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

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REScoop.eu / EnergieID
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.

Get started

Already using EnergyID? Sign in.
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...

“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

Types of Smart Grid Coordination

- **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

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Smart Energy Management Matrix

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

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

Decide local issues locally
Decide local issues centrally

One-way communications
Two-way communications

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

Transactive Interaction Model

Transactive Agent
- Optimize local business objectives
- Register and qualify capabilities to participate in others’ programs
- Judge terms & qualifications of others
- Bid for services needed, evaluate & accept offers from supplier(s)
- Value offers for services it renders, evaluate & accept bids from buyers
- Implement control of local assets under purview according to agreement
- Deliver & receive products, rights, or service required by transaction
- Deliver & receive data, measurements & verification as required by transaction
- Execute financial settlement as required by transaction & reconcile performance differences

Registration/Qualification
- Negotiation Process
- Operations Process*
- Measurement & Verification
- Settlement/Reconciliation

One or more other Transactive Agents

Local Devices/Systems
- Local Intelligence
- Transactive Interaction

Heating & DHW: +80% Fossil based

Transport: +90% Fossil based
DSO: 40.34% of family cost electricity*

*Actual situation without tax shift, before capacity tariff
New cost-effective business models for flexible Smart Grids

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

http://nobelgrid.eu/
SLAM: Smart Low Cost Advanced Meter

EU Policy: 80% Smart Meters deployed in 2020
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

Ecopower CoopBalance 2017

energie

kWh / 15min

Wide scale demonstration of Integrated Solutions for European SmartGrid
WiseGRID partners
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

1. Open Smart Box

2. Aggregator cooperative

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
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
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

Source: pylon-network.org
E-cloud

Coopérer dans les zonings pour une autoproduction efficace

L'E-cloud pensé comme un partenariat "4 win"

1. C'est un win pour les entreprises, son public cible.

2. C'est aussi un win pour les autres qui sont à côté du réseau E-cloud. Le fait que l'on ait une autoconsommation plus grande, réduit la quantité d'énergie qui transite sur le réseau de distribution pour remonter vers le réseau Elia et être consommée ailleurs. Il y a moins de flux d'énergie parasite. Cela diminue les besoins d'investissement et donc la facture de tous.

3. Pour la Wallonie, c'est un win aussi, car cela lui permet d'atteindre ses objectifs en termes d'énergies renouvelables et de compétitivité.

4. Pour les producteurs, c'est également un win car ils ont la possibilité d'installer des moyens de production dans des zones moins sensibles au phénomène NIMBY (Not In My BackYard). Par exemple, une partie des clients qui sont raccordés dans ce zonning vont voir les éoliennes d'un autre oeil et se dire qu'elles tournent eux. Ça change leur perception.


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 cryptographically 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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