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Mismatch between actual Italian ESCos BM and Policy maker expectation: a novel evaluative model

THESIS FOR MASTER'S DEGREE IN
MANAGEMENT ENGINEERING

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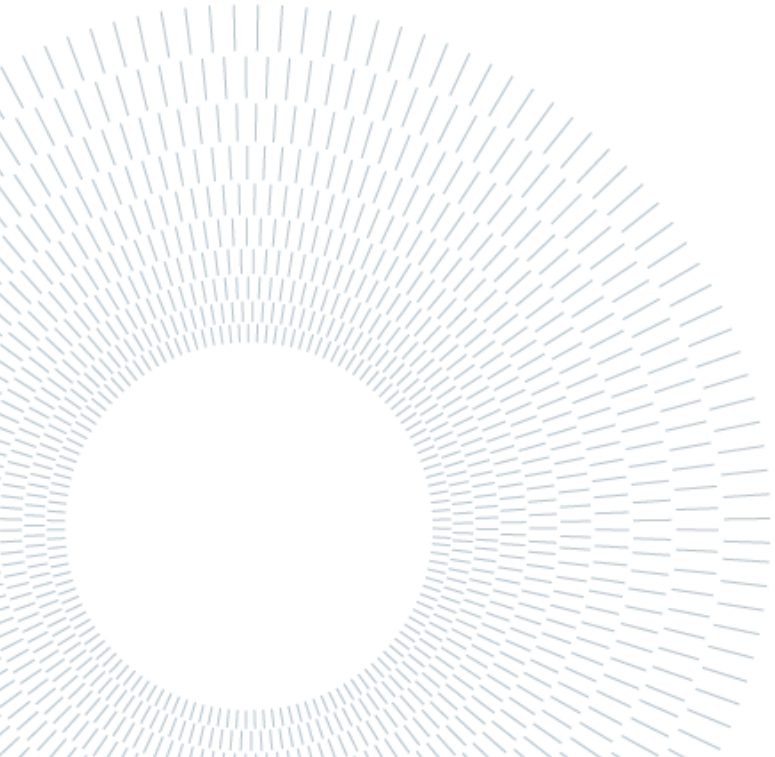

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1 Chapter: Introduction

1.1. Climate change

The world is living through tough times. Climate change has been a top tier 1 priority for many countries since almost two decades ago and despite the efforts of many groups and organizations to raise awareness and provide possible solutions to win the fight, the race against the clock seems to have a blurred future. Developed regions and countries around the world are trying to find mitigation and adaptation strategies to this issue, many agreements had taken part through the decades that somehow demonstrated the willingness to do a change. As the prime ones, the Kyoto Protocol [Link 1,2] in 1997, based on the claim supported by scientific research, demonstrated that global warming was and is primarily driven by CO2 emission as a result of Human activities (also called anthropogenic emissions). The conference that took place in Kyoto stablished the pursuit of industrialized countries and economies in the reduction and control of their GHG emissions. But still, almost 10 years had to pass for it to enter into force in the year 2005. The overall picture has not changed a lot, showing the precarious real commitment that the countries had by that time.

In the near past, the horizon has become brighter. In year 2015 with the Paris Agreement (COP 21) [link 3] an economic and social transformation based on global collaboration and the compromise of Long-Term strategies, together with the disclosure of the GHG emission reduction efforts (NDCs), was proposed and implemented. COP 21 first mentioned the pursuit of limiting global mean temperature rise above 1.5°C, challenge that was supported by the IPCC Special Report 1.5 [link 4,5]. This report first showed the consequences of reaching that temperature increase and the effects that it will have for the environment, the society, different ecosystems and life as we know it in different regions around the world. Still, the core part of the IPCC SR1.5, is not to show the negative aspects of such temperature increase, rather, the report highlights different general pathways that the global community could pursuit to revert these effects, which rely on a significant structural transformation in the energy sector. Figure 1 taken from the report shows the possible forecasts and scenarios that the IPCC modelled. In them, the accountability of human activities for actual global warming are showed as well as the future scenarios that will be driven too by human effort. As for the pathways, they rely on different solution inside the realms of Fossil Fuels and Industry, Carbon Dioxide removal (CDR), Carbon Capture and storage (CCS) and/or Agriculture, Forestry and Land Use (AFOLU). Each of them have a share on the different pathways, being Fossil Fuel and Industry the focus on each of them [link 4]. More in deep as Figure 2 shows, there are mainly four pathways from which we can highlight in the first two the role that technological and business

innovation for low emissions systems and models have in driving energy consumption down while bringing sustainable industries and other business models [link 4].

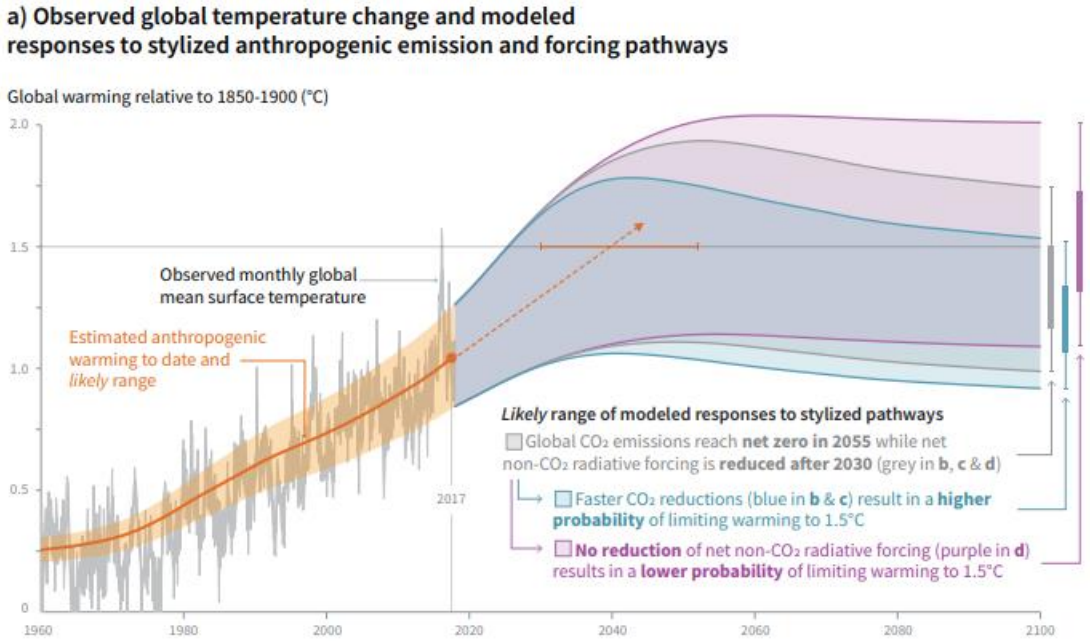

Figure 1: Temperature increase and anthropogenic emissions relation [link 4]

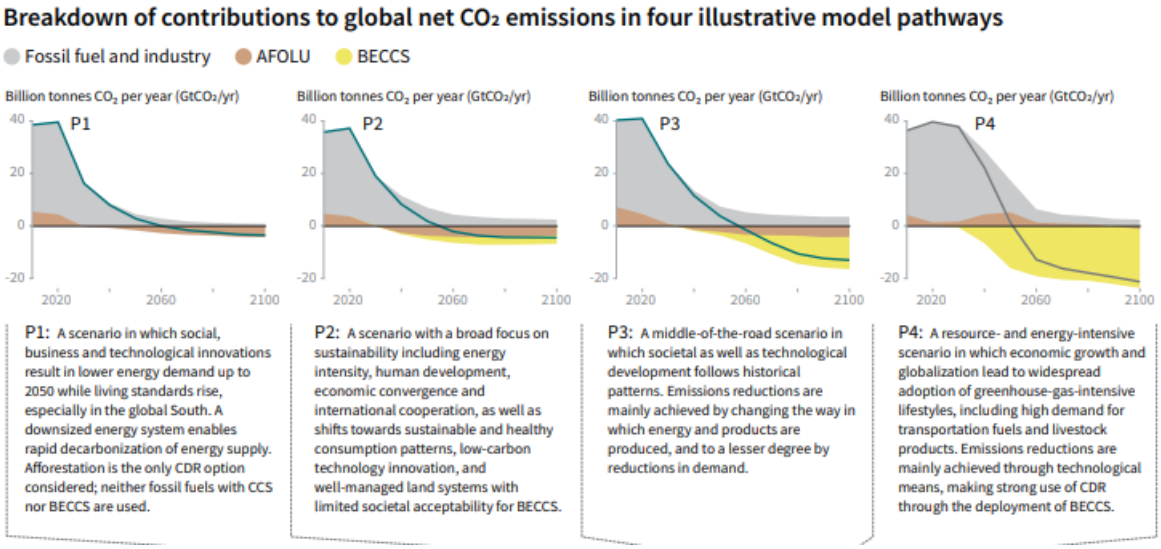

Figure 2: illustrative pathways [link 4]

Moreover, between 2021 and 2022, IPCC disclosed the Assessment Report 6 [link 6], which showed more recent data gathered by different scientific groups on climate change around the world. This report shows in a probabilistic way the different scenarios that humanity might face in the upcoming future and how each will affect

our day-to-day life and the world. The report is not a disclosure of alternatives, but a crude view of the consequences of anthropogenic emissions. The impact that human activities have had over the years, starting from the industrial revolution, put at risk the wellbeing of the future generations that will populate this planet, this is the aim of the las report from the IPCC, to open the eyes of the global community and really start to do strong commitments. The search for sustainability is now more important because we are reaching a point of no return.

1.2. Importance of Energy Efficiency

Other environmental organizations like the International Energy Agency (IEA), delivered a report to the COP26 in 2021 on Net Zero Emission (NZE) to be achieved by 2050 [link 7]. The report first shows the struggle and lack of materiality of past commitments and policies like National Determined Contributions (NDC's) from the Paris Agreement, the APC pathways or the STEPS scenarios which still relied on Fossil Fuels and foresee a future with higher Total Final Consumption (TFC) of Energy due to lack of Energy Efficiency. The Report strongly relies on Energy transition and decarbonization strategies such as energy efficiency, electrification of sectors and industries, generation from renewables energies, use of new fuels, CCUS and behavioural changes by different players. Previous of this, in year 2019, the European Commission approved its main action plan to become the first Climate Neutral continent by 2050, the European Green Deal that has in between its main pillars the fighting against climate change, digital transformation and inclusive growth [link 8]. Regarding the environmental goals, for them to be reached by 2050, a mid-target of 55% of GHG emission was set for 2030. In this mid-target energy efficiency plays a leading role to reduce energy consumption and so emissions coming from its use and production. Furthermore, in July 2021 the EU commission put forward new directives on energy efficiency to speed up the efforts on achieving the targets placed in the Green Deal [link 9,10,11,12,13]. The proposal puts energy efficiency in first place, almost doubling the efforts from 0.8 to 1.5% reduction per year from 2024 until 2030. The common goal of the EU Commission is to achieve a target of 32.5% in energy efficiency by 2030. This is, as said by the EU Commission, "an important instrument to drive energy savings in end-use sectors such as buildings, industry and transport". Directives are crucial elements to achieve carbon neutrality. The idea is to put Energy Efficiency as a priority and a first option in investment portfolios across all sectors and be treated as a first fuel option that can compete with conventional fuels and renewable energies. As a matter of fact, in the last 25 years, the countries that are part of IEA achieved a reduction of 10.2 million Tons of CO2 only in terms of Energy Efficiency [link 9,10,11,12,13]. For example, [Link 14] Figure 3 shows the increasing role of energy efficiency in 11 IEA members from 1973 to 2011. Demonstrating the important role this option will have in achieving NZE2050.

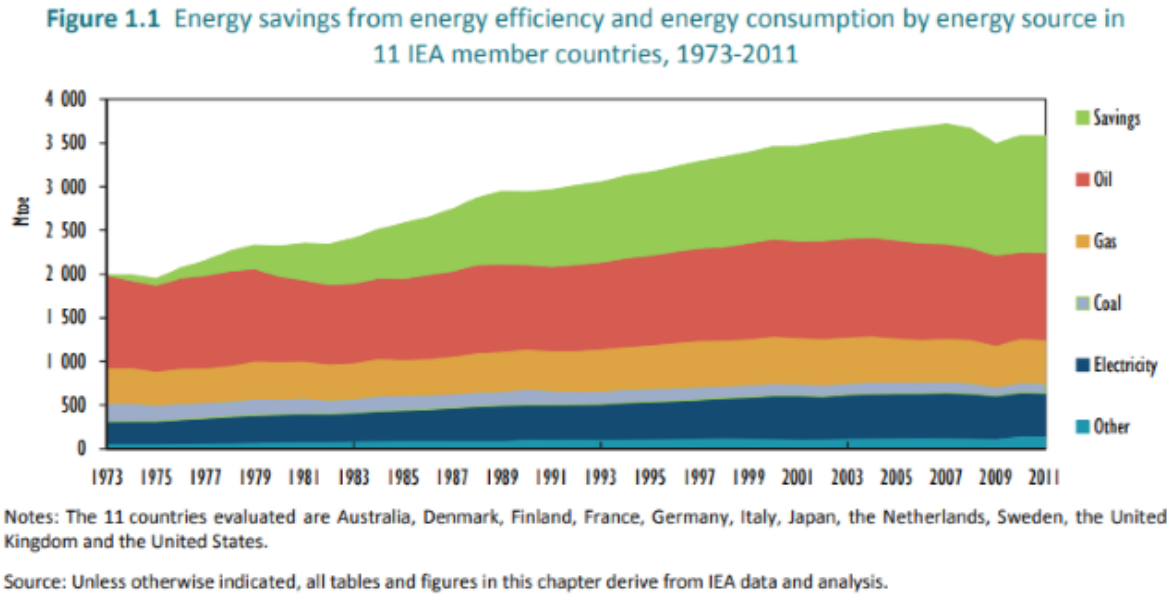

Figure 3: Energy savings from energy efficiency by energy source in IEA member states []

In line with this idea, IEA NZE 2050 report [link 7] shows the expected amount of energy avoided by different sources from which Energy Efficiency plays a distinctive role in the Industrial and Buildings sectors (Figure 4). Energy Efficiency has become a promising mitigation strategy in the energy transition pathway as a fast, cheap and safe alternative [link 15]. But despite all scenario's projections and past achievements, the expected targets haven't been achieved so far and an Energy Efficiency Gap has recently emerged. On the same idea, investments in Energy Efficiency were not remarkable in the past years too. Graph # [link 27] shows the annual share investments on EE for the IEA member countries. Despite of reaching more than 25% of government R&D spendings, this investment rhythm is and will not be enough to meet the targets estimated by the NZE scenario, therefore, annual spending in R&D should be tripled by 2030 and be spread over other countries and not just the EU [link 28]. Efforts should be focused in three main sectors; Buildings, Industry and Transportation, for which electrification will also play an important role. For them, higher investments should be allocated, even though an increasing amount of energy savings had taken place in the last decades, these sectors are still too reliant on energy coming from fossil fuels, therefore energy efficiency plays a leading role in reducing the energy consumption as well as emissions [link 27]. EE adoption is experiencing some challenges and barriers that need to be addressed for goals to be reached and for ensuring our wellbeing and the one of future generations.

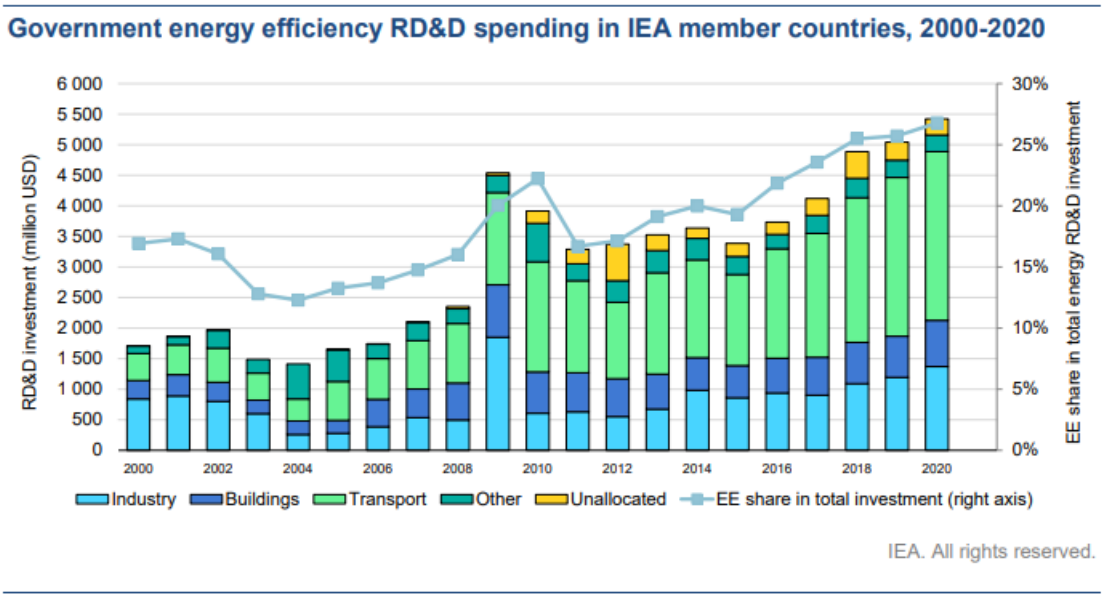

Figure 4: Energy Efficiency R&D spending in IEA countries [link 27]

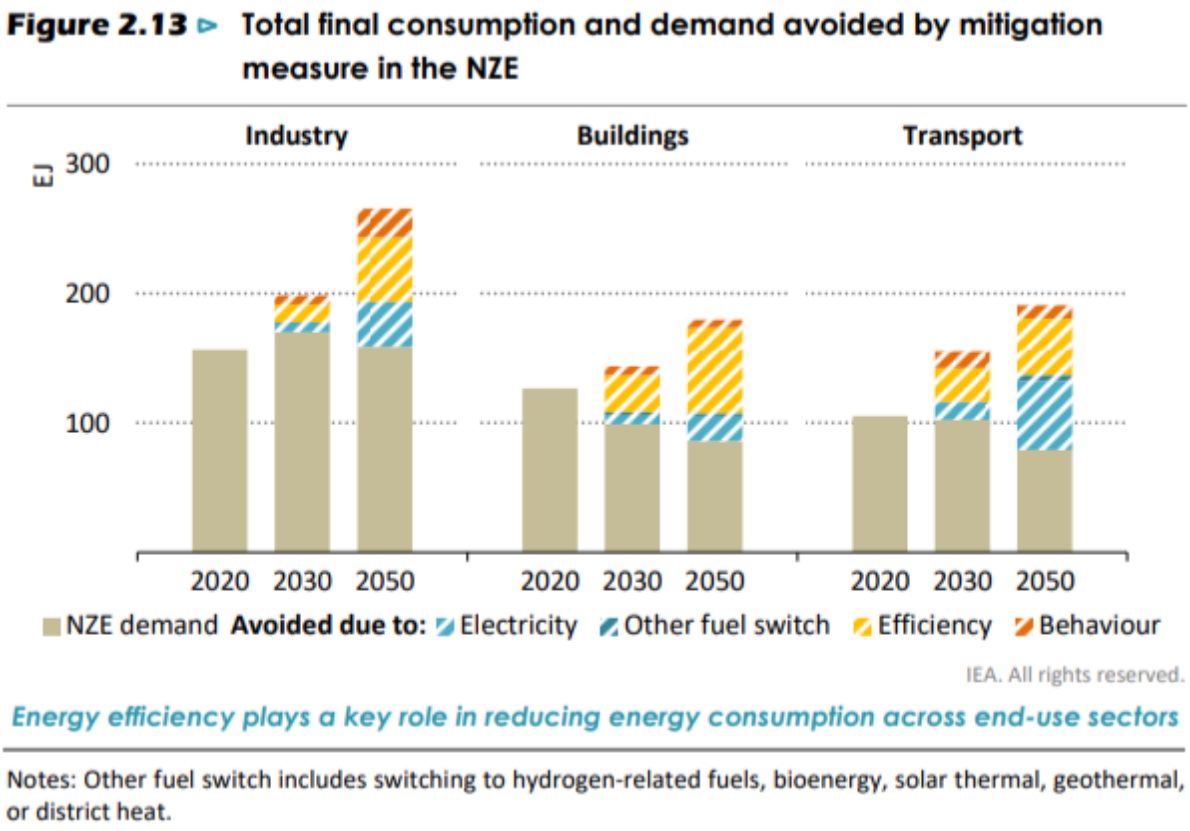

Figure 5: Total final consumption and avoided by mitigation measures in NZE

1.3. ESCos and Energy Efficiency

Even though energy efficiency is gaining more protagonist in the last decades, its concept and market has been present for decades. [link 16, 17,18] The concept moved from Europe to the US by mid 70's, place where it started to develop and thank to the energy crisis that American countries as well as mid-Asian ones experienced, the concept proved strong. By this time around 1980's, Energy Service Companies (ESCos) were born as a society that offered consulting services to minimize energy consumption and strength productive standards [link 17], and as said by [link 19] they "(...) have the necessary know-how to provide turnkey services and solutions achieving significant energy cost reductions while addressing various market related barriers on the ground". Because of this, more clients entered the market and together with the cut in energy bills and the rising of environmental awareness, the model gained acceptance and trust [link 21]. These companies and the market for EE investment have been growing since, reaching capitalization of billions of dollars, according to IEA [link 20]. As a fact, the global value of ESCO market grew a steady 8% per year since 2016 with a slight decrease in year 2019 due to pandemics lockdown and a further re balance with the previous trend, reaching more than 33 bn Dollars in capitalization [link 27]. Figure 6 shows the distribution of shares for the ESCO market in a global perspective, from which China is leading with more than half of the market presence, followed by the US, and then EU that is said to have an underdeveloped market when compared to the other two giants [link 15, 22, 27].

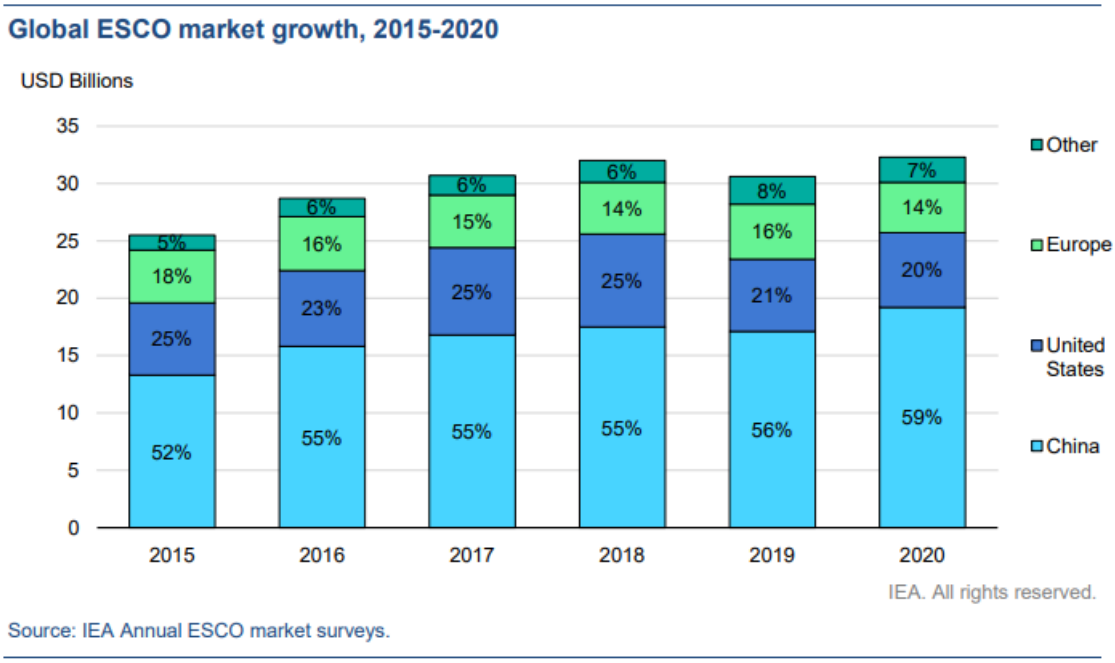

Figure 6: Global ESCO market growth, 2015-2020 [link 27]

More in deep inside the European market and coming back to the market growth perspective, Italy stands out as one of the most developed and with one of the biggest ESCO markets [link 23]. The country's plan on energy efficiency is driven by the Integrated National Energy and Climate Plan (PNIEC) [link 24] who's main goal is the so called "Energy Efficiency First", that aims to allocate capital to the green transition in terms of EE primary in the Industrial sector. The goal is to reduce consumption by 0.8% per year from 2021 to 2030 as graph # shows. Still, industry is not the only sector to be targeted, with the National Plan for Recovery and Resilience (PNRR) [link 25] new focus has been given to the buildings in the private and the public sector. The Issuing of different directives and instruments to push their implementation made prove of Italy's efforts to achieve their claimed goals. Nevertheless, After Covid Pandemic the country had to recover from many spheres, but the EU Commission is pushing Italy to rapidly implement the main instruments and policy measures identified in the PNIEC, to avoid delays that could jeopardize the achievement of the energy savings planned and the general objectives [link 24, 25, 26].

Figura 17 - Traiettoria dei consumi di energia primaria e finale (Mtep) nel periodo 2020-2030 [Fonte: RSE]

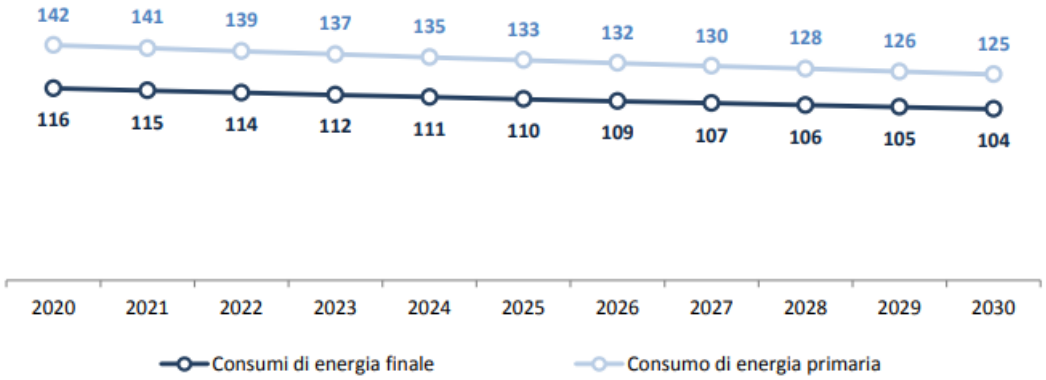

Figure 7: primary energy consumption and final (Mtep) 2020 -2030 (source: RSE) [link 24]

Figura 18: Ripartizione per settore economico dei risparmi oggetto dell'obiettivo 2030 (Mtep)

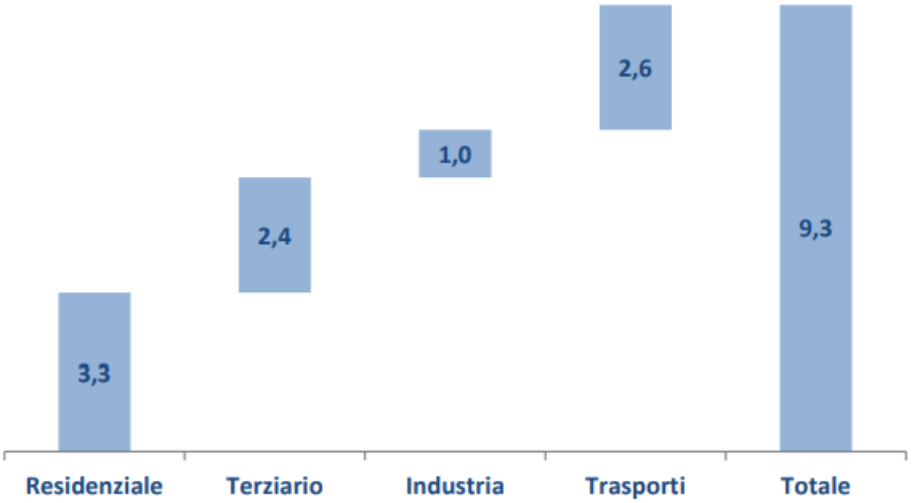

Figure 8: distribution of energy savings by sector 2030 [link 24]

1.4. Energy Efficiency in Italy

More in detail, Italy is putting is pursuing a reduction of primary consumption of 43% and final Energy of 39% for 2030. To achieve these objectives, Italy supported different economic sectors with financial aids that work as incentives for these sectors to undergo energy efficiency improvements (see table #)[link 26]. Amongst them, White Certificates or Energy Efficiency Titles (EET) are the principal mechanism to promote energy efficiency in industrial sector, transport and are now present in the construction sector [link 30]. Since 2018 [link 29] they have proven to be the best ones in terms of cost effectiveness, but the savings achieved from this mechanism have seen a decreasing trend as table # shows [link 26]. Even more, the objectives stablished in terms of savings coming from all mechanisms have fall short in recent years for all sectors except the residential as table # shows.

Table 10 - Cost-effectiveness of incentive mechanisms, cumulative data for 2017

Mechanism	Years	I_0	Savings		Costs		Cost-effectiveness
	(n)	(G€)	Energy (Mtoe)	Financial (G€)	(G€)		(c€/kWh)
White Certificates	13	12.0	57.3	38.0	7.0		2.9
Ecobonus	11	34.6	8.6	5.4	20.5		8.6
PV (Feed-in Tariff)	12		82.7		134	(20 y)	32.0
Other electric RES	<25				110	(20 y)	

Source: ENEA elaboration of data from ARERA, CSEA, Chamber of Deputies, ENEA, GME, Gestore dei Servizi Energetici S.p.A., Ministry of Economic Development

Figure 9: Cost-effectiveness of incentives [link 29]

Tabella 3-17. Risparmi energetici annuali conseguiti per settore, periodo 2011-2020 e attesi al 2020 (energia finale, Mtep/anno) ai sensi del PAEE 2017

Settore	Certificati Bianchi	Detrazioni fiscali	Conto Termico	Impresa 4.0	Fondi strutturali	Piano Informazione e Formazione	Marebonus e Ferrobonus	D.Lgs. 192/05 e D.Lgs. 26/6/15	Smart Working	Regolamenti Comunitari e Alta Velocità	Risparmio energetico conseguito nel 2020	Risparmio energetico Atteso al 2020	Obiettivo raggiunto (%)
Residenziale	0,76	3,49	0,2	-	-	0,04	-	1,84	-	-	**6,33**	**3,67**	**172,5%**
Terziario	0,16	0,03	0,07	-	0,03	0,01	-	0,09	0,43	-	**0,82**	**1,23**	**66,6%**
Industria	2,24	0,05	-	0,58	0,2	0,05	-	0,17	-	-	**3,29**	**5,1**	**64,5%**
Trasporti	0,01	-	-	-	0	-	0,16	-	-	2,12	**2,29**	**5,5**	**41,6%**
Totale	**3,17**	**3,57**	**0,27**	**0,58**	**0,23**	**0,1**	**0,16**	**2,1**	**0,43**	**2,12**	**12,73**	**15,5**	**82,1%**

Fonte: Elaborazione ENEA su dati Ministero dello Sviluppo economico, Ministero delle Infrastrutture e dei Trasporti, ISTAT, Gestore dei Servizi Energetici S.p.A., FIAIP, ENEA

Figure 10: Year energy Savings by sector 2011-2020 [link 26]

Tabella 3-3. Certificati Bianchi: risparmi energetici conseguiti (energia primaria, Mtep/anno), periodo 2005-2020

Periodo	Risparmio (Mtep/anno)
Cumulato 2005-2013	3,95
Annuale 2014	0,87
Annuale 2015	0,32
Annuale 2016	0,5
Annuale 2017	0,24
Annuale 2018	0,09
Annuale 2019	0,08
Annuale 2020	0,03
Totale 2005-2020	**6,08**

Fonte: GSE

Figure 11: Energy savings by white certificates 2005-2020 [link 26]

However, Italian and global ESCos are facing uncertain times. With a model coming from decades, its acceptance and inclusion as a priority in investing portfolios is not the one experts expected. Despite its growth in countries like the US, China and some of the Member States of the European Union, ESCos are still not recognised as an industry and in many other countries they need strong efforts to set bases and flourish [link 31]. The lack of participation of ESCos and overall, of energy services, are now a major issue to the global community. Many publications, as said before, suggests that there is a gap between the potential energy efficient interventions and the reality of these measure that create what is called as a "energy efficiency gap", that at its most is affecting climate change targets, [link 32] and even if ESCos are not the cause of this, they were set as a principal mechanism to close the gap and put energy efficiency in a competitive position against energy supply.

1.5. Research question

The introduction above suggests the importance that EE could have in combating climate change, and consequently the role of ESCos. But in order to be able to better analyse the potential of these players in the market, it is necessary to understand what they are called upon to offer. Actually, ESCos work in a harsh environment that is starting to be populated by bigger firms with a varied portfolio of services and not just ones aimed to energy efficiency, and since majority of ESCos are Small and Medium sized, they are in a position of disadvantage [link 19,33], even more, these new entrants in energy services markets are introducing business models different from each other, increasing the difficulties in understanding and recognize the ESCo model. Adding to this, the Business Model used by ESCos is not well defined in one complete or almost general one, as seen from studies [put some link], they are subjected to different contextual factors like customers, technologies or the contracting models they use that make them vary and thus, make hard the spread of the concept. For this, a comprehension of what ESCos is doing with their business models is needed so it could be compared to what they are truly bounded to do considering normative and policies. Therefore, taking the ESCo model as our unit of analysis, the overarching research question of this thesis is as follows:

Is there a mismatch between Normative framework and actual ESCo BM in the Italian market?

This first question can be splitted in other 2 sub-questions, which have also two different perspectives of analysis. The first one concerns the EE market, the research could clarify what are the characteristics of the ESCos BM that allow them to differentiate in the EE market, in order to be able to strengthen competitive differences:

What are the competitive differences of ESCos compared to other players in the market?

The second concerns policy makers, in particular analysing what is the BM that characterises an ESCo under the current legislative structure, so that they can be distinguished in the market:

What are the characteristics that current regulations require for ESCos BM?

Therefore, the aim of this work, as it will be further explained throughout the chapters, is to understand the mismatch between what ESCos should do according to binding laws and norms and the reality of their models of operation in the Italian context. In conjunction, the work will study which are the factors that are impeding ESCos to exploit its full potential and hinder them into spreading their activities, as well as the relationship between both macro ideas.

1.6. Structure of Thesis

In first sight to answer the research questions, research on existing literature, legislative framework, market dynamics was performed. Subsequently, based on this information, an analysis was conducted that led to the definition of a theoretical BMC, which includes both the elements that an ESCo must have in order to be in line with that deduced from the directives and those characteristics that it should have in order to better deliver the energy services. Then, in order to understand how ESCo's BMs in the current Italian market are aligned with what emerged from the theoretical analysis, it was necessary to conduct empirical research. Because of this, the inclusion of an Evaluative Model based on laws and norms that surround ESCos was designed and further implemented so the gap and issues between theory and practise could be better understood. The model was constructed using data from the Theoretical Business model that was built, its scope is to evaluate the ESCos Business model in the Italian market providing two evaluations: the first is a score help to understand the degree of alignment their core activities have with what normative and definitions expect, while the second is composed by different scores in order to give an evaluation of the customer importance and the type of services that these ESCo offer and so assess key point spotted in the literature and studies on barriers. Before putting it into practice, a tuning session for the model was held with help of an Italian ESCo, from which advice were taken and a mid-restructuration of the model was performed. Finally, for this model to be filled, surveys were delivered to ESCos that operate in Italy. Thirteen different companies were reached, from which data was then analysed and some commonalities between the interviewees' company approaches were also identified. Finally, as matter of wrap-up, below is a brief summary of the chapters:

As already seen in chapter 1, an introduction the climate change commitments, the role of energy efficiency in achieving future goals to reduce the chance of temperature

increase as well as the role of Energy Service companies in it. The chapter continues with a look to the Italian case and how ESCos entered in action in this country, and finally the scope of this work and set of problem.

Chapter 2 introduce the methodology this work uses to carried out the scope of research. It is explained the qualitative methodology applied to data collected and the one to conduct an empirical study.

Chapter 3 shows a clarification of the ESCO concept and the different features that compose this ecosystem, an understanding of the operative models and the services they offer to its customers.

For 4th chapter, a focus is given to the Business model canvas, firstly by defining why is it used in this work. Then, the search in the literature and other studies about the ESCO Business Model, a deep look to their core business model through the lenses of the business model canvas, and how they compare to the other players in the energy service markets. Finally, the explanation of issue related to the basics of the business model construction.

A 5th chapter in which a look to the records of legal and policy frameworks issued by the European union and Italy that act upon ESCos modus operandi and its market and serve to properly define the role of an ESCO.

Chapter 6 will explore the different barriers that are present in the global and Italian ESCO market that hinder their development as well as the drivers that allow their growth.

In Chapter 7, a theoretical BMC of ESCos is constructed based on the analysis of legislative frameworks, barriers and drivers. It includes both the fundamental elements that characterise an ESCos and the supporting elements for the core business.

The 8th Chapter introduces an evaluative model to comprehend the level of coherence of ESCos real business models and the ones of the chapter 6. It is used to conduct an empirical research based on Italian market. Further in the chapter the discussion and analysis of the results is performed.

Finally, A 9th chapter in which the main conclusions of the research are commented as well as recommendations for next research.

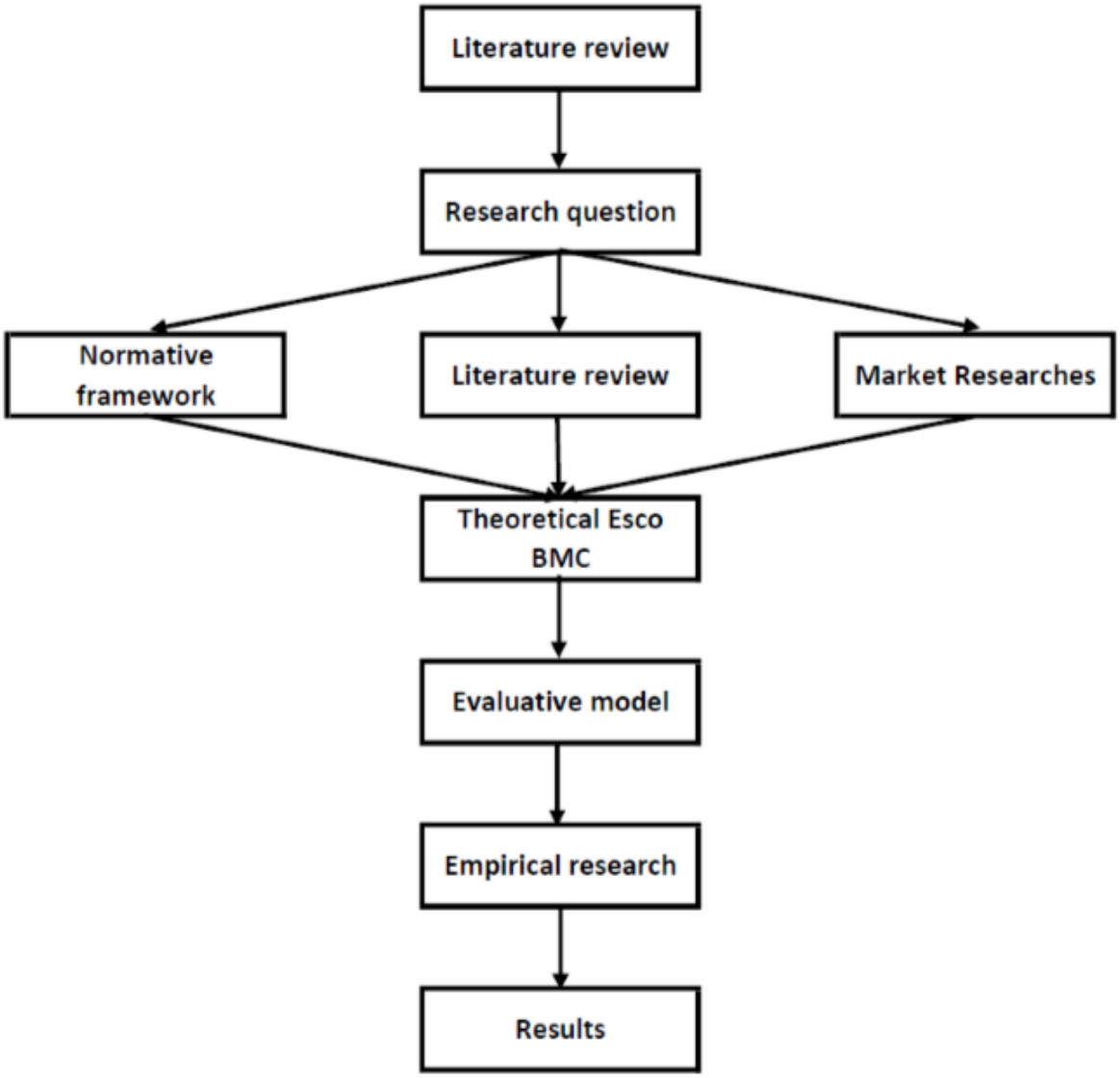

Figure 12: Flow of the thesis

2 Chapter: Definitions

2.1. What is an ESCO and an EPC model

Since their first appearance at the end of the 20th century, ESCos have struggled to acquire a complete and globalized definition. At first, [link 1] they were seen as companies that provide consulting and advisory in energy efficient activities mainly in the industrial sector. From that on, ESCos participation and recognition was not as relevant and it should have been, but thanks to the ongoing climate crisis and the need to search for transition solutions towards a greener lifestyle, the development along different continents and the efforts of different organizations and organisms to define the concept and put it in priority places, has now given much more clarity of its role. Narrowing into the European union and its willingness to fight climate change, by the year 2004 the EU commission worked on long term targets for energy efficiency that were included in the 20-20-20 package, an action plan aimed for 2020 in which GHG emissions, share of renewables and energy efficiency were to be improved by 20% compared to 1990 levels [link 2, 16]. This was followed by the Action on Energy Efficiency in 2006 which led to the Energy Service Directive in which a first formal definition of ESCos is found along with a repertoire of definitions concerning energy services and efficiency. As defined by the EU Commission [link 3], an ESCO is a:

"(...) natural or legal person that delivers energy services or energy efficiency improvements to an end user and assumes a degree of financial risk. ESCos payment comes from the achievement of savings or other agreed performance criteria." [link 3].

Considering this definition, there are still many blank spaces that can be filled with uncertainty when talking about the players that can assume or do the work of an ESCO, therefore a broader definition that encompasses more aspects of its functionalities, its mission and goals, is needed. Another concept that's needs to be introduced is the Energy Performance Contracting (EPC), this is the main model that ESCos use to deliver, capture and create value. A formal definition can be spotted in the ESD of 2006 and the EED of 2012 issued by the EU commission. They define an EPC as:

"a contractual arrangement between the beneficiary and the provider (normally an ESCO) of an energy efficiency improvement measure, where investments in that measure are paid for in relation to a contractually agreed level of energy efficiency improvement." [link 3,12].

This type of contract was supposed to be mainly delivered by ESCos but, they are not the only player allowed to do so [link 6], other actors in the market such as utilities can have their own division focalized in Energy Efficiency solutions with the possibility of

delivering an EPC. In theory, EPC follows distinctive steps that can be summarized in 5 macro groups [Link 4,5]:

A. Analysis of collected data and the prefeasibility studies that can take up to 2 years in which the ESCos can study the energy consumption through direct measurement or indirect when relying in the energy suppliers meters;

B. Design of the contract and defined agreements on energy savings with customers and other parties such as intermediaries, financial institutions or other service providers that are core to the functionality of the projects;

C. The core part which is the implementation of the contract that includes its execution and Verification of compliance through periodical energy audits;

D. Other service provisions that ensure the proper energy savings such as Maintenance, inspections or repairs;

E. End of the contract in which the ownership of the assets could be passed to the customer and so the costs. These projects normally take from 5 to 15 years from the start of the Implementation phase till the end when assets are transferred. EPCs are a way to provide relief to energy-users since risks are most of the time assumed by the ESCos in terms of the performance to be reached or the financing to implement the project, this is its distinctive attribute [link 9].

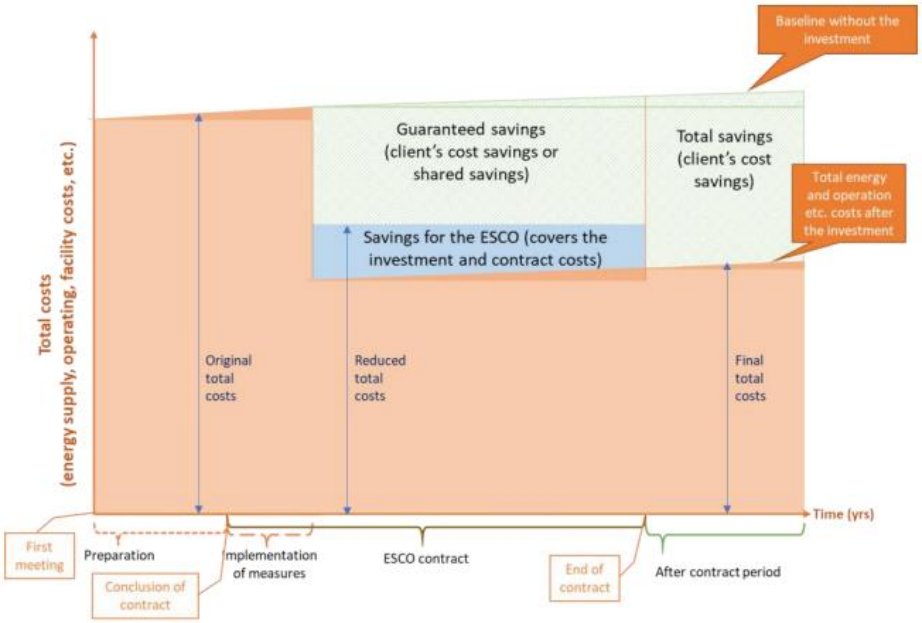

Figure 1. The costs and relative savings expected in an Energy Performance Contracting scheme. Own figure based on: Szomolanyiova and Sochor (2013)

Figure 13: Costs and savings in an EPC scheme [link]

Inside EPCs we can distinguish between two main types of agreements which are Shared Savings and Guaranteed savings. [link 7,8] Shared savings as its name suggests, consists in splitting the savings achieved by the energy efficiency intervention among the ESCO and the customer. Here the savings are in accordance with the reduction in the energy bill and the dependency on energy prices, giving a degree of uncertainty. This type of contract allows to reach customers that cannot access to financing since ESCos assume both performance and financial risks, also putting them in a hard situation since customers might be forced to end contracts in case of bankruptcy of an industrial player leaving ESCos without remuneration for their investments and a possible default with financial institutions. On the other hand, Guaranteed savings is based on the agreement of a certain level of savings to be reached by the performance of the project. Here, ESCos assume performance risk since they need to ensure a certain level of service, while customers assume the financial one through their own equity or by lending money. This model can be a better fit for Small and Medium ESCos that don't have the required capital or credit to borrow money.

Table 1 – Shared-savings EPC business model

Key partners	Key activities	Value proposition	Customer relationship	Customer segment
Financing Institutions; Construction and technical partners	Project preparation, development and operation	Energy savings without prior investment or commitment; Savings from the first moment	Contractual (medium-term, 10-15 years)	Large buildings: Public bodies; Corporate clients (building owners, commercial and industrial
	Key resources Technical and financial know-how		**Channels** Public projects; Special events	
Cost structure	Contruction cost; Interest rates		**Revenue Streams**	Energy savings from the project

Table 1: Shared savings EPC BM [link 15]

Table 2 – Guaranteed-savings EPC business model

Key partners	Key activities	Value proposition	Customer relationship	Customer segment
Construction and technical partners	Project preparation, development and operation	Guarantees energy savings; Stable cash-flows	Contractual	Corporate clients willing to invest in EE
	Key resources Technical know-how		**Channels** Corporate project; Special events	
Cost structure	Contruction cost		**Revenue Streams**	Energy savings from the project

Table 2: Guaranteed savings EPC BM [link 15]

However, these two are not the only Models that can be used by ESCos, there are variations of the same in which for example other players can be introduced or other contractual design; Other models can be described inside the ESCO portfolio [link 15]. These are:

1. Energy Supply Contract: This is like the EPC model where ESCos assume performance and credit risks. However, the focus of this type of contract is on the supply side while there are no incentives to intervene on the demand side. Common interventions are photovoltaics, CHP or biomass for heat supply [link 15]. With this model, ESCos are remunerated only for the useful energy output, and they can last up to 15 years. The model covers almost all steps, from financing, design, planning, construction and O&M [link 29].

Table 3 – Energy suply contract business model

Key partners	Key activities	Value proposition	Customer relationship	Customer segment
Financial Institutions; Construction and technical partners	Project preparation, development and operation **Key resources** Technical and financial know-how and marketing	Guarantees energy supply ('input'); 'Useful energy' service; Improvement of EE of supply	Contractual: typically 10–15 years **Channels** Funded projects; Special events	Buildings with energy saving potential: Public bodies; Corporate clients (building owners, commercial and industrial)
Cost structure	Maintenance/management cost; Construction cost (supply side)	**Revenue Streams**	Fee for the function provided (flat/escalating rate)	

Table 3: Energy Supply Contract BM [link 15]

2. Chauffage: Is a comfort driven contracting that target's both supply and demand side. However, it provides a less complex intervention when compared to traditional EPCs that can perform a complete retrofit of bigger buildings [link 15]. In this type of contract, the customer entrusts the management of its services to the ESCO, which should manage it in a more efficient way. This model last between 20-30 years. In the model, the ESCO assume a total responsibility of the services that are offered to the customer, as well as the maintenance and operations. They might be a better model in the matter they are more efficient and cheaper to implement [link 28]. This service approach the customer with a shared savings claims and a guarantee of savings.

Table 4 – Chauffage business model

Key partners	Key activities	Value proposition	Customer relationship	Customer segment
Financial Institutions; Construction and technical partners	Project development, management and operation **Key resources** Technical and financial know-how and marketing	Guarantees a function ('output'); Improvement of EE of supply; Management & optimization of energy consumption	Contractual: (variable lenghts) **Channels** Funded projects; Special events	Buildings with energy saving potential: Public bodies; Corporate clients (building owners, commercial and industrial)
Cost structure	Maintenance/management cost; Implementation/costruction cost (small)	**Revenue Streams**	Fee for the function provided (flat/escalating rate)	

Table 4: Chauffage BM [link 15]

3. Integrated Energy Contract (IEC): is sort of combination between EPC and Energy Supply Contract. Here the demand side is included as a priority before aiming to the supply side. It finds a common point between the complexity and high costs of EPC and the Supply orientation of Energy Supply Contracting [link 15]. It combines two objectives: reduction of energy demand through energy efficiency and supply of useful energy preferably through renewables [link 30].

Table 5 – Integrated energy contract business model

Key partners	Key activities	Value proposition	Customer relationship	Customer segment
Financial Institutions; Construction and technical partners	Project preparation, development and operation **Key resources** Technical and financial know-how	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	Contractual: (medium to long term) **Channels** Public projects; Special events	Buildings with energy saving potential that need large retrofits: Public bodies; Corporate clients (building owners, commercial and industrial)
Cost structure: Construction cost; Interest rates			**Revenue Streams**: Energy savings from the project	

Table 5: Integrated Energy Contract BM [link 15]

4. Build-Own-Operate-Transfer (BOOT): This type of model aims at producing systems and it recovers their investment through fees that vary according to the service provided. At the end of BOOT models, the idea is to transfer the assets to the customers [link 15]. It includes the design, building, financing, own and operation of equipment for a period [link 28].

Table 6 – Built-Own- Operate-Transfer business model

Key partners	Key activities	Value proposition	Customer relationship	Customer segment
Financial Institutions; Construction and technical partners	Project preparation, development and operation **Key resources** Technical and financial know-how	Energy savings without prior investment or commitment; Guarantees energy supply ('input'); 'Useful energy' service;	Contractual (long term, 20-25 years) **Channels** Public projects; Special events	Corporate clients; Public bodies
Cost structure: Construction cost; Interest rates			**Revenue Streams**: Free for the function provided (flat/escalating rate)	

Table 6: Build Own Operate Transfer BM [link 15]

5. EPC Variable Contract Term: Is same as the EPC model but in this case the contract length can be extended until full investment is recovered by the ESCO [link 15].

Table 7 – Variable contract term Epc business model

Key partners	Key activities	Value proposition	Customer relationship	Customer segment
Construction and technical partners; Equipment supplier	Design Procurement Installation	Energy efficiency project with legal responsibility until completion of the installation	Contractual	Buildings Public body Residential
	Key resources Technical know-how		**Channels** Corporate projects Public binding	
Cost structure	Construction cost		**Revenue Streams**	Lump-sum pricing method

Table 7: Variable contract term EPC [link 15]

6. **Turnkey contract:** This type of contract will be used here to describe the more general global arrangement of placing all design, procurement and construction responsibilities on one contractor. The contractor take responsibility for the design of the works, the employer's advisers find their involvement limited primarily to the tender process and supervision of the contractor's work. The turnkey system uses the lump-sum pricing method.

Table 8 – Turnkey contract

Key partners	Key activities	Value proposition	Customer relationship	Customer segment
Construction and technical partners; Equipment supplier	Design Procurement Installation	Energy efficiency project with legal responsibility until completion of the installation	Contractual	Buildings Public body Residential
	Key resources Technical know-how		**Channels** Corporate projects Public binding	
Cost structure	Construction cost		**Revenue Streams**	Lump-sum pricing method

Table 8: Turnkey Contract business model

2.2. Third Party Financing

EPC works around an ecosystem of diverse players and stakeholders. Amongst them, there can be distinguished three that participate hand in hand and have a direct effect in the delivery of the EPC model. They are [link 10]: The energy user, the ESCO and their External Environment, as well as the project itself. Focusing on the external environment we can find actors such as governments, policy makers or financial service providers that can pose barriers or can act as enablers of the Energy Efficiency Interventions, the market development and the spread awareness of the concept. More

in deep, from the different actors inside the External Environment, we highlight the role of financial institutions. Considering the models already described, focusing on EPC Guaranteed and Shared Savings, ESCos and/or users can rely on their own capital but also, they can opt to undergo leasing agreements with a financial institution. Third Party Financing (TPF) as it is called [link 11], refers to debt financing that can be acquired either by the Energy-user or the ESCO. In the first case, the debt is supported by the savings that ESCos guarantee to the user in the EPC, this can increase or reduce the risk perceived by financial institutions when lending the money. ESCos, being responsible for the delivery of stipulated savings, need to cover the client in case of default occasioned by the intervention. In the second case, when ESCO bore the debt, the repayments go by hand with the savings achieved where higher savings means a possible higher return on the investment for the financing part. Large ESCos might prefer this type of financing since using their own capital funds might be more costly. For small ESCos, this can be a mechanism to scale their operations. Even thought, when ESCos assume financing responsibility there is always the risk of default due to price changes, customer behaviour or unexpected contract termination [Link 11].

Figure 14: Guaranteed savings [link 8]

Figure 15: Shared savings TPF [link 8]

Some variations regarding these two models show that TPF can be accompanied by an insurance company that works as an intermediary providing Credit or Energy savings backup. Their main use is to reduce the risk perceived by banks or other financial institutions when low credit score ESCos want to sustain their projects with loans. As mentioned above, an insurance actor that provides credit coverage should assure the constant payment to ESCos when customer is unable to do so, while technical

insurance covers the ESCO when they can't respond for a project performance default [link 8].

Apart from this type of TPF, its used in EPC projects can be of various kinds [link 4]:

1. On-Balance sheet lending: Debt, Equity or Mezzanine. They are characterized by a presence in the Balance Sheet of the company or user that can affect their credit rating and their financial outcomes.
   - Debt type is the one commonly known as TPF when there is a direct loan between a debtholder that can be the ESCO or the energy user and the financial institution.
   - Equity financing demands shares in the project in exchange for the investors' money.
   - Mezzanine is a riskier but more rewarding hybrid approach between debt and equity financing where debt can be converted into equity in case of default in payments

2. Off-Balance Sheet:
   - Project financing is based on expected project cashflows and can be divided between debt and equity financing types
   - Leasing is commonly used for the use of equipment in energy interventions, and it is a good approach to dealing with capital barriers.

3. Special Purpose vehicles/entities (SPV/SPE): They are entities that facilitate the off-balance sheet lending type. They allow us to implement interventions without assuming the accountability of assets or liabilities in the balance sheet.

Despite the different options, there are still many barriers that hinder the use of TPF and reduce the opportunities of Energy Efficiency Interventions in many EU countries and worldwide. The main obstacles are still in terms of risk aversion and model awareness from these financial institutions, they will be further exposed in chapter 5.
As well as financial institutions and the companies that provide EPC service, other actors inside this market, this time in the Italian one, that are worth mentioning are the Facilitators and the National Association. The former is usually a consulting company that works on behalf of the energy-user and engage with the service provider. While the latter one is commonly a group of EPC providers and/or facilitators that work on mutual collaboration to be at the lead of new trends of the market and more, like AssoESCo [link 19].

2.3. Energy Services

In a first attempt to find a proper definition that enclose the energy services, some authors stress out the provision of thermal solutions such as heating or air conditioning, but also solutions that aim to increase the commodity of the user while achieving better standards, energy savings and emissions reductions such as efficient lighting, hot water and more [link 22]. From them, the definition provided by Paolo Bertoldi stands out by saying that Energy Services are a:

"(…) variety of activities, such as energy analysis and audits, energy management, project design and implementation, maintenance and operation, monitoring and evaluation of savings, property management, and energy equipment and supply." [link 25].

Leaving the concept still open. Yet, energy services cannot be caged into a common definition because the offerings are mostly bespoken depending on the customer and the context in which they develop.

Services can be distinguished in specific and generic services that depend on the type of technology they provide; they also can be cross sectional [link 21]. In addition, energy services vary in complexity and efficiency potential, they can be classified in direct and indirect. The first ones, as the name suggests, directly and tangibly affects the customer, while the indirect are the opposite [link 22]. To mention, more complex services and with higher potential are also the ones that involve more customer interaction in their process, those are the most advanced and the ones that promise an output instead of an input, the Energy Performance contracting and other services that have energy savings as a main priority fall in this category [link 22].

Continuing with the definition, ESCO services can be categorised as Knowledge Intensive Business Services (KIBS) [link 23] that are a transformation of traditional services into ones more innovative thank to the support of Research & Development and energy technologies. This type of services can provide innovative solutions to customers' needs with a focus in the energy efficiency arena [link 23]. The type of contract used by ESCos allows customers to acquire a desired outcome instead of implementing it by themselves [link 24]. However, there is a need of high involvement from the customer into better behaviours and practices to achieve better outcomes [link 24]. Authors classify services depending on two characteristics, the type of technological innovation and the degree of customer participation. Energy Efficiency Services provided by ESCos are allocated where a high degree of behavioural change is needed to achieve the expected results as well as incremental innovation in terms of the technology used [link 24].

As mentioned before, BM and Services can be segmented according to the customer they target. Moreover, they can be further divided by the level of customization. Four categories can be distinguished: Fully customized, considerably, limited and No customization [link 23].

- Unique (full customization): customer has wide variety of choices and has possibility of defining some service parameters.
- Selective (considerable customization): some parts of the service are standardized, still the customer has different choices.
- Restricted (Limited customization): most of the service is standardized. There are limited number of choices for the customer
- Generic (Little or no customization): almost all service is standard and customer has little amount of choices

Furthermore, along with the customisation, the numerous characteristics of ESCO can at least be sorted into different service innovation objects. These are [link 23]:

- Innovation Sources: Focus on service innovation rather than just technological innovation.
- Service Value Activities: Innovation is needed to enhance the value of services. Managerial involvement is crucial to find new key activities and to develop a proper environment for innovation.
- Service Externalities: Based on external networking, mainly by completely outsourcing services that could be integrated in an ecosystem.

From this same study [link 23], the ESCO services package approach should be reconsidered from a unique type meaning full customization of the offer, as they have been working so far, to a less unique one in which a certain level of standardization is added. This type of service is the Selective, and as mentioned by the authors [link 23], it is a customized service with some modularity that enable the reduction of set-up times, performance uncertainty and operational costs, thus, being a win-win situation for ESCos and its customers. In line with this recommendation, the Change Best project [link 26] also highlighted some lessons learnt in the studies they carried out with 38 energy service providers in the European community. As said, importance should be given to simple and easy understanding of the products/services this companies provide, also to the customer interaction in way to gather a better know-how on their context, to communicate better and raise the trust in the model.

These two factors seem to repeat all along the articles and books founded, and the studies realized by entities such as the JRC (which will be furthered discussed). Customers approach and relationship, but mainly the package of services that is offered needs to be deeply understood for it to be leveraged and spread. Some recent articles made the task to study the literature in order to find commonalities between the definitions and past researches, and be a step closer to identify the service bundle

and so a common ESCO business model [link 21]. From this study 35 single services were identified from various authors that at the end were clustered into 9 service categories, these can be seen as the macro stages that an Energy Efficiency project that is held by an ESCO needs to cover. They are:

- Preliminary Analysis
- Project assessment
- project contracting,
- project financing,
- project technology management,
- project supervision,
- energy procurement,
- management of incentives and regulations.
- "other services" includes activities carried out by ESCos that are typically outside the boundaries of an energy efficiency- or energy management-related project promoted by ESCos (e.g., user behaviour training).

This service structure resulted from a literature review and an empirical study based on the Italian ESCos. These macro categories will be used in the evaluative model to gather the necessary information on ESCos business activities. The more they align, meaning the more services they provide with the scope of an Energy Savings intervention and of course when compared to the requirements stated by norms and laws, the higher the score will be. This is going to be further explained in the chapter 8.

2.4. Business Model

Business Models help to recognize and stress the focal parts of a company [link 1]. It is a description of the element of a business and in its core is a set of strategic decisions that define how a company create, deliver and capture value [link 2]. It can be structured in different ways depending on the scope and the motivations of the beholder and the model used. Since the introduction of the Internet in the mid-1990s, business models have become increasingly popular [Link 10]. The business model term has gained predominance among the academic and business communities, yet this does not prove its added value for research and practice. In general, a better understanding of one's business model enables a company to comprehend and identify how it is creating and acquiring value; it allows a company to understand the connections between its own actions and its successes; and, most importantly, it enables a company to compare its own business model with that of competitors [Link 12]. In the literature many different definitions emerge about the concept of Business Model. One is given by Adrian Slywotzky [Slywotzky, A.(1999).Value Migration – How to Think Several Moves Ahead of the Competition,Harvard Business School

Press, Boston]: "A business (model) design is the totality of how a company selects its customers, defines and differentiates its offerings (or responses), defines the tasks it will perform itself and those it will outsource, configures its resources, goes to market, creates utility for customers and captures profits. It is the entire system for delivering utility to customers and earning a profit from that activity".

Another one is given by Markides [Markides, C.C. (1999). All the Right Moves–A guide to Crafting Breakthrough Strategy,Boston, McGraw-Hill Professional] emphasised that it is the identification of 'who', 'what' and 'how' that defines the fundamental elements of a business model. "Who' identifies customers and their needs? "What' represents the company's value proposition. 'How', finally, determines how the company configures its business operations, what types of products it offers on the market and what process technology it uses, and what type of interactions it establishes with other actors in the supply chain. of a company.

Nevertheless, there are some confusions on what exactly constitutes a business model. For this reason, Zott et al. [ZOTT, C., AMIT, R. & MASSA, L. 2011. The business model: Recent developments and future research. Journal of Management, 37, 1019-1042] conducted a detailed review of the business model literature in order to identify several common themes related to conceptualisation of business models [https://etheses.whiterose.ac.uk/3660/1/PhD_Thesis_MH.pdf]:

- First theme: the business model provides an explanation of how firms do business. In particular, how they create and capture value.
- Second theme: the Business model represents a systemic representation of how firms create, deliver and capture value.

As with the analysis of the business model concept, the literature is also equally rich in different types of them. They are becoming more complex each time [link 4] and companies need to work based in an open approach to correctly address the emerging market opportunities and the changing customer demands.

2.5. Business Model Canvas

The business model Canvas was developed by Alexander Osterwalder (2004) In his doctoral dissertation on business model innovation. The current version of the canvas, however, was only published in 2010 (in Osterwalder and Pigneur 2010) And is the result of the collaboration of Osterwalder and Pigneur with 470 practitioners from 45 countries. He proposed an alternative look to the business model from which three main groups can be identified: Value Proposition, Value Network and an Economic Model, each one containing a portion of the blocks. The attractiveness of the BMC is

explained by the support that it provides to entrepreneurs. Indeed, this tool is understood to pressure entrepreneurs to consider each of the elements of the business individually and, undertaking an exercise of constant reflection, which also stimulates business creativity and innovation (Trimi and Berbegal-Mirabent 2012) [Link 13]. It uses a graphical tool where all the elements are related to each other, providing cohesion to the overall business model.

As reported in their book "handbook for visionaries, game changers, and challengers striving to defy outmoded business models and design tomorrow's enterprises" [Link 14] the model consists in:

- Value Network:
    - **Key resources**: it describes the most important assets required to make a business model work Every business model requires Key Resources. These resources allow an enterprise to create and offer a Value Proposition, reach markets, maintain relationships with Customer Segments, and earn revenues. Different Key Resources are needed depending on the type of business model. Key resources can be physical, financial, intellectual, or human. Key resources can be owned or leased by the company or acquired from key partners.
    - **Key activities:** The Key Activities Building Block describes the most important things a company must do to make its business model work Every business model calls for a number of Key Activities. These are the most important actions a company must take to operate successfully. Like Key Resources, they are required to create and offer a Value Proposition, reach markets, maintain Customer Relationships, and earn revenues. And like Key Resources, Key Activities differ depending on business model type. For software maker Microsoft, Key Activities include software development. For PC manufacturer Dell, Key Activities include supply chain management. For consultancy McKinsey, Key Activities include problem solving.
    - **The Key Partnerships** Building Block describes the network of suppliers and partners that make the business model work. Companies forge partnerships for many reasons, and partnerships are becoming a cornerstone of many business models. Companies create alliances to optimize their business models, reduce risk, or acquire resources. We can distinguish between four different types of partnerships:
        - Strategic alliances between non-competitors
        - Coopetition: strategic partnerships between competitors
        - Joint ventures to develop new businesses
        - Buyer-supplier relationships to assure reliable supplies

There are three different motivations for creating partnerships:

- Optimization and economy of scale: The most basic form of partnership or buyer-supplier relationship is designed to optimize the allocation of resources and activities.
- Reduction of risk and uncertainty: Partnerships can help reduce risk in a competitive environment characterized by uncertainty. It is not unusual for competitors to form a strategic alliance in one area while competing in another.
- Acquisition of particular resources and activities: Few companies own all the resources or perform all the activities described by their business models. Rather, they extend their own capabilities by relying on other firms to furnish particular resources or perform certain activities.

- Customer interface:
  - **Customer Segments:** The Customer Segments Building Block defines the different groups of people or organizations an enterprise aims to reach and serve. In order to better satisfy customers, a company may group them into distinct segments with common needs, common behaviours, or other attributes. A business model may define one or several large or small Customer Segments. An organization must make a conscious decision about which segments to serve and which segments to ignore. Once this decision is made, a business model can be carefully designed around a strong understanding of specific customer needs. Customer groups represent separate segments if:
    - Their needs require and justify a distinct offer
    - They are reached through different Distribution Channels
    - They require different types of relationships
    - They have substantially different profitability
    - They are willing to pay for different aspects of the offer
  - **Value Proposition:** The Value Propositions Building Block describes the bundle of products and services that create value for a specific Customer Segment. The Value Proposition is the reason why customers turn to one company over another. It solves a customer problem or satisfies a customer need. Each Value Proposition consists of a selected bundle of products and/or services that caters to the requirements of a specific Customer Segment. In this sense, the Value Proposition is an aggregation, or bundle, of benefits that a company offers customers. Some Value Propositions may be innovative and represent a new or disruptive offer. Others may be similar to existing market offers, but with added features and attributes. A Value Proposition creates value for a Customer Segment through a distinct mix of elements catering to that segment's needs. It

could involve different elements: newness, performance, customisation, price, design, brand, accessibility, cost or risk reduction, convenience.

- **Distribution Channels:** It describes how a company communicates with and reaches its Customer Segments to deliver a Value Proposition Communication, distribution, and sales Channels comprise a company's interface with customers. Channels are customer touch points that play an important role in the customer experience. Channels serve several functions, including:
  - Raising awareness among customers about a company's products and services
  - Helping customers evaluate a company's Value Proposition
  - Allowing customers to purchase specific products and services
  - Delivering a Value Proposition to customers
  - Providing post-purchase customer support
  - Customer relationships: the type of relationships that are established with the customer

Finding the right mix of Channels to satisfy how customers want to be reached is crucial in bringing a Value Proposition to market. An organization can choose between reaching its customers through its own Channels, through partner Channels, or through a mix of both.

- **Customer relationship:** This Building Block describes the types of relationships a company establishes with specific Customer Segments A company should clarify the type of relationship it wants to establish with each Customer Segment. Relationships can range from personal to automated. We can distinguish between several categories of Customer Relationships, which may co-exist in a company's relationship with a particular customer segment: personal assistance, dedicated personal assistance, self-service, automated services, communities and co-creation.

- Economic Model:
  - **The revenue stream** building block represents the cash a company generates from each Customer Segment (costs must be subtracted from revenues to create earnings).

If customers comprise the heart of a business model, Revenue Streams are its arteries. A company must ask itself, For what value is each Customer Segment truly willing to pay? Successfully answering that question allows the firm to generate one or more Revenue Streams from each Customer Segment. Each Revenue Stream may have different pricing mechanisms, such as fixed list prices, bargaining, auctioning, market

dependent, volume dependent, or yield management. Revenue Streams A business model can involve two different types of Revenue Streams:

- Transaction revenues resulting from one-time customer payments.
- Recurring revenues resulting from ongoing payments to either deliver a Value Proposition to customers or provide post-purchase customer support.

- **The Cost Structure:** It describes the most important costs incurred while operating under a particular business model. Creating and delivering value, maintaining Customer Relationships, and generating revenue all incur costs. Such costs can be calculated relatively easily after defining Key Resources, Key Activities, and Key Partnerships. Could be useful to distinguish between two broad classes of business model Cost Structures:
  - Cost-driven business models focus on minimizing costs wherever possible. This approach aims at creating and maintaining the leanest possible Cost Structure, using low price Value Propositions, maximum automation, and extensive outsourcing.
  - Value-Driven: some companies are less concerned with the cost implications of a particular business model design, and instead focus on value creation. Premium Value Propositions and a high degree of personalized service usually characterize value-driven business models.

In addition, the models can be designed within a certain focus in one of the blocks, they can be price/revenues driven, cost drive, consumer driven, or partners or resource led. For each one, a proper sequence of block design is carried out to have the best possible outcome but at the end, all processes are an iterative just to find the correct fix among the blocks. As an example the Customer driven models are shown in the figure XX. For this type of modelling, considering that according to decrees proposed by the EU union the customer segment is already defined, a focus should be given to the next 3 blocks in line. Those are the Customer Relationships, the channels and of course the Value proposition, better modelling that is driven by a correct value proposition should be implemented. Other models in the market have been implemented such as the Price Led one, like the Energy Supply models in which customers pay for quantities of energy and companies borne the least costs possible. These last models are not completely in line with what ESCos should do by law and norm.

EXHIBIT 3 Costumer led business model analysis

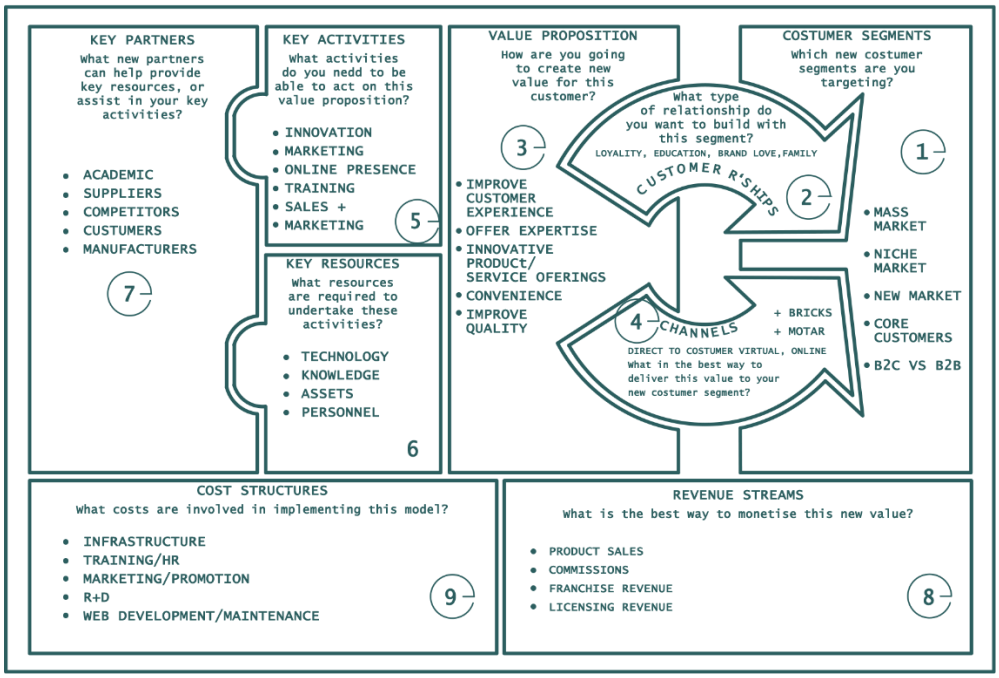

Table 9: Customer based BMC [link 2]

3 Chapter: Methodology

3.1. Methodology for the qualitative research

To understand the theoretical business models of ESCos and their mismatches between normative and actual market, research is conducted through with a qualitative focus. This type of methodology is a particularly well suited for providing detailed, holistic descriptions of events and their causes, as interpreted by those that experienced them (Weiss, 1994). This implies a broadly interpretivist epistemology, whereby the subjective meanings that human actors construct and associate with social phenomena are considered the acceptable form of knowledge (Saunders et al., 2009). One of the aims (and strengths) of qualitative research is to link research findings generated in a certain sociocultural setting to contextual and comparative information available in other ways. In order to be able to contextualize, researchers must spend considerable time on literature review and reading [https://etheses.whiterose.ac.uk/3660/1/PhD_Thesis_MH.pdf]. Some of the key aspects of the case study are (i) the collection of data that consists of multiple sources of both qualitative and quantitative evidence (as good practice a case study wants each piece of evidence to be corroborated by multiple sources through so-called triangulation of sources) and (ii) the need to understand complex phenomena [Scaini, 2015]. The researcher must become familiar both with literature on broad aspects of the setting or phenomena to be studied and with thematically relevant literature from other locations and settings. In addition, there is normally a range of theoretical work that needs to be identified and considered for its potential contribution to, and facilitation of, data analysis. [https://www.sciencedirect.com/science/article/pii/B9780127999432000100]
The analysis was conducted for the Italian market, for which information was collected, with an overview to the European Union. The research is based on a literature review, an analysis of rules and regulations and a market research of ESCos.

3.2. Literature review

Understanding the business models of an ESCO and their mismatches between normative and actual market requires a profound understanding of the literature to grasp the gaps that exist. In order to analyse current knowledge on the extant knowledge base and highlight research gaps. The search was conducted via 'Scopus', a bibliographic citation database. It initiated with a constrained search using strategic

words such as "ESCO" and "Business Model" with limitations in the language for English, Italian and Spanish, and the exclusion of different fields of study such as Medicine, psychology and others that do not pertain to the ESCO context and to our focus. However, this first research was not enough to capture all the possible sources of quality information since only 415 documents were found. A second research was carried out in which different keywords were used, specifically the use of "Energy service compan*" as key concept and same exclusions and limitations in the filters. From this second one, a total of 3735 results were obtained. In both researches, the analysis of the documents necessary to identify the relevant ones followed the same procedure:

1. *Abstract Analysis:* In this phase, a preliminary analysis was conducted on the abstracts of all documents found in the two searches performed. And they were filtered according to the potential relevance they could have for our research.
2. *Full text analysis:* For the relevant papers that emerged from the previous step, a full text analysis was carried out. This was conducted by excluding documents that referred to market analyses and case studies outside the European context. Finally, around 115 documents that included articles, books and scientific magazines were found from this source and used in the final examination. Subsequently, some categories of interest were identified that served to classify the documents useful for our analysis, some of them falling into more than one category:

- **Energy efficiency players**: in this category were included the papers analysing the different playes on the energy efficiency market, with no particular focus on ESCos. 11/ 115 are classified in this category
- **ESCo market:** in this category are included all documents analysing the ESCo market from both demand and supply side, including also barriers and opportunities that the market comprises. 60/115 documents.
- **ESCo Business model:** in this category were included not only research conducted on ESCo business model, but also case studies that bring out aspects of how ESCos work in the market. 76/115
- **Financial sources:** represents all documents analysing how ESCos finance their projects. 10/115
- **EPCs:** Several studies have focused on energy performance contracts. For this reason, we decided not to classify them together in the third category, but to leave them separate. 15/115 EPCs.

In addition to this approach, research performed in repositories from the European commission such as the Joint Research Center, QualitEE, Horizon projects, Italian and European law databases were also used to primarily obtain solid data from governmental entities. At the end, [insert the number of references] where used in this

work as for setting the context and of course the main points of comparison to test the issue related to ESCO business model mismatching.

3.3. Reference model

For our analysis it is necessary to have a vision of how an ESCo should be structured in such a way to have the characteristics that the European norms provides. So, to create the business model, used as a benchmark, a more traditional way of conceptualizing the nine blocks was used, dividing them between Value Proposition, Value Creation and Delivery, and Value Acquisition. It is the business canvas model proposed by Osterwalder. Therefore, this will not only represent the model used to create the theoretical ESCo BM but will also be the reference point for the preliminary analysis, where we will analyse the BM knowledge of existing ESCos in the literature. Thus, choosing to use this BM model on the one hand has the advantage that the main studies conducted on ESCo also use the model proposed by Osterwalder. On the other hand, the holistic view provided by the BMC allows to go and individually analyse the blocks that are relevant for the research. Moreover, in type of analysis, as it will be clarified later on, the researcher is called upon to collect a large number of evidence, in the form of factual data, and to interpret them in order to assign meaning to them, transforming an unconnected set of facts into 'knowledge' pertaining to a given interconnected reality [http://www.edurete.org/psol/RicercaInterpretativa.pdf]. This model through the concept of visual thinking and interconnection allows to simplify cognition and help build narratives that facilitate representation of a disconnected factors, stimulating a rapid and solution-oriented ideational approach (https://journals.aom.org/doi/10.5465/annals.2014.0072).

3.4. Empirical Research

Based on the type of qualitative methodology applied for our study, it was necessary to conduct research by outlining certain contextual factors. For this reason, the empirical analysis was only carried out on companies operating in the Italian sector. The selection of the sample was based on the heterogeneity of the companies. In particular, the selection involved companies with different sizes and customers. Thus, the analysis is not based on a statistical sample, but on a selection of companies that may be representative for the market. In the literature this type of selection is called "purposive sampling". It points out the technical practices that hand over the sample and underline the choose among a set of eligible observational instances. The sampling decisions were made with the explicit aim of obtaining the richest possible source of information for two reasons:

1. be able to answer the research question to ensure that we have collected appropriate data with a view to literal replication (Shakir, 2002; Voss et al., 2002)
2. Testing the novel evaluative model with respect to:
    - the capacity to properly represent all the activities carried out by the ESCo in the market.
    - ease of use and required data easily accessible to the respondent
    - Ability of the model to provide the data necessary for the researcher to adequately analyse the sample.

The research was conducted on 13 companies operating in different sectors, some of them having several customers in different sectors. In addition, the sample aimed to be representative for different company sizes from micro to large. The questionnaire also involved people with different roles in the same company, depending on their availability and knowledge of the data of interest.

ESCO	Answered by:	Dimension	Target sector
1	General Manager	Small	Residential, Industrial, utilities
2	CEO	Medium	Residential
3	CEO	Medium	Residential
4	CEO	Medium	Residential, Industrial, Public Administration
5	CEO	Micro	Residential, and Industrial
6	CFO	Large	Residential and utility
7	Responsible of marketing	Medium	Residential, Industrial, Public Administration
8	Anonymous	Micro	Industrial Sector
9	CEO	Micro	Residential, and Industrial
10	Responsible of general tasks	Small	Public administration and industrial
11	Sales Engineer	Small	Residential and utility
12	Project Manager	Micro	Industrial Sector
13	Energy Efficiency Technician	Micro	Industrial Sector

Table 10: Sample for study

The strength of having an evaluation model is the possibility of standardization of the data collected as much as possible. This allowed to minimise the impact of contextual effects. [https://psycnet.apa.org/record/1990-97369-000]. Data collection was divided into two steps:

1. In the first one a fine-tuning phase was conducted in which an ESCo was interviewed, which lasted approximately 90 minutes. The interview was divided into 4 parts:
   - Introduction: in which the purpose of the interview was explained, but neither the purpose of the thesis nor any information regarding the questionnaire to avoid possible bias as much as possible.
   - Compiling phase: in this phase, the interviewee completed the questionnaire independently.

- Reporting phase: In this phase, the interviewee listed the various strengths and difficulties encountered in the questionnaire during its implementation.
- Discussion phase: In this last phase, the purpose of the research was explained, and the various data of interest were listed accordingly. This was followed by a further discussion phase on how to present the data in the questionnaire.

2. In the second step, after having fine-tuned the questionnaire based on the considerations of the previous step, data was collected via the questionnaires. The persons involved were contacted via e-mail and direct contact through social sites (Linkedin).

4 Chapter: Business Model Canvas

The objective of this chapter is to provide a critical review of various literatures on key aspects of the ESCo business model. The focus is on the elements that can characterise an ESCo and the approaches used to study their business model. Furthermore, an analysis of the business model of different energy efficiency market players was conducted, with a perspective of benchmarking against ESCo. Furthermore, final considerations will be reported at the end with respect to the current knowledge of the literature and the gaps that this research wants to contribute to cover, a theoretical BM model for ESCo based on the legislator's intentions

4.1. ESCo Business Model

Starting from the definitions of ESCo in the literature we can find different statement. In the report published by Lawrence Berkeley National Laboratory (LBNL), Hopper et al. (https://inis.iaea.org/search/search.aspx?orig_q=RN:36004380) defined:

ESCO as a company that offers services related to energy efficiency and other value added services." Instead, Suchismita Bhattacharjee et [http://ascpro0.ascweb.org/archives/cd/2010/paper/CPGT211002010.pdf] defines ESCO as a business that provides a broad range of energy services for projects which are designed to improve energy efficiency.

The differences on the definition are resolved by the EC with Directive 2006/32/EC in which the definition of ESCo is provided. While we will see that of a more articulated nature is the analysis of the business model. Starting with the contractual modality that is certainly one of the most significant aspects for an ESCo [Link 23]. The first point of interest is provided by link 18, where we find a market analysis conducted in 2010 on what types of contracts are used by an ESCo, two categories are created:

With standard contracts they define a kind of outsourcing of the client's energy management. The ESCo's primary goal in these types of contracts is cost savings (not necessarily through energy efficiency), and its payment will either be a lump sum for individual interventions or coincide with the cost savings achieved throughout the contract period. But where there is no contractual obligation for performance targets.

While advanced type contracts refer to the epc contracts introduced by the Italian government in Directive 2006/32/EC.

The study shows that in 2010 they used 78% contracts defined as standard and 28% as advanced contracts. Following this analysis, Link 18 defines the Italian market as atypical due to the mismatch of ESCos with the contracts provided as this goes against

what was introduced for ESCos by the Italian government, i.e. the EPC mechanism, which should represent most of their activities.

A second point of interest emerges from the analysis conducted by Link 12, where it defines the market as not being perfectly delineated, with ESCos offering services in the same way as other players in the market, making competitive differences less clear. According to [Link 16 chapter law and regulations], this problem has prompted the European community to introduce certifications for ESCos. This is reflected in the various ESCo BM results analysed. During the research it emerged that it is impossible to represent a general ESCos' business model, but that they have different characteristics depending on the clusters identified. How argued by[20] that a firm (ESCo) and business model cannot be understood in a vacuum, it needs the consideration of contextual factors, which address their effect or impact on the business model. Most of the papers analysing the various BMs [(Link 17; Link 12; Link 18, Link 19)] and those analysing ESCos for specific case studies [Link 21, Link 22] found a generalised consistency across clusters. In particular, the target market was identified as the main classification driver.

Industrial:

This cluster has been identified in several documents (Link 12; Link 19; Link 21), is characterised by a very heterogeneous customer base and this leads to a range from large ESCos that have a large offer to small ones that focus only on a few industrial customers.

Economic Model:

In this case, the cost structure is not very lean, due to high human resources costs but also to costs related to: mobility costs, marketing, legal studies and specific equipment.

As for the revenue structure, it derives from three main streams

- payment from service provision: consulting services with contractually defined remuneration such as energy diagnosis and analysis;
- revenue sharing (Shared Savings)
- Sale of energy efficiency technologies or interventions with payment defined by contract (pure sale);

Customer interface:

Given the heterogeneity of customers, the value proposition is also broader:

1. Monitoring and control of energy costs
2. Energy efficiency improvements (with/without guaranteed saving)

3. Lower impact on company costs: thus, offering an energy efficiency project by reducing or eliminating the impact of the cost of the intervention on company cash flows.

4. Reduction of high energy bills. Not necessarily due to energy efficiency achievement

In this cluster, efforts are made to achieve customer loyalty in order to create a **relationship** with the customer for as long as possible, so that different services can be offered over the years.

In this case a direct or indirect approach is preferred depending on the customer. With the former there is contact between the client and an ESCo technician, with the latter one first interacts with the client through a network of agents.

Value Network:

The activities carried out represent all those necessary to offer energy efficiency measures. In addition, there are commercial activities, energy consulting and training.

In order to carry out these activities, 'Industrial' ESCos leverage different types of resources:

- Technical know-how
- Commercial network
- Financial know-how and capital resources

As far as key partners are concerned :

- Software providers
- Financing providers
- Technology providers
- Engineers and consultants

Residential sector:

This section represents the BMC of ESCos operating in the residential sector:

Economic Model:

The economic structure does not differ from those operating in industry. The differences lie in the different distributions of revenue streams and cost items.

Customer interface:

Value proposition: Here we find the offer to reduce utility costs through an efficient heating, lighting and energy production system. Both through integrated contracts and through 'pure' sales contracts (Ex. Turnkey)

Also in this sector there is a tendency to build customer loyalty by establishing a medium- long-term relationship. The difference from the industrial sector is that ESCos often do not interact directly with the direct customer but with the retailer.

Channel:

1. Commercial agents. They represent technology retailers, with whom a B2B relationship is established.
2. Partners: In this case the ESCo gets in contact with the retailer.
3. Trade fairs and conferences

Value Network:

- Key activities: they are represented on 'first' activities (audit and installation) while they tend to be outsourced for post-installation activities
- Key resources: reputation, technical know-how and commercial resources
- Key partners: engineering and architectural firms, commercial partners, equipment suppliers

Public Administration:

Economic Model:

The **cost** structure as before is mainly constituted by human resources. But with the difference that it includes costs related to the certifications required to fulfil legislative obligations.

In the case of **revenue** these are mainly two streams:

- Payment for heat system management services
- Payment for consultancy services

Customer interface:

Value proposition: compliance with legal obligations, implementation of specific systems, training of personnel, verification of billing and, to a lesser extent, energy diagnosis and optimisation of systems

In this case, there is no customer loyalty so the level of **relationship** is minimised.

Channels: the only accessible channels in this case are the monitoring of competitions.

Value Network:

Key activities: design, management of heat systems

Key resources: Technical and financial know-how, high sector knowledge, legal know-how

Key partners: engineering and architectural firms, consulting law firm, equipment suppliers

Production energy plant (renewable and high efficiency plant):

We are now examining the Business Model archetype for companies whose main target market is the renewable or high-efficiency power plant (CHP) sector.

Economic Model:

The main **costs** are those of human resources, mobility and travel and procurement of primary materials.

In the case of **revenue** these are mainly two streams:

- Lump sum payment for consultancy
- Lump sum payment for sale and installation of the plant
- Payment for energy supply

Customer interface:

Value proposition is technical advice on the production and sale of thermal or electrical energy at lower prices than the market.

In this case there is an enduring **relationship** with the customer. In the case of small installations, the relationships only concern the minimal ones for the various activities upstream from the installation

Channels: dedicated sales network and reputation for small installations.

Value Network:

Key activities: all project phases: from energy audit to O&M.

Key resources: Technical and financial know-how, high commercial skills.

Key partners: engineering and architectural firms, consulting law firms, equipment suppliers

ESCos interface with different customers and adapt their BM, but this does not only assume marginal or secondary characteristics but varies considerably depending on the clusters. As mentioned above, all these studies are based on empirical research, thus reflecting the Italian market, with reference to the years in which they were conducted. However, it is evident that a study conducted on ESCos already present in the market fails to provide theoretical results from which to subsequently analyse the

misalignment with the market and understand the possible causes. In part, this problem is highlighted by the empirical study conducted by [link 18] which identifies different archetypes, depending on the:

- Degree of coverage of energy and energy efficiency services offered
- The type of contract used (standard or evolved).

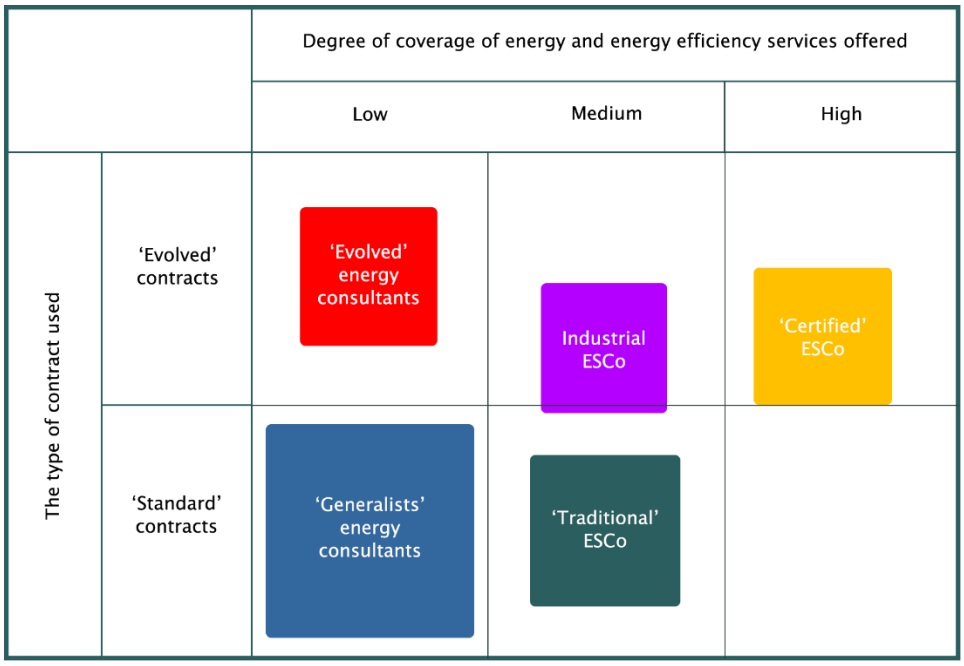

Table 11: type of contract and coverage of services [link 8]

These two evaluation parameters were deduced from an analysis conducted on Decree 102/2014. In this empirical analysis, it emerges that only 15% of the analysed sample fell into the cluster of "certified" ESCos, these do not only represent those certified by ACCREDIA but also those that have the requirements to do so but have not taken advantage of them. Therefore, this study shows a mismatch between the BM of ESCos in the Italian market and what is required by the legislator. However, this study does not show a real business model to compare, but only a categorisation of ESCos according to the two dimensions. Furthermore, the lack of a reference model that considers the regulatory structure causes incorrect or distorted information about the ESCo, resulting in a loss of market confidence.

4.2. Other players in the Energy Service Markets

As mentioned previously, ESCO concept is still one that lacks a proper definition and boundaries when talking about the actors that can provide the services associated.

Some players that act inside this market are not just ESCos but bigger companies that have small divisions destined to this kind of services and so they might not provide all the expected services or on the contrary they might provide even more services. So, before introducing more actors into the ESCO ecosystem, more specifically their competitors in the market, it is needed to make clear another concept that was known by the time ESCos emerged but was until 2012 that it received a proper definition. Energy Service Providers (ESP) as the EU commission establishes in the 2012 Energy Efficiency Directive [link 12ch2], are any "natural or legal person that delivers an energy service or energy efficiency improvement in a final customer facility or premise." They are normally called ESCos but, there are other actors that fall under this definition since it is quite broad. [link 4ch2,5ch2] ESP Companies provide services based on a fixed fee which is their remuneration scheme where many of the costs are recovered. ESP, differently from ESCos don't assume any performance risk, their motives to reduce consumption are not as clear and they might be seen as mere advice or equipment provider [link 13ch2]. A broader look at the ESCO competitors is shown in figure 16.

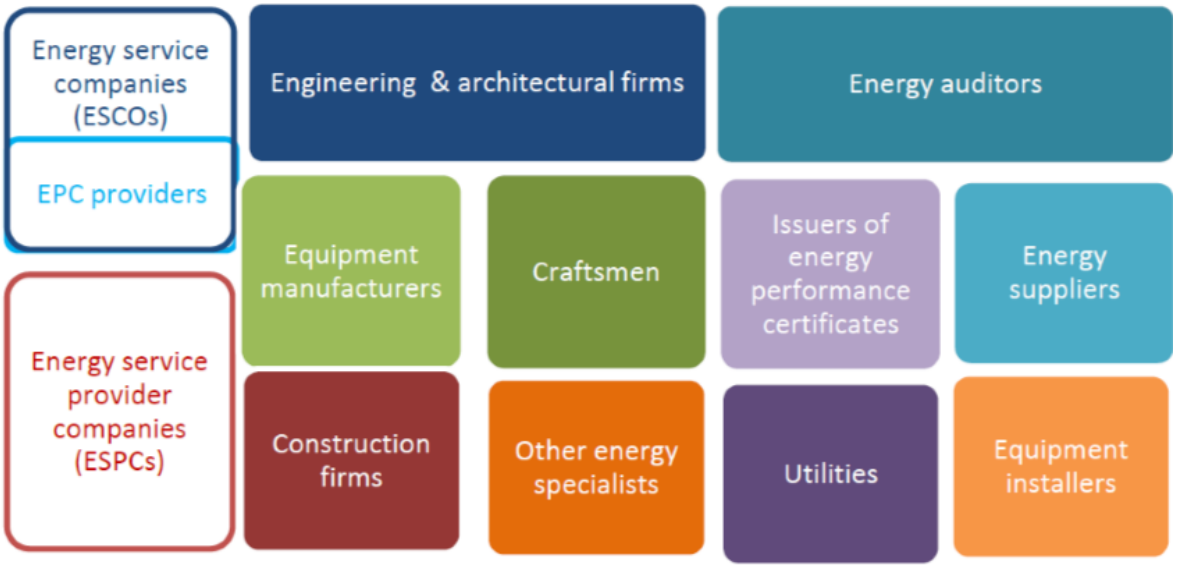

Figure 16: Energy service players [link 4ch2,5ch2]

ESCos stand out from their competitors because they can provide services that cover a wide range of activities that are more than just reducing energy consumption. The close relationship with their customers, their know-how and competences which allow them to easier access to money, the performance assurance and much more are a few features that distinguish them, and even in the case of not owning the capacities they can easily outsource the required activities (these services will be further explained in chapter 4) [link 4ch2, 14ch2]. To make a formal distinction, the EU commission

highlighted the main differences between the ESCos and ESP, they are primarily in 3 aspects exposed in 2014 by the UNI CEI 11352 norm [link 13ch2,14ch2,17ch2,18ch2]:

- ESCos offer guarantees to their clients using an Energy performance contract (EPC) in which an energy efficiency improvement is achieved through the services and activities dedicated to it. ESCos also assume technical and financial responsibilities that are previously established in the contract and to which they respond in case of default [link 18ch2].
- "The total or partial remuneration of ESCos is directly tied to the energy savings achieved that were contractually agreed;" [link 18ch2]
- "ESCos can finance or assist in arranging financing for the operation of an energy system by providing a savings guarantee to a financial entity that serves as a third-party financer" [Link 14ch2,18ch2]

This norm is also subjected to the correct delivery of energy efficiency services that are present in the UNI CEI EN 15900 norm [link 18ch2]. This norm revolves around the implementation of energy audits that enable the identification of the possible interventions and the further verification and measurement of these interventions. All done under the contract between the user and the service provider [link 19ch2]. This is too a distinctive characteristic of EPC against the ESC, which gives a certain degree of assurance and transparency of the work to be done.

4.3. Comparison between EPC and ESC

A further comparison was made by the Joint Research Center (JRC) in terms of the models that these companies use when delivering an energy efficient intervention [link 5ch2]. ESP most commonly adopts the Energy Service Contracting (ESC) model that is like the one previously mentioned as Energy Supply Contracting in which a focus is given to the supply side of the energy flow, where the remuneration is based on fees and no risks are assumed by the ESP. Furthermore, the differences between ESC main characteristics and the main models offered by ESCos such as guaranteed and shared savings are summarized in the following table:

	EPC – Guaranteed Savings	EPC – Shared Savings	Energy Service Contracting
Service Provider	ESCO/EPC provider	ESCO	ESP
Key Characteristics	Energy savings with M&V to provide a guarantee	Energy Savings (Demand side) for cost reduction in the energy bill	Supply of useful energy like heat, steam, electricity. Contracted, measured and delivered in physical units.
Energy Savings	High priority, detailed approach for supply and demand	High priority – primary focus. Use of incentives for cost reduction	Low or no priority – supply side
Payment	Derived from energy savings	Depends on reduction of energy costs	Fixed rate/tariff, with no energy performance requirements
Guarantees provided	Yes. Always. Established in contract	Not a standard. ESCos guarantee a minimum price	No guarantees. Incentives to energy reduction in supply side. No risk assumption
Providers risk	Technical design, implementation and performance guarantee risk	Performance risk, risk of energy price variation and customer credit risk	Not technical or financial risk
Energy Savings transparency	High transparency Ex-ante and Ex-post through M&V	Varied transparency. Depends on M&V quality	Low or no transparency. Contract does not consider M&V of EE

Table 12: Comparison between EPC and ESC in the European market [link 5ch2]

Other comparisons spotted in the literature shows some differences in the delivering of ESC and EPC against the selling of energy from Utilities. In the United Kingdom for example [link 16], ESCo market was shrinking due to energy price wars, Energy Utilities with the selling of high volumes of energy at low prices were driving ESCO models out (EPC and ESC). In this same study, Osterwalder's nine building blocks were used to spot how ESCos differentiated from Energy Utilities (EUCo) model. As the authors stated, information to fill the model was mostly taken from general concepts in the literature. However, the model was constructed using qualitative data from UK, meaning that models are context specific. In this line, this same study finds that ESCO flexibility and the lack of standards, enables the models to vary depending on different characteristics such as [link 16]:

- Customer sector
- Ownership of the ESCO and Organisational structure
- Contracting types
- Purpose or core objectives of the business
- Size and wealth

EPC and ESC models are compared under the light of an ESCO as energy supplier. At first, external perspective of the business model, meaning its interaction with the customer (target customer, channels, relationships), the value proposition and the key partners are quite similar between both: With long term contracts that are mostly adapt to customer needs, targeting the industrial and residential sector at most, providing societal benefits, communication through direct channels and close interaction with customers. The use of financial institutions, legal advisories and connection with local authorities. However, other building blocks vary, they are:

Building Block	EPC	ESC	Commonalities
Key activities	Preliminary audit, Measurement and verification of savings	Energy generation, distribution, supply, metering and billing.	-Design, financing, build, operate and maintenance. -Low carbon energy projects
Key resources	Secondary conversion equipment and building controls	Decentralised, primary conversion & distribution technologies, fuel	Financial and technical resources, legal expertise, billing
Revenues stream	Payment based on quality and quantity of energy services. Customer is covered by the energy savings achieved.	Customer pays for useful energy, and they got a savings because of cheaper prices. Low carbon incentives are present too	Bank finance, capital grants, customer investment
Cost stream	M&V of savings, compensation for missing energy performance targets.	Metering and billing, generation of energy and wholesale purchase, fuel, premises & land acquisition.	-Staff and contractors, -marketing and communications, -O&M, -finance or investment repayments, -technical, financial and legal consultancy

Table 13: EPC and ESC business model canvas assessment [link 16]

From the data exposed by the JRC, we can remark the flaws that other contracts different from EPCs such as the ESC have when approached their customers. Their low transparency, lack of result guarantees, the no risk assumption of any kind on the project and finally, the no use of M&V for the implementation and the divergent focus of demand side towards supply, should pose questions about the accountability and the final purpose of these types of contracts when looking at long term energy goals. As shown, EPC contracts have a clear final purpose of achieving Energy Efficiency and other Non-Energy Benefits in the Demand Side even though that financial gains are seen as of high priority too. Both purposes can't be separated in the offer, they are dependent for the model to be valid and for it to be carried out. Whilst for the ESC the lack of commitments showed in the table above give an idea of how much the profit purposes overcomes the environmental one, possibly posing more barriers into achieving energy efficiency goals if these actors or this model gains momentum. However, when considering the study held in the UK, value proposition of both type of contracts aligns in many aspects such as financial and technical risk assumption, high customization of the offer, social & climate benefits and the concern for Corporate Social Responsibility. Considering this, and what is exposed by JRC, it is still difficult to have a global definition of each type of business model. Even more, despite EPC being overly more trustable and clearly linked to energy savings from demand side than ESC, their model shows some flaws that might affect the implementation from supply or demand side and so the consideration of other contracting types. From one side, the EPC model complexity, the high costs of implementations, the long-term perspective and the scarce knowledge of it from potential customers, are posing barriers for its spread. From the ESCO perspective, risks associated with this model in terms of financing or ensuring guarantees, the risk of customer drop-off and the negative behaviours, as well as the risk of not achieving the targets [link 4ch2, 5ch2, 20ch2], might affect the willingness of ESCos to adopt this model as their predilect one and start aiming for others like ESC as their competitors do.

4.4. Chapter summary

In summary, this review has identified the lack of sufficient attention of the legislative field into the understanding of ESCo BM from a normative point of view. As seen, models are affected by its context. They vary depending on customers, countries, company size and other factors already mentioned. Because of this and many other reasons stated in the previous subtopics, there is a need to find the elements of the ESCo business model that are substantial between different archetypes. So, to not miss due to the heterogeneity of the market the potential of the innovative business model from which ESCos born, and consequently contribute in a real way to energy efficiency at the national level. To do this, a profound look into the norms and laws that govern and affect the functioning of an ESCO is carried out. In this way, a comprehension of

what an ESCO is obliged to do will open the path to design a proper theoretical business model. In addition, through a novel model will be able to analyse the current ESCos BM in Italy with an evaluative approach, in order to understand to address our research question:

Is there a mismatch between Normative framework and actual ESCo BM in the Italian market?

5 Chapter: Normatives and Regulations

This chapter will analyse Italian and European regulations and normative that have and had a direct or indirect impact on ESCos. Therefore, along with the analysis of policy and decrees directly regulate ESCos, also those directives that support the energy efficiency market, thus also involving ESCos, will be reported. Figure 17 shows the milestones over the years for ESCos in Europe, with a focus on the Italian scenario.

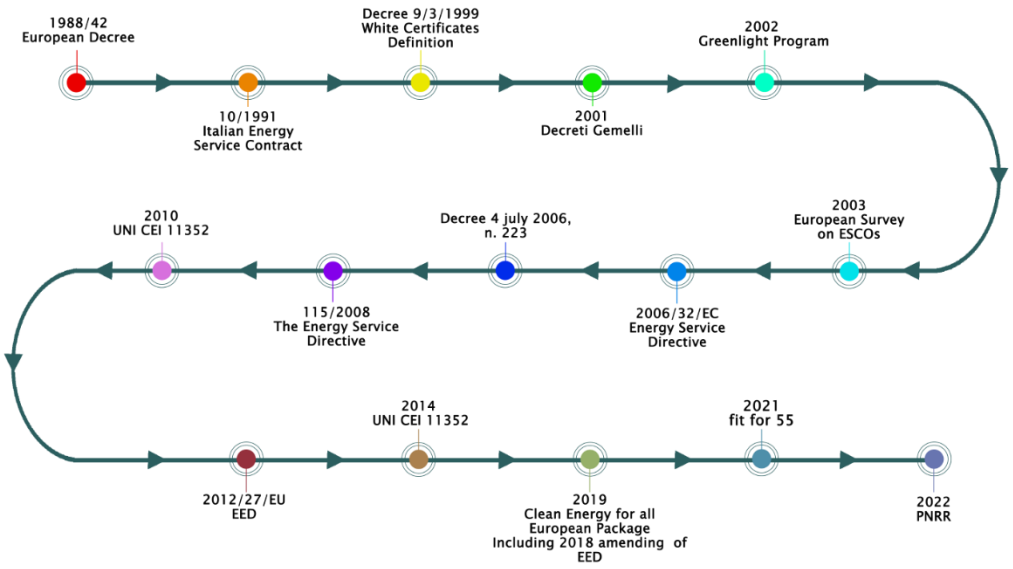

Figure 17: legislative and normative timeline

5.1. Italian regulations

Italian energy services were introduced with Law no. 10, 1991 [Link 23], which applied the term energy services contracts (Contratto Servizio Energia). These were traditionally used by fuel suppliers, in order to move up in the value chain by securing the sale of primary heat energy by including in the selling price operations and maintenance (O&M) costs of energy equipment. [Link 4]. But the first definition of Energy Service Company in Italy was given in the 2008 with the Legislative Decree 115/2008 [Link 24] (Implementation of Directive 2006/32 /EC on end-use efficiency and energy services). The definition is the one reported in the chapter 2. But despite the lack of a clear definition in Italian legislation, the ESCo market in Italy marked an important turning point as early in 2001 with the introduction of the TEE mechanism.

As reported in one of the JRC publications [Link 4], the Italian ESCo market was boosted by the white certificates, for these reasons the Gemelli Decree issued on April 24, 2001, by the Ministry of Productive Activities and the Ministry of the Environment and Land Protection was crucial for the energy efficiency market [link 3]. It established energy efficiency goals for Italy to meet in accordance with the European Union's Kyoto obligations to combat climate change. The ESCos market, as well as the energy efficiency market more broadly, will flourish as a result of the instrument introduced by this regulation. The mechanism calls for the Authority to issue energy efficiency certificates that may be traded on the electricity market and attest to the energy savings made possible by the implemented interventions. A further crucial turning point is the way in which the interventions are carried out. Article 8, paragraph 1, stipulates that the energy efficiency projects may be executed:

a) directly by the distribution companies;
b) through companies controlled by them;
c) through 'third companies operating in the energy services sector, including artisan companies and their consortia'.

With the last statement, ESCos will be permitted to implement energy savings measures for which the Authority will grant them White certificates. In fact, the establishment or acquisition of shareholdings in companies whose purpose is to carry out activities in the general interest falls within the exercise of the private law capacity of local administrations, and since the decrees do not call for any requirements in relation to 'third' companies under Article 8(1)(c), these entities could also operate as ESCos through companies they control or in which they have a shareholding. So, ESCos can be either mixed public/private or public energy agency operating at the national, regional, or local levels (in which private partners can be chosen from banks and credit institutions, component suppliers, installers, energy supply companies, maintenance companies and insurance companies). From a different perspective, the decrees of 21st April 2001 also present new opportunities for local governments, as ESCos will be able to aspire to become electricity distribution companies after 31 December 2030, i.e., following the liberalisation of the electricity market in accordance with European Union Directive EU 92/96 implemented in Italy by legislative decree no. 79/99, the so-called "Bersani" decree. On the other hand, these companies can, as of 1 January 2003, participate in tenders to be entrusted by the municipalities concerned with the natural gas distribution service.

5.2. European directives and Energy Efficiency measures for member states

The first initiative happened when the European Commission issued a recommendation to Member States in 1988 outlining the definition and workings of TPF and encouraging the use of ESCos. Article 4 of Directive 93/76/EC [link 20], approved by the European Council and Parliament in 1992, invited Member States to develop and carry out TPF-using programmes in the public sector. Numerous research and pilot projects were carried out under the THERMIE and SAVE programmes to boost ESCO and TPF operations. [link 5] The Community emitted this decree in order to reach the energy goals for 1995, the Commission has endorsed a recommendation on increasing the use of discrete energy efficiency investments through third party finance. An external investment firm finances investments in energy efficiency, which are then repaid with the cost savings realised. This was a novel financial structure. The Community has set a 20% increase in energy efficiency as one of its primary energy goals for 1995. Large amounts of private capital would be mobilised through third party financing for such investment. This will essentially entail that an energy service company (ESCO) conducts an energy audit at a business before recommending and funding the investment necessary to realise the energy savings identified in the audit. The operation and maintenance of the new equipment will subsequently fall under the purview of the ESCO. By leveraging the revenue from the resulting cost reductions, the owner of the firm in question pays back the expenses made by the ESCO. Unless the contract specifically states that ownership will be transferred, the user firm has two options after the agreement expires: extend the agreement or purchase the equipment.

One of the most important European documents used to develop the energy efficiency market was published in 2006, the directive 2006/32/EU [Link 21]. In addition to defining the national targets, the Article 3, provides the methods for calculating and certifying energy savings. According to the modalities outlined in Annex IV of Directive 2006/32/EC, which can be found in Appendix A, these mechanisms, which may also be beneficial for confirming the real validity of the interventions carried out by the ESCo, must be defined by decrees of the Ministry of Economic Development.

In the same decree is required that the measurement of energy savings shall necessarily be linked to the measurement of energy consumption. The definition of the methods for measuring and billing energy consumption will be made in Article 17 of this decree [link 10]. These modalities may be relevant for determining the real validity of the interventions carried out by the ESCo.

Numerous EU measures, recognise the importance of ESCos in releasing the market's potential for energy savings, like the Energy Efficiency Directive (2012/27/EU; EED).

That Decree established national goals for electric and gas distribution firms in terms of energy savings for the years 2013–2016. (with more than 50 thousand customers). This Decree served as a catalyst for market growth and ESCO adoption, as well as a contribution to the achievement of 2020 energy efficiency targets. It is used as a catalyst for the adoption of technologies created by domestic industries, which, in terms of energy efficiency, command a preeminent position globally [link 18]. There are different articles useful to report in order to analyse the implication of the directives on the energy efficiency market and as a consequent on the ESCos:

Article 1: Directive establishes a common framework of measures for the promotion of energy efficiency within the Union in order to ensure the achievement of the Union's 2020 20 % headline target on energy efficiency and to pave the way for further energy efficiency improvements beyond that date. It lays down rules designed to remove barriers in the energy market and overcome market failures that impede efficiency in the supply and use of energy and provides for the establishment of indicative national energy efficiency targets for 2020. [link 17]

Art. 3 "Each Member State shall set an indicative national energy efficiency target, based on either primary or final energy consumption, primary or final energy savings, or energy intensity. Member States should consider:

- EU targets by 2020
- Early action
- Cost-effective energy saving potential
- Development of all sources of renewable energies

In Art. 7 for the Energy Efficiency Obligation, there is a requirement for annual savings. "That target shall be at least equivalent to achieving new savings each year from 1 January 2014 to 31 December 2020 of 1.5 % of the annual energy sales to final customers of all energy distributors or all retail energy sales companies by volume, averaged over the most recent three-year period prior to 1 January 2013." The energy efficiency obligations (EEO) made it possible for new entities, such ESCos, to help the energy companies reach their end-use reduction objective. However, MSs are allowed to use different processes and policies, such as energy taxation schemes, energy efficiency funds, regulations and standards, or other efficiency-promoting tools that go beyond EU criteria. The following policy measures, or combinations of them, may be used to meet the savings target in Art. 7, but they are not required to be employed in this way:

- energy or CO2 taxes that have the effect of reducing end-use energy consumption; and are above existing minimum EU taxation requirements;

- financing schemes and instruments or fiscal incentives that reduce end-use energy consumption through energy efficient technology or techniques;
- regulations or voluntary agreements, provided they are recognised by the MS;
- standards and norms, including building codes that aim at improving the energy efficiency of products, buildings and services, provided they exceed the minimum requirements in the MS as required by EU legislation, including Eco-design and EPBD, the later using the cost-optimal level;
- energy labelling schemes, except for those that are mandatory and applicable in the MS under Union law;
- training and education, including energy advisory programmes, provided they lead to reduced end-use consumption using energy efficient techniques and technology. [link 17]

The requirement that large businesses conduct mandatory energy audits (Article 8) provides a boost for the demand for energy consultancies, a crucial area of the market for energy services. [link 2]

Article 18 lays out clear guidelines to promote the market for energy services. The article is divided into three sections, and in each, the Member State should have a significant supporting and regulating role in the Energy Service Market:

1. Member States shall promote the energy services market and access for SMEs to this market in different way:

- providing an interface where energy service providers can contribute information, or establishing a list of the available energy service providers who are qualified and/or certified and their qualifications and/or certifications in compliance with Article 16.
- Disseminating clear, understandable information on financial tools, incentives, grants, loans, and energy service contracts with their terms in order to assist the project of energy efficiency service while simultaneously ensuring the rights of the customers.

2. When necessary, Member States shall promote the efficient operation of the energy services market by:

- Identifying and promoting the point(s) of contact where the information mentioned in paragraph 1 can be obtained by the ultimate customers;
- removing the legislative and non-regulatory obstacles preventing the use of energy performance contracting and other energy efficiency service models for the identification and/or execution of energy-saving solutions, if necessary;

- allowing independent market intermediaries to participate in driving market growth on the supply and demand sides

3. The Member States shall make sure that energy distributors, distribution system operators, and retail energy sales companies refrain from any actions that could obstruct the supply of or demand for energy services or other energy efficiency improvement measures or impede the growth of markets for such services or measures, such as closing off the market to rivals or abusing dominant positions. [link18]

Article 20: To maximise the advantages of diverse streams of financing, Member States shall encourage the establishment of financial facilities for EE enhancements. Through yearly meetings, databases, and national comparisons, the Commission will assist member states in putting up these facilities and the sharing of best practises between actors. Additionally, MSs must establish an EE National Fund to aid EE initiatives.

EU has requested to Member States also to report on the progress achieved towards their national energy efficiency targets by 30 April each year as of 2013 in the form of the so-called Annual Reports (ARs). [link 7]

MSs were asked to provide updates on significant legislative and non-legislative actions taken in the previous year that helped the country reach its overall energy efficiency goals. There is a clear direction of the MSs for the types of actions they carry ouy to reach the energy efficiency goals, below there are the percentage of the actions from 2014 to 2018:

1. "Funds, financial & fiscal" (38.4%)
2. "Regulations, supporting legal & other legislative measures" (38.1%).
3. "Plans & Strategies" (8.9%)
4. "Information, knowledge & advice" (5.1%)
5. "Competition, pilot & demonstration projects" (4.5%)
6. "Market-based instruments (e.g. other and volountary agreements)" (3.0) [Link 7]

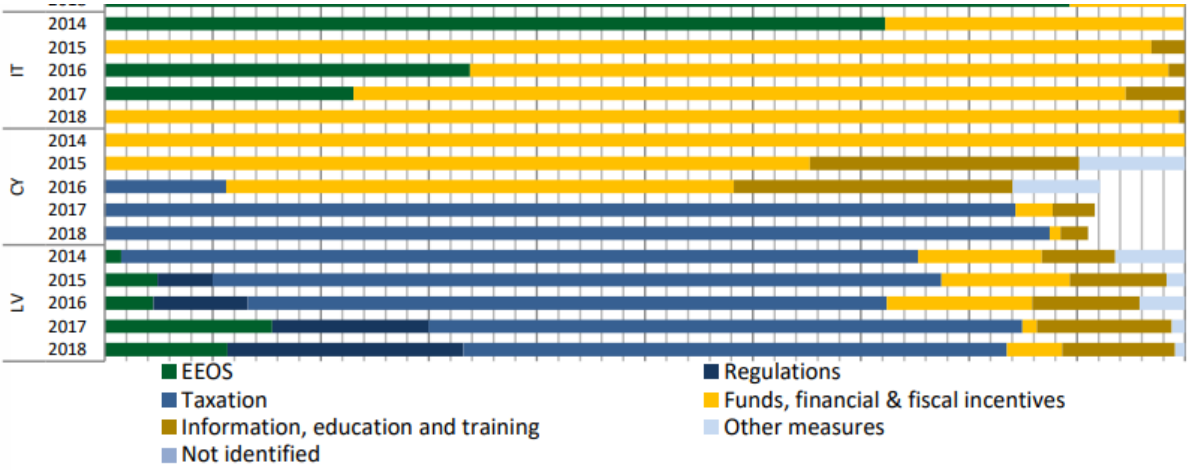

Figure 18: actions to reach EE goals [link 7]

Another important step towards the Energy efficiency was done in 2018 with the amending Directive on Energy Efficiency (2018/2002), as part of the 'Clean energy for all Europeans package'. Its raise the target to reach for 2030 of energy efficiency target of at least 32.5%. It extended energy efficiency obligation in Article 7(2012/27/EU; EED), the requirements for EU countries to achieve new energy savings of 0.8% each year of final energy consumption for the 2021-2030 period. [link 8].

There is not just a definition of the target and the willingness to support the energy efficiency market, but with the amending the EU gives a guideline to Member States to promote the EEM and as a consequence the ESCos. In particular with the Article 18[link 9]:

- ensuring access to clear information about EnPC contracts; financial instruments and opportunities for energy efficiency projects;
- encouraging the development of quality labels;
- developing and ensuring access to a list of certified and/or qualified service providers;
- supporting the public sector to use ESCO services including providing model contracts;
- identify and publish points of contact, where final customers can receive help;
- providing best practices
- if necessary, remove regulatory and non-regulatory barriers;
- find a solution for proper handling of complaints by customers;
- considering using independent market intermediaries; and
- ensuring that energy distributors, distribution system operators and retail energy sales companies refrain from blocking the market of energy services and do not abuse their dominant position.

The most recent document published by the EU for the achievement of Carbon neutrality by 2050 is the "Fit for 55 package" presented in 2021. The midstep is fixed to 2030, with a reduction of carbon at least to 55% compared with 1990 level. The principal targets to contribute to the overall 55 % net emissions reduction are a 40 % share of renewable energy sources by 2030, and a substantial reduction of primary energy (39%) and final energy consumption (36%) [Link 11]. As reported in the Directive of the European Parliament and of the Council on energy efficiency (recast)[Link 12] there is also an update about the energy efficiency directive of 2012. There are two article changes that could be interesting to analyse for our scope: the article 18 and 16. From the article 18 of the directive 2012. In particular the changes were carried out in the first point of the article, the one of 2012 was:

Member States shall promote the energy services market and access to it for SMEs to this market by:

(a) disseminating clear and easily accessible information on:
   a. available energy service contracts and clauses that should be included in such contracts to guarantee energy savings and final customers' rights;
   b. financial instruments, incentives, grants ⇨ , revolving funds, guarantees, insurance schemes, ⇦ and loans to support energy efficiency service projects;

Instead, the update part is:

   c. available energy services providers that are qualified and/or certified and their qualifications and/or certifications in accordance with Article 26.
   d. available monitoring and verification methodologies and quality control schemes.

Also the article 16 is changed with the 26:

1. Member States shall ensure the appropriate level of competences for energy efficiency professions that corresponds to the market needs. Member States in close cooperation with the social partners shall ensure that certification and/or equivalent qualification schemes, including, where necessary, suitable training programmes, are available for energy efficiency professions including providers of energy services, providers of energy audits, energy managers, independent experts and installers of building elements pursuant to Directive 2010/31/EU, and are reliable and contribute to national energy efficiency objectives and the overall EU decarbonisation objectives.

Providers of certification, and/or equivalent qualification schemes, including, where necessary, suitable training programmes shall be accredited according to Regulation (EC) No 765/2008 120 .

2. Member States shall ensure that national certification, or equivalent qualification schemes, including, where necessary, training programmes, take into account existing European or international standards.

As a consequence of this last update the European commission invite the MSs to incentivize the Energy efficiency markets for SME, but highlighting the concept of certified Energy service providers:

c. available energy services providers that are qualified and/or certified and their qualifications and/or certifications in accordance with Article 26.
d. available monitoring and verification methodologies and quality control schemes

In the paper there was a change in the meaning of energy service providers, eliminating the word "other", in order to be more straightforward about the energy efficiency improvement:

'Energy service provider' means a natural or legal person who delivers energy services or other energy efficiency improvement measures in a final customer's facility or premises.

One of the last documents including energy efficiency of Italian government is called the Piano Nazionale di Ripresa e Resilienza (PNRR) [Link 13]to show the European Commission how Italy wants to use the money that will be received through the Next Generation EU programme. The recently approved document lists the projects that Italy plans to carry out with the aid of EU funds. The plan also describes how these resources would be administered and provides a timeline for related reforms that are partly intended to carry out the plan's implementation and partially intended to modernise the nation.

It is proposed to distribute EUR 235.12 billion among 6 different categories. To meet the ultimate primary energy consumption targets by 2030, these include the "green resolution and ecological transition," which includes energy efficiency initiatives. The strategy calls for the usage of EUR 15.36 billion across three main sectors:

1. building energy efficiency in public spaces.
2. Private and public residential structures' seismic and energy performance.
3. mechanisms for distributing heat

So, it will help the energy efficiency market in the residential sectors. Infact, it was one of the less developed in Italy.

The PNRR plan contains initiatives to address non-economic barriers that limit investment options in building energy refurbishment or impede the execution of works, in addition to acting as a good economic driver for the growth of the energy

efficiency market. The proposal consists of four courses of action and three sets of reforms:

- Make the National Portal for Energy Efficiency in Buildings operational
- Strengthen the activities of the Information and Training Plan aimed at the civil sector
- Update and strengthen the National Energy Efficiency Fund
- Accelerate the implementation phase of projects financed by the PREPAC programme.

5.3. UNI CEI Standard

The definition of an ESCo, introduced by decree 115/2008 [Link 24], has too blurred contours to clearly identify operators that meet the definition. Some entities do not offer integrated energy services, as they specialise in a particular technology or type of intervention, others do not operate with a view to third-party financing [Link 16].

The European commission in the directive 2006/32/Eu in the article 8 highlight the necessity to create a more reliable EE market:

"With a view to achieving a high level of technical competence, objectivity and reliability, Member States shall ensure, where they deem it necessary, the availability of appropriate qualification, accreditation and/or certification schemes for providers of energy services, energy audits and energy efficiency improvement measure"

The Italian standard for the ESCo is the UNI CEI 11352, defines the minimal requirements for organizations that want to fulfil the job of an ESCo. The subsequent adoption of technical standard UNI CEI 11352: 2010 (Energy Management Companies providing energy services (ESCO) - General requirements and checklist for their assessment), provided the basis for the certification procedure for voluntary ESCos. This standard described the minimum requirements for energy efficiency services and capabilities that an ESCO must possess in order to be certified. That standard has been replaced by UNI CEI 11352: 2014 version, which contains more stringent criteria for the verification and validation of the requirements necessary to achieve certification, including the presentation of at least one case study of EPC and TPF [Link 2]

The standard UNI CEI 11352 implements the one related to the provision of an energy efficiency services, the UNI CEI EN 15900. The latter specifies the definitions and minimum requirements for an energy efficiency improvement service. The standard does not describe the requirements of the service provider but identifies and describes the main steps in the service delivery process and highlights the basic requirements. The standard EN 15900 [Link2] defines energy efficiency services as an agreed task of

set of tasks designed to lead to an energy efficiency improvement and other agreed performance criteria. An energy efficiency service shall:

11 be based on data collected about energy consumption;
12 be include an energy audit as well as identification, selection, and implementation of actions and verification.
13 be designed to achieve an energy efficiency improvement and meet other agreed performance criteria, such as comfort level, production throughput, safety, etc.;

The certification process for an ESCo takes place through the verification of a mandatory checklist of the requirements and capabilities of an ESCo. Among the requirements are the ISO 9001 quality management system, compliance of the service offered to the customer with UNI CEI EN 15900/2010, and the presence of a manager certified according to UNI 11339/2009. For the ESCos to obtain the certification it is necessary to apply to certification bodies recognised by ACCREDIA, and therefore qualified to issue the certification. ACCREDIA is the Italian Accreditation Body, the only national body authorised by the State to carry out accreditation activities [Link 18].

UNI CEI 11352:2014 is to be analysed, replacing the 2010 standard, which describes the general requirements and competences (organisational, diagnostic, design, management, economic and financial) that an ESCO must possess in order to be able to offer energy efficiency services and specific activities to its customers. In accordance with the standard, an ESCO must necessarily offer certain activities [Link 17]:

a. energy audits, including adjustment factors;
b. verification of the compliance of the installations and equipment subject of the energy efficiency improvement intervention to the reference legislation and regulations with identification of any necessary adaptation and maintenance of compliance with mandatory requirements;
c. elaboration of feasibility studies, preliminary to design, with technical-economic analysis and selection of the most advantageous solutions in terms of energy efficiency and cost-effectiveness;
d. design of the energy efficiency improvement measures to be implemented, with the drafting of technical specifications;
e. implementation of energy efficiency improvements;
f. management of energy efficiency improvement measures and conducting of the same, ensuring their optimal performance for the purpose of improving energy efficiency and economic;

g. maintenance of energy efficiency improvements, ensuring that they are maintained;
h. monitoring of the energy demand and consumption system, verification of consumption performance and results achieved according to methodologies, including statistical ones agreed with the customer or mandatory;
i. submission of appropriate periodic reports to the customer allowing a homogeneous comparison of energy consumption and energy savings over the contractual period. contractual term; for the purposes of homogeneity of the comparison, the following must also be included
j. technical support for the acquisition and/or management of financing, incentives tenders for energy efficiency improvement measures;
k. user training and information activities;
l. energy certification of buildings (if congruent with the field of activity of the ESCO)
m. financing of the energy efficiency improvement (no necessary for the certification acquisition);
n. purchase of the energy carriers necessary for the provision of the energy efficiency service;
o. exploitation of renewable energy sources, always with the aim of improving energy efficiency;
p. economic optimisation of supply contracts possibly also by modifying the withdrawal profiles of energy carriers (no necessary for the certification acquisition).

The standard reported also the list of capabilities that an ESCO must possess, enabling it to manage the activities listed above "carried out directly or outsourced to third parties and to offer the energy efficiency service as per UNI CEI EN 15900:2010" [link 19]:

- knowledge of Energy Management Systems and auditing techniques
- knowledge of energy efficiency technologies and use of renewable sources
- knowledge of the environmental implications of energy choices
- knowledge of the electricity and gas market
- knowledge of economic evaluation methodologies of projects
- knowledge of methodologies for evaluating energy savings

- knowledge of contractual arrangements for the purchase of goods and/or services
- knowledge of project management
- knowledge of environmental and energy legislation and technical regulations

The standard stipulates two areas of specialisation to which certified Energy Management Experts must adhere given the wide range of knowledge and the size of the field of work: the industrial sector (for EGEs with expertise in industrial applications and production processes) and the civil sector (for EGEs with skills on civil uses).

The assessment techniques provide for a periodic verification of the maintenance of competences with a maximum frequency of five years, whether it be through self-assessment, assessment by the organisation in which the EGE will work, or assessment by a third party.

A control table for the verification of requirements and capabilities is provided in the standard's appendix, UNI CEI 11352:2014. Which cannot be directly published because of copyright concerns. Where contracts for performance guarantees are a crucial requirement. It mandates that the ESCO have at least one contract with a performance guarantee where at least a first cycle of improvement has been completed. The latter refers to giving the client a report on the post-intervention situation that demonstrates an increase in energy efficiency relative to the baseline established during the early phases of the ESCO-customer relationship. An improvement cycle might last anywhere from a few weeks to perhaps several months, depending on the type and scope of the intervention. The inclusion of the ESCO's commitment to attain the result and penalties for doing so in the contract is another essential aspect. Therefore, the fundamental role of the result guarantee contract is clear, which is why the standard provides a guideline for drafting this type of contract.

In the Decree-Law 115/2008, Article 16, paragraphs 1 and 2, prescribes the adoption of UNI-CEI standards for the definition of certification procedures for entities operating in the energy services market as well as the way these entities carry out certain specific activities.

Qualification of energy service providers and suppliers:

1. In order to promote a process of increasing the level of quality and technical competence for energy service providers, one or more decrees of the Minister of Economic Development shall approve, following the adoption of a specific UNI-CEI technical standard, a voluntary certification procedure for ESCos referred to in Article 2, paragraph 1, letter i), and for energy management experts referred to in Article 2, paragraph 1, letter z)

2. In order to promote a process of increasing the level of objectivity and reliability for measures and systems aimed at improving energy efficiency, one or more decrees of the Minister for Economic Development shall approve, following the adoption of a specific technical standard by UNI-CEI, a certification procedure for the energy management system as defined in Article 2, paragraph 1, letter v), and for energy audits as defined in Article 2, paragraph 1, letter n)".

In this two first points of the art. 16 [Link 15] is put in evidence the willingness to reach a more reliable energy efficiency market through the certifications of the ESCos, but these certification procedures are of a voluntary nature for them and energy management experts, whereas those relating to certain activities to be carried out in the energy field would be binding. Nevertheless, only 340/1500 (it refers the 2015 situation) ESCos are under the standard UNI CEI 11352.

6 Chapter: Barriers and Drivers

Despite of all the directives, legislations and norms that regions like Europe and specific countries such as Italy have put in place along the years to promote and strengthen the use of Energy Service Companies as a primal option in investing portfolios, many barriers are still present that hinder the correct development of such firms. When talking about these barriers that reduce the change of market penetration and value creation of ESCO companies, a contextual and geographical delimitation needs to be done, since barriers are different for each country that is studied [link 19ch1]. However, there are some similarities among them, that might help into finding a common answer or maybe a starting point from which many other solutions can derive. At first, to understand the barriers and the possible drivers that affect the ESCO market in certain context, a proper understanding of the obstacles that hinder in an overall way energy services and specifically energy efficiency should be done, since this is a main purpose of ESCos activities and because, as shown previously there is an energy efficiency gap that needs to be addressed for global targets to be reached.

Starting from the barriers of Energy Efficiency, they are strongly related to the final customer and to its interaction with the service supplier. From the research performed [link 2, 3], a highlight should be done to the following ones since some of them are also present when analysing the ESCO market barriers in the future segments:

- **Imperfect information, Bounded rationality and Adverse Selection:** they go hand by hand since the first is a lack of information when taking decisions, while the second attains the issue of customers framing their knowledge and not seeking the whole truth when deciding. The final one refers to one side taking advantage of the lack of knowledge of the other in the transaction.
- **Principal-agent and Split incentives:** These two arise mainly when the actor who pays for the intervention is not the same that use it. As for the first one, issues may occur when final energy users (agent) don't behave accordingly so the expected returns on investment of the principal is affected. On the other hand, because there is a disconnection between who uses it and who pays for it, the financial part might decide to not intervene in fear of losing money or simply because they don't consume it.
- **Hidden costs, access to capital and risk**: More inside the economic perspective. The financial risk perceived by investors that could be private or third parties tend to scare them and hinder the access to capital. Hidden costs are the ones not properly disclosed in the face value of the projects, too high can leverage reluctancy of investors.
- **Form of information, credibility and trust**: Information that is provided to the final users as well as other parties involved in the intervention needs to be clear,

specific, transparent and complete, for the transaction to be performed correctly.

- **Values, culture and inertia**: The first two are related to the willingness of customers to initiate an energy efficiency intervention. Customers include environmental topics as ones of concern, and these might be the final push to do an intervention. While inertia correspond to the opposition of changing the things as they are, somehow like the status-quo biases.

In line with the same study [link 2], but also agreeing with other authors [insert links], ESCos are a mechanism to turn down these previously mentioned barriers in the Energy Efficiency markets as well as other barriers that are present in the Energy services one. ESCos, as mentioned in chapter 1, are present in the barrier mitigation strategies since they are obliged to provide a complete service package to the customers in which they should accompany users along the life of this, from energy audits until the transfer of assets or contract termination. All the steps performed in a transparent manner with the main purpose of achieving energy savings from the customer side and the return of their investments for the supplier side. As well, ESCos guarantee a level of savings and can also assume either financial or technical risks, which allow the access to capital and safer procedures for clients. However, ESCos are exposed to high risks when providing all the assurances they do to their customers. On one hand, is hard for ESCos to provide a guarantee when the consumption and so the returns are not completely dependent on them but are in a big part dependant of the demand side or a final user that can behave in an unpredicted or negative way, and of course the volatility of energy prices. As well, since returns are expected from energy savings, this can be reflected in long term contracts where there is the possibility of customers to drop off the interventions by bankruptcy or any other inconvenient [link 23ch1]. Furthermore, ESCos are not always affected the same. For this reason, a deeper study in the EU ESCO market and in the Italian market will follow to understand the particularities and the commonalities in terms of barriers and possible solutions.

6.1. European barriers

When talking about the barriers present in the Europe, is of crucial importance to mention the work held by Paolo Bertoldi and its contributions to the Joint Research Center (JRC) together with many other authors. From different market analysis performed along the years in the European context, a set of drivers and barriers have been spotted, as well as the market evolution of Europe and for each member state.

Starting with the barriers across all member states, they can be categorised into 6 main groups [link 23ch1]:

- **Information & awareness:** spreading a new concept is difficult in a nascent market when customers are distrustful. Case examples and success stories may raise the customer trust in a new service. However, the correct communication of the product/service as more than just a financial benefit might also be a good idea.
- **Institutional & legislative:** Ambiguities in the legal framework under which ESCos and EPC projects operate affect their easiness to implement.
- **Financial:** There are fewer financial resources available for these investments due to low awareness and so the reluctancy from financing entities and low budgets of firms. There is too an issue in the allocation of costs of energy efficiency matters inside the customer premises that affect their importance when evaluating a new investment opportunity
- **Market & external:** Scale of projects and volatility of energy prices have an impact in the costs and the risk perceived inside an EPC project. Also, energy efficiency is set to compete against power purchasing and this last has very low prices in the market as well as a major importance in investment portfolios.
- **Technical & administrative:** countries where EPC and ESCO concepts are new, are also affected by the lack of know-how and competences to correctly carry out this type of services, which can represent higher costs.
- **Behavorial:** user behaviour is unpredictable, and this can affect the investment payback that the supplier expects, posing risks for the supply side.

These are general barriers that can act alone or together to hinder the development of ESCos and the spread of Energy Efficiency as well as Energy Services. Table # shows them in more detail from the JRC study published in 2017 [link 23ch1].

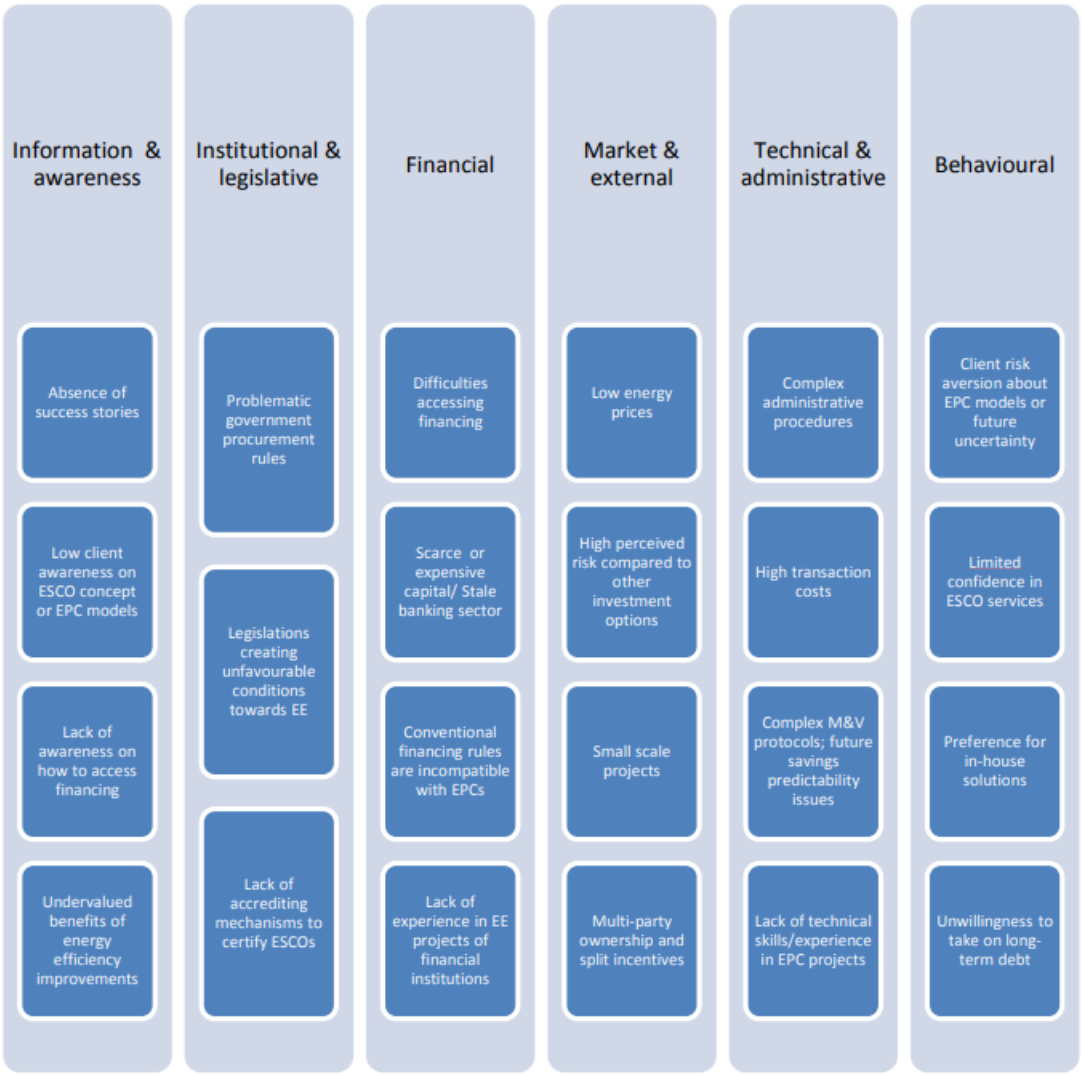

Figure 19: ESCO barriers in the European context [link 23ch1]

More recently, JRC published on 2019 a study on Energy Service Market in the EU [link 19ch1] in which again main barriers were identified, but mostly re spotted as the main ones, because they are present from past years, it may suggest that they are strong barriers to tackle or that the efforts in those years were not enough to reduce them across all member states. They are again: Mistrust from the potential client, lack of information and awareness, inexperience of actors, ambiguities in the legislative framework, market-size and transaction costs.

Adding up, customer role in the ESCO market development is of high importance. At the end, they are the ones who need to drive the market. However, some barriers coming from this side hinder their correct development and they are present in the European context in the form of [link 3]:

- Imperfect information: individuals with not complete information on EE

- Split incentives: tenants with lack of EE information and landlords don't invest
- Credit constraints: not enough financial resources
- Bounded rationality: use of shortcuts derives in suboptimal decisions
- Status quo bias: individuals prefer to maintain things as they are
- Loss aversion: EE might end in a potential loss
- High transaction costs: high upfront costs and hidden costs
- Rebound effects: due to EE lower costs or consumption, individuals think they are allowed to consume more

As an example, in a more specific case, when considering that energy efficiency is aimed to be a competitor of energy purchased from utilities in investment portfolios, a fast decline in energy prices and longer payback times from EEI, resulted in a reduction of Energy Efficiency implementation [link 4]. Energy supply is of higher importance for managers, lower prices of energy and the priority of short-term contracts. On the same idea, when implementing a EEI other actors are directly affected in its business [link 5]. For example: utilities perceive a loss in its revenues stream due to less energy demanded from customers while equipment contractors lose maintenance contracts against ESCos that provide that service. At the end, these are two competitors that are rising in the Energy Efficiency market, whether they are utility companies or equipment manufacturers, their economies of scale and customer base create a harsh environment that is also a barrier for ESCos to develop.

6.2. European drivers

Passing through the barriers, JRC studies also proposed some driving forces that will led to expected scenarios that might be helpful to overcome the already mentioned obstacles [link 19ch1, link 23ch1]. At its most, the aim of markets should be to achieve what is called a Demand Driven market, this type of market is the most developed one thanks to the high awareness of clients about the concept of Energy Efficiency and ESCo, and due to this, their willingness to invest in it. In this type of market, ESCos are one of the main solutions that are considered when analysing an investment decision and when allocating capital. For a while, this market existed in Europe, and they were mainly driven by the inclusion of peer examples, facilitators that represented market actors, quality labels to provide assurance of good services and financing mechanisms that provide access to customers for the services. However, as JRC shows, many of the countries inside the European Union are still stagnated in a less developed market that is driven by the supply side or Supply Driven Market. These markets are characterised by higher costs due to the need of bigger efforts to push customers decisions and make the services noticeable because of lack of

awareness and trust, which are the main barriers to tackle. For Supply market to reach a higher level and be at the doors of becoming a Demand Driven one, some solutions like supportive policy frameworks, prove of cases, associations and facilitators for ESCos, and mandatory procedures like energy audits are necessary. In addition to these two types of markets, there is the Policy-Driven market in which directives, incentives, legislative frameworks and obligations are imposed by governments to push forward the first two types of markets and help them flourish.

Overall, a list of actions and mechanisms that serve as enablers for ESCos market to flourish in the EU can be listed [link 19ch1, link 3]:

- **Increasing the level of awareness of clients:** aware clients are motivated not only by energy savings but also from non-energy benefits such as comfort, health and productivity.
- **Demonstration of projects and successful model contracting:** Considering that trust issues are amongst the main barriers, this is to leverage the trust in the EPC models and the ESCO companies
- **Facilitators and ESCO associations**
- **Transformative tools:** such as incentive for energy consumption reduction like White Certificates in Italy, or financial incentives as tax deductions. Also, the creation of financing networks that allow TPF will allow customers and suppliers to access more capital
- **Reduce transaction costs.**
- I**ncrease the presence of standard procedures and presence on bans**: For example, in energy audits, measurement and verification (M&V) or even the EPC model can be somehow standardized. However, this last action is evaded by many actors because they consider that Contracting models are unique in its nature [link 6,7]
- **Nudges and boosts:** while the firsts are action performed expecting a certain behaviour from the customers, the second one does not target behaviour but are aimed to empower individuals to make complex decisions.

6.3. Italian barriers

Italian ESCO market is one of the most developed, if not the most, between the member states. In here, the majority of ESCos pertain to the SME firms. This is a market where not only ESCos are providing Energy Performance Contracts, some other players like Utilities companies, consulting firms, energy auditors, engineering firms and some others are also in the capacity of doing so [link 19ch1]. Italy is one of the countries where the presence of Incentives like the White certificates helped in the increase of

energy savings investment. But, even if incentives have been introduced as a transformative mechanism, many of these SME firms would not be able to sustain their activities without them, creating a dependency for the feasibility of them projects. Despite been a developed market, it is growing in an inconsistent pattern [link 23ch1]. Now on, to understand the barriers that ESCO market in Italy is facing, two research are presented. The first one from the already mentioned JRC in 2019 [link 19ch1] in which ESCO experts were interviewed and a complementary literature research was performed to understand the Italian context by that time. In this case, an average of 3 direct sources were used. On the other hand, the QualitEE report focused on Italy [link 8] interviewed an amount of 6 ESCos and 3 facilitators in order to grasp the main barriers that they face when implementing their models. From these studies, the main barriers that were highlighted are the following:

- From JRC [link 19ch1]:
  - Lack of appropriate finance
  - Mistrust of the client
  - Ambiguities in the legislative framework
  - Small size projects and high transaction costs
  - Lack of Standarization

- From QualitEE [link 8]
  - Complexity of the concept / lack of information
  - Lack of trust in the ESCO industry
  - Administrative barriers
  - Subsidy / policy uncertainty

As it appears to be, barriers are not all the same in each study. Listed from the most relevant to the least according to the responses, the only barrier that seems to be allocated in a common place is the lack of trust from the customer towards the ESCO model. These types of barriers fall inside the “Structural Barriers” definition and so QualitEE suggests that is something to pay attention to and work towards diminishing it since it affects the core of the Business Model of ESCos, more specifically the way their value proposition is delivered and received by the customer. As part of the solution, ESCos can play a big part trying to get a clear model framework and a greater customer acceptance by reconceiving some ideas in their propositions. About the other barriers, issues with legislative frameworks or policy uncertainties are as well a common concern in both cases. However, incongruencies between the results from both studies are present. Apart from the differences in barriers, another mismatch is showed in how the market is categorized and which contracting model is preferred.

From JRC, it is suggested that Italian market is well developed with a preferred EPC model based on guaranteed savings. On the other hand, QualitEE suggested that, even if Italian market is one of the most developed markets in Europe, it still is in a developing phase with EPC shared savings as a preferred contracting model. QualitEE survey commented also that no energy efficiency services certification was yet identified in the Italian market even if respondents argued that it was needed to really make a positive impact on the ESCO and Energy Services perception.

6.4. Italian drivers

After asking for the main issues that the different interviewed experts suffered and after the literature review, the most important recommendations or changes in the legal, financial, informational and regulatory frameworks that these same actors and the researchers suggested where the following [link 19ch1, link 8]:

- Creation of an assistance service that support the development of projects
- Increase awareness of public authorities about EPC and the awareness of customers by doing seminars, conferences, discussions and networking and the promotion of best practices for EPC
- Creation of a solid based legal framework for EPC
- Promote the Standarization of EPCs as well as increase the level of Standarization for Energy audits and M&V.
- Promotion of best practices and the implementation of the European Code of Conduct.

The last one mention, which is the use of the European Code of Conduct (CoC) released in 2015 [link 9], is a set of values and principles for EPC providers to put in place and for clients to be aware of what they should receive when agreeing on these types of contracts. It aims to increase the transparency in this kind of contracting and so leverage the trust and awareness. Even if, by the time it was released, it was not legally binding but rather a voluntary measurement to be implemented. The CoC sets important considerations that might help the ESCO market in its growth. It is composed of nine principles [link 9]:

1. EPC providers delivers economically efficient savings
2. EPC providers take over the performance risk
3. Savings are guaranteed by the EPC provider and determined by M&V
4. The EPC provider support long-term use of energy management

5. The relationship between the EPC provider and the client is long-term, fair and transparent
6. All steps in the process of the EPC are conducted lawfully and with integrity
7. The EPC provider supports the client in Financing of EPC project
8. The EPC provider ensures qualified staff for EPC project implementation
9. The EPC provider focuses on high quality and care in all phases of project implementation

From them, some principles still warn ESCos for the number of risks they are assuming such as the case of number 3. However, as for the EED amendment in 2018, standardization of M&V procedures with the IPMVP methodology were introduced and forced to the Energy Services contracting models as well as the mandatory energy audits. From this perspective, a mention to principle 5 is also worth noting because customer involvement and awareness in all steps of the process serve as transparency warranty that will raise the level of trust and reduce the barriers that Italian and EU markets have identified.

7 Chapter: Normative ESCO BMC

In this chapter an analysis to understand the main characteristics that an ESCo must have in its business model and those that would be preferable to have according to the Norms and regulations is performed. The chapter is divided into two main sections. In the first one, an in-depth analysis of the regulatory framework referring to ESCos will be done in order to understand the necessary characteristics an ESCo must have and how they are reflected in the Business model Canvas. In the second one, the objective is to understand the characteristics that policy makers have identified as key elements to support the ESCo's business development, so the ones are not characterising but preferable to have in their business models. To do this analysis, in addition to using the relevant norms and laws, a use of the analysis carried out on Barriers and drivers conducted by JRC and QualitEE, both funded by the European community, already described in chapter 5.

7.1. Must have elements

Before beginning the analysis, is important to point out that for ESCO's in Italy there is no relevant legal form, nor a specific discipline for contracts: their form follows one of those provided for by the civil code and is characterised only by the corporate purpose [Link 15].

Thus, when talking about the elements that an ESCo must have in its BMC they are the ones deduced from the definitions given in the directives. Therefore, it is not an offence to have different characteristics, but the purpose of the study is to create a reference BMC in order to be as aligned as possible with the Italian regulation issued over the years.

Starting from the definition given by the EU with Directive 2006/32 /EC and subsequently taken over by Italy in decree law N° 115 of 30/05/2008, reported in chapter 3, three points of interest are highlighted:

1. Offer energy services or energy efficiency improvements to an end user

It is important to understand what is meant by energy services and energy efficiency improvement in order to analyse which activities an ESCo should perform. To do this, the definition given in Legislative Decree 115/2008 is useful:

"Energy efficiency improvements: an increase in energy end-use efficiency as a result of technological, behavioural and/or economic changes."

In addition, to be clearer is useful what they mean for energy efficiency:

"A ratio between an output of performance, service, goods or energy, and an input of energy;"

Energy services: "the physical benefit, utility or good derived from a combination of energy with energy efficient technology and/or with action, which may include the operations, maintenance and control necessary to deliver the service, which is delivered on the basis of a contract and in normal circumstances has proven to lead to verifiable and measurable or estimable energy efficiency improvement and/or primary energy savings."

While the definition of energy efficiency improvement limits the boundaries to those interventions that lead to energy efficiency as a result, for energy services the contours are more blurred. It follows from the definition that not only those services that lead directly to verifiable and measurable energy savings are classifiable as energy services, but also those activities that are necessary to achieve them. Thus, if it is difficult to classify all services that can be useful in bringing about actual savings from the directive, it seems clearer that this must at least be a precursor, through a contract, to an energy improvement service.

Since the directive is not so strict on the type of energy services an ESCo should offer, details cannot be provided on the type of energy services an ESCo must offer. For the classification of energy services, it is possible to use the framework analysed in chapter 3. But from this analysis the aspect that emerges is that the activities performed by ESCos must lead to energy savings, while for those services that do not lead directly to energy services they must be offered as enablers to implement services that lead to energy savings

To deliver an energy service/energy efficiency improvement the ESCo may rely entirely on its internal resources, but also through outsourcing. But in both cases this would require the ESCo to possess the technical know-how to interface with third party companies or to implement it internally, because contractually they will be the service providers with respect to the beneficiaries.

Key resources: Technical Know-How

Key activities: energy services, energy efficiency improvements.

2. ESCos accept some degree of financial risk for the achievement of improved energy efficiency in a user's facility

The second point underlines the need for an ESCo to assume part of the financial risk of the investment. Financial risk, this quantifies the possibility of losing money on an investment or business venture. It includes different types of risks: [https://www.investopedia.com/terms/f/financialrisk.asp]:

Credit risk: it represents the possibility the borrower become unable to repay the loan, they will default.

Liquidity risk: It is the possibility that a company will not be able to fulfil its commitments. One of the possible causes thereof is poor cash flow management.

Operational risk: it occurs due to lack of internal controls within the company, technological failures, mismanagement, human error or lack of employee training.

Thus, the ESCo must assume part of the financial risk during service delivery. In case the investment is undertaken by the ESCo, the ESCo will certainly bear the financial risk due to the possibility of not recovering the investment if the necessary savings are not achieved. In the case where the investment will be borne by the energy user the ESCo will have to share part of the financial risk by assuming the operational risk. Whereas, if the ESCo enters into a loan agreement with a third party, it will certainly bear the credit risk and thus the financial risk. But even if the beneficiary enters into the loan agreement with the third party, in the latter case the ESCo will at least bear the operational risk. Thus, in cases where the credit risk is assumed by the client, the financial risk will be that the client will not be repaid for the activities performed by the ESCo during the service delivery if the project does not meet the contractual performance criteria.

Key resources: Financial Know-How

3. ESCos accept some degree of financial risk for the achievement of improved energy efficiency in a user's facility.

In the third point lies one of the main competitive differences that ESCos must have when compared to other players in the EE market. This is represented by linking their revenues to the energy savings of the project, according to the terms of the contracts. This underlies an integrated contract that will not only include project implementation through feasibility studies, project design, installation, etc. But also, preliminary support activities for the evaluation of the saving to define the performance to be achieved, ongoing operation and maintenance activities to ensure the continuity of performance, and finally measurement and verification activities to control the effective performance of the project. Thus, entering integrated contracts is a necessity for ESCos to be able to sign contracts in which they bind themselves for a long time to a Project together with a customer, linking revenues to performance.

After identifying and studied the various characteristics, in Chapter 2, the different types of contracts currently used in the market for an energy efficiency implementation are studies to analyse which of these fully comply with the characteristics that an ESCo must have:

EPC: as already described in Chapter 2, the definition of EPC given by Decree Law 115/2008, is directly associated with ESCos. Therefore, from a regulatory point of view, the EPC contract represents the main operational tool through which an ESCo offers

its services of energy savings to the end user. In both modes of EPC, Guaranteed saving and Shared saving, ESCos link their revenues to the performance of the Project. In the first case, it will not assume the credit risk, because the investment will be financed through third parties and underwritten by the client, but it will assume the operational risk by guaranteeing the saving performance. Whereas, in the second case, it will assume both the credit risk by financing the Project, or by underwriting the loan agreement with a T.P.F., and the operational risk by guaranteeing performance.

ESC: In this contract, the ESCo proposes to implement an electricity, thermal energy, refrigeration energy and/or Bio-fuels production Project and resell it to the energy-end user. Thus, in this type of Project the ESCo assumes both the credit risk by financing the Project, through equity or debt, and retaining ownership of the investment also accepts the operational risk. But ESCos are remunerated only for the useful energy produced, thus with a focus on the supply side. Without any kind of contractual agreement on energy efficiency performance, payment will only be based on a fixed tariff for energy supplied. In this case, ESCos have no interest or at least no contractual obligation to improve the energy efficiency of the installations and even that of the energy-end user.

Chauffage contract: in this case the end user outsources the management of his own plant, with the aim of being able to achieve some savings from a more efficient use of it. In this type of contract, the ESCo's revenues are linked to the savings achieved respect the consumption of the period before the outsourcing. In this way, the ESCo assumes the technical risk due to the management of the plant, but also the financial risk if it intervenes on the plant with energy efficiency measures. Thus, through this contract the ESCo fulfils both the conditions of linking the revenues with the performance, but also of assuming the financial risks. This type of contract reflects the characteristics that an ESCo must have.

Trunkey contract: In this type of agreement, the ESCo designs, builds, trains the staff and starts the turnkey project for its client. After implementation, the project will be turned over to the buyer, who will pay the ESCo with a lump sum payment method. Thus, in this case, the ESCo does not assume the financial risk or link revenues to the realization of the project. Thus, it does not fulfil the characteristics of an ESCo.

Contratto di IEC: In this type of contract, the ESCo implements a supply of energy project by combining it with an efficiency project. The IEC model prioritises making demand-side EE measures before moving on to supply-side measures. Thus, as with EPC, the model ties revenue to performance and assumes financial risk.

BOOT contract: With this type of contract the ESCo, as in the case of ESC, assumes both financial and technical risk. In that it bears the investment cost, or enters into a financing contract, and retains ownership of the Project until it has recovered the agreed revenues, thus assuming the operation risk. However, it does not sign a contract in which it guarantees a certain performance, tying its revenues only to the

supply of electricity or heat produced by the project implemented. Moreover, since it does not guarantee any kind of savings, it has no contractual obligation to commit itself to energy efficiency. Therefore, like the ESC, it cannot be considered as a contract signed by an ESCo.

Considering the average timeframes of the various contracts, analysed in chapter 2, it is evident that these contracts create a long-term relationship between the client and the ESCo, which will not only have to interface with it only for the sharing of the savings, but also for any ongoing services to the project (O&M, M&V). This feature is also emphasised in Article 5 of European decree 2012/27/EU which mentions using ESCos in the long term.

Customer relationship: Medium-Long term relationships

Revenue stream: Shared saving

Downstream of these three characterising factors it is possible to analyse what is the ESCo's value proposition:

Value proposition: offer energy efficiency improvement with guaranteed saving

At the end of analysis, it emerged that the legislative framework about the ESCo does not allow a complete BMC to be outlined. The boundaries outlined by the definitions given by the policy maker leave very broad operational contours. Nevertheless, it was possible to identify 5 blocks involved in the characteristics an ESCo must have. These include at least one block for each macro group identified in the Osterwalder model:

Economic Model:

Revenue stream: Shared saving through long term integrated contract with guaranteed savings

Customer interface:

Customer relationship: Medium-Long term relationships

Value proposition: offer energy efficiency improvement with guaranteed saving

Value Network:

***Key resources*:** technical Know-How and financial Know-How

Key activities: energy services, energy efficiency improvements.

7.2. Should have elements

The business model created through regulatory definitions explains 'what' ESCos must offer in the market, but it is also interesting to analyse 'how' these should be offered in the market. Thus, those characteristics that are not essential for an ESCo but that policy makers have identified in order to best develop their market. Therefore, the analysis aims to identify those elements that impact on the building block of the BMC of an ESCo that are not necessarily distinctive but are supportive elements to be able to best offer energy services. While the analysis of the characteristics that an ESCo must has been a static study not related to market dynamics but only and exclusively to the definitions given by the standards. In this second step will be also considered market dynamics, contextual factors through the analysis of market studies conducted by independent researchers funded by EU commission, national agencies and directives aimed at identifying the main barriers in the ESCo market and possible drivers to overcome them. Therefore, this phase as well as all qualitative studies may suffer from a high correlation to contextual factors, also for this reason the study is referred only to the Italian market.

1. Third Party Financing

Having analysed the contracts deemed appropriate for the services provided by the ESCo, it is important to understand how they are financed. As mentioned above, there is no constraint in the definition regarding the need for an ESCo to finance the project. Thus, it could be financed directly by the client or by a third-party [LINK 1].

The latter was first promoted in Decree Law 93/76/EC and then taken up in Decree Law 2008/32/Eu where it is added in the definition that the third party could be an ESCo:

"contractual agreement that includes a third party, in addition to the energy supplier and the beneficiary of the energy efficiency improvement measure, which provides the capital for that measure and charges the beneficiary a fee equal to a portion of the energy savings achieved by making use of the measure. The third party may be an ESCO;"

Thus, in the case of an integrated contract the ESCo will be the beneficiary of the intervention and an external financier will provide the capital [LINK 2]. This will be repaid based on the energy savings made. As also explained in the JRC study, third party financing in the case of ESCos allows to overcome a barrier that is the availability of capital, which would create a limitation of interventions due to the liquidity problem that an ESCo might have due to the length of contracts. Which bind the ESCo to a medium- to long-term capital recovery. Moreover, even if the loan contract is taken by the energy-users/customer, the ESCo will guarantee the energy saving. And as explained, the savings guarantee demonstrates to the bank that the project for which the customer borrows will generate a positive cash flow, i.e. that the savings achieved

will certainly cover the debt repayment [link 3]. Thus, the energy savings guarantee reduces the risk perception of the bank, which has implications for the interest rates at which financing is acquired. The cost of borrowing' is strongly influenced by the size and credit history of the borrower. Therefore, this type of system is promoted by the European community and consequently by Italy with the corresponding implementation decrees to foster the ESCo market. In Italy with the decree 27/12/2006, the rotation fund for third party financing is established to foster the energy efficiency market. This provides capital to carry out energy efficiency projects directly to companies but also to ESCos. In addition, the T.P.F mechanism is favoured to achieve energy efficiency targets also in the public administration in Decree 102/2014. In the same decree, the Ministry of Economic Development prepares a programme to facilitate the efficient use of energy and among the various points of this programme there is one about T.P.F:

"To encourage the participation of banks and financial institutions in the financing of energy efficiency improvement measures, also through the provision of data and experiences of public-private partnerships;"

The T.P.F. is an important tool for the energy efficiency market, but especially for the ESCo market. To summarise, the modes of project financing are:

- Financed by the ESCo
- Financed by the energy-users/customers
- Financed by a third party underwritten by the ESCo
- Financed by a third party underwritten by the energy-users/customers

Graph # represents how energy savings are distributed in a ESCos EEI. In the left is the cost that the firm borne to pay the energy consumption that are paid to the energy supplier. In the middle column, a EEI is already performed showing a reduction in the energy consumption as well as some savings for the different actors involved. The top 2 blocks are distributed between ESCO and Beneficiary, while the third one corresponds to the investor. The last column represents the situation post-intervention, where all the savings are now for the customer.

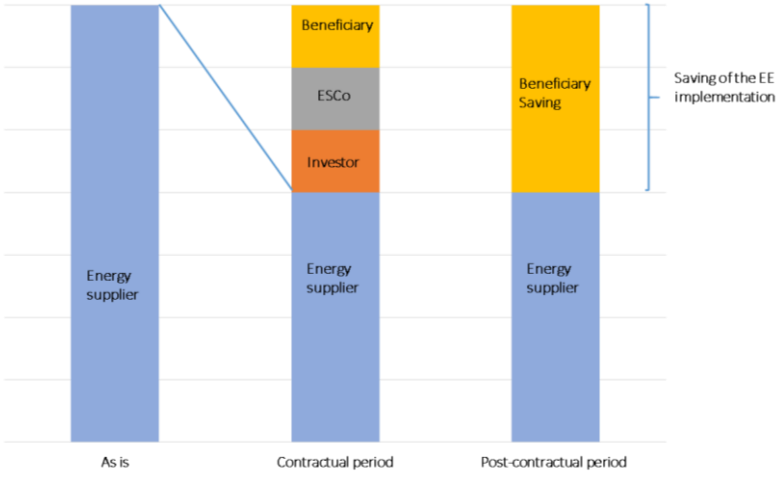

Figure 20: Distribution of costs and savings among actors in energy savings projects

The ESCo may find itself in situations of financial evaluations:

- Decision on financing mode
- Economic evaluation of the project
- Financial advisory support to the client, helping to raise capital
- Operational risk assessment

Thus, the ESCo in addition to possessing the financial know-how mentioned above might need some partners in order to explore the benefits of involving a third party.

Key partners: Financial providers

2. Certification

The ESCo market in Italy, but in general also in Europe, have some problem of lack of credibility and trust. The intrinsic long-term relationship between ESCo and customer lead this lack to a real barrier for the ESCo market. In order to face this barrier, the european commission try to achieve a high level of technical competence, objectivity and reliability of that market inviting the Member State to ensure the availability of appropriate accreditation with a certification schemes. As explained in the chapter 4 the Italian introduced the system of accreditation through ACCREDIA with the UNI CEI 11352.

Another important step forward in giving greater importance to certification was taken with the decree of 18 July 2014[Link 22 of nrms and law chapter], implementing Directive 2012/27/EU. This contains an explicit reference to UNI CEI 11352, in particular:

1. large companies (i.e. companies employing more than 250 people, whose annual turnover exceeds EUR 50 million or whose annual balance sheet total

exceeds EUR 43 million) are obliged to carry out an energy diagnosis, conducted by energy service companies, energy management experts or energy auditors, at their production sites located in the national territory by 5 December 2015 and every 4 years thereafter; this obligation does not apply to large companies that have adopted management systems in accordance with the ISO 50001 standard.

2. by 19 July 2016, these diagnoses must be carried out by entities certified according to UNI CEI 11352 and UNI CEI 11339 standards by accredited bodies; by the same deadline, ESCos and Energy Managers will only be able to participate in the white certificates mechanism if they are certified according to UNI CEI 11352 and UNI CEI 11339 standards respectively.

So, on the one hand it creates more demand for energy service market, on the other hand it limits the service to certified entities only. Thus, a greater benefit for certified ESCos, which have a larger potential market than non-certified ones [link 17]. In addition, the same decree restricts participation of the white certificate mechanism only if in possession of certification, respectively, according to the rules UNI CEI 11352 [law decree 102/2014 art.12].

A certified ESCo would significantly improve its operation over a non-certified ESCo, even just in terms of increase of demand, creating a more reliable market proposal. Additionally, it is possible that as the energy efficiency market develops, non-certified ESCos may face operational restrictions, like what is now the case in several industries with the certification of the quality management system. Adopting the UNI-CEI standard, which is mentioned in Article 16 (2), is crucial since it specifies the certification process for the "energy management" system and for how energy diagnosis are performed [link 14]. These procedures might enable an objective and trustworthy evaluation of the actual energy efficiency gain, which is required for an ESCo in accordance with its definition in Article 2 of decree 102/2014.

Key resources: UNI CEI 11352 certification

3. Standarization

Both studies conducted by Jrc [] and QualitEE [] identify the standardisation of contracts and services offered by ESCos as a potential driver for the ESCo market. This would overcome trust barriers on the part of customers, who would have less difficulty analysing a contract or service with standardised guidelines. But also, from the financial point of view, it would give financial institutions the opportunity to reduce difficulties in assessing financing risk. Furthermore, as described in the quality report, a standardised procedure would not only increase demand but also lead to a possible economy of scale on the part of service providers. With decree 27/2012, the European commission requires member states to support the standardisation of EPC,

in particular with articles on the measurement & verification process and the energy analysis process. The standardisation of contracts represents a more complex analysis, as explained in chapter 5, because although JRC and QualitEE reports identify this lack as a barrier, some studies consider it an elusive task as various companies consider their contract approaches unique and proprietary [Link 4]. The measures taken by Italian and European policy makers vary according to the types of sectors.

For the public administration, ENEA was requested in Decree 102/2014 to publish guidelines for the preparation of EPC contracts.

Regarding the building sector in the research and innovation programme conducted by Horizon 2020, funded by EU, a section describes that the building energy performance methodologies should also ensure a technology neutral approach, be transparently presented by making use of International and European standards. But as a specific challenge emerges the need to standardise the measurement and verification phase and the energy management system phase, with the help of new technologies have emerged opening the door for new types of services which use ICT to better control and steer energy consumption according to market and system needs.

While an important initiative for the industrial sector is the ICP. It is a US initiative exported to Europe in 2015 with the Horizon programme. As reported by [Link 5] with the ICP, a standardised methodology has been created for the development, documentation and measurement of energy efficiency projects. Which by ensuring transparency, consistency and reliability reduces the risk for owners and investors, reduces due diligence costs, increases the certainty of achieving savings, and enables the aggregation of projects. Even though there are no Italian representatives in this project, some companies in the country are certified by ICP. The lack of demand for standardisation of all the steps of an energy efficiency contract also emerges from the Code of conduct published in 2015 in which the only steps required to be standardised are those of energy audit and measurement & verification. This analysis also coincides with the analysis based on a quantitative methodology carried out by Shyu, Joseph Z. et. [Link 6] through an empirical study, as explained in chapter 3, in which it emerges that energy efficiency contracts should be selective in nature, thus partly standardised and partly customised.

As required by Legislative Decree n. 102/2014, Enea in cooperation with CTI has published some guidelines for energy analysis divided by sector. As explained in [Link 7] the standard EN 16247 defines the requirements, common methodology and products of energy audits:

- UNI CEI EN 16247-1: Applies to all forms of companies and organisations, all forms of energy and energy use, excluding individual residential building units.
- UNI CEI EN 16247-2 applies to building-specific energy audits.

- UNI CEI EN 16247-3 defines the requirements, methodology and reporting of an energy diagnosis within a process,
- UNI CEI EN 16247-4 used for the transport sector and addresses any situation in which a displacement is carried out, no matter who the operator is (public or private company or whether the operator is dedicated exclusively to transport or not).

As in the case of energy analysis, Decree n. 102/2014 requires standardisation for the measurement and verification of energy savings. In order to reduce the questionable results of unverified efficiency programmes, which cast a cloud over the entire sector, it is necessary to standardise measurement and verification (M&V) procedures to help end users and the financial community better understand EPCs. A general approach to energy savings and energy efficiency calculation using standard methods has been approved and established in Italy with UNI CEI EN 16212:2012. But the most widely used protocol is the 'International Performance Measurement and Verification Protocol (IPMVP) which serves as a framework for determining the energy and water savings resulting from the implementation of an energy efficiency programme. It was published in the 1990s for ESCO contracts in the United States and is currently translated into 16 languages and disseminated worldwide. Since 2004, the protocol has been maintained and published by the Efficiency Valuation Organisation (EVO®) [Link 8]. For the standardisation of M&V, another important tool is ICT (Information Communication Technology), as explained in the EU programme Horizon 2020 and in [Link 9]. According to these studies, digitisation and smart meters could increase the reliability of energy savings estimates through more streamlined measurement and verification protocols. It could increase the penetration of active energy management systems in industry, and advances in remote monitoring platforms should foster the development of the ESCO market in the future.

Key resources: Standardization in contracts in particular energy audit and M&V steps

4. Customer involvement

Another barrier for ESCos identified by the JRC and QualitEE and later taken up by Directive 102/2014 is the lack of information on the ESCo market. As explained in Chapter 5, a difficulty identified in the Italian market [Link 10] is the lack of coordination between ESCos and clients, operational and management staff, during projects. This coordination can be improved through a deeper understanding of the EPC process, which leads to a streamlining of the process and a reduction in total costs. From the ESCo perspective, it is important to increase communication as much as possible during the service process. Furthermore, the EC in Directive 2012/27/EU encourages the development of quality labels using trade associations. The national association, as explained in the QualitEE report [Link 11] may be a more effective tool

to increase communication between ESCos and the public sector (regional or local government) and customers.

The government, on the other hand, in Directive 102/2014 to increase awareness and information on energy efficiency sets up a national information and training programme.

Customer relationships: customer involvement

Key partnership: trade association

In the table 14 is represented the Business model Canvas for an ESCo, including both the must have element (red) and should have element(gray).

<table>
<tr>
<td rowspan="2">Key partner
• Financing Provider
• Trade associations</td>
<td>Key activities
•energy services
•energy efficiency improvements</td>
<td rowspan="2">Value proposition
• offer energy efficiency improvement with guaranteed saving</td>
<td>Customer relationship
• Medium-Long relationship
• Customer Involment</td>
<td rowspan="2">Customer segment</td>
</tr>
<tr>
<td>Key resources
•Financial know-how
•Technical know-how
•Standardization in contracts in particular energy audit and M&V steps</td>
<td>Channels</td>
</tr>
<tr>
<td colspan="2">Cost structure</td>
<td colspan="3">Revenue Streams
• Shared saving through long term integrated contract with guaranteed savings</td>
</tr>
</table>

Table 14: BM based on must have and should have elements

8 Chapter: Evaluative Model

8.1. Model Setup

As main part of the empirical approach for this work, an evaluative model for the ESCos was designed. Taking into consideration the analysis conducted in the precedent chapters a model that is able to understand what types and how an ESCO offers their services is necessary. As said, the main purpose is to evaluate the offer in the light of what norms and laws suggest. Additionally, the model was designed in a modular way so the evaluation of other topics can be assessed too and can be included over time. This modularity was included in the model because contextual factors affect it since they can affect the business models, barriers, normative and other aspects. Modularity arises above all for the service module part, this leverages the setting of the model itself. With the evaluation of the BM through the breakdown of the services provided and their weight on turnover, it will be possible to add new points of interest that will exploit this evaluation logic. It was designed as a two-part matrix where mainly qualitative information was used as well as some quantitative. The two-part matrix first evaluates the different services ("Other services") that an ESCO can provide apart from the traditional contracting models like EPC and ESC. The second part evaluates the traditional contracting models. For the evaluation carried out in this Thesis, the model is composed by:

1. Definition's part:
   I. Service groups: In this column, the rows are filled with six main macro categories of the energy services that ESCO offered. They are taken from the study performed by Cagno, E. [link #] that was discussed in chapter 2 since this is the most recent service definition after an extensive literature review and ESCO interviews in the Italian context. In addition, another row containing the macro category of Contracting models is used and has an important role because it is the main characteristic of comparison and ESCO evaluations.
   II. Services: In this part of the model a better description of the macro categories is given. Each of them might include more than one type of service.

2. Business Analysis: This is the main part of the model, in which the evaluation of ESCO alignment is performed.
   I. Importance on the turnover: As the name suggests, this part of the model is dedicated to understanding the relevance of each activity in the portfolio of the ESCO. Interviewees could supply information regarding the percentage of the turnover that corresponds to the activity, or the percentage of projects held

respect to the overall, in order to evaluate the importance of each service for the ESCO. The data must be provided as a value between 0 and 1.

II. Scope of the ES: This is as well divided into two parts. First, considering the services that ESCos can provide and the scope they use a qualification is provided. 0 if the Service is delivered with no further scope of performing an EEI or 0,5 if the service is provided with the scope of a future EEI. As for the second part, a rating of 0 is used when the contractual model does not meet the requirements described in the previous chapter and a rating of 1 for those that do.

III. Score: For this main part, the score is the product between the scope of the services and the importance on the turnover as in a percentage. The sum of each service score will provide a percentage of alignment with the ESCO model.

3. Service Module: This is, as mentioned previously, an example of the modularity of the model. Customer perspective is added because of their importance in delivering a proper service and the importance it has in the ESCO BM as previous chapters mentioned. It is also a way to understand how much the ESCos consider the customer in their activities which gives ideas on the customer awareness and participation and so is a method to evaluate how the main barriers are faced by the ESCo.

I. Level of customization: In this section, a qualitative measure is added to the model. It considers the level of customization with four different options: Generic (G), Limited (L), Selective (S) and Unique (U). This is used to understand the level of customisation each service and contracting model experience.

II. Customer involvement: using a value between 0 and 1, the customer involvement as the name suggest, tries to give an idea of the participation of the different clients in the reception of a service. 1 meaning the customer is fully aware and collaborates with the ESCO in the delivering of the process, and 0 when there is no communication or any type of information exchange between parties. The output of this section is a mix of service types giving an idea on how the ESCO approaches to their customers.

III. Score: for this score, the product between the importance of the turnover and the customer involvement is considered as a percentage. At the end, they are all summed up, it aims to describe the importance that the customer had in the ESCO offering. A 100% of Score, was that the customer has a key role.

The layout is showed as follows:

		Business Analysis			Service Module		
Service Group	Services description	Importance on the Turnover	Scope of the ES	Score	Level of customization	customer involvement	Score
Preliminary Analysis	Energy Audit						
Project Assessment	Technical & financial feasibility study, Project design	(0 -1)	0 if stand alone		G - Generic	(0 -1)	
Project Technology Management	Equipment supply, O&M, monitoring, Staff training,		0,5 if aimed for a future project contracting		L - Limited		
Project supervision	Project management, Evaluation, M&V,				S - Selective		
Management of incentives and regulation	ISO 50001				U - Unique		
	White Certificate, ETS, other incentives						
Other services	Property/facility management, user behaviour training						
Project contracting	EPC	(0 -1)	1 - if Part of ESCO model		G - Generic	(0 -1)	
	ESC		0 - not part of ESCO model		L - Limited		
	Chauffage				S - Selective		
	BOOT				U - Unique		
	Turnkey						
	IEC						
	Model Output						

Table 15: evaluative modular model

Now, in order to fill the models, a survey was delivered to ESCos that operate in the Italian market. The survey is structured in three sections: The first one was used to obtain general data from the company such as size, market segment and presence of certification. A second section in which the respondent provides information about the importance, customer involvement and level of customization of the contracting models that an Energy Service Provider can offer (EPC, ESC, Chauffage, and others). Finally, a third section aimed to describe the other services present in the macro categories that the ESCos offer (Energy audit, Project assessment, others). In this last section the same questions as in the second were asked, with the addition of the scope of the service and a last question regarding the main barriers for EPC in the market. When a first draft of the survey was done, a Fine-Tuning session was held in accordance with an ESCO to revise the different questions, the way in which they were delivered, its importance and other topics. Finally, after applying the respective changes and doing other adjustments, the survey was delivered via email and direct contact to ESCO employees. By the time this was written, 13 answers were collected and analysed.

8.2. Data collection and analysis

After delivering the survey and properly manage the data gathered by each of the questioners, it was possible to obtain data about the typologies and distinctive characteristics of the ESCos that were asked. Also from the data, some generalities between participants were spotted that could serve for future analysis into finding a common BM for the ESCos. At first, some general characteristics of the firms can be spotted such as firm size, presence of accreditation and customer segment that is targeted. Most firms are accredited 10/13. However, ESCos size and Customer segment are of various types with apparent no predominance. Considering the size; micro, small and medium size are around the same values, with 5,3 and 4 out of 13, respectively. When talking about the customer segment, each company can offer its services to more than one type. Industrial and residential sectors are the ones mostly targeted with 10/13 and 9/13 companies. From them, 6 companies offered services to both type of customers and others offer services to more than 2 types of customers.

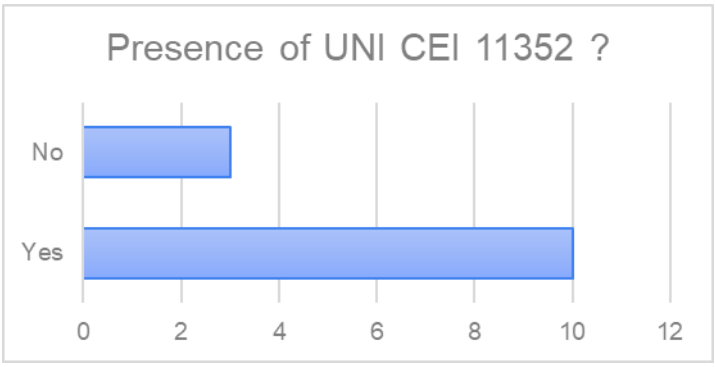

Figure 21: presence of accreditation in the sample

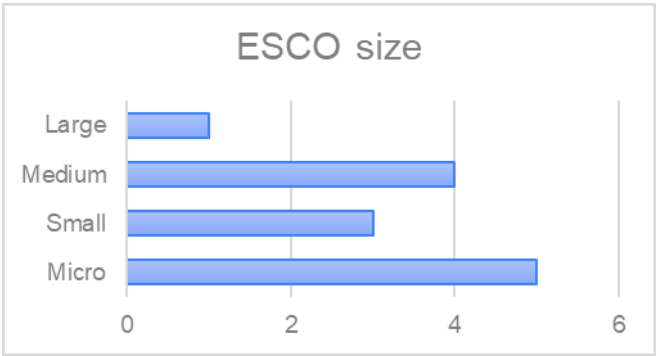

Figure 22: Size of the firms in the sample

Figure 23: Targeted segment of the sample

Going into the matters that attain the business model of the ESCO. Much other data can be collected that will be useful for further analysis. Regarding the use of the contracting models, the sample showed an inclination towards EPC contracting, 10/13 ESCos provided this service in the year 2021. For the others, graph # shows the distribution. Moreover, a closer look can be given to the ESCos that had offered EPC in the 2021. From these companies, only 3 offer ESC contracts, 1 the chauffage and 5 the Turnkey services. Now, when talking about the other services that ESCos can offer, the distribution showed in graph # shows that half of the ESCos provide all type of services. However, Project assessment and Energy Audit are present in more than 85-90% of the cases.

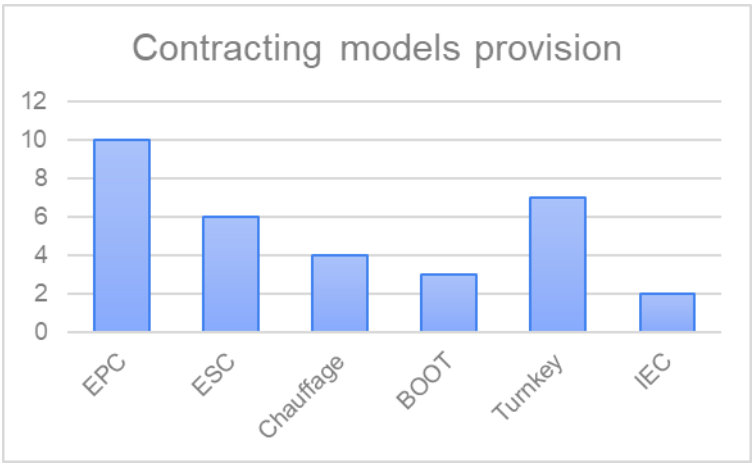

Figure 24: Type of models used by the sample

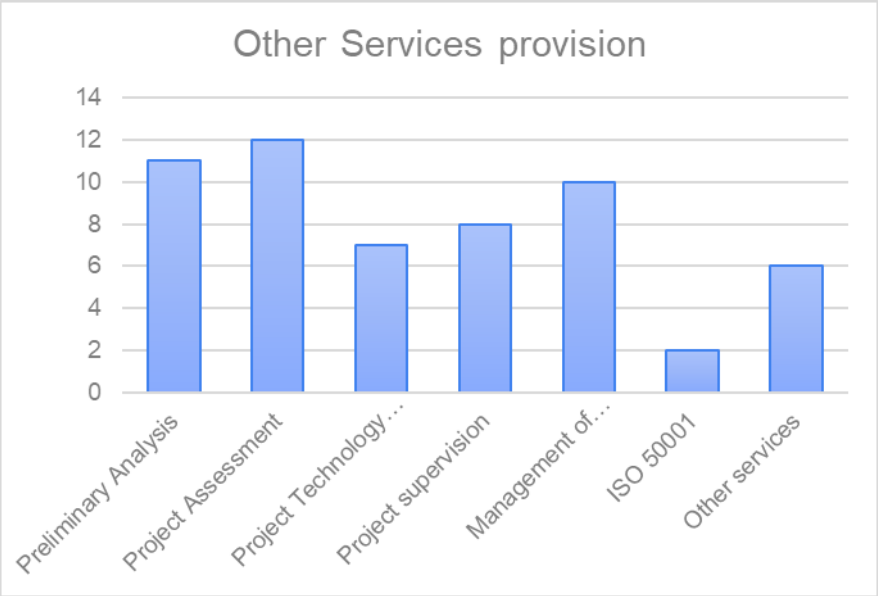

Figure 25: Other services provides by the sample

Moreover, apart from the general data, a comprehension of the different attributes that were asked in the survey can be exploited. Initiating with traditional contracting types, the distribution of importance on the turnover of each contract, the distribution of type of contract and the customer involvement is something worth mentioning. For the first category (importance on turnover), EPC and ESC have a high presence of low relevance (<15%) and while EPC also has higher percentage of importance, it does not exceed the 45-60%. Same with EPC. On the other hand, turnkey contract has in its majority, relevance that exceed the 60%, with 7/8 companies. Continuing in figure 26, the type of services that were mostly used in the EPC models are Unique and Selective, while generic and limited are almost non-existent. Turnkey instead, has the presence of all the types with a dominance of Limited type. Finally, when talking about the customer involvement (graph #), EPC and Turnkey, both share a high participation of level 4 and 5 of customer involvement (higher than 80%). While for ESC the share is evenly distributed for types 1,2,3 and 5.

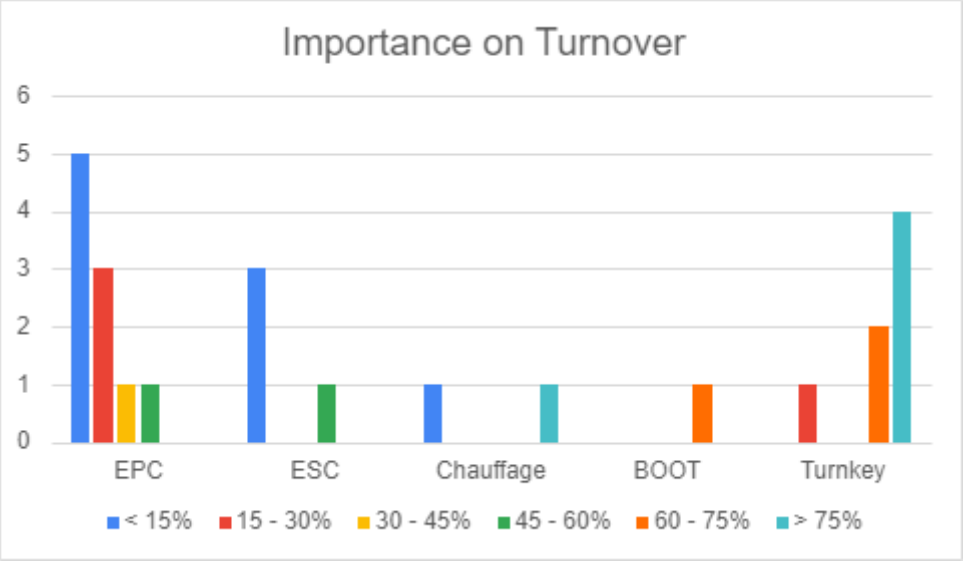

Figure 26: importance of contracts in the sample

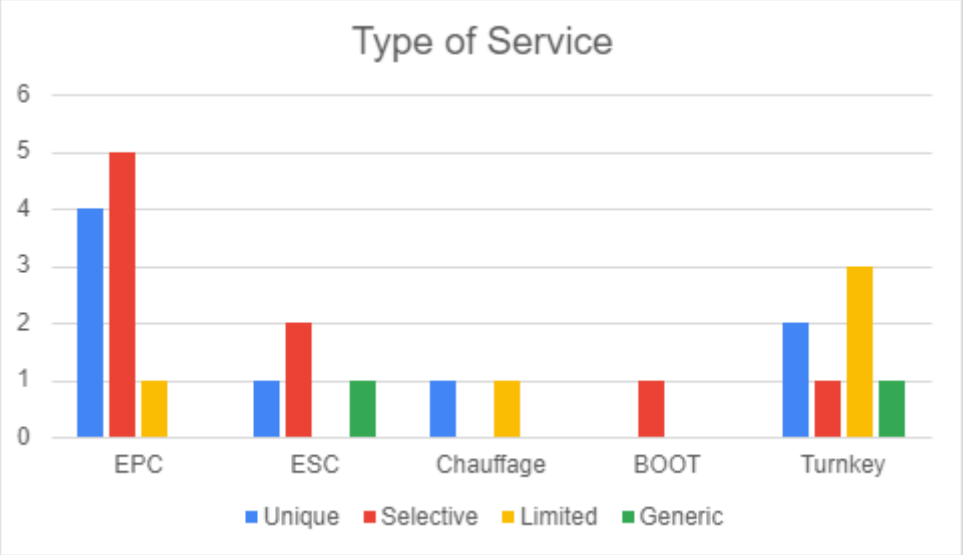

Figure 27: type of service offered for traditional contracts

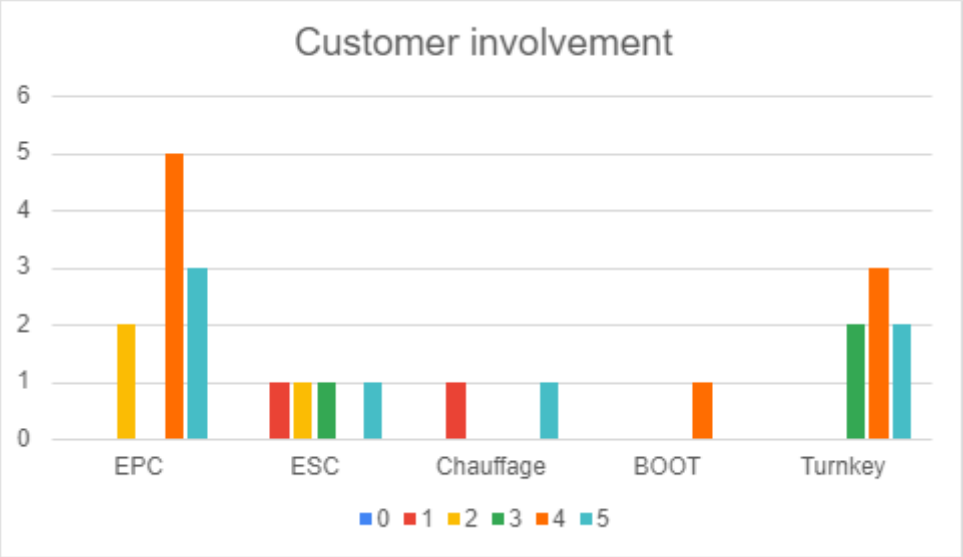

Figure 28: level of customer involvement for traditional contracts

Similar kind of information was asked to the companies with respect to the category of "Other Services". As same as before, ESCos were asked about the importance of each service in the turnover of the firm, the type of the service provided, customer involvement, and the addition of the scope of the service. The first category (graph#), shows the low relevance of these type of services in the firms' sources of income, being in some cases all of it. In terms of service level of customization (graph #), a better distribution of types is found in the answers. All services, excluding ISO 50001 and other services, have in their mix at least three categories (Unique, Selective and limited) with a predominance of Selective type of services. As for the customer involvement (graph #), there is even a higher presence of all the levels. Management of Services and project supervision have in their repertoire all six levels of involvement. In the same line: Other services, Project tech management and Energy Audits have 5/6 levels of involvement in their mix. Finally, when asking about the Scope with which the service is provided [graph#), respondents showed a high commitment to EEI in the cases of Energy Audits and Project assessments.

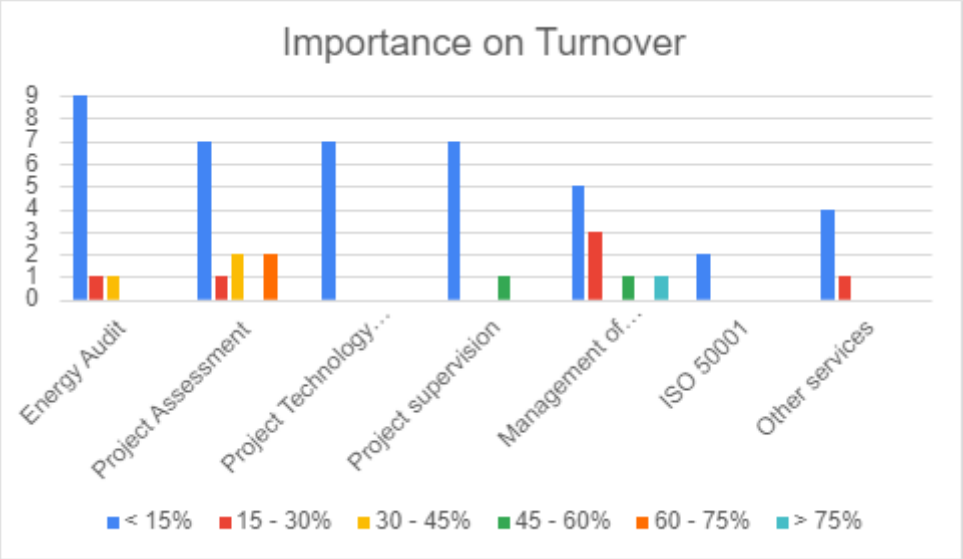

Figure 29: importance on turnover for Other services

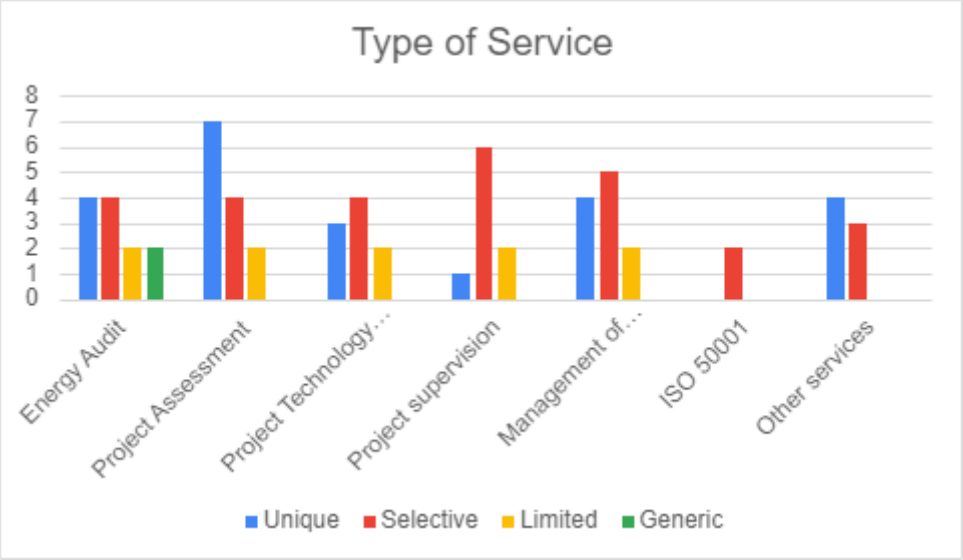

Figure 30: type of service offered for "Other services"

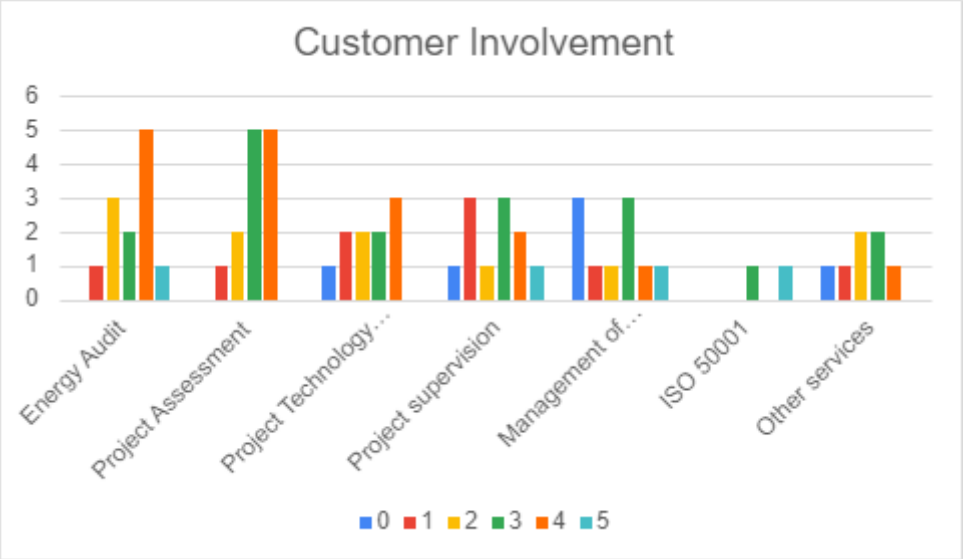

Figure 31: level of customer involvement for "Other services"

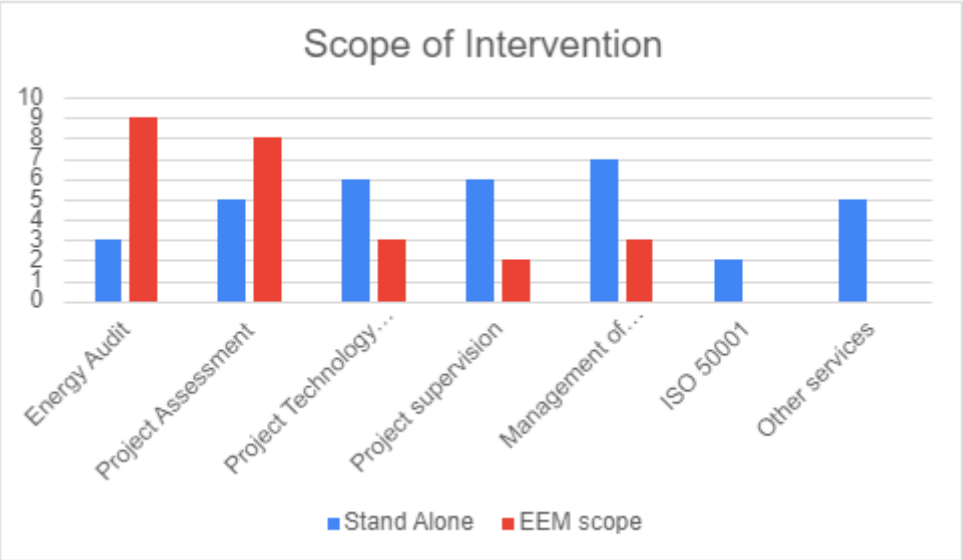

Figure 32: scope of the "Other services"

Finally, companies were asked about the financing methods they use for their activities and about what they perceived to be the main barriers to the use of EPC models. For the first one, table # shows the distribution of the different type of financing that each ESCO used in the year 2021. ESCO equity and TPF with ESCO as a debtor are the two most used and with the highest relevance. Also, 7/13 companies have both as a method of financing. In second instance, main barriers showed in graph # demonstrated again that companies are worried about the complexity of the EPC business model and so the lack of information that is in the market about these contracting methods.

	TPF- Client Based	TPF - ESCO based	Client financing	ESCO equity	Leasing	Mezzanine	SPE
1			60 - 80%	< 20%			< 20%
2					> 80%		
3		60 - 80%		< 20%			
4		> 80%	> 80%	> 80%			> 80%
5	> 80%	> 80%	> 80%	> 80%	> 80%	> 80%	> 80%
6				> 80%			
7	< 20%	40 - 60%		40 - 60%			
8		20 - 40%		60 - 80%			
9	< 20%						
10		60 - 80%		< 20%			
11		60 - 80%					
12		40 - 60%	< 20%	40 - 60%	< 20%		
13			< 20%	> 80%			

Table 16: Distribution of Financing in the sample

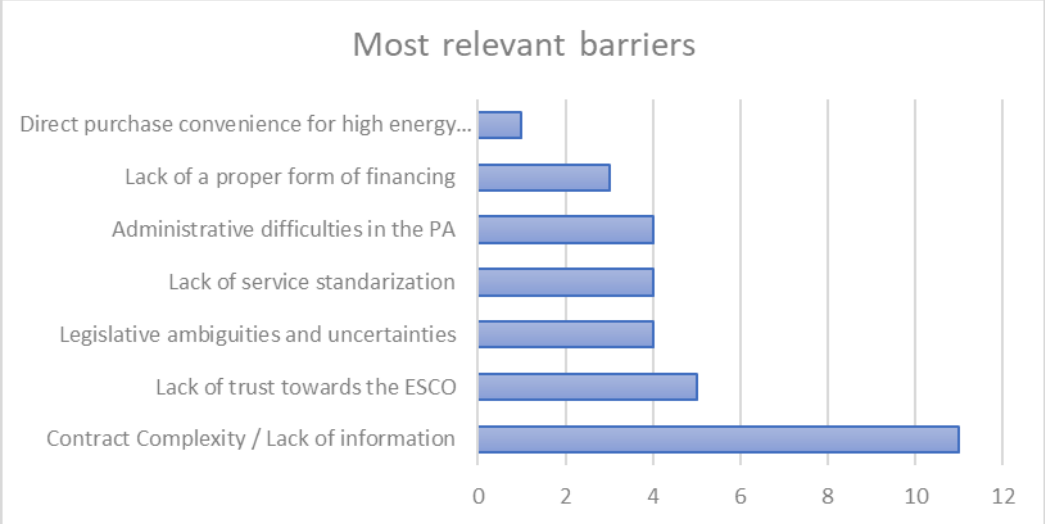

Figure 33: Relevant barriers considered by the sample

For what respects to the empirical models, all of them can be found in the annex section. However, some results and important numbers are shown as follows. First, all the main characteristics that the model evaluates, were gathered in table #. The column refers to Business Score is the final aim of the model, in which a percentage of alignment with the ESCO BM is expressed, this is as stated before, the sum of the scores for this section inside the evaluative model. The column related to type of services

considers only the level of customisation of those services that are aligned with energy savings, and the customer involvement in this case is the sum of the scores for both groups of services. From this data, it is possible to say, considering the sample size, that the firms are 30% aligned with the ESCO model and that on average customers are fairly involved in the processes with a 50%. Moreover, the data can be further exploited by providing a detailed look to what composes the importance in the turnover for each company. Figure # shows the distribution of importance doing the distinction between services based on Energy Savings, Other type of services linked to EEI and the rest of them. For this graph, two medians are shown. First a median of the Business Score, only considering traditional contracting models (EPC, chauffage, IEC) for which a 20% is achieved, and a second median of around 10% that considers the Other services that were offered with an EEI scope. The sum of both results in a median of 30% same as in table # for the business score.

ESCO	Answered by:	Dimension	Business Score	Service Type (ESCO model)	Customer involvement :	UNI CEI 11352
1	General Manager	Small	38%	1S	67%	Si
2	CEO	Medium	90%	1U	29%	Si
3	CEO	Medium	23%	0.5U ; 0.5S	22%	No
4	CEO	Medium	15%	1L	74%	Si
5	CEO	Micro	0%	-	80%	Si
6	CFO	Large	0%	-	25%	No
7	Responsible of marketing	Medium	15%	1U	59%	Si
8	Anonym	Micro	38%	1U	38%	No
9	CEO	Micro	34%	1U	26%	Si
10	Responsible of general tasks	Small	64%	1U	80%	Si
11	Sales Engineer	Small	49%	1U	28%	Si
12	Project Manager	Micro	6%	1S	72%	Si
13	Energy Efficiency Technician	Micro	23%	1S	44%	Si
Average:			30%		49%	

Table 17: results from the analysis

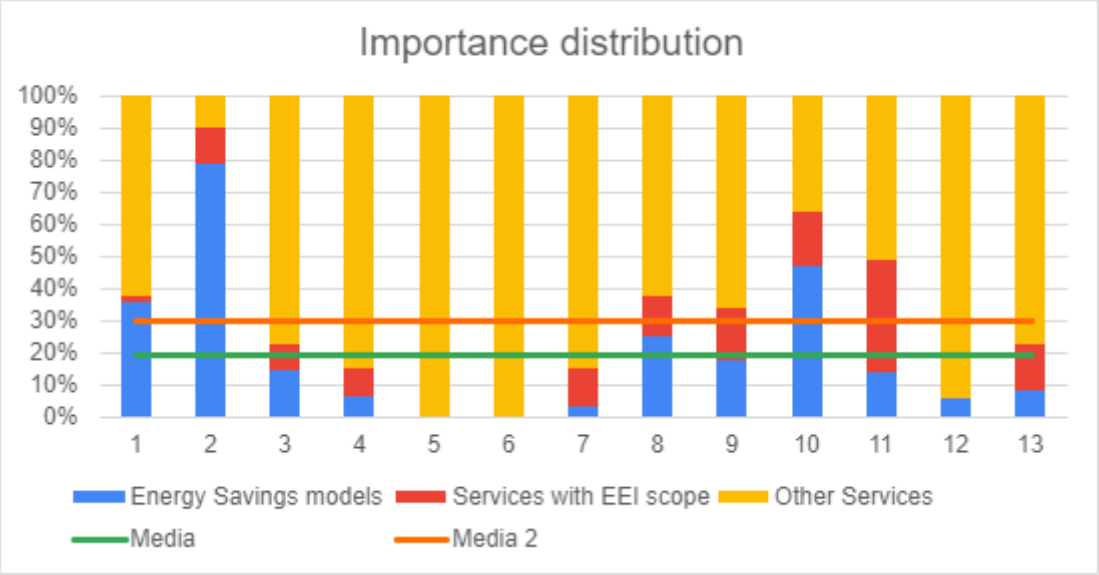

Figure 34: Distribution of importance on the turnover for the different service types

8.3. Commonalities

Now, as part of the scope of this section, when trying to find commonalities between the responses it is appropriate to set a base from which a guideline can be drawn. At first, considering that ESCos models and Offers are bespoken in its majority, and that they depend on different factors that are part of the context in which they operate. A proper starting point is the type of client they address. As mentioned before, Industrial and residential sectors are the ones mostly targeted with 10/13 and 9/13 of the companies respectively. Thus, starting from a customer perspective seems reasonable. Two main streams are taken and from them, 3 groups can be distinguished. The process used to form the groups has a similar step by step. At first, filtering by the type of traditional contracting, giving priorities to the Energy Savings type. Then an understanding of their level of customization and customer involvement also gives idea of possible commonalities. A similar approach is used for the "Other Services" with the difference of adding the scope of the service. Finally, a look to the types of financing that these firms offered and other possible common traits like barriers are analysed. Image # shows the profiles from the data gathered following a similar approach as the one described before. From them and from the data exposed previously, some points are worth mentioning:

- Overall, Services of whom its revenues are not directly linked with energy services have higher importance on the turnover of companies
- When talking about the type of service that is offered, there is no predominance of a type for the companies. There is a mix of all.

- Customer involvement in EPC type projects is quite similar with high resolutions (levels 4 and 5). However, when considering other services either inside the traditional contracts or the "Other services" the level of involvement varies depending on the ESCO.
- In the "Other services" category, apart from Energy Audit and Project assessment, most services have a standalone scope. However, all services have low relevance in the turnover of the company (<30%)
- From these common lines, there was also a lack of a distinctive type of firm in terms of their size. Mostly the small groups that resulted had a mix between micro, small and medium size companies.
- Only the medium size firms are the ones that perform ESC contracting. They all target residential / tertiary sector.

Even thought there was not a completely common type of firm in the terms of Services offered, scope, customisation, customer involvement, firm size and targeted customer. There are 3 types of companies from which common traits could be found, they are shown in fig #.

- **Group 1:** There are 4 firms that offer EPC and Turnkey services, being turnkey more representative (>60%) for the turnover than the EPC. They also provide Energy Audit & project assessment with the scope of EEI with a low relevance (<15%). These companies offer services to the industrial sector and mainly finance using TPF with ESCO as debtor and own Equity. EPCs are divided into Selective and Unique, with high customer involvement (4,5); Turnkey are mostly Limited with levels of customer involvement between 3-5; Energy audit & project assessment have a mix of service types with a wide range of customer involvement from 3-5. From this group, 3 out of 4 firms also offer their services to the industrial residential / tertiary sector.
- **Group 2:** Targeting the Residential/tertiary sector as well as industrial, there are 3 firms that offer EPC and Turnkey services also, again with the later having a higher relevance than the EPC (overall higher than 60% compared to 15-40%). EPC have a mix in the type of service offered while high levels of customer involvement (4,5). On the other hand, Turnkey have a dominance of Limited type with levels 3,4 in terms of customer involvement. For what concerns "Other services" these 3 companies offer Energy Audits and Project Assessment with EEI scope and involving customers at mid-levels (3,4). Only Project Assessment share a Limited approach, while Energy Audit is a mix of types. These 3 firms, as well as group 1, finance themselves by using TPF & Equity from the ESCO.
- **Group 3:** This one is worth mentioning since there is a high presence of diverse contracts. At first, mid-size firms are the only ones that perform ESC

contracting, adding also EPC and other contracts like Chauffage or Turnkey. Nevertheless, this group also incurs in the higher relevance for contracts like the ESC and Turnkey. As for EPC customer involvement is high with levels of 4 (1) and 5 (2) and contracts are Limited (1) and Unique (2) respectively. While for ESC, customer involvement goes from 1 to 3 while the type of services is selective (2) and generic (1). Now, for the "Other services" all three executed Energy Audit, Project assessment and Mangement of incentives, with the first two completely using a EEI scope and <15% in the turnover importance. Other services are also performed but in its majority with a stand-alone scope.

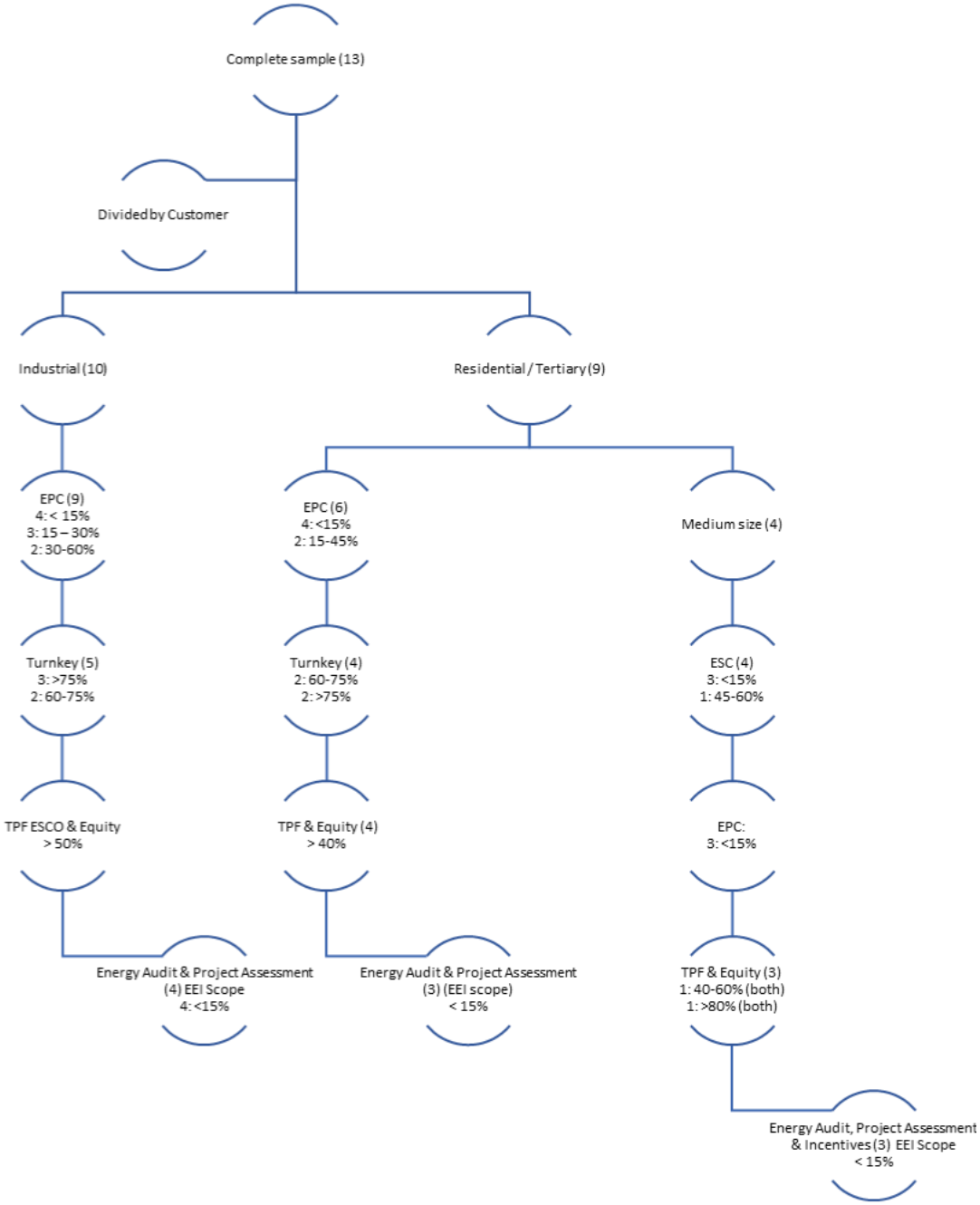

Figure 35: Commonalities tree obtained from data analysis

9 Chapter: Conclusions

This research focused on the identification of mismatches between what ESCos should do according to binding laws and norms and the reality of their models of operation in the Italian context. Additionally, the work studied which factors are impeding ESCos to exploit its full potential and hinder them into spreading their activities. The central questions to answer were the following:

1. Is there a mismatch between Normative framework and actual ESCo BM in the Italian market?
2. What are the competitive differences of ESCos compared to other players in the market?
3. What are the characteristics that current regulations require for ESCos BM?

Starting from the literature review on ESCo Business Models and passing through the normative and law that govern Italian ESCo market, a complete comprehension of the main features and deficits of the BMs was done. In addition to this and supported by empirical studies and research on this field, a proper comprehension of the ESCo ecosystem and its stakeholders were obtained. Moreover, with the extensive study on regulations, normative and laws that affect the Italian market, insights could be taken that allowed the construction of a Business Model based on what ESCos are legally expected to do. After this, and by leveraging the empirical evaluative model, the results gathered from the different surveys allowed to test the main issued addressed in this Thesis.

The analysis of the various firms provided insights on what is the current situation of the ESCos offering and what drives their business models. Even if it was not possible to generalize because on the small sample used, some conclusions can be derived from the analysis. On first instance, and most important, is to say that ESCos models show a low alignment with what is expected. The low relevance of contracting models and services that are aimed at doing an EEI, against the high presence and relevance of other contracts such as Turnkey or ESC, is the main source of misalignment. However, some other traits could be distinguished that still let a space for improvement in terms of a better alignment. The extensive use of TPF with ESCo as debtor, and the Equity financing, as well as in some cases the high levels of customer involvement in the contracts offered are things expected by the ESCo to do. More in deep, when comparing the results from the model and surveys with the barriers that affect the EPC implementation, it was possible to spot some difficulties too. What respects to the introduction of standardization in the service offerings, EPCs offers are still in a high level of customization and for the rest of the portfolio of services there is mix of types. On the other hand, from direct questioning, it seems that efforts from actors in the Italian market haven't been enough when trying to increase the awareness of the EPC

as well as the reduction of its complexity. In line with this, as spotted in the research, it does not exist a substantial regulatory framework for ESCos in Italy. This opens the space for increasing heterogeneity in their BM's leveraging in the lack of trust and awareness from potential clients, the loss of competitive advantage and efficiency of subsidies.

Still, the research allowed to grasp the modus operandi of a limited number of ESCos with the use of an innovative model based on literature and normative research. This model is a substantial contribution for next research's made in the ESCo field but also in the Energy Services markets. Thanks to its modularity, the model can adapt to the study of different topics such as barriers coming from the market, allowing a better comprehension and decision-making for solutions.

Some suggestions for future research could be useful. In synthesis, limiting research only into European countries won't allow to grasp all the possible issue that ESCo models have had along the years as well as the solutions other authors and countries have found. Extending the research in countries such as United States and China that are the top leaders in this market will allow to better understand the ESCos and will open the possibility to find solutions to close this and other possible gaps and barriers, with their cases. Another suggestion considers the way data is gathered to fill the empirical model, for sure a better approach would be direct interviewing the ESCos so to achieve better understanding on why they do business as they do it

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Chapter: Definitions

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Annexes

Evaluative models:

		1	Scope of the ES	Importance on Turnover (0-1)	Service customization	Customer involvement (0 No - 1 Full)	cx score
Model for Other Services	Audit energetico	|	0,5	0	L	0,8	0
	Valutazione del progetto	|	0,5	0	L	0,8	0
	Gestione tecnica del progetto	|	0	0	0	0	0
	Project supervision	|	0	0	0	0	0
	Gestione degli incentivi e obblighi amministrativi	|	0	0	0	0	0
	Supporto per la ISO 50001	|	0	0	0	0	0
	Altri servizi	|	0	0	0	0	0
	Score	|	0	0		0,8	0
		|					
Model for usual contracts	EPC	|	1	0,375	S	0,8	0,3
	ESC	|	0	0	0	0	0
	Chauffage	|	1	0	0	0	0
	BOOT	|	0	0	0	0	0
	Turnkey	|	0	0,675	G	0,6	0,405
	IEC	|	1	0	0	0	0
	Score	|	0,375	1,05		0,7	0,671
		|					
	Sum	|	0,375	1,05	0,36	S	0,671
		|			0,64	G	

Annex 1: Evaluative model for ESCO #1

		2	Scope of the ES	Importance on Turnover (0-1)	Service customization	Customer involvement (0 No - 1 Fulll)	cx score
Model for Other Services	Audit energetico	|	0,5	0,075	U	0,8	0,06
	Valutazione del progetto	|	0,5	0,075	U	0,8	0,06
	Gestione tecnica del progetto	|	0	0	0	0	0
	Project supervision	|	0	0	0	0	0
	Gestione degli incentivi e obblighi amministrativi	|	0	0	0	0	0
	Supporto per la ISO 50001	|	0	0	0	0	0
	Altri servizi	|	0	0	0	0	0
	Score	|	0,075	0,15		0,8	0,114285714
		|					
Model for usual contracts	EPC	|	1	0	0	0	0
	ESC	|	0	0,075	U	0,2	0,015
	Chauffage	|	1	0,825	U	0,2	0,165
	BOOT	|	0	0	0	0	0
	Turnkey	|	0	0	0	0	0
	IEC	|	1	0	0	0	0
	Score	|	0,825	0,9		0,2	0,171428571
		|					
	Sum	|	0,9	1,05	1,00	U	0,285714286
		|					

Annex 2: Evaluative model for ESCO #2

		3	Scope of the ES	Importance on Turnover (0-1)	Service customization (U Generic - 1 Unique)	Customer involvement (0 No - 1 Fulll)	Score
Model for Other Services	Audit energetico	|	0,5	0,075	U	0,2	0,015
	Valutazione del progetto	|	0,5	0,075	U	0,4	0,03
	Gestione tecnica del progetto	|	0	0,075	S	0,2	0,015
	Project supervision	|	0	0,075	S	0,2	0,015
	Gestione degli incentivi e obblighi amministrativi	|	0	0,075	U	0	0
	Supporto per la ISO 50001	|	0	0	0	0	0
	Altri servizi	|	0	0	0	0	0
	Score	|	0,075	0,3		0,25	0,0769
		|					
Model for usual contracts	EPC	|	1	0,075	U	0,2	0,015
	ESC	|	0	0,525	S	0,2	0,105
	Chauffage	|	1	0,075	L	0,2	0,015
	BOOT	|	0	0	0	0	0
	Turnkey	|	0	0	0	0	0
	IEC	|	1	0	0	0	0

	Score	|	0,15	0,675		0,2	0,138
		|					
	Sum	|	0,225	0,975	0,31	U	0,215
					0,69	S	

Annex 3: Evaluative model for ESCO #3

		4	Scope of the ES	Importance on Turnover (0-1)	Service customization (U Generic - 1 Unique)	Customer involvement (0 No - 1 Fulll)	Score
Model for Other Services	Audit energetico	|	0,5	0,0625	S	0,6	0,0375
	Valutazione del progetto	|	0,5	0,0625	L	0,6	0,0375
	Gestione tecnica del progetto	|	0,5	0	L	0,6	0
	Project supervision	|		0	L	0,6	0
	Gestione degli incentivi e obblighi amministrativi	|		0,0625	S	0,6	0,0375
	Supporto per la ISO 50001	|		0	0	0	0
	Altri servizi	|		0	U	0,2	0
	Score	|	0,0625	0,1875		0,533333333	0,1125
		|					
Model for usual contracts	EPC	|	1	0,0625	L	0,8	0,05
	ESC	|	0	0,0625	G	0,4	0,025
	Chauffage	|	1	0	0	0	0
	BOOT	|	0	0	0	0	0
	Turnkey	|	0	0,6875	L	0,8	0,55
	IEC	|	1	0	0	0	0
	Score	|	0,0625	0,8125		0,666	0,625
		|					
	Sum	|	0,125	1	0,13	S	0,7375
					0,81	L	
					0,0625	G	

Annex 4: Evaluation model for ESCO #4

		5	Scope of the ES	Importance on Turnover (0-1)	Service customization (U Generic - 1 Unique)	Customer involvement (0 No - 1 Fulll)	Score
Model for Other Services	Audit energetico	|	0	0,04	G	0,8	0,032
	Valutazione del progetto	|	0	0,36	S	0,8	0,288
	Gestione tecnica del progetto	|	0	0,04	S	0,8	0,032
	Project supervision	|	0	0,04	S	0,8	0,032
	Gestione degli incentivi e obblighi amministrativi	|	0	0,04	S	0,8	0,032
	Supporto per la ISO 50001	|		0	0	0	0
	Altri servizi	|		0	0	0	0
	Score	|	0	0,52		0,8	0,416
		|					
Model for usual contracts	EPC	|	1	0	0	0	0
	ESC	|	0	0	0	0	0
	Chauffage	|	1	0	0	0	0
	BOOT	|	0	0,36	S	0,8	0,288
	Turnkey	|	0	0,12	S	0,8	0,096
	IEC	|	1	0	0	0	0
	Score	|	0	0,48		0,8	0,384
		|					
	Sum	|	0	1	0,96	S	0,8
					0,04	G	

Annex 5: Evaluation model for ESCO #5

		6	Scope of the ES	Importance on Turnover (0-1)	Service customization (U Generic - 1 Unique)	Customer involvement (0 No - 1 Fulll)	Score
Model for Other Services	Audit energetico	|	0	0	0	0	0
	Valutazione del progetto	|	0	0,290	U	0,6	0,174
	Gestione tecnica del progetto	|	0	0	0	0	0
	Project supervision	|	0	0	0	0,2	0
	Gestione degli incentivi e obblighi amministrativi	|	0	0,354	U	0	0
	Supporto per la ISO 50001	|	0	0	0	0	0
	Altri servizi	|	0	0	0	0	0
	Score	|	0	0,645		0,4	0,174
		|					
Model for usual	EPC	|	1	0	0	0	0
	ESC	|	0	0	0	0	0
	Chauffage	|	1	0	0	0	0
	BOOT	|	0	0	0	0	0

	Turnkey	|	0	0,354	U	0,2	0,0709
	IEC	|	1	0	0	0	0
	Score	|	0	0,354		0,2	0,0709
		|					
	Sum	|	0	1	1,00	U	0,245
					0,04	G	

Annex 6: Evaluation model for ESCO #6

		7	Scope of the ES	Importance on Turnover (0-1)	Service customization (U Generic - 1 Unique)	Customer involvement (0 No - 1 Fulll)	Score
Model for Other Services	Audit energetico	|	0,500	0,033	U	0,800	0,027
	Valutazione del progetto	|	0,500	0,033	S	0,600	0,020
	Gestione tecnica del progetto	|	0,000	0,033	L	0,600	0,020
	Project supervision	|	0,000	0,233	L	0,600	0,140
	Gestione degli incentivi e obblighi amministrativi	|	0,000	0,233	L	0,600	0,140
	Supporto per la ISO 50001	|	0,000	0,033	S	0,600	0,020
	Altri servizi	|	0,000	0,033	S	0,600	0,020
	Score		0,033	0,633		0,629	0,387
Model for usual contracts	EPC	|	1,000	0,033	U	0,200	0,007
	ESC	|	0,000	0,033	S	0,600	0,020
	Chauffage	|	1,000	0,000	0,000	0,000	0,000
	BOOT	|	0,000	0,000	0,000	0,000	0,000
	Turnkey	|	0,000	0,300	L	0,600	0,180
	IEC	|	1,000	0,000	0,000	0,000	0,000
	Score		0,033	0,367		0,467	0,207
	Sum		0,067	1,000	0,067	U	0,593
					0,133	S	
					0,800	L	

Annex 7: Evaluation model for ESCO #7

		8,000	Scope of the ES	Importance on Turnover (0-1)	Service customization (U Generic - 1 Unique)	Customer involvement (0 No - 1 Fulll)	Score
Model for Other Services	Audit energetico	|	0,500	0,075	S	0,400	0,030
	Valutazione del progetto	|	0,500	0,225	U	0,400	0,090
	Gestione tecnica del progetto	|	0,000	0,000	0,000	0,000	0,000
	Project supervision	|	0,000	0,075	S	0,200	0,015
	Gestione degli incentivi e obblighi amministrativi	|	0,000	0,075	S	0,400	0,030
	Supporto per la ISO 50001	|	0,000	0,000	0,000	0,000	0,000
	Altri servizi	|	0,000	0,225	U	0,400	0,090
	Score		0,150	0,675		0,360	0,283
Model for usual contracts	EPC	|	1,000	0,225	S	0,400	0,090
	ESC	|	0,000	0,000	0,000	0,000	0,000
	Chauffage	|	1,000	0,000	0,000	0,000	0,000
	BOOT	|	0,000	0,000	0,000	0,000	0,000
	Turnkey	|	0,000	0,000	0,000	0,000	0,000
	IEC	|	1,000	0,000	0,000	0,000	0,000
	Score		0,225	0,225		0,400	0,100
	Sum		0,375	0,900	0,500	U	0,383
					0,500	S	

Annex 8: Evaluation model for ESCO #8

		9	Scope of the ES	Importance on Turnover (0-1)	Service customization (U Generic - 1 Unique)	Customer involvement (0 No - 1 Fulll)	Score
Model for Other Services	Audit energetico	|	0,000	0,294	S	0,400	0,118
	Valutazione del progetto	|	0,000	0,294	U	0,200	0,059
	Gestione tecnica del progetto	|	0,000	0,059	U	0,200	0,012
	Project supervision	|	0,000	0,000	0,000	0,000	0,000
	Gestione degli incentivi e obblighi amministrativi	|	0,500	0,176	S	0,000	0,000
	Supporto per la ISO 50001	|	0,000	0,000	0,000	0,000	0,000
	Altri servizi	|	0,000	0,000	U	0,000	0,000
	Score		0,088	0,824		0,267	0,188
Model for usual contracts	EPC	|	1,000	0,176	S	0,400	0,071
	ESC	|	0,000	0,000	0,000	0,000	0,000
	Chauffage	|	1,000	0,000	0,000	0,000	0,000
	BOOT	|	0,000	0,000	0,000	0,000	0,000
	Turnkey	|	0,000	0,000	0,000	0,000	0,000
	IEC	|	1,000	0,000	0,000	0,000	0,000
	Score		0,176	0,176		0,400	0,071
	Sum		0,265	1,000	0,353	U	0,259
					0,647	S	

Annex 9: Evaluation model for ESCO #9

		10,000	Scope of the ES	Importance on Turnover (0-1)	Service customization (U Generic - 1 Unique)	Customer involvement (0 No - 1 Fulll)	Score
Model for Other Services	Audit energetico	|	0,500	0,067	U	0,800	0,053
	Valutazione del progetto	|	0,000	0,333	U	0,800	0,267
	Gestione tecnica del progetto	|	0,500	0,067	U	0,800	0,053
	Project supervision	|	0,500	0,067	U	0,800	0,053
	Gestione degli incentivi e obblighi amministrativi	|	0,500	0,000	U	0,000	0,000
	Supporto per la ISO 50001	|		0,000	0,000	0,000	0,000
	Altri servizi	|		0,000	0,000	0,000	0,000
	Score		0,100	0,533		0,800	0,427
Model for usual contracts	EPC	|	1,000	0,467	U	0,800	0,373
	ESC	|	0,000	0,000	0,000	0,000	0,000
	Chauffage	|	1,000	0,000	0,000	0,000	0,000
	BOOT	|	0,000	0,000	0,000	0,000	0,000
	Turnkey	|	0,000	0,000	0,000	0,000	0,000
	IEC	|	1,000	0,000	0,000	0,000	0,000
	Score		0,467	0,467		0,800	0,373
	Sum		0,567	1,000	1,000	U	0,800

Annex 10: Evaluation model for ESCO #10

		11,000	Scope of the ES	Importance on Turnover (0-1)	Service customization (U Generic - 1 Unique)	Customer involvement (0 No - 1 Fulll)	Score
Model for Other	Audit energetico	|	0,500	0,045	U	0,200	0,009
	Valutazione del progetto	|	0,500	0,045	U	0,800	0,036
	Gestione tecnica del progetto	|	0,500	0,045	U	0,800	0,036
	Project supervision	|	0,500	0,045	S	0,200	0,009

	Gestione degli incentivi e obblighi amministrativi	|	0,500	0,136	U	0,200	0,027
	Supporto per la ISO 50001	|	0,000	0,000	0,000	0,000	0,000
	Altri servizi	|	0,000	0,045	U	0,800	0,036
	Score		0,159	0,364		0,500	0,155
Model for usual contracts	EPC	|	1,000	0,136	U	0,200	0,027
	ESC	|	0,000	0,000	0,000	0,000	0,000
	Chauffage	|	1,000	0,000	0,000	0,000	0,000
	BOOT	|	0,000	0,000	0,000	0,000	0,000
	Turnkey	|	0,000	0,500	U	0,200	0,100
	IEC	|	1,000	0,000	0,000	0,000	0,000
	Score		0,136	0,636		0,200	0,127
	Sum		0,295	1,000	0,955	U	0,282
					0,045	S	

Annex 11: Evaluation model for ESCO #11

		12,000	Scope of the ES	Importance on Turnover (0-1)	Service customization (U Generic - 1 Unique)	Customer involvement (0 No - 1 Fulll)	Score
Model for Other Services	Audit energetico	|	0,000	0,059	S	0,600	0,035
	Valutazione del progetto	|	0,000	0,059	S	0,600	0,035
	Gestione tecnica del progetto	|	0,000	0,000	S	0,400	0,000
	Project supervision	|	0,000	0,059	S	0,400	0,024
	Gestione degli incentivi e obblighi amministrativi	|	0,000	0,059	S	0,600	0,035
	Supporto per la ISO 50001	|	0,000	0,000	0,000	0,000	0,000
	Altri servizi	|	0,000	0,059	S	0,400	0,024
	Score		0,000	0,294		0,500	0,153
					1,000	S	
Model for usual contracts	EPC	|	1,000	0,059	S	0,800	0,047
	ESC	|	0,000	0,000	0,000	0,000	0,000
	Chauffage	|	1,000	0,000	0,000	0,000	0,000
	BOOT	|	0,000	0,000	0,000	0,000	0,000
	Turnkey	|	0,000	0,647	L	0,800	0,518
	IEC	|	1,000	0,000	0,000	0,000	0,000
	Score	|	0,059	0,706		0,800	0,565
		|					
	Sum	|	0,059	1,000	1,000	S	0,718

Annex 12: Evaluation model for ESCO #12

		13,000	Scope of the ES	Importance on Turnover (0-1)	Service customization (U Generic - 1 Unique)	Customer involvement (0 No - 1 Fulll)	Score
Model for Other	Audit energetico	|	0,500	0,225	L	0,400	0,090
	Valutazione del progetto	|	0,500	0,075	S	0,600	0,045
	Gestione tecnica del progetto	|	0,000	0,075	S	0,400	0,030
	Project supervision	|	0,000	0,075	S	0,600	0,045

	Gestione degli incentivi e obblighi amministrativi	|	0,000	0,225	L	0,200	0,045
	Supporto per la ISO 50001	|	0,000	0,075	S	1,000	0,075
	Altri servizi	|	0,000	0,075	S	0,600	0,045
	Score		0,150	0,825			0,375
Model for usual contracts	EPC	|	1,000	0,075	S	0,800	0,060
	ESC	|	0,000	0,000	0,000	0,000	0,000
	Chauffage	|	1,000	0,000	0,000	0,000	0,000
	BOOT	|	0,000	0,000	0,000	0,000	0,000
	Turnkey	|	0,000	0,000	0,000	0,000	0,000
	IEC	|	1,000	0,000	0,000	0,000	0,000
	Score	|	0,075	0,075		0,800	0,060
		|					
	Sum	|	0,225	0,900	1,000	S	0,435

Annex 13: Evaluation model for ESCO #13

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