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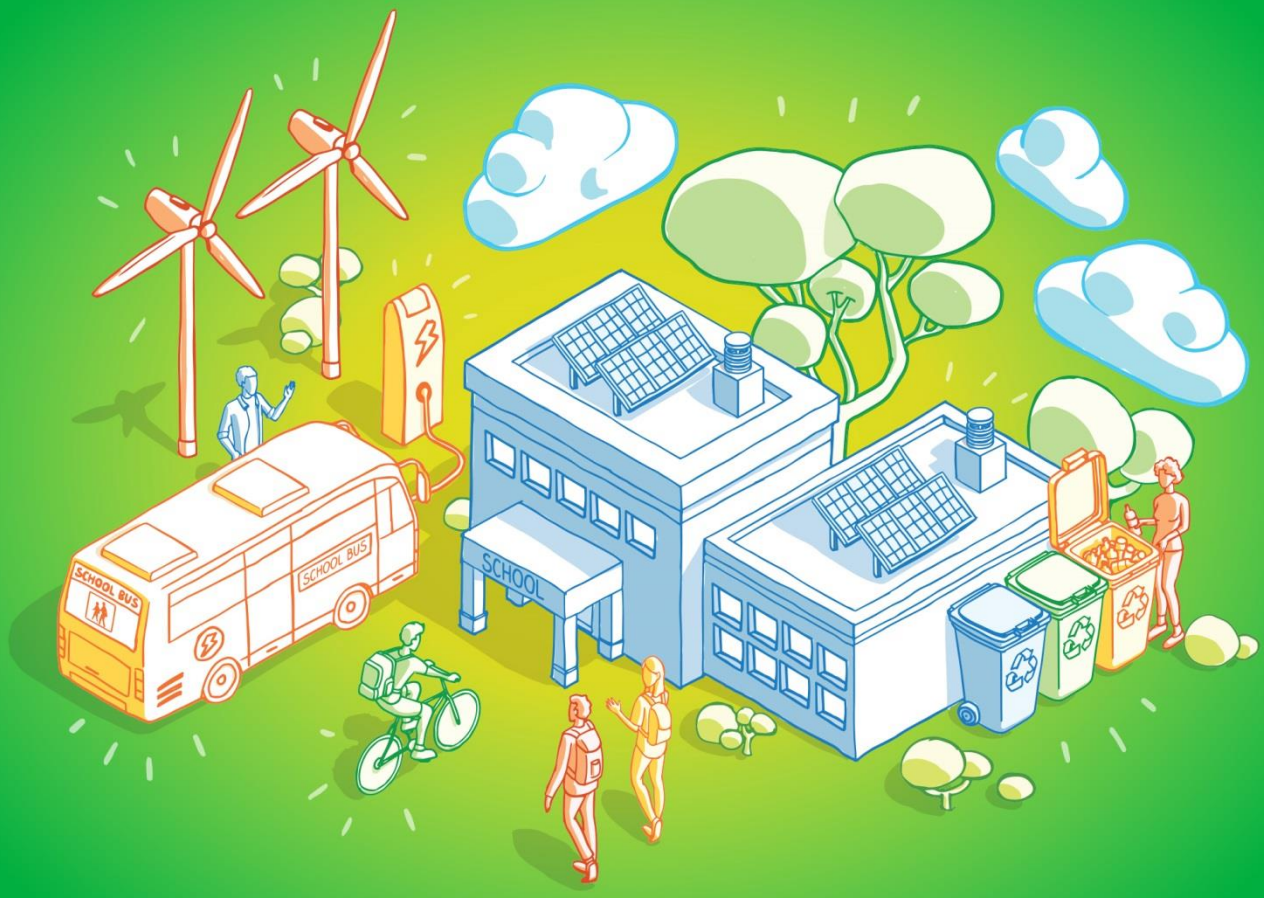

CLIMACT - ACTING FOR THE TRANSITION TO A LOW CARBON ECONOMY IN SCHOOLS – DEVELOPMENT OF SUPPORT TOOLS

E2.7.1 – Easy Guide on EPC Business Models

June 2017

WWW.CLIMACT.NET

Document history

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Acronym	Full name
BOOT	Build-Own-Operate-Transfer
ECM	Energy Conservation Measure
EE	Energy Efficiency
EED	Energy Efficiency Directive
EEEF	European Energy Efficiency Fund
EPC	Energy Performance Contract
EPBD	Energy Performance of Buildings Directive
ESC	Energy Supply Contract
ESCO	Energy Service Company
EU	European Union
ICP	Investor Confidence Project
ICT	Information and Communication Technology
IEC	Integrated Energy Contracting
JRC	Joint Research Centre
M&V	Measurement and Verification
O&M	Operation and Maintenance
PACE	Property Accessed Clean Energy
PDA	Project Development Assistance
R&D	Research and Development
SEAF	Sustainable Energy Asset Framework

Executive Summary

This deliverable is part of Activity 2.7 – Development of new business models and management strategies for schools and this task focuses on developing innovative business models for Energy Services Companies (ESCOs) which are aligned with the stakeholders' requirements.

The aim of this document is to provide methodological guidelines on Energy Performance Contracts (EPC) business models based, not only in building retrofitting, but also in smart management of energy, that will consider significant energy performance improvements without sacrificing occupants' comfort and health in the indoor environment.

To foster the implementation of energy efficiency investments in schools, ClimACT aims to facilitate the conditions to promote the adoption of EPC. Firstly, the existing EPC business models, which are based in building retrofitting, were studied. Then, new business models based on smart energy management were developed. These new business models consider significant energy performance improvements without diminishing occupants' comfort and health in the indoor environment.

The focus is not solely on the business environment at the project's pilot sites, but through the Living Lab and the involvement of relevant stakeholders, it will introduce new business approaches that will be transferable to all other SUDOE regions and beyond.

The main outcome of this document is the proposal of two innovative ESCO business models, which introduces energy management strategies and the adoption of gamification processes as a tool for raising school occupants' awareness for energy savings, without compromising the comfort and health parameters.

1 Introduction

Energy efficiency has an enormous potential, the investment in this sector can provide many different benefits to many different stakeholders. Either by directly reducing energy demand and respective costs (which allows investment in other goods/services) or helping the achievement of other objectives (e.g. making healthier indoor environments or boosting industrial productivity).The improvement of energy efficiency is strategic to enhance the energy system and environmental sustainability, economic and social development and prosperity (IEA, 2014).Energy services and the use of energy services companies (ESCOs) can play a critical role in promoting energy efficiency at the market level. During the last years, the awareness and understanding of energy efficiency services has increased and mistrust has decreased. A contribute to this was the growing importance of energy consumption cost efficiency due to rising energy prices and growing environmental awareness.

An ESCO is a commercial business providing a range of energy solutions including design and implementation of projects focused on energy savings, retrofitting and energy conservation. ESCOs develop, implement and provide or arrange financing for upfront energy efficiency investments for its clients. They provide a broad range of energy services to final energy users, addressing both individual buildings and groups of building premises, including: energy efficiency advice, energy audits, feasibility studies, design and implementation of retrofitting projects, energy conservation, equipment procurement, measurement and verification (M&V), operation and maintenance (O&M) and project financing.

The objective of this deliverable is to provide methodological guidelines on energy performance contracts (EPC) business models based not only in building retrofitting but also in smart management of energy that will consider significant energy performance improvements without sacrificing occupants' comfort and health in the indoor environment.

1.1 Scope of the document

This deliverable aims to provide methodological guidelines on EPC. Additionally, by extending existing EPC formats, this document aims to introduce novel business models for ESCOs that will consider significant energy performance improvements without sacrificing occupants' comfort and health in the indoor environment.

ClimACT will not only focus on the business environment at the project's pilot sites but, through the Living Labs and the involvement of relevant stakeholders, it will introduce new business approaches that will be transferable to all other SUDOE regions and beyond.

The results of this activity are strongly linked with activity T1.5 – ClimACT Resource Matching Platform, as the business models developed will be tested using this platform.

1.2 Deliverable structure

This document starts with a brief introduction of the methodology followed. Then the current state of the art of the existing ESCO business models are assessed, identifying main barriers and success factors and allowing the development of innovative business models that will be validated in ClimACT schools.

The document is structured as follows:

- **Chapter 2** presents a brief introduction of the methodology followed;
- **Chapter 3** describes current market status, barrier and drivers of EPCs;
- **Chapter 4** presents the current state of the art of the existing business models
- **Chapter 5** describes the innovative business models developed;
- Finally, **Chapter 6** presents the main conclusions of the present work.

2 Methodology

In order to enable the implementation of energy efficiency investments in schools, ClimACT aims to facilitate the conditions to promote the adoption of Energy Performance Contracts (EPC).

The methodology followed for developing new ESCO business models for the ClimACT schools started by studying the existing EPC business models which are based in building retrofitting and analysing the barriers and success factors of the ESCO market in the European Union (EU). Then, new ESCO business models were developed for the ClimACT schools based on smart energy management. These new business models consider significant energy performance improvements without diminishing occupants' comfort and health in the indoor environment.

2.1 Definition of business models

In order to characterize and compare the business models, the business model Canvas was used. This tool is a strategic management and a short start-up template for developing new or documenting existing business models and was developed by Osterwalder and Pigneur (2010). It is also a strategic management and entrepreneurial tool. It is a simple way to analyse and compare the many different business models, through its organized and clear structure.

The business model Canvas is divided in nine parts (Figure 1): 1) Value proposition, 2) Customer Segments, 3) Channels, 4) Customer Relationships, 5) Key Activities, 6) Key Resources, 7) Key Partners, 8) Revenue Streams and 9) Cost Structure.

<table>
<tr><td rowspan="2">7 - Key partners
The network of suppliers and partners that make the business model work</td><td>5 - Key activities
The main activities a company must do to make the business model work</td><td rowspan="2">1 - Value proposition
The bundle of products and services that create value for a specific customer segment</td><td>4 - Customer relationships
Relationships that the company establishes w/ its customer segments</td><td rowspan="2">2 - Customer segments
The different groups of people or organizations the company aims to reach and serve w/ the business model</td></tr>
<tr><td>6 - Key resources
The main assets required to make the business model work</td><td>3 - Channels
How the company communicates w/ and reaches its customer segments</td></tr>
<tr><td colspan="3">9 - Cost structure
All cost incurred to operate the business model</td><td colspan="2">8 - Revenue streams
The money the company generates from each customer segment served w/ the business model</td></tr>
</table>

Figure 1 – Business model canvas (adapted from Osterwalder and Pigneur (2010))

This business model translates into nine building blocks to show the logic of how a company intends to make money. The main purpose of a business model canvas is to foster understanding, encourage discussion, creativity and analysis.

3 Current ESCO market status

This section reviews the current ESCO market status in the EU. Starting from the analysis of the current regulation/legislation, along with financing sources and also drivers and barriers to ESCO projects.

3.1 Regulation/Legislation

The European Commission has long been supporting the ESCO industry through legislation and programmes. These efforts have been increased in recent years, in particular through directives, standards, campaigns, funding schemes, market researches, databases and R&D projects.

The Energy Efficiency and Energy Services Directive 2006/32/EC established conditions for the facilitation of the penetration of energy services in the Union countries This directive lead to the other legislation which detailed further market rules and facilitation processes- The two main directives that legislate the ESCO industry and reduction of energy consumption in buildings are the Energy Efficiency Directive (EED) 2012/27/EU and the Energy Performance of Buildings Directive 2010/31/EU (EPBD).

3.2 Financing sources

There are several funding schemes for ESCO projects offered by the European Commission. For example, the multi-annual Financial Framework is an important source for funding EPC policies and measures. Aligned with EU 2020 strategy “Smart, Sustainable and Inclusive Growth”, the present framework (2014-2020) has been designed to serve as the support of a shift to a competitive low carbon economy (EC-JRC, 2017).

On the other hand, programmes such as Horizon 2020 and INTERREG SUDOE support the research, demonstration and market up-take of energy efficient technologies.

Under the Intelligent Energy Europe, the European Commission has set up a series of facilities funding Project Development Assistance (PDA) to support public authorities and public bodies in developing bankable sustainable energy projects. The objective is to reduce the gap between sustainable energy plans and real investment through plan support and gather investment into the projects.

One of these PDA facilities is called ELENA and is managed by the European Investment Bank. Since its beginning it has supported local and regional authorities to develop and launch large-scale bankable sustainable energy investments. Many of the projects supported under these facilities have contributed to support the development of the EPC market in Europe.

While PDA facilities are targeted at project development, the European Energy Efficiency Fund (EEEF) is a funding source for ESCOs, financing EE, small-scale renewable energy, and clean urban transport projects targeting municipal, local and regional authorities.

The European Investment Bank has also been supporting ESCO projects with financial guarantee. JESSICA is a financial mechanism created by the EIB and it provides a range of financial tools such as equity investments, loans and guarantees.

Transparense (2013) indicates that the financing sources used in the EU are mainly a mix of investments made by the ESCO, the customer and 3rd-party entities or, on a smaller scale, an investment done by solely one of these entities (Figure 2).

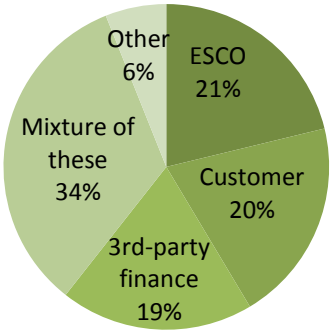

Figure 2 – Financing sources for ESCO projects in the EU (adapted from Transparense)

A financing model that is different to current European models is Property Assessed Clean Energy (PACE), which is used in the United States. This model enables local governments to raise money to fund clean energy projects in households or commercial buildings. In a PACE model the customer pays for the project during a pre-agreed period through a special tax or an assessment on the property tax bill. Financing is secured with a lien on the property, and then if the property is sold before the end of the repayment period, the new owner inherits both the repayment obligation and financed improvements (Almeida, 2015).

3.3 EPC and energy audits

There are several synergies between EPC and energy audits (GuarantEE, 2017), as presented in figure 3:

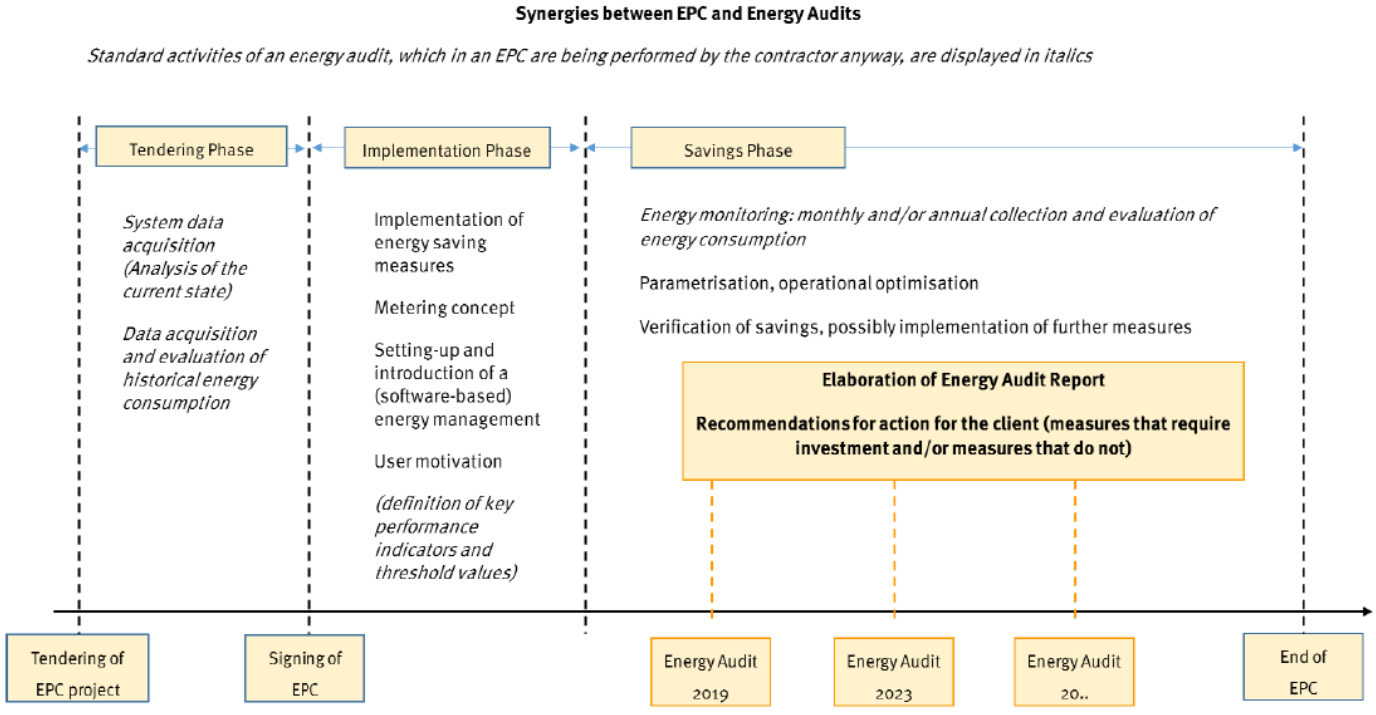

Figure 3 - Synergies between EPC and energy audits (guarantEE, 2017)

Usually EPCs involve the elaboration of energy audits to determine the savings opportunities and to assess the consumption baseline, in order to calculate savings in the future. Without the energy audits the uncertainty would make this business model too risky for most projects.

3.4 Drivers and success factors

The Investor Confidence Project[1] (ICP) Europe is a good example of an action to fight the current barriers of the ESCO market, being an innovative and actionable intervention to access financing for the building renovation market by standardizing how EE projects are developed and measure. ICP was developed in the USA by the Environmental Defense Fund and produced, among other open-source tools and energy performance protocols for the development of EE projects in buildings.

Another good example of bridging the gap between ESCOs and investors in Europe is the Sustainable Energy Asset Framework (SEAF)[2], aiming to make DR, EE and distributed renewable generation accessible to small and medium-sized enterprises through the development of a software platform that will be designed to function in ten European member states. By the end of the project (2018) it is expected a substantial investment in projects, unlocked through the platform.

The main driver of ESCO projects is the increase of energy prices, which creates pressure on facilities owner to cost reduction. ESCOs are a mean to that objective. Other drivers' sensibility to EE, customer demand, governmental policies, availability of financing and public subsidies (Transparense, 2013).

Bertoldi and Boza-kiss (2017) and Trust EPC South (2016) found that the success factors of ESCO projects can be summarized in the following categories:

- **Legal and political drivers**: long-term, manifested and credible commitment by the public authorities; supportive policies; dedicated ESCO legislation and measures; complementing measures on energy services; removal of regulatory barriers and ESCO services standardization.
- **Procedural factors/tools**: tools, models and handbooks for the various stages of an ESCO project implementation; standard documents; flexibility in the content and preparatory procedure of a contract and statistics system, data collection, centralized data collection and management systems (which decrease transaction costs).
- **Financing**: EU and national grants, financial incentives, preferential loans and third party financing (openness of the banking sector for financing ESCO projects).
- **Information and awareness**: motivation for refurbishing sites by municipalities (which motivates EE investments); environmental and climate awareness; awareness raising activities

[1] http://europe.eeperformance.org/
[2] https://www.seaf-h2020.eu/

- **Structural and market related changes:** energy price; recovery of the construction industry; ESCO associations and facilitators; progressive projects and the development of information and communication and smart technologies.

3.5 Barriers

Despite all efforts to promote energy efficiency, there are still barriers that limit the ESCO market. Addressing these barriers is paramount to develop this market and unlock energy saving potential.

The main barriers encountered in the EU are the lack of information on the complexity of the ESCO concept, leading to lack of trust in the ESCO industry. The lack of government effort to develop and promote ESCO regulation and EE policies creates uncertainty in the customers (Transparense, 2013).

The main limiting factors for ESCO market establishment were found to be the following by EC-JRC (2017) and Transparense (2013):

- **Awareness and information:** Lack of information on the complexity of the ESCO concept, leading to distrust by end-users and also by financial institutions.
- **Legal and political barriers**: Erratic legislation; lack of generally accepted ESCO definition; certification and standards; ambiguous legislation; problematic procurement rules.
- **Institutionalization and project tools**: Lack of facilitators; lack of proper M&V practices; savings predictability issues.
- **Financing barriers**: Accounting of EPC projects as loans by public authorities; problems with bank financing (low awareness and motivation to finance ESCO projects); aversion to loans by potential ESCO clients and high transaction costs.
- **Market and partnerships problems**: Low energy prices; high perceived risks; lack of well-established partnerships; failed projects.
- **Behavioural barriers**: Client risk aversion about EPC models; preferred in-house solutions; unwillingness to take on long-term debt.

4 ESCO business models

The definition of the business models for ESCOs and their current market status is one of the main objectives of this deliverable. Focusing on their success factors and deployment barriers, a review of the existing business models and current market status in Europe is provided.

An ESCO is a commercial business that provides a range of energy solutions to its customers. The main ESCO business is to design and implement energy savings projects, for that reason, the ESCO needs to follow a business plan defining specific agreements with customers, including the respective roles and responsibilities.

The ESCO market is extremely important because it turns possible the development of win-win relationships between the customer (who, by entering in an ESCO contract, saves energy and consequently money) and the ESCO (who invests or arranges investment and obtains return on the investment throughout the ESCO contract).

4.1 ESCO existing business models

The ESCO market is seen as an essential agent for implementing ECMs and achieving energy savings in buildings. ESCO models were developed in the USA and afterwards brought to Europe and have been used since the 1970s. The present section describes the ESCO models that are currently used.

4.1.1 Energy performance contracts (EPC)

An EPC allows to form a partnership between a customer and an ESCO to enhance the demand-side EE of their facilities (EU-ESCO, 2010), thus obtaining energetic and financial savings.

EPC is a performance based business model. This means that the ESCO will be remunerated based on the energy savings generated through the contract. The cost savings obtained with the ECMs will be split through the customer and the ESCO, even though, typically, ESCOs guaranty a minimum savings value to the customer.

The most common forms of EPC are shared-savings and guaranteed-savings, but it is also possible to perform variable contracts.

EPC is well suited for large scale projects, especially in the public sector, because of high transaction costs and long payback times. Usually, the private sector is less attracted to contracts with long payback times which means that, in order to establish a contract in the private sector, ESCOs should focus on the implementation of ECMs with rapid return of investment. Difficulties to set up an energy baseline make it harder for the ESCO to predict energy savings and the measurement and verification process needed to follow up on the project results can be costly (Warget, 2011).

4.1.1.1 Shared-savings EPC

With shared savings EPC the ESCO finances the project for implementation of ECMs at the customer facilities. Measured cost savings during the contract period are shared between the client who owns the facility and the ESCO. Usually, the contract specifies that a percentage of

the obtained savings goes to the ESCO, which was previously defined by the client and the ESCO. This percentage is highly dependent on factors like length of the project and project risks. Table 1 summarizes the shared-savings EPC business model.

Table 1 - Shared-savings EPC business model

<table>
<tr><td rowspan="2">7 - Key partners
Financial Institutions; Construction and technical partners</td><td>5 - Key activities
Project preparation, development and operation</td><td rowspan="2">1 - Value proposition
Energy savings without prior investment or commitment; Savings from the first moment</td><td>4 - Customer relationships
Contractual (medium-term, 10-15 years)</td><td rowspan="2">2 - Customer segments
Large buildings: Public bodies; Corporate clients (building owners, commercial and industrial)</td></tr>
<tr><td>6 - Key resources
Technical and financial know-how</td><td>3 - Channels
Public projects; Special events</td></tr>
<tr><td colspan="3">9 - Cost structure
Construction cost; Interest rates</td><td colspan="2">8 - Revenue streams
Energy savings from the project</td></tr>
</table>

The duration of the contract depends on the level of investment that was made. For large refurbishment measures it is expected a long-term contract (8-15 years). For EPC involving low levels of investment (e.g. 'EPC light'), short-term contracts (2-3 years) are also possible (GIZ, 2012).

4.1.1.2 Guaranteed-savings EPC

In a guaranteed-savings EPC the ESCO assumes the risk of the project's performance. Financing is, usually, provided by the ESCO, but may include capital investment from the client. The ESCO will guarantee a minimum energy savings level (percentage), if savings exceed the guaranteed level, they can be absorbed by the ESCO or the customer depending on the method of payment agreed. Fixed payment contracts mean that all savings belong to the customer while payment by percentage of savings means that all savings besides the ones guaranteed to the client are paid to the ESCO. (EC-JRC, 2016; DAREED, 2014). Table 2 summarizes the guaranteed-savings EPC business model.

Table 2 – Guaranteed-savings EPC business model

<table>
<tr><td rowspan="2">7 - Key partners
Construction and technical partners</td><td>5 - Key activities
Project preparation, development and operation</td><td rowspan="2">1 - Value proposition
Guarantees energy savings; Stable cash-flows</td><td>4 - Customer relationships
Contractual</td><td rowspan="2">2 - Customer segments
Corporate clients willing to invest in EE</td></tr>
<tr><td>6 - Key resources
Technical know-how</td><td>3 - Channels
Corporate projects; Special events</td></tr>
<tr><td colspan="3">9 - Cost structure
Construction cost</td><td colspan="2">8 - Revenue streams
Energy savings from the project</td></tr>
</table>

4.1.1.3 Variable contract term EPC

With a variable contract term EPC the ESCO designs, finances and implements the project. If the savings obtained are less than expected the contract term can be extended to allow the ESCO recover its full investment. In the First Out variation of this business model, the ESCO takes all the savings until it has received its full payment (SEAI, 2012). Table 3 summarizes the variable contract term EPC business model.

Table 3 –Variable contract term EPC business model

<table>
<tr><td rowspan="2">7 - Key partners
Financial Institutions; Construction and technical partners</td><td>5 - Key activities
Project preparation, development and management</td><td rowspan="2">1 - Value proposition
Energy savings without prior investment or commitment;
Savings from the first moment</td><td>4 - Customer relationships
Contractual (term depends on ESCO recovering its full investment)</td><td rowspan="2">2 - Customer segments
Corporate clients</td></tr>
<tr><td>6 - Key resources
Technical and financial know-how</td><td>3 - Channels
Corporate projects; Special events</td></tr>
<tr><td colspan="3">9 - Cost structure
Construction cost; Interest rates</td><td colspan="2">8 - Revenue streams
Energy savings from the project</td></tr>
</table>

4.1.2 Energy supply contract (ESC)

An energy supply contract (ESC), is a contract in which the ESCO takes over the planning and construction of energy production and distribution systems or systems for measurement and control technology. ESCOs assume responsibility for financing the project, operation and maintenance of equipment's and guarantee of supply. The building owners buy the output (useful energy) to the ESCO (Mayer et al, 2010). Costs for all equipment upgrades, renewal and repairs are borne by the ESCO, but ownership typically remains with the costumer (SEAI, 2012).

Typical examples are photovoltaics (PV), combined heat and power (CHP) or biomass heat supply installations. For example, in the case of heating, this includes planning and installation of equipment, energy distribution, operation and maintenance of the production facilities, procurement of fuel, etc.

The ESC focus is on the efficiency of energy supply, aiming to lower the cost of operation and maximize ESCO earnings, and at the same time provide security of supply. This way, supply-side EE is improved because the "useful energy" is guaranteed to the customer. The biggest weakness of ESC is that all the EE measures stay on the supply side and there are no incentives to lower the demand side consumption.

ESC is generally oriented towards decentralized (local) power supply rather than larger centralized solutions. However, the ESC model can be used to build up district heating systems as well (Warget, 2011).

Energy savings are typically around 10-20%. Usually, energy services achieve economic and environmental benefits because renewable energy solutions are considered in the contracting approach.

The main difference between EPC and ESC is that EPC goes beyond ESC. Whereas ESC is based on a business model that guarantees energy supply; EPC is a business model focused on energy savings (EU-ESCO, 2010). Table 4 summarizes the energy supply contract business model.

Table 4 –Energy supply contract business model

<table>
<tr><td rowspan="2">7 - Key partners
Financial Institutions; Construction and technical partners</td><td>5 - Key activities
Project development, management and operation</td><td rowspan="2">1 - Value proposition
Guarantees energy supply (“input”); "Useful energy" service; Improvement of EE of supply;</td><td>4 - Customer relationships
Contractual: typically 10-15 years</td><td rowspan="2">2 - Customer segments
Buildings with energy saving potential: Public bodies; Corporate clients (building owners, commercial and industrial)</td></tr>
<tr><td>6 - Key resources
Technical and financial know-how and marketing</td><td>3 - Channels
Funded projects; Special events</td></tr>
<tr><td colspan="3">9 - Cost structure
Maintenance/management cost; Construction cost (supply side)</td><td colspan="2">8 - Revenue streams
Fee for the function provided (flat/escalating rate)</td></tr>
</table>

4.1.3 Chauffage

C*hauffage*, also referred to as comfort contracting, is a contract form that is developed to provide the utility service and incorporates EE on both the supply side and the demand side (Warget, 2011). However, demand-side EE measures are often “light” when compared with and EPC (*chauffage* does not include comprehensive retrofitting measures or equipment substitution) and are essentially focused on management and optimization of the building’s operational conditions.

This arrangement is an extreme form of energy management outsourcing. Firstly, the current cost baseline will be accessed, analysing how much is the customer paying to provide the function. The ESCO will then provide a guarantee of reduced cost or charge on a price per meter squared basis.

As in an ESC, the ESCO will be responsible for everything needed to provide the function during the contract period, that can last 20 to 30 years. This can include setting up heat boilers/coolers, procurement of fuel, operation, service and maintenance of production facilities as well as customer side technical installations. To lower the cost of operation and maximize their earnings the ESCO will optimize and implement supply-side EE measures.

Compared to EPC, *chauffage* contracts are generally less complex with lower transaction costs and without the same need for costly measurement and verification. On the other hand, EPC contracts may have more comprehensive demand-side EE measures reaching a wider range of

areas and may be better suited for larger building. Table 5 summarizes the *chauffage* business model.

Table 5 –*Chauffage* business model

<table>
<tr><td rowspan="2">7 - Key partners
Financial Institutions; Construction and technical partners</td><td>5 - Key activities
Project development, management and operation</td><td rowspan="2">1 - Value proposition
Guarantees a function (“output”); Improvement of EE of supply; Management & optimization of energy consumption</td><td>4 - Customer relationships
Contractual (variable lengths)</td><td rowspan="2">2 - Customer segments
Buildings with energy saving potential: public bodies; corporate clients (building owners, commercial and industrial)</td></tr>
<tr><td>6 - Key resources
Technical and financial know-how and marketing</td><td>3 - Channels
Funded projects; Special events</td></tr>
<tr><td colspan="3">9 - Cost structure
Maintenance/management cost; Implementation/construction cost (small)</td><td colspan="2">8 - Revenue streams
Fee for the function provided (flat/escalating rate)</td></tr>
</table>

4.1.4 Integrated energy contract (IEC)

An Integrated Energy Contract (IEC) is a combination of an ESC and an EPC (SEAI, 2012). Table 6 summarizes the integrated energy contract business model.

Table 6 –Integrated energy contract business model

<table>
<tr><td rowspan="2">7 - Key partners
Financial Institutions; Construction and technical partners</td><td>5 - Key activities
Project preparation, development and operation</td><td rowspan="2">1 - Value proposition
Energy savings without prior investment or commitment; Savings from the first moment; Guarantees energy supply (“input”); "Useful energy" service; Improvement of EE of both supply and demand</td><td>4 - Customer relationships
Contractual (medium to long term)</td><td rowspan="2">2 - Customer segments
Buildings with energy saving potential that need large retrofits: Public bodies; Corporate clients (building owners, commercial and industrial)</td></tr>
<tr><td>6 - Key resources
Technical and financial know-how</td><td>3 - Channels
Public projects; Special events</td></tr>
<tr><td colspan="3">9 - Cost structure
Construction cost; Interest rates</td><td colspan="2">8 - Revenue streams
Energy savings from the project</td></tr>
</table>

This model extends the ESC model by including demand-side EE measures. This way, besides increasing the efficiency of supply, this model implements ECMs, reducing the demand for energy in buildings. Results to be achieved by the demand-side EE, in this business model, include modernization of the installations, lower consumption and maintenance costs and improvement of the energy indicators (DAREED, 2014).

The IEC model prioritizes making demand-side EE measures before moving on to supply side measures and tries to solve some of the problems with EPC and ESC; EPC being overly complex and expensive for many projects and ESC being completely supply side oriented (Warget, 2011).

4.1.5 Build-Own-Operate-Transfer (BOOT)

In the Build-Own-Operate-Transfer (BOOT) business model the ESCO elaborates the project, builds/deploys, operates with the owner and in the end of the contract transfers the installation/system to the customer. As ESC, this type of contract is typical in projects aimed at producing systems, such as CHP or PV.

ESCOs charge accordingly to the service delivered with the objective to recover capital and operating cost and collect profit (EC-JRC, 2016). This way, the ESCO investment and operational costs are covered by subscription fees. Due to the long-term nature of the arrangement, the fees are usually raised during the contract period. The BOOT model is similar to a loan made by the ESCO to the costumer, which also includes energy management during the contract period. Table 7 summarizes the BOOT business model.

Table 7 - Built-Own-Operate-Transfer business model

<table>
<tr><td rowspan="2">7 - Key partners
Financial Institutions; Construction and technical partners</td><td>5 - Key activities
Project preparation, development and operation</td><td rowspan="2">1 - Value proposition
Energy savings without prior investment or commitment; Guarantees energy supply (“input”); "Useful energy" service;</td><td>4 - Customer relationships
Contractual (long-term, 20-25 years)</td><td rowspan="2">2 - Customer segments
Corporate clients; Public bodies</td></tr>
<tr><td>6 - Key resources
Technical and financial know-how</td><td>3 - Channels
Public projects; Special events</td></tr>
<tr><td colspan="3">9 - Cost structure
Construction cost; Interest rates</td><td colspan="2">8 - Revenue streams
Fee for the function provided (flat/escalating rate)</td></tr>
</table>

5 Innovative business models developed

One of the main objectives of this report is to introduce novel ESCO business models, by extending current EPC formats. These novel business models will consider significant energy performance improvements without sacrificing occupants' comfort and health in indoor environment.

The work focuses on developing innovative business models, which are aligned with stakeholders' requirements following the review of existing business models and current market status in Europe, identification of their barriers and success factors. The Living Labs are pilot sites where every new product/service is tested in real conditions. The feedback from the stakeholders is essential to develop, optimize and address their critical needs.

The business analysis was extended beyond the limited environment at pilot sites (where these will be tested), introducing new business approaches that are transferable to other school environments, providing solutions with high replication potential.

In this section, the innovative business models for ESCOs are described. Two innovative business approaches were identified: Energy management based on enhanced EPC and raising school occupants' awareness as a tool for energy savings. A detailed analysis of each of these business models follows.

5.1 Energy management services based on enhanced EPC

This business model based on a share-savings EPC with an energy management service applied to schools, as an extension. The main innovation of the proposed business model is that it considers additional health and comfort parameters and a school comparison system, that will allow schools to see their current efficiency status compared with other schools. The energy management is performed fully preserving end users' preferences and needs.

Before the implementation of energy conservation measures the ESCO performs a feasibility study, where it identifies savings potentials and studies the impact of an energy management system. After the implementation, the ESCO is responsible for monitoring all key performance indicators, including the health and comfort parameters, provides consulting services and is responsible for the maintenance and optimization of equipment's.

The financial terms of the contract are pre-agreed between both parties and the ESCO receives a percentage of the energy savings achieved during the project period. The ESCO offers to customers' the implementation of energy conservation measures without prior investment while economical savings are shared between both.

Usually, an EPC with shared savings implies the implementation of energy conservation measures (ECMs) with high initial investment and long contracting periods. The present business model refers only to energy management and the implementation of low or no cost ECMs (e.g. small investment in equipment maintenance and optimisation).

Additionally, instead of applying this model to only one school, the model will aggregate similar schools in the same system (providing scalability and impact). Different strategies will be shaped for establishing optimal equilibria between energy performance, comfort and health according

to the requirements of buildings occupants and managers. Table 8 summarizes the energy management based on enhanced EPCs business model.

Table 8 - Energy management based on enhanced EPCs business model

<table>
<tr>
<td rowspan="2">7 - Key partners
Technical partners (Suppliers of monitoring systems; control systems; meters, ICT);

ESCOs offering energy management services.</td>
<td>5 - Key activities
Performing a study of the building to identify its savings potential;
Establishing data connection and collection;
Integrated energy and contextual management framework.</td>
<td rowspan="2">1 - Value proposition
Energy savings without investment offered by an ESCO;
Energy savings fully preserving contextual and operational school parameters.</td>
<td>4 - Customer relationships
Contractual (short to medium-term) incentivised by the desire to obtain energy savings fully preserving school occupants preferences.</td>
<td rowspan="2">2 - Customer segments
Schools that do not have an internal team for energy management (have no one monitoring energy bills);

Schools with potential for energy savings.</td>
</tr>
<tr>
<td>6 - Key resources
Data acquisition from heterogeneous sensor and metering devices;
Software that enables the integrated management of the schools premises.</td>
<td>3 - Channels
Personal sales;
Exhibitions;
Utilities; Public projects; Special events.</td>
</tr>
<tr>
<td colspan="3">9 - Cost structure
Technology and labour cost;
Small investment in equipment; maintenance or optimisation (measures with fast paybacks, e.g. < 1 year – low cost or no cost).</td>
<td colspan="2">8 - Revenue streams
Share energy savings from the project as in typical ESCO models. The main difference is the incorporation of contextual and operational building parameters on optimization process.</td>
</tr>
</table>

5.2 Raising school occupants' awareness as a tool for energy savings

Raising awareness of school occupants' (both students and employees) for the rational use of energy is considered a key component for saving energy. In most cases, the building users are not aware of the potential and possibilities for energy savings and this is a main goal for ESCOs towards fulfilment of an EPC. With increased access to metering infrastructure, smart meter data and software-based tools, many companies are designing ways to use behavioural and analytical concepts in the energy industry that have been successfully implemented in other industry sectors. If the cost savings are shared between ESCOs and consumers, it will be of the interest for all parties to ensure the rational behaviour of the school occupants'.

Therefore, one of the main innovations of this business model is to incorporate as part of the energy management framework, a gamification framework that will raise occupants' awareness about energy consumption and will ensure high level of fulfilment on EPCs. So this business model should be implemented along with the one previously described in order to maximize energy savings in the ClimACT schools.

There are different methods to achieve energy savings by increasing end users' awareness, for example:

- Training and following instruction on how to achieve improvements;
- Learning from the direct assessment of the impact of behaviour change on the savings achieved through behavioural triggering based on detailed evaluation of the consumption data;
- Learning through comparison with other end users (e.g., other schools);
- Learning about the most effective ways to use existing measuring and control equipment.

A combination of the aforementioned techniques will be considered, ensuring the successful establishment of a raising awareness framework. By incorporating this innovative framework to other energy management techniques, the proposed business model aims to promote the enhancement of occupants' awareness and confidence on EPC effectiveness and on the ability of ESCOs to guarantee results, thus fighting two of the main barriers of the ESCO market.

This business models aims to offer personalized information to customers through an internet portal and/or a smartphone application, enabling that way the implementation of successful behavioural triggering strategies. Table 9 summarizes the raising occupants' awareness as a tool for energy savings business model.

Table 9 –Raising school occupants' awareness as a tool for energy savings business model

<table>
<tr>
<td rowspan="2">7 - Key partners
Energy suppliers and ESCOs;
IT companies;
Technical partners;
Non-governmental organisations dealing with training and education (energy).</td>
<td>5 - Key activities
Education;
Providing information on consumption and billing;
Establishing channels for exchange of information;
Motivation of tenants.</td>
<td rowspan="2">1 - Value proposition
Energy savings with small or no investment;
Increasing knowledge about energy efficiency;
Supplying information about energy bills and billing;
Advising and consultation.</td>
<td>4 - Customer relationships
Contractual (short to medium-term) incentivised by the desire to obtain energy savings;
Support by key partners;
Recommendations.</td>
<td rowspan="2">2 - Customer segments
Building owners that do not have an internal team for energy management (have no one monitoring energy bills);

Buildings that have potential for energy savings;

Domestic, commercial and public buildings.</td>
</tr>
<tr>
<td>6 - Key resources
Educators from partner companies;
Equipment needed for communication channels.</td>
<td>3 - Channels
Internet portal with private log in for all stakeholders within contract;
Applications for mobile devices;
Automatic trigger messages.</td>
</tr>
<tr>
<td colspan="3">9 - Cost structure
Technology and labour cost;
Small investment in equipment maintenance or optimisation (measures with fast paybacks, e.g. < 1 year – low cost or no cost).</td>
<td colspan="2">8 - Revenue streams
Combined/in synergy with basic/additional ESCO business models;
Energy savings from the implantation of the associated strategies (for example: 50% for the ESCO and 50% for the costumer).</td>
</tr>
</table>

6 Conclusions

This deliverable is part of Activity 2.7 – Development of new business models and management strategies for schools and this task focuses on developing innovative business models for energy services companies (ESCOs) which are aligned with the stakeholders' requirements.

In order to enable the implementation of energy efficiency investments in schools, ClimACT aims to facilitate the conditions to promote the adoption of EPC.

The methodology followed for developing new ESCO business models for the ClimACT schools started by studying the existing EPC business models, which are based in building retrofitting and analysing the barriers and success factors of the ESCO market in the EU. Then, new ESCO business models were developed for the ClimACT schools based on smart energy management. These new business models consider significant energy performance improvements without diminishing occupants' comfort and health in the indoor environment.

The main outcome of this document is the provision of methodological guidelines on EPC business models and the proposal of two innovative ESCO business models, which introduce: energy management based on enhanced EPC and a tool for raising school occupants' awareness for energy savings. Incorporation of comfort and health parameters as part of an EPC, gamification and behavioural triggering are some examples of innovative aspects that are introduced in the ESCO business models.

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