

# Explorations of Blockchain Technology in Energy Systems

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Clean  
Energy  
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Council



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Middle East & North Africa

الشرق الأوسط وشمال أفريقيا

# Exploration of Blockchain Technology in Energy Systems

- What is Blockchain Technology?
- Applications of Blockchain
- Blockchain application in energy systems
- Issues and challenges
- What is the Clean Energy Business Council?

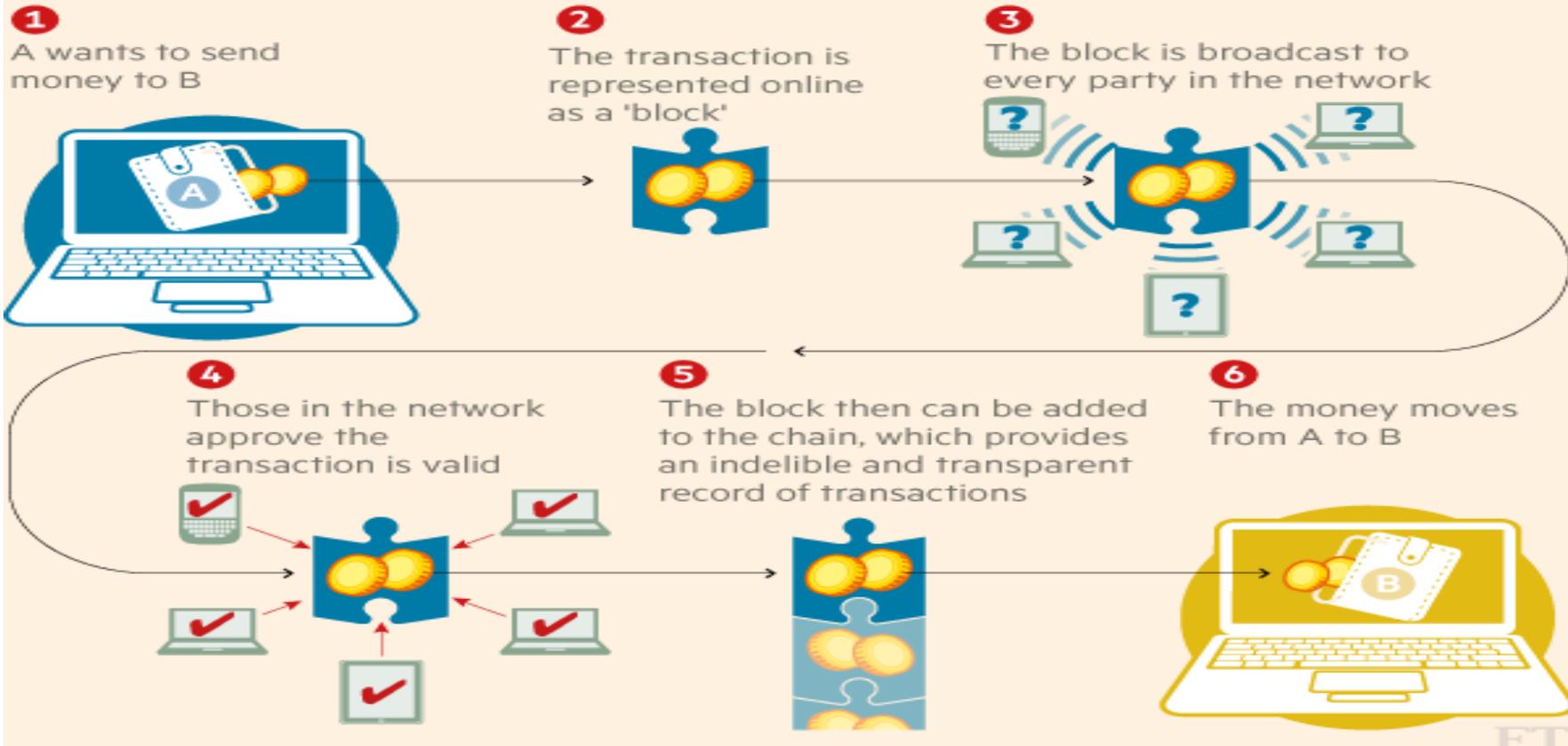
# What is Blockchain technology?

“At a high level, blockchain technology allows a **network of computers** to agree at regular intervals on the true state of a **distributed ledger**. Such ledgers can contain different types of **shared data**, such as transaction records, attributes of transactions, credentials, or other pieces of information. The ledger is often **secured** through a clever mix of **cryptography and game theory**, and **does not require trusted nodes** like traditional networks. This is what allows bitcoin to transfer value across the globe without resorting to traditional intermediaries such as banks.”

Prof. Christian Catalini, MIT Sloan School  
(emphasis added)

# How Blockchain works: provides security, privacy, trust, automation, decentralisation

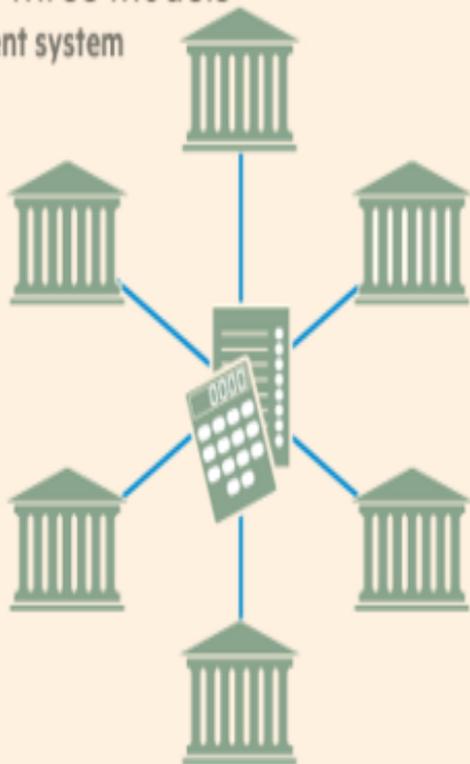
## How a blockchain works



# Blockchain tech is disruptive: transfer of unique digital property/asset is guaranteed to be safe & secure, verifiable by all, transparent and inalterably registered

## The three models

### Current system



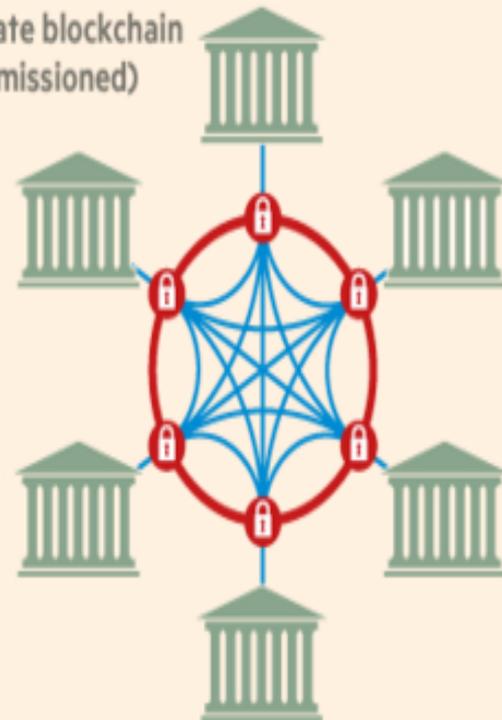
All banks check with central electronic ledger

### Public blockchain (permissionless)



An open network that anybody can access, like the bitcoin model. The digital ledger of transactions is shared, transparent and run by all participants

### Private blockchain (permissioned)



The preferred option of most banks. It is a closed system checking all details and controlling access via invitation

# Transformational power of Blockchain

- **Validating:** identifying the existence of something to be transacted & membership of the transacting community.
- **Transacting:** preventing duplicate transactions
- **Recording:** holding the validated, authenticated record of transactions in the event of dispute
- **P2P, B2B, P2B** transactions without intermediation
- **Lower costs** through shared infrastructure
- **Increased transparency**, especially with cross border transactions
- **Integrity** of record-keeping preventing fraud
- **Greater security** through cryptography

# Blockchain applications could be ubiquitous



## LEGAL

"Smart contracts" stored on the blockchain track contract parties, terms, transfer of ownership, and delivery of goods or services without the need for legal intervention.



## SUPPLY CHAIN

By utilizing a distributed ledger, companies within a supply chain gain transparency into shipment tracking, deliveries, and progress among other suppliers where no inherent trust exists.



## GOVERNMENT

Blockchain offers promise as a technology to store personal identity information, criminal backgrounds, and "e-citizenship," authorized by biometrics.



## ENERGY

Decentralized energy transfer and distribution are possible via micro-transactions of data sent to blockchain, validated, and re-dispersed to the grid while securing payment to the submitter.



## FOOD

Using blockchain to store food supply chain data offers enhanced traceability of product origin, batching, processing, expiration, storage temperatures, and shipping.



## RETAIL

Secure P2P marketplaces can track P2P retail transactions, with product information, shipment, and bills of lading input on the blockchain, and payments made via Bitcoin.



## HEALTHCARE

Electronic medical records stored in a blockchain, accessed and updated via biometrics, allow for the democratization of patient data and alleviate the burden of transferring records among providers.



## INSURANCE

When autonomous vehicles and other smart devices communicate status updates with insurance providers via the blockchain, premium costs decrease as the need for auditing and authenticating data vanishes.



## TRAVEL AND HOSPITALITY

Passengers store their authenticated "single travel ID" on the blockchain for use in lieu of travel documents, identification cards, loyalty program IDs, and payment data.



## EDUCATION

Educational institutions could utilize the blockchain to store credentialing data around assessments, degrees, and transcripts, as well as verification of knowledge transfer between parties.

# Blockchain technology is applicable to a wide range of distributed energy resources



## INDUSTRY FLOWS

- Settlements
- Change of supplier
- Real-time capacity matching



## ASSET MANAGEMENT

- Autonomous network configuration
- Self-serve maintenance
- Asset and inventory tracking
- Cross asset/industry data sharing



## IDENTITY MANAGEMENT

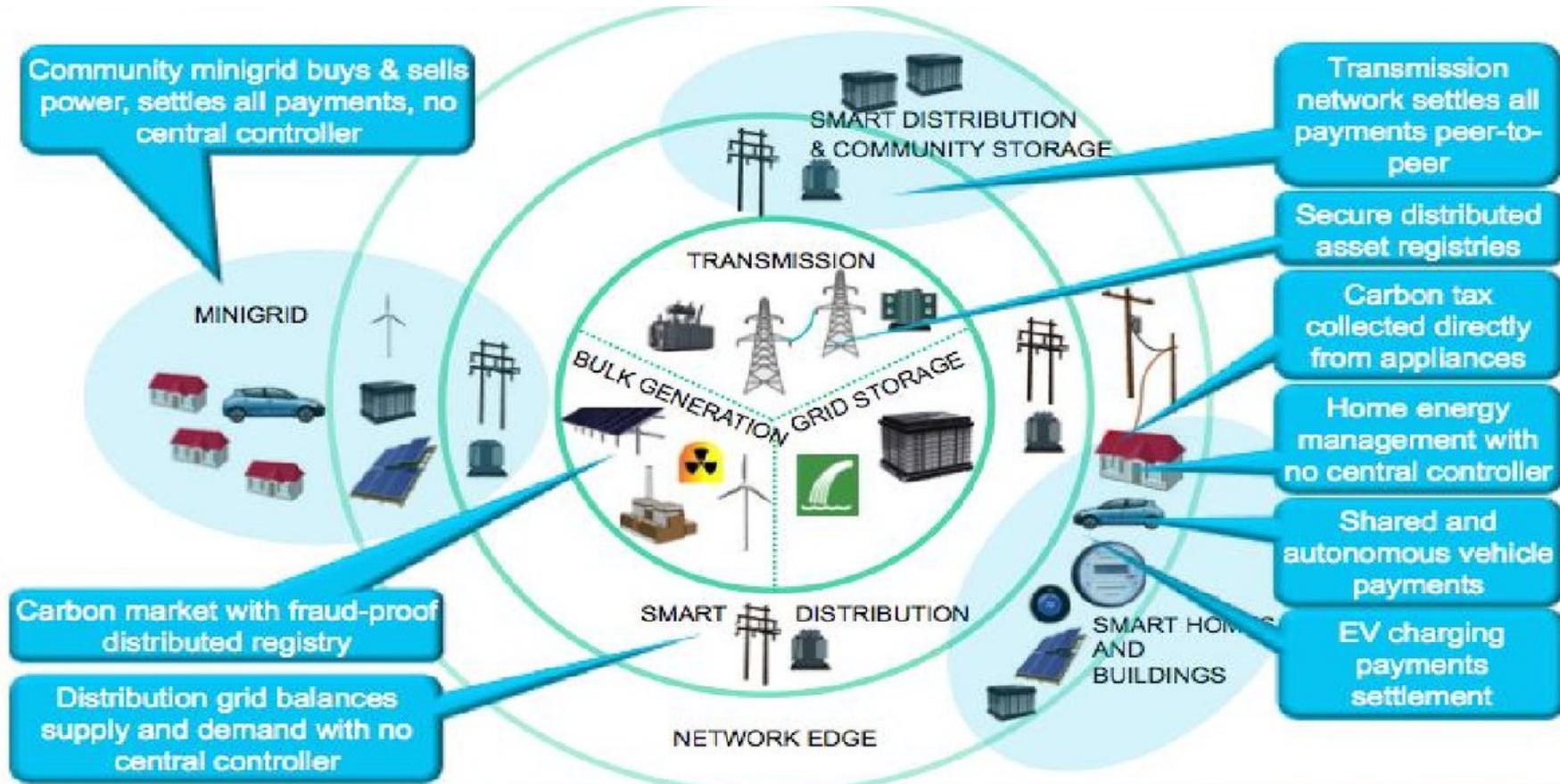
- Eligibility for social tariffs
- Safety authorizations and permit to work
- Fraud detection



## SMART CONTRACTS

- Electric vehicle charging
- Peer-to-peer trading
- Demand side management

# Blockchain for Power / Gridchain Applications



# Legal & Regulatory Issues

A decentralised energy transaction model and supply system implemented on the basis of Blockchain technology raises a number of issues, including:

- **Financial market regulation:** who will be responsible for the settlement of financial transactions?
- **Regulation of commercial activities:** would all parties supplying energy have to meet the regulation codes? Including households who are ‘prosumers’?
- **Liability:** energy systems are critical infrastructure. Can the system operate without a responsible central authority? A clear emergency plan needs to be defined in case of complete or partial failure of the system.
- Which party is responsible for **prosumer protection**?
- **Other issues:** Who performs the meter operator role? Who is the registered electricity supplier? Who is responsible for submitting schedules and forecasts to the transmission system operator? Who performs the balancing group manager role?

# Blockchain Regulations Across the Globe

- **US:** States can introduce their own Blockchain-related rules & regulations
- **Recent developments:** in Arizona (recognition of smart contracts), Vermont (Blockchain as evidence), Chicago (real estate records), and, most importantly, Delaware Blockchain Law (company formation, share register)
- **EU:** positive & proactive towards Blockchain technology. EU Commission is working on the Blockchain to support distributed ledger-based projects. German Energy Industry Act
- **Crypto Valley Association**, a Swiss non-profit Blockchain and cryptographic technology ecosystem, has started to develop an **ICO Code of Conduct**
- **Asia:** regulators (esp. Australia, HK, Singapore) are providing the necessary thrust for Blockchain innovation by establishing **regulatory sandboxes** to ease testing and piloting of blockchain projects

# Blockchain in the MENA/ UAE

Blockchain adoption in its infancy in MENA, but UAE stands at forefront:

- **Not bogged down by legacy infrastructure**
- **Major investments in renewable energy, mainly solar**
- **Breadth of applications** that may be developed (financial sector, logistics, trade, real estate, health services, energy, utilities...)
- **Government commitment**
  - City-wide Blockchain: All gov't documentation to be transacted digitally by 2020
  - Dubai established the Global Blockchain Council & Dubai Future Accelerators
  - Incentives for EVs (free public charging stations, Salik fees exemption, discounts on car registration & renewal fees) to meet target of 42k EVs in Dubai by 2030
  - Both ADGM & DIFC have FinTech start-up acceleration programs | active RegTech discussions (sandbox approach)
- **No laws prohibit the use of Blockchain** as an alternative to a more traditional database ledger

# Blockchain and Energy: Challenges

- We are witnessing initial birth pangs of two revolutions: AI-Blockchain and Renewable Energy
- Use of Blockchain starting with banking & financial industry, notably payments, before going mainstream & into other activities/sectors
- Can Blockchain become a GPT if it consumes excessive power?
- Centralised Utilities industries will be transformed. Blockchain technologies will lead to greater decentralization of energy systems
- Massive 'soft' and 'hard' investments will be required by industry, prosumers, governments in renewable energies & AI-Blockchain
- Missing and untested Legal & Regulatory framework
- MENA/GCC countries are major energy producers & exporters: need to develop well articulated strategies regarding AI-Blockchain-Energy

# What is the Clean Energy Business Council?

- ◆ The **Clean Energy Business Council** is a membership organisation, registered as a NPO Company in Masdar City in Abu Dhabi and is the pre-eminent NGO representing the private sector involved in the clean energy & clean tech sector across the MENA region.
- ◆ Our goal is to promote public awareness, establish a dialogue between the public and private sectors, and to drive the development of appropriate and much needed regulation and policy to support the development of the sector.
- ◆ Visit our website: <http://www.cleanenergybusinesscouncil.com/>

# What we do at the CEBC

- ◆ We are the **key organisation** representing the private sector involved in the clean energy and renewable energy sectors across the MENA region.
- ◆ We work on behalf of our members to promote the uptake of renewable and clean technologies, through **partnerships** with Government and stakeholders, **events** and opportunities to **collaborate**.
- ◆ We undertake **research**, develop and present **policy solutions**, in conjunction with our member organisations.
- ◆ We provide **advocacy**, **public awareness** and **thought leadership** for the sector.
- ◆ We **host workshops and events**, allowing our Members the opportunity to share and promote their ideas, services and knowledge
- ◆ We run a range of **working groups** in **New Electric Vehicles** , **Policy and Energy Efficiency** groups, a **Schools Programme**, and a **Women in Clean Energy Group**

**Thank you for participating!**

**Any questions?**

Email me at [nsaidi@cleanenergybusinesscouncil.com](mailto:nsaidi@cleanenergybusinesscouncil.com)

**Become a Member of the CEBC**

<http://www.cleanenergybusinesscouncil.com>