BLOCKCHAIN IN THE ENERGY SECTOR

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ABOUT ENERGY BRAINPOOL

Energy Brainpool is an independent market specialist for the energy sector that focuses on the electricity and energy trading in Europe. The expertise of Energy Brainpool encompasses the **analysis**, forecasting and simulation of energy markets and prices, researched and scenario-based studies, and providing individual **consulting** services as well as **training** and expert seminars for the energy sector.

Energy Brainpool combines knowledge and competence with practical experience in the fields of controllable and intermittent energy sources.

Analysis	Individual Consulting	Training
▪ Spot price forecast	▪ Trade strategies, risk, portfolio and procurement management	▪ Open and in-house seminars, workshops and management trainings on current topics of the energy sector
▪ Forecasts on control power and individual price forecasts	▪ Development and optimisation of marketing strategies and business models	▪ Management and face-to-face training
▪ Fundamental Energy Market Model Power2Sim	▪ Electricity trade and marketing	▪ Practice-oriented simulation games for energy trade

▪ Scientific studies on the
  ▪ energy market design
  ▪ development of electricity prices and price components
  ▪ influences of renewable energies
		▪ Workshops for players of international energy markets

ENERGY BRAINPOOL

In cooperation with the customers our experts develop solutions for the Energy Market 3D.

We provide market knowledge in:

- Analyses
- Scenarios
- Studies
- Workshops
- Trainings and
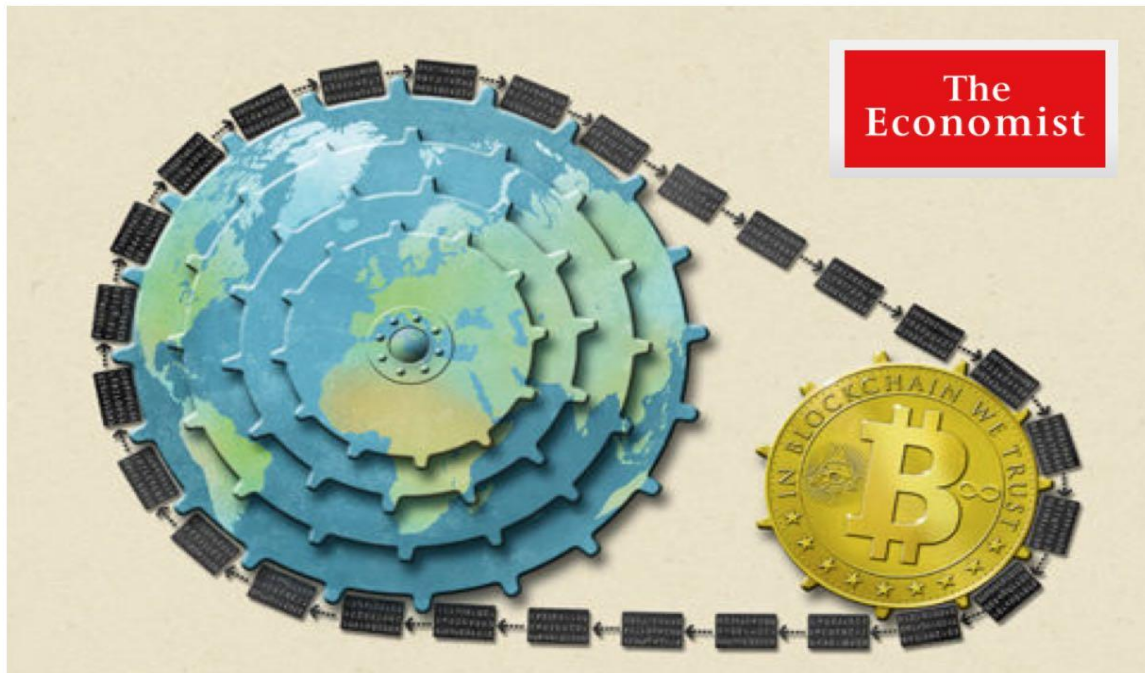- Individual Consulting Services

BLOCKCHAIN - THE TRUST MACHINE

Source: The Economist

BITCOIN– SATOSHI NAKAMOTO 2009

Known

Unknown

Bitcoin: A Peer-to-Peer Electronic Cash System

Satoshi Nakamoto
satoshin@gmx.com
www.bitcoin.org

Abstract. A purely peer-to-peer version of electronic cash would allow online payments to be sent directly from one party to another without going through a financial institution. Digital signatures provide part of the solution, but the main benefits are lost if a trusted third party is still required to prevent double-spending. We propose a solution to the double-spending problem using a peer-to-peer network. The network timestamps transactions by hashing them into an ongoing chain of hash-based proof-of-work, forming a record that cannot be changed without redoing the proof-of-work. The longest chain not only serves as proof of the sequence of events witnessed, but proof that it came from the largest pool of CPU power. As long as a majority of CPU power is controlled by nodes that are not cooperating to attack the network, they'll generate the longest chain and outpace attackers. The network itself requires minimal structure. Messages are broadcast on a best effort basis, and nodes can leave and rejoin the network at will, accepting the longest proof-of-work chain as proof of what happened while they were gone.
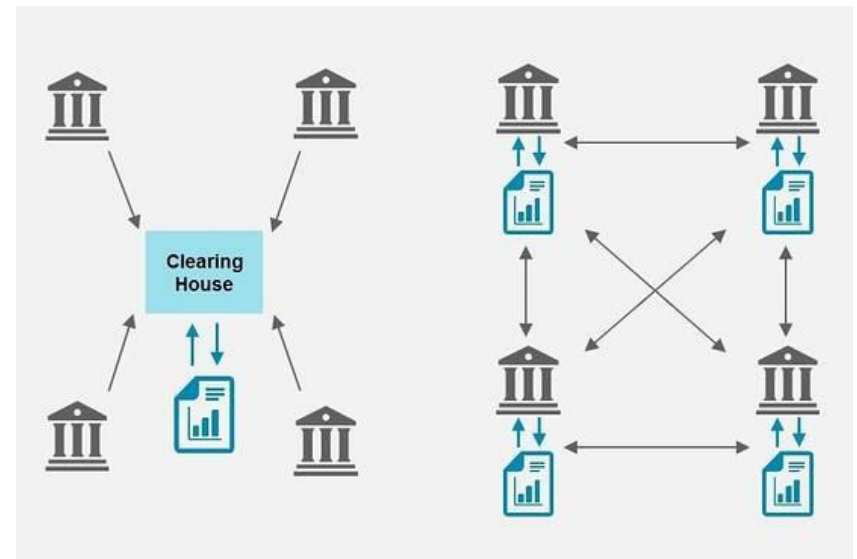
PUBLIC LEDGER

Public, distributed accounting book

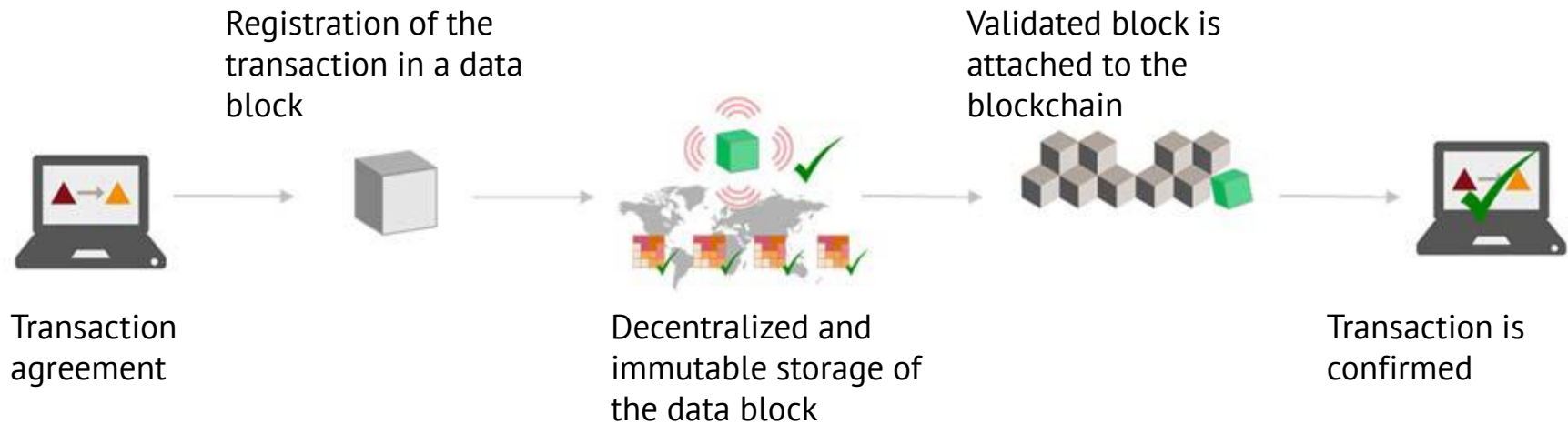### Central and analog

Decentral and digital

Source: Wall Street Journal
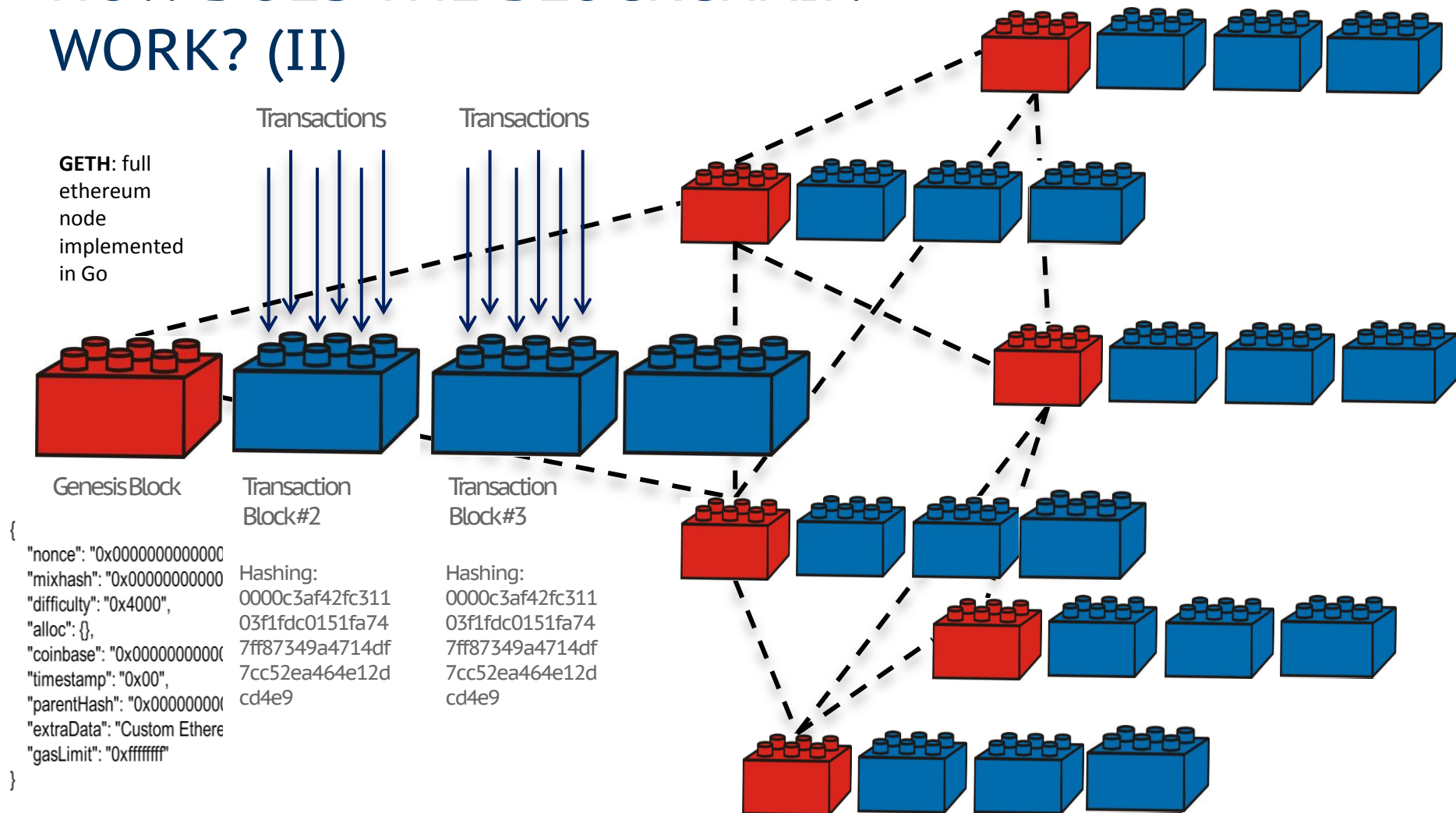
All PCs have a full copy of the decentralized public ledger on their hard disk

HOW DOES THE BLOCKCHAIN WORK? (I)

Registration of the transaction in a data block

Validated block is attached to the blockchain

Transaction agreement

Decentralized and immutable storage of the data block

Transaction is confirmed

Source: PWC, 2016

HOW DOES THE BLOCKCHAIN WORK? (II)

Transactions   Transactions

GETH: full ethereum node implemented in Go

Genesis Block

Transaction Block#2

Transaction Block#3

{
  "nonce": "0x0000000000000
  "mixhash": "0x00000000000
  "difficulty": "0x4000",
  "alloc": {},
  "coinbase": "0x00000000000
  "timestamp": "0x00",
  "parentHash": "0x000000000
  "extraData": "Custom Ethere
  "gasLimit": "0xffffffff"
}

Hashing:
0000c3af42fc311
03f1fdc0151fa74
7ff87349a4714df
7cc52ea464e12d
cd4e9

Hashing:
0000c3af42fc311
03f1fdc0151fa74
7ff87349a4714df
7cc52ea464e12d
cd4e9

Verification Concept: Proof-of-Work

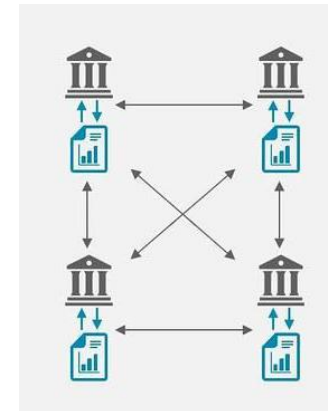# THE BLOCKCHAIN IS...

… the verification of a transaction…
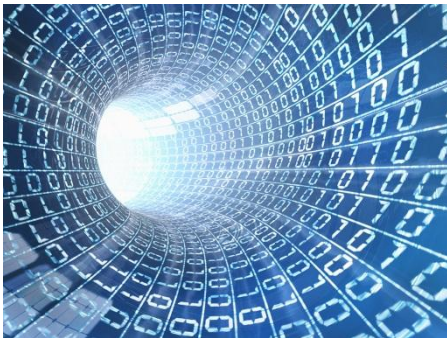

… at very low transaction costs…

… in a decentralized and distributed ledger

… in pseudonymous world.

TODAY THE BLOCKCHAIN **CANNOT**...
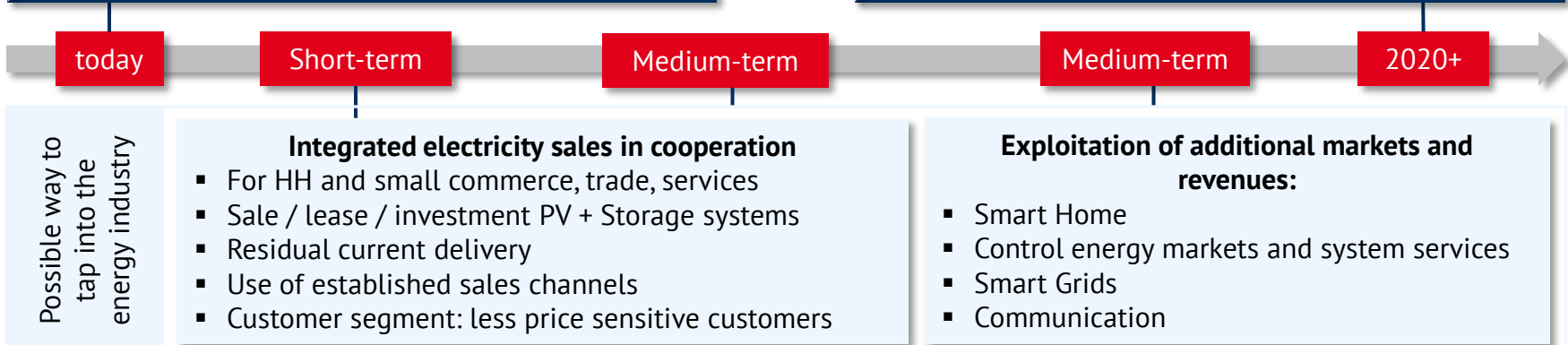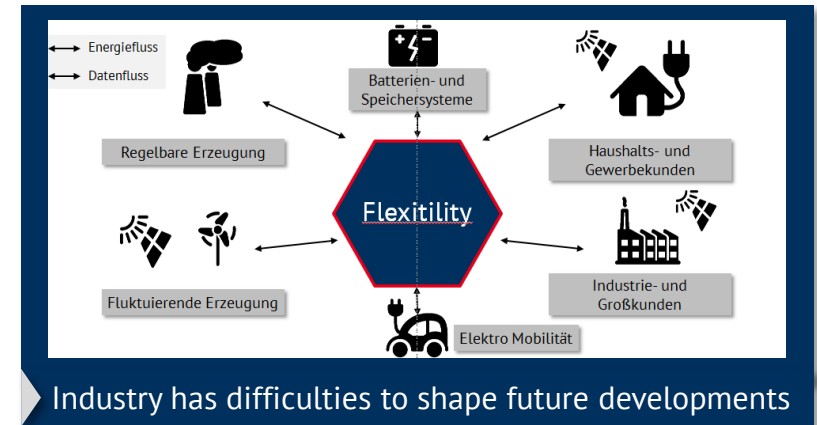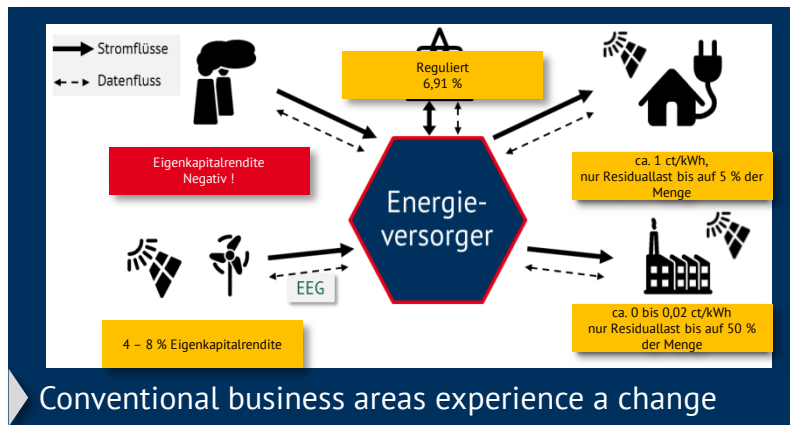
... save large amounts of data,...

... verify many transactions at the same time,

...and save energy (PoW vs. PoS)

THE CHANGE IN THE ENERGY INDUSTRY IS A TIME FRAME FOR A MARKET ENTRY

Conventional business areas experience a change

Industry has difficulties to shape future developments

today	Short-term	Medium-term	Medium-term	2020+

Possible way to tap into the energy industry

Integrated electricity sales in cooperation
- For HH and small commerce, trade, services
- Sale / lease / investment PV + Storage systems
- Residual current delivery
- Use of established sales channels
- Customer segment: less price sensitive customers

Exploitation of additional markets and revenues:
- Smart Home
- Control energy markets and system services
- Smart Grids
- Communication

Opportunity for new actors to conquer changing market segments

BLOCKCHAIN 2.0 – SMART CONTRACTS

Definition

- Predefined protocoll (Code)
- Saved on the blockchain
- Executed by the blockchain network

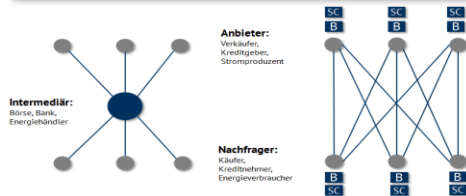Automatized execution of various transactions on the blockchain

A Blockchain allows for a secure storage.
A Smart Contract for the secure execution of transations.

BLOCKCHAIN IN THE ENERGY INDUSTRY

Transactions and Smart Contracts (automated triggering)

Documentation of ownership structures

Documentation of transactions (decentral)

Decentralised transaction and energy delivery system	

Anbieter:
Verkäufer,
Kreditgeber,
Stromproduzent

Intermediär:
Börse, Bank,
Energiehändler

Nachfrager:
Käufer,
Kreditnehmer,
Energieverbraucher

- Purchase/Sale of energy
- Switch of supplier unneccessary
- Integration of cryptocurrencies

Further applications for Smart Contracts:

E-Mobility Smart Devices

Register about ownership structures and plant condition (Asset Mgmt.)

Certification of green electricity

Certification of CO_2 certificates

Metering and billing electricity
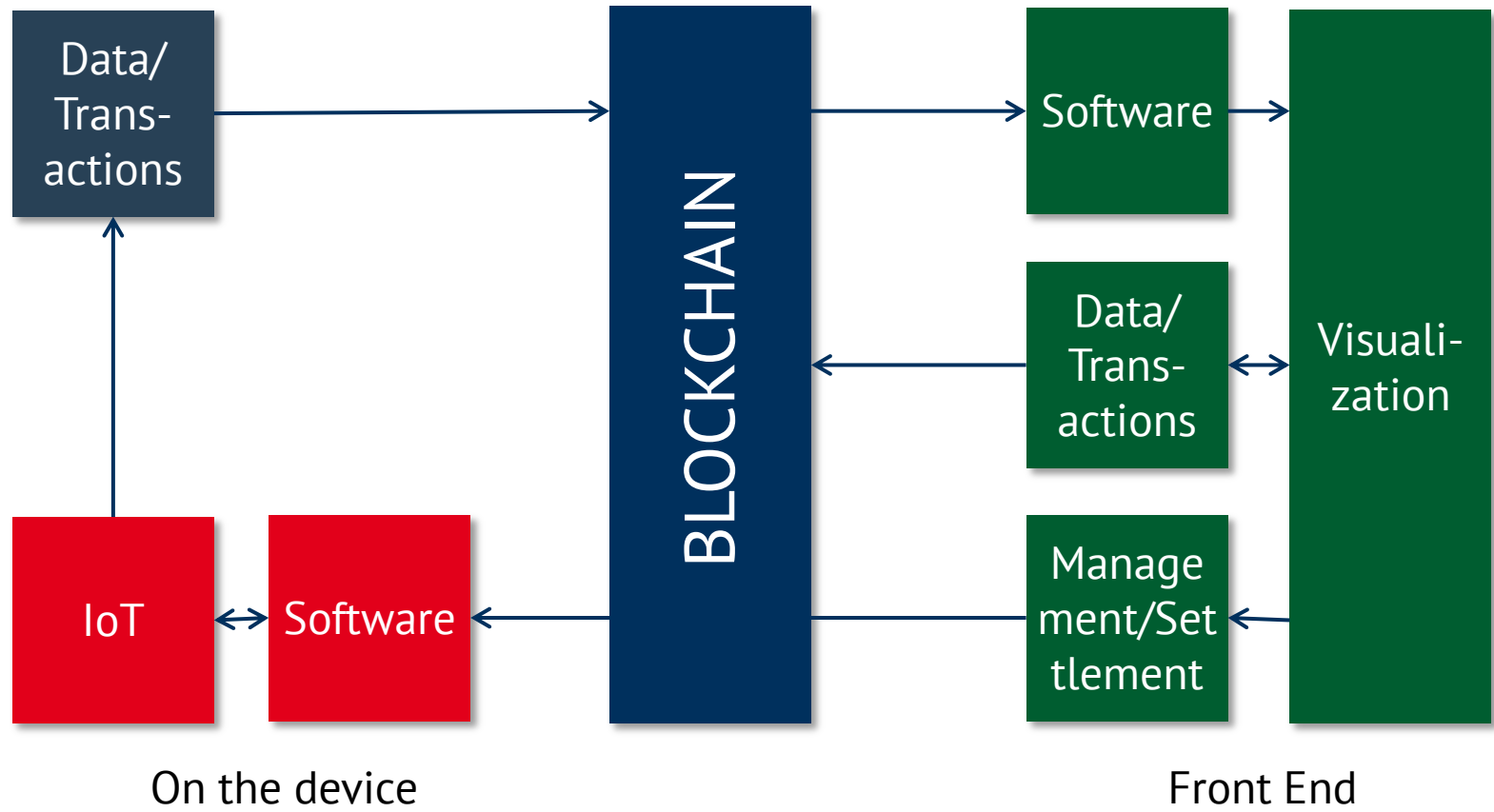
Metering and billing heat

Billing E-Mobility

Source: PWC, 2016

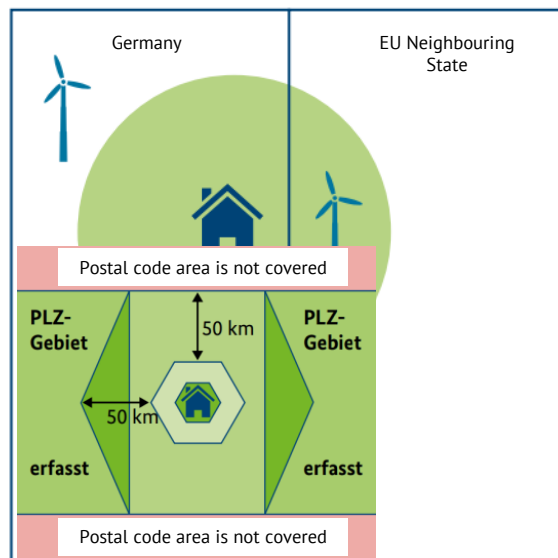# STEPS FOR A COMPREHENSIVE USE OF BLOCKCHAIN

By third parties

Data/Trans-actions

BLOCKCHAIN

Software

Data/Trans-actions

Visuali-zation

IoT

Software

Manage ment/Set tlement

On the device

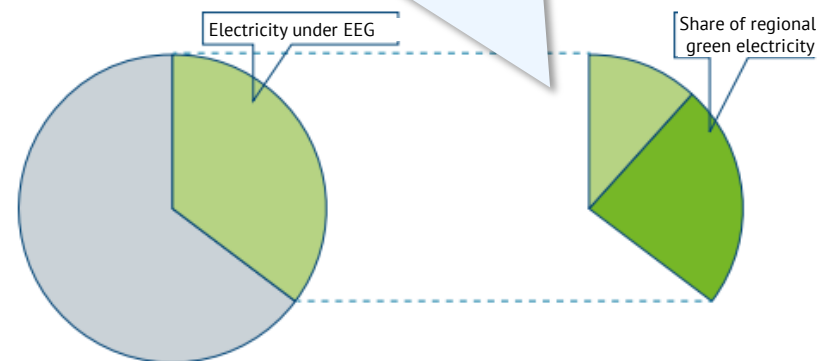Front End

REGULATION OF PROOF OF ORIGIN AND REGIONAL PROOF OF ORIGING -
RPOO: REGIONAL GREEN ELECTRICITY LABELLING

- Green electricity under EEG cannot be labeled as green electricity within the current system **(Prohibition of multiple sales of the EU)**, it is a fixed component of the „Grey Electricity" at the exchange

- The regional characteristics of electricity under EEG is not compensated according to the EEG, thus there is no prohibition of multiple sales, **reduction of financial promotion** of 0,1 cent/kWh

- In the future the regionality of directly marketed green electricity should be tradable as an additional proof, but will be attached to every kWh of traded green electricity (in contrast to PoO), regional proofs of origin are valid for 24 months
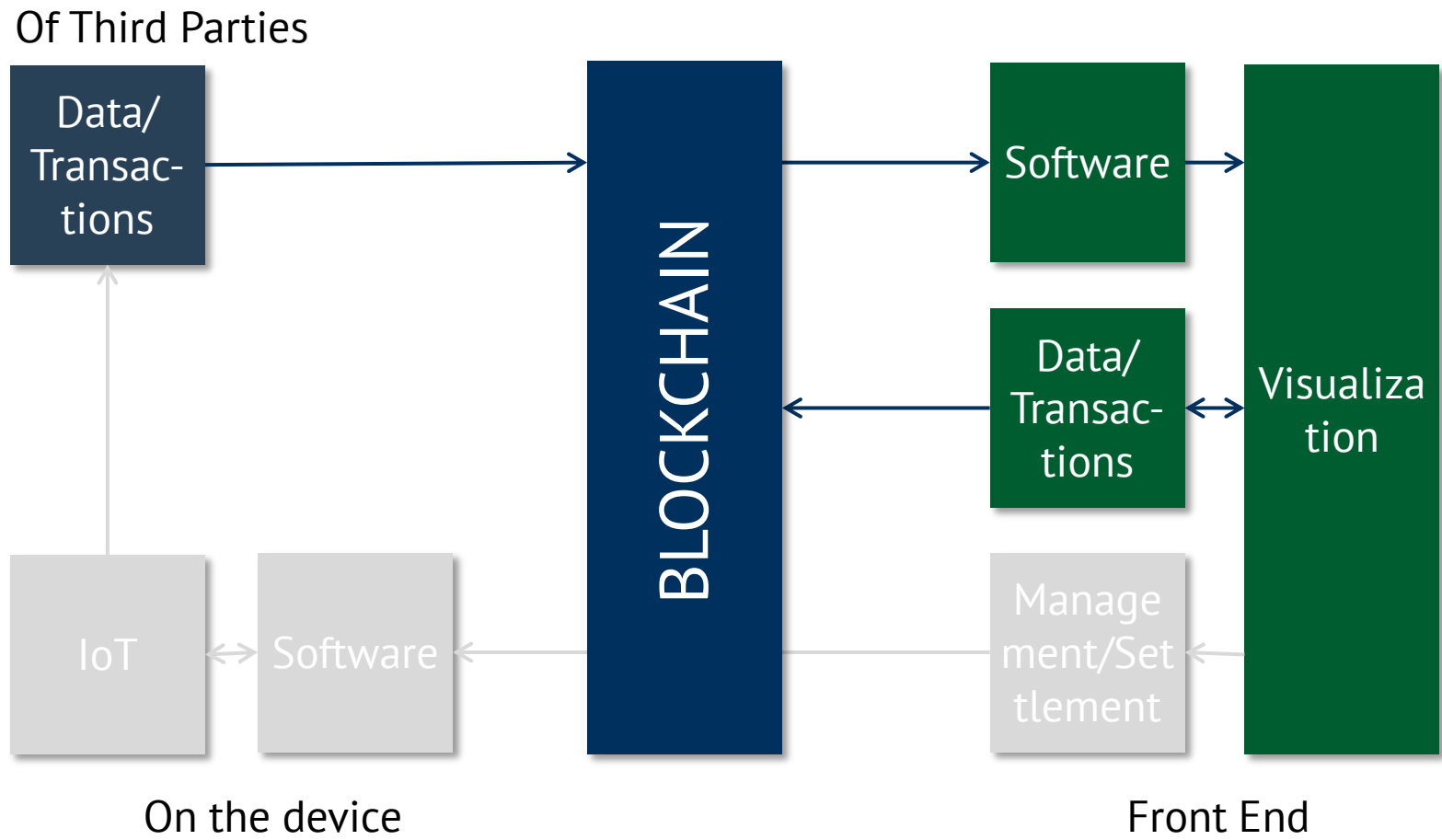

Germany

EU Neighbouring State

Postal code area is not covered

PLZ-Gebiet

50 km

PLZ-Gebiet

50 km

erfasst

erfasst

Postal code area is not covered

Regional PoO above the electricity share under EEG are not usable

Electricity under EEG

Share of regional green electricity

Source: BMWi

REGIONAL ELECTRICITY LABELING

Of Third Parties

On the device

Front End

BUSINESS CASES AND WORLDWIDE USE CASES

powerpeers
share your energy

Company: Powerpeers
Country: Netherlands
Market: P2P Energy

Startup launched by Vattenfall, focusing on a digital, interactive marketplace where supply and demand for self-generated energy converge.

LO3 ENERGY

Company: LO3 Energy
Country: USA
Market: P2P Energy

LO3 have launched TransActive Grid in Brooklyn, NY - a pilot delivering real-time metering of local energy generation and usage as well as other related data.

slock.it

Company: Slock.it
Country: Germany
Market: EV Charging

Startup, working with RWE to develop EV charging stations that use blockchain-based smart contracts to authenticate users and manage the billing process.

Company: SolarCoin
Country: USA
Market: Energy Incentives

Alternative digital currency reward system, SolarCoin is claimed by individuals living in homes with Solar Energy panels on their roof or large solar electricity farms.

bankymoon

Company: Bankymoon
Country: South Africa
Market: Energy Access

Projects aiming to enable African schools manage utility costs by leveraging the international donor market & receiving cryptocurrency payments directly to the meter.
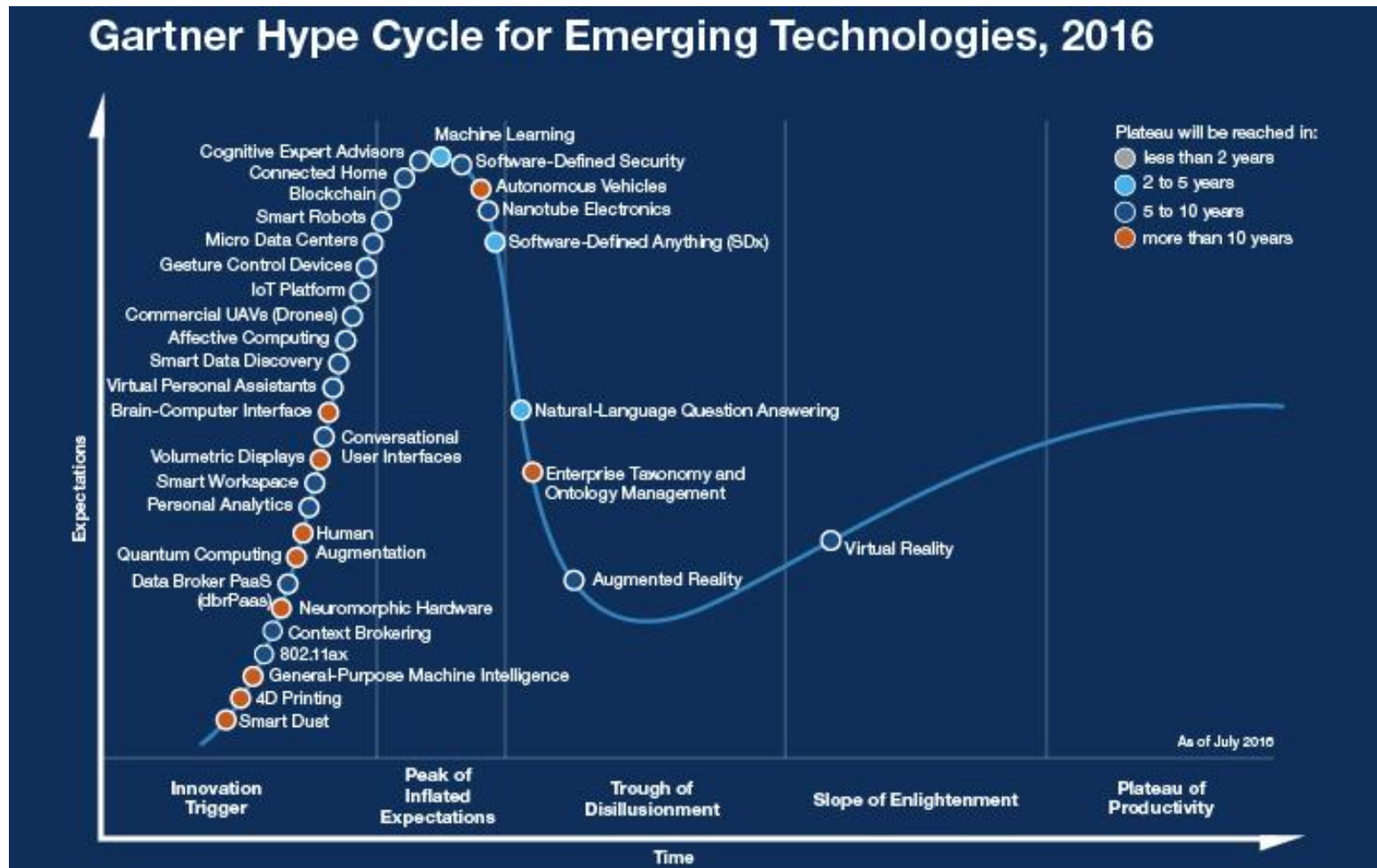
Gridgularity

Company: Grid Singularity
Country: Austria
Market: Various Energy Apps

Decentralized energy data exchange to facilitate data analytics, smart grid management, trading and investment decisions.

DEVELOPMENT OF BLOCKCHAIN START-UPS

Blockchain	Blockchain Developer	Energiewirt. Firma	EVU/Partner	Projekte	Art der Anwendung	Stadium
BitCoin		BankyMoon		PrePaid SmartMeter	Billing Accounting	MVP
Ethereum	Slock.it		Innogy	Share&Care	Billing Accounting	Roll Out
Ethereum	Slock.it		Innogy	E-Wallet	Billing Accounting	PoC
Ethereum	Consensys		Innogy	ConJoule	Peer-2-Peer	PoC
Ethereum	Consensys/LO3		Siemens	TransactiveGrid	Peer-2-Peer	PoC
Ethereum		Ponton		EnerChain	Trade Confimation	PoC
Ethereum	BrainBot	GridSingularity		D3A	Smart Home	PoC
Ethereum		Stromhaltig.de		StromDAO	Stromlieferung	Roll Out
Ethereum		Stromhaltig.de	Stadtwerke Energieverbund	Grünstromjeton	Zertifikate	Roll Out

BLOCKCHAIN IS A HYPE – AT LEAST FOR NOW

Blockchain in the energy sector

27. April 2017 in Berlin

1-day seminar

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