Smart energy services to solve the **SP**lit **IN**centive problem in the commercial rented sector

Call topic: H2020-LC-SC3-2018-2019-2020
Start date of the project: 01/09/2021
Duration: 36 months

D3.4 – SMARTSPIN SERVICE DEFINITION

Due date	**31 August 2022**	**Delivery date**	**12 October 2022**
Work package	Work Package 3		
Responsible Author(s)	Daniel Ring, Dilara Goker		
Contributor(s)	Ruchi Agrawal, Luciano De Tommasi, Nikos Skordoulias, Stergios Kokorotsikos		
Dissemination level	Public		

Version and amendments history

Version	Date (MM/DD/YYYY)	Created/Amended by	Changes
V0.1	17/08/2022	LS	First draft
V0.2	26/08/2022	LS	Second draft
V0.3	19/09/2022	LS	Third draft
V0.4	28/09/2022	LS	Fourth draft
V0.5	10/10/2022	IERC	Quality Review
V1.0	12/10/2022	IERC	Final Review and Submission

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033744.

TABLE OF CONTENTS

List of Figures

List of Tables

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033744.

List of Abbreviations

Abbreviation	Meaning
BMS	Building management system
DR	Demand Response
EEaS	Energy Efficiency as a Service
EPBD	Energy Performance of Buildings Directive
ESCO	Energy Service Company
ESG	Environment, Social, Governance
EU	European Union
EED	Energy Efficiency Directive
EEaS	Energy Efficiency as Service
EU MS	European Union's Member State
FM	Facility Manager
FMCO	Facility Management Company
GRF	Green Revolving Fund
IPMVP	International Performance Measurement and Verification Protocol
MEETS	Metered Energy Efficiency Transaction Structure
M&V	Measurement and Verification
O&M	Operation and Maintenance
OBF	On-bill Financing
OECD	Organisation for Economic Co-operation and Development
P2P	Peer to Peer Energy Trading
PPA	Power Purchase Agreement
RES	Renewable Energy Sources
SC	Shopping Centre
SMEs	Small and Medium Enterprises

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033744.

EXECUTIVE SUMMARY

SmartSPIN is an EU Horizon 2020 research project that aims to develop smart energy services in the commercial rented sector to solve the split incentive issue. To address the barriers involved in this issue and improve the energy services market, a new energy service model has been established and is discussed within this deliverable.

Considering the recommendations and the findings from WP2 and WP3, and following a discussion on the roles of energy efficiency service providers, landlords and tenants, the SmartSPIN service has been defined with its key features including a lease agreement review, building energy saving potential analysis, introduction of smart monitoring, data analytics, advanced measurement and verification through continuous monitoring, efficiency upgrades for engineering systems and building fabric and further potentially introducing onsite generation, storage, demand side management, dynamic tariffs and optimised energy procurement mechanisms for commercial buildings.

The proposed energy service model considers the varying opportunities and barriers in the market. Landlord-tenant landscape requires a case specific approach when it comes to the building energy services and investments around it. Depending on the tenancy period, ownership and management flexibility of the engineering services in the built environment, motivation of engagement of parties might vary. Depending on the level of interventions, tenants and/or landlords might be more involved in energy agreements and investments. Funding of investments for efficiency interventions could be via performance guarantee EPC model and/or building maintenance sinking/revolving funds.

In order to enhance the Energy-as-a-Service (EaaS) model, optimization of balance between demand and supply is offered with a combination of energy efficiency interventions and demand response management, even though the responsible parties vary for these offerings in the commercial rented sector. For such offerings, SmartSPIN proposes a multi-stage contract lifecycle, including a green lease, and agreements between energy efficiency service provider and tenant, and service provider and building owner.

Following the task, further contract templates will be presented to advance the implementation of the contractual agreements between energy efficiency service provider, building owner and tenant. The SmartSPIN business model will be developed in WP6 according to the service offering, and SmartSPIN service definition will be tested for validation and feedback within WP5 to evaluate and enhance its feasibility in each of the demonstration sites in order to enable the definition to address a wider market of implementations of flexibility, market maturity and frameworks legislation and regulations.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033744.

1 INTRODUCTION

Task 3.4 has the objective of defining the SmartSPIN service that an ESCO would offer to the commercial rented sector, and how such services could be proposed in the European market, especially focusing across the three countries of Ireland, Greece and Spain of the demonstration sites of the project.

The objective is to clearly define the SmartSPIN service that will be offered, including a discussion on the summary of recommendations on the service with input from external advisory board perspectives, and particularly addressing identified barriers of the split incentive and long contract periods. Following these, listing the key features of the service definition, and stating the conditions under which each feature should be deployed is an important line to be covered within the task.

While defining a service, it is important to understand the situation in the market and linking offering with balanced benefits. The offer should address and overcome the concerns and issues around the topic. For defining the SmartSPIN service, it is essential to understand the dynamics of the energy services and market investments especially in the private commercial rented sector.

SmartSPIN addresses the energy performance related contracting, agreement, and services where a landlord, a tenant(s), and energy and building service providers are involved. SmartSPIN advances the Energy-as-a-Service (EaaS) model that will be offered by an ESCO. It includes the solutions that combine demand management services and energy efficiency interventions, facilitates the adoption of renewables, and optimizes the balance between demand and supply. The split incentive issue is addressed among with some other related issues, to create the optimum business model for smart energy services in the commercial rented sector.

While undertaking an energy performance contracting or any other type of energy efficiency and/or smart energy services investment, the feasibility discussion includes several internal and external parameters for the built environment. SmartSPIN analyses the market barriers, evaluating the feasibility and effectiveness of the model, while engaging key market stakeholders. It is essential to bring a model which is beneficial for all parties involved.

2 INTAKES FROM REVIEWS AND RECOMMENDATIONS ON HOW TO OVERCOME BARRIERS

Within WP2 and WP3, reviews and research activities have been conducted around the smart energy services, market barriers, existing models, and recommendations on how to address the problems and overcome barriers while bringing in a solution. Following a detailed review of existing infrastructure and business models for smart energy services, the barriers around the solution and recommendations to address the split incentive issue and recommendations to define the SmartSPIN service have been gathered.

The analysis of existing business models from D2.1: Review of Existing Business Models for Smart Energy Services includes business models of:

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033744.

- Asset-based models, where the consumer pays for the fact that an energy asset is made available,
- Output-based models, where the consumer pays for the output of the energy asset and not for the asset itself, and
- Outcome-based models, where the consumer pays for the management and optimization of a building's operational conditions.

The asset-based business models include equipment leasing and continuous commissioning. The output-based business models include output purchase agreements, a modification from Power purchase agreements (PPA). Focusing on equipment requires a clear structure of ownership (who owns what), whereas focusing on output requires a clear mechanism for measurement and invoicing.

The SmartSPIN model initially has been based on the output-based model with delivered energy savings at the heart of the service proposition. These savings and further benefits can be gained and verified through integration of smart energy metering and analysis systems.

Based on the findings from previous tasks and perspectives gathered from the advisory board, stakeholder and market experts, the SmartSPIN approach and proposed solution has been developed and updated throughout the project timeline. The proposition will be further enhanced and validated throughout the project timeline with the feedback loop from the project demonstrations and market integrations. Initially, the research has focused on the existing market barriers, then developed towards how to overcome these obstacles, by looking at the alternative models, scenarios, and potential improvement transition in the market.

Throughout the previous tasks of WP3, SmartSPIN focuses on the existing market framework, barriers and opportunities and how to address and overcome them. Some of these barriers are around:

- impact of existing tenancy agreements and existing O&M contracts,
- impact of equipment warranties and technical requirements to participate in demand response
- impact of market maturity level of submetering, p2p trading and energy communities' applications across Europe.

Tenancy agreements address building services management and fees at varying levels, this can be reviewed and enhanced. O&M contracts with facility managers indicate responsibilities of a facility management for the building, where ESCO might need to get involved. Technical requirements of existing equipment infrastructure might be limiting some flexible management activities around the building energy. Auditing and replacing the equipment with smarter alternatives by their end-of-life cycle might bring more flexibility. Even though the real time market applications are limited as of today in terms of energy communities, smart dynamic tariffs and level of IoT infrastructure across Europe, the grid infrastructure improvements and energy transition throughout the markets are rapidly growing and this can also accelerate the market potential.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033744.

Throughout the project, the best practices around the world have been analysed which address specifically the split incentive issue, involving models of green leasing, on bill financing and metered energy efficiency transaction structures. It is essential to understand that some best practices from different countries may not work well in a certain country considering different market mechanisms and local legislations. For instance, green leasing is a useful approach to have a greener agreement between landlord and tenant to define and agree to meet sustainability goals and it can be adapted with various clauses in different European markets. On the other hand, on bill financing (OBF) has proven to be a successful alternative tool in markets such as North American residential sector in providing a scheme to get end users pay for investments via their utility bills, this might not be adapted into the dynamic energy markets in Europe. It is even more difficult to implement the OBF in commercial rented sector compared to residential, where tenant engagement motivation and levels are variable. Furthermore, restrictions linked to energy procurement will not operate in the current markets efficiently, also considering challenges around societal acceptance.

For the service definition, it is important to fully consider some key recommendations from WP2 and the D2.4 report. A summary of those is as follows:

- The SmartSPIN **Energy as a Service (EaaS)** model should cover: Energy Management, Maintenance, Total Guarantee of Equipment, Improvement works, Improvement of energy efficiency.
- The SmartSPIN service should comprise energy management, changing the electricity supplier, equipment/RES installation (e.g., solar PV installations) or replacement and O&M services.
- The **Measurement & Verification** process should be standardized, ensuring no measurement errors, and trusted by stakeholders.
- **Green leases** should be used to allow engagement of landlords and tenants for improvement of sustainability and energy efficiency in rented commercial buildings.
- Two cases should be considered for service definition: 1. the landlord owns space and equipment and 2. the landlord owns only the space.
- The engagement of both landlord and tenants with an ESCO should be achieved by means of a **tripartite Energy Performance Contract** which can deliver performance guarantee in the rented scenario (while circumventing the split incentive issue).
- Sub-metering is required for a fair billing of tenants' energy consumption.
- The energy tariff for the electricity, gas consumption and water applied to the tenants should be independent of the season, fair and easy to understand.

While developing a service definition around smart energy services within the SmartSPIN project, these recommendations are considered to ensure that the implementation and benefits are effective in the current market with an energy transition focus.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033744.

3 MOTIVATIONS AND BARRIERS FOR KEY STAKEHOLDERS IN DEFINING SERVICE DEFINITION

SmartSPIN proposes an innovative business model for smart energy services in the commercial rented sector. A detailed overview on project typography landscape has been prepared at earlier stages of the project timeline, can be viewed in Annex 1: Table 4 Project Typography Landscape

Table 1 Motivations & Barriers for Key Stakeholders shows the key stakeholders that engage with the energy services management of a building in the commercial rented sector, of those include landlord, tenant, an ESCO performing energy saving measures (ESM), energy efficiency service provider, technology provider, utility/ energy provider, property management / facility management company (representing landlord in most cases or an external body of engineering company, financial organization, and public bodies. The role, involvement, motivation, and barriers which these stakeholders hold might vary based on the case framework and requirements. The success rate of implementation of a service model is based on the balanced level combination of motivations, barriers, and synergies between these roles. The involvement level of these parties might differ based on case specifics, as some roles may be directly involved or not.

It is important to look for solutions that generate benefits for all involved parties. Based on the definition of the benefit, this could be:

- direct and/or indirect income,
- asset value,
- comfort,
- cost savings,
- forwarding of the savings,
- and marketing and sustainability value.

D7.2 Value Chain and Stakeholder Analysis Report shows the cross relations between stakeholders. Landlord, Tenant, and Energy services companies are being the 1st level of relevance. The stakeholder survey results indicate that both tenants and landlords find cost efficiency, sustainability, and a safe environment for the buildings' occupants the most important factors regarding their building, as it was also presented on the D7.2 report.

While the relation between service provider and building representative can vary, it becomes more variable when a building is owned by a landlord and used by a tenant. Split incentive occurs when the parties who pay, own, use and gain benefits and savings are different, and such building cases are less attractive for an ESCO to operate and invest in. Considering landlord tenant relationship, the split incentive problem occurs specifically when the investor is not the beneficiary of the energy cost savings and when the savings cannot be used for the re-financing of the investment. Segregated ownership of equipment and facilities might change the dynamics of motivation and create a barrier for participation of parties of landlord and tenant. The market solution should bring and show solutions for re-financing, allow all parties to benefit from the investment and redefine additional value benefits.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033744.

Table 1 Motivations & Barriers for Key Stakeholders

Stakeholders	Role & Involvement	Motivation	Barriers	Synergies
Landlord	Owns the building facilities The most reliable party for financial investments and linked guarantee agreements	Benefits increased asset value Benefits (in case of engineering systems ownership) Benefits the savings (in case of managing the utility bills) Benefits (in case of a fixed rent including utilities) Benefits from reduced GHG emissions Benefits from sustainability marketing	Wants to see direct maximized profit Not interested to invest if cannot directly see the benefit (if tenant gets and keeps the savings)	Tenancy Agreement with tenant Reliable contact with the ESCO / financing organization Might be a direct contact for utilities Direct contact with FMCO Direct contact for service providers
Tenant	Pays the rent Uses the facilities Agrees to the building use specifics	Benefits energy cost savings (in case of consumption-based bills) Benefits from increased comfort and increased efficiency Benefits from reduced GHG emissions Benefits from sustainability marketing strategy	In case of longer payback periods for opportunities compared to lease agreements, the investment may not be profitable Direct investment on landlord properties may not be profitable In case of a fixed services agreement, cannot see benefits or savings Not willing to participate in reduction measures in lack of direct benefits	Tenancy Agreement with landlord Might be a direct contact for utilities
ESCO (Energy Efficiency Service Provider)	Provides energy efficiency schemes Paid based on the efficiency performance Planning, implementation, and monitoring of energy services	Energy performance upgrades and smart energy services bring savings to share Added value services with new revenue streams	Complicated business cases with segregated ownership of systems Not willing to invest with a “temporary” tenant - high risk, lacking guaranteed schemes	May be a contractor to landlord / tenant / FMCO May be a subservice of FMCO / utility
Technology Provider	Providing smart energy solutions from a	Smart services can be provided as added value to overall energy investments	System integration of new proposed technologies with existing equipment	May be Contractor to Landlord / tenant / ESCO / FMCO

This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No 101033744.

	technology perspective May be a contractor or subservice of other parties	Smart metering can be used to verify and justify the savings measures Smart services can further be used to increase savings Smart services can bring additional revenue streams while enhancing engagement	services require additional cost Requires skilled facility manager & requires skilled and engaged users More than one user/ decision maker profile may be presented in the commercial rental buildings divisions	May be a subservice of ESCO, FMCO or Utility
Property / Facility Management Company (FMCO)	Facilities management Property maintenance (managing contractors) Rent & debt management Strategy management for commercials Letting management	Value added service to their offering Benefits in facilities financing Long-term decrease in maintenance costs Smart solutions to enhance the operations	Might not be trained adequately to use and integrate new services Existing Operations & Maintenance contracts might restrict to include new interventions Technical limits of equipment to participate in demand response and dynamic management	Facility management services agreement with the landlord Services agreement with the tenant
Utility / Energy Provider	Provides energy to the building Gains profit from consumption under a tariff agreed	Demand response participation supports the grid If it covers ESCO role, value added service for revenue If it covers technology provider, added service for revenue stream	Not interested in on-bill financing scheme for energy investment with a “temporary” tenant Not interested to modify their business as usual Regulated market might restrict innovative case required actions	Energy provider contract with landlord / tenant / FMCO Collaboration opportunity with ESCO and financial organizations in case of an on-bill financing scenario
Financial Organization	Provides capital for investment with loans with guarantees for energy projects	Might be involved in specific loan/grant/scheme programmes with national and international bodies Benefits from sustainability strategies Green mortgage/fund for properties	Complicated business cases with segregated ownership of systems Not willing to invest with a “temporary” tenant - high risk, lacking guaranteed schemes	
Public / Government bodies	Regulations / legislations around real estate, tenancy agreements, contractor agreements, building renovation, energy investments, financial management. Regulated market might restrict innovative case required actions. GDPR – data related regulations for energy and utilities data management. Real market implementations depend upon the regulation drivers, so the market maturity is linked to the legislative developments.			

This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No 101033744.

4 KEY CONSIDERATIONS IN DEVELOPING SERVICE DEFINITION

Various types of building landscapes have been analysed, initiation our research from the project demonstration sites, then taking it to wider market opportunities. Through this analysis, it can be observed that there is significant market appetite to progress building and engineering system upgrades.

In a commercial rented building project, the lease agreement between landlord and tenant can be reviewed to include green lease clauses, cost recovery clauses to cover building investment costs and clauses to address sustainability targets which could be common for both organizations. Certain lease structures may create complications with managing savings benefits. A tripartite EPC between an ESCO, landlord and tenant can be proposed. An ESCO involvement can be considered in case of guaranteed savings payment. The level of engagement of landlord and tenant for an EPC might vary depending on the ownership/management flexibility of building equipment systems which are directly related to energy consumption. Smart metering and control systems can be included to optimize energy efficiency, to measure and verify the system efficiency and savings and further smart metering is necessary to participate in demand response programmes. Demand response participation enables to create additional income which feeds into the building investment scheme.

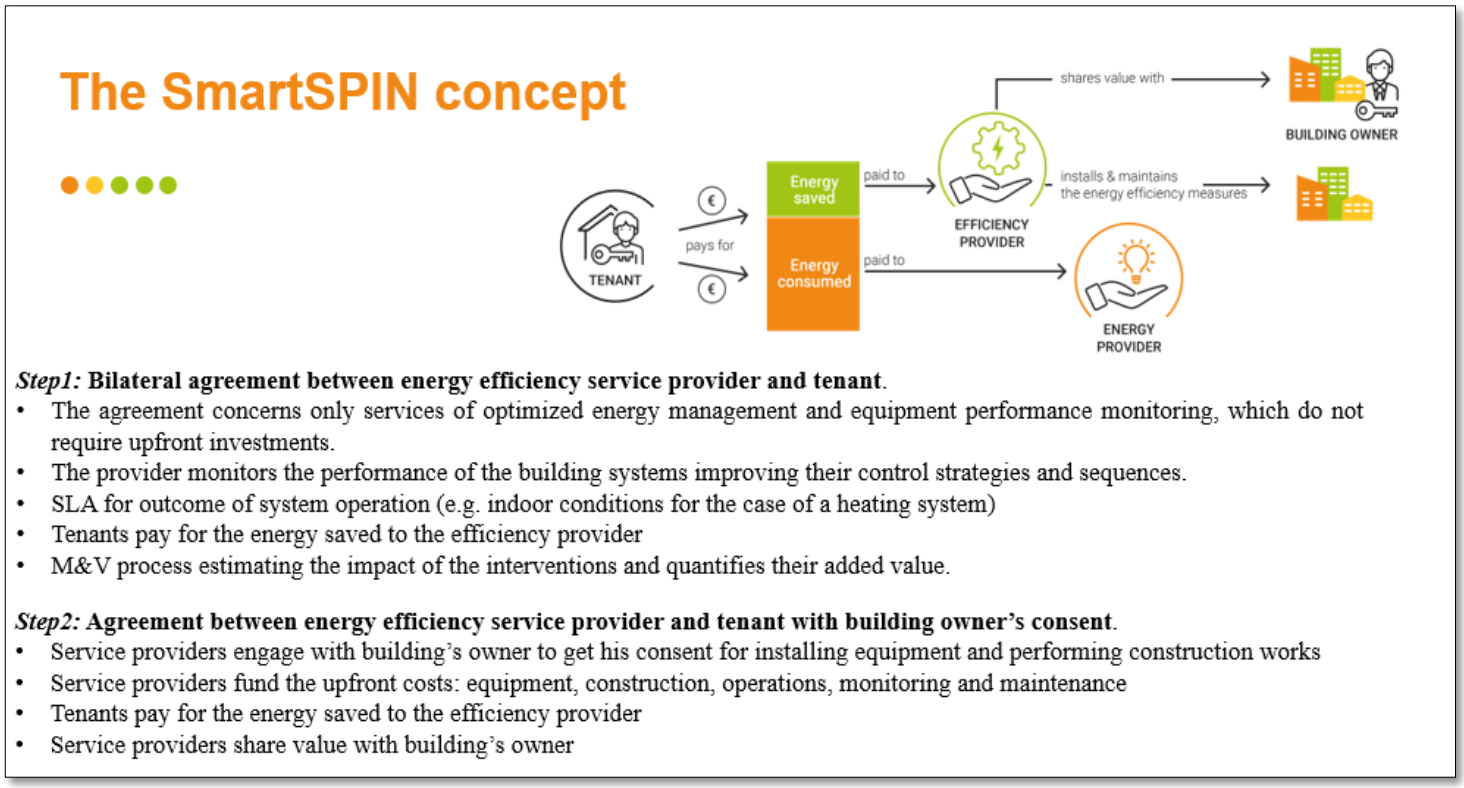

Figure 1 SmartSPIN Concept from the Proposal Stage

The initial proposition of SmartSPIN has been presented as in Figure 1 SmartSPIN Concept from the Proposal Stage. The initial project concept note is suggesting an ESCO or energy efficiency provider as a delivery partner and we see this as holding potential. The initial assessments would point strongly towards the ESCO as being a key actor and enabler in the market. The EaaS model

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033744.

is based on the idea that the promotion and up-scaling of energy efficiency requires treating all relevant costs as operational costs. The recommendations from stakeholders include a focus on the role of EPC facilitators, and use of existing contract templates for EPCs, performance guarantee contracts and maintenance contracts by ESCOs. According to its definition and linked European Union legislations, an ESCO can act in a contract agreement if they get paid based on the savings, they use a performance guarantee business model. In cases where there is no such direct agreement with payments based on savings, then an energy services provider/consultant can be present instead of an ESCO. Regarding energy services, they assist the building owners and users with identifying the most cost-efficient energy efficiency measures initially, however they also agree upon the importance of using smart tools and algorithms for optimization of the operations. Measurement and verification of efficiency and flexibility measures involvement is also very essential, and use of smart systems will enhance and validate such services in a more quantifiable and accountable manner.

The initial project concept note also suggests charging tenant for both the actual energy consumed and the estimated energy savings, while the benefits from improvements and services are shared among the landlord and energy efficiency service provider. However, in the actual market applications, ESCOs cannot engage tenants in such proposed scenario due to lack of incentives.

SmartSPIN initially adopts the two-staged approach to establishing contractual agreements: Bilateral agreement between energy efficiency service provider and tenant and an agreement between energy efficiency service provider and tenant with building's owner's consent. This has been also presented in Figure 2 The SmartSPIN EaaS Model Proposition.

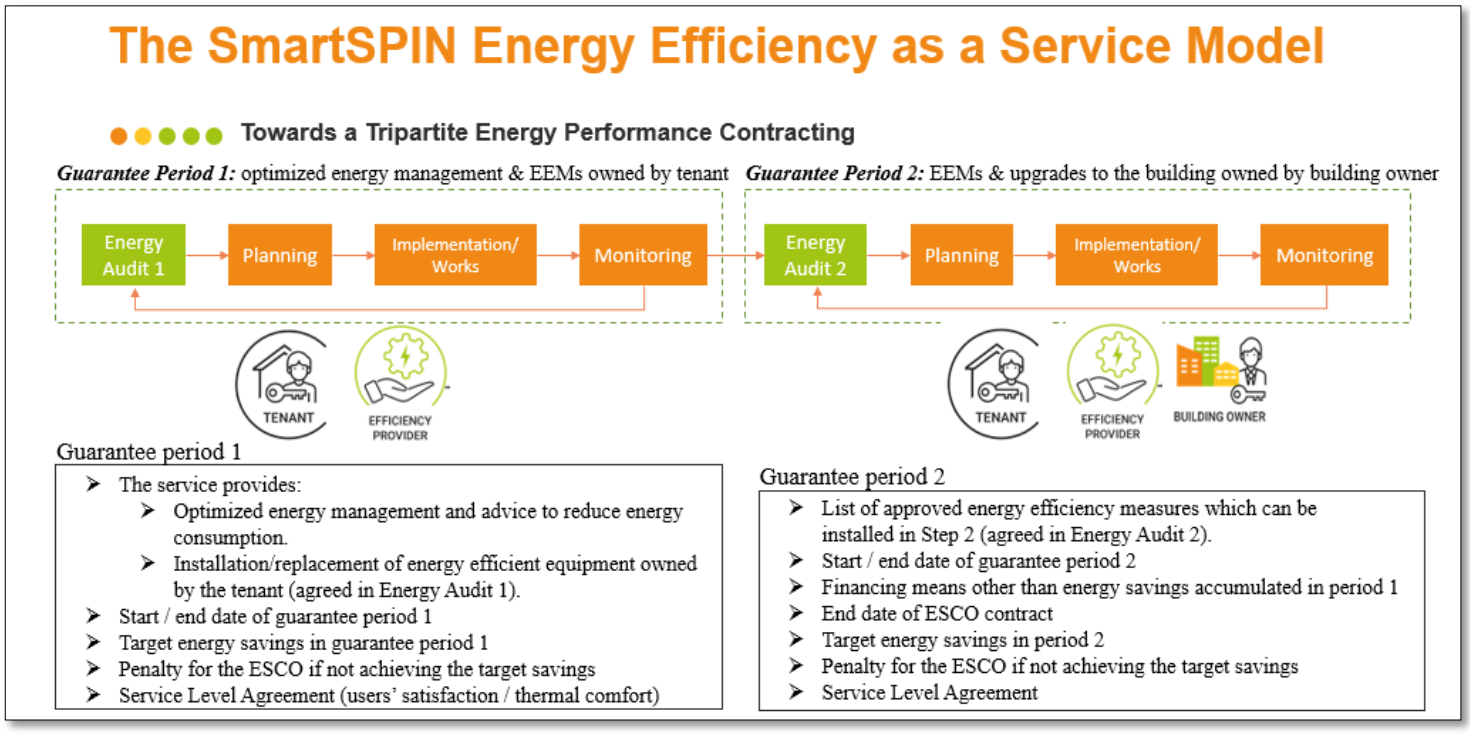

Figure 2 The SmartSPIN EaaS Model Proposition

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033744.

The SmartSPIN concept proposition from the initial stage offers as follows:

Step1: Bilateral agreement between energy efficiency service provider and tenant:

- The agreement concerns only services of optimized energy management and equipment performance monitoring, which do not require upfront investments.
- The provider monitors the performance of the building systems improving their control strategies and sequences.
- SLA for outcome of system operation (e.g., indoor conditions for the case of a heating system)
- Tenants pay for the energy saved to the efficiency provider
- M&V process estimating the impact of the interventions and quantifies their added value.

Guarantee Period 1:

- The service provides:
  -Optimized energy management and advice to reduce energy consumption.
  -Installation/replacement of energy efficient equipment owned by the tenant (agreed in Energy Audit 1).
- Start / end date of guarantee period 1
- Target energy savings in guarantee period 1
- Penalty for the ESCO if not achieving the target savings
- Service Level Agreement (users' satisfaction / thermal comfort)

Step2: Agreement between energy efficiency service provider and tenant with building owner's consent.

- Service providers engage with building's owner to get his consent for installing equipment and performing construction works
- Service providers fund the upfront costs: equipment, construction, operations, monitoring and maintenance
- Tenants pay for the energy saved to the efficiency provider
- Service providers share value with building's owner

Guarantee Period 2:

- List of approved energy efficiency measures which can be installed in Step 2 (agreed in Energy Audit 2).
- Start / end date of guarantee period 2
- Financing means other than energy savings accumulated in period 1
- End date of ESCO contract
- Target energy savings in period 2
- Penalty for the ESCO if not achieving the target savings
- Service Level Agreement

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033744.

Role of an ESCO

An energy performance contract with a performance guarantee model is based on a performance-based compensation with an ESCO. If a tenant is involved in such a scheme, this requires an agreement with the tenant and the landlord. Success of such a scheme also depends upon the term length of the lease agreement. Depending on the level of building energy services management ownership, landlord or tenant might have a higher interest in such performance guaranteed model. As part of the energy performance contract, the ESCO finances and covers the capital expenditure of the smart energy services and interventions proposed for the building and its systems. Following a thorough energy audit of the building and its systems, an optimized scenario of interventions is developed and aligned with the owner's (landlord) and user's (tenant in this case) requirements and characteristics ~~is~~ which needs to be agreed upon.

Depending on the ownership of equipment to be intervened, the ESCO can contract partly with landlord and partly with tenant. Any interventions regarding the building fabric and other elements owned by the landlord will be agreed between ESCO and landlord, but these interventions are to be implemented with the tenant's consent to ensure that their day-to-day business is not negatively affected by the activities. Any interventions regarding the elements owned or directly used by the tenant will be agreed between ESCO and tenant, but to be implemented with the landlord's consent to ensure that the building asset value is favourable for the landlord. A complexity in financing these interventions can be observed between parties of the building owner, tenant and energy efficiency service provider.

Based on the traditional approach in energy performance contracts, they do not address the rented building cases explicitly, and they only consider a single client for an ESCO. Though the EPCs could be well adopted in the public sector, the commercial and private sectors do not favour long-term contracts. Contract clauses should be well defined for scenarios where a tenant might leave the building before the benefits of an intervention can been realised. Some of the challenges however only become apparent when we look at actual market conditions and development. Firstly, from the ESCO perspective, the ESCO market across many EU territories is only developing and this can lead to slow uptake of the model and much time spent educating clients before a project proceeds. So, this results in long sales cycles and ultimately slow rate of model uptake. From an ESCO perspective, while agreeing on an energy performance contract, a commercial rented building case with two parties of landlord and tenant, causes more complexity around contract and project, and therefore it can be less attractive compared to a single ownership type.

Furthermore, savings should be verified by IPMVP measurement and verification approach. Smart technology solutions can be used to measure and monitor systems on consumption, generation, and storage. Technology can further be integrated in order to control systems to maximize impact, increase savings and participate in demand response. Smart tools such as Internet of Things (IoT) based sensors, meters and monitoring and analysis software services, mobile and online apps can be beneficial to interact with the end user and methodologies such as gamification can be integrated to better engage users and enhance the efficiency measures with behavioural changes.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033744.

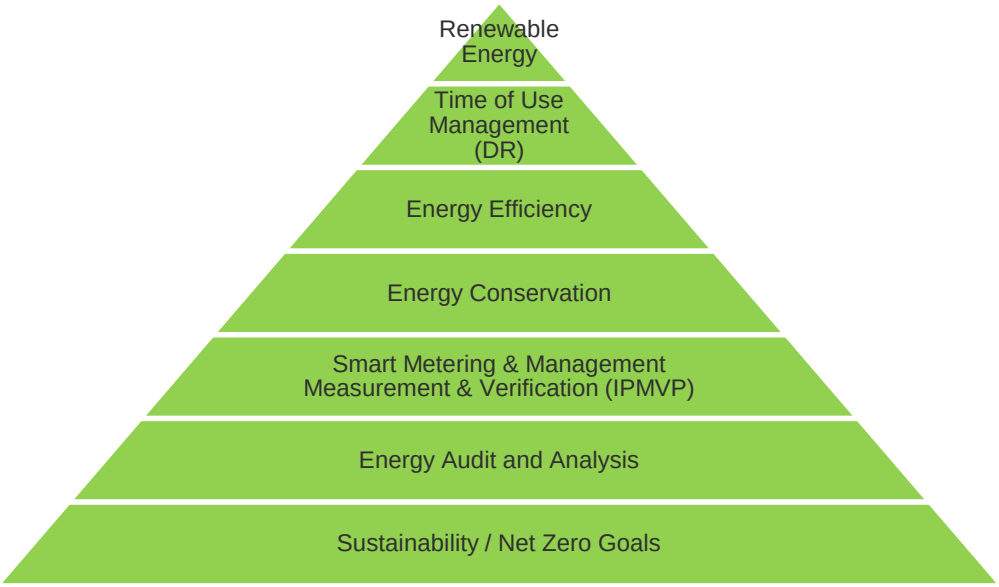

Figure 3 Energy Transition Approach in Commercial Building

A further and important consideration that an ESCO will face is project finance. ESCO might see a higher risk of investment for a commercial rented building with potentially disrupted revenue streams due to split incentive and other leasing mechanisms. These are some of the market challenges we see which suggest that simpler building owner typographies may be preferred by both ESCO and financing agent.

The combination of operational data collection and monitoring, advanced measurement and verification, and performance guarantees is the most promising route to mitigate the discrepancy between renewable energy generation and energy efficiency business models. For measurement & verification, a current trend is to rely on a combination of post-retrofit measurements and pre-retrofit assumptions and calculations. Smart solutions of trusted digital platforms can act as facilitators that automate and simplify the M&V process, therefore could facilitate the private investment. A technical infrastructure that allows data collection and monitoring helps in decreasing uncertainty in M&V results.

Alternatives to SmartSPIN Core Concept

It is worth considering further some challenges around its execution in commercial rented sector. The technical solutions are well developed, however the pathway to execution has some challenges.

Currently in the market, an emerging demand and ambition in the landlord/tenant landscape can be observed to improve building sustainability credentials and operational performance. It is likely that the buildings with the greatest commercial opportunities and sustainability ambition in addition to good financial covenants could progress through an ESCO route where landlord tenant topography exist ahead of less attractive single ownership buildings. However, the favouring of simpler landscape for both ESCO and their financing partner is a real consideration.

An alternative project model has also been identified during the market stakeholder interactions, encompassing project execution structure and project financing. This arises in the many landlord-

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033744.

tenant building topographies we examined where the operational costs including a provision for ongoing maintenance is supported through a sinking fund. This provides a financial reserve to ensure routine building maintenance with provision for periodic capital investment is put in place. This sinking fund can be accumulated through individual tenants' contributions or through the building owner moving a proportion of aggregated rent directly into this fund.

In discussions with landlords across a number of building topographies this has been noted as potentially the best mechanism to facilitate building investment that is required as we transition to net zero. As a mechanism it deals with two key challenges faced and noted earlier which is a complication for a traditional ESCO model. Firstly, it leverages off existing established relationships in terms of contributions and governance of a financial fund and secondly it creates an immediate financing model building on existing structures that would be much more attractive to both ESCO as it would avoid potentially a difficult barrier of bank funding for the ESCO.

So, whilst Task 3.4 set out to define a service that an ESCO would offer having had the benefit of some market research and experience we feel in addition to an ESCO model there is an opportunity to broaden out this service definition based on our market findings to consider typographies that aggregate a sinking fund. The sinking fund through increased contributions could offer a self-funded building owner model working directly with existing facility management supply chain or through an ESCO, or an ESCO should also merits description.

Energy efficiency service providers can propose their business services to a landlord, tenant or a building property management company. ESCO can be involved with an EPC if they gain payments based on the guaranteed savings. If and when an ESCO investment is not feasible for a commercial rental project, a sinking/revolving fund of building maintenance management fees can be considered as a source of capital investment.

Especially in a built environment with multiple tenants, it is more applicable to have a sinking fund from the service charges budget to cover the cost of major long-term expenses. While the services charges fees are mostly used to cover day to day maintenance, part of the budget should also be kept as a sinking fund for other interventions. This concept can also be combined with a green revolving fund (GRF) approach. GRF is an internal fund pool to cover energy efficiency, renewable energy, and sustainability projects that generate financial savings. The savings gained from the projects can be used to feed the "revolved" fund, creating a partly sustainable funding cycle. Such revolving and sinking fund approach still needs approval from parties involved and might still need some initial capital. When a green sinking-revolving fund is created and sustained with building service charges from tenants and cost savings from energy efficiency and renewable energy investment, this might decrease the investment risks.

Building scenarios with high energy costs and high sustainability ambitions, targeting high end tenants can be more attractive from energy performance investment approach compared to small buildings with low energy budgets and low sustainability ambition. In building scenarios where a landlord provides a large majority of utility services such as electricity, heat, fresh air, ownership and management of services, it is more attractive and efficient for landlord to engage directly for the efficiency investments, where the landlord will gain the initial benefits as well as an increased asset value for the building.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033744.

Table 2 Attractiveness Potential of a Commercial Rented Case for an ESCO

Early-Stage Attractiveness / Interaction Potential			
Key Influencing Factors	**Landscape Attractiveness**		
	Strong to approach Landlord	Medium / Complicated	Weak to approach Landlord Strong to approach Tenant
Landlord/Tenant Utility			
• Electricity	All by Landlord	Partly 50% by Landlord	None by Landlord
• Heating			
• Cooling			
• Fresh Air			
• Water			
• Renewables on site			
Energy Efficiency opportunity	Good	Limited	No
Demand Response	Good	Maybe	No
Sustainability Credentials	Yes	Maybe	No
Energy as a Significant Business Overhead	Yes	Limited	No
Financial Strength of Parties to be eligible for loans and investment	Good	Moderate	Poor
Lease length	+ 5 Years	2-5 Years	< 2 years
Building Maintenance Fund	Exists and well managed	Exists but not strong	Does not exist
Sustainability Agenda	Strong	Medium	Low

The attractiveness potential of getting involved/investing in a project might change based on the scope of the services and their criteria. Table 2 Attractiveness Potential of a Commercial Rented Case for an ESCO shows the landscape attractiveness from an ESCO perspective where green column shows a more favourable scenario to get an EPC, whereas yellow is average and red is the least attractive to get an EPC between ESCO and building owner.

The criteria can be covered under -utility -technical and -commercial. There is a changing range of landlord services to tenants and the greater the services the better the engagements. The attractiveness level of a project might depend on if energy is a significant operational overhead for the business scope and financial strength of involved commercial parties, sinking fund availability and length of lease agreement.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033744.

5 SERVICE DEFINITION

SmartSPIN offers a new innovative approach to developing collaboration between landlord and tenants across all building and portfolio typologies. This will reduce energy costs, and carbon footprints and ultimately be a significant contributor to achieving the net zero ambition.

The initial step of smart energy services is to see the building energy performance and improvement potential. For a basic start, the SmartSPIN interactive web app could be used by decision makers. The SmartSPIN interactive web app helps stakeholders to understand the potential for energy management in EPC in commercial buildings. The analysis includes benchmarking and scoring the building's potential based on the building location country, building characteristics (like whether it was built/renovated before or after 1990, the size of the building, total building consumption range in kWh/m2, and degree of existing smartness with a building management system) and use of demand response. Types of buildings taken into consideration include large offices, large shops and medium size hotels. The decision-making process shows the % potential of energy savings via smartness improvement and envelope improvement.

An audit and analysis of building and its engineering systems needs to be completed prior to higher cost energy efficiency interventions. Smart monitoring equipment and analytics systems can be installed primarily for achieving detailed benchmarking analysis of the building as well as for quick actions for energy savings on consumption.

Installing smart metering equipment and introducing basic data analytics on building energy consumption will provide stronger information on its saving potential and transparency for actual validation and measurement calculations. Reviewing the existing lease agreements, extract any elements that may be working against the shared ambition of decarbonising, and adding structure and green clauses to help collaboration, allow positive progress and clarity in terms of a roadmap to net zero. The service then also looks in detail at the buildings and their engineering systems. It will firstly benchmark existing energy use and develop a roadmap to net zero carbon. Building energy efficiency will be assessed and improved through 3 defined routes – building fabric improvements, technology upgrades to most efficient technologies available and measurement and verification through continued monitoring and control.

The process of energy efficiency studies in enterprises begins with a review of the current situation with measurements and inspections. With a detailed energy audit, all equipment and processes that use energy are evaluated in terms of energy use. Opportunities, problems, and solutions are revealed and detected via measurements, data, and observations. Efficiency levels of equipment are measured with panel, lighting, ventilation, engines, thermal insulation, boiler, compressed air, flue gas measurements. Leak detection measurements are made and reported. Then, suggestions for savings opportunities with and without investment are created.

Further efficiency and accelerated decarbonisation can be introduced through on-site generation and energy storage allowing production of low-cost renewable energy to displace high-cost carbon intensive electricity from the grid. The benefit assessment of the site interventions will be assessed and apportioned between landlord, tenant and energy efficiency service provider, and ensure it is equitable and transparent.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033744.

The services can also be broken out further with more details around individual stages of:

1. Energy potential image of a building via the interactive web app for decision making.
2. Introducing smart metering systems for visibility around existing systems via continuous monitoring and analysis and also for advanced measurement and verification calculations (based on IPVMP) of planned vs actual investments and savings for decisions and incentives.
3. Detailed energy auditing & benchmarking existing energy use.
4. Defining further upgrading investments for increasing efficiency.
5. Benefit assessment of the site interventions between landlord and tenant.
6. Funding & implementation options.
7. Lease agreements review and introducing green clauses for landlord-tenant joint targets.
8. Building engineering system upgrades with tenant (if applicable).
9. Building engineering system upgrades with landlord (for common and managed areas).
10. Building fabric improvements for increasing efficiency with landlord (if applicable).
11. Technology upgrades for smart energy controlling optimizations for increasing efficiency.
12. Technology upgrades for smart energy monitoring for advanced.
13. Introducing or improving onsite energy generation and storage (rooftop PV or generators).
14. Introducing demand response participation to increasing savings (if applicable).

This scope has been further presented on Figure 4 SmartSPIN Smart Energy Services and Table 3 SmartSPIN Service Scope.

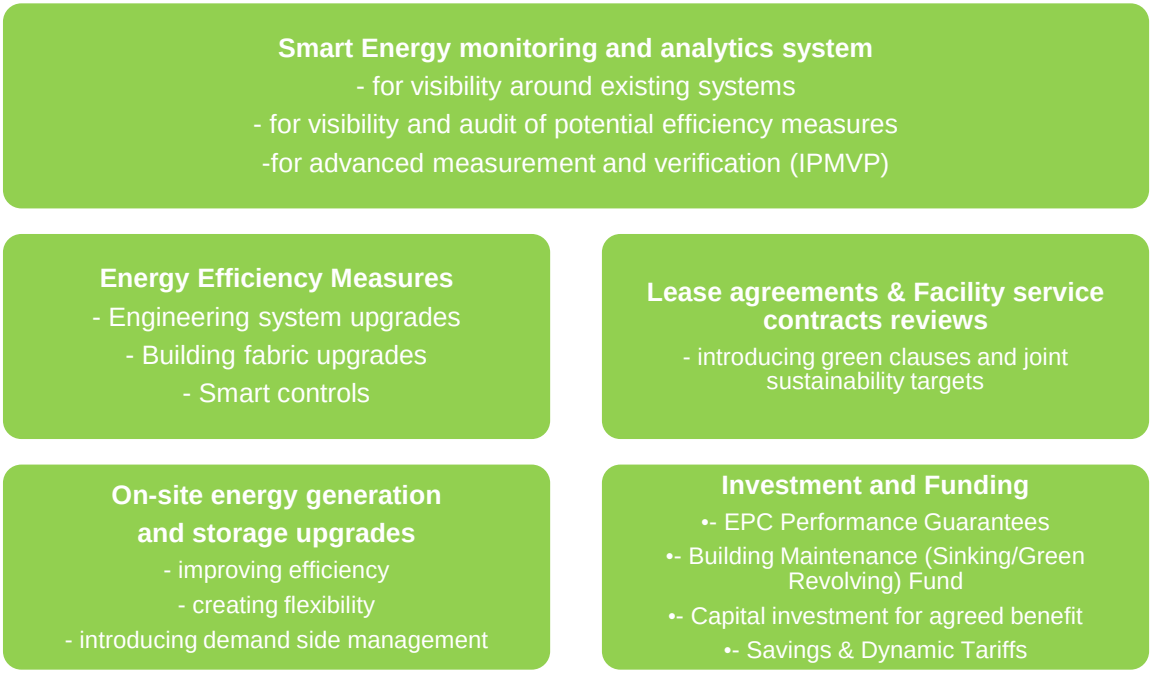

Figure 4 SmartSPIN Smart Energy Services

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033744.

Table 3 SmartSPIN Service Scope

SmartSPIN Service	
Definition & Key Features	*Smart energy services include:* - Full energy and building services audit on site and data analysis of the energy performance and opportunities based on historical data - Use utility bill, BMS or smart metering to benchmark and profile energy use, and to increase efficiency, savings, comfort and asset value - Propose building energy efficiency interventions: around building envelope, heating, cooling, air conditioning systems, building management systems and automations, integrate smart metering, control and management of building systems to increase efficiency, - Integrate an advanced measurement and verification based on IPMVP via smart metering and analysis tools - Microgeneration on site (rooftop PV), use of back-up generators/storage for flexibility and resilience, tariff-based schemes and agreements with aggregator or DSO for demand response participation, Analyse the energy supply and feasibility of on-bill financing - Alignment of existing systems, installation of new systems, alignment, integration and operation of landlord and tenant systems - Review and enhance lease agreement between landlord and tenant to cover energy and sustainability related green clauses (energy, water, consumption, efficiency related targets): green leasing *Funding and Implementation Options:* - Attractiveness of Landscape for an ESCO investment. - Analyse involvement of an ESCO with savings-based payments on guaranteed EPC model - Engagement levels of Landlord and Tenant for participation motivation & Benefit Assessment. - Engagement level of an existing Facility Management company with O&M agreement. - EPC agreement between ESCO, tenant and landlord where landlord will surcharge the efficiency gains in case of a need. - Review and enhance financing schemes between landlord, tenant with a potential building maintenance fund, sinking fund (service charge).

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033744.

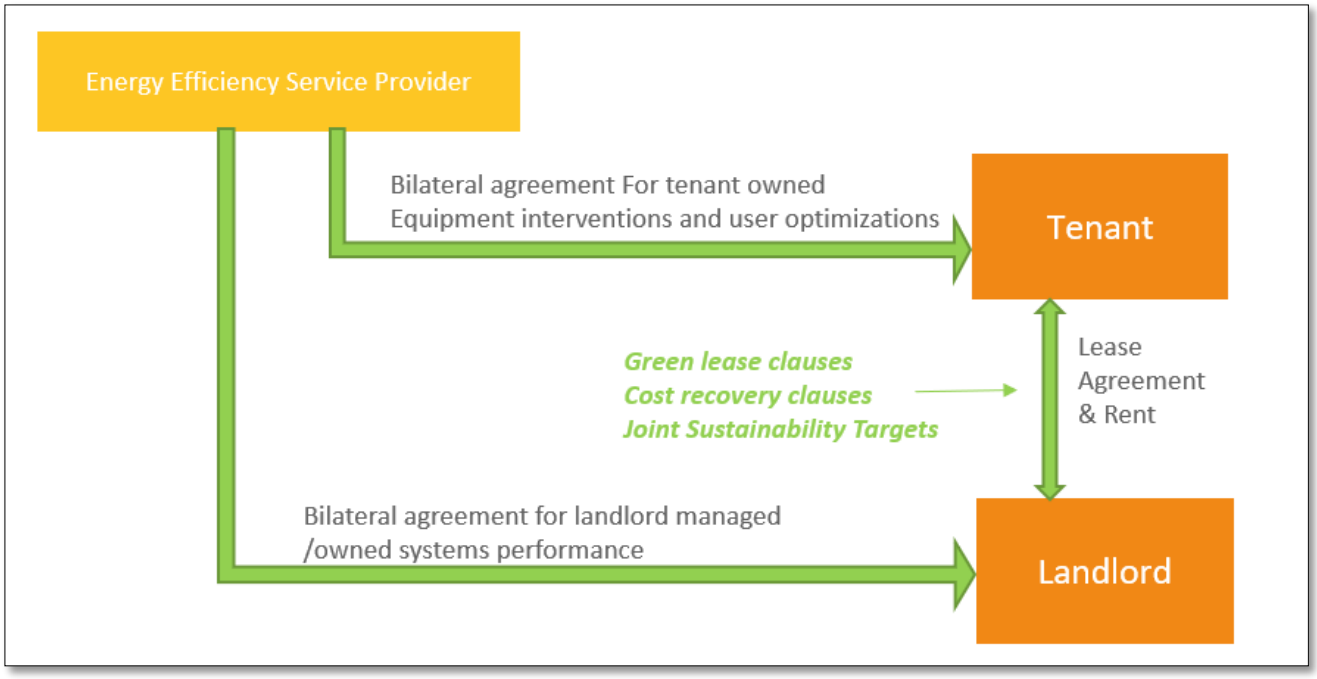

Figure 5 SmartSPIN Services via agreements between ESCO, Tenant and Landlord in Commercial Rented Sector

SmartSPIN offers a service model between energy efficiency service provider, tenant and landlord at a multi-staged approach where parties are involved at different stages of the building energy services lifecycle based on their motivation to engage.

1. **Bilateral agreement between energy efficiency service provider and tenant:**

   For tenant premises and/or tenant owned building services equipment related efficiency interventions, including smart metering and control services, and demand management with end-use optimizations and low cost interventions.

2. **Bilateral agreement between energy efficiency service provider and landlord:**

   For landlord owned and/or managed building services for common areas, or for some managed services which can be linked and re-billed to the tenants, efficiency interventions and system performance optimisation measures around engineering systems and building fabric.

3. **Introduction of green lease clauses and cost recovery clauses between tenant and landlord:**

   Energy efficiency service provider suggests landlord and tenant to introduce green lease clauses and cost recovery clauses with joint sustainability targets to address energy efficiency measures in commercial rented sector.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033744.

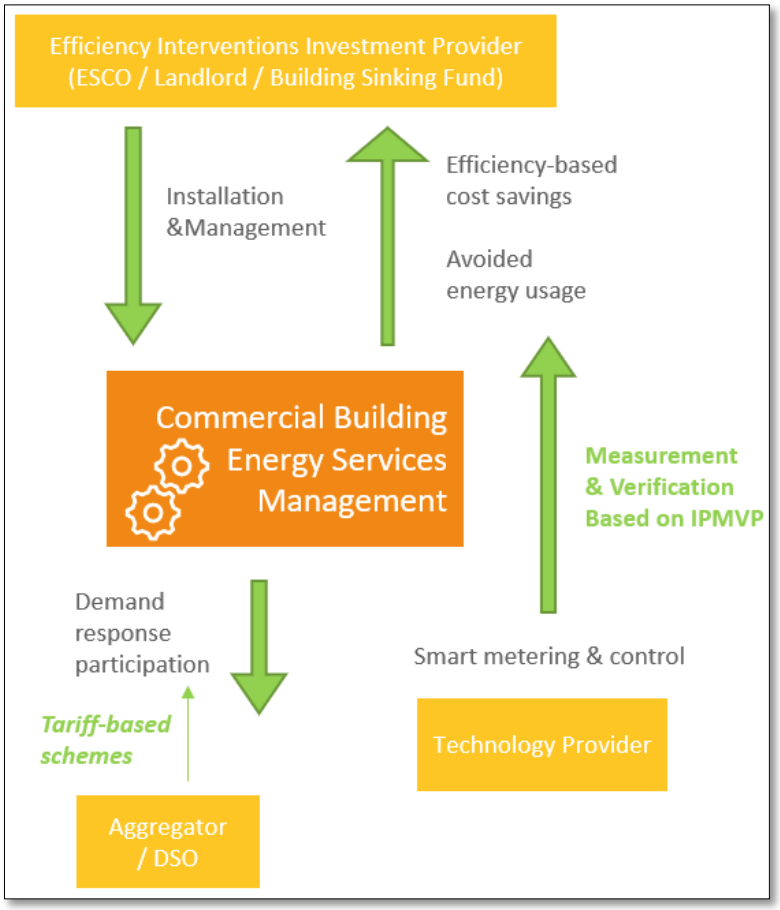

Figure 6 **Smart Energy Services Interventions and Gains**

The Figure 6 Smart Energy Services Interventions and Gains shows the flow diagram of the smart energy interventions and gains including efficiency measures, savings, demand management, smart metering and control and measurement and verification based on IPMVP.

SmartSPIN energy services approach include:

1. Efficiency & Renewables Interventions
2. Smart Metering & Control Systems
3. Demand Management
4. Measurement and Verification based on IPMVP

The capital investments required to have energy services interventions for efficiency measures and smart services installations can be funded by:

1. An ESCO if the landlord-tenant landscape and performance agreement scope is attractive to invest with high return of investment
2. Building Maintenance Sinking/Revolving Fund which is covered by service charges
3. Landlord if the services are owned/managed/re-billed by landlord to tenant
4. Tenant if the services are directly/solely managed/used in tenant demises/systems

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033744.

5. Co-funded by a local/national energy efficiency or digitalisation investment support scheme if exists for such commercial building typographies in the implementation country/region

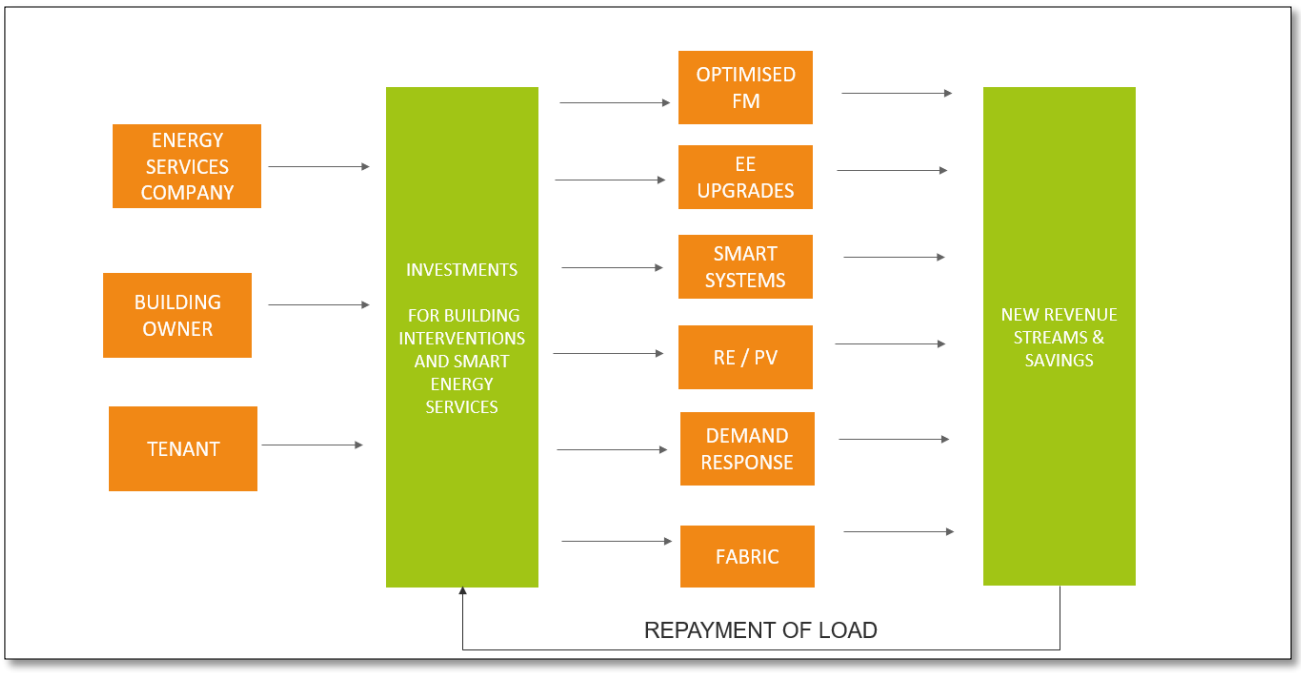

Figure 7 Revenue Streams for Smart Energy Services in Commercial Rented Sector

The investment required can be self-funded or delivered through a special Energy Performance Contract. Figure 7 Revenue Streams for Smart Energy Services in Commercial Rented Sector indicates that either an ESCO, landlord or tenant might invest, or smart energy services create new revenue streams via savings and tariffs for repayment of investments. The generic approach would require adoption based on specific landlord/tenant landscapes. Key influencers in this are whether the tenant is using the landlord's utility services or have their own and the level of sustainability ambition amongst both parties. With the increasing levels of sustainability ambitions globally, landlords and tenants are more likely to pursue and/or agree with energy efficiency investments, for their corporate ESG objectives and sustainability vision. If an ESCO and/or debt and equity provider do not find the project scope and savings adequate for the investment, an alternative scenario would be to get energy efficiency services from an engineering services company without a guaranteed savings approach.

6 SERVICE DEFINITION SPECIFICATIONS FOR SMARTSPIN DEMONSTRATION SITES

SmartSPIN proposes to bring innovative smart energy services to be successfully implemented in commercial rented sector. In order to address split incentive issue, scenarios are revaluated and service propositions are redeveloped to improve benefits for landlord, tenant, energy efficiency service provider and facility managers. To test and validate the propositions, there are four

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033744.

demonstration sites from three countries of Spain, Ireland, and Greece. According to the smart readiness scale across Europe Ireland is identified as a follower, where Spain is identified as a cautious adopter and Greece as slow-starter. So, the markets are not smart-ready but developing. For EPC potential, size and maturity of ESCO market in all three demo countries are small, compared to other sample European markets such as United Kingdom, Germany and France.

Demonstration cases are two large shopping centres in Spain, an office building in Greece and another office building in Ireland. The initial business proposition in Spain and Greece have been based on introducing smart metering services from technology provider to the facility manager representing landlord, whereas the initial business proposition in Ireland has been based on an initial overall energy site audit and presenting potential interventions from energy efficiency service provider to the property management company, their building manager and facility management company all linked to the landlord. So, analysing all sites and comparing will also present a benefit assessment on implementing an initial smart metering system while offering efficiency upgrades in commercial rental buildings.

Regarding all three demonstration cases, initial agreements are done between the service provider and landlord, focusing on all managed services and common areas. This decision depends on the engineering services provided by landlord to tenants in these commercial building landscapes. In all demonstration cases from Spain, Ireland and Greece, tenants receive the building energy services partly from the landlord facility manager. This fact affects the impact of having an initial agreement between service provider and facility manager or landlord to better interact with the building stakeholders.

6.1 SPAIN

In Spain, two shopping centres are chosen as demonstration buildings named La Gavia and Plenilunio. La Gavia is the largest shopping centre in Greater Madrid. The mall, which hosts 139 tenants, is divided between common areas and shops, each of them having independent HVAC systems, with several restaurants on the second floor. Tenants hold their own contract for electricity and water consumption with the utility, whereas the gas consumption is rebilled using energy meters. Plenilunio is a shopping centre near the Airport in Madrid, hosting 171 tenants. Tenants hold their own contract for electricity and water consumption, whereas the gas consumption is rebilled by surfaces. In the Spanish Pilot Sites, there are already installed smart meters and sensors, so the next step is to gather the operational data to be used in building data-driven control algorithms of WP4 and to measure their impact in WP5.

The shopping centre property/facility manager represent the building owner. Energy services provider and technology provider provides services with the linked relations. The facility manager acts as a single contact for both landlord and tenant for other service providers. Each tenant holds a lease agreement with the SC management company in which, together with other economic and legal details, it is defined for the energy supplies that: for heating/cooling, water at mild temperatures and flow are provided by a dedicated circuit according to the technical guideline for each shopping centre, if needed for reaching comfort temperatures, individual heat pumps available at each local provide the extra energy required. The cost of the total energy consumed by this dedicated circuit is rebilled to the tenants by energy meters available for each of the locals or by surfaces if the records

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033744.

of the thermal energy meters are not available. The cost of the energy consumed by the heat pumps is covered by the tenants that holds their own contract with the utility provider. For electricity and water, tenants hold their own contract with the utility.

The potential for demand response management lays at common services level, where high power electricity supplies exist for both La Gavia and Plenilunio, existing also PV generation systems for both sites, and considering that an advanced cloud-based monitoring system is already installed from supply level and down to sub-metered loads. Given the size of the contracts and the nature of the businesses, the potential at tenancy level is low. Technology provider's relationship with the tenants has been so far through SC management. Until project M12 (August 2022) and given the contractual situation between tenants and SC management, the efforts have been focussed at obtaining access to the consumption records (electricity and natural gas) for a significant sample of tenants and will continue in that direction in the coming periods of the project. Both demo sites in Spain obtained the BREEAM IN USE certificate with score 'Very Good' for its buildings and 'Excellent' for Management. Such green building certification schemes support the corporate sustainability goals and bring a framework to address an optimized energy and sustainability management methodologies.

The engagement level of a building manager and level of interventions are key criteria while designing the service. The energy performance savings are to be measured and verified in accordance with IPMVP.

6.2 IRELAND

The Irish demonstration site is an actively used office building located at 30 Herbert Street, Dublin with one landlord, one facility management company, and three tenants. The building was originally built in 1996 and refurbished in 2014. The tenants at 30 Herbert Street are responsible for managing their own electricity use within their respective levels and negotiating contracts with electricity suppliers. There are 6 electricity meters for 30 Herbert St. which are owned by the DSO, ESB Networks. Individual meters have been installed separately for landlord and for each floor of the building (lower ground floor, ground floor, first floor, second floor and third floor). There is no breakdown of energy use per floor in relation to lighting, HVAC, or equipment loads. There is one gas meter for the incoming gas which is owned by Gas Networks Ireland and has no breakdown of usage per floor. Each tenant is charged a percentage of the heating bill for gas based on their occupied floor area.

Lease agreements between landlord and tenant exist with a length of term of 15 years and rent reviews of every 5 years. The agreement covers tenant's and landlord's covenants around building and services management. The lease agreement is to be reviewed and additional green lease clauses and cost recovery clauses around energy management and joint sustainability targets can be included with agreement from both parties. In this scenario, the tenant pays rent, tenant pays the service charge to cover the office building services, maintenance and common areas, tenant pays for heating and air conditioning to the landlord, tenant pays their premised area electricity use to the energy supplier separately. The building owner along with the property/facility manager provides building services, common areas, all areas heating and air conditioning and other related office

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033744.

building services to the tenant. The building owner pays utility fees for common areas, and heating and air conditioning of all areas to the energy provider. Engineering services are provided to the building owner via a subcontract to the facility management company. As the tenants hold limited responsibility and accountability for the building systems, the landlord is the main responsible party to be approached for the building development services.

For potential energy efficiency measures, an ESCO involvement is based on the attractiveness of project investment and the level of savings. The ESCO can be involved based on the level of savings and they get paid based on guaranteed savings agreed upon an energy performance contract.

In case of a project approach where an ESCO does not get involved for the initial investment costs, the project capital cost can be covered via the existing building services fund that is present for the building management and maintenance services, a fund which has been managed by the building owner and fed by the service charges paid by the tenant. Energy savings from the building systems can feed this fund to keep the sinking/revolving fund.

For smart energy services, energy metering and control services are to be implemented:

1- to enhance the energy efficiency and savings
2- to participate in decentralised flexibility and demand response
3- to provide advanced measurement and verification based on IPMVP

Considering the project potential, a smart energy services agreement between the landlord / facility management company and energy services and technology provider has higher potential of implementation.

6.3 GREECE

For the demonstration case in Greece, a multiple tenant commercial building is utilized. The i4G building complex is a large office building in Thessaloniki, the second largest city in Greece. The building, which was originally built in 2002, is comprised by two inter-connected buildings of four floors each, hosting 15 tenants in a total operational surface of 1,600m^2 and 1,800m^2 respectively.

Current state of the contract between the tenants and the building owner, is based according to the rented surface area the tenant uses for its daily business operation, and specifically calculated through a gradual calculation algorithm which takes into account the square meters of each office. The contract also includes the use of all common areas, meeting and conference rooms, all of which are heated and air-conditioned through split air units. At the moment and prior to SmartSPIN demonstration-related interventions, no smart equipment or energy tracking was in place, while there is only one power line and a common energy bill for the whole building. Moreover, the energy needs are concentrated on a 10-hour daily electricity demand profile.

With the implementation of smart metering and data analytics, energy procurement agreements can be optimised, and landlord tenant revenues can be more evenly distributed. For such investments, in a scenario where the building owner and manager are also responsible for the building engineering

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033744.

and energy services, it is more likely to have a higher engagement and smart energy services agreement with the landlord.

The existing, newly formed, institutional framework has incorporated provisions for promoting DR systems. The Hellenic Distribution Network Code foresees the activation of distributed DR by the DSO by establishing “Demand Control Contracts” with individual electricity consumers located in congested network areas. These contracts shall allow the Greek DSO to set limits or even to interrupt, at its own initiative, the supply to the facilities of the contracted consumers, subsequent to their notification, in the periods specified in the contracts.

Curtailment of DER by the DSO is also foreseen under the following circumstances:

- When this is demanded by the TSO according to the system operation code.
- Under emergency situations.
- In case of faults or maintenance or in order to perform necessary operations on the network.
- If such an option is explicitly included in the connection agreement and/or sales agreement.

Greece to date aims to encourage demand-side participation through the application of flexibility and long-term capacity compensation schemes. Consumers connected to the electricity transmission and medium voltage network of the interconnected system can offer to the TSO the interruptible load service by participating in auctions. The TSO has then the right to temporarily decrease, up to a pre agreed value, the active power of interruptible counterparties, who are financially compensated for their services

In parallel, the option of establishing aggregators and energy communities is institutionally foreseen, giving electricity consumers the possibility to operate in the electricity market, either as consumers or as producers. To restrict the costs for consumers involved in these bodies, but also for the System, dynamic electricity tariffs are also instituted. Law 4342/2015 introduces the need of provisions within the market codes targeting to the TSO and the DSO and aiming to the equal and objective treatment of actors providing DR services, based also on their technical infrastructure and potential. The law also defines for the first time the role of “aggregator.” Regarding the contractual design to incorporate DR resources in the Greek electricity market, IPTO-ADMIE proposes a scheme where the load representative invoices the consumer both for the energy consumed and for the energy that was curtailed due to a DR event

In the above context, the users of SmartSPIN solution in the Greek demonstration pilot will potentially be able either individually or represented by aggregators to exploit extra revenues from demand response schemes by utilizing the smart equipment installed and possible Vehicle to Grid (V2G) configurations.

This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No 101033744.

7 CONCLUSIONS

SmartSPIN aims to propose an innovative and integrated smart energy services approach to address the commercial rented sector, overcoming market barriers around lack of or split of incentives for the involved parties of landlord, tenant and ESCO. Work on the project to date is suggesting potential scenarios where it could be feasible to create an energy performance agreement between these parties while creating an attractive landscape and minimizing the case risks. Minimizing the complexity around the agreement and financing is critical to have successful investments for the built environment. Especially in the commercial office or retail landscapes with multiple tenants, engaging with/via the building facility manager could be a key approach considering the current market applications in Europe. Depending on the level of investment, financing scheme and revenue streams might vary in different landscapes. Building maintenance sinking funds could be an additional investment fund to support the capital investment.

Although the building typographies, national market maturity levels of services, and engagement levels of landlord, tenant and facility managers vary in three demonstration sites of the project, similar approaches might be followed in these markets for a service proposition. Preliminary analysis around demonstration sites indicate that the services proposed for the Irish demo-site include investment around building equipment and systems, whereas in Spanish demo-site the systems exist with onsite renewables and equipment, and improvement actions focus on digitalisation, smart metering, and analytics of the energy management in the commercial retail facilities.

The service defined on this task will further be tested and validated in WP6 with business model approach and in WP5 with demonstration, creating a feedback loop to improve following the developments and interactions in Ireland, Spain, and Greece. To accelerate this transition with efficiency investment and optimization of energy management onsite is important in the European markets now more than ever, and existing building stock has a high potential of efficiency gains.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033744.

8 ANNEX-1: PROJECT TYPOGRAPHY LANDSCAPE

Table 4 Project Typography Landscape

Project Typography Landscape	Industrial – Heavy industry repurposed to sublet lighter scale industry	Industrial – Industrial Parks	Multi-Tenant office	Multi-tenant Retail	Multi-Tenant Residential
Assumed Site Overview Characteristics	Early concept of project was a site type where old heavy industry ceased, and the complex was then occupied by smaller businesses and split from single occupier to multi-tenant. Often state agency / govt. enterprise developer is the landlord in these redeveloped industrial zones. These tend to be large units in poor quality buildings who would have high energy costs Often a considerable fit-out investment means that the tenant is somewhat locked to the site and the landlord not under great pressure to facilitate or instigate upgrade investment.	More modern Industrial settings where there is a single landlord and units constructed – Retail / Light industrial Park. These are newer building stock but nonetheless were built to older building regulations and quite energy inefficient and substantially fuelled by fossil solutions	Typical city office with large tenancies and a small landlord area – Entrance, circulation & toilet areas. This stock is a mixture of young and old and ownership a mix of private and investment funds. Rent premiums and occupancy are beginning to link through to sustainability credentials.	Shopping Centre with central mall, no of large retail units (anchor tenants) and smaller shop units. There are mixed ages many of the Irl & UK ones are naturally ventilated malls with tenant fit outs of heat pump type A/C and LED lighting. Retail is quite Sustainability sensitive, and the asset owner is likely to be supportive of positive initiatives with tenants.	Large apartment block or complex of multiple blocks. Landlord owns entrance and circulation areas. Tenants owns / rent apartments. For older stock higher running costs and carbon footprint there will be tenant motivation to deep retrofit. This in many cases will align with landlord where he is the asset owner
Proposition to tenants – Step 1 (short lease)	Bilateral agreement EE Provider & Tenant IOT sensors to optimize control, Energy Procurement, Energy capacity & tariff review, Optimised FM As its low / no cost the proposition is likely to be attractive and should be supported. Where centralised landlord services exist, the landlord should/could be brought into this step.	Bilateral agreement EE Provider & Tenant IOT sensors to optimize control, Energy Procurement, Energy capacity & tariff review, Optimised FM As its low / no cost the proposition is likely to be attractive and should be supported	Bilateral agreement EE Provider & Tenant IOT sensors to optimize control, Energy Procurement, Energy capacity & tariff review, Optimised FM As its low / no cost the proposition is likely to be attractive and should be supported Where centralised landlord services exist,	Bilateral agreement EE Provider & Tenant IOT sensors to optimize control, Energy Procurement, Energy capacity & tariff review, Optimised FM As its low / no cost the proposition is likely to be attractive and should be supported Where centralised landlord services exist, the landlord	Bilateral agreement EE Provider & Tenant IOT sensors to optimize control, Energy Procurement, Energy capacity & tariff review, Optimised FM Logistically could be a lot of tenants to communicate and mobilise.. Relatively low energy footprint and therefore may not attract ESCO interest.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033744.

			the landlord should/could be brought into this step.	should/could be brought into this step.	Centralised systems may create ESCO interest directly with Landlord.
Step 1 - Challenge	Validation of savings and whether they will be sufficient to fund the ESCO input and generate enough interest from tenant too – large site better scope. Length of lease agreement could be a determining factor in ESCO participation. Overall proposition steps 1 & 2 would need to be presented at this stage to help with engagement.	Validation of savings and whether they will be sufficient to fund the ESCO input and generate enough interest from tenant too – large site better scope. Length of lease agreement could be a determining factor in ESCO participation Overall proposition steps 1 & 2 would need to be presented at this stage to help with engagement.	Validation of savings and whether they will be sufficient to fund the ESCO input and generate enough interest from tenant too – large site better scope. Length of lease agreement could be a determining factor in ESCO participation. Overall proposition steps 1 & 2 would need to be presented at this stage to help with engagement.	Validation of savings and whether they will be sufficient to fund the ESCO input and generate enough interest from tenant too – large site easier. Length of lease agreement could be a determining factor in ESCO participation. Overall proposition steps 1 & 2 would need to be presented at this stage to help with engagement. Possibly would benefit from support & coordination of landlord.	Validation of savings and whether they will be sufficient to fund the ESCO input and generate enough interest from tenant too – large site easier. Length of lease agreement could be a determining factor in ESCO participation.
Proposition to tenants (long lease) – Step 2 Capital Investment	<u>Agreement EE Provider and Tenant with Owners Consent</u> Demand response assessment, Energy trading potential, dynamic tariff opportunity assessment, PV & battery, heat pump / biomass, controls upgrades, major plant items upgrades, heat recovery and potentially other breakthrough technologies to arrive within the project timeframe.	<u>Agreement EE Provider and Tenant with Owners Consent</u> Demand response assessment, Energy trading potential, dynamic tariff opportunity assessment, PV & battery, heat pump / biomass, controls upgrades, major plant items upgrades, heat recovery and potentially	<u>Agreement EE Provider and Tenant with Owners Consent</u> Demand response assessment, Energy trading potential, dynamic tariff opportunity assessment, PV & battery, heat pump / biomass, controls upgrades, major plant items upgrades, heat recovery and potentially	<u>Agreement EE Provider and Tenant with Owners Consent</u> Demand response assessment, Energy trading potential, dynamic tariff opportunity assessment, PV & battery, heat pump / biomass, controls upgrades, major plant items upgrades, heat recovery and potentially	<u>Agreement EE Provider and Tenant with Owners Consent</u> Demand response assessment, Energy trading potential, dynamic tariff opportunity assessment, PV & battery, heat pump / biomass, controls upgrades, major plant items upgrades, heat recovery and potentially

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033744.

		other breakthrough technologies to arrive within the project timeframe	other breakthrough technologies to arrive within the project timeframe	other breakthrough technologies to arrive within the project timeframe. There is scope here to include the landlord here as a significant energy user in Step 2 and Step 1 also.	other breakthrough technologies to arrive within the project timeframe
Market / Model Concerns	Investment by ESCO in asset where no direct relationship exists with owners – this would require side agreement to preserve ESCO revenue in event of tenant default. This may be difficult to secure from Landlord unless its value is clear then this type of agreement unlikely to be entertained. ESCO may have difficulty funding this. Where centralized heating / cooling exists then this would need to be landlord investment.	Investment by ESCO in asset where no direct relationship exists with owners – this would require side agreement to preserve ESCO revenue in event of tenant default. This may be difficult to secure from Landlord unless its value is clear then this type of agreement unlikely to be entertained. ESCO may have difficulty funding this. Where centralized heating / cooling exists then this would need to be landlord investment.	Investment by ESCO in asset where no direct relationship exists with owners – this would require side agreement to preserve ESCO revenue in event of tenant default. This may be difficult to secure from Landlord unless its value is clear then this type of agreement unlikely to be entertained. ESCO may have difficulty funding this. Where centralized heating / cooling exists then this would need to be landlord investment.	Investment by ESCO in asset where no direct relationship exists with owners – this would require side agreement to preserve ESCO revenue in event of tenant default. This may be difficult to secure from Landlord unless its value is clear then this type of agreement unlikely to be entertained. ESCO may have difficulty funding this. Where centralized heating / cooling exists then this would need to be landlord investment. Where centralized heating / cooling exists then this would need to be landlord investment	As individual homeowners/ renters this cohort will possibly not act in unison. In situations where BER/EPC begins to effect valuations then external fabric upgrades is possibly where ESCO value be greatest. Where centralized heating / cooling exists then this would need to be landlord investment
Proposition to Landlord	Your asset is being improved through improved energy efficiency, your tenants need in	Motivators for this landlord are improved attractiveness of	Investors are more active in this typography and greater awareness	In the retail sector there is a sensitivity now around sustainability it's	Landlord will really only mobilize where they are apartment owners and

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033744.

	terms of rising energy costs are being managed, any net zero carbon agenda. The landlord's asset is still very poor in terms of Fabric and ideally if the model could address this it would be of greater appeal to the landlord. Where state ownership exists motivation to be exemplar may become a motivating factor in terms of support. In private case this motivation would be low.	portfolio to tenants. In retail parks their location overrides substantially sustainability credentials. This therefore is a typology where equally it could be argued that the split incentive is not present and while a landlord / tenant relationship exists for long lease agreements its likely that the tenant would make the investment in engineering system but that leaves fabric upgrades untouched.	around sustainability credentials of buildings. This will be a mobilizing factor for landlords in this sector and protection of asset value and attractiveness tor future tenants. This will mean that landlords in this sector will be supportive of the transition / investment for their tenants. This also means that they may offer the assurances to ESCOs. Ambition around Fabric upgrades here means that shared benefit model across engineering and fabric investment are more likely here.	a very 'bricks v clicks' competitive landscape and for many their future is uncertain. Shopping Centers with footfall reducing and putting pressure on overall center revenue. So strong focus on measures that deliver commercial benefits with environmental being secondary. So, any proposition has to consider fully this.	asset value / rental yields might be affected. They may get involved in engineering upgrades where there are communal heating systems. Envelope / fabric upgrades will be undertaken to preserve asset value and market attraction.
Ireland **Energy Trading** **Microgen revenue** **Demand response** **Dynamic Tariffs**	No Mid 2022 available Yes – load dependent No – but should exist during timeframe	No Mid 2022 available Yes – load dependent No – but should exist during timeframe	No Mid 2022 available Yes – load dependent No – but should exist during timeframe	No Mid 2022 available Yes – load dependent No – but should exist during timeframe	No Mid 2022 available Yes – load dependent No – but should exist during timeframe
Spain **Energy Trading** **Microgen revenue**	No Yes No	No Yes No	No Yes No	No Yes No	No Yes No

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033744.

Demand response Dynamic Tariffs	Yes	Yes	Yes	Yes	Yes
Greece Energy Trading	No bidirectional trading, but some utilities offer PPAs to large commercial and industrial consumers	No bidirectional trading, but some utilities offer PPAs to large commercial and industrial consumers	There is "virtual net metering" that allows a consumer to offset the cost of electricity consumption using the renewable energy generated by solar PVs installed somewhere else.	There is "virtual net metering" that allows a consumer to offset the cost of electricity consumption using the renewable energy generated by solar PVs installed somewhere else.	There is "virtual net metering" that allows a consumer to offset the cost of electricity consumption using the renewable energy generated by solar PVs installed somewhere else.
Microgen revenue	Yes (for renewables)	Yes (for renewables)	Yes (for renewables)	Yes (for renewables)	Yes (for renewables)
Demand response	No	No	No	No	No
Dynamic Tariffs	No	No	No	No	No

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101033744.