

Technology 4.0 to accelerate Energy Transition

SMARTCITY
EXPO WORLD CONGRESS



Yostina Boules
Energy Transition
Economist-Head Of
Product



Yostinaboules@gmail.com

Setting Context: Energy Transition

- The rise in demand in cities and RES integration, intermittency issues.
- Flexibility measures include the integration of fast-acting supply, demand response and energy storage services.
- Need for new Economic Models, although cost of solar is decreasing but subsidies are also curbing



IEA Tracking Clean Energy Progress 2017

1 Total renewable power generation by region



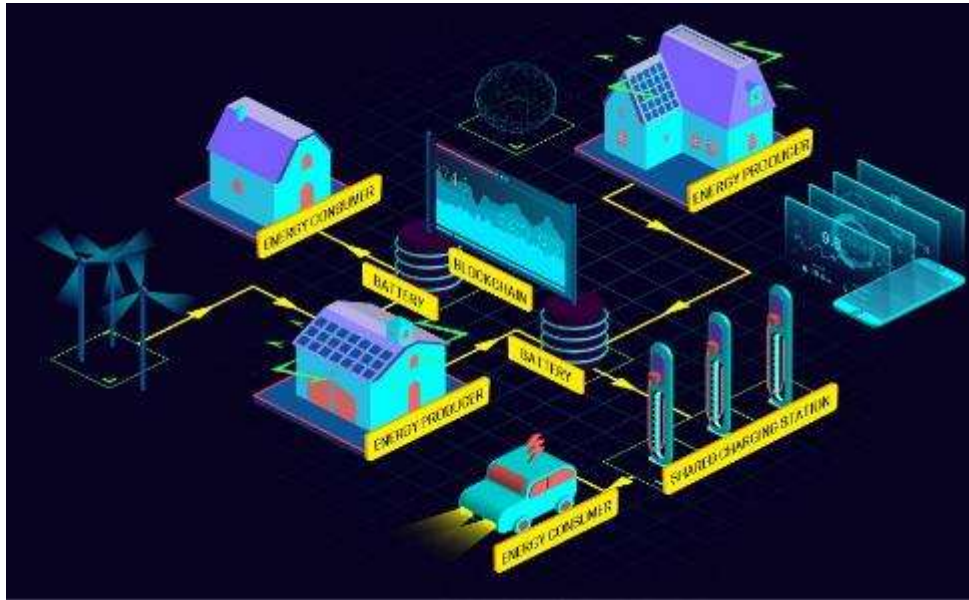
3 Solar PV LCOE and contract prices





Consumer Centered Power System:

Empowering Small actors and consumers to be self Sufficient is a pillar for both EU and UK policy. Currently, small players participation in the market is practically excluded and incentives for active consumer participation is not sufficient.



- The potential lies on the fact that blockchain or distributed ledger technologies (DLT) can redefine digital trust and can remove intermediaries forming a new paradigm of management that can potentially disrupt traditional forms of governance.
- The disruptive nature lies on the potential of replacing top-down control with consensus and also in the underlying philosophy of distributed consensus, open source, transparency and community based decision-making.

Why blockchain?

A blockchain is a digital data structure, a shared and distributed database that contains a continuously expanding log of transactions and their chronological order.





**Example of Transaction on
Blockchain**

- Secure
- Immutable
- Shared Consensus
- Interoperable

Blockchain for the Future Power Grid

1-Peer To Peer/ Transactive Energy/ Community Self Consumption: These are driving new user-centred business models.

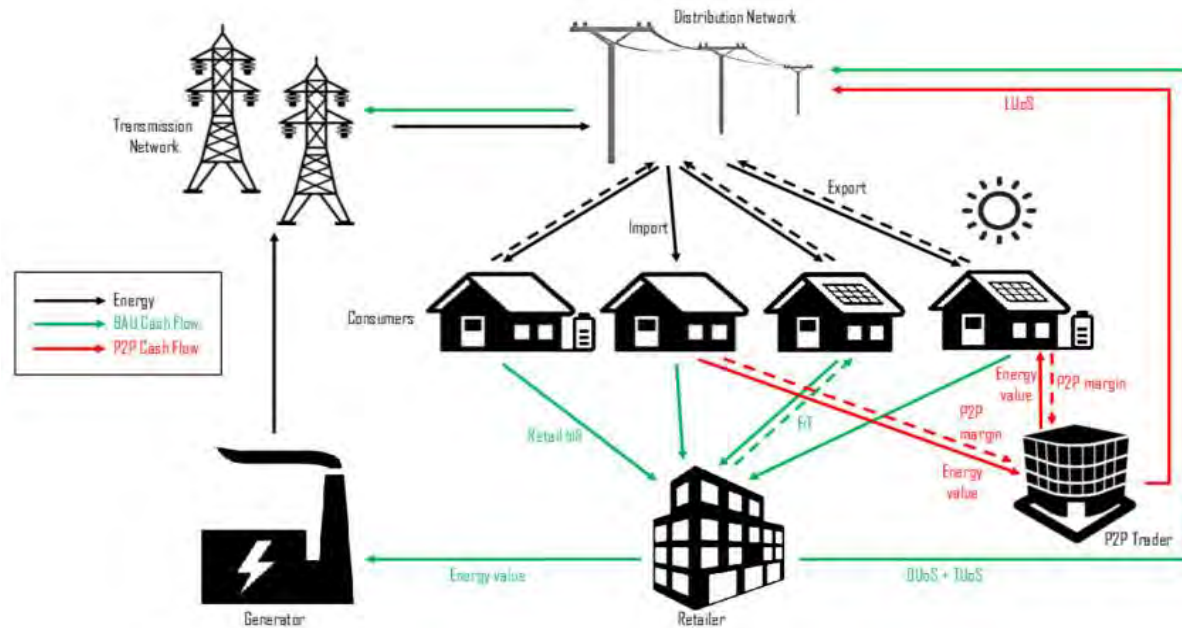
2-Trading Energy Certificates on Blockchain: New Economic Models and New Market Opportunities.



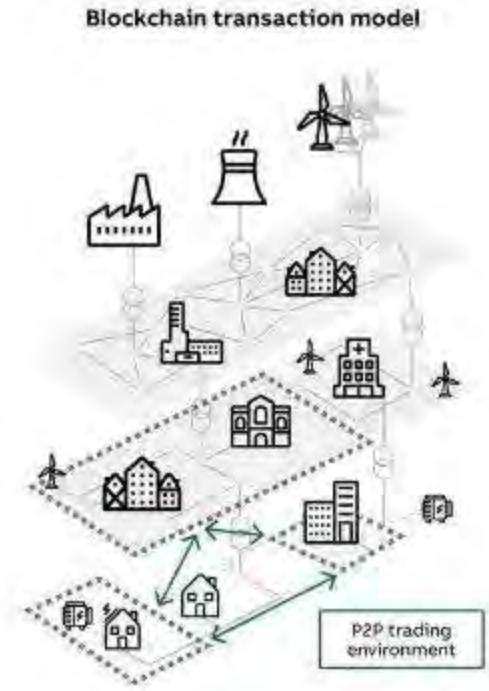
Why Peer To Peer Energy Trading?

- Consumers and prosumers are facing increasing energy prices and removal of RES incentives, respectively.
- Keeping the end consumer interested, Climate change, installing Energy Efficiency, Storage...Etc
- Consumers don't only respond to prices, they are social creatures not just market actors... Something not taken in consideration of the current market design





B- Example of Blockchain Microgrid





Outcome:

Increased awareness of energy efficiency potential and demand-side management; Wider socio-economic goals being met; Savings to future infrastructure costs.

Trading Energy Certificates on Blockchain to create new economic models

- Poor communication and transparency over Electricity sources
- Lack of mobility in the marketplace-regulations differ from one country to another.
- Electricity consumers to pay £ 1.4 billion on average a year in excessive prices for the period 2012–2021. A big percentage of it is administrative costs.



Current Market of Renewable Energy Certificates

Current State

- 1 Generator produces electricity and passes data to certificate-creating entities
- 2 Certificate-creating entities verify validity of renewable generation and issue certificate
- 3a Certification entity conducts annual audit on all certificate issuers
- 3b Brokers aggregate small certificates into larger blocks and source buyers. Note: many certificates are sold to purchasers by PPAs
- 4 Certificates are sold either on exchanges (ICE) or directly to purchaser in over-the-counter (OTC) deals
- 5 Load serving entity purchases and retires certificates

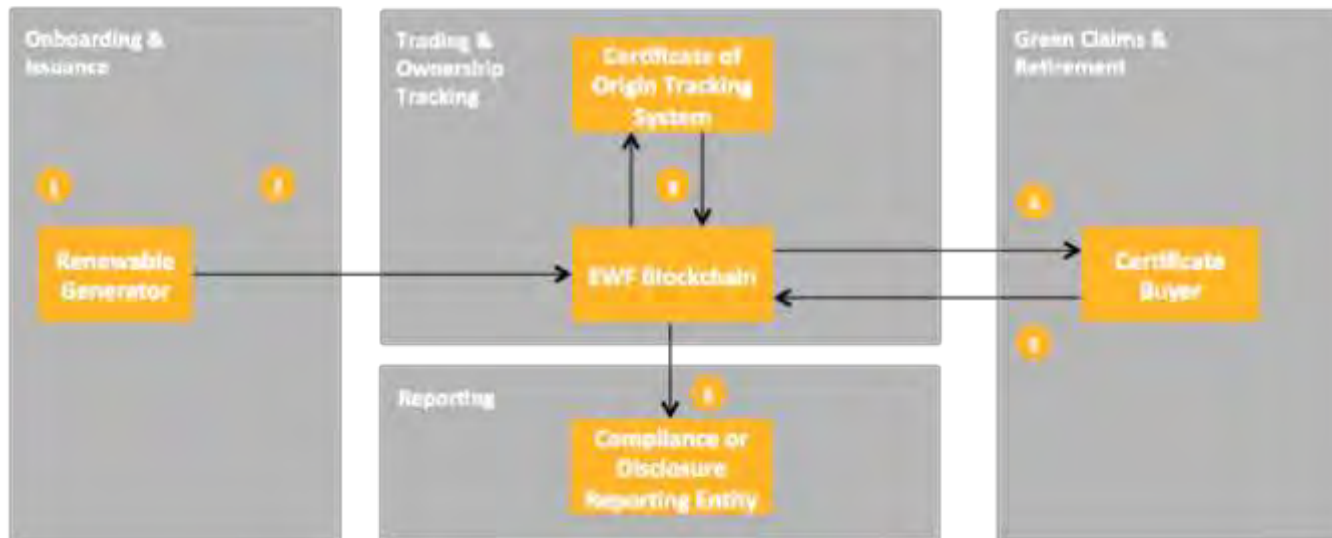


Pain Points

- 1 Certification system required to verify generator is compliant
- 2 Audit to ensure against double counting of certificates
- 3 Tracking system to ensure compliance with policy mandates
- 4 Retail certificates too small to be transacted cost-effectively; need aggregation for block transactions
- 5 Opaque, shallow markets require brokerage to find counterpart
- 6 Exchange cost and post trade paperwork and overhead

Blockchain Model for trading RES certificates

- 1 Generation asset is permitted to write data / modify blockchain after onboarding process
- 2 As each MWh generated, oracles or meters linked to generation assets automatically update blockchain with newly issued certificate
- 3 Changes in certificate (smart contract) ownership are tracked as an "event" on blockchain
- 4 Certificate buyers source certificate liquidity P2P through blockchain
- 5 When owner claims a certificate, smart contract makes its status change from *active* to *retired*; this is *tracked* as an "event"
- 6 Data about retired certificates and ownership is readily accessible for compliance and disclosure reporting entities



The background of the slide is a repeating pattern of stylized hexagons in shades of orange and red. These hexagons are arranged in a honeycomb-like grid. In the lower right area, there is a single blue hexagon that contains a white downward-pointing triangle.

Outcome:

Operational and Administration cost reductions, increased efficiency, fast and automated processes, transparency over their energy resources, more revenue to small generators

It is estimated that in the EU alone, the transition towards a more sustainable and secure energy system would require an investment of €200 billion per year for generation, network and energy efficiency development. \$2 trillion in electricity network upgrades will be required by 2030 in the US.

IEA Recommendations:

- Certainty of revenue to renewable generators by stable policy Framework.
- Second, policies should address infrastructure challenges and market design issues to improve grid integration of renewables.
- Third, countries should develop policy mechanisms that reduce the cost of financing and lower off-taker risks, especially in developing countries and emerging economies



From Energy of Fire to a Power system of Light

There is a role for everyone in the process of Energy Transition. Consumers can now choose to buy electricity from only renewable resources, governments can show their seriousness to a carbon neutral grid by enforcing legally binding commitments, and companies can transform by allocating finance for the development and deployment of clean technologies. Only then can we ensure a complete progression to creating a system of light to replace the old system of fire