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Abstract: This paper focuses on Business Model (BM) innovation practices within a specific field: the household sector energy transition. In recent years, the value chain between the stakeholders involved in this field has been modified due to recent technological changes, which poses a threat for current companies and an opportunity for insiders. This research work is carried out within the Greenplay project, which is an EU funded Horizon H2020 project. This project aims to develop new business models that reduce energy consumption in the household sector and can be successfully implemented. In this study, a systematic literature review is conducted related to energy business models. Furthermore, the proposed framework is a crossing classification based on criteria concerning innovation targets and various energy production, distribution and consumption BMs. In the second phase of the Greenplay project the authors will apply the proposed framework to the use cases identified in the project.

Keywords: Business model, energy transition, prosumer, energy value chain, PSS

1 Introduction:

Last decades, there has been a great pressure on the different sectors in order to reduce CO^2 emissions aiming to mitigate the climate change effects (Manabe and Wetherald, 1980). Energy sector's contribution to CO^2 emissions is one of the highest (Davis et al., 2010), thus more worth efforts have to be put towards more sustainable energy sources rather than the carbon based energy system. As a response to this call, energy utilities are redirecting their attention to more sustainable Business Models (BM). For example, most of the energy utilities in the U.S. have estimated a stagnant energy demand in the next few years and some of them expected a negative load growth (Utility Dive, 2015). This expected decline of energy demand is coupled with the expansion of renewable energy (RE) and distributed energy (DE). Moreover, European energy Utility Companies (EUCos) face up a threat regarding their stable deep-rooted traditional BM (Boston Consulting Group, 2010; Forrester, 2013). While the preliminary reaction of utilities to the upcoming changes is to develop new BMs and invest in distributed generation, the question is how and what are the mechanisms to overcome this challenge (Hellström et

al., 2015; Helms, 2016). This sector is facing an uncertain period due to the changing roles of current utilities and the arriving insiders in energy market.

Actions for CO^2 reduction in energy sector require changes in the energy utility BM that has been used by energy utilities for over a decades. There are two types of approaches regarding energy transition. On the one hand, top-down approaches where policy and regulations are pushing utilities and business stakeholders to take part on the energy transition. The emergence of Energy Service Companies (ESCos) is one of the results of this approach (Hannon et al., 2015). On the other hand, the bottom-up approaches, where social initiative cooperatives enable citizen and community to get involved in distributed energy market. In Germany, for example, the social cooperatives have raised from 136 utilities in 2008 to 888 in 2013 (Morris and Pehnt, 2012). In addition there are new marketing opportunities, where economic and financial benefits also drive the transition towards renewables and more efficient consumption (Johnson et al., 2012).

Based on a study lead by (Utility Dive, 2015) the shape of the energy service BMs, in the next few years could be based on: 1) Energy efficiency and demand response (71%); 2) consumer information services (51%); 3) distributed generation (48%). Yet the business model for energy services is vague and unclear; however, there are some characteristics that can be a cornerstone for researchers and practitioners to build their own energy service BM.

The paper is structured as follows. Section 2 reviews sustainable and collaborative business models. Besides, this section introduces the Greenplay project. Section 3 introduces a framework based on innovation targets classification and energy value chain. This framework is used to map the review of the literature about the energy transition BMs along the energy value chain .In section 4, in addition to the discussion, it poses the scope and the research questions of the PhD work of the main author. Finally, section 5 draws the conclusions.

2 Theoretical background and scope:

2.1 Sustainable and collaborative BMs:

The concept of BM has many definitions that vary according to the context of use: it refers to the logic of the firm and how it operates and creates value for its stakeholders. Moreover it reflects the realized strategy which is the base to come back when making critical decisions (Casadesus-Masanell and Ricart, 2010). BM can be viewed as a strategy transition into a logical framework for economic value creation (Osterwalder and others, 2004). The same technology can be developed through different business models, affecting the economic value created. Thus there are often conflicts between current BM and the desired one due to the deployment of emerging technologies (Chesbrough, 2010).

Sustainable business models (SBMs) have been discussed recently as a way of balancing the ecological, social and economic needs through value proposition, stakeholders involvement and taking the responsibility of ecological burdens rather than displacing them to customer or suppliers (Boons and Lüdeke-Freund, 2013). SBMs are the framework where sustainability is integrated in the activities of the organization and it is embedded into the business purpose and process. The scope in the deployment of SBMs often considers the firm level as well as the socioeconomic systems (Stubbs and Cocklin, 2008). Choosing the right SBM could be confusing for firms and start-up companies. In order to overcome this problem eight archetypes have been introduced by (Bocken et al., 2014) to categorize different practices and facilitate the adoption of new BMs.

These new BMs are often conceived between several organizations and developed within a scope that surpass the firm level. As a result of this fact, Collaborative Business Models

(CBMs) have been pointed as an interesting approach to co-develop BMs that are deployed jointly in the same value chain.

CBM has been defined as "an activity where multiple organizations that might differ in type (industry, public research and non-profit), their position in the value chain (manufacturing, service, etc.) and industry (energy, ICT, etc.) work together to create a value creation system. In some cases, they will also attempt jointly to create the value capture system" (Rohrbeck et al., 2013).

(Laudien and Daxböck, 2015) proposes four levels of collaborations: no collaboration, slight operational changes to BM, open the BM for the integration of consumer and external partners where internal adjustment of BM occurs, and finally to reach BM innovation and network partner-driven or customer-driven BM.

2.2 Greenplay Project:

The household sector represents 28% of the energy consumption in the EU. Households alone have a limited capability to change their consumption patterns, thus there is a need to include other actors who could support households toward sustainability (Sanne, 2002, Roy, 2000). However, energy efficiency organizations like ESCo haven't manage to reach this sector (Bertoldi et al., 2006). There is lack of awareness concerning energy efficiency specifically in the household sector. Moreover, energy efficiency is not a priority for consumers, it could be perceived as disruption and hassle to households and the fear of long-term commitment. All these factors made household unreachable for ESCos (Bertoldi et al., 2006).

This research work is developed in the framework of a European Union's Horizon 2020 project called GreenPlay. This project seeks to reduce by 30% the electricity consumption in the household sector and will be validated through a large-scale experiment based on 200 households situated in France and Spain.

The Greenplay system is composed by sensors, a smart monitoring platform and a game. The sensors installed at the user's home are linked to GreenPlay system, and measure global electricity, heating, water heating and temperature. The core of this system is a pervasive game i.e. eco-gestures in real life and thus electricity consumption reduction allows to earn points and evolve in the game.

The system allows to monitor real behaviour and possible long-term changes in the context of the participation of the customer in the load management (Apajalahti et al., 2015) and energy efficiency (Helms, 2016).

The use of game principles or "gamification" is an efficient tool to deal with behavioural modifications (Nieuwdrop, 2007), (Germaud, 2013).

(Abi Akle et al., 2016) have identified nine projects working on pervasive and persuasive gaming for energy conservation.

The main research objective of the Greenplay project is to study the potential of combining game elements and instructional advices for modifying energy consumption. The combination of these two elements within a serious games offers some possibilities to encourage the immersion in context, the empowerment and the learning appetence of users.

Through this approach, the system identifies the use of energy and users' behavior in the private sphere. This information can be used to identify decision variable for product design processes (building, home appliances, etc.), as well as an input for the

development of innovative business models that rely the product and services associated to the building ecosystem.

During the first phase of the Greenplay project, a review of existing BMs in the energy sector has been performed aiming to have a thorough picture related to energy transition. This paper presents some of the results of this review. Then, during the second phase of the project, the goal is to study the potential of joining the new household behavior patterns and energy consumption routines to innovative BMs that are being shaped in the energy sector.
The current impact of the household sector in the global energy consumption and the emerging technologies related to decentralized energy systems, set the basis for new BMs development that involve the household as a key stakeholder. Indeed, The household sector represents 28% of the energy consumption in the EU

Besides, rapid changes in the technologies, including small scale renewable energy, energy storage and smart grid provoke upcoming changes in the consumption and production model of energy. However these technologies alone are not enough to change the current patterns, thus exploiting them within appropriate BM seems to be the key factor for the emergence of new practices that create economic, social and environmental value. (Chesbrough, 2010) postulates that "*a mediocre technology pursued within a great business model may be more valuable that a great technology exploited via a mediocre business model*" (P.355).

Lately, there are increasing trends in the energy sector towards decentralized energy system especially in the household and city precinct (Daley, 2012). Furthermore, Rocky Mountin Institute has included the distributed generation (DG), zero-net buildings and energy metering as a major issues in the development of the 21st century energy business models (Lacy et al., 2012). (Skinner, 2013) highlights the fact that utilities have started not only to invest in renewable energy but also in distributed energy systems, providing services to users willing to be more independent of the centralized energy system.
In the next chapter, these disruptive energy systems are reviewed through the analysis of the associated BMs.

3 New business models for energy transition:

3.1 Energy business models framework:

In order to classify the different BMs, a framework based on two criteria was defined. On the one hand the BM category centred on the innovation focus. On the other hand the specific value chain related to the energy sector (Table 1).

Existing classifications concerning changes in business models as well as the degree of these changes is often related to the scope and the nature of the innovation. According to (Oslo manual, 2005) innovation is a system that targets not just the product and process but also the organizational structure of the firm, marketing strategies, institution and society. (Boons and Lüdeke-Freund, 2013) have defined three streams with regard to SBM: technological, organisational, and social innovation and stressed that these streams don't stand for separated phenomena and there is kind of dependency among them.
Concerning the energy value chain, segments of the energy market differ depending on the typology of the energy commodity. In the upstream phases there is the extraction or the generation of the energy commodity; then, there are different distribution and storage phases before the consumption stage. This division can be more detailed by including trading and retailing segments. Moreover, in specific energy value chain like the electricity, some operator can have a key role maintaining the system generation and load balance.

Consequently, the framework utilised in the next chapter includes two criteria:

- BM category is defined as follows:
  - *Technology*: focus on product, services or methods of production or procedures.
  - *Organization*: the responsibilities and the organizational structure of management.
  - *System*: goes beyond the organizations and targeting issue linked to the society or community (e.g. institutional arrangements, social norms and cultural values, etc.).
- And the energy value chain includes the production, distribution and consumption phases.

3.1.1 Technology level:

Recent advances in energy technologies allow the deployment of new BMs. This is the case of more efficient appliances, smart grid solutions, metering systems, smart devices or decentralized renewable energy means. Nevertheless, the technological oriented BMs (Mizobuchi and Takeuchi, 2016) are often subject to consumer behavior (Chen et al., 2015; Khazzoom, 1987), or other modifications within the scope of the new energy system. For this reason, some reviewed technologies have been discussed in the "system level" chapter. In this chapter, technologies that allow a transition to a service or function oriented BM have been reviewed.

Table 1 Mapping energy business models along the energy value chain

BM target	*Production*	*Distribution*	*Consumption*
Technology	(Sorrell, 2005)	(Kobus et al., 2015), (Laicane et al., 2015),	(Valencia et al., 2015), (Tan and Yavuz, 2015)
Organization	(Loock, 2012), (Liu et al., 2014), (Kroposki et al., 2008), (Schoettl and Lehmann-Ortega, 2011), (Richter, 2012), (Gsodam et al., 2015), (Hannon et al., 2013)	(Behrangrad, 2015)	(Bertoldi et al. 2006)
System	(Huybrechts and Mertens, 2014), Bell et al., 2011), (Holt and Wiser, 2007),(Hellström et al., 2015)	(Shomali and Pinkse, 2016), (Allan and Menzel, 2009)	(Knol and De Vries, 2011), (Bertoldi and Rezessy, 2008)

Servicizing has been discussed as a way of reducing natural resource dependency. The goal is to deliver a function instead of a physical product, decoupling the consumption from the used material (Heiskanen and Jalas, 2003).

In general, supplying a function or a final service is a process where the tangible product is replaced by integration of a product and a services, known as a Product-Service System (PSS), which is usually coupled with economic and environmental advantages (Tukker and Tischner, 2006). Yet little work has been done into the energy field to tackle energy as a service and scrutinizing the related business model (Apajalahti et al., 2015; Bertoldi et al., 2006; Hannon et al., 2013; Helms, 2016; Shomali and Pinkse, 2016).

Servicizing energy is providing what people really need; for example, people need light and accurate constant temperature rather than electricity, lamps or heating systems. It is a shift from energy commodity transaction to providing function. (Sorrell, 2005) proposed two concepts: the "useful energy" and the "final energy services" while the former is driven by primary conversion equipment such as boilers and CHP (Combined Heat and Power) which provide steam, hot water and coolant, the latter is driven by secondary conversion equipment such as radiators and fluorescent lighting which converts the useful energy to final energy services like heating and light.

In the distribution part of the value chain, Demand Response (DR) is a mechanism to reduce environmental impact of electricity's use and production cost, it includes time-shifting or load reduction or both in response to price signals or other incentives. The DR is a mechanism that allows the deployment of innovative BMs supported by emerging technologies such as smart devices. Nevertheless, DR in the residential sector depends on the user perception for the need to shift consumption, trust in utility or energy service provider, incentives and transition cost (Darby and McKenna, 2012).

(Laicane et al., 2015) indicates that smart meters provide useful information about appliance's consumption in households, and can lead to significant changes in load consumption, thus the load peak could be avoided. The emerging of smart devices enables a higher level of automation of appliances and reducing behavioral effects. Integrating smart appliances with dynamic electricity tariff and energy management systems resulted in significant shift in energy consumption towards sunny days when the solar panel power is maximum (Kobus et al., 2015). Furthermore, adding e-service for the smart devices through web portal enables more functions to be activated such as following consumption charts, comparing consumption and communicating with other consumers. This BM has been identified as Smart Product-Services System (Valencia et al., 2015). Offering energy saving technologies as a service would bring economic benefits for both the customer and the supplier as fluctuation of energy consumption, uncertainty in energy prices and carbon offset are considered, in addition to the environmental benefits (Tan and Yavuz, 2015).

3.1.2 Organization level:

Even if technological aspects are often the source of many new BMs in the energy sector, innovative BMs can arise in fields where technology is mature and are mainly related to modifications in the practices within the organization.

Existing energy companies for example have include within their activities, new energy service BMs. Some utilities addressed this need as a reaction to the de-growth of energy demand in U.S, where most of energy utilities are trying to face the energy reduction demand by identifying new BMs (Utility Dive, 2014). Innovative energy service BMs include Distributed Generation based on micro-generation in the consumer site supported

by the necessary services (Richter, 2013a). Furthermore, energy services have been outlined as Demand Side Management which related to energy end-user efficiency and conservation (Apajalahti et al., 2015). Energy Service Companies ESCos have also developed original energy service BMs that aims to reduce the customer consumption by either supplying energy from micro-generation or by providing efficiency measures that cut energy consumption (Bertoldi et al., 2006; Hannon et al., 2013; Sorrell, 2005). In an attempt to define the role of energy utilities in the transition towards renewable energy, package of services has been suggested, starting from simple consulting services that include financing, ownership, operation and maintenance (Gsodam et al., 2015; Richter, 2012).

Investors in the renewable energy sector prefer "customer intimacy" as a service-centralised business model rather than the upstream production-oriented model based on technology and lowest price (Loock, 2012). Likewise, leasing solar photovoltaic cells has been presented as a successful alternative to the purchasing one because it allows to get around of up-front payment and it offers supplement services like the regular maintenance. In addition (Liu et al., 2014). As changing to service-oriented BM is more complex than product-oriented BM and to reach broader markets concerning renewable energy, there is a need to include a third party who could manage the process. "1st Generation business model" is a BM driven by third party rather that the utility or the consumer. The advantages of such model are reducing the hassle and complexity for consumers (Kroposki et al., 2008). This BM is preferable for consumer who doesn't want to be bothered by selecting and installing their PV, and just need reliable sources of energy, competitive prices and assurance of rapid-response service and supporting maintenance (Schoettl and Lehmann-Ortega, 2011).

Distributed and small-scale electric power generation is defined as Distributed Generation. The combination of the DG and renewable energy sources is known as the Distributed Renewable Energy (DRE). In the last years new BMs have arisen in the field of the DRE. Two main stakeholders are concerned by these BMs: On one hand, utilities as the main actors in energy market. However, utilities do not see in distributed generation neither a threat nor an opportunity and many barriers hinder utilities from developing new BM for exploiting renewables such as lack of competencies, lack of consumer demand, lack of products and services and lack of profitability (Richter, 2013b). On the other hand, consumers are directly concerned by this approach as they have the opportunity to empower themselves by obtaining cheap clean sources of energy and become prosumer (producer and consumer). In this case the utility role would be confined to back-up source of power (Sioshansi, 2015). The environmental impact of distributed generation has been examined compared with the traditional utility model. The environmental impacts can be mitigated in four areas; reduction in greenhouse gases emissions, reduce damage to health, higher energy efficiency and conservation of resources for additional use (Akorede et al., 2010).

Demand Side Management (DSM) has been introduced as a way of flatten the load curve of consumption. Two main services have become the major elements of the DSM (Behrangrad, 2015) Energy efficiency and Demand response. The former is a model for incentivize customers to change their consumption pattern in order to reduce the electricity consumption and the peak of the consumption in the load curve. "Business model involving load" includes both price incentives and consumption awareness in order to reduce the cost of the load. This BM can be based on an infrastructure for the consumer in order to receive price information at a suitable time and format (Behrangrad, 2015).

Implementing energy efficiency measures and installing micro-generation in households seems a promising approach but it is blocked by many factors like low energy cost, long term engagement, weak recognition for energy services, less motivation as no show off, in addition to the disruption and hassle for the households (Bertoldi et al., 2006). Moreover there is a weak relationship between big utilities and its customers, and some authors have identified a distrust surrounding energy utilities to deliver efficiency measures (Apajalahti et al., 2015; Helms, 2016). As a solution to this fact, (Bertoldi et al., 2006) presents Mini-ESCos as a business model that can propose energy efficiency measures to households as alternative for big ESCos and services proposed by big utilities. Mini-ESCo could be small facilities that are used to provide maintenances and breakdown repair for households. The reasons are behind this proposal are the lack of awareness of ESCo business, the cost comparing with savings (Pätäri et al., 2016) and the lack of trust towards large energy utilities (Holt and Wiser, 2007; Richter, 2012) and scepticism about the real motivation for utility to engage in households energy efficiency (Apajalahti et al., 2015).

3.1.3 System level:

Going from the organization level to system level requires more collaboration between the stakeholders in the energy ecosystem. This collaboration comes out from the inability of one business model alone to deliver competitive and sustainable value in renewable business, which requires a broader system perspective. Furthermore, in complex and heterogeneous field like energy service, collaborative BM is needed to create in each stakeholder motivation for contributing towards the innovative system (Ericson et al., 2013). Thus, it is important to determine the factors that drive business models of the collaborating firms to facilitate system transition where the value creation is a holistic process. Sharing common BM elements and developing inter-dependencies between companies can create sustainable value that can't be captured by one business model (Hellström et al., 2015).

Even if efficient measures and renewable energy means already exist in the market, some barriers like landlord and tenant split incentives as well as the up-front payment are blocking the diffusion of these technologies. Designing innovative business models can overcome these barriers. For example, on-the-bill financing is a financial model to overcome the previous barriers and encourage households to participate in renewable and efficiency programs (Johnson et al., 2012). As a result, some utilities have changed their BM to integrate loans management, to provide maintenance and to work with contractors. This case study indicates that BM innovation can exploit technologies and bring out some changes like collaboration with municipalities and contractors who have a closer relationship with customers.

On-bill financing is an innovative financing method that allows consumers to overcome up-front payment of implementing energy efficiency measures by providing the necessary loan and dividing it to small monthly payments that are cut from the amount of monthly bill savings. This BM can lead to win-win situations and permit the energy companies to diffuse efficiency measures and renewable energy technologies (Johnson et al., 2012). This solution is a financial product served by utilities that work closely with energy efficiency services providers (Bell et al., 2011).

Similarly, White Certificates have been considered as a market mechanism for stimulating energy efficiency actions, it confirms that a specific amount of energy savings have been achieved by market actor as a results of energy efficiency improvement measures (Bertoldi and Rezessy, 2008). White certificates are tradable in

the market, so that it is considered as a cost recovery mechanism. A positive relationship between providing energy services and white certificate in France has been noticed and tested (Duplessis et al., 2012). Renewable energy certificate (REC) is an instrument proves that the supplier has generated and fed in the grid 1 megawatt-hour of electricity (in the U.S). RECs can be bought and sold separately from electricity and can facilitate the diffusion of renewables as their trading is easier than renewable electricity (Holt and Wiser, 2007).

The Renewable Energy cooperative BM represents a bottom-up approach where citizens set up their own socio-economic organisation aiming to exploit the benefits of renewable energy. RE cooperatives appeared after the liberalisation of energy markets as a reaction of local consumer desiring to control their source of energy. In some cases cooperatives offers lower prices, are more transparent, and have simpler pricing mechanisms. They diffuse democratic way of taking decisions and social acceptance of green consumption that leads to positive environmental and social effects for the community. Cooperatives have also implemented "demand side management" practices that provides advices about consumption and conservation (Huybrechts and Mertens, 2014).

Lastly, some technological approaches can be part of a systemic modification that involves several stakeholders of the energy value chain. For example, Smart grids have been described as a disruptive technology as it holds fundamental changes for current energy BM by allowing flow of energy and information in two-directions and by providing a real-time access to usage data. Moreover, it encourages people to move towards distributed generation, promotes energy saving, enables the implementation of new energy services and induces consumer's demand response (Shomali and Pinkse, 2016), Consequently the distinction between the role of the supplier and the consumer might be blurred. Smart grids offer more tailored energy services that match with consumer's need, extend the relationship with customer to be more continuous and bring new players to the market (Giordano and Fulli, 2011).

Gamification is powerful way to educate people and influence the energy consumption. EnerCities is serious game that has some preliminary results that led to increase user's awareness and stimulate more positive attitude towards some every-day energy related behaviours (Knol and De Vries, 2011). In gamification many factors affect energy conservation such as metering level, feedback visibility, financial incentives, competition as motivation, use social media and educate audience (Playgen, 2014).

The virtual enterprise/virtual organizations has examined in energy service as a platform that facilitates the flow and exchange of energy information among different partners (Allan and Menzel, 2009).

4 Discussion:

The Greenplay project focuses on electricity consumption of households and the electricity's consumer is a critical factor in our research as it moves away from traditional one-way relationship pattern to a more interactive system. The Greenplay project is seeking to better understand electricity consumers' behavior, their expectation and their capacity and ability to be engaged in new more dynamic business models. Going beyond the-meter-market and find the business opportunities beyond the two-side flow of information and energy, will change consumer preferences and rise energy diversity. Thus a bundle of energy services and products, such as home energy audit, consultation and devices or services to automate home energy can be developed as there is an emerging trends to overcome price issue and consume green energy. The interconnected homes can provide up-to-date information and enhance energy efficiency. It can also

contribute to deploy function based solutions like lighting and heating. Providing energy could be individualized as technologies could provide better analytic tools.

Taking into account these critical changes, this paper focuses on different energy BMs. It emphasizes the BMs that create sustainable value and outlines the role that the consumer can play within these new BMs.

Indeed the dominant role of utilities is fading while the share of sustainable distributed energy resources are expanding. The risk surrounding the existence of their BM "Spiral death" is widening (Costello and Hemphill, 2014). Consequently, the more and more utilities focus on the creation of innovative services that utilities can provide to consumer. Nevertheless, even if utilities have decades of experience related to energy production, distribution and consumption; they suffer from consumer lack of trust concerning of their role in energy efficiency and renewable energy.

Several questions arise related to the role of each stakeholder within the competitive and sustainable energy BMs, as well as the capacities related to intangible service, consumer relationship, regulations and the organizational structure. With this in mind, it is also necessary to analyze the arrival of some new actors, like ESCos, who have penetrated the energy market where they go beyond the energy retail and provide services that create win-win situations. .Yet ESCos are remaining far away from households. This gap is due to some barriers such as the lack of awareness about energy services, the low prices of energy commodities, as well as the hassle of being engaged in long term financial commitment. However (Bertoldi et al., 2006) suggests new business model based on "Mini-ESCo" which could be small enterprises that have long term close relationship with consumer based on trust.

Consumers' role is not anymore passive, they see in renewable energy an independent and more secure source of energy and become a key stakeholder in the load management. Therefore, it is necessary to engage them along the whole process of designing the new services and products considering their roles within the future BMs. The flow of energy and information in the two-directions thanks to the Smart Grid brings new opportunities manifested in various services that include from simple advices for energy analysis charts, to actions, to build interconnected home networks.

Finally, between the two sides, the consumer and the provider, many business model have arisen either related to the energy efficiency or to the demand response approach. Such BMs can target load control, electricity transaction and renewable energy correlation. In addition as retailer dealing with consumers, they have various BMs that can targets different segments of energy market rather than production or transmission units (Behrangrad, 2015). A promising role of Information and communication technology ICT in this part has been described as virtual organizations that mange the flow of information and energy which could be bought and sold through the smart grid. All on all, organizing the previous issues stimulate us to raise few questions related to energy business model. Wondering how energy can satisfy the final need of consumer, could the integration of energy and smart technologies creates new demand for specific needs, can appliance's manufacturers take parts in the energy value chain, what kind of capacities required from the consumer and what is the role of utilities and new insiders.

5 Conclusion:

In this paper, we scrutinize some BMs in the energy sector in order to have deep understanding of what could be the value proposition that new BM would deliver either by new version of current utility or by new insiders who would find their own way in the

liberalized energy market. From the review, we notice that exploiting technology by good business model is better than exploiting good technology by trivial BM. So that, the importance of this study comes from the fact that there is a lot of confusion about the future business in the energy sector and the shape of its BM. We discussed different issues such as the role of utilities and ESCOs, the new concepts that deal with energy as product-service rather that a commodity the prosumers emergence and their role in the new value chain, the increasing importance of demand side management and smart grids.

This paper could be considered as the cornerstone of the PhD launched within the Greenplay project which aims to define energy business models that respond to the changes in the energy value chain. It poses questions related to the degree of servicizing, interested stakeholders, the user expectations, the capability of utilities to take major role, as well as the possibility of new players to move into the energy value chain. In addition, it tackles the role of incentives factors and barriers such as dynamic prices and hampering factors like regulations and lack of trust on utilities. Lastly it addresses the issues related to up-front cost and the role of citizens and cooperatives.

The blurring picture of energy BMs that comes out of the recent technological advancements in energy sector can be better handled by deep understanding of its BM components and its value proposition. Sustainable business models contribution can be adopted to energy sector and add green value by innovating in energy efficiency and distributed generation. Moreover, collaboration business models could enable the different actors in energy sector to find their way to work together as energy sector is becoming the more and more complex system by emerging such concepts "Servicizing energy". In addition to the increasingly active role of consumer, which brings the need for a better management of the two-side energy and information flow.

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