The Instrument of 'Schéma Directeurs Des Énergies' of Lyon Metropolis:

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The Instrumentation of « *Schéma Directeurs des énergies* » of Lyon Metropolis

Drawing the city Smart Grid tools amidst the energy data-digitalization process, case of Lyon Living Lab Smart Grid Strategy.

Abstract

Since 2009, the European Commission through "The Task Force for Smart Grid" deliberate the agenda of Smart Grid & Smart Meter, digital technology solution is set to make energy systems across the European countries more connected, intelligent, and sustainable and more importantly are capable to tie the new and renewable energy within the network. The advances in data analytics, connectivity and interoperability are enabling a range of new digital applications such as smart appliances (Interview TL Smart Grid DG Energy, EU, 2018).

In 2012, EDF launched smart meter experimentation project in Lyon metropolis area. The project established a consortium named Smart Electric Lyon (SEL). The main purpose of SEL is to analyze the rapid stream of data that are being generated from the smart meter equipment sensor installed in 25,000 homes in Lyon. These devices could produce fine-grained data of household electricity consumptions in a real time basis. It reveals the new "data revolution" [Kitchin 2014, Townsend 2013, Cukier and Mayer-Schoenberger 2013] shifted beyond traditional quantifying methods (Desrosières 2000)*, and englobe both the traceability and the interoperability of people's behaviors [Boullier 2015, Lupton 2016]. Entitled as the biggest project in terms of investment, it hybrids the fund both EDF and national government via the l'ADEME (The Environment and Energy Management Agency). It aims to provide a wider choice for city managers to develop city energy tools [Ademe Smart Grid Report, 2011].*

While in the meantime, the Greater Lyon is pushing the bar high to institutionalized digital intelligent governance. New direction, the "Energy Mission (EM)" and its instrument Schema Directeurs des Energies (SDE) were established. Lyon is reshaping their internal institutional structure towards the new way to conduct public action with the purpose to keep pace with the inevitable digital ecosystems that comes penetrating every aspect of the city' activities (Severo and Romele 2015).

This paper is drawn mainly by the support of theories: the Tools of government in the "new governance" approach (Salamon 2002) *Governing by the instrumentation & public action through the prism of its instruments [Lascoumse & Le Gales, 2004, 2011, 2013], and furthermore the concept and context of Smart City* (Batty 2012; Meijer and Bolívar 2016) *and contemporary big data in contrast with the sociology of quantification [Boullier, 2015]. The result illustrates, instead of integrating the previous experience of SEL to the SDE, the EM Project Director rather triggered "Lyon Living Lab (LLL) Smart Grid". We figured out the intention of Lyon Metropolis has gone beyond the utmost utility of big data as merely quantitative sources. The interplay of big data discourses is veiled under the banner of Smart City programs. The set principle of strategy is carrying the goals to construct the new economic model of "digital energy ecosystem" to provide an added value to Lyon Metropolis as Living Platform test bed. A fairly governance adjustment within Lyon Metropolis is being occurred, the political agenda setting through the appointment of legislative members responsible for the thematic, the craft of the new direction of Smart City and Big Data, as well as hiring professionals in digital innovation and digital marketing coming from various facades of the private digital industry.*

Profound and intense observations, which are empirically conducted closely within the governance structure of Greater Lyon authority related to the subject, e.g. The Energy Mission & Lyon Smart City Project combined along with the result of in-depth interview with Task Force for Smart Grid-Directorate Energy, EU, the SEL and LLL consortium and its instigators and l'Ademe as the national governmental agency in favor of Smart Grid development are constituted as the primary source to construct this paper.

***Key words**: New Governance, Lyon Living Lab, Big Data, Smart Grid economic model.*

1. Introduction

As the fancy and hype notion of big data continues to take global attention, Desouza & Jacob (2017) suggests a large portion of big data literature has emerged to promote the use of big data as tools in decision-making. Unquestionably, the compliment to big data are coming mainly from the success of GAFA (Google, Amazon, Facebook, Apple) through its cloud computing systems, personified marketing approach based on the personal internet activity history, the proliferation of the web, social media, mobile devices, and sensor networks, and the artificial intelligence in their operational processing (Chen et. al, 2012; Müller et al., 2016). Within the current trends, mostly in smart cities' action, big data are more and more pushed to tap into the field of public services (Al Nuaimi et al., 2015). In the contemporary political rationalities and administrative innovations, the likes of big data appeared to be characteristically connected to the advance in knowledge information and the forces of new expertise as suggested by Rose and Miller (2010). At this stage, we underlined in certain discussion, the introduction of big data within the public institution does not only challenge the hegemony of statistic as common government's quantitative tools, big data have come to urge various transformations on its governance (Cai and Zhu, 2015). Based on this perspective, we would like to delve into the theoretical framework of big data and its empirical practices linked to the public policy.

Robert Kitchin proposed a conceptual understanding of big data as "data revolution", where it signifies all new dimension of data aggregation methods, data sourcing, data production and data visualization, subject of digital omnipresence (Kitchin 2014). As a new quantitative source, we comprehend the dynamics of accounting tools construction in public policy do not often outflow the layer of social and political debates. As suggested by Foucault in his analysis of "Instrumentation", the rational choice and effects of the instrument of public policy technics do not only reflect the proper utility of the tools, but also show the political relations they induce. To make an echo with the existing works, we propose to revisit the article of Johan Hotchl et al. (2016), "Big data in the policy cycle: Policy decision making in the digital era". The author generalized big data into a rational choice within the governance cycle. Thus, the contingent of big data were subjected to the rational policy agenda-setting (Hassenteufel, 2010). According to Hotchl, et al., big data will be considered as a set of tools if it were to satisfy the political advantage of public agents. This argument aligns itself to the theory of public policy instrument (for example in Lascoumes and Le Gales, 2004 & 2011) as the umbrella of critical perspective that restores the functionalism aspect of the instrument upon the socio-cultural and political dimension. This article juggles on the vicinity of the actual hypothesis and argument by bringing forth the empirical cases in a more specific sector of smart energy.

In order to frame big data in relation between technics and socio-cultural and political context, we overlay the approach of "commensuration" analysis proposed by Espeland and Stevens (1998). Commensuration was introduced as cultural technic that anticipates the transformation of different qualities into a common metric. In one part, commensuration identifies the ensemble of elements associated to the dynamism of power, value and interest, sometimes cognitive, or even political symbols that prefigure the tools and quantifying processes toward its objects. In other parts, it reveals a critic of the possible unproportioned weight or even a misleading social assessment in an object. Quantifying societal aspect is always intrigued by the inherent invisible qualities that cannot be reduced to the logic of metrics. Thus, commensuration ploys to carefully interrogate the whole composition involved in quantifying process—both the political dimension of the tools employed and the inherent values of the object. Commensuration appeared as a debate of a set of different qualities embedded into the metric of measurement. The author also explains that somehow commensuration is relative and abstract, and it varies depending on the agents. It provides a practical rationality that is able to translate thought into the domain of reality, and to establish in the world of persons and things, spaces, and devices for acting upon those entities of which they vision and scheme.

The perspective of commensuration in this paper could provide critical thinking towards our discussion on big data. In this case, the coat of commensuration would investigate the very substance of social political dimension that mobilize big data. For instance the hypothetical claim of big data tends to neglect the use of the theory but to universalize the worlds with the N=all formula, that is to say : "unlike the theory that needs hypothesis, the great quantity of would speak by themselves to explain the correlation of phenomena" (Cukier and Mayer-Schoenberger 2013).

Beyond its merely quantitative discussions, big data have been expanded into several categories that linked itself in certain themes, one of them, big data are allied in pair with the emergence of the notion of smart cities (Kitchin and Lauriault 2015; Picon 2015; Townsend 2013). Some authors are even convinced to define big data as the essential element that mark the advent of smart cities (Picon 2016). Smart Cities' movement are the application of big data in a specific configuration of urban innovation cases.

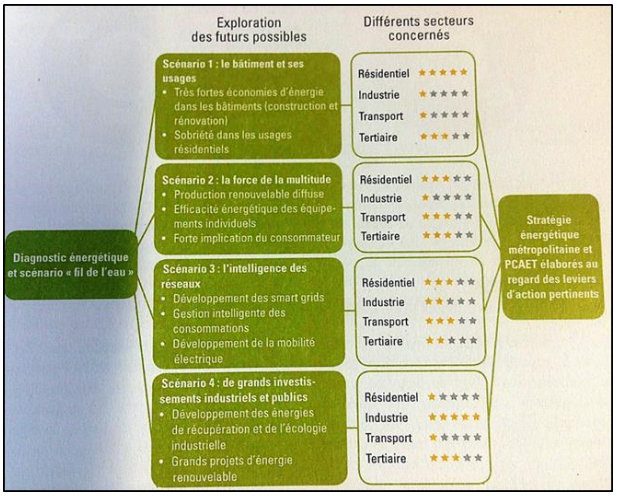
In the other hand, smart cities have a polarized typology, extending from the early form and the model proposed by big enterprises such as IBM, Microsoft and Cisco (Boullier, 2016) to a more democratic model across local society movement armed with the available technologies to deal with daily problems (Townsend, 2013). Different perspectives were also found within the researchers across the disciplines. For some geographers, Smart City is determined by the geo-localization of "smart city innovation" promoted by different actors (Florida, et al., 2017, Shearmur, 2016). Richard Florida perceived the Smart Cities as the cluster of creative classes in given spaces (Florida 2004). For political scientists, some part of Smart Cities programs are classified into the analysis of government tools of sectoral issues, regional competitiveness, international ranking, and benchmarking (Giffinger and Gudrun 2010). Smart City is far from being one fits for all because of the fragmentation and temporality of actors, different socio-cultural and political settings that gave a distinct output which must be portrayed as a discontinuity and fragmentation over Smart City application across the cities and metropolis (Graham and Marvin 2001). At the same time, in certain circumstances, such dynamics that frame Smart Cities are also applied on the big data as a column that contribute to Smart City architecture.

Many critics in the scientific journal of public policy state that there are insufficient numbers of articles apropos of big data that could provide the precise example of its application on public policy process or public policy output. The problem was, do big data can ever be pillar to public government instrument? or can we basically argue that big data are a new kind of quantitative rational to the contemporary world? The series of question are exercising two principle issues: (1) How big data could be perfectly fit into the politico-administrative of public institutions? and (2) what is the real impact of big data within the process of policy making? The two are incontestably relevant with respect to the fancy of big data coeval and the driving force of bedazzled theoretical expectations suggesting the outstanding success of such company employing big data (see GAFA). As suggested by Anthony Townsend, extracted from his interview with Collin Harisson, the Chief collaborator of "IBM Smarter Planet program", the Smart Cities campaign was coming from the idea to import the success of private company technologies into the urban life. Principally Smart Cities would like to enhance such idea of imbedding the RFID tag technology that was used to track goods to be applied on the city's activities, to retrace the flow of people within the city systems and to automatically collect and to analyses the real time data in a single integrated platform. These new technologies are supposed to be the breakthrough for public government in order to effectively manage the cities (Townsend 2013). Therefore, we argue the idea of Smart City was fundamentally a big data process through *datafication*, to create as highest quantity and resolution as possible of city' data at the disposal of the city government. The term of datafication is also parts of discussion on big data phenomena (Cukier and Mayer-Schoenberger 2013; van Dijck 2014; Lycett 2013).

After all, to carefully situate big data in its empirical condition, this paper looks at the case of Smart Grid and Smart Meter programs in Lyon Metropolis, particularly the Smart Electric Lyon (SEL) piloted by EDF and the Lyon Living Lab (LLL) experiment piloted by *Bouyges Immobilier* and numbers of consortium. The two projects respectively claim to mobilize big data as the core element of experiment. In this case, the Smart Grid project, fueled by big data are becoming a discourse, a symbol of solution to renewable energy, energetic transition toward a sustainable energy[1], the faith on the information technology as sustainable development solutions (Flippo, et.al., 2016). Our interests in SEL and LLL are also down to the fact there was an agreement, Memorandum of understanding between the promotor and the local representatives to integrate the project into Greater Lyon energy

[1] *Report 2016 : Enedis innovates and accelerates the energy transition of territories*

tools[2]. On one hand, Lyon would manage to benefit the result from the external actor, while on the other hand, Bouyges has its right granted by the legitimate political actor to deploy the territory (Cadiou, 2016). It was declared that the main outputs of the SEL project are the fine-grained data of electricity household consumptions, generated by a Smart Meter device named *Linky*. This device was also classified and validated by the French Ministry of the Environment, Energy and the Sea in 2017 as sustainable tools, which gave a strong political bargaining of Linky. As for the LLL project, the interplay of big data are in the heart of blockchain energy method. Thus, the benefit for Lyon Metropolis was to experience the new set of tools in Smart energy developed in its territory at its disposal of energy policy related to smart grid. While at the same time, Lyon Metropolis henceforth is very active to grasp with the agenda of big data and smart city. Specifically, in energy sector, Lyon Metropolis has been attributed the legal politico-administrative to develop its own energy tools and policy, named the Schema Directeur des Energies (SDE) in which Smart Grid is one of the priorities scenarios[3]. From this perspective we reinforced our hypothesis in which the SDE were expecting the contribution of Smart Grid or "*Reseaux Intelligents"* in Fench term were coming from the private "demonstrators" that underway within Lyon's territory as they stated on the annual report of SDE and territorial climate-energy plan 2018 (see the image).



As the political and technical administration is established into the governance of the SDE, inevitably, Lyon Metropolis possesses a concrete tool that becomes the interlocutor of external energy actors willing to demonstrate their Smart grid projects in the territory. In our analysis, we expect to constitute the SDE as the prism to understand how big data are well perceived as the additional element in Greater Lyon energy policy design and strategy. Especially, the initiative and scenario to integrate Smart Grid into the current instrument is registered on the agenda of SDE (scenario 3 on the image). Big data of energy is also identified as fundamental element to give a new element of analysis to reinforce and to develop another possibility scenario of the energy policy

Through these empirical phenomena, our principle objective remains emphasized on interrogating the following: to what extent such complex dynamics of big data could be concretized as tools for energy policy design to Greater Lyon?

2. Big Data within the Social Science regards

To provide a conceptual reply to our problematics, in this article we would like to bring forth the actual debates surrounding big data. The growing concern of Social Scientist toward big data emerged in 2009, mostly stimulated by the success of Google Flu Trends as the headline in the article written by Chris Anderson, the chief editor of Wired Magazine. The article was published in 2008 "*The End of Theory: The Data Deluge Makes the Scientific Method Obsolete*" (Anderson 2008). The idea of the article was to promote the agility of big data generated by Google for having contributed to provide real time information to United States government about the rapid spread of flu epidemic that struck United States during 2009-2010. Anderson intended to compare the slow response of government tools "The Centre for Disease Control". At that time, big data seems to gain a maximum momentum by comparing itself to traditional instrument of government relying on traditional method, expert's

[2] *Executive Summary of the Register of Decisions of the Standing Committee. Commission permanente du 20 juillet 2017 Décision n° CP-2017-1785.*
https://www.grandlyon.com/delibs/pdf/CommissionPermanente/2017/07/20/DELIBERATION/CP-2017-1785.pdf

[3] *Field notes : Complementary meeting of the Scientific Council of the master plan of energies of the Metropolis of Lyon September 2016*

resources, generating theory and hypothesis, and costly data. Meanwhile, Google can rapidly predict the spread of disease in the country based on the data correlation of search keyword and geo-localization.

Since then, the debate is growing rapidly among the social scientist to counter Anderson's article. The tagline "the numbers speak for themselves" is globally employed by the advocates of big data, which means that big data are committed to statistical analysis of pure correlation that is devoid of theory. It argues with enough data, the traditional, hypothetical scientific model will no longer be needed to understand a phenomenon (Cukier and Mayer-Schoenberger, 2013). Big data require a shift of mindset to understand the world. A more comprehensive perspective, a kind of N = all is a new formula, seeing phenomena through its own data reflex. As a result, the look at big data have led to the emergence of a new hypothesis, the competition of the usual conception based on the "hypothesis" and the "random sampling". In the era of big data, the need for sampling is an artefact of a period of information scarcity (*Ibid*, 2013).

Later, the "N=All" hypothesis has attracted a lot of critics. The first element concerns the proclamation of the objectivity proposed by big data, while on the contrary, big data were conceived in an interpreted technology which determines what will be measured, which can lead to new concentrations of power, and they are never methodologically excluded from human design (Crawford 2013, Kitchin 2014). Be that as it may, data, or even big data, is always "raw", it must be defined as cultural resource, the result of an interpretation instead of a natural resource. The configuration of data production is always percussed by conflicts, norms, and interests, all of which are reduced to the process of materializing data (Bowker et al. 2013). This observation refers to the traditional data analysis. The passage of big data will raise some adjustments in the look of socio-political and economic as the permanent framing of the company and the use of quantitative tools as explained by Desrosiers (2008). In his analogy of statistical tool as proof of action, he has never escaped the framing of subjective reflection or the political use that employs it, despite the scientific neutrality that he could embody.

Another more classical view, the etymology of data was derived from the Latin word "*dare*" which means "to give", so data means raw elements of overall universe or phenomenon that can be extracted, measured and recorded in various ways (Borgman 2009). However, in the current language, the word data is accidentally used in the way the data is captured elements (*capta* in Latin), the units of data that were selected and harvested from the sum of all potential data (Kitchin, 2014). This reinforces the fact that data are always elements of secondary products of thought, reflections and interpretations according to the tool and the instrument of harvesting and use employed. Data are not simply natural and essential elements as such, which are extracted from the world in a neutral and objective way and can be accepted at face value; the data is created within a complex assembly that actively shapes its constitution.

Delving amidst these debates, Dominque Boullier (2014), provided a fundamental insight to bridge the gap of big data on the sociological investigation. He extended the phenomena of big data to the works of sociology and quantification such as Emil Durkheim, "Suicide (1976)", in which the constitution of society from the optic of government is reflected by the statistic numbers produced by State administration. At the epoch, the scope of society "to govern" and "being governed" are those captured by the radar of statistical number. From this statement, Boullier argues the impending of big data should give another challenge to reconsider the sociology toward the conception of society. In other words, if at the given time sociology was struggling with the scarcity of data and could only passively generated such data from State statistical bureau, in the contemporary era, digital instrument had helped to automatically produced many data of almost all human activities in the daily basis. As such, the actual hypothesis is to rethink about the new epistemology of sociology, new model, and new concepts of how the society should be regarded.

Table: The social concept of quantification and its transformations (Boullier, 2014)

	1ère génération	2nde génération	3ème génération
Concept du social	Société(s)	Opinion(s)	Réplique(s)
Dispositifs de collecte	Recensement	Sondage	Plateformes/Big Data
Principe de validation	Exhaustivité	Représentativité	Traçabilité
Co-construction institutions/recherche	Registre/enquête	Audience/sondage	Traces/méthodes numériques réorientées
Acteurs majeurs de référence (et financeurs)	Etats	Mass media	Marques
Acteurs opérationnels du calcul	Instituts nationaux	Instituts de sondage	Plates-formes du web (GAFA)
Auteurs fondateurs	Durkheim	Gallup Lazarsfeld	Callon Latour Law
Problèmes clés des approches scientifiques	Division du travail et État providence	Propagande et influence des médias (mesures d'audience)	Science et technologie (scientométrie)
Conjoncture technique	Machines de Hollerith (calcul mécanographique)	Informatique (Turing et Von Neuman)	Internet, web et Big Data
Formats sémiotiques	Tableaux croisés et cartes topographiques	Courbes et histo-grammes/diagrammes circulaires (camemberts)	Graphes et timelines
Métriques	Statistique	Sampling	Topologie (Scores)
Critères techniques de qualité des données	Pertinence, précision, actualité, accessibi-lité, comparabilité, cohérence	Intervalle de confiance, probabilités	Volume, variété et vélocité (Big Data)
Modalités dominantes de compte-rendu	Explications	Corrélations descrip-tives puis prédictives	Corrélations prédictives

Almost in the same register, Robert Kitchin (2014) proposes to draw the line toward the paradigm of scientific revolution of Thomas Kuhn. For Kitchin, Thomas Kuhn has provided a crucial path of paradigm to understand the common consensus way to interrogate the world and synthesizing knowledge according to a substantial proportion of researchers in a discipline at any one moment in time". In a contemporary context of big data, the nature of data collection, visualization, method, and treatment has been deeply transformed, which means there must be a transformative challenge for social scientist (Hey, Tansley, and Tolle, 2009). Due to this point, Jim Gray, a Researcher of Microsoft proposes a hypothesis of The Fourth Paradigm: Data-Intensive Scientific Discovery. According to him, the science is entering the fourth paradigm based on the growing availability of data and new analytics. That is, data-driven scientific discovery by scientists who collect a tremendous amount of data with modern scientific instruments. Jim Gray believes that the fourth paradigm of science requires a lot of data and a radically new extension of the established scientific method. He suggests that Big Data ushered in a new era of empiricism, where the voluminous data reveal the finest granularity information of a single phenomenon. In terms of sociology quantification, we would like also to make an echo with the hypothesis the emergence of the finest accounting tools and methods in the era of big data as the anti-thesis of probabilistic science in the general concept of traditional statistics tools (Bardet, 2014).

In a broader context, the manifestation of big data have gone beyond the simple definition of massive quantity of data. Big data are no longer scaled by the simple characteristics of the triple "V" (Kitchin, 2014b). There are series of fundamental transformation proposed by numbers of authors. In the first place, big data are highly associated with the democratization of personal devices such as smartphone and geo-location, real-time sensors, RFID, surveillance camera, internet of things, and reinforced by the power of platforms such as GAFA (Boullier, 2015; Kitchin and McArdle, 2016; Picon, 2015; Townsend, 2013). In addition, subscription of transport and mobility card as well as loyalty purchasing card has been identified to contribute to big data (Batty, 2013).

The critical approach on Big data were also brought into the social transformations, cultural shift, and political frames (Boyd and Crawford, 2012). Certain important issues are ascending. In big data era, data and information production are becoming more and more decentralized. The hybrid of individual dimension and internet of things are also a means of data production (Brown, Chui, and Manyika, 2011) as well as private companies hold huge resources of data (Einav and Levin, 2013). This phenomenon opposed the traditional method in data production in which a centralized State

administration such as census bureau registry, survey and, inquiry were the main legitimate resources of data (Desrosiers, 2008). Every aspects of life and daily activities are now being numbered significantly, which gave rise to the term of statistical individual (Bouk 2015). The "self-quantified" method also took place as part of discussion, promoting an important place of data as becoming the daily individual commodity consumption. Self-quantified explain how people and their personal gadgets control, measure, and probably govern their daily life as the result of statistic individual (Lupton 2013).

Some thoughts have seen big data as the sign of massive behavior shift. The relation between individual and the city are transformed through the idea of big data, as the use of data sets at a granular, temporal, and spatial levels of the city to improve the services of city activities (Glaeser et al., 2018; Koonin and Holland, 2013). As an example, Smartphone is an interface for individual that connects the whole city function, such as location, transport system, and networks, as mentioned by Townsend (2013)—this device is a Swiss army knife to survive in the city. Big data also comprise the rise of new actors claiming to be the legitimate professionals to handle the great quantity of data such as data scientist (Chatfield et al., 2014; Provost and Fawcett, 2013). In a broader context, IBM and Microsoft have emerged as the plumber of city's data networks, obviously under the label of Smart Cities. We also identify that big data terms have been the propeller of massive open data platform programs of public institutions, notably city municipal (Gurin, 2014).

Table: Jim Gray's fourth paradigm in the big data era (Kitchin, 2014)

Paradigm	Nature	Form	When
First	Experimental science	Empiricism; describing natural phenomena	pre-Renaissance
Second	Theoretical science	Modelling and generalization	pre-computers
Third	Computational science	Simulation of complex phenomena	pre-Big Data
Fourth	Exploratory science	Data-intensive; statistical exploration and data mining	Now

3. The Big data perceived in Smart Grid programs: the case of SEL and LLL

Before we put together the promises, the debates, the controversies of big data among social scientists well as the layer of commensuration, it is worth to investigate in the first place how big data are currently engaged within the public authority. Certainly, there is a great enthusiasm shown by many actors especially public government to big data debates. We identified empirically that big data and Smart City is still in an obscure definition within the Lyon Metropolis actors. For instance, the "Open Data" program of Greater Lyon is defined both as the real engagement of the city to big data agenda as well as part of their Smart City strategy[4].

This temporary comprehension is gradually evolving along with the growth dynamics of external parties bringing in various projects entitled big data or smart city experiments. One of them is through the program "smart energy", later known as Smart Grid and Smart meter. Since 2007, Lyon is the first metropolis in France to experience the Smart meter application Linky Smart Meters developed by Edf and Enedis. In the first phase of project, 200 000 units of Linky Smart Meter has been installed in Lyon. Technically, Linky is a new digital electric meter embedded with connected features, more communicative interface, and capable of displaying and alerting real time electricity consumption, even via applications on Smart phone. The sophisticated ability of Linky lies in its capacity to produce and generate a fine-grained data of the consumers. In this case, we identify the fact while Lyon's territory is being reconfigured to be embedded with Linky, at the same time it is the ground-breaking processing[5] that actually engineering the urban spaces as the "niche". For some actors, the niche is a set of process to make the city more compatible according to the needs of their operations (Bulkeley, Castán Broto, and Maassen, 2014) (Bulkeley, Castán Broto, and Maassen, 2014).

[4] *Interview with Chief Data Officer of Greater Lyon.*

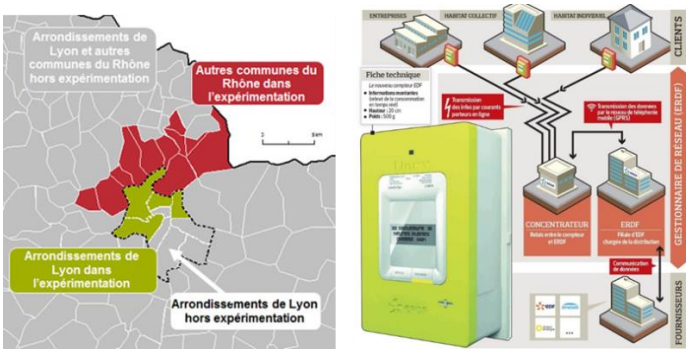
[5] *Interview with director of SEL*

Smart Electric Lyon (SEL)

In 2012, EDF launched SEL experiment project focusing on a profound research and development of data cascade stream from Linky. The project itself is the largest in France in terms of budgeting, 69 M€ is granted, scoping of 270 000 units of Linky installed in the city of Lyon as experiment materials. SEL and its Linky are also recognized as a national strategy of energetic transition. The key of Linky is aimed to raise awareness of customer behavior towards their energy consumption since the data provided by the Linky device will have no meaning without the attention of the citizens. Despite of highly sophisticated technology embedded, and it is believed Smart Grid could allow a constant integration of renewable energy production to the grid, at this level, we perceive the project could not dismantle a strong demand of social transformation supports, such as tailoring the rhythm of behavior change.

The SEL project is formalized by the creation a consortium. Around twenty members of different actors from energy sector, home appliance producer, and home smart connected devices are invited to perform each of their related products based on Linky. Our in-depth interview shows most of the consortium were interested in materializing the individual behavior of experimental through the fine-grained data generated by Linky into the industrial valuable products[6]. For example, a smart box was tested to integrate with Linky, allowing for a single interface control of energy consumption of every home appliances product. The box does not automatically contribute to energy reduction, but stimulate individual comportment transformation by providing showing the numbers to govern their own habits (Bouk 2015; Lupton 2013). This phenomenon has been part of a vocal critics from many associations and scientific, stating the new type of neoliberalism through smart electricity that have entered the household levels (Levenda et al., 2015), while in fact demanding more and more the works of consummator (Teboul, 2016). This method is subject of many critics as becoming more and more depending to social change (Lecler and d'Arcier 2015). This sort of citizen's empowerment through devices and data awareness corresponds to what Foucault defined as "the conduct of conduct" of Foucault (Lemke, 2000).

Figure: Linky's illustration functioning systems (Presse released Enedis, 2016)



Lyon Living Lab project: the idea of positive energy buildings

It appears that after the big success of Linky and Smart Electric Lyon[7] in reshaping the image of Lyon metropolis as the front runner of smart program and smart innovation, numbers of other experiment projects were installed. One of them is Lyon Living Lab (LLL). It plays a similar role to SEL, constituting the city as a living platform of innovation. It is "Quartier de confluence" in the peninsula of Rhone and Saone, one of the important sections of the city in the heart of Lyon. LLL intends to develop a positive energy neighborhood with the support of photovoltaic production and a new mechanism to integrate to the block energy network system locally. The project has been granted a direct supervision of CRE (Commission of energy regulation). Blockchain of energy will allow the photovoltaic energy produced by each building to be self-consumed within the same neighborhood.

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[6] *Interview with a consortium member*

[7] *The succès claim is indicated on the last rapport of activities of SEL, 2017.*

Located at Confluence Neighborhood, an attractive mix area of 31,500 square meters in the Saone and Rhone river quay, Confluence is home to business & commercials buildings and residential. The choice of the Confluence Block as a test bed naturally has plenty of positive reasons. The Confluence has been renowned as the sustainable district by WWF[8], which make it a valuable asset for the city of Lyon. The block was dedicated for the home of the future energy-friendly area. Many projects entitled smart-sustainable has taken place, such as Toshiba Hikari positive energy building project, Smart Community. The word "sustainable" is the respected keyword indicator for all innovation demonstrators.

This project is realized by a consortium piloted by *Bouyges Immobiliers and* supported by other 70 partners in the consortium, such as SPL Lyon Confluence, Lyon Métropole (energy mission) and GE/Alstom. The agreement conducted by the Ministry of Urban and Territorial Management and the ex-President of Lyon Metropolis, 12,9 M€, was fortunately injected to support the project under the title of "Numeric Project", which is coherent with the national strategy of numeric transition. Of the total amount, 5.57 M€ will be directed to the smart city project of Metropolis, aiming at supporting the establishment and monitoring of experimentation on smart electricity distribution networks, then 3.19 M€ will be allocated for the energy transition and the rehabilitation of more than 600 social housing to meet the eco-building standard. Lastly, 4.14 M€ are allocated to promote Lyon in international city cluster.

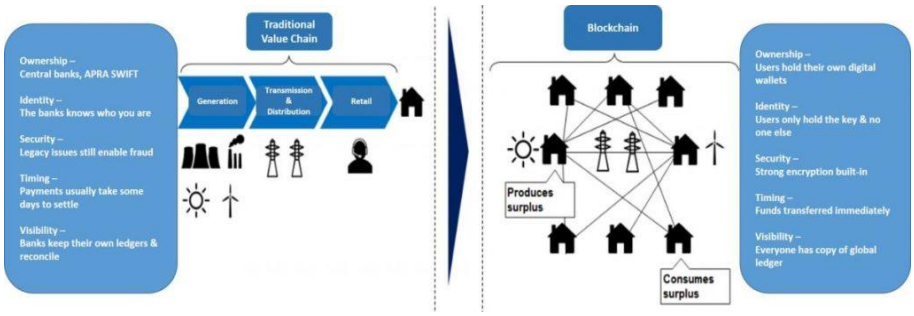
Lyon Living Lab demonstrator project sees the emergence of such constructor actor like *Bouyges Immobilier* starting to step-in into the affair of Smart City particularly on smart energy building or "the building of positive energy" to reintegrate its French terms. The experiment on a living platform of the city is a means to achieve more concrete panorama of the purported smart grid. The Lyon Living Lab project eventually shows greater interest of many actors from the different nature of activity, not only in the energy sector, but the sub-category of activities related to energy consumption of the building and construction sectors. Possessing the new challenge in the energy sector and to insist and avow its competency in smart energy system, in the early 2018, Bouyges acquired *Suisse Alpiq Engineering*—an important start-up based in Swiss operated in building energy infrastructure and transport and mobility. This step proved the dynamism of the current economy, that is being disrupted by the power of algorithm (Manyika et al., 2013)

In this project, the consortium introduced the idea of "*Blockchain*" method as the core of the project. It is supposed to disintegrate the block of Confluence from major electricity distributor, while testing a new "micro grid" that will promote local energy system. The blockchain is allowed by the promulgation of the July 2016 ordinance of CRE on the self-consumption and pooling of energy. It is claimed to facilitate the renewable sources, in this case the photovoltaic energy produced by each building equipped with solar panel to be locally consumed within the neighborhood. Its aims at answering the biggest challenge of Smart Grid, in which the intermittent of renewable sources are always reluctant to the main grid (Bal and Philibert 2013).

It seems the key element of the project is the ability of the building to positively fabric its own energy resources. This method is more and more intensified by the idea of closer control and monitoring through the assembly of real time local data energy supply and demand of the neighborhood. Technically, it is a completely closed system. A platform of information exchange between all the inhabitants plays a key role. The solar panel installed in all building could produce sufficient energy for local consumption. Based on the local source, the objective was to spread and open the data within the inhabitants that guaranteed securely by the crypted code that would avoid the intervention of third-parties—known as "Smart Contracts"—as an appealing feature. The mechanism of Smart Contracts is a term applied to blockchain such as digital rights management (Alharby and Van Moorsel, 2017). This mechanism allows a more decentralized system and a new democratic consensus among members to prevent acts of monopoly. The flow of surplus energy production will be distributed to the demanding side of district via the real-time information trade-off on the platform.

[8] *http://www.lyon-confluence.fr/en/innovating/2010-2015-wwf.html. The First Sustainable Neighbourhood in France*

Figure: Comparison of tradition chain and blockchain functioning systems



The Interplay of Commensuration

The use of big data on the two projects helps us understand the symbolic power behind the faith on the utility of big data as quantitative tools. Here we entrusted the commensuration approach to enlighten such phenomena. We recall in this part, commensuration as a concept that frames the holistic dynamism of quantitative usages. We identify the interplay of commensuration reflected on both projects at least in two important aspects. The first aspect connects directly to the intention and the definition of big data promoted by EDF in SEL and *Bouygues Immobilier* in the LLL as the solution toward sustainable energy consumption. As Espeland and Stevens explain, the ideology of quantitative tools usage is due to the power dynamisms of the agent. The back-and-forth of big data in this case are manifested in generating individual data consumption that is persuaded as the definition to reinforce the sustainability. Commensuration in this project is also reflected by the fact that big data are reviving the interest in accounting individual aspect, datafication and numbering the everyday lives of society which are the element evoked in big data phenomena. It reveals the use of big data as the "performance indicator" measuring tools. One person is comparative subject to another person through ratio, scale, and benchmarking. Such idea has given birth to the new term called "smart contracts", the trade-off among individuals within the closed system of the block. This new term describes the decentralized and peer-to-peer transfer of renewable energy.

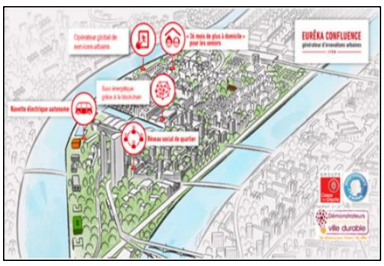
Other elements that, for the consortium, the economy of the whole set of the project lends itself to the into the stakes of market competition in the same field of business or to conquer other fields such as energy sector. The intention to uncover the potential market of individual data through R&D of industrial products, also determined our analysis of the weight of commensuration argument in the practice of Smart Grid. Accordingly, as suggested by Espeland, commensuration as technic reshapes the form of the institution. More in details from the technical view, privileging individual aspect as commensurable also reveals an indirect valuable variables (van der Vlist 2016) that could possibly being transformed into industrial marketing insight, such as quotidian personal behaviors. As it has occurred through the case of SEL, personal data will be considerably a treasury to develop other services.

We identify the second aspect of commensuration in this project is the use of big data to extend the meaning of sustainability in a broader context. This perspective wants to explain implicitly when big data as 'individual accounting tools' are applied on a given community or neighborhood would determine the sustainability label. From quantitative reductionism point of view (Gasparatos 2010; Gasparatos, El-Haram, and Horner 2008), sustainability consists of numbers of elements and 'preferable' quantitative formula, different models and scenarios and are parts of geopolitics issues (Dahan-Dalmedico 2007; Edwards 2004). Bouyges Immobilier are reducing the term sustainable of Confluence into the Big data-blockchain method that has the symbolic advantage of sophisticated algorithms formula to promote sustainability. It reveals primarily the manifestation of big data through the blockchain method, superimposed on the iconic section of the city that has already gained its "sustainable" international label from a credible organization examining the reductionism of sustainable indicators into the big data. It seems the invasion of the quantitative instrument has played a vital role to determine the image of certain space within the city.

Meanwhile the title of sustainable neighborhood that inherently embedded as the image of Confluence has two another divergent quantitative formula assessments. The value of "sustainable image" was the fruit of quantitative product of World Wildlife Fund (WWF), benchmarking of the ratio between the numbers of residents and CO^2 forecasting for 2020[9], the Confluence's CO2 emissions will not exceed those for the year 2000, despite the significant increase in the number of residents and employees. From the perspective of Lyon Metropolis, the sustainability context of Confluence is lied into the logic of economic formula. Confluence is a competitive pole that was built under the economic measure to foster the spatial productivity growth.

Confluence from Lyon Metropolis perspective

Confluence WWF Sustainable Block ratio of Co2

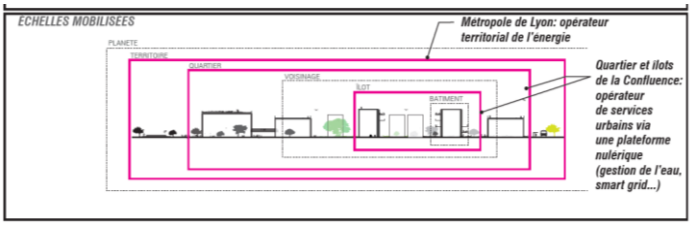


Blockchain as sustainable tools of Consortium LLL

Smart Grid Innovation project as parts of Lyon Metropolis energy (SDE) tools?

As we already explained previously, integrating the Smart Gird innovation project are parts of the negotiation between the promotor and Lyon Metropolis. The LLL are supposed to support the urban energy system through the instrument of SDE. The data exchange between the demonstrator and SDE is evoked. Perhaps, the big data dimensions in this project, particularly from the perspectives of Greater Lyon would be reflected by the fracture of the silos of the ecosystems' numeric established within the territory and the sovereignty territorial regarding the data issues (Boullier, 2015). In this perspective, the transfer of data results at the disposal of the SDE serves as a mean to leverage and to improve the efficiency and effectiveness of Lyon energy policy design.

***Figure**: The constellation of Lyon Living Lab to Greater Lyon Territorial Energy Mission, the SDE*



The current issue of the SDE was supposed to provide a quantitative tool for Lyon Metropolis to discuss the concession contract vis à vis the private actors who operate in Lyon. Despite the interest of SDE to develop Smart Grid as part of the scenarios, the SDE seems less likely to integrate SEL and LLL directly to their tools. The involve of fragmented actors, coming from different natures, thematic, and interests also posed another challenge of new mechanism of governance (Meijer and Rodríguez Bolívar 2013). Many new actors seek to employ big data on the city, sometimes in the conjunction of energy sector. The growth of numeric ecosystems within the city is inevitably leaving plenty of potentials and challenges to city municipal (Deltour and Le Gall, 2016), one of them is the growing ecosystems that being occurred within Lyon Metropolis. Thus, the governance mechanism arises upstream as important challenge to deal with.

We figured out from technical aspects, the unparalleled vision of industrial mode and the instrument of energy policy in SDE are the obstacles. The experts of SDE are reluctant to directly employ the results of SEL and LLL to the SDE, as SDE seeks different kind of business model scenarios[10]. Others, the granular type of individual data produced by the LLL are not yet to become the main concern of the SDE. Meanwhile, in terms of data ethics in big data era (Taylor 2016), *General data protection*

[9] *La Confluence Sustainable Action Plan (PAD)*
[10] *Interview with director of the SDE*

regulation France has restricted regulation to limit the exploitation of personal data. These issues practically drive to create more silos between the sovereignty of Lyon Metropolis and data flow within its territory. The term of accord that such demonstrator project could provide the benefits of city energy instrument remains a hypothetical issue. It may be premature to roughly criticize that we could not yet excavate more profoundly how big data could be a transformative tool for public policy in the energy sector. As suggested by some authors of sociology of public policy instrumentation, the choice and the construction of an instrument is an innovation, not as the simple materialization of cognitive idea, but as a dynamic, is often extracted from the chaotic situation to converge information, integration of constraints, and arbitration between divergent paths of development (Simondon, Hart, and Deforge 1989). For instance, the certainty of the close relationship between *Bouyges Immobilier* with the local actors would symbolically validate the project as recognizable by the public actors. Meanwhile for Lyon Metropolis, the presence of such actors would leverage its position as an important territory of Smart label innovation.

4. Conclusion: More "Smart City" less big data

Both projects posse similar characteristic that are being industrial-driven experiment project under the label of Smart City. Both also put big data as the core of solution to meet several expectations in one go, such as the energetic transition, the renewable energy solution, and people awareness and empowerment etc. Another common element is the faith in exploring individual data consumption as parts of the action towards more sustainable energy.

We argue specifically based on this empirical project, that primarily, big data must be classified into the sectoral issues to prevent the general conception and approach of big data in different categories of public services. The rise of various external actors interested in big data linked to the public services should not be neglected as important elements to public government. The current challenges show that the principle question has evolved. Big data have been expanded into the challenge of governance of the proliferation of different actors that contiguous big data including new model of energy sector that being attacked by the irregular actors. We contested that the utmost utility of big data were screened by the importance of Smart City' notion to be the first range of objectives. Big data itself are not as popular as the term Smart City[11]. However, big data is revelator that imply the manifold of interest and power struggle of different parties (Bourdieu 1984) at the same time, in which through these actors, big data have been transformed into a complex structure of innovation project. As for *Bouyges Immobilier*, the omnipresence of digital technologies has allowed them to expand even more on the energy sector by differentiating itself on the hybrid of construction field and the idea of smart energy building. The interest in industrial competition and the development of value added products has been very strongly induced in this project.

In terms of Greater Lyon strategy, for now the city has played an important role as reputable living platform and as the market enabler (Bourdieu 2000) of the Smart City extension into the territory. Through the two Smart Grid projects, we are witnessing the typology of Smart City model constructed by the historical actor, Edf/enedis and *Bouyges Immobilier*, but were initially non-Smart City player that became Smart City promotors, intended to tap on the energy sector. The notion of Smart City has produced the unprecedented effects of new economic transformation from various actors in other operating domains (Boulenguer and Yannick,2017). We argue this event opposes the early model of Smart City in which the primary advocates such as IBM, Microsoft, and Cisco teamed up directly with the municipality to create the so-called Smart City, for example Songdo City and the case of *Sala de Controle*, Rio de Janeiro (Townsend, 2013). Under the banner of Smart City, some parts of the city, both physical aspect and social aspect are henceforth engineered to accommodate the needs of experiments. At this stage the new dialect of the city-metropolitan as a reticular political-economic space that the new governance of spaces are emerging to produce and to proactively contribute to the needs of industrial development. We noted that Lyon absorbed 350 M€ direct investments since the last five years. The experimental projects have gone beyond big data. It is a showcase of Lyon to establish itself as a Living Platform, which is the new business models to attract more and more national and international actors in any sector. From this perspective, the city is focalizing its

[11] *Interview with meeber of SEL consortium*

entrepreneurialism model (Harvey 1989). Lyon Metropolis tends to exercise the governance model to organize multi-level actors coming from different natures of activities, at the meantime taking advantage of *image-branding* and international clustering of the city.

Eventually, big data have evolved into numbers of forms and thus the challenge, possess by big data for the government is multi-dimensional. From this case, it is not merely to produce or to grasp directly with the cascade of information. Big data are more than a significant data quantity; big data also come along with highly unprecedented disruptive impact. These phenomena bring us to the important question, do Smart City and big data elements have given rise to a new war field that would dispute the legitimate actor who govern the city? particularly the city municipal as the historic city manager.

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