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ESCO FORMATION AS ENABLING FACTOR FOR SMART CITIES DEVELOPMENT IN EUROPEAN UNION (UE): SPAIN CASE ANALYSIS

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ABSTRACT

Cities have reached a huge magnitude and they represent great potential improvement platforms for wealth, employment and competitiveness creation, but also they involve an enormous amount of complexity that emphasized their future management challenges. Cities evolution could be seen as a strong trend towards the development of more efficient and livable cities that have been called "Smart Cities", where one of key topics is linked to how efficiently scarce resources are managed. This document analyzes the development of Energy Service Companies (ESCO) in Spain, as a type of organization preliminary focused on promoting and managing projects related to the efficient use of energy, being their business success linked to energy savings achieved by their clients and getting their revenue from these achieved savings. Outcome of this study expects to provide information of interest to understand the current development of ESCO model projects in Spain as example of what is happening in several major European Union (EU) countries in relation to Smart Cities development and subsequence ESCO growth, the important barriers they currently face to grow faster, and to find evidences of how collaboration between organizations could facilitate

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energy efficiency management, which at the end is linked to a better understanding of the future development of “Smart Cities” initiatives in EU countries.

Keywords: Smart Cities, ESCO, collaborative relationship, Spanish ESCO, energy saving in European Union

1. INTRODUCTION

The XXI century, among other things, has led to the consolidation of the trend toward a stronger and faster concentration of the planet's inhabitants in cities. Suffice it to say that today more than half of the world population lives in cities and, as example, it is estimated that only in China more than 350 million people will migrate from rural areas to cities in the next 20 years, this means a higher figure than the current population of the United States of America.

Specifically in the European Union (EU), during the last decades of the twentieth century, the population living in cities has gone from 50 percent of total population in 1950 to over 77 percent in 2010, and last forecasts estimated 85 percent in 2050 (CARAGLIU et al. 2011). In this situation, the highest challenge is to be able to develop more livable ecosystem than today for such future huge population concentrated in large cities.

Also this issue is fully linked to energy consumption, and over three quarters of the worldwide energy is consumed in cities as they concentrated people and the main areas of economic development in the planet. Given this situation, there have been many, but scattered, initiatives all related with the quality and efficiency of services provided in cities, as the axis on which underpin the foundations of numerous projects to achieve attractive socioeconomic ecosystem which has been called as "Smart Cities". In this study authors analyze "Smart Cities" concept and discuss in greater depth one aspect thereof which is developing faster: efficiency in energy management as a basis for environmental, social and economic sustainability.

The importance of this topic is beyond doubt because although in cities are the main areas of development of the planet (because of population mobility), is also where it is consumed three quarters of the world's energy and for countries, as Spain, with limited conventional energy resources this issue becomes even more strategic.

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In this context, a significant example is the use of models of integrated energy management where the supply and consumption of a particular organization is managed by another organization working to optimize the client energy efficiency and linking supplier´s company their revenues to real savings achieved by their client in a given period

Cities authority vision should move beyond traditional way of managing problems. It is not enough to regulate traffic, collect garbage or lighting public roads, but they should be the focus on getting a better citizens life quality. They are becoming "socio-economic corporations" managers and they need vision and long term strategies where relevant issues are not only linked to construct nice bridges, public offices or rail stations for posterity, but cities where citizens could live better in terms of environment, safety, mobility, access to information, ...etc. Based on this, many initiatives -although somehow scattered- related to service efficiency improvement emerged within cities and European Union (UE) has included plans in its strategic agenda to promote actions focused to cities referred as "Smart Cities". Idea is to turn them into sustainability platforms in a broad sense (economic, environmental and social) through plans to achieve higher energy efficiency and extending communication networks. This study is focus on "Smart Cities" development and a novel practice in Spain that is rapidly gaining relevance: emergence of new types of partnerships between organizations to optimize energy management.

2. STUDY METHODOLOGY

The study seeks to understand to what extent Smart Cities have solid foundations to support a strong development on efficient use of energy, based of new type of collaboration models through so called Energy Service Companies (ESCO). To carry out this prospective study, in an area still no too much developed, authors have used qualitative research methods (in-depth interviews and study of good practices), that Eisenhardt (1989), Gummenson (1991) and Yin (1994) advise as appropriate for the exploration of innovative aspects in organizational management. In this study a kind of "participatory observation" in which several participants share information and personal opinion has been conducted during the field survey, all of them belonging to a group of people involved in energy saving management area (NANDHAKUMAR; JONES, 2000).

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Information has been obtained mainly by: i) in-depth interviews with senior corporate managers from four organizations strategically oriented to energy efficiency and development of new business models in European Smart Cities projects (Philips, Schneider Group, Endesa and Ingenia) and ii) Analysis of "good practices" both in “Smart Cities” and “not Smart Cities” based on information provided by Asociación Española de Empresas de Servicios Energéticos (ANESE) members. Regarding in-depth interviews to senior company´s executive, interviews were performed to eight different executives (two per company) in different meetings (two or three different meetings per executive) during years 2012 and 2013, using semi-structured questionnaires and including several open questions in following areas: i) Smart Cities current development and future vision, ii) energy efficiency as a potential pillar of Smart Cities development, iii) ESCO projects market characteristics, iv) their company business in ESCO v) Opportunities and roadblocks in ESCO projects. Always trying to guarantee that every relevant subject that appear could be touch in the discussion on top of issues pre-planned for authors and fully guaranteeing that information would be used only for academic meaning.

Given the nature of the topic and the difficulty of accessing the information source, often considered as highly confidential, companies selection was decided according to criteria such as: company relevancy within the sector and authors accessibility to organization´s top management.

3. WHAT IS THE MEANING OF SMART CITY?

The term “Smart City” has often been used to describe projects related to improving communications infrastructure and information technology within cities. The relationship between communication networks development and economic growth indicators has been studied by authors like Roller and Wavermann (2001) and other authors, all of them emphasized high relevance of human capital role and education as levers for cities development (GLAESER; BERRY, 2006). Some studies have attempted to characterize Smart Cities as: i) areas for urban and business development and capabilities to attract new business (HOLLANDS, 2008; SHAPIRO, 2008), ii) place where community learns, innovates and people use technology to improve their quality of life (COE et al, 2001; ABREU et al, 2008). Caragliu et al (2011) study defines "Smart Cities" as those where investments in human and social capital are managed besides efficient public services (such as

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transportation, communication network, etc.) supporting a balanced economic growth through proper and efficient use of resources both in public administration and private entities.

Some authors tried to emphasize the "technological angle" when they talk about Smart Cities, but this is only a piece of an entire, complex and multi-dimensional environment. Smart Cities involves many matters and subjects further than technology and if there is a well-known movement in this area is probably due to image opportunity given by some technologies start-ups. But cities are more than future internet accessibility and mobility, as the citizens require simple and reliable basic services as street lighting, security, health, water supply, garbage collection and processing and all other minor services than are critic for city life with a minimum of quality. Smart Cities concept is not only applicable for brand new cities where government decides to invest toms of money to build a new way of living, it is also applicable for large old cities where responsible aim to have a "rather better living environment". In this sense it will be more areas than technological ones where initiatives should influence to turn on the current practices into a fully new strategy and deployed policies.

Table 1: Different visions regarding Smart Cities

A. Network infrastructure to improve economy and public general services	Hollands (2008)
B. Strong emphasis in urban development and attractive and nicer cities to attract new businesses	Hollands (2008) Shapiro (2008)
C. Strong emphasis to attract high technology companies to city, creating high sophisticated environment for business and people	Florida (2002) Glaeser and Berry (2006) Nijkamp (2008) Hollands (2008)
D. Attention to relational and social capital development. A Smart City would be a place where community learn and innovate. People use technology to improve their quality of life	Cohen and Levinthal (1990) Coe et al. (2001) Abreu et al. (2008) Caragliu et al. (2011)
E. Social, environmental and economic sustainability are the main Smart City strategic component on long term	Caragliu et al (2011)

Source: author´s elaboration

Among all the contributions, Caragliu et al. (2011) has defined as "smart city" as the one that invests in human and social capital, at the same time that effectively and efficiently manage public services (such as transport, communications network, etc.) and support an balanced economic growth through the proper and sustainable

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use of their resources, both applicable in terms of public administrations and private entities.

In could be point out that a growing number of cities are seeking to be recognized as Smart Cities and they are working to show above aspects. Rankings are useful as the one provided by Giffinger and Gudrun (2010), which proposes criteria for the assessment and classification of cities that claim to be recognized as Smart cities (Table 2).

As discussed during this article, study is focused on Environment area (Table 2) and particularly in the new models being organized around the need to be more efficient in the use of energy. Today cities planning to get recognition as Smart Cities, have no other choice that to create an efficient energy management environment for energy use.

Even although achieving a "Smart" tag can be an incentive for such projects, energy efficiency is a must and the quality of life of citizens will be seriously influenced by this type of project. Growing number of cities want to be recognized as Smart Cities, so it is necessary to establish assessment criteria to recognize them as such and, as previously indicated, one of the most accepted classifications was developed by Giffinger and Gudrun (2010), including criteria as competitiveness, people capabilities, citizen participation, transports, communications, environment and quality of life.

Table 2: Criteria to be considered for Smart Cities classification

1. COMPETITIVENESS	**2. PEOPLE (HUMAN CAPITAL)**
Innovation, productivity and labor flexibility	Qualification level, public life participation and training
3. CITIZEN PARTICIPATION	**4. TRANSPORT AND COMMUNICATIONS**
Public participation, public services and performance, and participation forums	Accessibility, infrastructures and public transport
5. ENVIRONMENT	**6. QUALITY OF LIFE**
Energy efficiency, pollution level and waste recycling	Health attention level, education and housing quality

Source: based in Giffinger and Gudrun (2010)

Many projects related to cities development have attempted to be classified as "smart" during last decade and European and Spanish cities are not an exception in this new city strategic movement to get a kind of “quality recognition” aiming to capture attention from companies and citizens, despite some level of “marketing”

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that often is used by city responsible to increase their reputation as good administrators beyond typical cities achievement. Among others, projects listed in Table 3 represent this trend.

Table 3: Smart Cities projects sample

Country	Year	Objetives
Abu Dhabi (UAE)	2006	30% electricity saving in University area
Estockhom	2007	Mobility and energy saving project
Málaga (Spain)	2009	20% energy saving. Electric vehicle project
Songdo (South Korea)	2009	New city based on efficient resources use. 75% materials recycling
Valladolid y Palencia (Spain)	2010	Energy, mobility and recycling projects
Búzios-Rio de Janeiro (Brasil)	2010	City was planned to be a best practice on electricity consumption
Barcelona (Spain)	2010	Mobility and communications
Paredes (Portugal)	2011	New Project for a very efficient new design city
Madrid (Spain)	2011	Mobility, communication and energy efficiency projects
Proyecto *OutSmar*t (Santander (Spain) and others)	2011	European Union Project including: waste management, water, transport and lighting

Source: author´s elaboration

In Spain, Malaga city has been a pioneer in this movement and put big efforts to develop projects which have brought a high level of recognition among those cities considered as Smart Cities. For years this kind of “smart” projects development was more a result of local initiatives than a country or regional coordinated strategy, however the European Commission (2012) recently established these practices should be integrated into EU strategy.

4. EUROPEAN UNION STRATEGY FOR SMART CITIES

European Union has announced a new European Innovation Partnerships (EIP), with the intention to mobilize some relevant key innovation stakeholders. To avoid unsuccessful approaches and efforts strong dispersion this plan is focused on energy management efficiency and city transport improvement innovation across cities, so subjects related to energy management and urban energy use, cities transportation/mobility and communication systems. This plan looks for encouraging faster partnerships development to catalyze progress through new practices and models, finding ways to merge into comprehensive and multidisciplinary solutions to achieve better efficiency and shorter time spam, better use of resources and

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obtaining meaningful greenhouse emissions reduction. Ultimate goal is that European cities would become places with an advanced social and environmental progress and economic growth engines with a holistic sustainability (economic, social and environmental) view within 10-20 years.

To minimize opportunistic behavior risk it have been defined some specific project rules: i) solutions must be sufficiently robust and flexible enough to integrate future technologies, ii) It should not be introduced any additional market barrier from any particular manufacturer, iii) companies willing to work on these projects must be open to share information with others - even competitors - during the project development.

EIP involves "ecosystem test model" generation, where cities and companies, under sponsorship and supervision of the EC, will test and evaluate different solutions. This movement is framed within the overall strategy of European re-industrialization, since industry could be supported by this plan on their vital fight for global technological leadership. In the initial phase, initiative seeks to implement and demonstrate existing solutions in energy and communications areas at certain cities, not only just waiting for disruptive technology that would need some extra time to get results in field. These pilot projects should encourage strategic alliances formation by innovative companies acting in any of the three indicated areas and interested in joining the European project. These companies should establish partnerships agreements with interested cities and local companies to implement solutions in a short time spam.

5. ENERGY AS COMPETITIVENESS FACTOR IN CITIES AND ESCO FORMATION

Availability of abundant energy at low prices has fueled global economic growth during last twentieth and current twenty-first century. But this resource could be in the coming decades the biggest limiting factor to keep world quality of life, and this situation is somehow related to Thomas Malthus thoughts (1798) when he wrote on high risk involved in the population growth within limited land suitable for cultivation. Industrial Revolution generated in England – and then in the rest of Europe and America – developed new economic activities that avoid this potential problem and maybe we need now another revolution in the energy field.

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Today, the people who live and conduct their activities in cities jointly absorb the 75% of the world's total energy consumption and this volume is accelerating, on top of that the emergence of new sources of energy, working on profitable operating conditions is not always be able to follow the growth at a similar rate that demand, and energy prices tend to rise despite conjectural downs.

In this situation, the rapid growth of energy consumption in emerging countries create a particularly serious problem for countries like Spain, with a high de-dependence on external supply sources. It is therefore not surprising that the economic viability of companies and municipalities are affected not only by the way I which energy is produced, but also for the manner in which it is distributed and used. According to a report by McKinsey (MOHR et al., 2012), energy accounts for 45% of production costs for TV manufacturers so they are trying to redefine all product design and production processes, in order to avoid that the impact of the energy cost seriously impair the competitiveness of their products. Another example is related to consumer goods packaging in the United States, which has halved energy consumption in three years (DOBBS et al., 2012) through collaboration between the different members of the supply chain in search of materials, technologies and more efficient ways of working.

In this supply chain collaboration, an ESCO (Energy Service Company) could fit. ESCO is could be defined as a company that accepts an agreement with an entity (public or private), considered as the “client”, in order to optimize the overall - or part-management of their energy. Ensuring a certain service level with comprehensive cost savings and being able to improve the initial energy situation far above client could achieve alone will be major ESCO objective.

To achieve these savings, ESCO invests in more efficient technologies, install them, even in some cases fund the investments and maintain them for certain number of years included in the contract, seeking for maximum cost/efficiency ratio and ensuring service level agreement with the client for the specific project (Vine, 2005). It should be noted that such partnerships are already in use in the United States and Europe for over thirty years but only in last decade have been strongly pushed from governmental institutions within the European Union.

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No doubt as Hartley (2005) points out, that this type of practice is a kind of horizontal "collaborative innovation", as this new way of working seeks to simultaneously improve cost and service, through management information integration and the use of new technologies within a rather new collaborative model between organizations.

It should be point out that the basic ESCO model, according with Bertoldi et al. (2006), is based on a particular system of compensation with combinations related to the type of contract agreed between the parties and always with a commitment to compliance with the agreed service level.

In Spain, the Royal Decree 67-2010 regulates ESCO type companies and state that "energy service provided by the ESCO will consist of a range of services including conducting intangible investments, works or supplies necessary to optimize quality and reducing energy costs. This action may further comprise the construction, installation or transformation of works, equipment and systems maintenance, upgrade or renewal, exploitation or management arising from the incorporation of efficient technologies. The energy service, so defined, shall be paid based on a contract to be carried associate a verifiable, measurable or estimable savings"

As mentioned before, EU major goal is to identify successful business models that can be adapted to local circumstances, stimulate innovation and create local jobs. This view fits with models like those developed around ESCO (BERTOLDI et al., 2006) so they can contribute significantly to Smart City projects implementation. Also ESCO could capitalize their capabilities for efficient collaboration with complementary partners to extend their business to other technologies beyond energy management. Understanding Spanish ESCO opportunities development and barriers can anticipate implementation ways for faster development also gaps and be useful for further initiatives developed under Smart City umbrella.

6. ENERGY SERVICE COMPANIES DEVELOPMENT IN SPAIN

ESCO organizations operate in Europe to respond to something that is sorely needed: energy costs reduction based on more efficient use. ESCO are seen as part of conceptual models of "extended enterprise" where what matters is not if a specific chain link is very efficient but if whole chain is as efficient and competitive as

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possible. Energy consumption fast growth is a serious problem for countries like Spain with a high dependency on external sources of supply.

EU Directive 2006/32/EC on energy services, established framework for this type of companies within European Union: i) it sets energy efficiency targets for 2016, ii) it defines ESCO type companies management model, iii) it encourages service payment should be based on energy efficiency targets achievement, iv) It promotes financing agreements with financial institutions, v) it recommends to Public Sector to create best practices. In Spain, Law RD 6/2010 and RD 3/2011, regulate ESCO company standards and conditions for operation. Final agreements present several combinations depending on the type of con-tract agreed between parties. Typically, an ESCO is the main integrator responsible for the management and coordination of all the elements within energy project.

It should be told that this business model based on collaboration between organizations to achieve savings in energy management could be traced in Spain over thirty years ago when, still without specific legal regulations, it began initial projects around energy co-generation.

From cases studied in this research, most frequent services offered in Spain include lighting, air conditioning, operations and co-generation. Savings will depend on specific application area (shopping malls, hospitals, hotels, universities, offices, roads lighting, etc) and also in technology (main savings are expected in lighting and air conditioning). Potential savings range could be from 15% to 40%, and value will depends both on the baseline and applicable technology. Currently, most common projects are conducted in urban road lighting, hospitals and shopping malls. Spanish partners select ESCOs based on proven records in project experience and appropriate technology

6.1 ESCO agreement models in Spain

In Spain, ESCO agreements varied from project to project and it depends on bilateral negotiation between parties, but they used to be linked to specific service levels and potential savings that could be achieved by partners. However, we can distinguish two main types of agreements structures: i) energy supply agreements, where client pays for the useful consumed energy at certain agreed price. Energy efficiency measures are usually limited to energy supply to building or installation

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and client pays to ESCO a certain value based on electricity amount minus an agreed percentage of savings, ii) agreement on energy performance, service payment is based in energy efficiency improvements against objectives set in the contract, keeping service level.

In general, ESCO charged an agreed fee which depends on the energy saving achieved. If ESCO revenue is linked to “savings”, speaking of "performance" is a more appropriate measure to establish the success of the operations of the subcontractor, since savings may depend on the activity of the client or exogenous factors such as the weather.

Inside cases studied in this research, energy services offered were including: lighting, HVAC, equipment operations (machines, IT) and also cogeneration projects. Although in the case of city halls, the priority was lighting on public roads and major municipal office buildings, because the return on investment in these applications was relatively short (2-3 years), and these projects improves sharply the quality of lighting, giving a high visibility of results to the citizens.

Regarding the number of ESCO companies operating in Spain, the Instituto para la Diversificación y Ahorro de la Energía (IDAE), has created a database where they have registered hundreds of companies, of different size, that declare they have activities related to energy efficiency. However, taking into account the capacity to undertake projects of some complexity, both technical and economical, and also data bases from professional associations real number of companies able to carry out these projects could be below 60 companies (only 59 companies have over 250 employees (IDAE, 2012)). Other sources, as the Asociación de Empresas de Servicios Energéticos (ANESE), evaluates at a level of 130 companies the number of organizations active in its association as involved in ESCO activities (ANESE, 2012), nevertheless in this figure there are many different companies from those making real ESCO project integration, from main subcontractor till mere components supplier which belong to this professional organization just to be aware of what is happening in this new business models (i.e.: lighting manufacturers). If we consider another alternative source of information, such as the amount of the Spanish enterprises dedicated to the process of large projects installation and maintenance, grouped in the Asociación de Grandes Empresas Instaladoras, their experts

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estimate around 30 companies (IDAE, 2012) with current or potential future activity in the market ESCO, as real ESCO companies in Spain by the end of 2014.

It is important to note that although this business model based on collaboration between organizations is relatively new, its origins in Spain could be traced back to the late 80s of last century, when even without specific legal regulation the first projects started around energy cogeneration projects (as known, cogeneration is the process by which electricity and useful thermal energy is simultaneously obtained (steam and hot water)). In particular it could be highlight Sinae, a company formed in 1988 and owned by Mapfre, Atisae and Idae, to carry out this kind of projects so frequent at that time, implementing cogeneration plants in hospitals, businesses ceramics centers, shopping malls... etc.

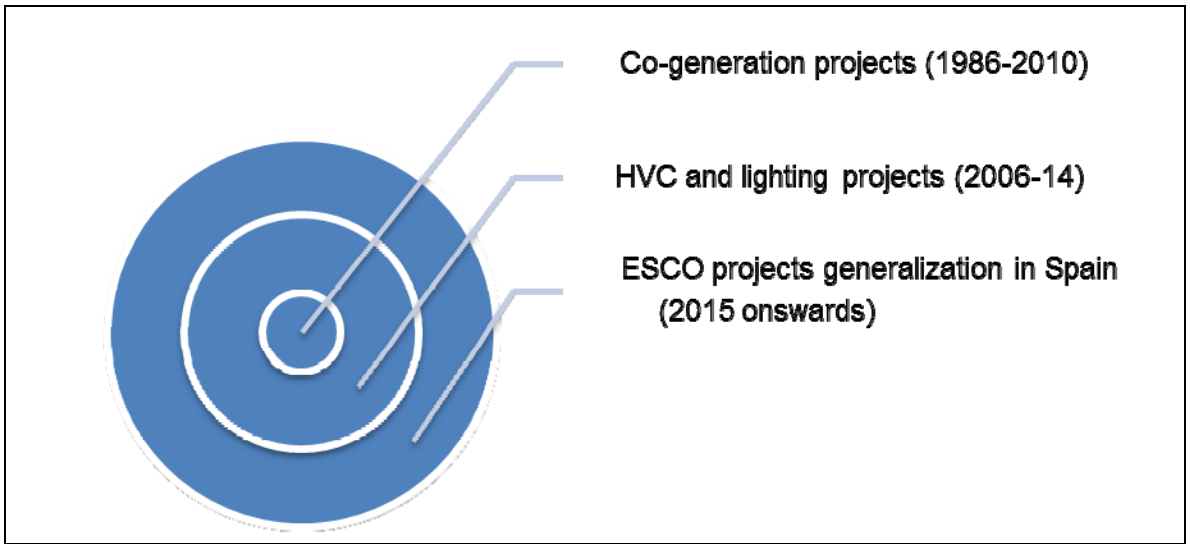

Figure 1: ESCO projects evolution in Spain.
Source: author´s elaboration.

Gradually energy savings knowledge was spread, and in 2006 began to be applied to common lighting and climate control projects, while the future trend is to integrate all these projects to present comprehensive proposals covering energy cost reduction.

Regarding agreements formalization, usually it takes shape as a formal contract between partners in which it will clearly indicated how savings will be distribute among parties. Generally contracts include client, ESCO and often a financial institution to support project financing, and two main types of contractors are distinguished in Spanish practice: a) guaranteed savings contract, in this case a certain saving amount is guaranteed to client whenever client operations remain

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within agreed limits. Investments are usually carried out by the client and its support financial risk. If the real savings are below guarantee level, ESCO must pay the difference. There is usually no contractual agreement between ESCO and financial institution but this entity frequently requires their technical commitment and economic compliance to guarantee project execution, b) shared savings contract, in this case real savings are shared between ESCO and client. Investments, usually, are manage by ESCO and transferred to client at the end of the contract. It is agreed a fix payment to ESCO including amortization, maintenance fee and a variable compensation linked to real savings.

An aspect quite interesting is to understand where ESCO projects more frequently happen, in other terms where potential areas of application could bring higher savings and/or return on investments. From available data (Comunidad de Madrid, 2010), it could be possible to identify main areas in which projects are bringing higher attention, both for public entities (offices, hospitals and universities and specially street lighting) and private organizations (industry equipment, offices, hotels, hospitals and shopping malls). Public entities focus is turning on street lighting projects which use to get a short term financial payback and very high citizen´s visibility but there many other areas where ESCO could fit perfectly as an attractive tool for energy higher efficiency, while private sector is more focused on areas like equipment in industry and air conditioning in offices, hotels and hospitals. Lighting used to be a common technology item for improvement for all kind of areas but direct expected savings are not as impressive as the others (equipment and air conditioning), but still interesting.

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Table 4: More frequent ESCO applications in Spain

Offices	Hospitals	Hotels
Areas: lighting, equipment and HVC	Areas: lighting and HVC	Areas: lighting and HVC
Consumption/employee: 2.453 kwh	Consumption/bed: 29.199 kwh	Consumption/daily guest: 1.920 kwh
Potential saving: 30-40%	Potential saving: 30-40%	Potential saving: 20-40%
Universities	**Street lighting**	**Shopping Malls**
Areas: lighting and HVC	Areas: lighting	Areas: lighting, equipment and HVC
Consumption/student: 406 kwh	Consumption/habitant: 73 kwh	Consumption/SQM: 350-400 kwh
Potential saving: 25-35%	Potential saving: 40-60%	Potential saving: 20-40%

Source: author´s elaboration

It is very interesting to measure potential savings achievable from ESCO projects, that it ranges from 20-40% like in shopping malls (lower level for buildings built within five years and higher level for oldest than ten years, but also depends on initial technology applied) to 40-60% in street lighting projects. That is the reason why city halls are so interested on developing this kind of agreements: high return on investment, low risk and short implementation timeframe.

6.2. Barriers faced by ESCO organizations in Spain

At the same time that ESCO projects are increasing and gaining additional relevance in Spain, from in-depth interviews to companies operating in the sector and additional data checked with other participants in the study, it has been identified following barriers to further ESCO development in Spain:

a) Financial and economic barriers

Energy is recognized as an expensive input for companies but probably not enough to force them to quickly enter into collaborative projects. Since energy price is still not considered expensive enough by companies, pressure to recover investment in a short term (2-4 years) gives very limited applicability to ESCO projects, especially when technological investment are required.

b) Legal Barriers

There are important legal difficulties for contracting with public entities, even in public-private partnerships. RDL 8/2010 law regulated all type of public obligations to

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avoid public deficit increase and introduce many regulation in governmental contract and obligations, in line with Spanish Government extraordinary measures to reduce public debt. This law is so complex in term of what could be considered as deficit that is blocking many ESCO projects when public entities are involved. Accounting treatment of these types of commitments make these contracts very unclear.

Also, private sector has serious difficulties to adapt contracts to specific client requirements. Contracts need to include many clause related to specific operational details and it is not easy to translate into legal norms. So, there is a serious difficulty to fit into Spanish legal practices despite it works extensively in other countries and it should be accommodated Spanish legal structure.

c) Clients lack of knowledge. Distrust

As it happen sometimes to new business model, clients distrust of something they do not know enough, also it contributes to this situation a limited availability of successful references. Dissemination of good practice is something that would help significantly to grow, giving to this collaborative relationships a high visibility and notoriety.

d) Opportunistic behavior

In some projects, collaboration aim was not well understood and some clients thought these projects will mean just earning some amount of money with low involvement. Opportunists clients interpret that this business model is was based on an external organization who will take over energy efficiency responsibility in their processes - and associated risk - with no responsibility on their side will remain and this is totally against the concept since mutual involvement in the collaborative relationships is the base for energy management improvement and anything is foreseeable within a close link between partners.

7. CONCLUSIONS

The growing EU interest for Smart City development clearly indicates a strong path for the development of different types of ESCO projects, as an innovative model that links collaborative initiatives between organizations (public and/or private) to achieve significant savings in energy consumption.

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In the case of Spain the steady increase in energy prices in recent years is an additional incentive for these projects development, as far as economic impact of energy savings will compensate price increases. Also, many ESCO projects could be self-financed for investors, because savings are huge enough to pay the amortization of the required investments, operating management expenses and ESCO margin in an affordable timeframe (2-3 years).

Public institutions, such as city halls, nowadays are searching for cost savings measures in order to reduce public deficit, and energy management has become a priority. Agreements with ESCO organizations able to manage and achieve net savings between 40 and 60 percent of consumption are being implemented, like for public roads lighting.

In the private sector important companies, well known for their best practices in process management, are beginning to realize that further improvements in operational processes (design, manufacturing, transportation, etc.) may have a limit, so some of them are applying efficiency practices to other relevant resources as energy, and ESCO projects perfectly fit in this scenario.

Interest shown by EU in the development of Smart Cities could be an important lever to speed up project implementation, since ESCO mean a pillar for energy efficiency. In fact, it would be very difficult to be a Smart City without achieving significant savings in energy management area, which are more easily achievable with ESCOs implementation.

However, it could concluded Spanish ESCO market is still not getting expected level of development due to reasons like: i) low energy efficiency permissibility in organizations is still high, since there is not a broad sense of real impact in the financial bottom line of the companies, ii) there are limited incentives for improvements, iii) there is a widespread ignorance of the benefits achievable through ESCOs, iv) still appear high difficulties in the Public Administration to find legal ways for public projects if the aim is to afford them without being counted as additional public debt.

From this analysis, it can be inferred that ESCO projects are an advisable tool to achieve energy efficiency goals in line with Smart Cities focus. In Spain, ESCO projects are being gradually implemented, however its potential applicability is still

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very huge and promising, probably much higher than initially identified and involve important achievable savings based on collaborative partnerships.

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