Digitalization of electricity sector… The 6 building blocks
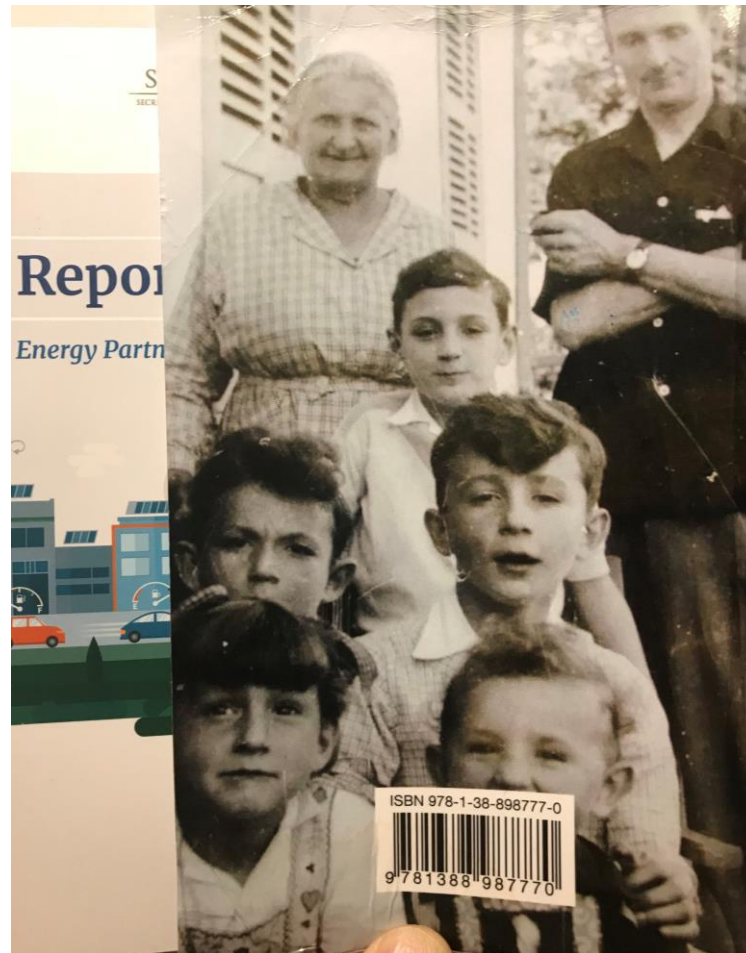
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GIZ & CRE

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You know me: born French analogical, not digital

Something else to know: 1ˢᵗ recorded French Blockchain

All details explained: in my Florence Policy Brief

1st *Block: from Analogical to Digital world…*

-- -- -- -- -- Digital (1st wave: yesterday) -- -- -- --

- **All data coded in a similar code :** storing, transmitting, aggregating, disaggregating, checking, injecting into programs for analysis & decision
- **Programs for devices similar codes:** Thanks A. Turing, computers & smart devices have storable & replaceable programs expressed in codes similar to data
- **Universal compatibility & universal access doable:** Data, devices, humans can be deeply intertwined

---- -- -- -- Digital (2nd wave: today) -- -- -- --

- **Internet (internetting private networks) & Cloud Computing:**
  + One day we will have Internet of Things

- **SmartPhones (3 billion) & Internet users (4 billion)**
  + One day we will have Internet of Things…
  at Home (smart homes with vocal assistants)

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2ⁿᵈ Block: from Grids doing the same to doing something else

- **Doing the same: (Wholesale Markets)** UK Electricity Pool (1 April 1990) took "Plants Merit Order Program" of integrated utility, made it "Open Merit Order" fed by each plant bids

- **Following the same: (Smart Grids 1.0)** Transmission equips with new ITC to manage the system & implement market decisions

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- **Doing something else: (Decentralization of the power system)**

Towards "Escamoles" Power Cuisine:

2GW nuclear, 200MW CCGT, 2MW Wind mill, 2kW PV panel

(+) storage (+) el.cars 450/900 GWh (+) ZNE buildings (+) Smart Cities

- **New Grids integrating all innovations: (Smart Grids 2.0…**

or 3.0 with "Distribution System Operation" as "Amazon Delivery Loop")

>S. Vadari 2018 *"Smart Grid Redefined. Transformation of Electric Utility"*

>> I. Perez-Arriaga 2016 (MIT) *"Utility of the Future"*

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3d Block: New market arrangements

- **Markets are tools & have technological foundations**

Markets revolution goes ahead with new digital support (platform is a **delivery loop**)

- **Digital supply of centralized services: the Tech & Social Media**

Google Map, Google Search – Apple Music – Netflix series

> Hybrid (the platform is the delivery loop; but you do your homework)

Gmail, YouTube, Twitter, Instagram, Facebook

- **The electricity industry: Digital supply of centralized services**

 > Hybrid (the platform is the delivery loop; but you do your homework)

Aggregators create units acting within the wholesale market (microeconomics) by virtual (digital) aggregation of too small units (nanoeconomics)

Aggregators link "Behind the Meter" with the core of the power system: generation & operation of the system

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4th Block: New market arrangements

- **Markets are tools & have technological foundations:**

Outside classical Wholesale Markets, more decentralized markets are created with digital support (platform is **not delivery loop**, but does its following –up)

- **Digital coordination of decentralized services: Uber, Airbnb**

Nobel Laureate Akerlof 1970 ("*Market for Lemons*")

> Strong information asymmetry on true quality of the good, kills the market

Nobel Laureate Tirole 2016 ("*Economics for the Common Good*")

>> Digital platforms offering cheap & credible good quality guarantee, recreate markets

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- **The electricity industry: Digital coordination of decentralized services:**

Platforms for distribution system operators: congestion management services

Platforms for selling renewables or green certificates

5th Block: Blockchains, Communities, Clubs

- **Markets are tools & have technological foundations:**

Markets **Peer2Peer full delivery** with no intermediary: Blockchain, Communities, Clubs

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- **Self-coordination of decentralized trade: Blockchain**

A strong chain of decentralized trade certification via encryption algorithms can give enough guarantee to the players involved

>"Type Pure": miners competing in an open space, as for crypto-currencies

>>"Type Hybrid": an already existing community of peers, or club of partners, add to encryption algorithm an external mechanism of governance

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- **The electricity industry: Self-coordination of decentralized services**

Blockchain cases presented at this event

"*Energy Communities*" as foreseen in coming EU new energy law package

6th Block: Virtual Resort for Artificial Intelligence

- **Markets are tools & have technological foundations:**

Markets are suppressed: the producer deletes the consumer's decision rights & encapsulates delivery of usage into **automated Artificial Intelligence delivery loop**

- **Self-coordination of centralized operation "resorts" : self-driven cars**

> **"Type Pure": A Google car will do what its proprietary grogram (produced and managed realtime by Alphabet network of artificial intelligence) will tell it to do**

>>**"Type Hybrid": smart homes equipped with vocal assistant; coming Internet of Things**

- **The electricity industry: Self-coordination of centralized operation "resorts"**

>**Fleet of el. self-driven cars managed by a fleet management program**

>>**Fleet of coming "Zero Net Consumption" buildings managed by a fleet management program**

Conclusions:

1/ You haven't seen yet much of the digital revolution we are entered in...

2/ Fasten your seat belt!

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Y ademas: Muchas Gracias!

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