Committee on Energy Resources and the Environment and the Task Force on Innovation

Blockchain & Transactive Energy

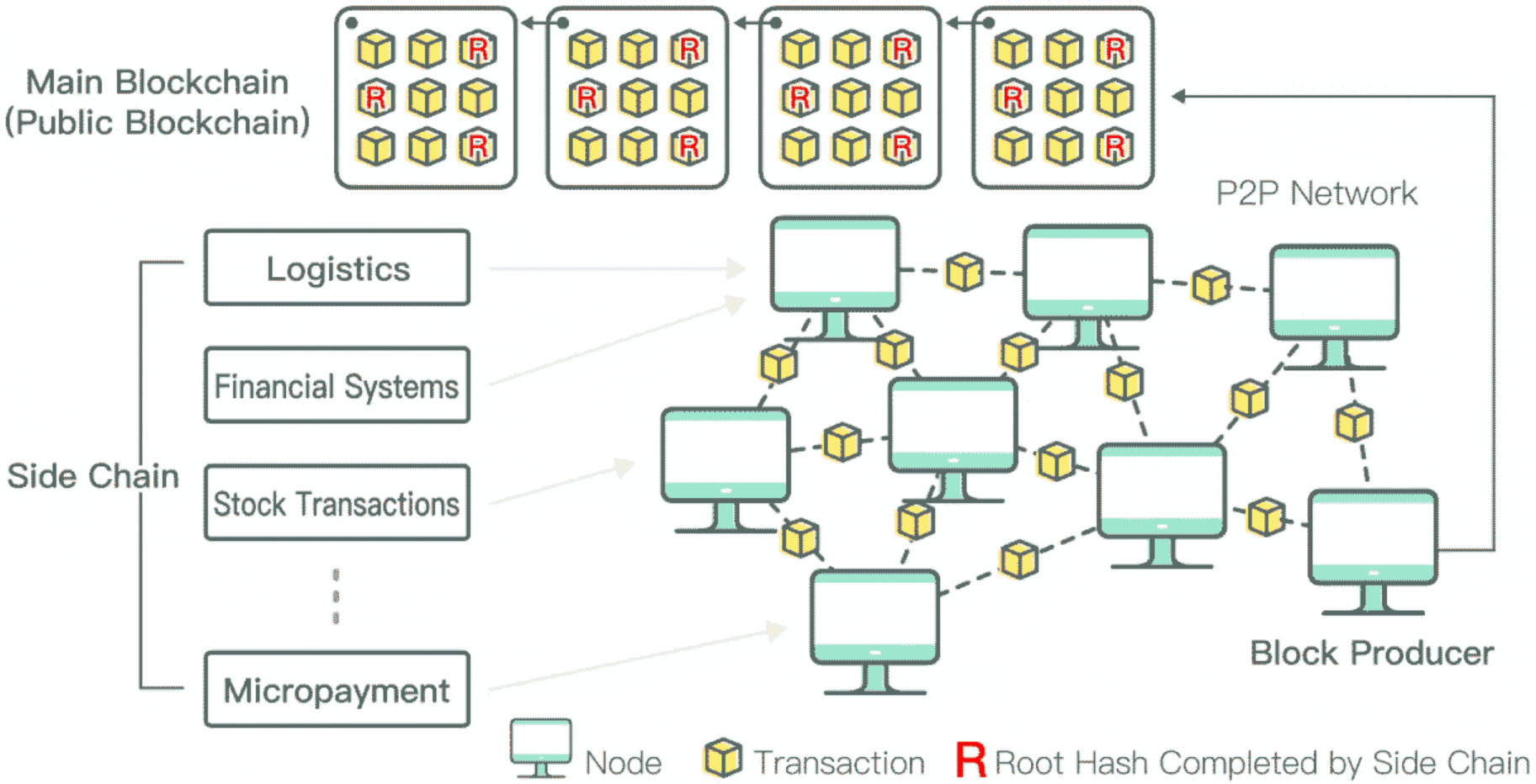
NARUC Summer Policy Summit


CINEMA
Now Playing
Blockchain
Potential and Limitations

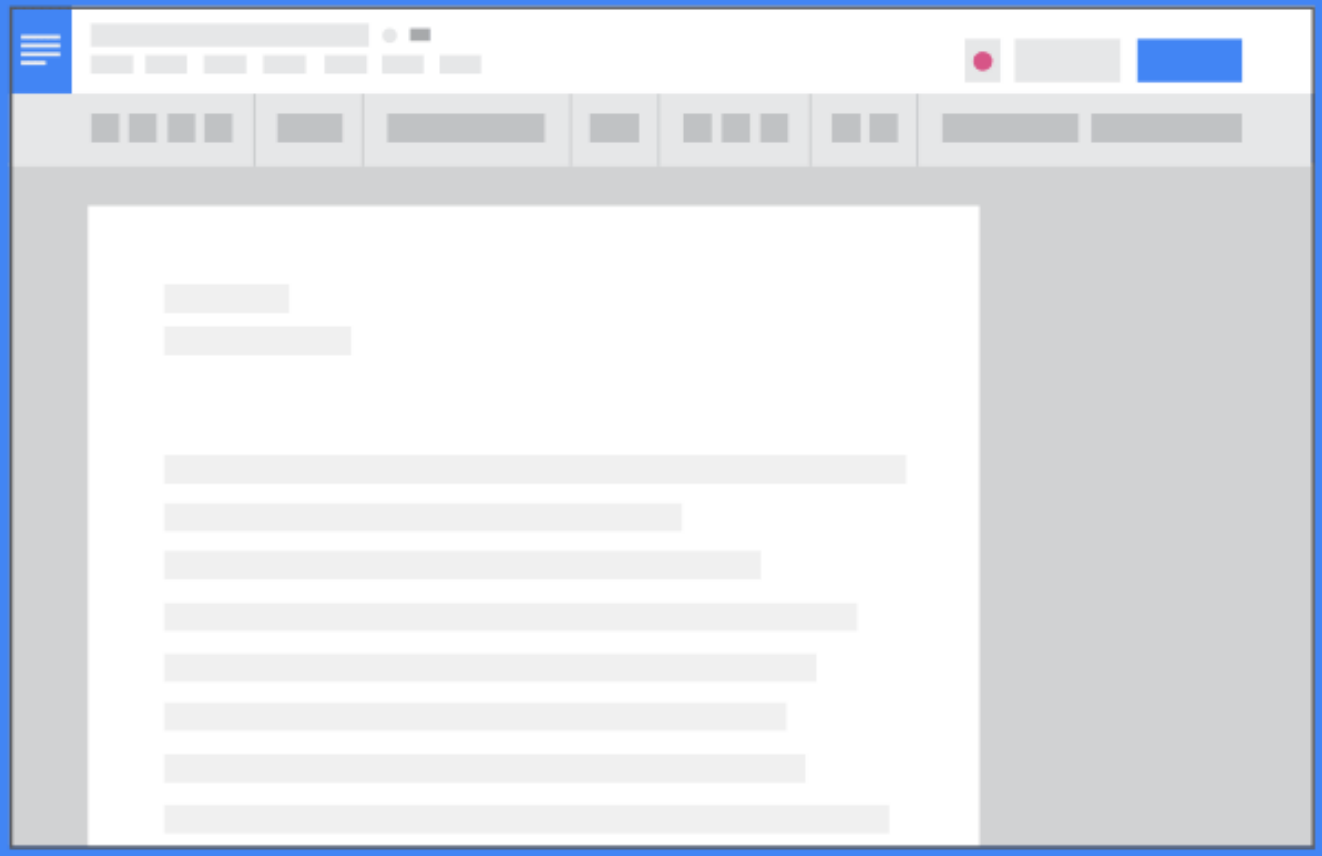

INTERNET
MICRO
BLOGGING
CONNECTIVITY
WEB 2.0
SOCIAL
MEDIA
NETWORKING
TECHNOLOGY


FALSE
TRUE
TRUTH-O-METER
CAUTION ON HIGH VOLTS
OFF
6000
1200
300
60
12
Ω
ADJ
D
C
V
A
C
V
OUT
PUT


BLD


Main Blockchain
(Public Blockchain)
R
P2P Network
Logistics
Financial Systems
Side Chain
Stock Transactions
Micropayment
Block Producer
Node
Transaction
R Root Hash Completed by Side Chain

Commenting, made even easier

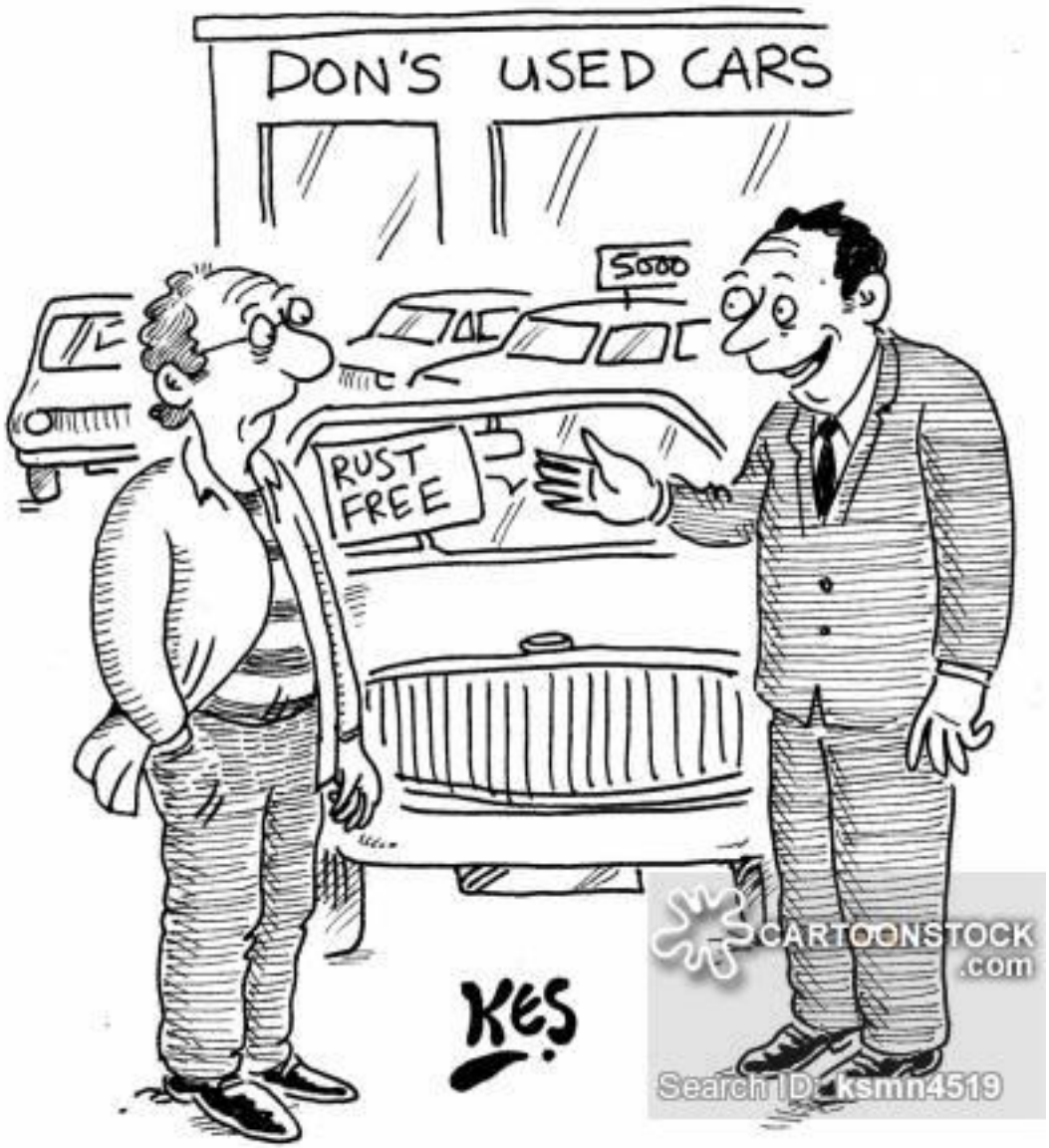


#GoogleDocs


MakeAGIF.com

Applications

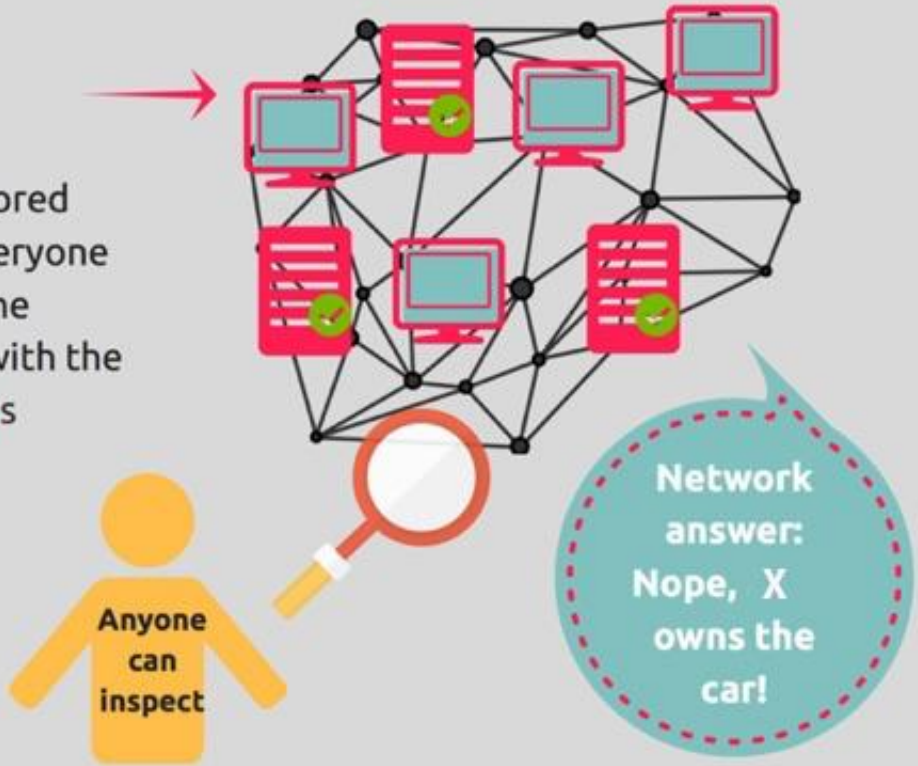
- Crypto currency
- Initial Coin Offering (ICO) & Smart Contracts
- Data Storage



"... Oh, no. That just means we won't charge you for the rust."

Why can I trust Code?

C steals the car and claims ownership of X's car.
Since every transaction is stored on the public blockchain, everyone can inspect it and see that the owner of the unique car ID with the Blockchain address 000AAA is X, not C



BlockchainHub

signs the contract with her private key transferring 20 000€ from her blockchain address (public key) 389157 to Y's blockchain address 757382

BlockchainHub

Limitations

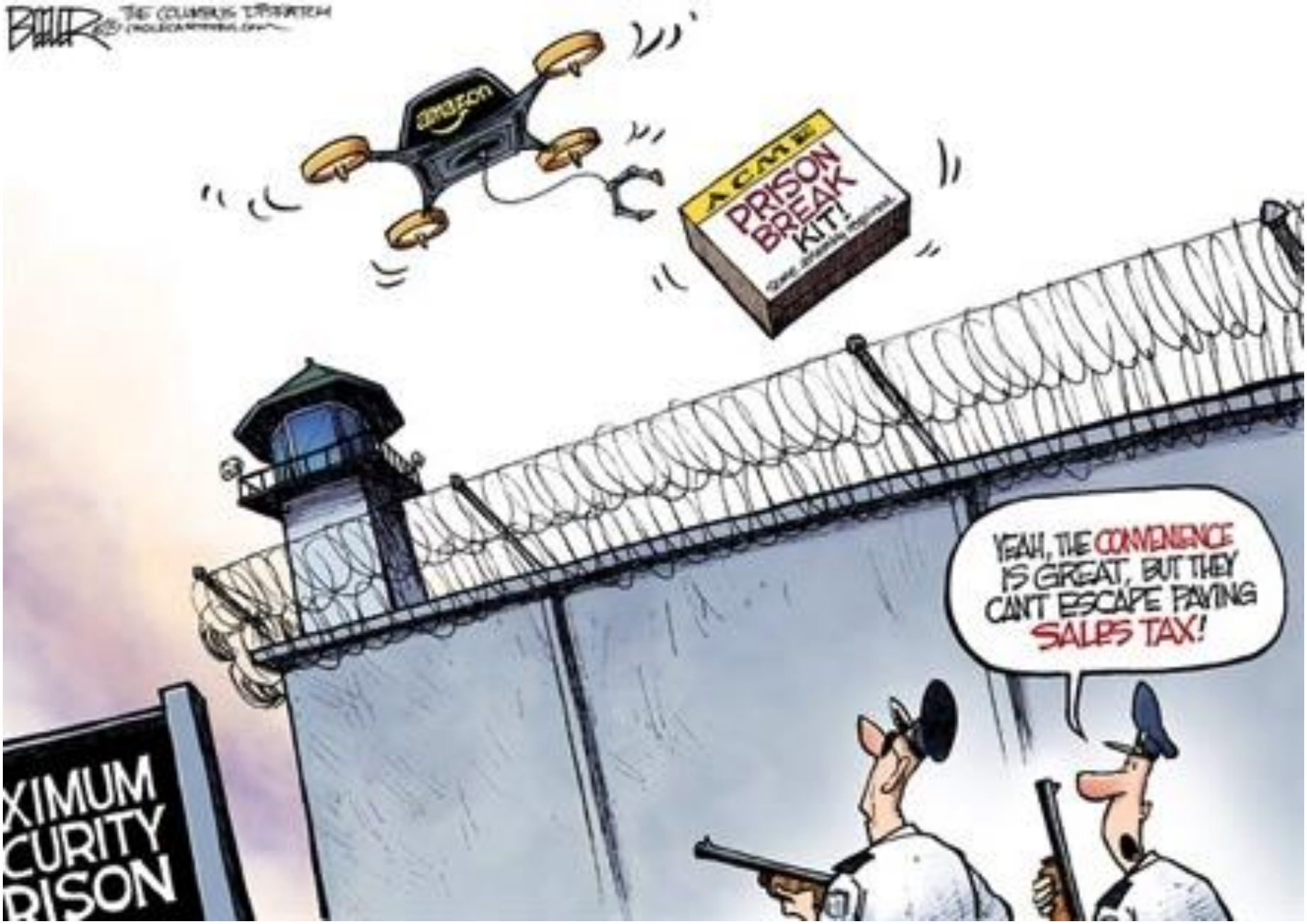
- Psychological
  - Mass implementation
  - Infrastructure
  - Latency
  - Behavioral issues
  - Sociopathic

Limitations

- Technological
  - User Interface
  - Illiquidity
  - Consensus Network
  - Inbuilt Inflation
  - Limited Storage

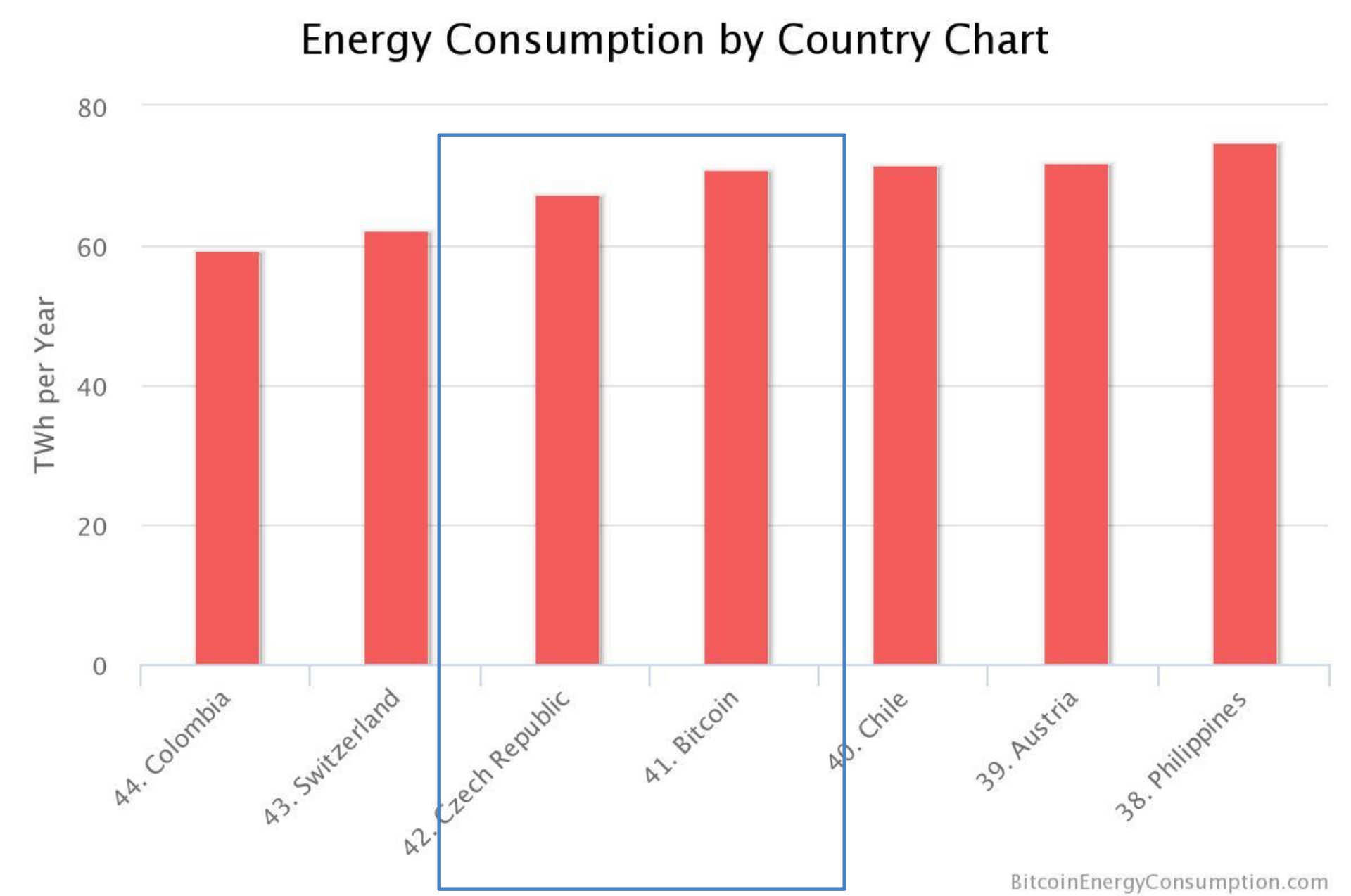
Limitations

- Regulation
  - Uncertainty
  - Banking (KYC)
  - Legal issues
  - Dictator’s learning curve


ACME
PRISON BREAK KIT!
YEAH, THE CONVENIENCE IS GREAT, BUT THEY CAN'T ESCAPE PAYING SALES TAX!
XIMUM
CURITY
RISON

Limitations

- Regulation
  - Uncertainty
  - Banking (KYC)
  - Legal issues
  - Dictator’s learning curve
  - Energy Consumption


Energy Consumption by Country Chart
80
60
40
20
0
TWh per Year
44. Colombia
43. Switzerland
42. Czech Republic
41. Bitcoin
40. Chile
39. Austria
38. Philippines
BitcoinEnergyConsumption.com


CRYPTOCURRENCY
LEGISLATION

Thank You!

Committee on Energy Resources and the Environment and the Task Force on Innovation

NARUC Summer Policy Summit

Energy Web Foundation

A platform for democratized energy

July 16, 2018

energy web
FOUNDATION

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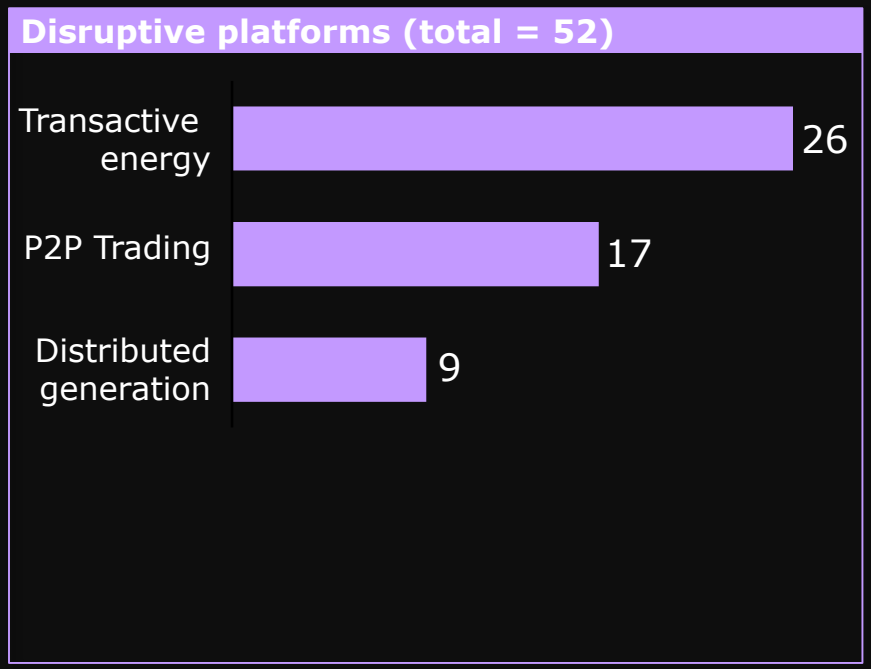
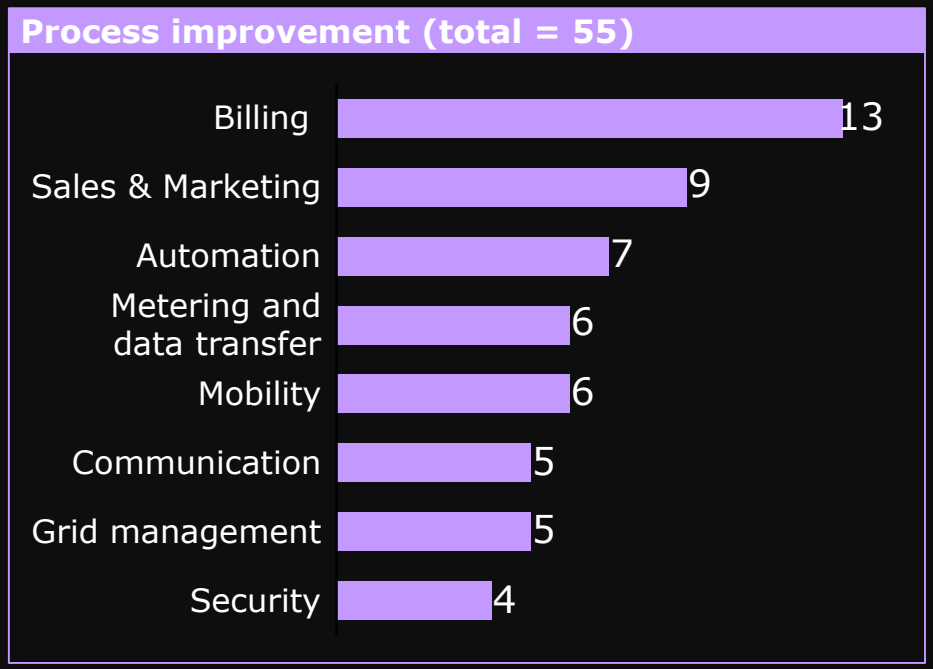
What are applications of blockchain in energy?

Blockchains unlock value in the new energy future





Source: DENA / ESMT survey of 70 German energy sector executives – Nov 2016

Example 1: electricity consumers

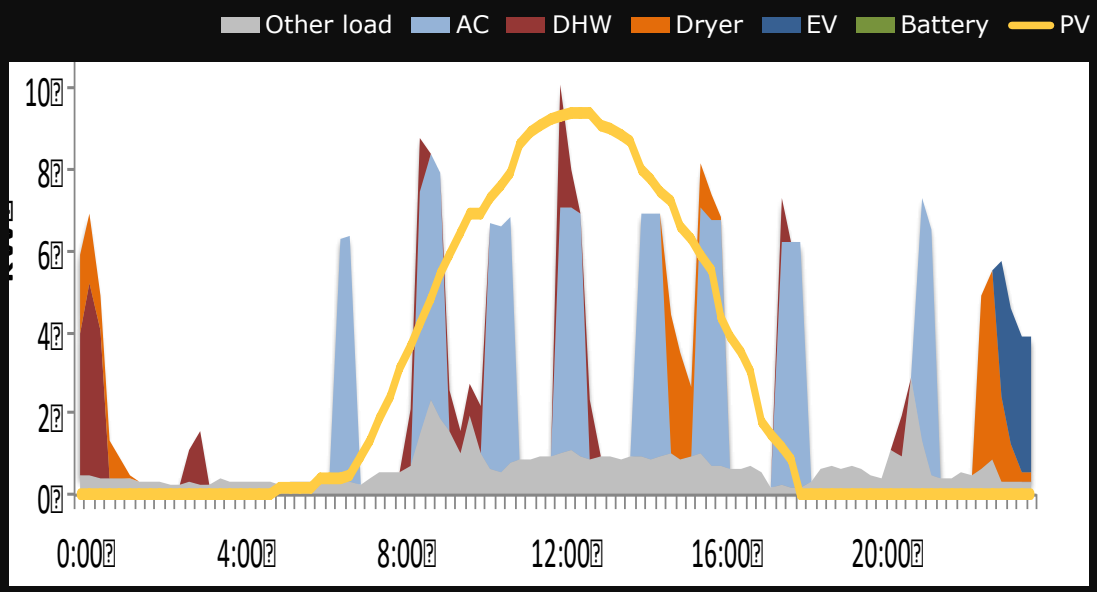
Who owns your energy consumption profile?

20th Century	Early 21st Century	Blockchain-enabled future
Irrelevant question (one meter reading a year)	Somebody else possibly monetizing it or inadvertently making it public	You

Example 1: electricity consumers

What if I owned my energy consumption profile?

Load profile

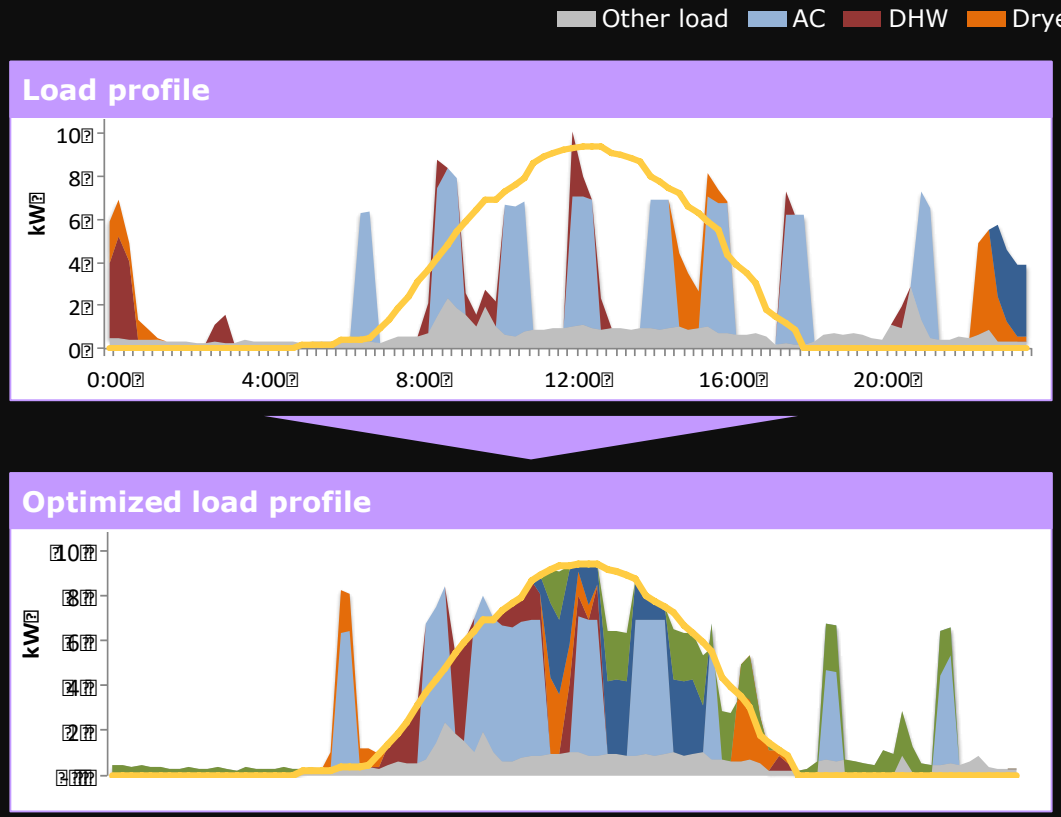


What if …

- As a consumer I could "own" my load profile?
- Imagine it is stored in a public blockchain – but encrypted
- Imagine I can sell my data to five retailers of my choice
- Imagine it is enhanced by analytics
- I can get the best price while protecting my privacy
- My bill is a smart contract
- I can check my bill with an app

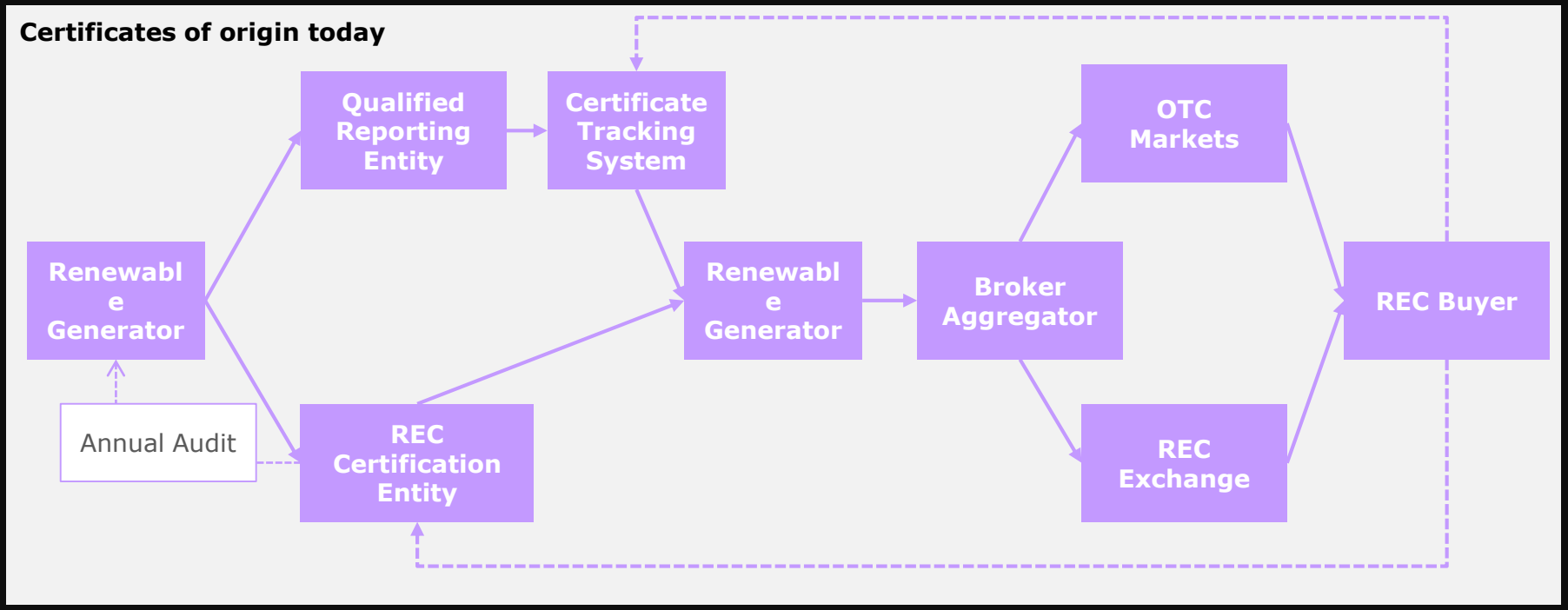
Example 1: electricity consumers

What a smart retailer could do with enough load profile information



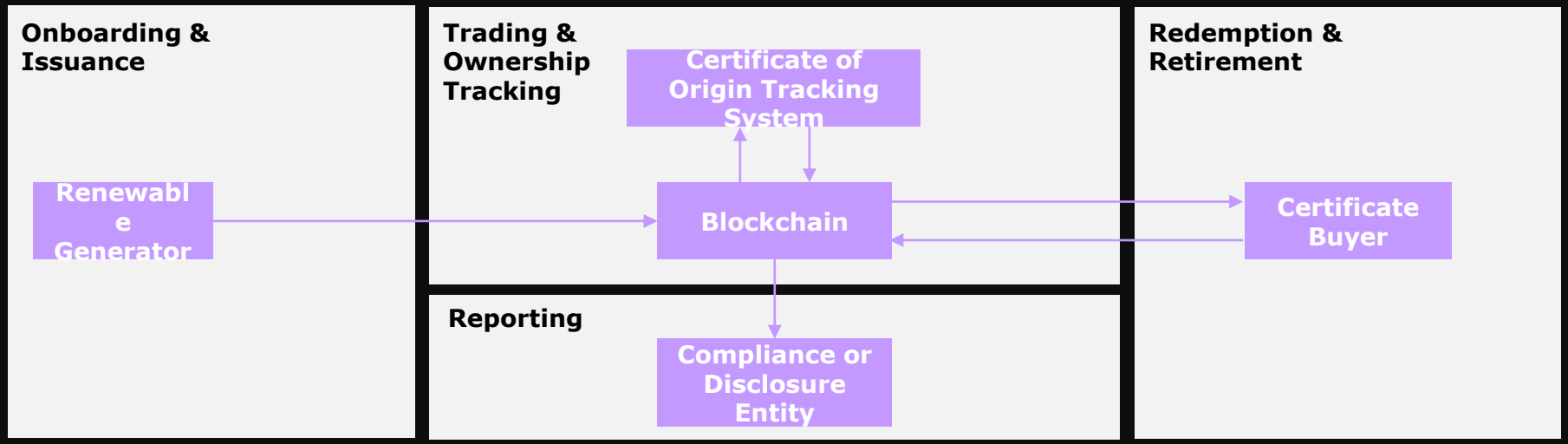
Example 2: Certificates of origin markets

Certificates of origin today are opaque and high cost



Example 2: Certificates of origin markets

Certificates of origin on the blockchain are efficient and transparent



- Lower transaction costs
  - Faster execution (minutes - not weeks)
  - Reduced working capital requirements
  - Reduced labor
- Increased transparency
- Increased cyber-security

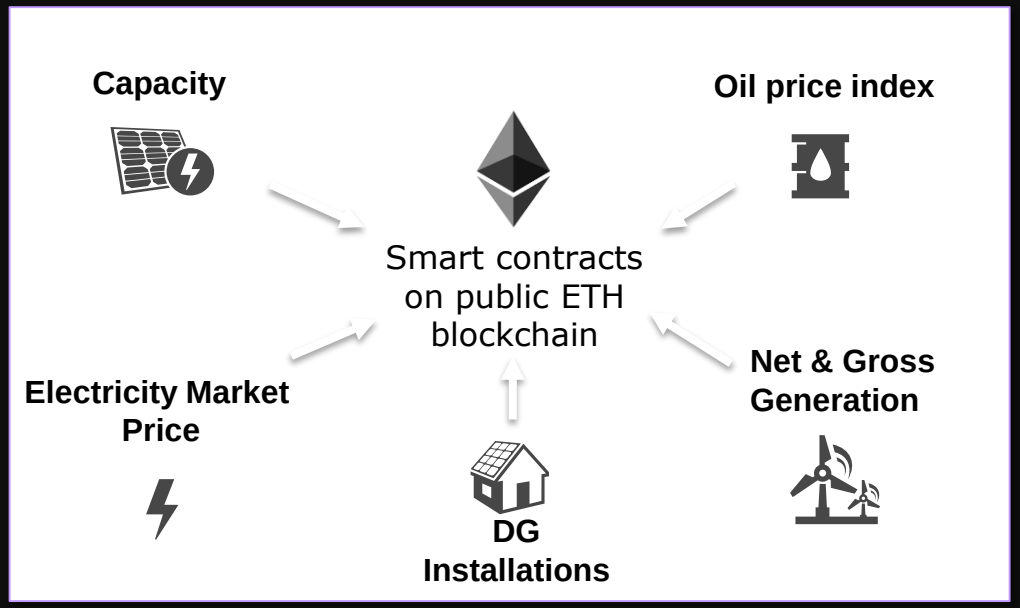
Example 3: Reinventing the role of the regulator with blockchain

Case study: Chilean National Energy Commission

Existing Pain Points

- Customers, developers, regulators have low access to energy information
- Major information asymmetries
- Low data security
- Very low "trust" — and investment — in energy sector

Solution: blockchain-based traceable data repository

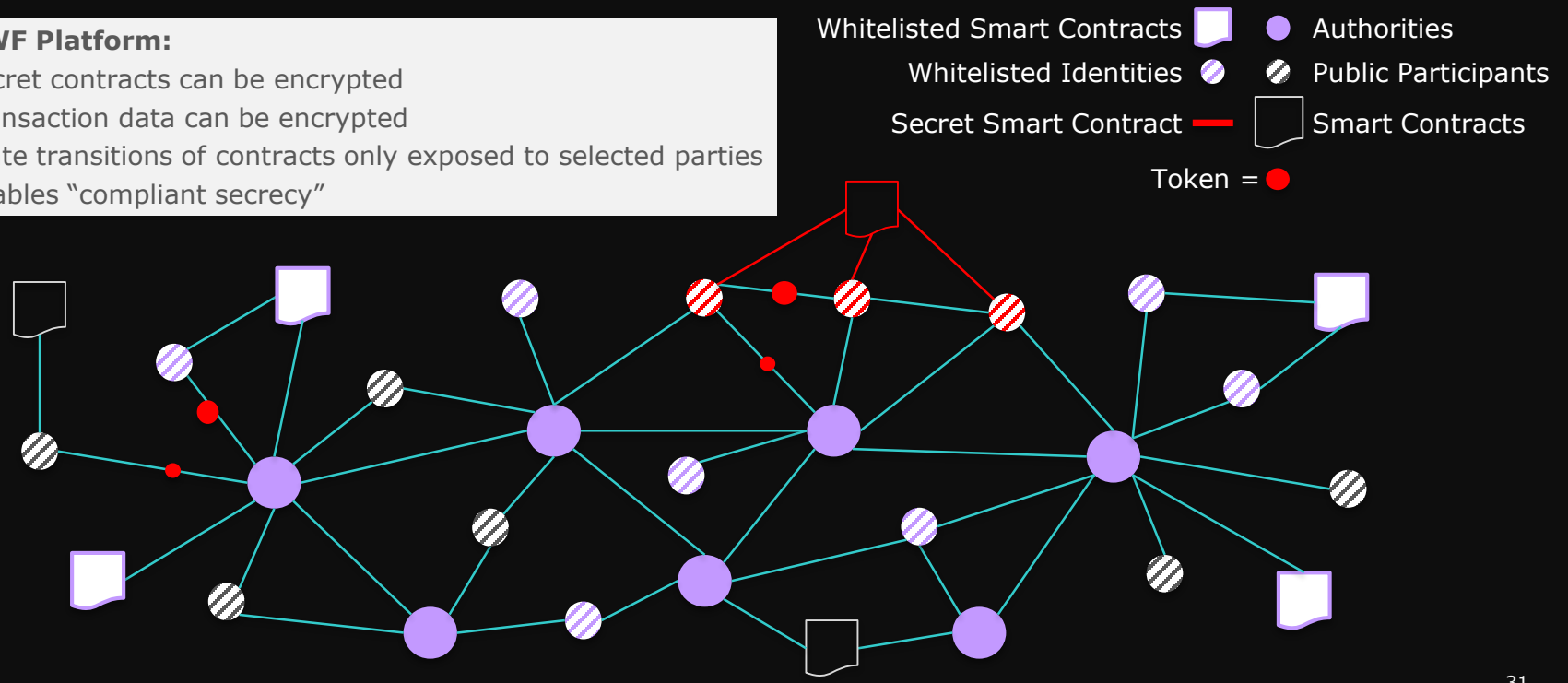


Example 3: Reinventing the role of the regulator with blockchain

Private transactions and “compliant secrecy”

On EWF Platform:

- Secret contracts can be encrypted
- Transaction data can be encrypted
- State transitions of contracts only exposed to selected parties
- Enables “compliant secrecy”



Where could this converge towards?

Reinventing the electricity system from the customer up

Generation → Transmission → Distribution → Ratepayer

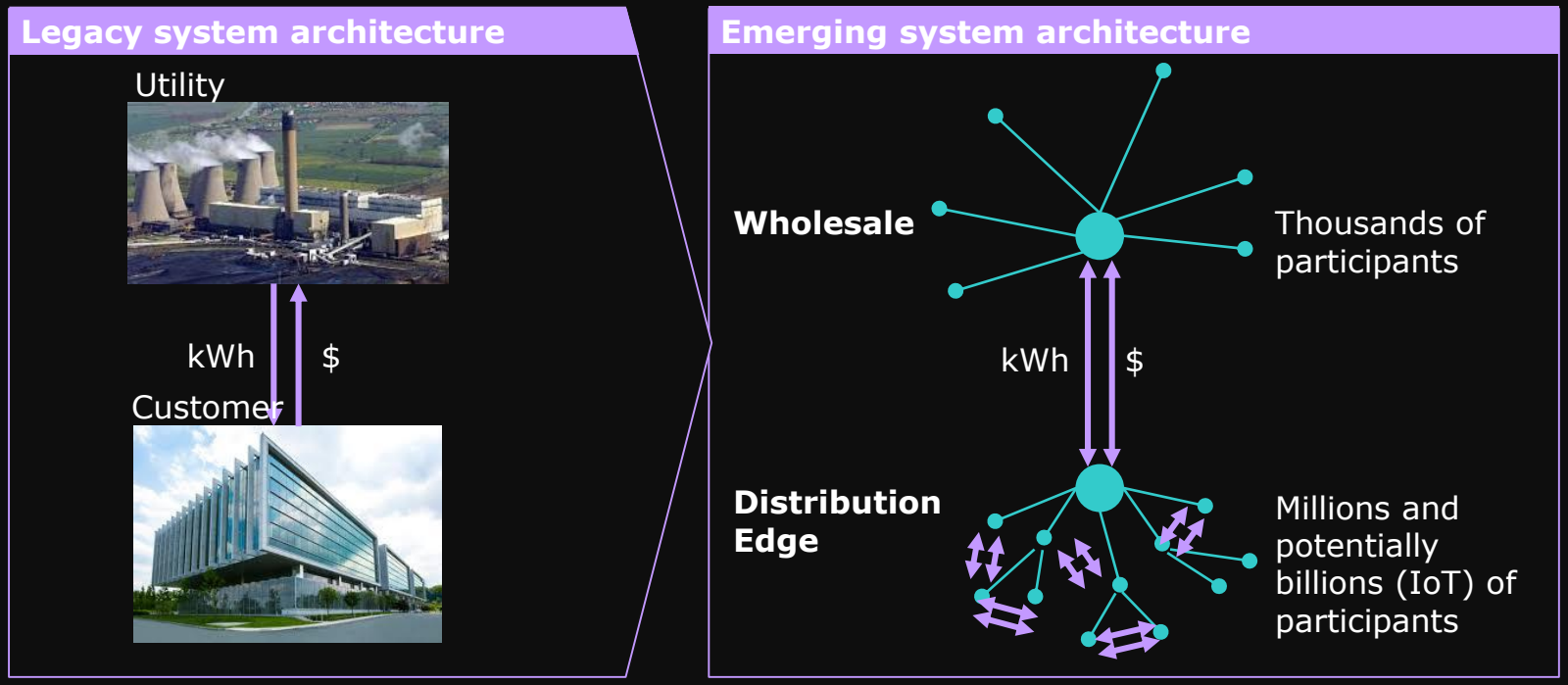
Focus (and value) in the past

Generation → Transmission → Distribution → Customer

Focus (and value) in the future

Where could this converge towards?

The key to a new model for electricity markets



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Barriers to blockchain innovation in energy

Existing technology can’t support energy apps	**Productive ecosystem doesn’t exist**	**Regulators aren’t yet engaged**	**No killer applications have been built**

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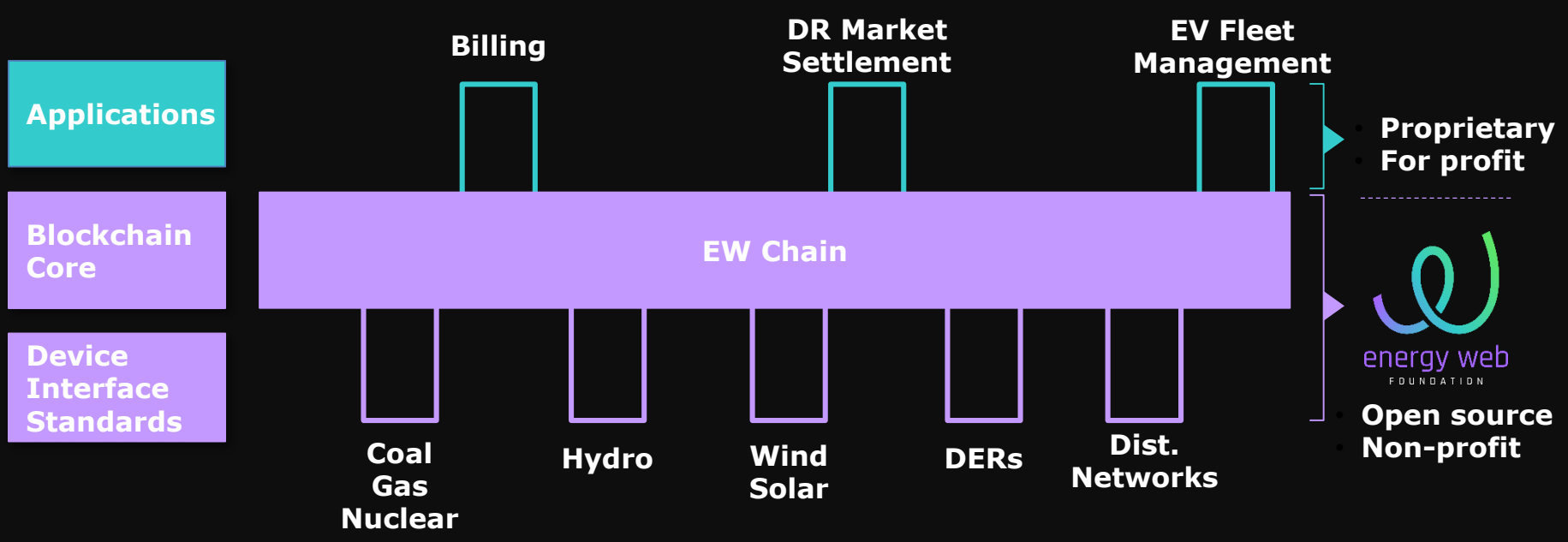
What is Energy Web Foundation ("EWF")?

Mission	**We enable and accelerate the transition to a decarbonized decentralized and digitized electricity system** by developing a blockchain-based infrastructure that the energy industry can use as a basis of wide variety of applications			
Pillars of Our Work	**Core Technology** We develop a high performing core blockchain technology fit for energy sector applications	**Ecosystem Development** We facilitate, incubate and train a diverse ecosystem in support of the technology	**Regulatory Engagement** We inform and engage with regulators on the potential of the technology and its applications	**Application Acceleration** We support our affiliates to launch early applications and spur market growth

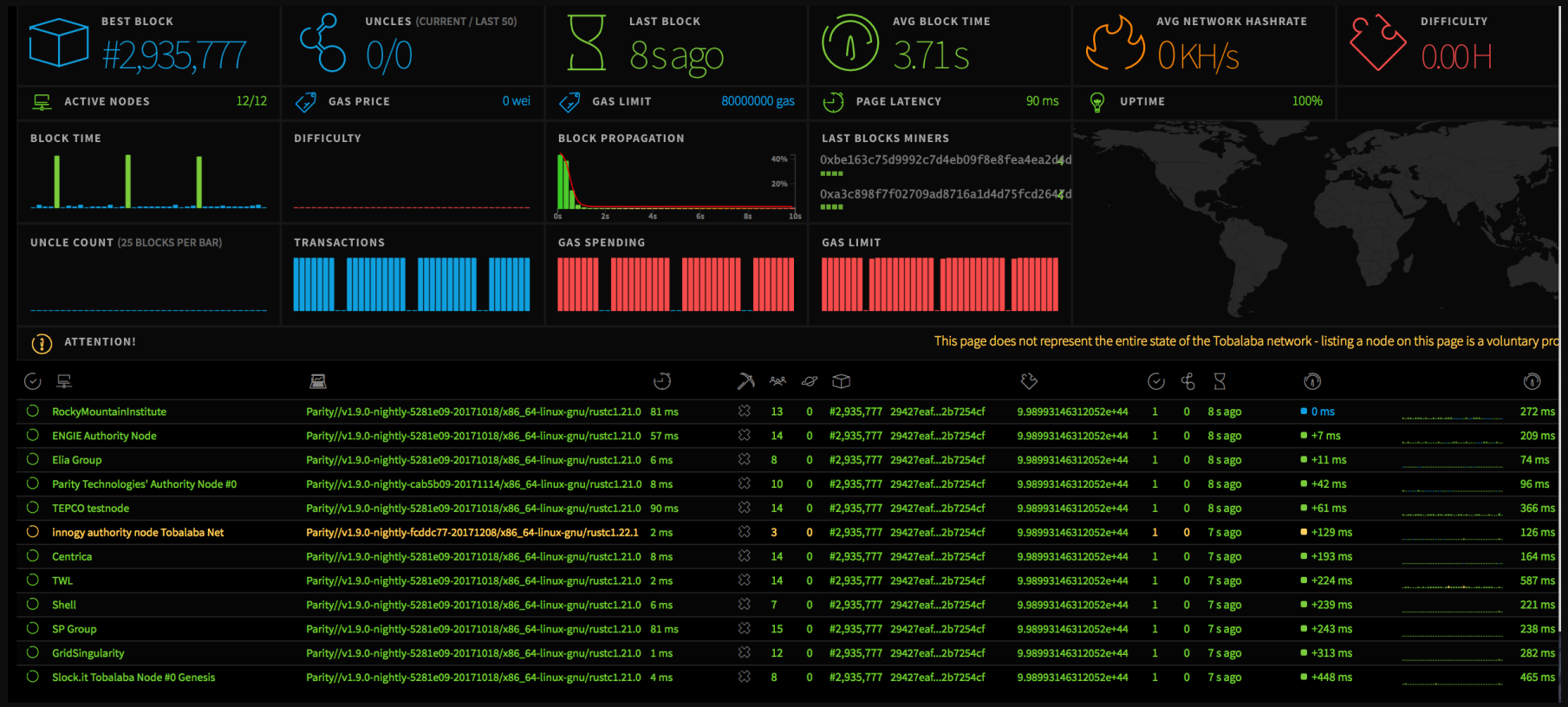
Core technology

EW Chain serves as the foundation for for-profit applications



Core technology

Our chain is up and running in beta-version



Ecosystem Development

We have assembled the largest consortium for blockchain and energy

Round A Affiliates

centrica
elia
ENGIE
Sempra Energy
Shell
SPgroup
Statoil
STEDIN
TEPCO
TWL
Meine Energiequelle.

Round B Affiliates

EVOLVE POWER
Green Running
Wirelane
WIREPAS
OLI
agl
swytch
ptt
innogy
DUKE ENERGY
swisspower
Exelon
radicle impact
Eneco
wipro
PG&E
SB Energy
SoftBank Group
eandis
e·on
ELECTRON
SHARE & CHARGE

* 18 VCs and vetted individual investors not shown. Total number of EWF Affiliates = 44

Regulatory Engagement

We have one regulator affiliate and are seeking others

Benefits of Blockchain to Regulators

1. Faster achievement of goals – resiliency, reliability, access, sustainability, security
2. Improved oversight and compliance evaluation
3. Process cost reduction and efficiency

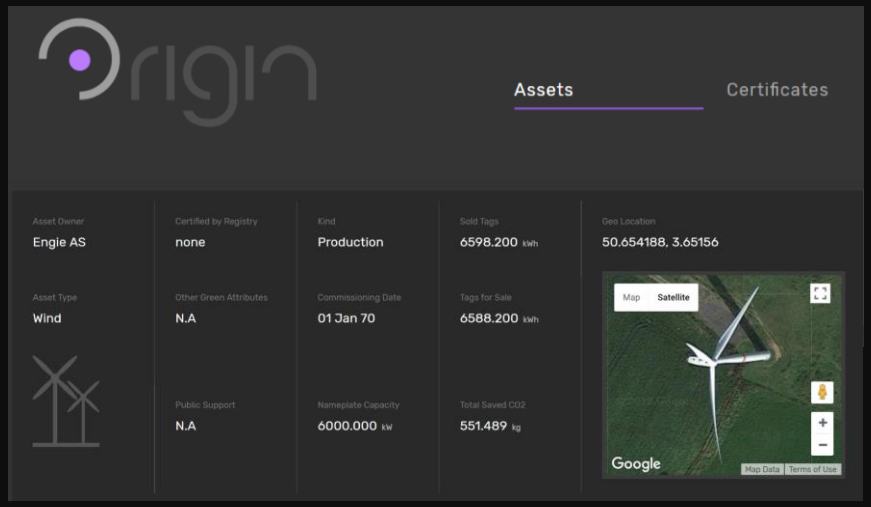
Ways for Regulators to Engage

1. Begin the process of education
2. Support pilots and early implementations
3. Inform development of governance and core technology

Application Acceleration

EWF provides frameworks to support applications

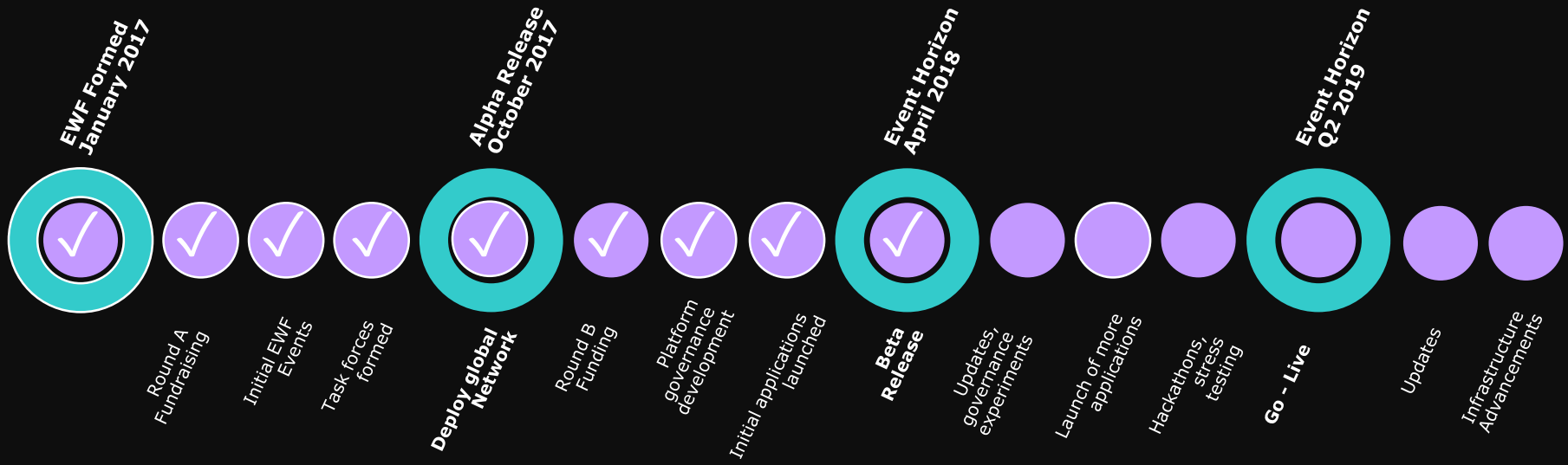
EW Origin Reference Application



EW Link Device Frameworks

Key achievements and milestones

We have maintained a strong focus on timely delivery



EWF Established and Affiliates Engaged	Test Network and Initial Applications Launched	Test Phase and Further Market Engagement and Development

Thank you!

claire.henly@energyweb.org

energy web
FOUNDATION

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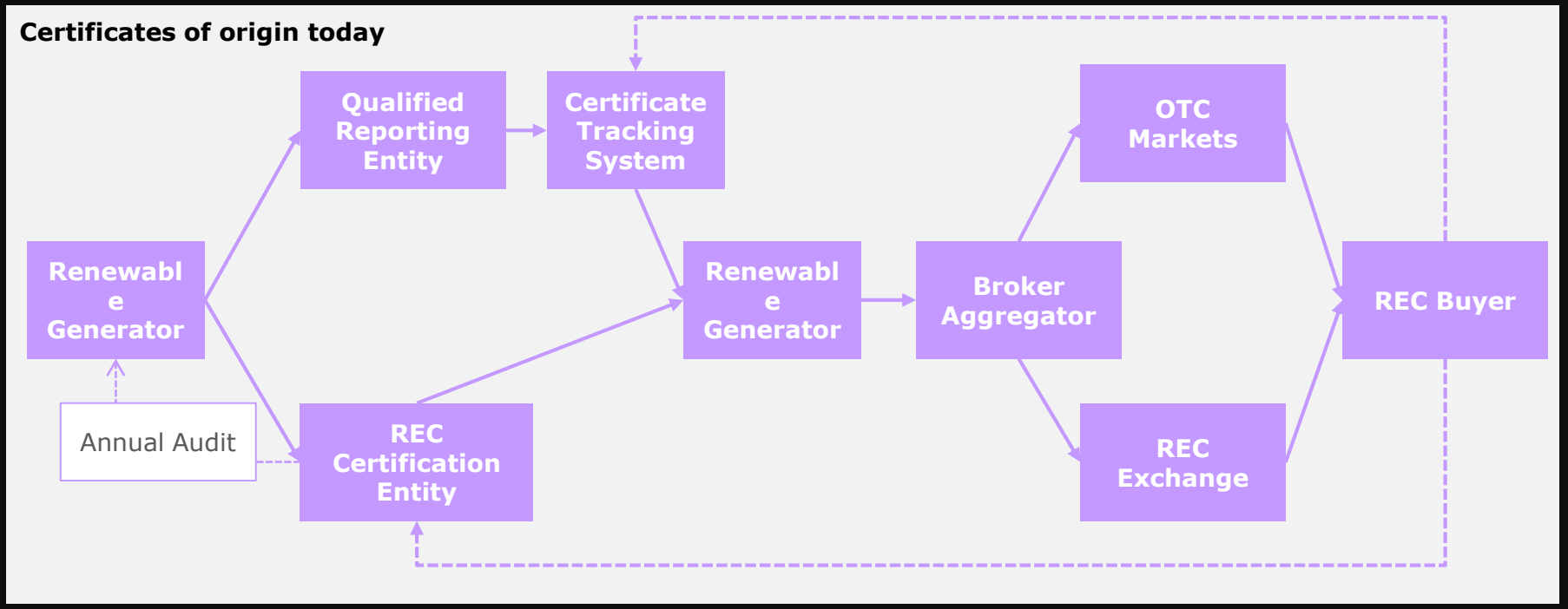

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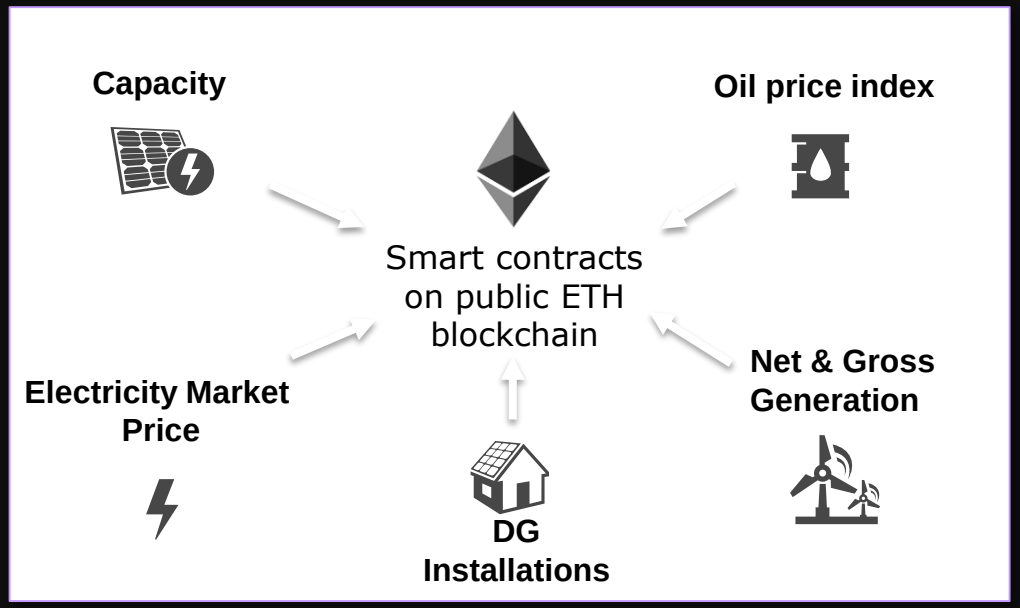

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NARUC Summer Policy Summit

opus one solutions

NARUC TASKFORCE ON INNOVATION

TRANSACTIVE ENERGY

WHO ARE WE

opus one solutions

=

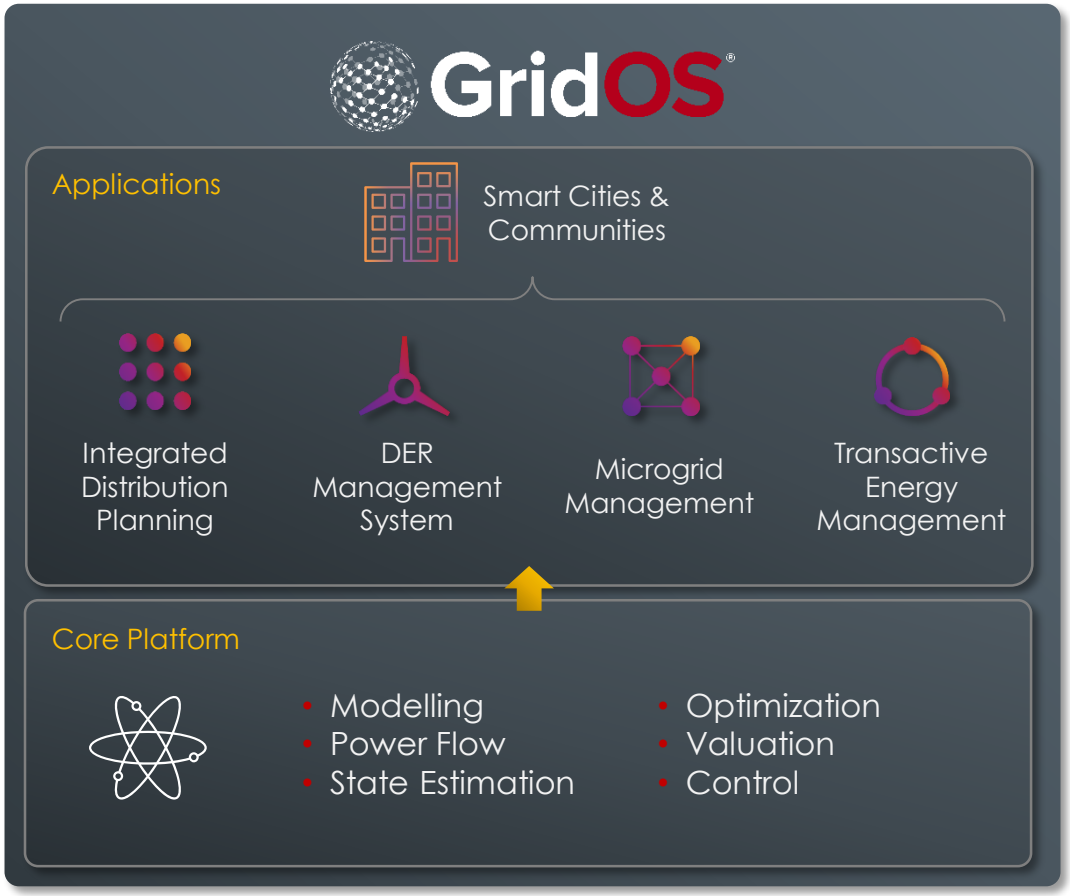
Modern Software

+

Power Systems Engineering

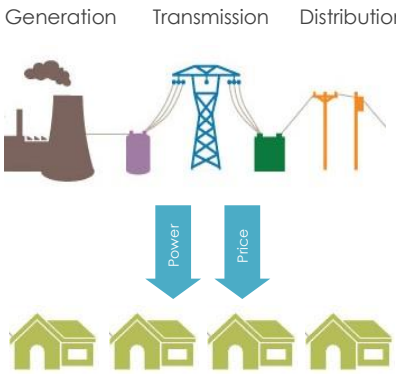
+

Economics



GLOBAL ENERGY NETWORK EVOLUTION

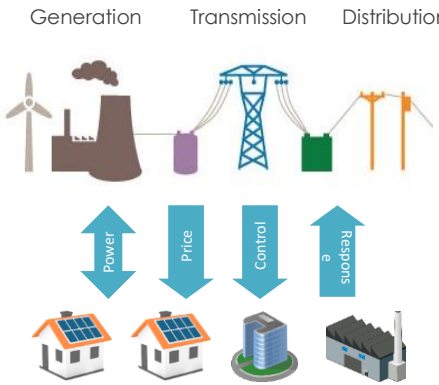
YESTERDAY



One-way pipeline model

- One-way "pipeline" model from centralized generation through to transmission and distribution
- Largely passive consumers
- Asset-based bricks and mortar platform (poles & wires)

TODAY



Distributed energy resources integration

- Increased adoption of distributed energy resources (DERs), e.g. generation, storage, demand, microgrids)
- DER accommodation to integration
- Friction between utilities/DER businesses
- Data-driven smart grid platform

TOMORROW

Multi-way transactive platform model

- Business and customer model transformation
- Utility as a service platform for DERs
- Integrative markets for win-win between utility/DER revenue models
- Value-based transactive platform

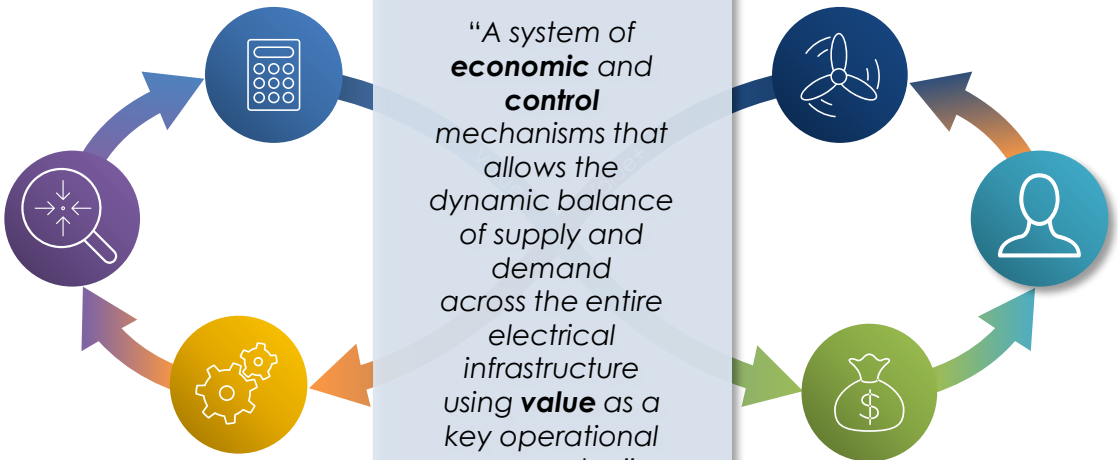
TE REVOLUTIONIZING THE UTILITY-CUSTOMER RELATIONSHIP

Grid/DER Valuation

DER locational and temporal valuation and price generation (if required), based on emerging economic/regulator models

Visibility, Control, Optimization

Power flow results on every node across the distribution network, dynamic hosting capacity, optimal power flow controls



Grid Investments & Operations

Utilities modernize grid investment planning and operations given the added value from DERs

TRANSACTIVE ENERGY (TE)

*"A system 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

Customer Value-Add to Grid

Engaged customers are incented to align operations to the benefit of the greater grid

Customer Engagement

Empowered customers can transact value with each other, enabled by the utility with the grid as a platform

New Platform Business Models

DER/energy efficiency values enable ***integrated and win-win energy/service programs, markets and business models*** between utilities and empowered customers

MARKETS CAPTURE AND EXCHANGE VALUE

Value Stacking

Bulk Power

Aggregation & resource integration

Distribution Grid as a Platform

Grid 1.0: Electron Platform – Poles & Wires

Grid 2.0: Data Platform – Smart Grid

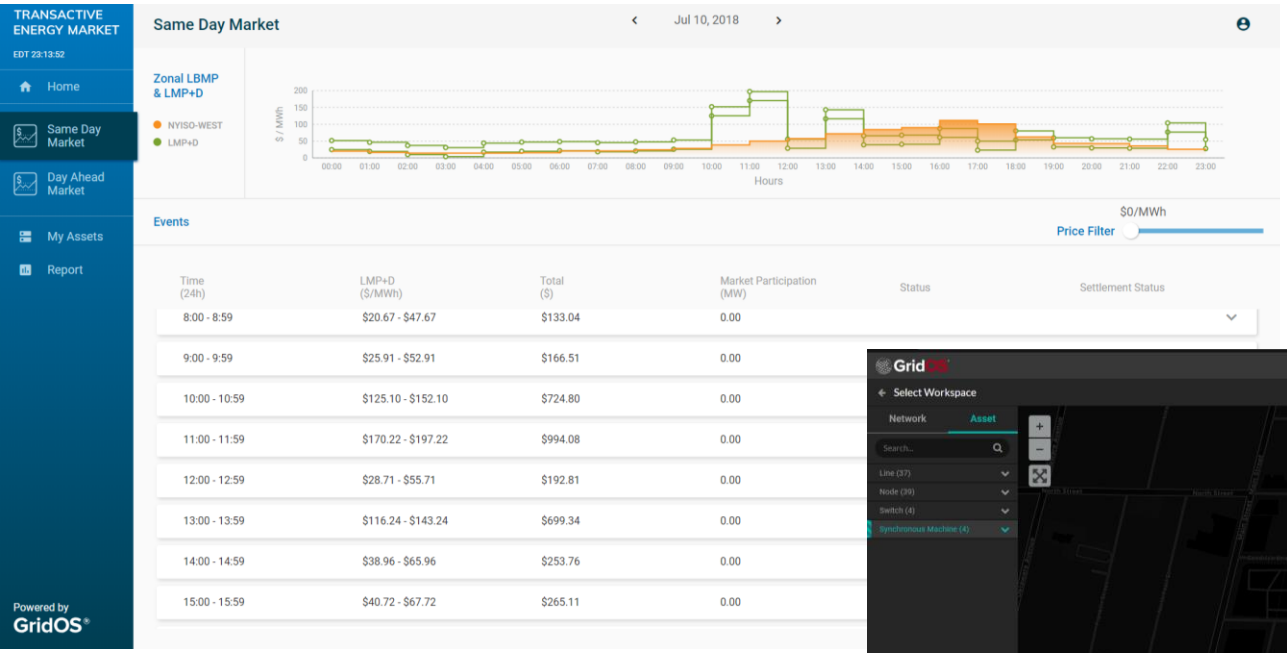
Grid 3.0: Transactive Platform – Value Exchange

Unlock customer service & stacked value models

DERs at the Edge

Aggregated to Locational Dispatch

TRANSACTIVE ENERGY – VISION TO REALITY



NEW YORK STATE OF OPPORTUNITY. | Reforming the Energy Vision

nationalgrid | Buffalo Niagara Medical Campus | opus one solutions

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