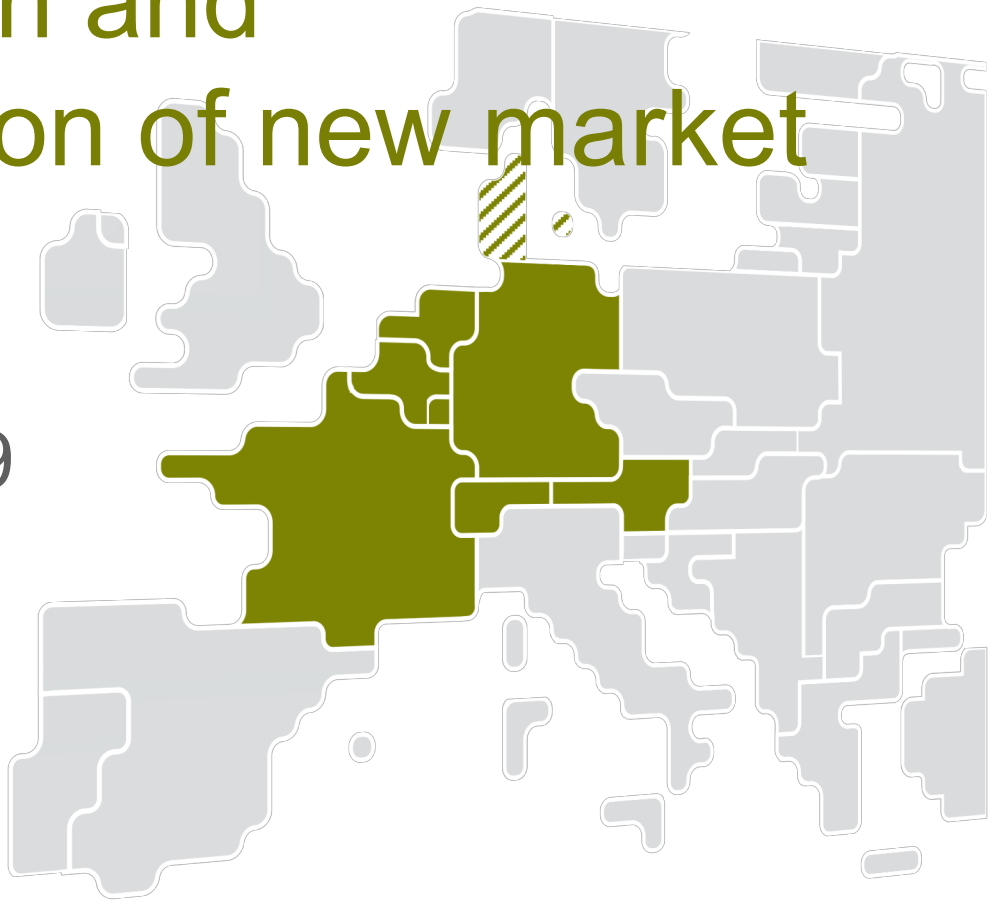
FCR cooperation:

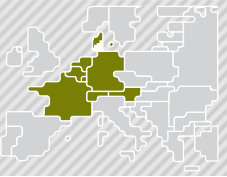
Stakeholder workshop on harmonization and implementation of new market design

19 February 2019

Brussels



Practical information



Physical attendance

- Microphone will be passed around for questions

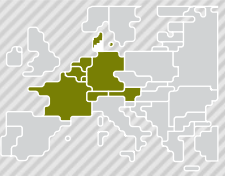
Online attendance

- All conference participants will be muted to avoid disturbance
- Questions and answers can be provided in the chat function, which is only available when joining the conference on a computer
- Q&A are to be sent to the participant ‘Questions & Answers’

General

- Questions and answers that cannot be answered during the conference will be answered afterwards
- Lunch will be at 12:30 and coffee at 15:00, both on the ground floor outside of this room

Agenda



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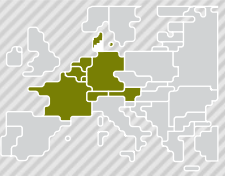
2	**Implementation of market design in 2019/2020** • Overview • Daily auctions and marginal pricing • Testing of the new features	Milos Djordjevic	10:30 – 11:00
3	**Harmonization – Part 1** • Scope overview • Aggregation • Power measurement location	Ronald Engelmair	11:00 – 12:30
	Lunch		12:30 – 13:30
4	**Harmonization – Part 2** • Backup requirements • Monitoring • Penalties • Additional properties on FCR	Georgios Giannopoulos	13:30 – 15:00 **Coffee** 15:30 – 16:30
5	**Closure** • Next steps for the harmonization • Closure	Markus Riegler	16:30 – 17:00

Agenda



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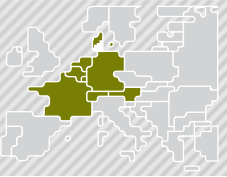
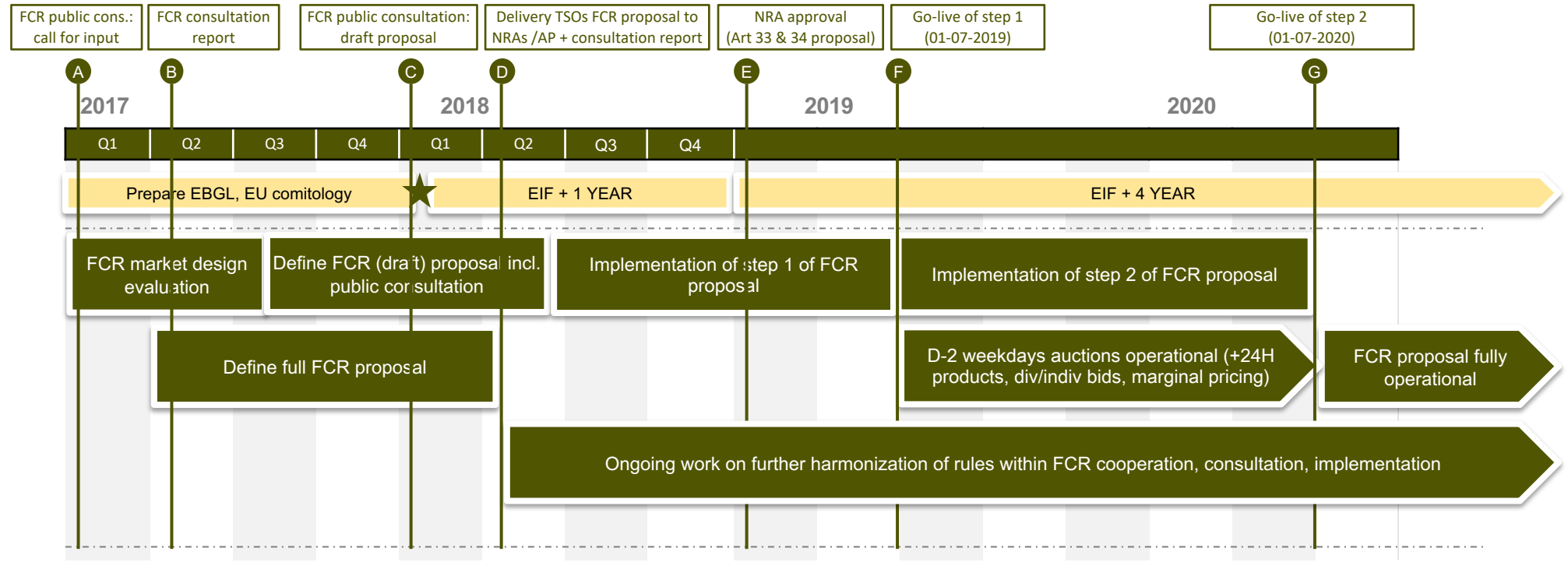


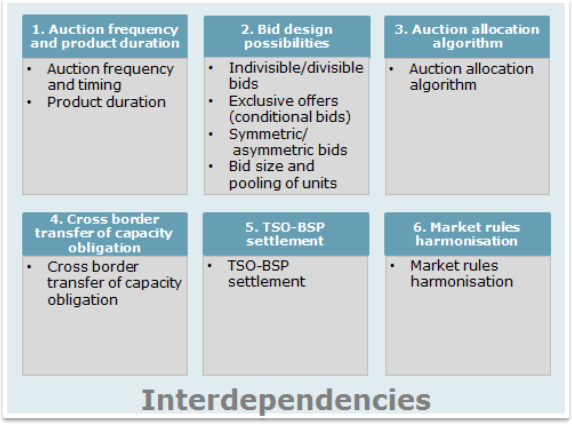
1. Road to the current proposal

Stakeholder consultation 2017



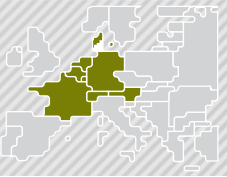
Stakeholder consultation 2017

TSOs conclusions on consulted topics:



- To change the auction frequency from weekly auctions to daily all days auctions.
- To propose GCT - subject to technical feasibility and time restrictions - :
  - GCT at 08:00 in D-1
  - Publication time at 08:30 in D-1
- To change the product duration from weekly to 4h products.
- To allow indivisible bids, with a restriction that no divisible bid can be paradoxically rejected.
- To limit to maximum bid size of an indivisible bid to 25 MW - not to introduce exclusive bids -.
- To keep the current minimum bid size of 1 MW.
- To introduce Marginal Pricing as the TSO-BSP Settlement scheme.
- Not to implement linked bids or multiple products.
- Not to introduce a cross border transfer of obligations.
- Not to introduce asymmetric products.
- To investigate and to come up with a joint solution for harmonization on these topics:
  - Rules for aggregation & Centralized frequency measurement
  - Monitoring & Penalties
  - Backup requirements (n-1)

Proposal in 2018 for implementation

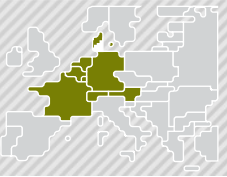


To fulfill EBGL requirements, a second public consultation on the detailed proposal was started in January 2018.

Amended proposal was approved by the NRAs with the following implementation timeline:

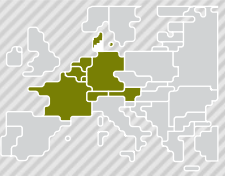
01.07.2019	01.07.2020
D-2 daily auctions (no gate closure on weekends and holidays)	D-1 daily auctions every day
24 hour products	4 hour products
Marginal pricing	
Divisible and indivisible bids	
No conditional bids (currently allowed in Switzerland)	

Road to the current proposal



Questions?

Agenda



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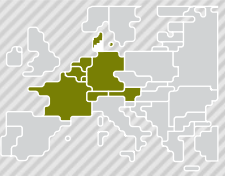
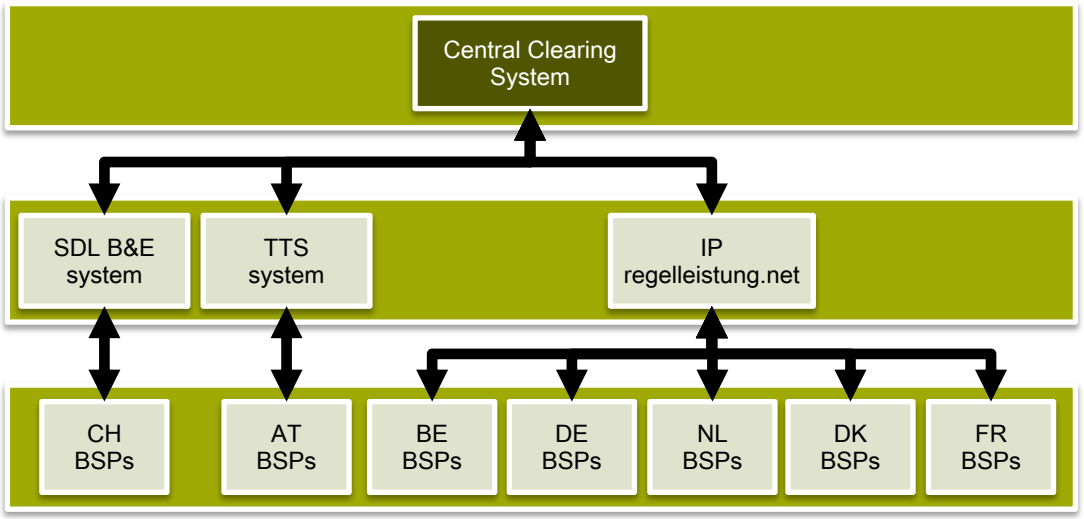


2. Implementation of market design in 2019/2020

Overview



Sending the bids

- Daily auctions and shorter products
- Divisible and indivisible bids

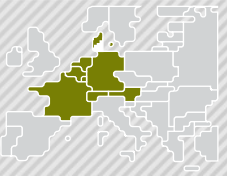
Publication of results

- Marginal pricing

Interactions between TSOs and BSPs vary in details per platform

- User Interface (online bidding)
- Uploading bid files
- Result files
- New WebAPI (on regelleistung.net)

Daily auctions and marginal pricing



Local marginal price / cross border marginal price

- If some export or import limits are hit then these countries could have a different “local marginal price”.
- All countries with no limits hit will have the same marginal price (“cross border marginal price”).

GCT for a D-2 daily auction on working days only

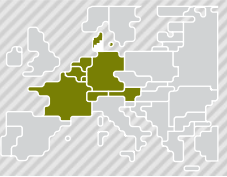
- regular week is shown below:

GCT 15:00	Monday	Tuesday	Wednesday	Thursday	Friday
Delivery (D)	Wednesday	Thursday	Friday	Saturday Sunday	Monday Tuesday

- For details such as weeks with bank holidays, see the auction calendar.

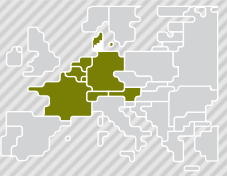
Starting from 01.07.2020, GCT of daily auctions will be D-1, 8:00 am for all days (also weekends and public holidays).

Testing of the new features with BSPs



- Tests are planned in May.
  (for all features introduced on 01.07.2019)
- BSPs will be invited by the connecting TSOs.
- Test scope:
  - updated user interfaces (online bidding)
  - bid files
  - result files
  - WebAPI and emergency procedures (regelleistung.net)
- For the preparation of the tests BSPs will be provided with:
  - an implementation guide (including process & technical changes and a test plan)
  - example files (bids and results)

Implementation of market design in 2019/2020



Questions?

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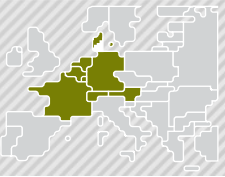

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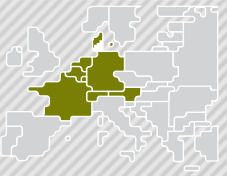
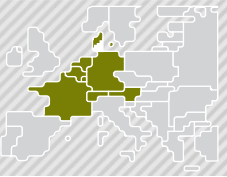


3. Harmonization – Part 1

Harmonization: Selected topics



Harmonization topics

- Aggregation
  - Structure of a BSP should be valid in the whole cooperation (often linked to software).
- Power measurement location
  - Related to aggregation.
- Backup requirements
  - High impact on level playing field.
- Monitoring
  - Quality of FCR should be the same in a common market.
- Penalties
  - Quality of FCR should be the same in a common market.
- (Frequency measurement)
  - Responsibility for European concept has shifted to another TSO working group (Synchronous Area Framework Agreement Continental Europe).

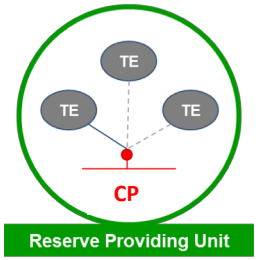
The selected topics are considered key to achieve market level playing field and most are part of the prequalification requirements

Aggregation – Definitions

Technical Entity (TE)

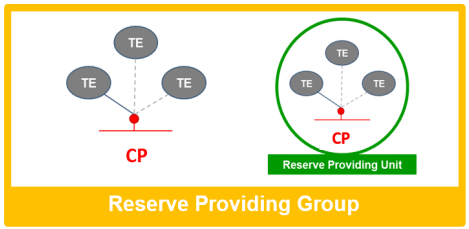
An indivisible power generation module or demand unit, which is not capable of providing FCR alone.

Reserve Providing Units (RPU)



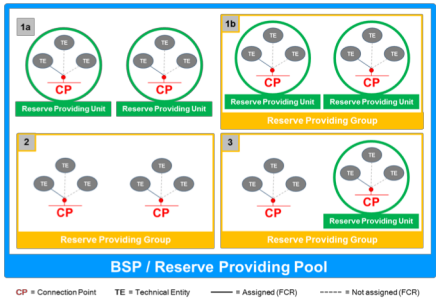
A single or an aggregation of TEs, connected to a common connection point fulfilling the requirements to provide FCR.

Reserve Providing Groups (RPG)



A single or an aggregation of TEs and/or RPUs connected to more than one connection point.

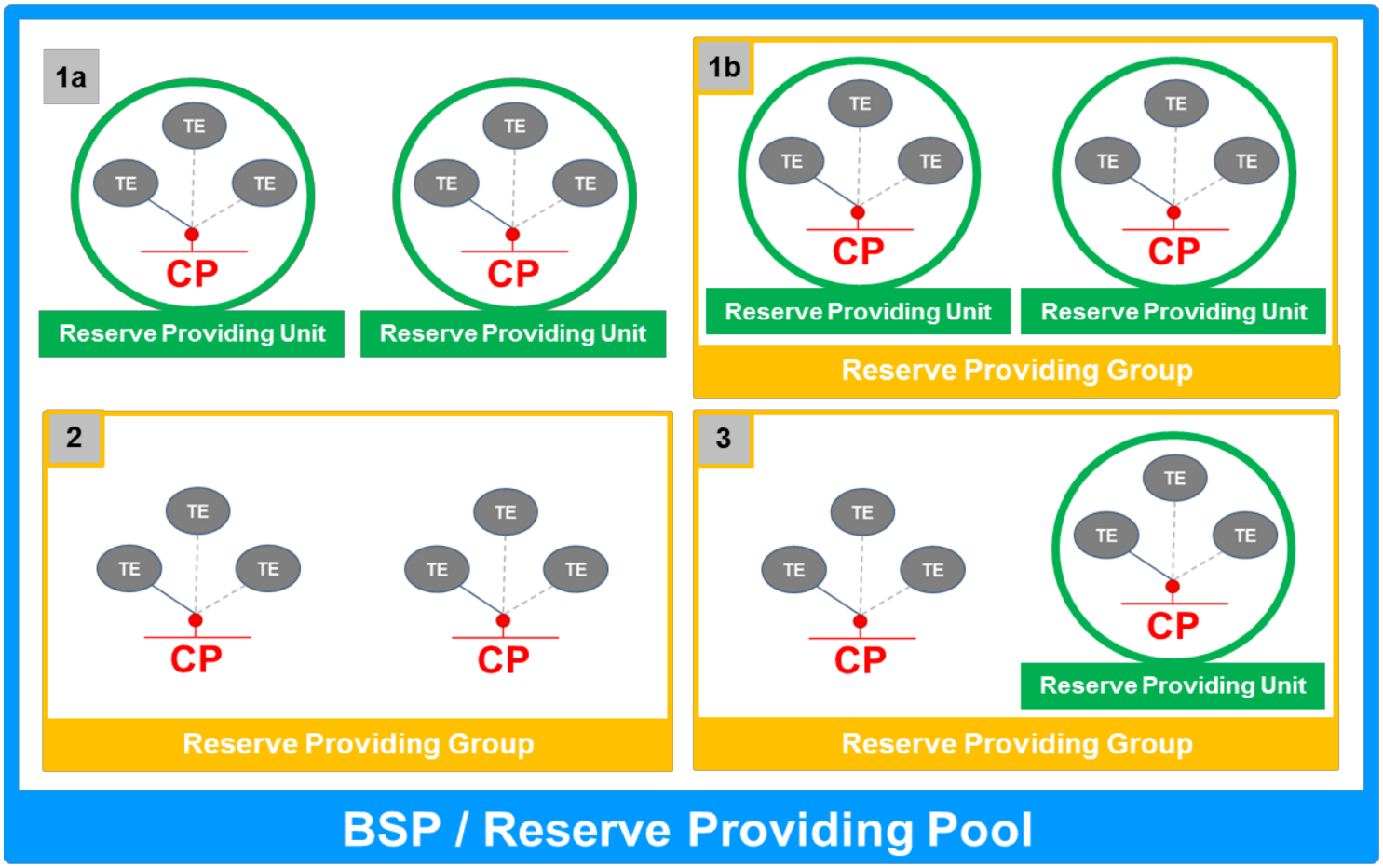
Reserve Providing Pool (RPP)



Means the RPUs and RPGs of a BSP within a control area.

Aggregation model

In principle, BSPs can choose from the below options:



Aggregation

Requirements

- TSOs need to clearly specify the further requirements for aggregation, taking into account the existing EU legislation and specific national aspects.
- Within FCR Cooperation all kinds of aggregation are allowed according to the common architecture, considering the following requirements:

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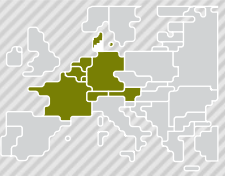
Legal requirements

TSOs‘ requirements

Aggregation



Explicit legal requirements

EBGL, SOGL, DCC and Operational Handbook Policy 1* were considered. Explicit legal requirements were found only in the SOGL:

* not a legally binding document, but an agreement among TSOs

- Article 163.8 SOGL: “The FCR providing unit or group shall be responsible towards its reserve connecting TSO for FCR activation.”

- Article 156.6(a) SOGL: “Each TSO shall ensure, or shall require its FCR providers to ensure that the loss of a FCR providing unit does not endanger the operational security by: (a) limiting the share of the FCR provided per FCR providing unit to 5 % of the reserve capacity of FCR required for each of the whole CE and Nordic synchronous areas. (…)”

- Article 154.9 SOGL: “Each FCR provider shall have the right to aggregate the respective data for more than one FCR providing unit if the maximum power of the aggregated units is below 1,5 MW and a clear verification of activation of FCR is possible.”

Aggregation 1/2

There are currently six TSOs‘ requirements:

1. TSOs can request BSPs to set up an aggregation for TE / RPU / RPG for monitoring reasons.

2. TSOs can request BSPs to split an RPG into RPUs for clear verification. TSOs requesting BSPs to split an RPG into RPUs shall clearly state the reasons to the BSP.

3. TEs/RPUs at all voltage levels can be aggregated to one RPG. However the TSO can request further information, e.g. about the FCR capacity being withheld per TE/RPU. FCR allocation can be changed within BSP/RPP.

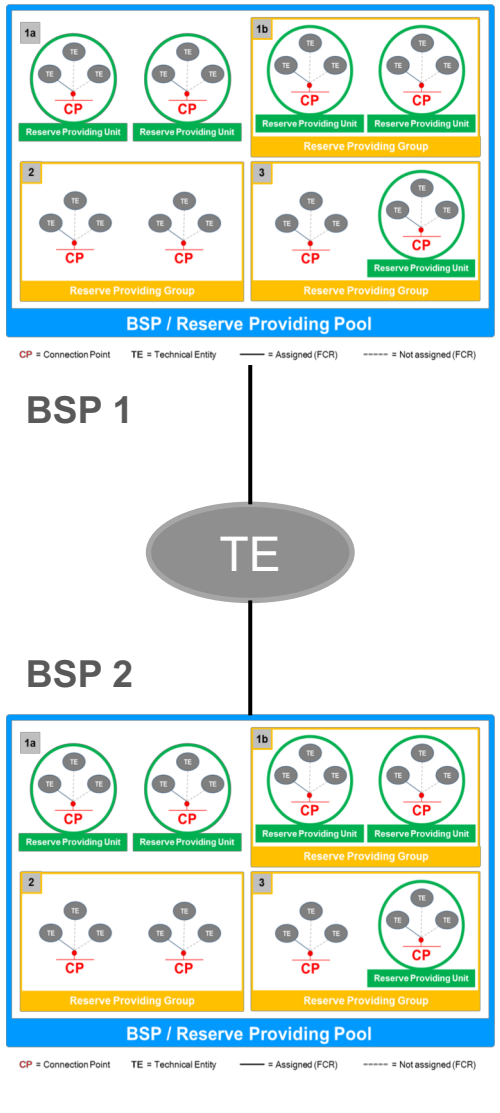
Aggregation 2/2

There are currently six TSOs' requirements:

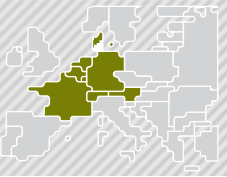
4. If the composition of a RPG changes, TSOs can request a renewed prequalification of the respective RPG. Furthermore, TSOs can allow the BSPs to add or withdraw TE(s)/RPU(s) without repeating the entire prequalification process if the TE(s)/RPU(s) are equivalent in technical characteristics and the used set of technologies is comparable to other TE(s)/RPU(s) in the RPG. Nevertheless, the process of adding or withdrawing such TE(s) / RPU(s) to a group is defined and coordinated by the TSO.

5. Each TSO may allow a TE / RPU to be assigned to multiple BSPs, with precondition that a clear verification of activation is possible.

6. Maximum FCR capacity of a RPG shall also be subject to the limits in Article 156.6(a) SOGL.



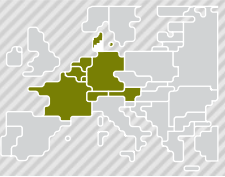
Aggregation



National implications (1/2)

Country	Current situation	Future design	Required action
AT	• The number of TE / RPU in a RPG (sum of TE and RPU) is limited to 1,000.	• The number of TE / RPU in a RPG (sum of TE and RPU) is not limited.	• Change of terms & conditions
	• No power limit for RPGs	• Maximum FCR capacity of a RPG is limited to 5% of the reserve capacity of FCR for whole synchronous area. This is currently 150 MW	• Adapt the requirements for prequalification.
BE	• In some cases, units >25MW or connected on TSO grid cannot be combined with the rest in the same group. • TEs connected to <1kV cannot be used for FCR provision	• BSPs will be able to group all units disregarding power output or voltage level. • All units will be able to offer FCR disregarding the voltage level	• Change of terms and conditions • Agreement by DSOs • Contractual changes on DSO side.
CH	• Slow and fast technologies cannot be combined to pass the prequalification test	• Slow and fast technologies can be combined to pass the prequalification test	• Change of terms and conditions.
	• No power limit for RPGs	• Maximum FCR capacity of a RPG is limited to 5% of the reserve capacity of FCR for whole synchronous area. This is currently 150 MW	• Adapt the requirements for prequalification.

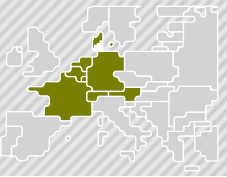
Aggregation



National implications (2/2)

Country	Current situation	Future design	Required action
DE	• Grouping (RPG) over several grid connections is currently not allowed.	• The formation of groups (RPG) is allowed.	• Adapt the requirements for prequalification / Change of terms & conditions
FR	• Power generating modules and demand units can be aggregated under conditions.	• Power generating modules and demand units can be combined in RPU / RPG.	• Change in IT market design • Change of terms and conditions
NL	• Maximum aggregated amount in one RPU is 150 MW.	• Limitation amount equal to article 156.6 of SOGL (currently 150 MW).	• Change of terms and conditions

Aggregation



Questions?

Power Measurement Location

Background & Motivation

Shall the power measurement of a Technical Entity be located at the connection point or directly at the TE?

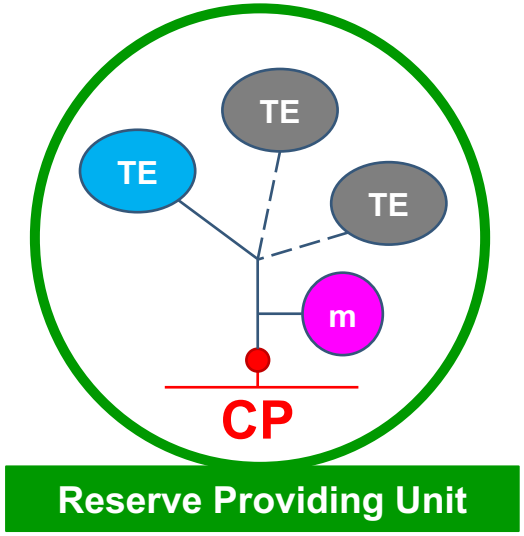
- The fundamental requirement of all TSOs is to ensure a reliable, transparent and comprehensible monitoring of activated control reserves. In this respect the overall requirement for the power measurement point is the possibility of a clear verification of availability and delivery of FCR.

- Up to date the TSOs within the FCR cooperation established two different methods to measure the power of a TE:
  - Power measurement located at the connection point
  - Power measurement located directly at the TE

Power Measurement Location

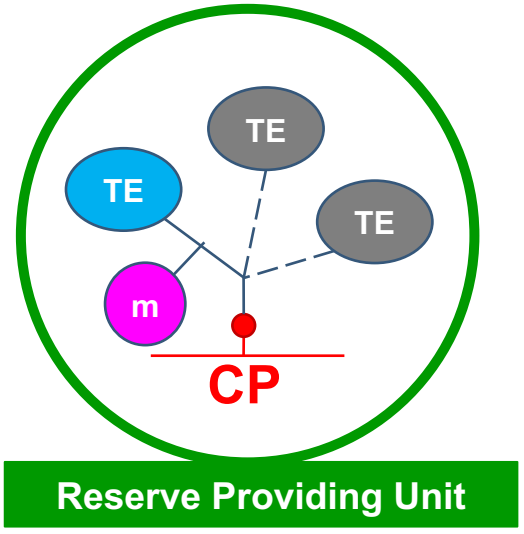
Model 1 – Grid connection point

- The measurement point is at the grid connection point. Superimposed power injection of other independent assets behind the same grid connection point has to be considered.



Model 2 –Technical Entity

- The measurement point is directly at the technical entity (TE). Superimposed power injection of other independent assets behind the same grid connection point does not influence the determination of FCR.

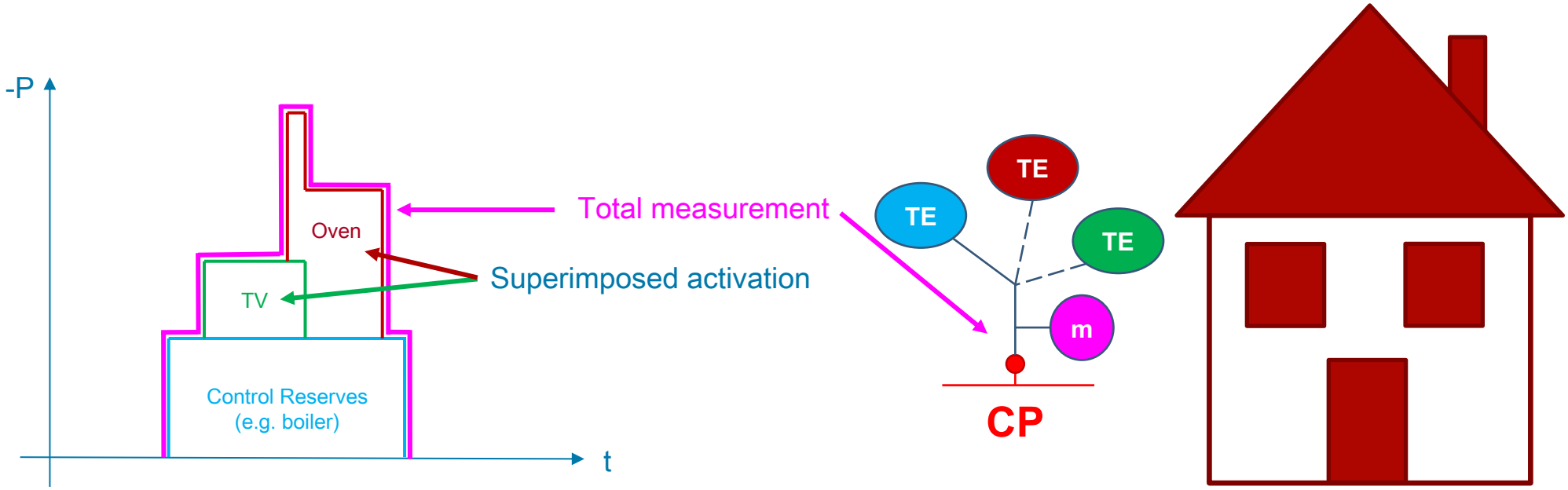


m - Measurement

TE - is the FCR providing TE

Power Measurement Location

Technical example for superimposed power injection

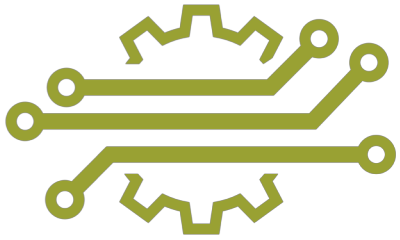


Superimposed power injection needs to be considered for clear verification of activation.

Power Measurement Location

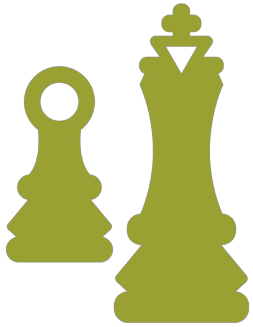
Evaluation

- Both models can be valid to determine an activation of FCR, depending on the boundary conditions (e.g. superimposed power injection behind a connection point).
- Therefore, the TSO is responsible to check individually, which model can be used to determine an activation of FCR.

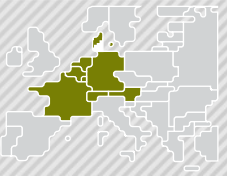


Impact on level playing field

- There is a level playing field when all TSOs use both models depending on the boundary condition and a clear verification as basis.
- It would have an impact if one TSO strictly sticks to one of this model and excludes the other one, although there is no technical reason.
- For example, if one TSO exclusively asks for one of the models, the BSP may have to install additional power measuring devices, which means additional costs.



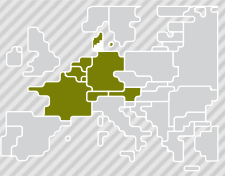
Power Measurement Location



Conclusions

- The overall requirement for the power measurement point is the possibility of a clear verification of availability and delivery of FCR.
- The BSP shall be able to choose from the following power measurement concepts with the precondition of clear verification of availability and delivery of FCR and without legal constraints:
  - The measurement point is directly at the technical entity (TE).
  - The measurement point is at the grid connection point.
- The clear verification has to be demonstrated by BSPs and is subject to TSO approval. TSOs declining a proposed power measurement concept shall clearly state the reasons to the BSP.

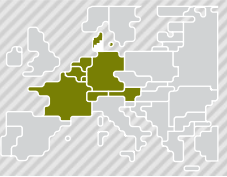
Power Measurement Location



National implications

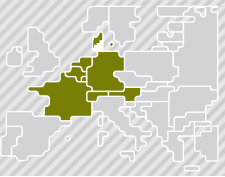
Country	Current situation	Implication
AT	• Power measurement at TE	• The corresponding concept for power measurement at the connection point will be added to the prequalification process.
BE	• Power measurement at TE or connection point	• None.
CH	• Power measurement at TE, when connected to the distribution grid. • Power measurement at TE or connection point for units, when connected to the transmission grid.	• The corresponding concept for power measurement at the connection point will be added to the prequalification process for TE connected to the distribution grid.
DE	• Power measurement at TE or connection point	• None.
DK	• Power measurement at TE or connection point	• None.
FR	• Power measurement at grid connection point	• The corresponding concept for power measurement at the TE will be added to the prequalification process.
NL	• Power measurement at TE or connection point	• None.

Power Measurement Location



Questions?

Agenda



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4	**Harmonization – Part 2** • Backup requirements • Monitoring • Penalties • Additional properties on FCR	Georgios Giannopoulos	13:30 – 15:00 **Coffee** 15:30 – 16:30
5	**Closure** • Next steps for the harmonization • Closure	Markus Riegler	16:30 – 17:00

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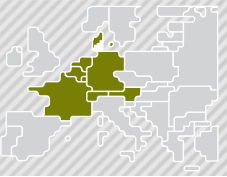

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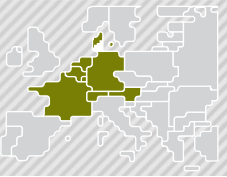
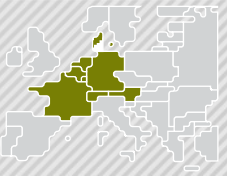


4. Harmonization – Part 2

Back-up requirements



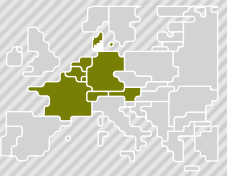
Back-up concept: Transfer of capacity obligation, within own BSP pool or via national transfer to other BSP

- BSPs are responsible to find a back-up in case of missing FCR volume.
- It is up to the BSP to find a counterparty to transfer its obligations.
- Transfer of capacity obligation provides the choice for a BSP to transfer its obligations contracted in the auction within its own BSP pool or to another BSP in the same country.

Argumentation for this back-up concept:

- The obligation is kept on BSPs side and gives the BSPs the option to find a replacement in case of outage.
- A market based approach.
- Reduces entry barriers for small players – the BSP is not obliged to secure additional volume as back-up.

Back-up requirements



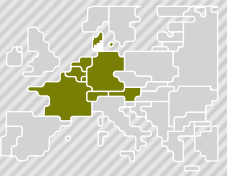
Conditions for this back-up concept:

- The BSPs need to find their own back-up in case of an outage to aim continuous availability.
- When the BSP makes a transfer, the TSO needs to know.
- The TSO does not need to see the contracts between the different BSPs in advance.
- In case of an outage, and the BSP transfers the obligation to another BSP, the TSO needs to know about it ex-ante.
- In case of an outage, and the BSP not able to transfer the obligation to another plant in his own pool, nor to another BSP, the TSO can decide to initiate an emergency process. However, this is a rare case with absolutely no capacity available for FCR.

Changes per country

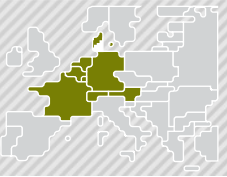
- Germany: In the future it will be allowed to transfer to another BSP within Germany.
- Austria: In the future there is no more ‘N-1’ back-up requirement.
- Other countries: No changes.

Back-up requirements



Questions?

Monitoring



Why do we need monitoring?

- FCR is an important reserve that ensures the stability of the power system.
- FCR providers shall guarantee the continuous availability of FCR.
- The responsibility for delivery lies with BSPs, but the **TSO needs to be ensured about the proper functioning of the service.**

Legal obligations

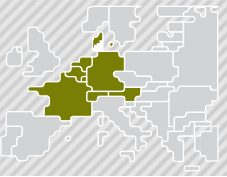
- According SOGL 156.1, “TSO shall ensure the availability of at least its FCR obligations”.
- According SOGL 154.8, “each reserve connecting TSO shall monitor its contribution to the FCP…”.

Challenges

- **Monitoring has become more complex** due to high amount of decentralized resources connected to distribution grid.
- Despite this, the TSOs should perform monitoring and define penalties in **non discriminatory way towards the different technologies and BSPs**.
- **New monitoring needs have appeared due to resources with Limited Energy Reservoir.**

Monitoring is needed by the TSO in order to have a clear view on the performance of contracted FCR and provide the necessary incentives for BSPs to fulfil their obligations.

Monitoring



Which types of monitoring exist?

Remark: Energy monitoring is more relevant for assets with limited energy reservoir while power monitoring is for all assets.

	Availability	Activation
Power	▪ **Check if a BSP can provide the full capacity he is contracted for.** ▪ Possibility (not responsibility) for TSO to inform a BSP if he identifies a problem (in some cases).	Check if a BSP has properly delivered the service.
Energy	▪ **Check if a BSP always has enough energy in his reservoir** to sustain an alert case* (e.g. a BSP could use the reservoir for energy arbitrage or other services). ▪ Possibility (not responsibility) for TSO to inform a BSP if he identifies a problem (in some cases).	

* The duration is linked to the ongoing work of Cost Benefit Analysis on resources with Limited Energy Reservoirs.

Monitoring

Description of possible monitoring methods for availability

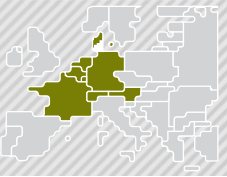
Power availability

Monitoring method	Description	Timing	Data required
Random tests	TSO requests BSP to perform a **predefined test at a random moment** (test duration of few minutes).	The test is launched real time but the data can be processed ex post.	Online / offline
Reserve band	The **TSO monitors if a BSP has reserved enough band** for FCR compared to its operational limits.	Real time and Ex post	Online / offline

Energy availability

Monitoring method	Description	Timing	Data required
Random tests	TSO requests BSP to perform a **predefined test at a random moment** (test duration of several minutes).	The test is launched real time but the data can be processed ex post.	Online / offline
Energy in the reservoir	**TSOs monitor the energy of the state of charge** (SOC) for limited energy resources.	Real time and ex post	Online / offline

Monitoring



Description of monitoring method for activation (similar for power and energy).

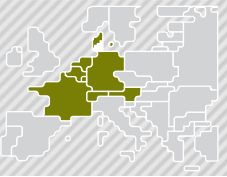
- The differences between the two methods for activation monitoring should not influence the BSPs but only the TSO processes.
- As a result, it is not perceived as necessary that TSOs change their current processes.
- We propose to **develop two scenarios** (continuous and discontinuous) that combine monitoring of activation and the equivalent penalties.

Monitoring method	Description	Timing	Data required
Discontinuous	Only a sample of the data is used to monitor the BSP performance.	Real time / Ex post	Offline / online
Continuous	The performance of BSPs is monitored during the whole contracting period.	Real time / Ex post	Offline / online

List of required data

- Unit/group on/off
- Active power
- Droop / Allocated FCR
- Setpoint
- Frequency

Penalties

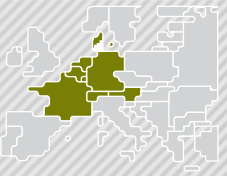


Why do we need penalties?

To incentivize BSPs to deliver FCR

- Penalties should be higher than the BSP revenues from FCR.
- Penalties should be high enough to encourage BSPs to find a backup.
- Penalties should be high enough to encourage BSPs to find a market based solution before TSO takes control (higher than the actions of TSO).

Penalties



Different types

1. Contractual

- BSPs could lose their qualification in case the service they deliver does not meet certain quality criteria.
- Alternatively, the prequalified volume of BSPs can be reduced by the TSO if they frequently under-deliver.

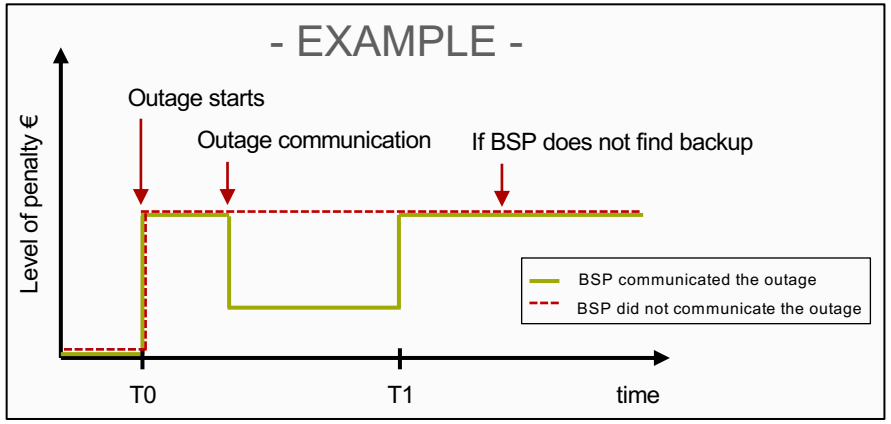
2. Financial

- BSPs need to pay penalties to TSO in case the quality of the service is not as expected.

Penalties

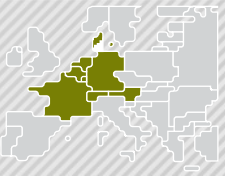
Penalty regimes can be different based on the following

1. Monitoring of availability or activation
2. Monitoring of power or energy
3. Continuous or discontinuous monitoring (discontinuous can be random or with fixed rule)
    - **Occasional monitoring requires higher penalties** than continuous monitoring to sufficiently incentivize BSPs because the chance of spotting a miss-delivery is smaller
4. The communication of the outage (see example)
    - BSPs should be incentivized to communicate forced outages in time
5. The duration of the outage (see example)
    - BSPs should be incentivized to find a replacement for FCR



This could result in a large variety of penalty regimes

Monitoring and penalties



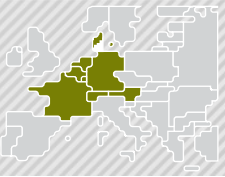
Summary

- Monitoring and penalties are highly interrelated topics which are to be considered jointly when harmonizing.
- Due to the variety of current practices this is a complex task
- TSO aim to find a balance between benefits and harmonization effort and thus, we want to involve stakeholders early in the process.

Questions

- Which type of monitoring (i.e. availability, activation) do you consider most important for harmonization (e.g. for level playing field for BSPs)? What benefits do you see, and what issues?
- How fast can you detect an outage and inform the TSO about it?
- Would you have a preference for a continuous monitoring/low penalty regime or for a discontinuous/high penalty regime? Why?
- What issues do you foresee in case of online / offline data provision?
    - Can these issues be overcome? How can TSOs support you on this?

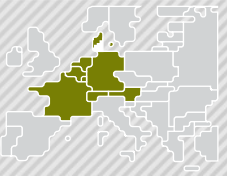
Additional properties on FCR



Update on relevant discussions on ENTSO-E (for information)

- An ENTSOE working group is currently developing a proposal for additional properties of FCR.
- This will be part of the synchronous area operational agreement according to SOGL article 154.2.
- There has been a public consultation on 13 April 2018.
- The work is ongoing in order to find an acceptable solution among the TSOs.
- The aspects that are discussed by this team are the following:
  - Frequency measurements for FCR (centralized/decentralized)
  - Requirements to stay connected to the grid during frequency deviations higher than 200mHz
  - Requirements on limited energy reservoir assets providing FCR

Harmonization – Part 2



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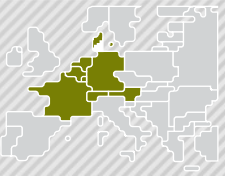

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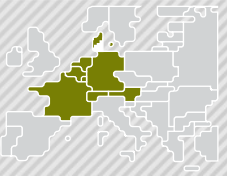
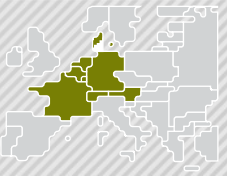
Next steps for the harmonization



TSOs want to make sure that the market evolves in a way that provides equal access to BSPs and creates a level playing field.

- We will include the input from this workshop in our discussions on harmonization aspects.
- Any decision by TSOs will be publicly consulted first before formally submitted to NRAs.
- TSOs aim to prepare such a consultation by the end of 2019/early 2020.
- An implementation timeline will be included in the consultation.

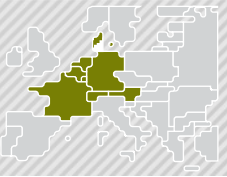
Questions



Final questions?

5. Closure

Closure



Thank you!