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Testbed Heimschuh: Blockchain-based LEC with Community Storage

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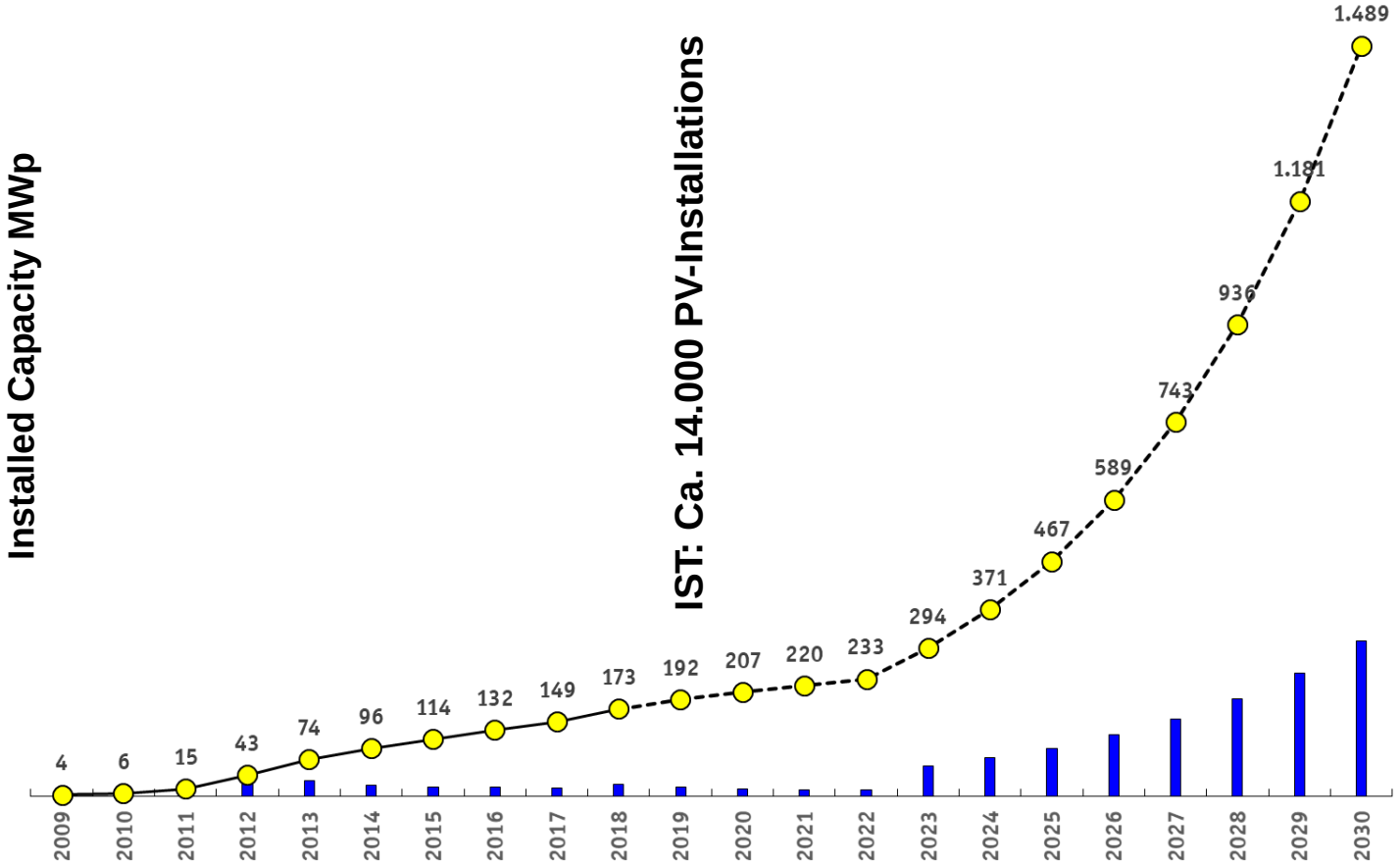
Challenges of Austrian DSOs

Planned connections of PV @Energienetze Steiermark



Goals 2030?

Challenges?

Solutions?

LEAFS: Overview

- **Title:** Integration of Loads and Electric Storage Systems into advanced Flexibility Schemes for LV Networks
- **Acronym**: Leafs
- **Budget**: 3.3 Mio €
- **Duration**: 3 Years
- **Type**: Lead-Project
- **Consortium**:

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

LEAFS: Concept

- **Why LEAFS? What is the Idea?**
  - **Multi-Use** of the storage to improve the economic efficiency
  - Storage with grid-support-functions as an alternative to the classical grid expansion
- **Why „central “ Storage?**
  - Lower specific costs
  - Simple Communication, Control and Maintenance
  - New Business Models
- **Why connected locally?**
  - Advantages for the DSO

Source: EN

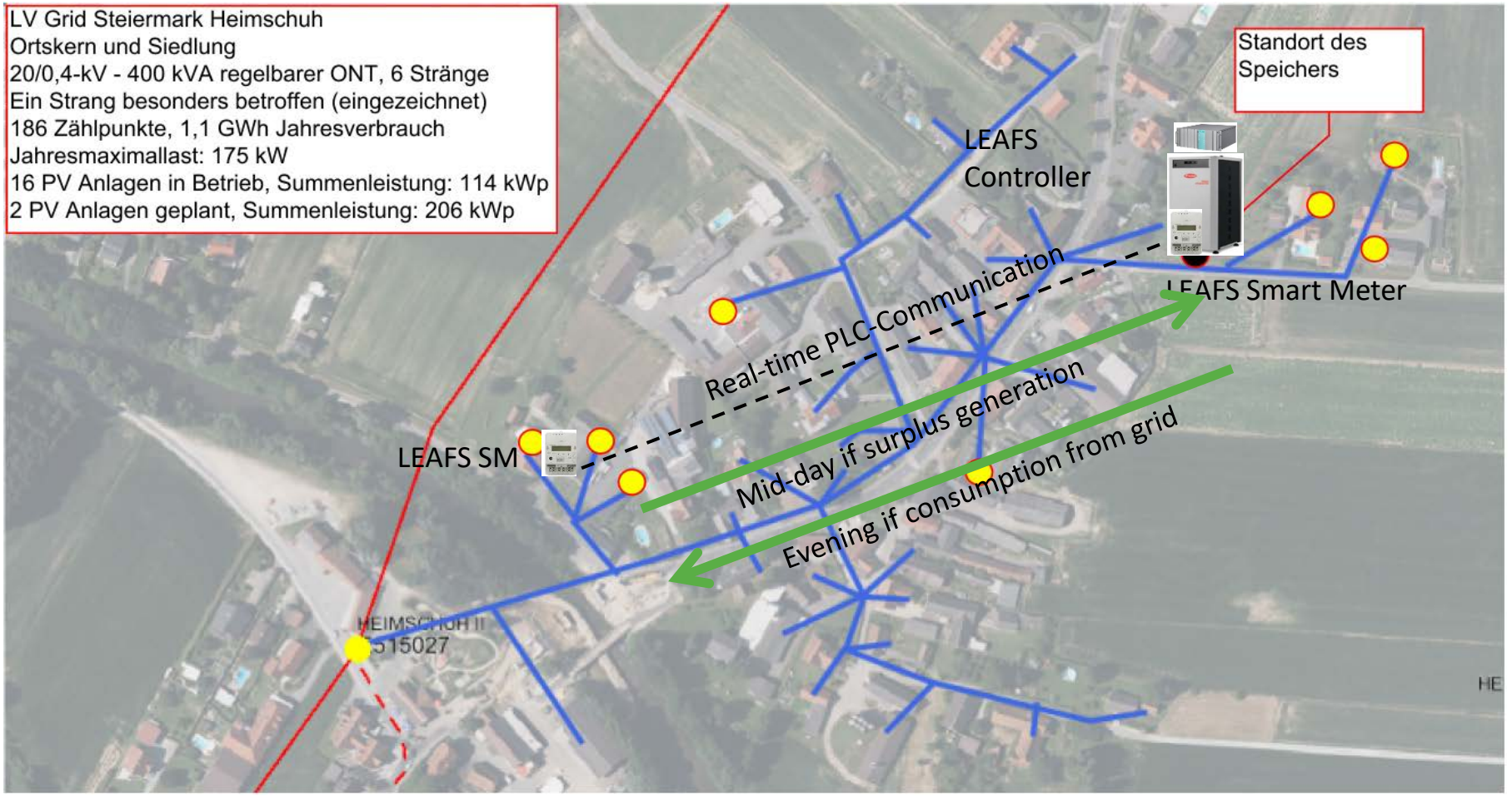
LEAFS: Community Storage

- Grid support: Location by DSO, Algorithms: Q(U), P(U)
- Customer Friendly:
  - No space needed
  - No adaptation of the electrical installation
  - Easy contract settlement
  - Possible to cancel the contract
  - No Maintenance for Customer
- Better Economic efficiency:
  - Multi-Use
  - „Overcrowding“ possible
  - Reduction of Losses
- **Challenge:**
  - **Existing Grid Tariff Model**

Source: EN

LEAFS: What has been done

- Smart Meter roll-out completed -> Data transfer on Minute basis
- Control algorithms implemented (Grid Support, Self-Consump., Market Signal)



Project LEAFS: Results – Grid Support

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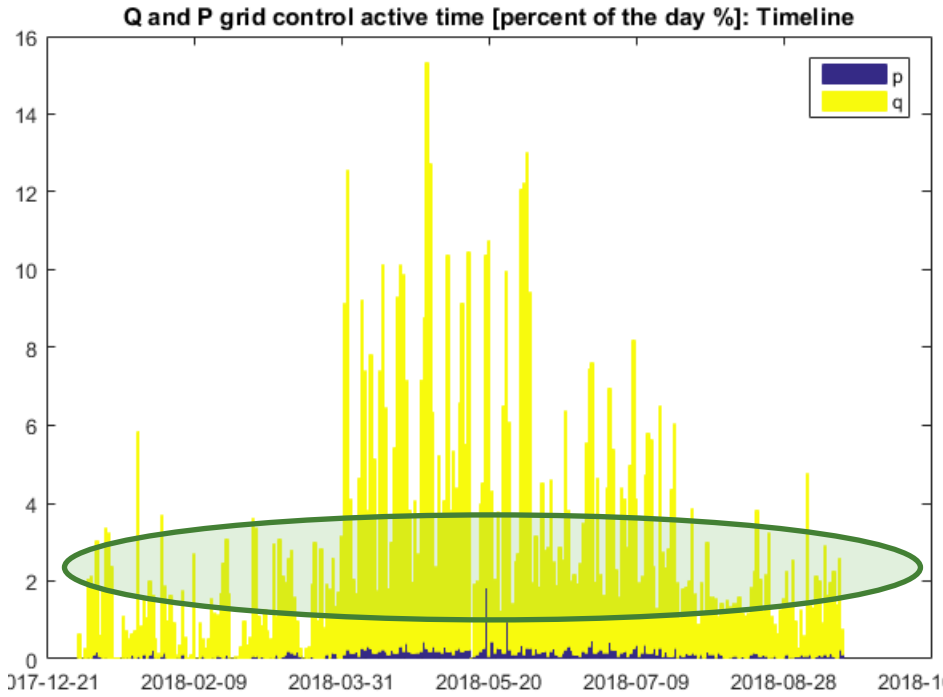
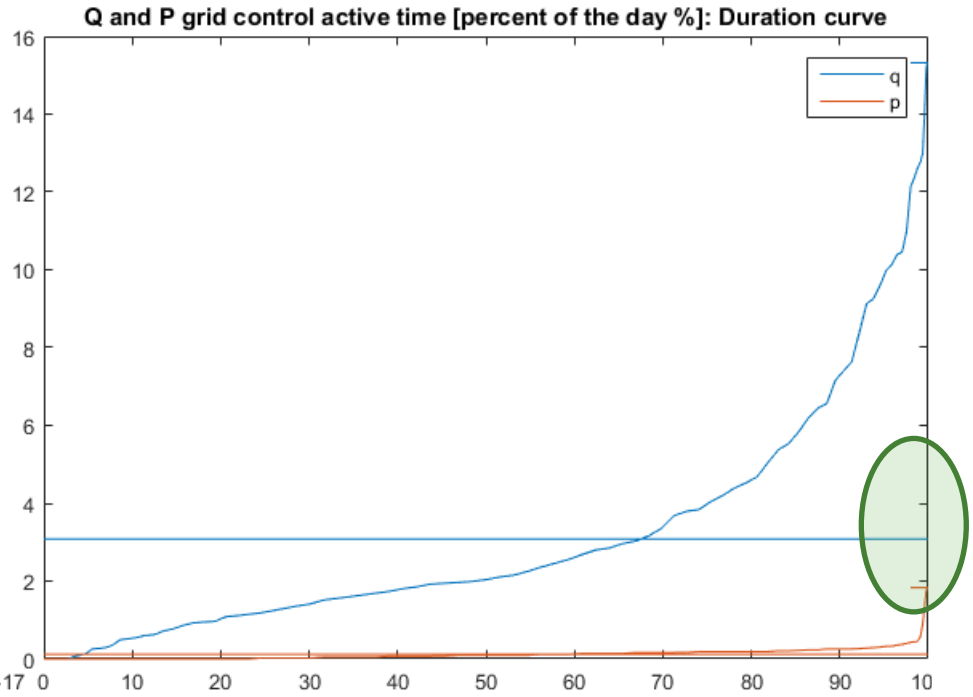
- Self-consumption optimization rate increased from 30% to 70%
- Realocation of storage capacity possible





- **Q: 266 h per Year**
- **P: 10 h per Year**

Cost Reduction Potential in Grid Expansion:

- Voltage Controller ca. EUR 30.000,-
- Cabling EUR 50.000,- bis EUR 70.000,-

Blockchain Grid Project: Overview

- **Title:** Blockchain-enabled utilisation of grid resources with prosumer flexibility
- **Acronym**: BC-Grid
- **Budget**: 1.5 Mio €
- **Duration**: 2 Years
- **Type**: Part of Green Energy Lab
- **Consortium**:

BCG vs. LEAFS: What is new?

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Use Cases:

1. **Multi-use Community Storage -> Implemented in LEAFS**
2. **P2P Trading**
3. **Dynamic allocation of free grid capacities**

Blockchain

Internet of Things

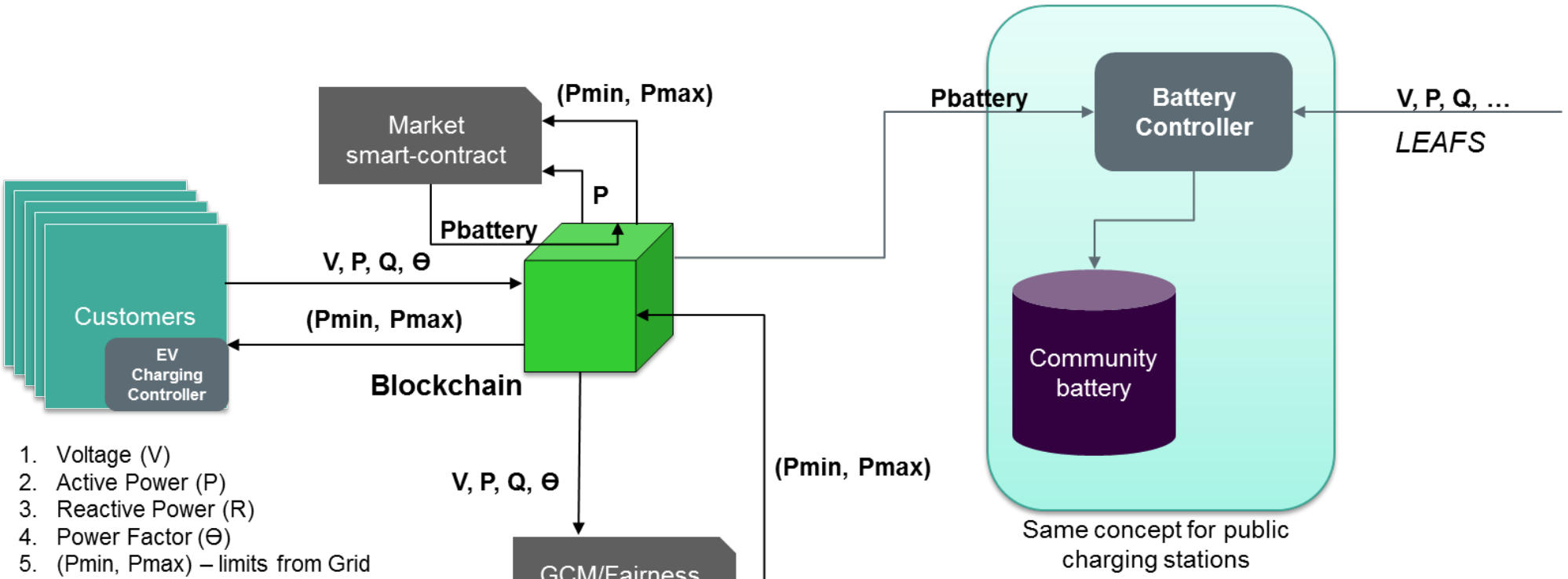
VS.

Blockchain
Smart Contracts

Central Database
Central Controler

BCG: Concept

- BC-Solution: Ethereum Parity with Proof of Authority
- **Private Blockchain -> due to GDPR**



1. Voltage (V)
2. Active Power (P)
3. Reactive Power (R)
4. Power Factor (Θ)
5. (Pmin, Pmax) – limits from Grid Capacity Management
6. Pbattery - Charging or discharging power of Community battery

Market Design

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- **Basic principles:**
  - Level playing field: Community storage should be treated equally to private- or pumped storage
  - No change in ownership of electricity -> no charges and levies should be imposed
- **Legal Framework and Ownership**
  - CEP: Market-based Procurement of flexibility should be prefered (BGRP, TSO,..)!
  - DSO (co-) Ownership should be possible for Grid Support
  - **!(proportional) commercial use of storage only by third parties (Lease)!**
- **Grid Tariff Framework**

  CEP: ***„… Grid Tariff Structure … should not lead to discrimination of Energy Storage and should not lead to negative incentives for the use of DSM“***
  - Reduced Tariff for Comunity storage if P(U) and Q(U) implemented
  - If in same LV-Grid -> Reduced Tariff for the consumption from storage (CEC)
  - **Selection of Location by the DSO** -> Proportional Investment by DSO possible!
  - Use of Storage by the DSO only in frame of efficient Asset Management

Findings and Recommendations

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- LECs should be: (1) easy to implement, (2) offer a business case, (3) provide grid support! -> important to reach Mission2030 goals!
- LEC Legal Framework should enable new Use-Cases!
  - Tradeoff: simplicity vs. amount of possible
- Multi-Use-Case LEC with Community Storage viable!
  - **Extension of the Legal- and Tariff Framework**
- Media coverage has waken a lot of interest; **best practice by the EU**
- **Central Message: the technology is there;** we are looking forward to the next challenge: **roll-out**
- **!Integrate the Grid Support Functions; Customers should not care!**

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Lots of Energy!