First experiences with EQUIGY – the Crowd Balancing Platform in Switzerland

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1 Introduction to EQUIQY

2 Crowd Balancing Platform (CBP)

3 Completed Swiss pilot project

4 Current Activities and Outlook

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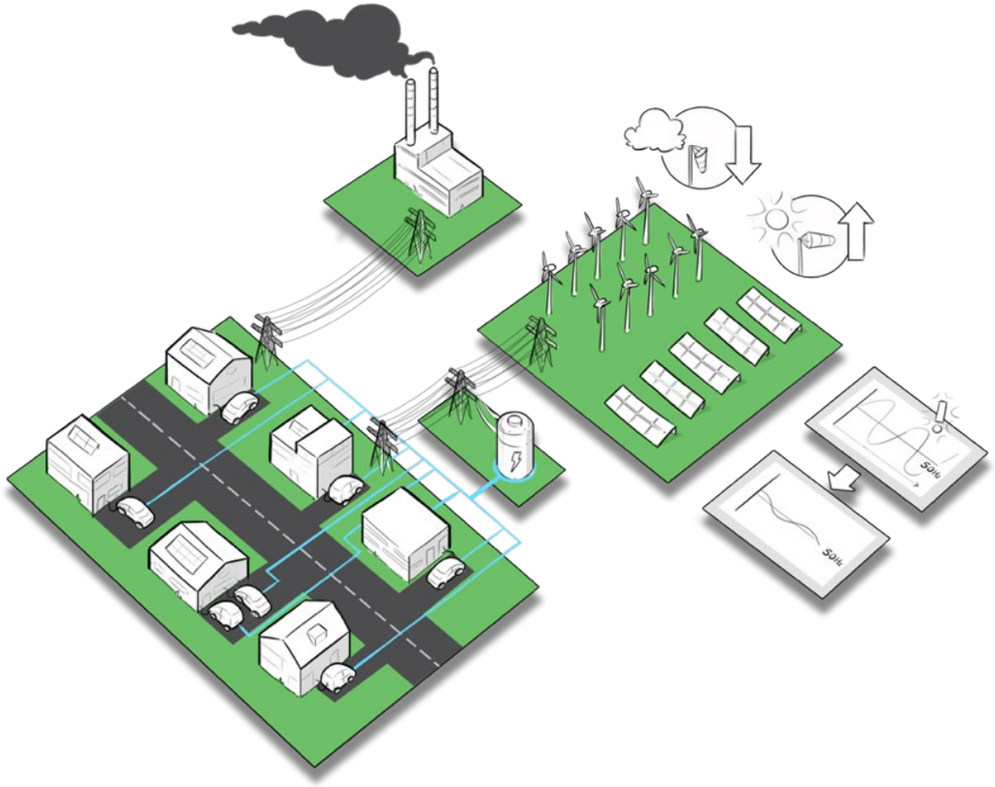
Challenges and opportunities with distributed energy resources

- **Challenges**
  - Higher needs for flexibility.
  - Fragmentation of power systems.
  - Internationalization of markets.
  - Increased penetration of Distributed Energy Resources (DERs).
  - Increasing electro-mobility shares. Projection: 360,000 electric vehicles in Switzerland by 2030.
  - DERs are not trivial to control in large aggregations.

- **Opportunities**
  - If appropriately controlled, aggregations of electric vehicles, stationary batteries and other DERs can be transformed from a problem to a solution.
  - To unlock this flexibility, DERs must be able to easily access the ancillary services markets.
  - Close collaboration among all stakeholders can lead to creation of standards (communication, processes, etc.).



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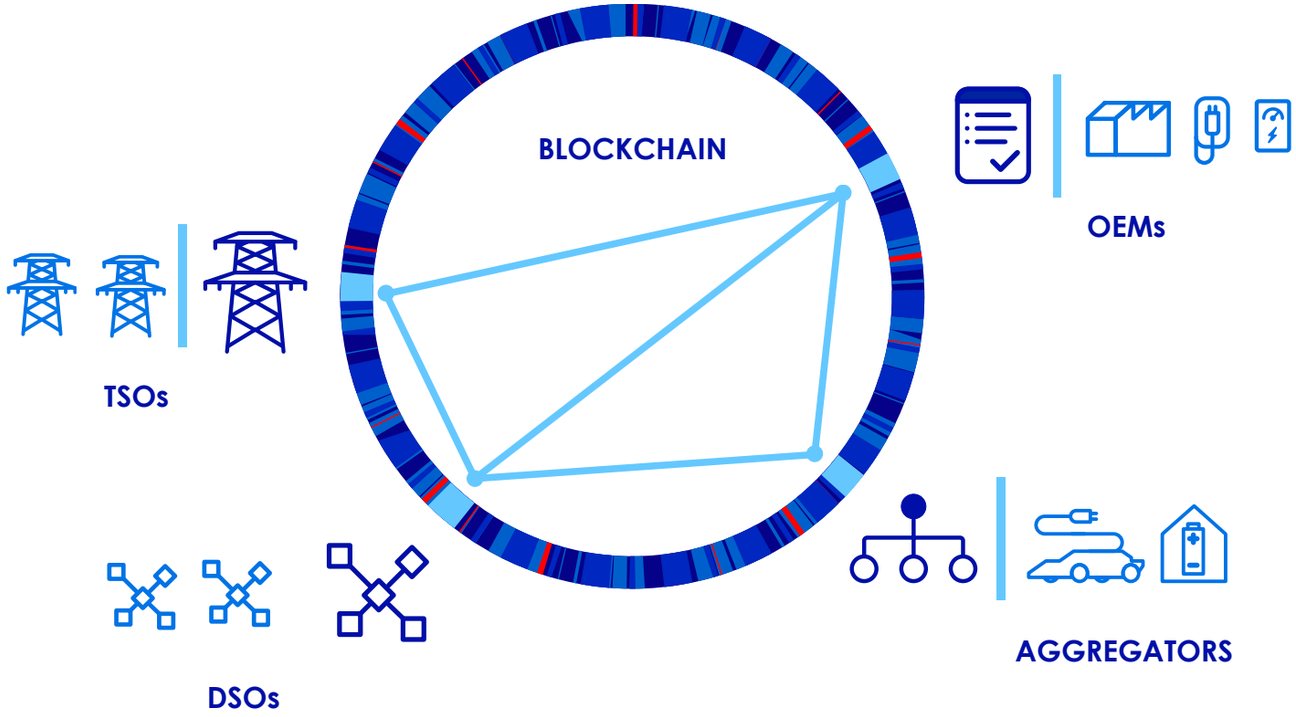
EQUIGY – Crowd Balancing Platform (CBP) in a nutshell

- EQUIGY founded in December 2020 as a Joint Venture of TenneT (Netherlands and Germany), Swissgrid and Terna.
- Facilitates access of DERs to markets for ancillary services and congestion management.
- Collaboration with Original Equipment Manufacturers (OEMs) of DERs (electric vehicles, batteries, heating/cooling devices).
- Uses blockchain technology to link the various actors and increase transparency: DERs, OEMs, aggregators, TSOs, DSOs.
- CBP increases market liquidity and automates business processes.
- Allows TSOs to validate the delivery of ancillary services with the functionality to collect device measurements directly from the IoT cloud of DERs.



EQUIGY: A rapidly growing ecosystem

- APG joined the EQUIGY Joint Venture in Spring 2021.
- Increasing number of OEM, aggregator and DSO partners.
- Completed pilot projects
  - The Netherlands: automatic Frequency Restoration Reserve (aFRR).
  - Germany: redispatch.
  - Switzerland: Frequency Containment Reserve (FCR).

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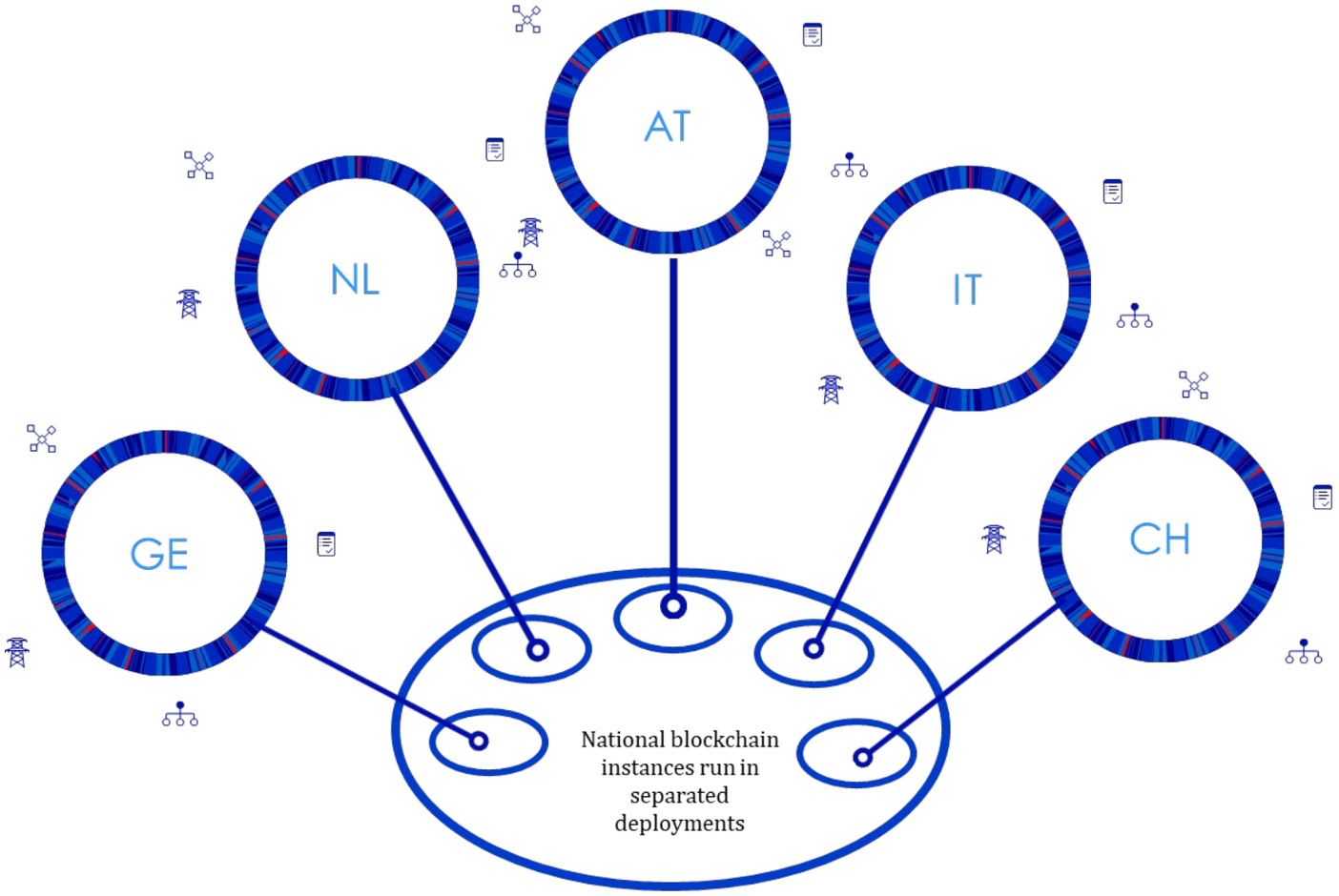
CBP structure: Creating European standards while maintaining national markets

The platform set-up is designed to:

- Create European standardisation while maintaining independence in national markets.
- Share a common core to leverage synergies across markets.
- Socialise relevant costs as much as possible between TSOs.



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Layered CBP architecture

Aggregators

OEMs

DSOs

CBP APIs

- Interface to backend systems
- Tailored to the needs of specific markets and products

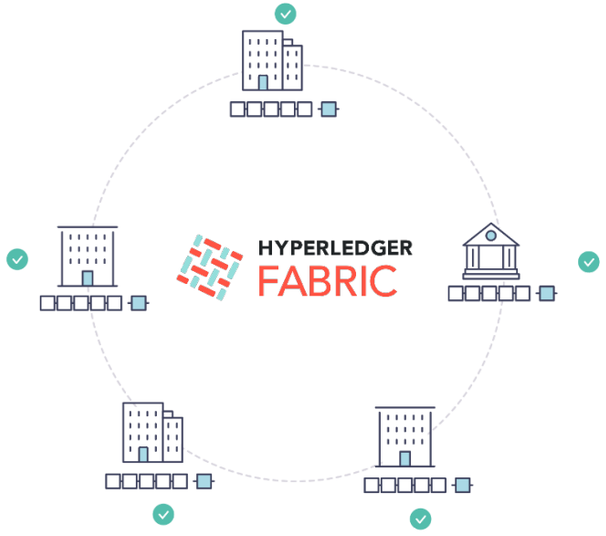
CBP Apps

- Business logic, functionalities and processes
- Tailored to the needs of specific markets and products

CBP Core

- Includes the shared ledger (blockchain) and background platform functionalities
- Common for all markets and products

TSO



Why blockchain?

- Immutability and trusted replication (“one truth”).
- Preserving privacy among network participants.
- Automatizing business processes with smart contracts.

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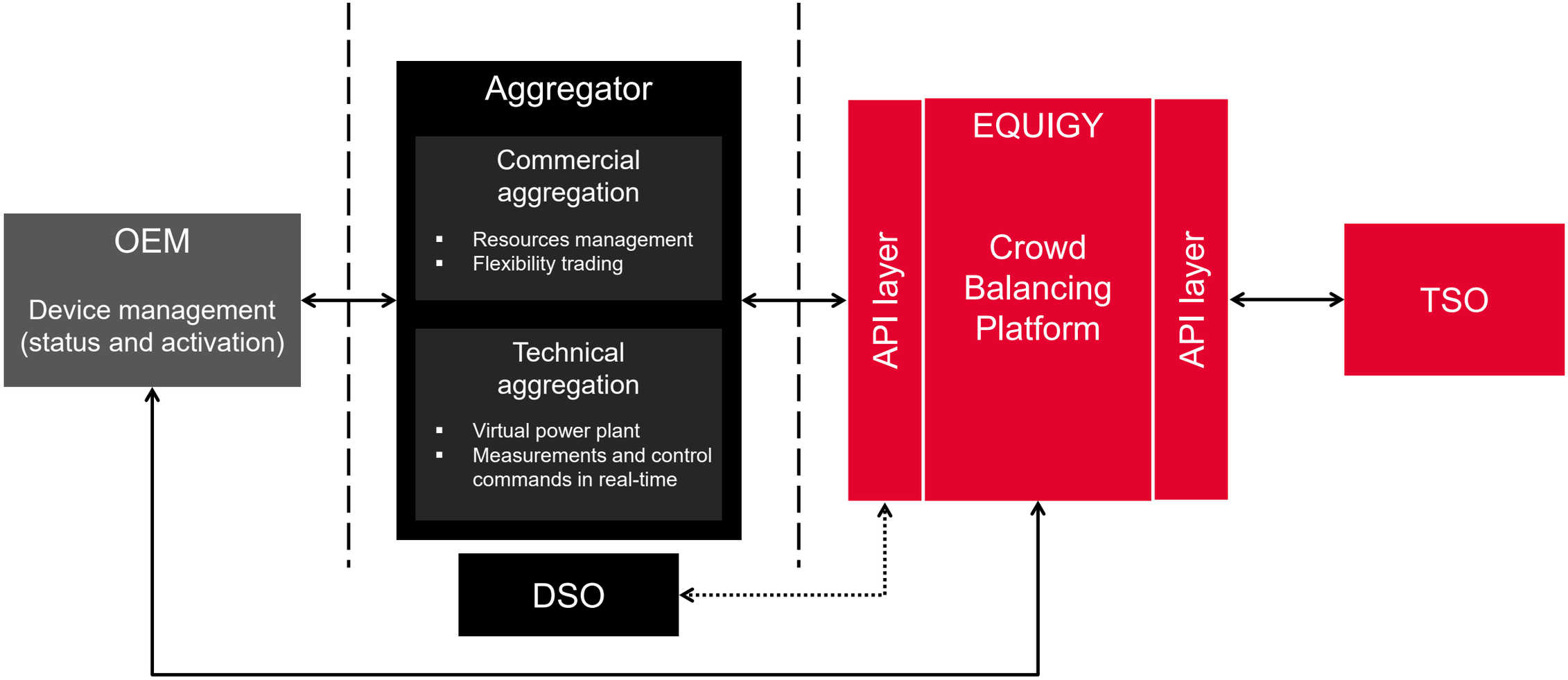
Who does what in CBP

Integration of CBP APIs is the responsibility of OEMs, aggregators and DSOs

Development of the platform and API layer is the responsibility of EQUIGY and the participating TSOs



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Scope of Swiss EQUIGY pilot

- Focus on Frequency Containment Reserve (FCR) with small-scale flexible devices (e.g., electric vehicles, batteries, heating/cooling devices).
- Main objectives:
  - Verify that CBP and its blockchain technology can be used as basis for all FCR-related business projects.
  - Identify the benefits for involved partners (focus on real-time monitoring of reserve provision and ex-post validation of FCR delivery).
  - Test market penetration, evaluate technology acceptance and investigate business models for involved parties.
- Testing with Alpiq as the commercial and technical aggregator using a 1.2 MW battery.
- Pilot project successfully completed in August 2020.
- Possibly the first industry-scale prototype of FCR provision with blockchain technology worldwide.
- Key milestone before Swissgrid's decision to join the EQUIGY Joint Venture.
- An operational FCR product on CBP is not available yet; the operationalization phase is know starting.

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FCR business processes in a user journey

Legend

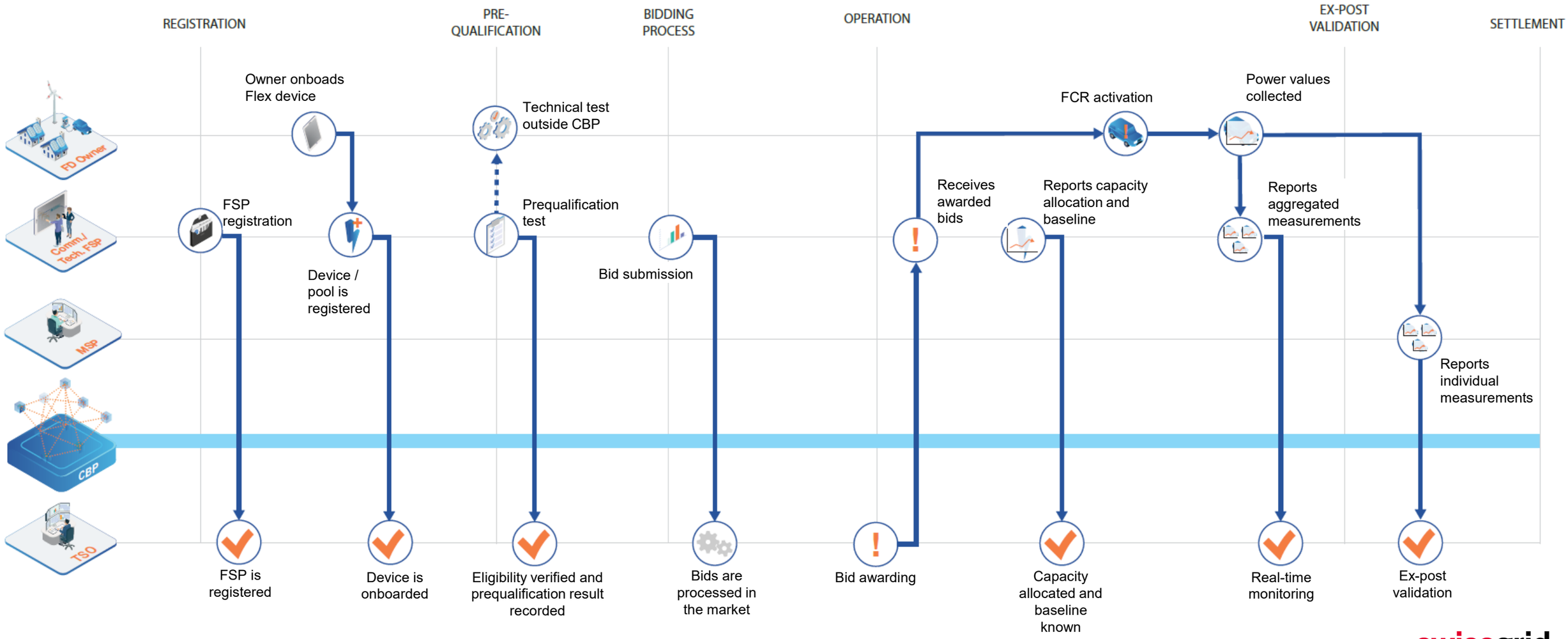
FD Owner - Flex Device Owner

Comm./ Tech. FSP - Commercial Or Technical FSP

MSP - Metering Service Provider

CBP - Crowd Balancing Platform

TSO - Transmission Service Operator



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Testing results and dashboard

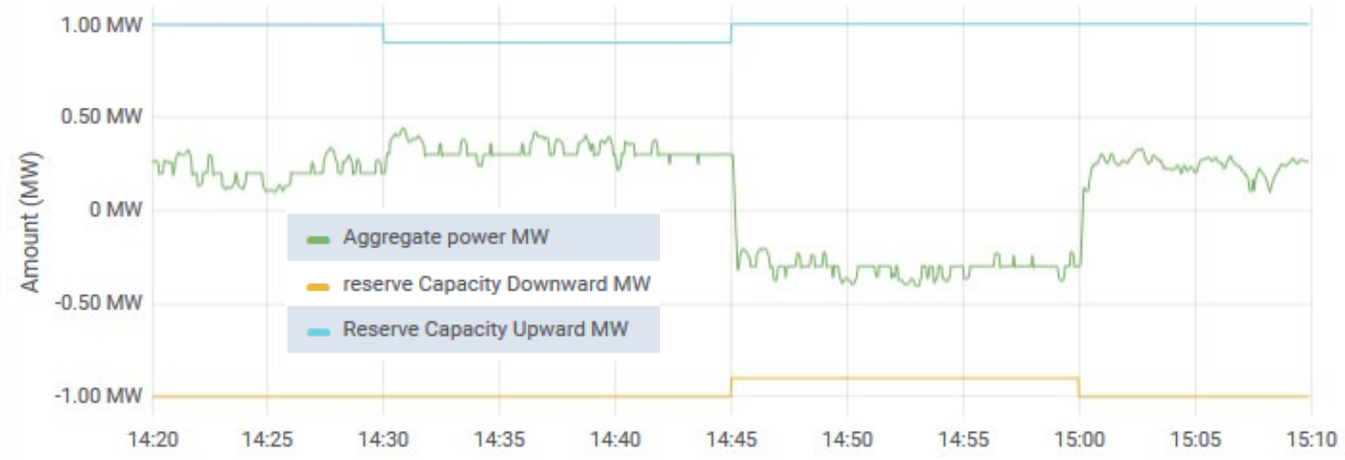
Registration of flexible resource

id	regist. Time	Resource Type	BRP ID	BRP Name	Device Type	LER	Nom. Power	Gradient
7609cb9a-254d-465c-8c4e-88b7e5e56993	2020-07-20 11:06:39	flex device	12X-0000000072-S	EBM_ENERGIEAG-ST	BAT	1	1.2	3.85

Submission of bid

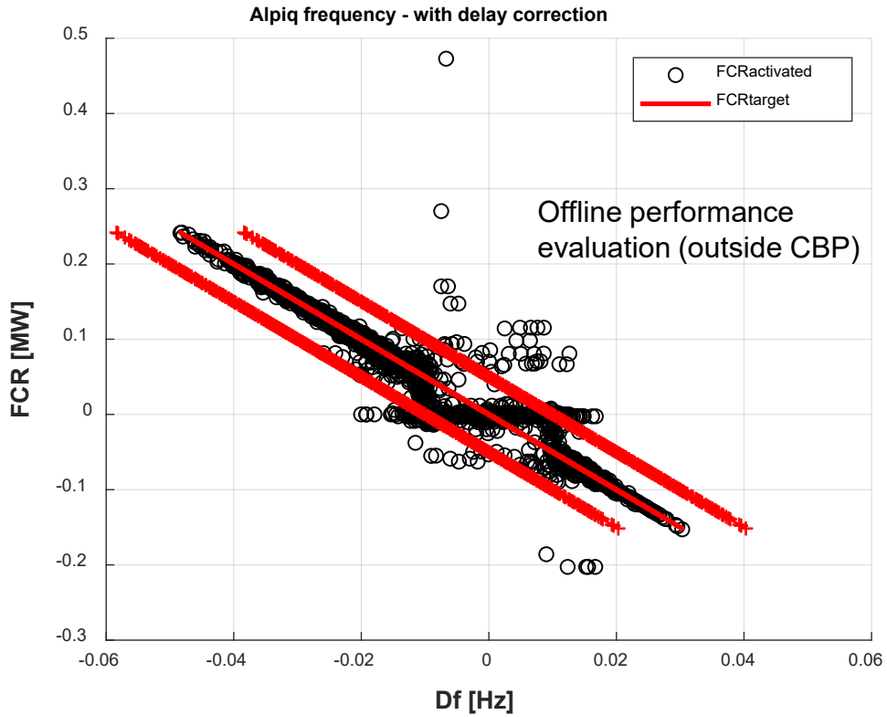
FSP	reserveBidPeriodTimeIntervalStartDateTime	BidTimeSeries ID	created	Position	Quantity (MW)
PRL_20_08_18_12XSDL-ATEL---W_2XSDL-ATEL---W	2020-08-18 01:00:00	b32f0ce1-c156-4a9b-82e2-877608222db-1	2020-08-04 11:28:51	1	1.00 MW

Real-time monitoring data



Tests performed:

- Integration tests
- Functional tests
- End-to-end tests
  - Registration
  - Bidding
  - Activation / Awarding
  - Real-time monitoring



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New EQUIGY activity in Switzerland: TSO-DSO coordination

- Stakeholders
  - TSO: Need for balancing energy, congestion management, etc.
  - DSO: Need for peak load and congestion management, etc.
  - Aggregator: Offer of aggregated flexibility from distributed resources.
- Goals
  - Concept for systematic coordination between the TSO and DSO with respect to the use of third-party distributed flexibility resources.
  - Implementation on the EQUIGY platform.
- Innovation
  - Market-based allocation of the available flexibility between the system operators considering their actual needs.
  - The aggregator markets the flexibility and the system operator with the highest willingness to pay receives it.
  - Key milestone with particular importance for Switzerland and Swissgrid.
- Benefits
  - For the TSO and DSO: Transparency, efficiency, situational awareness.
  - For the aggregator: Optimized revenue stream, standardized communication.

Innovation

Market efficiency

Transparency

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Pilot project between Swissgrid and ewz

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ewz

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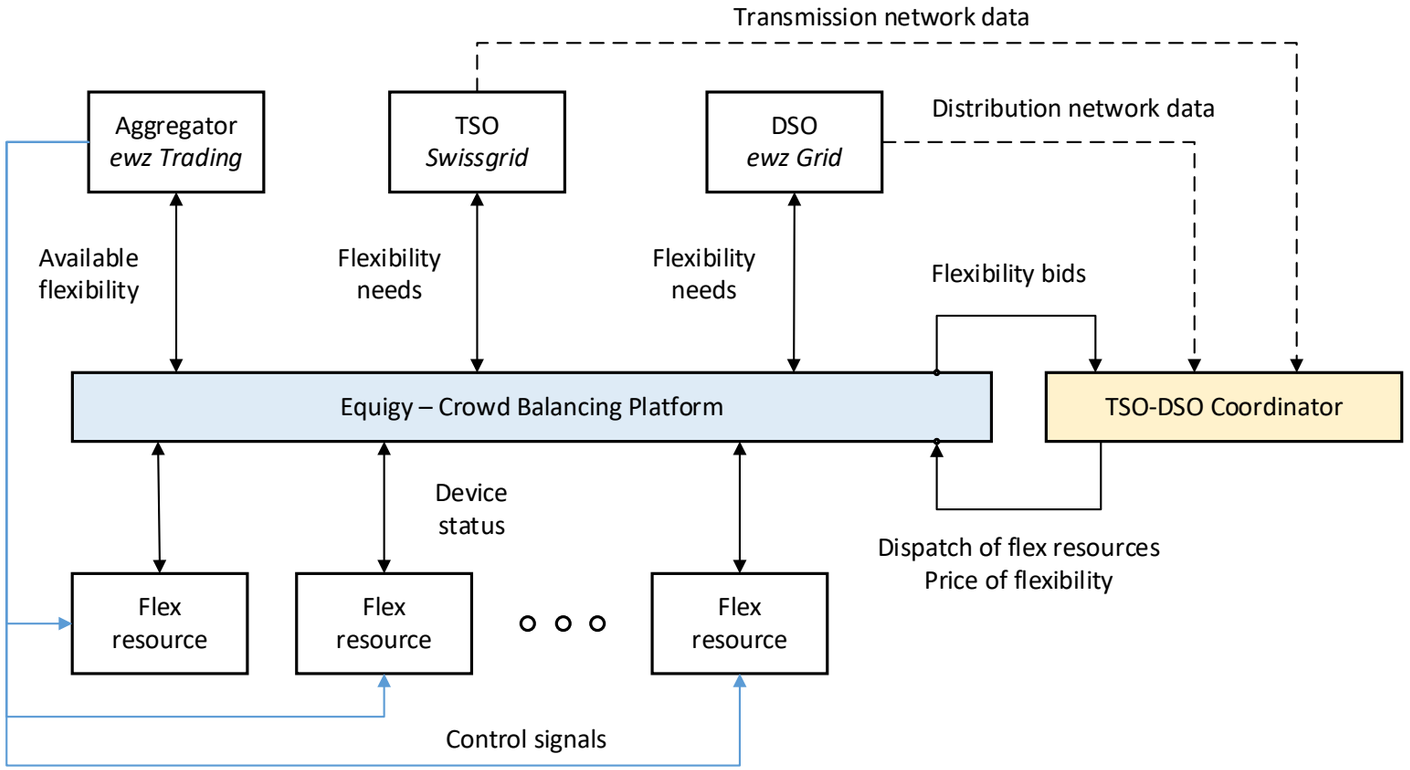
Wichtiger Schritt für die Integration dezentraler Energiequellen und Verbrauchern

Swissgrid und ewz starten gemeinsames Equigy-Pilotprojekt zur Koordination von Übertragungsnetz- und Verteilnetzbetreiber

Swissgrid und ewz haben im zweiten Quartal 2021 ein neues Pilotprojekt in Verbindung mit der Crowd Balancing Platform Equigy begonnen. Mit dem Projekt wird ein innovativer Ansatz für die zukünftige Nutzung von dezentralen Energiequellen und Verbrauchern, wie Heimbatteriespeicher, Photovoltaik-Anlagen, Wärmepumpen oder Elektro-Mobilität, für die Bedürfnisse des Übertragungs- und Verteilnetzes entwickelt und getestet.

Die Zusammenarbeit zwischen der Übertragungsnetzbetreiberin (ÜNB) Swissgrid und den verschiedenen Verteilnetzbetreibern (VNB) spielt schon heute eine wichtige Rolle innerhalb des Schweizer Stromsystems. Zukünftig wird ihr voraussichtlich noch eine grössere Bedeutung zukommen. Swissgrid und ewz (zusammen mit ihrer Tochtergesellschaft Smart Grid Solutions AG) führen aus diesem Grund gemeinsam ein Pilotprojekt in Verbindung mit der Crowd



- ewz joins the project with two distinct roles: DSO (ewz Netze) and aggregator (ewz Market).
- Swissgrid focus is on the products of the Integrated Market, namely tertiary control energy and international zonal redispatch.

Depending on the complexity, the TSO-DSO Coordinator module may be either a stand-alone component or an integral part of CBP.

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The pilot project is organized in phases

Phase A
Basic concept
(Q2/2021 to Q3/2022)

- Simpler rule-based approach
- Local flexibility market with DSO priority
- Traffic light model: TSO activations can be blocked by the DSO to avoid local violations (and vice versa)
- Quick prototyping on EQUIGY platform

Phase B
Advanced concept

- Common TSO-DSO flexibility market model
- Optimization-based market clearing considering grid constraints
- Focus on optimality and added value

Phase C
Professional concept

- Methodological improvements (e.g., decentralized optimization model)
- Focus on efficiency and scalability
- Adaptations to specific requirements

Phase D
Integrated platform

- Complete software module with all functionalities
- Focus on full integration in the EQUIGY platform
- Integration with backend systems of Swissgrid und ewz

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Summary

- EQUIGY is a growing consortium of European TSOs that co-develop CBP.
- The first pilot project on FCR was successfully completed in Switzerland.
- Operationalization of the EQUIGY FCR prototype at Swissgrid is about to start.
- Ongoing new Swissgrid pilot on TSO-DSO coordination in collaboration with ewz.
- Always open to discuss ideas about new EQUIGY pilot projects.

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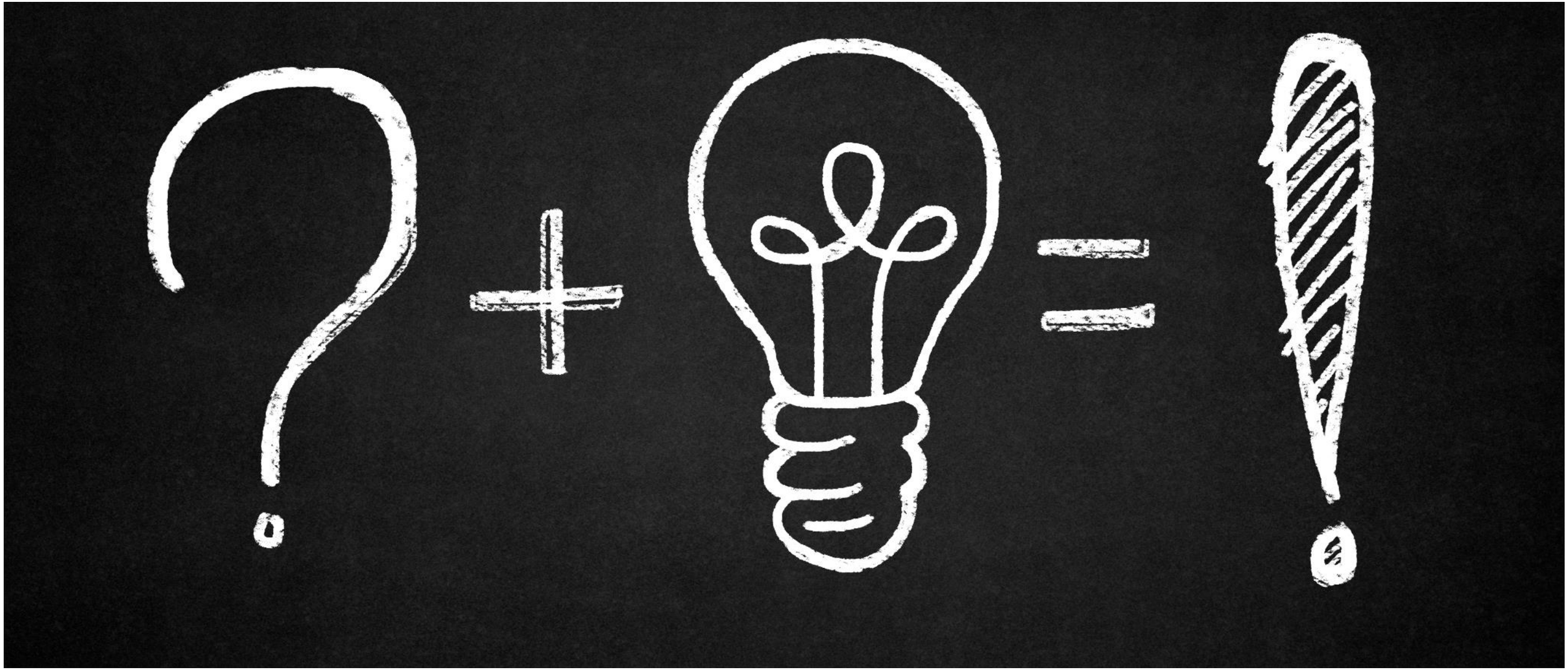
Questions?



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Thank you for your attention

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