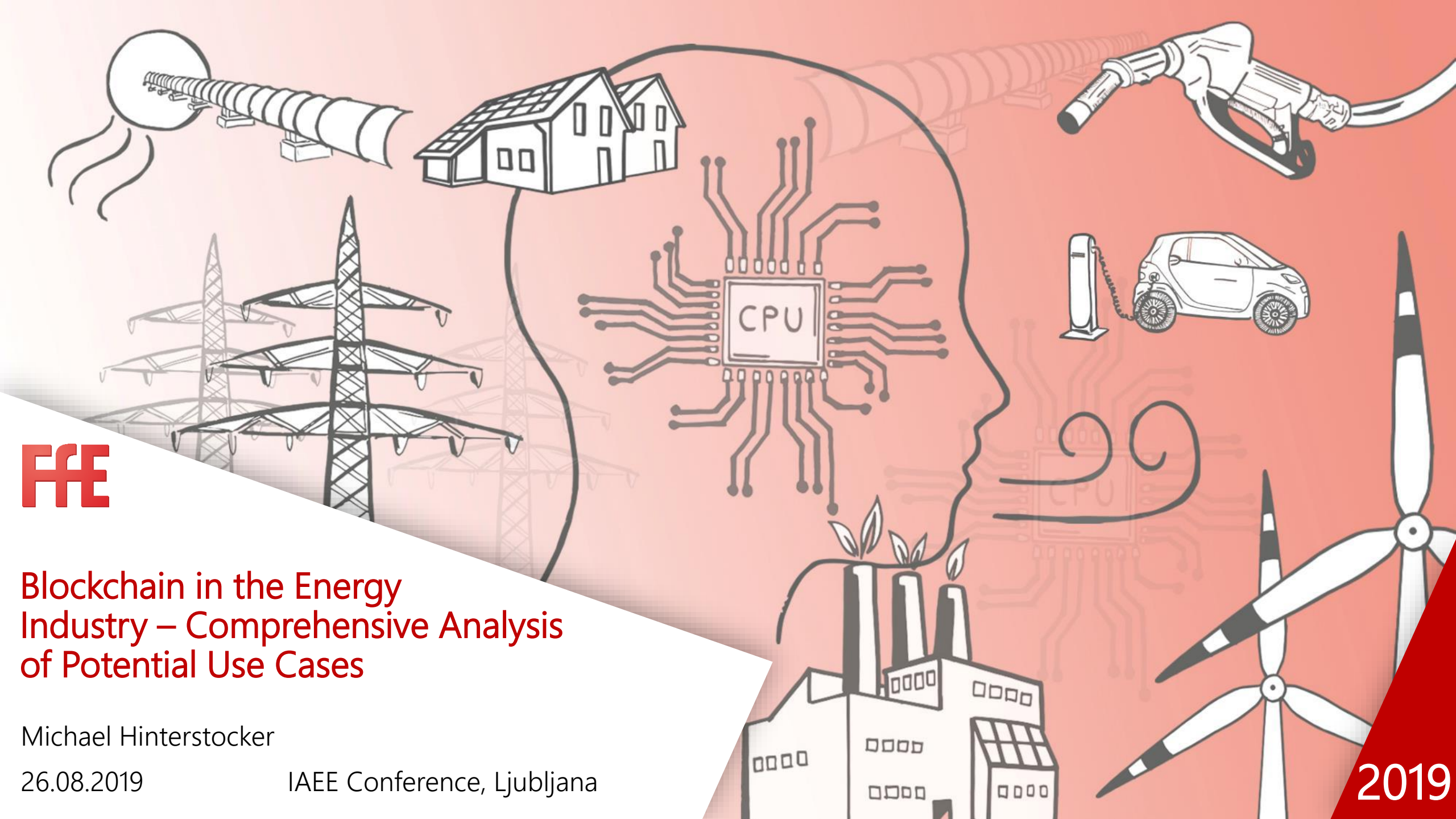

Blockchain in the Energy Industry – Comprehensive Analysis of Potential Use Cases

Michael Hinterstocker

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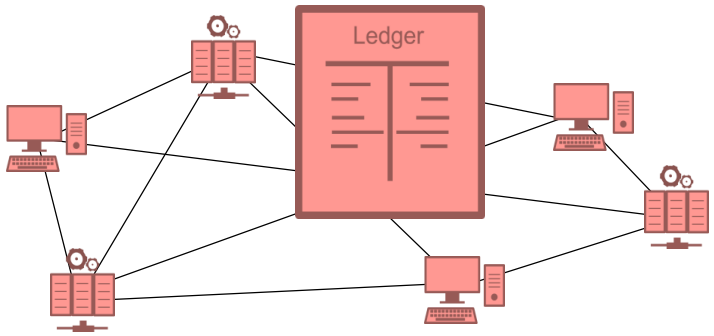
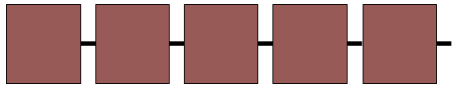
A blockchain can be used to record transactions and data transparently, immutably and decentralized





- A *blockchain* is a form of distributed ledger
- Transactions are recorded and validated by all participating parties
- No central authority necessary

- Transactions are collected in *blocks* which also include time stamps and hashes
- Blocks are only valid in combination with previous blocks, so a *chain* of blocks forms

Key features

- Transparency
- Decentralization
- Automation
- Pseudonymization
- Immutability
- Independence

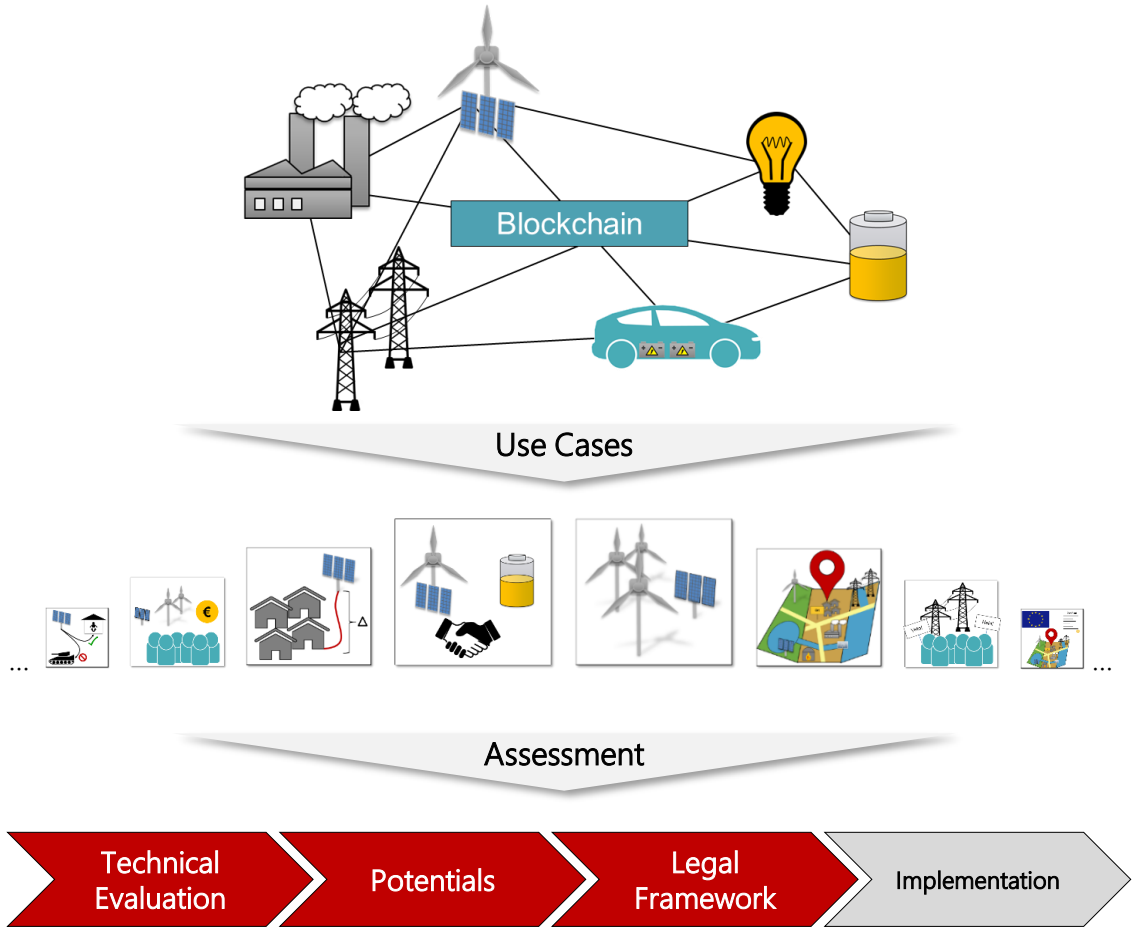
Potential applications and use cases of blockchain technology in the energy system were evaluated in a research project

Project Objectives

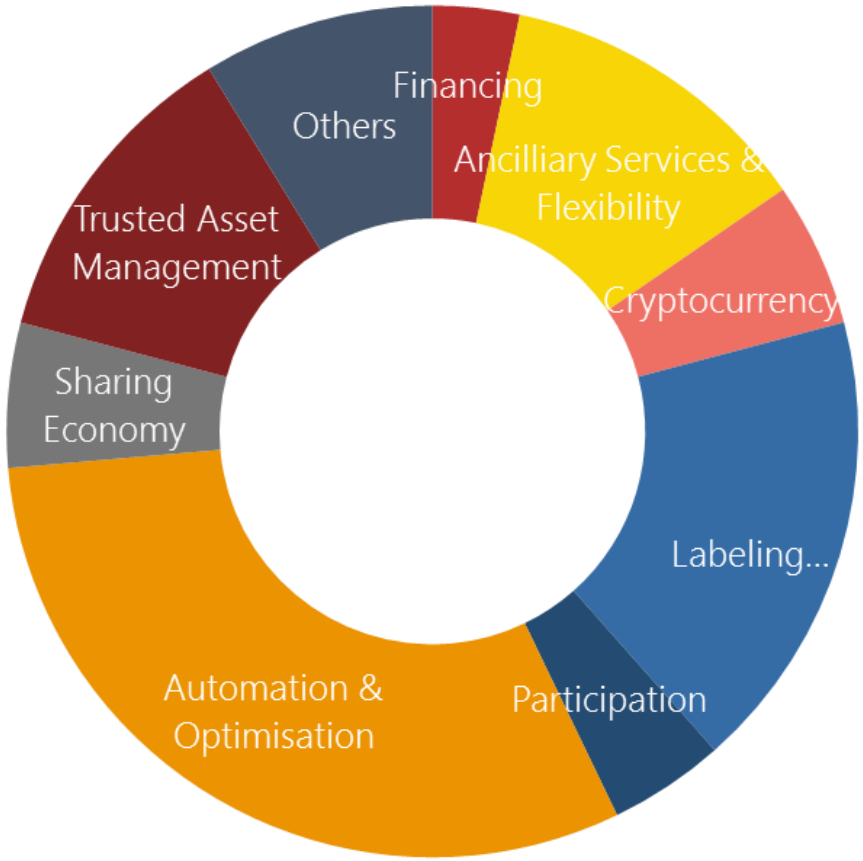
Investigation of the applications, chances, risks and potentials of blockchain technology for the transformation of the energy system.

Key Data

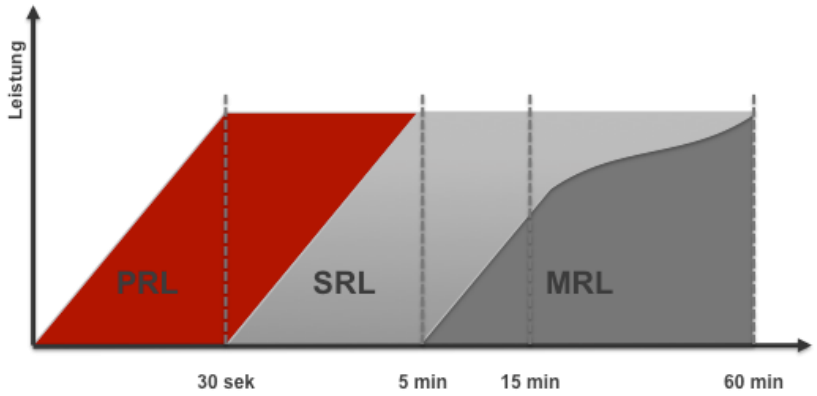
- 10/2017–10/2018
- **8 project partners** from the fields of energy supply, grid operation, technology and industry association
- Goal: **Identification of relevant use cases for implementation in a follow-up project**



91 use cases were identified in 11 workshops with project partners



A blockchain can be utilized for reliable verification of control reserve provision



Concept

- TSO checks proper provision of balancing power by comparison of planned and actual operating point
- Automation of data transmission and comparison possible via blockchain

Features

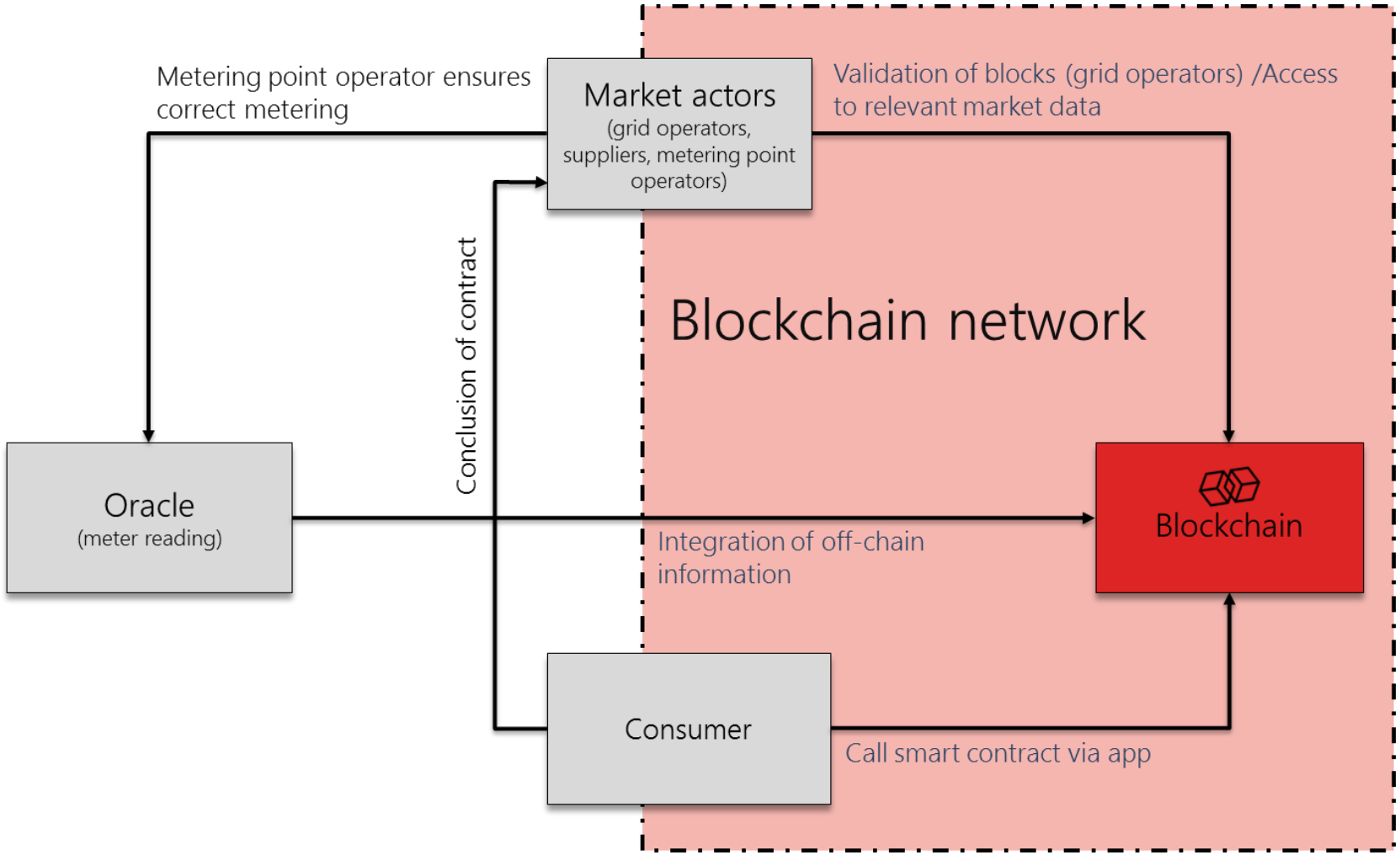
Transparency and immutability

- Storage of baseline
- Verification of correct provision
- Calculation of balancing energy for settlement

Efficiency

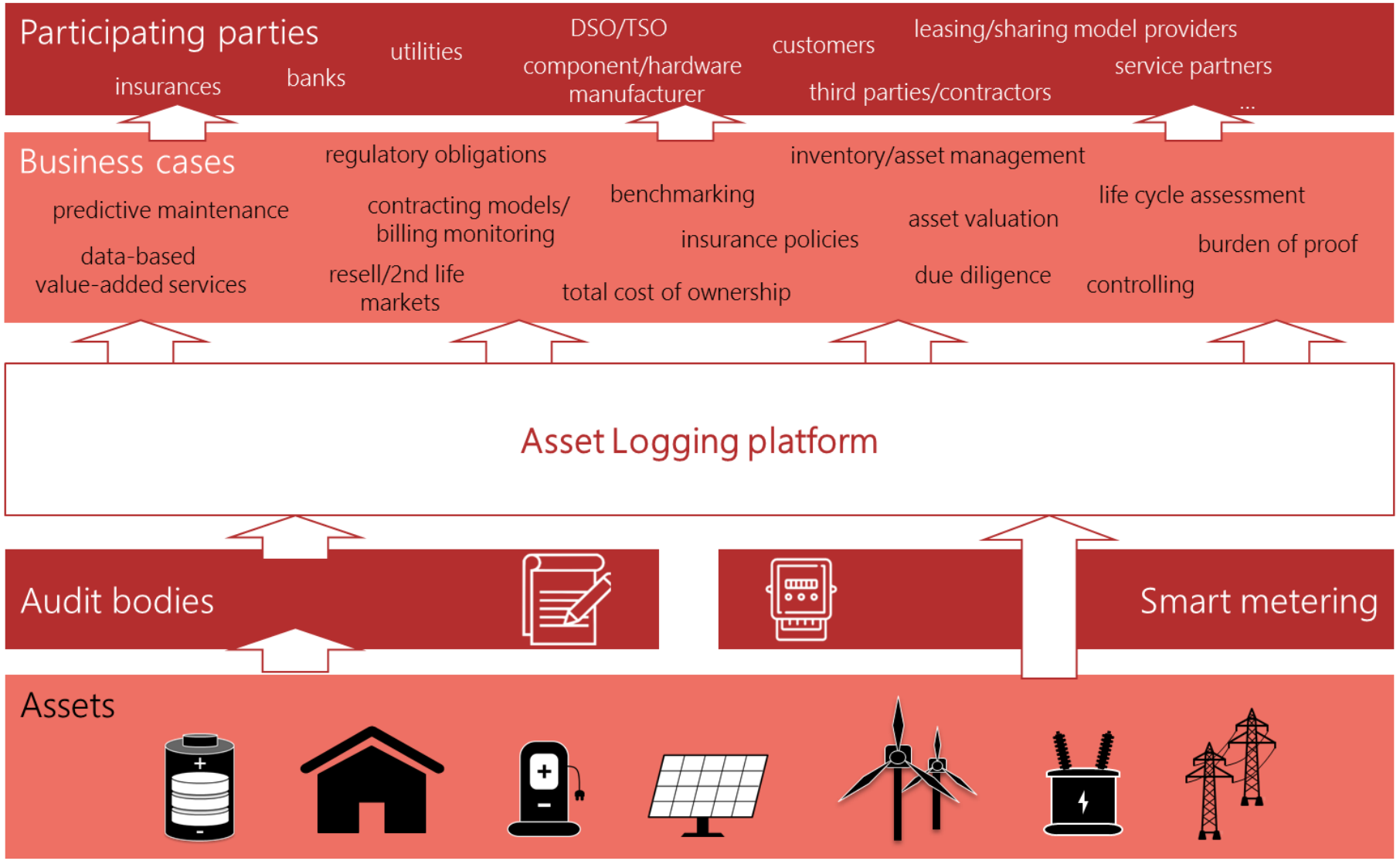
- Reduced effort for the verification and settlement processes at the TSO

Improved market communication processes enable applications like faster supplier switching

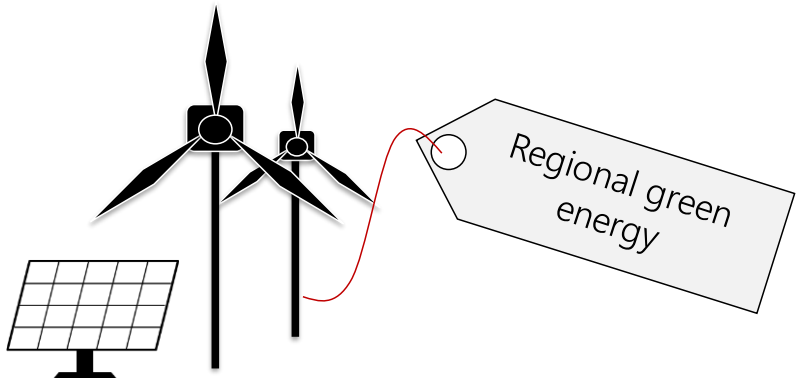


- EU's winter package demands improved customer experience
- Current switching process is inefficient and has a partly redundant verification process
- Blockchain offers some key features for process optimization
- Developed technical approach shows a significant simplified process
- Ethereum-based proof of concept could be realized with comparably low effort, leading to faster switching times

Blockchain platforms allow immutable, transparent and reliable storage of asset data



Several use cases in the context of energy labeling become possible with immutable recording of generation and consumption



Challenges:

- Complete representation of generation and consumption on the blockchain
- Utilization of smart metering infrastructure
- Tamper-proof and standardized data acquisition

Potential applications

- Temporal and regional certification of green electricity
- Regional direct marketing
- Certification and visualization of energy flows and CO2 emissions
- Local energy communities
- Certified mapping of generated energy to stored energy and to consumed energy

Labeling and Asset Logging Use Cases will be implemented and evaluated in an upcoming field test

Objectives

- Design and implementation of a **distributed data platform** for labeling of energy flows and asset logging
- Development and evaluation of **data-driven use cases and business models** based on this platform

Use Cases

- **Labeling:** *Distinct, transparent and immutable mapping of generation and consumption as well as their temporally and spatially linked evaluation under consideration of physical conditions.*
- **Asset Logging:** *Acquisition of operational data and maintenance data via smart metering systems, audit bodies or other suitable sources and their immutable and chronological storage and processing.*

Key Facts

- Planned duration of the project: 3 years, commencing in 2020
- Field test with approximately 100 assets of various types
- Cooperation with 11 project partners from the energy sector
- Interdisciplinary collaboration: 3 research institutes for energy economics, IT implementation and for legal issues
- Ongoing application for public funding

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