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Model Structure of the New EPC Template

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Status	Final	**Due**	M16	**Date**	30/09/2018
Author(s)	Michele Vavallo				
Description of the related task and the deliverable in the DoA	The purpose of this task is to develop and refine a new EPC template that provides for dual energy services in building renovation. The new EPC template will support an innovative method of funding, be able to provide the legal basis for the collaboration between all the participants working in the development and execution of a retrofitting project (ESCOs, aggregators, building owner, DSOs, TSOs, FM companies and the financial institutions) and determine how they will interact. The refinement of the new contract will pay special attention to the ESCO-Aggregator MoU, end user requirements and contractual terms of use and additional third parties provisions to deal with this multifaceted structure, enabling the selection of viable projects and win-win solutions.				
Comments					

V	Date	Authors	Description
0.1	30/05/2018	Michele Vavallo	Table of Contents for discussion
0.2	02/07/2018	Michele Vavallo	First Draft Version
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0.4	24/09/2018	Mircea Bucur	Market Player interaction feedback
1.0	28/09/2018	Michele Vavallo	Final version

1 CONTENTS

2 ABBREVIATIONS

BOOT	Build-Own-Operate-Transfer
IEC	Integrated Energy Contract
EE	Energy Efficiency
EPC	Energy Performance Contract
ESC	Energy supply contract
ESCO	Energy Services Company
FM	Facility Manager
DR	Demand Response
DSO	Distribution System Operator
DSR	Demand Side Response
TSO	Transmission System Operator

3 EXECUTIVE SUMMARY

The objective of this report is to develop and refine a new EPC template that covers the provision of dual energy services (energy efficiency and demand response) in building renovation projects. The new template must include provisions for innovative methods of financing these projects and cover the collaboration between ESCOs and aggregators that will be required to execute and deliver deep retrofit projects.

In an ever-changing market place where the business models and roles of market players are constantly changing, it is important to understand the dynamics between existing players in the market today and the likely future dynamics as the combined business model emerges as a suitable option. In the traditional market model, both ESCOs and aggregators operate independently from each other, with the only link between them being the client. ESCO will secure finance to deploy energy saving actions on the client side and the ESCOs will recover their initial investment over a number of years from the energy savings they generate for the client. The aggregator manages the flexibility of loads and access to the DSR markets, aggregates that load into portfolios which are assigned to various market programmes, and gets paid by the network operator. Typically aggregators retain a percentage of the payments from the DSO (after fully recovering the equipment cost,) as a management fee, covering the cost of the platform and portfolio management. For the dual energy services model to work in practice a new operating model is required that sees greater links between ESCOs, aggregators and end users.

In this report, existing EPC contracts that are currently in use have been analysed and the sections and clauses that are commonly found in most contracts have been identified. This has been used as a basis for tentatively integrating clauses that additionally cover the inclusion of demand response as a service within the EPC. Based on the analysis of existing EPC and DR contracts carried out in Sections 6.4 and 6.5, a draft of the possible enhanced EPC template that could be used to cover the provision of dual energy services under an EPC has been developed and discussed in Section 7. The enhanced EPC template considers the regulatory conditions and the business requirements under which both ESCOs and aggregators are able to operate comfortably, whilst taking into account the customer's requirements and enabling the two business models to be combined to generate economic advantages for the customer.

The typical EPC and DR contracts that are currently in common use have a very similar template structure and many of the same clauses can be found in both documents. The analysis reveals that although each contract is organised under different headings, both EPC and DR contracts deal with the same important financial, regulatory and contractual issues. Several chapters overlap, which allows the contract templates to be merged to create an enhanced EPC template for the provision of dual energy services. Each chapter of the contract simply needs to be modified to ensure that the requirements of each party (ESCO, aggregator and end user) are considered.

Using the new template proposed here, ESCOs and aggregators will be able to work together to create a new business opportunity and bring a combined service offering with significant financial benefits to the market. The analysis shows that it is entirely possible to augment the standard EPC template to include conditions and clauses that cover both energy efficiency and demand response services to create an Enhanced EPC for dual energy services.

4 OBJECTIVE OF THE REPORT

The objective of this report is to develop and refine a new EPC template that covers the provision of dual energy services (energy efficiency and demand response) in building renovation projects. The new template must include provisions for innovative methods of financing these projects and cover the collaboration between ESCOs and aggregators that will be required to execute and deliver deep retrofit projects. This work will pay special attention to the relationship between ESCOs and aggregators, keeping in mind the objective of delivering dual energy services and the need for a new EPC contract that will protect the interests of both parties. Existing EPC contracts that are currently in use have been analysed and the sections and clauses that are commonly found in most contracts have been identified. This has been used as a basis for tentatively integrating clauses that additionally cover the inclusion of demand response as a service within the EPC.

A further objective of this report is to identify innovative methods of funding and financing the retrofitting works that are to be covered by the EPC. For this purpose, the common sources of EPC financing have been examined and options for additional innovative financing solutions are also discussed.

Finally, the market interaction between the market actors involved in delivery of EPCs and deep energy efficiency retrofit projects and the legal basis for operation have also been explored.

5 DEFINITION OF MARKET ACTORS

5.1 ESCO

ESCO provide energy services to customers. This can include the installation of new energy efficient equipment; maintaining and efficiently operating existing equipment to provide outputs such as heat and light to the client; installation and operation of renewable energy technologies; or assistance in the purchase of energy, including most commonly electricity or gas. From the point of view of the client, one of the incentives to work with an ESCO is that projects are often offered on a turnkey basis which removes much of the complexity and technical hurdles to implementing several energy efficiency projects in parallel.

According to the definition of an ESCO given by the Joint Research Centre of the European Commission (http://iet.jrc.ec.europa.eu/energyefficiency/esco), the three main characteristics of an ESCO are:

- ESCOs guarantee energy savings and/or provision of the same level of energy service at lower cost. A performance guarantee can take several forms. It can revolve around the actual flow of energy savings from a project, can stipulate that the energy savings will be sufficient to repay monthly debt service costs, or that the same level of energy service is provided for less money.
- The remuneration of ESCOs is directly tied to the energy savings achieved by the project.
- ESCOs can finance, or assist in arranging finance for the installation and operation of an energy system by providing a savings guarantee.

This means that ESCOs accept some degree of risk, due to the fact that their incomes depends on the effective implementation of the project and achievement of the predicted energy efficiency savings that were guaranteed to the client as part of the contract.

5.2 AGGREGATOR

An energy aggregator is defined as any organization or individual that brings together trade energy customers as a group with the objective of achieving lower prices for energy, services, or other benefits. An aggregator could therefore refer to anything from a business association to a municipality or industrial cooperative. For example, a branch of a municipal energy utility could act as an aggregator for a particular group of consumers. Energy brokers also act as aggregators and obtain better prices for their customers by using their collective purchasing power to buy energy in bulk at a discounted rate. The reduced administrative burden to the energy supplier (i.e. the supplier only deals with the energy broker rather than several smaller customers) means that the broker can purchase energy at much lower price, and pass the savings on to their clients even after accounting for the cost of handling meter readings, billing and customer services. Thus, aggregation is a service that is normally performed in the interest of the energy customer rather than the energy producer.

Aggregators often additionally assume other roles to provide efficiencies and savings to customers, and may be responsible for planning, scheduling, accounting, billing and settlement, or virtually any aspect of energy management other than production and consumption of energy.

5.3 Building Owners

Building owners are private or public individuals or entities in possession of the title deeds of the building. They are responsible for paying any taxes related to the property and operating and maintaining the building.

5.4 Transmission System Operators (TSOs)

Among the stakeholders involved in the trading of Demand Response resources are the grid operators such as the Distribution System Operator (DSO) and the Transmission System Operator (TSO). The TSO is responsible for transporting electrical power on a national or regional level, from the point of generation to the local DSO in each area, using fixed infrastructure like high voltage power lines and substations. As TSOs are of critical importance to the national distribution and delivery of energy and due to the high costs involved in managing the transmission infrastructure, the TSO is usually a monopoly and is often totally or partially owned by state or national government. TSOs are not involved in upstream generation of power or downstream distribution of power and are financed by charging a fee in proportion to the amount energy they transport.

5.5 Distribution System Operators (DSOs)

The Distribution System Operator (DSO) has the responsibility of building and maintaining connections and substations for end users (buildings) and manages the power transmission (at voltage levels of 150 kV or less). The DSO also installs, preserves and manages the transmission and distribution grids to ensure that energy suppliers can always deliver the energy demanded by customers at any given moment. DSOs are impartial, so they can guarantee non-discriminatory access to third parties.

5.6 Facilities Management Company

The Facilities Management (FM) companies integrate the principles of the administrative, management, architectural, engineering and human science factors around the building administration. Their functions include: planning and steering the overall activities related to the correct and efficient global building management; leading the effective integration of corporate strategies with building resources (e.g. implementing a space optimization policy); coordinating building and retrofit projects; contracting all the services, utilities and products related to operation of the building (e.g. energy, water, security, asset management etc); and maintenance and conservation equipment.

5.7 Financial institution

Financial institutions could be private (shareholder-owned) or public (government-owned) organizations that act as a channel between funds managers. There are mainly two main types of financial institutions:

- Depository banks and credit unions which holds securities such as stocks, bonds or cash, acts as the custodian of the security for the customer and uses the funds to make loans to generate more interest for their customers.
- Non-depository insurance companies and mutual funds (unit trusts) which collect funds by selling their policies or shares (units) to the public and provide returns in the form of periodic benefits and profit gains.

6 DUAL ENERGY SERVICE

6.1 DEFINITION

The dual energy service is a new business model which combines Demand Response (DR) and the Energy Efficiency (EE) services traditionally provided by ESCOs to enhance the economic benefits of building energy retrofit projects and improve the business case for building owners wishing to invest in such projects.

As explained in Chapter 5, an **ESCO**, is a commercial business that provides a range of energy efficiency solutions to its customers and is able to design and implement energy saving projects. When preparing these projects, the ESCO must set up a contract with their client defining the specific roles and responsibilities of each party, the level of performance guarantee that both parties accept, the criteria that will be used to evaluate whether the guaranteed performance has been achieved in practice and the payments and penalties that will be applicable in the case of delivery or non-delivery respectively. The objective is to create a win-win contract between the customer (who, by entering in an EPC, saves energy and consequently money) and the ESCO (who invests or arranges investment and obtains return on the investment through delivery of the performance guarantee).

The business models most commonly used by ESCOs currently include:

- **Energy Performance Contract (EPC):** In this kind of contract the ESCO is responsible for defining and implementing a series of energy efficiency measures that will reduce the customer’s energy consumption. The ESCO guarantees that the energy conservation measures implemented will generate sufficient savings to pay for the project. This performance guarantee shifts the risk away from the customer and onto the ESCO as the contract includes penalty clauses in case the guaranteed level of saving is not achieved. EPCs are often offered at no upfront cost to the client with finance being provided either by the ESCO directly or by a third party. The savings on energy bills are used to pay back the loan for the duration of the contract. After the end of the contract, the customer receives the full value of the energy savings for the remaining life of the equipment. EPCs are often used for deep energy retrofit projects where the client is unable to fund the cost of renovations from internal resources, but this often results in long contract lengths of 8 to 15 years (or sometimes longer). As a result most EPCs are undertaken in the public sector where there is less of a requirement for fast payback periods and high return on investment.
- **Energy Supply Contract (ESC):** In this kind of contract, the ESCO is responsible for delivering a set of energy services to the customer. The ESCO controls and manages the operation and maintenance of the equipment (e.g. a boiler) and sells the output to the customer (e.g. heat). It is the ESCO’s responsibility to repair, maintain and upgrades the equipment, but ownership typically remains with the customer. Some examples are photovoltaics (PV), combined heat and power (CHP) or biomass heat supply installations where the customer owns the technology but the ESCO manages its operation and sells the outputs (electricity and/or heat) back to the customer. The ESC is focused on the efficient and secure supply of energy at a lower operating cost. One of the weakness of an ESC is that all the energy efficiency measures remain on the supply side and there are no incentives for the customer to lower the demand side consumption. ESCs are generally oriented towards decentralized (local) power supply rather than larger centralized solutions, however, the ESC model can also be used to build up district heating systems at a local level. The main difference between an EPC and an ESC is that whilst an ESC is based on a business model that guarantees energy supply, EPC is a

business model focused on energy savings. The EPC goal is therefore to avoid wasting energy and to invest the savings in energy efficiency.

- **Chauffage:** This kind of contract, also known as comfort contracting, provides a "function" (for example: keeping a room at 22 °C) and incorporates energy efficiency on the supply side and the demand side. The difference from an EPC is that the demand-side energy efficiency measures are often "light", as chauffage does not include retrofitting or equipment substitution, and essentially involve managing and improving the building's operational conditions. The ESCO is responsible for everything related to providing the service including commissioning of equipment, procurement of fuel, equipment operation, servicing and maintenance of production facilities as well as customer side technical installations. The purpose is to operate the equipment as efficiently as possible in order to maximize their revenue and it is for this reason that ESCOs operating chauffage contracts are normally are keen to optimize and implement supply-side energy efficiency measures. Compared to EPC, chauffage contracts are generally less complex with lower transaction costs and less requirement for costly measurement and verification.
- **Integrated energy contract (IEC):** An IEC is a combination between an ESC and an EPC (for instance combining CHP to supply heat and power with lighting upgrades). This model includes demand-side energy efficiency measures in two objectives: reduction of energy demand through the implementation of demand-side energy efficiency measures in the building (e.g. HVAC and lighting upgrades), and efficient supply of the energy demand, preferably from renewable energy sources. Compared to the ESC, the range of services and thus also the saving potential available through an IEC, are augmented and can include modernization of the installations, lower energy consumption, reduced maintenance costs and improvement of energy performance indicators.
- **Build-Own-Operate-Transfer (BOOT):** BOOT is a business model where the ESCO develops the project, builds/deploys it, operates the equipment with the owner and at the end of the contract transfers the installation/system to the customer. This type of contract is typically used in projects such as the installation of CHP or PV systems and allows the client to develop in-house expertise over an extended period of time. These are normally long-term supply contracts in which the BOOT operator is charged according to the service delivered; the service charge includes capital and operating cost recovery and project profit. In this way, the ESCO investment and operational costs are covered by subscription fees.

Demand Response (DR) is a tariff or programme that can incentivise changes in end user electricity consumption patterns in response by either changing in the price of electricity over time, or making payments for the ability to reduce consumption at times of high market prices or when grid reliability is jeopardised. DR is able to improve the adequacy of the existing electricity network without additional investment in infrastructure by shifting consumption away from times of extremely high demand. It can act as a cost effective resource to balance the requirements of renewable generation which can be variable and less predictable. Hence, it not only adds stability to the distribution system but also lowers the need for coal and gas reserve consumption. DR can decrease the need for local network investments, as it can shift consumption away from peak hours in regions with tight network capacity. In addition, DR also provides direct benefits to consumers by as network operators will pay them directly for the value of their demand-side flexibility.

The term 'demand response' is used to describe capability of changing the usual pattern of consumption of electricity consumers in response to an external event. DR is normally associated with reductions in energy consumption, but the concept is actually much broader since changes could be seen in both directions i.e. both decreases and increases in consumption). In fact, consumers could apply the term 'Demand Response' to each of the following examples:

- Electricity tariff variations linked to the time of day or season can promote a reduction in demand during specific periods of time that typically see high levels of energy consumption and an increase in consumption at times when there are typically low levels of consumption. For example, higher energy prices at 'peak' times can incentivise customers to change behaviour and run certain non-critical equipment at off peak times e.g. overnight when tariffs are lower.
- Customers are asked to reduce consumption at short notice and receive an incentive payments to do so wholesale market prices are high or when system reliability is jeopardized.

According to the DR arrangements, three possible actions could be followed:

1. **Demand shifting:** This is the most common action and involves moving some energy demand from one periods to another, usually from the peak to valley periods when energy is cheaper, or the operation of the grid is less critical. For example, air handling units could be turned down during a demand response event and the CO_2 concentrations in the building allowed to rise (whilst still within acceptable limits for building occupants), then ramped up at the end of the event to bring CO_2 levels back into the normal range of operation. At the end of the intervention the net balance in the energy consumption vs reduction could be zero, but, since the price of electricity is different during those periods the economic benefit achieved by the customer is positive.
2. **Demand reductions (or increases):** This is different from demand shifting because it is not compensated by the increasing (or decreasing) consumption outside of the demand response event. A typical example is lighting systems where lighting levels can be reduced in response to a DR event but the reduction in light level does not need to be 'recovered' after the event. In this case the customer experiments a loss of service, which could be translated into a loss of production and extra cost in the case of the industry or a reduction in the comfort levels of building occupants.
3. **Autonomous self-generation**: The third option is related to automatically producing the electricity that customers require onsite by powering up generators or using onsite renewable energy generation instead of drawing power from the grid.

Demand Response is an important application which should be widely deployed and implemented throughout the EU, not only to reduce the cost of energy for customers but also to deliver flexibility to the energy system to improve grid security. The current electrical power system **cannot currently store electricity** in large amounts, which means that supply and demand must be balanced in real time. Moreover, grid conditions can **unexpectedly change significantly over a short period of time**, creating a mismatch in supply vs demand, which can jeopardize the technical integrity of the grid. Managing this unpredictability through infrastructure upgrades is expensive and represents a poor return on investment in financial terms. The ability to take advantage of flexibility services offered by customers to the grid is therefore a cost effective way to balance supply and demand whilst ensuring grid security without the risks associated with large capital investments in infrastructure upgrades.

Demand Response programmes can be categorised as follows:

- **Explicit DR schemes:** These are often called "incentive-based" schemes where the available aggregated changes in load are traded on electricity markets, providing comparable services to supply-side resources (generators), and receiving the same prices for those services. Usually this takes place within the balancing, capacity or wholesale energy markets. Consumers receive direct payments to change their consumption upon request (i.e. consuming more or less at the request of the TSO), which is typically triggered by activation of balancing services, differences in electricity prices or a constraint on the network. Consumers can earn from their flexibility in electricity consumption individually or by contracting with an aggregator. The latter can either be a third-party aggregator or the customer's supplier.

- **Implicit DR:** This is sometimes referred to as a "price based" incentive, and refers to consumers choosing to be exposed to time-varying electricity prices or time-varying network tariffs (or both) that partly reflect the value or cost of electricity and/or transportation in different time periods. Customers are then free to react to those price differences if they choose to do so depending on their own requirements and constraints. Implicit demand response can therefore generate significant cost savings in close to real time, often at lower cost than deploying generation resources (1).

In the context of Europe different requirements dealing with demand side participation have been included in various EU policy documents, specifically the Electricity Directive (2009/72/EC) and the Energy Efficiency Directive (2012/27/EU). Nevertheless, their application strongly depends on the initiative of each country and its particular regulation because there is no single European energy market and programs developed within EU Member States differ from each other in terms of the rules for participation.

6.2 BARRIERS

The barriers to implementing the dual energy services model can be divided into regulatory, market, technological, financial barriers. These have been identified and discussed in detail for 9 European countries in D3.4 - SWOT Analysis of the Joint Services Model. The most significant barriers to overcome that will accelerate the market uptake of dual energy services EPC model are:

- Regulatory - lack of government support, subsidies and policy uncertainty
- Structural - lack of information, trust in the ESCO, concept complexity and
- Financial – ability to raise affordable finance, financial crisis affecting the availability of loans.

The DR market is not well supported in some countries and still in its infancy in others, but the market is growing. The main barriers for the expansion of this market are as follows:

- Inappropriate or incomplete definition of roles and responsibilities between market participants;
- Participation requirements too stringent to allow DR market actors to establish themselves;
- The measurement and verification (M&V) regulated methodology is not yet harmonized which means that there are no standardised and transparent requirements on how to control energy consumption reductions and hence how they should be evaluated;
- Adequate payment flow for DR is still challenging.

The barriers and the conclusions discussed in D3.4 will be considered for the definition of the tentative EPC template for the dual service exploitation developed here.

6.3 EPC BACKGROUND

EPCs have been used as a tool for delivering energy saving projects since the early 1990s. The main difference between an EPC and a conventional energy efficiency contract is that in a conventional contract the contractor is only required to advise on and ensure correct installation of the selected equipment but is not required to guarantee that the predicted energy efficiency savings will actually be realised in practice. In contrast, under an EPC the ESCO advises, implements and pays for an energy efficiency project at the customer's site and the customer uses the income derived from the energy savings to repay the investment over the duration of the contract. In this way the EPC transfers the technical risks from the customer to the ESCO because the ESCO commits to achieving an energy efficiency performance level which is guaranteed by the contract. The savings flow is then used to offset the cost of financing, installing, maintenance and monitoring & evaluation of the energy efficiency interventions.

There are many types of EPCs ranging from complete ownership and management of equipment by the ESCO (turnkey solutions) for the duration of the contract, to self-financed projects where the client pays for the equipment but the ESCO operates and manages it and guarantees the performance level. In general, there are four main types of performance contracts. The choice of contract depends on the needs of the client and their risk tolerance. In general there are 3 types of EPC:

- **Guaranteed Savings model:** In this type of contract the customer is obliged to provide the resources and the financing for the project, whilst the ESCO is responsible for delivering the promised energy savings over a certain period of time. The contract also includes penalties to be paid to the client should the ESCO be unable to deliver the guaranteed savings.
- **Shared Savings model**: In this model the ESCO has the opportunity to provide all or some of the financing for the project and the associated cost savings are shared between the ESCO and the client in the proportions specified in the contract.
- **Chauffauge or Utility Purchase Agreements:** In this type of agreement the ESCO owns, operates, and maintains the energy equipment, while the customer purchases the service provided (e.g. heating, air-conditioning, lighting, etc.) for an agreed rate for the duration of the contract.

6.4 EPC TEMPLATE

In this section, a selection of common EPC templates used in the market have been compared to identify which sections and/or clauses are most commonly used. This analysis will identify which areas of a standard EPC could be enhanced in a new version that includes provision for dual energy services. The analysis shows that there are 16 main sections to most EPCs:

- Section 1: Equipment to be installed;
- Section 2: Premise description and pre-equipment inventory;
- Section 3: Energy saving guarantee;
- Section 4: ESCO Compensation;
- Section 5: Baseline energy consumption;
- Section 6: Calculation procedure;
- Section 7: Construction and/or installation schedule;
- Section 8: Installed equipment start up, commissioning and operating parameters;
- Section 9: Comfort standard;
- Section 10: ESCO and End User maintenance duty;
- Section 11: Maintenance checklist;
- Section 12: ESCO training responsibility;
- Section 13: Yearly instalment payment schedules;
- Section 14: Pre-existing service agreement;

- Section 15: Forthcoming projects;
- Section 16: Financial performances;

Each section is further split into several chapters and sub-chapters.

6.4.1 EPC templates common sections

The exact structure of the EPC depends on the particular circumstances of the client and the project that has been agreed. The sections below are common to most EPCs but their specific content will be modified accordingly and some sections could be excluded if they are deemed unnecessary based on the project at hand:

1. ***The energy management plan:*** The ESCO presents the results of the energy audit report which has been approved and accepted by both agents (ESCOs and end user). It serves as a reference for the contract development.
2. ***Energy records and data management:*** Agreement on the required energy records and data management is described in this paragraph. Data requirements are set, including but not limited to: historical energy consumption; expected building occupancy levels; heating, cooling and lighting requirements; planned changes to the buildings; inventories of all energy consuming or saving equipment installed; energy bills and maintenance records. The objective of this section is to ensure that the ESCO has access to all the data they need, (both current and historical), in order to establish an accurate baseline. This is critical because it will serve as the basis against which post project energy savings will be measured.
3. ***Starting date and terms of contract:*** This section states the contract starting date which is normally coincident with date on which the first guaranteed savings begin and is typically the first month after ESCO has completed the equipment installation and commissioning. This section also states the contract duration.
4. ***Payment to ESCO:*** This chapter establishes the terms of the energy savings guarantee and the payments that are to be made to the ESCO on an annual basis. Normally this section also states any possible adjustments that may be linked to other sections of the contract. A second part sets the review and reimbursement process that occurs annually or on another agreed schedule. Payment modality, clauses dealing possible disagreement, and procedures for dealing with irregularity, etc. are also defined. ESCO compensation and fees, are clearly stated to ensure that the savings security will at least will cover the annual repayment of the initial project investment and all the annual ESCO service fees (e.g. maintenance and measurement and verification). Finally the billing procedure and the date of payment obligations is specified. It is usual to specify that the ESCOs fees shall not be paid until all the equipment are installed and in operation.
5. ***Coordination and approvals:*** This chapter specifies any support that the ESCO requires from the client to execute their duties (e.g. granting permission and authorization to installing the equipment) so that work can be appropriately coordinated during the installation to avoid any delays.
6. ***Location and access:*** This chapter describes the end user's responsibility to ensuring adequate space and protection for the installed equipment and authorizes the ESCO to access the facility to perform routine and emergency operations.
7. ***ESCO Responsibility:*** This section specifies the responsibilities of the ESCO to maintain and protect the premises and its contents and to restore the premises to its original condition in the case of any damage that occurs as a result of the ESCO carrying out their duties under the contract. Any costs incurred for this possible correction will be sustained by the ESCO.

8. ***Construction and equipment installation:*** This section specifies that the construction/installation phase for the project implementation should be managed in compliance with the end user's requirements and regulation. A second clause can be included that defines the responsibilities relating to the systems start-up and equipment commissioning. The inspection and final approval protocols for ensuring the system is working properly, testing equipment and verifying the specified operating parameters are defined here.
9. ***Standards of comfort:*** This chapter is about the standards of comfort that the ESCO is contractually responsible for keeping throughout the contract term. These standards will have already been negotiated between ESCO and the end user and aims to maintain a realistic range of heating, cooling and hot water temperatures, lighting levels, chilled water requirements, and other specified comfort and operating parameters.
10. ***Equipment warranty:*** This provision ensures that all the equipment to be installed will be new and protected by a written manufacturers warranty for a minimum period of time. During the warranty period, any defective equipment or parts should be replaced by the manufacturer
11. ***Training:*** A period of training is sometimes included in the contract to allow the end user learn how to correctly se and manage the new installations. Training can be undertaken before or/and after the installation. For this purpose, a training plan should be included in the contract.
12. ***Equipment service:*** This section refers to the maintenance and service responsibilities of each party. The ESCO commits to deliver all services relating to repairs and control of the equipment installed under the umbrella of the contract. The end user usually does not incur any additional costs for equipment servicing. Actions in the case of malfunctions and emergencies are also specified in this section. The end user must normally notify the ESCO as soon as possible about any situation that impacts the performance of the equipment, both pre-existing related equipment and the newly installed equipment, including any equipment malfunctions or modifications, or any changes that could impact on the baseline. The end user commits to making no changes to the operation and maintenance of the equipment without prior written approval of ESCO, unless exceptions are listed. In the case of emergency, the end user should follow the emergency plan provided by the ESCO.
13. ***Upgrading or altering the equipment:*** The terms and conditions under which ESCO may make changes to the equipment and/or its operating procedures is described. If those changes are implemented during the length of the contract, they will be described in a supplemental section and approved by the end user. Any equipment replaced should be new and should have the potential to generate the same or greater energy savings.
14. ***Material changes:*** This part of the contract outlines the definition of the term material changes which covers any condition, other than weather, that affects building energy use by more than the negotiated percentage. Those changes normally include any deviation in the premises, structure, operation, hours of occupancy, number of occupants or any conditions that could increase or decrease the annual energy consumption of the building. In the case of any such deviations, savings adjustments should be carried out to adjust the baseline against which savings are measured. The end user must notify the ESCO in writing if there are any actual or planned material changes to the facility which would affect energy consumption.
15. ***Representation and warranties:*** This provision indicates that each party has the pre-requisite, the authority and ability to sign the contract.
16. ***Additional representation of the parties:*** This chapter protects both ESCO and end user by creating a method for ESCO to supervise the end user compliance with its obligations.

17. ***Casualty and indemnification:*** This section needs to reflect the end user's requirements with respect to insurance and indemnification.
18. ***Ownership:*** Certain Proprietary Property Rights are detailed in this chapter. The vast majority of the time, this provision is related to the proprietary rights around use of the ESCO's own software used in the project energy management system. A clause allowing a free-license to use the software without violating ESCO's proprietary rights is normally written in to the contract. The ownership of existing equipment is also explicitly detailed and it is specified that the end user is the owner of all pre-existing equipment. Diagrams created specifically for the project are property of the end user.
19. ***Default and remedies:*** The actions to be taken in the event of a default by the end user or the ESCO are described in this section. Remedies and procedures for overcoming disputes are also defined and agreed.
20. ***Force majeure:*** In case of unexpected force majeure situations, the contract describes how to react in terms of actions and timing.
21. ***Assignment:*** This chapter discusses the possible situation in which the ESCO wishes to assign the contract to another party. In this case agreement from the end user is required because the new contractor must fully comply with all existing terms and conditions. In the case of a new end user, the procedure for assigning the contract to another party (e.g. a new building owner or occupant) is documented.
22. ***Miscellaneous:*** In this last section any other important clauses of conditions are stipulated that do not have a place elsewhere in the contract.

At this point the contract is normally accompanied by different schedules and attachment which are described below:

Section 1 - Equipment to be installed by ESCO: This section is normally provided by ESCO based on the final energy audit report. It specifies all the new equipment to be installed including the manufacturer, quantity, location and any accompanying warranties. Any modifications that are to be made to existing equipment, will also be described here, if applicable.

Section 2 - Premise description and pre-equipment inventory: This section is also based on the final energy audit report and lists important information about the condition of the premises such as floor area, building construction, use, occupancy, hours of operation etc. and any special conditions that may exist. An inventory of existing equipment and how it is configured is also taken. This action is important as it serves to define the accurate baseline for the savings calculations.

Section 3 - Energy saving guarantee: Details of the energy saving guarantee provided by ESCO are fully described in this section. The guarantee is normally specified in units of energy to be saved for the duration of the contract and the saving calculation protocol is defined. A breakdown of the expected savings could be included in this section.

Section 4 - ESCO Compensation: Details on the quantity and scheduling of all the expected payments should be forwarded to the ESCO. The compensation calculation mechanisms are also defined in this section as well as any other possible inflation index to be applied and / or any other fee included in the contract.

Section 5 - Baseline energy consumption: The baseline energy consumption is the baseline upon which the savings are controlled, monitored and calculated. For this reason, this section normally describes the methodology used to calculate the baseline including all the relevant documentation that supports the calculation process and any assumptions made. According to the contract typology, this information could avoided costs such as material savings (e.g. cheaper bulbs, ballast, filters, chemicals etc.), and cost savings associated with the elimination of external maintenance contracts.

Section 6 - Formula for calculating the foreseen savings and methodology: This section includes the description of the protocols used for calculating and monitoring the energy savings of the installed equipment. This calculation includes also the comparison methodology used to compare the baseline, i.e. the amount of energy that would have been consumed without the project with the quantity of energy actually consumed during a specific period. Due to the variability of the conditions, the baseline is periodically adjusted to account for weather patterns, number of billing days, building occupancy, and any other conditions that could impact on energy consumption during a given measurement period. To control for these possible changes, a checklist or other method could be used by the ESCO to ensure that they are notified about them by the end user.

Section 7 - Construction and/or installation schedule: The procedures and scheduling of the project construction and installation phases are described in this paragraph, including a list of key milestones and defined quality checks. Other contracts related to the construction and installation phase could be developed and attached in the contract annexes.

Section 8 - Installed equipment start up, commissioning and operating parameters: In this section the start-up testing procedures and the commissioning procedures of the installed equipment and total system are described in detail. A schedule showing the timeframe for completion is also provided to the end user so that they can be involved during the commissioning phase if required. The operating parameters for the installed equipment are specified here for example temperature control parameters, equipment run times, and load controlling specifications.

Section 9 - Comfort standard: The comfort standards to be achieved in terms of heating, cooling, lighting, hot water temperatures, humidity levels and/or any other conditions for occupied and unoccupied areas are described in this section.

Section 10 - ESCO and End User maintenance duty: The ESCO specific operation and maintenance responsibilities are included in this section along with the time schedule for this activity. If applicable any responsibilities assigned to the end user are specified here and agreed by both parties.

Section 11 - Maintenance checklist: The checklist is used by the ESCO to track and control compliance with the operation and maintenance procedures performed by the end users if applicable. It normally specifies a list of tasks and the schedule for the procedures.

Section 12 - ESCO training responsibility: If the ESCO is to provide training for the end user’s staff members the duration, contents and frequency of the specified training is specified in this section. Provisions for on-going training, inductions for new personnel, and training on possible future equipment or software upgrades to be installed are also described.

Section 13 - Yearly instalment payment schedules: In this section the amortized financing payments that are to be made to the financing institution for the capital costs of the project are defined. The frequency of payment and the specific amount due is listed.

Section 14 - Pre-existing service agreement: This chapter includes information on the scope and cost of pre-existing equipment service contracts, if applicable.

Section 15 - Forthcoming projects: This section gives a description of any planned projects that may be implemented future. It is important for the ESCO to have this information in advance of any work commencing because it could jeopardize the long-term energy savings performance calculated in this contract.

Section 16 - Financial performances: This section normally includes a diagram of the expected financial performance of the project for the duration of the contract. All the financial components including interest rates, current fuel prices, any escalation rates to be applied, guaranteed savings, ESCO compensation figures, cash-flow projections and projected net present value of the cumulative positive cash flow benefits are presented.

Any details or sections not covered above that are deemed important are included at the end of the contract as appendices.

6.5 DR Template

In this section an analysis of commonly used demand response and flexibility contracts has been undertaken to identify common approaches and clauses. Through analysing several contracts in use on the market, the general sections that are included in most contracts include the following:

- Article 1: Definition;
- Article 2: DR project development and operation;
- Article 3: Supply and payment obligation;
- Article 4: Measurement and verification and payment;
- Article 5: Credit and security requirement;
- Article 6: Representation;
- Article 7: Confidentiality;
- Article 8: Term;
- Article 9: Termination and default;
- Article 10: Force major;
- Article 11: Lender right;
- Article 12: Discriminatory action;
- Article 13: Liability and indemnification;
- Article 14: Contract administration
- Article 15: Miscellaneous

Each of these sections is further split into several sub-sections.

6.5.1 DR templates common sections

The exact structure of the DR contract depends on the particular circumstances of the client and the project that has been agreed. The sections below are common to most DR contracts but their specific content will be modified accordingly and some sections could be excluded if they are deemed unnecessary based on the project at hand:

Article 1 - Definition: In this section all the contract acronyms and technical terms are defined. A list of attachments to the contract and other relevant information is also given here.

Article 2 - DR project development and operation: This article specifies the control equipment to be used and ensures that it is designed, engineered, constructed and installed to operate in accordance with all contractual requirements for the duration of the contract. Suitable electrical connection points are also specified. Any other possible complications that can be foreseen are also specified in this article along with the specification of any commercial operation requirements, information to be provided by/to all parties, milestone in project delivery, operation procedure, insurance requirements and commitment to comply with any relevant regulations.

Article 3 - Supply and payment obligation: This article defines the volume of electricity demand curtailment that can be supplied, the operational controls governing this supply, the agreed level of payments and any supplier or buyer taxes that must be paid.

Article 4 - Measurement and verification and payment: In this section the plan and methodology for measuring and verifying the energy reductions is defined along with the payment procedure, payment account information and any other statements relating to payments and transfer of funds.

Article 5 - Credit and security requirement: This article defines the security and credit requirements from both buyer and supplier.

Article 6 - Representation: This article describes the conditions under which the buyer and the supplier can represent each other and the necessary agreements relating to this.

Article 7 - Confidentiality: Responsibilities with regard to handling copyright and confidentiality issues are defined in this paragraph.

Article 8 - Terms: In this article the contract commencement date and duration are specified.

Article 9 - Termination and default: This article defines the remedial actions to be taken in the case of a default on a payment and outlines the procedures for termination of the contract.

Article 10 - Force majeure: In case of unexpected force majeure situations, the contract describes how to react in terms of actions and timing.

Article 11 - Lenders Rights: The rights and obligations of lenders in terms of loan security and cooperation, are defined in this section.

Article 12 - Discriminatory actions: Discriminatory actions include new laws or regulations that enter into force after the contract agreement has commenced which could jeopardize the delivery of the contract (for example new regulation, etc.). This article defines how to deal with this situation if it arises.

Article 13 - Indemnification: Consequential damages from indirect incidents and how to liquidate and indemnify each party are defined in this article.

Article 14 - Contract operation and administration: Details specifying the individuals responsible for operation and administration of the contract, which records must be retained and for how long, the number and type of audits that are required, and details of the required inspections, checks, tests and notices are described in this article.

Article 15 - Miscellaneous: Any other aspects not already covered by other articles in the contract are detailed in this section.

At this point the contract is normally accompanied by different schedules and attachment which are described below:

Section A - Project summary: A template summarising the most important project data

Section B - Contracted demand reduction and revenues: A template summarising the contractual demand reductions that the client commits to and the revenues that will be received in the case of a response to a DR event.

Section C - Letter of credit format: A standard template letter for any necessary credit checks is included.

Section D – Guarantee: Any guarantees provided to the buyer are listed in this section with additional details on liability, indemnity, defence and representation.

Section E - Certificate of incumbency: This document is used to confirm the identity of those signing the contract and that they are authorised signatories.

Section F - Project milestones and dates: This section defines all the agreed project milestones and due dates which is used to track project progress.

Section G – Records: Any specific records that must be kept or provided are listed in this section

Section H – Watts: In this section the total amount of power available to respond to a DR event is specified.

Section I – Proposal: The full proposal developed by the supplier for the client is included as an annex and forms part of the contract.

Section J - Payment calculation: This section defines the calculation methodology used to determine the level of payment that is due when the site participates in a DR event. All the formulas used are described and fully explained.

Section K - Availability calculation: This section defines the calculation methodology used to determine the site availability and the associated payments.

Section L - Measurement and verification plan and guidelines: This section describes the measurement and verification plan and the guidelines for its implementation in detail.

Section M - DR agreement provision: This section grants permission for the installation of the required control equipment that enables the supplier to curtail the electricity demand of the site in accordance with the terms of the DR contract.

Section N - Arbitration procedures: This section defines the arbitration rules and procedures used to resolve any disputes.

7 DEVELOPMENT OF ADVANCED EPC TEMPLATES

7.1 DRAFT EPC TEMPLATE

Based on the analysis of existing EPC and DR contracts carried out in Sections 6.4 and 6.5, a draft of the possible enhanced EPC template that could be used to cover the provision of dual energy services under an EPC can be developed. As described above, the new enhanced EPC template must consider the regulatory conditions and the business requirements under which both ESCOs and aggregators are able to operate comfortably, whilst taking into account the customer's requirements and enabling the two business models to be combined to generate economic advantages for the customer.

The typical EPC and DR contracts that are currently in common use have a very similar template structure and many of the same clauses can be found in both documents. The analysis reveals that although each contract is organised under different headings, both EPC and DR contracts deal with the same important financial, regulatory and contractual issues. Several chapters overlap, which allows the contract templates to be merged to create an enhanced EPC template for the provision of dual energy services. Each chapter of the contract simply needs to be modified to ensure that the requirements of each party (ESCO, aggregator and end user) are considered.

The following table lists each section of the common EPC template and lists how it could be modified to incorporate the key clauses from the common DR contract to lay the basis for ESCOs and aggregators to work together.

Table 7-1: Common EPC sections and modifications required to include DR

№	ESCO common EPC template	DR implication
1	*Energy management plan*	The energy audit is presented in this section. This could be augmented to include the potential for flexibility activities by including an additional section to cover this detail.
2	*Energy records and data management*	Energy records and data management are used to set the energy baseline. This data is also important for DR as it gives an indication of the level of turn down potential and allows calculation of the best breakpoint formula between the ESCO and aggregators. The section could be augmented with additional information on typical usage patterns in the building, infrastructure and equipment lists to cover the DR baseline needs.
3	*Starting date and terms of contract*	This part should be common for both ESCO and aggregator as both services should commence on the same date and continue for the duration of the contract.
4	*Payment to ESCO*	This section should be augmented to include details of how payments will be made to the aggregator providing the DR service and any payments due to the end user for provision of the DR services. The ESCO saving guarantee, review and reimbursement, ESCO compensation and fees should be revisited according to the flexibility service plan. The billing procedure and date of payment could be similar for both the aggregator and ESCOs or could vary according to the market conditions in the country of operation.

5	*Coordination and approvals*	This chapter should be also extended to cover both ESCO and DR activities, detailing all the possible permissions and authorizations required to access the building, coordinate the work, install equipment and software and commission the services.
6	*Location and access*	Once equipment has been installed, activation of the DR service is carried out remotely. However, access could still be required by aggregator personnel after installation in case of maintenance or emergency works. This section should therefore also include access permissions for aggregator personnel to access the relevant areas of the site.
7	*ESCO Responsibility*	This section could be augmented to reflect the responsibilities of the aggregators relating to their activities inside the building. As ultimate responsibility for the contract lies with the ESCO this section should detail any requirements for the aggregator to inform the ESCO about any key changes or important information.
8	*Construction and equipment installation*	This section is mostly related to equipment installation and construction undertaken by the ESCO. It could be expanded to include the installation of any control or monitoring equipment that needs to be installed by the aggregator prior to system start up. The specifications of the DR equipment could be included here.
9	*Standards of comfort*	This section should be carefully structured to set client expectations and agree the standards of comfort that are to be maintained both under normal conditions and during a demand response event. Since DR services could impact on the levels of occupant comfort (e.g. by turning off heating, cooling or ventilation equipment during a DR event) it is important that the customer understands and agrees to an agreed comfort range that is applicable during a DR event and the length of time that these conditions can be in operation for.
10	*Equipment warranty*	This section could be augmented to include warranty details for equipment installed by both ESCOs and aggregators.
11	*Training*	This section can be expanded to include training for the end user or building manager on the dual energy services model. Training would ensure that the key personnel understand how the process works and the likely impacts of EE and DR activities on site operation.
12	*Equipment service*	This section refers to procedures for repair and maintenance of the installed equipment, the responsibilities of the ESCO, and what to do in the case of malfunction or emergency. This section could be expanded to cover the same topics for any equipment installed by the aggregator.
13	*Upgrading or altering the equipment*	In this paragraph normally, the terms and conditions under which ESCO may make changes to the equipment, operating procedures, etc. is described. This could be

		expanded to include the same topics for any equipment installed by the aggregator.
14	*Material changes*	This part of the contract outlines the material changes definition term which covers any condition other than weather, that affects building energy usage. Any impact that a material change could have on the flexibility service could also be covered in this clause.
15	*Representation and warranties*	This provision indicates that each party has the required authority and ability to sign the contract. The Aggregator can also be included in this formal part of the contract.
16	*Additional representation of the parties*	This chapter protects both ESCO and final user by creating a method for ESCO to supervise the end user compliance with its obligations. The same protection could be extended to include the aggregator and the relationship between the three profiles.
17	*Casualty and indemnification*	This section needs to reflect the end user's requirements in relation to insurance and indemnification.
18	*Ownership*	The vast majority of the time, this provision is related to the ESCO's proprietary rights regarding the software used in the project, the energy management system the ownership of existing equipment and the ownership of all studies produced to support the project. This can be extended to include equipment and software provided by the aggregator including ownership during and at the end of the contract.
19	*Default and remedies*	This section should be augmented to include procedures in the event of a default by the end user, the ESCO or the aggregator. Remedies, procedures and schedules in the case of default should also be defined for all parties.
20	*Force majeure*	In case of unexpected force majeure situations, this section describes how to react in terms of actions and timing. This paragraph should be expanded to include any unexpected occurrences that occur during the delivery of the flexibility service.
21	*Assignment*	This chapter talk about the possible situation in which the ESCO wants to assign the contract to another party, in this case it must be agreed by the end user. This eventuality could be applicable to the flexibility service, so provisions for this should be included in this section.
22	*Miscellaneous*	Any other aspects of the DR service and its relationship to the ESCO service and/or the end user should be covered in this section.

At this point the contract is normally accompanied by different schedules and attachment which can be amended to include flexibility services as described below:

Table 7-2: Expansion of EPC annexes and schedules to include DR

Section №	ESCO common EPC template	DR implication
1	*Equipment to be installed by ESCO*	This section usually includes the energy audit report and specifies all the new equipment to be installed including manufacturer, quantity, location and warranties. It could be expanded to include the same details for any equipment installed by the Aggregator.
2	*Premises description and pre-equipment inventory*	This section documents information about the condition of the premises before contract commencement including floor area, building construction, use, occupancy, hours of operation etc. This action is of critical importance because it defines the baseline against which ESCO performance will be measured. It has equal importance for flexibility services and should be expanded with any additional information required to ensure accurate baseline calculations for the aggregator.
3	*Energy saving guarantee*	Full details of the energy performance guarantee provided by the ESCO are defined in this section. For dual energy services, the savings should be re-calculated to include any revenues generated from DR services. This is one of the most important aspect to cover in the new business model as all parties must be confident of achieving the stated savings to ensure that predicted payback times are achieved and earnings for ESCOs aggregators and end users are within acceptable limits.
4	*ESCO Compensation*	This section is closely related to the previous one. Compensation is related to the quantity of savings achieved. This section should detail the schedule for payments to ESCO, aggregator and end user based on the maintenance of equipment, measurement and verification services and revenues achieved through the provision of dual energy services.
5	*Baseline energy consumption*	Details of the methodology used to calculate the energy baseline are given in this section including all relevant documentation to support any assumptions made in the calculation process. Any additional data gathered to define the flexibility service and approach should be included here to support the decision making process.
6	*Formulae for calculating the foreseen savings and methodology*	This section is the core part of the entire project. It includes the description of the protocols used to calculate and monitor the energy savings of the installed equipment and the saving achieved against the baseline. This section must be updated to consider the impact of dual services. The formulae for calculating energy and cost savings must be updated to include revenues from both energy efficiency and demand response and details of how the revenues are split between the three parties (ESCOs, Aggregators and end user) should be defined. This should be deeply analysed for each project to find the most favourable split between parties.

7	*Construction and/or installation schedule*	This section relates to the scheduling of the project construction and installation phases. It should be exande to include the installation schedule for DR equipment.
8	*Installed equipment start up, commissioning and operating parameters*	In this section the start-up testing procedures, the commission of the installed equipment and total system are described. The operating parameters for installed equipment are also specified. This could be expanded to include the start-up and testing procedures and scheduling for the DR equipment.
9	*Comfort standard*	The comfort standards to be achieved in terms of heating, cooling, lighting, hot water temperatures, humidity levels and/or any other conditions for occupied / unoccupied areas are described in this section. The impact of the DR should also be specified here since the flexibility approach could change the comfort levels during a DR event. The acceptable ranges and acceptable length of time outside of the ideal range should be specified here and linked to the compensation methodology.
10	*ESCO and End User maintenance duty*	The ESCO and (where applicable) end user specific operation and maintenance responsibilities are included in this section along with the time scheduling for this activity. Any maintenance requirement relating to DR equipment should be included in this section.
11	*Maintenance checklist*	This section is related to the previous one and the checklist should be extended to include any maintenance requirements for DR equipment.
12	*ESCO training responsibility*	Training sessions are organized by the ESCO for end user key personnel to introduce the new equipment and its function. These training activities should be expanded to include training provided to end user key personnel on the function and operation of any DR equipment.
13	*Yearly instalment payment schedules*	In this section the amortized financing payments to be made to the financing institution to repay the capital cost of the project are defined. The frequency and the amount of the payment could be subject to change when revenues from flexibility services are taken into account and should be considered carefully in this section.
14	*Pre-existing service agreement*	This chapter includes information on the scope and cost of any pre-existing equipment service contracts. If applicable any pre-existing service contracts relating to equipment that provides flexibility services could be included here (e.g. onsite battery or generator maintenance).
15	*Forthcoming projects*	This section includes a description of a any planned projects that the end user plans to implemented in future that could impact on the level of energy savings achieved by the EPC. This information is important to know in advance because it could jeopardize long-term energy savings performance calculated in this contract. This section should be augmented by considering the dual services business model and the formulas discussed

		above. Any forthcoming projects and their impact on the project cash flow status should be analysed and and its impact assessed to minimise the impact on projected revenues from the dual services contract.
16	*Financial performances*	This section normally includes a diagram of the expected financial performance of the project for the entire contract term. All the financial components including interest rates, current fuel prices, any escalation rates to be applied, guaranteed savings, ESCO compensation figures, cash-flow projections and projected Net Present Value of any cumulative positive cash flow benefits to the end user are presented. The financial performance in this case will consider and include the impact of DR services on the project. Any possible DR diagrams and other particular indicators will be included to clarify the DR service methodology.

As explained above any details or sections not covered above that are deemed important are included at the end of the contract as appendices. The above analysis shows that the standard EPC template could be modified and enhanced to incorporate the dual energy services model. The limits to its deployment are linked to the market readiness to adopt the business model rather than any contractual limitations relating to the EPC template.

7.1.1 Critical aspects in the new dual EPC

In addition to the regulatory requirements in each country and the development of a measurement and verification plan that considers both energy efficiency and demand response, one of the most important elements to consider in the enhanced EPC is management of cash flow in real time. Correct management of cash flow is critical to satisfying the interests of the three main parties to the contract, ESCOS, aggregators and end users. The formulae relating to the share of savings and distribution of revenues must be revised taking into account all possible market situations since in some cases a situation that is beneficial to one party is detrimental to another. A typical example of this is that the ESCO gains are based on reducing energy consumption but this reduces the potential gains from DR as energy efficiency reduces the turn down potential of each building.

The solution to this situation is to create formulae that assign the total revenues from the contract in proportional to the contribution from each party so that the gains from one cover the losses of another in a way that is mutually agreeable to all parties. If this approach can be agreed, the enhanced EPC could create a market in which the EPC contract length is reduced due to the increase in total annual revenues and all parties could benefit from an affordable cash flow scenario for the duration of the contract.

7.2 INNOVATIVE METHOD OF FUNDING

7.2.1 Sources of Financing for Performance Contracts

Financing for EPCs is often provided by large institutional lenders. Capital could also be provided by building owners or the ESCO or a combination of sources. Depending on the country, financial incentives and reimbursements are often available to help to incentivise these projects. The main sources of finance and the implications of each source on the EPC are given below:

- **Self-Financed**: In this case company or building owners provides the finance to pay for the works undertaken by the ESCO. Funds can come from an internal company budget, a third-party financier, or a combination of these options. This is one of the most common approaches used in EPC projects as this format provides the simplest contracting method and can still include a performance guarantee from the ESCO. In this case, the client may also be able to access more favourable interest rates than by using other options.
- **ESCO–Financed:** In this case the ESCO funds the capital costs of the project using their own capital. This is a very common option for very large ESCOs but for smaller companies it is more common for the ESCO to take out third-party financing. Whether the ESCO uses its own capital or takes out third-party financing, this model put the ESCO in a weak financial position. On-balance sheet debt is extremely limiting to ESCO growth as there is a limit to the amount of debt a company can realistically take on and manage. This generally limits the total number of projects an ESCO can take on at any one time.
- **Third–Party Financed:** In this option an external investor provides the funding for the project. This option may encompass rates and contractual conditions which may be dependent on the ESCO and the profile of the end client.
- **Lease-purchase agreements:** In this case a “lease arrangements” is in operation for the duration of the contract and the financier rents the equipment to the building owner. At the end of the contract ownership is passed to the building owner.
- **Bonds and Loan Pools:** This last case is usually only seen when the end user is able to apply for loan pools and bonds as financial supporting mechanisms.

From the European Commission point of view there are several funding schemes in place that support ESCOs and EPC projects:

- The ***multi-annual Financial Framework*** is a source for funding for EPC policies and measures. It is supported by the EU 2020 strategy “Smart, Sustainable and Inclusive Growth”, with the objective to serve as the support to shift to a competitive low carbon economy (EC-JRC, 2014).
- ***European Energy Efficiency Fund (EEEF)*** is an innovative public-private partnership (PPP), that finances energy efficiency projects.
- The ***JESSICA*** **fund** is jointly funded by the European Investment Bank, Private Financing for Energy Efficiency instrument (PF4EE) and European Structural & Investment Funds (ESIF) to support energy efficiency projects.
- The ***Property Assessed Clean Energy (PACE)*** programme uses a financing model mechanism to enable local governments to raise money to finance clean energy projects in houses or commercial buildings.

7.2.2 Financial innovative solutions

As a project partner in NOVICE, Joule Assets Europe expedites the process for projects to access finance that is currently available on the market, in particular, off-balance sheet solutions offered by private or public-private funds. Within Joule’s investor network, numerous private funds are willing to develop umbrella contracts that provide a lump sum of capital over a specific duration for an entire pipeline of smaller projects – often including future projects. This model is done off balance sheet, usually in the form of a Special Purpose Vehicle (SPV), enabling the ESCO to finance its pipeline and also concentrate on winning more projects – ultimately benefitting their overall growth.

In order to facilitate this type of flexible, off-balance sheet deal creation, Joule Assets leverages its eQuad platform, developed within the SEAF (the Sustainable Energy Asset Framework) H2020-funded project. eQuad is a holistic platform and set of services which helps contractors in energy efficiency and demand response projects across Europe access appropriate investment for their projects, and similarly, introduces investors to opportunities in the form of already vetted, viable projects according to their own investment criteria[1].

eQuad facilitates the pre-finance process by providing contractors with key elements that facilitate communication with investors related to projects in sustainable energy assets, including third party financial analysis and due diligence, project certification from the Investor Confidence Project (ICP), and access to performance insurance. Once a project has been through the vetting stage, it is then sent out to investors within Joule Assets' network whose criteria, in theory, fits the project. This network now counts upwards of 30 funds looking to invest in sustainable energy asset projects in Europe. From there, the contractor will be able to meet withinvestors and find the best financing solution for its project or pipeline of projects.

7.3 Interactions Between Market Players

In an ever-changing market place where the business models and roles of market players are constantly changing, it is important to understand the dynamics between existing players in the market today and the likely future dynamics as the combined business model emerges as a suitable option.

In the traditional market model, both ESCOs and aggregators operate independently from each other, with the only link between them being the client. While this model may also have a few different structures, depending on who is assisting the client in their relationship with both ESCO and aggregator (e.g. external energy consultants, EPC facilitator, FM company, or a combination of other organisations), the typical interaction in the market place is described in Figure 1 below.

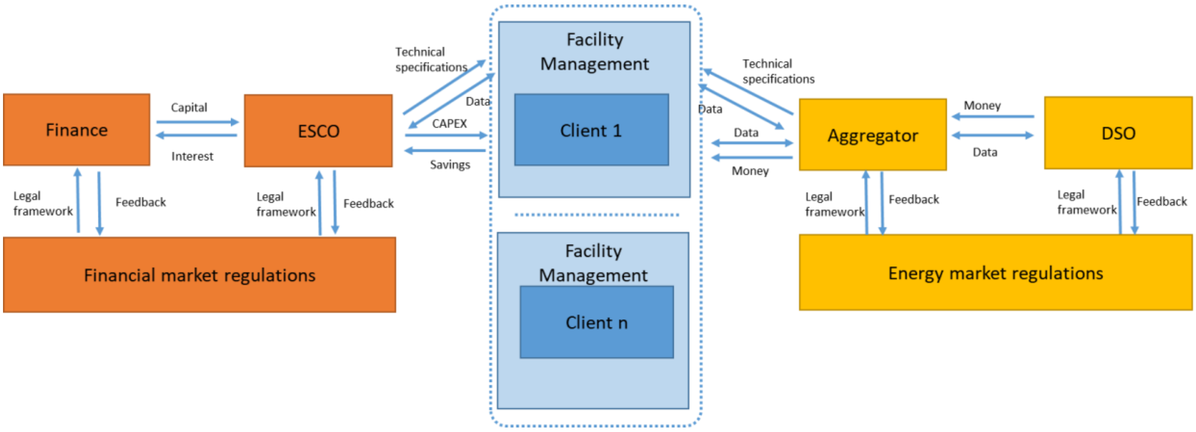

Figure 1: Interaction between exisitng market players

In this standard model, both ESCOs and aggregators interact independently with the client. Based on their specific business model, aggregators may or may not charge the client for the initial investment to enable the delivery of DSR services. The aggregator manages the flexibility towards the DSR markets, aggregates that into portfolios and contracts which are assigned to various market

[1] All of Joule's investor network of around 30 funds has identified that the success rate of real investment in projects reviewed is very low – about 5-10%. This means that 90-95% of potential energy efficiency and renewable generation projects are not getting financed or have to go through multiple rejection processes prior to accessing finance. This is expensive for both the funds (which review 20 projects for every 1 financed) and the ESCOs for whom a significant portion of CEO and COO time can be taken up by searching for financing.

programmes, and gets paid by the network operator. Typically aggregators retain a percentage of the payments from the DSO (after fully recovering the equipment cost, if not supported directly by the client) as a management fee, covering the cost of the platform and portfolio management. The regulatory bodies will have an impact on the TSO/DSO activity and will shape the type and number of commercial products in the market place.

ESCO will secure finance from their investors to deploy energy saving actions on the client side. This model will support a number of variants as described in the previous chapters, but typically ESCOs will recover their initial investment over a number of years from the savings they generate for the client.

The new combined model will provide some new dynamics between market players. At this moment it is envisaged that the standard model will move most of the client interaction to the ESCO side of the business, with the aggregator featuring as a partner or subcontractor to ESCO. Due to the complexities and legal requirements, the interaction with the TSO / DSO as well as payments for DSR services must be through the aggregator. However, on the client side, the specifications, equipment and works for enabling DSR will be incorporated into the wider energy efficiency actions and will be financed by the ESCO. The DSR payment to the client will also be processed through the ESCO, who will recover their capital costs and will also retain a management fee. The diagram below describes the interactions between the market players in the proposed new model.

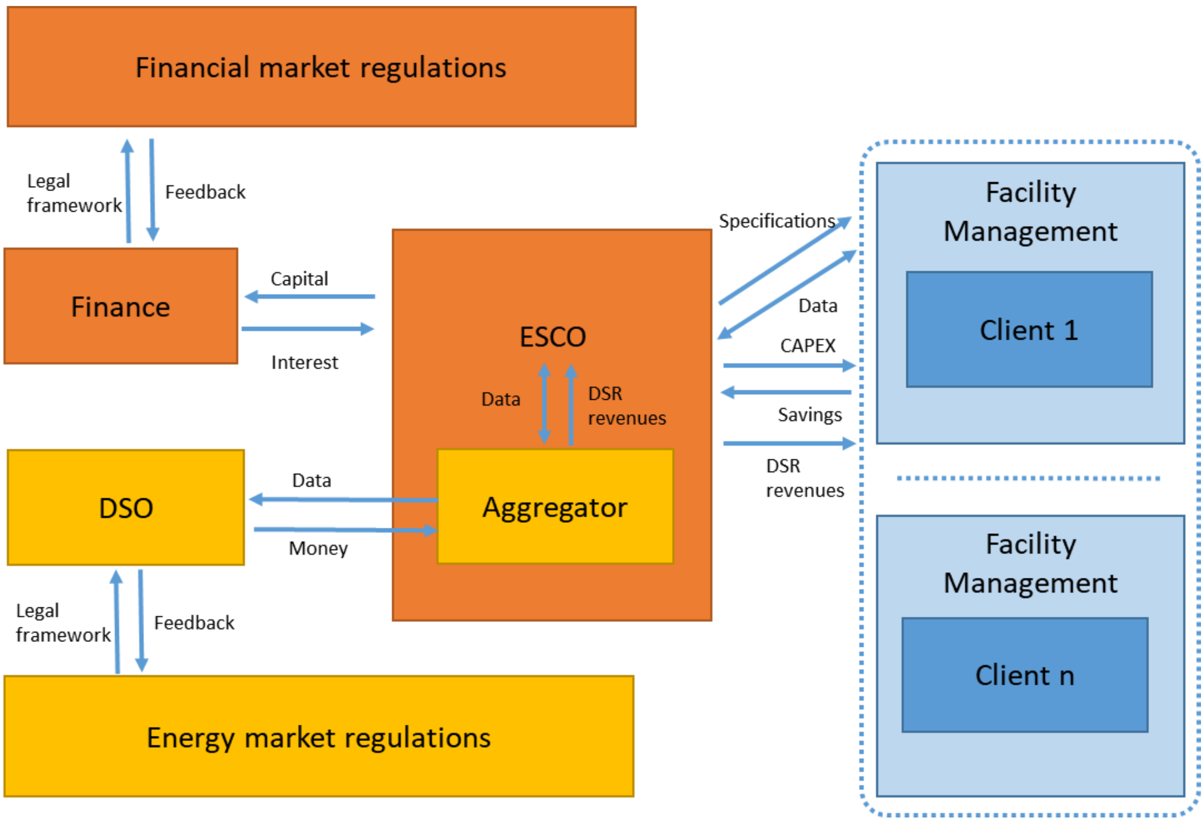

Figure 2: Interactions between market players in the new business model

7.4 Legal Basis

ESCOs have long been supported by the European Commission which has worked to create a legislative infrastructure to standardize and grow the business model across the European market. As a result in recent years directives, standards (such as EN 15900:2010), campaigns, funding schemes, market researches, databases and several projects relating to the promotion of EPCs as a method of increasing the energy efficiency of buildings have been developed.

The most important legislative baseline related to ESCOs and the 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).

The main concepts that can be extracted from the EPBD are:

- Energy performance certificates should be included in all advertisements for the sale or rental of buildings;
- EU countries must establish inspection schemes for heating and air conditioning systems or put in place measures with equivalent effect;
- All new buildings must be nearly zero energy buildings by 31 December 2020 (public buildings by 31 December 2018);
- EU countries must set minimum energy performance requirements for new buildings, for the major renovation of buildings and for the replacement or retrofit of building elements (heating and cooling systems, roofs, walls, etc.);
- EU countries have to draw up lists of national financial measures to improve the energy efficiency of buildings".

The EED establishes a set of actions to achieve the aim to improve % energy efficiency by 20% by 2020 and requires that all EU countries take action to increase energy efficiency. Regarding buildings, the following aspects stand out:

- EU countries must make energy efficient renovations to at least 3% of buildings owned and occupied by central government;
- EU governments should only purchase buildings which are highly energy efficient;
- EU countries must draw-up long-term national building renovation strategies which can be included in their National Energy Efficiency Action Plans.

The European Regulatory Framework for demand response is created by several existing legislative texts:

1. **The Electricity Directive – 2009/72/EC** - The current Electricity Directive of the Third Energy Package already defined the concept of "energy efficiency/demand-side management", acknowledging the positive impact on environment, security of supply, reducing primary energy consumption and peak loads. Article 25.7 requires network operators to consider demand response and energy efficiency measures when planning system upgrades. Article 3.2 also states "In relation to security of supply, energy efficiency/demand-side management and for the fulfilment of environmental goals and goals for energy from renewable sources, [...] Member States may introduce the implementation of long-term planning, taking into account the possibility of third parties seeking access to the system". This language was strengthened further within the Energy Efficiency Directive (EED).

2. **The Energy Efficiency Directive (EED) – 2012/27/EU** - constitutes a major step towards the development of demand response in Europe. According to its Article 15.2, Member States were required to undertake an assessment of the energy efficiency potentials of their gas and electricity infrastructure, in particular regarding transmission, distribution, load management and interoperability, […] and identify concrete measures and investments for the introduction of cost-effective energy efficiency improvements in the network infrastructure, by 30 June

2015. The most important part of the Directive is Article 15.8, which establishes consumer access to the energy markets, either individually or through aggregation. In detail the Article states: "Member states shall ensure that national regulatory authorities encourage demand side resources, such as demand response, to participate alongside supply in wholesale and retail markets. Member States shall promote access to and participation of demand response in balancing, reserves and other system services markets, inter alia by requiring national regulatory authorities […] in close cooperation with demand service providers and consumers, to define technical modalities for participation in these markets on the basis of the technical requirements of these markets and the capabilities of demand response. Such specifications shall include the participation of aggregators."

3. **The Network Codes.** The Network Codes are a set of rules drafted by European Network of Transmission System Operators for Electricity (ENTSO-E), with guidance from the Agency for the Cooperation of Energy Regulators (ACER) and the oversight of the European Commission, to facilitate the harmonisation, integration and efficiency of the European electricity market. These Codes – some of which are still in the final drafting phases- will be critical for the development of demand response, because they describe the terms and conditions under which demand-side flexibility providers will be able to participate in the electricity markets.

4. **State aid Guidelines for Energy and Environment.** In April 2014, the European Commission adopted new rules on public support for projects in the field of environmental protection and energy. Among other issues, the new Guidelines clarify under which conditions state aid to secure adequate electricity generation is permitted. This allows Member States to introduce so-called "capacity mechanisms", for example to encourage producers to build new generation capacity or prevent them from shutting down existing plants or to reward consumers to reduce electricity consumption in peak hours. Although the text still refers to "generation adequacy", it requests the primary consideration of "alternatives" to capacity mechanisms, such as Demand response. The rules state that, once set up, the capacity mechanisms must provide adequate incentives to existing and future generation, demand response and storage

5. **New legislative proposals in the Clean Energy Package.** The European Commission launched the Clean Energy Package in November 2016; a number of legislative proposals including, most importantly for demand response, the revision of the Electricity Directive and of the Electricity Regulation. This could represent the most important change in the regulatory context ever seen in Europe, for demand response. For example, the proposed text systematically includes demand response as a resource in the provisions for all organised electricity markets, alongside storage and generation. It also requires that provisions for balancing and wholesale markets accommodate renewable energy sources and increasing demand responsiveness. Specific improvements of production definitions for balancing and wholesale markets are proposed, regarding procurement and minimum bid sizes respectively. Long-term hedging opportunities are also made tradable on exchange in an open and transparent manner and, where they exist, capacity mechanisms shall select capacity providers in a transparent, non-discriminatory and market-based process. Balancing and ancillary services, as well as dispatching, re-dispatch and curtailment, are generally to be market-based (exceptions are possible in some cases). In addition, the incentive structures for Distribution System Operators are to be adapted to encourage the market-based sourcing of system services at the DSO level. Eligible parties, including customers, retailers and

aggregators, should be able to access relevant data based on the consumer's consent. Finally, the proposals include the obligation for all Member States to introduce a conducive legal framework for demand response aggregators to foster market participation of DR, including through independent aggregators, enable their access to the market, and define relevant roles and responsibilities.

8 CONCLUSIONS

This report has discussed and introduced a possible new EPC template that could be used to deliver the dual energy service model by creating a contractual relationship between ESCOs, aggregators and end users. Using the new template ESCOs and aggregators could work together to create a new business opportunity and bring a combined service offering with significant financial benefits to the market. Special attention has been paid to the analysis of the relationship between ESCOs and aggregators keeping in mind the potential for providing dual services and the advantages and disadvantages of the new EPC contract in terms of market uptake. This objective has been reached through the identifying the current market players (ESCOs, aggregators, building owners, financial institution, etc.), and the interactions between each of them to assess how the relationships may need to change under the proposed new business model.

The analysis of common EPC templates that are typically used by ESCOs and comparison with DR contracts typically used by aggregators has revealed that there are many similarities between the two documents. Sections and clauses covering measurement of the energy baseline, existing infrastructure, payment terms, resolving conflicts, actions in the case of default, definition of roles and responsibilities and several other matters are common to both documents. As a result it should be entirely possible to augment the standard EPC template to include conditions and clauses that also cover DR services to create an Enhanced EPC for dual energy services. Section 7.1 describes in detail the changes and additions that would need to be made to the standard EPC to convert it into a contract that is suitable for use by an ESCO adopting the NOVICE approach.

The final section of the report discusses in detail the possible funding mechanisms that could be used to finance a dual energy services project and the way that cash flows within the project can be handled to benefit all parties. Regulations specify that the aggregator must manage the relationship with the DSO and TSO and must handle any payments received for the provision of demand response services. However as the ESCO is the client facing party in an EPC, an MOU is required to cover the relationship ESCO and aggregator and the handling of fees for providing service and maintenance of equipment as well as revenues from energy savings and participation in demand response events. The MOU will be the subject of a further analysis and report as part of deliverable 4.2