*local **E**lectricity retail **M**arkets for **P**rosumer smart grid p**OWER** services*

The project goals, its rational and its potential impact

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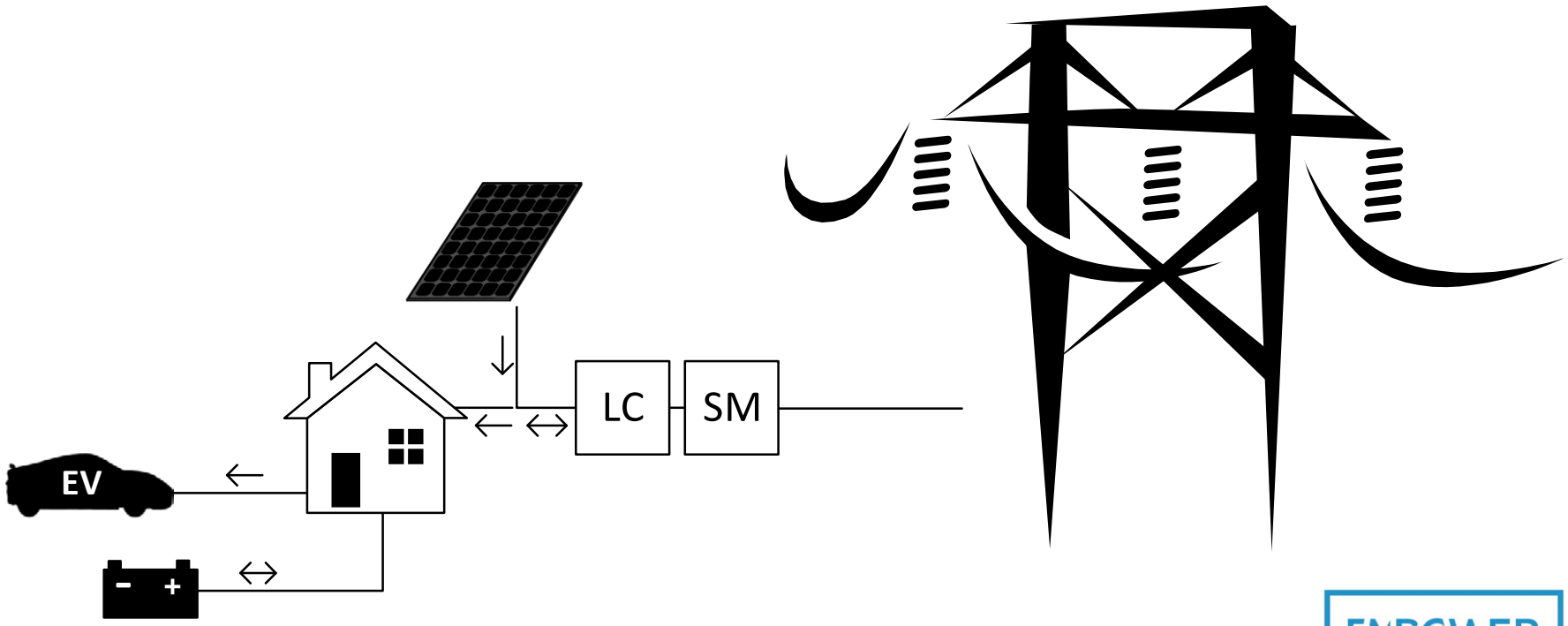
This project has received funding from the *European Union's Horizon 2020 Research and Innovation programme* under Grant Agreement No 646476.

A prime driver

The rise of prosumers will change the relation between customers, the grid and the market , but how?



Consortium partners

Schneider Electric

eSmart Systems

smart innovation østfold

UPC CITCEA

NewEn
ZUKUNFT AUS EINER HAND

MIEMA
Malta Intelligent Energy Management Agency

Institut für Wirtschaft und Ökologie
Universität St.Gallen

Fredrikstad energi

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Objectives

Develop and verify a local market place and innovative business models including operational methods to encourage micro-generation and active participation of prosumers exploiting the flexibility created for the benefit of all connected to the local grid.

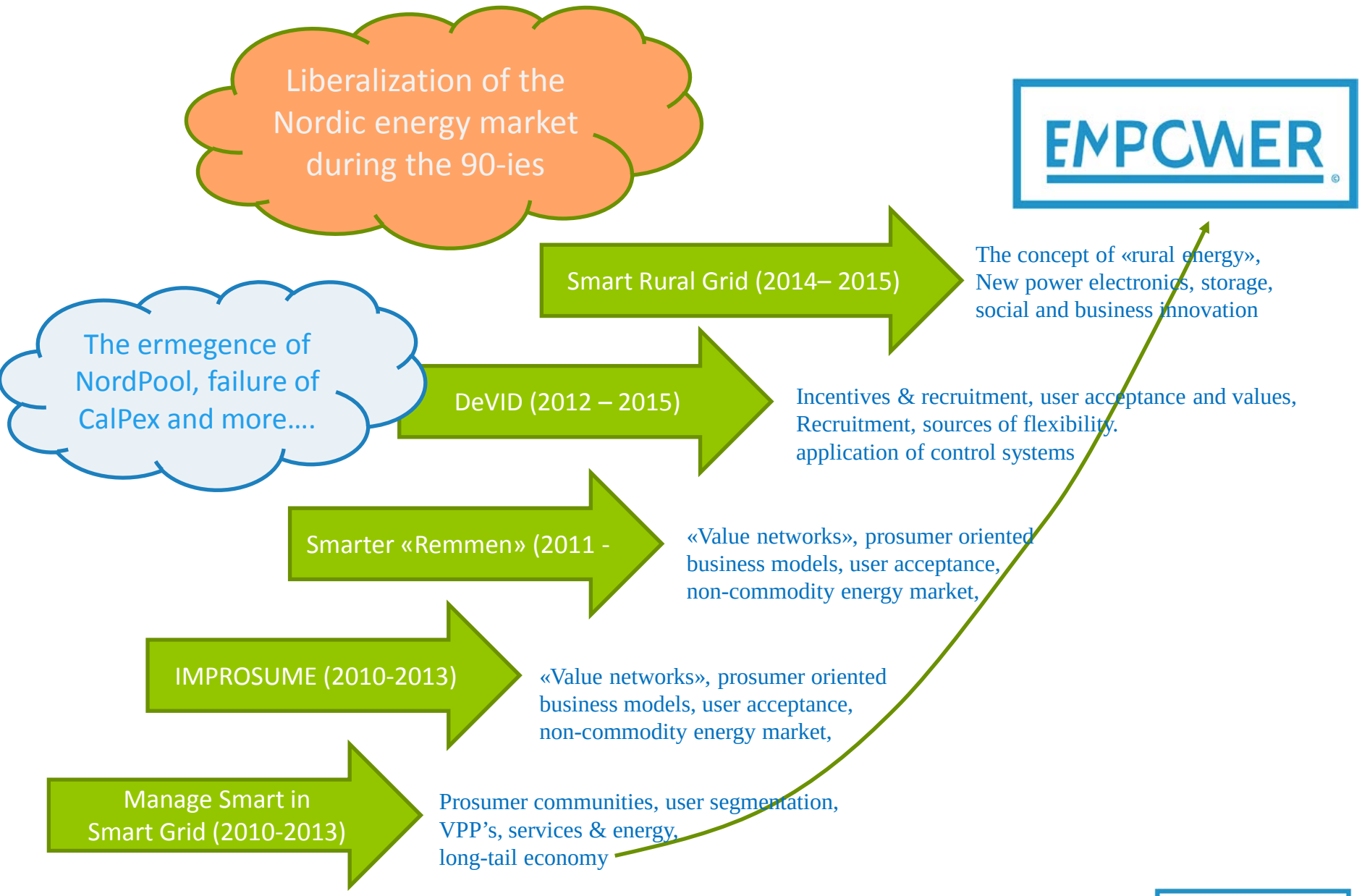
- Develop a new market design for local trading and involvement of the consumer/prosumer
- Develop prosumer oriented business models relevant for the market design developed
- Develop an ICT based monitoring and management system accommodated in the SESP
- Develop full bidirectional and secure communication between the market and business
- Integrate the different parts and demonstrate the viability of the concept in up to 3 physical regions in Europe (Norway, Germany and Malta)

Expected impact

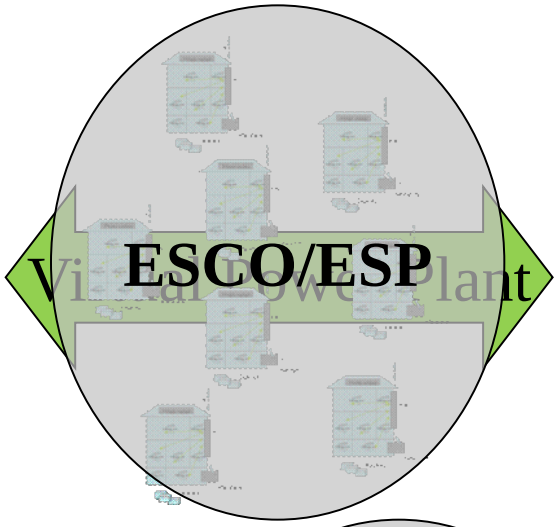
Demonstrate active demand response in real world environments in commercial operation with active involvement of consumers, aggregators, ESCOs, based on new business models.

- Integrating the results into smart grid test beds in Germany, Malta and Norway.
- Pilots will include DR programs to test user flexibility integrated with local micro-production
- The micro-market approach is meant to secure those and to manifest a proper credit assignment where contributions will be properly and timely honoured.

History and rational

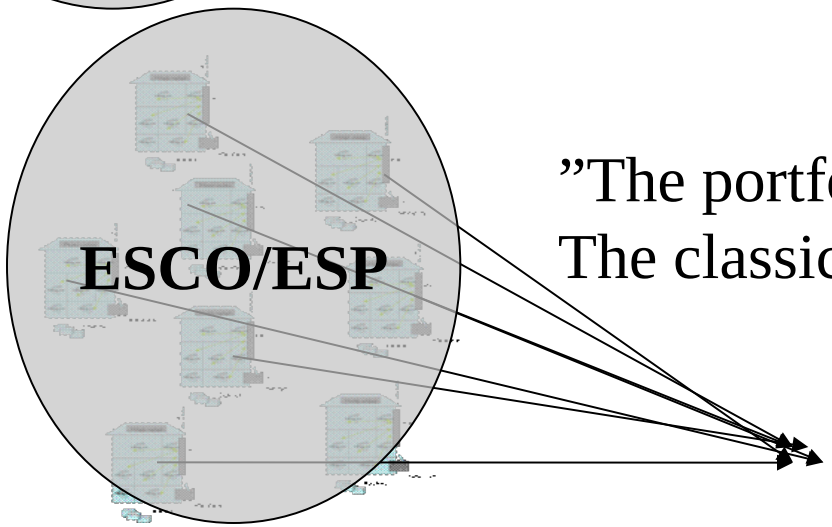

Liberalization of the Nordic energy market during the 90-ies
The ermegence of NordPool, failure of CalPex and more….
Smart Rural Grid (2014– 2015)
The concept of «rural energy», New power electronics, storage, social and business innovation
DeVID (2012 – 2015)
Incentives & recruitment, user acceptance and values, Recruitment, sources of flexibility. application of control systems
Smarter «Remmen» (2011 -
«Value networks», prosumer oriented business models, user acceptance, non-commodity energy market,
IMPROSUME (2010-2013)
«Value networks», prosumer oriented business models, user acceptance, non-commodity energy market,
Manage Smart in Smart Grid (2010-2013)
Prosumer communities, user segmentation, VPP's, services & energy, long-tail economy

Hindsight



In 2010 we looked into our crystal ball

”Cooperative model”
User communities have taken
Control of the ESCO/ESP and VPP



”The portfolio manager” model
The classic market players retain control

Old thinking prevails

Demningen som kan få Afrika til å briste:

Etiopia er i ferd med å demme opp Nilen for å lage et vannkraftverk som er fem ganger større enn Norges største

For første gang er Egypt i ferd med å miste kontrollen over sin hovedpulsåre.

Viten Eirik Øvregård, Jens Kristian Tosterud, Kåre Viga Skretting, Siri Kildal Hansen, Silje Eidsheim Raknes sivilingeniørstudenter, NTNU

«Downward thinking»

«Commodity thinking»

«Passive customers»

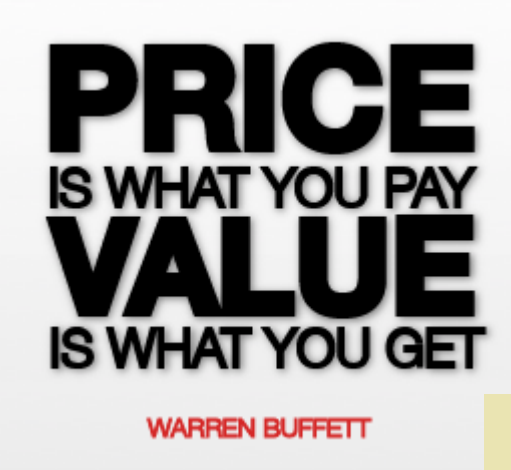
«Price & cost focus»

kWh

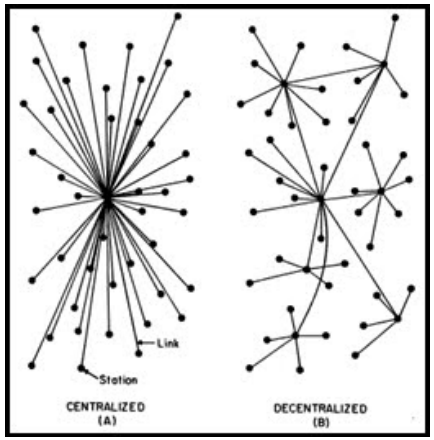
«Energy and energy efficiency»

«Centralization»

More novel thinking



kW vs kWh



Other influence: “Communities and neigbourhood markets”

- EcoGrid
- Cassandra
- Power Matching City
- Smart Grid Gotland
- Nobel
- PowerTac
- iPower
- Current developments in
  - Germany
  - Holland
  - US (US Army)

The EMPOWER concept

SESP

SESP = Smart Energy Service Provider

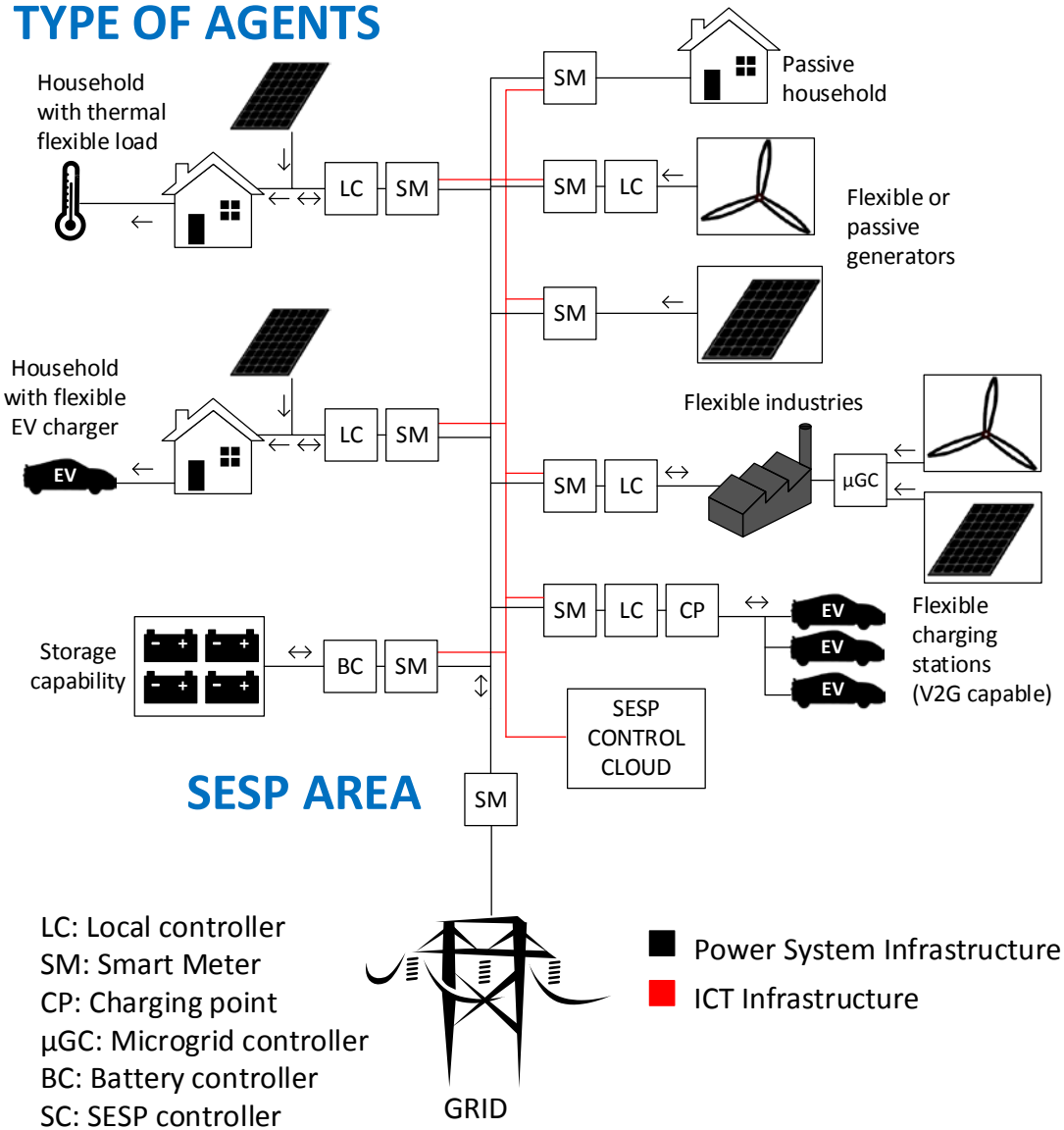
Provides:

An arena for local exchange of energy and flexibility
A set of consolidated services («service in the cloud»)

Personal Agents and Agent Technologies
to reduce complexity for users and increase response frequencies

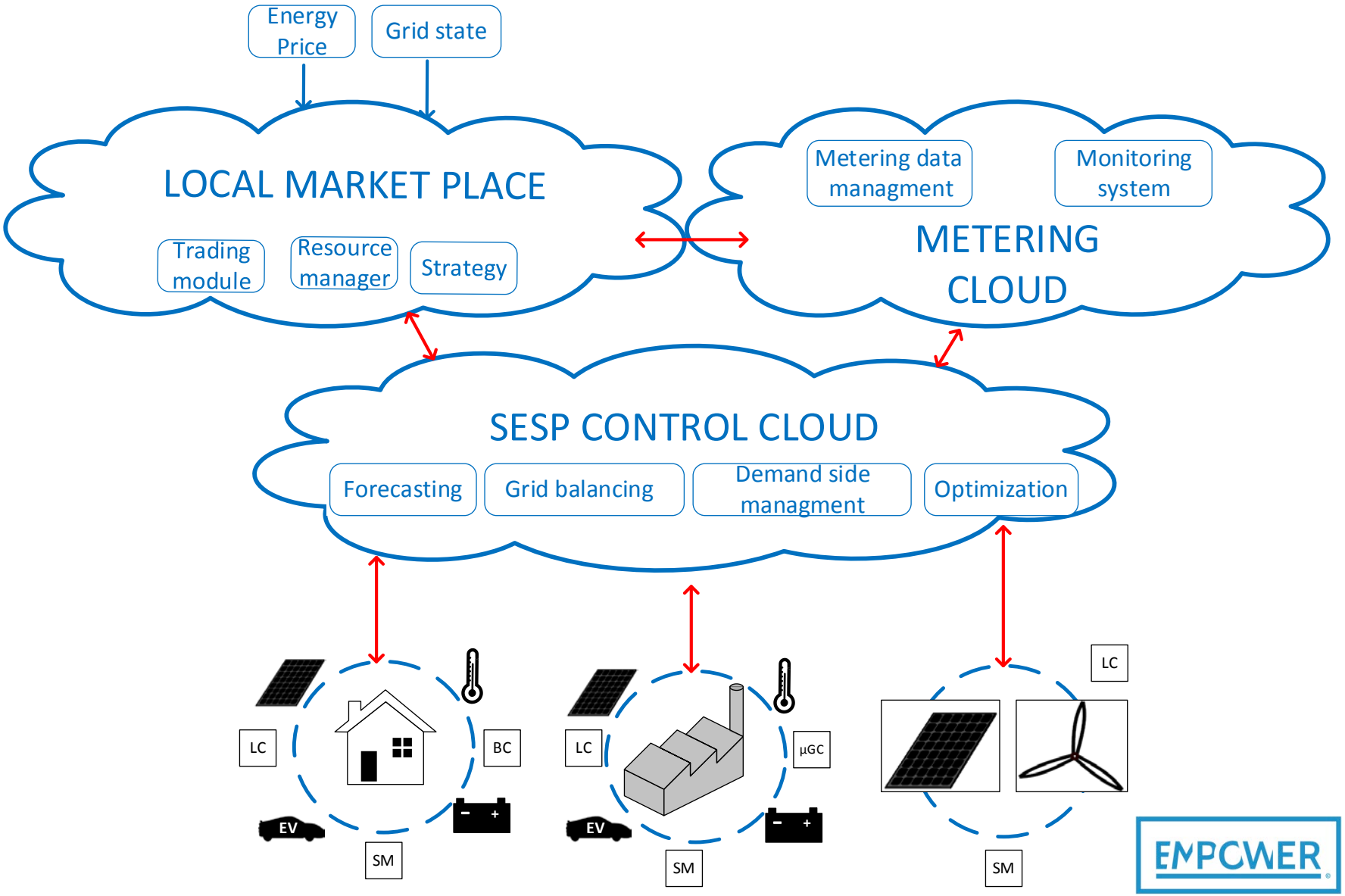
Structure

"Neighborhoods will balance themselves"



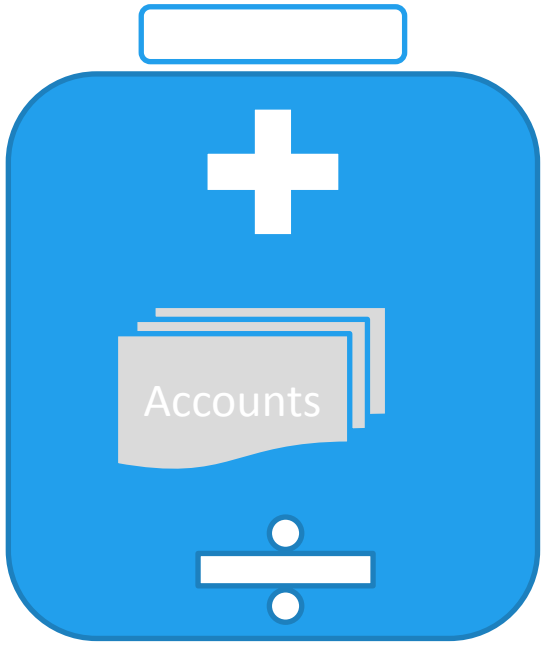
Virtual arena

Cloud based SESP platform

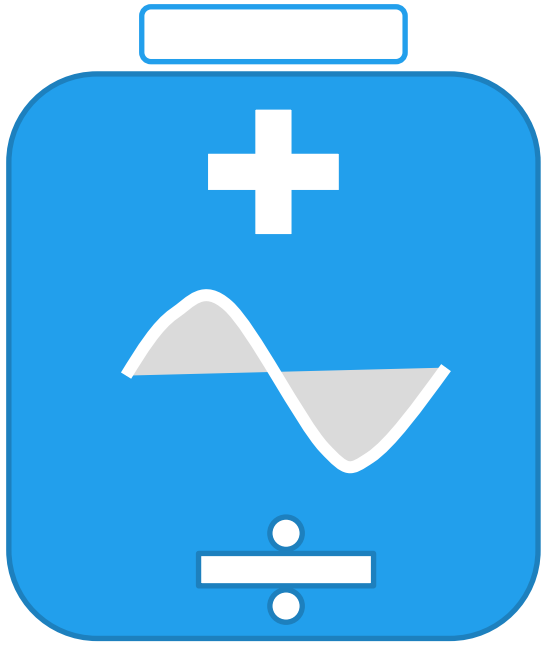


Control & Storage
are essential elements

The storage concept has multiple roles



Vault
(deposits and withdrawals)



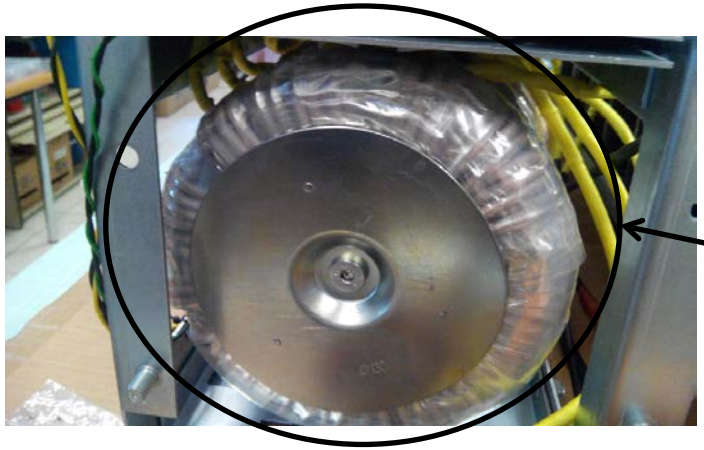
Balancing
(deposits and withdrawals)

The Intelligent Distributed Power Router (IDPR)

From UPC

Build of the coupling filter and stack

3D design



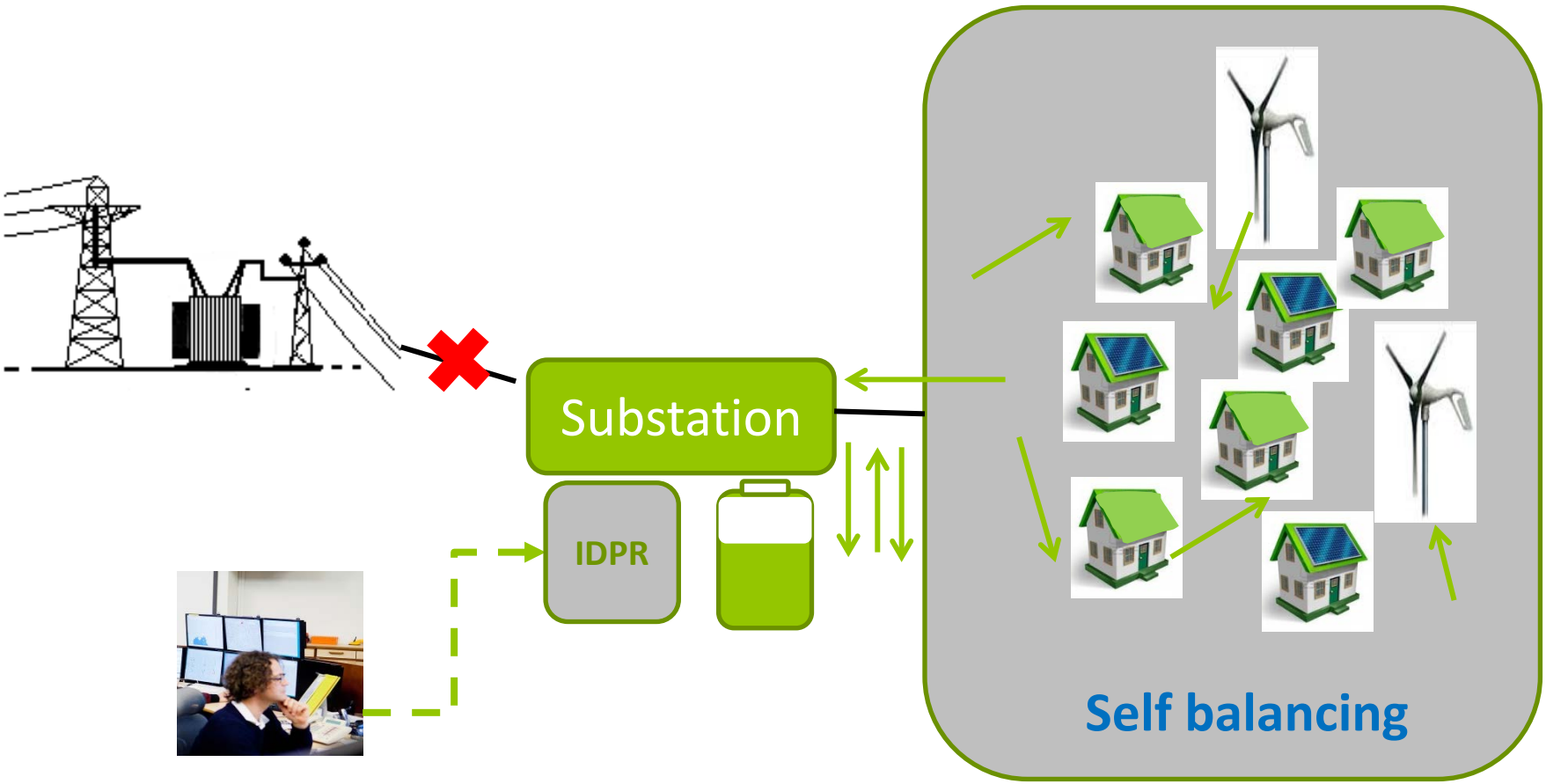
Real device

High efficiency coupling inductances

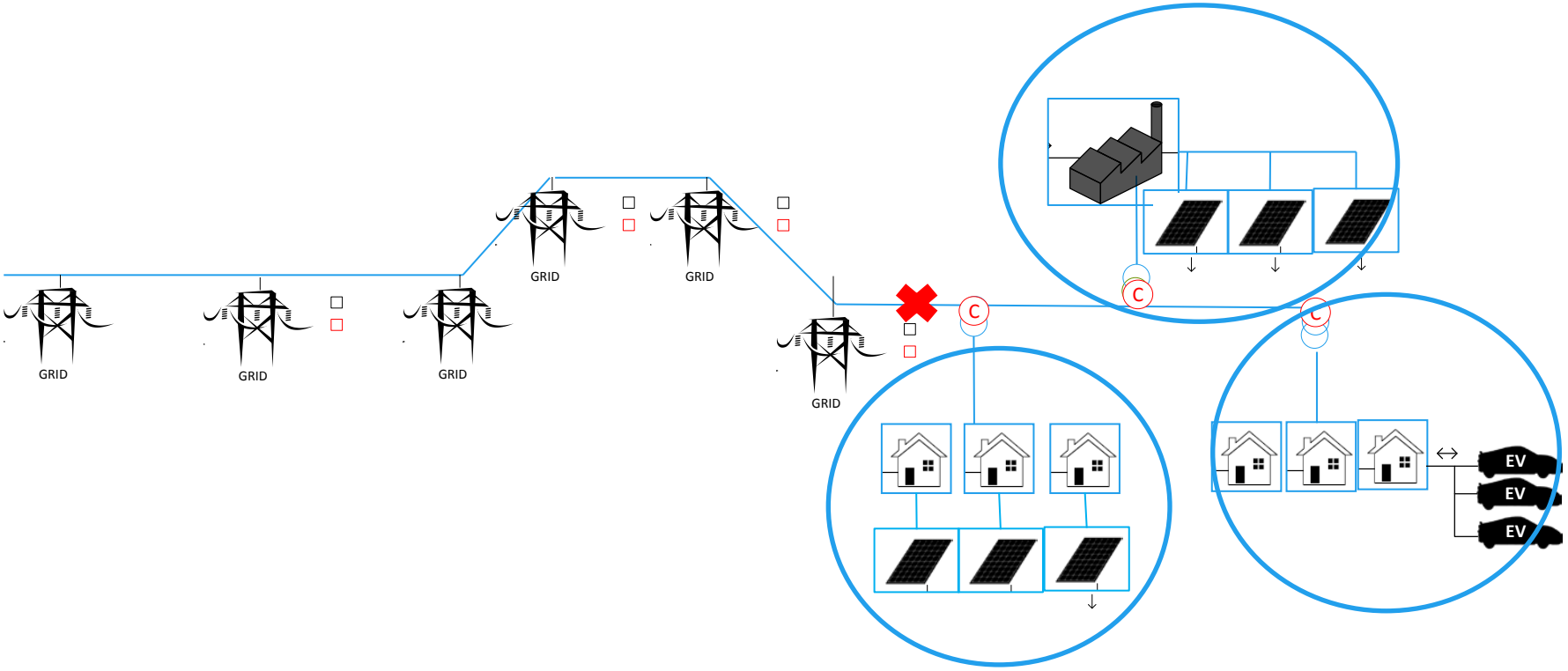
Power stack

SMART RURAL GRID

Project concept

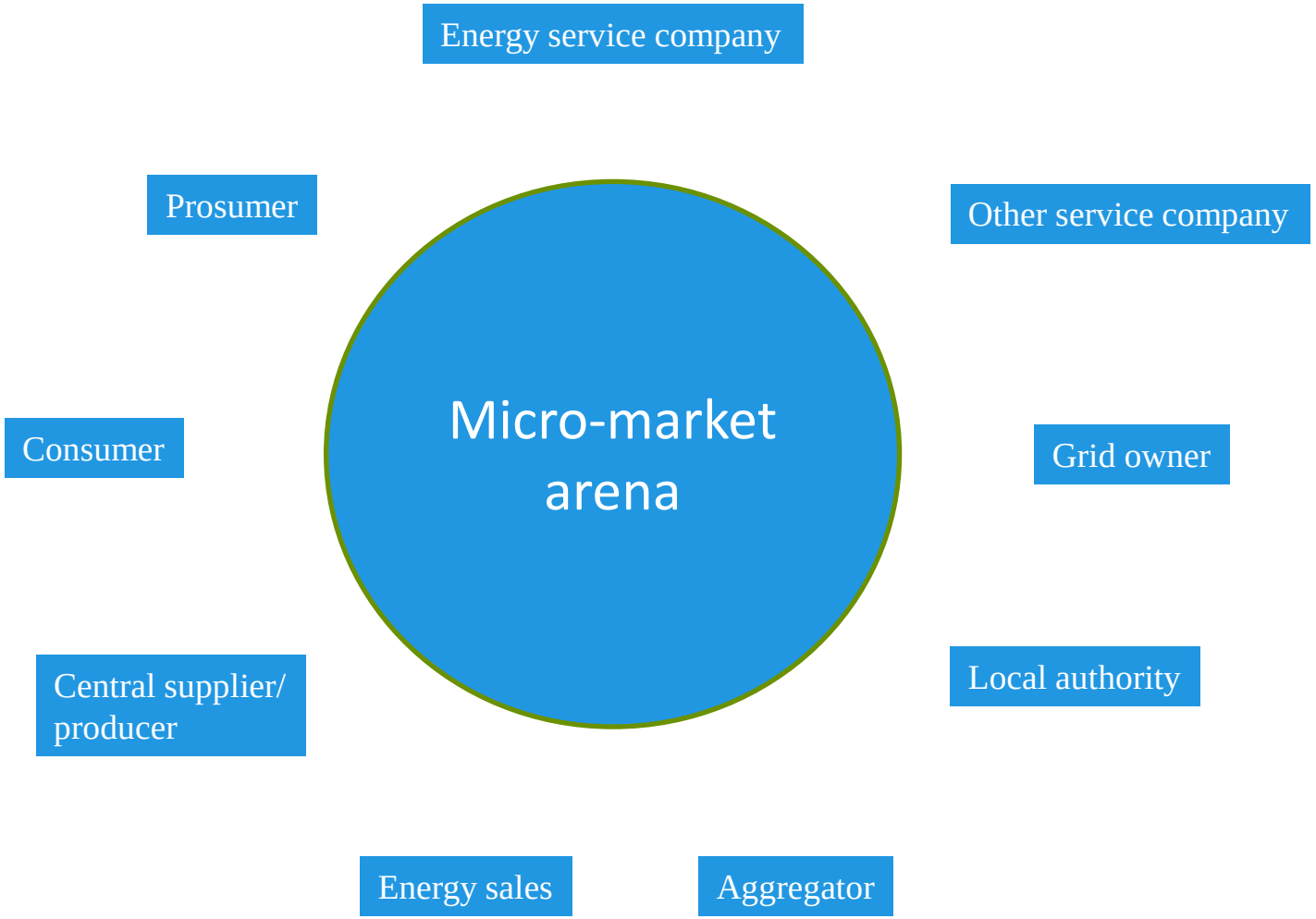


The concept applied in a regular grid

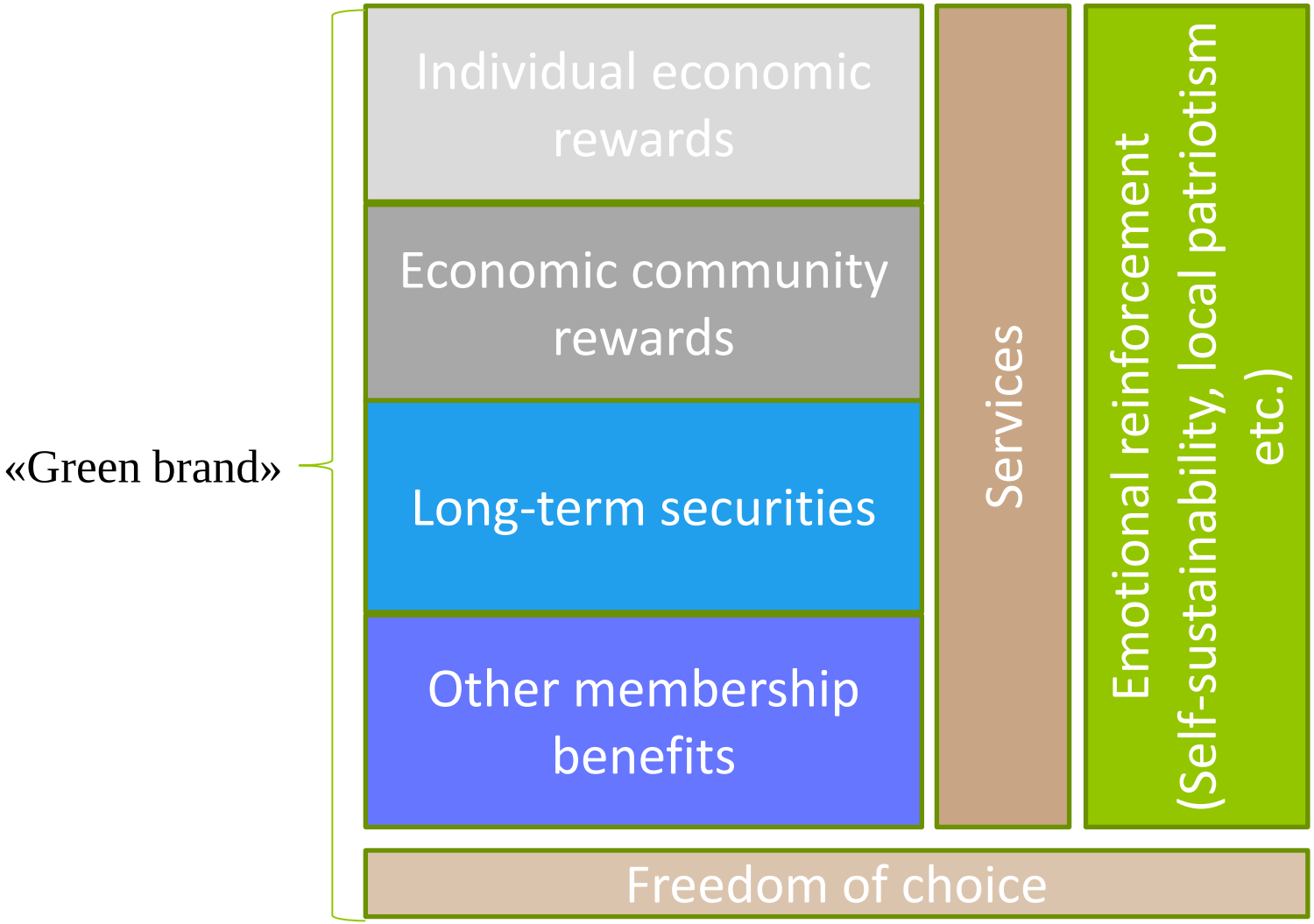


Energy cells

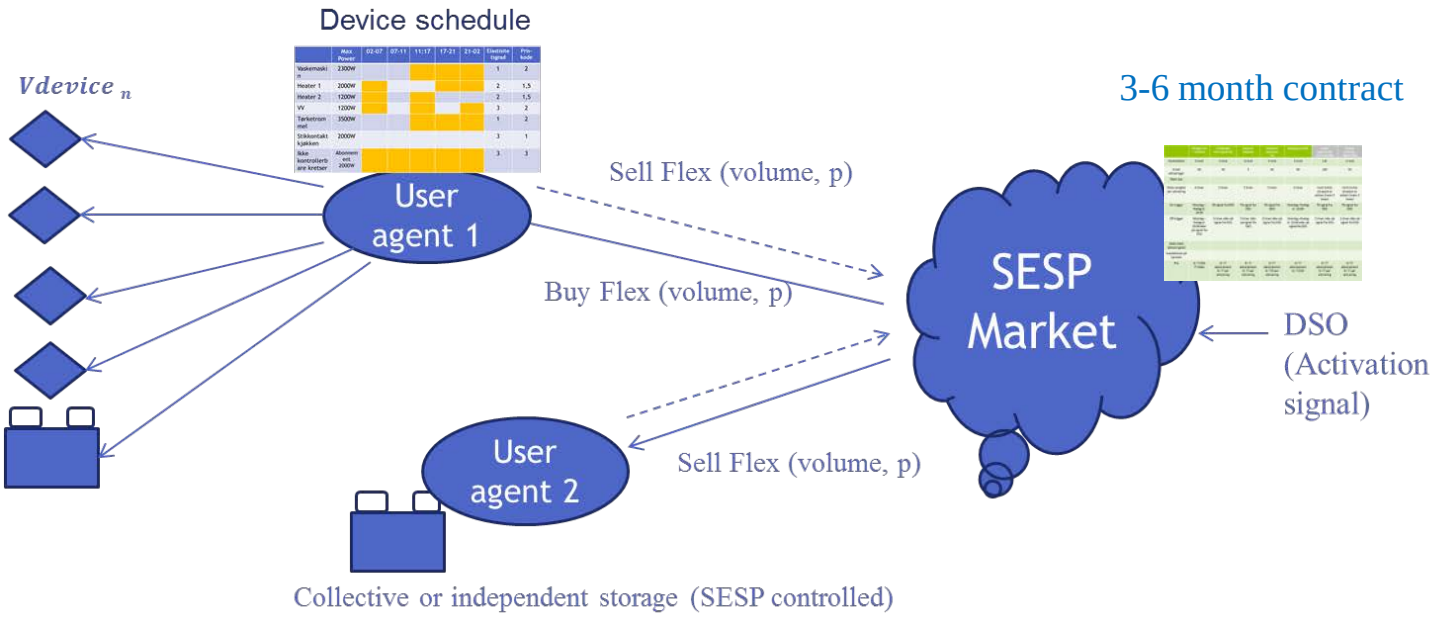
The market arena



The Value Stack

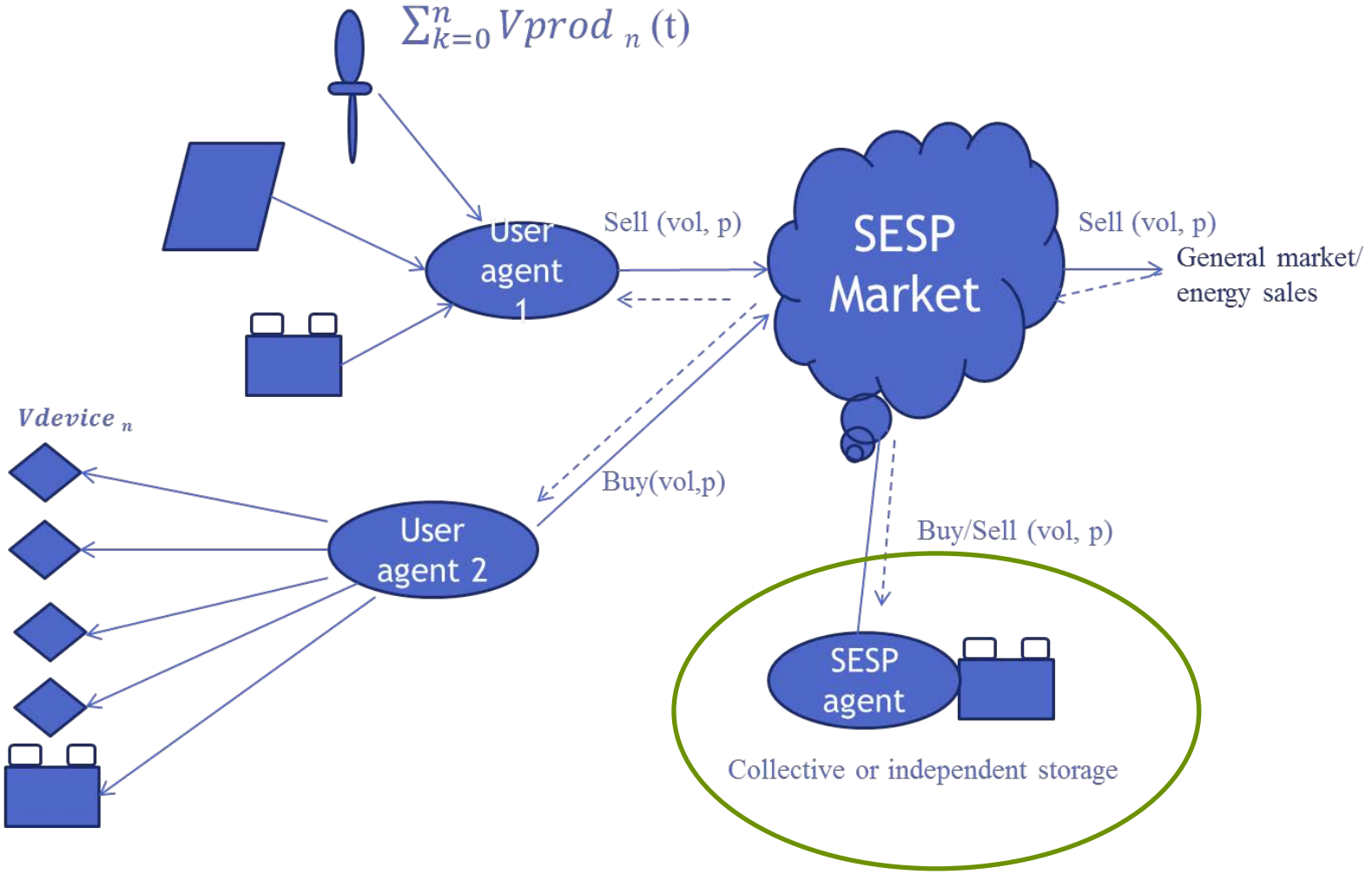


Agents



Agents trading flexibility:
DSO signal transformed into a trade signal

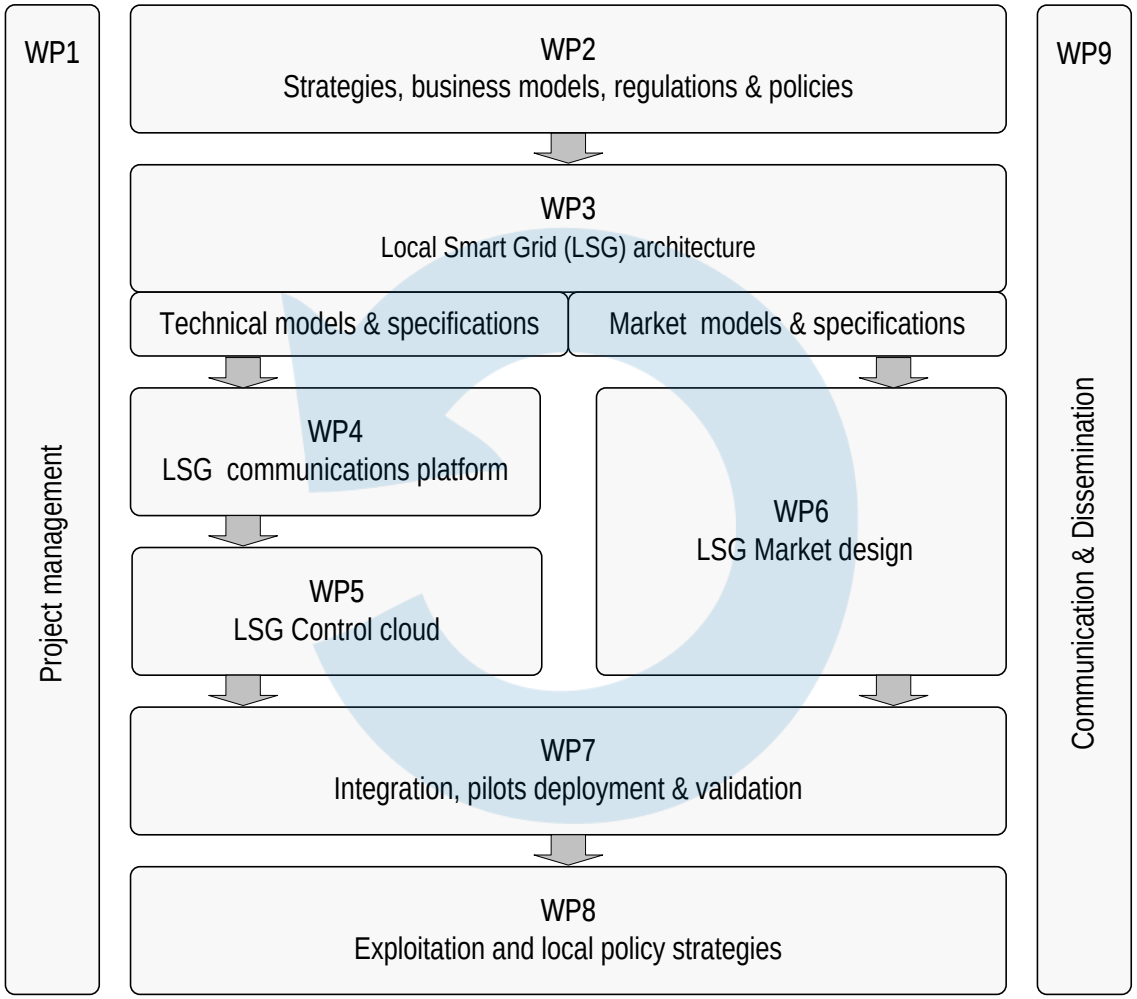
Agents



Agents trading energy

The concept

Work packages and partners



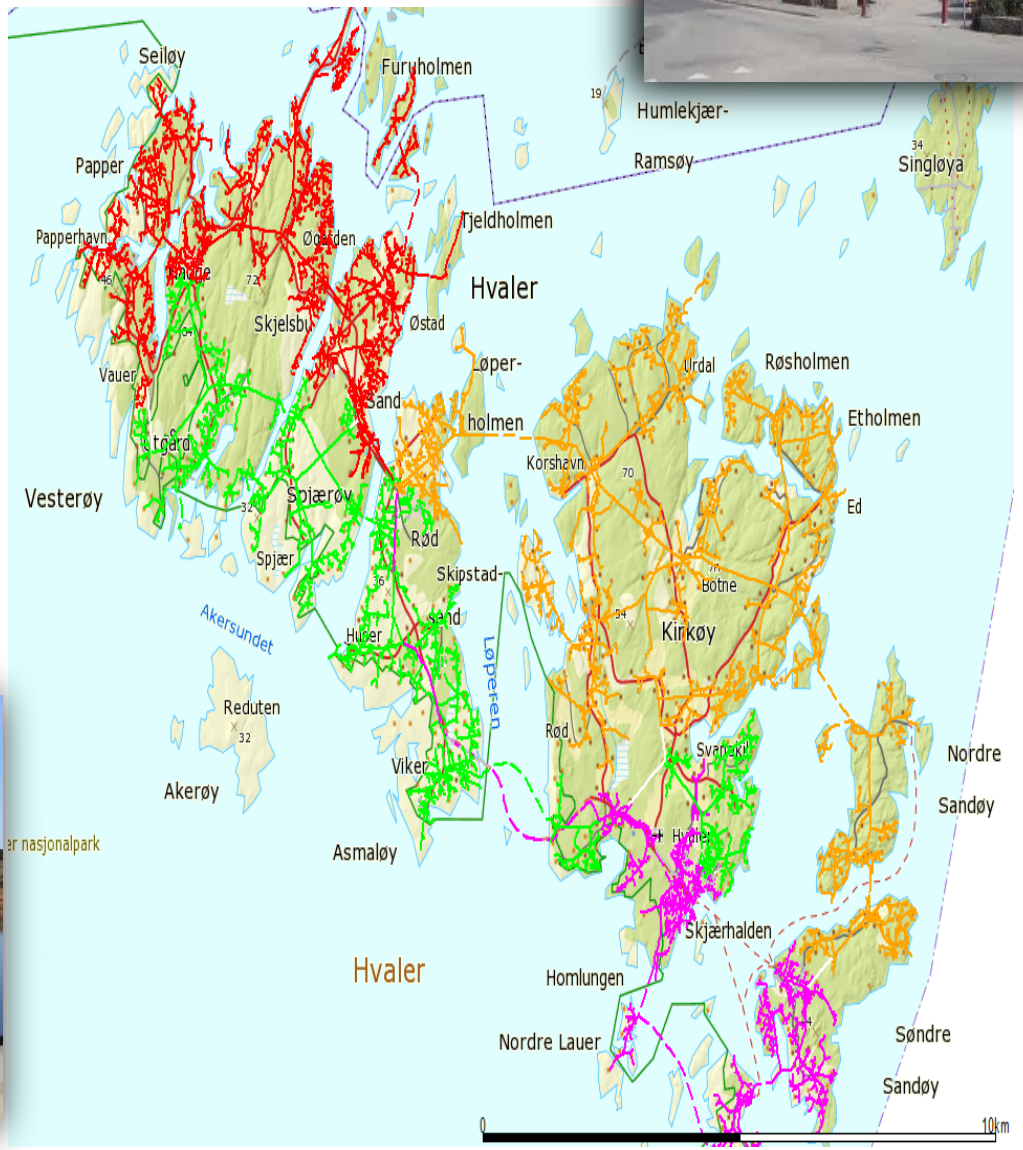
WP	Partner
WP1	Schneider / SmartIO
WP2	UNISG
WP3	UPC
WP4	Schneider
WP5	eSmart
WP6	SmartIO
WP7	Schneider
WP8	SmartIO
WP9	UPC

Demo areas

- Hvaler, Norway
- Lübben, Germany
- Malta

Hvaler

- 86 km2, islands
- 6 800 smart meters
- 4.300 cabins
- 50 kV radial supply
- 1 secondary station, 30 MW
- 18 kV MV grid (110 km air)
- 206 substations



EMPOWER

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