FLORENCE SCHOOL OF REGULATION

ROBERT SCHUMAN CENTRE

# Beginning of the end for the “new” electricity regulation

Jean-Michel Glachant

Director ‘*Florence School of Regulation*’

***“Energy Mission 2021”***

Genk, 21 October 2021

www.eui.eu

# *Beginning of the end for "new" electricity regulation*

***"New" electricity regulation was born in UK, from 1990:*** *To build an open power market, one needs networks & system operation complementary to this market > "Well regulated" =*
***"Incentive Regulation" for networks <\|> "Market Design" for the market***

**1** BUT… **markets are changing** (both Offer & Demand sides)
- ¤ Centralized el. wholesale markets respond to decentralized & foreign pushes
- ¤ Local el. markets appear & grow

**2** … **networks too are changing** (both Transmission & Distribution)
- ¤ Smart Grids 1st generation, were responding to centralized transactions
- ¤ Smart Grids 2nd generation, reacting to decentralized transactions

**3** … **institutional frame too** is changing
- ¤ *Behind "Incentive Regulation": a new world "Behind-the-Meter"*
- ¤ *Beyond "Incentive Reg": new Electrification world (EV, H&C, H2) & Carbon universe*

**4** AND **changes will only accelerate** till 2030, and towards 2050
- ¤ From 2008 to 2020 EU managed to "greening" 1/3 electricity output
- ¤ 2030 2x more "El. Greening" +starting direct&indirect electrification investment waves


Co-funded by the Erasmus+ Programme of the European Union

# 1 BUT markets are changing (both Offer & Demand)

***1Step -*** **¤ Sequence of centralized markets responds to decentralized & foreign pushes**

One actually needs 3 markets to make electricity tradable wholesale: Day Ahead + Intra Day + Real Time Balancing.
Day Ahead permits thermal plants to prepare generation of tomorrow. Intra Day is key for renewables to better predict actual output. Balancing real time keeps whole system stable.

But Renewables end lowering wholesale prices & crowding out thermal generators > El. SystOp can choose guaranteeing "*capacity adequacy*" by creating "*capacity markets*".

El. Systems need more than capacity being built, they actually need "*flexibility*" to follow renewables intermittency > Creating "*flexibility markets*" in which '*consuming less*' acts exactly as '*generating more*' > '*Demand Flex*' becomes as good as '*Offer Flex*'.

The sequence of 3 working El. wholesale markets is expanded to +/- 5 markets… but these 5 are also constrained by 2 other '*foreign*' markets: **World LNG market*, ***EU carbon market*


Co-funded by the Erasmus+ Programme of the European Union

# 1 BUT markets are changing (both Offer & Demand)

## *2 Step -* ¤ Local el. markets appear & grow

When generation only comes from big plants connected to the transmission grid, all key el. markets are centralized. When generation also comes from small units of wind & solar, connected to distribution grids, some key el. markets can move to local.

Local demand flexibility can be the key answer to several local issues faced by the local system operators, being the distribution grid managers.

Increasingly decentralized generation also increases the value created locally by flexible demand…

By asking local demand & local offer to interact, the local system operator can avoid both local congestion and future local investments to reinforce the grid.


Co-funded by the Erasmus+ Programme of the European Union

# 2 BUT networks too are changing (both Transmission & Distribution)

## *1 Step* - Smart Grids 1st generation, responding to centralized transactions

Transmission grids have an obvious interest into knowing better & managing better their grid capacity, to "sell" it better to the wholesale market transactions. It goes up to "*Market Coupling*" where TSOs guarantee to the market an interconnection capacity tomorrow for the DayAhead deals to be made today.

## *2 Step* - Smart Grids 2nd generation, responding to decentralized transactions

*"DERs"* (*Distributed Energy Resources*), EVs, Smart Interactive Buildings, etc. are using the distribution grids to have access to centralized & decentralized el. markets.

Distribution grids have to invest into new digital tools to collect very precise information, analyse it (up to "*Artificial Intelligence*"), create "*Digital Twins*", insert actuators-activators, etc.

This doesn't escape the general frame of "*Incentive Regulation*", but belongs to "*Performance Based Regulation*", it's an ad hoc, case by case tool. Up to the regulator to be smart enough to know what is true in each particular grid case…


Co-funded by the Erasmus+ Programme of the European Union

# 2 BUT networks are changing (both Transmission & Distribution)

## *2 Step* - Smart Grids 2nd generation & decentralized transactions Cted

Tradition in "new" network regulation was that players connected to any grid, were facing a natural monopoly, with limited capability to react to this monopoly's decisions.

Today this isn'st true anymore. Players connected to distribution grids can invest more, or less, into DERs (wind or solar), into individual storage, into EV charging stations, into their own private sensors & actuators controlling each of their consumption or storage devices, etc.

These decentralized players are pro-active & interactive; strategic & responsive. Incentive regulation was a game regulators were playing with networks owners & grid managers. It is become a two level game: where decentralized players strike back with new strings of investments & new schemes of behaviour.

It isn't enough anymore for regulators to be reasonably astute: they have to become super smart vis-à-vis self-consumption, EVs, individual storage, demand response, decentralized price arbitrage, etc.


Co-funded by the Erasmus+ Programme of the European Union

# 3 BUT institutional frame too is changing

***1 Step -* ¤ *"Behind-the-Meter" World is behind "Incentive Regulation"***

New world open by DERs, Individual storage, EVs, Smart Interactive Buildings, is not only decentralized: it is also "*Behind-the-Meter*" = Behind regulatory authority of energy regulators.

Amount of investment made, technology choice, actual decision of operation, do escape the energy regulator and, by the way, the delegated authority given to supplier as "supply hub" (having a delegated 'franchised monopoly' into supplying a given customer).

The potential of changes there, are enormous, as illustrated by 2 experiments in the US: *33,000 people in Los Angeles suburb (project RATES); **58,000 people in a Colorado cooperative (project TESS)

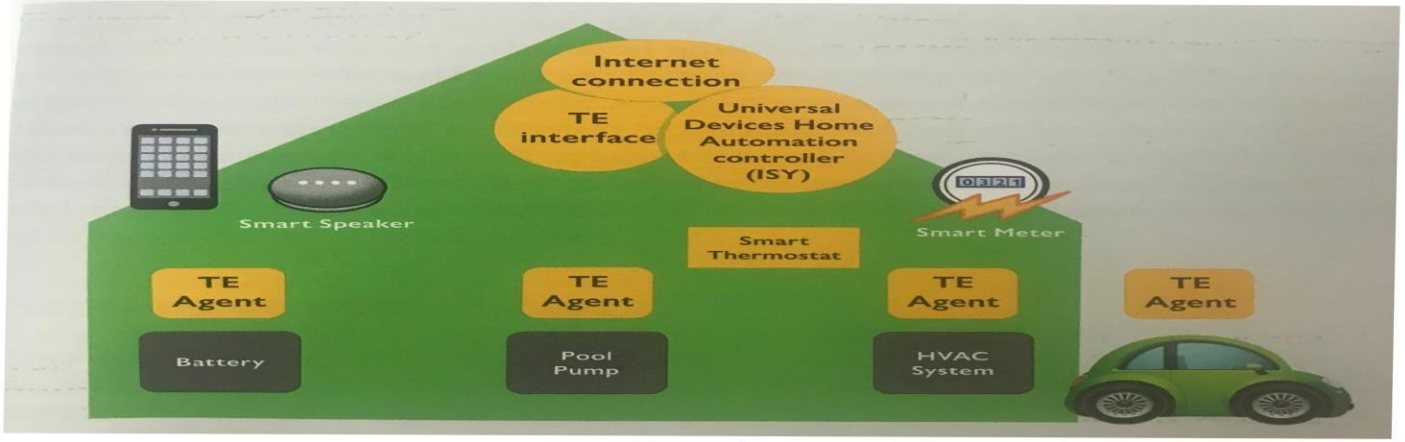
Each key home el. device can have its own sensor & actuator and follow instructions from a consumer algorithmic controller, connected to other el. Markets (be they local or centralized)
> ***see next slide***


Co-funded by the Erasmus+ Programme of the European Union

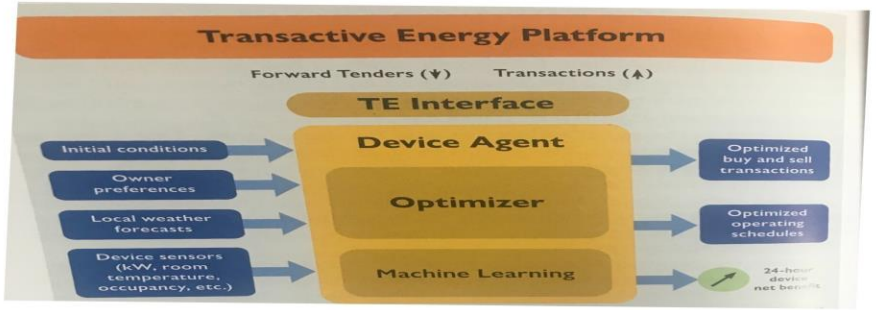
# *Pilot 'RATES' in California (33,000 people for 3 years)*

*1- Each home device is made controllable 2- Home controller learns how to best manage each device 3- Home controller connected to relevant el. Markets local or centralized, &Network tariffs*

1




2




3

# 3 BUT institutional frame too is changing

***2 Step -*** ¤ *Electrification (EV, H&C, Green H2) & Carbon (market & rules) are beyond "IncentiveReg."*

*In electrification decisions:* Amount of investment made, public support, technology choice, actual decision of operation, do escape the energy regulator and, by the way, the supplier as "*supply hub*" (having a delegated 'franchised monopoly' into supplying a given customer). In the case of EV, the design of the infrastructure of charging stations, and the option of equipping EVs with V2G interactive interface (Vehicule to Grid) also escape the energy regulator. Similar remarks apply to el. H&C and to "Green H2" (incl. "*additionality*" for H2).

The *big transformation of Carbon market & Carbon rules*, as described in "*Fit-for-55*" EU Package, also escapes the energy regulators & el. "*supply hubs*":
EU Package for (maritime, aviation; replacement of industry free allocation by CBAM) + (new ETS for road transportation & buildings)


Co-funded by the Erasmus+ Programme of the European Union

# 4 AND changes will only accelerate till 2030, and towards 2050

***1 Step -*** ¤ *From 2008 to 2020*, EU managed to "greening" 1/3 electricity output

***2 Step -*** ¤ *From 2021 to 2030*, EU would have to "greening" another 1/3 of electricity output
**+** to start direct (as EVs, H&C) & indirect electrification (as Green H2)

***3 Step -*** ¤ *Beyond 2030*, EU would have to "greening" its last 1/3 of historical electricity output **+** to feed all the new consumption born from direct & indirect electrification.
An idea of the challenges ahead:
The 2019 EU total electricity consumption, being decarbonized 1/3 by 1/3, is 2,500 TWh year

2019 EU road transportation fossil consumption, to be decarbonized is 3,150 TWh
2019 EU buildings fossil consumption, to be decarbonized is 3,000 TWh
2019 EU industry, maritime & aviation fossil consumption, to be decarbonized is 3,000 TWh
***= in total > 9,000 TWh = > 3.5 times 2019 electricity consumption…***
Of course, higher energy efficiency within electrification can indeed reduce that burden;
But lower energy efficiency in electrification can also increase the burden…


Co-funded by the Erasmus+ Programme of the European Union

# Conclusions

***The Old "New" universe of electricity regulation is dispearing, under our eyes***

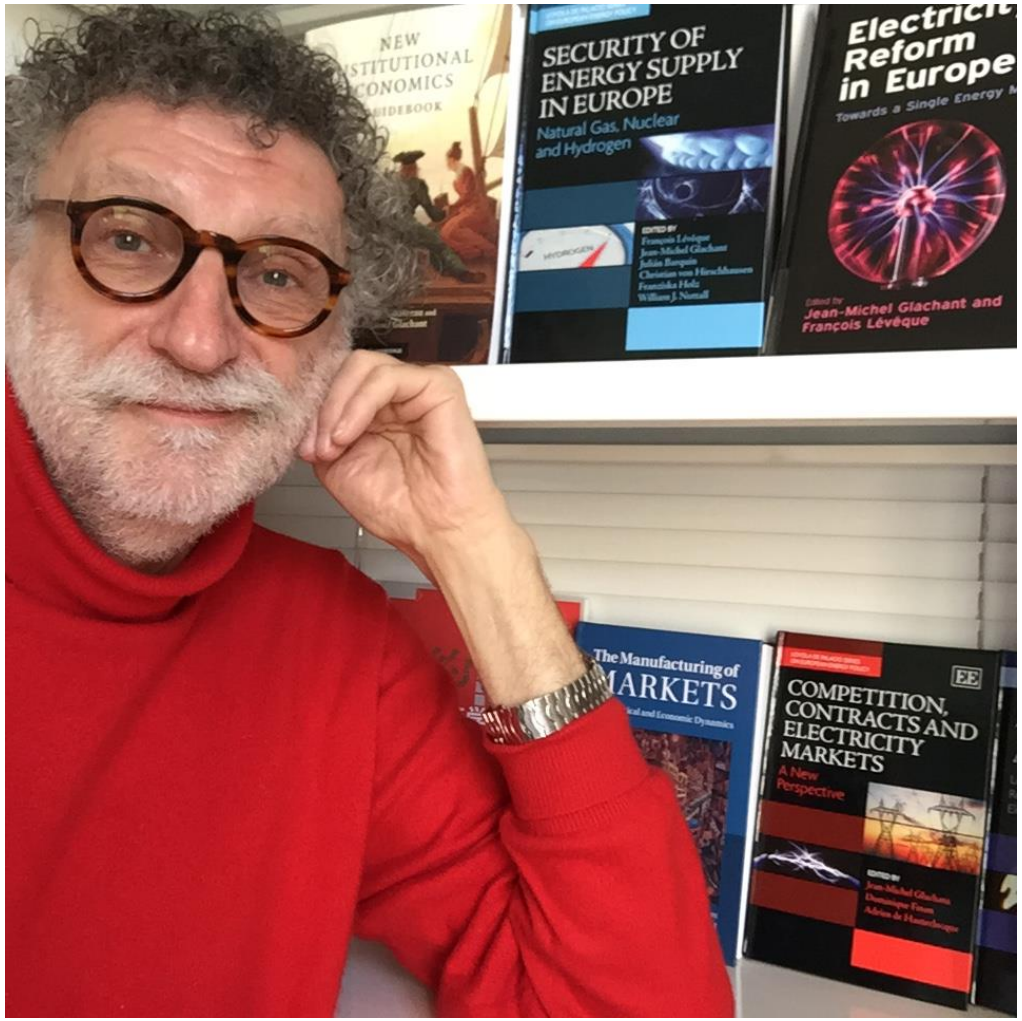
**1 ¤** As Digital trade of el. is expanding, New el. Markets are building a new El. Universe in 2 directions; *Demand response comes back in centralized markets with aggregators or other intermediaries; **Local el. Markets grow: incl. Peer-to-Peer; Peer-to-Grid; Vehicles-to-Grid; etc.

**2 ¤** Networks will adapt to these markets transformations. Transmission will learn how to share load management & balancing with distribution. Distribution is learning how to respond to DERs, individual storage, EVs, smart interactive buildings. Both network levels will enter into a 3 level el. system, with a new bottom being the "*Behind-the-Meter*" transactions.

**3 ¤** El. Regulation will have to learn how to interact with '*foreign*" forces, as world LNG and carbon markets & regulators (expanding EU ETS & CBAM). Also with pro-active "*B-t-M*" players incl. Peer-to-Peer, "*Collective Consumption*" and "*Energy Communities*". Plus direct & indirect electrification policies, and their electrification investors & operational managers.

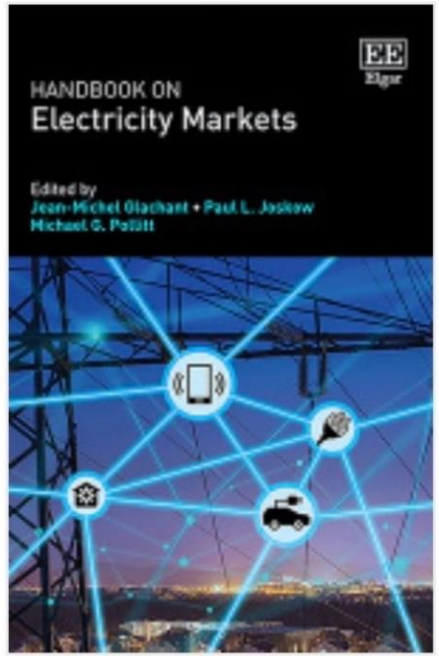
**3 ¤** El. Regulation can actually disappear in front of a new "*Energy & Carbon Regulation*".


Co-funded by the Erasmus+ Programme of the European Union




Add to Wish List ☆

*Nov. 2021*




## Handbook on Electricity Markets

Edited by Jean-Michel Glachant, Paul L. Joskow, Michael G. Pollitt



Co-funded by the Erasmus+ Programme of the European Union

# Thank You for your attention!

**Email : jean-michel.glachant@eui.eu**

**Web Site : http://fsr.eui.eu/**

***Twitter : @JMGlachant ~ 102, 000 tweets …***

**LinkedIn : Jean-Michel Glachant**