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ROBERT SCHUMAN CENTRE FOR ADVANCED STUDIES

FLORENCE SCHOOL OF REGULATION

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

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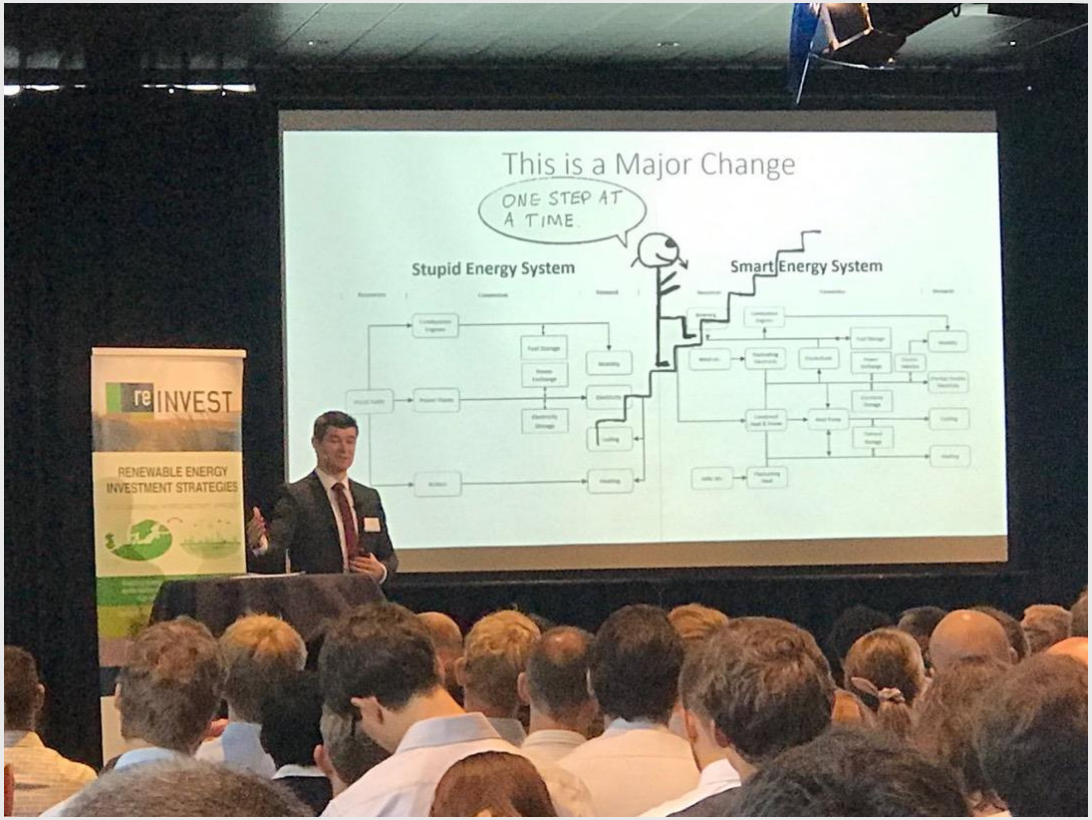
The world we are entering in…



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

(C2PI, 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

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

B2C = (Market price and central merit order) + (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 Pl 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

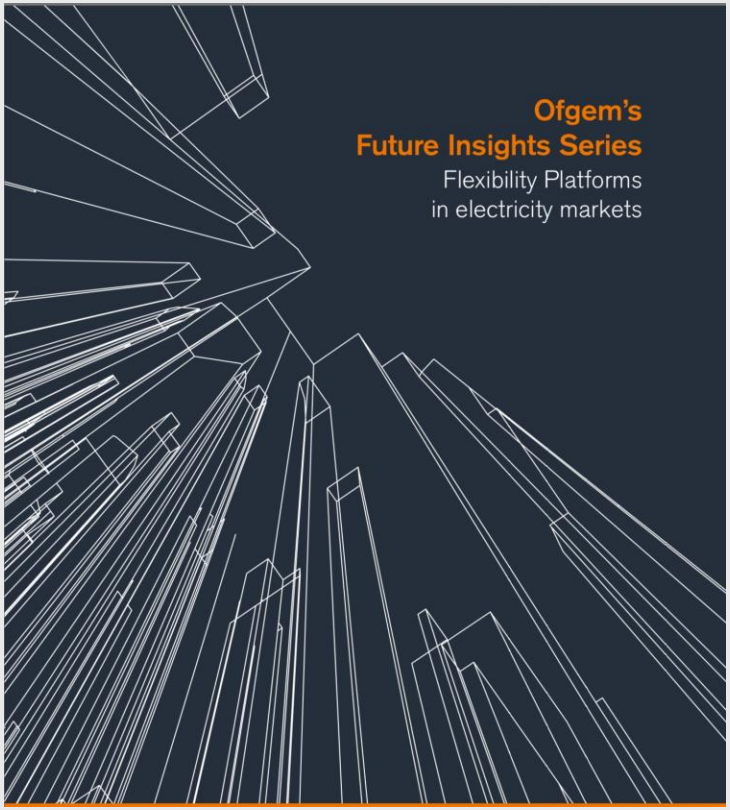
Could all electricity really change? Ask the energy regulators?

- 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?



Could all electricity really change? Ask the energy regulators?

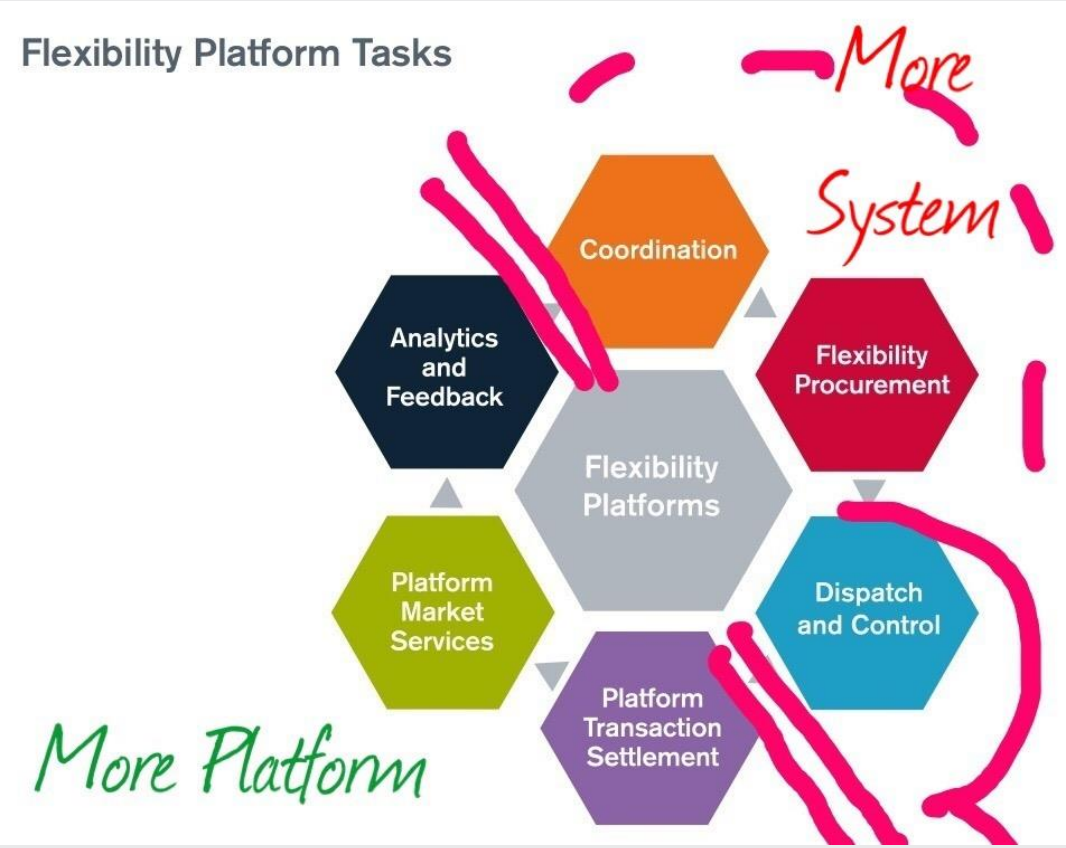
- b) (Ofgem, 2 September 2019)

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?

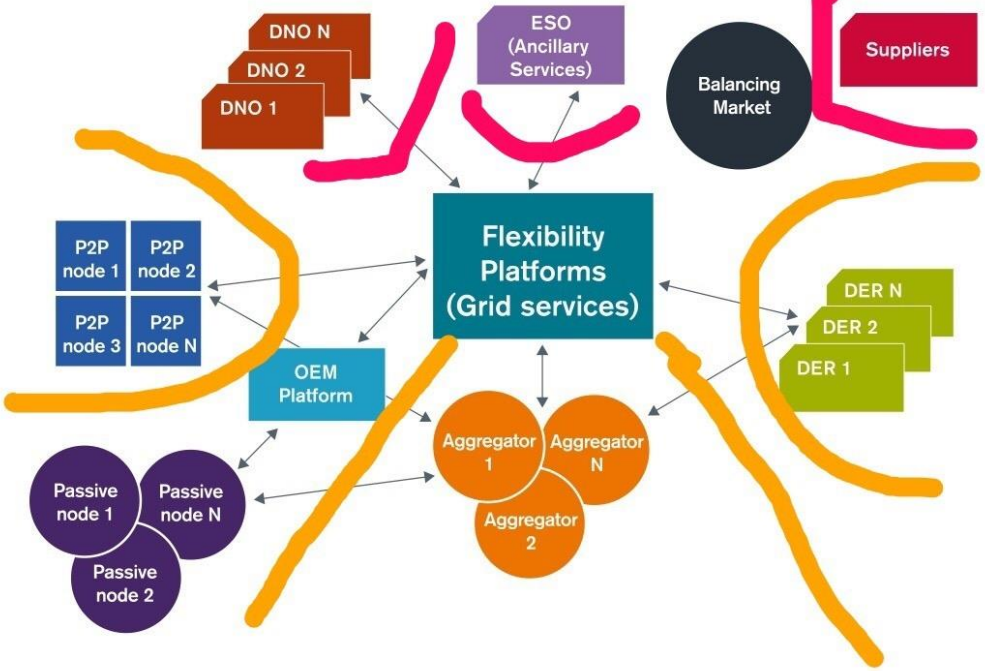


Figure 2 - participants in the Flexibility Platform ecosystem

That Energy Regulator sees "Transactive Energy" Smart System coming

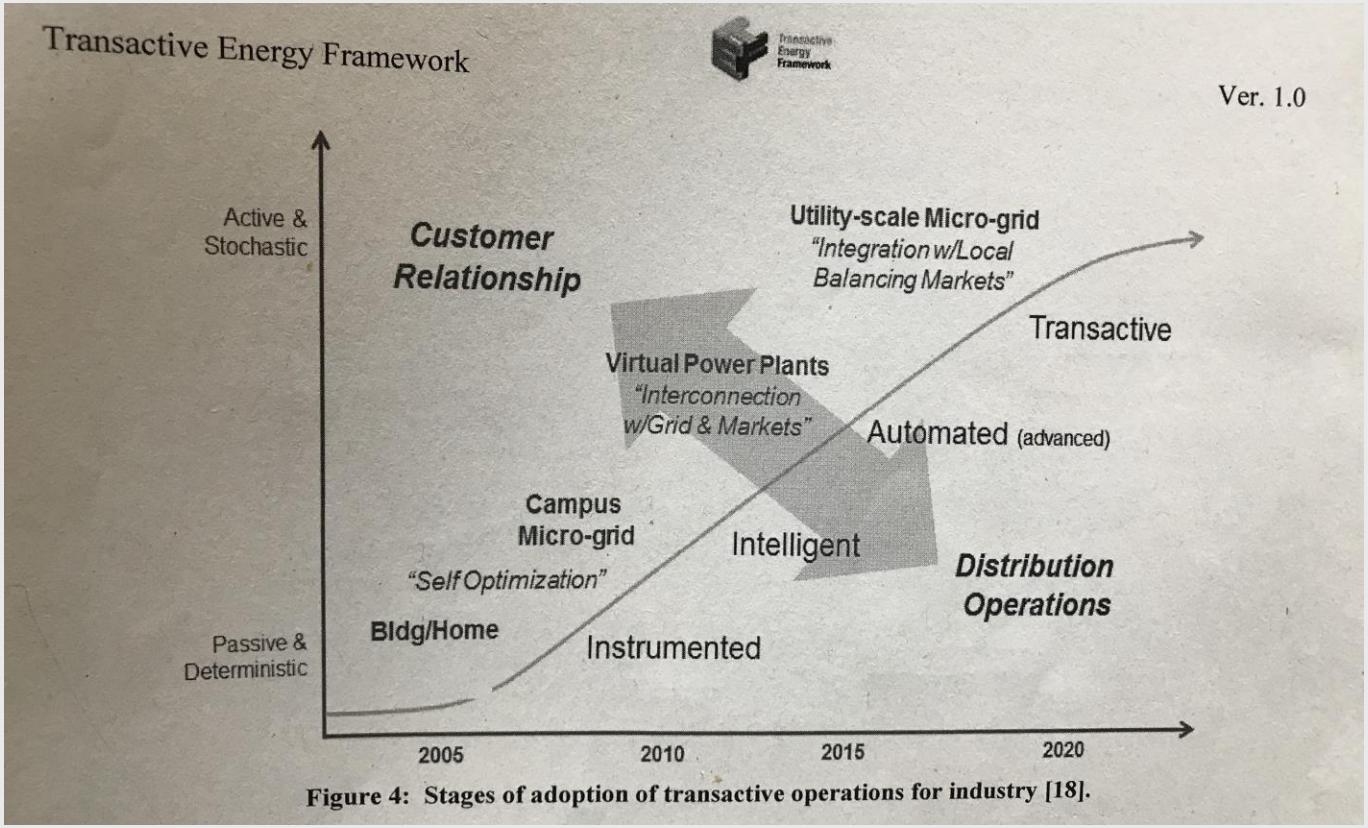


Figure 4: Stages of adoption of transactive operations for industry [18].

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Next?

With "Sector Coupling"
District Heating enters electricity interactive system
as smart flexibility resource, managed by energy communities.

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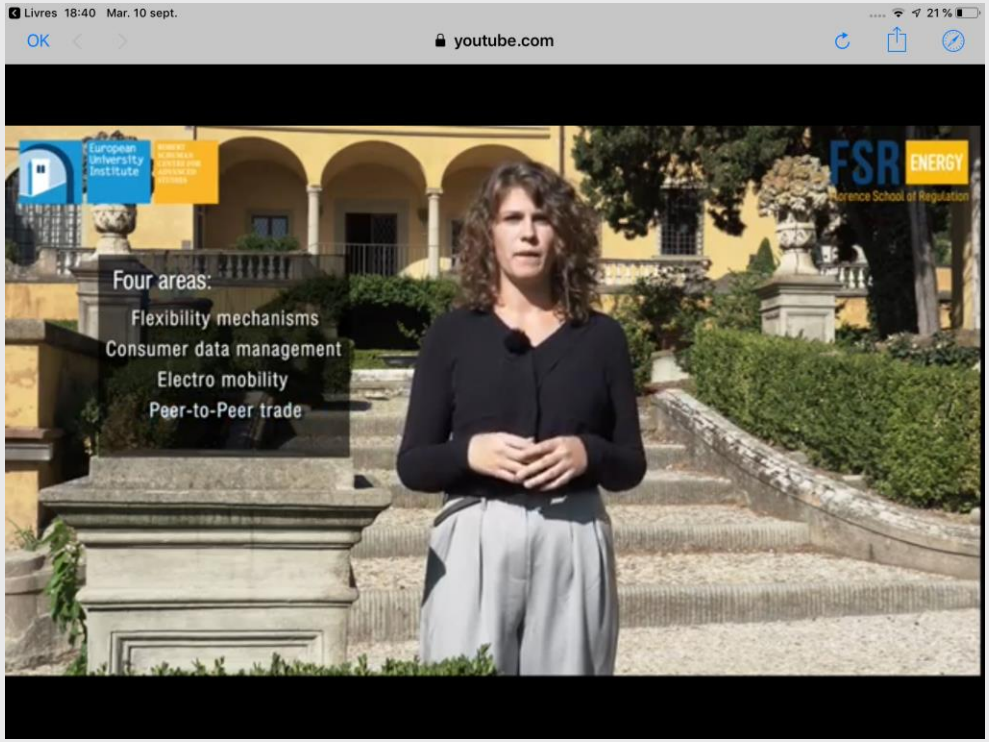

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