Blockchain for Energy Sector

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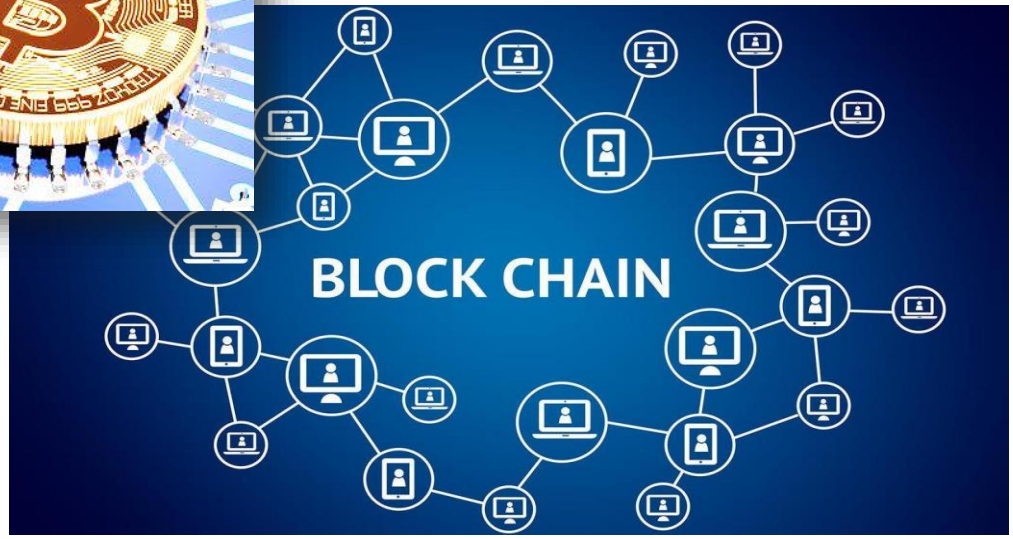
Blockchain – A revolutionary and highly Disruptive Technology for Future Energy Transactions?

Blockchain vs Bitcoins

Bitcoins = Digital Currency



Blockchain = Technology

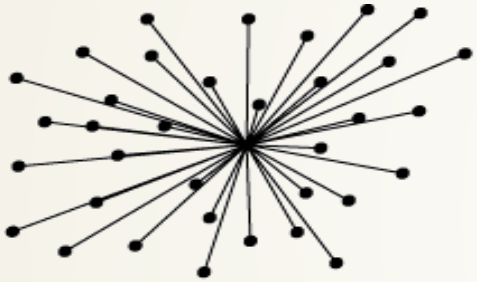
Popular CRYPTOCURRENCIES

- A pizza was first bought with Bitcoin on 22nd May 2010!
- There are over 2000 crypto currencies today
- Crypto currencies other than Bitcoin are called Alt Coins

What is Blockchain?

- Blockchain is a **decentralized**, **distributed ledger technology**
- It is a logfile of **final and definitive transactions**
- It is shared across many **distributed nodes**
- Blockchain enables **trust, traceability, security** – without intermediaries

Blockchain – Decentralized, Distributed Ledger Technology



centralised

SQL Databases

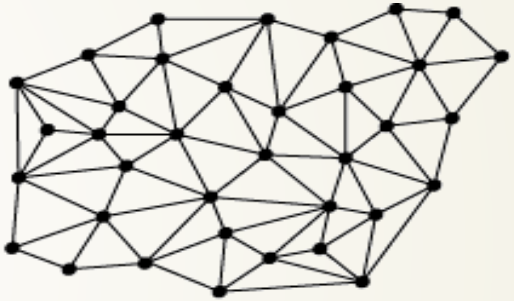
ORACLE

decentralised

Private Blockchains

HYPERLEDGER

Accenture, IBM, Intel, Cisco, SAP, JP Morgan, etc.



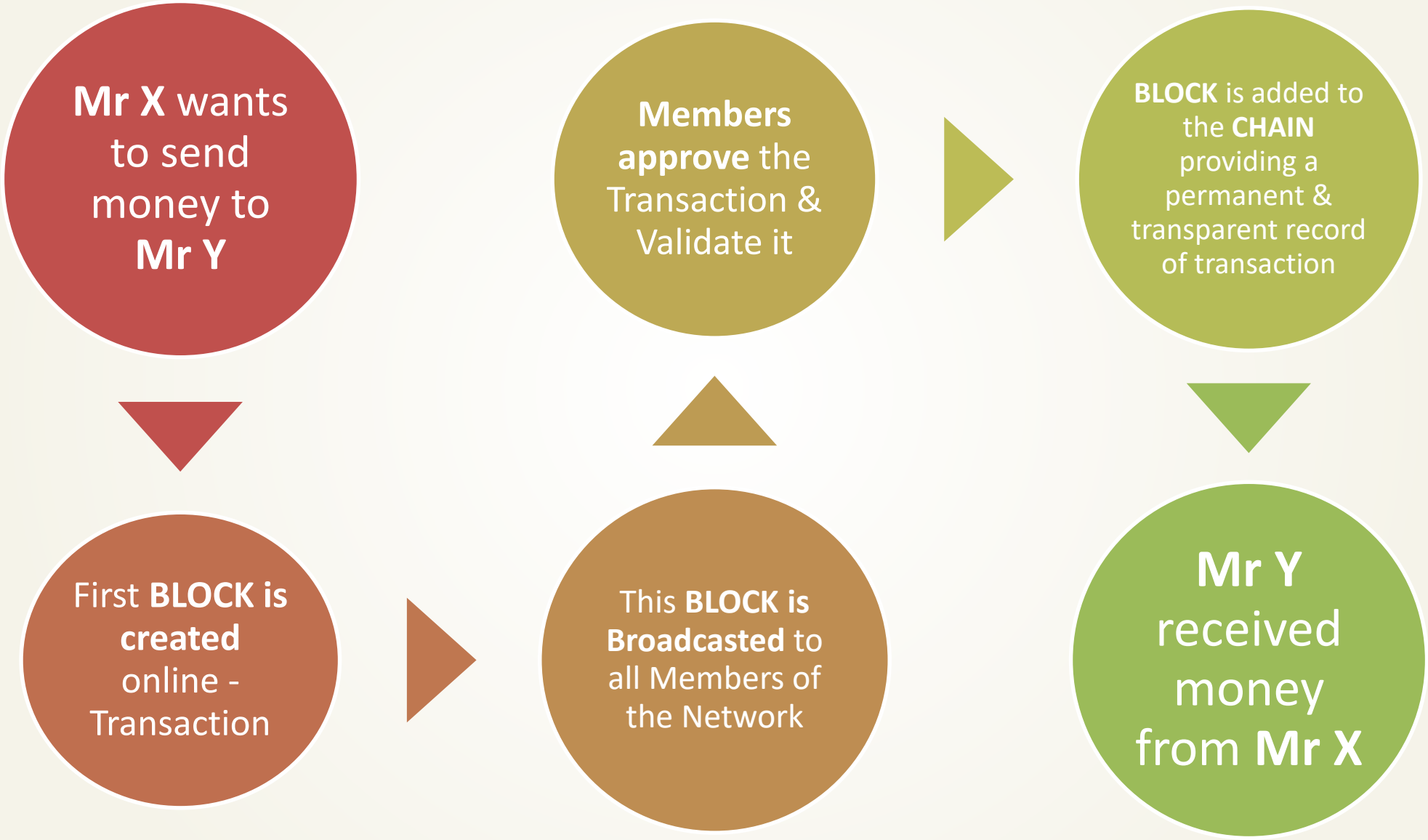
distributed

Public Blockchains

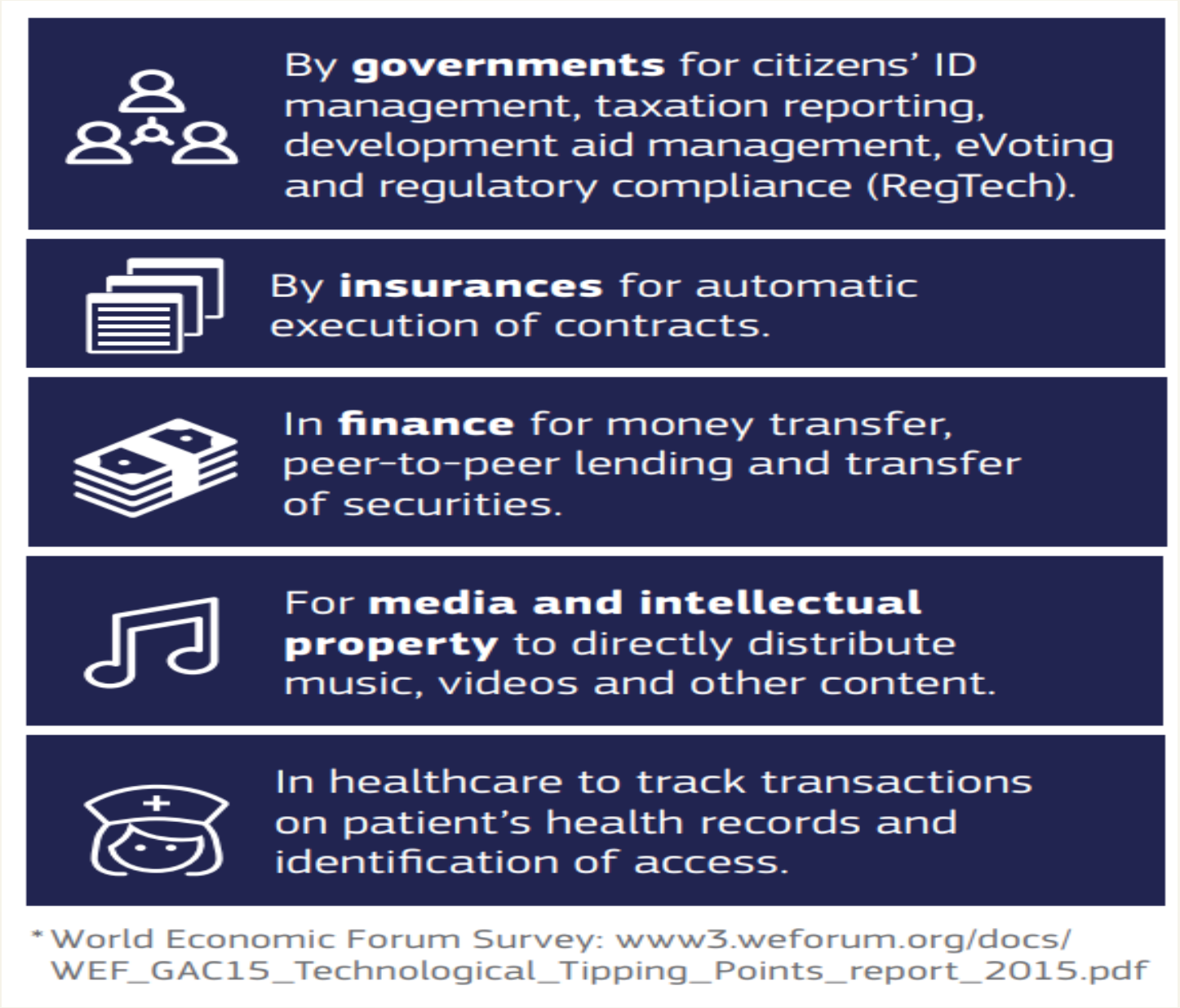
bitcoin

ethereum

How Blockchain Works?

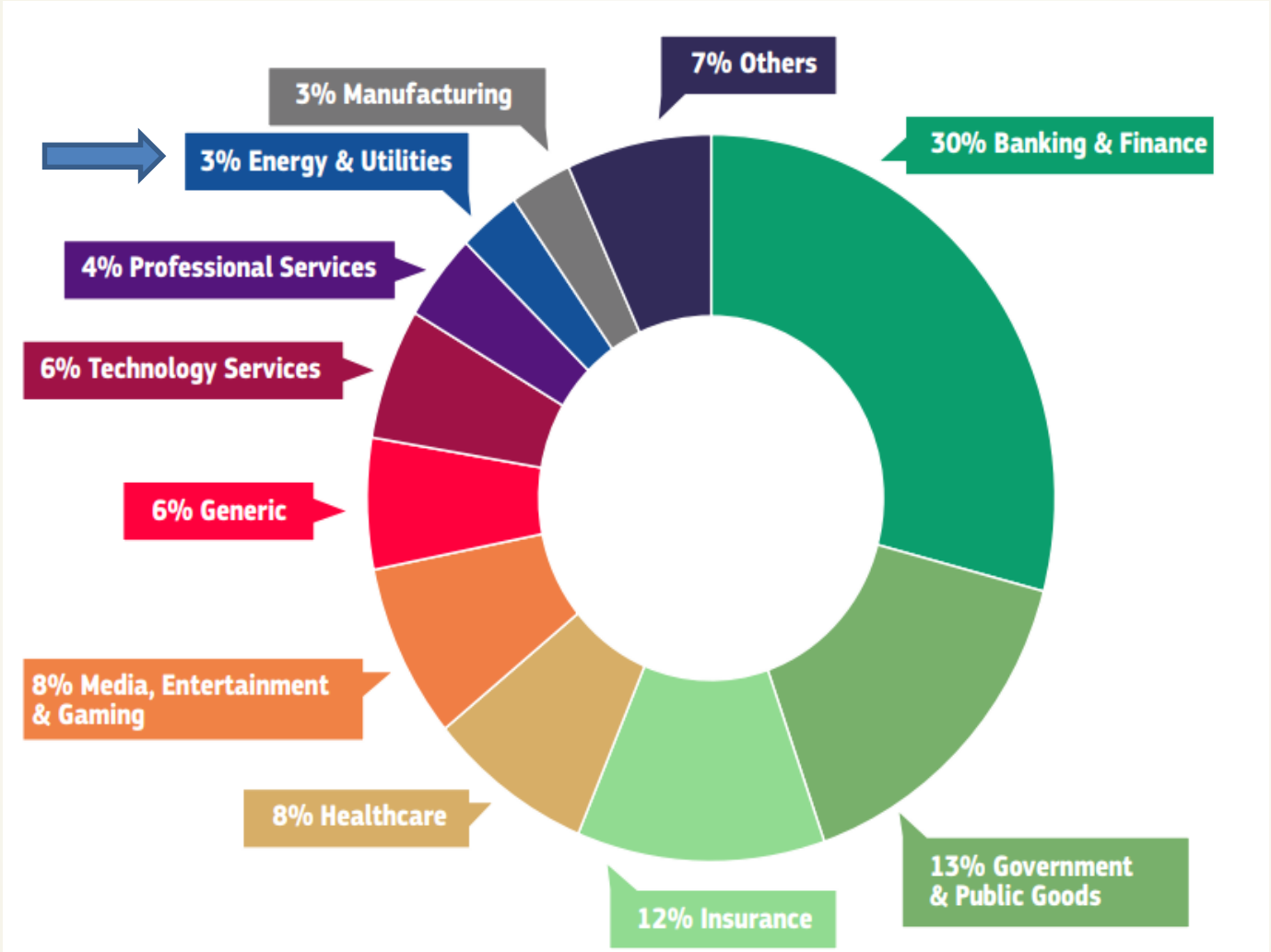


Blockchain: which sectors?



* World Economic Forum Survey: www3.weforum.org/docs/WEF_GAC15_Technological_Tipping_Points_report_2015.pdf

Sectors currently using Blockchain

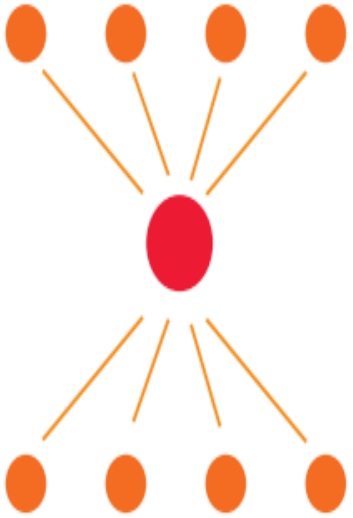


Source: www.jbs.cam.ac.uk/faculty-research/centres/alternative-finance/publications/global-blockchain/#.Wms8ZrPtypo

Why Blockchain for Energy Sector?

Traditional transaction model

Intermediary, platform
e.g. exchanges, traders, banks, energy companies

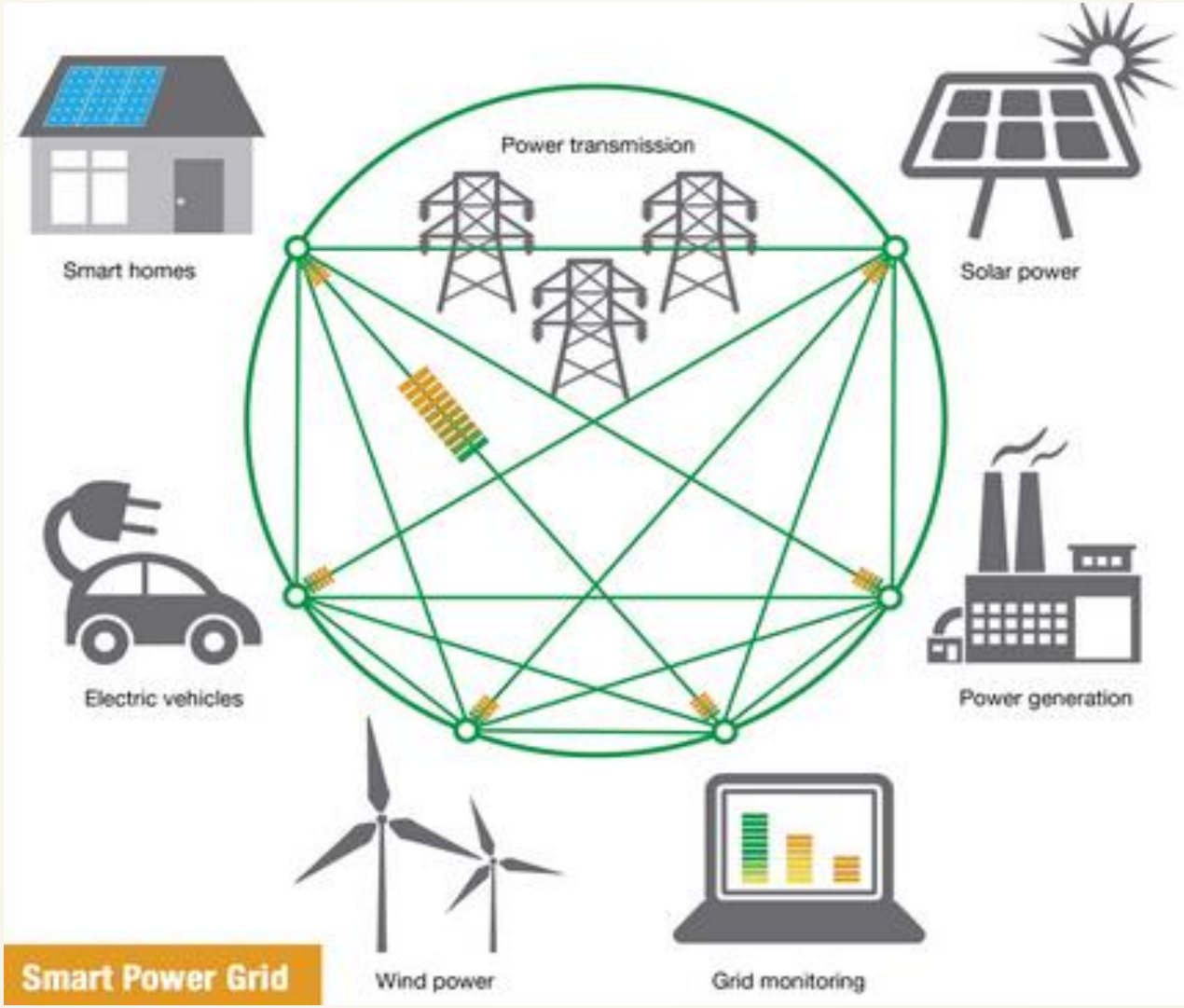


Blockchain transaction model

Providers
e.g. sellers, electricity producers, lenders

Customers
e.g. buyers, energy consumers, borrowers

Blockchain a Game-Changer Technology for Future Energy Transactions



Blockchain: Use Cases in the Energy Sector

A) Energy Trading

- P2P Trading and Micropayments between Prosumers and with Utility providing trusted authority customer service
- Trading Platforms to provision wholesale energy trading, wholesale market settlement, balancing markets and intraday trading

B) Grid Management

- Manage DER generation and DER service coordination: DER-DERMS integration
- Offer Transactive Energy based and **Price Responsive Demand Response**

Blockchain: Use Cases in the Energy Sector

C) Empower Customers

- Provide Green Energy **choices for purchase of power**
- **Enable P2P home EV charging** – unused charges can be utilized without creating charging infrastructure
- Provide Billing transparency

D) DER and EV Integration

- Enable EV Charging anywhere with unified billing
- Improve DER Integration

E) Emission Trading

- Encourage Green Energy Usage, Energy Conservation, Energy Efficiency with Sustainability Attributes and other means
- Certificate of Origin and Management of Emission Tracking

Blockchain: Use Cases in the Energy Sector

F) Energy Data, Metering

- **Record, Store, Track Energy Data** with MRV of data
- **Use Load Profile for Energy Procurement** Infrastructure Planning and VPP
- Provide Energy Management compliance for C&I and Buildings

G) Regulatory, Compliance

- **Provide Transparency to Regulators and Customers**
- Provide Regulators with Framework to manage energy trading
- Provide Regulators with data to manage anti-trust laws and de-regulation

H) Security

- Secure Edge Devices
- Protect Enterprise Data
- Grid Security – build a trustworthy infrastructure for all Digital Services including PKI, DC and DNS

Proposed PoCs for Energy Sector in India

- Peer to Peer Trading of Rooftop PV
- Remote Charging of Prepaid Meters
- Renewable Energy Certificates (REC)
- Power Trading – Deviation Settlement Mechanism (DSM)
- Trading of Demand Response

Risks and Challenges of Blockchain Technology

- Nascent Technology
- Uncertain Regulatory Status
- Large Energy Consumption
- Control, Security, and Privacy
- Integration Concerns
- Cultural Adoption
- Cost

Blockchain: Outlook

1. Blockchain technology is no more a **hype,** but it is **here to stay**

2. Blockchain has the potential to become a real **game-changer** in the **utility-sector**

3. Blockchain will lead to **faster processes, lower costs** and **greater flexibility** together with **high levels of security**

4. The **Internet-Of-Things** will be powered by a "**Ledger-Of-Things**", the **Internet-of-Everything** by a "**Ledger-of-Everything**"…

Thank You and Namaste

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