

Gridsingularity

Blockchain for the energy market

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gridsingularity.com

GSy

Company

Name: Grid Singularity GSy GmbH

Place: Vienna, Austria

Date: Feb. 2016

Co-founders:



Ewald
Hesse
CEO



Dr. Ana S.
Trbovich
STRATEGY



Erwin
Smole
SALES



Dr. Gavin
Wood
BLOCKCHAIN



Dr. Aeron
Buchanan
BLOCKCHAIN



Dr. Jutta Steiner
BLOCKCHAIN

Blockchain Technology

- Top blockchain development talent pool
- Ethereum Yellow Paper authorship
- CTO / COO / CFO positions at Ethereum
- Parity client developers

Energy and Policy

- Energy and regulatory senior management and advisory roles at: ABB, Andritz AG, Verbund, E-Control, PwC, AXA, World Bank, European Institute for Innovation and Technology

ICT

- 15 years of experience in substation, power plant and industrial automation
- full design engineering and implementation skills

Blockchain Basics

Decentral Network

Distributed Nodes confirm transactions in sequential intertied blocks through a **Consensus Mechanism**.

Public Key Infrastructure at the core of the system

Collateralized **trust**

Decentral Virtual Machine

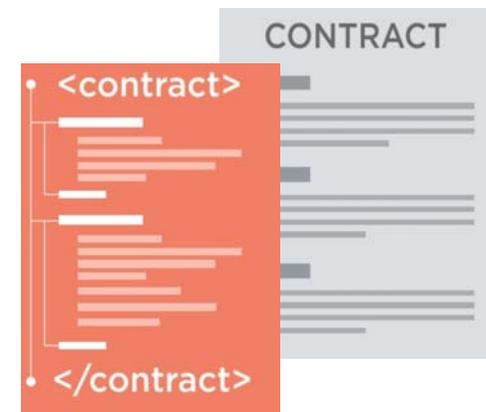
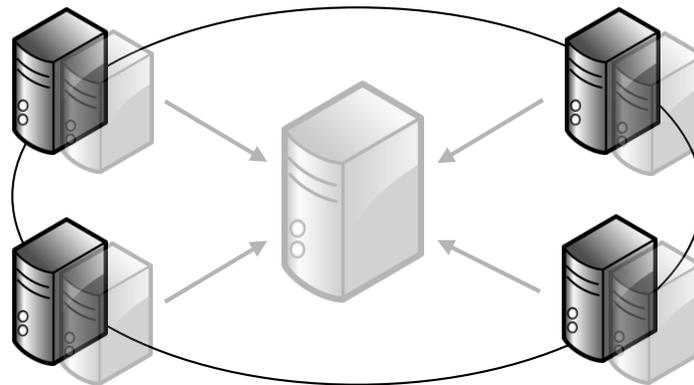
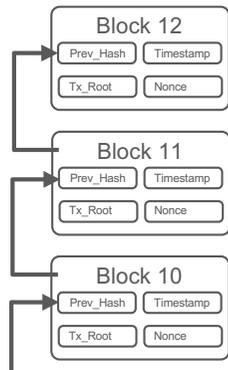
Distributed Nodes contribute with **virtual computational capacity** to the network.

Transaction speed of network is the equivalent to processor chip speed.

Smart Contracts

Programmed, automatic transactions performed in sequential manner.

Terms managed by computers representing interests of parties.



Validation – which approach for the energy market?

Energy market : High volume of transactions and very time sensitive!

Need for fast, efficient and low cost solutions

Proof of Work (PoW)

- Mining/Miner
- Electricity demand for mining (work) high
- Cost of production
- Period:
 - Bitcoin: 10 min
 - Ethereum: 10 sek
- Limited cases in the energy sector

Proof of Stake (PoS)

- Next development of PoW
- Approval based on Stakes
- Lower energy demand and lower costs compared to PoW

Proof of Authority (PoA)

- New Approach
- Authorities are approving transactions
- Actual test online at <http://kovan-stats.parity.io>
- Should be fast enough to get 1 Mio transactions in 1 second

Consensus Mechanism - Test Network

Permissioned Validator - Public network

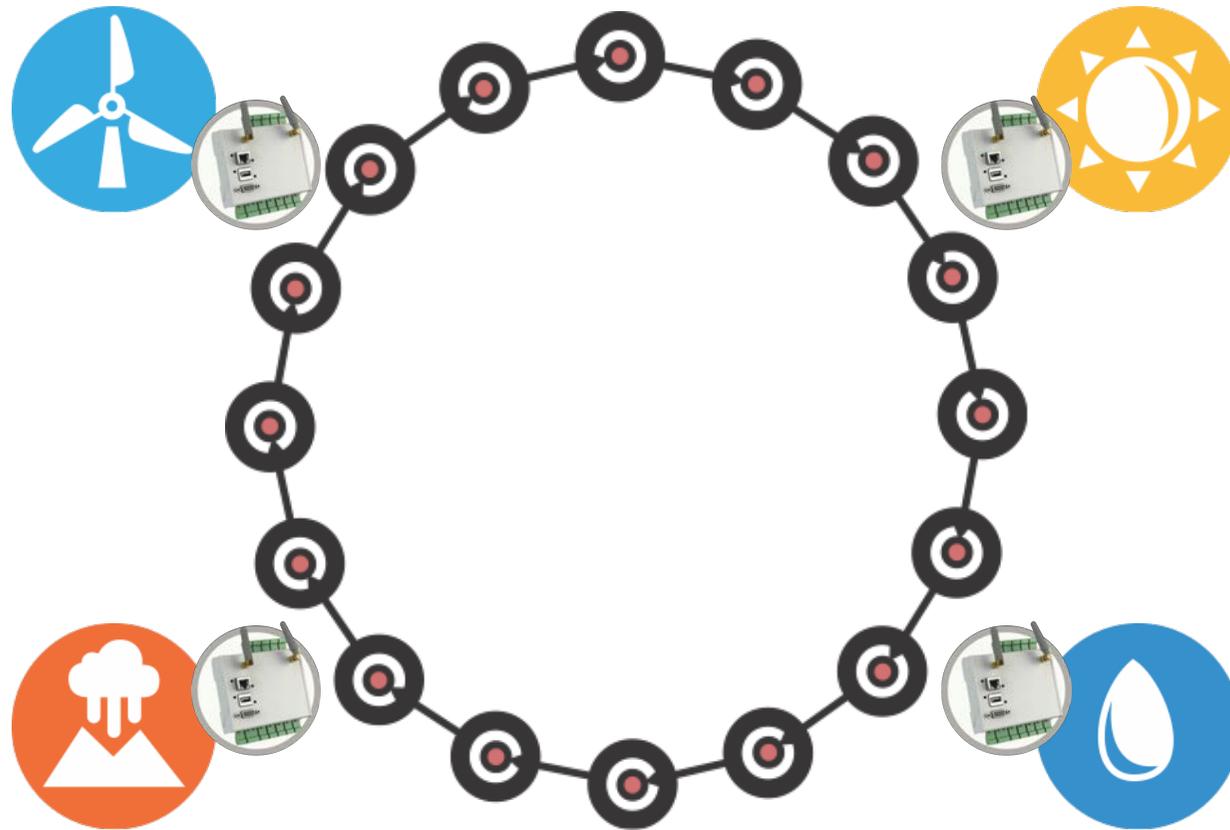
Ethereum Testnetwork – “Kovan”

Network Statistics <http://kovan-stats.parity.io/>

Network Browser <https://kovan.etherscan.io>

Parity Clients <https://github.com/paritytech/parity>

Distributed Operating System



GRID EDGE

ID = SIM CARD
FULL INTEGRITY

TRANSLATE..
AUTHENTICATE..
ENCRYPT..
SAVE..
DATA

BLOCKCHAIN
NODE



log in | sign up

start searching |

07-08 23:57:49.41	Ecatel LTD	unknown, Netherlands	93.174.93.164	San Rafael, United States
07-08 23:57:49.41	Ecatel LTD	unknown, Netherlands	93.174.93.164	San Rafael, United States
07-08 23:57:49.42	Ecatel LTD	unknown, Netherlands	93.174.93.164	San Rafael, United States
07-08 23:57:49.42	Ecatel LTD	unknown, Netherlands	93.174.93.164	San Rafael, United States

Login / App Store

DASHBOARD

Default Apps

- Property (\$145 (+3%))
- People (NEW MESSAGES)
- Mining (NEXT REWARD 1MIN)
- Catalog
- Make a deal
- Learn Ethereum

MY PROPERTY

\$789.01	\$321.98
COLLEGE FUND	SAVING FOR TAHITI
\$103.50	\$20.07
SWEAR JAR	POCKET MONEY

JANE & ZEK JOINT ACCOUNT

\$37,845.97

TOTAL ASSETS

Zek proposes to buy \$30 USD worth of ethGold at the... [check] [x]

Zek proposes to sell 20m2 of property in Second Life for... [check] [x]

PEOPLE

- Roger Snyder (Do you want to participate in a crowdale?)
- Carolyn Richards (I'm creating a token for babysitting exchanges.)
- Zek Babe (I found this great deal on a spaceship in this online game.)
- Alice Keller (I'm interested in your offer, is it still available?)

MINING

Bar chart showing mining activity over time.

NEXT REWARD: \$9.1

APPROXIMATE TIME: 20.

CURRENT RATE: 15.4Mfio

ROCKAL LIGHTHOUSE CROWDFUND

\$1,223.95

BY MIKE HEARN

UPDATE: I just came back from northern scotland and i can tell you that that community badly needs this lighthouse and the local government won't cooperate, so...

DROUGHT INSURANCE

World map showing drought risk areas.

\$10,030

ETHEREUM CATALOG catalog.eth

STARTER KIT CATEGORIES MOST USED RISING STARS SEARCH

Default Apps

- Property (\$1,045 (+3%))
- People (NEW MESSAGES)
- Mining (NEXT REWARD 1MIN)
- Catalog
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ESCROW

Allows two parties to securely trade money and goods by trusting a third party.

FAMILY TRUST

Double ownership of funds and assets, automatic inheritance in case of emergency.

MONEY MANAGER

Allows a paid third party to manage your money within theft-proof limits.

NEW SOCIETIES Join or create new kinds of voluntary societies

- TRADEABLE COMPANY**
Issues your own shares and sell them on the open market
- TRANSPARENT DEMOCRACY**
A society where members can vote on
- AUTONOMOUS FUTARCHY**
An organization that self organize based

MONEY TOGETHER Great things happen when everyone pools their money togir mr

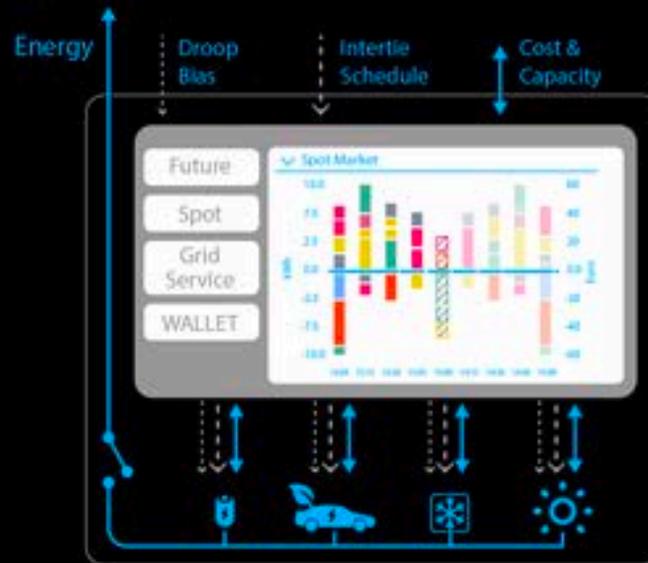
- DEVELOPER MARKETPLACE**
Offer your services, hire coding or design work for your Dapp
- TIME SHARE EXCHANGE**
Issue time based tokens and exchange your time for others
- TRUSTLESS CROWDFUNDER**
Help fund public goods, pay only if they are completed

INFORMATION IS POWER Leverage risks, gather trusted information, help science

Source: Ethereum Mist Browser

Turing Complete Energy Market Agent

Transactive Grid | Demand Side Response | Utility as a Service | E-Mobility
 Microgrid Controller | Virtual Power Plant | P2P Market

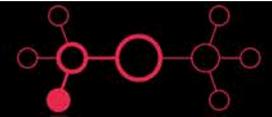


RECURSIVE

MARKETS	Futures, Spot, Balancing
VALUE	Wallet, Transactions, Currency, Certificates, Energy
STABILITY	Auxiliary Services, Reactive Power, Primary, Secondary, Tertiary Control

Proof of Concept by:

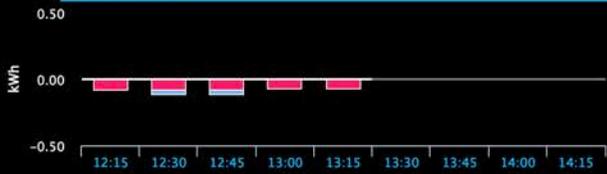




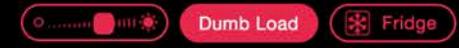
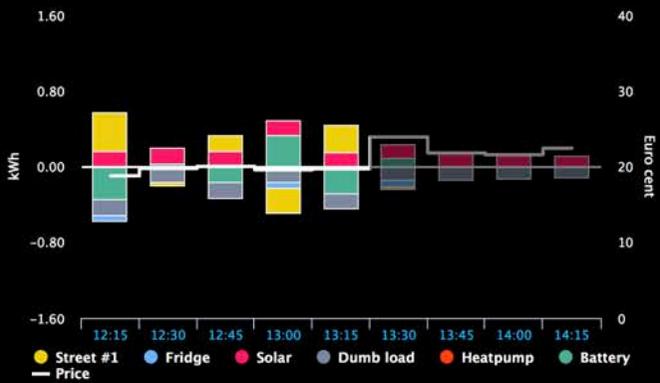
Wallet € 27.58

	24 hours kWh	Euro
Dumb Load	6.87	-1.97
Heatpump	0.60	-0.15
Fridge	1.78	-0.45
Solar	-3.50	0.87
Battery	4.81	-0.72

Balancing



Spot Market





15:26:30



Feb 19, 2017
Sunday

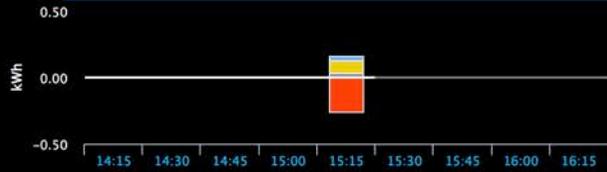


Balance

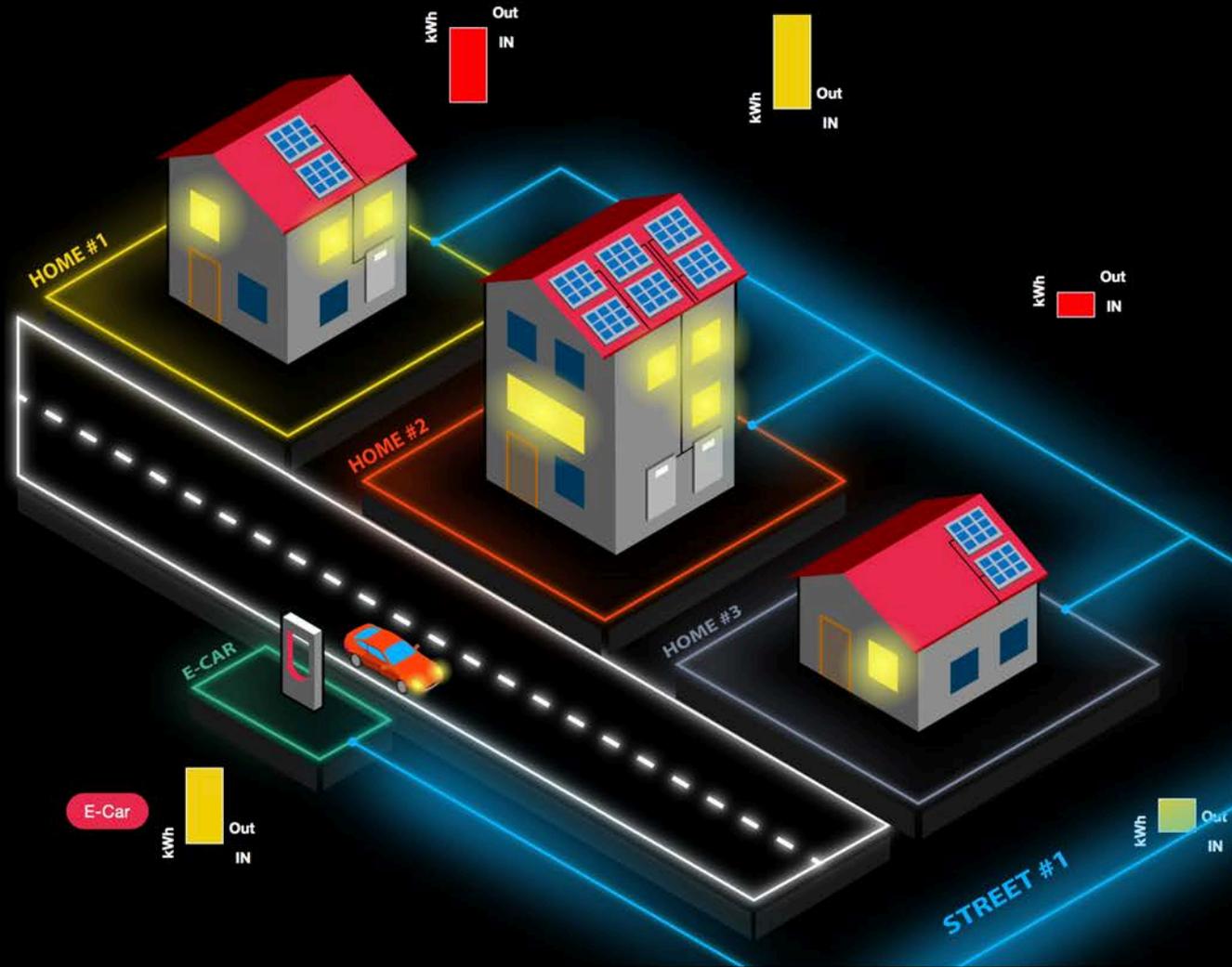
24 hours kWh Euro

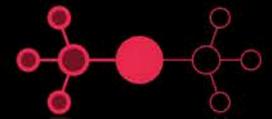
	24 hours kWh	Euro
House #1	11.71	-2.63
Region	-6.03	2.68
House #3	9.03	-2.43
House #2	-15.63	2.51
E-car	0.92	-0.12

Balancing



Spot Market



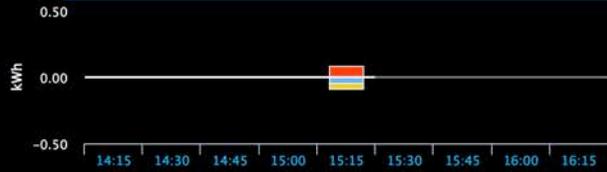


Balance

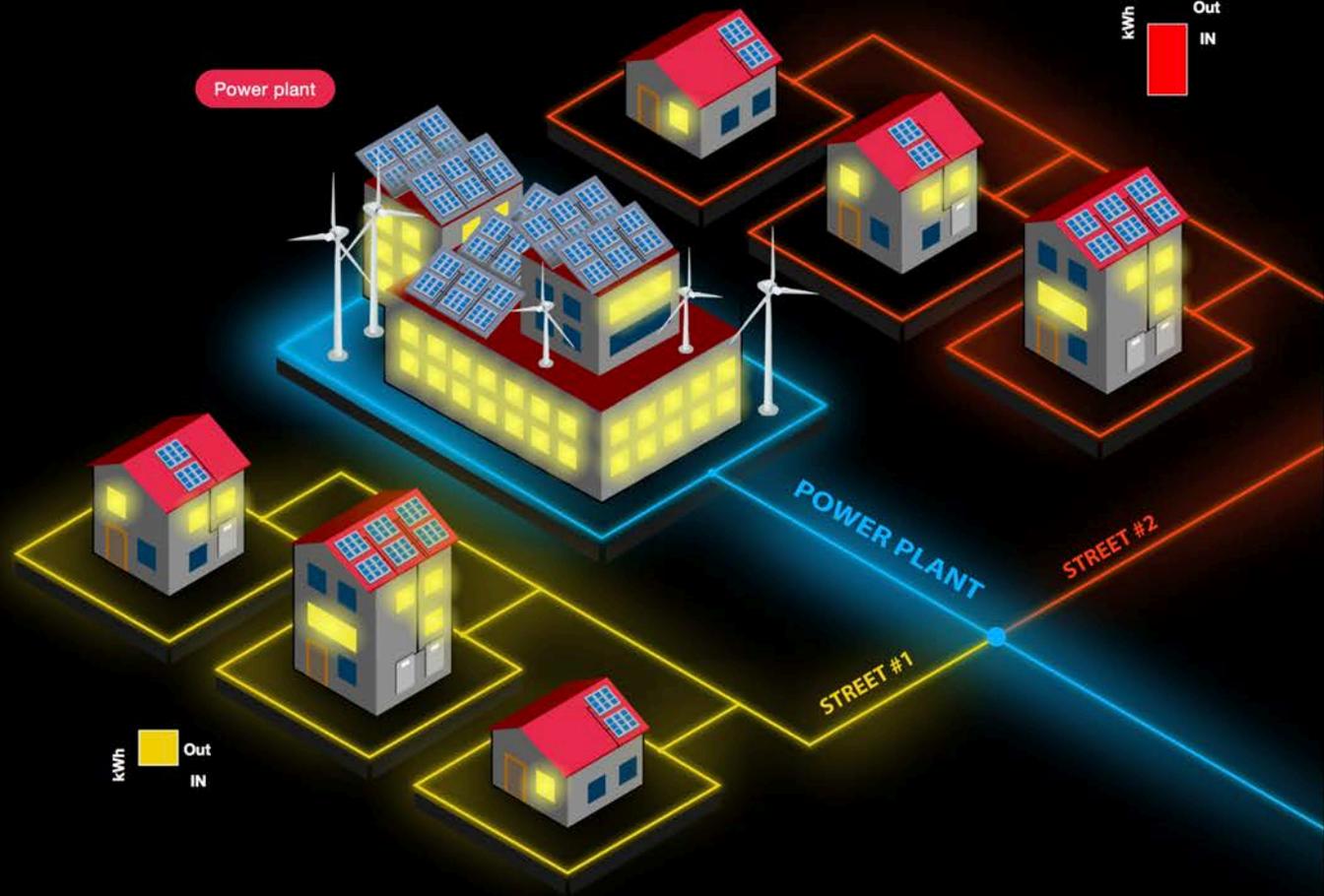
	24 hours	kWh	Euro
Street #2		27.26	-6.96
Power Plant		-33.29	9.99
Street #1		6.03	-3.03

kWh Out
IN

Balancing



Spot Market

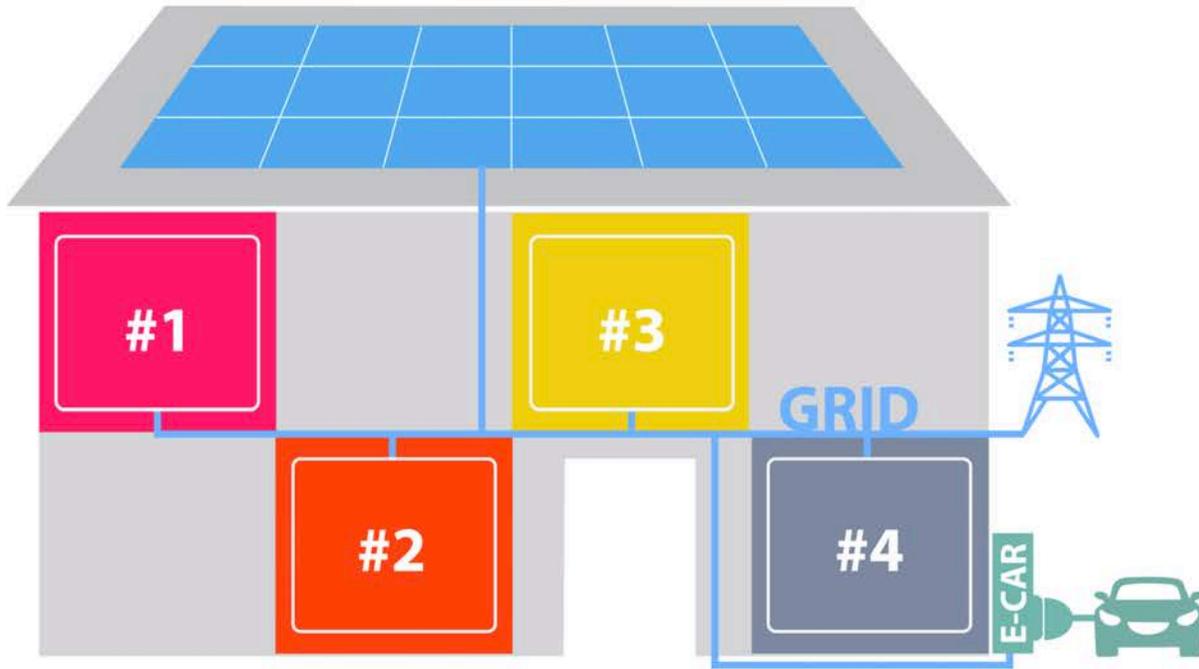


14:02:00

Feb 14, 2017
Tuesday



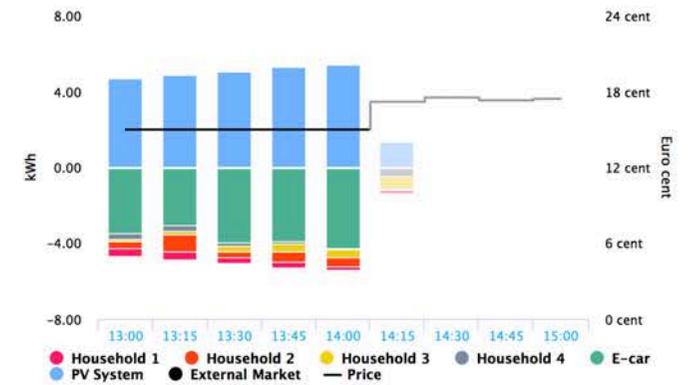
PV Revenue: €3.31
Additional PV revenue compared to pure feed in.



Balance

Household 2	13.06	-2.26
External Market	-43.81	8.76
Household 4	23.82	-3.39
Household 3	13.63	-2.35
Household 1	7.22	-1.18
PV System	-66.15	8.51
E-Car	52.24	-8.09

Spot market



Why the Energy Web Foundation?



ENERGY
WEB
FOUNDATION

Our core beliefs

- 1** Blockchain will be transformative
- 2** Nobody should “own” the technology
- 3** We should jointly develop a common good

Affiliates - Advisory Board



Technology Provider



Foundation Council



Jesse Morris
Principal, RMI



Dr. Herve Touati
MD RMI
President, EWF



Dr. Christoph Frei
Secretary General of
the World Energy
Council



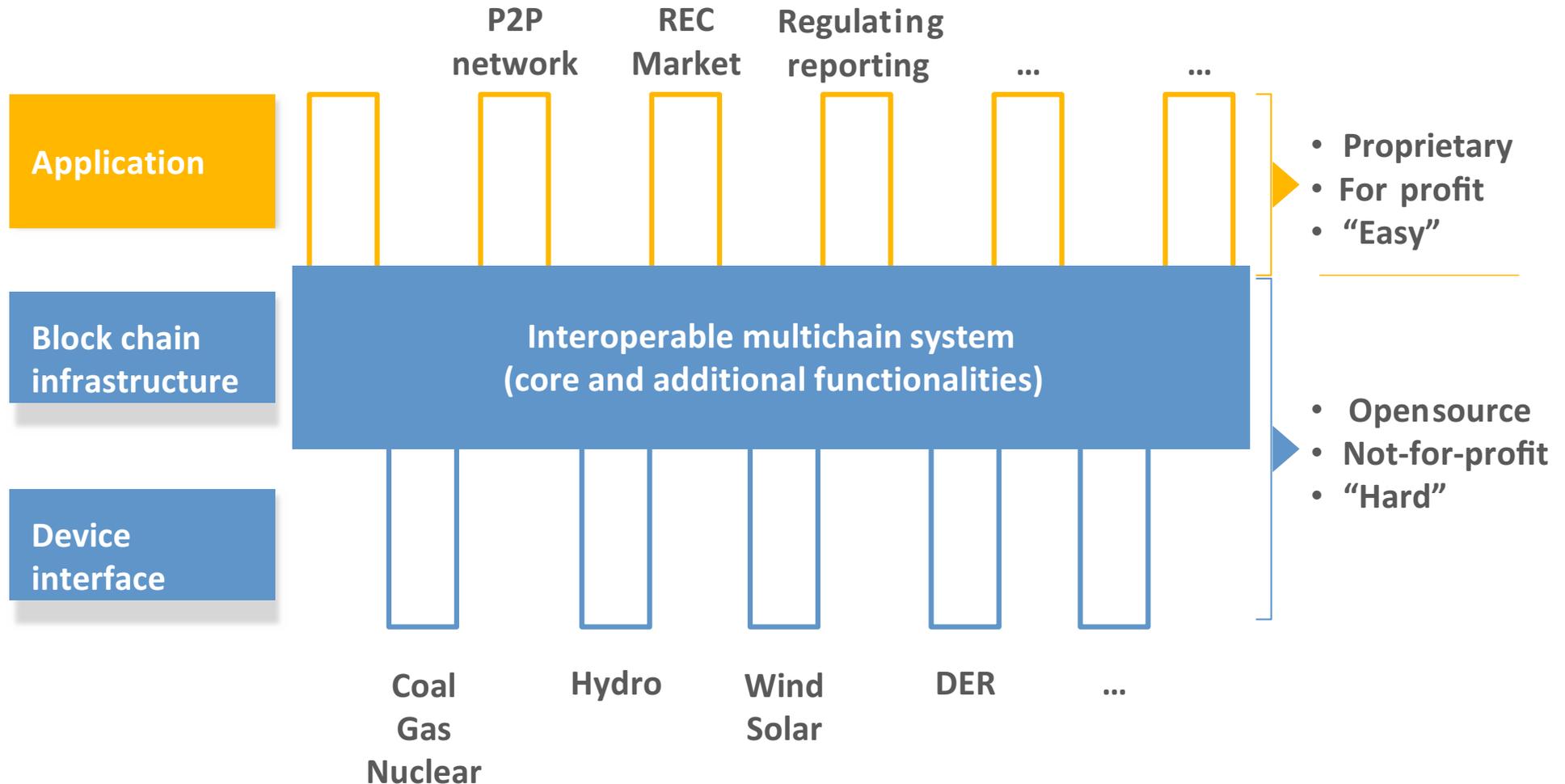
Ewald Hesse
CEO, GSy
Vice-President, EWF



Dr. Ana S. Trbovich
Strategy, GSy

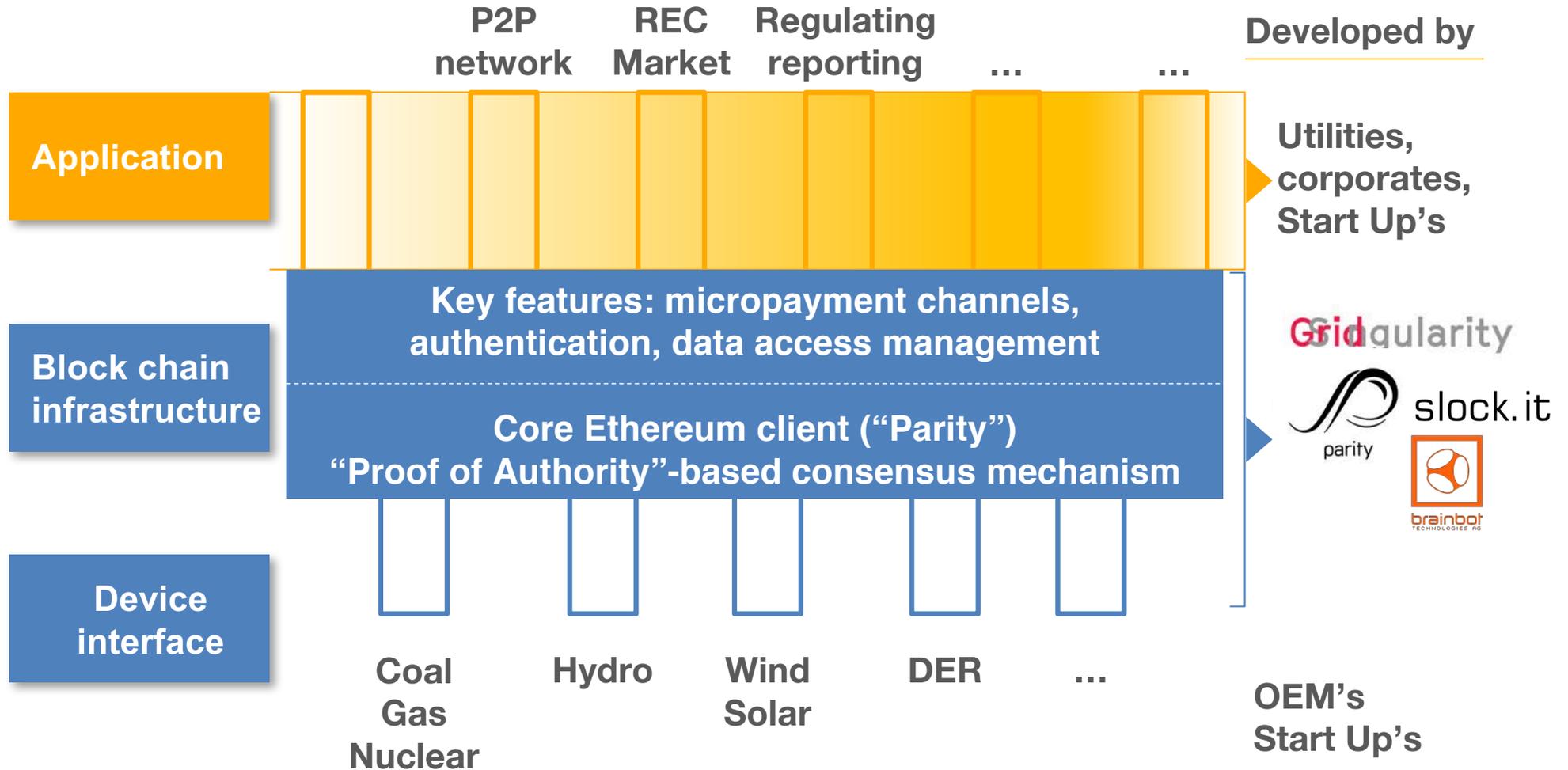
Nobody should “own” the technology

Owning applications is fine – not the shared infrastructure

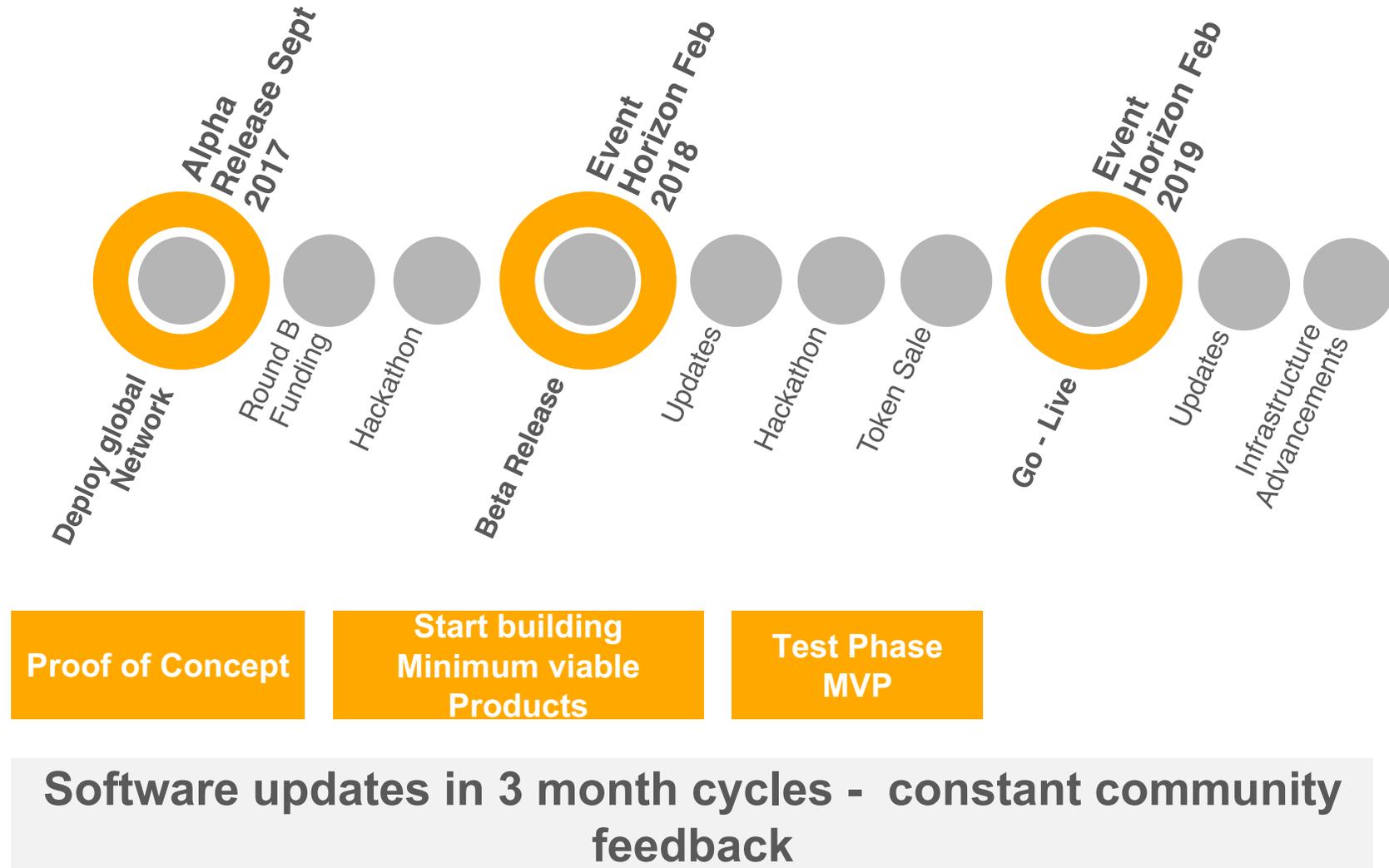


IT Infrastructure – Proposed approach

EWF will finance and provide access to the two bottom layers



Timeline



We have started to build the eco-system

Many of the 100 or so startups are in the room today



Adpteve

Ledger

POWER LEDGER

energysme

Lumenaza

powerpeers
share your energy

bankymoon

ENERGY
BLOCKCHAIN LABS

Lykke

Slok.it

CONSENSYS

LO3 ENERGY

CO-TRICITY

EnergyCoinFoundation

M-PAYG

EcoChain

oneup

ENSEK

theSunExchange

Volt Markets

ELECTRON

FILAMENT

guardtime

ener chain

Gridgularity

TRANSACTIVEGRID

Permissioned Validator - Public network

Ethereum Testnetwork – “Kovan”

Network Statistics <http://kovan-stats.parity.io/>

Network Browser <https://kovan.etherscan.io>

Parity Clients <https://github.com/paritytech/parity>

Features Catalogue

PoA contract + UI admin	Deployment Tooling	Permission txs	Unit tests	Permission transport layer	General deployment of Alpha
Netstats 2 & Structured logging	Network tests & empirical research	Documentation (Deployment)	Money on chain	Code Audit	Documentation (API)
Education Hackathons	Dev events	Encrypted contracts	IPFS integration	IoT image	Tx signing device
Name registry	KYC	Hardware ID registry	Events library	Secret Store	Data exchange
Data access control	Data notarization contract	UI library	Smart Contract library	Debug tools	IDE
Light client	Ewasm upgrade	Zk-snarks	(expressive) Smart Contract language	Comms protocols	
Raiden	Casper Protocol	Polkadot	Device domain management	Commercial PK management	

Features Catalogue / Energy Related

PoA contract + UI admin	Deployment Tooling	Permission txs	Unit tests	Permission transport layer	General deployment of Alpha
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Name registry	KYC	Hardware ID registry	Comms protocols	Secret Store	Data exchange
Data access control	Data notarization contract	Developer Resources			
Extensions					
Infrastructure Advancements – still in development				

Agile Development Stage 1

Alpha Release / Beta Release / Backlog

PoA contract + UI admin	Deployment Tooling	Permission txs	Unit tests	Permission transport layer	General deployment of Alpha
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Light client	Ewasm upgrade	Zk-snarks	(expressive) Smart Contract language	Comms protocols	
Raiden	Casper Protocol	Polkadot		

Agile Development Stage 2

Alpha Release / Beta Release / Additional / Backlog

PoA contract + UI admin	Deployment Tooling	Permission txs	Unit tests	Permission transport layer	General deployment of Alpha
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Organizational structure

Ecosystem

- Affiliates / Regulators / Start-ups

Technical Committee

- Reviews / Advisory

API Team

- Point of Contact to Ecosystem
- Documentation / Wiki
- Hackathons / Use Cases
- Community Building

Core Team

- Software Architecture Design
- Client Development

Energy Web Foundation Developer Hub – Berlin

Grid Singularity

Welcome in the digital energy market

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