"How transactive energy will enable citizen communites to support the public grid"

23/05/2018

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REScoop.eu / EnergieID

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Add profile section

More...

EFIKA engineering cvba

Katholieke Universiteit Leuven

See contact info

See connections (500+)

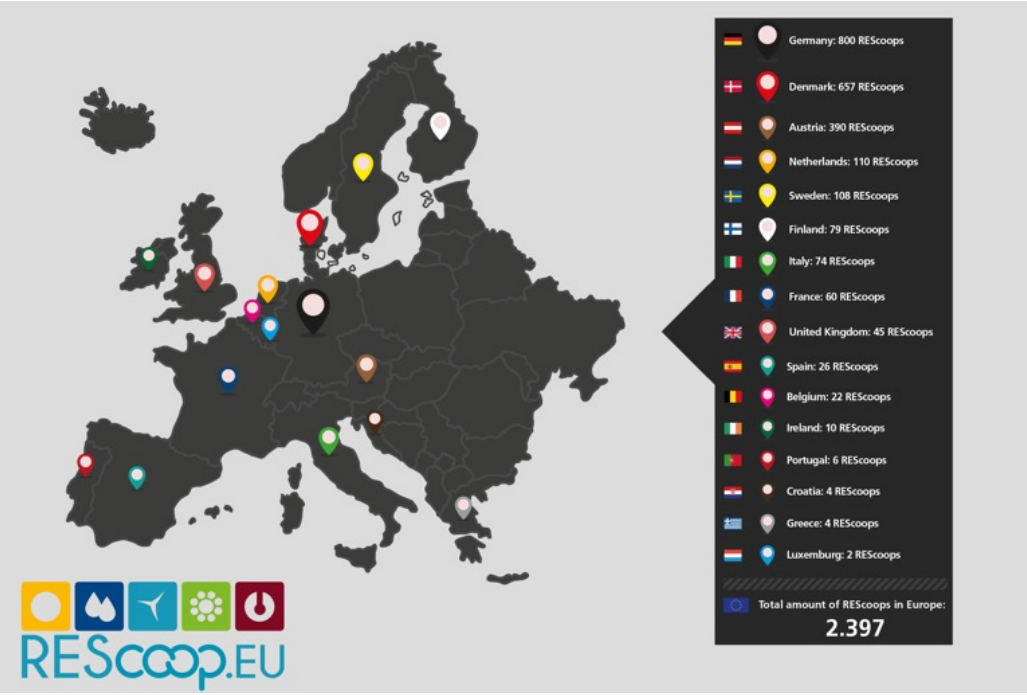
About REScoop.eu

European federation for REScoops

- 1.500 REScoops from 12 Member States
- 1.000.000 citizens

Objectives

- Represent the voice of citizens and REScoops
- Support start up of new REScoops
- Provide services to members
- Promote the REScoop business model



What is a REScoop?

REScoop is short for a Renewable Energy Sources Cooperative.

Groups of citizens who co-operate in the field of RES or EE Production

- Production
- Distribution
- Supply
- Services

= Community Power initiatives

Legal entity < ICA principles

Smarter use of energy, together

EnergyID helps you collect, analyse and compare your energy, water and transport data, individually and collectively.

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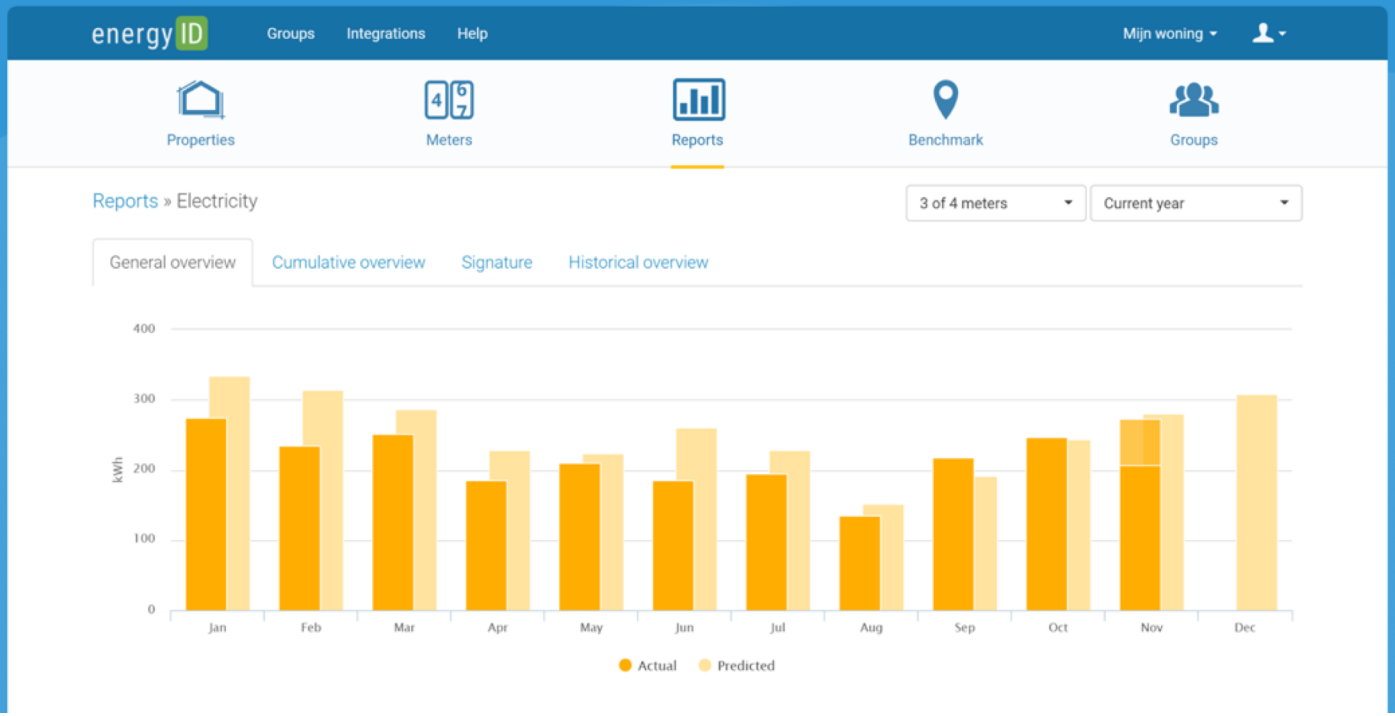

Overview

- Transactive Energy and energy collectives
- Towards active communities
  - H2020 Nobel Grid
  - H2020 WiseGRID / Interreg cVPP
  - H2020 FlexCOOP
  - UIA Circular South
- Blockchain
- Examples
- Conclusion

Transactive Energy – an approach to responding to our changing world…

Pacific Northwest NATIONAL LABORATORY
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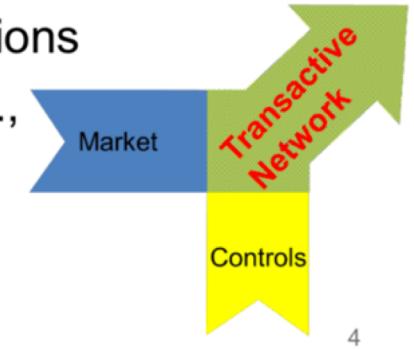
"A set of economic and control mechanisms that allows the dynamic balance of supply and demand across the entire electrical infrastructure using value as a key operational parameter."

GridWise® Architecture Council, Transactive Energy Framework

- Use market mechanisms to perform distributed optimization
  - Reflect value in exchangeable terms (price)
  - Effectively allocate available resources and services in real-time
  - Provide incentive for investment on longer time horizon
- Use communications and automation of devices and systems as real-time agents for market interaction
  - Agents convey preferences and perform local control actions
  - Engage in one or more markets to trade for services, e.g.,
    - Real-time energy, peak-shaving
    - System reserves



Source: http://www.ieadsm.org/wp/files/IEA-Symposium-TransactiveEnergy-Widergren.pdf

Types of Smart Grid Coordination

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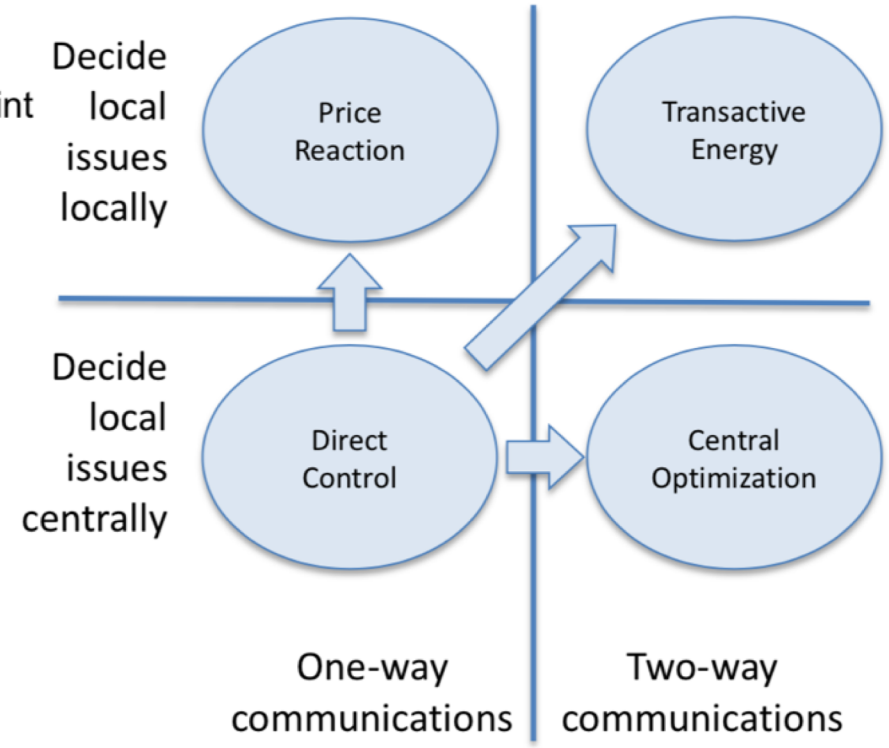
- **Direct (Top-Down) Control**
  - Utility switches devices on/off remotely
  - No local information considered
- **Central Control/Optimization**
  - Optimization and control from a central point
  - Relevant local information must be communicated to central point
- **Price Reaction Control**
  - Prices signalled to customers and/or their automated devices
  - No communication of local information
- **Transactive Energy (TE)**
  - Automated devices engage in market interactions
  - Information exchange includes quantity (e.g., power, energy) and price



Slide produced with permission from Dr. Koen Kok, The PowerMatcher Smart Coordination for the Smart Electricity Grid, published by TNO, The Netherlands, 2013. www.tinyurl.com/PowerMatcherBook

Source: http://www.ieadsm.org/wp/files/IEA-Symposium-TransactiveEnergy-Widergren.pdf

Smart Energy Management Matrix

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	One-way communications	Two-way communications
Decide local issues locally	**Price Reaction** ↑ Full use of response potential ↓ Uncertain system reaction ↓ Market inefficiency ↑ Mitigates privacy issues	**Transactive Energy** ↑ Full use of response potential ↑ Predictable system reaction ↑ Efficient market ↑ Mitigates privacy issues
Decide local issues centrally	**Direct Control** ↓ Partial use of response potential ↓ Uncertain system reaction ↓ Autonomy issues	**Central Optimization** ↑ Full use of response potential ↑ Predictable system reaction ↓ Privacy & autonomy issues ↓ Scalability issues

Slide produced with permission from Dr. Koen Kok, The PowerMatcher Smart Coordination for the Smart Electricity Grid, published by TNO, The Netherlands, 2013. www.tinyurl.com/PowerMatcherBook

Source: http://www.ieadsm.org/wp/files/IEA-Symposium-TransactiveEnergy-Widergren.pdf

Transactive Interaction Model

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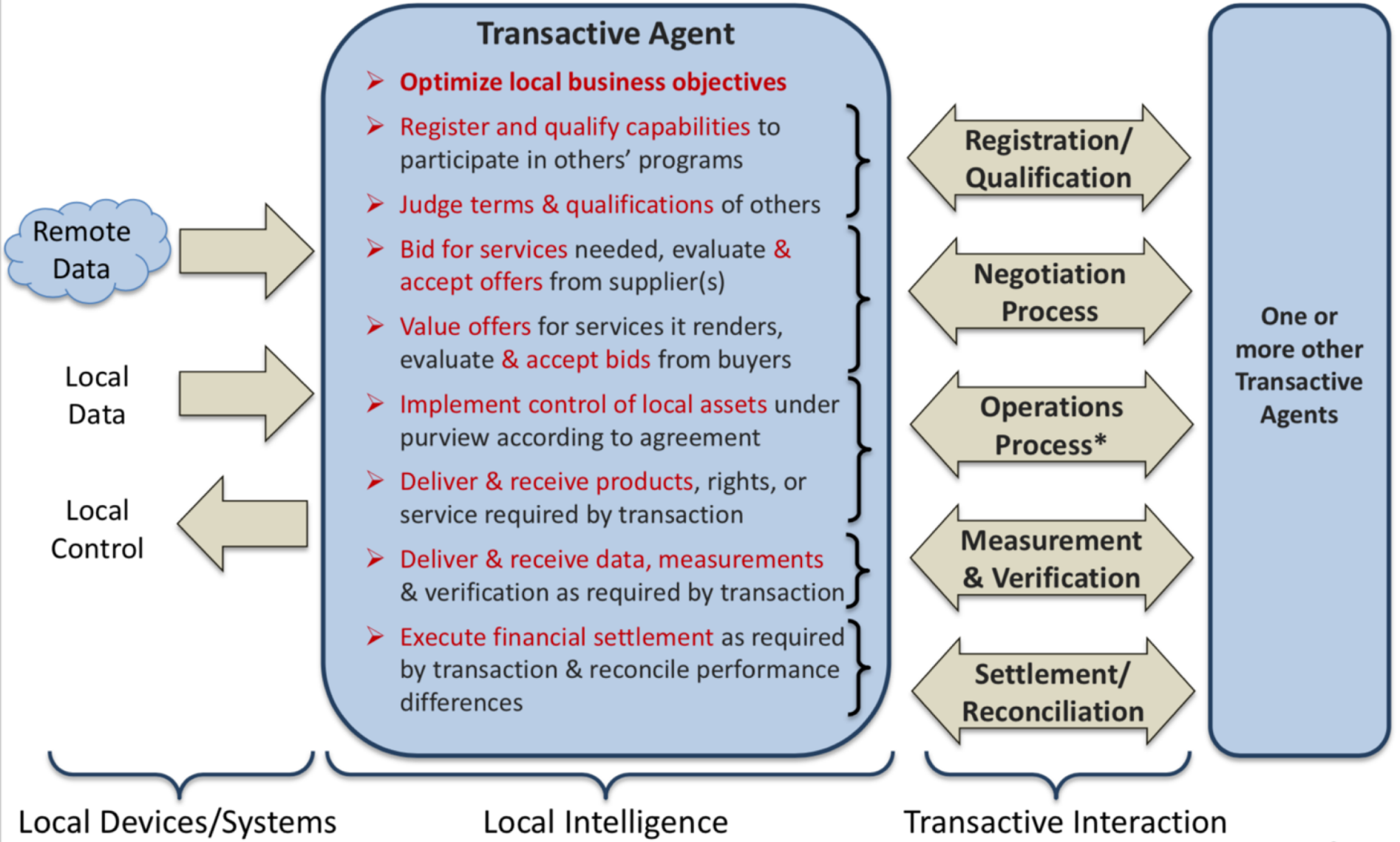

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* E.g., operations signals or e-product exchange

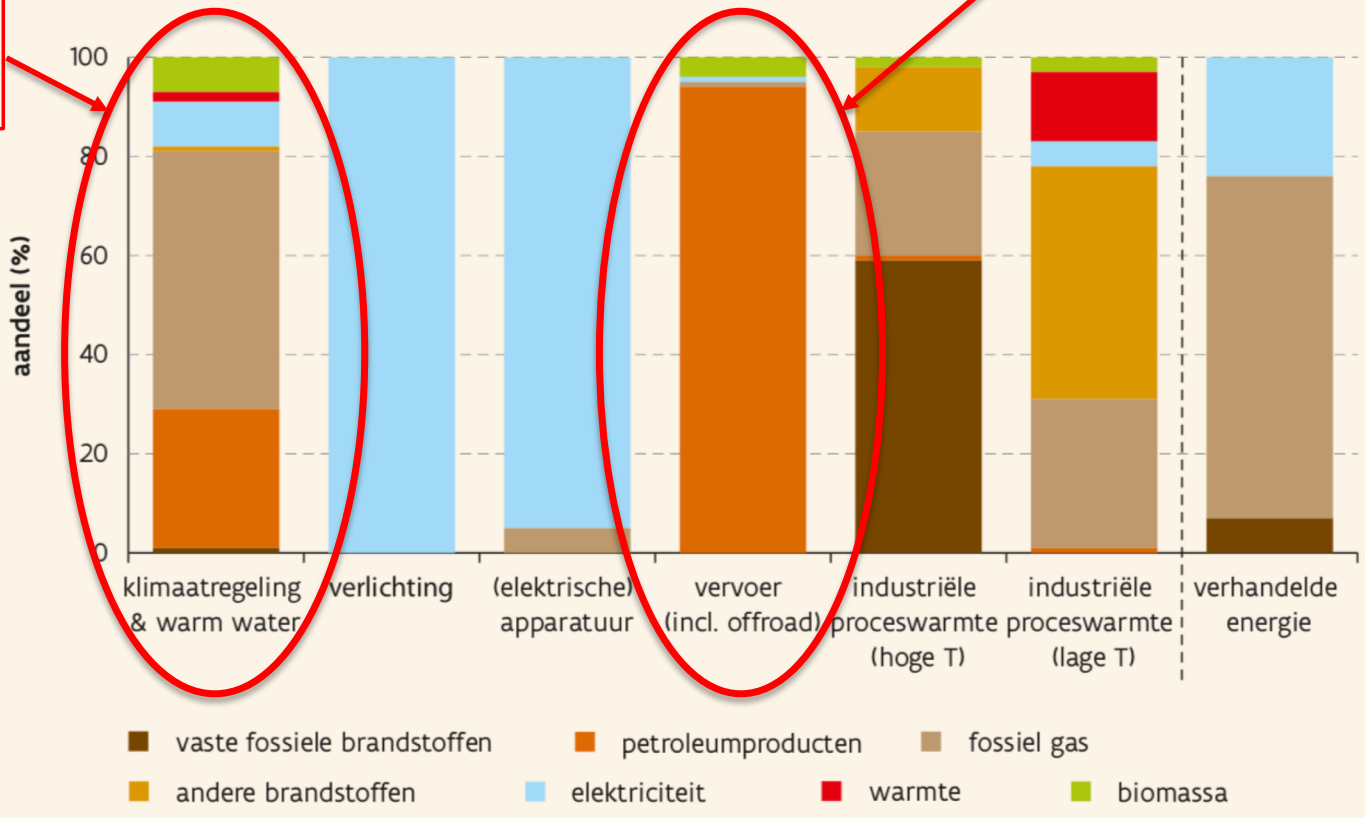
Source: http://www.ieadsm.org/wp/files/IEA-Symposium-TransactiveEnergy-Widergren.pdf

Context

Transport:
+90 % Fossil based

Heating & DHW:
+80 % Fossil based

Figuur 1.6 Energetisch energiegebruik per energiedienst opgedeeld naar energiedrager (Vlaanderen, 2014)

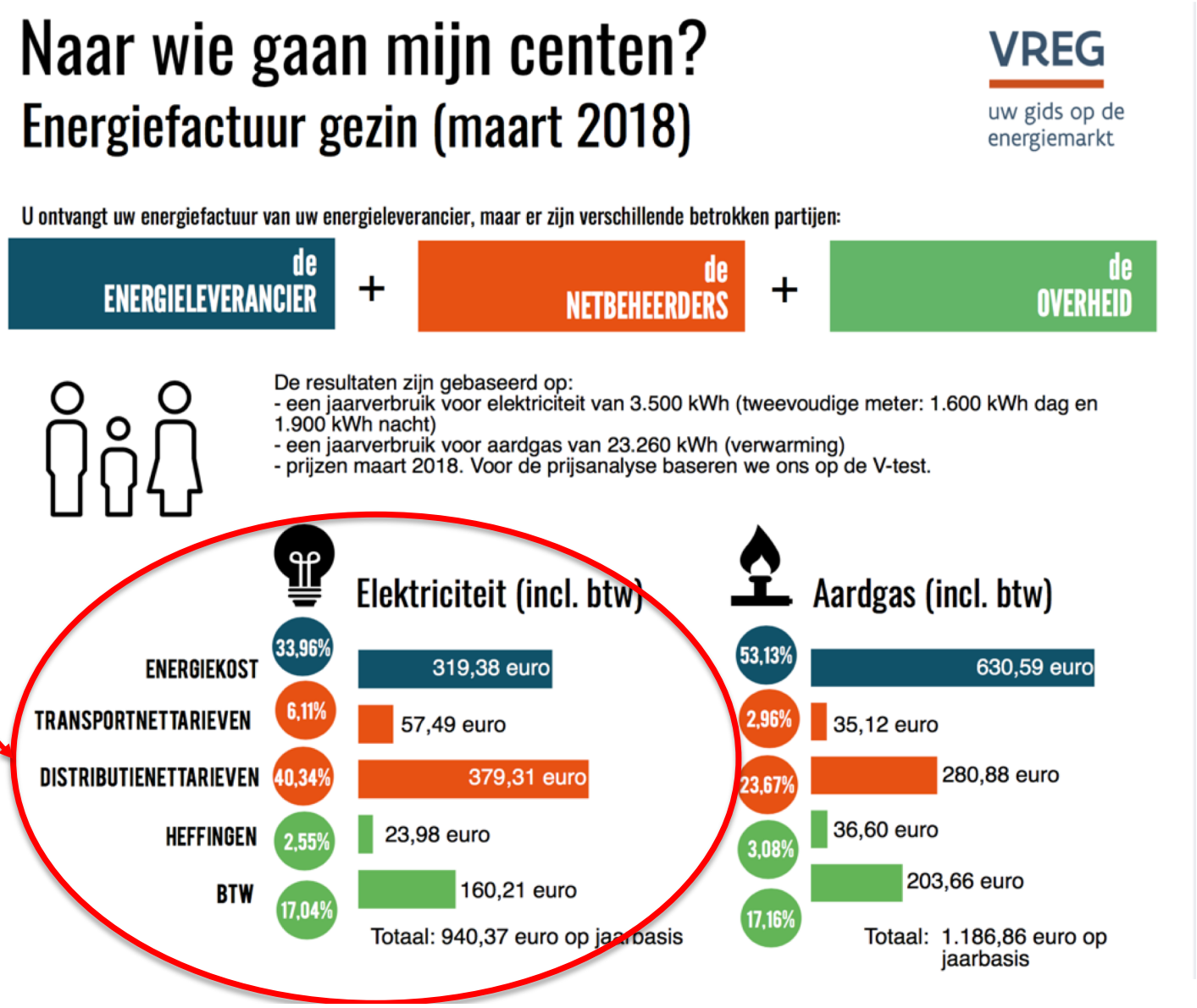


Bron: MIRA op basis van Aernouts et al. (2016)[2], Couder (2013)[5], ODYSSEE-MURE (2016)[6], CLO (2016)[7], Pennartz & Van den Bovenkamp (2016)[8]

Context

DSO:
40,34% of family cost electricity*

*Actual situation without tax shift, before capacity tariff



Nobel Grid

Smart energy for people

New cost-effective business models for flexible Smart Grids

http://nobelgrid.eu/

This project has received funding from the European Union's Horizon 2020 research and innovation programme under the grant agreement No 646184.

etra I+D

SLAM: Smart Low Cost Advanced Meter

EU Policy: 80% Smart Meters deployed in 2020

SLAM: Smart Low Cost Advanced Meter

Standard Interfaces *Diversity* of Users

Extended functions *Diversity* of Applications

USM SMX

SMART METER EXTENSION

(Specific Smartness)

USM SMM

SMART(*er*) METROLOGY METER

(Simple Standard Smartness)

Tools and ICT services for Smart Grid actors

G3M Framework

A cockpit that facilitates and reduces the costs of the management, control and maintenance of the distribution grid to DSO.

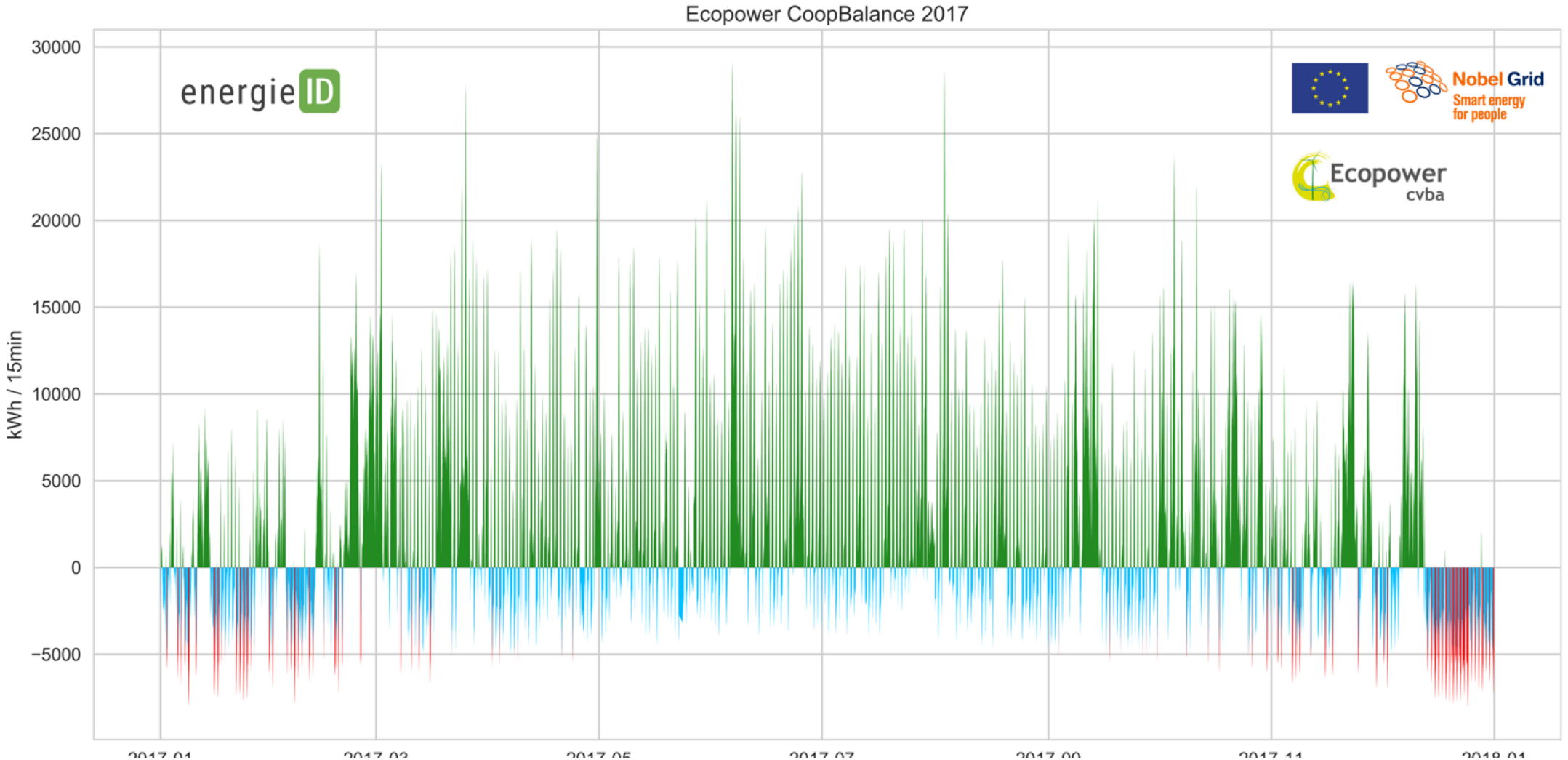
EMA App

An energy monitoring and active participation App for domestic and industrial prosumers

DRFM cockpit

A Demand Response cockpit for aggregators, energy service companies (ESCOS) and retailers.

Coop Balance



Wide scale demonstration of Integrated Solutions for European SmartGrid

etra I+D

This project has received funding from the European Union's Horizon 2020 research and innovation programme under the grant agreement No 731205.

WiseGRID partners

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MAY THE ENERGY BE WITH YOU

Emotion

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ENERCOOP

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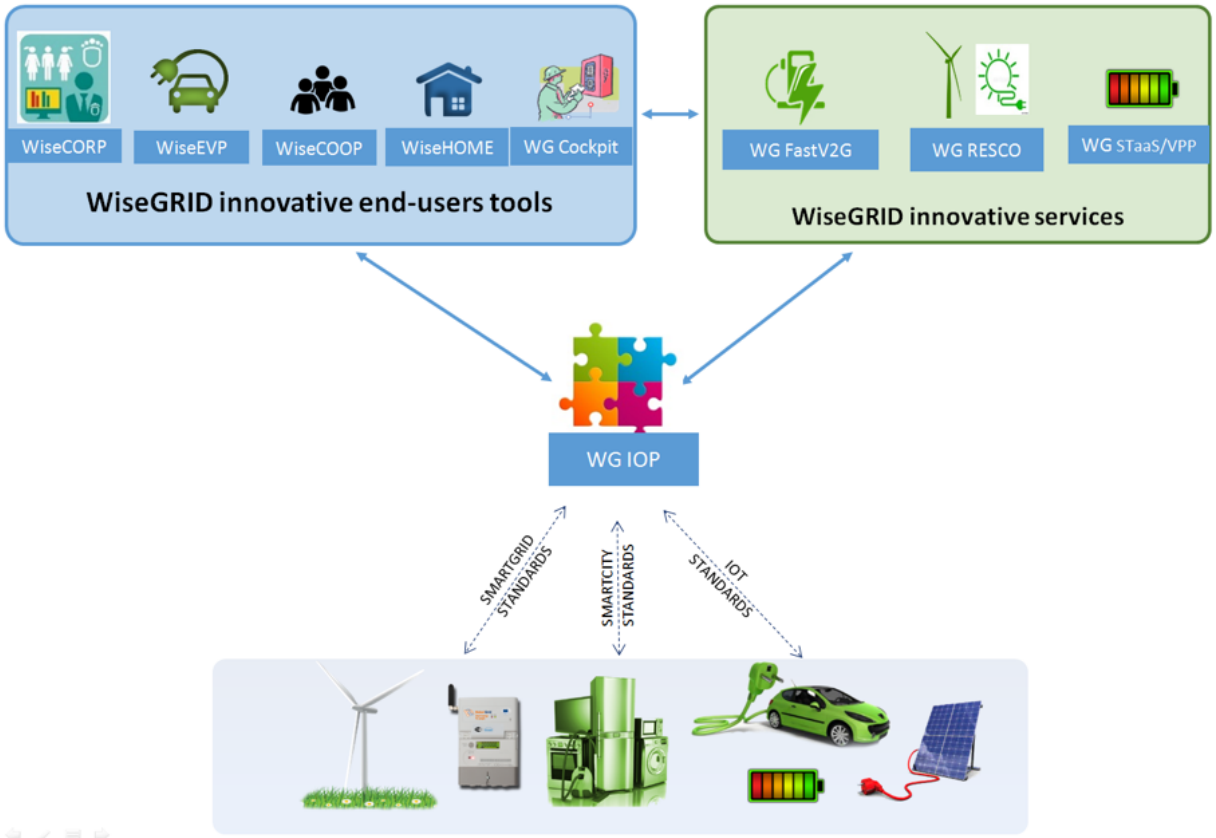
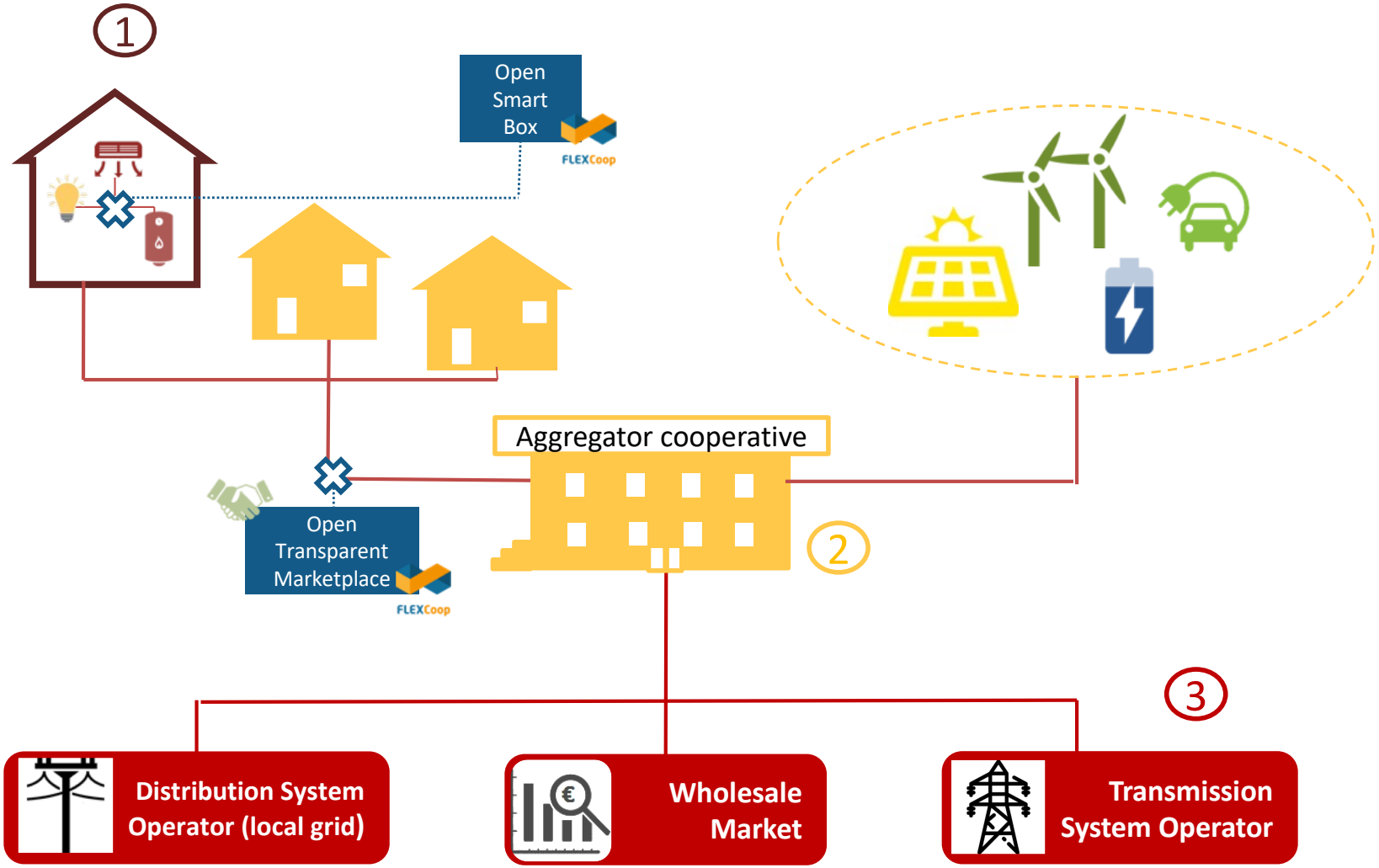
WiseGRID technological solutions



WiseGRID Nominations

1. ***Good Practice of the Year award from the Renewable Grid Initiative***
   (award ceremony 24th of May in Copenhagen)
2. ***EU Sustainable Energy Award 2018***
   (award ceremony 5th June in Brussels)

H2020 FlexCoop



Antwerpen
Circular South

Circular South realizes smart and less use of energy, water and materials and increases the share of renewable energy.

Smart use of Energy

Encouraging residents to use the available energy smart through innovative tools:

- Towards a self-sufficient neighborhood thanks to co-operative solar panels and batteries
- Smart meters and sensors in appartments
- City data sources (heating, waste collection, weather,…)
- Powerful central ICT platform for processing and control
- App and dashboard for nudging, guidance and information

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Getting rewarded for your contribution

- Project pioneers Blockchain technology with smart contracts to log everyone's contribution to the circular neighborhood
- Contribution is converted by system into local currency: the 'Circular Coin’
- Research how this can be converted into real value through automated settlement (e.g. eduction in energy bill), voting on community projects or spending in local economy

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BLOCKCHAIN

Blockchain for Energy

- Smappee – SolarCoin wallet

Source: https://support.smappee.com/hc/en-us/articles/218317783-Solarcoins

Blockchain for Energy

- sonnenCommunity (sonnen GmbH)

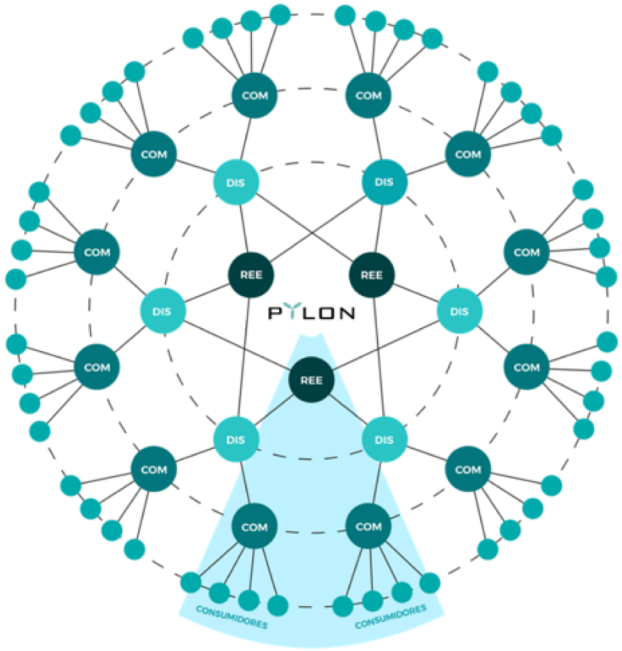
Source: https://sonnen.de/sonnencommunity/

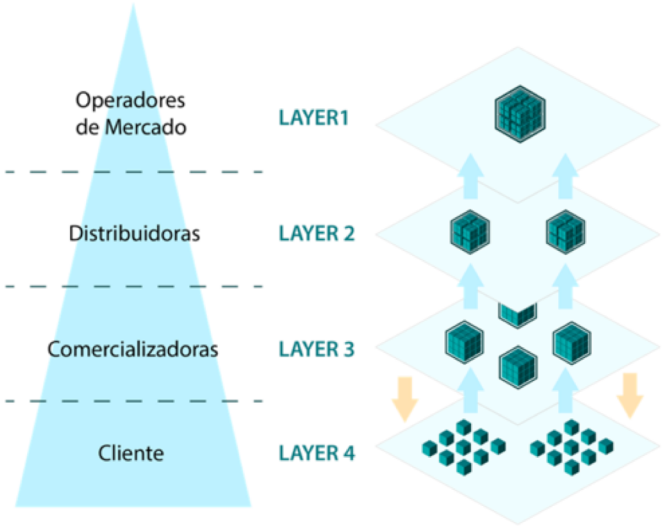
Blockchain for Energy

- Pylon – Klenergy

Pylon Network Blockchain

First fully functional Open Source blockchain algorithm – designed specifically for the energy sector needs.





POWER TO THE PEOPLE

goiener

Energia berriztagarrien sorkuntza eta kontsumo kooperatiba

Cooperativa de generación y consumo de energía renovable

Source: pylon-network.org

Blockchain for Energy

- E-cloud

Source: https://www.ores.be/entreprises-et-industries/faire-economies/e-cloud-cooperer-dans-les-zonings-pour-une-autoproduction-plus-efficace

Paper: https://orbi.uliege.be/bitstream/2268/220759/1/PSCC_2018_blockchain.pdf

Blockchain for Energy

- EWF - Energy Web Foundation

Decentralization

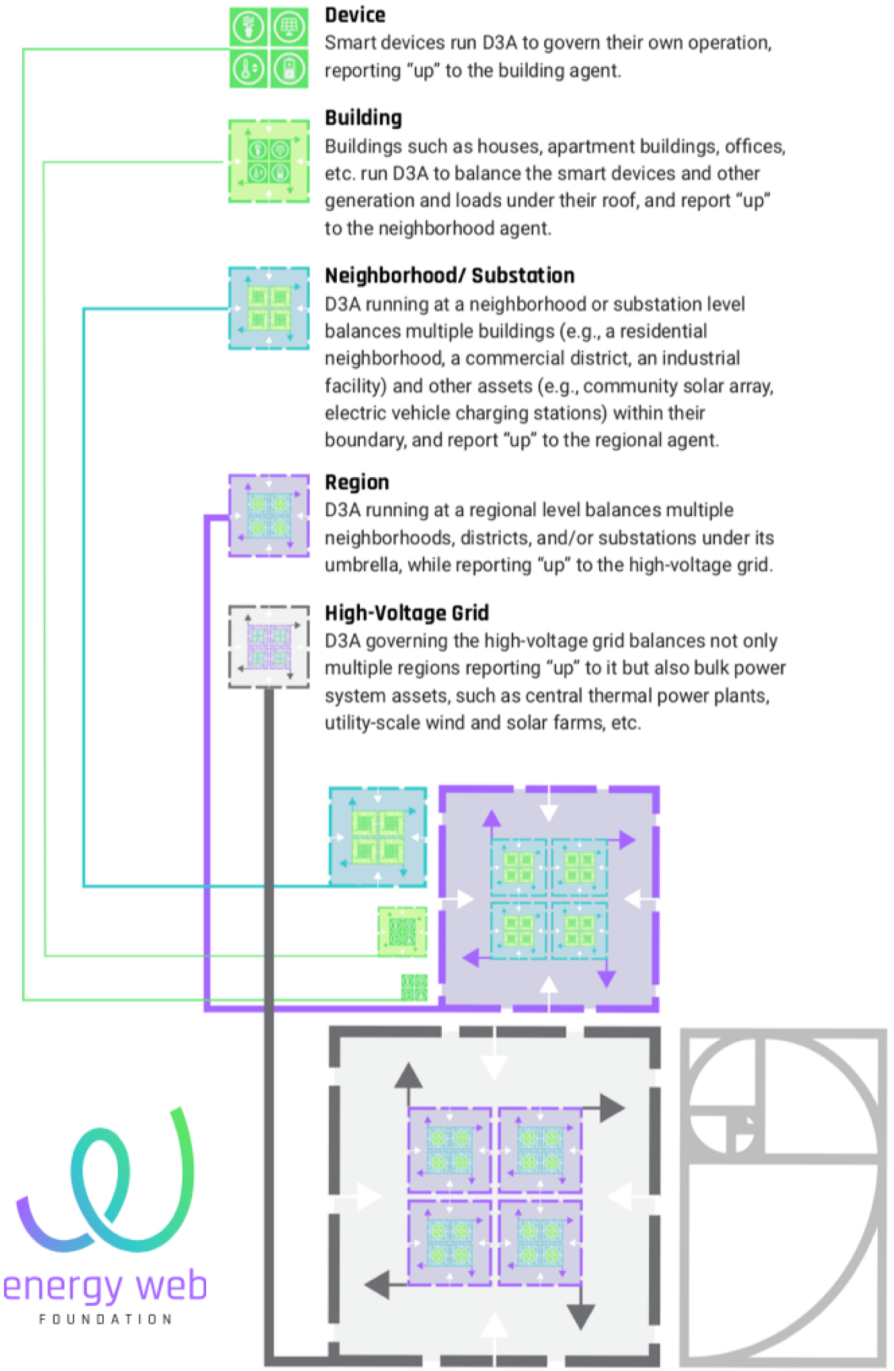
The grid should be fully decentralized — both in terms of physical infrastructure and operational management. This distinguishes between "distributed" and "decentralized" systems; the former implies a diverse asset base spread across geographic locations controlled by a single entity, while the latter includes both the distribution of resources as well as the transfer of authority and control from a central authority to a network of autonomous actors.

Recursion

Grids should be recursive, where each component and each boundary area scale (e.g., device, building, neighborhood, distribution grid) is a self-contained ecosystem, replicated and nested within the next layer of the system, like matryoshka Russian dolls. All components and each scale of the system operate with identical information and control models and each have operational decision-making capabilities.

Private Transparency

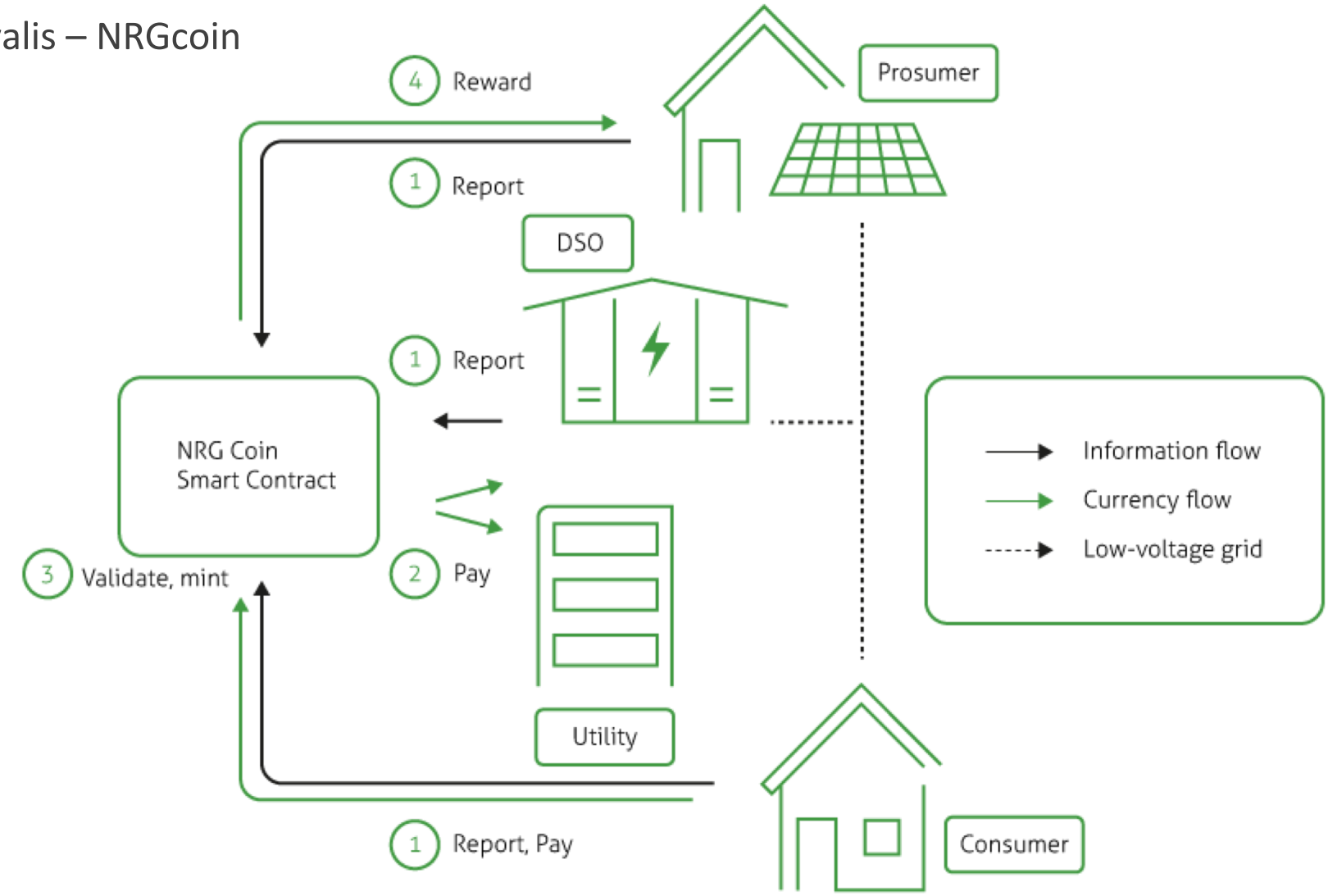
A privately transparent electricity market is one with as much "perfect information" as possible, defined by complete transparency of market conditions including the physical state of the grid, external conditions (e.g., weather), as well as anticipated and actual behaviors of market participants, all while protecting the identities and sensitive information of those participants in a crypto-graphically secure environment.



Source: https://energyweb.org/d3a/

Blockchain for Energy

- Enervalis – NRGcoin

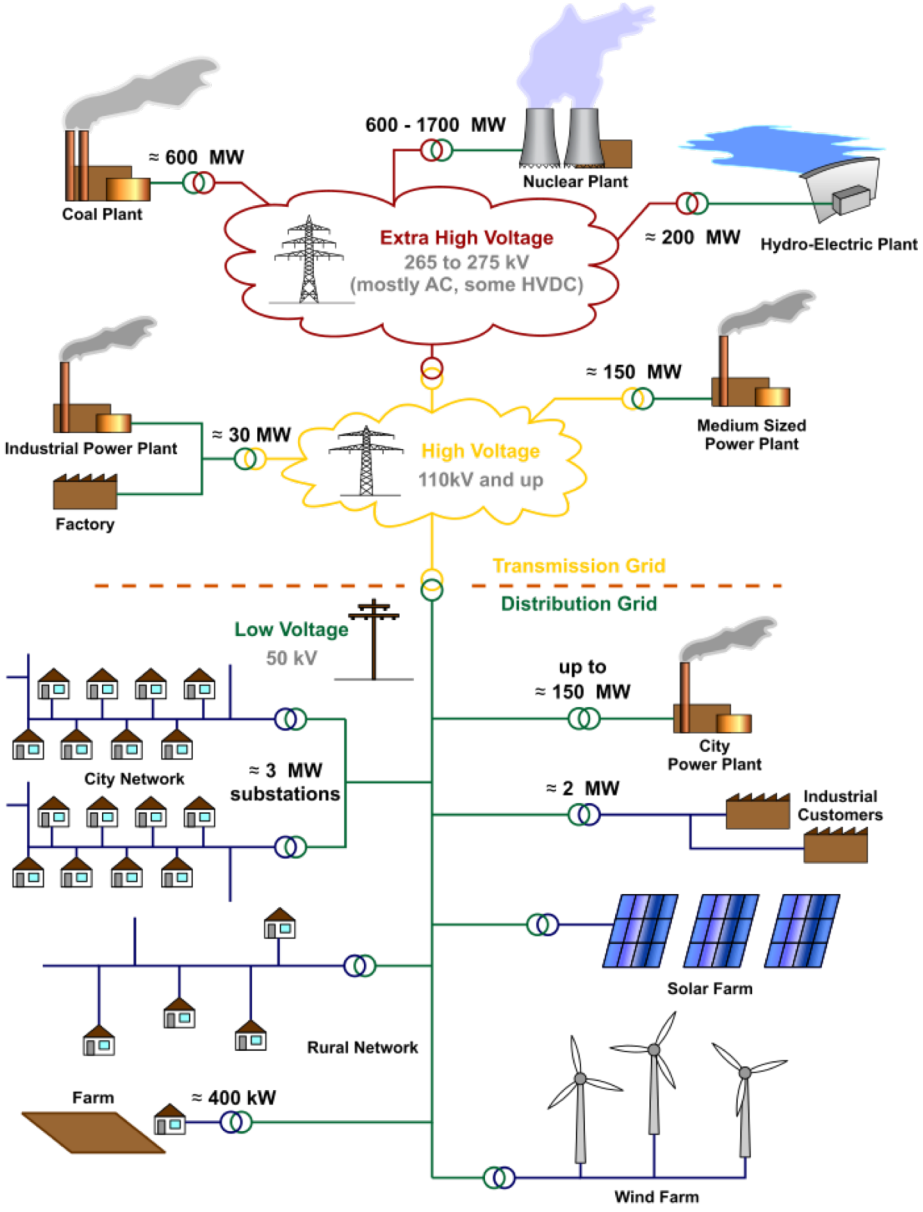


Source: https://www.enervalis.com/smart-settlement/

Communities supporting public grid

- Technology rapidly advancing to enable bottom-up approach
- Grid becomes recursive ecosystem.
- Transactive approach can support public grid to lower total investment and operational cost
- DSO should reward positive effects by energy collectives
- Collective implementation necessary to avoid wealthy going off-grid

The future is renewable, give everybody a chance to be part of it!



Source:
https://en.wikipedia.org/wiki/Electrical_grid

THANKS!

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