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DELIVERABLE: D2.3

Status Quo Analysis of NEBs

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Building Up Next-Generation Smart Energy Services Offer and Market Up-take Valorising Energy Efficiency and Flexibility at Demand-Side.

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Summary of deliverable

This deliverable is based on Task T.2.3 Analysis of NEBs associated with energy efficiency services in the EU. It examines Energy Service Provider Companies (ESPCs) and their development in member states, as well as their role in the market and responsibility for energy savings. The study investigates the variations in their structure, particularly the types of services they provide.

The objective is to identify the technical solutions used by ESPCs to assess Non-Energy Benefits (NEBs), which are not well-described at the national or EU level. While there is sufficient information available about the market structure, approximate company sizes, and prevailing types of contracts, there is limited knowledge about the diversity of implemented non-energy measures, especially their combination with other energy services.

The Deliverable 2.3 also includes the contents of Sub-tasks 2.3.1 Engaging ESPCs and 2.3.2 Identification of consumers' needs. National ESPCs were approached through national partners to discuss the NEBs issue. Emphasis was placed on discussing comprehensive projects that combine various measures, particularly the approaches to the market role of ESPCs in the target countries, their current practices, and implemented projects. National ESPCs were also asked to summarize the measures used in implemented projects and their experience regarding customer interest in NEBs.

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1. Introduction

Non-energy benefits (NEBs) refer to the additional or indirect benefits that come with the provision of energy services, beyond the direct provision of energy itself. These benefits can include improvements in health, safety, productivity, comfort, and environmental quality, among others.

For example, energy-efficient lighting can provide better lighting quality and reduce eye strain, leading to improved productivity and job satisfaction. Similarly, efficient air conditioning systems can improve indoor air quality and reduce the risk of respiratory problems. Renewable energy technologies like solar panels can also provide benefits such as reduced greenhouse gas emissions and improved local air quality.

NEBs are important to consider when evaluating energy service options because they can help justify investments in more efficient and sustainable energy systems. While these benefits are not always easy to quantify or monetize, they can provide significant value to individuals, businesses, and society as a whole.

Non-energy benefits (NEBs) can take many forms and can vary depending on the specific context and energy service being provided. Here are some examples of different types of NEBs:

- **Improved health:** Energy-efficient buildings and appliances can improve indoor air quality and reduce the risk of respiratory problems. Access to modern energy services like clean cooking technologies can reduce exposure to harmful smoke and improve respiratory health;
- **Increased productivity:** better lighting quality, reduced noise, and improved indoor temperature regulation can improve working conditions and productivity in buildings. Access to reliable electricity can also increase productivity in businesses that rely on energy-intensive processes;
- **Enhanced safety:** Energy-efficient lighting can improve safety in outdoor public spaces by increasing visibility and reducing the risk of accidents. Access to reliable and affordable energy can also reduce the use of hazardous lighting alternatives like kerosene lamps;
- **Environmental benefits:** Energy efficiency and renewable energy technologies can help reduce greenhouse gas emissions, air pollution, and water usage, leading to improved environmental quality and public health;
- **Increased economic opportunities:** Access to modern energy services like electricity and clean cooking technologies can enable income-generating activities like small businesses and cottage industries. Improved energy access can also reduce the time and effort required for household tasks like cooking and water collection, freeing up time for education or income-generating activities;
- **Improved education:** Access to reliable electricity can enable better lighting and educational technology in schools, improving the learning environment and educational outcomes.

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2. ESPCs markets

An Energy Service Provider Company (ESPC) is a company that provides energy-related services to clients, typically in the form of energy efficiency upgrades, renewable energy solutions, and energy management services. ESPCs are usually specialized firms that work with a range of clients, including commercial and industrial businesses, government agencies, and residential customers.

ESPCs typically provide services such as energy audits, energy-efficient lighting and HVAC upgrades, solar panel installations, and demand response programs. They may also offer financing options and help clients secure rebates and incentives for energy-saving measures.

The task of this part of the SQA is to determine how ESPCs are represented in individual countries, how the form of ESPCs and their offered services differ, whether there are different offerings across countries, and whether it is possible to create a uniform structure or if the conditions are so different that each country must be approached separately.

ESPCs are typically focused on delivering measurable energy savings to their clients, often through performance-based contracts. These contracts typically specify that the ESPC will guarantee a certain level of energy savings, and if those savings are not achieved, the ESPC will be responsible for making up the difference. This helps to ensure that clients receive the expected financial benefits of their energy efficiency investments.

2.1. ESPC market concept in each country

Energy Savings Performance Contracting (ESPC) has emerged as a pivotal mechanism in numerous countries, serving as a catalyst for energy efficiency initiatives. This chapter delves into the unique characteristics of the ESPC market in various nations, shedding light on the operational dynamics, market size, services rendered, participating entities, and government involvement.

ESPC, at its core, represents a contractual arrangement between energy service companies (ESCOs) and clients, typically government agencies or private enterprises, aimed at implementing energy efficiency measures without upfront capital costs. The market's intricacies vary significantly from one country to another, influenced by regulatory frameworks, economic conditions, and the energy landscape.

An exploration of each country's ESPC market begins with an overview of its operation. This encompasses the contractual structures in place, the scope of services provided, and the extent of market penetration. Understanding the size of the market involves analysing the volume and value of ESPC projects undertaken, providing insights into the industry's overall impact on energy consumption and cost savings.

Furthermore, a comprehensive examination of the participating organizations forms a critical component of this exploration. ESCOs play a pivotal role in the ESPC ecosystem, offering a range of services from energy audits and project implementation to long-term monitoring

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and verification. Their diversity in expertise and approach contributes to the market's vibrancy.

Government involvement is a key determinant of the ESPC market's success in each country. Legislative frameworks, financial incentives, and policy support can significantly influence the growth and sustainability of ESPC initiatives. By analysing the level of government engagement, we gain a nuanced understanding of the broader context in which the ESPC market operates.

As we navigate through the intricacies of the ESPC market in each country, attention will be directed towards the specific organizations participating in these endeavours. Understanding their roles, responsibilities, and contributions is crucial for comprehending the collaborative efforts shaping the energy efficiency landscape. Whether they are ESCOs, regulatory bodies, or industry associations, each entity plays a distinct role in fostering the growth and success of the ESPC market.

This chapter aims to provide a comprehensive overview of the ESPC market concept in various countries, offering valuable insights into the diverse approaches, challenges, and achievements within the realm of energy efficiency and savings performance contracting.

2.1.1. Czech Republic

Energy Performance Contracting (EPC) legislation

The method of Energy Performance Contracting (EPC) in the Czech Republic is legally defined by Act No. 406/2000 Coll. on Energy Management. This law establishes the framework for energy management and promotes energy efficiency in various sectors, including public buildings and industry. According to this law, a public contracting authority (such as a municipality, local government, or state institution) can enter into an energy performance contract with an equipment operator who provides energy services. This contract allows the equipment operator to implement energy-saving measures, which will result in energy savings, and subsequently allows them to claim a portion of these savings to cover costs and profit.

Act No. 406/2000 Coll. sets out the conditions for concluding energy performance contracts, including public procurement processes and criteria. In this way, it encourages investments in energy efficiency in public buildings and infrastructure.

Definition of Energy Service

The purpose of an energy service is the verifiable and measurable or calculation-based increase in energy utilization efficiency or energy consumption savings through energy-efficient technologies or operational activities, maintenance, or control.

An energy service is provided based on an energy service agreement, which is a contractual arrangement between the recipient and the energy service provider for measures to increase energy utilization efficiency, verified and monitored throughout the duration of the contractual commitment, with the costs of these measures being paid in relation to the

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contractually stipulated level of energy utilization efficiency improvement or another agreed-upon energy performance criterion, such as financial savings.

An energy service can be provided as a guaranteed performance energy service. This service is provided with the aim of achieving pre-determined energy savings and related cost savings for a specified period during which the energy service provider bears a contractually agreed level of financial risk or penalties in the event of non-achievement of the savings.

Definition of Energy Services Contract
An energy services contract is understood as a contractual agreement between the recipient and the energy service provider regarding measures to improve energy efficiency, verified and monitored throughout the duration of the contractual commitment, where the costs of these measures are paid in relation to the contractually specified level of energy efficiency improvement or other agreed-upon energy performance criteria, such as financial savings.

Definition of ESCO
An energy service provider is defined as a natural or legal person who supplies energy services or undertakes other measures to enhance the energy efficiency of the final user's equipment or within their building.

List of energy service providers

The list of energy service providers is maintained by the Ministry in accordance with §11, paragraph 1p of Act No. 406/2000 Coll. on Energy Management as amended.

Following the amendment to Act No 406/2000 Coll. on Energy Management, as amended by Act No 103/2015 Coll. of 4 May 2015, a list of energy service providers was compiled pursuant to Section 10f, which is administered by the Ministry of Industry and Trade. The data from the list are published in a separate file and contain the following data on companies:

- business name;
- identification number;
- registered office address;
- contact details (telephone number, e-mail address, internet address);
- identification of the type of services provided.

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The Association of Energy Service Providers (APES) of the Czech Republic

The Association of Energy Service Providers (APES) of the Czech Republic was founded in October 2010 with the aim of contributing to the sustainable development of energy services on the Czech market. Currently, it brings together 30 leading companies engaged in energy efficiency.

EPC Projects in the Czech Republic

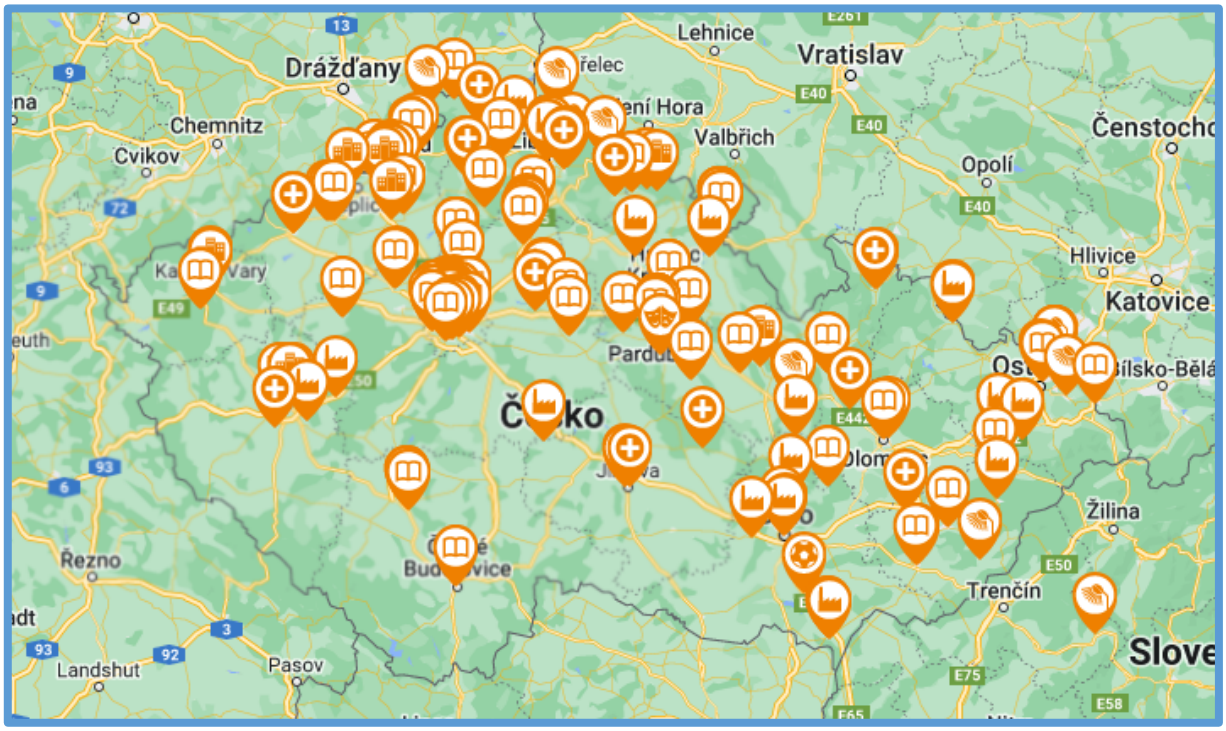

Figure 1 - Map of the location of EPC projects (Source: APES)

Energy services with guaranteed results have nearly a thirty-year tradition in the Czech Republic. The first energy-saving project implemented through Energy Performance Contracting (EPC) was commissioned in 1994. Since then, nearly 275 projects, comprising approximately 1,300 facilities, have been successfully completed through strategic investments to achieve energy savings. A total of 4.7 billion CZK was invested in these projects. To date, these investments have yielded savings of 5.7 billion CZK.[1]

[1] The Association of Energy Service Providers (APES) , https://www.apes.cz/mapa-projektu.php

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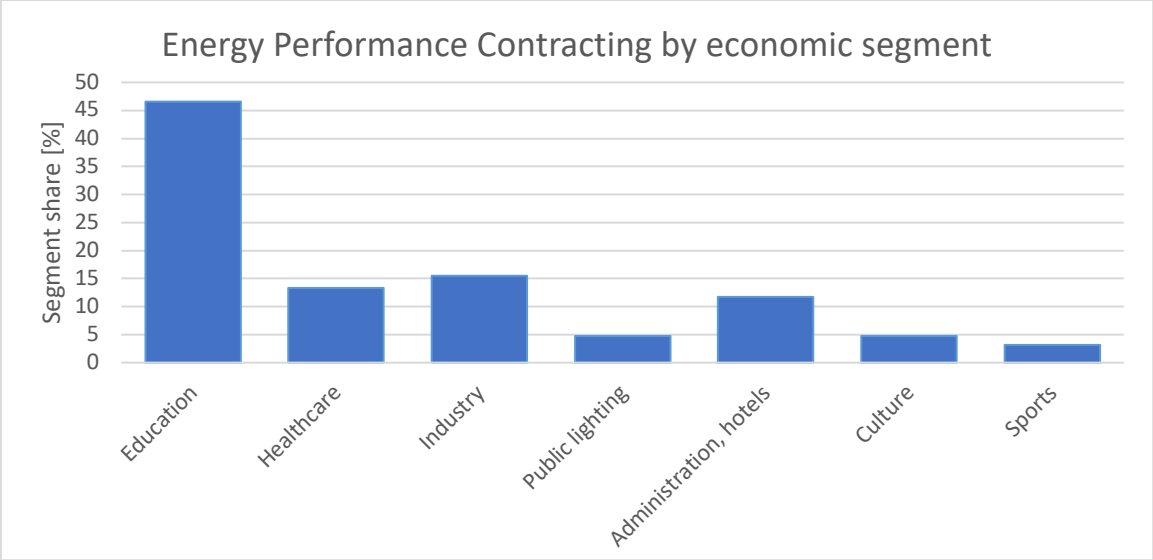

Figure 2 - Chart of the distribution of EPC projects by economic segment[2]

The most frequent clients are municipalities, ministries, followed by regions, and private companies. State organizations have only marginally embraced this method so far. Based on experience, it can be said that EPC projects are suitable for entities whose energy costs exceed 1.5 million crowns per year. Therefore, this method is mainly used in hospitals, schools, industrial and administrative buildings.

2.1.2. Germany

The main motivation to invest in energy-efficiency projects is to save energy and achieve associated financial benefits. In line with the EU's Energy Efficiency Directive (EED), Germany has enacted the national Energy Efficiency Act (Energieeffizienzgesetz – EnEfG). This act aims to reduce energy consumption in public buildings, industry, and rapidly growing data centers across the country. The goal is to achieve a 26.5% reduction by 2030 compared to 2008 levels. In the household sector, Germany ranks among the highest electricity-prices in the EU, and household expenditures on energy have risen steadily since 2004. Already before the crisis, households faced final energy consumption expenditures of more than 20.000 €/capita[3]. The development since 2023 leads to an even higher burden against a worsening macroeconomic background. In Germany, approximately 15.8% of the population (according to Eurostat) are on the brink of energy poverty and cannot afford essential energy services such as heating and hot water.

EnEfG defines energy services as:

''Any activity contractually provided by third parties through which the implementation of energy efficiency measures is prepared, supported, planned or carried out''.

[2] Source: APES - Distribution of EPC projects
[3] https://energy-poverty.ec.europa.eu/observing-energy-poverty/national-indicators_en

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In addition to the environmental and climate goals, the legislation lacks sufficient consideration for non-energy benefits or co-benefits. The recently adopted EnEfG spells out obligations for companies to propose implementation plans for all economically viable energy efficiency measures (German: wirtschaftlich), which does not include non-energy benefits specifically[4]. The only exemption is the explicit consideration of waste heat (Abwärme), which is an external benefit from the company's perspective, but still falls within a narrow perspective of energy from a system perspective.

As a result, there are no explicit guidelines or regulatory framework in place to incorporate these non-energy benefits into energy efficiency projects. Most of the activities associated with non-energy benefits are currently voluntary, with energy service companies proposing additional benefits alongside energy savings.

2.1.3. Portugal

In Portugal the definition of an Energy Services Company - ESCOs (recognised by the acronym ESE in Portuguese), is an entity that invests in, develops and manages energy efficiency projects. To do this, the company participates in contracts involving the rationalization, savings or decentralised efficient production of energy. Therefore, it aims to optimise energy investments and make them more cost-effective. In general, energy efficiency contracts are established between the ESCOs and other private organizations or Public Administration Authorities. An alternative definition commonly used for energy service companies is: companies that provide energy efficiency services to customers, typically on a performance-based contract. This means that the ESCOs guarantee a certain level of energy savings or cost reductions, and the customer only pays for the results that are achieved.

Typically, the **Energy Performance Contract (EPC) is established between ESCOs and a contracting organization** (some contracts mays include one or more ESCOs working in consortium) and are **mostly based on savings performance** (guaranteed savings or shared savings).

To be considered ESCOs companies, these institutions have to make a registration in the General Directorate of Energy and Geology database though a qualification scheme. After being accepted, they are habilitated to work as ESCOs in the Portuguese market.

In the public administration sector, a specific legislative framework was created for Energy Performance Contracting (EPC) which is called ECO-AP. The ECO-AP - Energy Efficiency in Public Administration Programme was defined by the Decree-Law 29/2011 and Decree-Law 50/2021. The EPC contract under this regulation incentivise the implementation of measures aimed at improving energy efficiency in public buildings and in the equipment used to provide public services. Additionally, ESCOs legislation in Portugal is governed by Decree-Law No. 118/2013, of August 30, which established a public contracting regime with ESCOs. This legislation aimed to establish a key role for the public sector in the development of the

[4] https://dserver.bundestag.de/btd/20/068/2006872.pdf

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Portuguese energy services market, as well as to promote measures to optimize the end-use of energy.

There is no specific regulation to develop EPCs in the private sector. Most often to increase client trust in the business model, ESCOs apply the regulation used for the public administration sector.

The Portuguese ESCOs market concept is based on:

- **Definition and Purpose**: ESCOs are companies that provide a range of energy services to businesses, public institutions, and other entities. Their primary goal is to optimize energy consumption, reduce costs, and enhance overall energy performance. These services often include energy audits and/or energy diagnostics, design and implementation of energy-efficient and cost-effective technologies, and energy performance contracting;
- **Key Activities**: ESCOs in Portugal are engaged in a variety of activities to achieve energy efficiency and sustainability goals. This includes the identification of energy-saving opportunities, implementation of energy-efficient technologies, and the financing of projects through innovative models such as Energy Performance Contracts (EPCs). ESCOs may also provide ongoing monitoring and maintenance to ensure energy savings are achieved. Most of the contracts made so far are based on the following technologies: high-efficient lighting systems (LEDs), and renewable energy systems (e.g. photovoltaic and solar thermal);
- **Creation of market drivers**: Several factors contribute to the growth of the ESCO market in Portugal. These factors include government initiatives to meet energy efficiency targets, environmental regulations, rising awareness of sustainable practices, and the desire of organizations to reduce energy costs over the long term. However, additional incentive programs and supportive policies to further stimulate the demand for ESCO services are still needed;
- **Regulatory Environment**: The regulatory framework in Portugal was created with the intent of supporting the development of the ESCO market. Government policies and regulations aim to promote energy efficiency, reduce carbon emissions, and enhance the overall sustainability of the energy sector. Clear guidelines for energy performance contracting and financial incentives contribute to a favorable environment for ESCOs activities;
- **Financing Mechanisms**: ESCOs projects often involve significant upfront investments in energy-efficient technologies, and usual this is the largest barrier to the implementation of EPC contracts. In Portugal, various financing mechanisms, including public-private partnerships, grants, and third-party financing, facilitate the implementation of energy efficiency measures. These financial models help organizations to overcome budgetary constraints allowing them to make sustainable investments. However, the investments are strongly dependent on the banking system that most often do not have the required knowledge to properly evaluate the cost-effectiveness of these projects.
- **Industry Challenges**: Despite the positive momentum, the ESCOs market in Portugal faces challenges such as economic uncertainties (namely the large variations in energy

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prices), the need for greater awareness among potential clients, and evolving technologies. Overcoming these challenges requires collaboration between ESCOs, government authorities, and industrial stakeholders to create a supportive ecosystem;

- **Future Outlook**: The ESCOs market in Portugal is expected to continue to grow as the country strives to meet its energy efficiency and sustainability targets. Ongoing innovation, technological advancements, and a focus on creating a resilient and sustainable energy infrastructure will likely drive the expansion of ESCOs services in the coming years.

The ESCO market size has suffered a significant fluctuation since its start in 2009 were 10 companies declared themselves as ESCOS. With the creation of the first ESCO qualification scheme in 2011 the number of companies increased to almost 90. However, most of this companies were qualified as ESCOs due to the perspective that EPCs could be a new and very profitable business. The economic crises in 2012 and the lack of available financing to ESCO projects due to banking sector lack of knowledge, made most companies to abandon this line of business. Presently in 2023, there are around 20 ESCOs registered in Portugal, however most of them are not developing EPCs. More than 60% of these companies do very little or no work as ESCOs. Their core business is often related to renewable energy systems and/or work for the Portuguese DSO in power grid expansion maintenance. The list of ESCO is available the General Directorate of Energy and Geology website[5].

The ESCO market in Portugal represents a slowly evolving sector within the broader energy landscape. ESCOs can play an important role in achieving the country objective in terms of emissions reduction, as well as in facilitating energy efficiency improvements, sustainability initiatives, and in the transition towards cleaner and more sustainable energy practices. Presently ESCOs are having an important role in the creation of energy communities mostly within the private sector (SMEs and electricity end-users).

Portuguese Association of Energy Services Companies - APESE (in Portuguese Associação Portuguesa das Empresas de Serviços de Energia) is a non-profit organisation set up in 2011 to promote the development and structuring of the energy services market in Portugal. It represents and defends the interests of ESCOs, which in turn promote the efficient use of energy.

[5] DGEG -https://www.dgeg.gov.pt/pt/areas-setoriais/energia/eficiencia-energetica/empresas-de-servicos-energeticos-ese/sqese-lista-de-ese-qualificadas-despacho-n%C2%BA-6227-22-18-de-maio/

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Portuguese ESCO market characterization and development

The next figure characterizes the Portuguese ESCO market in terms of ESCO size and targeted business areas.

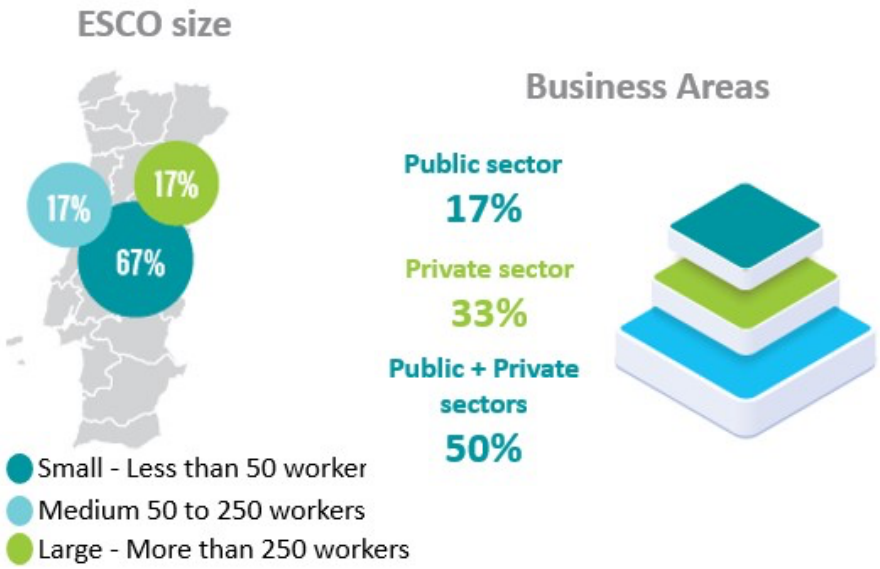

Figure 3 - Portuguese ESCO market characterization

Most ESCOs in Portugal have small dimension and are classified as SMEs (Small Medium Enterprises). Since the market is quite small, half of them implement projects both on public and private sectors. Next figure presents the location of ESCOS in the Portuguese territory and the average number of projects implemented per year by region. The largest number of projects is implemented in the Centre Region including Lisbon.

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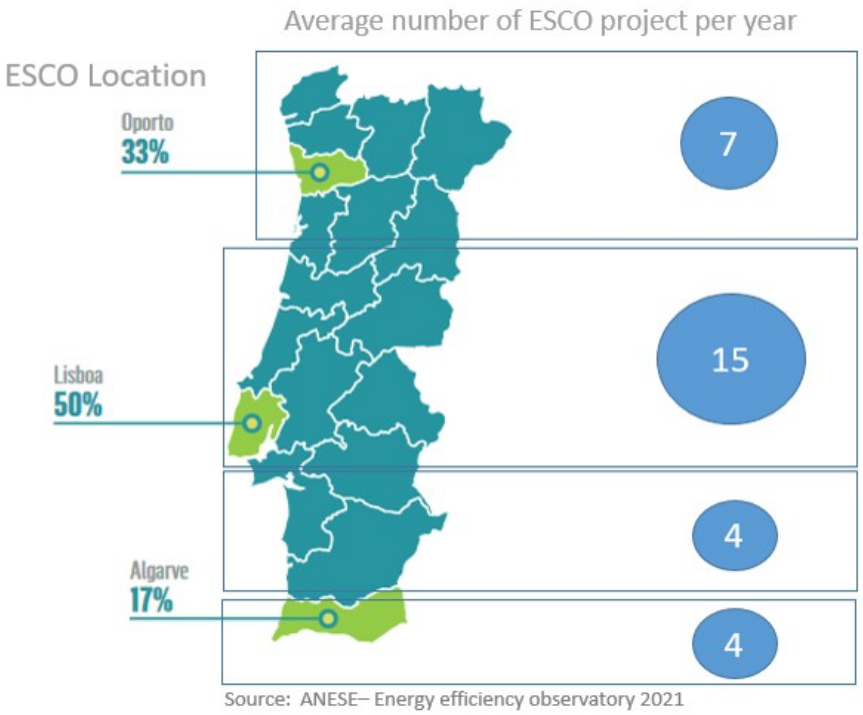

Figure 4 – Average number of ESCO project per year

The following figure presents the average achievements obtained in an ESCO project in Portugal.

Figure 5 – Average achievements in ESCO Projects

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Next figure presents a disaggregation of the implemented ESCO projects per economic sector/activity and per technologies.

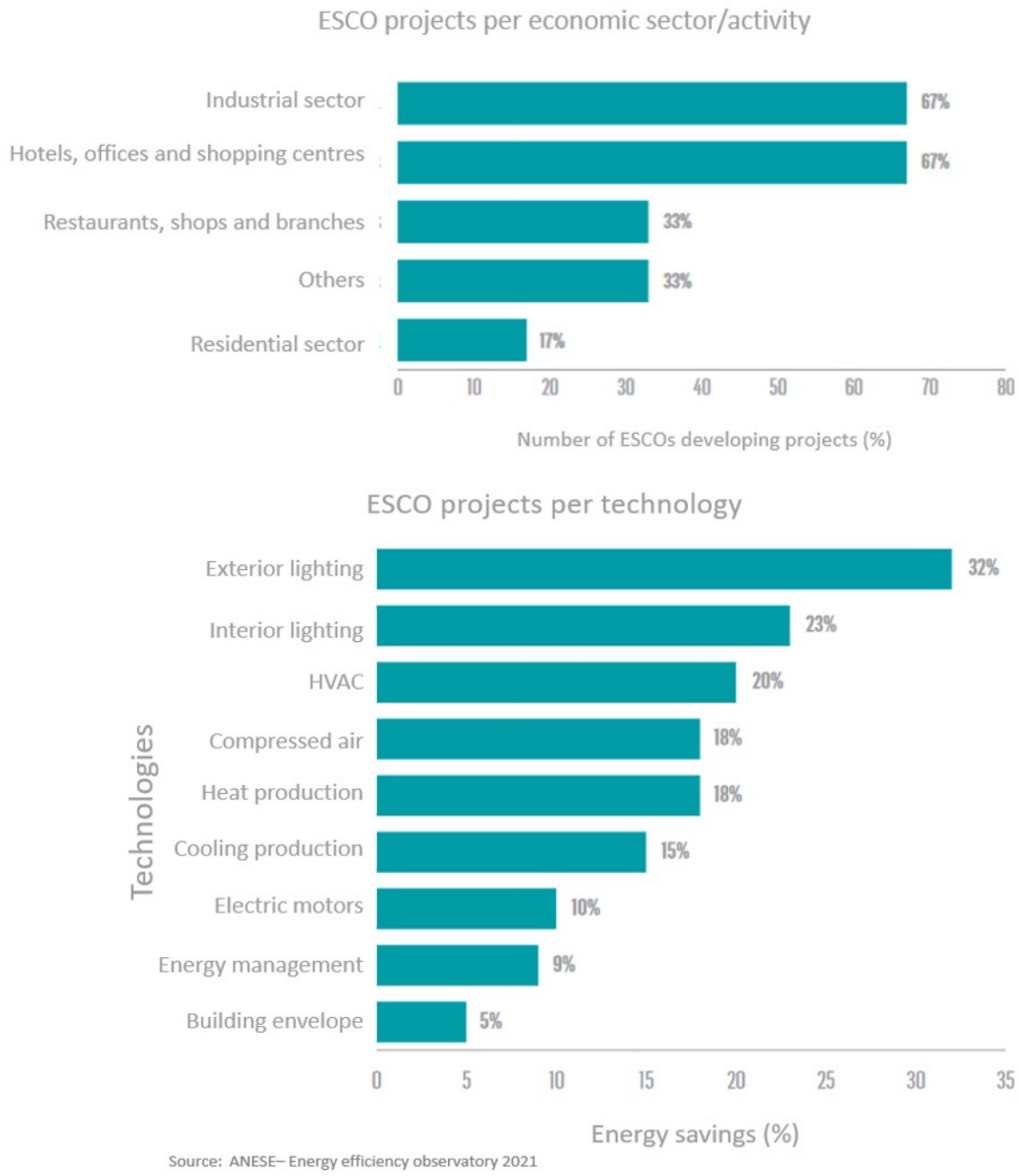

Figure 6 – ESCO projects per economic sector

The industrial and non-residential building sector are sectors that can be considered as drivers to the ESCO market. Regarding technologies, lighting is the most used technology for ESCO projects (street lighting included).

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2.1.4. France

Context and regulations

The ESPCs market trend is largely given by the many European and national regulations related to energy and environment topics.

France has stipulated several mid- and long-term legislative and strategic programmes to get the transition towards a reduction of GHG emissions, energy consumptions and an increase of the share of renewable energies while promoting sustainable economic growth and the creation of sustainable jobs. The mid-term Multiannual Energy Plan (MEP) covers the period until 2028 and sets priorities for action by public bodies and institutions in order to move towards a more efficient energy system. The MEP covers many areas among which are the renovation of building envelopes and the transition to an increased number of renewable heating systems.

Among the structuring regulations and legislations, we could list:

At the European level

- Directive (EU) 2018/2002, Energy Efficiency Directive
- Directive (EU 2019/2001, Revised Renewable Energy Directive
- Regulation (EU) 2018/844, Revised Energy Performance of Buildings
- Etc.

At the French level

- Building Automation & Control Systems (BACS) decree, obliging most of tertiary building to be equipped by BACS by 2025.
- Building Energy renovation plan. In three phases : These phases include a mandatory energy audit prior to the sale or lease of an inefficient home beginning in 2022, secondly the requirement for homeowners of inefficient homes to undertake renovations by 2028 and thirdly the application of fines to property owners if they do not comply with the obligations to renovate inefficient homes.
- Multiple financial support heat pump installations: CEE, MaPrimeRénov', etc.
- ER 2020 imposes a minimum level of renewable heat in all new buildings (individual, collective and tertiary).
- Etc.

Global market organization

In France, ESPCs offer a large range of services: including energy efficiency consulting, renewable energy installation, energy management, and energy-saving performance contracts, etc.

These companies range from multinational energy service providers to local, specialized firms. They are also often segmented into B2B vs. B2C companies.

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To help consumers (business or residential) among ESPCs, many standards, labels and certifications are set up by French Government or independent semi-public institutions (e.g., ADEME): RGE labels, NF HQE, etc.

Plenty of business models exist for these companies: Energy Performance Contracts (EPC), recurrent fees, one-shot payment, etc.

Size of the market

ESPCs French market is a very dynamic market, due to the many current policies in favour of energy transition. Several sectors, for instance heat pump installations and maintenance where demand is very strong due to policies, are basically (or will be shortly) limited by number or maintainers and installers on the market.

According to ADEME, the Energy-efficiency services market was valued to 10.6 Md€ in 2015, excluding energy supply[6]. More largely, according to INSEE, the total of French energy market in 2017 was estimated to : 26 000 companies (98% micro companies, 2% SMEs, O,2% large companies), turnover of 127 Md€, 211 000 employees.

Participating organizations

The French government plays a crucial role in fostering the ESPC market. Government agencies, such as the French Environment and Energy Management Agency (ADEME) or ANAH, provide financial incentives, subsidies, and regulatory support to encourage energy efficiency and renewable energy projects.

Dozens of organizations (federations, groups, etc.) gather compagnies of the sector, in order to set up common standards and positions to defend in front of Government: AFPAC, IGNES, FF3C, AFPG, Enerplan, AIDEE, etc.

2.1.5. Spain

Legislation on Energy Performance Contracting (EPC)

The method of contracting energy efficiency (EPC) in Spain is defined with respect to Article 18.1 of Directive 2012/27/EU, Member States will promote the market for energy services by making available to the public and regularly updated a list of Energy Service Providers.

A supplier of energy services is defined as any natural o legal person that provides energy services or applies other measures to improve energy efficiency in the installation or in the premises of the final customer, in relation to current regulations.

In Spain, this activity is regulated by Royal Decree 56/2016 of 12 February which transposes Directive 2012/27/EU on energy efficiency with regard to energy audits, accreditation of

[6] « ETAT DES LIEUX ET ANALYSE DU MARCHE FRANÇAIS DES SERVICES D'EFFICACITE ENERGETIQUE », ADEME, 2016

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energy service providers and auditors, accreditation of energy service providers and auditors and promotion of energy supply efficiency.

Article 7 regulates the requirements for the pursuit of the professional activity of the energy service provider, Article 8 for the rating and responsible declaration concerning compliance with the requirements for the exercise of its activity and Article 10 concerning the public listing of energy service providers.

Article 13 of Royal Decree 56/2016 of February 12 refers to the promotion of energy efficiency in the production and use of heat and cold.

Definition of Energy Performance Contracting (EPC)

The contracting of Energy Performance Contracting (EPC), it is a form of financing to increase the level of capital that it allows to finance the energy improvements from cost reductions. Under an EPC agreement, with an external organization (ESCO-ESE) implement projects for energy efficiency improvement or renewable energy production usisng the revenue stream of cost savings or renewable energy returns. Essentially the Energy Services Companies (ESE) will not receive their payment unless the project allows an energy saving.

Limitation in the Energy Performance Contracting (EPC)

Despite the great economic potential for energy savings in the EU, there are many limitations that have this type of contract, such as:

- High transaction cost: Payback periods under EPC contracts are not attractive.
- High fragmentation of the market: Exist a great variety of the buildings that they characterize to provide the variety of technologies and devices. It dispons a big diversity of communication protocols, lack of clear standardisation guidelines making data collection and management task more complex.
- Problem owner/renter: Owners does not have incentives for reducing their electricity costs.
- Variety of individual needs and behaviours.
- Fear of dependence on specific contractors for a long period of time.
- Inability of tenants/owners to cope with initial investments.

ESE

An energy service provider responsible for the integral management of energy installations. It assumes the initial cost of the equipment and its installation, passing it on the final customer in monthly payments and selling the energy to the final customer.

List of the energy services providers

The Ministry maintains the list of the energy service companies in accordance with Article 18.1 of Directive 2012/27/EU.

It develops a list of energy service companies in relation to the article 18.1 of Directive 2012/27/EU, manages to the Ministry for Ecological Transition and the Demographic Challenge. The details od the list are found in a link and contain the following information about the companies:

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- Commercial name
- Identification number
- Registered office
- Contact details (telephone number, e-mail, website)
- Type of services

https://www.idae.es/companies/energetic-services

The National Association of Energy Services Companies (ANESE) of Spain

The National Association of Energy Services Companies of Spain was funded in 2009. Its mission is to structuration and impulse the market of the energy services sustainable that incorporate solutions, technologies, and inversion of the vanguard, focus in promote the energy transition and mitigate the climate change. The goals that the Association promote is the creation of a leader network of companies' specialist in service, technologies and investment focus in the action against the climate change. It must be involved in structuring and developing the market for efficient and sustainable energy service models. It currently gathers 37 members among the different categories that it treasures such as the partners Gold, Silver and Bronze as well as more than 100 collaborators established with the name of members number.

EPC projects

The number of projects that the National Association of Energy Services Companies (ANESE) is developing is 10. It estimates that the volume of facturation of the energy services in Spain in 2020 have been 1.604 M€. While public sector tenders that have been registered for ESCs between the years 2019 and 2020 have been 2.452 projects.

Taking as an example the savings provided by the different technologies, it can be indicated that in recent years 53% of the savings are provided by outdoor lighting, 45% is obtained through indoor lighting, other technologies such as monitoring, and energy management provide up to 19% savings. In Spain the average duration of contracts with ESE projects is 8 years with an average amount in terms of projects of 706.000 €.

3. Engaging ESPCs

The following chapter deals with a key aspect of cooperation with national energy service companies (ESPCs). This phase is key to understanding the complex workings of ESPCs and gaining valuable insights directly from key players in the industry.

To facilitate this exploration, we have conducted interviews with national ESPCs, aiming to glean detailed information that goes beyond the surface-level understanding of their operations. The insights derived from these interviews are documented through a structured questionnaire, which is an integral part of our research process, or through structured interviews, the contents of which are described in detail in the following subsections.

The attached questionnaire, presented in Annex A of this document, serves as a comprehensive tool to capture the essence of the ESPC operations in each country. The

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questions are designed to elicit specific details about the contractual structures, services offered, challenges faced, and the overall impact of ESPCs on energy efficiency.

3.1. Reaching out to ESPCs, questionnaire survey

The form of communication during this engagement process is adaptable and has been left to the discretion of the responsible partner. Whether through the completion of the questionnaire, bilateral meetings, workshops, or any other suitable means, the goal is to foster open and transparent communication with ESPCs.

In the case of interviews, a meticulous record has been maintained to showcase the results of the investigation. This detailed record not only provides a summary of the responses but also offers insights into the nuances of the discussions, allowing readers to grasp the context in which the information was shared.

3.1.1. Slovakia

Launch meeting of the Platform for Smart Energy Services (PSES) – name decided by the stakeholders, Mr Laktiš of state agency Slovak Innovation and Energy Agency (SIES) welcomed the guests and explained PSES and its functioning. The platform is a join initiative of the project BungEES and GreenDeal4Buildings. It will focus on cooperation (excluding areas regulated by Articles 101-106 TFEU) of market participants on both the supply and demand side. The platform is expected to bring together people, assets, and data to create entirely new ways of designing, delivering and consuming smart energy services and relevant products. Relevant activities will, for example, include:

- Sharing data, know-how, best practices, innovative solutions, case studies, new business and financial models developed by international projects under EU programmes, such as the BungEES project: Developing the supply and commercialisation of a new generation of smart energy services capitalising on energy efficiency and demand-side flexibility;
- Training of experts for smart energy services and use of international projects, e.g. REPowerE(d)U project: Further education and qualification system to support the European Commission's measures to decarbonise flexibility, reduce gas consumption and smooth energy peaks;
- Standardisation of contractual arrangements between different actors;
- Networking to reach out to top experts and operators in the market;
- Market development and use of services that combine energy efficiency with other energy services, technologies, and non-energy benefits.

The platform will include:

- Energy lab, which will facilitate the design of new complex solutions;
- Market Group, which will test legislative conditions against the needs of market participants;
- Education platform that will focus on disseminating knowledge and skills related to planning, installing, maintaining, testing the smart energy systems in buildings.

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Mr Kováčik, President of the Association of Construction Entrepreneurs of Slovakia (ZSPS), welcomed the guests and explained the history and the need for the implementation of the Green Deal for Buildings project, the activities of ZSPS, expressed the need for the renovation of buildings as the future of the construction industry. He stressed that the links between the Slovak and Czech Republic in the construction industry is very good, therefore it is necessary to solve problems together. Developments in the construction and energy sector have been very turbulent in recent years and there is a need to respond to EU directives which specify the need to have buildings, formerly NZEBs, energy positive. Community energy will also be a big challenge, and smart technologies are needed for this. The link between building and energy is obvious and it is the future, which is why PSES was created. At the same time, it is important to focus on education in secondary schools and universities.

Mr Lauko, Director of Association of Energy Services Providers of Slovakia (APES SK) - took over the patronage of PSES - explained the activities of APES, stressed that performance-based projects are the way to the future, it is necessary to expand the use of smart energy services, to pay attention to the quality of the indoor environment, it will be necessary to address the involvement of all buildings in energy communities, the provision of flexibility. APES is currently implementing the Fortesi project - focusing on the implementation of technical solution packages, innovative financing, the aim is to increase EE, influencing user behaviour. He expressed the need to bring sectors together, as in the current environment it is no longer possible to address energy and construction separately.

3.1.2. Czech Republic

Communication in the Czech Republic with the Energy Service Company was conducted through meetings and mutual exchanges. The discussion was conducted in the form of deliberation on predetermined topics. The discussion was held with The Association of Energy Service Providers (APES) of the Czech Republic. The association was established in October 2010 with the aim of contributing to the sustainable development of energy services in the Czech market. The association comprises 30 of the most significant companies in the field of energy services with a proven track record.

The meeting took place at APES premises. In the first part of the meeting, the BungEES project and its activities were introduced. The project's goals and outputs that will be useful to APES members were presented. The project partners, their work, and roles in the project were introduced. Furthermore, model examples of energy services and the created models of energy services that are part of the project were presented. Subsequently, a discussion on the topic of energy services was opened. In the next part of the meeting, the topic of Non-Energy Benefits was briefly introduced, followed by an extensive discussion.

During the discussions with APES, important topics were discussed, which served as the basis for the preparation of this deliverable. Among the topics discussed were:

Knowledge and awareness of non-energy benefits;

- Experience with NEBs; Specific use of NEBs;
- Examples of specific NEBs;

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- Cooperation with clients and
- Barriers and challenges.

A more detailed description of the topics is provided in Appendix A within the description of each question in the created questionnaire.

3.1.3. Portugal

Since the Portuguese ESCO market is quite small (presently only 20 companies) a direct contact approach was made through phone calls and/or emails. Most of the contacted companies mentioned they are registered as ESCOs but currently not working in that line of business. However, the surveys on NEBs was sent and it was requested to these companies to answer it based on previous ESCO projects/experiences or on presented proposals to potential clients.

Communication with the Portuguese Energy Service Companies was made as, as mentioned above, through emails (mostly at ESCOs request the questionnaire by email because it was not possible so schedule interviews with them). In other cases, were the ESCOs were willing to participate, a semi-structured interview was made were the questionnaire was filled in an online meeting or phone call. The survey on NEBs was firstly disseminated by APESE (Portuguese ESCO Association) through its associates and later the project team contacted the ESCOs to request their participation in this survey. More than 40 questionnaires were sent to ESCOs (in some cases for more than one person in each company). However, the response rate was quite low, around 20%. During this interaction with stakeholders relevant topics were discussed with special focus on ESCOs knowledge and awareness of NEBs.

The most relevant stakeholders willing to cooperate with BungEES were Coopérnico, Cleanwatts and Veolia Portugal.

Coopérnico was officially created on 15 November 2013, founded by 16 people from different fields of expertise. Coopérnico is an energy cooperative that promotes the involvement of citizens in the creation of a new social, economic and environmental paradigm. Coopérnico develops renewable energy projects and share the benefits between investors, society and the planet. All the electricity produced comes solely from renewable sources, with the ultimate gold of creating a renewable, fair and responsible energy model that contributes to a socially, environmentally and energetically sustainable future. Coopérnico is one of the players in the Portuguese electricity suppliers market. Additionally, Coopérnico implements solar photovoltaic (PV) projects among it associates (almost 4,500), has close to 4,000 energy supply contracts and has invested more than 2 million euros (own funds) in renewable energy projects.

Cleanwatts plays an important role in the Portuguese energy market as an ESCO with special focus on the establishment of energy communities. One of its most important projects was the 100 villages energy community, an award-winning project to fight energy poverty by delivering affordable clean energy to over 25,000 families in rural areas in the centre region of Portugal. These small villages were interconnected as an energy community using PV to produce clean energy to its inhabitants. Members of the energy communities benefit from

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around 30% lower energy prices by purchasing locally sourced energy from prosumers, who in turn can increase their returns by trading surplus energy within the community. Cleanwatts has more than 100 energy communities around Europe with an aggregated solar PV capacity of over 50MW.

Veolia Portugal is a company with French origins, in the 19th century. Veolia have marked a profound transformation in areas such as water (Compagnie Générale des Eaux), energy (Compagnie Générale de Chauffe/ Montenay Group), waste (Grandjouan, Soulier) and, public transport. Veolia Portugal was founded in 1992, when Esys Montenay entered Portugal, acquiring stakes in Portuguese companies such as Tepclima and Gaspar Correia, with activities in the fields of air conditioning, special technical installations and energy. Veolia Portugal was part of several iconic projects, including the Belém Cultural Centre and the Caixa Geral de Depósitos bank headquarters in Lisbon. Additionally, Veolia Portugal has established a long-term partnership with SUCH - Hospital Common Use Services, with the aim of implementing resilient and efficient energy solutions for hospitals. Today Veolia and SUCH partnership covers 12 hospitals in Portugal. Veolia works in areas such as decarbonisation of entire value-chain in industry and commercial buildings and integrated resource management in energy, water, and industrial and commercial waste.

3.1.4. France

Due to its activities, Voltalis is in contact with dozens of ESPCs since its creation in 2006: energy suppliers, aggregators, energy data visualisation providers, heating appliances installers, EV charging points installers, etc.

Thus, results explained later in the documents are the synthesis of years of interactions with French ESPCs. Results will also include vision of Voltalis, which is a French ESPC

3.1.5. Spain

In Spain the communication for the participation of ESPC has been followed through the questionnaire provided by the leader of the work package. This questionnaire has been sent several times to a certain number of companies that are registers in the Energy Services Companies portal.

Communication has been sent to companies to recruit data in the following times:

- The 4th of August, 12 surveys were sent to ESPC companies from the Energy Services Companies list.
- The 25th of August, 17 surveys were sent to new ESPC companies from the Energy Services Companies list.
- The 4th of September, 26 surveys were sent to ESPC companies from the Energy Services Companies list like reminder to obtain it feedback.
- The 2nd of October, 42 surveys were sent to ESPC companies from the Energy Services Companies. 24 surveys were sent as reminder and 18 were sent to new companies.

The model of email sent to the providers companies of services has been the next:

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"Buenos dias

Desde Plenitude, formamos parte de un proyecto europeo conocido como BungEEs (Building Up Next-Generation Smart Energy Services Offer and Market Up-take Valorising Energy Efficiency and Flexibility at Demand-Side). El objetivo de este proyecto es la creación de ofertas de servicios energéticos inteligentes junto con la valorización de la energía y la flexibilidad de la demanda. Dentro de este proyecto, nuestros socios nos piden que realicemos encuestas en España para obtener información sobre los beneficios no energéticos (BNE).

Los beneficios no energéticos (BNE) se refieren a los beneficios adicionales o indirectos de la prestación de servicios energéticos, más allá del propio suministro de energía. Para analizarlos, se han preparado una serie de preguntas básicas para obtener un análisis de las respuestas según cada país.

Los resultados del cuestionario en el que participará se procesarán en dos documentos, el Análisis del statu quo de los BNE y el Catálogo de servicios no energéticos, que se pondrán a su entera disposición.

Por favor, rellene el documento adjunto con sus experiencias.

Un saludo y gracias,"

About the result of the obtention of the feedback by the companies, it is only 2 companies have given us their response.

3.2. Results of interviews with ESPCs

As we proceed with this chapter, the emphasis is not only on presenting the findings from the interviews but also on interpreting and analysing the data to draw meaningful conclusions. The engagement with ESPCs serves as a critical juncture in our quest to unravel the complexities of the ESPC market, offering a first-hand account of the challenges, successes, and future prospects within the energy efficiency landscape.

3.2.1. Slovakia

The exchange of information and knowledge in Slovakia on non-energy benefits was created through a discussion that was part of the inaugural meeting of the Platform for Smart Energy Services (PSES). The Platform is a joint initiative of the BungEES and GreenDeal4Buildings projects. It will focus on cooperation (except in areas covered by Articles 101-106 TFEU) between market participants on both the supply and demand side. The platform aims to connect people, their knowledge, assets and data to create entirely new ways of designing, delivering and consuming smart energy services and related products, which undoubtedly include non-energy benefits.

The following text is a summary of an extensive discussion that was held on this topic:
Mr. Karásek of SEVEn - Presented the topics of energy services and their development, development of SES business models, non-energy benefits of SES in the framework of the BungEES project, presented its consortium, deliverables, and timeline. Two partners are

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implementation carriers - Voltalis - French aggregator, at the same time one of the largest in the world in residential sector - 150 thousand households connected, short response time, sells its capacity on energy markets. The second firm – Plenitude, and Europe-wide operator, represented by its Spanish subsidiary. Plenitude applies everything that is created in the project to its business, which is unique for similar projects. The research partner is Germany's Fraunhofer. He presented the flexibility model of the family house that the project has developed. It addresses the involvement of, for example, electromobility and providing flexibility through electric vehicles and at the same time engaging in community energy. Issues to be resolved: energy management costs, installation costs, fees - who will pay them, who will own the installation? Electricity trading? Data sharing, who owns it?

Question to the plenary: should aggregation focus on residential and non-residential sector (schools, nurseries)?

The project also addresses flexibility setup, data transfer, flexibility management instructions in family homes. The morphology of energy services is questionable. The project therefore addresses the creation of business packages that companies will be able to use. These are e.g., packages for electromobility, energy and electricity storage, heat pumps, etc. They addressed whether it makes sense to focus only on electricity or to also address heat and cooling or gas.

Mr Karásek presented the Voltalis system. The flexibility system controls heating, water heating and cooling. They have not yet offered to purchase the equipment and operate it. They have tried to incorporate heat pumps, which are more complex in terms of providing flexibility. The aggregator can shut down the system for heating and hot water for a contracted period, while maintaining the comfort of the user, to trade off expensive electricity at a particular time while helping the grid and its stability and trimming peaks.

Plenitude offers a PV installation service and has about 50 installation companies contracted. They also offer provision of hot water supply, energy storage and battery storage and provide management of subsidy mechanisms.

Q: Mr Piontek (EIB ELENA) - the project also focuses on energy savings, energy communities? What should the one-stop-shop look like?

A: Mr Karásek: our goal is to integrate energy saving with RES and flexibility, it is not a goal to install PV on any house in any condition, this would lead to problems in winter when electricity will be expensive and in summer it will be almost free or in negative prices, so a combination of EE, energy saving. One stop shop - a comprehensive OSS that would provide A to Z energy has not been seen in the Czech Republic yet, it is really a complex issue. The project is focused on creating a package of services and business models so that companies are not just selling electricity but a whole package of services. Energy communities - the Czech Republic is running into legislative barriers, gradually every three quarters of a year legislation is being added, but they need to set the rules of the game and municipalities are the ones that are being stretched so far. The biggest gap is the development of energy communities in municipalities. They have future EC projects ready, but they are still waiting. A big boom can be expected when the rules are clear.

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Mr Lauko - on SR in the heating sector it is useful to focus also on multi-family buildings within the flexibility, in combination with district heating. Also, non-residential buildings should be involved.

Mr Doktor of ViaEuropa Competence Centre (ViaEuropa) - the project has a focus given by the EC, so it will not focus on gas. So far it is focused on residential sector. In Slovakia these services are not so developed and the project should bring inspiration.

Powerex (energy services provider) - What is the final product of the project? - Proposals for business models applicable to all EU countries, legal standards, one stop shop in the sense that the company would provide a comprehensive package of services on its own or in cooperation with partners. They will be publicly available.

Mr Doktor of ViaEuropa - at the same time trained professionals and experts are also needed for SES provision needs. This is what the REPowerE(d)U project is being implemented to do.

Mr Karásek of SEVEn - Non energy benefits - NEBs are additional or indirect benefits associated with the provision of energy services beyond direct energy savings. An example is a manufacturing hall, a green roof building was created, with indoor environmental management. The biggest benefit was that they didn't have to find workers, they didn't have a shortage of staff, recruiting people became very easy. Improved lighting reduces eye strain and better work productivity, better air conditioning reduces CO2 concentration, therefore work productivity, people think better. NEBs are becoming part of EPC projects as well.

What is the experience in Slovakia?

Mr Lauko of APES - every renovation aimed at increasing EE automatically brings NEB. Important whether they were also part of the contract, whether they were required. This does not happen in Slovakia. The design and build method can bring about the design of NEBs in the project. There is no guarantee required for NEBs. There is no experience, there are no clear methodologies on how to measure the achievement of NEB. Several things we cannot measure, e.g., user comfort, how do people feel in the building, reduction in employee sickness, increased work efficiency? It is counted that with the implementation of austerity measures will come NEB.

Amicus (construction company) - expressed willingness to be part of the NEB research using their zonal control technology.

Mr Nemec of Union of Cities - Can any of this be taken into the preparation of EPC projects or would it make sense to press the Ministry of Finance to drop the condition that payback be evaluated solely on energy savings without operational savings. Mr Lauko of APES - NEB also includes savings on personnel and operations, these can be quantified but cannot be applied in EPC projects. Of course, there are business models where they can be included in some way.

Mr Doktor of ViaEuropa - the NEB could also include e.g., the provision of social services (electric car transport to the doctor, etc.) by a company that provides energy services and operates an electric mobility system in the city.

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EIB presentation made by Zuzana Kaparová - Head of EIB Representation in Slovakia and Andreas Piontek - EIB ELENA Programme Specialist.

Mr Kováčik - introduced the section of the programme aimed at EIB. Slovakia is significantly underinvested and underutilised, both in public and private investment. Slovakia's problem is that we have a problem to use up the euro funds for construction investments. Grant resources and national resources cannot be enough and private and repayable resources need to be involved. We can take inspiration from abroad and apply good examples of practice. The EIB can help to improve investment.

Mrs Kaparová - The EIB is made up of the European Investment Fund and the EIB .The shareholders are the Member States, it is an EU bank. It is the EU's climate bank, it is committed to compliance with the Paris Agreement. The EIB also operates outside Europe. Largest provider of funds internationally. In its history, it has lent over EUR 4.9 trillion. They lend to the public sector but also to the private sector (corporates, framework loans to banks who then lend to businesses). EIB provides low interest rates and long maturities. The most common products are direct loans, framework loans. ELENA programme - an initiative of the EC and the EIB. It finances project preparation and investment.

3.2.2. Czech Republic

SEVEn conducted a survey in which energy service companies were contacted in order to gather valuable experiences and opinions regarding Non-Energy Benefits (NEB). This research aimed to identify and evaluate the practical aspects of utilizing NEB, their significance, and practical examples of implementation in business practice. The acquired information provides us with valuable insights into how companies leverage NEB to achieve their sustainability and efficiency goals. The following text presents the main findings and key trends of this research, themes that were discussed during the communication.

Complexity of individual packages from a production/delivery perspective

The service model being developed within the BungEES project focuses on providing service packages that allow for the individual customization of service parameters. In projects undertaken by the Association of Energy Service Providers (APES), there is likely to be an emphasis on the utilization of comprehensive packages (ideally, all-inclusive). The aim is to provide the most comprehensive services possible, ensuring a wide range of energy-saving measures. Some APES projects are already operating in areas beyond just energy efficiency.

Non-Energy Benefits, experiences and discussions

Some of the benefits of Energy Efficiency Services (EES) may not necessarily be considered non-energy benefits; for instance, the **reduction in CO2 emissions** can be regarded as part of the energy-related benefits. Therefore, it is worth considering whether benefits closely associated with energy-related gains should be viewed as distinct non-energy benefits.

> **Practical Example - School Building Renovation**
> In the Czech Republic, when addressing the renovation of school buildings, a situation often arises where the energy balance of the facility worsens due to the

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need to comply with current ventilation standards for school buildings, leading to increased energy consumption. Because the **existing building did not adequately address ventilation**, the increase in energy consumption ensures sufficient air exchange and indoor air quality improvement, even though it results in higher energy consumption.

A common benefit that contract initiators often overlook in the initial project phase is a **reduced need for personnel** due to higher automation of the building's energy system, resulting in lower operating and maintenance costs.

Another non-energy benefit of energy-saving measures, such as installing modern equipment, is **reduced equipment breakdowns** and **increased availability of spare parts**.

One of the non-energy benefits can be an **increase in safety**, which may be related, for example, to a **reduction in accidents within the building's operations**. The use of modern lighting can enhance the overall lighting comfort within the facility, prevent insufficient illumination of certain areas of the building, and potentially reduce the number of accidents. The question is how to quantify benefits of this nature and evaluate whether the measures had this benefit or not.

A similar issue arises with the enhancement of energy security. Implementing measures can lead to a **reduction in energy dependency** or an **increase in fuel diversification**, which can ensure uninterrupted operations during network outages or price spikes and potentially enhance competitiveness. Again, the problem lies in how to quantify these measures until a crisis situation occurs in which these benefits are utilized, making it difficult to assess them within the project procurement process.

Discussion on technical solutions to NEBs, control of NEBs, responses and legislation

How will the distribution respond? Will they be interested or resist?
Distribution companies may have several reasons to resist the introduction of aggregator systems:

- **Control over the grid**: Distribution companies are responsible for the operation and management of electrical grids. The introduction of aggregators could potentially mean that some control over grid operations would be transferred to these systems, which could impact the traditional role of distribution companies.
- **Disruption of the traditional model**: The introduction of aggregators and decentralized energy may alter the traditional model of electricity supply, where distribution companies provide electricity one-way—from central sources to customers. Aggregators enable customers to participate more in the production and management of their energy.
- **Economic reasons**: The introduction of aggregators can have economic implications for distribution companies. For example, if aggregators take over certain functions, the revenue from grid operation for distribution companies may decrease.

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- **Limiting investments**: Distribution companies may be interested in investing in their infrastructure and innovations and may not be willing to support the introduction of new technologies that could compete with their own investments.

The introduction of aggregators can be seen as an opportunity for innovation and modernization of the energy system, as well as a challenge to reevaluate traditional models and practices.

Centralized Remote Control

In the Czech Republic, a system of centralized remote control (CRC) is developing. This technology allows for the transmission of codes or signals that control the activation and deactivation of certain electrothermal appliances, such as boilers, electric heating, and the like. It is highly likely that when used in conjunction with an aggregator system, the CRC system will be controlled much more comprehensively and with greater reach. It can be said that the current CRC system, for the time being, performs part of the aggregator's tasks.

Aggregated Services Contract?

What will bind the customer to allow someone to control the shutdown of appliances?

- Customers should participate in the aggregator program on a voluntary basis. This means that they can voluntarily decide whether they want to integrate their appliances into the system or not.
- A predetermined period during which participating customers may temporarily reduce the consumption of certain appliances. Customers agree to limit their consumption during these times through the aggregator or system automation.
- The aggregator can offer customers flexibility in terms of consumption scheduling. Customers may have the option to set preferences for when and how their appliances can be controlled by the aggregator. For example, they can specify times when the aggregator should not affect the operation of certain devices.
- The aggregator can provide customers with notifications before it starts affecting the operation of their appliances. This allows customers to know when their consumption will be temporarily restricted and gives them the opportunity to intervene and cancel the restriction if desired.

Overall, ensuring that the customer agrees to have their appliances controlled by the aggregator should be done on a voluntary basis, respecting each customer's individual preferences and privacy. In turn, customers will be motivated by the opportunity to achieve cost savings on their energy expenses. The aggregator will offer them lower electricity prices or financial incentives associated with using flexibility in their devices and appliances. Another motivation for the customer is the convenience associated with automation and the use of new modern technologies.

Technical Parameters for Appliance Shutdown

The technical parameters for shutting down customer appliances by the aggregator may vary depending on the specific system, application, and needs.

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- The aggregator should establish a hierarchy of appliance priorities, meaning that certain appliances may be switched off before others if there is a need to reduce grid load.
- The duration and frequency of appliance shutdowns should be determined in a way that does not compromise customer comfort and appliance functionality.
- Data collection and modeling of customer consumption. The aggregator can work based on previous consumption and appliance behavior data. This can help predict when and how appliances will be used.
- The aggregator should transparently share information about how it affects the operation of appliances and inform customers about the reasons and plans for shutdowns. The aggregator should employ secure authentication and communication methods with appliances to prevent unauthorized access or interference.
- Customers should have the option to intervene and prevent the shutdown of their appliances if they so desire.

Measurement, Data Collection, and Prediction

The aggregator must monitor several key factors and parameters to efficiently respond to grid demands and optimize appliance operations. These factors help it understand the current state of the grid and energy utilization, enabling it to plan and implement appropriate measures.

- Monitor current energy consumption at various levels:
  - Overall;
  - Among individual customers or customer groups; and
  - For individual appliances.
- Monitor energy production from various sources;
- Monitor voltage and frequency of the electrical grid;
- Monitor available network capacity;
- Track demand in the energy market;
- Monitor current electricity prices;
- Monitor and evaluate historical energy consumption and production;
- Monitor and forecast weather conditions;
- Monitor the status of the energy grid, including faults, outages, repairs, etc.

Cogeneration Units in Large Buildings

In the Czech Republic, large buildings such as hospitals, shopping centers, and the like typically have backup energy sources in the form of cogeneration units. The use of these units could offer more interesting possibilities compared to residential homes.

For instance, hospitals often have cogeneration units solely as backup for emergency situations, but there is potential to utilize these units to meet the energy grid's needs. Cogeneration units can be controlled to rapidly respond to changes in electricity or heat demand. This provides flexibility in optimizing operations based on current requirements.

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During peak demand periods, cogeneration units can generate electricity and heat directly at the point of consumption, reducing the burden on the distribution grid and minimizing the risk of voltage fluctuations.

Cogeneration units offer the potential to participate in energy flexibility not only for electricity but also for thermal energy.

3.2.3. Germany

In Germany, some projects and pilots have shown that non-energy benefits can greatly improve energy service quality and energy savings. For example, NEBs like Health indoor quality, Reduction in greenhouse gas emission, identified as main NEBs in the building sectors.

When these benefits are taken into account, the financial benchmarks for all pilots have significantly improved. The payback periods of many projects have also decreased after considering non-energy benefits (M-Benefits[7]). However, for some companies, factors other than profitability have been more important in deciding to implement energy efficiency measures. Nevertheless, NBEs are not often included in the energy service contracts.

The **main obstacles to incorporating** non-energy benefits (NEBs) in energy efficiency projects are **the lack of data**, and the **often-qualitative nature of NEBs. Monetization of NEBs is notoriously difficult**, which is not particular to the German case, but nevertheless precludes the consideration of NEMs in net present value terms. Inadequate calculation of baseline savings, and poor communication of financial advantages are a result of the measurement problem. For example, investors do not include NEBs in the financial assessment of energy efficiency retrofits. In the main energy efficiency policy support scheme by the German development bank KfW, the qualification for retrofit support hinges predominantly on the achieved energy savings[8]. There are indeed broader supplementary schemes for sustainability certification that do include some non-energy benefits, but those measures are assessed as separate from the energy efficiency programs[9]. Additionally, there is a lack of developed business models that integrate energy savings and NBEs. Improving this specific focus is necessary to make NEBs more appealing to both end-consumers and service providers. For value chains in particular, research shows that companies do not consider potential benefits from coordination within the value chain, and in many cases are unaware of NEMs that can arise in this regard[10]. The narrow perspective of the individual firm is a further barrier to the integration of NEMs, which can accrue outside of a specific project within a single company.

One of the challenges in this direction is effectively communicating non-energy benefits (NEBs) and having the necessary skills to first measure, and then implement them. For instance, a heat pump installation can not only save space in buildings but also provide

[7] https://www.mbenefits.eu/
[8] https://www.kfw.de/inlandsfoerderung/Privatpersonen/Bestehende-Immobilie/Zinsvorteil
[9] https://www.foerder-welt.de/content/foerderwelt/de/wohnen/wissen-stories/Nachhaltigkeitsklasse_Qualitaetssiegel_fuer_Ihr_KfW-Effizienzhaus.html
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improved safety compared to conventional gas or oil-fired heating systems. However, these benefits are often given less priority and not adequately addressed in energy efficiency projects.

Investment in non-energy benefits (NEBs) is not the primary factor influencing decision-making in energy efficiency projects. Instead, it is more about financial decisions that allow for monitoring of energy benefits. Strategy does not extend beyond those energy benefits. There are several obstacles in market organization, such as a strong division of labor and the investor-user dilemma, as well as framework conditions that prioritize minimizing investment costs rather than considering the entire life cycle. These obstacles need to be addressed through targeted measures in order to promote the widespread adoption of NEBs in commercial buildings and achieve a breakthrough.

3.2.4. Portugal

The feedback from Portuguese stakeholders was collected using the questionnaire within the scope of this deliverable, through semi-structure interviews and informal interviews with the stakeholders. The most important conclusions, findings and key trends which were raised by the stakeholders during this interaction with the BungEES project team are:

- From end-users perspective the NEBs concept are not the most relevant point regarding implementation of energy efficiency projects. The energy savings and economics, especially upfront cost, are still the key points for implementation of energy efficient solutions. The upfront costs are still considered to be major barrier;

- ESCOs are not giving enough relevance and focus to NEBs as they should. They recognize the importance of NEBs, but they also know that for most customers the upfront investment, payback period and economic savings are the key points in the decision making process for implementing or not a project;

- The concept of demand response and/or flexibility is still an uncharted territory in Portugal (e.g. only the second half of 2024 there will be a flexible dynamic tariff that for electricity due to mandatory regulation issued by the National Directorate of Energy and Geology). There is little information available on the multiple benefits of these energy services. It is likely that with the introduction of flexible electricity tariff in 2024 more interest will raise among consumers/prosumers and more attention will be given by ESCOs to these services;

- The project team presented some typical examples NEBs (e.g. installation of high-efficiency equipment and automation systems that can result in less down-time and less maintenance requirements (number of hours/personnel); the use of adequate lighting can increase the work productivity and environment, etc. Some companies were not aware of such NEBs or have mentioned that would have difficulties in quantifying them;

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- The type of control performed by Voltalis in its clients was also mentioned by the Portuguese project team as an example. The ESCOS mentioned that the implementation of such type of service in the Portuguese market could face some significant constraints. Some examples of these constraints are:

    - Lack of knowledge and awareness of clients;
    - Fear of losing comfort and the idea of losing control of appliances at their own home;
    - Lack of trust in the system and the idea that it might damage the equipment;
    - Technical difficulties due to existence of large number of old appliances still in operation in the countries;

- ESCOs also mentioned that NEBs are not easy to quantify and that this might be the most significant barrier to its inclusion in the proposals made for their clients. This quantification needs to be clear, with a well-defined metrics that allows ESCOs to present it to their customers without any doubts, it was mentioned that "it needs to be a very clear concept";

3.2.5. France

Presentation of NEBs in France

Non-Energy Benefits (NEBs) play a growing role in the French energy market, especially for ESPCs. In 2023, it becomes rare to see a ESPC website without highlighting NEBs, and professional organizations always present NEBs in their wide public communications or in their discussion with Government entities.

In parallel, expert agencies like ADEME regularly publish reports to try to value these NEBs (or in the opposite, non-energy costs of current state), with the target to support relevant and virtuous energy services and/or technologies in their development[11].

Depending on the ESPC solution(s) and/or its target(s), different NEB are highlighted: improved health, environmental benefits, enhanced safety, etc.

Uses and roles of NEBs in ESPCs

Environmental benefits (in global, and especially GHG emissions) have progressively become a very important argument for ESPCs due to:

- Environmental policies constraining market players and end-users to adapt in favour of more sustainable and eco-friendly behaviour (with potential penalties, thus giving a money value to environmental actions)
    - For instance, large companies are obliged to provide a yearly HSE report, detailing environmental actions

[11] For instance "Social cost of noises in France", ADEME, 2021 : https://librairie.ademe.fr/air-et-bruit/4815-cout-social-du-bruit-en-france.html

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- For instance, in buildings sectors:
  - Environmental performance of the building is now always considered in the different building's labels: LEED, NF HQE, BREEAM, etc.
  - In France, Energy Performance Diagnosis (DPE), that are mandatory to rent / sell its house or apartment, now take into account CO_2 emissions of the housing and housings with low ratings can no more be rent or sold
- Awareness and commitment from citizens on this topic, for personal purposes and within their professional activity

For these reasons, environmental benefits given by ESPCs solutions are often presented as one of main arguments of these ESPCs: in France, NEBs play a key role in marketing differentiation of ESPCs.

Practical example - Voltalis

At Voltalis, we use several arguments to convince end-users to install Voltalis solution:

1. Make energy savings
2. See/follow energy consumptions
3. Pilot his heating appliances, having a smart thermostat ➔ Partial NEB, about increasing housing comfort
4. Have an environmental behaviour (avoid CO_2 emitting thermic power plants) ➔ NEB
5. Have a solidarity behaviour (participate in power grid balancing, contribute in avoiding blackouts) ➔ NEB

Among these arguments, several of them are NEBs: comfort, environment, solidarity behavior with power grid[12].

Solidarity with power grid, which is the business core activity of Voltalis, plays progressively a key role in Voltalis argumentation. Several years ago, this argument was given to explain Voltalis business model (and why our solution provides energy savings being free), but progressively it has become a solid argument to convince end-users to install Voltalis solution, often coupled with environmental argument. Especially since 2022, French power grid presents serious stress with concrete risks of shedding or even blackouts[13]. This situation led to massive communication campaigns to sensitize citizens about grid balancing issues, and largely contributed to help ESPCs contributing to power grid stability to use this NEB to convince end-users.

Quantification of the NEBs can help, depending on the nature of the NEB. For instance, comfort increase and personal solidarity / participation to power grid stability are not so

[12] Results of Voltalis prosumers survey (D2.4) will provide quantified elements about arguments that are mainly considered by Voltalis subscribers
[13] Due to a combination of multiple factors, including nuclear power plants maintenance

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relevant to quantify, while quantification of environmental benefits, and especially GHG emissions cuts, presents real impact to convince end-users. That is why in 2019, Voltalis realized a detailed GHG study[14], to conclude about -70% in GHG emissions for end-users using Voltalis solution.

3.2.6. Spain

Eni Plenitude Iberia S.L. released the survey in that contact with energy services companies with the goals to obtain important information and experience about the No Energy Benefits (NEBs). The research was aimed at identifying the use of NEB. This information will give us a knowledge of how companies in Spain have positioned the NEBs and the importance they give.

Attached to this document are the surveys conducted with the two companies that responded to them.

3.3. Summarize the measures used in implemented projects

3.3.1. Portugal

In Portugal, since so far there is no significant focus on NEBs, ESCOs usually consider NEBs as any other benefit and no clear or specific separation is made between energy and non-energy benefits.

Additionally, depending on the target client, different approaches are made by ESCOs. For residential customers that show high concern with sustainability, ESCOs usually give special focus on their proposals to matters that can be included in NEBs and presented them as advantages or benefits of the project. By doing this, NEBs are used as a way to attract these clients that are more motivated with energy transition and environmental sustainability. In these cases, ESCOs give focus on their commercial proposals to:

- Impacts in terms of emissions reduction;
- Reduction of the carbon footprint;
- The importance of being eco-friendly to protect future generations;
- Importance of contributing for a greener and sustainable future to preserver biodiversity and the environment.

For other clients the economic part (savings and upfront cost) is the main motivation and in these cases ESCOs give more focus on their proposals to these issues.

But most often NEBs are only mentioned since some of them are very difficult to quantify. When the ESCO clients are companies, ESCOs have to adapter their commercial offer and need to presents additional advantages that the project may bring to the company (in addition to the above NEBs). Some of these advantages are:

[14] The study has been realized by an independent French expert company Carbone 4

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- Improved worker productivity;
- Free publicity to the company, allowing to be present as an environmentally friendly business;
- Showing that the company has social responsibility and is concern with environmentally sustainable and with the community living standards;
- The fact that the project allows fulfil potential needs to reduce energy consumption, most often these needs are mandatory in case of big consumers and are include in energy reduction agreements;
- Cost reduction in operation during the building/facilities lifecycle;

Some of these items are quantifiable (the last two points that deal with energy savings and cost reduction), however the first three points are not tangible and harder to quantify in a clear way.

3.4. Market role of ESPCs in the target countries

3.4.1. Czech Republic

The following text summarizes practical experiences from the Czech Republic, demonstrating how non-energy benefits are approached, utilized, and evaluated. It also presents insights into customer interest, their requirements, and their engagement with NEBs.

The issue with incorporating non-energy benefits into the decision-making process during the procurement of a contract lies primarily in the inadequate quantification. It is not possible to precisely determine the values that energy-saving measures will lead to. Consequently, comparing projects and evaluating the winning bid becomes challenging. Therefore, projects often resort to limiting, omitting, and standardizing requirements to make the remaining demands quantifiable. As a result, the benefits typically revolve around energy reduction or cost savings, which are easily measurable and verifiable. However, when it comes to non-energy benefits, proving whether energy-saving measures have contributed to them is exceedingly complex.

Non-energy benefits are often part of projects in the Czech Republic but are treated as standardized benefits achieved through the utilization of any type of measure, precisely because of the lack of quantification possibilities.

A different situation arises when changing technologies and building operations, where it is possible to quantify, for example, a reduction in the number of employees and the associated costs or the benefits in terms of water savings.

In the initiation of projects, data characterizing the initial state is often missing; only short-term measurements before the project may be available, or sometimes no data are available at all. Therefore, after the project is completed, evaluating the change and the achieved benefits becomes extremely challenging.

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3.4.2. Portugal

Most often NEBs are already incorporated in the ESCOs business proposals presented to customers, however they usually associate them with all other types of benefits. There is no clear separation and/or quantification of NEBs in ESCO projects, but some NEBs are mentioned in the business proposals.

The main problem lies on the quantification of some of the NEBs. Most often NEBs have an inadequate/non-existent quantification, because it is very difficult to precisely determine the impact that a specific NEB has on each energy-saving measure or in a project when they are affect by external factors (climate, human behaviour, indirect impacts such as people awareness, publicity effect, etc.).

Due to this fact, usually procurement procedures do not include the quantification of NEBs as requirement and/or do not consider it in the decision process to choose a winning bid. Consequently, bids are usually graded considering the total overall upfront cost and savings (energy savings and economic savings) which are easily quantifiable, measurable and verifiable.

When it comes to non-energy benefits, with the exception of emissions reduction which are easily quantifiable, usually ESCOs use standard values to quantify the impacts or even use qualitative indicators for NEBs (e.g., impact in living standards, etc.).

The ESCO market in Portugal is **still developing at a slow rate**, with most of the contracts developed made in the public street lighting, which is under the municipalities responsibility, and in decentralized production of electricity using solar photovoltaics systems mostly in large companies or in municipality buildings. In the last couple of years, the concept of energy communities and more recently the energy crises (due to war in Ukraine) gave a boost to the market increasing consumer awareness due to the high prices of energy (electricity and gas) and revealed the importance of a faster transition to clean energy systems. It is likely that due to these factors the market will have a faster growth over the next few years. Namely if financial support (from the banking sector) is available, ESCOs can have a significant growing role in the energy transition.

3.4.3. Spain

In Spain we can summarize the experiences that have been had in relation to how non energy benefits are found, addressed and used. Highlights of customer interest, requirements and commitment to the NEB are presented.

The problem when evaluating and quantifying non-energy benefits (NEB) is the ignorance on the part of the final customer and the littles clarification of this service in the current energy efficiency products that are being sold by not giving added value to this extra.

These NEBs, is related to efficiency projects, but they are hardly measurable being from an improvement in health by reducing emission, a reduction in absenteeism, improved learning outcomes through better training facilities, increased production as costs are reduced and

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profits are increased, as well as improving working conditions, workers perform their work more efficiently.

These NEBs should be used to build better business cases currently it seems that one of the most effective ways to create better business lines is the valorisation and identification of clear non-energy benefits (NEBs).

To make better business cases with the use of non-energy benefits it is proposed to follow the following steps:

- Identify the EE Project and energy cost savings.
- Identify the NEB
- Link the NEB to a strategic value creation.
- Assess the financial value and include it in the financial assessment along with energy cost savings.
- Capture strategic and financial value and include it in the feasibility study.

4. Technical solutions used to assess NEBs

NEBs encompass a wide range of non-energy benefits, such as improved air quality, increased comfort, enhanced productivity, and reduced environmental impacts. Technical assessment ensures a systematic and comprehensive evaluation of these benefits alongside energy savings. Technical assessments provide decision-makers with quantifiable data and insights into the value of NEBs, enabling more informed and balanced decisions regarding the implementation of energy projects or policies. Common technical solutions and methods used for assessing NEBs:

- **Data Analysis**: Leveraging data analytics tools and techniques can help analyse various data sources, such as energy consumption data, environmental data, and social data, to quantify and assess NEBs. Statistical analysis can reveal correlations and trends related to non-energy benefits.
- **Case Studies**: Conducting in-depth case studies of specific energy efficiency or sustainability projects can provide insights into the NEBs achieved. This approach often involves a combination of interviews, data analysis, and site visits.
- **Simulation and Modelling**: Simulation and modelling tools can be used to estimate and project non-energy benefits. For example, economic models can forecast job creation and economic growth resulting from energy projects.
- **Benefit-Cost Analysis (BCA)**: BCA is a standard economic method that can be adapted to assess NEBs by considering both quantitative and qualitative non-energy benefits and costs. It helps decision-makers evaluate the overall desirability of a project.
- **Social Cost-Benefit Analysis (SCBA)**: SCBA is a comprehensive approach to assessing NEBs. It involves quantifying and monetizing both energy and non-energy benefits and costs, allowing for a holistic evaluation of the project's impact.
- **Environmental Impact Assessment (EIA)**: For projects with environmental NEBs, conducting an EIA can be a crucial technical solution. EIAs evaluate the potential

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environmental impacts of a project, including positive non-energy benefits like reduced emissions or improved air quality.

- **Surveys and Questionnaire**s: Gathering data through surveys and questionnaires can help assess NEBs by directly asking stakeholders or beneficiaries about their experiences and perceptions of non-energy benefits. This qualitative data can be valuable for understanding the social and economic impacts.

4.1. National level

The following chapter summarizes the key findings in the field of assessing Non-Energy Benefits, obtained during the analysis. The assessment is divided by partner countries for a better overview and comparison of situations among countries.

4.1.1. Czech Republic

In the Czech Republic, non-energy benefits are often included in projects, but they are frequently perceived as standardized benefits assumed to be achieved when any type of energy-saving measure is implemented. This perception stems from the challenges associated with quantifying these benefits and the uncertainty surrounding their specific attainment. Therefore, it is evident that a challenge for the future may lie in finding effective methods and tools for quantifying and verifying non-energy benefits, enabling their better integration into decision-making processes and ensuring that they are properly valued and considered within projects and procurement.

The problem associated with incorporating non-energy benefits into the procurement decision-making process is primarily linked to their challenging quantification. One key aspect is the inability to precisely determine the values that different energy-saving measures would lead to. This uncertainty complicates subsequent project comparisons and the evaluation of winning bids. As a result, strategies of reduction, elimination, or standardization of requirements are often employed, leaving behind requirements that can be quantified, at least approximately. This leads to a preference for benefits associated with energy or cost reduction, as they are relatively easy to measure and verify. Conversely, non-energy benefits usually remain insufficiently documented and challenging to substantiate.

4.1.2. Portugal

In Portugal, NEBs are usually included in energy efficiency projects, and usually ESCOs combine only some types of benefits in their proposals. This happens due to the difficulties in the quantification of NEBs. This quantification can be challenging due to inherent complexities associated with capturing and measuring intangible factors. NEBs are usually related to the positive impacts that result from energy efficiency or sustainability measures but are not directly related to energy savings. In Portugal NEBs usually include improvements in indoor air quality, enhanced occupant comfort, increased productivity, and impacts in reduction in environmental footprint.

Some of the problems and challenges associated with the quantification of NEBs mentioned by ESCOs are:

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- Often NEBs are subjective and can vary among different stakeholders, making it difficult to establish standardized measurement criteria;

- NEBs can be interconnected, making them challenging to isolate and measure individual benefits accurately. For example, improved indoor air quality may contribute to enhanced occupant health, which, in turn, could have impact in workers/people productivity. Measuring these benefits over extended periods can be challenging, especially when there are other factors influencing the outcomes;

- The collection of data required to quantify NEBs can be resource-intensive and the reliability of this data can also be a concern, particularly when relying on self-reporting measures such as occupant satisfaction or productivity;

- Assigning monetary value to non-energy benefits is often necessary for comparison with energy savings, but it can be challenging due to the subjective nature of some benefits. There are no valuation methods, such as IPMVP (International Performance Measurement and Verification Protocol) which is universally accepted. There is a need for a similar methodology for grading NEBs;

- There is a lack of standardized methods and metrics for quantifying certain non-energy benefits, making it difficult to compare results across different projects or industries;

- Building environments are dynamic, and occupant behaviors and preferences can change over time. This dynamic nature introduces additional complexities when trying to quantify NEBs that are depend on occupant satisfaction or behavior;

Considering all of the above, ESCOs tend to prefer to use the energy benefits that are quantifiable, measurable and verifiable (energy savings or cost reduction) by using well-established international protocols such as IMPMV. Most often NEBs are mentioned using a qualitative grading system or are only mentioned due to its positive potential to improve livings standards, working condition, etc.

Summarizing, in Portugal NEBs are usually neglected and ESCOs are not taking full advantage of these benefits due to lack of international recognized methods and regulation to support the clear quantification of NEBs.

4.1.3. France

In France, NEBs are often considered as “co-arguments” of a solution, besides the energy benefits (or direct money benefits) permitted by the solution. Depending on the nature of these NEBs, they are not always directly quantified but often qualitative, that can minimize their contribution in decision-making processes, in particular for ESPCs with B2B activities.

However, public standards and private labels with energy and/or environmental issues try to include these NEBs in their ratings: that could participate to support NEBs valuation in ESPCs solutions comparisons.

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4.1.4. Spain

In Spain, non-energy benefits have been studied and the companies surveyed are not very familiar with the concept as it is not developed and within these two companies, they have answered one if they know the concept and apply it, the other company has no knowledge of this. Within a particular knowledge of our company on non-energy benefits is not developed within the offers that are made in the company, but it is an option to implement within the company itself to give value to non-energy benefits and encourage them in the services offered in the energy sector.

It is found that the development of tools for the quantification and valorisation of non-energy benefits is important because these benefits lead. A key aspect is the inability to accurately determine the values to which different energy saving measures would lead. This uncertainty complicates subsequent comparisons of projects and the evaluation of winning bids.

4.2. EU level

In this chapter explore the technical solutions instrumental in evaluating Non-Energy Benefits (NEBs) at a European scale. NEBs, encompassing a broad spectrum of positive outcomes beyond direct energy savings, require nuanced assessment methodologies. Understanding the technical underpinnings of these evaluations is essential for comprehending the holistic impact of energy efficiency initiatives.

The chapter delves into advanced tools and methodologies employed in the assessment of NEBs. From data analytics and modelling software to innovative monitoring techniques, these technical solutions enable a thorough examination of the multifaceted benefits associated with energy efficiency projects. This exploration not only highlights the complexity of NEB assessments but also underscores the importance of employing sophisticated tools to capture the full spectrum of positive impacts.

By scrutinizing the technical landscape, this chapter aims to provide insights into how European-level assessments of NEBs are conducted. The utilization of state-of-the-art technologies not only enhances the accuracy of assessments but also contributes to the formulation of policies that go beyond immediate energy savings, fostering a more sustainable and resilient future for the continent.

4.2.1. Collaborative initiatives for Non-Energy Benefits Standardization

The M-Benefits project, funded by the European Union and accessible at www.mbenefits.eu, has collaborated with the European Standardisation Body (CEN-CENELEC) to initiate the process of creating a new EU standard. This standard is designed to empower companies and organizations in identifying, quantifying, monetizing, reporting, and communicating the non-energy benefits associated with investments in energy efficiency.

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The insights and expertise acquired during the M-Benefits project have been shared with members of the Standardisation Body, Sector Forum Energy Management and Energy Transition (SFEM). This collective knowledge has served as a foundation for the proposed standard titled "Values and Benefits of Decarbonisation and Energy Performance Actions: A General Framework for Assessment."

Standardisation focusing on "Energy management and energy efficiency in the framework of energy transition," is seeking support from stakeholders to facilitate the development of this new standard. This standard aims to enhance capacity building and foster market uptake. The initiation of the standard development is scheduled shortly after the summer break, and it will involve a dedicated call for experts from across Member States[15].

The objective of this proposed standard is to complement existing standards related to Energy Audits, Energy Management Systems, Valuation of Energy-related investments, and Energy Performance Contracts. The overarching goal is to mitigate implementation risks associated with the Green Deal[16].

5. Identification of consumers' needs

In this part of the text, customer needs identified during the creation of SQA are listed. Customer needs are divided into chapters to make them easier to work with and clustered by topic. Selected topics include the following:

Health: Customers may need to improve air quality and reduce the risk of health problems, such as respiratory illnesses. They may prefer energy-efficient homes and appliances that reduce exposure to harmful substances.

Comfort: Customers may need to improve comfort in spaces such as offices, stores, or homes. Energy-efficient buildings and appliances can provide better temperature regulation, improve lighting quality, and reduce noise levels.

Safety: Customers may require better safety in areas such as parks, streets, or homes. Energy-efficient lighting and security cameras can improve visibility and reduce the risk of accidents.

Environment: Customers may be sensitive to environmental issues and require energy-efficient and environmentally friendly technologies. For example, they may prefer renewable energy sources that reduce greenhouse gas emissions and air pollution.

Economic opportunities: Customers may need better access to energy for business and income-generating opportunities. For example, reliable and high-quality electricity can be important for utilizing modern technologies in small businesses and for developing local economies.

[15] https://cordis.europa.eu/programme/id/H2020_LC-SC3-EC-4-2020
[16] https://cinea.ec.europa.eu/news-events/news/powerful-collaboration-standardise-value-non-energy-benefits-energy-efficiency-investment-decisions-2022-05-17_en

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6. Variety of implementation of non-energy measures

This chapter delves into the diverse landscape of implementing non-energy measures (NEMs) across different contexts and sectors. Non-energy measures, encompassing a wide array of actions beyond direct energy savings, play a crucial role in comprehensive energy efficiency strategies. Understanding the variety of approaches to their implementation sheds light on the adaptability and effectiveness of these measures in addressing unique challenges.

The chapter begins by exploring the different sectors where non-energy measures are prominently applied. Whether in industrial settings, commercial establishments, or residential areas, each sector presents distinct opportunities and challenges for the integration of NEMs. Examining the variety of contexts allows for a nuanced understanding of the tailored strategies required to maximize the impact of non-energy measures.

The role of technology and innovation in driving the variety of non-energy measures is a focal point of this exploration. From smart building solutions to advanced monitoring systems, the integration of technological advancements contributes significantly to the effectiveness and efficiency of NEM implementation. Understanding the technological landscape is essential for stakeholders seeking to optimize the outcomes of non-energy measures in their respective domains.

Smart Building Solutions in Commercial Spaces: Implementation of non-energy measures in commercial buildings involves the integration of smart technologies for lighting, heating, and cooling systems. Smart sensors and automation not only enhance energy efficiency but also contribute to improved occupant comfort and productivity.

Residential Energy Retrofits: In the residential sector, non-energy measures may include home energy retrofits, where energy-efficient appliances, insulation, and smart home devices are installed. This approach not only reduces energy consumption but also enhances the overall living environment and property value.

Industrial Process Optimization: Industries often implement non-energy measures through process optimization. This may involve upgrading equipment, implementing waste heat recovery systems, and adopting circular economy principles. These measures contribute not only to energy savings but also to resource efficiency and waste reduction.

Green Infrastructure in Urban Planning: Non-energy measures in urban planning can take the form of green infrastructure initiatives, such as the incorporation of green roofs, permeable surfaces, and urban green spaces. These measures enhance environmental sustainability, mitigate heat island effects, and improve overall urban liability.

Health and Well-being Programs in Commercial Offices: Beyond direct energy considerations, non-energy measures in commercial offices may include health and well-being programs. These initiatives can involve ergonomic office designs, indoor air quality improvements, and wellness amenities. The resulting benefits include increased employee satisfaction and productivity.

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Community-Based Renewable Energy Projects: Non-energy measures are also evident in community-based renewable energy projects. Initiatives like community solar installations not only contribute to clean energy generation but also foster community engagement, local economic development, and energy resilience.

Circular Economy Practices in Manufacturing: Manufacturing sectors can implement non-energy measures by adopting circular economy practices. This involves recycling, reusing, and remanufacturing materials to minimize waste generation. Such measures align with sustainability goals, reduce environmental impact, and optimize resource use.

7. Combination NEBs with other energy services

The effective implementation of energy efficiency measures not only leads to direct energy savings but also brings about a range of additional benefits known as Non-Energy Benefits (NEBs). These NEBs encompass various aspects such as improved indoor air quality, enhanced occupant comfort, reduced greenhouse gas emissions, and increased resilience of energy systems. Recognizing the importance of these additional benefits, the focus of this chapter is on exploring the combination of NEBs with other energy services.

Combining NEBs with other energy services offers a promising opportunity to maximize the overall impact of energy efficiency initiatives. By integrating NEBs into comprehensive projects and strategies, stakeholders can unlock multiple co-benefits and create synergies that go beyond energy savings alone. This approach not only addresses energy consumption but also contributes to broader sustainability goals, health and well-being, and the overall quality of the built environment.

The following text of deliverable explores the combination of NEBs with other energy services, with a specific focus on the practices and experiences of Energy Service Provider Companies (ESPCs) in the European Union (EU). By examining the role of ESPCs and their current practices in relation to NEBs, we aim to gain insights into the diverse range of measures implemented by ESPCs and their effectiveness in delivering combined benefits.

By analysing the combination of NEBs with other energy services aims to provide valuable insights for policymakers, energy service providers, and stakeholders involved in energy efficiency efforts. Understanding the potential synergies and challenges associated with integrating NEBs into broader energy strategies will contribute to more informed decision-making and the development of effective policies that prioritize holistic benefits for both the environment and society.

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8. Conclusion

All countries emphasize the importance of energy efficiency and the search for innovative ways to reduce energy consumption. Quantifying NEBs presents a challenge, and countries collectively grapple with the difficulty of measuring these non-energy benefits, requiring clear metrics and standards.

Across all countries, there is a discussion about changes in the traditional electricity supply model. Experts are trying to understand how new technologies and services can enable consumers to have greater participation in the production and management of their energy. Everywhere, there is also a **shared challenge in incorporating NEBs into energy projects**, with a **lack of data and the difficulty of quantification being common obstacles**.

However, differences between countries are apparent. Each country has its own legislative environment, influencing its stance on energy communities and other projects. Distribution companies in individual countries may react differently to the introduction of aggregation systems and decentralized energy, for reasons such as concerns about control over the energy grid.

Financial considerations are also a crucial factor. Countries vary in their approach to financing energy projects, even within the support provided by institutions like the European Investment Bank (EIB). Some countries highlight the role of NEBs, as seen in France, while in other countries, such as Portugal, NEBs are perceived with lower priority compared to energy savings and economic considerations.

Technical solutions used to assess Non-Energy Benefits (NEBs) exhibit significant similarities and differences across the examined countries.

At the national level, all countries emphasize the importance of energy efficiency and the exploration of innovative ways to reduce energy consumption. Although the quantification of NEBs poses a challenge for all countries, there is a highlighted **need for clear metrics and standards for their measurement**.

In the Czech Republic, NEBs are often included in projects but are frequently perceived as standardized benefits achievable with any energy-saving measure. The challenge lies in finding effective methods and tools for quantifying and verifying NEBs, enabling their better integration into decision-making processes.

In Portugal, NEBs are typically included in energy efficiency projects, but quantification is challenging due to complexities associated with measuring intangible factors. ESCO companies face issues with the subjectivity and interconnectedness of NEBs, making it difficult to isolate and accurately measure individual benefits.

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In France, NEBs are often considered as "co-arguments" alongside energy benefits, with their evaluation being qualitative. Standards and labels aim to incorporate NEBs into their ratings, potentially contributing to supporting NEBs' valuation in solution comparisons.

In Spain, NEBs have been studied, but some companies are not familiar with the concept. The development of tools for quantifying and valuing NEBs is considered important, emphasizing the need for accurate determination of the values associated with different energy-saving measures.

Overall, the approach to energy services and NEBs depends on local conditions, legislation, and priorities in each country. The quantification of NEBs remains a challenge at both technical and regulatory levels, and future efforts should focus on seeking common standards for the effective integration of these benefits into energy projects.

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Annex A: Questionnaire for communication with ESPC

Sub-task 2.3.1 Survey

Instructions

The purpose of the survey is to find out as much information as possible about non-energy benefits. The questions selected and prepared are the core questions to be answered. These questions can be supplemented with any additional questions that will deepen the information on the topic. Further information can also be obtained through consultations, seminars or video interviews to help get an overview of the current situation.

Questionnaire label:

ID of survey: …

Introduction to non-energy benefits

Non-energy benefits (NEBs) refer to the additional or indirect benefits that come with the provision of energy services, beyond the direct provision of energy itself. For example, energy-efficient lighting can provide better lighting quality and reduce eye strain, leading to improved productivity and job satisfaction. Similarly, efficient air conditioning systems can improve productivity, as well as indoor air quality and reduce the risk of respiratory problems. Renewable energy technologies like solar panels can also provide benefits such as reduced greenhouse gas emissions and improved local air quality.

NEBs are important to consider when evaluating energy service options because they can help justify investments in more efficient and sustainable energy systems. While these benefits are not always easy to quantify or monetize, they can provide significant value to individuals, businesses, and society.

Non-energy benefits (NEBs) can take many forms and can vary depending on the specific context and energy service being provided. Here are some examples of different types of NEBs:

- Improved health;
- Increased productivity;
- Enhanced safety;
- Environmental benefits;
- Increased economic opportunities;
- Improved students' performance and learning condition.

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Questions:

A) Information about the respondent:

Organisation name:	…
Country	…
Website:	…
Contact person:	…
Email address:	…
Date:	…
Responsible BungEES Partner:	…

B) Basic questions and thematic areas

1) Knowledge and awareness of non-energy benefits (NEBs)

- Have you already encountered NEBs in the process of your work? Can you describe one of this NEBs in your work, for example if you have air conditioning or other equipment.
- How do you define non-energy benefits in relation to your energy services?
- What aspects do you consider as non-energy benefits?

2) Experience with NEBs

- What specific types of non-energy benefits can be associated with your energy services?
- Have you experience with Non-Energy Benefits in your work?

3) Specific use of NEBs

- Do you include Non-Energy Benefits in the evaluation of the cost-effectiveness of the implemented measures?
- How do you measure and evaluate non-energy benefits?
- Do you use any standardized metrics or procedures?
- How do you prioritize and balance the focus between energy savings and non-energy benefits in your project planning and decision-making processes?
- Which of the Non-Energy Benefits do you use most often when evaluating the efficiency measures impacts?

4) Examples of specific NEBs

- Can you provide examples of specific projects where you have identified and achieved non-energy benefits?
- What were these Non-Energy Benefits, and how did the project contribute to their achievement?

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5) Cooperation with clients

- Have you registered customer interest in Non-Energy Benefits resulting from the proposed measures?
- What methods or approaches do you use to engage clients in discussions about Non-Energy Benefits?
- Do you provide guidance or assistance to clients in quantification or monetizing Non-Energy Benefits?
- Do you have specific tools or frameworks to help clients identify and articulate their non-energy benefit goals?
- How do you communicate/disseminate the Non-Energy Benefits to your clients and stakeholders?
- Do you receive feedback from clients regarding non-energy benefits?

6) Barriers and challenges

- What are the main barriers to identifying, evaluating, and achieving non-energy benefits?
- How do you see the role of non-energy benefits in energy services evolving in the future?
- What challenges and opportunities do you see?
- How do you consider addressing these challenges?

C) Recommendations and feedback

- Do you have any recommendations for improving the identification, assessment, and attainment of non-energy benefits?
- Could you recommend any resources that discuss non-energy benefits in the field of energy services?

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