SUMMARY RECORD
CONFERENCE ON THE FUTURE OF UTILITIES: FROM BANKRUPTCY RISK TO NEW BUSINESS MODELS

Wednesday 27 September 2017, 9h30 to 19h00
Université Paris-Dauphine, Salle Raymond Aron, 2nd Floor

The present document summarizes the main messages outlined to the conference organised by the Chaire European Electricity Markets (CEEM) at the University Paris-Dauphine on September 27, 2017.

Speakers:

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Patrice Bruel (EDF),
Marius Buchmann (Jacobs University, Bremen),
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Jean-Michel Glachant (Florence School of Regulation, Director),
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Antonio Haya (CELEST),
Julien Janes (Commission de Régulation de l'Énergie),
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David Newbery (EPRG, Cambridge),
Luc Poyer (Uniper France),
Pablo Rodilla (IIT, Comillas),
Cyril Roger-Lacan (Tilia),
Matti Supponen (European Commission, DG Energy),
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Thomas Veyrenc (Director of Markets and Regulatory Affairs, RTE),
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All presentations of this conference are available on the CEEM Website:
http://www.ceem-dauphine.org/agenda/fr/a9b8e79a6a70ea953a557105e944367005669183

INTRODUCTION

The conference focused on the new regulatory and market design orientations since the adoption of provisions aimed at an energy transition in most European countries. Combined with rapid technological and economical changes, these orientations have a significant impact on generators of electricity from conventional sources, transmission or distribution system operators, and incumbent suppliers.

The German case was taken as a starting point to show that the recent upheavals have very wide consequences, affecting all consumers, indeed the entire economy. The conference specifically pointed out that the situation confronted by German utilities heralded a trend now rather common in the European electricity sector which faces changes that are rapid as well as profound. The conference also illustrated that some actors, incumbents or newcomers, prove able to benefit from new opportunities.

Almost unanimously, the speakers stated that the factors of change are far from having produced all their effects: new breaks appear very likely. The conference recalled the measures proposed within the "Clean Energy Package" (tabled by the European Commission on November 30, 2016) to cope with the expected changes. Several speakers felt that these proposals remained insufficient; they described the work to be done to ward off the various risks.

This work is primarily the responsibility of governments and regulators, but some of the recommendations made in the conference were directly related to business strategies. Two cases of companies having adopted disruptive strategies were mentioned: the German groups E-ON and RWE. Beyond Germany, the emergence of new business models is now confirmed and clear enough for company managers to learn from. The recommendations addressed to the utilities during the conference, however, fall within a general framework, and do not advocate any absolute model.

I- THE SITUATION IN 2017 AND THE GERMAN ENERGIEWENDE:

In Europe the profitability of the traditional business model of utilities has fallen in recent years, as margins upstream have collapsed following the drop in power prices. This led to massive capital destruction: more than 100 Billion of Euros (Bn€) of impairments. It is not just a transitional trend as the market rebalances, but a structural issue that will undermine sustainably investment in generation.

The hardest hit country is Germany. The merit-order effect reduced average wholesale prices in Germany by 45% from 2007. Gas-fired power plants are especially hit. Incumbents are losing market shares quickly, from nearly 90% in 2000 to 50% in 2015[1]. Not only have the utilities of this country suffered badly, but from an academic point of view, the Energiewende may be qualified as 'a disaster' in several respects:

- It induced no reduction in greenhouse gas emissions due to lack of coordination with EU ETS.
- It is responsible for the increasing fragmentation of Germany's and its neighbours' energy markets.
- It has problematic distributive consequences (poorer households tend to subsidise richer ones).

[1] Besides the consequences of low wholesale prices, the big utilities pay for not having invested in renewable sources in the past decade. The "big 4" owned only 5% of total renewable capacity in 2012: feed-in-tariffs set strong incentives for private households to invest. Now, tendering system rather favours companies; still, last onshore tender was 100% won by cooperatives, not utilities, because project developers are using the cooperatives to introduce loophole in current tendering process.

- Market forces have largely been eliminated.
- It proved to be very expensive. The overall cost includes:
    - Direct cost of the energy turnaround (i.e. the subsidies paid out to renewable energy; from 2000 to 2015 these costs sum up to 125 Bn€; until 2025 this cost will increase to 408 Bn€.
    - Indirect cost until 2025: grid expansion 56 Bn€; offshore insurance, redispatching, reserve capacity, etc. 15 Bn€; interest rate rebates: 6 Bn€; research funding 12 Bn€; write downs of conventional plants 6 Bn€; negative electricity prices 0.5 Bn€.

The reason for such a high cost seems to lie within the approach. Until recently, there has been no element of competition in the renewable energy sector; instead, about 5,000 different feed-in-tariffs were jointly determined by two parliamentary chambers (Bundestag and Bundesrat), with a differentiation according to technology (solar/PV, biomass, wind, geothermal), plant size, plant location, date of installation. Due to the enormous rates of return the approach has been highly effective so far in promoting renewable sources.

The newly introduced tender processes for large-scale PV and wind (onshore and offshore) is encouraging. In contrast to predictions by many proponents of feed-in tariffs, subsidy levels have significantly decreased. Competition between green technologies should play a larger role in the future, while more direct responsibility for marketing green electricity is being introduced (instead of 'produce and forget' mentality). However, as past decisions will have long term consequences, there is a suggestion to move part of the cost from electricity to energy, then to public accounts. This could also happen to network charges for social reasons.

Thus, being a utility in Germany is a challenging task… and it is just starting! New difficulties lie ahead. Although renewable source capacity exceeds peak load already today by 20 GW, renewable capacity is projected to double till 2050, while peak demand will remain rather stable (efficiency compensates for new demand from electric vehicles, air conditioning, heat pumps, etc.). In April 2017 renewables provided 88% of total demand for the first time in Germany. As a result, projections show that negative electricity prices in Germany could appear during 1,000 hours by 2022 if we don't increase flexibility.

II- DRIVING FORCES FOR CHANGE

Overview:
Driving forces for change are summarized by the "4 D":

- Decarbonisation
- Decentralisation (of generation and demand response)
- Digitalisation
- Disruption (due to new technologies, new economic patterns, new actors)

Decarbonisation & Decentralisation move forward due to a series of factors:

- Large renewable energy sources are already cost competitive (and would be all the more so with a right carbon price): grid scale photovoltaic, wind farms, off-shore wind in good sites… As an example, recent auction in Great Britain procured off-shore wind at £74.75 (to be commissioned by 2021/22) & £57.50/MWh (2022/23), less than nuclear (£92.5/MWh post 2024).
- Household photovoltaic appears attractive, because of over-generous subsidies and network costs covered by tariff per kWh and/or net metering.
- Leading companies make business case to go 100% renewable (Facebook, Google, Microsoft…).

A step further, self-generation is likely to expand, thanks to favourable provisions in the "Clean Energy Package". A risk of inefficient and distortive cost allocation appears in case of inappropriate regulatory framework, especially in case of net metering: lower to no cost-reflectiveness may undermine efforts to enhance customer flexibility. Self-generation also raises the issues of unfair cross-subsidisation, with vulnerable customers paying more for the system than "prosumers".

Disruptive digital technologies:
As regards digitalisation, several speakers insisted on blockchain as a potential factor of new disruptions. A blockchain is a digital contract which allows an individual party to conduct and bill a transaction directly with another party (peer-to-peer). Decentralisation of transactions ensures greater independence with respect to central authority and tamper-proof recording of transactions while allowing for speeding up of transactions and reduction of transaction costs.

The blockchain could allow to bypass traditional intermediaries, such as energy suppliers and banks. A range of potential applications of the blockchain can be envisaged in the energy sector leading to "decentralisation of trade", such as the automatization of transaction and supply systems using smart contracts, the documentation and securing of ownership (asset management, guarantee of origin, emission allowances…) and the recording of transactions (metering and billing of electricity consumption, billing of roaming…).

The blockchain could meet the "Internet of Things" and narrow the gap between data and action (the number of connected devices was 1.7 billion in 2014 and should be 5.5 billion in 2020). In other words, technologies are ready for the agents to decide how to manage their energy.

Thanks to these technologies, new platforms are likely to emerge to coordinate distributed system operation, local energy actors and prosumers. The traditional role of network operators and utilities will need to be reconciled with such new platforms, which will compete to capture value associated with system optimisation of decentralised resources, to develop new services for active consumers, to provide coordination signals for system planning and operations.

New challenges:
TSOs and DSOs will be at the forefront to limit the "des-optimisation" of the energy system. Both operators face a strong pressure to find local solutions, stemming from:

- The rapid growth of the fleet of electric vehicles and heat pumps, requiring to control the time of charging/functioning in order to prevent massive peak demand.
- The rapidly decreasing prices of batteries, allowing for a decentralised storage of local generation (wind and solar).

Most speakers call for a regulation preserving an "integrated future", but they recognise that new actors may advocate a different policy. Indeed, homes & electric vehicles will be transformed by actors from outside the power sector.

III- THE "CLEAN ENERGY PACKAGE"

According to the European Commission, competition within the retail energy market is key for unlocking efficient consumer behaviour and keeping the cost of the energy transition at check. As an example, only 20 GW of Demand Response is currently activated in front of 100 GW theoretical Demand Response potential

today and 160 GW theoretical Demand Response potential in 2030. In most Member States, Demand Response is limited due to market entry barriers towards new service providers, such as independent aggregators (which aggregate individual flexibility). It must also be noted that unlike transmission system operators, distribution system operators cannot manage their network in a flexible manner to reduce costs for the consumer.

Keeping these points in mind, the “Clean Energy Package” has 5 objectives:

1. Abolish regulated prices, priority dispatch for renewable energy sources and mandatory ancillary services (in the present situation, 16 Member States maintain some form of energy price regulation for households).
2. Ensure fair market access for independent aggregators and other new service providers; allow flexible management of distribution networks through curtailment of renewables and demand response solutions; set clear principles for DSOs to ensure neutrality.
3. Improve competition, market liquidity, network tariff structures, free price formation (with a hope that the retail price will be the hourly spot price), capacity payments (it is too late for an EU-wide harmonised capacity mechanism), Regional Operation Centres.
4. Leave to the market: redispatching, markets for ancillary services, right to self-produce, consume and store electricity, right to be aggregated (as they ensure balance responsibility, aggregators will look for ways to improve balance, which will lead to huge savings).
5. Combine Market & Regulation in fields like emissions trading, trading of green certificates, auctions.

Renewable energy targets and energy efficiency targets are still under discussion. As regards subsidies, no major change is expected.

IV- KEY RECOMMENDATIONS:

Some speakers disagree with the way that the “Clean Energy Package” deals with security of supply, asking: "Can we let prices explode in time of scarcity, enhancing profitability of some players while many suppliers will go bankrupt? Electricity is not a place where to experiment and take the risk of dramatic errors". Other speakers preferred to voice detailed recommendations to complement, improve or modify the proposals from the “Clean Energy Package”.

The main recommendations are summarized hereafter according to their topic, motivation and objectives for a new market design being almost unanimously shared:

- Develop the system at lowest costs in relation to capabilities
- Strengthen the "user pays principle" separately for capacity and energy
- Increase the competition and incentives for innovation
- Improve the integration of renewables
- Ensure neutrality between decentralised and centralised investments
- Prepare the way for system-coupling electric-cars and heat-pumps

1. Cost-reflective prices and charges:

As a basic principle, customer price structure should reflect the cost structure, in order to give producers and customers the same incentives for investment. This translates in prices and charges based on the individual injection & withdrawal profiles, symmetrical, with a fair sharing of risks between plant operators (all types)

and customers. In this situation, producers and customers are equally exposed to the wholesale market and to fixed costs.

The rationale for fixed cost (capacity) payment relates to the fact that electricity markets do not work like other commodity markets in which new plants are remunerated only from the wholesale market price. The following points were underlined:

- Electricity is non-storable and faces high demand range for required supply security. We now face overcapacity (and low wholesale market prices) as an average but still persisting concerns regarding security of supply (both on short and long term).
- In electricity market few plants are in baseload and those see lower average prices than in a typical commodity market.
- Wholesale price covers energy costs but only part of required peak supply costs; scarcity pricing will not fill the gap–at least not as a reliable basis for investment.
- Ambitious RES targets need flexible back-up, but without a contract, investment in new flexible back-up seems too risky.
- Two EU directives, "Large Combustion Plant" and "Integrated Emissions", will limit conventional generation. The aging baseload capacity will soon become a European-wide concern.
- Capacity markets play a role to enhance Demand-Response and may encourage new consumption patterns to drive into offering new flexibility capabilities.

The bill should therefore incorporate two components:

- Energy component (wholesale market): The efficient price is set by the System Marginal Cost, reflecting the variable cost of the most expensive in merit generator.
- Capacity component (capacity market): The theoretical price is: Loss of Load Probability x (Value of Lost Load – System Marginal Cost).

Auctions for capacity or reliability options seem the best avenues for structuring a capacity market. However, it must be tailored to the needs: the capacity market in France is to incentivise peak generation, strategic reserves in Germany to reduce redispatching. Badly built capacity markets may have perverse effects. As an example, flaws in the British Capacity Procurement over-encourage entry of costly subscale plants (small diesel and reciprocating engines of about 10 MW).

Several speakers also advocate for long-term tradable contracts and location signals, summarised in the motto: 'optimize the granularity of price signals with respect to both time and location'. Finally, speakers insisted on consistency across retail and wholesale market price signals being key[2].

2. Correcting the CO_2 price:

The conference largely acknowledged that the ETS CO_2 price is neither adequate, durable nor credible; it provides no visibility. It must be noted that investors are not interested only by the carbon price, but mainly by its stability. Reforms to date had no impact, notably because setting the right price is difficult: the social cost of future harm is hard to estimate and the break-even price highly sensitive to price of fossil fuel.

[2] Detailed proposals were made in this respect, such as a capacity subscription. In this proposal, consumers buy (subscribe to) capacity they need during scarcity events; demand is restricted to subscribed level when a scarcity event occurs. In this scheme, security of supply becomes a private good (with subsidised minimum capacity volume for energy poverty, though). Interested readers will find the complete corresponding presentations on the web site of the Chair. It was noticed that the system somehow existed in France through former tariffs EJP or TEMPO.

Solutions therefore diverge and include either a corrective tax bringing the EU ETS allowance price up to the "right" level, or emissions performance standards (EPS), or a zero-carbon subsidy to compensate the shortfall in wholesale price (in €/MWh). Against the latter proposal, it was however said that auctioned capacity subsidy would be simpler for renewable energy sources. For several speakers, a solution must be found to prevent exit of existing nuclear plants.

3. Improved network regulation:

Liberalized markets need good price signals, many of which are regulated (transmission, distribution). Regulators should therefore be equipped with state of the art tools to reduce information asymmetry and manage uncertainty, such as incentive-compatible menu of contracts to induce accurate utility forecasts and minimize strategy behaviour or engineering-based reference network models for forward-looking benchmarks and analyse uncertainty scenarios.

In order to establish efficient network tariffs, regulators should distinguish efficient price and resulting shortfall in required revenue. The economic theory provides principles for revenue shortfall, notably the Ramsey-Boiteux pricing to "tax" inelastic demand or the Diamond-Mirrlees for charges on final consumers. In any case, network tariffs should be capacity based; it will avoid wholesale price distortion and reflect network costs, which are mainly capital costs. The study *Utility of the Future* is rich in recommendations to this aim[3].

4. Post 2020 RES-E support:

Support is deemed as justified, since learning spill-overs need remuneration; a support also addresses failure to set the right CO_2 price. Tender is regarded as the best way to determine a fair support for large scale variable renewable energy sources, with Government providing location, site studies and permits. Some speakers plead that Transmission System Operators should provide grid connection. If everyone agrees that there should be location and dispatch price signals, opinions are divided between generation aid (€/MWh) or investment aid (€/MW). Which form will minimize the interference in electricity markets?

Proponents of investment aid argue that auctioned capacity-based subsidies reduce cost of capital and risk via debt finance, incentivizes efficient location & connection, create level playing field between large scale and small scale projects and do not amplify benefits of high wind or sun (not over-reward favoured locations with same learning). In addition to support, wholesale market rules should be updated (such as bidding formats and products) to reflect the operational constraints of new resources.
If the costs of variable renewable energy sources tenders are added to the consumer price of electricity, it creates a level playing field for self-generation: there is no need for subsidies and there is an efficient incentive for storage behind the meter. The drawback is that the consumer price will not be the same as the marginal cost, because of the renewable levy and VAT. Hence finance subsidies for clean technologies through general budget might be considered.

As regards small scale renewables, all speakers reject net-metering: it ignores the time value of electricity, allows evasion of taxes and levies and in most countries allows avoidance of network tariffs and raises the issue of equity by granting subsidy for those who can afford self-generation. It has been proposed that self-generation can be netted with consumption in real time only, and that small consumers pay real-time prices for their momentary consumption or injections.

[3] MIT Energy Initiative, in collaboration with IIT Comillas, Utility of the future, 2016.

5. **The case for storage:**

A surge of intermittency increases the incentive to shift supply and/or demand to when/where needed. Storage has value but is expensive; it can arbitrage prices but ancillary services are likely more valuable (inertia, fast frequency response, back-up reserves). Some speakers believe that the battery revolution has been over-hyped: in spite of reduced battery costs, supply or demand shifting over time and space are cheaper; back-up generation or interconnection are also usually cheaper than storage.

Coupling the electricity and heating systems through District Heating can help to efficiently manage intermittency from wind and solar at an affordable cost. This can be done through the optimised use of thermo-electric equipment like heat pumps, electric boilers and heat networks, together with thermal storage, which is already contributing to a higher integration of intermittent generation in some countries like Denmark. Cooperation is important to optimise those systems and maximise their community benefits and collective value for money. Coupling electricity and heating seems relevant for a country like Germany, where there are already 100 GW of intermittent generation, above current peak demand (81 GW).

V- NEW BUSINESS MODELS

E.ON and RWE as forerunners?

Both E.ON and RWE have split activities:

- E.ON has been split into a core company (E.ON) and a noncore company (UNIPER), which was brought onto the stock exchange in September 2016. E.ON focuses on the new business areas whereas UNIPER becomes a traditional utility with focus on generation and energy security of supply.
- RWE remains a traditional utility with focus on generation while the new company INNOGY is moving away from conventional power generation towards distribution networks (smart grids).

E.ON and INNOGY are both moving towards service-based business models, focusing their efforts on the consumer and searching for new products, with renewable generation and network assets being large parts of their portfolio. So in this respect, they qualify as “Product Innovators”. UNIPER plans to reshape conventional energy world (upstream & gas infrastructures, commodity trading, power plants), with assets across Europe and Russia. UNIPER will also accompany renewable producers to direct marketing.

Business Models:

Diverse speakers have expressed their view on how business models could evolve.

1. **Traditional business (conventional generators, retailers, network operators):**

Generators face depressed wholesale prices and should therefore defer investment until profitable thanks to capacity or reliability option auctions. Retailers may act as aggregators for flexibility services and offer innovative use of smart meters, but in the latter opportunity benefits seem modest, due to rising levies to finance renewable energy sources.

As said above, distribution network operators must cope with an old tariff model (mostly per kWh) no longer fit, as it over-encourages distributed generation and strands remaining customers paying for fixed costs. Therefore the main issue consists in seeking innovative network tariffs, e.g.:

- Tariffs with high initial charge per kWh with option to move to lower energy charges and higher capacity charge (potentially shifting fixed costs to higher consumers).

- Time of use tariffs for large new loads (solar generation, electric vehicles and heat pumps) having them to pay for peak consumption (to cover upgrades)

Ancillary services is a narrow but growing market. It was included in Distribution System Operators business, but it will become open to new actors. It will move from physical assets to data management, while Demand-Response will provide new services.

2. New business models emerging upstream on the value chain:

Upstream on the value chain, new business models are emerging to monetize distributed generation, storage, and demand response. It consists in aggregating small players and allowing them participation in wholesale markets: aggregators of virtual power plants and demand response will act as intermediaries. New business may also arise in capturing value from missing markets for local flexibility value, e.g. local balancing platforms.

Monetizing flexibility in electricity markets generates 5 key sources of value:

- Capacity: Load reduction and storage capacity is bid into capacity markets as a replacement for conventional generation; it reduces the need for generation capacity requirements during peak demand hours.
- Energy: Wholesale market price compensation (arbitrage), providing/avoiding energy use at peak times.
- Environmental: Optimising energy mix to reduce CO_2 intensive electricity generation at peak demand periods; ensuring maximal efficiency from new and existing conventional generating assets through consistent running.
- Reserves: Providing modifications in electricity demand or supply to a Transmission System Operator or energy supplier; providing additional ancillary services (e.g. frequency, voltage etc.).
- Network: Active electricity management at the local level by demand adjustments or storage to limit capital investments in the network through peak avoidance, reduced congestion and improve reliability.

However, in many countries in Europe still, neither aggregation nor Demand-Response have an adequate regulatory framework. The “Clean Energy Package” includes provisions supporting Demand-Response but opens the way to potential distortion if suppliers are not compensated for the energy sourcing costs.

3. New business models emerging downstream on the value chain:

Downstream on the value chain, new business models are centred on provision of services to consumers, with a risk that some business taking advantage on regulatory holes will not be sustainable.

The evolution of retail market design and the relevant price signals for consumers could be very different depending on two drivers: commodity vs. service pricing approach and prosumer attitude toward electricity. Some utilities are already moving toward the energy service company model:

- Optimizing customer participation by understanding behaviour patterns, increasing customer awareness through products and facilitating customers’ ability to manage energy bills.
- Providing energy management products and services, expanding services to small commercial and residential customers (e.g. building management systems, demand-response and energy efficiency programs, behind the meter distributed energy resources such as solar and battery storage).
- Aggregating customers in order to decrease transaction costs, e.g. in communities (municipal, community, commercial, non-profit), support community and multi-family based renewal energy

projects, e.g. sponsorship of micro-grid projects or community-based distributed generation projects.

4. General remarks:

To reach a digitalised, decentralised and decarbonised future, companies need to break siloes, integrate goals and see energy as an asset: in the future, a countless number grid-enabled, responsive assets, aided by advancing technology, will be monetised and optimised in real time. In order to benefit from provisions in favour of renewable energy sources, utilities will need different business models, as their balance sheet is not adapted to access to the capital. Some speakers believe in lean fixed cost utilities to avoid high volatility of revenues and the risk of green but stranded asset. These speakers argue that business models have a shorter lifetime and state that only asset light business will last.

Conversely, other speakers see the global energy transition as replacing carbon by long term capital. As feed-in tariffs will disappear, local investors (e.g. crowdfunding & citizens) will become reluctant to invest and face market risks. Investors and lenders are already active in the energy space; the new frontier for project finance players is access to small and decentralized projects (bundling challenge), technology projects, new segments like energy efficiency, electro-mobility, etc., whilst securing an infra-like risk profile.
Examples of unaddressed market opportunities:

- Energy Efficiency: This sector offers many opportunities for investors who are able to manage the complexity and develop tailored solutions (including “Third-Party Investor" model).
- Local energy supply services: District energy (cooling & heating), innovative waste to energy solutions.
- Smart city: Eco-district “smart” infrastructure, electric cars charging infrastructure (home, work and motorways), demand side management infrastructure (electricity storage, decentralized renewables, new digital technology integration and grids strengthening).
- Alternative Renewables: Non-mainstream renewables with barriers to entry. Ability to structure these projects with leading industrial operators to “de-risk” these assets is essential as well as implementing robust offtake contractual structures.

CONCLUSION

It is undeniable that the European power sector is enduring a period of severe breaks; however the above list of new business opportunities shows that the current period may also be named as "creative destruction". Out of a former state of shock, many utilities demonstrate their ability to recover. Accepting that the future will not look like the past, these utilities now explore ways to take advantage of the upcoming rules. Will these rules leave enough room for them? The conference has brought out many recommendations with the aim to avoid crisis, set a level playing field for competition of centralized & distributed resources and enable an efficient outcome regardless of the future development of technologies or policy objectives.