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**When meters start to talk: The public's encounter with smart meters in France**

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ABSTRACT

Efficiency targets proposed as part of international commitments to reduce CO2 emissions include future changes in individual patterns of energy consumption. This goal is presently being addressed in France through the installation of smart meters. Considering that public resistance or blatant opposition could jeopardize the grid modernization in the whole country, this study focused on the responses of groups of citizens from the two French communities where the new meters were first installed: Château-Renault (rural) and Lyon (urban). This study used the method of reconvened focus groups to inform policymakers about the reasoning of citizens in this situation. The discussions and the material generated by the groups provided very concrete elements on how the participants tried to make sense of the meter device itself and the policy goals, in relation to their daily and social life. The exchanges between participants seemed to fit into three main dialogical pairs, or themata: collective vs. individual (daily life); private (my behaviour) vs. public spheres (others' behaviours); and consumption: individualist vs. collectivist. The collective elaboration throughout the group sessions reinforced the empowerment of the groups and led to considering more collectively-oriented approaches in contrast to the prevailing individualistic lifestyles.

*Keywords*: smart meters, smart grid, pilot projects, France, stakeholders, social representations, themata.

## 1. INTRODUCTION

Since 1990, CO2 emissions in Europe were reduced by 19% while wealth production increased by 45%. Today, Europe is one of the first world economies, generating only 9% of global anthropic emissions, against 24% for China and 12% for the USA. Consistent with its sustainability-orientated policy, the European Commission has set in 2009 as a goal that before 2020, 80% of all Europeans households have access to electric smart meters, reaching 100% by 2022. Following these European sustainable ambitions, France engaged a nation-wide program in that direction (Poumadère et al., 2015a).

These sustainability-oriented programs include, among other issues, changes in the way we, as a society, are able to produce energy and how efficiently we consume it, through 'Demand Side Management' (DSM) for example. Still, the way electrical power systems are designed presents various barriers that have slowed down the adoption of these changes. These barriers can be associated with (1) operational issues, (2) technological issues, and the (3) slow innovation cycle existing in the electricity industry.

At an operational level, a well-functioning power system requires that the balance between energy production and consumption must be kept within a very narrow margin at all times (Kundur, 1993). This particular constraint directly affects energy prices due to the supply and demand effect, thus creating 'peak hours' (when the aggregate energy use is high) and 'no-load hours' (when aggregate energy usage is low). Expensive generators are required to provide for the increased energy production in the peak hours. For example, in the Mid-Atlantic States, 15% of the generation and transmission capacity is used during 1% of the time to meet exactly the peaks in demand (Spees & Lave, 2008). This example shows how until recently,

the production-consumption balance was only kept by the producers. Demand-side management (DSM), on the other hand, allows this balance to also be kept by the consumption side through the possibility that consumers adapt their energy consumption as a response to the 'real time' energy price. This type of self-regulated system would also insure less risks of blackout, less expensive fares and an overall more reliable system (Siddiqui et al, 2008).

Moreover, a technological barrier also kept domestic users from willingly shifting their consumption away from peak hours: their mechanical counter with manual data collection. This kind of energy measurement only allows the feedback of a household's consumption on a large, pre-defined temporal base (e.g. each month, semester, etc.), being therefore impossible for the consumer to account for hourly shifts in energy fares. This is why the application of 'Information and Communication Technology' (ICT) to the energy metering process has enabled an increase in the implementation of renewable energy, an improved power system efficiency, and a reduction in costs involved in operation and infrastructure expansion. Nevertheless, the power system industry is still known for its 'slow innovation cycles' – lapsing decades or even centuries (Hughes, 1983).

### 1.1. SMART METERING AND CHANGES IN ENERGY CONSUMPTION

Smart meters therefore play a pivotal role in Europe's achievement of its energy efficiency goals. The real-time display of household energy consumption can provide a feedback loop to consumers in terms of their real-time energy consumption and in terms of the applied billing rate (Darby, 2012; D'Oca, Corgnati, & Buso, 2014; Hargreaves, Nye, & Burgess, 2010), along with the information they need to shift from peak-hours to other times, when the use of electricity is cheaper.

But these possibilities for the collective change in consumption monitoring and shifting energy use to off-peak times will only be effective if people indeed accept the installation of smart meter devices and engage in changing their energy consumption behaviour. Great insight into how successful the installation of smart meters and 'in-home display' (IHD) devices has been in fulfilling energy efficiency goals is gained from studies describing the reduction of energy consumption through real-time feedback (D'Oca et al., 2014; Hargreaves et al., 2010) and the smart meter roll out in different countries (Mah, Wu, Ip, & Hills, 2013; Naus, Spaargaren, Van Vliet, & Van der Horst, 2014).

All of these studies demonstrate the positive gains of reinforcing energy efficiency, contributing to the overall positive image of these devices (D'Oca et al., 2014; Goulden, Bedwell, Rennick-Egglestone, Rodden, & Spence, 2014; Krishnamurti et al., 2012; Langheim et al., 2014; Mah, van der Vleuten, Hills, & Tao, 2012). Moreover, in general, technological innovations tend to be positively reported on by the media, which is associated with the valorisation of information or technology labelled as scientific by western societies (Bertoldo, Mays, Poumadère, Schneider, & Svendsen, 2015; Sorell, 2013).

However, once these innovations are actually implemented, people might react in a different way than was initially expected, as it has been extensively observed in the case of wind energy (Batel & Devine-Wright, 2014; Devine-Wright, 2009). And considering that smart meters and DSM – in contrast to other efficiency measures – involve communities' behavioural response in terms of shifts in consumption, it is particularly important to better understand communities who use these new meters, and how they make sense of, represent, and domesticate this new technology (Aune, 2007; Ryghaug, Sørensen, & Næss, 2011; Silverstone, Hirsh & Morley, 1992). By

providing information about people's consumption that would not be available otherwise, smart meters are able to challenge deep-seated habits and implicit consumption beliefs.

This is why the installation of these devices constitutes an interesting opportunity to gain insight into the concrete and abstract drives – beliefs or material constraints – behind energy consumption routines. One of these drivers are the empirical constraints people find in their everyday experience (Marres, 2012); the others are the social representations, core ideas and values actualized by these practices (Moscovici, 2008). A main advantage in considering both the abstract and the concrete levels of everyday experiences is that "knowledge (…) needs to be *enacted* in everyday life, and this enactment involves articulation of positions with respect to truth and falseness of knowledge claims but also considerations about how to act on the perceived challenges" (Ryghaug et al., 2011, p. 781, italics added). Social representations can therefore be considered as meaning-drivers for our everyday, concrete experiences.

This paper proposes an in-depth analysis of how people living in the first French localities to be equipped with the new 'smart' energy meters exchanged in groups and made sense of these novelties in their concrete, everyday lives in a French context. As a theoretical framework for the analysis of the focus groups' material, we will use the social representations approach.

## 1.2. SOCIAL REPRESENTATIONS: HOW PEOPLE BECOME FAMILIAR WITH UNFAMILIAR ISSUES

The social changes initiated by the new international policy and technologies conceived for reducing carbon emissions (Baker, 2007; Buijs et al., 2012; Poumadère,

Bertoldo, & Samadi, 2011) have influenced the incentives and the implementation of renewable energies on different levels over the last decade (Barnett, Burningham, Walker, & Cass, 2012; Batel & Devine-Wright, 2014; Brondi, Armenti, Cottone, Mazzara, & Sarrica, 2014). These changes are being generalized on a legal level (Castro, 2012) but still face resistance and contestation at the local and concrete level (Castro & Mouro, 2011), revealing the difference between the response of the 'real' public and the 'imagined' public, whose response is anticipated by policymakers (Barnett et al., 2012; Castro & Mouro, 2015).

The social representations approach focuses on how this 'real' public understands and makes sense of scientific, technological, cultural or legal innovations through common sense rationality (Moscovici, 2008). During the process of knowledge appropriation, and in the goal of reconstructing the new object in socially meaningful terms, laypeople often resort to metaphors and images that may have little to do with the original scientific concepts (Wagner & Hayes, 2005). In this sense, the social representations approach opposes a 'deficit model' approach, which aims to understand the process of science popularization as the introduction of biases and misunderstandings in what is considered to be the rightful comprehension of scientific theories. On the other hand, social representations are conceived as mediators "between the science world and the life world, bridging the 'gap' by transforming expert knowledge into hybrid forms drawing on both science and the life world" (Bauer & Gaskell, 1999, p. 166).

From a dialogical perspective, meaning making is often organized through pairs of opposed meanings (Billig et al., 1988; Marková, 2003). According to Moscovici and Vignaux (2000), these dual pairs, or *themata* (i.e. good vs. evil; dirty vs. clean,

etc.) structure the way we conceive our worlds, serving therefore also as a basis for analysing representations.

### 1.3. THE PRESENT STUDY

Drawing from the concepts of domestication (Aune, 2007; Silverstone et al., 1992) and social representations (Moscovici, 2008), in this paper we will analyse how some of the first French households to have received the new smart meters make sense of these devices and, as such, resource to dialogical pairs (or themata) and actualize them in their everyday, concrete experiences (Marres, 2012).

The importance of analysing the public reasoning and the empirical response to a certain technology lies in the early identification of discrepancies in relation to the response expected at the policy level and what could improve the implementation of smart grid projects on a greater scale (Barnett et al., 2012; Mah et al., 2013). Concerns raised by smart meters' early adopters include, for example, health concerns with wireless transmission (Hess & Coley, 2012), privacy issues (Naus et al., 2014), cost concerns, and trust in the involved institutions (Balta-Ozkan, Davidson, Bicket, & Whitmarsh, 2013).

Building on previous experiences of smart meters' rollout and how they were able to alter citizens' daily lives (D'Oca et al., 2014; Hargreaves et al., 2010; Naus et al., 2014), this article proposes an in-depth analysis of how people living in the first households in France to be equipped with the new 'smart' energy meters make sense and respond to these novelties in their real, everyday lives. The primary aim of this study is not to describe how smart meters may influence their attested behaviour, as this has already been analysed in previous studies (see D'Oca et al., 2014; Hargreaves et al., 2010; Naus et al., 2014). Our focus is directed to the meanings and

representations activated by participants when brought to reflect on their empirical experience with these devices (Marres, 2012; Silverstone et al., 1992) during a pilot implementation of smart energy meters in France. More globally, this type of research can help support the endeavours of public policies targeted at future reduction in carbon emissions (Skjølsvold, 2014) based on concrete, real-life settings (Horlick-Jones & Prades, 2014).

Considering the different energy needs and related behaviour in a rural or urban household, the study involved participants from localities with contrasting socioeconomic characteristics and energy needs: Château-Renault (rural area) and Lyon (urban area). This study used the reconvened focus group method to inform policymakers about "something of the informal, real-world, significance of sustainability-related policy issues for target groups of consumers in specific settings" (p. 2, Horlick-Jones & Prades, 2014). Let us now explore the context in which the first smart meter pilot was implemented in France.

## 1.4. CONTEXT OF THE STUDY IN FRANCE

This research was conducted in cooperation with two French institutions directly involved in the smart meters implementation: the General Council for the Environment and for Sustainable Development (*Conseil Général de l'Environnemment et du Développement Durable*, CGEDD), which is part of the Ministry of Ecology, Sustainable Development, and Energy (*Ministère de l'Écologie, du Développement Durable et de l'Énergie*, MEDDE) and the French Electricity Distribution Network Operator (*Electricité Réseau Distribution France*, ERDF). In the sequence of the French compromise to reduce its greenhouse gas emissions by four by 2020, energy efficiency measures – for instance, correctly stimulating changes

in lifestyle and energy consumption through smart meters – also became a central political issue (ERDF, 2015; Poumadère et al., 2015a). *Linky* (how the French smart meter was baptised) can therefore be considered to be both a technical issue (dealt by the ERDF) and a public policy instrument at the same time.

ERDF manages the public distribution network of electricity in 95% of French continental territory, and is also a subsidiary of the French electricity producer (Electricité de France, EDF). One of the goals of ERDF is to control the electricity consumption of their clients, and for this reason it has been charged with the mission of implementing and testing a new smart meter system. If this pilot deployment validates the technical choices made by ERDF, the deployment will be generalized all over French territory with some 35 million meters to be installed over several years.

As part of this trial phase, a pilot rollout concerned both sites: a rural area (including the town of Château-Renault) and a major urban context (Lyon), where about 250,000 French citizens had received the new Linky meters. During this period, the contracts and billing system remained the same for households disposing of smart or analogue meters. Households were not charged for the new meters. However, some newly equipped participants reported changes in their bills (either higher or lower bills), which the electricity company attributed to the better and more accurate performance of the new meter. Among the new functions of the smart meter is a monthly bill that actually corresponds to a month's consumption – in contrast with the previous billing system dividing a forecast of a whole year's consumption over 12 months. Moreover, participants are able to keep track of their real-time consumption in kWh, but also in euros – variable according to the electricity contract. The new meters have substituted the old analogue meters and have hence been installed in the exact same location that is often away from the main living areas of the house. During

this first trial, 'in-home displays' (IHD) were not installed, thus policymakers were curious to know the groups' opinion on this issue.

This first trial constituted an important test of ERDF's economic and procedural hypothesis. Soon after this experiment, on September 28th 2011, the government decided to generalize the project to the whole country: at a final stage, 35 million Linky meters would be installed in France by 2020 (ERDF, 2015). This decision was partly based on the conviction held by policymakers that citizens would alter their electricity consumption in response to the real-time feedback about their consumption. Considering the political and strategic importance of this trial, our research group, together with policymakers, were especially interested in how households equipped with new meters were integrating it into their daily lives: how did these communities make sense and relate to the new meters?

## 2. METHOD

Pro-environmental beliefs and behaviours are often estimated through self-assessments. One of the outcomes of this desirability bias is the already classic belief-behaviour gap where participants present high environmental concerns but, on the other hand, fail to fulfil them by concretely putting them into action (Vining & Ebreo, 2002). In this sense, the lack of correspondence between the attested and the actual behaviour *per se* can be quite important when the concrete conditions under which these intentions are actualized and taken into account (Aune, 2007; Gram-Hanssen, 2010). And "we might go so far as to say that respondents to research questions are 'playing a different game' from when they are engaged in getting on with the mundane tasks entailed in their everyday domestic lives" (p. 3, Horlick-Jones & Prades, 2014). Considering that the objective of this study was to better understand

how these new meters have been domesticated (Aune, 2007; Silverstone et al., 1992), and have triggered social representations based on their real everyday experiences (Bauer & Gaskell, 2008), we needed a method that would facilitate our access to *meaning making,* yet without losing sight of how participants *concretely* experience these smart meter devices (Marres, 2012). This is why focus groups would provide an insightful and manageable way to immerse the research group into the exchanges and meaning-making efforts made by the participants about their new practices (Horlick-Jones, 2008; Horlick-Jones & Prades, 2014). And in order to assure a greater insight about these participants' daily lives, group participants have also filled in diaries on a daily basis for a given period of time, as we will explain in the procedure session (see Horlick-Jones & Prades, 2014).

### 2.1 PARTICIPANTS

Three reconvened groups with nine participants each were organized. One of these groups met in the rural village of Château-Renault and the two others in the urban city of Lyon. A private research institute conducted the recruitment of participants based on an extensive list of households having received the smart meter. The profile of groups was as diversified as possible in terms of age, gender and occupation (see Table 1). Specifically in Lyon, one of the groups gathered participants around their 20's, and another group, around their 30's. This difference aimed to illustrate the diversity of needs that could be more specific to different family compositions (e.g. with or without children at home).

Table 1: *Composition of the three reconvened groups*

| | **Gender** | **Age** | **Occupation** | **Family Situation** |
|---|---|---|---|---|
| *Group 1, Château-Renault (rural area)* | | | | |
| | Man | 40 | Manager | Married, one ten-year-old child |
| | Woman | 30 | Employee | Single, two persons at home |
| | Man | 36 | Factory Worker | Married, one seven-year-old child |
| | Man | 42 | Production Manager | Married, two teenagers (13 and 16 years-old) |
| | Woman | 60 | Cook | Single |
| | Man | 70 | Retired | Married, two adults at home |
| | Man | 72 | Retired | Married, two adults at home |
| | Woman | 62 | Retired | Single, six children who have left home |
| | Woman | 65 | Retired | Single |
| *Group 2, Lyon (urban area)* | | | | |
| | Man | 27 | Buyer | Two adults home |
| | Man | 31 | Lawyer | Single |
| | Woman | 26 | Art Director | Single |
| | Man | 28 | Manager Computer Safety | Single |
| | Woman | 28 | Computer Marketing Specialist | Single |
| | Man | 30 | Management Controller | *** |
| | Woman | 28 | Medical Secretary | Single |
| | Woman | 25 | Nurse | Two adults home |
| | Woman | 35 | Psychomotor Therapist | Two adults home |
| *Group 3, Lyon (urban area)* | | | | |
| | Woman | 24 | Sales Manager | Single |
| | Man | 33 | Cartoonist | Two adults home (expecting newborn) |
| | Man | 38 | Company Manager | Single |
| | Woman | 32 | Accountant | Single |
| | Woman | 36 | Unemployed | Two adults home |
| | Man | 33 | Audio-Visual | Single |

| | | | |
|---|---|---|---|
| | | Engineer | |
| Woman | 41 | Employee, Insurance Company | Married, two children (three and seven-year-old) |
| Man | 38 | Free Lance Photographer | Flatshare (two adults home) |

Despite their variability, three small groups with a total of 26 persons cannot claim to be representative of the larger French community. The aim of this approach of reconvened and heavily instrumented (individual diaries, exercises and feedback, group interaction) is in-depth reasoning and elaboration. When questioned during the final debriefing session about the representativeness of this study results, participants responded that it was representative of the way they see the situation.

## 2.2 PROCEDURE

The method used in this study corresponds to the combination of different methods supporting a systematic exploration of the participants' casual exchanges about electricity consumption within the group, without losing sight of their reflections with other family members, or common constraints emerging from their everyday household life (e.g. Naus et al., 2014).

More concretely, this combination of methods consists of three distinct focus groups with different participant composition, each group meeting in three different occasions (see Table 1). During the 15-day interval between meetings, participants had to fill-in a diary over a whole week (Horlick-Jones & Prades, 2014). Participants would provide the team with two one-week waves of daily questionnaires: one after the first group session and the second after the second group session. In these diaries, group participants could make notes about tangible actions taken in relation to their electricity consumption, e.g. consulting the smart meter display; turning off electrical

appliances so that they will not be on 'stand by', controlling the heating, using a timer-socket for some appliances, etc. The third and final group sessions were the moments when the group achieved the greatest maturity in their reflection about the issues explored, with participants engaged in deep-seated reflection about their own daily lives and how they could benefit from insights from the other participants. Dairies were available for participants either on an online platform, easily accessed by the urban population from Lyon, or in paper booklet for part of the rural participants from the Château-Renault village[1].

Diary completion therefore had a very important role in reminding participants of how their habits and household appliances can impose constraints to their energy efficiency goals. Diary keeping was approached in the context of this study as a way to overcome the gap between what participants 'say they do' and what they 'actually do' (Vining & Ebreo, 2002). "We hoped that completing the diaries, and then discussing them during group sessions, would provide a concrete linkage between the participants' daily routines and their accounts of those practices" (Horlick-Jones & Prades, 2014, p. 6).

Some information was provided by ERDF to newly equipped citizens about the implementation of the new meter and its functionalities. It was however expected that some participants either had not received the information, or no longer recall having received it (see Poumadère & Bertoldo, 2010). So as to assure that all participates disposed of a common ground of information about the new meters, they received a

[1] Participants were compensated for their participation with a sum of €140, paid half at the first session and the second half after the last meeting. During debriefing, participants commented that this was very little money compared to the heavy work they had to perform, but they were glad to have taken part in the study which they found appealing as they hoped to have contributed to exploring new ways towards more sustainable consumption.

simulated newspaper article (Figure 1) especially prepared by the research team for the occasion. Similar procedures of simulated news articles before focus group discussions have already been used in risk management research (Poumadère et al., 2015b) and also in the smart meters domain (Goulden et al., 2014).

**Echos du Territoire**, Janvier 2012

# Linky est arrivé

## *Le compteur communicant sera-t-il un bon pédagogue?*

De notre correspondant **Etienne Lefébure**

*Moi aussi j'en ai un chez moi, on ne peut pas le confondre avec l'ancien, il est jaune !*

*—Tu le vois jaune ?! Je trouve plutôt qu'il est vert, un vert anisé ».*

Cette discussion entre voisins ne concerne pas un apéritif mais Linky, le nouveau compteur électrique installé sur une fraction du territoire français. Et si sa couleur retient d'abord l'attention, il possède de nombreuses caractéristiques qui nourrissent les discussions.

Déjà, il ne s'agit pas d'une initiative française isolée : la Commission européenne a en effet proposé que 80% des foyers européens aient accès, avant 2020, à des systèmes communicants permettant de varier les tarifs en fonction de la consommation, de faciliter la concurrence et de maîtriser la consommation d'électricité. Et les Etats de l'Union européenne doivent procéder, avant le 3 mars 2012, à l'évaluation technologique et économique d'un dispositif adapté à cet objectif.

### phase expérimentale

En France, la phase expérimentale actuellement conduite par Electricité Réseau de Distribution France (ERDF, filiale d'EDF) comprend plus de 250 000 compteurs, installés à Lyon et en Indre et Loire. En fonction du bilan de cette expérimentation, ce sont 35 millions de compteurs électriques qui seront remplacés sur une période de 6 à 7 ans.

Pour ERDF, les avantages offerts par Linky sont clairs: la réalisation à distance et en moins de 24h d'interventions telles que le relevé des compteurs, le changement de puissance, ou la mise en service, simplifie ont la vie des clients.

De plus, Linky fournira des informations qui devraient permettre au consommateur de faire des économies. Donc tout serait rose —pardon, vert anisé —au pays de Linky ? Pas vraiment, si l'on considère les questions qui soulèvent des controverses.

Le coût du nouveau compteur et de l'installation d'abord : qui va payer ? Si les avantages du compteur communiquant pour le consommateurs sont annoncés, ils existent aussi pour ERDF : les opérations à distance représentent des gains opérationnels, de même que la réduction des fraudes.

Une rumeur a pourtant circulé un temps, mettant Linky à la charge du client : 230 euros lors de l'installation de Linky, ou sinon le coût du nouveau compteur communicant serait progressivement intégré dans les factures d'électricité. Mais les pouvoirs publics ont coupé court à ces rumeurs et confirmé la gratuité de Linky.

### mieux gérer sa consommation ?

En revanche, l'incertitude demeure quant à l'équipement en aval du compteur, permettant justement à chacun de mieux gérer sa consommation pour faire des économies. Il est vraisemblable que cet équipement supplémentaire sera à la charge du consommateur. Outre son coût, cet équipement sera-t-il pratique et efficce ?

Il serait par exemple nécessaire d'afficher la consommation en Euros, voire en contenu de $CO_2$, et non plus seulement en kilowattheures, avec des fonctions de mémorisation et de comparaison, pour aider le consommateur à s'orienter dans ce qui sinon risque de ressembler à une "jungle tarifaire". Vaut-il mieux pour cet affichage un écran spécifique déporté dans une pièce du domicile, des écrans déjà utilisés (télévision, téléphone mobile), ou un accès à sa consommation via Internet ?

Un autre niveau de préoccupation concerne les garanties de confidentialité des données recueillies par ERDF. Linky ne devrait pas devenir un "mouchard" ou un "Big-Brother" par trop intrusif dans la vie privée des ménages.

Le pari de base est donc que l'information précise et disponible de façon quasi constante (à terme, la consommation de chaque appareil pourrait être connue) va inciter le consommateur à faire des économies d'énergie: par exemple, en évitant de surchauffer (passer de 22° à 18° permet de vraies économies), éteindre les appareils en veille, choisir les meilleures périodes tarifaires.

Ce sont autant de *nudges*, ou "coup de pouce", qui permettent à chacun de s'engager dans un comportement actif dans sa vie quotidienne, tout en allant dans le sens de l'intérêt général et le long terme: les économies d'énergie font partie des stratégies de lutte contre le changement climatique et ses conséquences menaçantes. Il s'agit donc de comportements vertueux et d'une situation gagnant-gagnant pour les parties-prenantes.

### clarifier les controverses

Un Comité Linky, placé sous l'autorité du ministre de l'Intérieur, s'emploie à clarifier les controverses. Mais, passé le moment de curiosité pour cette nouvelle technologie, le consommateur ne risque-t-il pas de reprendre ses habitudes anciennes ? Quels aménagements concrets peuvent contribuer à pérenniser les comportement contribuant à une consommation durable ?

Les compteurs communicants constituent certes une avancée technologique, mais un communicant n'est pas forcément un bon pédagogue: reste maintenant à davantage dialoguer avec les citoyens pour les associer à la définitions des pratiques qu'ils se voient mettre en œuvre dans leur vie quotidienne. n

*Figure 1:* Fictitious journal article distributed in the beginning of each discussion group (translation of some exerts to English in annex).

The initial results of the first group meeting, along with the first wave of dairy questionnaires were reported to our partner policymakers. These briefing sessions with policymakers were strategic to either validate (or not) their previous assumptions about the attitudes towards smart meters. They also represented an opportunity for policymakers to suggest new issues for discussion in the group. One of these issues was for example the cold spell that hit France in February 2012. The abnormally low temperatures for the season were the perfect opportunity to discuss issues related with house insulation and heating. Group participants in Lyon were given thermometers to measure the temperature in the different rooms of their house at a given day and time.

Small group research has shown how interactions (e.g. through associative chains) generate insight and content that go deeper and beyond each individual vision (Bales, 2002). Thus we globally approach the data as a result of the creative encounter with the smart meter made possible by the group setting. The small group format, exercises and social interactions certainly provided the setting, which led to greater awareness. However, the new meter is no small event: as a technological object, it replaces the old meter which has been around for quite a long time; the role associated to the new meter is meaningful (energy savings, sustainable consumption, climate, etc.). Therefore the new meter, as a personal and social experience, condenses the latent meaning that is collectively unfolded and elaborated in the group setting. The group activities would therefore facilitate the construction of new meaning that would probably be different from the participants previously held ideas and more tuned into the groups' exchanges and concerns enhanced by the meetings (see Staats, Harland, &

Wilke, 2004). Therefore, when participants are asked to consider the possible usefulness of the meter, they would end up collectively – after informing each other of his/her own private 'concrete' experience – combining a rather complete set of functions that characterize smart meters as an instrument of public policy. Furthermore, the repeated group interactions fuelled by data stemming from the individual diary and several group exercises, led participants to reach a deeper level of reflection and analysis about their own private energy consumption patterns that would hardly have been possible outside of a group environment.

### *2.2.1 DATA ANALYSIS*

All group sessions were audio recorded and photographed, and discussions were fully transcribed before data analysis.

The groups' content analysis provided very tangible elements of the relation of these groups with (1) the meter device itself (e.g. how to visualise one's personal electricity consumption); (2) sustainable consumption in general (with other related concerns, e.g. public transportation in a rural area) and with (3) daily life events (e.g. the cold spell of February 2012 and the resulting peak consumption). Given the exploratory nature of the study, the categories used to analyse the content of group discussions were data-driven (Flick, 2014). In a meta-analysis of these initial categories, it soon became clear that they formed pairs of opposites, corresponding to the description that Marková (2003) makes of the dialogicities and basic oppositions that structure social thought (Billig et al., 1988; Marková, 2003; Smith & Joffe, 2012): collective vs. individual (daily life); private (my behaviour) vs. public spheres (others' behaviours); and the consumption model: individualist vs. collectivist.

## 3. RESULTS

In reaction to the fictitious journal article describing the new meter and the main goals of the national deployment program (Figure 1), participants provided observations relating to the meters' installation. These issues were mainly related to some differences they remarked in their electricity bills since the new meter started functioning. For example, these participants expressed different positions in relation to the 'increased accuracy' of their meters.

> *"I have decreased my bill from about 60€ to 40€ per month, which corresponds to great savings. I don't know if this is related to Linky, but looking at the dates, it does correspond!"*
>
> *"My electricity bill has increased by about 150€ because of Linky. So I had to complain. Of course I did not have to pay that amount, but it took me about 3-4 days, 3-4 phone calls."*

This difference between the rate participants used to pay for their electricity before and after the meters is probably due to improved bill accuracy (Krishnamurti et al., 2012). Electromechanical meters tend to run slower with time, which may underestimate actual household consumption. This is described by Krishnamurti et al., (2012) as one of the possible risks associated with the installation of these new and more precise meters.

Another general issue initially raised by group participants is that they largely ignored the functionalities of their new meter. Before the first group meeting, about half of the participants had never looked at the new smart meter which replaced their old one – often installed outside the household. Participants affirmed they lacked

information about these devices and that the fictitious journal article contained information that should have already been made available to them, for instance, at the moment of the new meters' installation. The quotation below expresses this concern.

*"I said to myself: they were just refurbishing the stair cage, and also installing new nice green meters, but I completely ignored the interest of such a meter. Then here (during the group sessions) I learned we could use it for something!"*

Participants rarely mentioned information being given to them by ERDF when their old meter was replaced. This does not mean they had not received the information, they simply cannot remember (Poumadère et al, 2015a). In the course of the group debates, some of them recalled having received letters and notices. And one moment seemed to be clearly remembered by the majority of participants: the visit of the technician that installed the meter.

> *"The technician presented himself and went on saying that he was going to replace the meter. I let him do it. No information was given. He put in his small green case and did not explain anything else. The idea of being able to follow one's own consumption is very good, but knowing that we don't have any information…!".*
>
> *"My new meter is installed in my house, I can access and see it. The technician who installed it had also showed me how to access it. I can't change a thing, but being able to see my own consumption is already a good thing".*

Overall, these contents demonstrate to what extent participants feel they could have made a much greater use of their smart meters if they had been adequately informed, at the right moment. Studies about electricity savings suggest that practical information tailored to a specific household, provided by a technician for example, is very effective in performing enduring changes in electricity consumption behaviour in general (Abrahamse, Steg, Vlek, & Rothengatter, 2005; Gram-Hanssen, 2010). Considering that the visit of the ERDF technician to install the meter was the moment of contact with ERDF that participants remembered most vividly, this could possibly be regarded as a strategic moment to deliver information about electricity consumption tailored to each household.

After the groups voiced these first ideas about the new meter and about the way ERDF was managing information, participants started to tackle the issues behind the smart meter *per se*, and about energy saving practices in society. These sense-making efforts often resorted to collectively shared dialogues organised in pairs of opposites (Marková, 2003; Smith & Joffe, 2012). We will present below the three main pairs of opposites we could identify in the group discussions during the three meetings: collective vs. individual (daily life); private (my behaviour) vs. public spheres (others' behaviours); and the consumption model: individualist vs. collectivist.

### 3.1. COLLECTIVE VS. INDIVIDUAL (DAILY LIFE) CONTEXTS

The possibility of saving money from a more direct observation of their consumption patterns through the direct feedback provided by the meter appears to greatly encourage participants to engage in energy efficiency or saving practices. The quotations below illustrate this type of motivation to change one's behaviour for 'a greater cause':

*"As for me, if someone tells me do it like this, it will be better for everybody' I do it, there is really no problem at all. Unless it keeps me from living, but there is always some flexibility".*

*"When I say for the future, I mean that if we're making an effort to reduce our consumption, it better be sustainable so that it has a real impact on the future".*

The majority of participants shared this type of positive attitude towards sustainable consumption in general, accepting their own responsibility in the process. However, these arguments were soon opposed to or limited by numerous constraints faced by participants in their everyday life. Even more than their electricity consumption, they must manage their family, work and social lives:

*"(Barriers are) the lack of time to pay attention, the children that we can't watch all the time, the cold, the collective heating that we cannot control…"*

*"My greatest barrier is when I have other worries in mind. In these moments I am much less attentive to my energy consumption"*

More practical issues have been raised in the week following the participants' task of measuring the temperature in the different rooms of their home. Precisely during this week, a major cold spell hit France, reinforcing participants' group reaction regarding their own basic needs being a priority.

*"We are told all the time to pay attention to our energy consumption. But we are cold! We are told: lower down your temperature. I am already at 16º, and I am not reducing more than that!"*

The acknowledged importance of reducing energy use, and at the same time the real life constraints that reduce the possibilities of saving behaviour, are a recurrent argumentation topic among participants. This limitation of one's motivations at an individual level has also been raised by previous studies having analysed this paradox in relation to concrete behavioural changes in relation to climate change (Smith & Joffe, 2012) or as a response to the consumption feedback provided by smart meters (Goulden et al., 2014). This individual and more concrete counterpoint is even more important when these changes (e.g. smart meter implementation) are situated in the social dynamics of the domestication of this space (Aune, 2007). Social dynamics present in families with different compositions (e.g. small kids, adolescents, mature couples, etc.) can differ significantly in how they are able to adjust their consumption behaviour, change only to a certain extent, or simply completely ignore the change propositions (Gram-Hanssen, 2010). This result demonstrates how policymakers should be attentive and sensitive to the different constraints for behavioural change present in different family configurations.

This dichotomy between what is desirable and what is concretely possible was then completed by a second dialogical pair, the one found between the knowledge of one's own efforts for the 'common good', and the uncertainty about what is being done by others in general.

### 3.2. PRIVATE (MY BEHAVIOUR) VS. PUBLIC (OTHERS' BEHAVIOURS) SPHERES

Different lines of argument were proposed by participants when trying to give meaning to responsibilities in terms of energy efficiency that can be perceived as either private or public. Participants insisted on the importance of a broader societal framework in which certain roles and responsibilities could be attributed. For instance, commercial and public sectors are expected to display exemplary behaviour in terms of energy efficiency – avoidance of energy waste related for example to the sometimes useless illumination of some streets, of public monuments, and of offices. This preoccupation with the example that is being provided by public institutions is present in the quotations below.

> *"This is a national and political issue: I don't think it's up to the consumer… to me, when the motivation is national and political, it becomes way more generalized. I will be motivated when the public sector will do something. And I don't think this is the case…".*
>
> *"But really, collectively speaking, can we make the right decisions? Developing the technique that will favour our energy saving; stopping stupid decisions, shutting off the lights of shop windows that are on all night for nothing, of banks?".*

Considering that up until now there is no individually binding regulation for energy efficiency at home, participants anticipate that their isolated efforts might come to nothing "*as long as the neighbours continue to waste*". Therefore, group

discussions started to focus on a way to find a 'common binding frame' so that a larger number of people would alter their behaviour in the desired way:

> *"I think it should initially be imposed. If a real concern over our electricity consumption does indeed exist, it should be imposed to everybody, at the same time – what time to start and what time to stop – all over France".*

This type of top-down, individually binding proposition has initially been justified by the electricity savings it could generate. However, it has soon met the groups' resistance when other participants started discussing the ways through which this mandatory energy-saving practices should be operationalized – e.g. if fines or incentives should be applicable or not. Overall, groups opposed any type of coercive approach (e.g. fines for excessive home heating, discussed in analogy to over-speeding on the road), and were at least sceptical about alarm systems designed to alert households about, for example, energy fare shifts or blackout risks. Finally, participants strongly fear the possibility that the price of electricity might be overcharged during peak hours as a measure to reduce consumption during these times of the day. The arguments used to oppose control practices over the private sphere are illustrated by the quotations below.

> *This upsets me… I think this is… especially the fact of receiving an alert telling you when it's the time you can start consuming and all, this makes me think of movies like "Gattaca" or "1984". It is heavy policing!*

*"About this idea of making people pay more for their electricity: if we may have to come to that point to make people aware of its importance, it would be a shame..."*

*"There is a peak in consumption at 19h but why? Because people get off work at about 18h, 18h30 (...). It is definitely not our responsibility to pay more because we are all consuming at the same time!"*

In the previous section, we have seen that the frontiers between the two poles of the dialogical pair individual/collective are rather negotiable since some types of households can easily adopt changes in their consumption patterns (Gram-Hanssen, 2010). On the other hand, the tensions between the private/public spheres seem to raise more apprehension, as they evoke the fear that participants' private lives would be monitored and controlled. Electricity consumption is still regarded as something private, where the government or other agencies should not attempt to control or be fully aware of. These contents and preoccupations are in line with one of the main concerns that Balta-Ozkan et al. (2013) identified in the public sector. Future research might examine if the home regulation of electricity consumption remains in the private domain, or if public control becomes more acceptable by consumers.

Even if these concerns are real and represent a problem for participants, towards the end of the group sessions they started to shift the focus of the debate to an even greater issue and a possible solution that would surpass these previous concerns. This debate started to concentrate on the opposition between two different consumption paradigms that coexist today in our western societies: individualistic or collectivist.

## 3.3 CONSUMPTION MODEL: INDIVIDUALIST VS. COLLECTIVIST

Another point that emerged several times in the discussion is our modern individualistic consumption model that is designed to make individuals consume more and more. Participants have raised criticism in relation to how our current consumption-driven societal structure has made them dependant on a kind of hyper-consumption, to which they cannot react as individuals. The quotations below illustrate participants' ambivalent position regarding their unsustainable – and at the same time inescapable – role as consumers.

> *"So we must be stopped being pushed towards consumption. We live within consumption. Ever since we are born, we are pushed towards consumption. Kids that are entering school already have a cell phone, that's ridiculous".*
>
> *"The culpability is not well-placed here, I don't agree when I hear 'you consumers you should do this, and that' and when we take a look at the packaging (...) and I have not asked to have tomatoes for sale during the winter, and there they are though".*

Participants frequently questioned the consumption-production pair, especially considering the nuclear-dependant French energy production context. In this sense, energy production, or even its overproduction can be seen as the *cause* of, rather than individuals' collective response to, a growing energy consumption demand.

Moreover, participants go as far as questioning the comfort that is often associated to the 'modern' electronic appliances. The options that come as default on these products, such as the 'stand by', are not thought to meet the consumers' needs and save energy at the same time. Aware of some of the difficulties the industry imposes on them to save energy, participants feel lost about what they should be doing to save energy in an efficient way.

*"Technically there are lots of home appliances that keep us from saving money simply because of their design. They have not been initially thought of to save energy, it can be dangerous to make them do it and it can reduce the products' life span. They have not even been produced to be turned off: this is an aberration!".*

Group debates also sought to establish a distinction between the over-consumption that is associated with comfort and over-consumption that is associated with basic needs. These basic needs are discussed as structuring collectively driven life-rhythms, which causes peaks in consumption as a side effect. Conscious of how these peaks are collectively produced by our relatively standardized working hours, participants proposed solutions where these standards would be made more flexible. Yet this is not always possible, as for example when people have school-aged children or work in less flexible institutions.

*"I would love to have variable working hours. But my boss says: it is 9h-12h and 14h-18h. It would be nice to re-start earlier at 13h and finish earlier".*

Despite some problems raised in the group about the feasibility of such an approach, participants became increasingly more optimistic about the importance of opening up the debate and searching for collective solutions or new approaches to this dilemma – e.g. through new ways of domesticating the household space (Aune, 2007) –, instead of focusing strictly on one's individual consumption. The quotations below

illustrate this quest for innovative ways of conceiving our current resource consumption patterns.

*"It is true, I tell myself that collectively it is good to find solutions, be it in closed commissions or in this type of meetings".*

*"Collectively, there is always someone with ideas (...), ideas that will make everybody else save more energy".*

Then, participants started applying this principle to their own situation in the group, in that very moment, *hic et nunc*. As a response to the experience of one of the members of the group who had lived in Denmark where kitchen appliances were partly shared among other dwellers of the same building, participants started exploring how consumption itself could also be shared, and friendly as part of a different concept of what home 'is' (Aune, 2007; Silverstone et al., 1992). Departing from these ideas, group participants changed the paradigm and started proposing alternative, collectivistic consumption models that could, in the long run, contribute to a more rational and solidarity-based society. In this sense, some after-work collective activities could provide a good solution to buffer the arrival of the population that comes home at exactly the same time, as this dialogue suggests.

*"- Instead of going home directly after work, we could promote collective gatherings in the buildings, a happy hour!*

*- We could also have a collective oven, a fridge?*

*- The oven could be complicated, the fridge too... it would make one's own yogurts disappear!"*

This debate about which consumption paradigm (collective or individualistic) is more adapted to the energy challenges we face today, becomes central when our lifestyles are approached at an aggregate level. Participants of this study, especially the urban ones, through these group exchanges have become aware and sensitive to the fact that our modern, individualized lifestyles are simply unsustainable and wasteful in terms of energy consumption. They also seem to be aware that the argument 'do *your* part for the planet' might correspond to a milder, mundane (Kashima, Paladino, & Margetts, 2014) and domesticated version (Aune, 2007) of the profound changes we have to face as a society in order to correctly respond to climate change threats (Guiddens, 2009; Uzzell & Räthzel, 2009).

### 3.4 RURAL VS. URBAN SIMILARITIES AND DIFFERENCES

Participants in both rural and urban groups demonstrated the same type of reasoning about their energy practices along the three bipolar dimensions presented above. Rural and urban groups differed however regarding larger sustainable issues, to which they became increasingly sensitive during their participation in the group discussions. Participants from the Château-Renault group for instance interpreted their geographical isolation as impairing their choice for more sustainable transport alternatives - that are more widely available in Lyon. This type of reasoning and preoccupation for other environmental issues, not directly related with the behaviour at hand, shows how groups are a useful binding source of motivation that can spill over to other types of environmental behaviours (Staats et al., 2004).

## 4. DISCUSSION

The present dynamics of new grids development is an interesting combination of economical, technological and psychological factors. In the same way, as peak-hours are produced through life rhythms, they can also be shifted through innovative approaches to better understand our social functioning as it emerges from cultural frames, habits, empirical constraints, norms and shared representations (Bauer & Gaskell, 2008; Castro, 2012; Skjølsvold, 2012). This paper therefore proposed to gain a deeper understanding about the meanings and representations activated by participants when reflecting on their concrete, everyday experience with the new smart meters, in the context of a pilot implementation of these devices in two French communities (Lyon and Château-Renault). The analysis of the core beliefs and representations activated by these new and concrete experiences with the meters is considered to be an important contribution for a deeper understanding of the collective response of a community at the aggregate level, which can range from the acceptance of the process to a full-blown opposition (Barnett et al., 2012; Batel & Devine-Wright, 2014; Castro & Mouro, 2015).

These analyses were based on discursive material produced by reconvened groups especially designed to complement policymaking with informal and real-world evidence about citizens' constraints and possibilities for more sustainable policies (Horlick-Jones & Prades, 2014). The use of this tool was considered, by participants and by policymakers, to be a valuable asset supporting (1) citizens' reflections about what their needs and barriers really are; and (2) the validation of policymakers' expectations about citizens' responses to policy before actual implementation.

The group exchanges have evolved in the course of the three meetings, benefiting from deeper analysis of concrete and practical points stemming from the diary data, where they were asked to reflect on their energy consumption patterns.

The verbatim produced by groups was then content-analysed, which revealed the existence of three main dialogical pairs (Billig et al., 1988), or themata (Marková, 2003; Smith & Joffe, 2012): collective vs. individual (daily life); private (my behaviour) vs. public spheres (others' behaviours); and the consumption model: individualist vs. collectivist.

The first dichotomy found was between the *collectively* desirable sustainability and the sometimes important constraints presented by a time-reduced and charged *individual* lifestyle (Goulden et al., 2014; Hargreaves et al., 2010). Participants in all groups acknowledge the importance of reducing energy use and actively engaging in energy saving practices. On the other hand, they also bring to the groups' attention specific family situations that render any shifts in the patterns of energy use difficult: small kids, elder people, tight working hours, etc. This paradox has also been suggested by previous studies debating the individual limitations to broader sustainability goals (Goulden et al., 2014; Smith & Joffe, 2012).

The second dichotomy found in group discussions mirrored a debate about who should be held accountable for a population's consumption on the aggregate level: the *public* sphere or the *private* sphere. Participants started thinking that maybe a top-down, coercive approach could possibly be envisaged to control abuses in energy use, rather than leaving this control up to individual consumers. Soon after, participants discussed the issues behind this type of option: individuals would have to be told what to do all the time, how to behave and how to organise their household activities, which probably would involve fines – for excessive heating, for example. Participants ended up rejecting this type of surveillance and punishment, that is in line with results from previous studies depicting this type of coercive approach to private sphere behaviours as unpopular (Balta-Ozkan et al., 2013; de Groot & Schuitema, 2012).

This pair of opposites suggests that consumption-control policies, which fail to leave a certain individual degree of choice and privacy, are presently doomed to failure. However, research could bear upon the possible future acceptability, e.g. under increased pressure from climate threats, of more control exerted upon what is considered today as a protected private sphere. An example of such a change occurred recently in France when road radars were generalized to automatically fine over-speeding drivers. This new control was globally accepted, although it infringed upon the private sphere to which cars and driving were previously associated.

The third and final dichotomy found in the discussion groups opposes our current modern *individualistic* consumption paradigm with other more *collectivistic* paradigms. Our modern lifestyle where people go to their jobs and return to their apartment at night to sleep is discussed as very wasteful. Each apartment is equipped with electronic devices often not designed to save energy, but to serve our comfort. A more collectivistic consumption paradigm would defy this uniform individualized lifestyle. For instance, rather simple changes like getting together after work – at least at the level of a household or a building – could buffer the energy needs related with the collective behaviour pattern of going home after work. Conceiving spaces in buildings for collective meetings could be a great encouragement, not only to increase socialization between neighbours, reinforcing proximity ties, but also to shift peak electricity consumption.

The reasoning actualized along these three main dimensions has been found in the rural and urban groups alike. These groups differed in relation to their perceptions about the possibility of adopting a more sustainable lifestyle, which is considered to be more readily achievable in large cities (through public transport for instance). This point demonstrates how this group activity around a seemingly specific issue such as

energy consumption has actualized a wide array of other behaviours, meanings and ideas that circulate today about what it means to be sustainable.

Moreover, this study was able to inform policymakers about the culturally and pragmatically seated meanings and concerns people have regarding this new technology and how it is likely to influence the electric system configuration in the future. And more than that, these in-depth elaborations have provided us with a deeper understanding about the way wider meanings and 'themata' (Moscovici & Vignaux, 2000) are solicited to convey meaning and contribute to the domestication of these new devices within the intimate environment of our households (Aune, 2007; Silverstone et al., 1992). Interestingly, with the evolution of group dynamics throughout the meetings, participants became more aware that changes in their individual habits – often pointed to as the locus of the problem and target of many sustainability endeavours – would be largely facilitated when coupled with changes at the level of *our productive patterns*. Should individuals continue to be solicited to alter their private behaviour while productive structures continue to work as usual (Kashima et al., 2014; Uzzell & Räthzel, 2009)? Or should we start thinking collectively so as to consider more consistent and sustainable pathways for social environmental change? The reasoning level reached by participants in a focus group context demonstrates how everyday thinking is capable of anticipating wider social changes, and of finding resources on its own when it is given the same importance and put in the position of the everyday life 'expert' (Moscovici, 2008).

We would like to mention that the small scale of this study was designed as part of a wider demonstration of how such reconvened group techniques could be deeply informative for policymaking, yet manageable in terms of cost and time (Horlick-Jones & Prades, 2014).

To conclude, the smart meter appears simultaneously as a technological device, a public policy tool, and a socially invested object (Skjølsvold, 2014). The production of this innovative set is complex, as each level cannot be reduced to another. The development of the device, along with the technical and economic control of its deployment, represent key issues for the reinforcement of our societies' energy efficiency. And similarly, the implementation of new regulation requires that policymakers harmonize the various stakeholders' strategies towards change. However, it would be prejudicial that these technical challenges retain the whole attention at the expense of the social object. This study has shown how small group elaboration facilitates both the ownership of the smart meter as a technological innovation, and the exploration of social innovation in terms of electricity consumption. The participation in these groups and the concretely based reflection about how smart meters could influence their household electricity consumption have triggered a larger awareness of sustainable consumption as a societal issue, leading to creative thinking. Therefore, the larger deployment of smart meters offers the rare opportunity to directly involve a very large number of citizens – at the level of a building, a neighbourhood, a city or even a territory in a rural environment.

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## 7. Annex

Translation of excerpts of Figure 1.

(...) This is not a French initiative alone: the European Commission has proposed that 80% of the households, by 2020, have access to smart meters allowing the shifting of their consumption according to the visualisation of variable energy tariffs being charged.

(…) In France, the experimental phase is carried out by *Electricité Réseau de Distribution France* (ERDF, subsidiary of EDF) and concerns about 250,000 smart meters installed in Lyon and the rural area of Indre et Loire.

**Better manage one's consumption?**

However, an uncertainty remains as to what will happen as a result of the new meter, which will make the management of households' energy consumption a lot easier. It is true that this equipment will be available for the consumers and for their use. But considering its financial cost, will it be practical and efficient? (…).