The Power of Many
DLT in Energy and more

Jos Röling – EE&U Blockchain CTO
Global Center of Excellence for Energy, Environment and Utilities

jos.roling@nl.ibm.com

IBM Consulting

# IBM's Energy & Utility industry mission
Nr 1 : Partner to help achieve clean electrification

1. Distributed Energy
(Utility-Scale Renewables and DER)

2. Flexible Energy
(Buildings, Energy Networks and Markets)

3. Mobile Energy
(EVs, storage)

4. Grid Resilience
(Orchestrated with Smart Metering (AMI), IoT, Edge & Cybersecurity)

IBM Commercial Confidential

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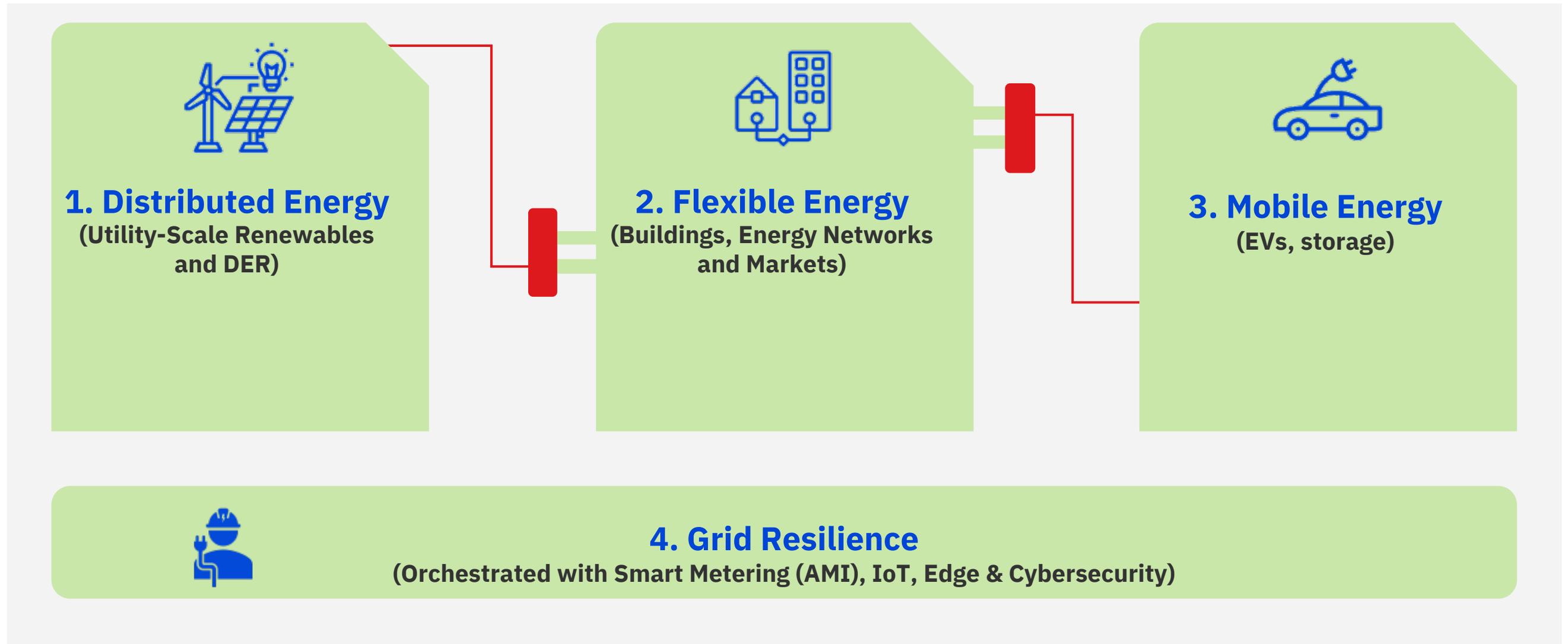
The traditional utility value chain is being transformed with the adoption of Smart Grid solutions
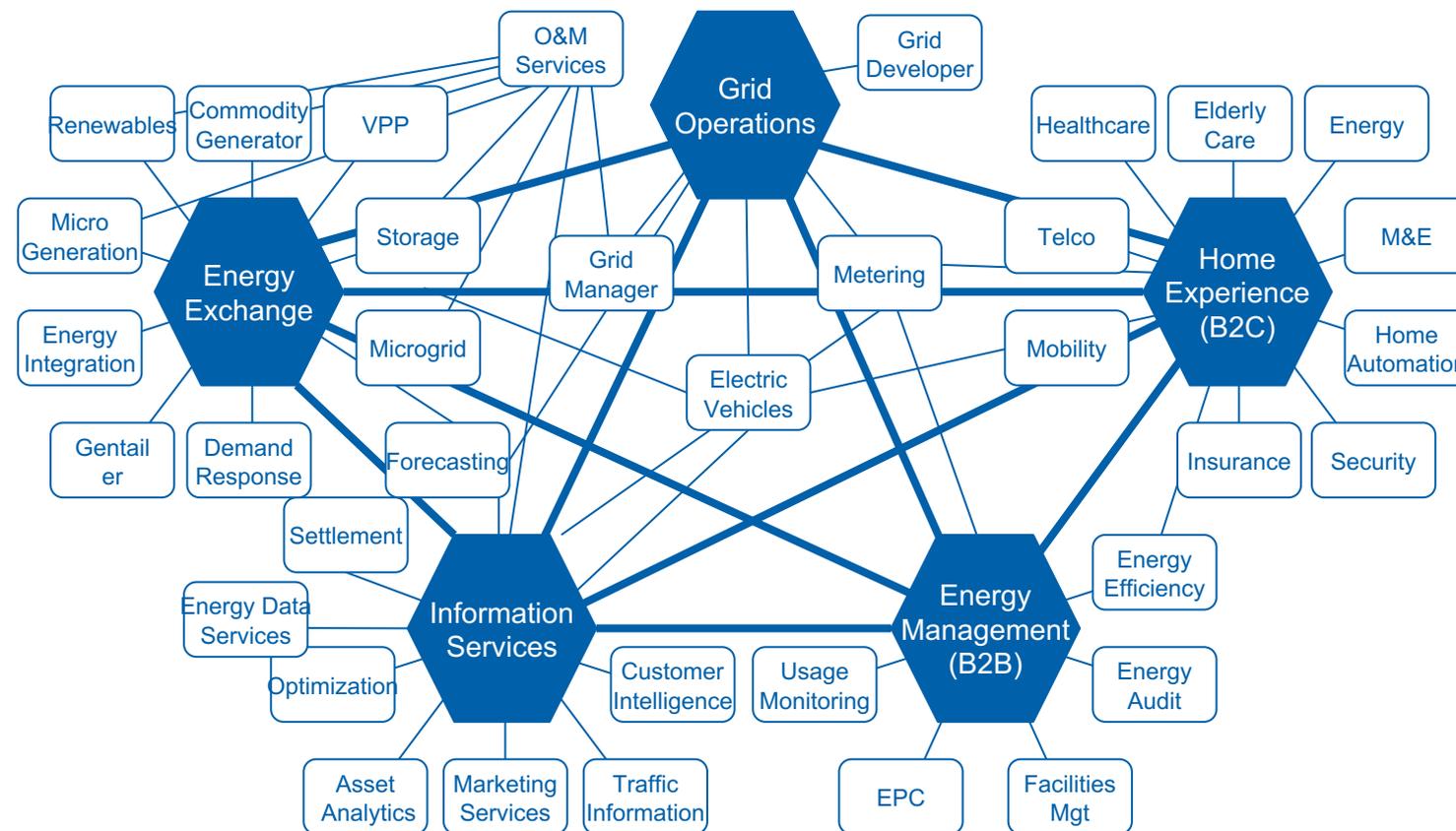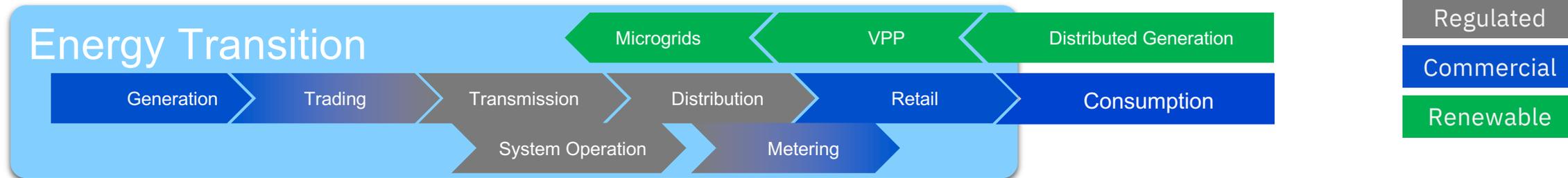
EE&U Blockchain Project Status Dashboard (jos.roling@nl.ibm.com)
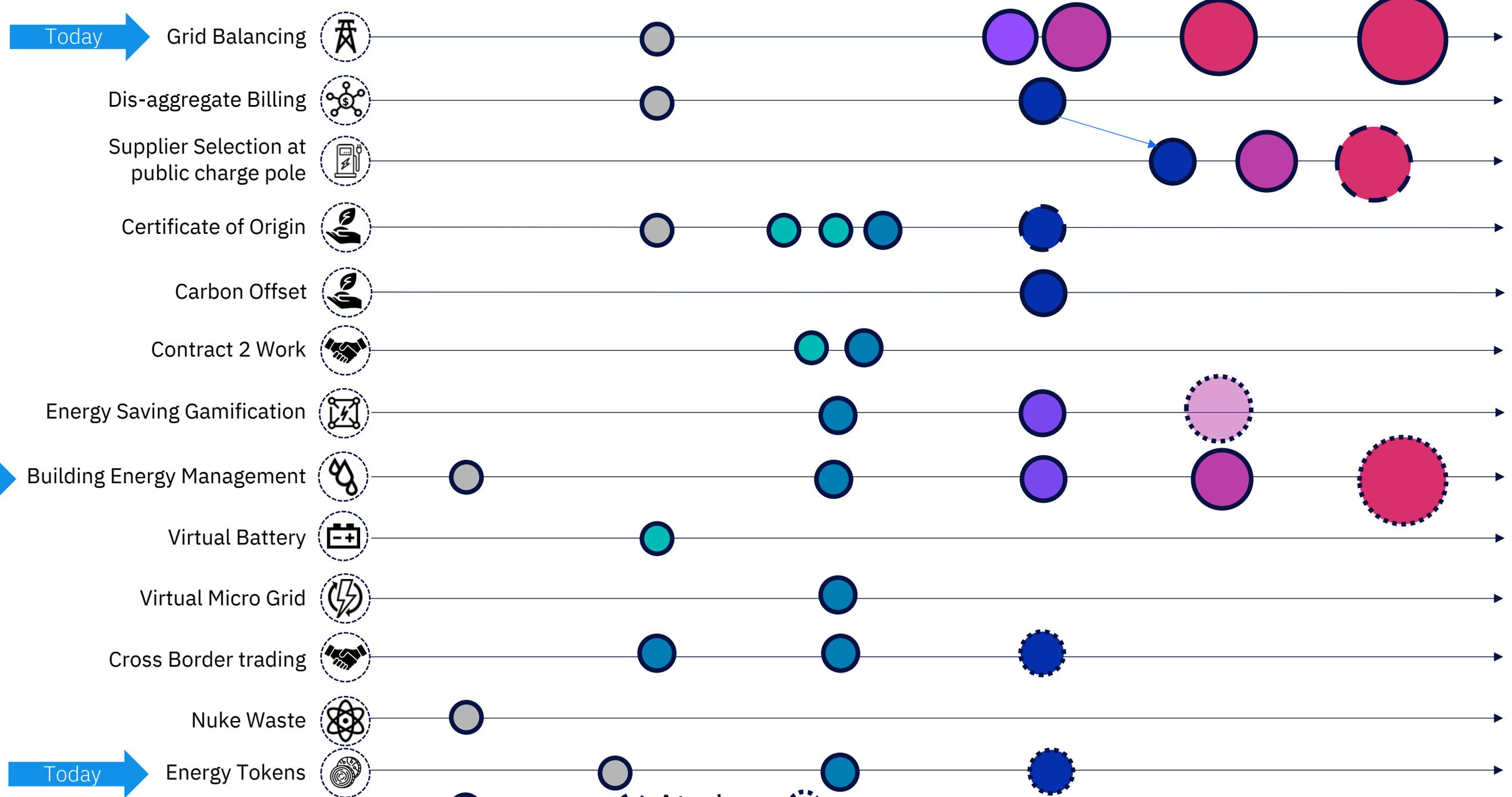
GRID Balancing

DER's represent an alternative source of flexibility to serve the existing, multi-billion Euro, European market for flexible power

E.g. registered EVs in Europe = **850k**[1] represent
8.5GW flexibility

Primary Reserves Market in Europe
3GW

GW

Unlocking a billion euro market

Estimated value[2] per EV ~ €500/y

OEMs and their clients can now benefit from participating in this market.

TSOs are looking to tap into smaller decentralized resources of flexible power.

1. European Alternative Fuels Observatory - https://www.eafo.eu/europe#europe_pev_fleet_fcev_graph_anchor
2. D-fine study on primary reserve ancillary service income for batteries

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Equigy & IBM
using demand side flexbility to achieve flexibility

BLOCKCHAIN

TSOs

DSOs

OEMs

AGGREGATORS
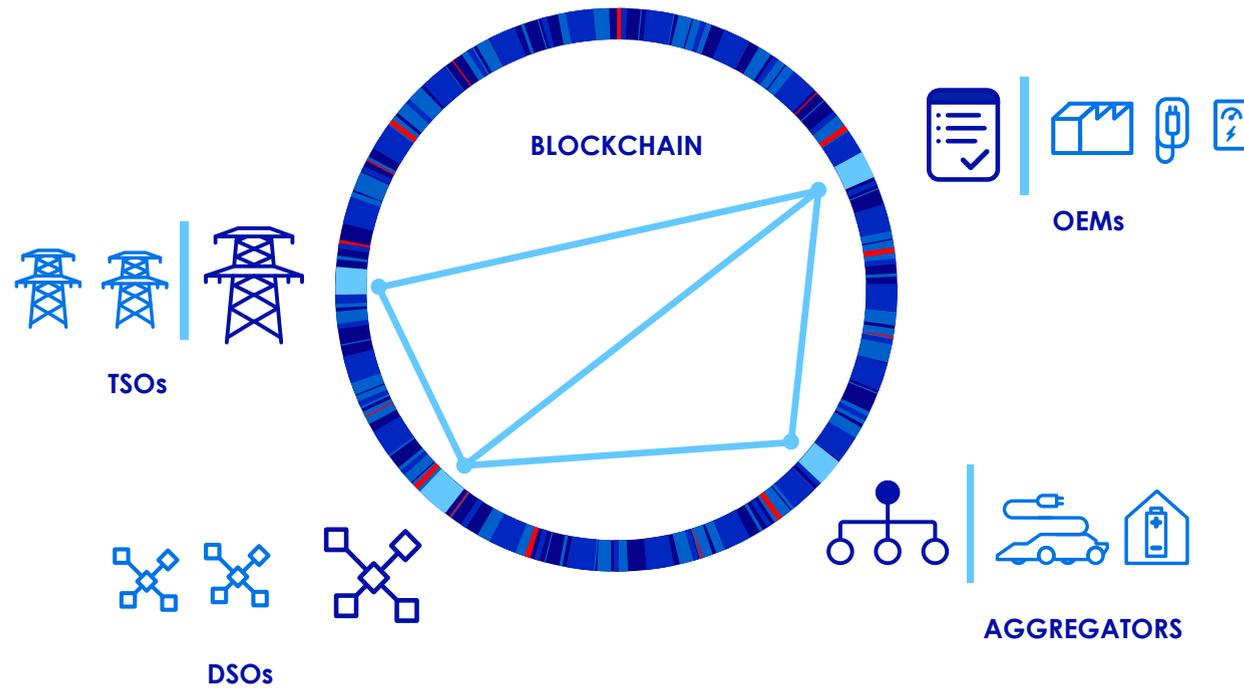
IBM has been the **technology partner** since inception in 2016, executing on design, development, test, deployment & operations.

2016 TenneT and IBM start discussions & build a blockchain-based PoC
2017 Two successful pilots launched with Vandebron (NL) & Sonnen (DE)
2018 IBM signs framework agreement with TenneT to build European platform
2019 Crowd Balancing Platform goes live in the Netherlands
2020 Equigy is launched & IBM deploys platform in Germany and Switzerland
2021 Equigy OEM partnerships & IBM deploys platform in Italy and Austria

What?

Increased renewable energy is volatile by nature, hence the need for flexible energy. Equigy integrates flexible capacity supplied by electric cars and household batteries into the electrical grid.

How?

The platform enables small-scale energy resources to participate in the ancillary services market, by integrating device data from back-end systems via the blockchain.

Benefits

- Enables consumer participation in the market through aggregators.

- Provides insights and transparency to all parties, including the transmission system operator, flex service providers and drivers.

- Standardizes the integration of a variety of devices into the market, lowering the barriers to entry.

Founders:

TenneT
Taking power further

swissgrid

Terna

Publicly announced partners:

sonnen

BMW

vandebron

SCHOLT
ENERGY CONTROL

ENERGINET

NISSAN

NL running on Hyperledger Fabric since November 2017,

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Adoption

Crowd Balancing Platform

as of Q3 2021

5 EU Countries

  IBM Consulting

IBM Services

www.equigy.com/the-platform

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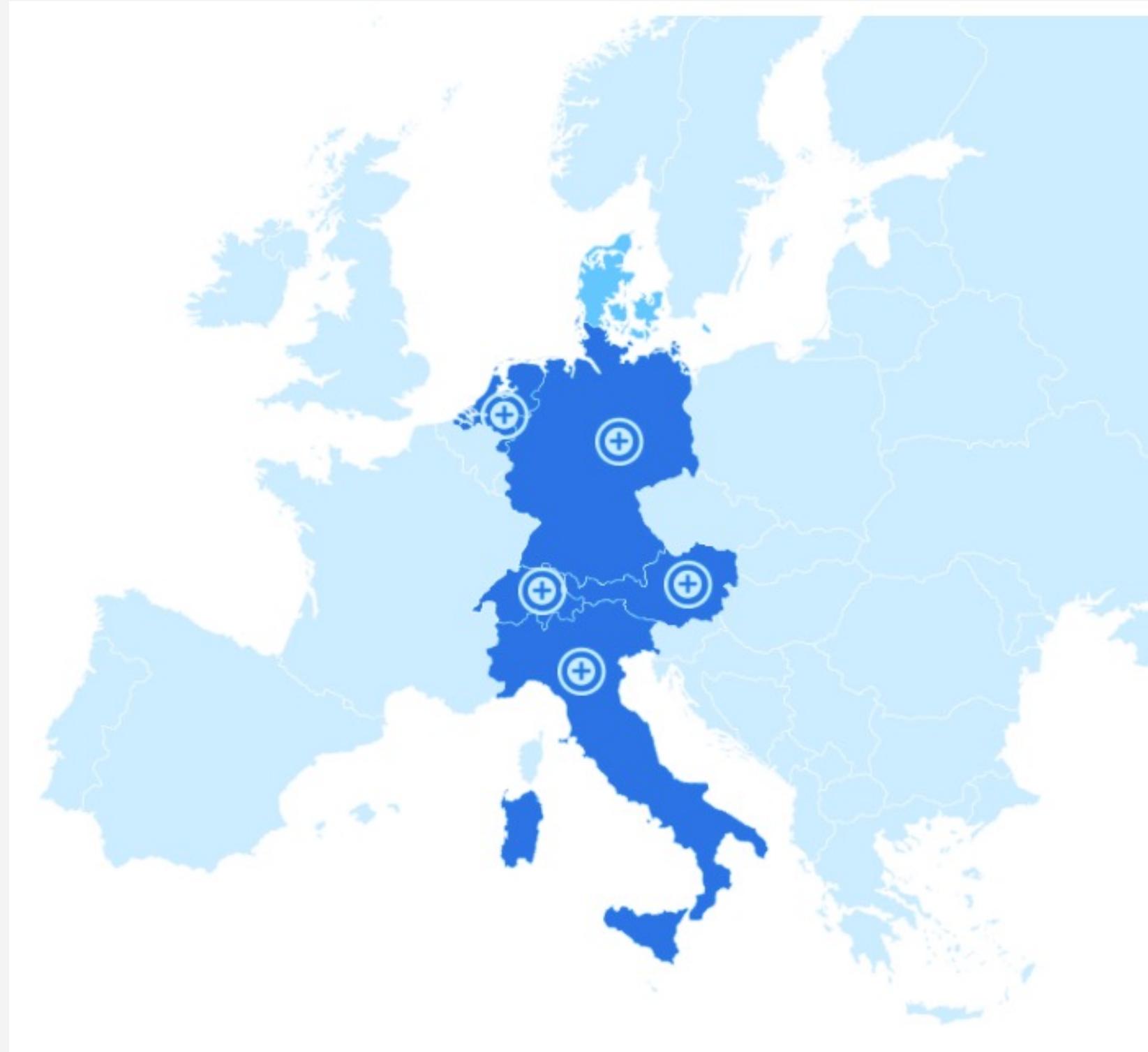
# IBM Flex Platform

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Vast pools of unlocked flexibility resides in our cities, buildings, factories, electrical vehicles and infrastructures

Buildings make up for approx.

40%

of our total energy consumption

In buildings approx.

25%

of this energy **is flexible**

HVAC

Potential: ~30 %

Pumps

Potential: ~25 %

Cooling and freezing

Potential: ~70 %

Electric motors and industrial equipment

Potential: ~10 %

Electrical vehicles

Potential: ~70 %

OFFICE CENTER

FOOD

RESTAURANT
*** Best in Town ***

BOOKS

PHARMACY

•SUPERMARKET•

COFFEE SHOP
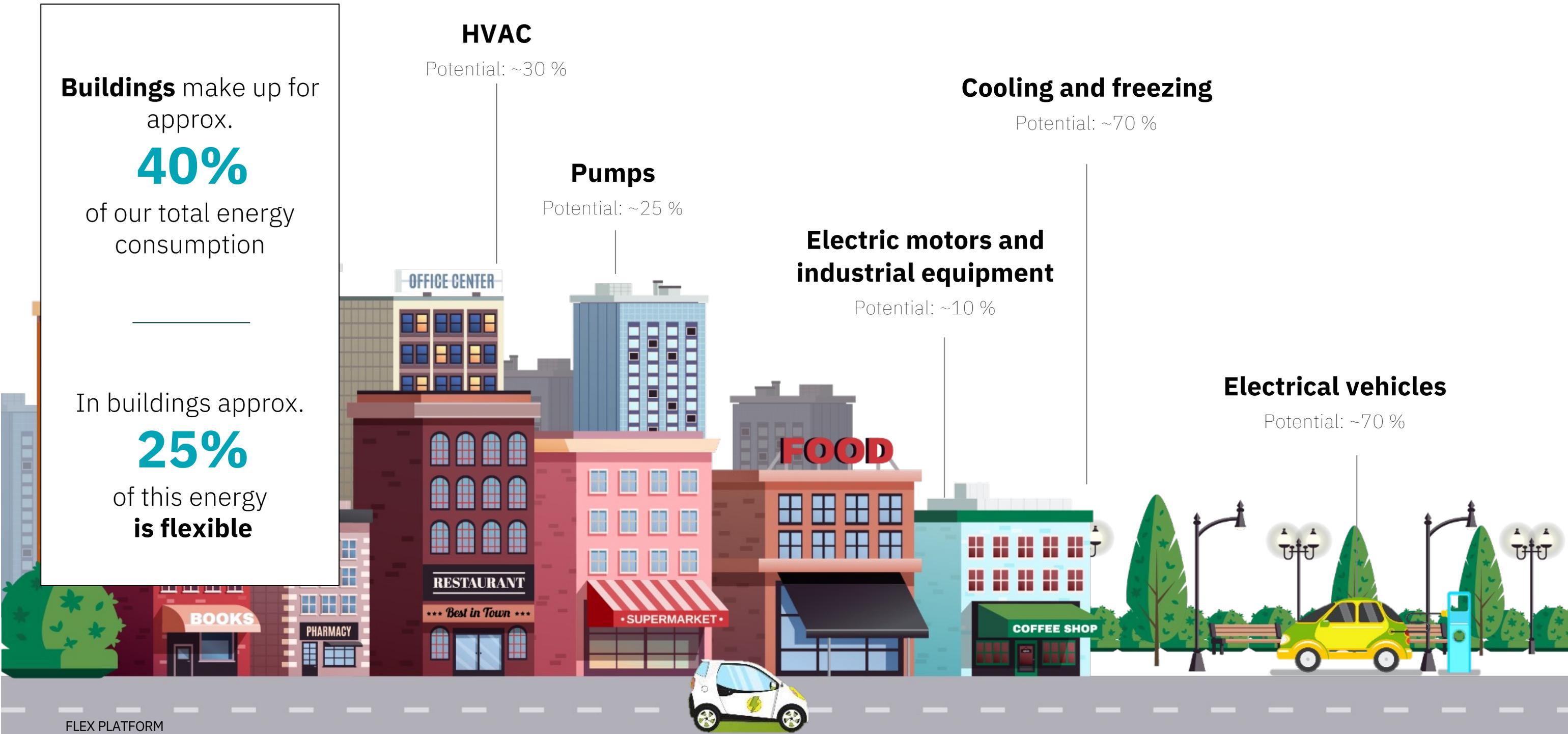
By intelligent instrumentation of assets, electricity consumers can unlock a vast valuable pools of flexibility, participate in the flexibility markets, and earn revenue from their energy assets

FLEX PLATFORM

IoT
Connects assets to the platform, profiles, monitors and sends flex activation requests to the assets at the right time to ensure the delivery of flexibility

AI
Forecasts and optimize flexibility from thousands of assets into portfolios of green flexibility services that are traded on the power balancing markets

Blockchain
Documents the flexibility delivered, to ensure transparency and trust in the trade of consumption flexibility.

FLEXIBLE ENERGY CONSUMPTION AND STORAGE

CURTAILMENT SERVICES

CONGESTION SERVICES

ANCILLARY SERVICES
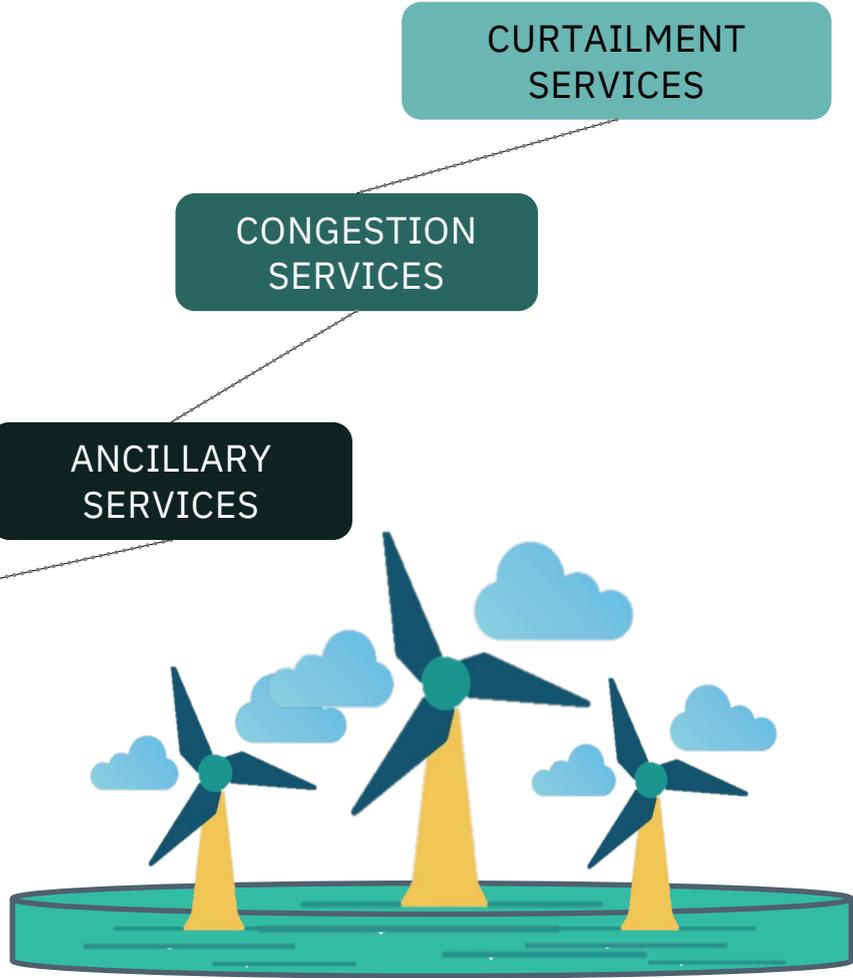
BALANCING THE ELECTRICITY SYSTEM

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Tokens

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Why Tokenizing The Energy Sector?

Both classified as Critical Infrastructure of an economy [1]
- A lot of jargon used
- Heavily regulated

This imposes risk for investors
- Impact of regulatory changes
- Lack of transparency (ability to understand)

Risks are mitigated by
- Using Consultants and SMEs in the field
- Risks are estimated by actuaries and insurred

1: https://ec.europa.eu/energy/topics/energy-security/critical-infrastructure-and-cybersecurity_en?redir=1

Source   https://www.cisa.gov/identifying-critical-infrastructure-during-covid-19

How to define a token?

What makes a token?

Token Taxonomy Structure

Token Base
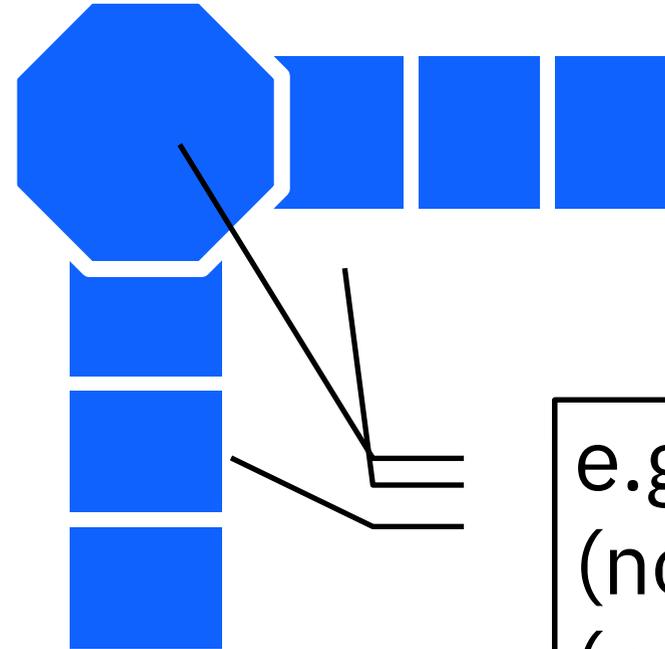
Set of **properties**
(Data attributes)

Set of **Behaviors**
(Allowable actions)

e.g. (non)Fractional (non)Fungible
Certificate

    28 June 2022

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Proposed

Energy Token System

Asset Ownership
Wind — 10% Turb... Loc...
Solar — 1 Solar Panel — ID+GPS

Power
Power S — kW
Power D — kW

Energy
Energy S — kWh
Energy D — kWh

Data
Temperature — Date — C°...
Green Signal — TOU — Date

EnergyTag™
eTag Wind — k...
eTag Solar — PTU+kWh

GoO/REC
Certificate Wind — k...
Certificate Solar — kWh

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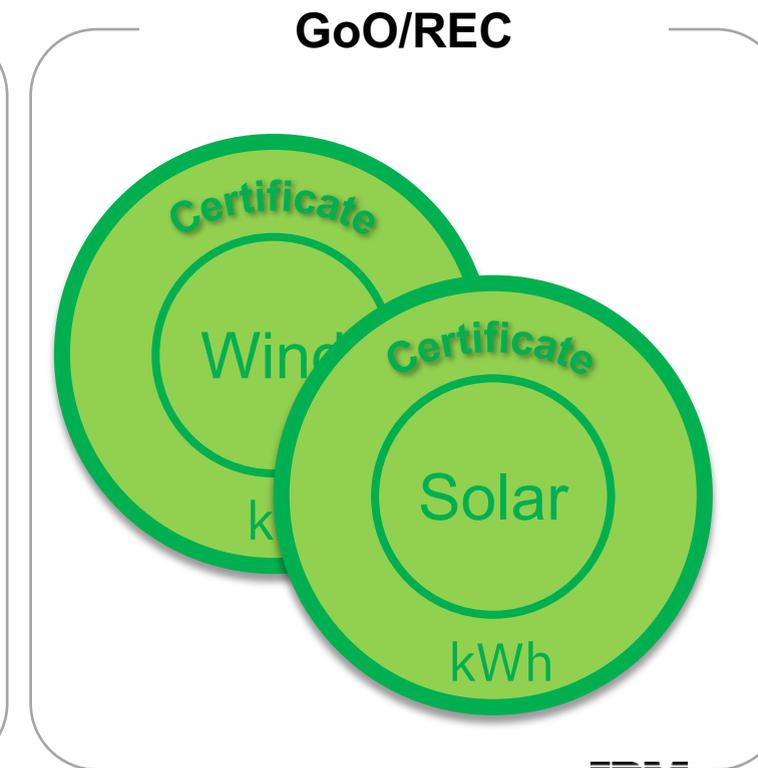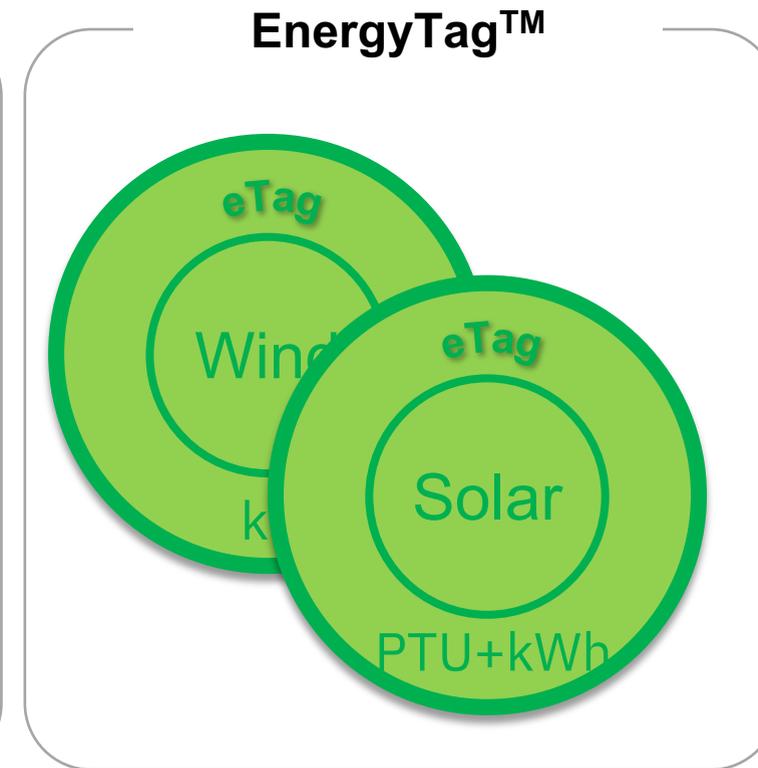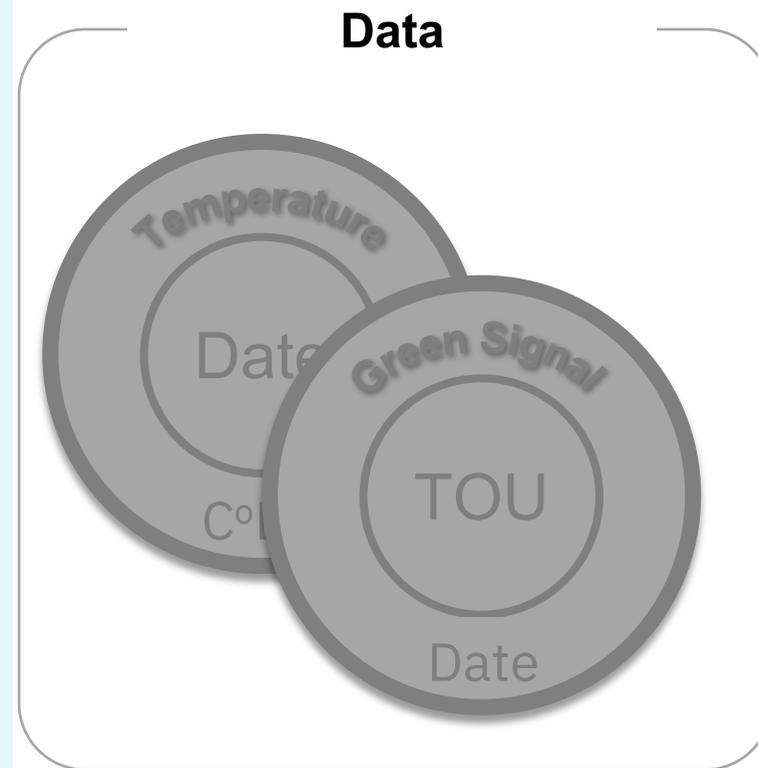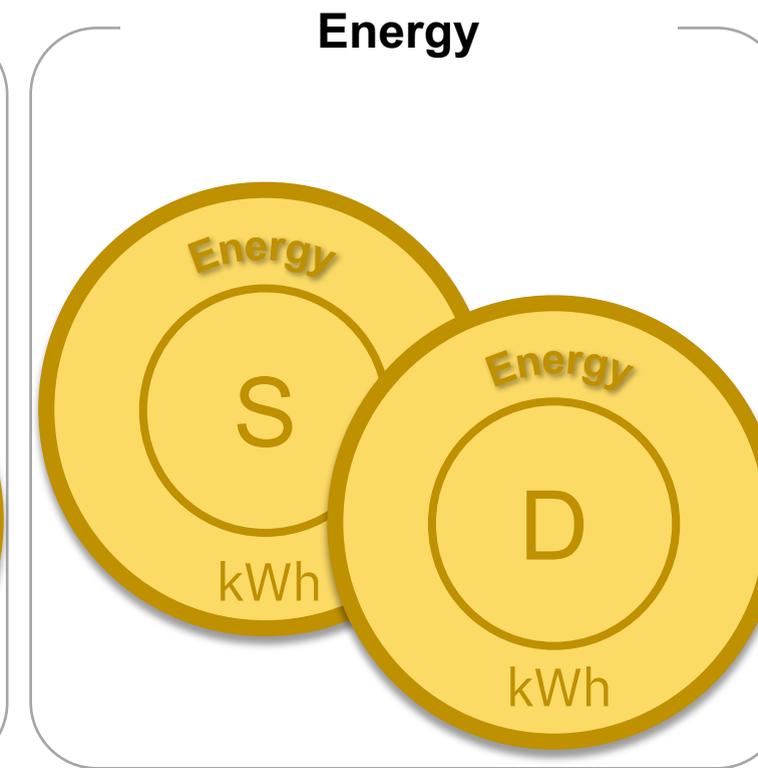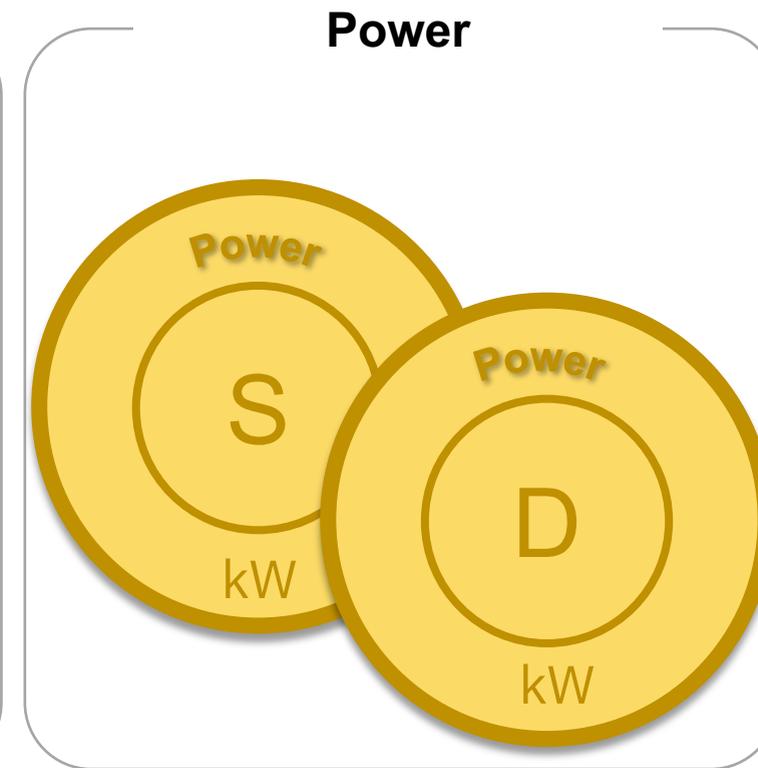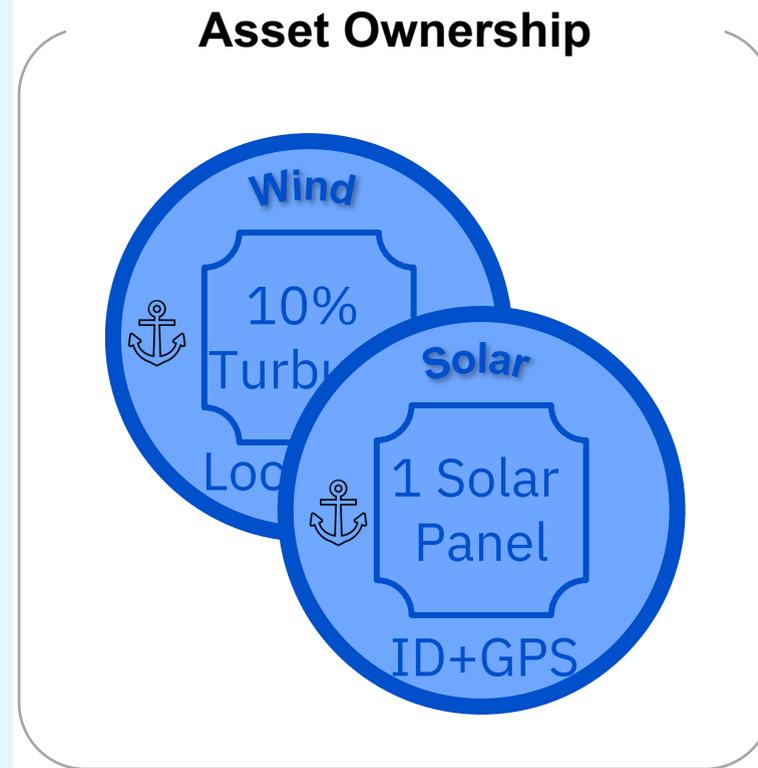
Fractional Ownership

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Solar Farm - Factional Ownership
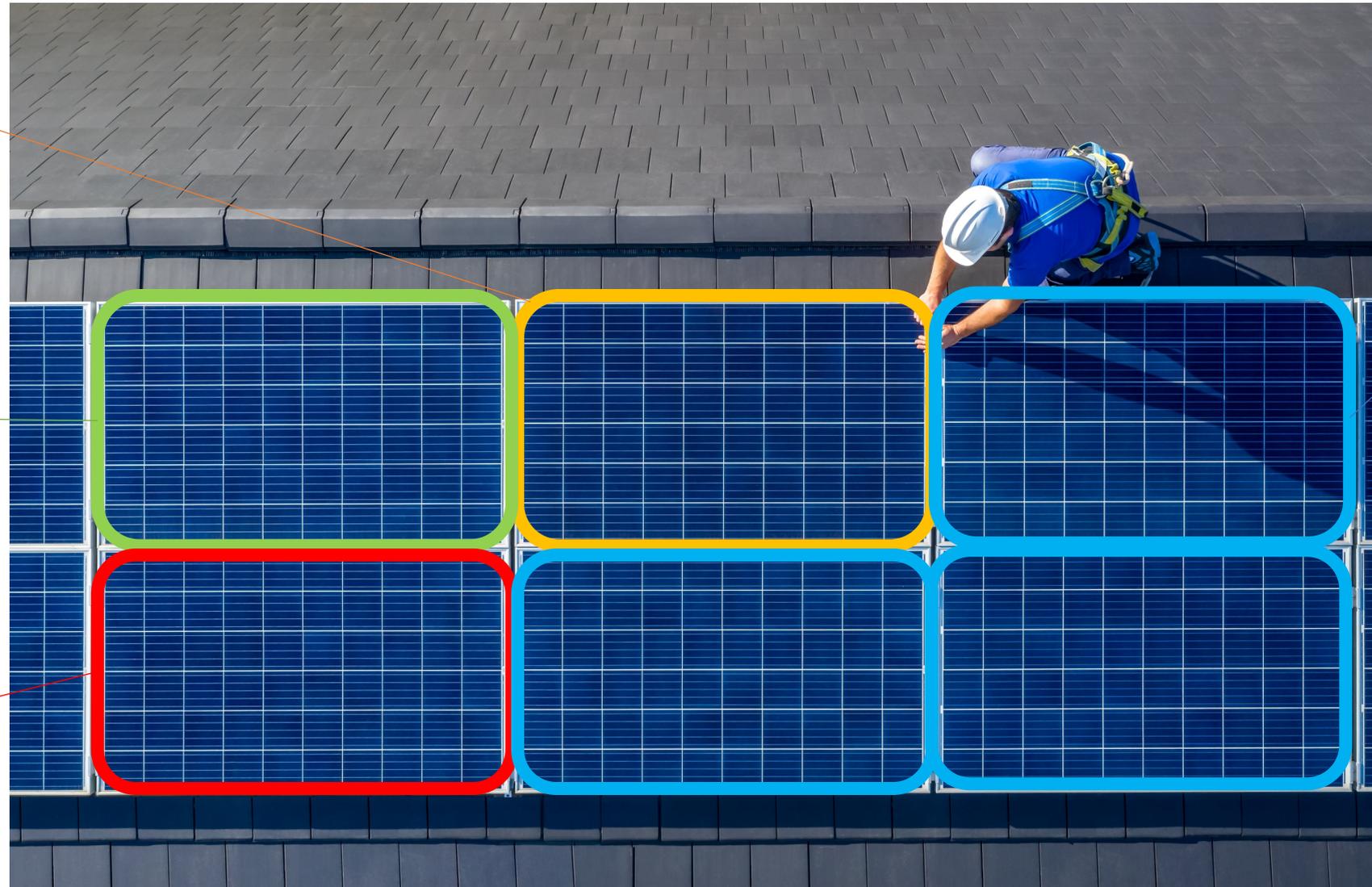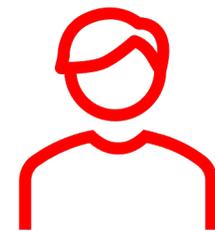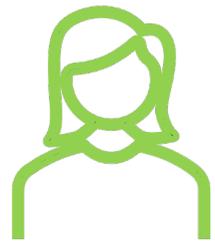
Energy tokenization
Launched May 6th 2021 by 2Tokens
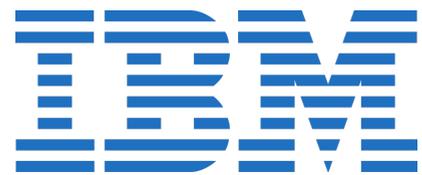
Status

- Demonstator (9 panels) is running
- Scaleup to small site 500 panels is contracted
- Whitepaper 1st project phase due July 2022
- Webinars, podcasts are available at 2tokes.org

- August kickoff phase 2
- Tokenizing the off-take of the fractional solar farm

Programmable Energy

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Programmable Energy

Programmable Energy
Smart Grid
Traditional Grid

Leverage Smart Grid investments

Leveraging the investments by all parties building a smart grid

Grid Operators and their supply chain

OEM platforms building, leasing, operating IoT devices like EVs

A 3rd Layer on the grid

Understand the time sensitivity of the constraints (like congestion) of the grids

Understand the energy market signals

Leverage the existing control points

Apply Exponential Tech

Using 5G, IoT, Blockchain, Tokenization to built the new world

Leverage the open bodies like GBBC and its public Token Taxonomy Framework

Apply emerging insights of FinTech, DAOs etc

Programmable Energy –

linking current initiatives

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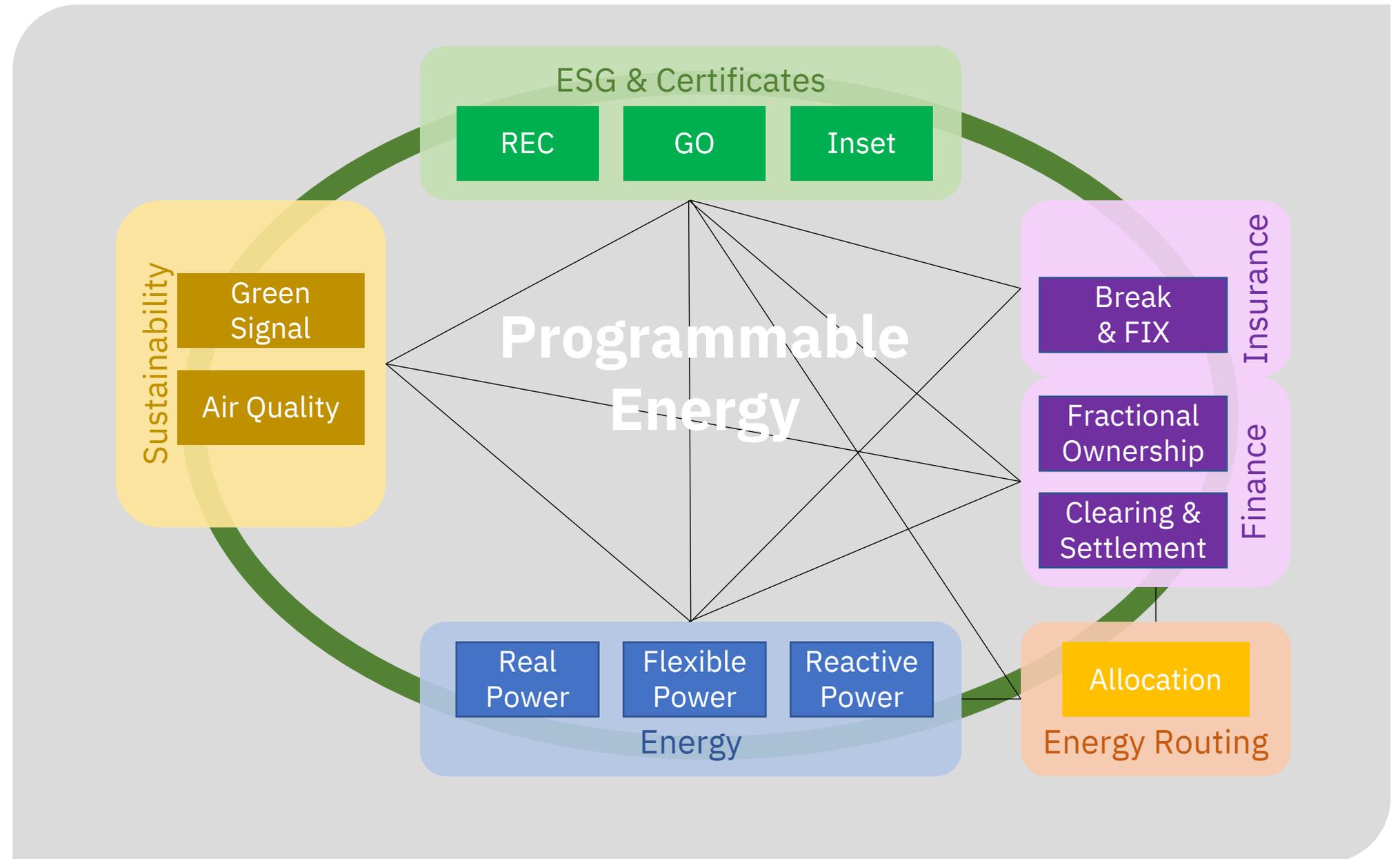
Programmable Energy the 3rd Layer

- Manage the constrained grid on a higher abstraction level
- Enables new business models
- Enables new grid usage patterns
- For consumer participation in peer-2-peer energy trading
- For multi-party intelligent workflows
- Multiple suppliers on a single consumer grid connection
- Supporting the circular economy
- Reducing the green house gass emissions
- Unleashes the flexibility of generation and consumption
- Creates new consumption patterns, offerings, services

Is a gradual replacement for the current "all you can eat" consumption model up to the connection capacity

Programmable Energy

Tokens · Energy Collectives · Adaptive Charging · Energy Cooperatives · Blockchains · Peer2Peer Energy Trading · Micro transactions · eWaste · Green Signals · Smart Appliances · Materials passport · Energy bundle Appliances · Energy Services

Smart Grid

Renewable Generation · EV Charging · PMU · Prosumer · Smart EV Charging · TOU Tarifs · Crypto Anchors · IoT/Edge · DERMS · ESG Scope 1, 2, 3 · Smart Meters · IEC 61850 · AMI · MDM · GvO / RECs · OpenADR

Traditional Grid

Island Grid · Integrated-grid · Asset Management · RTU · SCADA/EMS · Large Scale Generation · HV · MV · Micro-grid · Grid Management · LV · Substations · Cables/Poles/Wires · IEC 60870-5-101/104

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