TSO - DSO INTERACTION

Austria

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MOTIVATION TSO-DSO INTERACTION

Key Drivers

- **Increasing availability of flexibility in lower grid levels** due to electrification of heat and mobility, but also industrial processes
- **Increasing need for flexibility:** Flexibility is needed to counteract high volatile energy sources (Wind, PV) by Congestion management, Frequency/Voltage control

Challenges

- Flexibility activation of the TSO can lead to **higher simultaneity** in the distribution grid
- Flexibility should be **used optimally by both TSOs and DSOs**

⇒ **Coordination for flexibility use for network operators**

Selected open issues for TSO-DSO interaction

- **Harmonization and standardization** of ICT architecture, requirement and interfaces
- **Improved regulatory mechanisms** to facilitate interaction between TSOs and DSOs

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Preventive solutions

- **Fixed power limitation** or limited participation in the balancing energy market by fixed maximum value per unit
- **Feed-in management** (P (U) or Q (U)) as well as load management
- **Distribution of balancing energy activation** to different grid areas by virtual power plants regardless of the network status

Continous coordination

- Simplified coordination possible if there is only one virtual power plant operating in a distribution grid section (more interesting for simulation)
- Continous coordination between VPP-DSO-TSO
  - Distribution of the activation signal by distribution system operators
  - Common marketplace for flexibility
  - Comparison of 4 different TSO-DSO schemes in 4 different countries
  - Constant coordination near real-time between distribution system operator, aggregator and transmission system operator

General Project Information & Traffic Light System (TLS)

- **H2020 call**: “Demonstration of smart grid, storage and system integration technologies with increasing share of renewables: distribution system”.
- **Objectives**
  - The role of the DSO as system optimizer and as market facilitator.
  - Integration of existing demonstration activities in three different regions allowing to move from single solutions to an integrated management at a higher scale while focusing on the scalability and replicability considering current and evolving market (and regulatory) conditions.
- **3 Demonstrators & 3 DSOs**
  - *Portugal (EDP.D), Slovenia (Elektro Ljubljana) and Sweden (Ellevio)*
- **Budget**
  - **EU Contribution :** 11.320.811 €
  - **Total Cost :** 14.553.618 €
- **Project duration**
  - **Start:** 1 January 2017
  - **End:** 30 June 2020

AIT Development: Traffic Light System (TLS)

InteGrid's Context

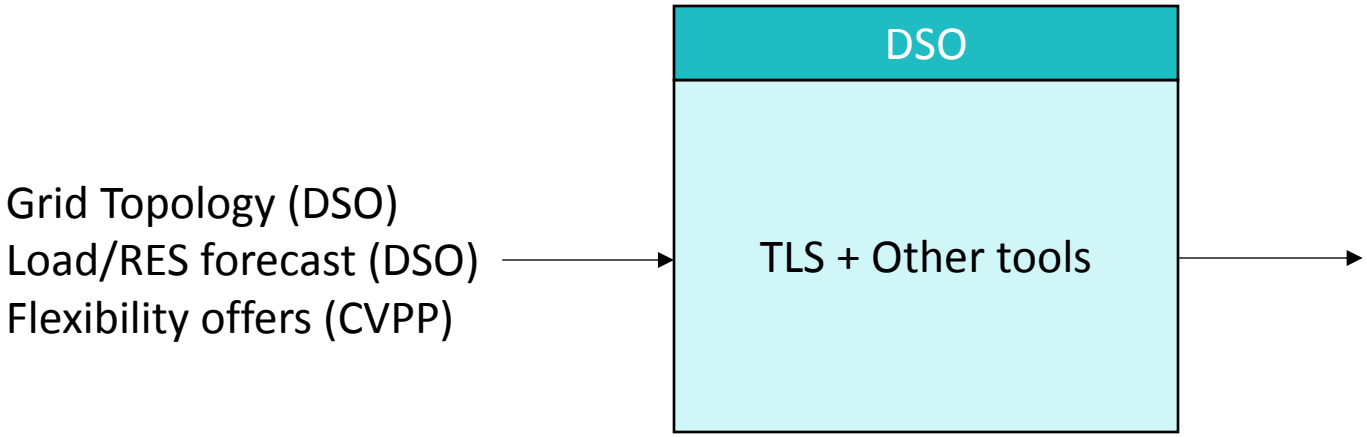
- VPP in Integrid's view
  - **Technical VPP** (TVPP): Flexibilities exclusively for the DSO
    - **No need** for the **Traffic Light System**
  - **Commercial VPP** (CVPP): Flexibilities for the TSO and other agents.
    - Increasing need of **ancillary services** for the **TSO**, in particular balancing reserve, through **CVPP** (offering aggregated DER)
    - **Need** for the **Traffic Light System**

- **Traffic Light System Solution (TLS)**
  - **Technical validation of flexibility products** in MV & LV grids in order not to create potential violations at the distribution side
  - **AIT** as **developer** and **implementor** in **Slovenia** and **Portugal**

Traffic Light System

General information

1. TLS Input/Output overview



Flexibility Report

- Activatable flexibility per bus
  - Units: MW
  - Granularity: hour
- Traffic light per bus
  - **Red**: No flex activatable
  - **Yellow**: Flex need to be curtailed
  - **Green**: Flex can be fully activatable
- Report sent to
  - CVPP
  - DSO

2. TLS operates in day-ahead & intraday

Implementation of the TLS

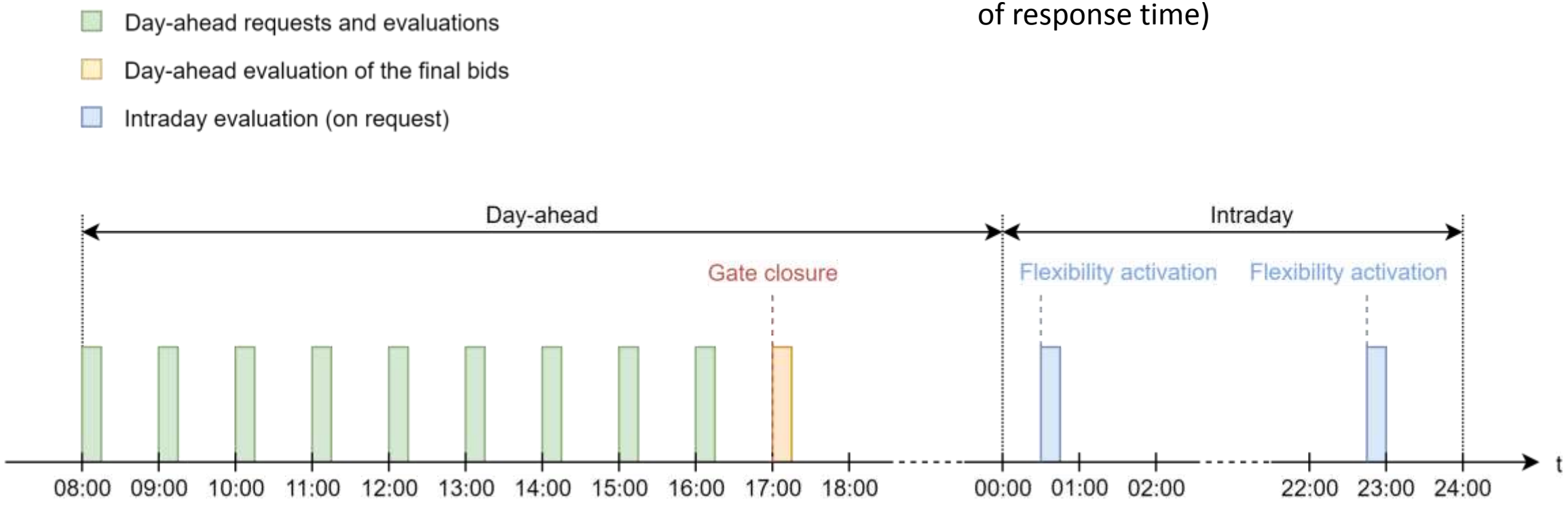
Timeline

Procedure

- In day-ahead, the evaluation is performed hourly for the 24h of the next day (**before gate closure time** of the balancing markets)
- In intraday, the evaluation is made upon request in real time (after an mFRR activation by the TSO) and for the next hour

Possible enhancements of InteGrid concept

- **Potential extension to other markets as for example** secondary balancing control (aFRR) and redispatch/congestion management
- **Periodical intraday evaluation**
  (-> evaluation not after activation -> reduction of response time)



Lessons learned

InteGrid – TLS

Conclusions

- **Functioning concept for full TSO-DSO interaction still work in progress**
- **Traffic light system good starting point**
  - Enables indirect coordination between TSO and DSOs via the VPP that bids on the balancing market and is contraint by the DSO in contraint grids
  - TLS deployment eases **pre-qualification** for the flexible units in constraint areas
    → **TLS enables more available flexibility**
  - Deployment interesting for already constraint areas or foreseen constraint areas
  - Solid communication infrastructure
- VPP shall have **backups** to avoid penalties (as some flexibilities might not be activatable due to grid limitations)
- **National regulatory implementation**: EU Regulation is existing and it needs to be defined and implemented on national level

Electricity balancing guideline (EB GL): System Operation Guideline (ENTSO-E), Article 182, Paragraph 5, Article 5: Each reserve connecting DSO and each intermediate DSO shall have the right, in cooperation with the TSO, ***to set, before the activation of reserves, temporary limits to the delivery of active power*** *reserves located in its distribution system. The respective TSOs shall agree with their reserve connecting DSOs and intermediate DSOs on the applicable procedures*

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CIGRE SEERC TAC Meeting, 23-24th January 2020, Athens

TSO/DSO Cooperation Austria: Flex Hub

SEERC Workshop Athens, 22.01.2020

Situation

The Decarbonisation requires next to Innovation also Participation and Courage for Change

Situation

- Austrian Energy Goals are summarized in #mission2030 and include:
  - Exit from fossile energy production,
  - Strengthen the Security of Supply,
  - Extension of Balancing Market,
  - Using flexibility potentials of households, commerce and industry (grid stability).

Challenges

- Simultaneous opening of markets and ensuring system stability can only be done by introducing consistend and standardised processes.
- Flexibility potentials in the lower grid levels may be limited technically.
- A thourough coordination and communication between the actors (consumers, producers,stock market, TSO, DSOs, regulators, innovative partners, aggregators, etc.) is vital.
- Other challenges are cyber security as well as handling the data flow.

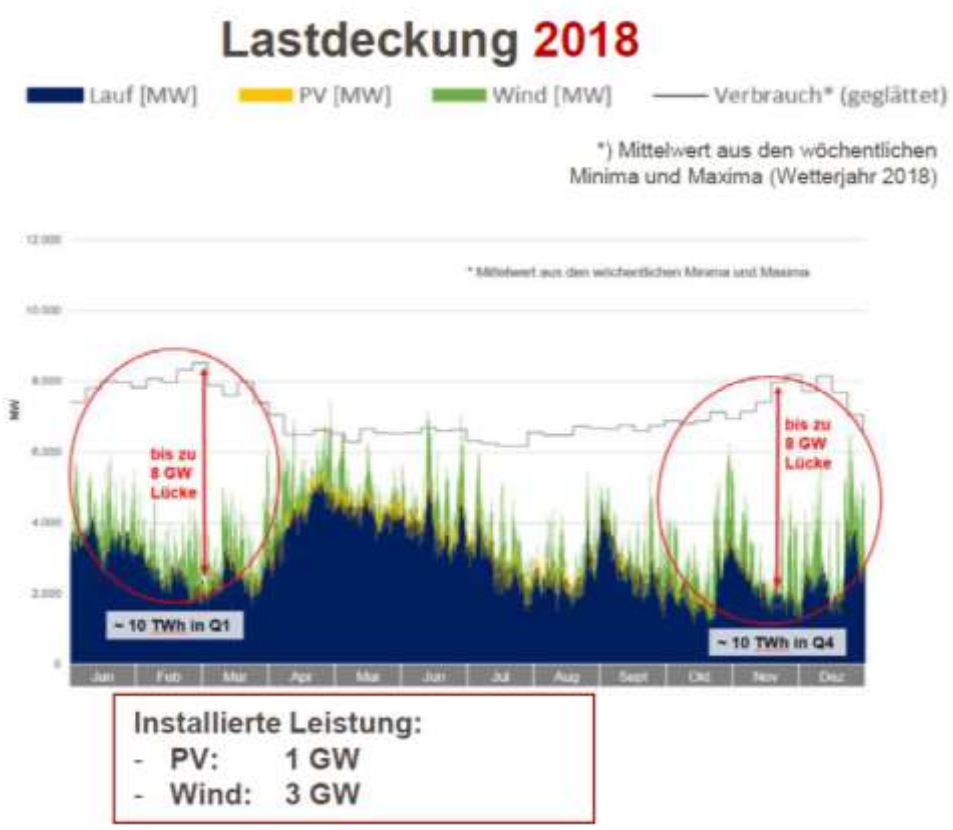
Key Question

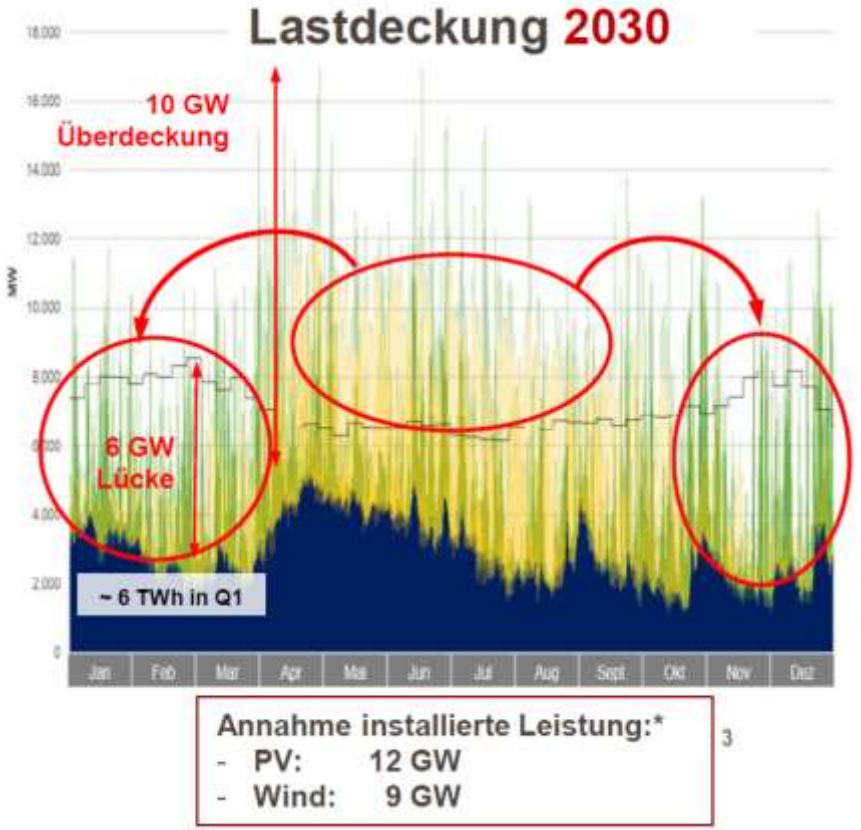
? **How can the, in the future (massively) increasing, flexibility potentials be provided and used for grid stability.**

Flexibility Demand

Without using flexibility potentials the energy change cannot be done**.

Demand of flexibility





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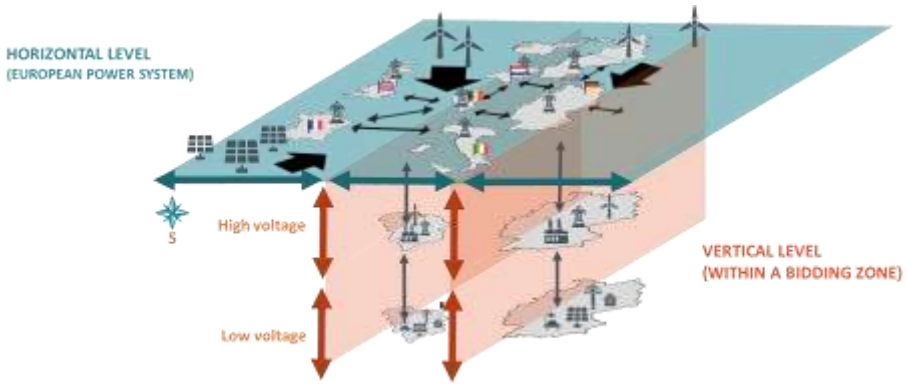
*TU Wien; Stromzukunft Österreich 2030; Mai 2017

**From the perspective of system stability and security of supply!

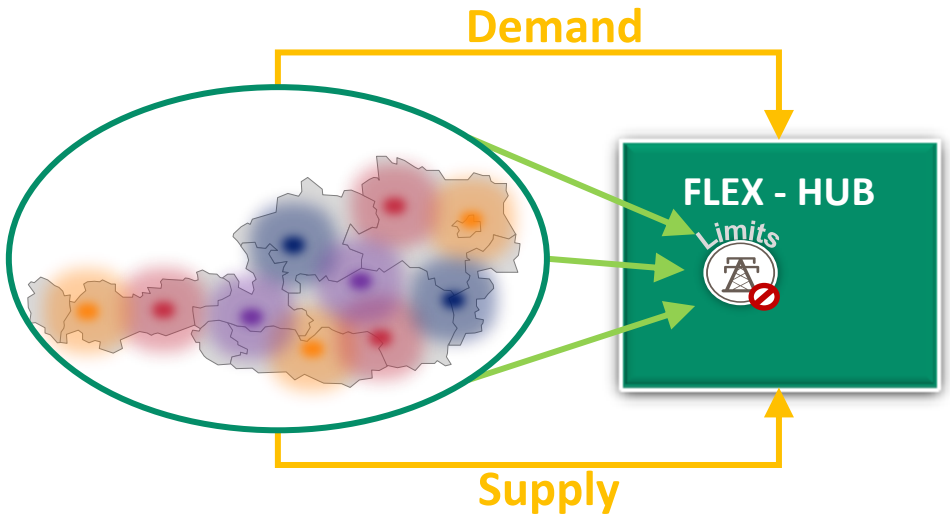
Transformation of the Electrical Energy System

TSO/TSO Coordination (XBID, FB-MC,...)



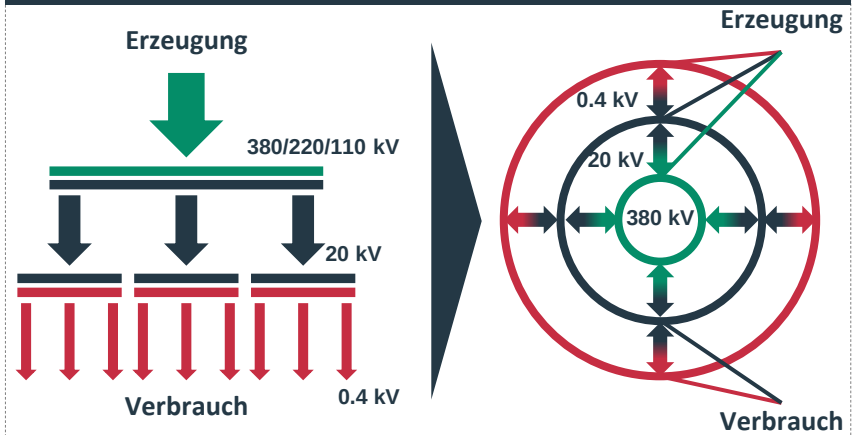
TSO/DSO Coordination

Energy market



TSO/DSO Coordination

Transformation

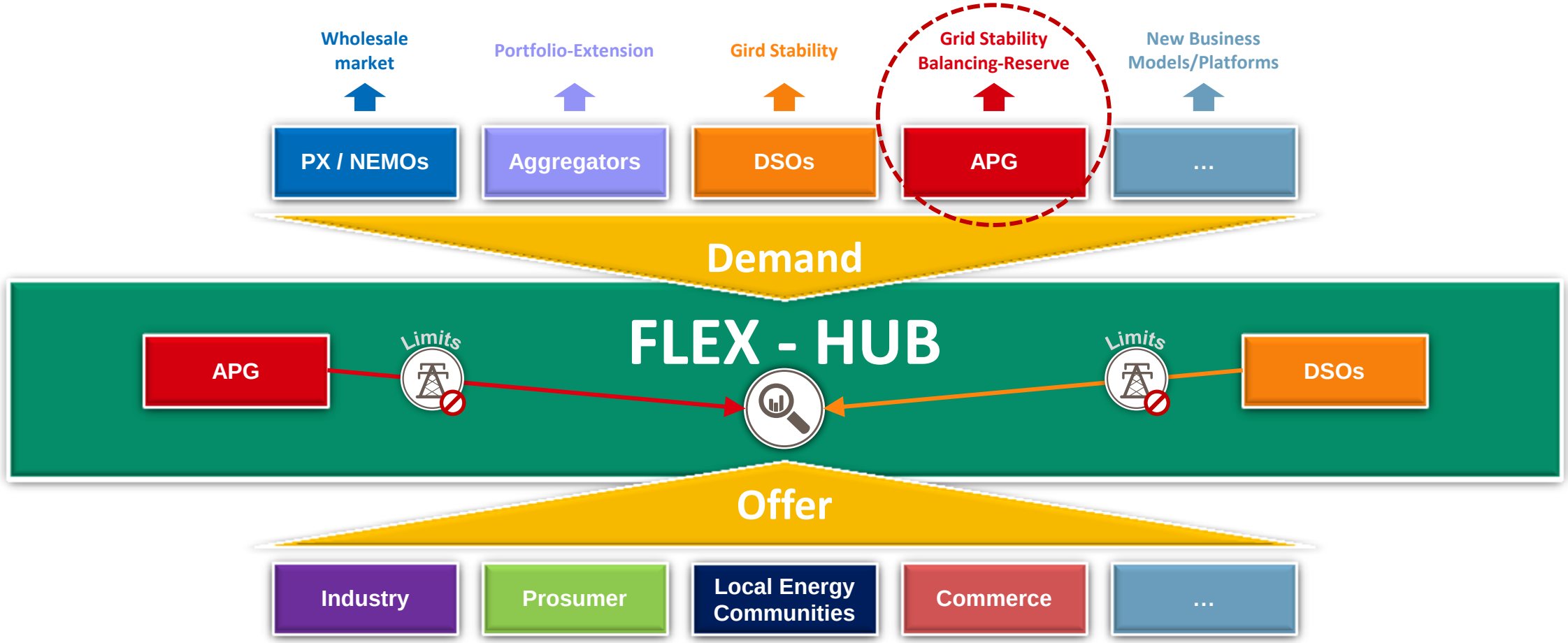


- Decarbonization
- Decentralization
- Digitalisation
- Democratisation

 Quelle: Elia System Operator SA-NV (obere Grafik)

Integration of decentral flexible Ressources

Flex-Hub provides flexibility under consideration of technical restrictions (TSO/DSO) for all market participants.



Implementation

- PXs
- DSOs
- RZF
- EVUs
- Aggre-gators
- Industry
- WKO
- ECA
- BMNT
- …

Experts VMI

Regular project reporting
Questions to experts
Concrete Tasks

Inputs / Hints / Suggestions for the project
Answering of questions

- APG
- AIT
- DSOs
- …

Research Project „Industry 4 Re-Dispatch“

Implementation projects VMI

- APG
- evtl. Project Partners

Delivers Flex-Hub

Operation

Limits

- DSO-Limits
- TSO-Limits

Flex-Hub

- Ownership / Governance not defined yet (= part of the project and discussion with experts)

Markets / Flexibility Demand

- Balancing Reserve
- Wholesale ?
- DSO-Flex
- Third Parties, Aggregator, Etc.
- Redispatch