Digital technology and the management of open data: New prospects for electricity distributors

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Abstract:
At the core of both the energy transition and the digital revolution, electricity distribution grids have fully plunged into the era of big data. The electricity network is becoming smarter and smarter, as it is equipped with sensors that provide information — an outstanding example being the 35 million smart electricity meters to be installed in French households by 2021. Backed by recent legislation, the trend toward open data is, for distributors, both a requirement and a lever. It is an economic, social and environmental requirement for enabling local authorities to draft plans on energy efficiency and for developing innovative services for users. It is a lever for distributors to be open to their ecosystem and operators who process real-time flows — a lever for new business models for managing energy locally.

Electricity distributors are caught up in a twofold trend toward big data, as the quantity of available digital data explodes, and toward open data, as these data are made available for free to be reused without technical, legal or financial restrictions.[1] A turning point has recently been reached. Given the expansion of the Internet of things (henceforth, IoT), there will be by 2025 nearly 155 billion connected devices in the world.[2] This will accelerate the massive production of information and the crossing of re-usable data about: the state of energy resources (in response to precise demands); the environment (the weather or the levels of CO and CO_2 in a home); the performance of devices (sensors in industry or farming); and behavior patterns (related to a person's residence or energy consumption).

The convergence of several technological trends has accelerated the growth of the volume of data. The Web 2.0 moved the Internet out of a static phase, with inert contents produced only by developers and webmasters, into a dynamic phase as users acquired the capacity for generating contents themselves via blogs, forums and, of course, the social media. The blazing successes of the giants Facebook (1.7 billion active users) and Twitter (310 million users) is another factor accelerating the production of data by users. In 2012, 500 To (teraoctets) of data per day passed through Facebook's servers: the equivalent of 10,000 Blu-ray discs. We can add to this list of technological changes the increasing number of connected devices per capita: an average of 2.5 per person on earth in 2017. Homes themselves are becoming smarter and smarter, via connections for television sets, refrigerators and washing machines as well as thermostats and electricity meters.

[1] This article has been translated from French by Noal Mellott (Omaha Beach, France). The translation into English has, with the editor's approval, been completed a few references.
[2] https://en.idate.org/

The IoT will, of course, reach far beyond households. Nearly all the equipment (motors, landing gear, flaps…) used in airplanes are connected to the Internet and produce data. According to Virgin Atlantic, a Boeing 787 generates nearly 0.5 To of data per flight. Sensors have also invaded assembly lines in factories, while cities are becoming smarter and more connected. Another example from the United States: UPS has a new system for routing its vehicles based on a real-time analysis of the data generated by the drivers and their vehicles. The firm thus saves time, money and fuel, and gains a real competitive advantage.

Given the general awareness of the value of big data, the rules applying to competition will be upended. Information has passed over a threshold: data used to have a support function, but are now a strategic asset. This deeply affects organizations. Corporate strategies will be increasingly "data-driven", since big data is a driving force for producing innovations and new business models. Tomorrow's firms will be "quantitative", in direct contact with their environment, constantly evolving; and data will be their most precious asset.

The energy sector and its big infrastructures are not sheltered from this upheaval. The electricity grid will be smarter tomorrow than today — equipped with sensors that provide information to users. For this reason, the installation by 2021 of 35 million smart connected meters will be the key to multiplying by a factor of from 2000 to 4000 the information on electricity consumption that will become available to consumers. The utility of this smart meter, Linky, depends on the optimization attained thanks to it and the development by third parties (external to energy distributors) of value-added services, in particular for efficiently monitoring the steps taken to control energy consumption. For these third-party services, the key issue will be how to draw profit from consumption data and from features developed down the line from the meter. This calls for facilitating the access to data, boosting their use, developing more applications and creating the conditions for a profusion of services around Linky. At the same time, it entails fully assuming the role of a trusted third party, who guarantees the protection of the consumer's data. Linky will open access to real-time flows of data via information and communications technology (henceforth ICT) for monitoring and controlling appliances and devices (via eight switches for plugging into the meter a range of additional features). Using the features down line from Linky will demonstrate the interoperability of components and thus confirm that the right technological and industrial choice has been made.

Open innovation also lays the conditions for many other useful applications for optimizing grid management. Enedis has invested in the Sogrid project in Toulouse for installing chips (low-rate sensors from Sigfox) at different places along lines in order to obtain real-time information about the grid's state. Through a partnership with the startup GeoKaps, customers experiencing electric incidents can be targeted via Twitter and immediately receive personalized messages.

All the data generated and managed by electricity distributors are to be rendered to three precise categories of users: the grid itself (for honing management, improving performance and ensuring the security of the electricity supply in the areas served); customers (to whom Enedis is already providing data on their consumption and the state of the grid); and public authorities (who use aggregate — anonymous — data for local plans for improving energy efficiency).

It is in the interest of electricity distributors to take part in this revolution. They obviously have the expertise: the information systems and the capacity for continuously processing, storing and certifying — from a neutral position and under the control of public authorities — the flow of big data.

Six activities can be distinguished in the chain of electricity data: producing and collecting the data; extracting and cleaning them; transmitting and storing them; assimilating them; analyzing and interpreting them; and the customer interface. The first three are, of course, the distributor's core activities in information technology (a genuine strategic asset), since they guarantee that the raw data have been classified and safely stored. Bearing in mind the weight carried by the GAFA (the web giants: Google, Apple, Facebook and Amazon), this is no light detail.

Various types of platforms (technological, service-oriented, organizational) will provide the material evidence that the managers of electricity distribution grids are involved in these data activities. Despite this variety and the fact that they have been built with various partners, these platforms share several characteristics.[3] For one thing, they are places for multiple (virtual or physical) exchanges with a minimum of intermediaries. For another, they rely on technological tools for the rapidity and security of exchanges. Finally, they assemble information on numerous activities or sectors. Building a data platform usually calls for skills and know-how about how to assimilate data from several sources, whether only internal or crossed with data from external sources. Cooperation can open the access to third-party data sources and help enhance the value offered to the platform's users.

Enedis quite clearly has the expertise and the position for pursuing its ambition to be a genuine data operator. The firm is already developing several innovative platforms with local authorities. One of them is the prototype Synchrone, for providing information on the volume of electricity consumed from, and uploaded to, the grid in Mené, Brittany.[4] The project Dethermalisation intends to analyze the correlations between the current demanded from the grid and outside temperatures on Yeu Island over a four-year period. The prototype Pointe Maille will provide data about peak power on the grid to the urban areas of Lyon and Grenoble.[5] Algorithms and professional expertise will be used to analyze and interpret the data from the platform so as to propose services (usually, applications) to users. This opens unlimited new possibilities not only for assisting decision-making, acquiring knowledge and optimizing activities but also for making innovations.

Thanks to the real-time management of data, electricity distributors will be modern services adapted to their times, the 21st century, and capable of backing the new models for locally managing energy (the consumption of self-produced energy, decentralized production, etc.). Their job will be to place the data at the disposal of stakeholders in time-to-market and in accordance with standards.

The information produced will be decisive for designing and improving, as part of an ongong process of innovation, new services for consumers and, more broadly, citizens. Thanks to ICT and Internet, a new "energy economy" is arising out of an ever finer knowledge about how customers use energy. It is going to upend the usual intermediaries in the value chain in electricity.

In this new context, the managers of power distribution grids must modify, all at once, their position, assignments and methods. From being grid managers, they must *mutatis mutandis* become local systems managers, the leading actors in integrating decentralized resources and the new uses associated with them (*e.g.*, recharging the batteries of electric vehicles).

Consumers are calling for this transformation. According to a study by Harris International however, nine out of ten persons in France think they are poorly informed about how firms use their data; and only 37% feel that firms and public organizations are using the data in their hands "responsibly" and "reasonably".[6]

For distributors, the transparent release of data for everyone's benefit is both a requisite and a lever: a social, economic and environmental requisite for enabling public authorities to perform their duties and for fostering the development of new innovative services for users; a lever that distributors can use to change their organization, adapt to new demands from their ecosystem and become more agile. One thing is certain: the involvement of distributors is essential for developing the new local platforms associated with the many smart grid projects under way.

[3] The Conseil National du Numérique (in its memorandum "Plateformes et dynamiques concurrentielles", 2015), has defined a platform as a service intermediary in the access to the information, contents, services or goods edited or provided by third parties.

[4] Mené is one of the first "community of communes" innovating in the field of energy and pioneering the label Tepos. J.M. CHEVALIER, M. DERDEVET & P. GEOFFRON, *L'Avenir énergétique, cartes sur table* (Paris: Gallimard: 2012). See too: http://www.territoires-energie-positive.fr/.

[5] The data will be recalculated per IRIS (Ilots Regroupés pour l'Information Statistique), a geographical unit that, adopted by French National Institute of Statistics and Economic Studies (INSEE), groups approximately 2000 inhabitants.

[6] Survey conducted on line between 29 February and 2 March 2016 for Quantmetry.

Beyond the opportunities offered however, the exponential growth of data also carries risks, whence the need for a legal and regulatory framework for protecting personal data and corporate know-how. Till now, the legal status of data has been tenuous, in particular the conditions for using data and algorithms (artificial intelligence). Many a question crops up. Who owns which data? What does the law have to say about the sharing or exclusive use of data? And what about having a share in the presumed value (current and future) of data? Several legal texts are being drafted or have recently been adopted on this topic.

At the EU level, the European Commission is drafting texts (the fourth Energy Package, the new Market Design, etc.) that recognize and confirm, along side transmission system operators (TSOs), the indispensable role of distribution system operators (DSOs) as *"neutral market facilitators"*.[7]

In France, energy distributors are legally obliged to provide a "*public data service*" spanning the full chain from the collection of data to their delivery to stakeholders. With regard to data collection, articles L322-8 and L322-9 of the Energy Code hold distribution system operators (DSOs) liable for metering, building and running the grid, managing voltage fluctuations and overseeing the grid's efficiency, safety and security. These assignments imply collecting a large quantity of data of various sorts: data from meters, technical data about the grid, customer data, and data on the operation of the electricity market.

Precise legal rules define the DSOs' responsibility for protecting the sensitive data they collect and manage. For one thing, the confidentiality of information qualified as "*commercially sensitive*" (under decree n°2001-630 of 16 July 2001) must be protected in order to comply with the rules and regulations on free and fair competition. For another, certain data processed by DSOs are "personal" (under the 1978 law "Informatics and Liberty") and have to be processed in compliance with strict rules under the CNIL's oversight (Commission Nationale de l'Informatique et des Libertés). Finally, DSOs must also protect data having to do with national security and business confidentiality or trade secrets.

This legislative and regulatory framework has been reinforced recently. These modifications share the same objective: an ever wider communication of the data available.

— The Valter Act of 28 December 2015 establishes the principle that data from the public sector are for free and can be reused (with the exception of data on audiovisual licencing fees).[8]

— In compliance with article 28 of the TECV Act on the "*energy transition for green growth*", Enedis has to provide aggregate annual data on energy consumption to the owners and managers of buildings requiring action in order to control consumption for their occupants.[9] Article 179 stipulates that annual data (aggregate data on different geographical scales) on consumption and production are to be conveyed to the public authorities who need the data for their duties and to the general public. Enedis thus releases open data on annual consumption by branch of the economy and on annual production by industry and by IRIS.(5) Estimates at this level of the heat-sensitive share of consumption are scheduled to be released in 2018; and data on annual consumption at the level of individual buildings will be systematically released as "*open data*" in 2019.

[7] The texts of law mentioned hereafter are available via: http://eur-lex.europa.eu/legal-content/FR/TXT/?uri=CELEX%3A02006R1907-20140410 for the European Union; & https://www.legifrance.gouv.fr/Droit-francais for France.

[8] Act n° 2015-1779 of 28 Décember 2015 available at: https://www.legifrance.gouv.fr/affichTexte.do?cidTexte=JORFTEXT000031701525&categorieLien=idea.

[9] Act n°2015-992 of 17 August 2015, available at: https://www.legifrance.gouv.fr/affichTexte.do?cidTexte=JORFTEXT000031044385.

— In compliance with the first article of the Lemaire Act for a "*Digital Republic*" of October 2016,[10] Enedis is to transmit the documents to public authorities that it produces or receives and that are necessary for them to perform their duties. This act organizes as open data both data of general interest and detailed data on consumption and production for the purpose of developing energy offers (uses and services). The privacy of the persons concerned by these data is to be upheld by applying methods that render the data anonymous and will be specified in a forthcoming decree.

Regardless of the implications of these legal texts, one thing is for sure: DSOs in electricity are fast becoming "managers of electricity systems". The changes they are undergoing are already tangible in several EU member states.

To face up to this new situation, DSOs must not only fall back on their historical role of metering but also, imperatively, advance and become full-fledged managers of real-time data, managers open to their ecosystem. Lest they become extinct or be "uberized" by more agile players, DSOs must make strides in digitizing their activities. They must project themselves into the future and prepare for the complexity of "co-creating" with entirely new ecosystems, both territorial and technological. DSOs must adapt to trends and disruptions in the electricity system: flexible local markets, the consumption of self-produced electricity, peer-to-peer transactions, roaming (loading stations for electric vehicles, "vehicle-to-grid" systems) or systems for coupling intermittent sources of current with its storage. The traditional "system assignments" of DSOs (and, too, of TSOs) will be forced to evolve in new structures for ensuring the regional and national coherency of the energy transition. For this, a pragmatic approach has to be adopted that is based on large zones that are geographically, economically and technically well-knit.

By setting a high level of requirements, performance and excellence for their activities as data operators, DSOs must make it possible to develop market platforms for managing and monitoring local "flexibilities" and for fostering new, resilient business models capable of taking account of expected breakthroughs (blockchains, peer-to-peer certification, neutral facilitator of "electric-vehicle-to-grid" systems, etc.).

Many initiatives have already been undertaken, not only the demonstrations made by Enedis throughout France but also the actions by other players in the energy industry or by local authorities. However this momentum will not have a full impact without "proactive" regulators. For example, despite the ACPR's support (Autorité de Contrôle Prudentiel et de Resolution) for blockchain technology via the FinTech Forum and FinTech Innovation, French regulations seem to be falling whereas, by way of comparison, British regulatory authorities are already delivering authorizations to firms for this technology.

One thing is for sure: DSOs will play a key role in digitizing the grid, whether through the big data revolution or the upsurge of new forms of technology (such as smart grids). This entails a thoroughgoing transformation that turns the DSO into into a local systems manager. But this will be possible only as part of a momentum in the French ecosystem of electricity, in particular in its regulatory framework.

[10] Act n°2016-1321 of 7 October 2016 for a Digital Republic available at https://www.legifrance.gouv.fr/affichTexte.do?cidTexte=JORFTEXT000033202746&categorieLien=id.