The (r)evolutionary role of the DSOs

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The customer: “I have a dream”

✓ I woke up at seven with intelligent and increasing lighting in my room, the system that replaced the alarm clock a few years back, thanks to special lamps, is now controlled by “The Box” connected to my smart meter.

✓ Hot water at 52°C has been prepared and kept at temperature using the electric power I stored yesterday integrated with energy bought at the lowest market price over the night. Kids are away, so last night I punched in we’d have been just two to take a shower this morning: no wastes.

✓ The same applies to my washing machine and dishwasher, honest night shift workers, very reliable, very much independent.

✓ The fridge is still silent, working on the deep cold stored yesterday. In fact yesterday was an extra-sunny day…

✓ Today it will be equally sunny. I shall produce full “X” kilowatt over 6 hours and will presumably need just the half… I will present the extra production to my mother: she leaves 600 kms away but my “BlitzGeschenk” application will notify Mom’s retailer they are offered “X-Y” kilowatt over the grid and ask them to account it in Mom’s bill for a small fee…

✓ …. 
Yesterday I bought at the supermarket a test 500 kWh voucher from a new retailer at an interesting price: just stick the card into the smart meter and here you go! (or – just text the retailer to activate it: within the hour your metering company and previous retailer will be alerted…)

I’ll be on holiday three weeks in July: my self-produced electricity will be sold almost in full to the grid: my broker will take care of it..

I’ll be on holiday three weeks in July: my self produced electricity will be sold to my neighbourhood self balancing microgrid at a price we agreed beforehand or I shall be credited the same amount of energy for my later use…

My EV is fully charged in empty hours but I’ll be away a few days: I’ll sell “X” kilowatts to “BlitzParking” and will retrieve the same amount for free over the next month when I park at their installations and recharge…

I’ve just bought an “EnergyRoamingPass” to carry my own energy around when on holiday in my mountain house, boat , camper…

…
The DSO: "I had a nightmare..."

- Off-grid installations
- Microgrids, Nanogrids
- Organised prosumers
- Real estate developers
- Residential and industrial facility managers
- PV producers/retailers, aggregators joint ESCOs
- EV Charging operators
- Platforms and apps developers
- Dirk Vansintjean, RESCoop.be, and his European virtual power plant
- ...

By the way, this one is a telephone pole, they really are going to totally disappear...
Give-up the “New Paradigm”?
According to a recent PWC study and presentation, disruption will drive business model and technology transformation along the whole value chain…

We are already witnessing a business model change and imperious technology changes.

Business models will be impacted by new markets, new products and services, new competitors new partnerships and even new customers.

Technology changes do produce the digitisation of customers, of assets and operations; distributed energy resources and micro-grids, energy efficiency, demand response based application that will generate business and beyond-the-meter automation – and further services alike.

Based on PWC study “The Road Ahead – Gaining Momentum from Energy Transformation”; www.strategyand.pwc.com :: www.pwc.com/utilities
Disruption factors

✓ Distributed generation and “grid defection”
✓ Customers expectation
✓ New customer-centric entrants competitors
✓ Demand uncertainty
✓ Technology
✓ Changes in policy and regulations
✓ Fuel security
✓ Decarbonisation

Based on PWC study “The Road Ahead – Gaining Momentum from Energy Transformation”; www.strategyand.pwc.com :: www.pwc.com/utilities
## THE EVOLVING SCENARIO

- New breed of consumers, highly digitalised and eager for slick and efficient service, wanting high quality and reliable supply
- Innovative and efficiently operated microgrids, fully efficient off-grid communities demonstrations and operations widely using distributed generation
- Quick and up-to-date offer from smart home appliances and apps providers, energy service companies offering more than basics, reliable and trustworthy data and information providers, almost automated/default price-cost comparison and choice
- New forms of possible unbundling, structured capacity markets and revised approach to CAPEX and OPEX in distribution
- Lower cost photo-voltaic and storage, lower cost communications and sensors, digitisation of traditional grid equipment, digitisation of customers
- New uses of electricity (district heating, heat pumps etc.), Increased demand response, Increased electrification and economic growth in developing countries
- Geo-political risk, Competition for scarce resources, Growing global demand for energy

Based on PWC study “The Road Ahead – Gaining Momentum from Energy Transformation”; [www.strategyand.pwc.com](http://www.strategyand.pwc.com) :: [www.pwc.com/utilities](http://www.pwc.com/utilities)
Operational change

ACTIVE MANAGEMENT  PASSIVE MANAGEMENT

Power plant  Transmission  Distribution
Enhanced interaction and monitoring of transmission grid dynamics, bulk generation inflow, renewable feed-ins, own distribution grid, connecting points...

ACTIVE MANAGEMENT OF OWN, THIRD PARTIES AND CUSTOMER ASSETS
Smart buildings production/consumption, individual and collective local storage, unpredictable self generation/usage ratio, EV domestic charging/storage...

Based on PWC study “The Road Ahead – Gaining Momentum from Energy Transformation”; www.strategyand.pwc.com :: www.pwc.com/utilities
Multiple approaches possible

- Classic 20th Century grid based on thermal generation with hydro controlled feed with no or limited wind,

- Interconnections at continental level cater for extra distance transmission of electric power

- Interacting local grids with no or very limited need of classic distribution grid; massive TSO ops not necessary.

- Comfort model connecting RES to TSO grids balanced through storage and demand side management

- Generation and storage connected to the distribution grid. TSO marginalised

Based on PWC study “The Road Ahead – Gaining Momentum from Energy Transformation”; www.strategyand.pwc.com :: www.pwc.com/utilities
In this scenario we need

✓ Forward looking regulation to handle the technological progress and the multiple choices that will flood the market at the customer level.

✓ A policy-engineering effort capable to accommodate rapid evolution without disrupting the evolving role of DSOs and their commitment to guaranty an equanimous access to electric power, which requires further investments.

✓ A framework that contemplate shared language relations between TSOs, DSOs, aggregators retailers and all other actors on the market.

✓ Consideration of the evolutionary/revolutionary role of DSOs that are bound to become actual facilitators with wider responsibilities in terms of security and quality of supply.

✓ Clear, long term signals necessary to approach the investments required to support the evolution of the market and of the use of electric power.

✓ Complexes and prejudice free further discussion on the evolving DSOs business model and how to combine this with value disruption and stranding investments avoidance.
Evolving the DSOs role

Source: EvolvDSO; European-funded project
The prosumer dilemma: additional intermittence and tariffication problems

✓ In principle, self-consumption is not an issue: prosumers should be able to use their own generation as they please.

✓ However, in most European countries distribution network tariffs are not yet adapted to self-consumption.

✓ The network tariff paid by consumers is based on their energy use, while the cost incurred by the DSO depends on the network capacity used by consumers.

✓ Self producing and consuming households consume less energy, but do not lower the need for grid capacity.
Let's have a look at a regular household

When consumption is low, energy is fed back to the grid. This is a grid use.

When the sun does not shine, the grid is used to cover the energy need of this household.

If the distribution tariff is energy-based, the DSO is only paid for the blue hours, while investment and maintenance (depending on maximum grid capacity used) are not reduced.
Why is this an issue?

- An imbalance appears between the DSO costs and the DSO revenues.
- This adds uncertainty for the DSO: revenues will vary depending on DER generation. This can be significant with a high PV penetration.
- Today, to cover this risk, the DSO (backed by the regulator), has to increase the network charges (€/kWh) for all consumers.

**BUT, this is not a long term solution.** The uncertainty issue is not solved, and consumers without generation are penalised.
Tariffs should be more capacity-based rather than volume-based.

Other options to be investigated, complementary to the volume-based tariffs:

- Special tariffs for prosumers?
- Time of use tariffs?
- Direct incentives (smart contracts) for the users having a larger impact on the grid?
- Dynamic tariffs?
Support to innovation
Cost reflectiveness
Sufficiency: network tariffs should ensure full recovery of all allowed network cost and reasonable return on capital
Market openness: network tariffs should not hamper innovative pricing for demand response and energy efficiency
Transparency: determination of tariffs should be transparent, auditable, consistent and easily understandable.
Non-discrimination: there should be no discrimination between customers of the same customer group
What we recently asked the EU Commission

✔ A new market design where actual flexibility is possible

✔ Data management left in the hands of DSOs: these are neutral market facilitators, already regulated, efficient and cheaper than any project to set up new entities to deal with data

✔ Acknowledgement for DSOs in providing services necessary to operate the network in security (e.g.: in many Member States existing regulation hinders DSOs to use flexibility measures)

✔ Clear role to align the system to those policies that have so far encouraged the development of decentralized electricity generation, electric vehicles, energy storage, flexible demand and the push towards the energy transition.
What do we stand for…

✓ An equal footing in discussions and regulation with TSOs.

✓ A balanced split of roles and responsibilities with TSOs – where DSOs are considered full-fledged network operators actively managing their networks.
What do we stand for…

DSOs to:

✓ maintain control over their networks,
✓ run the direct interaction with distributed generators – and
✓ be responsible of the consumer related data management either commercial or technological
What do we stand for…

✓ Neutrality of the DSOs as a strong position to oppose proprietary unbundling
✓ Innovative regulatory frameworks better reflecting the shift from capacity to operational costs
✓ Demand-side response (DSR) framework representing a high potential for network management, although a market set-up is not the only option.
What do we stand for…

✓ An increased network **reward system** to provide adequate return on investment needed to develop wide scale smart technologies

✓ DSOs to use **flexibility services from generators and consumers**, suitable to take stock from “prosumers” production and their evolution
What do we stand for…

✓ “Smart contracts” between DSOs and grid users should also be considered as an alternative. If a market model prevails, assurances that market signals will not contradict each other to the detriment of grid stability should be in place, as should the possibility for DSOs to override market signals in cases of emergency.

✓ More cooperation between TSOs and DSOs when preparing and executing defense and resilience plans
Thanks for listening
The Prosumer dilemma
Micro-generation in a flexible market

✔ Prosumers, electricity producing consumers, are gaining ground in the electricity market.

✔ The promotion of electricity from renewable energy sources has created a strong incentive in many countries for many consumers to produce energy for their own consumption or even more than that.

✔ The term “micro-generation” refers to a wide variety of energy sources, like river or pumped storage power plants, photovoltaic, wind, biogas or small cogeneration installations, all of which having unique production profiles.

✔ Particularly impressive how solar photovoltaic has shown how peak demand can be met by local.

✔ For this reason distribution networks need to be more flexible and a greater variety of local energy production is needed to balance weather-dependent issues.

GEODE report “Flexibility in Tomorrow’s Energy System DSOs’ approach”, May 2014
Micro-generation in a flexible market

✓ From the economic perspective, the installation of such technologies will secure real consumer benefits by providing financial gains, depending on each Member States’ subsidy policies, from feed-in tariffs and / or bill savings from not buying electricity from the grid.

✓ The future challenge for the DSOs will be to create dynamic databases bringing together consumption and decentralised production on a spatial level.

✓ At this level, efficient energy management including heat and gas is crucial. The coordinated control of a large number of distributed energy sources, with probably conflicting requirements and limited communication, is problematic and will create higher costs for the DSOs.
Micro-generation in a flexible market

✓ A large number of micro-generators can impact the operation of distribution networks. For this reason, the DSOs may need real-time information from micro-generators.

✓ For this information flow a separate information channel is needed, because smart metering systems are not designed to provide this real-time information.

✓ The unbundling provisions of the Third Package directive and the on-going efforts to implement the NCs, may be seen as a first step towards a framework to develop locally optimised market models.

✓ This goal can be achieved by the deployment of the right infrastructure together with an adequate legislative framework.