From “stupid” to “smart” energy systems
(Flexibility markets, P2P & Energy Communities)

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The world we are entering in...
The world I was born in, 60 years ago
How does electricity change?

• 1// To go “stupid”: still a vertical supply hierarchy but based on markets & system operators (B2B, B2C)

• 2// To be “smarter”: creating a Demand Loop with Aggregators, & Flexibility Markets (C2B, C2SO)

• 3// To become fully “smart”? fully activating Demand (C2Pl, P2P) and welcoming Communities...

• 4// Do Energy Regulators join these last smart waves? The case of Ofgem
How electricity did change?

(1) Wholesale Supply Hierarchy

- a) Wholesale Market ranks generating plants in Day-Ahead merit order

- b) TSO manages system & flows accordingly
  > Adding its own grid congestion constraints
  > And its central balancing needs

- c) All El.System is managed B2B: within the supply central hierarchy
How electricity did change?

(1) Wholesale Supply Hierarchy

- **Retail Market** is only retailing the Wholesale Supply Hierarchy

\[ B2C = (\text{Market price and central merit order}) + (\text{System congestion & central balancing}) \]

“packaged” for retail-size units

via new digitalization tools as: smart metering, smart grids, Balancing Responsible Parties, etc.
How electricity did change? (2) Demand Loop

• a) **Aggregators** create something new:

   a **C2B** loop between retail-size units and wholesale

   by packaging “demand activation” as a wholesale tradable product

   These new intermediaries aggregate retail via new “digitalization” tools (roughly: digital control of retail-size consumption units)
How electricity did change?

(2) Demand Loop

- b) *TSOs or DSOs* can push C2B one step ahead: C2SO

*Aggregators* package “demand activation” for wholesale market

*System Operators* package “demand activation” for their own grid congestion & balancing needs

Combining 2 kinds of tools:*

**“Platform-like tools” to trade with consumption units**

**“System Operator IT & control tools” to guarantee system reliability**
How electricity did change?

(3) P2P & Communities

• a) One more step ahead into smartness

Aggregators package “demand activation” for wholesale market: **C2B**

System Operators package “demand activation” for system & grid needs: **C2SO**; if using Platforms: **C2Pl**

**Platform** is digital space providing: product definition, trade partner search and matching, delivery process & settlement

Platform can provide “**double activation**”: **C2C** alias **P2P**
How electricity did change?
(3) P2P & Communities

b) **Peer-to-Peer** is “double activation” via appropriate digital tools

If both Demand & Supply have to be “activated”:
Both too small, having not enough size & professional skills to trade in “for-pro” markets like B2B, B2C

“**Double activation**” (**Sharing Economy**) also eliminates the need for intermediaries like aggregators being C2B

> Either **Platforms** as new intermediaries: P2 PI 2P
> Or direct trade as “**Blockchains in clubs**”: P2 Block 2P
How electricity did change?

(3) P2P & Communities

• c) Communities what are they?

Peer-To-Peer is “double activation” of individual units in ad-hoc market frame

Communities is voluntary association of individual units in a collective decision-making unit

- Association breaks too small size, too little expertise constraints the individuals have

- Voluntary association permits collective supply, investments, assets operation, demand management
How electricity did change?

(3) P2P & Communities

- d) Loose Community: “Asset Fleet” Management
  Individuals will have many management options open by smart devices, smart homes, smart buildings, IoT

  Tempting to be “De facto Community”: loose community of users of asset fleets managed by Pro.
  ➢ “Electrical Car Fleet”, with central Pro. charging App
  ➢ “Zero-Net-Consumption Buildings”, being fully autonomous mini-grid systems
Could all electricity really change? 
Ask the energy regulators?

• a) (CEER, 25 June 2019)

Not at ease with P2P & Communities, both seen disruptive of existing wholesale market & central system operation, grid universal access & consumers protection

But...
Could all electricity really change? Ask the energy regulators?

• b) (Ofgem, 2 September 2019)

Fully acknowledges that

➢ “Flexibility” issue is an entry in “new interactive electricity system” where users’ assets activation (as consumers or prosumers) is key

➢ “Platforms” are digital tools opening markets to P-2-P
Could all electricity really change?
Ask the energy regulators?
Could all electricity really change? Ask the energy regulators?

Figure 2 - participants in the Flexibility Platform ecosystem
That Energy Regulator sees "Transactive Energy" Smart System coming

Figure 4: Stages of adoption of transactive operations for industry [18].
With “Sector Coupling” District Heating enters electricity interactive system as smart flexibility resource, managed by energy communities.
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