

# ELECTRON

Trading Energy on Blockchain

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# What is Blockchain?

- System in which separate, independent entities record and synchronise transactions amongst themselves, without the need for a trusted intermediary – distributed database/ledger
- Bitcoin and Ethereum are most popular blockchain implementations
- Ethereum adds possibility to execute logic: smart contracts – distributed computer
- Both use `Proof of Work` consensus mechanism – others exist
- Decentralised – no single point of control or failure
- Transactions validated according to agreed and transparent rules, very difficult/expensive to cheat
- Immutable and auditable
- Inherent cyber-security – based on public key cryptography
- Low transaction costs
- Can be public or private/permissioned
- Potential issues with scalability (Tx/s)
- Immutability is rather unforgiving



# When (and when not) to use Blockchain

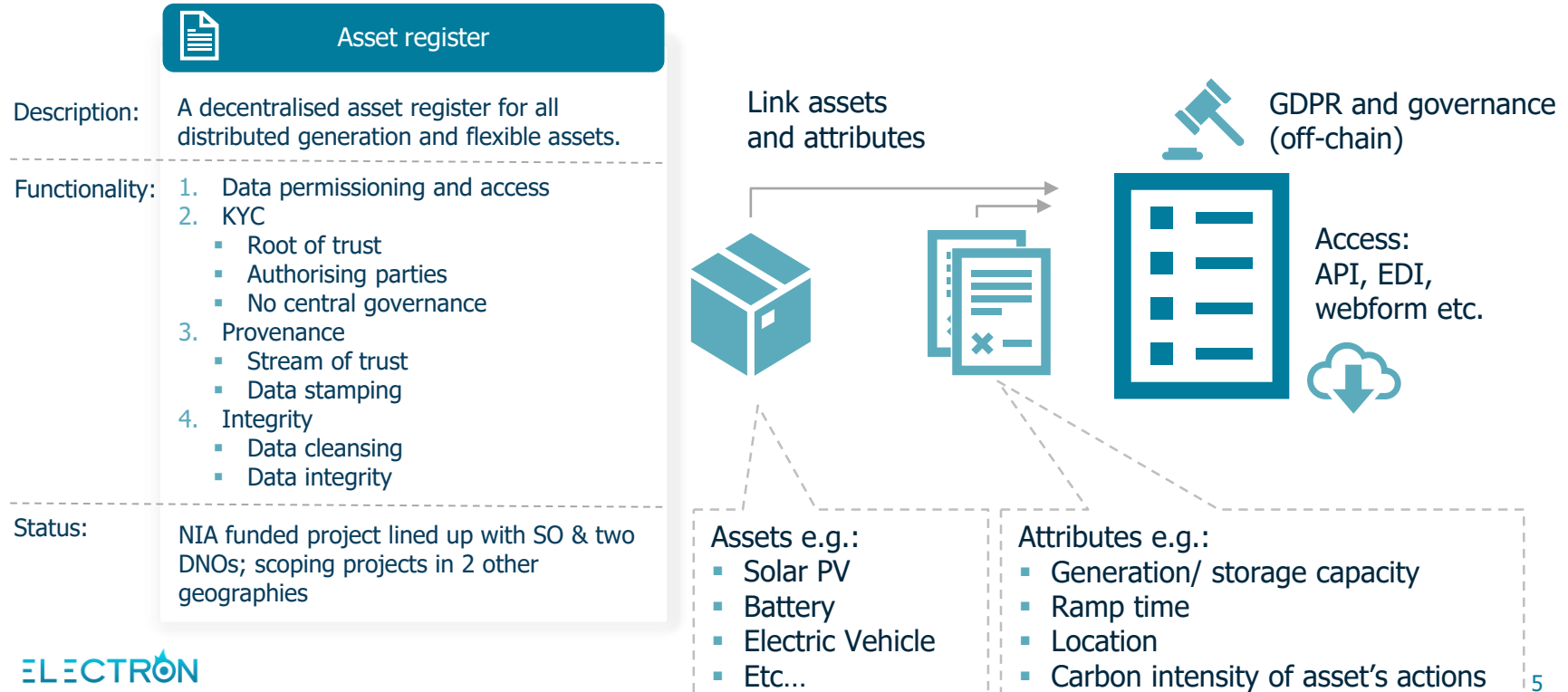
- The first question should always be: “Why Blockchain?”
- When to use Blockchain
  - When multiple (non-trusting) parties need to coordinate interactions and transact with one another
  - Where multiple parties need to share access to the same data or to collaborate and allocate value in transactions
  - Where those interactions must be done in a provably fair and transparent manner, particularly if there may otherwise be actual or perceived conflicts of interest
  - When it is important that transaction costs are as low as possible
  - When the alternative would be multiple disconnected data sets and transaction platforms – liquidity fragmentation
- When not to use Blockchain
  - When there is only a single party involved!
  - When there is an existing or natural trusted central entity/counterparty/facilitator
  - When there is inherent centralization in the problem
  - When performance is critical

# Applications of Blockchain in the Energy Sector

- Commodity Trading – Ponton, Vakt
- Replacing Utility/Retailer Back-Office Functionality – Grid+
- Certificates of Origin – PJM/EWF market for RECs
- Peer-to-Peer Energy Trading – Powerledger, LO3
  
- Electron – Managing coordination problems between different actors in the energy system, enabling local markets and `whole system' management:
  - Asset identity and permissioning data access
  - Decentralised/Local marketplaces
  - Collaborative trading

# Asset register

Single source of truth for identity, and access and permissioning of data



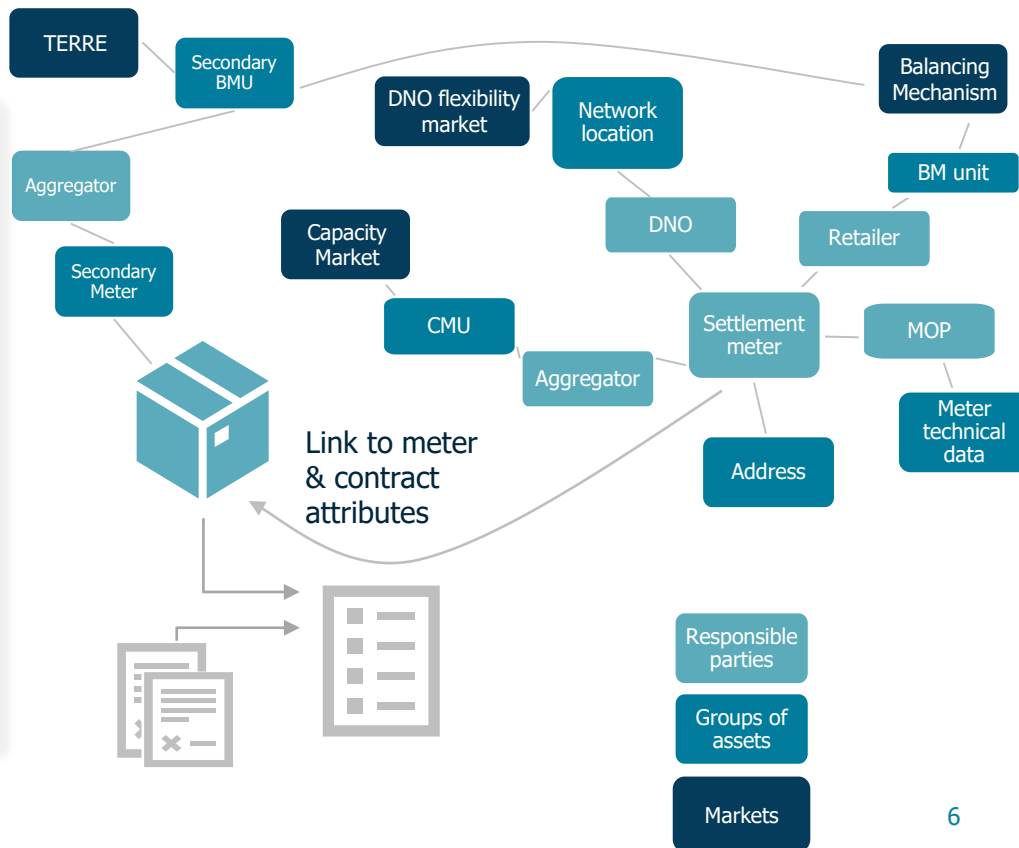
# Asset register - adding contractual relationships

## Asset register

Description: A decentralised asset register for all distributed generation and flexible assets.

- Functionality:
1. Data permissioning and access
  2. KYC
    - Root of trust
    - Authorising parties
    - No central governance
  3. Provenance
    - Stream of trust
    - Data stamping
  4. Integrity
    - Data cleansing
    - Data integrity

Status: NIA funded project beginning with SO & two DNOs; scoping projects in 2 other geographies



# Local Markets - Network Capacity Trading

## Constraint queue management

Description:

A decentralised marketplace where distribution connected assets can pay others/be paid to curtail

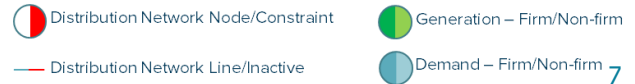
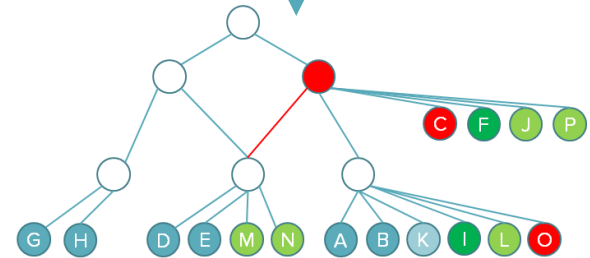
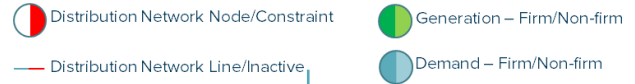
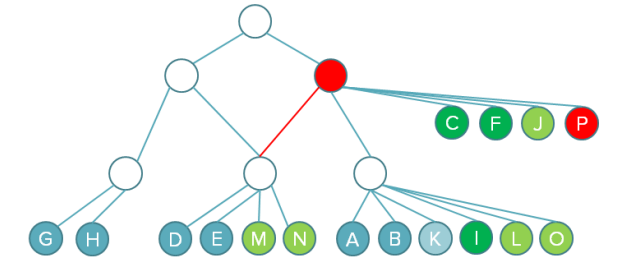
Functionality:

- Allow network connected assets to trade curtailment
- Enable bilateral and multilateral trading
- Maximising economic outcomes

Status:

- System currently in development at request of a DNO – plan to trial 2019
- In discussions with other stakeholders for phased implementation in 2019

Constraint Queue	Constraint Queue
P	P
O	O
N	N
M	M
L	L
K	K
J	J
I	I
H	H
G	G
F	F
E	E
D	D
C	C
B	B
A	A



# Collaborative Trading

Enable simultaneous trading of `Non-rival` products, allowing assets to revenue stack



## Locational balancing and constraint

Description:

Active power product that includes options for collaborative trading. Designed so local grid operators can overlay locational pricing. This will solve the current conflict that exists between local constraint and imbalance management.

Functionality:

- Allow DNOs to add locational pricing to their networks to create visibility over areas with constraints or spare capacity
- Coordinate SO balancing actions and local network management actions

Status:

- This product is an ideal `end state` product
- Some component parts in development (e.g. asset register)
- Exploring routes to trial

