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
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.).
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).

TSO Owners

- Tenner
- swissgrid
- APG

Other companies in the ecosystem:
- Nissan
- ENGIE
- enervalis
- GREENCOM
- ewz
- BMW
- ALPIQ
- Viessmann
- Energie samen
- Sun
- The Mobility House
- 50hertz
- Vandebron
- SCHOLT
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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.
Layered CBP architecture

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

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

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

Why blockchain?
- Immutability and trusted replication ("one truth").
- Preserving privacy among network participants.
- Automatizing business processes with smart contracts.
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

- **OEM**
  - Device management (status and activation)

- **Aggregator**
  - Commercial aggregation
    - Resources management
    - Flexibility trading
  - Technical aggregation
    - Virtual power plant
    - Measurements and control commands in real-time

- **DSO**

- **EQUIGY**
  - Crowd Balancing Platform

- **API layer**

- **TSO**

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 now starting.
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

**REGISTRATION**
- Owner onboards Flex device
- FSP registration
- Device / pool is registered
- FSP is registered

**PRE-QUALIFICATION**
- Technical test outside CBP
- Prequalification test
- Device is onboarded
- Eligibility verified and prequalification result recorded

**BIDDING PROCESS**
- Bid submission
- Bids are processed in the market
- Bid awarding
- Capacity allocated and baseline known

**OPERATION**
- FCR activation
- Power values collected
- Reports aggregated measurements
- Real-time monitoring
- Ex-post validation

**EX-POST VALIDATION**
- Receives awarded bids
- Reports capacity allocation and baseline
- Reports individual measurements

**SETTLEMENT**
- Reports capacity allocation and baseline
- Real-time monitoring
- Ex-post validation
Tests performed:
- Integration tests
- Functional tests
- End-to-end tests
  - Registration
  - Bidding
  - Activation / Awarding
  - Real-time monitoring

Registration of flexible resource

<table>
<thead>
<tr>
<th>id</th>
<th>regist. Time</th>
<th>Resource Type</th>
<th>BRP ID</th>
<th>BRP Name</th>
<th>Device Type</th>
<th>LER</th>
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Submission of bid

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<th>FSP</th>
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<td>2020-08-04 11:28:51</td>
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</tr>
</tbody>
</table>

Real-time monitoring data

Alpiq frequency - with delay correction
- Offline performance evaluation (outside CBP)
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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.
Pilot project between Swissgrid and ewz

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.
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
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.
Questions?
Thank you for your attention

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