BGM Partner Meeting 2022

Zürich Airport and Online Meeting, 15th November 2022

Presentations are available on Swissgrid website:
https://www.swissgrid.ch/en/home/customers/topics/bgm.html#operational-documents

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Agenda

09:30	Welcome address	Bastian Schwark
09:45	Outlook Winter 2022/23: Swissgrid preparatory activities	Julius Schwachheim
10:05	Outlook Winter 2022/23: Availability of XB capacities	Constanze Mende
10:25	Outlook Winter 2022/23: Enhanced Balance Group Monitoring	Marc Rüede
10:40	Outlook Winter 2022/23: Hydropower Reserve	Roger Wiget
11:15	Power break	
11:30	Adequacy Study of SFOE	Astrid Sontag, SFOE
11:55	Swiss balance group management and operational incidents	Marco Lenzin
12:15	Lunch break	
13:10	Breakout Sessions: • Details planned week ahead analysis and production forecasts • Impact of weather forecast on BRPs imbalances • Possible improvements of monthly and yearly auction products	 Thomas Hauri / Marc Rüede Tobias Bisping Theodoros Sevdas
14:00	EPEX Spot market developments	Davide Orifici, EPEX Spot
14:20	EFET insights from their international perspective on power markets	Federico Barbieri, EFET
14:35	International balancing co-operations and impact on imbalance price	Dimitrios Nousios
14:55	Feedback and questions	Bastian Schwark

Your contact persons for balance group management at Swissgrid

Bastian Schwark
Head of Market Operations

Marc Rüede
Head of Capacity Allocation & Market Systems

Julius Schwachheim
Head of Capacity & Congestion Management

Thomas Hauri
Responsible for BGM Partner Meeting

Markus Imhof
Head of Balancing & Scheduling

Marco Lenzin
Responsible for BGM Expert Group

New E-Mail Addresses

Day ahead schedule management

Phone +41 58 580 30 77

scheduling@swissgrid.ch

Intraday schedule management

Phone +41 58 580 29 11

scheduling.intraday@swissgrid.ch

Balance group registration

balancegroup@swissgrid.ch

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Outlook Winter 2022/2023: Swissgrid preparatory activities

Julius Schwachheim
Head of Capacity and Congestion Management

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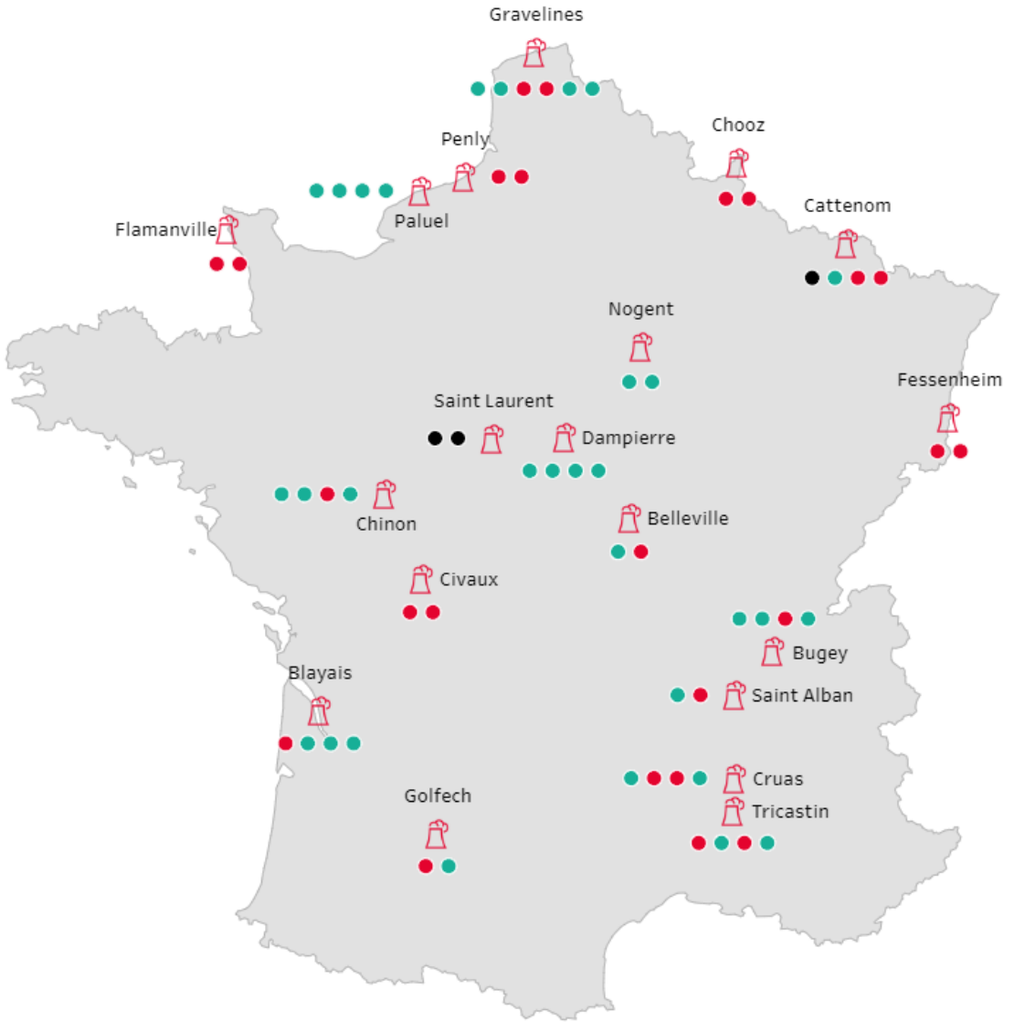
The France nuclear power plants availability increased during the past weeks. The outlook is good, yet not certain. Swiss nuclear plants are fully available.

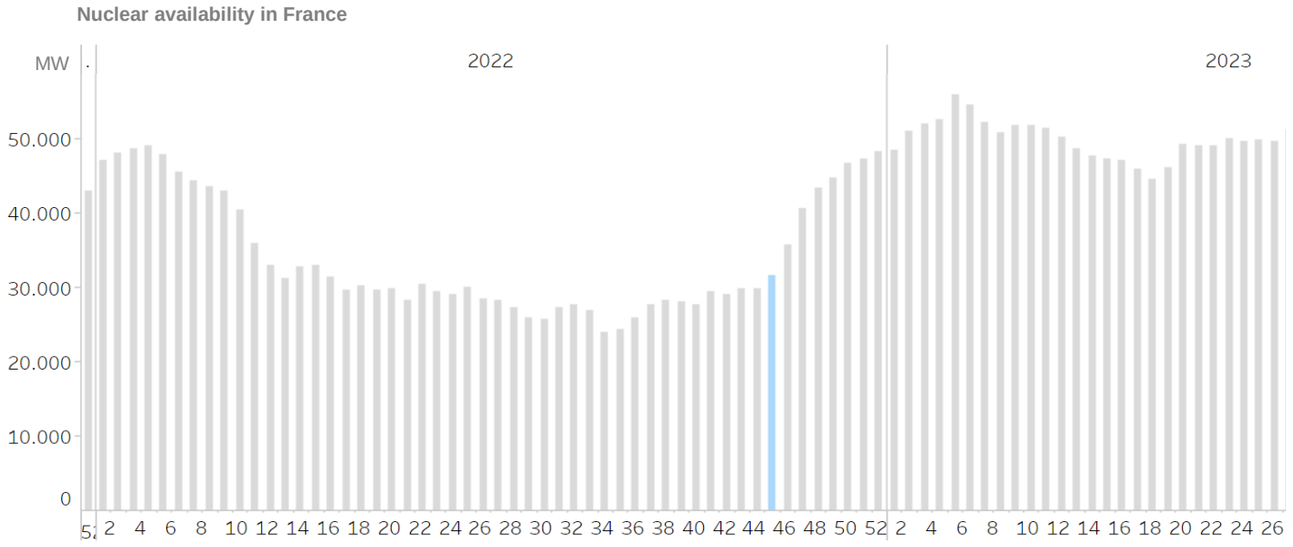


France

- weeks 44 Ø production: **28.591 MW**
- Ø availability this week: **35.176 MW**
- Ø availability week 1 – 17 2023 above previous year

Switzerland

- all nuclears fully in service throughout the winter



All data taken from https://transparency.entsoe.eu/; as of 11.11.2023 6:33

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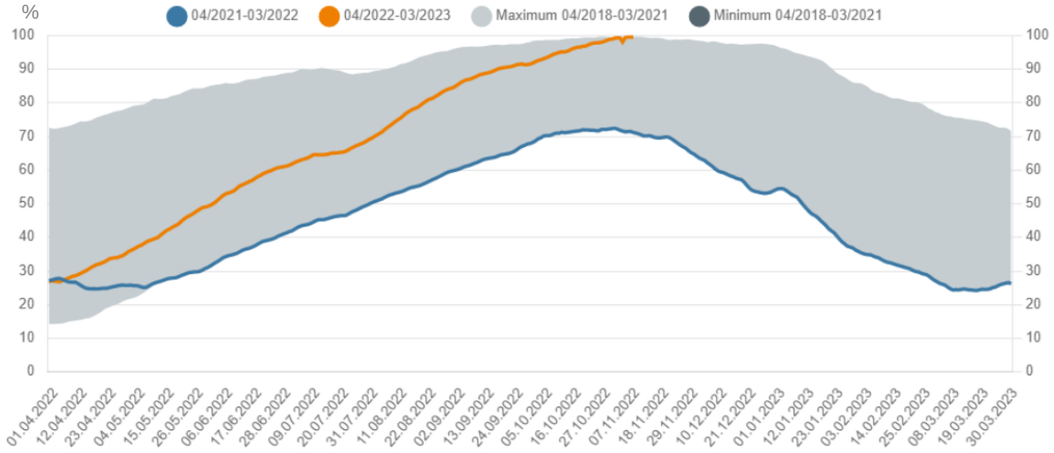
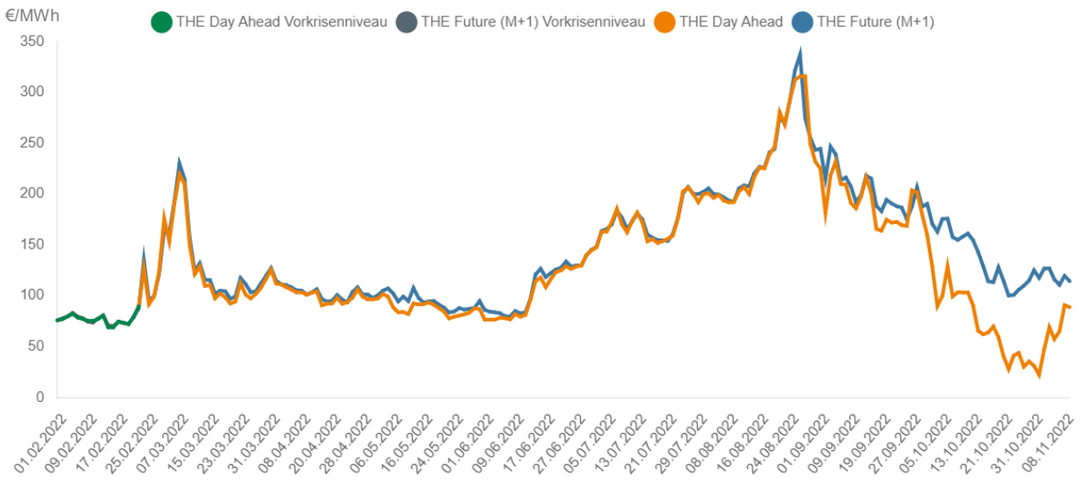
Gas storage levels went up from the minimum of recent years to maximum in Germany due to different factors

Gas storage levels Germany



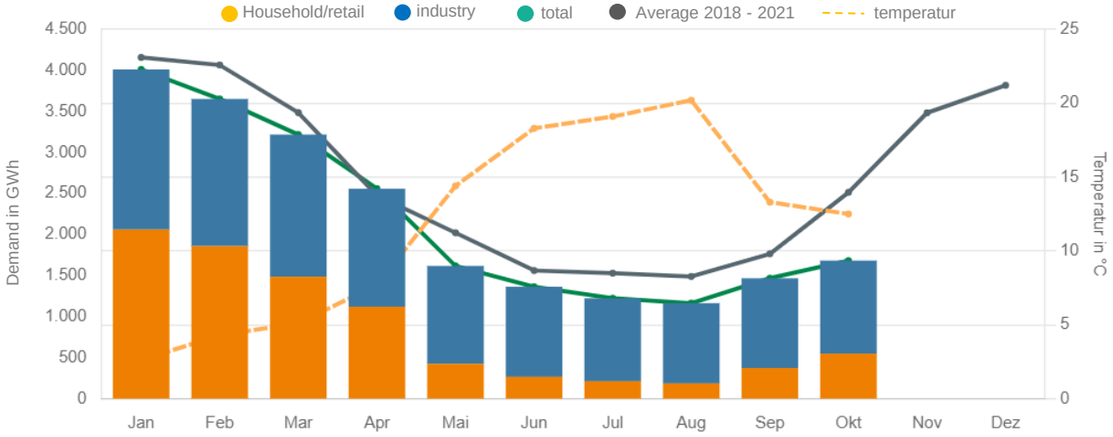
Source: AGSI+, Bundesnetzagentur
10.11.2022, 07:47

Gas prices



Source: EEX, Bundesnetzagentur
10.11.2022, 07:46

Gas demand Germany



Source: Trading Hub Europe (THE), Bundesnetzagentur,
3.11.2023, 06:46

- Last year marked recent historically low storage levels
- Storage could be filled up to almost 100% in October
- Demand is comparatively low both in industry and retail
- Weather is surely a factor

… will gas be available for electricity generation?

Interesting note:
Dutch TTF gas spot prices went negative on the 24th of October

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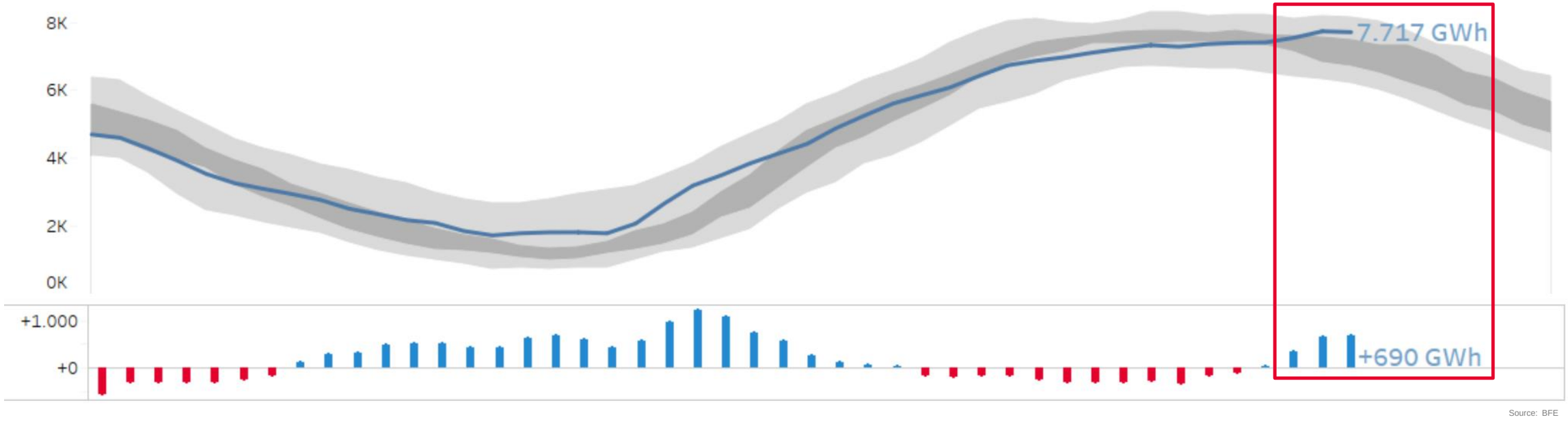
The Swiss hydro reservoirs are at a very good level, despite the comparatively extremely high prices in this pre-winter period

Switzerland	Graubuenden	Wallis	Tessin	Other parts
7.717 GWh **87%**	**1.795 GWh** **91%**	**3.628 GWh** **89%**	**867 GWh** **70%**	**1.427 GWh** **89%**
Deviation from median + 7pp ¦ +690 GWh	Deviation from median + 8pp ¦ +156 GWh	Deviation from median + 6pp ¦ +391 GWh	Deviation from median - 10pp ¦ -112 GWh	Deviation from median + 8pp ¦ +142 GWh



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Swissgrid is preparing the winter under all possible scenarios. Ensuring the grid security and stability has the highest priority

Swissgrid has activated an internal Taskforce «Winter 2022/2023»:

- permanently follows and analyses the current situation
- plans possible measures based on the different future scenarios
- informs and is in exchange with authorities
- executes tasks for the authorities

Securing:

1) Ability to control frequency
2) N-1-Security & import capacities
3) Voltage control

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Swissgrid is working on multiple different topics to stabilize the grid during the Winter 2022/2023 and help authorities in their decision making

- Swissgrid performed calculations for an **Adequacy** analysis «SoS CH in Winter 22/23» for the BFE
- An advanced **balance group monitoring** for this winter will be implemented
- Swissgrid did extensive calculations about the maximum possible imports to Switzerland (**net import capacity**)
- Together with RTE, for the autumn period, the **maximum NTC** FR → CH was **increased** by 500 MW; already previous year the maximum NTC for winter was increased by the same amount

- Swissgrid is currently preparing the «emergency operation» of the 220kV lines **Bickigen – Chippis** and **Bassecourt – Mühleberg** according to the new regulation (footnote)
- The work to connect the new **gas turbines** in Birr to the transmission grid are at full speed

- The necessary **reserve power** (tertiary and secondary) is being procured early in advance; in maximum five auctions all necessary power will be procured
- The **hydro water reserve** auction could successfully be concluded and is available for emergency situations from the 1st of December on
- Swissgrid prepares its roles as the «supply direction» in emergency case 4 of **OSTRAL**

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Outlook Winter 2022/2023: Availability of XB capacities

Constanze Mende
Principal Market Operations

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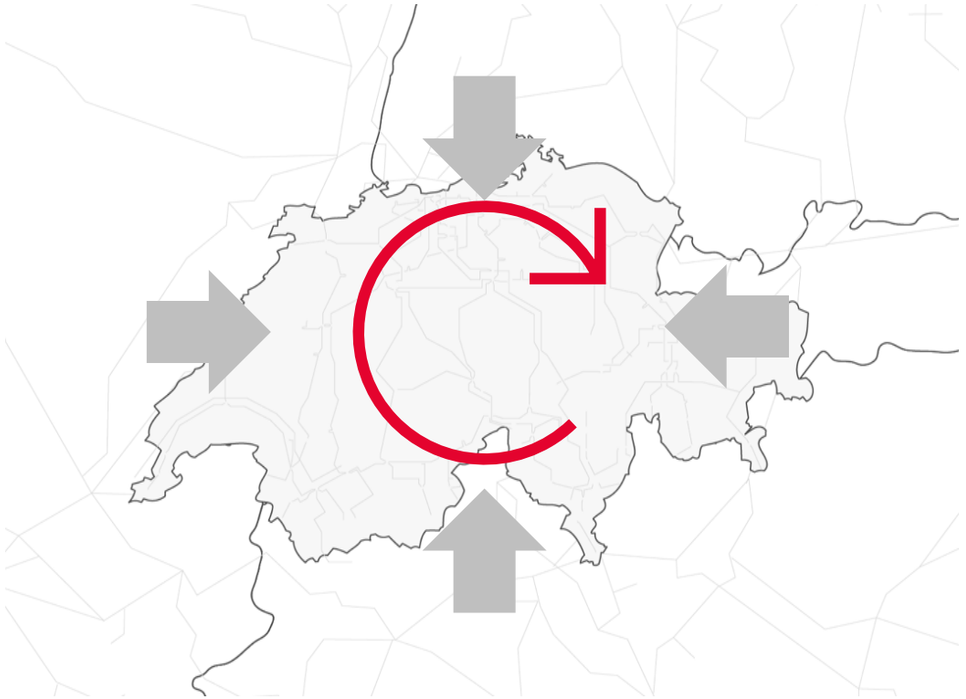
The net import capacity described the technical import capability of Switzerland



Import NTC values

net import capacity

- The net import capacity is the **integral over all CH-borders**
- For its calculation, certain assumptions must be taken, e.g. for this winter it is assumed that the energy imported by Switzerland is **produced in Germany***. This energy **must not be transferred via the direct path** (DE → CH), but can also come via DE → FR → CH or DE → AT → CH.
- **Italy's import** was considered as a **parameter** in the calculation
- The net import capacity is **unequal to the sum of all import NTC values**. The NTC values are determined for specific scenarios separately per border.
- It is the maximum possible import of Switzerland for various scenarios.

*Considering import from France it is not reasonable for the up-coming winter

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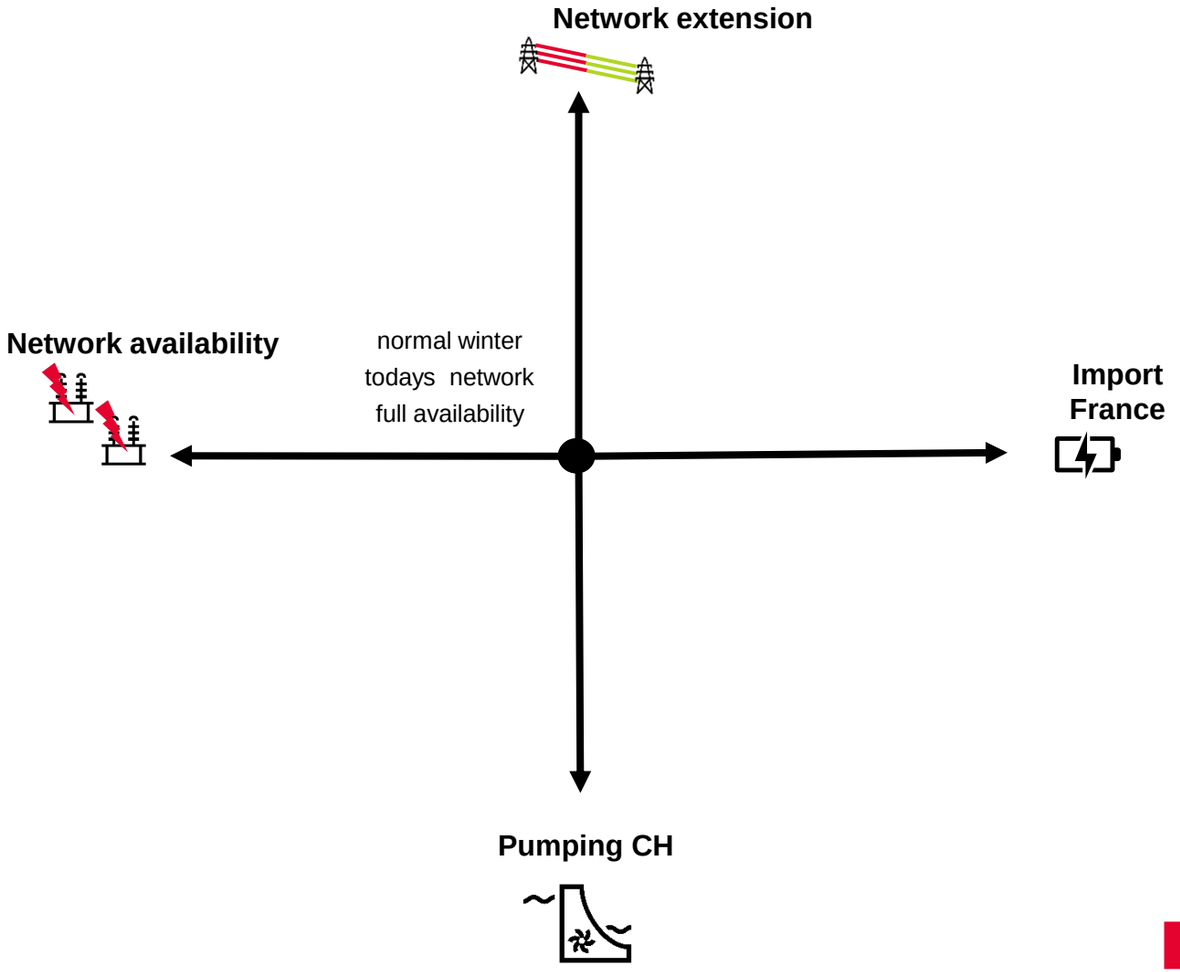
The net import capacity of Switzerland is determind by various parameters. Several scenarios were considered.



Impact on net import capacity

Grid refurbishment:
- None
- Only 380kV Bassecourt – Mühleberg
- Only 380kV Bickigen – Chippis
- both

Import need FR:
- Normal
- High
- Very high

Pumping CH:
- Moderate pumping operation
- Max pumping of all pumps

Grid availability:
- Full availability
- Loss of 1 northern PST
- Loss of 2 northern PSTs

The combination of all of these parameters lead to **72 scenarios**, that were considered, for which the net import capacity has been calculated for several levels of the Italian import → **in total 576 calculations**

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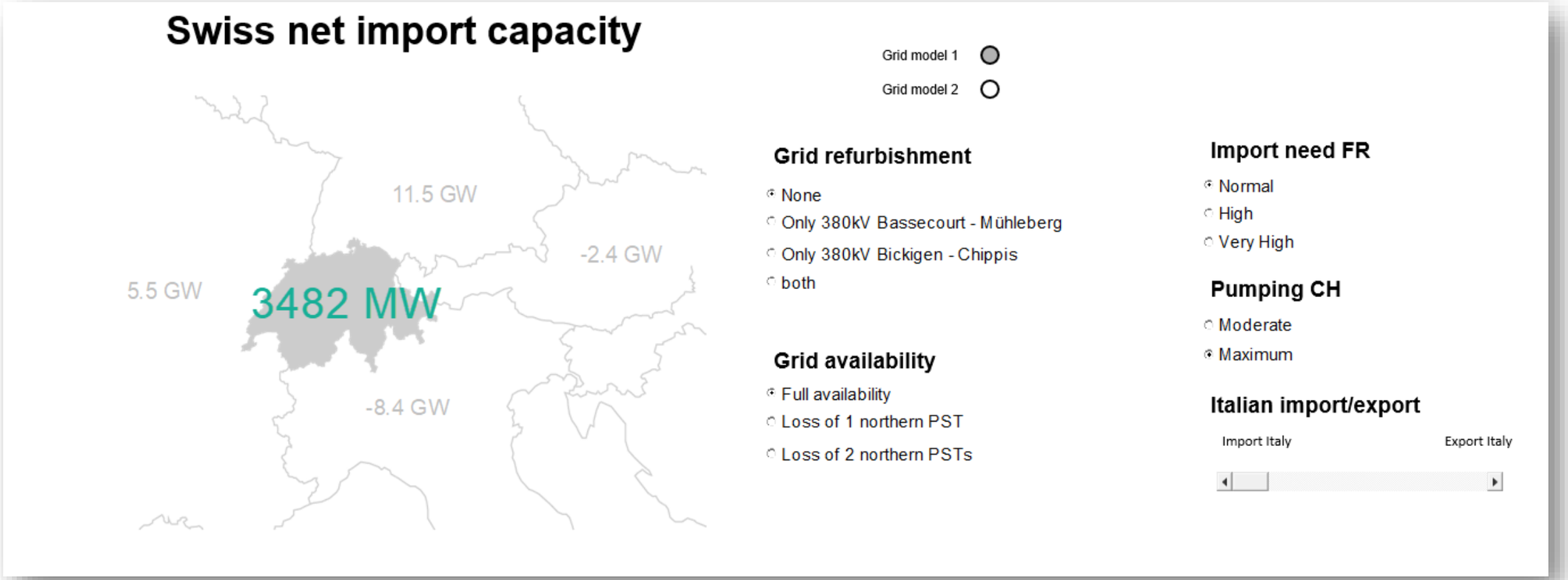
We made a tool available on our website with which the net import capacity can be displayed for all the combination of parameters



→ Published on page «Planning for winter» (swissgrid.ch) → Downloads → Tool «Net import capacity of Switzerland»

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Outlook Winter 2022/2023: Enhanced Balance Group Monitoring

Marc Rüede
Head of Capacity Allocation & Market Systems

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BGM responsibilities according to Balance Group Contract and General Balance Group Regulations

- The **contact office must be available** and ready to take action as long as the balance group has open intraday positions.
- In the event of a fault in or **failure of** its means of **communication**, the **BGM must notify Swissgrid** (or vice versa) without delay to agree on alternative means of communication and/or coordinate subsequent action.

- The BGM is responsible vis-à-vis Swissgrid for ensuring the **zero power balance position** of the power balance of its balance group.
- As soon as a BGM can foresee it **cannot ensure the zero power balance** of its balance group, the BGM is obliged to **notify Swissgrid immediately** and if possible 14 day ahead.

- In the event of load, pump and/or production **failures of more than 100 MW** in its balance group, the BGM undertakes to **notify Swissgrid** without delay.
- The BGM must also **inform Swissgrid** as quickly as possible from what time and in what quantity the BGM procures reserve energy and **when the outage ends**.
- The BGM is responsible for making sure that **imbalances** in its balance group as a result of a load, pump and/or production failure are **compensated within two hours**.

Finally, in view of the great challenges of the future, we would like to point out to you that it is of utmost importance to check whether your trading positions are closed in advance in the case of known risks or whether there is a possibility to close them in time.

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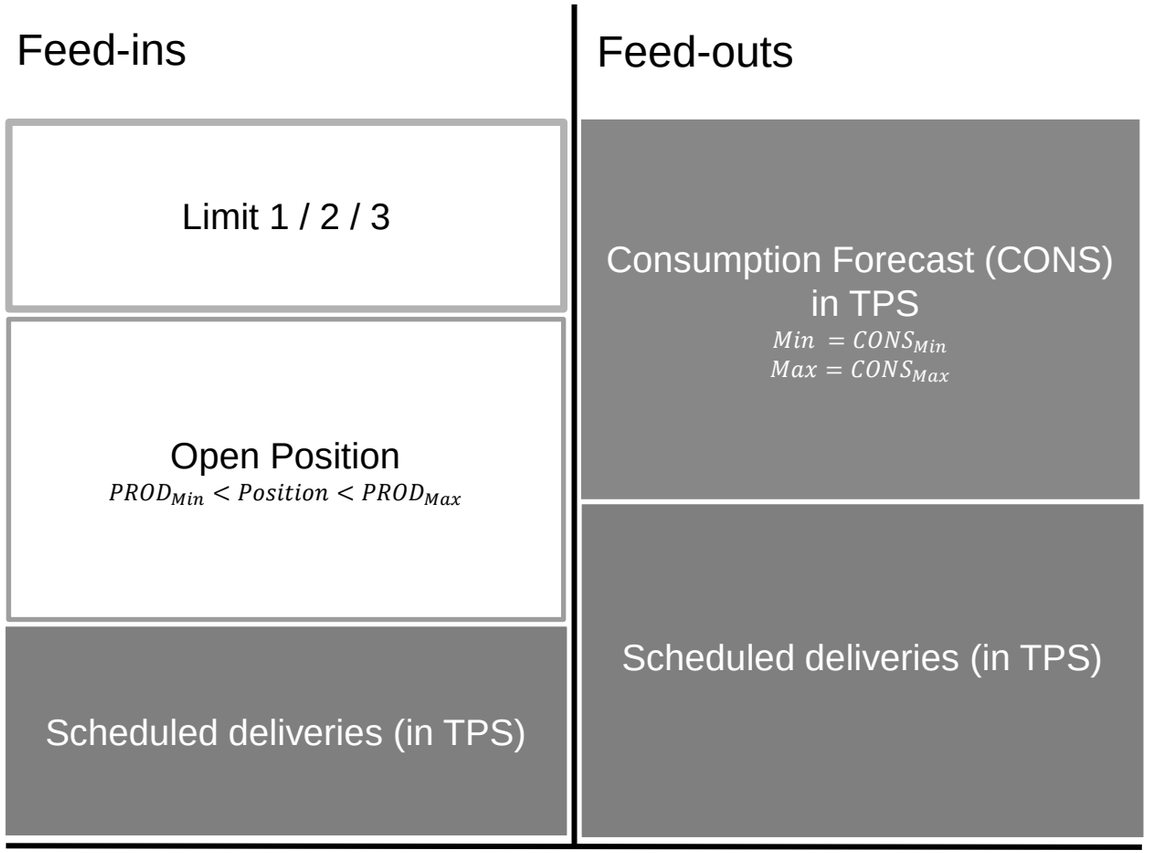
Current Balance Group Monitoring for Balance Groups with metering points



$$CONS_{min} \leq CONS \leq CONS_{max}$$

VALIDATION

DATA

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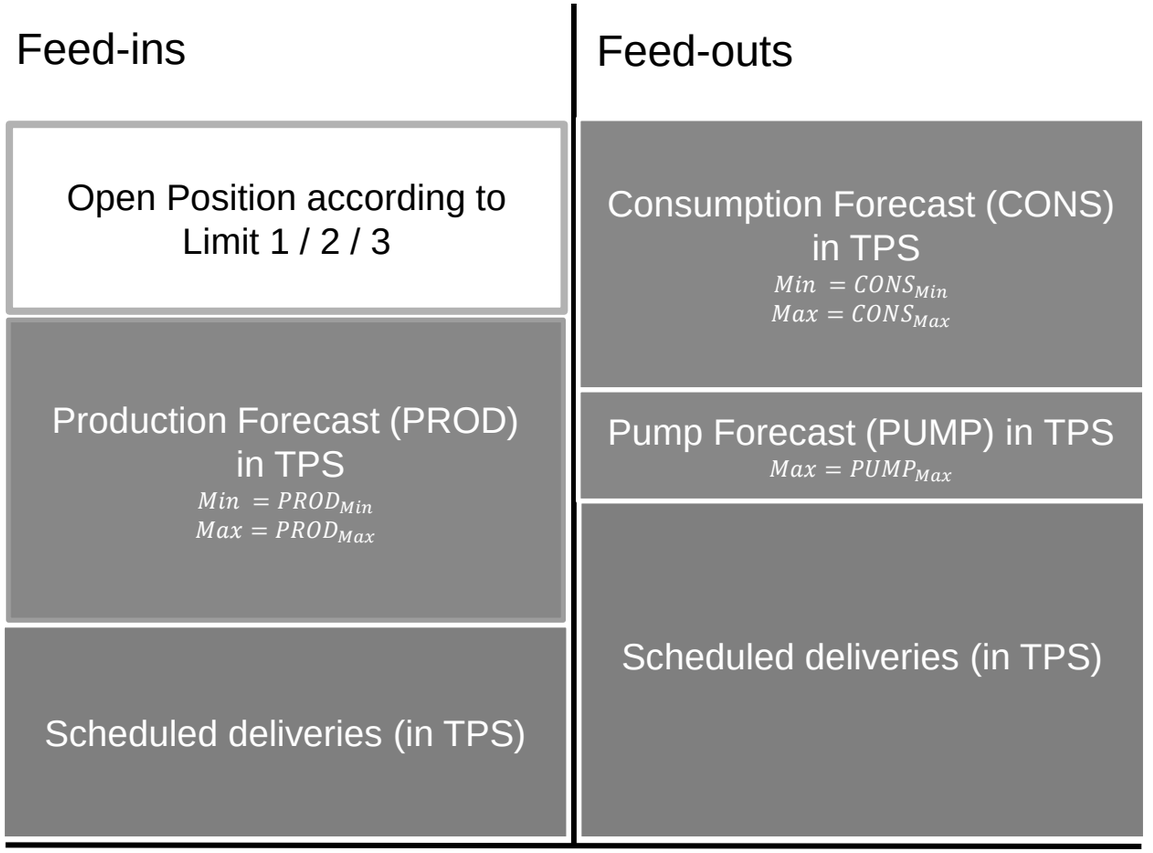
Extended Balance Group Monitoring for Balance Groups with metering points

$PROD_{min} \leq PROD - PUMP \leq PROD_{max}$



$CONS_{min} \leq CONS \leq CONS_{max}$

VALIDATION

DATA

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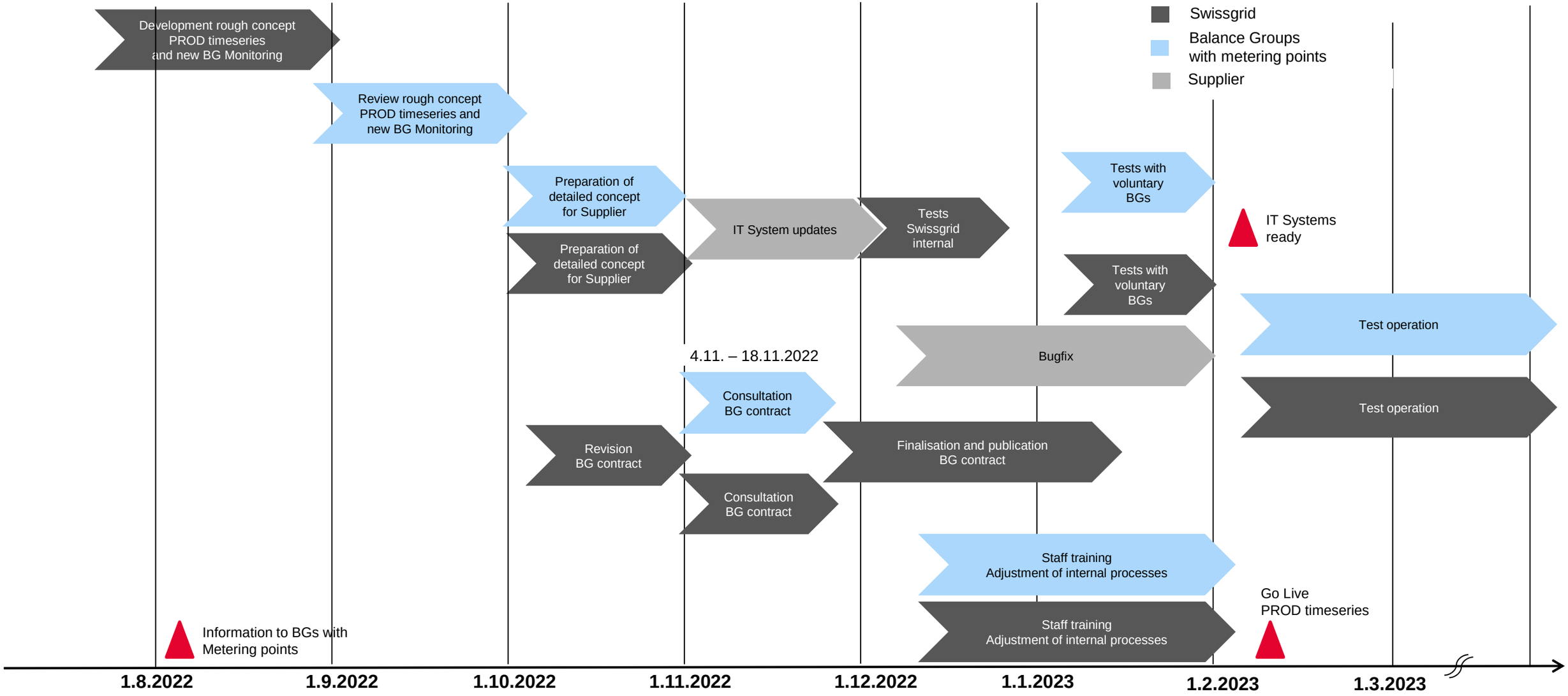
Project plan for extended BG Monitoring for BGs with metering points



Status of additional provisions for the coming winter

Use of load profile aggregate and input profile total from «Organisation for Supply of Electricity in Extraordinary Situations» (OSTRAL) in d+1 for Balance Group Monitoring

- Current status: Permission of approx. 250 DSOs are still missing
- Current data quality: in d+1 about 65%, in d+2 much better

Establishment of d-7 and d-14 Balance Group Monitoring

- Currently on hold

Revision of collateral concept for Balance Groups

- External consulting company commissioned
- First results by end of this year expected

Introduction of Hydro Reserve

- More information on the next slides

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Outlook Winter 2022/2023: Hydropower Reserve

Roger Wiget
Senior Specialist Product Development

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About Hydropower Reserves

- On 17th February 2022, the Federal Council decided that Switzerland should have an energy reserve
- The hydropower reserve (HPR) should come into force as early as winter 2022/2023
- DETEC commissioned the SFOE to draw up a corresponding ordinance

«Ordinance on the establishment of a hydropower reserve» (WResV)

In effect since 1st October 2022

ElCom's Benchmarks

In effect since 3rd October 2022

- Swissgrid is assigned the role of Supplier of Reserve (SOR)
- Auction for provision was at 25th October 2022

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3 key facts for balance groups

Is the participation compulsory?

No, as long as you do not send demand to Swissgrid.

Is the participation beneficial?

Yes, the cost for Hydropower Reserve are much cheaper than for imbalance energy.

Do I have a guarantee for delivery of my demand?

No, since it is an energy provision only, the available power may not satisfy all demand at certain time.

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Prices

Prices for demands are defined by ElCom

HPR Price = SPOT Price + Surcharge

Surcharge = (Balance Energy Price Short – SPOT Price)*0.25

Example:

SPOT Price	4 000 EUR/MWh
Balance Energy Price Short	12 000 EUR/MWh
Surcharge	2 000 EUR/MWh
HPR Price	**6 000 EUR/MWh**

Demand	20 MW
Cost with HPR	**120 000 EUR**
Cost with balancing energy	240 000 EUR

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Hydropower Reserve Provision Auction – 25 October 2022

- Energy only auction
- Provision period is 1st December 2022 to 15th May 2023
- 14 storage power plant operators participated in the tender
- 672 GWh were offered in total

- Total energy volume of 400 GWh was procured – decision by ElCom
  - Maximum 75 GWh per hydropower complex

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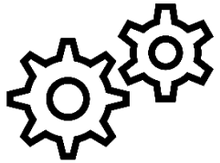
Hydropower Reserve Process – Overview

D-1 11:30 – SPOT Market
The offers on the day-ahead market cannot cover the demand -> the market does not close

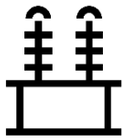
D-1 18:30 – Demand request
The balance groups report their demand for every 15 minutes for the next day

D-1 – Covered Demand
The BGs receive feedback on how much of their request can be covered



D+1 and later – Post process
INS schedules are sent and invoicing is done

Triggering Event



D-1 – Provider Prompt
Providers are asked to report their available capacity for tomorrow latest by 18:30

D-1 – Send calls
Swissgrid sends the requests to the providers and receives a confirmation

D – Delivery
The confirmed energy is delivered

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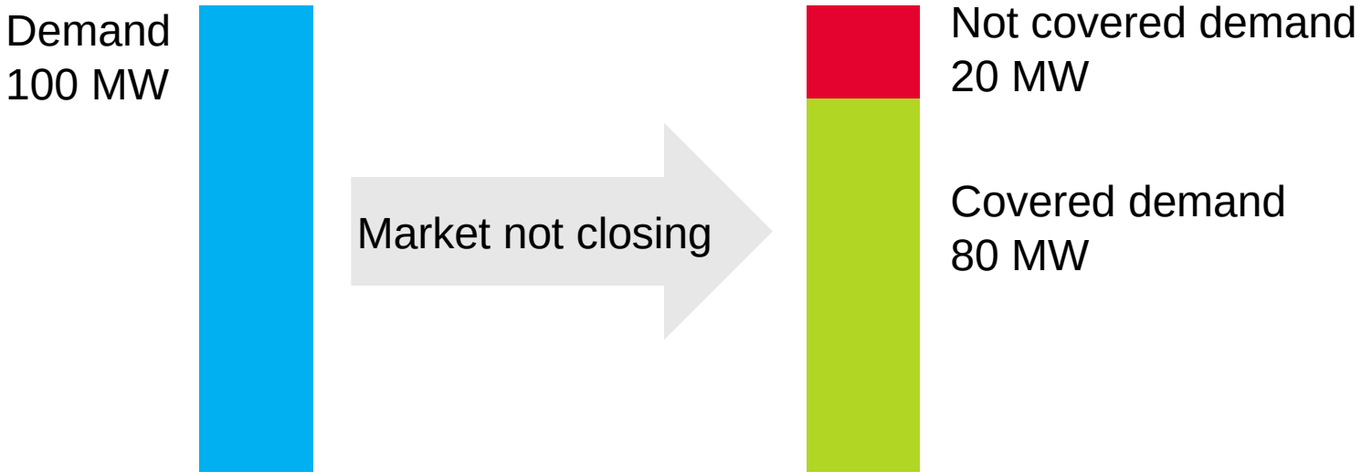
Hydropower Reserve Process for BGs

Triggering event:

EPEX SPOT Day-Ahead Auction CH does not close, even in the second round

- Responsibility of BG to determine the triggering event
- The not covered demand for each hour can requested from the HPR

Example – 1 hour



BG is allowed to request 20 MW from HPR

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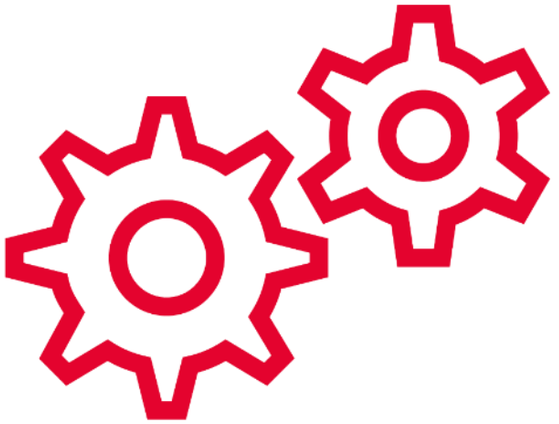
Hydropower Reserve Process for BGs

BG send demand request to Swissgrid

- Gate closing D-1 18:30, every day
- CSV-File with energy values for each quarter-hour for the next day
- Template provided by Swissgrid, changes should not be done
  - Beginning 1st December 2022 by e-mail to sor@swissgrid.ch
  - Soon afterwards replaced by upload in SDL B&E



Swissgrid checks availability of the providers

Swissgrid confirms covered demand

- CSV file with energy values for each quarter-hour for the next day
- Sent by e-mail

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Hydropower Reserve Process for BGs

Postprocess

- Swissgrid sends an INS schedule up to D+1 11:00 with the values for HPR, business type C89
- BGs are responsible to send in each TPS to Swissgrid Scheduling System new time series with business type C89

and Invoice

- Invoicing is done during the following month
- Invoice must be paid within 30 days

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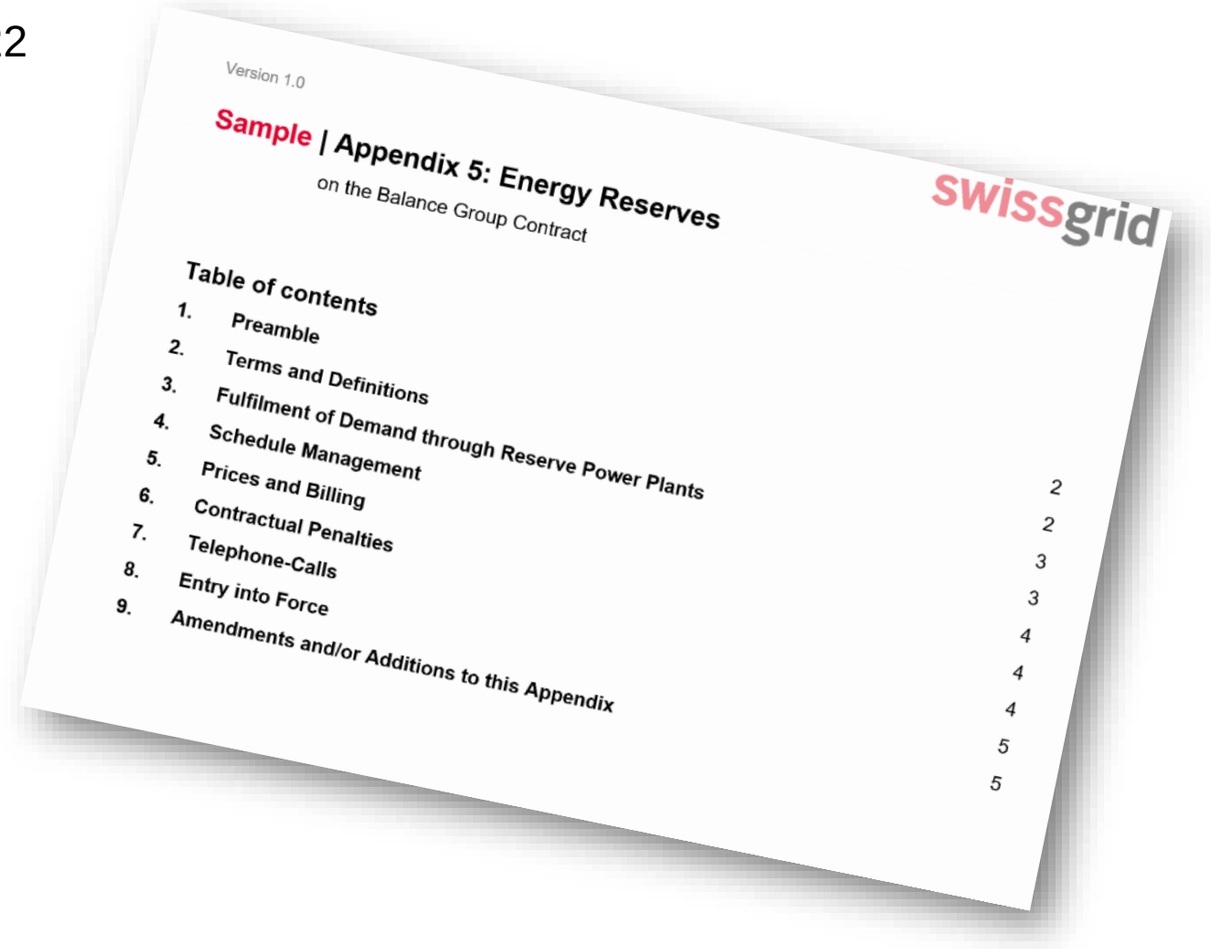
Contract

- The process is defined in new «Appendix 5 – Energy Reserves» to the Balance Group Contract
- Appendix is valid from 1st December 2022
- Consultation is ongoing until 18th November 2022



Version 1.0

Sample | Appendix 5: Energy Reserves

on the Balance Group Contract

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Status further planned energy reserves

- The hydro power reserve is based on the **«Ordinance on the establishment of a hydropower reserve» (WResV)** which is in effect since 1th October 2022.
- On 19th October 2022 a consultation on the «ordinance for winter reserves». This ordinance is an extension of the WResV and should come into effect February 2023.
- Additionally to the hydro power reserve, it foresees **an additional winter reserve of up to 1000 MW**.
- One part of the additional reserve will be **gas and oil fired backup power plant(s)** such as the new gas turbines in Birr.
- The other part of the additional reserve will be **pooling of existing emergency generators**.

- In case of an energy shortage with very high prices, it might be economically beneficial for large consumers, to not consume the energy and shut down their energy intense processes
- Depending on the energy delivery contract and the capabilities of the energy provider, **it is not always possible to use this flexibility.**
- The established **scheduling processes of pooling for tertiary reserves**, shall be opened to **sell the non-consumed energy on the energy market**.
- An appendix to the « VSE Branchendokument Anbindung von Regelpools an den Schweizer SDL-Markt» is currently under development.

Status further planned energy reserves – impact on balance groups

Reserve type	How balance groups can receive energy out of the reserve	How balance groups are affected by the delivery of the reserve
Gas power plant 	Process for balance groups to receive the energy out of the reserve is **the same as for the hydro power reserve** The order, in which the reserves will be activated, is under development by ElCom. But it **won't impact the balance groups.** Necessary changes to the balance group contracts are contained in the new **appendix 5 «Energy Reserves» valid from 1th of December.**	Power plant will be in one balance group of power plant operator. Delivery of the reserve has **no influence on other balance groups**.
Emergency generators 		Emergency generators can be located in **various balance groups, not limited to the one of the pooler** itself. Scheduling processes of **"pooling for tertiary reserves" will be used** to ensure correct scheduling in the post scheduling process. An **additional change of the balance group contracts will be needed** as these processes are currently limited to balancing energy activations.
Demand side flexibility 	Energy is sold on energy markets. No changes needed.	Scheduling processes of **"pooling for tertiary reserves" will also be opened for "energy trades".** Change of the balance group contracts will be done at the same time as for emergency generators.

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Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Bundesamt für Energie BFE
Office fédéral de l'énergie OFEN
Ufficio federale dell'energia UFE
Uffizi federal d'energia UFE

SYSTEM ADEQUACY STUDY WINTER 2022/23

SYSTEM ADEQUACY STUDY WINTER 2022/23

Reference scenario:

Input data based on data collection of the European association for the cooperation of transmission system operators (ENTSO-E) and a reduced availability of French nuclear power plants (-35%)

The simulations of this scenario show that sufficient energy produced in Switzerland and abroad is available to cover Swiss consumption. This is based on the assumptions of functioning European markets and mutual cooperation.

Scenario with limited availability of natural gas:

Limited availability of natural gas for electricity production (-15% in Europe)

Most (87%) of the ca. 2'400 simulations do not show loss of load in Switzerland. In about 8% of simulations the energy not served during the winter period exceeds the consumption of a typical winter day (ca. 170 GWh). In about 5% of simulations energy not served exceeds the consumption of about 2.5 winter days.

SYSTEM ADEQUACY STUDY WINTER 2022/23

Scenario with limited availability of nuclear power plants:

Limited availability of nuclear power plants in France (-50%) and Switzerland (-50%, Beznau 1 and Leibstadt)

In Europe, regional tight situations might arise in case of a reduction of French nuclear plant availability by 50% combined with unavailability of the Swiss nuclear power plants Leibstadt and Beznau 1. Yet energy not served in Switzerland may be avoided thanks to the availability of flexible hydro power and sufficient import capacities with neighbouring countries.

Extreme scenario:

A combination of a paneuropean limitation of natural gas and the unavailability of all Swiss nuclear power plants would significantly impact Switzerland. In such a not very probable scenario energy not served would amount on average to the consumption of about six winter days.

Conclusion: The electricity situation this winter remains tense, even if security of electricity supply is not in grave danger. The measures decided by the Federal Council (hydro reserve, strategic reserve, emergency units and energy savings) contribute to ensure electricity security of supply in winter.

Swiss balance group management and operational incidents

Marco Lenzin
Specialist Capacity Allocation & Market Systems

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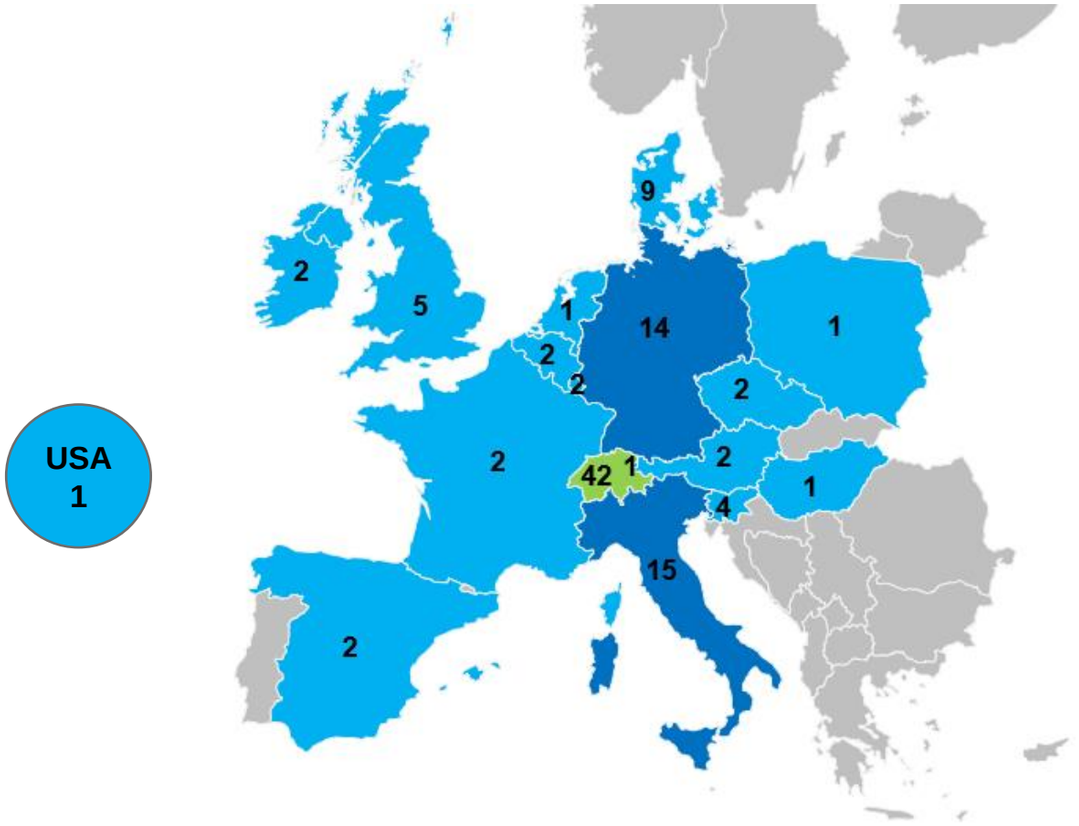
Balance Group Management
BG statistics (Status Q3 2022)

	BGs	↓	↑	Mutations
2018	104	13	6	161
2019	107	4	7	108
2020	108	5	6	101
2021	106	3	1	88
2022	109	2	5 (+5 planned)	87



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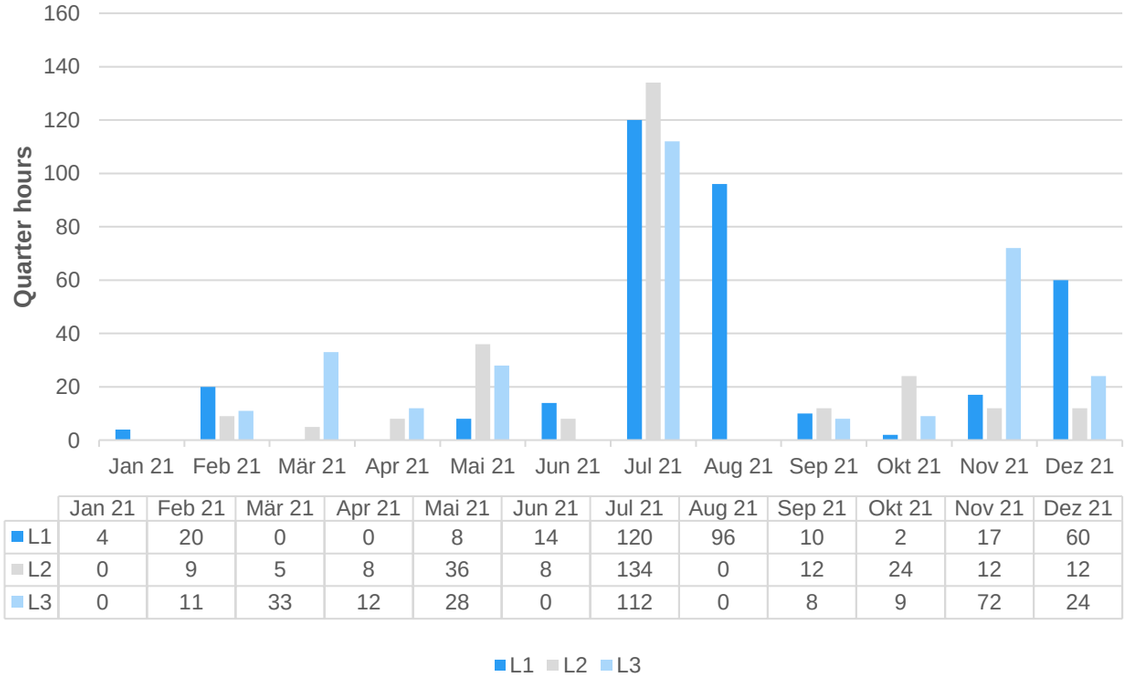
Balance Group Management

Number of limit violations in quarter hours



	Jan 21	Feb 21	Mär 21	Apr 21	Mai 21	Jun 21	Jul 21	Aug 21	Sep 21	Okt 21	Nov 21	Dez 21
L1	4	20	0	0	8	14	120	96	10	2	17	60
L2	0	9	5	8	36	8	134	0	12	24	12	12
L3	0	11	33	12	28	0	112	0	8	9	72	24

Facts

- Request for a written statement: **10 BGs**
- Meeting with Swissgrid: **3 BGs**
- Intraday suspension: **0 BG**
- Penalties in case of repeated L3 violations:
  3 BGs → 39 755 EUR
- Number of limit violations in quarter hours: 920 (24 BGs)

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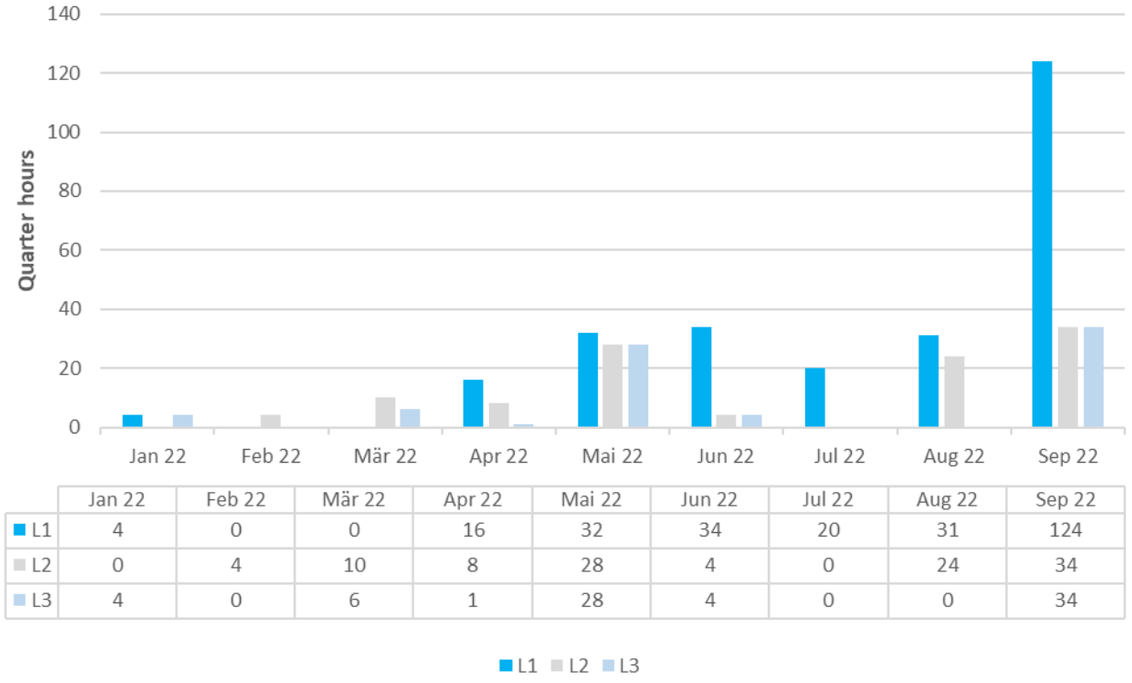
Balance Group Management

Number of limit violations in quarter hours



	Jan 22	Feb 22	Mär 22	Apr 22	Mai 22	Jun 22	Jul 22	Aug 22	Sep 22
L1	4	0	0	16	32	34	20	31	124
L2	0	4	10	8	28	4	0	24	34
L3	4	0	6	1	28	4	0	0	34

Facts

- Request for a written statement: **6 BGs**
- Meeting with Swissgrid: **4 BGs**
- Intraday suspension: **1 BG**
- Penalties in case of repeated L3 violations:
  4 BGs → 239 240.43 EUR
- Number of limit violations in quarter hours: 450 (18 BGs)

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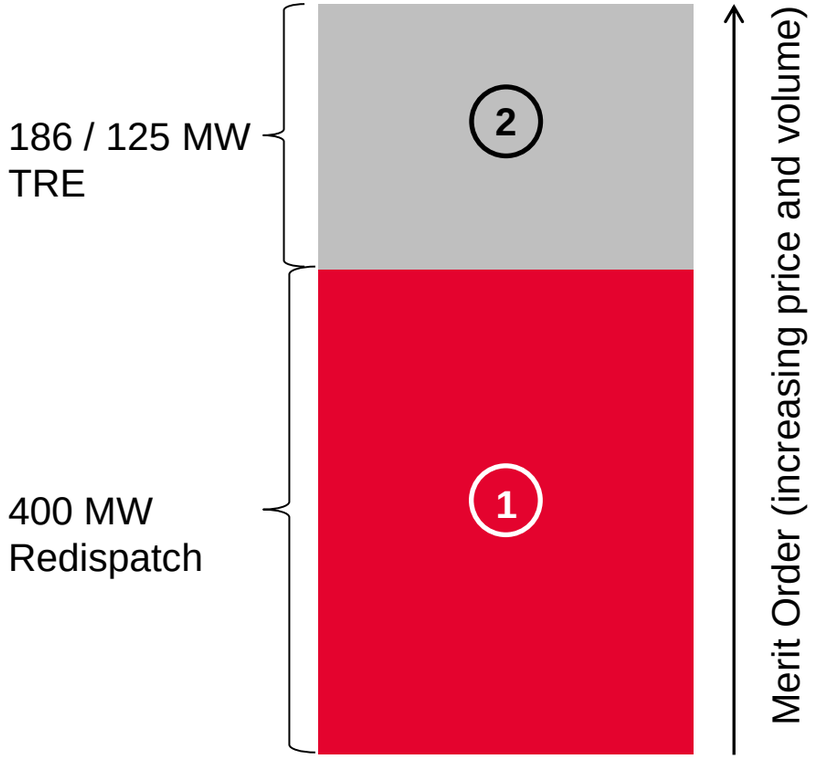
Calculation of Imbalance Price in case of simultaneous Redispatch
Case Studies 03.08.2022 & 04.08.2022

Case 03.08.2022

- The following demands were given for the hour (22:00 - 23:00):
- Redispatch 18:00 - 23:00 400 MW (requester APG)
- TRE demand 22:00 - 23:00 186 MW
- Balancing energy price for the hour: 6332.10 EUR/MWh

Case 04.08.2022

- The following demands were given for the hour (19:30 - 20:00):
- Redispatch 19:00 - 20:00 400 MW (requester APG)
- TRE demand 19:30 - 20:00 125 MW
- Balancing energy price for the third and fourth quarter hour: 4025.30 EUR/MWh



In both cases, the request from the redispatch was before the TRE demand request. This means that the cheaper bids were allocated for redispatch and the expensive bids were included in the balancing energy price.

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Elimination of lead time for Switzerland internal trades

- Swissgrid will eliminate lead times for internal trades as of February 2023 (the exact date will be communicated in December 2022)
- This would mean that the balance groups can adjust their Switzerland - internal time series with the B-Type A02 in future until the end of Post Scheduling D+2 16:00. A confirmation will continue to be sent when the time series are matched

What will stay…	What will change…
CNFs continue to be sent if the matching is successful	The previously known **GCT/COT of 15min** (lead time) for the nomination of internal transactions is no longer valid.
ANOs are sent in case of mismatches or missing time series	No **ACK with RC A57 (TS level)** «Deadline limit exceeded»
ACKs on incoming TPS of the BG are still sent	
BGs can correct differences within the PS until D+2 16:00	

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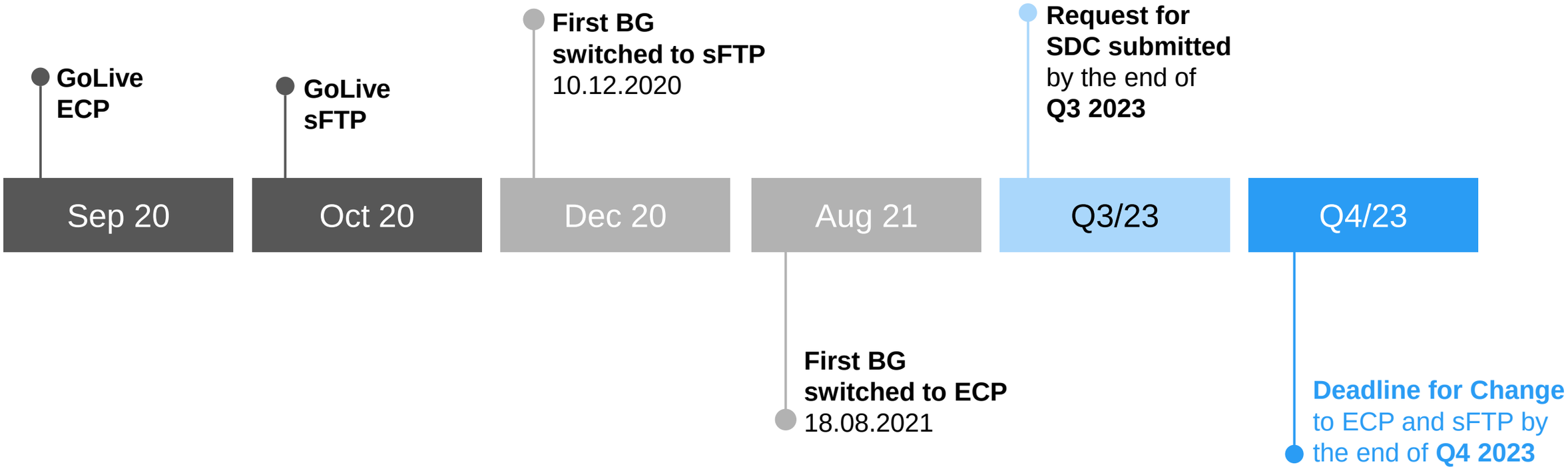
Roadmap Secure Data Communication (ECP/sFTP)



Glossary

ECP	Energy Communication Platform
sFTP	Secure File Transfer Protocol
SDC	Secure Data Communication

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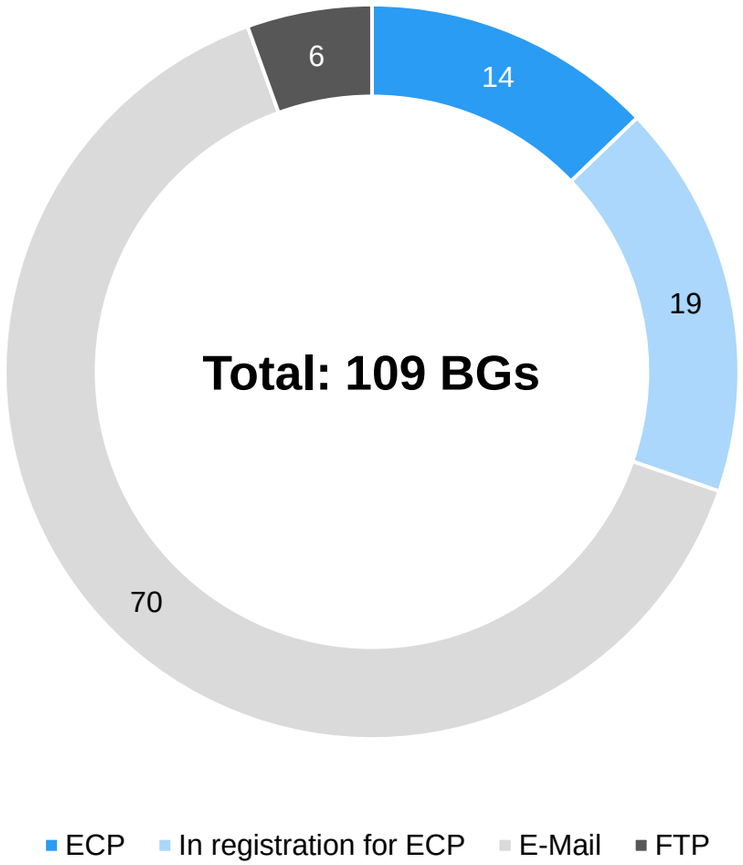
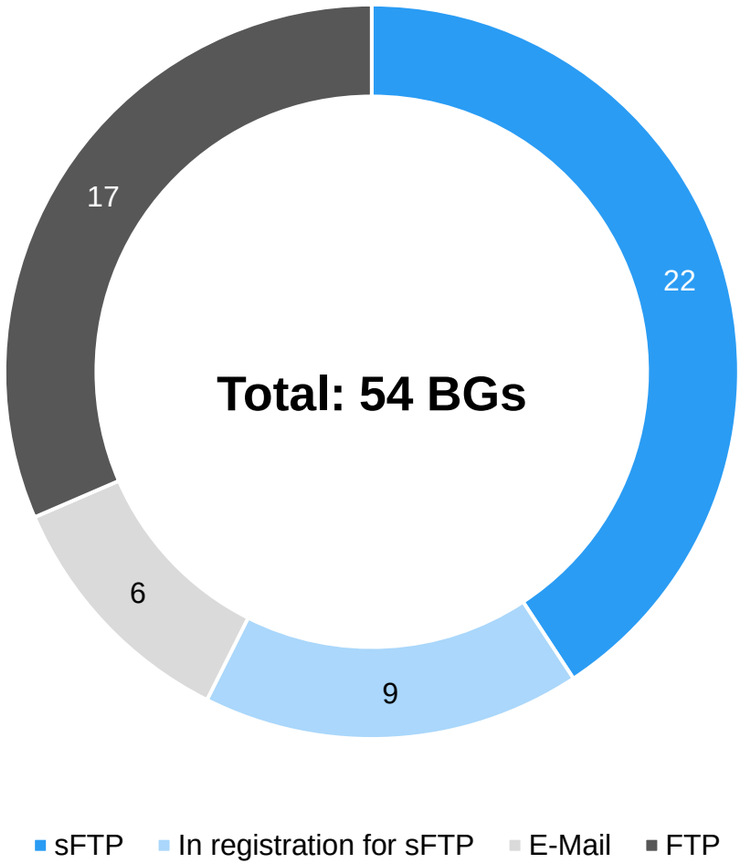
Connection Balance Group (Status Q3 2022)

Standard connection



Backup connection



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BG Customer Portal & Mail Addresses

BG Customer Portal

- Access to the BG customer portal is possible for a second person
- Creation of a Knowledge page instructions and information
- Contact Swissgrid directly from the customer portal

Mail Addresses

- New mail address: balancegroup@swissgrid.ch
- New mail address: scheduling@swissgrid.ch
- New mail address: scheduling.intraday@swissgrid.ch
- Old mail addresses will be replaced: (auction.office@chtso.ch & scheduling.day-ahead.fo@chtso.ch and scheduling.intra-day.fo@chtso.ch)

We are in parallel operation and inform you in case of a mail to the wrong mail address.

Breakout Sessions

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Details planned week ahead analysis and production forecast

Marc Rüede
Head of Capacity Allocation & Market Systems

Thomas Hauri
Principal Market Operations

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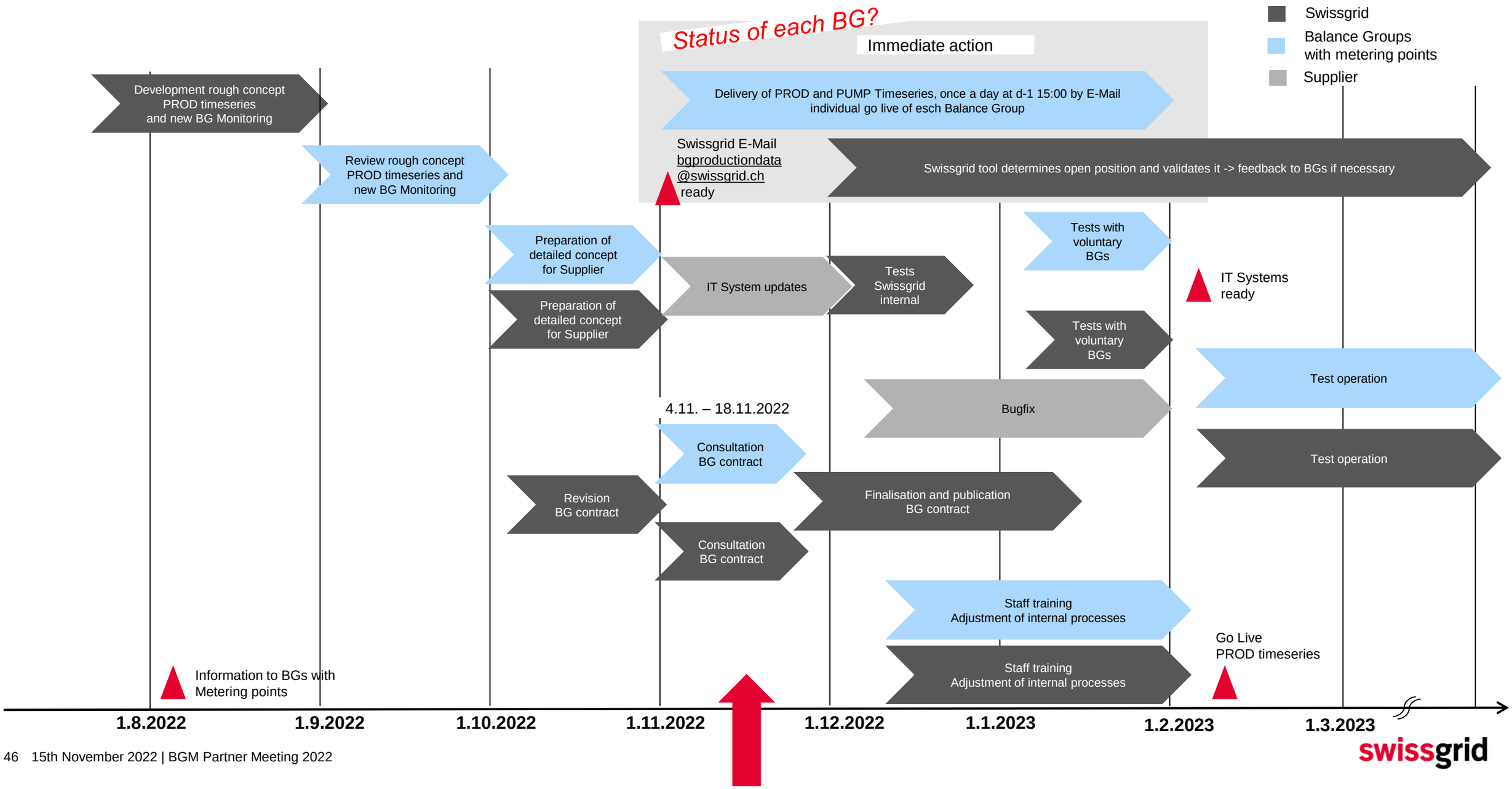
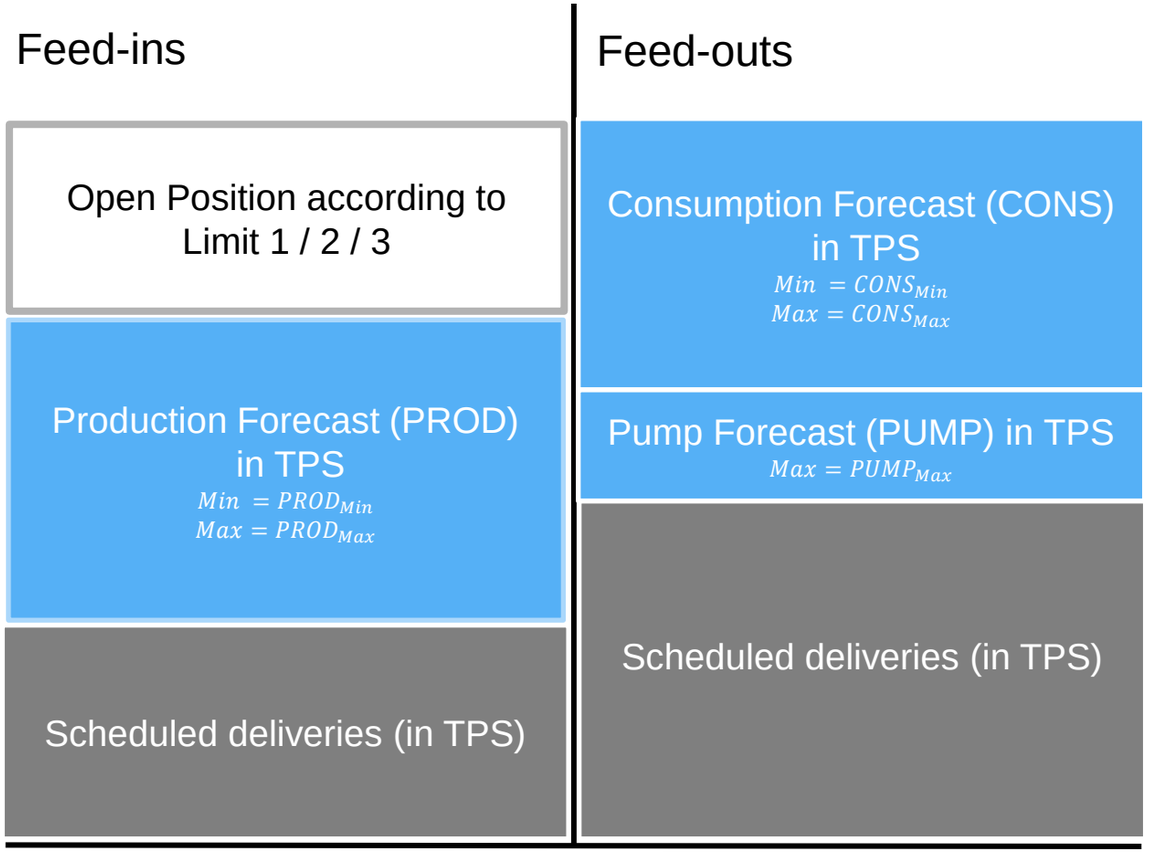
Project plan for extended BG Monitoring for BGs with metering points



Extended Balance Group Monitoring for Balance Groups with metering points

$$PROD_{min} \leq PROD - PUMP \leq PROD_{max}$$

Status of each BG regarding delivery of individual timeseries, not netted?



$$CONS_{min} \leq CONS \leq CONS_{max}$$

VALIDATION

DATA

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Status of additional provisions for the coming winter

Establishment of d-7 and d-14 Balance Group Monitoring

- Currently on hold
- Would d-4 Balance Group Monitoring be more reasonable?
- Would d-4 sending of nominations of monthly / yearly capacities and CONS/PROD/PUMP be useful?

Revision of collateral concept for Balance Groups

- External consulting company commissioned, first results by end of this year expected
- Amount of bank guarantees of BGs with metering points will be verified in December 22
- Limitation of the open position sets: decrease threshold values or increase bank guarantees?

Limit 1: DA bis D-2h [MW] (long/short)	Limit 2: D-2h bis COT ID [MW] (long/short	Limite : COT ID und PS [MW] (long/short)	Collateral [EUR]
10	10	10	100 000
25	10	10	200 000
50	25	10	400 000
100	25	10	550 000
200	50	10	850 000
300	75	10	1 100 000
400	100	10	1 400 000

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Impact of weather forecast on BRPs imbalances

Tobias Bisping
Specialist System Operations

swissgrid

Impact of weather forecast on BRPs imbalances

Person & Education

Name	Tobias Bisping
Age	23
Origin	NRW, Germany
Studies	Energy Engineering
University	RWTH, Aachen
Current State	Thesis student at Balancing & Scheduling

Contact

Mail	tobias.bisping@swissgrid.ch
Tel.	+41 58 580 23 74
Mobile	+41 79 328 25 93

Master's Thesis

Analysis of the influence of increasing photovoltaic power on the balance of the Swiss control area

- Quantification of correlations: PV-forecast-error ↔ CH-imbalance
- Discussion with BRPs about the origin of the correlations

Today & further on

- Extrapolation of the correlations to scheduled PV-installations of 2040
- Identification of measures to decrease the correlations
- Determination of most suitable measures for SG and BRPs

Scheduled end: April 2023

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Impact of weather forecast on BRPs imbalances

1 Introduction

2 Example 1: Weather change from day to day (27.02.2021)

3 Example 2: Weather change within a day (07.01.2022)

4 Control reserves in Switzerland

5 Conclusion and discussion

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Photovoltaic in Switzerland

	Installed capacity
2021	≈ 3.7 [GWp] [1]
Goal for 2040	≈ 24 [GWp] [2]

∗ 6.5

Treatment of photovoltaic power

- Non-adjustable production of PV-power
- Weather-forecasts to calculate power flows
  - Inaccurate forecasts lead to imbalances
  - Activation of balancing reserves necessary
  - High amounts of balancing prices to be paid

▶ **Photovoltaic is capable of destabilizing the transmission grid of Switzerland.**

▶ **Problems rise with increasing installed capacity.**

[1] BFE: Schweizer Statistik der erneuerbaren Energien
[2] BFE: Szenariorahmen 2030/2040 für die Stromnetzplanung

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Observations and Assumptions

Observation:

- Correlation between weather changes and the system imbalance of Switzerland
- Foundation:
  - Qualitative observations in realtime
  - Quantitative data analysis of bygone days

First assumption:

- Inaccurate forecasts of PV-production
- Few success for intraday balancing

► **To be discussed:**
PV-forecasts based on the production of any past day instead of weather expectations?

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Database

System imbalance of Switzerland

- Indirect measurements based on realtime reserve applications
- Inaccurate indicator of the imbalance (± 10%)

Imbalance of the balance groups

- Calculations based on production- and load-profiles
- Accurate and agreed between SG and BRPs

Production of photovoltaic power

- Simulations based on a model of the installed PV-capacity in Switzerland
- Obtained via an external data-provider

- **Unit:** [MW]
- **Resolution:** [15 min]

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Impact of weather forecast on BRPs imbalances

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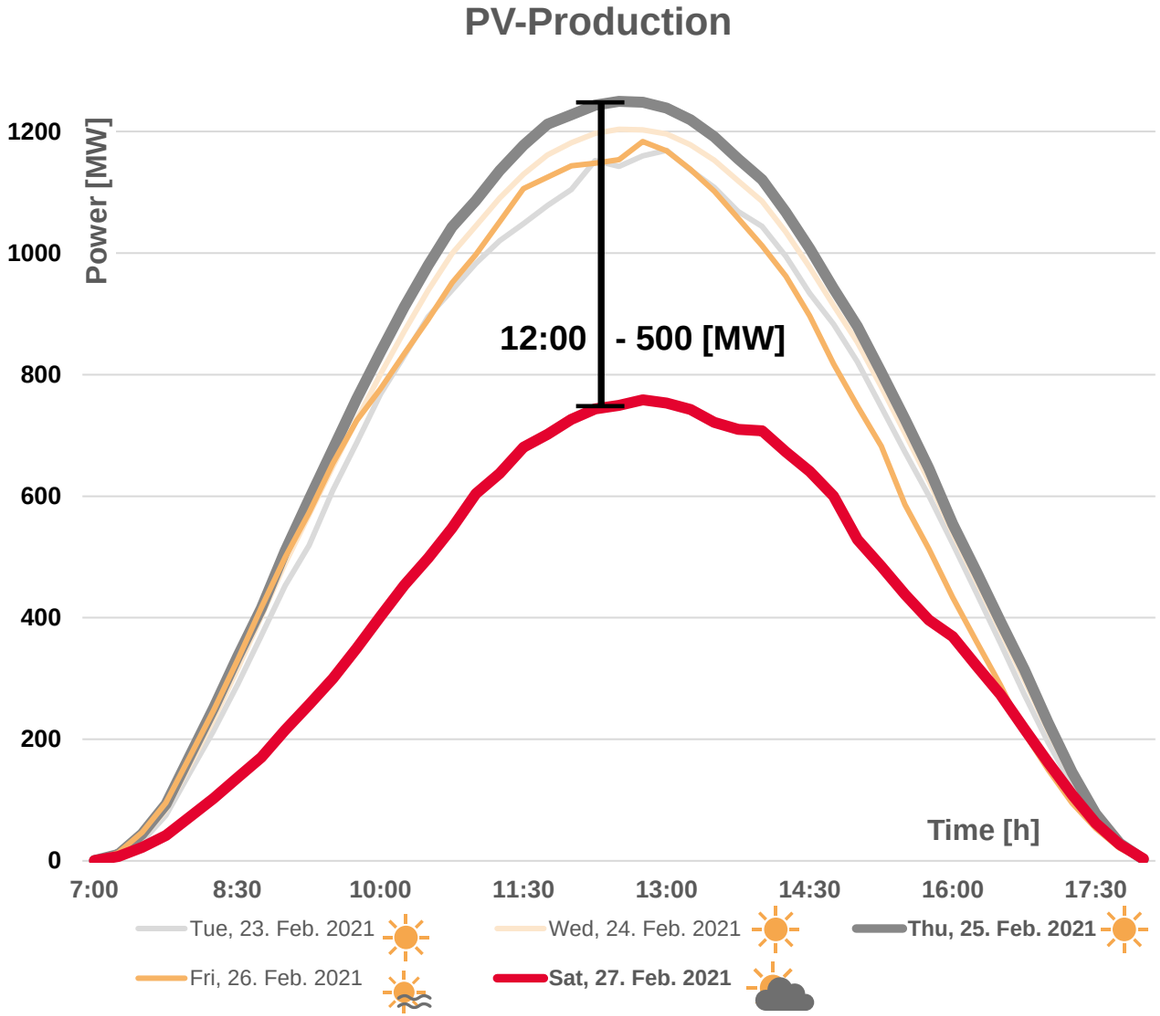
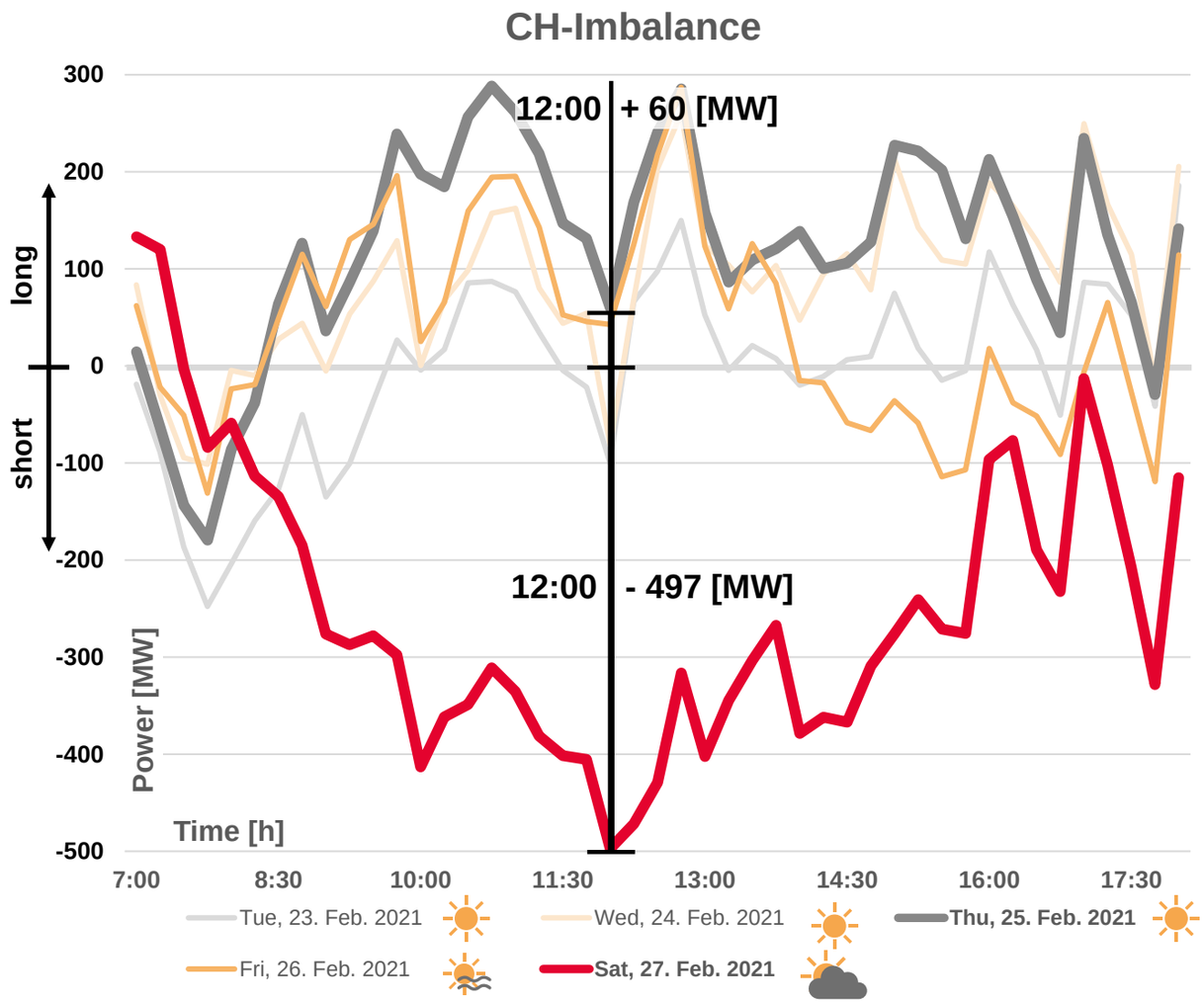
CH-imbalance follows the drop of PV-production from 26th to 27th February 2021





Installed PV-capacity: approx. **3000 [MWp]**

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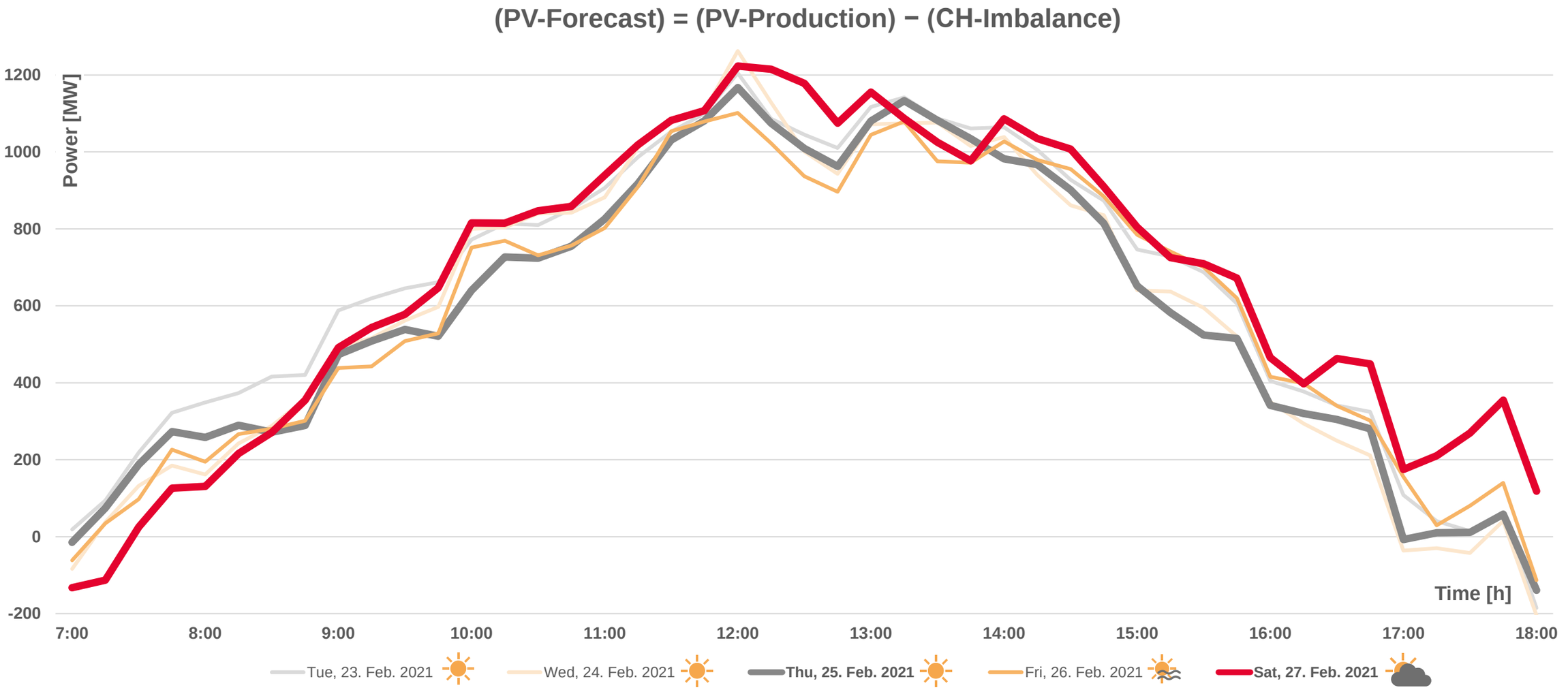
PV-forecasts seem to match for days with changing weather conditions



Installed PV-capacity: approx. **3000 [MWp]**

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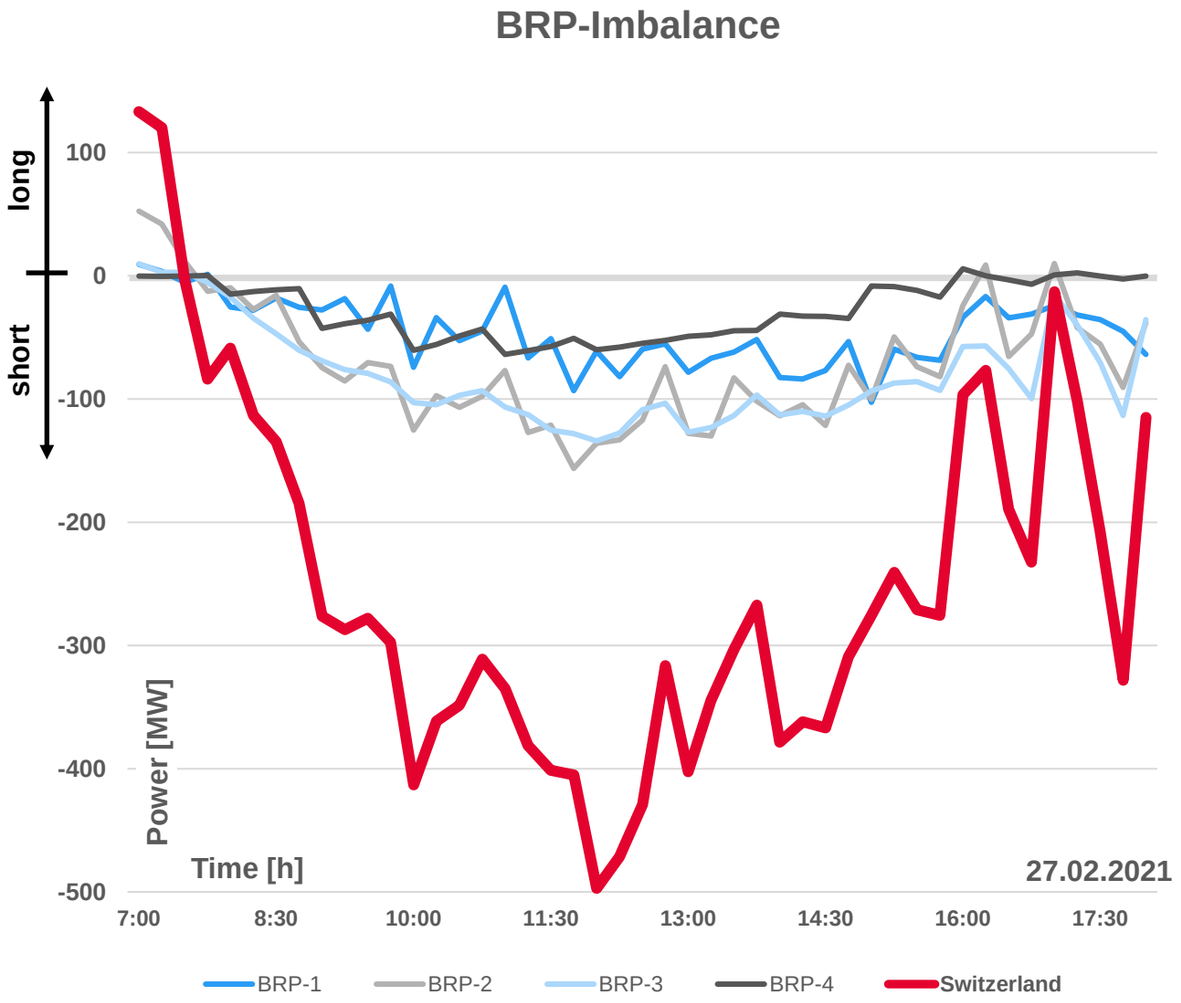
Several BRPs show similar imbalance patterns over the 27th February 2021



BRP	Price for balance energy
BRP-1	36 800 [€]
BRP-2	58 600 [€]
BRP-3	65 300 [€]
BRP-4	22 100 [€]

Price per Energy		
$\left[\frac{ct}{kWh}\right]$	As observed	09.2022
long	-2.82	-24.09
short	7.32	59.18

Sign convention:
- ⊕ **BRP pays**
- ⊖ **BRP earns**

Conclusion of the observations:

- Decrease in solar radiation (26th → 27th February 2021)
- Less PV-production
- Imbalance of BRPs
- Short Swiss control area
- High prices for balance-energy

Installed PV-capacity: approx. **3000 [MWp]**

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Impact of weather forecast on BRPs imbalances

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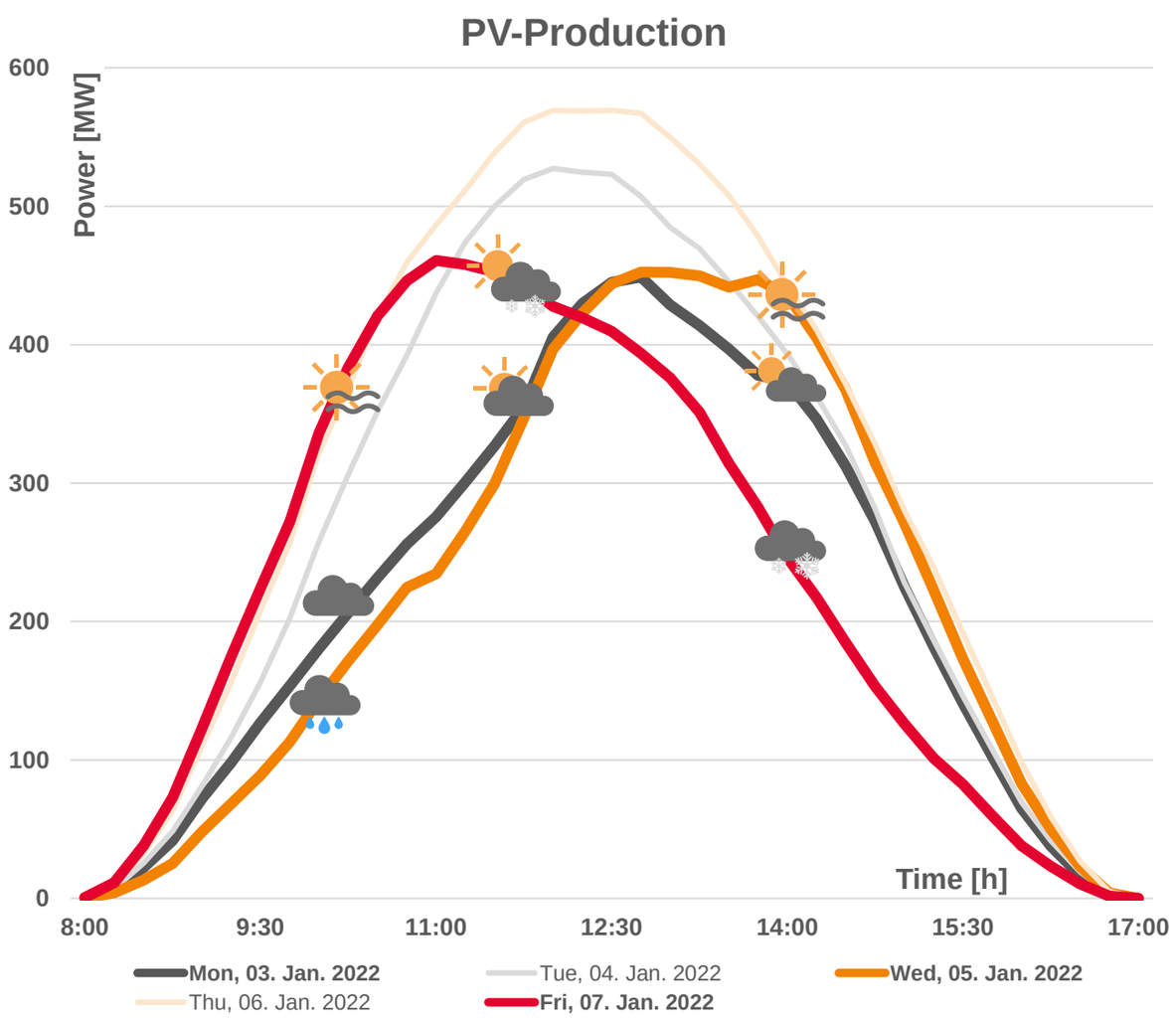
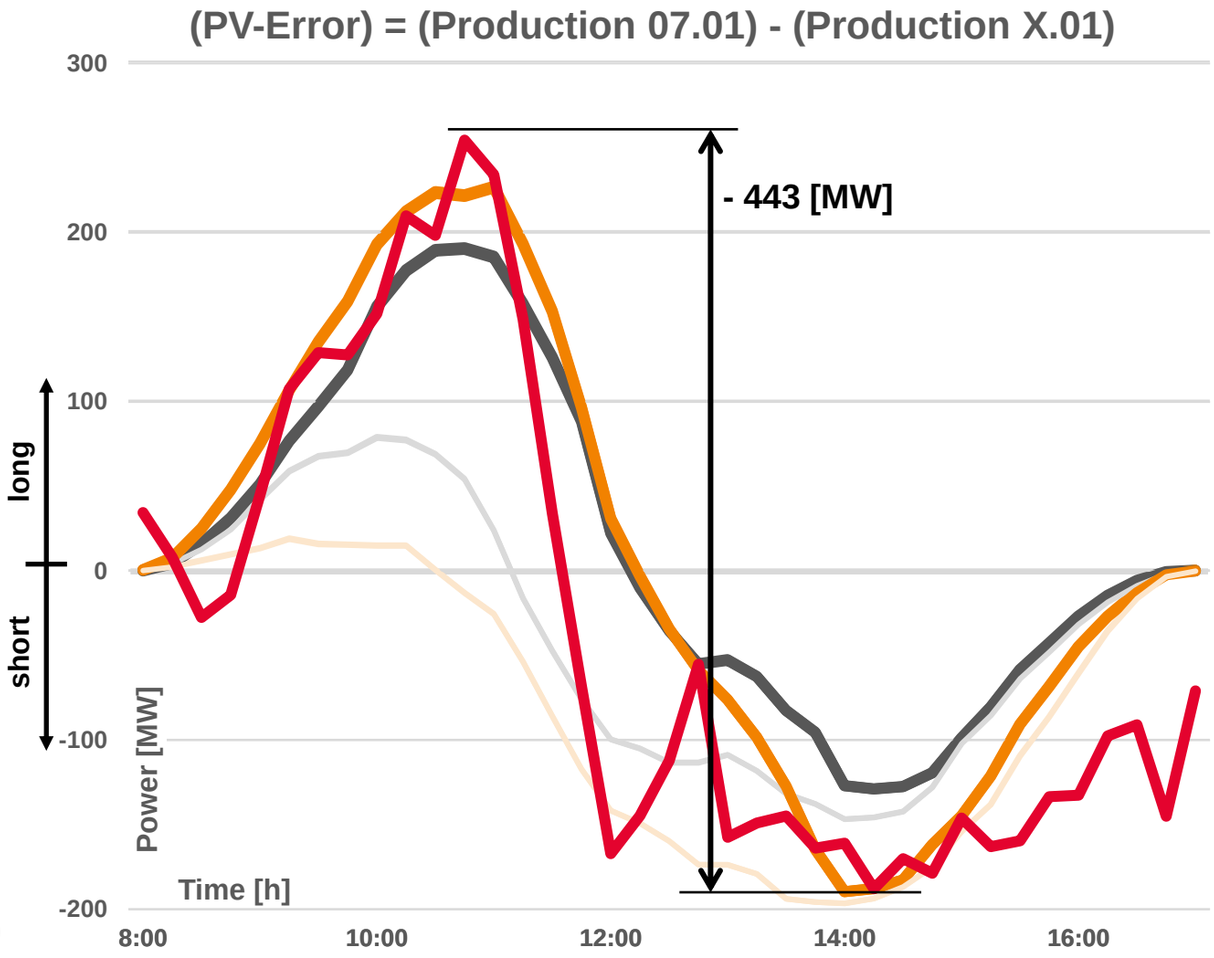
CH-imbalance follows the change of the weather conditions on the 7th January 2022





Installed PV-capacity: approx. **3700 [MWp]**

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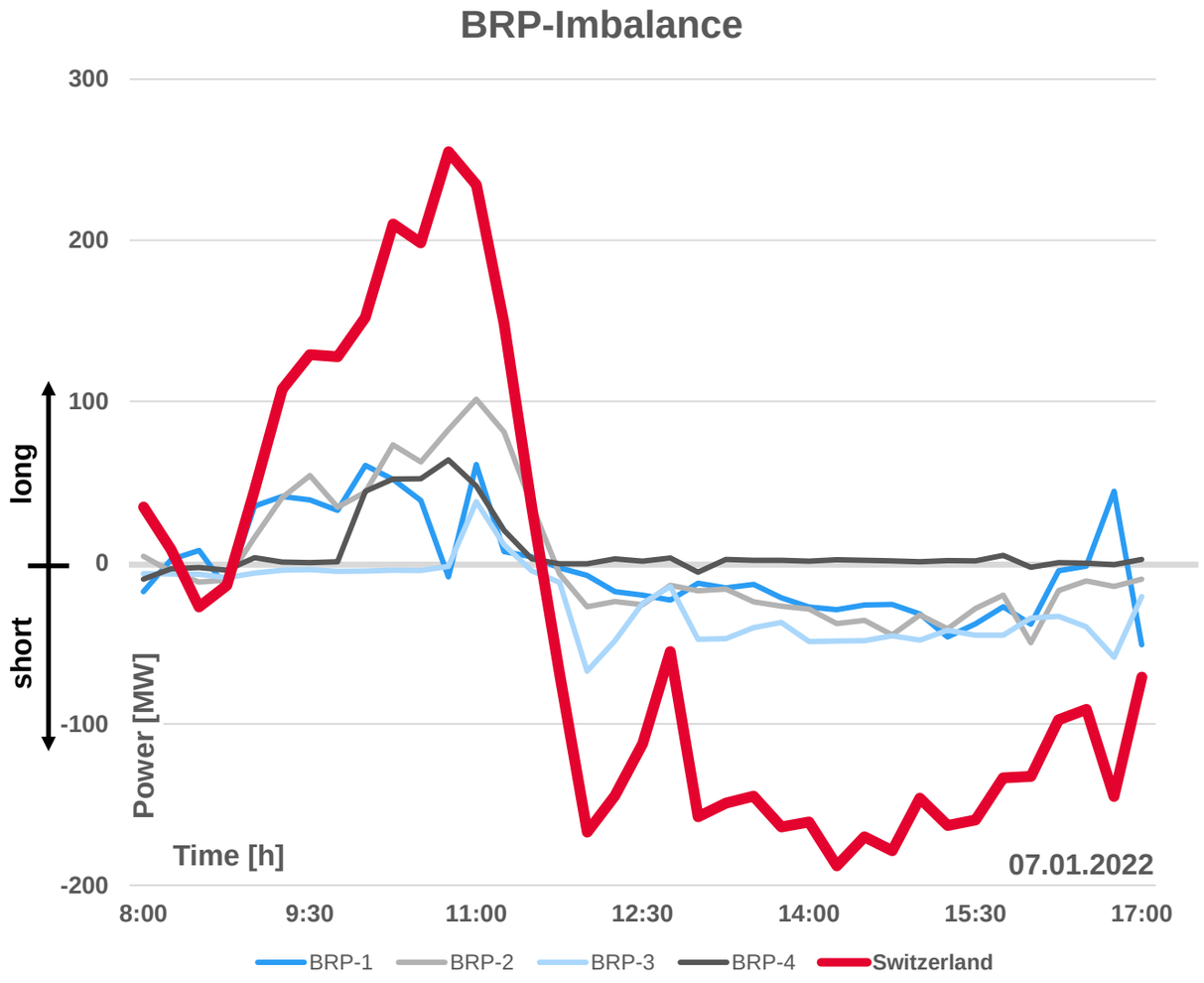
Several BRPs show similar imbalance patterns over the 7th January 2022



BRP	Price for balance energy
BRP-1	–18 782 [€]
BRP-2	22 300 [€]
BRP-3	78 600 [€]
BRP-4	–10 500 [€]

Price per Energy		
$\left[\frac{ct}{kWh}\right]$	As observed	09.2022
long	- 17.01	- 24.09
short	33.86	59.18

Sign convention:
- ⊕ **BRP pays**
- ⊖ **BRP earns**

Conclusion of the observations:

- Varying PV-production over the course of a day
- Imbalance of BRPs
- CH-imbalance following the gap in PV-production
- High prices for balance energy

Installed PV-capacity: approx. **3700 [MWp]**

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Impact of weather forecast on BRPs imbalances

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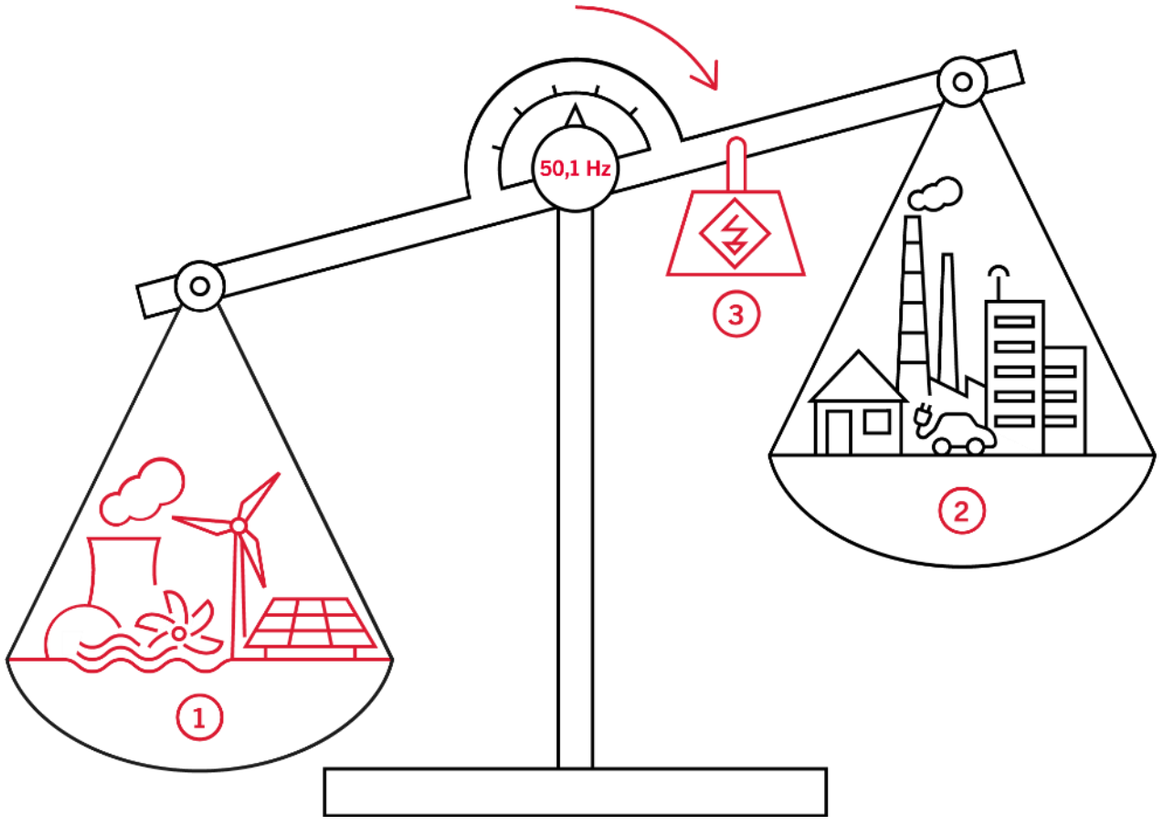
Balancing PV forecast errors can consume around 50% of all control reserves

Amount of control reserves procured:

Secondary reserve	Tertiary reserve
≈ ± 400 [MW]	≈ ± 500 [MW]

- Secondary & tertiary reserves to cover failures of power plants
- Flexible, but expensive secondary reserves
- Tertiary reserves for longer lasting imbalances



- **Imbalances based on PV-production errors are mainly covered by tertiary reserves.**
- **Huge PV-errors decrease the controllability of Switzerland.**

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Impact of weather forecast on BRPs imbalances

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4 Control reserves in Switzerland

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Today’s processes are incapable of handling tomorrows PV installations

- Correlation: Weather-changes ↔ CH-imbalance
  - Weather-changes from day to day
  - Weather-changes within a day
- PV-forecasts based on PV-production of bygone days assumable
- PV-errors decreasing controllability of Switzerland
- Similar imbalance-patterns for BRPs
- Few success for intraday balancing from BRPs
  → High prices for balance energy

- ► **Increasing problems with increasing PV-capacity expectable**
- ► **Increasing prices for balance energy expectable**

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Can SG improve their processes together with BRPs to tackle future problems?

- How is PV-production forecasted?
- What happens in real-time if imbalances occur?
- Is data on the actual PV-production available?
  - Does information on the actual installed capacity exist?
  - Is the PV-production-power available in real-time?
  - Is the PV-production visible in the net even though its consumed in the same household?

→Is it detectable if PV-production causes imbalances?

- Do the prices for balance energy based on PV-forecast-errors represent a significant portion of the overall prices?

- **Is there a real pattern behind the observations and assumptions, or are the correlations coincidences?**
- **Is it scheduled to improve the PV-forecasts and is this operationally possible?**

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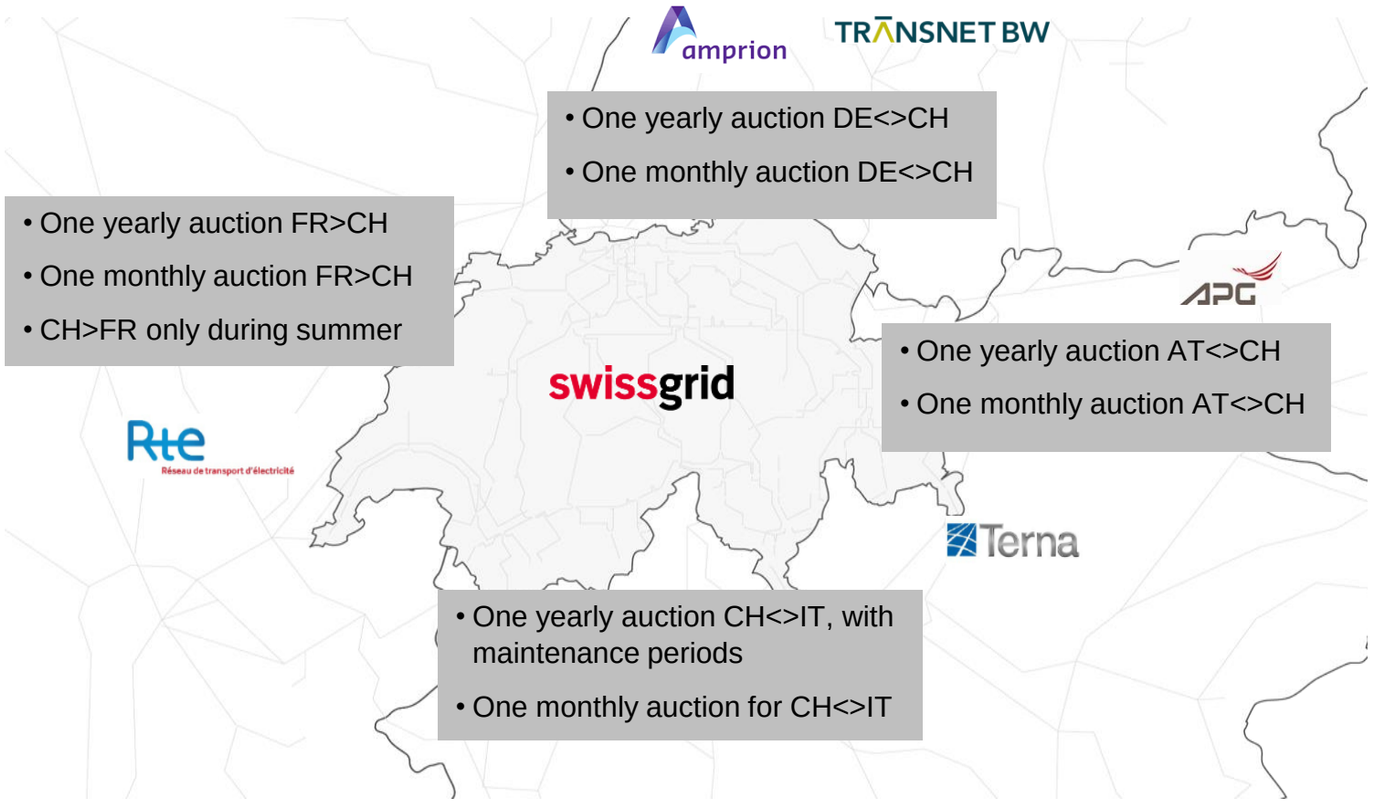
Possible improvements of monthly and yearly auction products

Theodoros Sevdas
Principal Market Operations

swissgrid

Status Quo long term allocation of cross border capacity



- In view of current and future market challenges, TSOs and NRAs and JAO are exploring possible improvements of the existing setting for explicit yearly- and monthly auctions on CH borders
- Focus of considerations so far:
  - How to **improve import possibilities** to CH by adapting auction timings?
  - How to allow for **better use of available market information** by adapting auction timings?
  - How to **relieve market participants from additional liquidity constraints** in the context of the auctions?

→ So far, no adaptations with effect on yearly product and monthly products for 2023 have been decided.

→ Swissgrid would like to use this session for gaining insights on challenges for market participants and possible impacts of adapting the settings for explicit auctions.

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Possible improvements of long term auction products

Proposals for discussion	Expected benefits / consequences / open questions
Performing monthly auctions several months ahead (e.g. in Jan 23 for Apr 23)	**Pro**: Allow market participants to secure long term transactions (capacity + energy). → Would this possibility be used by market participants? **Con**: ATC for earlier monthly auction would have to be more conservative. Additionally available capacity would have to be allocated in daily auction. → does this outweigh the possible benefits of earlier hedging?
Introduce quarterly auctions	**Pro**: Allow market participants to secure long term transactions (capacity + energy). → Would this possibility be used by market participants? **Con**: ATC for yearly and monthly auction would relatively decrease, as available capacity is distributed on more products. → Preferences of market participants?
Splitting of currently one yearly auction in several auctions with a part of the available capacity in each auction.	**Pro**: The idea is to distribute the collateral that has to be offered on the day of the auction over several days. → Is the collateral that has to be delivered for the auctions at JAO a significant amount in comparison to the amounts for trading **Con:** Bidding process becomes more complex in case needed capacity has to be obtained in several auctions
Other suggestions?	

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Monthly and yearly auction products at CH borders

EFET supports

- **Keep only one yearly auction** to have the maximum volume available
- Auctions of yearly products **more than one year in advance**

EFET is against

- Introduction of **quarterly auctions**
- Clustering of **3 monthly auctions** in December

EPEX SPOT
Markets Overview
Political developments – new EU Regulation
EPEX New Markets & Products

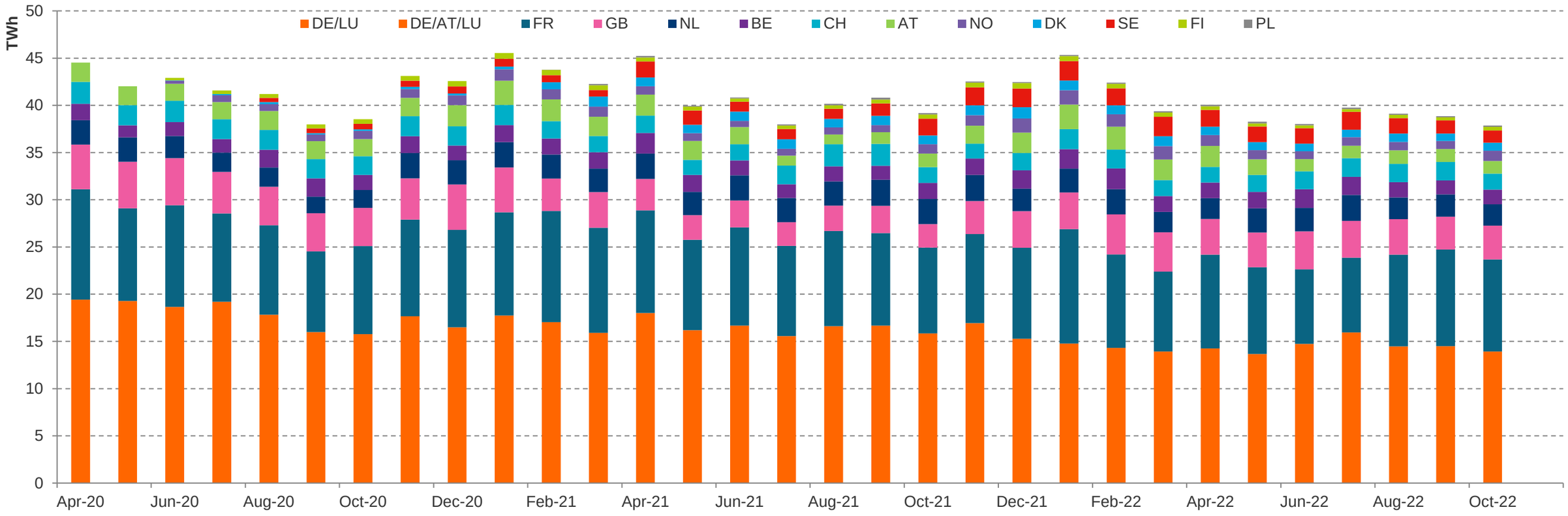
Swissgrid – BGM Meeting, 15 November 2022
Davide Orifici – d.orifici@epexspot.com
Head of Swiss Office – Director Public & Regulatory Affairs EPEX SPOT

epexspot

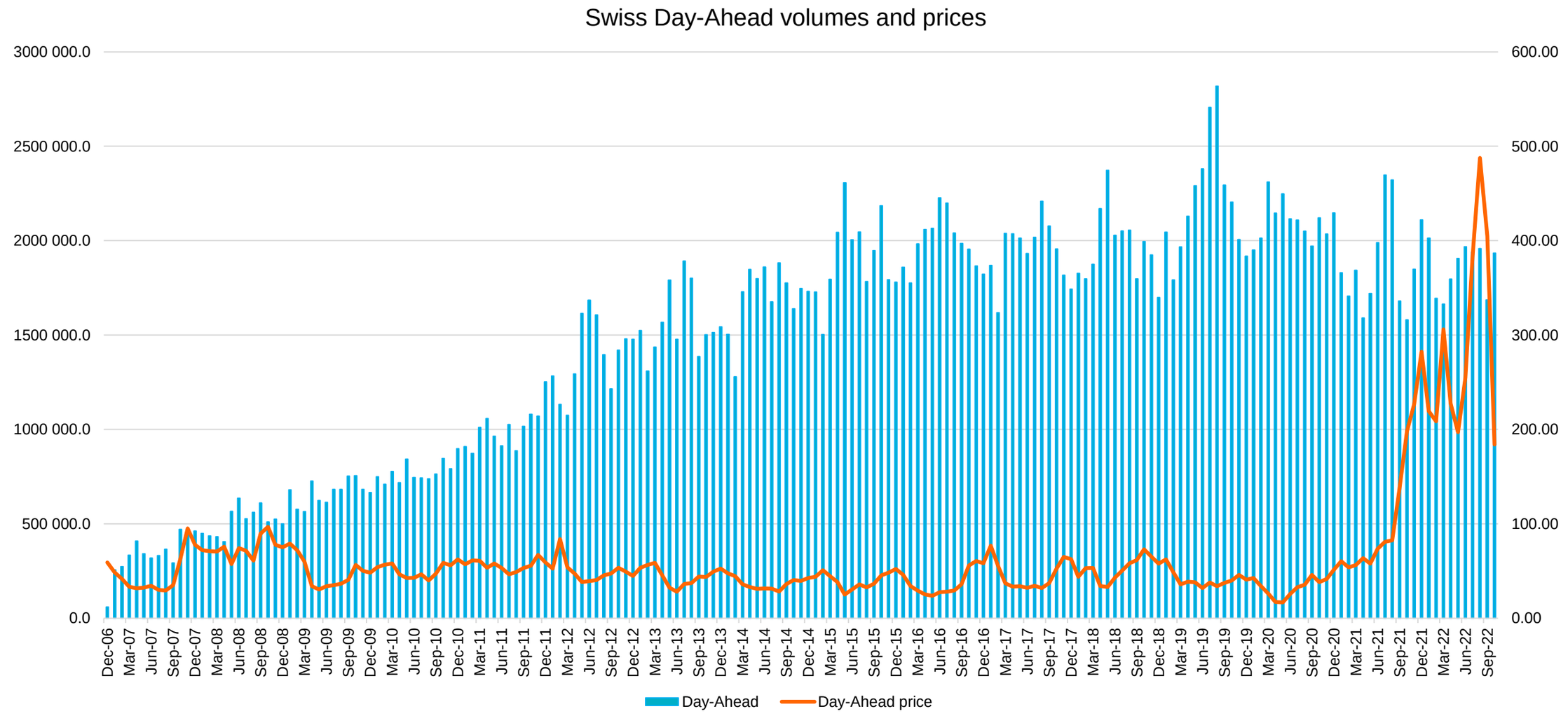
part of eex group

Markets Overview

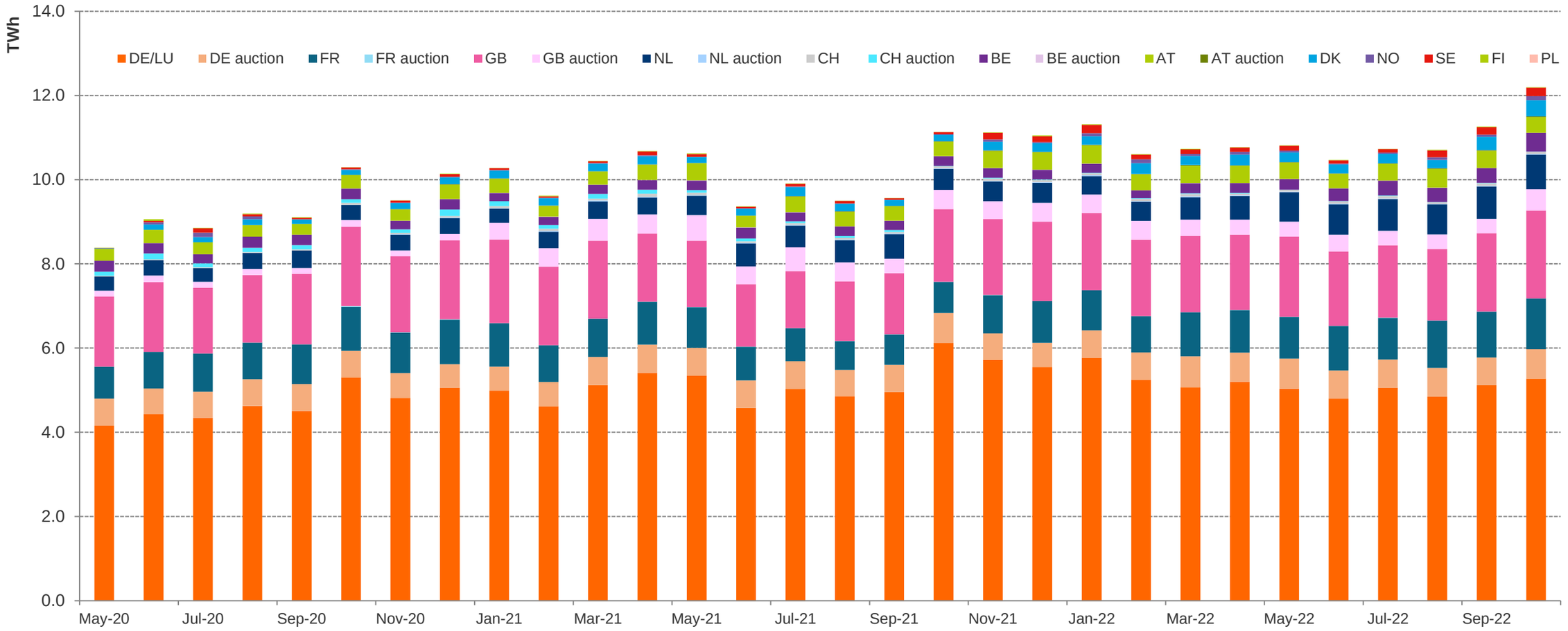
EPEX SPOT Volumes Day-Ahead Market



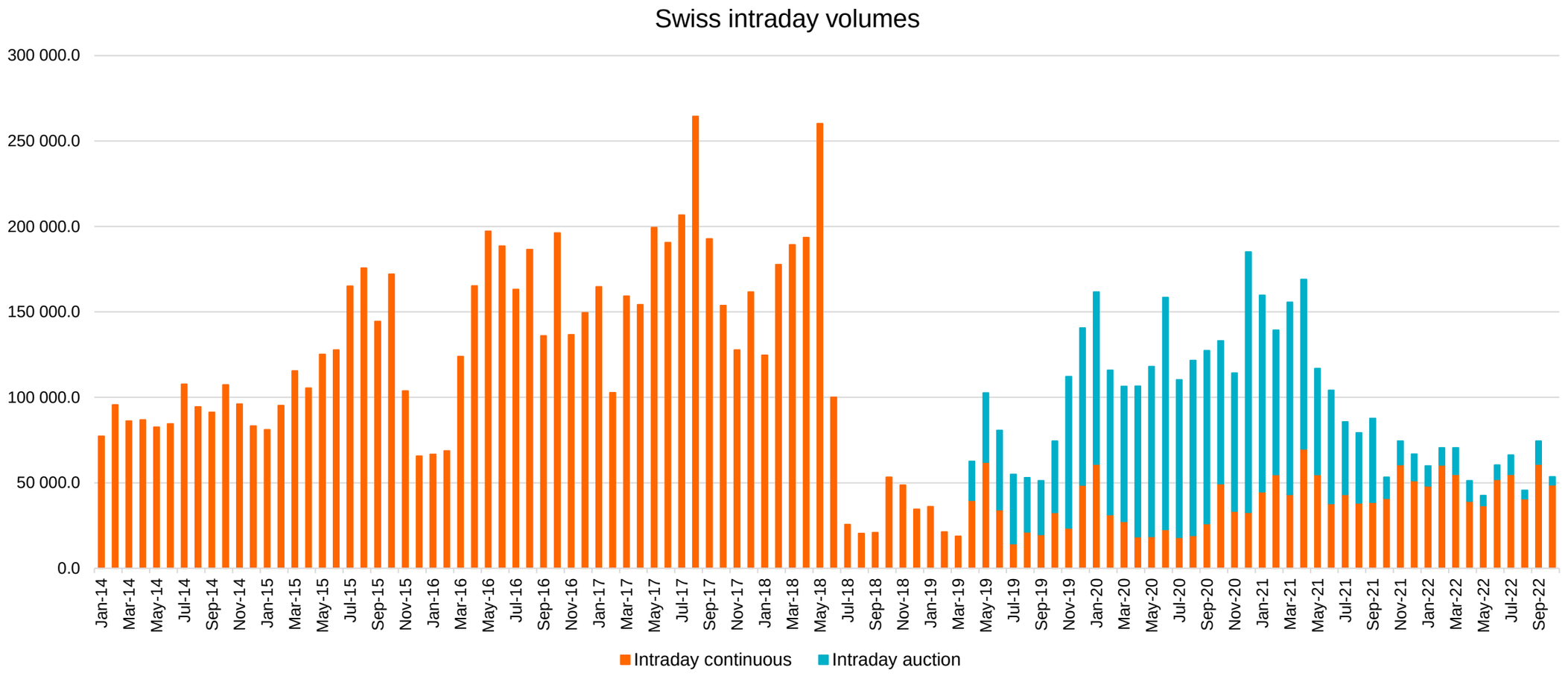
Swiss Day-Ahead volumes and prices



EPEX SPOT volumes Intraday Markets



Swiss Intraday continuous and 15-minutes IDA1 / IDA2 auctions volumes



Maximum Day-Ahead and Intraday clearing Prices on the Spot Power markets – revision of methodology

Update on Harmonised Maximum and Minimum Clearing Prices

Regulatory requirements

- The current HMMCP methodologies were approved in November 2017 and provide for them to be re-assessed every two years at least.
- As a methodology for Intraday Auctions was missing, the revision of the methodology was scheduled to be launched in Q1 2022, and the occurrence of sufficiently high prices became apparent in 2022, all NEMOs launched a consultation on the methodologies until 15 July 2022 and published the results on 29 August 2022.

Past trigger events

- On 3 April 2022 (trading day), high prices of 2,712.99 and 2,987.78 EUR/MWh were reached on 3 April 2022 (trading day) in France in hours 8 and 9, respectively.
- On 16 August 2022 (trading day), a curtailment situation and the maximum price of 4,000 EUR/MWh occurred in hour 18 in the three Baltic Member States.

Update on Harmonised Maximum and Minimum Clearing Prices

The current SDAC HMMCP rule is made up by these parameters:

- Price limit for max price: 3.000 €/MWh (was amended to 4.000 €/MWh as of 10 May 2022)
- Price limit for min price: – 500€

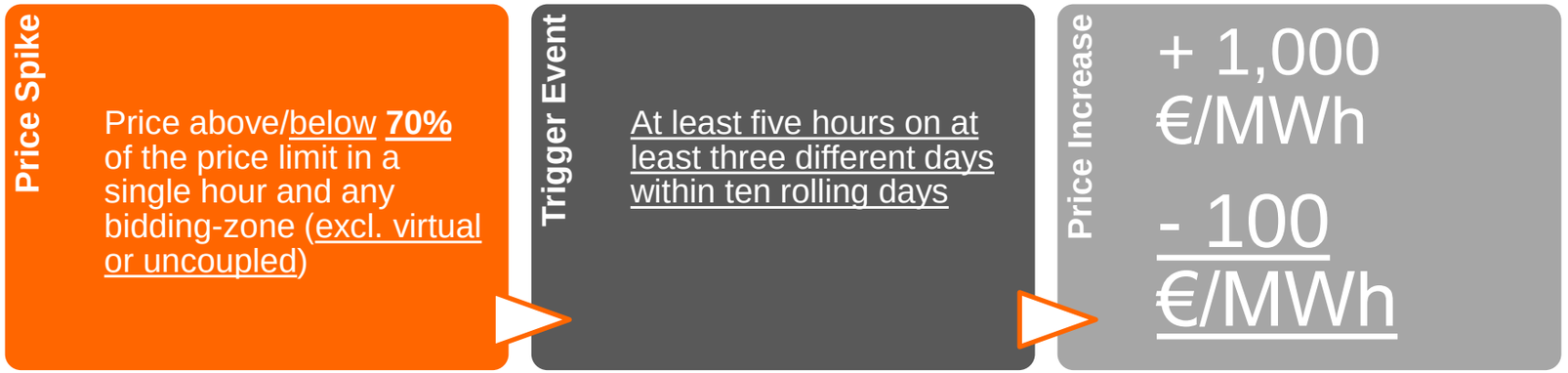
<u>Transitional period:</u>

- The price increase is implemented five (5) weeks after the price spike
- During the transitional period, price spikes are detected against amended price limit

Update on Harmonised Maximum and Minimum Clearing Prices

Rationale: *We see a need to distinguish structural and representative trigger events from more isolated situations. Only the first category shall trigger a change. We also want to limit the sheer number of increases over a short period by excluding further increases during the transitional period. A change of the minimum price limit shall be possible following the same conditions.*
Following the opinion expressed by stakeholders in the consultation, de-escalating the price caps shall be also allowed under specific conditions. Moreover, the process of adapting the price shall be shortened.

The revised SDAC HMMCP rule shall be made up by these parameters:



Transitional period:

- The price increase is implemented four (4) weeks after the last price spike
- During the transitional period, no further price limit increase is initiated.

In line with the consultation outcome, it is proposed that after 12 months without reaching a given 70% limit X, HMMCP set back the limit X, keeping the predefined floor of 3.000 €/MWh.

Update on Harmonised Maximum and Minimum Clearing Prices

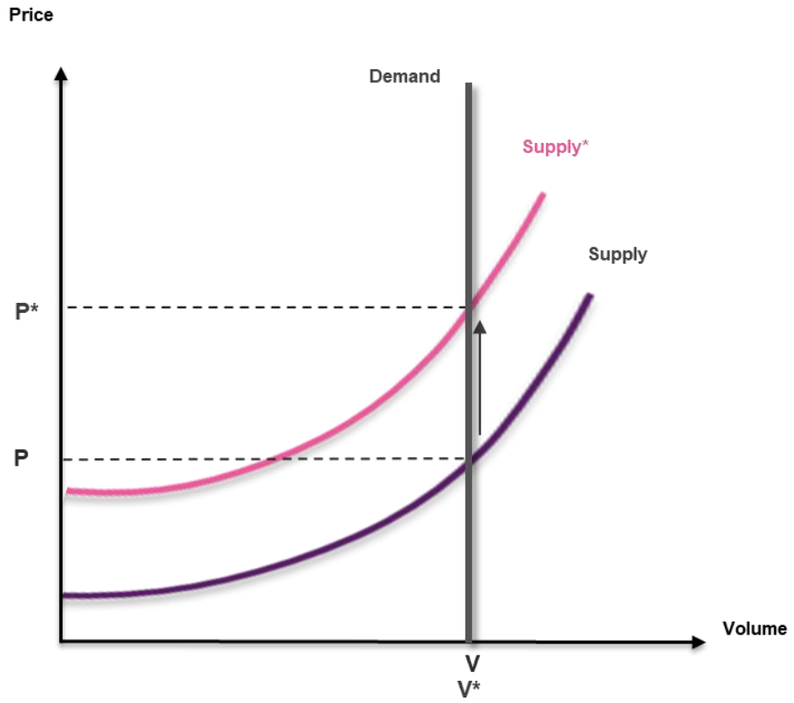
ACER consultation and next steps

- ACER consulted the all NEMOs proposal until 9 October 2022
- We strongly advised market participants to submit their views and contribute to have a revised methodology that is operationally sound and manageable
- Status and/or further handling of the current methodology is being discussed between ACER, NEMOs and market participants

Political developments – new EU regulation

It‘s a supply shock, not a failure of the electricity market

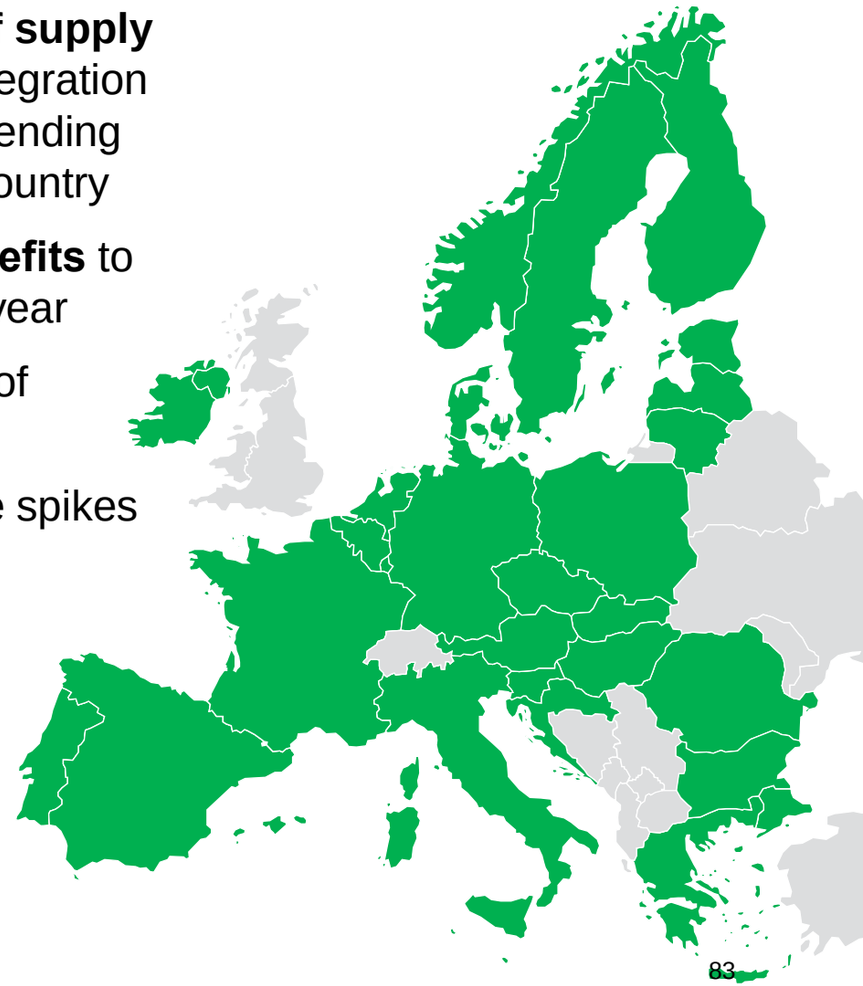
How does the Power Market react?



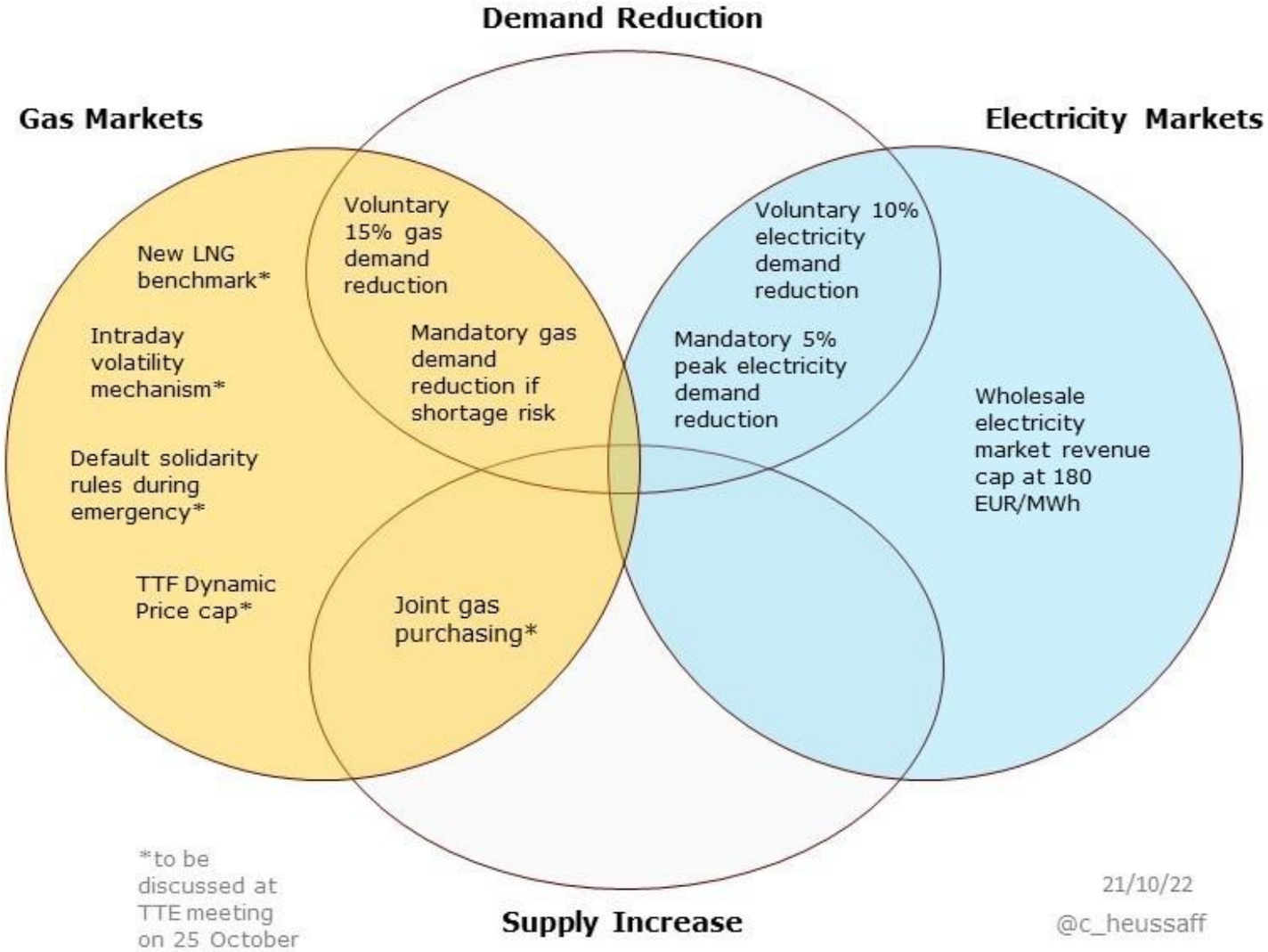
(i) the inflexible demand curve
(ii) additional generation assets cannot be established in the short run

Benefits of European Market Coupling

1. Higher **security of supply** through market integration and no longer depending on the individual country
2. **€34 billion of benefits** to consumers every year
3. Facilitates growth of **renewables**
4. Smoothing of price spikes



Energy Crisis Response - EU Policy Mix



European Initiatives since August 2022

Several non-papers or less formal initiatives emerged after Summer 2022 at EU level

Power

- Reduction of electricity consumption
- Cap in market revenues
- Retail measures
- Solidarity contribution

Gas

- Gas demand reduction
- Supply solidarity (joint purchasing, coordinated storage)
- Gas price measures (LNG indices, price cap for RU gas, renegotiations)
- Extend Iberian model

Clearing

- Amendments to collateral calculation and calls
- State aid framework to provide liquidity
- Circuit breakers to interrupt or suspend trading

Transparency

- Strengthening existing market monitoring
- Cooperation with ACER
- Coordination between regulators (financial vs. energy market regulation and oversight)

Revenue cap on inframarginal technologies
Regulation on an emergency intervention

Final agreement reached among EU MS upon on 30 September 2022 – Regulation entered into force on 7 October 2022

Reduction of consumption

- Reduction of gross consumption by 10%
- Reduction of consumption during peak hours by 5% between December 2022 and March 2023

Cap on market revenues

- Market revenues
- Applies to several technologies
- Generally set at EUR 180 per MWh
- Covers all markets with the possibility to except system services
- Maximum discretion is given to Member States and limited harmonisation and coordination

Retail market measures

- Temporary possibility to regulate prices for SME
- Temporary possibility to set power prices below generation costs

Solidarity contribution

- Activities in crude petroleum, natural gas, coal and refinery sector covered
- Calculated on taxable profits more than 20% above the preceeding 4 years
- Contribution amounts to 33% of these profits

Revenue cap on inframarginal technologies
Next steps

The EU Council regulation and the revenue cap

- Formal adoption on 6 October 2022
- EC guidance on implementation expected shortly after (?)
- National implementations to be concluded
- Entry into force on 1 December 2022; application until 30 June 2023
- Some EU countries considering not to apply the revenue cap
- Some other EU countries struggling to implement it

The wider debate (mid- & long-term perspective)

- More extensive review of market design still scheduled
- Degree of public involvement is highly unclear due to time constraints
- Importance to be part of the more long-term process
- EPEX will approach authorities directly and in coordination with the EEX group, Europex and other associations

Long-term Electricity Market Design Reform

- Von der Leyen statements: '**EU electricity markets do not work anymore**' (June 2022) & 'we have to **decouple** the dominant influence of gas on the price of electricity' (September)
- **Objective:** bringing benefits of affordable and low-carbon renewable energy to consumers while preserving the benefits of a common EU electricity market
- **Expected timeline**:
  - Public Consultation on European Commission white paper by **end 2022**
  - Formal European Commission proposal in **Q1 2023**
- UK Review of Electricity Market Arrangements (ongoing)

Long-term Electricity Market Design Reform – first ideas

European Commission
Directorate-General for Energy

Implementation and next steps towards an evolution of the market design

- Enhance **cross-border trade**
  - ➔ Market coupling further development, 70% rule, balancing platforms
- Optimize use of **infrastructures**
  - ➔ Optimization of the grid use, grid and system services, OPEX/CAPEX, boost innovation
- Enhance **locational price signals**
  - ➔ Proper bidding zone configuration
- Unlock **demand response and flexibility**
  - ➔ Electricity Directive implementation, Network Code on Demand Response, DSO-TSO
- Strengthen **forward markets**, to secure investments and stabilize the market price
  - ➔ Cross-border contracts/transmission rights, CfDs / capacity mechanisms,

European Commission

ACER
European Union Agency for the Cooperation of Energy Regulators

ACER Director Zinglersen presentation takeaways:

- **Several options** on the table for short-term (market split, nodal, lmp) and long-term markets (forward liquidity, CRM, CfDs, PPAs, affordability options)
- Options assessment against **criteria** of: affordability, security of supply and cross-border flows, energy transition compliant, demand response signals, investment signals, implementation time
- **Reforms and implementation take time**

EPEX SPOT's policy recommendations for the power system of the future

- Recommendation 1: **Protect the significance of markets & price signals for decarbonisation**
  - Price formation in European Spot Markets – rely on price signals – use marginal costs
  - Finalise European Market coupling: Nordic FBMC, Pan-EU IDAs, 15 minutes Markt time unit – enable competition
- Recommendation 2: **Boost renewables through markets**
  - Market integration of renewables: foster market-based remunerations, limit support schemes
  - GOs for renewable electricity
- Recommendation 3: **Value flexibility to transform power systems**
  - Grid congestion and demand flexibility: SOs market based flexibility procurements, Demand side flex
  - Local flex markets

EPEX SPOT Policy Paper (June 2022) – Website – Downloads – Publications – Advocacy:

- https://www.epexspot.com/sites/default/files/download_center_files/Epx_Advocacy_UK_220615-compressed.pdf

New Markets and Products: Guarantees of Origin Auctions – Local Flex Markets

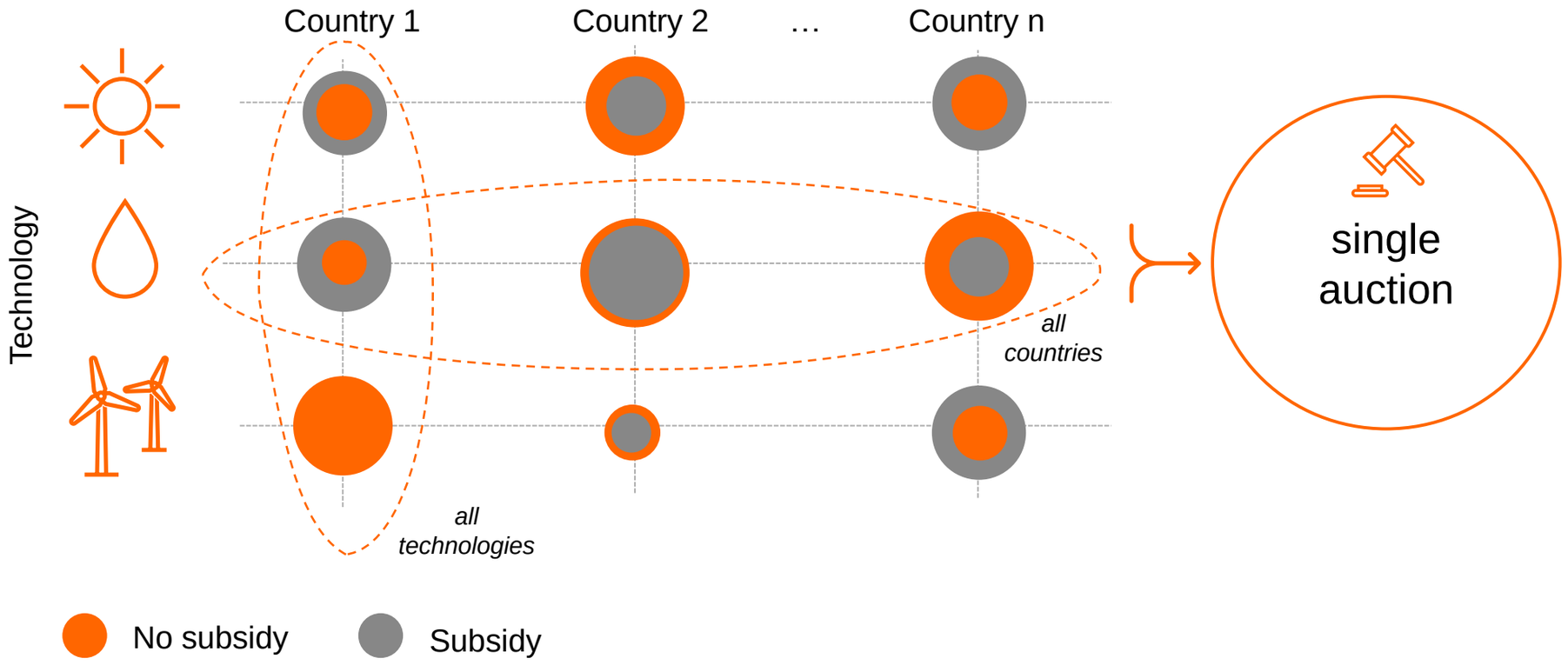
Pan-European spot auction for Guarantees of Origin

Pan-European spot auction for Guarantees of Origin

Anonymous & exchange-based: a market matching today's needs and fit for tomorrow's evolutions

- Monthly multilateral spot auctions
- GOs from renewable production in selected EECS countries covering most of Europe
- Both specific and generic GOs tradable with several levels of genericity
- Strong and diverse European trading community
- Reliable EPEX SPOT membership and market rules
- Fully secured clearing, settlement and delivery performed by ECC and EEX as a registry

Gos spot auction - Bundle specific and generic demand with a multi-dimensional market

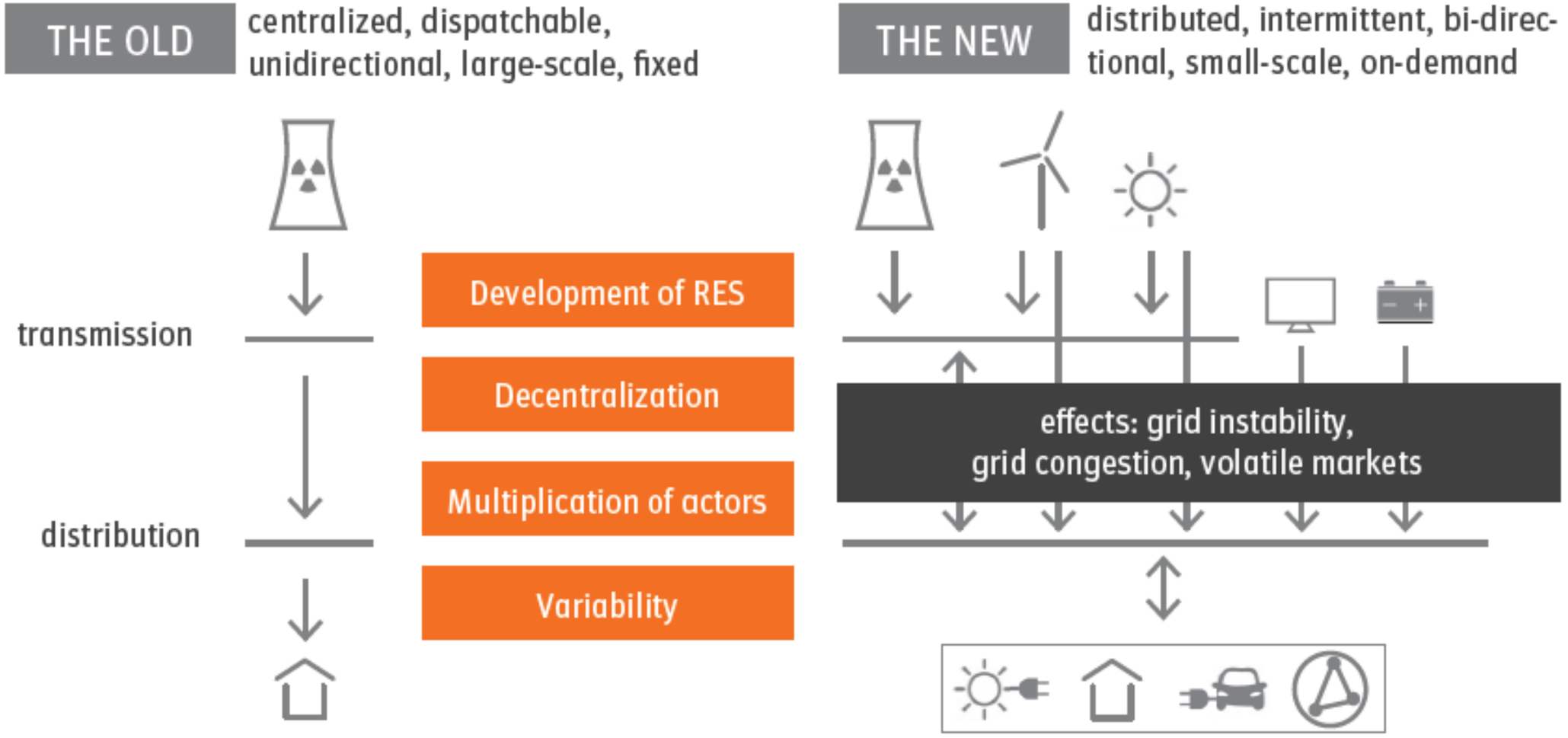


Successful go-live on 28.09.2022

- 26 Members onboarded for the first auction
- 15 members were active in the first auction and traded 20 GWh of Gos
- The second auction took place on 26 October 2022. A total of 69,326 MWh was traded with GOs from the production period January 2022 to September 2022
- GOs from several countries were traded for Wind, Hydro and Solar
- 4.739 TWh of firm buy orders were deposited! This reflects high interest for the auction
- Clearing prices on the high end of recent Platts indices and consistent with major buyer interest
- The market should be more balanced in coming auctions as system has been tested, existing members start transferring GOs and more members join. We expect the market to balance out between sell/buy interests and volumes to grow in upcoming auction.

Local Flex Markets

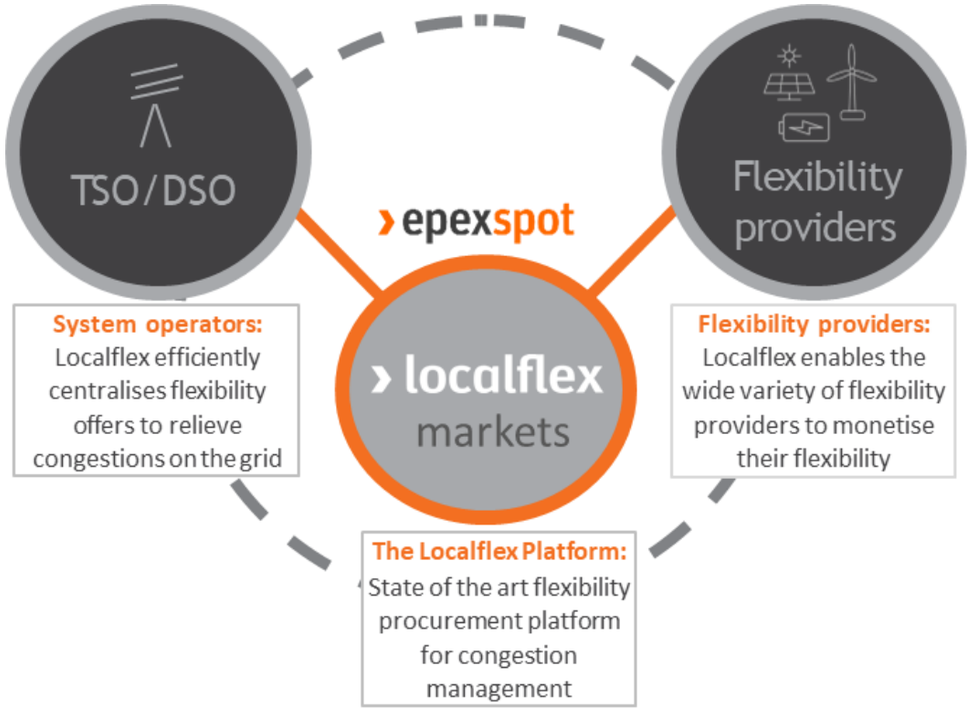
Flexibility is the only solution in the short term and a necessary condition for the long term



Local flexibility markets create the right economic space for the development of flexibility

Local flexibility markets are about the implementation of a **market mechanism** to:

1. **Efficiently centralize** localized physical flexibility **where and when needed**
2. Facilitate grid-oriented **TSO/DSO coordination and optimization**
3. Foster the **development of new decentralized flexibility sources**



The emergence of market platforms is a key enabler for the development of local flexibility markets

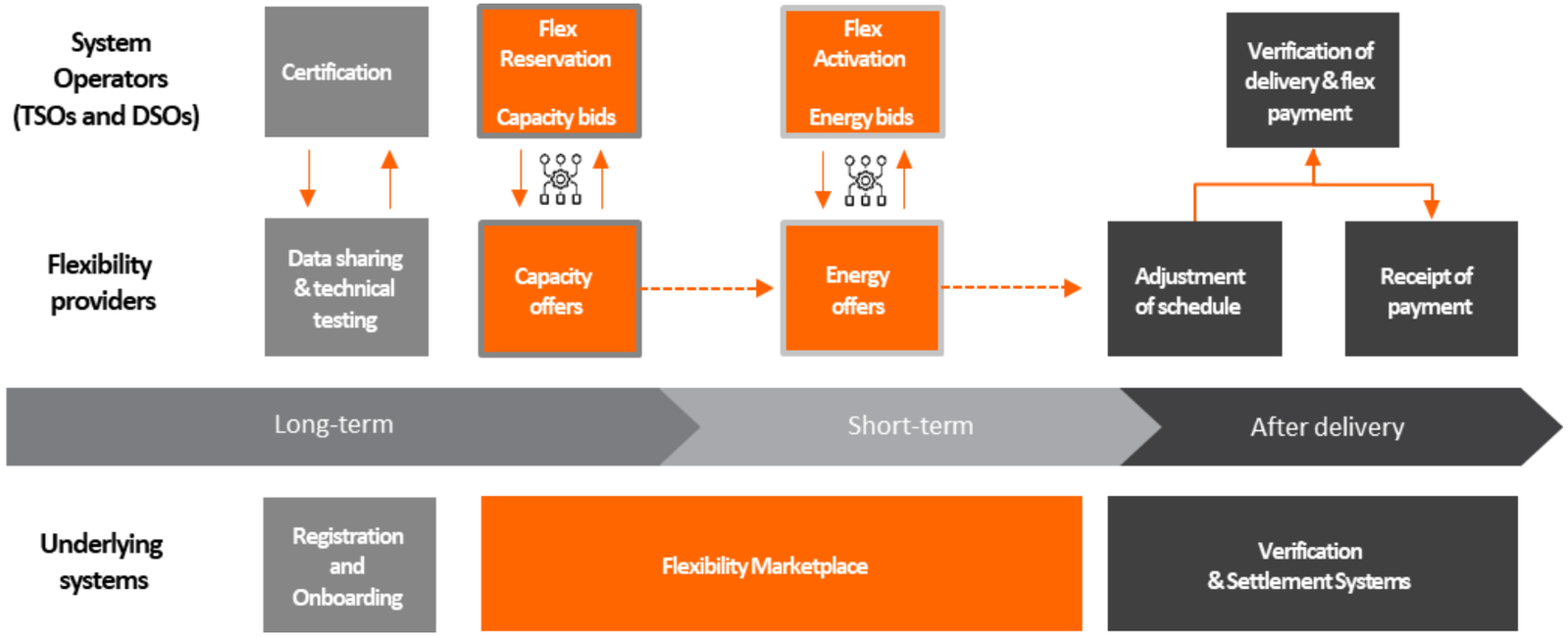
Emergence of market platforms

Market platforms and neutral market operations for flexibility markets are key to:

(1) ensure a **level-playing field** and **easy market access** for **all market participants** and **all flexibility technologies**

(2) foster innovation and new product development for congestion-management

Important principles for a flexibility market:
Transparency – Open to all technologies – Harmonized products – Platform synergies
Neutral market operation – Price signals for flexibility – Contractual framework



Thank you for your attention!

Q & A

Please address any question to
d.orifici@epexspot.com

EFET insights from their international perspective on power markets

Federico Barbieri
EFET

swissgrid

EFET European Federation of Energy Traders

Swissgrid BGM Partner Meeting

14 November 2022

AGENDA

1. Introducing EFET
2. Overview of policy development in EU and effects in Switzerland
3. Recommendations on market design
4. Development of markets in Switzerland and perspective from the EU

OUR MISSION

- We promote **competition, transparency and open access** in the European energy sector.
- We build trust in power and gas markets across Europe, so that they may underpin a sustainable and secure energy supply and enable the **transition to a carbon neutral economy**.

Over 130 energy trading companies

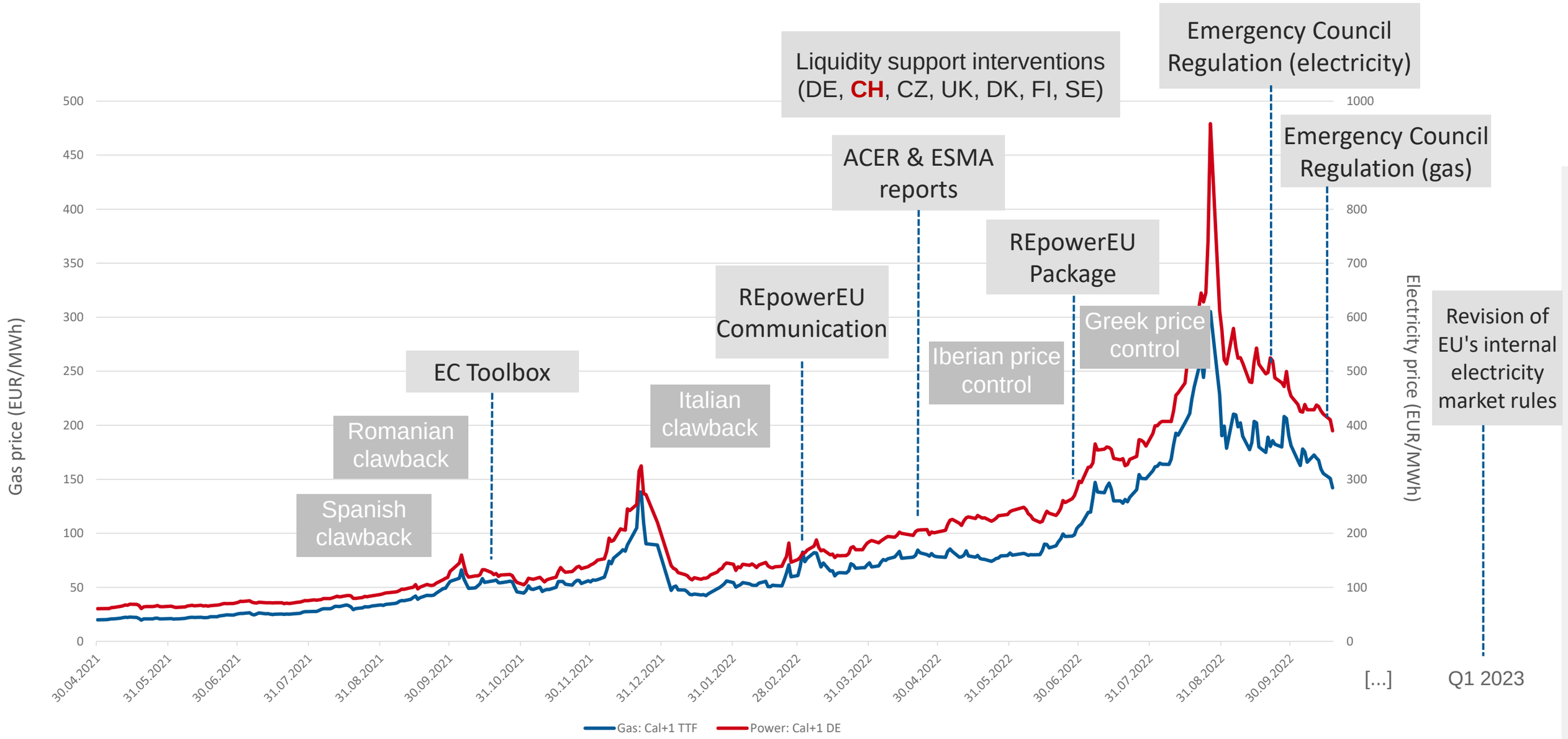
Active in over 30 European countries

OUR MAIN ACTIVITIES

- Promotion of the single **European energy market**, integrated and interconnected
- Supporting the **liberalisation** of the energy markets
- Legal **standardizations**

Overview of EU policy development

Effects in Switzerland


Liquidity support interventions (DE, CH, CZ, UK, DK, FI, SE)
Emergency Council Regulation (electricity)
ACER & ESMA reports
Emergency Council Regulation (gas)
REpowerEU Package
REpowerEU Communication
Iberian price control
Greek price control
EC Toolbox
Italian clawback
Romanian clawback
Spanish clawback
Revision of EU's internal electricity market rules
Gas price (EUR/MWh)
Electricity price (EUR/MWh)
0
50
100
150
200
250
300
350
400
450
500
0
100
200
300
400
500
600
700
800
1000
30.04.2021
31.05.2021
30.06.2021
31.07.2021
31.08.2021
30.09.2021
31.10.2021
30.11.2021
31.12.2021
31.01.2022
28.02.2022
31.03.2022
30.04.2022
31.05.2022
30.06.2022
31.07.2022
31.08.2022
30.09.2022
[...]
Q1 2023
Gas: Cal+1 TTF
Power: Cal+1 DE

EU Council Regulations

2022/1854 and 2022/1032

- Inframarginal cap (clawback)
- Demand reduction
- Liquidity support
- Regulated tariffs
- Gas storage targets

EFET position

- No price caps
- Demand reduction
- Targeted support for consumers
- Liquidity support
- Improve forward markets

Recommendations on market design (1)

Monthly and yearly auction products at Swiss borders

Monthly and yearly auction products at CH borders (1)

Swissgrid proposals

- Splitting the current only one yearly auction into two or three yearly auctions, each one week apart in December
- Introduction of quarterly auctions
- Performing the monthly auctions for January, February and March already in December

Monthly and yearly auction products at CH borders (2)

EFET supports

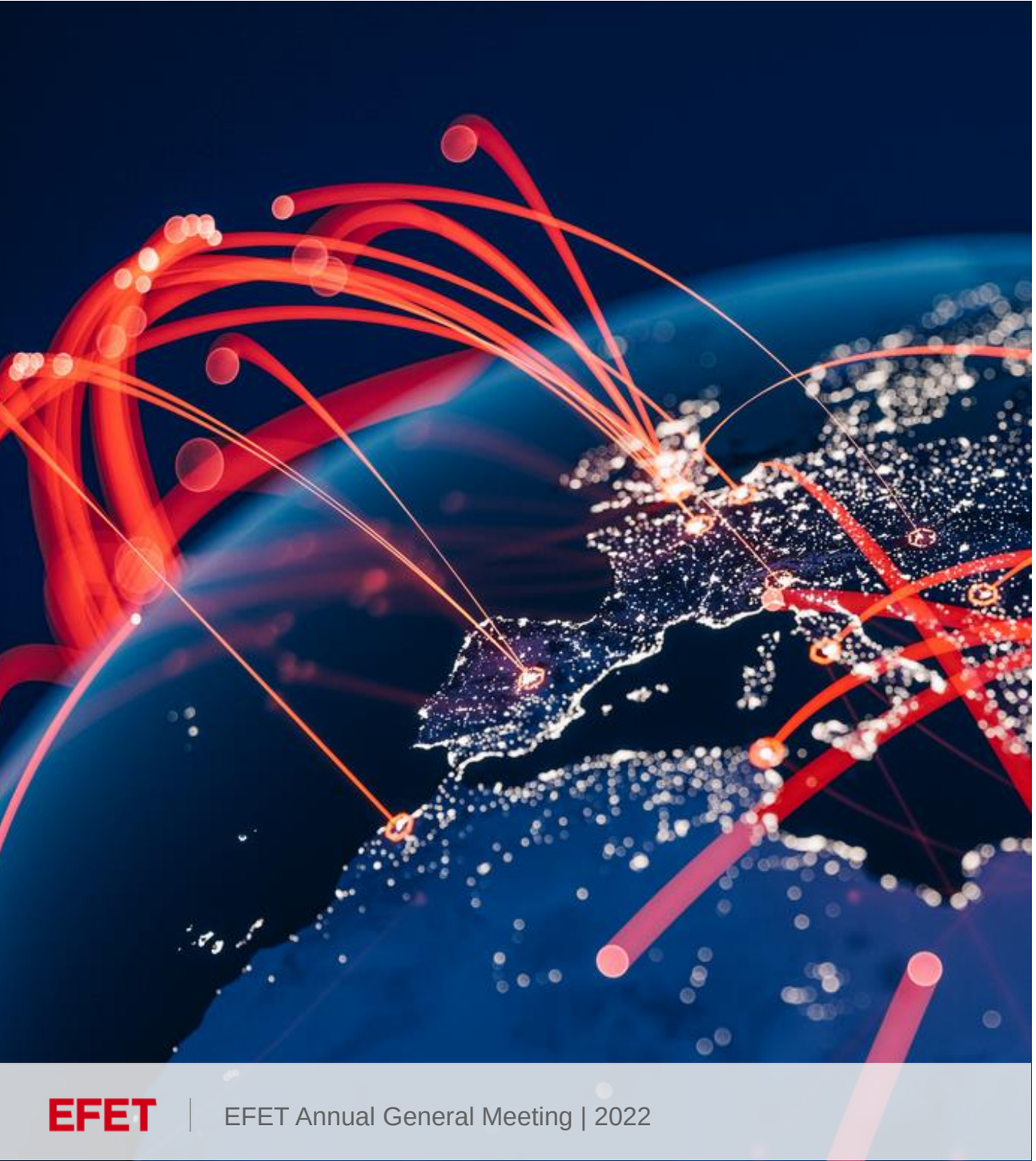
- **Keep only one yearly auction** to have the maximum volume available
- Auctions of yearly products **more than one year in advance**

EFET is against

- Introduction of **quarterly auctions**
- Clustering of **3 monthly auctions** in December

Recommendations on market design (2)

Cross-border capacity allocation and 70% rule for 3rd countries



Cross-border capacity allocation and 70% rule for 3rd countries

Impact

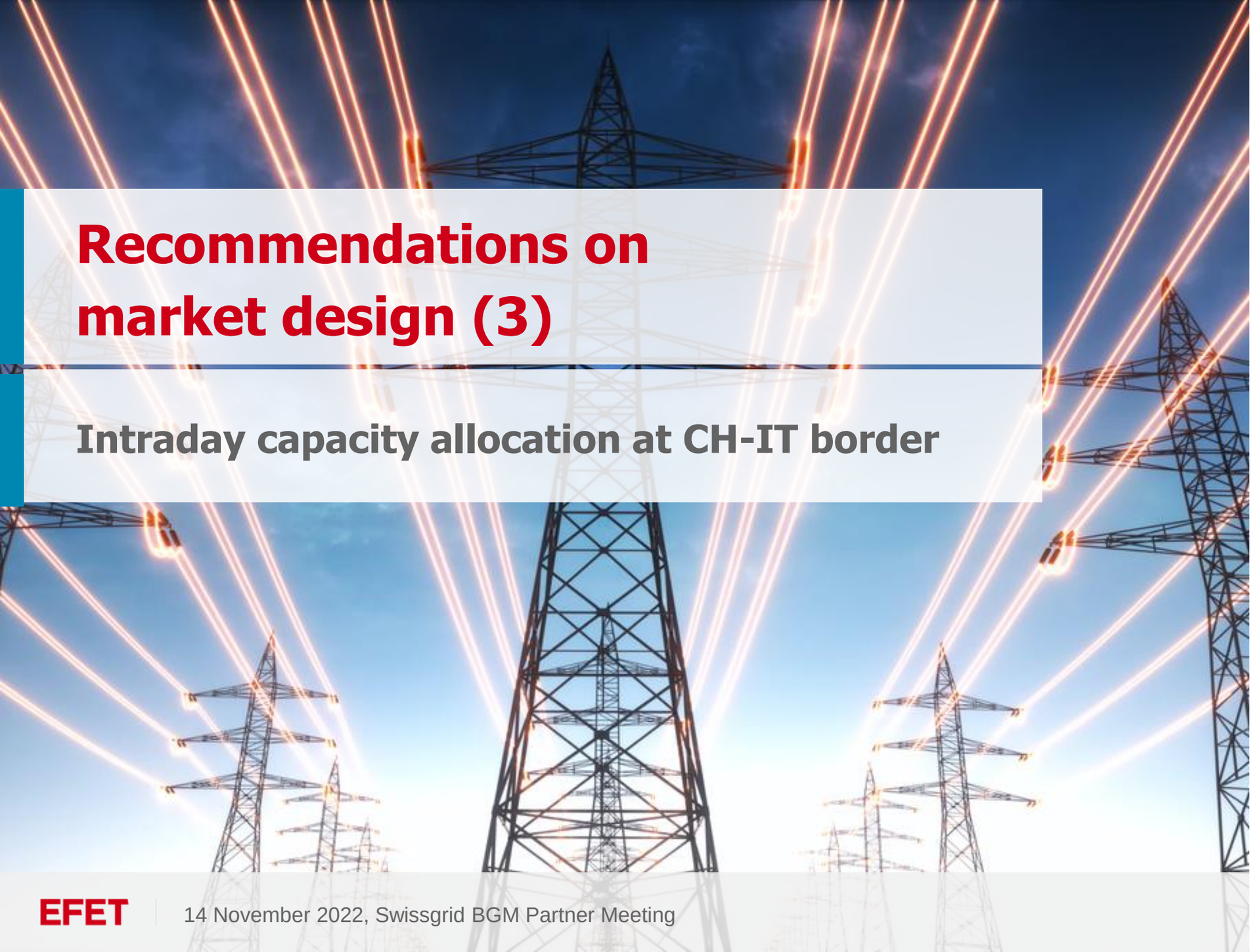
Impact of 3rd country flows on capacity calculation & allocation within the EU is a reality

EFET advocacy

Integration of external EU borders and 3rd countries flows in a cost-efficient calculation & allocation of capacity

Current status

ACER and NRAs collecting data and reporting on 70% requirement **with and without** 3rd countries flows



Recommendations on market design (3)

Intraday capacity allocation at CH-IT border

Intraday capacity allocation at CH-IT border

EFET advocacy

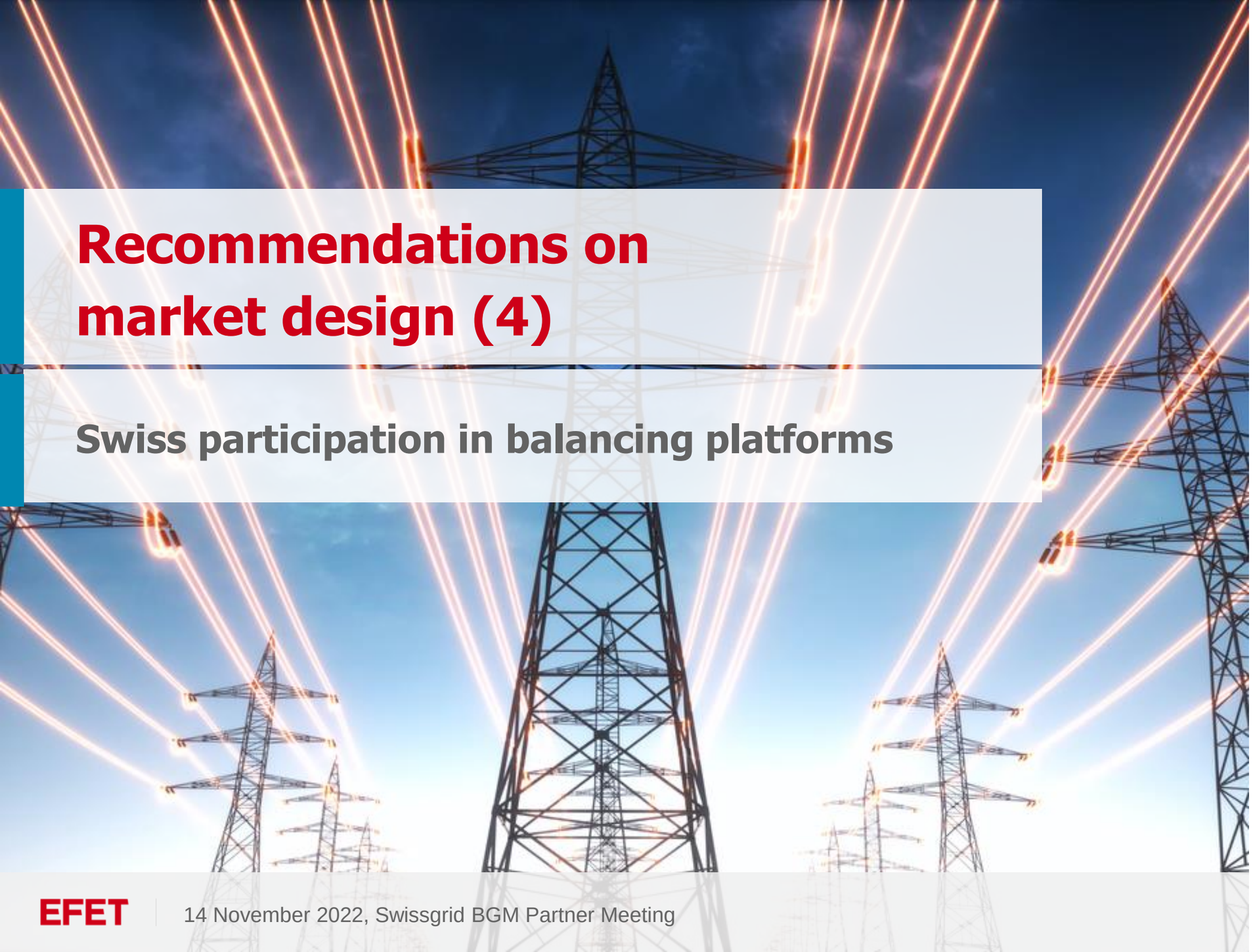
- Quick implementation of **continuous explicit ID capacity allocation**

Delays

- TSOs & NRAs still considering the impact of the current energy crisis
- **Paused** due to resources

Current status

- Discussion postponed to the next Italy North Stakeholder Forum in **April 2023**



Recommendations on market design (4)

Swiss participation in balancing platforms

Balancing platforms

EFET advocacy

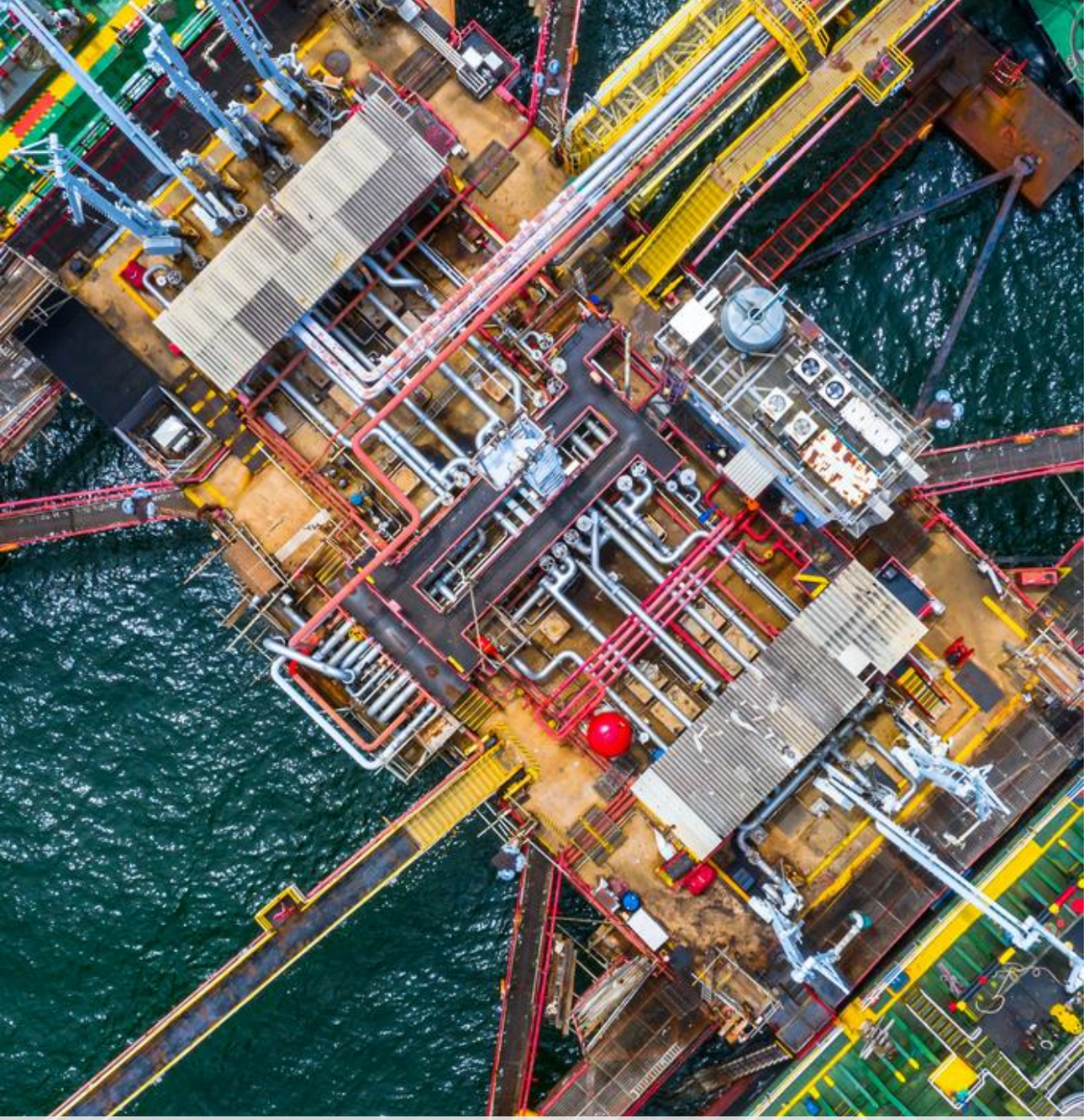
- **Inclusion of Switzerland** into the internal energy market (IEM)
- **Inclusion of Swissgrid in the balancing platforms** (PICASSO, MARI and TERRE) to secure the system security of the region

Current status

- Still subject of litigation at the General Court of the European Union
- Swissgrid using the platform but not connected to EU markets

Developments of markets in Switzerland

Perspective from the EU



Latest developments

Electricity rescue mechanism

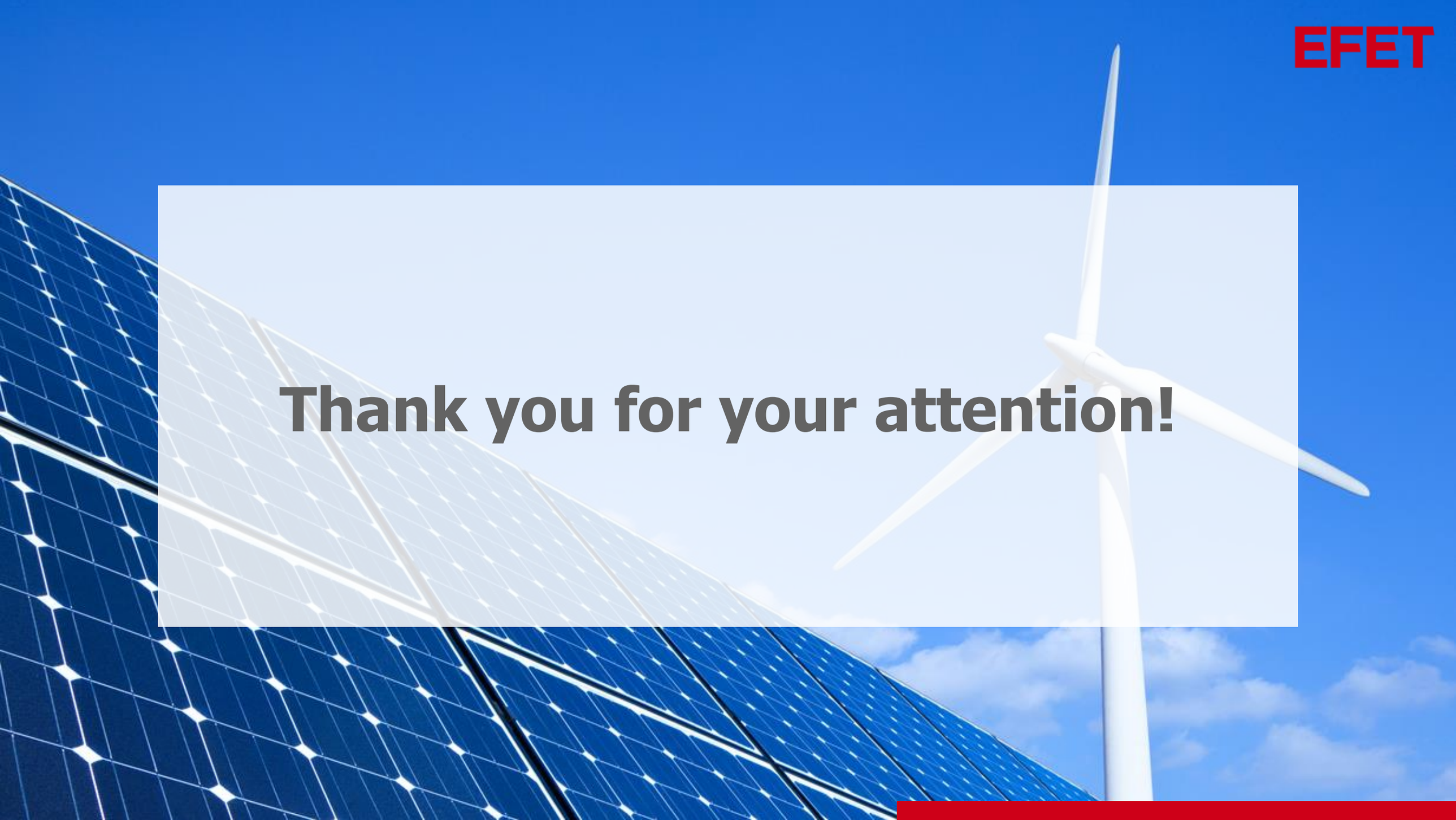
Consulted and adopted in May ‘22

Hydro water reserve

Introduced in Sept’ 22 and 400 GWh auctioned in Oct’ 22

Winter reserve

Consultation on-going (dual-fuel reserve power plants)

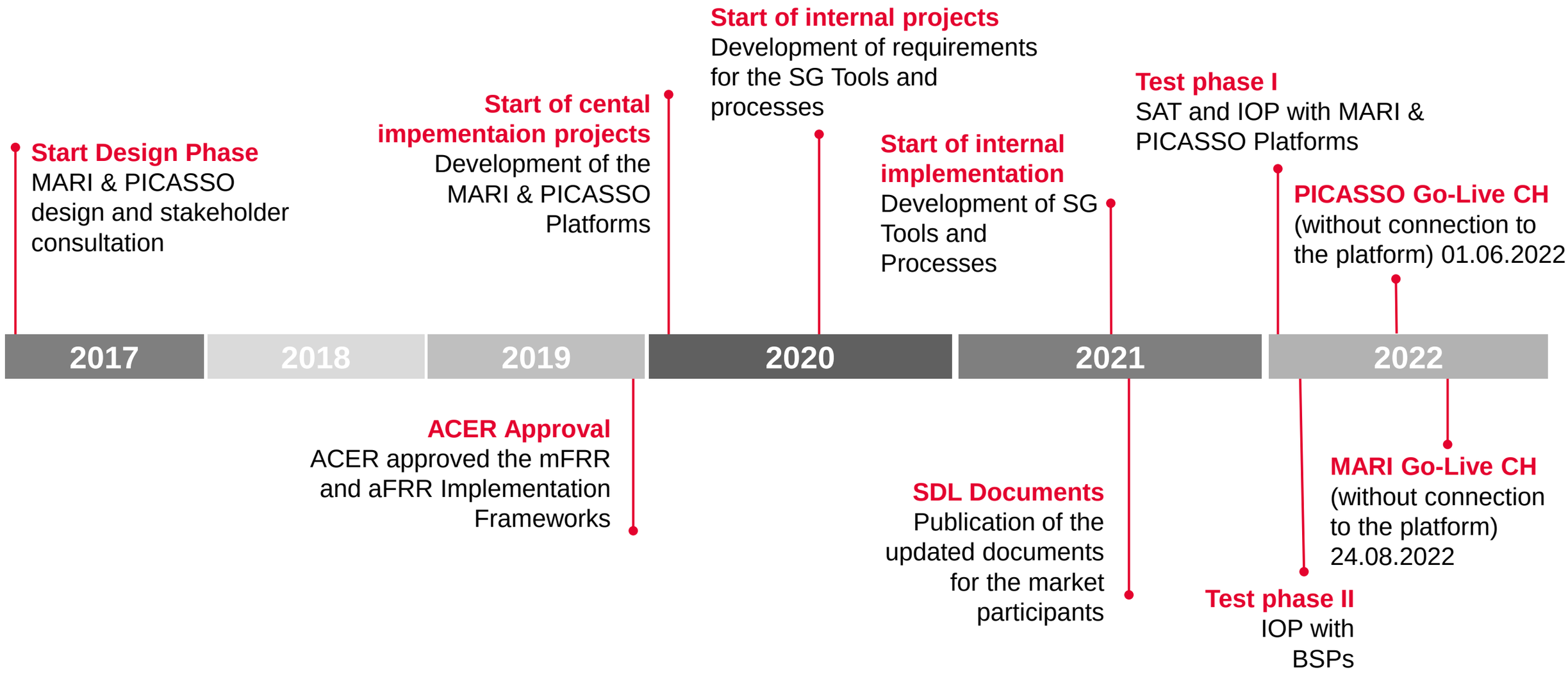

EFET
Thank you for your attention!

International balancing co-operations and impact on imbalance price

Dimitrios Nousios
Senior Specialist Product Development

swissgrid

MARI and PICASSO Roadmap



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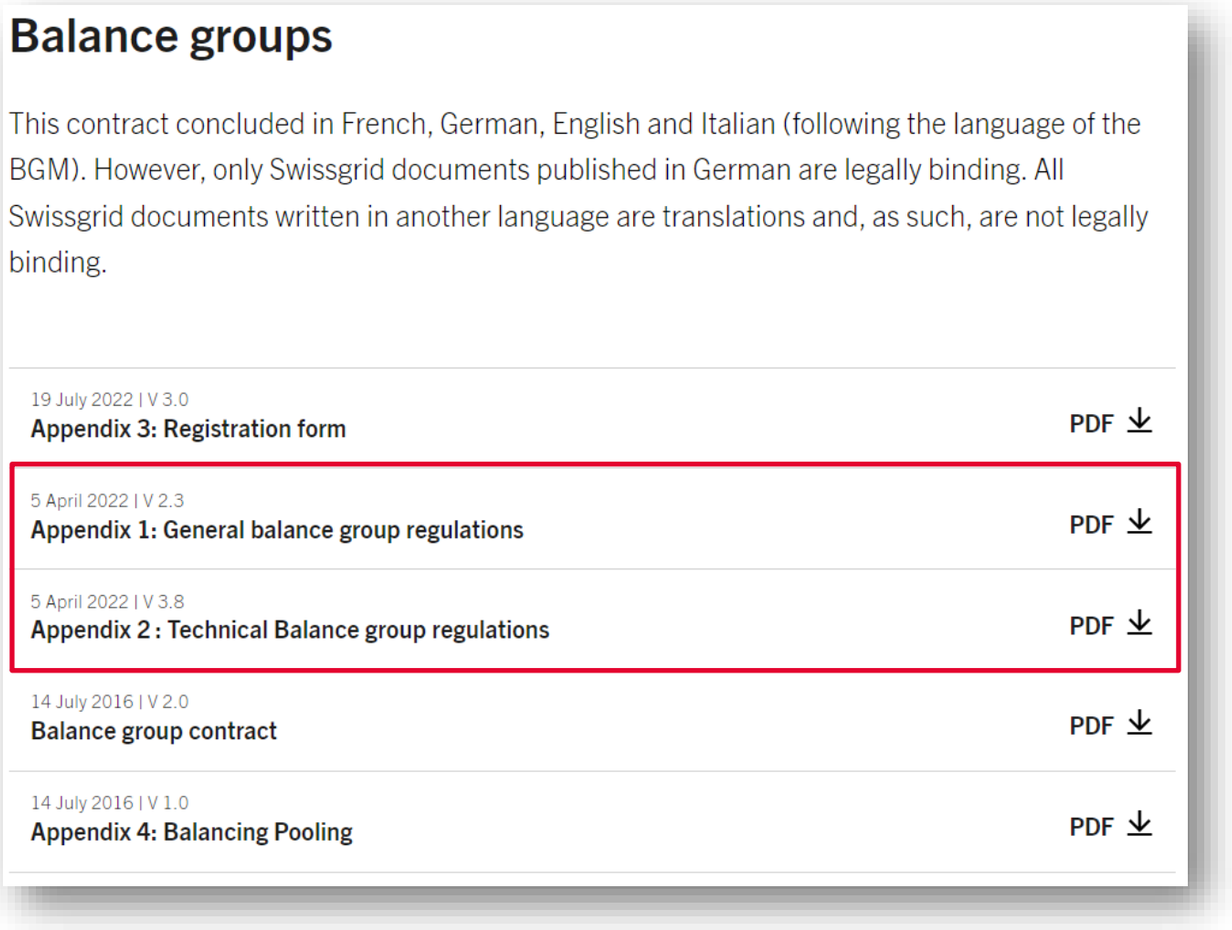
Changes in the General / Technical Balance Group Regulations

- As part of the PICASSO and MARI projects, the annexes 1 & 2 to the balance group contract were amended.
- The updated versions of the appendices were published on the Swissgrid website on 5th April 2022.
- Both documents are valid from 1st June 2022.



Balance groups

This contract concluded in French, German, English and Italian (following the language of the BGM). However, only Swissgrid documents published in German are legally binding. All Swissgrid documents written in another language are translations and, as such, are not legally binding.

19 July 2022 | V 3.0 **Appendix 3: Registration form**	PDF
5 April 2022 | V 2.3 **Appendix 1: General balance group regulations**	PDF
5 April 2022 | V 3.8 **Appendix 2 : Technical Balance group regulations**	PDF
14 July 2016 | V 2.0 **Balance group contract**	PDF
14 July 2016 | V 1.0 **Appendix 4: Balancing Pooling**	PDF

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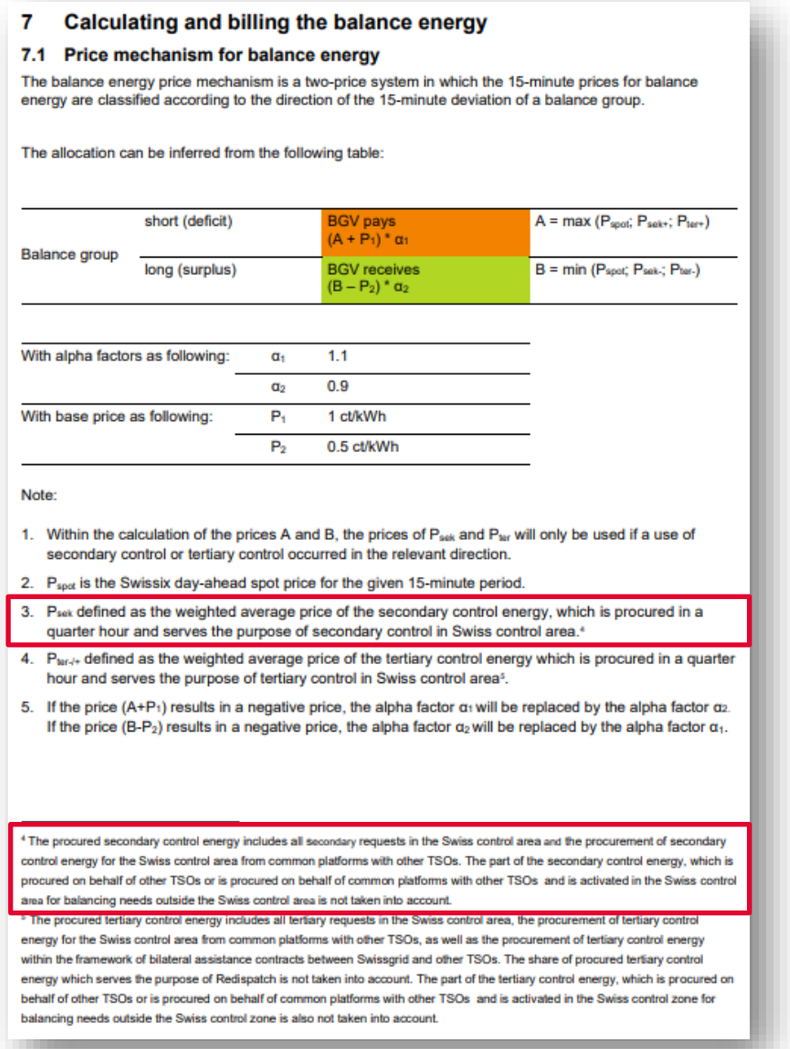
Updated Version of the general Balance Group Regulations (Annex 1)

After the introduction of PICASSO and MARI:

- The «secondary control energy component» of the balancing energy price (P_{sek}) is the weighted average price of the secondary control energy procured in a quarter of an hour, which serves the purpose of secondary control in the Swiss control area.
- The MARI transactions are taken into account in the «tertiary control energy component» of the balancing energy price (P_{ter}) in the same way as the TERRE transactions. Therefore, no specific changes in the General Balance Group Regulations were necessary for MARI.



7 Calculating and billing the balance energy

7.1 Price mechanism for balance energy

The balance energy price mechanism is a two-price system in which the 15-minute prices for balance energy are classified according to the direction of the 15-minute deviation of a balance group.

The allocation can be inferred from the following table:

Balance group	short (deficit)	BGV pays $(A + P_1) * \alpha_1$	$A = \max(P_{spot}; P_{sek+}; P_{ter+})$
	long (surplus)	BGV receives $(B - P_2) * \alpha_2$	$B = \min(P_{spot}; P_{sek-}; P_{ter-})$

With alpha factors as following:	α_1	1.1
	α_2	0.9
With base price as following:	P_1	1 ct/kWh
	P_2	0.5 ct/kWh

Note:

1. Within the calculation of the prices A and B, the prices of P_{sek} and P_{ter} will only be used if a use of secondary control or tertiary control occurred in the relevant direction.
2. P_{spot} is the Swissix day-ahead spot price for the given 15-minute period.
3. P_{sek} defined as the weighted average price of the secondary control energy, which is procured in a quarter hour and serves the purpose of secondary control in Swiss control area.[4]
4. $P_{ter-/+}$ defined as the weighted average price of the tertiary control energy which is procured in a quarter hour and serves the purpose of tertiary control in Swiss control area[5].
5. If the price $(A+P_1)$ results in a negative price, the alpha factor α_1 will be replaced by the alpha factor α_2. If the price $(B-P_2)$ results in a negative price, the alpha factor α_2 will be replaced by the alpha factor α_1.

[4] The procured secondary control energy includes all secondary requests in the Swiss control area and the procurement of secondary control energy for the Swiss control area from common platforms with other TSOs. The part of the secondary control energy, which is procured on behalf of other TSOs or is procured on behalf of common platforms with other TSOs and is activated in the Swiss control area for balancing needs outside the Swiss control area is not taken into account.

[5] The procured tertiary control energy includes all tertiary requests in the Swiss control area, the procurement of tertiary control energy for the Swiss control area from common platforms with other TSOs, as well as the procurement of tertiary control energy within the framework of bilateral assistance contracts between Swissgrid and other TSOs. The share of procured tertiary control energy which serves the purpose of Redispatch is not taken into account. The part of the tertiary control energy, which is procured on behalf of other TSOs or is procured on behalf of common platforms with other TSOs and is activated in the Swiss control zone for balancing needs outside the Swiss control zone is also not taken into account.

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Accounting process before & after MARI / PICASSO

	Before	After
BSP compensation	mFRR: price of activated offer (Pay as bid) aFRR: Based on CH spot price (index pricing)	**Connected with the Platforms:** Marginal Pricing (BSP receives minimum the Marginal Price) **Disconnected from the Platform:** price of activated offer (pay as bid)
Resolution of the calculations	1h	15min for mFRR and 4s for aFRR
Invoicing	monthly	monthly

	Before	After
Pricing of the tertiary/secondary control energy component	mFRR: Based on TERRE Price/price of activated offer aFRR: Based on CH spot price	Based on MARI/TERRE/Picasso Price or price of activated offer in case of disconnection from the Platforms
Weighting factor	mFRR: satisfied demand from TERRE and all mFRR activations in CH aFRR: all activations	Satisfied mFRR/aFRR demand from MARI/TERRE/PICASSO (all activations, in case of disconnection from the Platforms)

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Secondary control energy component of the balancing energy price (P_{sec})

Short

BRP pays $(A + P_1) \cdot \alpha_1$

with $A = max(P_{spot}; P_{sek+}; P_{ter+})$

Long

BRP receives $(B - P_2) \cdot \alpha_2$

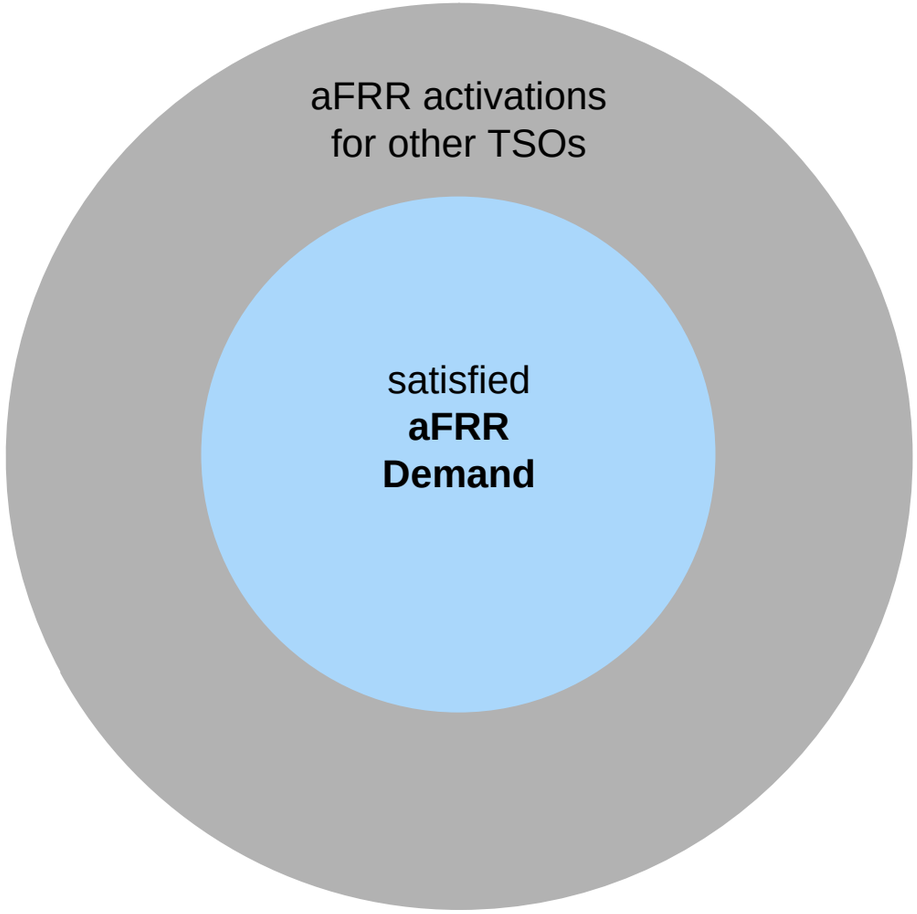
with B $= min(P_{spot}; P_{sek-}; P_{ter-})$

α_1 = 1.1	α_2 = 0.9
P_1 = 1 ct/kWh	P_2 = 0.5 ct/kWh

Contribution to $P_{sek\pm}$:

Procured secondary control energy for control needs in the **Swiss** control area

PICASSO



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Influence of PICASSO on the balancing energy price

According to the Balance Group contract Annex 1, chapter 7.1:

Satisfied control energy demand from PICASSO	is considered in the balancing energy price
aFFR-activations in the Swiss control area for other PICASSO TSOs	is **not** considered in the balancing energy price

Examples

1 100 MWh control energy demand satisfied by PICASSO for 40 EUR/MWh (e.g.: activated in Germany for Switzerland)

→ The 100 MWh satisfied Swiss demand for 40 EUR/MWh will be considered in the balancing energy price.

2 50 MWh aFRR activated in Switzerland for PICASSO. Simultaneously, 70 MWh control energy demand satisfied for Switzerland by PICASSO. Clearing-Price 50 EUR/MWh.

→ The 50 MWh aFRR activations will **not** be considered in the balancing energy price. The 70 MWh satisfied demand for 50 EUR/MWh will be considered in the balancing energy price.

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Tertiary control energy component of the balancing energy price (P_{ter})

Short

BRP pays $(A + P_1) \cdot \alpha_1$

with $A = max(P_{spot}; P_{sek+}; P_{ter+})$

Long

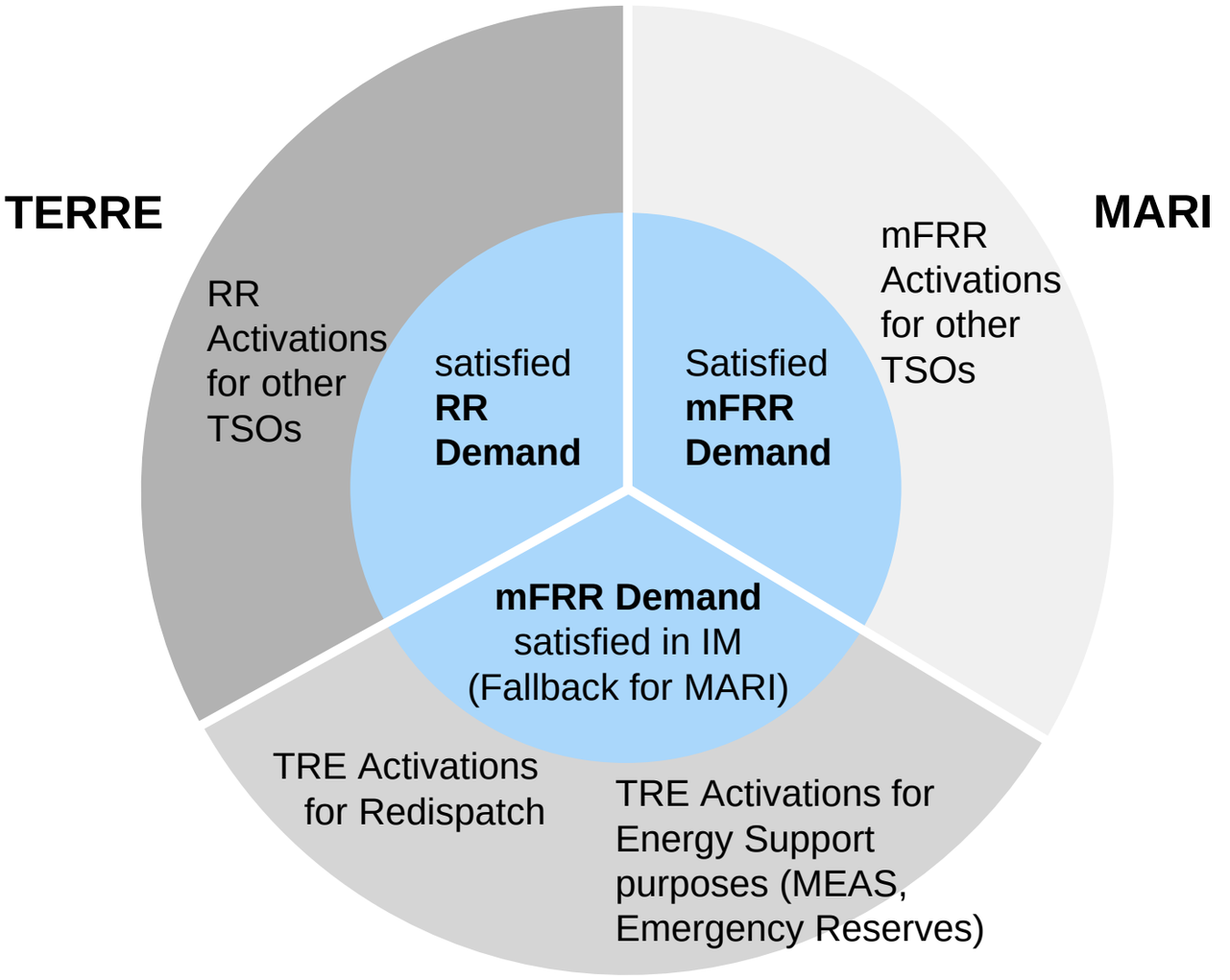
BRP receives $(B - P_2) \cdot \alpha_2$

Mit B $= min(P_{spot}; P_{sek-}; P_{ter-})$

α_1 = 1.1	α_2 = 0.9
P_1 = 1 ct/kWh	P_2 = 0.5 ct/kWh

Contribution to $P_{ter\pm}$:

Procured tertiary control energy for control needs in the **Swiss** control area



Example: tertiary control energy component of the balancing energy price

RR

200 MW RR- activated in Switzerland for TERRE. Simultaneously, -50 MW control energy demand satisfied for Switzerland by TERRE. CBMP 30 EUR/MWh.

→ The 200 * ¼ = 50 MWh RR- activations are **not** considered in the balancing energy price. The 50 * ¼ = 12.5 MWh satisfied demand for 30 EUR/MWh are considered in the balancing energy price.

mFRR

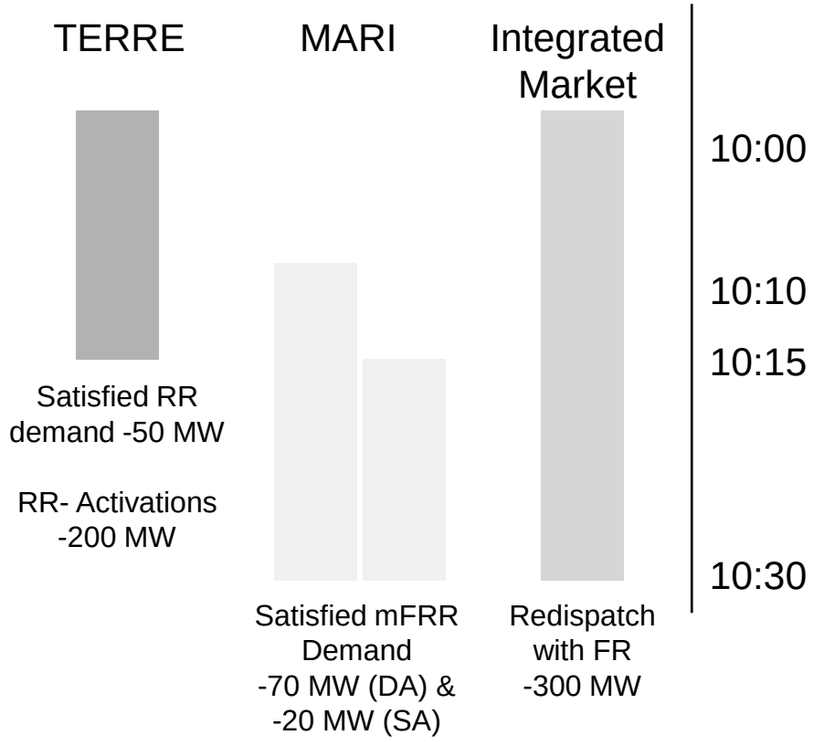
-70 MW control energy demand from 10:10 to 10:30 (Direct Activation) and additionally -20 MW control energy demand 10:15 – 10:30 (Scheduled Activation) satisfied for Switzerland by MARI. CBMP DA 5 EUR/MWh in QH1 and QH2. CBMP SA 20 EUR/MWh.

→ 10:00 – 10:15: 70 * 1/12 = 5.83 MWh for 5 EUR/MWh are considered in the balancing energy price.

→ 10:15 – 10:30: 70 * ¼ = 17.5 MWh for 5 EUR/MWh and 20 * ¼ = 5 MWh for 20 EUR/MWh are considered in the balancing energy price.

IM

The TRE- activations for international redispatch are **not** considered in the balancing energy price.



P_{ter-} :

10:00 – 10:15 22.05 EUR/MWh
*= (12.5*30 + 5.83*5) / (12.5 + 5.83)*

10:15 – 10:30 8.33 EUR/MWh
*= (17.5*5 + 5*20) / (17.5 + 5)*

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Imbalance of the Swiss control area and activated balancing energy

- With the implementation of MARI and PICASSO, the «Control Area Balance» File has been updated.
- The file can be found on the Swissgrid website: Energy statistic Switzerland (swissgrid.ch)
- The publication takes place since October 2022 with a 15 min resolution and a lead time of around 15 min.

A	B	C	D	E	F	G	H	I	J	K	L	M	N
Date Time	Abgedeckte Bedarf der aFRR+	Abgedeckte Bedarf der aFRR-	NRV+ (Import)	NRV- (Export)	Abgedeckte Bedarf der SA mFRR+	Abgedeckte Bedarf der SA mFRR-	Abgedeckte Bedarf der DA mFRR+	Abgedeckte Bedarf der DA mFRR-	Abgedeckte Bedarf der RR+	Abgedeckte Bedarf der RR-	FRCE+ (Import)	FCRE- (Export)	Total System Imbalance (Positiv = long / Negativ = short)
01.01.2022 00:00	95.45	0.00	14.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16.21	0.00	-126.45
01.01.2022 00:15	120.68	0.00	26.74	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-6.66	-140.75
01.01.2022 00:30	23.51	0.00	87.98	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-3.66	-107.83
01.01.2022 00:45	16.81	0.00	68.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.66	0.00	-86.65

swissgrid

Together we can solve this tense winter situation!
See you again in a year

Swissgrid Ltd
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5001 Aarau
Switzerland

swissgrid