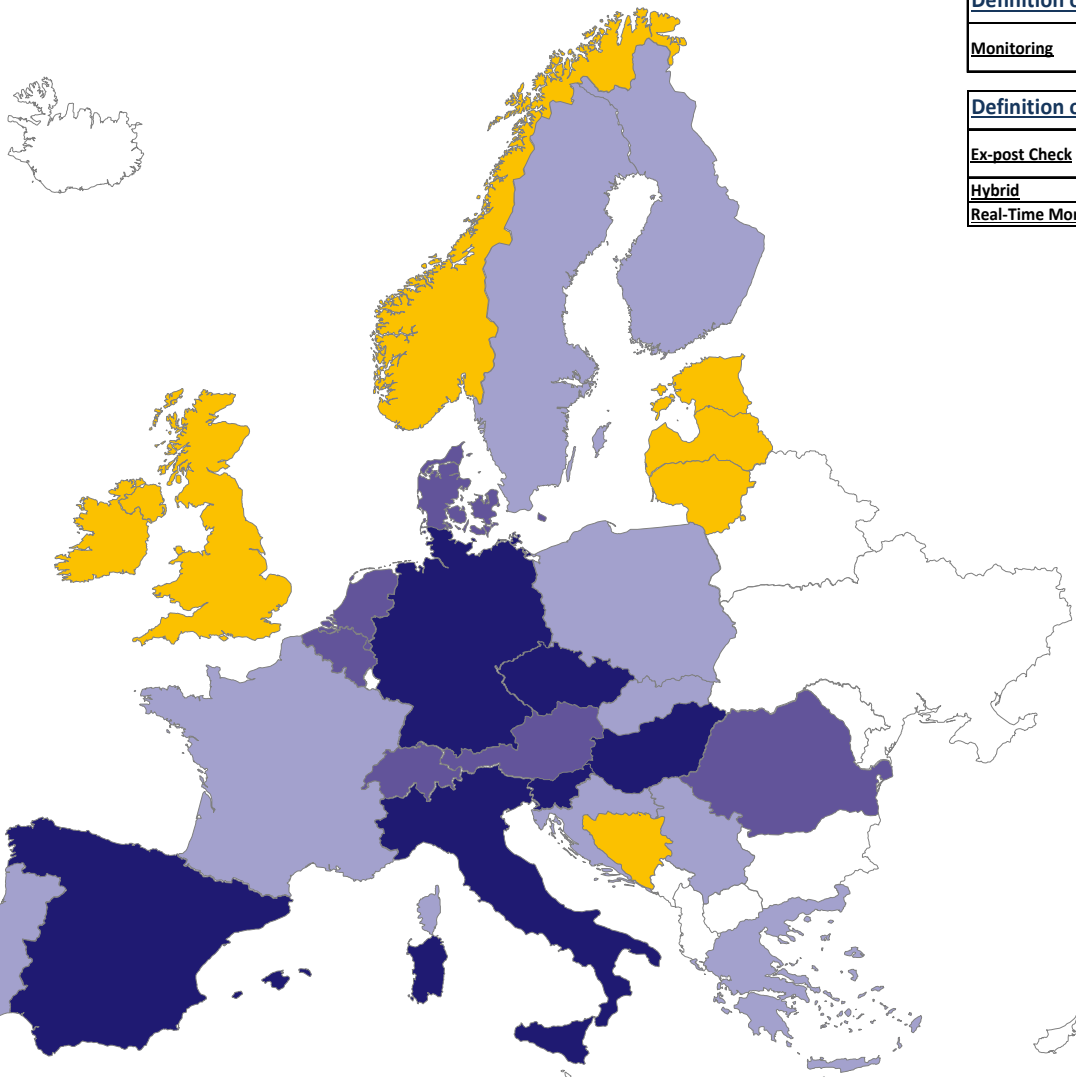
Balance Responsible Party (BRP)	Balancing Responsible Party means a market participant or its chosen representative responsible for its Imbalances.
Grid User	The natural or legal person supplying to, or being supplied with active and/or reactive power by a TSO or DSO.



Key:

	Missing data
	N/A
	100% Grid Users
	100% BRP
	100% end consumers
	Mix of Grid Users and BRP
	Mix of generators and BRPs

Frequency Restoration Reserve (Automatic) - Energy - Monitoring



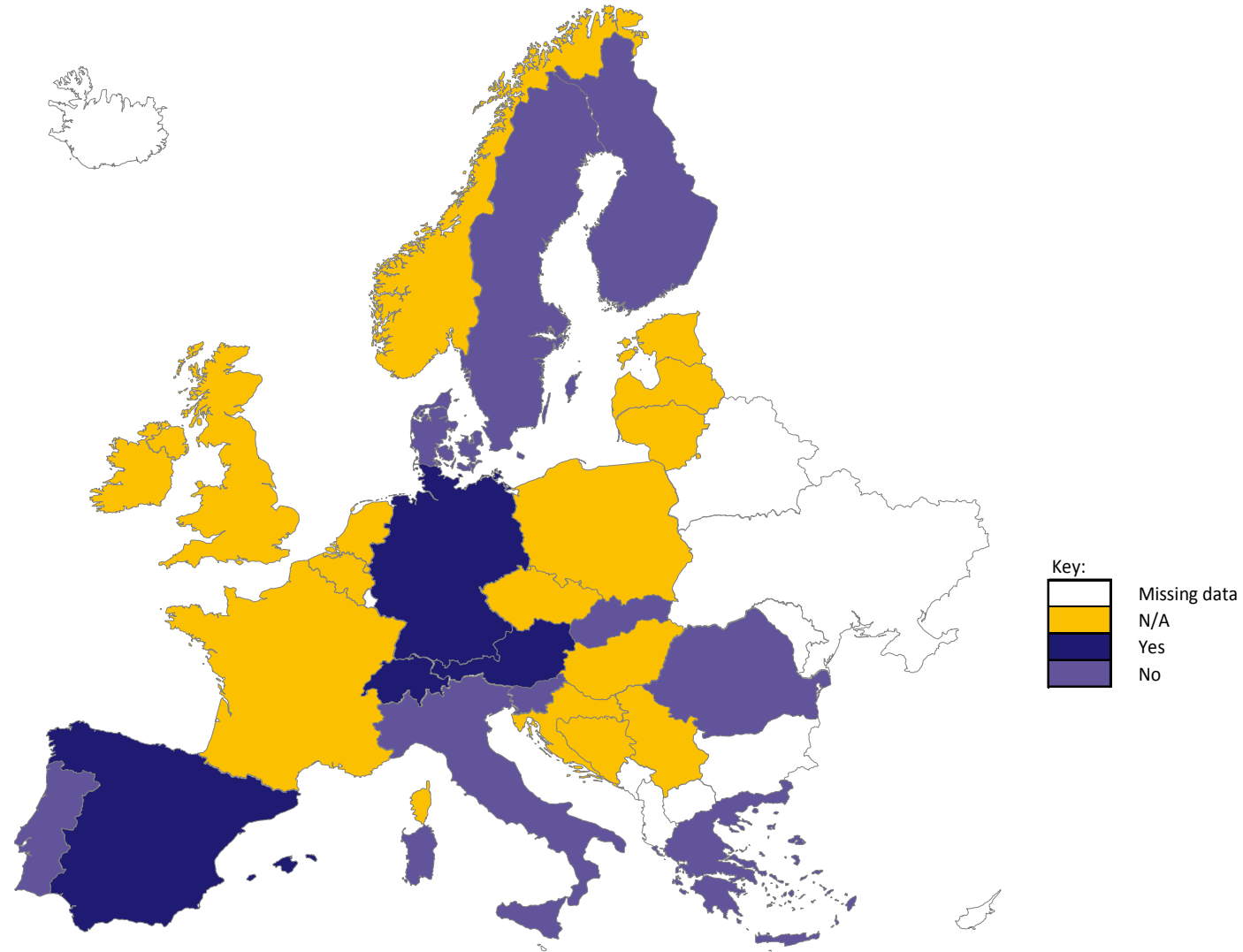
Definition of question	
Monitoring	Refers to the type of monitoring in place by the system operator to ensure performance of plant.

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

Key:

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

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

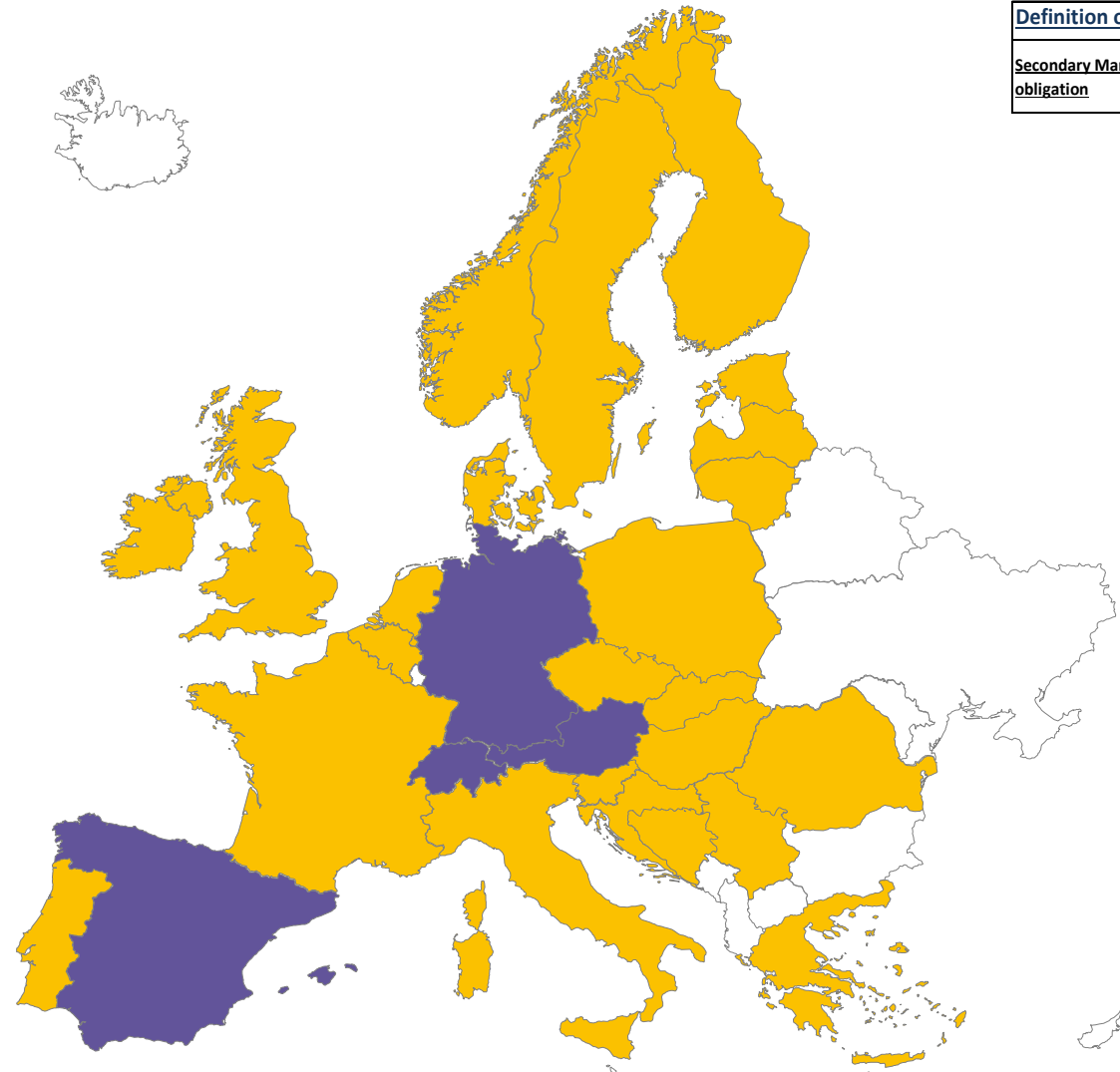


Frequency Restoration Reserve (Automatic) - Energy - Obl. allowed, organised secondary market exists

Definition of answer

Secondary Market for reserve obligation

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



Key:



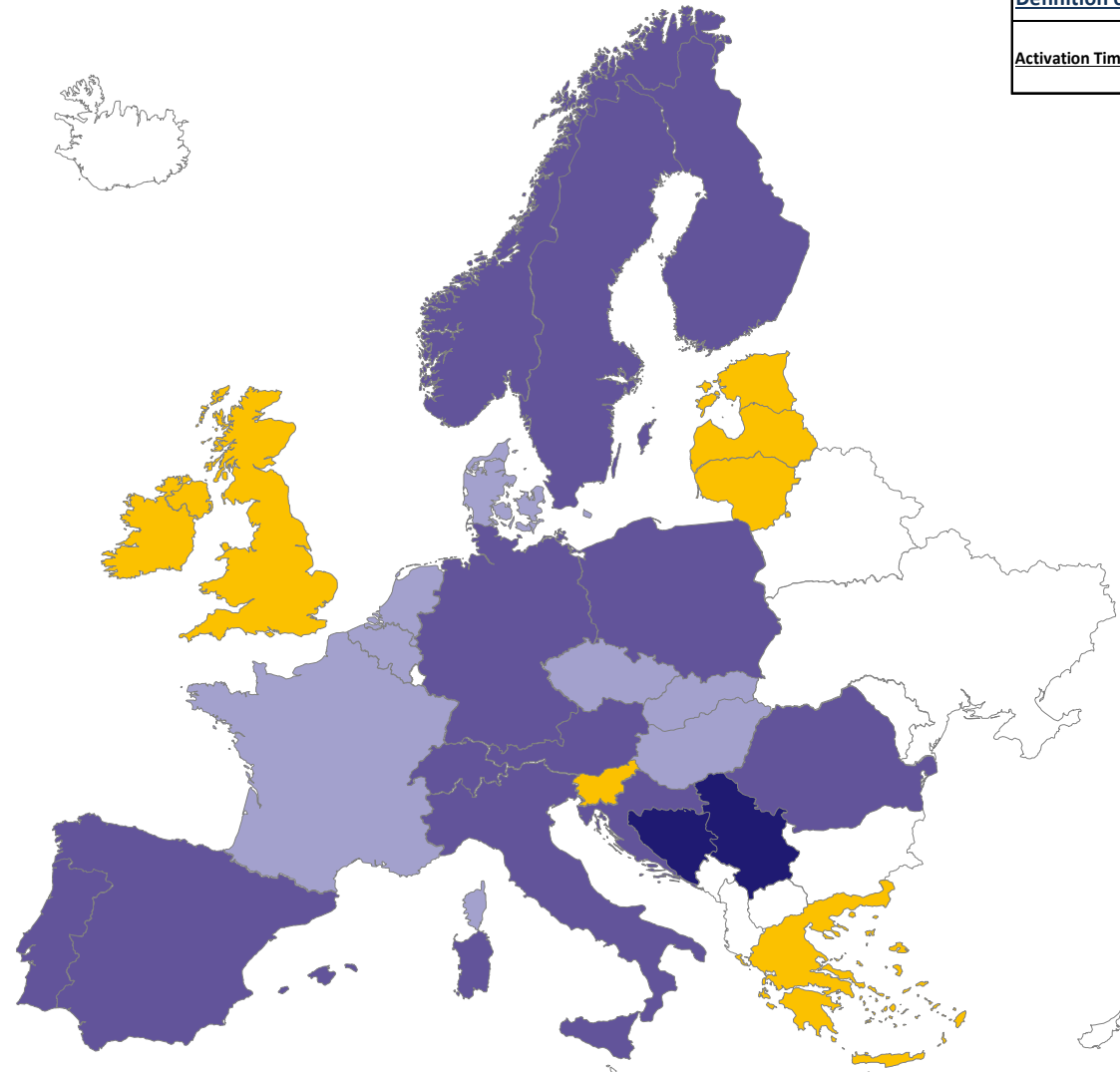
Missing data
N/A
Yes
No

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

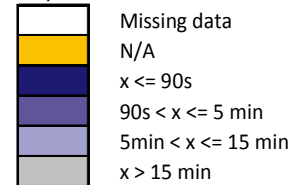
Definition of question

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:

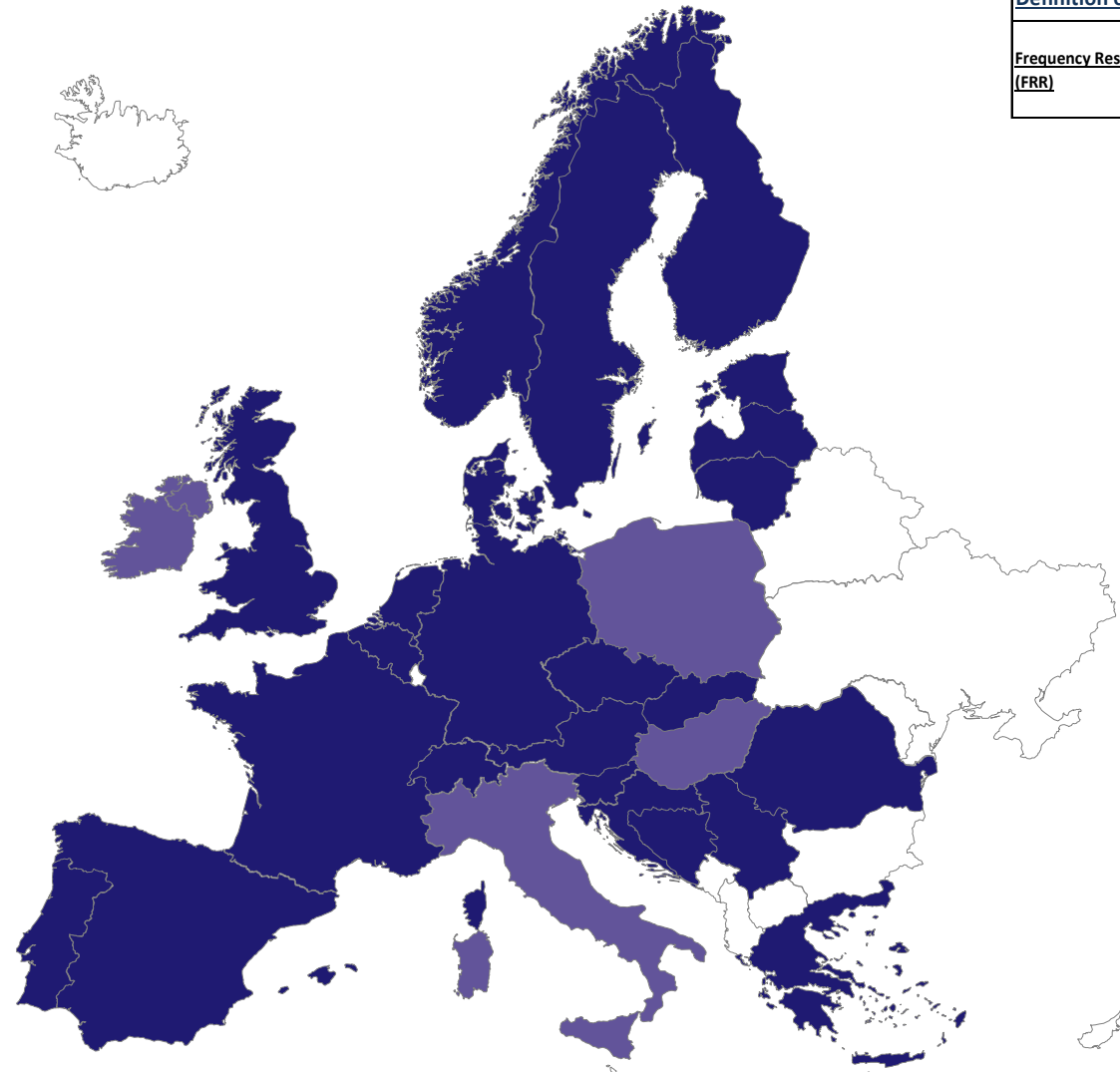


Using Frequency Restoration Reserve (Manual)

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.
FRRa means automatic FRR, FRRm means manual FRR.

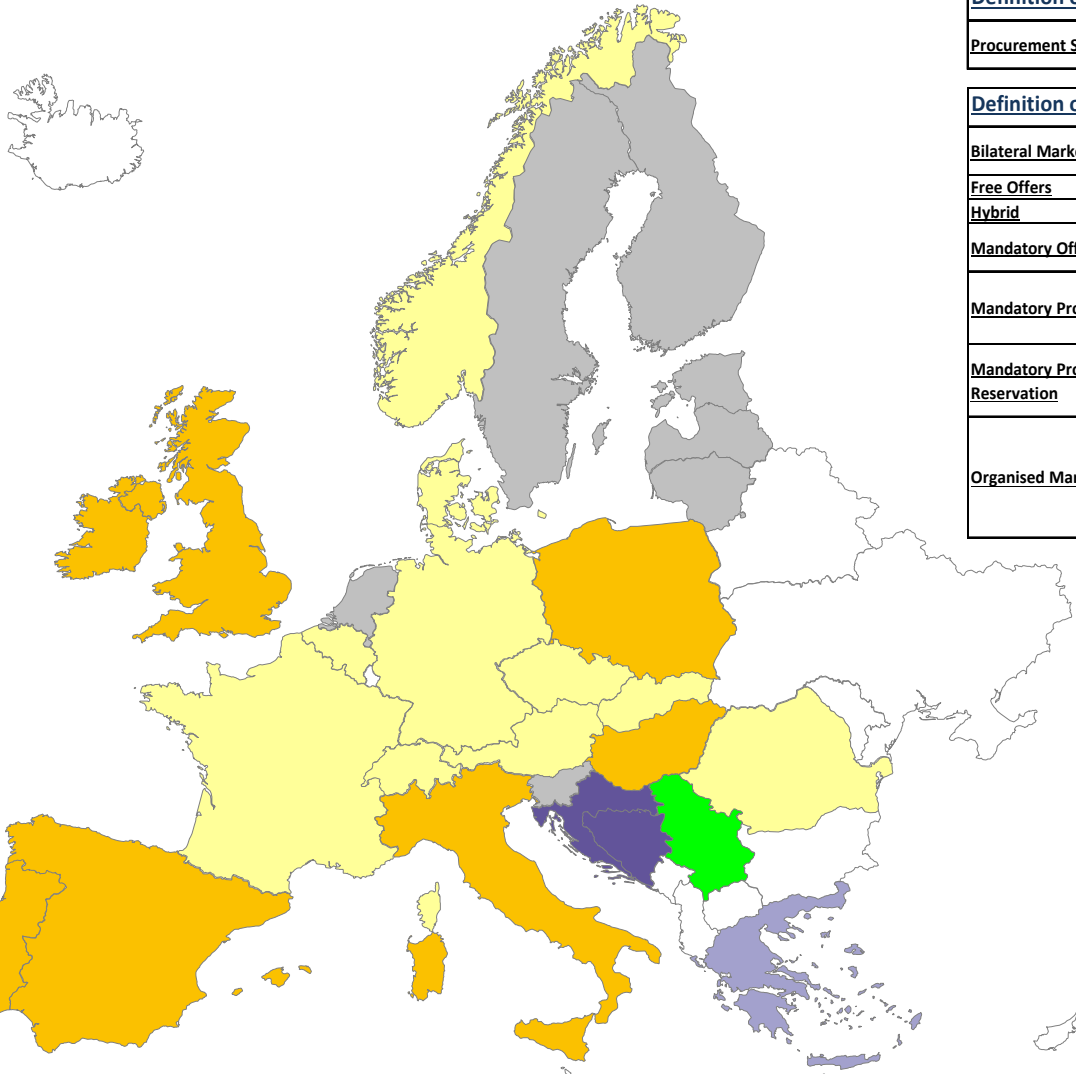


Key:



Missing data
N/A
Yes
No

Frequency Restoration Reserve (Manual) - Capacity - Procurement Scheme



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

<u>Definition of answer</u>	
Bilateral Market	A grid user and TSO negotiate a contract regarding the offered service and price/price system.
Free Offers	Non-regulated offers.
Hybrid	Combination.
Mandatory Offers	Generators connected to the grid are obligated to offer the remaining capacity/available capacity.
Mandatory Provision	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.
Mandatory Provision without Reservation	It is mandatory for dispatchable units to be able to provide frequency containment reserve, but these units are not required to reserve capacity to provide this service.
Organised Market	There is no contract or obligation for a grid user to offer the reserve (before the offer). The grid user can voluntarily participate in the market (e.g. tender, auction, market platform (like PX)) and bid a price or customize his offer (e.g. the volume, timeframe). The market result may lead to a bilateral contract.

Key:

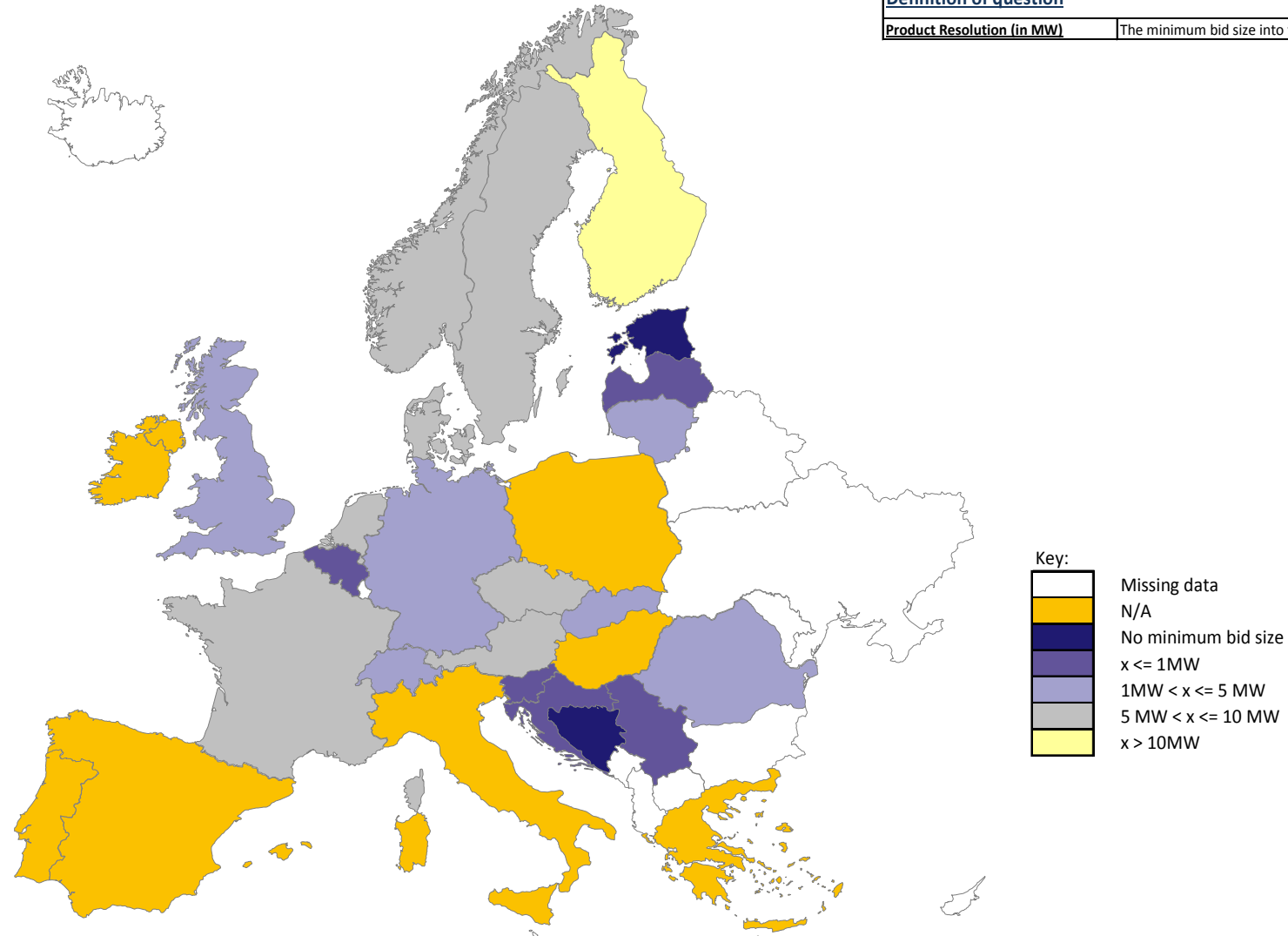
	Missing data
	N/A
	Mandatory Offers
	Mandatory Provision
	Mandatory Provision without Reservation
	Bilateral Market
	Organised Market
	Hybrid
	Other
	Pre-contracted Offers only
	Pre-contracted and Mandatory Offers
	Pre-contracted and Free Offers

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

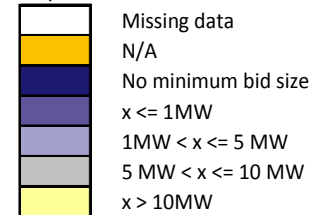
Definition of question

Product Resolution (in MW)

The minimum bid size into the balancing market.



Key:

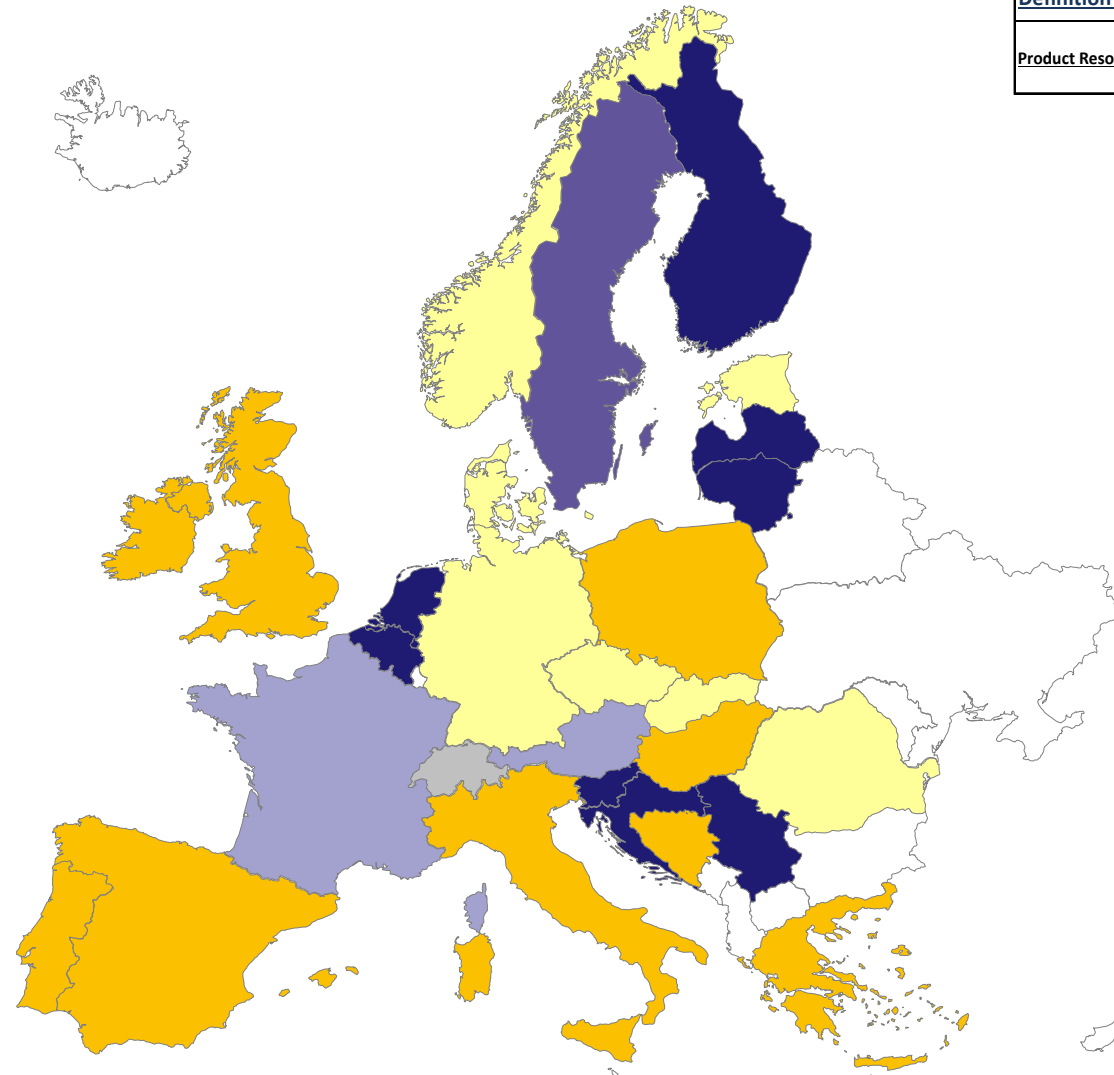


Frequency Restoration Reserve (Manual) - Capacity - Product Resolution (in time)

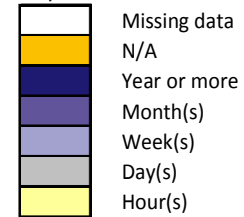
Definition of question

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).



Key:

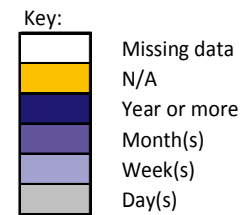
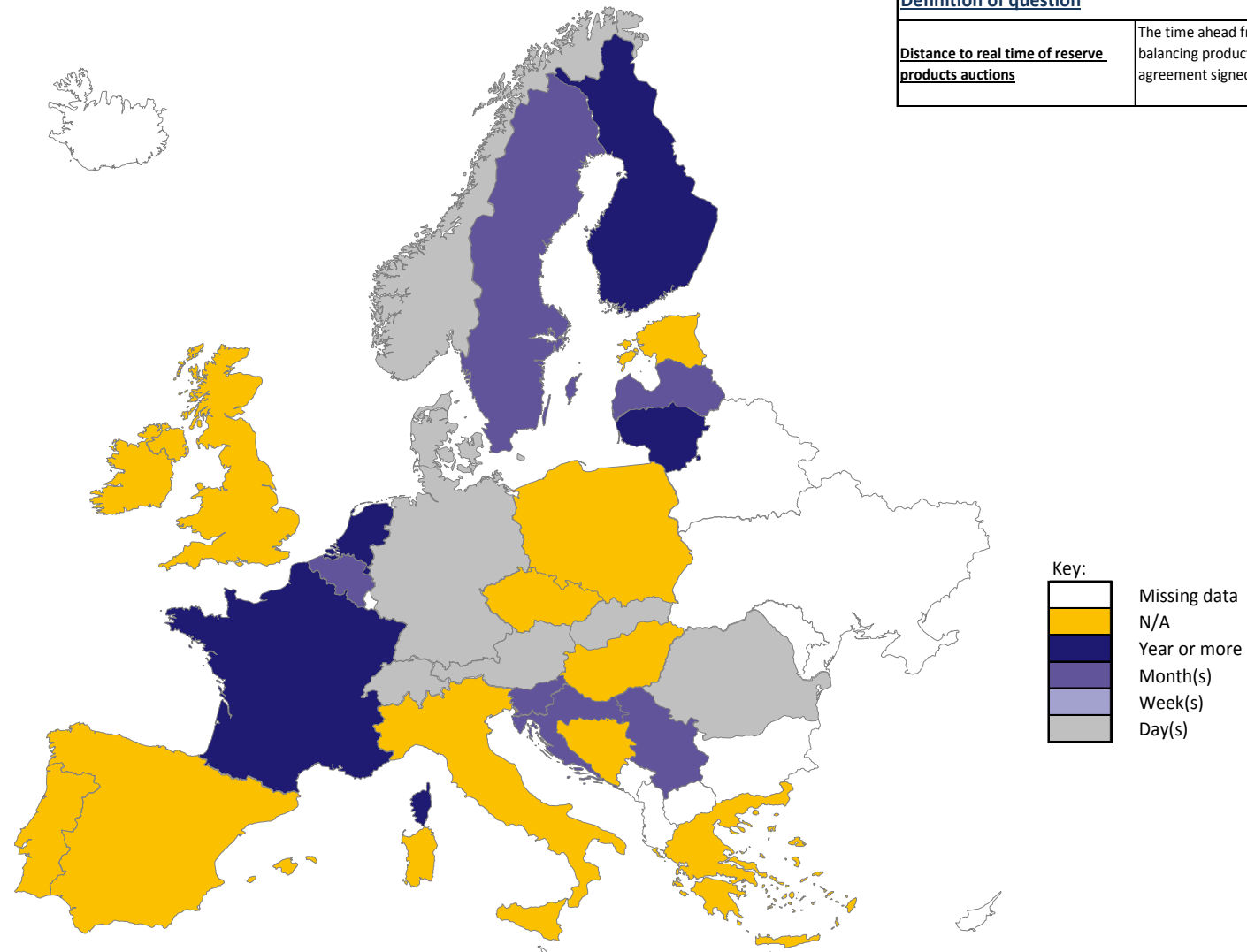


Frequency Restoration Reserve (Manual) - Capacity - Distance to real time of reserve products auctions

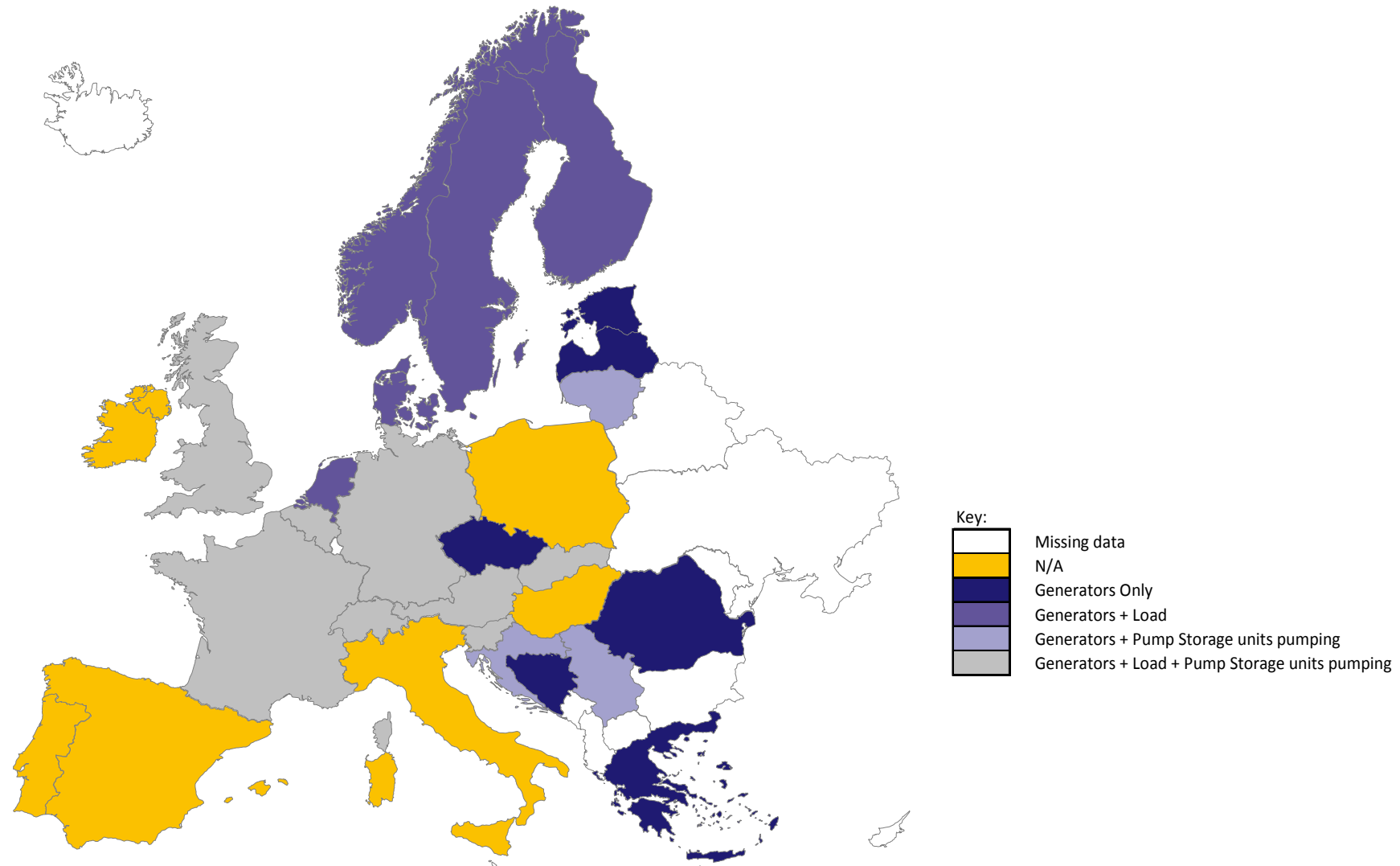
Definition of question

Distance to real time of reserve products auctions

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



Frequency Restoration Reserve (Manual) - Capacity - Provider

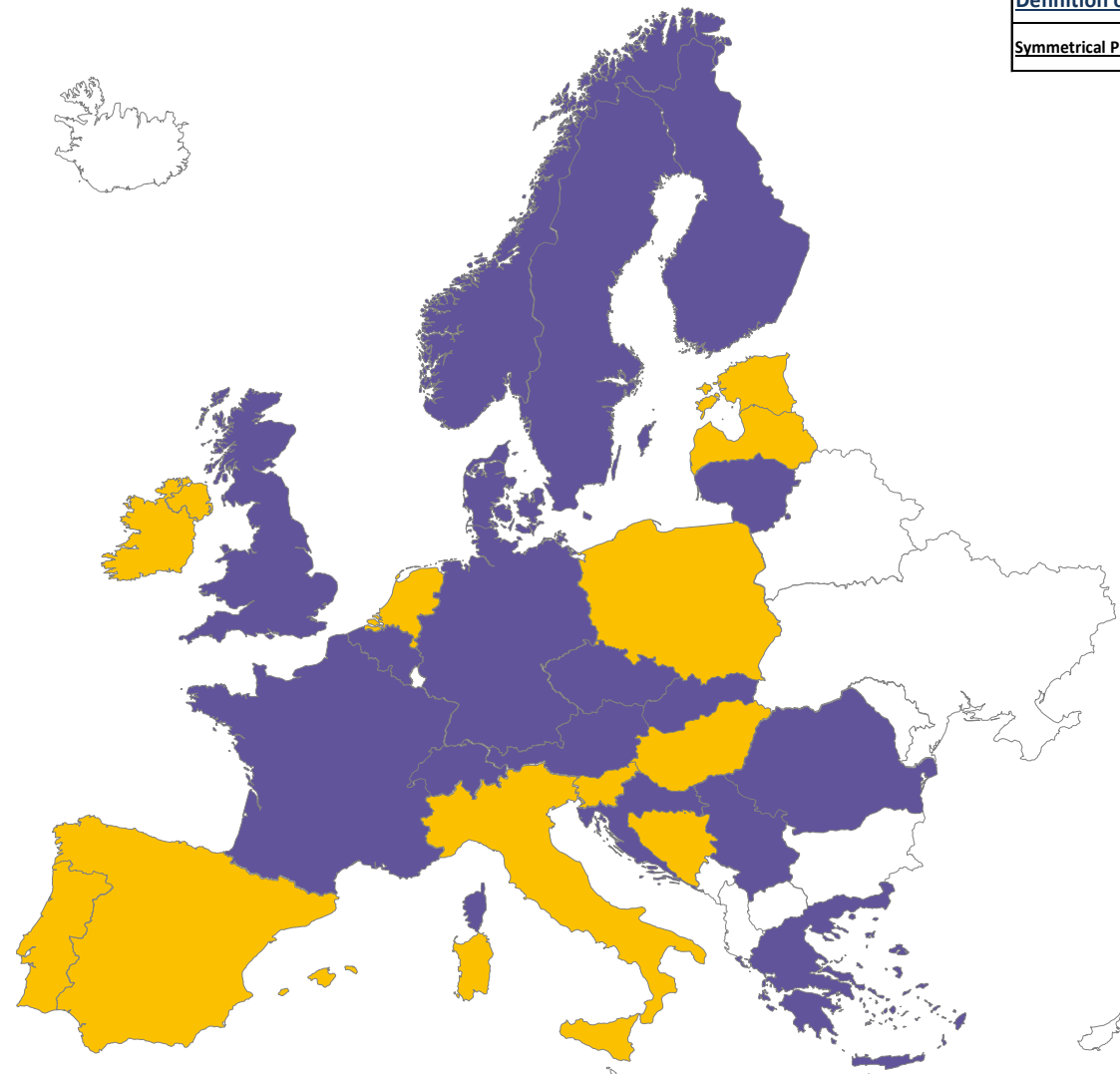


Frequency Restoration Reserve (Manual) - Capacity - Symmetrical Product

Definition of question

Symmetrical Product

Upward regulation volume and for downward regulation volume has be equal.



Key:



Missing data

N/A

Has to be symmetrical

Don't need to be symmetrical

Frequency Restoration Reserve (Manual) - Capacity - Settlement Rule

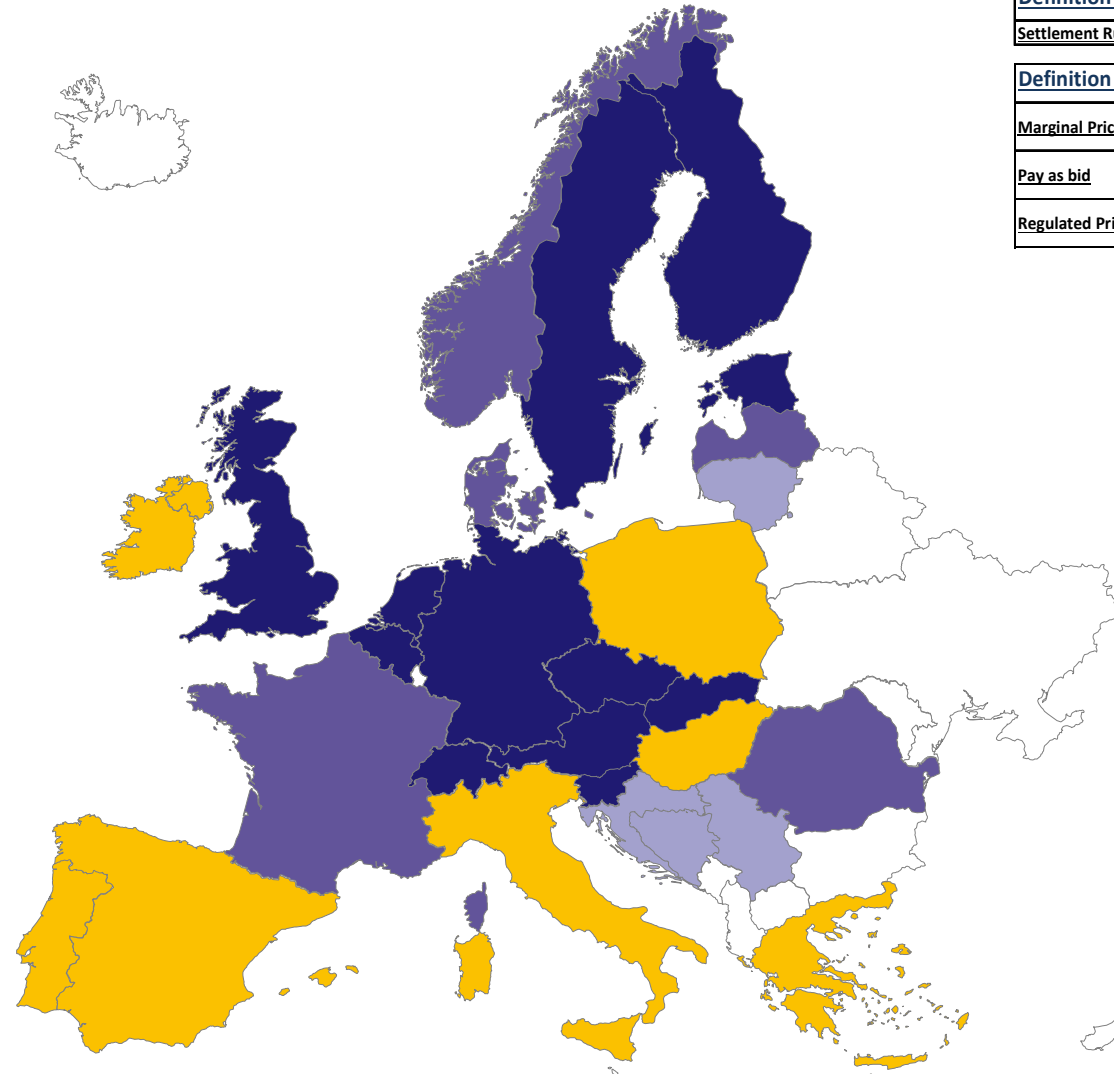


Definition of question

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

Definition of answer

Marginal Pricing	Marginal pricing is the change in total cost that arises when the quantity produced changes by one unit.
Pay as bid	Contracted parties who provide a service are paid based on their offer price.
Regulated Price	Price for this service is based on a price that is set by the relevant regulatory authority.



Key:

White	Missing data
Yellow	N/A
Dark Blue	Pay as bid
Medium Blue	Marginal Pricing
Light Blue	Regulated Price

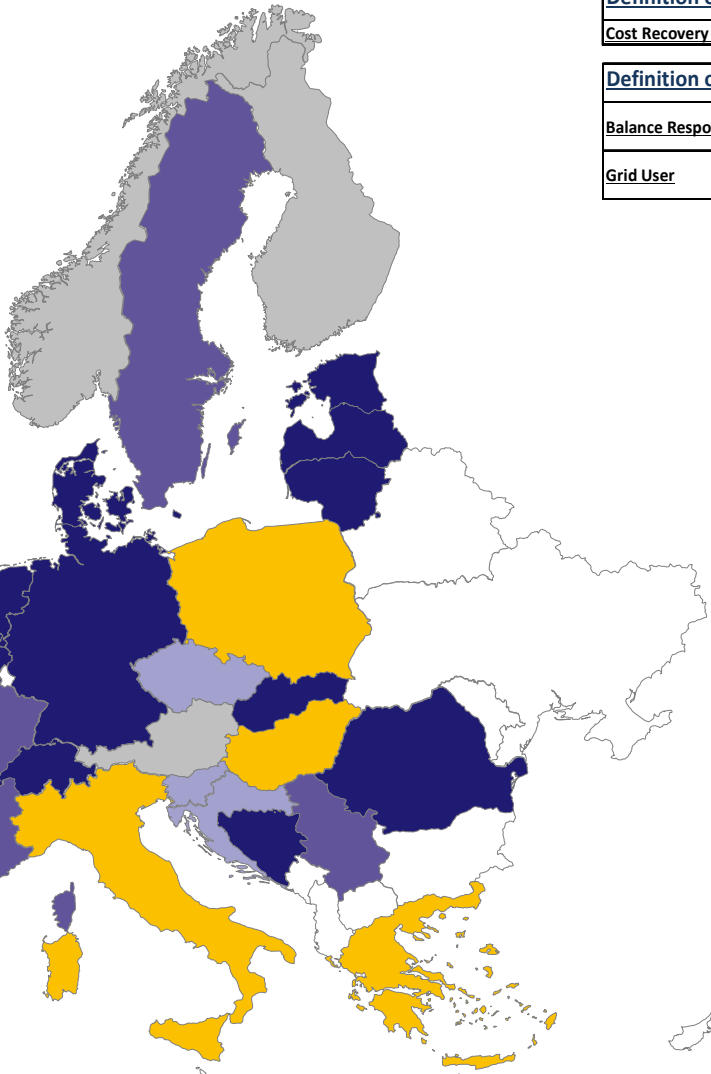
Frequency Restoration Reserve (Manual) - Capacity - Cost Recovery Scheme

Definition of question

Cost Recovery Scheme	From whom are the costs recovered.
-----------------------------	------------------------------------

Definition of answer

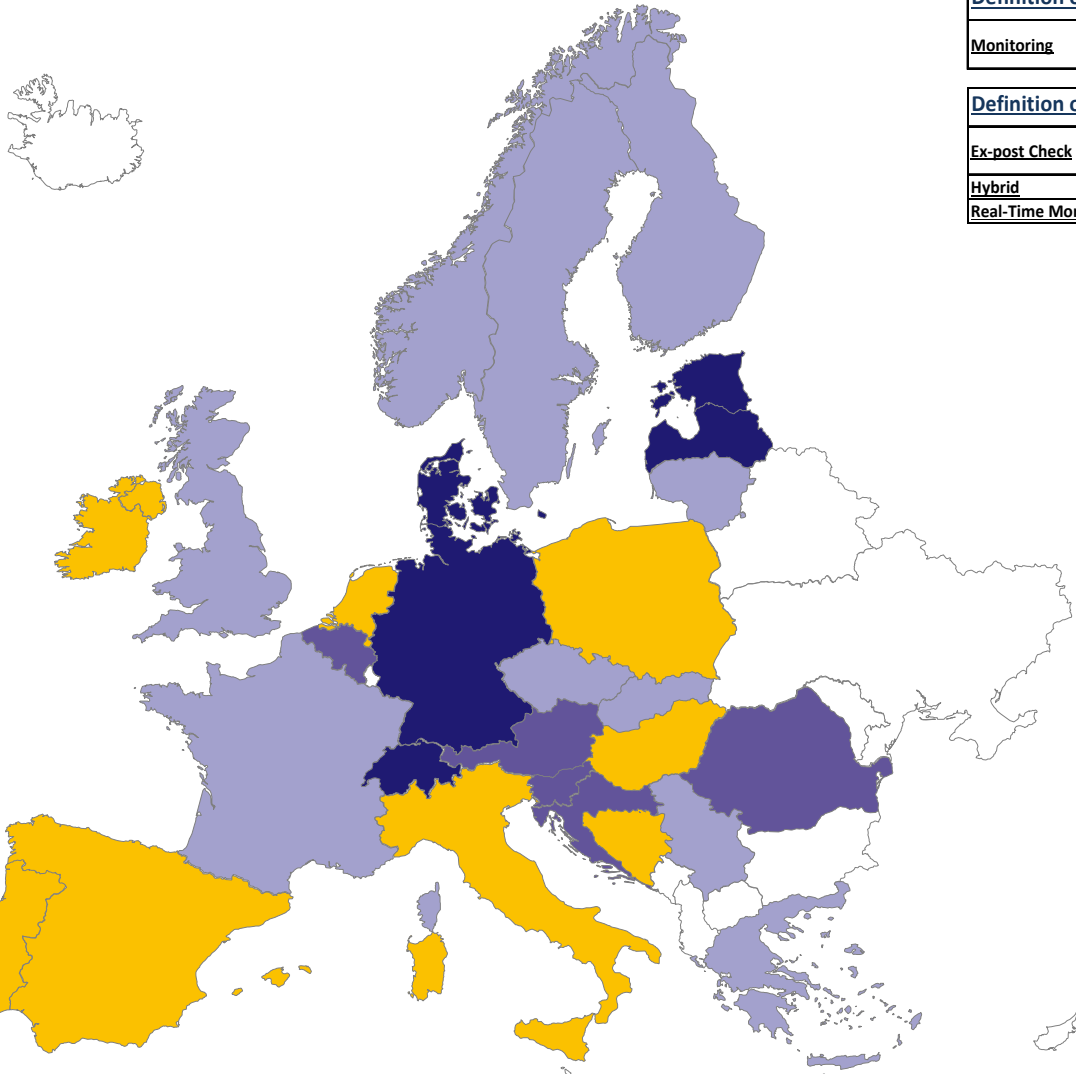
Balance Responsible Party (BRP)	Balancing Responsible Party means a market participant or its chosen representative responsible for its Imbalances.
Grid User	The natural or legal person supplying to, or being supplied with active and/or reactive power by a TSO or DSO.



Key:

White	Missing data
Yellow	N/A
Dark Blue	100% Grid Users
Medium Blue	100% BRP
Light Blue	100% end consumers
Grey	Mix of Grid Users and BRP

Frequency Restoration Reserve (Manual) - Capacity - Monitoring



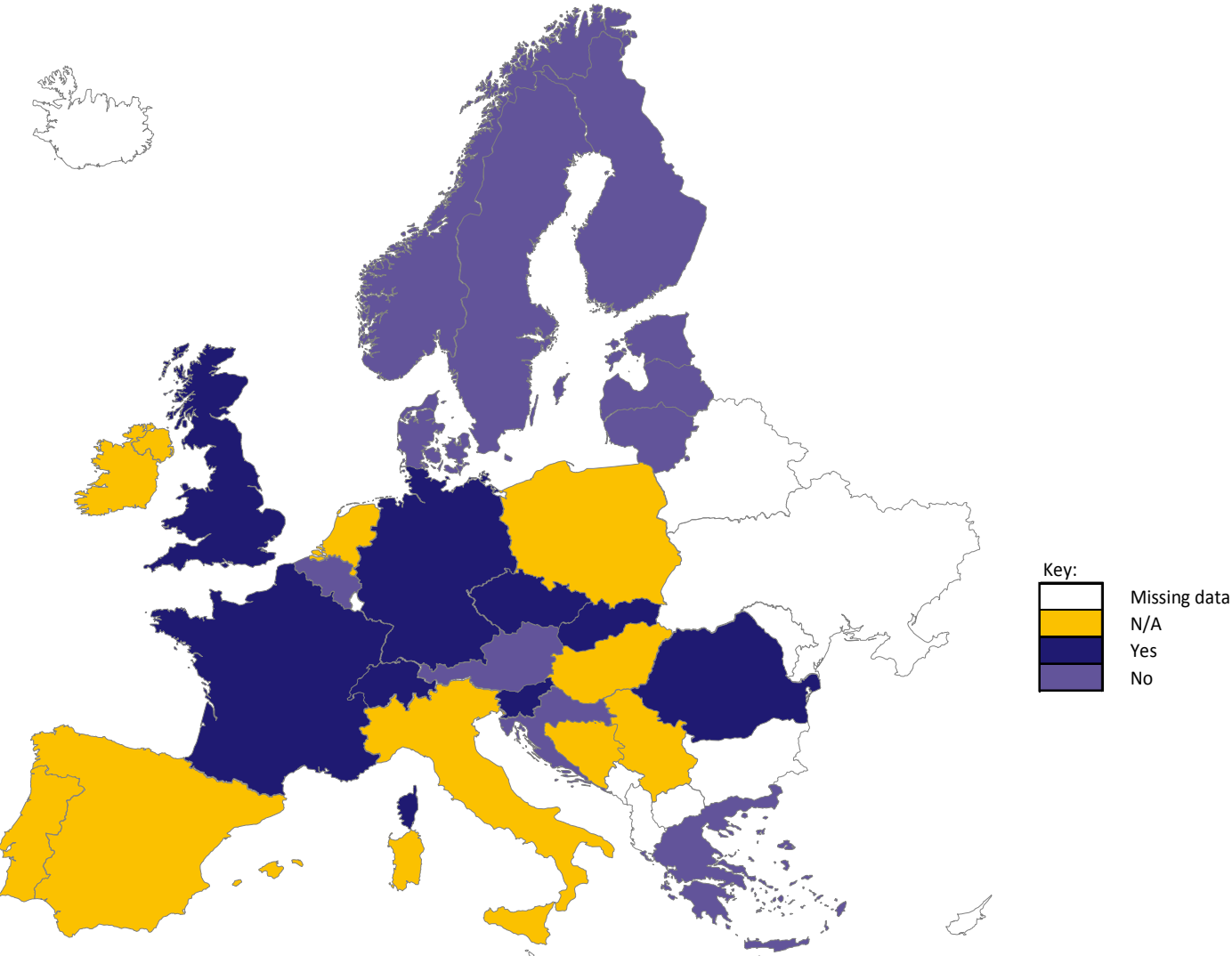
Definition of question	
Monitoring	Refers to the type of monitoring in place by the system operator to ensure performance of plant.

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

Key:

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

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

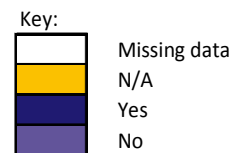
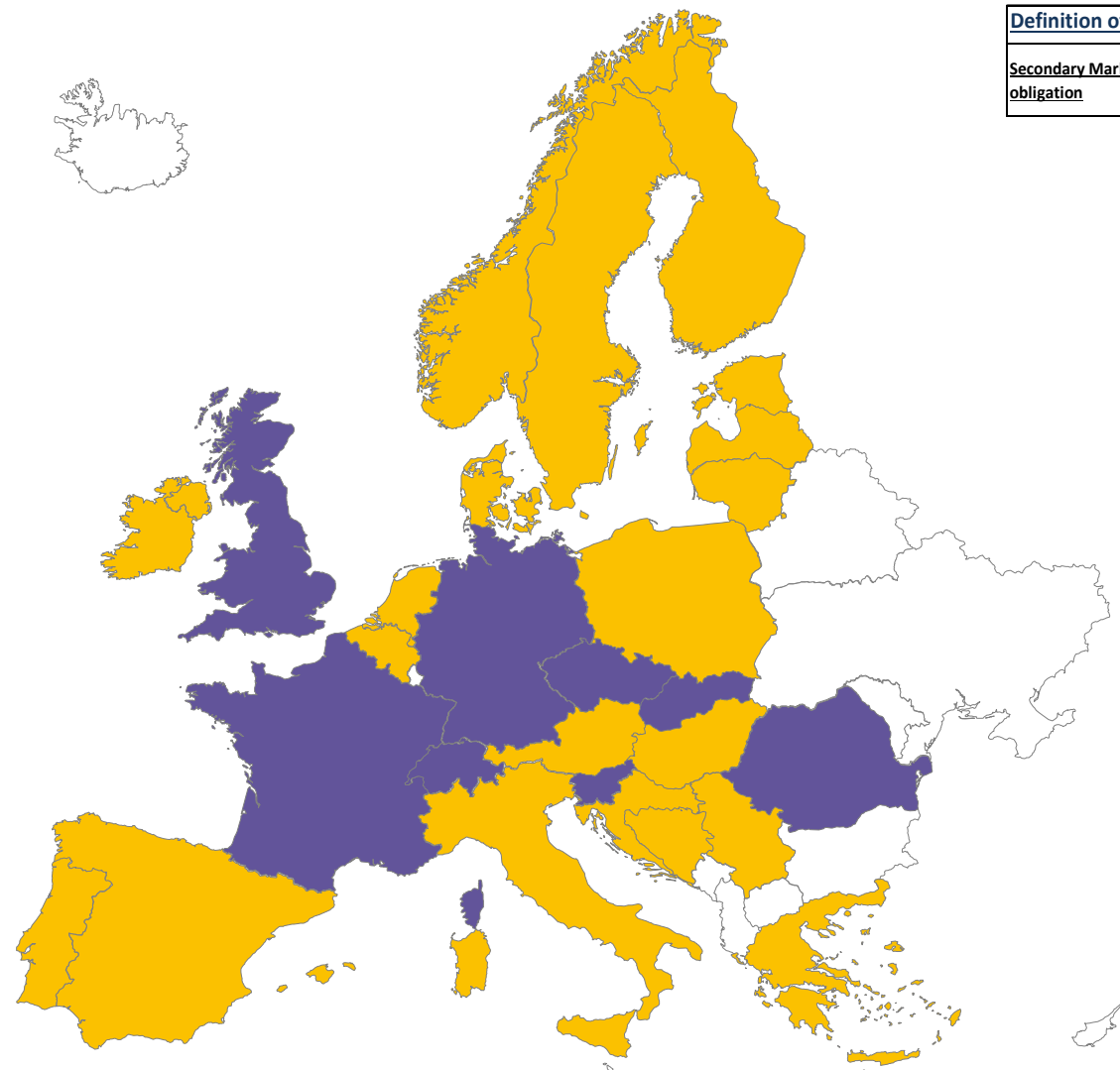


Key:

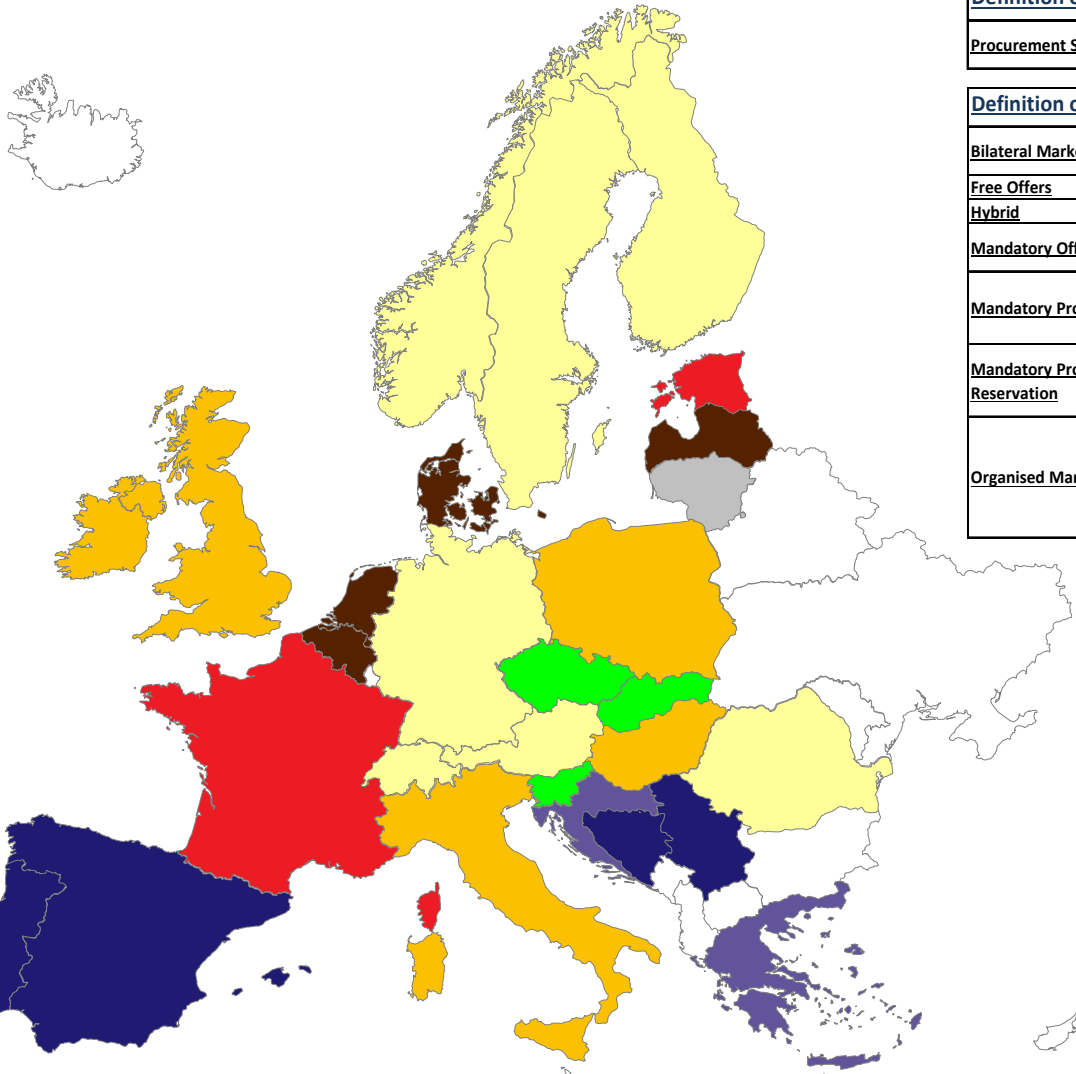
- Missing data
- N/A
- Yes
- No

Frequency Restoration Reserve (Manual) - Capacity - Obl. allowed, organised secondary market exists

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

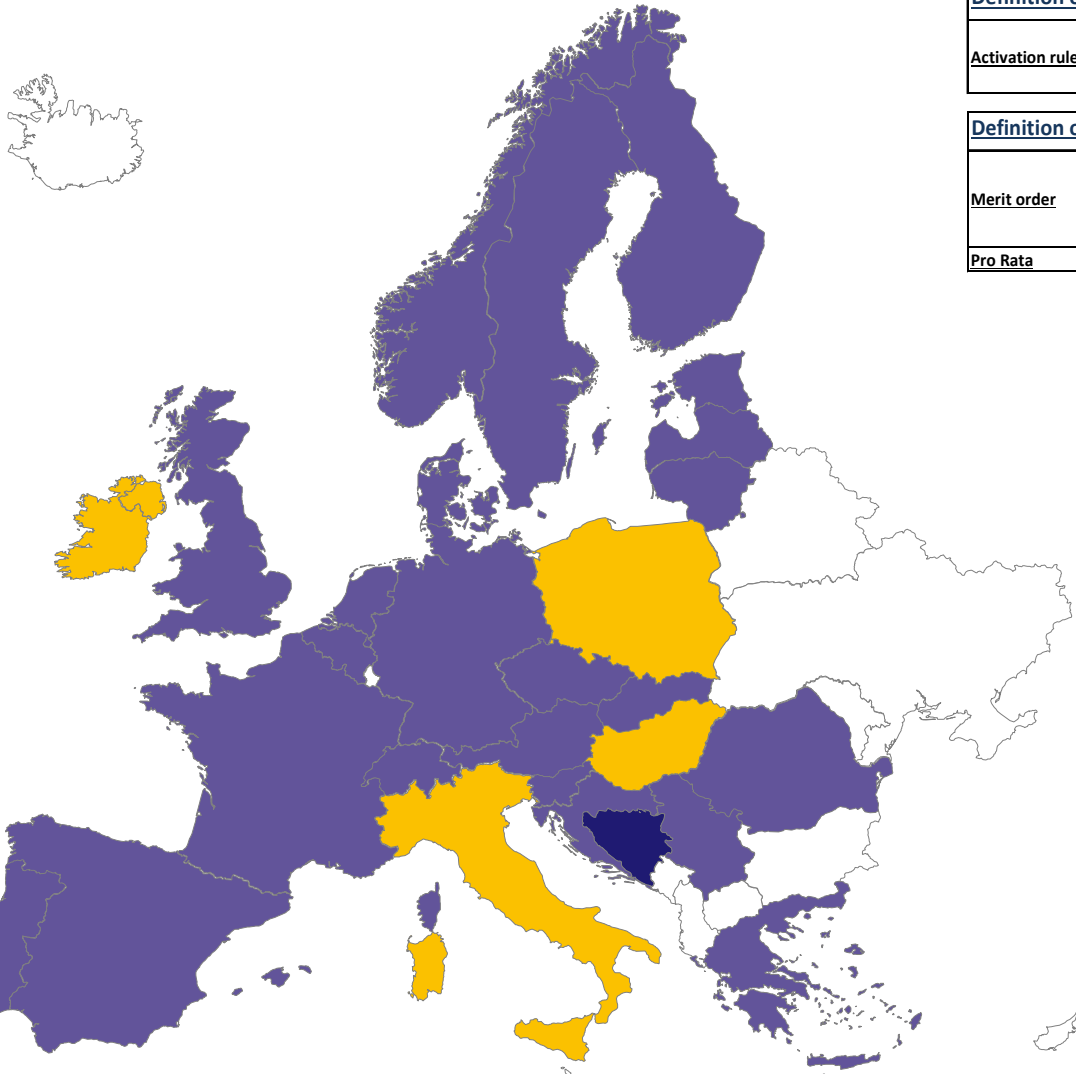


<u>Definition of question</u>	
<u>Procurement Scheme</u>	Background of the offer, which is closest to the real operation time.
<u>Definition of answer</u>	
<u>Bilateral Market</u>	A grid user and TSO negotiate a contract regarding the offered service and price/price system.
<u>Free Offers</u>	Non-regulated offers.
<u>Hybrid</u>	Combination.
<u>Mandatory Offers</u>	Generators connected to the grid are obligated to offer the remaining capacity/available capacity.
<u>Mandatory Provision</u>	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.
<u>Mandatory Provision without Reservation</u>	It is mandatory for dispatchable units to be able to provide frequency containment reserve, but these units are not required to reserve capacity to provide this service.
<u>Organised Market</u>	There is no contract or obligation for a grid user to offer the reserve (before the offer). The grid user can voluntarily participate in the market (e.g. tender, auction, market platform (like PX)) and bid a price or customize his offer (e.g. the volume, timeframe). The market result may lead to a bilateral contract.

Key:

	Missing data
	N/A
	Mandatory Offers
	Mandatory Provision
	Mandatory Provision without Reservation
	Bilateral Market
	Organised Market
	Hybrid
	Other
	Pre-contracted Offers only
	Pre-contracted and Mandatory Offers
	Pre-contracted and Free Offers

Frequency Restoration Reserve (Manual) - Energy - Activation Rule



<u>Definition of question</u>	
<u>Activation rule</u>	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).

<u>Definition of answer</u>	
<u>Merit order</u>	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.
<u>Pro Rata</u>	In Proportion (Parallel Activation).

Key:

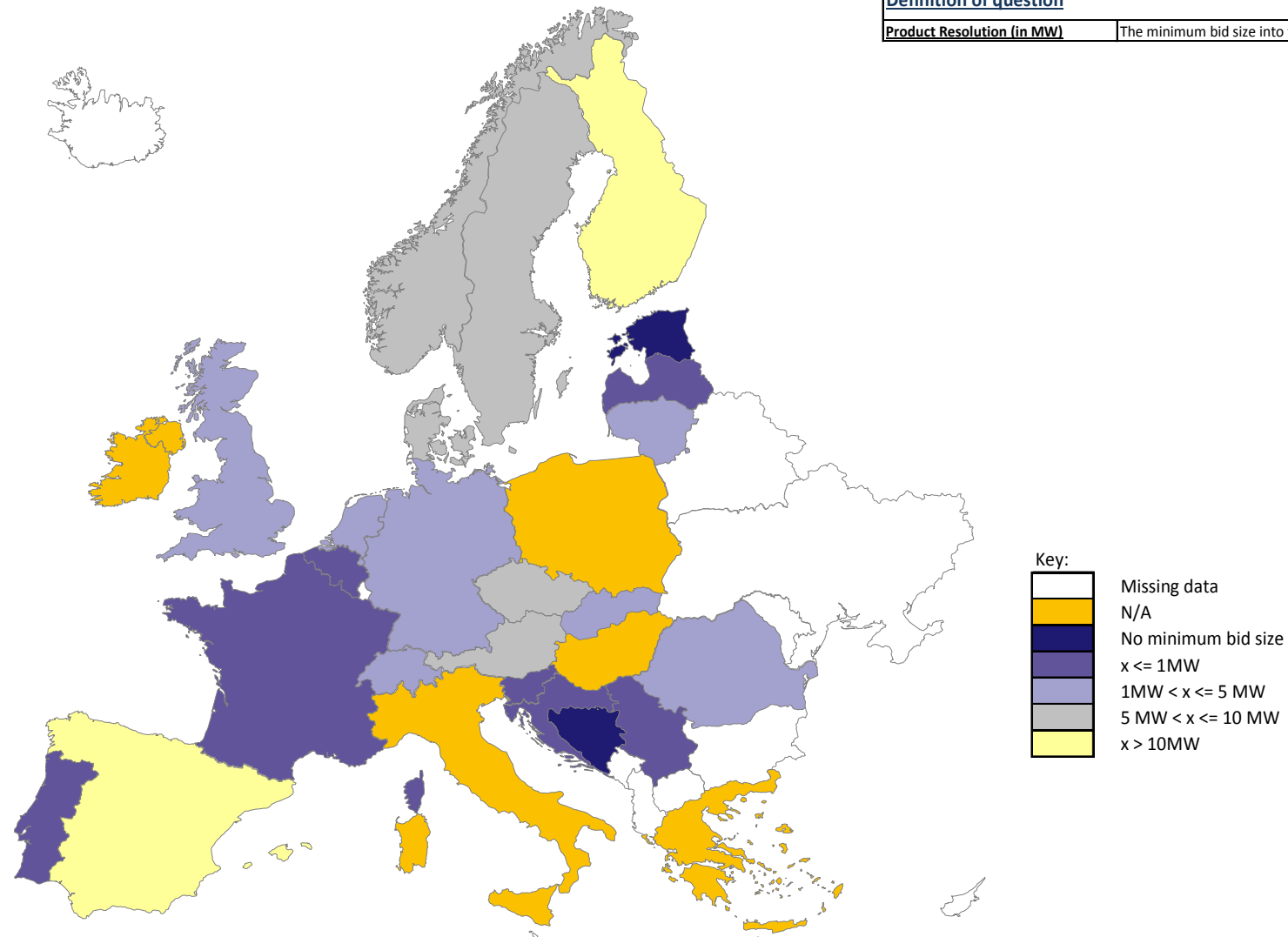
	Missing data
	N/A
	Pro Rata (Parallel Activation)
	Merit order

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

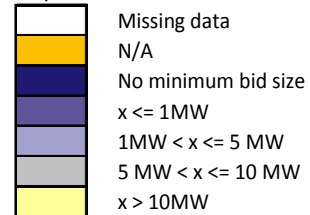
Definition of question

Product Resolution (in MW)

The minimum bid size into the balancing market.



Key:

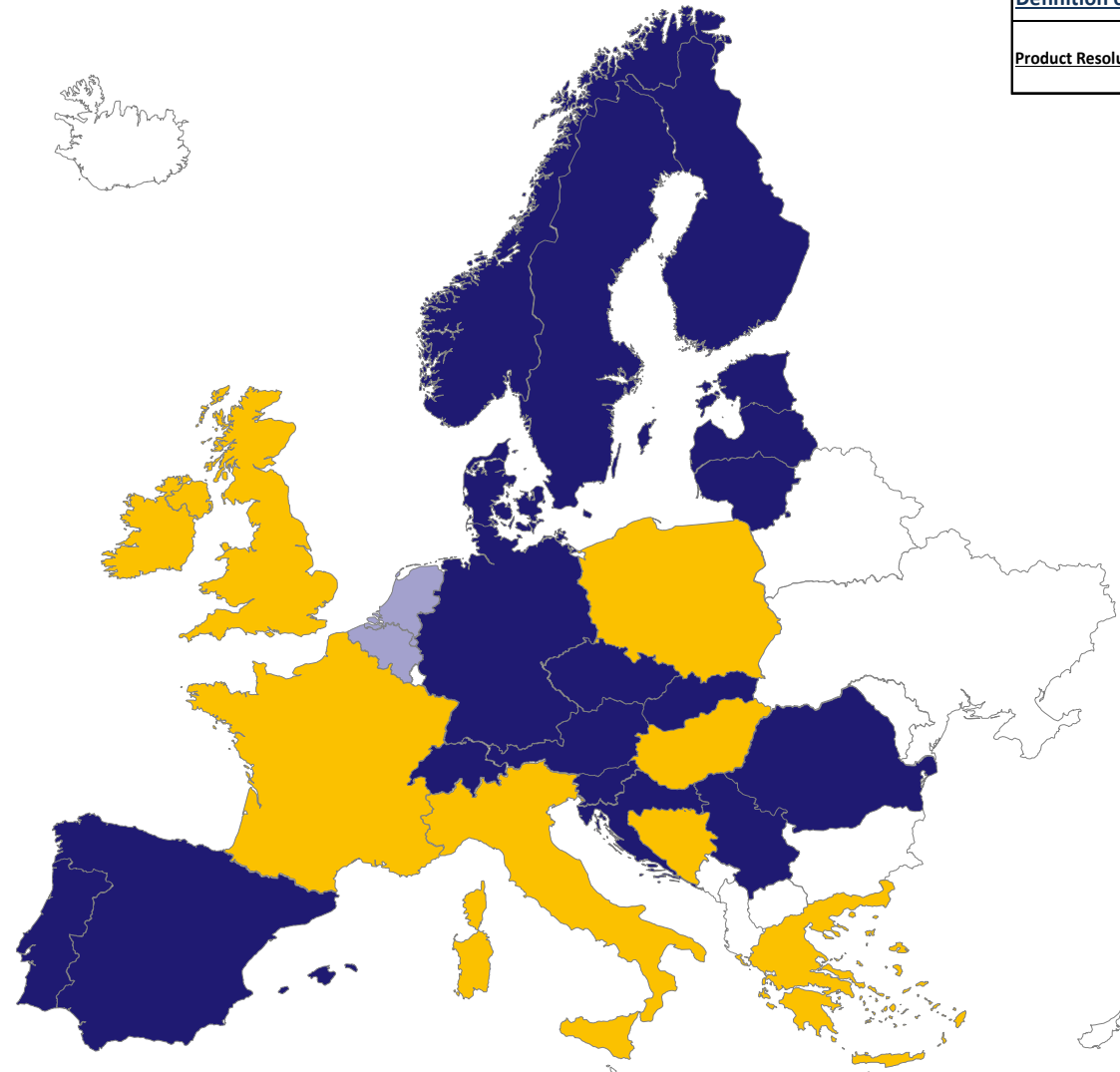


Frequency Restoration Reserve (Manual) - Energy - Product Resolution (in time)

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).



Key:



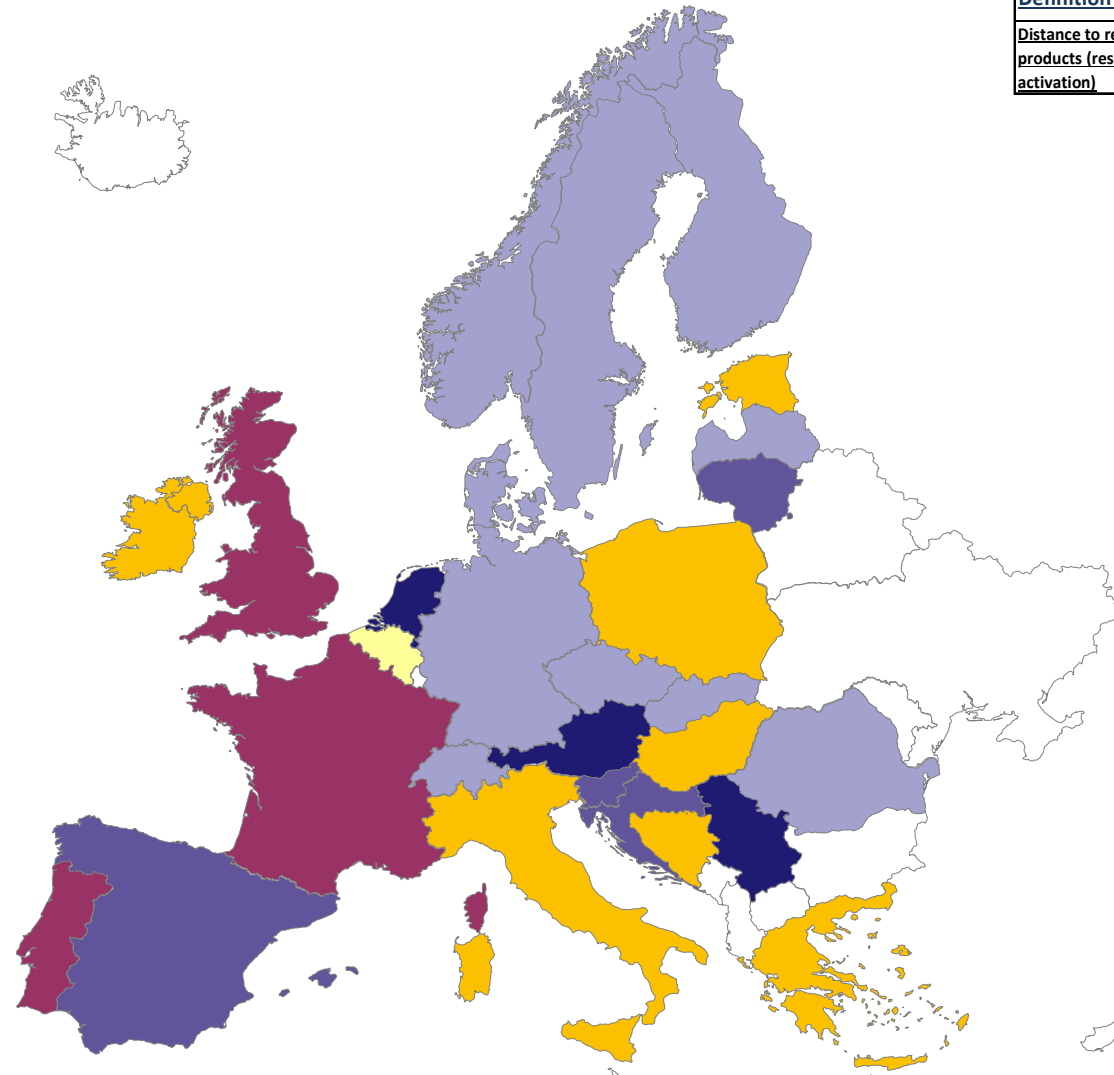
Missing data
N/A
Hour (or blocks)
30 minutes
15 minutes

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)

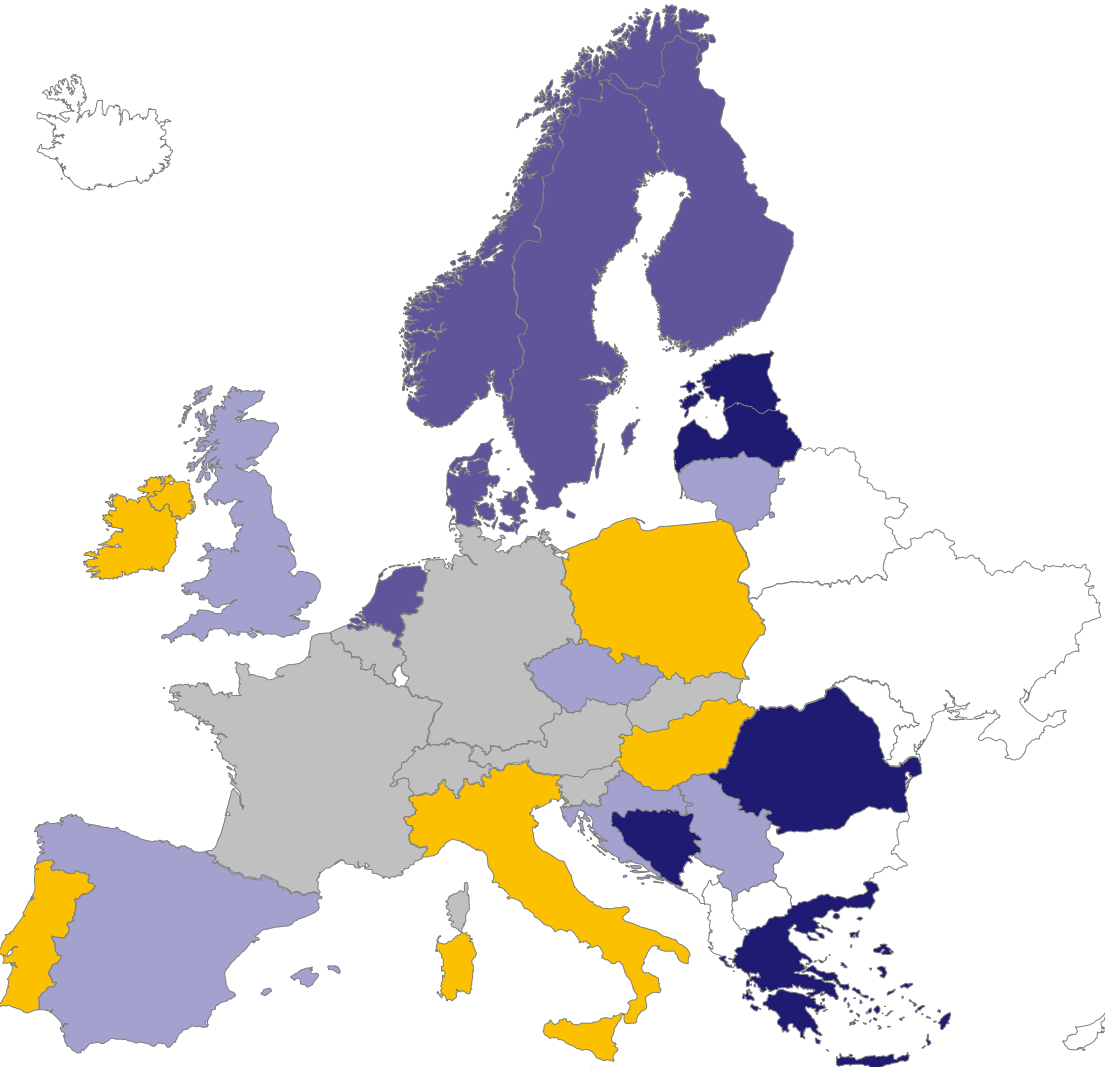
The time ahead from real time when TSO activates a given product (for instance 15 minutes in the case of mFRR/tertiary energy).



Key:

	Missing data
	N/A
	$x > H-1$
	$15 \text{ minutes} < x \leq H-1$
	$5 \text{ minutes} < x \leq 15 \text{ minutes}$
	$1 \text{ minute} < x \leq 5 \text{ minutes}$
	$x \leq 1 \text{ minute}$
	Depends on the unit

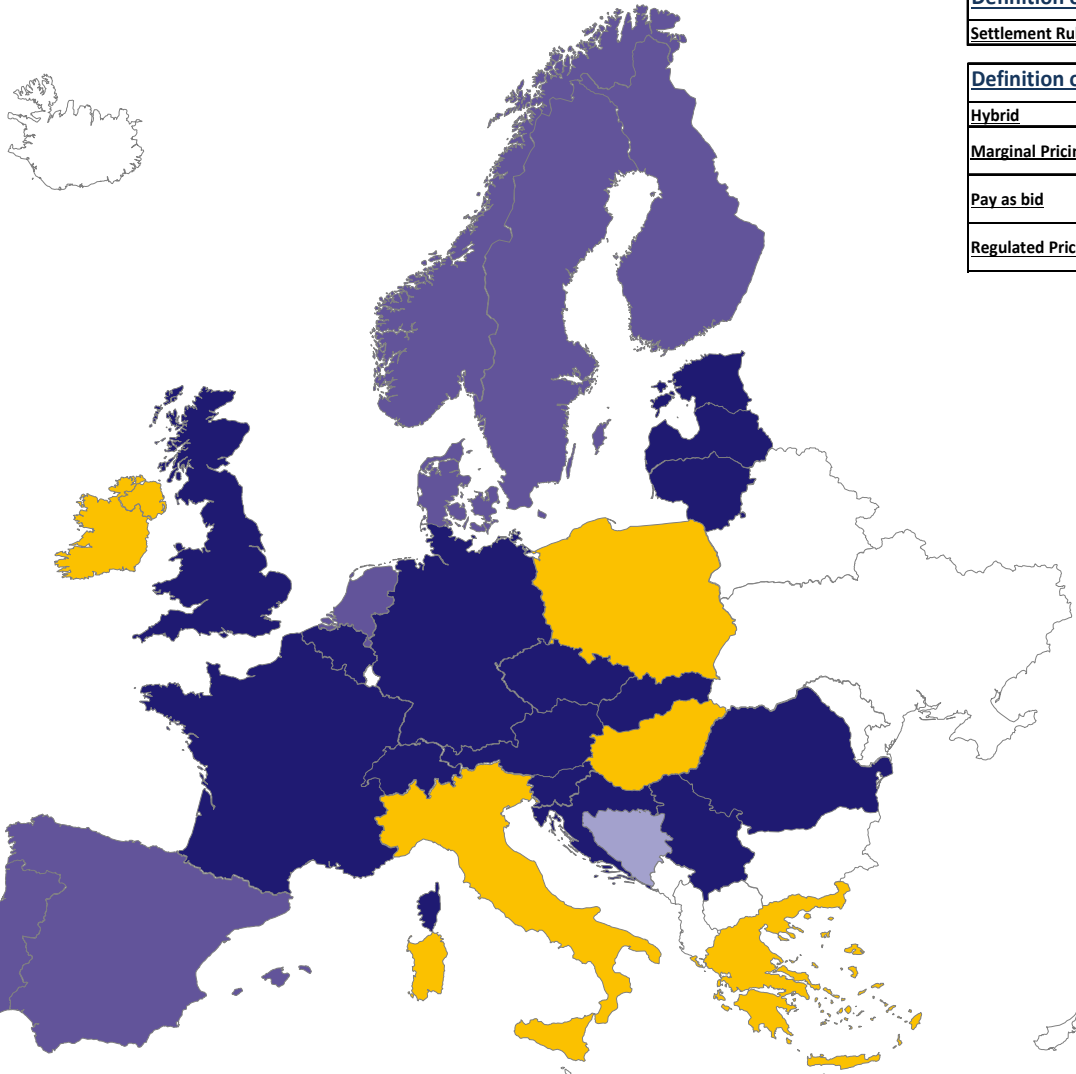
Frequency Restoration Reserve (Manual) - Energy - Provider



Key:

White	Missing data
Yellow	N/A
Dark Blue	Generators Only
Medium Blue	Generators + Load
Light Blue	Generators + Pump Storage units pumping
Grey	Generators + Load + Pump Storage units pumping

Frequency Restoration Reserve (Manual) - Energy - Settlement Rule



<u>Definition of question</u>	
<u>Settlement Rule</u>	The pricing rules for settlement.
<u>Definition of answer</u>	
<u>Hybrid</u>	Combination.
<u>Marginal Pricing</u>	Marginal pricing is the change in total cost that arises when the quantity produced changes by one unit.
<u>Pay as bid</u>	Contracted parties who provide a service are paid based on their offer price.
<u>Regulated Price</u>	Price for this service is based on a price that is set by the relevant regulatory authority.

Key:

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

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

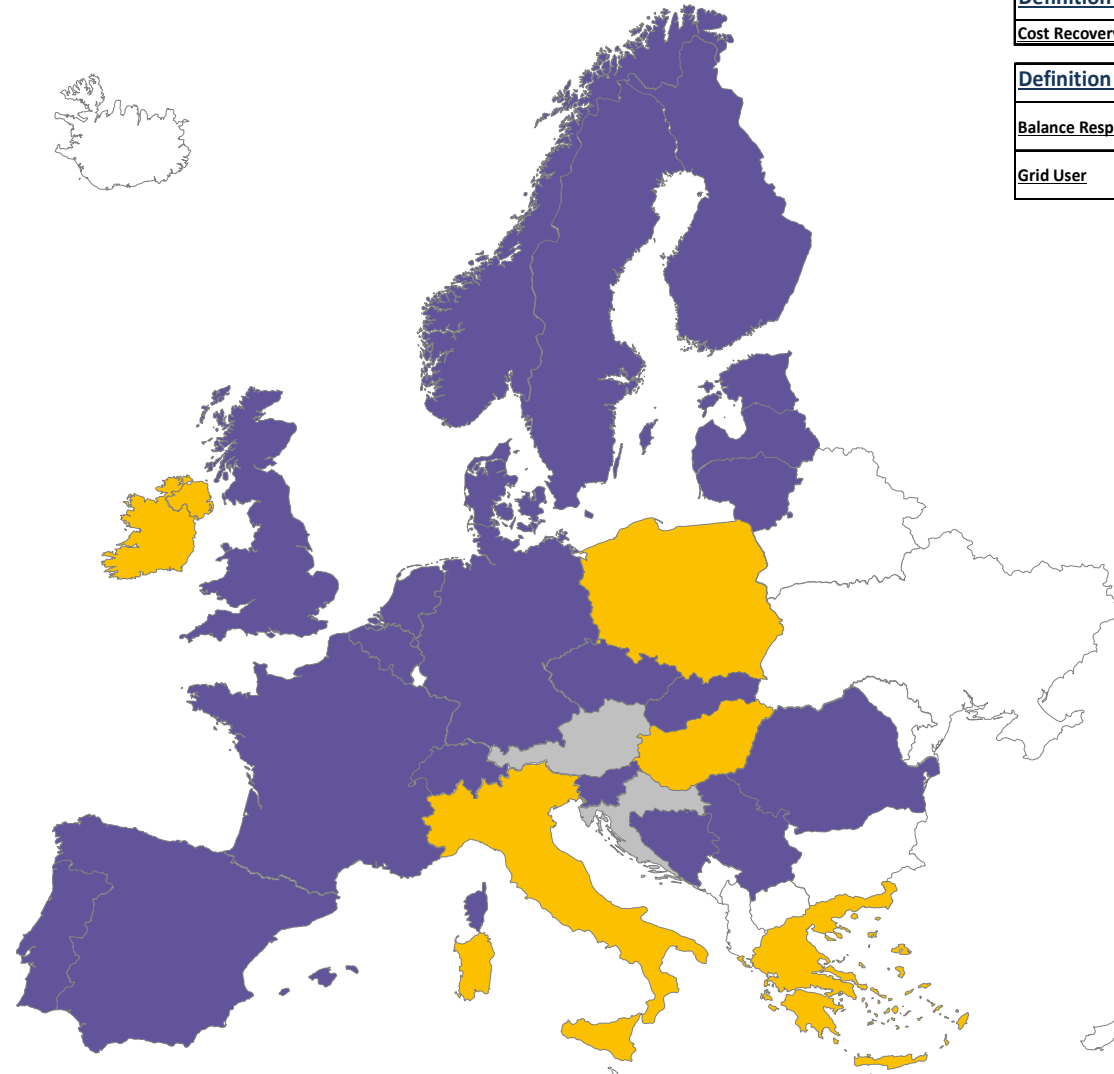


Definition of question

Cost Recovery Scheme	From whom are the costs recovered.
-----------------------------	------------------------------------

Definition of answer

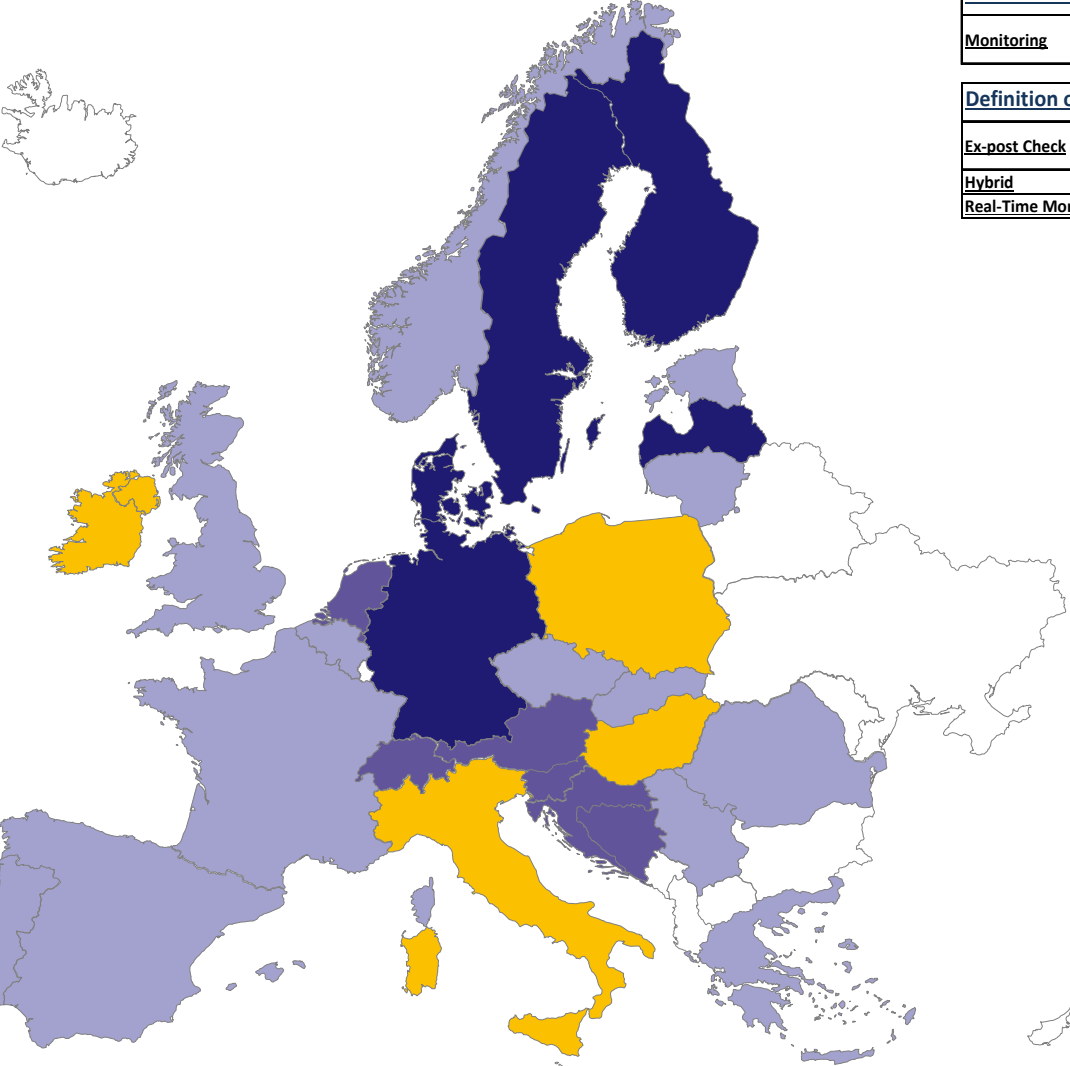
Balance Responsible Party (BRP)	Balancing Responsible Party means a market participant or its chosen representative responsible for its Imbalances.
Grid User	The natural or legal person supplying to, or being supplied with active and/or reactive power by a TSO or DSO.



Key:

White	Missing data
Yellow	N/A
Dark Blue	100% Grid Users
Medium Blue	100% BRP
Light Blue	100% end consumers
Grey	Mix of Grid Users and BRP

Frequency Restoration Reserve (Manual) - Energy - Monitoring



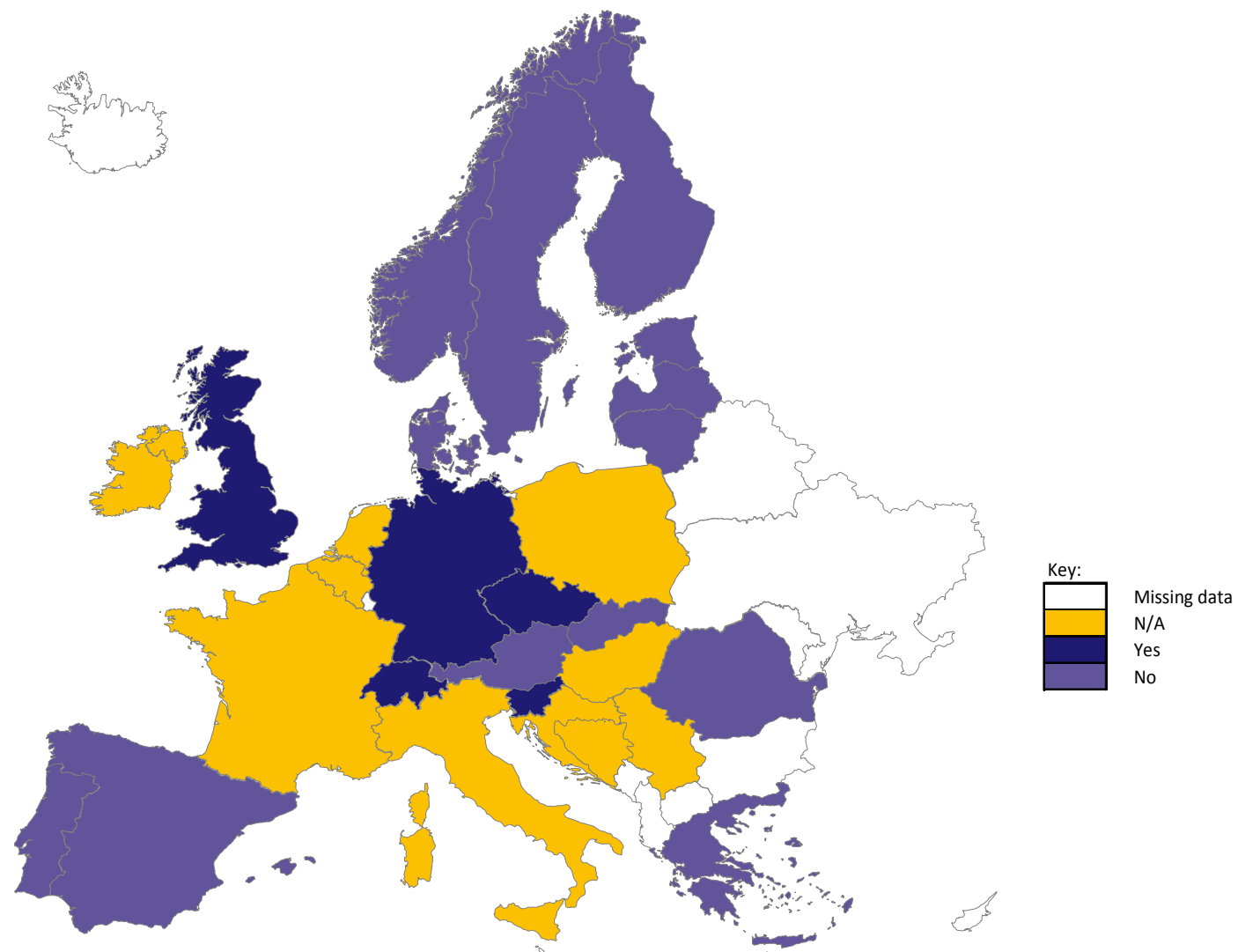
Definition of question	
Monitoring	Refers to the type of monitoring in place by the system operator to ensure performance of plant.

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

Key:

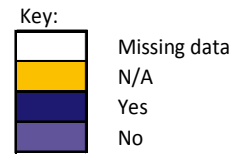
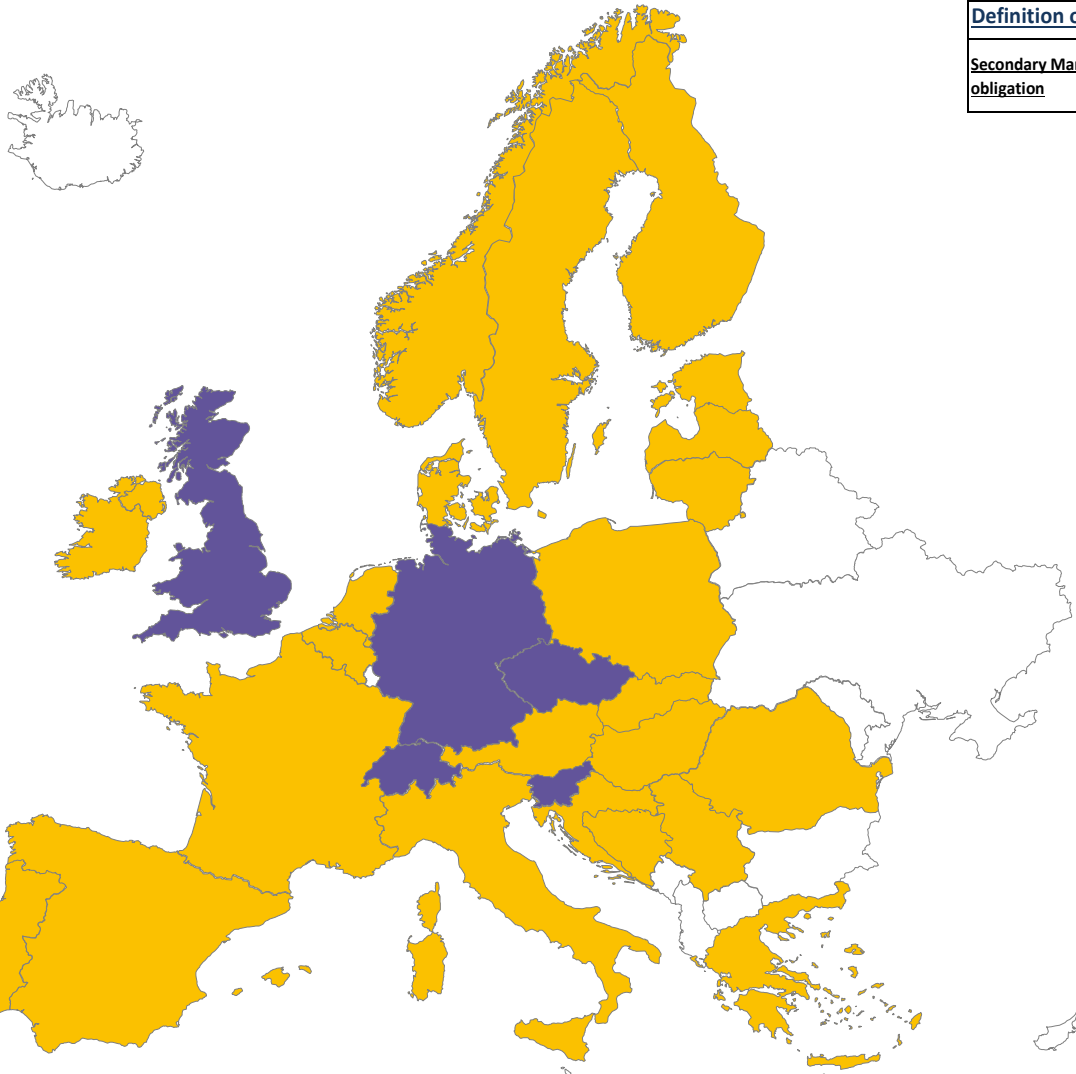
White	Missing data
Yellow	N/A
Dark Blue	Real-Time Monitoring
Medium Blue	Ex-Post Check
Light Blue	Hybrid

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

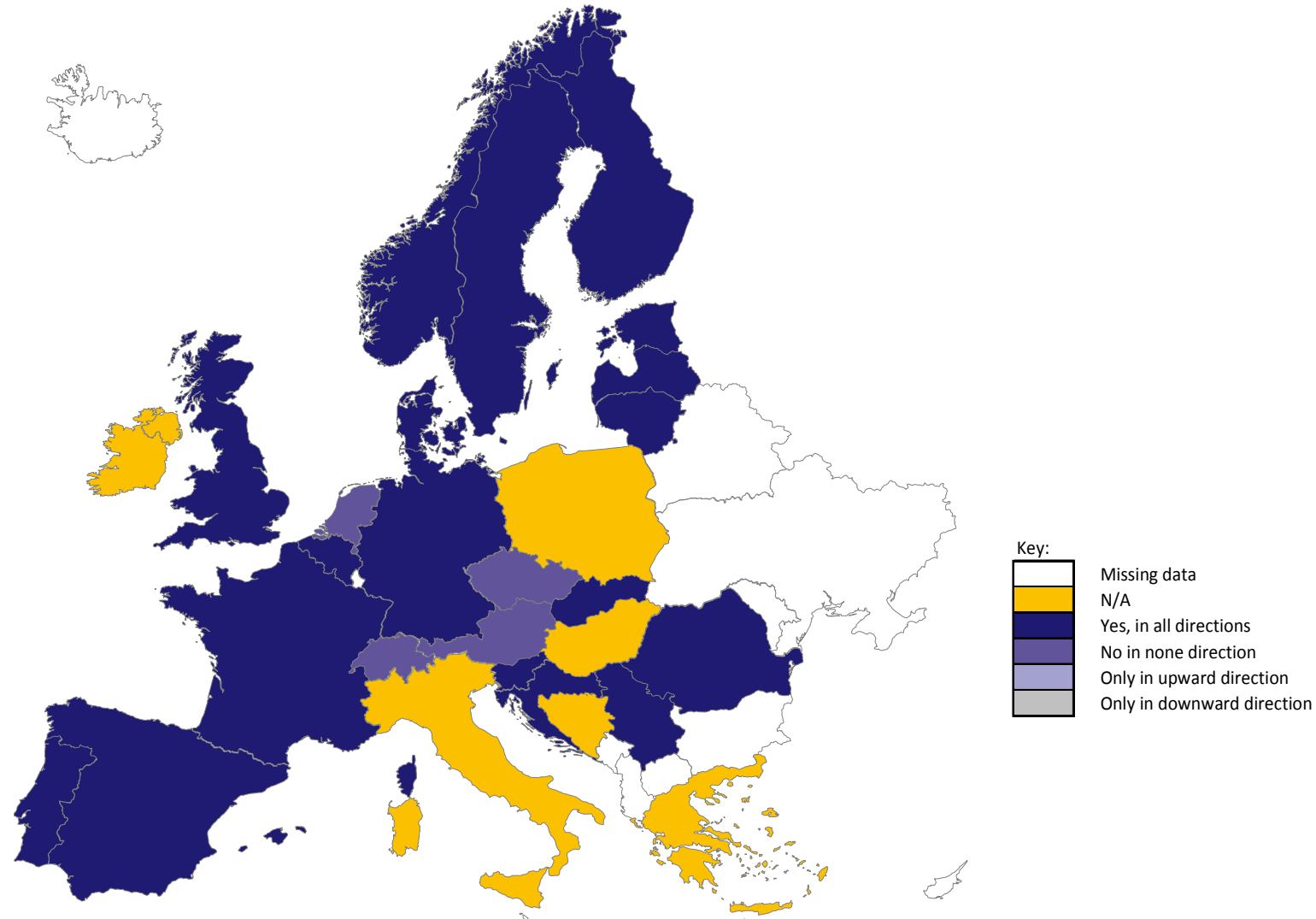


Frequency Restoration Reserve (Manual) - Energy - Obl. allowed, organised secondary market exists

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 - Partially activated product

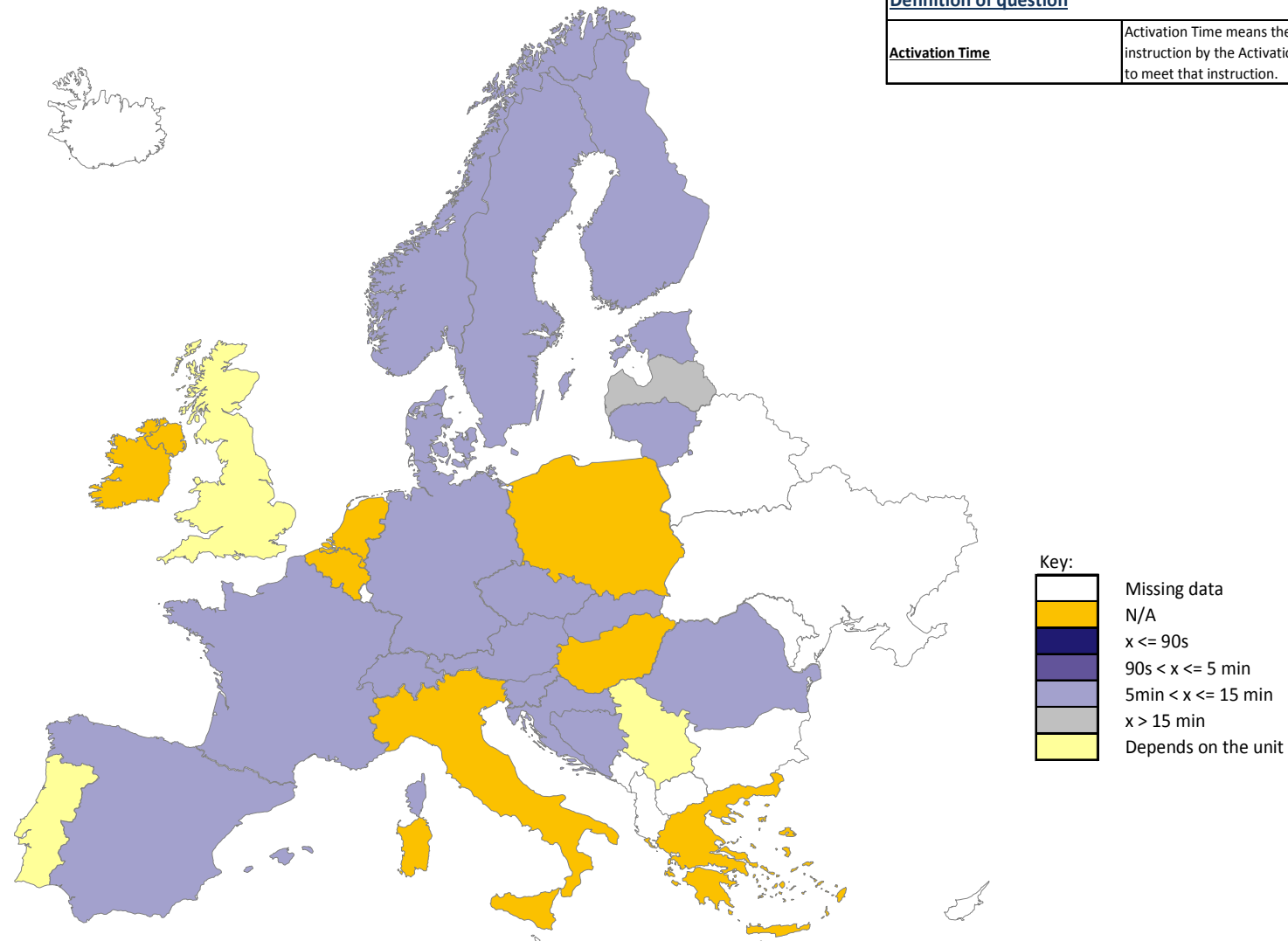


Frequency Restoration Reserve (Manual) - Energy - Activation time of FRRm from 0 to max

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.

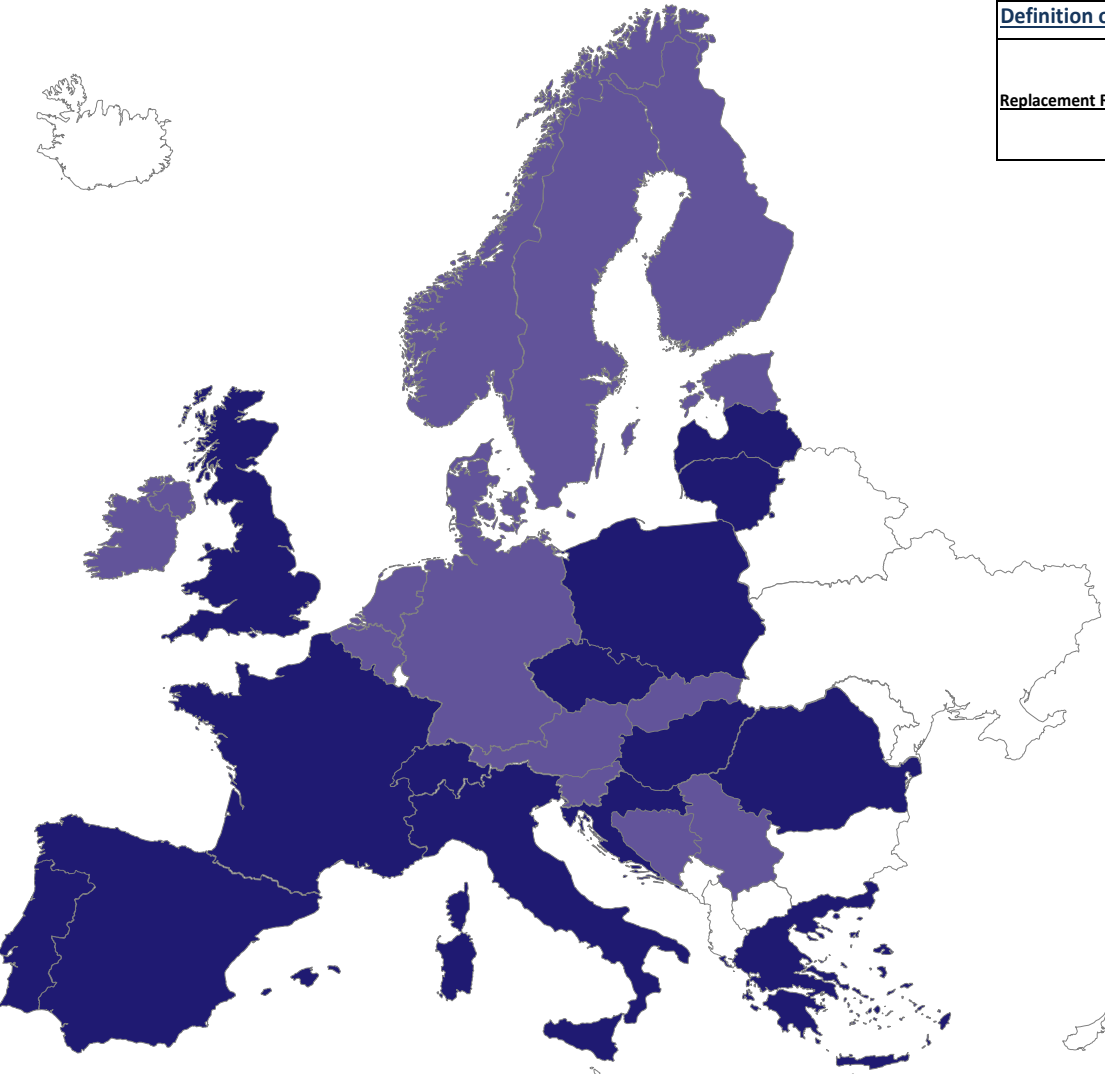


Key:





Missing data	White
N/A	Orange
$x \leq 90s$	Dark Blue
$90s < x \leq 5 \text{ min}$	Medium Blue
$5 \text{ min} < x \leq 15 \text{ min}$	Light Blue
$x > 15 \text{ min}$	Grey
Depends on the unit	Yellow

Using Replacement Reserve

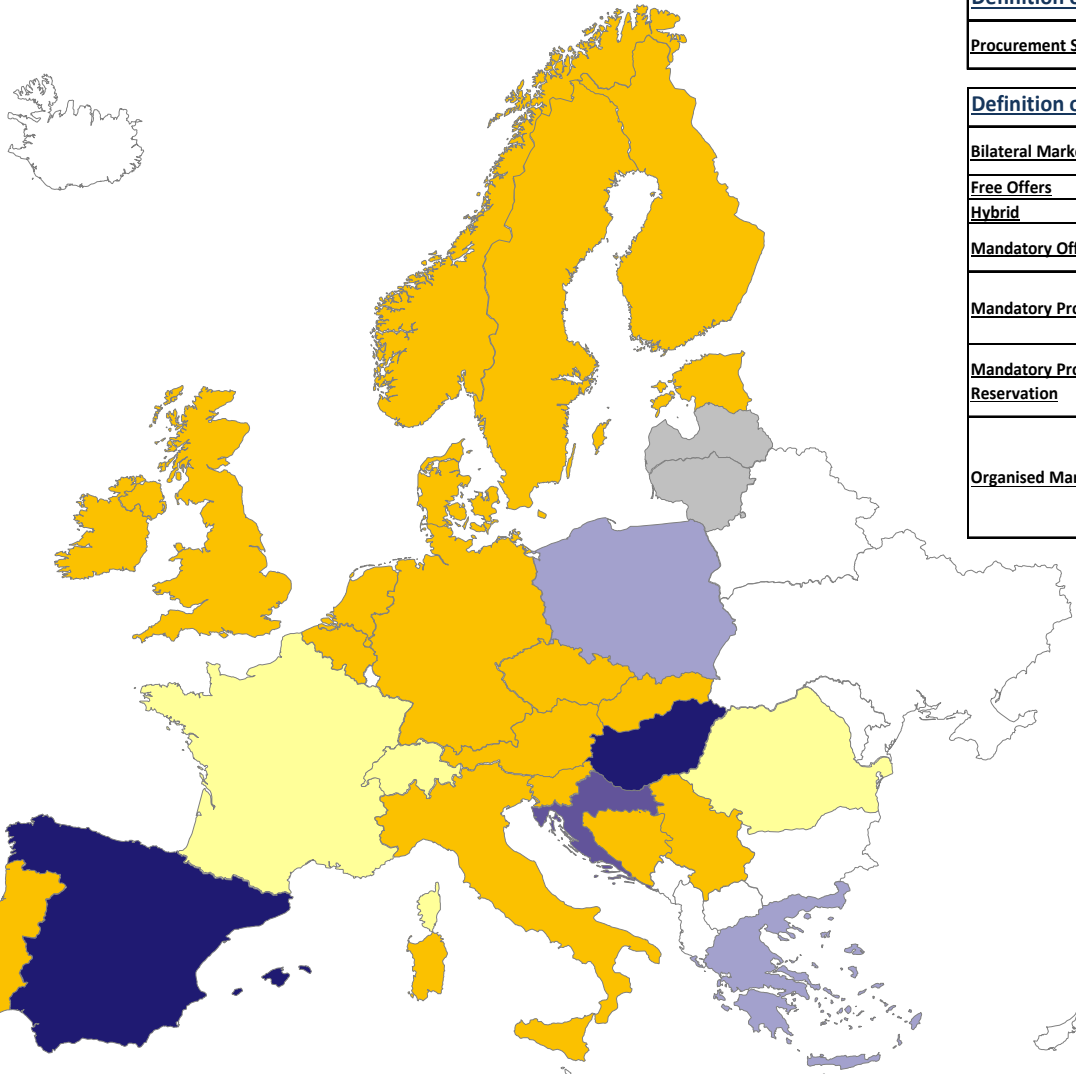
Definition of answer	
Replacement Reserve (RR)	Replacement Reserves (RR) means the reserves used to restore/support the required level of FRR to be prepared for further system imbalances. This category includes operating reserves with activation time from Time to Restore Frequency up to hours.



Key:

	Missing data
	N/A
	Yes
	No

Replacement Reserve - Capacity - Procurement Scheme



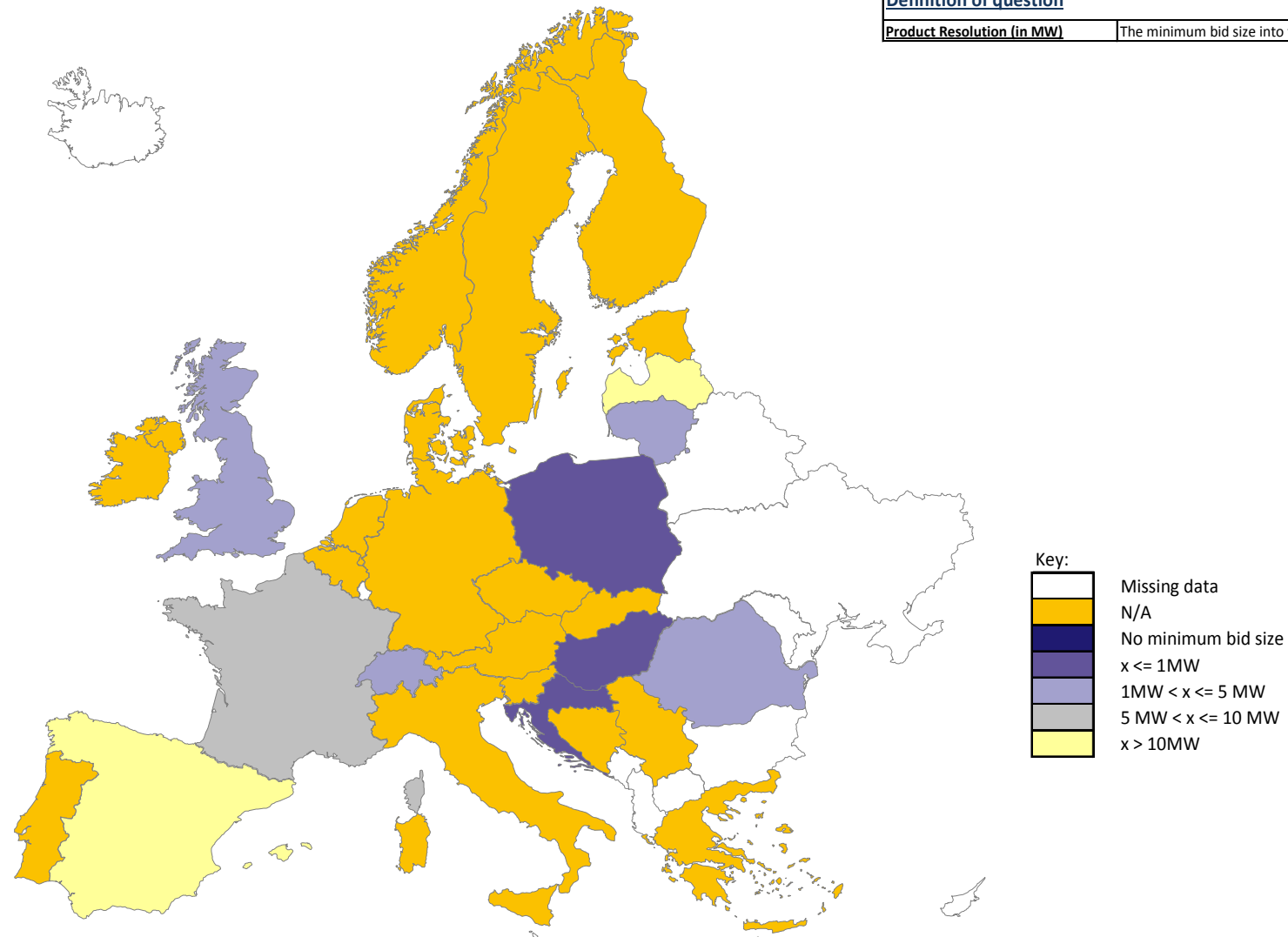
Definition of question	
Procurement Scheme	Background of the offer, which is closest to the real operation time.
Definition of answer	
Bilateral Market	A grid user and TSO negotiate a contract regarding the offered service and price/price system.
Free Offers	Non-regulated offers.
Hybrid	Combination.
Mandatory Offers	Generators connected to the grid are obligated to offer the remaining capacity/available capacity.
Mandatory Provision	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.
Mandatory Provision without Reservation	It is mandatory for dispatchable units to be able to provide frequency containment reserve, but these units are not required to reserve capacity to provide this service.
Organised Market	There is no contract or obligation for a grid user to offer the reserve (before the offer). The grid user can voluntarily participate in the market (e.g. tender, auction, market platform (like PX)) and bid a price or customize his offer (e.g. the volume, timeframe). The market result may lead to a bilateral contract.

- Key:
- Missing data
 - N/A
 - Mandatory Offers
 - Mandatory Provision
 - Mandatory Provision without Reservation
 - Bilateral Market
 - Organised Market
 - Hybrid
 - Other
 - Pre-contracted Offers only
 - Pre-contracted and Mandatory Offers
 - Pre-contracted and Free Offers

Replacement Reserve - Capacity - Product Resolution (in MW)

Definition of question

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

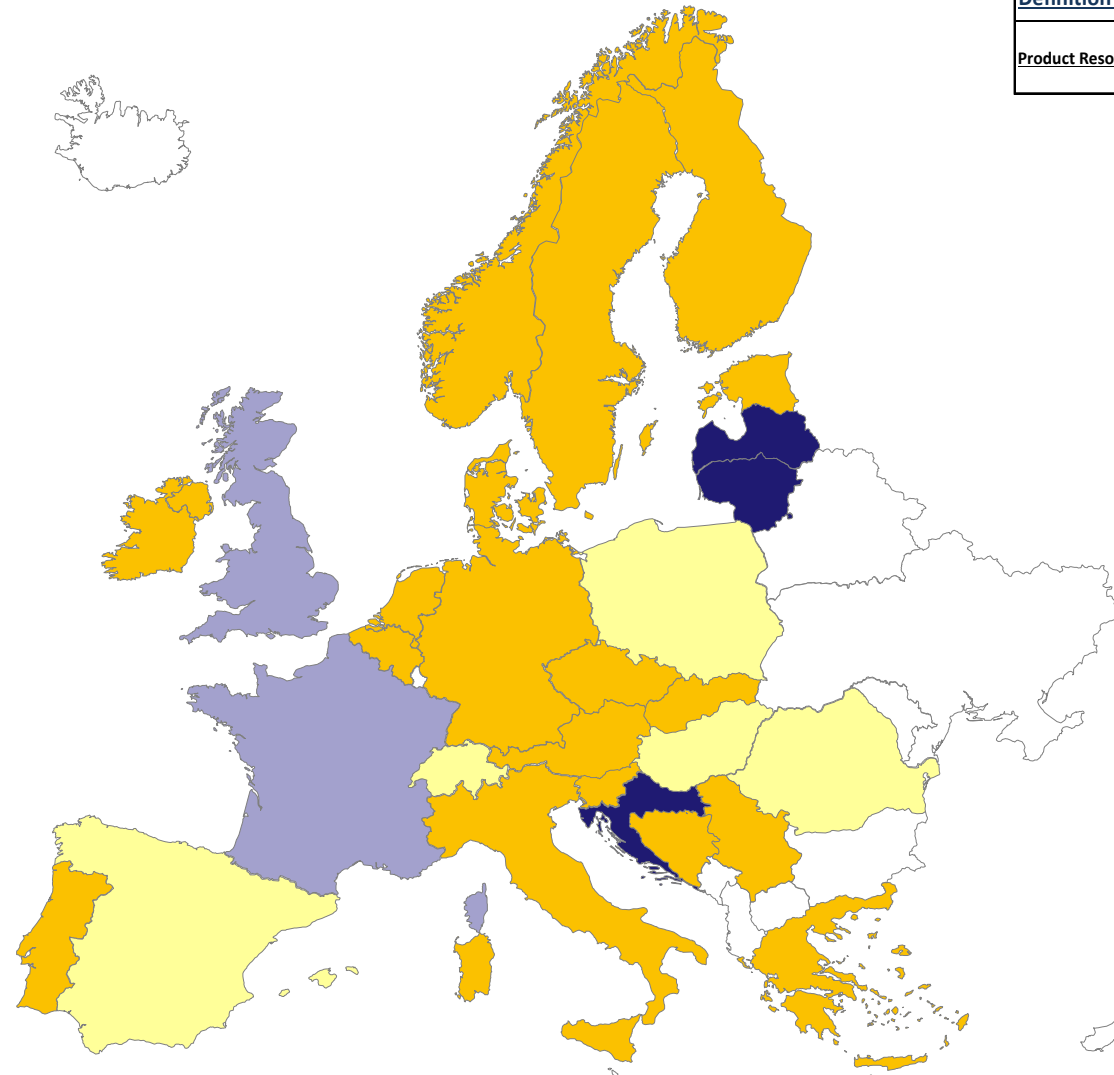


Replacement Reserve - Capacity - Product Resolution (in time)

Definition of question

Product Resolution (in time)

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

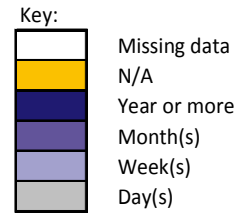
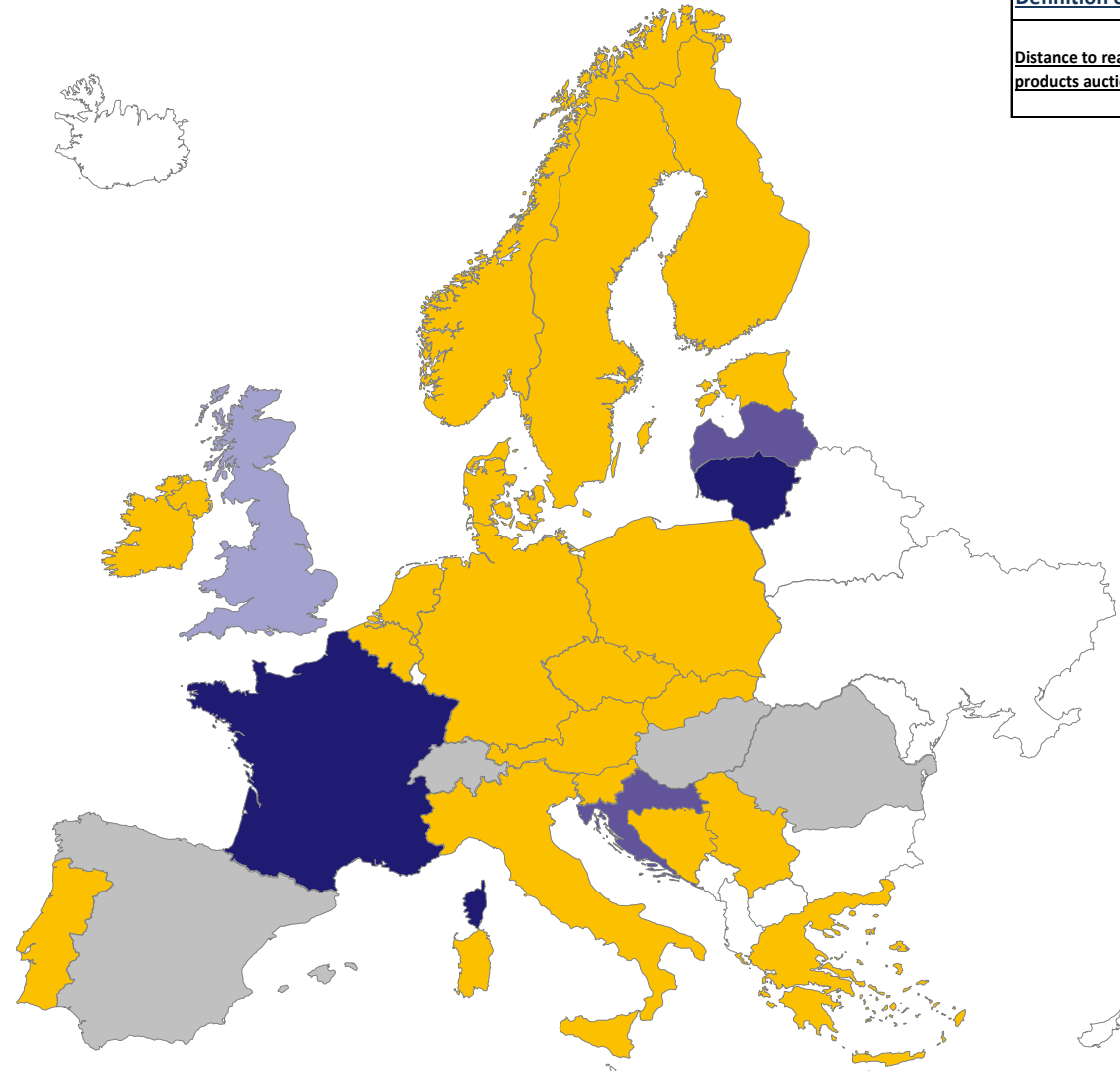


Key:

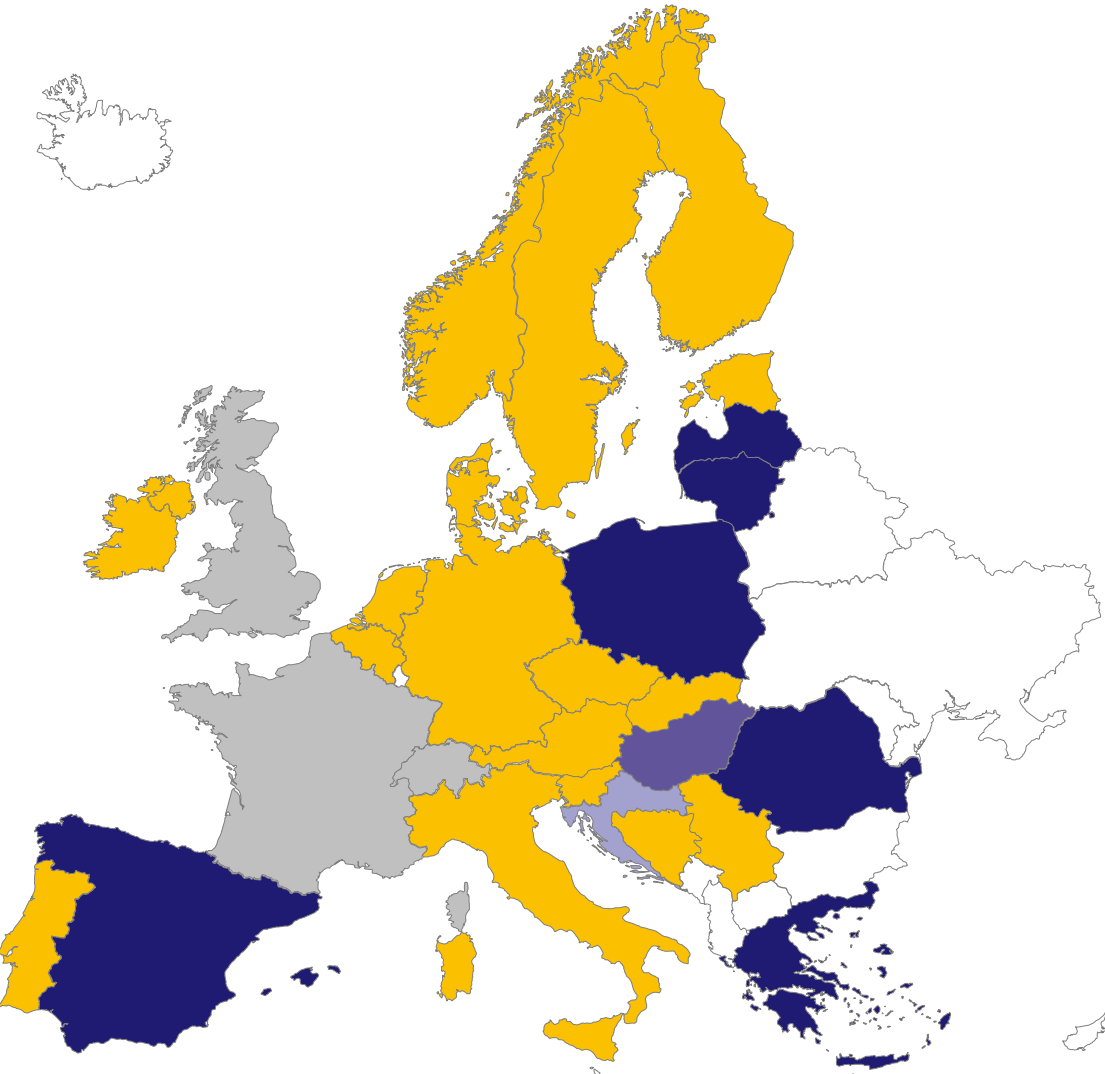
	Missing data
	N/A
	Year or more
	Month(s)
	Week(s)
	Day(s)
	Hour(s)

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

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



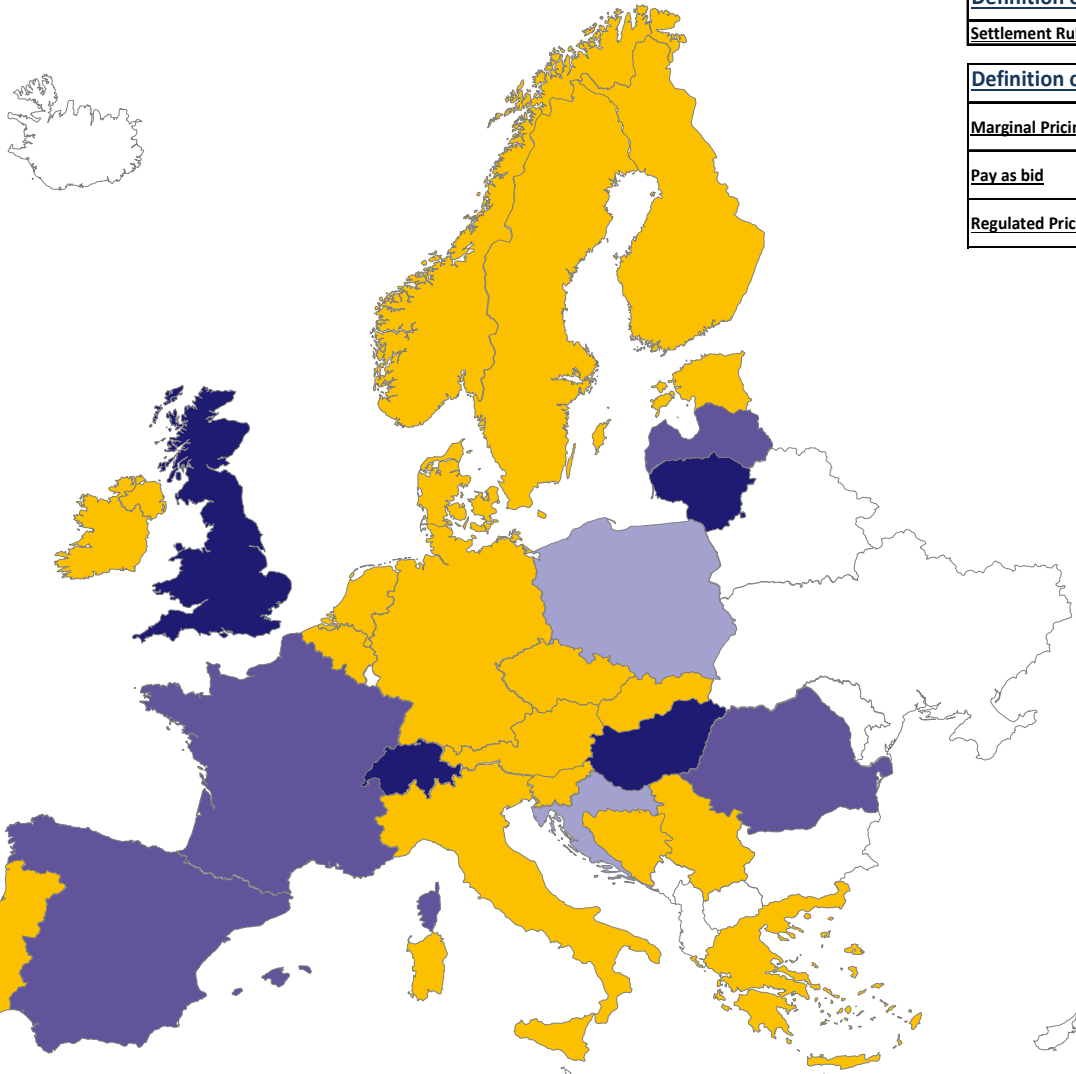
Replacement Reserve - Capacity - Provider



Key:

	Missing data
	N/A
	Generators Only
	Generators + Load
	Generators + Pump Storage units pumping
	Generators + Load + Pump Storage units pumping

Replacement Reserve - Capacity - Settlement Rule



<u>Definition of question</u>	
Settlement Rule	The pricing rules for settlement.
<u>Definition of answer</u>	
Marginal Pricing	Marginal pricing is the change in total cost that arises when the quantity produced changes by one unit.
Pay as bid	Contracted parties who provide a service are paid based on their offer price.
Regulated Price	Price for this service is based on a price that is set by the relevant regulatory authority.

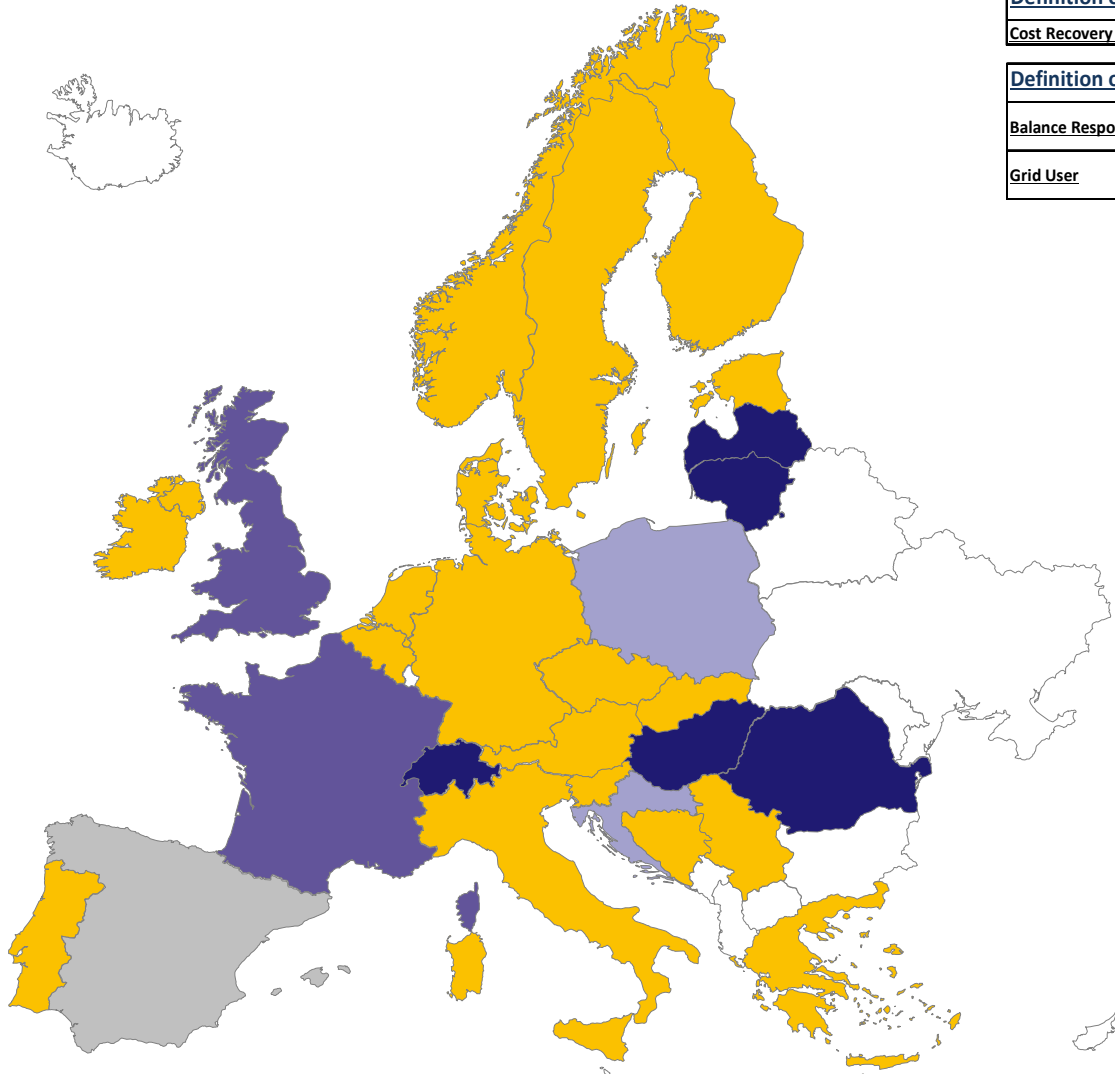
Key:

	Missing data
	N/A
	Pay as bid
	Marginal Pricing
	Regulated Price

Replacement Reserve - Capacity - Cost Recovery Scheme



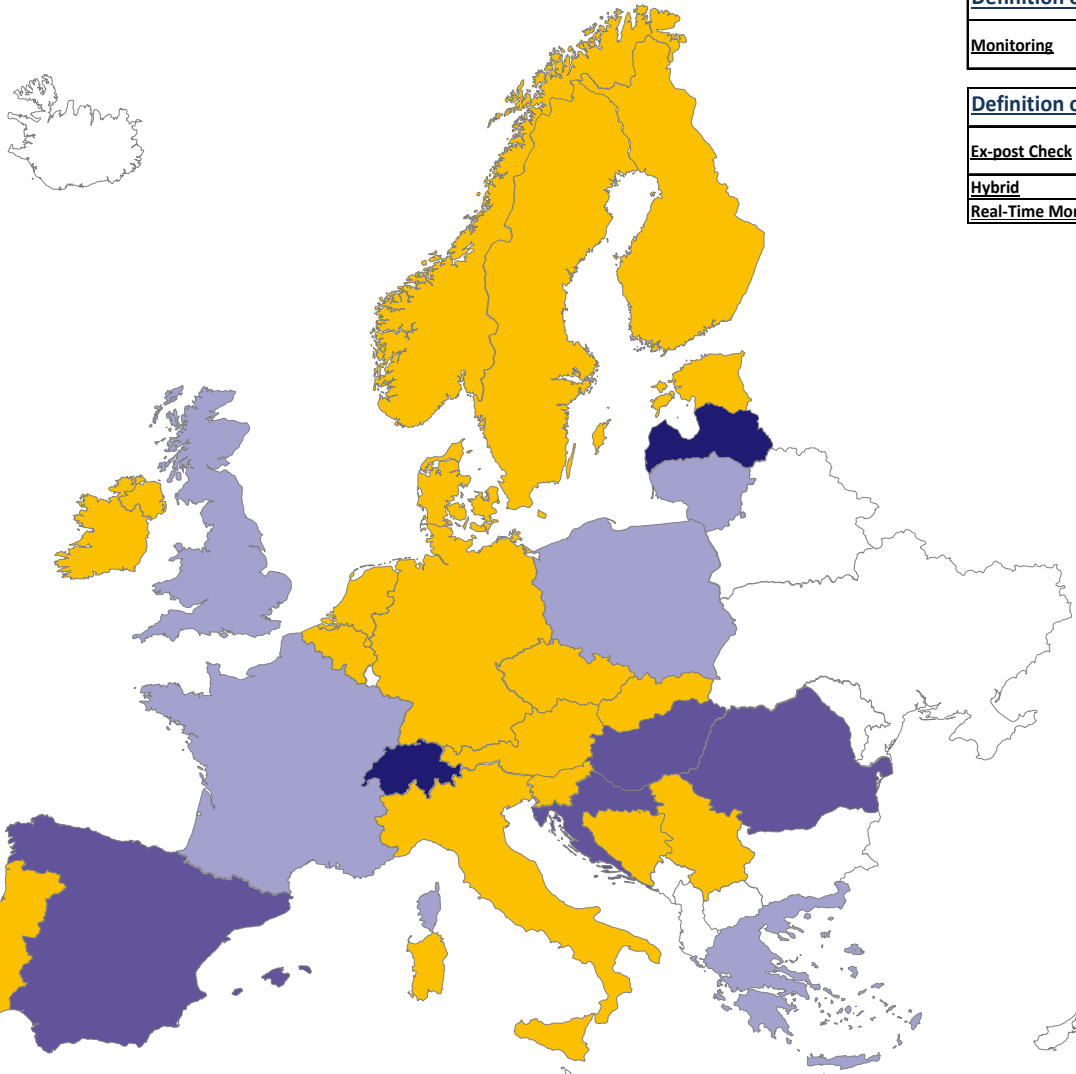
Definition of question	
Cost Recovery Scheme	From whom are the costs recovered.
Definition of answer	
Balance Responsible Party (BRP)	Balancing Responsible Party means a market participant or its chosen representative responsible for its Imbalances.
Grid User	The natural or legal person supplying to, or being supplied with active and/or reactive power by a TSO or DSO.



Key:

White	Missing data
Yellow	N/A
Dark Blue	100% Grid Users
Medium Blue	100% BRP
Light Blue	100% end consumers
Grey	Mix of Grid Users and BRP

Replacement Reserve - Capacity - Monitoring



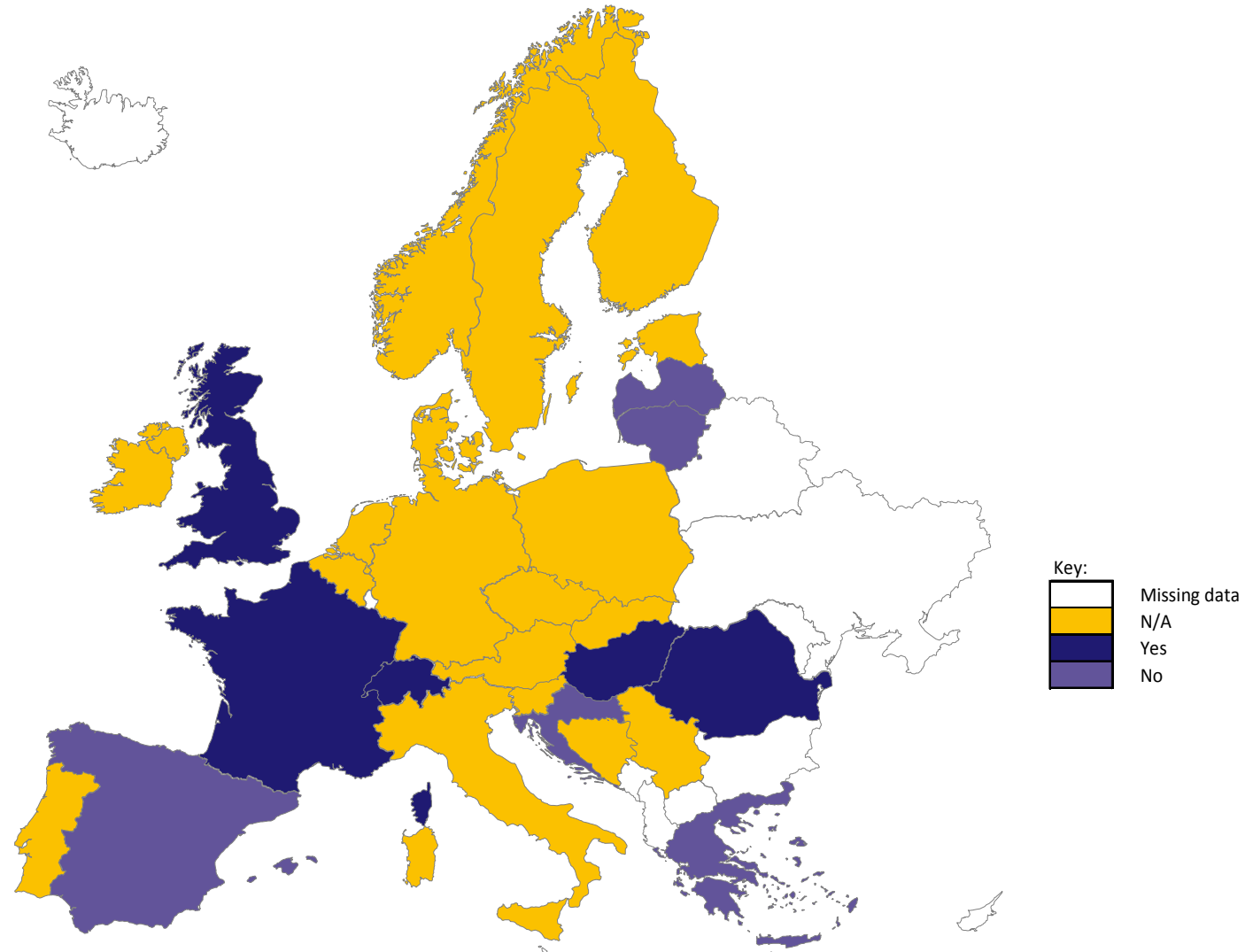
Definition of question	
Monitoring	Refers to the type of monitoring in place by the system operator to ensure performance of plant.

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

Key:

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

Replacement Reserve - Capacity - Transfer of obligation allowed

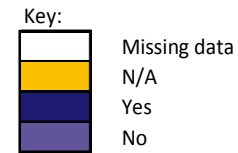
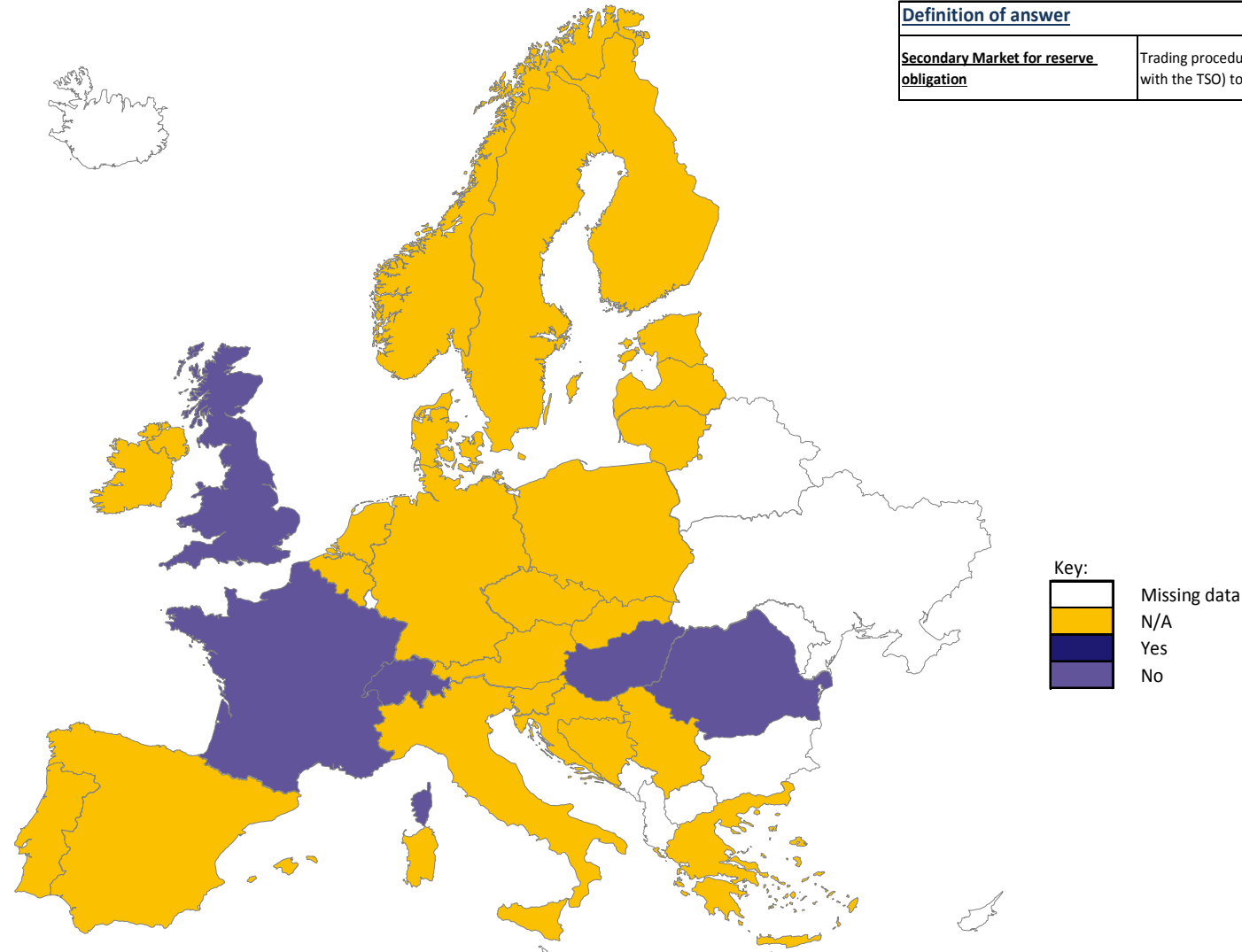


Replacement Reserve - Capacity - Obl. allowed, organised secondary market exists

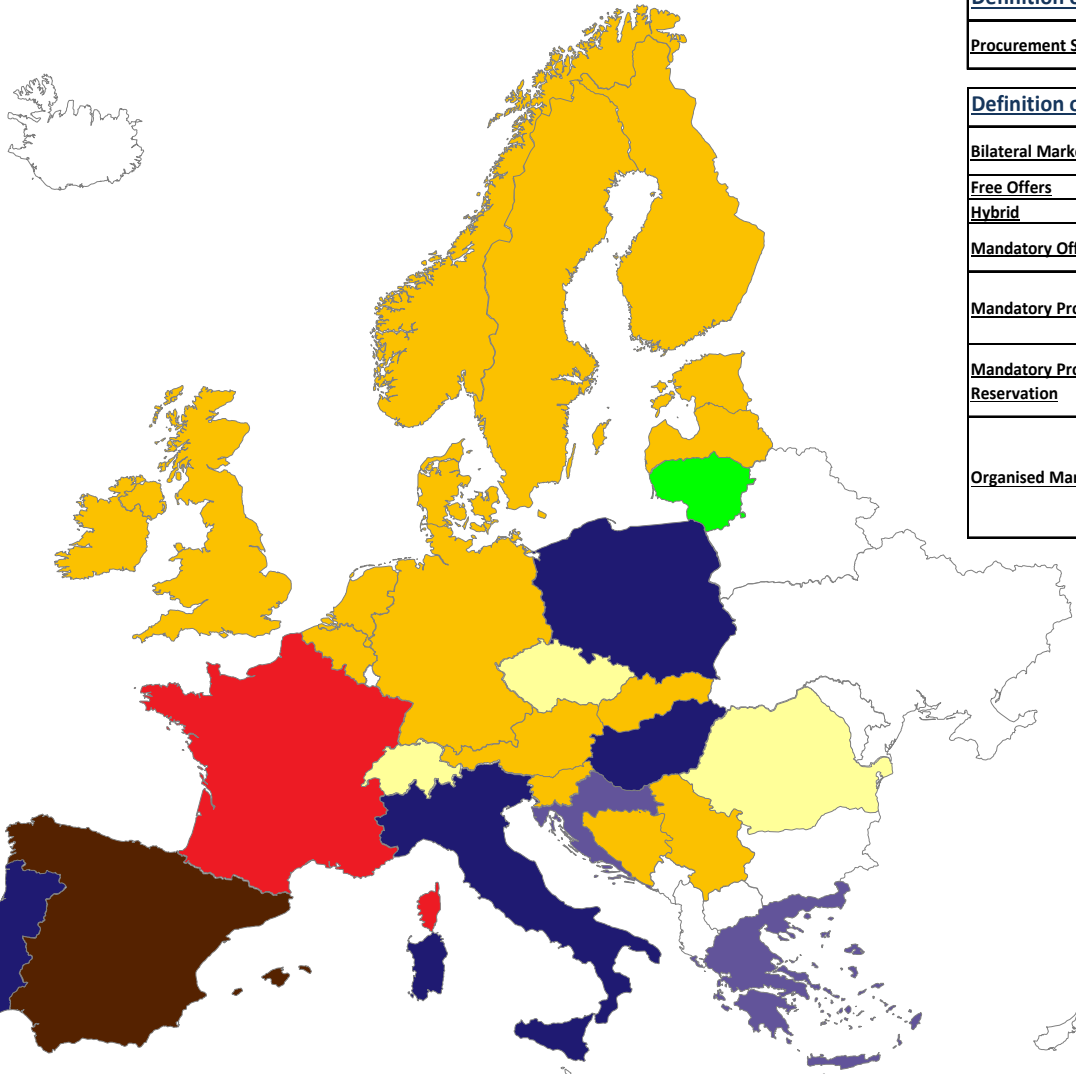
Definition of answer

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

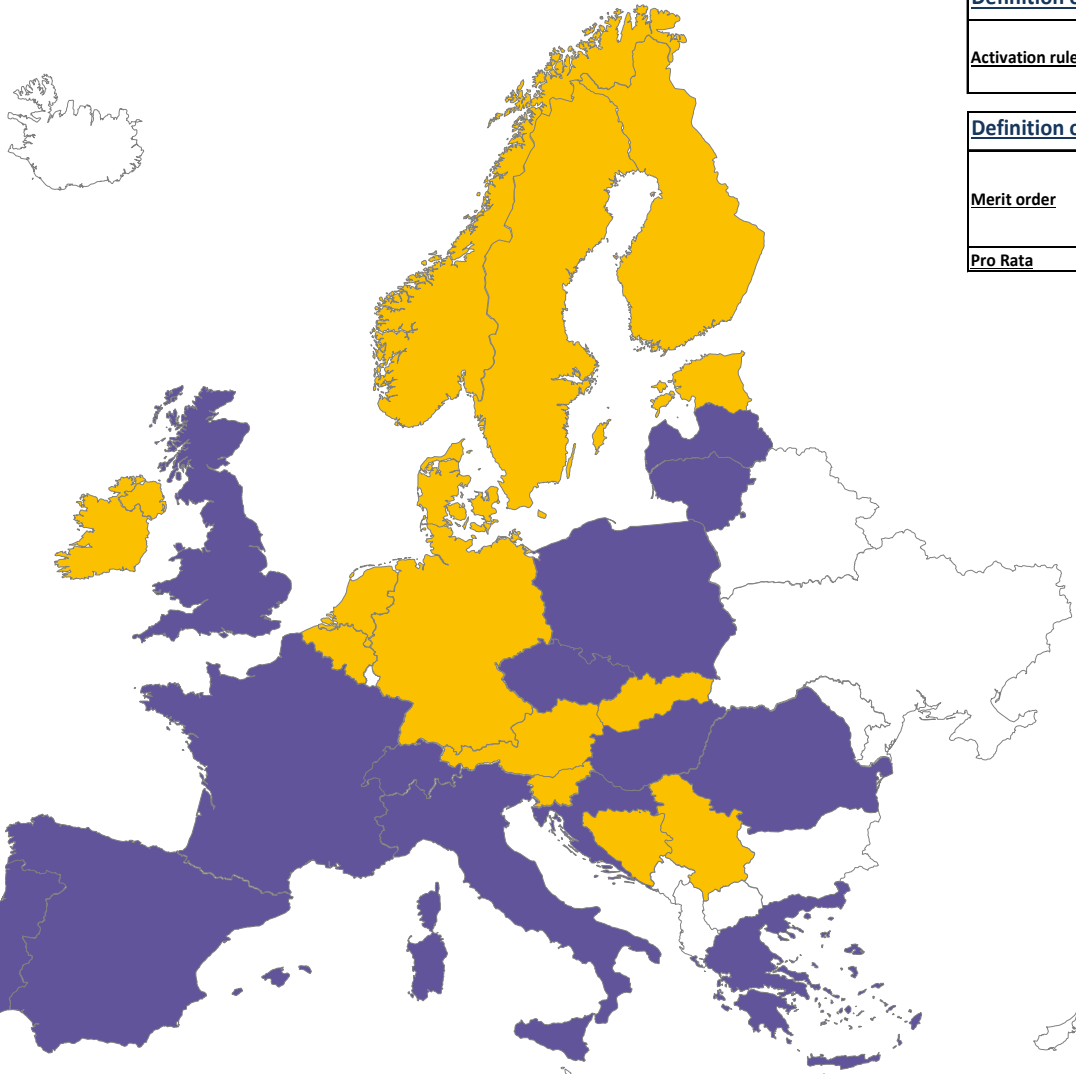


Definition of question	
Procurement Scheme	Background of the offer, which is closest to the real operation time.
Definition of answer	
Bilateral Market	A grid user and TSO negotiate a contract regarding the offered service and price/price system.
Free Offers	Non-regulated offers.
Hybrid	Combination.
Mandatory Offers	Generators connected to the grid are obligated to offer the remaining capacity/available capacity.
Mandatory Provision	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.
Mandatory Provision without Reservation	It is mandatory for dispatchable units to be able to provide frequency containment reserve, but these units are not required to reserve capacity to provide this service.
Organised Market	There is no contract or obligation for a grid user to offer the reserve (before the offer). The grid user can voluntarily participate in the market (e.g. tender, auction, market platform (like PX)) and bid a price or customize his offer (e.g. the volume, timeframe). The market result may lead to a bilateral contract.

Key:

Missing data	White
N/A	Yellow
Mandatory Offers	Dark Blue
Mandatory Provision	Light Blue
Mandatory Provision without Reservation	Purple
Bilateral Market	Grey
Organised Market	Light Yellow
Hybrid	Maroon
Other	Green
Pre-contracted Offers only	Bright Green
Pre-contracted and Mandatory Offers	Red
Pre-contracted and Free Offers	Brown

Replacement Reserve - Energy - Activation Rule



<u>Definition of question</u>	
<u>Activation rule</u>	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).

<u>Definition of answer</u>	
<u>Merit order</u>	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.
<u>Pro Rata</u>	In Proportion (Parallel Activation).

Key:

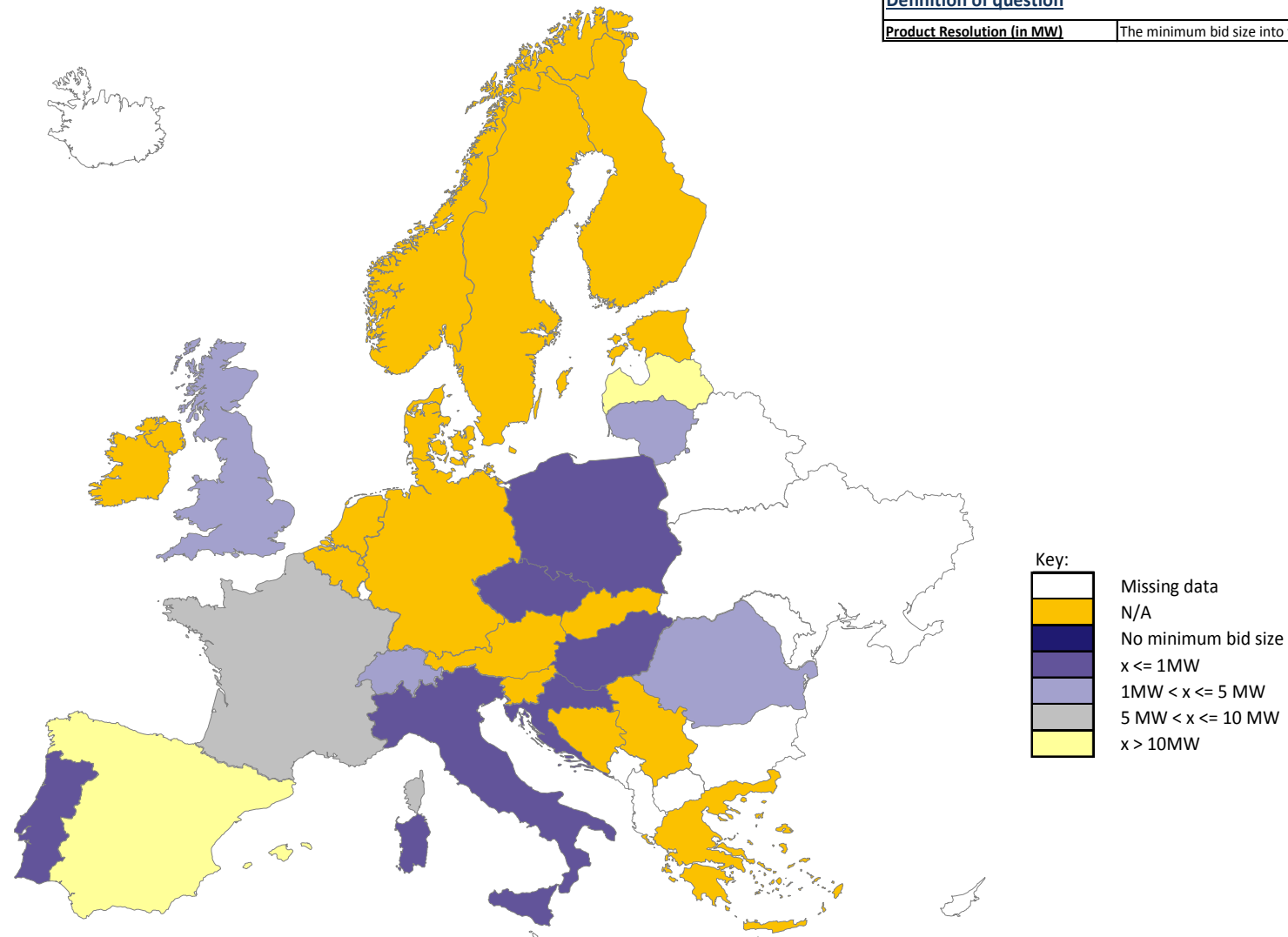
	Missing data
	N/A
	Pro Rata (Parallel Activation)
	Merit order

Replacement Reserve - Energy - Product Resolution (in MW)

Definition of question

Product Resolution (in MW)

The minimum bid size into the balancing market.

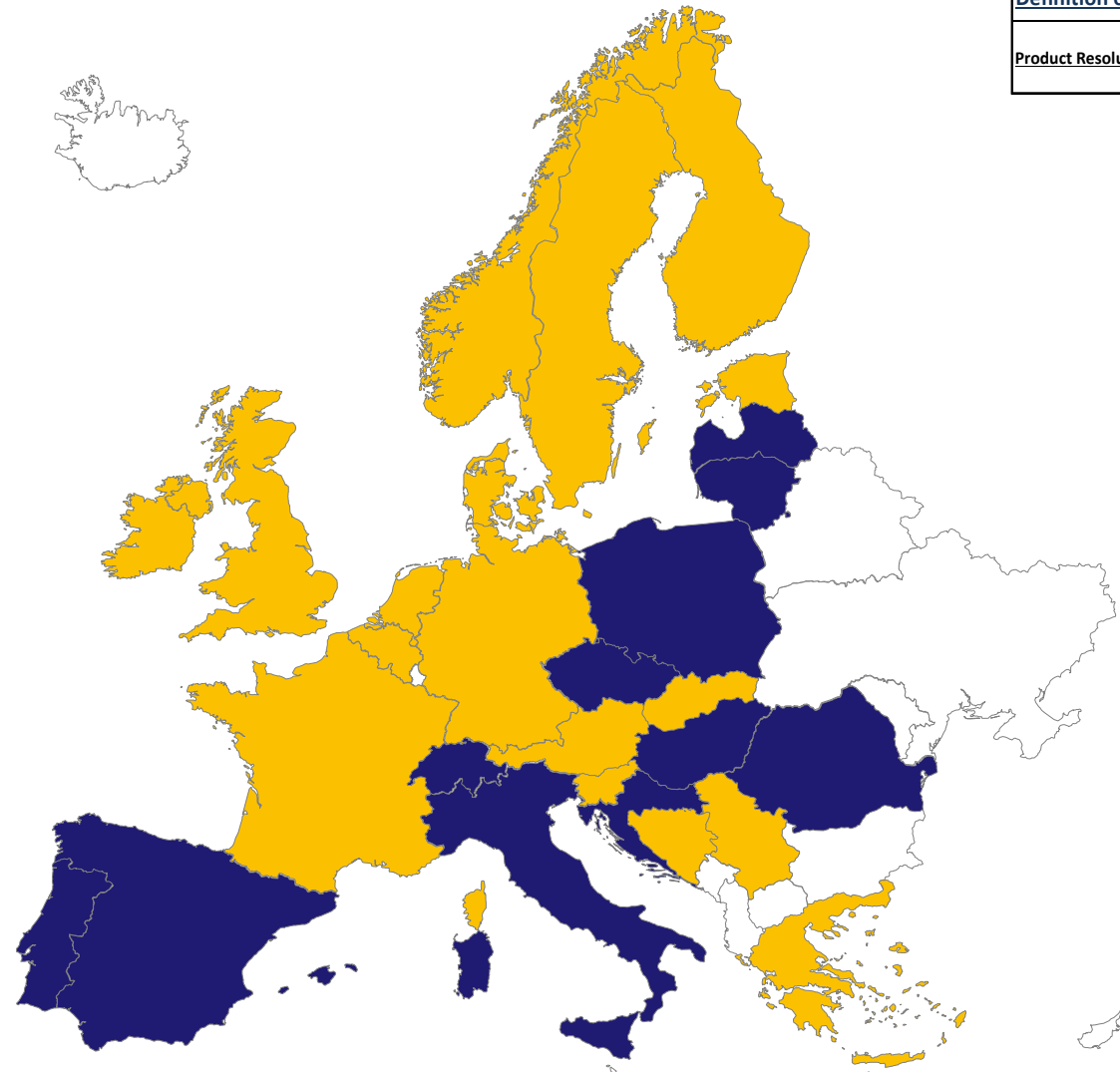


Replacement Reserve - Energy - Product Resolution (in time)

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).



Key:



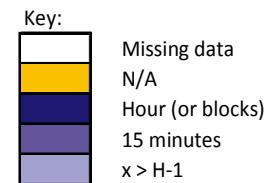
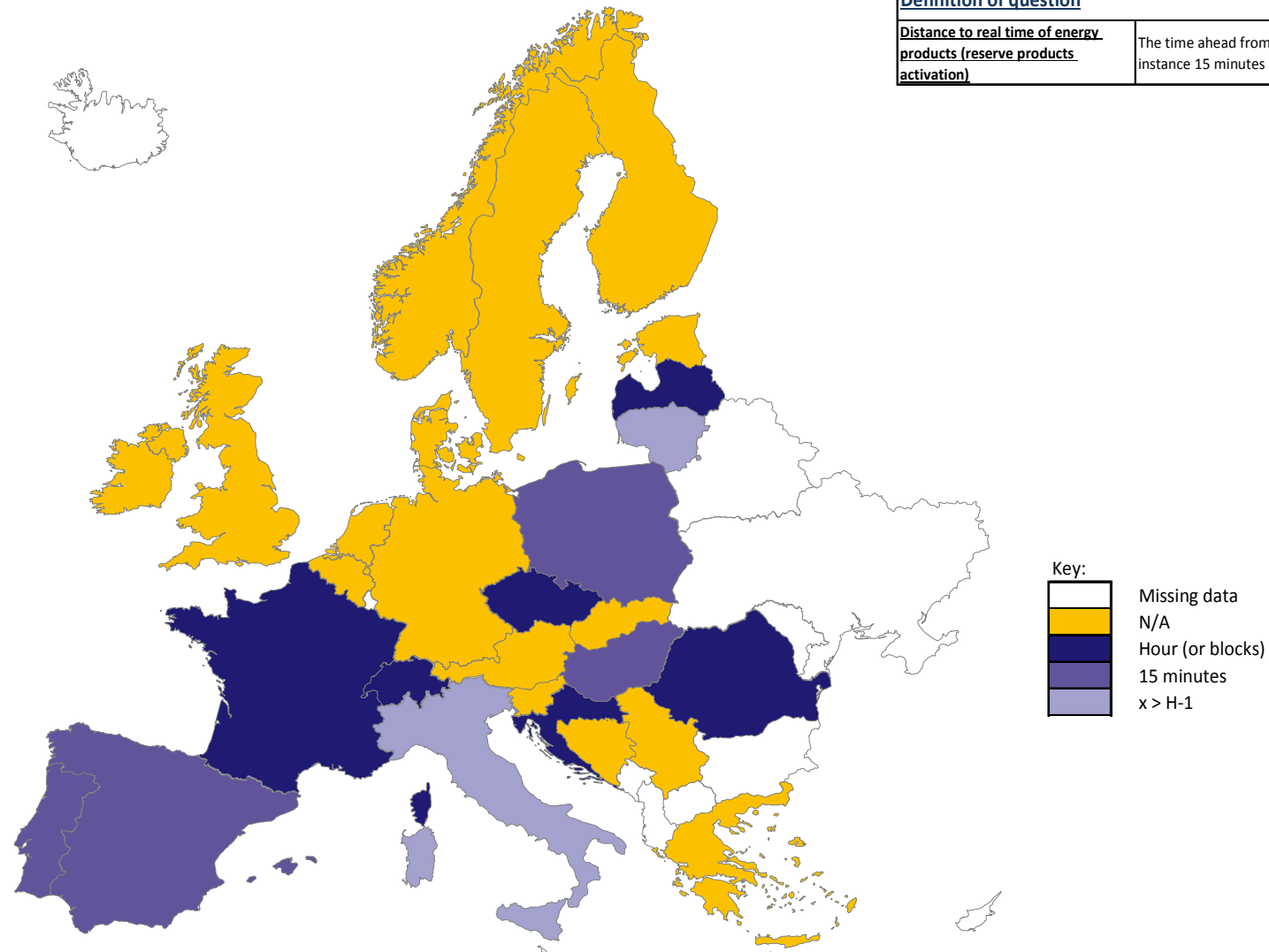
Missing data
N/A
Hour (or blocks)
30 minutes
15 minutes

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

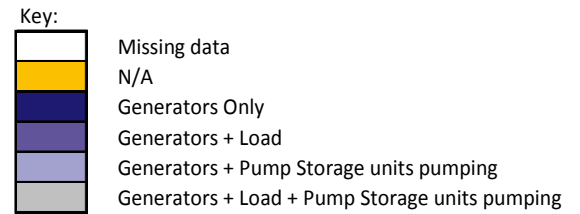
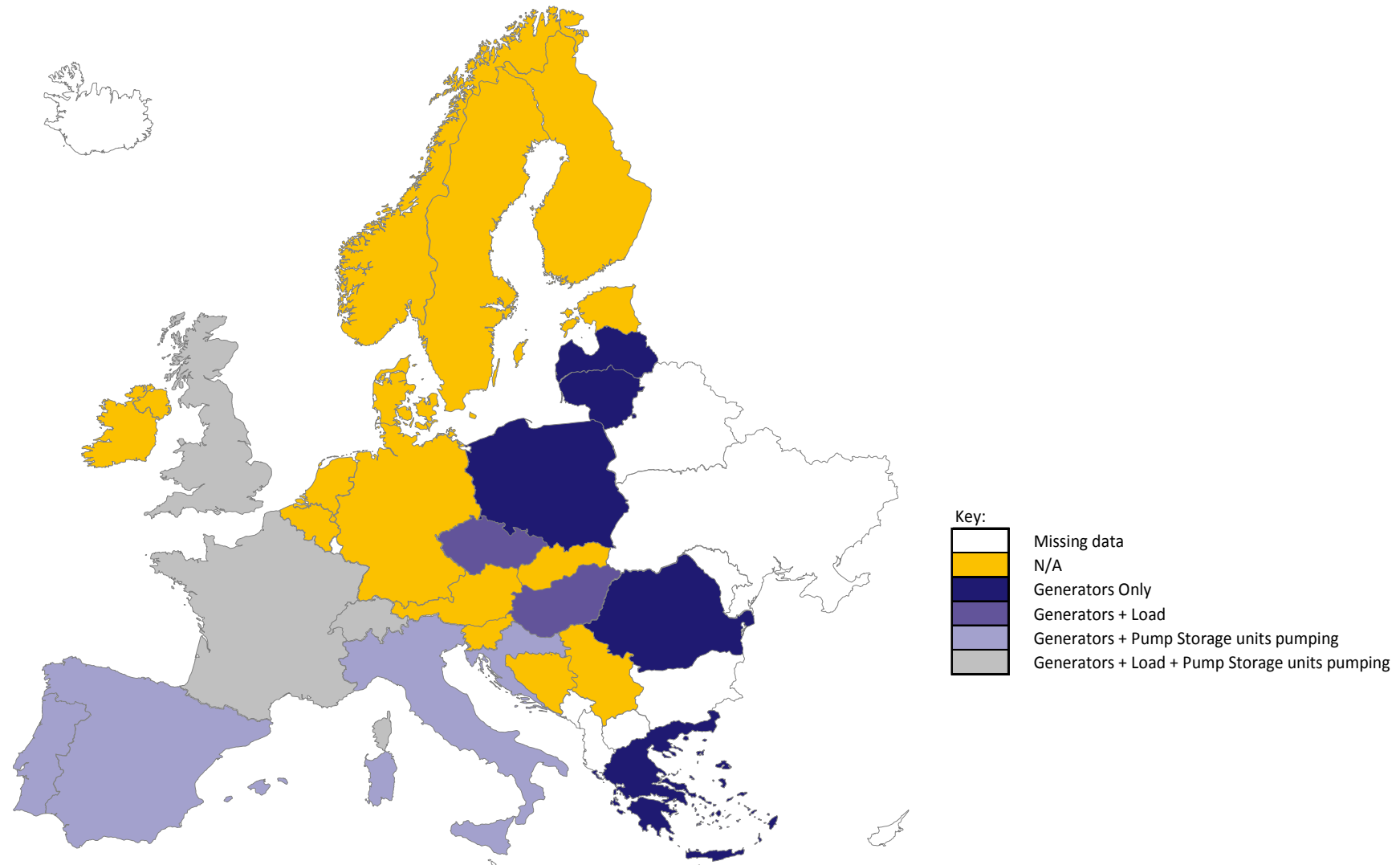
Definition of question

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

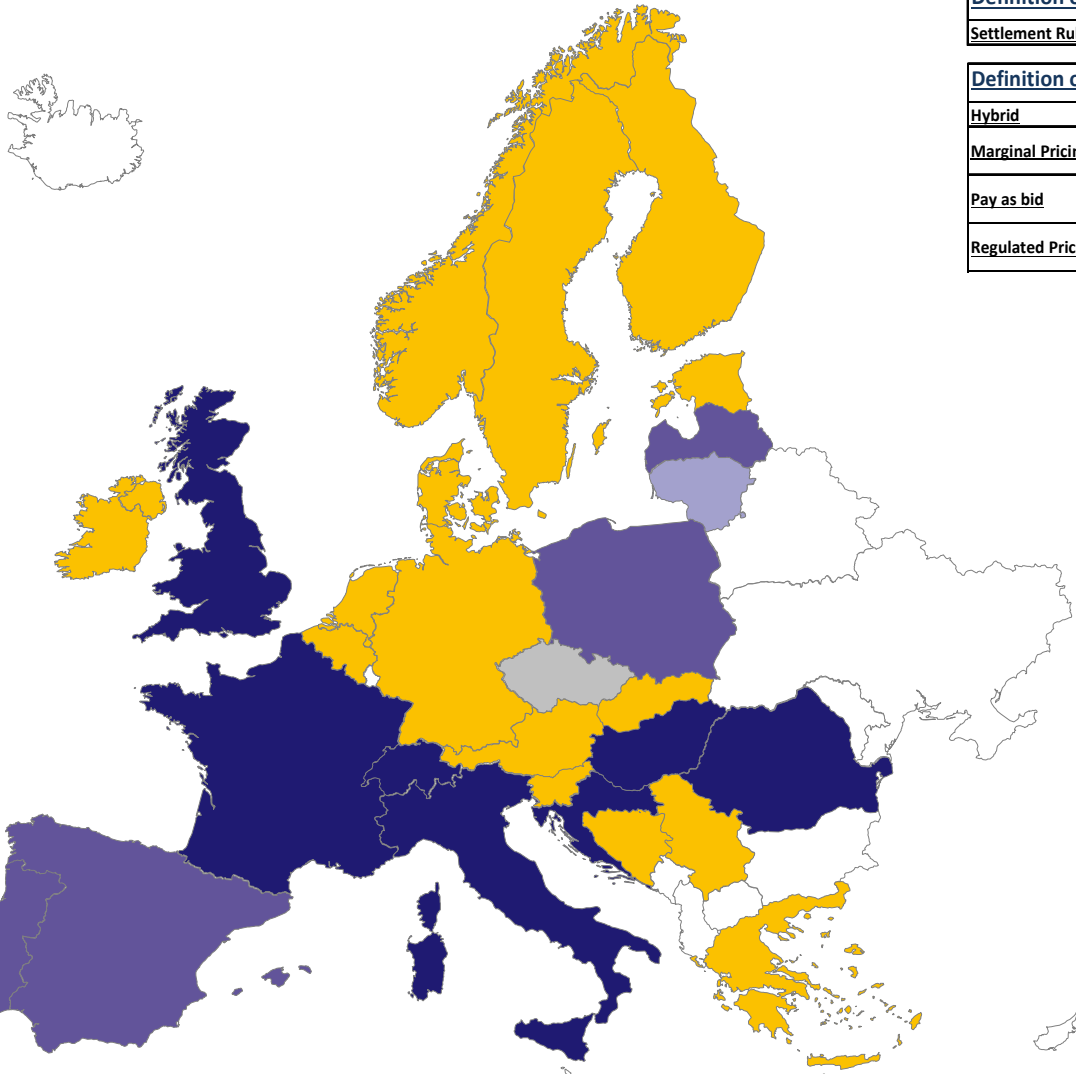
The time ahead from real time when TSO activates a given product (for instance 15 minutes in the case of mFRR/tertiary energy).



Replacement Reserve - Energy - Provider



Replacement Reserve - Energy - Settlement Rule

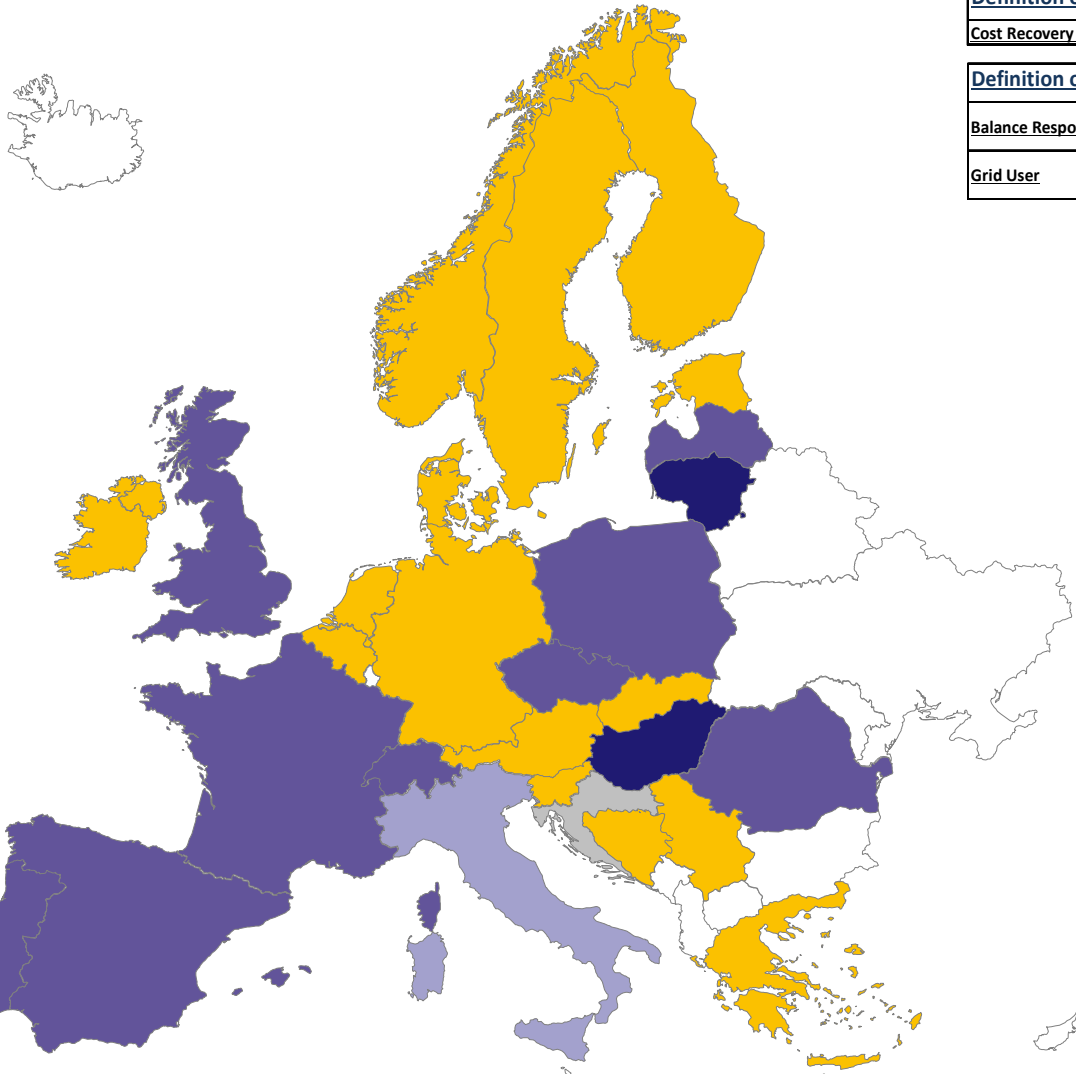


<u>Definition of question</u>	
<u>Settlement Rule</u>	The pricing rules for settlement.
<u>Definition of answer</u>	
<u>Hybrid</u>	Combination.
<u>Marginal Pricing</u>	Marginal pricing is the change in total cost that arises when the quantity produced changes by one unit.
<u>Pay as bid</u>	Contracted parties who provide a service are paid based on their offer price.
<u>Regulated Price</u>	Price for this service is based on a price that is set by the relevant regulatory authority.

Key:

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

Replacement Reserve - Energy - Cost Recovery Scheme

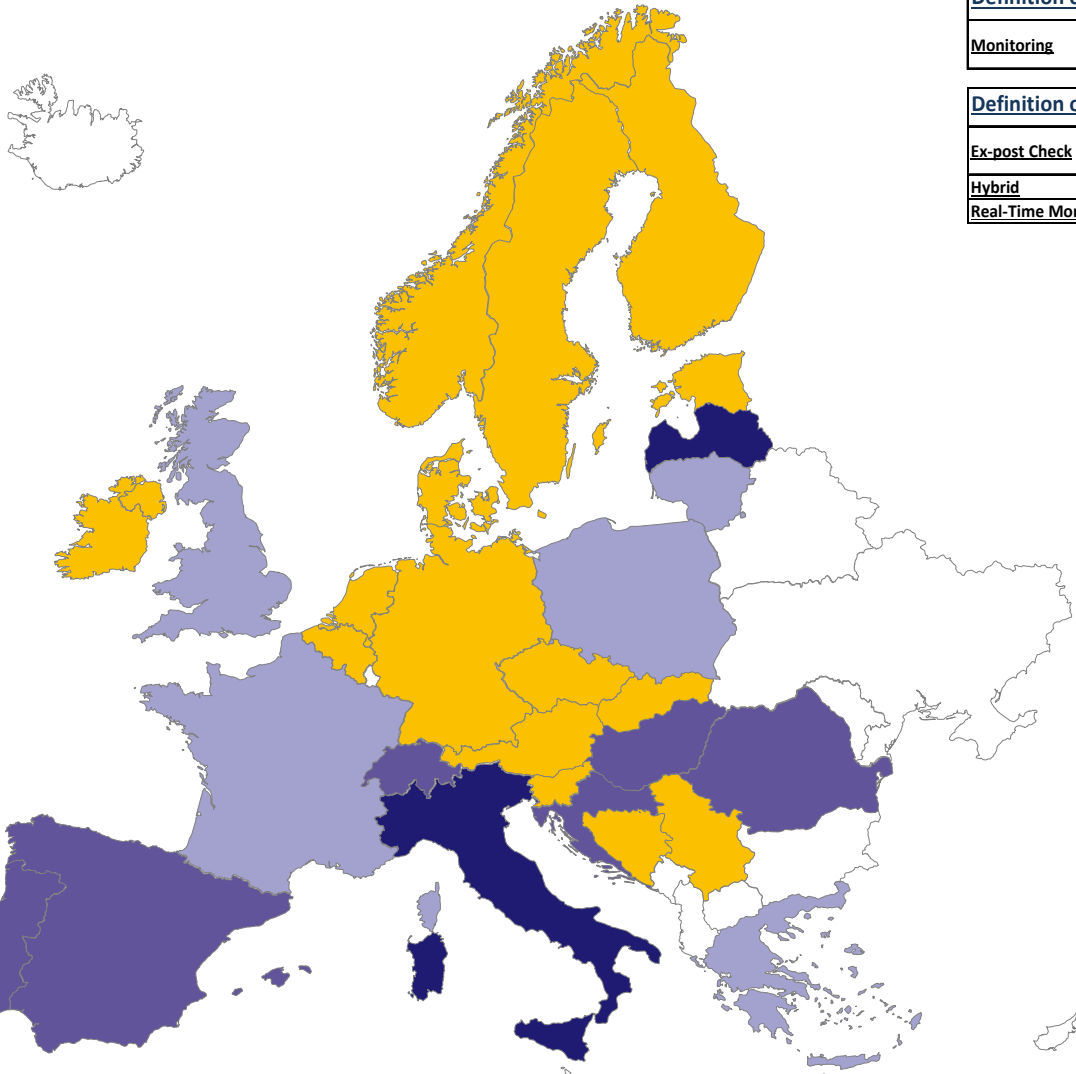


<u>Definition of question</u>	
Cost Recovery Scheme	From whom are the costs recovered.
<u>Definition of answer</u>	
Balance Responsible Party (BRP)	Balancing Responsible Party means a market participant or its chosen representative responsible for its Imbalances.
Grid User	The natural or legal person supplying to, or being supplied with active and/or reactive power by a TSO or DSO.

Key:

	Missing data
	N/A
	100% Grid Users
	100% BRP
	100% end consumers
	Mix of Grid Users and BRP

Replacement Reserve - Energy - Monitoring



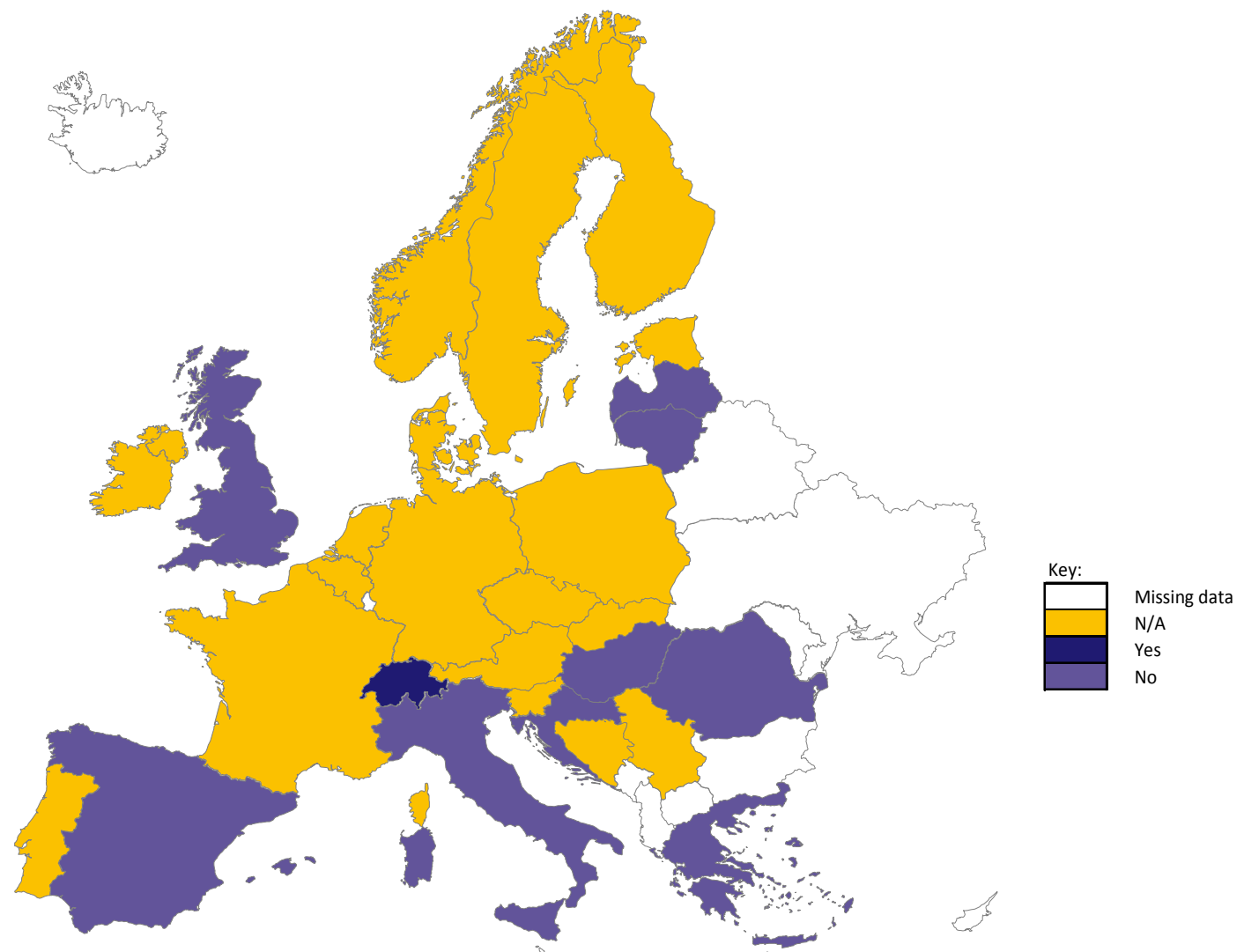
Definition of question	
Monitoring	Refers to the type of monitoring in place by the system operator to ensure performance of plant.

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

Key:

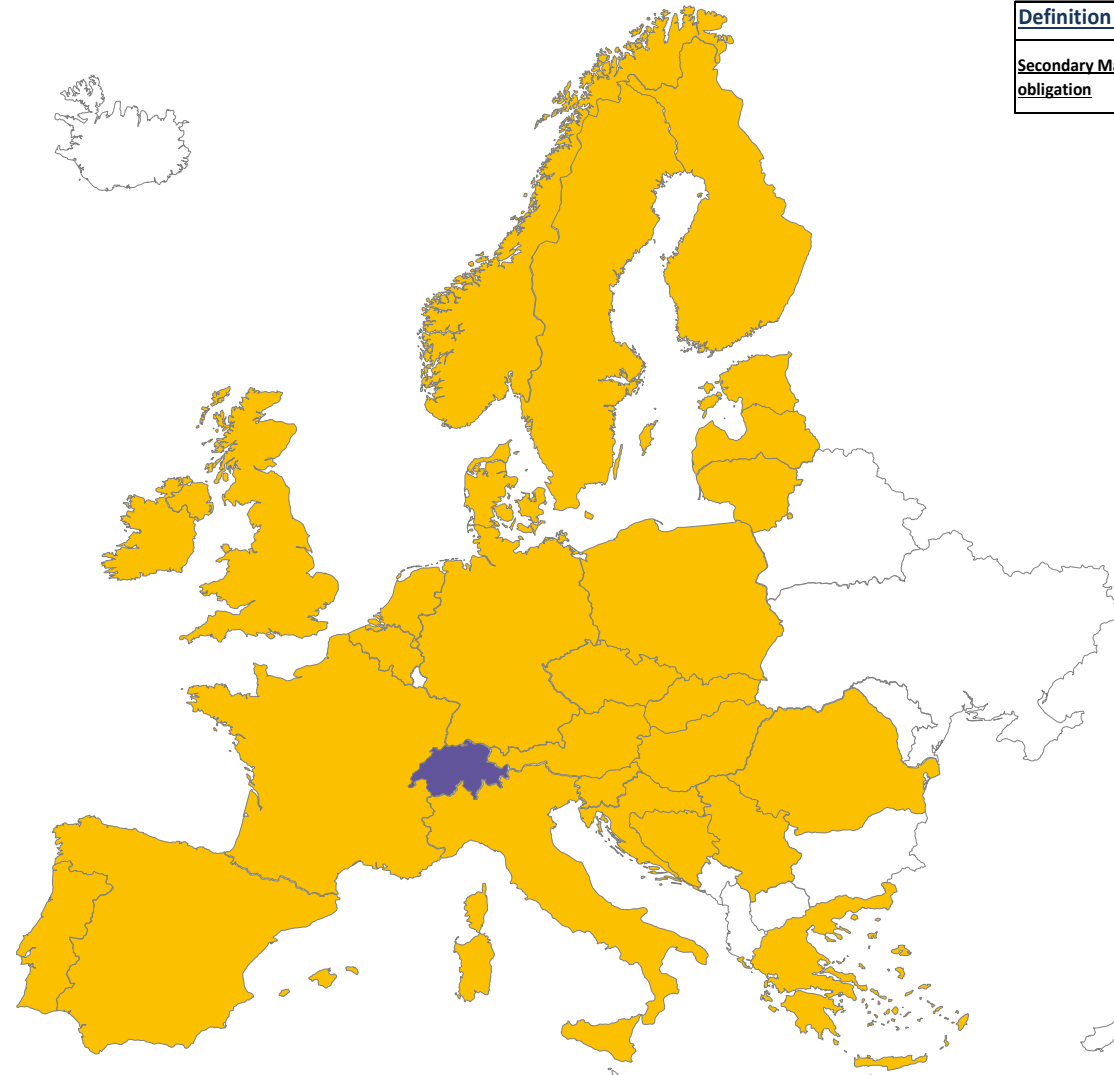
	Missing data
	N/A
	Real-Time Monitoring
	Ex-Post Check
	Hybrid

Replacement Reserve - Energy - Transfer of obligation allowed



Replacement Reserve - Energy - Obl. allowed, organised secondary market exists

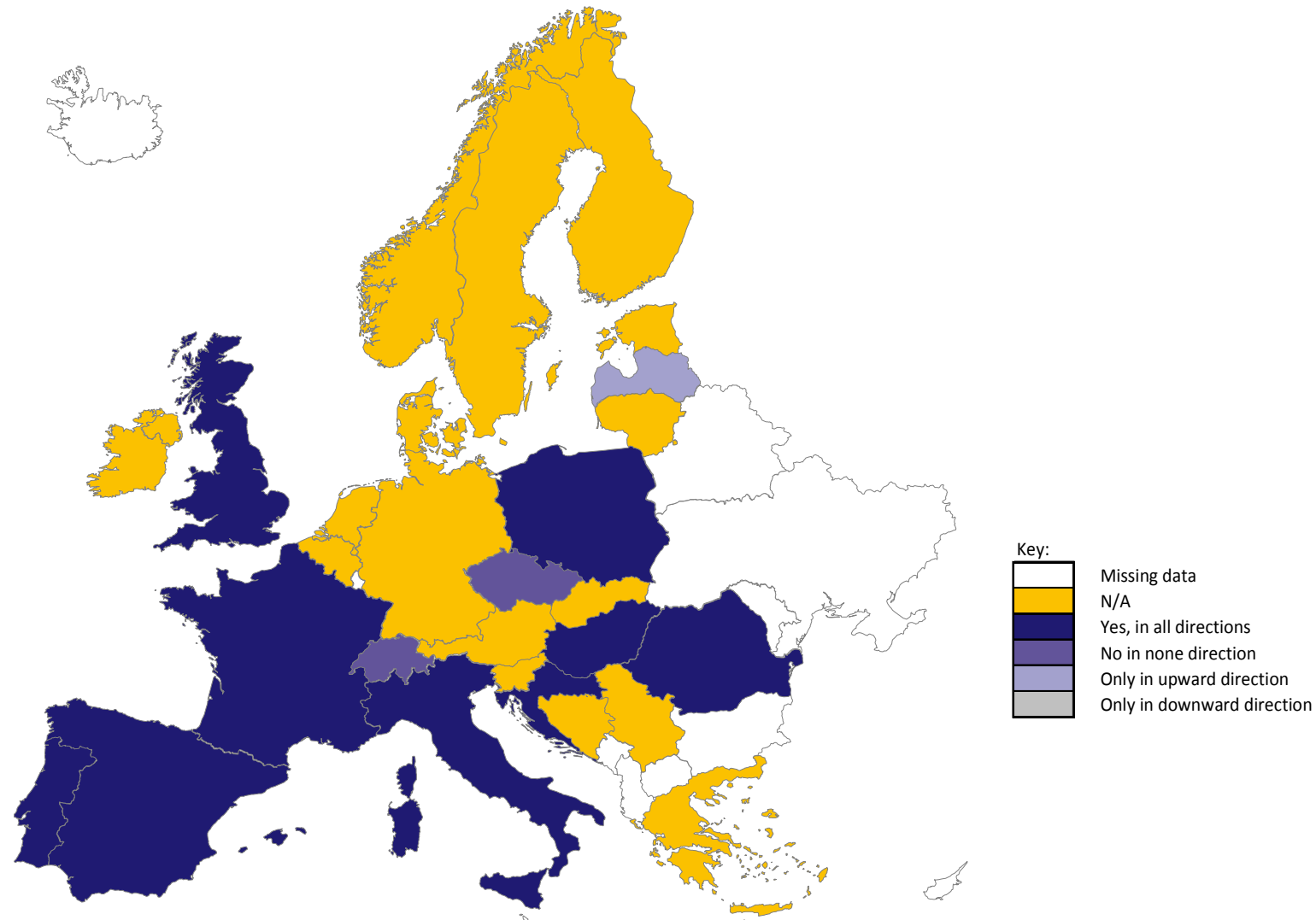
Definition of answer	
Secondary Market for reserve obligation	Trading procedure between the BSPs (where at least one BSP has contract with the TSO) to ensure the prescribed reserve amount of the TSO.



Key:

White	Missing data
Yellow	N/A
Dark Blue	Yes
Purple	No

Replacement Reserve - Energy - Partially activated product

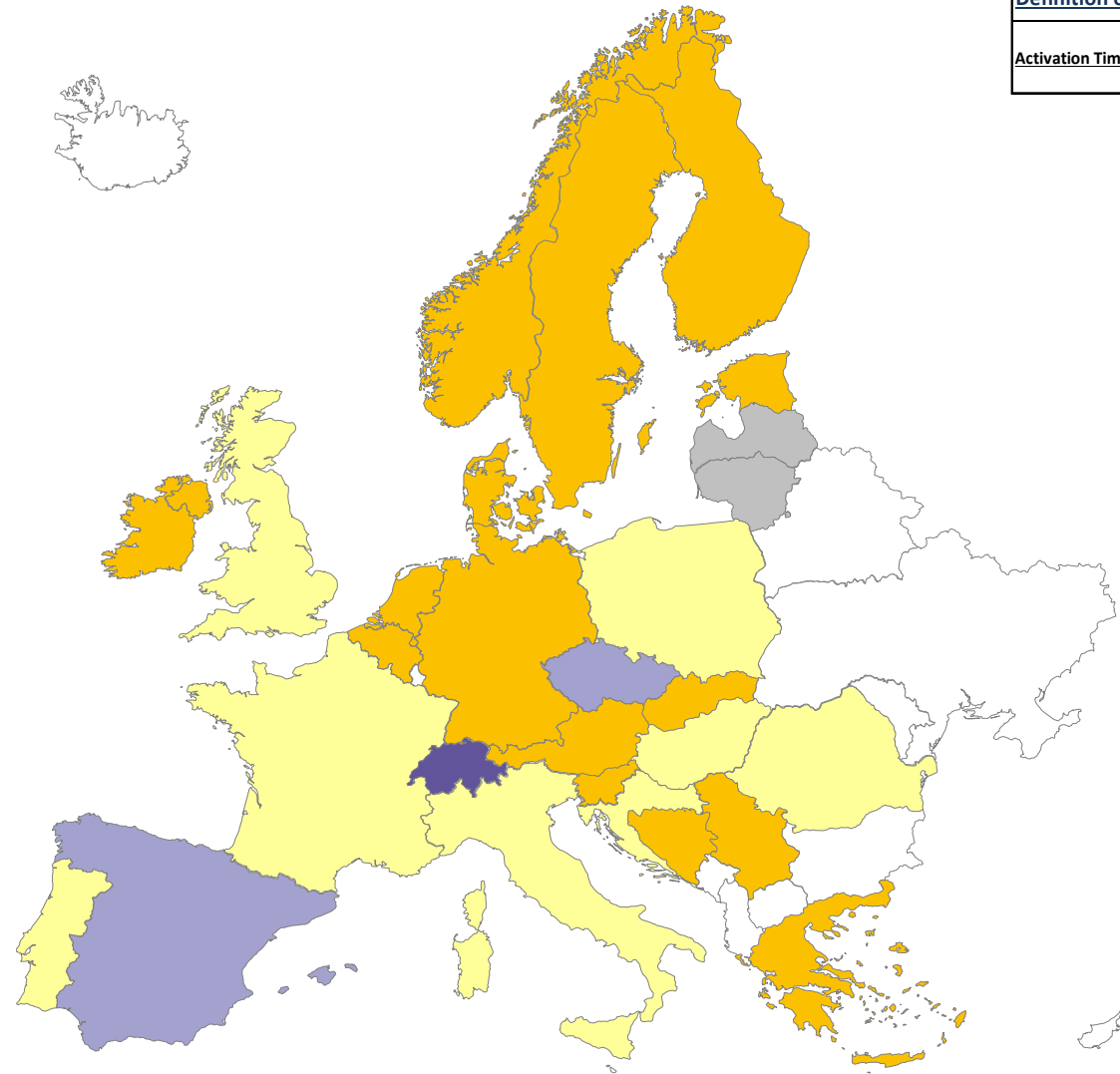


Replacement Reserve - Energy - Activation time of RR from 0 to max

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:

White	Missing data
Orange	N/A
Dark Blue	$x \leq 15$ min
Purple	$15\text{min} < x \leq 20$ min
Light Purple	$20\text{min} < x \leq 1$ hour
Grey	$x > 1$ hour
Yellow	Depends on the unit



Imbalance settlement

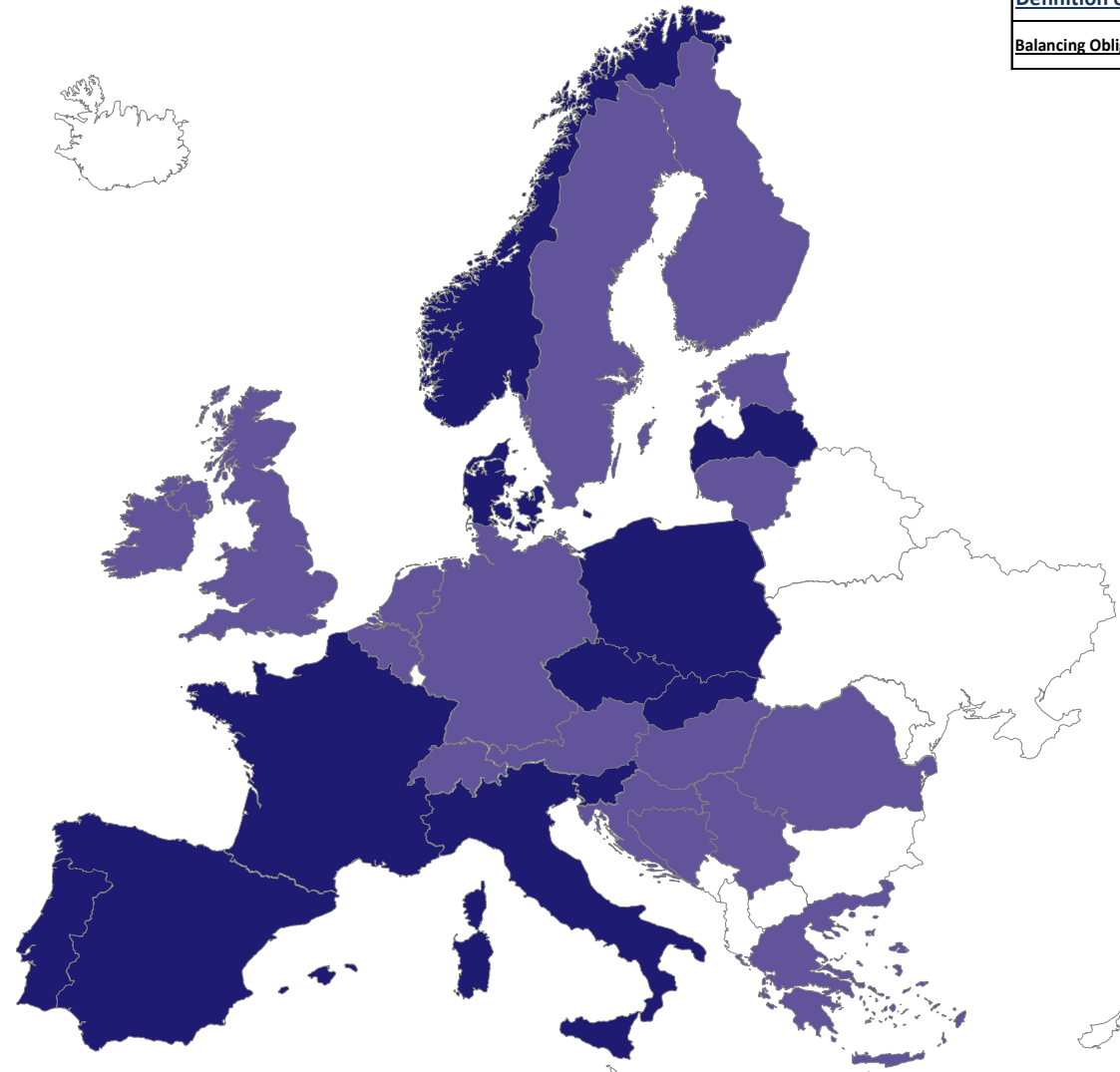
(Referring to questions of AS survey from IS1.0 to IS15.0)

Imbalance settlement - Nature of the Balancing Obligation

Definition of question

Balancing Obligation

Balancing obligation may apply, when the Balance Responsible Party makes imbalanced volume.



Key:



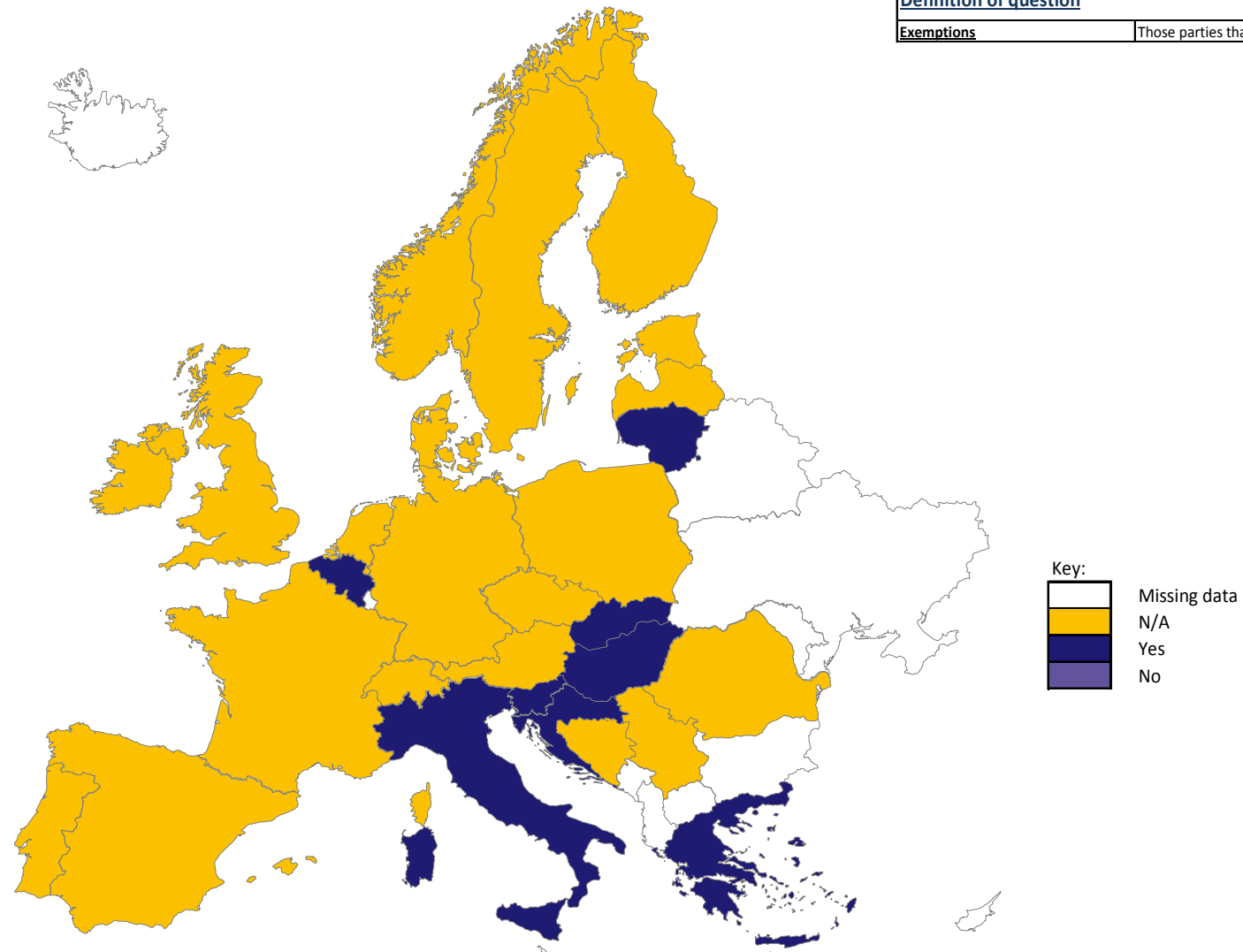
Missing data
N/A
Financial only
Legal+financial

Imbalance settlement - Exemptions for RES

Definition of question

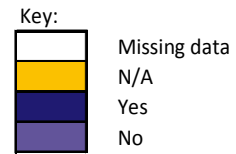
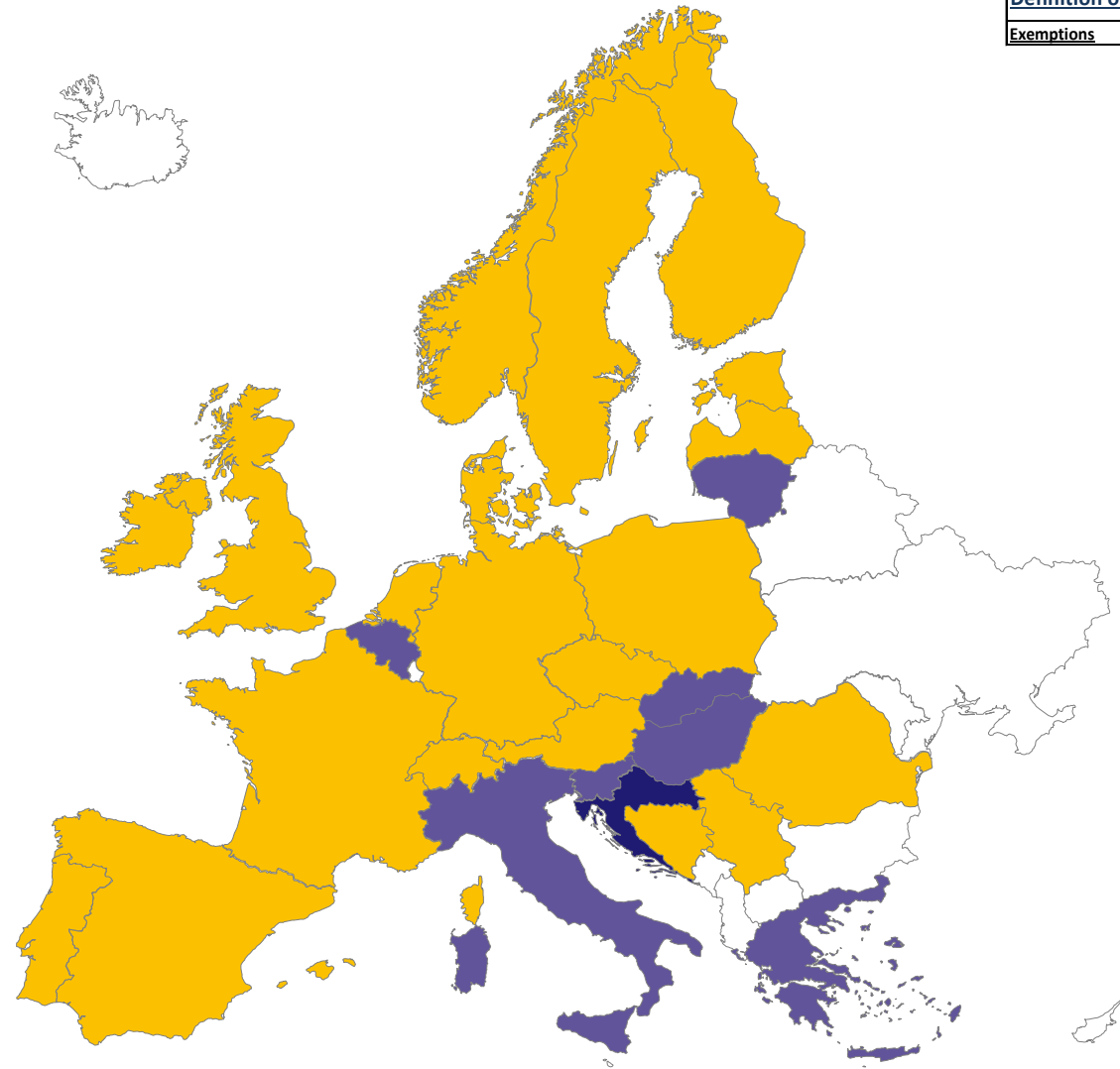
Exemptions

Those parties that do not have a balancing obligation.



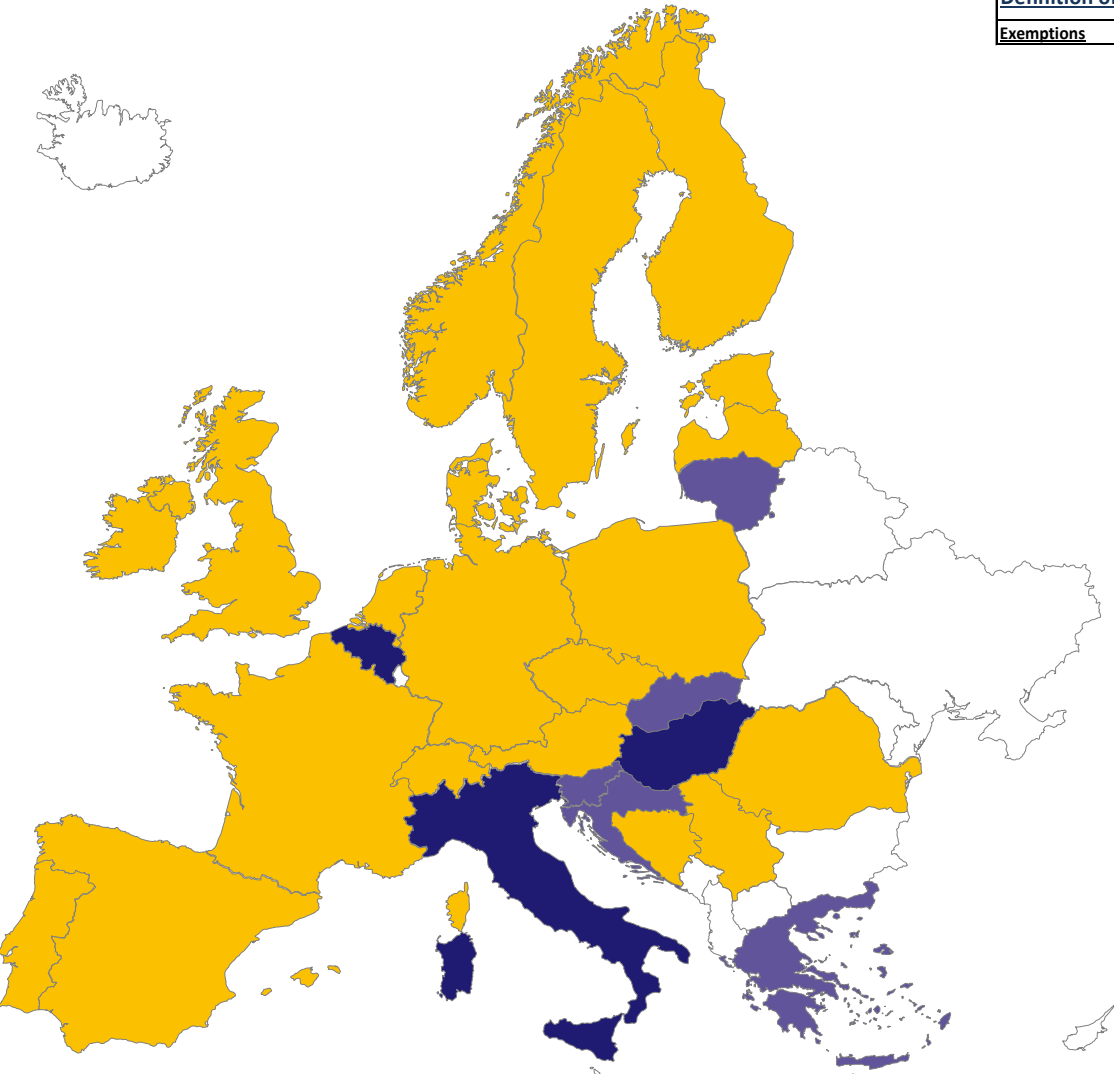
Imbalance settlement - Exemptions for Generators licensed for the AS market

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



Imbalance settlement - Exemptions for Other

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

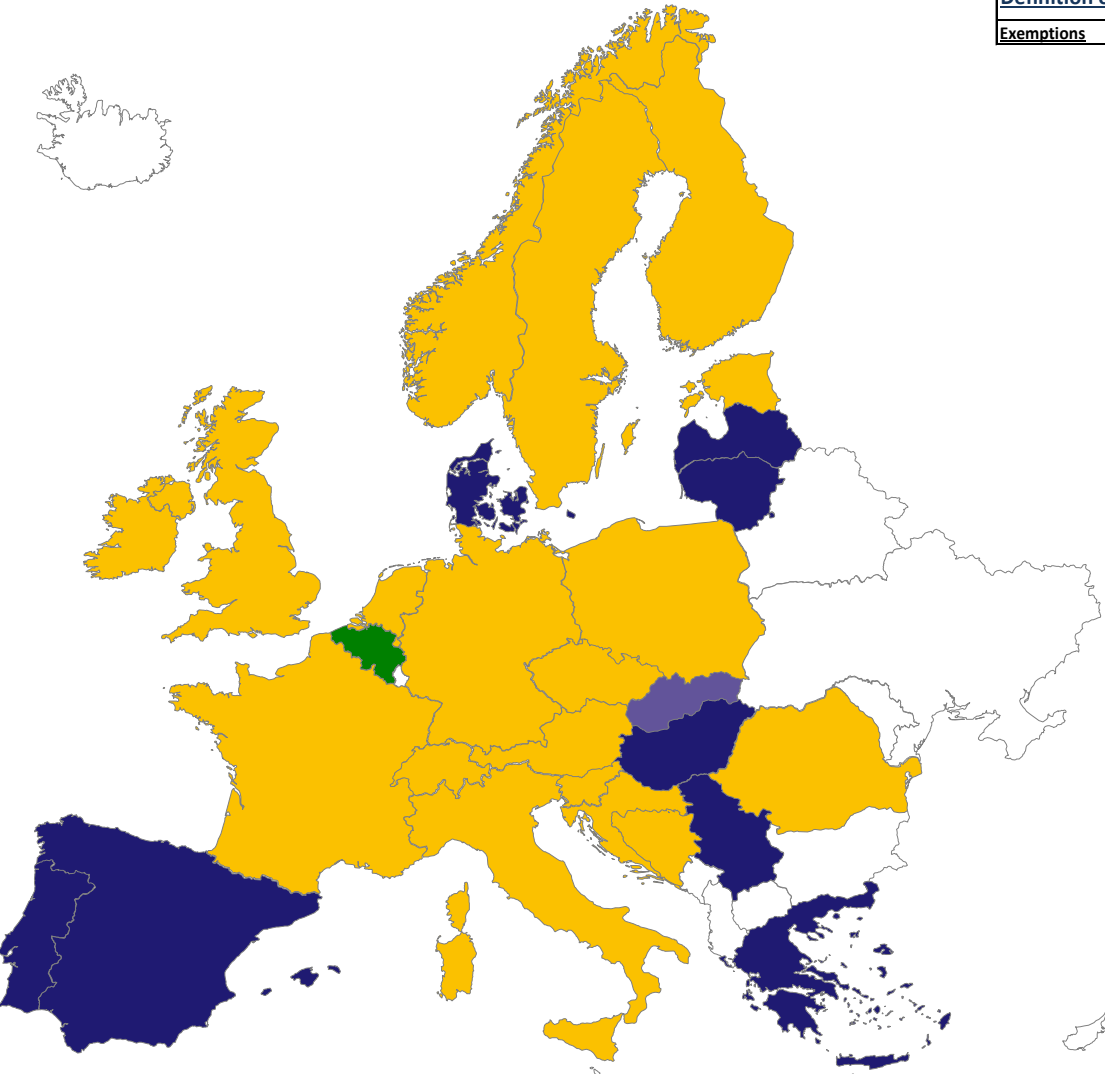


Key:

White	Missing data
Yellow	N/A
Dark Blue	Yes
Purple	No

Imbalance settlement - Limit to exemption

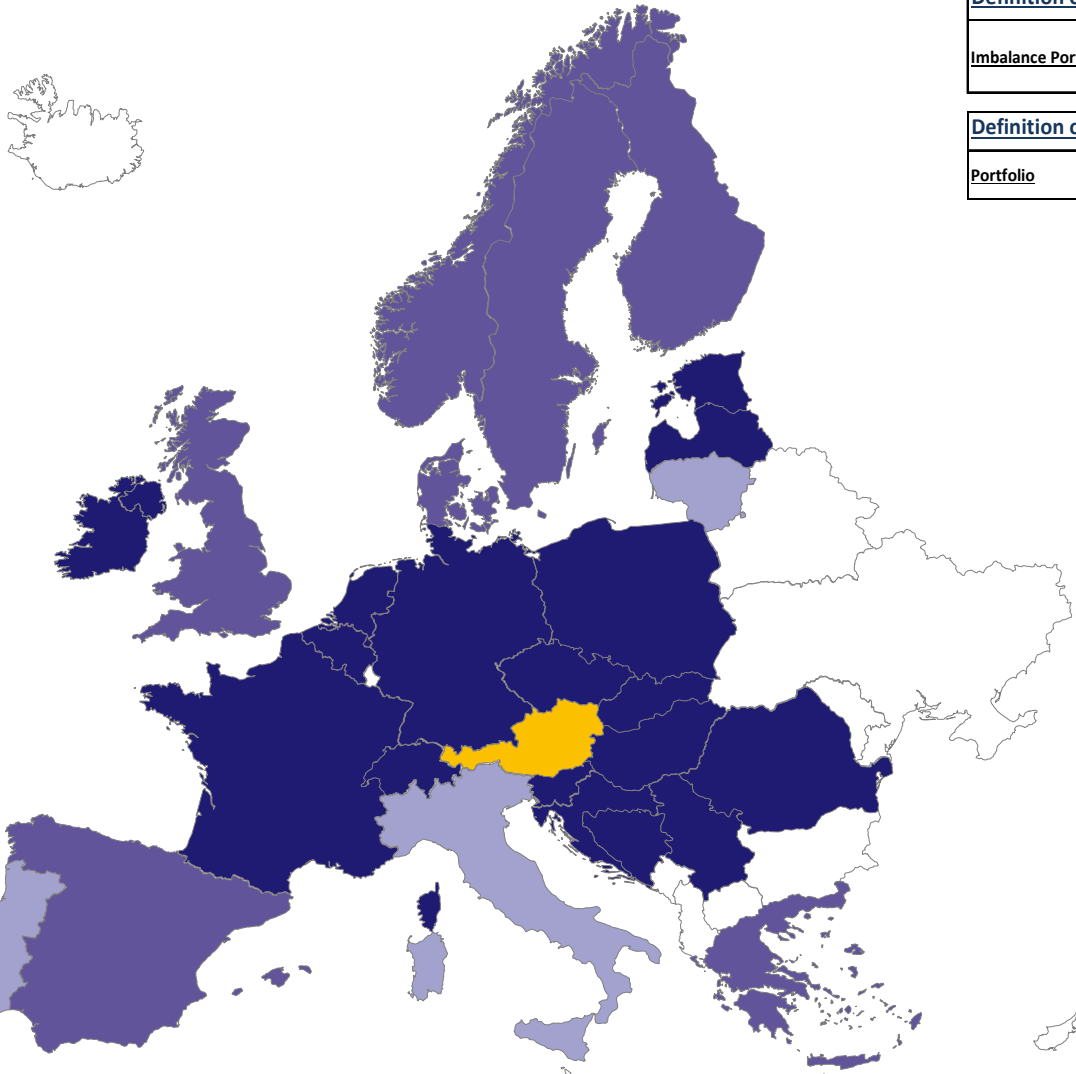
Definition of question	
Exemptions	Those parties that do not have a balancing obligation.



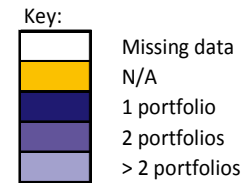
Key:

- Missing data
- N/A
- No
- $x \leq 1\text{MW}$
- $1\text{MW} < x \leq 5\text{MW}$
- $5\text{MW} < x \leq 10\text{MW}$
- $x > 10\text{MW}$
- Other
- % of nominations

Imbalance settlement - Number of Imbalance Portfolios



Definition of question	
Imbalance Portfolios	A fundamental property of local market design is the number of Imbalance Volumes to be calculated, attributed and charged to BRP's (Market) per settlement time unit.
Definition of answer	
Portfolio	A group of plant which could be a mix of generation, demand etc., which bid in aggregate into the relevant market.



Imbalance Settlement - If you have more than 2 portfolios, please, explain!



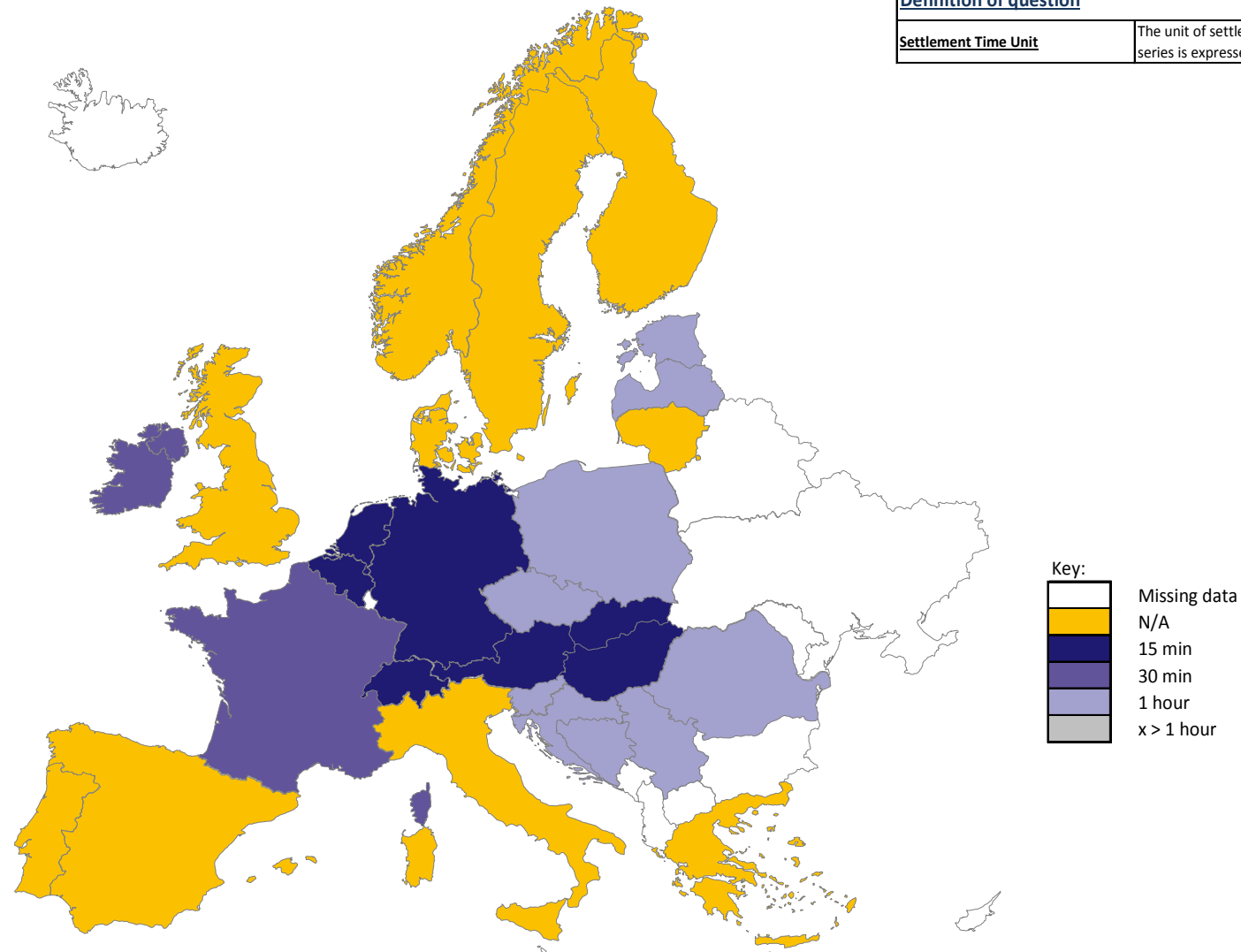
TSO	Answer
Litgrid	<ol style="list-style-type: none">1. Consumption portfolio2. Generation portfolio3. Cross border trade with 3rd countries portfolio.
REN	For generator the imbalance is calculated by imbalance area. A market player can have more than one imbalance area.
Terna	In Italy we calculate an imbalance volume for each unit.

Imbalance settlement - Settlement Time Unit - If 1 volume

Definition of question

Settlement Time Unit

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

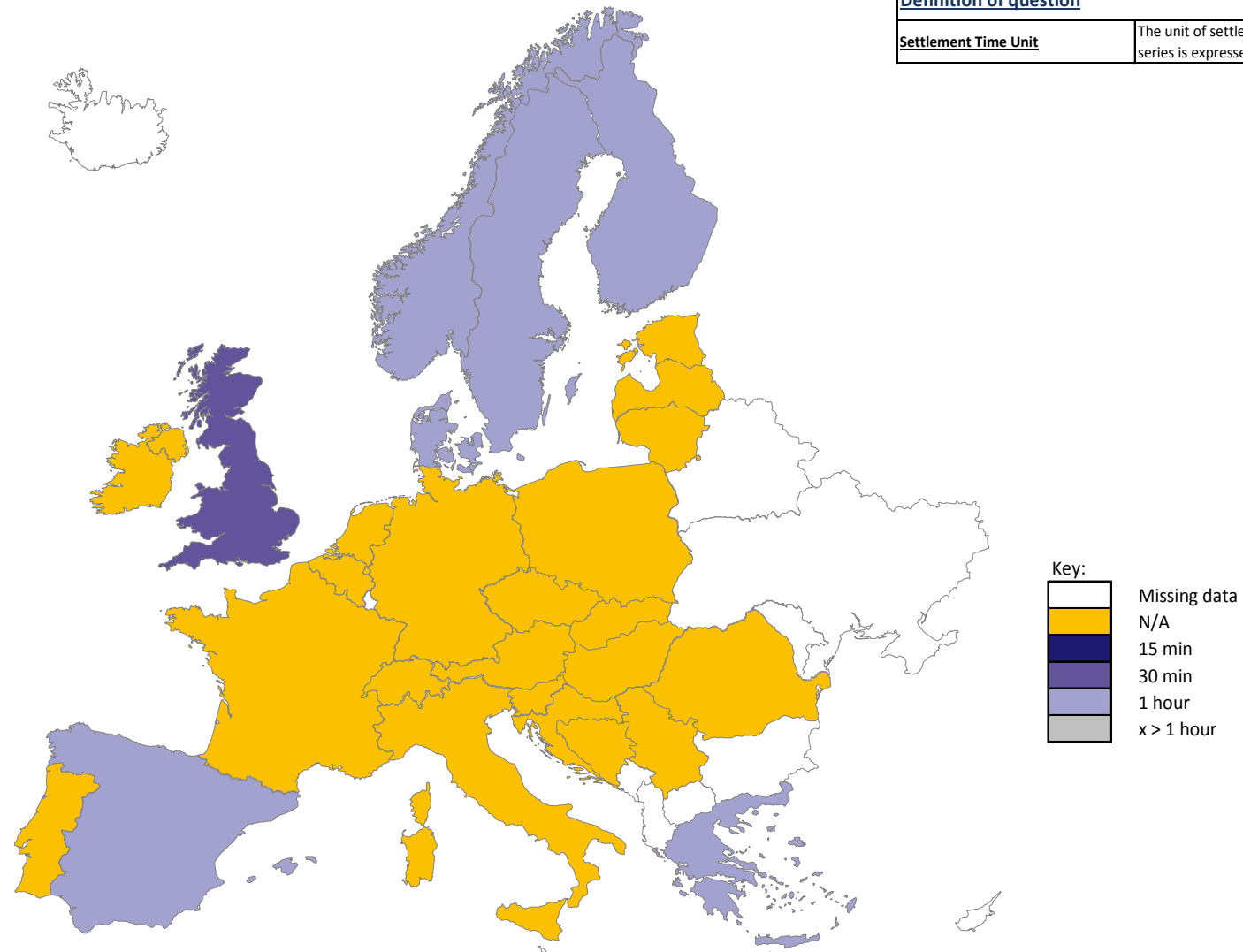


Imbalance settlement - Settlement Time Unit - If 2 volumes - Generation

Definition of question

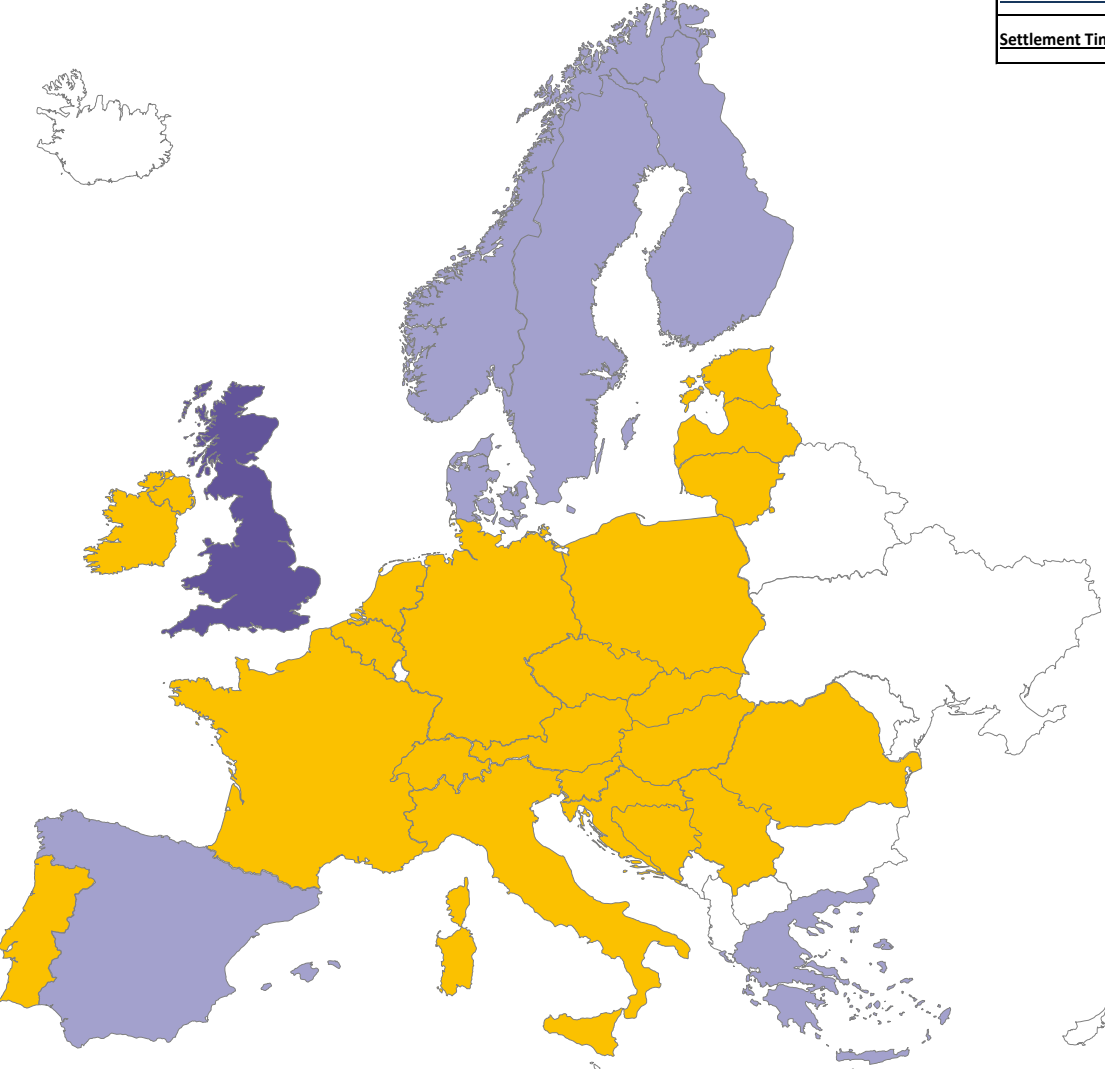
Settlement Time Unit

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

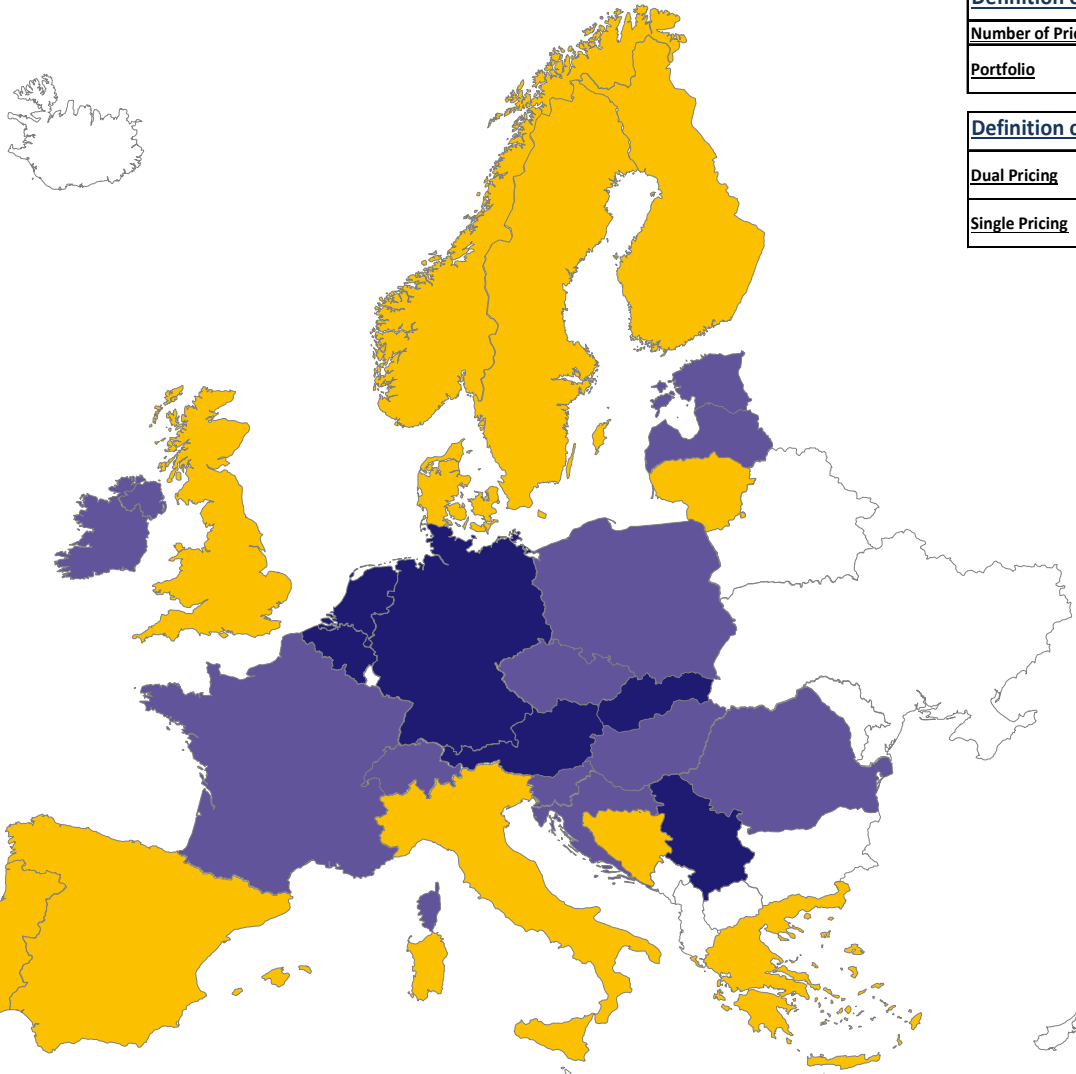


Imbalance settlement - Settlement Time Unit - If 2 volumes - Consumption

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



Imbalance settlement - Number of Prices - If 1 portfolio



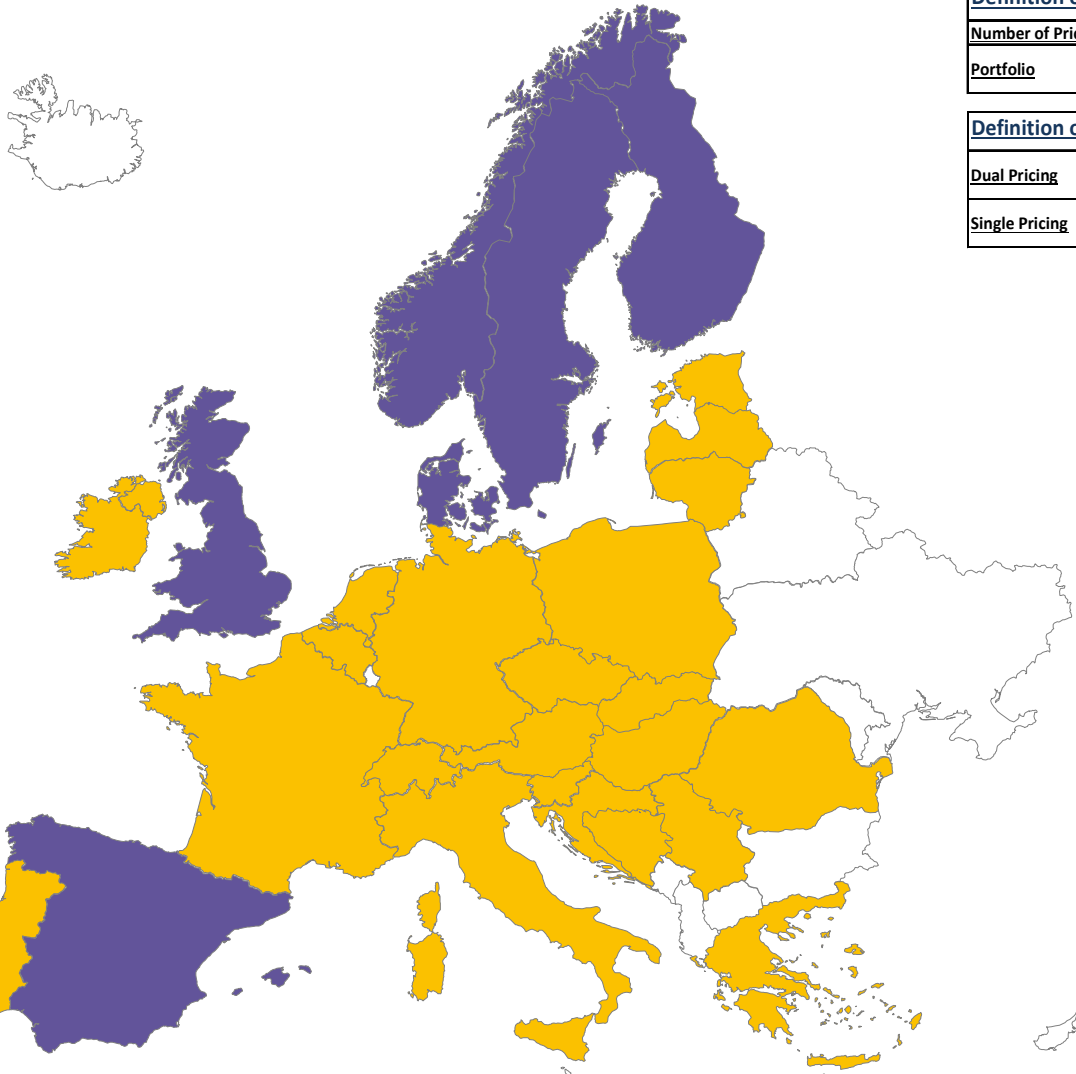
<u>Definition of question</u>	
Number of Prices	Number of prices which are owed by the portfolio(s).
Portfolio	A group of plant which could be a mix of generation, demand etc., which bid in aggregate into the relevant market.

<u>Definition of answer</u>	
Dual Pricing	Prices dependent on deviation direction of specific BRP type and deviation direction of System or Control Area Imbalance.
Single Pricing	Price independent from deviation direction, one side pays, the other gets paid.

Key:

	Missing data
	N/A
	Single Pricing
	Dual Pricing

Imbalance settlement - Number of Prices - If 2 portfolios - Generation

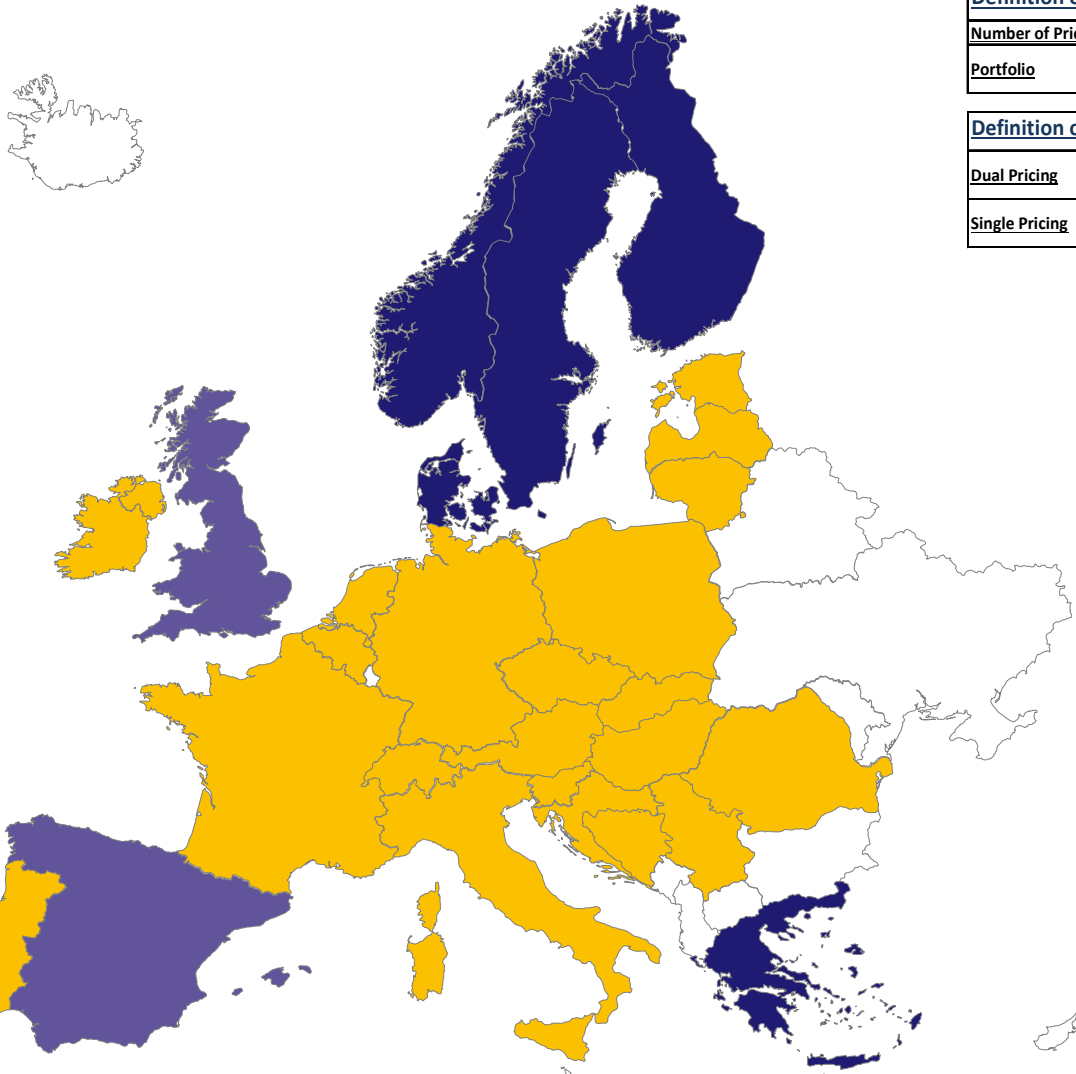


<u>Definition of question</u>	
Number of Prices	Number of prices which are owed by the portfolio(s).
Portfolio	A group of plant which could be a mix of generation, demand etc., which bid in aggregate into the relevant market.
<u>Definition of answer</u>	
Dual Pricing	Prices dependent on deviation direction of specific BRP type and deviation direction of System or Control Area Imbalance.
Single Pricing	Price independent from deviation direction, one side pays, the other gets paid.

Key:

	Missing data
	N/A
	Single Pricing
	Dual Pricing
	Other

Imbalance settlement - Number of Prices - If 2 portfolios - Consumption



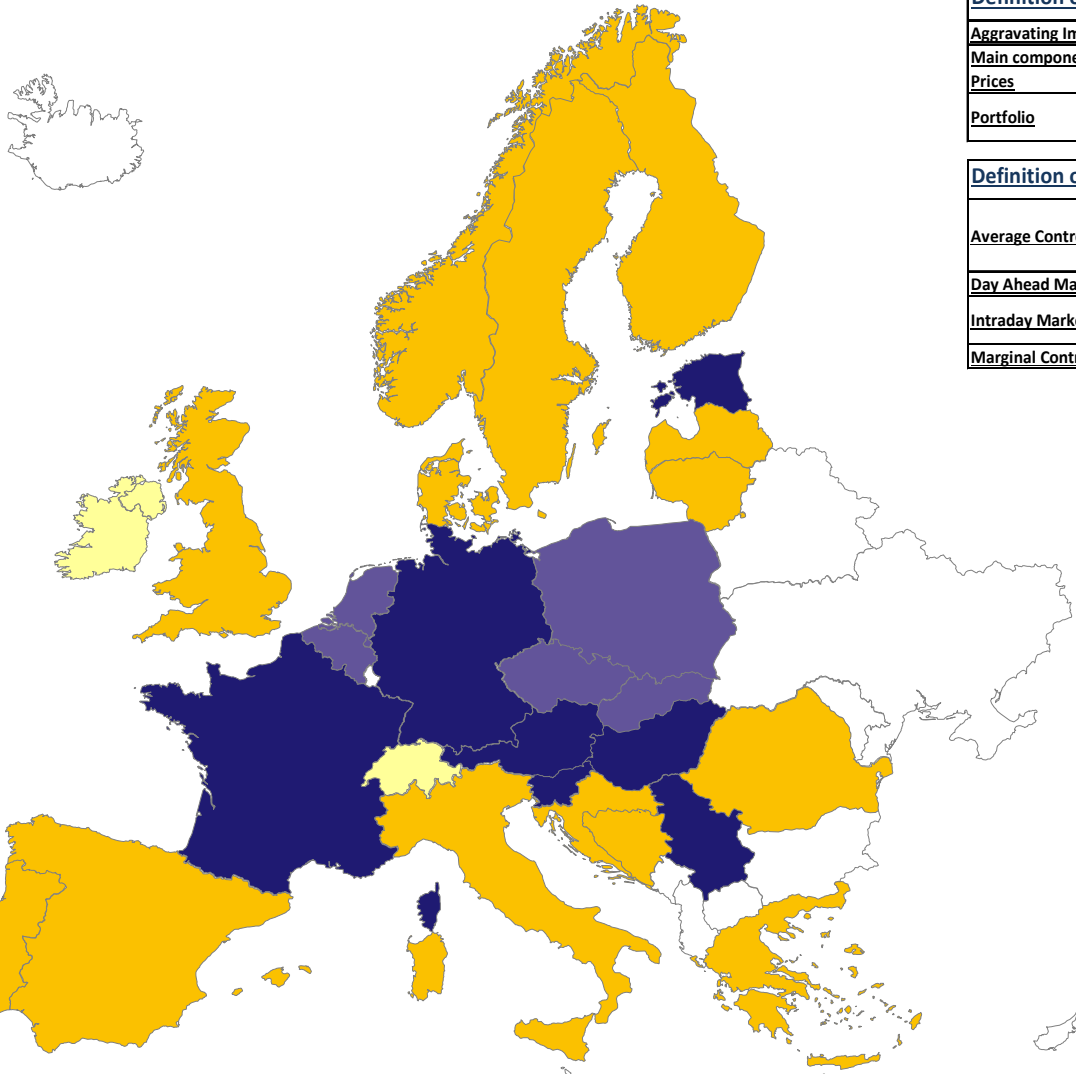
<u>Definition of question</u>	
Number of Prices	Number of prices which are owed by the portfolio(s).
Portfolio	A group of plant which could be a mix of generation, demand etc., which bid in aggregate into the relevant market.

<u>Definition of answer</u>	
Dual Pricing	Prices dependent on deviation direction of specific BRP type and deviation direction of System or Control Area Imbalance.
Single Pricing	Price independent from deviation direction, one side pays, the other gets paid.

Key:

	Missing data
	N/A
	Single Pricing
	Dual Pricing
	Other

Imbalance settlement - Main comp. of Imb. Prices - If 1 portfolio - Aggravating imb.



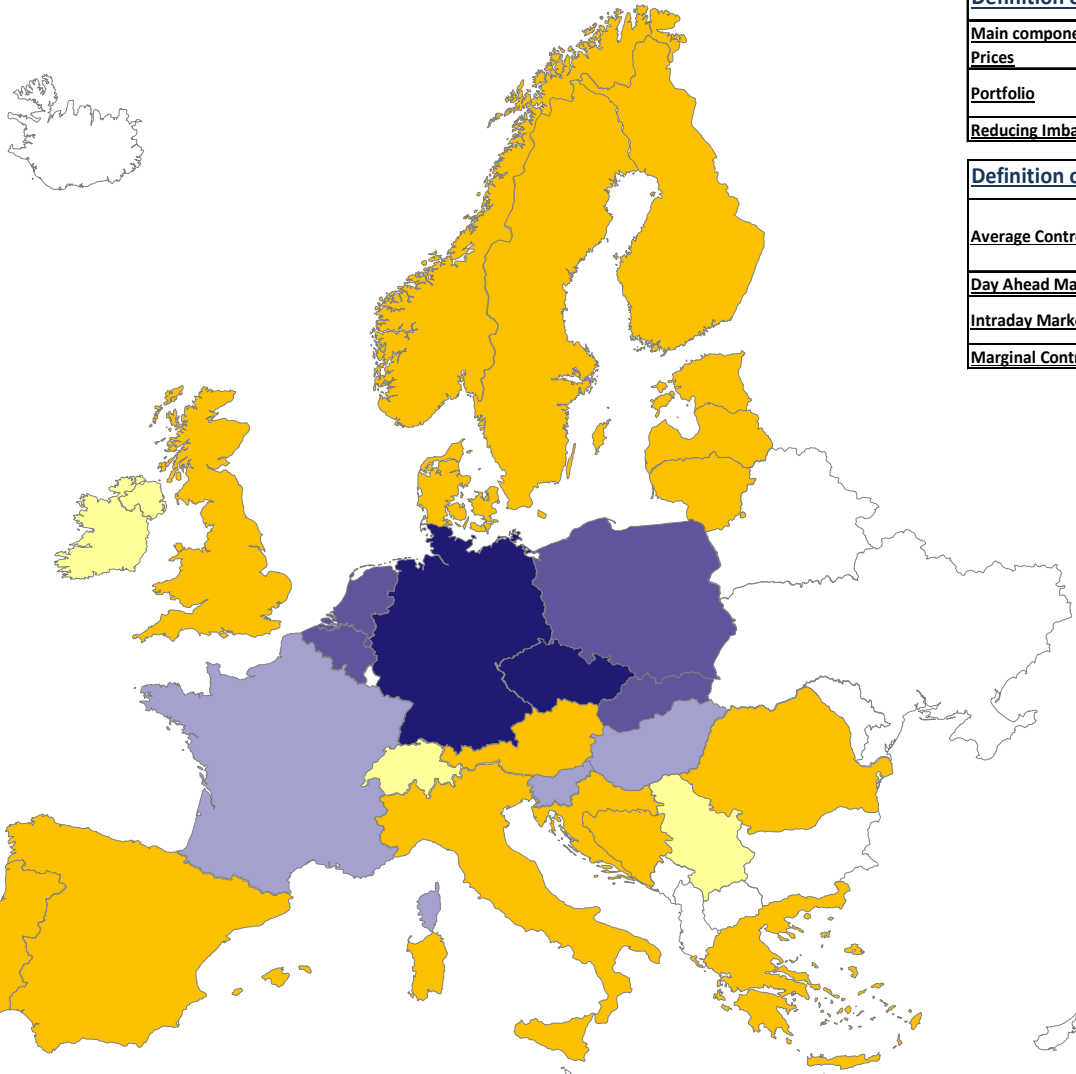
<u>Definition of question</u>	
Aggravating Imbalance	Imbalance volumes are increasing.
Main component of Imbalance Prices	The component that determines imbalance charges most of the time.
Portfolio	A group of plant which could be a mix of generation, demand etc., which bid in aggregate into the relevant market.

<u>Definition of answer</u>	
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 portfolio - Reducing imb.

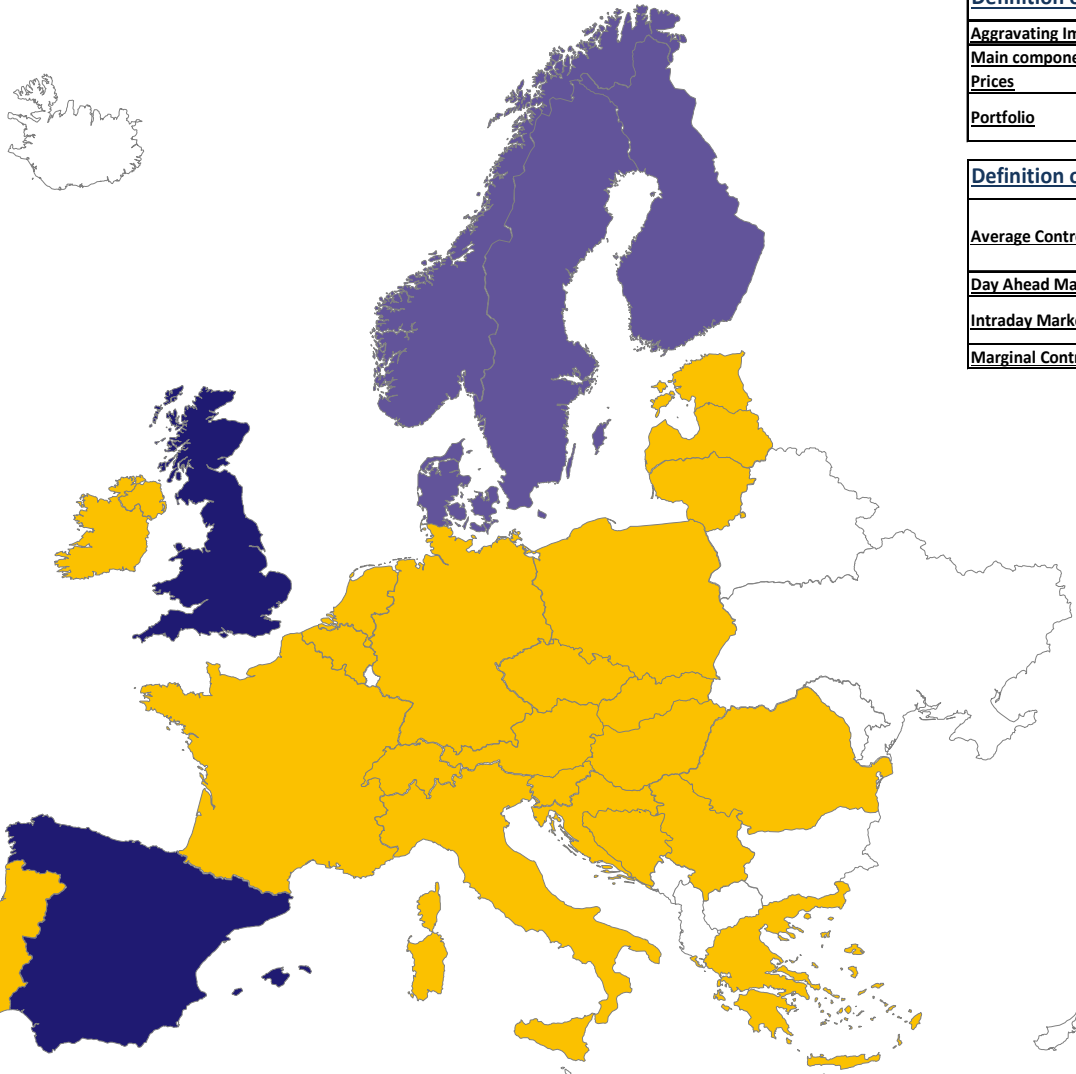


<u>Definition of question</u>	
<u>Main component of Imbalance Prices</u>	The component that determines imbalance charges most of the time.
<u>Portfolio</u>	A group of plant which could be a mix of generation, demand etc., which bid in aggregate into the relevant market.
<u>Reducing Imbalance</u>	Imbalance volumes are decreasing.

<u>Definition of answer</u>	
<u>Average Control Energy Price</u>	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.
<u>Day Ahead Market Price</u>	Price which evolved on the day ahead market.
<u>Intraday Market Price</u>	The price of the market within regular business hours, short-term prices.
<u>Marginal Control Energy Price</u>	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 portfolios - For generation "aggravating imb."



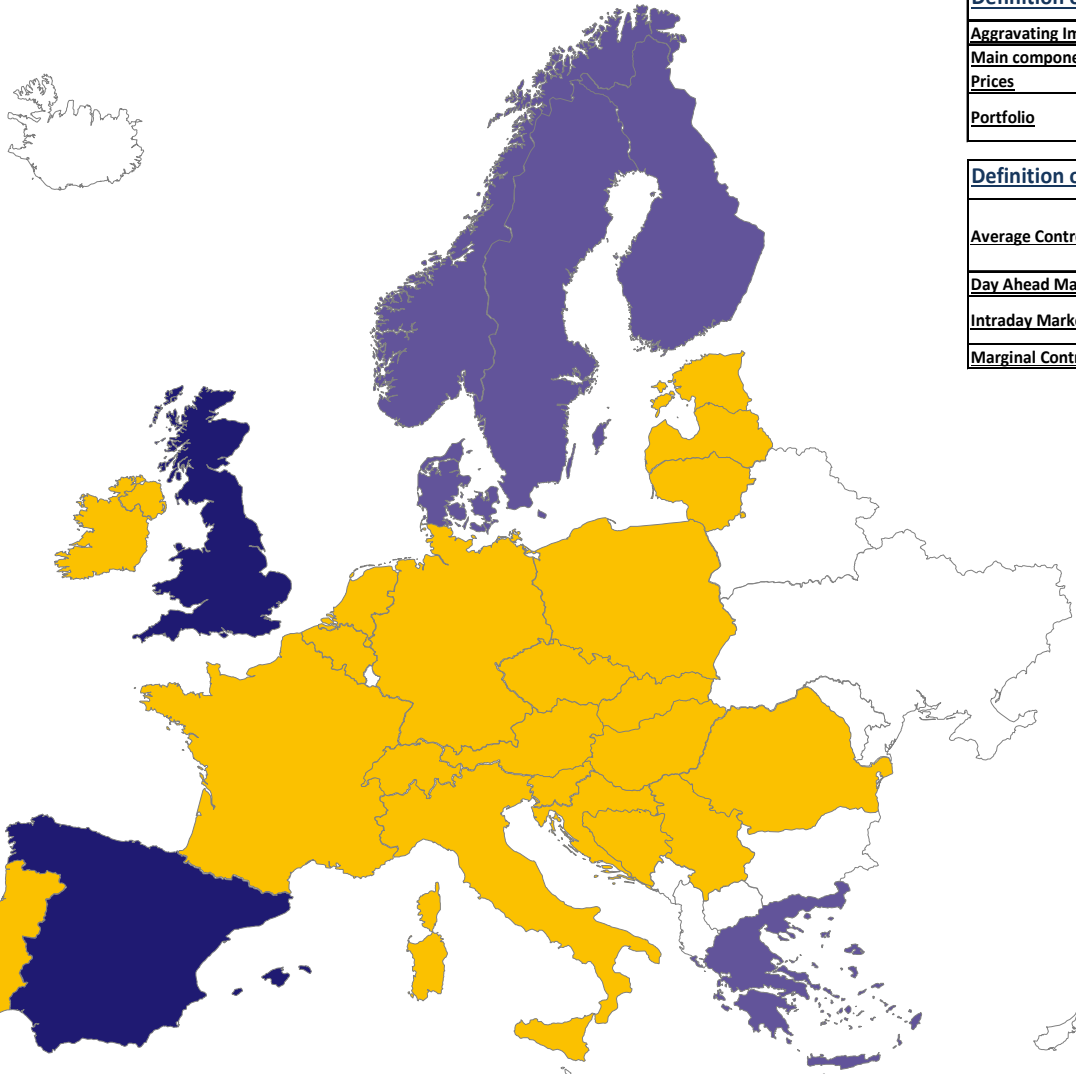
<u>Definition of question</u>	
Aggravating Imbalance	Imbalance volumes are increasing.
Main component of Imbalance Prices	The component that determines imbalance charges most of the time.
Portfolio	A group of plant which could be a mix of generation, demand etc., which bid in aggregate into the relevant market.

<u>Definition of answer</u>	
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 portfolios - For consumption "aggravating imb."



<u>Definition of question</u>	
Aggravating Imbalance	Imbalance volumes are increasing.
Main component of Imbalance Prices	The component that determines imbalance charges most of the time.
Portfolio	A group of plant which could be a mix of generation, demand etc., which bid in aggregate into the relevant market.

<u>Definition of answer</u>	
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.

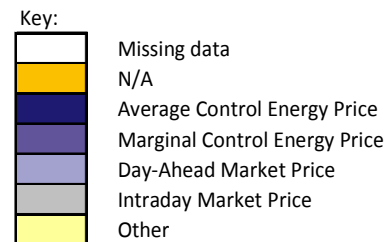
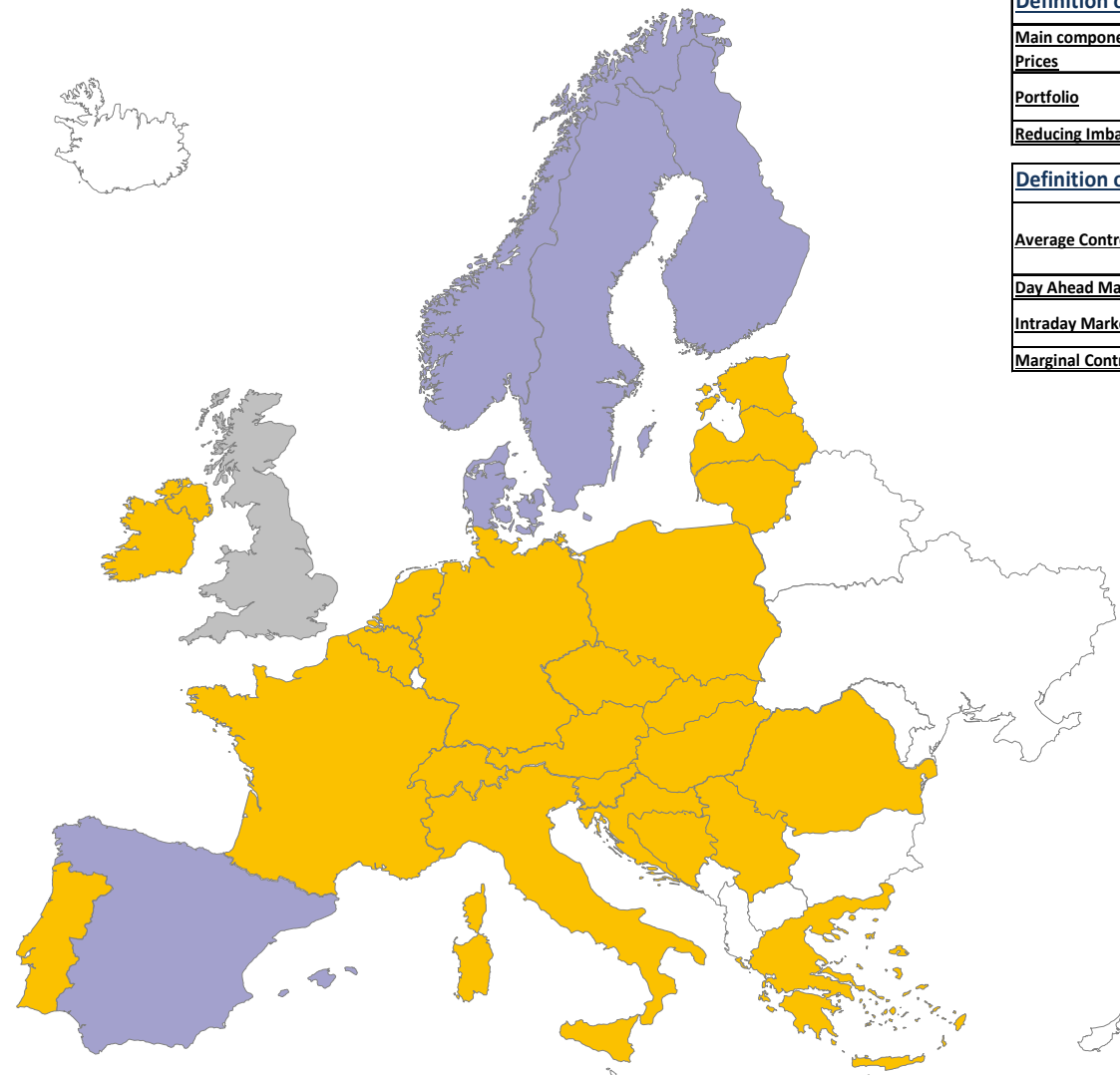
Key:

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

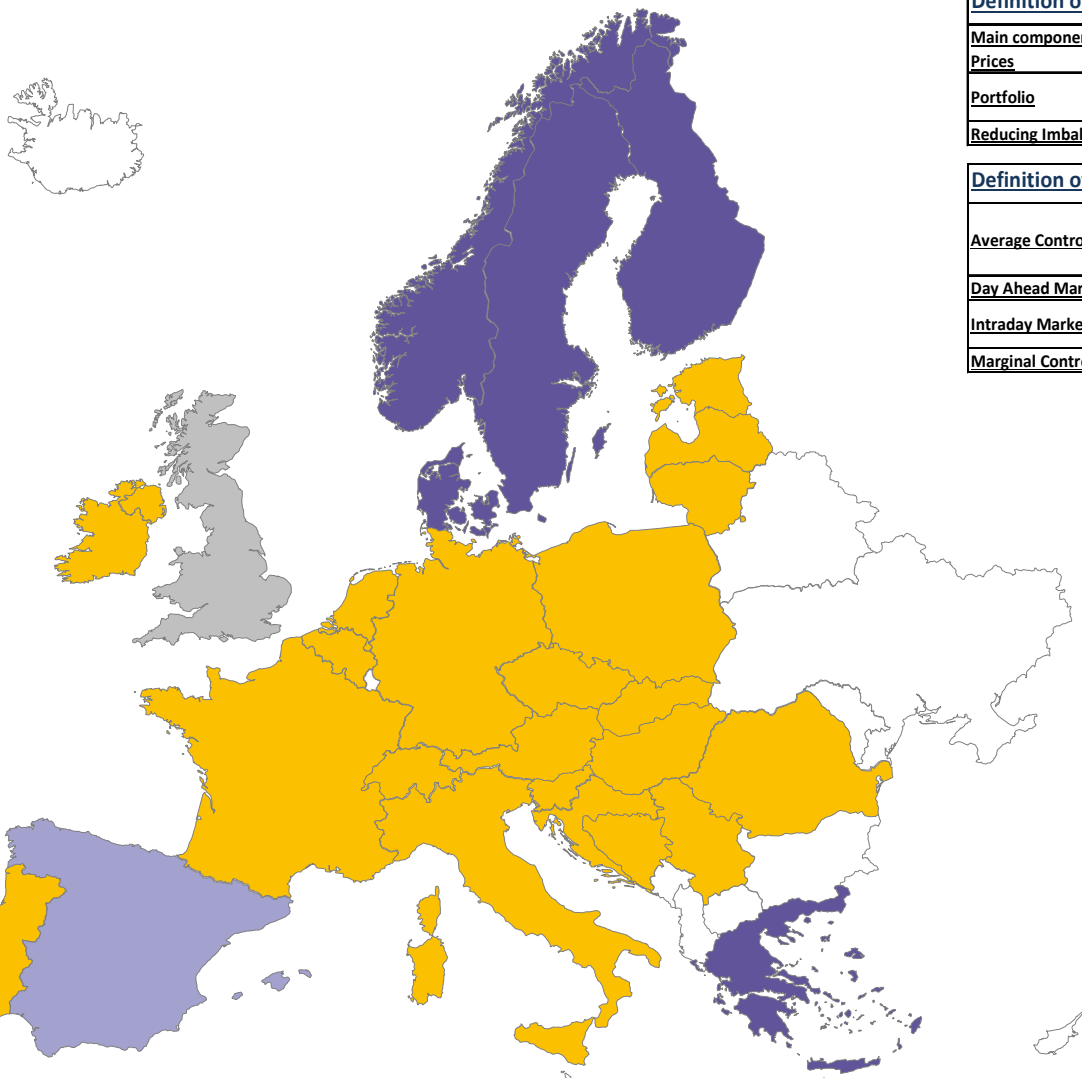
Imbalance settlement - Main comp. of Imb. Prices - If 2 portfolios - For generation "reducing imb."

<u>Definition of question</u>	
Main component of Imbalance Prices	The component that determines imbalance charges most of the time.
Portfolio	A group of plant which could be a mix of generation, demand etc., which bid in aggregate into the relevant market.
Reducing Imbalance	Imbalance volumes are decreasing.

<u>Definition of answer</u>	
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 portfolios - For consumption "reducing imb."



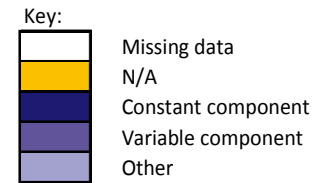
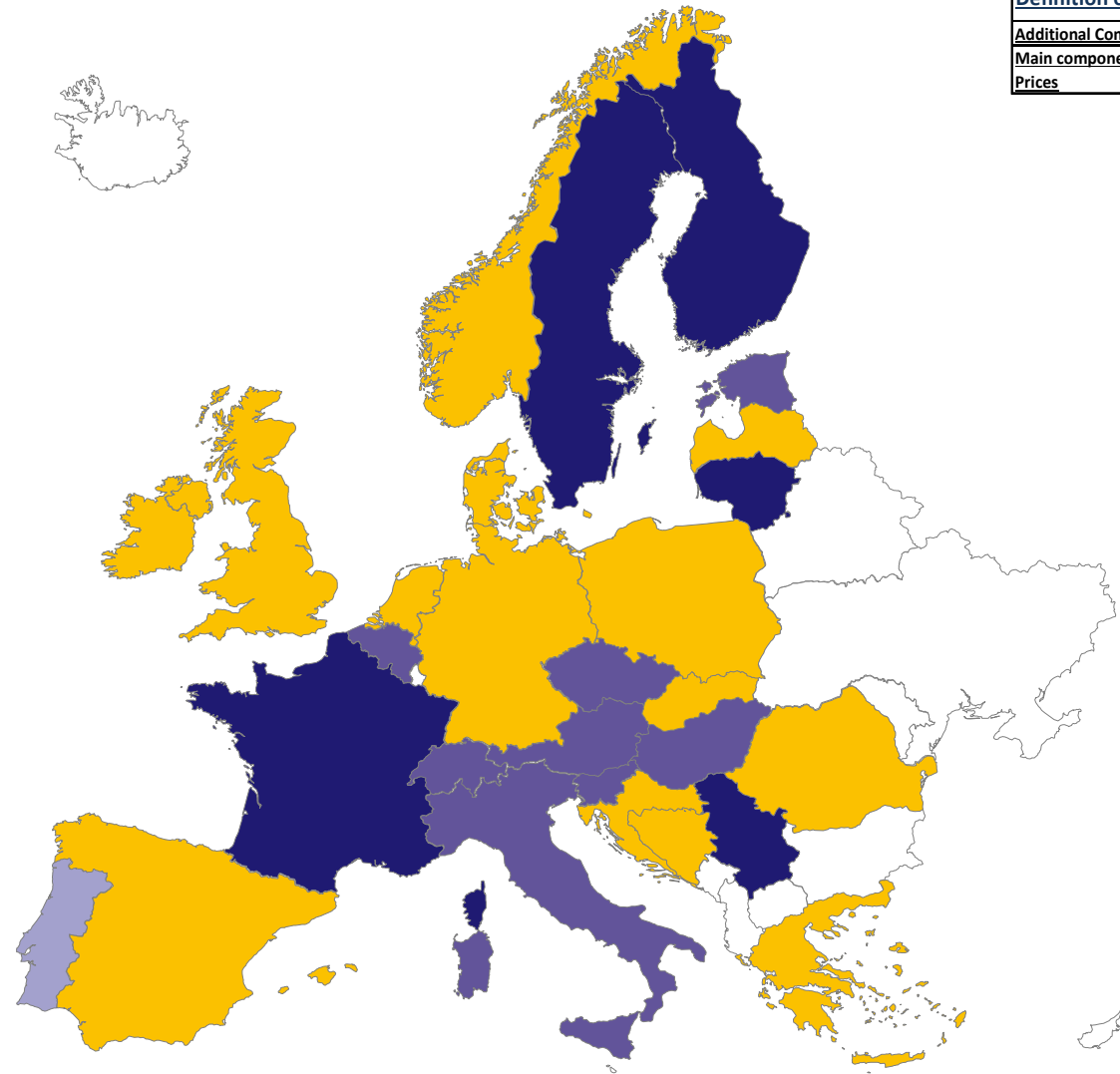
<u>Definition of question</u>	
<u>Main component of Imbalance Prices</u>	The component that determines imbalance charges most of the time.
<u>Portfolio</u>	A group of plant which could be a mix of generation, demand etc., which bid in aggregate into the relevant market.
<u>Reducing Imbalance</u>	Imbalance volumes are decreasing.

<u>Definition of answer</u>	
<u>Average Control Energy Price</u>	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.
<u>Day Ahead Market Price</u>	Price which evolved on the day ahead market.
<u>Intraday Market Price</u>	The price of the market within regular business hours, short-term prices.
<u>Marginal Control Energy Price</u>	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	
<u>Additional Components</u>	Other components which determine imbalance charges.
<u>Main component of Imbalance Prices</u>	The component that determines imbalance charges most of the time.

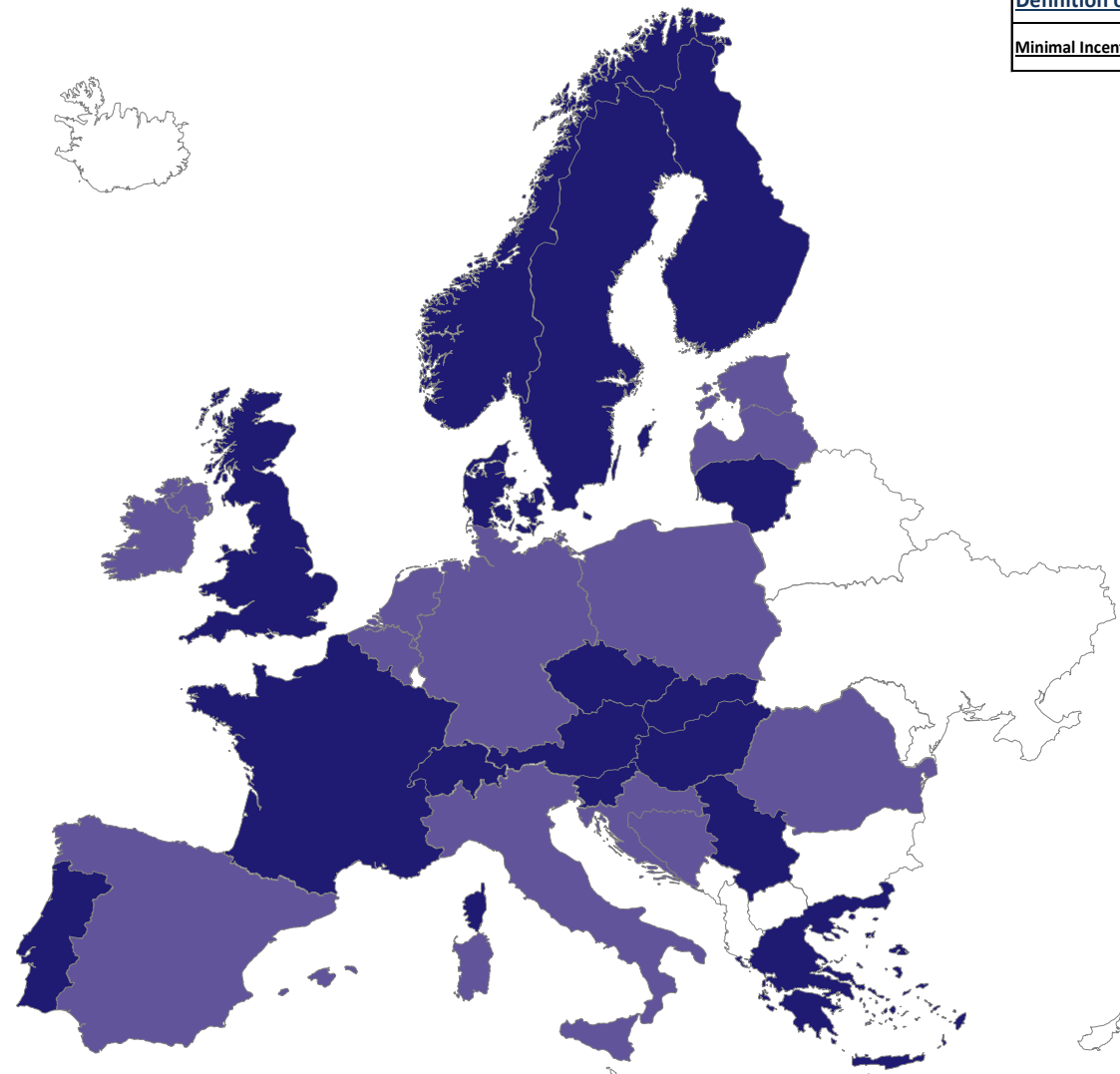


Imbalance settlement - Is there a minimal incentive?

Definition of question

Minimal Incentives

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



Key:



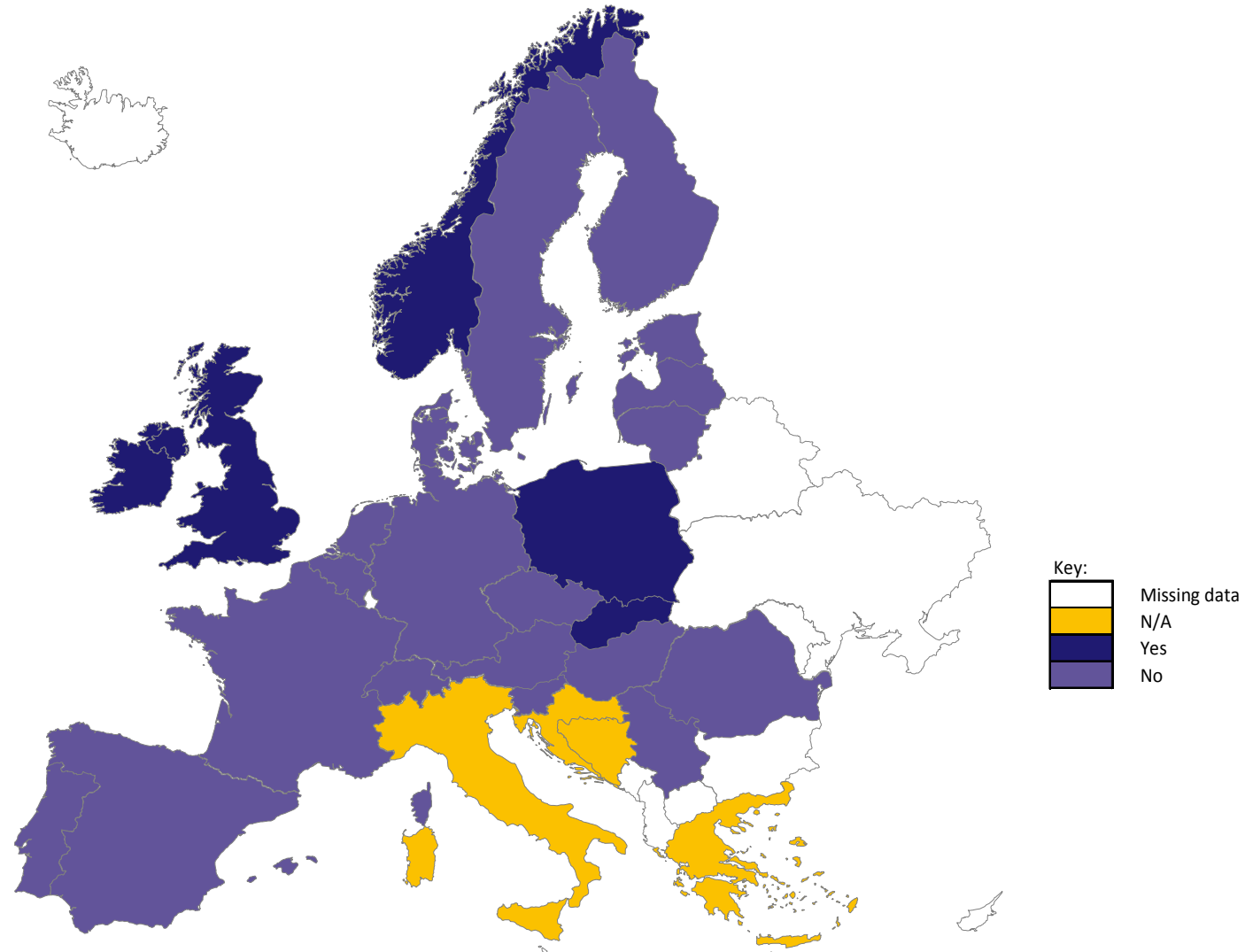
Missing data

N/A

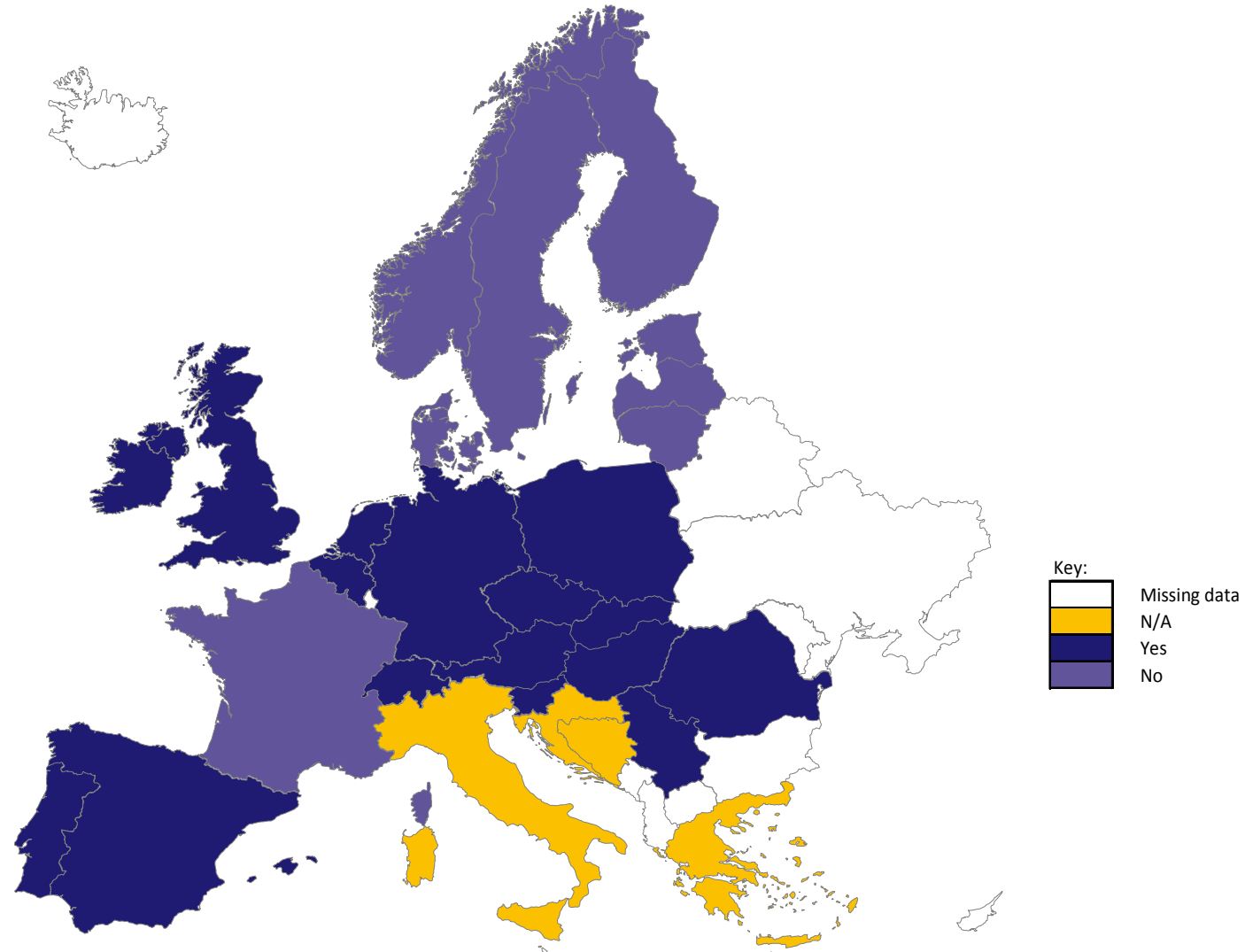
Yes

No

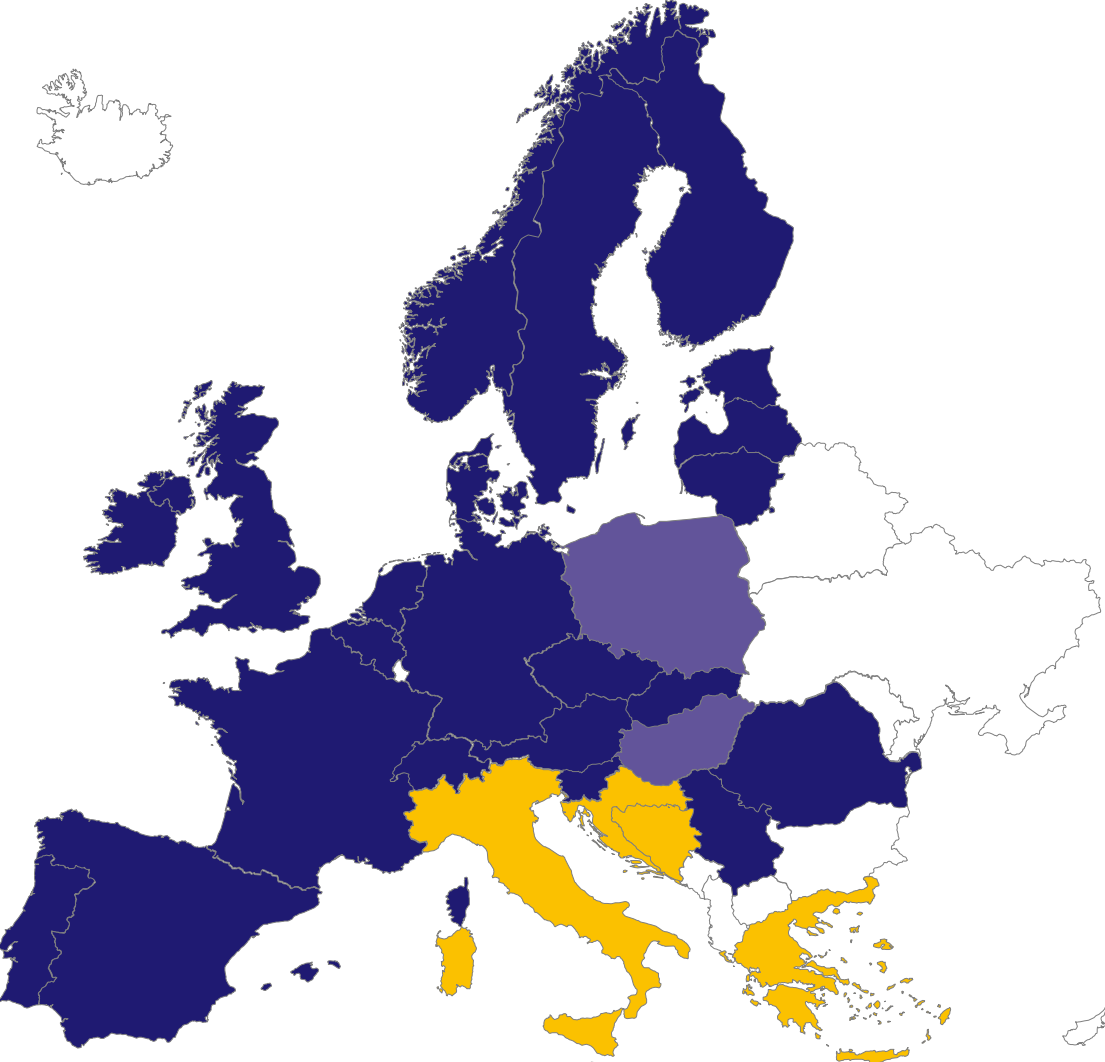
Imbalance settlement - Control Energy Prices used - FCR



Imbalance settlement - Control Energy Prices used - FRR (Automatic)



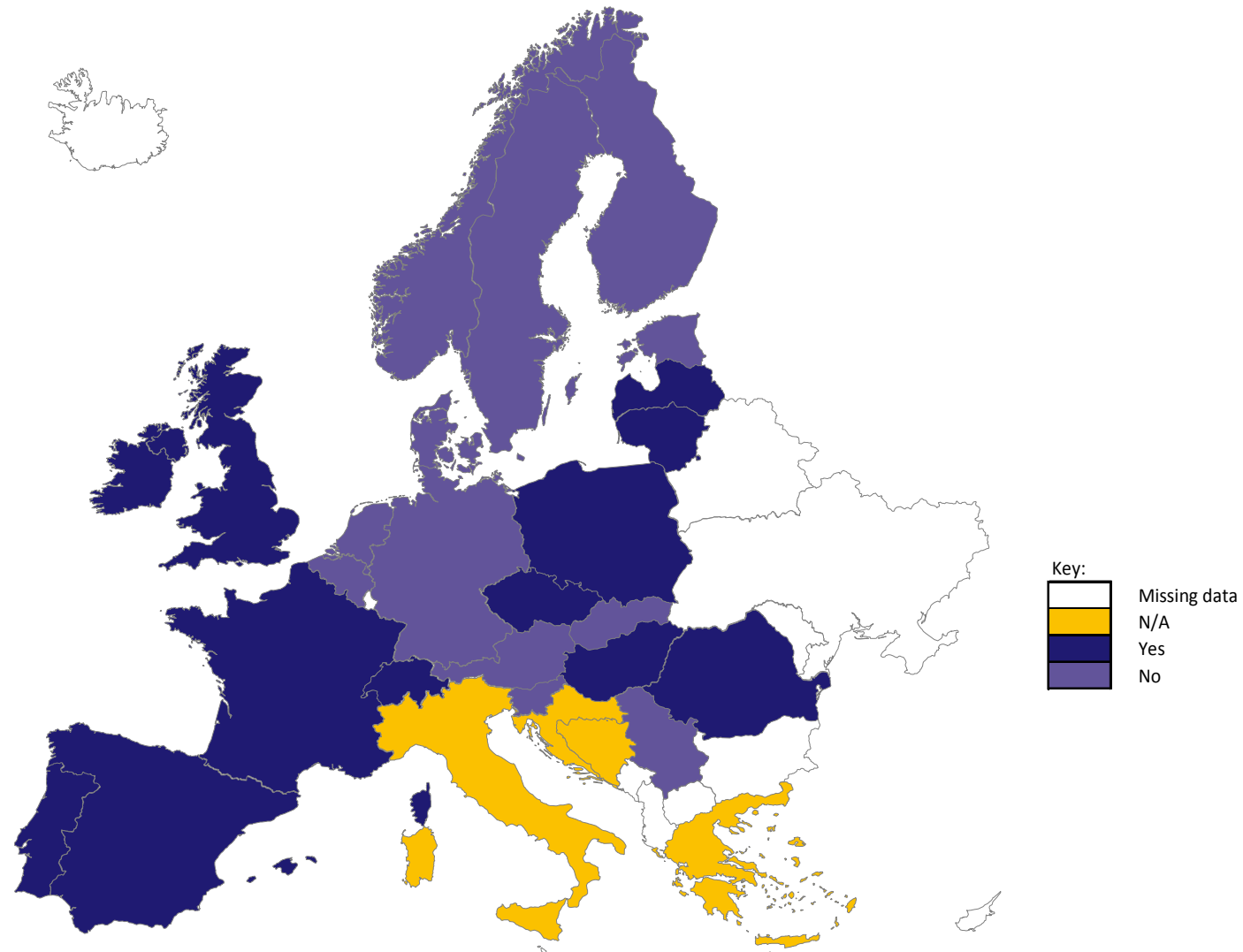
Imbalance settlement - Control Energy Prices used - FRR (Manual)



Key:

White	Missing data
Yellow	N/A
Dark Blue	Yes
Purple	No

Imbalance settlement - Control Energy Prices used - RR

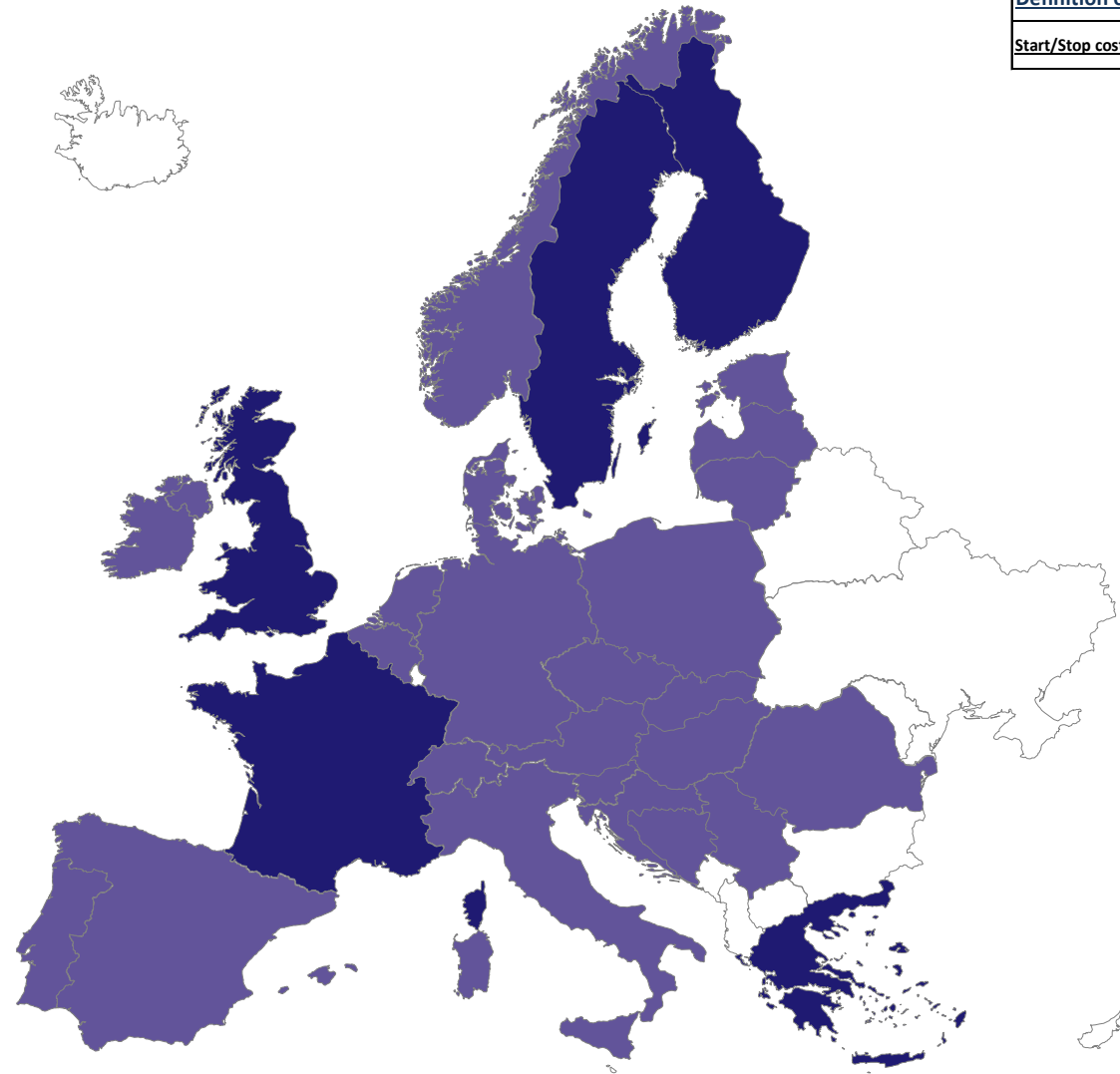


Imbalance settlement - Start/Stop costs in Imbalance Charges

Definition of question

Start/Stop costs

Starting and stopping of the power plants have costs, which can be included in the imbalance charges.



Key:



Missing data

N/A

Yes

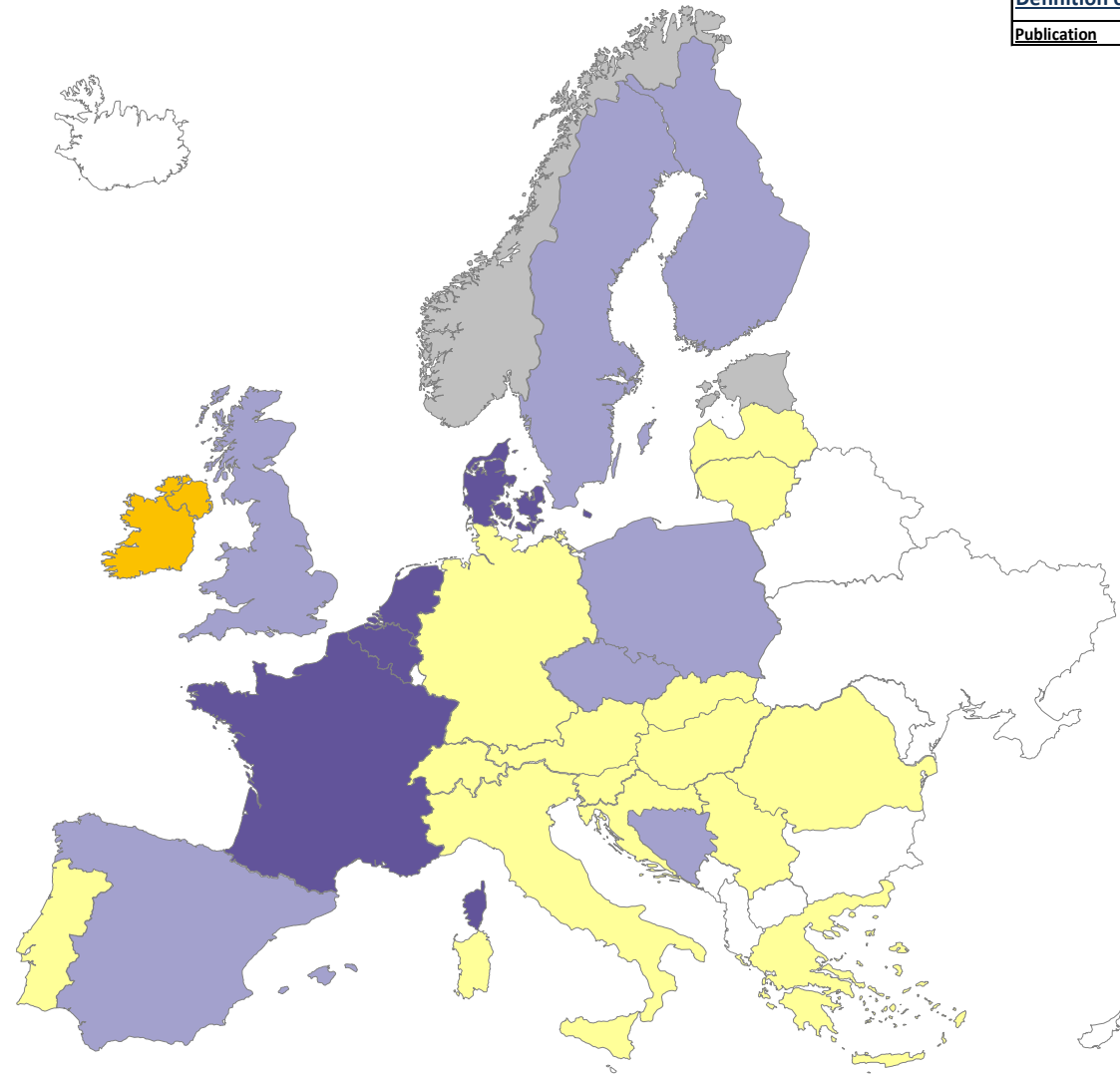
No

Imbalance settlement - Publication

Definition of question

Publication

Definitive imbalance charges are published.



Key:



Missing data

N/A

Prior to delivery

$x \leq 1$ hour after delivery

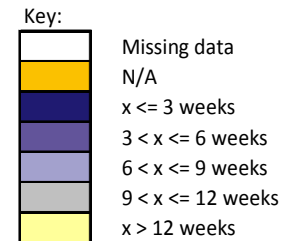
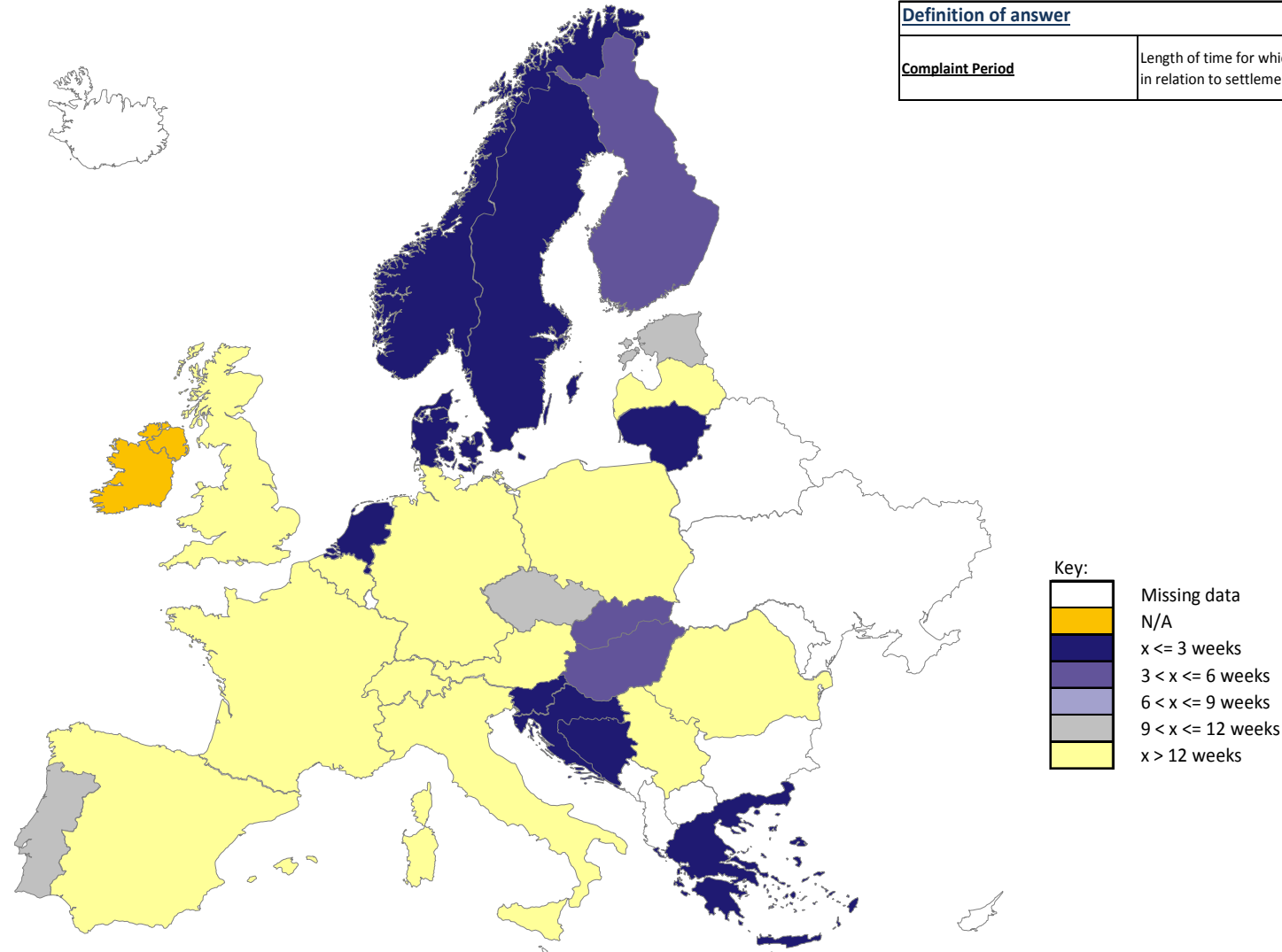
$x \leq 1$ day after delivery

$x \leq 1$ week after delivery

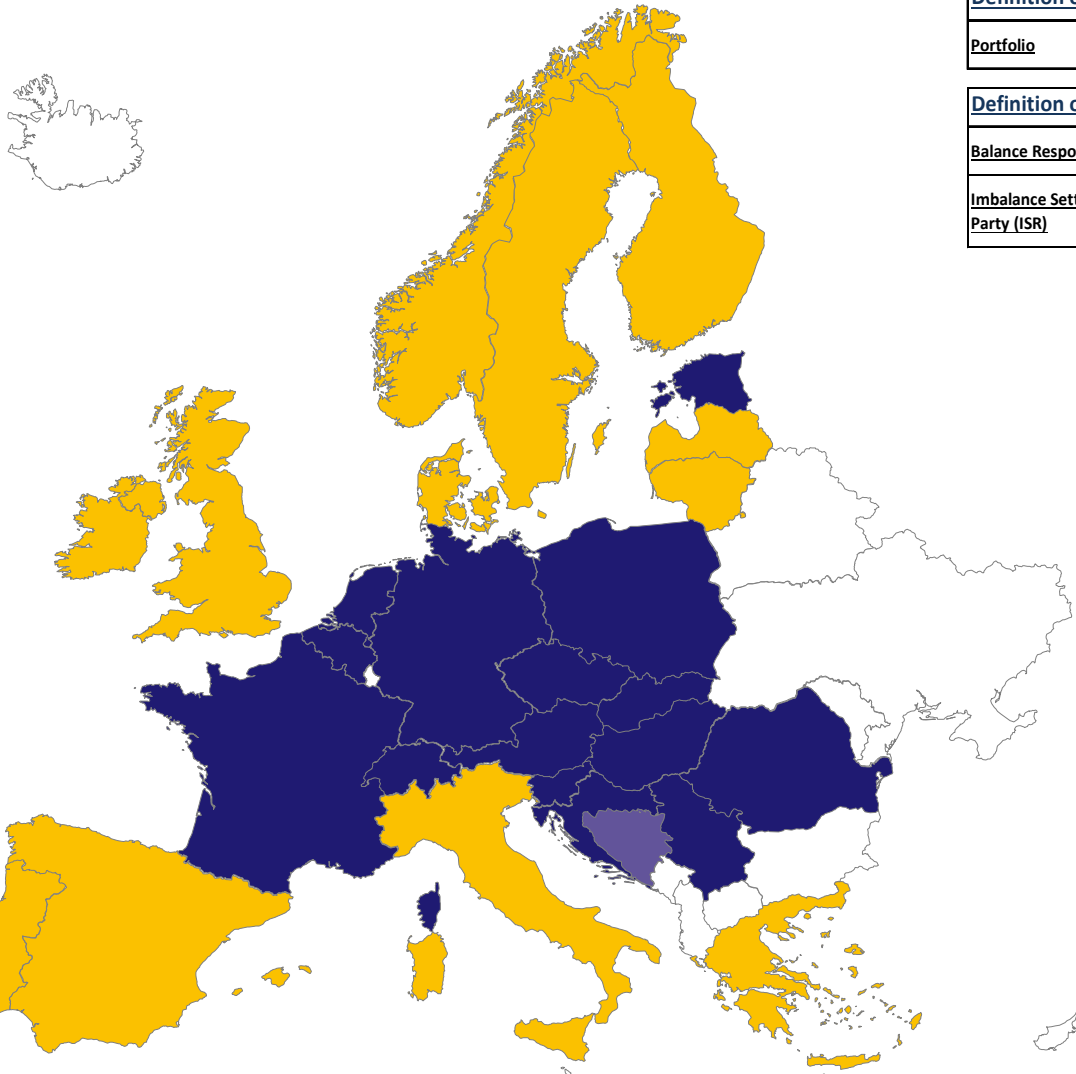
$x > 1$ week after delivery

Imbalance settlement - Complaint Period

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

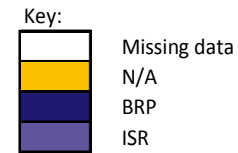


Imbalance settlement - Settlement - If 1 portfolio

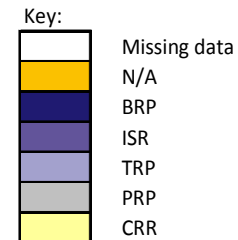
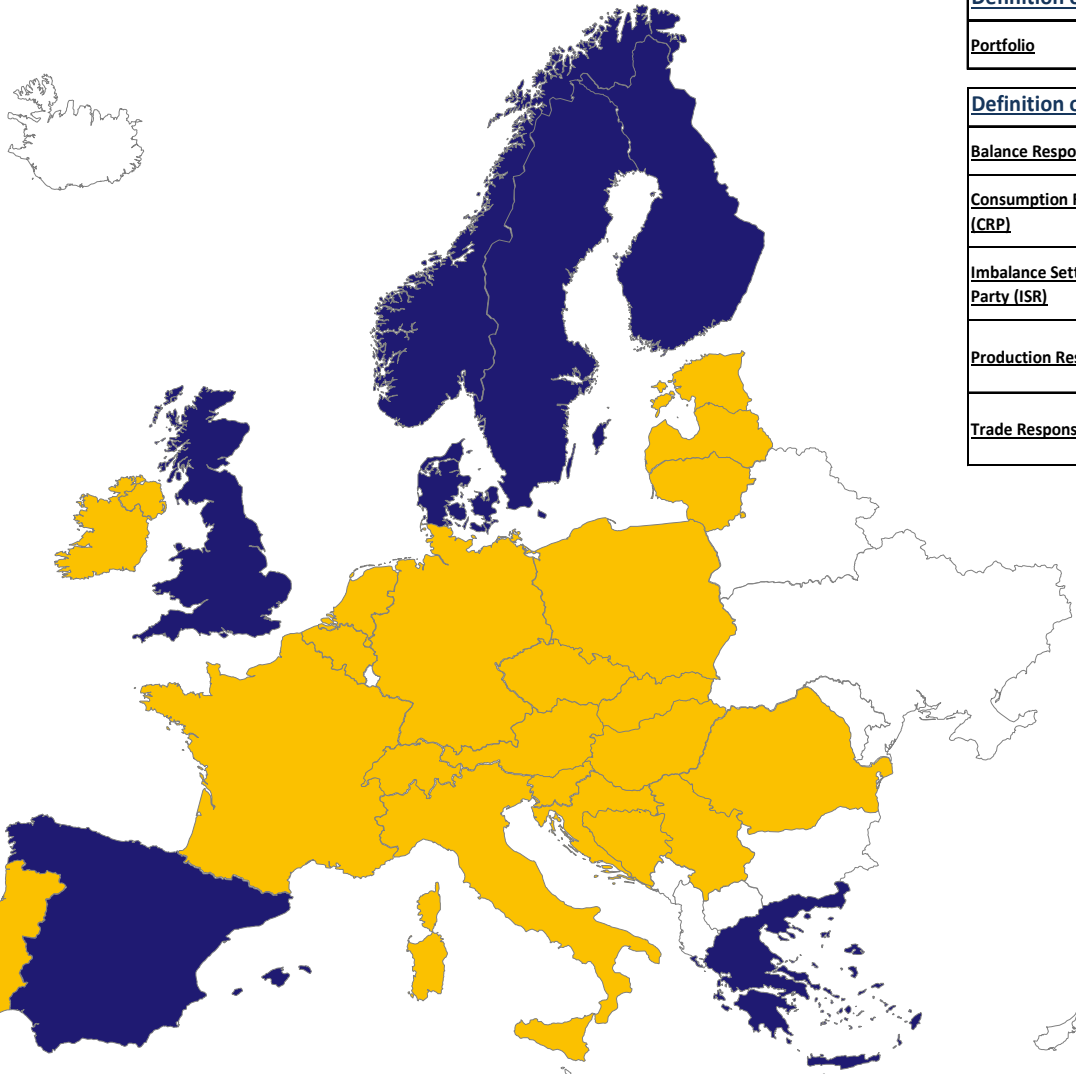


Definition of question	
Portfolio	A group of plant which could be a mix of generation, demand etc., which bid in aggregate into the relevant market.

Definition of answer	
Balance Responsible Party (BRP)	Balancing Responsible Party means a market participant or its chosen representative responsible for its Imbalances.
Imbalance Settlement Responsible Party (ISR)	A party that is responsible for settlement of the difference between the contracted quantities and the realized quantities of energy products for the BRPs in a Market Balance Area.

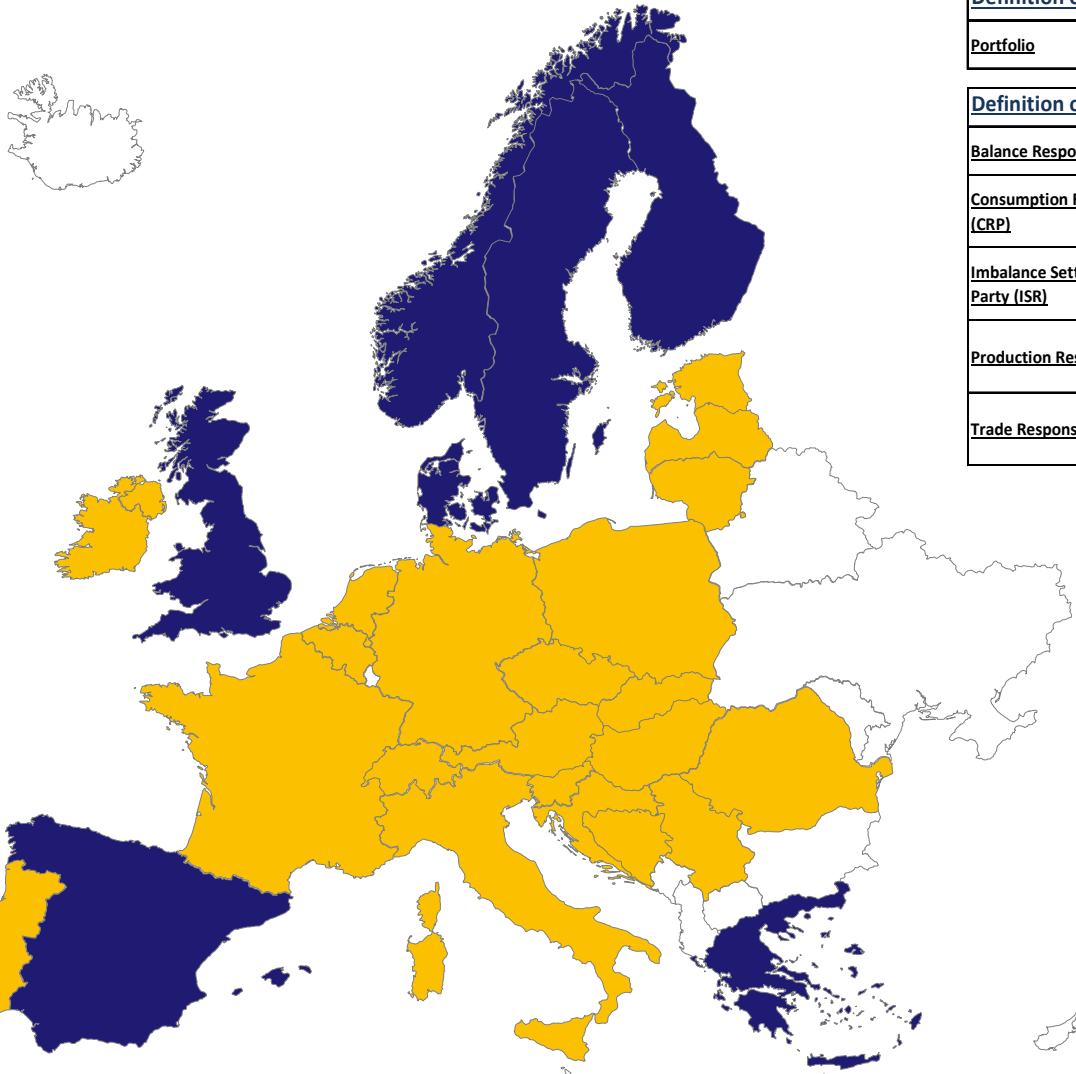


Imbalance settlement - Settlement - If 2 portfolios - Generation










Definition of question	
Portfolio	A group of plant which could be a mix of generation, demand etc., which bid in aggregate into the relevant market.
Definition of answer	
Balance Responsible Party (BRP)	Balancing Responsible Party means a market participant or its chosen representative responsible for its Imbalances.
Consumption Responsible Party (CRP)	A party who can be brought to rights, legally and financially, for any imbalance between energy nominated and consumed for all associated Accounting Points.
Imbalance Settlement Responsible Party (ISR)	A party that is responsible for settlement of the difference between the contracted quantities and the realized quantities of energy products for the BRPs in a Market Balance Area.
Production Responsible Party (PRP)	A party who can be brought to rights, legally and financially, for any imbalance between energy nominated and produced for all associated Accounting Points.
Trade Responsible Party (TRP)	A party who can be brought to rights, legally and financially, for any imbalance between energy nominated and consumed for all associated Accounting Points.

Imbalance settlement - Settlement - If 2 portfolios - Consumption

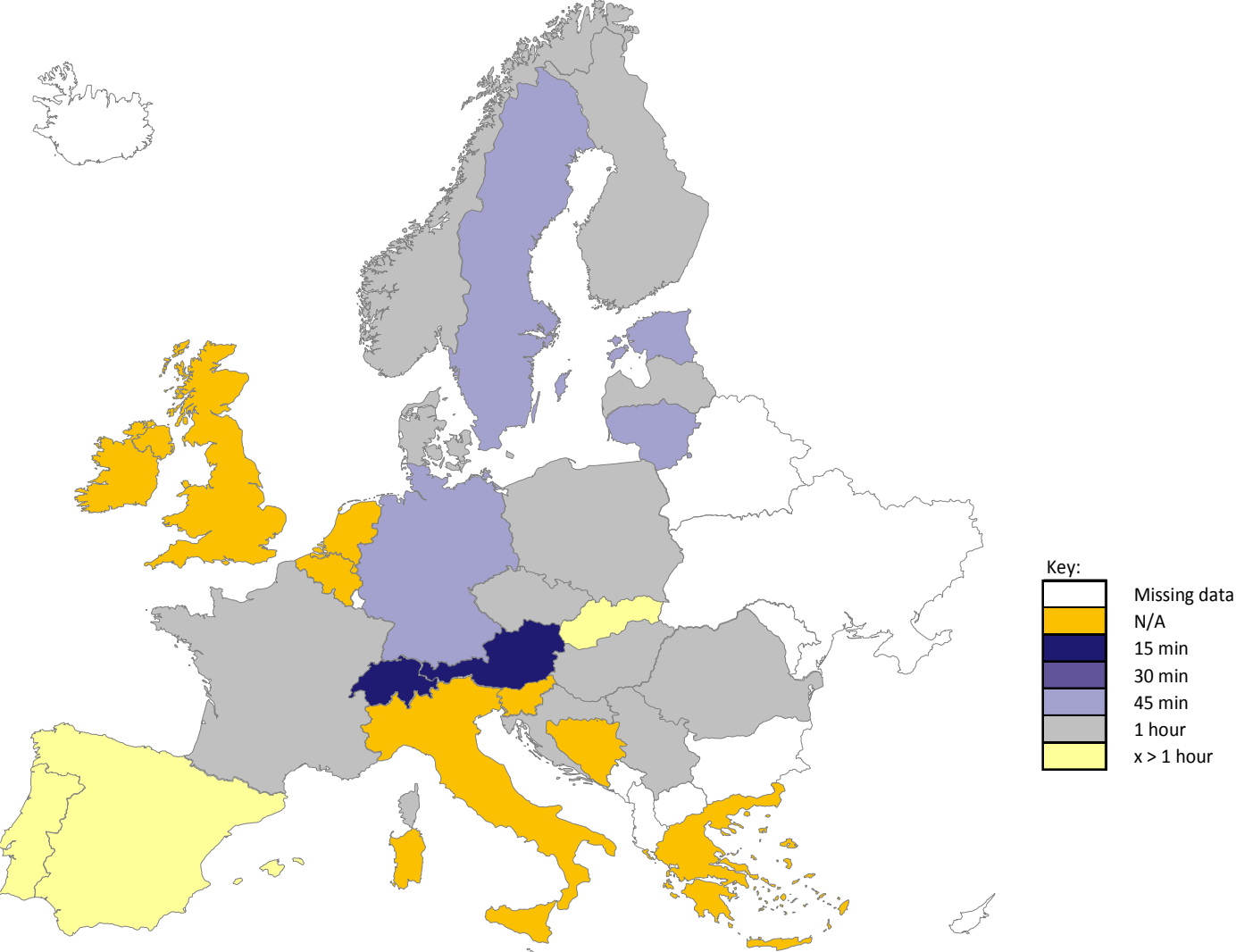


Definition of question	
Portfolio	A group of plant which could be a mix of generation, demand etc., which bid in aggregate into the relevant market.
Definition of answer	
Balance Responsible Party (BRP)	Balancing Responsible Party means a market participant or its chosen representative responsible for its Imbalances.
Consumption Responsible Party (CRP)	A party who can be brought to rights, legally and financially, for any imbalance between energy nominated and consumed for all associated Accounting Points.
Imbalance Settlement Responsible Party (ISR)	A party that is responsible for settlement of the difference between the contracted quantities and the realized quantities of energy products for the BRPs in a Market Balance Area.
Production Responsible Party (PRP)	A party who can be brought to rights, legally and financially, for any imbalance between energy nominated and produced for all associated Accounting Points.
Trade Responsible Party (TRP)	A party who can be brought to rights, legally and financially, for any imbalance between energy nominated and consumed for all associated Accounting Points.

Key:

	Missing data
	N/A
	BRP
	ISR
	TRP
	PRP
	CRR

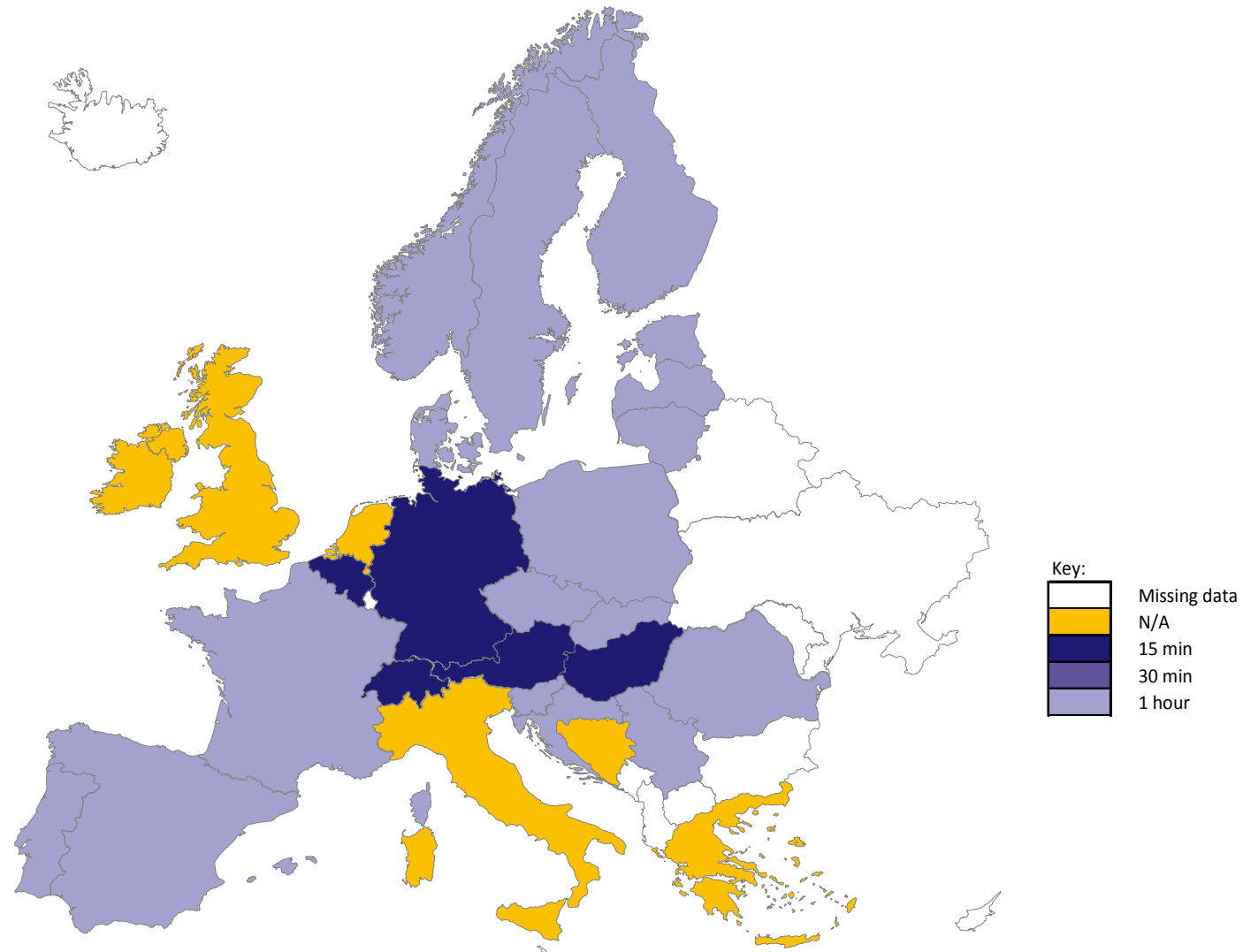
Imbalance settlement - Time before real time for BRP to carry out a re-schedule in Internal ID market



Key:

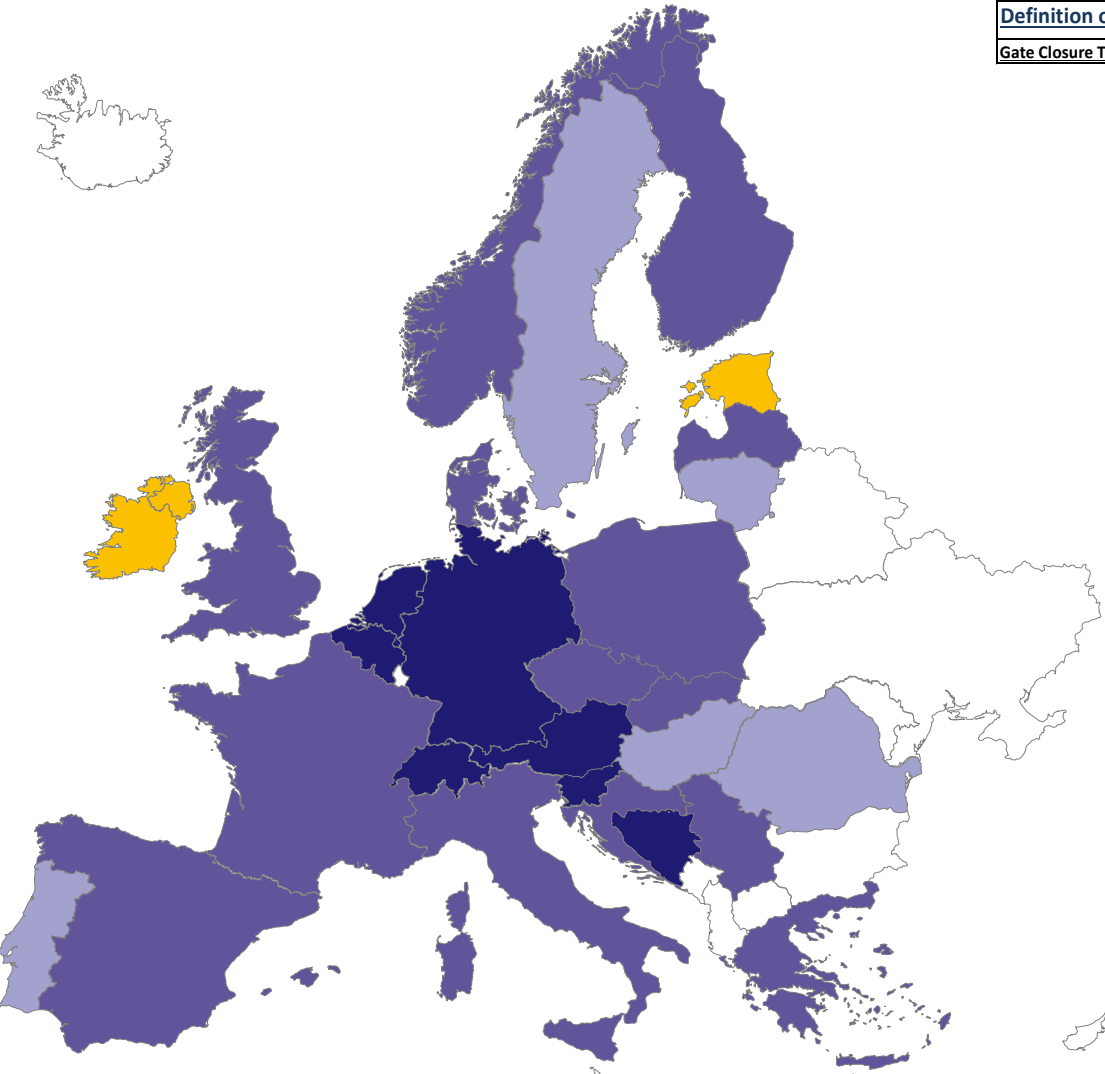
- Missing data
- N/A
- 15 min
- 30 min
- 45 min
- 1 hour
- x > 1 hour

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	Deadline for the participation to a given market or mechanism.



Key:

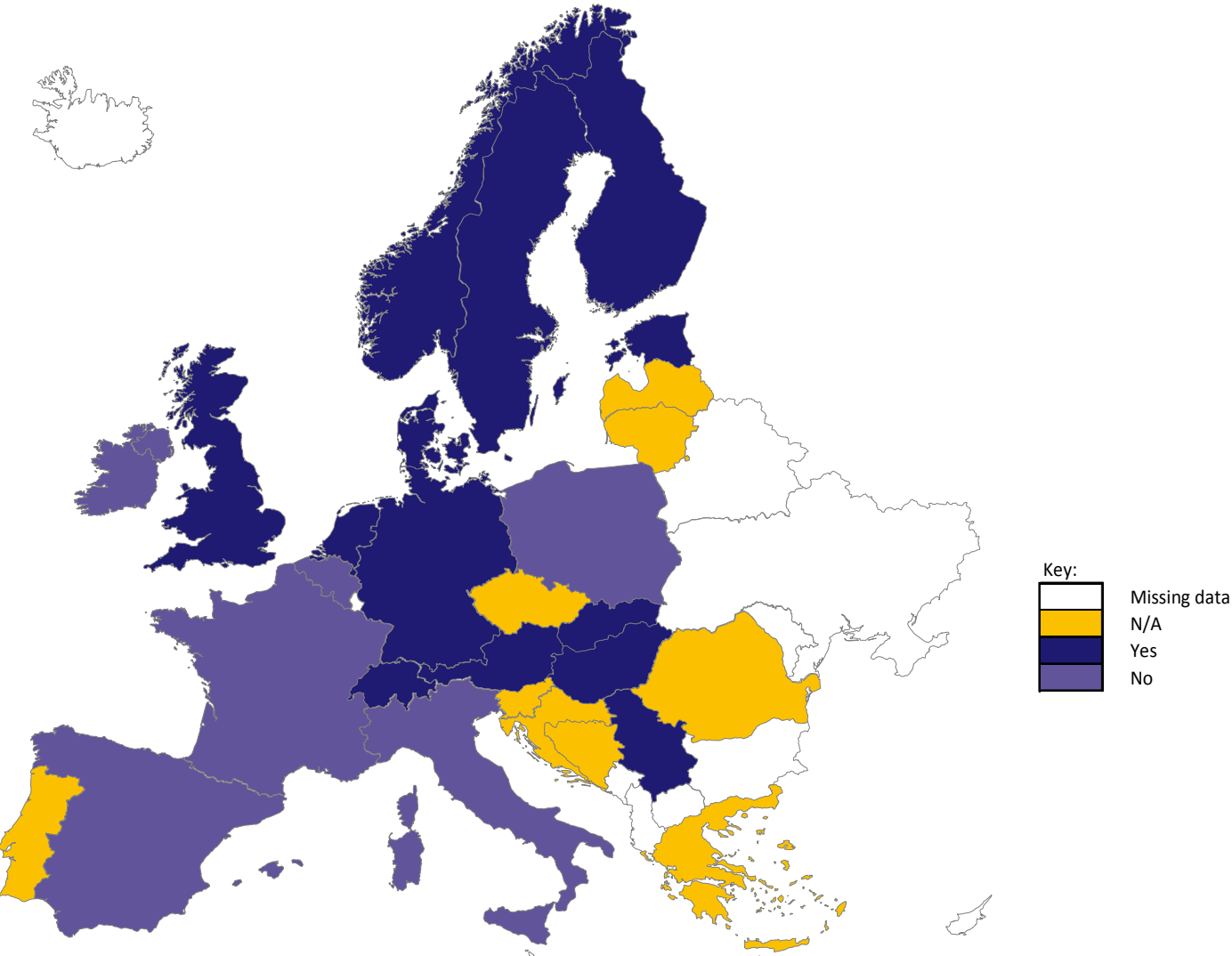
- Missing data
- N/A
- Always (GCT after delivery)
- Never (GCT before delivery)
- Only in case of IT or any other problems (TSO approval)



Load participation

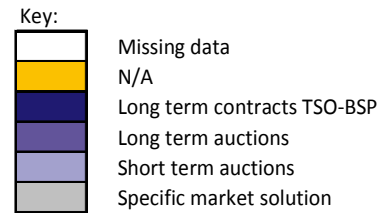
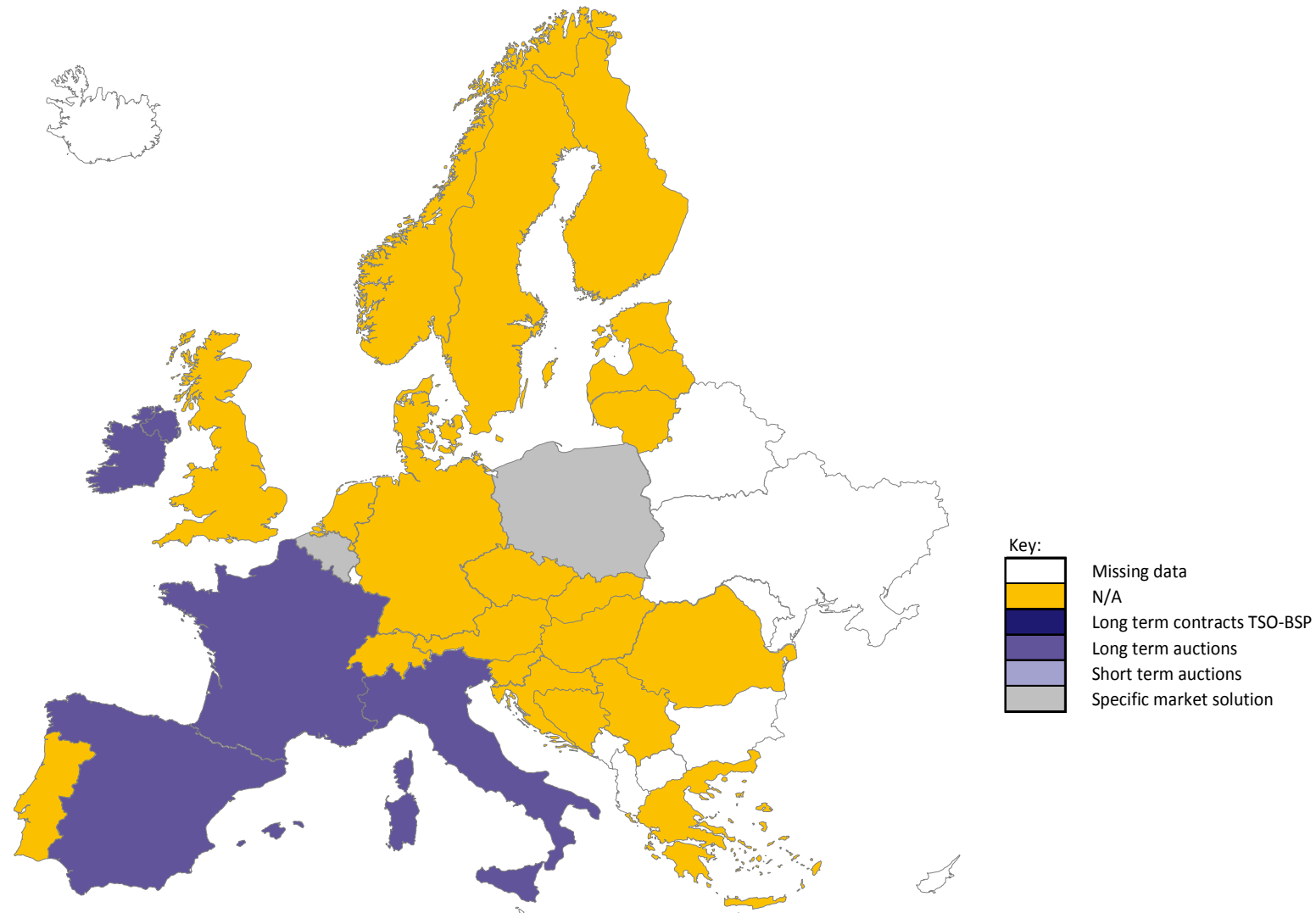
(Referring to questions of AS survey from L1.0 to L7.0)

Load participation - Load providers use the same market mech. and act. proc. as generation (cap.&energy)



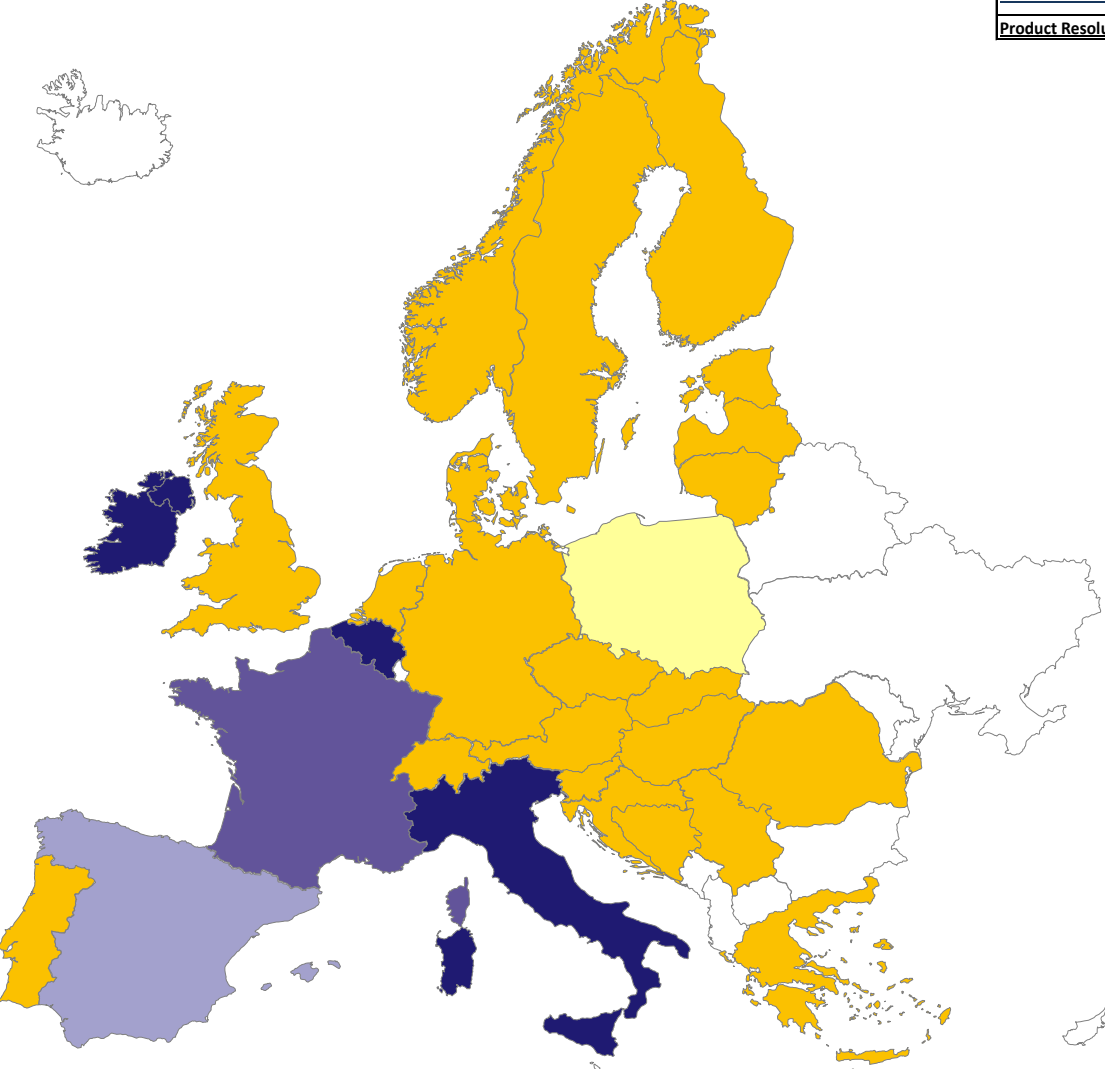
Key:
Missing data
N/A
Yes
No

Load participation - Specific market solution use for load providers of balancing services (cap.&energy)



Load participation - Product Resolution (in MW)

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



Key:

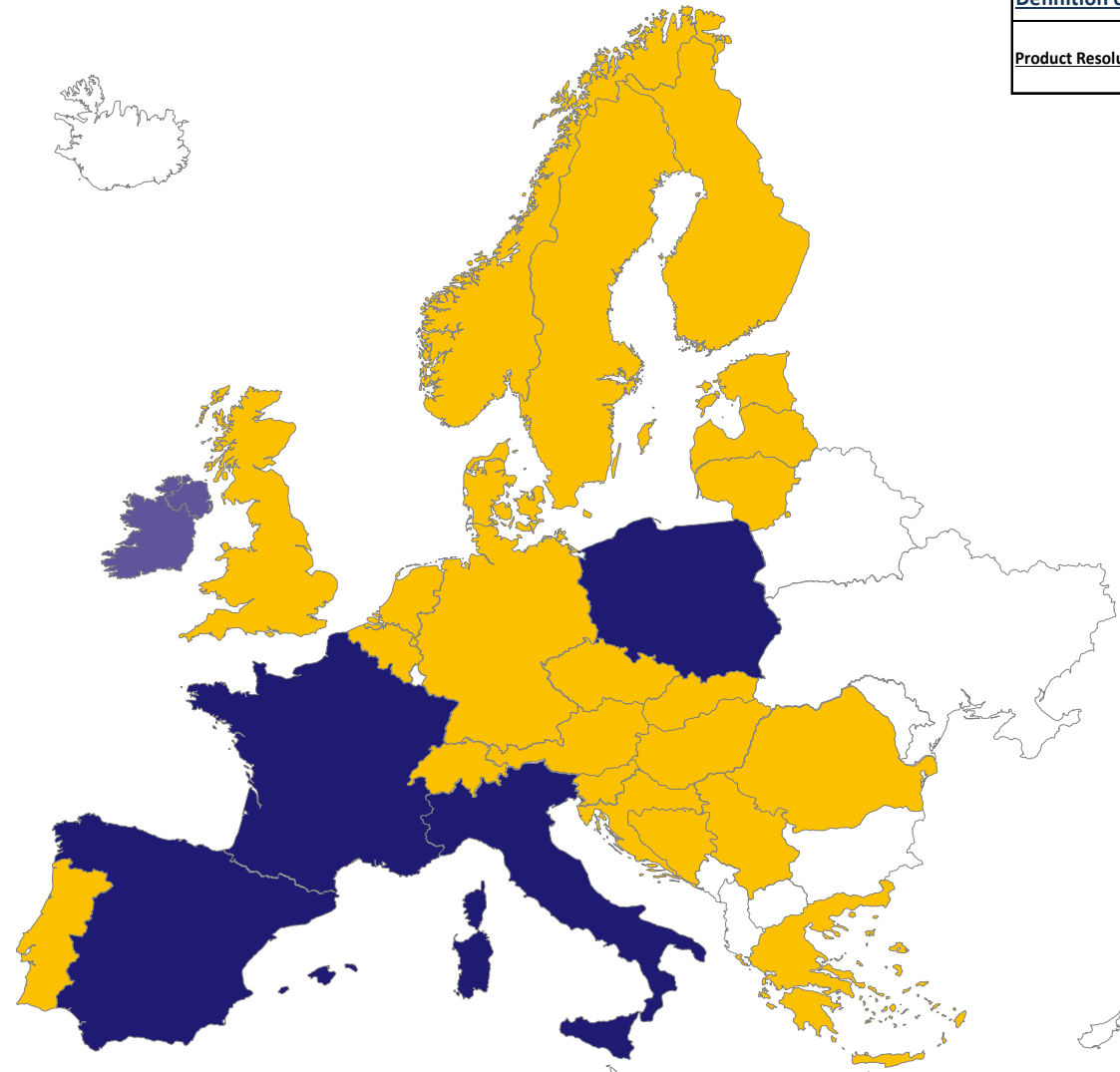
White	Missing data
Yellow	N/A
Dark Blue	$x \leq 1\text{ MW}$
Medium Blue	$1\text{ MW} < x \leq 5\text{ MW}$
Light Blue	$5\text{ MW} < x \leq 10\text{ MW}$
Grey	$x > 10\text{ MW}$
Light Yellow	Other

Load participation - Product Resolution (in time)

Definition of question

Product Resolution (in time)

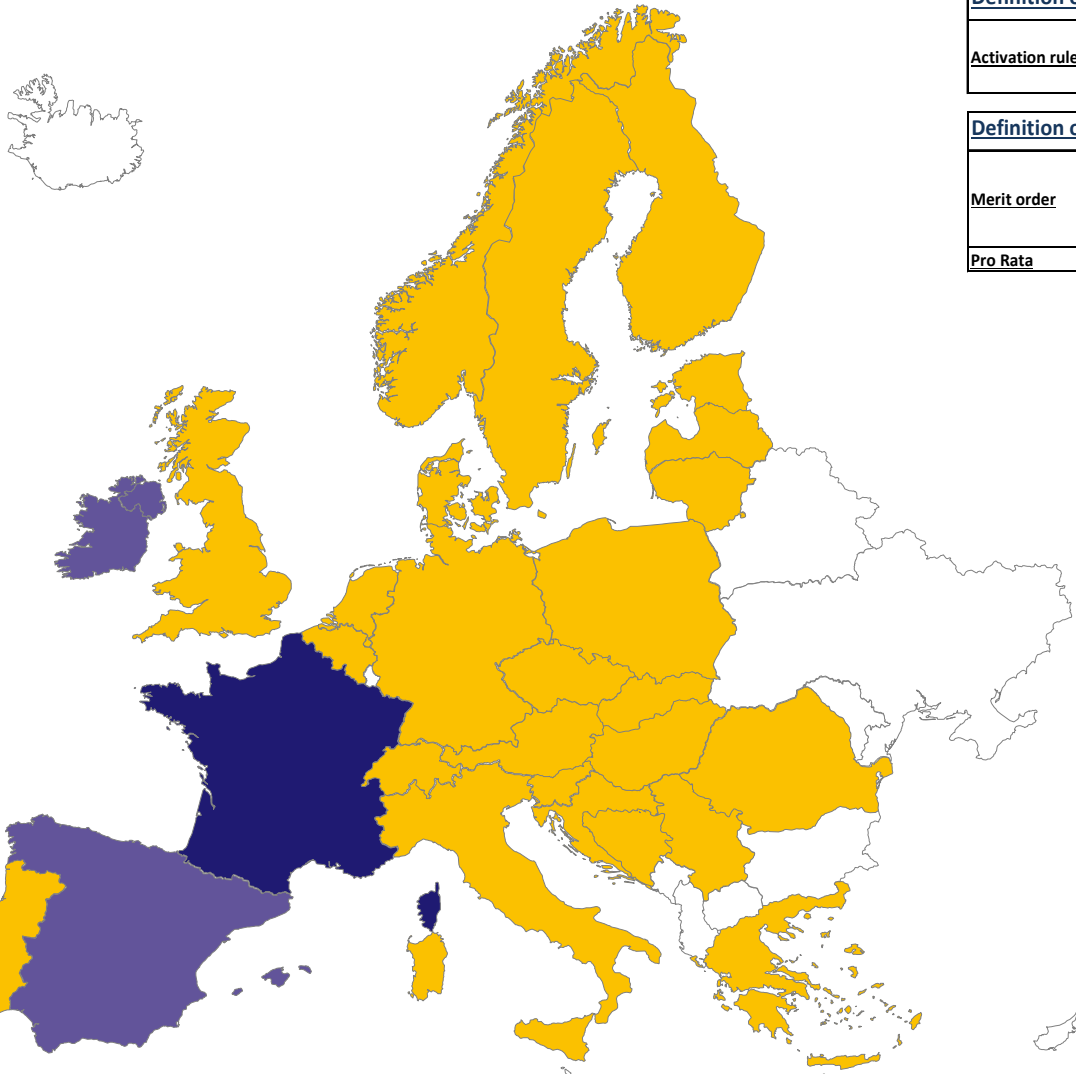
The maximum resolution for which the product can be bid into the market (for instance =1 hour in the case of a 24 auctions day ahead market for reserve provision).



Key:

White	Missing data
Yellow	N/A
Dark Blue	Hour (or blocks)
Purple	30 minutes
Light Purple	15 minutes

Load participation - Specific act. rule for load type BSP's



<u>Definition of question</u>	
<u>Activation rule</u>	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).

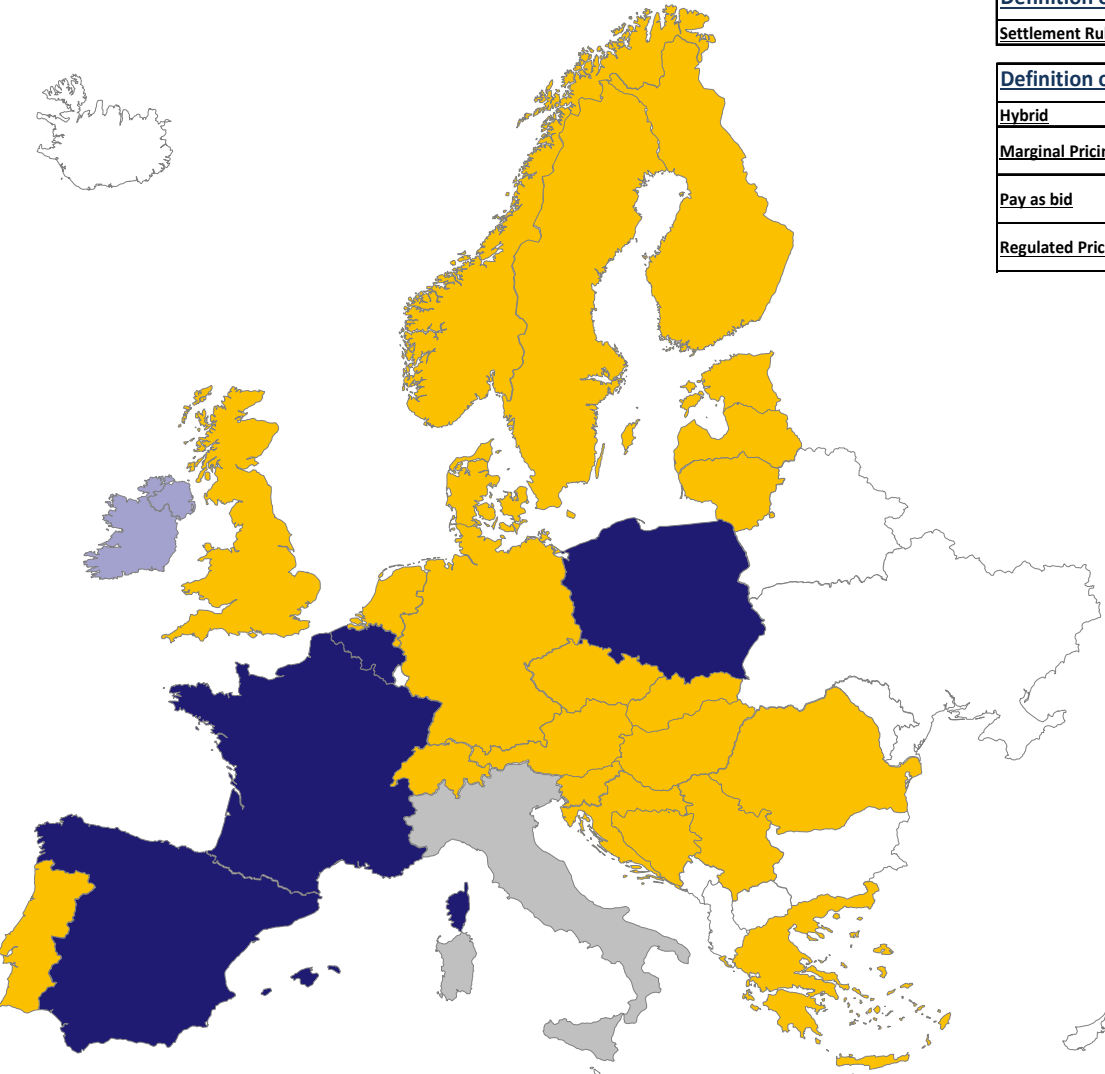
<u>Definition of answer</u>	
<u>Merit order</u>	A merit order is a way of ranking available sources of energy in ascending order of their short run marginal costs of production, so that those with the lowest marginal costs are the first ones to be brought online to meet demand.
<u>Pro Rata</u>	In Proportion (Parallel Activation).

Key:

	Missing data
	N/A
	Merit Order
	Pro Rata

Load participation - Settlement Rule

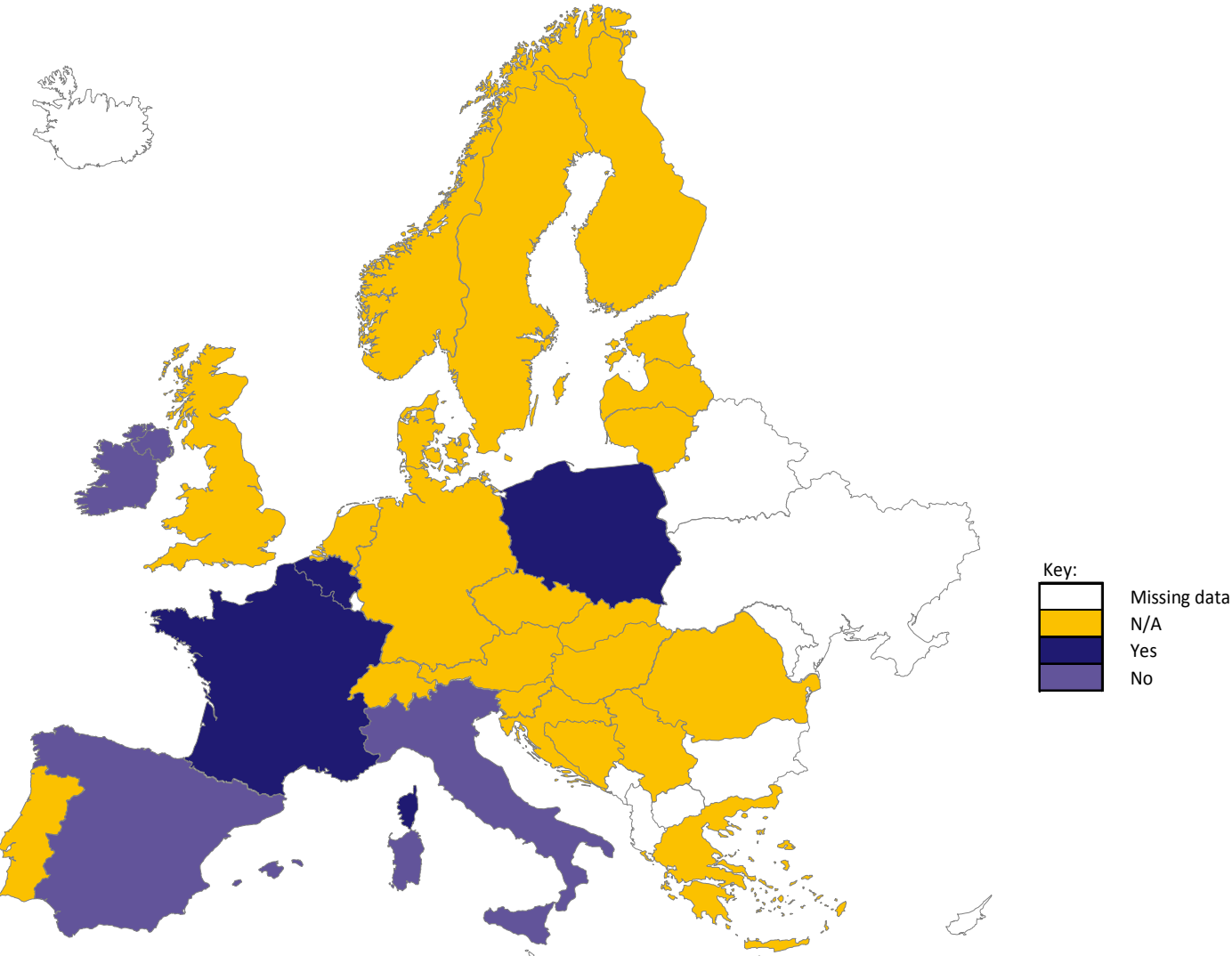
Definition of question	
Settlement Rule	The pricing rules for settlement.
Definition of answer	
Hybrid	Combination.
Marginal Pricing	Marginal pricing is the change in total cost that arises when the quantity produced changes by one unit.
Pay as bid	Contracted parties who provide a service are paid based on their offer price.
Regulated Price	Price for this service is based on a price that is set by the relevant regulatory authority.



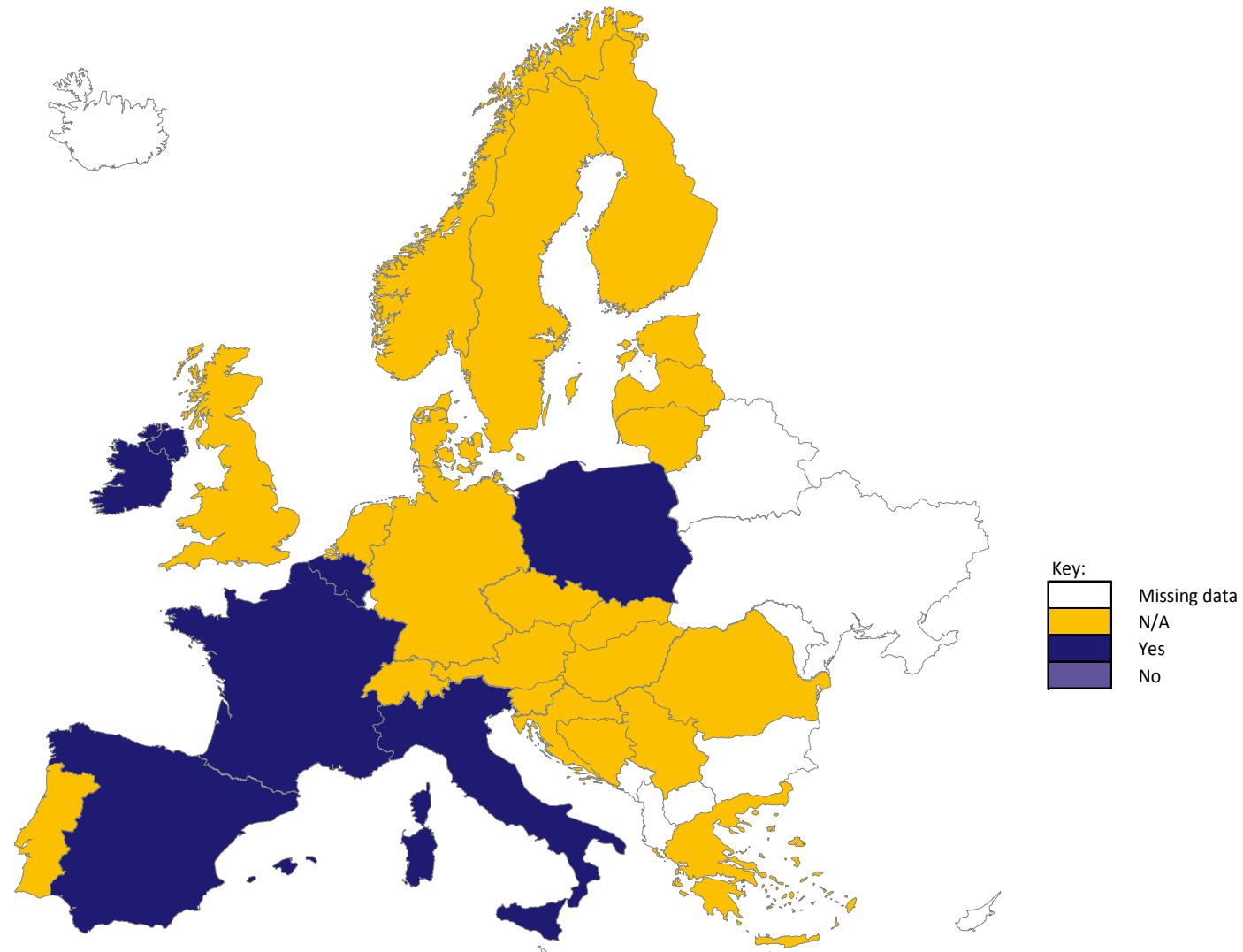
Key:

White	Missing data
Yellow	N/A
Dark Blue	Pay as bid
Purple	Marginal Pricing
Light Purple	Regulated Price
Grey	Hybrid

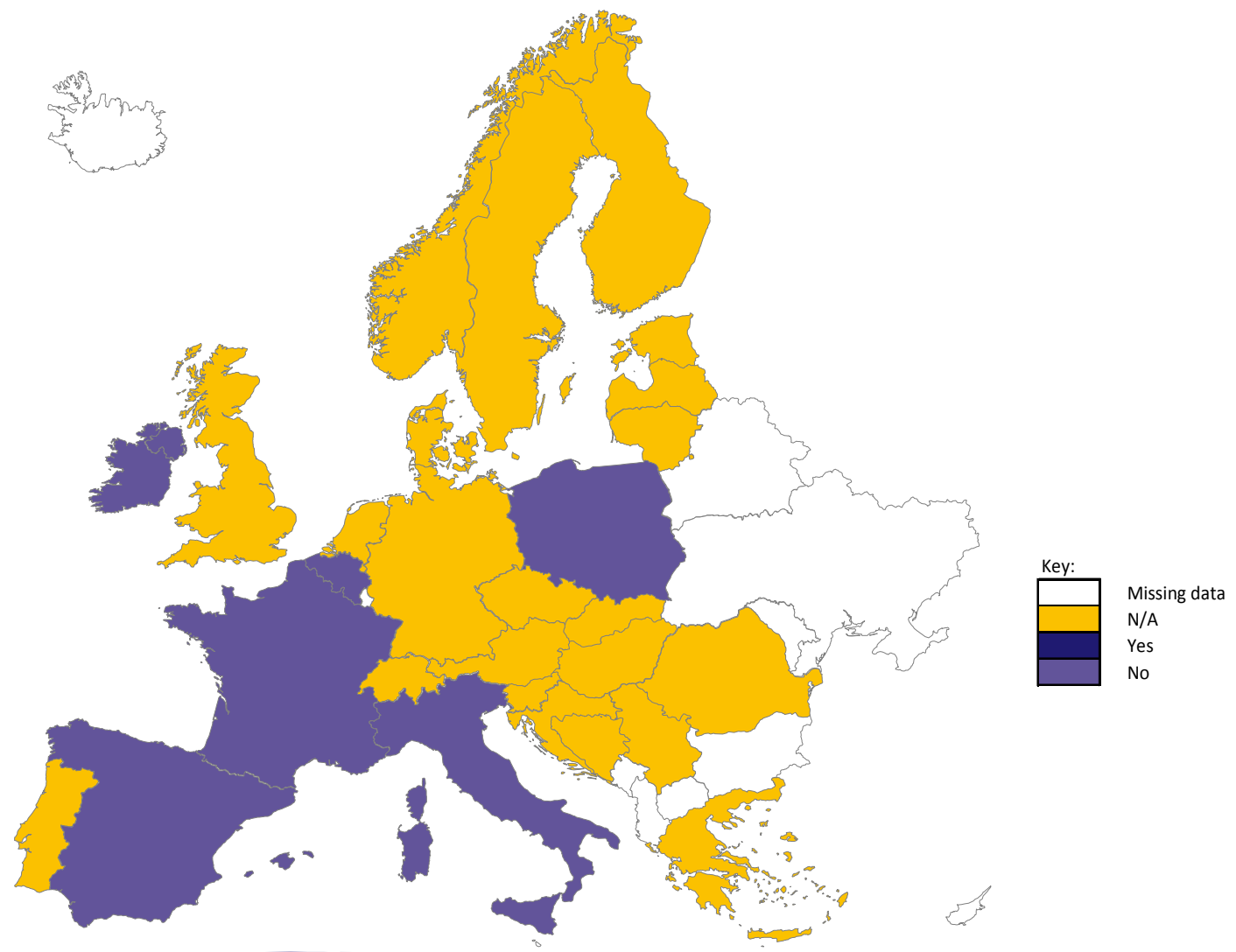
Load participation - Participating in the balancing services - Aggregators



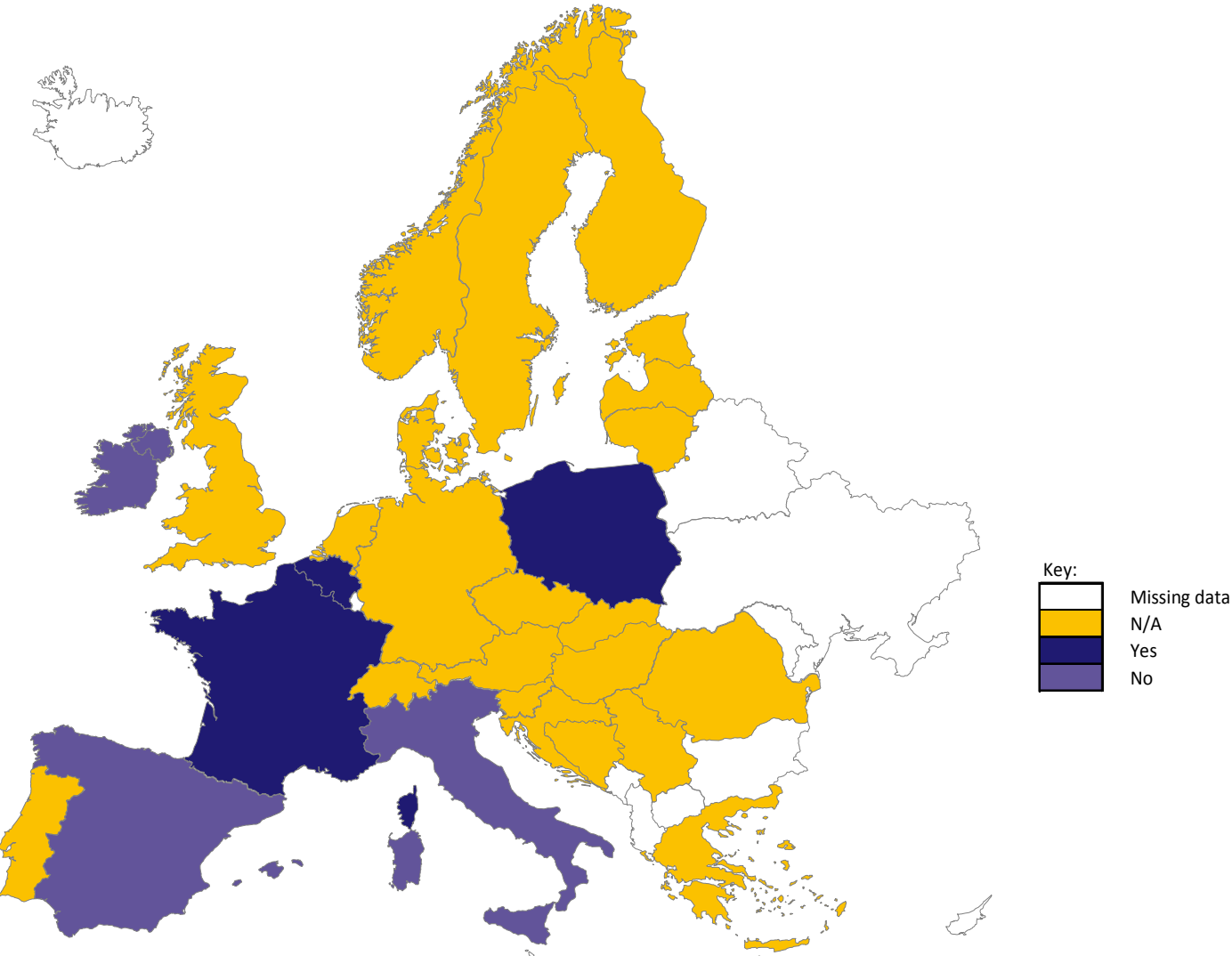
Load participation - Participating in the balancing services - Large consumers



Load participation - Participating in the balancing services - Pump storage units consumers



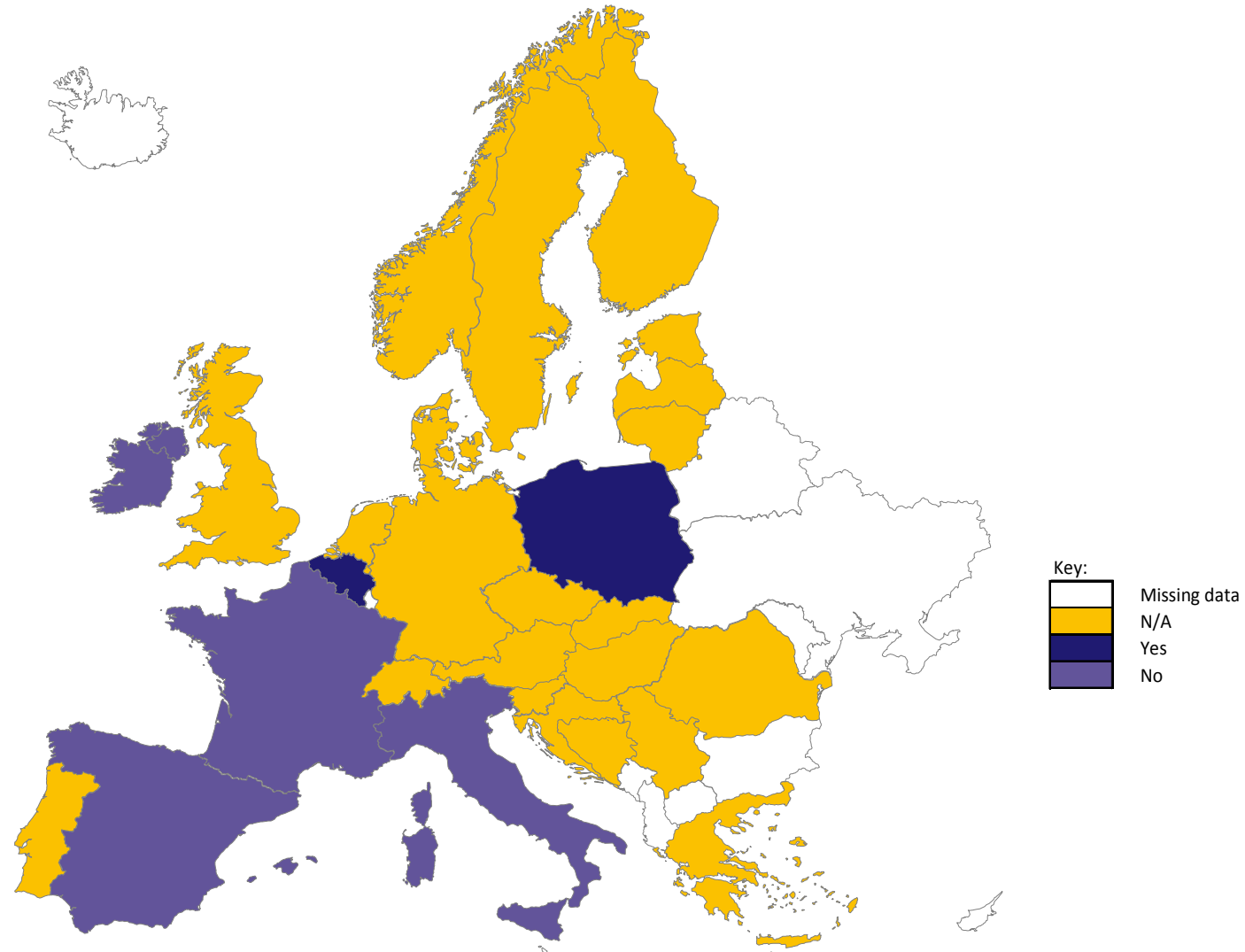
Load participation - Participating in the balancing services -Aggregated small size consumers



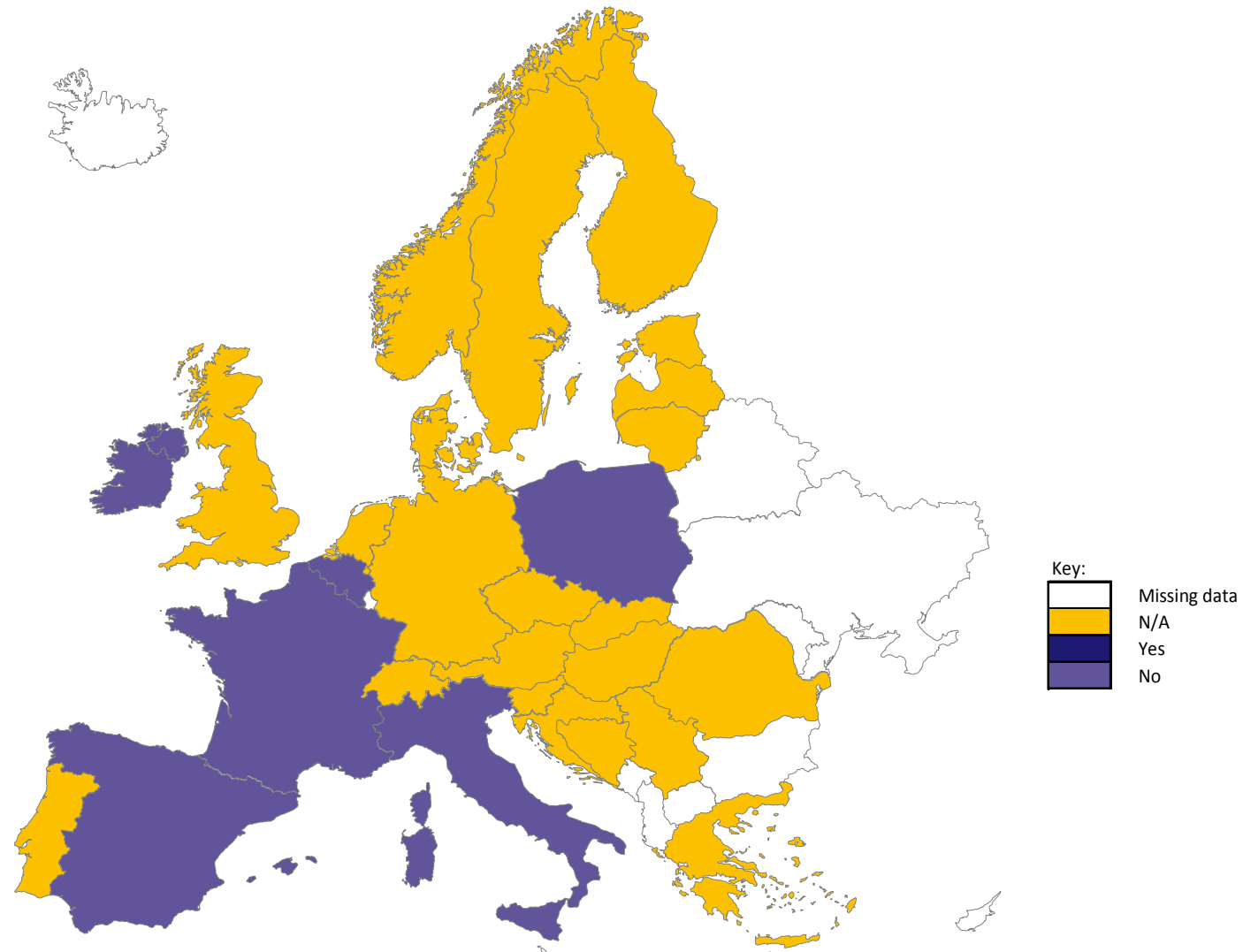
Key:

White	Missing data
Yellow	N/A
Dark Blue	Yes
Purple	No

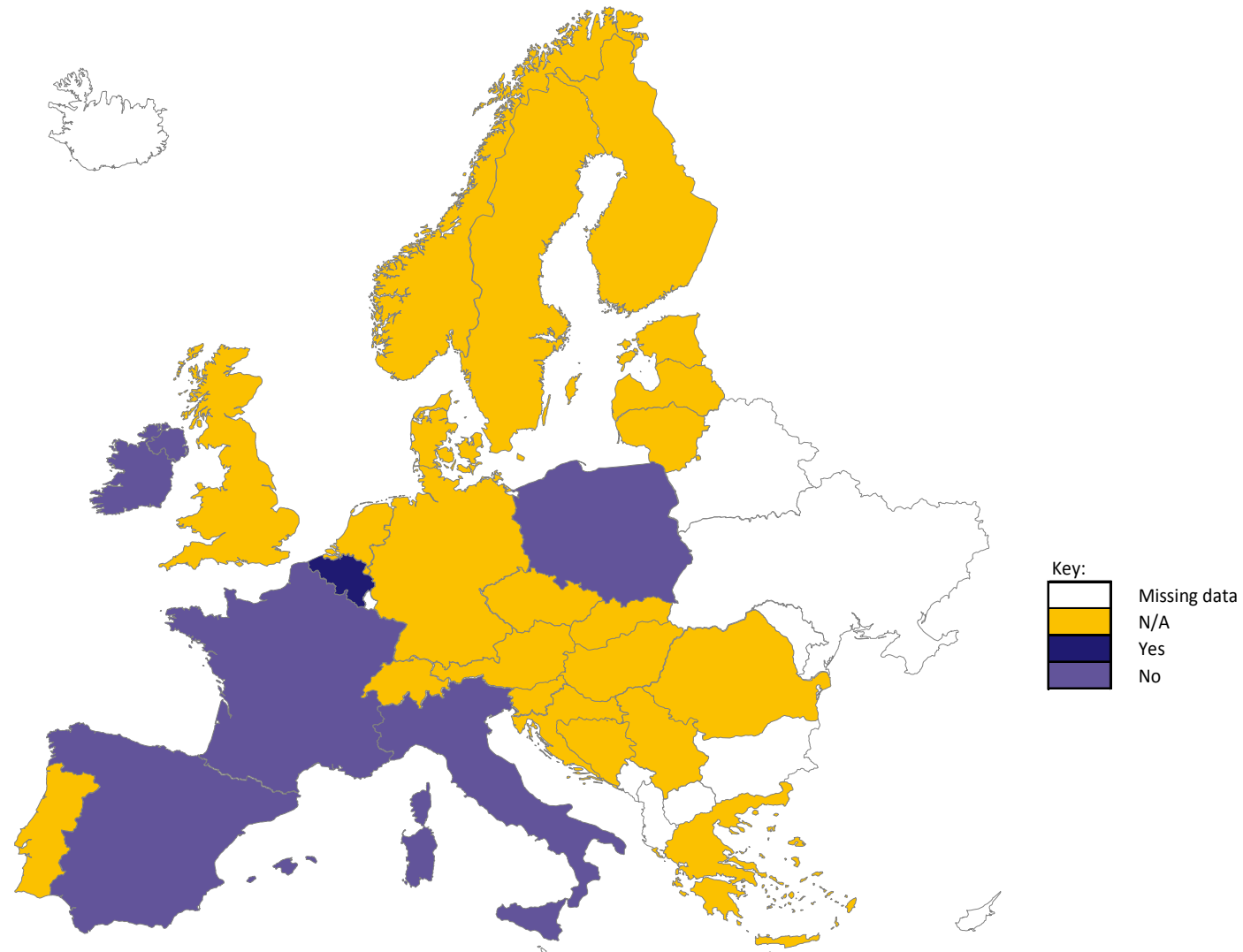
Load participation - Participating in the balancing services - Small consumers



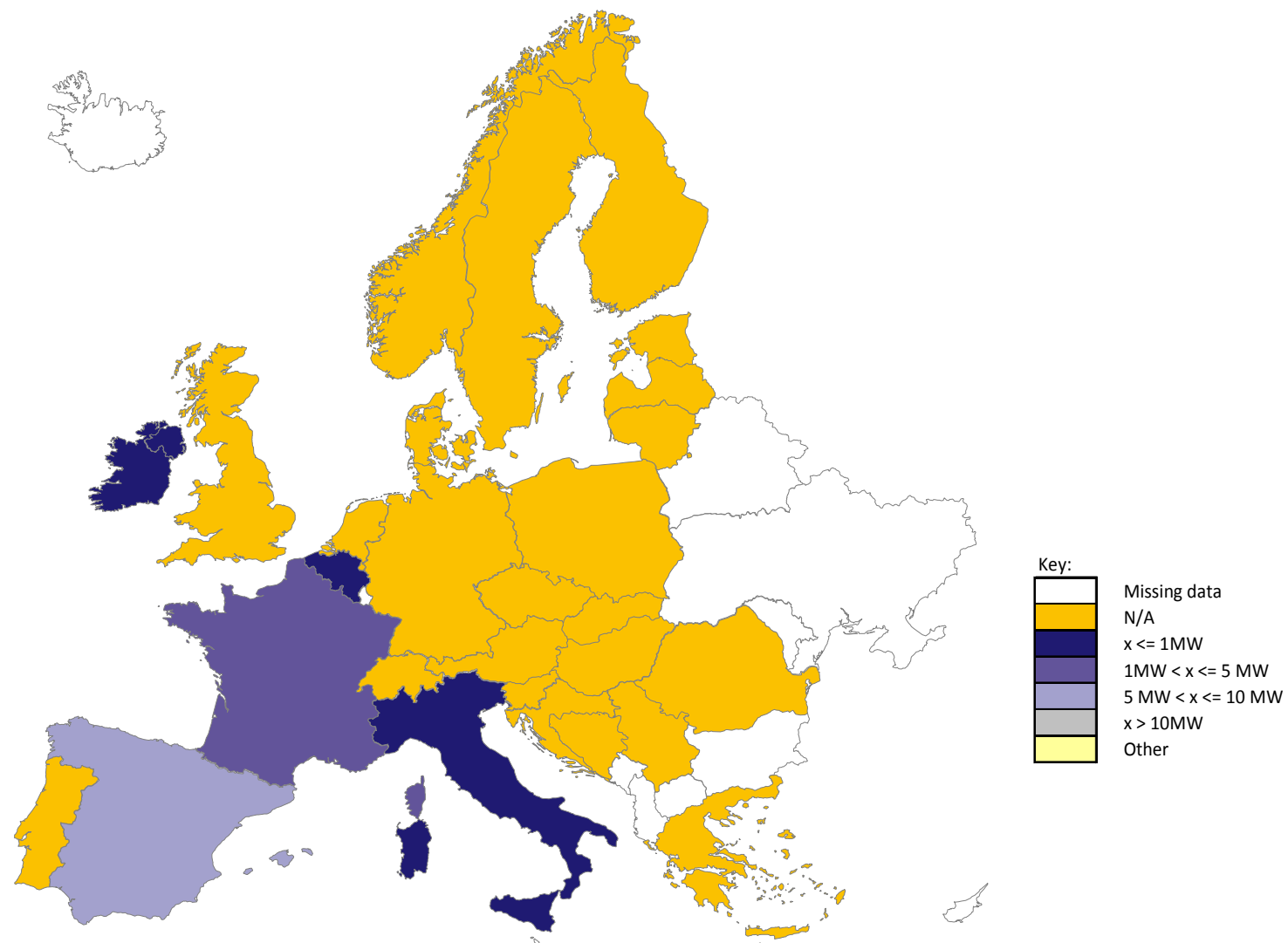
Load participation - Participating in the balancing services - Other storage consumers



Load participation - Participating in the balancing services -Other consumers



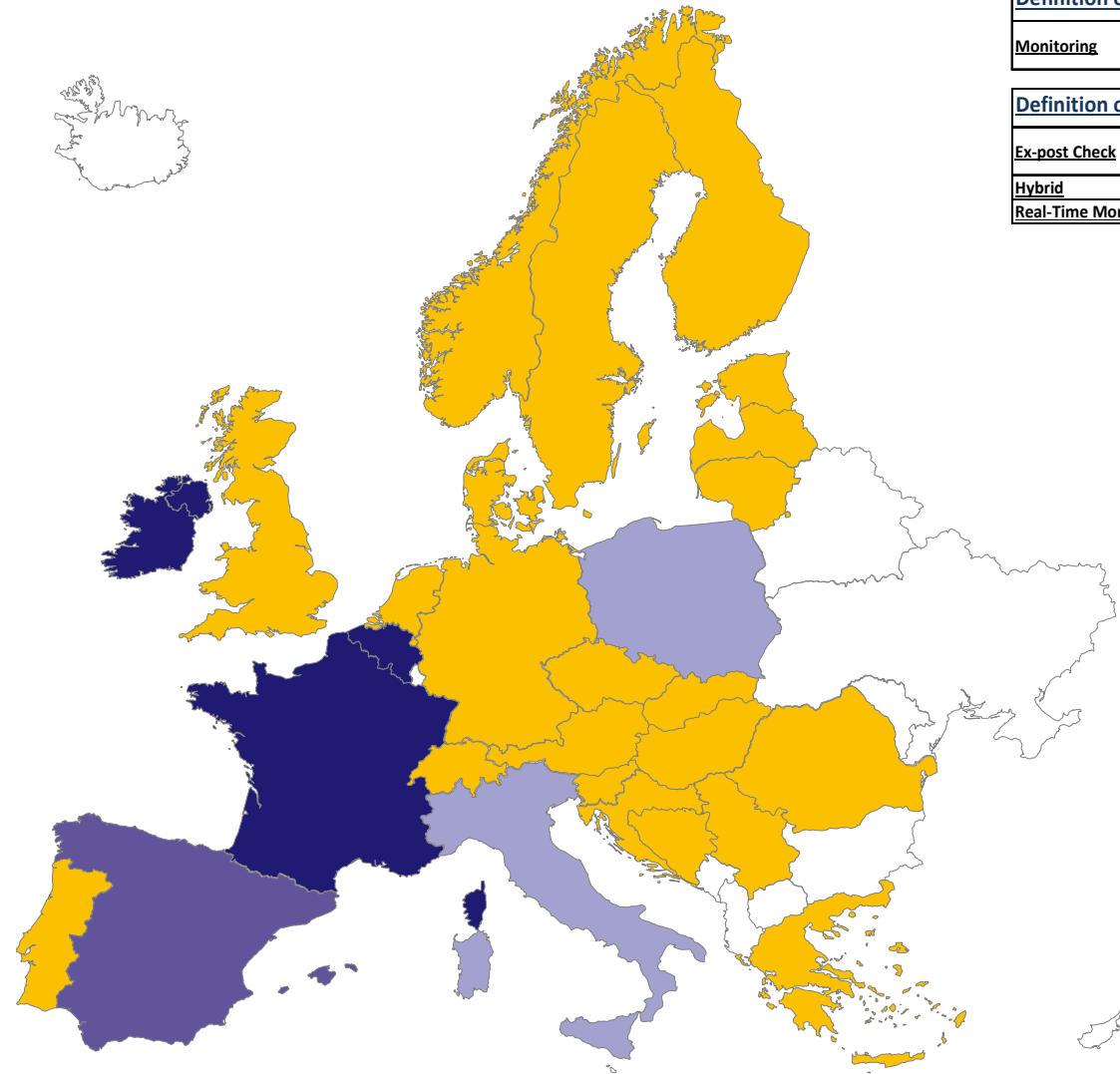
Load participation - Product resolution for load BSP's in the balancing services



Load participation - Monitoring

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

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



Key:

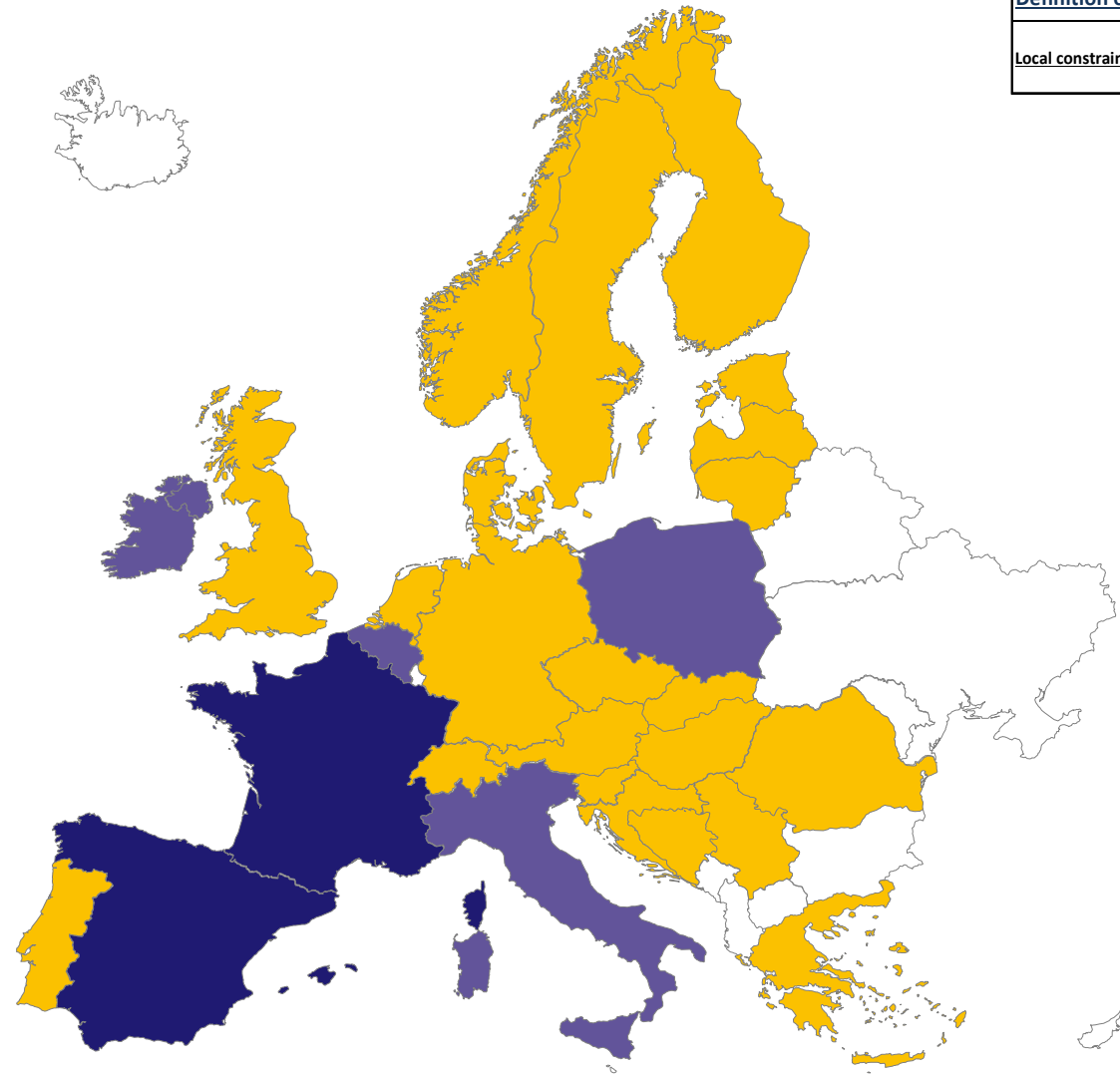
	Missing data
	N/A
	Ex-Post Check
	Real-Time Monitoring
	Hybrid

Load participation - Using load BSP's in order to solve local constraints

Definition of question

Local constraint

Local constraint means a situation in which there is a need to implement Remedial Action in order to respect Operational Security Limits in the matter of the location.



Key:



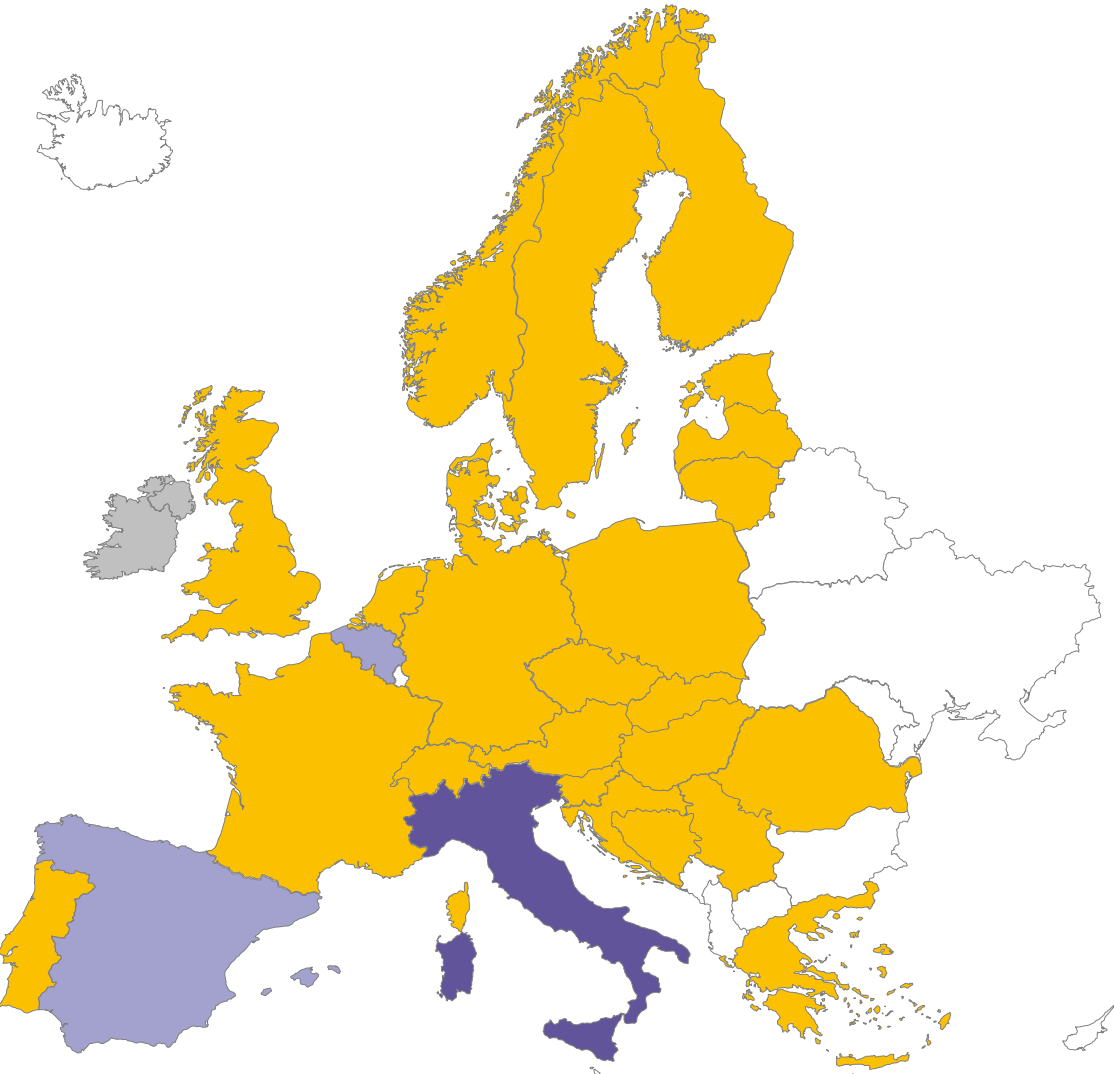
Missing data

N/A

Yes

No

Load participation - Level of the control of the TSO



Key:

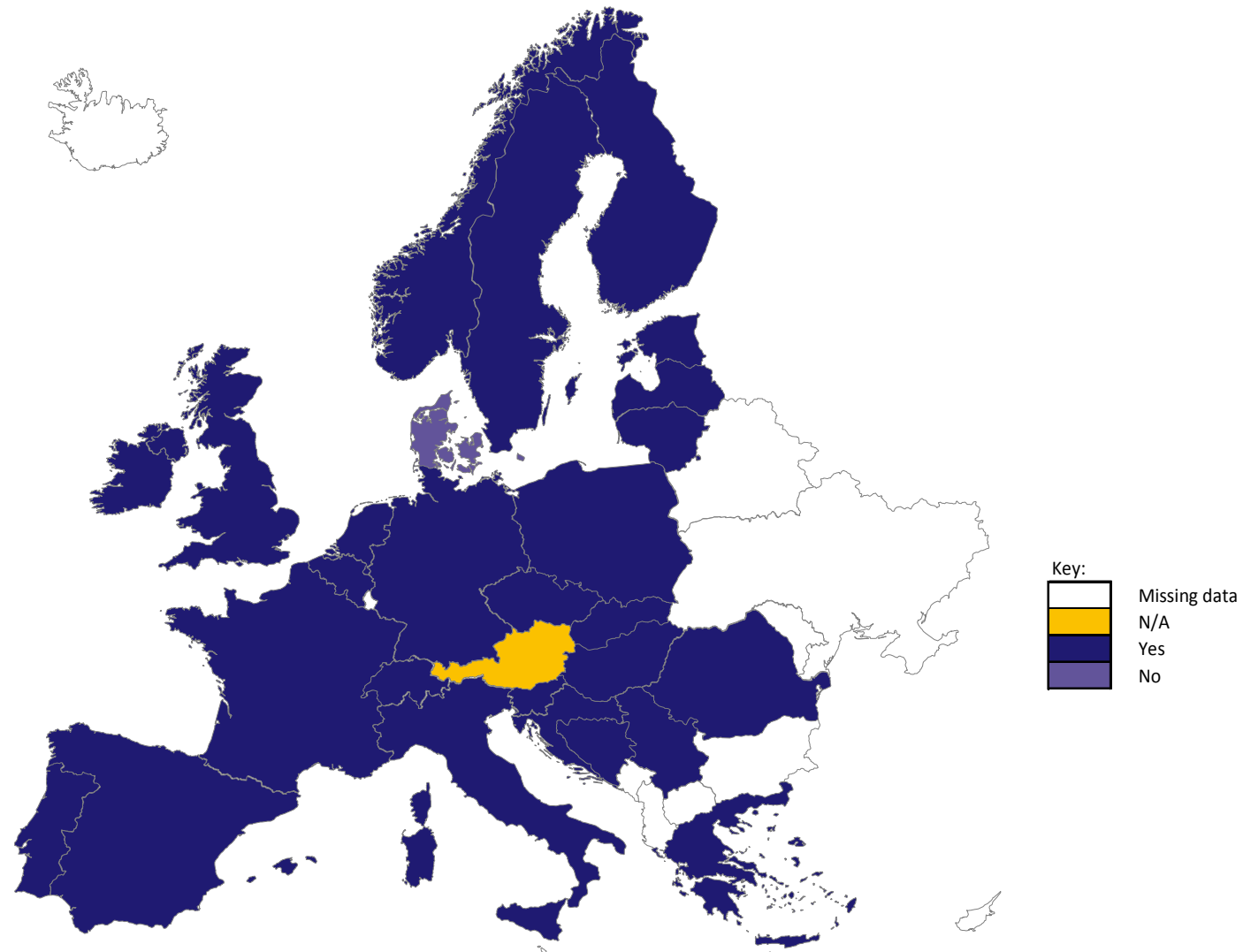
White	Missing data
Yellow	N/A
Dark Blue	No Control
Light Purple	Direct Control (Automatic)
Medium Purple	Direct Control (Manual)
Grey	Relay



Voltage control

(Referring to questions of AS survey from VC1.0 to VCQ12.0)

Voltage control - Voltage support as part of ancillary services



Voltage Control - Which power plants have to provide voltage control? Is it a mandatory service in your country? 1/3

TSO	Answer
ADMIE	Production units of > 2 MW (RES are exempted) have to comply with technical regulation and have minimum requirements to provide voltage control.
APG	It is a mandatory service.
CEPS	All units connected to the grid must be capable of voltage control.
EirGrid	Yes. Targe control.
Elering	It is mandatory. All power plants that are connected to the main grid must have voltage control capability.
Elia	Power plants above 25 MW of installed capacity are obliged by technical regulation to be able to provide voltage control service to Elia (automatic & manual reaction at Elia's request), and thus dispose and install specific equipment's to do so. Power plants below 25 MW of installed capacity are obliged by technical regulation to be able to switch between at least 2 reactive mode at Elia's request.

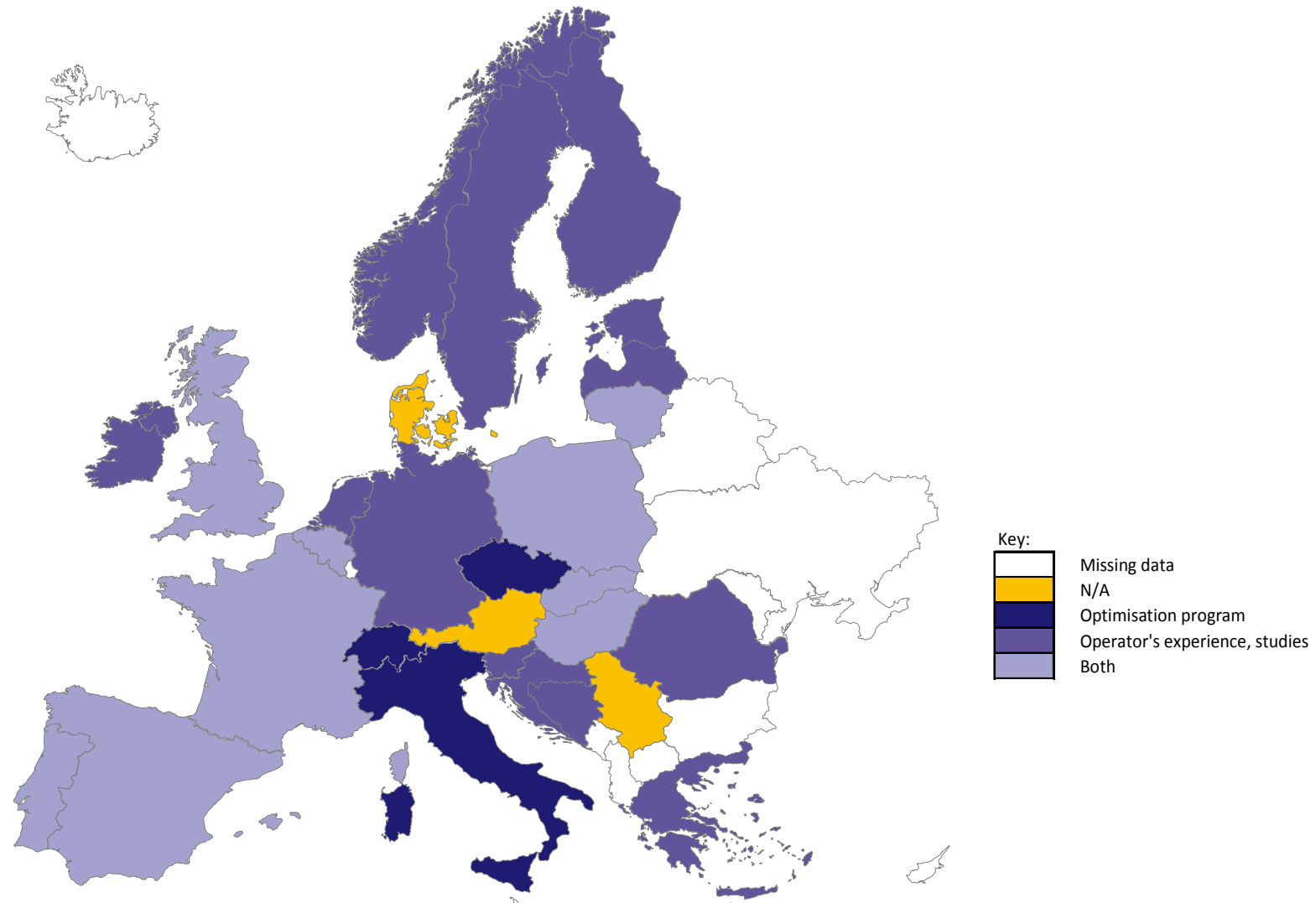
Voltage Control - Which power plants have to provide voltage control? Is it a mandatory service in your country? 2/3

TSO	Answer
EMS	All PP connected to transmission system. It is mandatory service.
Fingrid	Mandatory for all power plants.
German TSOs	The framework of voltage control requirements for plants connected to the high-voltage grid is provided by the German Transmission Code. Concrete requirements within the given framework are agreed between connecting TSO and power plant operator and included in the grid connection contracts. A similar framework does also exist for medium-voltage grids.
HOPS	All. There is a mandatory range. Beside it, it has to be payed.
Litgrid	All power plant conected to transmission gird. All running generator shall provide votage support according technical possibilities from generator.
MAVIR	If the installed capacity is more than 50 MW and the power plant is connected to the transmission grid or 132 kV, the service is mandatory.
NOS BiH	It is a mandatory service.

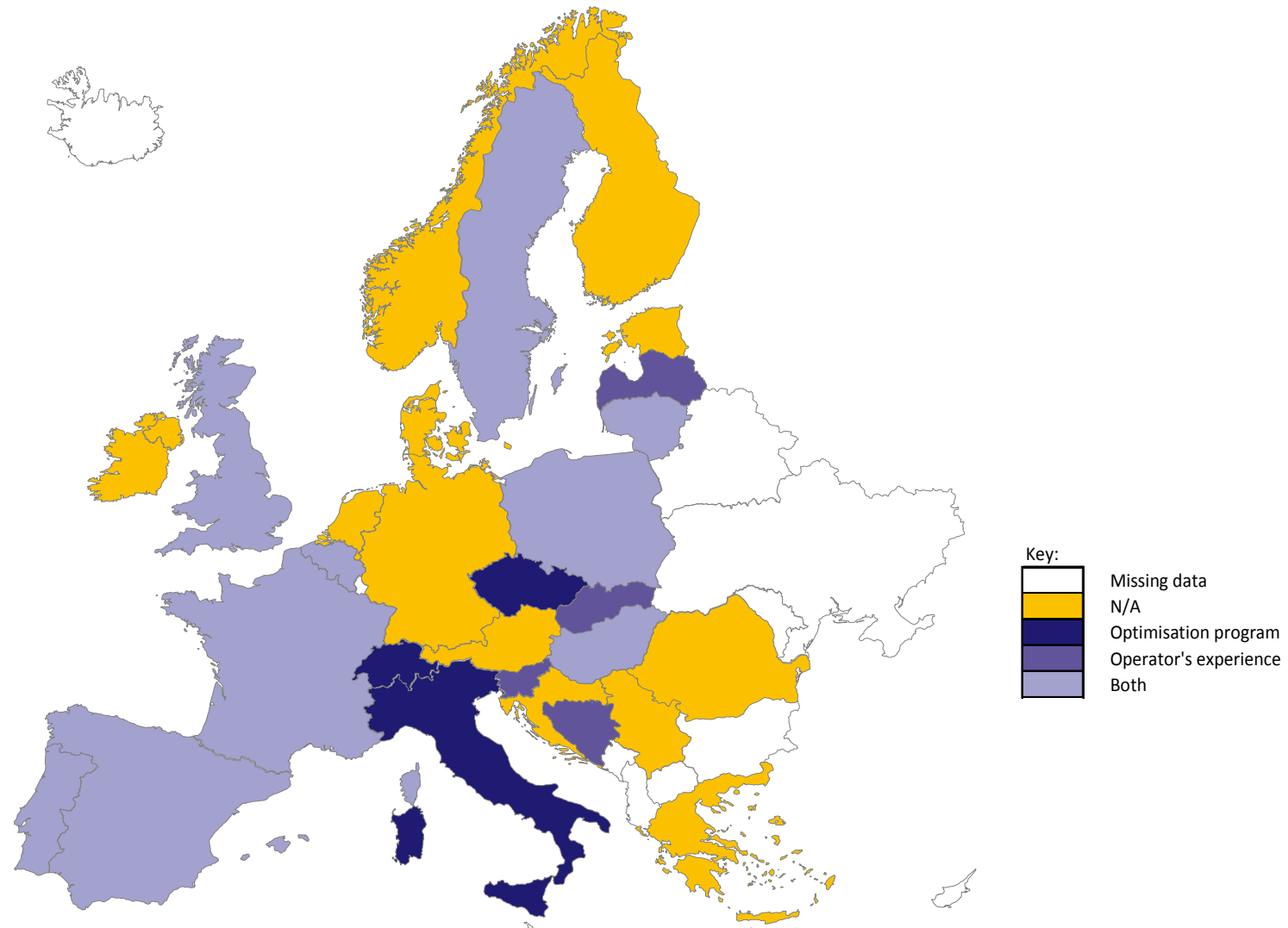
Voltage Control - Which power plants have to provide voltage control? Is it a mandatory service in your country? 3/3

TSO	Answer
PSE	All generating units according to the Polish Grid Code are obliged to control the voltage, centrally dispatched units are contracted for such service.
REE	Mandatory service Regarding transmission system, all units connected to this level with rated power equal or above 30 MW should provide it.
RTE	Every G.U. connected to RTE grid has to provide voltage control. The type of control depends on several parameters as it is explained in the question below (VCQ2).
SEPS	Primary voltage control is mandatory and secondary voltage control is paid service. We use secondary voltage control just at transmission level (400 kV and 220 kV).
Swissgrid	All power plants directly connected to the transmission system which are in operation (production, pump mode or synchronous/phase shifting mode), within the scope of their available reactive power that can be exchanged with the transmission system without compromising the active power.
TenneT TSO BV NL	Generators > 5 MW mandatory capability, contracted service.

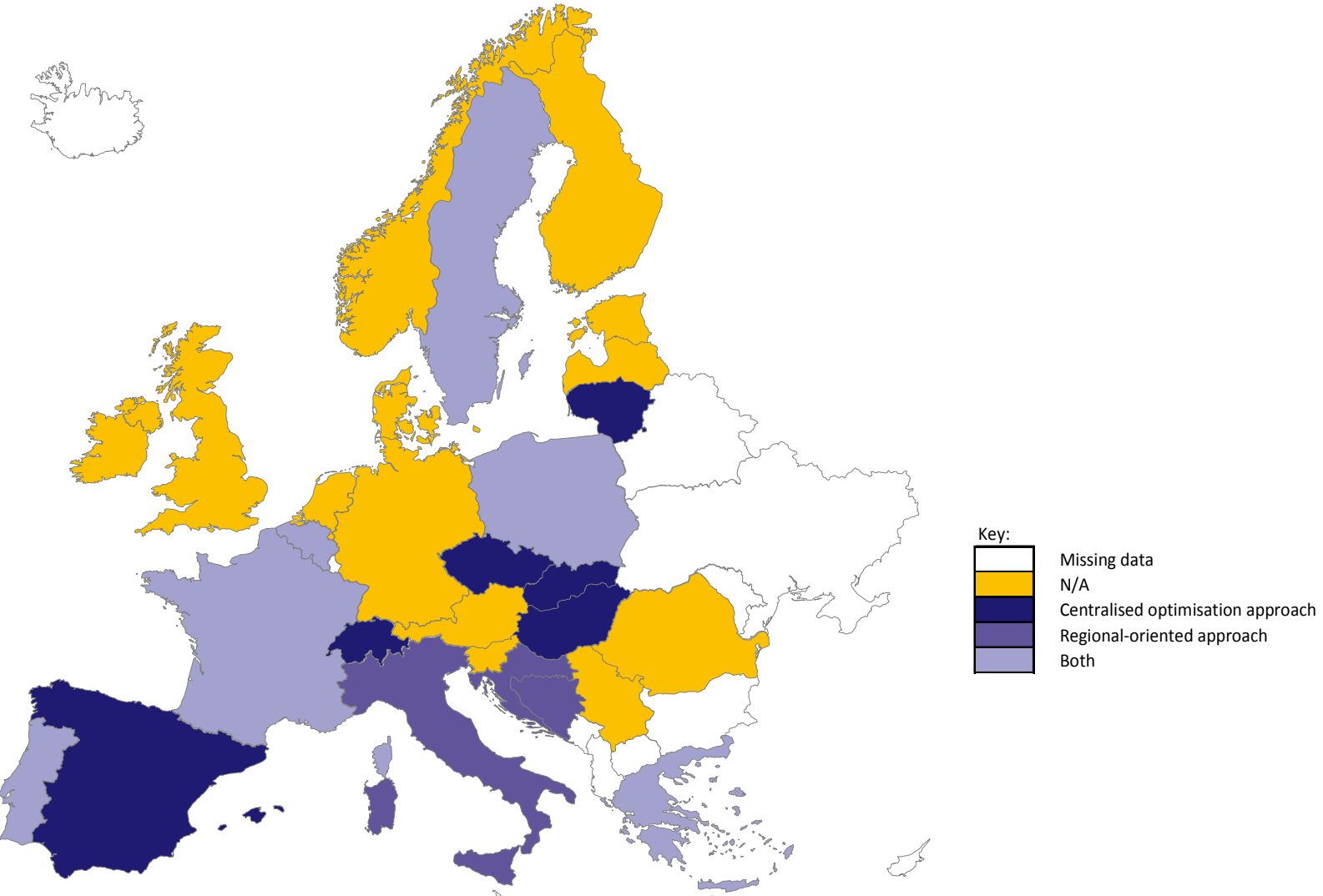
Voltage control - Determination the optimal use of reactive energy



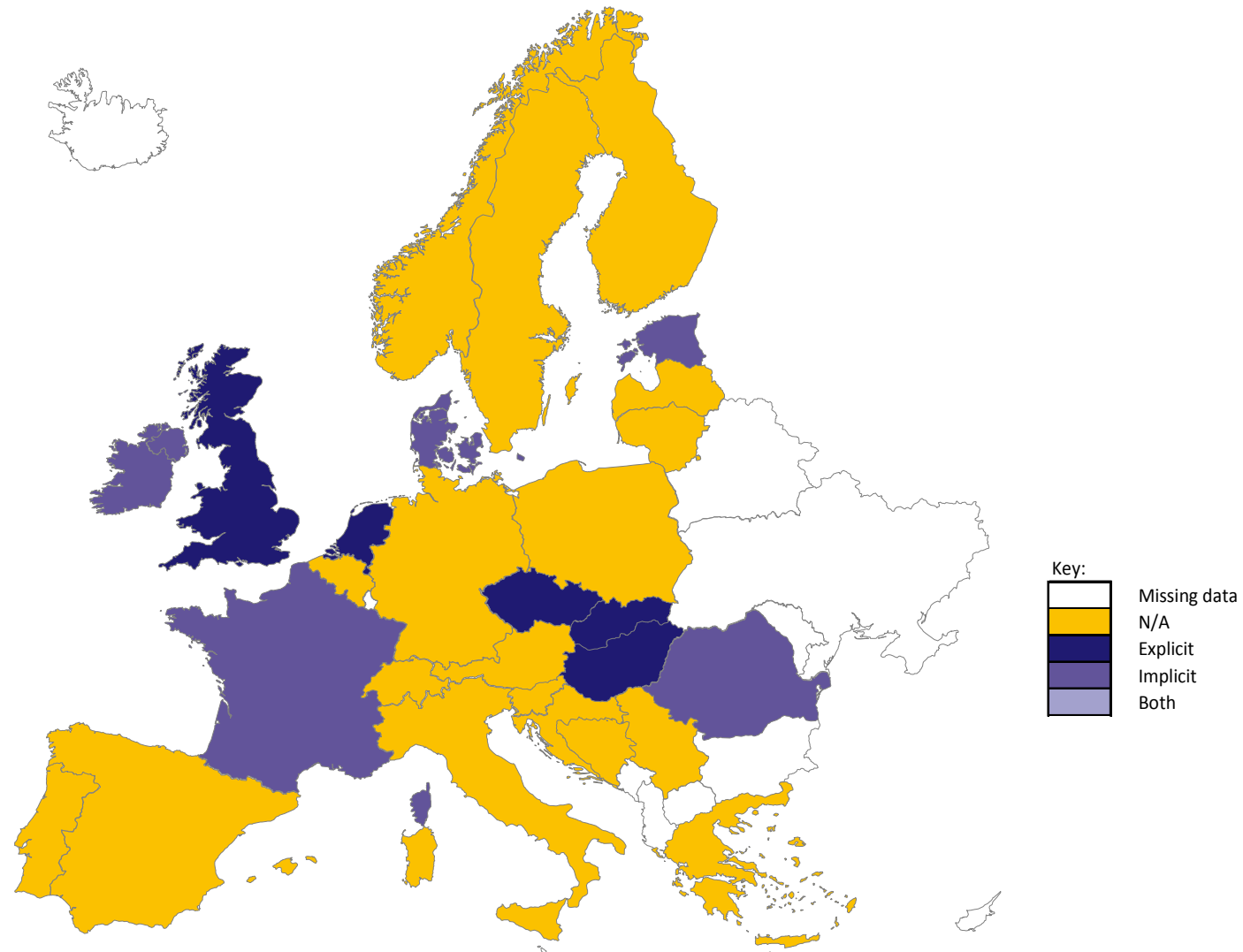
Voltage control - In case of opt.problem - objective function



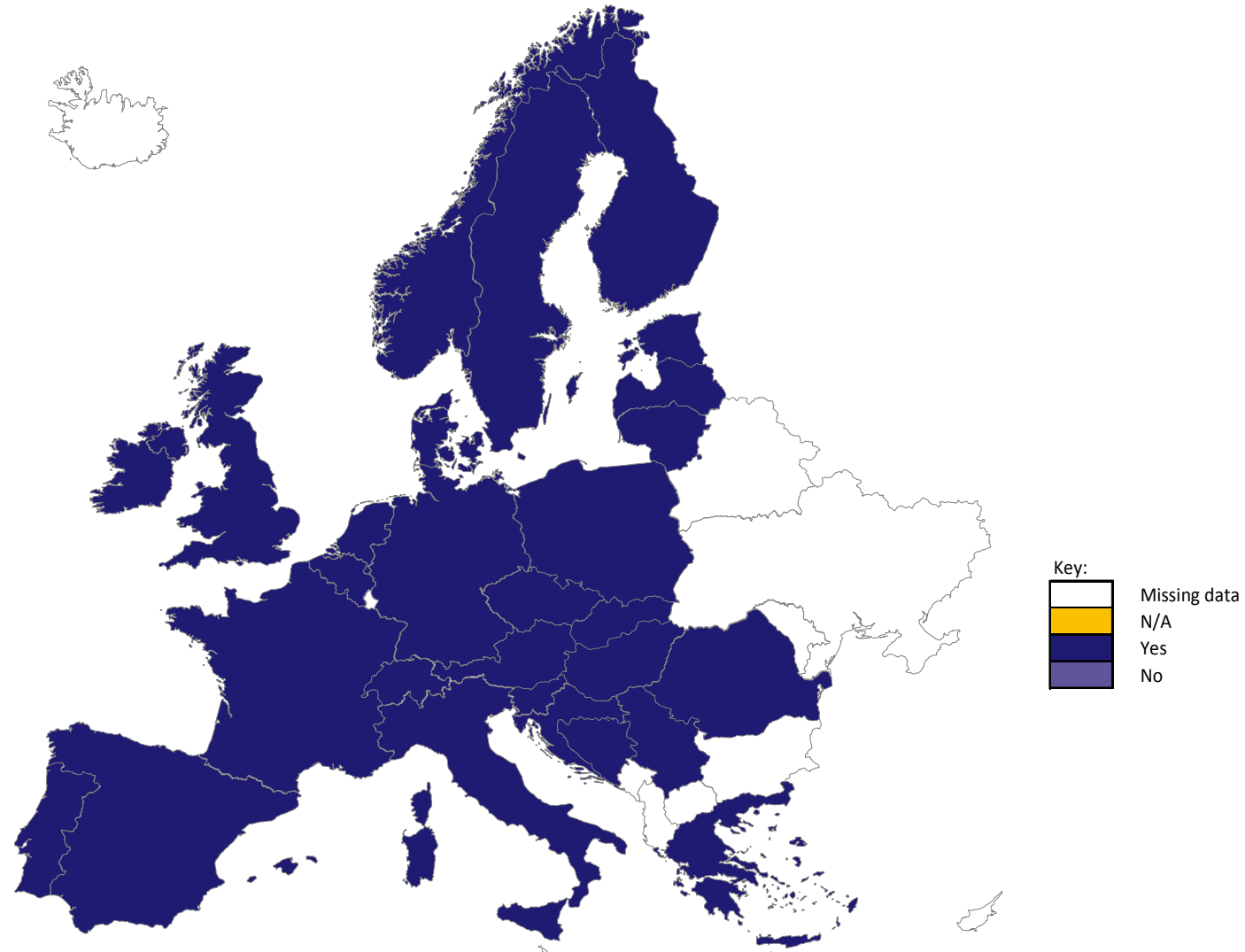
Voltage control - Type of optimization approach



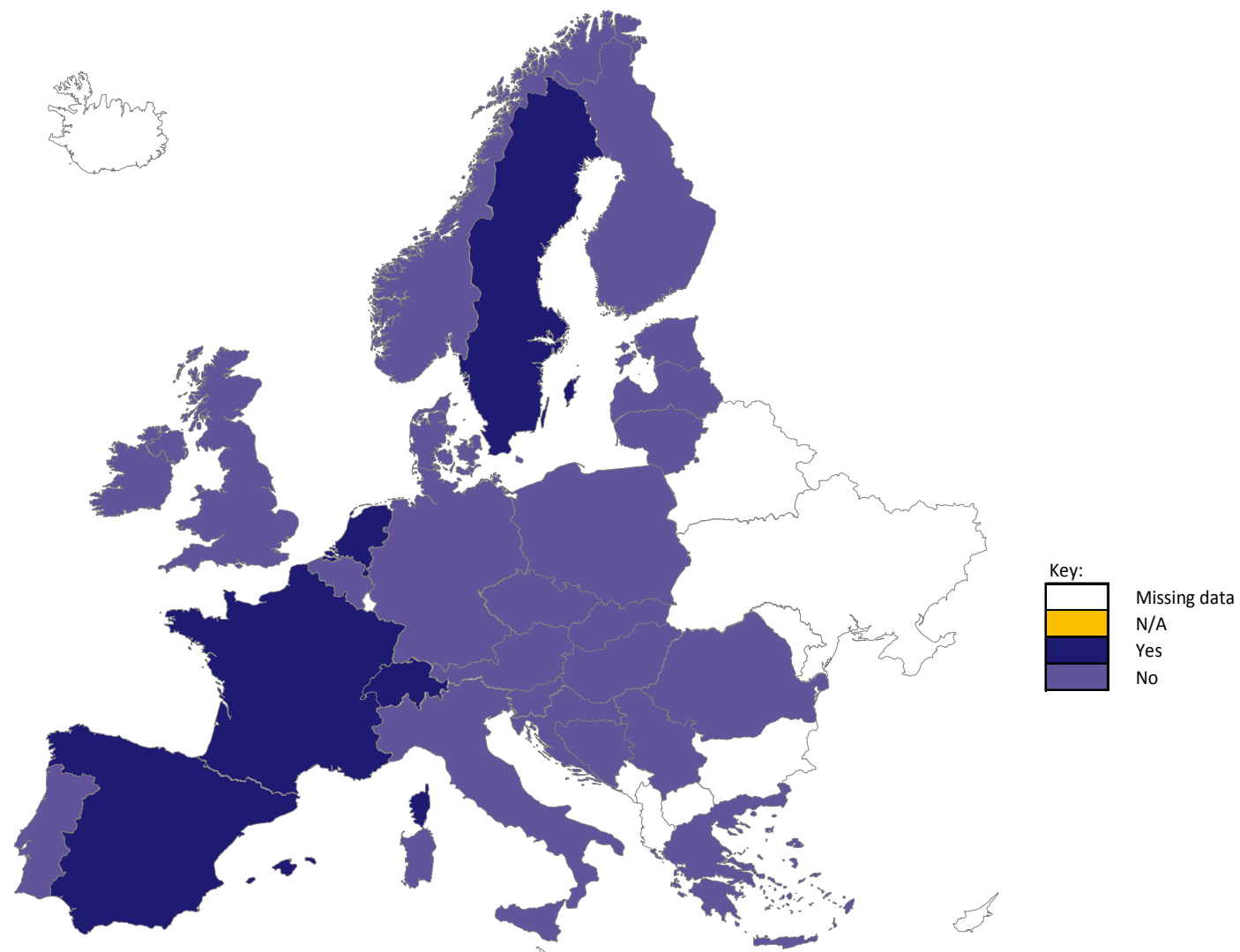
Voltage control - Implicit / explicit offers bids from BSP



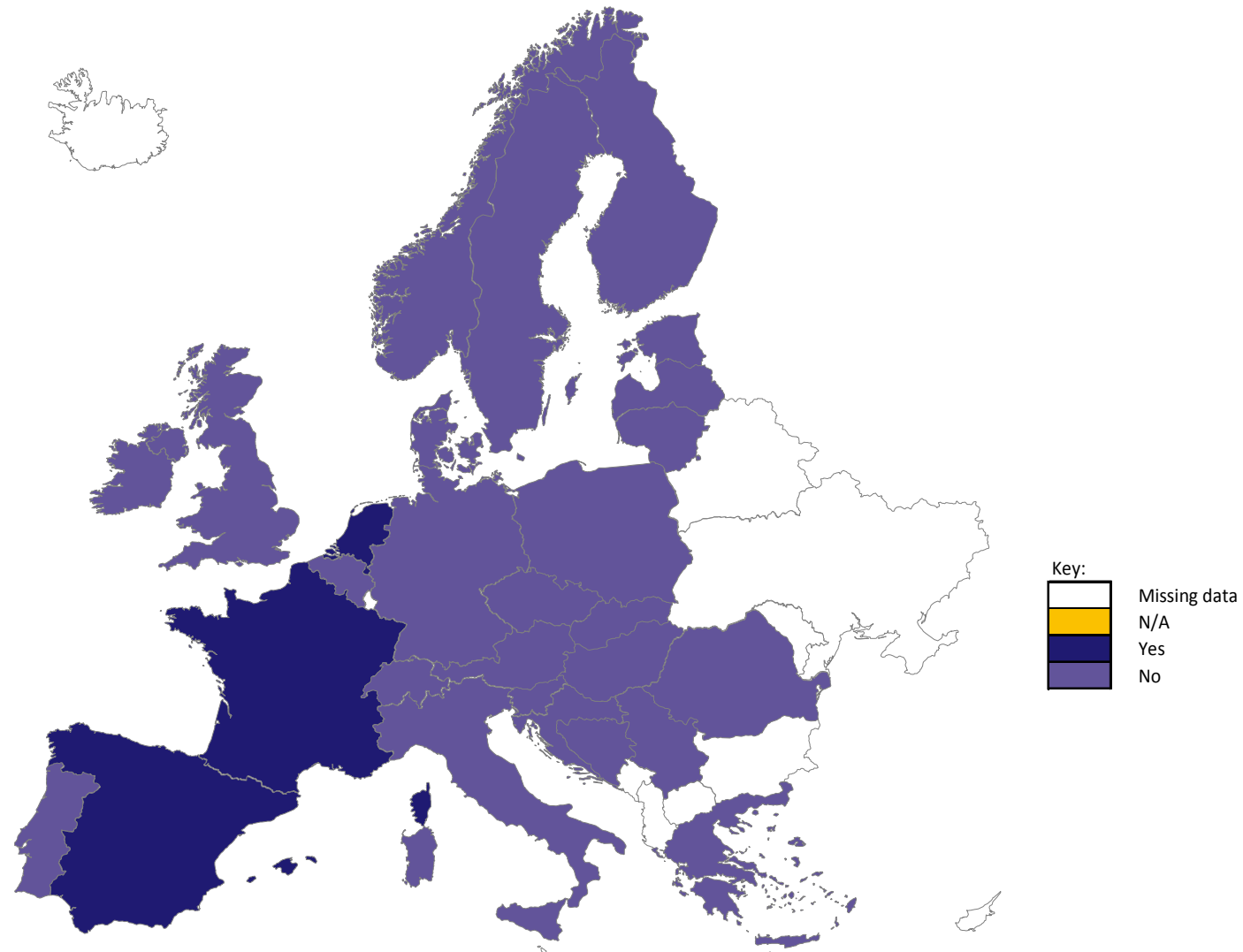
Voltage control - Provider - Generators



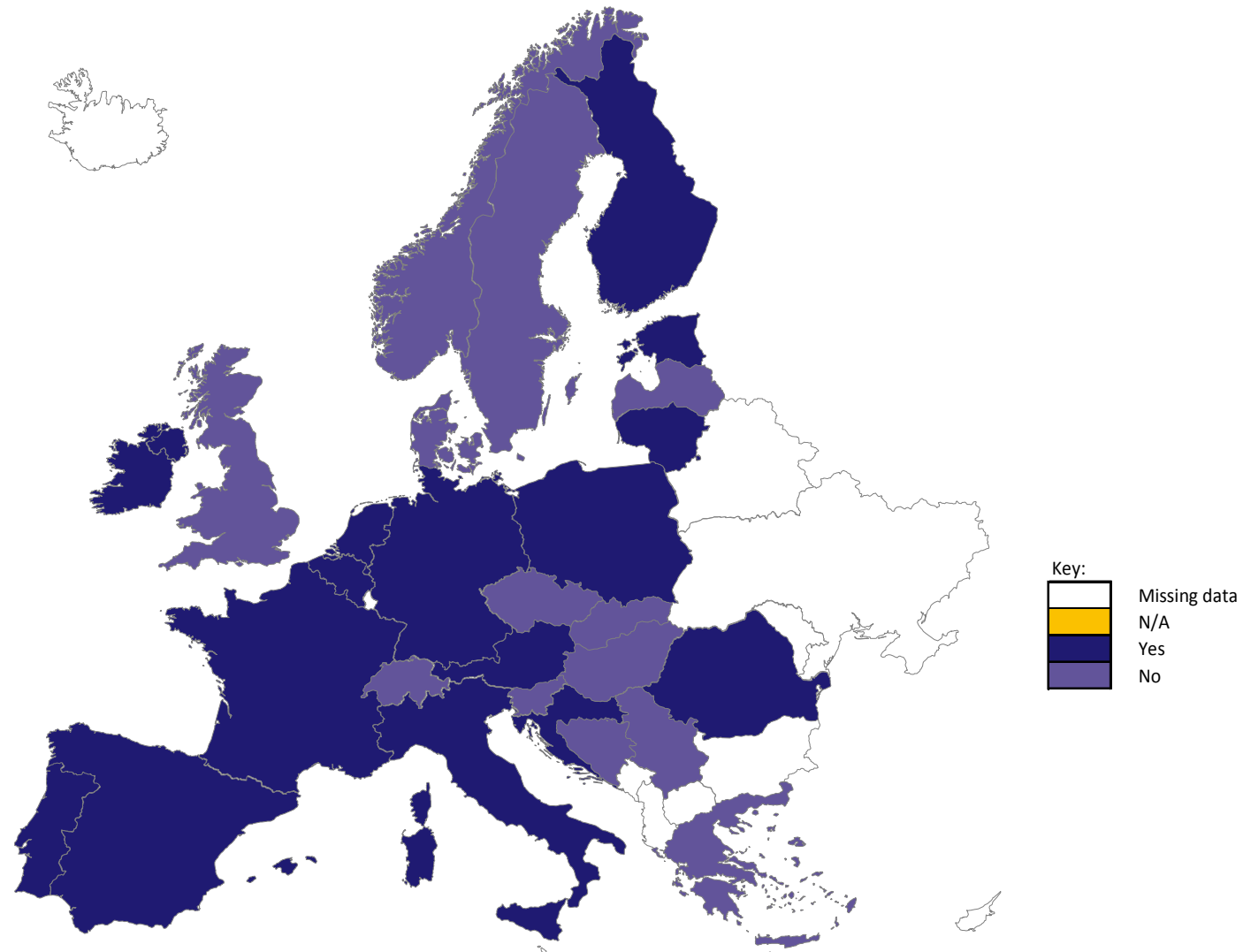
Voltage control - Provider - Distribution system operators



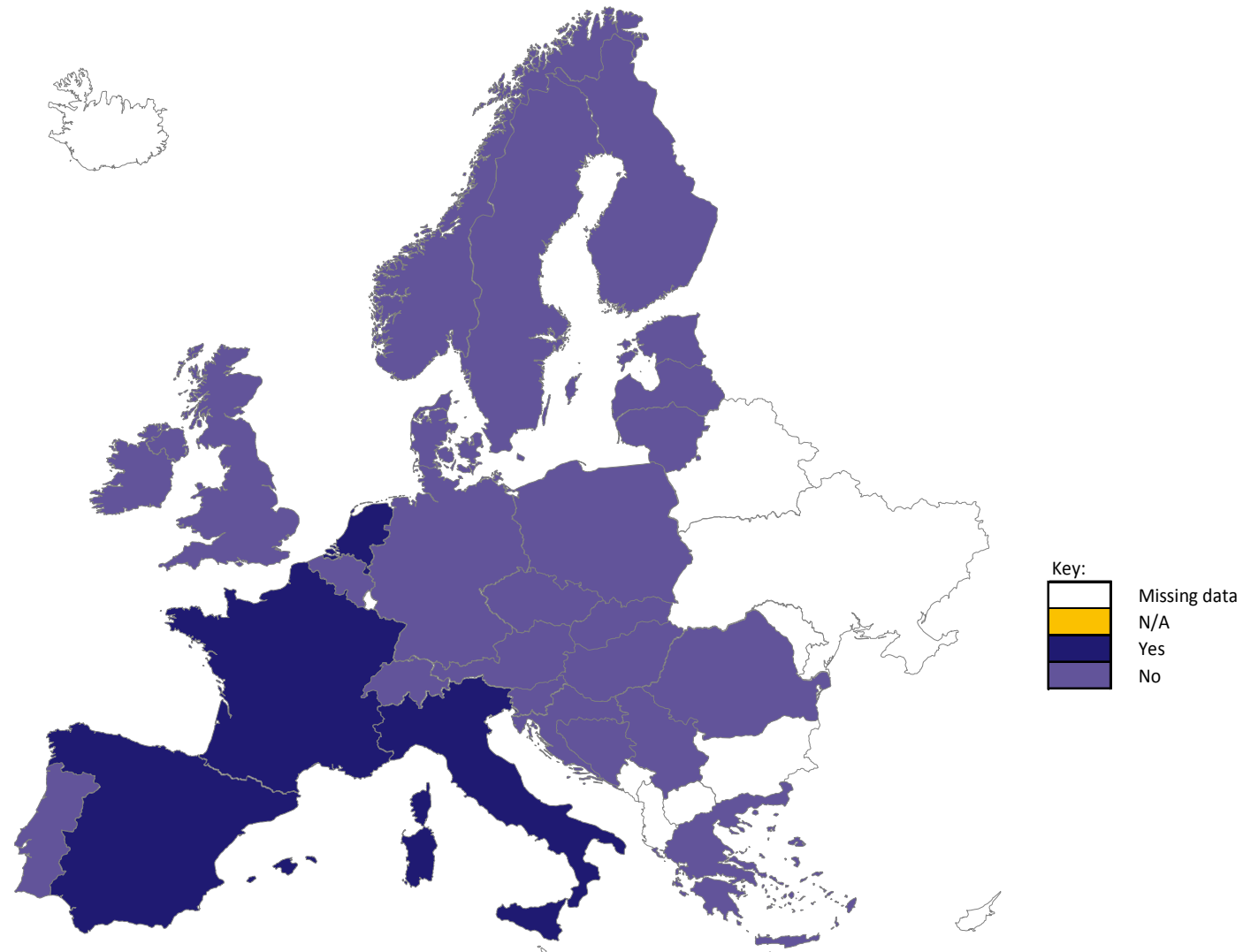
Voltage control - Provider - Industrial consumers



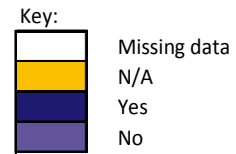
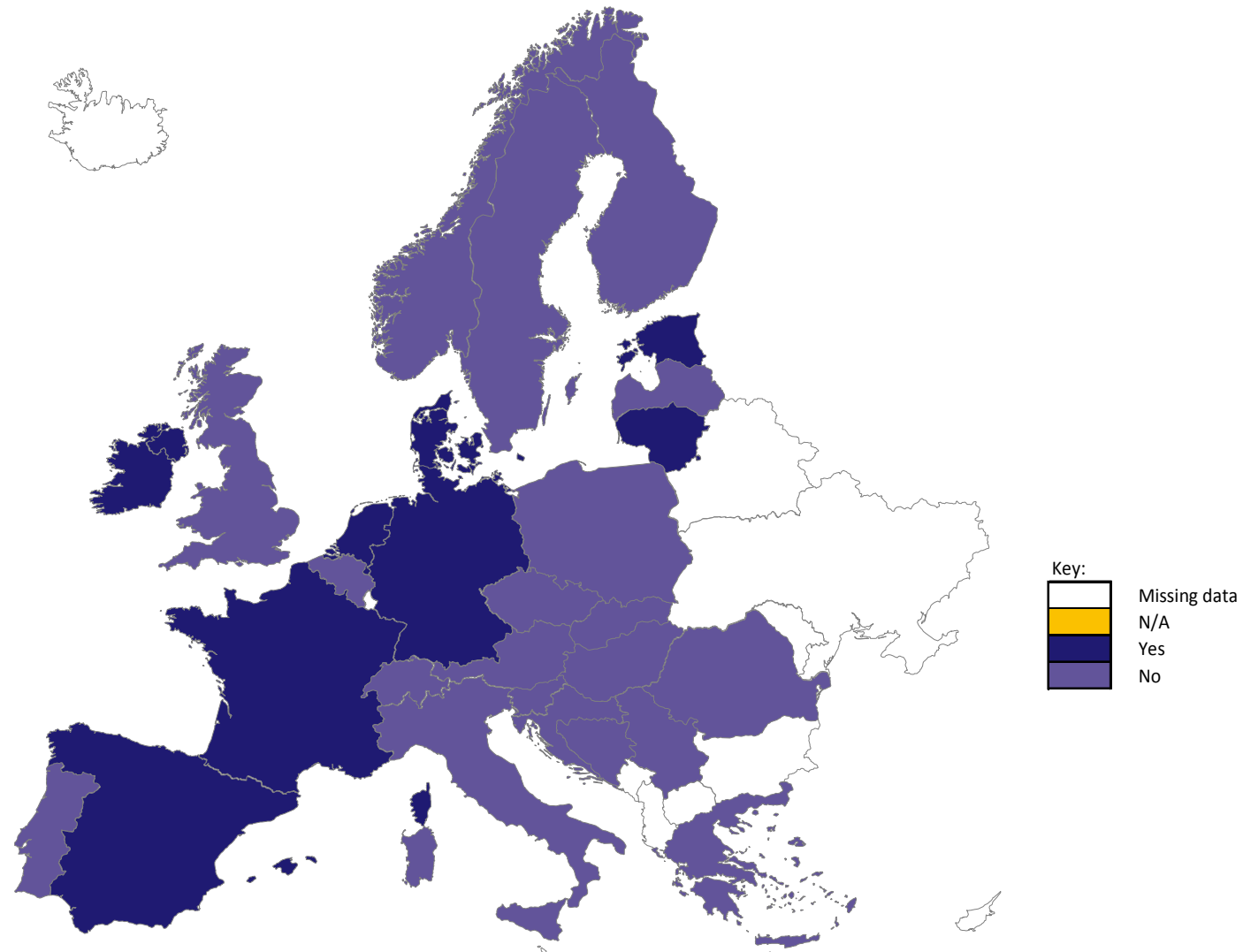
Voltage control - Provider - Windfarm producers



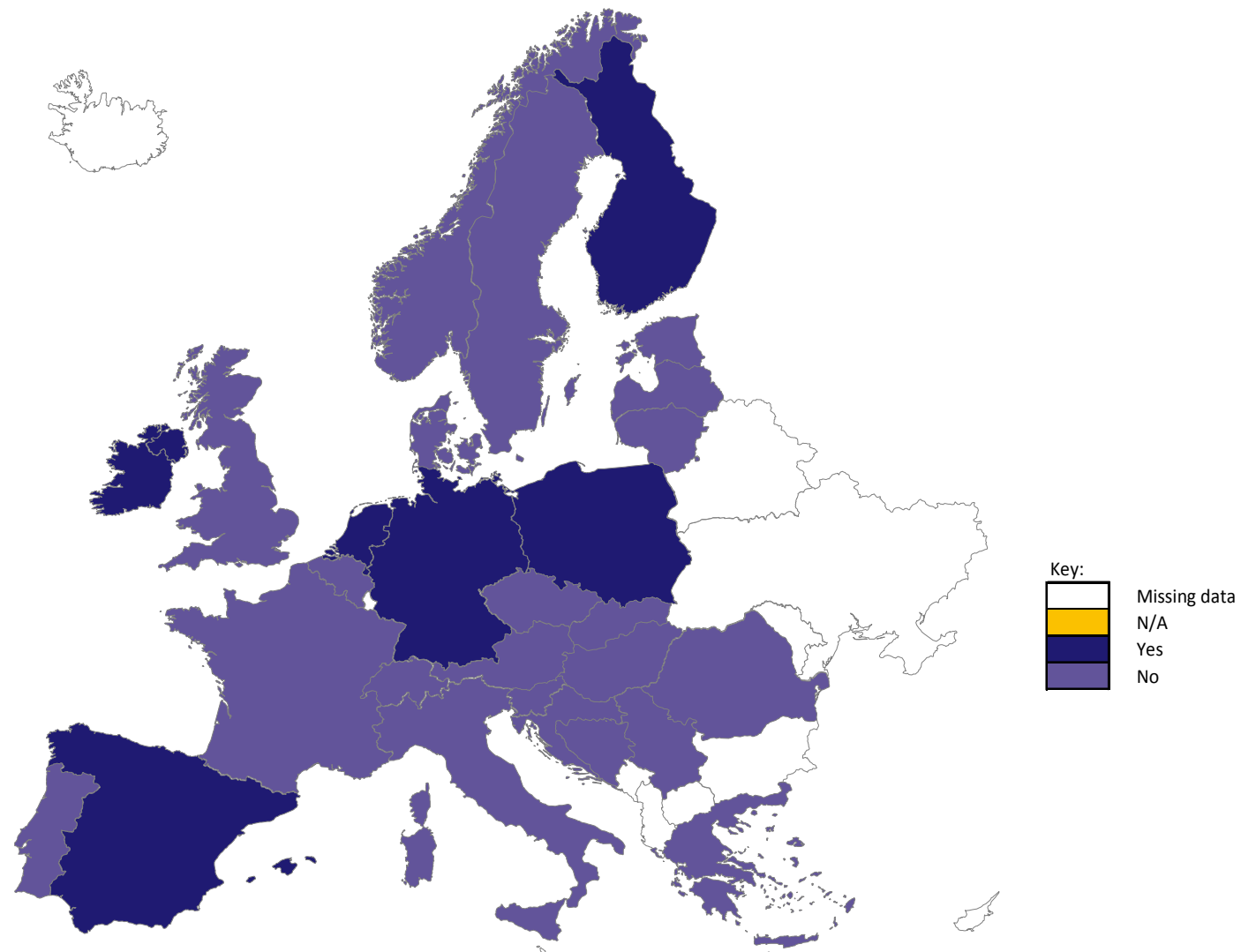
Voltage control - Provider - Photovoltaic systems



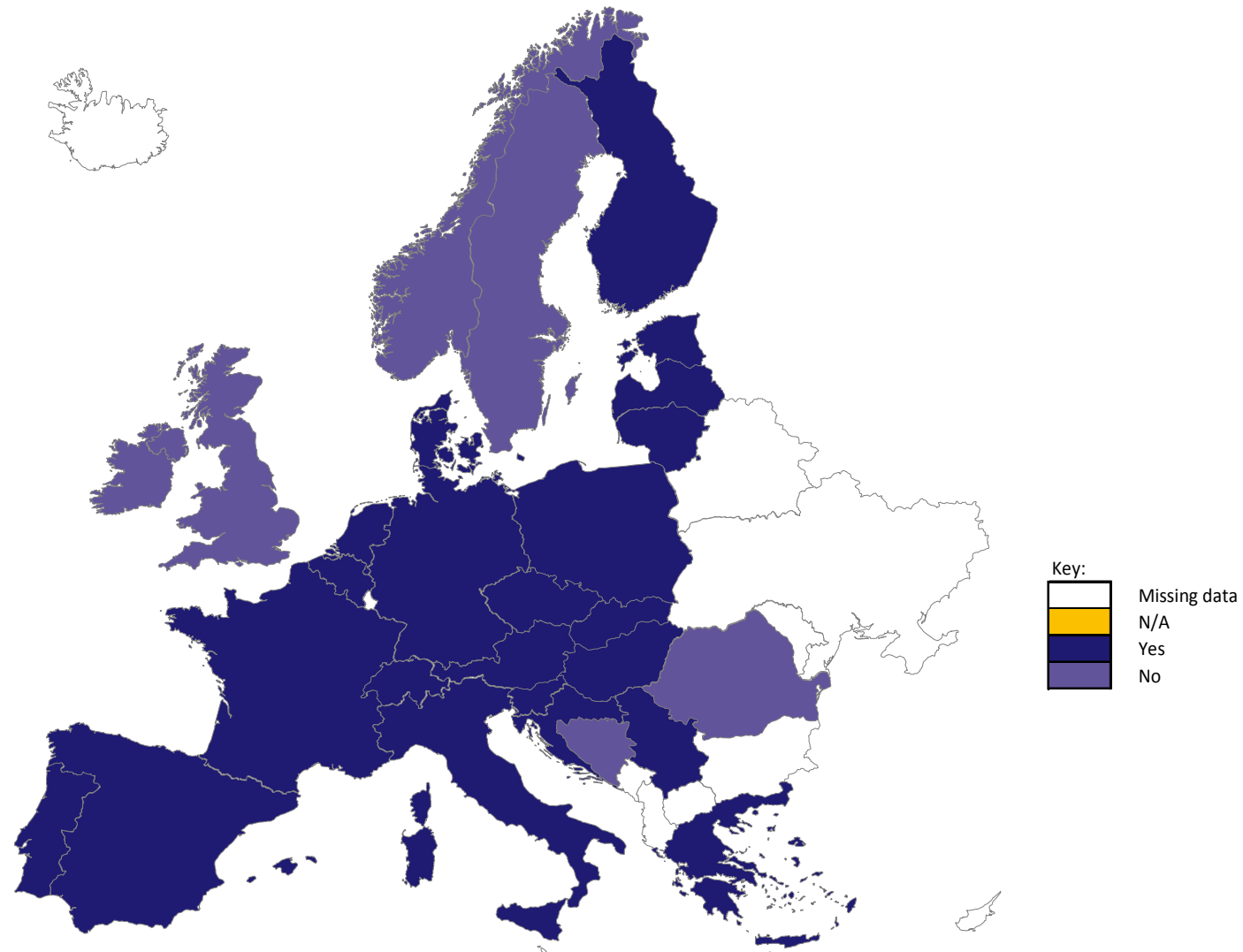
Voltage control - Provider - HVDC links



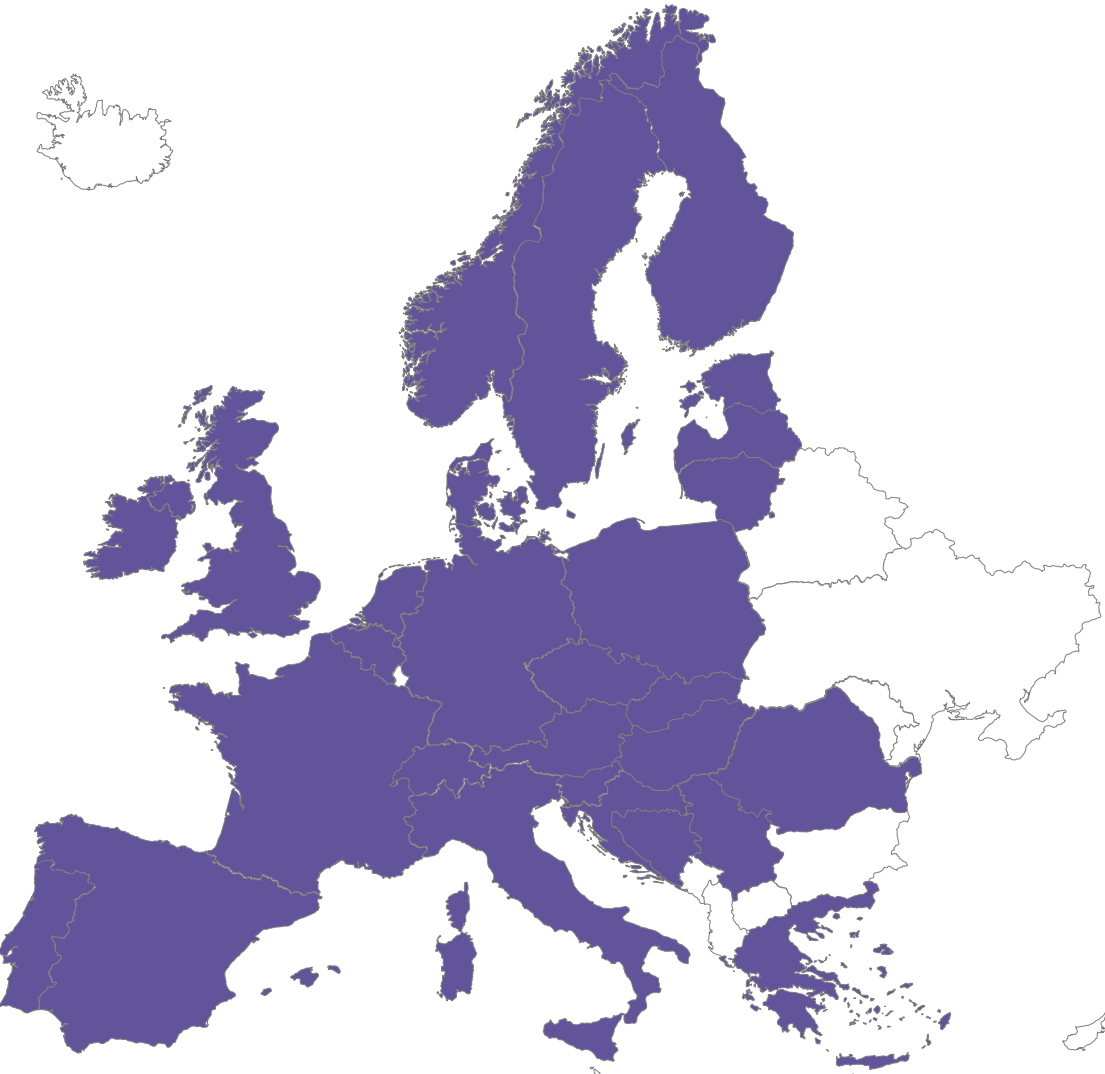
Voltage control - Provider - Windfarm producers or photovoltaic systems connected on the DSO



Voltage control - Provider - Transformers of the transmission grid



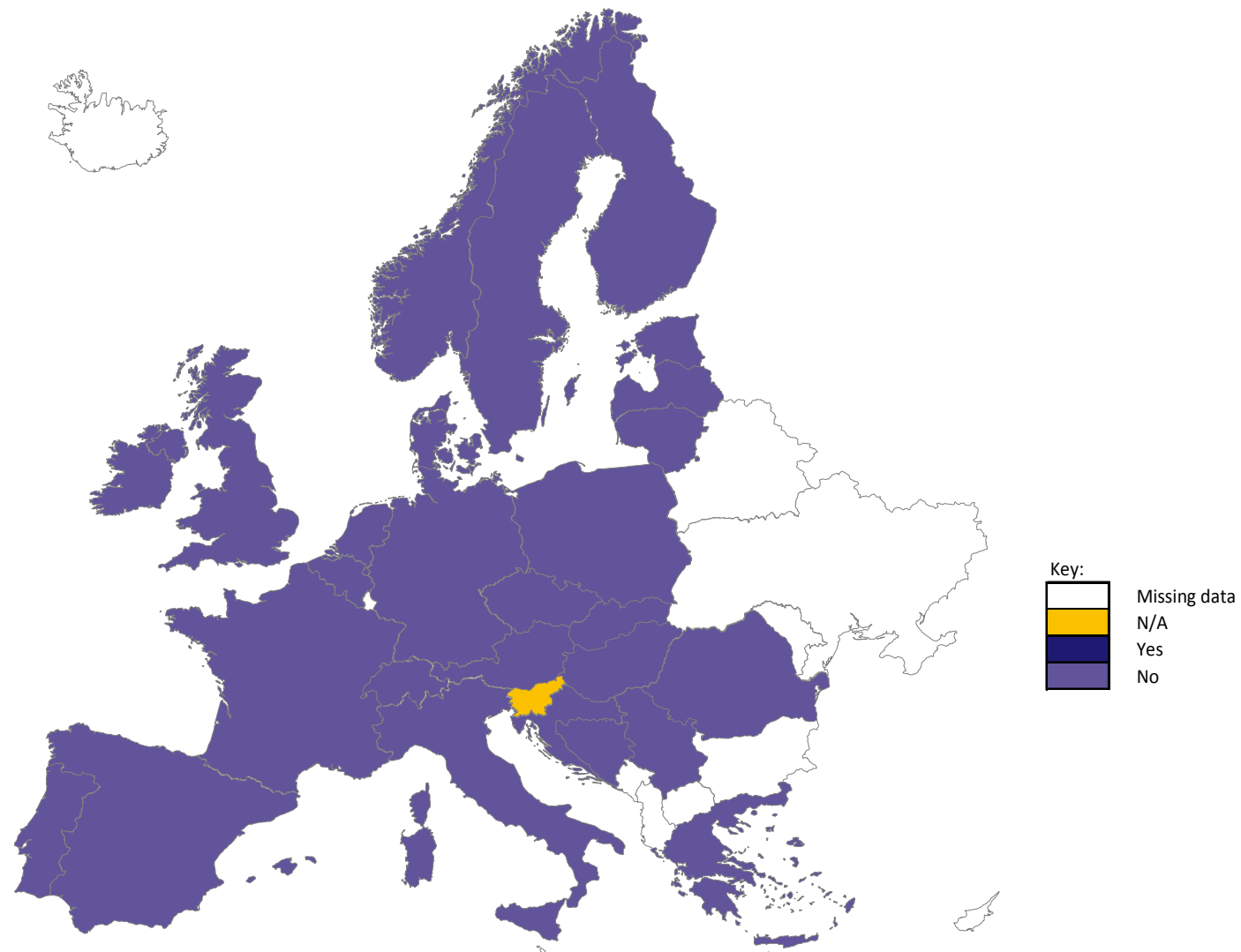
Voltage control - Provider - None of above



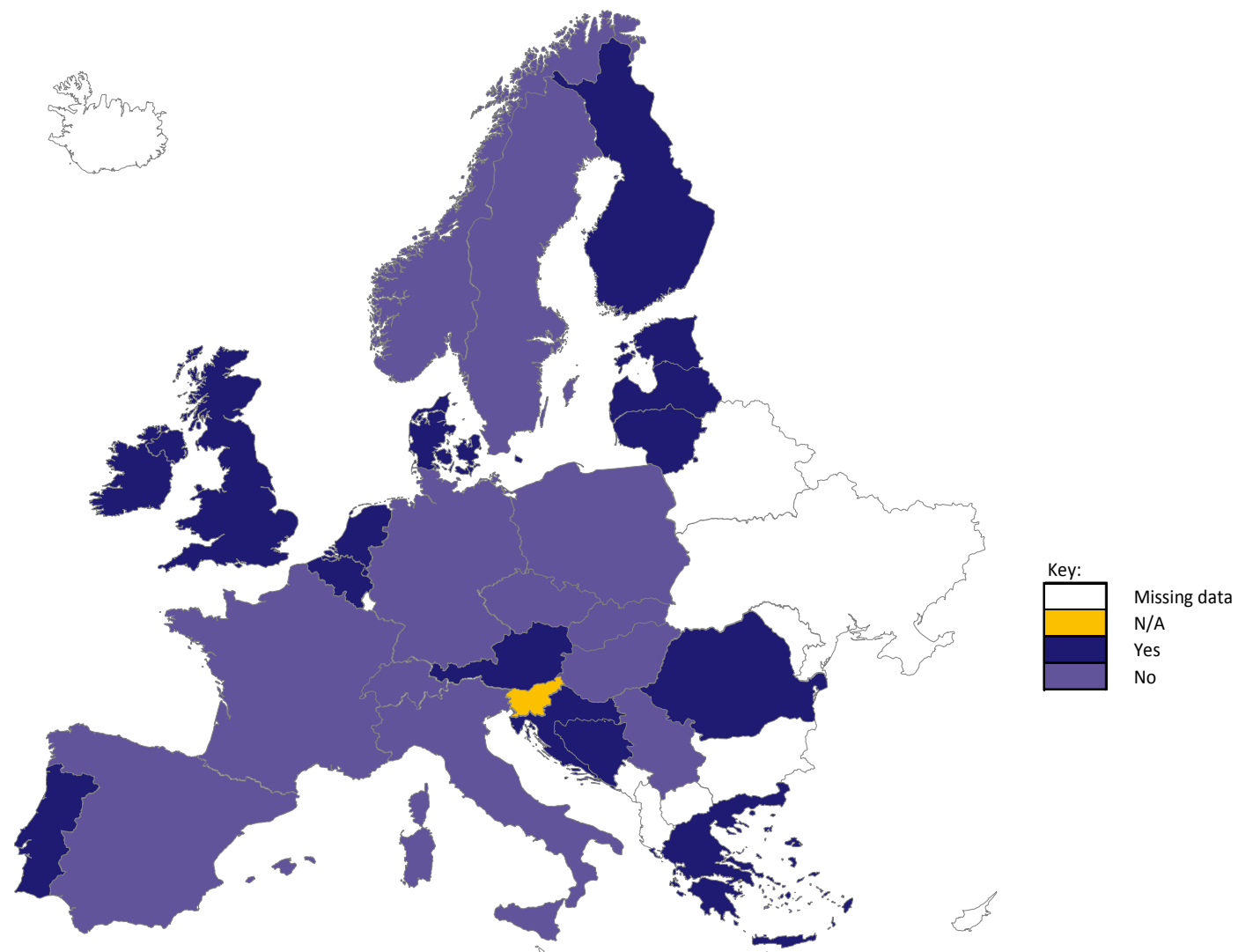
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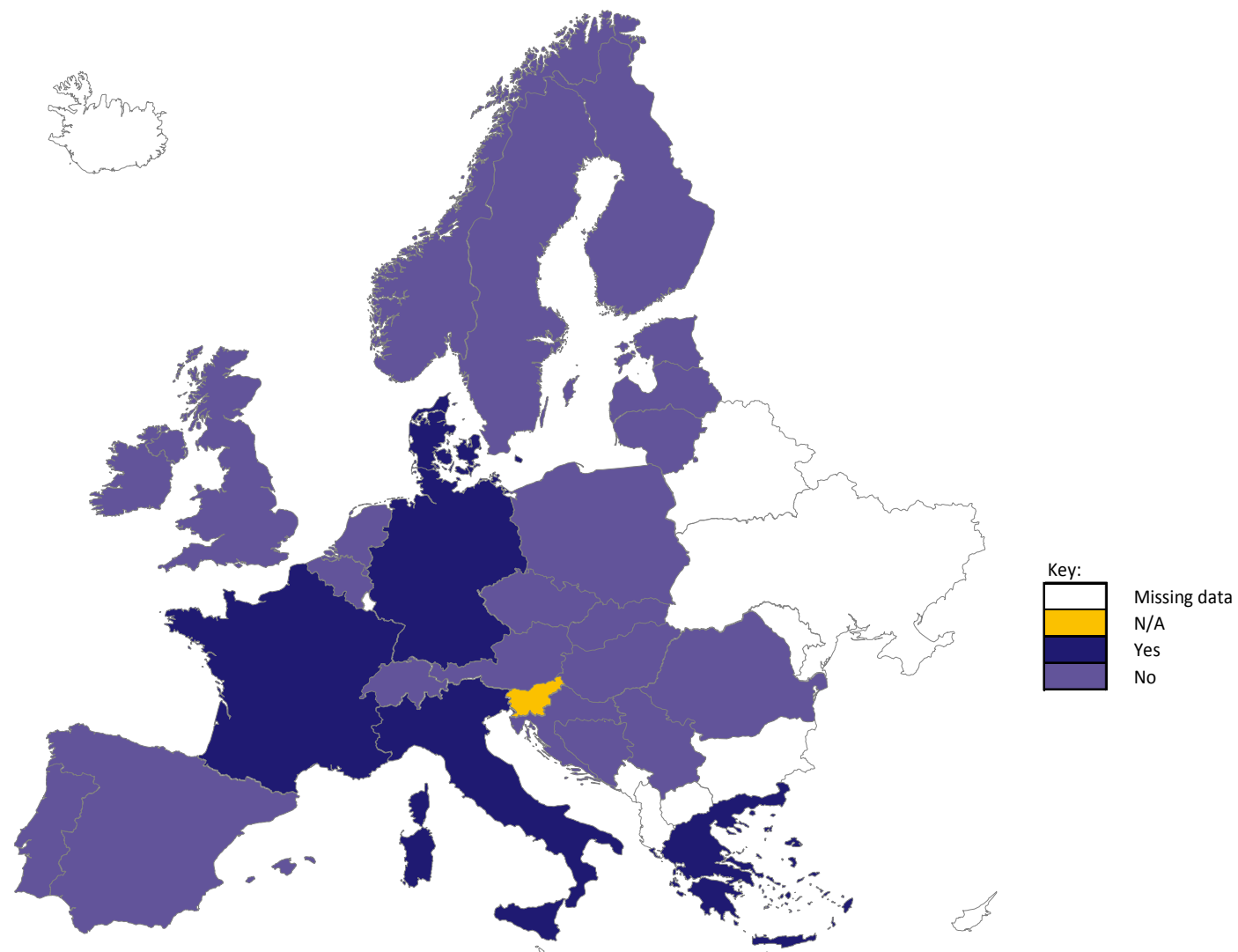
Voltage control - Type of regulations for the voltage control demanded to the power plants - No regulation



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



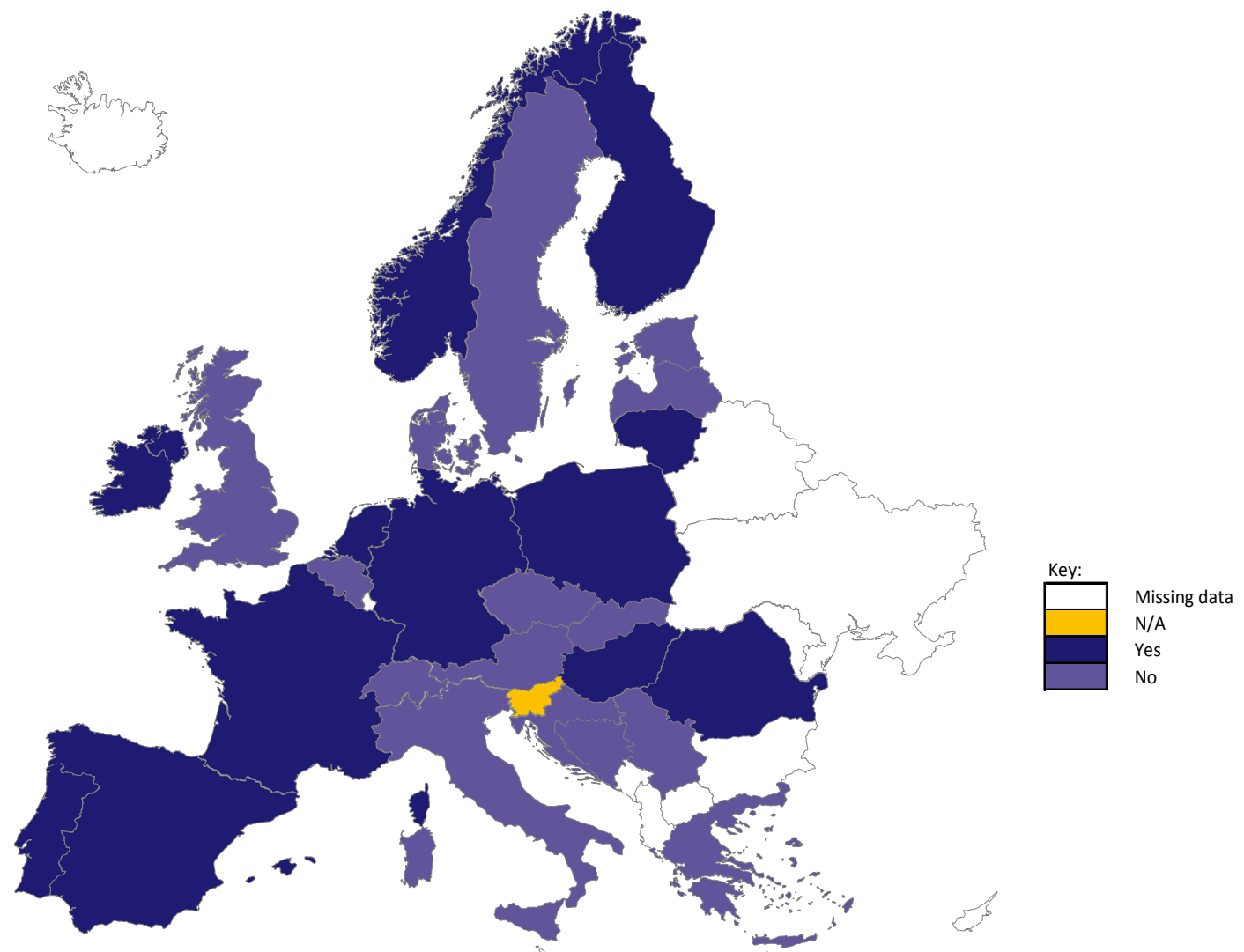
Voltage control - Type of regulations for the voltage control demanded to the power plants - Voltage stator setpoint



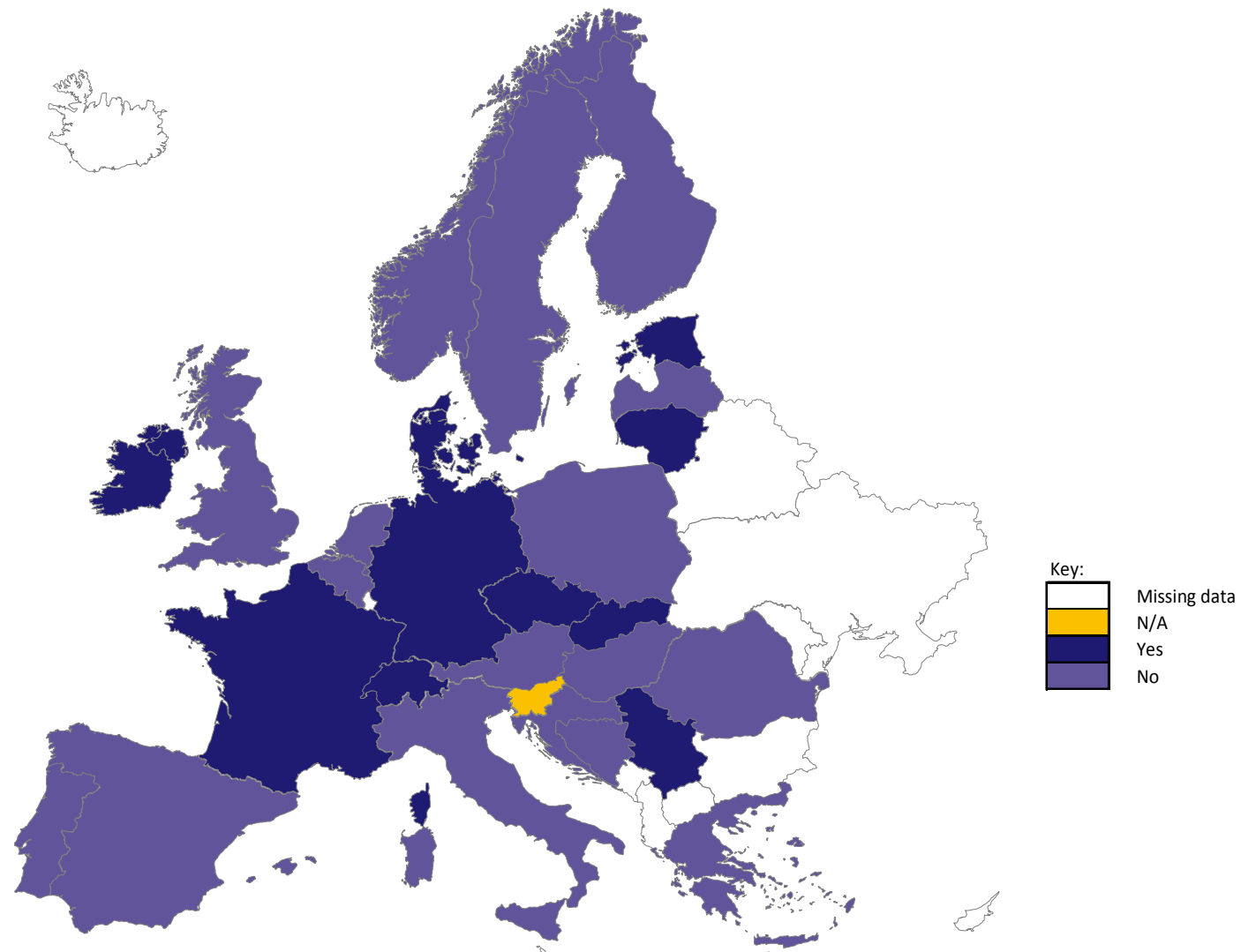
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- Yes
- No

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



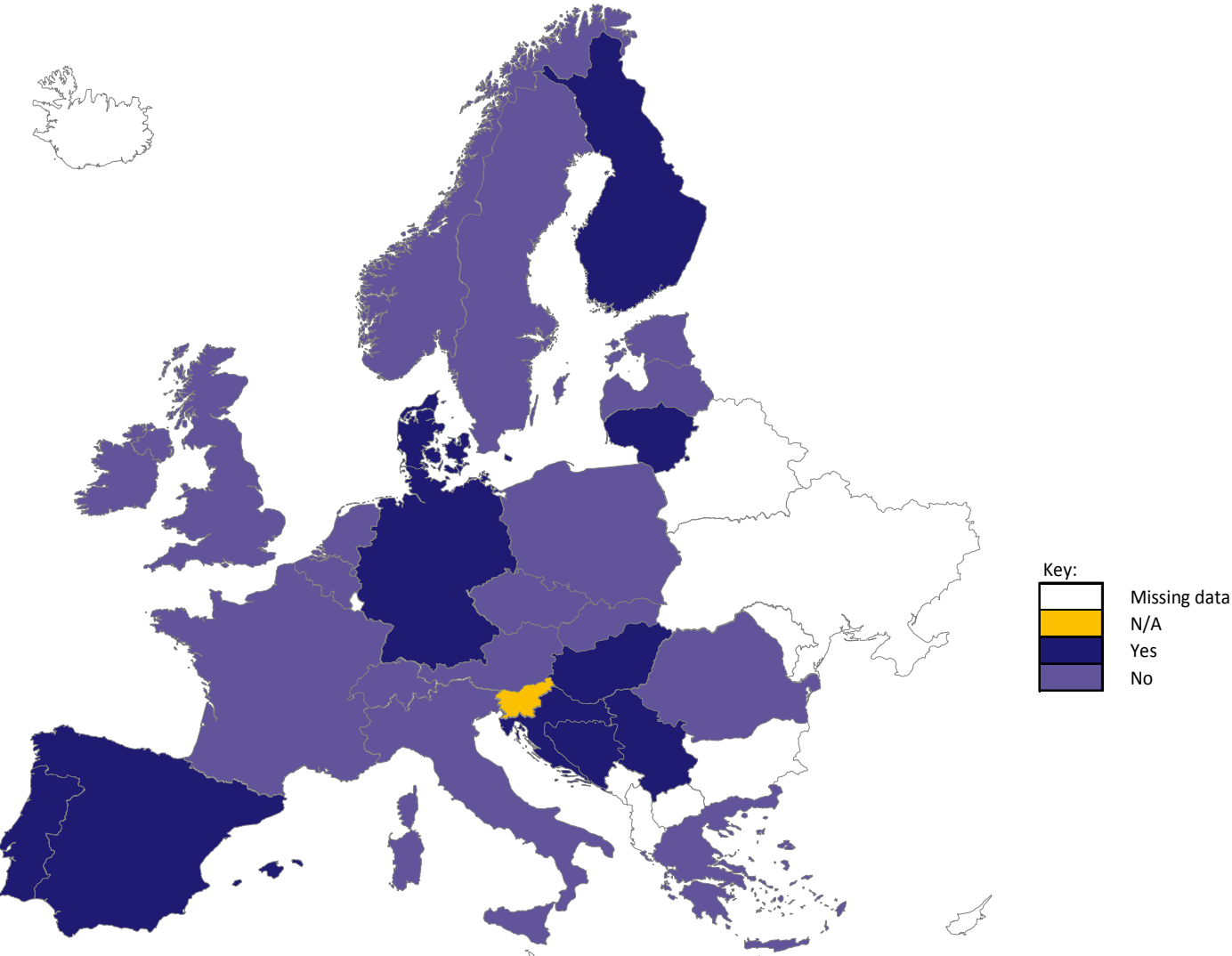
Voltage control - Type of regulations for the voltage control demanded to the power plants - Voltage setpoint at the connexion point function of a signal sent by the TSO (possibility of variation of the EHV setpoint)



Key:

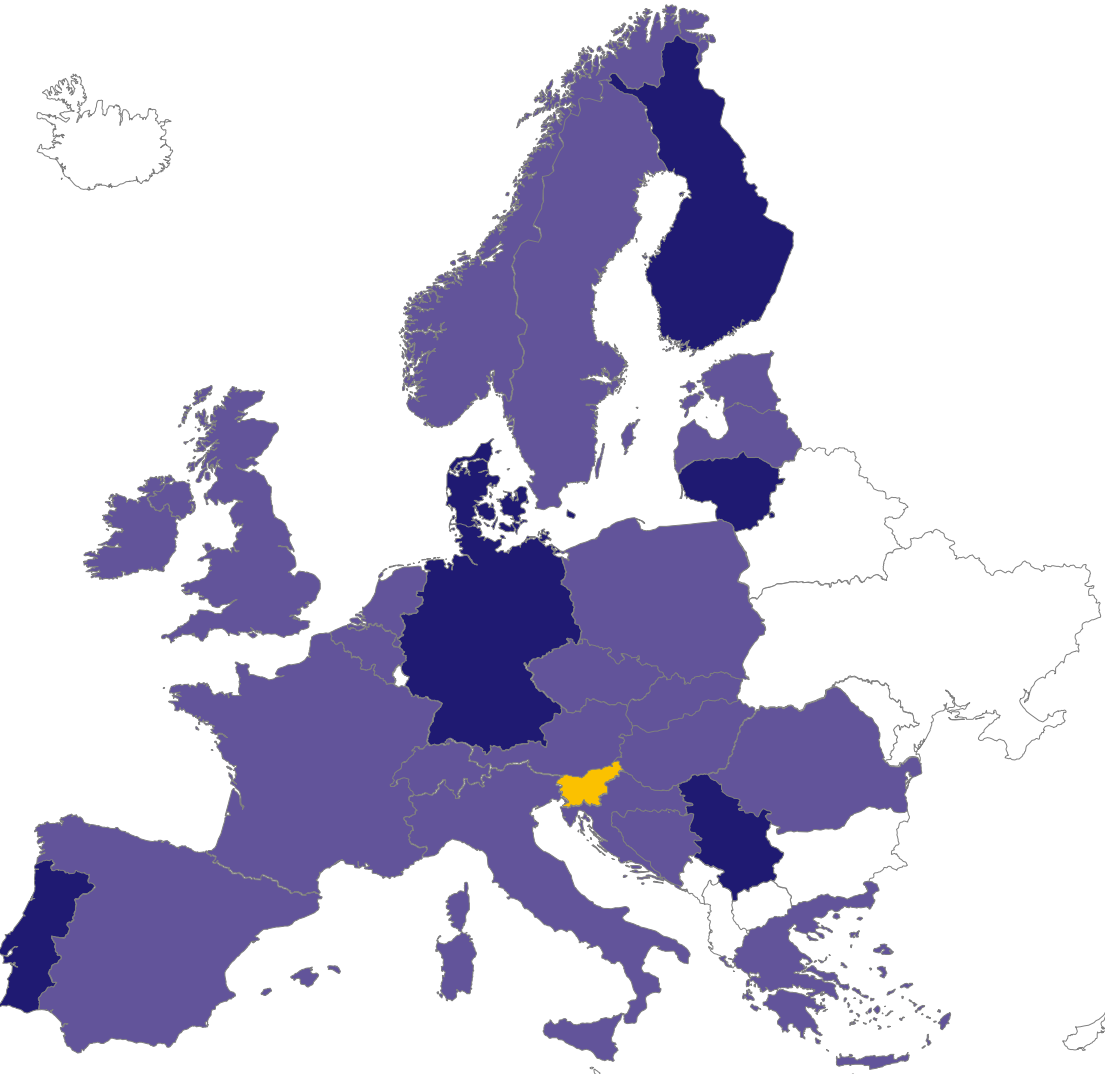
- Missing data
- N/A
- Yes
- No

Voltage control - Type of regulations for the voltage control demanded to the power plants - OLTC on the main transformer (manual control)



Key:
Missing data
N/A
Yes
No

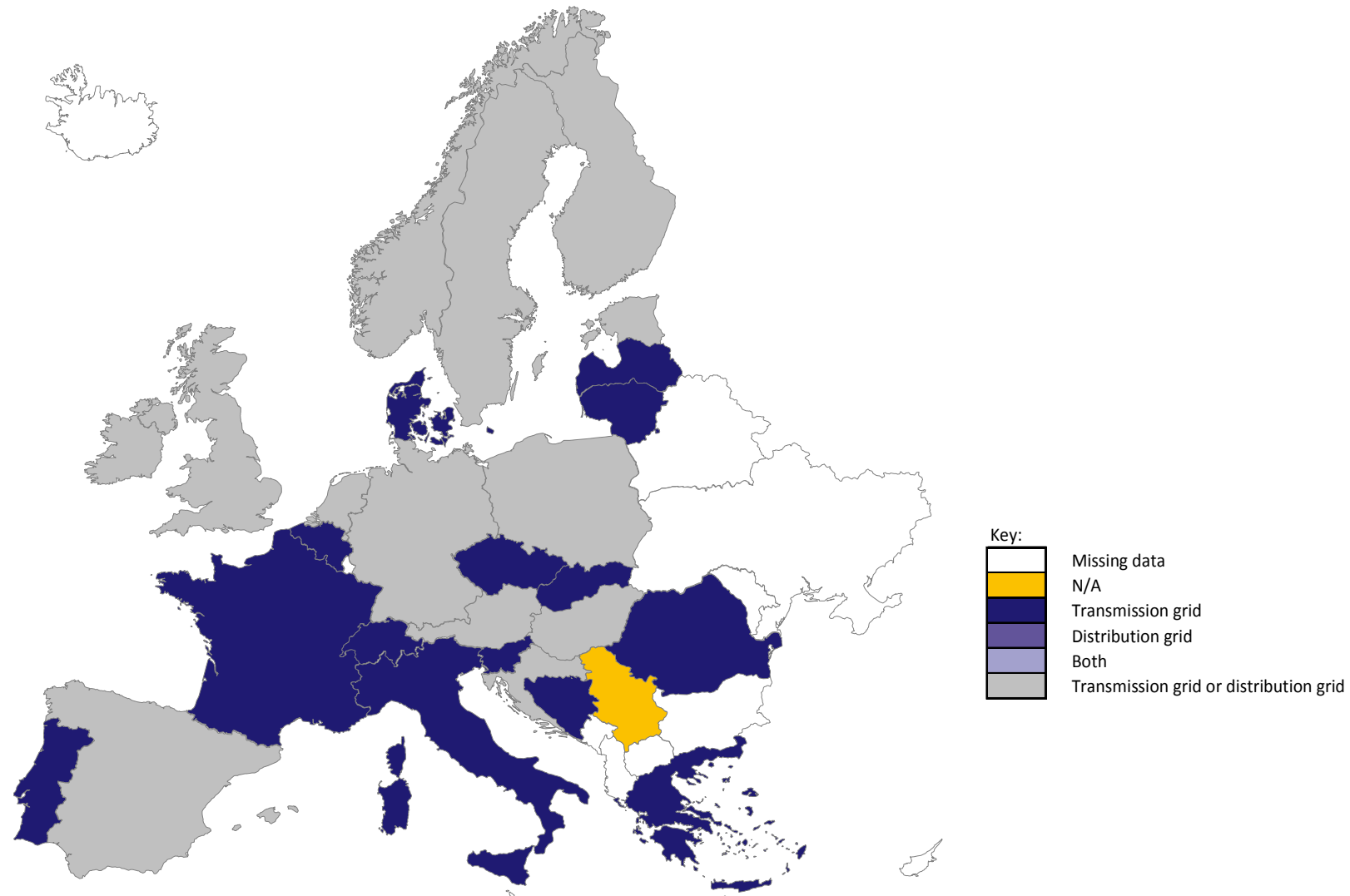
Voltage control - Type of regulations for the voltage control demanded to the power plants - OLTC on the main transformer (automatic control of the EHV voltage)



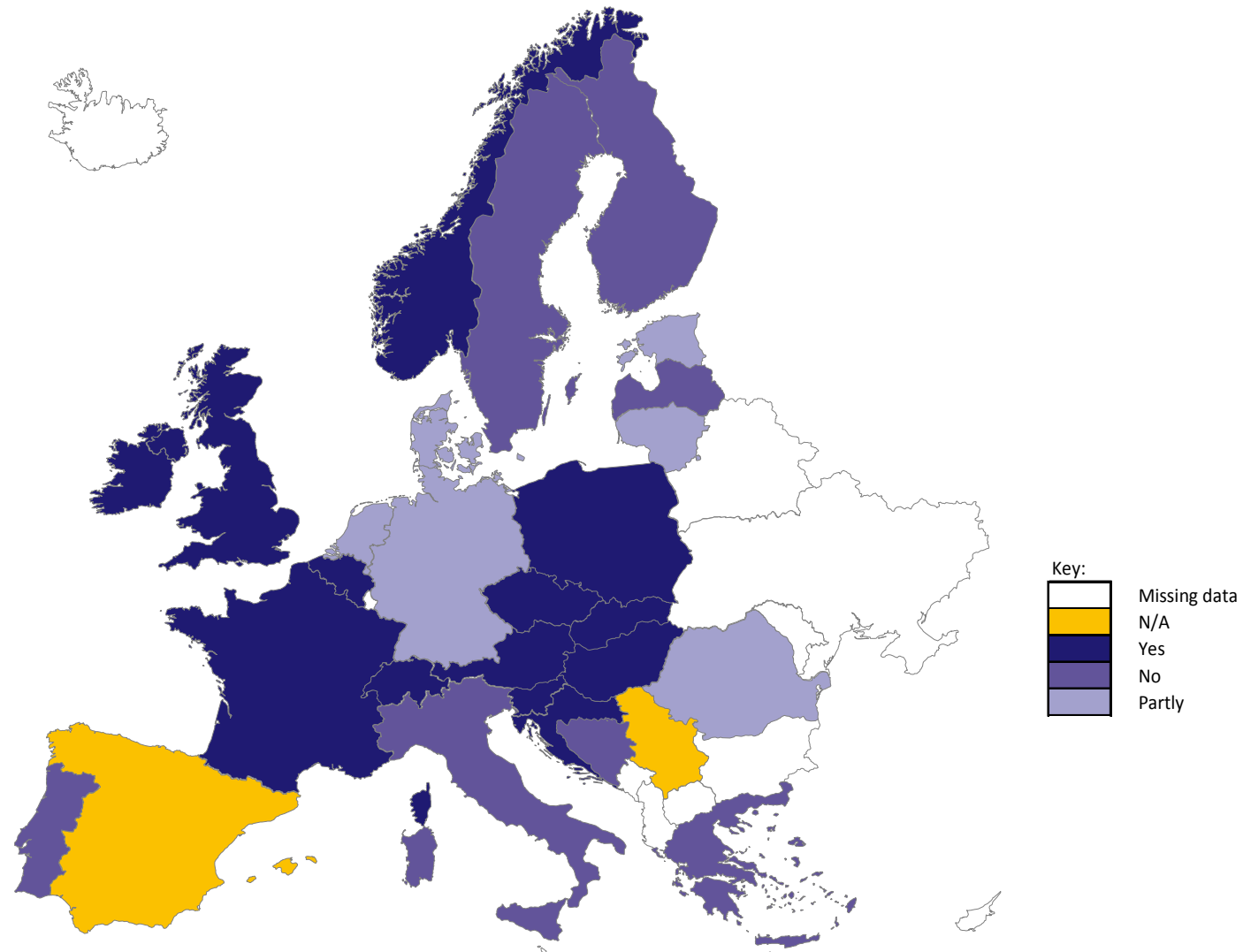
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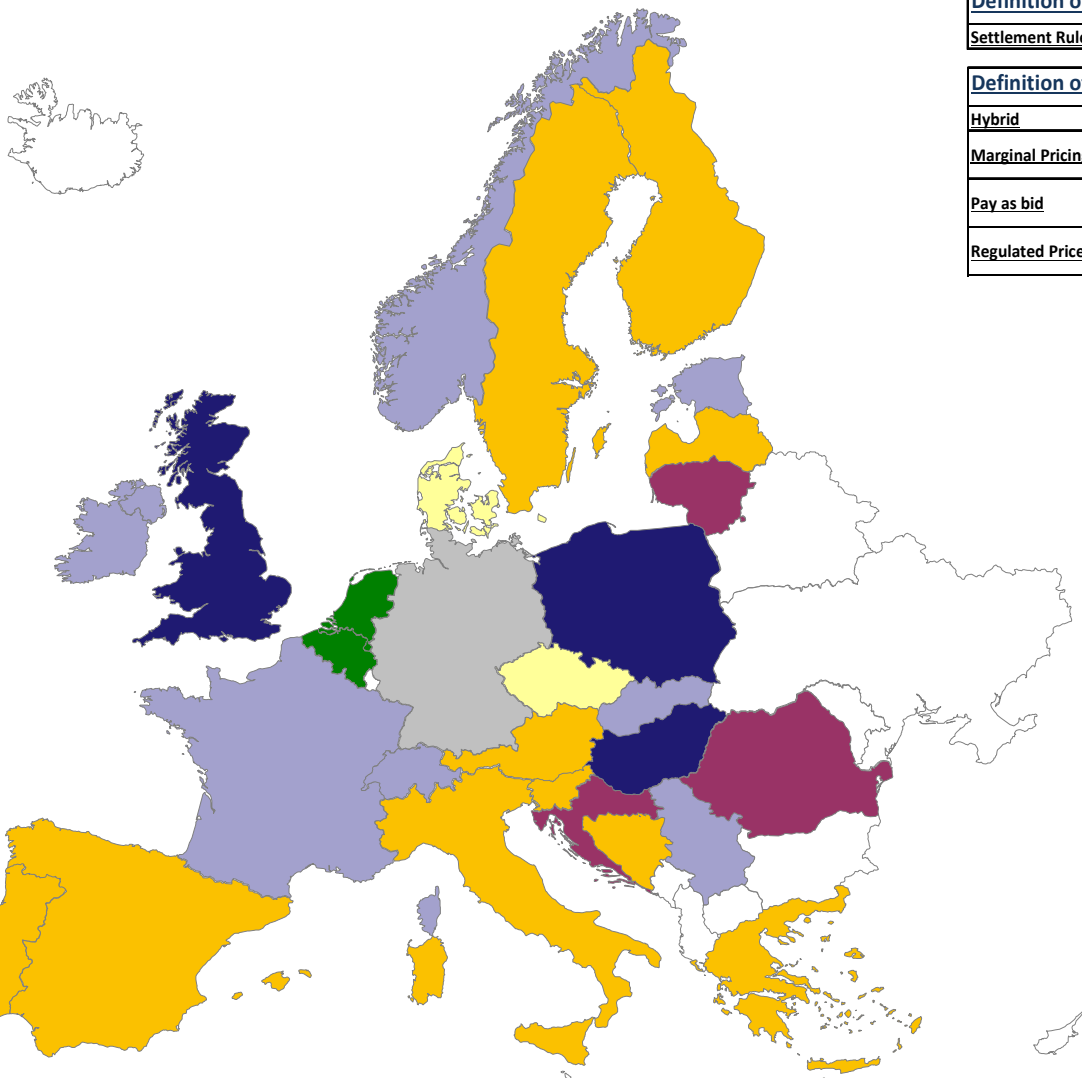
Voltage control - If a power plant is able to provide voltage control, which grid it should be connected to?



Voltage control - Is it a service paid by the TSO?



Voltage control - Settlement Rule



Definition of question	
Settlement Rule	The pricing rules for settlement.
Definition of answer	
Hybrid	Combination.
Marginal Pricing	Marginal pricing is the change in total cost that arises when the quantity produced changes by one unit.
Pay as bid	Contracted parties who provide a service are paid based on their offer price.
Regulated Price	Price for this service is based on a price that is set by the relevant regulatory authority.

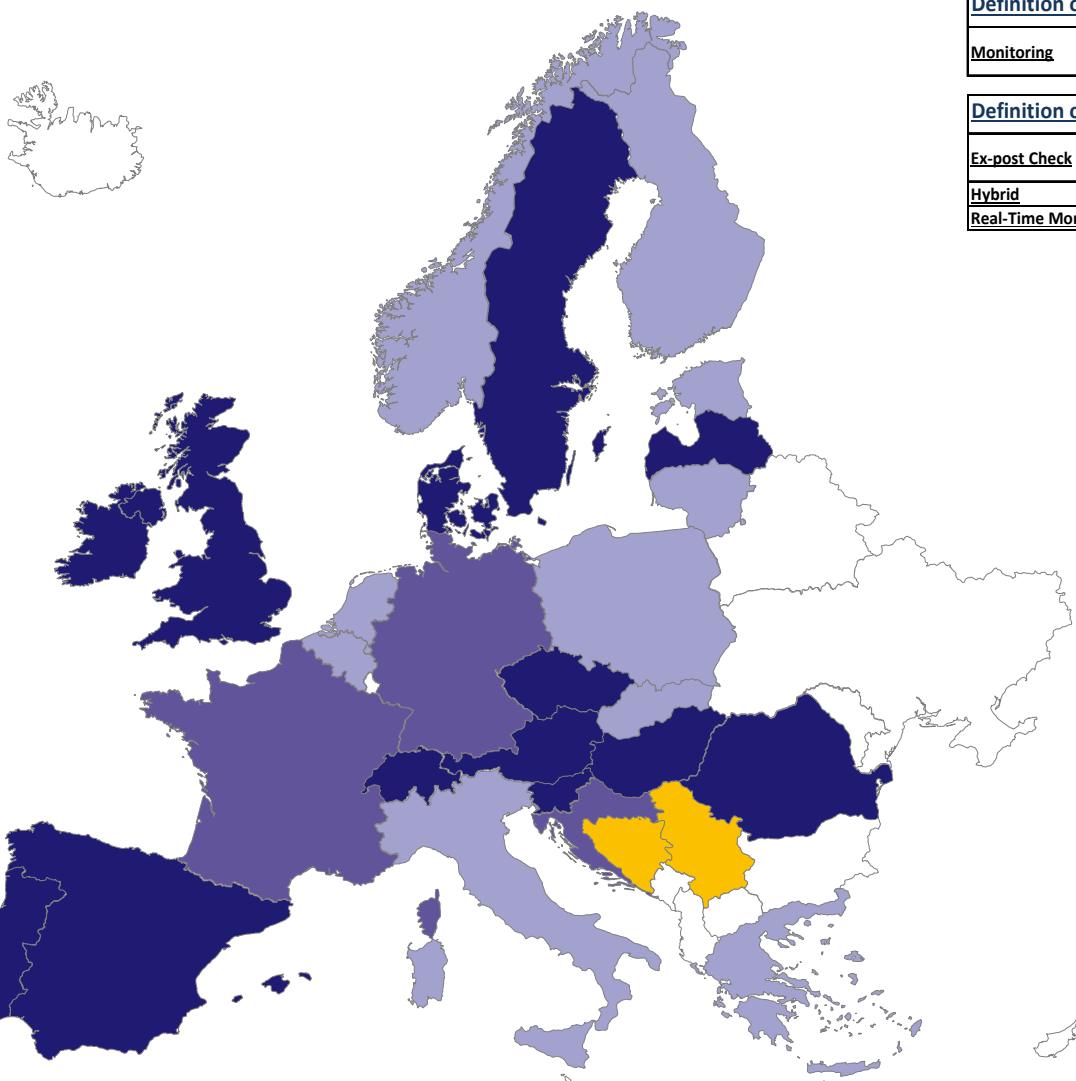
Key:

	Missing data
	N/A
	Pay as bid
	Marginal pricing
	Regulated price
	Free
	Hybrid
	Regulated price + Free
	Pay as bid + Free






Voltage control - Monitoring

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

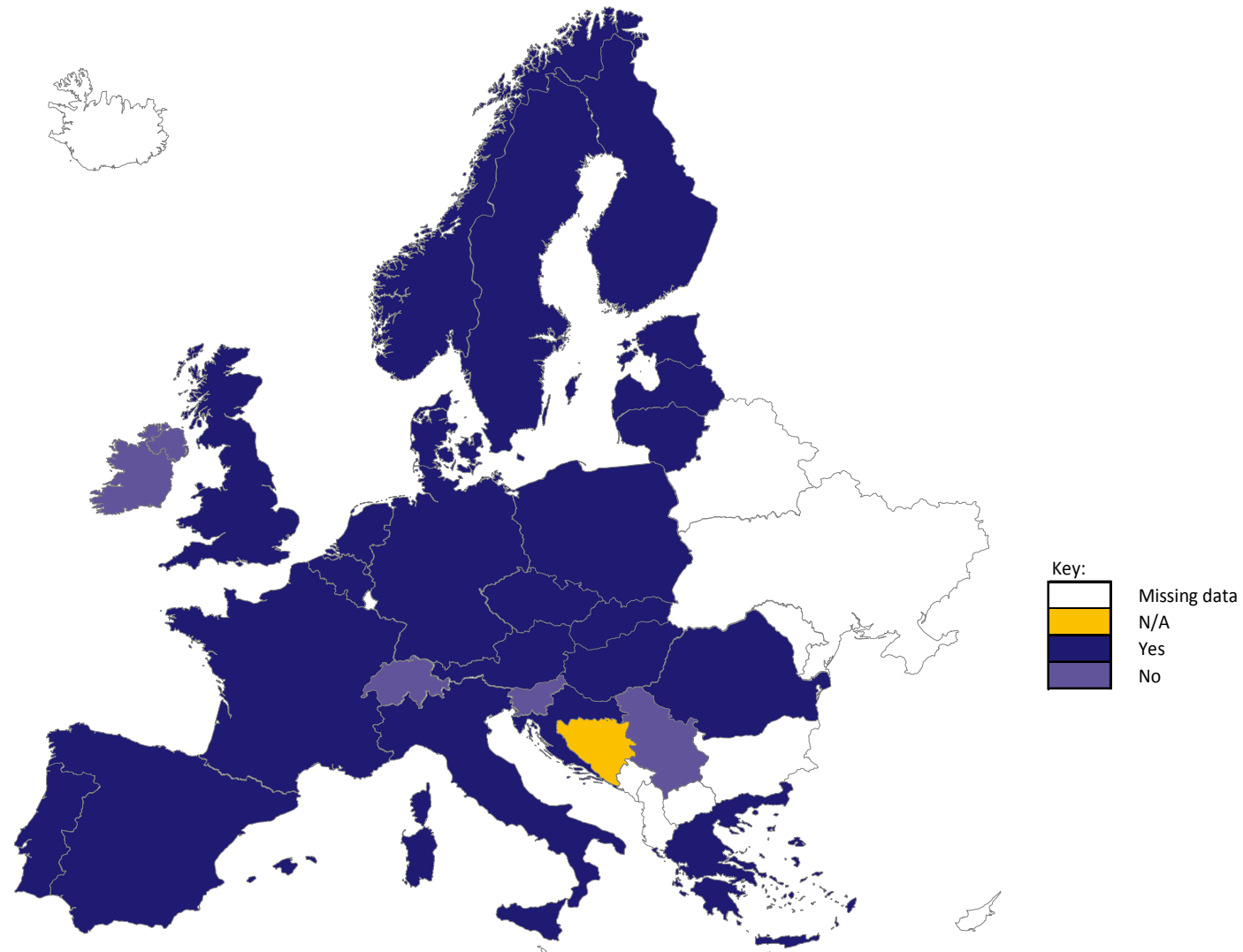
Definition of answer	
Ex-post Check	When the monitoring of performance of plant carried out after the event.
Hybrid	Combination.
Real-Time Monitoring	Monitoring of delivery of ancillary services in real time.



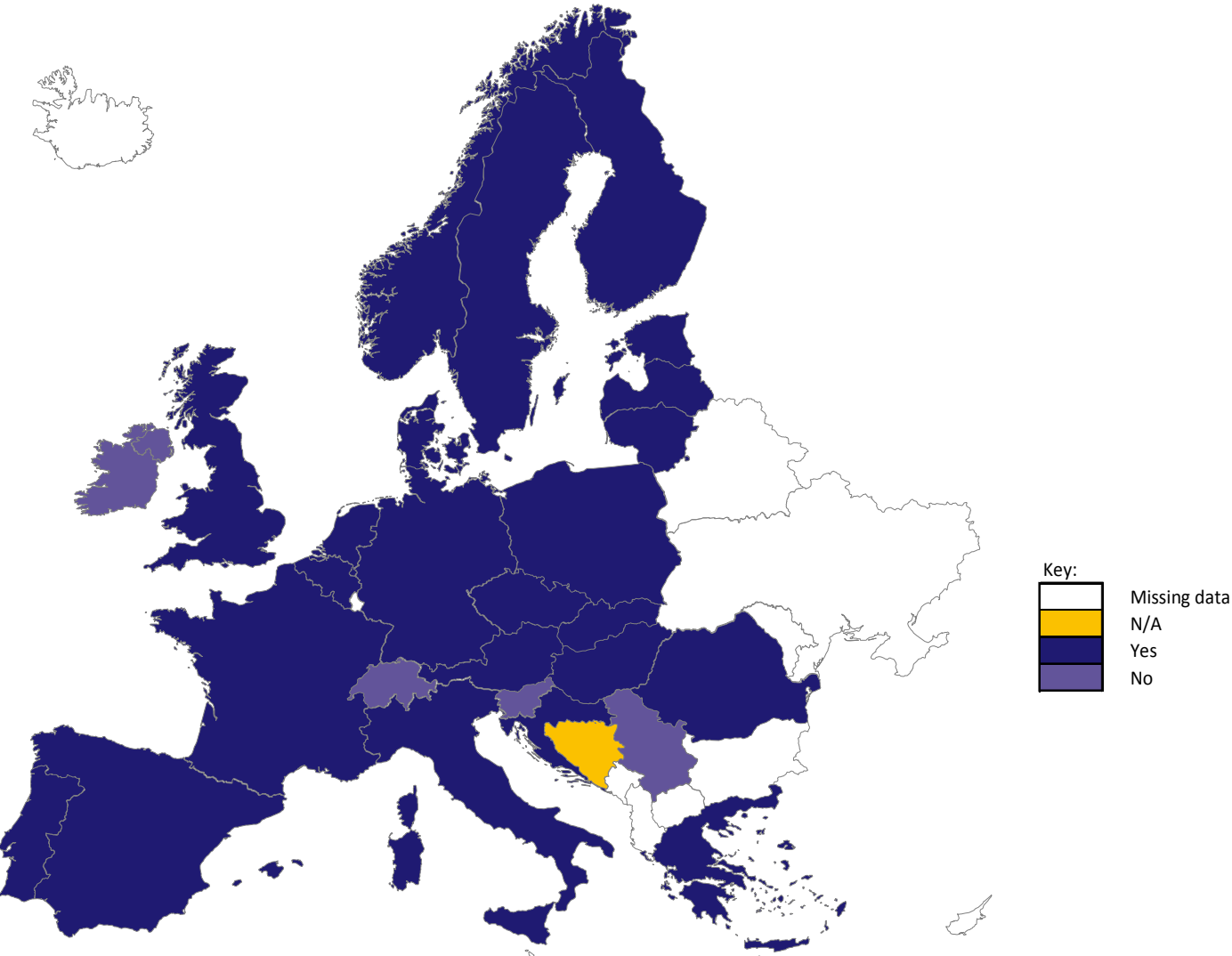
Key:

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	Real-time monitoring
	Ex-post check
	Hybrid

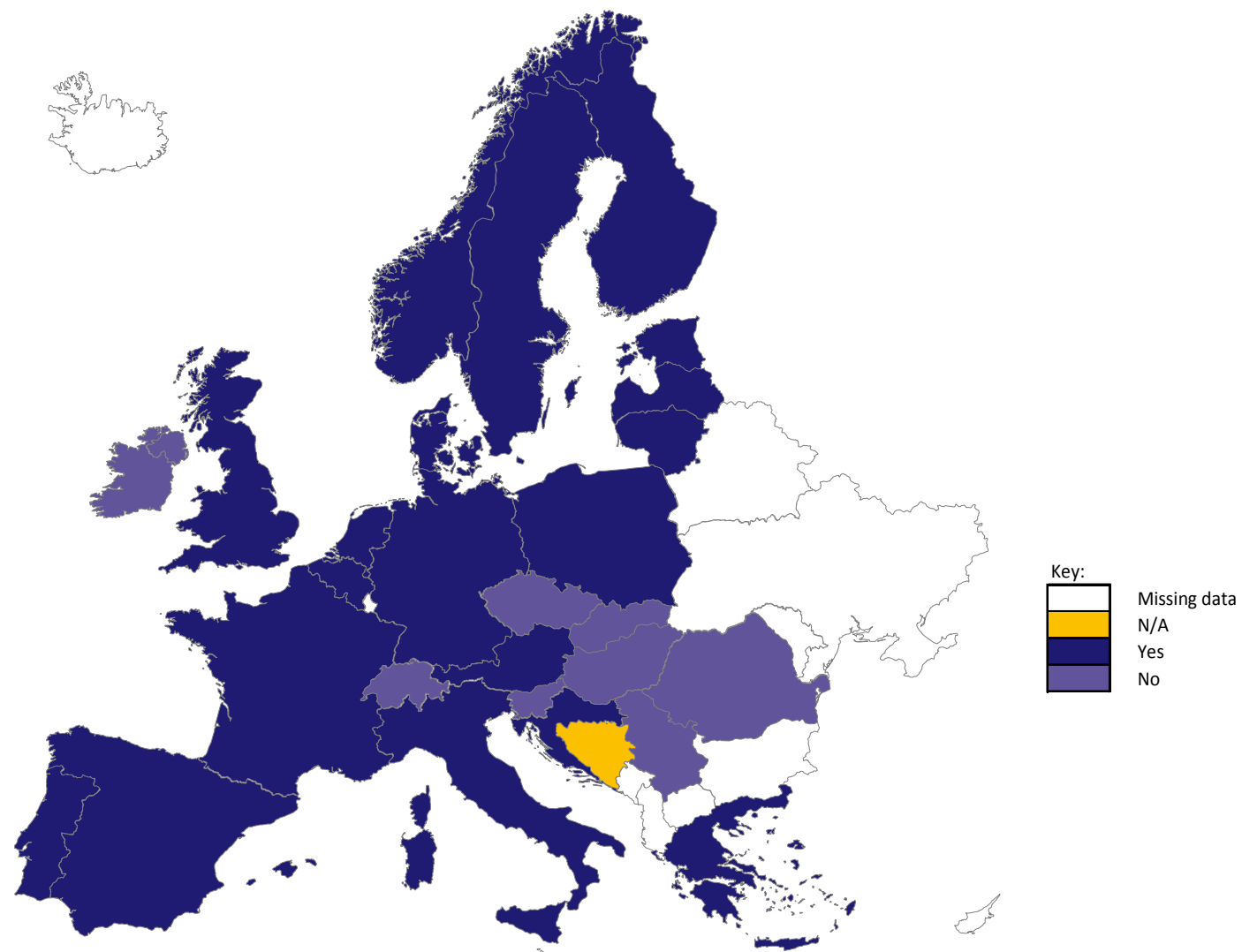
Voltage control - Does the TSO own reactive power compensation systems?



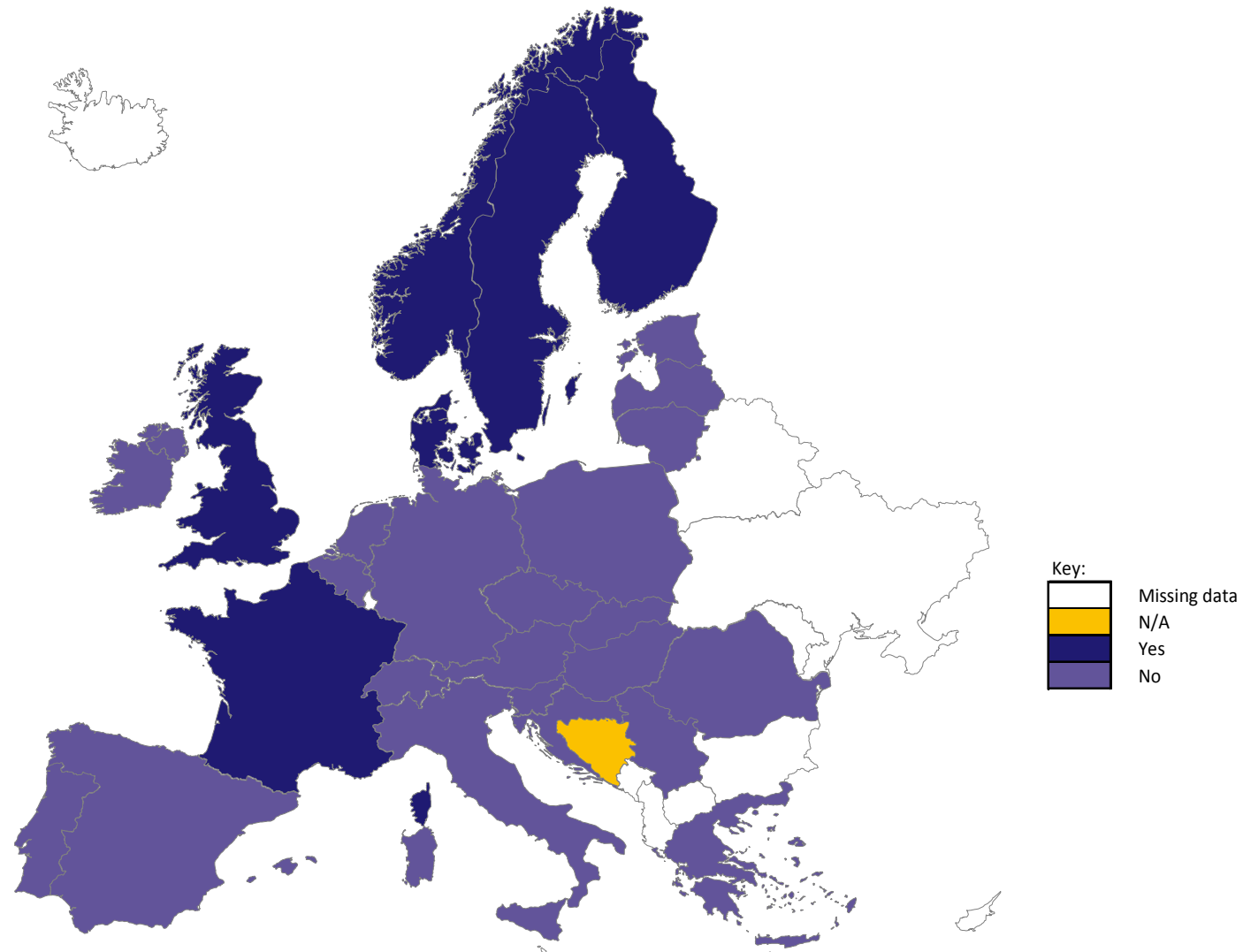
Voltage control - Owning by the TSO the reactive power compensation systems - Inductance



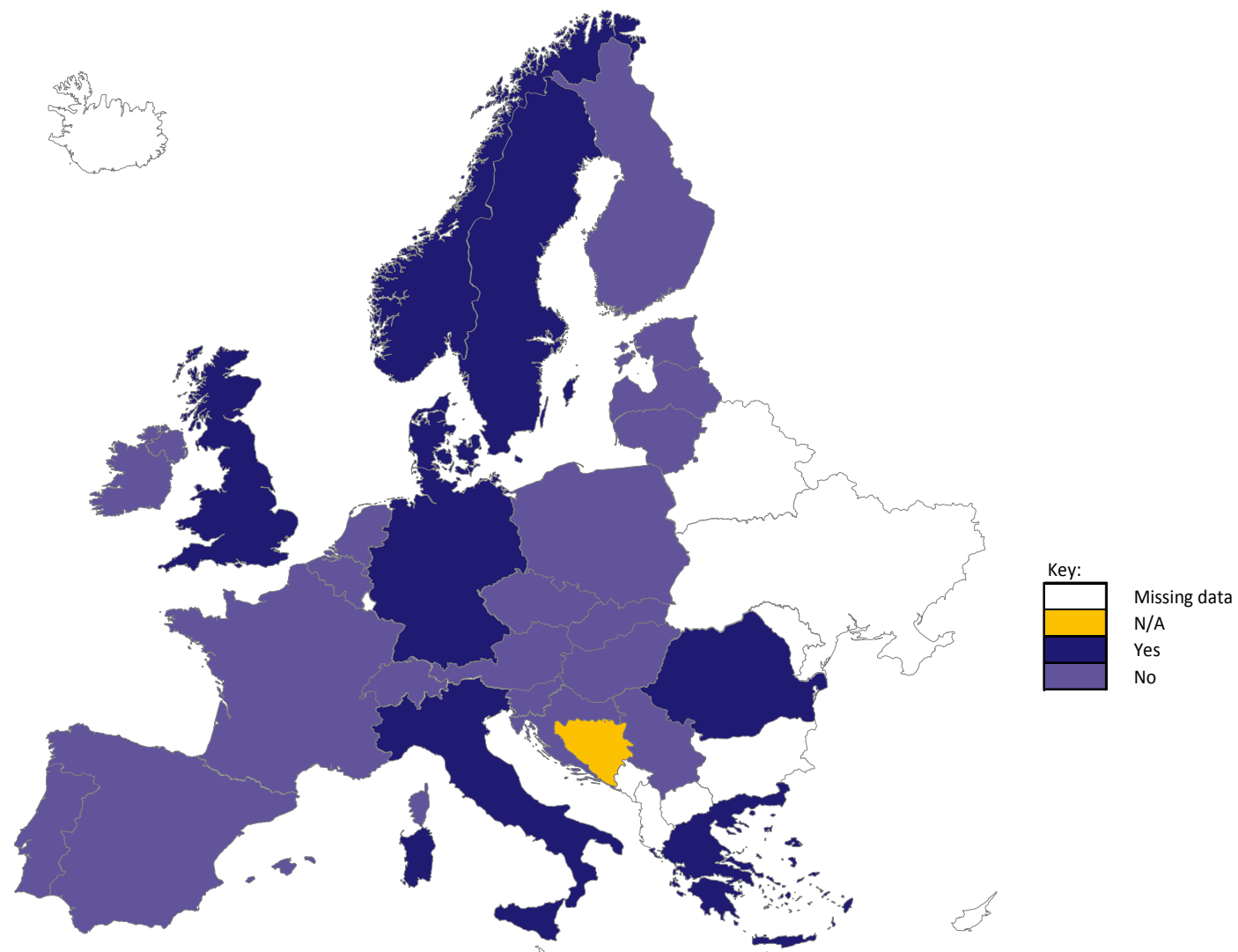
Voltage control - Owning by the TSO the reactive power compensation systems - Capacitor banks



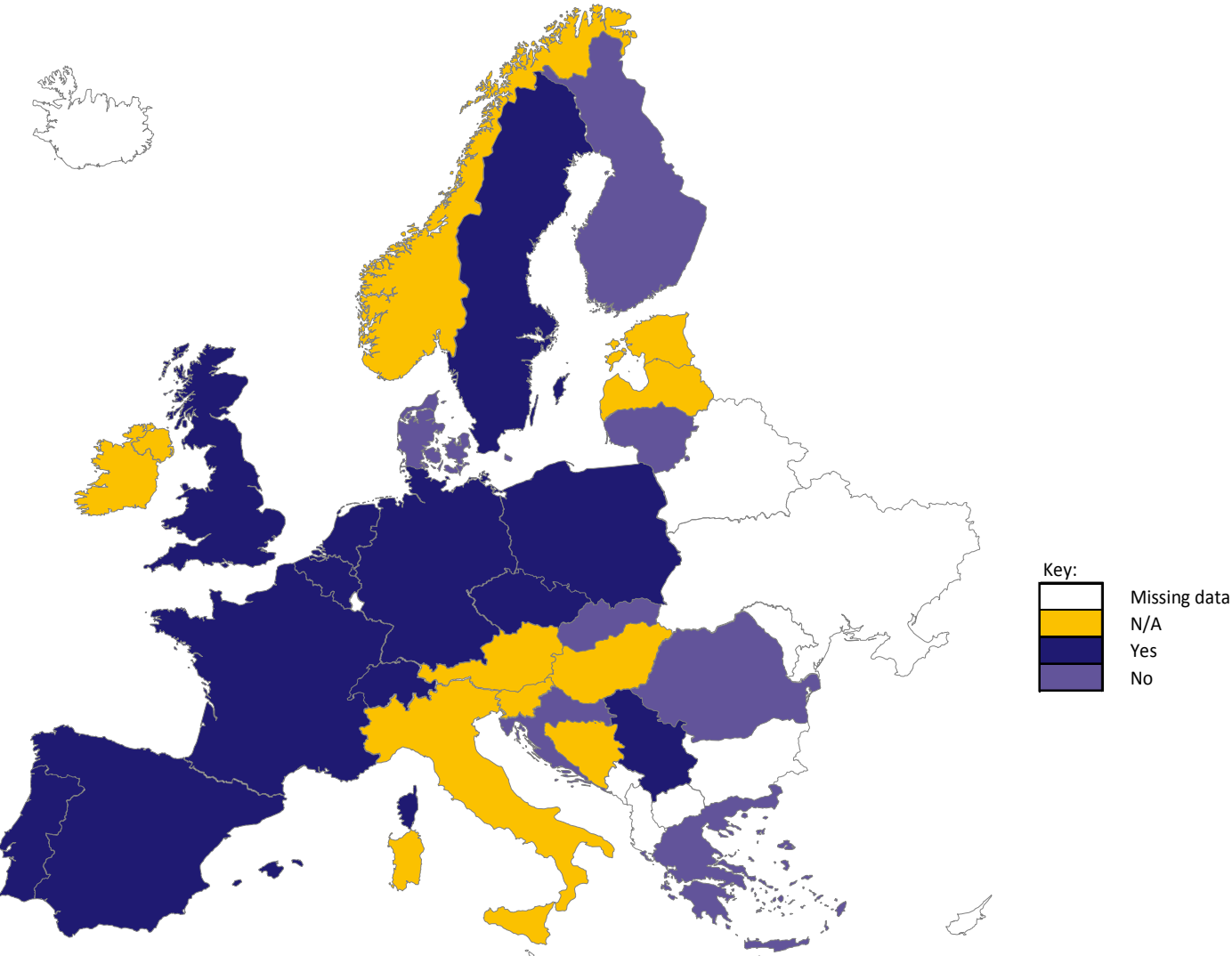
Voltage control - Owning by the TSO the reactive power compensation systems - SVC



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



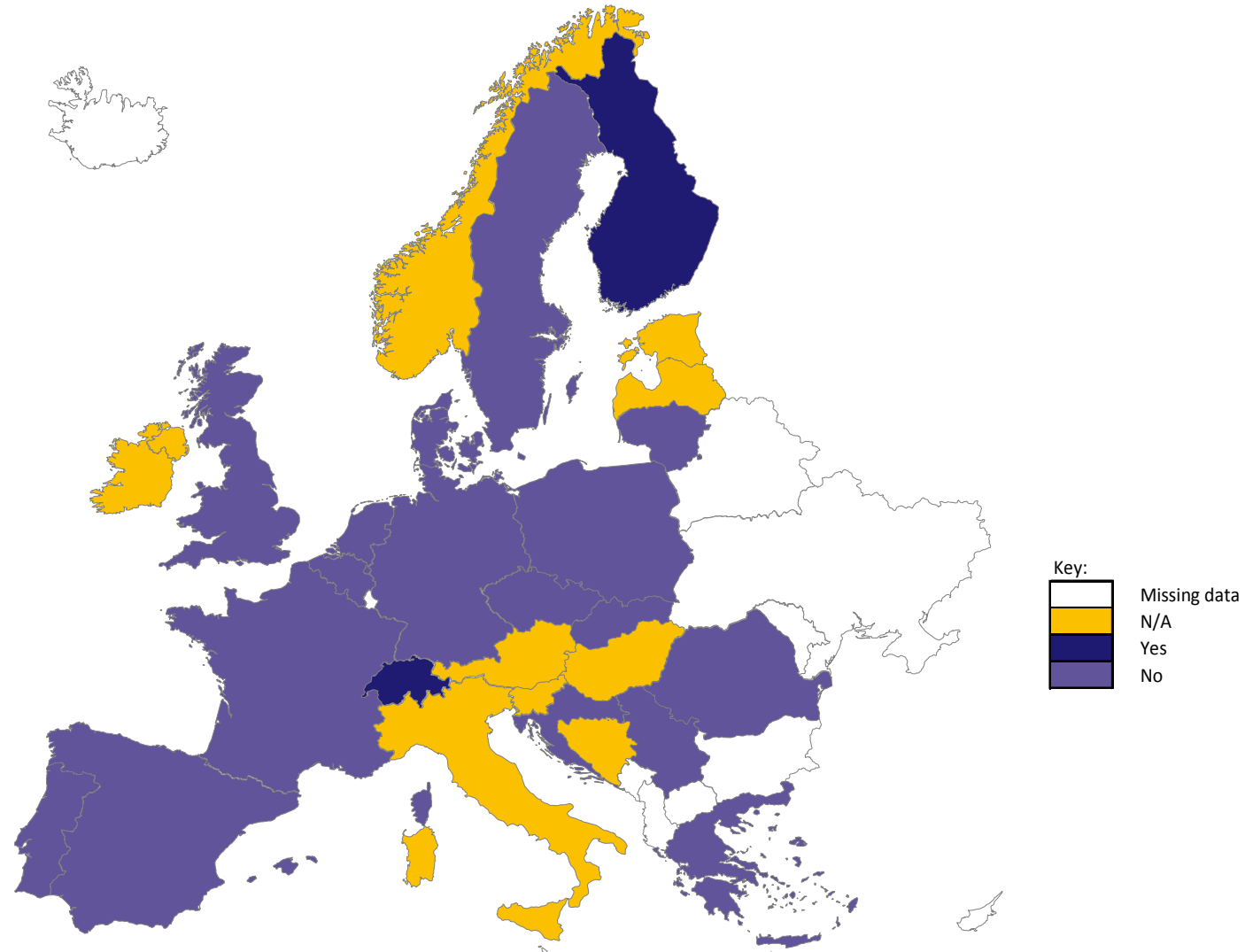
Voltage control - Settlement rules for the exchange of reactive power between transmission and distribution grids - Respect a Reactive/Active power ratio



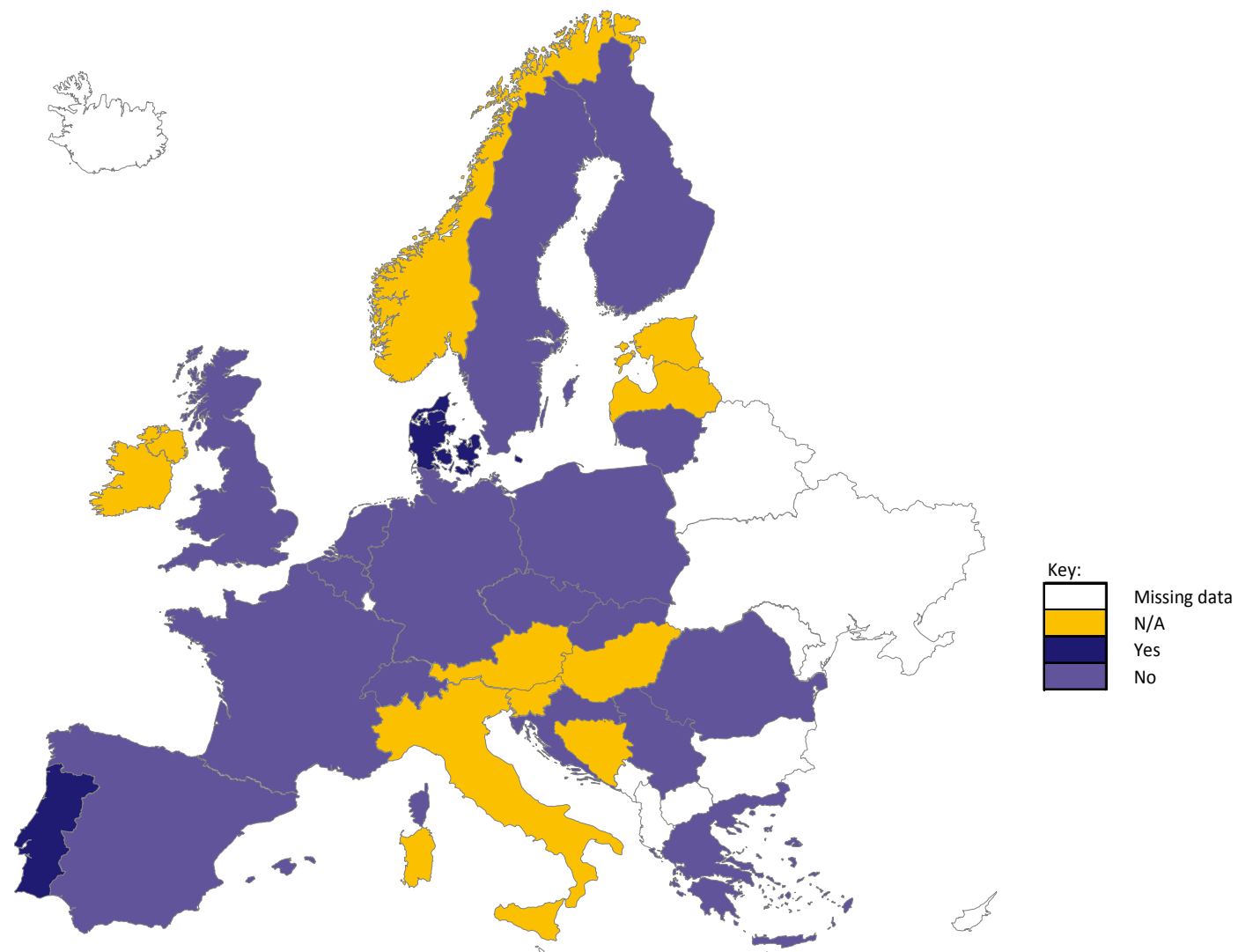
Key:

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Dark Blue	Yes
Purple	No

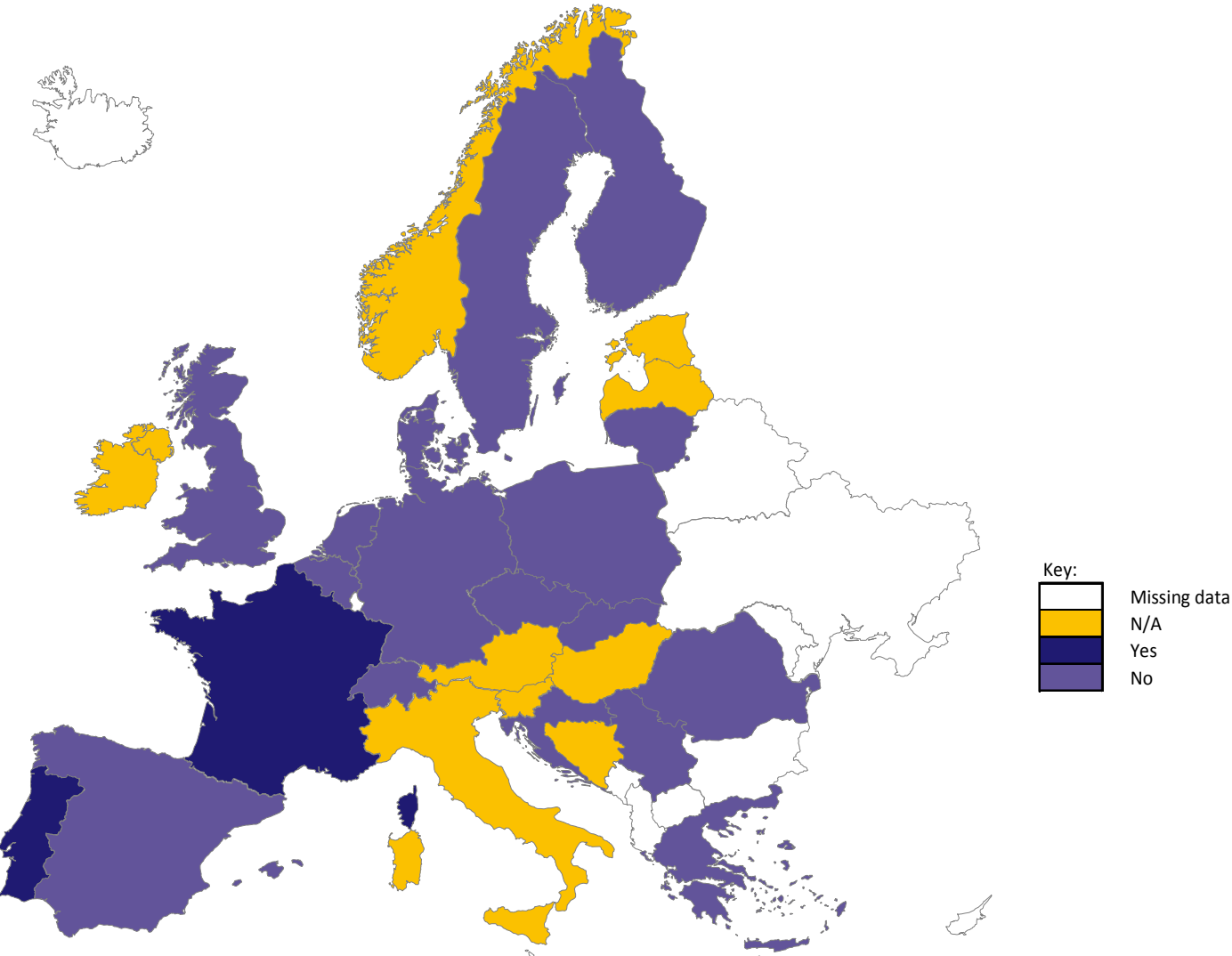
Voltage control - Settlement rules for the exchange of reactive power between transmission and distribution grids - Respect of an Active/Reactive Power Diagram at the connexion point



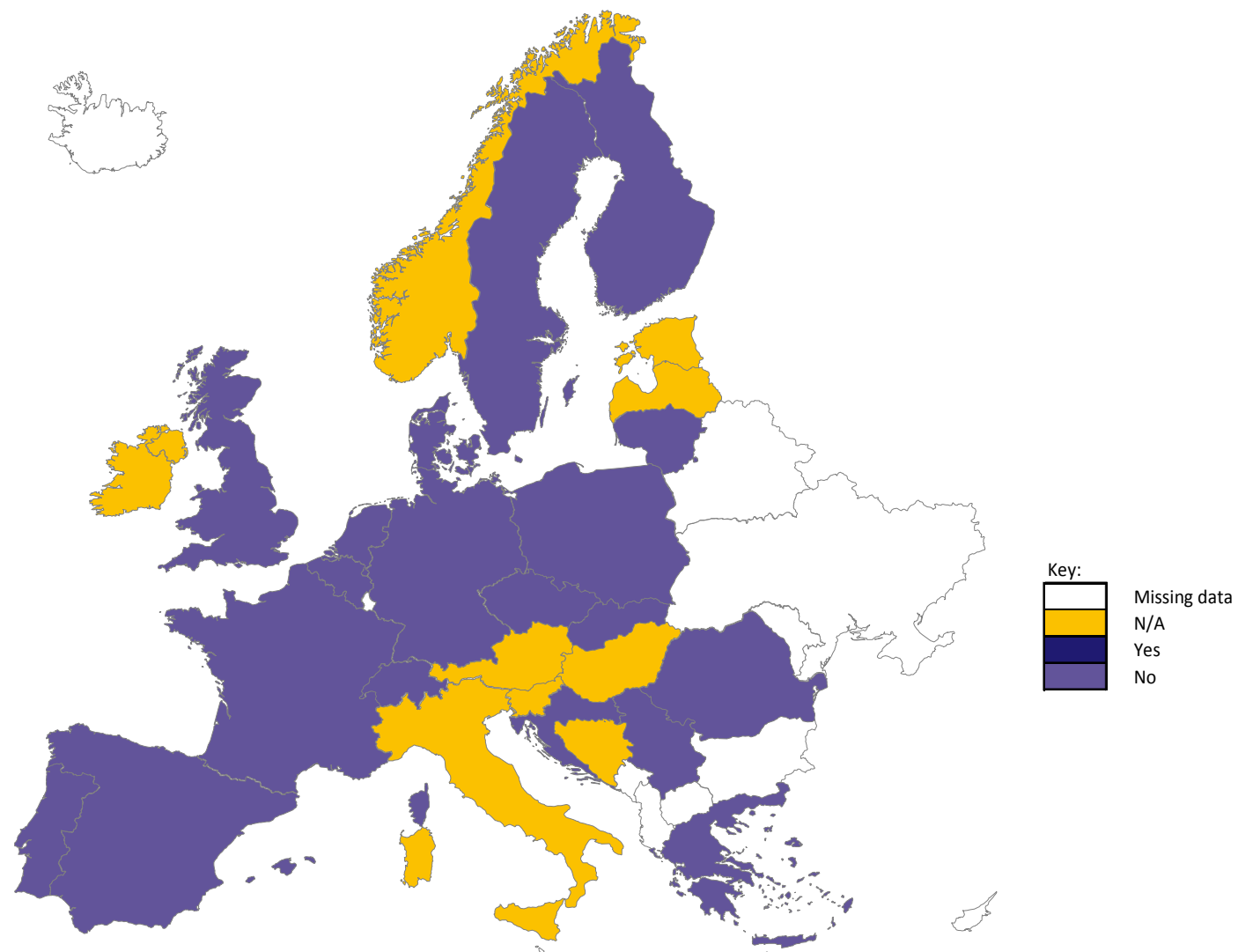
Voltage control - Settlement rules for the exchange of reactive power between transmission and distribution grids - Min/max fixed value of reactive power



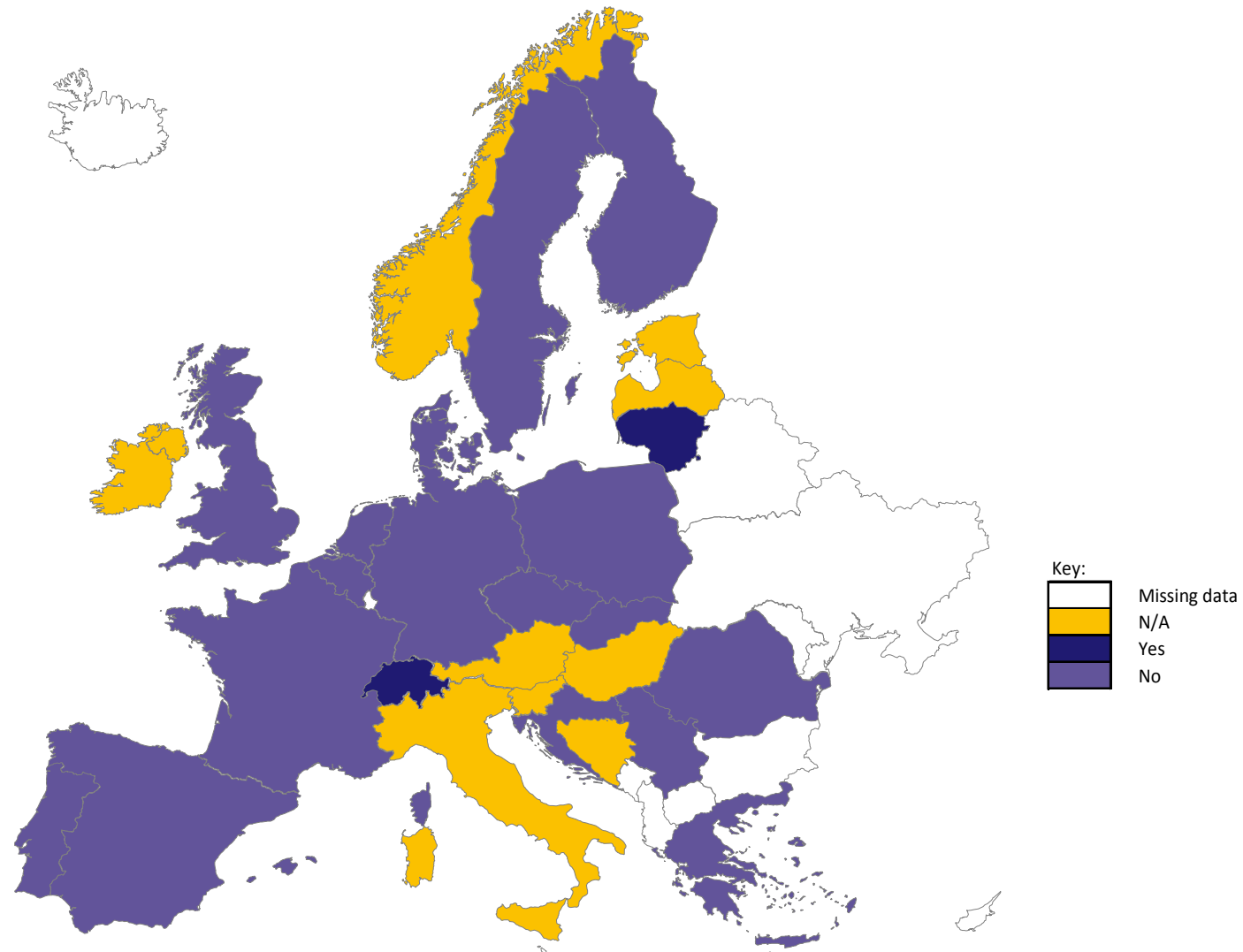
Voltage control - Settlement rules for the exchange of reactive power between transmission and distribution grids - Depending of the period of the day and/or year



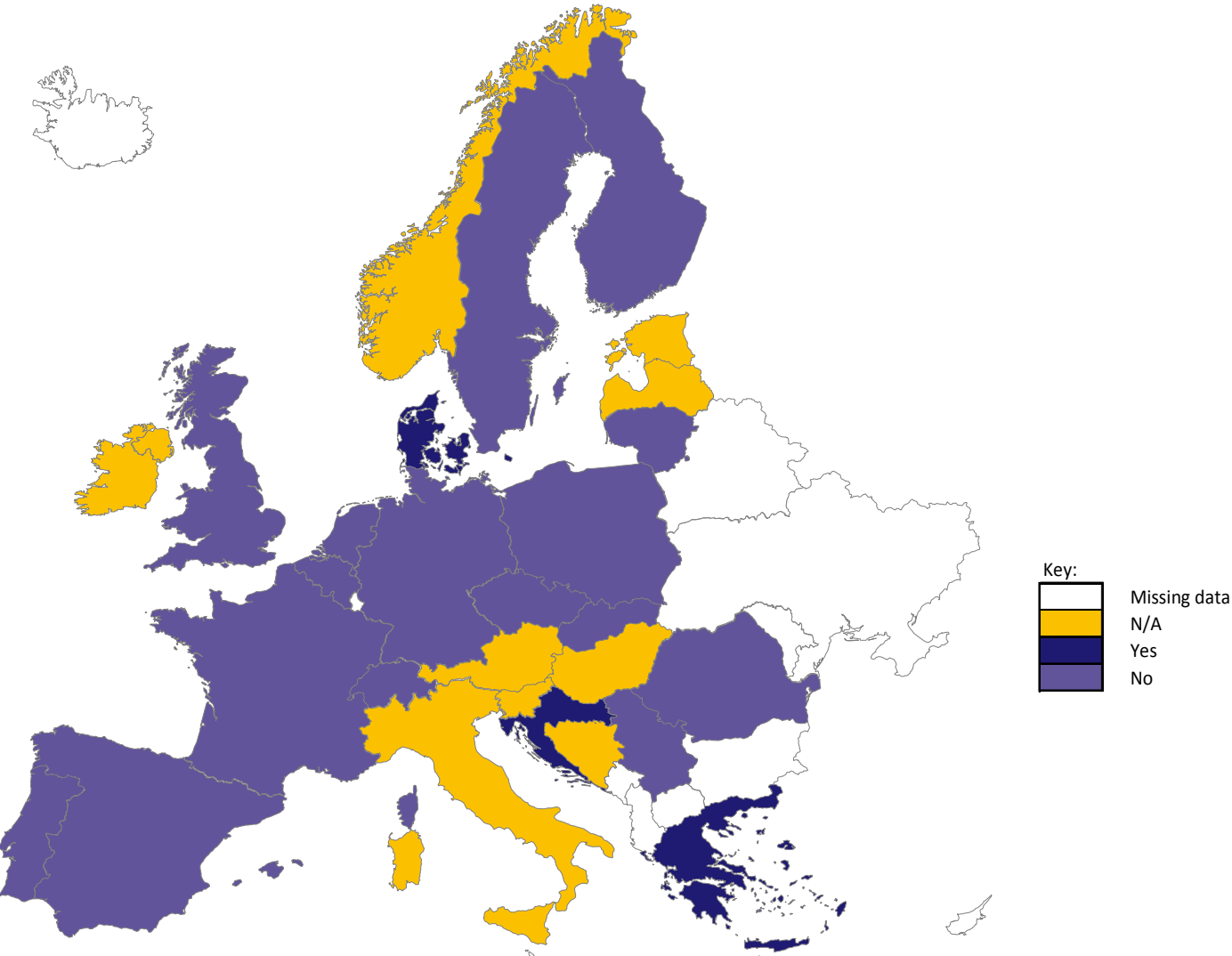
Voltage control - Settlement rules for the exchange of reactive power between transmission and distribution grids - Depending on the localization of the DSO



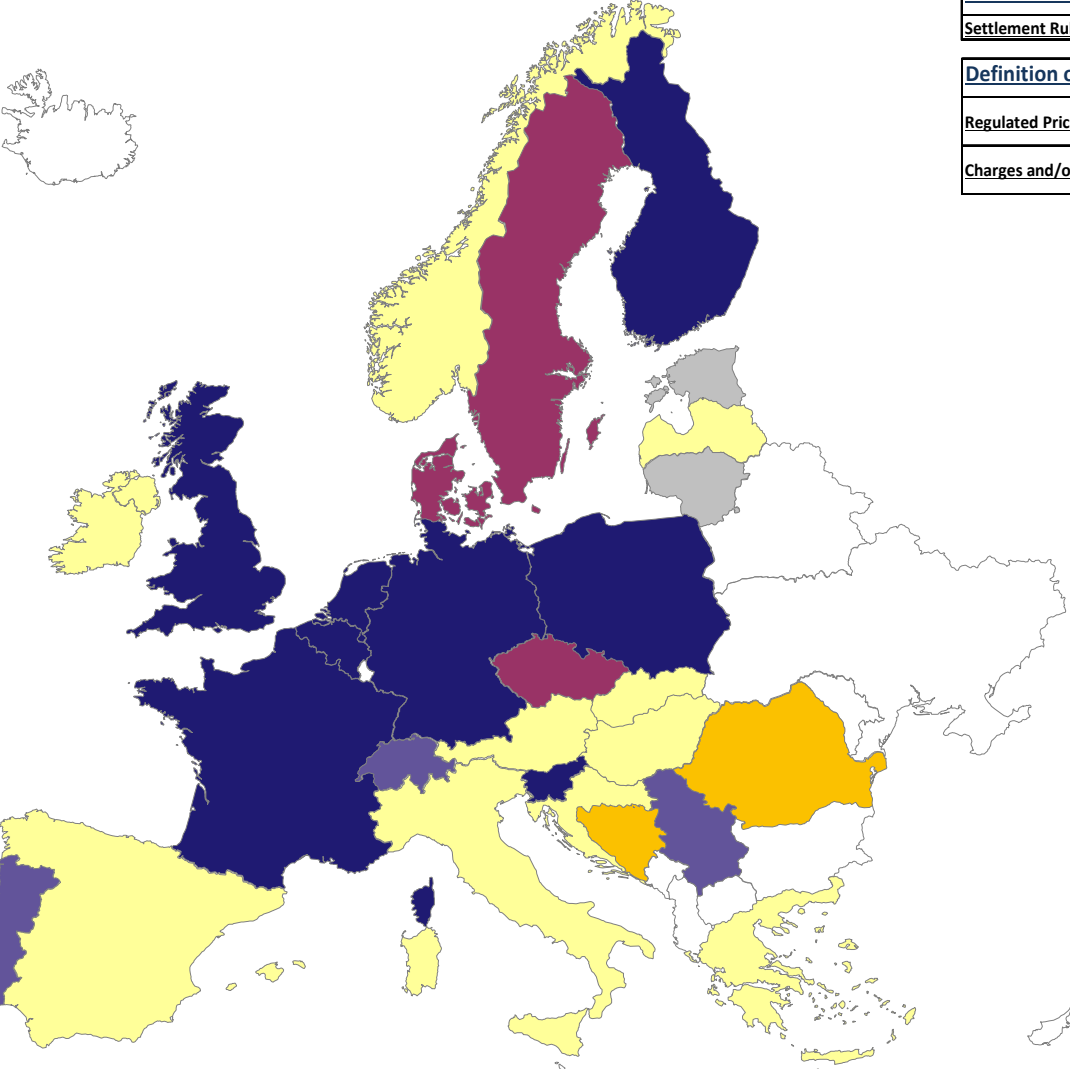
Voltage control - Settlement rules for the exchange of reactive power between transmission and distribution grids - According to the measurement



Voltage control - Settlement rules for the exchange of reactive power between transmission and distribution grids - No rules



Voltage control - Settlement Rule for the price of reactive power between transmission and distribution grids

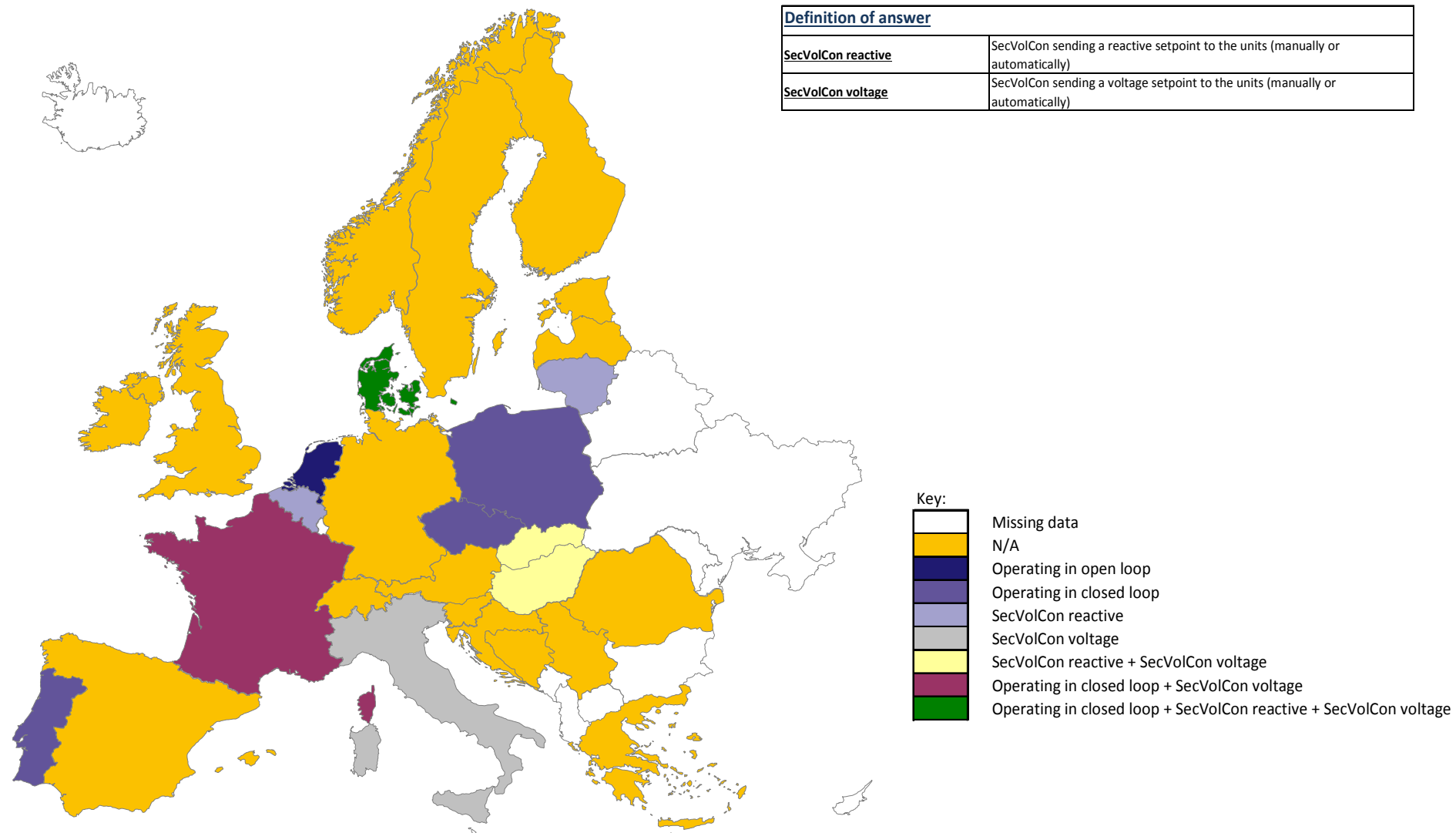


Definition of question	
Settlement Rule	The pricing rules for settlement.
Definition of answer	
Regulated Price	Price for this service is based on a price that is set by the relevant regulatory authority.
Charges and/or fees	Charges and/or fees if the DSO does not respect the tan Phi and/or the diagram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

- Key:
- Missing data
 - N/A
 - Charges and/or fees
 - Charges and/or fees + Regulated price
 - Bonus link to a specific diagram
 - Regulated price
 - No rules
 - Free

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

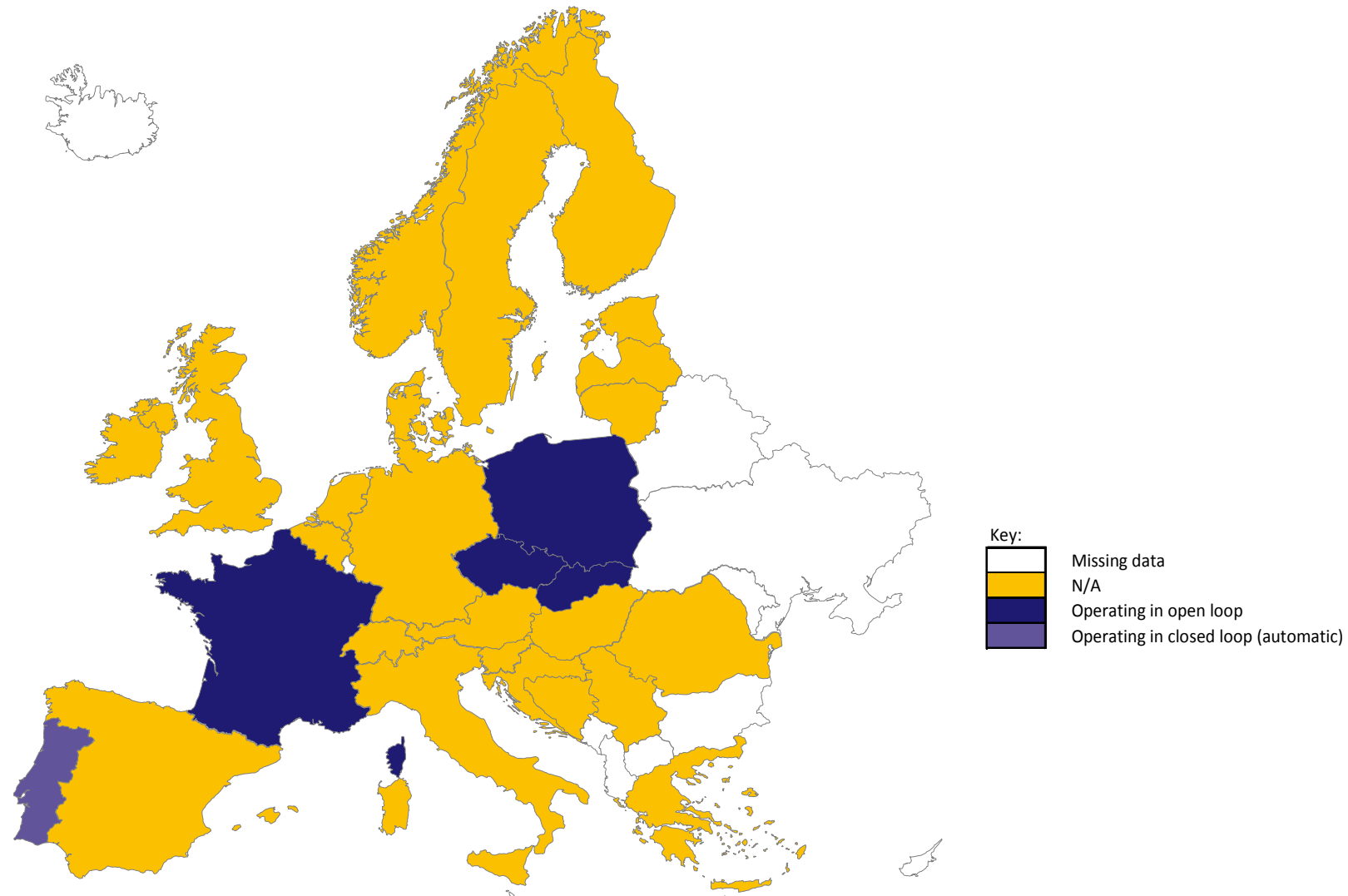
Definition of answer	
SecVolCon reactive	SecVolCon sending a reactive setpoint to the units (manually or automatically)
SecVolCon voltage	SecVolCon sending a voltage setpoint to the units (manually or automatically)



Key:

White	Missing data
Yellow	N/A
Dark Blue	Operating in open loop
Purple	Operating in closed loop
Light Purple	SecVolCon reactive
Grey	SecVolCon voltage
Light Yellow	SecVolCon reactive + SecVolCon voltage
Maroon	Operating in closed loop + SecVolCon voltage
Green	Operating in closed loop + SecVolCon reactive + SecVolCon voltage

Voltage control - Existing of tertiary voltage control





Black start

(Referring to questions of AS survey from BSQ1.0 to BSQ13.0)

Black Start - Which power plants have to provide black start (for example: capacity, technology etc)? Is it a mandatory service in your country? 1/3

TSO	Answer
ADMIE	Predefined power plants have to provide Black Start service.
APG	Black start provision according to respective black-start concepts, based on grid connection and specific contracts.
AST	No special rules - agreement with hydro power plant for providing the service.
CEPS	No obligations to provide black start for any unit.
EirGrid	It is not mandatory in RoI. It is mandatory in NI. Technologies providing black start: Hydro, pumped storage & open cycle gas turbines.
Elering	Black start service is provided by power plants which are included in the restoration plan as black start providers. It is not a mandatory service.
ELES	No.
Elia	Gas Power plant & Hydraulic power plants. It is not mandatory.
EMS	HPPs. It is mandatory according to Grid Code.
Energinet.dk	No.

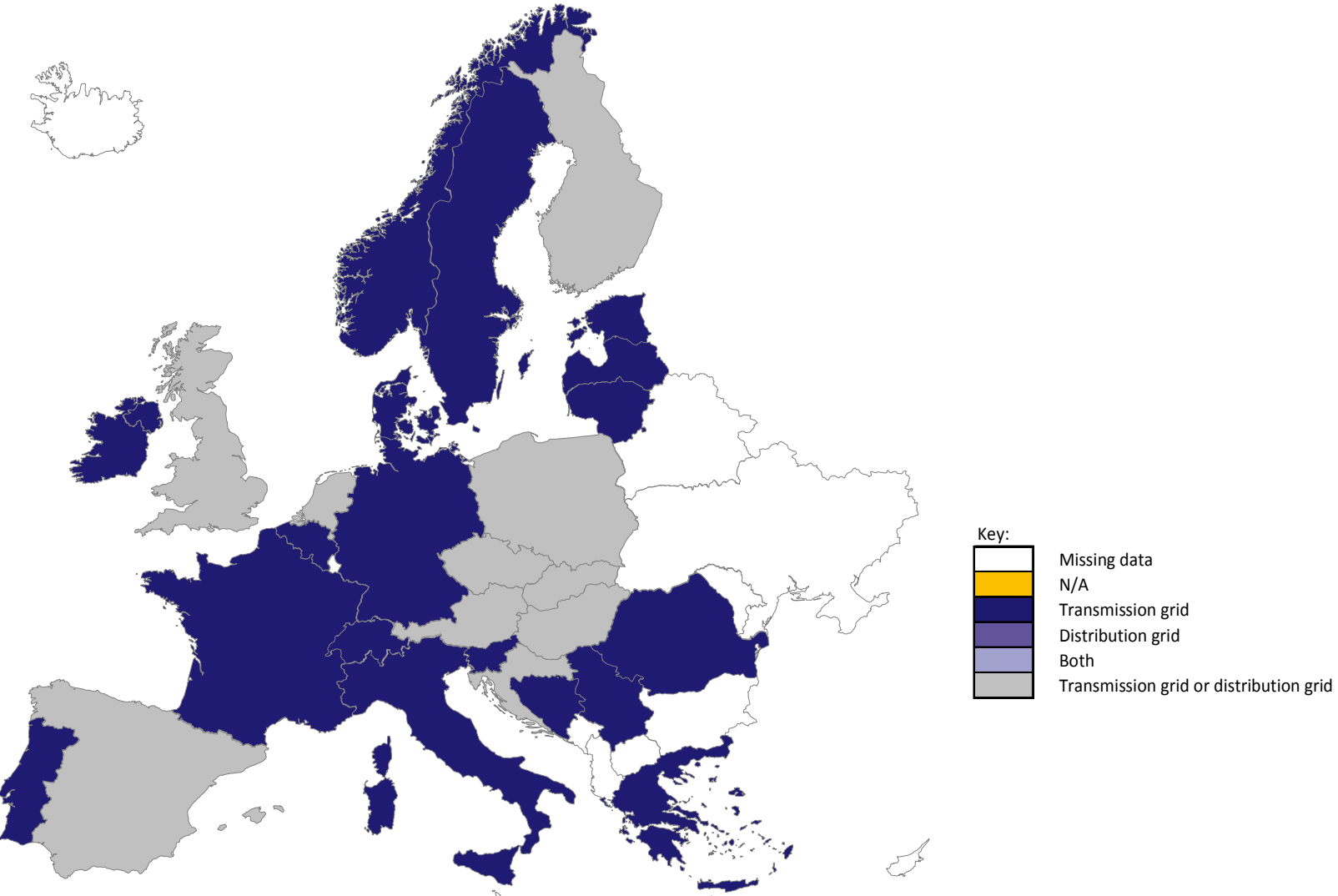
Black Start - Which power plants have to provide black start (for example: capacity, technology etc)? Is it a mandatory service in your country? 2/3

TSO	Answer
Fingrid	Not mandatory, agreed bilaterally with suitable plants.
German TSOs	Black start provision according to respective black-start concepts, based on grid connection and specific contracts.
HOPS	It is mandatory for plants determined by defense plan.
Litgrid	Power plants that are included in the black start plan must provide the black start service (due to technology).
MAVIR	If the installed capacity is more than 500 MW and the power plant is connected to the transmission grid, the service is mandatory. But there are some power plants who are able to provide BS capability, but their installed capacities are less than 500 MW.
National Grid	Not a mandatory service for generators. However, mandatory for NG to maintain Black Start capability – Grid Code & Transmission Licence requirements. Black Start services are procured via bilateral contracts with power stations.
NOS BiH	It is a mandatory service.

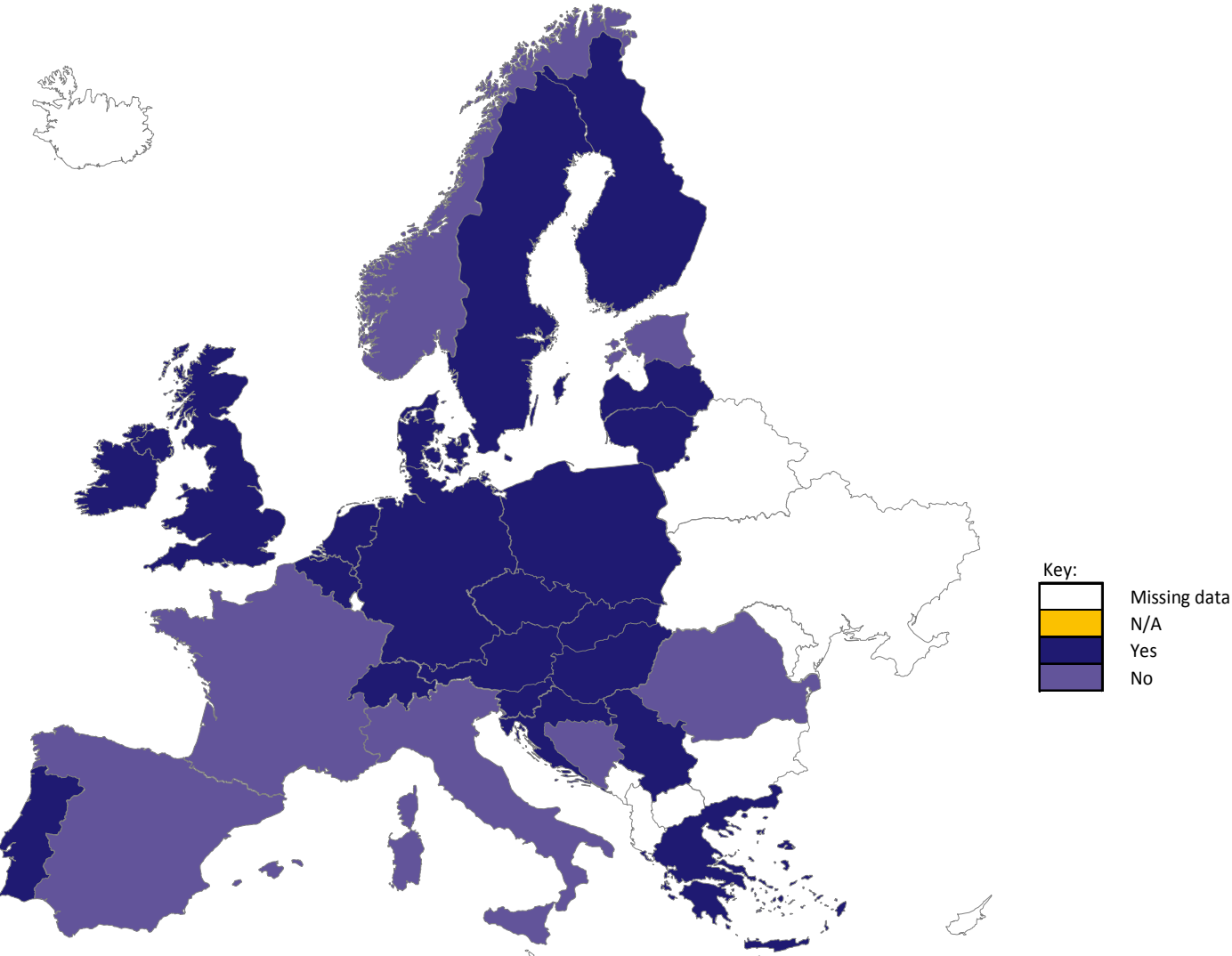
Black Start - Which power plants have to provide black start (for example: capacity, technology etc)? Is it a mandatory service in your country? 3/3

TSO	Answer
PSE	It is not a mandatory service in Poland.
REE	Not a mandatory service; main providers are hydro units.
REN	Black Start is not a mandatory service in Portugal. We have a CCGT and a Hydro that provide that service.
RTE	Nuclear, hydro, gas units.
SEPS	No, this service is not mandatory.
Statnett	Power plants that have a significance impact on the reconstruction of the network or other critical functions: >100MVA.
Svenska kraftnät	We have contracts with some suppliers of blackstart capability.
Swissgrid	Currently 8 power plants are prequalified to provide this service.
TenneT TSO BV NL	It is contracted service. it is not a mandatory service.
Terna	It is not mandatory.
Transelectrica	Power plants that are included in the black start plan must provide the black start service (due to technology).

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

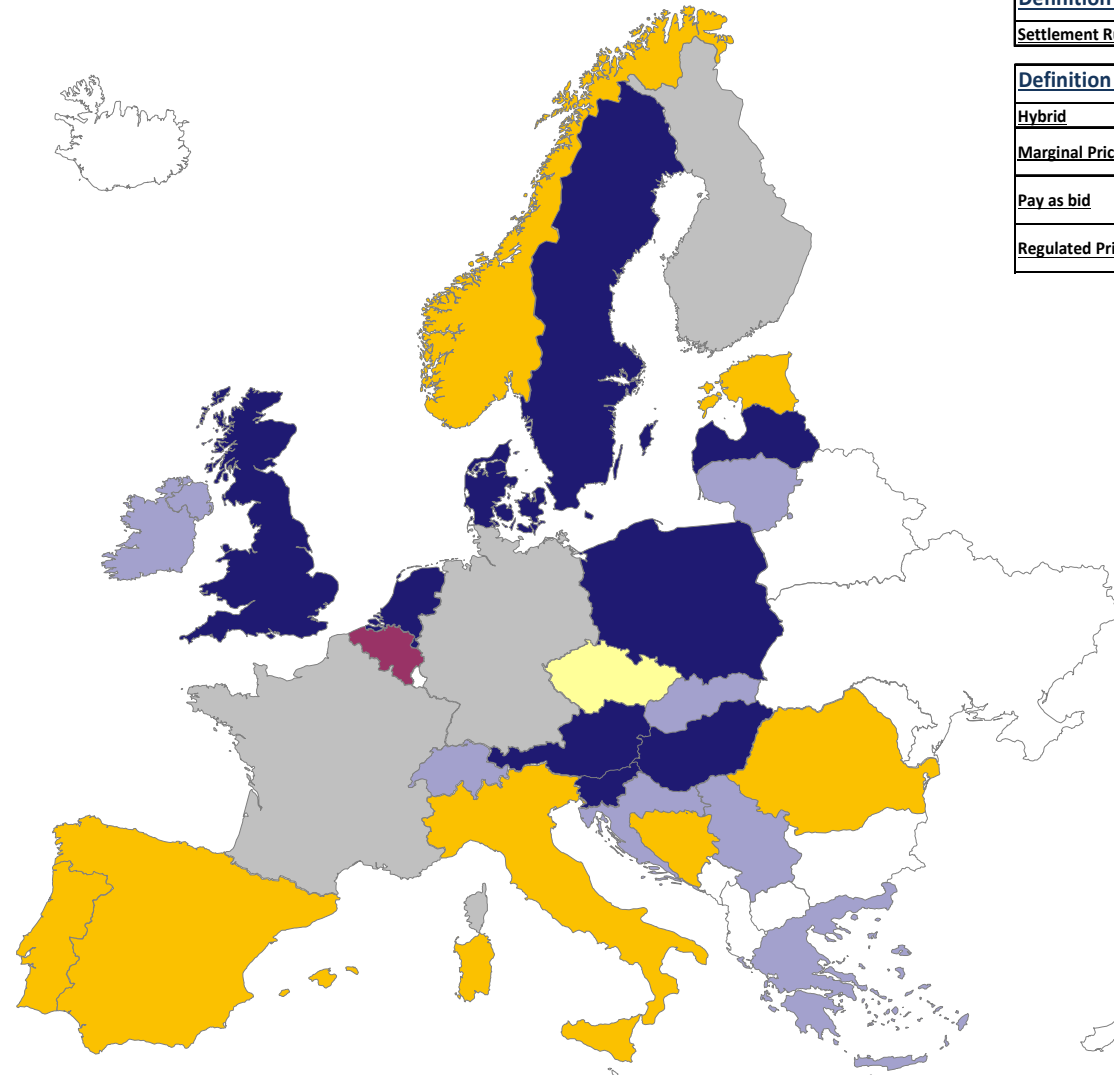


Black Start - Is it a service paid by the TSO?



Black Start - Settlement Rule

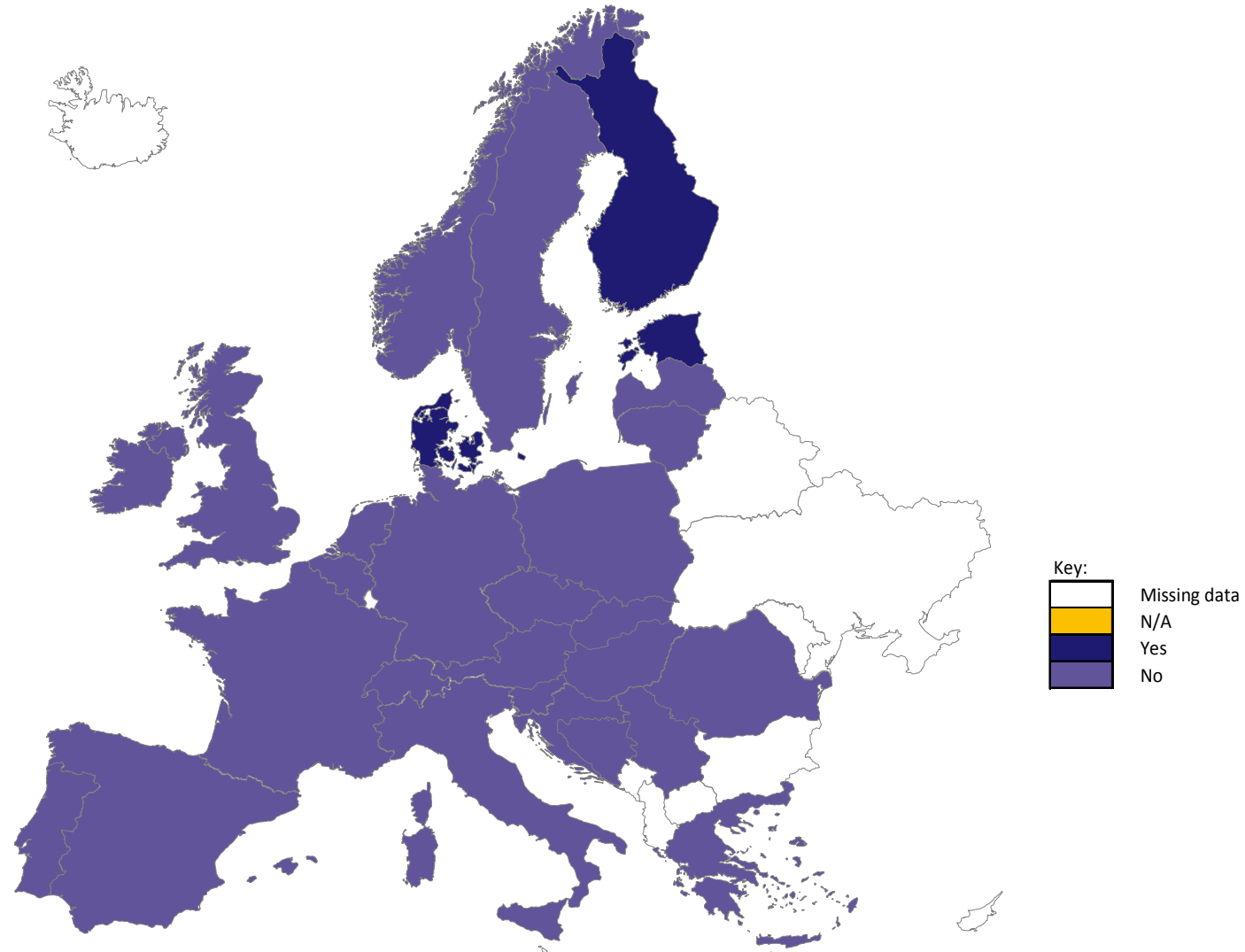
Definition of question	
Settlement Rule	The pricing rules for settlement.
Definition of answer	
Hybrid	Combination.
Marginal Pricing	Marginal pricing is the change in total cost that arises when the quantity produced changes by one unit.
Pay as bid	Contracted parties who provide a service are paid based on their offer price.
Regulated Price	Price for this service is based on a price that is set by the relevant regulatory authority.



Key:

White	Missing data
Yellow	N/A
Dark Blue	Pay as bid
Purple	Marginal pricing
Light Blue	Regulated price
Grey	Free
Light Yellow	Hybrid
Maroon	Pay as bid + Free

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	Geographical Distance.
AST	No special rules.
EirGrid	Black Start is procured through a tender process. The location of the service is one of the factors considered in the tender, so that the system can be divided into subsystems for restoration and each subsystem will have one or more sources of black start.
Elering	There is no special rules.
Elia	Number of BS production unit is defined at control level (Belgian control area) but Elia defined specific rules for their location (electrical zones within BE control area).
EMS	No.
Energinet.dk	2 units pr. area (DK1 - DK2). These can be max. 1 VSC HVDC and min. 1 generation units.
German TSOs	According to respective black-start concept.
HOPS	No, exact units are determined by defense plan.

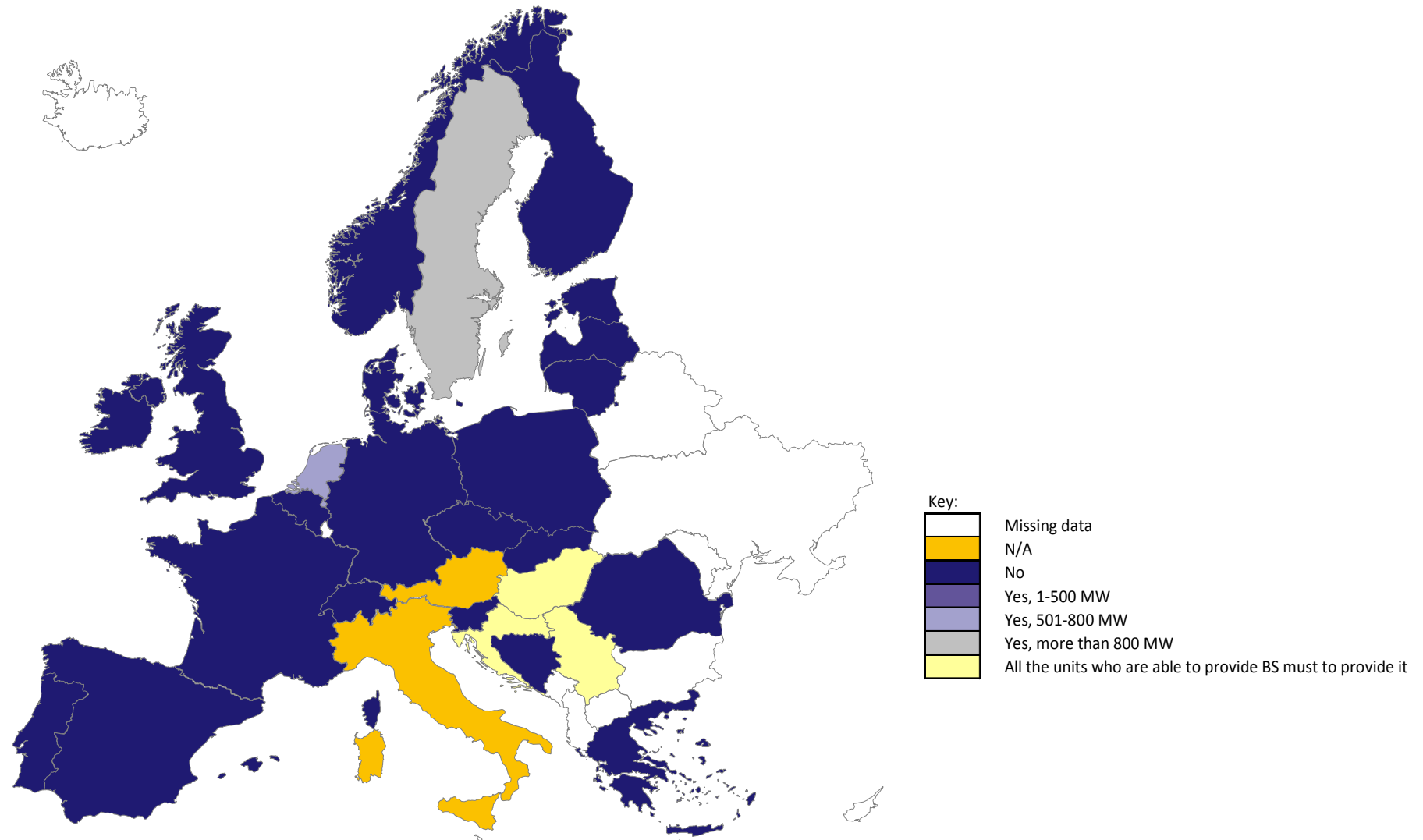
Black Start - Does the TSO have some special rules for the distribution/location/number etc of black start service units? 2/3

TSO	Answer
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.
MAVIR	No special rules.
National Grid	Contracting strategy is to split GB in to 6 geographical zones (Scotland, North West, North East, Midlands, South West & South East) and contract for at least 3 Black Start power stations within each zone.
NOS BiH	No.
PSE	TSO is obliged to fullfill standards from OH Policy 5.
REN	No special rules.
RTE	No special rule, we just ensure a sufficient spread over France to fulfil blackstart capacities.
SEPS	Yes, we have a set of different rules. Each application for BS providing is assessed separately.
Svenska kraftnät	Yes, we have a set of different criterias.

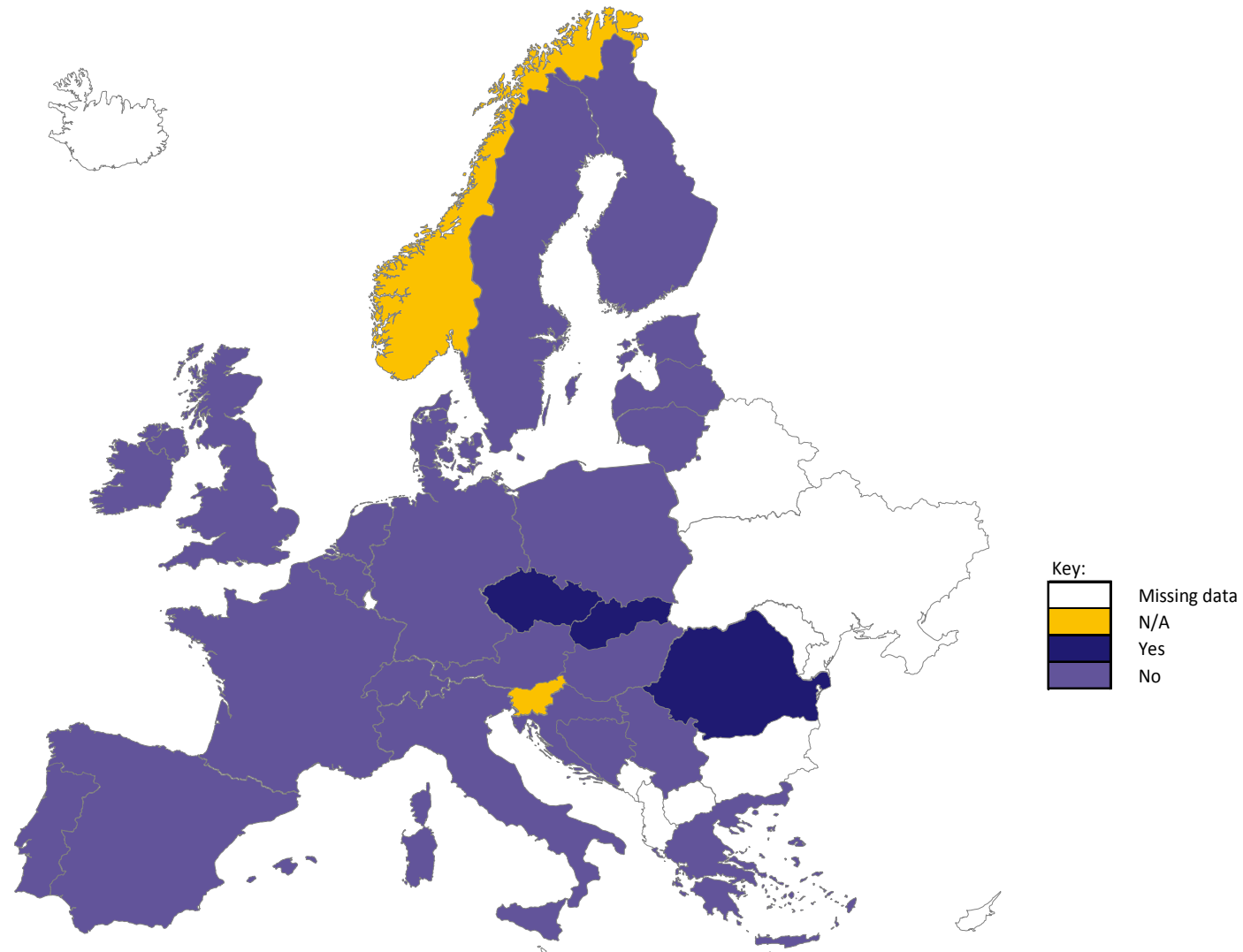
Black Start - Does the TSO have some special rules for the distribution/location/number etc of black start service units? 3/3

TSO	Answer
Swissgrid	The distribution of the black start service units depends also on the geographical location of the units. It is foreseen to have at least 4 clusters of units providing that service covering the whole Swiss system. These clusters are named accordingly: Middle, East, West, South. The aforementioned concept is not yet in place.
TenneT TSO BV NL	Minimum 3 locations 2 units per location 200 MW capacity per location These are own requirements, i.e. not regulated (see next question).
Terna	We have a fixed number of "restoration paths".
Transelectrica	Geographical distance according to respective black-start concept.

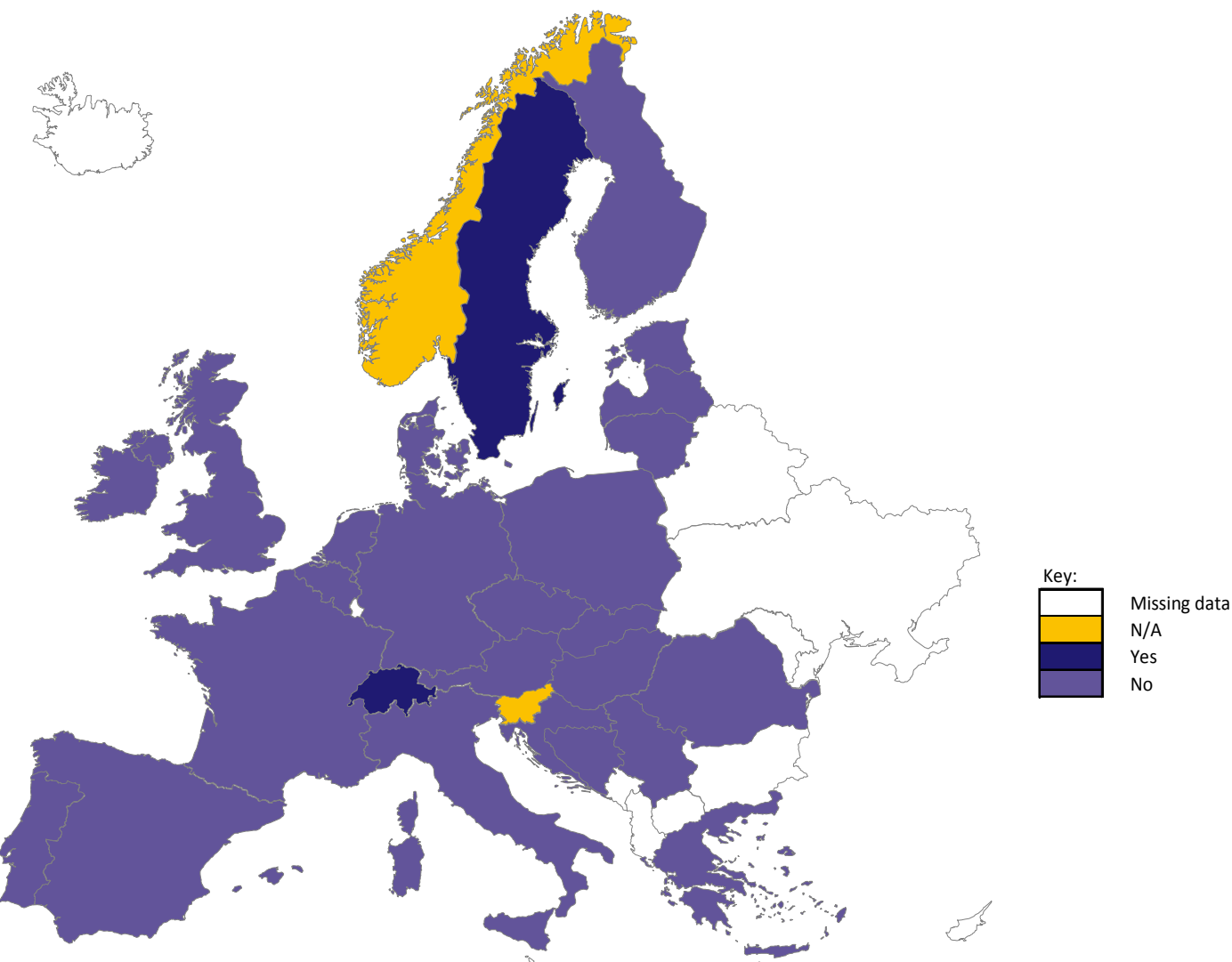
Black Start - Does the TSO have a regulated amount of BS control (regarding the whole control area)?



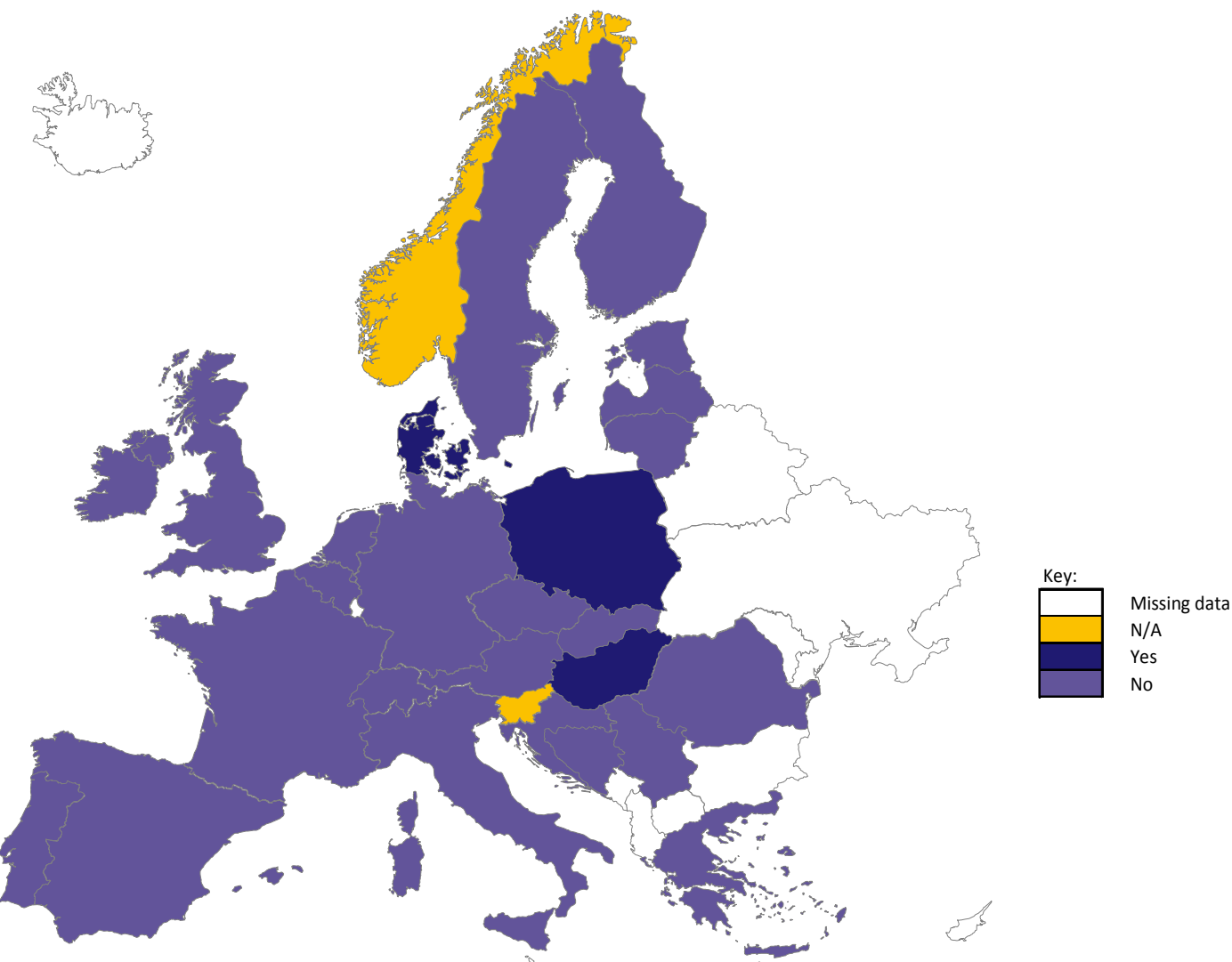
Black Start - Testing the BS ability by the TSO - During the accreditation process only



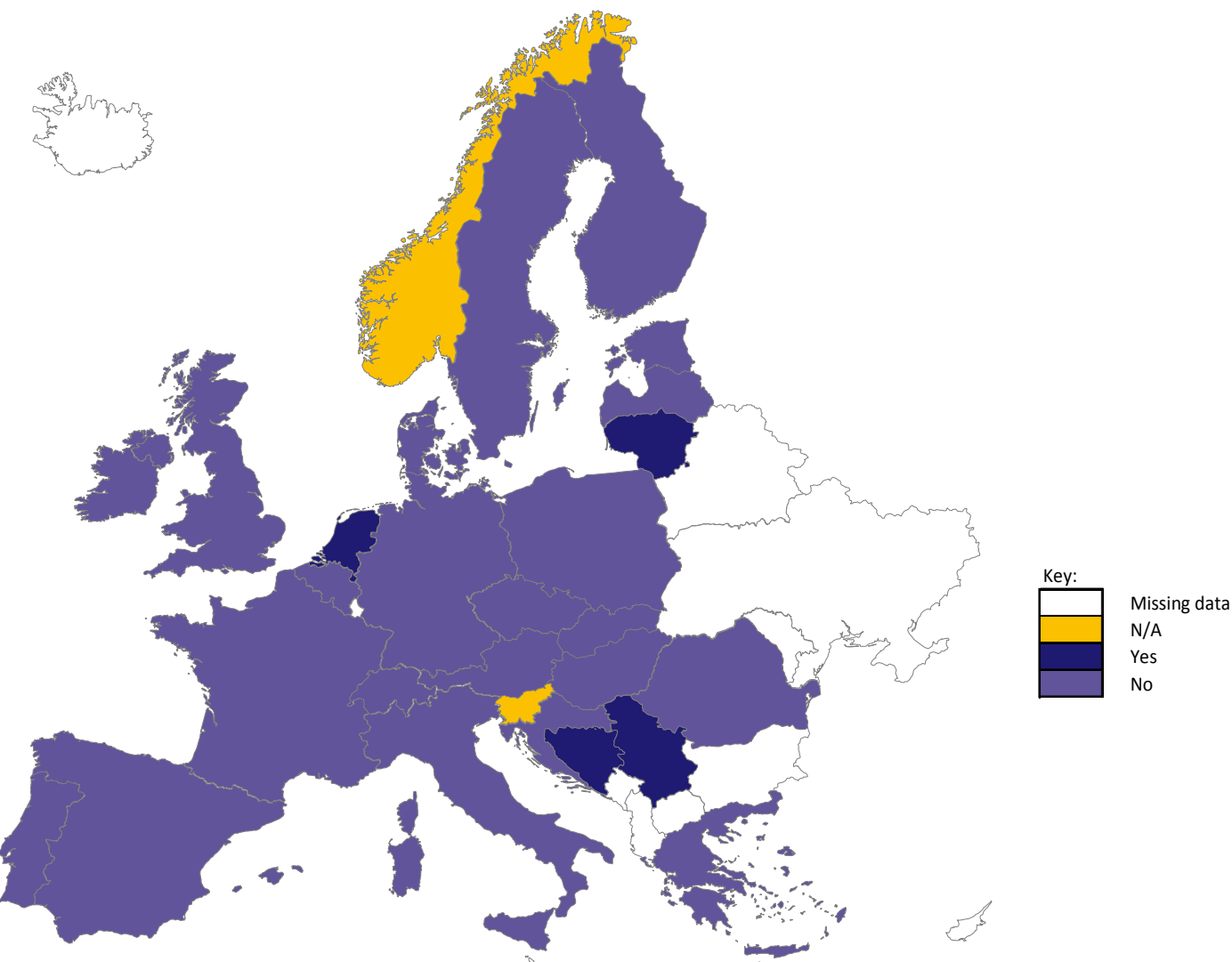
Black Start - Testing the BS ability by the TSO - After the accreditation process/ Only the operational function of the BS unit (unit is working, not connected to the grid)/Once a year



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



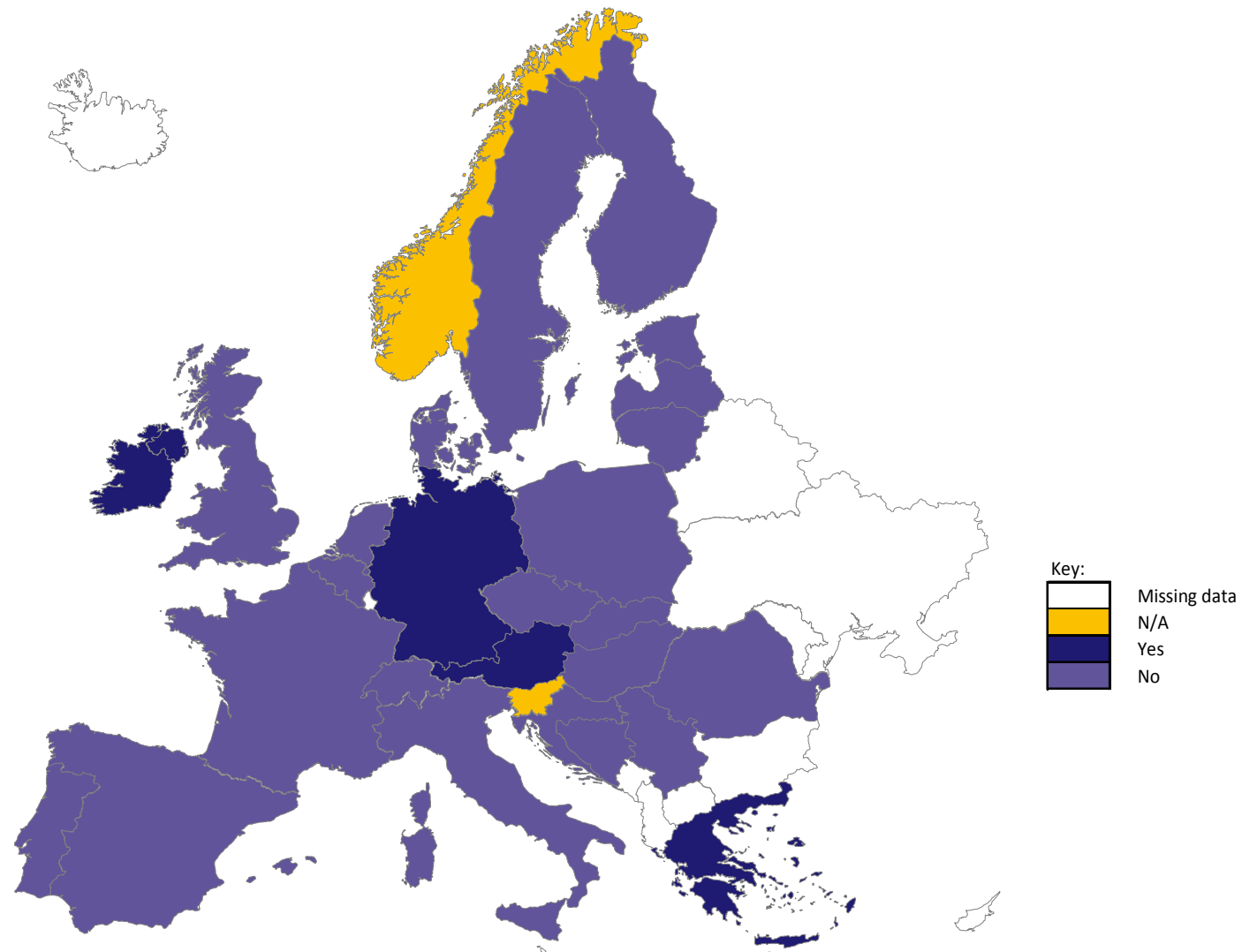
Black Start - Testing the BS ability by the TSO - After the accreditation process/ Only the operational function of the BS unit (unit is working, not connected to the grid)/Occasionally



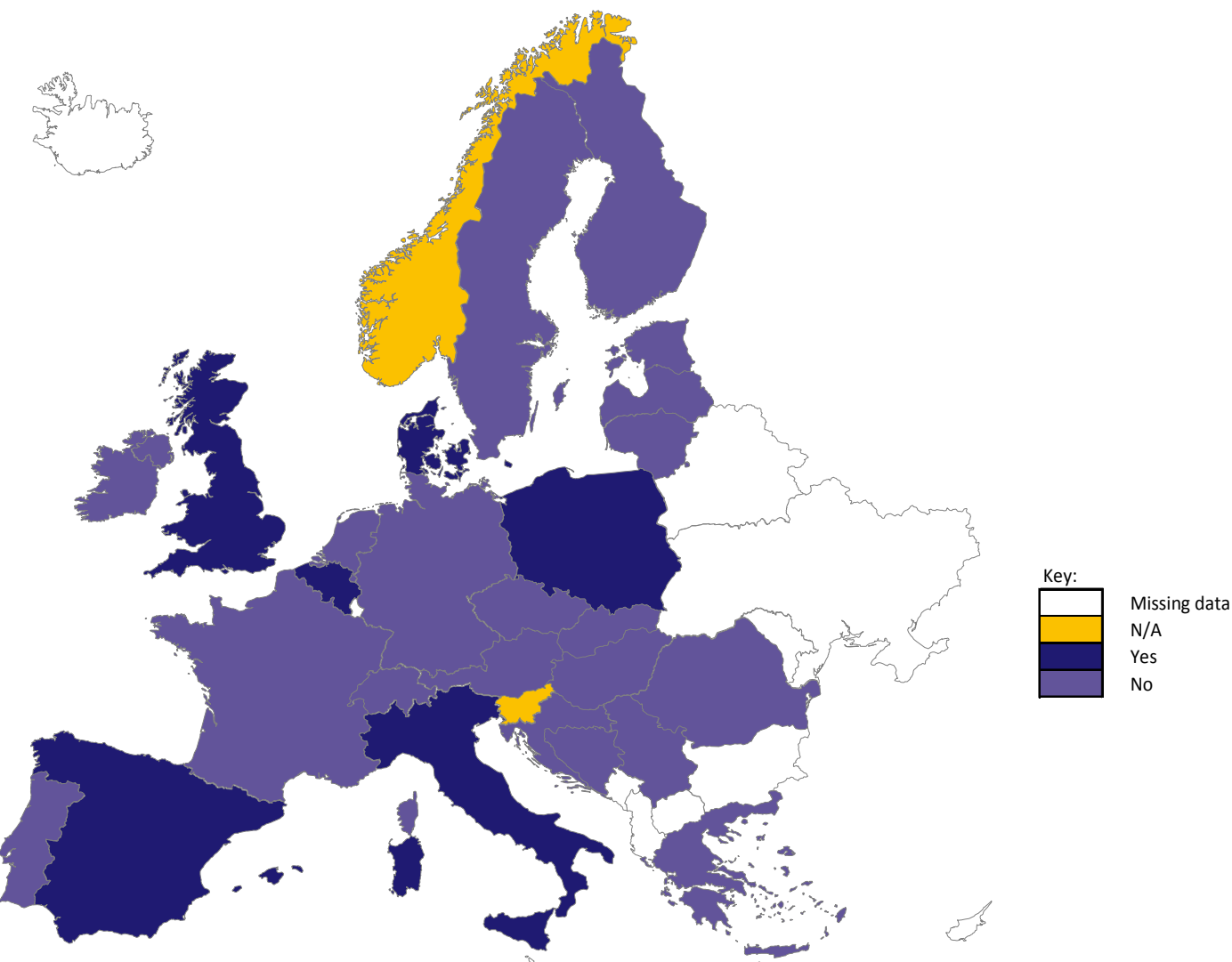
Key:

White	Missing data
Yellow	N/A
Dark Blue	Yes
Light Blue	No

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



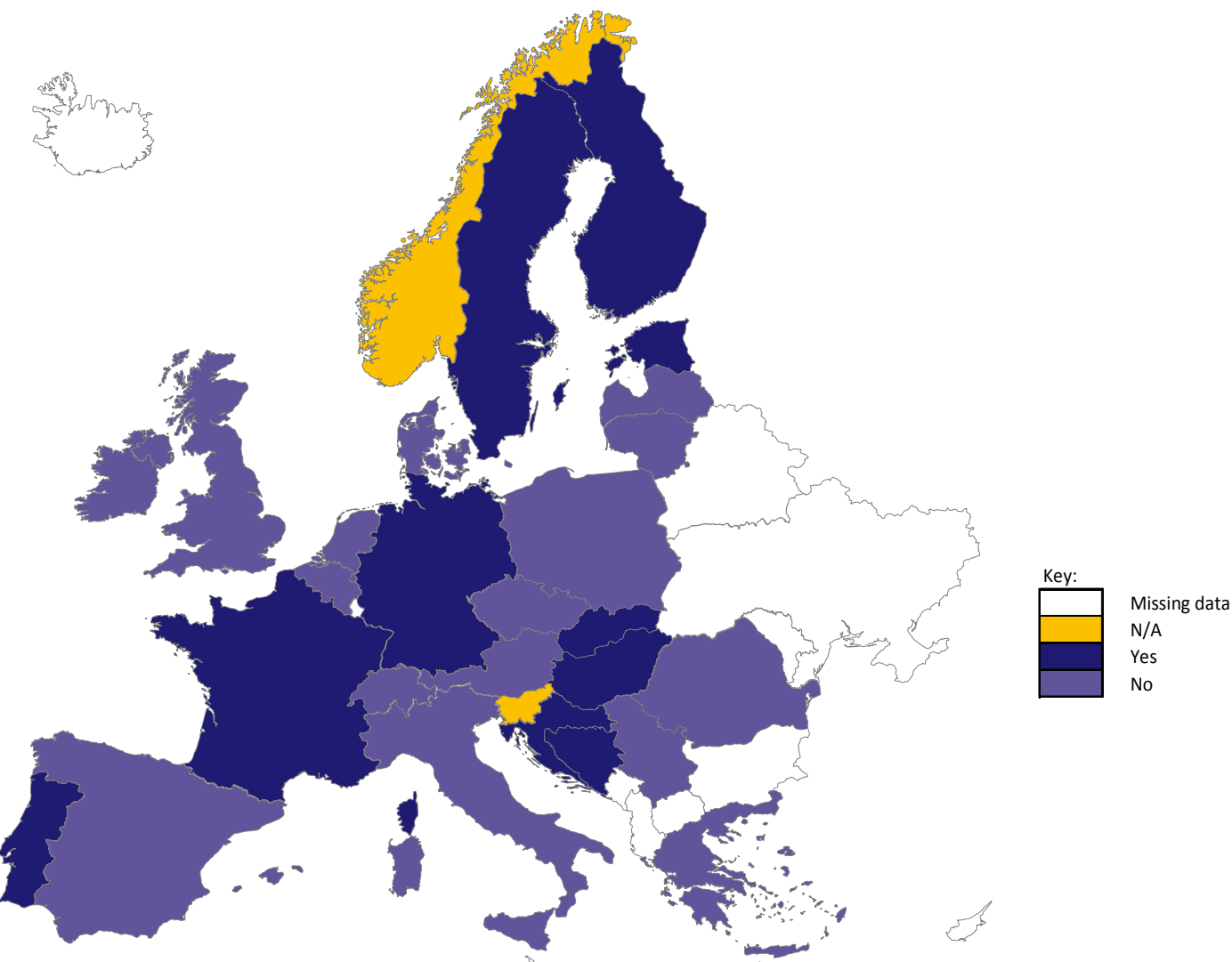
Black Start - Testing the BS ability by the TSO - After the accreditation process/ Control function of the BS unit (unit is working, connected to the grid and has to provide some predefined orders)/Several times a year



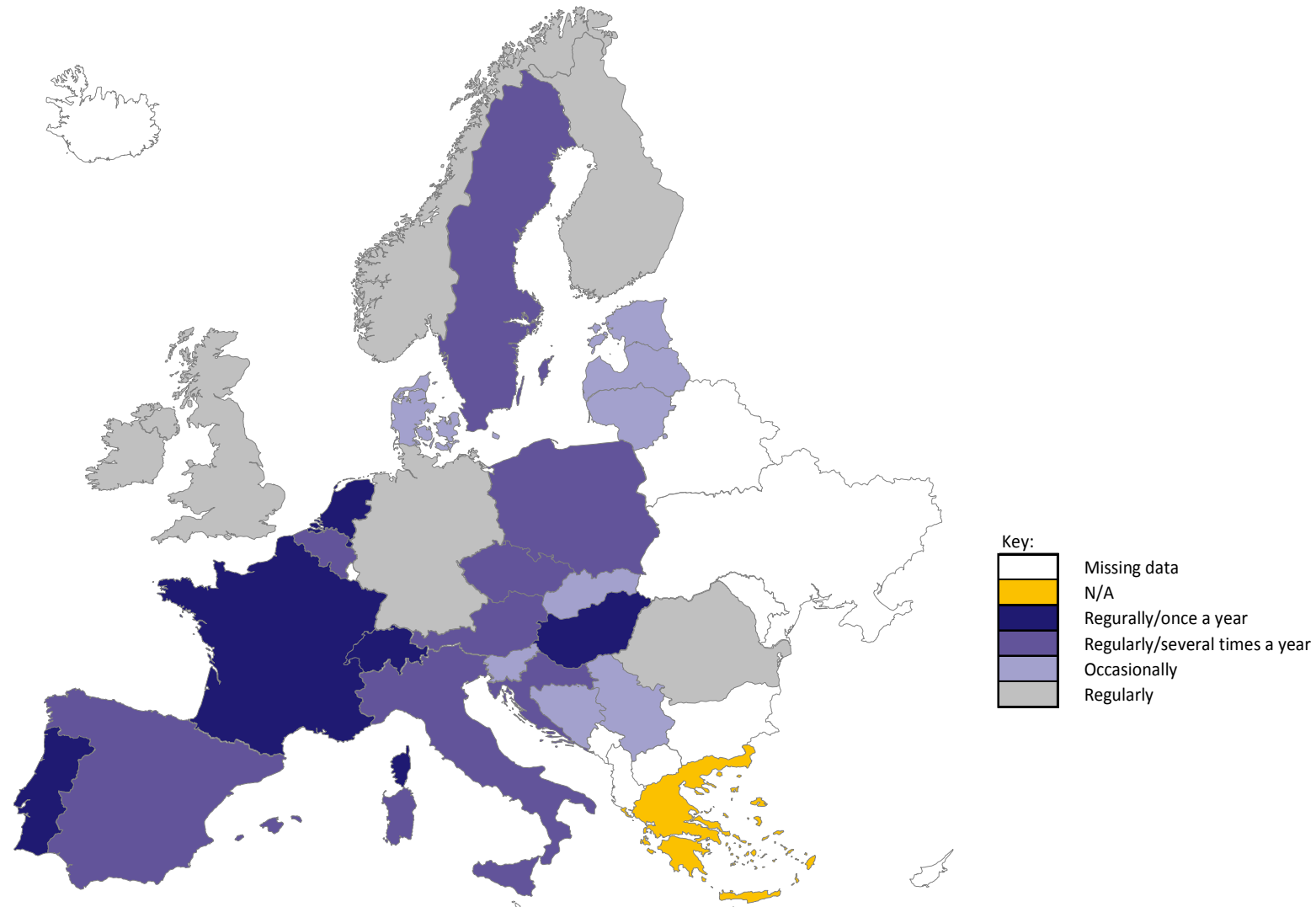
Key:

White	Missing data
Yellow	N/A
Dark Blue	Yes
Medium Blue	No

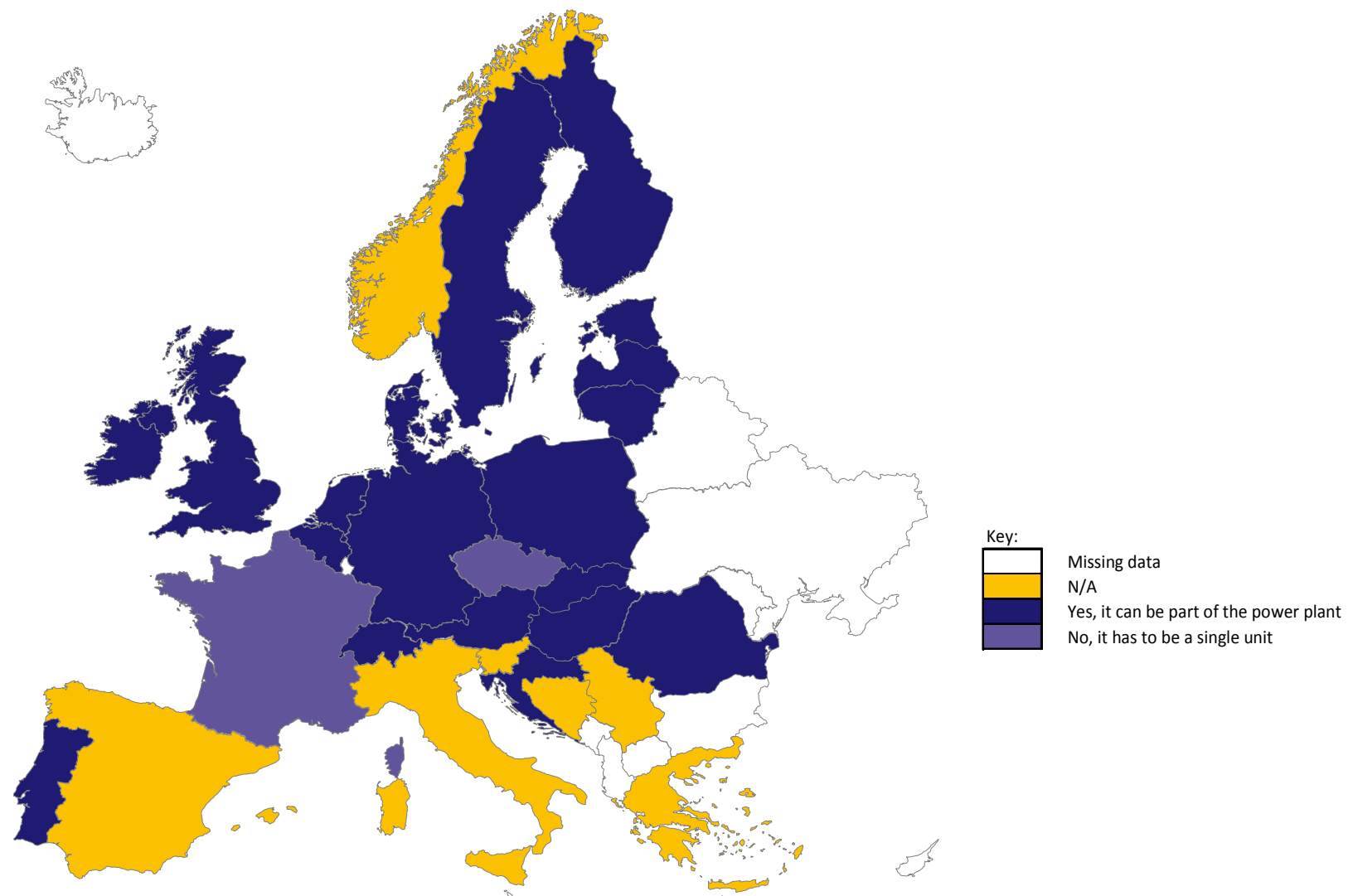
Black Start - Testing the BS ability by the TSO - After the accreditation process/ Control function of the BS unit (unit is working, connected to the grid and has to provide some predefined orders)/Occasionally



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



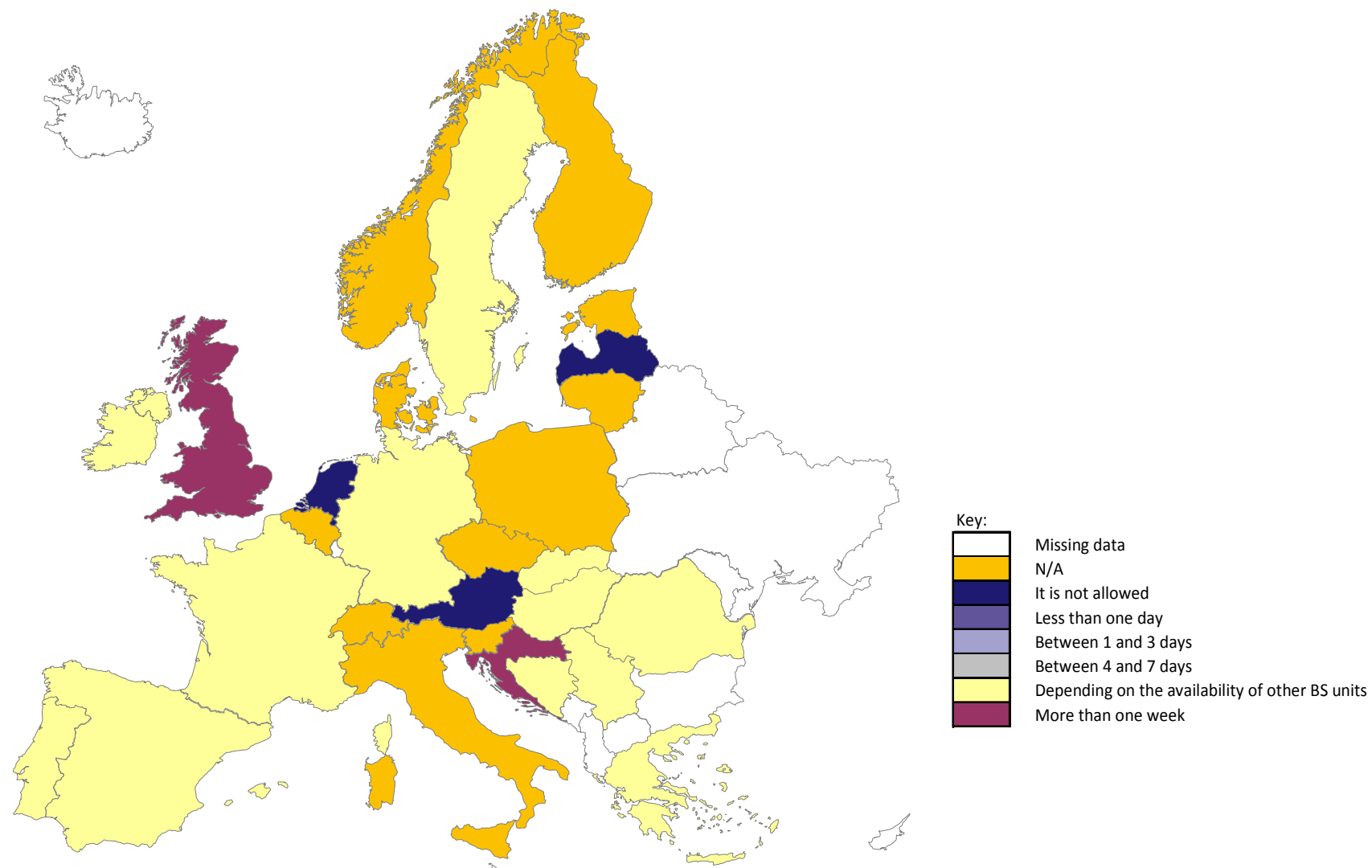
Black Start - Should be the Black start service provided by a single unit or it is allowed to be a part of a power plant?



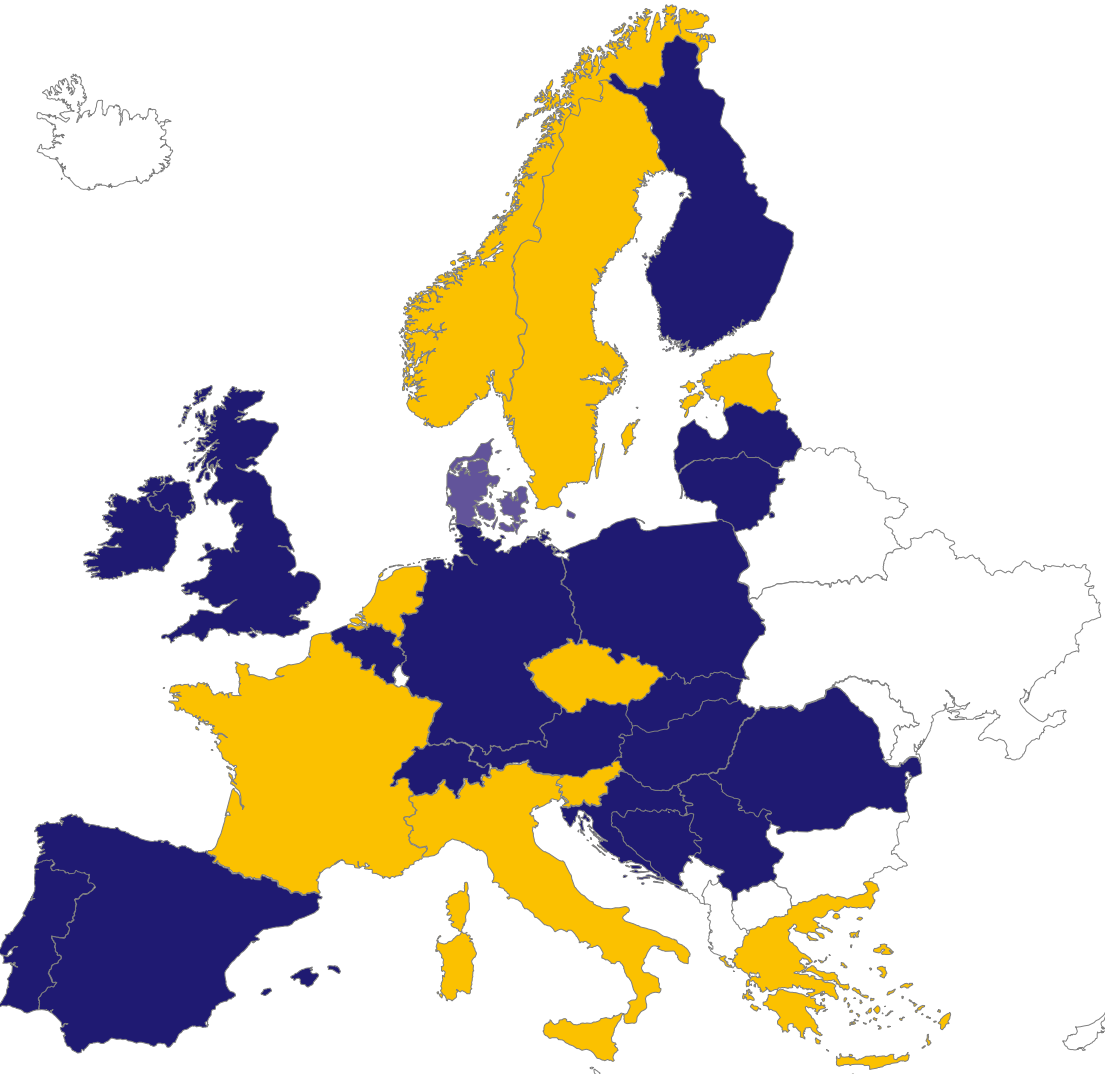
Key:

- Missing data
- N/A
- Yes, it can be part of the power plant
- No, it has to be a single unit

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



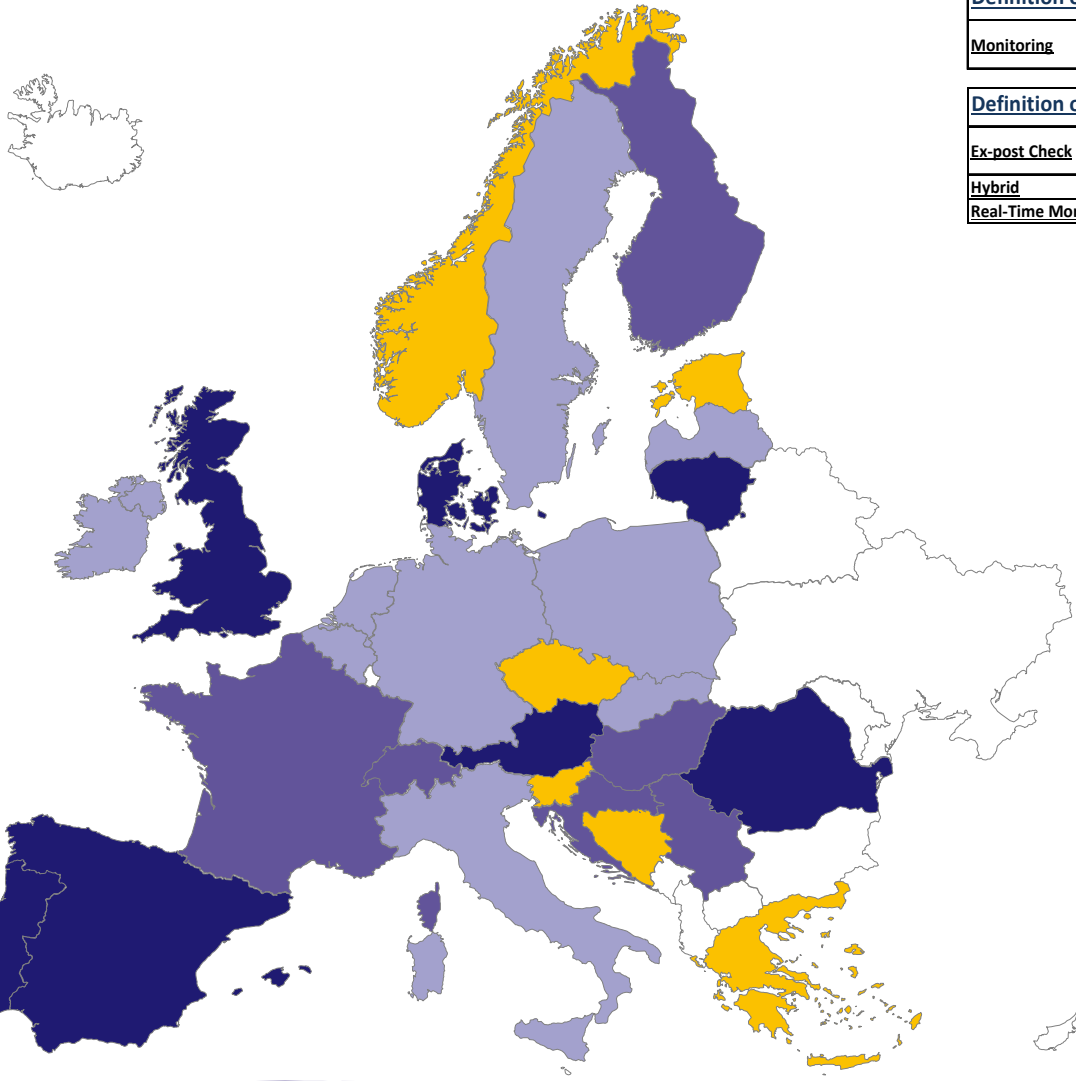
Black Start - Is there a regulated gradient for the BS unit?



Key:






White	Missing data
Yellow	N/A
Dark Blue	No
Purple	Yes, 0-100MW/15 min
Light Purple	Yes, 101MW-200MW/15 min
Grey	Yes, more than 200 MW/15 min

Black Start - 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 after the event.
Hybrid	Combination.
Real-Time Monitoring	Monitoring of delivery of ancillary services in real time.

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