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EUROPEAN TECHNOLOGY AND INNOVATION PLATFORM
SMART NETWORKS FOR ENERGY TRANSITION

Project session 3: “Flexible Generation”

leafs

Integration of Loads and Electric Storage Systems
into Advanced Flexibility Schemes for LV Networks

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Short presentation of the project

- **Project Datasheet**
  - National lighthouse project with nine partners
  - 3.4 Mio. EUR Budget
  - 42 month project duration (11/2015 – 03/2019)

- **Overarching objectives**
  - grid friendly activation of flexibility for market services
  - increase the possible penetration of distributed generation in LV grids with flexibility

- **Project activities**
  - Implementation and assessment of different concepts in field trials
  - Comprehensive analysis including technical, economic, regulatory and socio-economic assessments

leafs

Integration of Loads and Electric Storage Systems into Advanced Flexibility Schemes for LV Networks

Short presentation of the project

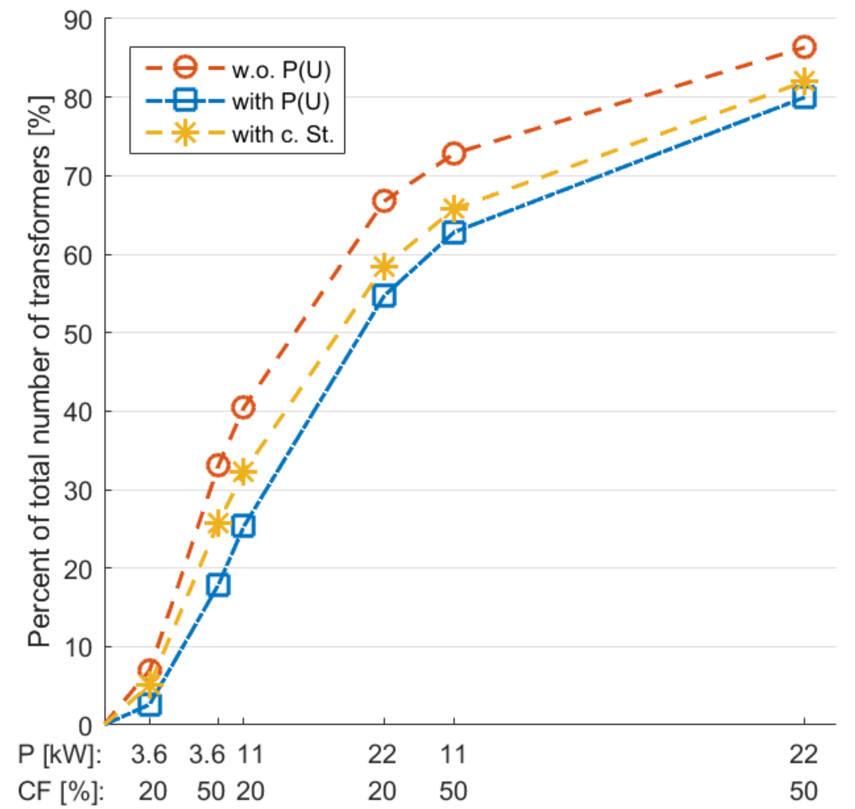
- **Four main concepts in field trials**
  - Separate control of customer assets
  - Combined control of customer assets
  - Combined control of utility assets
  - Monetary incentives for end customers

	DG DemoNet Smart LV Grid control scheme		Addition in leafs	
	MV/LV Tap Changer	PV System (no battery)	PV Battery & Grid Storage	Flexible Loads
Level 0	U_{busbar} = const	-	-	-
Level 1	U_{busbar} = const	Q(U), P(U)	Q(U), P(U), x%	P(U), x%
Level 2	Field sensors	Q(U), P(U)	Q(U), P(U), x%	P(U), x%*
Level 3/4	Field sensors	$Q(U)_{DYN}$, $P(U)_{DYN}$	$Q(U)_{DYN}$, $P(U)_{DYN}$, $x\%_{DYN}$	$P(U)_{DYN}$, $x\%_{DYN}$*

*Flexible loads do need a local control for the consideration of grid requirements
x% = Reduction of the active power in % of nominal power

Key exploitable results addressing energy system integration

1. Flexibility potential exists and will grow in the future
2. System impact of load side already visible and high in the future (especially EV)
3. Grid friendly operation of distributed systems possible but system integration in DSO operation requires high effort even in existing infrastructure
4. Simple grid integration measures such as P(U), and feed-in limitation have a visible impact on the future grid reinforcement requirements
5. Operation of a community storage system poses positive synergetic effects for customers and the grid
6. Economic feasibility (from a pure economic perspective) is not given in Austria for residential PV-BESS, even with flexibility activation, but other drivers such as autarky exist
7. End customers are willing to participate if integration effort is low



Lessons learned and barriers to innovation deployment

Technical

- Control & communication infrastructure implementation effort too high
- Interoperability of components not sufficient

Economic

- Integration effort & costs too high
- CAPEX of PV-BESS too high

Regulatory

- Grid tariffs for central BESS operation not available
- Monetary bonuses for end customers not defined

Socio-Economic

- Willingness of customers to participate limited
- Data protection matters in all interactions with the end customer

Deployment prospects of the most promising solutions

	Separate control of customer assets	Combined control of customer assets	Combined control of utility assets	Monetary incentive
Interfaces	The component requires two interfaces for each market control and grid control	The component requires only one interface for both market and grid control		Activation signals are communicated through a smartphone app or arbitrary website
Infrastructure	Depending on the control channel a local control infrastructure is required in the substation. Future implementations might also use an internet connection for communication		Components are usually integrated directly into the control infrastructure of the DSO/utility	Server systems to integrate customers in the incentive scheme and information infrastructure
Relevance	This setup is very likely since a lot of component manufacturers are able to control their products remotely	This setup requires proper interfaces between the DSO, market participants and the components. This inherits a significant implementation effort	Especially for larger systems this setup is interesting. This includes community ESS but no small-scale systems such as PV-BESS	Incentives do not necessarily trigger a predictable behaviour of end customers. Hence, planning with such an approach is hard.

Needs for future R&I activities coming out of the project (if any !)

1. **Extended grid integration functions** such as P(U), limitation of feed-in power, reactive power control and others for both generators and especially loads have to be further developed

2. **Complexity of coordinated control systems** needs to be reduced by improving interoperability, providing standardised interfaces, increasing longevity and robustness of components, development efficient monitoring systems and error analysis tools as well as increasing cyber security

3. **Optimal operation of central storage systems** providing benefits for both customers and grid operators have to be further investigated

4. …list not exhaustive

Thank you for your attention!

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